MEPNN Supplier Scouting Opportunity Synopsis

Section 1: General Information

Scouting Number	2025-361
Item to be Scouted	Cellular Modem
Days to be scouted	30
Response Due By	12/19/2025
Description	The cellular modem must provide connectivity between devices, systems, and locations for Florida Department of Transportation (FDOT) projects. Ensure that the cellular modem is fully compatible and interoperable with connected

Section 2: Technical Information

Type of supplier being sought	Complete details in FDOT Specification Sections 684 and 996, attached file. Manufacturer
Reason	Florida BABA
Describe the manufacturing processes (elaborate to provide as much detail as possible)	Product must meet FDOT Standard Specification requirements; see attached file. Requirements include: The cellular modem shall be configured to use a network service that is 4G long-term evolution (LTE), at minimum. The modem shall support multiple cellular carrier services, including FirstNet.
Provide dimensions / size / tolerances / performance specifications for the item	Product must meet FDOT Standard Specification requirements; see attached file. Requirements include: 996-3.7.7 Mechanical Requirements: Every conductive contact surface or pin shall be gold-plated or made of a noncorrosive, nonrusting, conductive metal. Do not use self-tapping screws on the exterior of the assembly. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. 996-3.7.8 Electrical Requirements: The cellular modem shall operate on a nominal voltage of 12 VDC and be provided with a power supply that also allows operation using 120 VAC. The cellular modem shall have diagnostic LEDs including indications for power, link, TX, RX, and cellular communications connectivity. 996-3.7.9 Environmental Requirements The cellular modem shall have an operating temperature range of -30? Celsius to 70? Celsius and withstand 90 percent non-condensing relative humidity.
List required materials needed to make the product, including materials of product components	Product must meet FDOT Standard Specification requirements; see attached file. Materials include electronic components, connectors, software, and antenna.
Are there applicable certification requirements?	Yes
Certification(s) required	IEEE
Details	Product must meet FDOT Standard Specification requirements; see attached file. Code of Federal Regulations (CFR) Section 200.216 Federal Communication Commission (FCC) identification number The cellular modem LAN connections shall comply with the IEEE 802.3 standard for 10/100 Ethernet connections.
Are there applicable regulations?	Yes

Details	Product must meet FDOT Standard Specification requirements; see attached file. Code of Federal Regulations (CFR) Section 200.216 Federal Communication Commission (FCC) identification number The cellular modem LAN connections shall comply with the IEEE 802.3 standard for 10/100 Ethernet connections.
Are there any other stndards, requirements, etc.?	Yes
Details	Product must meet FDOT Standard Specification requirements; see attached file. Mechanical, Electrical, and Environmental requirements, per FDOT specification.
Additional Technical Comments	

Section 4: Business Information

Estimated potential business volume	50 units per year purchased by FDOT Contractors for statewide projects. Additional quantities may be purchased by local agencies within Florida.
Estimated target price / unit cost information (if unavailable explain)	$2000 each, may vary by product requirements.
When is it needed by?	Begin within 5 months; ongoing need to meet FDOT and BABA requirements
Describe packaging requirements	No packaging requirements. Best available. Delivered undamaged. Specifics discussed in negotiation.
Where will this item be shipped?	Florida

Additional Comments

Is there other information you would like to include?	Agency providing funds: Florida Department of Transportation Name/POC for BABA related questions: Melissa Hollis or Karen Byram Email address of contact: Melissa.Hollis@dot.state.fl.us or Karen.Byram@dot.state.fl.us

SECTION 684
NETWORK DEVICES

684-1 Description.

Furnish and install network devices as shown in the Plans. Meet the requirements of Section 603.

684-2 Materials.

684-2.1 General: Meet the following requirements:

Managed Field Ethernet Switch*.....Section 996
Managed Hub Ethernet Switch.....Section 996
Device Server*.....Section 996
Wireless Communication System*.....Section 996
Media Converter*.....Section 996
Cellular Modem*.....Section 996
*Use products listed on the Department's APL.

684-2.2 Managed Field Ethernet Switch: Ensure that the managed field Ethernet switch (MFES) provides Ethernet connectivity between devices, systems, and locations as required by the Contract Documents.

Ensure that the ITS network administrator will be able to manage each MFES individually and as a group for switch configuration, performance monitoring, and troubleshooting.

Ensure that the MFES is fully compatible and interoperable with connected Ethernet devices and the traffic control system network.

Ensure the MFES provides a switched Ethernet connection for each connected device and at least one open RJ45 Ethernet port for technician access.

684-2.2.1 Optical Ports: Ensure that all fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode. Ensure that the optical ports are Type ST, SC, LC, or FC only, as specified in the Plans or by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an MFES having a minimum of two optical 100 Base FX ports capable of transmitting data at 100 megabits per second unless otherwise shown in the Plans. Ensure the MFES is configured with the number and type of ports detailed in the Contract Documents. Provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. The optical ports must have an optical power budget of at least 15 dB, or as detailed in the Contract Documents.

684-2.2.2 Copper Ports: Provide an MFES that includes a minimum of four copper ports unless otherwise shown in the Plans.

Ethernet over very high speed digital subscriber line (EoVDSL) ports are permitted for use in applications where fiber optic cable is not available.

684-2.3 Managed Hub Ethernet Switch: Ensure that the managed hub Ethernet switch (MHES) provides wire-speed Ethernet connectivity at transmission rates of up to ten gigabits per second to and from adjacent MHES within the traffic control network.

Ensure that the ITS network administrator will be able to manage each MHES individually and as a group for switch configuration, performance monitoring, and troubleshooting.

Ensure that the MHES is fully compatible and interoperable with field devices and the traffic control system network.

Ensure the MHES includes any license(s) required to utilize all Layer 3 features.

Ensure the MHES provides a switched Ethernet connection for each connected device and at least one open RJ45 Ethernet port for technician access.

684-2.3.1 Optical Ports: Ensure that all fiber optic link ports are modular SFP/SFP+ ports that operate at 1310 or 1550 nanometers in single mode and support 100Base-FX, 1000Base-X, and 10GBase-X. Ensure that the optical ports are Type LC unless otherwise shown in the Plans. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an MHES having a minimum of six optical Gigabit Ethernet ports as required to interface adjacent network devices. Optical ports must be capable of 100M, 1G, and 10Gbps data rates unless otherwise shown in the Plans. Ensure the MHES is configured with the number and type of ports detailed in the Contract Documents. Furnish hot-swappable fiber optical transceivers. Provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. The optical ports must have an optical power budget of at least 15 dB, or as detailed in the Contract Documents.

684-2.3.2 Copper Ports: Provide an MHES that includes a minimum of twelve gigabit Ethernet copper ports unless otherwise shown in the Plans. All copper ports must be Type RJ-45 and auto-negotiate speed (e.g., 10/100/1000 Base) and duplex (i.e., full or half).

684-2.4 Device Server: Ensure that the device server provides Ethernet connectivity to devices with serial data interfaces as required by the Contract Documents. The device server must operate using a nominal input voltage of 120 V_{AC}. If the device requires nominal input voltage of less than 120 V_{AC}, furnish the appropriate voltage converter.

684-2.5 Wireless Communication System: The wireless communication system (WCS) must provide connectivity between devices, systems, and locations as required by the Contract Documents. Ensure that the WCS is fully compatible and interoperable with connected Ethernet devices and the traffic control system network.

684-2.6 Media Converter: The media converter must allow transition between the transmission media shown in the Plans or required to construct a functional system, such as conversion from twisted pair to optical fiber or from twisted pair to coaxial cable.

Ensure that fiber ports are single mode with a minimum link budget of 30 dB or the type and power detailed in the Contract Documents.

Media converters must operate on a nominal voltage of 120 V_{AC} if POE is unavailable. Supply an appropriate voltage converter for devices that require operating voltages of less than 120 V_{AC}.

684-2.7 Cellular Modem: The cellular modem must provide connectivity between devices, systems, and locations as required by the Contract Documents. Ensure that the cellular modem is fully compatible and interoperable with connected Ethernet devices and the traffic control system network. Coordinate cellular services, network configuration, and settings for cellular modems with the Department a minimum of thirty (30) days prior to scheduled installation.

684-3 Installation.

684-3.1 General: Install network devices at the locations shown in the Plans. Ensure that network devices are mounted securely and are fully accessible by field technicians. Ensure that all unshielded twisted pair/shielded twisted pair Ethernet network cables are compliant with the EIA/TIA-568-B standard.

684-4 Field Acceptance Testing.

684-4.1 General: Conduct field acceptance testing in accordance Section 611.

684-4.2 MFES Field Acceptance Testing: Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform the following:

1. Verify that physical construction has been completed as detailed in the Plans.
2. Inspect the quality and tightness of ground and surge protector connections.
3. Verify proper voltages for all power supplies and related power circuits.
4. Connect devices to the power sources.
5. Verify all connections, including correct installation of communication and power cables.
6. Verify network connection and MFES configuration using a laptop PC.

684-4.3 MHES Field Acceptance Testing: Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform the following:

1. Verify that physical construction has been completed as detailed in the Plans.
2. Inspect the quality and tightness of ground and surge protector connections.
3. Verify proper voltages for all power supplies and related power circuits.
4. Connect devices to the power sources.
5. Verify all connections, including correct installation of communication and power cables.
6. Verify network connection and MHES configuration using a laptop PC.

684-4.4 Device Server Field Acceptance Testing: Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform the following:

1. Verify that physical construction has been completed as specified in the Plans.
2. Verify the quality and tightness of ground and surge protector connections.
3. Verify proper voltages for all power supplies and related power circuits.
4. Connect devices to the power sources.
5. Verify all connections, including correct installation of communication and power cables.
6. Verify network connection and device server configuration using a laptop PC.
7. Verify serial data transmission through the device server.

684-4.5 Wireless Communication System Field Acceptance Testing: Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform the following:

1. Verify that physical construction has been completed as detailed in the Plans.
2. Inspect the quality and tightness of ground and surge protector connections.
3. Verify proper voltages for all power supplies and related power circuits.
4. Connect devices to the power sources.
5. Verify all connections, including correct installation of communication and power cables.
6. Verify all device settings comply with the network configurations and settings provided by the Department using a laptop PC.
7. Verify connectivity and data exchange between the WCS, connected devices, and the traffic control network.

684-4.6 Cellular Modem Field Acceptance Testing: Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform the following:

1. Verify that physical construction has been completed as detailed in the Plans.

2. Inspect the quality and tightness of ground and surge protector connections.

3. Verify proper voltages for all power supplies and related power circuits.

4. Connect devices to the power sources.

5. Verify all connections, including correct installation of communication and power cables.

6.Verify all device settings comply with the network configurations and settings provided by the Department using a laptop PC.

7. Verify connectivity and data exchange between the cellular modem, connected devices, and the traffic control network.

684-5 Warranty.

Ensure that network devices have a manufacturer's warranty covering defects for 1 year from the date of final acceptance. Ensure that the manufacturer will furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification.

684-6 Method of Measurement.

The Contract unit price for each network device, furnished and installed, will include furnishing, placement, and testing of all equipment and materials, and for all tools, labor, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, documentation, and incidentals necessary to complete the work.

684-7 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 684- 1-	Managed Field Ethernet Switch-each.
Item No. 684- 2-	Device Server-each.
Item No. 684- 5-	Media Converter-each.
Item No. 684- 6-	Wireless Communication System Device-each.
Item No. 684- 7-	Managed Hub Ethernet Switch-each
Item No. 684- 8-	Cellular Modem-each

SECTION 996

INTELLIGENT TRANSPORTATION SYSTEM DEVICE AND AUXILIARY COMPONENT MATERIALS

996-1 Description.

996-1.1 General: This Section governs the requirements for all permanent intelligent transportation system devices, surge protection devices for traffic control devices, pull boxes, splice boxes, fiber optic splice vaults, camera lowering devices, and traffic control system auxiliaries. All equipment shall be permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number.

996-1.2 Product Acceptance: All specified products shall be items listed on the Department's Approved Product List (APL), unless otherwise noted below. Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6 and include the following documentation. A separate application must be submitted for each product to be evaluated, showing that the product meets the applicable requirements.

Table 996-1	
Documentation	Requirements
Assembly and Installation Instructions	Include any surface preparations, assembly/installation instructions, operation manual, troubleshooting guides, and repair procedures.
Independent Laboratory Test Results	Product meets requirements of this Section.
Product Label Photo	Labeling shows the manufacturer's name, trademark, and product model number/name. Label shows the date of manufacture and/or the manufacturer's batch number. Additional label requirements, as listed within this Section.
Product Photo	Displays the significant features of the product as required in this section.
Compliance Matrix	Include completed compliance matrix at https://www.fdot.gov/traffic/traf-sys/product-specifications.shtm
Manufacturer's Product Specifications	Include product specifications showing electrical requirements, voltages, etc.
Product Drawings or Cut Sheet	Show mounting points, mechanical details, block diagrams, schematics, etc.
Parts List	List major parts and field serviceable components.

996-1.3 Abbreviations: The following abbreviations are used in this Section:

Alternating Current (AC)
Closed Circuit Television (CCTV)
Direct Current (DC)
Hypertext Transfer Protocol (HTTP)
International Electrotechnical Commission (IEC)
Internet Protocol (IP)
International Organization for Standardization (ISO)
Local Area Network (LAN)
Network Time Protocol (NTP)
Pan, Tilt, Zoom (PTZ)
Telecommunications Industry Association (TIA)
Uniform Resource Locator (URL)
Ultraviolet (UV)

996-3 Network Devices.

996-3.1 General: Network devices shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6. All network devices shall be capable of secure local and remote access for configuration, operation, monitoring, and firmware updates.

996-3.2 Managed Field Ethernet Switch:

996-3.2.1 Description: The Managed Field Ethernet Switch (MFES) shall be compliant with the Code of Federal Regulations Section 200.216 Prohibition on certain telecommunications and video surveillance services or equipment https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200/subpart-C/section-200.216.

The MFES provides wire-speed fast Ethernet connectivity at transmission rates of 100 megabits per second.

Each MFES shall be managed individually and as a group for switch configuration, performance monitoring, and troubleshooting. The MFES shall include Layer 2+ capabilities, including, Quality of Service (QoS), IGMP v2, rate limiting, security filtering, and general management.

The MFES shall support half and full duplex Ethernet communications.

The MFES shall provide 99.999% error-free operation. The MFES shall comply with Ethernet data communication requirements using single-mode fiber optic transmission medium and Category 5E copper transmission medium.

The MFES shall have a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

996-3.2.2 Networking Standards: The MFES shall comply with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

1. IEEE 802.1Q standard for Local and Metropolitan Area Networks - Bridges and Bridged Networks used with port-based Virtual Local Area Networks (VLANs) and Rapid Spanning Tree Protocol (RSTP).
2. IEEE 802.1 p for QoS.
3. IEEE 802.3 standard for LAN and Metropolitan Area Network (MAN) access and physical layer specifications.
4. IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX.
5. IEEE 802.3x standard regarding flow control with full duplex operation.

996-3.2.3 Optical Ports: All fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode. All optical ports are Type ST, SC, LC, or FC only. Mechanical transfer registered jack (MTRJ) type connectors are not allowed.

MFES shall provide a minimum of two optical 100 Base FX ports capable of transmitting data at 100 megabits per second. MFES shall provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. The optical ports shall have an optical power budget of at least 15 dB.

996-3.2.4 Copper Ports: MFES shall include a minimum of four copper ports. All copper ports shall be Type RJ-45 and shall auto-negotiate speed (i.e., 10/100 Base) and duplex (i.e., full or half). All 10/100 Base TX ports shall meet the specifications detailed in this section and shall be compliant with the IEEE 802.3 standard pinouts.

Ethernet over very high speed digital subscriber line (EoVDSL) ports shall support standard telephone-grade twisted copper pair and automatically negotiate the fastest data rate possible depending on cable length and quality.

996-3.2.5 Management Capability: The MFES shall support all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

1. An MFES that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard and has a minimum 4-kilobit VLAN address table.
2. A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
3. A minimum 4 kilobit media access control (MAC) address table.
4. Support of, at a minimum, IGMPv2.
5. Support of remote and local setup and management via Secure Shell Version 2 (SSHv2) and secure Web-based graphical user interface (GUI).
6. Support of the Simple Network Management Protocol (SNMP) version 1/2/3. Verify that the MFES can be accessed using the resident TIA -232 management port or a telecommunication network.
7. Support of Remote Authentication Dial-In User Service (RADIUS) or Terminal Access Controller Access-Control System Plus (TACACS+)
8. Support of remote monitoring (RMON) of the Ethernet agent and the ability to be upgraded to switch monitoring (SMON), if necessary.
9. Support of Secure Copy (SCP) or Secure File Transfer Protocol (SFTP) and either Network Time Protocol (NTP) or the Simple Network Time Protocol (SNTP). Ensure that the MFES supports port mirroring for troubleshooting purposes when combined with a network analyzer.

996-3.2.6 Mechanical Requirements: Every conductive contact surface or pin shall be gold-plated or made of a noncorrosive, nonrusting, conductive metal. Do not use self-tapping screws on the exterior of the assembly. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

996-3.2.7 Electrical Requirements: The MFES shall operate on a nominal Voltage of 120 V_{AC}. Supply an appropriate voltage converter for devices that require operating voltages of less than 120 V_{AC}. The MFES shall have diagnostic Light Emitting Diodes (LEDs), including link, TX, RX, and power LEDs.

996-3.2.8 Environmental Requirements: MFES shall operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2 , Sections 2.2.7, 2.2.8, and 2.2.9.

996-3.3 Managed Hub Ethernet Switch:

996-3.3.1 Description: The Managed Hub Ethernet Switch (MHES) shall be compliant with the Code of Federal Regulations Section 200.216 Prohibition on certain telecommunications and video surveillance services or equipment https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200/subpart-C/section-200.216.

The MHES shall provide Ethernet connectivity at transmission rates of 10/100/1000/10000 megabits per second. The MHES shall support half and full duplex Ethernet communications. The MHES must support 12000 IPv4 routes and 2000 IPv6 routes and all routing protocols shall be in performed hardware to ensure maximum speed.

The MHES shall support management individually and as a group for switch configuration, performance monitoring, and troubleshooting. The MHES shall include Layer 2 capabilities, including, QoS, IGMP v2, rate limiting, security filtering, and general management.

The MHES shall include full Layer 3 capabilities, including Open Shortest Path First (OSPF) routing protocol, Routing Information Protocol (RIP), and Protocol Independent Multicasting (PIM). The MHES includes all license(s) required to utilize all Layer 3 features.

996-3.3.2 Networking Standards: The MHES shall comply with all applicable IEEE networking standards for Ethernet communications, including:

1. IEEE 802.1Q Standard for Local and Metropolitan Area Networks - Bridges and Bridged Networks used with port-based VLANs and RSTP.
2. IEEE 802. 1p for QoS.
3. IEEE 802.3 standard for LAN and MAN access and physical layer specifications.
4. IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX.
5. IEEE 802.3x standard regarding flow control with full duplex operation.
6. IEEE 802.3z supplement standard regarding 1000 Base X.

996-3.3.3 Optical Ports: All fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode. Provide Type LC connectors unless otherwise directed. MTRJ type connectors are not allowed.

MHES shall provide a minimum of 6 optical ports capable of transmitting data at 10/100/1000/10000 megabits per second. MHES shall provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. The optical ports shall have an optical power budget of at least 15 dB.

996-3.3.4 Copper Ports: MHES shall include a minimum of 12 10/100/1000 Base TX copper ports. All copper ports shall be Type RJ-45 and shall auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). All 10/100/1000 Base TX ports shall meet the specifications detailed in this section and shall be compliant with the IEEE 802.3 standard pinouts.

996-3.3.5 Management Capability: MHES shall support all Layer 2 management features and all Layer 3 features as defined by this Section. Layer 2 and Layer 3 features must include:

1. Port-based VLAN and VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard and has a minimum 4-kilobit VLAN address table.
2. A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second, and 1,488,000 packets per second for 1000 megabits per second.
3. A minimum 4 kilobit MAC address table.
4. Support of IGMPv2.
5. Support of remote and local setup and management via SSHv2 and secure Web-based GUI.
6. Support of SNMP version 2 and version 3.
7. Support of RADIUS or TACACS+.

8. Support of RMON of the Ethernet agent and the ability to be upgraded to SMON, if necessary.

9. Support of SCP or SFTP and either NTP or SNTP. Ensure that the MHES supports port mirroring for troubleshooting purposes when combined with a network analyzer.

10. Sampled Flow Network Monitoring export protocol capable of being turned on or off on individual Ethernet ports without affecting traffic.

11. OSPF routing protocol. 12000 IPv4 routes and 2000 IPv6 routes.

12. RIP.

13. Virtual Router Redundancy Protocol (VRRP).

996-3.3.6 Mechanical Specifications. Ensure the MHES is no greater than 1-Rack Unit tall.

Every conductive contact surface or pin shall be gold-plated or made of a noncorrosive, nonrusting, conductive metal. Do not use self-tapping screws on the exterior of the assembly. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

996-3.3.7 Electrical Specifications. MHES must shall operate on a nominal voltage of 120 V_{AC}. Supply an appropriate voltage converter for devices that require operating voltages of less than 120 V_{AC}. The MHES shall have diagnostic LEDs, including link, TX, RX, and power LEDs.

996-3.3.8 Environmental Specifications. Ensure that the MHES has an operating temperature range of -34° Celsius to 74° Celsius. Ensure that the MHES can withstand 90 percent non-condensing relative humidity at 40° Celsius.

996-3.4 Device Server:

996-3.4.1 Description: The device server allows the connection of serial devices with TIA-232, TIA-422, and TIA-485 connections to an Ethernet network. The device server provides a TCP/IP interface to one or more field devices using TIA-232/422/485 standard connections. The device server supports TCP/IP, UDP/IP, Dynamic Host Configuration Protocol (DHCP), Address Resolution Protocol (ARP), Internet Control Message Protocol (ICMP), SNMP, Hypertext Transfer Protocol (HTTP), and telnet.

The device server shall provide 99.999% error-free operation and TIA-compatible Ethernet data communication by way of a Category 5E copper or fiber optic transmission medium.

The device server is resistant to all electromagnetic interference.

Data security shall comply with SSHv2, or the NIST requirements as defined in the Federal Information Processing Standard (FIPS) Publication (PUB)-197 for the Advanced Encryption Standard (AES).

The device server has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours.

996-3.4.2 Serial Interface: The device server provides a minimum of one serial data interface and connector that conforms to TIA-232/422/485 standards. The serial interface supports 2-wire and 4-wire TIA-485 connections. The serial ports support data rates up to 230 kbps; error detection procedures utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).

The device server provides flow control (request to send [RTS]/clear to send [CTS] and transmit on/transmit off [XON/XOFF]), as well as allow control of the Data

Terminal Ready (DTR), Data Carrier Detect (DCD), Data Set Ready (DSR), CTS, and RTS signals. The device server supports RTS toggle for half-duplex emulation.

996-3.4.3 Network Interface: The device server includes a minimum of one Ethernet port, which shall provide a 10/100 Base TX or a 10/100 Base FX connection as specified in the Plans. All copper-based network interface ports utilize registered jack (RJ)-45 connectors. The optical ports are Type ST, SC, LC, or FC only. MTRJ type connectors are not allowed.

996-3.4.4 Configuration and Management: The device server shall support local and remote configuration and management, which shall include access to all user-programmable features, including but not limited to addressing, port configuration, device monitoring, diagnostic utilities, and security functions. The device server shall support configuration and management via SNMP, telnet login, and browser-based interface.

996-3.4.5 Mechanical Requirements: Do not use self-tapping screws on the exterior of the assembly. All parts are made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

996-3.4.6 Electrical Requirements: The device server operates using a nominal input voltage of 120 V_{AC} If the device requires nominal input voltage of less than 120 V_{AC}, furnish the appropriate voltage converter. The maximum power consumption shall not exceed 12 watts. The device server has diagnostic LEDs, including link, TX, RX, and power LEDs.

996-3.4.7 Environmental Requirements: The device server performs all required functions during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9.

996-3.5 Wireless Communication System

996-3.5.1 Description: The wireless communication system (WCS) shall be a wireless Ethernet device suitable for outdoor use and capable of transmitting TCP/IP data and multicast video streams. The WCS shall be compliant with the Code of Federal Regulations Section 200.216 Prohibition on certain telecommunications and video surveillance services or equipment https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200/subpart-C/section-200.216.

WCS devices shall be compliant with Federal Communications Commission (FCC) rules and operate within their authorized radio frequency range. Submit frequencies supported for approval. The WCS shall be clearly labelled with a FCC identification number.

The WCS shall be compatible with the existing systems and management software maintained by the Department or provided with management software at no cost. WCS shall be able to provide point-to-point and point-to-multipoint wireless connections in outdoor environments.

WCS shall have and meet the following features and requirements:

1. Support a minimum data rate of 450Mbps
2. Auto-sensing 10/100/1000Mbps Ethernet interface
3. Dynamic data rate selection
4. Transmit power control
5. Antenna alignment utility
6. QoS Support
7. Software integrity check
8. Dynamic frequency selection

9. Bridging and Routing modes
10. Protocol and address filtering
11. DHCP server function
12. VLAN support
13. Security Features
    a. RADIUS MAC authentication
    b. WEP/WPA/WPA2
14. Configuration and Management
    a. System configuration and user account management
    b. Ping watchdog
    c. SNMP
    d. HTTPS and SSHv2
    e. SCP and SFTP
    f. NTP

996-3.5.2 Networking Standards: The WCS shall be Wi-Fi certified and comply with IEEE 802.11 Wi-Fi standards.

996-3.5.3 Ports and Connectors: The WCS shall include all necessary ports and connectors for a complete weatherproof assembly. All ports shall be legibly and permanently marked designating their intended use. All copper ports shall be weatherproof Type RJ-45 and shall auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). All 10/100/1000 Base TX ports shall be compliant with the IEEE 802.3 standard.

996-3.5.4 Antennas: The WCS shall include all antennas necessary for a complete and functional system. The WCS shall include features or utilities to aid system setup and antenna alignment to provide minimum interference and maximum throughput for wireless links.

996-3.5.5 Configuration and Management: WCS devices shall be provided with all hardware, software, configuration tools and software licenses required for local and remote configuration, operation, and management including access to all user-programmable features as well as health and status monitoring, event logging, and diagnostic utilities. WCS devices shall support configuration and management via SNMP, telnet login, and browser-based interface. Configuration and management functions shall be password protected. The WCS shall provide the ability to:

1. Configure advanced security options like MAC address filtering and WPA3 features.
2. Configure QoS to prioritize bandwidth and optimize network performance for specific devices or applications.

996-3.5.6 Mechanical Requirements: All conductive surfaces and pins shall be either gold-plated or constructed from a corrosion and rust-resistant metal.

All parts and mounting hardware shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

996-3.5.7 Electrical Requirements: WCS devices shall be provided with a power over ethernet (PoE) injector. Powered ports on the PoE injector shall meet the requirements set forth in IEEE 802.3. The PoE injector shall operate using a nominal input voltage of 120VAC. If the PoE injector requires nominal input voltage other than 120VAC, furnish the appropriate voltage converter.

996-3.5.8 Environmental Requirements: The WCS shall have an operating temperature range of -30° Celsius to 60° Celsius and withstand 95 percent non-condensing relative humidity. WCS devices for outdoor use shall have an IPX6 rating.

996-3.6 Media Converter:

996-3.6.1 Description: The media converter connects different transmission media for the purposes of transmitting Ethernet data.

996-3.6.2 Network Interface: The media converter LAN connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections. The media converter has a minimum of one Ethernet port, which shall be, at a minimum, a 10/100 Base TX connection or a 100 Base FX ST, SC, LC or FC interface. The connector complies with applicable TIA requirements. Copper-based network interface ports utilize RJ-45 connectors. Fiber ports are single mode with a minimum link budget of 30 dB.

996-3.6.3 Mechanical Requirements: Every conductive contact surface or pin shall be gold-plated or made of a noncorrosive, nonrusting, conductive metal. Do not use self-tapping screws on the exterior of the assembly. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

996-3.6.4 Electrical Requirements: Ethernet to coax media converters shall operate using PoE. Media converters shall operate on a nominal voltage of 120 V_{AC} if PoE is unavailable. Supply an appropriate voltage converter for devices that require operating voltages of less than 120 V_{AC}. Ensure that the media converter has diagnostic LEDs, including link, TX, RX, and power LEDs.

996-3.6.5 Environmental Requirements: Ensure media converters perform all required functions during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9.

996-3.7 Cellular Modem:

996-3.7.1 Description: The cellular modem shall be compliant with the Code of Federal Regulations Section 200.216 Prohibition on certain telecommunications and video surveillance services or equipment https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200/subpart-C/section-200.216.

The cellular modem shall be clearly labelled with a FCC identification number.

The cellular modem shall be compatible with the existing systems and management software maintained by the Department or provided with management software at no cost. The cellular modem must support web-based user access through a GUI that provides secure access for device configuration, operation, and maintenance.

996-3.7.2 Network Interfaces: The cellular modem shall be configured to use a network service that is 4G long-term evolution (LTE), at minimum. The modem shall support multiple cellular carrier services, including FirstNet. The modem shall comply with all applicable networking standards and protocols, including:

1. Network: TCP/IP, UDP/IP, Domain Name System (DNS).
2. Routing: Network Address Translation (NAT), Host Port Routing, DHCP, Point-to-Point Protocol over Ethernet (PPPoE), VLAN, Virtual Router Redundancy Protocol (VRRP), Reliable Static Route.
3. Application: Short Message Service (SMS), SSHv2, SCP, SFTP, Simple Mail Transfer Protocol (SMTP), SNMP, SNTP, HTTPS, Reliable Static Route.

4. Serial: TCP/UDP Packet Assembly Disassembly (PAD) Mode, Modbus (ASCII, RTU, Variable), Point-to-Point Protocol (PPP).

The cellular modem LAN connections shall comply with the IEEE 802.3 standard for 10/100 Ethernet connections. All copper ports shall be Type RJ-45 and shall auto-negotiate speed (i.e., 10/100 Base) and duplex (i.e., full or half).

996-3.7.3 Ports and Connectors: The cellular modem shall have following physical interfaces:

1. Two redundant subscriber identity module (SIM) slots.
2. Three copper Type RJ-45 ports for 10/100 Ethernet connections.
3. Three subminiature version A (SMA) antenna connectors.
4. One reverse polarity SMA (RP-SMA) Wi-Fi antenna connector.

996-3.7.4 Event Reporting: The cellular modem shall have the capability to report the following events in plain text:

1. Network parameters.
2. Data usage.
3. Power.
4. Device Temperature.
5. Digital input status.
6. Global Positioning.
7. System/Automatic.
8. Global positioning system automatic vehicle location (GPS/AVL).
9. Timer.

996-3.7.5 Security: The cellular modem shall have the following security provisions:

1. Ability to establish virtual private network (VPN) tunnels.
2. IPsec, Secure Sockets Layer (SSL), and Generic Routing Encapsulation (GRE).
3. Port forwarding and Demilitarized Zone (DMZ).
4. Port Filtering.
5. Trusted IP.
6. MAC address filtering.

996-3.7.6 Antennas: Meet the following requirements:

1. Dual diversity.
2. NEMA 3 rating.
3. Frequencies: F1 = 824 to 896 MHz, F2 = 1850 to 1990 MHz, F3 = 1850 to 1955 MHz, F4 = 1710 to 1770 MHz, F5 = 2110 to 2170 MHz.
4. Voltage Standing Wave Ratio (VSWR) of 1.5:1 or less at resonant point.
5. 50 Ω nominal impedance.
6. Gain of 3.0 dB to 5.15 dB.
7. Omni-directional radiation pattern.
8. Vertical polarization.
9. Glass-filled polypropylene radome.
10. Adhesive mounting or Bolt mount
11. SMA male plug connectors 10 ft. (minimum) coaxial length.

996-3.7.7 Mechanical Requirements: Every conductive contact surface or pin shall be gold-plated or made of a noncorrosive, nonrusting, conductive metal. Do not use self-tapping screws on the exterior of the assembly. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

996-3.7.8 Electrical Requirements: The cellular modem shall operate on a nominal voltage of 12 V_{DC} and be provided with a power supply that also allows operation using 120 V_{AC}. The cellular modem shall have diagnostic LEDs including indications for power, link, TX, RX, and cellular communications connectivity.

996-3.7.9 Environmental Requirements The cellular modem shall have an operating temperature range of -30° Celsius to 70° Celsius and withstand 90 percent non-condensing relative humidity.