Reliability of the Internet
IXP Role

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First some jargon:

IXP Internet Exchange Point.

ISP Internet (or Network) Service Provider.
aka network operators

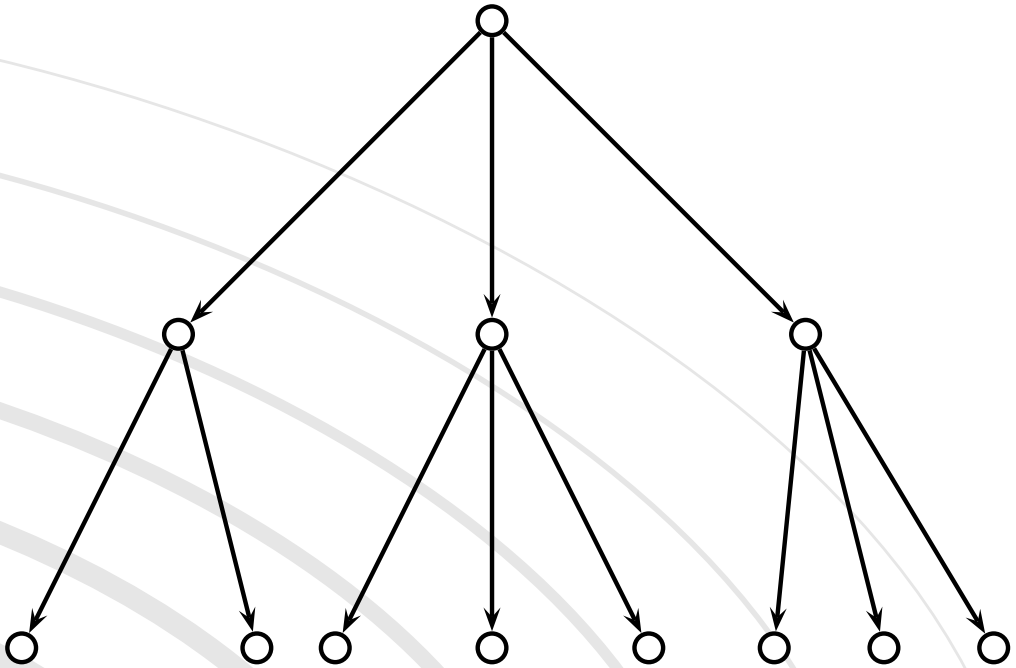
peering Agreement to exchange own and customers' traffic.

transit Agreement to carry all traffic.

Basics and Background

The Internet is a network of interconnected networks. There is no overall structure to the network.

Compare the Telephone Network...



Hierarchical Network

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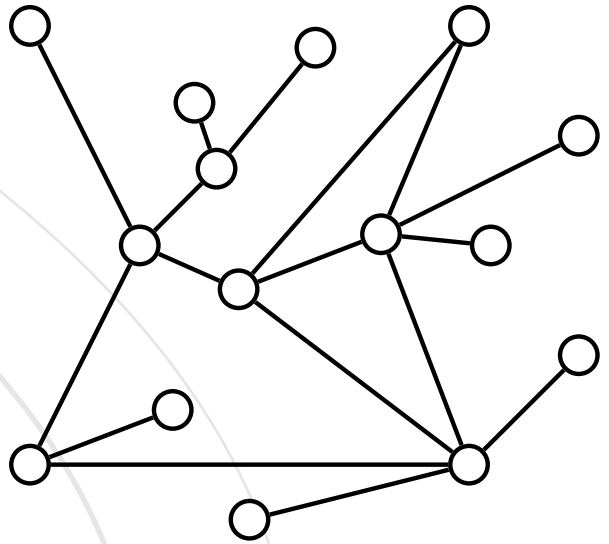
Network of Networks

Basics



. . . with the Internet.

Initially networks were interconnected only via private lines.

As the number of networks grew larger, the number of private lines grew very fast. ("$O(n^2)$")

Two concepts attenuated this growth: transit and exchanges.

Internet Exchanges

It is cheaper for all ISPs to connect to one location (i.e. IXP) to meet other ISPs instead of every ISP connecting directly to every other ISP.

According to different estimates 50 – 90 percent of European Internet traffic flows over IXPs.

In Northern America IXPs carry only 10 – 50 percent of all traffic. Private peering is more popular in the US.

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Traffic Growth

There have been several paradigm shifts in what most of the traffic on the Internet is about during its brief history. Here's some examples:

- bulk traffic (mail, news) → surfing (ftp, http)
- surfing → download and consume (music)
- download and consume → streaming (video)

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Traffic Growth (continued)

- New usage patterns emerge that will drown out old ones.
- Network usage caused by old patterns does not dimish!
- Consumer usage has surpassed research and business usage.
- Domestic network usage will still continue to grow.
- New user classes will continue to emerge. (e.g. m2m)
- Tendency toward applications that require more and more reliability.

Neutrality

ISPs don't easily place trust in an IXP that is essentially a product of a rival ISP.

$\longrightarrow$ IXPs need to try to stay neutral.

Neutrality plays a role in many other aspects too.

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Redundancy and Capacity

ISPs usually connect to most exchanges located in the area where the ISPs operate.

- keeps traffic local
- each IXP adds to the total bandwidth available between ISPs
- traffic shifts to close by IXPs in case of any failures
  (as opposed to transits or trans-oceanic IXPs)

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Services

- clock synchronization source
- root name servers
- ...

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Forum

for...

- debugging problems
- sharing experiences
- spreading information

...affecting the wider network

Forum can be:

- mailing list
- workshop
- seminar or conference

Some IXPs also take part in societal discussion.

End of Slides

- Open discussion
- Q and A?
- `http://iplu.vtt.fi/`
- `http://www.trex.fi/`