Florida State University

Networking Equipment Guidelines for Construction and Renovation Projects

Revision 2.2

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Prepared by: FSU Information Technology Services

Introduction

The purpose of this document is to provide design guidelines and operating specifications for data networking equipment installed in newly constructed or renovated facilities at Florida State University. FSU Information Technology Services (ITS) is generally responsible for the design, installation, operation and maintenance of these networks. ITS will work closely with Facilities Planning and Construction, departmental representatives, and the design professional to ensure that appropriate network hardware is specified for each project.

Definitions

Networking Equipment - Those components aside from the building wiring infrastructure that are necessary to implement a local area network. This includes routers, switches, media converters, uninterruptible power supplies (UPS), patch cables, etc.

Building Wiring Infrastructure - The horizontal copper wiring between telecommunications room and wall jack, the vertical fiber optic and/or copper wiring between telecommunications rooms, and the fiber optic entrance cable.

Local Area Network (or Building Network) - The integrated system of building wiring infrastructure and networking equipment that allows computers and network activated devices to communicate with other computers and network activated devices within a building. The building network is connected to the campus core network to allow computers and network activated devices in the building to communicate with computers and network activated devices outside the building and across the Internet.

Network Design

Local area networks in campus buildings are typically configured in a star topology. A building entry switch is installed in the main telecommunications room. The building entry switch is connected to the campus core network via the fiber optic entrance cable and acts as an extension of the campus core network. The building switch feeds secondary switches located in the intermediate telecommunications rooms via the fiber optic riser system. The secondary switches feed wall jacks via the horizontal copper

wiring. (Refer to the FSU Telecommunications Infrastructure Standard for details concerning wiring specifications and telecommunications room design.)

The building entry switch has redundant power supplies, a high-speed backplane, and high-bandwidth uplinks to the secondary switches. Provisions for redundant backbone fiber feeds and/or alternate routing between the building entry switch and the campus core network should be considered early in the project. The best selections for secondary switches from current industry products are those that are modular in design, stackable, 1-3 RU in height with 24 or 48 ports per switch. Ports should be equipped with Power-over-Ethernet (POE) or be POE upgradeable. Minimum link speeds for newly purchased switches is 10/100/1000 Mbps on copper ports with 10 Gbps optical uplink and stacking capability.

Switches are physically mounted in the telecommunications room equipment racks in close proximity to the data wiring patch panels. This allows for minimum patch cord length, efficient troubleshooting, and cable management. The use of Ethernet hubs or mini-switches outside the telecommunications room is prohibited. All data connections should be wired back to the telecommunications room.

UPS are installed in telecommunications rooms wherever networking equipment is installed. These units provide filtered, uninterrupted a/c power to the equipment. If a networking device is equipped with dual power supplies, one power supply is connected to the UPS and the other connected to a building electrical wall outlet.

Wireless networking is prevalent in all new construction. The physical placement of wireless access points within the building vary from building to building, depending on the area of coverage required, number of users, physical characteristics of the building, materials used for construction, electromagnetic interference, etc. Considerations for wireless connectivity should be made early in the project.

Specifications

Ethernet Switches

The FSU network relies on standards based equipment to ensure interoperability. Ethernet switches shall adhere to the following standards:

• 802.3 10Base-T
• 802.3u 100Base-TX
• 802.3u 100Base-FX
• 802.3u 100Base-LX
• 802.3z 1000Base-SX/LX
• 802.3ab 1000Base-T
• 802.3ae 10-Gigabit Ethernet
• 802.3af Power over Ethernet
• 802.3x Flow Control
• 802.3ad Link Aggregation
• 802.1d Ethernet Bridging
• 802.1D MAC Bridges
• 802.1p/q VLAN Tagging
• 802.1w Rapid Spanning Tree
• 802.1s Multiple Spanning Tree
• 802.1X Port-based Network Access Control
• 802.1Q Generic VLAN Registration Protocol
(GVRP)
• 802.3AB LLDP
• 802.1p Mapping to Priority Queue
•SNMP Management Information Base (MIB) II, SNMP MIB extensions, Bridging MIB (RFC
1493)
•Internet Group Membership Protocol (RFC 1112)
•Telnet Remote Management

Wireless Access Points
Wireless access points shall adhere to the following standards:

• 802.11a 5 GHz 54 Mbps OFDM
• 802.11b 2.4 GHz 11 Mbps DSSS/CCK
• 802. 11f IAPP
• 802.11g 2.4 GHz 54 Mbps
• DSS/CCK/OFDM
• 802.11h DFS/TPC
• 802.11i AES hardware
• 802.11n 2.4/5 GHz 300 Mbps MIMO
• 802.1p/Q VLAN tagging and priority
• 802.1x wireless station authentication
• 802.3 10BaseT
• 802.3u 100Base-Tx
• 802.3af Power over Ethernet
• SNMP Management Information Base (MIB) I and II
• Telnet Remote Management

Patch Cables
Patch cables shall be ADC/Krone "TrueNet" Category 5E cables in any of the following lengths: 4, 7, 10 or 15 ft. These cables are matched specifically to the ADC/Kone building-wiring infrastructure installed by ITS. The specified lengths correspond to the critical wavelengths of data transmission frequencies and, when installed in the ADC/Krone impedance matched system, ensure zero bit errors from wall jack to switch port.

Uninterruptible Power Supplies
UPS are 120-volt input and 120-volt output with 15-minute battery backup at full load. These units are normally mounted in the lower 1/3 of the telecommunications equipment rack and provide power to the networking equipment. All UPS should connect to the building network and have SNMP management for power and environmental monitoring. UPS load capacities are determined according the electrical requirements of each individual telecommunications room.

Heat Load
Power dissipation and heat load for networking equipment is determined on a room by room basis. Provisions should be made in the building HVAC design to accommodate the heat load.

Equipment Costs
Networking equipment costs vary according to the type and use of the building (classrooms, laboratory space, administrative offices, student housing, etc.). Projects typically average ±$1.50 per gross square foot.