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IMPLEMENTATION
A PROVEN METHODOLOGY

Introduction

Harris excels in the multifaceted implementation of mission critical radio systems to fulfill the specific needs of our customers and support their vital public safety operations. The flowchart below shows the steps necessary to deliver a radio system that will replace components of Aurora and Naperville's (Aurora/Naperville) legacy system. The process starts with the system design, and culminates with acceptance of the new Harris DMR/P25 radio system.

1	2	3	4	5	6
SYSTEM DESIGN	FACTORY ACCEPTANCE TEST	SYSTEM IMPLEMENTATION	FIELD ACCEPTANCE TEST	SYSTEM CUTOVER	FINAL SYSTEM ACCEPTANCE

System Design

Kick-Off Meeting and Preliminary Design Review

The project manager initiates project implementation with a Project Kick-Off Meeting, followed by a Preliminary Design Review. The Harris Team, and Aurora/Naperville, will mutually agree on the timing of these meetings. The objectives of the meeting include:

- Introduction of all project participants
- Review of the roles of the project participants
- Review of the overall project scope, objectives, and deliverables
- Review of the current site status

- Review of customer owned site documentation

- Review of the preliminary project schedule

- Schedule site surveys with Aurora/Naperville, and/or site owner designated representatives.

Customer Design Review (CDR)

The Harris Team uses the information obtained during the kick-off meeting, preliminary design review, and site surveys, along with the regulatory and engineering documentation, to deliver the final system design at the CDR. The Harris Team presents design drawings and documentation during the CDR with Aurora/Naperville.

Figure 1. Customer Design Review Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Prepare for Customer Design Review		
Assemble project team and travel to the Aurora/Naperville's location	X	
Assemble customer team for kick-off meeting		X
Provide location in appropriate conference room or training facility		X
Present preliminary information on sites and design	X	
Provide information and status on sites		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 surveys (if required)	X	
Provide site plans and applicable electrical and layout plans		X
Provide up-to-date drawings along with a current mapping of installed antennas and cabling		X
Perform grounding analyses	X	
Develop required drawings	X	
Develop network plans and IP backhaul requirements	X	
Develop site electrical loads	X	
Develop preliminary cutover plan	X	
Develop formal project schedule	X	
Prepare acceptance test procedure (ATP) documents	X	
Customer Design Review Deliverables		
System block diagrams	X	
List of deliverable equipment for each site	X	
Rack elevation drawings	X	

Tasks	Harris	Aurora/Naperville
Preliminary cutover plan	X	
ATP	X	
Project schedule	X	
Customer Design Review		
Provide deliverables for review	X	
Review documents		X
Provide location for CDR meeting		X
Approve the design following CDR meeting (within 5 business days)		X

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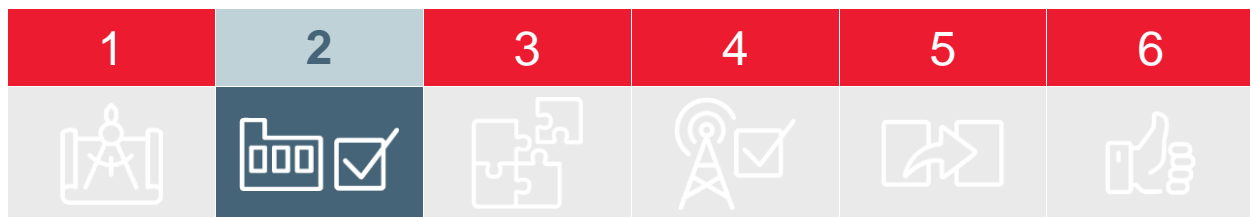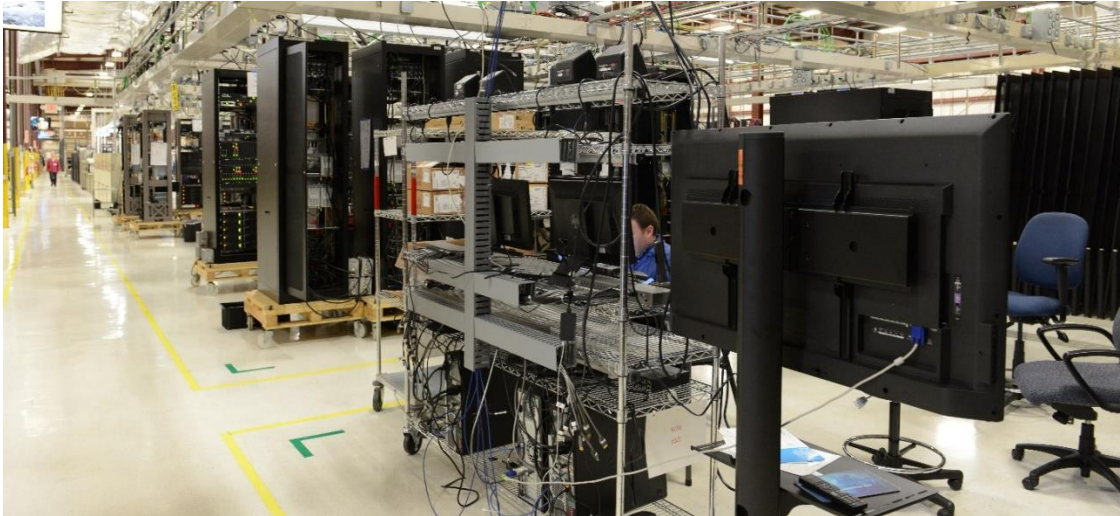
Factory Acceptance Test

System Integration and Test – Factory Staging

Immediately following customer approval of the final design, the Harris 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 items, and then tests each rack of equipment.

After assembly and test, each RF site rack will go through configuration, which consists of loading customer specific parameters and personalities into each applicable piece of equipment. The network switching center (NSC) will undergo an imaging process. After imaging is complete, a Staging technician will perform a build and validation check against the NSC image. The Staging technicians make all network connections for each site's equipment including NSC, dispatch,. Ethernet and/or fiber cable connections are made to simulate backhaul networks and ensure the equipment connects to the network switches. The Staging Team verifies system levels and tests all features to confirm the system is ready for factory acceptance test (FAT). Once a dry run FAT completes by the Staging Team, the system transitions over to the system engineer for a week-long dry run of the FAT.

Running the FAT demonstrates the radio system functionality. The FAT uses the functional acceptance test plan (ATP) tests appropriate to run in the factory staging environment. The ATP defines each test, with instructions on how to set up and run the test, and compares the actual results to the expected results. The responsibility matrix shown in Figure 2 provides the Staging activities that the Harris Team is responsible for, and those activities that are the responsibility of Aurora/Naperville.

Figure 2. System Integration and Test - Staging Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Insert equipment delivery dates into the material planning system	X	
Place orders with the factory	X	
Place orders with key suppliers	X	
Place orders for supplier items	X	
Manufacture all infrastructure equipment	X	
Assemble equipment in staging area on a per site basis	X	
Run FAT	X	

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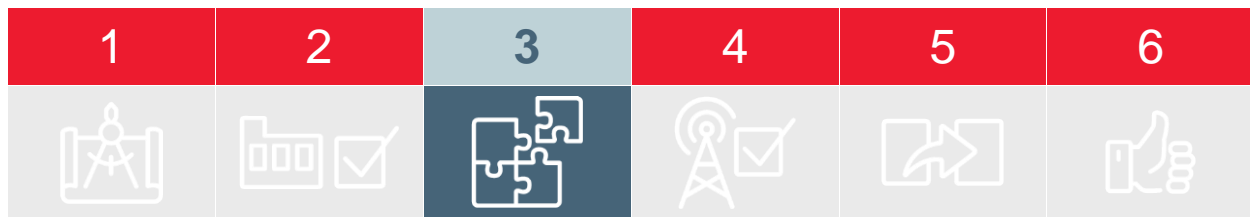
Shipping, Warehousing, and Inventory

After a successful factory acceptance test (FAT), the Harris Team packages all system elements 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.

Figure 3 shows the shipping and inventory activities that the Harris Team is responsible for, and those activities that are the responsibilities of Aurora/Naperville.

Figure 3. Shipping & Inventory Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Break down equipment and ship to storage area	X	
Provide temporary storage near Aurora/Naperville's location		X
Inventory equipment	X	
Validate Harris equipment inventory		X
Sort equipment in preparation for site delivery and installation	X	

System Implementation

Site Development

All site development activities shall be the responsibility of Aurora/Naperville. This includes space, electrical, HVAC, backup power, etc.

Shelters/Equipment Rooms

EXISTING SHELTERS/EQUIPMENT ROOMS

Existing shelters/equipment rooms shall be physically inspected and floor space calculations performed to verify that there is adequate space to install new equipment racks without removing existing equipment racks. Inadequate space in existing shelters/equipment rooms shall result in additional fees.

General and Site Development Responsibility Matrices

The general responsibility matrix in Figure 4 describes the general project responsibilities of both parties that are not associated with any specific site.

Figure 4. General Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Coordinate with federal, state, and local government agencies, as required		X
Provide access to all buildings and sites, including temporary ID badges for Harris project team		X
Provide parking permits for Harris 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		X

Tasks	Harris	Aurora/Naperville
required to provide the adequate AC power needed for each site		
Develop sites		X
Provide final backhaul requirements to the Aurora/Naperville	X	
Provide backhaul which meets the final backhaul requirements provided by Harris		X

The site responsibility matrices in Figure 5 define the responsibilities of both parties for the implementation of the P25 Project.

Figure 5. Existing Customer-Owned Sites Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Customer-Owned Site Tasks		
Obtain any necessary zoning approval for site changes		X
Provide existing site plans		X
Perform grounding analysis	X	
Provide Aurora/Naperville site survey results reports and recommendations	X	
Existing Shelter/Equipment Rooms		
Provide floor space in existing RF shelter/equipment rooms 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
Upgrade existing interior ground system (if required)		X
Provide additional cable ladder for new equipment row		X
Prepare and submit electrical permits on behalf of the customer		X
Provide floor space at the dispatch center and network center for new system equipment		X
Provide backup power (UPS) for NSC		X
Provide backup power (UPS) for consoles		X
Provide demarcation blocks for connection to existing legacy radios to be used in interoperability system		X

Infrastructure Installation

The Harris Team develops the installation plan during the detailed design phases of the project and presents it to Aurora/Naperville for review and approval. The installation plan includes floor plan drawings, equipment rack-up drawings, and installation procedures based on site surveys conducted by the Team, or designated subcontractors. The installation plan coordinates all 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 VIDA core and network equipment in existing equipment locations.

Harris assumes that Aurora/Naperville-provided shelters/equipment rooms will accommodate the height of open racks and allow them to position to maintain the desired 36 inches of free aisle space (in front and in the rear). Racks and cabinets anchor to the floor using at least four anchor points.

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

Site equipment installations follow industry standards, including Harris Grounding and Lightning Protection. The Team reviews the installation work to ensure implementation of these standards.

Infrastructure Equipment

Upon completion of the VIDA core work, system engineers (or maintenance technicians) upgrade the OpenSky base-stations, and associated equipment.

Aurora/Naperville personnel and/or their representatives are given advanced notice to prepare for their participation in acceptance testing.

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

Figure 6 provides a system installation responsibility matrix the infrastructure equipment. This matrix shows those tasks that Harris is responsible for, and those activities that are the responsibility of Aurora/Naperville.

Figure 6. System Infrastructure Installation Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Deliver equipment to each site	X	
Install equipment, connect to ground system and apply power	X	
Interface to network, verify network connectivity	X	

System 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.

Harris will conduct a preliminary acceptance test to determine that the systems are fully optimized and ready for the acceptance test with Aurora/Naperville.

Figure 7. System Optimization Matrix

Tasks	Harris	Aurora/Naperville
Prepare all installed sites for site inspections	X	

Tasks	Harris	Aurora/Naperville
Verify microwave/backhaul system is functional and meets reliability specifications		X
Provide frequencies to use for optimization and testing (if frequencies are currently in use in existing system)		X
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 network switching operation	X	

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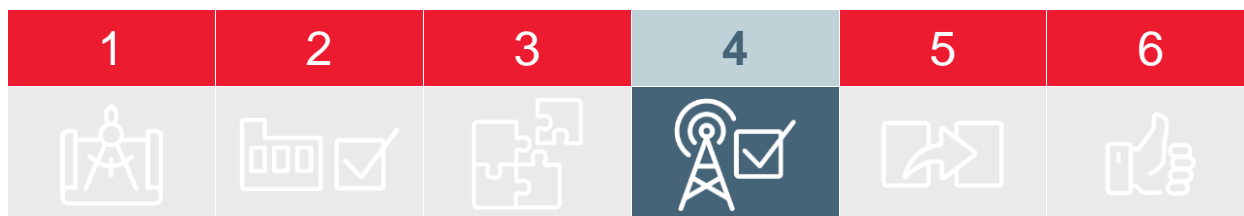
Functional Acceptance Test

Acceptance Testing

We will perform systems acceptance testing per the agreed upon acceptance test plan (ATP). The Harris Team notifies Aurora/Naperville 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. The Harris Team uses a punch list 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 Aurora/Naperville's project manager(s). With Aurora/Naperville's approval, the project team, and Aurora/Naperville, can proceed with cutover.

Figure 8 provides a detailed listing of those acceptance testing activities performed by Harris, and those activities to be performed by Aurora/Naperville.

**Figure 8. Acceptance Testing Responsibility Matrix**

Tasks	Harris	Aurora/Naperville
Provide appropriate team members to participate in acceptance tests		X
Inspect each site with newly installed equipment, noting discrepancies on the punch list	X	
Inspect each dispatch center, noting discrepancies on the punch list	X	
Inspect each network switching center, noting discrepancies on the 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, and network monitoring	X	
Submit functional ATP results	X	
Approve functional ATP results (within 5 business days)		X

Conditional System Acceptance

Harris will submit initial system acceptance documentation for Aurora/Naperville to sign, marking the successful conclusion of acceptance testing, and readiness for system cutover.

Figure 9. System Acceptance Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Submit letter of system acceptance	X	
Sign letter of final system acceptance (within 5 business days)		X
Approve Cutover Plan		X
Notify users of system cutover date		X
Proceed with System Cutover according to Cutover Plan	X	

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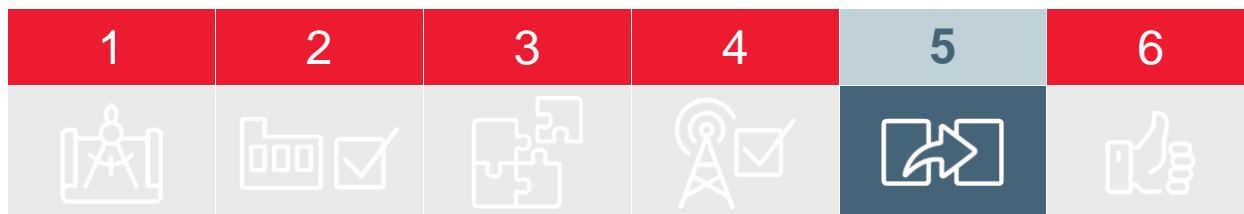
System Cutover

Cutover Plan

Cutover will be closely tied to the construction sequence and site build out. The complexity, and interdependence of support systems involved, and the large number of subscribers need to be taken into consideration during the planning of cutover. Harris is certain that Aurora/Naperville and Harris share the same overarching goals in the process – that there are no lost calls, and that each agency maintains departmental communications during the process.

We will collaboratively plan cutover from the existing radio systems to the new radio system to minimize disruption to operations of the participating agencies. Cutover generally occurs at a mutually agreeable time during a relatively quiet period where any cutover disruptions would have little effect on operations. For the cutover to progress as rapidly as possible, the plan will consider:

- Fixed equipment cutover

- Interfaces with and transfer of control to or from existing systems/equipment

- Dispatching transitions

- Special sequences

- Scheduled downtime

- Dual operation as necessary

- Personnel schedules

Harris will provide a detailed cutover plan to Aurora/Naperville for approval prior to beginning acceptance testing. Cutover will occur only after the cutover plan approval by Aurora/Naperville, acceptance testing completion.

To make cutover a success, careful planning, and good communication of the plan, must take place to ensure everything, and everyone, is ready, scheduled and coordinated. Dispatcher training is critical to a successful cutover and will occur just before the selected cutover date and time.

Cutover Plan Development

Harris and Aurora/Naperville will work together to prepare a mutually agreed upon cutover plan 90-120 days before the system is available for user integration.

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 would be broken into multiple phases to ensure the smooth transition to new system.

The cutover plan will address:

- **Dispatch Support During Cutover** – During NSC cutover, it may be required that users communicate on backup radio channels for a brief maintenance window. A solution will be created where the dispatcher positions can talk to field units on the backup system during the transition phase.

- **Dispatch Center Cutover** – Operation of the new consoles will be verified before cutover is to begin. Harris will work closely with the Aurora/Naperville's Project Manager to coordinate the Dispatch Center cutover soon after the Aurora/Naperville NSC cutover.

- **Dispatcher Training** – Radio users will need to be trained on the new subscriber radios' operation. Our Harris training team will provide the City of Aurora quick-reference materials per trainee and produce seminar-oriented train-the-trainer materials per trainee to facilitate this.

Because the new system would have already undergone extensive testing the probability the new system must be taken down for repairs 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 Aurora/Naperville and put into action only with proper consent of the Aurora/Naperville's Project Director.

Reaching a final cutover plan is typically the result of several customer meetings that include the Aurora/Naperville's representatives, and department heads.

Cutover Methodology

To minimize downtime Harris will install and test the new VIDA core and network equipment at the site locations while the legacy system is still in operation. Once the equipment is installed Harris will coordinate with Aurora/Naperville to cut the sites over to the new VIDA core. Harris will then coordinate with the Aurora/Naperville dispatch centers to install the Symphony consoles.

NSC Cutover

After completion of cutover planning, the Harris Team and Aurora/Naperville agree on a day and time for cutover to begin. The Team is present with Aurora/Naperville to provide any last-minute answers to users as they go live on the new system. The Team also stations dispatch-knowledgeable personnel in the dispatch center to be available if any questions arise.

Figure 10. Cutover Responsibility Matrix

Tasks	Harris	Aurora/Naperville
Identify system administrators		X
Provide administrator training	X	
Attend system administrator training		X
Develop dispatcher training plan and schedule with Harris (collaborative effort)		X
Develop console programming profiles		X
Migrate system database to SR10A.X	X	
Define which conventional (backup) channels are desired during cutover		X
Provide dispatcher training	X	
Attend dispatcher training		X

Symphony Console Cutover

Symphony console installation will ocurr after the NSC cutover has been completed. After collaborative planning with the dispatch managers for both Aurora and Naperville, the console installation will be scheduled in a manner that is least disruptive for dispatch operations. Ideally, installation will occur promptly after console training has been completed.
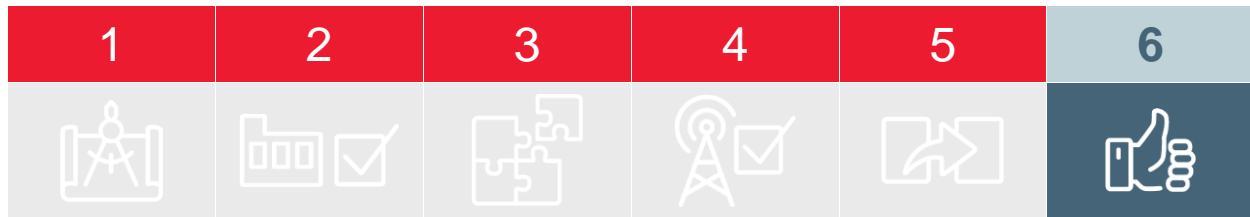
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Final System Acceptance

Harris will submit initial system acceptance documentation for Aurora/Naperville to sign, marking the successful conclusion of cutover.

Final System Acceptance

Upon the completion of acceptance test plan (ATP) tests, cutover, and submission of the final drawing package, the project manager submits the final system acceptance letter for Aurora/Naperville 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 Harris Team provides the contact information and procedures used to obtain service during the warranty period.

Figure 11. Final Acceptance Responsibility Matrix

Tasks	Harris	Aurora/Naperville
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 Harris to review warranty contact procedures		X
Meet with Harris 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