DE CIX

When to peer and when to use transit

White Paper

Whether you are a small hosting provider, an ISP, a content publisher, or a content application provider, at one point or another in your network's growth cycle, you will ask yourself the question: When should I peer and when should I use transit? As soon as you have an ASN and are multihomed, you will think about peering.

The benefits of peering have been stated countless times. Peering reduces latency, improves the network quality, enhances the end user experience, reduces networks costs, etc. But what does that mean exactly?

An empirical study conducted by Adnan Ahmed, Zubair Shafiq, Harkeerat Bedi, and Amir Khakpour[1] involved a large-scale measurement-based performance comparison of peering and transit interconnection strategies, quantifying the performance differences between transit and peering.

Definition

Transit: *You pay money (or settlement) to another network for Internet access (or transit), also known as "Upstream."*

Peering: *Two networks exchange traffic between each other freely (settlement-free), and for mutual benefit. At Internet Exchanges, networks can peer with up to hundreds of networks with one connection (public peering)*

1 Adnan Ahmed, Zubair Shafiq, Harkeerat Bedi, Amir Khakpour: Peering vs. Transit: Performance Comparison of Peering and Transit Interconnections; Available at http://homepage.divms.uiowa.edu/~mshafiq/files/adnan-peering-icnp2017.pdf (30 August 2018)

Peering vs. transit – A performance comparison of peering and transit interconnections

The study used JavaScript to conduct application layer latency measurement between 510,000 clients in 920 access ISPs and multi-homed Content Delivery Network (CDN) servers located at 33 Internet Exchanges around the world. It collected more than one million latency measurements over the duration of about two years. In the following, we will show you some of the study's results.

Example: CDNs and access ISPs

While content publishers and Content Delivery Networks traditionally relied on buying transit to deliver their content to end users, today they are deciding more and more in favor of peering relationships with access ISPs (or eyeball networks) to reduce transit costs.

Global Internet traffic volume has increased by more than 40% every year in recent years, and access ISPs are engaging increasingly in peering relationships instead of buying transit.

Peering paths substantially outperform transit paths

The results of the above-mentioned study show that:

- *Peering paths outperform transit paths for 91% of Autonomous Systems (ASes);*
- *Peering paths have smaller propagation delays as compared to transit paths for more than 95% of ASes;*
- *Peering paths outperform transit paths in terms of propagation delay due to shorter path lengths;*
- *Peering paths also have smaller queueing delays as compared to transit paths for more than 50% of ASes.*

Methodology

In collaboration with a commercial CDN, IFrames containing the measurement JavaScript were embedded in client-requested webpages to carry out end-to-end latency measurements via peering and transit paths.

> *"More than 10 milliseconds improvement in propagation delays on peering paths compared to transit paths for 68%."*

Definition

Propagation delay *is the amount of time it takes for the packet to travel from sender to receiver.*

Queueing delay *is the sum of delays encountered by a packet between the time of insertion and the time of delivery.*

> *"Half of the ASes experience up to 12-15 milliseconds shorter propagation delays over peering paths as compared to transit."*

Fewer IP hops

The study's measurements confirmed that peering paths have on average fewer IP hops than transit paths, resulting in consistently lower propagation delays for peering paths.

The results quantify the performance benefit of using well-provisioned peering paths in real-world networks.

Why peering paths outperform transit paths

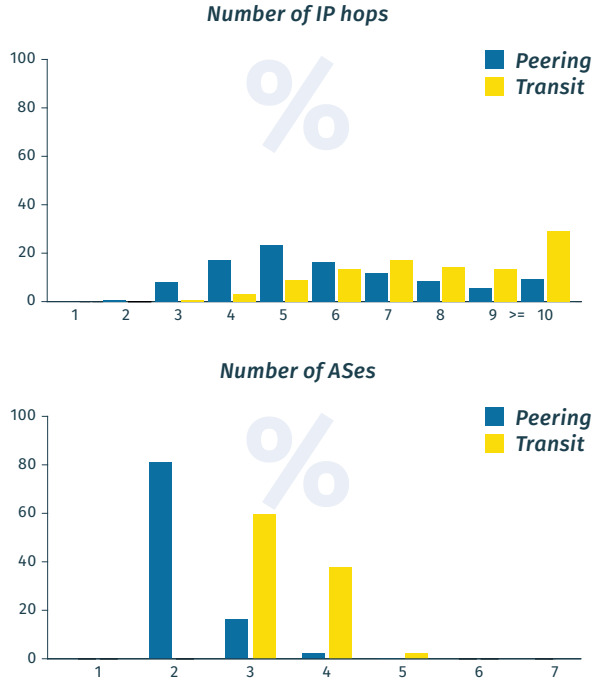
Possible reasons that peering paths perform better than transit paths may be that peering paths typically carry the bidirectional traffic only, so peering links likely experience less congestion.

In addition, peering paths are less circuitous as compared to transit paths; therefore, they provide better end-to-end latency even in the absence of congestion.

How do I know if I am one of the 95% with better performance via peering paths?

Although the authors do not say much about why 5% get better performance via transit paths, there is good reason to believe that the small numbers of networks which achieve similar or better performance with transit are probably very often remote peers of Internet Exchanges. If you connect to an Internet Exchange remotely, and the AS you want to reach also connects there remotely, transit may in this case offer you a shorter route and better performance. These cases are very rare, but after all: Peering is about keeping local traffic local. So choose the nearest Internet Exchange for peering first, and rely on transit for the rest.

Distribution of path lengths in terms of IP hops and AS hops (percentage)



Source: Ahmed/Shafiq/Khakpour/Bedi: Peering vs. Transit: Performance Comparison of Peering and Transit Interconnections, p.7

> *"At least 5% improvement in end-to-end latency over peering paths compared to transit paths for more than 91% of ASes."*

With peering: Fewer hops, shorter paths, less propagation and queueing delays

So how should you decide when to use peering instead of transit? Besides the economic reasons to reduce transit costs, peering is all about performance. If you need your content to be delivered fast, if you need your data to get to its destination with as few hops as possible, peering is the solution of choice. Empirically proven.

More details can be found in the study by Adnan Ahmed, Zubair Shafiq, Harkeerat Bedi, and Amir Khakpour:

Peering vs. Transit: Performance Comparison of Peering and Transit Interconnections.

Available at http://homepage.divms.uiowa.edu/~mshafiq/files/adnan-peering-icnp2017.pdf (30 August 2018).

> *"More than 60 % of ASes experience at least 20 milliseconds improvement in queueing delays via peering paths compared to transit paths."*

To start peering you need to

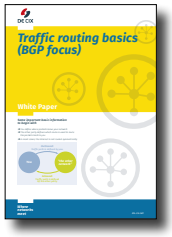
- → *Develop your own peering strategy and/or policy*
- → *Select one or more Internet Exchanges*
- → *Have the capability to take care of your peering ops*
- → *Have a peering manager to take care of all this*

Questions?

If you have questions or any suggestions for these guidelines, please contact ***bernd.spiess@de-cix.net****.*

Recommended reads

→ ***10 useful tips on how to maximize the benefits of peering***
Bernd Spiess, peering expert, developed 10 tips for peering; from optimizing routing data base entries to prefix aggregation.



→ ***Traffic routing basics (BGP focus)***
Learn more about inbound and outbound routing, how a router decides which path is best, localpref, MED and AS-PATH rules, and best practices.

Take a look at de-cix.net/academy