

Internet Exchanges and peering

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Who is Marco

Marco d'Itri

- Involved with the italian Internet since the mid '90s.
- A Debian Developer for over 25 years (mutt, inn, ppp, netbase, hotplug, udev, systemd...).
- I also wrote the `whois` command used by all Linux distributions.
- Employed by Seeweb, an italian cloud infrastructure, web hosting and colocation provider.
- Designed and manages the Seeweb network, developed other services like our cloud orchestrator, antispam platform and Security Operations Center.
- Manages MINAP, the alternative Internet Exchange of Milano.



What is Seeweb

A cloud services provider in Italy

- 1998: founded as a pure hosting provider, after an experience as an ISP.
- 2005: opens a second data center in the Via Caldera Campus in Milano.
- 2010: first in Italy to provide cloud infrastructure.
- 2015: creates DHH S.p.A., a company listed on the Milano stock exchange which invests in cloud computing companies in the emerging markets of Europe.

Seeweb owns 4 data centers in Milano and near Rome.

DHH is also present in Switzerland, Slovenia, Croatia, Serbia and Bulgaria.



Internet: independent networks exchanging traffic

The Internet is a group of **independent interconnected networks**: technical and commercial agreements allow independent companies to interoperate and everybody to have connectivity to everybody else.

How does a network know how to reach the others?

- There is no central coordination of the Internet.
- Each side of an interconnection uses the BGP protocol to let the other side know for which networks they want to accept traffic to.

Internet: multiple types of interconnections

Different commercial agreements are possible.

- **Customer:** they pay me to use my network to reach the rest of the Internet.
- **Peering:** we agree to directly exchange the traffic of our own customers. Maybe one party pays the other, maybe not.
- **Transit:** I am somebody's else customer: I pay them to use their network to reach the rest of the Internet.

What is peering

A technical and commercial agreement which governs the interconnection of two networks to allow them to mutually exchange their own and their customers' traffic.

- Bilateral relationship.
- Does not replace transit!
- Can be informal or regulated by a contract.

Models for peering (1)

Financial classification

Settlement free peering

There is no exchange of money.

Paid peering

One party pays the other.

Two networks may connect without fees if they agree that it will be mutually useful: if one party does not believe to benefit from peering then they will want to be payed for it.

Regulators may force large networks to peer as an antitrust remedy.

Models for peering (2)

Technical classification

Public peering

A connection to the shared LAN of an Internet Exchange.

Private peering

A direct connection to another network.

Which method is better depends on how much traffic is exchanged.

Public vs. private peering and paid vs. settlement free peering are totally orthogonal issues!

Benefits of peering

Peering improves the quality of connectivity.

Keep local traffic local

- Lower latency.
- Avoid other jurisdictions.

Avoid *Other People's Networks*

- Higher reliability.
- Control the traffic paths.

(A foreign carrier is subject to a foreign jurisdiction even if traffic does not leave the country. . .)

Where to interconnect?

Interconnection methods

- Dedicated circuits.
- The meet me rooms of data centers.
- Internet Exchanges.

... and different combinations of these methods.

What is an Internet Exchange?

The bare minimum

- Just one Ethernet switch providing the peering LAN.

Extras

- More interconnected switches.
- Route servers.
- Its own data center (usually I do not recommend this).
- A community of operators.
- Recurrent meetings.
- ...

Benefits of public peering

Easy and convenient.

Higher efficiency

- Connecting to an Internet Exchange allow operators to not have to reserve a dedicated router port and circuit for each peer.
- Aggregating the traffic of multiple networks on a single router port optimizes the cost of equipment and circuits.

Disadvantages: when exchanging a lot of traffic with a specific peer it may be more financially convenient to use a direct interconnection.

Non-benefits of peering

In developed markets nowadays the financial benefits of peering are minor.
But what about Tunisia? And the rest of the Maghreb region?

Cost of IP transit in Italy:

- In 2000: 3500 - 4000 €/Mbps/month (revalued to 2023).
- In 2023: 0.20 - 0.30 €/Mbps/month.

Cost of peering at MIX-IT:

- 0.035 - 0.064 €/Mbps/month.

The cost of connectivity is often marginal when compared to other business expenses (equipment, power, salaries...) so saving on transit costs is not a priority.
Is this still true here?

Other benefits of Internet Exchanges

They attract key internet infrastructure

- Root name servers and TLD name servers.
- Caches of CDNs (Akamai, Cloudflare, Fastly, Netflix...) and OTTs (Google, Facebook...)

They attract carriers and transit providers

IXes and carriers have a symbiotic relationship: they attract each others in data centers and create a critical mass.

They create a **community**

People meet to share business and technical experience.



A cronology of italian IXes

- NAP CILEA (1995-2000?)
- NAMEX (1995)
- MIX (1996, 2000)
- TIX (2000)
- TOP-IX (2002)
- NAMEX Bari, 1st edition (2006-2010)
- MINAP (2008)
- VSIX (2009)
- FVG-IX (2009-2015)
- PCIX (2015)
- DE-CIX Palermo (2015)
- Equinix Milano (2017)
- STIX (2018)
- MIX Palermo (2020)
- NAMEX Bari, 2nd edition (2021)
- MIX Bologna (2022)
- NAMEX Napoli (2022)
- Ge-DIX (2022)
- MIX Caserta (2023)
- MIX Roma (2024?)
- MIX Trieste? (2024? *relata refero*)

TunIXP started as a government/incumbent transit service, then after the Arab spring events it transitioned to a neutral platform and now has many international content providers as members.

- TunIXP in Tunis (1996).
- TunIXP in Enfidha (2014? Inactive: did it ever exist?).

Do the large telcos use private interconnects among themselves?

Countries compared (1)

Italy: 18 in 1200 x 500 km

- Roma (2), Milano (3), Napoli, Torino.
- Palermo (2), Bari, Firenze, Bologna, Padova, Genova.
- Bolzano, Caserta, Piacenza, Trieste.

Countries compared (2)

Great Britain: 12 in 900 x 480 km

- London (4), Manchester (2), Liverpool, Leeds, Newcastle
- Edinburgh, Cardiff
- Isle of Man

France: 12 in 960 x 950 km

- Paris (3), Lille (2), Marseille (2), Lyon
- Toulouse, Rennes, Grenoble, Clermont-Ferrand

Spain: 4 in 1000 x 800 km

- Madrid (2), Barcellona (2)

Other issues...

Cost of local vs. international capacity

In some markets it is cheaper to buy international transity or capacity than local circuits to less served areas of the country.

Land vs. sea cross-border interconnections

Tunisia is in a very strategic position for accessing submarine cables, but what about land connectivity to Algeria and Lybia?

(Does Tunisia have cheap enough capacity on the existing submarine cables?

If more is needed, then current tecnologies allow very cheap amplifier-less cables on distances such as Tunisia to Sicily...)

Any questions?



`https://www.linux.it/~md/text/peering-adcd2023.pdf`
(Google ... Marco d'Itri ... I feel lucky)

