STATEWIDE EMERGENCY COMMUNICATIONS BOARD

STEERING COMMITTEE

October 12, 2016 1 p.m.
Chair: Dan Hartog
Call-in number: 1-888-742-5095
Code: 2786437892#

North Memorial Ambulance Service
4501 68th Ave N,
Brooklyn Center, MN 55429

Meeting Agenda

Call to order

Approval of Agenda

Approval of Previous Meetings' Minutes

- August 2016 (No quorum)
- September 2016

Action Items

Discussion Items

- Red Cross and DRO Participation on ARMER (Bill Schmidt)
- Subsystem Roaming (Jim Stromberg)
- National Weather Service Participation and Standard (Jim Stromberg)
- Motorola IV&D Enhanced Data Proposal to St. Cloud (MnDOT and Motorola)

Adjourn

STATEWIDE EMERGENCY COMMUNICATIONS BOARD

STEERING COMMITTEE

WEDNESDAY, SEPTEMBER 7, 2016

1 P.M.
CHAIR: DAN HARTOG

NORTH MEMORIAL AMBULANCE SERVICE
4501 68TH AVE N
BROOKLYN CENTER, MN 55429

MEETING MINUTES

Attendance
Members:
Present

Member/Alternate	Representing
Dan Hartog, CHAIR	Minnesota Sheriff's Assn.
Joe Glaccum, Vice Chair	Minnesota Ambulance Association
Mike Slavik/Tom Wolf/Troy Tretter	Metropolitan Emergency Services Board
Mukhtar Thakur/Tim Lee/Jim Mohn	MnDOT OSRC
VACANT	MN State Patrol
VACANT	MN.IT
Tina Lindquist/Kristen Lahr	Central MN ESB

Guests:
Jackie Mines, DPS ECN
Jim Stromberg, DPS ECN
Rick Juth, DPS ECN
Carol Salmon, DPS ECN
Jill Rohret, MESB

CALL TO ORDER

Chair Hartog calls the meeting to order at 1:08 p.m. with no quorum.

APPROVAL OF AGENDA

Carol Salmon would like to add to the agenda a report from the Education and Outreach Workgroup.

APPROVAL OF PREVIOUS MEETING'S MINUTES

Tom Wolff was in attendance at the March meeting and should be added to the minutes.

ACTION ITEMS

DRAFT

SUBSYSTEM ROAMING (JIM STROMBERG)

Jim Stromberg introduces draft standard 7.04.01 System Loading Conflict Resolution. This is in follow up to guidance from this committee to create more clarity and define a process to follow when there is a perceived or actual impact on a system. The suggestion was to draft a new standard under the conflict resolution section of standards and to consider merging standards 2.9.0 and 2.11.0 and also to not address conflict resolution in those two standards.

Stromberg reviews draft standard 7.04.1, as presented in the meeting materials. The purpose of the proposed standard is to establish procedures for resolving conflicts because ARMER is so robust in interoperability and there is the ability to limit talkgroup and radio access to ARMER repeaters which tin and of itself has the potential for conflict. The proposed standard is intended to address that. Under the operational context, Stromberg notes that there is a MnDOT Best Practices Guide and that ARMER system administrators are empowered by these standards and other standards to make changes to optimize ARMER and to minimize conflicts. The procedure for the standard is that if there is a perceived subsystem loading issue the subsystem administrator with the concern should informally try to resolve the issue by contacting the other subsystem administrator. If that is unsuccessful, the next step would be to formally contact the subsystem administrator by email or mail and to copy the subsystem administrator's supervisor and the RAC chair. If still unresolved, the next step would be to engage ECN to help facilitate a resolution by engaging staff or a RIC to meet with subsystem administrators to try to moderate and resolve the issue. Other people could be invited to that meeting, for example MnDOT representatives or other subsystem administrators or regional representatives, to help shed light on the problems and solution. If still not resolved, the last step would be for the system administrator with the concern to bring the grievance to the OTC for guidance. If the SECB agrees with the finding of the OTC, that decision would be binding.

Stromberg notes that there are some other conflict resolution standards, such as Standards 7.3.3 and 7.1, but the only one that seemed to be close was 7.2.0. Standard 7.2.0 prescribes consequences for non-compliance and that seemed severe. He says that the spirit of the standard being proposed is to provide guidance for conflict resolution and thinks that is more in line with what the committee was looking for.

Troy Tretter notes that the draft standard was not reviewed by the workgroup. He would like to see Radio Coordinators added to the standard in addition to System Administrators. He adds that it may be difficult to identify the supervisors of system administrators. He mentions that the recommendations in the proposed standard might be enveloped into Standards 2.9.0 and 2.11.0.

Stromberg responds that it was an oversight that the standard was not reviewed by the workgroup in advance of this meeting and he will submit it to the workgroup for review before the committee meets next. He has no issue with adding Radio Coordinators to the draft standard. His opinion is that rolling this into Standards 2.9.0 and 2.11.0 would be contrary to the guidance given by this committee.

NATIONAL WEATHER SERVICE PARTICIPATION AND STANDARD (JIM STROMBERG)

Stromberg reports that he was asked to look at this issue and to review and update the standard that is in place and determine how the National Weather Service (NWS) is a participant on the ARMER system. He brought before this committee the question as to whether to pursue interoperability participation or sponsorship for the NWS. The committee guided Stromberg that the NWS be considered a regional asset and to explore regional sponsorship. However, Standard 1.10.2 requires that sponsors hold an FCC license on the ARMER system. ECB regions do not hold FCC licenses and therefore are ineligible to sponsor. The options were to pursue a waiver for the FCC license requirement, seek out a local entity with an FCC license, or find and alternative solution. The workgroup identified an alternative solution which is that NWS ARMER participation be established by the NWS ARMER Standard. To accomplish this, the following language was included in the draft standard:

This standard establishes authority for NWS offices serving Minnesota to participate on ARMER. NWS offices shall be considered Interoperability Participants. As an Interoperability Participant, the NWS office shall follow ARMER standards just as any other ARMER participant.

Stromberg notes that the NWS has been on the ARMER system for quite some time without any formal participation plan and also that it has an SECB approved standard dictating its activities on ARMER. The proposal of the workgroup is to prescribe the participation of the NWS via this standard and cover in the standard responsibilities such as programming and training. He asks the committee if this is a reasonable alternative to the committee's previous guidance. Some of the operational details are still being worked out by the workgroup. If agreeable, the next step would be to bring the standard to the OTC for consideration.

Troy Tretter asks if the weather service has reviewed the operational process and if it is in agreement.

Stromberg responds that the weather service is in agreement with everything up until the recommended procedures option 1 and option 2. A meeting is set up to resolve this.

Tretter brings up that if the NWS were to be a participant on ARMER via the proposed standard, it would still need to sign agreement with MnDOT.

Stromberg says that create a dilemma because the weather service has referred to the difficulty of getting an agreement signed at the federal level.

Jill Rohret notes that she prefers that NWS participation be established via standard rather than sponsorship. She adds that the MESB had taken a stance that it does not sponsor entities because of the liability to the sponsor for the programming, maintenance, etc. if the sponsee does follow through on those things. The metro region has a standard for the national weather service, which originally came on with assistance from the emergency managers.

Question about where the radio I.D.s would come from. Stromberg responds that it would only require about 12 I.D.s and he spoke with John Anderson of MnDOT about this. Anderson said it would not be a problem to pull 12 I.D.s from the state's miscellaneous pool.

Discussion about who would program and maintain the radios and who would be responsible for training. Stromberg points to page 2, paragraph 2 in the proposed standard, which states that the ECB/ESB regions served by a NWS office shall be responsible for maintaining, repairing and programming the radios and for training NWS staff. The cost and burden shall be shared by those regions.

It is noted that this is happening already in several regions, including the Northeast and Northwest.

Stromberg says he is looking for guidance from the committee as to whether or not the workgroup is on the right track. He notes that the issue of the NWS needing to sign an agreement with MnDOT might make this an unworkable option but asks the committee if the workgroup should continue with this plan to prescribe NWS participation by standard and work with MnDOT and the NWS on something that could eventually be signed.

Agreement that the workgroup should proceed in this direction.

UPDATE FROM EDUCATION AND OUTREACH WORKGROUP

Stromberg reports that the Education and Outreach workgroup meets every other month but cancelled the July meeting for lack of agenda items. He considered cancelling the September meeting for the same reason but held the meeting and discussed the mission of the workgroup. It originated out of the IPAWs committee and moved to the

Steering Committee so it could serve the entire SECB. Stromberg has spoken with the IPAWs chair and with the ECN NG911 Program Administrator and neither have work for the workgroup at this time. The workgroup is asking for clarity or guidance from the Steering Committee on what work should be done and if there is no work at this time, the workgroup asks to stand down until there is work.

Chair Hartog asks about working on an SECB logo.

Stromberg responds that the workgroup likes the idea and has some ideas of how a logo might be used. A couple of uses would be on the strategic reserve towers and on a proposed regional website. The workgroup is awaiting guidance on how to best proceed with the creation of a logo, as it has been somewhat difficult project in the past.

Questions about if the workgroup would be involved with the Interoperability Conference and if the Legislative Committee has requested work from the workgroup.

Agreement to discuss a logo and the work of the Education and Outreach Workgroup further at the next Steering Committee.

Meeting adjourns at 2:13 p.m.

DRAFT

STATEWIDE EMERGENCY COMMUNICATIONS BOARD

STEERING COMMITTEE

WEDNESDAY, AUGUST 10, 2016

1 P.M.
CHAIR: DAN HARTOG
by conference call

MEETING MINUTES

Attendance
Members:
Present

Member/Alternate	Representing
Dan Hartog, CHAIR	Minnesota Sheriff's Assn.
Joe Glaccum, Vice Chair	Minnesota Ambulance Association
Mike Slavik/Tom Wolf/Troy Tretter	Metropolitan Emergency Services Board
Mukhtar Thakur/Tim Lee/Jim Mohn	MnDOT OSRC
VACANT	MN State Patrol
VACANT	MN.IT
Tina Lindquist/Kristen Lahr	Central MN ESB

Guests:
Jim Stromberg, DPS ECN
Rick Juth, DPS ECN
Carol Salmon, DPS ECN
Jill Rohret, MESB
John Hyde, Duluth

CALL TO ORDER

Chair Hartog calls the meeting to order at 1:00 p.m.

APPROVAL OF AGENDA

Joe Glaccum makes a motion to approve the agenda.
Troy Tretter seconds the motion.
Motion carries.

APPROVAL OF PREVIOUS MEETING'S MINUTES

Tretter makes a motion to approve the May meeting minutes.
Glaccum seconds the motion.
Motion carries.

DRAFT

SUBSYSTEM ROAMING (JIM STROMBERG)

Jim Stromberg reports on a meeting of the Subsystem Roaming workgroup in St. Cloud on July 11. He thanks Brandon Larson for coordinating and hosting the meeting. In attendance were: Brandon Larson, Kristen Lahr, Troy Tretter, John Hyde, Jennifer Hauer-Schmidtz and Dave Thomson.

The point of the meeting was to discuss the impact of non-subsystem user roaming on subsystem and how to evaluate if that is an issue and whether it should be allowable and how to measure it.

The group came up with three main points:

- Quantifying roaming is not the best approach;
- It should be addressed through a qualitative process;
- A Best Practices Radio Programming Guide should be created to help educate and establish a unified platform for all radio programmers.

The workgroup saw a lot of value to the reports that MnDOT provides as a quantitative measure but thought that this is not the only way to do it.

The responsibility for monitoring the subsystem roaming should not be on MnDOT. It should be on the individual subsystem owners.

The workgroup asked that Standards 2.9.0 and 2.11.0 be forwarded to the Standard workgroup for review.

It was noted that there is a Best Practices guide at MnDot and the workgroup should work with MnDot to update it and add more clarity as it relates to subsystem roaming.

Tretter says the workgroup reviewed the standards and made some recommendations to the Standards Workgroup.

It is agreed that after the review by the Standards Workgroup, the proposed revisions will be sent to the Operations and Technical Committee for consideration and then to the Steering Committee.

Discussion that the goal is to create through the standards more clarity on the process to follow when there is a perceived or actual impact on a system and that the standards define the process to work through any issues. The idea is to resolve issues at a local level where possible and layout a process for resolution when this is not possible. Suggestion to draft a new standard under the conflict resolution section of standards. Stromberg will draft a standard and present it to the Subsystem Roaming Workgroup for review and then to the Steering Committee. Stromberg will be a part of the Standards Workgroup when the Standards 2.9.0 and 2.11.0 are addressed and will give the guidance to consider merging the two and to not address conflict resolution in these standards.

Glaccum makes a motion to adjourn to meeting.
Tretter seconds the motion.
Motion carries.

Meeting adjourns at 1:30 p.m.

DRAFT

RADIO SYSTEM UPGRADE PROJECT

DRAFT

MOTOROLA SOLUTIONS

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Control No. PS-000070323

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SECTION 1

SYSTEM DESCRIPTION

1.1.1 Integrated Voice and Data Upgrade

Integrated Voice and Data (IV&D) operation allows data traffic to seamlessly utilize G–Series base radio stations, improving in–field efficiency. Voice is prioritized, allowing mission–critical traffic to always take precedence over data transmissions. The IV&D service creates a data transport layer capable of supporting both industry–standard IP and customer–developed applications including:

- Advanced Messaging.
- Outdoor Location.
- Over the Air Programming (POP25).
- Over the Air Rekeying (OTAR).

Users can achieve a number of important benefits, including:

- Conservation of valuable airtime.
- Increased communications accuracy.
- Better return on investment–same assets for multiple functions.
- Utilizes common radio units for both voice and data applications.

Figure 1–1 shows the general components that make up the data network of the trunked IV&D system, which are mostly the same components that comprise the voice network with a few additions.

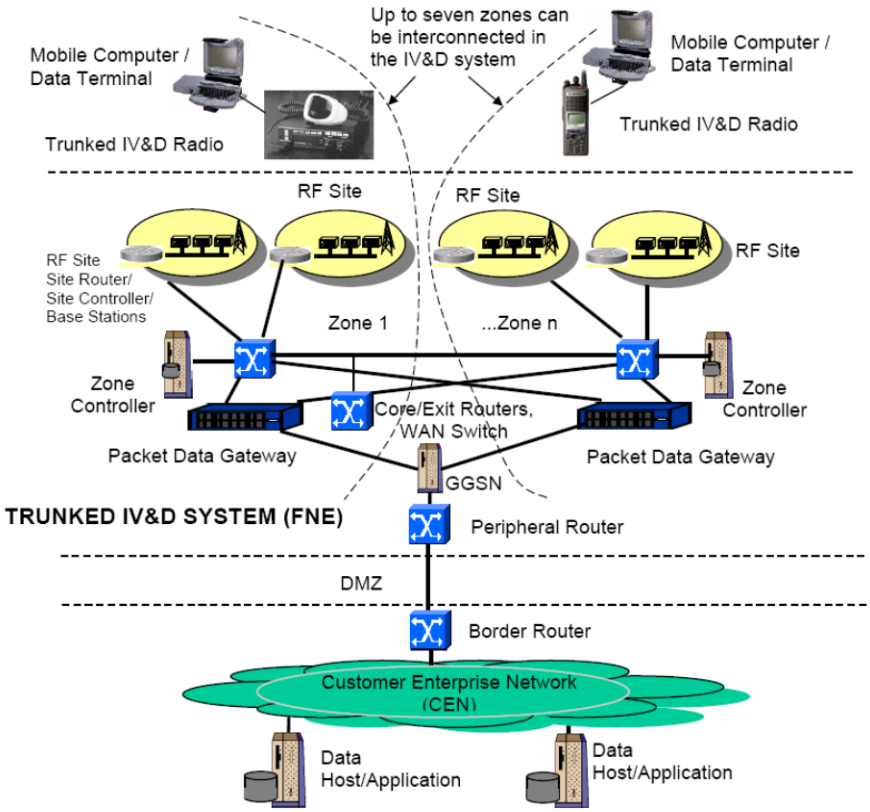

Figure 1–1: ASTRO Trunked IV&D Block Diagram

1.1.2 Enhanced Data Upgrade

Enhanced Data is used by Public Safety and other GPS location customers who require a real time view of the location of their field resources, as well as any customers using inbound messaging data like telemetry and biometrics. Enhanced Data is an inbound–only data technology which increases inbound data efficiency up to 12 times over that of standard two–way P25 data solutions. This is especially beneficial for GPS applications–where tracking users needs to be done at a higher cadence. This improvement in efficiency permits a more practical outdoor tracking solution for APX™ portable and mobile users on an ASTRO 25 Trunking system. Enhanced Data is optimized for variable data reporting rates, so that system configurations can be customized for specific customer operations. Customers who utilize Enhanced Data have the opportunity to eliminate recurring monthly carrier charges by owning and controlling their own mission critical data network.

Enhanced Data can be used in conjunction with St. Cloud's vehicle location/mapping solution that is currently used via the UNS server. The UNS server is located on the Customer Enterprise Network (CEN). GPS information can be plotted on most mapping applications, giving command centers and field commanders a visual of personnel and resource locations providing real–time updates for improved decision making. The interface between the UNS and customer mapping application requires an Application Programming Interface (API). Customers have access to the API through purchase of the UNS. The mapping services can also be partitioned by different agencies. St. Cloud is responsible for the connectivity between the UNS server and the mapping applications.

1.1.3 Simulcast Subnet Upgrade

1.1.3.1 Simulcast Prime Site

The following equipment upgrades to the Simulcast Subnet are proposed for the data upgrade:

Simulcast Site Controllers

There are currently three simulcast subsites in the St. Cloud simulcast system, including a co–located remote and prime site and two remote subsites. There are two simulcast site controllers at the prime site which will be upgraded to include IV&D and Enhanced Data capability. This license upgrade will cover data operations throughout the entire 3–site simulcast subnet.

1.1.4 Applications

1.1.4.1 Programming Over P25

Motorola is providing a powerful Over–the–Air Programming (OTAP) tool called Programming over P25 (POP25), which allows simple, wireless updates of Land Mobile Radios (LMR). This is an alternative to the standard method of programming, which is to connect a PC with a cable to the radio in order to read/write the programming changes. POP25 allows end–users and radio users to stay in the field during the reconfiguration process, thus saving valuable time and resources.

One of the key features of POP25 is being able to make and receive voice calls during the process:

- Retain full use of the radio during the configuration data transfer without interrupting communication.
- Voice always takes priority over POP25 data transfers.
- When a voice call ends, POP25 starts where it paused programming; there's no need to restart.
- Users do not have to switch to a non–busy channel.
- Users do not have to stay in an area with high signal strength during the download.
- All radio functions and capabilities are accessible and enabled.

The duration of the file transfers can vary greatly with size and configuration of the subscriber codeplug files. Some examples of file transfer times on implemented IV&D systems with POP25 are:

- Transfer to subscriber without voice files–elapsed time 4 min, Size of codeplug 1MB.
- Transfer to subscriber with voice files–elapsed time 24 min, Size of codeplug 1.6MB.

Note: Voice files contain canned voice audible announcements for use with the subscriber (such as announcing zone and mode of radio).

POP25 allows for scheduled batch programming and can make specific programming changes instead of requiring a full codeplug rewrite. The system will automatically generate a report, showing which radios were successfully programmed. It is assumed St. Cloud will provide the client computer for use with the POP25 application.

1.1.5 Option for Additional 800MHz Radio Channels

An option for adding two additional radio channels to the simulcast remote sites is included. The additional base radios will be GTR8000 radios. It is assumed the channels are 800MHz and will meet the frequency spacing requirements of the transmit combining equipment. The implementation scenario for the channel addition is to replace the existing two STR racks at each radio site with

Expandable Site Subsystem (ESS) racks. All rack and Radio Frequency Distribution Systems (RFDS) equipment related to the channel addition would be replaced. There would be new primary and expansion transmit combiners, receive multicouplers, phasing, filtering, etc. In addition, a new Tower Top Amp (TTA) and Control Monitoring Unit (CMU) would need to be installed (the existing TTA used with the STR equipment is not compatible with the ESS RFDS equipment). This scenario is beneficial since all peripherals at the remote sites will be new and the use of existing out–of–date periphery equipment would not be necessary.

To replace the existing STR racks with ESS racks/peripherals for the channel addition, the following hardware components are needed:

- GTR8000 800MHz Base Radio at Remote Sites–Quantity 2.
- CGM8000 Comparators at Prime Site–Quantity 2.
- Primary and expansion ESS racks with transmit combiner, receive multicoupler, filtering, phasing, and power distribution.
- Tower Top Amp and Control Monitoring Unit.
- 4–port DDM card for existing TRAK GPS reference equipment at Prime and Remote Sites.

SECTION 2

STATEMENT OF WORK

2.1 DATA UPGRADE STATEMENT OF WORK

Motorola is proposing to St. Cloud for the data upgrade for the installation and configuration of the following equipment at the specified locations.

Table 2–1: Major Site Equipment

Site Name	Major Equipment
Co–Located Prime Site Calvary Hill	Simulcast Site Controllers for Data Upgrade

The document delineates the general responsibilities between Motorola and St. Cloud as agreed to by contract.

2.1.1 Overview

This proposal includes the software and site licensing to enable data on St Cloud's existing 3 site simulcast subnet which will enable Programming over P25 (POP25) and GPS location services. For further information on the data upgrade see the system description.

This Statement of Work (SOW) describes the deliverables to be furnished to St. Cloud. The tasks described herein will be performed to implement the solution described in the System Description. It describes the actual work involved in installation, identifies the installation standards to be followed, and clarifies the responsibilities for both Motorola and Customer during the project implementation.

This SOW provides the understanding of the work required by both parties to ensure a successful project implementation. In particular, Motorola has made assumptions regarding the project. Should any of the information change, a revision to the SOW and associated pricing will be required. It is understood that this SOW is a working document, and that it will be revised as needed to incorporate any changes associated with contract negotiations, Contract Design Review (DDR), and any other change orders that may occur during the execution of the project.

2.1.2 Assumptions

All assumptions have been listed below for review. Should Motorola's assumptions be deemed incorrect or not agreeable to St. Cloud, a revised proposal with the necessary changes and adjusted costs may be required. Changes to the equipment or scope of the project after contract may require a change order.

- Zone 4 of the ARMER system is capable of supporting IV&D and Enhanced Data functions, this upgrade is part of the recent MN/DOT SUAII+ contract for the system–wide ARMER upgrade.
- St. Cloud's existing simulcast subnet has been upgraded to IP–based technology this is also part of the recent MN/DOT SUAII+ contract for the system–wide ARMER upgrade.
- St. Cloud's existing stations have been upgraded to GTR's. Antennas, line and combining equipment are existing.
- St Cloud has upgraded to APX subscribers with GPS software.
- As an option two additional channels were included into the design of this project.
- No additional GPS user licenses beyond what is included in MN/DOT SUAII+ contract.

- Motorola's ASTRO 25 Outdoor Location Solution does not contain a mapping application. The solution contains an Application Programming Interface to connect to mapping applications in the Customer Enterprise Network (CEN). A Software Development Kit (SDK) is available for third party application developers to interface to applications located on Motorola's Radio Network.
- The customer is supplying the connection between the Unified Network Services (UNS) server and the customer–supplied mapping application.
- All backhaul connectivity and associated equipment for all sites is the responsibility of St. Cloud.
- Customer is supplying and testing the network connections, per Motorola specifications.
- Customer is responsible for UPS/backup power for Fixed Network Equipment and the backhaul connectivity equipment. All backup power at each site is sufficient and capable of supporting the data upgrade equipment and is the responsibility of St. Cloud.
- Assumptions for the option for Additional 800MHz Radio Channels:
  - Assume additional channels are 800MHz.
  - Assume St Cloud procures additional 800MHz channels. No frequency coordination has been included in this project.
  - Assume additional 800MHz channels will work with existing antennas and meet frequency spacing requirements of combining equipment.
  - Assume rack space available for additional comparators at Prime Site.
  - Assume rack space in existing racks is available for additional GTR base radios at remote sites.
  - Assume LAN switch ports available at all sites.
  - Assume all antenna/feedline and surge protection are existing.
  - Assume Prime Site Controllers and remote sites are already licensed for IVD and Enhanced Data.
  - Assume power and back up power is sufficient to accommodate additional channels and comparators.
  - Assume card slots available in existing TRAK GPS equipment for additional DDM cards at Prime Site and Remote Sites, if needed.
- No Furniture has been included.
- No transport, storage or disposal of old equipment is included in this quote. The customer is responsible for the removal and/or relocation of existing equipment.
- No coverage guarantee or coverage acceptance test plan is included in this proposal.
- The existing sites or equipment locations will provide sufficient space for the equipment installation referencing the R56 standards. The customer will make necessary site improvements to follow the R56 guidelines. Reasonable attempts should be make for worker safety, proper spacing and good grounding practices.
- All existing sites or equipment locations will have adequate electrical power in the proper phase and voltage and site grounding to support the requirements of the system described.
- Any site/location upgrades or modifications are the responsibility of the customer.
- Approved Local, State, or Federal permits as may be required for the installation and operation of the proposed equipment are the responsibility of the customer.
- Where necessary, the customer will provide a dedicated delivery point, such as a warehouse, for receipt, inventory, and storage of equipment prior to delivery to the sites.

- If, for any reason, any of the proposed sites cannot be utilized due to reasons beyond Motorola's control, the costs associated with site changes or delays including, but not limited to, re–engineering, frequency re–licensing, site zoning, site permitting, schedule delays, site abnormalities, re–mobilization, etc., will be paid for by the customer and documented through the change order process.
- All work is to be performed during normal work hours, Monday through Friday.
- Any required system interconnections not specifically outlined here will be provided by the customer. These may include dedicated phone circuits, microwave links or other types of connectivity.

2.1.3 Motorola Responsibilities

Motorola's general responsibilities include the following:

- Conduct project kickoff meeting with St. Cloud to review project design and finalize requirements.
- Inventory the Motorola supplied equipment described in the system description and the equipment list.
- Deliver and perform the installation of the Motorola supplied equipment described in the system description and the equipment list.
- Connect the appropriate equipment to St. Cloud supplied ground system in accordance with Motorola's R56 Site Installation Standards.
- Program the data upgrade and network interface devices and enter that information into the appropriate ARMER Zone database. Integration of system into the ARMER system.
- Optimize the existing equipment for data upgrade operation.
- Testing with customer to confirm operation using existing configurations.
- Coordinate the activities of all Motorola subcontractors under this contract.
- Administer safe work procedures for installation.
- Test operation and functionality to ensure they are in accordance with manufacturers' specifications.
- For the optional channel addition, check forward and reflected power for all radio equipment, after connection to the antenna systems, to verify that power is within tolerances.
- If any major task as contractually described fails, repeat that particular task after Motorola determines that corrective action has been taken.
- Document all issues that arise during testing.
- Document the results of any acceptance tests and present to St. Cloud for review.
- Resolve any punchlist items before project completion.

2.1.4 St. Cloud's Responsibilities

St. Cloud will assume responsibility for the installation and performance of all other equipment and work necessary for completion of this project that is not provided by Motorola. St. Cloud's general responsibilities include the following:

- Assign a Project Manager, as the single point of contact responsible for Customer signed approvals.
- Assign other resources necessary to ensure completion of project tasks for which the Customer is responsible. Coordinate the activities of all St. Cloud's vendors or other contractors.
- Customer is responsible for assisting with the integration and coordination between Motorola and the CAD vendor for mapping applications and providing the necessary system parameters.
- Attend and participate in project meetings and reviews.

- Provide ongoing communication, as applicable; with ARMER regarding the project and schedule.
- Ensure sites meet space, grounding, power, and connectivity requirements for the installation of all equipment.
- Obtain all licensing, site access, or permitting required for project implementation.
- Customer is responsible for coordinating with the appropriate resources to provide training for the equipment provided in this proposal.
- Customer is responsible for the removal, transport, storage or disposal of any old equipment.
- Customer will provide a dedicated delivery point, such as a warehouse, for receipt, inventory and storage of equipment prior to delivery to the site(s).
- Supply adequately sized electrical service, backup power (UPS, generator, batteries, etc.) including the installation of conduit, circuit breakers, outlets, etc., at each equipment location. Provide AC power (dedicated 20 Amp AC outlets–simplex with ground) for each major piece of equipment within six feet of the location of the Motorola–supplied equipment, including the associated electrical service and wiring (conduit, circuit breakers, etc.).
- Provide adequate HVAC, grounding, lighting, cable routing, and surge protection (also, among existing and Motorola–provided equipment) based upon Motorola's "Standards and Guidelines for Communication Sites" (R56). Ceiling (minimum 9 feet) and cable tray heights [minimum eight feet] in the equipment rooms in order to accommodate the equipment racks.
- Bring grounding system up to Motorola's "Standards and Guidelines for Communication Sites" (R56) and supply a single point system ground, of five ohms or less, to be used on all FNE supplied under the Contract. Supply grounding tie point within 10 feet from the Motorola–supplied equipment.
- Provide free and open access to all owned or leased sites of work. This includes but is not limited to, the following:
  - Provide escort at no charge, if escorts are required at any particular site. The availability of such escort shall not be unreasonably withheld.
  - Arrange site permission; provide keys to all the locks at sites and/or temporary identification cards should be issued to Motorola personnel if required for access to the sites.
  - Provide site access to all sites for Motorola personnel and Motorola's subcontractors for the purpose of installing, and optimizing Motorola provided equipment, and for testing of the equipment and system operation.
  - Provide any required parking permits to Motorola personnel for restricted access entry and/or parking.

SECTION 3

EQUIPMENT LIST

3.1 DATA AND SITE MOVE EQUIPMENT LIST

Table 3–1: Site Move Equipment List

Site	SysSeg	Type	Qty	Nomenclature	Description
ZONE	IVD+ENH DATA	RENEW SILVER TIER	1	T8229	DATA INFRASTRUCTURE SILVER ADD–ON
ZONE	IVD+ENH DATA	RENEW SILVER TIER	1	SQM01SUM0257	UNIFIED NETWORK SERVICES
ZONE	IVD+ENH DATA	RENEW SILVER TIER	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE
ZONE	IVD+ENH DATA	RENEW SILVER TIER	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
ZONE	IVD+ENH DATA	RENEW SILVER TIER	1	CA02383AA	ADD: ASTRO REST OF THE WORLD (ROW) APPLICATION INTERFACE
SIMULCAST SUBNET	IVD+ENH DATA	LICENSE	1	SQM01SUM0273	MASTER SITE CONFIGURATION
SIMULCAST SUBNET	IVD+ENH DATA	LICENSE	1	CA02629AA	ENH: EXPAND 7.15
SIMULCAST SUBNET	IVD+ENH DATA	LICENSE	1	CA01471AA	ADD: WINDOWS SUPPLEMENTAL TRANS CONFIG
SIMULCAST SUBNET	IVD+ENH DATA	LICENSE	1	T7140	G–SERIES SOFTWARE UPGRADE
SIMULCAST SUBNET	IVD	LICENSE	6	CA02206AA	ADD: SIMULCAST REMOTE SITE LICENSE IV&D
SIMULCAST SUBNET	ENH DATA	LICENSE	6	CA03010AA	ADD:SIMUL REM ST LC EXP IV&D–ENDATA
ZONE	POP25	ASK	1	DVN4046B	MASTER SYSTEM KEY STARTER KIT
ZONE	POP25	CPS	1	RVN4186AX	SOFTWARE,CPS R20.01.00 ASTRO XTS/XTL

PROPOSAL TO
MINNESOTA DEPARTMENT OF TRANSPORTATION

SECTION 3I

EQUIPMENT LIST

SYSTEM UPGRADE AGREEMENT 2+ IVD/ED & WAVE OCTOBER 2016

MINNESOTA DEPARTMENT OF TRANSPORTATION

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Equipment List 3-1

EQUIPMENT LIST

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
Integrated Voice and Data (IVD) / Enhanced Data (ED) Equipment						
WE	Z1	LICENSE	1	1	SQM01SUM0273	MASTER SITE CONFIGURATION
WE	Z1	LICENSE	1a	1	CA02389AA	ENH: TRUNKED ENHANCED DATA
WE	Z1	LICENSE	1b	15	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES
WE	Z1	LICENSE	1c	1	CA02629AA	ENH: EXPAND 7.15
WE	Z1	LICENSE	1d	1	CA02081AC	ADD:TRUNKED INTEGRATED DATA
WE	Z1	DMZ FIREWALL	2	1	DDN9590	SSG140 FIREWALL-NON CANCELLABLE,NON RETURNABLE,1 YR WNTY
WE	Z1	IVD RACK	3	1	TRN7343	SEVEN AND A HALF FOOT RACK
WE	Z1	IVD RACK	4	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
WE	Z1	IVD RACK	5	12	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1
WE	Z1	IVD RACK	6	1	BLN6200	AC POWER STRIP, 6 OUTLET
WE	Z1	DMZ LAN SW	7	1	DSJPM112AR5	ECONOMY CAT5E, 32 PORT RJ45 PATCH PANEL
WE	Z1	BORDER ROUTER	8	1	SQM01SUM0205	GGM 8000 GATEWAY
WE	Z1	BORDER ROUTER	8a	1	CA01616AA	ADD: AC POWER
WE	Z1	DMZ LAN SW	9	1	CLN1856	2620-24 ETHERNET SWITCH
WE	Z1	UNS	10	1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
WE	Z1	UNS	10a	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
WE	Z1	UNS	10b	1	CA02358AA	ADD: ASTRO NETWORK SERVER
WE	Z1	UNS	10c	1	CA02362AA	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE
WE	Z1	UNS	10d	1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATION
WE	Z1	UNS	10e	1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENCE
WE	Z1	UNS	10f	1	CA02053AC	ADD: SUPPLEMENTAL CD TRANSPARENT IA ON PRESENCE AND/OR LOCATION
WE	Z1	UNS	10g	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
WE	Z1	IVD RACK	11	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS
WE	Z1	GGSN	12	1	SQM01SUM0205	GGM 8000 GATEWAY
WE	Z1	GGSN	12a	1	CA01616AA	ADD: AC POWER
WE	Z1	GGSN	13	1	ST5102	MNR GGSN SOFTWARE UPGRADE
GV	Z2	LICENSE	14	1	SQM01SUM0273	MASTER SITE CONFIGURATION
GV	Z2	LICENSE	14a	1	CA02389AA	ENH: TRUNKED ENHANCED DATA
GV	Z2	LICENSE	14b	15	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES
GV	Z2	LICENSE	14c	1	CA02629AA	ENH: EXPAND 7.15
GV	Z2	LICENSE	14d	1	CA02081AC	ADD:TRUNKED INTEGRATED DATA
GV	Z2	DMZ FIREWALL	15	1	DDN9590	SSG140 FIREWALL-NON CANCELLABLE,NON RETURNABLE,1 YR WNTY
GV	Z2	IVD RACK	16	1	TRN7343	SEVEN AND A HALF FOOT RACK
GV	Z2	IVD RACK	17	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
GV	Z2	IVD RACK	18	12	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1
GV	Z2	IVD RACK	19	1	BLN6200	AC POWER STRIP, 6 OUTLET
GV	Z2	DMZ LAN SW	20	1	DSJPM112AR5	ECONOMY CAT5E, 32 PORT RJ45 PATCH PANEL
GV	Z2	BORDER ROUTER	21	1	SQM01SUM0205	GGM 8000 GATEWAY
GV	Z2	BORDER ROUTER	21a	1	CA01616AA	ADD: AC POWER
GV	Z2	DMZ LAN SW	22	1	CLN1856	2620-24 ETHERNET SWITCH
GV	Z2	UNS	23	1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
GV	Z2	UNS	23a	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
GV	Z2	UNS	23b	1	CA02358AA	ADD: ASTRO NETWORK SERVER
GV	Z2	UNS	23c	1	CA02362AA	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE
GV	Z2	UNS	23d	1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATION
GV	Z2	UNS	23e	1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENCE
GV	Z2	UNS	23f	1	CA02053AC	ADD: SUPPLEMENTAL CD TRANSPARENT IA ON PRESENCE AND/OR LOCATION

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
GV	Z2	UNS	23g	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE
GV	Z2	IVD RACK	24	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS
GV	Z2	GGSN	25	1	SQM01SUM0205	GGM 8000 GATEWAY
GV	Z2	GGSN	25a	1	CA01616AA	ADD: AC POWER
GV	Z2	GGSN	26	1	ST5102	MNR GGSN SOFTWARE UPGRADE
ROCH	Z3	LICENSE	27	1	SQM01SUM0273	MASTER SITE CONFIGURATION
ROCH	Z3	LICENSE	27a	1	CA02389AA	ENH: TRUNKED ENHANCED DATA
ROCH	Z3	LICENSE	27b	15	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES
ROCH	Z3	LICENSE	27c	1	CA02629AA	ENH: EXPAND 7.15
ROCH	Z3	LICENSE	27d	1	CA02081AC	ADD:TRUNKED INTEGRATED DATA
ROCH	Z3	DMZ FIREWALL	28	1	DDN9590	SSG140 FIREWALL-NON CANCELLABLE,NON RETURNABLE,1 YR WNTY
ROCH	Z3	IVD RACK	29	1	TRN7343	SEVEN AND A HALF FOOT RACK
ROCH	Z3	IVD RACK	30	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
ROCH	Z3	IVD RACK	31	12	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1
ROCH	Z3	IVD RACK	32	1	BLN6200	AC POWER STRIP, 6 OUTLET
ROCH	Z3	DMZ LAN SW	33	1	DSJPM112AR5	ECONOMY CAT5E, 32 PORT RJ45 PATCH PANEL
ROCH	Z3	BORDER ROUTER	34	1	SQM01SUM0205	GGM 8000 GATEWAY
ROCH	Z3	BORDER ROUTER	34a	1	CA01616AA	ADD: AC POWER
ROCH	Z3	DMZ LAN SW	35	1	CLN1856	2620-24 ETHERNET SWITCH
ROCH	Z3	UNS	36	1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
ROCH	Z3	UNS	36a	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
ROCH	Z3	UNS	36b	1	CA02358AA	ADD: ASTRO NETWORK SERVER
ROCH	Z3	UNS	36c	1	CA02362AA	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE
ROCH	Z3	UNS	36d	1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATION
ROCH	Z3	UNS	36e	1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENCE

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
ROCH	Z3	UNS	36f	1	CA02053AC	ADD: SUPPLEMENTAL CD TRANSPARENT IA ON PRESENCE AND/OR LOCATION
ROCH	Z3	UNS	36g	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE
ROCH	Z3	IVD RACK	37	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS
ROCH	Z3	GGSN	38	1	SQM01SUM0205	GGM 8000 GATEWAY
ROCH	Z3	GGSN	38a	1	CA01616AA	ADD: AC POWER
ROCH	Z3	GGSN	39	1	ST5102	MNR GGSN SOFTWARE UPGRADE
ST CLD	Z4	LICENSE	40	1	SQM01SUM0273	MASTER SITE CONFIGURATION
ST CLD	Z4	LICENSE	40a	1	CA02389AA	ENH: TRUNKED ENHANCED DATA
ST CLD	Z4	LICENSE	40b	15	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES
ST CLD	Z4	LICENSE	40c	1	CA02629AA	ENH: EXPAND 7.15
ST CLD	Z4	LICENSE	40d	1	CA02081AC	ADD:TRUNKED INTEGRATED DATA
ST CLD	Z4	DMZ FIREWALL	41	1	DDN9590	SSG140 FIREWALL-NON CANCELLABLE,NON RETURNABLE,1 YR WNTY
ST CLD	Z4	IVD RACK	42	1	TRN7343	SEVEN AND A HALF FOOT RACK
ST CLD	Z4	IVD RACK	43	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
ST CLD	Z4	IVD RACK	44	12	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1
ST CLD	Z4	IVD RACK	45	1	BLN6200	AC POWER STRIP, 6 OUTLET
ST CLD	Z4	DMZ LAN SW	46	1	DSJPM112AR5	ECONOMY CAT5E, 32 PORT RJ45 PATCH PANEL
ST CLD	Z4	BORDER ROUTER	47	1	SQM01SUM0205	GGM 8000 GATEWAY
ST CLD	Z4	BORDER ROUTER	47a	1	CA01616AA	ADD: AC POWER
ST CLD	Z4	DMZ LAN SW	48	1	CLN1856	2620-24 ETHERNET SWITCH
ST CLD	Z4	UNS	49	1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
ST CLD	Z4	UNS	49a	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
ST CLD	Z4	UNS	49b	1	CA02358AA	ADD: ASTRO NETWORK SERVER
ST CLD	Z4	UNS	49c	1	CA02362AA	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE
ST CLD	Z4	UNS	49d	1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATION

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
ST CLD	Z4	UNS	49e	1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENCE
ST CLD	Z4	UNS	49f	1	CA02053AC	ADD: SUPPLEMENTAL CD TRANSPARENT IA ON PRESENCE AND/OR LOCATION
ST CLD	Z4	UNS	49g	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE
ST CLD	Z4	IVD RACK	50	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS
ST CLD	Z4	GGSN	51	1	SQM01SUM0205	GGM 8000 GATEWAY
ST CLD	Z4	GGSN	51a	1	CA01616AA	ADD: AC POWER
ST CLD	Z4	GGSN	52	1	ST5102	MNR GGSN SOFTWARE UPGRADE
DULUTH	Z5	LICENSE	53	1	SQM01SUM0273	MASTER SITE CONFIGURATION
DULUTH	Z5	LICENSE	53a	1	CA02389AA	ENH: TRUNKED ENHANCED DATA
DULUTH	Z5	LICENSE	53b	15	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES
DULUTH	Z5	LICENSE	53c	1	CA02629AA	ENH: EXPAND 7.15
DULUTH	Z5	LICENSE	53d	1	CA02081AC	ADD:TRUNKED INTEGRATED DATA
DULUTH	Z5	DMZ FIREWALL	54	1	DDN9590	SSG140 FIREWALL-NON CANCELLABLE,NON RETURNABLE,1 YR WNTY
DULUTH	Z5	IVD RACK	55	1	TRN7343	SEVEN AND A HALF FOOT RACK
DULUTH	Z5	IVD RACK	56	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
DULUTH	Z5	IVD RACK	57	12	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1
DULUTH	Z5	IVD RACK	58	1	BLN6200	AC POWER STRIP, 6 OUTLET
DULUTH	Z5	DMZ LAN SW	59	1	DSJPM112AR5	ECONOMY CAT5E, 32 PORT RJ45 PATCH PANEL
DULUTH	Z5	BORDER ROUTER	60	1	SQM01SUM0205	GGM 8000 GATEWAY
DULUTH	Z5	BORDER ROUTER	60a	1	CA01616AA	ADD: AC POWER
DULUTH	Z5	DMZ LAN SW	61	1	CLN1856	2620-24 ETHERNET SWITCH
DULUTH	Z5	UNS	62	1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
DULUTH	Z5	UNS	62a	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
DULUTH	Z5	UNS	62b	1	CA02358AA	ADD: ASTRO NETWORK SERVER
DULUTH	Z5	UNS	62c	1	CA02362AA	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
DULUTH	Z5	UNS	62d	1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATION
DULUTH	Z5	UNS	62e	1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENCE
DULUTH	Z5	UNS	62f	1	CA02053AC	ADD: SUPPLEMENTAL CD TRANSPARENT IA ON PRESENCE AND/OR LOCATION
DULUTH	Z5	UNS	62g	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE
DULUTH	Z5	IVD RACK	63	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS
DULUTH	Z5	GGSN	64	1	SQM01SUM0205	GGM 8000 GATEWAY
DULUTH	Z5	GGSN	64a	1	CA01616AA	ADD: AC POWER
DULUTH	Z5	GGSN	65	1	ST5102	MNR GGSN SOFTWARE UPGRADE
DET LAKES	Z6	LICENSE	66	1	SQM01SUM0273	MASTER SITE CONFIGURATION
DET LAKES	Z6	LICENSE	66a	1	CA02389AA	ENH: TRUNKED ENHANCED DATA
DET LAKES	Z6	LICENSE	66b	15	CA02473AA	ENH: 500 ENHANCED TRUNKED DATA USER LICENSES
DET LAKES	Z6	LICENSE	66c	1	CA02629AA	ENH: EXPAND 7.15
DET LAKES	Z6	LICENSE	66d	1	CA02081AC	ADD:TRUNKED INTEGRATED DATA
DET LAKES	Z6	DMZ FIREWALL	67	1	DDN9590	SSG140 FIREWALL-NON CANCELLABLE,NON RETURNABLE,1 YR WNTY
DET LAKES	Z6	IVD RACK	68	1	TRN7343	SEVEN AND A HALF FOOT RACK
DET LAKES	Z6	IVD RACK	69	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
DET LAKES	Z6	IVD RACK	70	12	DS37502851	BREAKER KIT AIRPAX 15AMP SNAPAC, FOR AC EDGE QTY 1
DET LAKES	Z6	IVD RACK	71	1	BLN6200	AC POWER STRIP, 6 OUTLET
DET LAKES	Z6	DMZ LAN SW	72	1	DSJPM112AR5	ECONOMY CAT5E, 32 PORT RJ45 PATCH PANEL
DET LAKES	Z6	BORDER ROUTER	73	1	SQM01SUM0205	GGM 8000 GATEWAY
DET LAKES	Z6	BORDER ROUTER	73a	1	CA01616AA	ADD: AC POWER
DET LAKES	Z6	DMZ LAN SW	74	1	CLN1856	2620-24 ETHERNET SWITCH
DET LAKES	Z6	UNS	75	1	SQM01SUM0257	INTELLIGENT MIDDLEWARE
DET LAKES	Z6	UNS	75a	1	CA02354AA	ADD: ASTRO NETWORK APPLICATION INTERFACE
DET LAKES	Z6	UNS	75b	1	CA02358AA	ADD: ASTRO NETWORK SERVER

Site	SysSeg	Type	Item No.	Qty	Nomenclature	Description
DET LAKES	Z6	UNS	75c	1	CA02362AA	ADD: MCAFEE STANDALONE ANTI VIRUS SOFTWAARE
DET LAKES	Z6	UNS	75d	1	UA00015AA	ADD: 501-1000 RESOURCES FOR LOCATION
DET LAKES	Z6	UNS	75e	1	UA00056AA	ADD: 501-1000 RESOURCES FOR PRESENCE
DET LAKES	Z6	UNS	75f	1	CA02053AC	ADD: SUPPLEMENTAL CD TRANSPARENT IA ON PRESENCE AND/OR LOCATION
DET LAKES	Z6	UNS	75g	1	CA02384AC	ADD: UNIFIED NETWORK SERVICES SOFTWARE
DET LAKES	Z6	IVD RACK	76	1	DSTSJADP	RACK MOUNT GROUND BAR, 19 IN FOR TSJ AND WPH SERIES DATA SPDS
DET LAKES	Z6	GGSN	77	1	SQM01SUM0205	GGM 8000 GATEWAY
DET LAKES	Z6	GGSN	77a	1	CA01616AA	ADD: AC POWER
DET LAKES	Z6	GGSN	78	1	DS110110711	PDU, AC EDGE RACK MOUNT DISTRIBUTION PANEL, 120VAC 60A, 12-15A CIRCUIT
WAVE Equipment						
WE	Z1	LICENSE	1-1	1	TT2775	SOFTWARE,WAVE SERVER LICIENSING
WE	Z1	LICENSE	1-2	1	TT2789	NEW WAVE SYSTEM
WE	Z1	LICENSE	1-3	5	TT2776	WAVE COMMUNICATION CHANNEL-NO RADIO
WE	Z1	DEVICE SW	1-4	20	TT2779	WAVE DESKTOP COMMUNICATOR-INCLUDES
WE	Z1	DEVICE SW	1-5	5	TT2781	WAVE ADVANCED DESKTOP COMMUNICATOR
WE	Z1	SERVER	1-6	1	SQM01SUM0284B	WAVE 5000 SERVER
WE	Z1	SERVER	1-7	1	SQM01SUM0227	ISGW SERVER USED FOR ISSI / CSSI
WE	Z1	SW	1-8	1	TT2820	SOFTWARE,WAVE RADIO GATEWAY SOFTWAR
WE	Z1	DMZ FIREWALL	1-9	1	TT1932	ISG 1000 FIREWALL W/ 2 YR SUPPORT
WE	Z1	LICENSE	1-10	20	TT2777	WAVE COMMUNICATION CHANNEL-WITH RAD
WE	Z1	DEVICE SW	1-11	100	TT2782	WAVE MOBILE COMMUNICATOR ANDROID &
WE	Z1	LICENSE	1-12	1	DSWAVEARUS1	ANNUAL RELEASE AND UPDATE SUBSCRIPT
WE	Z1	LICENSE	1-13	1	DSWAVEARUS1	ANNUAL RELEASE AND UPDATE SUBSCRIPT
WE	Z1	SERVICE	1-14	80	DSWAVEENGSVC	PER HOUR - WAVE SYSTEM ENGINEERING
WE	Z1	SERVICE	1-15	16	DSWAVEPMSVC	PER HOUR - WAVE PROJECT MANAGEMENT

PROPOSAL TO
MINNESOTA DEPARTMENT OF TRANSPORTATION

SECTION 1I

ENGINEERING DOCUMENTS

SYSTEM UPGRADE AGREEMENT 2+ IVD/ED & WAVE | OCTOBER 2016

MINNESOTA DEPARTMENT OF TRANSPORTATION

MOTOROLA

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Control No. PS-0000

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ENGINEERING DOCUMENTS

1.1 SYSTEM DESCRIPTION AND OVERVIEW

Motorola offers MNDOT an upgrade to all the Master Site Cores (Z1 - WatersEdge, Z2- Golden Valley, Z3 - Rochester, Z4- St Cloud, Z5- Duluth, and Z6- Detroit Lakes) to support a future data application layer on the ARMER system, which can be a combination of Integrated Voice & Data (IV&D) or Enhanced Data (ED). In addition, Motorola offers a WAVE upgrade to Master Site Core (Z1 – WatersEdge) to support future broadband Push To Talk (PTT) voice services system wide.

The proposed IV&D / ED data layer and Broadband PTT upgrade system design is subject to approval by the Statewide Radio Board (SRB) and Statewide Operations & Technical Committee (OTC). The approval of the SRB is required prior to enabling data capability on the system. The required resource allocation at the Master Site needs to be coordinated prior to equipment programming and optimization.

1.2 INTEGRATED VOICE AND DATA (IV&D) AND ENHANCED DATA (ED) SYSTEM DESIGN

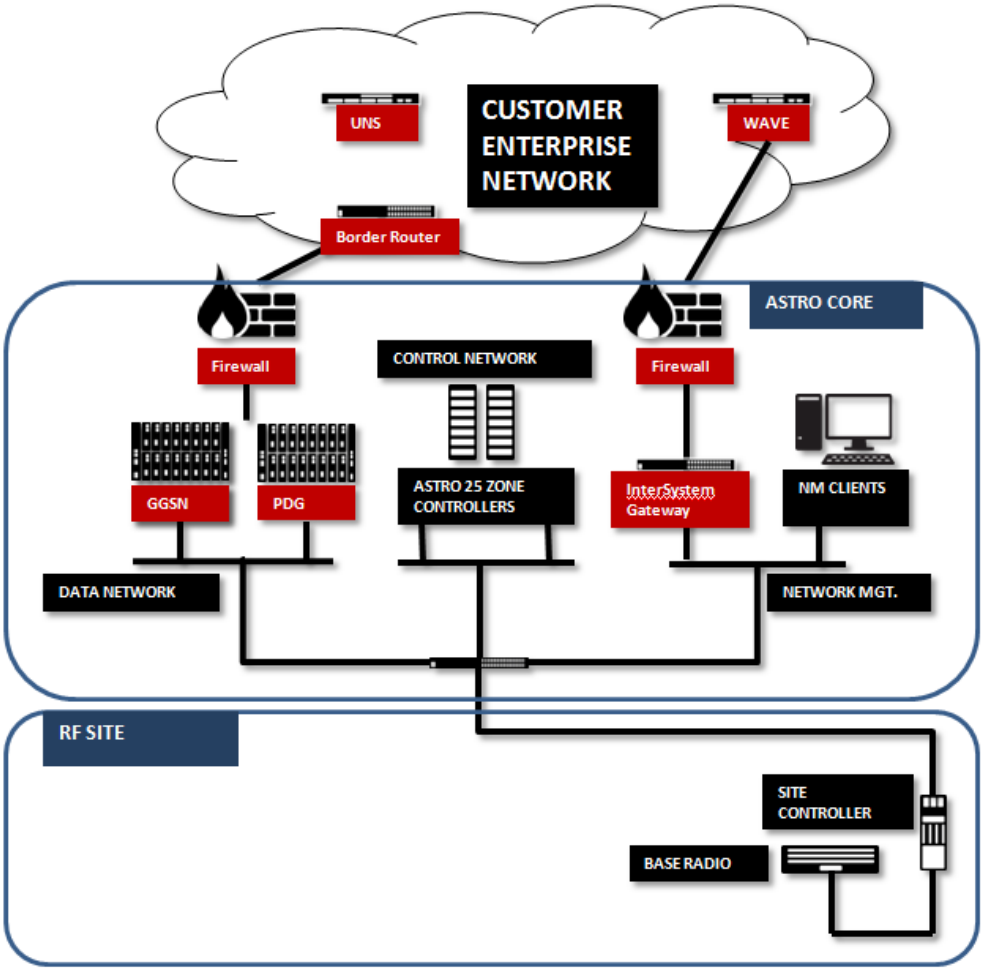
The data layer upgrade design for MNDOT consists of equipment additions to the Master Site Core only, additional data service licenses for the RF sites has not been included. The equipment design for the Master Site Core will support any combination of IV&D and/or ED data transport layers. It includes adding Packet Data Gateways, GPRS (General Packet Radio Service) Gateway Service Node (GGSN), and Firewall DMZ. Although this upgrade excludes device application software and RF Site licensing, it does cover the majority of costs associated with adding data features to the ARMER ASTRO25 architecture.

Typically IV&D supports applications such as 'Programming Over P25' (POP25) applications, 'Over The Air Rekeying' (OTAR) applications, Text Messaging, Fire Station Alerting, and limited Computer Aided Dispatch (CAD) GPS location services. Whereas, ED is designed solely to support GPS location services because it is optimized for inbound messaging. Detailed information on the IV&D / ED upgrade is provided below.

1.2.1 Integrated Voice and Data (IV&D)

The Project 25–compliant Integrated Voice and Data (IV&D) operation allows data traffic to seamlessly utilize your existing ASTRO 25 stations, improving in-field efficiency. Voice is prioritized, allowing Mission-Critical traffic to always take precedence over data transmissions. The IV&D service creates a data transport layer capable of supporting both industry-standard IP and customer-developed applications.

The figure below shows the general components that make up the data network of the trunked IV&D system, which are mostly the same components that comprise the voice network with a few additions. The equipment additions (shown in red on block diagram) are described in more detail below,.



ASTRO Trunked IV&D/ED and WAVE Master Site Core Block Diagram

1.2.1.1 Master Site Core

The following equipment additions to the Master Site Cores (Z1 - WatersEdge, Z2- Golden Valley, Z3 - Rochester, Z4- St Cloud, Z5- Duluth, and Z6- Detroit Lakes) are proposed for the IV&D/ED upgrade:

Zone Controller License (ZC)

The Zone Controller has one license to support IV&D:

- Trunked Integrated Voice and Data User license, this enables the IV&D software and includes the necessary hardware (PDG) to support IV&D and ED (max qty 1).

Packet Data Gateway (PDG)

The Packet Data Gateway (PDG) is a modular platform designed to link the wireline IP Data Network to Motorola's ASTRO 25 network.

The PDG software platform manages IP message traffic to and from the wireless network, supporting wide-area roaming. This software is virtualized on the Zone Controller Common Platform

Architecture. With wide-area roaming, data radios can roam seamlessly throughout the coverage area of the ASTRO 25 system without the need to select a different channel or have any specific knowledge of the RF network. The PDG supports Simple Network Management Protocol (SNMP)-based network management by providing detailed statistics and alarm information to monitor system activity and performance. These statistics and alarms allow you to monitor system operation and loading to support audit, diagnostic, and optimization activities using the SNMP-based standard. The information can be viewed directly via the PDG local console or through the Network Management System. SNMP is an application-layer protocol that facilitates the exchange of management information between network devices. It is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite. SNMP enables network administrators to manage network performance, find and solve network problems, and plan for network growth. An SNMP managed network consists of three key components: managed devices, agents, and network management systems (NMSs).

General Packet Radio Service Gateway Service Node (GGSN) Router

Motorola's General Packet Radio Service (GPRS) Gateway Service Node (GGSN) router provides for the internetworking between the customer's network and the ASTRO 25 data system, allowing for independent management of IP addresses across networks.

The GGSN router handles the IP routing services in support of end-to-end IP data messaging. These services include Static and Dynamic IP addressing, IP fragmentation, and ICMP error reporting messaging for diagnostics and troubleshooting. Each GGSN is capable of supporting 48,000 data connections.

Customer Network Interface (CNI)

The Customer Network Interface (CNI) is the common access point between the ASTRO 25 radio network and the Customer Enterprise Network(s) (CENs) at the physical and logical layers. The CNI design includes the physical LAN and/or WAN links that provide the connectivity, the routing and IP addressing involved, as well as the application interaction across the interfaces. The appropriate firewall, switch and border router are included in this design. Each Master Site Core is equipped for one CEN interface, and is able to be expanded up to 10 per zone. Each subscriber can be members of only one data CEN interface within their Home Zone mapping. It is suggested multiple agencies interface to this one data CEN, instead of segregating agencies into separate CENs. The benefit becomes data system resources can be shared between agencies, such as POP25 and OTAR features.

Master Site Core Capacity Limits

1) Number of CENs Supported for Data Services: 10 per Master Site
2) Maximum number of active Trunking Data users per zone (Note: this includes both home and foreign Trunked Data and Enhanced Data users):
    - 20,000 per zone with GGSN per zone / 20,000 users per system with one GGSN.
    - Maximum 70,000 users system wide across all zones
    - Examples – 7 zone system with 10,000 users per zone. 4 zone system with 20,000 users per zones (1-3) and 10,000 users in zone 4
3) Total number of active data users per zone in an overlay configuration. An overlay condition is multiple data bearer services in one zone or multiple active data bearer services at a master site such as a DSR scenario where both zones are active at one master site. (Note cannot exceed each individual data service capacity): 40,000
4) Trunked Data Maximum Messages per Hour – Per Zone/System: 300,000 per Zone with GGSN in each zone / 300,000 System with one GGSN / Total 300,000 system wide
5) Total number of messages per hour per zone in an overlay configuration. An overlay condition is multiple data bearer services in one zone or multiple active data bearer services at a master site such as a DSR scenario where both zones are active at one master site. (Note cannot exceed each individual data service capacity): 3,000,000
6) Maximum Trunked Data Channels per Site: No upper limit, usage is based on traffic and number of physical channels at site

7) Trunked Data Maximum Messages per Hour – Single Channel / Simulcast Channel: 5,000/2,000

1.2.1.2 RF Site

The following equipment upgrades to the RF Controller Subnet has not been proposed as part of the IV&D/ED upgrade. Local agencies who decide whether to enable the data network feature to their local sites will be offered at a local level, as well as perform a loading analysis to determine if additional channel capacity is necessary.

ASR or Simulcast Site Controllers

The site controller is responsible for managing resources and data services at the RF sites. The Site Controller provides the following functions at the site:

- Connects to the PDG at the master site to route inbound/outbound data traffic flow
- Site and channel management
- Forwards registration and context activation requests.

Each controller at ASR or Simulcast Prime Site must be licensed to enable the data network for the coverage defined by the RF sites. The licensing is based on the number of sites; each RF Site controller must be licensed based on the ASR site or the number of Simulcast SubSites. In the future, local agencies can decide to add data network feature capability to their local area.

Packet Data Channel

The Packet Data Channel is a Trunked RF channel that provides the over-the-air transmission path for packet data messages between the Subscriber and the site infrastructure. In non-Simulcast sites, a Packet Data Channel is provided by a Base Radio / Site Repeater. In Simulcast sites, a Packet Data Channel is provided by a combination of a Comparator and a Multi-Site Base Radio. The following types of Packet Data Channels are supported:

- P25 Trunked IVD
- Enhanced Data (GTR Series site equipment only)

All data licensing at RF sites is done on a per site basis.

1.2.1.3 Subscriber

A data-capable Subscriber supports onboard data applications such as OTAR and POP25. Each subscriber requires a data software option and/or group services option to enable certain data features. The IV&D/ED upgrade has not included any subscriber software flash upgrades.

Additionally, a computer or other device running data applications may be connected to the Subscriber via a Motorola proprietary data cable. The data cable's computer interface is USB, and communication over the data link uses Remote Network Driver Interface Specification (RNDIS) provided by the Windows OS. The Subscriber acts as a data conduit between the attached device and the infrastructure. The following types of Packet Data Channels are supported by Motorola Subscribers:

- P25 Trunked IVD
- Enhanced Data (APX Subscribers only).

1.2.1.4 Applications

The following application have not been proposed for the IV&D/ED upgrade, but are available to local agencies once the locals enable RF sites licenses in their area and interface to the data CEN:

Over-the-Air Programming (POP25)

Motorola is providing a powerful Over-the-Air Programming (OTAP) tool called Programming over P25 (POP25), which allows simple, wireless updates of Land Mobile Radios (LMR). This is an alternative to the standard method of programming, which is to connect a PC with a cable to the radio in order to read/write the programming changes. POP25 allows end-users and radio users to stay in the field during the reconfiguration process, thus saving valuable time and resources.

One of the key features of POP25 is being able to make and receive voice calls during the process:

- Retain full use of the radio during the configuration data transfer without interrupting communication
- Voice always takes priority over POP25 data transfers
- Users do not have to switch to a non-busy channel
- Users do not have to stay in an area with high signal strength during the download
- All radio functions and capabilities are accessible and enabled

The duration of the file transfers can vary greatly with size and configuration of the subscriber codeplug files. Some examples of file transfer times on implemented IV&D systems with POP25 are provided below:

- Transfer to subscriber without voice files - Elapsed time 4min, Size of codeplug 1MB
- Transfer to subscriber with voice files - Elapsed time 24min, Size of codeplug 1.6MB

Note: Voice files contain ‘canned voice’ audible announcements for use with the subscriber, i. e., announcing zone and mode of radio.

POP25 allows for scheduled batch programming and can make specific programming changes instead of requiring a full code plug rewrite. The system will automatically generate a report, showing which radios were successfully programmed.

Over-the-Air Rekeying

Digital encryption helps keep your communications secure. Over-the-Air Rekeying (OTAR) is enabled via Motorola's Federal Information Processing Standard (FIPS) 140-2 certified Key Management Facility; this allows system operators to easily and securely change encryption keys on a regular basis, making the keys a moving target, and thus more difficult for adversaries to crack. If one of the radios is compromised, you have the ability to:

- **Remote inhibit** – Securely prevent radios from gaining access to the network from a distance
- **Remote enable** – Securely re-establish a radio’s network access from a distance
- **Zeroize** – Securely remove a radio’s key material
- **Change-over** – Securely switch a radio’s keyset to another keyset for use

OTAR, like POP25, sends updates to radios over the air, so users do not have to bring their radios in for manual service. This is especially important for encryption keys, because a manual change out could take days or weeks to accomplish — meaning lost money and productivity, as well as a longer window of vulnerability.

1.2.2 Enhanced Data (ED)

Enhanced Data introduces a new type of data channel to support short, periodic inbound messages on APX subscribers, such as GPS location. The ASTRO 25 Enhanced Data option can provide up to 12 times the capacity of a P25 standard data channel. Enhanced Data provides for optimized data services such as outdoor tracking, increasing the safety of field users. Dispatchers use these inbound messages to track the radio users' status and location with a mapping application.

Enhanced Data coverage is equal to your ASTRO 25 voice system, overcoming limited coverage of a broadband carrier.

DATA TRAFFIC DYNAMICALLY ADJUSTS
TO EMERGENCY VOICE NEEDS

Converting P25 FDMA channels to TDMA makes room for additional channels for voice and data. Channels can be dedicated to data to optimize throughput and access times – but emergency voice traffic can automatically take priority.

For agencies using carriers for broadband traffic, Enhanced Data moves the short-burst inbound traffic to the ASTRO 25 network, avoiding carrier charges and coverage limitations.

Enhanced Data enables several data-driven applications (e.g. SCADA, geofencing, telemetry, biometrics, etc.) over the ASTRO 25 system. When supporting a variety of special-purpose applications, Enhanced Data can help provide a more timely and detailed view of resource locations and conditions.

1.2.2.1 Master Site Core

The equipment additions as part of the Master Site Cores IV&D upgrade apply to the Enhanced Data feature as well. The Zone Controller has two additional licenses to support Enhanced Data:

- Trunked Enhanced Data License, this enables the Enhanced Data software on the Master Site Core. One license has been included in this proposal (max qty 1).
- Enhanced Data Trunked User License, this user license enables enhanced data radios to context activate to the Master Site Core. Each license is bundled in groups of 500 users. Motorola has included fifteen licenses, or a total of 7,500 enhanced data users per Master Site Core as part of the IV&D/ED upgrade.

Unified Network Services (UNS)

Unified Network Services (UNS) is the Motorola Solutions software platform that provides common services, such as Presence, Location, Messaging, and Group Management for multiple MSI networks. UNS Presence will be offered in support of ASTRO25 Advanced Messaging Solution (AMS) and UNS Location will be offered in support of ASTRO25 GPS Location. UNS provides standard web based API's for mapping tools and applications that utilize Presence, Location, Messaging and Group Management, and allow application development to be more efficient. UNS Location and Presence APIs are available to Third Party Application Developers in order to support customers with an end-to-end Location and/or Presence Solution. The UNS Presence and Location licensing comes in bundles of 500 users each. Motorola has proposed with the IVD/ED upgrade Presence and Location licenses for 1000 users.

Master Site Core Capacity Limits

1) Enhanced Data Maximum Messages per Hour – Per Zone/System: 1,200,000 per zone with GGSN in each zone / 1,200,000 system with one GGSN / Total 8,400,000 system wide\
2) Maximum Enhanced Data Channels per Site: No upper limit, usage is based on traffic and number of physical channels at site
3) Enhanced Data Maximum Messages per Hour – Single Channel or Simulcast Channel: 18,000

1.2.2.2 RF Site

The following equipment upgrades to the RF Controller Subnet has not been proposed as part of the IV&D/ED upgrade. Local agencies who decide whether to enable the data network feature to their local sites will be offered at a local level, as well as perform a loading analysis to determine if additional channel capacity is necessary.

Each controller at ASR or Simulcast Prime Site must be licensed to enable the enhanced data network for the coverage defined by the RF sites. This Enhanced Data site license is in addition to the IV&D site license, there is an option on the site controller to include both types of data licenses. The licensing is based on the number of sites; each RF Site controller must be licensed based on the ASR site or the number of Simulcast SubSites. In the future, local agencies can decide to add IV&D and/or ED feature capability to their local area.

Packet Data Channel

The Packet Data Channel is a Trunked RF channel that provides the over-the-air transmission path for packet data messages between the Subscriber and the site infrastructure. In non-Simulcast sites, a Packet Data Channel is provided by a Base Radio / Site Repeater. In Simulcast sites, a Packet Data Channel is provided by a combination of a Comparator and a Multi-Site Base Radio. The following types of Packet Data Channels are supported:

- P25 Trunked IVD
- Enhanced Data (GTR Series site equipment only)

All data licensing at RF sites is done on a per site basis.

1.2.2.3 Subscriber

A data-capable Subscriber supports onboard data applications such as OTAR, POP25, and Outdoor Location. Each subscriber requires a data software option and/or group services option to enable certain data features. The IV&D/ED upgrade has not included any subscriber software flash upgrades.

The following types of Packet Data Channels are supported by Motorola Subscribers:

- P25 Trunked IVD
- Enhanced Data (APX Subscribers only).

1.2.2.4 Applications

The following application have not been proposed for the IV&D/ED upgrade, but are available to local agencies once the locals enable RF sites enhanced data licenses in their area and interface to the data CEN:

GPS Location

Motorola's solution streamlines the location services to a single client that provides device location coordinates to a central database, which any application on the network can access via standards-based 3GPP compliant APIs. Location services consist of client and server software and respective server hardware and network fabric. When deployed, location service will allow a responder to see his location on a device. A dispatcher will be able to view the location of the responder and vehicles displayed on a map, and utilize this information to dispatch responders to incidents, etc. User equipment (UE) must contain GPS hardware that determines its location and conveys this location information to the location client in UE. Applications in the agency can request device location from the location server using the device's address from the agency. The location server communicates with the location client in the device and retrieves the location information.

1.3 WAVE SYSTEM DESIGN

WAVE may be used to extend the Land Mobile Radio (LMR) communications to broadband enabled devices and allows users to securely communicate with land mobile radio system users using an easy-to-use application. The WAVE solution is comprised of WAVE Communicators, the WAVE Server, integration to an ASTRO25 system, via a wireline interface with the ASTRO25 InterSystem Gateway.

1.3.1 WAVE Solution Components

WAVE consists of infrastructure and subscriber components and applications that function together in a system. This section defines the different components and the applications available, their offered services, and their roles in the system.

1.3.1.1 WAVE Communicators

WAVE Mobile Communicator

WAVE Mobile Communicators is an Android and Apple iOS platform application. The WAVE Communicator requires the user to provide the username, password, and server address of the WAVE Server for each login. The WAVE Communicator can be configured to store the password on the device or to require the user to manually enter the password each time they login to the WAVE Server. The username and password are encrypted using AES-256 bit encryption and validated on the WAVE Server. The WAVE Communicator username and password can only be configured on the WAVE Server by the WAVE Server administrator.

The WAVE Communicator is a free download from the Apple iTunes and Google Play Store websites. Therefore the total number of devices with the WAVE Communicator installed is not significant and a WAVE user that loses their device, breaks their device, upgrades their device, etc. can download the WAVE Communicator on their new device for free without contacting the WAVE system manager

WAVE Desktop Communicator

WAVE Desktop Communicator is a software application that loads on a desktop CPU with monitor. This client allows users to monitor/talk on talkgroups and provides features such as instant playback, simulcast, status/presence information, location/mapping, and telephony integration.

WAVE Advanced Desktop Communicator

WAVE Advanced Desktop Communicator is a software application that loads on a desktop CPU with monitor. This client allows users to monitor/talk on WAVE talkgroups, make private calls, perform patching and simulcast communications, make/take phone calls with full PBX integration, initiate and respond to alarms, leverage instant recall and long-term recording options, map users' locations, and a host of other dispatch-type functions.

1.3.1.2 WAVE Servers

A WAVE solution can consist of multiple Management, Media and Proxy servers depending on the size, configuration and architecture of the system. These servers are grouped under the term "WAVE Server(s)" and can be hosted on a single server hardware, as virtual machines, or on separate server hardware platforms. The MNDOT WAVE upgrade is based on a single server design. Each of these entities function is described in the following subsections.

The WAVE Server(s) provides the following services.

- Controller for WAVE System
- Receives and Responds to Registration Requests
- Receives and Responds to Call Requests
- Network Manager for WAVE System
- User Management
    - Login Credentials
    - Talkgroup Associations
- System Usage Monitoring
- Software License Management
- System Backup and Restore
- System Software Upgrade

The WAVE server, in addition of its standard WAVE functions, interfaces to the ASTRO25 Radio System (via InterSystem Gateway to be provided by a separate ARMER project) by

- Performing Mapping between WAVE Channels and ASTRO25 talkgroups
- Converting Audio Formats Between the WAVE System and the ASTRO25 InterSystem Gateway

The WAVE Server supports a total of 50 Simultaneous ASTRO25 wireline talkgroup calls whether encrypted or clear. Use of encrypted talkgroups does not negatively impact capacity. The WAVE Server simultaneous call capacity is dependent on the participants involved in the call. When a WAVE channel is mapped to an ASTRO25 talkgroup, there is a maximum of 50 simultaneous calls possible involving ASTRO25 trunking talkgroups because the WAVE Server solution supports a maximum of 50 simultaneous talkgroup calls.

WAVE Management Server

The WAVE Management Server provides a web based interface for configuration and control of the WAVE Domain. A WAVE Domain is every WAVE Server and WAVE Client that looks to this particular WAVE Management Server for its configuration. The configuration is maintained on a SQL database. This database may be maintained on the same machine as the WAVE Management Server or may be maintained on a customer's existing SQL Server cluster.

The ability to share assets between WAVE Domains is extremely beneficial during periods of task reorganization. User groups can extend their collaborative capabilities across organizational boundaries as needed.

The WAVE Management Server requires a license for each WAVE Communicator that is logged into the system at a time. The license is a floating license; it is not locked to a specific device or user. When the WAVE Communicator deregisters from the WAVE Management Server the license becomes available for another WAVE Communicator. A user that is registered on the WAVE Management Server from multiple WAVE Communicators uses one license per WAVE Communicator.

The total number of devices that will be logged into the WAVE Management Server at the same time is defined by the number of Client Access Licenses (CALs) that are required on the WAVE Management Server. If the same user is logged into the WAVE Management Server from three (3) devices at the same time, this will use three (3) CALs.

WAVE Media Server

The WAVE Media Server acts as a media processing “engine” for the system, performing digitizing, mixing, and audio transcoding. The WAVE Media Server software runs as a service on a Windows Server. The WAVE Media Server processes audio streams, either multicast audio channels or telephony type H323 and SIP streams. The exact number of these streams that the WAVE Media Server can handle is determined by the specification of the server. In most WAVE domains, a PC acting as a WAVE Media Server may also run other applications.

WAVE Proxy Server

The WAVE Proxy Server handles the connectivity to smartphone devices that have the WAVE Mobile communicator application loaded on it. The WAVE proxy server can handle approximately 500 simultaneous users on one server. The Proxy server will encrypt the data stream from the server to the mobile device using AES-256 bit encryption. The WAVE proxy servers automatically operate in load balancing role for dual server designs in the event of a single server failure, distributing user load as reconnections happen in a real time manner, all controlled via the WAVE Management Server. This load balancing also occurs if new Proxy Servers are brought online in the event that more capacity is required.

WAVE Radio Gateway

The WAVE Radio Gateway, WRG, is a WAVE server which allows the interconnection of WAVE Channels and wireline interfaces into radio systems. It typically provides greater system density as one WRG can support many concurrent group calls and private calls.

For a deployment requiring ASTRO25 encryption, additional equipment is required. WAVE CRYPTR is a hardware device connected with an Ethernet crossover cable to the WAVE Radio Gateway Server to provide encryption services for the WAVE solution. The WAVE CRYPTR is required for use with encrypted ASTRO® 25 Talkgroups integrated with the WAVE Radio Gateway. This WAVE CRYPTR is not included as part of the IV&D/ED and WAVE upgrade design for MNDOT.

1.4 SYSTEM DESCRIPTION SUMMARY

The ARMER regional 800 MHz Project 25 trunked radio system consists of multiple ASTRO 25 radio subsystems that support voice communications, this IV&D/ED and WAVE Master Site Core upgrade allows local agencies the flexibility to add data applications to their fleet of radios, and extend coverage to broadband devices. It offers more productive and informative dispatching capabilities by having current user location and/or the ability to text a group of users or individual. For technicians, time is saved by allowing radios to be programmed or rekeyed over the air. The WAVE solutions extends the coverage to broadband devices, and offers a lower cost solution to school safety or communicate with an extended workforce without compromising the reliable, high-quality ASTRO25 network whenever - or wherever - they may be located. All these advancements in technology will help simply the management and responsiveness of the field personnel.