AS6461 IP NETWORK

Global Peering and Interconnection Policy

Overview

This Policy provides guidelines for the selection of network Peers on a global or regional basis to connect to Zayo's public network AS6461. The Policy is intended to provide reasonably accurate technical information and does not in any way constitute an agreement between 3rd parties and Zayo. In the event of any conflict between this document and any written document between a 3rd party and Zayo, the written agreement shall be the governing document.

DISCLAIMER: ZAYO EVALUATES THIS POLICY ON AN ONGOING BASIS AND RESERVES THE RIGHT TO MAKE CHANGES TO IT AT ANY TIME AT ITS SOLE DISCRETION. THIS PEERING POLICY IS ONLY A GUIDELINE, NOT AN AGREEMENT OR A SET OF RULES GOVERNING A SPECIFIC PEERING RELATIONSHIP.

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1. Background

Historically, IP Peering policies have dealt with traffic ratios, minimum commit levels, number of ASNs and interconnects. This policy uses more relevant information for Zayo's business & network operations to evaluate potential Peering candidates::

- Where is your network?
- What type of network do you operate?
- Who are you exchanging traffic with?
- What value do you bring to the interconnection relationship?

Responses to these questions, along with any NetFlow analysis and information from the PeeringDB public website, are the primary sources of this data.

Note: Zayo will evaluate new IXP memberships on an individual case basis.

2. Types of Peers

Zayo maintains two levels of Peering guidelines, based on provider type and market definitions. These are Restrictive and Selective. Each arrangement is based upon market definitions and traffic type.

2.1   Content Providers

Content Providers are network operators that source high volumes of content for transmission across the public Internet. Typical examples are media streaming companies, content delivery networks, and web hosts.

- Content Providers control egress path selection for traffic originating from their servers & customers
- Content network traffic tends to be volatile in nature & can consume all available interconnection headroom during popular events
- Content networks control the nature of the traffic they originate, including, but not limited to:
    - Volume
    - Class of Service
    - Window Size
    - Reaction to Congestion
    - Point of Origin

Zayo maintains a "Restrictive" settlement-free Peering policy for Content Providers. This means that Zayo can offer Content Providers a 30-day trial period for both parties to evaluate performance and traffic flows. If it is decided that the Content Provider is suitable, Zayo will announce Local/Regional

routes only as part of a settlement-free agreement. In addition, Content Providers must also meet/adhere to the mandatory conditions set in Section 3.1

If it is decided that a Content Provider is not eligible for settlement-free Peering, then a Paid PNI can be offered instead.

2.2   Other Network Operators

This type of Peer network will include "Eyeball" operators and other Enterprise networks, large and small. Zayo maintains a "Selective" settlement-free Peering policy for all Other Network Operators that are not primarily Content Providers. To qualify, network operators will need to provide Zayo with the following information for evaluation:

- Peering candidates shall indicate their primary metropolitan area markets (up to 10) with approximate levels of total traffic using this form.
- Peering candidates shall provide a snapshot of the two most recent months (at application time) of traffic levels to the list of Zayo core ASNs provided on https://as6461.Peeringdb.com (the Peer must maintain a flow data collection system)

In addition, Content Providers must also meet/adhere to the mandatory conditions set in Section 3.1

3. Criteria for Peering

3.1   Requirements

In addition to the traffic and market considerations set in Section 2, Peer must meet the following criteria:

- All prefixes announced to Zayo must have IRR data and/or valid RPKI ROA
- Zayo will reject prefixes with invalid RPKI ROA
- IPv6 prefix lengths accepted: /16 to /48
- IPv4 prefix lengths accepted: /8 to /24
- Dual-stack or IPv6-only; no new IPv4-only Peers will be accepted
  (Zayo announces all IPv6 customer routes to all connected IXPs' route-servers)
- Public IXP Peers will be expected to remain below 5% of IXP port capacity (measured 95th%)
- When a Public Peer's 95th% traffic exceeds 5% of IXP port capacity, the Peer will be evaluated for Private Network Interconnects (PNIs)
- PNIs: Delivered as 2x10GE or Nx100GE, always configured with LACP Active (no more than two 10GE links)

- The Peer must maintain a network flow data collection system.
- The Peer's network operations contact must be available on a 24x7x365 basis.
- Zayo's NCC must be able to open trouble tickets with the Peer via email or web portal.
- The Peer must cooperate with Zayo in preventing DDoS attacks and any other network abuse (e.g. prefix hijacking, etc).
- MANRS membership is encouraged
- The Peer must be a member of their Regional Internet Registry and maintain accurate abuse contact information on their LIR data.
- The Peer must maintain a PeeringDB entry, including accurate max prefix numbers.
- The Peer will set next-hop-self on all advertised routes.
- The Peer must not point default or static routes to Zayo's routers.

3.2   Private Network Interconnects (PNIs)

Once a Public Peer's traffic is exchanged with Zayo (cumulative across all Peer & Zayo ASNs) reaches 5% IXP port capacity on a 95th% basis over two consecutive months, the Peer will be evaluated for private interconnection.

- At a minimum, Zayo will require multiple redundant 2x10GE PNIs
  - Once over 10Gbps traffic is measured at 95th%, Zayo will evaluate the Peer for an upgrade to redundant 100GE PNIs
- >30% of Peer's traffic exchanged with a single Zayo customer ASN or organization (including Peers' own ASNs) will result in migration to Paid PNIs
- >30% of Peer's traffic over Zayo's intercontinental links will result in migration to Paid PNIs
- Peers will be responsible for all cross-connect fees to Zayo's CFA unless prior arrangements are made.

3.3   Re-evaluation

Zayo reserves the right to re-evaluate established Peers at any time. Peers no longer meeting the required criteria will be given 90 days notice to reestablish original qualifying conditions. If the Peer is unable to meet the criteria within 90 days, alternative options will be proposed including reduction of geographic routing visibility, migration to Paid PNIs, and disconnection.

3.4   Acceptable Use Policy (AUP)

All Peers and customers must adhere to Zayo's Acceptable Use Policy (AUP) which outlines prohibited activity relating to the use of Zayo's services. The AUP can be found on our website here:

- https://www.zayo.com/policies/

Repeated violations of Zayo's AUP will result in re-evaluation; see section 3.3

4. Peering Locations

4.1   Core Markets

A "Core Market" is defined as a location where Zayo maintains dedicated core WAN routers and a dense dark fiber network. Zayo maintains a restrictive Peering policy for Content Providers in these markets and a selective Peering policy for Other Network Operators. In addition to the mandatory conditions outlined in section 3.1, the provider must also meet the following criteria:

- A minimum of two physical connections are required, separated across diverse routers for redundancy.
- Peers will interconnect with Zayo in at least half of our common metro areas, preferably more (unless otherwise specified by Zayo).

Market	Country
Frankfurt	Germany
Paris	France
Amsterdam	Netherlands
London / Slough	United Kingdom
Washington, DC / Northern VA	USA
Atlanta	USA
Chicago	USA
Dallas / Ft. Worth	USA
Denver	USA
Houston	USA
Los Angeles	USA
New York / Northern NJ	USA
Phoenix	USA
San Jose / San Francisco	USA
Seattle	USA

4.2   Edge Markets

Defined as a metropolitan area where Zayo maintains at least one standalone IP PoP. Zayo has a restrictive Peering policy for Content Providers in these markets and a selective Peering policy for Other Network Operators. In addition to the mandatory conditions outlined in section 3.1, the provider must also meet the following criteria:

- A minimum of a single interconnection point is required.
- Peers will interconnect with Zayo in at least half of our common metro areas, preferably more (unless otherwise specified by Zayo).

As noted in section 2.1, Zayo will announce Local Routes to Content Providers in Edge Markets.

Zayo's list of Edge Markets is constantly evolving and the latest information can be found at the following locations:

- https://tranzact.zayo.com/
- https://as6461.Peeringdb.com/

5. Glossary

Term	Definition
ASN	Autonomous Systems Numbers are required by network operators in order to govern traffic within their infrastructure for the purpose of other Internet Service Providers (ISPs) being able to exchange routing information. An Autonomous System (AS) is a collection of at least one IP prefix (IP address that can be accessed on a network) managed by a singular, well-defined routing protocol maintained by the network operator.
Content Provider	Network operators that primarily originate outbound content traffic from within their own networks. Typical examples include hosting companies and content distribution networks.
Other Network Operators	All other network types, including "eyeball" networks, mobile/cellular, regional ISPs and ILECs, enterprise networks, NGOs, etc.
Core Market	Zayo Tier 1 markets. These have the best connectivity to the AS6461 intercity long-haul backbone as well as downstream tertiary markets through dedicated core routers, typically are the easiest in which to augment capacity thanks to Zayo dark fiber, and often have dedicated Peering routers available.
IXP	Internet Exchange Point, "public" Internet interconnection infrastructure operated by a neutral 3rd party that enables interconnection between more than two network operators.
Edge Market	Select Tier 2 markets around the "edge" of AS6461 that tend to provide connectivity to networks that may not be present in other locations. A few of these markets may

	eventually be promoted to "Core Market" status as they grow.
Restrictive Peering Policy	Zayo will offer selected Content Providers a 30-day trial period for both parties to evaluate performance and traffic flows. If it is decided that the Content Provider is suitable, Zayo will announce Local/Regional routes only as part of a settlement-free agreement. If it is decided that a Content Provider is not suitable for settlement-free Peering, then a Paid PNI can be set up instead.
Selective Peering Policy	Zayo will evaluate Other Network Operators based on the conditions set forth in Section 3. If deemed a qualified candidate, Zayo will work with the Network Operator to establish settlement-free interconnection in select markets
Peering	A mutual agreement to a bilateral IP traffic interconnection relationship with AS6461. This is based on the assumption that another AS will receive Zayo customer prefixes, in exchange for the Peer also advertising their customer prefixes to Zayo. Both parties benefit approximately equally from the relationship and are referred to as settlement-free Peers.
PNI	Private Network Interconnect, a direct interconnection between two network operators, with no intermediate 3rd party routing in the path.
Regional Routes	IP prefixes from Zayo customers connected in the same continent as the Peer.
Local Routes	IP prefixes from Zayo customers connected in the Market itself and any directly connected downstream Markets.
RPKI	Resource Public Key Infrastructure is a security framework that helps network operators make more informed and secure routing decisions for BGP announcements. In turn, this prevents bad actors from advertising address space (spoofing/hijacking) that isn't theirs, which can

	result in critical outages or fraudulent traffic manipulation.