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Specifications for Exchange Points in the Global Network Architecture

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Executive Summary

This document describes a set of recommendations and proposals for services and capabilities for Global Research and Education Exchange Points (GXPs) participating in the Global Network Architecture. This is a supplementary specification to the Global Network Architecture (GNA) Reference Architecture. Some services are related to policy issues ("exchange philosophy") and some are technical (e.g., support of Layer 2 services).

Introduction

These specifications are not an attempt to rate GXPs or to determine their ability to participate in a GNA-compliant infrastructure. They are a set of recommendations for GXPs to strive toward and reflective of the evolving needs of many NRENs.

A separate activity based on this document is to catalogue the GXPs that have expressed an interest in adopting some or all of the recommendations in this document. The aim of the cataloguing activity is to create a global awareness about the capabilities of participating GXPs.

Services and Capabilities of a Global Exchange Point

Given that the services and capabilities of a GXP is a developing model, many GXPs may adopt a tiered approach towards the full implementation of these specifications. Recognizing that the needs of the community will continue to evolve, GXPs must be able to evolve to meet these new developments.

For the purposes of this document, a GXP will be considered to have these fundamental characteristics:

- A non-blocking switch where participant circuits are attached,
- The ability to create non-blocking connections between ports on that switch,
- A colocation facility (owned or leased) where the switch is located.

A GXP may have multiple switches, though in that case there must be sufficient capacity between the switches to effectively deliver non-blocking capability. Where this is not the case sites are thought of as a set of GXPs connected by a circuit.

A GXP will be located in a carrier neutral facility. It is desirable that the facility also be a natural hub location for domestic and international circuits. There is a set of characteristics of these facilities that are desirable and must be made known to perspective participants of the GXP.

GXP Colocation Characteristics

o   Colocation: GXPs are encouraged to make colocation space available to participants of the GXP, subject to the requirements of the GXP operator and the facility owner.

o   Cross Connects: Where possible the GXP should be located inside a facility that offers fiber cross-connects. Any meet-me room, if present, should be available to all customers within the building.

o   Remote Hands: Remote hands and on-call support should be available 24x7x365 for scheduled assistance at commercially reasonable labor rates. In cases where this is not available there must be some means to contact the GXP operator during off hours.

o   Security and access: The facility housing the GXP must provide basic security and access monitoring. The building managers should monitor access to the building and where possible to the floor or suite where the GXP is located. The organization managing the facility should maintain a list of personnel with authorized access. The GXP operator must make available information related to security and access to potential participants.

o   Power and air conditioning: The facility must supply, monitor and maintain adequate power, UPS backup facilities and air conditioning, appropriate to the region, for the GXP and all collocated equipment. In locations where natural events like earthquakes or floods are a concern, precautions in alignment with local standards should be implemented.

GXP Principles of Operation

The facility and the GXP operator must be transparent about their operations. This includes proactively making available information about its capabilities and services in order to assist potential users of the GXP in determining its suitability.

A critical component to the open and free exchange of traffic among participants is the GXP where they interconnect. A GXP must allow any Research and Education (R&E) organization, within the constraints of appropriate business practices, to establish a connection. The GXP operator may not force or restrict the ability of that organization to establish services with the other participants of the GXP.

GXPs should be open to the possibility of hosting content servers as well as providing access to commercial services of interest to R&E.

GXPs should have 24x7x365 NOC support available for monitoring the status of the exchange components (switches, etc.) and for on call support to assist in resolving any outages, problems or questions involving the exchange.

All traffic that is originating or terminating inside an R&E participant's network at a GXP must be able to traverse the GXP without limits or restrictions. This does not imply that individual

participant organizations cannot have or impose Acceptable Use Policy (AUP) restrictions within their networks. They are free to define their own policies as needed.

Community Engagement

Leadership of the GXP should actively participate in forums like the GNA and Global Lambda Integrated Facility (GLIF) where participating R&E networks can interact with and jointly plan services with the operations staff.

Measurement

The GXP will strive towards openness of information related to the operational status of the facility and its usage. This should not be taken to imply the GXP will make available information on individual users or organizations. The GXP should however make information available related to its performance, e.g., packet loss issues or port capacities.

It is understood that the GXP operator does not own the traffic between participants; all such information is owned by the participants. Metadata on traffic and other characteristics is, however, owned by the GXP operator. This does not imply that a GXP operator may not access user level information for debugging or other legitimate purposes, only that it is not theirs to publish without explicit permission.

An organization managing a GXP where circuits terminate must minimally collect aggregate throughput data. This would be simple count of bytes in and out or packets in and out of the switch, generally aggregated as high level utilization statistics.

It is acceptable to publish that information on web sites for public viewing, although privacy and security standards are likely to become discussion points in GLIF and GNA settings in the coming years.

Organizations may have dedicated bandwidth allocated to them (a VLAN) according to some pre-defined scheme, determined by for instance contributions to cost of the circuit. Upon request, the GXP may collect information on VLAN utilization and report it to the consortia partners for the circuit that VLAN connects. Unless specifically authorized by the organizations this information should not be made public.

Privacy of Data Policy Statement

The operator of a GXP must create policies, procedures and communications detailing practices to maintain the highest level of privacy of the data transiting the GXP, specifically to address network flow data, packet captures or other operational data that could be used to identify individuals, institutions or workstations. Policies and procedures should be in place to assure

any personal identification data or usage trends among participants of the GXP are managed under a written privacy policy that is made available to all participants.

It is important to reiterate that the GXP *does not own* any of the data that transits its facilities, that information is owned by some combination of the source and destination sites.

Performance Assurance Node and Ad Hoc Testing

To monitor the operational stability and track the history of links across its distributed network, a performance monitoring node should be placed at each GXP. In most networks today, such nodes are currently deployed using perfSONAR.

These nodes will function as a part of a global performance assurance mesh. Optimally these nodes would have a minimum of a 10 Gb uplink to the exchange fabric and would be operated by the GXP. The node would be used for NOC alarming, operational agreements on reachability, service management and incident management. This will fall under an open statistics framework.

Having such information would enhance a GXP's ability to demonstrate the quality of the services that are offered.

Of equal value would be for the GXP to provide and maintain a perfSONAR node for ad hoc testing as needed for incident management and performance base-lining. Where possible, state of the art (currently 100 Gb), perfSONAR nodes for this purpose would be available.

Service Support and Service Delivery

A goal of the GNA is for a participating organization to be able to deliver services to its users, at any place and at any time, with as close to the same characteristics as local delivery of that service. Some differences may be unavoidable (latency being the obvious example). The GXP operators will need to work together to define a common set of service delivery expectations that attempts to normalize regional, political and cultural expectations against the global set of expectations for timely service delivery. Ultimately the goal of the GNA activity is to enable capabilities that are not currently possible.

GXP operators must publish these and other Service Levels on their website.