

# Network Report

## Jan – Mar 2020

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CREATED APRIL 7, 2020

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Information Technology Services  
Communication Technologies: Networking



THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

**Forward:**

*For those of you that are off campus, we hope that you are all adjusting well to your new work from home environment!*

*The networking staff has principally moved to a work from home posture. However, the Network Deployment group (lead by David Valleroy) has been deemed critical to University operations, and they continue to be on campus with reduced hours and staggered shifts. They are on campus to ensure that we can quickly respond to any network event and can continue to provide the same service you have come to expect. Someone recently sent me an email asking, 'Are you still doing port activations?' Yes, we are!*

*We are not entirely sure how we are going to be operating over the next few months with regards to life cycling, but it is our plan to continue to life cycle things as we deem appropriate and safe. We will be targeting areas that have a reduced risk of impacting remote instructional support (especially during the Spring semester) and will be obtaining permission from department I.T. leads prior to scheduling or administering major work. If you think your location would be a good location for us to upgrade in the next couple of quarters, send me an email. We will contact you about your eligibility and options.*

*We would like to also announce some changing to staffing. We are very pleased that we were able to hire Dawn Douglass to serve as a Wireless Network Engineer, reporting to Keith Miller. Dawn has a B.S. in Computer Science from Campbell University and over 20 years of I.T. experience.*

*We would also like to announce an upcoming retirement. Dr. Hiawatha Demby has decided to retire at the end of May. Hiawatha holds a PhD in Biomedical Engineering that he received from UNC in 2004. Hiawatha has been with the Networking group since 1996 but has been working with network technology at university since 1985. Prior to that, he worked with Village Cable (which was providing cable in Chapel Hill prior to Time Warner). He has been with the state for 32 years. One of the most disappointing and sad things about this time will be the inability for us to give Hiawatha the going away party that he has earned and deserved. Please join me in send him congratulations and well wishes!*

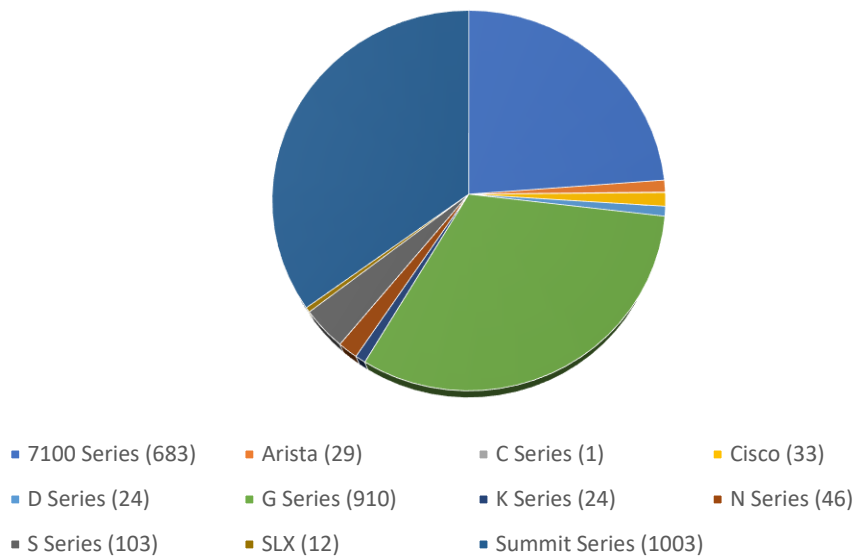
*Sincerely,  
Ryan Turner  
Head of Networking*

## Key Campus Metrics

### WIRED

Number of switches on campus:	2,868
Number of ports:	173,260
Peak download rate:	20 Gbps (January 22nd)
Peak upload rate:	14 Gbps (March 20)
Traffic sent to Internet:	4.1 Petabytes
Traffic received from Internet:	5 Petabytes

Switch Distribution - Entire Campus



- The switch distribution over the next quarter is unlikely to change much as a result of reduced on-site work.
- We are assessing what buildings we can upgrade during the shutdown with an emphasis on personal safety and business continuity.

Explanation of major model types:

**Cisco Nexus 7706** – These chassis-based routers act as the core of our network and feature high density 40G/100G capabilities. These switches provide almost all core routing for campus and were the part of our major core redesign in 2018. They also serve as the layer 3 core for ITS data centers, providing an aggregate of 400 Gbps from ITS Franklin and ITS Manning.

**Arista** – We used a variety of Arista switch models to provide high-density high-speed connections to ITS Research Computing as well as other research entities across campus.

**Extreme Summit Series** – Comprised of the most current generation fixed format of switches in our network and are divided into many sub-categories (not shown). As we eliminate the older generation switches, we will break down this category into more granular models. These switches have a minimum of 1G to the desktop, 10G to the server, and either 10G, 40G or 100G uplinks. They come in copper or fiber-based form factors. Most will support 802.3at power over ethernet. Newer models will support 802.3bt power over ethernet.

**Extreme SLX series** – These high density 40G/100G switches are currently used as spine layer switches in the new data center design. They can support a high number of 100G ports, will support 400G in the future, and feature a deep packet buffer system that can eliminate packet drops from a congested network. They come in chassis and fixed format, and we will be considering this line for replacement of our current distribution tier 1 switches (S series).

**Extreme 7100 series** – Currently supported previous generation of fixed format switches that feature 1G to the desktop, 10G to the server, and 10G or 40G uplinks. This switch is no longer available for purchase and runs a network operating system that will eventually be deprecated by the manufacturer. Most will support 802.3at power over ethernet.

**Extreme G series** – Past generation of modular switches that feature 1G to the desktop. They are no longer available for purchase and have no software support. As modular switches, they can support up to 4 cards of 24 ports each. These switches will support only 1 card of 802.3af power, and its 10G capability is channelized, substantially limiting its ability to carry high data rates. These switches will not be adequate for the power needs of the current generation access points and replacing them is a priority as we life cycle.

**Extreme K / S series** – These past generation of chassis-based and fixed format switches act as the workhorses for many of our key distribution points across campus. They currently carry software support. They support 10G connectivity at density, but lack in their 40G capabilities. Many of these switches will be replaced in the next 2 years as we attempt to move away from chassis-based switching in as many places as possible, toward fixed format high density 40G/100G switches.

**Extreme N series** – These are switches that were introduced over 10 years ago and still exist in limited parts of campus. They are 1G switches. These are a priority for replacement during the next year. Few exist on the campus network.

### WIRELESS

Number of APs on campus:	10,007
Peak concurrent connections:	50,500 (February 11 <sup>th</sup> )
Devices onboarded to eduroam:	11,990
Top Onboarded OS:	iOS at 48%

AP Distribution - Entire Campus



■ AP-225 (3530)	■ AP-315 (3124)	■ AP-135 (1171)	■ AP-325 (836)
■ AP-303H (375)	■ AP-205H (365)	■ AP-224 (335)	■ AP-335 (91)
■ AP-134 (54)	■ AP-275 (47)	■ AP-277 (46)	■ AP-515 (22)

- We have nearly exhausted our supply of AP-3XX series 802.11ac wave 2 access points (Wi-Fi 5).
- We will be working to bring the entire campus up to firmware versions that will support the deployment of 802.11ax (Wi-Fi 6) over the next quarter. Expect announcements in the not to distance future.
- We are beginning to life cycle 200 series access points on campus. It will take almost 3 years to replace that inventory, when the 200 series will be at end of support.

#### Explanation of major model types:

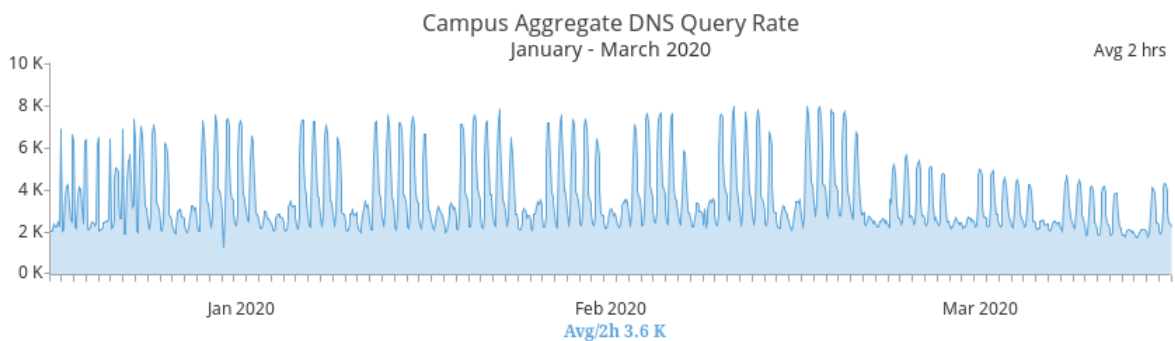
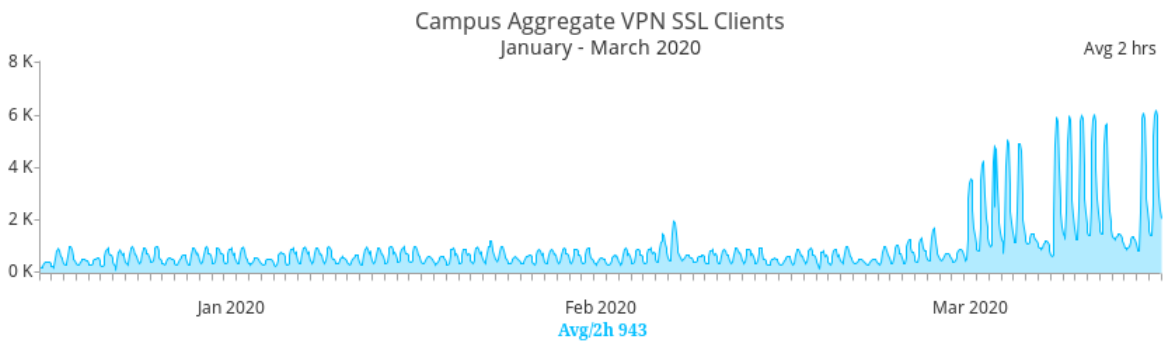
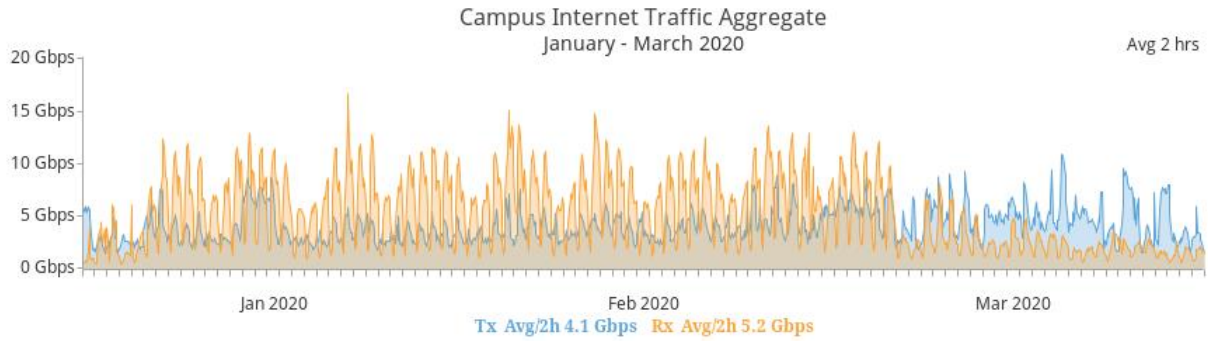
**AP-1XX** – Aruba access points that feature 802.11n capabilities. Aruba has set the end of support date for AP1XX access points as some time in 2021.

**AP-2XX** – Aruba access points that feature wave 1 of 802.11ac capabilities. Aruba has set the end of support date for these access points as some time in 2023.

**AP-3XX** – Aruba access points that feature wave 2 of 802.11ac capabilities. Aruba has not set the end of support date for these access points, and we consider these still current generation.

**AP-5XX** – Aruba access points that feature wave 1 of 802.11ax capabilities (pre standards ratification). We will be installing these access points as standard beginning in 2020

### ADDITIONAL GRAPHS



## Major Initiatives Review:

### *New Campus VPN*

In an effort to mitigate any issues over limited VPN capacity, we purchased and upgraded our campus client VPN from a pair of Cisco 5585s to a pair of Cisco Firepower 4150s. These new appliances increase our bandwidth capacity from 2 Gbps to nearly 15 Gbps and increase our concurrent user connection count from 10,000 users to 20,000 users. These were installed and operational within 5 working days of delivery with the substantial configuration effort of Jerry Woodside and Frank Seesink. Many other folks also helped to make this happen. We would also like to thank ITS Security for spinning up the Palo Alto VPN solution as an overflow option in the event we were unable to operationalize the new VPN units in time.

### *Campus Distribution Switching upgrade*

We have been evaluating the SLX9640 high density 100/40/10 Gbps deep packet buffer switch as a replacement to our current Extreme S series switches which form the distribution layer of switching for campus. We call this the 'Tier 1' layer. Tier 1 switching layers act as a physical aggregator of fiber connections for many buildings in a geographical area. We have around 30 of these locations across campus. Northbound of these Tier 1 switches are the routed cores (Main Campus, School of Medicine, ResNet). Our Tier 1 switches are not capable of anything greater than 10 Gbps to building entrance switches and have reached the end of their intended lifespan. We have been evaluating the SLX9640 in the Franklin Tier 1 location and expect to conclude our testing of this switch by the end of May. At this point, we intend to begin life cycling tier 1 switches all over campus. Change notices will be sent as we schedule this work in advance.

### *Campus server proxy has been launched*

ITS Networking has officially purchased and deployed a pair of A-10 hardware proxies for immediate use. The purpose of this proxy service is to provide Internet access for servers that are utilizing RFC1918 (private) IP space. In the past, many departments ran their own proxies. Please submit a service request if you have questions or wish to be onboarded onto the new platform. Will Whitaker is the architect of the service.

### *Progress on UNC Chapel Hill and UNC Hospital Network Extension*

Skynet is UNC Health's primary SSID. We have been working with UNC Health to extend this SSID onto campus wireless access points. This project has been extremely timely given the COVID-19 situation and we have successfully deployed the SSID to limited parts of the School of Medicine. Over the coming months, we will have skynet available across the entirety of the School of Medicine, and

potentially into conference spaces like the Friday Center. The hospital is working with the university to enable edu roam, but this is a low priority given the current circumstance.

*Progress on options for providing cheaper connectivity to remote sites*

We have been evaluating a new hardware solution that would allow remote sites to utilize relatively inexpensive business class ISP connections to connect to campus as opposed to expensive Metro Ethernet connections. We have installed this new solution at a location in Raleigh and are currently evaluating its effectiveness. So far, the testing has gone well. This was a site that previously had a hardware VPN connection to campus with no campus maintained switching or wireless. With this new hardware, we were able to install all campus networking services to their site providing full network management at a fraction of the ongoing cost for a metro ethernet connection. This would also allow for the extension of campus VLANs. We have determined that the base level of connection needed for this service will be 50 Mbps bidirectional. If you are interested in learning more, please send us a service request.

*Preparations underway for new AT&T Managed Voice Services*

Cheri Beasley's team is preparing to start moving over from Verizon to AT&T for campus VOIP. We deployed a pair of 6509 VSS multi-layer switches in both ITS Franklin and ITS Manning to support the upcoming solution. The new core provides redundancies and resiliencies for switch chassis, dedicated connections to ATT MPLS network, and connections to different campus routing domains. Furthermore, the new core will enable campus VoIP traffic to go through campus commodity internet if both dedicated circuits to ATT MPLS networks becomes unavailable. We are currently testing this new service with ATT and Cheri's group.



## Life Cycle Update:

The following locations have received substantial new switching gear during the past quarter:

- Frank Porter Graham
- 116 Merritt Mill
- Prestwick Place
- Carroll Hall
- Blood Lab
- Bell Tower Parking Deck
- Art Building-BES
- Dogwood Parking Deck
- Giles Horney (prepped but not started due to COVID)
- A.O.B. (prepped but not started due to COVID)

The following locations have received substantial new wireless gear during the past quarter:

- 109 Church St.
- 215 W. Cameron
- Ackland Art
- Horace Williams Airport buildings
- Alumni Hall
- Anderson Stadium
- Brooks Hall
- Carolina Hall
- Carolina Inn
- Carrington
- Hanes Hall
- Quadrangle Buildings
- 720 MLK
- Kenan Music
- Woollen Gym
- Boshamer
- Botanical Gardens
- Steele
- Bynum Hall
- Carroll

The following locations are being **targeted for switch upgrades** in the coming quarter (subject to change):

- Hanes Hall
- Carmichael Auditorium
- Woollen Gym
- Boshamer
- Steele

Our work during this quarter is highly subjective to customer willingness and staff availability. If you have a building that you would like to be placed on the upgrade list this quarter, send me an email. If your building has equipment older than 7100s series, we will work with you to see how possible this could be. If you don't know how old the switching is in your building, then just shoot us an email and we will let you know if it is eligible.

## Critical Incidents Review:

3/31/2020      **Spectrum users experiencing extreme slowness connecting to campus**

We received numerous reports from users on the CTC list that connectivity from home to campus was very slow. We were able to determine that all of these users were connecting with Spectrum. Upon investigation with our upstream Internet provider (MCNC), we determined they had made an unannounced change with regards to how Spectrum traffic routes to them on the previous day. MCNC reported that their peering links between MCNC and Spectrum had become saturated, and they disabled those links so that the traffic would come through a alternate commodity link (Level 3). This had unanticipated consequences, as the situation worsened when the change was made. Many schools connecting through MCNC also reported complaints of slowness from Spectrum remote users. MCNC worked with Spectrum to bring the peering back online, increasing the pipe substantially to multiple 10G connections up from multiple 1G connections. MCNC had the connections upgraded late on April 1<sup>st</sup>, and a formal announcement was sent on April the 2<sup>nd</sup>.