



Peralta Community College District

Network and Wi-Fi Standards

Information Technologies

333 East 8th Street

Oakland, CA 94606



Table of Contents

I.	Introduction	3
A.	Purpose.....	3
B.	Scope.....	3
C.	Application	3
D.	Systems Supported.....	3
E.	Terminology	3
II.	Procedures.....	4
A.	Designer Qualifications.....	4
B.	Design Approvals.....	4
C.	Contractor/Installer Qualifications	4
D.	Construction Coordination and Approvals	4
E.	Products and Materials	5
F.	Schedule Considerations.....	5
G.	Owner-Provided Equipment and Functions.....	5
III.	Network Equipment Deployment Locations	6
A.	Equipment Deployment Locations	6
IV.	Network Equipment.....	7
A.	Core.....	7
B.	Distribution	7
C.	Access.....	8
D.	Edge.....	8
E.	Wi-Fi	9
V.	Administration and Labeling	10
A.	Administration Requirements.....	10
B.	Monitoring Requirements	11
C.	Labeling Requirements.....	11



I. INTRODUCTION

A. Purpose

This purpose of this document is to describe the minimum requirements and establish the design guidelines for Information Technology systems that will support network and Wi-Fi connectivity.

This document is not intended to replace a Designer. Rather, the requirements and criteria of this document shall guide the Designer and the other Design Team members (electrical, mechanical, and other disciplines) to provide the minimum infrastructure and support for information systems.

B. Scope

The scope of this document includes the following:

- Wired Ethernet network connectivity
- Wireless / Wi-Fi connectivity
- Administration / Labeling

C. Application

The requirements and criteria herein apply to the District Office complex and each campus within the District – Berkeley City College, College of Alameda (including Aviation Facility), Laney College and Merritt College.

All construction projects – both renovation and new construction – shall follow the guidelines of this standard.

D. Systems Supported

The telecom infrastructure is intended to support data network communications from the equipment in the telecom room (e.g., switch) to the work area equipment (e.g., desktop computer) and between equipment in telecom rooms (e.g., edge switch to core switch).

The data network will support, at a minimum, IP-based host-client protocols and voice-over-IP (VoIP) protocols.

The telecom infrastructure, particularly the fiber optic backbone, can support additional building systems such as security systems, building control systems, fire alarm systems, etc.

E. Terminology

Active network equipment generally refers to network devices such as switches, routers, wireless access points, UPS, etc. Active network equipment usually requires electrical power to operate. Active equipment is supplied, installed and configured by Peralta IT or its designated 3rd Party, unless specifically stated otherwise, in which case, the Peralta IT liaison shall approve the device and its application.

Passive network equipment generally refers to physical layer (OSI Layer 1) network hardware and standards such as cables, jacks, signal testing, etc. and related hardware, such as racks, patch panels, junction boxes, labeling, etc. Passive network equipment also does not, in and of itself, require electrical power. Passive network equipment is described within the Telecommunications Infrastructure Standards document issued to District IT.



II. PROCEDURES

A. Designer Qualifications

The Wi-Fi and network shall be designed by an IT Design Professional.

The IT Design Professional:

- Shall be thoroughly familiar with PCCD's Telecommunications Infrastructure, Wi-Fi and network standards.
- Shall be thoroughly familiar with referenced codes and standards.
- Shall be an accredited Wi-Fi and network designer.
- Should be authorized by Cisco as a design and engineer

B. Design Approvals

The Designer shall be responsible for ensuring that all District standards are met. If variances to District standards are necessary, the Designer shall obtain written approval from the District IT Project Liaison in writing for such variances.

The Designer or Design Team Lead shall issue contract documents to District IT Project Liaison for review, comment, and approval prior to completion of 50% CD, if not before.

C. Contractor/Installer Qualifications

The network installer shall have a Cisco certification aligned with the equipment being installed. At a minimum, the installer shall possess Cisco's CCNA.

The Wi-Fi installer shall have a Cisco certification aligned with the equipment being installed. In addition, the installer shall possess at Wi-Fi survey too certification such as AirMagnet, Ekahau or equivalent.

D. Construction Coordination and Approvals

The design and installation shall comply owner and general contractor as follows:

1. Owner
 - a) Comply with owner standards and direction
 - b) Comply with manufacture standards and best practice guidelines
 - c) Coordinate activation and integration with district and college IT teams
2. Construction
 - a) Comply with general contractor standards and direction
 - b) Coordinate access to required project spaces
 - c) Coordinate equipment shipping, receiving, storage and mounting
 - d) Review and approve equipment room readiness
 - (1) Clean
 - (2) Cool
 - (3) Power energized
 - (4) Physically secure



(5) Room construction complete

3. Standards

The design and installation shall comply manufacture, owner and construction standards

4. Guidelines

The design and installation shall comply with manufacturer, owner and construction guidelines.

E. Products and Materials

Active network equipment shall be furnished, installed and tested by the Contractor. Refer to Appendix 1 for a list of parts.

The Contractor shall submit, prior to installation, a parts list and cutsheets to District IT (or the Engineer) for review and approval.

Patch cord installation shall be clean, organized/bundled and physically secured, using appropriate cable management hardware. All equipment labeling shall be compliant with project labeling standards.

F. Schedule Considerations

1. Network

Information Technology staff are responsible for oversight of installation and testing of active network components (routers, switches, etc.), which cannot be performed until passive equipment (cables, patch panels, jacks, etc.) is fully installed, labeled and tested. The Contractor shall complete the network equipment work reasonably in advance of the first required network connection within the building and no less than one week prior to occupancy. The first required wired network connection will probably be physical security cameras, access control, BMS or other base building system prior to their commissioning. The magnitude of the project scope dictates the minimum amount of notice needed for active component installation and testing.

2. Wi-Fi

Information Technology staff are responsible for oversight of installation and testing of Wi-Fi components (WAPs, controllers, etc.), which cannot be performed until passive equipment (cables, patch panels, jacks, etc.) is fully installed, labeled and tested. The Contractor shall complete the Wi-Fi equipment work reasonably in advance of the first required Wi-Fi connection within the building and no less than one week prior to occupancy. The first required Wi-Fi connection will probably be the building occupants. But there may be other systems being installed requiring Wi-Fi connectivity prior to commissioning. The magnitude of the project scope dictates the minimum amount of advance notice needed for active component installation and testing.

The Construction Team's Project Manager shall notify both the District and College Information Technology Staff, with reasonable advance, of the anticipated completion of the Contractor's work and planned occupancy dates.

G. Owner-Provided Equipment and Functions

1. Network Equipment

PCCD District IT Department will have oversight in the design, procurement, and installation of the network equipment (e.g., edge switches, core switches/routers, firewalls).

The racks within telecom rooms will be provided for the network equipment to be installed. Obtain from PCCD IT rack space location for intended equipment



Power service with appropriate receptacles will be provided by PCCD District IT Department or construction project. Contractor should verify power receptacles are of correct type and energized.

Patch cords will be provided by PCCD District or project low voltage contractor. Obtain patch cords from appropriate source

2. Wi-Fi Equipment

PCCD District IT Department will have oversight in the design, procurement, and installation of the Wi-Fi equipment (e.g., WAPs, controllers).

The racks within telecom rooms will be provided for the Wi-Fi equipment to be installed. Obtain from PCCD IT rack space location for intended equipment

Patch cords will be provided by PCCD District or project low voltage contractor. Obtain patch cords from appropriate source

3. Telecom and VoIP Equipment

PCCD District IT Department will design, procure, and install the telecom equipment and services (e.g., IP telephones, CENIC, Gigamon, PRI's...etc.).

4. Telecommunication services

PCCD District IT Department will provide 1 or 10 gigabit per second services between PCCD campuses and district office via the Corporation of Education Network Initiatives in California (CENIC). Each campus and the District offices will leverage CENIC for network connectivity.

III. NETWORK EQUIPMENT DEPLOYMENT LOCATIONS

A. Equipment Deployment Locations

The network equipment shall be installed in one of the following telecom spaces:

Telecom Space Name	Network Equipment
Entrance Facility / EF (also, MPOE Room)	Location of telco demarcation services and equipment Network edge equipment may or may not be deployed in the EF.
Main Distribution Facility / MDF	The core network equipment serving data communications to the entire campus/complex should be deployed in the MDF. If applicable, the WAN interface to the District office should be deployed in the MDF, in direct connection to the network core. The MDF may also act as a BDF and/or an IDF.
Building Distribution Facility / BDF	No inbuilding network distribution equipment should be deployed. All access layer network equipment will home-run to campus core. The distribution spaces will function as passive connectivity for patching access-layer network equipment to core network equipment via backbone fiber. The BDF space may also support access layer network equipment.
Intermediate Distribution Facility / IDF	The access layer network equipment serving data communications within a service area shall be deployed in the IDF.



	UPSs will be deployed into the IDFs to support PoE applications such as VoIP (i.e., keep telephones powered).
Satellite Distribution Facility / SDF	A small enclosure supporting access layer network equipment and less than 96 connections remote to an IDF.
Equipment Room / Server Room	Network access layer equipment connecting servers, storage systems. Often the Equipment Room / Server room functions as an MDF supporting core network equipment (switches, routers, etc.)

IV. NETWORK EQUIPMENT

A. Core

The network core interconnects building networks within a PCCD campus. PCCD's network core routes TCP/IP Ethernet packets between buildings, WAN and local server resources.

The follow are functional requirements of the network core equipment

1. Redundant Cores
 - a) Cisco 3800 series stackable switches where less than 200 ports are required
 - b) Cisco 6800 or Cisco 4500 chassis based hardware where more than 200 ports are required.
Note that the manufacturer will be replacing these models with Nexus 9000 series.
2. TCP/IP (layer 3) routing is enabled
3. VLAN support within a single VTP domain
4. LACP or EtherChannel support
5. Quality of Service (QoS) support
6. Uplinks are sized that is appropriate for redundant interbuilding 1Gbps / 10 Gbps interbuilding connectivity using either single mode fiber. Some older structures may be restricted to multimode fiber
7. Support Single mode and Multimode fiber
8. 2N redundant power supplies
9. Rack mounted
10. Backup power needs to be provide via a centralized or localized UPS with a minimum of 30 minutes run-time
11. Cisco 8x5xNBD Smartnet maintenance

B. Distribution

No inbuilding network distribution equipment should be deployed. All access layer network equipment will home-run to campus core.



The distribution spaces will function as passive connectivity for patching access-layer network equipment to core network equipment via backbone fiber

C. Access

The network access layer interconnects end devices (workstations, WAPs, VoIP phones...) to the Ethernet network within a building. Access switches are stackable to aggregate uplinks to PCCD's network cores.

The follow are functional requirements of the network access equipment

1. Cisco 4000 series stackable hardware
2. TCP/IP (layer 3) routing is available but not enabled
3. VLAN support within a single VTP domain
4. LACP or EtherChannel support
5. Uplinks are sized that is appropriate for redundant interbuilding 1Gbps / 10 Gbps interbuilding connectivity using either single mode fiber. Some older structures may be restricted to multimode fiber
6. Copper Ethernet ports are sized appropriately to support all active connections plus 20% growth
7. Power over Ethernet (PoE+) support
8. Support single mode and Multimode fiber
9. N+1 redundant power supplies
10. Rack mounted
11. Backup power needs to be provide via a centralized or localized UPS with a minimum of 30 minutes run-time
12. Available spares for self-maintenance support. Leverage manufacturer warranties for repairs.

D. Edge

The network edge interconnects CCD's distributed egresses to the internet. Each campus and the district office house edge firewalls. The CENIC network is leveraged for individual college access the centralized egress located at the district office.

The follow are functional requirements of the edge equipment

1. Cisco or Fortinet hardware
2. Redundant High Availability (HA)
3. LACP support
4. Sized appropriately for available bandwidth utilization
5. 2N redundant power supplies
6. Rack mounted within PCCD District office data center



7. Minimum of four 10 Gbps ethernet interfaces housed at the campus facility MPOE or MDF
8. Cisco 8x5xNBD Smartnet (or equivalent) maintenance

E. Wi-Fi

The Wi-Fi system interconnects 802.11 end devices (workstations, tablets, laptops, VoIP phones, SmartLocks...) to the Ethernet access network switches. A redundant Wireless Lan Controller (WLC) is deployed at each campus and district office. The controller manages the Wireless Access Points (WAPs) configuration and provides SSID separation.

The follow are functional requirements of the Wi-Fi equipment

1. Cisco hardware
2. Multiple SSID supported
3. 802.11 a,d, n and ac Wave 2
4. LACP or EtherChannel support
5. WAP density will align with device density such that a maximum of 25 active Wi-Fi devices will associate with a single WAP
6. 802.11 throughput shall be at a minimum of 24 mbps for each end device
7. 802.11 overlap shall be at a minimum of 20% for roaming support
8. WAP power setting shall not exceed 50% within a non-failed environment
9. WAP placement shall require a predictive survey to optimize mounting location to support end device density, overlap and anticipated throughput
10. Radio Resource Management (RRM) support
11. WAP Uplinks single 1Gbps with expansion to two
12. WLC interfaces are support multiple 10 Gbps
13. Power over Ethernet (PoE+) support
14. WAPs are ceiling mounted
15. WLC's are rack mounted
16. WLC's have 2N redundant power supplies
17. Backup power needs to be provide via a centralized or localized UPS with a minimum of 30 minutes run-time
18. WAPs have available spares for self-maintenance support. Leverage manufacturer warranties for repairs
19. WLC's have Cisco 8x5xNBD Smartnet maintenance



V. ADMINISTRATION AND LABELING

A. Administration Requirements

1. Shipping and receiving

The network contractor is responsible for shipping and coordination of receiving of network equipment. The equipment shall be stored in a clean secure location until commissioned.

2. Segmentation and Address Space Coordination

Active network equipment shall be configured to support VLAN segmentation. Coordination of the VLANs and address spaces must be coordinated by contractor with PCCD IT. Documentation of equipment VLANs and address spaces shall be recorded by contractor and shall include a patching matrix.

3. Wi-Fi segmentation

The contractor shall coordinate SSID and associated VLANs with PCCD IT. Documentation of Wi-Fi SSID VLANs and address spaces shall be recorded by contractor.

4. Management Addresses

Network Equipment management addresses must be coordinated by contractor with PCCD IT. Each manageable equipment shall be assigned a unique address for remote management. Equipment management address must be recorded within patching matrix.

5. Management Accounts

Active network equipment deployed throughout the district has local and centralized access used to administer the equipment. These accounts have various privilege levels. Upon deployment of active network equipment, the management accounts must be secured by contractor to restrict unauthorized access. At a minimum, the management account passwords must be changed during commissioning. Password length and complexity must meet the districts password policies.

6. Equipment Inventory

The network equipment inventory must be gathered by contractor at time of installation. The inventory information must include model number, serial number and deployed location. The inventory must be presented to the district within a spreadsheet and cross-checked with packing lists and purchase order.

7. Topology Sketch

An as-built topology sketch showing network equipment interconnectivity, model numbers and location shall be developed by contractor and delivered to PCCD IT upon completion of installation

8. Testing and Acceptance

The contractor shall develop and provide system testing details. Testing details and their results shall be provided to PCCD IT during equipment deployment.

9. Packing Material Disposal

The contractor shall remove equipment packing material from project site. Coordinate disposal of material with PCCD IT and/or General Contractor.

10. Maintenance and Support

The contractor shall coordinate maintenance contract requirements with PCCD IT. The contractor shall include required maintenance within Bill of Materials.



B. Monitoring Requirements

Active network equipment administration for and monitors active network equipment. Network equipment must be integrated within the district monitor systems. Active network equipment includes but not limited to routers, switches, firewalls, and controllers used to transport network packets throughout the campuses and district.

Network monitoring will leverage SNMP architectures provided by enterprise grade equipment. The SNMP information will be collected by one or more existing monitoring engines such as SolarWinds or equivalent systems. Monitoring of equipment shall include the following at a minimum:

- a) Status up/down
- b) Environmental parameters such as temperature and power sources (if available)
- c) Component functionality such as blades, fans, supervisors
- d) Uplink interface status
- e) Uplink bandwidth utilization
- f) CPU utilization
- g) SNMP traps
- h) Syslog messages

C. Labeling Requirements

Network equipment requires clear, legible labeling using printed (not hand-written) labels according to District Standards. The Contractor shall review the labeling standard and select labeling products that are compatible, in the opinion of District IT, with the equipment receiving the labels.

Identifiers for active network equipment and WAPs shall be no longer than 10 characters in length using 7-point Arial font.