SYSTEM SOLUTION NARRATIVE

P25 Conventional Solution

INTRODUCTION

The purpose of this P25 Conventional Radio Solutions narrative is to provide NASPO ValuePoint Sourcing (NASPO) with enough detail to accurately assess L3Harris' products, services, and capabilities. L3Harris offers a unique IP-based network solution for the challenges many critical communications users face today. This solution grants access to information that users need today and well into the future: it is flexible, scalable, and ready to address communications needs. L3Harris' product offering is called "VIDA", as it delivers unprecedented Voice, Interoperability, Data and Access (VIDA).

Figure 1. **The L3Harris VIDA Architecture**

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

The proposed P25 conventional system is a fully integrated voice and data capable network designed around an IP-based infrastructure. VIDA employs some of the latest technologies, including: VIDA conventional controller with the option for geographically split high availability, MASTR V conventional base stations/repeaters,

centralized network management, next generation Symphony IP Dispatch Consoles, and highly acclaimed full spectrum XL-series P25 portable and mobile radios.

THE L3HARRIS ADVANTAGE

> **Reliability, Outstanding Value –** The proposed P25 conventional system is a complete communications package that can leverage IP infrastructure. In addition, L3Harris has provided a VIDA Essentials conventional controller with network management.

> **MASTR V Base Station/ Repeater –** The MASTR V base station/ repeater's flexible hardware platform supports P25 Conventional, P25 Trunked Phase 1 (FDMA), and P25 Trunked Phase 2 (TDMA) operation, reducing migration costs.

> **Next Generation IP Consoles** – L3Harris understands the critical role that dispatchers play during life safety events, and it requires a platform that is intuitive and minimizes the time it takes for each task. A unique hardware design supports the reliability needed for emergency responses, and advanced digital audio technology delivers high capacity and secure end-to-end communications. The L3Harris Symphony dispatch console is so easy to use that it quickly becomes second nature.

> **XL-series subscriber radios –** L3Harris brought the technology from the battleground of our military customers to the battleground of Public Safety. An example of this is the highly acclaimed XL-185/200P that is not only full spectrum LMR, but also includes standard GPS, Wi-Fi and Bluetooth. The XL-185/200P is a game-changer in the industry. L3Harris continued to innovate and developed the mobile variant of the XL family, the XL-185/200M. This mobile radio serves as a converged device in every vehicle that has it installed.

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

> **Expandable –** The scalability of the proposed P25 network offers the ability to add different sub-systems to the system to meet emerging needs. The proposed architecture can easily expand to accommodate additional users, enhanced coverage, and features as needs change, in a cost-effective manner. In addition to P25, this L3Harris system is a gateway to technologies such as the national LTE system, and L3Harris' own PTT over LTE technology BeOn, which bridges LMR talk groups with cellular handsets.

EQUIPMENT OFFERING PER LOCATION

The flexible nature of the VIDA network architecture permits the redistribution of subsystems, as required by NASPO's needs, during contract negotiations or preliminary phases of network design.

Controller Equipment

The following controller equipment is proposed for this solution:

- One VIDA Essentials conventional controller including:
  - VIDA Application Server (VAS), which hosts the following services in a virtual machine (VM) environment:
    - Network Switching Server (NSS)
    - Regional Network Manager (RNM)
    - Unified Administration System (UAS)
    - Active Directory (AD)
  - System Network Clock
  - Cisco Wide Area Router (WAR) and Ethernet switch

Dispatch Equipment

The following dispatch equipment is proposed for this solution:

- Three Symphony consoles, each equipped with:
  - Foundation bundle with 8 radio channels
  - 22" Non-touch HD monitor
  - Two Nano speakers
  - Single USB footswitch
  - Desk Microphone
  - Six-wire jack box and adapter
  - USB 104-key keyboard and optical mouse
- Cisco Site Access Router (SAR) and Ethernet switch

RF Equipment

The following RF equipment is proposed for this solution:

- One 4-Channel, VHF conventional P25 single site, including:
  - One VIDA Virtual Site for database management and SNMP reporting
  - Four VHF MASTR V conventional P25 stations
  - One system reference oscillator
  - Cisco Site Access Router (SAR) and Ethernet switch

Subscribers

The following subscribers have been included as part of this proposal along with one set of radio programming software, key loader software, and associated cables:

- (50) XL-185P single band VHF, partial keypad portables, featuring:
  - P25 conventional
  - Single key AES and DES encryption
  - Bluetooth, GPS, WiFi
  - AT&T & Verizon Certified and FirstNet Ready™
  - 3100 mAH, Lithium-Ion battery
  - Antenna
  - Metal belt clip
- (4) XL-185M single band VHF desktop control stations, featuring:
  - P25 conventional
  - Single key AES and DES encryption
  - Bluetooth, GPS, WiFi
  - AT&T & Verizon Certified and FirstNet Ready™
  - Antenna, roof-mount base, and all necessary mounting hardware

Figure 2 provides the block diagram for the proposed design. The equipment can all be located all together at a single site or separately at any site on the IP network. Figure 3 provides a sample rack-up drawing of the site equipment for a 4-channel site and the VIDA Essentials controller.

Figure 2. **System Block Diagram**

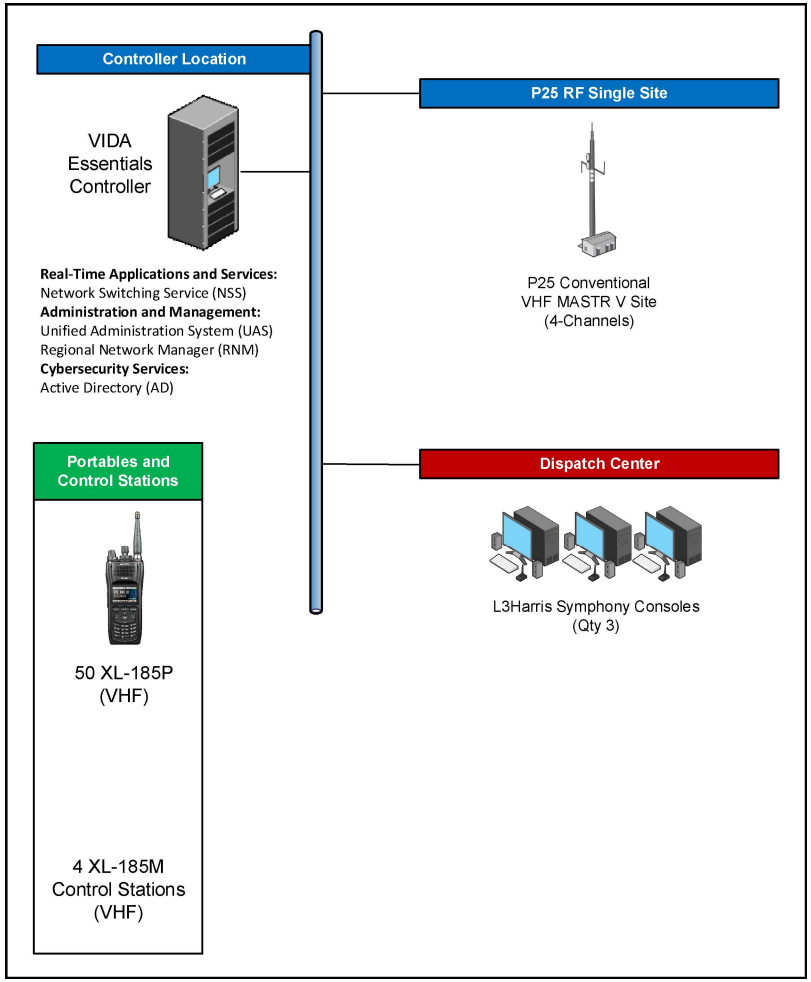
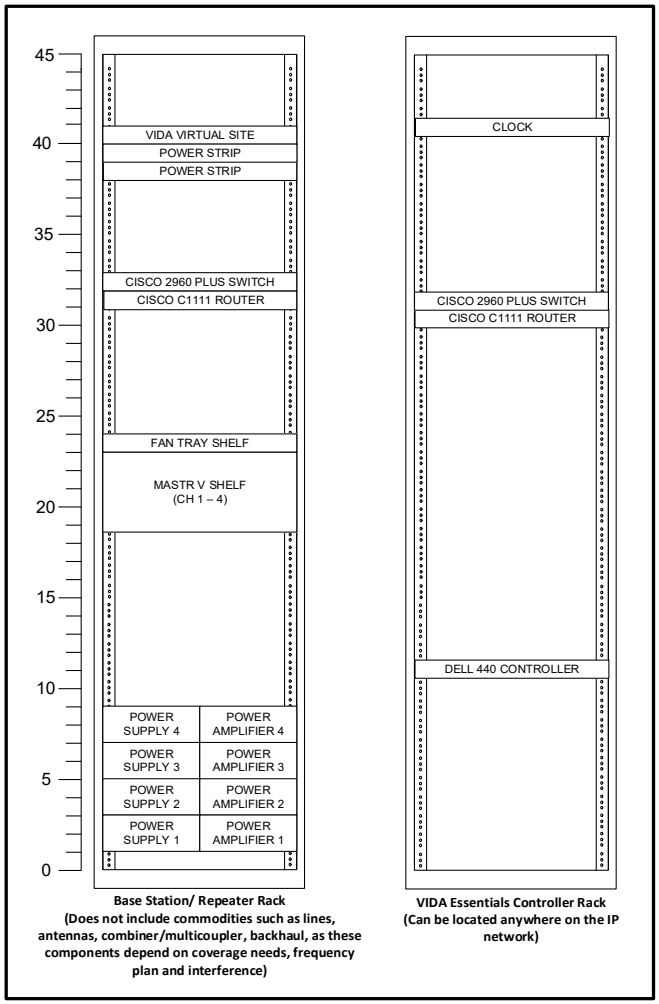


Figure 3. **Sample Rackup**



VIDA NETWORK WAN REQUIREMENTS FOR BACKHAUL

To guarantee the quality of voice through the VIDA network, all WAN links will need to strictly adhere to the requirements provided in the following sections. Conformance with these design requirements is a necessary condition for L3Harris to meet the overall performance needs of the VIDA system. All these requirements are necessary to provide a guaranteed level of service for voice quality. Failure to adhere to these requirements could result in poor audio for which L3Harris cannot be held accountable. In the event of audio problems, L3Harris will work with the customer to determine the source of the problem. If the problem is determined to be in the customer supplied backhaul, L3Harris will be available on a contract basis to help resolve the issue.

Packet Loss Requirements

Due to the connectionless nature of UDP used in transmitting voice packets, minimal packet loss is tolerable in the VIDA network. However, *any* packet loss could result in degraded voice quality or loss of voice. L3Harris will not be held responsible for degraded voice quality that comes from the result of packet loss in the customer provided transport network.

Performance testing to be measured based on the following:

- RFC 2544 standard to be used
- Length of test per link shall be at least 12hrs
- Frame loss shall be less than .01%
- Out-of-Order packets shall be less than .01%

Multisite and Console-site Jitter (One-way)

Jitter is the variability of packet delays within the same voice packet stream (talk spurt). The L3Harris requirement is for the overall jitter to average near zero and to never build up to more than 60ms one-way. Any streams with excessive jitter will be considered to have packet loss which can cause voice quality issues.

For example, if a voice packet were 60 milliseconds late, then it would be optimal for the next few voice packets to be early to get the average jitter back to zero. This will allow the voice buffer to build back to a stable point.

Latency Requirements (One-way)

Some degree of latency, such as satellite links, can be supported within the VIDA network. Any latency within the system will need to stay constant to avoid jitter. Latency requirements differ based on the site type and traffic patterns. This section defines latency requirements for Multisite and Console site to NSC.

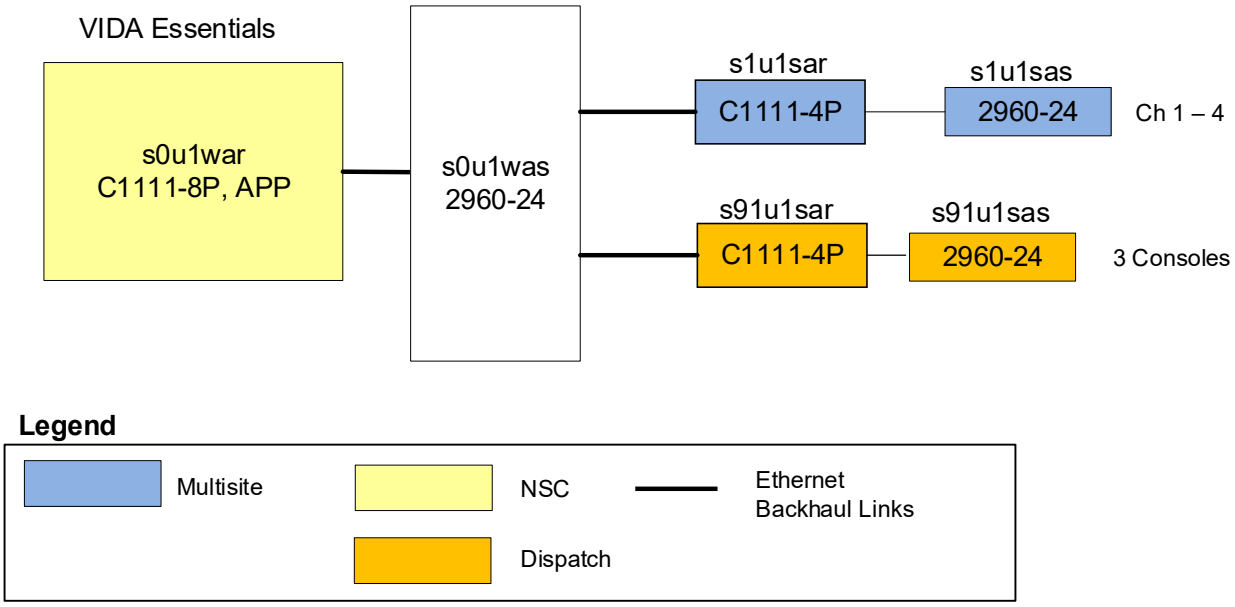
Latency is measured one-way. Asymmetric latency is permitted if one-way measurements meet specifications below. Satellite links can be supported after system timers are modified to account for satellite delay.

> Multi-site/Console-site to NSC latency must be less than *150ms*

Backhaul Bandwidth Requirements

The proposed system consists of the VIDA Essential core, one RF site with 4 channels (Phase 1 P25) and one console site with three Symphony Consoles. The RF and Console Site network equipment connects to the VIDA Essential core over a WAN interface. This WAN interface connects to the core WAR router via a wide area switch (WAS) which is a 2960-24 Ethernet switch. The Ethernet backhaul links between the RF and Console sites to the core will require a minimum link each of 1536 kbps.

Figure 4. **Network Diagram**



Layer 2 Quality of Service Requirements

If Layer 2 WAN services are being provided, the layer 2 WAN should map our layer 3 DSCP markings into the appropriate layer 2 queues that meet the layer 3 requirements.

Layer 3 Quality of Service Requirements

At OSI Layer 3, the network will recognize and forward L3Harris voice traffic marked using the Differentiated Services Code Point (DSCP) byte and the network will also meet the following requirements:

- The Platinum (DSCP EF) queue should be treated as a strict priority queue for voice.
- All other queues should be treated as CBWFQ.
- All DSCP values should not be manipulated during transport.

Figure 5. **QOS Level Summarization**

LEVEL	DSCP MARKING	BANDWIDTH RESERVATION	QUEUING METHOD	IP SERVICES
Platinum Plus	CS6	5%	Class Based Weighted Fair Queue	EIGRP Traffic
Platinum	EF	50%	Priority Class Based Weighted Fair Queue	VNIC Voice Traffic VNIC Management Traffic
Multicast	AF42	15%	Class Based Weighted Fair Queue	Site Multicast Traffic (Heartbeat)
Gold	AF41	10%	Class Based Weighted Fair Queue	HA Synchronization Traffic P25 Data (OTAP, OTAR, etc.)
Silver	AF31	10%	Class Based Weighted Fair Queue	RNM ICMP Traffic Windows Remote Desktop (RDC) Secure Shell (SSH)
Bronze	AF11	5%	Class Based Weighted Fair Queue	SNMP Management Traffic SysLog ICMP
Best Effort (Default)	BE (0)	None	None	All Else

POWER, HVAC, AND SPACE REQUIREMENTS

Power and HVAC Requirements

Please see the power loading and HVAC requirements for the controller, dispatch, and RF site equipment in Figure 6. It is NASPO's responsibility to provide the adequate 120 VAC backup power and HVAC per the requirements below.

Figure 6. **120 VAC Power Requirements with 20% Growth**

LOCATION	EQUIPMENT PEAK POWER (W)	EQUIPMENT PEAK HEAT (BTU)	DUAL HVAC REQUIRED (TONS)	DUAL HVAC POWER (W)	TOTAL PEAK POWER: EQUIPMENT+ HVAC+ GROWTH (W)
Controller	436	1,488	1.0	7,762	9,838
Dispatch	574	1,958	1.0	7,762	10,003
RF Site	2,512	8,571	1.0	7,762	12,329

Space Requirements

It is NASPO's responsibility to provide floor space for the L3Harris equipment racks and cabinets. L3Harris has included a single 86" tall rack for the RF site equipment and a single 78.4" tall cabinet for the VIDA controller equipment.

Equipment Descriptions

SYMPHONY IP DISPATCH CONSOLES

The Symphony dispatch console is a full-featured dispatch console with true, IP-secure network connectivity. The Symphony console is L3Harris' latest offering in IP dispatch technology based on the Microsoft Windows operating system. It is the NASPO dispatcher's best weapon in the fight against time. Built upon a proven platform, it is simple, organized, and efficient. The screen layout is easy to learn and operate; maximizing productivity while minimizing training time. Large buttons and intuitive, customized layouts make maneuvering through the console functions easy and straightforward. L3Harris dispatch systems are supportive of, and can operate in, a method fully consistent with the NFPA 1221 standards.

A single, logical network connection to the PC-hosted Symphony console replaces the traditional audio switches found in traditional systems. With less equipment and complexity, the Symphony console is a more robust solution. The core package of the

Symphony includes a Central Processing Unit (CPU), monitor, microphone, mouse, and speakers, which can be placed on any standard furniture that has space to accommodate a monitor and the accessories shown in Figure 7. Symphony also supports a complete set of audio accessories, including headsets, microphones, speakers and footswitches. The Symphony Dispatch Platform (SDP) is an industrial grade computer running the Windows 10 operating system, and hosts the Symphony application, which provides the dispatch features with a highly customizable graphical user interface.

Figure 7. **Symphony Dispatch Console and Accessories**

It utilizes the CPU to perform the digitization of voice, like Voice over Internet applications. The Symphony console is an integral part of the VIDA network and does not require any “back room” electronics equipment, as required for other systems. This is a great savings in terms of installation cost and space requirements. Because the console is IP based and only requires a network connection to tie into the VIDA network, ad hoc backup dispatch centers can be quickly established as the need dictates.

Also, installed in the SDP is the Symphony Audio Processor (the “Audio Box”) which provides the platform for modulating, demodulating, routing and recording dozens of concurrent audio streams. The Audio Box also provides automatic gain or level control of various inputs, equalizing responses from different combinations of responders and equipment. The wide array of connectors on the SDP simplifies the cabling for the peripheral options at each dispatch position.

The Symphony application supports full P25 functionality to provide the dispatcher with all the features necessary to successfully dispatch on the system. Symphony can control a mix of up to 1024 different talkgroup modules, individual call modules, conventional base station modules, paging modules, I/O modules and specialized request-to-talk and radio status message workflow management modules. Symphony

provides an instant recall recorder that can be configured to provide up to 24 hours of call history. The Symphony feature set is highly customizable with the use of value-added feature licenses.

Figure 8 shows a sample of the Symphony console's user interface. The display screen is composed of panels and communications modules that provide dispatchers system status at a glance. The panels appear on every page of the display, and their contents do not change from page to page. Communication modules, on the other hand, are linked to specific pages of the display. Thus, when you switch from page to page, the panels will remain the same and the communication modules will change.

Figure 8. **User Display Symphony Dispatch Console**

A communication module is the fundamental component for communicating through the console. Each communication module can be individually programmed with a single entity, representing a talk group, a radio unit, a conventional channel, or another console. When an entity is programmed into a module, all audio related to that entity is routed to the console. Modules provide incoming call monitoring and outgoing console-originated call transmissions. On the display screen, rectangular boxes represent the modules. Up to 1,024 communication modules can exist across eight pages of the display.

The Symphony Console comes with several standard features that enable a dispatcher to perform their functions efficiently.

Figure 9. **Symphony Standard Features**

FEATURE NAME	FEATURE EXPLANATION
Select and Unselect Modules	Any programmed module can be selected as the select module for direct communications from the dispatcher. Other programmed modules will be the unselect modules.
Emergency	The consoles are equipped to both declare and clear an emergency. When an emergency is declared from a radio unit, there is both an audible and visual indication on the module. The audible indication is in the form of an alert tone. The visual indication involves both changing the color of the module to “red”, as well as the text “EMER” displaying on the module. The console can be set up, so a dispatcher can clear the alarm, to stop the noise and then service the emergency.
Alert Tones	Pulsed, warbled, and alert tones can be transmitted to alert radio units of specific emergency conditions.
Intercom Call	Allows two-way personal console-to-console communications.
Call History	Displays the last five select and unselect module call history.
Extended Call History	Displays the last hundred select and unselect module calls and other programmed module calls.
Patch	Modules patched together can communicate with one another.
Simulselect	Dispatcher can communicate to the modules simulselected but cannot communicate with one another.
Encrypted Calls	Encrypted calls between the dispatcher and field units are only un-encrypted at the source and destination, ensuring secured communications as the voice packets travel through the radio network.
Cross-mute	Reduces unnecessary receive audio at the local console by preventing transmissions from other consoles from being heard and prevents audio feedback problems when two or more consoles are placed in proximity and at least one is equipped with speakers.

MASTR V BASE STATION

L3Harris' P25 was the first completely Internet Protocol (IP)-based mobile radio communications system developed for users requiring the secure digital voice and data capabilities of Project 25. P25 is part of a portfolio of solutions that L3Harris offers for wide-area communication systems – each of which can meet the communications requirements of federal, public safety, public service and first responders. P25 meets the requirements of the P25 Phase 1 and Phase 2 standards, plus provides value-added voice and data features.

The MASTR V base station powers secure P25 digital voice and data communications. Its functionality and architecture meet public safety requirements and set it apart from other base stations in the P25 industry:

- Compact and integrated hardware supports up to eight channels in a single cabinet or rack. Multiple RF channels sharing a rack lower costs, minimize the amount of supporting hardware, reduces maintenance, necessary floor space, and the burden on other site resources such as HVAC systems.
- Digital-signal processing routes voice and data calls as IP packets to the network, resulting in economical routing and backhaul.

Any MASTR V channel at a site can operate as a control channel, providing greater system resiliency. Other manufacturer systems limit the number stations that can act as control channels.

- The distributed architecture results in high-fault tolerance, minimizing the effects of hardware failure. For example, unlike other vendors' architectures that use a single or redundant site controller computer, each MASTR V base station has a built-in traffic controller that controls call-processing functions. An Ethernet switch in the repeater chassis connects each traffic controller to two local area networks (LANs) for network management and call processing.
- The flexible hardware platform supports P25 Conventional, P25 Trunked Phase 1 (FDMA), and P25 Trunked Phase 2 (TDMA) operation, reducing migration costs.
- The native IP operation simplifies data integration with wireless IP data applications.

- Remote programming of the MASTR V base station allows the system administrator to perform software upgrades, firmware upgrades, or individual parameter changes without traveling to the site and manually connecting to the stations.
- The hardened design allows the MASTR V to operate in rugged environments, with an operating ambient temperature range of -30 °C to +60 °C and to operational altitudes of 15,000 feet above sea level. These base stations currently operate in harsh environments, such as the blazing sands of the Middle East, the frigid extremes of northern Saskatchewan, and the towering peaks of the Sierra Nevada Mountains.
- Modular boards simplify maintenance procedures.

Figure 10. **MASTR V Base Station Modules**

MODULE	BENEFITS
Tx Module	Provides a highly stable RF output to drive the high-power amplifier (HPA) module. Uses a Direct Digital Synthesizer (DSS) that optimizes its modulation characteristics. The DSS can digitally create a precision waveform or modulation scheme from a single on-board oscillator.
Rx Module	The MASTR V Rx modules are dual-IF conversion receivers. The receiver uses a sigma-delta-analog-to-digital converter to process the incoming IF signal. The output of this analog-to-digital converter is a complex pair of I/Q baseband digital signals. Supports a wide range of modulation waveforms required for current and next generation public safety two-way radio communications.
Baseband Processor Module	Generates all receive, transmit, and control processing for one or more RF channels. Provides a data interface between the Traffic Controller and the Tx and Rx modules. Generates a heartbeat message to monitor the health of base station modules.
Traffic Controller Module	Manages data and control information for one Tx and one Rx channel module. It interprets and directs inbound calls and issues appropriate control commands to and from the Tx and Rx modules. These include how to handle data between the base station and the control point. Processes decoded radio information received from the baseband processor module.

MODULE	BENEFITS
	Implements P25 call control, network management, and remote channel management. P25 features (e.g., radio registration, authentication, mobility management) are available on a channel-by-channel basis. Encapsulates P25 clear and encrypted voice and data calls into IP packets for routing throughout the network. The packets contain P25 user and talk group IDs, allowing the network to operate with seamless end-to-end IP functionality. Handles IP connectivity of each channel with the P25 network. It monitors repeater communications while providing routing for multi-site voice and data calls. The Traffic Controller replicates key P25 database information at the site to allow uninterrupted channel operation. All the controllers share database and dynamic call processing information from the Network Switching Center (NSC) to avoid having a single point of failure.
High Power Amplifier (HPA) Module	Provides continuous duty, solid state, and wideband RF power amplifier. Amplifies the exciter output to the rated station output power level. Equipped with an RF linearizer circuit to improve RF performance. The RF linearizer samples the RF output of the HPA and provides waveform correction to the RF input signal relative to its RF output characteristics.
Power Supply Module	Provides continuous duty-switching power supply. Includes front-panel LED status indicators for each DC output, an AC Power input LED, and a front-panel on/off switch used to disable the power supply and built-in cooling fan.

VIDA CONTROLLER SYSTEM ARCHITECTURE

Network Switching and Management

The L3Harris conventional controller is the VIDA Network Switching Center (NSC). The NSC is the heart of L3Harris' P25 packet-switched network. NASPO is configured for a VIDA Essentials NSC with a single server, providing a small-level sized network switching capability. The Essentials NSC uses the same technology used in all L3Harris NSC configurations which allows easy upgrades to an NSC configuration capable of supporting a larger system when needs dictate expansion of network capacity. All the

components in the NSC are commercial off-the-shelf (COTS) computer and networking equipment leveraging the IP industry, thus providing key benefits. This equipment:

- Leverages the continual technological advancements of the computing and networking industry. Each new generation of equipment has more memory, more processing power, and often occupies a smaller physical footprint
- Spreads the research and development (R&D) costs across a much larger customer base. This lowers overall costs to achieve greater technology improvement results, thus reducing total cost of ownership
- Allows the use of commercially available parts from a wide variety of sources, which ensures competitive pricing
- Provides scalable hardware to accommodate future growth, protecting NASPO's initial investment

In effect, the NSC is a cost-effective means to deploy a scalable radio network as user needs require and budgets dictate. It is easily configurable to accommodate additional sites, talkpaths (channels), and consoles.

VIDA APPLICATION SERVER (VAS)

The Essentials NSC is made up of one main hardware component; the VIDA Application Server (VAS). The VAS provides the single point of access for the call switching, as well as management and administrative tasks for a VIDA Network. Powerful virtual machine (VM) technology consolidates several call routing and management applications on a single server (as opposed to running on separate servers). This provides L3Harris customers with a simplified (hardware configuration) solution and achieves cost savings through reduced maintenance activities, valuable equipment room space conservation, and reduced power consumption. The VAS is a server workstation that hosts a voice controller application performing routing functions for digital conventional voice messages through an IP backbone.

VIRTUAL MACHINE (VM) TECHNOLOGY

VM technology allows many applications running under separate operating systems to co-exist on a single server. The VM software allocates processor power, Random Access Memory (RAM), and Network Interface resources to each application. It isolates each application and ensures that no application impacts the operation of the others. VM technology also allows the addition of software capabilities on the server. For example, a customer adding encryption to the radio system can easily install the KMF VM software package on the VAS (instead of the conventional installation of a separate server to support that application).

NETWORK MANAGEMENT AND EVENT MONITORING

The L3Harris network management system consists of a suite of network management software programs that complement each other. The combination of these applications offers a high level of system management as well as standard and customized reporting capabilities. The following is a list of the network management applications included in this solution. These applications are VMs residing on the VAS.

- Regional Network Manager (RNM)
- Activity Warehouse (AW)
- Unified Administration System (UAS)

In addition, the network management solution includes the VIDA Virtual Site device, which is the L3Harris Remote Terminal Unit and is installed at the RF location.

Regional Network Manager (RNM)

The RNM is a powerful network manager that monitors and consolidates faults from various sites and presents them to the user through elegant graphical user interface. It provides performance, event and fault monitoring, and reporting for the radio network through a collection of applications and administrative programs. It uses Simple Network Management Protocol (SNMP) for managing alarms. The radio system manager can monitor the overall health of the Network Switching Server (NSS), view real-time diagnostics, monitor call activity, set system/network configuration parameters, and generate reports. Managed network objects continuously monitor their performance grade of service. Through active polling of the objects and receipt of autonomous trap information, the RNM keeps the network operators up to date with the latest status of the network. Aided with tools such as the Network Viewer, Object List, Fault Browser, Notification Manager, History Browser, and Real-Time Viewer, an RNM user can carry out the task of network management much more efficiently.

Activity Warehouse (AW)

Activity Warehouse is a reporting application that monitors and reports airtime usage, site affiliations and various other aspects of the network. Reports are based on IP call activity related to RF sites, consoles, gateways, and other devices on the VIDA network. Activity Warehouse performs data searches on call logging data created and stored by VIDA network components. Parameters stored within this data are reported by Activity Warehouse in textual, table, and graphical formats. Activity Warehouse is configured with a set of predefined report types that are accessible from the SMT. Some report types may include Input filters that may be customized by the user for specific search limits. User-definable filters include dates, times, systems, and Agency IDs. Some input fields allow direct entry while others are populated with a dropdown box providing specific limits or choices.

Unified Administration System (UAS)

The Unified Administration System (UAS) service provides an open system interface to the radio system. It enables the radio system administrator to manage operational aspects of the system including configuring users; establishing their privileges, organization, and security; and configuring voice group coverage.

VIDA Virtual Site – Remote Terminal Unit

The VIDA Virtual Site is a powerful, compact computer that hosts Site Management Services as part of L3Harris' total Site Management System. It provides a full array of digital communications capabilities for fast, accurate, and efficient relay of critical information. The VIDA Virtual Site monitors the site call processing local area network (LAN) for call activity and fault messages. The VIDA Virtual Site ensures that data such as user, group, and channel configurations is reliably transferred to configured site devices. The fault monitoring services take input from the site call processing of LAN, RF Power, Digital Input/ Output (I/O), Channel Test services and current alarms. It uses this information to identify potential problems and their severity, status, and reason for the most recent failure. This increases operator awareness, improves response time for maintaining vital communication links, and decreases repair time and system downtime. The VIDA Virtual Site can be custom configured with an array of analog or digital Input or digital Outputs adapters which can be used to gather site alarms or control relay logic devices. These I/Os can also be configured by the user to indicate faults in devices such as tower beacons, doors, temperature alarms, etc. that require remote controlling and monitoring. This information allows users to make quick, informed decisions to meet their needs and to adapt as those needs change.

ADDITIONAL APPLICATIONS THAT RUN ON THE VAS

In addition to the RNM, AW, and UAS, the following applications are also VMs that reside on the VAS.

Network Switching Service (NSS)

The Network Switching Service (NSS) is a fully integrated voice and data controller. The switching services route calls to and from each voice group or mobile data user on a real-time basis and regulates voice and data traffic on the network. It maintains a database of these voice group files and routes the IP voice traffic of one member to all the other members of a given voice group.

Regional Site Manager (RSM)

The Regional Site Manager (RSM) routes administrative information (users and groups) between the UAS and each site. The RSM also routes activity data from the Sites to the RNM.

Active Directory (AD)

Active Directory (AD) is the primary method of controlling access to the VIDA network. This centralized service performs authentication and authorization of users and devices to restrict unauthorized network access. AD authentication is extended to UNIX servers with the integration of Quest Authentication Services for Solaris and Linux operating systems, and to devices that do not support the protocols (i.e. Cisco) through RADIUS. Active Directory allows the NASPO administrators to create multi-level role-based accounts. These differentiated roles are not only keyed to a user but to the machine they are accessing. This permits an administrator to not only control access to infrastructure devices, but to generate and push security policies and establish trusted websites and certifications. Active Directory Group Policies allow not only differentiation by user role, but also the tandem application of joint machine and user profiles.

VIDA Device Manager (DM)

VIDA Device Manager is a Microsoft Windows-based application that facilitates the loading of code updates and personalities to numerous devices throughout the VIDA network. It centralizes and provides a common interface for this function.

USER RADIOS

With a proven track record of Land Mobile Radios and battle-tested military tactical radios, L3Harris offers the XL family of portables, mobiles, and control station radios. Please see Exhibit B1 – Equipment Specifications for data sheets on the proposed radios.

Figure 11. **Proposed User Radios**

XL Portable XL Mobile