ISSUE
04
November
2014

N-WaveNews

this issue

From the N-Wave Science Network Manager P.1
N-Wave Organization P.2
N-Wave Network Performance Metrics P.4
Feature Articles P.6
Tickets Report February through September 2014 P.8
N-Wave Updates P.9

NOAA N-Wave

N-Wave is NOAA's science network. Built on partnerships and relationships among NOAA and the Academic and State research network communities, N-Wave connects researchers to the data and resources needed to advance environmental science.

Mission

N-Wave is committed to provide innovative networking capabilities with integrity, excellence, value, and flexibility, to enable NOAA's science and research through reliable high-performance networking.

Our Vision

A consolidated, agency-wide network resource that meets NOAA's research connectivity requirements and where appropriate, supplements NOAA's operational connectivity requirements.

From the N-Wave Network Manager

Four years ago, from the floor of the SC10 NOAA Exhibition booth at the Ernest N. Morial Convention Center New Orleans, N-Wave was officially announced as a NOAA networking resource. Therefore, it is by no coincidence that this edition of the N-Wave newsletter finds us once again heading to "The Big Easy" to engage with this community of high performance computing, networking, storage and analysis in which N-Wave has deep roots.

SC14 New Orleans, LA | hpc matters.

Within the N-Wave program, the past four years yields a unique story of opportunity, engineering excellence and cross-line office support that has allowed the N-Wave program to mature into its intended vision of providing networking services in support of NOAA's mission of science and service.

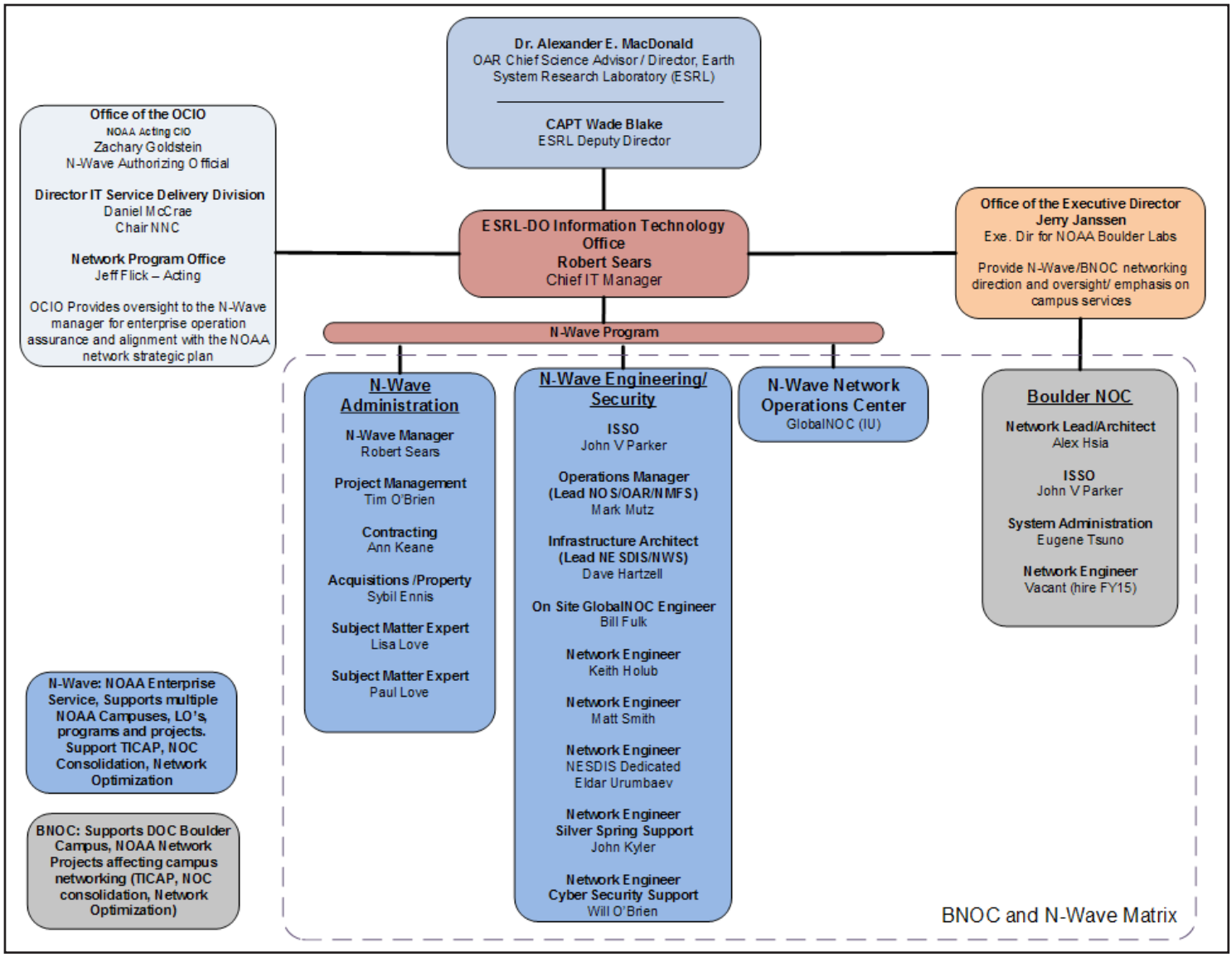
With this edition at our four-year anniversary, I would like to take a moment to convey the vitality of the N-Wave program by examining the organizational structure, partnering relationships and integration with NOAA leadership that has allowed intra-NOAA expertise to establish an enterprise networking resource. And of course we will also cover ongoing project, statistics and other great content with dazzling images to keep an interested eye!

Robert Sears
Network Manager

N-Wave Organization

N-Wave is an enterprise operational network that supports multiple NOAA line-office missions through a highly scalable, stable and secure national network infrastructure. The N-Wave network and program is managed by and operated within the NOAA Oceanic and Atmospheric Research (OAR) Line Office, Earth System Research Laboratory Office of the Director (ESRL-DO). From its inception, N-Wave has had a direct relationship with the Office of the Chief Information Officer (OCIO), which oversees and advocates for the program and ensures its alignment with NOAA-wide networking strategic goals. This approach has been an example of how to leverage and promote expertise within a line office in order to develop a sustainable enterprise service for NOAA-wide use.

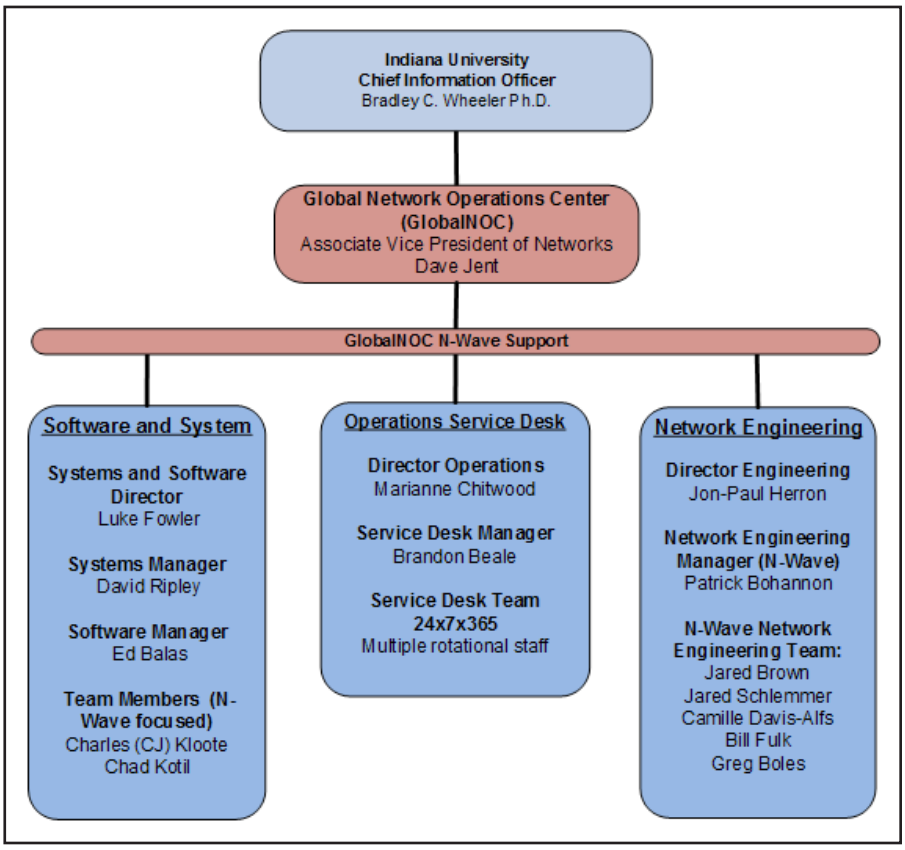
N-Wave's strength is derived from its administration and engineering teams, as well as its partnership and matrixed relationship with the Boulder Network Operations Center (BNOC). This arrangement allows for engineering expertise to be leveraged across N-Wave and the BNOC programs, and to support of NOAA-wide networking initiatives.



Within the organization, the N-Wave administration team is responsible for initiation of acquisitions, contract management (COR functions), budget execution and planning, resource allocation, project management, program and line office agreements, partnering relationships, and overall management of N-Wave. One relationship critical to N-Wave's success from origin is between N-Wave and the NOAA Acquisition and Grants Office (AGO), Strategic Sourcing Acquisition Division (SSAD), most notably through the direct support of Contracting Officer (CO) Michael Blumenfeld. Mr. Blumenfeld has established a talented team with broad contracting expertise that supports the NOAA High Performance Computing and Communications Program (HPCC) along with N-Wave. On Mr. Blumenfeld's team, contract specialists Franklin Miles, Craig Kurtz, Lowell Thomas, and Jack Mitchell have managed acquisitions for the N-Wave program over the years providing outstanding support ad continuity of operations.

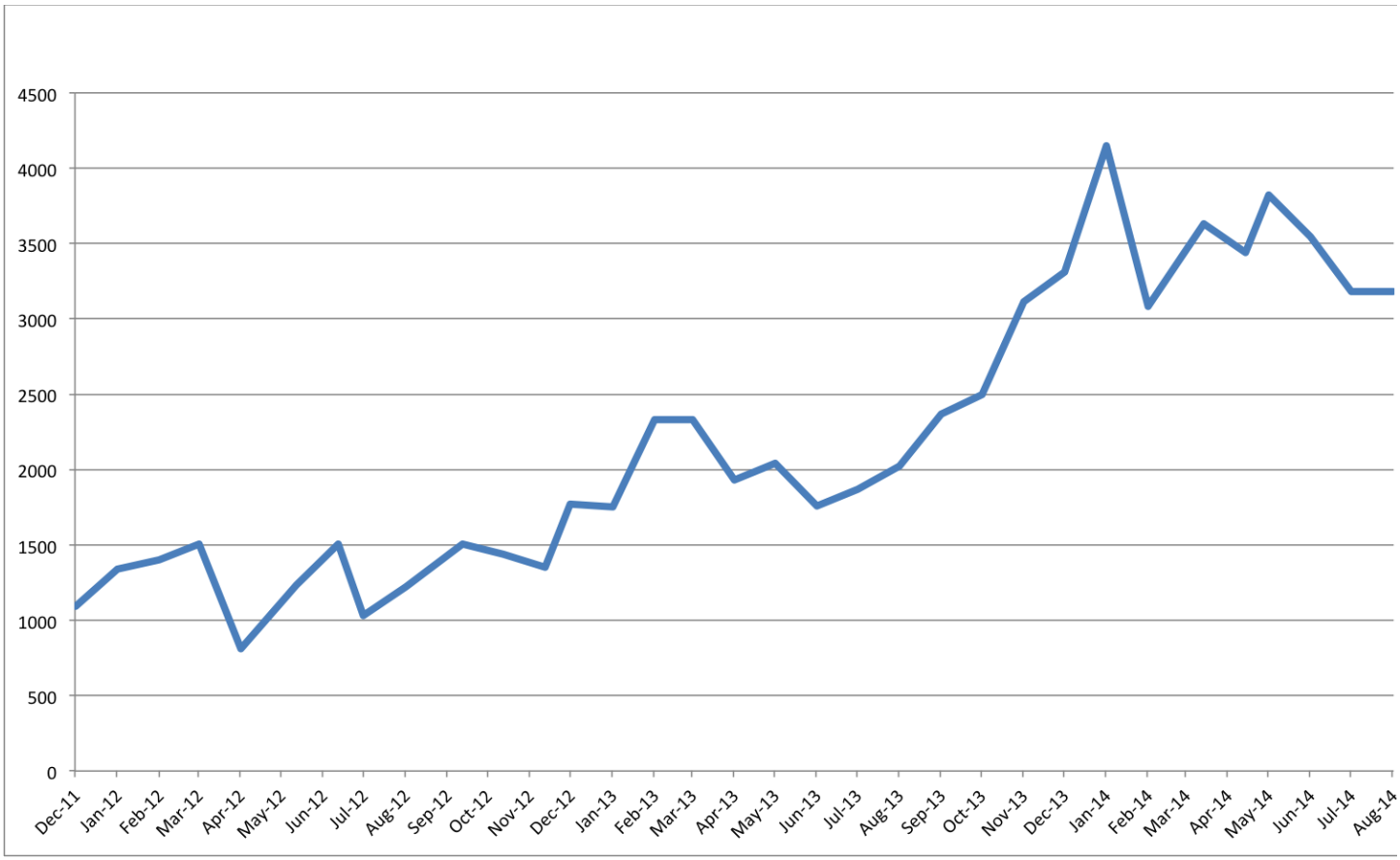
N-Wave's strength is derived from its administration and engineering teams, as well as its partnership and matrixed relationship with the Boulder Network Operations Center known as the (BNOC).

The N-Wave engineering team is comprised of high-caliber network engineers with expertise in architecture, assessment, design, customer onboarding, capacity planning, service inquiries and program security. Along with the administration team, the engineering team plays a key role in the establishment and ongoing development of NOAA's core competency for the N-Wave network, including defining and monitoring requirements to meet NOAA's advanced networking needs. Within the engineering team, some engineers are dedicated to directly supporting individual line offices and the NOAA Cyber Security Center (NCSC). Within the administration and engineering teams, members also work directly with the NOAA Networking Committee (NNC), the newly established NOAA Network Program Office and OCIO to support NOAA-wide networking initiatives, including network operations integration and standardization, and Trusted Internet Connection (TIC) projects.



Through both a contractual and partnering relationship, the Global Research Network Operations Center (GlobalNOC) at Indiana University provides carrier-grade operations, tools, and network expertise for N-Wave. Base services include a 24/7/365 service desk; Tier-2 and Tier-3 network engineering support; monitoring; measurement and visualization via advanced tool sets created directly by the GlobalNOC or well-established within the advanced research and networking community; system administration support; and full participation in the security certification and accreditation of the N-Wave system. The GlobalNOC is the single point of contact for N-Wave customer support and new service requests. It in turn passes the request elsewhere within N-Wave or contacts the appropriate partner or vendor.

Total N-Wave Traffic Volumes (TBytes/month)



N-Wave Network and Performance Metrics

N-Wave continues to carry high volumes of data for various NOAA line offices

Since our last report in April, 2014 (Newsletter #3), the traffic levels have remained about the same around 112TB per day—with a majority of the traffic going to and from the NOAA supercomputing facilities at the NOAA Environmental Security Computing Center (NESCC) in Fairmont, WV; Oak Ridge National Laboratory (ORNL) in Oak Ridge, TN; and the National Center for Environmental Prediction's (NCEP) Weather and Climate Operational Supercomputing Systems (WCOSS) in Reston, VA, and Orlando, FL.

The National Environmental Satellite, Data, and Information Service (NESDIS) usage of N-Wave continues to grow, while the Comprehensive Large Array-data Stewardship System (CLASS) data volumes remain consistent. Since service turn-up in April, 2014, the National Climatic Data Center (NCDC) flows to the Eastern Trusted Internet Connection Access Point (TICAP) gateway (operated by the Silver Spring Network Operations Center) continue to grow slightly over time.

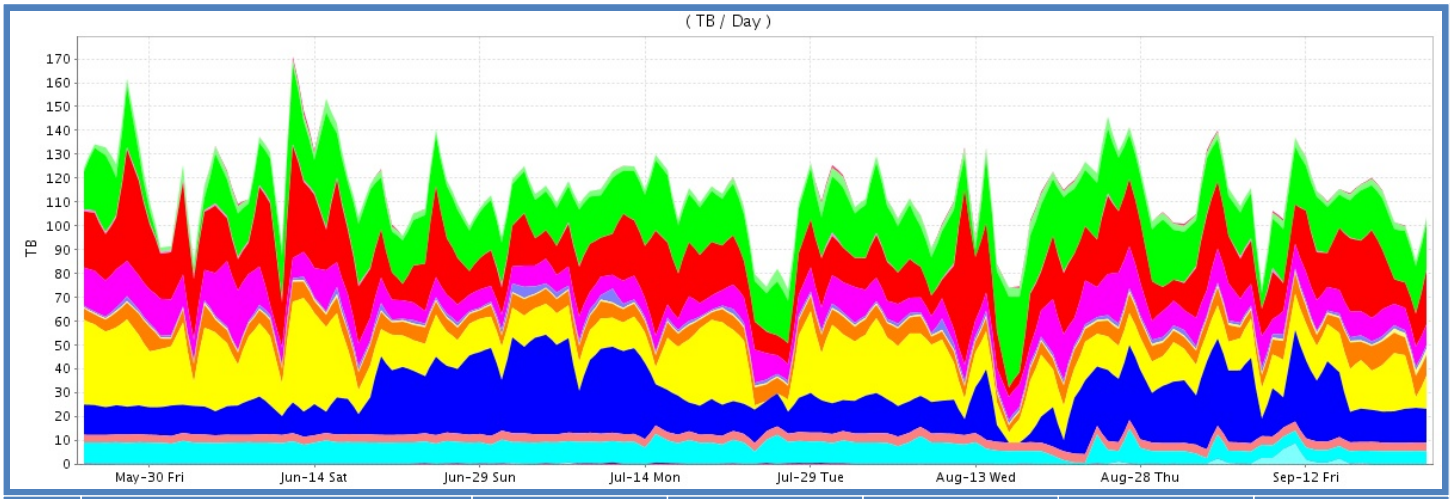
Total traffic volumes are expected to increase as additional sites and line offices transition to N-Wave. More traffic is also expected due to the agency-wide adoption of Trusted Internet Connections and the next-generation weather satellite systems (GOES-R and JPSS) coming online in the next few years.

IdeaData
TOTAL NETWORK VISIBILITY

CostCentre Source Traffic Monthly

Period From: Sat 2014-05-24 00:00:00 MDT
To: Tue 2014-09-23 23:59:59 MDT

Source Account		<>	NWAVE	



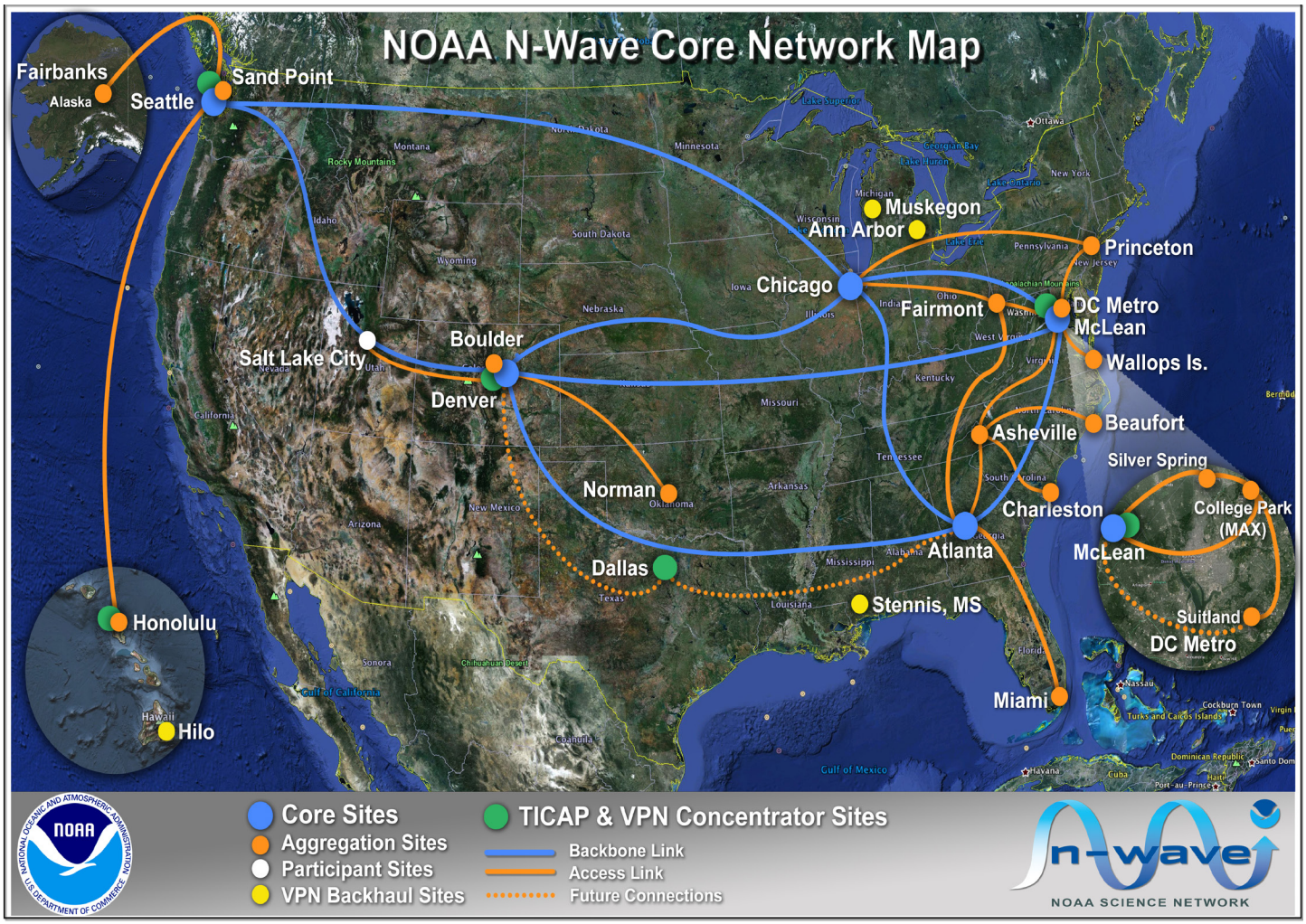
No.	Source CostCentre	TB sum	TB avg	TB max	G.Pkts sum	K.Flows sum
1	RDHPCS-FAIR	2,586.035	21.025	73.459	893.376	17,337.301
2	RDHPCS-ORNL	2,469.222	20.075	48.491	279.788	1,071.147
3	NCEP-WCOSS-ORLANDO	2,415.189	19.636	41.744	313.317	3,961.257
4	NCEP-WCOSS-RESTON	2,369.496	19.264	47.736	834.987	2,989.891
5	RDHPCS-BOUL	1,312.307	10.669	27.522	180.580	10,490.488
6	CLASS-NSOF	957.670	7.786	14.506	646.861	4,733.458
7	NESDIS-NCDC	754.244	6.132	11.173	556.403	43,141.079
8	Layer2 Transport	439.554	3.574	4.043	426.011	784.586
9	Undefined	354.682	2.884	6.320	509.726	71,421.928
10	NOAA-GFDL	178.864	1.454	5.802	113.833	5,774.346
11	NOAA-Boulder	88.564	0.720	2.548	113.325	10,712.134
12	RDHPCS-GFDL	44.549	0.362	1.659	113.464	2,476.285
13	CLASS-ASH	35.390	0.288	8.647	104.042	2,569.190
14	WISC-EDU	32.469	0.264	2.156	28.275	190.719
15	CLASS-BLDR	17.887	0.145	0.735	95.600	3,081.006
16	NOS-HILO	1.746	0.014	0.058	1.609	301.289
17	NOAA-NSSL	0.881	0.007	0.035	12.732	1,028.026
18	PRC	0.368	0.003	0.085	0.547	151.686
19	NOAA-AOML	0.276	0.002	0.074	0.521	4.053
20	RDHPCS-CLPK	0.120	0.001	0.005	0.152	43.144
	Total (21)	14,059.513	114.305	170.965	5,225.149	182,263.013

Note: TB = 1000^4 Bytes, G.Pkts = 1000^3 Packets, K.Flows = 1000^1 Flows

If you would like to subscribe to the outbound traffic information, please go to:

http://noc.nwave.noaa.gov/

There you can submit a service inquiry and fill in a request.



NESDIS and N-Wave to Deploy 100-G DWDM Ring Network in DC Area

The ring network will connect three sites in Maryland and one site in Virginia

N-Wave, with funding and coordination from the National Environmental Satellite, Data, and Information Service (NESDIS), is executing a deployment of a 100 gigabits per second (Gbps) ring network in the DC Metro area as part of the GOES-R Phase 2 Network Refresh effort. Dense Wave Division Multiplexing (DWDM) optical networking is an integral part of the ring, to ensure expandability beyond 100 Gbps.

The ring network will connect three sites in Maryland—Silver Spring, College Park (the University of Maryland Mid-Atlantic Crossroads (MAX) colocation facility), and Suitland—and one site in Virginia (McLean, Level 3 Communications). Each location will offer local add/drop 1 and 10 Gbps ports, which will be aggregated into a single 100 Gbps channel between each site on the ring.

Ciena network equipment was procured for the system through a contract with Ronco, Inc. Ciena is a well-established equipment manufacturer in the optical networking sector and works with other N-Wave partners such as Internet2 and Level 3. Initially, the system will use a single, 100 Gbps channel over the 88-channel ring,

leaving a theoretical maximum capacity into the terabit per second (Tbps) range. Additional 10, 100 or 400 Gbps optical channels can be added to the system as needed.

The ring will provide additional capacity and redundancy to NESDIS programs like CLASS, JPSS and GOES-R, as well as provide additional capacity to the Trusted Internet Connections (TIC) project. In CY15, N-Wave will migrate its existing DC-area 10 Gbps services onto the ring. Any program or project interested in gaining access or capacity to the ring network (or N-Wave) should contact the N-Wave NOC (nwave-noc@noaa.gov).

What does it mean to be an N-Wave VPN Site?

A VPN safely extends a private network across a public network

N-Wave recently began providing Virtual Private Network (VPN) services to help NOAA entities meet the Trusted Internet Connection (TIC) requirements set by the Department of Homeland Security.

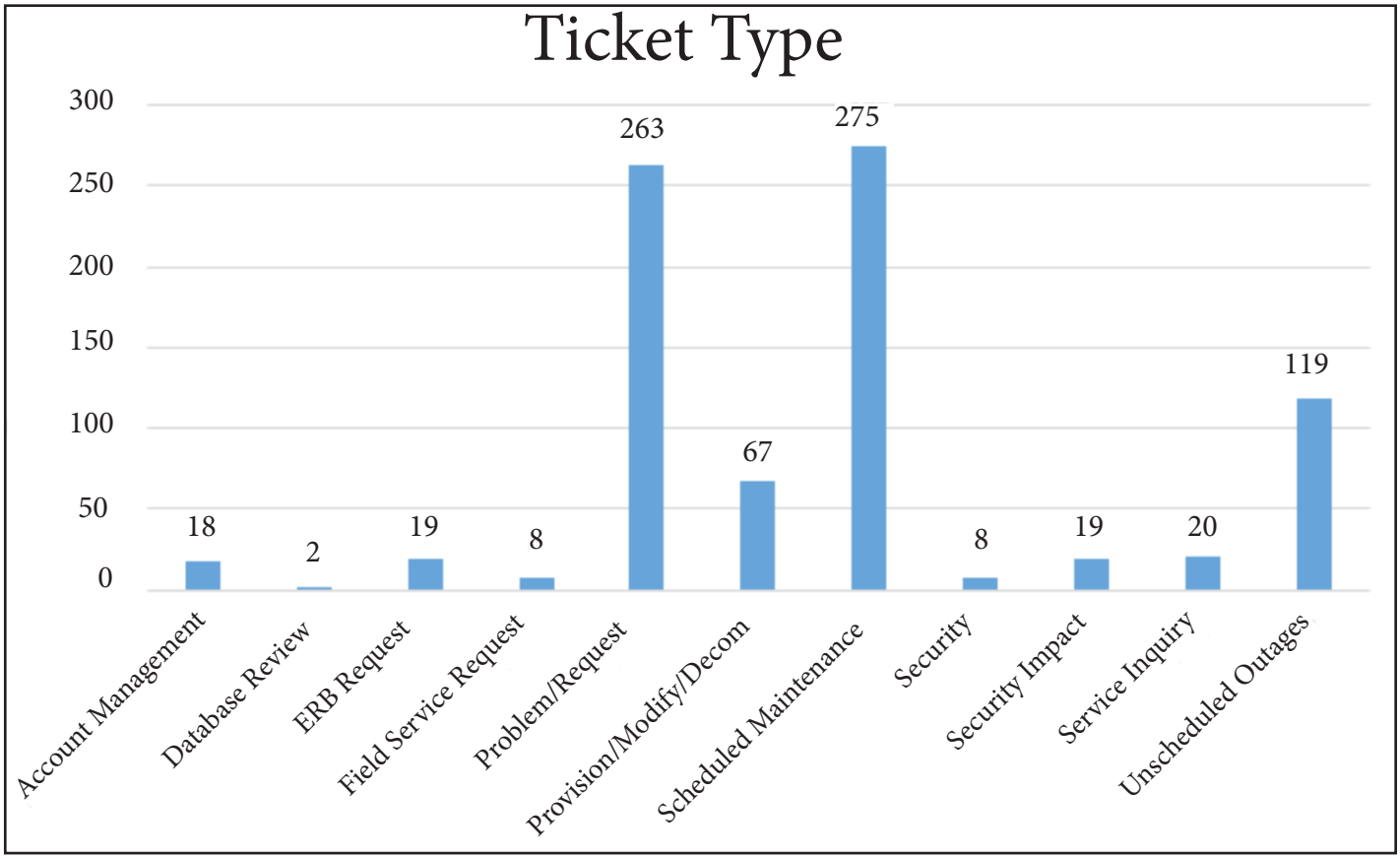
A VPN extends a private network across a public network (which includes both the commercial Internet & Internet2) by encrypting the data so it moves safely "out in the open." At NOAA, traffic from an N-Wave VPN site is routed to a NOAA VPN concentrator, which brings it safely inside NOAA's enterprise network. From there, the traffic can flow anywhere within NOAA. If the traffic is destined for the public Internet, the traffic, just like any other NOAA enterprise traffic, is passed through a Trusted Internet Connection Access Point (TICAP) where TIC services are provided. The traffic is routed over the Internet. Accessing an N-Wave VPN network allows sites to be in the NOAA enterprise and have TIC functionality without a physical connection to N-Wave.

A VPN extends a private network across a public network by encrypting the data so it moves safely "out in the open."

Currently, N-Wave provides VPN concentrators at two TICAP locations: Boulder, CO and Ford Island, HI. Although the N-Wave VPN network provides both enterprise networking and TIC services to VPN sites, redundancy is not available. N-Wave cannot control the path data takes to the VPN concentrator since it's traversing the public Internet, so utilizing the VPN over the Internet may result in outages and poor performance. Poor performance can sometimes be alleviated by planning for the increased bandwidth needed. N-Wave's first VPN success story is the National Coastal Data Development Center (NCDDC), the coastal division of NOAA's National Oceanographic Data Center (NODC) co-located at the Mississippi State University (MSU) facility at the Stennis Space Center. MSU has multiple 10Gbps uplinks to the Internet and Internet2 and it provides that bandwidth to NCDDC, allowing superb VPN performance. Other sites using N-Wave's VPN services include OAR's Global Monitoring Division Pacific sites, which use the concentrator in Honolulu, and Great Lakes Environmental Research Laboratory sites in Ann Arbor and Muskegon, MI, which use the concentrator in Boulder. Other NOAA line offices using this technology include the National Weather Service (NWS) and the National Ocean Service (NOS).

N-Wave NOC Tickets Report February through September 2014

This report contains data from 918 Tickets



This N-Wave tickets report tracks various ticket types that are used to support the N-Wave Network. In this issue, we will feature and discuss one of these ticket types and its associated workflows: the Scheduled Maintenance ticket.

Maintenance tickets are created to document and communicate to the N-Wave community upcoming work to be performed and the status of completed maintenance.

N-Wave engineers apply a standard Change Management process for all planned maintenance to be performed during a pre-approved window. However, maintenance required for the health and security of the network may be performed with shorter notice. The N-Wave Network Operations Center (NOC) sends advance notification for upcoming maintenance and timely updates upon completion. Maintenance tickets can be viewed on the N-Wave Public Operations Calendar and the Trouble Ticket Viewer: https://noc.nwave.noaa.gov/nwave/support.html. Participants should note that the N-Wave NOC also provides a mechanism at the link above to monitor maintenance and outage activity via RSS.

In addition, participants are urged to contact the N-Wave NOC by e-mail or trouble ticket submission form to declare maintenance plans in advance to prevent unnecessary notifications of outages and inquiries to the participant.

- Ticket type is a categorization of events that may not necessarily result in customer impact. The robust engineering, design, operations and management of N-Wave has yielded 100% customer availability on the back bone and dual backbone connected customer sites since January 2011.

N-Wave Updates

N-Wave Network Expands to the NESDIS Fairbanks Command and Data Acquisition Station, Alaska

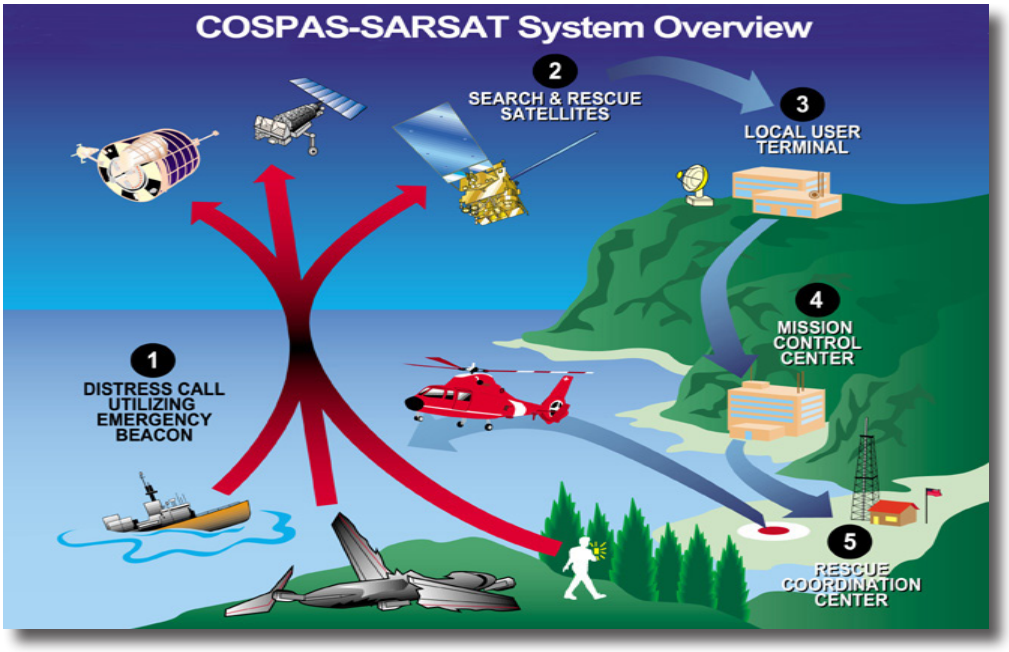
The new service joins the N-Wave network at the Seattle Core PoP

September 25 marked the deployment of N-Wave's second extension outside the continental U.S. with the installation of a point-of-presence (PoP) at the National Environmental Satellite, Data, and Information Service (NESDIS) Fairbanks Command and Data Acquisition Station (FCDAS), located north of Fairbanks in Gilmore Creek, Alaska.

N-Wave installed a 100 megabit per second (Mbps) Internet Protocol (IP) circuit for the initial service offering. As usage increases, the service is expandable to 1000 Mbps. The new service joins the N-Wave network at the Seattle Core PoP, located at the Westin co-location facility. The service was acquired through an existing N-Wave contract with the Seattle-based Pacific Northwest Gigapop (PNWGP), who partnered with Fairbanks-based AlasConnect, Inc.

Prior to the installation of the N-Wave PoP, FCDAS communicated with legacy network services, including multiple T1 circuits running at 1.5 Mbps. With new satellite missions coming online, such as MetOp and the Deep Space Climate Observatory (DSCOVR), these T1s lacked adequate capacity and were prohibitively expensive.

MetOp is a system of polar orbiting meteorological satellites operated by the European Organisation for the Exploitation of Meteorological Satellites (EUMESAT). The DSCOVR spacecraft is expected to launch in early 2015. This new mission will extend United States ability to give accurate warnings of potentially disruptive and costly solar activity, and return full-frame images of the Earth from Lagrange Point 1. DSCOVR plans to utilize N-Wave at multiple locations, initially sending data to the Space Weather Prediction Center (SWPC) in Boulder, CO.



Search and Rescue Satellite Aided Tracking (SARSAT) also plans to utilize the N-Wave service at Fairbanks. SARSAT is a vital mission consisting of international, humanitarian search and rescue systems that use satellites to detect and locate emergency beacons carried by ships, aircraft, or individuals.

NESDIS plans to maintain a minimal array of T1 circuits for critical command-and-control services to support the various satellite missions at Fairbanks. Higher volume data movement

will move over to N-Wave, primarily for transport to NOAA's Satellite Operations Facility (NSOF) in Suitland, MD.

In addition to providing additional capacity for mission support, N-Wave is also providing Trusted Internet Connectivity (TIC) for the FCDAS administrative network. This brings the NESDIS line office to a TIC compliance rating of 95 percent for FY14.

Alaska satellite dish network.

Network Changes and New Participants

All of the changes since the last newsletter revolve around the agency's push to meet the federal mandate for the use of Trusted Internet Connections (TICs).

- The National Weather Service (NWS) Western Region Headquarters in Salt Lake City is now utilizing N-Wave, via a 10 Gigabits per second (Gbps) circuit to Denver, for TIC.
- The NWS OPSnet network has installed redundant 10Gbps connectivity to N-Wave in Boulder for TIC redundancy.
- N-Wave assumed control of the Sand Point, WA Internet border and TIC access point routing infrastructure.
- The National Ocean Service (NOS) facility in Beaufort, NC now utilizes N-Wave for network connectivity to the NOS private network and TIC connectivity.
- Two Office of Atmospheric Research (OAR) labs, the Atlantic Oceanographic and Meteorological Laboratory (AOML) in Miami, FL and the National Severe Storms Laboratory (NSSL) in Norman, OK use N-Wave for Trusted Internet Connection Access Provider (TICAP) connectivity. The NWS Radar Operations Center in Norman is also using N-Wave for TIC connectivity.
- N-Wave now has a point-of-presence at Gilmore Creek, Alaska (see related article). The National Environmental Satellite, Data, and Information Service (NESDIS) program is using N-Wave for TIC connectivity back to Seattle, as well as satellite data transfer back to the continental US.
- N-Wave brought online a VPN concentrator in Boulder to facilitate TIC compliance for NOAA sites unable to connect to N-Wave via dedicated circuits. The National Coastal Data Development Center (NCDDC) located in Stennis, MS is the first user of this service.

Utah Education Network (UEN) - http://www.uen.org/

In addition to higher and public education, UEN customers include public libraries, the state government, and private schools

Utah's research and education (R&E) network, the Utah Education Network (UEN), was established in 1993 to provide telecommunications services to higher and public education statewide. UEN operates a network that ranges from 100 gigabits per second (Gbps) over a dark fiber infrastructure in Salt Lake City to 100 megabits per second (Mbps) via microwave to remote schools. In addition to higher and public education, UEN customers include public libraries, the state government, and private schools.

UTAH EDUCATION NETWORK
WWW.UEN.ORG

UEN's three core areas are network services, application services, and support services. All are important to educational constituents. Of the three, network services accounts for nearly 75 percent of UEN's yearly budget and provides both conventional network services and digital broadcast services (UEN-TV). Working with multiple service providers across the state, UEN designs, deploys and maintains necessary infrastructure; monitors the network for both infrastructure and security issues from their Network Operations Center (NOC); and provides support to their members. UEN connects to both multiple commodity Internet Service Providers (ISPs) and other R&E networks including the national academic R&E network, Internet2.

NOAA's initial relationship with UEN is in support of the National Weather Service's (NWS) Western Regional Headquarters (WRHQ), located in the Federal Building in downtown Salt Lake City. By good fortune, the UEN fiber backbone that runs through downtown passes right outside WRHQ, so by installing an underground lateral into the building, WRHQ was able to connect to N-Wave at 10 Gbps.

SC14 New Orleans, LA hpc matters.

SC14 is back in New Orleans with new ideas and a fresh take on HPC. Spotlighting the most original and fascinating scientific and technical applications from around the world, SC14 will once again bring together the HPC community — an unprecedented array of scientists, engineers, researchers, educators, students, programmers, system administrators, and developers.

NOAA speakers include:

Frank Indiviglio, Birds-of-a-Feather Session: ***System Testing and Resiliency in High-Performance Computing***

Mark Govett, Talk: ***Directive-Based Parallelization of the NIM weather Model for GPUs***

n-wave NOAA SCIENCE NETWORK

For more information contact:
NOAA N-Wave Science Network
http://noc.nwave.noaa.gov/
Earth System Research Laboratory, Office of the Director
http://www.esrl.noaa.gov/
Robert Sears, Network Manager
Jerry Janssen, System Owner

U. S. Department of Commerce, NOAA
325 Broadway, R/ESRL
DSRC-3B107
Boulder, CO 80305-3328