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N-Wave News

About N-Wave

N-Wave delivers stable, secure, high-speed network services to enable the vast missions of its stakeholder community within the federal government.

Our national network infrastructure extends across the contiguous U.S., Alaska and Hawaii—reaching remote field sites, major campuses, data centers and supercomputing facilities. Combined with our scalable cloud solutions, robust catalog of enterprise managed services and advanced network operations, N-Wave supports all stakeholder missions with integrity, transparency and flexibility, and employs a unique partnership approach to provide the best customer experience.

The N-Wave Program Office operates under the Office of the Chief Information Officer within the National Oceanic and Atmospheric Administration. N-Wave is NOAA's enterprise network and has expanded to serve other federal government agencies.

in this edition:

From the N-Wave Program Manager

Robert Sears

Every Friday, the entire N-Wave team meets virtually. This has been our routine for many years, to review the past week's operations across all service portfolios. While the meeting is optimal for diving into any technical or administrative issues, it is also a great virtual venue to see the many wonderful faces of our ever-expanding N-Wave family.

Starting over 10 years ago, initially with only two federal staff, our team of federal and contractor staff has now grown beyond Google Meet's 49-video-square limit to view this nationwide team in a single pane.

Reflective of our nation, N-Wave team members bring a diversity of culture, backgrounds, experience and creativity, which has led to the proliferation of multiple advanced technical services. Without the inclusion of each team

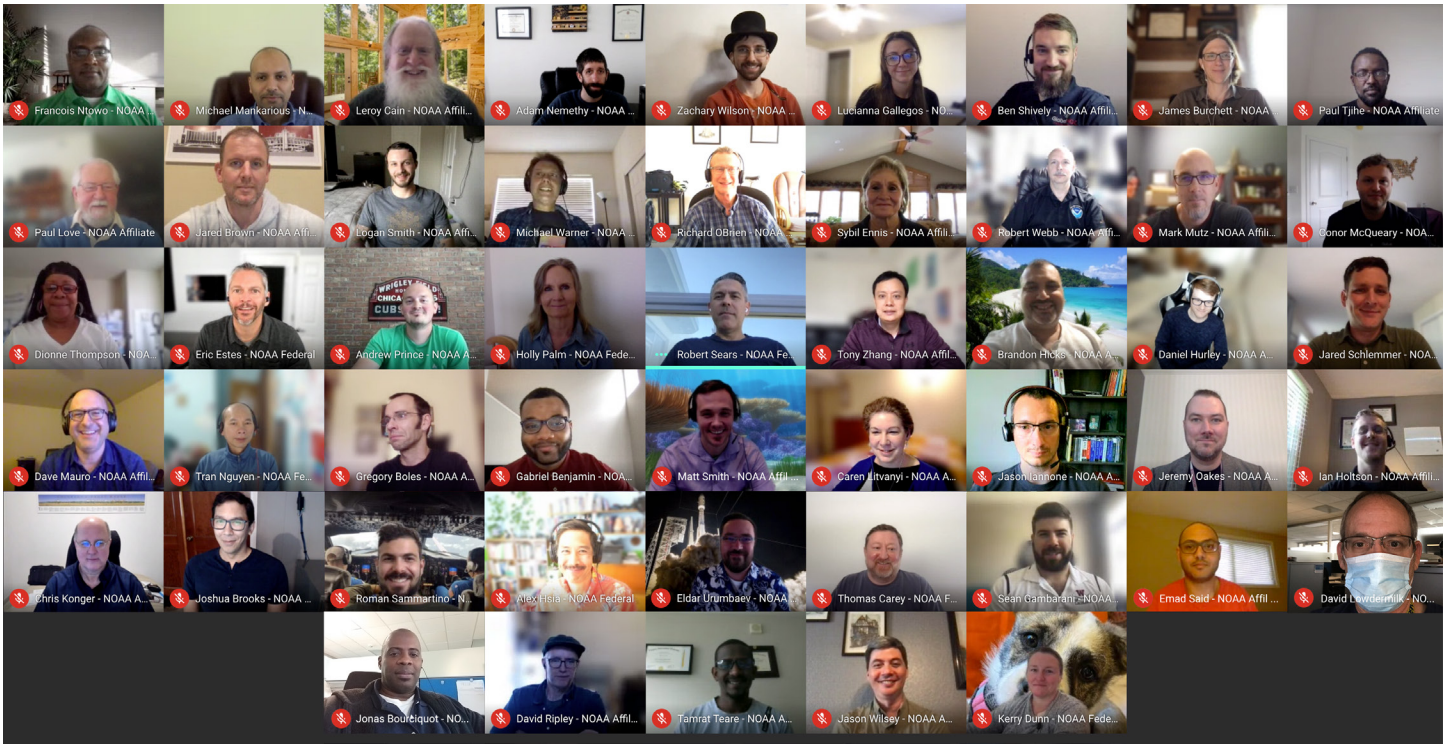
member, N-Wave would not be able to meet its mission to support the equally broad and diverse stakeholder community we serve across the Department of Commerce and the world-leading science they deliver to the American public.

I learn from this great N-Wave team every day and embrace our differences. The variety of thought and care we have for one another can be seen across all our interactions—from small, day-to-day collaborations to large, multifaceted engineering efforts.

Without the inclusion of each team member, N-Wave would not be able to meet its mission to support the equally broad and diverse stakeholder community we serve across the Department of Commerce and the world-leading science they deliver to the American public.

Although a picture can never do reality justice, we tried to capture the spirit of this team with live snapshots from one of our regular Friday operations calls in all its virtual glory! Those live snapshots, plus a little Photoshop magic to bring as many faces as possible into a single view, resulted in our first ever N-Wave virtual team photo.

Further reflective of this team's extensive efforts are the variety of articles you will find in this edition of the N-Wave newsletter, which span from ongoing operations to new participants and projects.



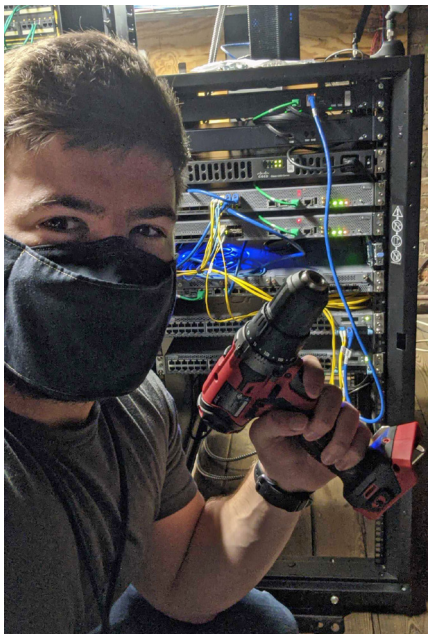
Members of the N-Wave team pause for a virtual team photo during a weekly network operations call. Not all staff are pictured.

N-Wave Engineers in the Field

With employee health, safety and well-being the top priority, N-Wave continues to operate under NOAA's current guidance for maximum telework. Travel is limited to only mission-critical activities. When employees must travel, they adhere to strict safety protocols and state/local requirements regarding testing and quarantine to maximize individual safety and minimize the transmission of COVID-19.

Despite the challenges—and with appropriate precautions while COVID-19 vaccinations continue across the country—the N-Wave team is working hard to deliver new and upgraded network services in support of customers' missions and operations.

From new installations to troubleshooting existing services, many customer needs require on-site support. These efforts include safe travel on a limited basis and creativity to partner with local hands and eyes whenever possible. The following are two examples of N-Wave team members traveling to meet the mission.



Sean Gambarani, network engineer with the N-Wave enterprise network services team, and Greg Boles, network engineer with the N-Wave transport team, recently traveled to Gulfport, MS, to install a new Managed LAN service for NOAA's Office of Marine and Aviation Operations (OMAO) in its new Ship Fleet Support System facility. The Managed LAN service supports wireless, VPN, and local and wide area network services for OMAO staff operating in temporary offices at the Gulf and Ship Island Railroad Office Building.

Emad Said, network engineer with the N-Wave enterprise network services team, recently traveled to the National Weather Service (NWS) Western Region Headquarters in Salt Lake City, UT. There Emad installed N-Wave's Enterprise Wireless service at the Wallace F. Bennett Federal Building in support of NWS staff at that location. Because the site was able to provide a local staff member to help rack and install equipment, N-Wave only needed to send one engineer to Salt Lake City.

Above: Sean Gambarani prepares a power drill to install a suite of network components needed to deliver N-Wave services.

Right: Emad Said tests wireless access points before deploying the equipment throughout the NWS Western Region Headquarters facility.

N-Wave Security - A Stakeholder's Perspective

Security teams tend to be insular, focusing on administrative boundaries, a clear understanding of the demarcation between 'us' and 'them,' and protecting 'our' assets from outside threats. It can be easy to lose sight of the fact that we are here to serve a higher purpose—supporting the missions of our NOAA and DOC stakeholders. If these missions cannot be fulfilled, securing the N-Wave network and its assets holds no intrinsic value.

Taking a step back to think about security from our stakeholders' perspectives is a powerful step in recalibrating that mindset. What aspects of N-Wave security matter most to our stakeholders? When considering the CIA triad (i.e., confidentiality, integrity, availability), the clear choice for utmost importance is availability. N-Wave is a High Impact FISMA system and a High Value Asset due to the implications of our network's availability on the NOAA and DOC missions. Our stakeholders depend on the network to be available at all times to carry their mission essential data from point A to point B.

As a result of these high availability requirements, the N-Wave network is architected with a layered approach to emphasize redundancy and resiliency at each layer.

Core Network

N-Wave's core network consists of sites at Seattle, WA, Denver, CO, Chicago, IL, Atlanta, GA, and McClean, VA. Each of these sites has extremely high physical security, redundancy and bandwidth. All are connected via multiple high-bandwidth paths to N-Wave's nationwide Multiprotocol Label Switching backbone, allowing traffic to re-route seamlessly via Border Gateway Protocol in instances of failure.

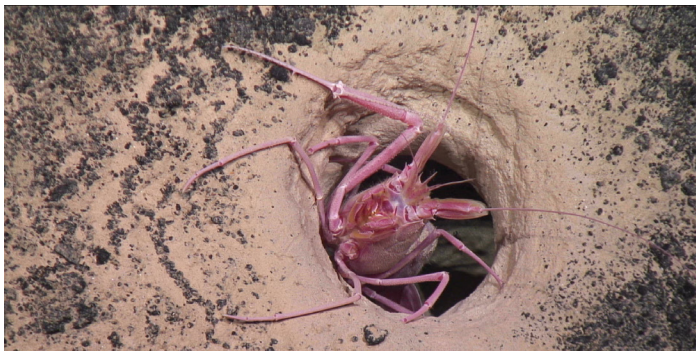
Management Network

While the core network transports stakeholder data across the country, N-Wave operates an entirely separate network for the infrastructure needed to monitor and manage the core network. The primary design concept behind the management network is isolation. Its boundary is protected by three bastion hosts which require Common Access Card, or CAC, login. All management sessions must traverse these bastion hosts, providing a single choke point of control and oversight for the management network. Once logged into the bastions, users must then establish additional login sessions to destination devices, leveraging a robust, centralized role-based access control system. That system provides granular control over which devices each user can log into and which actions they can perform on those devices.

Security Initiatives

Above and beyond the security provided by the network architecture, the N-Wave security team is constantly working to improve the security posture of the network through an iterative process of finding gaps and weaknesses and then formalizing projects to address them.

One example of a security initiative under way is an effort to better understand and standardize how physical and environmental security controls are implemented across all physical points of presence on the N-Wave network—ranging from remote field sites to large campuses to core colocation facilities. When this project is complete, the N-Wave security team will have much better understanding and oversight of the physical security mechanisms in place across N-Wave's extensive deployment.



Credit: NOAA Okeanos Explorer Program

Progress Continues with Efforts to Expand Alaska Connectivity

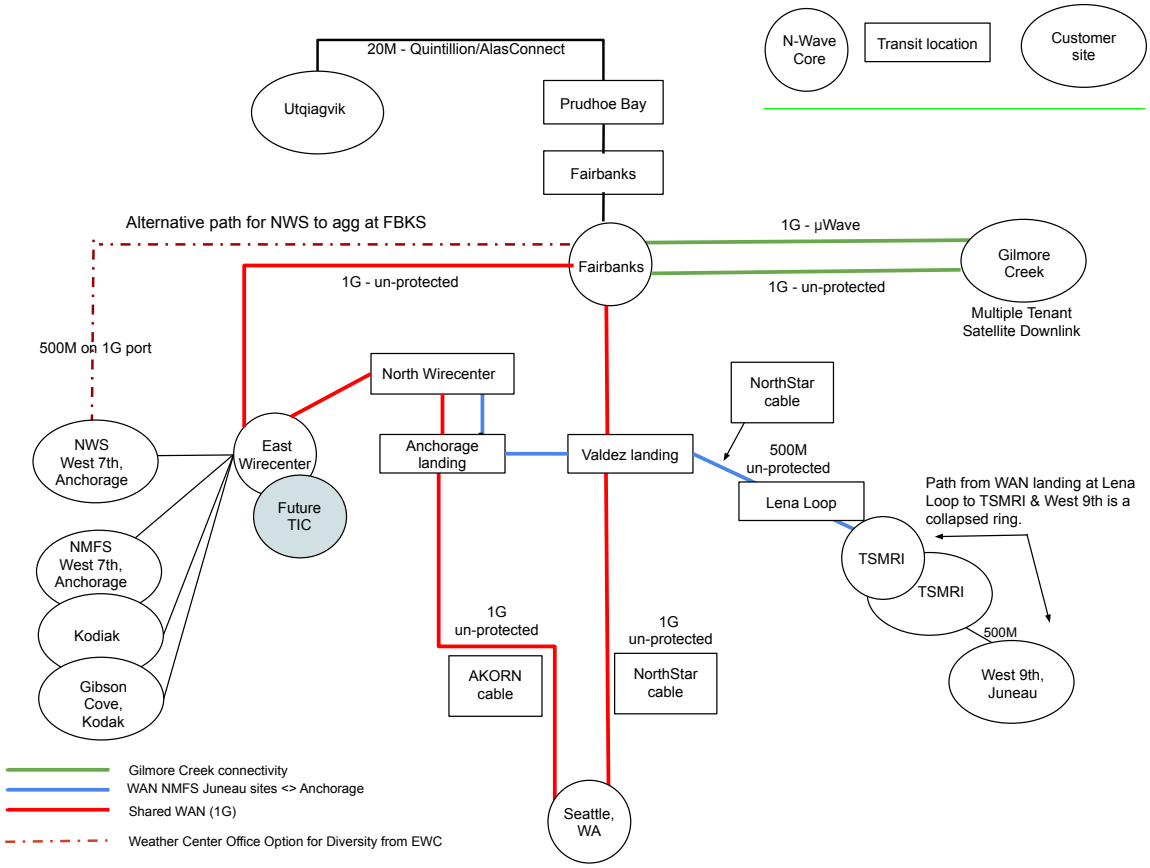
NOAA faces the continued challenges of enabling high-speed network access at remote field sites across the U.S.—connectivity that is required to ensure scientists and engineers have access to the resources needed to propel the blue and green economies, advance research on climate change, and achieve multiple life and property missions. Among the most difficult-to-reach locations is the Alaska region, where the sheer size of the state and its limited infrastructure combine to make stable, high-speed, cost-efficient connectivity a significant challenge.

To improve this network landscape, N-Wave and its partners in the region initiated the Alaska Shared Network Infrastructure project at the start of FY21. With new network points of presence in Anchorage and Fairbanks, new fiber in Utqiaġvik, and new circuits extending south to Juneau and west to Kodiak, the project will directly benefit science and operations across all NOAA Line Offices.

Since the last edition of the N-Wave Newsletter, significant progress has been made on the Alaska project. This includes the planned addition of a Trusted Internet Connection Access Point (TICAP), refinement of the wide area network (WAN) architecture and completion of initial site surveys for new N-Wave customers in Alaska.

New Alaska TICAP to Reduce Latency

NOAA Cyber Security and N-Wave will endeavour to repurpose the TICAP at Dallas-Fort Worth, TX, to the N-Wave aggregation site at the Alaska Communications East Wire Center (EWC) in Anchorage. Due to Alaska's remoteness, adding a TICAP in Alaska will significantly reduce network latency for customers in the state—as the TICAP in Honolulu has benefitted customers in Hawaii. This new resource could also help other federal partners in the state. Service at the Dallas-Fort Worth TICAP site was turned down on March 31, 2021. The install date for the Alaska TICAP is yet to be determined.



This diagram shows the current architecture for the Alaska Shared Network Infrastructure project.

WAN Architecture Refinements Focus on Redundancy

In light of new information, N-Wave has

updated the architecture for WAN aggregation sites, network circuits to CONUS and customer site connectivity. In the previous iteration of the network design, the WAN aggregation sites were at the EWC in Anchorage and the Federal Building in Juneau. In the new design, the Anchorage aggregation site will remain, but Fairbanks will replace the Juneau location. Based on existing fiber paths, the move to Fairbanks will provide better redundancy to all N-Wave Alaska region participants.

The new WAN connectivity will be made up of three 1 gigabit per second (gbps) circuits: Fairbanks to Seattle, WA, Fairbanks to Anchorage and Anchorage to Seattle. The two connections to CONUS use different submarine cables, thereby providing diverse paths between Alaska and CONUS. The three circuits will initially be 1 gbps committed information rate (CIR) on 10 gbps physical interfaces at each location, with procurement options to go to 2 gbps CIR if customers require additional bandwidth.

Augmenting Customer Connectivity

Plans for customer connectivity remain relatively the same since last fall, except in the Juneau area. Previously, the Juneau Federal Building was going to be both an aggregation site and a customer site supporting the National Marine Fisheries Service (NMFS) Alaska Regional Office, which would then feed the Alaska Fisheries Science Center's Ted Stevens Marine Research Institute (TSMRI). With the new architecture, TSMRI will be fed directly from the Anchorage aggregation point and will then provide connectivity to the Juneau Federal Building as a spur off of the TSMRI connection. The connectivity from Anchorage to TSMRI will be 500 mbps, with the spur to the Juneau Federal Building also at 500 mbps. The TSMRI site will become a mini aggregation site for that office and the Juneau Federal Building. It will also be able to support other NOAA facilities in the Juneau area.

Other customer connectivity changes are in progress in Alaska. A 1 gbps microwave link from Gilmore Creek to Fairbanks is being added to provide redundancy for the current 1 gbps fiber-based circuit that supports the National Environmental Satellite, Data, and Information Service (NESDIS), its international partners and other U.S. agencies. In Utqiaġvik, the northernmost city in the United States, a fiber project is underway to replace the existing infrastructure with a new fiber path across the tundra, away from the Arctic Ocean and any beach erosion. The project will increase the resiliency for NESDIS and the Earth System Research Laboratories' Global Monitoring Division.

NMFS and N-Wave Partner on Virtual Site Surveys

To prepare customer sites for the upcoming installs, N-Wave worked with NMFS to virtually conduct the requisite site surveys. While virtual site surveys have been done in the past, COVID travel restrictions made them essential in this case. Customers provided information on power, space, cooling and cabling, which gives N-Wave a better understanding of the site status and any required modifications. Equipped with information about rack locations, cabling requirements, power cables needed and more, project leads and engineers can coordinate related work in parallel to the circuit order and installation, ultimately expediting the install process.

Next Steps in Alaska

Circuits and hardware for the Alaska project have been procured. Once the circuits are installed and the hardware has arrived, N-Wave and the Arctic Slope Telephone Association Cooperative (ASTAC) will begin installing the aggregation hardware at Anchorage and Fairbanks. N-Wave has contracted ASTAC for installation services at aggregation and customer sites in Alaska. ASTAC will rack and mount equipment, provide hands and eyes support to ensure services are working as expected, and make future repairs as needed.

Network Changes and New Participants

(November 1, 2020 – March 31, 2021)

NOAA's Information Technology Center (ITC) Relocation – Ashburn, VA, and Largo, MD

N-Wave assisted in the relocation of the ITC, including the Commerce Business System, by removing all network equipment from the Largo facility and installing needed cabling and equipment at the Enterprise Data Center (EDC) in Ashburn.

National Ocean Service (NOS) Data Center Equipment Relocation – Ashburn, VA, and Silver Spring, MD

N-Wave worked with NOS to move equipment for the Center for Operational Oceanographic Products and Services and the Office of Coast Survey from the Silver Spring Metro Center (SSMC) to the EDC in Ashburn. This completed NOS's hardware migration to EDC. Following this relocation, the former SSMC4 data center will be converted into staff office space.

Campus Core Move to the Boulder Compute Facility (BCF) – Boulder, CO

N-Wave completed a project to move the N-Wave Boulder campus backbone network equipment from the National Institute for Standards and Technology (NIST) building to the new BCF. Existing fiber connectivity was also migrated from the current connections in the NIST building to the BCF. The change ultimately provides better environmentals for the campus backbone switches and supporting devices.

National Telecommunications and Information Administration (NTIA) Trusted Internet Connection Access Provider (TICAP) Services – Boulder, CO, Gettysburg, PA, and Washington, D.C.

N-Wave migrated NTIA from its previous commercial internet service to the N-Wave Internet/TICAP service. The migration included services at NTIA's offices in Boulder, Gettysburg and at the Herbert C. Hoover Building in Washington, D.C.

Office of Satellite and Product Operations (OSPO) Mission Segment LAN (MSL) – College Park, MD, Suitland, MD, and Wallops Island, VA

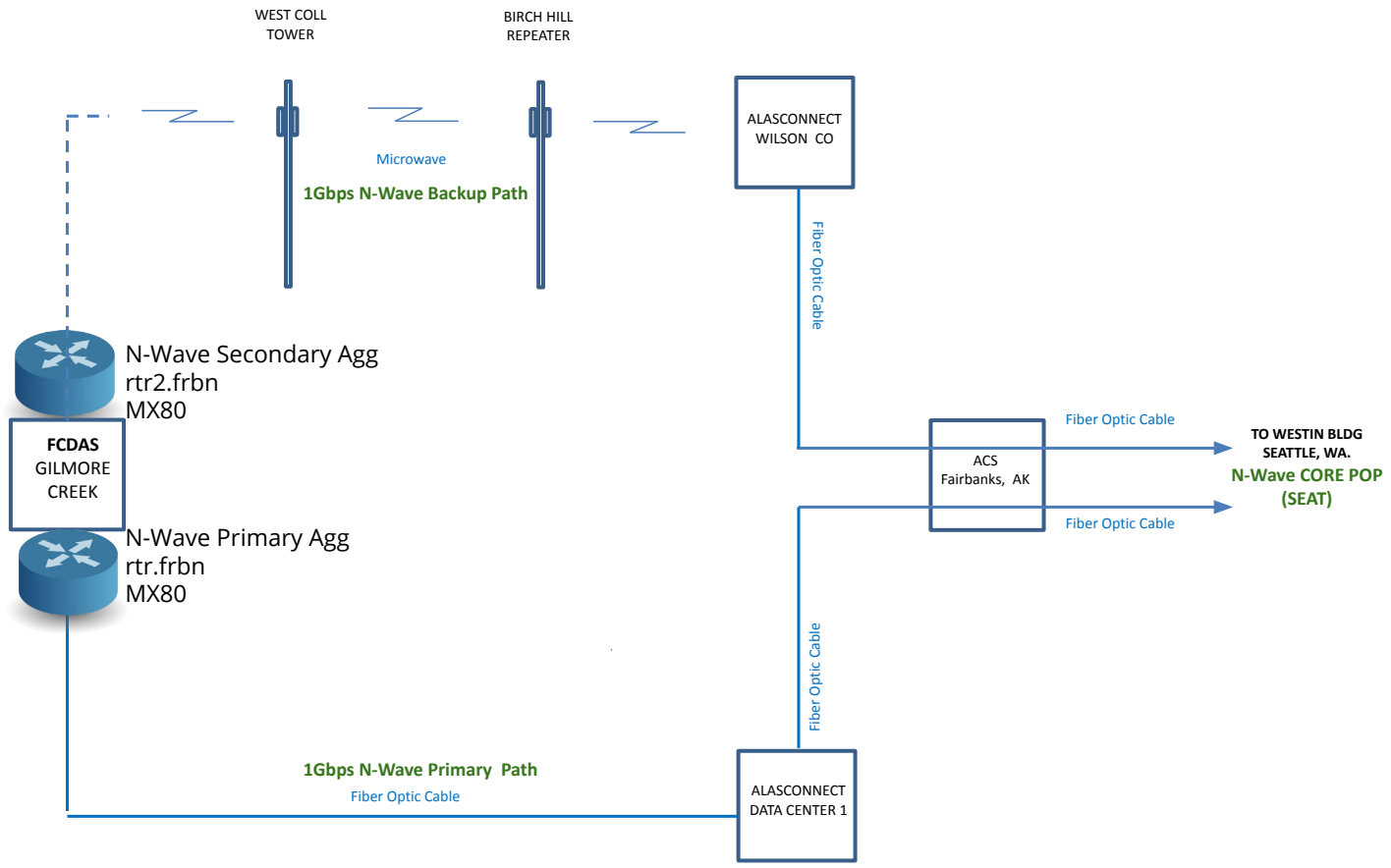
N-Wave provisioned 1 gbps private virtual routing and forwarding (VRF) connections for MSL at the NOAA Satellite Operations Facility in Suitland, NOAA Center for Weather and Climate Prediction in College Park, and Wallops Command and Data Acquisition Station on Wallops Island. OSPO's MSL provides IT resources to support multiple NOAA satellite missions including GOES, POES and others.

Office of Chief Financial Officer (OCFO) Site Transition – Germantown, MD, and Silver Spring, MD

N-Wave worked with the OCFO and the Office of the Chief Information Officer's Service Delivery Division to turn down the OCFO office in Germantown, MD. N-Wave removed all equipment from this site and helped transition the office to NOAA's Silver Spring campus.

Fairbanks Command and Data Acquisition Station (FCDAS) Microwave Backup – Gilmore Creek, AK

N-Wave implemented a 1 gbps microwave backup link for the NOAA FCDAS facility in Gilmore Creek. To maximize diversity for the current fiber path that connects the Gilmore Creek site to the N-Wave backbone core site in Seattle, WA, the local circuit vendor delivered the microwave path from Gilmore Creek to the long-haul provider's point-of-presence in downtown Fairbanks. This change meets the redundancy requirements for current and upcoming satellite missions for the satellite data downlink and commanding ground station.



Diverse network path for the Fairbanks Command and Data Acquisition Station.

Center for Operational Oceanographic Products and Services (CO-OPS) 100 Mbps WAN – Gulf Breeze, FL

N-Wave worked with the National Ocean Service's CO-OPS to move its Gulf Breeze office from a commercial MiFi connection to a 100 mbps WAN connection on N-Wave.

National Weather Service (NWS) Western Region Headquarters (WRH) Router Install – Salt Lake City, UT

N-Wave installed a router at NWS's WRH. This install was needed to enable N-Wave to transport multiple VRFs to the site to support additional services. The new router also extended N-Wave monitoring of the existing Denver to Salt Lake City circuit from the Denver core node to the WRH office.

New Managed LAN Service Deployments

- NOAA Enterprise Data Center – Fairmont, WV
- Office of Marine & Aviation Operations (OMAO) Ship Fleet Support System – Gulfport, MS
- Office of the CIO Service Delivery Division
  - Richard Bolling Federal Building – Kansas City, MO
  - Federal Building – Norfolk, VA
  - Western Regional Center Closed-Circuit Television (CCTV) System – Sand Point, WA

New Enterprise Wireless Service Locations

- OMAO Ship Fleet Support System – Gulfport, MS
- OMAO Marine Operations Support Facility – Middleton, RI
- NWS's WRH – Salt Lake City, UT

Internal Network and Service Improvements

AirWave Moved to Virtual Environment

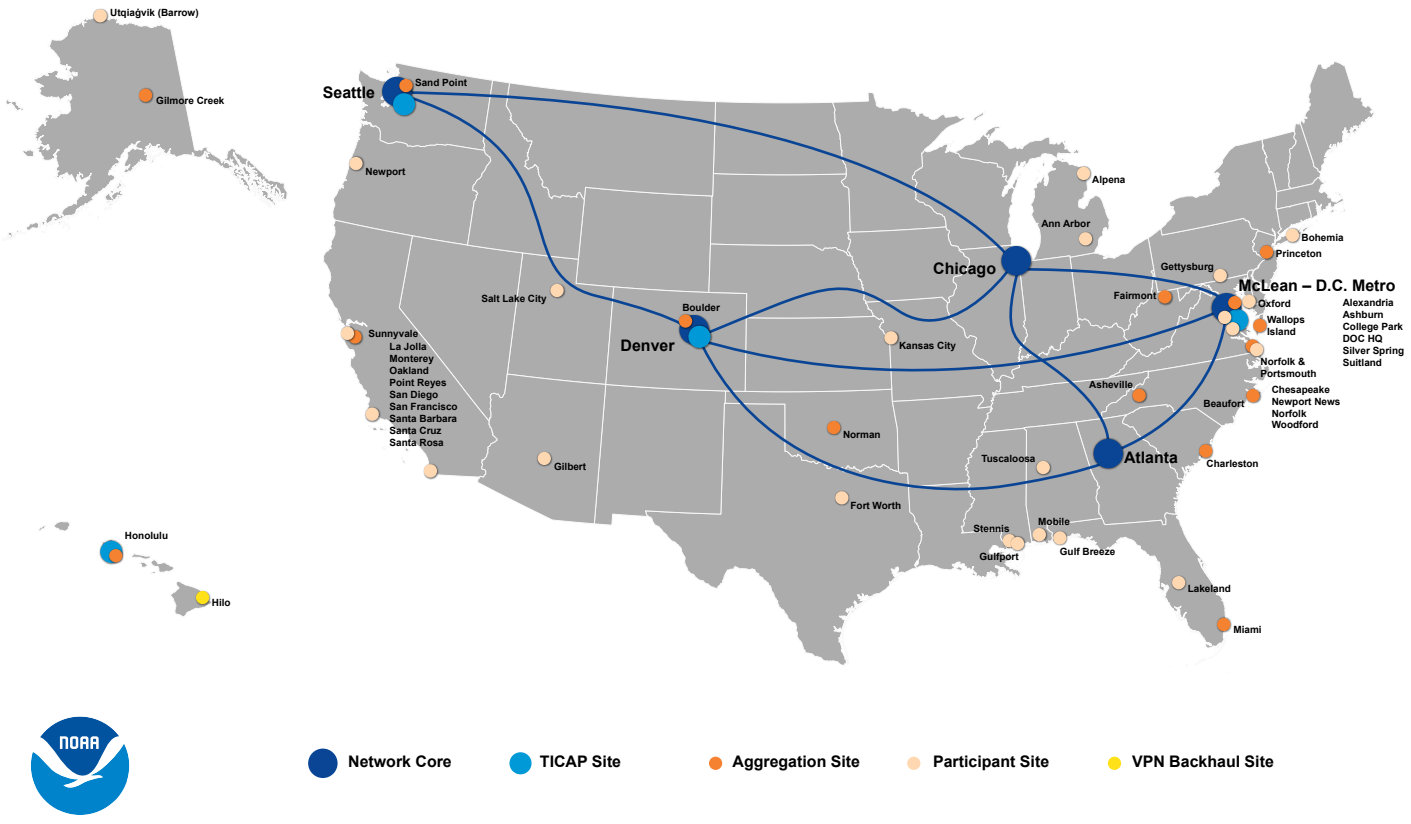
N-Wave uses the Aruba AirWave network management system to monitor the wireless environment and provide access point layout heat maps for customers of N-Wave's Enterprise Wireless service. This tool was migrated from dedicated hardware to the GlobalNOC's virtual environment, thereby providing better resiliency.

Infoblox Equipment Upgrade

Infoblox is one of the tools N-Wave uses for IP address management. N-Wave replaced end-of-life Infoblox equipment in Boulder with new hardware.

New Wireless Lab

N-Wave set up a wireless lab in Boulder. This will be a testing facility for new hardware, software and configurations before they are deployed to the Enterprise Wireless service.



N-Wave Enterprise Services Updates

(November 2020 – March 2021)

For many, the pandemic has caused a major shift in perspective regarding both the challenges and opportunities associated with a remote workforce. As the COVID-19 pandemic recedes, we will get a better understanding of how the abrupt changes of the last year will impact the workplace going forward. Whether a large telework presence remains the new normal or employees gravitate back to on-site work—or perhaps more likely a combination of the two—N-Wave is in a unique position to provide network services that continue to meet the needs of the enterprise.

Enterprise Remote Access VPN (ERAV)

ERAV Supports Mass Telework
ERAV continues to support the mass telework policies put in place by the Department of Commerce and NOAA. While maintaining the service for current needs, N-Wave is also continuously looking at ways to improve the service to meet the future needs of its stakeholder community.

Reminder About CAC Modernization Impacts on ERAV
As many are aware, new Common Access Cards (CACs) are being issued with 16-digit UPNs in place of the previously used 10-digit UPNs. ERAV supports either. Before renewing their CACs, ERAV users should work with their VPN administrators to submit an N-Wave request to update their ERAV accounts ahead of time. An account can be set up for a 16-digit UPN before a new card is issued, while continuing to work with the current CAC in the meantime. This minimizes the risk of any impacts and ensures a seamless transition when a user receives a new card.

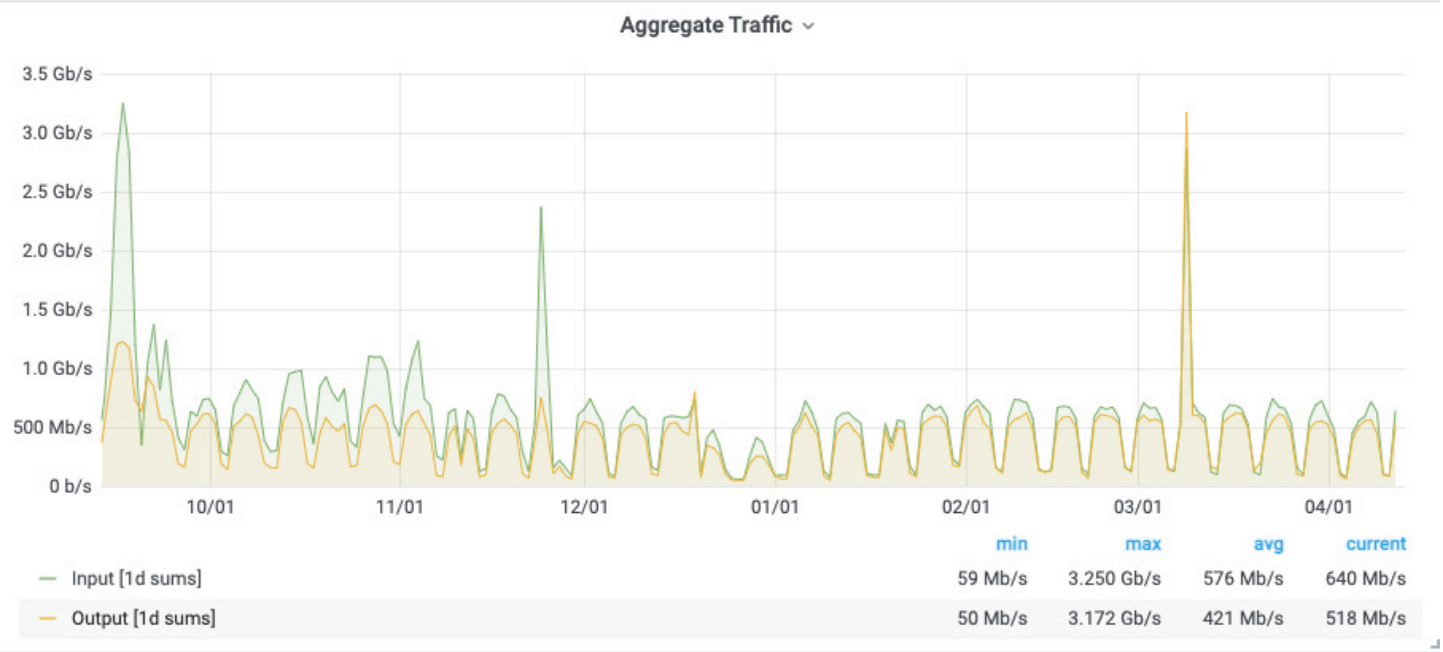
NOAA Announces New eVPN Standard
The NOAA Cyber Security Center (NCSC) and N-Wave recently collaborated to develop a new Enterprise Virtual Private Network (eVPN) Standard. As it stands today, the ERAV service complies with the majority of the standard's requirements. N-Wave engineers are working to implement changes to the service in regard to client posture enforcement and posture check logging within the next year to reach full compliance. All other existing VPN solutions across the NOAA enterprise must also be compliant with the standard by March 2023. All new deployments must be compliant upon launch. N-Wave's goal with its enterprise solution is to provide a compliant VPN service that Line and Staff Offices can readily utilize, reducing any barriers or burden involved in meeting the standard.

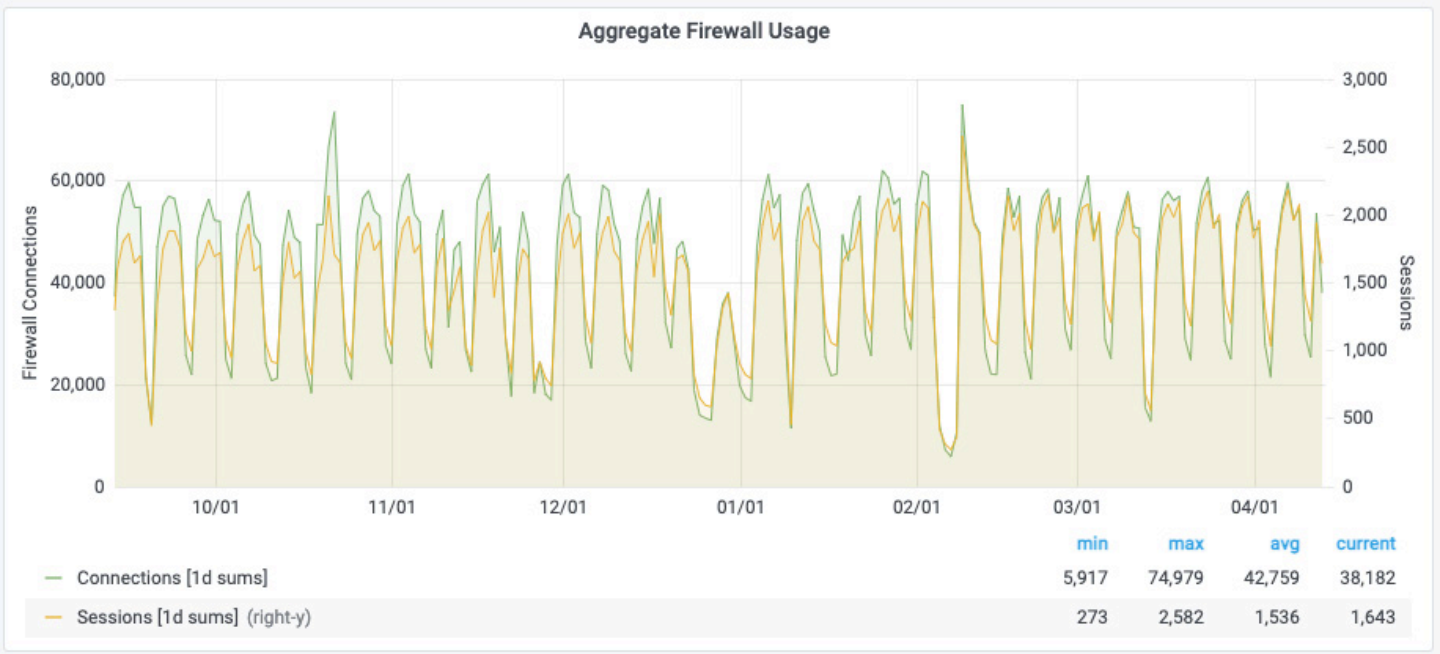
50+ VPN groups

All **6** NOAA Line Offices and **1** other federal entity use ERAV

7,000+ registered users

The table on page 12 outlines ERAV's current compliance status for each requirement of the eVPN Standard. NOAA employees can access the complete standard on the NOAA Cyber Security Division website.





Aggregate usage and traffic on N-Wave's VPN services. With continued mass telework across the agency, these services remain key mechanisms for providing access to NOAA and DOC internal resources.

eVPN Standard Requirement	ERAV Service Compliance Status
Identification and Authentication	ERAV meets all requirements: •HSPD-12 compliant authentication •Acceptance of system use prior to login •Account lock after three failed attempts •Certificate revocation
Authorization	ERAV meets all requirements: •Least access •Access based on centralized authorization source
Client Posture Enforcement	ERAV changes required to reach full compliance: •Restrict access to GFE only via technical controls (ERAV currently restricted by policy only) •Validate security posture before authorizing remote connection •Clients that fail must be restricted to certain resources
Configuration Parameters and Architecture	ERAV meets all requirements: •Prohibit split tunneling •Use FIPS 140-2 encryption algorithms •Maintain favorable assessment with DOC and NOAA
Mandatory Logging	ERAV is currently compliant, except for new posture check logging: •Generate audit logs for the following types of events: • User identification and authentication • VPN client IP address assignment • Established connections • Attempted connections • Session timeouts • Security posture checks •Include the following event log information (where applicable): • VPN client origination IP address • VPN client assigned IP address • VPN client hostname • VPN termination device IP address • VPN termination device hostname • Date / time (including timezone) • Associated username •Route all applicable audit logs to NCSC for monitoring and analysis
VPN Termination Device Registration	ERAV meets all requirements: •Register all devices that terminate inbound remote access VPN connections with the Security Operations Center

Enterprise Wireless

Wireless Deployed at New Sites, Despite Challenges During the Pandemic

COVID travel restrictions have led N-Wave to be creative in responding to customer requests for new Enterprise Wireless service deployments. While N-Wave engineers have been able to safely travel to complete some essential work (see p. 3, *N-Wave Engineers in the Field*), in other cases local staff are able to assist with installations and troubleshooting. This allows N-Wave to ship equipment for a customer self-install, an option that is viable only at small sites and in special circumstances. As an added benefit, the new approach has also led N-Wave to review and refine the install process to enable a non-technical person to complete it with remote guidance from N-Wave engineers—ultimately simplifying the process and improving documentation.

New Remote Access Point Solution for Field Sites

Remote access points (RAPs) are wireless access points that communicate back to centralized wireless controllers over the internet instead of via a private routing instance. N-Wave has successfully used this approach in a few test cases to meet specific customer needs and recently initiated a pilot project with National Weather Service's (NWS) Western Region Headquarters to provide RAPs to their Weather Forecast Offices. With both benefits and drawbacks, RAPs serve as the ideal solution in only some circumstances.

25+ service locations spanning the U.S.

15 states with service locations

1,000+ wireless access points

Benefits

- Uses any type of internet connection, with required static IP and Power over Ethernet.
- Provides Trusted Internet Connection compliant internet.
- Effective for micro sites that can use a VPN to access internal resources.
- Fast to deploy for short-term or emergency situations.
- Can be converted to a campus AP remotely if and when the site deploys N-Wave's Managed LAN service.

Drawbacks

- No roaming between APs.
- Requires a static public IP address.
- Allows less visibility into service issues.
- Requires more customer hands and eyes for troubleshooting.

Credit: NOAA Okeanos Explorer Program

Managed LAN

Maximize the Benefits of Multiple Enterprise Services

Managed LAN—a service that customers often deploy last from N-Wave's catalog—is an anchor that allows customers to maximize the benefits and realize the full complement of N-Wave services. Managed LAN provides a single entry point into WAN and LAN connectivity, wireless access and VPN services. As a result, N-Wave teams have end-to-end visibility to configure devices, resolve issues and enhance services. Switches reside inside the N-Wave FISMA boundary and are capable of supporting multiple services and tenants. At smaller sites where wireless service has already been deployed, Managed LAN can often be deployed without any additional hardware. Similarly, adding wireless is easy at sites where N-Wave managed switches are already deployed.

Rapid growth for the Enterprise Data Center

NOAA's Enterprise Data Center (EDC) continues to expand its footprint. Taking advantage of N-Wave's Managed LAN service has allowed the EDC team to quickly grow site-to-site. Expanding connectivity between two sites on Managed LAN requires just a single ticket to the N-Wave NOC. This kicks off the behind-the-scenes work among multiple teams configuring different parts of the LAN and WAN. Troubleshooting is simplified and the overall customer experience improves. EDC and N-Wave continue to work together to compliment each other's services and ensure both groups can meet the growing needs of NOAA and DOC.

Converged Networks Lead to More Agility

With a converged network, any service can be delivered to any part of the network. At some of the campuses where N-Wave provides managed LAN to a single tenant, the service has grown to reach multiple tenants while using the same physical hardware—ultimately freeing up fiber, cooling, power and rack space. This is extremely valuable at larger campuses, where moving office space and network access during renovations, repairs or restacking can become as simple as just reconfiguring the ports. Alternatively, in an environment where everyone runs their own separate networks, such moves often require major network changes to move hardware devices to new closets and extend cabling.

For example, if two Line Offices switch floors in SSMC, both need to change their physical architecture, move equipment, patch new fiber paths, etc. If both were using Managed LAN, a ticket to N-Wave prior to the move to reconfigure the ports would be all that is needed. Then staff could move all at the same time or as they were ready.

10+ Managed LAN deployments

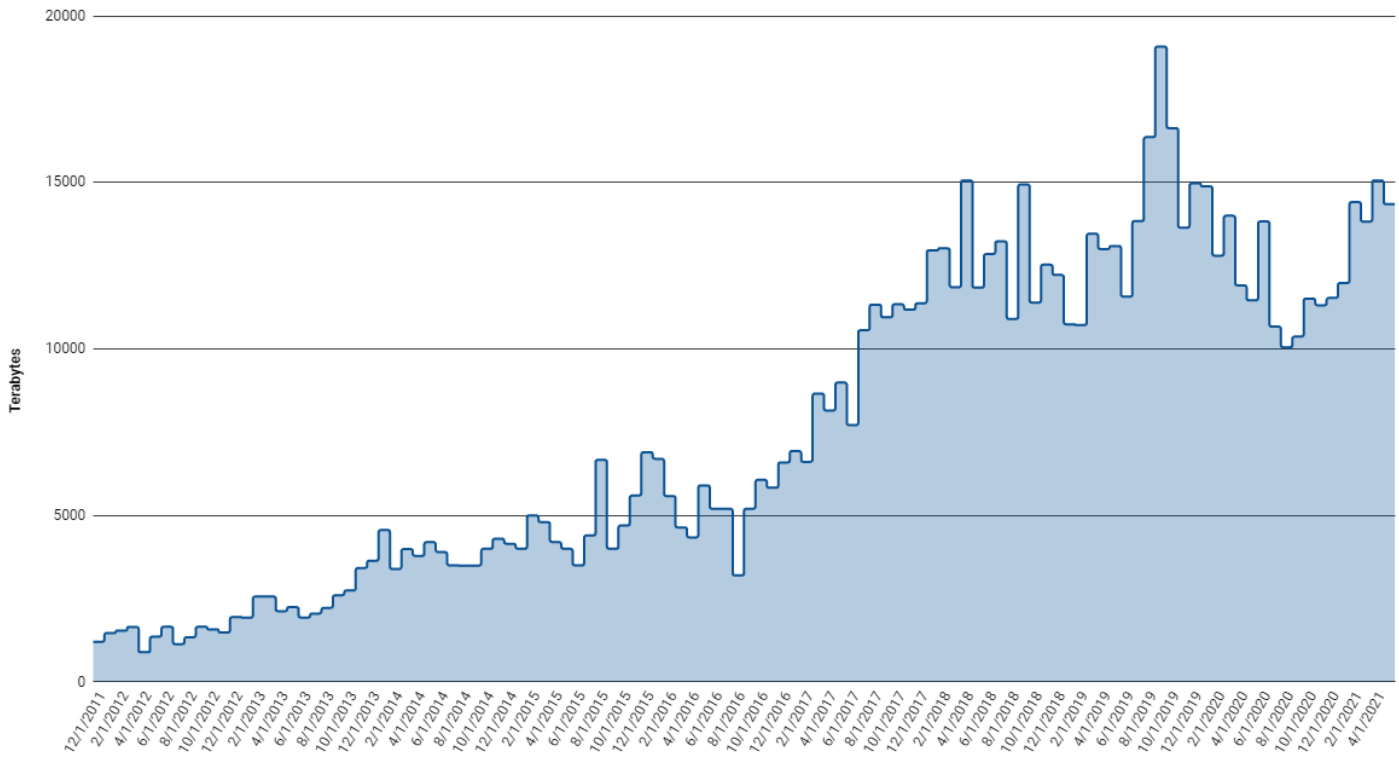
15+ additional sites use a form of the Managed LAN service in support of NOAA Enterprise Wireless

235+ switches deployed

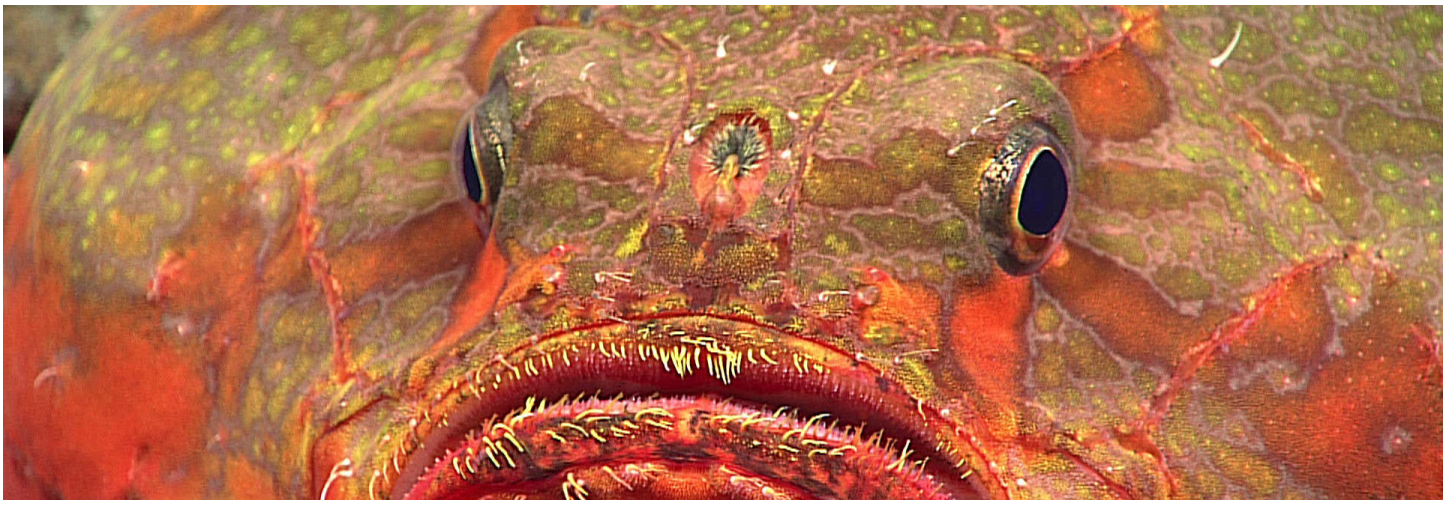
Credit: NOAA Okeanos Explorer Program

N-Wave Network Performance Metrics

Network Traffic (December 2011 – March 2021)



As the monthly traffic graph shows, N-Wave peak traffic has returned to a level last seen in late 2019. Among other factors, the growth reflects the multiple site turn-ups for current and new N-Wave stakeholders (see p. 7, *Network Changes and New Participants*). As mentioned in last fall's issue, N-Wave is developing a revised metrics collection system to more accurately reflect the changing traffic patterns that result from the inclusion of more Department of Commerce bureaus and the NOAA workforce's embracing of maximum telework. This is continuing with the expectation of completion this fall.



Credit: NOAA Okeanos Explorer Program

Network Operations Center Metrics and Updates

(October 2020 – March 2021)

Credit: GlobalNOC at Indiana University

N-Wave partners with the GlobalNOC at Indiana University to provide advanced network operations, offering support 24 hours a day, 365 days a year. N-Wave NOC support includes tier I, II and III engineering, along with monitoring, measurement and analysis.

Support metrics gathered from October 2020 through March 2021 indicate that the N-Wave NOC opened 12,640 tickets. That number encompasses all incidents, service requests, change and maintenance events, and customer communication records, such as individual phone calls and incoming and outgoing email correspondence of the NOC. Service requests (18%) and communication records (61%) make up the bulk of those tickets, while incidents and changes account for only 11% of tickets.

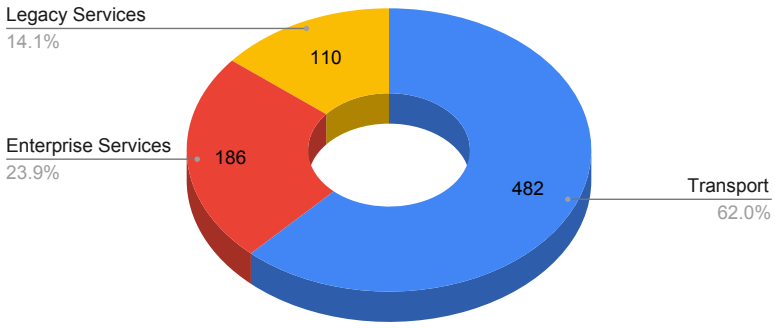
Trends in Requests and Incidents

The trend line for customer requests is increasing, indicative of N-Wave's continued growth as it extends services to new sites and customers. Even with this growth, the trend line for incidents remains nearly flat—reflecting operational stability and network resiliency.

The Active Requests metric shows the trend of all catalog tasks active on any given day.

The Active Incidents metric shows the trend of all incidents active on a given day.

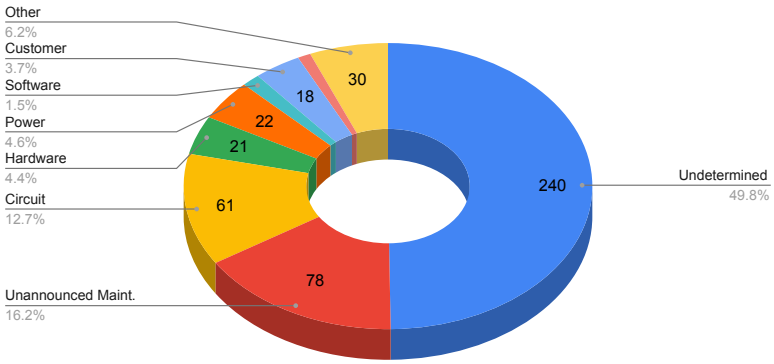
Incidents by Service Portfolio



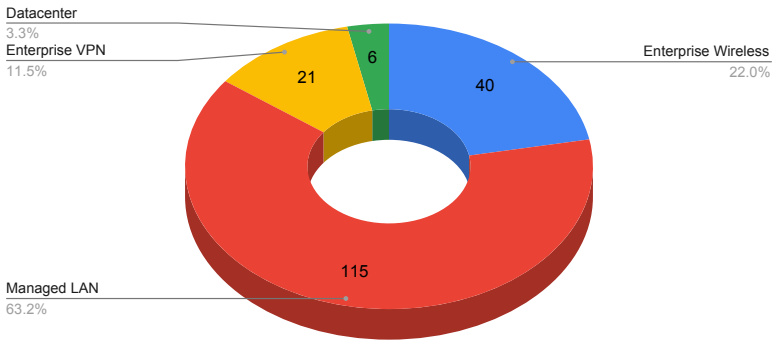
This represents 778 total incidents, broken down by service portfolio: N-Wave Transport, N-Wave Enterprise Services and NOAA Silver Spring Legacy Services.

Transport Incidents by Category

This shows the 482 total Transport incidents, broken down by category. Undetermined incidents mostly comprise very brief, mainly non-customer-impacting observed outages for which a vendor is not able to determine the cause. Unannounced maintenance events typically occur when customers or providers do not announce the maintenance to N-Wave. Circuit incidents are outages caused by fiber damage, bumped fiber, vandalism or cut fiber.



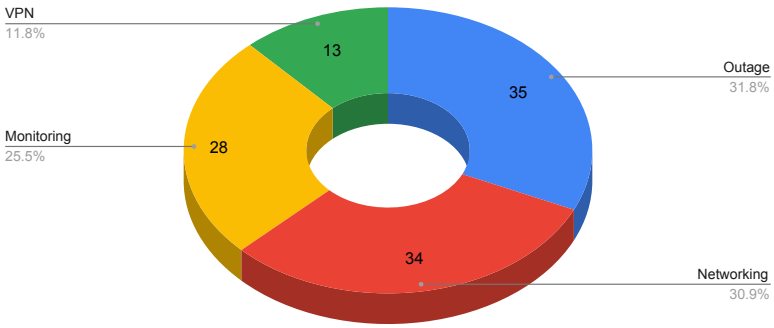
Enterprise Services Incidents



This shows the 186 total incidents related to N-Wave Enterprise Services, broken down by specific service: Datacenter, Enterprise Remote Access VPN (ERAV), Enterprise Wireless and Managed LAN.

Legacy NOC Incidents by Category

This shows the 110 total incidents related to NOAA Silver Spring Legacy NOC, broken down by category: Outage, Networking, Monitoring and VPN.



Recap: First N-Wave JETI Meeting

More than 80 attendees participated in the inaugural N-Wave Joint Engineering and Technical Interchange (JETI), marking a successful and collaborative launch of this annual technical community event. Due to COVID-19, the meeting was held virtually December 1-3, 2020.

JETI emerged as part of a new direction and decision to indefinitely pause the NOAA Networking Committee (NNC). One of the goals of the NNC was to provide a principal technical forum for providing management and direction for the evolution of NOAA's enterprise IT networks, but a new vision was needed for a broader-reaching interchange among the technical community. As a result, JETI was conceived as a new annual workshop held for network engineers and technical staff who operate and design NOAA and Department of Commerce (DOC) networks. It is intended to serve as a forum for the exchange of technical updates across NOAA Line and Staff Offices, DOC Bureaus and N-Wave's network partners and provide a much deeper technical focus than what is discussed at the N-Wave Stakeholders Summits.

With 22 unique sessions spanning three days, and a 12-5 p.m. EST window to accommodate the time zones in which DOC Bureaus operate across the United States, the JETI agenda yielded a fast-paced meeting. The speakers included representatives from NOAA Line and Staff Offices, as well as N-Wave's external partner organizations including the Department of Energy (DOE), Engagement and Performance Operations Center (EPOC) and Internet2. In light of the recent Office of Management and Budget (OMB) memo directing that all networks become IPv6 only, IPv6 was the main focus of the meeting. Other highlights from the program are provided in the sidebar and below. More information from the 2020 JETI and upcoming events is available online:

- Public access: https://www.noaa.gov/n-wave-jeti
- Internal event site (registration or NOAA Google account required): https://sites.google.com/noaa.gov/nwave-jeti/

Engagement and Performance Operations Center (EPOC) Application Deep Dive

Jason Zurawski, a science engagement engineer at DOE's ESnet, provided insight into the EPOC Application Deep Dive process. The Deep Dive approach is based on an almost 10-year practice used by ESnet to understand the growth requirements of DOE facilities. Deep Dives aim to understand the full science pipeline for research teams and suggest alternative approaches for the scientists, local IT support and national networking partners as relevant to achieve the long-term research goals via workflow analysis, storage and computational tuning, identification of network bottlenecks, etc.

N-Wave is actively looking for NOAA programs to engage in an Application Deep Dive. Anyone looking to help their scientists conduct their research easier, faster and safer should contact nwave-jeti@noaa.gov so we can initiate an Application Deep Dive.

OMB IPv6-Only Mandate
Nick Buraglio, a network engineer from the Planning and Architecture team at DOE's ESnet, provided insight into the recently signed OMB memo on completing the transition to running IPv6-only networks. Opposed to prior OMB memos on IPv6, the current memo is multi-step and designed to be more complete than the previous IPv6 deployment strategies. Nick highlighted some key takeaways from the memo:

- No later than FY 2023, all new networked Federal information systems are IPv6-enabled prior to being made operational.
- Complete at least one pilot of an IPv6-only operational system by the end of FY 2021
- Develop an IPv6 implementation plan by the end of FY 2021 to fully enable native IPv6 operation. The plan shall describe your transition process and include the following milestones and actions:
  - At least 20% of IP-enabled assets on Federal networks are IPv6-only by the end of FY 2023
  - At least 50% of IP-enabled assets on Federal networks are IPv6-only by the end of FY 2024
  - At least 80% of IP-enabled assets on Federal networks are IPv6-only by the end of FY 2025
  - Identify and justify all Federal information systems that cannot be converted to use IPv6 and provide a schedule for replacing or retiring these systems.

How to Get an IPv6 Only Network to Communicate with IPv4 Resources
Scott Hogg, CTO of Hexabuild, provided a live demo showing how to use DNS64 and NAT64 to enable clients on an IPv6-only network to communicate with resources that are only reachable over the legacy IPv4 network. Scott's demonstration of the configuration and operation of DNS64 and NAT64 on a variety of different platforms provided a clear pathway to enable IPv6-only networking before the internet has transitioned to fully supporting IPv6.

The demonstration spurred discussions about how N-Wave could possibly support the IPv6-only transition by initially testing and then deploying as a centralized resource DNS64 and NAT64 operations. One approach N-Wave is considering is to deploy an IPv6-only network, with the associated DNS64 and NAT64 resources, as a new WiFi network on the NOAA Enterprise Wireless Service. This would allow network engineers at sites where the wireless service is deployed to experience and test IPv6-only networking.

Credit: NOAA National Severe Storms Laboratory

Stakeholder Community Gathers Virtually for the 2021 N-Wave Summit

With ongoing care for the safety and well-being of our stakeholder community, N-Wave moved full steam ahead to host its 2021 N-Wave Stakeholders Summit virtually on February 23-25.

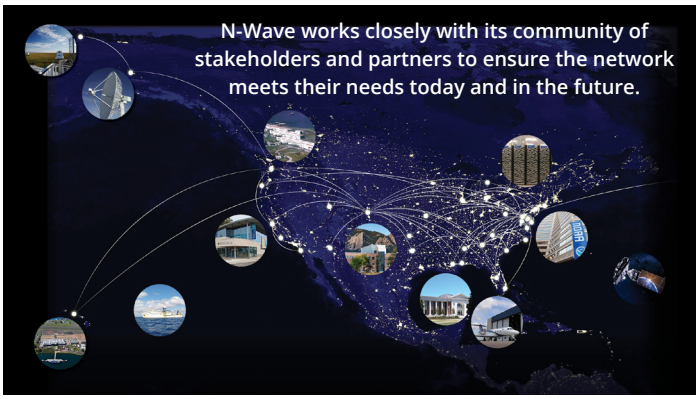
N-Wave's continuous objective is to cultivate collaborative partnerships with our stakeholder community to deliver services that meet their unique needs and provide the best possible customer experience. The annual Stakeholders Summit is just one of many ways N-Wave facilitates that open communication to gain a deeper understanding of community needs, including:

- What's happening within NOAA's science community and the other Department of Commerce bureaus today? What's anticipated 2-5 years out?
- How will science and requirements drive the next generation of instrumentation, products and services?
- How will those factors ultimately impact the network as a gateway for delivering data to the public and connecting scientists to the resources they need?
- How to continually improve the service provider-to-customer relationship within the federal government space?

This year's three-day event included 26 unique briefings by 43 speakers and panelists who contributed their insight and expertise to the program. More than 120 attendees participated in the virtual gathering, including stakeholders from NOAA and other Department of Commerce bureaus, along with N-Wave's partners from the science, research and education network community.

Commerce CIO Delivers Keynote on Technology Evolution

Among the program highlights, André Mendes, Chief Information Officer for the Department of Commerce, delivered a gripping, visionary keynote on how the evolution of computing technology mirrors biological evolution, with much shorter



N-Wave works closely with its community of stakeholders and partners to ensure the network meets their needs today and in the future.

intervals but much larger leaps expected now for the evolution of everything. His synthesis of future predictions provided an almost science-fiction-like image of reality, with massive opportunities for progress driven by unlimited processing, storage and bandwidth. The keynote set the stage for continued conversations throughout the event about the role of agility and adaptability in maintaining what's needed today while building for tomorrow.

IPv6 Panel Discussion Maps the Way Forward

A panel discussion on "Moving Forward with IPv6 on Internal Networks" brought together multiple perspectives from IT leadership in the federal space to share about their agencies' journeys and progress toward IPv6. Ron Broersma of the Department of Defense's Defense Research and Engineering Network moderated the discussion, and panelists included Roland Alexander of the Environmental Protection Agency, Ron Bewtra of the Department of Justice, Nick Buraglio of the Department of Energy's ESnet, and Scott Morizot of the Internal Revenue Service. Both Ron Bewtra and Ron Broersma are also part of the Federal IPv6 Task Force. The panel unpacked commonly perceived barriers, shed light on the major challenges and key contributors to success, and distilled lessons learned that can be applied within other organizations. Takeaways from the

discussion included:

- Understand that executive support and organizational commitment are the most significant keys to success for deploying IPv6.
- Cultivate relationships with vendors who can help resolve issues and make progress.
- Realize that IPv6 is not just a network program, but rather requires a community approach.
- Develop an implementation plan as early as possible to set realistic milestones and allow for speed bumps in the process.

These takeaways are invaluable as the Department of Commerce and its bureaus move forward with efforts to complete the transition to IPv6-only networks (OMB M-21-07). The migration to IPv6-only will also be discussed extensively at the upcoming N-Wave Joint Engineering and Technical Interchange (see p. 25).

Continuing the Conversation

Thank you to all who participated in the virtual 2021 N-Wave Stakeholders Summit! A special thanks to the speakers and panelists who shared about upcoming initiatives that will drive network requirements and provided feedback that will contribute to better services in the future.

More information about the N-Wave Stakeholders Summit is available at https://noc.nwave.noaa.gov/nwave/public/events.html. To sign up for announcements regarding the 2022 N-Wave Stakeholders Summit, please email nwave-summit@noaa.gov.

Credit: NOAA/OAR/AOML/Hurricane Research Division

2021 N-Wave Stakeholders Summit Program

Tuesday, February 23

- Welcome to the 2021 Stakeholders Summit
  Robert Sears, N-Wave
- Evolution of Technology
  André Mendes, Chief Information Officer, Department of Commerce
- N-Wave Transport Update
  Mark Mutz, N-Wave
- N-Wave Cloud Transport Update
  Dave Mauro, N-Wave
- N-Wave Services Updates: Service Catalog from 30,000 ft.
  Adam Nemethy and Michael Mankarious, N-Wave
- Institutional Examinations of Data Needs: EPOC Deep Dives
  Jason Zurawski, ESnet
- National Weather Service Central Processing and Dissemination
  Beckie Koonge, Michelle Mainelli and David Michaud, NWS
- NOAA's Research and Development HPC System Update on Big Data Initiatives
  Frank Indiviglio and Eric Schnepp, RDHPCS
- NOAA Big Data Program – The Cloud Gateway to NOAA Data
  Patrick Keown, Otis Brown, Jon ONeil and Jonathan Brannock, NOAA BDP

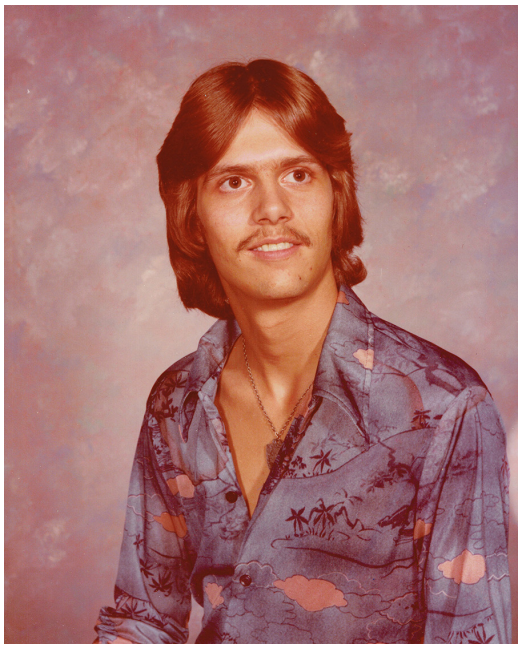
Wednesday, February 24

- N-Wave Customer Feedback Survey
  Robert Sears, N-Wave
- N-Wave 24x7 Service Desk, Tier 1 Support and Customer Service
  Jeremy Oakes, GlobalNOC
- N-Wave Security – A Stakeholder's Perspective
  Eric Estes, N-Wave
- TICAP Next Generation
  Chi Kang, NOAA Cyber Security Division
- Regional Partnerships and The Quilt
  Jen Leasure, The Quilt
- Regional Peering - MAX, FRGP, PNWGP
  Tripti Sinha, Mid-Atlantic Crossroads; John Hernandez, Front Range GigaPoP; and David Sinn, Pacific Northwest Gigapop
- NOAA Network-Related Initiatives in Alaska
  Walt Schleicher, National Environmental Satellite, Data, and Information Service; Daniel "Dune" Rothman, National Marine Fisheries Service; Per Pedersen, National Weather Service; and Brian Vasel, Office of Atmospheric Research
- NOAA Radio Frequency Management
  Ivan Navarro, Department of Commerce Office of Radio Frequency Management

Friday, February 25

- Panel Discussion: Moving Forward with IPv6 on Internal Networks
  Ron Broersma, DOD Defense Research and Engineering Network (Moderator); Roland Alexander, Environmental Protection Agency; Ron Bewtra, Department of Justice; Nick Buraglio, ESnet; and Scott Morizot, Internal Revenue Service
- IPv6 – Recap of Progress and Discussions at N-Wave JETI Meeting
  Alex Hsia, N-Wave
- Identity, Credential, and Access Management
  Jung Lee, NOAA OCIO Service Delivery Division
- NOAA Enterprise Infrastructure Solutions
  Jeff Flick, NOAA OCIO Service Delivery Division
- N-Wave Business Operations
  Ann Keane, N-Wave
- Migration to the N-Wave Managed LAN Service NCCOS and Enterprise Data Center
  Bill McMullen and Mark Mohs, NOS
- U.S. Patent and Trademark Office
  Deborah Stephens, Bob Simms and Sidney Thomas Sr., USPTO
- National Institute of Standards and Technology
  Rob Densock, NIST
- 2021 N-Wave Stakeholders Summit Wrap-Up
  Robert Sears, N-Wave

Long-time NOAA and N-Wave Employee Announces Retirement



John Kyler in 1976, the year he joined NOAA.

After more than 40 years supporting NOAA, the last eight of which he spent working with N-Wave, John Kyler announced his final retirement at the end of January 2021. In honor of his service and the integral role he played as a member of the N-Wave team, we asked John a few questions to reflect on his career supporting innovation in computing and networking across NOAA.

More than 40 years supporting NOAA—that is an impressive career span! Can you take us back to the earliest years of your career?

I joined NOAA in 1976 as a computer aid for the National Geodetic Survey (NGS) in Rockville, MD. I later became a programmer with NGS, and was able to claim and experiment with one of the first personal computers built by IBM. By the mid-80s, my office had acquired an IBM PC/AT boasting a 10MB hard drive and a 1.2MB floppy drive, which we used to create a network using serial ports and a multi-port piece of hardware called Multi-Link. The AT was the server and the PC dual floppy drives were the workstations. Before long, I upgraded the 10MB hard disk to 20MB. These were full-height drives, which were twice as tall as a CD-ROM drive. The upgrade cost around $2,500, and we had to trade in the 10MB drive.

When did your career path officially shift into networking?

In 1990, I accepted a role as a network administrator for the NOAA Office of Finance and Administration. A few years later, the NOAA consolidation into the Silver Spring, MD, campus was in its final stages. All of the campus buildings had Cisco routers installed vertically on every other floor, with a horizontal fiber network connecting the buildings. Most NOAA offices moving into these buildings brought their own networks with them, and they were still connecting to each other via metro area networks, often using commercial Fiber Distributed Data Interface (FDDI) network services. Believe it or not, that included connections between Line Offices in separate buildings and between Line Offices on different floors within the same building!

This caused the Line Offices to form a networking council to determine better ways to connect offices together. The council decided that the Cisco routers needed to be managed by a single entity under their purview. I was selected to manage the new Silver Spring Network Operations Center (NOC) in 1994, a role I filled for 15 years.

What came next and what eventually led you to N-Wave?

In 2008, I left the Silver Spring NOC and spent a few months supporting the National Weather Service network. Then I joined the NOAA CIO Budget Office, where I spent the next four years. The N-Wave network was built during that time, initially as an R&D network but designed for the enterprise, which was later migrated to a production network.

I retired from the federal workforce in April 2012 and joined N-Wave that July. My role was to provide hands and eyes for the N-Wave network in the Washington, D.C., area. Early on, it was easy to keep up with everything. But as you can imagine, once the DWDM metro ring was installed in 2015, the number of devices that required support seriously increased and kept me busy.

Congratulations on your retirement, John! Any final words to pass along as you look forward to the things you'll do and the places you'll go in retirement?

I cannot believe it has been over 40 years since I joined NOAA. I realize that many people may not enjoy going to work every day, but I was so lucky. PCs and networking came into play when I was pretty young, and NOAA gave me the opportunity to dive into them.

N-Wave Welcomes Three New Staff

Lucianna Gallegos has been hired as N-Wave's federal cyber security specialist. She provides support for security compliance, assists with ongoing Assessment and Authorization activities, and works closely with N-Wave engineers and the security team to analyze and mitigate risk. Lucianna joined N-Wave in April 2021 and is based in Boulder, CO. Her career background includes serving as a data center engineer for an investment banking company and data center technician for an information technology solutions company. She has a Bachelor of Science in computer information systems from the Metropolitan State University of Denver and served in the U.S. Air Force for five years, stationed at Joint Base Andrews in Maryland, Aviano Air Base in Italy and Osan Air Base in South Korea.

Gabriel Benjamin has been hired as a network engineer with the N-Wave enterprise network services team, providing support for Enterprise Wireless, Enterprise Remote Access VPN and Managed LAN services. Gabriel joined N-Wave in December 2020 and is based in Silver Spring, MD. His career background includes experience in network engineering, Windows administration and Voice over IP telephony. Prior to joining N-Wave, he supported the Amazon Web Services cloud migration at the Department of Homeland Security. Gabriel was raised in the Silver Spring area, and he attended Stevenson University where he played college football.

Richard OBrien has been hired as a network engineer, specializing in cloud transport and connectivity. Richard joined N-Wave in January 2021 and is based in Boulder. Most recently he worked as a network engineer at IBM, and his previous career was as a college music professor. Richard has a doctorate in choral music from the University of Colorado Boulder.

N-Wave Joint Engineering & Technical Interchange

The next fully virtual meeting of N-Wave's Joint Engineering & Technical Interchange (JETI) will be held August 3-6, 2021.

This is the second meeting in the annual series of workshops for network engineers and technical staff who operate and design NOAA and Department of Commerce (DOC) networks. The JETI community includes participants across six time zones from Washington, D.C. to Hawaii. To accommodate as much participation as possible, all sessions are single tracked with the exception of the IPv6 training on Tuesday.

While the agenda is still being developed as this issue goes to press, Tuesday will be dedicated to IPv6 training. Wednesday through Friday will include continuing discussions on the OMB IPv6-only mandate and updates on N-Wave's transport infrastructure, cloud services and enterprise services—Enterprise Remote Access VPN, Enterprise Wireless and Managed LAN.

More information about the event is available online:

- Public access: https://www.noaa.gov/n-wave-jeti
- Internal event site (registration or NOAA Google account required): https://sites.google.com/noaa.gov/nwave-jeti/

Date	Start and End Time	Agenda
Tuesday, August 3	11:30 a.m. – 5:30 p.m. EDT / 5:30 a.m. – 11:30 a.m. HST	IPv6 Training
Wednesday, August 4 - Friday, August 6	1 p.m. – 5:00 p.m. EDT / 7 a.m. – 11:00 a.m. HST	JETI Programming and Discussions

N-Wave Stakeholders Summit

The next N-Wave Stakeholders Summit is scheduled for the week of February 28, 2022.

For more information:
NOAA N-Wave Program
http://noc.nwave.noaa.gov
Office of the Chief Information Officer
https://www.noaa.gov/information-technology

Robert Sears, Director, N-Wave
Paul Love, Newsletter Coordinator
Holly Palm, Design and Layout
Amber Rasche, Editor

U. S. Department of Commerce
National Oceanic and Atmospheric Administration
N-Wave
325 Broadway
Boulder, CO 80305-3337