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# Interconnecting IXPs: pros and cons

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## Agenda

- Motivation
- Definition of an IXP
- Examples of Interconnections
- Reseller Programs
- Summary



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## Motivation

- Reseller Programs at IXP are a hype nowadays
- Panel discussion at 19<sup>th</sup> Euro-IX forum in October 2011 in Lyon
- Start a discussion on the nature of IXP

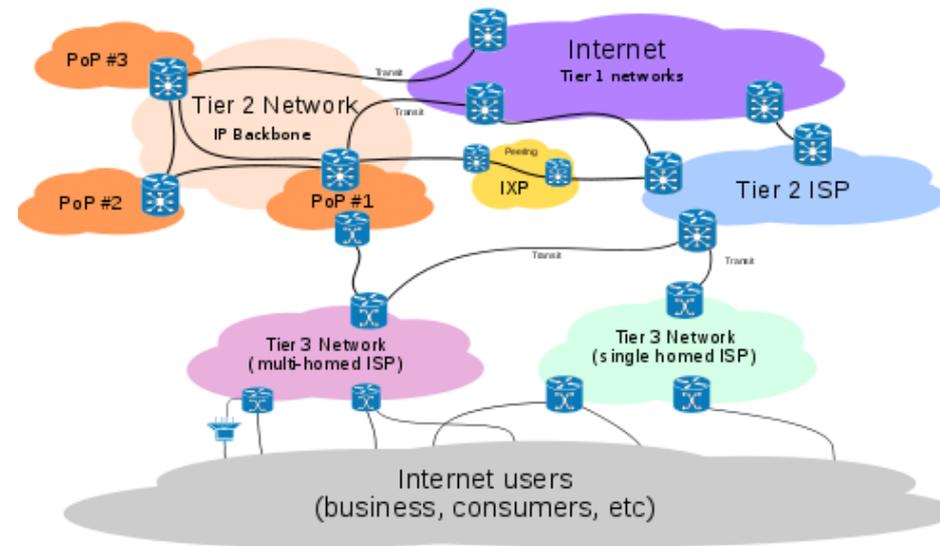


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## Definition of an IXP

- (distributed) Layer 2 infrastructure under a single administrative and technical control
- Purpose is to facilitate (settlement free) peering between ISPs (in a broadest sense. I.e. everyone that does have an ASN)
- Increase quality and save costs



[http://en.wikipedia.org/wiki/File:Internet\\_Connectivity\\_Distribution\\_%26\\_Core.svg](http://en.wikipedia.org/wiki/File:Internet_Connectivity_Distribution_%26_Core.svg)

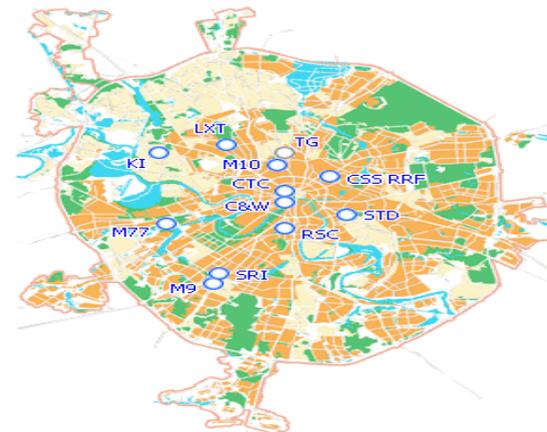


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## Diameter of an IXP

- Originally all IXP simply were a single switch/hub
- For resiliency and to cover more colocations IXP spread across a (not so?) well-defined area
- The diameter (direct reach with own equipment) depends on the geographic location of the IXP
  - London / LINX 45 / 50 km
  - Moscow / MSK-IX 40 / 30 km
  - Tokyo / JPIX Tokyo 50 / 10 km
  - Frankfurt / DE-CIX 20 / 15 km





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## Value of an IXP / Critical mass / Gravity

- Assumptions
  - next best alternative for peering is buying transit
  - Transit prices range from 1€/Mbps - 5€/Mbps
  - Simplified model (only IXP fees vs. transit)
- $Cost_{IXP} = \sum (P_i * C_i)$ 
  - $P_i$  is the number of Ports of Speed  $i$
  - $C_i$  is the cost of a Port of Speed  $i$
  - $Cost_{DE-CIX}$  is ~ 1.3 Mio €
- $Value_{IXP} = Peaktraffic * Cost\ of\ Transit$ 
  - $Value_{DE-CIX}$  is ~ 3.5 Mio €
- Value/Cost ratio:  $Value_{IXP} / Cost_{IXP}$ 
  - DE-CIX: 2.7



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## Value of an IXP / critical mass / gravity

IXP	#customer	Traffic (Gbps)	Traffic/customer
DE-CIX	424	1870	4.410
AMS-IX	472	1462	3.097
LINX	405	1256	3.101
MSK-IX	345	773	2.241
UA-IX	102	349	3.422
Netnod	76	268	3.526
NIX.CZ	104	200	1.923
NL-ix	269	140	0.520

Source: <https://www.euro-ix.net/ixp-matrix>

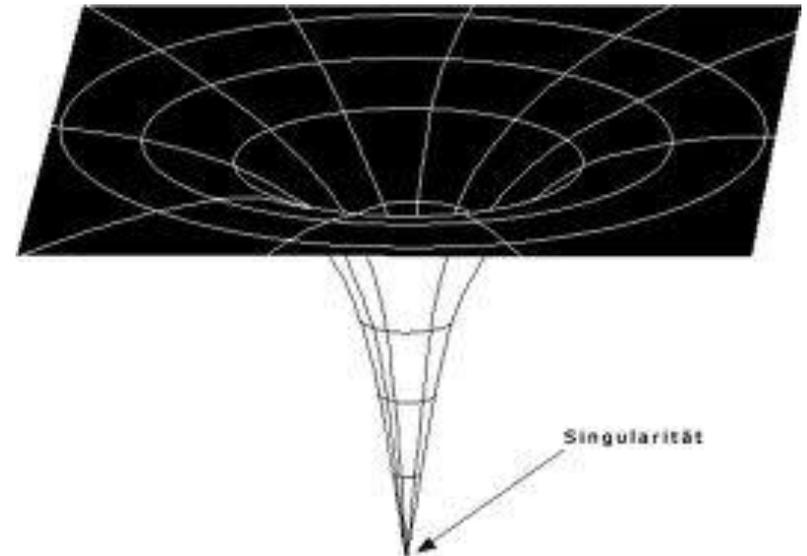


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## Value of an IXP /critical mass /gravity

- Each IXP tries to increase the critical mass / value according to its own metrics
  - Amount of traffic
  - Number of customers
  - Number of (unique) prefixes
  - Number of carriers
- The better the gravity the more customers
- Like a party: the more guests there are, the more will come





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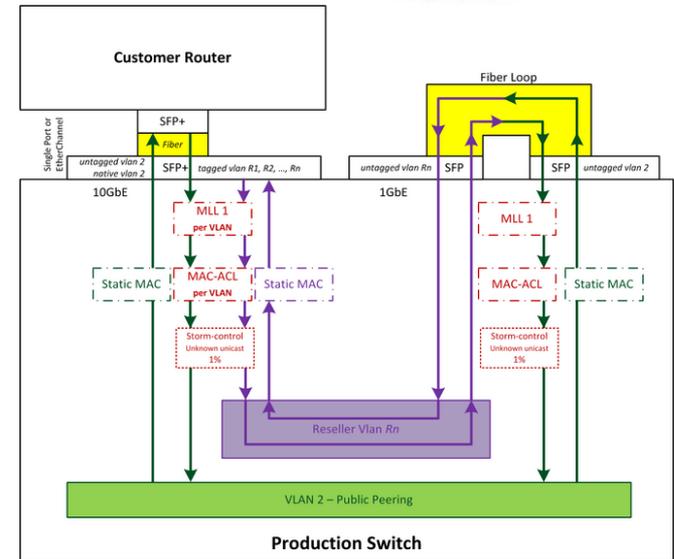
## Technically interconnecting IXPs

- Simplest approach is to create a single broadcast domain
  - Being under single administration or not
- Customers on IXP<sub>1</sub> is able to peer with all customers at IXP<sub>2</sub> and vice versa
- If under different administration IXP<sub>1</sub> and IXP<sub>2</sub> have to agree on clear interfaces between the bigger IXP and create common procedures to resolve issues

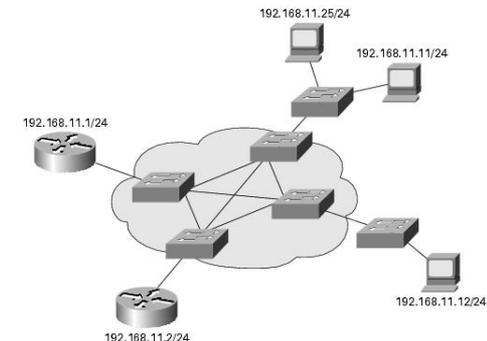


## Technically interconnecting IXPs

- Only using customer base at each IXP
- Using VPLS or Vlan technologies to hand off each customer on a single “administrative” port though using bigger pipes to interconnect
- VPLS interconnection became attractive recently when IXPs moved to VPLS for the own infrastructure
- Vlan interconnect is around for years



(!) MAC → one acceptable defined Customer-Mac-Address per VLAN MLL → MAC-Learning-Limit





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## Examples of Interconnections (Lyonix – Topix)

- Lyonix (Lyon, France) and Topix (Turin, Italy) are fully interconnected to each other (1Gbps)
- Costs are shared among each other
- Purpose is also to develop the region
- Each customer of Lyonix is able to become a customer of Topix and vice versa
- No price reductions



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## Examples of Interconnections (InterLAN – BalkanIX)

- BalkanIX (Sofia, Bulgaria) is connected to InterLAN (Bucharest, Romania) via 10Gbps
- Technically BalkanIX is putting a switch in a colocation facility in Bucharest
- BalkanIX customers are not paying for using InterLAN services



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## Examples of Interconnections (France-IX – SFINX)

- France-IX (Paris, France) and SFINX (Paris, France) are interconnected
- Located in some same colocation in Paris (i.e. local loops only)
- Free of charge, but limited to a certain bandwidth
- If more bandwidth is needed you have to join the other IXP



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## Reseller Programs

- Using VPLS in the IXP network facilitates reseller programs
  - Use one 10Gbps port to connect lots of (small) customers
- Other (smaller?) IXP seem to be partners of first choice
  - Do have customer relation already
  - Connection to IXP is physically established
  - But is this win/win?
- Business for carriers who are connected to lots of IXP



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## Don't do!

- Leave your home turf (i.e. go beyond your diameter)
  - Your carrier customers will lose revenue on local backhaul
- If you run several IXP, don't interconnect them
  - You turn from an IXP to carrier / ISP



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## Summary

- Reseller/partner programs does not really mean interconnecting IXP but using synergies
- Interconnecting **smaller IXP** can make sense to gain more critical mass / better gravity
- The “P” in IXP stands for “point” 😊



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Thank you

Join DE-CIX now!

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