# Appendix H

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## Florida State University

## Networking Equipment Guidelines for Construction and Renovation Projects

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### 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. The Office of Technology Integration/Academic Computing and Network Services (OTI/ACNS) is generally responsible for the installation, operation and maintenance of these networks. ACNS will work closely with Facilities Planning and Construction, the Office of Telecommunications (OTC), departmental representatives, and the design professional to ensure that appropriate network hardware is specified for each project.

### Definitions

Networking Equipment - The 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. Networking equipment falls under the purview of ACNS.

Building Wiring Infrastructure - The horizontal copper wiring between telecommunications closet and wall jack, the vertical fiber optic and/or copper wiring between telecommunications closets, and the fiber optic entrance cable. Building wiring infrastructure falls under the purview of OTC.

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

### Network Design

Networks in campus buildings are typically configured in a star topology. A "master" switch is installed in the main telecommunications closet (MDF). The master switch is connected to the campus core network via the fiber optic entrance cable. The master switch feeds secondary switches located in the intermediate distribution closets (IDFs) via the fiber optic riser system. The secondary switches feed wall jacks via the horizontal copper wiring. (Please refer to the FSU

Telecommunications Infrastructure Standard for details concerning wiring specifications and telecommunications closet design.)
The master switch typically has a high-speed backplane and high-bandwidth uplinks to the secondary switches. Provisions for redundant feeds and/or alternate routing between the master 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. Minimum bandwidth for newly purchased switches is 10/100 Mbps on copper ports with 1000 Mbps stacking and uplink capability.

Switches are physically mounted in the telecommunications closet 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 wiring closet is strongly discouraged. All data connections should be wired back to the wiring closet.

UPS are installed in telecommunications wiring closets wherever networking equipment is installed. These units provide filtered, uninterrupted a/c power to the equipment.

Wireless networking is becoming increasingly prevalent. The physical placement of wireless access points and bridges within the building vary greatly from building to building, depending on the area of coverage required, 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 as applicable:

IEEE 802.3 10Base-T specification

IEEE 802.3u 100Base-TX specification

IEEE 802.3ab 1000Base-T specification

IEEE 802.3z 1000Base-X specification

IEEE 802.3x full duplex on 10Base-T, 100Base-TX, and 1000Base-X ports

IEEE 802.1d Spanning-Tree Protocol

IEEE 802.1p CoS Prioritization

IEEE 802.1q VLAN

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 and Bridges**

Wireless access points and bridges shall adhere to the following standards:

IEEE 802.11b

IEEE 802.1x (EAP and RADIUS)

IEEE 802.11 WEP (Wired Equivalent Privacy)

SNMP Management Information Base (MIB) I and II

Telnet Remote Management

**Patch Cables**

Patch cables shall be Krone "TrueNet" Category 5E cables in any of the following lengths: 4, 7, 10 or 15 ft. These cables are matched specifically to the Kone building-wiring infrastructure installed by the Office of Telecommunications. The specified lengths correspond to the critical wavelengths of data transmission frequencies and, when installed in the 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 wiring closet.

**Heat Load**

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

## Equipment Costs

Equipment costs vary according to the type and use of the building (classrooms, laboratory space, administrative offices, student housing, etc.). Most projects average $0.50 - $0.80 per gross square foot.