Florida Department of Transportation

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ANANTH PRASAD, P.E.
SECRETARY

December 22, 2011

Monica Gourdine
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section 784
Proposed Specification: **7840102 ITS – Network Devices**

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Trey Tillander to update the specification to industry and Department standards.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to SP965RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4280.

Sincerely,

Signature on File

Rudy Powell, Jr., P.E.
State Specifications Engineer

RP/ft
Attachment
cc: Calvin Johnson, Chief Civil Litigation
Florida Transportation Builders' Assoc.
State Construction Engineer

INTELLIGENT TRANSPORTATION SYSTEMS – NETWORK DEVICES.
(REV ~~5-31-11~~*11-17-11*) ~~(FA 7-28-11) (1-12)~~

SUBARTICLE 784-1.2.2 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.2 Networking Standards: Ensure that the MFES complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

1. IEEE 802.1D ~~s~~*S*tandard for ~~m~~*M*edia ~~a~~*A*ccess ~~c~~*C*ontrol (MAC) ~~b~~*B*ridges used with the *Rapid* Spanning Tree Protocol (*R*STP).
2. IEEE 802.1Q standard for port-based virtual local area networks (VLANs).
3. IEEE 802.1P standard for Quality of Service (QoS).
~~4. IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP).~~
~~5~~*4*. IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications.
~~6~~*5*. IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX.
~~7~~*6*. IEEE 802.3x standard regarding flow control with full duplex operation.

SUBARTICLE 784-1.2.3 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.3 Optical Ports: Ensure that all fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode. *Ensure*~~Verify~~ 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. *Ensure the MFES is configured with the number and type of ports detailed in the Contract Documents.* ~~Each~~*Provide* optical port*s designed for use with* ~~shall consist of~~ 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*, or as detailed in the Contract Documents*.

SUBARTICLE 784-1.2.5 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.5 Management Capability: Ensure that the MFES supports 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 STP healing rate that meets or exceeds specifications published in the IEEE 802.1D standard.~~

~~2. An RSTP healing rate that meets or exceeds specifications published in the IEEE 802.1w standard.~~

~~3~~*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.

~~4~~*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.

~~5~~*3*. A minimum 4-kilobit MAC address table.

~~6. Support of Traffic Class Expediting and Dynamic Multicast Filtering.~~

~~7~~*4*. Support of, at a minimum, Version 2 of the Internet Group Management Protocol (IGMP).

~~8~~*5*. Support of remote and local setup and management via telnet ~~or~~ *and* secure Web-based GUI ~~and command line interfaces~~.

~~9~~*6*. Support of the Simple Network Management Protocol (SNMP). Verify that the MFES can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

~~10~~*7*. Port security through controlling access by the users. Ensure that the MFES has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.

~~11~~*8*. Support of remote monitoring (RMON) of the Ethernet agent and the ability to be upgraded to switch monitoring (SMON), if necessary.

~~12~~*9*. Support of ~~the~~ TFTP~~,~~ *and either* ~~the~~ 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.

SUBARTICLE 784-1.2.6 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.6 Mechanical Specifications: Ensure that all wiring complies with NEC requirements and standards. Furnish and identify all equipment and appurtenances by name, model number, serial number, technical support and warranty telephone numbers, and any other pertinent information required to facilitate equipment maintenance.

Ensure that every conductive contact surface or pin is gold-plated or made of a noncorrosive, nonrusting, conductive metal.

~~Ensure that all external screws, nuts, and locking washers are Type 04 or 316 passivated stainless steel.~~ 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.

SUBARTICLE 784-1.2.7 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.7 Electrical Specifications: Ensure that the MFES operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the MFES *operates over an input voltage range from*~~has a minimum operating input of~~ 85~~9~~ VAC *to*~~and a maximum operating input of 265~~*135* VAC. If the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts.

Ensure that the MFES has diagnostic light emitting diodes (LEDs), including link, TX, RX, ~~speed (for Category 5E ports only),~~ and power LEDs.

SUBARTICLE 784-1.2.8 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.8 Environmental Specifications: Ensure that the MFES ~~performs all of the required functions~~*operates properly* during and after being subjected to *the environmental testing procedures described in* ~~an ambient operating temperature range of -30 degrees (°) to 165° Fahrenheit (F) as defined in the environmental requirements section of the~~ NEMA TS 2, *Sections 2.2.7, 2.2.8., and 2.2.9* ~~standard, with a noncondensing humidity of 0 to 95%.~~

~~Verify that the MFES manufacturer certifies their device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Verify that vibration and shock resistance meet the requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard..~~

~~Ensure that the MFES is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.~~

SUBARTICLE 784-3.2.1 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.1 General: Use DVEs and DVDs that are specialized network-based hardware devices and software which allow video and data signals to be transmitted across IP networks. Ensure that the video and data packets produced by the DVE and placed onto the network allow reconstruction of digital video signals by hardware-based and software-based DVDs that are also attached to the network.

Ensure that the complete video and data transmission system, defined as the combination of DVE and DVD hardware together with the existing or planned network infrastructure, simultaneously transports video and data from multiple remote field locations to multiple monitoring locations for roadway surveillance and traffic management. ~~Ensure that end-to-end transmission of 30 frames-per-second (fps) D1 resolution video and data signals from DVE inputs to DVD outputs occurs within 250 milliseconds.~~

SUBARTICLE 784-3.2.3 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.3 MPEG-2 Format: Furnish DVE and DVD components that utilize the Moving Picture Experts Group's MPEG-2 video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 13818 standard. Ensure that the DVE and DVD are capable of unicast and multicast operation. *Ensure DVEs*~~, and that they~~ support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974. Ensure that the DVE provides 99.999% error-free operation. Ensure MPEG-2 DVE and DVD equipment supports programmable bit rates. Ensure that MPEG-2 equipment supports fixed bit rate mode.

SUBARTICLE 784-3.2.4 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.4 H.264 Format: Furnish DVE and DVD components that utilize video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 14496-10:2009 standard. Ensure that the DVE and DVD are capable of unicast and multicast operation~~,~~. *Ensure that DVEs* ~~and that they~~ support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974, and Real Time Streaming Protocol (RTSP). Ensure that the DVE provides 99.999% error-free operation. Ensure H.264 DVE and DVD equipment supports programmable bit rates. Ensure that H.264 equipment supports fixed bit rate mode.

SUBARTICLE 784-3.2.6.2 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.6.2 Software-based Decoder: ~~Provide a software-based DVD that is compatible with the Department's SunGuide® software.~~ Ensure that any software-based decoder applications do not interfere with SunGuide® software operating when installed and used together on a shared hardware platform. Ensure that the software application provides PC desktop display of IP network video streams ~~and control of any PTZ camera connected to the network. The decoder and PTZ functions may be achieved through the use of discrete software applications~~. Ensure that the software-based decoder offers an open Application Programming Interface (API) and software development kit available to the Department at no cost for integration with third party software and systems.

SUBARTICLE 784-3.2.7 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.7 Interoperability: Provide DVE and DVD devices and software that are interoperable and interchangeable with DVE and DVD devices and software from other manufacturers. Ensure that the DVE is compatible and fully interoperable with software and hardware DVDs from the DVE manufacturer, as well as a minimum of two software and hardware DVDs from other manufacturers. Ensure that the DVD is compatible and fully interoperable with DVEs from the DVD manufacturer, as well as a minimum of two other DVEs from other manufacturers. *Ensure DVE and DVD can be controlled using SunGuide® or support stream selection and switching using ONVIF commands.*

SUBARTICLE 784-3.2.8 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.8 Video Specifications: Ensure that ~~any~~*composite* video input*s and outputs* utilize~~s a~~ BNC connector*s. Ensure video inputs and outputs support* ~~and delivers~~ 1 volt peak-to-peak (Vp-p) NTSC composite video ~~signals for encoding~~. Ensure that the DVE and DVD operate with both color and monochrome video, and that they allow the user to select and adjust video resolution. Ensure that the DVE and DVD support resolutions that include, but are not limited to, those defined in Table 3.1. Ensure that the DVE and DVD are capable of delivering color and monochrome video at 30 fps regardless of resolution.

Table 3.1 – Resolution Requirements	
Format	Resolutions
MPEG-2	352 x 240, 352 x 480, 720 x 480
H.264	176 x 120, 352 x 240, 720 x 480
Note: The resolutions attained depend on the data transmission rate.	

SUBARTICLE 784-3.2.10 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.10 Network Interface: Ensure that the DVE/DVD local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections. Provide a DVE/DVD having a minimum of one Ethernet port, which shall be a 10/100 Base TX connection or a 100 Base FX ST, SC, LC or FC interface ~~capable of multi-hop configuration using two sets of optical ports (e.g., Tx1, Rx1, Tx2, Rx2)~~. Ensure that the connector complies with applicable EIA and TIA requirements. Provide copper-based network interface ports that utilize RJ-45 connectors.

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

Ensure that all Category 5E, unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard. Ensure that the network communication conforms to User Datagram Protocol (UDP), Version 4 of the Internet Protocol (IP) and Version 2 of the Internet Group Multicast Protocol (IGMP).

SUBARTICLE 784-3.2.12 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.12 Configuration and Management: Provide DVEs and DVDs that support local and remote configuration and management. Configuration and management functions shall include access to all user-programmable features, including but not limited to addressing, serial port configuration, video settings, device monitoring, and security functions. Ensure that the DVE and DVD support configuration and management via serial login *and* ~~,~~ telnet login, *web browser, or* ~~and~~ Simple Network Management Protocol (SNMP).

INTELLIGENT TRANSPORTATION SYSTEMS – NETWORK DEVICES. (REV 11-17-11)

SUBARTICLE 784-1.2.2 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.2 Networking Standards: Ensure that the MFES complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

1. IEEE 802.1D Standard for Media Access Control (MAC) Bridges used with the Rapid Spanning Tree Protocol (RSTP).
2. IEEE 802.1Q standard for port-based virtual local area networks (VLANs).
3. IEEE 802.1P standard for Quality of Service (QoS).
4. IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications.
5. IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX.
6. IEEE 802.3x standard regarding flow control with full duplex operation.

SUBARTICLE 784-1.2.3 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.3 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. 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 shall have an optical power budget of at least 15 dB, or as detailed in the Contract Documents.

SUBARTICLE 784-1.2.5 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.5 Management Capability: Ensure that the MFES supports 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 MAC address table.

4. Support of, at a minimum, Version 2 of the Internet Group Management Protocol (IGMP).

5. Support of remote and local setup and management via telnet and secure Web-based GUI.

6. Support of the Simple Network Management Protocol (SNMP). Verify that the MFES can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

7. Port security through controlling access by the users. Ensure that the MFES has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.

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 TFTP 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.

SUBARTICLE 784-1.2.6 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.6 Mechanical Specifications: Ensure that all wiring complies with NEC requirements and standards. Furnish and identify all equipment and appurtenances by name, model number, serial number, technical support and warranty telephone numbers, and any other pertinent information required to facilitate equipment maintenance.

Ensure that every conductive contact surface or pin is 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.

SUBARTICLE 784-1.2.7 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.7 Electrical Specifications: Ensure that the MFES operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the MFES operates over an input voltage range from 89 VAC to135 VAC. If the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts.

Ensure that the MFES has diagnostic light emitting diodes (LEDs), including link, TX, RX, and power LEDs.

SUBARTICLE 784-1.2.8 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2.8 Environmental Specifications: Ensure that the MFES operates 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.

SUBARTICLE 784-3.2.1 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.1 General: Use DVEs and DVDs that are specialized network-based hardware devices and software which allow video and data signals to be transmitted across IP networks. Ensure that the video and data packets produced by the DVE and placed onto the network allow reconstruction of digital video signals by hardware-based and software-based DVDs that are also attached to the network.

Ensure that the complete video and data transmission system, defined as the combination of DVE and DVD hardware together with the existing or planned network infrastructure, simultaneously transports video and data from multiple remote field locations to multiple monitoring locations for roadway surveillance and traffic management.

SUBARTICLE 784-3.2.3 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.3 MPEG-2 Format: Furnish DVE and DVD components that utilize the Moving Picture Experts Group's MPEG-2 video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 13818 standard. Ensure that the DVE and DVD are capable of unicast and multicast operation. Ensure DVEs support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974. Ensure that the DVE provides 99.999% error-free operation. Ensure MPEG-2 DVE and DVD equipment supports programmable bit rates. Ensure that MPEG-2 equipment supports fixed bit rate mode.

SUBARTICLE 784-3.2.4 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.4 H.264 Format: Furnish DVE and DVD components that utilize video compression technology in accordance with the International Organization for

Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 14496-10:2009 standard. Ensure that the DVE and DVD are capable of unicast and multicast operation. Ensure that DVEs support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974, and Real Time Streaming Protocol (RTSP). Ensure that the DVE provides 99.999% error-free operation. Ensure H.264 DVE and DVD equipment supports programmable bit rates. Ensure that H.264 equipment supports fixed bit rate mode.

SUBARTICLE 784-3.2.6.2 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.6.2 Software-based Decoder: Ensure that any software-based decoder applications do not interfere with SunGuide® software operating when installed and used together on a shared hardware platform. Ensure that the software application provides PC desktop display of IP network video streams. Ensure that the software-based decoder offers an open Application Programming Interface (API) and software development kit available to the Department at no cost for integration with third party software and systems.

SUBARTICLE 784-3.2.7 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.7 Interoperability: Provide DVE and DVD devices and software that are interoperable and interchangeable with DVE and DVD devices and software from other manufacturers. Ensure that the DVE is compatible and fully interoperable with software and hardware DVDs from the DVE manufacturer, as well as a minimum of two software and hardware DVDs from other manufacturers. Ensure that the DVD is compatible and fully interoperable with DVEs from the DVD manufacturer, as well as a minimum of two other DVEs from other manufacturers. Ensure DVE and DVD can be controlled using SunGuide® or support stream selection and switching using ONVIF commands.

SUBARTICLE 784-3.2.8 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.8 Video Specifications: Ensure that composite video inputs and outputs utilize BNC connectors. Ensure video inputs and outputs support 1 volt peak-to-peak (Vp-p) NTSC composite video. Ensure that the DVE and DVD operate with both color and monochrome video, and that they allow the user to select and adjust video resolution. Ensure that the DVE and DVD support resolutions that include, but are not limited to, those defined in Table 3.1. Ensure that the DVE and DVD are capable of delivering color and monochrome video at 30 fps regardless of resolution.

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Format	Resolutions
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Note: The resolutions attained depend on the data transmission rate.	

SUBARTICLE 784-3.2.10 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.10 Network Interface: Ensure that the DVE/DVD local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections. Provide a DVE/DVD having a minimum of one Ethernet port, which shall be a 10/100 Base TX connection or a 100 Base FX ST, SC, LC or FC interface. Ensure that the connector complies with applicable EIA and TIA requirements. Provide copper-based network interface ports that utilize RJ-45 connectors. 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.

Ensure that all Category 5E, unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard. Ensure that the network communication conforms to User Datagram Protocol (UDP), Version 4 of the Internet Protocol (IP) and Version 2 of the Internet Group Multicast Protocol (IGMP).

SUBARTICLE 784-3.2.12 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.12 Configuration and Management: Provide DVEs and DVDs that support local and remote configuration and management. Configuration and management functions shall include access to all user-programmable features, including but not limited to addressing, serial port configuration, video settings, device monitoring, and security functions. Ensure that the DVE and DVD support configuration and management via serial login and telnet login, web browser, or Simple Network Management Protocol (SNMP).