History of Peering and the effectiveness of IXes

MENOG5, Beirut, Lebanon

Why exchange traffic?

- One provider will never have all customers
  - Providers might also target different customer bases, i.e content vs. eye-balls
- A provider with a limited network foot-print will need to exchange traffic with a provider with a larger (or different) foot-print

Peering vs. transit

- The 10k meter view is that
  - Peering is exchange of traffic in both directions without a service charge
  - Transit is exchange of traffic in both directions for service charge (that is exchanged in only one direction)

Why pay for traffic?

- An operator with a larger foot-print will have to transport the traffic over a longer distance
  - The cost for maintaining the larger network is higher
  - So in principle the transit charges are comparable to transport costs

Why pay for traffic?

- An operator with a significantly larger customer base will have had larger costs for building out infrastructure
- Traffic fees are paid from the smaller to the larger

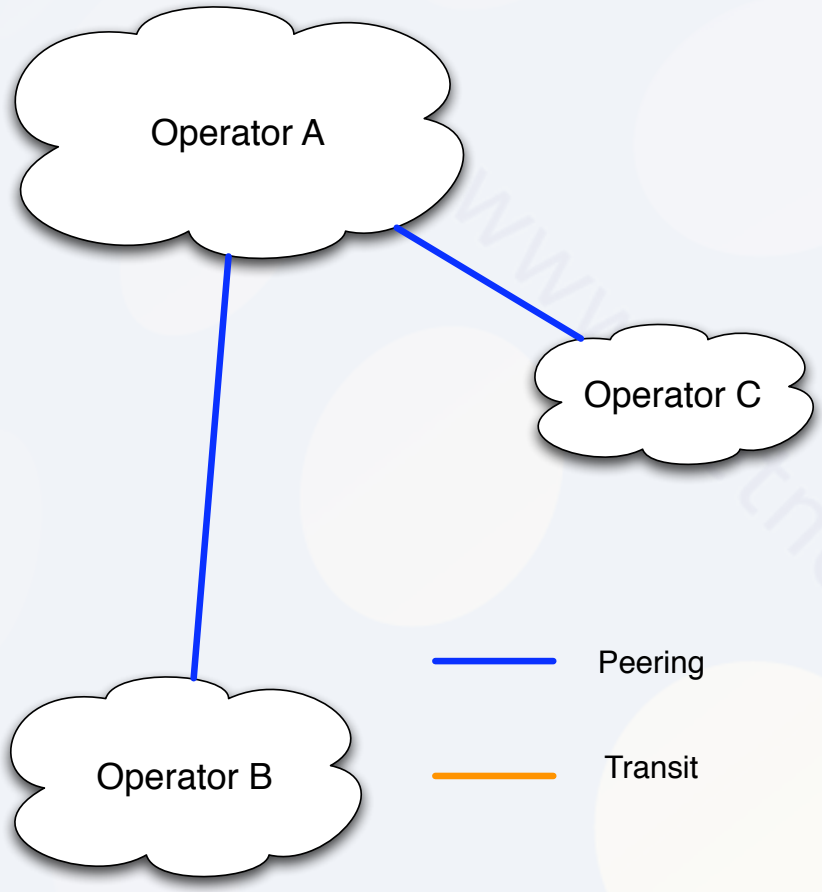
Why not pay for traffic?

- *Old rule:* If two providers consider their network foot-print, cost, and traffic volumes more or less equal, sending invoices in one or both directions are unnecessary under the assumption they will be of equal monetary value
- If you have multiple parties that are equal - a free exchange of traffic will lower your transit costs
- Money saved on transit can be invested in better peering infrastructure for the benefit of end-users

The options

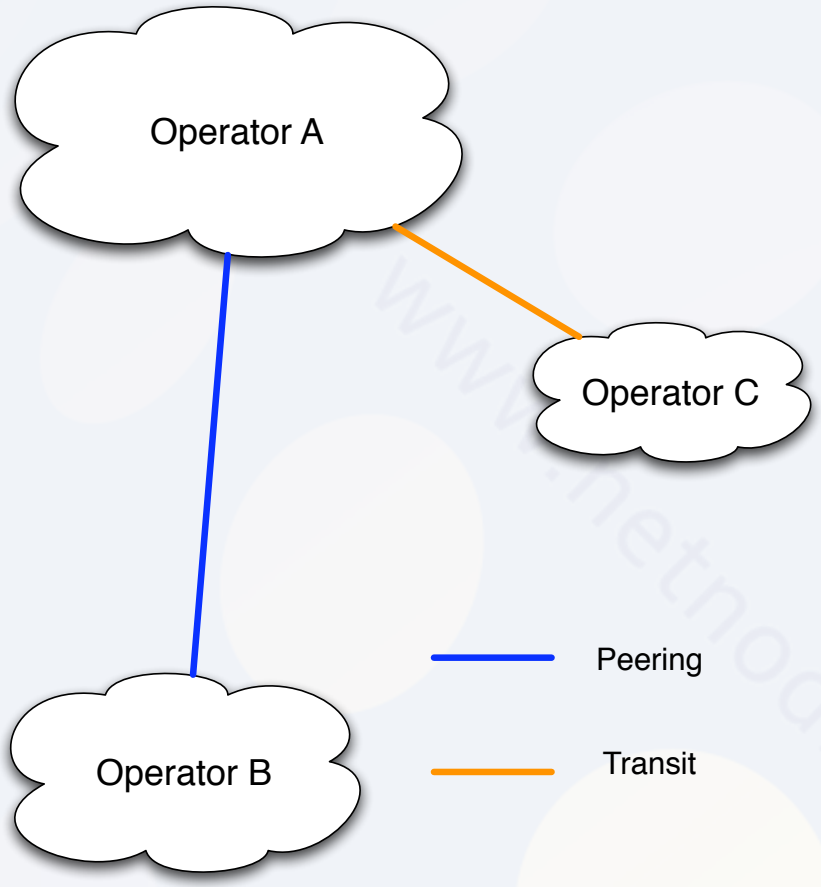
- Transit
  - I pay you for sending you traffic and receiving your traffic back
- Private peering
  - We agree to send traffic for free between our network and our customers networks. This is implemented over a dedicated connection
- Public peering
  - We agree to send traffic for free between us and we implement in a neutral exchange point where we both are located

Peering



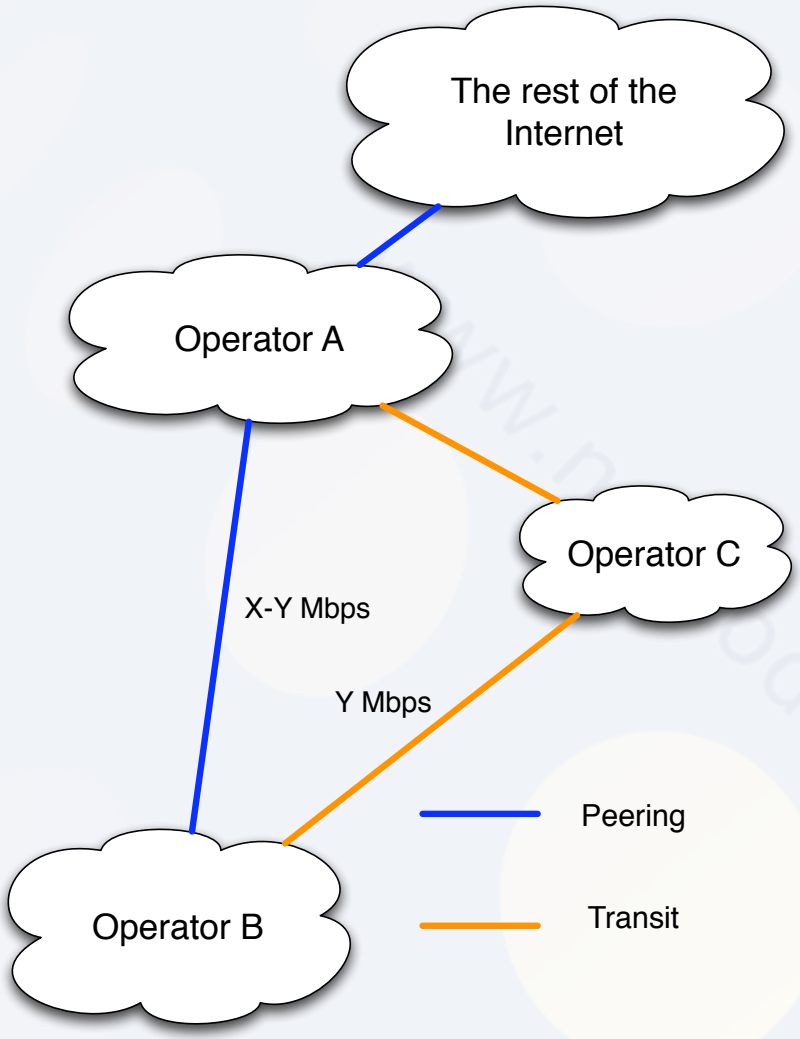
Operator A and it's customers can reach Operator B and Operator C
Operator B and it's customers can reach Operator A
Operator C and it's customers can reach Operator A

Transit



Operator A and it's customers can reach Operator B and Operator C
Operator B and it's customers can reach Operator A and Operator C
Operator C and it's customers can reach Operator A and Operator B

But in reality...



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Hybrid models

- There are also hybrid models, for example "paid peering"
  - Where a single dominant player (mostly current or former monopolies) charges others operators for sending and receiving traffic to the dominant players customers
  - The cost is lower - and access it limited to the dominant players customers - not the rest of the Internet

This might seem like a statement but it is as much a question…

Why interconnect at all?

- Presentation grew out of talking to some old time people from the early days of Internet in Europe and trying to collect observations…
- Interconnects are
  - Transit links, paid connectivity
  - Private peering with other networks based on unilateral agreements
  - Public peering over shared infrastructure

History of peering in Europe

Basically divided into three phases

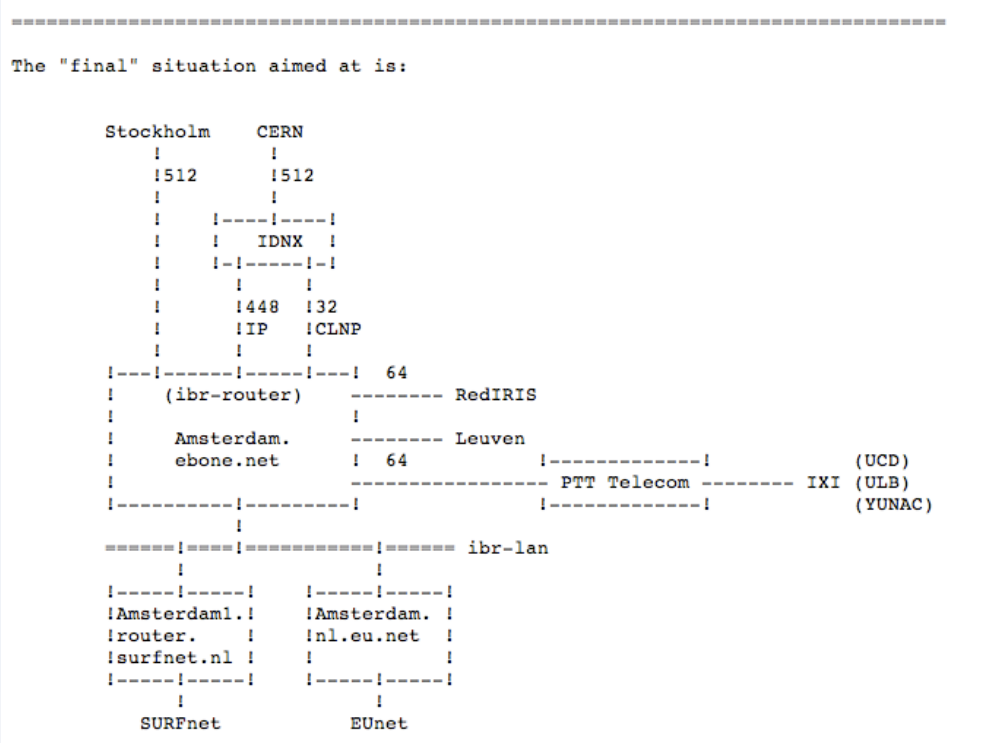
1. Early and mostly academic days, 1993-1995
2. Early commercial days, mid to late 1990's
3. Modern times

Early and academic days

- No competition
- People 'wired up' where possible
- Great co-operation among all parties
- Traffic mostly UUCP email and news

Early and academic days

- One of the first larger interconnects was the IBR-LAN at CWI in Amsterdam



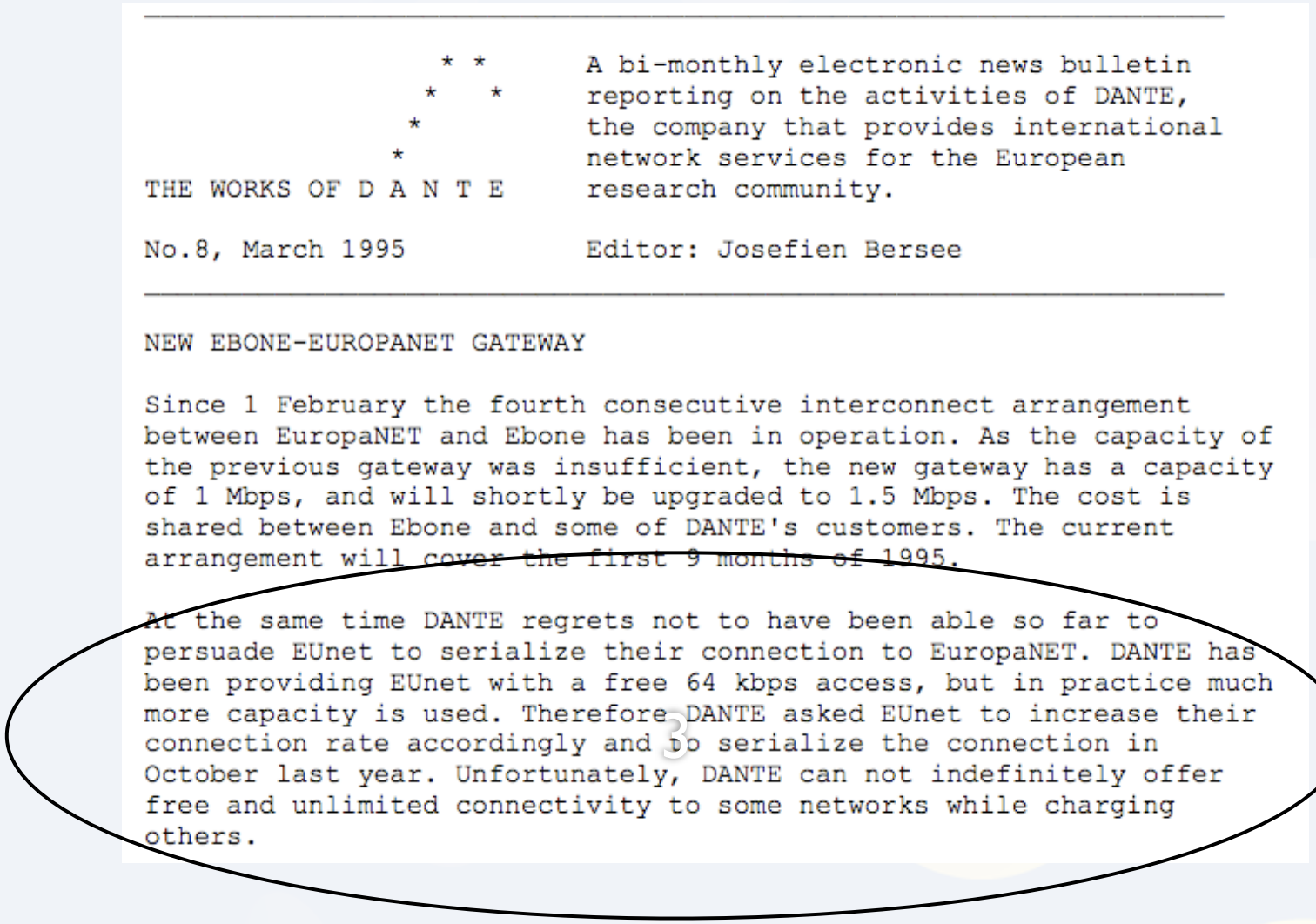
Early commercial days

- Educational network funding shifts to universities
- Players are starting to form peering policies
- The basic rule of "both networks that peer must benefit" is emerging

Early commercial days

- The first commercial service offerings are starting to use peering as service differentiation
- The early non-incumbents also share common values and implicit trust
  - What is good for the market will in the end by good for them
  - Often used as against the incumbent
    - but not always

First de-peering threat?



THE WORKS OF D A N T E

A bi-monthly electronic news bulletin reporting on the activities of DANTE, the company that provides international network services for the European research community.

No.8, March 1995 Editor: Josefien Bersee

NEW EBONE-EUROPANET GATEWAY

Since 1 February the fourth consecutive interconnect arrangement between EuropaNET and Ebone has been in operation. As the capacity of the previous gateway was insufficient, the new gateway has a capacity of 1 Mbps, and will shortly be upgraded to 1.5 Mbps. The cost is shared between Ebone and some of DANTE's customers. The current arrangement will cover the first 9 months of 1995.

At the same time DANTE regrets not to have been able so far to persuade EUnet to serialize their connection to EuropaNET. DANTE has been providing EUnet with a free 64 kbps access, but in practice much more capacity is used. Therefore DANTE asked EUnet to increase their connection rate accordingly and to serialize the connection in October last year. Unfortunately, DANTE can not indefinitely offer free and unlimited connectivity to some networks while charging others.

History of peering in Europe

- Emerged as a way to save on costs
  - For transport capacity (that was kept 'artificially' high by ex/PTTs and half-circuit pricing)
  - For transit / transatlantic costs
- International circuits where low bandwidth so delay was less of an issue in the early days

History of peering in Europe

- In the early European Internet, most traffic was destined for the US as most content was US based
- Over (modern) time, more content was developed in Europe
  - Mainly to meet localized interest, culture and language
- Local content changed the traffic flows, and most likely changed the interconnect landscape

History of peering in Europe

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History of peering in Europe

- As can be seen on the previous slide traffic shifted to be localized to language regions around 2001
- Keeping traffic local helped with "customer experience", and became (at least partly) a goal in itself
- Hot potato routing helped and meant that transport costs where shifted to the peer as quick as possible

History of peering in Europe

- While hard to prove, the dense interconnects in Europe helped innovate services and content
- At a time when transit prices and transport prices where high, peering provided a way to lower end-user costs and stay competitive against mostly foreign (US based) providers

European Interconnect growth

Source: Euro-IX IXP survey

So what do I gain from peering?

- Keeping regional/national traffic regional and local is always good
  - Cheaper, Better performance - will help to develop local content
- Redundancy
  - You are no longer dependent on a single provider as upstream and their current operational status
- Control - allows you greater control of traffic flows

But where do I peer?

- Can be done via private or public peering
- Public peering and the establishment of Internet Exchange Points (IXPs) followed in the deregulation of Europe (as consequence of more operators - not of deregulation)
- Establishing neutral ground where traffic can be exchanged with multiple parties to the price of one connection will benefit the exchange of traffic

Other benefits with IXPs

- Often IXPs or the local operator community have decided to co-locate common services at IXPs
- These services are normally of general benefit to the Internet community
  - NTP-service, ccTLD-servers, IRR copies, etc
- Peering with and providing (often free) transit to the IXP infrastructure will help your customers

But how much difference does it make?

- A small asian provider with a satellite uplink connecting to Linx in London picked up 11k routes from the route-servers and 40k routes in total
  - With only little traffic to offer and little effort
- Peering abroad doesn't always make sense, but be sure to make the numbers
- But peering nationally almost always makes sense

But I am the dominant transit provider!

- Are there cases where peering won't be beneficial?
- Well, if you are the dominant telco (PTT) you can only loose customer base over time
  - The immediate standard action is to try and monopolize the transit connections, but that will only work that far
  - The moment there is an alternative transit path (terrestrial or satellite) everyone will loose out

Regulation!

- Governments tend to like to regulate (keeps them busy and justify their jobs :-))
- But in the case of peering, i.e for-free exchange of traffic - there really isn't anything to regulate
  - When it comes to resilience and robustness there isn't really anything to regulate either, as peering is a complement to transit (And from on a national security POV the converse is also true) - and here customer demand will regulate better than any government

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And a lot of thanks to Per Bilse for a lot of the ideas and history!