



Please see page 3 for technical
and contact information

OHN/NOC Network Information Form

Site Information

Site Name:

Street Address:

City:

State:

Zip code:

Vendor Information

Vendor Name:

Street Address:

City:

State:

Zip Code:

Service Provider NOC:

Email:

Phone:

Network Engineer for this project:

Name:

Email:

Phone:

Technical Data

Circuit ID(s):

Circuit Transport Type:

Circuit Capacity:

Circuit Provisioned Capacity:

Circuit Endpoint (if other than Service provider):

Service Provider Equipment Type:

OHN Port Speed (please note this must be set to 100 Mbps Full):

Please list the port assignments:

Circuit Endpoint IP Address:

Leaf node IP:

Leaf Node Sub Net Mask:

Leaf Node Gateway:

Vendor Gateway:

Local Exchange (if not NWAX):

Is the Circuit Installed? (If not please provide estimated install date.)

WHO DO I CONTACT?

Test and turn-up of OHN NOC leaf nodes

OHN NOC Test and Turn-Up Department
Phone: (503) 213-5400, Option #2
Toll Free: (877)260-1881, Option #2

OHN Staff Contacts

Peter Trnavskis, *IT Project Manager*
ptrnavskis@oregonhealthnet.org
Phone: (503) 344-3757
Cell: (503) 327-3126

LEAF NODE INSTALLATION CONFIGURATION NOTES:

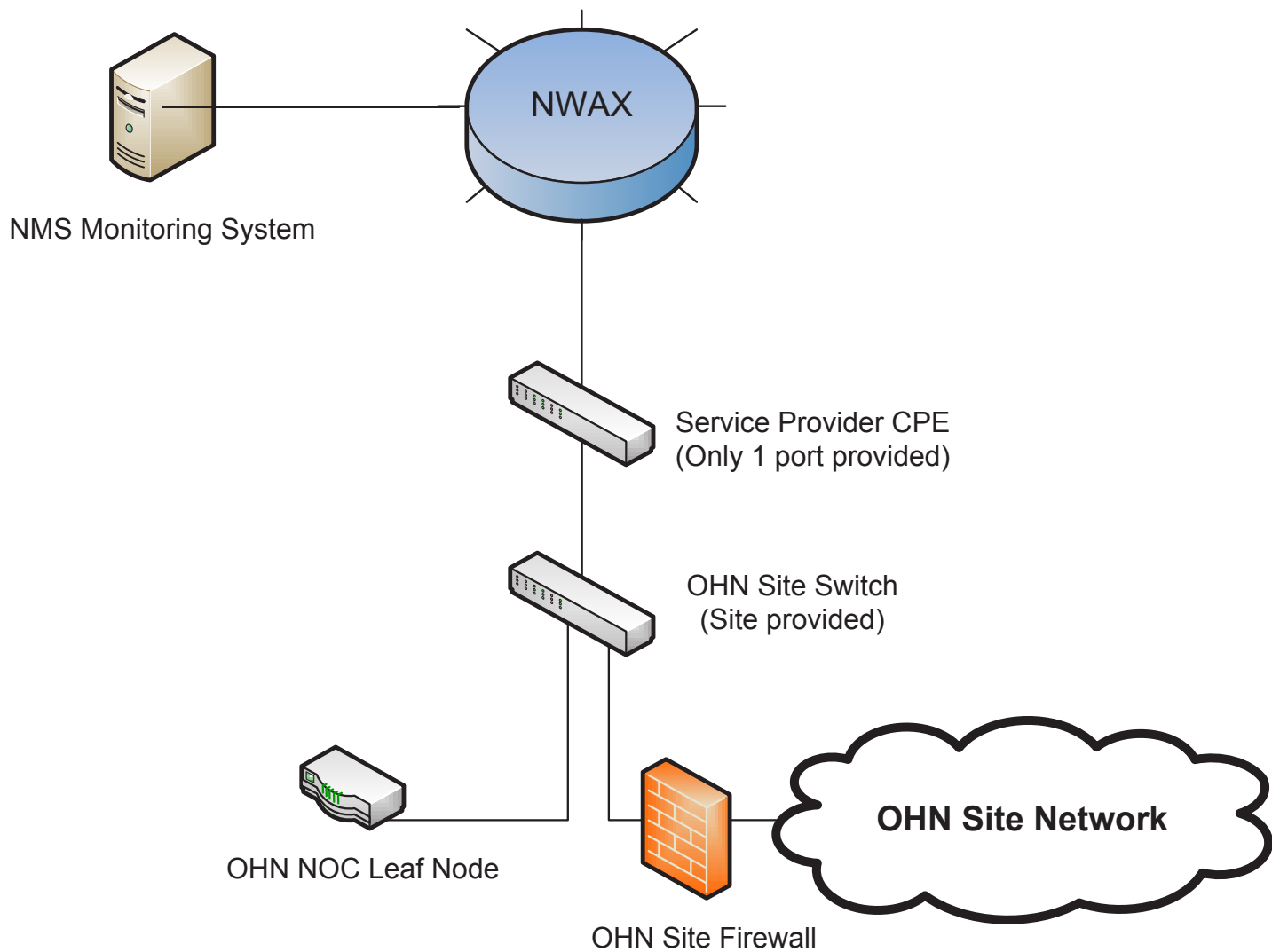
The OHN NOC will assist sites with the complete the installation of the OHN Leaf Node monitoring devices, however we felt it would be valuable to your network engineers to view the four standard methods we use to accomplish this task. Please review the following 4 diagrams on page 4 and contact the OHN NOC if you have any questions.

They are always available to provide you with information regarding the Leaf Nodes as well as the OHN NOC monitoring system. Once the leaf nodes are installed and connected to our NOC, you will have live access to their data via your OHN Vendor Portal. Please contact OHN directly if you have any questions regarding your OHN Vendor Portal.

Leaf Node Configuration

OPTION 1

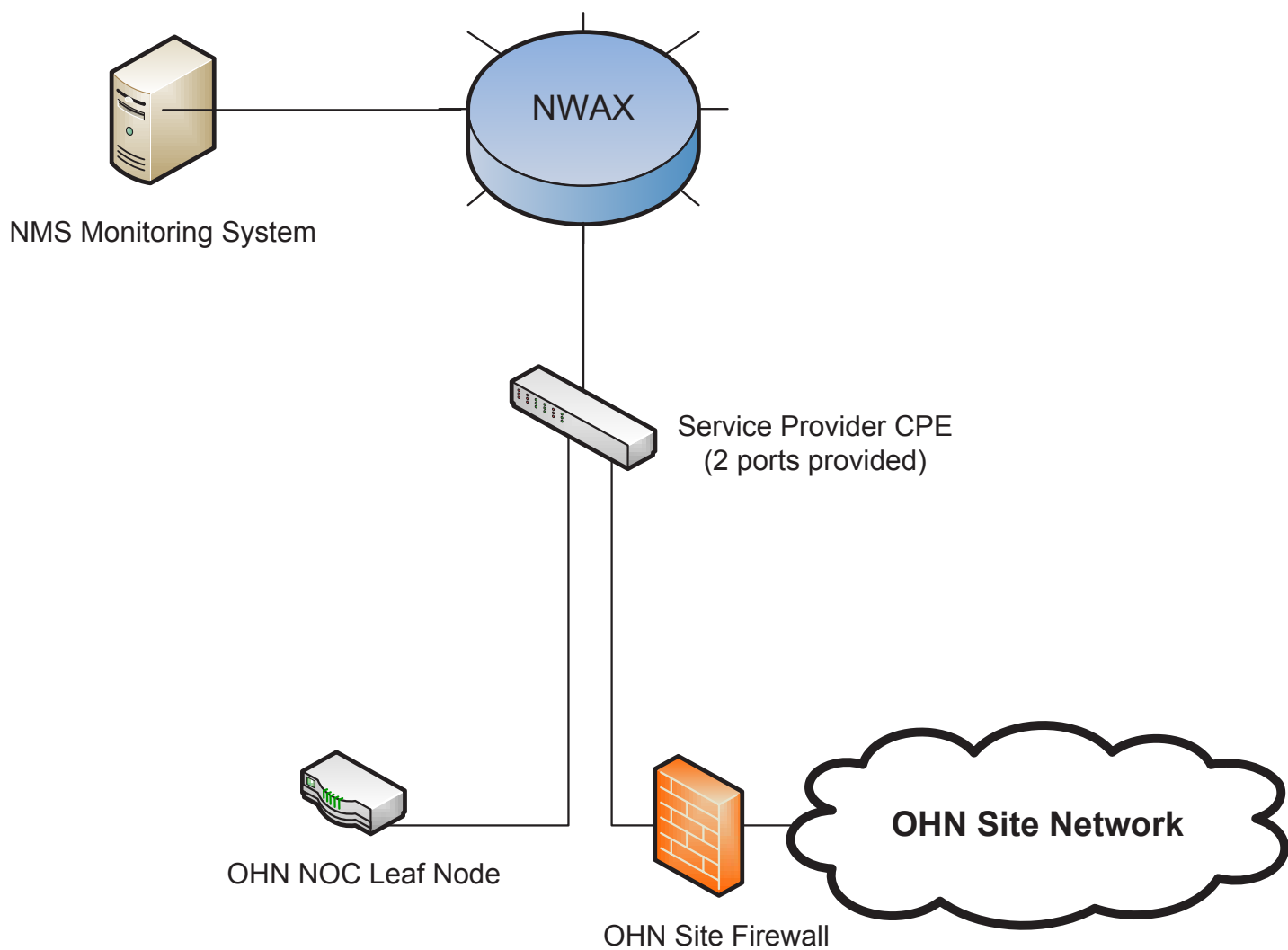
One SP port



Leaf Node Configuration

OPTION 2

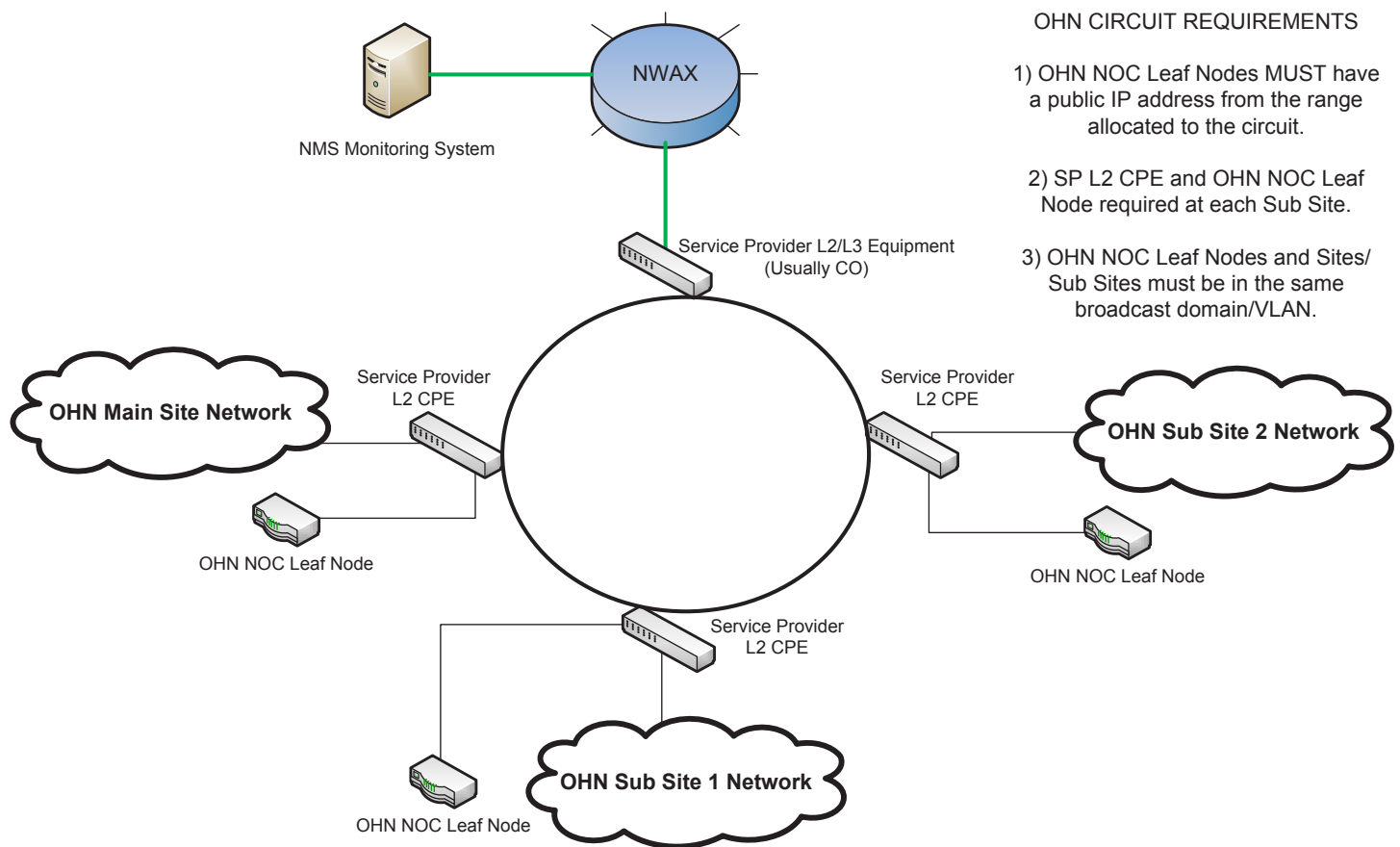
Two SP ports



Leaf Node Configuration

OPTION 3

Multi-site L2 Ring



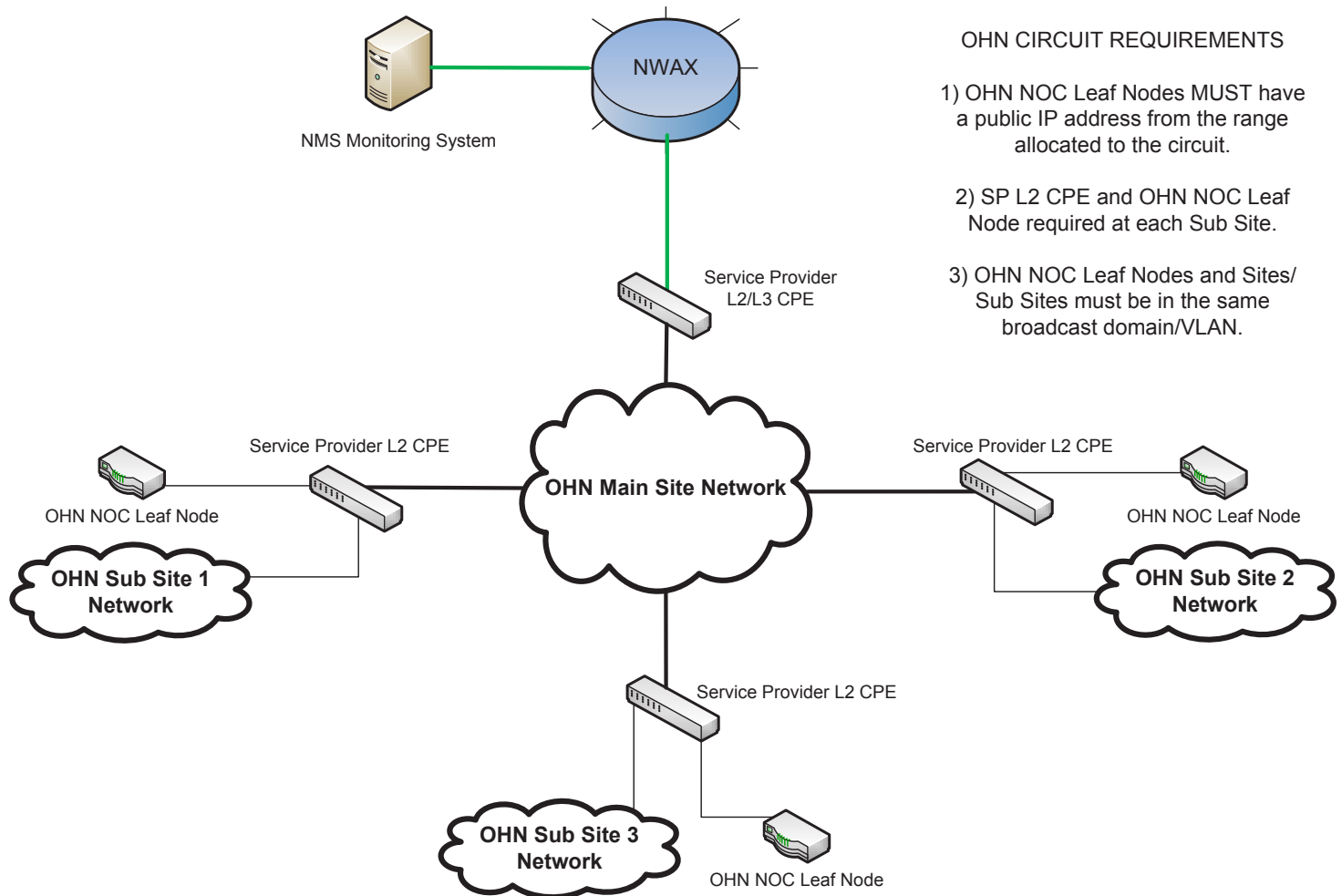
OHN CIRCUIT REQUIREMENTS

- 1) OHN NOC Leaf Nodes MUST have a public IP address from the range allocated to the circuit.
- 2) SP L2 CPE and OHN NOC Leaf Node required at each Sub Site.
- 3) OHN NOC Leaf Nodes and Sites/ Sub Sites must be in the same broadcast domain/VLAN.

Leaf Node Configuration

OPTION 4

Multi-site L2 Star



OHN CIRCUIT REQUIREMENTS

- 1) OHN NOC Leaf Nodes MUST have a public IP address from the range allocated to the circuit.
- 2) SP L2 CPE and OHN NOC Leaf Node required at each Sub Site.
- 3) OHN NOC Leaf Nodes and Sites/ Sub Sites must be in the same broadcast domain/VLAN.

NOC Monitoring System (NMS)

OHN NOC's Network Monitoring System (NMS) will monitor leaf nodes and responders as well as the health (QoS and Reachability) of their Network Gateways. Monitoring for network equipment on the participant's LAN, such as a non-associated switch for instance, is not within the scope of the NMS System.

- The NOC will monitor QoS performance on vendor links via leaf nodes at the sites and responders at NWAX and other exchanges
- Leaf nodes and responders must be IP-reachable via the NMS
- Leaf nodes and responders must be IP-reachable across the link being monitored
- Ad-hoc/transient monitoring requires that leaf nodes be reachable via IP to each other across the link in question
- Leaf nodes are, by design, inexpensive and low-powered devices. IP connectivity and routing are expected to be via static, connected, and/or default routes
- QoS measurements will be initiated by the leaf nodes and the NMS will poll the leaf nodes for performance information
- Leaf nodes will generate pseudo-traffic on UDP and/or TCP ports to simulate application traffic

Additional traffic analysis and troubleshooting will utilize sniffer/troubleshooting devices at the exchanges. The exchange will provide traffic data for analysis via a mirror port or similar technique.

FAQs About the NOC Monitoring System (NMS)

1. Q: What are the components of the OHN NOC monitoring network?

- A: Leaf node (traffic generator and monitoring point)
- Leaf node responder (traffic reflector)
 - Troubleshooting device (general purpose server, sniffer)
 - NMS (Network Monitoring System)

2. Q: How does the OHN NOC monitoring system measure SLA performance?

A: Leaf nodes generate artificial traffic directed at leaf node responders. The responders add telemetry data and return it to the leaf node. The traffic is generated and returned using Cisco's "IP SLA" feature.

3. Q: What is measured by the monitoring system?

- A: The monitoring system monitors the following:
- Round Trip Time (RTT) between leaf nodes and responders

- One-way latency between leaf nodes and responders
- UDP jitter between leaf nodes and responders NOC Service Provider & IXP Spec Sheet & FAQ
- Measured data will be used to ensure SLA specifications are met by service providers and exchanges.

4. Q: What are the physical and electrical requirements for OHN NOC monitoring equipment?

A: The following are requirements for accommodating leaf nodes:

- Leaf nodes are deployed at participant sites and will require public IP addresses, which are provided by the participant's vendor
(NOTE: It is recommended that the vendor route the participant a minimum of a /29 (6 usable IP addresses) when they install the circuit so that the leaf node is guaranteed a usable IP Address)
- The leaf nodes are Cisco 1721 routers and are 12"x4"x9" (WxHxD). They are desk/shelf/wall mountable and have a separate power supply with dimensions of 7"x3"x2". Nameplate power requirements are 120VAC at 1.0A with NEMA 5 plugs
- Responders are deployed at exchanges. They are Cisco 2801 routers and are 18"x2"x17". They are 2-post and 4-post rack mountable and have an internal power supply. Nameplate power requirements are 120VAC at 5.0A with NEMA 5-15 plugs
- Troubleshooting devices are Compaq DL320 servers and are 19"x2"x28". They are 2-post and 4-post rack mountable and have an internal power supply. Nameplate power requirements are 120VAC at 5A with NEMA 5-15 plugs. They will require two IP addresses, one for direct access and one for "console" ILO management access
- Leaf nodes and responders will be deployed in pairs: an active device and a cold-spare. Additional capacity should be reserved for responders if capacity requirements increase
- One troubleshooting device will be deployed at each exchange with the potential for additional devices if capacity requirements increase
- All monitoring equipment at each site should be located in immediate proximity to each other

5. Q: What are the network requirements for the OHN NOC monitoring equipment?

- A: Network requirements are as follows:
- Bandwidth requirements for each leaf node are 375KB over 5 minutes (10Kbs)
 - Bandwidth requirements for each responder are

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375KB over 5 minutes (10Kbs) multiplied by the number of leaf nodes that are generating traffic to the responder

- Generally, troubleshooting devices will not regularly use network bandwidth. They will use bandwidth on an as-needed basis for troubleshooting purposes
- Leaf nodes are connected via 100Mbps ethernet over Category 5 cable. They require unfettered IP connectivity to the NMS, responders, other leaf nodes and the troubleshooting devices. Category 5 cable and access port (ethernet port) is to be supplied by the vendor or participant's Network Administrator for OHN NOC leaf nodes to be plugged into. Leaf nodes should be connected at the vendor network entrance, if possible. They may also be connected behind the client CPE, but this will affect the SLA measurements and troubleshooting.
- Responders are connected via 100Mbps ethernet over Category 5 cable. They require unfettered IP connectivity to the NMS, leaf nodes, other responders and troubleshooting devices
- Troubleshooting devices are connected via 100Mbps ethernet over Category 5 cable. They require unfettered IP connectivity to the NMS, leaf nodes, responders, and other troubleshooting devices
- Troubleshooting devices will need to have vendor-managed access to "sniff" traffic. This may be accomplished via a SPAN, Mirror, or similar ethernet switch port and can be provided as part of the normal network connectivity. A second ethernet port is available on the troubleshooting device for connection to a dedicated monitoring port if needed. The NOC will coordinate with the vendor if use of the monitoring port is needed.

6. Q: Who will purchase the leaf node responders and leaf nodes?

A: OHN NOC through EasyStreet

7. Q: Who will purchase the network troubleshooting devices?

A: The OHN NOC through EasyStreet

8. Q: What level of operational involvement is required of vendors and IXPs?

A: Network equipment will be configured by the OHN NOC and shipped to the vendors and IXPs for physical deployment. Vendors should work with the participant to fill out the OHN NOC Site Start-Up Form and will need to provide public IP addresses for the monitoring equipment. Service Providers will physically install the leaf nodes at participant sites per OHN NOC instructions. IXPs will physically install the leaf node responders and network troubleshooting devices per OHN NOC instructions. Vendors and IXPs will be required to work with the

OHN NOC to ensure the installation of network equipment is IP reachable. Vendors and IXPs will also need to work with the NOC to troubleshoot and resolve problems.

9. Q: How does the NOC know I have a problem with my service?

A: Alerts are generated in the NOC under the following conditions:

- Node Down
- IP SLA MOS Less Than 4.0
- IP SLA Jitter DS Greater Than 12ms
- IP SLA Packet DS Loss Greater Than 0.3%
- IP SLA Jitter SD Greater Than 12ms
- IP SLA Packet SD Loss Greater Than 0.3%
- RTT Greater Than 90ms

Alert Configurations—Any one of the following will generate an alert in the NOC:

OHN: Node Down

- Check for alert conditions every 1 minute
- Trigger immediately

OHN: IP SLA Jitter (Destination to Source) Greater Than 12ms

- Check for alert conditions every 5 minutes
- Do not trigger until conditions exist for more than 14 minutes

OHN: IP SLA Jitter (Source to Destination) Greater Than 12ms

- Check for alert conditions every 5 minutes
- Do not trigger until conditions exist for more than 14 minutes

OHN: RTT (Round Trip Time) Greater Than 90ms

- Check for alert conditions every 5 minutes
- Do not trigger until conditions exist for more than 14 minutes

OHN: IP SLA MOS (Mean Opinion Score) Less Than 4.0

- Check for alert conditions every 5 minutes
- Do not trigger until conditions exist for more than 9 minutes

OHN: IP SLA Packet (Destination to Source) Loss Greater Than 0.3%

- Check for alert conditions every 5 minutes
- Do not trigger until conditions exist for more than 14 minutes

OHN: IP SLA Packet (Source to Destination) Loss Greater Than 0.3%

- Check for alert conditions every 5 minutes
- Do not trigger until conditions exist for more than 14 minutes