

BGP at the IXP: What every Network Operator should get right!

MISPA Member Meeting
30th September 2026



These materials are licensed under the Creative Commons Attribution-NonCommercial 4.0 International license
(<http://creativecommons.org/licenses/by-nc/4.0/>)



UNIVERSITY OF OREGON

Last updated 30th September 2026



Topics

- Peering Router Configuration Basics
- Peering Basics
- Peering Best Practices
- Other Considerations

Peering Router Configuration Basics

- Peering Router is used **only** for **peering**
 - Carries IXP member/network operator's own routes
 - Carries routes learned from private and IXP peers
 - Must have **NO** default route
 - Must **not** carry the global routing table
 - Quite often these are “small” FIB devices with very high throughput interfaces
 - Route Reflector Client of the network's core routers



UNIVERSITY OF OREGON



Peering Router Configuration Basics

- Most IXes prohibit (as part of membership agreement) the subnets used for the peering LAN being propagated anywhere on the Internet – it is a security issue
- IX members sometimes carry the IX LAN in their IGP so that traceroutes to peers via the IX will show the IX hop
 - Avoids “broken” traceroutes
- IBGP sessions with other routers are configured with “next-hop-self”
 - Cisco IOS: `neighbor 100.64.0.1 next-hop-self`



Peering Router Configuration Basics

- Disable IGP discovery on the IX LAN
 - Either “no mention” (depending on vendor)
 - Or “passive” (which announces the IX LAN subnet by IGP on Cisco IOS)
 - In summary: **NO** IGP on the IX LAN

```
interface Ethernet0/0
  description IXP LAN
  ip address 100.65.0.34 255.255.255.0
  ipv6 address 2001:db8:ffff:0::34/64
  !
router isis isp-net
  passive-interface Ethernet0/0
  !
```



Peering Router Configuration Basics

- Disable interface discovery services
 - CDP – Cisco Discovery Protocol
 - LLDP – Link Layer Discovery Protocol
 - IPv6 auto configurations
 - Cisco IOS:

```
interface Ethernet0/0
  description IXP LAN
...
  no cdp enable
  no lldp transmit
  no ip redirects
  no ip proxy-arp
  ipv6 nd prefix default no-advertise
  ipv6 nd ra suppress all
!
```



Peering Router Configuration Basics

- IX LAN interface packet filters
 - Only allow BGP sessions from peers on IX LAN to access router control plane
 - Cisco IOS:

```
interface Ethernet0/0
  description IXP LAN
  ip address 100.65.0.34 255.255.255.0
  ip access-group ixp-lan-in in
  ...
!
ip access-list extended ixp-lan-in
  permit icmp any any
  permit tcp 100.65.0.0 0.0.0.255 100.65.0.34 eq bgp
  permit tcp 100.65.0.0 0.0.0.255 eq bgp 100.65.0.34
  deny tcp 100.65.0.0 0.0.0.255 100.65.0.34 any
  ...
```

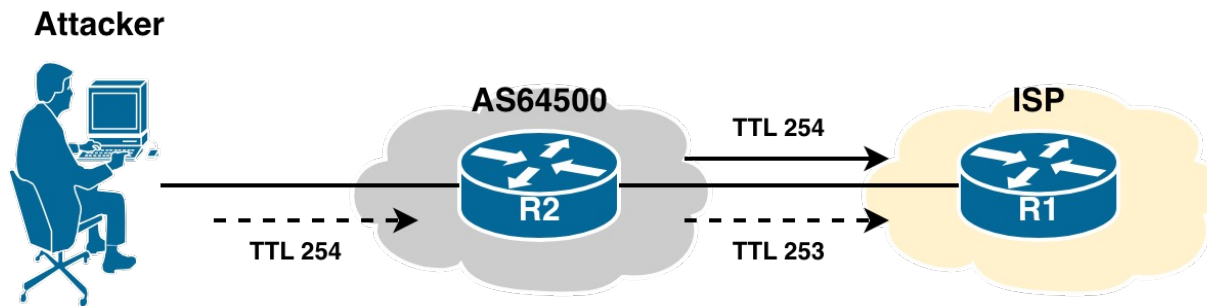


Topics

- Peering Router Configuration Basics
- **Peering Basics**
- Peering Best Practices
- Other Considerations

Peering Basics: Protection

- Passwords on EBGP sessions
 - Cisco IOS: `neighbor x.x.x.x password <secret>`
- BGP TTL Security (RFC5082)
 - Set BGP session TTL to 255 (rather than default of “1”)
 - Packets not matching expected TTL will be dropped



- Cisco IOS: `neighbor 100.121.0.2 ttl-security hops 1`



Peering Basics: Policies

- Open Peering
 - Where a network operator publicly states that they will peer with all parties who approach them for peering
 - Commonly found at IXPs where the network operator participates via the Route Server (RS)
- Selective Peering
 - Where a network operator's peering policy depends on the nature of the operator who requests peering with them
 - At IXPs, the operator will not peer with RS but will only peer bilaterally
- Restrictive Peering
 - Where a network operator decides who its peering partners are, and is generally not approachable to considering peering opportunities



UNIVERSITY OF OREGON



Peering Basics: PeeringDB

- The Peering Database documents network operator peering policies
 - <https://www.peeringdb.com>
- Every AS owner needs to have an up-to-date PeeringDB entry whether they peer or not

PeeringDB Search here for a network, IX, or facility. [Advanced Search](#) [Register](#) [Login](#) [English \(English\)](#)

MISPA-IXP

Peers: 13 | Connections: 13 | Open Peers: 8 | Total Capacity: 131G | % with IPv6: 61

[EXPORT](#)

Organization	Gemnet LLC
Also Known As	MISPA-IX
Long Name	MISPA internet exchange point
City	Ulaanbaatar
Country	MN
Continental Region	Asia Pacific
Service Level	Not Disclosed
Terms	Not Disclosed
Last Updated	2025-04-11T09:13:25Z
Notes	
Logo	

Contact Information

Company Website	https://mispa.mn
Traffic Stats Website	
Technical Email	support@mispa.mn
Technical Phone	+97670160055
Policy Email	info@mispa.mn
Policy Phone	
Sales Email	
Sales Phone	
Health Check	

LAN

Payload MTU	1500
IX-F Member Export URL Visibility	Private

Prefixes

Protocol	Prefix
IPv4	103.8.60.0/24
IPv6	2401:d600:0:aa::/64
IPv6	2001:df3:a340:8::/64

Peers at this Exchange Point

[Filter](#)

Peer Name	ASN	Capacity	Policy
IPv4	IPv6	Port Location	
GMOBILENET-MN	58625	10G	Open
103.8.60.20	2401:d600:0:aa::20		
GNET Mongolia	24496	10G	Restrictive
103.8.60.23			
Homenet Mongolia	55342	10G	Open
103.8.60.41			
Kewiko	56293	10G	Selective
103.8.60.11	2401:d600:0:aa::11		
M-ROOT DNS Server	7500	1G	Open
103.8.60.33	2401:d600:0:aa::33		
MISPA IXP Route Servers	24064		Open
103.8.60.6			
MobiCom Corporation	55805	10G	Selective
103.8.60.24	2401:d600:0:aa::24		
NBCCOLTD	134356	10G	Open
103.8.60.14			
PCH AS3856	3856	10G	Open
103.8.60.36	2001:df3:a340:8::36		
PCH AS42	42	10G	Open
103.8.60.35	2001:df3:a340:8::35		
RackCorp	56038	10G	Open



UNIVERSITY OF OREGON

Peering Basics: ROAs

- A Route Origin Authorisation is a digital object that contains a list of address prefixes and one AS number
- Created by the address space holder in their RIR member's portal
- A typical ROA would look like this:

Prefix	10.10.0.0/16
Max-Length	/18
Origin-AS	AS65534

- There can be more than one ROA per address block
- **NB:** Only create ROAs for the aggregate and the exact subnets expected in the routing table!! (See RFC9319)



UNIVERSITY OF OREGON



Peering Basics: IRR

- Internet Routing Registry objects
 - Route Object – documents the ASN that is originating the prefix (created automatically when ROA created)
 - AS Object – documents peering policy with adjacent ASes, and includes details and contact information of the network operator
 - AS Set – gathers downstream (customer) ASes in one easy to use identifier to allow more complex policy declarations
- IRR entry mandatory requirement by many major network operators and content providers
- RIR members should use the component of the IRR run by their RIR
 - accessible via the RIR member portal



UNIVERSITY OF OREGON



Topics

- Peering Router Configuration Basics
- Peering Basics
- **Peering Best Practices**
- Other Considerations

Peering Best Practices (1)

- Use BGP Communities to tag routes
 - Internal use
 - Customer identification
 - Private & IXP Peer identification
- Use BGP Communities as part of outbound announcement policy
- Examples:

<code>ip community-list standard aggregates</code>	<code>permit 64500:1000</code>	ISP Aggregates
<code>ip community-list standard subnets</code>	<code>permit 64500:1001</code>	ISP Subnets
<code>ip community-list standard pi</code>	<code>permit 64500:1005</code>	Customer independent
<code>ip community-list standard private-peer</code>	<code>permit 64500:2000</code>	Private Peer Routes
<code>ip community-list standard ixp-peers</code>	<code>permit 64500:3000</code>	IXP Peer Routes

- Upstreams and peers get “aggregates + pi” communities



UNIVERSITY OF OREGON



Peering Best Practices (2)

- Filter each peer according to what is in IRR
 - Use BGPQ4 to generate configurations
 - BGPQ4: BGP filter generation tool relying on IRR objects
 - prefix-lists
 - AS-PATH filters
 - Different routing OS outputs
 - <https://github.com/bgp/bgpq4>
- If not possible to filter, “max-prefix” is mandatory

```
neighbor <x.x.x.x> maximum-prefix <max> [restart N] [<threshold>] [warning-only]
```

- *restart*: how many minutes to wait before restoring BGP session
- *threshold*: percentage of maximum before sending warnings

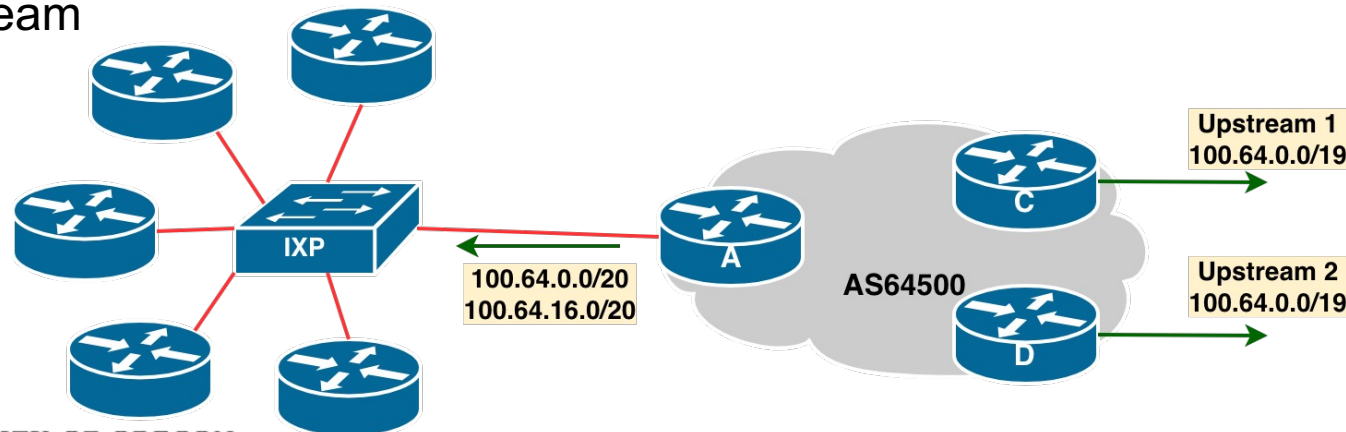


UNIVERSITY OF OREGON



Peering Best Practices (3)

- Care needed with prefix announcements!
 - Prefixes announced to upstream MUST be announced to IX peers as well
 - Subnets used for traffic engineering with upstream MUST be announced to IX peers as well
- IX members often send only subnets of aggregates to the IX peers
 - This forces inbound peering traffic across the IX, rather than accidentally through upstream



UNIVERSITY OF OREGON



Peering Best Practices (4)

- Check validity of received routes
 - Run ROV on IXP peering router!
 - In fact, run ROV on any router with EBGP session; and drop all invalids
 - Note that some IXPs also run ROV on the IXP route server so that invalid routes are not propagated by the IXP
- Remove internal BGP communities from advertised routes
 - Overwriting is easiest

```
router bgp 64508
  address-family ipv4
    neighbor 100.69.1.1 remote-as 64500
    neighbor 100.69.1.1 route-map upstream out
    neighbor 100.69.1.1 prefix-list default in
  !
  route-map upstream permit 10
    match community aggregate pi
    set community 64500:1
  !
```



UNIVERSITY OF OREGON

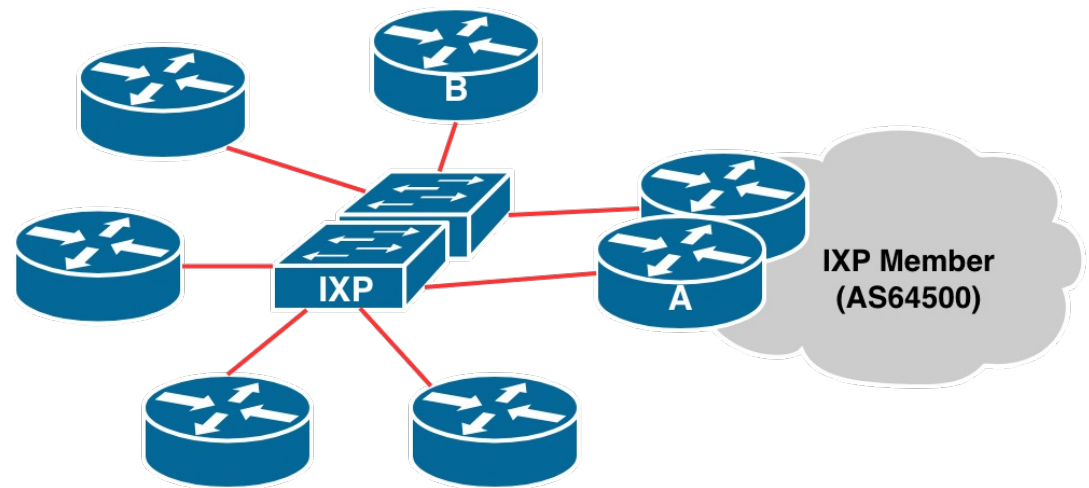


Topics

- Peering Router Configuration Basics
- Peering Basics
- Peering Best Practices
- Other Considerations

Two routers at an IXP?

- IXP LAN configuration:
 - Second connection is on same subnet on IXP
 - Member receives another IP address from the same subnet
- Second EBGP session is established
 - With the IXP Route Server (if present)
 - With the other IXP members (with their second router, if they have one)
 - With IXP services infrastructure (if applicable)



UNIVERSITY OF OREGON



Peering Priorities

- Most preferred – BGP customers
 - We would like traffic from us to our BGP customers to go directly, not via our peers or transits
- Next – private peers
 - Connect by direct cross-connection
- Next – local IXP Bi-Lateral
 - Keep local traffic local
- Next – local IXP RS
 - Keep local traffic local
- Last preference – paid transit
 - Will cost money for physical connectivity and for traffic

- Local Preference Table

Peering Policy	Local Preference
BGP Customer	250
Private Peer	200
IXP Bi-lateral	170
IXP RS	150
(default)	100
Primary Paid Transit	50
Backup Paid Transit	40



UNIVERSITY OF OREGON



Questions?

This document is a result of work by the Network Startup Resource Center (NSRC at <http://www.nsrc.org>). This document may be freely copied, modified, and otherwise re-used on the condition that any re-use acknowledge the NSRC as the original source.



UNIVERSITY OF OREGON

