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SYSTEM PURCHASE AGREEMENT

BETWEEN

HUNT COUNTY, TEXAS
(Buyer or County)

and

L3HARRIS TECHNOLOGIES, INC.
COMMUNICATION SYSTEMS SEGMENT
(Seller or Contractor)

DATE: August 26, 2022

SYSTEM PURCHASE AGREEMENT

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SYSTEM PURCHASE AGREEMENT

THIS SYSTEM PURCHASE AGREEMENT ("Agreement") is made and entered into this 26th day of August, 2022 ("Effective Date"), by and between Hunt County, Texas, (hereinafter referred to as "Buyer" or the "County") and L3Harris Technologies, Inc., a Delaware corporation, acting through its Communication Systems Segment (hereinafter referred to as "Seller" or "Contractor") together the ("Parties").

WITNESSETH:

WHEREAS Seller, whose address is 221 Jefferson Ridge Parkway, Lynchburg, VA 24501, delivered a proposal (collectively, the "Seller's Proposal") to provide the radio communication System and services.

WHEREAS Buyer has selected Seller's Proposal and now desires to contract with Seller to provide Buyer with the radio communications System and services set forth in the Statement of Work attached to this Agreement as an exhibit.

WHEREAS Buyer and Seller desire to enter into this Agreement to set forth in writing their respective rights, duties and obligations hereunder.

NOW, THEREFORE, for and in consideration of the mutual promises contained herein and other good and valuable consideration, the sufficiency and receipt of which are hereby acknowledged, it is mutually agreed between the Buyer and Seller as follows:

SECTION 1. DEFINITIONS:

As used herein, the terms set forth below shall have meanings set forth below.

A.   "Acceptance" shall mean Acceptance of the System as set forth in the Testing and Acceptance section of this Agreement.

B.   "Acceptance Date" shall mean the date the System is accepted or deemed accepted as set forth in the Testing and Acceptance section of this Agreement.

C.   "Acceptance Tests" shall mean the testing procedures attached to the Statement of Work and mutually agreed upon by Buyer and Seller to be performed to determine whether the System has met the Acceptance criteria either set forth in the Statement of Work attached to this Agreement as an exhibit or as mutually agreed upon in writing by Buyer and Seller.

D.   "Certificate of Insurance" shall mean the certificate to be provided by Seller evidencing the insurance coverage of Seller.

E.   "Change Order" shall mean a written modification to the Total Agreement Price, Project Schedule or other Agreement terms which is signed by both Parties.

F.   "Detailed Design Documents" shall mean those documents deliverable by Seller to Buyer at the conclusion of the Detailed Design Review described in the subsection Detailed Design Review under the Project Management Planning section of this agreement.

G. "Detailed Design Review" or "DDR" shall have the meaning given in the subsection Detailed Design Review under the Project Management Planning section of this agreement.

H. "Documentation Deliverables" shall mean the standard commercial quality manuals to be furnished by the Seller to the Buyer pursuant to the terms set forth in the Statement of Work attached to this Agreement as an exhibit and this Agreement.

I. "Effective Date of the Agreement" shall be the date on which the Agreement is signed by the last of the parties to sign the Agreement. The "Effective Date" shall be the date inserted on the first page of the Agreement.

J. "Expiration Date" shall mean the date on which the Term of this Agreement shall end which shall be the end of the Warranty Period (as defined in the Warranty Section) except that some other sections of this Agreement may have a later end date for that section of the Agreement as specifically provided in those sections of this Agreement.

K. "Hardware" shall mean, collectively, the Terminal Hardware and Infrastructure Hardware, as defined below.

L. "Infrastructure Hardware" shall mean the equipment, goods, and materials to be supplied by Seller for the System infrastructure, as further described in the Statement of Work attached to this Agreement as an exhibit.

M. "Project Kick-Off Meeting" shall have the meeting given in the Project Management and Planning section of this Agreement.

N. "Project Manager" shall mean each respective Party's duly authorized representative designated to manage each Party's obligations.

O. "Project Schedule" shall mean the schedule attached to the Statement of Work or otherwise mutually agreed upon by Seller and Buyer in writing for the delivery of the Hardware and Software and the performance of the Services described in the Statement of Work attached to this Agreement as an exhibit.

P. "Project Sites" shall mean those sites where any construction work is performed or any Infrastructure Hardware is installed under the terms of this Agreement. The term "Project Sites" will include all of the Tower Sites (as defined below).

Q. "Responsibility Matrix" shall mean the table included in the Statement of Work attached to this Agreement as an exhibit, which depicts the roles and responsibilities of Seller and Buyer set forth this Agreement.

R. "Services" or "Work" shall mean the services and work to be provided by Seller to Buyer included in the Statement of Work attached to this Agreement as an exhibit.

S. "Software" shall mean the proprietary computer software of Seller as owned exclusively by Seller or Seller's suppliers, as appropriate, and as further defined in and licensed to Buyer pursuant to the terms of the Software License Agreement.

T. "Software License Agreement" shall mean the System Software License Agreement set forth in an exhibit attached to this Agreement.

U. "Statement of Work" shall mean the description of the work to be performed by Seller to deliver the Hardware, install the System and provide the Services, all as described in an exhibit attached to this Agreement.

V. "System" shall mean the radio communications System comprised of the Hardware and Software to be furnished by Seller to Buyer pursuant to the terms set forth in the Statement of Work attached to this Agreement as an exhibit.

W. "Terminal Hardware" shall mean mobile units, portable units, control stations and related accessories to be provided by Seller as listed in the Statement of Work attached to this Agreement as an exhibit.

X. "Total Agreement Price" shall mean the price of the Hardware, the Software license and the Services to be furnished by Seller to Buyer pursuant to the terms set forth in the Statement of Work attached to this Agreement as an exhibit and this Agreement.

Y. "Tower Sites" shall mean those sites where Infrastructure Hardware will be installed on existing or new towers as included in the Contractor's Statement of Work and to be finalized in the Detailed Design Documents or subsequent Change Orders.

SECTION 2. SCOPE OF WORK:

A. Seller shall furnish, deliver and install the Hardware and Software for the System and provide the Documentation Deliverables and Services in accordance with the terms of the Statement of Work, attached to this Agreement as an exhibit, the Project Schedule and this Agreement.

B. The Detailed Design Documents, as described in the Project Management and Planning section of this Agreement and as amended from time to time in writing by the Parties, shall be incorporated into this Agreement after the Detailed Design Documents are approved by the Buyer and thereafter shall supersede any contrary provisions in the Statement of Work attached to this Agreement as an exhibit.

C. Seller shall commence, carry on and complete its obligations under this Agreement with all deliberate speed in accordance with the dates set forth in the Project Schedule and in a sound, economical and efficient manner, in accordance with this Agreement and all applicable laws. In providing services under this Agreement, Seller agrees to cooperate with the various departments, agencies, employees and officers of Buyer.

D. Seller agrees to secure at Seller's own expense all personnel necessary to carry out Seller's obligations under this Agreement. Such personnel shall not be deemed to be employees of Buyer nor shall they or any of them have or be deemed to have any direct contractual relationship with Buyer. Seller expressly understands and agrees that the Seller is and shall in all respects be considered an independent contractor.

SECTION 3. PROJECT MANAGEMENT AND PLANNING:

A. **Project Managers.** Seller shall designate a Project Manager who will lead the Seller's team for the System installation project and other Services and Work described in this Agreement (the "Project") and will serve as the Buyer's primary point-of-contact for Seller's project team and the official liaison

between Seller's project team and Buyer. Buyer shall designate a Project Manager to function as the single point-of-contact and official liaison between Seller's Project Manager and the Buyer.

B. **Project Completion Dates.** The Project completion dates are described in the schedule included in the Statement of Work, entitled "Project Schedule." The Project Schedule may only be modified by mutual written approval of the Parties or as otherwise provided in this Agreement.

C. **Project Kick-off Meeting.** Promptly after the Effective Date of the Agreement, the Seller's Project Manager shall schedule a Project Kick-Off Meeting, the timing and location of which will be mutually agreed upon by Seller and Buyer. The objectives of this meeting include introduction of all project participants, review of the roles of the project participants, review of the overall project scope and objectives, review of the resource and scheduling requirements and review of current site status.

D. **Site Visits.** All existing towers, shelters and associated equipment provided by or mandated by Buyer shall be satisfactory in all manners to accommodate the System proposed by the Seller. Following the Effective Date of the Agreement, the Buyer shall provide Seller with access to all Project Sites upon reasonable notice to allow Seller to thoroughly examine each Site and to perform the Detailed Design Review, to prepare a schedule of preparatory work required for each site and a timeline for completion of the preparatory work at each site.

E. **Construction Management Services, Site Preparatory Work.** Seller shall perform the civil construction services set forth in the Statement of Work and the Responsibility Matrix including, but not limited to, the site improvement civil construction to be performed at the identified sites. Buyer shall identify and disclose to Seller any and all problems or conditions at all Project Sites of which Buyer is aware that may affect the Work to be performed by Seller under this Agreement.

F. **Detailed Design Review.** The Detailed Design Review ("DDR") phase will commence after the Effective Date of the Agreement, and conclude at a mutually acceptable time to maintain adherence to the Project Schedule. During the DDR, Seller's Project Manager will meet with Buyer's project team on one or multiple occasions to review the System design, technical data, and site specific information to confirm and to refine the System and Tower Sites. At the conclusion of the DDR, Seller will provide Buyer with the following documents (the "Detailed Design Documents") for review and approval by Buyer:

- Final Siting Plans
- Project Schedule
- Engineered Site plans (sufficient for the Buyer to obtain required zoning approvals) and construction drawings for each site.
- Shelter Floor Plan Drawings
- Rack Elevation Drawings
- System Block and Level Diagrams
- Power and HVAC Loads
- Antenna Network Diagrams
- Site Frequency Plans (including spectrum analysis and intermodulation studies of existing and proposed frequencies at each site).
- TX Combiner Plan by Site

- Network Backhaul Plans
- Any other documents as mutually agreed upon by the parties

Buyer shall have fourteen (14) days to conduct its review of the above documents. Approval of Detailed Design Documents by the Buyer shall not be unreasonably withheld, conditioned or delayed.

G. **Project Schedule.** The Project Schedule for the Work is included in the Statement of Work, as an attachment entitled "Project Schedule." Updates to the start dates and durations will be made as the information evolves and will be mutually agreed upon by both parties or updated as otherwise provided herein.

H. **System Implementation Communications.** Seller and Buyer shall jointly establish a plan that defines regular meetings, reporting structure, and other communications activities, including working sessions that may be needed throughout the term of this Agreement to plan sub-tasks, including at a minimum: (a) one or more DDR meetings to communicate the final engineering design; (b) formal monthly reports to Buyer's Project Manager concerning work in progress and accomplishments; (c) periodic status meetings at which the parties' Project Managers and other project participants will provide updates; (d) conference calls with Seller's and Buyer's project teams to discuss tasks, assign responsibility, and establish schedules; and (e) workshops or working sessions that may be needed throughout the Project to plan subtasks.

I. **Buyer Approvals.** Buyer will review and respond with reasonable promptness to all submittals or other items requiring its approval under this Agreement. For all such submittals or other items Buyer will provide the Seller with either; (i) written notification of Buyer's approval, or (ii) a written notification of conditional approval subject to Seller providing prompt correction of any noted deficiency, or (iii) in the case of a submittal that does not meet the requirements of the Agreement, a written notification of Buyer's disapproval. Buyer's disapproval notification will be provided with reasonable detail to sufficiently advise Seller of the basis on which the submittal was determined to be unacceptable. Buyer agrees that, except as otherwise provided, failure to provide approval, conditional approval or non-approval of a submittal for which its approval is required within fifteen (15) days of receipt of the submittal from the Seller shall constitute approval of the submittal. The parties agree that this section, Project Management and Planning, does not relate to the Testing and Acceptance procedures in the Testing and Acceptance section of this Agreement.

SECTION 4. OBLIGATIONS FOR SYSTEM IMPLEMENTATION:

The following subsections apply to the Work to be performed under the Agreement.

A. **Project Management and Implementation Plan.** Buyer and Seller each agree to perform their respective tasks and obligations pertaining to permits and licenses, Project Site surveys, general Project Site-related responsibilities, general Hardware-related responsibilities, and Project Site-specific responsibilities as set forth in the Statement of Work. The Buyer's obligations set forth in the Statement of Work shall be performed by Buyer in a timely and proper fashion in accordance with the Project Schedule, or as otherwise agreed upon by Buyer and Seller, to allow Seller to timely perform its obligations under the Agreement.

B. **Access.** Buyer shall provide access, at no cost to Seller, to all owned, leased, or licensed Project Sites at reasonable times, and with an escort (if required) at no charge, upon reasonable prior notification from Seller. Buyer shall ensure sufficient room, within reason, for construction vehicles used by Seller.

Buyer shall issue temporary identification cards to Seller's personnel and its authorized subcontractors, if required, for access to any of the Project Sites.

C.   **Changes in Sites.** Any sites where Seller will operate and perform System installation under the terms of this Contract must be approved by Buyer, which approval shall not be unreasonably withheld, delayed or conditioned. Should Buyer direct an addition to, removal from, or modification of the list of sites as detailed in this Agreement that affects Seller's cost or schedule or System performance, including, but not limited to coverage, the parties agree that such change shall entitle Seller to a Change Order and each Party shall attempt, in good faith to fully negotiate and execute such Change Order prior to commencement of the Work at the changed site.

D.   **Preparatory Work on Sites.** Notwithstanding anything to the contrary contained in this Agreement, the parties agree that some Project Sites may require tower replacement or modifications, as well as related permitting and licensing for Work and/or obtaining physical real estate space. As stated in the Responsibility Matrix, Buyer shall be responsible for securing all necessary site zoning, site access, or other permits (including but not limited to easements, impact studies, planning commission approval, variances, etc.) necessary for the Work, whether required by federal, state, or local authorities, with Seller assisting by providing information and any required civil engineering drawings. Buyer shall also have the responsibility to secure by lease, purchase, easement or otherwise all rights and access to selected sites or additional real estate as may be required. Buyer also shall be responsible for paying all utility charges to the appropriate utility for providing utility services to the System installation areas. The Parties agree to mitigate the need for tower replacement or modification to the extent practical. If any unanticipated tower replacements or modifications become necessary, Seller is entitled to an extension of time for any impacted activities and/or an equitable adjustment to the Contract Price to maintain the Project Schedule.

E.   **Frequency Federal Communications Commission (FCC) Licensing.** The Seller will be responsible for obtaining all FCC frequency licenses for the System in Buyer's name as licensee, with Buyer providing support and information, including the signing of documents, as set forth in the Statement of Work. It is acknowledged and understood that Seller does not guarantee license approvals, and that, if licenses are not timely granted or changes in licensing cause a redesign, in either case, resulting in a material impact on the cost of Work performed by Seller under the Agreement and/or the Project Schedule, the parties agree that Seller shall be entitled to an equitable adjustment to the Project Schedule, the Total Agreement Price, or both and that a Change Order shall be agreed to by the parties.

F.   **Federal Aviation Administration (FAA) Approvals.** Buyer will be responsible for obtaining all FAA approvals for newly-constructed or modified towers.

G.   **Contractor Licenses.** Seller will be responsible for obtaining all contractor licenses required for the performance of its duties and obligations.

H.   **Construction Permits.** The Contractor shall be responsible for obtaining all necessary construction permits for system installation and implementation. The County will provide assistance in expediting the permitting process. The Contractor will retain the ultimate responsibility for obtaining the appropriate construction permits.

SECTION 5. DELIVERY, TITLE AND RISK OF LOSS:

A.   **Infrastructure Hardware**. Seller shall ship the Infrastructure Hardware to Buyer at Seller's expense on or before the dates set forth in the Project Schedule. Partial deliveries shall be permitted. Upon delivery to the customer's designated location, title to each portion of the Hardware and all risk of loss or damage shall pass to Buyer. Infrastructure Hardware may be shipped directly to Buyer or to a mutually agreed upon staging or storage location. Buyer shall keep the Hardware fully insured for the total amount of all monies then due, or yet to become due, to Seller with respect to this Agreement.

B.   **Terminal Hardware**. Seller shall ship the Terminal Hardware to Buyer at Seller's expense on or before the dates set forth in the Project Schedule. Partial deliveries shall be permitted. Upon delivery to the customer's designated location, title to each portion of the Hardware and all risk of loss or damage shall pass to Buyer.

C.   If Buyer fails to take delivery of any of the Hardware, Seller may place such Hardware in storage at the place of manufacture or elsewhere. In such event: (1) Seller shall notify Buyer of the placement of any Hardware in storage; (2) Seller's delivery obligations shall be deemed fulfilled and title and all risk of loss or damage shall thereupon pass to Buyer; (3) any amounts otherwise payable to Seller upon delivery shall be payable upon presentation of Seller's invoices therefore; and (4) promptly upon submission of Seller's invoices therefore Buyer shall reimburse Seller for all expenses incurred by Seller such as preparation for and placement into storage, handling, storage, demurrage, inspection, preservation and insurance.

SECTION 6. PRICE:

The Total Agreement Price to be paid by Buyer to Seller is Four Million One-Hundred Twenty-One Thousand One-Hundred Sixty-Five United States Dollars and Zero Cents ($4,121,165.00). The individual prices for the units of Hardware, the Software license and the Services to be performed are as set forth in the Price Schedule as an attachment to the Statement of Work.

SECTION 7. TAXES:

In addition to any price specified herein, Buyer shall pay the gross amount of any present or future sales, use, excise, value-added, or other similar tax applicable to the price, sale or any Hardware or Services furnished hereunder or to their use by Seller or Buyer, or Buyer shall otherwise furnish Seller with tax exemption certificates acceptable to all applicable taxing authorities.

SECTION 8. CHANGES AND ADDITIONS:

A.   **Hardware Changes**. In the event of any change in the Hardware as a result of the imposition after the Effective Date of this Agreement of any requirements by any federal, state, or local government, Seller shall be entitled to an equitable adjustment, by Change Order, in the Total Agreement Price, the Project Schedule, or both. Any such adjustment in the Total Agreement Price or Project Schedule shall be mutually satisfactory to Buyer and Seller. Price increases and/or extensions of time shall not be binding upon either Party unless and until evidenced by a Change Order signed by the parties hereto.

B.   **Buyer Requested Changes**. Buyer may request changes in or additions to the Work or in the time or place of performance of the Work under this Agreement. If any such change causes an increase or decrease in the cost of, or the time required for, performance of any part of the Work under this Agreement, Seller shall be entitled to an equitable adjustment, by Change Order, in the Total Agreement Price, the Project Schedule, or both. Any such adjustment in the Total Agreement Price

or Project Schedule shall be mutually satisfactory to Buyer and Seller. Price increases and/or extensions of time shall not be binding upon either Party unless and until evidenced by a Change Order signed by the parties hereto.

C.   **Buyer Delays In Performance.** To the extent that Buyer fails to timely perform its obligations under the Responsibility Matrix or otherwise under this Agreement, and such failure has a material impact on the cost of Work performed by Seller under the Agreement and/or the Project Schedule, the Parties agree that Seller shall be entitled to an equitable adjustment to the Project Schedule, the Total Agreement Price, or both. Any such adjustment in the Total Agreement Price or Project Schedule shall be mutually satisfactory to Buyer and Seller. Price increases and/or extensions of time shall not be binding upon either Party unless and until evidenced by a Change Order signed by the parties hereto.

D.   **Concealed Conditions.** If, following Buyer's Acceptance of the Detailed Design Documents, Seller encounters a concealed condition, of which it had no reason to be aware, at one or more Project Sites, then the Parties agree to work together to determine the best course of action and agree to negotiate in good faith a Change Order and an equitable adjustment to the Project Schedule and/or Total Agreement Price. Any such adjustment in the Total Agreement Price or Project Schedule shall be mutually satisfactory to Buyer and Seller. Price increases and/or extensions of time shall not be binding upon either Party unless and until evidenced by a Change Order signed by the parties hereto.

E.   **Product Discontinuance.** Subject to its obligation to fulfill its obligations set forth in the Agreement, Seller reserves the right to change or to discontinue any product covered by the Agreement provided that Seller agrees to make available to the Buyer a functionally equivalent replacement product equal to or better than the product discontinued.

F.   **Frequency Support and Frequency Changes.** Seller shall reasonably support Buyer in submitting the Buyer's frequency licensing applications to the regional authorities and the FCC for this project. In the event that, after all commercially reasonable efforts and due diligence have been expended, the Buyer cannot obtain all of the necessary United States and Canada government approvals for the frequency plan as described in this Statement of Work and this Agreement, it shall be treated as an excusable delay event pursuant to the Excusable Delays section of this agreement for which an extension to the Project Schedule shall be granted, and Seller will diligently and expeditiously prepare and provide to Buyer a System re-design for its review and approval including all price and Project Schedule changes. Notwithstanding anything to the contrary contained in the Agreement, the Parties agree if a System re-design has a material impact on the cost of Work performed by Seller under the Agreement and/or the schedule, the Parties agree that that Seller may be entitled to an equitable adjustment to the Total Agreement Price and/or the Project Schedule for Seller's services on any such System re-design. Any such adjustment in the Total Agreement Price or Project Schedule shall be mutually satisfactory to Buyer and Seller. Price increases and/or extensions of time shall not be binding upon either Party unless and until evidenced by a Change Order signed by the parties hereto. In the event that Buyer and Seller cannot mutually agree on the System re-design, either party may then terminate the Agreement on thirty (30) days written notice to the other Party.

SECTION 9. PAYMENTS:

A.   The Total Agreement Price for the Hardware, the Software license and the Services shall be paid by the Buyer to Seller as follows:

A.1. Infrastructure Hardware:

1. Ten percent (10%) of the Total Agreement Price (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) shall be due at the time of the signing of the Agreement by the Buyer and Seller.

2. Ten percent (10%) of the Total Agreement Price (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) shall be due at the time of the first System design review meeting.

3. Twenty percent (20%) of the Total Agreement Price (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) shall be due at the time of Infrastructure Hardware factory staging as described in the project schedule.

4. Thirty percent (30%) of the Total Agreement Price (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) shall be due at the time of Infrastructure Hardware shipment and delivery to Buyer. Partial payments of the total Infrastructure Hardware amount due under this subparagraph shall be allowed and shall be calculated using the value of the Infrastructure Hardware shipped and delivered as a percentage of the total value of the Infrastructure Hardware to be shipped and delivered under the terms of this Agreement. The Buyer shall have the right to inspect and confirm that the Infrastructure Hardware included in Seller's invoice has been delivered to Buyer.

5. Fifteen percent (15%) of the Total Agreement Price (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) shall be due upon substantial completion of the Hardware installation (exclusive of the mutually agreed upon value of any punchlist items).

6. Fifteen percent (15%) of the Total Agreement Price (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) plus any remaining unpaid portion of the Total Agreement Price for all Hardware, Software and Services to be provided under the terms of this Agreement (excluding the aggregate price of the Terminal Hardware included in the Total Agreement Price) shall be due upon final Acceptance of the System.

A.2. Terminal Hardware:

1. One Hundred Percent (100%) of the purchase price of Terminal Hardware shall be invoiced upon shipment of unit on a per unit basis.

B. **Invoices and Electronic Funds Transfer**

Unless otherwise agreed by the parties, Seller shall electronically submit invoices using Seller's standard invoice template. Buyer shall pay all invoices via Electronic Funds Transfer ("EFT") directly to Seller's banking institution using Seller's banking information and EFT instructions below.

L3Harris Technologies, Inc.
Bank of America, New York, NY 10038
Account No.: 4451124230
Routing/ABA (ACH ONLY): 111000012
Routing/ABA (Wire ONLY): 026009593

C.   **Payment Dates**

The Payment(s) associated with the event(s) above shall be due thirty (30) days following the date of Seller's invoice.

D.   **Other Amounts**

Any other amounts due Seller hereunder shall be due upon Buyer's receipt of Seller's invoice.

E.   **Late Payments**

PAYMENT will be made upon receipt and acceptance by the County of items ordered, if applicable, and receipt of a valid invoice, in accordance with the State of Texas Prompt Payment Act, Article 601f V.T.C.S. All amounts past due over thirty (30) days shall accrue interest from their due date at the rate of one and one-half percent (1-1/2%) per month (or such lesser rate as may be the maximum permissible rate under applicable law).

SECTION 10. SUBCONTRACTING:

Seller may subcontract any portion of Work to be performed by Seller hereunder provided that Seller shall be responsible for the performance and Work of any such subcontractors.

SECTION 11. EXCUSABLE DELAYS:

A.   Seller shall not be liable for delays in delivery or failure to perform due directly or indirectly to: (1) causes beyond Seller's reasonable control, (2) Acts of God, acts (including failure to act) of any governmental authority (de jure or de facto), wars (declared or undeclared), riots, revolutions, strikes or other labor disputes, fires, floods, sabotage, nuclear incidents, earthquakes, storms, epidemics, (3) Seller's inability to timely obtain necessary materials, items, components or services from suppliers who are affected by the foregoing circumstances, or (4) Buyer Delays in Performance of its obligations hereunder in a timely manner. The foregoing shall apply even though any of such causes exists at the time of signature of the Agreement by Seller or occurs after delays in Seller's performance of its obligations due to other reasons.

B.   In the event of any delay or failure excused by this Section Excusable Delays, Seller shall as soon as practical notify Buyer and shall at the same time, or at the earliest practical date after such notice, specify the revised delivery and performance dates. In the event of such delay, the time of delivery or of performance shall be extended for a reasonable time period to compensate for the time lost by Seller by reason of the delay.

SECTION 12. SELLER'S INSURANCE:

A.   In order to protect itself and Buyer, its officers, boards, commissions, agencies, employees and representatives under the indemnity and other provisions of this Agreement, Seller shall obtain and at all times during the term of this Agreement keep in full force and effect comprehensive general liability and auto liability insurance policies issued by a company or companies authorized to do business in the State of Texas and licensed by the Insurance Department, with liability coverage provided for therein in the amounts of at least $1,000,000.00 CSL (Combined Single Limits). Coverage afforded shall apply as primary. Within ten (10) days after execution of this Agreement, Seller shall furnish Buyer with a Certificate of Insurance listing Buyer as an additional insured. Seller shall maintain coverage for the duration of this Agreement and for two years following the completion of this

Agreement. Seller shall furnish Buyer, annually on the policy renewal date, a Certificate of Insurance as evidence of coverage. It is further agreed that Seller shall furnish the Buyer with a 30-day notice of cancellation or renewal. Seller shall furnish evidence of adequate Worker's Compensation Insurance.

B.   In case of any sublet of Work under this Agreement, Seller shall furnish evidence that each and every subcontractor has in force and effect insurance policies providing coverage substantially equal to that required of Seller.

C.   The parties do hereby expressly agree that Buyer, acting at its sole option and through its Risk Manager, may waive any and all requirements contained in this section Seller's Insurance, such waiver to be in writing only. Such waiver may include or be limited to a reduction in the amount of coverage required above. The extent of waiver shall be determined solely by Buyer's Risk Manager taking into account the nature of the Work and other factors relevant to Buyer's exposure, if any, under this Agreement.

SECTION 13. TESTING AND ACCEPTANCE:

A.   Seller shall notify Buyer that the System is ready for Acceptance Tests at least ten (10) days before commencement of the Acceptance Tests. Buyer and Seller shall jointly commence the Acceptance Tests on the date specified in Seller's notice (or other mutually agreeable date) and a representative of Seller and a representative of Buyer shall sign off on the form provided as part of the test procedure whether each item of the test was passed or failed. If the System does not fulfill the requirements of the Acceptance Tests, Seller shall correct the defects at no additional cost to Buyer as soon as practicable. Upon correction of the defects the Acceptance Tests for the applicable part of the System shall be repeated in accordance with the procedures set forth in this Section. Successful completion of the Acceptance Test is the sole criterion for Acceptance of the System and the initiation of the Warranty Period. Final System Acceptance shall occur when the Hardware and Software for the System, Documentation Deliverables and Services have been furnished, delivered, installed, the Acceptance Tests have been passed, and acceptance test reports have been submitted. Final System Acceptance will be issued by the County no later than thirty (30) days after successful completion of the foregoing.

B.   Notwithstanding the Acceptance testing of the System set forth in subsection A above, if Buyer commences use of any portion of the System for its intended purpose, other than for the express purpose of training or testing as mutually agreed upon by Seller and Buyer in writing, prior to System Acceptance, the applicable portion of the System shall be deemed accepted by Buyer. The final payment for the applicable portion of the System shall be due and payable upon such Acceptance. The Warranty Period for the applicable portion of the System put into use together with the associated installation Services shall be deemed to have commenced concurrently with the use of the applicable portion of the System for its intended purpose. The use of the applicable portion of the System for its intended purpose shall be deemed to have occurred when Buyer commences to use and rely primarily on the applicable portion of the System for its communications.

C.   As used in the Agreement, the term "Acceptance Date" shall mean and "Acceptance" of the System shall be deemed to occur upon the earlier of: (1) the date on which the System is deemed accepted pursuant to subsection (A) above, or (2) the date on which the System is deemed accepted pursuant to subsection (B) above.

D.   Buyer and Seller agree that in the process of completing the Acceptance Tests, most if not all of the Acceptance Tests can be successfully completed with only a minor number of punchlist items remaining to be completed. In such event, Buyer and Seller shall mutually (and reasonably) agree

upon the punchlist items to be completed, the value of those items and that "Conditional Acceptance" of the System has occurred. For the purpose of initiating the Warranty Period, satisfying the Project Schedule requirements and the release of any retained funds (other than the value of the punchlist items) conditional Acceptance shall constitute "Acceptance" of the specific portion or phase of the System. Conditional Acceptance shall not, however, release Seller from its obligations to complete the remaining punchlist items by the dates set forth on the punchlist schedule.

E.   Terminal Hardware purchased after the Acceptance Date shall be deemed accepted upon Buyer's receipt of delivery at a Buyer-controlled facility, together with a bill of sale or other reasonably requested evidence of title.

SECTION 14. SOFTWARE LICENSE:
Subject to the terms and conditions of the Software License Agreement attached hereto as an exhibit to this Agreement, Buyer is granted a license to use the Software only in conjunction with the System purchased under this Agreement. "Software" means the "Licensed Programs" as defined in the Software License Agreement.

SECTION 15. COVERAGE:

Seller's representations concerning the distance at which usable radio signals will be transmitted and received by Hardware supplied hereunder are set forth in the Statement of Work. Coverage for the System shall be measured as provided in the Testing and Acceptance section of this Agreement.

SECTION 16. WARRANTIES:

A.   **Hardware and Services**

Seller warrants for the following periods of time from the Acceptance Date (hereinafter referred to as the "Warranty Period"), that the Hardware and installation Services furnished by Seller under this Agreement shall be free from defects in material and workmanship and shall conform to the Agreement specifications. Any Services provided during the Warranty Period are set forth in the Statement of Work. Any and all claims for breach of this warranty are conclusively deemed waived unless made within the Warranty Period.
1. for mobile and portable radios, thirty-six (36) months.
2. for all other Hardware, thirty-six (36) months.

B.   For purposes of this Warranty the batteries supplied by Seller shall be deemed defective if: (1) the battery capacity is less than 80% of rated capacity, or (2) the battery develops leakage. Replacement batteries shall be warranted only for the remaining unexpired portion of the Warranty Period. This warranty becomes void if: (1) the battery has been subjected to any kind of misuse, detrimental exposure, or has been involved in an accident which affects the integrity of the battery or its casing, or (2) the battery is used in equipment or service other than the Hardware for which it is specified.

C.   During the Warranty Period if any component of the Hardware or portion of the installation Services fails to meet the foregoing warranties, Seller's sole obligation and Buyer's exclusive remedy under this warranty shall be the correction by Seller of the failure. Seller shall, at Seller's sole option, (1) repair any defective component of the Hardware, or (2) furnish necessary repaired, refurbished, or replacement parts, or (3) correct the faulty installation. Seller will be responsible for all shipping charges incurred in returning defective parts to Seller's facility and the shipping charges to return repaired, refurbished, or replacement parts to Buyer. Any such repair or replacement of the defective component or the redoing of any installation shall not extend the Warranty Period. All warranty work

must be at the Seller's place of business, for mobile or portable equipment, or at the Buyer's location for fixed location equipment.

D.   Any additional purchases of equipment, including radios, and installation services which may be purchased by Buyer and delivered or performed by Seller after System Acceptance, shall be warranted on the same terms, limitations, and exclusions as are set forth herein, except that the warranty on the equipment and installation services shall be for a period of two (2) years for additional Terminal Hardware items from the date of delivery of that item of equipment, one (1) year for additional Infrastructure Hardware items from the date of delivery of that item of equipment, and one (1) year from the date of completion of that installation service.

E.   Seller's obligations shall not apply to: (1) Hardware or components thereof which are normally consumed in operation, or, or (2) defects which are the result of improper storage, use, or installation performed by other than Seller, maintenance performed by other than Seller, or repair performed by other than Seller, or (3) Hardware which has been subjected to any other kind of misuse or detrimental exposure or has been involved in an accident, or (4) Hardware or installations altered or repaired by any party other than Seller without Seller's prior written consent.

F.   **Coverage Warranty.** Notwithstanding the other provisions of this Section Warranties, Seller's only Warranty as to radio coverage is that the System, prior to Acceptance, shall have successfully passed the coverage tests in the Acceptance Test Plan.

G.   **Software.** The warranty for the Software is set forth in the Software License Agreement.

H.   THE WARRANTIES AND REMEDIES SET FORTH IN THIS SECTION AND IN THE SOFTWARE LICENSE AGREEMENT CONSTITUTE THE ONLY WARRANTIES WITH RESPECT TO THE HARDWARE, SOFTWARE AND SERVICES AND THE BUYER'S EXCLUSIVE REMEDIES IN THE EVENT SUCH WARRANTIES ARE BREACHED. THEY ARE IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL, EXPRESS, IMPLIED, OR STATUTORY INCLUDING, WITHOUT LIMITATION, THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL, CONSEQUENTIAL OR INDIRECT DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUES.

SECTION 17. INTERFERENCE:

Radio System coverage and performance are subject to degradation or disruption due to anomalous propagation and interference by natural phenomena or other radio Systems ("Outside Interference"). Seller cannot be responsible for Outside Interference over which the Seller has no reasonable control. In the event of a case of degradation or disruption due to Outside Interference by natural phenomena or an outside party, Seller will provide engineering support to Buyer at Buyer's expense to support Buyer's efforts in investigating and resolving the Outside Interference.

SECTION 18. INDEMNIFICATION:

A.   Seller shall be responsible for and agrees to indemnify, hold harmless and defend the Buyer and its boards, commissions, agencies, officers and employees from and against all liability, losses, damages, costs or expenses which the Buyer and its boards, commissions, agencies and employees may sustain, incur or be required to pay by reason of third party claims, demands and causes of action for damages resulting from personal injuries, loss of life or damage to tangible property to the extent resulting from the willful misconduct or negligent acts or omissions of Seller, Seller's officers, agents, employees, or

subcontractors. Buyer agrees to notify Seller in writing as soon as practical of any third party claim, demand or cause of action for which Buyer will request indemnification from Seller. Buyer will provide Seller with the necessary information and assistance to defend or settle such claim, demand or cause of action. The obligations of Seller under this paragraph shall survive the expiration or termination of this Agreement.

B. Buyer shall be responsible for and agrees to indemnify, hold harmless and defend the Seller and its board of directors, officers and employees from and against all liability, losses, damages, costs or expenses which the Seller and its board of directors, officers and employees may sustain, incur or be required to pay by reason of third party claims, demands and causes of action for damages resulting from personal injuries, loss of life or damage to tangible property to the extent resulting from the willful misconduct or negligent acts or omissions of the Buyer and its boards, commissions, agencies, employees and subcontractors. Seller agrees to notify Buyer in writing as soon as practical of any third party claim, demand or cause of action for which Seller will request indemnification from Buyer. Seller will provide Buyer with the necessary information and assistance to defend or settle such claim, demand or cause of action. The obligations of Buyer under this paragraph shall survive the expiration or termination of this Agreement.

SECTION 19. PATENTS:

A. Seller warrants that the System furnished hereunder shall be delivered free of any rightful claim of any third party for infringement of any United States patent or copyright. If Buyer notifies Seller promptly of the receipt of any claim that the System infringes a United States patent or copyright and gives Seller information, assistance and exclusive authority to settle and defend such claim, Seller at its own expense shall defend, or may settle, any suit or proceeding against Buyer so far as based on a claimed infringement which breaches this warranty. If, in any such suit arising from such claim, the continued use of the System for the purpose intended is enjoined by any court of competent jurisdiction, Seller shall, at its expense and option, either: (1) procure for Buyer the right to continue using the System, or (2) modify the System so that it becomes non-infringing, or (3) replace the System or portions thereof so that it becomes non-infringing, or (4) remove the System and refund the purchase price (less reasonable depreciation for use). The foregoing states the entire liability of Seller for patent or copyright infringement by the System and is subject to any limitation of total liability set forth in this Agreement.

B. The preceding subsection (A) shall not apply to: (1) any portion of the System which is manufactured to Buyer's design, or (2) the use of the System in conjunction with any other apparatus or material not supplied by Seller to the extent that such conjoined use causes the alleged infringement. As to any portion of the System or use described in the preceding sentence, Seller assumes no liability whatsoever for patent infringement.

C. THE PATENT AND COPYRIGHT WARRANTY AND INDEMNITY OBLIGATIONS RECITED ABOVE ARE IN LIEU OF ALL OTHER PATENT AND COPYRIGHT WARRANTIES AND INDEMNITIES WHATSOEVER, WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED OR STATUTORY.

SECTION 20. LIMITATION OF LIABILITY:

A. IN NO EVENT, WHETHER AS A RESULT OF BREACH OF AGREEMENT, WARRANTY, TORT (INCLUDING NEGLIGENCE OR INFRINGEMENT), STRICT LIABILITY OR OTHERWISE, SHALL SELLER, OR ITS SUBCONTRACTORS OR SUPPLIERS, BE LIABLE

FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, INDIRECT OR EXEMPLARY DAMAGES.

B.   The provisions of this Section, LIMITATION OF LIABILITY, shall apply notwithstanding any other provisions of this Agreement or any other agreement.

C.   The provisions of this Section, LIMITATION OF LIABILITY, shall survive the expiration or termination of this Agreement.

SECTION 21. REMEDIES:

A.   Termination for Cause: If the Contractor fails to fulfill in a timely and proper manner its obligations under this Agreement, or if the Contractor violates any of the covenants, conditions, agreements, or stipulations of this Agreement, the County shall have the right to terminate this Agreement by giving written notice to the Contractor of such termination and specifying the effective date thereof, which shall be at least 90 days after written notification to correct, cure and/or case the violations of the terms of the Agreement, after which this Agreement may be terminated for cause immediately. In the event of termination for cause, all finished or unfinished documents, data, studies, surveys, drawings, maps, models, photographs and reports prepared by the Contractor pursuant to this Agreement shall, at the option of the County, be turned over to the County and become the property of the County. In the event of termination for cause, the Contractor shall be entitled to receive reasonable compensation for any necessary services actually and satisfactorily performed prior to the date of termination. Notwithstanding the above, the Contractor shall not be relieved of liability to the County for damages sustained by virtue of any breach of contract by the Contractor, and the County may set-off the damages it incurred as a result of the Contractor's breach of contract from any amounts it might otherwise owe the Contractor.

B.   In the event of a material breach of this Agreement by Seller which shall continue for ninety (90) or more days after written notice of such breach (including a reasonably detailed statement of the nature of such breach) shall have been given to Seller by Buyer, Buyer shall be entitled to avail itself cumulatively of any and all remedies available at law or in equity (provided such remedies are not otherwise limited under the terms of this Agreement) and either: (1) suspend performance of its payment obligations under the Agreement for as long as the breach continues uncorrected; or (2) terminate this Agreement by written notice to Seller if the breach remains uncorrected. The following shall constitute material breaches of this Agreement:
1. violation by Seller of any State, Federal or local law, or failure by Seller to comply with any applicable States and Federal service standards, as expressed by applicable statutes, rules and regulations.
2. failure by Seller to carry applicable licenses or certifications as required by law.
3. failure of Seller to comply with reporting requirements contained herein.
4. inability of Seller to perform the Work provided for herein.

C.   Termination for Convenience: the County may at any time and for any reason terminate Contractor's services and work at the County's convenience upon providing written notice to the Contractor specifying the extent of termination and the effective date. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement. Upon such termination, all Services performed and finished and unfinished Hardware and Documentation Deliverables produced or made by Contractor for the County, up to and including the date of termination, shall become property of the County, and Contractor shall be entitled to payment only as follows: (1) that portion of the Total Agreement Price accrued up to the point of termination for any

such Services performed and finished and unfinished Hardware and Documentation Deliverables, plus (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by the County. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Except as set forth in this Section, Contractor shall not be entitled to any claim or claim of lien against the County for any additional compensation or damages in the event of such termination and payment.

In the event of: (1) any failure by Buyer for thirty (30) or more days to make any payment when due, or (2) any other material breach of this Agreement by Buyer which shall continue for one hundred twenty (120) or more days after written notice of such breach (including a reasonably detailed statement of the nature of such breach) shall have been given to Buyer by Seller, Seller shall be entitled to avail itself cumulatively of any and all remedies available at law or in equity (provided such remedies are not otherwise limited under the terms of this Agreement) and either: (1) suspend performance of its obligations under this Agreement for as long as the breach remains uncorrected; or (2) terminate this Agreement by written notice to Buyer if the breach remains uncorrected.

SECTION 22. CONFIDENTIALITY:

A.   During the term of this Agreement, it is anticipated that one party (hereafter the "Disclosing Party") may disclose to the other party (hereafter the "Receiving Party") information which the Disclosing Party considers proprietary and confidential. Accordingly, with respect to any specification, drawings, sketches, models, samples, tools, technical information, confidential business information or data, in written or other tangible form which: (1) has been designated in writing by the Disclosing Party as confidential or proprietary, or (2) is of the type that the Receiving Party customarily treats as confidential or proprietary, and which is furnished by the Disclosing Party to the Receiving party in contemplation of or under this Agreement (hereinafter "Information"), the Receiving Party shall treat such Information, for a period of five (5) years after the Effective Date of this Agreement, as confidential information with the same degree of care as the Receiving Party affords to confidential information of its own of a similar nature and shall not reproduce any such Information, in whole or in part, except as specifically authorized in writing by the Disclosing Party.

B.   The provisions of the preceding subsection shall not apply to any Information which:
1. is or shall become publicly available without breach of this Section Confidentiality, on the part of the Receiving Party;
2. is already known by the Receiving Party prior to receipt from the Disclosing Party;
3. is independently developed by the Receiving Party;
4. is rightfully obtained by the Receiving Party from third parties without restriction; or
5. is required to be disclosed by appropriate governmental or judicial order provided that Receiving Party gives Disclosing Party prior written notice of such order and assists Disclosing Party in taking reasonable actions to restrict such order.

C.   The provisions of this Section, Confidentiality, shall survive the expiration or termination of this Agreement.

D.   The confidentiality obligations of this Section, Confidentiality, shall not apply to Software, the confidentiality and other rights and obligations with respect to which are set forth in the Software License Agreement.

E.   Except as required to fulfill its obligations under this Agreement, Seller will have no obligation to provide Buyer with access to its Confidential Information and/or proprietary information. Under no circumstances will Seller be required to provide any data related to cost and pricing.

SECTION 23. COMPLIANCE:

Seller agrees to comply with all federal, state and local laws, ordinances, codes, rules and regulations in effect as of the Effective Date of this Agreement that may in any way affect the Work by Seller hereunder, including but not limited to the latest adopted versions of the International Building Code, National Electrical Code, International Fire Code, International Mechanical Code, and all other applicable codes by the State of Texas. The Contractor shall also be responsible for compliance with applicable Environmental Protection Agency, Federal Communications Commission, and Federal Aviation Administration regulations. Any Hardware or Software furnished by Seller under this Agreement shall comply in all material respects with federal, state and local laws and regulations applicable to the manufacture, packing, sale and shipment of such Hardware or Software as of the Effective Date of this Agreement and shall comply with any amendments thereto which may have come into effect prior to the time such Hardware or Software are delivered provided that the price and, if necessary, delivery of such Hardware or Software shall be equitably adjusted to compensate Seller for the effect of compliance with any such amendments.

SECTION 24. NOTICES:

Notices and other communications between the parties shall be transmitted in writing by certified mail or nationally recognized overnight courier service to the parties at the addresses set forth below and shall be deemed effective upon receipt by the receiving party. Either party may change its address by giving notice in writing thereof to the other party.

IF TO BUYER:
Hunt County
2507 Lee Street
Greenville, Texas 75401
Attn: _____

WITH A COPY TO:

_____
_____
_____
Attn: _____

IF TO SELLER:
L3Harris Technologies, Inc.
221 Jefferson Ridge Parkway
Lynchburg, Virginia 24501
Attn: [Program Manager]

WITH A COPY TO:
L3Harris Technologies, Inc.
221 Jefferson Ridge Parkway
Lynchburg, Virginia 24501
Attn: Jeremy Roe

BUYER INVOICE CONTACT:

_____
_____
_____
Attn: _____

L3Harris Technologies, Inc.
221 Jefferson Ridge Parkway
Lynchburg, Virginia 24501

SECTION 25. ORDER OF PRECEDENCE:

The Statement of Work and the following Exhibits are expressly incorporated herein by reference and, together with this Agreement, constitute the Agreement Documents. In the event of a conflict among or between the Agreement Documents, the documents shall control in the order of precedence set forth below:
1. Amendments to this Agreement
2. This Agreement (not including the Exhibits and documents listed below)
3. Detailed Design Documents
4. **Exhibit A** - Statement of Work, with Attachments
5. **Exhibit B** - Software License Agreement
6. **Exhibit C** – Infrastructure Managed Services Agreement

SECTION 26. TERM:

The term of this Agreement shall commence upon the Effective Date of this Agreement and shall run through the Expiration Date. The term of the Software license is set forth in the Software License Agreement.

SECTION 27. ENTIRE AGREEMENT:

The entire agreement of the parties is contained herein and this Agreement supersedes any and all oral agreements and negotiations between the parties relating to the subject matter hereof.

SECTION 28. AMENDMENT:

The parties expressly agree that this Agreement shall not be amended in any fashion except in a writing(s) executed by authorized representatives of both parties.

SECTION 29. SEVERABILITY:

The invalidity, in whole or in part, of any Section or part of any Section of this Agreement shall not affect the validity of the remainder of such Section or the Agreement.

SECTION 30. WAIVER:

No term of this Agreement may be waived except in a writing signed by the party waiving enforcement. No term of this Agreement shall be deemed to be waived by reason of any failure to previously enforce such term. In no event shall the making of any payment required by this Agreement constitute or be construed as a waiver by Buyer of any breach of the covenants of this Agreement or a waiver of any default of Seller and the making of any such payment by Buyer while any such default or breach shall exist shall in no way impair or prejudice the right of Buyer with respect to recovery of damages or other remedy as a result of such breach or default.

SECTION 31. HEADINGS:

Section headings are inserted for convenience only and shall not be used in any way to construe the meaning of terms used in this Agreement.

SECTION 32. GOVERNING LAW:

It is expressly understood and agreed to by the parties hereto that in the event of any disagreement or controversy between the parties, the law of Texas and Hunt County shall be controlling. Venue for any legal proceedings shall be in Hunt County or federal court in the State of Texas.

SECTION 33. ASSIGNMENT; SUCCESSORS AND ASSIGNS:

This Agreement shall not be assigned nor any interest or obligation in this Agreement transferred by either Party without the written consent of the other Party, which shall not be unreasonably withheld or delayed. Notwithstanding the above, Seller may assign this Agreement, without consent, (a) in whole or in part, to an affiliate, subsidiary, or authorized reseller or (b) in the event of a change of controlling ownership interest (either directly or indirectly) in Seller or in the event of merger, recapitalization, consolidation, other business combination or sale of all or substantially all of the assets of Seller. In addition, Seller may also assign or transfer, without consent, claims for money due or to become due Seller from Buyer under this Agreement to a bank, trust company or other financial institution if and only if the instrument of assignment contains a provision substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to Seller shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for in this Agreement. Seller shall promptly provide to Buyer notice of any such permitted assignment or transfer without consent.

SECTION 34. DEBARMENT AND SUSPENSION (EXECUTIVE ORDERS 12549 AND 12689):

The Contractor certifies, by entering into this Agreement, that neither it nor its principals are presently debarred, suspended, or otherwise excluded from or ineligible for participation in federally-assisted programs under Executive Orders 12549 (1986) and 12689 (1989). The term "principal" for purposes of this Agreement is defined as an officer, director, owner, partner, key employee, or other person with primary management or supervisory responsibilities, or a person who has a critical influence on or substantive control over the operations of the Contractor. The Contractor understands that it must not make any award or permit any award (or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549, "Debarment and Suspension."

SECTION 35. EQUAL OPPORTUNITY CLAUSE:

During the performance of this contract, the Contractor agrees as follows:

A.   The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

B.	The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

C.	The Contractor will not discourage or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

D.	The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

E.	The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, "Equal Employment Opportunity," and of the rules, regulations, and relevant orders of the Secretary of Labor.

F.	The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

G.	In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

H.	The Contractor will include the portion of the sentence immediately preceding paragraph (a) and the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

SECTION 36. CIVIL RIGHTS ACT OF 1964:

Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color, religion, sex, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

SECTION 37. SECTION 109 OF THE HOUSING AND COMMUNITY DEVELOPMENT ACT OF 1974:

The Contractor shall comply with the provisions of Section 109 of the Housing and Community Development Act of 1974. No person in the United States shall on the ground of race, color, national origin, religion, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

SECTION 38. SECTION 504 REHABILITATION ACT OF 1973, AS AMENDED:

The Contractor agrees that no otherwise qualified individual with disabilities shall, solely by reason of his/her disability, be denied the benefits of, or be subjected to discrimination, including discrimination in employment, under any program or activity receiving federal financial assistance.

SECTION 39. AGE DISCRIMINATION ACT OF 1975:

The Contractor shall comply with the Age Discrimination Act of 1975 which provides that no person in the United States shall on the basis of age be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

SECTION 40. BYRD ANTI-LOBBYING AMENDMENT (31 U.S.C. 1352):

The Contractor certifies that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining this contract. The Contractor shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award.

SECTION 41. SMALL, MINORITY, WOMEN'S AND LABOR SURPLUS ENTERPRISES/CONTRACTORS:

A. The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area Contractors are used when possible.

B. Affirmative steps must include:
   i. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
   ii. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
   iii. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
   iv. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

v.   Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and

vi.   Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (1) through (5) of this section.

SECTION 42. COMBATING TRAFFICKING IN PERSONS:

Pursuant to Chapter 52.222-50 of the F.A.R. the consultant agrees to comply with all provisions of the Combating Trafficking in Persons Act.

SECTION 43. INCREASING SEAT BELT USE IN THE UNITED STATES:

Pursuant to Executive Order 13043, 62 FR19217 (Apr. 18, 1997), Recipient should encourage its contractors to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented or personally owned vehicles.

SECTION 44. REDUCING TEXT MESSAGING WHILE DRIVING:

Pursuant to Executive Order 13513, 74 FR 51225 (Oct. 6, 2009), Recipient should encourage its employees, sub recipients, and contractors to adopt and enforce policies that ban text messaging while driving.

SECTION 45. ENERGY EFFICIENCY:

The Contractor shall comply with the mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201). (2 CFR 200 Appendix II (h)).

SECTION 46. VERIFICATION NO BOYCOTT ISRAEL:

As required by Chapter 2270, Government Code, the Contractor hereby verifies that it does not boycott Israel and will not boycott Israel through the term of this Agreement. For purposes of this verification, "boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

SECTION 47. FOREIGN TERRORIST ORGANIZATIONS:

Pursuant to Chapter 2252, Texas Government Code, the Contractor represents and certifies that, at the time of execution of this Agreement neither the Contractor, nor any wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of the same (i) engages in business with Iran, Sudan, or any foreign terrorist organization as described in Chapters 806 or 807 of the Texas Government Code, or Subchapter F of Chapter 2252 of the Texas Government Code, or (ii) is a company listed by the Texas Comptroller of Public Accounts under Sections 806.051, 807.051, or 2252.153 of the Texas Government Code. The term "foreign terrorist organization" in this paragraph has the meaning assigned to such term in Section 2252.151 of the Texas Government Code.

SECTION 48. CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT:

Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended. The Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401–7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251–1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA). 2 CFR 200 APPENDIX II (G).

SECTION 49. ACCESS TO RECORDS:

Access to Records (formerly 24 CFR 85.36 (i)(10)). Hunt County, the Texas Comptroller of Public Accounts, the Comptroller General of the United States, the U.S. Department of Treasury, or any of their duly authorized representatives, shall have access to any books, documents, papers and records of the Contractor which are directly pertinent to this specific contract, for the purpose of making audit, examination, excerpts, and transcriptions.

SECTION 50. RETAINAGE OF RECORDS:

Retainage of Records (formerly 24 CFR 85.36(i)(11)). The vendor will maintain all relevant project records for five (5) years after Hunt County has made final payment to the Contractor and all other pending matters are closed.

SECTION 51. COOPERATIVE AND ADDITIONAL PURCHASING:

A.   Purchases by Other Public Entities: This Agreement may be used, during the Term of the Agreement, by the Buyer or other public bodies to purchase additional infrastructure and related services, subscriber equipment and consoles on the pricing set forth below and in accordance with the terms, including applicable warranties, of this Agreement unless otherwise specified herein. This pricing cannot be combined with any other promotional offers. Such public bodies shall place their own order(s) directly with Seller, and Seller shall deal directly with any public body Buyer approves to use the Agreement. The terms and conditions of this Agreement shall govern purchases by other public bodies unless they and the Seller agree to execute separate contracts. With the approval of the Seller, any public body using this Agreement may add terms and conditions required by statute, ordinances, or regulations. To the extent permitted by law, the parties may agree to additional or modified terms and conditions unique to the public body or as required by the circumstances surrounding the purchase. Buyer, its officials and employees, are not responsible for placement of orders, invoicing, payments, contractual disputes, or any other transactions between the Seller and any other public bodies. In no event shall Buyer, its officials or employees, be responsible for any costs, damages or injury resulting to any party from use of a Buyer contract. If, when preparing such a contract, the additional terms and conditions of a public body seeking to purchase pursuant to cooperative procurement are unacceptable to the Seller, the Seller may withdraw its consent to extension of the contract to that particular body. Buyer assumes no responsibility for any notification of the availability of this Agreement for use by other public bodies, but the Seller may carry out such notification.
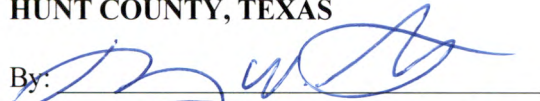
B.   Equipment Discounts. The specific Equipment listed below qualifies for the discounts as set forth in this Section 51:

(1)   L3Harris Equipment. Public bodies may purchase equipment with product codes C, N, NB, S, and P, at a discount of forty-five percent (45%) off the then-current catalog price.

(2)   Standard Vendor Equipment. Public bodies may purchase equipment with product codes V, VC, and 77, at a discount of ten percent (10%) off the then-current catalog price.

(3)   Tait Equipment. L3Harris-Tait co-branded products are excluded from the discounts provided herein.

(4)   Infrastructure-related Services. Services are excluded from the discounts provided herein.

[Signature Page Follows]

IN WITNESS WHEREOF, Buyer and Seller have executed this Agreement.

BUYER
HUNT COUNTY, TEXAS
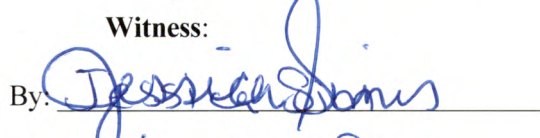
By: _____

Name: _____Bobby W. Stovall II_____

Title: _____County Judge_____

Date: _____Aug. 30, 2022_____

Witness:

By: _____

Name: _____Jessica Sims_____

Title: _____Executive Assistant_____

Date: _____8-30-2022_____

SELLER
L3HARRIS TECHNOLOGIES, INC. ACTING THROUGH ITS COMMUNICATION SYSTEMS SEGMENT
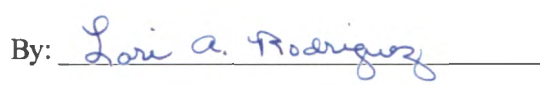
By: _____

Name: _____Jeremy S. Roe_____

Title: _____Principal, Contracts_____

Date: _____August 26, 2022_____

Witness:

By: _____Lori A. Rodriguez_____

Name: _____Lori A. Rodriguez_____

Title: _____Director of Contracts_____

Date: _____August 26, 2022_____

LIST OF EXHIBITS

Exhibit A -   STATEMENT OF WORK (with Attachments)
Exhibit B -   SOFTWARE LICENSE AGREEMENT
Exhibit C -   INFRASTRUCTURE MANAGED SERVICES AGREEMENT

EXHIBIT A

STATEMENT OF WORK

TABLE OF CONTENTS

Attachments to Exhibit A

SYSTEM DESCRIPTION

Overview

L3Harris excels in the multifaceted implementation of mission critical radio systems that fulfills the specific needs of our customers and supports their vital public safety operations.

It is L3Harris' goal to partner with Hunt County, Texas to deliver radio communication services by providing guaranteed P25 coverage, a high level of redundancy, and low total cost of ownership to support a new P25 Phase 2 Radio system.

By leveraging advances in standards-based Information Technology, L3Harris offers a unique IP-based network solution for the challenges many critical communications users face today. This solution grants access to information that users need today and well into the future: It is flexible, scalable, and ready to address communications needs. L3Harris' product offering is called "VIDA", as it delivers unprecedented Voice, Interoperability, Data and Access (VIDA).

Figure 1. The L3Harris VIDA Architecture

L3Harris makes communications projects simpler with the customer's goals at the forefront. The provided solutions are designed for long-term deployment and low total cost of ownership. IP-centric solutions are meant to ease installation and transition burdens and provide a flexible path to future technologies with managed services along the way to avoid costly forklift upgrades.

The proposed P25 system is a fully integrated voice and data capable network designed around an IP-based infrastructure. VIDA employs some of the latest technologies, including simulcast radio coverage using Two47 trunked base stations, geographically split High Availability Network Switching Centers, a Centralized Network Management System, and user centric IP Dispatch Consoles.

The L3Harris Advantage

> **Reliability, Outstanding Value –** The proposed system is a complete communications hardware package that is offered at a cost-effective price-point and designed to support mission critical communications. Geographically split Network Switching Centers provide redundancy and survivability. Non-proprietary, commercial-off-the-shelf (COTS) equipment provides ease of replacement and mitigates system obsolescence.

> **User Centric Consoles –** We understand the critical role that dispatchers play during life safety events, and it requires a platform that is intuitive and minimizes the time it takes for each task. The L3Harris Symphony dispatch console is so easy to use that it quickly becomes second nature.

> **Next Generation XL-Series Radios –** Advantages to our customers include: AT&T and Verizon Certified and FirstNet Ready™, Loud and clear audio with advanced noise cancellation, Optional cellular modem for voice and data wherever cellular/LTE are available, Built-in Wi-Fi®, Bluetooth® and GPS connectivity, Ruggedized to meet stringent MIL-SPEC standards, Secure voice and data encryption, and Intuitive and easy-to-use.

> **P25 Trunk Phase 2 Advantages –** The proposed 4 Channel, P25 Phase 2, Simulcast Trunked design, reduces Cost, Energy Consumption, and Maintenance. There is more voice talkpath capacity compared to 8 Channel P25 Trunk phase 1 or Type II Trunk Smartzone® systems.

> **Support for mobile devices PTT over LTE –** The BeOn® app brings full Push-to-Talk (PTT) services to Android™, Windows® PC, and iOS™ platforms operating on broadband networks—whether 3G, 4G or 5G commercial cellular, Wi-Fi, or LTE. BeOn Premier Server (up to 500 user capacity) is provided with the L3Harris IMS Facility core. Android, IOS, and/or Windows client licenses can be added with or without AES encryption.

> **Configurable for a Long-Life Cycle –** True end-to-end IP system architecture greatly reduces the need for network hardware, resulting in lower maintenance and total cost of ownership via modular architecture that uses virtualization. L3Harris understands the convergence of public safety narrowband and broadband operation and has designed VIDA to be leveraged for future public safety broadband convergence. Hunt County will have a network ready to evolve as future needs change.

> **Expandable –** Whether the goal is to grow to a county-wide system or even be the core of a state-wide system, the scalability proposed with L3Harris P25 networks offers the ability to add different sub-systems to meet any emerging needs. The proposed architecture can easily expand to accommodate additional users, enhanced coverage, and advanced features, all in a cost-effective manner. In addition to P25, this L3Harris system is a gateway to technologies such as the national FirstNet® system, and L3Harris' own PTT over LTE technology BeOn, which bridges LMR talk groups with cellular handsets.

Summary of System Offering

BASE OFFERINGS

The L3Harris system base offering includes:

> Dispatch Consoles:

   – 3 Symphony Dispatch Consoles for the Sheriff's Office Dispatch Center

> P25 Phase 2 Simulcast system (700 MHz band), powered by Two47 RF site equipment:

   – 4 Tx/Rx sites

     • 2 sites are software-based Distributed Control Points (DCP)

   – 4 channels each, supporting up to 6 concurrent talkpaths available for voice communications

> Extended contiguous coverage

   – 3 Tx/Rx additional simulcast sites provided and owned by the L3Harris facility

     • 2 sites are software-based Distributed Control Points (DCP)

> 40 XL-200M multiband (VHF, 7/800MHz) mobile radios with remote mount control head:

   – P25 Trunking, GPS, Bluetooth

   – Multi-key AES/DES Encryption

   – P25 Phase 2 TDMA

> 50 XL-200P multiband (VHF, 7/800MHz) portable radios:

   – P25 Trunking, GPS, Bluetooth

   – Multi-key AES/DES Encryption

   – P25 Phase 2 TDMA

> 140 BeOn Licenses for portable, mobile radios, or smartphones (iOS or Android)

> Microwave Backhaul

   – 5 MPLS Routers

   – 1 Microwave Link (Spur)

     • Water Tower to Ring

   – 4 Microwave Links (Ring)

> 1 Inter-RF Subsystem Interface (ISSI)

   – 3 External Systems

   – 8 Talkpaths per System

> 1 Zetron Pathway+ interoperability gateways with 8 Talkpaths

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— The Zetron Pathway+ are network based analog interoperability solution interfacing analog gateways to the VIDA Network via a P25 compliant Digital Fixed Station Interface (DFSI).

ADDITIONAL BENEFITS

The L3Harris system offering includes:

> Lower total cost of ownership system:

— The high availability cores will be hosted at Hunt County Sheriff's Office and at the L3Harris IMS Facility

— Shared long term maintenance and warranty costs with L3Harris IMS Facility.

Block Diagram

Figure 2. System Block Diagram
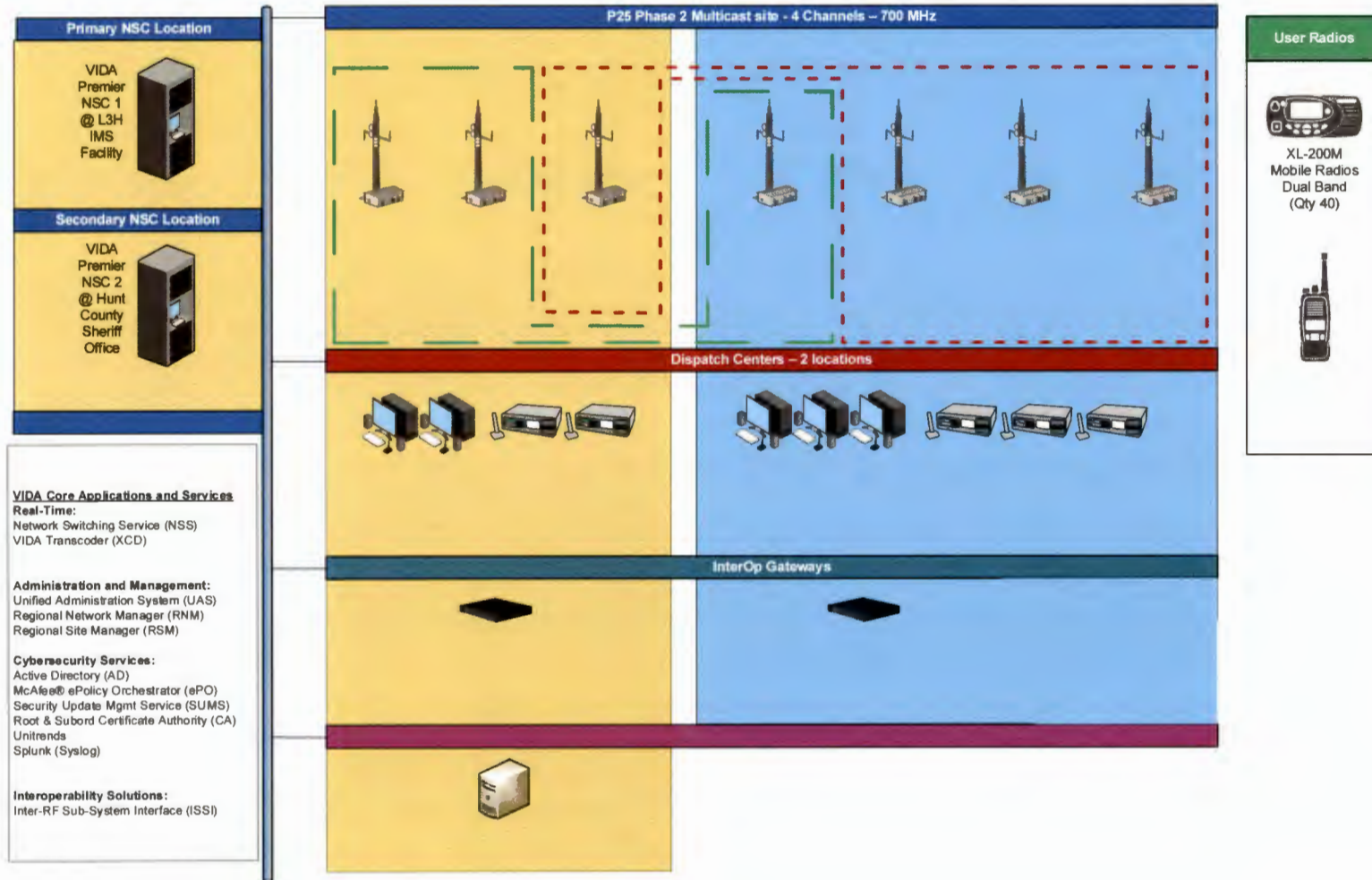
Equipment Offering per Project Location

L3Harris carefully researched and studied Hunt County's RFP requirements including existing communications capabilities, existing network topology, current land usage and communications needs and decided to use the following locations, strategically assigning systems and functionality to fully comply with the written RFP requirements and maximize their usefulness and value. However, the flexible nature of the VIDA network architecture permits the redistribution of subsystems, as required by Hunt County's needs, during contract negotiations or preliminary phases of network design.

HUNT COUNTY SHERIFF'S OFFICE

The following LMR equipment is proposed for this site:

> Symphony Dispatch Site

> Two47 Simulcast Site

> Interop Gateways

Hunt County will utilize L3Harris IMS Facility's Geo-redundant High-Availability network controller; the controllers will be installed at the Hunt County Sheriff Office and the L3Harris IMS Facility. The VIDA Premier Core provides support for mission critical communications, administration and management services, cybersecurity, and interoperability solutions.

HUNT COUNTY SHERIFF'S OFFICE DISPATCH SITE

> Three Symphony IP Dispatch Consoles, each equipped with:

- AES encryption
- Licensing for Premier package features including Call Director, I-calls, 8 patches per position, dynamic cross muting,
- Licensing for RTT/RSM,
- 27" Hi-Def monitor
- Two Nano speakers
- Gooseneck desktop microphone
- USB keyboard and mouse
- USB single footswitch
- Six-wire jack box
- Over-the-Head Headset with wireless headset adaptor

> Three Backup Control Stations with Antenna systems

> Redundant Cisco dispatch site access routers and ethernet switches

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WHITLEY HALL SIMULCAST SITE

> P25 Tx/Rx Site

The following LMR equipment is proposed for this site:

> One 4-Channel, 700 MHz P25 Phase 2 simulcast transmit site including:
  - P25 simulcast site common equipment
  - One Virtual Site for alarming and P25 data
  - Four 700 MHz Two47 Phase 2 Stations providing 6 trunked talkpaths
  - RF antenna system including:
    - One 4-port combiner
    - One Rx multicoupler/TTA system
    - One 700 MHz Tx antenna
    - One 700 MHz Rx antenna
    - Coax, cables, and connectors
> Redundant Cisco site access routers and ethernet switches

CROWN CASTLE SIMULCAST SITE

> P25 Tx/Rx Site

The following LMR equipment is proposed for this site:

> One 4-Channel, 700 MHz P25 Phase 2 simulcast transmit site including:
  - P25 simulcast site common equipment
  - One Virtual Site for alarming and P25 data
  - Four 700 MHz Two47 Phase 2 Stations providing 6 trunked talkpaths
  - RF antenna system including:
    - One 4-port combiner
    - One Rx multicoupler/TTA system
    - One 700 MHz Tx antenna
    - One 700 MHz Rx antenna
    - Coax, cables, and connectors
> Redundant Cisco site access routers and ethernet switches

WATER TOWER SIMULCAST SITE

> P25 Tx/Rx Site

The following LMR equipment is proposed for this site:

> One 4-Channel, 700 MHz P25 Phase 2 simulcast transmit site including:
  - P25 simulcast site common equipment
  - One Virtual Site for alarming and P25 data
  - Four 700 MHz Two47 Phase 2 Stations providing 6 trunked talkpaths
  - RF antenna system including:
    - One 4-port combiner
    - One Rx multicoupler/TTA system
    - One 700 MHz Tx antenna
    - One 700 MHz Rx antenna
    - Coax, cables, and connectors

> Redundant Cisco site access routers and ethernet switches

> This site is designated as a Distributed Control Point (DCP) site.

CELESTE SIMULCAST SITE

> P25 Tx/Rx Site

The following LMR equipment is proposed for this site:

> One 4-Channel, 700 MHz P25 Phase 2 simulcast transmit site including:
  - P25 simulcast site common equipment
  - One Virtual Site for alarming and P25 data
  - Four 700 MHz Two47 Phase 2 Stations providing 6 trunked talkpaths
  - RF antenna system including:
    - One 4-port combiner
    - One Rx multicoupler/TTA system
    - One 700 MHz Tx antenna
    - One 700 MHz Rx antenna
    - Coax, cables, and connectors .

> Redundant Cisco site access routers and ethernet switches

> This site is designated as a Distributed Control Point (DCP) site.

Coverage Solution

COVERAGE MODEL

L3Harris' internal toolset for propagation modeling is known as RAPTR (Radio Analysis and Propagation Tool Repository). RAPTR propagation modeling is compatible with Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin TSB-88 "Wireless Communications Systems - Performance in Noise and Interference Limited Situations – Recommended Methods for Technology Independent Modeling, Simulation, and Verification." RAPTR uses the Okumura-Hata-Davidson (OHD) model as described in TSB-88. Factors relating to environment and terrain combine to derive the total path loss value. RAPTR employs the Epstein-Peterson diffraction model in conjunction with the OHD model in a proprietary method to greatly enhance the path loss calculation. The diffraction calculations coupled with the environment database further increase the accuracy of the path loss calculation.

RAPTR uses a tile method for analyzing the propagation, a much more accurate method than the older radial method. Radial methods begin to lose resolution as the distance from the site increases; the distance increases between evaluation locations from radial to radial. The tile method uniformly predicts the coverage for a system by dividing the project area (i.e., Hunt County boundary area) into small areas called tiles. The size of the tiles used by RAPTR is three arc-seconds, approximately 300 feet per side. RAPTR models the propagation from a site to each tile in the project area. With the tile method, the interaction of signals from different sites can be more accurately determined. This increases the accuracy of evaluating coverage for simulcast systems, voting systems, multisite networks, interference, and handoff (roaming).

The RAPTR path loss calculation methods are the result of evaluating over 189,000 different propagation paths as part of an extensive data collection effort performed over a period of years. These paths encompassed a variety of terrain and environment features, ranging from over water paths, to flat terrain, to mountainous areas. It also included varying environmental conditions, ranging from highly urbanized areas to rural, open and forested areas. As a result, the propagation model has been refined to perform in all the conditions present in a land-mobile radio system. The model is accurate from flat terrain to highly rugged mountainous terrain, and from urban to rural areas.

TERRAIN DATABASE

The accuracy of any coverage prediction is to a large degree dependent upon the terrain data available for the project. RAPTR makes use of three arc-second database derived from the United States Geological Survey (USGS) Digital Elevation Model (DEM) data that provides high resolution and accuracy, both spatially and in elevation. More recent USGS 30-meter data can supplement the database providing higher degrees of resolution and accuracy. The 30-meter data incorporates into the main RAPTR terrain database using methods described in TSB-88. L3Harris uses thirty-meter data when available from the USGS for analyzing the coverage design and predictions.

The terrain data can be displayed within RAPTR to give system designers the ability to locate sites based on elevation. The terrain can be displayed in either an aerial view, as a colored contour map or combined as shown in Figure 3 and Figure 4.

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Figure 3. Hunt County Terrain Data
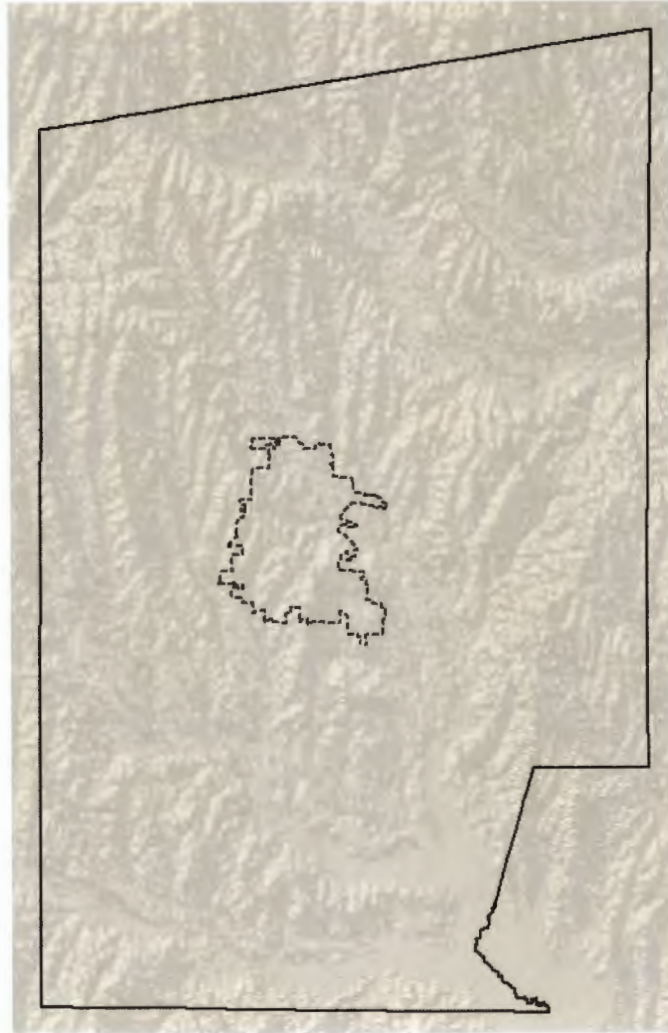
Figure 4. Hunt County Terrain Data with Elevation
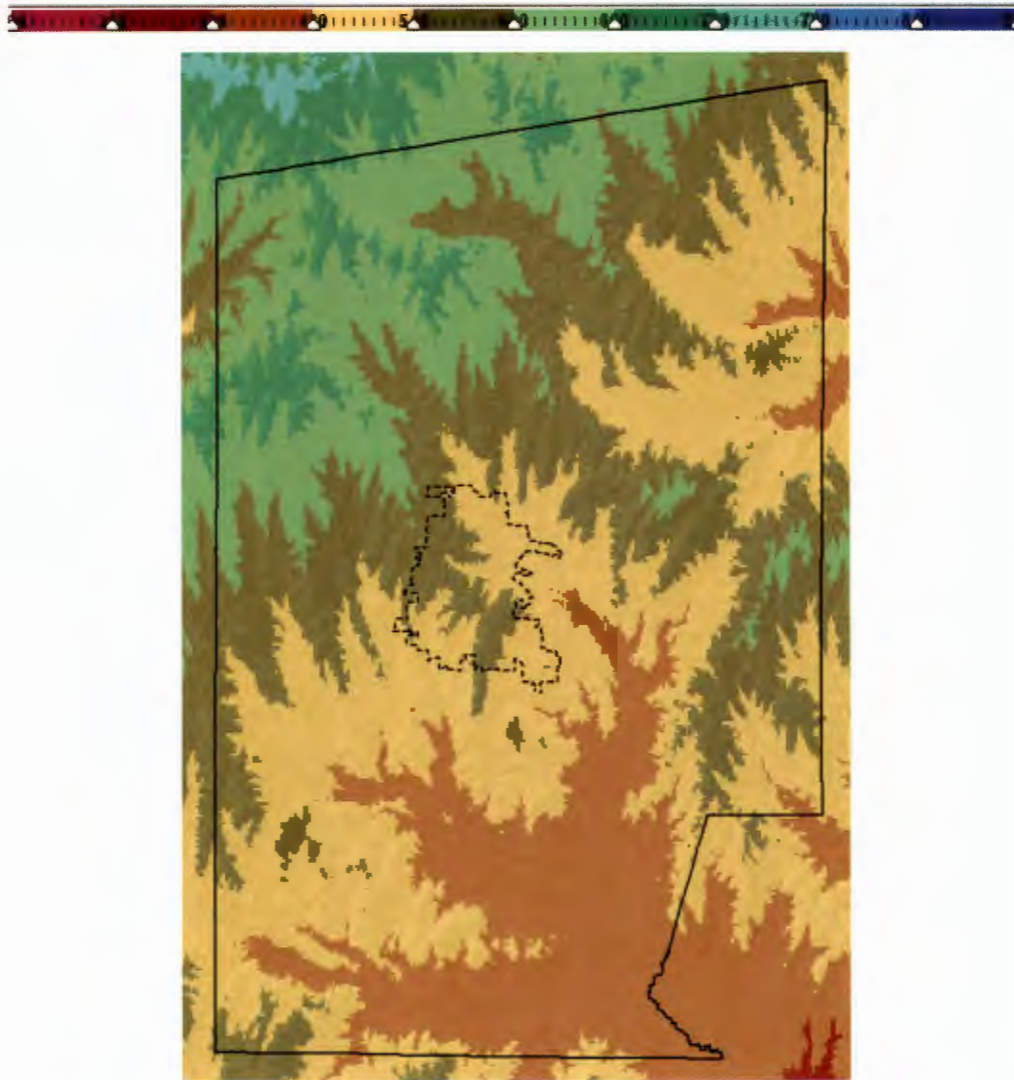
ENVIRONMENT DATABASE

Using an environment database further enhances the coverage prediction accuracy. This database describes the ground structures contained in an area such as urban, residential, forest, water, etc. It increases the coverage design accuracy by allowing the propagation model to account for the type of local clutter present.

RAPTR's main database derives from the USGS Land Use Land Clutter (LULC) data set. The database is updated every five years with the most recent update in 2016. An example of environment database information is shown in Figure 5. The LULC was updated manually to capture recent changes in the environment caused by expansion around Greenville, TX.

H P25 T   dio S s
Hunt County, Texas

E   bit A – State nent f W ork
System Descr ptic n
Revision 4

Figure 5. Hunt County Environment Database
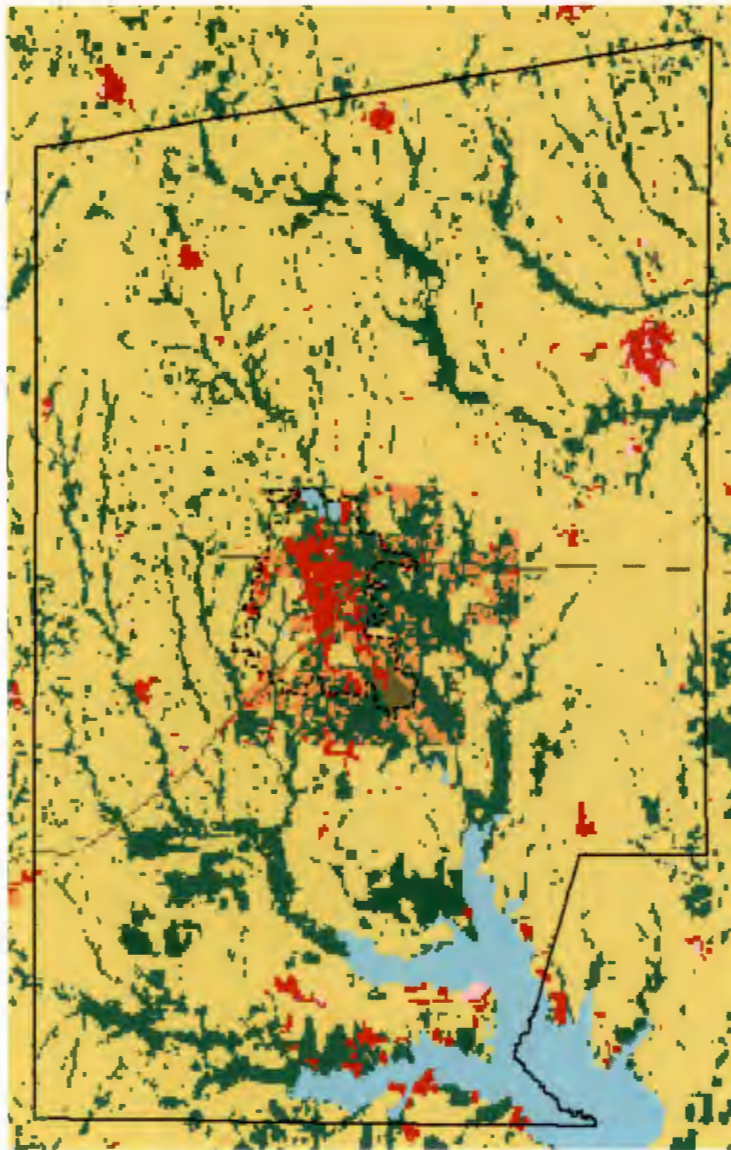
RAPTR employs sophisticated analysis techniques when evaluating coverage. Instead of only considering what the environment type is at the location, or tile, being evaluated, it also considers the environment surrounding the location. This further increases the accuracy of coverage predictions by detecting transitions in the environment – for instance, when transitioning from agricultural to forest, or urban to suburban. In addition, a designer can select from a category of environment. For example, the designer can select from the forest environment class categories of pine, hardwood, mixed, etc.

Also, RAPTR can perform an analysis of the environment and classify it based on density. This increases the accuracy of coverage predictions by being able to account for dense forests and sparse forests. All these factors combine to allow RAPTR to incorporate a very detailed model of the environment into coverage designs.

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COVERAGE GUARANTEES

The L3Harris coverage design is based on bounded area reliability and is path-balanced for portable radios, meaning portable radio coverage is equal in the talk out and talk back directions. The Hunt County, Texas design achieves portable user balance for 700 MHz. The design is established to achieve DAQ 3.4 voice quality throughout the predicted covered areas, as described below in Figure 7.

Figure 6. Delivered Audio Quality Classifications as defined by TSB 88

DELIVERED AUDIO QUALITY	SUBJECTIVE PERFORMANCE DESCRIPTION
DAQ 5.0	Speech easily understood.
DAQ 4.5	Speech easily understood. Infrequent noise/distortion.
DAQ 4.0	Speech easily understood. Occasional noise/distortion.
DAQ 3.4	Speech understandable with repetition only rarely required. Some noise/distortion.
DAQ 3.0	Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
DAQ 2.0	Understandable with considerable effort. Frequent repetition due to noise/distortion.
DAQ 1.0	Unusable: speech present but unreadable.

It is important to note that usable coverage extends beyond DAQ 3.4. In areas that do not have DAQ 3.4 coverage, but have DAQ 3.0 coverage, users will still be able to make portable on-street calls, with occasional repetition, as this is still usable coverage.

The following coverage guarantees are therefore offered for the proposed systems for Hunt County, Texas.

Figure 7. 700 MHz System Coverage Guarantees

COVERED AREA DEFINITION	DESCRIPTION	REQ'D PERFORMANCE CRITERIA	% VALIDATED CPC COVERED AREA RELIABILITY ACCEPTANCE CRITERIA
Hunt County	Mobile	DAQ 3.4	95%
Hunt County	Portable Outdoor	DAQ 3.4	95%

Please refer to the Coverage Acceptance Test Procedure for additional details on the coverage guarantees and how L3Harris will test them.

The system configuration associated with these guarantees is presented in the Hunt County, Texas System Block Diagram presented earlier in Figure 2.

SITE SELECTION

The L3Harris technical solution utilizes seven currently existing towers and buildings. The coverage design and guarantees are based on the design parameters noted in Figure 7 and Figure 8. In the event there are site or tower changes, L3Harris will reassess impacts to the coverage and guarantees included in this proposal.

RF Site Configuration for 700 MHz

Figure 8 shows the proposed site locations and antenna mounting positions.

Figure 8. P25 RF Site Parameters for 700 MHz Antennas

SITE	LATITUDE	LONGITUDE	MAX ERP (W)	TX ANT CL (FT)	RX ANT CL (FT)	TX AND RX ANTENNA MODEL
Crown Castle	33.1372	-96.2133	54.1	150	150	SE4192-SWBP2LDF(D00)
Celeste	33.3050	-96.2009	53.5	250	250	SC49C-HWBLDF(D00-PIP)
Hunt County Sheriff's Office	33.1377	-96.1052	52.3	190	190	SC46A-HF1LDF(D00-PIP)
Whitley	33.2368	-95.9101	53.8	170	170	SC49C-HWBLDF(D00-NUFP)
Water Tower	32.9022	-96.1121	53.6	160	160	SC49C-HWBLDF(D00-PIP)
L3Harris IMS North	33.0751	-96.0700	52.4	120	120	SC46A-HF1LDF(D04-PIP)
L3Harris IMS South	33.0641	-96.0697	52.4	80	80	SC46A-HF1LDF(D04-PIP)

FREQUENCY PLANNING

700 MHz Frequency Plan

L3Harris proposes a design consisting of two simulcasts cells. The North cell utilizes the Crown Castle, Celeste, Hunt County Sheriff's Office, and Whitley sites, and the South cell utilizes the Water Tower, L3Harris IMS North, and L3Harris IMS South sites.

L3Harris has industry leading expertise in frequency planning and management. Our Spectrum Engineering Group has reviewed the currently allocated frequencies for the geographic region of Hunt County and believes there are sufficient frequencies to meet the requirements of the system. Frequency availability and acquisition is a dynamic and complex environment and subject to change. We will

establish usable and licensable frequencies post contract award and support the County in the acquisition of those frequencies.

Frequency Planning Assistance

L3Harris will provide engineering analysis and technical documentation required to complete one set of FCC license applications per site for the proposed system.

Engineering analysis is defined as:

> Co-Channel Contour Analysis

> Adjacent Channel Contour Analysis

> Co-Channel Coverage Interference

> Adjacent Channel Coverage Interference

> Safe Harbor Showings

Additional engineering analysis that may be required to address unusual or atypical licensing requirements will be addressed through the program change order process. L3Harris will complete and submit the FCC license applications on behalf of the County.

Hunt County will be responsible for all FCC Application and Coordination Fees. L3Harris requires the County to approve all documents/applications prior to submission to the Regional Planning Committee, FCC Certified Coordinator, or FCC, as applicable.

INTERMODULATION INTERFERENCE ANALYSIS

Our intermodulation interference analysis at this stage consists only of the frequencies we propose to place at each site. During the detailed design phase L3Harris would conduct expanded intermodulation interference analysis which would consider all identifiable co-located tenants at the site.

L3Harris will base its intermodulation analysis on the L3Harris system frequencies and those identifiable in the FCC database for each site or that Hunt County provides L3Harris in advance of L3Harris' intermodulation analysis.

L3Harris cannot be responsible for omissions or inaccuracies to the FCC data or for which frequency assignments cannot be specifically defined such as with market-based allocations.

Further, L3Harris cannot be responsible for interference to equipment installed near proposed equipment that is inadequately designed or installed, making it susceptible to interference from equipment that is operating properly. L3Harris will make a best faith effort to identify any such equipment and recommend engineering solutions that might be applied to that equipment.

L3Harris cannot be responsible for interference, either self-induced or external to the system, caused by any of the following:

> Self-induced/external adjacent interference.

> Self-induced or created with other transmitters IM distortions.

> Self-induced interference due to elevated noise floor.

The following mitigation steps are taken in the design to minimize intermodulation products and self-interference:

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> Filters as needed for transmit antenna feed line

> Vertical or horizontal separation between transmit and receive antennas

> Use of low passive intermodulation (PIM) antenna system products where available such as use of DIN connectors after the transmit combiner

Coverage Maps

700 MHZ COVERAGE

L3Harris has included a full complement of coverage maps in the next section. A sampling of those coverage maps is included here.

All maps represent P25 Phase 2 Trunking DAQ 3.4 or better communications to a receiver terminal at the indicated level (e.g. mobile, portable outdoors). The following colors are used to represent coverage:

> Green represents areas predicted to reliably have DAQ 3.4 or better communications

> White represents areas not predicted to have reliable DAQ 3.4 communications due to inadequate signal level

> Pink represents areas not predicted to have reliable DAQ 3.4 communications due to the presence of Time Domain Interference (talk-out maps only).

Because this system is balanced around portable radio users, portable radios on the hip will have the same coverage in the talk-in and talk-out directions. While mobile radios in theory would have talk-in coverage that exceeds their talk-out coverage, they will in practice be limited by their talk-out coverage as a radio on a trunked system cannot place a call unless it is able to receive the control channel.

Figure 9. Hunt County Mobile Talk Out Coverage
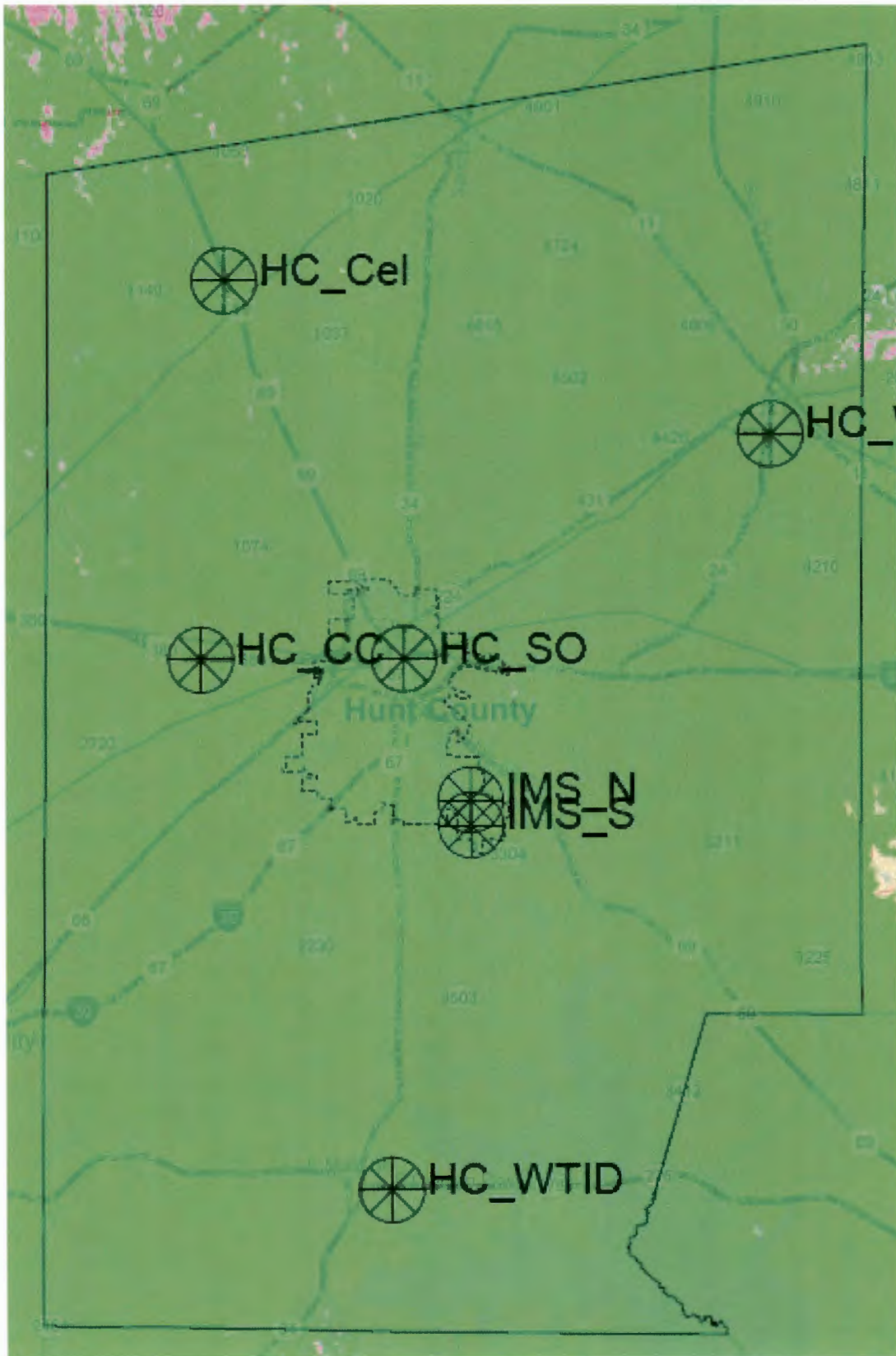
Figure 10. Hunt County Portable Outdoor Talk Out Coverage
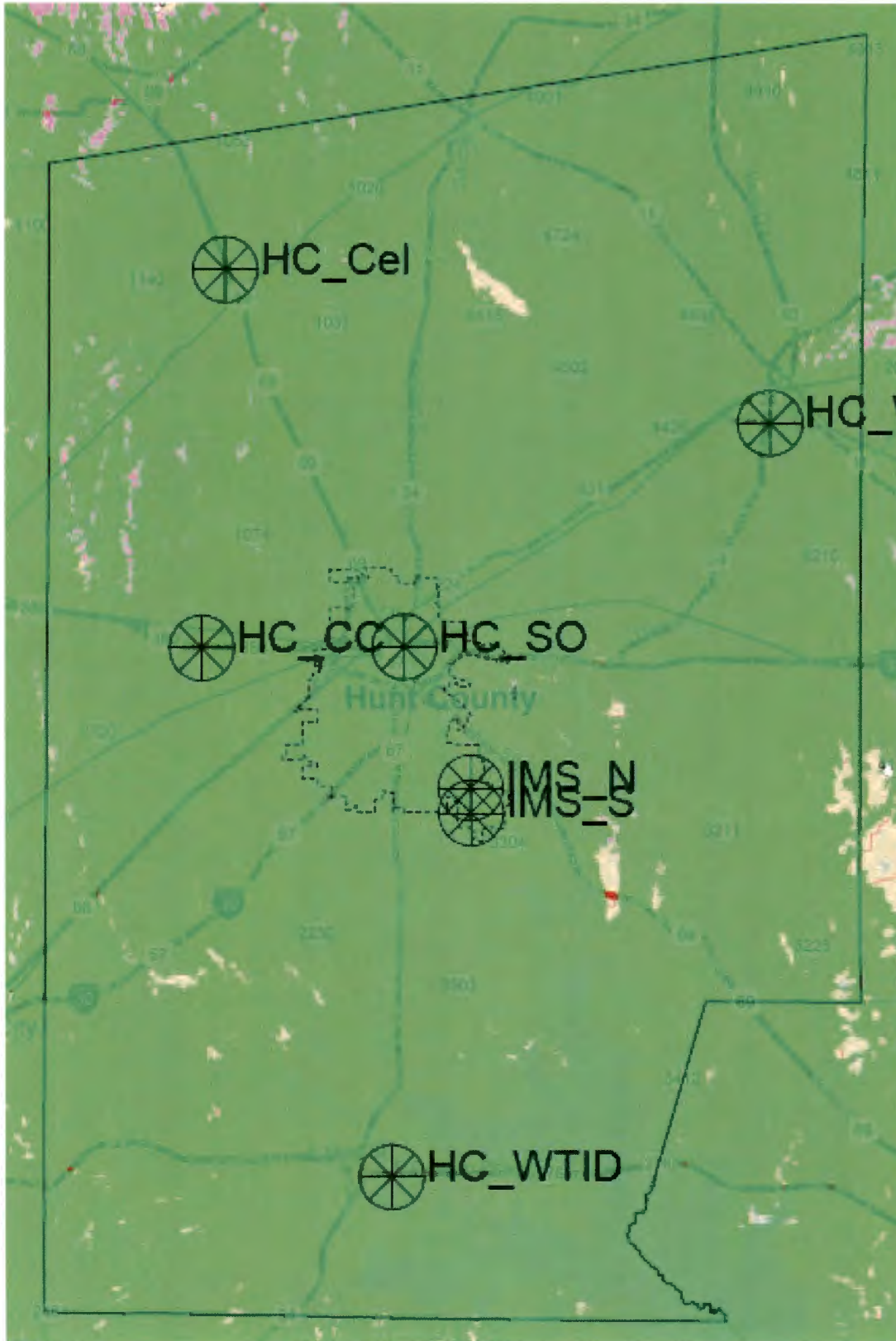
The following list of figures correlates with the 700 MHz coverage maps that are included in this proposal. Full size versions of these maps are located in the Coverage Maps section of this proposal. All maps show proposed DAQ 3.4 coverage.

> Figure 1 – 700 MHz P25 Mobile Talk Out Coverage

> Figure 2 – 700 MHz P25 Mobile Talk Back Coverage

> Figure 3 – 700 MHz P25 Portable Outdoor Talk Out Coverage

> Figure 4 – 700 MHz P25 Portable Outdoor Talk Back Coverage

> Figure 5 – 700 MHz P25 Portable Coverage Heat Map

SYSTEM PLANNING AND CAPACITY

Traffic analysis was performed utilizing an L3Harris proprietary traffic analysis tool. L3Harris has provided a capacity analysis based on a GPS polling every 15 min and a maximum 1% Grade of Service (GOS) respectively. L3Harris has utilized generally accepted public safety parameters into this traffic analysis.

GOS number represents the probability that a call would get blocked and is based on Erlang C analysis. L3Harris has made the following generally accepted non-public safety assumptions in this calculation.

Typical utility voice-user call profile:

> 6.5 Group Call PTT's per hour per user,

> 3.2 seconds transmission time average per Group Call PTT,

> Max allowable delay is set at 1 sec.

> GPS-data call profile:

    – Tier 2 GPS (P25 TIA Standard)

    – Polling for all subscribers every 15 minutes,

Figure 11. Hunt County Busy Hour Load (3-minute polling)

USER DISTRIBUTION WITH GPS	TOTAL USERS PER SYSTEM	BUSY-HOUR USERS PER SYSTEM	VOICE CHANNELS REQUIRED	TALK PATHS AVAILABLE	GRADE OF SERVICE WITH DELAY
100% User Distribution Simulcast (Across All Towers)	574	574	4 (per site)	6 (per site)	<1.00%

> A few items should be noticed in the Figure 11:

    – The Talk Paths available do not equal the total number of physical channels/ frequency pairs because of the efficiencies of P25 Phase 2 trunking, which provides two talk paths per physical RF channel (minus the Control Channel).

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- Please note that, as the number of resources increase, the amount of traffic or number of users placing calls increases exponentially. This is the advantage of trunking versus conventional radio.

- Figure 11's 100% user distribution scenario assumes that 100% of the 574 busy-hour radios will be distributed over Hunt County's simulcast system.

> The results of the baseline traffic study show that a 4-site simulcast configuration equipped with 4 physical channels (1 CC, 3 Voice) can accommodate up to 574 active users during the busy hour before the 1% Grade of Service w/ Delay threshold is reached.

STATUSAWARE: GEOLOCATION AND PRESENCE INFORMATION REPORTING

StatusAware is an advanced feature that consists of a virtual machine (VM) running on the L3Harris VIDA Network Switching Center (NSC). The StatusAware Service provides a single interface for collecting location (GPS data) and status (Presence data) information from devices such as P25 radios and L3Harris BeOn clients. L3Harris calls these devices "Presentities". Presence information can include data such as unit availability, permissions, capabilities, and affiliations (e.g. talk group, site, etc.).

StatusAware can then send this information to other internal or external applications such as Automatic Vehicle Location (AVL). L3Harris calls these applications "Watchers". Visual representation of GPS location and Presence data greatly enhances the ability to respond to crisis incidents and operational changes. As part of the L3Harris Situational Awareness Mapping solution, the StatusAware service communicates automatically and securely in real-time to ensure the most up-to-date information is available to the dispatcher or mapping application user for faster incident responses.

StatusAware Manages:

> P25 Tier 2 GPS Location Requests: Tier 2 Location Request is a TIA P25 standards-based feature that requires a working channel utilizing a voice communications talkpath to make the data transmission.

> Binary Efficient Location Reporting (BELR): BELR messaging is similar to Tier 2 GPS in that it requires a working channel utilizing a voice communications talkpath to make the data transmission. However, BELR streamlines GPS data exchanges into a single outbound P25-GLR message, and a single inbound P25-GLP message for more efficient use of system resources. This feature increases efficiency over standard Tier 2 functionality and is proprietary to L3Harris.

> In-Band GPS Location Requests: In-Band GPS transmits GPS data without disruption while also transmitting voice communication with no additional working channel required. This proprietary L3Harris feature provides the most efficient use of system resources while also supporting location services.

DISPATCH CONSOLE SYSTEM

L3Harris Technologies is proud to offer Hunt County a dispatch console system based in the Symphony dispatch platform.

With the L3Harris design, Hunt County will gain the following capabilities:

> **Enhanced Dispatch Experience** – The Symphony dispatch console was designed for simple, efficient public safety radio dispatch (9-1-1) operation. The Symphony Dispatch Console combines the Symphony Dispatch Platform with advanced application software to support 24-hour mission-critical operations.

> **Cutting Edge Technology** – A unique hardware design supports the reliability needed for emergency responses. Advanced digital audio technology delivers high capacity and secure end-to-end communications.
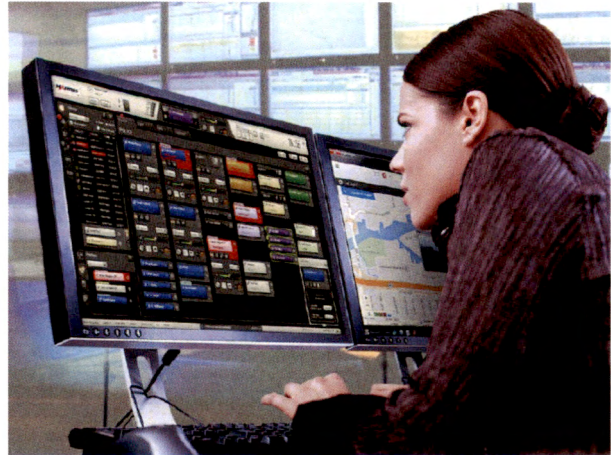
Overview

The proposed dispatch console system is based on the L3Harris' Symphony Dispatch Platform, and it is controlled by the VIDA Premier Core, so it has operational control over all the communication resources interfaced into the system as per below:

> BeOn (LMR over Broadband) users (allows for the ability to receive and place radio calls over LTE and Wi-Fi)

> Interop Gateway Talkgroup users (Helps communicate with Legacy radios during and after the transition/cutover period). This capability provides dispatcher to communicate with other radio systems, including legacy conventional networks.

Locations

The proposed dispatch center equipment will be deployed at the existing Hunt County Sheriff Office dispatch center.

Equipment

L3Harris will provide the following equipment:

> 3 Symphony IP Dispatch Consoles, each equipped with:

   – AES encryption

   – Licensing for conventional control

   – 27" Hi-Def monitor

   – Two Nano speakers

   – Gooseneck desktop microphone

   – USB keyboard and mouse

- – USB single footswitch

- – Six-wire jack box

- – Over-the-Head Headset with wireless adapters

> Redundant Cisco dispatch site access routers and ethernet switches

> 3 XL-200M desktop control stations with power supply and mobile radio antennas to be utilized as backup radio to the 3 Symphony Consoles

BATON

A differentiating feature of the Symphony software is the patented Baton™, which simplifies workflow by putting the features dispatchers use the most where they need them. The Baton provides a heads-up display of radio system status and controls to the dispatcher directly on their main CAD position using the same mouse and keyboard. Up to 95% of the functionality of the full Symphony application is presented in 10% of the screen real estate to the user, reducing the number of monitors, mice and keyboards required.

The Symphony Baton Remote makes complex tasks simple by integrating directly with the existing 9-1-1/dispatch console software and CAD software allowing dispatchers to handle calls using a single monitor, mouse and keyboard. It can be placed on any screen, anywhere.
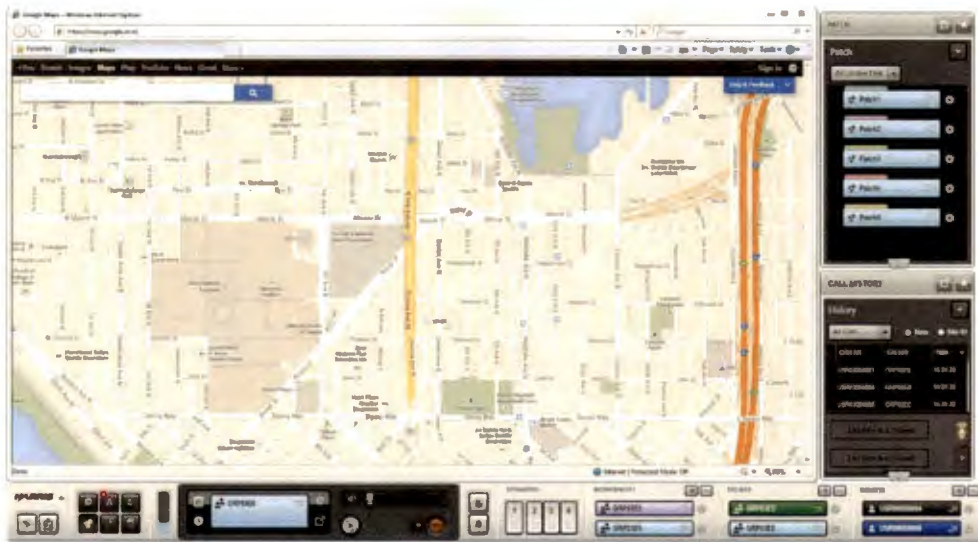
BACKUP RADIO CONFIGURATION

If connectivity between VIDA core and Symphony console is lost, Hunt County may use the console's advanced backup radio digital interface feature.

This feature allows dispatchers to control the XL-200M backup radio directly from the Symphony application. Dispatchers can seamlessly continue their dispatch operations and workflow, in the event of a network disruption, via the backup radio.

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The advanced backup radio digital interface feature will support initiating a group call, declaring/clearing emergency and changing talkgroups using the Symphony application.

Figure 12 illustrates the configuration planned for Hunt County's XL-200M desktop mobiles.

Figure 12. Backup Radio in Desktop Cabinet

PRIMARY DISPATCH SITES – SECONDARY CONNECTION

The backup radio feature enables the dispatcher to connect the console to a mobile radio in the event the network connection is disrupted. The PTT and audio signals from the console desk microphone, headset, speakers, and footswitch are summed and sent to a mobile control station in backup mode. A three-position backup radio switch (Auto, Disable, or Manual) located on the front of the Symphony Dispatch Platform enables or disables the backup radio mode.

> Auto mode – The backup radio will be engaged when the console is shut down and automatically disengage when the console starts

> Manual mode – The backup radio is in a "Bypass Only" state and will stay enabled and activated until the mode is changed.

> Disable mode – The backup radio will always be disabled.

The connectivity between the console and the backup radio is shown below:
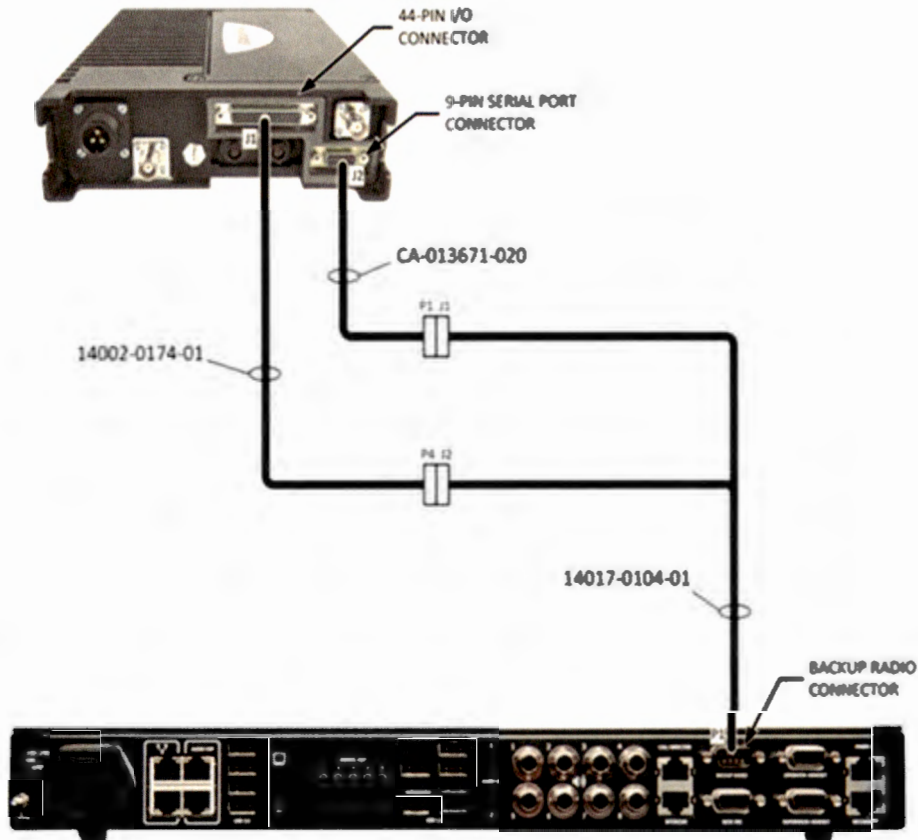
The Status Bar displays information about whether Symphony is currently in backup radio or console mode. The dispatcher will also be able to change the channels on the backup radio directly from the Symphony console's user interface. There is no need to touch the radio control head itself.

COMMON ELECTRONICS EQUIPMENT

The Symphony Console does not have common electronics equipment. The Symphony Dispatch Platform directly connects into the Network Switching Center. This allows seamless audio and control signal routing between the dispatch operator positions and the proposed P25 system.

The consoles are independent of one another, therefore, failure of one console does not affect operations of the other consoles, eliminating any single points of failure. Any other console can be quickly reprogrammed with the functionality of the failed console. Any user can log into any available console and continue dispatching. Likewise, the Symphony console supports individual dispatcher login and personalization to permit dispatch specific settings and common architecture so dispatchers can access their specific settings at any dispatch console location. L3Harris will work with Hunt County to customize the console screen layout to meet individual dispatcher needs.

Interoperability

INTER-RF SUB SYSTEM INTERFACE - ISSI

ISSI connections to three (3) external systems with 8 concurrent talkpaths each have been priced. ISSI features are limited to the capabilities of the most limited side of the connection. For ISSI connections to other L3Harris P25 systems the following features are supported.

> Seamless roaming of subscriber units

> Access to coverage from neighboring system sites

> Backup coverage for border areas in the event of a site outage

The Inter-RF Subsystem Interface (ISSI) is a wireline interface that is part of the P25 standards to facilitate the connection of two or more P25 networks. Regardless of frequency or manufacturer, two or more different P25 LMR networks that support the ISSI can communicate with one another. L3Harris supports the P25 standard and uses the ISSI to connect to adjacent L3Harris systems. By leveraging a standards-based method of connectivity, statewide and adjacent systems can utilize any manufacturer radio that is P25 compliant and be assured that interoperability will remain functional.

The ISSI provides the features and capabilities necessary for communicating and interfacing with surrounding agencies. The ISSI server is virtualized on the NSC hardware. Therefore, one ISSI server is highly scalable and expandable with mere software upgrades to a maximum capacity of:

> 1,000 concurrent talkpaths between systems

> 10 external system interconnections

Additional connections can be supported by adding another ISSI server to the radio system. Figure 13 lists features supported by the L3Harris ISSI. . Please note that these features need to be supported by the external system for final implementation.

Figure 13. Features Supported by the L3Harris ISSI

ISSI FEATURES	
Home User Roaming	ISSI Supplementary Data – Group Emergency Cancellation
Roaming Management	Console Subsystem Interface (CSSI) Voice Services
Automatic (forced) Group Registration	Unit Tracking
Group Calls (confirmed)	Support for P25 Phase 2
Group Calls (unconfirmed, encrypted)	Support Site Adjacency
Emergency Calls	Fixed Group Mapping
Group Affiliation	Highly Secure Operation
Send Caller ID in Group Calls	Fault and Performance Traps
Group Tracking	Real Time and Historical Call Activity
Inter-RF Subsystem Interface (ISSI) Supplementary Data – Emergency Alarm	Foreign User Registration Support
ISSI Supplementary Data – Emergency Alarm Cancel	Granting Requested Resources
CSSI Mobility Management Functions	Capability Polling

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Disclaimer

The ISSI pricing included in the price pages assumes the following items.

> All systems ISSI links will be designed together, and at the same time.

> All systems will be at SR10A.7 release

> All systems will not use VIDA ID or TDMA CC

> All systems will have ISSI with HA, including IAR routers

> All systems are coordinated (same IDEN tables)

> All systems are L3H vendor

> ISSI to be designed in spoke and hub, with Hunt County being the hub (or home) system; all other systems (Henderson, Rockwall, and Kaufman) will be spoke.

> No other ISSI links will be considered, or added.

> All the radios are the same frequency band

> Connectivity between systems is not included in this proposal (backhaul – microwave, etc.)

PATHWAY+ ANALOG RADIO GATEWAY

The Pathway+ Analog Radio Station Gateway uses the Zetron Pathways+ Digital Fixed Station Interface (DFSI) Gateway to provide voice connections for interoperability between VIDA networks and repeaters, base stations, and control station radios on legacy radio systems.

Figure 14. Front View of the Zetron Pathway+ Gateway

Pathway+ acts as a communication bridge that operates over IP networks while replacing proprietary and legacy network connections. It allows for two-way communications between base stations and DFSI-connected consoles, regardless of the manufacturer or age of the equipment. This makes Pathway+ a powerful tool for agencies that are not ready to invest in fully upgrading their voice communication systems.

The audio from the legacy system is transported to the VIDA network using the Encompass Gateway, which maps the DFSI talkpaths to VIDA P25 Talkgroups.

The Zetron Pathway+ Gateway supports:

> Up to 2 connected base stations or repeaters.

> Up to 4 radio connections (2 gateways) in a 1RU rack mounted configuration. Multiple gateways can be installed at any suitable location.

> The following base station control features:

  – Conventional Control Channel Selection

  – Conventional Control Repeat Mode (Enable/Disable)

  – Conventional Control Squelch Mode (Monitor Mode On/Off)

Hunt County will need to provide the audio sources, such as a mobile radio that operates on the existing conventional systems, for the Zetron Pathway+. Multiple Zetron Pathway+ will be placed at the Sheriff's Office dispatch center. All provided audios sources are within the coverage area footprint of the source system.

ENCOMPASS GATEWAY

The Encompass Gateway for Digital Fixed Station Interface (DFSI) provides the capability for a VIDA Network to interface to any device that supports the DFSI P25 TIA-102 BAHA Fixed Station Interface. The application provides configuration, call control, and audio processing into and out of the VIDA Network for connected stations. The application also provides some Conventional Control capability.

The Encompass Gateway for DFSI bridges VIDA with DFSI stations or gateways, providing connectivity between conventional stations and Dispatch, BeOn, and P25 radios.

The Encompass Gateway provides the following conventional controls, which are supported by the Symphony Dispatch Console:

> Channel Selection

> Repeat Mode (Enable/Disable)

> Squelch Mode (Monitor Mode On/Off)

The Encompass Gateway application runs on the VIDA Application Server (VAS) as a Virtual Machine (VM). The Regional Network Manager (RNM) monitors, reports and logs the link status of the DFSI to the VNIC. Call records are recorded in Activity Warehouse. Realtime call activity is displayed by the RNM.

BeOn – LMR Over Broadband Solution

This proposal includes sixty (60) BeOn licenses that can be used for the L3Harris Portable Radios or iOS / Android Smartphones.

L3Harris developed the BeOn group communications suite to extend P25 Land Mobile Radio (LMR) Push-to-Talk (PTT) communication services to users on commercial cellular and private LTE broadband networks. With the BeOn solution, voice communication services can be delivered to subscribers as Voice-over-IP data packets using wireless broadband IP data services. Using the BeOn solution, subscribers on a cellular or Public Safety LTE broadband network can communicate amongst themselves or with interconnected LMR users. L3Harris has included, as an option, the BeOn solution.

The BeOn solution goes beyond LMR functionality by providing integrated voice, messaging, and location functionality. BeOn subscribers can use the coverage and bandwidth capabilities of a commercial or

private broadband data network for communications between team members. BeOn subscribers can interoperate with users on existing LMR systems, exchange text messages with other BeOn subscribers, dispatchers using the BeOn PC client, and pass real-time location and presence information between connected BeOn team members. Transmitted voice and text messages can then be communicated in real-time and also be available locally on the subscriber handset for later recall. When these communications are combined with integrated mapping and presence (subscriber status) information, BeOn users have the ability to determine the most efficient actions to take.

Because BeOn operates over both commercial cellular and LTE networks, utilizing these networks provides an additional level of interoperability with LMR narrowband communications. This extends the network coverage of a regional, statewide, or nationwide LMR network to the available coverage of global commercial cellular networks. BeOn subscribers operating on broadband networks have a cost-effective approach to extend the reach of their LMR communication systems.

THE BEON USER EXPERIENCE

BeOn Solution

The BeOn subscriber application fully leverages the capabilities of the Apple iOS, Android OS and Windows operating systems and uses discrete buttons on the supported hardware platforms. The BeOn subscriber application provides intuitive and distinguishable icons for core functionality, with features driven through use of the Android touch screen. For ease of access, the Push-to-Talk function is mapped to a specific hardware button on each device.

> **The BeOn solution extends LMR features to cellular and broadband-based devices, and adds text, location and presence information and functionality.**

> **It has been configured (Capable/Enabled) for the XL family of portable radios.**

The BeOn Home screen shows the currently selected talk group, scan operation, connection status and the user identification of incoming calls. Using the tabbed interface, the user can select the Groups screen to change talk groups, the Contacts screen to communicate individually with other BeOn users, the Events screen to replay missed conversations, and the Scan screen to select and manage scan lists. Other icons on the display provide access to Presence/Status updates and the Location services.

Figure 15. BeOn Subscriber Application

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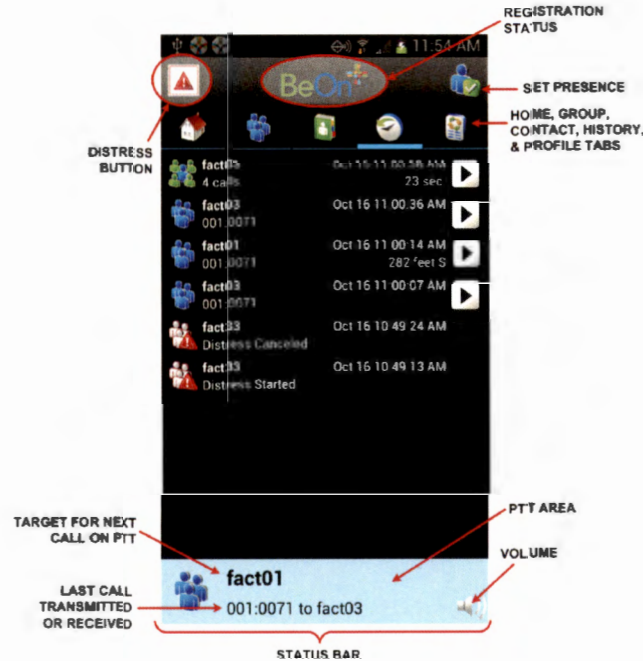
PTT Features

The BeOn PTT feature set comprises a collection of communications features focused on one-to-many (group) communications between mobile users. Individual PTT communications (one-to-one) are also supported. A summary of the currently supported PTT feature set between BeOn devices is provided in Figure 16.

Figure 16. Push-to-Talk Features between BeOn Devices

FEATURE	DESCRIPTION
Group Call	The ability for a user to simultaneously communicate with multiple users who are all part of the same talk group on the BeOn network.
Individual Call	The ability for a user to establish a private 1.1 call with another user on the BeOn network.
User Registration	Every user device is registered and authenticated on the BeOn network.
Caller ID	Devices display the number and alias of the talking user while the transmission is ongoing.
Distress Calls	Distress calls notify a talk group that a field user needs assistance. Distress calls scan at a higher priority than normal calls.
Caller Location	Ability to include the device based geographical location (latitude and longitude) of a talker in each transmission. (Also includes relative location so the call participant knows where the call initiator is relative to his/her own location)
Location Privacy	A user may optionally disable the location feature from the handset.

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FEATURE	DESCRIPTION
User Presence	Allows a user to determine whether another user is logged onto the system and active or in silent mode.
Group Presence	Allows a user to determine which other users are currently members of a particular talk group
Call Logging and Callback	The device retains a log of each received transmission. By selecting the call record of a particular transmission, the user can "call back" the talk group or individual that was the source of the transmission.
Late Call Entry	Ability to join and participate in an ongoing talk group call due to the receiver being busy or out of coverage at the beginning of the transmission.
Group Scanning	Allows a user to monitor activity on groups other than its selected group and scan over to it when activity is detected.
Supervisor Override	Allows a Supervisory user to take the floor from the current talking party.
Console Override	Allows a Console to take the floor from the current talking party.
Instant Recall	Enables users to re-play recordings of recent transmissions directly from the call-log window of the device.
SmartGPS	The end user can configure the application to periodically report location to the server. The reports are sent on a time interval and distance removed basis.

Disclaimer

L3Harris cannot guarantee either the extent or consistency of the wireless coverage and communications of a cellular commercial carrier's network or other third-party network nor can L3Harris guarantee the quality of the data service provided. Given the dependency on commercial cellular and third-party networks, the operation of the BeOn solution, including location information, is not intended for mission critical communications but rather for administrative and other communications.

BACKHAUL NETWORK REQUIREMENTS

Transmit Site locations and the dispatch centers, the access to L3Harris provided microwave backhaul is accomplished by establishing Ethernet connections between redundant Site Access Routers (SAR's) and a local MPLS router. Aviat Networks is providing the microwave backhaul and MPLS routing will be part of the microwave infrastructure. The microwave vendor has provided this interface equipment. In addition, L3Harris has provided the VIDA Network WAN Requirements documentation for reference in case in the future Hunt County would like to invite a neighboring jurisdiction to the network.

At the dispatch center, redundant SAR's connect to redundant Site Access Switches (SAS'). Each switch provides a connection to the Symphony dispatch consoles.

VPN access for remote monitoring and for BeOn communications is established through the internet and protected by the firewall (IFW).

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All network equipment are COTS. The proposed microwave system is based on the Aviat Eclipse microwave radio (IRU-600). The MPLS network will be deployed with MPLS routers at each site using the Nokia 7705 SAR-8.

At the Dispatch site (Hunt County Sheriff's Office), the following network equipment is provided:

> SAR = Cisco C1111 (Site Access Router) - redundant

> SAS = Cisco C1000-24 (Site Access Switch) - redundant

At the simulcast sites (Whitley Hall, Water Tower, Celeste, Crown Castle), the following network equipment is provided:

> DCP SAR = Cisco C1111 (Site Access Router)

> DCP SAS = Cisco C1000-24 (Site Access Switch)

VIDA NETWORK WAN REQUIREMENTS

To guarantee the quality of voice through the VIDA network, L3Harris will design all microwave wide area network (WAN) links to strictly adhere to the requirements provided in the following sections. Conformance with these design requirements is a necessary condition for L3Harris to meet the overall performance needs of the VIDA system. All requirements are necessary to provide a guaranteed level of service for voice quality.

PACKET LOSS REQUIREMENTS

Due to the connectionless nature of UDP used in transmitting voice packets, minimal packet loss is tolerable in the VIDA network. However, *any* packet loss could result in degraded voice quality or loss of voice. The microwave backhaul links will be designed to prevent degraded voice quality that comes from the result of packet loss. The minimum link availability design will be based on a minimum of 99.999% over a year.

Performance testing measurements will be made based on the following:

> RFC 2544 standard to be used

> Frame loss shall be less than .001%

> Length of test per link will be 12hrs

> Out-of-Order packets shall be less than .001%

MULTISITE, DCP CELL OR CONSOLE LINK LATENCY (ONE-WAY)

Any latency within the system will need to stay constant to avoid jitter. The latency requirement differs based on the site type and traffic patterns. The VIDA network supports up to 150msec of one-way latency between the two HA cores on the L3Harris IMS Facility / Hunt County, Texas backhaul network. Therefore, latency for each multisite link, DCP simulcast cell link or console link plus the link latency between the two HA cores should add up to less than 150 msec. The low latency and jitter specifications of the Aviat equipment will ensure that the L3Harris requirements are exceeded.

MULTI-SITE JITTER (ONE-WAY)

Jitter is the variability of packet delays within the same voice packet stream (talk spurt).   The L3Harris requirement is for the overall jitter to average to zero and to never build up to more than 60 ms one-way. Any streams with excessive jitter will be considered to have packet loss which can cause voice quality issues. For example, if a voice packet were 60 milliseconds late, then it would be optimal for the next few voice packets to be early to get the average jitter back to zero. This will allow the voice buffer to build back to a stable point.

CRITICAL BUILDING COVERAGE ANALYSIS

Hunt County identified a number of critical buildings from a set of addresses they provided. L3Harris identified the latitude and longitude coordinates associated with the provided building information. This information was then imported into the RAPTR propagation software.

With these locations imported into the propagation software, a coverage analysis from the system design was performed to determine the mean signal level and the standard deviation at each of these locations. These values were used to calculate the predicted 95th percentile of the available in-building penetration margin at these locations.

Building penetration losses presented by actual buildings vary widely between buildings, and even in different locations inside of the same building. The predicted available margins may not be enough to provide reliable radio coverage inside some of the buildings. Some of the many factors' contributing to this are construction materials used in the interior and exterior of the building, internal layout of the building, direction to the serving radio site(s), and even the type of glass used in the building's windows. The predicted available margin is calculated by examining a predicted outdoor signal strength adjusted by a number of correction factors to calculate the Predicted Available Margin.

The Hunt County design, in cooperation with the L3Harris IMS facility design, is predicted to provide the building penetration margin to a portable radio for each building shown in Figure 2 using the site locations shown in Figure 1. These margins do not reflect a coverage guarantee and are for informational purposes only.

The site locations provided in Figure 1 are used for a design consisting of two simulcasts cells with a total of 7 sites in Hunt County and include the L3Harris IMS Facility. The use of these sites is based on the following assumptions:

> Permission for use of towers and shelters not currently owned by Hunt County will be obtained.

> There is adequate space on proposed towers for the antennas at the currently specified heights.

> Frequencies are available for the required number of channels in the multisite design.

Any deviation from these assumptions will require a reevaluation of the coverage design, guarantees, and margins shown in Figure 2.

Figure 1. Proposed Hunt County Site Locations

SITE ID	SITE NAME	SIMULCAST CELL	LATITUDE	LONGITUDE
HC_CC	Hunt County - Crown Castle	North	33.13722	-96.2133
HC_Cel	HC_Celeste	North	33.30472	-96.2008
HC_SO	Hunt County - Sheriff's Office	North	33.13771	-96.1052
HC_Wly	Hunt County - Whitley	North	33.23680	-95.9101
HC_WTID	Hunt County - Water Tower	South	32.90215	-96.1121
IMS_N	IMS North	South	33.07514	-96.0700
IMS_S	IMS South	South	33.06408	-96.0697

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Figure 2. Critical Building Predicted Margin for the Hood County/L3Harris IMS Design

BUILDING	LATITUDE	LONGITUDE	PREDICTED AVAILABLE MARGIN (dB)
Lee Elementary	33.07536389	-96.22872778	17
Griffis Elementary	33.04856111	-96.23622778	10
Caddo Mills Intermediate	33.07106389	-96.22773333	13
Caddo Mills Middle School	33.07934722	-96.22879167	17
Caddo Mills High School *** Under construction ***	33.05594167	-96.21890278	14
Bland Elementary	33.22001944	-96.2705250	16
Bland Middle	33.22001944	-96.2705250	16
Bland High	33.20913333	-96.29590278	12
Celeste Elementary	33.29265556	-96.20134722	34
Celeste Middle	33.29245556	-96.19920000	34
Celeste High School	33.29003611	-96.20194444	34
Wolfe City Elementary	33.36756944	-96.07516667	18
Wolfe City Middle	33.36707500	-96.07565833	18
Wolfe City High School	33.35703056	-96.07977778	20
Campbell Elementary/Middle	33.15152778	-95.95443056	17
Campbell High School	33.15147222	-95.95385000	16
Lone Oak Elementary	32.98848056	-95.93440556	13
Lone Oak Middle	32.98743333	-95.93290000	17
Lone Oak High School	32.98596111	-95.93130833	17
Boles Schools	32.94629722	-96.10147222	23
DC Cannon	32.90563611	-96.13473056	39
Thompson Middle	32.91723056	-96.12893056	40
Butler Intermediate	32.90588611	-96.13106111	39
Ford High School	32.89226667	-96.13571389	34
Commerce Elementary	33.23045833	-95.88791111	41
Commerce Middle	33.23637778	-95.88841667	35
Commerce High School	33.24191111	-95.92492500	41
Commerce A&M	33.24206111	-95.90461944	47
Hunt Regional	33.23263056	-95.91097222	50
Walmart	33.23502778	-95.91472778	48
Walmart	32.90860833	-96.12509722	41

BUILDING	LATITUDE	LONGITUDE	PREDICTED AVAILABLE MARGIN (dB)
Thompson's Residential Treatment Center	33.01388333	-96.04888611	14
Redemption Camp	33.15969722	-96.24774722	24
Individual Care of TX	32.94035833	-96.16658333	20
Hunt Regional	32.90446111	-96.12128889	41
Texas Beach Club	33.12841667	-95.98971389	19

Figure 3. Hunt County Design Sites' Parameters

SITE NAME		HC_CELESTE	HUNT COUNTY - CROWN CASTLE	HUNT COUNTY - SHERIFF'S OFFICE	HUNT COUNTY - WATER TOWER
Site ID		HC_Cel	HC_CC	HC_SO	HC_WTID
Latitude		33° 18' 17.930" N	33° 08' 14.000" N	33° 08' 15.763" N	32° 54' 07.740" N
Longitude		96° 12' 03.330" W	96° 12' 48.000" W	96° 06' 18.817" W	96° 06' 43.589" W
Datum		WGS 1984	WGS 1984	WGS 1984	WGS 1984
Site Elevation		676 ft	568 ft	532 ft	499 ft
Base Station		MASTR V	MASTR V	MASTR V	MASTR V
Frequency Range		764 - 806 MHz	764 - 806 MHz	764 - 806 MHz	764 - 806 MHz
SITE TRANSMIT	Station Output Power	60.3 W	64.6 W	69.2 W	66.1 W
	Combiner Model	DSCC75 (4 ch.)	DSCC75 (4 ch.)	DSCC75 (4 ch.)	DSCC75 (4 ch.)
	Tx to Tx Spacing	250	250	250	250
	Combiner Loss	2.4 dB	2.4 dB	2.4 dB	2.4 dB
	Filter/Duplexer Model	CP05470	CP05470	CP05470	CP05470
	Filter/Duplexer Loss	1.0 dB	1.0 dB	1.0 dB	1.0 dB
	Coax Type	1-5/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	300 ft	200 ft	240 ft	210 ft
	Coax Loss	2.1 dB	2.3 dB	2.7 dB	2.4 dB
	Antenna Model	SC49C-HWBLDF (D00-PIP)	SE4192-SWBP2LDF (D00)	SC46A-HF1LDF (D00-PIP)	SC49C-HWBLDF (D00-PIP)
	Antenna Height (C.L)	250 ft	150 ft	190 ft	160 ft
	Antenna Azimuth	0°	215°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°

SITE NAME		HC_CELESTE	HUNT COUNTY - CROWN CASTLE	HUNT COUNTY - SHERIFF'S OFFICE	HUNT COUNTY - WATER TOWER
	Antenna Gain (Hzn)	11.2 dBd	11.7 dBd	10.0 dBd	11.2 dBd
	Maximum ERP (Hzn)	223.8 W	257.0 W	169.8 W	229.1 W
	HAAT	290.0 ft	144.0 ft	168.0 ft	180.0 ft
SITE RECEIVE	Total System Gain	7.2 dB	7.3 dB	7.2 dB	7.3 dB
	Multicoupler Model	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	300 ft	200 ft	240 ft	210 ft
	Tower Top Amp Model	CP00732	CP00732	CP00732	CP00732
	TTA Pad	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	6.1 dB	6.5 dB	7.1 dB	6.4 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	SC49C-HWBLDF (D00-PIP)	SE4192-SWBP2LDF (D00)	SC46A-HF1LDF (D00-PIP)	SC49C-HWBLDF (D00-PIP)
	Antenna Height (C.L)	250 ft	150 ft	190 ft	160 ft
	Antenna Azimuth	0°	215°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	11.2 dBd	11.7 dBd	10.0 dBd	11.2 dBd
	HAAT	290.0 ft	144.0 ft	168.0 ft	180.0 ft

Figure 3. Hunt County Design Sites' Parameters (Continued)

SITE NAME		HUNT COUNTY - WHITLEY	IMS NORTH	IMS SOUTH
Site ID		HC_Wly	IMS_N	IMS_S
Latitude		33° 14' 12.480" N	33° 04' 30.512" N	33° 03' 50.681" N
Longitude		95° 54' 36.432" W	96° 04' 11.821" W	96° 04' 10.870" W
Datum		WGS 1984	WGS 1984	WGS 1984
Site Elevation		532 ft	522 ft	525 ft
Base Station		MASTR V	MASTR V	MASTR V
Frequency Range		764 - 806 MHz	764 - 806 MHz	764 - 806 MHz
SITE TRANSMIT	Station Output Power	67.6 W	77.6 W	69.2 W
	Combiner Model	DSCC75 (4 ch.)	DSCC75 (4 ch.)	DSCC75 (4 ch.)
	Tx to Tx Spacing	250	250	250
	Combiner Loss	2.4 dB	2.4 dB	2.4 dB
	Filter/Duplexer Model	CP05470	CP05470	CP05470
	Filter/Duplexer Loss	1.0 dB	1.0 dB	1.0 dB
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	220 ft	270 ft	230 ft
	Coax Loss	2.5 dB	3.1 dB	2.6 dB
	Antenna Model	SC49C-HWBLDF (D00-NUFP)	SC46A-HF1LDF (D04-PIP)	SC46A-HF1LD0F (D04-PIP)
	Antenna Height (C.L)	170 ft	120 ft	80 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	11.4 dBd	1.9 dBd	1.9 dBd
	Maximum ERP (Hzn)	239.9 W	26.9 W	26.9 W
	HAAT	177.0 ft	119.0 ft	89.0 ft
SITE RECEIVE	Total System Gain	7.3 dB	7.3 dB	7.3 dB
	Multicoupler Model	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam

SITE NAME	HUNT COUNTY - WHITLEY	IMS NORTH	IMS SOUTH
Coax Length	220 ft	270 ft	230 ft
Tower Top Amp Model	CP00732	CP00732	CP00732
TTA Pad	0.0 dB	0.0 dB	0.0 dB
Distribution Pad	6.3 dB	5.7 dB	6.2 dB
Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
Antenna Model	SC49C-HWBLDF (D00-NUFP)	SC46A-HF1LDF (D04-PIP)	SC46A-HF1LDF (D04-PIP)
Antenna Height (C.L)	170 ft	120 ft	80 ft
Antenna Azimuth	0°	0°	0°
Antenna Mechanical Tilt	0°	0°	0°
Antenna Gain (Hzn)	11.4 dBd	1.9 dBd	1.9 dBd
HAAT	177.0 ft	119.0 ft	89.0 ft

RF Solutions

RAPTR Version 33.1.487
Monday, July 18, 2022 16:22:30
Project: 22CS48419 - Hunt County TX P25 System
MBP: 3787
Figure: Hunt County Mobile Talk Out
Engineer: Jessica Barron
Map type - 1:217,000
Note: Map depicts coverage across the defined service area. Statistical variability does not allow
for guarantee of coverage in specific locations, but does represent graphically area % coverage

L3HARRIS

RF Solutions

RAPTR Version 33.1.487
Tuesday, July 19, 2022 11:20:29
Project: 22CS48419 - Hunt County TX P25 System
MBP: 3787
Figure: Hunt County Mobile Talk Back
Engineer: Jessica Barron
Map type - 1:217,000
Note: Map depicts coverage across the defined service area. Statistical variability does not allow
for guarantee of coverage in specific locations, but does represent graphically area % coverage.

L3HARRIS

RF Solutions

RAPTR Version 33.1.487
Tuesday, July 19, 2022 14:25:15
Project: 22CS48419 - Hunt County TX P25 System
MBP: 3787
Figure:
Engineer: Jessica Barron
Map type - 1:217,000
Note: Map depicts coverage across the defined service area. Statistical variability does not allow
for guarantee of coverage in specific locations, but does represent graphically area % coverage.

RF Solutions

RAPTR Version 33.1.487
Tuesday, July 19, 2022 13:32:35
Project: 22CS48419 - Hunt County TX P25 System
MBP: 3787
Figure: Hunt County Portable Outdoor Talk Back
Engineer: Jessica Barron
Map type - 1:217,000
Note: Map depicts coverage across the defined service area. Statistical variability does not allow
for guarantee of coverage in specific locations, but does represent graphically area % coverage.

L3HARRIS

L3HARRIS

- Portable Outdoor
- Portable Indoor 10 dB
- Portable Indoor 20 dB
- Portable Indoor 30 dB

IMPLEMENTATION

A Proven Methodology

L3Harris excels in the multifaceted implementation of mission critical radio communications systems to fulfill the specific needs of our customers and support their vital public safety operations as shown in the successful implementation of more than 150 P25 systems to date.

L3Harris uses a tollgate approach to implement projects with excellence. The tollgate methodology standardizes a control point where each phase of the project is reviewed, then approved (or not) before continuing with the next phase. With this methodology, L3Harris ensures that the project is reaching the expected performance, it controls cost, improves schedule, and promotes projects being executed in the most efficient way.

Upon contract signing, the L3Harris proposal and implementation teams will go through a 'contract hand-off' process. The proposal team coordinates with the assigned L3Harris implementation project manager and systems engineer to review the contractual obligations, key milestones, and other important issues. The process concludes with a hand-off of all necessary documentation to the L3Harris implementation team.

This document details the scope of work required for the project, through the following implementation phases:

> Design

> Production

> Installation/Optimization

> Acceptance Testing

> Cutover

> Final Acceptance

> Responsibility Matrices

1	2	3	4	5	6
DESIGN	PRODUCTION	INSTALLATION/ OPTIMIZATION	ACCEPTANCE TESTING	CUTOVER	FINAL ACCEPTANCE
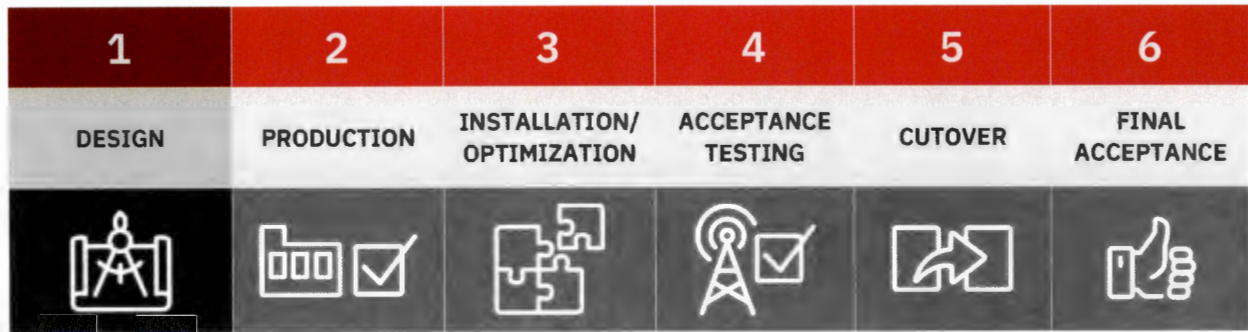
Design

KICK-OFF MEETING

The pricing, schedule, and design are contingent on Hunt County entering into an agreement with the L3Harris RMS Greenville Facility for the Hunt County P25 system to connect to the L3Harris RMS Greenville Facility P25 system.

The project manager initiates project implementation with a project kick-off meeting. The L3Harris Team, and Hunt County, will mutually agree on the timing of these meetings. The objectives of the meeting include:

> Introduction of all project participants

> Review the roles of the project participants

> Review the overall project scope, objectives, and deliverables

> Review the current site status

> Review customer owned site documentation

> Review the current frequency plan

> Review the preliminary project schedule

> Schedule site surveys with Hunt County, and/or site owner designated representatives

CUSTOMER DESIGN REVIEW (CDR)

The L3Harris Team uses the information obtained during the kick-off meeting and site surveys, along with regulatory and engineering documentation, to deliver the final system design at the CDR. The design drawings and documentation are presented during the CDR with Hunt County.

L3HARRIS™

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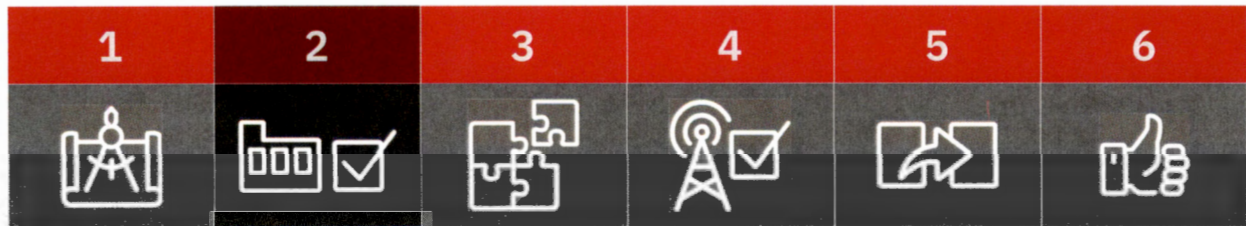
Production

SYSTEM INTEGRATION AND TEST - *FACTORY STAGING*

Immediately following approval of the CDR, the L3Harris Team procures material and schedules system integration and test using its' material requirements planning (MRP) system. Our Eagle Focus Factory assembles the RF equipment, integrates it with the key supplier components, and then tests each rack of equipment.

After assembly and test, each RF site rack will be configured. This entails loading customer-specific parameters and personalities into each piece of equipment, as applicable. The staging technicians make all network connections for each site's equipment including RF, dispatch, interoperability gateways, and other subsystems. Ethernet and/or fiber cable connections are made to simulate backhaul networks and ensure the equipment connects to the network switches. The staging team programs radios to operate on a test user database. Next, system levels are verified and tested to confirm that system is ready for the factory acceptance test (FAT). Once the staging team completes a dry run FAT, the system is transitioned to the systems engineer for additional testing and verification.

Running the FAT demonstrates the radio system functionality. The FAT uses the functional acceptance test plan (ATP) tests appropriate in a factory staging environment. The FATP defines each test, with instructions on how to set up and run the test, and compares the actual results to the expected results. The test team, consisting of the L3Harris systems engineer and the Hunt County representatives, scores and initials each test.

SHIPPING, WAREHOUSING, AND INVENTORY

After a successful factory acceptance test (FAT), all system equipment is packaged using established procedures depending on the mode of transportation. The Team engages appropriate freight carrier services to deliver the system to the address designated in the sales order. The system equipment will be warehoused and inventoried at an L3Harris provided facility.

Subscriber equipment may ship with the system or separately as determined by the L3Harris Team.

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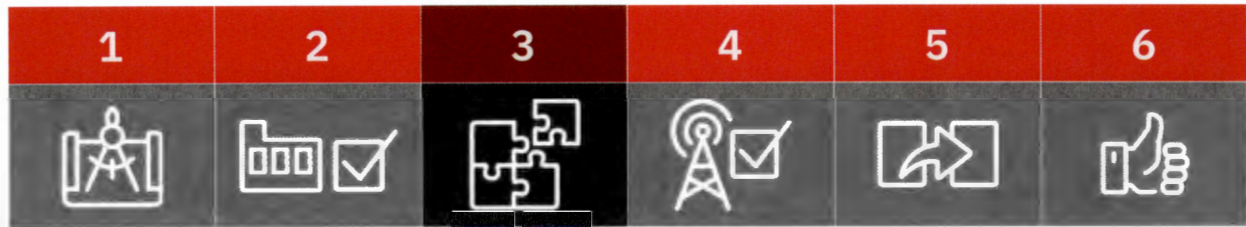
Installation/Optimization

SITE DEVELOPMENT

All site develop activities will be the responsibility of Hunt County.

SHELTERS & TOWERS

Existing Towers

For those sites that have existing towers, we perform a structural analysis to verify that the towers have the capability to support the loads of the existing antennas and cables, as well as the loads for any new antennas and cables. The Team reviews each tower configuration, recommends the best location to mount the new antennas, and presents this data at the CDR.

Existing Shelters

Sites that have existing shelters will be physically inspected and floor space calculations performed to verify that there is adequate space to install new equipment racks. We will also review the existing electrical power, HVAC, and standby power systems, and discuss needed upgrades at the CDR.

GROUNDING AND LIGHTNING PROTECTION

At existing sites identified in this implementation plan, we will measure the site grounding system resistance using the three-point "fall of potential" testing procedure (where possible). This procedure requires the following:

> Powering down the entire site and any co-located sites (including any co-located equipment at the site)

> Disconnecting the AC power utility side neutral by an electrician

> Conducting - where there is enough open space - the test equivalent to five to ten times the diagonal of the fenced compound

At existing sites, it is generally not practical or even possible to perform an accurate three-point fall of protection test. After contract award, L3Harris will perform a ground system inspection to determine the suitability of existing ground systems. L3Harris will identify and make recommendations for any ground system improvements or deficiencies identified during the ground system inspection. L3Harris can provide a quotation to perform any recommended ground system improvements or Hunt County may elect to handle the issues directly.

If a three-point "fall of potential" test is not possible, L3Harris can perform "clamp-on" ground resistance test if there is only one AC power utility feed to the site. In this case, the site and any co-located sites can be powered down or put on backup power; then the AC power utility side incoming neutral can be accessed).

INFRASTRUCTURE INSTALLATION

The L3Harris Team develops the installation plan during the detailed design phases of the project and presents it to Hunt County for review and approval. The installation plan includes floor plan drawings, equipment rack-up drawings, antenna location details, and installation procedures based on site surveys the team or designated subcontractors conduct. The installation plan helps drive the activities of the project team, minimizing installation conflicts, and ensures that system implementation proceeds

efficiently. The project team takes great care to ensure there is minimal disruption in service when installing the new P25 system in existing equipment locations.

Site equipment installations follow industry standards, including L3Harris Grounding and Lightning Protection. We review the installation work after it is complete to ensure we followed these standards.

ANTENNA SYSTEMS

A key aspect of the infrastructure equipment work is installation of the new P25 antenna systems. Installation of new antenna systems may occur on a newly constructed tower, existing towers in use by the customer as part of their legacy radio system, or on existing towers that are not part of the legacy radio system.

In the case of newly constructed customer-owned towers, antenna system installation is very straight forward per the system design. For towers that are part of the customer's legacy system, new antenna system installations must consider the location of the existing customer antennas, and the timing of their removal. Antenna system installation on existing towers that are not part of the customer's current system are not impacted by the presence of legacy system antennas. However, Hunt County must coordinate the proposed location of the antenna systems on the tower with the tower owner when they obtain a site lease.

Our experienced tower crews place antennas on side arm mounts and support the RF cables with transmission line hangers secured to the tower cable ladder. The cables have ground kits that will be installed at the top, at the bottom as the cable leaves the tower, and at the end of the ice bridge before the cable entry port. Where applicable, grounding kits will be installed in the middle every 75 ft., so that there is no more than a 75-foot gap between grounds.

The tower crew runs coaxial cables down the tower cable ladder, and onto the ice bridge terminating just inside the cable entry port.

After installation, we sweep the receive and transmit transmission lines separately, and one sweep from the transmission line to the transmit antenna(s) as a system to confirm that the line and antenna(s) were properly connected, with an Anritsu Site Master, or equivalent cable-testing device, on the appropriate frequency band(s) to ensure proper performance.

We then record the baseline test data and provide it to Hunt County. A copy will remain on-site for future reference.

INFRASTRUCTURE EQUIPMENT

The P25 trunked base station, microwave, and associated equipment typically mounts in 86-inch standard aluminum EIA 19-inch open-frame racks or EIA 19-inch enclosed cabinets. The RF connections extend to the coaxial cables using appropriately sized jumper cables.

L3Harris assumes that Hunt County-provided shelters will accommodate the height of these racks and allow them to position the desired 36 inches of free aisle space (in front and in the rear). Racks and cabinets are anchored to the floor using at least four anchor points.

Once the infrastructure racks are secured, we ground and connect them to power, and technicians verify proper levels and settings, preparing the site for the acceptance test.

L3Harris will work with Hunt County personnel and/or their representatives to prepare for their participation in acceptance testing. After the test is complete, the installation team records the

alignment and test data and provides copies to Hunt County. Copies of the individual site alignment and test data will be available at the sites.

Installation crews also install and commission the network switches, dispatch consoles, and other infrastructure equipment, per the detailed implementation plan.

OPTIMIZATION

Upon installation of infrastructure equipment, the system engineer(s) works with the on-site technicians to optimize the equipment in preparation for acceptance testing.

Simulcast – Per Simulcast cell, includes verify launch timing, verify timing drive test, making iterative adjustments, repeat timing drive test, if needed, and verify configuration, test voter, test network latency, verify network switches, and dispatch console operation.

Multi-site – Includes set up site adjacency in the VNIC, build roaming personality, drive test roaming and hand-off, and finalize roaming personalities.

L3Harris will conduct a preliminary acceptance test to determine that the systems are fully optimized and ready for the acceptance test with Hunt County.

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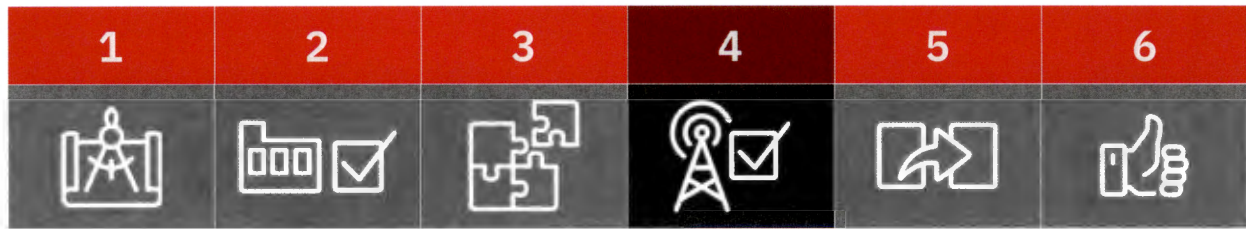
Acceptance Testing

We will perform systems acceptance testing per the agreed upon acceptance test plan (ATP). The L3Harris Team notifies Hunt County when installation and optimization are complete, and the system is ready for acceptance testing.

The system engineer provides documentation defining each of the test areas. The ATP procedures contain a short description, test methodology, and a record form for logging results and acceptance signatures for each test. A punch list is used to document any issues found, so the team can quickly resolve them. Follow-up documents will show the correction of open items. Upon satisfactory completion of each testing phase, the project manager will present the system acceptance documentation to Hunt County's project manager(s). With Hunt County's approval we will proceed with cutover.

L3Harris will submit initial system acceptance documentation for Hunt County to sign, marking the successful conclusion of acceptance testing, and readiness for system cutover.

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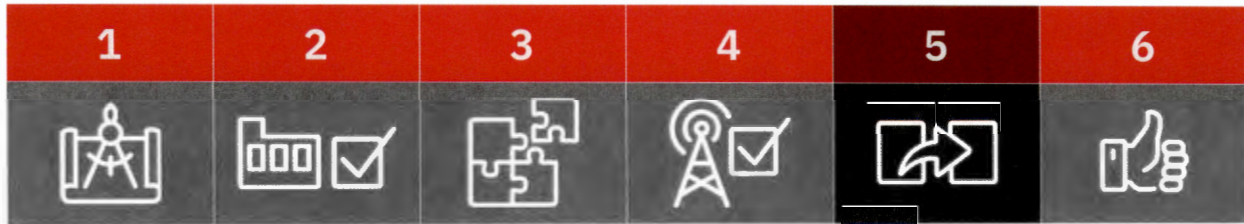
Cutover Approach

L3Harris and Hunt County will work together to prepare the cutover plan prior to user integration.

L3Harris is certain that Hunt County and L3Harris share the same overarching goals in the process – that there are no missed calls, and that each agency maintains adequate departmental communications during the cutover process.

Other than the bulleted items below, the cutover plan may also include topics such as the timing of the cutover, systematic fleet-by-fleet or agency-by-agency users' cutover, initial trial window or live system test window for the first batch of migrated users, milestones during cutover process, and finally, a fallback plan in case of any uncertainty. The entire cutover plan will be broken into multiple phases to ensure the smooth transition to new system.

The cutover plan will address:

> System User Migration – A transition plan will be jointly developed to schedule the public safety users obtaining new radios.

> User Unit Personalities – L3Harris will assist the Hunt County's project manager to develop a series of user profiles for the radio system users. These profiles will determine the user defined parameters for each agency and radio. Project worksheets will be filled out and approved, then forwarded to Hunt County for creation of individual personality files.

> Dispatch Support During Cutover – Since there may be a period when dispatchers may need to coordinate users on both systems, an interim solution will be created where the new dispatcher positions can talk to field units on both the existing system and the new system during the transition phase.

> Dispatch Center Cutover – Operation of the new consoles will be verified before cutover is to begin. L3Harris will work closely with the Hunt County's project

manager to coordinate the dispatch center cutover with the Hunt County cutover.

> Dispatcher and Radio User Training - Radio users will need to be trained on the new subscriber radios' operation. Our training team will help the County Name develop quick-reference materials and produce seminar-oriented train-the-trainer materials to facilitate this.

Because the new system would have already undergone extensive testing the probability that the new system would need to be taken down for repairs during cutover will be very low. However, provisions and plans for reverting to the old legacy system will be established in the event it becomes necessary. These plans will be worked out with the Hunt County and put into action only with proper consent of the Hunt County's project director.

Reaching a final cutover plan is typically the result of several customer reviews that include the Hunt County's representatives, and department heads.

After completion of cutover planning, the L3Harris Team and Hunt County agree on a day and time for cutover to begin. The L3Harris Team will be present with Hunt County to provide any last-minute answers to users as they go live on the new system.

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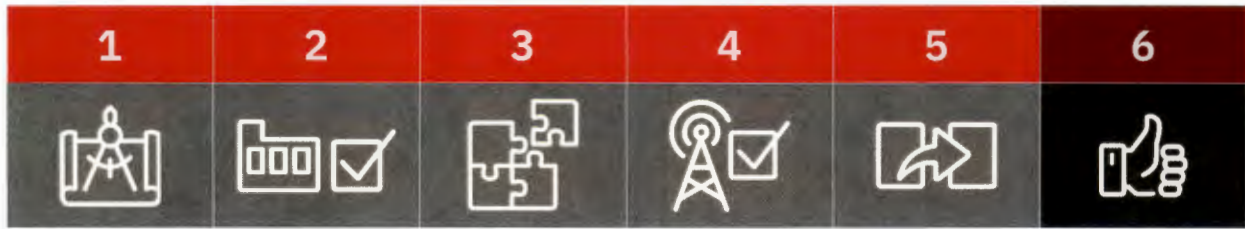
Final Acceptance

L3Harris will submit initial system acceptance documentation for Hunt County to sign, marking the successful conclusion of cutover.

FINAL ACCEPTANCE

Upon the successful completion of acceptance tests, cutover, and submission of the final drawing package, the project manager submits the final system acceptance letter for Hunt County to sign. With the final acceptance, the project manager arranges a meeting with the field service team to review maintenance support during the warranty period. The L3Harris Team provides the contact information and procedures used to obtain service during the warranty period.

Responsibility Matrices

The following responsibility matrices provides the project activities for which the L3Harris Team is responsible, and those activities that are Hunt County's responsibility.

Figure 1. Customer Design Review Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
PREPARE FOR CUSTOMER DESIGN REVIEW		
Provide location in appropriate conference room or training facility		X
Assemble project team and complete handoff from proposal team	X	
Assemble customer team for kick-off meeting		X
FCC licensed frequencies that meet contour limits and fulfill the frequency plan in accordance with the project schedule		X
Provide a team and propose a schedule for site surveys	X	
Arrange access to sites and confirm site survey schedule		X
Provide site-knowledgeable personnel (customer and site owner reps, as appropriate) to accompany the project team on site surveys		X
Conduct site survey(s) and provide recommendations	X	
Provide site plans and applicable electrical and layout plans		X

TASKS	L3HARRIS	HUNT COUNTY
Provide current tower and foundation drawings, along with a current mapping of installed antennas and cabling sufficient to complete a structural analysis as determined by the structural analysis firm		X
Perform structural analysis on existing towers, and provide results at CDR	X	
If tower(s) fails load analysis, strengthen or replace tower (L3Harris can provide quotes to strengthen (if possible) or replace the tower)		X
Conduct grounding inspection and provide recommendations	X	
Prepare one set of FCC license applications for Hunt County's submission	X	
Submit FCC license applications and pay requisite fees		X
Acquire property for any new customer-owned greenfield sites (if required)		X
Arrange for site lease for any non-customer-owned sites (if required)		X
CUSTOMER DESIGN REVIEW DELIVERABLES		
System block diagrams	X	
List of deliverable equipment for each site	X	
Network connection plan	X	
Tower antenna placement drawings	X	
Antenna system drawings	X	
Coverage prediction maps	X	
Frequency plans	X	
Combiner plans	X	
Rack elevation drawings	X	
AC power and BTU requirements	X	
Tower antenna placement plan	X	
Preliminary cutover plan	X	
ATP	X	
Project schedule	X	
CUSTOMER DESIGN REVIEW		
Present design	X	
Approve the design following CDR meeting (within 5 business days)		X

Figure 2. System Integration and Test - Staging Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Insert equipment delivery dates into the material planning system	X	
Place orders with the L3Harris Eagle Focus Factory and key suppliers	X	
Manufacture all infrastructure equipment	X	
Assemble equipment in factory staging area on a per site basis	X	
Run FAT	X	
Provide approval for FAT test and authorize the system to ship (within 5 business days)		X

Figure 3. Shipping & Inventory Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Provide temporary storage near Hunt County's location	X	
Package equipment and ship to storage area	X	
Inventory equipment	X	
Validate L3Harris equipment inventory		X
Sort equipment in preparation for site delivery and installation	X	

Figure 4. General Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Coordinate with federal, state, and local government agencies, as required		X
Provide access to all buildings and sites, including temporary ID badges for L3Harris project team		X
Provide parking permits for L3Harris project team for any restricted parking areas		X
Provide adequate road access for delivery vehicles		X
Arrange for temporary parking to off-load equipment at all buildings and sites		X
Clean up site and remove all installation debris	X	
Remove any hazardous material found on site		X
Ensure that no utility transformers additions or upgrades will be required to provide the adequate AC power needed for each site		X
Comply with FCC OET65 Signage requirements (https://www.fcc.gov/general/oet-bulletins-line)		X
Install materials in accordance with industry and L3Harris standards	X	
Provide backhaul which meets the final backhaul requirements		X

Figure 5. Existing Customer-Owned Sites Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
CUSTOMER-OWNED SITE TASKS		
Obtain any necessary zoning approval for site changes		X
Perform physical path surveys for each microwave path (microwave path studies are not final until a physical survey is made)	X	
Provide existing site plans		X
Conduct grounding inspection and provide recommendations	X	
Conduct site survey(s) and provide recommendations	X	
EXISTING TOWER		
Identify specific tower attachment points to mount new antennas per the system design	X	
Confirm availability of tower attachment points for L3Harris antennas		X
Provide space on existing tower to mount new system antennas at L3Harris specified locations		X
Ensure adequate space is available on cable ice bridge, and tower cable ladders, to support new cable runs		X
Install new antenna(s) using appropriate side arms and mounting hardware	X	
Install antenna coax, connectors and jumpers, using cable clamps to properly secure cable to tower, and add grounding kits at the top, bottom, and on ice bridge	X	
L3Harris will install new tower top amplifiers	X	
Install antenna lightning protection devices on each transmission line LMR run after it enters shelter via cable entry port; ground device to main ground bus bar	X	
Install new microwave dish(es) on pipe mounts with anti-sway kits	X	
Install new microwave waveguide or coaxial feed lines, secure to cable ladder(s), and add grounding kits at the top, bottom, and on ice bridge	X	
Tag and identify each new antenna line	X	
Sweep test each new antenna line in accordance with L3Harris' "Transmission Line Analysis (Antenna Sweep) procedure	X	
EXISTING SHELTER		
Provide floor space in existing RF shelter for new equipment racks used in the new design		X
Provide adequate shelter/equipment room utility AC electrical power, single-point ground system HVAC, and backup generator power		X

TASKS	L3HARRIS	HUNT COUNTY
Provide adequate cable entry ports		X
Upgrade existing interior ground system (if required)		X
Provide additional cable ladder for new equipment row	X	
Provide floor space at the dispatch center and network center for new system equipment		X
Provide backup power (UPS) for consoles		X

Figure 6. Existing Collocation Sites Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
COLLOCATED SITE TASKS		
Arrange for access to third party collocated site		X
Negotiate and obtain lease (or modify existing lease) for third party co-location site, ensuring the site lease includes required space on the tower, cable ice bridge, and tower cable ladders to support new cable runs, space-in compound for new shelter, generator, and fuel tank		X
Ensure co-location agreements address site compound space requirements to include confirmation that no subsurface obstructions preclude running conduits for power or leased circuits, as well as running lines between Hunt County's shelters, generators, and fuel tanks		X
Arrange for third-party site owner to perform tower analysis	X	
Perform physical path surveys for each microwave path (microwave path studies are not final until a physical survey is made)	X	
Provide existing site plans		X
Conduct grounding inspection and provide recommendations	X	
Conduct site survey(s) and provide recommendations	X	
EXISTING TOWER		
Identify specific tower attachment points to mount new antennas per the system design	X	
Confirm availability of tower attachment points for L3Harris antennas		X
Provide space on existing tower to mount new system antennas at L3Harris-specified locations (defined in site lease)		X
Ensure adequate space is available on cable ice bridge, and tower cable ladders, to support new cable runs		X

TASKS	L3HARRIS	HUNT COUNTY
Install new antenna(s) using appropriate 6 ft. side arms and mounting hardware	X	
Install antenna coax, connectors and jumpers, using cable clamps to properly secure cable to tower, and add grounding kits at the top, bottom, and on ice bridge	X	
L3Harris will install a new tower top amplifier	X	
Install antenna lightning protection devices on each transmission line LMR run after it enters shelter via cable entry port; ground device to main ground bus bar	X	
Install new microwave dish(es) on pipe mounts with anti-sway kits	X	
Install new microwave waveguide or coaxial feed lines, secure to cable ladder(s), and add grounding kits at the top, bottom, and on ice bridge	X	
Tag and identify each new antenna line	X	
Sweep test each new antenna line in accordance with L3Harris' "Transmission Line Analysis (Antenna Sweep) Procedure, and maintain copies in site logbook	X	

Figure 7. System Infrastructure Installation Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Deliver equipment to each site	X	
Install equipment, connect to existing ground system and apply power	X	
Connect all RF cables	X	
Interface to network, verify network connectivity	X	
Set all P25 system levels and parameters	X	
Connect all P25 system alarms	X	

Figure 8. System Optimization Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Prepare all installed sites for site inspections	X	
Verify microwave/backhaul system is functional and meets reliability specifications	X	
Verify P25 system levels and parameters are set	X	

TASKS	L3HARRIS	HUNT COUNTY
Verify P25 system alarm and system monitoring system are operational	X	
Verify system database is installed and operating correctly	X	
Verify proper dispatch operation	X	
Verify proper P25 system functional operation	X	
Verify proper network switching operation	X	
Coordinate testing of the desired interoperability channels		X
Verify proper interoperability from gateways	X	

Figure 9. Acceptance Testing Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Provide appropriate team members to participate in acceptance tests		X
Inspect each site (RF, dispatch, VIDA core), noting discrepancies on a punch list	X	
Submit site inspection results	X	
Approve site inspection results (within 5 business days)		X
Perform functional ATP on radio system, dispatch consoles, network monitoring, and user radios	X	
Submit functional ATP results	X	
Sign approval of functional ATP results (within 5 business days)		X
Provide team members to participate in coverage tests		X
Provide test vehicles and drivers for acceptance testing	X	
Provide new test radios for automatic coverage tests as defined in the CATP	X	
Perform automated coverage test of P25 system per system contract	X	
Provide new test radios for voice quality test as defined in the CATP		X
Perform voice quality test of P25 system per system contract	X	
Submit coverage ATP results	X	
Sign approval of coverage ATP results		X
Submit letter of system acceptance	X	
Sign letter of system acceptance		X

TASKS	L3HARRIS	HUNT COUNTY
Approve cutover plan		X
Notify users of system cutover date		X
Proceed with system cutover according to cutover plan	X	

Figure 10. User Equipment Matrix

TASKS	L3HARRIS	HUNT COUNTY
Program and distribute L3Harris portable units with accessories	X	
Provide a central facility for mobile vehicle installation that has garage bays for mobile installations, workbench space for portable radio programming, and storage for radios.		X
Provide a continuous supply of vehicles to meet the project schedule timeline		X
Provide cost and schedule relief for crew demobilization and remobilization for non-continuous supply of vehicles or for installations requested outside of the schedule		X
Program and install L3Harris mobile units	X	
Provide pre and post installation vehicle assessments, presenting installation documentation for customer acceptance for each vehicle	X	
Provide a representative to review installation documentation and provide acceptance for each vehicle		X

Figure 11. Cutover Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Identify system administrators (optional)		X
Provide administrator training (optional)	X	
Attend system administrator training (optional)		X
Provide workshops for talkgroup planning	X	
Attend workshop for talkgroup planning		X
Provide training on system database creation (optional)	X	
Develop user training plan and schedule with L3Harris (collaborative effort)	X	X
Develop dispatcher training plan and schedule with L3Harris (collaborative effort)	X	X

TASKS	L3HARRIS	HUNT COUNTY
Develop user programming profiles with L3Harris (collaborative effort)	X	X
Develop console programming profiles with L3Harris (collaborative effort)	X	X
Develop and enter system database	X	
Define which interoperability channels are desired during cutover		X
Provide radio user training	X	
Attend radio user training		X
Provide dispatcher training	X	
Attend dispatcher training		X
Create interoperability for cutover, using proposed gateways	X	

Figure 12. Final Acceptance Responsibility Matrix

TASKS	L3HARRIS	HUNT COUNTY
Removal of decommissioned legacy network, console, or site infrastructure equipment		X
Submit final drawing package	X	
Submit letter of final system acceptance	X	
Provide warranty and contact information	X	
Meet with L3Harris to review warranty contact procedures		X
Meet with L3Harris to outline system support and services requirements		X
Accept final drawing package (within 5 business days)		X
Sign letter of final system acceptance (within 5 business days)		X

Name	Duration	Start	Finish	Resource Group
V6.2 Project Schedule_Full Version	**336 days**	**Thu 8/4/22**	**Fri 12/8/23**	
Hunt County	**283 days**	**Thu 9/1/22**	**Fri 10/20/23**	
L3H Internal Startup	**10 days**	**Thu 9/1/22**	**Thu 9/15/22**	
Contract Start	**1 day**	**Thu 9/1/22**	**Thu 9/1/22**	
Contract Signed	0 days	Thu 9/1/22	Thu 9/1/22	
Contract Mobilization Billing Milestone	0 days	Thu 9/1/22	Thu 9/1/22	
Customer Kickoff	**13 days**	**Thu 9/1/22**	**Tue 9/20/22**	
Hold Kick-Off Meeting with Customer	**3 days**	**Fri 9/16/22**	**Tue 9/20/22**	
Final Design (Through DDR)	**50 days**	**Wed 9/7/22**	**Thu 11/17/22**	
Site Development Requirements	**30 days**	**Wed 9/14/22**	**Wed 10/26/22**	
Customer Requirements	**0 days**	**Wed 9/14/22**	**Wed 9/14/22**	
Customer provides all site, tower, and foundation drawings for existing sites.	0 days	Wed 9/14/22	Wed 9/14/22	
Customer acquires site leases	0 days	Wed 9/14/22	Wed 9/14/22	
Site Survey's	**2.5 days**	**Mon 9/19/22**	**Thu 9/22/22**	
Perform site surveys on contracted design (or selected or proposed) sites	1.5 days	Mon 9/19/22	Wed 9/21/22	L3H
Microwave Path Analysis	**27 days**	**Wed 9/14/22**	**Fri 10/21/22**	
Perform Microwave Path Survey (1 day per Path, estimated duration)	4 days	Wed 10/5/22	Tue 10/11/22	
Tower 5tructural Analysis	**25 days**	**Thu 9/15/22**	**Wed 10/19/22**	
Preliminary Grounding Requirements	**19 days**	**Thu 9/15/22**	**Tue 10/11/22**	
Design Finalization for DDR (CDR)	**3 days**	**Wed 10/26/22**	**Mon 10/31/22**	
Detailed Design Review (DDR)	**12 days**	**Mon 10/31/22**	**Thu 11/17/22**	
Conduct DDR with Customer	**3 days**	**Mon 10/31/22**	**Thu 11/3/22**	
DDR Meeting Held with Customer	0 days	Wed 11/2/22	Wed 11/2/22	L3H
Design update from DDR	**9 days**	**Thu 11/3/22**	**Thu 11/17/22**	
Customer Approval of DDR	0 days	Thu 11/17/22	Thu 11/17/22	
Detailed Design Review Billing Milestone	0 days	Thu 11/17/22	Thu 11/17/22	
Final Design (Post DDR Activities)	**49 days**	**Mon 10/24/22**	**Wed 1/11/23**	
Training and Cutover Planning with Customer	**2 days**	**Tue 11/29/22**	**Wed 11/30/22**	
System Administrator Identified by Customer	0 days	Wed 11/30/22	Wed 11/30/22	
Customer Approves Training Schedule provided by L3Harris	0 days	Wed 11/30/22	Wed 11/30/22	
Customer Identifies and Approves Training Location(s) and schedule	0 days	Wed 11/30/22	Wed 11/30/22	
Start Initial Cutover Planning with Customer	1 day	Tue 11/29/22	Tue 11/29/22	L3H
LMR Frequency Licensing	**49 days**	**Mon 10/24/22**	**Wed 1/11/23**	
ASR's Numbers	**45.S days**	**Mon 10/24/22**	**Fri 1/6/23**	
FCC - FCC Processes ASR License Filling	45 days	Mon 10/24/22	Fri 1/6/23	L3H
FCC - ASR Licensing approval received	0 days	Fri 1/6/23	Fri 1/6/23	L3H
LMR Frequency Licensing	**3.5 days**	**Fri 1/6/23**	**Wed 1/11/23**	
FCC - Prepare Application for Frequency Licensing Submittal (FCC Form 601)	2 edays	Fri 1/6/23	Sun 1/8/23	L3H

Name	Duration	Start	Finish	Resource Group
FCC - Submit FCC Frequency Licensing Application	0 days	Sun 1/8/23	Sun 1/8/23	
FCC - Frequency Licensing approval received	2 days	Sun 1/8/23	Tue 1/10/23	L3H
All Licensing/permitting approvals received	1 day	Tue 1/10/23	Wed 1/11/23	L3H
Procurement	**91 days**	**Thu 11/17/22**	**Thu 4/6/23**	
3rd Party Execution	**81 days**	**Fri 11/18/22**	**Thu 3/23/23**	
L3H Standard Material	**91 days**	**Fri 11/18/22**	**Thu 4/6/23**	
Radio Subscriber Orders	**91 days**	**Fri 11/18/22**	**Thu 4/6/23**	
Production	**49 days**	**Thu 4/6/23**	**Thu 6/15/23**	
LMR Assembly and Staging	**26 days**	**Thu 4/6/23**	**Fri 5/12/23**	
Assembly	**21 days**	**Thu 4/6/23**	**Fri 5/5/23**	
Stage and Test System	**5 days**	**Fri 5/5/23**	**Fri 5/12/23**	
Internal Factory Acceptance Testing (IFAT)	**11 days**	**Fri 5/12/23**	**Tue 5/30/23**	
Shipping	**12 days**	**Tue 5/30/23**	**Thu 6/15/23**	
System Tear Down and Shipping	**10 days**	**Thu 6/1/23**	**Thu 6/15/23**	
Inventory of equipment at Warehouse or sites	1 day	Tue 6/13/23	Wed 6/14/23	
Infrastructure Equipment Shipment Billing Milestone	0 days	Wed 6/14/23	Wed 6/14/23	
Installation	**160.75 days**	**Wed 11/30/22**	**Wed 7/26/23**	
Microwave Installation and Testing	**34 days**	**Wed 3/22/23**	**Tue 5/9/23**	
Hunt County - Crown Castle MW Installation	**5 days**	**Wed 3/22/23**	**Wed 3/29/23**	
Hunt County - Celeste MW Installation	**5 days**	**Wed 3/29/23**	**Wed 4/5/23**	
Hunt County - Whitley MW Installation	**5 days**	**Wed 4/5/23**	**Wed 4/12/23**	
Hunt County - Water Tower MW Installation	**5 days**	**Wed 4/12/23**	**Wed 4/19/23**	
Microwave Field Acceptance test	**14 days**	**Wed 4/19/23**	**Tue 5/9/23**	
Customer Acceptance Test for Microwave Installation	1 day	Thu 4/20/23	Fri 4/21/23	
Antenna System Installation	**18 days**	**Wed 6/14/23**	**Tue 7/11/23**	
System Infrastructure Installation and Optimization	**28.75 days**	**Wed 6/14/23**	**Wed 7/26/23**	
Install Equipment (bolt down, wire, connect to pwr)	**19 days**	**Wed 6/14/23**	**Wed 7/12/23**	
Network Switching Center Optimization	**2.5 days**	**Wed 7/12/23**	**Fri 7/14/23**	
Dispatch Center Turn-Up	**1.75 days**	**Fri 7/14/23**	**Tue 7/18/23**	
Final Optimization	**6.5 days**	**Tue 7/18/23**	**Wed 7/26/23**	
RF Optimization	**4 days**	**Tue 7/18/23**	**Mon 7/24/23**	
Interoperability Turn-Up	**1.5 days**	**Mon 7/24/23**	**Tue 7/25/23**	
Acceptance Testing Readiness	**2.5 days**	**Mon 7/24/23**	**Wed 7/26/23**	
Installation (System) Billing Milestone	0 days	Mon 7/24/23	Mon 7/24/23	
Subscriber Programming and Installation	**100 days**	**Wed 11/30/22**	**Fri 4/28/23**	
Fleet Mapping	**7 days**	**Wed 11/30/22**	**Fri 12/9/22**	
Training to conduct Fleet Mapping workshop with the Customer	3 days	Wed 11/30/22	Mon 12/5/22	
Finalize Fleetmap Plan with the Customer	1 day	Mon 12/5/22	Tue 12/6/22	L3H

Name	Duration	Start	Finish	Resource Group
Fleet Maps Approved by Customer	0 days	Tue 12/6/22	Tue 12/6/22	
Upload UAS Database	3 days	Wed 12/7/22	Fri 12/9/22	L3H
Personality Development	**10 days**	**Fri 12/9/22**	**Fri 12/23/22**	
Develop Mobile Personalities	5 days	Fri 12/9/22	Fri 12/16/22	L3H
Develop Portable Personalities	5 days	Fri 12/16/22	Fri 12/23/22	L3H
Programming	**16 days**	**Thu 4/6/23**	**Fri 4/28/23**	
Program Mobile Fleet	8 days	Thu 4/6/23	Tue 4/18/23	
Program Portable Fleet	8 days	Tue 4/18/23	Fri 4/28/23	
Installation	**6 days**	**Tue 4/18/23**	**Wed 4/26/23**	
Install Public Safety Mobiles	5 days	Tue 4/18/23	Tue 4/25/23	
Installation (Subscribers) Billing Milestone	0 days	Tue 4/25/23	Tue 4/25/23	
System Acceptance	**188.25 days**	**Tue 1/3/23**	**Thu 9/28/23**	
Functional Testing	**24.75 days**	**Thu 7/6/23**	**Wed 8/9/23**	
Prepare for Functional Testing	**1 day**	**Thu 7/6/23**	**Thu 7/6/23**	
Functional Test Execution	**10 days**	**Wed 7/26/23**	**Wed 8/9/23**	
Functional Test Approved	0 days	Wed 8/9/23	Wed 8/9/23	
Coverage Testing	**22 days**	**Wed 8/2/23**	**Fri 9/1/23**	
Coverage Test Execution	**17 days**	**Wed 8/9/23**	**Fri 9/1/23**	
Ready to Start Coverage Testing	0 days	Wed 8/9/23	Wed 8/9/23	
Perform In-Bound BER test and generate Test Report	0.5 days	Wed 8/9/23	Thu 8/10/23	
Perform Out-Bound BER test and generate Test Report	0.5 days	Thu 8/10/23	Thu 8/10/23	
Perform RSSI test and generate Test Report	3 days	Thu 8/10/23	Tue 8/15/23	
Perform Indoor DAQ test and generate Test Report	2 days	Tue 8/15/23	Thu 8/17/23	L3H
Perform Outdoor DAQ test and generate Test Report	2 days	Thu 8/17/23	Mon 8/21/23	L3H
Provide test reports to Customer	0.5 days	Fri 8/25/23	Fri 8/25/23	L3H
Coverage Test approved by Customer	0 days	Fri 9/1/23	Fri 9/1/23	
System Acceptance	**4 days**	**Fri 9/1/23**	**Fri 9/8/23**	
Submit Letter of System Acceptance	0 days	Fri 9/1/23	Fri 9/1/23	L3H
Customer Signs Letter of Acceptance of System	0 days	Fri 9/8/23	Fri 9/8/23	
Customer Warranty Start	0 days	Fri 9/8/23	Fri 9/8/23	
Cutover Planning and Execution	**180 days**	**Tue 1/3/23**	**Fri 9/15/23**	
User Training	**20 days**	**Tue 1/3/23**	**Tue 1/31/23**	
User training classes scheduled with the Customer and L3H Training	5 days	Tue 1/3/23	Mon 1/9/23	L3H
Conduct training classes	15 days	Mon 1/9/23	Tue 1/31/23	
Radio Distribution	**9 days**	**Tue 1/31/23**	**Mon 2/13/23**	
Cutover Execution	**5 days**	**Fri 9/8/23**	**Fri 9/15/23**	
Users Notified of Cutover time	0 days	Mon 9/11/23	Mon 9/11/23	L3H
Cutover to the new L3Harris Radio System	3 days	Mon 9/11/23	Thu 9/14/23	L3H

Name	Duration	Start	Finish	Resource Group
Cutover Complete	0 days	Thu 9/14/23	Thu 9/14/23	
Decommissioning	**8.5 days**	**Fri 9/15/23**	**Thu 9/28/23**	
Final Acceptance	**30.25 days**	**Fri 9/8/23**	**Fri 10/20/23**	
Program Documentation Finalization	**12 days**	**Fri 9/8/23**	**Tue 9/26/23**	
Deliver Final Documentation Package to the Customer	**1 day**	**Mon 9/25/23**	**Tue 9/26/23**	
Warranty Hand off Meeting with Customer	**11 days**	**Thu 9/28/23**	**Fri 10/13/23**	
Final Acceptance with Customer	**5.75 days**	**Fri 10/13/23**	**Fri 10/20/23**	
Bond Release & Final Billing	**5.75 days**	**Fri 10/13/23**	**Fri 10/20/23**	
Submit Performance Bond release form to the Customer	0.25 days	Fri 10/13/23	Fri 10/13/23	L3H
Receive Performance Bond release from the Customer	0.25 days	Fri 10/20/23	Fri 10/20/23	
Acceptance Billing Milestone	0 days	Fri 10/20/23	Fri 10/20/23	

STANDARD WARRANTY

Local Support

The Regional Service Manager responsible for Hunt County, TX (the County) is Rodney Philgren, and he is your primary point of contact for all system warranty, maintenance, and support. Mr. Philgren and his assigned service technician will have continual support from other L3Harris technicians employed through the local L3Harris service office in Forest, Virginia to provide the highest level of service which will exceed your requirements.

To provide knowledge continuity in the warranty and maintenance phase of the project, Rodney and his team will be involved throughout staging, installation, and testing to provide the background knowledge to properly maintain your new P25 mission critical public safety communications system.

L3HARRIS AUTHORIZED SERVICE OFFICE

L3Harris is providing the County with local services through our service office located in Dallas, Texas. This team will be supported by regional technical staff, the L3Harris factories, L3Harris engineers, our channel partners, and the L3Harris national office, to ensure the County's system will have deep technical expertise when it needs it most.

All personnel participate in multiple layers of training to ensure everyone is up to date on the latest technology and updates throughout the life of the radio system. Training options include on-site training at the factory, online L3Harris classes, training manuals, and L3Harris regional training.

All assigned technicians, for the benefit of the County have:

> Calibrated test equipment to ensure FCC compliance including CFR 47 Part 90 §213-216

> All-weather vehicles and safety preparedness gear to access sites, the necessary training to maintain general radio systems, as well as the County's specific system configuration

> Multiple back-up technicians of similar skill and preparedness when extra assistance is necessary

Warranty Support

L3Harris warrants that that hardware and installation services furnished by L3Harris will be free from defect in material and workmanship. During the warranty period, if any component of the hardware or portion of the installation services fails, L3Harris will examine the failure and remedy by:

1. Repairing any defective component of the hardware;
2. Furnishing any necessary repaired or replacement parts;
3. Correcting the faulty installation at no additional cost to the County.

Warranty Coverage	INFRASTRUCTURE	SUBSCRIBER RADIOS
Coverage Period	3 years	3 years
Commences	Upon Acceptance Date	Upon Acceptance Date

L3Harris will perform, at its discretion, all warranty labor at an L3Harris location. Where L3Harris has determined it is not feasible to ship fixed equipment for repair, L3Harris will repair on premise. Standard warranty response times are standard business days, 8:00 a.m. to 5:00 p.m. Eastern. For additional levels of support, premium services are available.

THIRD-PARTY WARRANTIES

Third-party original equipment manufacturer (OEM) equipment and services are covered as described in the System Purchase Agreement. Throughout the entire warranty and contracted maintenance periods, L3Harris will act on behalf of Hunt County to coordinate and settle warranty issues with third-party equipment and software companies. As part of the final acceptance, any remainder of warranty from a third-party vendor transfer to Hunt County. If any third-party manufacturer warranty period is greater than one-year, we will recognize that OEM warranty for the specified equipment.

DEPOT REPAIR & RETURN

The Depot Repair and Return service covers the cost to fix covered equipment at L3Harris or other third-party manufacturer's factories. This service is part of our standard warranty and is a premium service during the maintenance periods. The L3Harris Depot Repair and Return facility is ISO 9001:2015, UL, and Factory Mutual certified. Master technicians using state-of-the-art test equipment verify that all repairs meet or exceed prescribed specifications.

WARRANTY RETURNS

The following procedure describes the returns process for equipment under warranty:

1. L3Harris creates a support case number, verifies product part numbers, serial numbers, reasons for return and then forwards the approved request for processing.

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2. L3Harris reviews the request and provides a return merchandise authorization number (RMA) to the County, along with instructions for return of the equipment.

3. The assigned L3Harris technician ships the equipment back to L3Harris Depot Repair and Return.

4. L3Harris repairs or replaces any equipment free of charge unless there is evidence of abuse or damage beyond the terms of the service

5. L3Harris ships the repaired or replacement unit back to the County.

6. The assigned L3Harris technician will deliver the repaired equipment back to the County spares cache or re-install if a spare was not used.

7. L3Harris closes the RMA and updates the tracking database.

Requests for repairs out of warranty will require a purchase order unless a service agreement exists. Any repairs out of warranty are subject to a flat rate, per-unit fee, regardless of fault found with the equipment. If the item for repair does not have a flat rate fee listed, a time and material charge applies. The turn-around time for equipment repair or replacement is typically ten business days.

DEMAND SERVICES

Demand services are available when an unexpected event or situation occurs outside the scope of work and requires repairs from L3Harris, its agents, or partners. For demand services, Hunt County will receive an invoice on a time and materials basis. Examples may include the following:

> Installation, updating, upgrading, maintaining, or removing software, hardware, or non-L3Harris infrastructure after initial installation.

> Repair of equipment damaged by vandalism, abuse, neglect, or noncompliance to L3Harris recommended practices, to the extent such equipment damage is not caused by L3Harris or any of its agents.

> Damages due to acts of God or other uncontrollable events

> Any other repair or service not outlined in the Scope of Work

PREMIUM WARRANTY SERVICES

The following services are included in the System Purchase Agreement during the three-year system warranty period:

> Rapid Response 24x7x365

> On-Site Corrective maintenance

> Software Managed Services (SMS)

> Standard Repair & Return

> Preventive Maintenance

> Premium Technical Support

> SMS infrastructure installation

> Demand Services

Feature Descriptions

PREMIUM TECHNICAL SUPPORT

Continuous operation of a system providing critical communications leads customers to recognize the importance of having 24-hour-a-day, seven-day-per-week assistance. When the system malfunctions at 2 a.m., the personnel responsible for restoring operation are reassured when they have technical expertise available to assist. Premium Technical Support (PTS) provides this assurance. PTS services from L3Harris offers comprehensive support 24/7, 365 days a year. PTS subscribers have toll-free phone access to L3Harris' Technical Assistance Center (TAC) that recognizes your call as a priority. Support Engineers will endeavor to provide a response within two hours if a technician is not readily available to answer the call. For emergency system off-air calls, we guarantee a one-hour response time.

PTS is always available to support customers with answers to technical and user support questions about your operations, programming, software, maintenance and troubleshooting issues. Users also have self-service access to the L3Harris Tech-Link website that offers a wealth of technical information, technical bulletins and manuals with search engine support. Calls to TAC are logged and assigned a tracking number for more efficient handling of your specific situation and are resolutions are added to our knowledge base to quickly resolve any future issues efficiently.

PTS services provides key benefits like:

> Toll-free telephone access to TAC for year-round support

> 24/7/365 Level 1 and Level 2 helpdesk support

> 24/7/365 Level 3 and Level 4 technical support on L3Harris products

> L3Harris management of 3rd party Level 4 technical support and account maintenance

> Priority technical assistance on systems and terminal equipment

> One-hour guaranteed callback window for emergency off-air calls and guaranteed two-hour callback window for non-emergency calls

> All-access subscription to the online L3Harris Tech-Link website, a complete library of technical resources and product information

> TAC coordination with on-site service personnel when necessary.

> License and maintenance renewals of third-party software and hardware used in the L3Harris system infrastructure.

RAPID RESPONSE

L3Harris will provide enhanced on-site response 24x7x365 when system issues are detected. Specific terms can be customized to fit your specific user requirements. This can include initiating a 30-minute problem resolution action (phone or remote) and on-site response based on the SLA agreement. This level of rapid response will maximize your system's availability and maintain the level of communications your users demand.

This 24x7x365 service covers the cost to have local technicians available to respond to severity level 1 and severity 2 issues within 30 minutes. This service includes:

> Notification that a problem resolution action has been initiated (telephone or remote diagnostics) within 30 minutes

> Provide a 24x7x365 call number and timed escalation plan

> Coordinate and dispatch on-site technicians if necessary

> Equipping local technicians with all-weather vehicles, storm gear, storm training, and calibrated test equipment at all times

> Tracking every incident and updating customer of actions

> Provide technician coverage 365 days per year, arranging for additional coverage by local technicians when the primary technician is unavailable

ON-SITE CORRECTIVE MAINTENANCE

On-Site Corrective Maintenance provides labor to troubleshoot, repair and if necessary, remove and replace defective infrastructure equipment as agreed upon between the customer and L3Harris. L3Harris personnel will remotely troubleshoot the reported issue and dispatch a technician to the customer's location to perform the corrective maintenance. If required, the technician will replace the defective equipment using spares purchased separately by the customer and arrange for the original item to be sent to a certified L3Harris repair facility. The corrective maintenance will be documented in a report and the customer will be informed of the status of all repairs in progress. On-Site Corrective Maintenance is performed 8x5 Monday – Friday but can be extended to 24x7x365 if a Rapid Response Service Level Agreement is purchased.

SOFTWARE MANAGED SERVICE (SMS)

As an integral component of the L3Harris Service Managed offering, the Software Managed Service (SMS) provides new releases of system software tailored to each customer's system. These releases contain improvements and enhancements for current generation system software, as well as occasional new product capability and the ability to enable licensed features. Keeping the infrastructure software up to date is vital to maintaining the value of the initial purchases so future capabilities such as Mission Critical PTT (MCPTT) can be deployed to the system's users. Under SMS, customers will receive:

> Periodic software releases for system and programming software components

> Software release notes and features summary with each release

> A System configuration audit is performed with initial subscription

> Current release as supported by the customer hardware at enrollment

> Software installation support from the PTS service

> Software replacement services if media becomes corrupt or damaged

> Enhancements for existing features

> New features built upon earlier generations of software capability to enable new licensed features

SMS INSTALLATION

L3Harris technicians will manage the installation of Software Managed Service updates for improved performance on a bi-annual basis. As part of this service, L3Harris will:

> Ensure that your equipment continues to function at peak performance by installing the Software Managed Service updates

> Provide an installation schedule and approximate equipment outage times (if any)

> Provide a summary report of actions

ON DEMAND SERVICES

L3Harris and our customers collaborate to decide the right level of service for each system's specific needs. However, a situation may arise where needed service is not a part of the original scope of work. Known as Demand Services, L3Harris' experienced personnel will quickly assess the need and provide customers with a quote for services on a time and material basis.

As an example, Demand Services may include:

> Installation or removal of mobile radio equipment after the initial installation

> Repair of equipment damaged by vandalism

> Repair of equipment damaged through abuse or physical neglect

> Damages due to extreme conditions or events outside of L3Harris reasonable control

Optional Services:

NETWORK OPERATIONS CENTER (NOC) MONITORING

NOC Monitoring is real-time, 24x7x365, careful observation of the radio system by experienced L3Harris personnel. The NOC ensures quick identification of existing or potential network issues and action to correct them, resulting in reduced system downtime and minimal impact to system users. As part of this service, L3Harris will:

> Monitor your system 24x7x365 using secure connections into the network

> Have immediate recognition of note-worthy events

> Initiate a service ticket upon detection of a system alarm condition

> Notify appropriate personnel

> Support L3Harris engineering staff, L3Harris field technicians, subcontractors/vendors, and authorized customer representatives

> Escalate to L3Harris management when required

> Document alarm activity, date/time of alarm, actions taken, and results of those actions using Advanced Management Maintenance System incident logging that provides:
>   - Accurately documented data pertaining to the current issue
>   - Comparison of current incident against past occurrences to assist with troubleshooting
>   - Real time email notifications to appropriate personnel customized to specific equipment
>   - Real time web access to view work order status
> Provide a monthly summary via email to you documenting response activity

Maintenance Exclusions

FIXED EQUIPMENT

L3 Harris covers the items identified below during the warranty period if we have provided and installed them. Following the end of the warranty period, these items are specifically excluded from coverage by this Maintenance Agreement. The County may request services on these items at demand services rates listed in the managed services agreement.

> Site Antenna Systems – Specifically excluded are:
>   - Antennas mounted external to the site equipment shelter – including antennas mounted on towers, building tops or other structures.
>   - Antenna feedlines mounted external to the site equipment shelter – including feedlines to antennas as noted above.
>   - Microwave system antennas (dishes) and antenna waveguides are excluded
> Batteries of any type or equipment location. Batteries are considered a consumable item and are not covered by this agreement.
> Any UPS or power conditioning equipment and associated batteries are excluded from this Agreement.
> Tower mounted portions of tower top amplifiers (TTA or TMA) are covered by the Agreement, however, tower work required to access these devices is not covered by this agreement.
> Site civil work items are excluded from this agreement to include:
>   - Towers and Tower Lighting Systems
>   - Shelters – including lighting fixtures or bulbs, HVAC systems and fire suppression systems.
>   - Fences
>   - Roads and surface coverings
>   - Landscaping
>   - Generators
>   - Generator fuel tanks
>   - Site Electrical Feed (whether underground or overhead)

> Antennas and antenna feedlines as well as cabling from remote controller to desktop control stations associated with desktop stations / control stations / remote controllers

> Console furniture

> Console personal audio accessories (headset, earpiece)

> Microwave radio system antennas (dishes) and antenna waveguides

TERMINAL (NON-FIXED) EQUIPMENT

> Portable Radios – specifically excluded are:

  – Antennas

  – Batteries

  – Carrying cases

  – Audio accessories (speaker microphone, headset, earpiece)

> Mobile Radios – specifically excluded are:

  – Antennas

  – Power cables

  – Control head to T/R package cables for remote mount units

  – Fuses and fuse holders

  – Audio accessories (microphone, headset, earpiece)

  – Any issues related to vehicular power systems

    – Voltages out of radio specification range

    – Voltage spikes

FACTORY/FUNCTIONAL ACCEPTANCE TEST PLAN

Customer:

Hunt County, Texas

Prepared by:

Craig Inouye, Stephen Chang

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TEST PLAN

INTRODUCTION

L3Harris designed this System Test Plan to validate the installation and functionality of our P25 Phase 2 Trunking system at the SR10A.7 release. It defines the plan for conducting tests and analyzing test results, to confirm that the system satisfies design objectives.

The Test Team shall perform these tests in the order they appear in the plan and test procedures, or as required by the L3Harris systems engineer. The team will record test results in the appropriate test procedure referenced by this document. The prescribed test procedures have been developed and rigorously vetted by L3Harris engineering to provide extensive functional verification of the system features under test.

ROLES AND RESPONSIBILITIES

A Test Team consisting of at least one L3Harris system engineer and one Hunt County, Texas representative to act as a witness to the testing is required to execute the test plan. It may be necessary for a secondary team, consisting of an additional L3Harris employee and a Hunt County, Texas witness, to be present at another location to test certain features, such as multisite calls or for the secondary team to initiate site alarms so that the primary team can observe them from a system management terminal (SMT).

An L3Harris employee will execute the test steps outlined in the test procedure using the required equipment and with optional assistance from the County representatives. Additional personnel may attend as desired, or as required, to provide access or escort others to certain locations, such as RF shelters or other restricted access areas. Hunt County, Texas shall provide access for the entire team to its facilities, including, the Network Switching Center (NSC) locations, RF site shelters, and dispatch locations. For secure facilities, appropriate access permissions must be granted prior to the testing events.

ACCEPTANCE TESTING CLARIFICATION

Final acceptance testing can occur in two separate phases. The first phase of testing begins with functional testing performed in the L3Harris staging facility immediately after initial factory configuration is complete. During this first phase, the County representatives may be on-site to witness the testing. The second phase occurs after final installation at customer facilities.

Staging tests, as detailed in the identified test procedures, verify equipment functionality that we can reasonably perform in a factory environment. We will perform all identified functional testing in the field after final install and commissioning of the system.

Factory staging tests will be virtually conducted via a remote video conferencing session. The virtual testing allows for a greater number of participants than typically allowed for during an on-site visit.

Once acceptance testing begins, we will lock system configurations, hardware platforms, and software versions, except to correct software defects affecting system performance. Prior to conducting the

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factory tests, we perform a system audit to verify installation of the appropriate software system release version on each platform.

ELECTRICAL SPECIFICATIONS

If requested, L3Harris will provide raw test data and site alignment measurements from the factory Automated Manufacturing Test Station (AMTS) for the L3Harris provided transceiver equipment.

BASELINE CONFIGURATION

L3Harris systems include a baseline configuration with a predefined test agency and group structure to support the defined test procedures. L3Harris system engineering will determine the hardware and software revisions during program planning and check the system conforms to that baseline prior to the start of testing.

A complete set of as-built system schematics will be available during testing and includes:

> System block diagrams
> Network schematics
> Connection diagrams
> Wiring and cabling schematics
> Rack up drawings
> Alarm punch down drawings
> Grounding and power schematics

TESTING PREREQUISITES

Following installation and commissioning of the applicable hardware and software, L3Harris will verify the system readiness for test. If the testing includes RF sites, L3Harris will complete site alignment and optimization by setting site configurations, aligning stations, and optimizing system timing parameters. As part of the standard installation practices, we measure equipment settings and record levels. L3Harris will provide these site measurements as part of the final documentation package. These parameters include:

> Transmit frequency and deviation
> Output and reflected power
> Receiver sensitivity
> Receiver multicoupler gain (if applicable)
> Receiver preamplifier gain (if applicable)
> Time domain reflectometry of transmission line
> Combiner loss (if applicable)
> Audio line out
> Audio line in

Prior to conducting installation testing, L3Harris performs a system audit to verify installation of the appropriate system release version of software on each platform.

Finally, prior to conducting the testing procedures detailed in this document, L3Harris and Hunt County, Texas representatives will agree upon the dates and times of the test.

PASS/FAIL CRITERIA

Criteria for Pass / Fail is determined by execution of the test procedures in the Acceptance Test Plan. If a feature test is successfully executed, that feature is deemed to be compliant and results in a PASS. If a failure occurs, the failed test may be repeated to address missed steps or configuration requirements overlooked during execution.

If a certain piece of equipment is deemed to be malfunctioning and duplicate spare equipment is available to replace it, the test may be executed using the spare equipment. If the feature test is successfully executed on the spare equipment, the feature will be deemed compliant and result in a PASS. At such time as the original piece of equipment is repaired or replaced and is able to function as designed, the original equipment will be returned to service and tested to ensure functionality.

If a feature is found to be non-compliant, L3Harris will address the non-compliance and retest. Until a successful retest, the feature is deemed to be non-compliant and results in a FAIL.

If there is an inconsistency in operation observed during a test, the test may be re-executed to determine if the inconsistency can be repeated. If the inconsistency is unable to be reproduced, the feature will be deemed compliant and result in a PASS. If the inconsistency persists but the test is successfully executed, the feature will be deemed compliant and result in a PASS.

If it is necessary to defer a test for any reason, it may be marked as Not Yet Evaluated (NYE). The test may be executed, with appropriate witnessing, at any time afterward to change the result to a PASS.

TROUBLE REPORTING

Any issues found during testing will first be recorded on the comment page at the end of the feature set, and then they will be reported directly to the L3Harris program manager to be logged in the project issues log for corrective action.

Failures must be appropriately addressed. For hardware failures occurring during test events, failed hardware will be removed from the system being tested and turned over to L3Harris' quality organization for repair or replacement.

Test Procedures

FEATURES TO BE TESTED

The following list of acceptance procedures will be used to validate system performance:

> Network Switching Center
> Symphony Dispatch Consoles
> Subscriber Units

TOOLS / TEST EQUIPMENT

Unless otherwise specified, L3Harris will supply all special tools necessary to test the product.

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Equipment list TBD during program planning.

EQUIPMENT MODEL NUMBER	DESCRIPTION	SERIAL NUMBER
TBD	TBD	TBD

RADIO MODEL NUMBER	DESCRIPTION	SERIAL NUMBER
TBD	TBD	TBD

Safety

L3Harris will take reasonable safety precautions to ensure personnel against harm while operating within and traversing the installations.

General safety guidelines for portable radios:

> Do not hold onto the antenna when the radio is powered on.
> To ensure you do not exceed FCC RF exposure compliance requirements, always keep the antenna at least 0.43 inches (1.1 cm) away from the body and 0.98 inches (2.5 cm) from the face when transmitting.
> Do not use the portable radio with a damaged or missing antenna. A minor burn may result if skin comes into contact with a damaged antenna. Replace a damaged antenna immediately. Operating a portable radio with the antenna missing could cause personal injury, damage the radio, and may violate FCC regulations.
> Use only manufacturer-approved antennas. Use of unauthorized antennas, modifications, or attachments could cause damage to the radio unit and may violate FCC regulations.
> RF energy from portable radios may affect some electronic equipment. Most modern electronic equipment in cars, hospitals, homes, etc., is shielded from RF energy. However, in areas in which you are instructed to turn off two-way radio equipment, always observe the rules. If in doubt, turn it off!

L3Harris engineering will identify environmental detriments prior to testing, if deemed applicable. L3Harris will make adjustments to the extent required to address any such deficiencies deemed to present a danger to either system performance or personnel safety; examples include excessive temperature variations, contaminants, hazardous materials, or obstructions to LMR equipment.

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TEST PROCEDURES

SYSTEM FEATURE SET

P25 TDMA Phase 2 Functionality (Single-site / Simulcast Single Site)

Purpose: Demonstrate P25 TDMA Phase 2 implementation provides the additional traffic channel capacity and features of P25 TDMA Phase 2 while allowing backwards compatibility with FDMA Phase 1 radios and talkgroups.

Expected Results: Verify that a P25 FDMA call will work on a TDMA system.

Setup: In the following tests, Radios 1 and 2 will be set up as FDMA only. Radios 3 and 4 will be set up as TDMA and FDMA capable, depending upon TG.

FDMA refers to Phase 1 and TDMA refers to Phase 2.

Log into RNM, Realtime Tab, start RSM Site Activity or VNIC site calls to monitor system channel assignment and call type during active calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SYSTEM
Radio 1	9980001	TG 64051 P25	64051	Phase 1
Radio 2	9980002	TG 64051 P25	64051	Phase 1
Radio 3	9980003	TG 64051 P25	64051	Phase 2
Radio 4	9980004	TG 64051 P25	64051	Phase 2

MIXED MODE SITE TO MIXED MODE SITE CALL — FDMA TO FDMA

Purpose: Demonstrates that an FDMA call will work on a FDMA system.

Expected Results: Verify that a P25 FDMA call will work on the system.

Setup: Turn off Radios 3 and 4.

Execution:

1. PTT Radio 1 and talk. The transmit (TX) indicators should turn on at Radio 1.
   > Verify that the call is assigned as an FDMA by viewing the real time viewer site activity on the RNM.
   > Verify Radio 2 can **hear Radio** 1.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

MIXED MODE SITE TO MIXED MODE SITE CALL — FDMA AND TDMA

Purpose: Demonstrates that a mixed mode call can function on a TDMA system.

Expected Results: Verify that a TDMA radio will hear a call from a FDMA radio.

Setup: Turn on Radios 1, 2, 3, and 4.

Execution:

1. PTT Radio 1 and talk. The transmit (TX) indicators should turn on at Radio 1.
    > Verify that the call is assigned as an FDMA by viewing the real time viewer site activity on the RNM.
    > Verify Radios 2, 3, and 4 can hear Radio 1.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

MIXED MODE SITE TO MIXED MODE SITE CALL — FDMA

Purpose: Demonstrates that a mixed mode call can function on a TDMA system.

Expected Results: Verify that an FDMA radio will hear a call from a TDMA radio.

Setup: Turn on Radios 1, 2, 3, and 4.

Execution:

1.   PTT Radio 3 and talk. The transmit (TX) indicators should turn on at Radio 3.
     > Verify that the call is assigned as an FDMA by viewing the real time viewer site activity on the RNM.
     > Verify Radios 1, 2, and 4 can hear Radio 3.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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TDMA SITE CALL

Purpose: Demonstrates that a TDMA call will work on a TDMA system.

Expected Results: Verify that a P25 TDMA call will work on a TDMA system.

Setup: Turn off Radios 1 and 2.

Execution:

1. PTT Radio 3 and talk. The transmit (TX) indicators should turn on at Radio 3.
   > Verify that the call is assigned as an TDMA by viewing the real time viewer site activity on the RNM.
   > Verify Radio 4 can hear Radio 3.

TEST RESULTS
Tester:
Date:
Result: ☐ Pass   ☐ Fail

TRANSMISSION TRUNKING

Purpose: Test will demonstrate that the system is working as a transmission trunking system.

Expected Results: Verify the control channel will assign a working channel to the radio and that the radio and site will work as a trunking set by dropping radio transmission upon PTT release.

Setup: Radios 1, 2, and 3 should be the only radios on the system.

Use RNM real time viewers to monitor system channel assignment.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	1
Radio 3	9980003	TG 64001 P25	64001	1

Execution:

1. Log into RNM, Realtime Tab, start RSM Site Activity, to monitor system channel assignment. Observe all channels on Site 1.
2. PTT Radio 1 and talk.
   > The transmit (TX) indicators should turn on at Radio 1.
   > Verify the number of the channel assigned.
   > Un-PTT Radio 1.
3. PTT Radio 2 and talk.
   > The transmit (TX) indicators should turn on at Radio 2.
   > Verify the next channel is assigned.
   > Un-PTT Radio 2.
4. PTT Radio 3 and talk.
   > The transmit (TX) indicators should turn on at Radio 3.
   > Verify the next channel is assigned.
   > Un-PTT Radio 3.
   > Verify the channel immediately drops, or as configured by station hang timers.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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P25 Trunked Calls and Site Features

MULTISITE GROUP CALL
(PHASE 1 AND PHASE 2)

Purpose: This test will demonstrate that the system will allow a group call to function in a multisite environment.

Expected Results: The test will demonstrate that all radios assigned to a common group will hear a call regardless of the site they are affiliated with.

Setup: Radios must be affiliated with sites with VNIC connectivity (wide area communications).

DESCRIPTION	RADIO LID	SITE AFF	TG DESCRIPTION	TG ID
Radio 1	9980001	Site 21	TG 64001 P25	64001
Radio 2	9980002	Site 21	TG 64001 P25	64001
Radio 3	9980003	Site 25	TG 64001 P25	64001

Execution:

1. PTT Radio 1 and talk.
2. The transmit (TX) indicators should turn on at Radio 1.
3. Radios 2 and 3 should hear the call.
4. Switch all radios to TG 64051 to test phase 2 multisite.
5. Repeat Steps 1 and 2.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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MULTISITE ANNOUNCEMENT GROUP CALL

Purpose: This test will demonstrate that the system will allow an announcement group call to function in a multisite environment.

Expected Results: The test will demonstrate that all radios assigned to a common group will hear a call, although some of the radios are at distant sites, and all radios assigned to an uncommon group will not hear the call.

Setup: Groups 64001 and 64002 are in announcement group 64007 per test group structure. Ensure scan is turned OFF.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	AN 64007 P26	64007	1
Radio 2	9980002	TG 64001 P26	64001	1
Radio 3	9980003	TG 64002 P25	64002	2
Radio 4	9980004	TG 64008 P25	64008	1

Execution:

1. PTT Radio 1 and talk.
2. The transmit (TX) indicators should turn on at Radio 1.
   > Audio should be heard on Radios 2 and 3.
   > ANNOUNCE should be displayed on Radios 2 and 3.
   > Radio 4 should not receive announcement call.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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MULTISITE EMERGENCY GROUP CALL

Purpose: Demonstrate the capability of the system to process an emergency group call.

Expected Results: This test will verify that when a radio initiates an emergency group call, all other radios in the group indicate an emergency and the emergency can be cleared by a supervisor radio or console.

Setup: Program three radios with the same emergency home group. Set the supervisor (Radio 1) & Radio 2 to the home group. Set Radio 3 to a different group (not home group). A console will be used to clear the emergency.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	2
Radio 3	9980003	TG 64003 P25	64003	1

Execution:

1. Press the Emergency call button on Radio 1 and talk within the pre-defined Emergency Auto-key time, and/or PTT Radio 1 during or just after that time.
   > Verify that Radio 1 indicates the "TX EMER" declaration and that it reverts to the home group.
   > Verify Radio 2 (on Site 2) indicates a "RX EMER" and hear audio on the emergency home group.
   > Verify Radio 3 does not display the emergency.
2. Clear the emergency with a supervisor radio or console.
   > Verify the emergency clears in the radios.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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MULTISITE ROUTING (FOR MULTISITE LOGOUT)

Purpose: Demonstrate the system will not route a call to a site if all the radios logged into the site have moved to a different site.

Expected Results: When the radio moves away from a site, the system will not route calls to the site that it has roamed away from.

Setup: Site 1 and 2 should be selected so Radio 2 can log into Site 1 and then Site 2.

The primary objective of this test is to demonstrate that the system routes calls to Site 2 whenever a unit (i.e. Radio 2) is logged onto Site 2 and does not route calls to Site 2 when no units are logged into Site 2. Radio 1 logged into Site 1, and Radio 2 logged into Site 2.

Ensure no other radios are logged into system during this test.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	2

Execution:

1. Key Radio 1 on Site 1.
   > Verify channel assignments occur on Site 2. Un-key radio.
2. Move Radio 2 from Site 2 to Site 1. Key Radio 2 (Radio 2 is no longer logged into Site 2).
   > Verify no channel assignments occurs on Site 2, since no radios are logged into Site 2. Unkey Radio 2.
3. Key Radio 1.
   > Verify no channel assignments occurs on Site 2, since no radios are logged into Site 2. Unkey Radio 1.
4. Move Radio 2 from Site 1 to Site 2. Key Radio 2.
   > Verify a channel assignment occurs on Site 2. Unkey Radio 2.
5. Key Radio 1.
   > Verify channel assignment on Site 2, since Radio 2 is logged into Site 2. Unkey Radio 1.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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SITE TRUNKING (FAILSOFT) INDICATION

Purpose: Demonstrate that radio displays a fail soft icon, when the site is unable to communicate with the system/network.

Expected Results: This test will verify that the radio will display an 'F' when the site it is logged into is not connected to the system.

Setup: Radios must be programmed to display fail soft.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	1
Radio 3	9980003	TG 64001 P25	64001	2

Execution:

1. PTT Radio 1.
   > Verify that the Radio 1, Radio 2, and Radio 3 can communicate on the system.
2. Disconnect the network connection from the network switching center to the site router, causing loss of communication from the site back to the network switching center.
   > Verify that Radio 1 and Radio 2 indicate a fail soft alarm ("F") on their displays, this may take several minutes.
3. PTT Radio 1 on talkgroup A. Verify audio is heard at Radio 2. Verify audio is not heard on Radio 3.
4. Re-connect the network from the network switching center to the site router.
   > Verify the fail soft alarm disappears on the Radios and that communications with Radio 3 is reestablished.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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UNCONFIRMED CALL (MULTISITE LATE-ENTER)

Purpose: Verify a radio will late enter an ongoing group call made from another site.

Expected Results: A radio creates demand for talkgroups even when no channels are available at a site. Ongoing calls on a talkgroup will be joined as channel resources become available.

Setup: Site 1 should only have one working channel, disable all other working channels at Site 1.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64002 P25	64002	1
Radio 3	9980003	TG 64001 P25	64001	2
Radio 4	9980004	TG 64001 P25	64001	2

Execution:

1. Key up Radio 2 on Site 1 and hold the call up. [Then there are no channels available to process a call on TG64001 on Site 1.]
2. Key up Radio 3 on TG64001 on Site 2 and hold the call up.
    > Verify that Radio 3 should get the grant tone, and the call should go through to Radio 4 on Site 2.
    > Since Site 1 has no channels available, the call should not go through to Radio 1 on Site 1.
3. While Radio 3 is still keyed up, free up a channel on Site 1 by unkeying Radio 2.
    > Verify that the call from Radio 3 gets routed to Site 1, and that Radio 1 late-enters into the call on that site.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

CONFIRMED CALL
(NON SINGLE-CELL / MULTISITE ONLY)

Purpose: Demonstrate that the system allows confirmed calls.

Expected Results: The radio will be briefly queued before being allowed to talk while the system attempts to wait until there are available channels, or the confirmed call timer expires.

Setup: In the system, enable "Confirm Call" on TG64001. Ensure that the group is set up for multisite operation. For this test, set the "Confirmed Call Timeout" to a default of 1 second in the site via device manager.

Site 1 should only have one working channel, disable all other working channels at Site 1.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64002 P25	64002	1
Radio 3	9980003	TG 64001 P25	64001	2
Radio 4	9980004	TG 64001 P25	64001	2

Execution:

1. Key up "Radio 2 on Site 1, TG64002, and hold the call up.
2. Key up Radio 3 on TG64001, on Site 2, and hold the call up.
   > Verify the confirmed call is not allowed to proceed, until the "Confirmed Call Timeout" period has expired.
   > When the timer expires, the call will proceed, but only to Site 2.
   > Verify Radio 4 late enters in the call from Radio 3.
   > Verify Radio 1 does not get the call from Radio 3, since Site 1 does not have any available channels.
3. Radio 2 is still keyed. Now, unkey Radio 2, to free up the channel on Site 1.
   > Verify the call from Radio 3 gets routed to Site 1 and Radio 1 late-enters into the call.
4. Repeat test. Key up Radio 2 on Site 1, TG64002 and hold the call up.
5. Key up Radio 3 on TG64001, on Site 2, and hold the call up.
   > Verify Radio 4 hears the call.
6. Unkey Radio 2, before the "Confirmed Call Timeout" period expires.
   > Verify the call from Radio 3, Site 2 is heard on Radio 1, Site 1, and late-enters on Radio 1.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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Emergency

LOCAL FDMA EMERGENCY, MULTISITE (NON SINGLE-CELL SIMULCAST / MULTISITE ONLY)

Purpose: This test is set up to demonstrate the multisite FDMA emergency.

Expected Results: This test will verify that the system will not drop a channel to assign a channel an emergency in FDMA mode.

Setup: This test requires six radios and two working talk paths on the site. Disable channels (if necessary) until there are only two working talk paths on the site.

Description	Radio LID	TG Description	TG ID	Site
Radio 1	9980001	TG 64101 P25	64101	1
Radio 2	9980002	TG 64102 P25	64102	1
Radio 3	9980003	TG 64103 P25	64103	1
Radio 4	9980004	TG 64101 P25	64101	2
Radio 5	9980005	TG 64102 P25	64102	2
Radio 6	9980006	TG 64103 P25	64103	2

Execution:

1. Disable channels at Site 1 and Site 2 so the sites only have two working FDMA talk paths.
2. PTT Radio 1 and 2 to busy up the sites.
3. Declare an emergency on Radio 3.
   > Radio 3 Should enter the queue.
4. Un-key Radio 2.
   > Verify Radio 3 is assigned the call.
5. Un-key all radios and clear the emergency with the Radio 1.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

LOCAL TDMA EMERGENCY, MULTISITE

Purpose: This test is set up to demonstrate the multisite TDMA local emergency.

Expected Results: This test will verify that the system will drop a local channel to assign a channel an emergency in TDMA mode.

Setup: This test requires six radios and two working talk paths on the site. Disable channels (if necessary) until there are only two working talk paths on the site.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64151 P25	64151	1
Radio 2	9980002	TG 64152 P25	64152	1
Radio 3	9980003	TG 64153 P25	64153	1
Radio 4	9980004	TG 64151 P25	64151	2
Radio 5	9980005	TG 64152 P25	64152	2
Radio 6	9980006	TG 64153 P25	64153	2

Execution:

1. Disable channels at Site 1 and Site 2 so that the sites only have two working TDMA talk paths.
2. PTT Radio 1 and 2 to busy up the sites.
    > Verify Radio 4 and 5 are listening.
3. Declare an emergency on Radio 3.
    > Verify call is dropped to Radio 1 and tone is heard.
    > Verify Radio 3 is assigned a channel / one TDMA Slot.
    > Verify a console hears calls from Radio 2 and 3.
    > Verify Radio 6 hears Radio 3.
4. Un-key all radios and clear the emergency with the Radio 1.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

![L3HARRIS™ logo]

REMOTE TDMA EMERGENCY, MULTISITE

Purpose: This test is set up to demonstrate the multisite TDMA remote emergency response.

Expected Results: This test will verify that the system will not drop a remote channel to assign a channel an emergency in TDMA mode.

Setup: This test requires five radios and two working talk paths on the site. Disable channels (if necessary) until there is only two working talk paths on the site.

Site Personality Setup: Configure Section 17: Emergency Declarations;

Handling When All Chans Busy – Drop Calls of Lower Priority

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64151 P25	64151	1
Radio 2	9980002	TG 64152 P25	64152	1
Radio 3	9980003	TG 64153 P25	64153	1
Radio 4	9980004	TG 64151 P25	64151	2
Radio 5	9980005	TG 64152 P25	64152	2

Execution:

1. Disable channels at Site 1 and Site 2 so that the sites only have two working TDMA talk paths.
2. PTT Radio 4 and 5 to busy up the sites.
3. Declare an emergency on Radio 3.
   > Verify audio is dropped to Radio 1.
   > Verify calls from Radios 4 and 5 continue.
   > Verify Radio 3 is assigned a channel.
   > Verify a console hears calls from Radio 3, 4, and 5.
4. Un-key all radios and clear the emergency with the Radio 1.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

P25 TDMA Phase 2 Functionality (Multisite / Non Single-Cell Simulcast)

Purpose: Demonstrate the system will allow radios that are on different sites to communicate, while the radios are on different phases on P25.

Expected Results: Verify the system will allow FDMA and TDMA radios to inter-communicate.

Setup:

Radios 1 and 2: FDMA only

Radios 3 and 4: TDMA and FDMA capable, depending upon trunk group

FDMA refers to Phase 1 and TDMA refers to Phase 2.

Use RNM real time viewers to monitor channel assignments and call type.

Place a group call from Radio 1 to Radio 2 on the site and verify that the event viewer displays the TG ID and calling party ID. Verify the state changes from free to talk. Verify the trunk group alias displays the group number.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SYSTEM	SITE	ON / OFF
Radio 1	9980001	TG 64051 P25	64051	Phase 1	1	On
Radio 2	9980002	TG 64051 P25	64051	Phase 1	1	On
Radio 3	9980003	TG 64051 P25	64051	Phase 2	2	On
Radio 4	9980004	TG 64051 P25	64051	Phase 2	2	On

MIXED MODE SITE TO MIXED MODE SITE CALL — FDMA TO FDMA (NON SINGLE-CELL SIMULCAST / MULTISITE ONLY)

Purpose: Demonstrates that an FDMA call will work on a TDMA system

Expected Results: Verify that a P25 FDMA call will work on a TDMA system

Setup: Turn off Radios 2 and 4.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SYSTEM	SITE	ON / OFF
Radio 1	9980001	TG 64051 P25	64051	Phase 1	1	On
Radio 2	9980002	TG 64051 P25	64052	Phase 2	1	Off
Radio 3	9980003	TG 64051 P25	64051	Phase 1	2	On
Radio 4	9980004	TG 64051 P25	64052	Phase 2	2	Off

Execution:

1. PTT Radio 1 and talk.
    > The transmit (TX) indicators should turn on at Radio 1.
    > Verify that the call is assigned as FDMA at Site 2 by viewing the real time viewer site activity on the RNM.
    > Verify Radio 3 can hear Radio 1.

TEST RESULTS
Tester:
Date:
Result: ☐ Pass   ☐ Fail

MIXED MODE SITE TO MIXED MODE SITE CALL — FDMA AND TDMA (NON SINGLE-CELL SIMULCAST / MULTISITE ONLY)

Purpose: Demonstrate that a mixed mode call can function on a TDMA system.

Expected Results: Verify that TDMA radios will hear a call from a FDMA radio.

Setup: Turn on Radios 1, 2, 3, and 4.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SYSTEM	SITE	ON / OFF
Radio 1	9980001	TG 64051 P25	64051	Phase 1	1	On
Radio 2	9980002	TG 64051 P25	64051	Phase 1	1	On
Radio 3	9980003	TG 64051 P25	64051	Phase 2	2	On
Radio 4	9980004	TG 64051 P25	64051	Phase 2	2	On

Execution:

1. PTT Radio 1 and talk.
    > The transmit (TX) indicators should turn on at Radio 1.
    > Verify that the call is assigned as FDMA at Site 2 by viewing the real time viewer site activity on the RNM.
    > Verify Radios 2, 3, and 4 can hear Radio 1.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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MIXED MODE SITE TO MIXED MODE SITE CALL — FDMA (NON SINGLE-CELL SIMULCAST / MULTISITE ONLY)

Purpose: Demonstrate that a mixed mode call can function on a TDMA system.

Expected Results: Verify that a FDMA radio will hear a call from a TDMA radio.

Setup: Turn on Radios 1, 2, 3, 4.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SYSTEM	SITE	ON / OFF
Radio 1	9980001	TG 64051 P25	64051	Phase 1	1	On
Radio 2	9980002	TG 64051 P25	64051	Phase 1	1	On
Radio 3	9980003	TG 64051 P25	64051	Phase 2	2	On
Radio 4	9980004	TG 64051 P25	64051	Phase 2	2	On

Execution:

1. PTT Radio 3 and talk.
   > The transmit (TX) indicators should turn on at Radio 3.
   > Verify that the call is assigned as FDMA at Site 2 by viewing the real time viewer site activity on the RNM.
   > Verify Radios 1, 2, and 4 can hear Radio 3.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

![L3HARRIS™ logo]

TDMA SITE CALL (NON SINGLE-CELL SIMULCAST / MULTISITE ONLY)

Purpose: Demonstrate that a TDMA call works on a TDMA system.

Expected Results: Verify that a P25 TDMA call will work on a TDMA system.

Setup: Turn off Radios 1 and 2.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SYSTEM	SITE	ON / OFF
Radio 1	9980001	TG 64051 P25	64051	Phase 1	1	Off
Radio 2	9980002	TG 64051 P25	64051	Phase 1	1	Off
Radio 3	9980003	TG 64051 P25	64051	Phase 2	2	On
Radio 4	9980004	TG 64051 P25	64051	Phase 2	1	On

Execution:

1. PTT Radio 3 and talk.
   > The transmit (TX) indicators should turn on at Radio 3.
   > Verify that the call is assigned as a TDMA at Site 1 by viewing the real time viewer site activity on the RNM.
   > Verify Radio 4 can hear Radio 3.

TEST RESULTS
Tester:
Date:
Result: ☐   Pass   ☐   Fail

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P25 Simulcast Bypass Operation

Program the MASTR V modules (both Control Points and Transmit Sites) to the Final Configuration. Refer to the installation manual for the guide to setting TX Traffic Controllers / CP Traffic Controllers personality parameters.

Verify the BYPASS plan has been reviewed and approved by customer representative. This procedure makes assumptions on bypass sites before implementation and test of the System. After WMS/Panther signal strength data collection, final decision will be made on the actual bypass "ON" and "OFF" sites.

Prepare a minimum of two terminal radios programmed to operate on the active BYPASS site and the main simulcast system.

SITE OFF - FINAL CONFIGURATION

Purpose: Confirm sites configured to be in the "OFF" condition during BYPASS are in the expected BYPASS mode.

Expected Results: The "OFF" site traffic controllers have no control channel.

Setup: Sites intended to be "OFF" in event of BYPASS must have all channels set to disabled (unchecked in Device Manager, TC personality).

Execution:

1. At one of the sites designated as an "off" site, create a condition to force BYPASS by disconnecting the router to MPLS connection. All other sites will have the HPAs disabled locally.
   > Verify transmit site is in BYPASS mode.
   > The Traffic Controller module display indicates "TC" instead of "TR". Note: TC= Working Traffic Channel, standalone mode, TR=Working Channel, simulcast mode, and Control Channel, simulcast mode is indicated by the transmit LED indicator.
2. Observe the repeater (station) Traffic Controller modules.
   > Verify there is no active control channel.
   > Verify no stations are keyed or producing RF power.
3. Restore the site to normal by returning the site to simulcast mode by reconnecting the router to MPLS connection.
   > Verify transmit site is in normal simulcast mode. The Traffic Controller modules will indicate "TR(n)", where n is the channel number.
4. Repeat Steps 1-3 for the remaining "OFF" bypass sites in the simulcast system under test.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐	Fail

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SITE ON (TRUNKING) - FINAL CONFIGURATION

Purpose: Confirm sites configured to be in the "ON" condition during BYPASS are in the expected BYPASS mode.

Expected Results: The "ON" site traffic controllers have a control channel.

Setup: Site is configured to be ON during BYPASS.

Execution:

1. Create a condition to force BYPASS by disconnecting the router to MPLS connection.
   > Verify transmit site is in BYPASS mode. BYPS LED on Baseband module and the Traffic Controller module display indicates either "TC" or "CC" instead of "TR.
   > Observe the stations/repeater Traffic Controller modules. Verify there is an active control channel on one of the Traffic Controller modules. The remaining repeater/stations Traffic Controller modules will indicate "TC".
   > Verify the station appearing as control channel is keyed, producing RF power and modulated with control channel data.
   > Verify a terminal radio set to the system programmed for the site in BYPASS with the correct site ID recognizes the site's control channel data.
2. Key the terminal radio on a group call.
   > Verify a working channel assignment is made within the channel group allowed in the personality.
   > Verify the call is heard on a second terminal radio set to the active BYPASS system.
3. Restore the site to simulcast mode by reconnecting the router to MPLS connection.
   > Verify transmit site is in normal simulcast mode. Traffic Controller modules indicate "TR(n).
4. Repeat Steps 1-3 for remaining "ON" bypass sites in the simulcast system under test.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

CONTROL POINT TRUNKING RESET CONTROL

Purpose: A properly set up Simulcast BYPASS system will disable CP Traffic Controller modules associated with active channels at a TX site operating in BYPASS. This keeps the remaining sites operating in Simulcast mode from being assigned to channels expected to be active at the site in BYPASS. Sites programmed to be OFF in BYPASS will not require any Traffic Controller modules to be held OFF.

Expected Results: This test will verify that the Control Point Traffic Controller modules will be held OFF corresponding to the active channels at a site, due to the TX site being in BYPASS.

Setup: N/A

Execution:

1. Force a TX site that will become active into BYPASS by disconnecting the router to MPLS connection.
   > Verify TX site is in BYPASS mode.
   > Verify transmit site is in BYPASS mode. Traffic Controller module display indicates either "TC" or "CC" instead of "TR".
   > Verify the CP Traffic Controller modules on the channels intended to be OFF are held OFF.
2. Observe the RNM screen for the simulcast system.
   > Verify the channels intended to be OFF at the Control Point are reported as OFF (RED).
3. Restore the site to simulcast mode by reconnecting the router to MPLS connection.
   > Verify the TX site Traffic Controller modules revert to normal Simulcast.
   > Verify the CP Traffic Controller modules associated with the site in BYPASS are returned to normal.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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BYPASS – SITE MINIMUM CHANNELS

Purpose: Confirm a site enters bypass when active channels fall below site minimum channels setting.

Expected Results: The site enters bypass mode.

Setup: Sites are configured with cluster minimum channels set to 6 and site minimum channels to 7. Bypass Plan: TR Site 1 Ch 3,4,5; TR Site 2 Ch 6,7,8; TR Site 3 Ch 9,10,11 TR Sites 4 and 5 dark.

Note: Settings and bypass plan can be customer final settings; execution will have to adjust to accommodate those settings.

Execution:

1. At TR Site 1 disable Channels 8 - 11 using the TX disable switch on the PA (only Channels 1-7 are still functioning).
   > Verify system and site still functioning in simulcast; the disabled Channels 8-11 are in alarm state at the control point site.
   > At TR Site 1 the Traffic Controller modules displays still indicates "TR" not "TC" or "CC". Note: TC= Working Traffic Channel, standalone mode, TR=Working Channel, simulcast mode, and Control Channel, simulcast mode is indicated by the transmit LED indicator.
2. At the same site, disable Channel 7 using the TX disable switch on the PA.
   > Verify system is still functioning in simulcast. Control Point ch 3,4, and 5 in alarm state.
   > Verify TR Site 1 is in bypass. The Traffic Controller module display indicates "TC" instead of "TR". All channels status indicates alarm. Note: TC= Working Traffic Channel, standalone mode, TR=Working Channel, simulcast mode, and Control Channel, simulcast mode is indicated by the transmit LED indicator always on.
3. At the same site restore all channels back to service (enable the PA using the TX disable switch on the PA).
   > Verify transmit Site 1 is in normal simulcast mode. The Traffic Controller modules will indicate "TR(n)", where n is the channel number.
   > Verify all channels are in service at the control point.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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BYPASS – CLUSTER MINIMUM CHANNELS – TR SITE FAILURES

Purpose: Confirm all sites enter bypass when available channels fall below the cluster minimum channels setting. Depending upon the system size, bypass plan, and which channels have been failed a subset of sites may subsequently come out of bypass and operate as a cluster before any channels are restored to service.

Expected Results: All site in the system enter bypass mode.

Setup: Sites are configured with cluster minimum channels set to 6 and site minimum channels set to 7 (these settings are normally lower; they are set high to simplify testing).

Execution:

1. At TR Site 1 disable Channels 9, 10 and 11 using the TX disable switch on the PA (8 channels are still functioning).
    > Verify system and site still functioning in simulcast.
    > The Traffic Controller module displays still indicates "TR" not "TC" or "CC". Note: TC= Working Traffic Channel, standalone mode, TR=Working Channel, simulcast mode, and Control Channel, simulcast mode is indicated by the transmit LED indicator.
2. At TR Site 3 disable Channels 6, 7 and 8 using the TX disable switch on the PA (5 channels are still functioning).
    > Verify All sites have entered bypass (the TCs display "TC" and "CC", not "TR" and every channel status indicates failed at every site.
3. Enable the PAs at the sites using the TX disable switches.
    > Verify the system recovers to simulcast mode with all transmit sites in normal simulcast mode. The Traffic Controller modules will indicate "TR(n)", where n is the channel number.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

SITE ON (TRUNKING) - ENHANCED BYPASS FINAL CONFIGURATION

Purpose: Confirm sites configured to be in the "ON" condition during BYPASS are in the expected BYPASS mode and can connect to VNIC.

Expected Results: The "ON" site traffic controllers have a control channel and calls between terminal radios and dispatch can be made.

Setup: N/A

Execution:

1. Create a condition to force BYPASS that does not disrupt network connectivity by logging into both GPS receivers and configuring their notifications to set the major alarm threshold to minimum satellites 12 and duration below threshold 5 seconds. This will cause the GPS receivers to set a major alarm after 5 seconds.
2. Configure Notifications from Spectracom GPS Receivers
   > Navigate to: Management > Notifications

3. In the **Events** window pane, click the **GPS** tab.
4. Set the Major Alarm Threshold as follows:
   > Minimum Satellites: **12**
   > Duration Below Threshold: **5**
5. Click: Submit
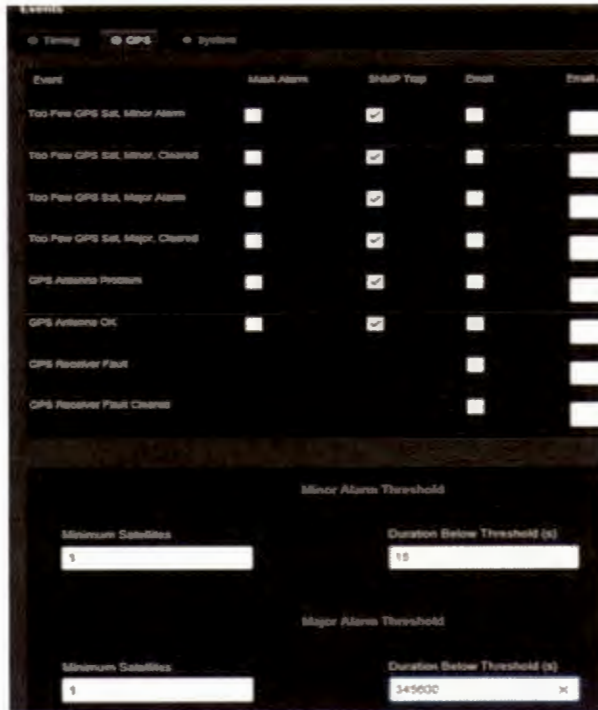
6. Verify transmit site is in BYPASS mode. The Traffic Controller module display indicates either "TC" or "CC" instead of "TR".

   > Observe the stations/repeater Traffic Controller modules. Verify there is an active control channel on one of the Traffic Controller modules. The remaining repeater/stations Traffic Controller modules will indicate "TC".

   > Verify the station appearing as control channel is keyed, producing RF power and modulated with control channel data.

   > Verify a terminal radio set to the system programmed for the site in BYPASS with the correct site ID recognizes the site's control channel data.

7. Key the terminal radio on a group call.

   > Verify a working channel assignment is made within the channel group allowed in the personality.

8. Restore the site to simulcast mode by restoring the GPS major alarm notification threshold to minimum satellites = 1 and duration = 345600 for both GPS receivers.

   > Verify transmit site is in normal simulcast mode. Traffic Controller modules indicate "TR(n).

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

Control Point Movement

DCP FORCED CONTROL POINT MOVEMENT

Purpose: This test will demonstrate the DCP system can move the control point in response to user command.

Expected Results: This test will verify that the Control Point can be moved from the active site to an alternate Control Point Site. After the control point is switched to the alternate Control Point the system should operate normally.

Setup: The DCP system is operating with an active control point and at least two sites are enabled to be the control point.

Execution:

1. Log into the RNM.
2. In Network view identify the site which is the active control point.
3. Right click on the control point site icon and select "Change Control Point to Best Site Available".
4. Verify system is still functioning (i.e. voice calls can be made – between radios and a radio and console and optionally data calls can be made (e.g. radios can be 'pinged').
5. Verify that the RNM indicates a different site as control point and the previous control point is now a TX site. (Note – a CP only site displays "zzzz" when it is not the active control point.)
6. On the RNM right click on the previous control point site and select "Change to be the Control Point".
7. Verify system is still functioning (i.e. calls can be made – between radios and a radio and console and optionally data calls can be made (e.g. radios can be 'pinged').
8. Verify that the RNM indicates the control point has moved to the site selected in Step 6 and the previous control point is now a TX site. (Note – a CP only site displays "zzzz" when it is not the active control point.)

TEST RESULTS					
Tester:					
Date:					
Result:	☐	Pass		☐	Fail

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DCP CONTROL POINT MOVEMENT IN RESPONSE TO FAULTS AT THE ACTIVE CONTROL POINT

Purpose: This test will demonstrate that the Control Point will move in response to failures at the active Control Point.

Expected Results: This test will verify that the DCP system will move the active Control Point to an alternate control point site when the active control point experiences failures. After the Control Point moves the old control point should drop into bypass and the rest of the system should operate normally as a Simulcast cluster.

Setup: The DCP system is operating with an active control point and is properly configured with at least two sites enabled to be the control point.

Execution:

1. Verify system is functioning (i.e. calls can be made – between radios and a radio and console and optionally data calls can be made (e.g. radios can be 'pinged').
2. At the control point site disconnect the 1pps cable from GPS B.
3. Verify the system is still functioning (i.e. calls can be made – between radios and a radio and console and optionally data calls can be made (e.g. radios can be 'pinged') and control point has not moved. The traffic controllers at the control point display 'CC xx' and 'TC xx' when idle; at a satellite site the traffic controllers display "TR xx' where xx is the channel number.
4. At the control point site disconnect the 1pps cable from GPS A.
5. Verify that the control point moved to next ranked site and the old control point is now in bypass. The traffic controllers at the control point display 'CC xx' and 'TC xx' when idle: Any channels that are configured to be active at the old control point site when it is in bypass will have all their status LED red. In bypass all the traffic controllers display 'CC xx' and 'TC xx' when idle and the status LED will be red.
6. Verify the RNM indicates the new control point and shows the old control point site is now in bypass.
7. Verify the simulcast system is still functioning (i.e. calls can be made – between radios and a radio and console and optionally data calls can be made (e.g. radios can be 'pinged').
8. If the old control point has channels active in bypass, verify radios switched to this bypass site acquire the control channel and can communicate.
9. Restore the connections to the GPS receivers at the site in bypass (the old control point site).
10. Verify that the site exits bypass and joins the simulcast cluster.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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System Test Notes / Issues

System Functional Test Acceptance

This Functional Test Acceptance Procedure has been fully and successfully completed with all action items resolved.

Hunt County, Texas Representative   L3Harris Technologies Representative

_____   _____

Signature   Signature

_____   _____

Printed Name and Title   Printed Name and Title

_____   _____

Date   Date

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NETWORK SWITCHING CENTER FEATURE SET

VIDA Universal Administration Server (UAS)

ACTIVE DIRECTORY CONTROL OF UAS USER ACCOUNTS (SR10A.4 OR LATER)

Purpose: Transition from managing UAS-user accounts in the UAS application to AD instead. New systems will be shipped w/ AD control instead of UAS application user control. Existing systems may choose to switch to AD control or continue to use the existing accounts in UAS.

Expected Results: Demonstrate for SR10A.4 or later UAS Login; the UAS uses Active Directory-configured user login with AD username and password.

Setup: All users configured in Active Directory prior to UAS Login. UAS Users are added to AD 'Active Directory Users and Computers' > within vida. local area > VIDA Users > VIDA Administrators > "each User defined here". For "User X", within "Properties" > "Member of" Tab; User X needs appropriate "VIDA UAS access group".

Execution:

1. Login into UAS with AD user login. Use AD username and password.
   With SR10A.4 or later, UAS web login interface will pass username and password to Active Directory for authentication.

   > Verify user has logged into the UAS.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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CREATE AN AGENCY LEVEL ADMINISTRATOR ACCOUNT IN THE UAS

Purpose: Demonstrate the capability to create agency admin accounts in the UAS.

Expected Results: Test will create a new agency level administrator account.

Setup: Need system level access to an UAS or UAS client. Predefined agency and region in the UAS.

Execution:

1. Browse to the UAS at the address of 'https://s0u1uas.vida.local:8443/nas'
2. Log in with UAS administrator level account.
    > Verify that default accounts are created (see list below) and verify a default Agency administrative class, by selecting System/Administration/Admin User.
3. Select "Add" to display the Administration User Detail screen.
4. Enter a name (e.g., TestAgency), description, and password. Select save to download and click 'OK'.
5. Log out of the default account.
6. Log in with the new TestAgencyAdmin.
    > Verify access to account.
7. Log out of the Test AgencyAdmin.
8. Log in with the default account and delete the TestAgencyAdmin.

TEST RESULTS			
Tester:			
Date:			
Result:	☐	Pass	☐	Fail

PROVISION AGENCY WITH TALKGROUPS AND SUBSCRIBER UNITS IN THE UAS

Purpose: Demonstrate the capability to add talkgroups and users to the agency accounts in the UAS.

Expected Results: Test will show that a user can add a new talkgroup and users to the system.

Setup: System/region/agency level access to the UAS or a UAS client.

Execution:

1. Log into the UAS with one of the default accounts.
2. Select Agency 998, select 'R/W Talkgroup', to create a talkgroup.
3. Click 'Add' and then on the 'Talkgroup Detail' screen input the talkgroup ID from the table below. For any setting not listed, use the auto setting. Click OK and download.
   > Verify the talkgroup has been added to the list of talkgroups.

TG ID	NAME	DESCRIPTION	SPNI	PROPERTY ID	PRIORITY ID	COVERAGE	VALID COVERAGE
64454	64454ANA	Half Rate Low Priority	1	3	5	P25Sites_PSAPs	P25Sites_PSAPs

4. Using PuTTy on an SMT, log into a traffic controller at a control point for simulcast or site for multisite and issue the command 'show gdb'.
   > Verify that Group 64454 exists in the traffic controller user data base.
5. Once the group has been verified, delete it from the UAS.
6. In the UAS, select Voice End (VEU) User tab and add a VEU.
7. Select the Subscriber Unit tab, and add a Subscriber Unit for the Voice End User.
8. Using PuTTy on an SMT, log into a traffic controller at a control point for simulcast or site for multisite and issue the command 'show udb'.
   > Verify the added user exists in the traffic controller user data base.
9. Once the user has been verified, delete it from the UAS.

TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

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DYNAMIC REGROUP FROM THE UAS

Purpose: Demonstrate ability to dynamically regroup subscriber units from the UAS.

Expected Results: Test will combine selected talkgroups into a single interop group.

Setup: Radios must have "Allow P25T Unsolicited Dynamic Regroup" checked in the radio personality under general options. Ensure radio IDs and talkgroup IDs are uploaded to the site.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64002 P25	64002	1
Radio 3	9980003	TG 64003 P25	64003	1

Execution:

1. At the UAS, select 'Regroup' tab and 'Regroup Profile'.
2. Click 'Add' to add profile detail; name Group 'Regroup1', and Description 'Regroup1 Test'.
   > Define regroup profile; select Agency 998 and 'TG64003'.
   > Select 'OK' and save changes to the UAS.
3. Click 'End User Group' and click 'Add'. Name Group 'Regroup1' and Description 'Regroup1 test'.
   > Select Agency 998 from 'Select a Scope' drop down box.
   > Add 'Radio 1' and 'Radio 2' to the 'Selected' windows.
   > Select 'OK' to close 'End User Group Detail'.
   > Click 'Save' button to download the new regroup.
4. Click 'Define Regroup' and click 'Add' to name the regroup 'Regroup1' and description 'Regroup1 test'.
   > Change 'Profile Name' to 'Regroup1' and change 'End User Group Id' to 'Regroup1'.
   > Click 'OK' and save to click 'Save' the changes to the UAS.
5. Click 'Manage Regroup' check the box for 'Regroup1' and select the button for 'Regroup'.
   > Click 'Save' to start regroup.
   > Verify that Radio 1 and Radio 2 are forced to 'Talkgroup 64003'.
6. At 'Radio 1' and 'Radio 2', attempt to change talkgroups away from 'Talkgroup 64003'
   > Verify that both radios are forced to remain on 'Talkgroup 64003'.
7. PTT 'Radio 1' on 'Talkgroup 64003'.
   > Verify that 'Radio 3' hears audio on 'Talkgroup 64003' and can respond.
8. Clear the dynamic regroup from the UAS client.
   > Verify 'Radio 1' and 'Radio 2' are no longer forced to 'Talkgroup 64003' (i.e., they can select other predefined talkgroups).

TEST RESULTS			
Tester:			
Date:			
Result:	☐	Pass	☐ Fail

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UNIT DEREGISTRATION

Purpose: Demonstrate that a radio will automatically deregister when the radio is turned off.

Expected Results: Test will show that the radio is off and will not create traffic load demand.

Setup: Radio 1 is the only radio on 'Talkgroup A' for this test. All other radios should be on different talkgroups. UAS>System Properties>Protocol Timer>Radio Re-Registration Timer for P25 trunked sites must be lowered to a minimum value to test this feature. It is typically setup for 360 minutes. Set the timer for two minutes and note the "calculated" value of "VNIC Remove Demand Timer". The VNIC Remove Demand Timer value is the "wait time" to see the radio be "deregistered" by the system after losing connectivity. Restart the VNIC following the change. Be sure to set the timer back to 360 minutes following the test.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Console	9989101	TG 64001 P25	64001	1

Execution:

1. On a client computer, open Windows Internet Explorer and browse to https://s0u1rnm.vida.local/nmc and log in with an Active Directory account. Choose 'System Map' and select 'Launch Application' button. Open 'Realtime' tab and click 'Mobiles.'
   > Verify Radio 1 LID is shown registered on the site.
2. PTT console on Talkgroup 64001 and verify it communicates on the system to Radio 1.
   > Return call from Radio 1 to the console on Talkgroup 64001.
3. Turn off Radio 1 and wait for expiration of the radio timeout period.
4. Refresh RNM mobiles screen periodically and verify Radio 1 is deregistered after VNIC *Remove Demand Timer* has passed.
5. PTT console on Talkgroup 64001, after the expiration of the timeout.
   > Verify no channel is assigned to site, since no demand exists at the sites.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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UAS SITE ADJACENCY CONFIGURATION

Purpose: Demonstrate the capability to configure site adjacencies in the UAS.

Expected Results: Site adjacencies will be successfully configured and modified.

Setup: UAS is installed and functioning on system network. Basic test is to follow the manual and SRN instructions to configure site adjacencies using the new graphical interface.

Execution:

1. In the UAS go to System > System Properties > Site adjacency.
2. Select a site on the left-hand side to configure for adjacency information.
3. Use the left-hand side to add adjacencies for the site.
   > Confirm the adjacent sites are removed from the non-adjacent site list and display correctly on the right side.
4. Use the right-hand side to remove a site adjacency.
   > Confirm the removed adjacency disappears on the right side and is displayed as a non-adjacent site on the left side.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐	Fail

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UNIT ENABLE/DISABLE FROM THE UAS

Purpose: Demonstrate the ability to disable a lost/stolen radio from the UAS.

Expected Results: Test will disable and re-enable a designated radio.

Setup: Ensure radios can communicate together on same trunk group. Verify all sites are connected to the NSC and are online.

Note: If a radio is encrypted, unit disable will automatically delete the encryption key from the radio, as it is disabled. To restore unit functionality for an encrypted radio, the radio must have the encryption key re-installed.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 4	9980004	TG 64001 P25	64001

Execution:

1. Select Talkgroup 64001 on Radios 1, 2, and 4.
    > Verify that the radios can communicate.
2. From the UAS:
    > Click Radio 4 Enable/Disable.
    > Under the Unit Enable/Disable tab, enter the ID of Radio 4 to be modified.
    > Select the disable button and check the status.
    > Attempt to PTT Radio 4 and verify that it will not communicate with the other encrypted radios.
    > PTT Radio 1 and verify that Radio 4 cannot receive the call.
3. Enable the ID of Radio 4.
    > Verify that the Enable/Disable screen indicates that the current state of the radio is enabled.
    > Confirm that the radios can communicate in unencrypted mode.
4. Switch off Radio 4 and disable it from the Enable/Disable screen.
    > Switch on the radio and verify that, on logging into the site, it becomes disabled.
    > Verify that the state settings change to disabled and that the radios cannot communicate.
5. Enable Radio 4.
    > Verify that radios can communicate in unencrypted mode.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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CREATE A RESTRICTED USER ACCOUNT IN THE UAS

Purpose: Show that a user can be created in the UAS that has restricted access.

Expected Results: New user will only have access to the agencies tab and 998 agency.

Setup: User will need system level access to a UAS to define a new administration class that has limited access privileges and create a new user with that class.

Execution:

1. Browse to the UAS at the address of https://s0u1uas.vida.local:8443/nas.
2. Log in to the UAS system administrator level account.
3. Select the 'System' tab and 'Admin User.'
4. Click 'Add' to add the new user.
   > In the 'Admin User' text field type 'LimitedUser.'
   > In the 'Admin Class' field select 'Agency998.'
   > In the 'Description' text field type 'Limited User for ATP.'
   > Type a password into both 'Password' text fields.
   > Select 'Ok.'
5. Select the 'Save' button to save the results.
6. Log out and log back in as the 'LimitedUser.'
   > Verify the new user only has access to the 'Agencies' tab and agency 998.
7. Log out of the UAS.
8. Log in with the default account and delete the 'LimitedUser.'

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

UAS SITE ACCESS CONTROL FOR INVALID USER ID

Purpose: Demonstrate access control for subscriber units with invalid radio IDs and high availability of the Regional System Manager (RSM).

Expected Results: Radio will be denied access to the system with an invalid subscriber ID. Once the radio is added to the system in the UAS database, the primary RSM will download the database that includes it to the sites and allow the radio access. When the primary RSM is turned off and the radio is deleted from the UAS database, the secondary RSM will download the database that deletes the radio from the system. Once the radio is deleted from the system, the radio will again be denied access.

Required Materials: Three radios, a programming cable, and computer with RPM2 installed.

Setup: Use the table below to set up the new radio in the UAS.

VOICE END USER	INPUT	SUBSCRIBER UNIT	INPUT
User ID	010:998:9150	Description	Radio9150
Name	Rad9150	Electronic Serial No.	0109989150
Description	Radio9150	RSI	0000000109989150
Personality	Pers1	Protocol Mask	P25
User Privilege	998_10_default	Status	Enabled Unit
Message Trunked Icall	TRUE	Sub Type	Harris XL-200P
Enable P25 AES OTAR	TRUE	Assigned End User	010:998:9150
Manually Keyed	FALSE	Algorithm Support	AES
Preferred Vocoder	P25 Half Rate		
Transc Allowed Flag	TRUE		

Execution:

1. Log into a site traffic controller, issue a "show udb 9989150."
   > Verify radio is not present in the traffic controller database.
2. Program Radio 1 with an ID 9989150.
3. Attempt to PTT Radio 9150.
   > Verify access to the site is denied and audio is not heard on Radio 2.
   > Verify the system is still functional by PTT Radio 2 and verify the audio is heard on Radio 3.
4. Use the supplied table to enter Radio 0109989150 into the UAS database.
   > Select Agency/"agency name"/Voice End User. Click 'Add Entry' and then on the 'End User' Detail screen input the user ID, password ("p25user"), name, description, etc. of the user. Click OK and download.
   > Verify user ID has been added to the list of users.
   > Select agency/"agency name"/subscriber unit and enter appropriate user ID, IP address, and ESN for the user created in the Create a Restricted User Account in the UAS section.
   > Click OK and download.
5. Log into a site traffic controller, issue a "show udb 0109989150."

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>   Verify the radio is now present in the traffic controller database.
6.   Key Radio 1 (9150).
>   Verify access to the site is permitted and audio is heard on radio.
7.   Restart Radio 1 (9150) and PTT the radio.
>   Verify access to the site is permitted and audio is heard on Radio 2.
8.   Delete 0109989150 from the UAS database.
9.   Key Radio 1 (9150)
>   Verify access to the site is not permitted and audio is not heard.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

CREATE A SUBSCRIBER UNIT REPORT FROM THE UAS

Purpose: Demonstrate the capability to create a report of subscriber units in the UAS database.

Expected Results: Test will create a subscriber unit report.

Setup: Agency level access to UAS or a UAS client.

Execution:

1. Browse to the UAS using Internet Explorer and the address of 'https://s0u1uas.vida.local:8443/nas'
1. Log into the UAS as an agency-level administrator.
2. Select System/Report/Voice End User.
3. Type '0210' into the 'User ID' and select apply.
   > Verify that the UAS displays the user info for user '0210'

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

RADIO INACTIVE DEREGISTRATION

Purpose: Confirms the site will send a radio detach command when its configured registration timer expires.

Expected Results: Radio reregisters on the site in response to the radio detach command.

Setup: Program site with a radio registration age timer [UAS > System > System Properties > Protocol timer > Radio re-registration timer] set to five minutes. Radios 1 and 2 programmed for operation on the site.

Execution:

1. Power up site
2. Power up one radio
   > Confirm the radio registers on the site
   > Log into RNM>Realtime>Mobile>Track User.
3. After two minutes, power up the second radio
   > Confirm the radio registers on the site.
4. Wait three minutes
   > Confirm the first radio registers on the site again.
5. Wait two minutes
   > Confirm the second radio registers on the site.
6. Reprogram the site for the default registration timer setting.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐	Fail

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Network Management

REAL-TIME SITE MONITORING (RNM)

Purpose: Demonstrate the capability to monitor real-time call activity from the RNM.

Expected Results: This test will show active call traffic on specific talkgroups and caller IDs.

Setup: Administrator access to the RNM.

Radio 1 and Radio 2 operating on a site and NSC under test, both programmed with Group A.

Execution:

1. On a client computer, open the Windows Internet Explorer and browse to https://s0u1rnm.vida.local/nmc and log into the RNM.
   > Choose the 'System Map' and select the 'Launch Application' button.
   > Open the 'Real-time' tab and click 'Site Activity'.
   > Select the site and expand.
2. Check the box next to the channels and select it to add the channels to the target list. Select the 'OK' button to launch the application.
3. Place a group call from Radio 1 to Radio 2 on the site.
   > Verify the event viewer displays the talkgroup ID and caller ID.
   > Verify the state changes from free to talk.
   > Verify the trunk group alias displays the group number.
4. Place an emergency call from Radio 1 to Radio 2 on the site.
   > Verify the event viewer displays the emergency indication.
   > Verify the event viewer displays the talkgroup ID and caller ID.
5. Place an individual call from Radio 1 to Radio 2 on the site.
   > Verify the event viewer displays an individual call on the channel.
   > Verify the VNIC-assigned talkgroup ID changes with each transmission.
6. For P25 Phase 2: Verify the P25 Phase 2 RF traffic channels are sub-divided into two bearers (2-slot TDMA) when all Radios on the talkgroup are Phase 2 capable.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

REGIONAL NETWORK MANGER (RNM) MONITOR SYSTEM STATUS

Purpose: Demonstrate the capability to monitor system status from the RNM.

Expected Results: This test will show system level equipment icons.

Setup: Administrator access to the RNM.

Execution:

1. On a client computer, open the Windows Internet Explorer and browse to https://s0u1rnm.vida.local/nmc and log into the RNM.
2. Choose the system map and select the 'Launch Application' button. Select the 'Network' tab and expand the tree in the left-hand panel until you can see a site in the right-hand panel.
   > Verify the infrastructure is presented.
   > Select an object and right click to select properties to view information related to the object.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

RF SYSTEM ALARMS INDICATIONS ARE REPORTED (RNM)

Purpose: Demonstrate the capability to monitor system faults and alarms at the RNM.

Expected Results: Site equipment will send alarms to the RNM.

Setup: Need access to the site under test and the regional RNM. The alarm will need to be generated by equipment being physically powered-down or reset. Note the time of the alarm condition for later tests. On the 'RNM Domain' screen, verify all map icons are either green or blue. On the fault browser screen, delete any prior alarms.

Execution:

1. On a client computer, open the Windows Internet Explorer and browse to https://s0u1rnm.vida.local/nmc and log in with an Active Directory account.
    > Choose the system map and select the 'Launch Application' button.
    > Select the 'Network' tab and expand the tree in the left-hand panel until a site is in the right-hand panel.
2. Generate an alarm on a device (see chart) by powering down or otherwise disabling the device.
    > Verify that the RNM Network Viewer indicates a site alarm for the affected device.
    > Review alarm details by doing a right mouse click on an 'Alarm Object'. Select the desired menu option.
    > Verify alarm is listed in the 'Fault Browser'.
3. Turn the device back ON.
    > Verify that the device alarm clears and displays green.
4. Repeat Steps 2 - 3 for all equipment listed in the below chart.
5. Substitute https://s0u2rnm.vida.local/nmc and repeat test Steps 1 - 4 for the second RNM.
6. Record the results below for each site.

Note: This form can be modified to reflect actual as-built alarms

SITE #		SITE NAME	
ALARM #	NAME	RESULTS (PASS/FAIL)	REMARKS
1	Traffic Controller		Press the reset button on the TC and watch for the alarm
2	Router		Remove cable from Gi0/0 (interface to SAS)
3	Switch		Remove a cable from a PLAN port
4	PA		Disable one of the site PAs

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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ENTERPRISE NETWORK MANAGEMENT DISPLAY VERIFICATION (ENM)

Purpose: Demonstrate ENM monitoring capabilities.

Expected Results: Monitor various components of the LMR system.

Setup: The ENM product must be configured in Active Directory, in the "VIDA ENM Administrators" group. The user must log into the ENM with an administrator account.

Execution:

1. Open Internet Explorer and browse to https://s0u0enm.vida.local.
2. On the left side of the screen select the "Maps" heading and the "Maps Dashboard" sub-heading. From here, you can select the type of map you would like to view.
3. Verify that geographical maps display system and NSC information as configured.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

ENTERPRISE NETWORK MANAGER ALARM AND ALERT TEST (ENM)

Purpose: Demonstrate the capability to monitor system faults and alarms at the ENM.

Expected Results: ENM will detect in system status by displaying the appropriate alarm.

Setup: Need access to the system under test and the ENM. The alarm will need to be generated by equipment being powered-down or reset. The ENM product must be configured in Active Directory in the "VIDA ENM Administrators" group. The user must log into ENM with an administrator account.

Execution:

1. On a client computer, open Windows Internet Explorer and browse to https://s0u0enm.vida.local. Log in with the Active Directory account.
2. On the left side of the screen select "Maps" heading and "Maps Dashboard" sub-heading. Then select "System" map. At the "System" map, select the icon for the NSC that you will be working on.
3. Generate an alarm on a device (see chart below) by powering down or otherwise disabling the device.
4. The machine will take a few minutes to shut down.
    > Verify after a few minutes that the host will be highlighted red, and the icon in the "Status" column will turn red.
5. Turn the device back on.
    > Verify after a few minutes the icon in the "Status" column will turn green. (It may take some time for the red highlight to clear).
6. Repeat Steps 1 - 5 for all equipment listed in the below chart.
    Note: This form can be modified to reflect actual as-built alarms.

Alarm #	Name	Description	Results (Pass/Fail)	Remarks
		NSC1		
1	NSS	Network Switching Service		
2	ISSI	Inter Sub-System Interface		
3	ADSA	Active Directory Server (A, B, C)		
4	RCA/SCA	Root Certificate Authority/ Subordinate Certificate Authority		
5	VCC (vCenter)	VCenter Computer		
6	VREP	Virtual Replication Server		
7	UAS	Unified Administration System		
8	RSM/PRO	Regional Site Manager		
9	LAP (BeOn)	LMR Access Point		
10	RNM	Regional Network Manager		
11	VPS	VIDA Presence Server		

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Alarm #	Name	Description	Results (Pass/Fail)	Remarks
12	TXT	TextLink Server		
13	EDTA	eData Server		
14	KMF	Key Management Facility		
15	EPO	ePolicy Orchestrator		
16	SUMS	Security Update Management Service		
17	BAK	Backup Server (Unitrends)		
18	DFC	Defense Center Server		
19	NIDS	Network Intrusion Detection		
20	SMT	System Management Terminal		
21	Console- Dispatch (CON)	Console		
22	VMT	Virtual Management Terminal		
23	XCD	Transcoder		
NSC2				
1	NSS	Network Switching Service		
2	ISSI	Inter Sub-System Interface		
3	ADSA	Active Directory Server (A, B, C)		
4	SCA	Subordinate Certificate Authority		
5	PRO	Regional Site Manager		
6	LAP (BeOn)	LMR Access Point		
7	RNM	Regional Network Manager		
8	VPS	VIDA Presence Server		
9	EDTA	eData Server		
10	BAK	Backup Server (Unitrends)		
11	DFC	Defense Center Server		
12	NIDS	Network Intrusion Detection		
13	VMT	Virtual Management Terminal		
14	XCD	Transcoder		

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TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

ENTERPRISE NETWORK MANAGER MOM FUNCTIONALITY TEST (ENM)

Purpose: Demonstrate the capability to monitor manager of managers (MoM) system alerts from the RNM to the ENM.

Expected Results: This test will show that when the s0u1rnm is turned off the ENM will show faults.

Setup: Administrator access to the ENM. The ENM product must be configured in Active Directory in the "VIDA ENM Administrators" group. The user must log into the ENM with an administrator account.

Execution:

1. On a client computer, open the Windows Internet Explorer and browse to https://s0u0enm.vida.local and log in with the Active Directory account.
2. To see the active devices, click on the check box icon at the upper right-hand side of the screen.
3. Go to the red 'Host Down' icon that is next to the check box icon.
4. Shutdown s0u1rnm
5. The machine will take a few minutes to shut down.

    > After a few minutes, the host will show up in the 'Host Down' page.

6. Select the 'Critical' icon and see that:

    > s0u1rnm is up and has an error.

7. Turn the s0u1rnm back on and:

    > Make sure the error cleared.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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Cybersecurity Testing

ACTIVE DIRECTORY

Purpose: The purpose of this test is to view the GPO structure on an Active Directory server.

Expected Results: The GPO structure is valid.

Setup: None

Execution:

1. Remote desktop into each Active Directory server.
2. Open Active Directory 'Users/Groups'
    > Validate that the computer accounts are in the appropriate containers.
    > Verify VIDA administrator accounts exist.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

SUMS

Purpose: Demonstrate the SUMS server is communicating with the remote client.

Expected Results: Test will verify the SUMS server is communicating with the remote clients and that the remote clients are updated.

Setup: N/A

Execution:

1. Remote Desktop into the SUMS server 's0u1sum'.
2. Launch the 'IBM Endpoint Manager Console' and log into the console with the SUMS administrative user.
3. Expand 'Sites' 'Custom Sites' 'VIDA' and select 'Subscribed Computers'
   > Verify that each computer is listed, in the "Subscribed Computers" window
   > Check to make sure that each computer has reported to the SUMS server within the last 30 minutes by checking the 'Last Report Time' column.
   > To check to make sure all the subscriber computers are updated by selecting the 'Baseline' in the left-hand window.
   > Make sure the 'Baseline' window is empty or all computers in the window are gray.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

EPOLICY ORCHESTRATOR

Purpose: This test verifies that ePolicy Orchestrator is communicating with its end devices and it will report actions taken by McAfee Antivirus on a remote computer.

Expected Results: ePolicy Orchestrator is accessible and displays valid reporting.

Setup: N/A

Execution:

1. Use Internet Explorer on a client PC to navigate to the McAfee E-Policy Orchestrator server located at "https:/s0u1epo.vida.local:8443".
2. Log in using proper credentials
   > Use local account user "xAdministrator".
3. Go to 'System Tree.'
4. Expand VIDA groups.
   > Verify all servers are in their appropriate containers (corresponding to Active Directory).

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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UNITRENDS SYSTEM BACKUP

Purpose: This test verifies the Unitrends server has a schedule for performing backups of network computers and that it can display the backup status of those computers.

Expected Results: The test will verify the backup configuration.

Setup: N/A

Execution:

1. Use Internet Explorer on a client PC to navigate to the Unitrends backup servers:
   > s0u1bak.vida.local located at "https://10.128.0.145".
   > s0u2bak.vida.local located at "https://10.128.0.177".
2. Log in using credentials for "vida\vida".
3. Go to the Main screen.
4. At the bottom corner of the main screen is a box named "Backup Copy _ Hot Targets".
5. Click on number of backed up hosts. Scroll down to view 'Assets.'
   > Verify that devices are visible and configured for backups.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

INTRUSION DETECTION

Purpose: This test verifies that the Cisco FireSIGHT is communicating with its IDS sensors at remote sites across the network.

Expected Results: Cisco FireSIGHT is communicating with its IDS sensors.

Setup: N/A

Execution:

1. Use Internet Explorer on a client PC to navigate to the Cisco FireSIGHT server at "https://s0u1dfc.vida.local" or "https://10.128.0.135".
2. Log in using proper credentials.
3. Go to the Cisco FireSIGHT dashboard.
4. Click 'Operations.' Go to 'Sensors.'
   > Verify all sensors are visible.

   NOTE: There is only one Cisco FireSIGHT Server with two sensors (one at each NSC) reporting to it.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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Over the Air Rekeying (OTAR)

GENERATING A SYSTEM UKEK

Purpose: Test is setup to verify the KMFs ability to create a UKEK.

Expected Results: KMF will create a UKEK.

Setup: Test requires a computer that is on the IP network and has 'Harris Key Manager' installed and running.

Execution:

1. Log into the KMF with the administrator level Active Directory account.
2. Open the 'Network KMF Management'
3. Select UKEK tab
4. Change 'Save As' text field to '\\fileshare\fileshare\kmf_files\ProvisionFile.ukek'
5. Generate UKEK file by selecting the 'Export UKEK' button
6. Select 'SLN Bindings' tab
7. Change 'Save As' text field to '\\fileshare\fileshare\kmf_files\SlnBindingsReport/xml'
8. Generate bindings by selecting 'Generate SLN Bindings Report'. This file will be used in a later test.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

UKEK A RADIO

Purpose: Test is setup to verify the KMFs ability to load UKEKs into a radio.

Expected Results: Radio should accept the UKEK file developed by the KMF.

Setup: Test requires a computer that is on the IP network and has 'Harris Key Manager' installed and running. Three radios programmed with a talkgroup using an AES encryption key. All radios should be feature-encrypted and enabled for OTAR operation. Two radios should have keys and one radio should not have keys. In test "Unit Enable/Disable from the UAS" the keys were removed from Radio 9980005.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 5	9980005	TG 64001 P25	64001

Execution:

1. On a computer with 'Harris Key Manager' installed, save the file at '\\fileshare\fileshare\kmf_files\ProvisionFile.ukek' to the local computer.
2. Start 'Harris Key Manager' and connect the radio to the local computer.
3. Select 'Tools' -> 'Key Load Wizard' to open key load wizard
4. Select 'Next' -> Load a UKEK file into one or more devices" and open the UKEK file in Step 1 and select 'Next'
5. Once the UKEKs are loaded select 'Next'
6. Choose the com port
7. Power on the radio and put the radio into 'Key Load Mode.'
8. Select 'Load' to load UKEK into the radio.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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WARM STARTING A RADIO FROM THE UAS KEY MANAGEMENT APPLICATION

Purpose: This will test the system's ability to push encryption keys to a radio and the radio to hear other radios on the encrypted talkgroup.

Expected Results: Radio will accept keys from the system and be able to communicate with other encrypted radios on an encrypted talkgroup.

Setup: Test requires three radios with a talkgroup using an AES encryption key. Radios and the talkgroup need to be in a test CryptoNet in the UAS Key Management application. Radios should be both feature-encrypted and enabled for OTAR operation. Two radios should have working encryption, and Radio 5 should have the UKEK load but no keys.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 5	9980005	TG 64001 P25	64001

Execution:

1. PTT all three radios
   > Radios 1 and 2 should communicate normally
   > Radios 1 and 2 should hear calls from Radio 5, but Radio 5 should not be able to hear calls from the encrypted radios
2. From the UAS, warm start Radio 5.
   > The UAS will report "Warm Starting".
3. After the operation is complete, refresh the UAS screen.
   > Verify the UAS reports "Warm Started Success" for Radio 5.
4. Again, PTT Radio 1 on the encrypted talkgroup and talk.
   > Radio 1's transmit (TX) indicator should turn on and be amber.
   > Verify that Radio 2 and 5 now decrypt the call's audio.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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REKEYING AND CHANGING OVER A CRYPTO NET FROM THE UAS

Purpose: Test will show that the system can change encryption keys to a new set of keys.

Expected Results: After this test is complete, the radio will be able to communicate with the new set of keys sent by the system

Setup: Test requires three radios programmed with a talkgroup using an AES encryption key. Radios and talkgroup need to be in a test crypto net in the UAS Key Management application. All radios should be feature-encrypted and enabled for OTAR. Radios should have been warm started previously. If a console and/or gateway (GWB) are present in the system, then these devices should be included in this test also. They need to be in the same test crypto net as the radios and be programmed with the test talkgroup. They should have been warm started previously.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 5	9980005	TG 64001 P25	64001

Execution:

1. Put Radios 1, 2, and 5 on the encrypted talkgroup.
   > Verify that all 3 Radios can transmit and receive on the encrypted talkgroup.
2. Leave Radios 1 and 2 powered on and power off Radio 5.
3. From the UAS, rekey the crypto net. The UAS will report "Rekeying" for the crypto net.
4. Select report icon for the crypto net.
   > Radios 1 and 2 should be shown as "Rekeyed."
   > Any consoles and/or GWB's should also be shown as "Rekeyed."
   > Radio 5 should be shown as "Rekey Failed."
5. From UAS, change over the crypto net. It should report "Changing Over" for the crypto net.
6. After the operation is complete, refresh the UAS screen. It should report "Changing Over Complete" for the crypto net
7. Turn on Radio 5. PTT Radio 1 on the encrypted talkgroup and talk. The transmit (TX) indicator should turn on and be amber at Radio 1.
   > Verify that Radio 2 but not 5 decrypt the call's audio.
   > Verify that any consoles and/or gateway bases decrypt the call's audio also.
8. PTT Radio 5 on the encrypted talkgroup and talk.
   > The transmit (TX) indicator should turn on and be amber at Radio 5.
   > Verify that Radios 1 and 2 decrypt the call's audio.
   > Verify that any consoles and/or GWB's decrypt the call's audio.
9. From UAS, do an end user level rekey on Radio 5 for that crypto net.
   > The UAS will report "Rekeying" for Radio 5.
10. After the operation is complete, refresh the UAS screen. It should now show "Rekeyed" for Radio 5.
    > Select the report icon for the crypto net. Radios 1, 2, and 5 will be shown as "Rekeyed."
    > From the UAS, do an end user change over on Radio 5 for the test crypto net. The UAS will report "Changing Over" for Radio 5.

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11. Again, PTT Radio 1 on the encrypted talkgroup and talk.
> Verify that Radio 1's transmit (TX) indicator turns amber.
> Verify that Radio 2 and 5 decrypt the call's audio.
> Verify that any consoles and/or GWB's also decrypt the call's audio.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

ZEROIZING A RADIO FROM THE UAS KEY MANAGEMENT APPLICATION

Purpose: Test will verify system's ability to delete keys from a radio that was encrypted.

Expected Results: A radio that has keys and can communicate with other encrypted radios and will have the keys removed so the radio cannot communicate with other encrypted radios.

Setup: Three radios programmed with a talkgroup using an AES encryption key. Radios and the talkgroup need to be in a test crypto net in the UAS Key Management application. All radios should be feature-encrypted and enabled for OTAR. The radios should have been warm started previously.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 5	9980005	TG 64001 P25	64001

Execution:

1. Put Radios 1, 2, and 5 on the encrypted talkgroup.
   > Verify that all 3 radios can transmit and receive on the encrypted talkgroup.
2. From the UAS, zeroize Radio 5.
   > The UAS will report "Zeroizing" for Radio 5 with the date and time updating to reflect the date and time the operation was initiated.
   > After the operation is complete, refresh the UAS screen. Verify the UAS reports "Zeroized" for Radio 5.
3. PTT Radio 1 on the encrypted talkgroup and talk.
   > The transmit (TX) indicator should turn on and be amber at Radio 1.
   > Verify that Radio 2 decrypts the call's audio.
   > Radio 5 should hear garbled audio or muted audio.
   > Verify the receive indicator is amber on both radios and the ID of Radio 1 should be seen at both Radios 2 and 5.
   > Verify Radio 5 shows "No Key 0" when it is PTT'ed on the encrypted talkgroup.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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REKEY A RADIO FROM THE RADIO

Purpose: Test system's ability to send keys to a radio, when radio requests keys.

Expected Results: Take a radio that has no keys and can't communicate with other encrypted radios and add keys to the radio, so it can communicate with the system.

Setup: Three radios programmed with a talkgroup using an AES encryption key. Radios and the talkgroups need to be in a test crypto net in UAS Key Management application. All radios should be feature-encrypted and enabled for OTAR. One of the radios should be the radio that was zeroized in the previous test.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 5	9980005	TG 64001 P25	64001

Execution:

1. Key Radio 1 on an encrypted talkgroup.
   > Radio 1 should display 'No key' Radio 2, and Radio 5 should not hear the call.
2. From the menu on Radio 1 select 'Rekey' to request new key for Radio 1.
   > Once the radio receives the encryption keys, key Radio 1 and verify Radios 2 and 5 hear the call.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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UKEK AND SYMPHONY

Purpose: Test is setup to test the KMF's ability to make UKEK files for Symphony.

Expected Results: Symphony should accept UKEK file developed by the KMF.

Setup: Test requires three radios programmed with a talkgroup using an AES encryption key. All radios should be feature-encrypted and enabled for OTAR operation.

Execution:

1. With an encrypted radio, make a call on an encrypted talkgroup,
    > Radio with encryption should hear the call.
    > Symphony Console will not hear the call, since it does not have keys.
2. To load UKEK Keys to the Symphony Console, close the Symphony Console application, and start the Manual Key Load application to load UKEK Keys.
3. In 'Manual Key Load' application, do a "Zeroize", to remove any potential unwanted keys.
4. In 'Manual Key Load' application, do a "Load UKEK". Enter the UKEK filename, the password (if a password is associated with the file), and the RSI.
    > [RSI for Symphony (User ID), is defined in UAS > Subscriber Unit (for Symphony); or defined in KMF > in NKMC (Network KMF Mgmt. Console) > End Users Tab > at Console User ID.]
5. Restart Symphony Console application. UKEK keys are now available.
    > Verify Symphony 'System History' shows "KMF Key Load Completed".
    > Verify on console group / unit modules, the "encryption" key is enabled, no longer grayed out.
6. With an encrypted radio, make a group call on an encrypted talkgroup.
    > The radio with encryption will play the call,
    > The console will now hear the talkgroup audio.
7. On the Symphony talkgroup, ensure the encryption key is set for locked. Initiate call on Symphony talkgroup, and the call should be heard on the encrypted radios.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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WARM STARTING A SYMPHONY FROM THE UAS KEY MANAGEMENT APPLICATION

Purpose: This will test the system's ability to push encryption keys to a console.

Expected Results: UAS will push keys to the console to allow for communication on an encrypted talkgroup.

Setup: Three radios programmed with a talkgroup using an AES encryption key. Radios and the talkgroup need to be in a test crypto net in UAS Key Management. All radios should be feature-encrypted and enabled for OTAR. Radios should have their UKEK's loaded but not have any traffic encryption keys. (delete keys if required).

Execution:

1. Attempt to switch a talkgroup to encrypted mode by selecting the talkgroup and selecting the private button.
   > Verify that the console will not allow you to encrypt the talkgroup because the console does not have the encryption keys.
2. From the UAS, warm start the console. After the operation is complete, refresh the UAS screen.
   > The UAS will report "warm started success" on the console.
3. Attempt to switch a talkgroup to encrypted mode by selecting the talkgroup and selecting the private button.
   > The console will now allow you to encrypt the talkgroup because the console has the encryption keys.
4. PTT the console and the encrypted radios should hear the call.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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Over the Air Rekeying (OTAR) BeOn Clients

GENERATING A SYSTEM UKEK

Purpose: Demonstrate KMFs ability to create a UKEK.

Expected Results: Verify KMF will create a UKEK.

Setup: Test requires a computer that is on the IP network, and has 'Harris Key Manager' installed and running.

Execution:

1. Log into KMF with administrator level Active Directory account.
2. Open 'Network KMF Management' console.
3. Select UKEK tab.
4. Change 'Save As' text field to '\\fileshare\fileshare\kmf_files\ProvisionFile.ukek'.
5. Generate UKEK file by selecting 'Export UKEK' button.
6. Select 'SLN Bindings' tab.
7. Change 'Save As' text field to '\\fileshare\fileshare\kmf_files\SlnBindingsReport.xml'.
8. Generate bindings by selecting 'Generate SLN Bindings Report'. This file will be used in a later test.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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UKEK A BEON WINDOWS CLIENT

Purpose: Demonstrate ability to load UKEKs into a BeOn Windows client (BWC).

Expected Results: Verify BeOn Windows client should accept UKEK file developed by KMF.

Setup: BeOn Windows Client is installed and running on computer on VIDA IP network. Define BeOn Windows client in UAS voice end users and subscriber units

UAS > Agencies > Voice End User: (ensure BWC, 10:998:0210, is enabled for OTAR)

USER ID	DESC	PERS	ENABLE P25 AES OTAR
10:0098:0210	BeOn_210	BeOn_Encr_Pers	True

UAS > Agencies > Subscriber Unit:

NO IP ADDRESS	DESC	RSI	ESN	PROTOCOL MASK	SUBTYPE	ASSIGNED END USER
N/A	BeOn Windows Client	9980210	0000109980210	BeOn	BeOn Device	0010:0998:0210

Include BWC in UAS Crypto Net:

> UAS Crypto > Crypto Nets > Manage Crypto Nets > co-p25-aes > Manage Users > add 'BWC' User (10:998:0210)

> UAS Crypto > Crypto Nets > Manage Crypto Nets > co-p25-aes > Manage Talkgroups > add encrypted TGs

Ensure BWC (10:998:0210) is present in NKMF Network Management Console > 'End Users' Tab

Execution:

1. Log into KMF with administrator level Active Directory account.
2. Open 'Network KMF Management' console.
3. Select UKEK tab.
4. Change 'Save As' text field to '\\fileshare\fileshare\kmf_files\ProvisionFile.ukek'.
5. Generate UKEK file by selecting 'Export UKEK' button.
6. On computer with BeOn Windows client installed, copy ProvisionFile.ukek file created in KMF, from '\\fileshare\fileshare\kmf_files\ProvisionFile.ukek' to the computer Desktop.
7. Start BeOn Windows client, go to Settings, select "Security" tab.
8. Select 'Load Keys" button on BeOn Windows client, select "ProvisionFile.ukek" File from desktop, and select "Open".

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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WARM STARTING (OTAR) BEON WINDOWS CLIENT FROM UAS KEY MANAGEMENT APPLICATION

Purpose: Demonstrate system's ability to push encryption keys to BeOn Windows client (BWC) to hear other BeOn capable smartphone or LMR radio on encrypted talkgroup.

Expected Results: Verify BeOn Windows client will accept keys from VIDA System and be able to communicate with encrypted radios on an encrypted Talkgroup.

Setup: Three radios / talkgroups are in same Crypto Net as BWC. Two radios have working encryption, and Radio 3 has UKEK loaded but no keys. BeOn Windows client has UKEK loaded. [Perform "UKEK a BeOn Windows client" test procedure, prior to running this test procedure.]

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn Windows Client	9980210	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201
BeOn Radio 3	9980003	TG 64201 P25	64201

Execution:

1. PTT all three radios
   > Radios 1 and 2 should communicate normally
   > Radio 1 and 2 should hear calls from Radio 3, but Radio 3 should not be able to hear calls from encrypted radios.
   > BWC hears call from Radio 3 but should not hear calls from Radios 1 and 2.
2. On UAS Crypto Officer at "P25 Functions" Tab, do a warm start on BeOn Windows client, by selecting "0010:0998:0210", select "Warm Start" and "Save".
   > Verify UAS reports "Warm Starting".
3. While BWC is warm starting, in Step 2, at KMF Network Management Console, on "Event Log" tab, monitor the 'Warm Starting' of BeOn Windows client.
   > Verify on KMF event log, BWC "Successfully" warm started.
4. After warm start operation is complete, refresh UAS screen.
   > Verify UAS reports "Warm Started Success" for BeOn Windows client.
5. PTT Radio 1 on encrypted talkgroup and talk.
   > Verify Radio 2 and BeOn Windows client both now decrypt the call's audio.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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ZEROIZE KEYS ON BEON WINDOWS CLIENT FROM UAS KEY MANAGEMENT APPLICATION

Purpose: Demonstrate system's ability to delete keys from an Encrypted BeOn Windows Client.

Expected Results: Remove keys from BeOn Windows Client so they cannot communicate with other encrypted BeOn-capable smartphone or LMR radio.

Setup: BeOn-capable smartphone or LMR radio programmed with a talkgroup using an AES encryption key. BeOn Windows client, BeOn radios, and talkgroups need to be in same test CryptoNet in UAS Key Management application. BeOn Windows client and BeOn capable smartphone or LMR radio are enabled for OTAR and have been warm started previously. BeOn-capable radios are feature-encrypted.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn Windows Client	9980210	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201

Execution:

1. Radio 1, Radio 2, and BeOn Windows client are on encrypted talkgroup 64201.
   > Verify both radios and BeOn client can transmit and receive audio on encrypted talkgroup 64201.
2. On UAS Crypto screen, zeroize BeOn Windows client.
   > UAS will report "Zeroizing" for BeOn Windows client with date and time updating to reflect date and time operation was initiated.
   > After zeroize operation is complete, refresh UAS screen. Verify UAS reports "Zeroized" for BeOn Windows client.
3. PTT Radio 1 on encrypted talkgroup 64201 and talk.
   > Verify Radio 2 decrypts Radio 1 call's audio.
   > BeOn Windows client hears garbled audio or muted audio on talkgroup 64201.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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UKEK AND WARM START (OTAR): BEON IOS CLIENT

Purpose: Demonstrate ability to create UKEKs and then load UKEK into a BeOn iOS Client on iOS Phone.

Expected Results: Verify BeOn iOS client accepts UKEK file developed by KMF.

Setup: Test requires a computer on IP network and has 'iTunes' installed and running. Define BeOn iOS client in UAS Voice end users and subscriber units

> UAS > Agencies > Voice End User: (ensure BeOn iOS Client, 10:998:0202, is enabled for OTAR)

USER ID	DESC	PERS	ENABLE P25 AES OTAR
10:0098:0202	BeOn_202	BeOn_Encr_Pers	True

UAS > Agencies > Subscriber Unit:

NO IP ADDRESS	DESC	RSI	ESN	PROTOCOL MASK	SUBTYPE	ASSIGNED END USER	ALGORITHM SUPPORT
N/A	BeOn iOS Client	9980202	0000109980202	BeOn	BeOn Device	0010:0998:0202	AES

Include BeOn iOS Client in UAS Crypto Net:

> UAS Crypto > Crypto Nets > Manage Crypto Nets > co-p25-aes > Manage Users > add 'BWC' User (10:998:0202)
> UAS Crypto > Crypto Nets > Manage Crypto Nets > co-p25-aes > Manage Talkgroups > add encrypted TGs

Ensure BeOn iOS Client (10:998:0202) is present in NKMF Network Management Console > 'End Users' Tab

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn iOS Client	9980202	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201

Execution:

1. Log into KMF with Administrator level Active Directory account
2. Open 'Network KMF Management' console.
3. Select UKEK tab.
4. Select radio button for 'User ID' and enter region: "10"; Agency: "998"; and User ID: "202". [Important note: for BeOn iOS Clients, a separate UKEK file must be created for each BeOn iOS Client that needs to be OTAR'd.]
   > Alternate Step: Select radio button for 'Agency' and enter Region: "10"; Agency: "998". In addition, check box for "Generate Separate Files", to create a separate UKEK file for each BeOn iOS client that needs to be OTAR'd.

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5. Change 'Save As' text field to:
   > '\\fileshare\fileshare\kmf_files\ProvisionFile_10_998_0203.ukek', when generating one UKEK file; <or>
   > '\\fileshare\fileshare\kmf_files', when generating separate files for each user ID in the agency.
6. Generate UKEK file by selecting 'Export UKEK' button.
7. On computer on the VIDA IP network, access UKEK file from file share directory and open iTunes application.
8. Connect BeOn iOS phone to computer on VIDA IP network, via USB cable.
9. In iTunes application, select "phone icon" (on top left, to the right of "Music"). In "Settings" go to "File Sharing". Select "BeOn" application, select "Add File…" and select UKEK file. Select "Done".
10. In BeOn iOS client, go to "Preferences", "Security Settings", "Load Encryption Keys" and note the UKEK file is in the 'File Box'.
    > Select UKEK file and select "Load Keys" button.
    > Go back to 'Security Settings' screen and select "Security Key Details".
    > Note "OTAR Enabled" now indicates "Yes".
11. Log into UAS Crypto Officer.
    > Go to "P25 Functions" tab, select "0010:0998:0202", select "Warm Start" and "Save".
    > UAS will report "Warm Starting".
12. While BeOn iOS client is warm starting, at KMF Network Management console, on "Event Log" Tab, monitor the 'Warm Starting' of BeOn iOS Client.
    > Verify on KMF event log, BeOn iOS client "Successfully" warm started.
13. After warm start operation is complete, refresh UAS screen.
    > Verify UAS reports "Warm Started Success" for BeOn iOS client.
14. In BeOn iOS Client, on Security Key Details screen
    > Verify for each talkgroup and SLN/KeyID listed, that the "Loaded" column has a check mark to indicate talkgroup has the key loaded.
    > Talkgroups re now encrypted.
15. PTT Radio 1 on encrypted talkgroup and talk
    > Verify Radio 2 and BeOn iOS client both decrypt the call's audio.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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UKEK AND WARM START (OTAR): BEON ANDROID CLIENT

Purpose: Demonstrate ability to create UKEKs, load UKEK into BeOn Android client, and warm start BeOn Android client.

Expected Results: Verify BeOn Android client accepts UKEK file and does a reverse warm start.

Setup: Test requires computer on IP network. Define BeOn Android client in UAS voice end users and subscriber units

UAS > Agencies > Voice End User: (ensure BeOn Android Client, 10:998:0202, is enabled for OTAR)

USER ID	DESC	PERS	ENABLE P25 AES OTAR
10:0098:0203	BeOn_203	BeOn_Encr_Pers	True

UAS > Agencies > Subscriber Unit:

NO IP ADDRESS	DESC	RSI	ESN	PROTOCOL MASK	SUBTYPE	ASSIGNED END USER	ALGORITHM SUPPORT
N/A	BeOn Android Client	9980203	0000109980203	BeOn	BeOn Device	0010:0998: 0203	AES

Include BeOn Android client in UAS Crypto Net:

> UAS Crypto > Crypto Nets > Manage Crypto Nets > co-p25-aes > Manage Users > add 'BWC' User (10:998:0203)

> UAS Crypto > Crypto Nets > Manage Crypto Nets > co-p25-aes > Manage Talkgroups > add encrypted TGs

Ensure BeOn Android client (10:998:0202) is present in NKMF Network Management console > 'End Users' Tab.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn Android Client	9980203	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201

Execution:

1. Log into KMF with Administrator level Active Directory account
2. Open 'Network KMF Management' console.
3. Select UKEK tab.
4. Select radio button for 'User ID' and enter Region: "10"; Agency: "998"; and User ID: "202". [Important note: for BeOn Android Clients, a separate UKEK file must be created for each BeOn Android client that needs to be OTAR'd.]

    > Alternate Step: Select radio button for 'Agency' and enter Region: "10"; Agency: "998". In addition, check box "Generate Separate Files", to create a separate UKEK file for each BeOn Android client that needs to be OTAR'd.

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5. Change 'Save As' text field to:
   > '\\fileshare\fileshare\kmf_files\ProvisionFile_10_998_0203.ukek', when generating one UKEK file; <or>
   > '\\fileshare\fileshare\kmf_files', when generating separate files for each User ID in the Agency.
6. Generate UKEK file by selecting 'Export UKEK' button.
7. On Computer, on the VIDA IP Network, access UKEK file from file share directory.
8. Connect BeOn Android phone to computer on VIDA IP network, via USB cable, and on the Phone, Allow access to device data, "Allow".
9. On Computer, on VIDA IP Network, in 'File Explorer', go to the root directory on the Android phone. (This PC\SAMSUNG-SM-G900A\Phone). Copy UKEK file, "ProvisionFile_10_998_0203.ukek" to the root directory on the Android phone.
10. On BeOn Android phone, restart BeOn Android client.
    > While BeOn Android client is starting, see notification "Loading Keys".
    > Go to "Preferences", "Security Settings", "Security key details".
    > Note "OTAR Enabled" now indicates "Yes".
11. In parallel with Step 10, log into UAS Crypto Officer.
    > Go to "P25 Functions" Tab, for "0010:0998:0203", note 'Reverse Warm Start in Progress', and when complete for 0010:0998:0203, the warm start status shows "Reverse Warm Start Completed".
12. Also, while BeOn Android client is warm starting, at KMF Network Management console, on "Event Log" Tab, can monitor 'Warm Starting' of BeOn Android client.
    > Verify on KMF event log, BeOn Android client "Successfully" warm started.
13. After warm start operation is complete, refresh UAS Crypto screen.
    > Verify UAS reports "Reverse Warm Started Success" for BeOn Android client.
14. On BeOn Android client, on "Security Key Details" screen
    > Verify for each talkgroup and SLN/KeyID listed, the "Loaded" column has a check mark to indicate talkgroup has key loaded.
    > Talkgroups are now encrypted.
15. PTT Radio 1 on encrypted talkgroup and talk
    > Verify Radio 2 and BeOn Android phone both decrypt the call's audio.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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ZEROIZE BEON ANDROID CLIENT AND BEON IOS CLIENT FROM UAS KEY MANAGEMENT APPLICATION

Purpose: Demonstrate system's ability to delete keys on a BeOn Android client and BeOn iOS client.

Expected Results: Remove keys from BeOn Android client and BeOn iOS client so they cannot communicate with other encrypted BeOn capable smartphone or LMR radio BeOn Windows client.

Setup: BeOn capable smartphone or LMR radio, BeOn Android client, BeOn iOS client programmed with a talkgroup using an AES encryption key. BeOn radios, BeOn Android Client, BeOn iOS client, and talkgroup need to be in same test CryptoNet in UAS Key Management application. All radios are feature-encrypted and enabled for OTAR. BeOn-capable radios and BeOn clients have been warm started previously.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn Android Client	9980203	TG 64201 P25	64201
BeOn iOS Client	9980202	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201

Execution:

1. Put BeOn capable smartphone or LMR Radio 1, BeOn capable Radio 2, BeOn Android client, and BeOn iOS client on encrypted talkgroup 64201.
   > Verify BeOn-capable radios, BeOn Android client, and BeOn iOS client can transmit and receive on encrypted talkgroup 64201.
2. From UAS, zeroize BeOn Android client and zeroize BeOn iOS client.
   > The UAS will report "Zeroizing" for BeOn Android client and BeOn iOS client with the date and time updating to reflect date and time the operation was initiated.
   > After operation is complete, refresh UAS screen. Verify UAS reports "Zeroized" for BeOn Android client and BeOn iOS client.
3. PTT Radio 1 on encrypted talkgroup 64201 and talk.
   > Verify Radio 2 decrypts the call's audio.
   > BeOn Android client and BeOn iOS client should hear garbled audio or muted audio.

TEST RESULTS
Tester:
Date:
Result: ☐ Pass ☐ Fail

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REKEYING AND CHANGING OVER A CRYPTONET ON BEON CLIENTS

Purpose: Demonstrate system can change encryption keys to a new set of keys.

Expected Results: Verify BeOn Windows client, BeOn iOS Client, BeOn Android client, and BeOn-capable smartphone or LMR radio will be able to communicate with new set of keys sent by the system.

Setup: Test requires BeOn Windows client, BeOn iOS Client, BeOn Android client, and BeOn-capable smartphone or LMR radio programmed with a talkgroup using an AES encryption key. Radios and the talkgroup need to be in a test CryptoNet in the UAS Key Management application.

> All BeOn capable smartphone or LMR radio should be feature-encrypted.
> All BeOn clients and BeOn capable smartphone or LMR radio and enabled for OTAR.
> All BeOn clients have previously been warm started.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn Windows Client	9980210	TG 64201 P25	64201
BeOn iOS Client	9980202	TG 64201 P25	64201
BeOn Android Client	9980203	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201

Execution:

1. All BeOn Clients and BeOn capable smartphone or LMR radio are on encrypted TG 64201.
   > Verify all BeOn clients and radios can transmit and receive on encrypted TG 64201.
2. All BeOn Clients and BeOn Radio 1 are powered on. Power off Radio 2.
3. At UAS Crypto, "Rekey" Crypto Net. UAS > "Crypto Nets" tab > Rekey Crypto Nets > select Crypto Net: co-p25-aes (Crypto Net) > press "ReKey" button > "Save" button.
   > Verify UAS reports "Rekeying" for CryptoNet.
4. When ReKey Operation complete, refresh UAS screen, and check Crypto Net status:
   > Verify Crypto Net (co-p25-aes) indicates "Rekey Completed".
5. At UAS, "Change Over" Crypto Net. UAS > "Crypto Nets" tab > Change Over Crypto Nets > select Crypto Net: co-p25-aes (Crypto Net) > press "Change Over" button > "Save" button.
   > Verify UAS reports "Changing Over" for Crypto Net.
6. After change over operation is complete, refresh UAS screen, and check status:
   > Verify CryptoNet (co-p25-aes) indicates "Change Over Completed".
7. Turn on BeOn Radio 2. PTT BeOn Radio 1 on encrypted talkgroup 64201 and talk. Transmit (TX) indicator should turn on at Radio 1.
   > Verify BeOn Windows client, BeOn iOS client, and BeOn Android client decrypt the call audio.
   > Verify that BeOn-enabled Radio 2 does not decrypt the call audio.
8. At UAS, do an end user level "Rekey" on Radio 2 for same CryptoNet (co-p25-aes).
9. UAS Crypto > "Crypto Nets" tab > Manage Crypto Nets > select Crypto Net: co-p25-aes (Crypto Net) > Re-Key > Users > select Radio 2 "0010:0998:0002" > select "ReKey" button.
   > UAS will report "Rekeying" for Radio 2.
   > Verify when rekey complete, UAS reports "Rekey Completed" for Radio 2.

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10. At UAS, do an end user level "Change Over" on Radio 2.
11. UAS Crypto > "Crypto Nets" tab > Manage Crypto Nets > select Crypto Net: co-p25-aes (Crypto Net) > Change Over > Users > select Radio 2 "0010:0998:0002" > select "Change Over" button.
    > Verify UAS reports "Changing Over" for Radio 2.
    > Verify when change over complete, UAS reports "Change Over Completed" for Radio 2.
12. PTT Radio 1 on encrypted talkgroup 64201 and talk. Transmit (TX) indicator should turn on at Radio 1.
    > Verify BeOn Windows client, BeOn iOS client, and BeOn Android client decrypt the call audio.
    > Verify that BeOn-capable Radio 2 decrypts the call audio.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

Over the Air Programming (OTAP)

P25 OVER-THE-AIR DATA TEST

Purpose: Confirm remote radio terminals can be accessed from a Profile Manager host over the VIDA network and personalities can be read/programmed using Over-the-Air-Programming (OTAP).

Expected Results: The radio can be pinged, and radio personality can be read/programmed using the Profile Manager host.

Setup: Test requires a radio on the system and a host computer that is logged on to the system. Verify Profile Manager and RPM2 are both installed and running on the host computer.

> ProFile Manager > Tools > ProFile Transport Configuration... >
> Data Environment > select "LandLine Data"
> LandLine Data > enter "First LID", "Last LID", "First IP Address", and select "Add"
> Select "OK"

Execution:

1. Log the radio into the site to be tested.
   > Using ProFile Manager, verify that a host can ping the radio.
2. Using ProFile Manager, over the air, read the radio personality. Radio > Read. Save the personality.
3. Using RPM2, change the name of one of the talkgroups. Save the updated personality file with a different file name.
4. Using ProFile Manager, write the change to the radio. Radio > Write.
   > Verify that the name of the talkgroup has changed on the radio.
5. With ProFile Manager, reprogram the radio with the initial personality.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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Activity Warehouse

SITE ACTIVITY USING THE ACTIVITY WAREHOUSE

Purpose: Demonstrate the capability to create various agency level system usage reports.

Expected Results: Test will create an agency level user report.

Setup: Ensure radio traffic has occurred across the network recently. If necessary or desired, place some calls with a known radio ID on multisite talkgroups prior to running the test for reference during the test.

Execution:

1. Log into the SMT PC as a system level administrator.
2. Open Internet Explorer and browse to 'https://s0u1pro.vida.local/reports' and log in with active directory credentials.
3. Select 'Activity Reports' → Call Activity
4. Enter the time period for the report (Example: 2-hour window before this test).
5. Enter additional report information required.
6. Click on "View Report"
   > Check to make sure that there is call activity.

   NOTE: These reports can be up to two hours behind.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

Transcoder Test

TRANSCODER TEST

Purpose: Test will demonstrate the transcoder ability to transcode calls made with different vocoders.

Expected Results: This test will verify that the transcoder is needed to transcode a call, and each transcoder will transcode calls.

Setup: Radio 1 Personality: Systems > P25 Trunked > Select the "System Name" > "TDMA Capable" needs to be unchecked (for FDMA / Phase 1).

Radio 2 Personality: Systems > P25 Trunked > Select the "System Name" > "TDMA Capable" needs to be Checked (for TDMA / Phase 2).

UAS > Agencies > Voice End User >

> Radio 1 > P25 Full Rate
> Radio 2 > P25 Half Rate

DESCRIPTION	RADIO LID	TYPE	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	Phase 1 Radio	TG 64051 P25	64051	1
Radio 2	9980002	Phase 2 Radio	TG 64051 P25	64051	2
Radio 3	9980210	BeOn Radio	TG 64051	64051	3
Console	9989110		TG 64051	64051	

Execution:

1. Shutdown s0u1xcda.vida.local, s0u2xcda.vida.local and s0u1xcdb.vida.local.

TRANSCODER	STATE
s0u1xcda.vida.local	Off
s0u2xcda.vida.local	Off
s0u1xcdb.vida.local	Off

2. From the console place a call on Talkgroup 64051, a P25 TDMA Phase 2 call.
   > Verify call is not heard on BeOn Radio 3 on Talkgroup 64051, this call failed, since there is no working transcoder.
   > Verify call is not heard on P25 FDMA Radio 1 on Talkgroup 64051, this call failed, since there is no working transcoder.
   > Verify call is heard on P25 TDMA Radio 2 on Talkgroup 64051.
3. From FDMA Radio 1 place a call on Talkgroup 64051.
   > Verify call is not heard on TDMA Radio 2 on Talkgroup 64051, since there is no working transcoder.
4. Restart s0u1xcda.vida.local.

TRANSCODER	STATE
s0u1xcda.vida.local	On
s0u2xcda.vida.local	Off

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s0u1xcdb.vida.local   Off

5. From the console place a call on Talkgroup 64051, a P25 TDMA call.
   > Verify call is heard on P25 FDMA Radio 1, call is using s0u1xcda.vida.local.
   > Verify call is heard on a BeOn Radio 3, call is using s0u1xcda.vida.local.
   > Verify call is heard on P25 TDMA Radio 2.
6. From FDMA Radio 1 place a call on Talkgroup 64051.
   > Verify call is heard on TDMA Radio 2 on Talkgroup 64051, call is using s0u1xcda.vida.local.
   > Verify call is heard on BeOn Radio 3 on Talkgroup 64051, call is using s0u1xcda.vida.local.
7. Restart s0u2xcda.vida.local wait for 15 minutes for services to start
8. Shutdown s0u1xcda.vida.local.

TRANSCODER	STATE
s0u1xcda.vida.local	Off
s0u2xcda.vida.local	On
s0u1xcdb.vida.local	Off

9. From the console place a call on Talkgroup 64051, a P25 TDMA call.
   > Verify call is heard on P25 FDMA Radio 1, call is using s0u2xcda.vida.local.
   > Verify call is heard on a BeOn Radio 3, call is using s0u2xcda.vida.local.
   > Verify call is heard on P25 TDMA Radio 2.
10. From FDMA Radio 1 place a call on Talkgroup 64051.
   > Verify call is heard on TDMA Radio 2 on Talkgroup 64051, call is using s0u2xcda.vida.local.
   > Verify call is heard on BeOn Radio 3 on Talkgroup 64051, call is using s0u2xcda.vida.local.
11. Restart s0u1xcdb.vida.local
12. Shutdown s0u2xcda.vida.local

TRANSCODER	STATE
s0u1xcda.vida.local	Off
s0u2xcda.vida.local	Off
s0u1xcdb.vida.local	On

13. From the console place a call on Talkgroup 64051, a P25 TDMA call.
   > Verify call is heard on P25 FDMA Radio 1, call is using s0u1xcdb.vida.local.
   > Verify call is heard on a BeOn Radio 3, call is using s0u1xcdb.vida.local.
   > Verify call is heard on P25 TDMA Radio 2.
14. From FDMA Radio 1 place a call on Talkgroup 64051.
   > Verify call is heard on TDMA Radio 2 on Talkgroup 64051, call is using s0u1xcdb.vida.local.
   > Verify call is heard on BeOn Radio 3 on Talkgroup 64051, call is using s0u1xcdb.vida.local.
15. Restart s0u2xcda.vida.local and s0u1xcda.vida.local

TRANSCODER	STATE
s0u1xcda.vida.local	On
s0u2xcda.vida.local	On
s0u1xcdb.vida.local	On

16. From the console place a call on Talkgroup 64051, a P25 TDMA call.
   > Verify call is heard on P25 FDMA Radio 1.

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> Verify call is heard on a BeOn Radio 3.
> Verify call is heard on P25 TDMA Radio 2.

17. From FDMA Radio 1 place a call on Talkgroup 64051.

> Verify call is heard on TDMA Radio 2 on Talkgroup 64051.
> Verify call is heard on BeOn Radio 3 on Talkgroup 64051.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

BeOn Features

Purpose: Demonstrate the BeOn features.

Expected Results: Following tests will demonstrate that BeOn works as designed.

Setup: Tests will show that the BeOn system allows a smartphone to communicate with the radio system.

TRANSMIT GRANT TONE

Purpose: Demonstrate the grant tone on BeOn.

Expected Results: When the smartphone PTTs on the BeOn app, it will play a grant tone.

Setup: Grant tone (Ready to Talk tone) enabled in smartphone radio personality.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn_202	9980202	TG 64151 P25	64151
BeOn_203	9980203	TG 64151 P25	64151
BeOn_204	9980204	TG 64151 P25	64151

Execution:

1. Press PTT button on smartphone with valid group selected.
    > Verify grant tone is heard at smartphone when working channel access is granted.
    >
    > *Note: If the call is queued, the grant tone will be delayed until the call is assigned a working channel.*

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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GROUP CALL

Purpose: Confirms BeOn can make group calls.

Expected Results: Selected talkgroup call audio is heard.

Setup: Set Smartphones 1, 2, and 3 to (Group A) per test group structure. Make sure Scan is turned OFF.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn_202	9980202	TG 64151 P25	64151
BeOn_203	9980203	TG 64151 P25	64151
BeOn_204	9980204	TG 64151 P25	64151

Execution:

1. PTT on BeOn_202 and talk.
   > The transmit (TX) indicators should turn on at BeOn_202.
   > Audio should be heard in BeOn_203 and BeOn_204.
   > The ID of BeOn_202 should be seen at BeOn_203 and BeOn_204.
2. Set BeOn_204 to TG 64152 P25. PTT on BeOn_202 and talk.
   > The transmit (TX) indicators should turn on at BeOn_202.
   > Audio should be heard in BeOn_203 only.
   > The ID of BeOn_202 should be seen at BeOn_203 only.

TEST RESULTS		
Tester:		
Date:		
Result:	☐ Pass	☐ Fail

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INDIVIDUAL (PRIVATE) CALL

Purpose: Confirms individual calls can be initiated using BeOn enabled smartphones.

Expected Results: Individual calls are confirmed.

Setup:

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn_202	9980202	TG 64151 P25	64151
BeOn_203	9980203	TG 64151 P25	64151
BeOn_204	9980204	TG 64151 P25	64151

Execution:

1. Using the BeOn_202, select the pre-stored ID of BeOn_203 or enter the BeOn_203 ID directly from the keypad, and PTT Smartphone 1.
   > Verify that BeOn_203 receives the call and displays the ID of Smartphone 1.
   > Verify that BeOn_204 remains idle.
2. Release the PTT on BeOn_202 and immediately PTT on BeOn_203.
   > Verify that BeOn_202 receives the call and displays the ID of BeOn_203.
   > Verify BeOn_204 remains idle.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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GROUP SCAN

Purpose: Confirms the scan function which allows a smartphone to hear audio on selected talkgroups other than the current talkgroup.

Expected Results: Selected talkgroup call audio is heard.

Setup: BeOn_202 set up with Talkgroup 64151 P25 and TG64152 P25 in the scan list, Talkgroup 64151 P25 selected, and group scan initially disabled.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn_202	9980202	TG 64151 P25	64151
BeOn_203	9980203	TG 64151 P25	64151

Execution:

1. Place a call from BeOn_203 on Talkgroup 64151 P25.
   > Verify the call is received and audio is heard on BeOn_202.
2. Place a call from BeOn_203 on Talkgroup 64152 P25.
   > Verify the call is not received by BeOn_202.
3. Enable group scan on BeOn_202.
4. Place another call from BeOn_203 on Talkgroup 64152 P25.
   > Verify that the call is now received, and audio is heard on BeOn_202.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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EMERGENCY GROUP CALL

Purpose: Confirms an emergency can be declared, recognized, and cleared by a smartphone.

Expected Results: The emergency is declared, recognized, and cleared.

Setup:

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn_202	9980202	TG 64151 P25	64151
BeOn_203	9980203	TG 64152 P25	64152
BeOn_204	9980204	TG 64153 P25	64153

Execution:

1. Press the emergency call button on BeOn_204 and then PTT BeOn_204.
   > Verify that BeOn_204 indicates the "TX EMER" declaration and that it reverts to the home group.
   > Verify that BeOn_202 and BeOn_203 indicate a "RX EMER" and hear audio on the emergency home group.
2. Clear the emergency with the supervisor smartphone (BeOn_202).
   > Verify the emergency clears in the smartphones.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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PATCH WITH BEON (SR10A.2 OR LATER)

Purpose: Confirm the console patch feature creates shared communication between multiple selected talkgroups between radios and smartphone.

Expected Results: Demonstrate patched talkgroups can communicate.

Setup: Console 1 programmed with talkgroups: Talkgroup 64151 P25, Talkgroup 64152 P25, Talkgroup 64153 P25, and Talkgroup 64154 P25.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
BeOn_202	9980202	TG 64351 P25	64351	1
BeOn_203	9980203	TG 64352 P25	64352	1
P25T Radio 1	9980001	TG 64353 P25	64353	1
P25T Radio 2	9980002	TG 64354 P25	64354	1

Execution:

1. Create a patch on Patch 1 with all four talkgroups above.
2. Place a call from the newly created patch.
   > Verify the call is heard on the two BeOn smartphones and on the two P25T radios.
3. Place a call from BeOn_202.
   > Verify the call is heard on BeOn_202, on both P25T Radios 1 and 2 and on the console.
4. Deactivate the patch.

TEST RESULTS
Tester:
Date:
Result: ☐ Pass   ☐ Fail

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SIMULSELECT WITH BEON (SR10A.2 OR LATER)

Purpose: Confirm operation of the console Simulselect feature, which allows multiple talkgroups to be selected for communication simultaneously between radios and smartphone.

Expected Results: Console can select multiple talkgroups and communication is allowed.

Setup: Console 1 programmed with talkgroups: Talkgroup 64151 P25, Talkgroup 64152 P25, Talkgroup 64153 P25, and Talkgroup 64154 P25.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
BeOn_202	9980202	TG 64351 P25	64351	1
BeOn_203	9980203	TG 64352 P25	64352	1
P25T Radio 1	9980001	TG 64353 P25	64353	1
P25T Radio 2	9980002	TG 64354 P25	64354	1

Execution:

1. On the console, create Simulselect group on the four test group modules.
2. Place a call from the console on the Simulselect group.
   > Verify the call is heard on the two BeOn smartphones and on the two P25T radios.
3. Place a call from each smartphone and radio.
   > Verify that only the console hears the calls.
4. Deactivate the Simulselect group.

TEST RESULTS		
Tester:		
Date:		
Result:	☐ Pass	☐ Fail

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GROUP EMERGENCY AND EMERGENCY ALERT WITH BEON (SR10A.2 OR LATER)

Purpose: Confirm console receives a group emergency and an emergency alarm (unit alert) declared by a BeOn smartphone.

Expected Results: BeOn smartphone can declare an emergency alert.

Setup: BeOn Smartphones 1 and 2 have "Emergency Alarm" enabled in the personalities.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
BeOn_202	9980202	TG 64352 P25	64352	1
BeOn_203	9980203	TG 64352 P25	64352	1
P25T Radio 1	9980001	TG 64353 P25	64353	1
P25T Radio 2	9980002	TG 64354 P25	64354	1

Execution:

1. On Smartphone BeOn_202 declare an emergency on Talkgroup 64352 and PTT to talk on the emergency group.
    > Verify BeOn_202 Smartphone indicates the "TX EMER" declaration.
    > Verify BeOn_203 Smartphone and P25T Radio 1 indicates "RX EMER" and can hear the emergency group call.
    > Verify P25T Radio 2 does not display the emergency.
2. On Symphony Console's Sidebar Panel, go to the Emergency Panel.
    > Verify emergency listed shows Talkgroup 64352, in a mini module, with a red background.
    > Verify Declarer ID, BeOn_202, is listed, with an "ACK" button and a number "1" for the number of group emergencies declared. [Listed below talkgroup mini module.]
    > Verify below declarer ID, single unit icon and declarer ID is listed with an "ACK" button and a number '1', for number of unit alerts declared.
3. Clear group emergency from BeOn_202 Smartphone.
    > Verify Symphony Console no longer displays group emergency.
    > Verify group emergency is no longer seen on BeOn_203 Smartphone and P25T Radio 1.
4. PTT on Radio 1, to do a group call.
    > Verify an emergency group call goes to the BeOn Smartphones 202 and 203, and the console.
    > This occurs, since the emergency alert is still active on Talkgroup 64352.
5. On Symphony 'Emergency Sidebar Panel,' clear emergency alert tone by selecting second "ACK" button next to unit icon and declarer ID. Also, clear group emergency alert tone on Talkgroup 64352, by selecting first "ACK" button next to declarer ID.
    > Verify emergency tones have been silenced.
6. On 'Emergency Sidebar Panel,' clear group emergency by selecting first "Clear" button next to Declarer ID. Also, clear Unit Alert by selecting second "Clear" button next to Unit icon and Declarer ID.
    > Verify emergency on Talkgroup 64352 has been cleared from the console, Smartphones, and Radio 1.
7. PTT on BeOn_202 Smartphone to do a group call.

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> Verify a group call without an emergency is seen and heard at the console, at BeOn_203 Smartphone, and P25T Radio 1.

TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

TDMA MESSAGE TRUNKING WITH BEON

Purpose: Demonstrate system, for TDMA Phase 2 group calls, operates as standard message trunking for group calls.

Expected Results: System will assign same working channel to a message trunked (MT) call, if next call happens within MT hang time. During hang time, transmitting radio will remain on traffic (Working) channel for Phase 2 group calls.

Setup: TDMA-enabled Radios 1, 2, and 3 should be only radios on the system. Each call needs to take place within three seconds of each other for this test to work. Talkgroup 64353 is a TDMA (Phase 2) MT group

Monitor system channel assignment in RSM site activity real-time viewer.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
BeOn_202	9980202	TG 64353 P25	64353	1
BeOn_203	9980203	TG 64353 P25	64353	1
Radio 1	9980001	TG 64353 P25	64353	1

Execution:

1. Log into RNM and start RSM site activity application in the real-time viewer. Observe all channels on Site 1 for each of the steps below.
2. PTT BeOn_202 Smartphone and talk.
   > Transmit (TX) indicators (red light) should turn on at BeOn_202 Smartphone.
   > On RNM, observe number of channels assigned and channel slot assigned.
   > Verify audio from BeOn_202 Smartphone is heard at BeOn_203 Smartphone and Radio 1.
3. Un-PTT BeOn_202 Smartphone.
   > Verify BeOn_202 Smartphone's LED Receive (RX) indicator turns green, to indicate BeOn_202 Smartphone remains on traffic (Working) channel, during the hang time. (This is standard message trunking for TDMA.)
4. PTT BeOn_203 Smartphone, within the three second hang time and talk.
   > Transmit (TX) indicators (red light) should turn on at BeOn_203 Smartphone.
   > Verify same channel / slot is assigned, as in Step 2.
   > Verify audio from BeOn_203 Smartphone is heard at BeOn 202 Smartphone and Radio 1.
5. Un-PTT BeOn_203 Smartphone.
   > Verify BeOn_203 Smartphone's LED light turns green, to indicate Receive (Rx). Indicates BeOn_203 Smartphone remains on Traffic (Working) channel, during Hang Time.
6. PTT Radio 1, within 3 second hang time, and talk.
   > Transmit (TX) indicators (red light) should turn on at Radio 1.
   > Verify same channel / slot is assigned in Steps 2 and 4.
   > Verify audio from Radio 1 is heard at BeOn_202 and BeOn_203 Smartphones.
7. Un-PTT Radio 1.
   > Verify Radio 1's LED light turns green, to indicate receive (Rx). Indicates Radio 3 remains on traffic (Working) channel during hang time.

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TEST RESULTS

Tester:

Date:

Result: ☐   Pass   ☐   Fail

BeOn Server High Availability

BEON SERVER HIGH AVAILABILITY

Purpose: Demonstrate BeOn LAP servers operate as high availability.

Expected Results: Verify BeOn LAP servers provide high availability BeOn operational status.

Setup: Two BeOn LAP servers are up and operational. Test can include BeOn Windows client, BeOn iOS client, BeOn Android client, and BeOn-capable radio programmed with Talkgroup 64201.

> Use RNM > "Network" tab > BeOn Sites > LAP1 and LAP2 to view Server Active Status.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
BeOn Windows Client	9980210	TG 64201 P25	64201
BeOn iOS Client	9980202	TG 64201 P25	64201
BeOn Android Client	9980203	TG 64201 P25	64201
BeOn Radio 1	9980001	TG 64201 P25	64201
BeOn Radio 2	9980002	TG 64201 P25	64201

Execution:

1. All BeOn clients and BeOn-capable radios are on Talkgroup 64201.
   > Verify all BeOn clients and radios can transmit and receive on Talkgroup 64201.
2. On RNM > "Network" tab > BeOn Sites > LAP1 and LAP2 > "Properties":
   > Verify both LAP1 and LAP2 are "Online" and "Reachable" and "Up".
3. Shutdown LAP1 server.
4. Monitor at RNM, the status of LAP1 server, to indicate when LAP1 server is down. RNM > "Network" tab > BeOn Sites > LAP1 > "Properties".
   > Verify "Monitor" is "Offline".
   > Verify "Connectivity" is "Unreachable".
   > Verify "Operation" is "Down".
5. Ensure at RNM, status of LAP2 server remains "Online", "Reachable", and "Up".
   > Verify "Monitor" is "Online".
   > Verify "Connectivity" is "Reachable".
   > Verify "Operation" is "Up".
6. PTT Radio 1 on Talkgroup 64201 and talk. Transmit (TX) indicator should turn on at Radio 1.
   > Verify BeOn Windows client, BeOn iOS client, BeOn Android client and BeOn-capable Radio 2 all receive the call audio.
7. Restart LAP1 server.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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High Availability NSS Switchover

HIGH AVAILABILITY WIDE AREA ROUTER FAILURE

Purpose: Demonstrate capabilities of the system to work after a WAR failure.

Expected Results: System components that are set-up with high availability will continue to work after a WAR failure.

Setup: These tests are setup to be run twice, once on each router. After completing Step 4 restart the WAR router if not already running. Wait 20 minutes and rerun the tests for the second router. These tests will simulate a WAR failure by disconnecting it from the Wide Area Network (WAN), so the WAR to WAN connection will need to be known.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	1
Radio 3	9980003	TG 64002 P25	64002	1
Radio 4	9980004	TG 64002 P25	64002	2

Execution:

1. Use Radio 1 to initiate a call
   > Verify that the call is heard on the Radio 2. Keep the call active during fail-over.
2. Use Radio 3 to initiate a call
   > Verify that the call is heard on Radio 4. Keep the call active during fail-over.
3. Log in to s0u1nss and s0u2nss; change your user to the Root User and enter the password.
4. Type 'HArunning' into both NSSs, one will report that it is the 'Stand By' and one will report that it is the 'Primary'. Note the name of the primary NSS **and the** primary WAR.

DESCRIPTION	TEST RUN 1	TEST RUN 2
Primary NSS Name		
Primary WAR Name		
Primary RNM Name		
Primary RSM Name		
Time of Server Reboot		

5. Log into the WAR that is associated with the 'Primary' NSS. "Reload" the WAR router.
   > The call from Radio 3 to Radio 4 will be dropped.
   > The call from Radio 1 to Radio 2 will continue and the console will lose connectivity to the VNIC.
   > Verify that after a short delay, the backup server NSS2 automatically takes over as the primary server.
6. Wait 20 minutes for the two NSS servers to synchronize and replicate their databases.

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TEST RESULTS

Tester:

Date:

Result: ☐ Pass   ☐ Fail

UNIT 1 NSS SWITCHOVER

Purpose: Confirm when the primary NSS losses power, it will fail over to the second NSS. The secondary NSS will take over the function of the primary NSS and restart multi-site (console) call traffic.

Expected Results: Test will simulate NSS failure of the active NSS and show the redundant NSS will restart call handing functionality. The calls between the radios (1 and 2) on the same site will operate normally during the failover, the call between radios (3 and 4) on different sites will drop for about 40 seconds. During the failover, the console will lose connectivity to the system for about 40 seconds.

Setup: To start this test, the VNIC needs to be on s0u1nss; if it is not, start with Unit 2 NSS Switchover Test and perform this test after that test. Open a terminal screen. For single site simulcast system only, ignore Radios 1 and 2.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	1
Radio 3	9980003	TG 64002 P25	64002	1
Radio 4	9980004	TG 64002 P25	64002	2
Console	9989101	TG 64001 P25	64001	
Console	9989101	TG 64002 P25	64002	

Execution:

1. Log into both NSS's.
2. Open a terminal window and login as a 'Super User'.
3. Type 'HArunning' in to both terminal windows. The server that displays 'Running as Primary' is the primary.
4. Start calls with Radio 1 and Radio 3, listen to the calls with Radio 2, Radio 4, and the console.
5. Create an NSS failure, on the primary Network Switching Server (NSS), by initiating a "HArestart" command in the NSS window.

   > Primary NSS gives an alert message and goes down.

   > The call from Radio 1 to Radio 2 will continue and the console will lose connectivity to the VNIC. The call from Radio 3 to Radio 4 will be dropped.

   > Verify that after a short delay, the backup server NSS2 automatically takes over as the primary server.

6. On the RNM, verify:

   > NSS1, MDIS, and VNIC icons turn red.

   > NSS2, MDIS, and VNIC icons turn green.

   > RNM reports NSS1, MDIS, and VNIC failure messages.

   > Verify the call between Radio 1 and Radio 2 continues to be heard on Radio 2, then drop the test call.

   > After failover, verify that multi-site group and individual radio calls can be made between Radio 3 and Radio 4.

   > Verify NSS in Step 5 comes back into standby operation.

   > Verify NSS1 Icon turns blue on RNM.

7. Wait 20 minutes for the two NSS servers to synchronize and replicate their databases.

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TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

UNIT 2 NSS SWITCHOVER

Purpose: Confirm when the secondary NSS loses power, it will fail over to the primary NSS. The primary NSS with take over the function of the secondary NSS and restart multi-site call (console) traffic.

Expected Results: Test will simulate NSS failure and show the redundant NSS will restart call handing functionality. The calls between the radios (1 and 2) on the same site will operate normally during the failover, the call between radios (3 and 4) on different sites will drop for about 40 seconds. During the failover, the console will lose connectivity to the system for about 40 seconds.

Setup: To start this test, the VNIC needs to be on s0u2nss; if it is not, start with Unit1 NSS switchover test and perform this test after that test. Open a terminal screen. For single site simulcast system only, ignore Radios 1 and 2.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	1
Radio 3	9980003	TG 64002 P25	64002	1
Radio 4	9980004	TG 64002 P25	64002	2
Console	9989101	TG 64001 P25	64001	
Console	9989101	TG 64002 P25	64002	

Execution:

1. Log into both NSSs.
2. Open a terminal window and login as a 'Super User'.
3. Type 'HArunning' in to both terminal windows. The server that displays 'Running as Primary' is the primary.
4. Start calls with Radio 1 and Radio 3, listen to the calls with Radio 2, Radio 4, and the console.
5. Create an NSS failure, on the primary NSS, by initiating a "HArestart" command in the NSS window.
   > Primary NSS gives an alert message and goes down.
   > The call from Radio 1 to Radio 2 will continue and the console will lose connectivity to the VNIC. The call from Radio 3 to Radio 4 will be dropped.
   > Verify that after a short delay, the backup server NSS2 automatically takes over as the primary server.
6. On RNM, verify:
   > NSS1, MDIS, and VNIC icons turn red.
   > NSS2, MDIS, and VNIC icons turn green.
   > RNM reports NSS1, MDIS, and VNIC failure messages.
   > Verify call between Radio 1 and Radio 2 continues to be heard on Radio 2, then drop the test call.
   > After failover, verify that multi-site group and individual radio calls can be made between Radio 3 and Radio 4.
   > Verify NSS in Step 5 comes back into standby operation.
   > Verify NSS1 Icon turns blue on RNM.
7. Wait 20 minutes for the two NSS servers to synchronize and replicate their databases.

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TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

VIDA Inter-Operability Gateway Test

LOCAL INTEROPERABILITY

Purpose: The purpose of this test is to verify correct functionality of the Interoperability Gateway.

Expected Results: Verify that the Interoperability Gateway connects via four-wire audio connections in its Universal Access Cards (UAC) cards to interoperability radio units (mobile or desktop). The gateway also connects to a router and the Network Switching Center (NSC) to provide call functionality across the network.

Setup: N/A

Execution:

1. Select 'Inter-op Group 1' on the radio.
2. Initiate a call from the radio to Group 1
   > Verify that audio is heard on inter-op Group 1 radio.
3. Initiate a call from the inter-op Group 1 radio to Group 1
   > Verify that audio is heard on the radio.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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NSC Test Notes / Issues

NSC Test Acceptance

This Functional Test Acceptance Procedure has been fully and successfully completed with all action items resolved.

Hunt County, Texas Representative

L3Harris Technologies Representative

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Signature

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Signature

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Printed Name and Title

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Printed Name and Title

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Date

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Date

SYMPHONY CONSOLE FEATURE SET

TRANSMITTING WITH A MICROPHONE

Purpose: Demonstrate Symphony operator can initiate communication with a radio using Symphony select functions and foot pedal.

Expected Results: Confirms Symphony communication with radio

Setup: Radio set to TG64001 P25 and console programmed with TG64001 P25

Execution:

5. Press INSTANT TX function (right mouse button) on module with test group.
   > Verify call is heard on radio.
   > Verify a ripple effect on 'TX' indicator is displayed.
   > Verify a channel access tone is heard.
   > Release the Instant TX key.
6. Right click on gear symbol for TG64001 and select 'Select' to make TG64001 the selected talkgroup.
   > Verify module for TG64001 is highlighted, indicating it is selected talkgroup.
7. Make a call on TG64001 by pressing PTT foot pedal.
   > Verify a channel access tone is heard.
   > Verify halo around the 'TX' indicator is displayed.
   > Verify call is heard on radio.
   > Verify audio is heard at radio on talkgroup TG64001.
   > Release foot pedal to end call.
8. Make a call on TG64001 by pressing headset button.
   > Verify a channel access tone is heard.
   > Verify halo around 'TX' indicator is displayed.
   > Verify call is heard on radio.
   > Verify audio is heard at radio on talkgroup TG64001.
   > Release headset button to end call.
9. Make a call on TG64001 by selecting it with a mouse.
   > Verify a channel access tone is heard.
   > Verify halo around 'TX' indicator is displayed.
   > Verify call is heard on radio.
   > Verify audio is heard at radio on talkgroup TG64001.
   > Release mouse button to end call.

TEST RESULTS

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Tester:				
Date:				
Result:	☐	Pass	☐	Fail

RECEIVING CALLS (UNIT ID DISPLAY, TALKGROUP ID DISPLAY, ALIASING)

Purpose: Confirm Symphony operator can receive communications from a radio, using both talkgroup and individual calling.

Expected Results: Communications are initiated and received on appropriate speaker (select or unselect) and radio's ID is displayed.

Setup: Symphony has talkgroups 64001 and 64002, programmed with 64002 selected, and radio set to TG64001 P25

Talkgroup Call

Execution:

1. Key radio and verify
   > That call is heard at unselect speaker.
   > Calling radio ID is displayed on module for TG64001.
   > A green light ID displayed indicating an incoming call on module TG64001.
2. Switch radios talkgroup to TG64002 and key radio.
   > Verify call is heard at select speaker.
   > Verify calling radio ID is displayed on TG64002 module.
   > Verify a green light ID displayed indicating an incoming call on module TG64002.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

Individual Call (Unit – Unit)

Execution:

1. Right click on 'Harris' box on top left-hand side of screen.
2. Select 'Open Directory' this will open a pop-up window for 'Directory'.
3. Select 'Users' tab.
4. Select 'Radio 1' under "ALIAS" column.
5. Press 'Radio 1' button right side to screen to place an individual call to 'Radio 1'.
   > Verify ripple effect on 'TX' indicator is displayed.
   > Verify a ringing tone will be heard at console and radio.
   > Verify radio displays 'INDV' and consoles 'ID".
6. Respond to console by PTTing radio.
   > Verify call is heard on Symphony and calling radio's ID and call indicator are displayed.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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EMERGENCY CALL AND EMERGENCY ALARM

Purpose: Confirms Symphony indicates an emergency declared by a radio and can reset and clear emergency.

Expected Results: Symphony indicates and can clear emergency.

Setup: Test requires a test radio capable of generating and clearing an emergency (i.e. supervisor radio).

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001

Execution:

1. Select TG64002 in Symphony. Using test radio, declare an emergency on TG64001.
   > Verify 'TG64001' module turns red,
   > Verify ID/name of test radio is displayed
   > Verify emergency alert tone is heard on Symphony.
2. Select triangle with a '!' to access emergency menu.
   > Verify acknowledge 'Ack' button is red and check box is red.
3. Using radio, transmit on talkgroup
   > Verify call is received by Symphony.
4. With Symphony, transmit on group with emergency.
   > Verify test radio receives call and is still in emergency mode.
5. Acknowledge emergency by selecting 'Ack' button
   > Verify button changes from 'Ack' to clear.
   > Verify radio and Symphony are still in emergency mode.
6. Clear the emergency by selecting 'Clear X' button
   > Verify Symphony clears emergency.
   > Verify radio clears emergency.
7. Transmit on radio.
   > Verify emergency is cleared and normal group calls have resumed.
8. Select TG64001 group selected on Symphony, declare an emergency on test group by pressing 'Emer Declare'.
   > Verify Symphony and radio have same indications as Steps 2 to 4.
9. Acknowledge by hitting 'Ack' in Step 5.
10. Clear emergency with Symphony.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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SYSTEM WIDE CALL

Purpose: Confirm Symphony can initiate system wide calls.

Expected Results: Symphony can initiate system wide all call.

Setup: Program console modules with 'TG64000 P25' talkgroup

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64051 P25	64051
Radio 2	9980002	TG 64052 P25	64052
Radio 3	9980003	TG 64001 P25	64001
Radio 4	9980004	TG 64002 P25	64002

Execution:

1. Press INSTANT TX on 'TG64000' module.
   > Verify channel access tone is heard,
   > Verify ripple effect on 'TX' indicator is displayed
   > Verify call is heard at all radios
   > Release Instant TX key.
2. Press INSTANT TX on 'TG64051' module.
   > Verify channel access tone is heard,
   > Verify ripple effect is displayed
   > Verify call is heard at Radio 1.
   > Verify Radios 2, 3, and 4 do not hear audio.
   > Release Instant TX key.
3. Press INSTANT TX on 'TG64001' module.
   > Verify that a channel access tone is heard,
   > Verify ripple effect is displayed,
   > Verify call is heard at Radios 3.
   > Verify Radios 1, 2 and 4 do not hear audio.
   > Release Instant TX key.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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ALERT TONES

Purpose: Confirm Symphony can initiate alert tones which can be heard at radio.

Expected Results: Tones can be initiated and heard.

Setup: Symphony programmed with TG64002 and TG64001 selected.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64002 P25	64002

Execution:

1. Make TG64001 P25 selected talkgroup.
2. Select tones tab on talkgroup module.
3. Select one of three ALERT TONE keys by selecting drop-down list next to orange button.
4. Radio 1 will receive call.
5. Test all three alert tones to ensure all alert tones can be heard on radio.
    > Verify ALERT TONE is received by Radio 1 and is also heard on Symphony. (To hear tones on Symphony, press and hold foot pedal and listen for tone on SELECT speaker).
6. When ALERT TONE key is released.
    > Verify call on Radio 1 drops.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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CONSOLE PRE-EMPT

Purpose: Confirm Symphony can pre-empt an ongoing call between radios.

Expected Results: Call started by the radio will be interrupted by the console.

Setup: Symphony programmed with TG: TG64001 P25

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001

Execution:

1. Key Radio 1 on TG64001 and hold call up. Verify that audio is heard at Radio 2 and Symphony.
2. Key Symphony on TG64001 and hold, while continuing to hold call up on Radio 1
   > Verify console pre-empts.
   > Verify transmit indicator is displayed along with pre-empted caller LID and CALL indicator.
   > Verify second radio begins to hear Symphony audio and not first radio call.
   > Verify pre-empted radio audio is still heard on pre-empting console.
3. Un-key first radio.
   > Verify pre-empted caller LID and CALL indicators are removed, and pre-empted radio audio is no longer heard on pre-empting Symphony.
4. Un-key Symphony.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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SIMULSELECT

Purpose: Confirms operation of Symphony simulselect feature, which allows multiple talkgroups to be selected for communication simultaneously.

Expected Results: Symphony can select multiple talkgroups and communication is allowed.

Setup: Symphony programmed with TGs: TG64051 P25, TG64052 P25, TG64053 P25, and TG64054 P25.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64051 P25	64051
Radio 2	9980002	TG 64052 P25	64052
Radio 3	9980003	TG 64053 P25	64053
Radio 4	9980004	TG 64054 P25	64054

Execution:

1. Create simulselect group on 4 test group modules.
2. Place a call from Symphony on simulselect group.
   > Verify call is heard at all four radios.
3. Place a call from each radio.
   > Verify only Symphony hears calls.
   > Verify only radios on the same talkgroup hear each other.
4. Deactivate simulselect group.

TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

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PATCH

Purpose: Confirms Symphony patch feature creates shared communication between multiple selected talkgroups.

Expected Results: Patched talkgroups can communicate.

Setup: Console 1 programmed with TGs: TG64051 P25, TG64052 P25, TG64053 P25, and TG64054 P25.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64051 P25	64051
Radio 2	9980002	TG 64052 P25	64052
Radio 3	9980003	TG 64053 P25	64053
Radio 4	9980004	TG 64054 P25	64054

Execution:

1. Create patch on PATCH 1 with all four groups above.
2. Place a call from newly created patch.
    > Verify call is heard on all radios.
3. Place a call from each radio.
    > Verify call is heard on Symphony and each radio.
4. Deactivate patch.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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CALL HISTORY

Purpose: Confirms a history of calls processed at the Symphony.

Expected Results: History is accessible and valid.

Setup: Test compares programmed module call activity to history scroll lists. Utility page, dispatch menu will be selected. Select either "Select History" or "Unselect History".

Execution:

1. Press 'scroll up' and 'scroll down' buttons to scroll through Unselect Call History list.
   > Compare these calls with known activity.
2. Press 'scroll up' and 'scroll down' buttons to scroll through Selected Call History list.
   > Compare these calls with known activity.
3. Press 'Esc' button to exit history scroll mode.
4. To monitor call history on a single group, use 'module history' button on 'module modify' menu.
5. Use 'scroll up' and 'scroll down' buttons to scroll through calls for picked module.
   > Compare these calls with known activity.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

GROUP EMERGENCY AND UNIT ALERT WITH SYMPHONY

Purpose: Confirm Symphony receives a group emergency and an emergency unit alert declared by a radio. Confirm console can acknowledge and clear emergency alarm (unit alert) and acknowledge and clear group emergency.

Expected Results: Symphony Console can indicate emergency alarm (unit alert) and group emergency. Symphony can also clear unit alert & cancel group emergency.

Setup: Radios 1 & 2 have "Emergency Alarm" enabled in personalities.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64152 P25	64152	1
Radio 2	9980002	TG 64152 P25	64152	2

Execution:

1. Select TDMA TG 64152 on the console. On Radio 1, declare an emergency on TG 64152. PTT Radio 1 to talk to the dispatcher.
   > Verify Radio 2 on site 2 receives emergency and hears emergency group call.
2. On Symphony's TG 64152 Module:
   > Verify TG 64152 Module has a striped red background.
   > Verify TG Smart Button flashes an "emergency icon", which alternates with TG icon.
   > Verify Declarer ID is shown in Red on TG Module.
   > Verify emergency alarm tone and radio emergency group call audio is heard on Symphony.
3. On Symphony's Sidebar Panel, go to the Emergency Panel:
   > Verify emergency listed shows TG 64152, in a mini module, with a red background.
   > Verify declarer ID is listed, with an "ACK" button and a number '1', for number of group emergencies declared, [listed below TG Mini Module].
   > Verify below declarer ID, single unit icon and declarer ID is listed, with an "ACK" button.
4. To clear group emergency alarm tone on Symphony emergency sidebar panel, select top "ACK" button next to declarer ID.
   > Verify group emergency alarm tone is silenced on the console.
   > Verify group emergency is still displayed on talkgroup module and emergency sidebar panel.
   > Verify unit alert "ACK" is still displayed below group emergency.
5. On Symphony, select and transmit on TG 64152.
   > Verify Radio 1 and 2 both receive emergency call.
6. Clear group emergency on Radio 1.
   > Verify console TG module no longer indicates a group emergency.
   > Verify the group emergency is no longer seen on Radio 1 and Radio 2.
7. PTT on Radio 1, to do a group call:
   > Verify an emergency group call goes to the Symphony on TG64152 module, and to Radio 2.
   > Verify emergency is also seen in emergency sidebar panel.
   > (This occurs, since emergency unit alert is still active on TG 64152.)

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8. On Symphony emergency sidebar panel, clear unit alert tone by selecting second "ACK" button next to unit icon and declarer ID. Also, clear group emergency alarm tone on TG 64152, by selecting first "ACK" button next to declarer ID.

   > Verify all emergency tones have been silenced.

9. On emergency sidebar panel, clear group emergency by selecting first "Clear" button next to declarer ID. Also, clear unit alert by selecting second "Clear" button next to Unit Icon and declarer ID.

   > Verify emergency on TG 64152 has been cleared from Symphony, Radio 1, and Radio 2.

10. PTT on Radio 1 on TG 64152, to do a group call.

    > Verify a group call without an emergency is seen and heard at Symphony and Radio 2.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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CONSOLE TO CONSOLE CROSS-MUTE

Purpose: Confirm creation of a cross-mute of another console to quiet the muted consoles audio on the local console.

Expected Results: Cross-muted console's audio cannot be heard on local console.

Setup: Establish two Symphony consoles (A and B) to test cross mute function. Both Symphony consoles must be on same NSC. Program and select a test group on both consoles.

Execution:

1. Place a call on Console A on test group.
   > Verify Console B can hear Console A.
2. Open Symphony configuration utility for Console B, in 'General' section, add ID for Console A to 'cross mute' list.
3. Select 'Apply' to save changes.
4. Place a call on Console A on test group.
   > Verify call can't be heard at Console B.
5. Restore desired cross mute setup.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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Symphony Console Test Notes / Issues

Symphony Console Test Acceptance

This Functional Test Acceptance Procedure has been fully and successfully completed with all action items resolved.

Hunt County, Texas Representative

L3Harris Technologies Representative

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Signature

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Signature

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Printed Name and Title

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Printed Name and Title

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Date

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Date

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SUBSCRIBER UNIT FEATURE SET

TRANSMIT GRANT TONE

Purpose: Demonstrate the system channel grant tone is heard on the radio.

Expected Results: This test will show that the radio will play a grant tone when the radio is assigned a working channel.

Setup: One radio with valid ID and a valid group on selected system. Grant tone (ready-to- talk tone) enabled in radio personality as applicable for specific radio type being tested.

Execution:

1. Press PTT button on radio with valid group selected.
2. Verify grant tone is heard at radio when working channel access is granted.

   Note: If the call is queued, the grant tone will be delayed until the call is assigned a working channel.

TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

OUT OF RANGE TONE ON PTT

Purpose: Test demonstrates the radios out of range tone.

Expected Results: When the radio losses connectivity with the control channel the radio plays a tone to make the user aware that it has lost connectivity to the control channel.

Setup: One radio with a valid ID and a valid group on selected system. System scanning should be disabled in the radio personality as necessary for specific radio type being tested.

Execution:

1. With valid group selected, and radio initially logged into and monitoring the control channel on the selected system, reduce the signal strength reaching the radio by some means (ex. unscrewing and removing the portable radio antenna, or moving further from the site).
   > Verify that the radio indicates loss of control channel on the display when the received signal strength is sufficiently reduced (i.e. out of range of system).
   > Press PTT button on radio and verify that an out of range tone is heard at the radio.

TEST RESULTS		
Tester:		
Date:		
Result:	☐ Pass	☐ Fail

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GROUP SCAN

Purpose: Verify when scan is enabled, calls from groups in the radio's scan list are received.

Expected Results: In this test the radio will play calls from multiple talkgroups while scan is enabled.

Setup: All radios for this test need to have scan ability.

Radio 1 set up with TG64001 P25 and TG64002 P25 in the scan list, TG64001 P25 selected, and group scan initially disabled.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001

Execution:

1. Place a call from Radio 2 on TG64001 P25.
   > Verify the call is received and audio is heard on Radio 1 on TG64001.
2. On Radio 2, change to TG64002. Place a call from Radio 2 on talk TG64002 P25.
   > Verify the call is not received by Radio 1.
3. Enable group scan on Radio 1.
4. Place another call from Radio 2 on talkTG64002 P25.
   > Verify that the call is now received, and audio is heard on Radio 1.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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PRIORITY SCAN

Purpose: Demonstrate groups assigned a higher priority in the scan list override groups of a lower priority.

Expected Results: Radio will play calls with a higher level of priority.

Setup: Set Radio 1 to priority scan TG64001 P25, and scan (at lower priority – 3 bars) TG64002 P25. Set Radio 1 to TG64003. Have scan enabled on Radio 1.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1 (SCAN)	9980001	TG 64003 P25	64003
Radio 2	9980002	TG 64002 P25	64002
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. Have Radio 1 selected to TG64003 P25. Place a call from Radio 2 on TG64002 P25.
   > Verify Radio 1 scans to TG64002 P25 and hears audio from Radio 2. Continue transmitting from Radio 2.
2. Place a call from Radio 3 on TG64001 P25. [Radio 2 is still transmitting on TG64002 P25.]
   > Verify Radio 1 priority scans to TG64001 P25 and hears audio from Radio 3.
3. Unkey all radios and turn off scan.

TEST RESULTS

Tester:

Date:

Result: ☐   Pass   ☐   Fail

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TRANSMIT BUSY LOCKOUT

Purpose: Demonstrate a radio cannot key on a group, on which a group call is already active.

Expected Results: A radio will not be allowed to transmit on a talkgroup while a different radio is transmitting on the same talkgroup.

Setup: Talkgroup used for test must be set up as transmission trunked. This feature does not apply to message trunked calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001

Execution:

1. Place a call from Radio 1 on selected talkgroup by pressing and holding the PTT button.
   > Verify the call is received and audio is heard on Radio 2.
2. While the call is in progress, press the PTT button on Radio 2.
   > Verify that Radio 2 does not transmit over (step on) the call in progress. (A double bump busy sound will be heard).

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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CONTINUOUS CONTROL CHANNEL UPDATE

Purpose: This test will demonstrate that a radio will join a call that is already in progress.

Expected Results: This test will verify that a radio will join a call that is already in progress.

Setup:

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001

Execution:

1. Set both radios to the test group.
2. Turn Radio 2 OFF.
3. Key Radio 1 and hold. Turn ON the Radio 2 (and set it to the test group if necessary).
   > Verify that the second radio joins the call in progress and hears audio from the call in progress.
4. Unkey Radio 1.

TEST RESULTS

Tester:

Date:

Result: ☐   Pass   ☐   Fail

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CONVERT TO CALLEE

Purpose: Demonstrate when radios are simultaneously keyed, only one radio is given talk privilege.

Expected Results: When two radios on the same talkgroup are keyed simultaneously, only one radio will receive access to the working channel. The other radio will play the audio from the first.

Setup: Test of single site simultaneous call arbitration. Radio 1 and Radio 2 are registered on the same site and talkgroup.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64001 P25	64001	1
Radio 2	9980002	TG 64001 P25	64001	1

Execution:

1. Set two radios to the same site and group.
2. Key both radios at the same time.
   > Verify that one radio ends up transmitting and the other ends up receiving.
   > Verify that the call audio is routed and received by one of the units although the PTT is pressed.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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GROUP TEST CALL

Purpose: A group test call will show that the site will allow a radio to communicate using a group call.

Expected Results: Test will demonstrate that all radios assigned to a common group will hear a call and all radios assigned to an uncommon group will not hear the call.

Setup: Make sure scan is turned OFF on the radios.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. PTT Radio 1 and talk.
    > The transmit (TX) indicators should turn on at Radio 1.
    > Audio should be heard in Radios 2 and 3.
    > The ID of Radio 1 should be seen on Radios 2 and 3.
2. Set Radio 3 to (TG64002 P25). PTT on Radio 1 and talk.
    > The transmit (TX) indicators should turn on at Radio 1.
    > Audio should be heard in Radio 2 only.
    > The ID of Radio 1 should be seen at Radio 2 only.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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INDIVIDUAL (PRIVATE) CALL

Purpose: Verify the site will allow two radios to communicate on a private call.

Expected Results: Test will demonstrate that two radios can communicate on an individual call and other radios will not hear the private conversation.

Setup:

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. On Radio 1, select the Individual Call Function, and select a pre-stored Radio 2 ID, or enter Radio 2's ID.
2. PTT Radio 1 and make a test call.
   > Verify that Radio 2 receives the call and displays the ID of Radio 1.
   > Verify that Radio 3 remains idle.
3. Release the PTT on Radio 1 and immediately PTT on Radio 2.
   > Verify that Radio 1 receives the call and displays the ID of Radio 2.
   > Verify Radio 3 remains idle.
4. On Radio 1, select the Individual Call Function, and select pre-stored Radio 3 ID, or enter Radio 3's ID, and PTT Radio 1.
   > Verify that Radio 3 receives the call and displays the ID of Radio 1.
   > Verify that Radio 2 remains idle.
5. Release the PTT on Radio 1 but do not immediately PTT Radio 3.
   > Verify that Radio 3 gives a call back Alert (WHC- "Who Has Called") Indication.
6. Make the return call from Radio 3 back to Radio 1.
   > Verify that Radio 1 receives the call and displays the ID of Radio 3.
   > Verify Radio 2 remains idle.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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UNIT TO UNIT ALERT PAGING

Purpose: This test will demonstrate that a radio can send a page to a different radio on the system.

Expected Results: Page will go from Radio 1 to Radio 2.

Setup: Radio 1 with call alert programmed into a button ("PAGE") and Radio 2's ID programmed into its individual call list. Radio 1 and Radio 2 are registered on the same site.

Execution:

1. Select the PAGE function from the MENU on Radio 1. Select Radio 2 from the preprogrammed list of radios and PTT Radio 1.
    > Verify Radio 1 displays "*TX PAGE" on the second line.
    > Verify Radio 2 displays the ID of Radio 1 on its first line and "*RX PAGE" on the second line.
    > Verify Radio 2 beeps multiple times to indicate a received page.
    > Verify Radio 1 beeps multiple times to indicate the page was successfully sent.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

SYSTEM ALL CALL

Purpose: Demonstrate the capability of the system to route a call to all radios on the system.

Expected Results: This test will demonstrate the system's ability to route a single call to all available radios on the system.

Setup: Radio 1 must be on the full rate all call talkgroup.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64000 P25	64000
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64002 P25	64002

Execution:

1. With Radio 1 place an individual call to talkgroup 64000 (all call talkgroup).
   > Audio should be heard at Radios 2 and 3.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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TRANSMIT DENIED (FOR INVALID RADIO ID)

Purpose: Demonstrate that a radio can be denied system access.

Expected Results: Radio with invalid ID will not be able to transmit or receive on the system.

Setup: Program system so that radio ID is not valid on the site under test. Download database to site.

Execution:

1. Program Radio 1 with an invalid ID.
2. PTT Radio 1.
   > Verify the radio is prohibited access to system and the radio displays "Invalid ID".
3. Reprogram the radio to the original personality.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

SINGLE SITE CALL QUEUE DECLARATION ALERT

Purpose: This test will demonstrate the system queuing.

Expected Results: This test will verify that the system will assign users in a queue when the system has no available channels and assign users a working channel when the system has an available channel.

Setup: This test requires four radios and two working channels. Disable channels (if necessary) until there are two working channels at the site. This test is to be run with no other users on the system.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64002 P25	64002
Radio 3	9980003	TG 64003 P25	64003
Radio 4	9980004	TG 64003 P25	64003

Execution:

1. Busy up all talk paths on the system with Radio 1, and 2 by pressing and holding the PTT button.
2. With all talk paths busied, momentarily press, and release the PTT button on test Radio 3.
   > Verify that a call queued tone is heard at the radio.
3. Unkey (release PTT button) Radio 2.
   > Verify that Radio 3 is assigned to the free talk path.
4. The grant tone is heard at the radio, without having to rekey the radio (re-pressing the PTT button).
5. Press the PTT button on Radio 3 within the auto key time applicable to the radio type (approx. 2 seconds) to keep the assigned channel.
   > Verify that audio from Radio 3 is heard at Radio 4.
6. Unkey all radios.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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RECENT USER PRIORITY

Purpose: Demonstrate system's ability to prioritize recent users in queueing situations.

Expected Results: When radios of the same priority level enter the queue, one that has been recently active will exit the queue first.

Setup: This test requires four radios and two working channels.

Disable channels (if necessary) until there are two working channels at the site. Set the radio according to the table below. This test is to be run with no other users on the system and at intervals as set in the recent caller interval (a time of greater than 10 seconds is recommended for the test, which is configurable in the traffic controller module). *This will only work if performed quickly.*

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64002 P25	64002
Radio 3	9980003	TG 64003 P25	64003
Radio 4	9980004	TG 64004 P25	64004

Execution:

1. PTT and release Radio 1 (establish a recent user entry).
2. PTT Radios 3 and 4 and hold on transmit to busy both working channels.
3. PTT and release Radio 2 (queue a call less recent than Radio 1).
4. PTT and release Radio 1 (queue the recent user).
5. Unkey Radio 4.

   > Verify that Radio 1 un-queues and transmits.

6. Unkey all radios.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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CALL PRIORITY FOR GROUP IDS

Purpose: Demonstrate the system's ability to allow a user with a higher priority to be assigned a channel before a user with a lower priority, despite who enters the queue first.

Expected Results: This test will verify that a user who has a higher priority will be assigned a channel before users with a lower priority regardless of who entered the queue first. In this test Radio 4 should get the first available channel, because it has a higher priority, and Radio 3 will be assigned a channel next because it has a lower priority.

Setup: This test requires two working channels on the site. Disable channels (if necessary) until there are two working channels on the site. Setup the radio according to the table below. This test is to be run with no other users on the system.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64002 P25	64002
Radio 3	9980003	TG 64003 P25	64003
Radio 4	9980004	TG 64004 P25	64004

Execution:

1. PTT Radios 2 and 4 and hold on transmit to busy both working channels.
2. PTT and release Radio 1 (medium priority entry into the queue).
3. PTT and release Radio 3 (high priority entry into the queue).
4. Un-key Radio 4.
   > Verify that Radio 3 un-queues and keys.
5. Un-key Radio 2.
   > Verify that Radio 1 un-queues and keys.
6. Un-key all radios.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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EMERGENCY CALL PRIORITY FOR GROUP IDS IN PHASE 1

Purpose: Demonstrate the system's ability to allow a user that declares an emergency to be assigned a channel before other users, despite queue entry sequence or priority level.

Expected Results: This test will verify that Radio 1 is assigned a channel before Radio 2 although Radio 2 has a higher priority and entered the queue first.

Setup: This test requires four radios and two working channels on the site. Disable channels (if necessary) until there are only two working channels on the site.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64002 P25	64002
Radio 3	9980003	TG 64003 P25	64003
Radio 4	9980004	TG 64004 P25	64004

Execution:

1. PTT Radios 3 and 4 and hold on transmit to busy both working channels.
2. PTT and release Radio 2 (high priority entry into the queue).
3. Declare an emergency on Radio 1 (medium priority entry into the queue but now at Emergency Priority).
   > Verify that the emergency is displayed on the console. (Audio will follow when a working channel is freed).
4. Un-key Radio 4.
   > Verify that Radio 1 un-queues and is assigned a channel without having to PTT. (Key the radio within the specified auto key time in order to keep the channel).
5. Un-key all radios and clear the emergency with Radio 1.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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TDMA Phase 2 Calls

ACKNOWLEDGED I-CALLS FOR P25 TDMA

Purpose: P25T TDMA Phase 2 acknowledged Individual Call test will verify the site will allow two radios to communicate on a private call after the callee radio accepts the incoming call message.

Expected Results: Demonstrate that two P25T TDMA radios can communicate on an acknowledged Individual Call and other radios will not hear the private conversation.

Setup:

UAS: Radios 1, 2, & 3: Voice end user: "P25 Half Rate"

Site Personality: Individual Call: Acknowledged I-Call: "Enabled"

Radios 1, 2, 3: Radio personality: TDMA capable

Use RNM Real Time Viewers: RSM Site Activity or VNIC site calls to observe calls

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
TDMA Ph2 Radio 1	9980001	TG 64051 P25	64051	1
TDMA Ph1 Radio 2	9980002	TG 64051 P25	64051	1
TDMA Ph1 Radio 3	9980003	TG 64051 P25	64051	1

Execution:

1. On Radio 1, select the Individual Call function, and select a pre-stored Radio 2 ID, or enter Radio 2's ID.
2. PTT Radio 1 and make an Acknowledged I-Call to Radio 2.
   > Verify that Radio 2 receives the message to accept incoming I-Call from Radio 1.
   > Radio 2 operator accepts the acknowledged I-Call from Radio 1.
3. PTT Radio 1 to talk to Radio 2, in the acknowledged I-Call.
   > Verify that Radio 2 receives the call, hears audio, and displays the ID of Radio 1.
   > Verify that Radio 3 remains idle.
4. Release the PTT on Radio 1 and PTT on Radio 2.
   > Verify that Radio 1 receives the call, hears audio, and displays the ID of Radio 2.
   > Verify Radio 3 remains idle.

TEST RESULTS			
Tester:			
Date:			
Result:	☐	Pass	☐ Fail

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CONVERT P25 FULL RATE TO HALF RATE VOICE

Purpose: Mixed mode sites can assign a channel in the P25 Phase 1 mode when FDMA radios affiliate with a talkgroup to interoperate with the rest of the sites in the system that use TDMA.

Expected Results: A P25 FDMA radio, on a mixed mode Site, affiliated with a mixed mode talkgroup, can communicate with a TDMA radio on a TDMA site.

Setup:

Radios 1, 2, 3: Transcoding Allowed: "True"

Site 1: UAS: P25 Site Capability: "Mixed Mode"

Site 2: UAS: P25 Site Capability: "Phase 2"

No other radios registered on Site 1 or 2

Use RNM real time viewers: RSM site activity or VNIC site Calls to show phase 1 and Phase 2 Calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
FDMA Ph1 Radio 1	9980001	TG 64051 P25	64051	1
TDMA Ph2 Radio 2	9980002	TG 64051 P25	64051	2
TDMA Ph2 Radio 3	9980003	TG 64051 P25	64051	2

Execution:

1. PTT on Radio 2.
   > Verify the transmit (TX) indicators turn on at Radio 2.
   > Verify Radio 1 receives call and hears audio from Radio 2.
   > Verify Radio 3 receives call and hears audio from Radio 2.
   > The ID of Radio 2 should be seen on Radios 1 and 3.
2. While PTTing Radio 2, at the RNM VNIC site calls:
   > Verify Site 1 is processing call from Radio 2 as a FDMA (Phase 1) call to Radio 1.
   > Verify Site 2 is processing call from Radio 2 as a TDMA (Phase 2) call to Radio 3.
3. PTT on Radio 1.
   > Verify the transmit (TX) indicators turn on at Radio 1.
   > Verify Radios 2 and 3 receive call and hears audio from Radio 1.
   > The ID of Radio 1 should be seen on Radios 2 and 3.
4. While PTTing Radio 1, at the RNM VNIC site calls:
   > Verify Site 2 is processing call from Radio 1 as a TDMA (Phase 2) call to Radios 2 and 3.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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ENHANCED DYNAMIC DUAL MODE (EDDM)

Purpose: Demonstrate EDDM technology provides efficient use of network and over-the-air resources by independently assigning the best site resource at each RF site participating in a call.

Expected Results: L3Harris TDMA calls use two talk paths per base station slot. At sites where a FDMA radio registers to a TDMA talkgroup, the call reverts to FDMA. All other sites participating in the same multisite call remain in TDMA mode.

Setup:

Radio 1: Radio Personality: TDMA Capable: Not checked

Radios 2, 3, 4: Radio Personality: TDMA Capable: Checked

UAS: Sites 1 and 2: P25 Site Capability: "Mixed Site"

Sites 1 and 2: Site Personality:

Channel Allocation: Transcoding Options: "Capacity Optimized"

Default Subscriber Unit Parameters: Transcoding Allowed: "Yes"

Default Group Parameters: Transcoding Allowed: "Yes"

Log into RNM real time viewers: RSM site activity or VNIC site calls to observe FDMA and TDMA calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
FDMA Ph1 Radio 1	9980001	TG 64051 P25	64051	1
TDMA Ph2 Radio 2	9980002	TG 64051 P25	64051	1
TDMA Ph2 Radio 3	9980003	TG 64051 P25	64051	2
TDMA Ph2 Radio 4	9980004	TG 64051 P25	64051	2

Execution:

1. PTT Radio 1.
   > Verify the transmit (TX) indicators turn on at Radio 1.
   > Verify Radios 2, 3 and 4 receive the call and hear the audio from Radio 1.
   > The ID of Radio 1 should be seen on Radios 2, 3, and 4.
2. While PTTing Radio 1, at the RNM real time viewers:
   > Verify Site 1 is processing the call from Radio 1 as a FDMA (Phase 1) call to Radio 2.
   > Verify Site 2 is processing the call from Radio 1 as a TDMA (Phase 2) call to Radios 3 and 4.
3. PTT Radio 2.
   > Verify the transmit (TX) indicators turn on at Radio 2.
   > Verify Radios 1, 3, and 4 receive the call and hear the audio from Radio 2.
   > The ID of Radio 2 should be seen on Radios 1, 3, and 4.
4. While PTTing Radio 2 from Step 3, at the RNM real time viewers:
   > Verify Site 1 is processing the call from Radio 2 as a FDMA (Phase 1) call to Radio 1.
   > Verify Site 2 is processing the call from Radio 2 as a TDMA (Phase 2) call to Radios 3 and 4.
5. PTT Radio 3.
   > Verify the transmit (TX) indicators turn on at Radio 3.

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> Verify Radios 1, 2, and 4 receive the call and hear the audio from Radio 3.
> The ID of Radio 3 should be seen on Radios 1, 2, and 4.

6. While PTTing Radio 3 from Step 5, at the RNM real time viewers:
   > Verify Site 1 is processing the call from Radio 3 as a FDMA (Phase 1) call to Radios 1 and 2.
   > Verify Site 2 is processing the call from Radio 3 as a TDMA (Phase 2) call to Radio 4.

7. Turn off Radio 1.
8. PTT Radio 3.
   > Verify the transmit (TX) indicators turn on at Radio 3.
   > Verify Radio 2 and Radio 4 receive the call and hears the audio from Radio 3.
   > The ID of Radio 3 should be seen on Radios 2 and 4.

9. While PTTing Radio 3 from Step 8, at the RNM real time viewers:
   > Verify Sites 1 and 2 are processing the call from Radio 3 as a TDMA (Phase 2) call to Radios 2 and 4.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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TDMA RUTHLESS PREEMPT, FOR EMERGENCY DECLARATION

Purpose: When all active channels/timeslots at a site are busy, an emergency declaration can preempt calls of a lower priority.

Expected Results: Site will attempt to drop a lower priority local TDMA call when the emergency declaration is TDMA.

Setup:

UAS: TG 64051: "Low Priority"

UAS: TG 64052: "High Priority"

Site 1: UAS: P25 site capability: "Mixed Site"

Site 1: One control channel and one working channel only

Site personality: Emergency declaration: Handling when all channels are busy: "Drop Calls of Lower Priority"

Log into RNM real time Viewers: RSM site activity or VNIC site calls to observe Phase 1 and Phase 2 calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
TDMA Ph2 Radio 1	9980001	TG 64051 P25	64051	1
TDMA Ph2 Radio 2	9980002	TG 64056 P25	64056	1
TDMA Ph2 Radio 3	9980003	TG 64052 P25	64052	1
TDMA Ph2 Radio 4	9980004	TG 64052 P25	64052	1

Execution:

1. PTT Radio 1, and PTT Radio 2.
   > Verify on RNM real time viewers that two TDMA calls are active on the traffic (working) channel.
2. While the two calls are active in Step 1, declare an emergency on Radio 3, and PTT Radio 3 to perform an emergency group call.
   > Verify on the RNM, that the active call on Radio 1 is preempted, and the group emergency is now on the available channel, where the Radio 1 call had been preempted from.
   > Verify Radio 1 no longer has an active call, checking to see that the transmit indicator is off, while still PTTing Radio 1.
   > Verify Radio 4 has received the emergency call and can hear the audio.
3. Release PTT on Radios 1 and 2. Release PTT on Radio 3 and clear the group emergency on Radio 3.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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PRIORITY PREEMPTION OF INBOUND P25 TDMA CALL FOR INBOUND EMERGENCY CALL, QUEUE OPERATION

Purpose: When all active channels/timeslots at a site are busy, the handling of an Emergency Declaration when configured for "queue", results in site always queueing the new emergency declaration request at the emergency priority in the priority preempt queue.

Expected Results: Demonstrate an emergency declaration request will be queued when all active channels/timeslots are busy.

Setup:

Site 1: UAS: P25 Site Capability: "Mixed Site"

Site 1: 1 CC & 1 WC only

Site personality: Emergency Declaration: Handling When All Channels Are Busy: "Queue".

Log into RNM Real Time Viewers: RSM Site Activity or VNIC Site Calls to observe Phase 1 and Phase 2 Calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
TDMA Ph2 Radio 1	9980001	TG 64051 P25	64051	1
TDMA Ph2 Radio 2	9980002	TG 64052 P25	64052	1
TDMA Ph2 Radio 3	9980003	TG 64053 P25	64053	1
TDMA Ph2 Radio 4	9980004	TG 64053 P25	64053	1

Execution:

1. PTT Radio 1, and PTT Radio 2.
   > Verify on RNM real time site activity that 2 TDMA calls are active on the traffic (working) channel.
2. While the 2 calls are active in step 1, declare an emergency on Radio 3 and PTT Radio 3 to make an emergency group call.
   > Verify on the RNM, that Radio 1 and Radio 2 remain on the 2 TDMA slots on the traffic (working) channel.
3. Un-PTT Radio 1.
   > Verify on the RNM real time site activity that the emergency from Radio 3 is now on the channel/slot that Radio 1 had been on previously.
   > Verify Radio 4 has received the emergency call and can hear the audio.
4. Release PTT on Radio 2. Release PTT on Radio 3 and clear the group emergency on Radio 3.

TEST RESULTS
Tester:
Date:
Result: ☐   Pass   ☐   Fail

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P25 RADIO CHECK

Purpose: To verify the radio is connected to the VIDA system and is available for communications.

Expected Results: Symphony dispatcher can send a message to a radio, and the dispatcher can see the time the text message was sent to the radio.

Setup:

Radio 1 registered on Site 1.

Radio 2 not registered on Site 1.

Symphony Console has radio check license.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
TDMA Ph2 Radio 1	9980001	TG 64051 P25	64051	1
TDMA Ph1 Radio 2	9980002	TG 64051 P25	64051	1

Execution:

1. Dispatcher presses "Radio Check" button for Radio 9980001, on Symphony.
   > Verify text to the left of the "Radio Check" button indicates the time the message was sent.
2. Dispatcher presses "Radio Check" button for Radio 9980002, on the Symphony.
   > Verify the text to the left of the "Radio Check" button indicates that the text message failed to reach Radio 9980002.

TEST RESULTS	
Tester:	
Date:	
Result: ☐ Pass	☐ Fail

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MESSAGE TRUNKING ON PHASE 1

Purpose: Test will demonstrate that the system, for FDMA Phase 1 group calls, operates as enhanced message trunking (MT) for group calls.

Expected Results: Verify the system will assign the same working channel to a message trunking call if the next call happens within the message trunking hang time. During the hang time, the transmitting radio will return to the control channel for FDMA (Phase 1) group calls, which is enhanced message trunking.

Setup: Radios 1, 2, and 3 should be the only radios on the system. Each call needs to be made within 3 seconds of each other. Trunk group 64301 is a FDMA (Phase 1) MT group.

Use RNM real time viewers to monitor system channel assignment and call type.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64301 P25	64301	1
Radio 2	9980002	TG 64301 P25	64301	1
Radio 3	9980003	TG 64301 P25	64301	1

Execution:

1. Log into RNM, Realtime Tab, start RSM Site Activity or VNIC Site Calls to monitor system channel assignment and call type during active calls. Observe all channels on Site 1 during the test. PTT Radio 1 and talk.
    > The transmit (TX) indicators (red light) should turn on at Radio 1.
    > On the RNM, observe the number of the channel assigned.
    > Verify audio from Radio 1 is heard at Radio 2 and Radio 3.
2. Un-PTT Radio 1.
    > Verify Radio 1's LED light turns off, no color, to indicate Radio 1 is on the control channel (CC), during the hang time.
3. PTT Radio 2, within the 3 second hang time, and talk.
    > The transmit (TX) indicators (red light) should turn on at Radio 2.
    > Verify the same channel is assigned, as in Step 1.
    > Verify audio from Radio 2 is heard at Radio 1 and Radio 3.
4. Un-PTT Radio 2.
    > Verify Radio 2's LED light turns off, no color, to indicate Radio 2 is on the control channel (CC), during the hang time.
5. PTT Radio 3, within the 3 second hang time, and talk.
    > The transmit (TX) indicators (red light) should turn on at Radio 3.
    > Verify the same channel is assigned as in Steps 1 and 3.
    > Verify audio from Radio 3 is heard at Radio 1 and Radio 2.
6. Un-PTT Radio 3.
    > Verify Radio 3's LED light turns off, no color, to indicate Radio 3 is on the control channel (CC), during the hang time.

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TEST RESULTS

Tester:

Date:

Result: ☐ Pass ☐ Fail

MESSAGE TRUNKING ON PHASE 2

Purpose: Demonstrate the system, for TDMA phase 2 group calls, operates as standard message trunking for group calls.

Expected Results: System will assign the same working channel to a message trunked call if the next call takes place within the message trunked hang time. During the hang time, the transmitting radio will remain on the traffic (working) channel for TDMA phase 2 group calls, which is standard message trunking.

Setup: TDMA-enabled Radios 1, 2, and 3 should be the only radios on the system. Each call needs to take place within 3 seconds of each other. Trunk group 64353 is a TDMA (Phase 2) message trunked.

Use RNM real time viewers to monitor system channel assignment and observe calls.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID	SITE
Radio 1	9980001	TG 64353 P25	64353	1
Radio 2	9980002	TG 64353 P25	64353	1
Radio 3	9980003	TG 64353 P25	64353	1

Execution:

1. Log into RNM, Realtime Tab, start RSM Site Activity or VNIC Site Calls to monitor system channel assignment and call type during active calls.
2. PTT Radio 1 and talk.
   > The transmit (TX) indicators (red light) should turn on at Radio 1.
   > On the RNM, observe the number of the channel assigned and the channel slot assigned.
   > Verify audio from Radio 1 is heard at Radios 2 and 3.
3. Un-PTT Radio 1.
   > Verify Radio 1's LED Receive (RX) indicator turns green, to indicate Radio 1 remains on the Traffic (Working) channel, during the hang time.
4. PTT Radio 2, within the 3 second hang time, and talk.
   > The transmit (TX) indicators (red light) should turn on at Radio 2.
   > Verify the same channel / slot is assigned, as in Step 2.
   > Verify audio from Radio 2 is heard at Radios 1 and 3.
5. Un-PTT Radio 2.
   > Verify Radio 2's LED light turns green. Indicates Radio 2 remains on the traffic channel, during the hang time.
6. PTT Radio 3, within the 3 second hang time, and talk.
   > The transmit (TX) indicators (red light) should turn on at Radio 3.
   > Verify the same channel / slot is assigned in Steps 2 and 4.
   > Verify audio from Radio 3 is heard at Radios 1 and 2.
7. Un-PTT Radio 3.
   > Verify Radio 3's LED light turns green, to indicate receive (Rx). Indicates Radio 3 remains on the traffic channel, during the hang time.
   > After the hang time expires, verify Radio 3's LED light turns off.

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TEST RESULTS

Tester:

Date:

Result: ☐   Pass   ☐   Fail

Unencrypted / Encrypted Calls

Radios need to have encryption keys loaded prior to doing the tests in this section.

SINGLE SITE GROUP TEST CALL

Purpose: The group test call will show that the site will allow a radio to communicate using a group call.

Expected Results: The test will demonstrate that all radios assigned to a common group will hear a call and all radios assigned to an uncommon group will not hear the call.

Setup: Ensure scan is turned OFF on radios. All radios should not be in encrypted mode but have encryption keys.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. PTT Radio 1 and talk.
   > The transmit (TX) indicators should turn on at Radio 1.
   > Audio should be heard in Radios 2 and 3.
   > The ID of Radio 1 should be seen on Radios 2 and 3.
   1. Set Radio 3 to (TG64002 P25). PTT on Radio 1 and talk.
3. The transmit (TX) indicators should turn on at Radio 1. Audio should be heard in Radio 2 only.
   > The ID of Radio 1 should be seen at Radio 2 only.
4. Repeat Steps 1-3 for encrypted mode

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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SINGLE SITE INDIVIDUAL (PRIVATE) CALL

Purpose: Verify that the site will allow two radios to communicate on a private call.

Expected Results: Demonstrate two radios can communicate on an individual call and other radios will not hear the private conversation.

Setup: All radios should not be in encrypted mode but have encryption keys.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. On Radio 1, select the Individual Call Function, and select pre-stored Radio 2 ID, or enter Radio 2's ID, and PTT Radio 1.
   > Verify that Radio 2 receives the call and displays the ID of Radio 1. Verify that Radio 3 remains idle.
2. Release the PTT on Radio 1 and immediately PTT on Radio 2.
   > Verify that Radio 1 receives the call and displays the ID of Radio 2.
   > Verify Radio 3 remains idle.
3. On Radio 1, select the Individual Call Function, and select pre-stored Radio 3 ID, or enter Radio 3's ID, and PTT Radio 1.
   > Verify that Radio 3 receives the call and displays the ID of Radio 1.
   > Verify that Radio 2 remains idle.
4. Release the PTT on Radio 1 but do not immediately PTT Radio 3.
   > Verify that Radio 3 gives a Call Back Alert (WHC - "Who Has Called") Indication.
5. Make a return call from Radio 3 back to Radio 1.
   > Verify that Radio 1 receives the call and displays the ID of Radio 3.
   > Verify Radio 2 remains idle.
6. Repeat Steps 1-5 for encrypted mode.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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ENCRYPTED GROUP CALL TEST

Purpose: Encrypted call test will demonstrate that radios that have the encryption keys will hear encrypted calls and radios that do not have encryption keys will not hear encrypted calls.

Expected Results: Radios 1 and 2 will hear encrypted calls, and Radio 5 will not hear encrypted calls because it does not have encrypted keys. All the radios will hear unencrypted calls.

Setup: Radios 1 and 2 should have encryption keys and be set to encryption mode. Radio 5 should not have encryption keys and be set to encryption mode.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64051 P25	64051
Radio 2	9980002	TG 64051 P25	64051
Radio 5	9980005	TG 64051 P25	64051

Execution:

1. PTT Radio 1 and talk.
   > Audio should be heard on Radio 2.
   > No audio should be heard on Radio 5.
2. PTT Radio 5 and talk.
   > Audio should be heard on Radio 1 and 2.
   > Radio 5 should display that it does not have a key.

TEST RESULTS
Tester:
Date:
Result: ☐   Pass   ☐   Fail

ENCRYPTED INDIVIDUAL (PRIVATE) CALL

Purpose: The individual call test will verify that the site will allow two radios to communicate on a private call.

Expected Results: Test will demonstrate that two radios can communicate on an individual call and other radios will not hear the private conversation.

Setup: Set Radios 1, 2, and 3 to (TG64001) per test group structure. All radios should not be in encrypted mode but have encryption keys.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. On Radio 1, select the Individual Call Function, and select pre-stored Radio 2 ID, or enter Radio 2's ID, and PTT Radio 1.
2. Verify that Radio 2 receives the call and displays the ID of Radio 1. Verify that Radio 3 remains idle.
3. Release the PTT on Radio 1 and immediately PTT on Radio 2.
4. Verify that Radio 1 receives the call and displays the ID of Radio 2. Verify Radio 3 remains idle.
5. On Radio 1, select the Individual Call Function, and select pre-stored Radio 3 ID, or enter Radio 3's ID, and PTT Radio 1.
6. Verify that Radio 3 receives the call and displays the ID of Radio 1. Verify that Radio 2 remains idle.
7. Release the PTT on Radio 1 but do not immediately PTT Radio 3. Verify that Radio 3 gives a Call Back Alert (WHC- "Who Has Called") indication. Then make the return call from Radio 3 back to Radio 1.
8. Verify that Radio 1 receives the call and displays the ID of Radio 3. Verify Radio 2 remains idle.

TEST RESULTS

Tester:

Date:

Result: ☐   Pass   ☐   Fail

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TDMA DES

Purpose: Confirms the operation of DES encryption for TDMA voice calls.

Expected Results: Encrypted talkgroups can communicate.

Setup: Console 1 programmed with a DES encrypted TDMA trunk group and two radios programmed with the same DES trunk group and key, one radio with the group but no key and one radio with the DES group with a different key.

Execution:

1. Place a call from one of the radios with the correct key on the DES group.
   > Confirm that the call is heard on the other radio and the console.
   > Confirm the call is not heard on the two radios that do not have the correct key.
2. Place a call on the DES group from the console.
   > Confirm that the call is heard on the two radios with the correct key.
   > Confirm the call is not heard on the two radios that do not have the correct key.

TEST RESULTS				
Tester:				
Date:				
Result:	☐	Pass	☐	Fail

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MULTISITE ENCRYPTED GROUP TEST CALL

Purpose: Demonstrate group test call will show that the site will allow a radio to communicate using a group call.

Expected Results: Test will demonstrate that all radios assigned to a common group will hear a call and all radios assigned to an uncommon group will not hear the call.

Setup: Ensure scan is turned OFF. All radios should not be in encrypted mode but have encryption keys.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. PTT Radio 1 and talk.
   > The transmit (TX) indicators should turn on at Radio 1.
   > Audio should be heard in Radios 2 and 3.
   > The ID of Radio 1 should be seen on Radios 2 and 3.
2. Set Radio 3 to (TG64002 P25), PTT on Radio 1 and talk.
   > The transmit (TX) indicators should turn on at Radio 1.
   > Audio should be heard in Radio 2 only.
   > The ID of Radio 1 should be seen at Radio 2 only.

TEST RESULTS
Tester:
Date:

Result:	☐	Pass	☐	Fail

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MULTISITE ENCRYPTED INDIVIDUAL (PRIVATE) CALL

Purpose: Demonstrate individual call test will verify that the site will allow two radios to communicate on a private call.

Expected Results: Test will demonstrate that two radios can communicate on an individual call and other radios will not hear the private conversation.

Setup: All radios should not be in encrypted mode but have encryption keys.

DESCRIPTION	RADIO LID	TG DESCRIPTION	TG ID
Radio 1	9980001	TG 64001 P25	64001
Radio 2	9980002	TG 64001 P25	64001
Radio 3	9980003	TG 64001 P25	64001

Execution:

1. On Radio 1, select the Individual Call Function, and select pre-stored Radio 2 ID, or enter Radio 2's ID, and PTT Radio 1.
   > Verify that Radio 2 receives the call and displays the ID of Radio 1.
   > Verify that Radio 3 remains idle.
2. Release the PTT on Radio 1 and immediately PTT on Radio 2.
   > Verify that Radio 1 receives the call and displays the ID of Radio 2.
   > Verify Radio 3 remains idle.
3. On Radio 1, select the Individual Call function, and select pre-stored Radio 3 ID, or enter Radio 3's ID, and PTT Radio 1.
   > Verify that Radio 3 receives the call and displays the ID of Radio 1.
   > Verify that Radio 3 remains idle.
4. Release the PTT on Radio 1 but do not immediately PTT Radio 3.
   > Verify that Radio 3 gives a Call Back Alert (WHC - "Who Has Called") Indication.
   > Then make the return call from Radio 3 back to Radio 1.
   > Verify that Radio 1 receives the call and displays the ID of Radio 3.
   > Verify Radio 2 remains idle.

TEST RESULTS			
Tester:			
Date:			
Result:	☐ Pass	☐ Fail	

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Subscriber Unit Test Notes / Issues

Subscriber Unit Test Acceptance

This Functional Test Acceptance Procedure has been fully and successfully completed with all action items resolved.

Hunt County, Texas Representative   L3Harris Technologies Representative

_____   _____
Signature   Signature

_____   _____
Printed Name and Title   Printed Name and Title

_____   _____
Date   Date

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APPENDIX A – ACRONYMS AND DEFINITIONS

ACRONYM	DEFINITION
AD	Active Directory
AES	Advanced encryption standard
ATP	Acceptance test procedure
CAI	Common air interface (usually in reference to P25)
CME	Cisco Mobility Exchange (Telco Interconnect)
CNM	Central Network Manager, a L3Harris product
Confirmed Call	A confirmed call is a special type of call where the call is queued until all sites have resources available, or until the confirmed call timer expires (configurable, typically one or two seconds)
COTS	Commercial-off-the-shelf
CPC	Channel performance criterion
DAQ	Delivered audio quality
DES	Digital encryption standard
LMR	Enterprise land mobile radio
ESN	Electronic serial number (64 bits)
FDMA	Frequency division multiple access
GID	Group ID (16 bit). This corresponds to a talkgroup. The group ID is unique within a VNIC and can be reused on other VNICs within the same WACN. Some of the older P25 documents refer to the GID as a talkgroup ID (TGID)
HA	High availability
Individual Call	An individual call is a private call between one user and another. It can be between two radios, or between one radio and a dispatch console
KEK	Key Encryption Key
KID	16-bit encryption key ID
KMF	Key Management Facility
KMM	Key Management Message
LAN	Local area network
MASTR V	A L3Harris base station product
MES	Mobile end system, a subscriber radio
MME	Miniature mobility exchange, which consists of L3Harris software running on a SitePro card at the base site. The MME runs the SNDCP layer of the data protocol and is the equivalent of the P25 RFG (RF Gateway)

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ACRONYM	DEFINITION
N(S)	A 3-bit sequence number for the packet data unit
NSC	Network switching center
NSS	Network switching server
NWS	Network Sentry
OTAP	Over-the-air-programming
OTAR	Over-the-air-rekeying
P25	Project 25, a suite of standards for digital radio communications, developed by the Association of Public Safety Communications Officials (APCO) under the TIA TR-8 engineering committee, and published as the TIA-102 set of documents
Priority Talkgroup	The priority talkgroup selected on the subscriber device. Usually this is the talkgroup that the radio will transmit on when the user presses PTT
ProFile	A L3Harris product used for configuring radios over the P25 radio channel
ProScan	A L3Harris software algorithm used for radio roaming
PTT	Push-to-talk
RAR	Regional access router
RF	Radio frequency
RNM	Regional network manager
RSM	Regional site manager, a server that runs the RSM, Activity Warehouse and Device Manager applications
RSSI	Received signal strength indicator
RVM	Regional VIDA Manager, a server that runs the UAS and RNM applications
SAN	Storage area network
SMT	System management terminal.
SU	Subscriber unit. In the P25 world, an SU is a mobile or portable radio
SUT	System under test
SUMS	Security Update Management Service (a L3Harris product)
SUMSplus	Version of SUMS
TAC	Technical Assistance Center, a L3Harris service
TDMA	Time division multiple access
TEK	Traffic Encryption Key
TGID	Talkgroup ID (16 bit, equivalent to GID). The P25 documents usually use GID but some of the older documents use TGID
Traffic Controller	Software entity that resides in a base station at the site and generates the P25 control channel
Tx	Transmit
UAC	Unified audio card

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ACRONYM	DEFINITION
UAS	Unified administration server
UKEK	User Key Encryption Key
UPS	Uninterrupted power supply
VAS	VIDA Application Server
VIDA	Voice, Interoperability, Data, Access (a L3Harris system product)
VLAN	Virtual local area network
VM	Virtual machine
VNIC	Voice network Interface Controller, the L3Harris voice switch
VPN	Virtual private network
VTI	VIDA Telephone Interconnect
WACN	Wide area communication network (20 bit network ID, part of SUID). This is a customer network that can include many VNICs
WAR	Wide area router
Zeroize	A P25 control channel command which causes the mobile radio to erase its encryption keys (but then requires manual loading to restore encryption keys)

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COVERAGE ACCEPTANCE TEST PLAN

Customer:
Hunt County, TX

Prepared by:
Jessica Barrón

Table of Contents

About This Test

These procedures provide an accurate, statistically valid, repeatable, objective, and cost-effective method to verify all of L3Harris's coverage commitments to Hunt County, TX are met.

This Coverage Acceptance Test Plan (ATP), where applicable, conforms with the requirements set forth in the latest revision of Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin TSB-88 titled "Wireless Communications Systems - Performance in Noise and Interference-Limited Situations - Recommended Methods for Technology-Independent Modeling, Simulation, and Verification". TSB-88 defines Channel Performance Criterion (CPC) as the specified minimum design performance level in a faded channel and provides a set of Delivered Audio Quality (DAQ) CPCs that define subjective voice quality performance applicable to both analog and digital voice systems.

L3Harris designs a balanced system such that uplink performance is comparable to downlink performance. Because of this design approach, the principal of reciprocity (as defined by TSB-88) ties the inbound predictions to the outbound test results in a mathematically predictable manner. In accordance with TSB-88, we will infer talk-in performance from the outbound test data.

SITE PERFORMANCE VALIDATION

As part of our standard installation practices, we measure and record electrical measurements and timing parameters of equipment. L3Harris will provide these measurements to the County as part of the final documentation package. These parameters may include:

> Base station output and reflected power
> Base station receiver sensitivity
> Receiver subsystem alignment parameters
> Time domain reflectometry of transmission line
> Combiner loss (if applicable)

Prior to conducting the testing procedures detailed in this document, we review each site to verify that the radio system is operating properly. The reviews verify the antenna configuration, the power into the antenna, the antenna installation, and the system channel used for test. We will provide all test equipment necessary to perform the reviews.

Definitions

SUBSCRIBER UNIT USAGE

All tests requiring subscriber (terminal) units in this document will use L3Harris subscriber units as proposed and similar to or taken from the County's original order. L3Harris will bench test and align all subscriber (terminal) radios prior to their use during coverage testing.

Test Vehicle Configuration

The non-stationary test equipment will mount inside one or more SUVs or vans, with external antennas mounted on the roof. The roof of the test vehicle(s) must not contain any other objects, including lightbars, roof racks, or other obstructions. All non-test radios must be off during testing. We may divide

test equipment into multiple test vehicles. L3Harris will determine the number of test vehicles required and which tests, if any, can be run concurrently.

SERVICE AREA

TSB-88 defines a service area as a boundary of the geographic area of concern for a user, and states that Validated CPC Service Area Reliability is the percentage of test locations in the bounded service area that meet or exceed the specified CPC. We are using a Bounded Area design for the County as defined in TSB-88 wherein coverage predictions are made out to the boundary of the defined service area and coverage verification occurs throughout the service area out to the boundary through the performance of a Validated CPC Service Area Reliability test.

Figure 1 shows the service area of Hunt County, TX.

Figure 1. Hunt County, TX Service Area
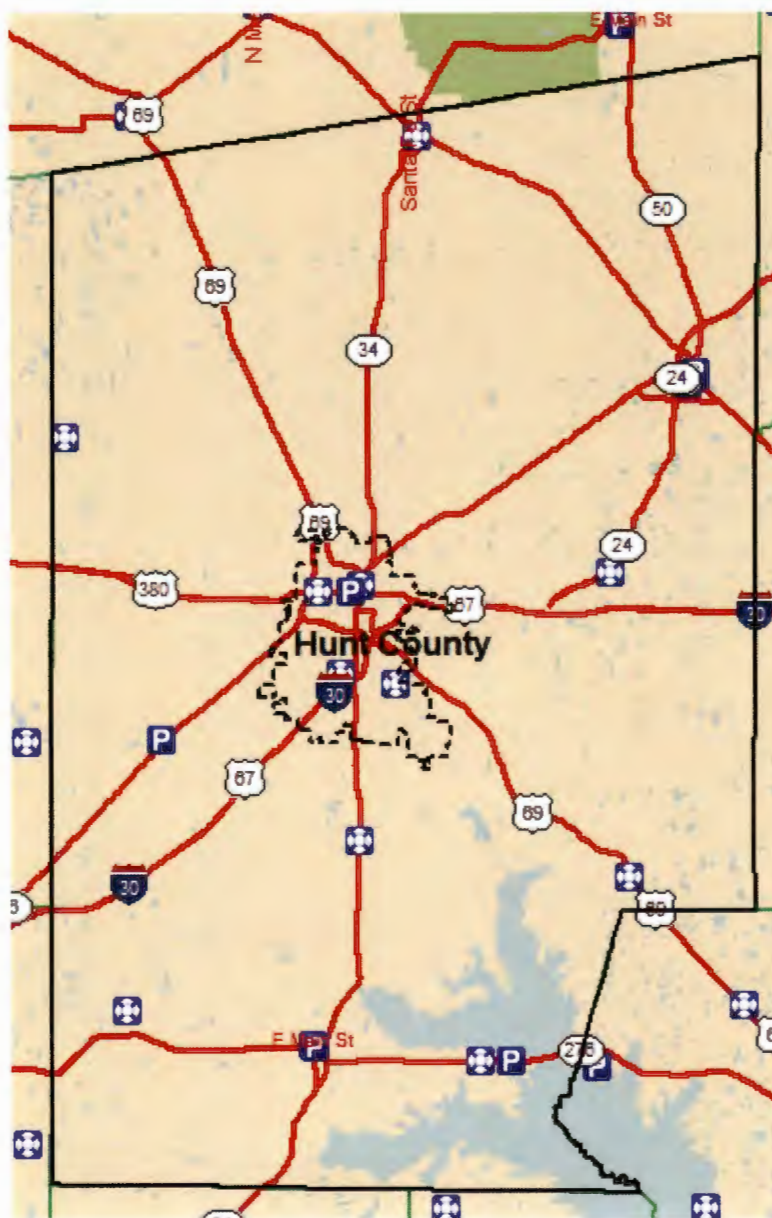
SERVICE AREA GRID STRUCTURE

TSB-88 recommends coverage verification measurements at a statistically significant number of random test locations, uniformly distributed throughout the service area. We divide the service area by a test grid pattern using TSB-88 Estimate of Proportions analysis to determine the number and size of the test tiles. This analysis provides both statistically significant measurement results and a high confidence that the results are a true indication of the installed radio system coverage.

Figure 2 provides our recommended tile sizes to obtain a uniform distribution of tiles throughout the service area(s).

Figure 2. Service Area, Tile Size, and Tile Count

SERVICE AREA DEFINITION	TILE SIZE (MILES)	APPROXIMATE TILE COUNT
Hunt County	1 x 1	890

Figure 3. Hunt County Unfiltered Tile Structure
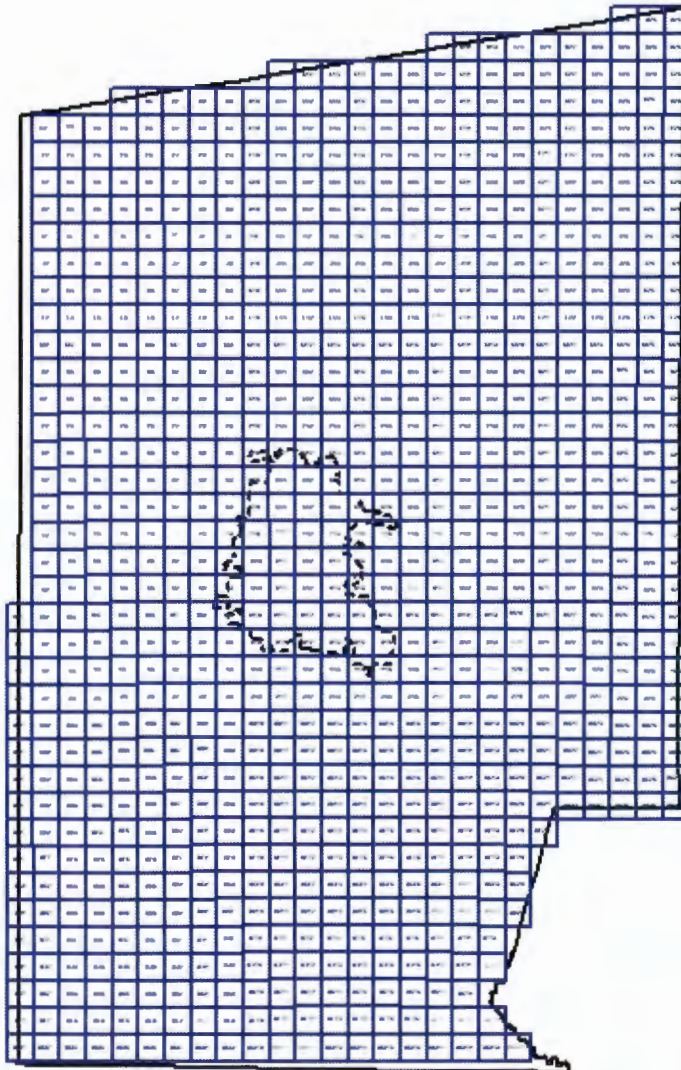
The grid pattern overlays onto street maps and the drive test team will navigate through all accessible tiles (i.e. those having roads) within the defined service area boundaries. Based on the US Census Bureau TIGER roads database, Figure 4 shows the estimated number of accessible tiles in the service area.

Figure 4. Service Area Accessible Tile Count

SERVICE AREA	APPROXIMATELY ACCESSIBLE TILE COUNT
Hunt County	870

To include as many test tiles as possible, we deem the following roads accessible:

> Primary roads
> Secondary roads
> Local roads (streets)
> Ramps
> Service drives

The final determination on accessibility will be made by the drive test team based on the conditions they encounter. The following are examples of tiles that will be deemed inaccessible:

> Tiles that require special permission from property owners to (not counting cases where the County has obtained or provided permission)
> Tiles that are hazardous to navigate or may result in the test vehicle becoming stuck or damaged
> Tiles that require clearing of brush, debris, or other obstacles before the vehicle can enter
> Tiles that do not have road access

The test team should not pass through tunnels, underpasses, underground garages, or other man-made obstructive areas where radio coverage is not planned or expected while testing. If they do pass through any of these areas while testing, we disable the TYPHON test unit to prevent collection of data in these areas.

Measurements will be made in all accessible tiles within the defined service area boundaries. We do not use test measurements outside of each service area boundary. Any areas or accessible tiles within the service area boundary that the County decides not to test will score as a PASS in the reliability calculations.

We will discard inaccessible tiles (i.e. those having no roads) from the reliability calculations with the acceptance criteria adjusted by treating the inaccessible tiles as exclusion zones.

Figure 5 shows the accessible tile structure of Hunt County, TX.

Figure 5. Hunt County Accessible Tile Structure
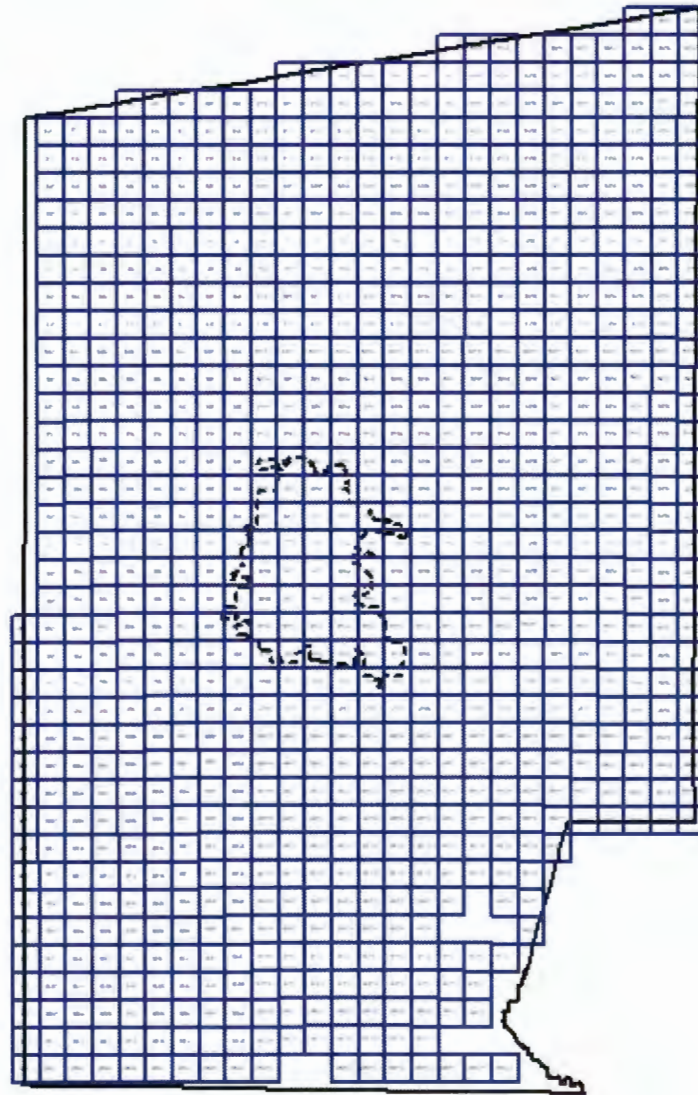
DELIVERED AUDIO QUALITY

TSB-88 defines Channel Performance Criterion (CPC) as the specified minimum design performance level in a faded channel and provides a set of Delivered Audio Quality (DAQ) CPCs that define subjective voice quality performance applicable to both analog and digital voice systems. The DAQ definitions are in Figure 6.

Figure 6. Delivered Audio Quality Scale Definitions

DELIVERED AUDIO QUALITY	SUBJECTIVE PERFORMANCE DESCRIPTION
DAQ 5.0	Speech easily understood.
DAQ 4.5	Speech easily understood. Infrequent Noise/Distortion.
DAQ 4.0	Speech easily understood. Occasional Noise/Distortion.
DAQ 3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion.
DAQ 3.0	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion.
DAQ 2.0	Understandable with considerable effort. Frequent repetition due to Noise/Distortion.
DAQ 1.0	Unusable, speech present but unreadable.

STAKEHOLDER RESPONSIBILITIES

Hunt County, TX to provide:

> Any non-automobile test vehicles required for the testing (e.g. boats for water-based coverage testing)
> A driver / operator for any customer-provided test vehicles
> Customer representative(s) to participate in tests as necessary
> Access to the test areas as may be required in each test procedure

L3Harris to provide:

> SUV/van for roads-based drive testing
> A driver for L3Harris-provided vehicles
> Drive test measurement equipment
> Representatives to operate this equipment and execute the test procedures
> Representative(s) to participate in tests as necessary
> Final test results

Coverage Guarantees

L3Harris offers these guarantees based on the system design provided in the proposal. Deviation from the details of the design including, but not limited to, site count, tower location, antenna make and model, antenna location on the tower, changes to the antenna sub-systems, etc. will require a re-analysis of the coverage and may require a change to the coverage guarantee. The details of the design are shown in Figure 10 at the end of this document.

These coverage guarantees only apply once installation and testing of all sites in the system has been completed.

Figure 7. Service Area Coverage Guarantees

SERVICE AREA DEFINITION AS SHOWN IN FIGURE 2	DESCRIPTION	REQUIRED PERFORMANCE CRITERIA	% VALIDATED CPC SERVICE AREA RELIABILITY ACCEPTANCE CRITERIA
Hunt County	Mobile	DAQ 3.4	95%
Hunt County	Portable Outdoor	DAQ 3.4	95%

Radio system coverage and performance are subject to degradation due to undefined anomalous propagation and interference beyond control of L3Harris. L3Harris cannot be responsible for degradation or disruption of Service caused by operation of other radio systems or by natural phenomena or other interference over which L3Harris has no reasonable control. In the event of a case of degradation due to interference by an outside source, with outside source encompassing everything other than L3Harris supplied equipment, L3Harris will provide engineering support to Hunt County, TX at the County's expense to support efforts in resolving the interference issue with the outside party.

The project schedule may have to be adjusted to account for both the time spent reviewing and determining the source of the interference and the time spent working on potential mitigation efforts. Not all interference may be able to be mitigated and coverage guarantees may have to be adjusted based on the presence of external interference that is unable to be mitigated.

If a failure of the tests defined in this document occurs, L3Harris reserves the right to determine if failed test point/test tiles are due to undefined anomalous propagation and interference. If these are external sources of interference and are beyond the control of L3Harris, any point/tiles will be excluded from subsequent data analysis, and the Percent Validated CPC Service Area Reliability re-calculated.

In locations where multiple coverage guarantees apply, performance need only be demonstrated at the most stringent level. For example, a test point that is demonstrated to have passing portable outdoor coverage is also considered to have passing mobile coverage.

Talk-Out Signal Strength Characterization Test

This test characterizes RF coverage by measuring talk-out (base to mobile) signal strength throughout the County's defined bounded service area.

SETUP

This test will use our TYPHON wireless testing system to measure coverage performance. TYPHON uses calibrated test receivers to produce repeatable measurement results in conformance with industry standards. L3Harris maximizes the accuracy of test measurements through periodic calibration of the TYPHON system and using its integrated automated hardware and software that minimizes the likelihood of procedural errors. TYPHON can configure with up to four industrial grade measurement receivers to provide RSSI data for single or multiple sites, a GPS receiver to provide accurate position information for each measured data point, a computer with an internal clock that coordinates and records the test data, and a roof mounted antenna. TYPHON contains multiple receivers to facilitate gathering data simultaneously from several multi-sites or simulcast sites at common measurement locations.

DATA MEASUREMENTS

The TYPHON equipment mounts inside the test vehicle (a large van or SUV is recommended) with an external antenna mounted on the outside and centrally located on the vehicle's roof, without other equipment installed on the roof.

Each radio system base station site transmits either on the control channel, or an unmodulated carrier, on one selected working channel, and the equipment makes measurements of this signal at equal distance intervals throughout the entire drive route. The TYPHON equipment, operating at a minimum 1000 Hz sampling rate, operates in the "40λ Wave Distance Average" analysis mode. With the test vehicle in motion[1] along the drive route, a local mean signal measurement is made every 40-wavelengths[2]. By averaging a minimum of 200 data points within each 40-wavelength measurement window, the estimated mean value is within ±1 dB of the actual value with 99% confidence.

DATA ANALYSIS

As defined by Section 5 of TSB-88.3, latest revision, we post-process all mean measurement data records collected from the drive test within the defined service area boundary, with data records recorded every 0.1-mile (typically) used in the final analysis.

For each service area, we adjust the minimum acceptable signal level at a portable radio to the mobile measurement reference point using the loss factors shown in Figure 8 (e.g., portable body loss, excess signal required to penetrate each random building category). A comparison is made between the mean

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[1] *Vehicle velocity must not exceed 60 miles per hour to ensure an adequate number of points over the measurement window.*

[2] *40 wavelengths for UHF, 800 MHz and 900 MHz. 20 wavelengths for VHF 150 MHz.*

measurement points in the service area and this adjusted minimum level, denoting the adjusted signal threshold.

Figure 8. Coverage Service Area and Signal Level

SERVICE AREA DEFINITION AS SHOWN IN FIGURE 2	DESCRIPTION	MINIMUM REQUIRED SIGNAL LEVEL (DBM)	BODY LOSS (DB)	BUILDING LOSS (DB)	ADJUSTED SIGNAL THRESHOLD (DBM) [3]
Hunt County	Mobile	-110 dBm	0 dB	0 dB	-110 dBm
Hunt County	Portable Outdoor	-110 dBm	8 dB	0 dB	-102 dBm

RESULTS PRESENTATION

We plot the data records on a map showing the test tiles, the areas tested, and the test results. Different colors show ranges of measured mean signal levels. An included test report summarizes the test results.

Adjusted Signal Threshold accounts for portable body loss and antenna gain and will be finalized prior to acceptance testing based on actual equipment configuration.

Talk-Out Bit Error Rate (BER) Bounded Area Test

This test verifies RF coverage by measuring talk-out (base to mobile) BER throughout the bounded service areas defined in Figure 2, and by calculating the percentage of measurements that are equal or better than a BER of 2.4% required to support the specified CPC of DAQ 3.4.

SETUP

We use our TYPHON wireless testing system to measure BER. TYPHON consists of L3Harris terminal radios, a GPS receiver to provide accurate position information for each measured data point, a computer with an internal clock that coordinates and records the test data, roof mounted antennas, and variable attenuators for use when testing portable coverage.

The TYPHON equipment mounts inside the test vehicle (SUV/van) and has an external antenna(s) mounted on the outside, centrally located on the vehicle's roof, without other equipment installed on the roof.

When testing portable coverage, a variable attenuator installs in the test vehicle between the radio and the external antenna to simulate portable operations on the hip for both outdoor and indoor operation. For portable outdoor coverage verification, the variable attenuator is set to the appropriate level to account for portable body losses. For portable indoor coverage verification, the variable attenuator is set to account for the portable body losses plus the loss of the building category under evaluation. Variable attenuator values, where applicable, are shown in Figure 9.

Figure 9. Coverage Service Area, Body/Building Loss, and Attenuator Values

SERVICE AREA DEFINITION AS SHOWN IN FIGURE 2	DESCRIPTION	BODY LOSS (DB) [4]	BUILDING LOSS (DB)	ATTENUATOR VALUE (DB)
Hunt County	Mobile	0 dB	0 dB	0 dB
Hunt County	Portable Outdoor	8 dB	0 dB	8 dB

DATA MEASUREMENTS

Each radio system base station site continuously transmits a P25 test pattern data sequence on a working channel (in a simulcast system, the same working channel is used for each simulcast site). The TYPHON equipment inside the test vehicle collects measurements of this signal every 3 seconds as it is driven along the defined test drive route. The software in the TYPHON laptop computer automatically records the BER as reported by the terminal radio for each 3-second measurement data record along the test drive route.

Attenuator portable loss accounts for portable body loss and antenna gain and will be finalized prior to acceptance testing based on actual equipment configuration.

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DATA ANALYSIS AND ACCEPTANCE

As defined by Section 5 of TSB-88.3, latest revision, we post-process all mean measurement data records collected from the drive test within the defined service area boundary, with data records recorded every 0.1-mile (typically) used in the final analysis. Measurements that have a BER equal to or less than 2.4% record as PASS; the remainder record as FAIL.

The installed radio system meets the coverage requirements if, for each bounded service area in Figure 7, the ratio of the number of PASS points to the total number of points in the service area equals or exceeds the minimum validated CPC service area reliability acceptance criteria.

RESULTS PRESENTATION

We plot the data records on a map showing the test tiles, the areas tested, and the test results. Different colors show ranges of measured BER. An included test report summarizes the test results.

System Parameters

Figure 10. System Design Parameters

SITE NAME		HC_CELESTE	HUNT COUNTY - CROWN CASTLE	HUNT COUNTY - SHERIFF'S OFFICE	HUNT COUNTY - WATER TOWER
Site ID		HC_Cel	HC_CC	HC_SO	HC_WTID
Latitude		33° 18' 17.930" N	33° 08' 14.000" N	33° 08' 15.763" N	32° 54' 07.740" N
Longitude		96° 12' 03.330" W	96° 12' 48.000" W	96° 06' 18.817" W	96° 06' 43.589" W
Datum		WGS 1984	WGS 1984	WGS 1984	WGS 1984
Site Elevation		676 ft	568 ft	532 ft	499 ft
Base Station		MASTR V	MASTR V	MASTR V	MASTR V
Frequency Range		764 - 806 MHz	764 - 806 MHz	764 - 806 MHz	764 - 806 MHz
SITE TRANSMIT	Station Output Power	60.3 W	64.6 W	69.2 W	66.1 W
	Combiner Model	DSCC75 (4 ch.)	DSCC75 (4 ch.)	DSCC75 (4 ch.)	DSCC75 (4 ch.)
	Tx to Tx Spacing	250	250	250	250
	Combiner Loss	2.4 dB	2.4 dB	2.4 dB	2.4 dB
	Filter/Duplexer Model	CP05470	CP05470	CP05470	CP05470
	Filter/Duplexer Loss	1.0 dB	1.0 dB	1.0 dB	1.0 dB
	Coax Type	1-5/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	300 ft	200 ft	240 ft	210 ft
	Coax Loss	2.1 dB	2.3 dB	2.7 dB	2.4 dB
	Antenna Model	SC49C-HWBLDF (D00-PIP)	SE4192-SWBP2LDF (D00)	SC46A-HF1LDF (D00-PIP)	SC49C-HWBLDF (D00-PIP)
	Antenna Height (C.L)	250 ft	150 ft	190 ft	160 ft
	Antenna Azimuth	0°	215°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	11.2 dBd	11.7 dBd	10.0 dBd	11.2 dBd
	Maximum ERP (Hzn)	223.8 W	257.0 W	169.8 W	229.1 W
	HAAT	290.0 ft	144.0 ft	168.0 ft	180.0 ft

SITE RECEIVE	Total System Gain	7.2 dB	7.3 dB	7.2 dB	7.3 dB
	Multicoupler Model	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	300 ft	200 ft	240 ft	210 ft
	Tower Top Amp Model	CP00732	CP00732	CP00732	CP00732
	TTA Pad	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Distribution Pad	6.1 dB	6.5 dB	7.1 dB	6.4 dB
	Duplexer Loss	0.0 dB	0.0 dB	0.0 dB	0.0 dB
	Antenna Model	SC49C-HWBLDF (D00-PIP)	SE4192-SWBP2LDF (D00)	SC46A-HF1LDF (D00-PIP)	SC49C-HWBLDF (D00-PIP)
	Antenna Height (C.L)	250 ft	150 ft	190 ft	160 ft
	Antenna Azimuth	0°	215°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°	0°
	Antenna Gain (Hzn)	11.2 dBd	11.7 dBd	10.0 dBd	11.2 dBd
	HAAT	290.0 ft	144.0 ft	168.0 ft	180.0 ft

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Figure 10. System Design Parameters (Continued)

SITE NAME		HUNT COUNTY - WHITLEY	IMS NORTH	IMS SOUTH
	Site ID	HC_Wly	IMS_N	IMS_S
	Latitude	33° 14' 12.480" N	33° 04' 30.512" N	33° 03' 50.681" N
	Longitude	95° 54' 36.432" W	96° 04' 11.821" W	96° 04' 10.870" W
	Datum	WGS 1984	WGS 1984	WGS 1984
	Site Elevation	532 ft	522 ft	525 ft
	Base Station	MASTR V	MASTR V	MASTR V
	Frequency Range	764 - 806 MHz	764 - 806 MHz	764 - 806 MHz
SITE TRANSMIT	Station Output Power	67.6 W	77.6 W	69.2 W
	Combiner Model	DSCC75 (4 ch.)	DSCC75 (4 ch.)	DSCC75 (4 ch.)
	Tx to Tx Spacing	250	250	250
	Combiner Loss	2.4 dB	2.4 dB	2.4 dB
	Filter/Duplexer Model	CP05470	CP05470	CP05470
	Filter/Duplexer Loss	1.0 dB	1.0 dB	1.0 dB
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam
	Coax Length	220 ft	270 ft	230 ft
	Coax Loss	2.5 dB	3.1 dB	2.6 dB
	Antenna Model	SC49C-HWBLDF (D00-NUFP)	SC46A-HF1LDF (D04-PIP)	SC46A-HF1LD0F (D04-PIP)
	Antenna Height (C.L)	170 ft	120 ft	80 ft
	Antenna Azimuth	0°	0°	0°
	Antenna Mechanical Tilt	0°	0°	0°
	Antenna Gain (Hzn)	11.4 dBd	1.9 dBd	1.9 dBd
	Maximum ERP (Hzn)	239.9 W	26.9 W	26.9 W
	HAAT	177.0 ft	119.0 ft	89.0 ft
SITE RECEIVE	Total System Gain	7.3 dB	7.3 dB	7.3 dB
	Multicoupler Model	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)	CP00929-12MHzAC (8 ch.)
	Coax Type	7/8" Foam	7/8" Foam	7/8" Foam

Coax Length	220 ft	270 ft	230 ft
Tower Top Amp Model	CP00732	CP00732	CP00732
TTA Pad	0.0 dB	0.0 dB	0.0 dB
Distribution Pad	6.3 dB	5.7 dB	6.2 dB
Duplexer Loss	0.0 dB	0.0 dB	0.0 dB
Antenna Model	SC49C-HWBLDF (D00-NUFP)	SC46A-HF1LDF (D04-PIP)	SC46A-HF1LDF (D04-PIP)
Antenna Height (C.L)	170 ft	120 ft	80 ft
Antenna Azimuth	0°	0°	0°
Antenna Mechanical Tilt	0°	0°	0°
Antenna Gain (Hzn)	11.4 dBd	1.9 dBd	1.9 dBd
HAAT	177.0 ft	119.0 ft	89.0 ft

REVISION HISTORY

DATE	REVISION	DESCRIPTION
July 27, 2022	0	Initial release

TRAINING

Overview

The training program proposed by L3Harris provides Hunt County personnel with the knowledge and skills needed to operate the new P25 radio system.

The knowledge and skills of Hunt County (County) personnel will have to be developed to successfully operate the proposed P25 radio system. County personnel will require performance-based training for system administrators and end user operations.

To provide high-quality, performance-based training, L3Harris develops and maintains our training courses using a systematic approach. This methodology identifies the training necessary for each job position and focuses on the performance of tasks. Courses are designed and developed with explicit learning objectives and appropriate content. We evaluate the training effectiveness and use the results to maintain and improve the training programs.

The systematic approach to training methodology also ensures that we deliver training in the most effective learning environment, such as a classroom or laboratory, and use a proper mixture of discussion, lecture, and hands-on training to provide for optimal learning. In addition, we create easy to follow student materials that support the training and provide appropriate supplemental technical documentation.

Our technical training staff, comprised of training professionals with extensive experience in both telecommunications and adult learning, deliver the training. Instructor certification ensures that each trainer possesses the instructional skills and technical competencies to deliver high-quality training to our customers. We regularly evaluate our instructors and they participate in a continuing instructor development program to maintain and improve their technical and instructional knowledge and skills. Further, we assign our instructors to conduct customer training based on their areas of expertise.

The proposed Training Program for Hunt County encompasses P25 System Manager Training for five (5) persons, Radio User Training and Dispatcher Training.

The Training Plan for the County encompasses:

> System Manager Training

> Radio User Training

> Dispatcher Training

System Manager Training

Figure 1 lists the training courses that comprise the Custom P25 System Manager Training Program and indicates whether the training uses a virtual classroom or traditional classroom training conducted on-site in Hunt County.

Figure 1. P25 System Manager Training Program

COURSE/WORKSHOP NAME	WEB-BASED TRAINING	ON-SITE TRAINING
P25 Fleet Mapping Workshop	-	4 days
Custom P25 System Manager Training		8 days
P25 System Overview		included
Unified Administration System Course		included
Regional Network Manager/Activity Warehouse Course		included
P25 System Manager Web-based Training Package for five (5) managers	included	N/A

The P25 Fleet Mapping Workshop will be conducted at a facility provided by the County and should be attended by the system manager(s) and key representatives from the user community. Each student will receive a hardcopy of the training presentations, associated hands-on exercises, and applicable technical documentation for each course.

The contract includes tuition for up to five (5) Radio System Managers to participate in the eight (8) day Custom P25 System Manager Training that will be delivered on site in Hunt County.

In addition to the above traditional classroom training, system managers will receive unlimited access to the following web-based training courses for one (1) year beginning on a date of the customer's choosing. The courses below are some of the training topics covered by the P25 System Manager Web-based Training Bundle.

> P25 Fleet Mapping Overview
> XL-200P Radio Operation
> Symphony Console Operation
> Radio Programming Overview
> Advanced Access Control (AAC)
> Radio Personality Manager 2 (RPM 2)
> Active Directory
> Activity Warehouse

> Unified Administration System (UAS) Overview
> UAS "How to…" Training Modules
> Regional Network Manager (RNM) Overview
> Enterprise Network Manager (ENM)
> Over-The-Air Programming (OTAP)
> Over-The-Air Rekeying (OTAR) Fundamentals
> OTAR "How to…" Training Modules
> Inter-RF Subsystem Interface (ISSI) Fundamentals

Additional self-paced courses will be added to the web-based training program, as developed, at no additional cost to the County.

Course descriptions that make up the System Manager Training Plan are listed below:

P25 FLEET MAPPING WORKSHOP

This workshop will assist the County in defining the system fleet map and planning radio personalities. The workshop begins with an abbreviated overview of the P25 system that focuses on system design and operation so that participants can make informed decisions about the fleet map. The workshop explores advantages of different talk group structures and configuration parameters (e.g., property classes, priority levels, etc.) associated with talk groups and radio users. We will include discussion of other configuration options such as announcement groups and the workshop will also ensure sufficient definition of interoperability talk groups. This workshop should be conducted during system installation.

P25 SYSTEM OVERVIEW COURSE

This course provides system managers with an understanding of terminology, equipment, components, and operational processes associated with the P25 system. Topics include RF communication basics, VIDA network and site equipment, call processing, wide-area coverage solutions, interoperability, and much more. This course provides system managers with prerequisite knowledge for system management application training on the Unified Administration System and Regional Network Manager.

UNIFIED ADMINISTRATION SYSTEM COURSE

This course provides system managers with the knowledge to create and maintain system databases using the Unified Administration System (UAS). Course topics include logging into the UAS, establishing user accounts, navigating through the user interface, creating, and changing parameter values, and adding/deleting radio users and talk groups.

REGIONAL NETWORK MANAGER/ ACTIVITY WAREHOUSE COURSE

This course provides system managers with the knowledge to monitor and manage the P25 system using the Regional Network Manager (RNM) for diagnostic processes, and the Activity Warehouse Application for report generation. Course topics include system access, monitoring the status of system equipment, identification and acknowledgement of system faults, historical views of system performance, exploring real-time viewers, and scheduled vs dynamic report generation.

RADIO PROGRAMMING COURSE

This course provides system managers with the knowledge and skills to program L3Harris P25 portable and mobile radios using Radio Personality Manager 2 (RPM 2) software. Participants will be trained to perform the following tasks, as applicable:

> Develop radio personalities to meet user needs

> Select the appropriate bandwidth settings

> Create trunked and conventional frequency sets

> Create group sets

> Create channel identity set

> Create an individual call set

> Create a phone call set

> Create trunked and conventional systems

> Create zones

> Configure radio roaming capabilities

> Configure options specific to the programmed radio

> Convert sets from local to global and global to local

> Program a P25 radio and verify proper operation

This content completes the System Manager Training Plan which also provides the ongoing support of 1-year of access to L3Harris Technical University for up to five (5) Radio System Managers.

Radio User Training

INSTRUCTOR-LED TRAINING

The importance of radio users understanding basic system operation and the operation of their portable and/or mobile radios cannot be overstated. L3Harris provides Radio User Training based on a train-the-trainer approach. In this approach, we will provide model training and support materials for designated County trainers to use during the implementation phase. Each train-the-trainer session on radio operation is scheduled for 4-hrs and two sessions can be scheduled for the (1) day proposed. Each session may include up to fifteen (15) County trainers. The training includes the following:

> An overview of the Hood County P25 radio system including the talkgroup structure

> A description of system operation including failure modes

> A discussion of radio/system coverage expectations

> A discussion and demonstration of the differences between analog and digital voice

> A demonstration of basic radio operations including proper radio use

> Hands-on practice with the radios

> A discussion of basic radio care including battery maintenance

L3Harris will provide customized presentation materials for the instructors as well as electronic copies of the training materials to allow for additional customization, if desired. County trainers will also be provided with a flash drive that contains three (3) short training videos on conventional versus trunked operation, analog versus digital voice, and the radio noise cancellation feature.

This training will be conducted approximately two-to-four weeks prior to cutover to allow time for the trainers to practice using the equipment as well as to hold training sessions for their trainees. This training will occur at a facility provided by the County and use L3Harris radios purchased as part of the system.

ONLINE REFRESHER TRAINING

L3Harris Technical University will host and provide one (1) year of unlimited access to standard radio operational self-paced, web-based training courses for all County personnel. Each student will require a unique e-mail address, self-register, and create a unique username and password. Students will be able to access transcript information showing course progress and completion status, and print a completion certificate once all course activities are completed. One County appointee will receive training from the L3Harris Technical University Administrator to manage the delivery of the online training content.

Dispatcher Training

Dispatch personnel are at the core of effective and efficient implementation of a radio system. While the time required for training is minimal, the payback is immense. Training on the Symphony Dispatch Console consists of console configuration and operation training for designated dispatch personnel, and web-based refresher training.

CONSOLE CONFIGURATION & OPERATION TRAINING

L3Harris will conduct an on-site, two-day Console Configuration and Operation course for up to five (5) designated dispatch personnel. This course provides participants with the knowledge and skills to configure the Symphony Dispatch Console to meet operational needs, and operational training using a train-the-trainer approach that prepares participants to train County dispatchers.

The console configuration portion of the training includes a detailed operational overview that introduces the various features and capabilities of the console. Participants will work within the configuration utility to explore the various settings and how these settings impact the operation of the console. With an understanding of the Configuration Utility settings, participants will have the requisite knowledge to define the parameters that best satisfy operational needs. These settings will be saved and used as a template to set up additional consoles. Additionally, the operating characteristics of the console will be defined, and the Configuration Editor will be used to create setups to address the various functions required. This includes performing the following tasks:

> Adding, renaming, and deleting workspace tabs

> Designing communications modules (i.e., entities, colors, sizes, etc.)

> Adding, deleting, and moving communication modules

> Changing the sidebar panel layout

> Creating, switching, deleting and password protecting console setups

> Setting encryption indicators and controls (if applicable)

The operational portion of the training includes performing the following tasks using the Symphony Dispatch Console, as applicable:

> Select communication modules

> Transmit and receive group and individual calls

> Transmit, receive, and clear emergency calls

> Review call history and play back audio

> Modify communication modules

> Create, modify, and transmit on patches and simulselects

> Control conventional channels

> Use the paging function

> Change console setups

> Use special and enhanced console features

This training will take place at a county dispatch facility after the Symphony Dispatch Consoles are installed and made operational but prior to cutover. Each participant will receive a copy of the training presentation, any applicable technical documentation, and both an electronic and hard copy of the Symphony Dispatch Console Operation Quick Reference Guide.

ONLINE REFRESHER TRAINING

The importance of refresher training for dispatchers is paramount to smooth and effective operations. L3Harris Technical University consists of a web-based Symphony Dispatch Console Operation training course that effectively delivers ongoing training and reinforce knowledge transfer that took place during instructor-led training. Performance will improve, and the number of trouble reports reduced by enhancing the knowledge and skills of County personnel on console operation. Additionally, it can be used to train new personnel due to turnover. A web-based training solution has numerous benefits that include the following:

> Training is accessible whenever needed (24 hours a day, seven days a week) from any location that has access to the Internet.

> The course is self-paced, highly interactive, and developed utilizing animation and other multimedia tools to help keep students engaged, which increases retention.

> It is cost-effective, especially when considering student or instructor travel and living expenses associated with attending traditional classroom instruction.

> Training delivery is consistent and structured to ensure learning objectives are met.

Figure 2. The Symphony Dispatch Console was designed with input from dispatchers to reduce workflow

L3Harris will provide the County with one year of unlimited access to the web-based Symphony Dispatch Console Operation course for all County dispatch personnel. The training will be delivered through L3Harris Technical University. L3Harris recommends that access is provided to dispatchers prior to the instructor-led training to optimize learning console operation.

Summary

The comprehensive training program recommended and proposed for Hunt County involves personnel from various departments and at many levels. We envision a program that facilitates a smooth and seamless transition to the new P25 radio system and builds the foundation for long-term excellence. Wide participation and in-depth instruction reflect our commitment to delivering an outstanding training program. Additional training content may be purchased if desired. The following link opens the Technical Training webpage where one can download the current Technical Training Catalog which lists all available courses, schedules and pricing. https://www.l3harris.com/all-capabilities/technical-training-emergency-responders

Trainers who would potentially work on this project are listed on p.34-36 of the above-linked 2022 Technical Training Catalog.

PRICING SUMMARY
Firm Fixed Price Disclaimer

L3Harris is pleased to provide Hunt County, Texas with the following firm fixed price proposal. Pricing is valid for 60 days from submittal date of August 26, 2022. Upon expiration of the pricing validity, L3Harris reserves the right to provide an updated pricing proposal.

P25 TRUNKED LMR SYSTEM	PRICE (USD $)
RF Site Equipment - 4 Sites	$1,174,195.00
Microwave	$937,500.00
Disptach Equipment - Networking, Consoles & Back-up Control Stations	$161,554.00
Interoperability	$26,212.00
DC Plants	$144,350.00
ISSI - 3 Systems with 8 Talkpaths Each	$148,140.00
P25 TRUNKED SYSTEM SUBTOTAL	**$2,591,951.00**
SUBSCRIBER UNITS	**PRICE (USD $)**
Mobile Radios - XL-200M Qty. 40	$475,139.20
Portable Radios - XL-200P Qty. 50	$460,250.50
SUBSCRIBER UNITS SUBTOTAL	**$935,389.70**
PROFESSIONAL SERVICES	**PRICE (USD $)**
Professional Services	$1,016,992.00
Installation	$904,414.00
Training	$91,405.00
Managed Services (Years 1-3)	$474,440.00
PROFESSIONAL SERVICES SUBTOTAL	**$2,487,251.00**
SYSTEM TOTAL	***$6,014,591.70***
Less System Discount	**$1,418,986.70**
Managed Services (Years 1-3) Discount	**$474,440.00**
PROJECT TOTAL	**$4,121,165.00**

*State and Local taxes not included

SOFTWARE LICENSE AGREEMENT

This License Agreement ("License Agreement") is made upon the Effective Date of the Primary Agreement (the "Effective Date") between L3Harris Technologies, Inc., a Delaware Corporation, acting through its Communication Systems Segment, ("LICENSOR" or "L3Harris") with offices at 221 Jefferson Ridge Parkway, Lynchburg, VA 24501 and Hunt County, Texas ("LICENSEE"). LICENSOR is the owner of certain wireless communications software programs and LICENSEE desires to obtain a license from LICENSOR to use such wireless communications programs.

1.0 Definitions.

1.1 "Designated Systems": Means the L3Harris System(s), products, and Designated Terminals purchased by Buyer and identified in the Primary Agreement for which the Licensed Programs and documentation are intended to be used.

1.2 "Designated Terminals": Means the LICENSOR's Terminals purchased by LICENSEE.

1.3 "Licensed Programs": The term Licensed Programs shall mean the wireless communications computer programs in software or firmware supplied under this License Agreement by LICENSOR in binary object code format to the LICENSEE (stand alone or in conjunction with the purchase of a LICENSOR wireless communications System.) Licensed Programs shall also include all other material related to the Licensed Programs supplied by LICENSOR to LICENSEE hereunder, and which may be in machine readable or printed form, including but not limited to user documentation and/or manuals.

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Seller warrants, for the greater of a period of one year or, if a longer Warranty Period for the product containing the Licensed Program is set forth in a Primary Agreement, the longer Warranty Period shall apply commencing with the date of Licensee's Acceptance of their Designated System, that any Licensed Program furnished to Licensee under this License Agreement shall be capable of successfully operating on the Designated System in accordance with the logic defined in the operator's manuals when the System is supplied with correct input data. If, on the basis of evidence submitted to LICENSOR within the term of this warranty, it is shown that any Licensed Program does not meet this warranty, LICENSOR will, at its option, either correct the defect or error in the Licensed Program, free of charge, or make available to Licensee a substitute program. The foregoing warranty is exclusive and in lieu of all other warranties whether written, oral, implied or statutory. **NO IMPLIED OR STATUTORY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, SHALL APPLY, ALL OF WHICH ARE EXPRESSLY DISCLAIMED BY LICENSOR.**

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If any term or provision of the License Agreement is determined by a court or government agency of competent jurisdiction to be invalid under any applicable statute or rule of law, such provision(s) are, to that extent, deemed omitted, but this License Agreement and the remainder of its provision shall otherwise remain in full force and effect.

9.0 Waiver.

No waiver will be implied from conduct or failure to enforce rights. No waiver will be effective unless in writing signed on behalf of the party against whom the waiver is asserted.

10.0 Compliance with Laws.

Licensee acknowledges that the Licensed Programs are subject to the laws and regulations of the United States and Licensee will comply with all applicable laws and regulations, including export laws and regulations of the United States. Licensee will not, without the prior authorization of L3Harris and the appropriate governmental authority of the United States, in any form export or re-export, sell or resell, ship or reship, or divert, through direct or indirect means, any item or technical data or direct or indirect products sold or otherwise furnished to any person within any territory for which the United States Government or any of its agencies at the time of the action, requires an export license or other governmental approval. Violation of this provision is a material breach of this License Agreement.

11.0 Governing Law.

This License Agreement will be governed by the laws of the Unites States to extent that they apply and otherwise to the laws of the State of Texas and Hunt County. The terms of the U.N. Convention on Contracts for the International Sale of Goods do not apply. The parties expressly agree that the Uniform Computer Information Transactions Act ("UCITA") applicable in any jurisdiction shall not apply to this License Agreement.

12.0 U.S. Government.

If Licensee is the U.S. Government, the Licensed Programs and documentation qualify as "commercial items," as that term is defined at Federal Acquisition Regulation ("FAR") (48 C.F.R.) 2.101, consisting of "commercial computer software" and "commercial computer software documentation" as such terms are used in FAR 12.212. Consistent with FAR 12.212, and notwithstanding any other FAR or other contractual clause to the contrary in any agreement into which the License Agreement may be incorporated, Customer may provide to Government end user or, if the License Agreement is direct, Government end user will acquire, the software and documentation with only those rights set forth in the License Agreement. Use of either the software or documentation or both constitutes agreement by the Government that the software and documentation are "commercial computer software" and "commercial computer software documentation," and constitutes Acceptance of the rights and restrictions herein.

13.0   Agreement.

This License Agreement may be part of a Primary Agreement between LICENSOR and LICENSEE for the purchased products by LICENSEE from LICENSOR. The Primary Agreement and this License Agreement contain the full understanding of the parties with respect to the subject matter hereof and which supersede all prior understandings and writings relating thereto and which shall become binding on the Effective Date of this License Agreement. No waiver, consent, modification, amendment, or change to the terms of this License Agreement shall be binding unless agreed to in a writing signed by LICENSEE and LICENSOR. If there is any conflict between the terms of the Primary Agreement and this License Agreement as to the Licensed Programs, the terms of this License Agreement will prevail.

14.0   Notices.

Notices shall be provided as set forth in the Primary Agreement. In the event there is no notice provision in the Primary Agreement, notices and other communications between the parties shall be transmitted in writing by certified mail or nationally recognized overnight courier service.

15.0   Survival.

Sections 2, 3, 5, 6, 8, 9, 11, and 13 of this License Agreement shall survive termination of this agreement.
[End of Document]

EXHIBIT C

INFRASTRUCTURE MANAGED SERVICES AGREEMENT

[Attached Separately]