

NWAX Customer Operations Document

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Version Change Record

<u>Version Date</u>	<u>Change</u>
030702	Original published
072903	Update Emergency Contact Info

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2 Offered Services

- Dual connection into parallel exchange networks (preferred)
- Ethernet interfaces: GigSx (mm), GigLx (sm), 100bF (mm), 10/100bT (Pittock Suite108 only)
- NWAX member peering with PREN members (local College/Universities)
- BGP relationships between NWAX members across Exchange networks
- BGP relationships between NWAX members on Private 802.1Q VLANs
- IP Multicast connectivity, MSDP, MBGP, PIM (sparse mode)
- Consulting
- NWAX performance monitoring
- Use of conference room (Pittock Suite108), for H.323 video conferencing
- Participation in development of new regional services, QOS, Multicast...

3 Member requirements

1. Member access to NWAX is obtained via fiber interconnection in the Pittock meet-me room, or directly in Suite 108, as specified by NWAX engineers
2. Members may only use one globally-unique MAC address for each port on the NWAX, without prior written approval
3. Multiprotocol BGP (MBGP) provides a method for Exchange members to distinguish which route prefixes they will use for performing RPF checks. The Multicast Source Discovery Protocol (MSDP) is used to exchange multicast source information between NWAX member multicast domains (and the PREN domain). NWAX members may use PIM sparse-mode to build multicast route distribution trees. When configuring their multicast routers, NWAX members must perform filtering to prevent unwanted traffic from flooding other NWAX members. In particular PIM rp-announce, rp-discover, and administratively scoped multicast addresses should be filtered. It is recommended that NWAX customers using multicast should read <http://www.iana.org/assignments/multicast-addresses> and http://www.cisco.com/univercd/cc/td/doc/cisintwk/intsolns/mcst_p1/mcstmsdp/mcst_p1.htm#xtocid6430 and http://www.cisco.com/univercd/cc/td/doc/cisintwk/intsolns/mcst_sol/mcst_ovr.htm
4. Members peer with PREN using an IP address/mask provided by NWAX engineers
5. The member needs to have a registered Autonomous System Number (AS#).

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6. The member must configure their directly attached router such that:
 - a. No proxy ARP service
 - b. No ICMP redirects
 - c. No IP directed broadcast
 - d. Their switch/router runs spanning tree with bridge priority over 10,000
 - e. No IGP route announcements
 - f. No discovery protocols such as CDP or IRDP
 - g. The Exchange networks 198.32.195.0/24 and 198.32.196.0/24 will not be advertised within the member's Autonomous System, or to other Autonomous Systems that the member may be connected to.
 - h. There is a summary route to member-owned address space (to prevent route flapping)
 - i. The standard member/NWAX link is an access link (NOT a VLAN trunk). This feature is negotiable however.
 - j. Unwanted multicast or broadcast traffic is not flooded to other NWAX members.
7. Routers must support route refresh capability as described in RFC 2842
8. Members must set duplex and speed settings on NWAX interfaces and disable auto negotiation
9. Members are responsible for implementing private peering relationships with other NWAX members (if they exist). NWAX engineers may help in defining and communicating the peering requirements, but is not responsible for tracking and enforcing such requirements.
10. Member shall not obtain or attempt to obtain unauthorized access to the Exchange, or attempt to bypass implemented security mechanisms.
11. Whenever possible, members must only advertise a summary route to their address space.
12. Members must meet all other requirements as defined in the [NWAX membership agreement](#)
13. Members must not use PREN as their default route. Members may use other NWAX members as their default route only if permission to do so is explicitly granted. Members are responsible for appropriate route and packet filters to prevent others' intentional or unintentional use of their network for transit.

4 Support contacts

NWAX NOC hotline (503-418-0203) or noc-em@nwax.net See paragraph 9.1.

- Pittock engineers are on call 24 hour/day, 7 day/week at (503) 226-6777
- Foundry Foundry's TechNet Gold™ Warranty enables NWAX engineering access to a 24 hour/day, 7 day/week phone support line.

5 NWAX Outage Reporting and Service Level Agreements

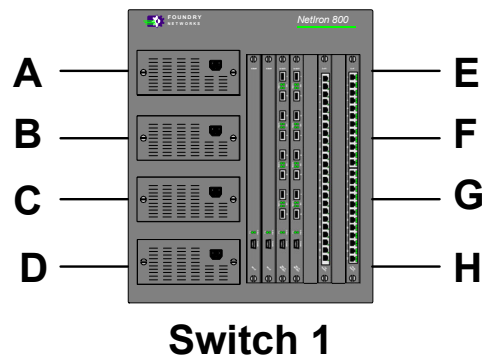
The NWAX [membership agreement](#) guarantees dual-connected members that the Exchange will be available at least 99.9% (99% for “Single Connection”) of the time during any 30-day period, except for: (a) periods of unavailability for Regular Maintenance; (b) the time before Member notifies NWAX of the problem that caused an unanticipated period of unavailability in breach of this Section (the "Outage"); (c) any Outage caused in whole or in part by Member, its employees or licensees; and (d) any event of force majeure. We feel confident that the Exchange will be able to exceed these levels, and will likely adjust them in the future based upon actual operational experience.

5.1 Definitions

5.1.1 Dual vs. Single Connection

Member fees are the same for single and for dual connections. We recommend dual connections even if the member has a single router. NWAX has two completely separate Foundry NetIron switches. The switches have dual power sources (one with generator/battery backup and one commercial) and separate fiber optic feeds to the meet-me room, and are housed in separate cabinets. There are no physical or logical connections between the switches.

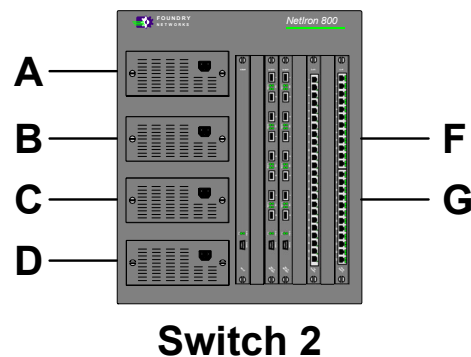
Currently, all members are connected to Switch 1 and members that elected dual connections are additionally connected to Switch 2. This is illustrated in figure to the right. Members E and H in this figure have only single connections while the others have dual connections.



Switch 1

5.1.2 Major vs. Minor Outages

NWAX will record and report on two kinds of general outages, major and minor. A major outage occurs when both Switch 1 and 2 are unavailable for any reason and the outage was not planned and announced in advance in accordance with Exchange operating procedures. A minor outage occurs when a single switch (either Switch 1 or Switch 2) becomes unavailable for any reason and the outage was not planned and announced in advance. The Exchange will maintain a mailing list and web page for general outage information.



Switch 2

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5.1.3 Member Service Outage

As a future service, NWAX will record and report when individual members experience an unplanned loss of service in accordance with our membership agreement. Member Service Outages may be the result of a major or minor outage or an outage of the switch ports or fibers serving the individual member. The Exchange is responsible for providing service at International Standards Organization (ISO) model for Open Systems Interconnection (OSI) layers 1 (physical) and 2 (data link) from the Exchange patch panel in the meet me room, to the switch port and across the switch. Loss of peering or other layer 3 services is not considered an Exchange outage because Exchange members are responsible for peering arrangements. NWAX may offer other, additional services in the future and will develop appropriate service level agreements and outage reporting at that time.

6 Hardware

6.1 Foundry

- OS code revisions NWAX engineers will schedule an OS upgrade 72 hours in advance of the regular service window (at present Sunday 1-5am). Generally this happens to correct bugs which affect NWAX, or to enable new functionality. When upgrading, both the original and new OS will be put in flash memory (and a TFTP server) to facilitate reverting to old OS should this be necessary. One switch at a time will be upgraded. The Foundry 2 system will generally be the first and will be evaluated for a week before upgrading Foundry 1.
- Configuration revisions Configurations are archived by date to a tftp server, which is backed up off site.
- Performance monitoring SNMP, NetFlow, and RMON will be used to gather statistics for performance monitoring. A utility called Cricket will be used to enable members to access aggregate performance statistics via HTTP - as well as any relevant statistics requested by the member. Baselines and performance thresholds will be established for parameters such as CPU, memory, and link utilization, error rates, packet size statistics, etc. Software mechanisms will notify engineering personnel when thresholds are exceeded.
- Fault monitoring A syslog server will be used to record anomalous conditions. Errors at level 5 (Notifications) and below will be logged. Foundry has some predefined SNMP traps for NetIron switches. These will also be used for fault management. In addition, the UNIX tool "Big Brother" will be employed to page NWAX personnel in the event of a fault. Note that members concerned with uptime statistics are directed to take advantage of dual connections into the Exchange. NWAX Outage Reporting and Service Level Agreements are described in Paragraph 5.
- Security is discussed in paragraph 7.1.

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- Reloads and power cycling will take place during the service window (Sunday mornings between 1 and 5 am) with advance notice to all members, unless we need to correct a timely problem (a very rare event). The NetIrons reboot in less than ten seconds, and only one will be reloaded at a time. The most common cause of reboot thus far has been OS update.

6.2 Sun

The machine is used for internal support services only, and runs at least the following services:

- TFTP
- Syslog
- HTTP/Cricket (histograms, notification)
- Big Brother (state, notification)
- SNMP
- NTP via stratum 1 at cse.ogi.edu
- Offsite backups to OHSU OGI Campus/Hillsboro

The Sun system will also be used as a repository for NWAX engineering documentation

6.3 BSD

This system will host benchmarking tools and utilities.

6.4 Interconnections & patch cables

Members are responsible for getting to the NWAX demarc point (the NWAX patch panels in the Pittock meet-me room). NWAX engineers in conjunction with the Pittock Block will connect the member to NWAX patch panels, although the member is responsible for any cross connection fees.

7 Policies

7.1 Security policies

With the exception of access to configuration and control of NWAX systems themselves, the Exchange does not implement any security mechanisms. Security is the responsibility of NWAX members. Physical security is covered in paragraph 10.

NWAX members are encouraged to filter traffic to prevent unauthorized use of Internet transit.

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7.2 *PREN BGP policy*

Members are free to make any BGP relationships they like with other members.

The Portland Research and Education Network (PREN.NET) which is the parent organization for NWAX, handles a number of IP routing services for PSU, OHSU, and other regional education members. PREN's policies are as follows:

- BGP passwords are used to authenticate NWAX members
- BGP Version 4 must be used
- NWAX member route advertisements will be damped if they flap
- Private Autonomous System (AS) numbers will be filtered out
- The PREN AS (14262) advertises only the prefixes for the OHSU, OGI, and PSU AS's. Prefixes for the Exchange networks 198.32.195.0/24 and 198.32.196.0/24, will not be advertised.
- The PREN AS (14262) will not advertise any prefixes learned from NWAX members to other NWAX members.
- The PREN AS will act as transit between NWAX members and OHSU, OGI, PSU
- The PREN router(s) will not accept or advertise any prefix smaller than a /24
- Multiprotocol BGP links can be established with the PREN AS if desired.
- PREN peers must support the route refresh capability as described in RFC 2842

8 IP address allocations and assignments

IP addresses are assigned and managed by NWAX engineers.

9 Member Support

9.1 *Trouble reporting procedures*

Exchange problems that are not urgent can be reported by email to noc@nwax.net. NWAX engineers will acknowledge receipt of the email during normal business hours, and will open a trouble ticket as appropriate. For NWAX problems that need to be immediately addressed, members may call the emergency NOC hotline (503-418-0203) and leave a message. A NWAX engineer will be automatically paged. The hotline is available 7 days/week and 24 hours/day. The noc-em@nwax.net email address will also work, but only the first 180 characters will be forwarded to the pagers, so contact information and a very brief summary must be at the beginning of the message. The following information should be provided with all reported problems:

- Name, phone number, and organizational affiliation of person reporting the NWAX problem.
- E-mail address of person reporting the problem
- Date and time that the problem occurred
- NWAX contract number is needed to find member contact information
- A detailed description of the problem

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9.2 Fault detection and isolation of Exchange problems

The mechanisms used to recognize and isolate Exchange problems include SNMP traps, audit logs, protocol analyzers, and observations of deviations from expected performance statistics. The following network statistics will be gathered to establish baseline performance (among others):

- Port error statistics (collisions, runts, jabbers, and CRC errors)
- Bandwidth utilization during peak and normal operations
- Frame variations (peak and average size, & number per second)
- CPU utilization
- Top n talkers – identifies the top (n) points of high network utilization (for internal use only)

The NWAX design uses a syslog server as a repository of SNMP traps and NetIron error messages. Errors at level 5 (Notifications) and below will be logged. In addition to the automated mechanisms listed above, NWAX engineers will use “show”, “debug”, “ping”, and “traceroute” commands to diagnose problems as they occur. Issues will be escalated to Foundry, Pittock, or whatever engineers are appropriate. Foundry’s TechNet Gold™ Warranty enables NWAX engineering access to a 24 hour/day, 7 day/week phone support line. It also expedites hardware replacement.

9.3 Maintenance Schedule

The Exchange will be maintained as described in paragraph 3.4 of the [NWAX Membership Agreement](#)

9.4 Member Performance monitoring

NWAX will create a continuously updated graph of total traffic through the Exchange as described in paragraphs 5 and 9.4. At the member’s request, NWAX will create a custom web page with statistics relevant to the member.

10 Facility

NWAX hardware physically resides in Suite 108 of the Pittock Building in downtown Portland, OR and makes use of separate fiber feeds to the meet-me room. Each equipment rack in the Pittock facility is powered by redundant feeds from different power sources. Physical access is restricted through the use of card-keys, CCTV, and 24-hour security personnel. Pittock facility engineers are on call 24 hour/day, 7 day/week at (503) 226-6777