Introduction

The following document contains the standards and requirements regarding Network installations for Cherokee County, Georgia ("County") new construction and remodels.

It is broken out into multiple sections:

Section 1 – Tabulated Summary of Requirements

This section contains a condensed version of the detail document in Section 2. Any questions about the requirements listed in Section 1 should reference Section 2 for clarity. If a question still persists, contact the County Network Infrastructure team by calling **678-493-6000** and asking for the IT Department, specifically **Brian Robison, Network Infrastructure Manager**.

Section 2 – Detailed County Standards for Network Installations

This section contains more detail about specifications listed above.

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Section 1 – Tabulated Summary of Requirements

Networking Hardware	
CISCO Switches	• 3-year SmartNet support
Cisco Catalyst 9300X UPOE (Small to Med installations) Cisco Catalyst 9400 / UPOE line cards (Larger installations)	• 1 per 48 ports, stackable if more than 1 switch needed • Stackable installations require Stackwise/Stackpower cables • Layer 3 routing license purchased if necessary • DNA or Network Advantage licensing purchased • Redundant power supplies
CISCO Router	• 3-year SmartNet support
If required, Cisco 4xxx/k9 router sized accordingly to installation	
Power over Ethernet (POE)	• Power over Ethernet (PoE+ or UPOE) is mandatory for any user-facing switch ports • PoE shall conform to applicable standards, including but not limited to IEEE 802.af, IEEE 802.3at Type 1, IEEE 802.3at Type 2, IEEE 802.3bt Type 3, and IEEE 802.3bt Type 4 • Any additional network device requiring PoE, including but not limited to IP cameras or DVRs, shall be figured into the PoE capacity sizing for the network switches
VOIP If this is a new facility requiring new Cisco VoIP phones, Cisco VoIP phones and licenses must be purchased. Contact IT for details.	• The total number of VoIP phones needed for a project shall be figured into the PoE capacity sizing for the network switches. • Contact IT for model of phones as they differ depending on usage.
Wireless Infrastructure (WiFi) Cisco Aironet 9120 series (medium density) Cisco Aironet 9130 series (high density)	• Supports Cisco CleanAir • Appropriate licensing • Number of devices needs to factor into the POE requirements • Outdoor installations require consultation with IT and Property Management

Wiring Infrastructure (Copper)	
Cat 6A UTP	• 25-year warranty • Size all conduits accordingly
Cat 6A RJ-45 data jacks	• 8 position jack • minimum 50 micro inches of gold surface plating. County prefers **Panduit Minicom** modules • Plenum-rated • T568B termination standard
End to End testing • Including patch cables • Total run not to exceed 100 meters	• Wire Map • Length • Insertion Loss • NEXT Loss • PS NEXT Loss • ACR-F Loss • PS ACR-F Loss • Return Loss • Propagation Delay • Delay Skew

Routing	• Terminated at a patch panel
	• No cables run directly from the wall to equipment
	• Wiring above ceiling fastened to building structure every 4-5 feet
	• Continuous run from outlet to wiring closet without breaks or splices in star configuration
	• Minimum of **2' service loop** above ceiling for each drop
	• Copper cabling patch panel terminations shall maintain cable jacket and twist a minimum of **½" from point of termination**.
	  ○ End station terminations shall maintain cable jacket and twist up to the edge of the jack housing.
	  ○ Dust caps must always be used to provide pair protection and strain relief.

Wiring Infrastructure (Fiber)	

	• The basic fiber type for all runs shall be at least 6-pair single-mode fiber. Different fiber types or pair counts may be specified as needed.
	• All fiber drops shall be terminated in LC-female style connectors at both ends, unless specified otherwise.
	• The fiber patch panel shall be clearly labeled with the location of the termination of the far end and the fiber type (OM4, single mode, multimode, etc).
	• Optical fiber connecting hardware shall be installed to provide well-organized installation and cable management and always in accordance with manufacturer's guidelines.
	• Fiber optic cable service loops shall be provided at all fiber termination points. Wiring closet loops shall be a minimum of 15ft. End termination or main termination point loop is to be a minimum of 30ft.
	• Splice trays must be enclosed and protect all fiber splices.
	• All inside distribution and outside plant fiber cabling must be strain relieved to hinder the possibility of breakage and connection failure.
	• The use of inner duct is mandatory in ALL situations where fiber is being installed. Buried or aerial fiber optic cable must be approved and designed to specific standards intended for aerial or buried application. In general, all fiber must run in inner duct to its termination point (fiber patch panel).
	• Testing is to be end to end with all terminations and splices involved for each strand tested.
	  • OTDR, Both directions.
	  • Test results shall be presented in an Excel spreadsheet, version 5.0 or greater, detailing cable detailing cable port, location (building, closet etc.) length and attenuation in dB.
	  • Additionally, each test is to include a graphical representation of the test, measurement results, and cable information and set up parameters. The following standards will be used:
	  ○ ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR.
	  ○ ANSI/TIA/EIA-455-60A, Measurement of Fiber or Cable Length Using an OTDR.

	1. ANSI/TIA/EIA-455-61A, Measurement of Fiber or Cable Attenuation Using an OTDR. 2. ANSI/TIA/EIA-526-7, Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant. 3. ANSI/TIA/EIA-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

Installation	
Access Control	• All designated wiring closets, IDFs, or MDFs shall have an access control method on its door(s), including but not limited to: push-button lock, swipe-card reader, contactless RF device reader, or biometric device. • All IT spaces shall have a camera trained on the access door(s), with a DVR to record footage. • Not a shareable space with other uses. No janitorial, storage, or other uses that would invalidate the above.

Racks
 	
Rack(s) will be tied to earth ground in a manner consistent with local electrical code.
	• Wall-Mount applications
	  ○ Hoffman EWMW2424340 telco rack with dual hinges or Middle Atlantic Products DWR-12-22PD rack
	• Floor-Mount Applications
	  ○ 2-Post Open Rack
	  ▪ CPI 55053-703 telco rack
	  ▪ CPI 10250-712 12” ladder rack to run cables to the rack
	  ▪ CPI 11421-712 12” wall angle kit
	  ▪ CPI 10595-712 rack mounting plate
	  ▪ If multiple telco racks are used and one or more do not have a ladder rack tying them to the wall, use the CPI 12407-719 rack bracing kit.
	  ▪ Equivalent models from other manufacturers may be used if CPI models are not available.
	  ○ 4-post enclosed rack
	  ▪ Tripp Lite SR42UBDPWD or equivalent

Cabling	• Vendor is responsible for supplying, pulling, installing, terminating, splicing, testing, labeling, identifying, tracing, toning, and certifying all network cabling, patch panels, network jacks, fiber cartridges, faceplates, and other associated hardware not specifically mentioned here. • 4 x Panduit WMPVF45-E vertical cable management trays (for floor-mount racks only) • 2 x Panduit NMF-2 or NMF-3 horizontal cable management trays, depending on size of cable bundle to manage • IT/wiring closet shall be provided with at least one wall-mounted sheet of 4'x8' fire-retardant plywood backboard • Backboard will have mounted on it a grounding strip tied to earth ground in a manner consistent with local electrical code. • In the event that underground conduit is required to bring in service from the street, the bare minimum is 2 x 4" buried conduit from the building to the utility pole. • All inter-building conduits shall have an end-to-end pull tape conforming to industry standards run through them, and all vendors installing cable after the original install shall re-pull a new pull tape when using the existing pull tape. • All data runs are to match the color of the jacks they are running to. A gray jack shall have grey-jacketed cable run to it, etc. • Each color of data cable shall have its own patch panel in the data rack. White cables are to terminate in one patch panel, blue cables in a different patch panel, etc.
Power	• At least 4 x 20A 120VAC and/or 1 x 30A 208VAC outlets to power UPS and other backboard-mounted devices. • Alternate and/or supplemental power feeds of differing voltages and/or current capacities may be specified as needed. • Outlets shall be fed with generator power if applicable.
Installation (cont)	

Power Protection	• Single-phase loads
	  ○ 1 x Eaton PX Lithium-Ion rack-mount UPS (dual-conversion or double-conversion model only), sized appropriately for the intended load.
	  ○ Eaton PX Lithium-Ion units shall be purchased with Eaton SNMP monitoring card or the equivalent built-in management card.
	  ○ UPS up to 3kVA servicing a 120VAC load shall be operated from a 120VAC outlet sized appropriately for the current draw of the purchased unit.
	  ○ UPS larger than 3kVA shall be operated from a 208VAC outlet unless specifically needed otherwise, with a step-down PDU if needed.
	  ○ 1 x APC AP9625 two-post adapter for two-post telco style rack applications.
	  ○ 1 x Hubbell MCCPSS19 horizontal 20A PDU
	• Three-phase loads
	  ○ Locations requiring 3-phase power protection will be evaluated and sized on a case-by-case basis.

Fire Suppression	• All designated wiring closets, IDFs, or MDFs shall have a method of fire suppression consisting of a HALON-type or "Clean Agent" type and not a water sprinkler if at all possible.
Climate Control	• Generally speaking, the target environmental temperature for wiring closets, IFDs, or MDFs, shall be between 60 and 80 degrees Fahrenheit • The room shall not be configured so that it receives active heating during the winter months, unless the temperature in said room is reasonably projected to fall to or below 50 degrees Fahrenheit, but the climate control system for that room shall still be capable of keeping the room under 80 degrees Fahrenheit.

Wall Plates	• Panduit Minicom compatible wall plates • 3 jacks per wall plate: blue, white, and gray. • Jacks shall be labeled by affixing a unique number to the wall plate; this number will apply to all jacks, so that for faceplate "1" there will be a "Blue-1", a "White-1", and a "Gray-1", with corresponding numbers being applied to the patch panel ports.
Wireless Access Point Jacks	• All runs servicing a wireless access point shall consist of two Cat6A runs (white and blue, labeled as described above), each terminating in a jack in a common faceplate mounted to the ceiling and/or ceiling tile close to the access point's desired location. The faceplate shall be labeled with the jack number.

Section 2 – Detailed County Standards for Network Installations

- Network devices
  - Ethernet switches and routers
    - All construction, remodel, or expansion projects shall include a VoIP-capable gigabit router and/or switch as needed. Please contact IT for details on specific ordering information.
    - Ethernet copper speeds of 10/100/1000 are mandatory for any user-facing switch ports. Additional network speeds may be specified as needed.
    - Switch
      1. The basic model type for all new facilities is a single Cisco Catalyst 9300 with UPOE (see section 2 for more information) for smaller and medium installations.
      2. Multiple Cisco 9300 switches arranged in a stack configuration may be used for closets requiring more than 48 ports.
      3. Larger locations may call for a Cisco modular switch. The basic model type for larger locations shall be the Catalyst 9400 with UPOE line cards.

        4. Any site requiring a different device will be evaluated on a case-by-case basis.
        5. If the specified switch or switch stack is purchased for use as a Layer 3 switch, the appropriate Layer 3 routing license add-on(s) shall be purchased.
            a. The Layer 3 routing license add-on(s) specified shall enable full OSPF and/or EIGRP routing capabilities.
        6. DNA Advantage and/or Network Advantage licensing shall be purchased with the switch.
        7. Any switch with the ability to house a redundant power supply and/or fan module shall be ordered with all possible redundant power supplies and/or fan modules.
        8. Any stackable switch intended for use in a stack shall be ordered with all required StackWise and/or StackPower cables.
    - Router
        1. The basic model type (if a router is required) for all new facilities is the Cisco 4xxx/K9 router, sized and licensed appropriately for throughput and features.
    - All networking devices purchased shall be purchased with at least 3 years of Cisco SNT SmartNet (8x5xNBD) support, or 3 years of SNTP SmartNet (24x4x365) for critical components.
- Power over Ethernet (PoE)
    - Power over Ethernet (PoE+ or UPOE) is mandatory for any user-facing switch ports. Additional PoE standards may be specified as needed.
    - PoE shall conform to applicable standards, including but not limited to IEEE 802.af, IEEE 802.3at Type 1, IEEE 802.3at Type 2, IEEE 802.3bt Type 3, and IEEE 802.3bt Type 4.
    - Any additional network device requiring PoE, including but not limited to IP cameras or DVRs, shall be figured into the PoE capacity sizing for the network switches.

- VoIP
    - If this is a new facility requiring new Cisco VoIP phones, Cisco VoIP phones and licenses must be purchased, and additional consultant's fees may be needed to bring up the facility with the county's central Cisco VoIP phone system. Contact IT for details.
    - The total number of VoIP phones needed for a project shall be figured into the PoE capacity sizing for the network switches.

- Wireless infrastructure (WiFi)
    - <u>Since wireless standards change so quickly, this document will be adjusted on at least a yearly basis.</u>
    - For calendar year 2021, the standard for new-installation internal access points is:
        1. Cisco Aironet 9120 series for medium-density indoor deployments
            a. These radios require 802.3bt UPoE for full functionality. Please size switch accordingly.
        2. Cisco Aironet 9130 series for high-density indoor deployments

        a. These radios require 802.3bt UPoE for full functionality. Please size switch accordingly.
    3. For outdoor deployments, the access points will be specified on a case-by-case basis
  - Any access point purchased will be a model that supports Cisco CleanAir air quality sensing capability.
  - All access points will be purchased with an additive license for the applicable Cisco Wireless controller, either singly or in a package as needed.
  - The total number of access points needed for a project shall be figured into the PoE capacity sizing for the network switches.

- Designated network infrastructure areas
  - Access control
    - All designated wiring closets, IDFs, or MDFs shall have an access control method on its door(s), including but not limited to: push-button lock, swipe-card reader, contactless RF device reader, or biometric device.
    - All rooms mentioned above shall have a method to detect, and generate an alarm, if the access-controlled door is propped open or fails to close completely.
  - Non-shared storage space
    - All designated wiring closets, IDFs, or MDFs shall be designated as non-shared space, with the idea being that these devices will not share space with janitorial supplies, sinks, floor basins, cooking implements, flammable or toxic substances, general storage, or similar things.
  - Minimum size of rooms
    - For small rooms where a single rack is specified, the minimum size shall be no less than 6'x7' (Width x Depth).
      1. Allowance may be made for minor variations in width or depth, but not in such a way that it makes access to front, back, and at least 1 side of a typical 2-post telco rack with cable management difficult or impossible.
      2. An overriding factor to the above allowance is that there shall be no less than 3' clearance for the front, back, and at least one side of whatever rack is housed in the room.
    - For larger rooms, where the expectation is that more equipment than can be held by a single rack shall be housed, the size of the room shall be determined on a case-by-case basis.

  - Fire suppression
    - All designated wiring closets, IDFs, or MDFs shall have a method of fire suppression consisting of a HALON-type or "Clean Agent" type and not a water sprinkler if at all possible.

  - Climate control
    - Generally speaking, the target environmental temperature for wiring closets, IFDs, or MDFs, shall be between 60 and 80 degrees Fahrenheit.
    - Any location requiring the installation of active electronic devices (switches, routers, firewall, UPSs, DVRs, servers, or any other electronic devices) shall be evaluated for the projected total thermal load created by such devices, and

appropriate climate control measures shall be installed, including but not limited to: passive venting, active venting, dedicated thermostat, or dedicated air conditioning system.

- The room shall not be configured so that it receives active heating during the winter months, unless the temperature in said room is reasonably projected to fall to or below 50 degrees Fahrenheit, but the climate control system for that room shall still be capable of keeping the room under 80 degrees Fahrenheit.

- Copper wiring
  - The basic copper wiring type for all new work shall be Cat6A. This requirement may be waived or modified on a per-situation basis, for reasons including but not limited to:
    1. Interoperability with existing cabling infrastructure
    2. Need for greater throughput
    3. Space considerations in existing conduit
  - All wiring termination shall be consistent in manufacturer from end-to-end so as to be eligible for the 25 year warranty.
  - Copper wiring shall be plenum-rated as dictated by code
  - All terminations shall be 25-year certified and installed by a technician certified in the manufacturer's installation and terminate requirements so as to qualify for the 25-year warranty.
  - No networking hardware shall be residential-grade, unless there is no difference between the enterprise/commercial grade hardware and residential-grade hardware.
  - Data terminations shall be made on standard single Category 6A RJ-45 8 position jack with a minimum of 50 micro inches of gold surface plating on the contact wires and plugs. The County currently employs Panduit Minicom modules.
  - Wiring standard for Category 5e/6/6A wiring termination is T568B.
  - The following tests shall be run on all installed copper networking (Cat 5E, 6, 6A, etc) data runs.
    1. Testing shall be end to end, patch panel to jack including patch cables. (Total run length not to exceed 100 meters).
       a. Wire Map
       b. Length
       c. Insertion Loss
       d. NEXT Loss
       e. PS NEXT Loss
       f. ACR-F Loss
       g. PS ACR-F Loss
       h. Return Loss
       i. Propagation Delay
       j. Delay Skew
    2. Test results shall be presented in an Excel spreadsheet, version 5.0 or

greater, detailing cable port location (building, closet etc.) and all requested test data for the run.

- Cable routing
  - All cables shall be brought to the wiring rack or enclosure and terminated to a patch panel appropriate for the type of cable.
  - No cables shall be run directly from the wall, cable chase, or conduit to the network equipment.
  - Wiring to all outlets to run above the ceiling shall be fastened to the building structure at eight (8) foot intervals through the combined use of, but not limited to, J hooks, beam clamps, D-rings, and hangers.
  - At no time are voice or data drops/homeruns to be directly secured to the building structure above ceiling without the use of cable supports.
  - Cabling above ceiling shall be sectioned off, bundled and tied, and routed back to intermediate or master wiring closets using a star configuration.
  - All wiring shall run continuously from the outlet to the wiring closet without breaks or splices. Cable supports shall be employed every eight (8) feet. Cable supports (J Hooks etc.) shall be sized 50% larger than needed to allow for future growth.
  - Cable pulling tension shall not exceed 110N (25lbf) for UTP horizontal four pair cables.
  - Copper cabling (Cat 5E, 6, 6A, etc) shall have a minimum two (2) foot service loop for each cable above ceiling. Service loop is to be neatly dressed and secured.
  - Copper cabling patch panel terminations shall maintain cable jacket and twist a minimum of one- half inch from point of termination.
    1. End station terminations shall maintain cable jacket and twist up to the edge of the jack housing.
    2. Dust caps must always be used to provide pair protection and strain relief.
- Wiring type
  - Category 6A UTP is considered the bare minimum, unless specified otherwise
  - Consideration: Cat6A is thicker than Cat 5, 5e, or 6. Ensure that conduits are sized accordingly.
  - Wiring jacket color is to correspond to the jack attached to it, so that a white jack will have white cable run to it.

- Patch panels
  - Leviton Quickport eXtreme 6+ snap-in jacks
  - For any number of drops exceeding 11 installed in a single patch panel, the standard is to use a 48-position patch panel.
  - Use either Leviton 4S255-Q48 or 4S255-Q24 high-density patch panels, or their successor model numbers having equivalent traits.

- Wall plates
  - Leviton Quickport compatible wall plates
  - 3 jacks per wall plate: blue, white, and gray.

- Jacks shall be labeled by affixing a unique number to the wall plate; this number will apply to all jacks, so that for faceplate “1” there will be a “Blue-1”, a “White-1”, and a “Gray-1”, with corresponding numbers being applied to the patch panel ports.

- Wireless access point jacks
  - All runs servicing a wireless access point shall consist of two Cat6A runs (white and blue, labeled as described above), each terminating in a jack in a common faceplate mounted to the ceiling and/or ceiling tile close to the access point’s desired location. The faceplate shall be labeled with the jack number.

- Fiber
  - The basic fiber type for all runs shall be at least 6-pair single-mode fiber. Different fiber types or pair counts may be specified as needed.
  - All fiber drops shall be terminated in LC-female style connectors at both ends, unless specified otherwise.
  - The fiber patch panel shall be clearly labeled with the location of the termination of the far end and the fiber type (OM4, single mode, multimode, etc).
  - Optical fiber connecting hardware shall be installed to provide well-organized installation and cable management and always in accordance with manufacturer’s guidelines.
  - Fiber optic cable service loops shall be provided at all fiber termination points. Wiring closet loops shall be a minimum of 15ft. End termination or main termination point loop is to be a minimum of 30ft.
  - Splice trays must be enclosed and protect all fiber splices.
  - All inside distribution and outside plant fiber cabling must be strain relieved to hinder the possibility of breakage and connection failure.
  - The use of inner duct is mandatory in ALL situations where fiber is being installed. Buried or aerial fiber optic cable must be approved and designed to specific standards intended for aerial or buried application. In general, all fiber must run in inner duct to its termination point (fiber patch panel).
  - Testing is to be end to end with all terminations and splices involved for each strand tested.
    1. OTDR, Both directions.
    2. Test results shall be presented in an Excel spreadsheet, version 5.0 or greater, detailing cable detailing cable port, location (building, closet etc.) length and attenuation in dB.
    3. Additionally, each test is to include a graphical representation of the test, measurement results, and cable information and set up parameters. The following standards will be used:
       a. ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR.
       b. ANSI/TIA/EIA-455-60A, Measurement of Fiber or Cable Length Using an OTDR.
       c. ANSI/TIA/EIA-455-61A, Measurement of Fiber or Cable Attenuation Using an OTDR.

d. ANSI/TIA/EIA-526-7, Optical Power Loss Measurements of Installed Single mode Fiber Cable Plant.
e. ANSI/TIA/EIA-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

- Power protection
  - Single-phase 120/208VAC loads
    - 1 x APC rack-mount UPS (dual-conversion or double-conversion model only), sized appropriately for the intended load.
      1. All 120VAC UPS shall be Eaton 9PX Lithium-Ion dual-conversion units with SNMP management card.
      2. UPS up to 3kVA servicing a 120VAC load shall be operated from a 120VAC outlet sized appropriately for the current draw of the purchased unit.
      3. UPS larger than 3kVA shall be operated from a 208VAC outlet unless specifically needed otherwise, with a step-down PDU if needed.
    - 1 x APC AP9625 two-post adapter for two-post telco style rack applications.
    - 1 x Hubbell MCCPSS19 horizontal 20A PDU
  - Three-phase loads
    - Locations requiring 3-phase power protection will be evaluated and sized on a case-by-case basis.

- Racks and power delivery
  - Wiring rack
    - For wall-mount applications
      1. Hoffman EWMW2424340 telco rack with dual hinges or Middle Atlantic Products DWR-12-22PD rack.
    - For floor-mount applications
      1. If a 2-post open rack is needed
         a. CPI 55053-703 telco rack
         b. CPI 10250-712 12” ladder rack to run cables to the rack
         c. CPI 11421-712 12” wall angle kit
         d. CPI 10595-712 rack mounting plate
         e. If multiple telco racks are used and one or more do not have a ladder rack tying them to the wall, use the CPI 12407-719 rack bracing kit.
      2. If a 4-post enclosed rack is needed
         a. Tripp Lite SR42UBDPWD or equivalent
    - Rack(s) will be tied to earth ground in a manner consistent with local electrical code.

  - Cable management
    - 4 x Panduit WMPVF45-E vertical cable management trays (for floor-mount racks only)
    - 2 x Panduit NMF-2 or NMF-3 horizontal cable management trays, depending on size of cable bundle to manage

- The bare minimum for underground pathway from the street to a new facility will be 2 x 4” conduit. This conduit will run from the utility pole to the wiring closet.

- Backboard
  - IT/wiring closet shall be provided with at least one wall-mounted sheet of 4’x8’ fire-retardant plywood backboard
  - Backboard will have mounted on it a grounding strip tied to earth ground in a manner consistent with local electrical code.

- Power outlets
  - At least 4 x 20A 120VAC and/or 1 x 30A 208VAC outlets to power UPS and other backboard-mounted devices.
  - Alternate and/or supplemental power feeds of differing voltages and/or current capacities may be specified as needed.
  - Outlets shall be fed with generator power if applicable.