**MODIFIED SPECIAL PROVISION APPROVAL REQUEST**

(REV 3-8-16)

**Date: 8/31/2020 District: 5 Type: Project Specific**

**Letting Month: January 2021 FPID Number: 436325-2-52-01**

**Requested by: Noemi Rodriguez Bonilla, P.E. Office/Phone: 386-943-5327**

**Specification being modified: 684 NETWORK DEVICES**

**Affected Pay Items: 684-**

**Expected Cost Impact to this project:** No significant cost impact anticipated. The project budget was estimated based on the use of network devices similar to those already in use throughout the District, including the Managed Multilayer Ethernet Switch (MMES) described in this MSP.

**Project Description:** The Event Management Phase II project builds upon an existing system used by FDOT, Volusia County, and the City of Daytona Beach to manage traffic entering and existing events and provide parking guidance for the Daytona International Speedway. The system also provides motorist guidance as part of incident management operations on I-95. Changes to Speedway parking facilities, the need for signing at other decision points, the need to provide parking guidance for Volusia County beaches, and desired system operational improvements require that the existing system be modified and updated.

**Background Data:** The District 5 ITS network topology requires Ethernet switches for access and distribution that include routing features that are not commonly supported by the typical Managed Field Ethernet Switch (MFES) as described in section 684. This MSP introduces a subarticle describing a MMES including the routing capabilities required by the District. These requirements have typically been required on previous District 5 projects as a technical special provision (TSP). However, the Department requested during the project design review process that they be incorporated as a MSP.

**\*Name and PE Number of PE signing and sealing the Modified Special Provision:**

**\*** *Project Specific Modifications to the Standard Specifications or Workbook Specifications must be signed and sealed by the Professional Engineer responsible for this Special Provision under the following statement and kept in the Project Files maintained in the District.*

**PE Name: Paul Mannix PE Number: 57712**

***I hereby certify that this Specification was prepared under my responsible charge, and that it has been reviewed in accordance with procedures adopted and implemented by the Florida Department of Transportation.***

The official record of this Special Provision has been electronically signed and sealed using a Digital Signature as required by 61G15-23.004, F.A.C. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Professional Engineer: Paul Mannix

Date: 8/31/2020

Fla. License No.: 57712

Firm Name: Atkins North America, Inc

Firm Address: 482 South Keller Road

City, State, Zipcode: Orlando, FL 32837

Certificate of Authorization: 24

Pages: 6

## NETWORK DEVICES

(REV 8-31-20)

ARTICLE 684-5 is deleted and the following substituted:

684-5 Managed Multilayer Ethernet Switch.

**684-5.1 Description:** Furnish and install a Managed Multilayer Ethernet Switch (MMES) as shown in the Plans. The MMES must comply with the John S. McCain National Defense Authorization Act for Fiscal Year 2019, section 889, Prohibition on Certain Telecommunications or Video Surveillance Services or Equipment.

**684-5.2 Materials:**

**684-5.2.1 General:** Ensure that the MMES is fully compatible and interoperable with the ITS trunk Ethernet network interface and supports half and full duplex Ethernet communications.

Ensure that the MMES includes Layer 3 routing features including use of Open Shortest Path First (OSPF) routing protocol, Routing Information Protocol (RIP), Generic Routing Encapsulation (GRE), and Virtual Router Redundancy Protocol (VRRP). Ensure the MMES includes any license(s) required to utilize all available Layer 3 features.

Furnish a MMES that provides 99.999% error-free operation and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber optic and Category 5E/6 cables. Ensure the MMES provides a switched Ethernet connection for each remote ITS field device and spare port capacity.

Ensure that the MMES has 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.

**684-5.2.2 Networking Standards:** Ensure that the MMES complies with all

applicable Institute of Electrical and Electronics Engineers (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 (RTSP).

2. IEEE 802.1p standard for QoS.

3. IEEE 802.3 standard for local area network and metropolitan area network access and physical layer specifications.

4. IEEE 802.3u supplement standard regarding 100BASE-TX/100BASE-FX.

5. IEEE 802.3x standard regarding flow control with full duplex operation.

6. IEEE 802.3z supplement standard regarding 1000BASE-X.

**684-5.2.3 Optical Ports:** Ensure that all fiber optic link ports operate at 1310 or 1550 nanometers in single mode. Ensure that the optical ports are Type ST, SC, LC, or FC only, as shown in the Plans or as directed by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Furnish small form factor pluggable transceivers as shown in the Plans for each MMES. Ensure the MMES is configured with the number and type of ports detailed in the Contract Documents. Provide a MMES having a minimum of four Gigabit Ethernet (GbE) SFP ports with optical transceivers unless otherwise shown in the Plans. Optical ports must have an optical power budget of at least 15 dB unless otherwise shown in the Plans. Provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data.

**684-5.2.4 Copper Ports:** Provide a MMES that includes a minimum of twelve 10/100/1000BASE TX ports unless otherwise shown in the Plans. All copper ports must

be Type RJ-45 and shall auto-negotiate speed and duplex (i.e., full or half).

**684-5.2.5 Configuration, Management, and Operation:** Ensure that the MMES can be managed individually and as a group for configuration, performance monitoring, and troubleshooting. Ensure that the MMES includes Layer 2 and Layer 3 capabilities, including Quality of Service (QoS), Internet Group Management Protocol (IGMP), rate limiting, security filtering, routing functions, and management. Ensure that the MMES supports IPv4, IPv6, and is suitable for network access and aggregation, with Layer 2 and Layer 3 protocols and features that include:

1. Port-based VLAN support and VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard and has a minimum 4-kilobit VLAN MAC address table.

2. A minimum switching capacity of 200 Gbps, minimum forwarding capacity of 150 million packets per second, and ability to support 10,000 IPv4 routes.

3. Support of, at a minimum, IGMP Version 2.

4. Support of remote and local setup and management via secure shell and secure Web-based graphical user interface.

5. Support of the Simple Network Management Protocol. Verify that the MMES can be accessed using the resident EIA-232 management port or a telecommunication network.

6. Support of Remote Authentication Dial-In User Service (RADIUS) or Terminal Access Controller Access Control System Plus (TACACS+).

7. Support of remote monitoring of the Ethernet agent and the ability to be upgraded to switch monitoring.

8. 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.

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

10. OSPF routing protocol.

11. RIP.

12. GRE.

13. VRRP.

**684-5.2.6 Mechanical Specifications:** Ensure the MMES is a stackable switch that occupies only one rack unit (RU) when mounted with the MMES front panel facing the cabinet door. Ensure equipment is permanently marked with manufacturer name or trademark, part number, and serial number.

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.

**684-5.2.7 Electrical Specifications:** MMES must be capable of operating on a nominal voltage of 120 volts alternating current (VAC). Ensure the MMES includes redundant and hot-swappable power supplies. Supply an appropriate voltage converter as needed for each device to be powered from cabinet power, including cabinet uninterruptable power supply (UPS) output.

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

**684-5.2.8 Environmental Specifications:** Ensure that the MMES has a minimum operating temperature range of 23 to 122 degrees Fahrenheit and storage temperature range of -13 to 158 degrees Fahrenheit. Ensure that the MMES has a minimum non-condensing relative humidity operating range of 5% to 95% at 158 degrees Fahrenheit.

**684-5.3 Installation:**

**684-5.3.1 General:** Mount the MMES inside a field site cabinet utilizing a rack mount kit that does not exceed 1RU. Ensure that the MMES is resistant to all electromagnetic interference. Ensure that the MMES is mounted securely and is 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.

**684-5.3.2 Testing:** Subject the MMES to all tests as required by the project specifications and technical special provisions.

ARTICLE 684-6 is deleted and the following substituted:

684-6 Warranty.

**684-6.1 General:** 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.

The Contractor must assign any and all manufacturers' or other sellers' warranties that come with any products, materials, or supplies incorporated into or consumed in the project in any way to the Department. Should any such warranties not extend to subsequent purchasers or owners or such warranties contain a limitation on assignment, Contractor agrees that Contractor purchased the products, materials and supplies on behalf of the Department and that the Department is the recipient of all warranties. All documents associated with or describing such warranties shall be delivered to the Department along with the other project final acceptance documents and shall be deemed to be a part of the required final acceptance documentation. Contractor shall not take any action or fail to act in any way that would void any such warranties.

**684-6.2 MFES:** Ensure that the MFES has a manufacturer’s warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.

**684-6.3 Device Server:** Ensure that the device server has a manufacturer’s warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608**.**

**684-6.4 Digital Video Encoder and Decoder:** Ensure that the DVE or DVD has a manufacturer’s warranty covering defects for two years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.

**684-6.5 Media Converter:** Ensure that the media converter has a manufacturer’s warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.

**684-6.6 Managed Multilayer Ethernet Switch:** Ensure that the MMES has a manufacturer’s warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.

ARTICLE 684-7 is deleted and the following substituted:

684-7 Method of Measurement.

The Contract unit price for each MFES, MMES, device server, DVE, DVD, or media converter 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.

Provide software-based decoders at no additional cost when furnished in conjunction with DVEs. A software-based DVD provided individually must be paid under the pay item below.

ARTICLE 684-8 is deleted and the following substituted:

684-8 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- 3- Digital Video Encoder with Software Decoder-each.

Item No. 684- 4- Digital Video Decoder-each.

Item No. 684- 5- Media Converter-each.

Item No. 684- Managed Multilayer Ethernet Switch-each.