GATEWAY ROUTERS - Item No.

1.   SCOPE

This Special Provision covers the requirements for the installation of Gateway Routers with integrated digital subscriber line (DSL) modems or Mobile Broadband (cellular) modems for data communication between the Traffic Operations Centre (TOC) and field sites not connected to the Ministry's hard-wired network.

2.   REFERENCES

This Special Provision refers to the following standards, specifications, or publications:

Institute of Electrical and Electronics Engineers:

IEEE 802.3   IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

Mobile Technology Standard:

High Speed Packet
Access (HSPA)   A broadband communications standard for the wireless transmission of data through radio signals composed of the High-Speed Downlink Packet Access (HSDPA) protocol and the High-Speed Uplink Packet Access (HSUPA) protocol

LTE Advanced   Also referred to as True 4G, it is the major enhancement in the capacity and speed on the LTE wireless communication standard.

3.   DEFINITIONS

For the purpose of this Special Provision, the following definitions apply:

APN means Access Point Name, a gateway between a 3G or 4G mobile network and another computer network, frequently the public Internet.

CAT 5e Cable means an unshielded twisted pair cable type designed for high signal integrity. It provides performance of up to 100 MHz, and is frequently used for both 100 Mbit/s and gigabit Ethernet networks.

GPS API (Application Program Interface) means a set of routines, protocols and tools that provides a method for computers to retrieve their geolocation.

DSLAM means Digital Subscriber Line Access Multiplexer. It is a network device, located in the telephony exchanges of the service providers, that connects multiple customer Digital Subscriber Lines to a high-speed Internet backbone

MIB (Management Information Database) means a set of network objects that can be managed using the SNMP protocol.

Integrated Mobile Broadband Modem means a device that allows the router to wirelessly receive Internet access through an Internet Service Provider (ISP) via mobile broadband (cellular) connection.

SNMP means Simple Network Management Protocol which forms part of the internet protocol suite as defined by the Internet Engineering Task Force (IETF). SNMP is used by network management systems to monitor network-attached devices for conditions that warrant administrative attention.

VDSL2 means very-high-bit-rate digital subscriber line 2, a data communications technology that enables broadband data transmission over copper telephone lines.

4.   DESIGN AND SUBMISSION REQUIREMENTS

4.1   Submission Requirements

Specification sheets for the Gateway Router shall be submitted to the Contract Administrator for review prior to ordering.

5.   MATERIALS

5.1   General

5.1.1   The Gateway Router shall have the required integrated DSL or cellular modem, come in a single form factor package and include all mounting hardware required for installation on an EIA 480 mm equipment rack shelf.

5.1.2   The Gateway Router shall be field ruggedized and rated for operation in temperatures ranging from -40 to +50 °C, with a relative humidity of 10 to 95%, non-condensing.

5.1.3   The Gateway Router shall be externally powered using input voltage of 115 VAC ±15%, 60 Hz ±5%. Any necessary external power adapters/converters shall be provided with the units.

5.1.4   The Gateway Router shall be supplied with any and all cables required to connect to both the telecommunications service provider demarcation point and the field equipment in the cabinet. Data interface unshielded twisted pair patch cables for IP field equipment in the cabinet shall be CAT 5e rated or higher.

5.1.5   The manufacturer, model number, serial number, and firmware version of the Gateway Routers shall be visible on the outside casing of the units.

5.2   Digital Communications

5.2.1   The Gateway Router shall provide full IEEE 802.3 switching functionality between its LAN ports, and IP routing functionality to provide centre to field connectivity for IP devices in the cabinet via a wide area network (WAN).

5.2.2   The Gateway Router shall include a minimum of two, 100BASE-TX ports with RJ45 connectors for connection to the Ethernet switch in the cabinet and shall support static routing and Network Address Translation with Port Forwarding, to enable remote computers from the WAN interface to access devices connected on the router's private LAN

5.2.3   The Gateway Router shall support IPSec Virtual Private Networking with Advanced Encryption Standard (AES) support, to provide security for network traffic routed out through public wide area network interfaces.

5.2.4   The Gateway Router shall come complete with firewall functionality which allows administrators to designate specific IP addresses or blocks of IP addresses which will be granted (whitelisted) or refused (blacklisted) access to the router's network interfaces.

5.3   **Remote Configuration & Management**

5.3.1   The Gateway Router shall run an HTTP server for remote device configuration over an IP network, and shall also support configuration via a direct console port serial link.

5.3.2   The Gateway Router's utility shall be operable on a standard web browser, and shall not require client side ActiveX support.

5.3.3   The Gateway Router shall support basic remote management functionality via Simple Network Management Protocol (SNMP) v2 or higher.

5.3.4   The HTTP configuration utility shall require password authentication for security, and shall enable users to remotely configure all necessary router system parameters, including:

a)   Router and WAN Adapter IP configuration settings;

b)   Routing and gateways;

c)   Port-forwarding configurations;

d)   DSL configuration;

e)   VPN settings.

5.3.5   All remote commands and configuration changes shall not require the routers to power cycle.

5.3.6   The Gateway Router shall provide non-volatile storage for the retention of all configurable settings, and the previously deployed configuration shall be reapplied automatically pursuant to any power cycling of the device.

5.4   **Integrated DSL Modems**

5.4.1   The DSL modem shall provide a minimum of 1 Mbps upload and 7 Mbps download speeds and support full duplex, telecommunications service provider configured, Point-to-Point Protocol over Ethernet (PPPoE) or Bridged Mode over DSL links.

5.4.2   The DSL modem shall be fully compatible with the telecommunication provider's network and service.

5.4.3   The DSL modems shall automatically attempt to re-establish connections to the service provider DSLAM, in the event of momentary link loss.

5.4.4   The DSL modem shall be integrated into a single form factor package with the Gateway Router, and provide a standard type connector for the public telecommunications provider's network connection.

5.4.5   The Contractor shall supply all interface cables and connectors shall be connected to the modem to the associated equipment and/or patch panels specified in the Contract Drawings.

5.5   Integrated Mobile Broadband Modems (Cellular Modems)

5.5.1   The cellular modem shall conform to LTE-Advanced and HSPA+ standards for the transfer of data over their cellular network.

5.5.2   The cellular modem shall be integrated into a single form factor package with the Gateway Router, and provide an SMA connector for connection to an external multi-band antenna.

5.5.3   The cellular modem shall provide an ultra-reliable "always on" cellular connection with remote diagnostics, configuration, updates and shall re-establish connection with the service provider upon power-up following a power reset.

5.5.4   The cellular modem shall be unlocked and fully compatible for use on the service provider's LTE-Advanced network with fallback to HSPA+ depending on the availability of the network. The router shall be programmed with a password to be provided by the Contract Administrator.

5.5.5   The cellular modem shall have a unique public static IP address to support data communications with consistent addressing. The static IP address shall be assigned by the telecommunications service provider APN, and the same static IP address shall be reassigned by the APN whenever the cellular modem is online

5.5.6   The cellular modem shall come equipped with an external low-profile "puck type" panel mountable antenna, which includes the connecting antenna cable, and is compatible with the service provider's transmission frequencies.

5.5.7   The cellular modem shall come with GPS functionality, with API or standard MIBs provided in order to query GPS information from the router while in operation. GPS API and/or MIB documentation shall be supplied with the modem.

6.   EQUIPMENT – Not Used

7.   CONSTRUCTION

7.1   Installation

7.1.1   Each Gateway Router shall be installed and suitably mounted in the field cabinets at the locations specified in the Contract Drawings.

7.1.2   If an external power supply component is required for the operation of the router, it shall be securely fasten the connector. The Gateway Router power supply cord shall be connected to the power distribution assembly receptacles reserved for communication equipment, or preferably to the output receptacles where UPS units are present in the cabinet.

7.1.3   The data interface unshielded twisted pair patch cables for all networked field equipment shall be connected to the Gateway Router integrated 100BASE-TX LAN ports.

7.1.4   Where a DSL connection is required, the DSL cable shall be connected from the telecommunications provider demarcation point to the Gateway Router integrated wide area network port.

7.1.5   The antenna shall be mounted on the cabinet and connect to the modem.

7.2   **Provision of Data Communications Service**

7.2.1   The Contractor shall arrange for a guaranteed uplink/downlink of minimum data rate 1Mbps/7Mbps. The DSL service shall include one (1) static IP addresses and an unlimited bandwidth usage.

7.2.2   An account for third party data service to each Gateway Router shall be setup with the Owner's approved vendor for the specific geographic service area where each Gateway Router is to be installed under the Owner's name and activated.

7.2.3   Service activation shall be arranged to meet the schedule and constraints specified in the Contract Documents.

7.3   **Configuration**

7.3.1   Utilizing either the serial console or LTE/HTTP based configuration tools on a locally connected client, the IP address of the Gateway Router shall be set as instructed by the Contract Administrator.

7.3.2   Required settings for Virtual Private Network integration shall be configured with the Owner's internal network, as instructed by the Contract Administrator.

7.3.3   The data account from the data provider shall be assigned to the modem's ESN (electronic serial number). The Contractor shall input all required telecommunications provider account/authentication information and IP address details and activate the modem onto the service provider network.

7.3.4   Router gateway settings shall be configured to enable remote access to devices in the cabinet across the router's wide area network interface, on all necessary TCP/UDP ports. This shall include suitable configuration of Network Address Translation settings for internal/external IP address matching.

7.3.5   Modems shall be configured to prevent unauthorized login based on access control and any firewall settings that the modem may support (i.e. IP filtering, whitelisting, blacklisting, port filtering, etc.). All login credentials, passwords and configuration settings shall be submitted to the Contract Administrator.

7.3.6   All wireless LAN functionality on the Gateway Router– shall be disabled such that only authorized, directly connected wireline devices can join the Gateway Router LAN.

7.4   **Link Integrity**

The Contractor shall confirm correct hardware configuration and verify reliable and optimal data transmission between field units and the TMC. End-to-end latency between then Gateway Router and TMC Firewall shall not exceed 150 milliseconds under regular conditions.

7.5　　　　　　　　**Quality Control**

The Contractor is responsible for all testing and documentation required to establish approval and acceptance of installation and operation of this equipment. The framework of the approval process shall be as specified elsewhere in the Contract Documents.

The following table details the clauses within this Special Provision, which are to be validated through the PIT, POP, and SIT processes as indicated:

CLAUSE	PIT	POP	SIT
5.1.1	√		
5.1.2	√		
5.1.3	√		
5.2.1	√	√	√
5.2.2		√	√
5.2.3			√
5.2.4			√
5.3.1	√	√	
5.3.2	√	√	
5.3.4		√	
5.3.5		√	
5.3.6		√	
5.4.1		√	
5.4.2	√	√	
5.4.3	√	√	
5.4.4	√		
5.5.3	√	√	
5.5.5	√	√	
5.5.7		√	
7.3.4			√
7.3.5			√
7.3.6			√
7.4			√

8.　　　　　　　　**QUALITY ASSURANCE – Not Used**

9. **MEASUREMENT FOR PAYMENT**

Measurement for payment of Gateway Routers is by Plan Quantity.

The unit of measure is each.

10. **BASIS OF PAYMENT**

10.1 **Gateway Routers - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the work.

The Contractor shall be responsible for the payment of all monthly data communication fees and service charges for administration and installation throughout the duration of the Contract. Payment for service shall be included in the tender price for this item.