

Peering Economics

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Peering Economics Topics

- Why peering is an investment
- When peering is worth the investment
- Assessing the impact on network devices
- Why you need a peering strategy
- Why you need peering security

Why Peering is an Investment

- Peering is a connection between two network devices. Network devices require a serious investment of cash.
- People are needed to configure and maintain network devices. People are not free. They want salaries.
- The network devices need electric power and a space to occupy. Power and space are not free, which is clear from your colocation bills.

Why Peering is an Investment

Peering requires an investment, but as with anything that has a cost, it also has value. To determine its value to you, you need to think about what it actually costs you:

- How much your port costs, including optics and equipment support costs.
- Consider where the costs for connecting to the peering exchange, including the cross-connect costs at the data center that hosts you and the exchange or circuit costs if you are paying a third-party provider to reach the IX. Don't forget the setup fees.
- Now that we have considered these things, let's look at the numbers:

Why Peering is an Investment

	MyISP	MyIX
One-time Costs		
Device Port	€200	€200
Setup Fee for Cross-connect	€500	€500
Setup Fee for Service	€250	€500
Recurring Costs		
Commit Level (Mbps)	2000	n/a
Commit Price	€2,000	n/a
Price per Mb above commit	€1	n/a
Price per port	n/a	€500
Cross-connect	€250	€250

When Peering is Worth the Investment

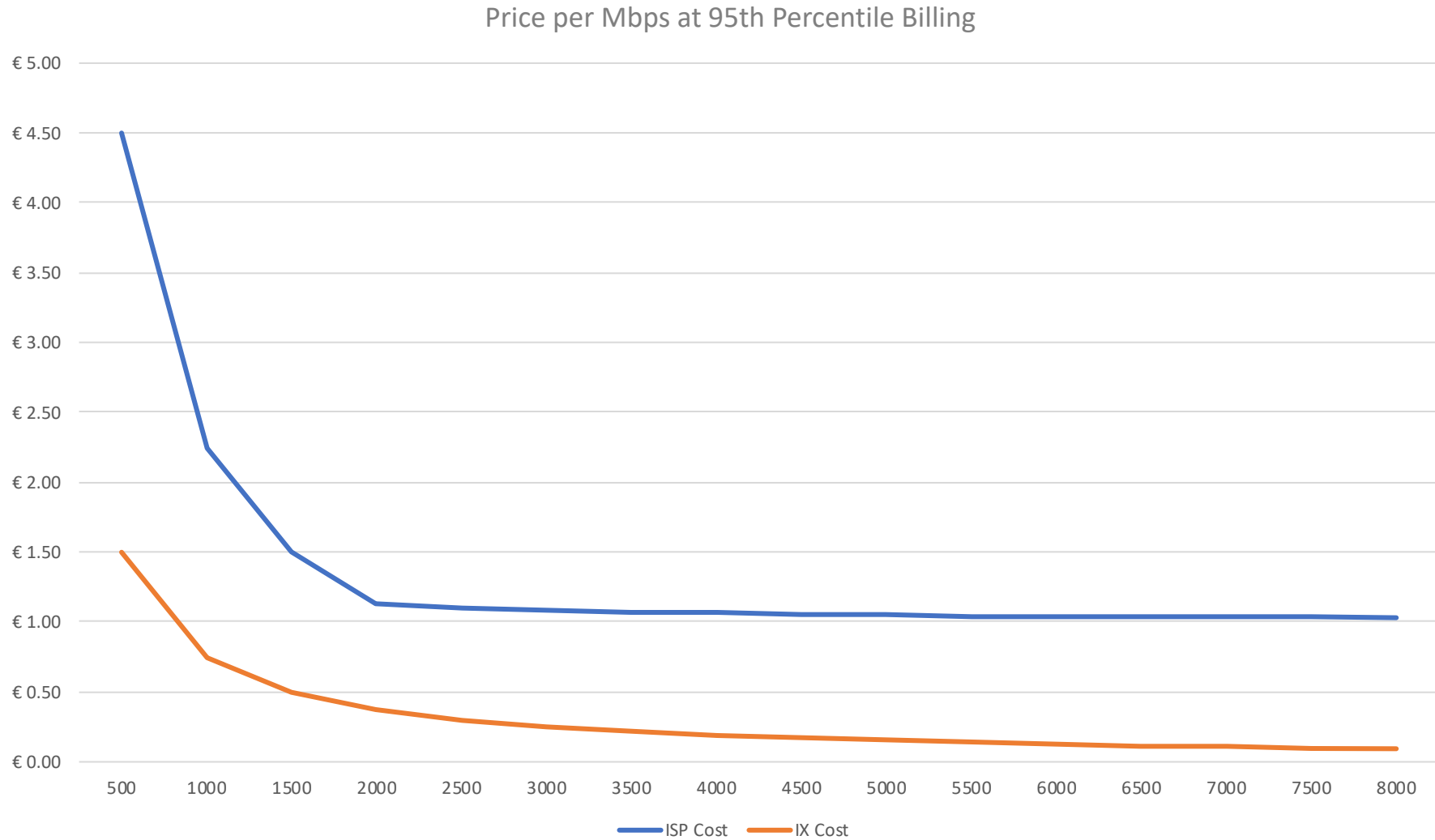
Now that you have calculated your costs, it's time to assess the benefits. To make the best investment, you should consider who your potential peering partners will be on the exchange:

- Exchanges where you can reach content networks or cloud providers can be very advantageous.
- Don't forget to peer with the caching networks like Akamai, Fastly, Limelight, etc.
- Netflow or Sflow can give you a lot of information about your highest traffic sources and destinations.

When Peering is Worth the Investment

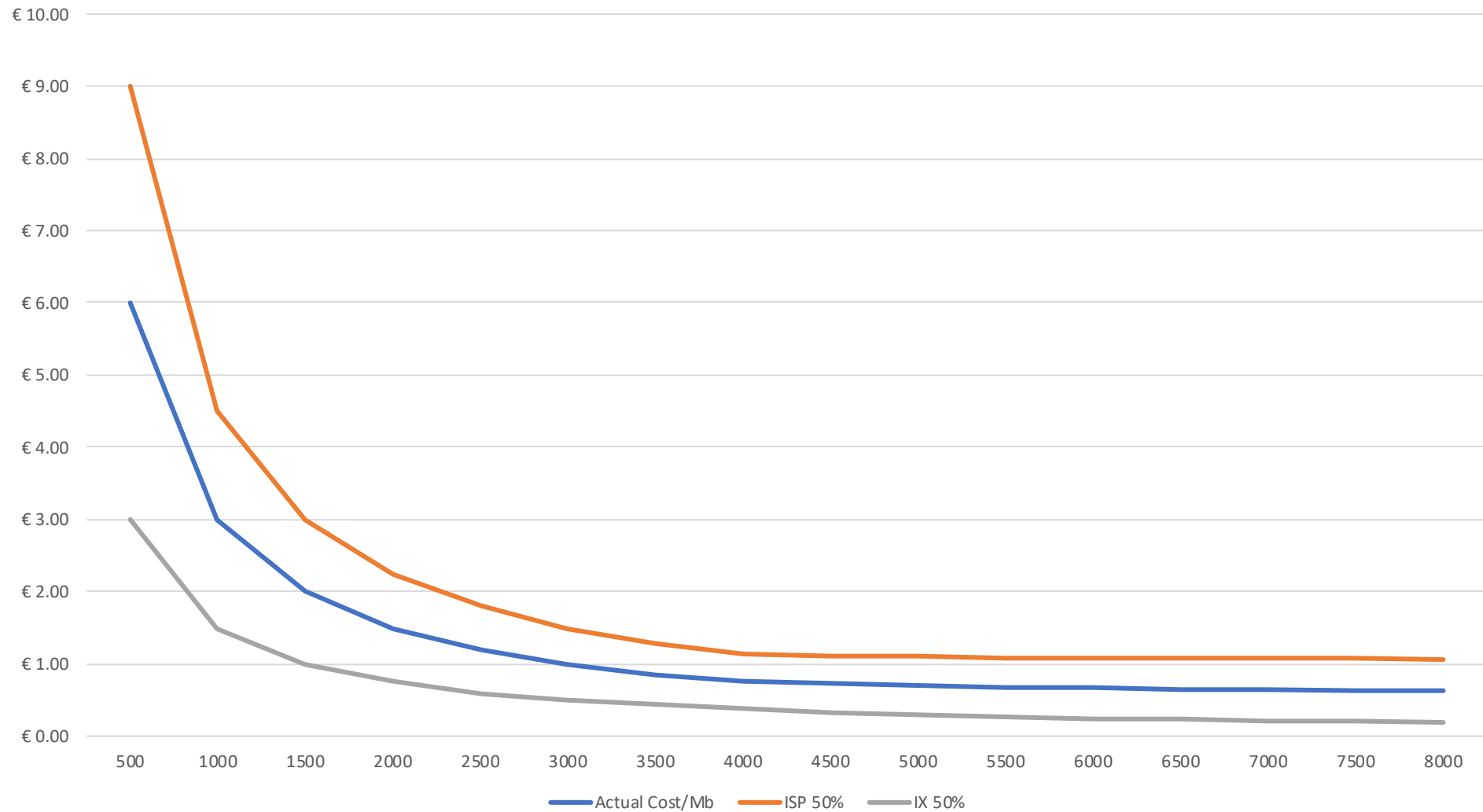
Once you have this information, you see if the getting a port on the exchange makes good business sense based on cost:

When Peering is Worth the Investment

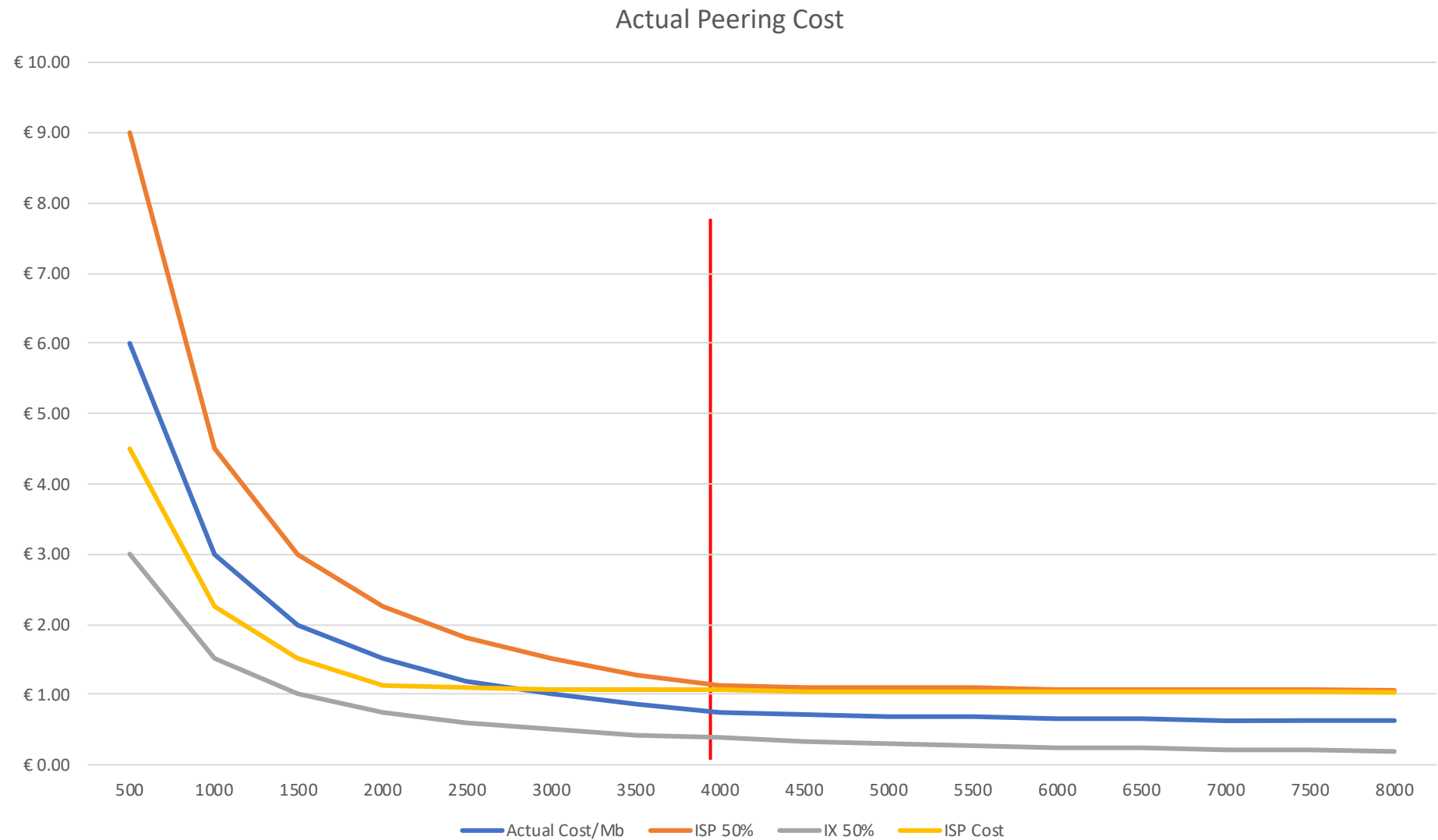


When Peering is Worth the Investment

Costs When Dividing Traffic between your ISP and your Peering Link



When Peering is Worth the Investment



When Peering is Worth the Investment

Don't forget to factor in operational support costs—and save by streamlining or automating them.

- Pre-configure peer groups for your neighbors to make turn-up quick and easy.
- Consider the support priority of peers. You may not need to wake up your on-call engineers.
- Monitor port capacity on your IX connections and increase it before you get into trouble.

When Peering is Worth the Investment

It's not all about the money.

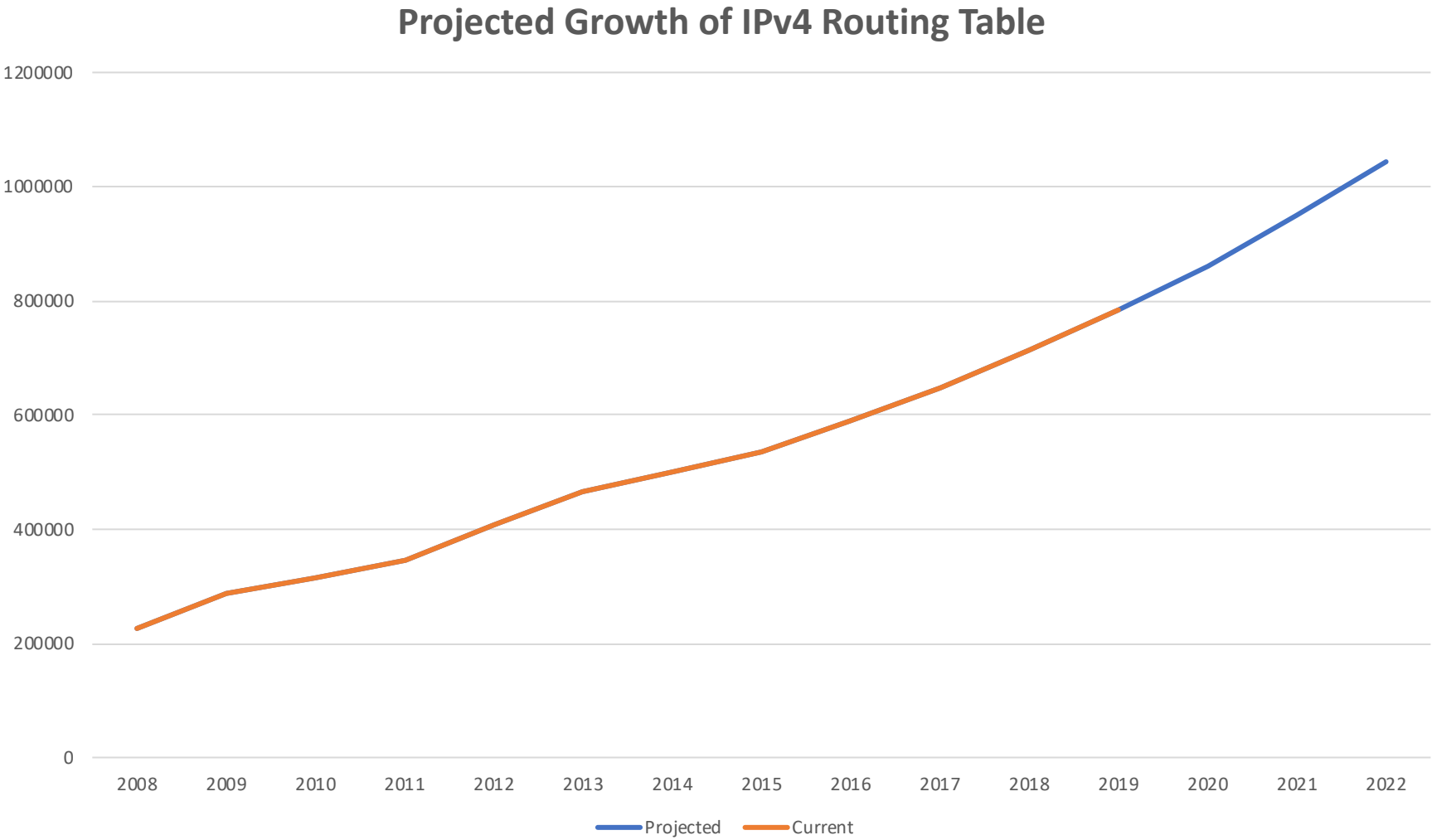
- Peering can provide real tangible benefits in terms of reduced latency and improved throughput.
- You will gain more diversity at your edge. This will improve traffic flow, decrease latency and can help your routers rebuild their tables more quickly when a link goes down.
- Improves the scale of your network and prepares you for future growth.
- Your internal and external customers will be happier.

Assessing the impact on network devices

After weighing your costs against your benefits and choosing potential peering partners, it's time to consider your network devices.

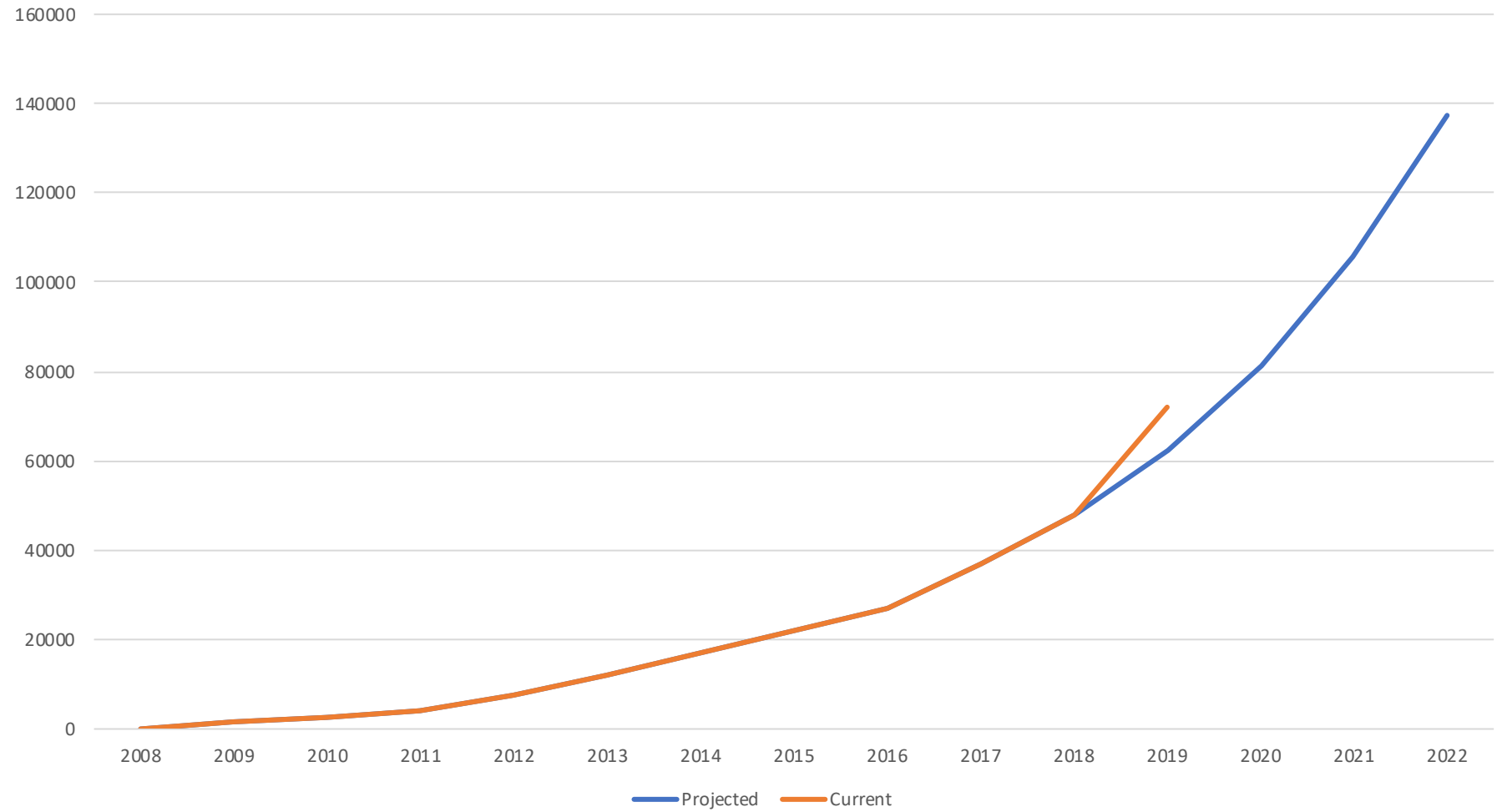
- Additional routes mean bigger tables and more memory usage.
- Routers are built to handle both traffic throughput and routing tables, but a router does not have infinite capacity.
- Networks have different replacement rates, but 5 years is a common expectation for a router purchase. To project if your router will last that long, it will help to take a look at how much the Internet routing tables are expected to grow.

Assessing the impact on network devices



Assessing the impact on network devices

Projected Growth of IPv6 Routing Table



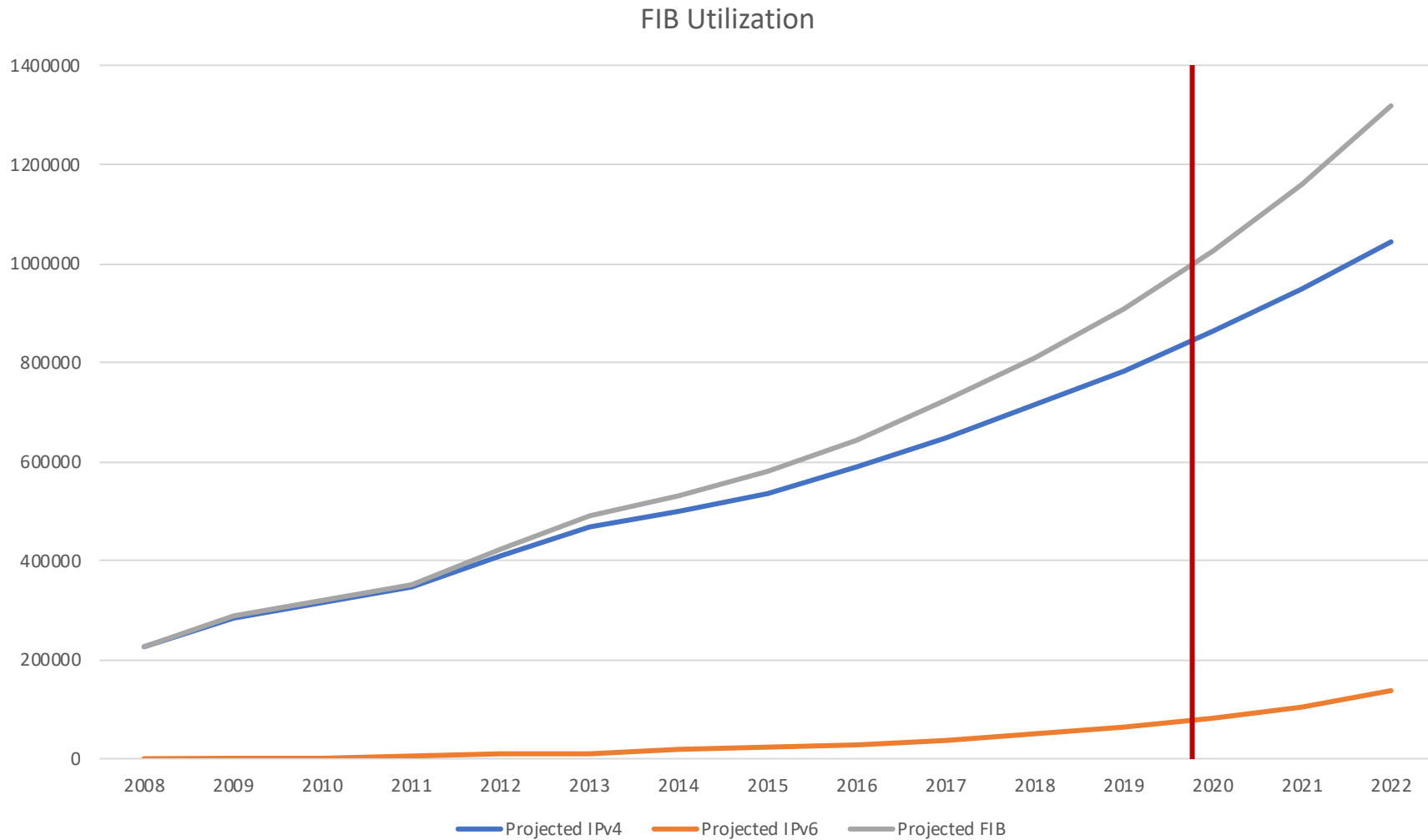
Assessing the impact on network devices

Now consider the FIB in your router, where all the best paths are stored.

- The size of IPv4 and IPv6 tables determine how much FIB you need.
- Looking at the forecasts that we saw for the IPv4 and IPv6 tables can tell you how much FIB you will need. The actual impact on your router will depend on a specific vendor's implementation.
- In the best-case scenario, you will observe one-to-one correlation between the combined size of IPv4 and IPv6 tables and FIB table. In some devices, IPv6 entries can use twice as much space as IPv4 entries.

Let's look at how this can play out:

Assessing the impact on network devices



Assessing the impact on network devices

If your any of your routers are limited to 1 million routes, that projection might not be good news.

We have more math to do, however.

Today's IPv6 table is a little over 70,000 routes. So to determine its FIB space, we and multiply it by two.

Then add that to the current BGP table of nearly 800,000 routes

$$(70,000 \times 2) + 800,000 = 940,000$$

Assessing the impact on network devices

It might not take that long if you:

- Accept a large number of disaggregated internal routes, such as loopbacks, point-to-point addresses, and customer routes in your network.
- Have peers who are advertising more specifics that they do not advertise to the rest of the Internet.
- Need to have Multicast, MPLS VPN, or L2 VPN routes in your FIB to support other services.

Why you need a peering strategy

If you have adequate hardware to accomplish your goals, you are going to need a peering strategy.

A peering strategy helps squeeze most value from your exchange port. Some of the things we are going to consider are:

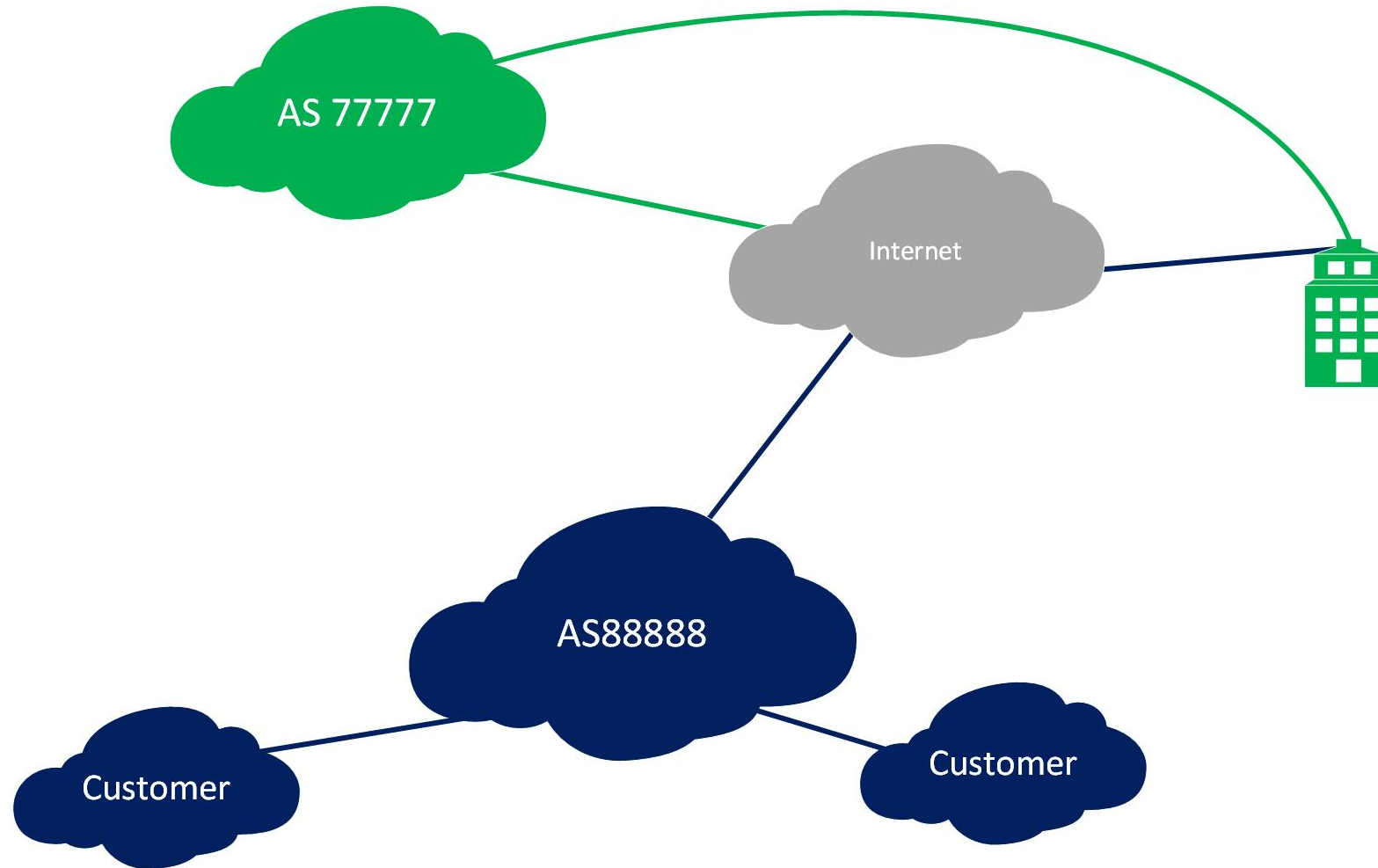
- What networks would benefit you the most?
- What exchanges should you join?
- How will you route the prefixes you receive in your network?

Why you need a peering strategy

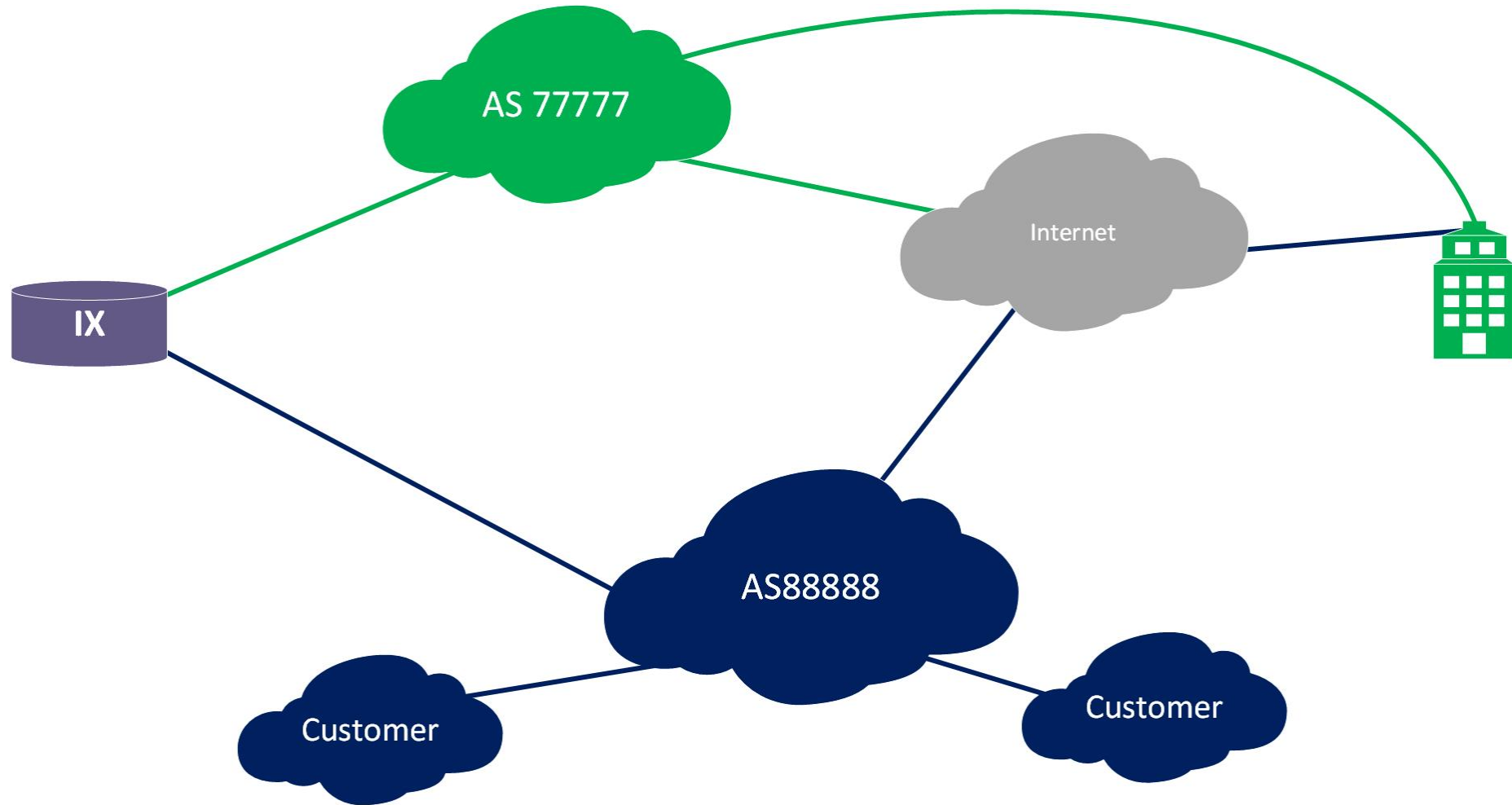
Evaluate what potential peers will provide the biggest benefit. Criteria you might want to consider:

- Do you send a lot of traffic to this peer over transit connections?
- Could a direct connection with lower latency have a compelling performance improvement on your network?
- Do you have excess bandwidth on your IX interface?

Why you need a peering strategy



Why you need a peering strategy



Why you need a peering strategy

- So as we have seen, peering can improve your routing and reduce latency. Or not.
- If you peer at more than one location, consider a routing architecture that allows prefixes to be announced strategically to keep traffic local.
- Start by adding the peers on the exchange can do the most for your network.
- Making these assessments can get you a bigger return on your investment more quickly.

Why you need peering security

Peering works when it is a good experience for both parties.

- Clean up your advertisements. You shouldn't be leaking your private IP space or routes that don't originate from a public AS.
- Be easy to contact by keeping up-to-date routing and contact information in Peeringdb.com.
- Keep your IRR records up to date.
- Create Route Origin Authorizations (ROAs) for all of your prefixes and update them on a periodic basis.

Why you need peering security

While the other network you are peering with is probably a fine organization, trust no one.

- Set maximum prefix limits for your peers.
- Filter the routes to accept only routes valid from the peer's AS and deny private IP space and bogons. Don't forget to check services like Spamhaus to prevent acceptance of blocked prefixes.
- Consider using AS-Path filters to further ensure your peers are not leaking routes from their upstream providers.

Why you need peering security

Building filters does not have to be hard. You can script it yourself or use a tool like bgpq3. Here is an example using bgpq3 to generate a prefix list for a Juniper router:

```
Galadriel:~ susan$ bgpq3 -J6l MyNewPrefixList AS44684
```

```
policy-options {  
  replace:  
    prefix-list MyNewPrefixList {  
      2a00:1098::/32;  
      2a00:7d81:1000::/48;  
      2a00:7d81:1001::/48;  
      2a00:9b40::/48;  
      2a06:1c80::/29;  
    }  
  }  
}
```

Why you need peering security

Your IX port exposes your network to security risks that are inherent to a layer 2 port.

- Don't connect an interface with a default configuration to an IX Port. Dozens, sometimes hundreds, of other networks are directly connected.
- Many IXPs will post their recommended port configuration ([HKIX](#), [AMS-IX](#), etc).
- Most IXs allow only unicast traffic. (IPv6 neighbor discovery uses multicast, which is the exception.)

Why you need peering security

Because the IX LAN is has next-hop addresses, it is not uncommon for engineers to route the LAN prefix inside their networks.

It is not Internet-routed IP space, it doesn't originate from your AS, and you should not ever advertise it externally. It also should never be accepted by you. Even so, it happens:



HURRICANE ELECTRIC INTERNET SERVICES

210.173.176.106

Quick Links

[BGP Toolkit Home](#)
[BGP Prefix Report](#)
[BGP Peer Report](#)
[Exchange Report](#)
[Bogon Routes](#)
[World Report](#)
[Multi Origin Routes](#)
[DNS Report](#)
[Top Host Report](#)
[Internet Statistics](#)
[Looking Glass](#)
[Network Tools App](#)
[Free IPv6 Tunnel](#)







IP Info

Whois

DNS

RBL

210.173.176.106 ([gigabithernet2-8.core1.tyo1.he.net](#))

Announced By		
Origin AS	Announcement	Description
AS7521	210.173.160.0/19  	
AS7521	210.173.176.0/20  	
AS18403	210.173.176.0/24  	

Address has 0 hosts associated with it.

Why you need peering security

- Be responsive when you are notified of an issue. No one likes a peer who ignores them, especially if they are experiencing a DDoS, phishing, or other types of naughty behavior from users on your network.
- No one can take advantage of you without your permission. Control your advertisements.
- Even if you do everything right, not all networks will want to peer with you. This usually is more to do with their peering policy and strategies and less to do with you.

Thank you!

Questions?

Resources

- <http://bgphelp.com/2017/01/01/bgpsize>
- https://labs.ripe.net/Members/nusenu_nusenu/the-rpki-observatory
- <https://rpki-monitor.antd.nist.gov>