FORSYTH COUNTY SCHOOLS
Quality Learning and Superior Performance for All

Technology Department Guide

Information Services – Instructional Technology – Technology Services

FCS Technology…Exceptional Service, Innovation, and Excellence

FCS Technology: Who Are We & What We Provide

Forsyth County Schools is entering a new era in the use of classroom technologies. For many years we've weeded out all the extras, focusing our efforts on growing a standard set of hardware and software. Through this effort, our students and teachers are able to expand learning in powerful and important ways. More recently, Forsyth County implemented a *Bring Your Own Technology Program (BYOT)*. New thinking is springing up, not just about the tools students have available to use, but about the way Technology Services provides support in all areas. We have seen the benefits of allowing students to choose tools to direct their own learning.

There are two guiding principles for classroom technologies that drive the work of Technology Services:

1. District efforts are focused on employing Grappling's Spectrum of Technology Uses. Of the three levels of the spectrum, Forsyth County Schools is increasing the transformational use of classroom technology, which is where students are information producers, not consumers and where students to go beyond existing information.
2. The second is a focus on the 4 C's of Transformational Learning including Creativity, Communication, Collaboration and Critical Thinking.

To support the school system's technology initiatives, Instructional Technology Specialists are assigned to each school to work with teachers to model teaching and learning strategies for technology integration.

Teachers and Administration participate in on-going professional development to experiment, initiate, and create new models of teaching and learning for dynamic and changing curricula.

Teachers throughout the district can now share resources, activities, and assessments through an online repository of digital learning objects.

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Vision, Mission, and Beliefs

Forsyth County Schools' Technology Department is committed to providing teachers, students, and staff with the most effective technology possible. To achieve that, **WE BELIEVE:**

- Technology is integral to the instructional process, and the Technology Department exists to facilitate that process.

- Technology in schools increases student productivity in and outside the classroom, encourages individual leadership in learning, expands access to learning resources, and helps develop digital citizenship within a structured environment.

- Forsyth County Schools has earned a reputation for being a leader in technology, which can only continue through **exceptional service**, forward thinking, and by building a strong relationship with stakeholders.

- Technology should enrich the instructional environment to the benefit of all involved.

- **Innovation** and collaboration are more important to success than regulation.

- Having passionate, well-informed employees, who understand the challenges and goals of providing a superior technology experience to our staff, students, and parents, is crucial.

- **Excellence** is the standard by which we measure our work and ourselves.

- Our Core Values and Beliefs provide a solid foundation for everything we do.

- Clarity of purpose comes from the emphasis placed on these values, and our customers – the staff and students of the district – employees, parents, and business partners always know where we stand and what we stand for.

- Meeting the needs of our stakeholders is our guiding principle.

Timeline

PROJECTS				TECHNOLOGY TIMELINE								
2017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Legacy Desktops												
CRT Removal												
New Teacher Notebooks												
Legacy Hardware Removal												
Chromebooks												
Chromebook Carts												
Windows 10												
Interactive Display Panels												
Lock 'n' Charge Chromebook Cages												
Printer Refresh												
New Admin Notebooks												
Macs												
Primary Data Center												
Firewall Upgrade												
Secondary Data Center												
Core Network Upgrade												
School Switch Upgrade												
WiFi Upgrade												
Increase H Drive Space												
Security Audit												
Exchange (email) Upgrade												
Data Vault												
New Work Ticket System												
Training Program for Technicians												
Technology Center Redesign												

PROJECTS				TECHNOLOGY TIMELINE								
2018	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chromebooks												
Chromebook Carts												
Windows 10												
Interactive Display Panels												
Lock 'n' Charge Chromebook Cages												
Printer Refresh												
New Admin Notebooks												
Macs												
School Switch Upgrade												
WiFi Upgrade												
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Security Audit												
Exchange (email) Upgrade												
Data Vault												
New Work Ticket System												
Training Program for Technicians												
Technology Center Redesign												
Desktop Refresh												
Innovation Areas												
District Owned WAN												

PROJECTS				TECHNOLOGY TIMELINE								
2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chromebooks												
Chromebook Carts												
Windows 10												
Interactive Display Panels												
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Desktop Refresh												
Innovation Areas												
District Owned WAN												

Project Start		*In Progress*		*Project Complete*

Forsyth County Schools is an international leader in the effective practice of BYOT, which encourages students to bring their personal technology tools to school for learning. The acronym "BYOT" stands for Bring Your Own Technology, a practice also sometimes often referred to as BYOD – Bring Your Own Device. It is an initiative that is having an impact in the business world as well as in education. From a user's point of view, there is a certain comfort with using a technology tool that has been customized and personalized to one's needs and interests. As students utilize their personal technology devices in school, they can learn new ways to use them for collaborating and interacting with their teachers and each other to research information, solve complex problems, create original products, and publish their work.

The district began its BYOT initiative several years ago by expanding the wireless infrastructure so that every school now has a guest "BYOT" wireless access point that provides filtered Internet access. The initial pilot phase for BYOT involved 40 teachers in seven schools who explored innovative uses for students' technology tools through the 4 C's of Digital Age Learning - Creativity, Collaboration, Communication, and Critical Thinking. These skills are essential for successful careers in today's colleges and businesses. Over time, teachers have also developed strategies to address the following issues: equity of devices, responsible use, and classroom management. Currently, BYOT is supported in every school within the district, and as devices and tools continue to change, new instructional skills and strategies are evolving to promote their use.

Some of the technology tools that students bring to school include the following: laptop computers, tablet computers, e-readers, netbook computers, Internet-capable gaming devices, and cell phones. The response has been very positive, and teachers participate in multiple professional learning opportunities to improve their understanding for this new way of learning. The district also provides additional support and guidance to our schools, as requested, to facilitate the implementation of BYOT.

5 Pillars of Our Digital Learning Curriculum

Extended Learning. The district has used a learning management system (LMS) the infrastructure for digital learning since 2002. For the 2014-2015 school year, FCS will use itslearning (ITSL) for all grade levels in its brick and mortar school buildings. The students access digital content within the LMS from home or school to support their learning within the face-to-face classroom. This practice extends learning opportunities beyond the school environment.

Blended Learning. FCS is the first major school system in the southeast to adopt a blended learning approach system-wide. Teachers and students use a suite of tools to develop collaborative learning communities with itslearning being the hub of the Blended Learning environment. The teachers take advantage of this platform to organize units of inquiry mapped to standards; teachers also present content, communicate with students, and develop assessments. Students utilize their own devices to access this system to communicate with each other, complete assignments collaboratively and individually, and post their original work.

Hybrid Learning. Some FCS students are enrolled within face-to-face schools but complete online classes for part of the regular school day. FCS uses Apex Learning, Georgia Virtual Schools and Forsyth Virtual Academy for hybrid learning. Some reasons for this hybrid enrollment are due to credit recovery, scheduling, and expanding course options. Click here to learn more about Georgia Virtual School classes.

Virtual Learning. In 2010, FCS opened Forsyth Virtual Academy. This school is Georgia's first full-time online school operated by a public-school district that offers a high school diploma. FCS employs and trains its own teachers for this virtual school. Forsyth Virtual Academy is open for students in grades 6-12. This school offers students the opportunity to engage in a digital learning environment to achieve their individual potential through innovative, flexible, socially-connected, and student-focused education.

Personalized Learning. FCS was selected by the U.S. Department of Education as one of 49 grantees for a 2010 Investing in Innovation Fund (i3) grant. FCS was the only recipient in Georgia and one of twelve public school districts in the nation to be a grantee. This transformational system eclipses the current paradigm that results in silos of data, replacing it over time with a fully integrated system, extended to include standards-based learner plans and a content management system where activities and resources are matched to students' current performance level and individual learner characteristics. This system will be viewed in a user interface that engages learners as well as teachers, leaders, and parents. Although the grant has concluded, FCS continues to use the platform and has now shifted the focus to align teaching and learning with technology.

Responsible Use Guidelines

The mission of Forsyth County Schools (FCS) is to prepare and inspire all students to contribute and excel. The district provides ongoing student instruction that develops graduated digital citizenship for using technology as a tool to achieve this mission. Information and Communication Technology is an integral part of FCS' curriculum across subjects and grades in developmentally appropriate ways, and it is aligned to the competencies listed in the district's Learner Profile which include: pursue continuous learning, exhibit strong personal qualities, utilize creative and critical thinking, engage and contribute and interact effectively.
We understand that using digital devices (whether personal or school owned) and the FCS network is a privilege, and when we use them according to the Responsible Use Guidelines we will keep that privilege.

All members of Forsyth County Schools' community agree to follow the Forsyth County Schools Code of Conduct, school rules and commit to the following responsible use guidelines:

I will:

- Use digital devices, networks and software in school for educational purposes and activities.
- Keep my personal information (including home/mobile phone number, mailing address, and user password) and that of others private.
- Show respect for myself and others when using technology including social media.
- Give acknowledgement to others for their ideas and work.
- Report inappropriate use of technology immediately.

The Responsible Use Procedure will be reviewed each school year together with students and teachers and will provide a springboard for teaching and learning around topics such as Internet safety, digital citizenship and ethical use of technology.

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Network Infrastructure Guidelines

1. General requirements

1.1 On premise connectivity

All building closets (IDF) aside from the main closet (MDF) shall be provided with two or more separate links via fiber optic cabling (Multi Links on Multi Strands) to the main closet of the site. All closets within one physical building shall be provided with two or more separate links via fiber optic cabling (Multi Links on Multi Strands) to the main closet of the site (known as the MDF). Any building to building cabling must be in underground conduit unless a retrofit has been ordered where aerial (Under/Above Breezeways roofing, etc.) conduit installation is the only method possible. **See fiber specifications in section 1.4 and 2.**

FCS Technology will not provide Internet/WAN/LAN connectivity until all data rooms are secured, cleaned, climate controlled, and have stable power service as outlined in this document.

1.2 Data outlet type and distribution

All building spaces shall be provided with data outlets with quantity and positions in accordance with the needs of the location or the requirements of the blue print documents. **Data outlet layouts designed by a project architect or project manager shall be approved by the Forsyth County Schools Technology Department before preliminary acceptance.** Preliminary and final acceptances are conditional on receipt of documentation.

1.3 Wireless infrastructure

All building spaces shall be provisioned with **dual outlet Category 6A Bonded** data outlets for wireless access points (WiFi, wireless APs) unless the blueprint documents or project plans deviate from this guideline. Owing to this rapidly-changing technology, design shall be performed only by the Forsyth County Schools Technology Department.

1.4 Cabling etc. requirements

Any work involving installation, re-installation, modification, or movement of data outlets requires that the outlets be (re)tested and (re)certified**. All data outlets shall be RJ45 outlets to Category 6+ standard.** All horizontal cabling (i.e. cabling connecting RJ45 data outlets and/or fiber optics connecting closets and electronics) shall be made with approved products and terminated in data racks or cabinets in accordance with Section 5. **No cable run shall be longer than 328ft or 100m to include the length of patching cables.** Where necessary, a building shall be provided with more than one wiring center or IDF. **All cabinet layouts shall be designed by the Forsyth County Schools Technology Department ONLY.** Cabinets should be floor mounted, unless authorized by Forsyth County Schools Technology.

2. External services

2.1 External cabling and micro ducts

Data connections between buildings shall be made using fiber optic cables. Copper cables are not permitted between buildings. **The default standard for fiber optic cables is 12 strand multi-mode to OM3 (50/125) specifications or better.** Fiber optic interconnections between wiring closets and buildings shall be designed as shown in schematics by the Forsyth County Schools Technology Department. Wherever possible, interconnections between buildings shall be made using fiber in approved inner-ducts; between buildings these shall be installed within the normal 4 inch ducts. **Fiber optic cables for external connections shall be terminated in rack mounted metal termination boxes fitted with duplex LC connectors ONLY.** The patch panel boxes shall be appropriately sized to accommodate the needs of the closet plus future expansion. The rear cable entries shall be slotted to allow removal of the cable without the need to cut and re-terminate it. **Single-mode and multi-mode terminations shall not be mixed in the same fiber termination box unless prior approval is acquired.** Each pair in a fiber optic installation shall be fitted as a crossover. **Schools built in a campus design shall be connected with single mode fiber between all locations.**

3. Wiring Closets

3.1 Access

Data closets shall be secure (lockable) rooms keyed to a district grand master. Key issue shall be restricted to Forsyth County Schools Technology Department staff members only. Access must be available to authorized Forsyth County Schools Technology Department staff members, including out-of-hours access. Closets shall be located so that access is from indoor public areas rather than departmental areas, which may be closed off, if possible. **Access to staff other than the Forsyth County Schools Technology Department and their contractors is prohibited.** Access for contractors will be by arrangement with the Forsyth County Schools Technology Department. All data closets should have video surveillance and electronic access control. **MDF closets should be no smaller than 10' by 16'. IDF closets should be no smaller than 9' by 9'.** Both MDF/IDF should be centrally located on each floor within their coverage area. **Cooper drops will never traverse from one floor to another.** In a multi-story building, it is ideal to have closets vertically aligned.

3.2 General design and layout

Data Closets shall consist of a dedicated room provisioned with appropriate services for lighting, power, and cooling. **The room shall not be used for storage or any other purpose not directly related to the delivery of Forsyth County Schools data services.** Data closets shall not be used for site power distribution equipment other than that dedicated to the operation of the data equipment unless not possible through retrofit. Certain other building services shall be excluded from data closets. These include but are not limited to water supplies, drains (including drain pipes), and heating pipes. There must be no water or liquid pathway, sources or outlets in the ceiling above the cabinet(s). This includes waste water pipes, chilled water pipes, hot water pipes, sewer pipes, and rainwater downpipes unless not possible through retrofit. New data closets shall be capable of accommodating an appropriate number of data cabinets or racks to meet total outlet count necessary with room for expansion. After construction and decoration, and before any active equipment can be fitted, the data closet shall be thoroughly cleaned to eliminate all dust and debris, including racks and the interiors of data cabinets. **Flooring in all data rooms should be polished concrete or waxed VCT (Five coats of wax required).**

3.3 Power and environment

Adequate ventilation and/or cooling shall be provided to maintain a nominal room temperature of 72 degrees Fahrenheit and no more than 50% relative humidity. Each data closet shall be provided with a dedicated 110/120-volt outlet fed from a dedicated main supply. Two circuits per cabinet in Data Center settings. Additionally, **two 30 amp 208/240 volt service outlets – one from house power and the other from a generator are required and shall utilize an L5-30 outlet.** Placement of outlets must be at the discretion of the FCS technology department.

4. Data outlet distribution

4.1 Design and planning

Data outlet quantities and locations shall be designed by or in consultation with the Forsyth County Schools Technology Department before construction. **Subject to the foregoing and the rest of this section, data outlet layout may be designed by a project architect or project manager, but shall be approved by the Forsyth County Schools Technology Department.** Such approval shall be conditional on receiving lists of quantities and drawings indicating proposed layout. High-level data outlet quantities and locations for wireless AP's shall be designed by the Forsyth County Schools Technology Department. All data outlets shall be fitted in pairs, as "twin" or "dual" RJ45 outlets. All components of the installation shall be to bounded Category 6A standard for wireless and Category 6+ for all other drops, unless previously agreed with IT Services, shall be chosen from a single range of the products listed in Section 5, and shall only be installed by an installer approved by the manufacturer for that product range. **Wiring runs shall be in dual post supported wire trays or approved j-hooks within equipment rooms, risers, ceiling voids, and loft spaces.** In under-floor spaces, where outlets are to be in floor boxes, rigid conduit must be utilized. Where wiring runs are not in such spaces they shall be enclosed in plastic latch duct on the surface of a wall. Designers should note that bounded Category 6A cable is significantly thicker than older types and should use one of the readily-available cable containment calculators to ensure adequate containment provision. Prior to commencement of cabling work, DWG, VISIO, or BlueBeam files shall be provided to the Forsyth County Schools Technology Department so that modeling software can be used to determine precise quantities and locations of all data outlets. Audio visual cabling will be addressed on a case-by-case basis, as it is no longer part of a standard building design used by Forsyth County Schools.

4.2 Installation

All data outlets shall be labeled in accordance with the Forsyth County Schools Technology Department. All horizontal cabling (i.e. cabling connecting RJ45 data outlets) shall be installed with approved products contained in Section 5, and certified to comply with the relevant standards. Below ceiling cable bundles shall be secured with Velcro cable ties or an equivalent cable tie designed to prevent any possibility of crushing or deforming the cable. Above ceiling may use standard cable "zip ties". All data cabling must be one continuous unjointed length from patch panel to outlet and shall not have splices or in-line connectors other than those integral to the patch panel and the room outlet. No "consolidation points" shall be used. For reasons of warranty, cables shall not be installed by one contractor and terminated/tested by another unless by prior approval from the Forsyth County Schools Technology Department. Final acceptance of an installation is conditional on receipt of documentation by the Forsyth County Schools Technology Department as described in Section 8. Forsyth County Schools Technology Department will not patch or "make live" any outlet until it has been finally accepted as above. Please refer to attached drawing for a "Typical Rack" design. **Any ladder rack used should be one continual piece until a turn or joint is needed and should end at a logical place to meet cabling requirements.**

4.3 Wireless

The requirement for design and layout by the Forsyth County Schools Technology Department for data outlets supporting wireless access points shall be included in any requirements for new or refurbished building work. Inclusion of dual data outlets for wireless access points shall be included in designs for corridors, open spaces, office space, classrooms, and other areas that may be advised by Forsyth County Schools Technology Department. Prior to commencement of cabling work, DWG, VISIO, or Bluebeam files shall be provided to the Forsyth County Schools Technology Department so that modeling software can be used to determine precise quantities and locations of dual data outlets for wireless access points. Wireless access points shall be provisioned and installed with due regard to wireless and client density, interference, propagation differences at different wavelengths including 2.4GHz and 5GHz and using different modulation techniques including but not limited to 802.11a/b/g/n/ac, interaction with neighboring wireless access points, and any building features or construction which may impede the signals. Dual data outlets using the bounded 6A standard for wireless access points shall be either wall mounted or securely fastened with termination boxes at above ceiling level, or such as to allow for ceiling mounted access points, to be decided by the Forsyth County

Schools Technology Department according to the type and model of wireless access point planned. High-level outlets and mounting bracket positions for wall mounted access points shall be fitted at a height of approximately 9 feet from the floor. Data outlets intended to serve ceiling-mounted access points shall be located in such a position as to be readily accessible to authorized Forsyth County Schools Technology Department staff without the use of specialist tools or equipment for the purpose of patching to the access point when fitted or serviced. Where external Wireless Access Points are required weather proofed AP's shall be used. See color coded guide for cabling requirements. All wireless cabling should be terminated in vertically adjoining patch panel locations. (See FCS Technology Staff for help with this.)

5. Preferred Structured Cabling Hardware

5.1 Two Post Racks – Typically used in MDF and IDF applications

Belden 2-Post 45U upright racks – BHRR194 (Black)

5.2 Wall Mounted Cabinets – Only used when authorized by FCS Technology Staff

5.3 Floor Standing Cabinets – Typically used in Data Center applications

Panduit Net-Access N-Type cabinet – White – Example: N8522WV

Panduit Net-Access S-Type cabinet – White – Example: S7522WV

5.4 Overhead Cable-Way (Ladders, etc.) – Typically used in Rack and Cabinet applications

MDF and IDF applications – Below Ceiling Grid/Exposed

Chatsworth 18" Cable Runway - 10250-718 (Black)

Chatsworth 12" Cable Runway - 10250-712 (Black)

Data Center applications – Below Ceiling Grid/Exposed

Panduit 18" Wyr-Grid - WG18BL10 (Black)

Panduit 12" Wyr-Grid - WG12BL10 (Black)

Hallway and Common area applications – Above Ceiling/Common

Panduit 18” Wyr-Grid – WG18BL10 (Black)

Panduit 24” Wyr-Grid – WG24BL10 (Black)

J-Hooks for Hallway and Common area applications when applicable – Above Ceiling/Common

Panduit JP2 Series Hooks

Panduit JP4 Series Hooks

5.5 Fiber Enclosures

MDF Rack Mount Enclosures

Belden 4U Fiber Enclosure – AX105565 (Black)

Appropriate LC termination panels (SC or ST are not allowed)

IDF Rack Mount Enclosures

Belden 1U Fiber Enclosure – AX105563 (Black)

Appropriate LC termination panels (SC or ST are not allowed)

5.6 Patch Panels

Belden 1U 24 Port Modular Patch Panel - AX103114

Belden 1U 48 Port Modular Patch Panel - AX103121

5.7 Cable Management

Horizontal Cable Management

Switch Rack: Panduit WMPF1E

Cabling Rack: Panduit WMP1E

Vertical Cable Management

WMPVHC45E

5.8 Patch Cables

Copper Patch Cable Specification: Bounded Category 6A and Category 6+

Belden Bonded Pair: 3ft, 7ft, 10ft, 15ft, 20ft, 25ft

MDF and IDF Panel to Switch Cross Connect: 3ft (7ft for extended cross connect)

Device side: 7ft, 10, 15ft (20ft and 25ft for extended connection)

Fiber Patch Cable Specification: LC OM3 50/125 (50 Micron) (Aqua)

Belden Fiber Patch Cables: 1m, 2m, 3m

MDF and IDF Enclosure to Switch & Switch to Switch Cross Connect: 1m, 2m, 3m

5.9 Color Coding

Structured Cabling and Jack Color Coding and Patch Cable

Blue: General Data

Yellow: Wireless Access Points

Blue: IP Phone Equipment

Green: IP Cameras/Access Control/Alarm

Purple: Intercom

Orange: HVAC/Electrical

Pink: Digital Signage

***Fiber Patch Cable Specification*: LC OM3 50/125 (50 Micron) (Aqua)**

Belden Fiber Patch Cables: 1m, 2m, 3m

MDF and IDF Enclosure to Switch & Switch to Switch Cross Connect: 1m, 2m, 3m

6. Layout

6.1 General

Cabinet and rack layouts shall be designed by the Forsyth County Schools Technology Department. Contractors shall not install ladders, racks, patch panels or wire management until they are in receipt of final layout documents. General network racks are composed of groups of panels. Upper panels are for General Data, IP Phones, and WAP's. Lower rack panels are for IP Cameras and Access Control. (See examples in Section 6.2)

7. Vendor Staff Conduct and Regulations

7.1 General Conduct

Vendor staff members working for Forsyth County Schools are subject to general conduct or common-sense conduct observance. Profanity will not be tolerated. Any blatant use of profanity will result in that staff member being asked to leave the location where work is being performed. Violators of this rule will be immediately asked to leave the site and subsequent violations will result in permanent banning of the violators from the project site indefinitely. Vendor staff members must communicate in ways that do not disrupt the learning and administrative processes that occur throughout the day in our schools. (Example: Yelling down a hallway excessively).

7.2 Clothing and/or Uniform

Vendor staff members must wear uniform clothing which represents the vendor performing the work. Though we cannot enforce appearance of members 100%, it is requested that staff members have their shirts tucked in to project a more professional operation. Torn pants or shirts are not allowed. The wearing of backward hats is not allowed. Clothing must never contain the advertising of alcohol or tobacco products at any time.

7.3 Alcohol and Tobacco Usage

The use of any alcohol, tobacco, or vaping products is not allowed in any building owned or operated by Forsyth County Schools. Violators of this rule will be immediately asked to leave

the site and subsequent violations will result in permanent banning of the violators from the project site indefinitely.

7.4 Background checks and ID

All vendor staff members that work on projects in schools operated by Forsyth County Schools are required to pass a background check. The background checks are signed off by the offices of the superintendent. After a staff member is approved, the approved staff member must acquire a color-coded ID badge from the central office print shop before working in a school.

8. Acceptance of Services and Products

8.1 Documentation

Prior to final acceptance and payment, documentation must be provided showing all data cabling locations and where they correspond to in regard to endpoint to endpoint mapping. Room numbers, Patch Panel slot labels and ports, and closet room number must be documented together. This is to aid in knowing where cables begin and end from each direction.

8.2 Building clean up

Prior to final acceptance and payment, all cleanup must be performed. This includes cleaning floors of debris, restoring ceiling tiles to their proper installed location, replacing damaged ceiling tiles or ceiling grids, and removing boxes for new parts and equipment.

8.3 Product Inspection

Prior to final acceptance and payment, a general inspection of parts and equipment will be performed to ensure that no damage has occurred during the installation process. Bent, scratched, and damaged equipment will not be accepted. This includes issues with threaded holes, latches, fasteners, and hinges that may be present.

9. Acknowledgment of these guidelines

The below signature acknowledges that all guidelines have been read and understood by the service provider and all associates involved. Any deviation from these guidelines are subject to possible delay of payment unless prior approval was obtained for such deviations from the original design.

_____

Company Name

_____

Valid Signature

_____

Printed Name

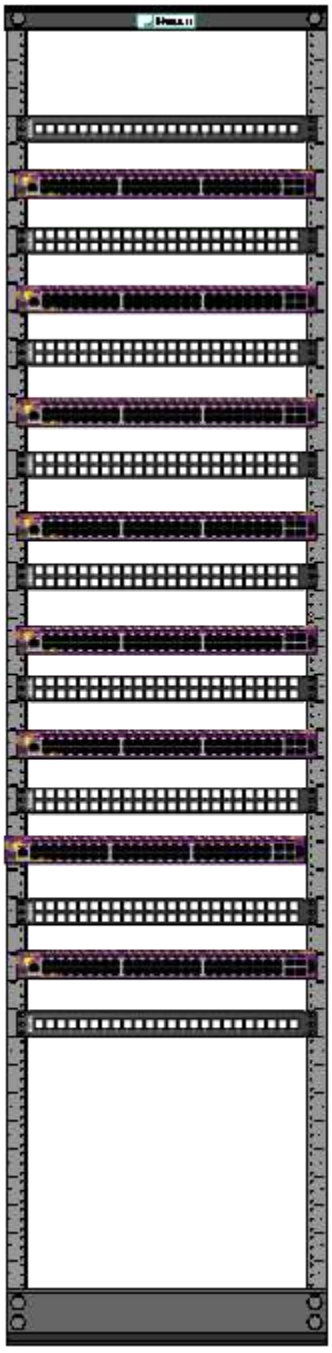
_____

Job Title

_____

Appendix A

Typical Rack Design



Network Infrastructure Evaluation Checklist

Internet Connection

Level 4 – Provides separate internet connections from two different providers of at least 100 Mb/s per site per carrier.

Level 3 – Provides separate internet connections from two different providers of at least 100 Mb/s per site with a secondary carrier providing at least 50% of the primary carriers provided bandwidth for spillover or failover.

Level 2 – Provides one internet connection with at least 100 Mb/s per site.

Level 1 – Provides one internet connection with less than 100 Mb/s per site.

Data Center

Firewall

Level 4 – Internet connection(s) connect into two redundant firewalls with Active-Active configuration. Redundant connections to internal LAN.

Level 3 – Internet connection(s) connect into two redundant firewalls at a single location. Redundant connections to internal LAN.

Level 2 – Internet connection(s) connect into single firewall with redundant connections to internal LAN.

Level 1 – Single internet connection comes into single firewall with single link to internal LAN.

Core Switch

Level 4 – Redundantly "stacked" layer three **10 gigabit** core switches or a resilient modular chassis.

Level 3 – Redundantly "Stacked" layer three **1 gigabit** core or a resilient modular chassis**.**

Level 2 – Single layer three **10 gigabit** switch/chassis for core operations.

Level 1 – Single layer three **1 gigabit** switch/chassis for core operations.

Generator Requirements

Level 4 – Industrial grade generator on-site with failover less than 10 seconds and can operates continually for minimum 24 hours uninterrupted.

Level 3 – Industrial grade generator on-site with a startup time of more than 10 seconds and can operate from 12-24 hours.

Level 2 – Industrial grade generator on-site, with slower but sufficient startup time, which can operate for 2-12 hours.

Level 1 – No industrial grade generator on-site.

UPS Requirements

Level 4 – Centralized UPS in line with data center circuits to supply power for all DC operations for 30-60 minutes or until generator startup.

Level 3 – Redundant Distributed UPS units for dual circuits in every rack to supply power for 30 to 60 minutes or until generator startup.

Level 2 – Centralized or Distributed in rack UPS units to supply power, with no generator present, for 30 to 60 minutes.

Level 1 – Centralized or Distributed in rack UPS units to supply power, with no generator present, for minimum time to protect against brownouts and surges. OR, no UPS present at all.

Fire Suppression and Detection

Level 4 – Data Center is equipped with gas suppression system, fire extinguisher, and smoke and fire detection system.

Level 3 - Data Center is equipped with water suppression system, fire extinguisher, and smoke and fire detection system.

Level 2 - Data Center is equipped with fire extinguisher and smoke and fire detection system.

Level 1 - Data Center is equipped with smoke and fire detection system.

General Appearance

Level 4 – Data Center is well lit, clean, and cabinets are enterprise grade and in excellent condition. Switches and servers are labeled, clean, and in logical order.

Cabling is color-coded and appropriate punch downs and cable management are used.

Level 3 - Data Center is well lit, clean, and cabinets are enterprise grade and in excellent condition. Switches and servers are labeled, clean, and in logical order.

Appropriate punch downs and cable management is used.

Level 2 - Data Center is well lite, clean, and cabinets are enterprise grade and in excellent condition. Switches and servers are labeled, clean, but not in logical order. Cabling is adequate but not color-coded and cable management is not as efficient as it should be.

Level 1 – Data Center is well lite, clean, and cabinets are not enterprise grade but are in good condition. Switches and servers are not labeled. They are clean, but not in logical order. Cabling is adequate but not color-coded and cable management is not as efficient as it should be.

Co-Location Data Center

Firewall

Level 4 – Internet connection(s) connect into redundant firewalls at separate locations (one in each location) (DC1 **AND** DC2) for diverse path external connectivity. Redundant connections to internal LAN.

Level 3 – Internet connection(s) connect into two redundant firewalls at a single location (DC1 **OR** DC2). Redundant connections to internal LAN.

Level 2 – Internet connection(s) connect into single firewall with redundant connections to internal LAN.

Level 1 – Single internet connection comes into single firewall with single link to internal LAN.

Core Switch

Level 4 – Redundantly "stacked" layer three **10 gigabit** core switches or a resilient modular chassis.

Level 3 – Redundantly "Stacked" layer three **1 gigabit** core or a resilient modular chassis**.**

Level 2 – Single layer three **10 gigabit** switch/chassis for core operations.

Level 1 – Single layer three **1 gigabit** switch/chassis for core operations.

Generator Requirements

Level 4 – Industrial grade generator on-site with failover less than 10 seconds and can operates continually for minimum 24 hours uninterrupted.

Level 3 – Industrial grade generator on-site with a startup time of more than 10 seconds and can operate from 12-24 hours.

Level 2 – Industrial grade generator on-site, with slower but sufficient startup time, which can operate for 2-12 hours.

Level 1 – No industrial grade generator on-site.

UPS Requirements

Level 4 – Centralized UPS in line with data center circuits to supply power for all DC operations for 30-60 minutes or until generator startup.

Level 3 – Redundant Distributed UPS units for dual circuits in every rack to supply power for 30 to 60 minutes or until generator startup.

Level 2 – Centralized or Distributed in rack UPS units to supply power, with no generator present, for 30 to 60 minutes.

Level 1 – Centralized or Distributed in rack UPS units to supply power, with no generator present, for minimum time to protect against brownouts and surges. OR, no UPS present at all.

Fire Suppression and Detection

Level 4 – Data Center is equipped with gas suppression system, fire extinguisher, and smoke and fire detection system.

Level 3 - Data Center is equipped with water suppression system, fire extinguisher, and smoke and fire detection system.

Level 2 - Data Center is equipped with fire extinguisher and smoke and fire detection system.

Level 1 - Data Center is equipped with smoke and fire detection system.

General Appearance

Level 4 – Data Center is well lit, clean, and cabinets are enterprise grade and in excellent condition. Switches and servers are labeled, clean, and in logical order.

Cabling is color-coded and appropriate punch downs and cable management are used.

Level 3 - Data Center is well lit, clean, and cabinets are enterprise grade and in excellent condition. Switches and servers are labeled, clean, and in logical order.

Appropriate punch downs and cable management is used.

Level 2 - Data Center is well lite, clean, and cabinets are enterprise grade and in excellent condition. Switches and servers are labeled, clean, but not in logical order. Cabling is adequate but not color-coded and cable management is not as efficient as it should be.

Level 1 – Data Center is well lite, clean, and cabinets are not enterprise grade but are in good condition. Switches and servers are not labeled. They are clean, but not in logical order. Cabling is adequate but not color-coded and cable management is not as efficient as it should be.

WAN

Level 4 – Two redundant 10 Gigabit links between redundantly "stacked" core switches and redundantly stacked head-end switches at each site.

Level 3 – Two redundant 10 Gigabit links between redundantly "stacked" core and one head-end switch at each site.

Level 2 – One 10 Gigabit link from core to head-end switch at each site.

Level 1 – One 1 Gigabit link from core to head-end switch at each site.

MDF (Each Site)

Racks

Level 4 - Two racks, one for cabling and one for switches, that have horizontal and vertical wire management, appropriate pathways for cabling, and secured to the floor with bolts.

Level 3 - One rack for cabling and switches that have horizontal and vertical wire management, appropriate pathways for cabling, and secured to the floor with bolts.

Level 2 – Two racks, one for cabling and one for switches, that have some horizontal and vertical wire management, weak pathways for cabling, and secured to the floor with bolts.

Level 1 - One rack for cabling and switches that have little or no appropriate wire management, weak pathways for cabling, and secured to the floor with bolts.

Head-end Switch

Level 4 – Redundantly "stacked" layer three **10 gigabit** core switches or a resilient modular chassis.

Level 3 – Redundantly "Stacked" layer three **1 gigabit** core or a resilient modular chassis**.**

Level 2 – Single layer three **10 gigabit** switch/chassis for head-end operations.

Level 1 – Single layer three **1 gigabit** switch/chassis for head-end operations.

Access Switch

Level 4 – Enterprise grade access switches in a "stacked" configuration with redundant connectivity back to the core or head-end switch(s).

Level 3 – Enterprise grade access switches in a "stacked" configuration with single connectivity back to the core or head-end switch(s).

Level 2 – Enterprise grade access switches in stand-alone mode with mixed connections back to other access switches or head-end switch(s).

Level 1 – Enterprise grade access switches in stand-alone mode 100% daisy-chained with single connectivity back to the core or head-end switch(s).

Cabling

Level 4 – All patch cables and cabling to each IDF is Cat 6 or greater. Cabling is color coded by usage with minimum being separate colors for data, security cameras, WIFI access points, and security doors. (As examples)

Level 3 - All patch cables and cabling to each IDF is Cat 6 or greater. Cabling is not color coded by usage.

Level 2 - All patch cables and cabling to each IDF is Cat 5E or greater. Cabling is color coded by usage with minimum being separate colors for data, security cameras, WIFI access points, and security doors. (As examples)

Level 1 - All patch cables and cabling to each IDF is Cat 5E or greater. Cabling is not color coded by usage.

Room Requirements

Level 4 – Room is dedicated to MDF components only. It has appropriate air conditioning and ventilation.

Level 3 - Room is dedicated to MDF components and other technology equipment. It has appropriate air conditioning and ventilation.

Level 2 - Room is dedicated to MDF components and other technology equipment.

Level 1 – Room is not dedicated as an MDF and is shared with others.

UPS Requirements

Level 4 – Redundant UPS units that supply power for approximately 1 hour to MDF.

Level 3 - Redundant UPS units that supply power for approximately 30 minutes.

Level 2 – Single UPS unit that supplies power for 30 to 60 minutes.

Level 1 – One UPS that supplies power for brownouts and surges with little backup power.

Fire Suppression and Detection

Level 4 – MDF is equipped with water suppression system, fire extinguisher, and smoke and fire detection system.

Level 3 - MDF is equipped with fire extinguisher and smoke and fire detection system.

Level 2 - MDF smoke and fire detection system.

Level 1 – There is no fire suppression or detection available.

IDF (Each Area)

Floor Racks

Level 4 - Two racks, one for cabling and one for switches, that have horizontal and vertical wire management, appropriate pathways for cabling, and secured to the floor with bolts.

Level 3 - One rack for cabling and switches that have horizontal and vertical wire management, appropriate pathways for cabling, and secured to the floor with bolts.

Level 2 – Two racks, one for cabling and one for switches, that have some horizontal and vertical wire management, weak pathways for cabling, and secured to the floor with bolts.

Level 1 - One rack for cabling and switches that have little or no appropriate wire management, weak pathways for cabling, and secured to the floor with bolts.

Cabinets or Wall Racks (If not floor racks)

Level 4 – Sufficient and vented lockable cabinet for cabling and switches that has horizontal wire management and space for expansion.

Level 3 - Open rack for cabling and switches that has horizontal wire management and space for expansion.

Level 2 – Sufficient and vented lockable cabinet for cabling and switches that has no wire management and little space available.

Level 1 - Open rack for cabling and switches that has no wire management and little space available.

Cabling

Level 4 – All patch cables and cabling to each IDF is Cat 6 or greater. Cabling is color coded by usage with minimum being separate colors for data, security cameras, WIFI access points, and security doors. (As examples)

Level 3 - All patch cables and cabling to each IDF is Cat 6 or greater. Cabling is not color coded by usage.

Level 2 - All patch cables and cabling to each IDF is Cat 5E or greater. Cabling is color coded by usage with minimum being separate colors for data, security cameras, WIFI access points, and security doors. (As examples)

Level 1 - All patch cables and cabling to each IDF is Cat 5E or greater. Cabling is not color coded by usage.

Room Requirements

Level 4 – Room is dedicated to IDF components only. It has appropriate air conditioning and ventilation.

Level 3 - Room is dedicated to IDF components and other technology equipment. It has appropriate air conditioning and ventilation.

Level 2 - Room is dedicated to IDF components and other technology equipment.

Level 1 – Room is not dedicated to as an IDF and is shared with other areas

UPS Requirements

Level 4 – Redundant UPS units that supply power for approximately 1 hour to MDF.

Level 3 - Redundant UPS units that supply power for approximately 30 minutes.

Level 2 – Single UPS unit that supplies power for 30 to 60 minutes.

Level 1 – One UPS that supplies power for brownouts and surges with little backup power.

Cabling Throughout Building

Level 4 – Cat 6 cabling is used throughout the building. J-hooks are used and securely fastened. All cabling is run through the J-hooks in tight bundles. Sleeves are used when passing through a barrier. Cabling is Cat 6 or higher. Cabling is color coded by use with minimum being separate colors for data, security cameras, WIFI access points, and security doors. (As examples)

Level 3 - Cat 6 cabling is used throughout the building. J-hooks are used and securely fastened. All cabling is run through the J-hooks in tight bundles. Sleeves are used when passing through a barrier. Cabling is Cat 6 or higher.

Level 2 – Cat 5E cabling is used throughout the building. J-hooks are used and securely fastened. All cabling is run through the J-hooks in tight bundles. Sleeves are used when passing through a barrier. Cabling is Cat 5E. Cabling is color coded by use with minimum being separate colors for data, security cameras, WIFI access points, and security doors. (As examples)

Level 1 - Cat 5E cabling is used throughout the building. J-hooks are used and securely fastened. All cabling is run through the J-hooks in tight bundles. Sleeves are used when passing through a barrier.