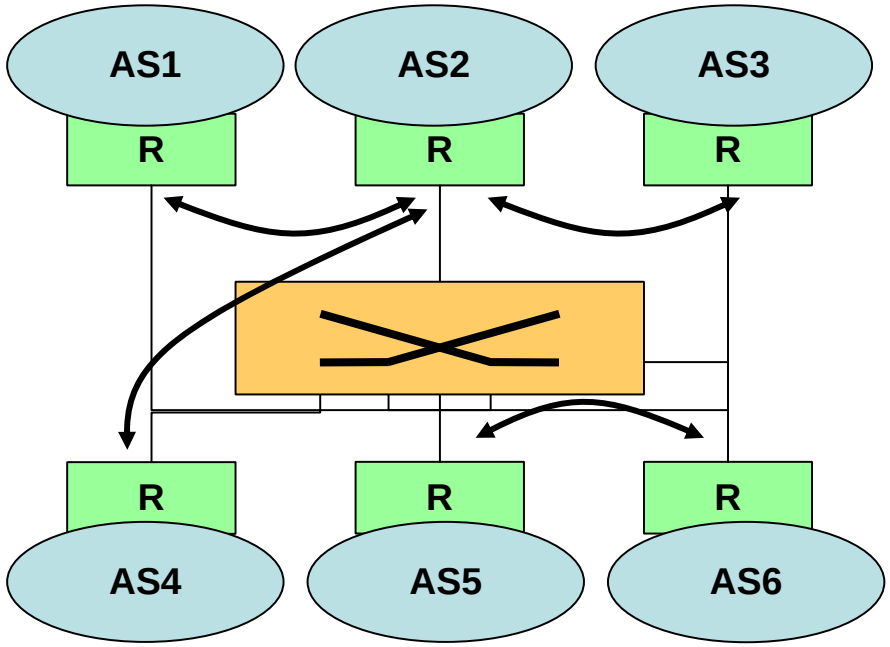
IXPs Overview

a contribute of

Definition of an IXP

- *A physical network infrastructure operated by a single entity with the purpose to facilitate the exchange of Internet traffic between Internet Service Providers. The number of Internet Service Providers connected should at least be three and there must be a clear and open policy for others to join.*

(definition agreed in Euro-IX)



Peering on an IXP

- Why:
  - lower costs
  - better performances (< hops)
  - No centralized decisions: interconnection policies are defined by each AS and based on mutual agreements

- How:

  Agreements based on:
  - technical/commercial evaluations (performances, traffic balancing, costs)
  - ISPs internal policies
  - government indications /commitments

IXPs models

- Not for profit associations / consortia / private companies
  - AMS-IX, LINX, MIX …
- Managed by Research Networks, Universities, Research centers …
  - VIX, BNIX, CIXP, Namex …
- Provided by co-location providers
  - Equinix, Terremark, ….
- Commercial companies
  - XChange Point, ….
- Substained by Public Bodies
  - Top-IX, TIX, …

IXPs topology

- Centralized :
  - One location (Namex, TIX, VIX …)
  - Local interconnection between IXP's equipment
- Distributed :
  - More locations (Top-IX, NL-IX, …)
  - Metropolitan interconnection (Gigabit) between IXP's equipment (AMS-IX, LINX, MIX ….)

IXPs infrastructures

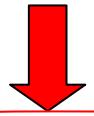
- Examples in Italy:
  - MIX owns and manages colos and services
  - TIX c/o third parties DC, services management outsourced
  - Namex c/o third parties DC, managed by Namex staff
  - Topix c/o consortium members' DC, managed by Topix and third parties staff
- Examples in Europe:
  - Netnod c/o underground DC of Swedish Telekom Regulator managed by Netnod staff
  - VIX c/o University DC, managed by University staff
  - Parix c/o telco

the most c/o *"neutral colocators"* , internally managed

Role of an IXP

- An IXP is not just a physical infrastructure:
- It must guarantee:
  - Quality in exchanging of data
  - Armonization between different platforms
  - Variety of different typologies of traffic
  - Balancing in ISP's backbone traffic routing

- This must be true also on distributed infrastructures



An IXP represents an unique and reliable point of reference for ISPs and carriers operating on the IXP

Euro-IX (www.euro-ix.net)

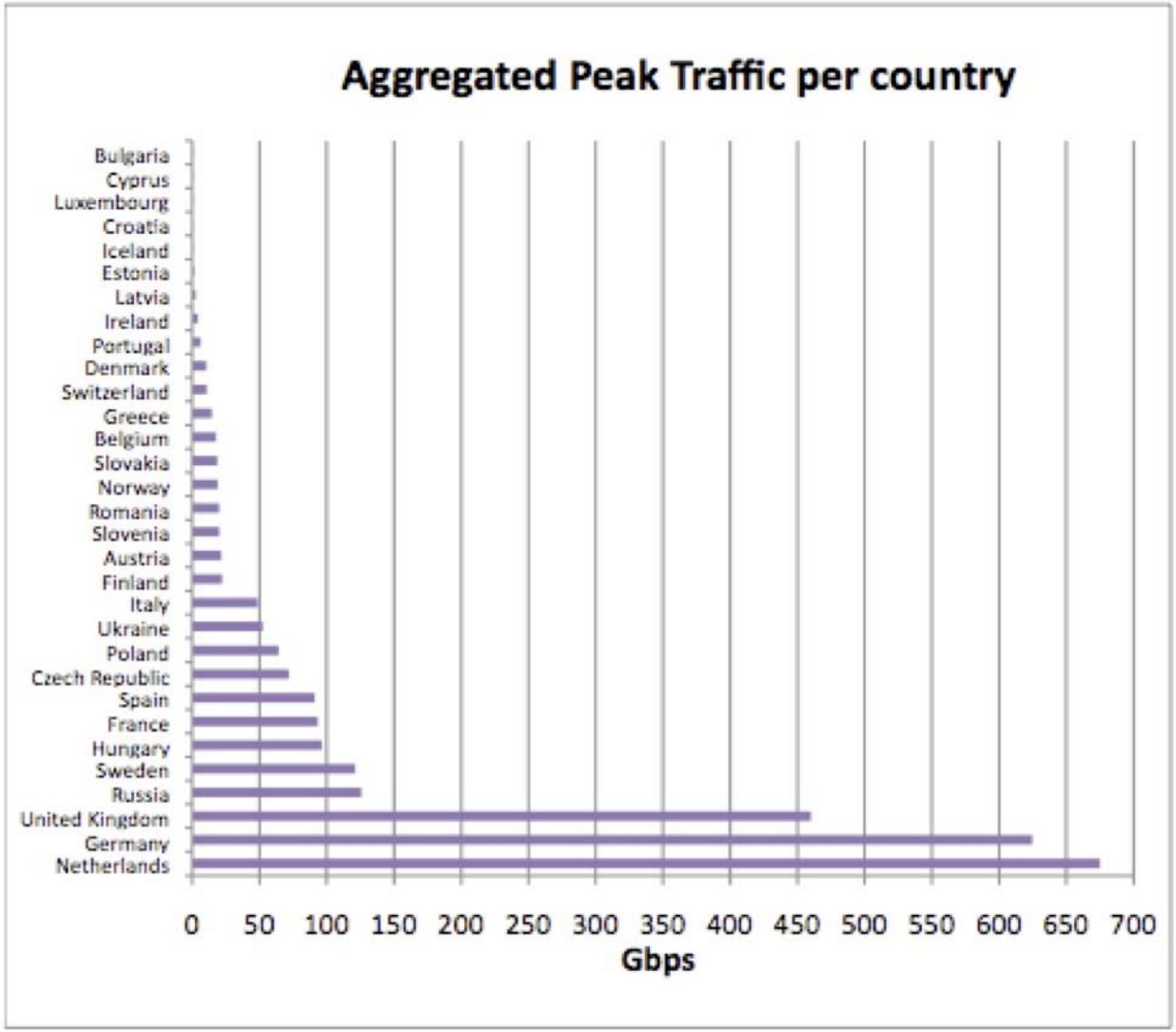
- Formed in May 2001 by 7 charter members:
  - **AMS-IX** (Amsterdam Internet Exchange) NL
  - **BNIX** (Belgian National Internet Exchange) BE
  - **DE-CIX** (Deutscher Commercial Internet Exchange) DE
  - **LINX** (London Internet Exchange) GB
  - **MIX** (Milan Internet eXchange) IT
  - **NETNOD** (Internet Exchange Sverige) SE
  - **VIX** (Vienna Internet eXchange) AT
- 49 IXP members (39 in Europe + 10 outside Europe)
- Scope:
  - coordination and armonization;
  - Development of common activities and procedures;
  - Sharing of experiences and information

European IXPs scenario

	2009	2008	2007	2006
Known operating IXPs	**121**	116	116	116
Number of cities with IXPs	**115**	102	96	92
Total IXP Sites	**389**	324	282	226
Number of countries with IXPs	**33**	31	31	31
Aggregated peak IXP traffic	**2714.165**	1765.78	1151.822	631.43
12 month IXP traffic growth	**53.71%**	53.30%	82.41%	93.76%
Gbps per Million people in Europe	**3.943**	2.583	1.695	1.000
Gbps per million users in Europe	**7.464**	n/a	n/a	n/a
Total IXP participants	**5167**	4466	3959	3401
Total published ASNs	**4719**	3987	3458	2970
Total unique published ASNs	**2822**	2340	2105	1965
Estimated total unique ASNs	**3090**	2621	2410	2249
Average traffic per IXP participant	**437 Mbps**	326 Mbps	295 Mbps	192 Mbps
Average traffic per unique ASN	**571 Mbps**	444 Mpbs	547 Mbps	235 Mbps
ASNs peering at 2 or more IXPs	**782**	661	577	429
ASNs peering at 10 or more IXPs	**29**	18	17	12
Total number of switches at IXPs	**564**	434	372	266
Average Traffic load per switch	**5.9 Gbps**	5.1 Gbps	3.9 Gbps	2.4 Gbps

(source Euro-IX)

data captured on 27th August 2009



Note: This traffic data was captured on the 27th of August 2009

European IXPs traffic

(source Euro-IX)

Italian IXPs Scenario

•Four (pro)active IXPs:
–MIX (Milan): Est. 2000
–NAMEX (Rome): Est. 2001
–TOP-IX (Turin): Est. 2002
–TIX (Florence): Est. 2003

▪Other recent IXPs:
–MINAP (Milan): Est. 2008
–FVG-IX (Udine): Est. 2009
–VS-IX (Padua): Est. 2009
–Other regional IXPs establishing

▪Common purposes:
▪Optimize Italian Internet Traffic
▪Keep Italian Internet Traffic in Italy
▪Operate with neutrality

▪Some numbers: *(of four IXPs)*:
•Tot. ASes peering on 4 IXPs: 197
•ASes peering just in Italy: 77
•ASes peering in Italy and in Europe: 120
•ASes peering on more IT IXP: 25
•Italian Peering Traffic: 108 Gbps (5% of EU IXP Aggregated Peak Traffic)

Italian Internet Landscape

- Italy is not (yet?) a hub for several countries (like France, UK or others): IXP customer base is still mainly national
- Italy has a strong Incumbent, which usually is also a critical factor: difficult to attract international player without its support
- The Italian ISPs vision has been always focused on trying to extend service portfolio as much as possible in order to gain more and diverse type of customers : IXes often perceived as a competitor
- There are (still) large areas of very difficult penetration of Telecommunication Services while there are high demand areas across the country
- However, Italy had and has in general a lot of enthusiasts: we’re not afraid to research and develop tricky solutions...;)

Questions?