

Network and Communication Infrastructure

This section provides guidelines and requirements for deployment of IT networks across institutions. Any institution that is intending to build a new network or upgrade the existing network infrastructure shall first seek guidance from RISA.

For better network management practices, the following shall be considered:

- Network design
- Network Implementation
- Network Management

Network design

The following parameters shall be based on while designing institution network:

1. **Number of users in the institution:** The number of network users shall be both employees and guests.
2. **Services accessed or offered by the institution:** Services shall be defined and categorized depending on operational and availability requirements.
3. **Broadband technology:** The technology to be used shall be chosen according to location, institutional business requirements, and offices set up. Wireless local area networks are advised for convenient and modernized work spaces.
4. **Physical network diagram:** The design of the physical network diagram will consider the number of users based on the institutional structure, the interior design/aesthetic of the building and sitting arrangement (i.e. whether all users sit on the same floor or on different floors) and shall also consider whether the infrastructure of the building is shared or not.
5. **Logical network diagram:** The design of the logical network diagram shall consider existing systems, services, and applications according to the institutional business processes. The design should also provide the capability for scaling up and growth.
6. **Network Security:** All Government institutions shall comply with the current cyber security directives for network and information systems issued by a competent authority.

The below recommended bandwidth allocated to the different categories of users considers the average number of end user devices to be two and these devices can be computers, smartphones or tablets among others.

Number of users using devices	Bandwidth in Mbps		Number of users using computers	Bandwidth in Mbps
1-10	15		121-140	210
11-20	30		141-160	240
21-30	45		162-180	270
31-40	60		181-200	300
41-50	75		201-240	360
51-60	90		241-280	420
61-70	105		281-320	480
71-80	120		321-360	540
81-90	135		361-400	600
91-100	150		Above 400	Individual Case Basis (ICB)
101-120	180			

Network Implementation

1. **Network equipment:** The network equipment and devices comprising the core network infrastructure to provide connectivity and security features shall among others include a rack, minimum routers, switches, and access points, as well as a firewall.
2. **Network cabling, labeling and physical layout:** Any network structure shall consider latest cabling and labeling standards.
3. **Network room:** Institutions shall have network rooms at their premises. Modular racks/containerized racks are recommended to be used. Note that this room will not serve as a data center for the institution.

They shall comply with the following minimum requirements for a modular rack:

Location	The network room at the institutional premises shall be in an isolated secure place away from mechanical shocks and/or excessive vibrations, clean and shall not be used for other purposes.
Size	Minimum depending on the number of network equipment
Room Temperature	The network equipment shall be put in a place where there is an environmental control installed i.e. air condition/cooling system that allows devices to remain in good condition.
Structural consideration (floor, ceiling, and walls)	Doors shall be metallic and no other materials that are fire prone. The network room shall not have exterior windows. In case of existing windows, frosting has to be implemented. Ceiling shall be fully closed and with a minimum height of 2.7 meters. Floor shall have a rack raiser. The walls shall not have water pipes that could burst and drench the system.
Environmental Control	Environmental control includes ventilation (natural and mechanical), filtration, ultraviolet germicidal irradiation, and other methods of air cleaning. A network room shall have sensors throughout the area that measure both temperature and humidity. In case of modular racks, environmental monitoring shall be inbuilt. Airflow Planning: A good airflow plan helps to avoid ‘hot spots’ and eliminates heat from the area so it doesn’t cause damage.

Cable Management Solutions	Cabling shall be properly routed, organized, and supported. This involves organizing your cabling and connectivity hardware in a way that makes it easy to identify components and troubleshoot problems. This makes future upgrades and repairs easier while keeping your IT spaces professional (Cable management and labeling).
Electrical system	The network room shall have two different power sources dedicated non-switched, power redundancy, supplies connected to UPSs on separate power circuits, a clear-labeled emergency power-off switch and monitor system. Shall have an automatic voltage regulator with circuit drawing and main switch board for all services, equipment grounding system and lighting rod. A regular maintenance and testing shall be performed. For proper load monitoring, Power Distribution Unit (PDU) installed in racks shall be smart PDUs.
Access control and safety	Physical access to the network room shall be limited to only authorized individuals. Such access control systems (access card or biometric keyboard or locking door) shall be used at all entry points 24/7, and clear procedure to ensure access is removed when an individual no longer has entry permission, and access list shall be reviewed periodically. Communication rooms shall have fire prevention system, electric all type fire extinguishers and dry pipe fire suppression. Alarm system and CCTV cameras shall be installed to monitor and record all events.
Network room cabinet systems	Racks enclosures shall have at least adjustable 19U, 24U with mounting rails and other sizes depending on the need. They shall also have terminals that allow cables for power and data pathways at the top and bottom. All cabinets shall be lockable.
Personal Protective measures	In order to safeguard Engineers' lives during the line of duty, protecting them from hazards and other injuries that they may sustain, adopting the use of personal protective equipment is recommended. These are key PPE to consider per personnel involved: • Safety footwear • Evolution 6121 Hard • Hat Safety glasses • Safety gloves

Noise protection Earplug
Class 3 high visibility vest Anti-static wrist strap.

RISA framework contract shall be used while procuring the network room equipment.

Documentation: This includes network drawings, network connection, network segmentation and configuration information, addresses of all devices on the network with static IP addresses, and logbooks. The document versions shall be reviewed periodically, and any changes shall be tracked.

Network Management

- **Network performance:** Redundancy, load balancing, application response time, and quality of service shall be controlled and assured.
- **Network maintenance:** Each institution shall elaborate a network maintenance plan together with the disaster recovery (DR), business continuity (BC) plan and an escalation matrix in reference to the DR and BC published by RISA. RISA maintenance framework contract shall be used.