ESnet LHCONE Service for Universities

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Date	Edited By	Change
13-Jan-2015	J Metzger	Created
15-Jan-2015	J Metzger	Minor updates
16-Jan-2015	P Giuntoli, J Metzger	Improved Clarity & Focus, added Appendix 2.
22-Jan-2015	Dorn	Readability improvements; consistency of terms (especially ESnet LHCONE Service and global LHCONE VRF network)
28-Jan-2015	J Metzger	Entered Experiment Site Coordinator Names.

Overview

The global LHCONE VRF network is a multi-domain layer 3 Virtual Private Network (VPN) dedicated to high energy physics and used by the LHC and Belle II research communities to exchange science data. The global LHCONE VRF network is supported by the collaborative efforts of research and education network providers including ESnet, Internet2, Canarie, GEANT, Renater, DFN, GARR, RedIRIS, ASGC, CERN. The goal of the global LHCONE VRF network is to optimize the performance of science data movement between LHC storage and analysis resources.

The global LHCONE VRF network provides services to a well defined and bounded community. As such, ESnet's LHCONE Service is only offered to participants in the US LHC and Belle II collaborations. University participation in ESnet's LHCONE Service further

requires compliance with the Worldwide LHC Computing Grid (WLCG) operations[1] and security[2] standards and practices.

The ESnet LHCONE Service is implemented as an overlay on the existing ESnet network in the US and Europe.

Service Description

Service Design

ESnet's LHCONE Service is built as an overlay on the ESnet Backbone. It is implemented as a Virtual Private Routed Network (VPRN) on the ESnet routers, including LHCONE-specific virtual interfaces and separate EBGP peering for external connections (VLAN tagged interfaces) with LHCONE-specific routing and packet filtering policies.

ESnet's LHCONE Service is interconnected with the global LHCONE VRF network via connections to CERN, GEANT, Internet2, Nordunet and Canarie at this time.

ESnet's LHCONE Service is provided via a BGP peering with the university at existing ESnet hubs. *The underlying last-mile network service between the ESnet hub and the university is outside the scope of the ESnet service and must be provided by the university.*

Demarcation Point

The primary way ESnet will deliver the LHCONE Service is via an existing shared ESnet connection to an open exchange such as Starlight or MANLAN. In this case the ESnet LHCONE Service demarcation point will be the ESnet port on the exchange switch. ESnet will be responsible for the ESnet port on the exchange switch, and the university will be responsible for the university's port on the exchange switch. The list of open exchanges where ESnet can deliver the LHCONE Service is in Appendix 1.

An alternative connection option is that the University may build their infrastructure out and make a direct 10G (LR) or 100G (LR4) connection to an existing ESnet 100G router. The demarcation point in this case will typically be a patch panel in the ESnet rack. **Connections of this type are limited. They must be reviewed and approved by the Experiment Site Coordinator and agreed to by ESnet management.** The list of hubs where ESnet is able to provide the LHCONE Service is in Appendix 1.

Service Policies and Requirements

All use of the ESnet LHCONE Service must comply with all appropriate policies, including, but not limited to, relevant WLCG, US LHC, ESnet, and DOE policies.

In addition to those policies, usage must comply with the following requirements:

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[1] http://wlcg.web.cern.ch/grid-operations
[2] http://wlcg.web.cern.ch/security/computer-security

- The primary purpose of the service is to facilitate data transfers between high energy physics instruments, scientific data storage, and scientific data analysis systems. All usage must be consistent with this purpose.
- Prefixes advertised to the service must not include general desktop users, dorms, wireless subnets, or other systems not associated with scientific data storage and analysis.
- Traffic injected into the service must not include traffic to or from general desktop users, dorms, or wireless subnets.
- Universities must comply with BCP38[3] on their LHCONE Service. This Internet Best Common Practice requires that organizations filter traffic on their border to insure the traffic they send out does not have forged IP source addresses. This reduces DDOS risk and facilitates tracking back the source of security events. [4]

Participant Roles and Responsibilities

The global LHCONE VRF network is a collaborative service that requires varying levels of participation by universities, experiments, DOE laboratories, national and regional R&E networks, and ESnet. ESnet has developed Site Coordinator and various technical contact roles to define relationships and responsibilities to help deliver a cohesive, organized and resilient service.

DOE Laboratory and ESnet Site Contacts

ESnet has a named "Site Coordinator" for each participating DOE lab. The Site Coordinator is responsible for ensuring that laboratories use of ESnet complies with all appropriate policies. The Site Coordinator is appointed by Site Management and must have the authority to ensure that any requests will meet the Site's policies, ESnet's policies and the ESnet Acceptable Use Policy[5]. At a DOE National Laboratory, the appointment would likely be made by the Director for Computing or the CIO. See Appendix 2 for an overview of site coordinator responsibilities.

Experiment Site Coordinators

ESnet has extended the Site Coordinator role to include representatives of the LHC Experiments. The Experiment Site Coordinators will have the same responsibilities as a Site Coordinator, but they will represent an experiment and US universities participating in that experiment.

While the Experiment Site Coordinators may delegate much of the technical and operational responsibilities to the respective sites and universities, they have a critical responsibility to ensure compliance with policies, to set priorities and to work with ESnet on service design modifications and exceptions.The Experiment Site Coordinators will assume responsibility for

[3] https://tools.ietf.org/html/bcp38

[4] ESnet filters routes, and only accepts routes from the approved prefix list. ESnet filters packets, and only accepts packets sourced from the approved prefix list.

[5] http://www.es.net/about/governance/AUP/

ensuring that all university sites comply with appropriate policies. This responsibility cannot be delegated.

University Contacts

Universities will not have ESnet Site Coordinators. Universities will, however, name a Technical Contact, that will serve as the primary point of coordination, a Security Contact for security issues and a Network Operations Center (NOC) contact for operational issues.

Service Request and Implementation Process

Universities interested in using ESnet's LHCONE Service should start by contacting the ESnet Experiment Site Coordinator who represents their experiment and requesting their university to be added to that coordinator's prioritized list. The Experiment Site Coordinator will prioritize all university requests and then submit requests to ESnet.

1. The Atlas Experiment Site Coordinator are:
    a. **Michael Ernst of BNL**
    b. **Rob Gardner of U Chicago**
2. The CMS Experiment Site Coordinator are:
    a. **James Letts of UCSD**
    b. **Kevin Lannon of Notre Dame**

Once a University has been approved and included in the experiment coordinator's list, ESnet will assign an engineer to collaborate with the University Technical Contact to evaluate which service connection options and understand appropriate operational policies.

Once the Experiment Site Coordinator ensures that the participating university is aware of the policies and have appropriate procedures in place, the service will be implemented. The *Experiment Site Coordinator will accept responsibility for the university compliance with ESnet policy.*

Sustaining Operations Activities

ESnet Planned Maintenance

- ESnet will send a notice to the Universities' Technical/NOC Contact in advance of a maintenance event that will significantly impact the service, providing an ESnet ticket number for event tracking.
- University NOCs or Technical Contacts may contact the ESnet NOC (trouble@es.net) if they have any questions or concerns.
- ESnet will not provide announcements when the maintenance starts or completes.

University Planned Maintenance

- The universities' NOC should provide advance notice to trouble@es.net if the BGP peering, or the physical interface across which the service is provided will go down.
- The ESnet NOC will enter this into our planned maintenance calendar.

- The ESnet NOC will contact the university NOC if the BGP session is down beyond the expected maintenance window.

ESnet Unplanned Maintenance

- The ESnet NOC will send an email to the university NOC contacts if the service is significantly impaired or down.
- The ESnet NOC will send an email to the university NOC contacts when the service recovers.

University Unplanned Maintenance

- The university should send an email to trouble@es.net if they are experiencing an unplanned maintenance event which takes down the BGP session or the physical interface serving the peering.

Security Event

- The ESnet Security team may contact the University Security Contact, the University Technical Contact, and the Experiment Site Coordinator if there is a report of a security event that needs to be investigated and mitigated.

Policy Event

- The ESnet team will contact the Experiment Site Coordinator in the event of suspected policy violations. Policy violations will be handled according to the ESnet AUP.

Service Status and Futures

- ESnet staff will report on the status of the LHCONE Service, and any future enhancements as needed at the bi-annual ESnet Site Coordinators Committee (ESCC) meetings. University Technical Contacts and other significant users of the service are welcome to attend these meetings.

Routine Technical Changes

- Routine technical changes, such as changing the accepted list of prefixes from a university will require approval by the University Technical Contact. Requests for changes that would cause ESnet to incur additional costs must be approved by the Experiment Site Coordinator before they will be entered into the ESnet Site Request Process for evaluation.

Debugging Performance Problems

- The University Technical Contact should contact the ESnet NOC (trouble@es.net), and open a ticket if they suspect network problems are impacting performance.
- ESnet staff will assist in localizing and debugging end-to-end performance problems.
- LHCONE performance problems will be handled in the same manner as other ESnet network performance problems. ESnet has a highly skilled staff that have been very

successful localizing and resolving complex multi-domain network performance problems.

- ESnet will also maintain several perfSONAR servers accessible via the LHCONE service to facilitate performance monitoring and debugging.

Appendix 1: LHCONE Access Points

ESnet can offer LHCONE Services to US universities via the following partners and at the following locations:

Exchange Points, Gigapops & Shared Fabrics
Internet2 AL2S
MANLAN
OMNIPOP
Pacific Wave
Starlight
WIX

ESnet 100G Hubs for Private Cross Connections	
Albuquerque	505 Marquette, Albuquerque, NM 87102
Atlanta	180 Peachtree St NW, Atlanta, GA 30303
Cambridge	300 Bent St, Cambridge, MA 02141
Chicago	710 N Lake Shore Dr, Chicago, IL 60611
Chicago	900 N Kingsbury St, Chicago, IL
Denver	1850 Pearl St, Denver, CO 80203
El Paso	501 W Overland Ave, El Paso, TX 79901
Houston	12001 N I-45, Houston, TX 77060
Kansas City	1100 Walnut St, Kansas City, MO 64106
Nashville	2990 Sidco Dr, Nashville, TN 37204
New York	32 Avenue of the Americas, New York, NY 10013
New York	111 8th Ave, New York, NY 10011
Sacramento	1075 Triangle Court, West Sacramento, CA 95605
Seattle	2001 6th Ave, Seattle, WA 98109
Sunnyvale	1380 Kifer Rd, Sunnyvale, CA 94086
Washington DC (McLean)	1755 Old Meadow Rd, McLean, VA 22102

Appendix 2: Overview of Site Coordinator Responsibilities

ESnet Site Coordinator: The role of 'site coordinator' includes the following:

- The Site Coordinator is appointed by Site Management and is responsible to ensure that any requests will meet the Site's policies, ESnet's policies, ESnet Acceptable Use Policy, and applicable DOE policies.
- The Site Coordinators must have the authority to accept that responsibility
- The appointment should be made by Laboratory (or Site) management with the authority and responsibility for site networking. At a DOE National Laboratory, the appointment would likely be made by the Director for Computing or the CIO.
- The identification of a Site Coordinator for a new site will be a part of the activities for implementing a new site.
- Changes in the personnel who fill the Site Coordinator role must be approved by the responsible Laboratory (or Site) management, and must be communicated to ESnet management (routing@es.net) and to the chairman of the ESnet Site Coordinating Committee (ESCC).
- The Site Coordinator represents the site organization on the ESCC and participates in ESCC meetings. The ESCC is the technical forum where community practice related to the ESnet-Labs/sites joint networking endeavor is established.
- The Site Coordinator makes or approves requests to the ESnet for changes to the operation of the site's network related functionality as it relates to ESnet.
- The Site Coordinator's initiation or approval of a request to ESnet indicates the request will be consistent with the Site's policy, ESnet policy and the ESnet AUP
- The Site Coordinator is responsible for providing a security contact to ESnet. This contact should be able to receive and act on security issues
- A site may request and be assigned a block of addresses from ESnet's address space. The Site Coordinator must supply ESnet with the information necessary to register the assignment with the American Registry for Internet Numbers (ARIN).
- ESnet staff may need to contact a site for a variety of reasons such as confirming a site power outage, reporting network problems with a host internal to a site, etc. Occasionally an ESnet access problem cannot be fixed without the assistance of a site representative (power cycling a router, moving a cable, etc.) The Site Coordinator must supply a contact for network problems and specify the hours of availability. Typically this would be a Network Operations Center mailer. While ESnet will monitor the site's network access 24x7x365, it is recognized that not all sites will have that level of local coverage. In this case the Site Coordinator may supply an off-hours contact.

- Since DNS operation can involve ongoing dialog between site technical personnel and ESnet staff, the Site Coordinator may name one person as a DNS Contact to make DNS requests, including requests involving new top-level domains.
- The site Coordinator is responsible for the physical tracking and security of any ESnet equipment at the site. This may include participating in routine inventory audits.