

**PARTICULAR SPECIFICATION**  
**APPENDIX T**  
**IT CONNECTIVITY REQUIREMENTS**

## **IT CONNECTIVITY REQUIREMENTS**

### **1 Computer Distribution Room**

1.1 The Computer Distribution Room (CDR) shall include, but not limited to the following:

- a. the CDR shall be for the Authority's IT connectivity only;
- b. a solid lockable door;
- c. door access management system;
- d. at least 5m x 3m;
- e. an electrical DB for the Computer Distribution Room separate from the electrical DB for the users;
- f. a "clean earth" ( $<1$  Ohm) for the computer server FTP patch panel in the building;
- g. earthing point that is connected to the earth electrode via an earth cable and this earth bar shall be at least 460mm long with 6mm screw holes spaced at 60mm center to center;
- h. grounding cable of 4mm or 16mm (yellow/green) connecting each component (patch panel, FTP cable drain wire, rack) to the earth bar;
- i. air-conditioning system comprising two (2) separate units that operates on a 24hr X 7 day's basis with 100% redundancy between the 2 air-conditioning system using an electrical control timer;
- j. at least eight (8) number of 13 amp power points;
- k. at least one (1) number of telephone points;
- l. a cable trunk (at least 5" x 4") that leads from the cable trays to the equipment rack. No other services shall share this trunk;
- m. at least one (1) table and one (1) chair;
- n. smoke detector with alarm; and
- o. no windows.

## **2 Network Connectivity Requirement**

- 2.1 The Contractor shall appoint a single point of contact to provide and maintain the different internet Wide Area Network (WAN) setup for the Authority's network connectivity via virtual private network of the Authority and the different systems required onsite for the monitoring of the site activities and personnel. The systems mentioned primarily are:
- a) Dedicated internet line with cyber security protection for the Authority's office to allow network tunnelling to the Authority's virtual private network and resources required such as networking, printing and scanning;
  - b) Internet line and Closed Circuit Television Systems using such as IP cameras with a clear transmission and resolution to control centres; and
  - c) Access Management and Identification Systems with Internet of Things (IoT) or sensors for the managing and control of personnel profiles or devices within the Contract work site.
- 2.2 The Contractor shall provide all manpower and materials for installation of lead in pipe and trunking required for the WAN and Local Area Network (LAN) setup. The Contractor shall coordinate installation works with the WAN/LAN service provider to ensure that the Authority is able to obtain network connectivity in a timely manner.
- 2.3 The Contractor shall provide underground lead-in-pipe(s) and concealed pipes for exposed cables from the WAN service provider's manhole (or any other facilities) up to the proposed Computer Server Rooms within the office. This shall include all other works that is necessary to facilitate the installation of IT/telecommunications circuits.
- 2.4 The Contractor shall support and coordinate any protocol or wide area network connection charges at a maximum of one time every three years to the Authority's network due to security or features enhancement whenever initiated. In the event of network changes required by the Authority, any cost incurred for additional cabling, trunking, power requirement or coordination required for the changes will be borne by the Contractor, without additional cost to the Authority.
- 2.5 The Contractor shall be the single point of contact during any changes, rectification or repair works for any equipment and/or circuit failure. Upon notification from the Authority that the hardware/software has failed or is malfunctioning, the Contractor shall liaise with the corresponding vendors or manufactures to provide the recommendation(s) and solution(s) to resolve the issue until closure, and provide the action plan to the Authority.

- 2.6 The Contractor shall maintain and troubleshoot all network connectivity faults issue arises throughout the contract period. The Contractor shall document the procedures of work that is performed. The Contractor shall keep record of the documents/services report and submit to the Authority as requested.
- 2.7 The Contractor shall update and maintain the inventory list from time to time in the course of performing the Services and replacement of faulty part(s). The inventory list shall be made available to the Authority as requested.
- 2.8 The Contractor shall ensure that the hardware and software are always maintain to the latest patches and any vulnerabilities shall be addressed immediately to prevent any cyber security risk post to the network connection by the Authority.

### **3 WIFI Requirement**

- 3.1 The Contractor shall subscribe to Wireless@SG or equivalent internet line with at least 1Gbps for internet connection with cyber security protection in place. This is to allow, the Authority staff to securely connect to internet and tunnel via its own virtual private network and systems within the work site as requested by the Authority. The internet access coverage shall be within the Authority's office and worksite area under this Contract.
- 3.2 The Contractor shall use fibre with converter or outdoor wifi repeater for the wifi signal covering the work site for the mentioned systems, and the signal transmission shall be free from interruption.
- 3.3 The Contractor shall recommend and ensure a proper secured configuration of this internet access encompass with appropriate security and required hardware to secure the environment such as firewall, controller, mac filtering, content filtering, private VLAN, quality of service (QoS) for different systems as requested.
- 3.4 The Contractor shall recommend on the LAN segregation physically for the bandwidth usage by the office and other systems via different cablings, router and switch to ensure minimising the disruption of office connectivity from other systems using the same wireless network.
- 3.5 The Authority shall request the internet public IP addresses to be translated to a segment viable for the functioning of the Authority's end point devices within the duration of the contract. There must be a firewall segregating between the internal local area network and internet facing IP addresses and a controller to manage the access points and its configurations.
- 3.6 The Contractor shall coordinate with the Authority representative to provide usb wifi receiver for any desktop used by the Authority onsite

for this project to ensure all computing devices from the Authority is able to connect to the wifi provided.

- 3.7 The Contractor shall work with its printer supplier to ensure that the printing and scanning services are able to function via its wireless/wired setup allowing the supplied notebooks and the Authority's notebook and desktop able to use the print/scan function when connected to wifi/wired provided under this Contract with either direct print or via storing the document securely with builtin harddisk of the printer so as to allow user to access via web browser to access the printer securely to print and scan.
- 3.8 The Contractor shall perform wireless coverage survey to ensure wireless coverage shall not cover beyond the Authority's premises. The report shall be submitted to the Authority for review.
- 3.9 The Contractor shall propose the access point (AP) position to be approved by the Authority representative on the installation that covers the Authority's premises.
- 3.10 The AP power shall be supplied by using an external power adapter for the access point or via the power over ethernet switch as propose by the Contractor
- 3.11 The Contractor shall disable any feature that permits over-the-air provisioning and administration of the wireless system.
- 3.12 The COM/console ports to the access points shall be password-protected.
- 3.13 The internet surfing plan shall comply to 802.11 IEEE (Institute of Electrical and Electronics Engineers) standard minimally builds on 802.11i security standard that makes use of WPA2 (WIFI Protected Access Version 2) service and shall not broadcast the service set identifier (SSID) and shall have security settings for blocking of undesirable web sites with at least antivirus scanning and content filtering.
- 3.14 The WLAN shall be Password Protected using minimally WPA2-Enterprise and the Advanced Encryption Standard-Counter Mode with Cipher Block Chaining Message Authentication Code Protocol that is minimally 256-bit AES CCMP encryption.
- 3.15 The WLAN shall implement Wireless Intrusion Protection System (WIPS) as part of its overall design. The WLAN should have features that include:
  - a. Access point impersonation detection;
  - b. Rogue access point classification;

- c. Enable detection of attempted wireless attacks, such as access point spoofing and invalid address combination; and
  - d. Event logs and issues shall be logged to allow for systematic review and rectification.
- 3.16 The Contractor shall work with the Authority on the agreed setup of the access points and dedicated network points in designated area for internet surfing and printers
- 3.17 The administration login ID and password of the router and/or wireless access points shall be changed and handed over to the Authority's representatives after successful testing and accepted by the Authority while the maintenance contractor maintain its own login ID and password for maintenance work purpose.
- 3.18 The contractor shall review and submit a monthly report to the Authority representative the privileged administration account of the network to confirm the validity of the role and account.
- 3.19 The Contractor shall provide at least three common notebooks with minimally twenty-seven inch (27") of LED monitors at the common area for internet surfing. Another common PC would have dedicated for door access security configurations and WLAN monitoring. The Specifications of the notebooks shall follow **Clause 5** of the Particular Specification for common notebook Specifications.
- 3.20 Each internet surfing notebook shall connect via wireless or USB cable to laser monochrome A4 printer (x2) and A3 (x1) printer respectively.
- 3.21 The Contractor shall provide at least two (x2) multi-functional devices (MFD) compatible to the Authority's personal computer (PC)/notebook for local area network printing/scanning or printing/scanning via wireless device. The MFD shall have a built in harddisk and feature to allow the Authority's PC to store document securely and print via web browser respectively.
- 3.22 The printer connection protocol shall be capable of either via wireless or USB or Ethernet network. The Specifications and features of the printers shall be capable of automatic duplex printing, >512mb RAM, >50 pages per minute, >2 trays, >250,000 duty cycle per month, media size supported has to be A3, A4, A5 and A6.
- 3.23 The Contractor shall demonstrate that the wireless printing/scanning from the MFD using the Authority's secure PC/notebook shall be achievable without additional components connected to the Authority's PC/notebook.
- 3.24 The Contractor shall be responsible for the supply, installation and testing of the data cabling required for the setting up of the LAN (Local Area Network) and WAN (Wide Area Network) within the Office. The Contractor shall ensure that the data cables and network hardware (i.e.

switches, firewalls, UPS etc.) are supported by the principal manufacturer throughout the contract period. The Contractor shall be fully responsible to ensure the service links connects the Authority's existing network at the Authority's office.

- 3.25 The Contractor shall install any additional access points required for the office premises used by LTA due to reconfiguration of office layout or additional peripherals installed.
- 3.26 The Contractor shall ensure that the service provider's Distribution Box (DB) be located in the proposed Computer Distribution Room. There shall be no intermediate DB. This shall be installed and maintained at the Contractor's expense, which shall include one-time installation charge, monthly subscription plus all other works involved to facilitate the installation of the connectivity/telecommunications services.
- 3.27 The Contractor shall ensure that a stable and adequate supply of electrical power is provided to all IT equipment within the office including the Computer Distribution Room with system grounding.

#### **4 Network Requirement**

- 4.1 The Contractor shall ensure that the Hardware is new and purchased from the product principal. The Software shall be licensed and supported by product principals. No third-party or refurbished parts are allowed without prior approval by the Authority.
- 4.2 The Contractor shall enter into back-to-back support agreements with the product principals and/or its appointed subcontractors.
- 4.3 The Contractor shall provide complete product information and specifications for the Hardware and Software to show that they meet or exceed the requirements in this Requirement Specifications.
- 4.4 All Hardware and Software shall not have End-of-Sale announced by the principal manufacturer before the acceptance of the design. The Contractor shall discuss and seek approval from the Authority before the order is placed.
- 4.5 The Contractor shall provide maintenance to all active device or equipment provided in this contract. The equipment shall not have any EOL (End of Life) or EOS (End of Support) announcements from the principal vendor or manufacturer within the contract period.
- 4.6 The Contractor shall replace equipment which have End-of-Software-Support and/or End-of-Hardware-Support, whichever is earlier, should there be an announcement by the principal manufacturer within the contract period. The equipment shall be replaced with the recommended replacement from the principal manufacturer, without additional cost to the Authority.

- 4.7 The firmware and licenses for network and security devices shall have support from the principal manufacturer throughout the Contract period. Upon principal manufacturer announced End-of-Support (EOS) for firmware and / or licenses, the Contractor shall recommend and provide principal-supported firmware and / or licenses for the remainder of the Contract. There shall not be any change in service level and scope of maintenance for this contract due to change in network firmware and / or licenses unless given approval by the Authority.
- 4.8 Without any cost to the Authority, in the event of a hardware and software failure of equipment and/or circuit failure, the Contractor shall replace/rectify within eight (8) hours with an equivalent make/model or a device and/or circuit of higher specification with the same function and feature.
- 4.9 The Contractor shall propose and provide an Uninterruptible Power Supply (UPS) unit of at least 3000 VA suitable for IT equipment use in each of the Computer Server Room or network cable room. Such UPS must come with at least a 100Mbps Ethernet port for SNMP management purpose with latest version software.
- 4.10 The Contractor shall label all equipment and inter-device cables inclusive of power cord identification.

## **5 Cabling Requirement**

- 5.1 The Contractor shall supply all materials and labour for the network point installation, termination, labelling and test all network cabling (end to end), patch panels, cable management and furnish specifications of at least Cat 6 UTP straight patch cords to the Authority's staff workstation with access in the Authority's office(s). The number of network points are subjected to the Authority's approval.
- 5.2 The Contractor shall provide 2 x metal cable trays per floor, at least 120mm wide, which runs along the full length of the office within the false ceiling, to carry data cables. The trays shall be strategically bridged at 3 locations and shall lead into the server room. No other services shall be placed on these cable trays and electrical cable trays should be placed at least 5cm apart.
- 5.3 For IT cable drop-down where there is no wall, either a metal trunking or PVC/metal casing shall serve as a drop-pole from which the horizontal network cable runs will channel the cables into the nearest system furniture.
- 5.4 The Contractor shall provide the required openings and trunkings (either metal or PVC) for the sole purpose of running computer cables and/or data communications cables between floors or offices as instructed and agreed upon by the Authority (where applicable).



- 5.5 The Contractor shall provide attendance, co-ordinate and work closely with the service provider to install the LAN / WAN.
- 5.6 The Contractor shall ensure that the termination ends with appropriate connector for the network equipment from the DB.
- 5.7 Each workstation and printing area shall have a computer port / socket including all associated cabling, or otherwise, advise by the Authority dependent on the floor layout.
- 5.8 The Contractor shall engage certified data cable installers for all data cabling works.
- 5.9 The Contractor shall propose a detailed route for all the cabling system, supply the necessary cables, and provide the services for cabling work in accordance to the routing plan. The Contractor shall prepare and submit the cable routing plan at least one (1) week before the commencement of the installation for the SO's acceptance.
- 5.10 The Contractor shall estimate the length of the cables required. Each copper cable length shall not exceed 90m.
- 5.11 The Contractor shall provide fibre patch cabling, where required.
- 5.12 The Contractor shall provide additional or re-locate network points in the existing office only throughout the duration of the contract should the Authority decide to re-configure office furniture layout or add more capacity to support the Authority's contract to optimise the office floor area.
- 5.13 All cabling routing diagram, test results, floor layout shall be documented and submitted to the Authority for approval.

## **6 Equipment Rack Requirements**

- 6.1 The Contractor shall provide ONE (1) equipment rack required to house and physically secure all the Products. In addition, the Contractor shall also provide all necessary accessories and cables.
- 6.2 The Contractor shall propose and provide standard 42-U network rack(s) for 19-inch rack-mount equipment. The rack shall be 800mm (w) x 1000mm (d).
- 6.3 The equipment rack shall have at least 2 trays for placement of devices. The trays shall be able to be secured to the front and back mounting rails.
- 6.4 The equipment rack shall have U markings in all FOUR (4) the mounting rails.
- 6.5 The equipment rack shall be equipped with front, rear doors and key locks to protect the equipment housed in from unauthorised access.

- 6.6 The equipment rack shall have sufficient mounting plates and an adjustable keyboard tray for the Products.
- 6.7 The equipment rack shall come with adjustable feet and heavy caster wheels with brake locks. Perforated doors on front and rear doors to provide maximum ventilation and visibility to rack mounted equipment.
- 6.8 The equipment rack shall be equipped with power and cable management module. The Contractor shall utilise these facilities to arrange the cabling house within the racks.
- 6.9 The equipment rack shall provide at least 1 x 10-way Power Distribution Unit (PDU) with 3-pin electrical outlets for hardware to draw the power in the rack. The PDU shall support the required power input to prevent PDU and equipment overheating and pose safety threat to the Server Room.
- 6.10 The Contractor shall rack-mount, setup, install, configure, test and commission the Products including interconnection and integration between the Products and the Authority's existing infrastructure.

## **7 Uninterruptible Power Supply (UPS)**

- 7.1 The Contractor shall provide One (1) 3KVA Uninterruptible Power Supply (UPS).
- 7.2 The Contractor shall ensure the supplied UPS comply with the relevant Singapore's code of practices and standard.
- 7.3 The UPS shall support at least twenty (20) minutes of battery backup time prior to shutting down of the System. The UPS shutdown and battery shall be tested as part of the acceptance tests.
- 7.4 The UPS shall withstand power outages, surges and continuous under-voltage without affecting the System operations.
- 7.5 The UPS shall be equipped with adequate network interfaces and leverage on the Authority's network infrastructure to provide information and status which includes the operating mode, meter data and power load. The loss of UPS information shall not cause the controller to bypass the UPS, shutdown servers or drop the power supply load.
- 7.6 If it requires more than the capacity of one UPS, the UPS controller shall have the capability to determine the loss. In the event any one unit of controller or UPS fail, it shall not bring down whole or partial of the System, the other controller shall be able to continue supply power.
- 7.7 For parallel configurations, single points of failure shall be eliminated whereby each UPS module is autonomous, incorporating individual active components such as Power Units, Static Bypass Switches, CPUs, Control Panels and Separate Battery Sets. All UPS modules

shall operate simultaneously and equally share the load without utilising a centralised static bypass switch or system control module.

- 7.8 The Contractor shall ensure that the supplied UPS electrical components reside in the hardware comply with the relevant Singapore code of practices and standard. The Contractor shall replace any non-compliant equipment with its equivalent or higher-end model/product subject to the Authority's acceptance.
- 7.9 The Specifications for the proposed UPS racks are detailed below:
- a. Shall have a network module to enable it to be monitored. The Contractor shall configure the UPS to connect to the Authority's SNMP server so that it can be remotely monitored;
  - b. Shall have an LCD user interface that can control behaviour, measure in and out power and log faults;
  - c. Shall be configurable to set and trigger alarms when overload thresholds are reached;
  - d. Shall be rack mountable;
  - e. Shall have options to monitor UPS status so that it can do graceful shutdown for the connected devices; and
  - f. Shall be equipped with at least Eight (8) C13 and One (1) C19 output receptacles.

## **8 Documentation**

- 8.1 All submitted documents shall be in English and must be in good print quality.
- 8.2 All equipment shall come complete with installation and documentation.
- 8.3 The Contractor shall propose a detailed route for the cabling system, supply the necessary cables, and provide the services for cabling work in accordance to the routing plan. The Contractor shall prepare and submit the cable routing plan at least one (1) week before the commencement of the installation for the Authority's acceptance;
- 8.4 Documentation shall include, but not limited to the following:
- a. Drawings of the indoor and outdoor cable route;
  - b. Floor plan showing the distribution of data points installed and cable trunk route; and

- c. Network cable patching list for patch panel to data faceplates.  
Network cable test results.
- 8.5 One set of hardcopy documentation and one set of softcopy documentation (in compact discs / digital video discs) of as-built drawings and termination lists shall be supplied not later than 1 month upon successful completion of the purchase order.
- 8.6 For the softcopy (in compact discs / digital video discs), text documentation shall be provided in Microsoft Word format and drawings shall be provided in Microsoft Visio format.