Evolution of an IXP

www.top-ix.org

Summary

- History & Introduction
- Current Activities
- Evolution

History & Introduction

Who we are and What we do

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TOP-IX: TOrino Piemonte Internet eXchange

No-profit consortium founded in 2002

Geographically Distributed IXP for North West Italy

12 People

70+ affiliated members

Integrated within WI-PIE Local Gov. program

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Develop and manage the network infrastructure to provide IXP services to ISPs, Carriers, Content Providers and anyone that has an ASN.

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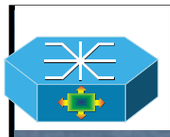

Internet eXchange (IX)
Develop and manage the network infrastructure to provide IXP services to ISPs, Carriers, Content Providers and anyone that has an ASN.

Development Program (DP)
Make available an open innovation environment to foster new business creation by providing infrastructural support to Internet ventures

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Where we are

Where we are


Berne
SWITZERLAND
AUSTRIA
HUNGARY
Geneva
Bolzano
Tarvisio
Ljubljana
Udine
Trento
Zagreb
Aosta
Como
Bergamo
SLOVENIA
Milan
Venice
Trieste
CROATIA
Verona
Turin
Piacenza
Ferrara
Alessandria
Parma
BOSNIA-
HERZEGOVINA
Genoa
Ravenna
Bologna
FRANCE
SAN MARINO
Nice
MONACO
Sarajevo
Florence
Split
Cannes
Ancona
Siena
Grosseto
Perugia
Adriatic Sea
SERBIA &
MONTENEGRO
Elba
Terni
Pescara
CORSICA
VATICAN CITY
ITALY
Rome
Foggia
Bari
Olbia
Naples
Sassari
Taranto
Brindisi
Salerno
Potenza
Otranto
Gulfo di
Taranto
SARDINIA
Tyrrhenian Sea
Cosenza
Cagliari
Isole Lipari
Catanzaro
Messina
Reggio di Calabria
Palermo
Trapani
Catania
SICILY
Ionian
Sea
Tunis
ALGERIA
TUNISIA
Siracusa
Pantelleria (IT.)
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Mediterranian Sea

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Tunis
ALGERIA
TUNISIA
Pantelleria (IT.)
Ionian Sea
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1861
150° anni
CAMEL CAMEL


Lake Geneva
Rhone
Domodossola
Lago Maggiore
Lago di Como
Verbania
Luino
Bellagio
Stresa
Varese
Como
Cantu
Arona
Gallarate
Saronno
Busto Arsizio
Legnano
Rho
Magenta
Trecate
Abbiategrasso
Vigevano
Mortara
Pavia
Garlasco
Mede
Casale Monferrato
Valenza
Stradella
Voghera
Tortona
Nizza Monferrato
Canelli
Novi Ligure
Serravalle Scrivia
Bobbio
Acqui Terme
Busalla
Torriglia
Voltri
Varazze
Savona
Rapallo
S. Margherita
Sestri Levante
Vado Lig.
Genova (Genoa)
Finale Ligure
Albenga
Stura di Demonte
Borgo San Dalmazzo
Garessio
Limone-Piemonte
Tanaro
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The top ix torino piemonte internet exchange evolution timeline

The top ix torino piemonte internet exchange evolution timeline

2 node (metro Torino)
1 Gbe
100 Mps Traffic X

2002

Start operation

- 14 members

© mario bros. courtesy NINTENDO

top ix torino piemonte internet exchange

The top ix torino piemonte internet exchange evolution timeline

•6 node
•2 Long haul FO Gbe
•500 Mps Traffic X

2004

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Interregional development
Local Government joins
24 members

Start operation
●14 members

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8 node
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10 GBE trunk
2 Gbps Traffic X

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•Development program
(start-up support program)
•37 members
•1st startup –hosted
•1 apps 1 server

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- 18 node
- **2 Long haul 10 GBE Ring**
- N x 10 GBE trunk (metro)
- 10 Gbps Traffic X

2008

- Regional expansion
- Public Admin & Research
- CDN provider
- 64 members
- 56 start-up hosted
- **Starting virtualization process**

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2008

•Regional expansion
•Public Admin & Research
•CDN provider
•64 members
•56 start-up hosted
•Starting virtualization process

•19 node
•3 Long haul 10 GBE Ring
•N x 10 GBE trunk (metro)
32 Gbps Traffic X

2010

•International interconnection (LyonIX - Lyon – France)
•70+ members
•120+ star-up hosted
CLOUD paradigm

top ix torino piemonte internet exchange

Current Activities

IX model

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Distribuited IXP open to ISPs, Carriers, **Content&App** Providers, **CDNs**, etc.

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High availability infrastructure

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TOP-IX DP supplier

High availability infrastructure

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Open Environment

Integrated with WI-PIE program

TOP-IX DP supplier

High availability infrastructure

IX - Access & Housing

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- ACCESS: 10 Mbps to 10 Gbps Ethernet
  - Your own infrastructure (Fiber)
  - Leased Connectivity from carriers
    - National: Telecom Italia, Fastweb, Wind,……
    - International: Level3, Tinet, Interoute, Colt
- Wireless (Hyperlan, WI-MAX): PoPs prepared for antennas and cabling available

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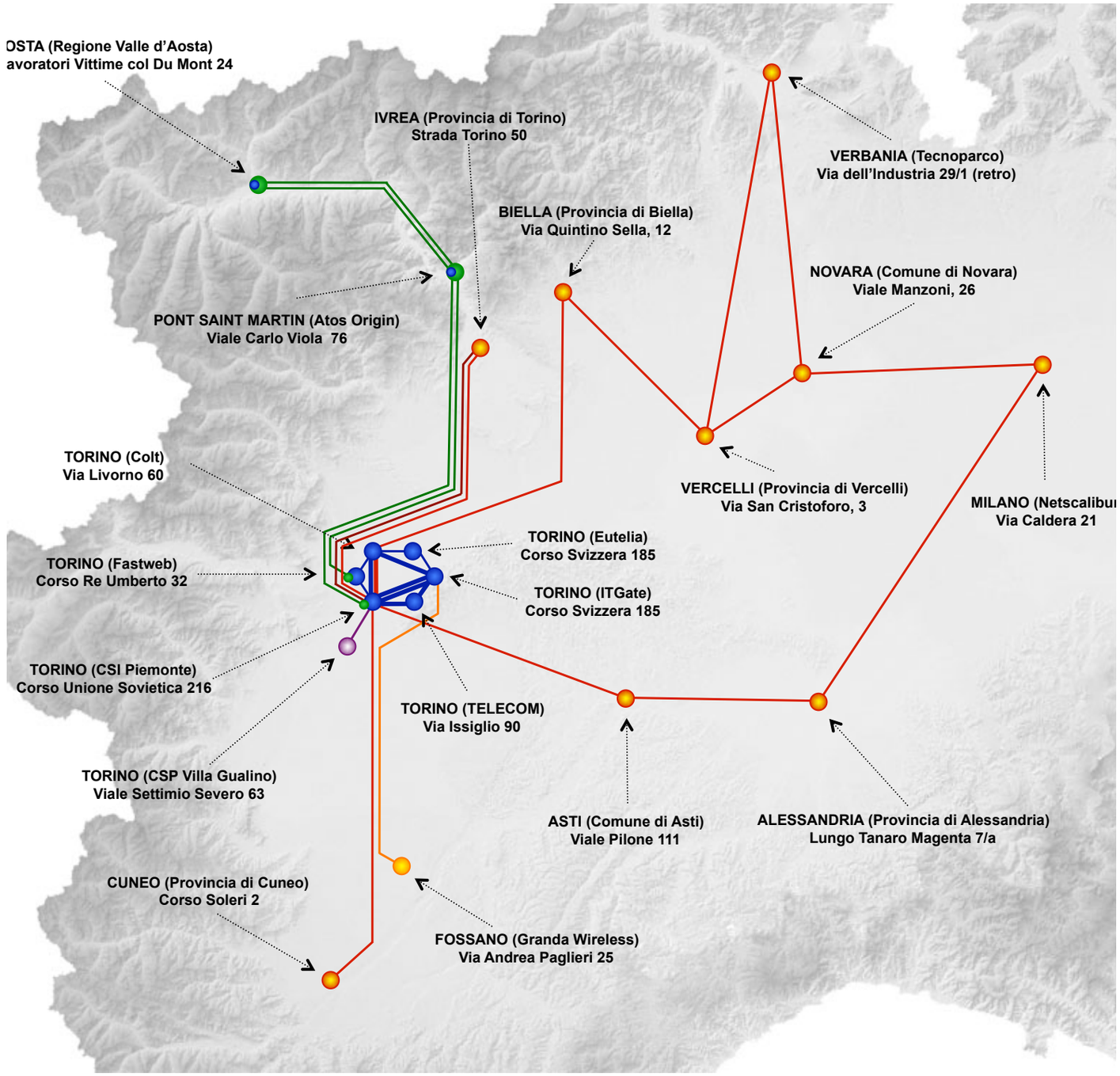
- HOUSING available on each PoP - different housing locators

IX - Network



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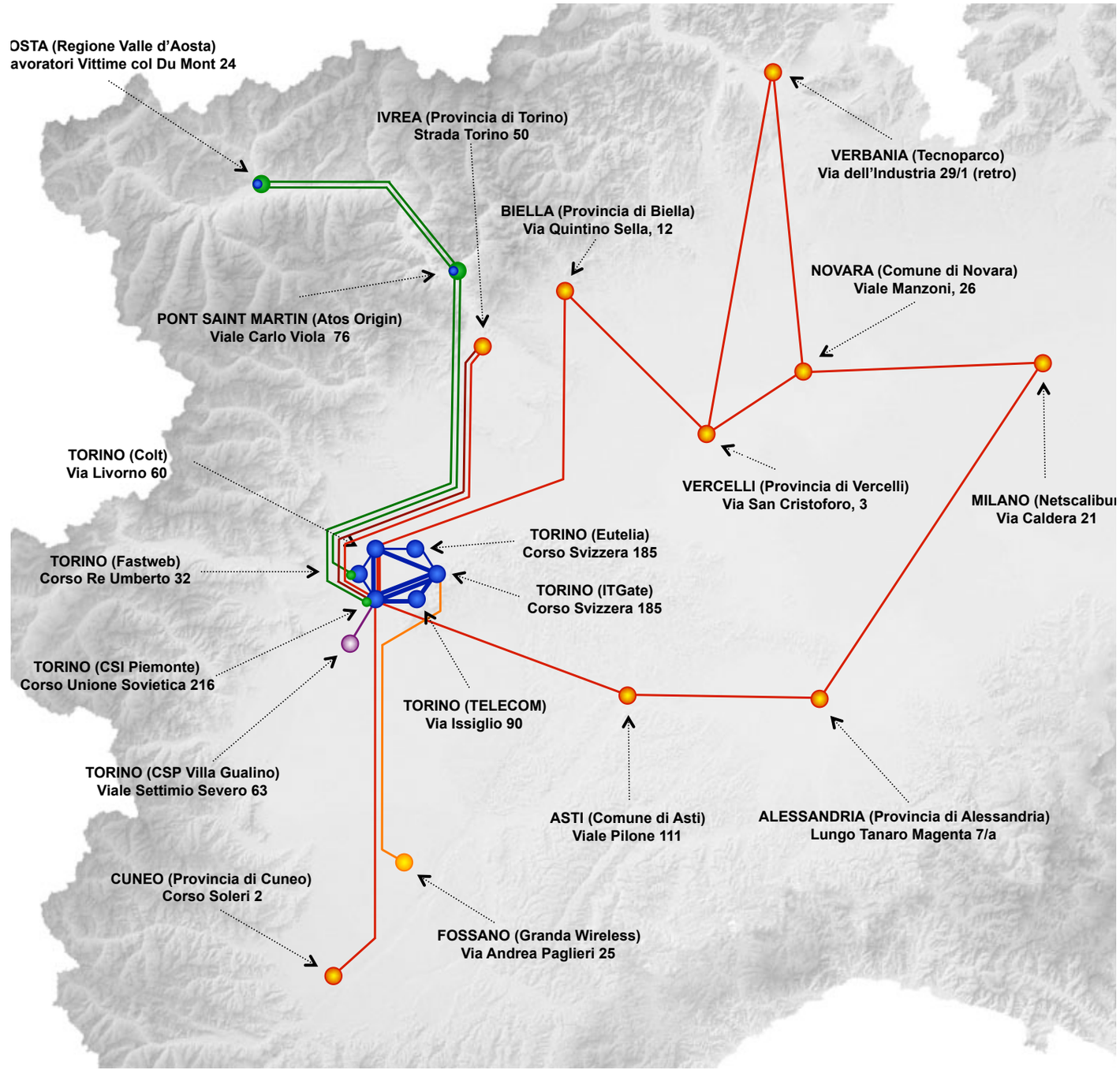
IX - Network

- Core (4)
  - Cisco 6509E
  - Force10 C150
- Backbone (9)
  - Cisco 4900M
  - Cisco 3750G
- Edge (5)
  - Cisco 3750G



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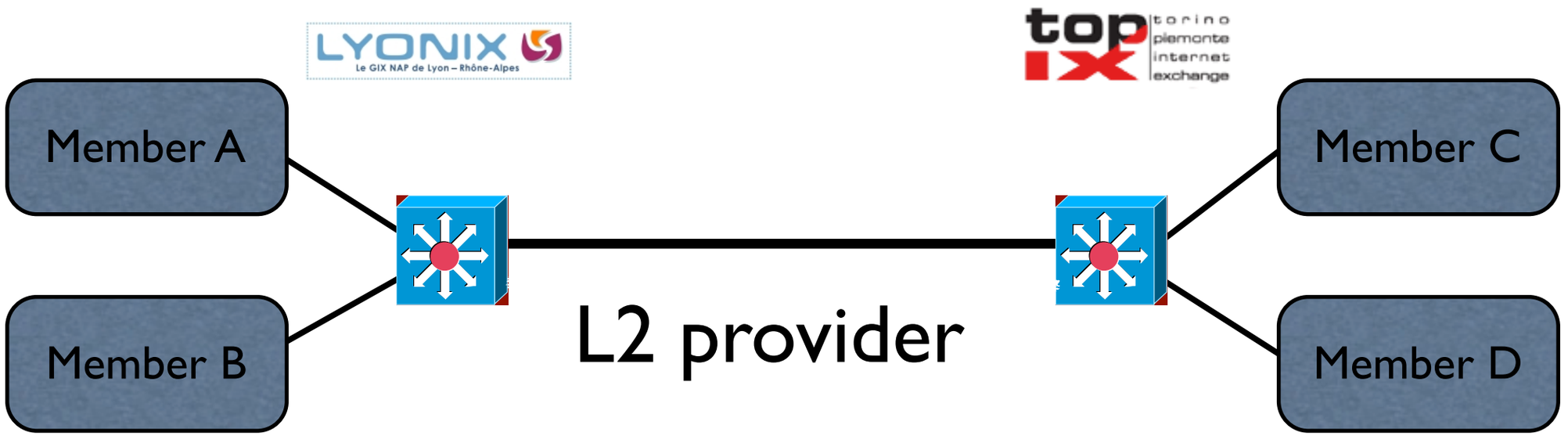

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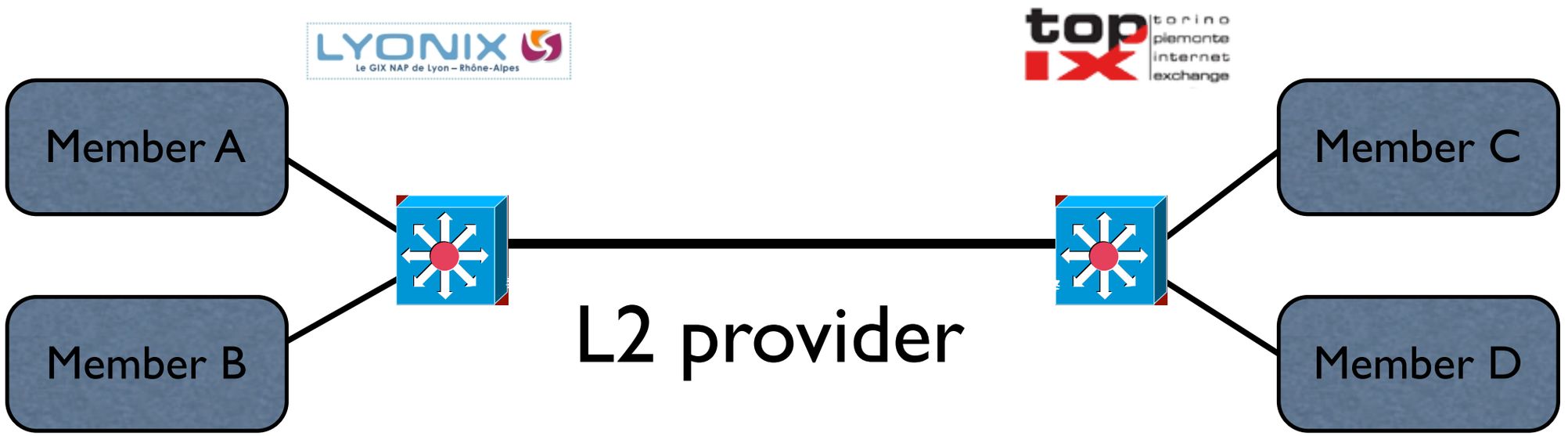

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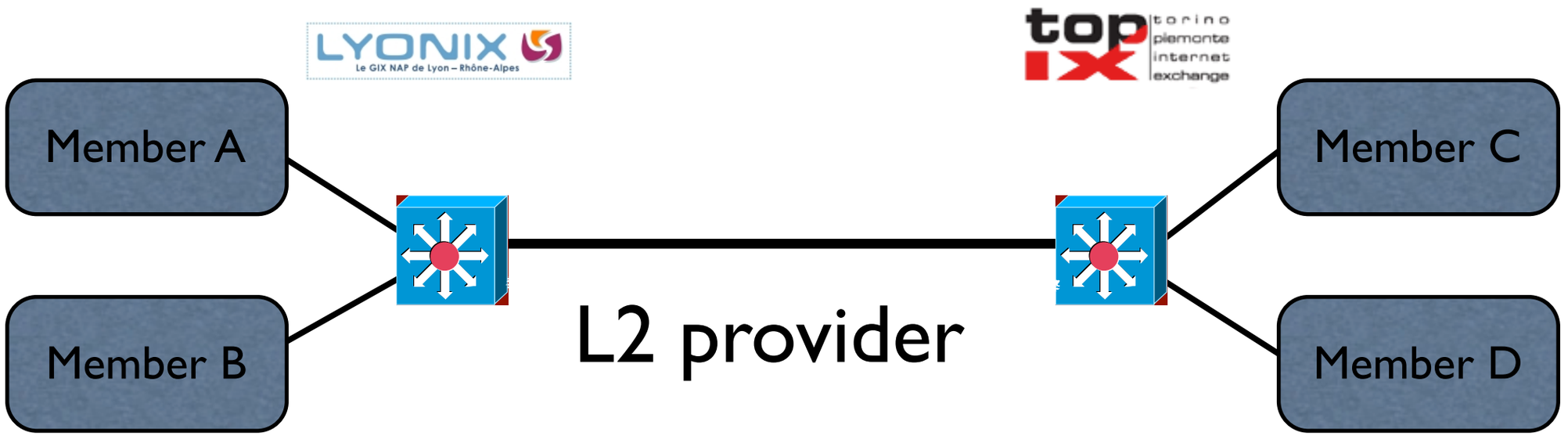

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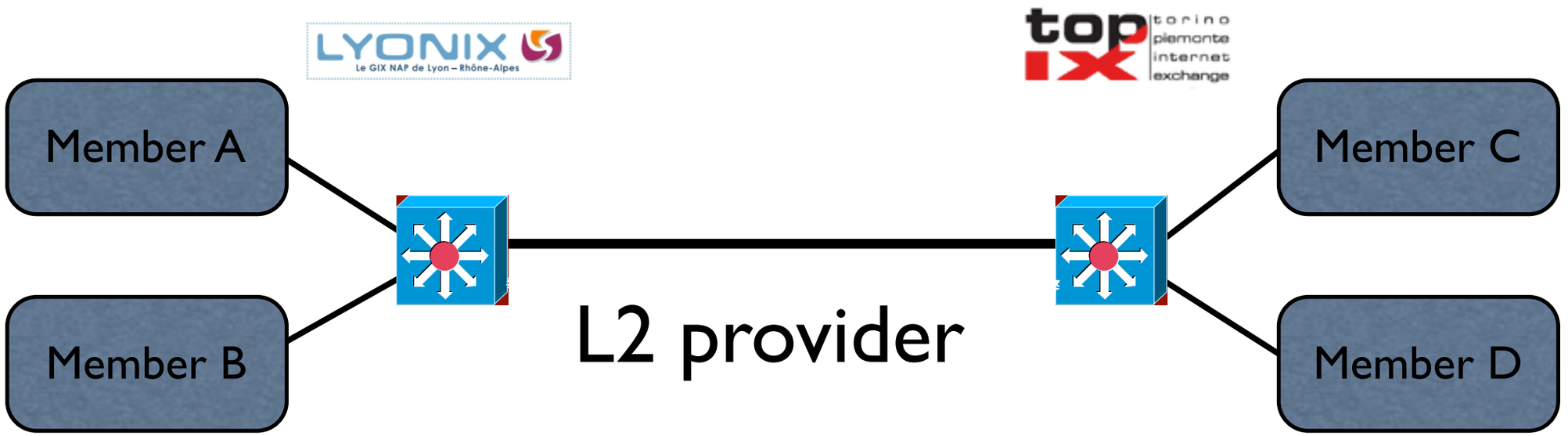

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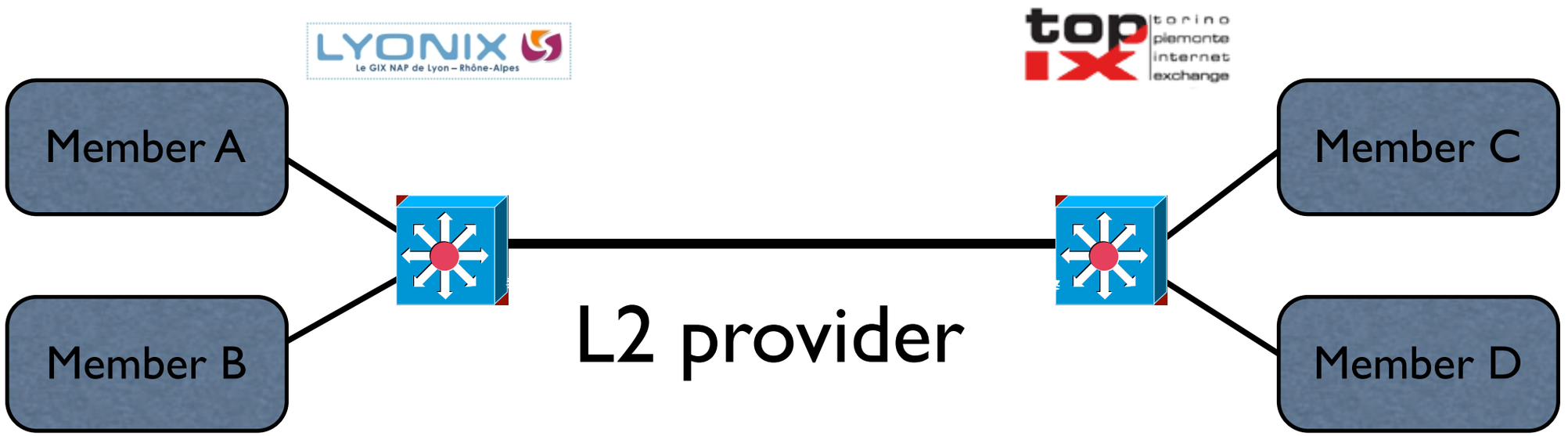

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- **Soon (1q 2011) with Quality Statements**

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IX - Key Features

- **Quality Statements** provided & measured
- **Public Peering** and **private VLANs** available
- **Up to 32 Gbps** peak traffic (IPv6 < 1%)
- **60+ ASN** connected
- Multicast and IPv6 enabled (and IPv4)
- **F-Root** and **J-Root** Servers
- Redundant **Route Server QUAGGA (IPv4 and IPv6)**
- Experimenting **connection with VSIX**

Development Program

Supporting innovative projects (business, academic, no-profit) with:

A. “Infinite” bandwidth

B. Computing power

C. Dynamic allocation of resources in a Cloud environment

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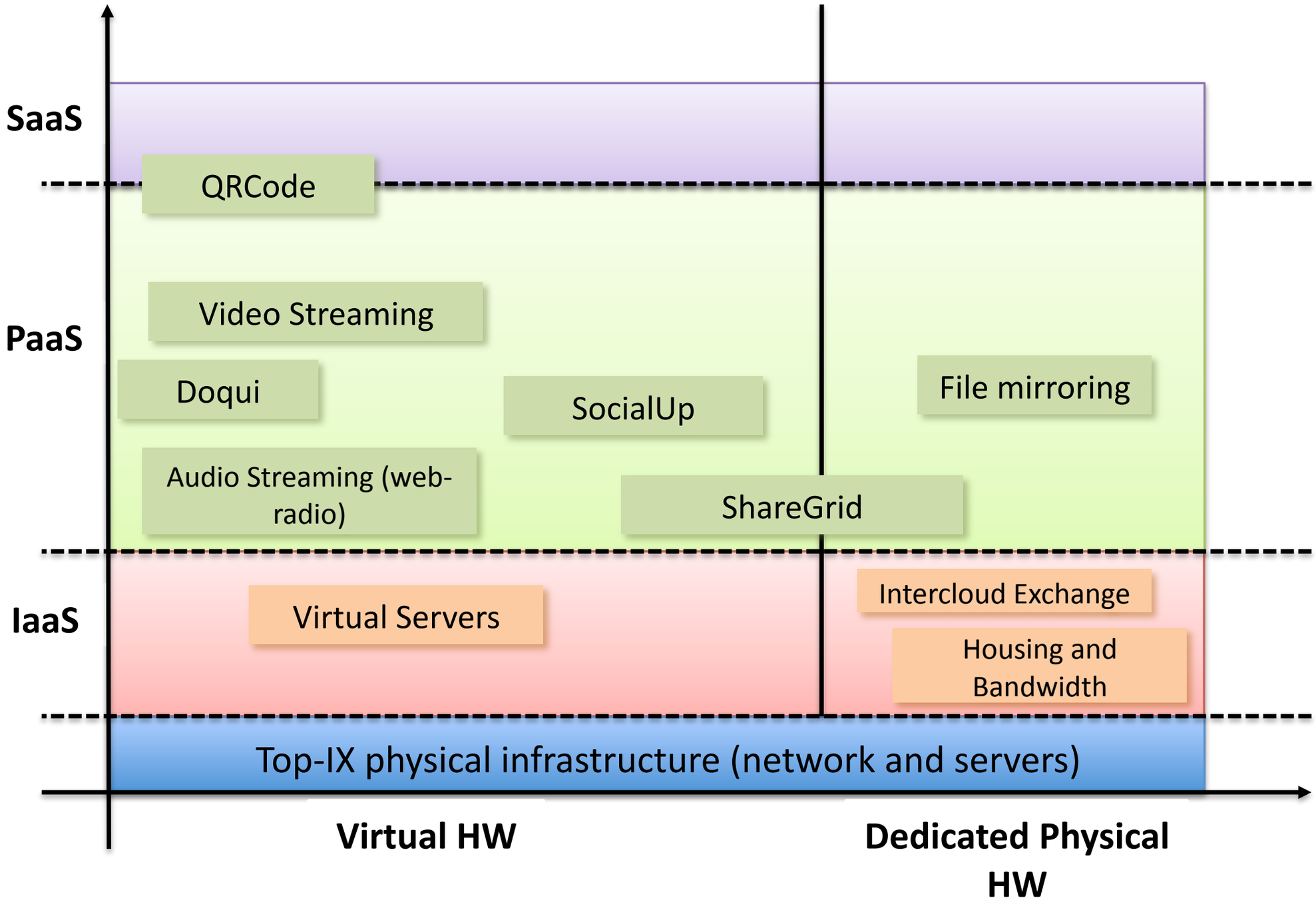
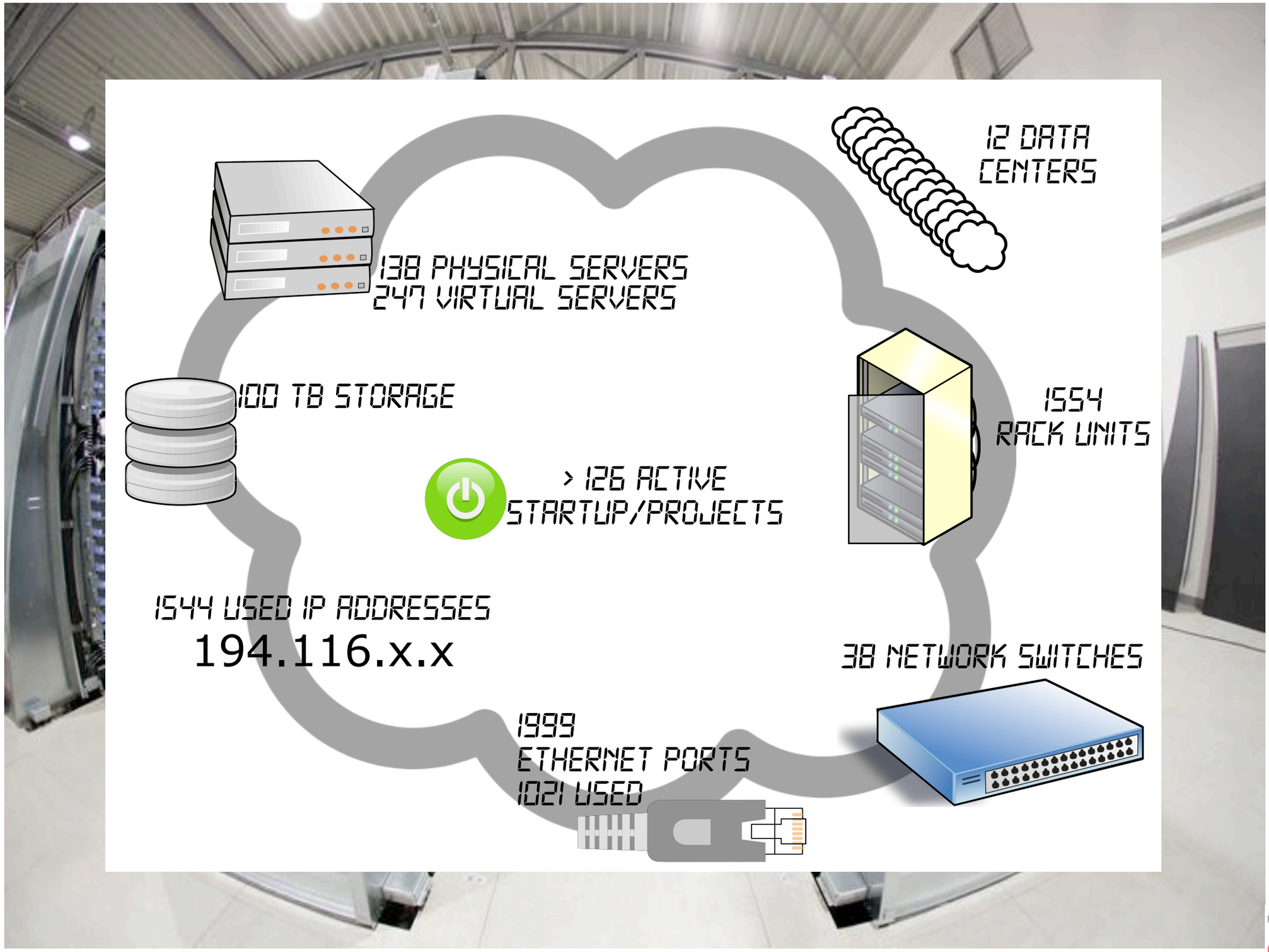
TOP-IX Cloud


SaaS
QRCode
PaaS
Video Streaming
Doqui
SocialUp
File mirroring
Audio Streaming (web-radio)
ShareGrid
IaaS
Virtual Servers
Intercloud Exchange
Housing and Bandwidth
Top-IX physical infrastructure (network and servers)
Virtual HW
Dedicated Physical HW

Cloud Environment

Cloud Environment



Virtualization Infrastructure

Virtualization Infrastructure

Cloud architecture to provide:

- Virtualized access to resouces: decoupling hardware resources and application software
- Elasticity: allocating resource dynamically depending on specific application load
- Multi-tenancy: different applications safely sharing hardware resources, thus resulting in better resource utilization

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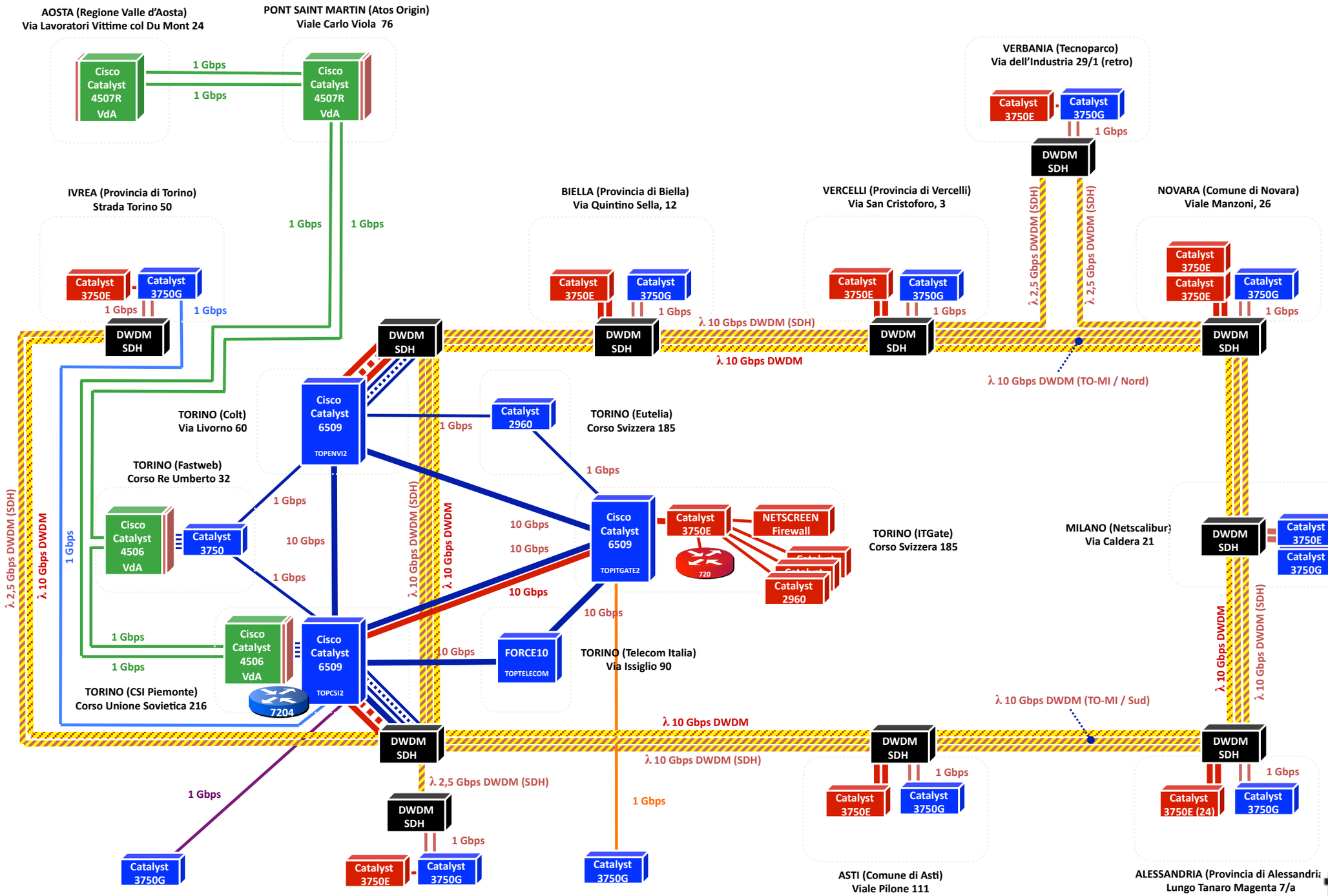
Technology:

- Linux Ubuntu/Debian + Xen (21 servers)
- VMWare ESXi (3 servers)
- Custom deployment, management and monitoring tool

Network complexity



Custom Tools

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CentralServices
Integration with asset management (RackTables)
Integration with statistics (Cacti & MRTG)
Config and fault management for network nodes
Members' access to IXP info (ports, peering stats, traffic, etc)

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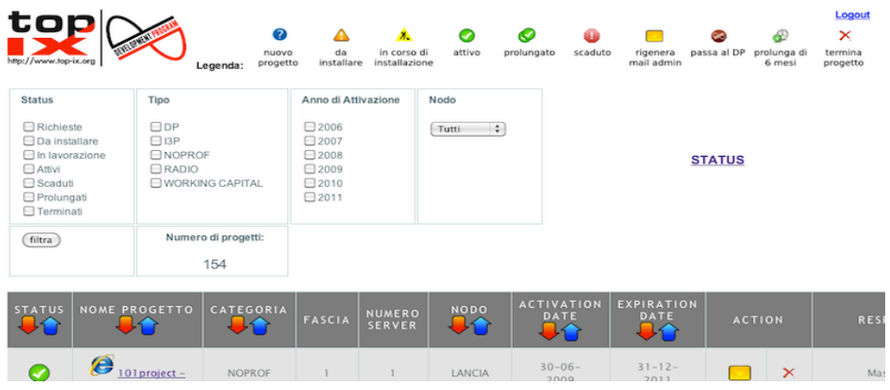
DP Tools
Self-registration and self-service for supported projects



Evolution

Internet : Internet eXchange

=

Cloud Computing : InterCloud eXchange

Internet eXchange

InterCloud eXchange

Internet : Internet eXchange
=
Cloud Computing : InterCloud eXchange

Internet eXchange

Flexibility

Neutrality

Interoperability

SLA management

Exchange

Trade

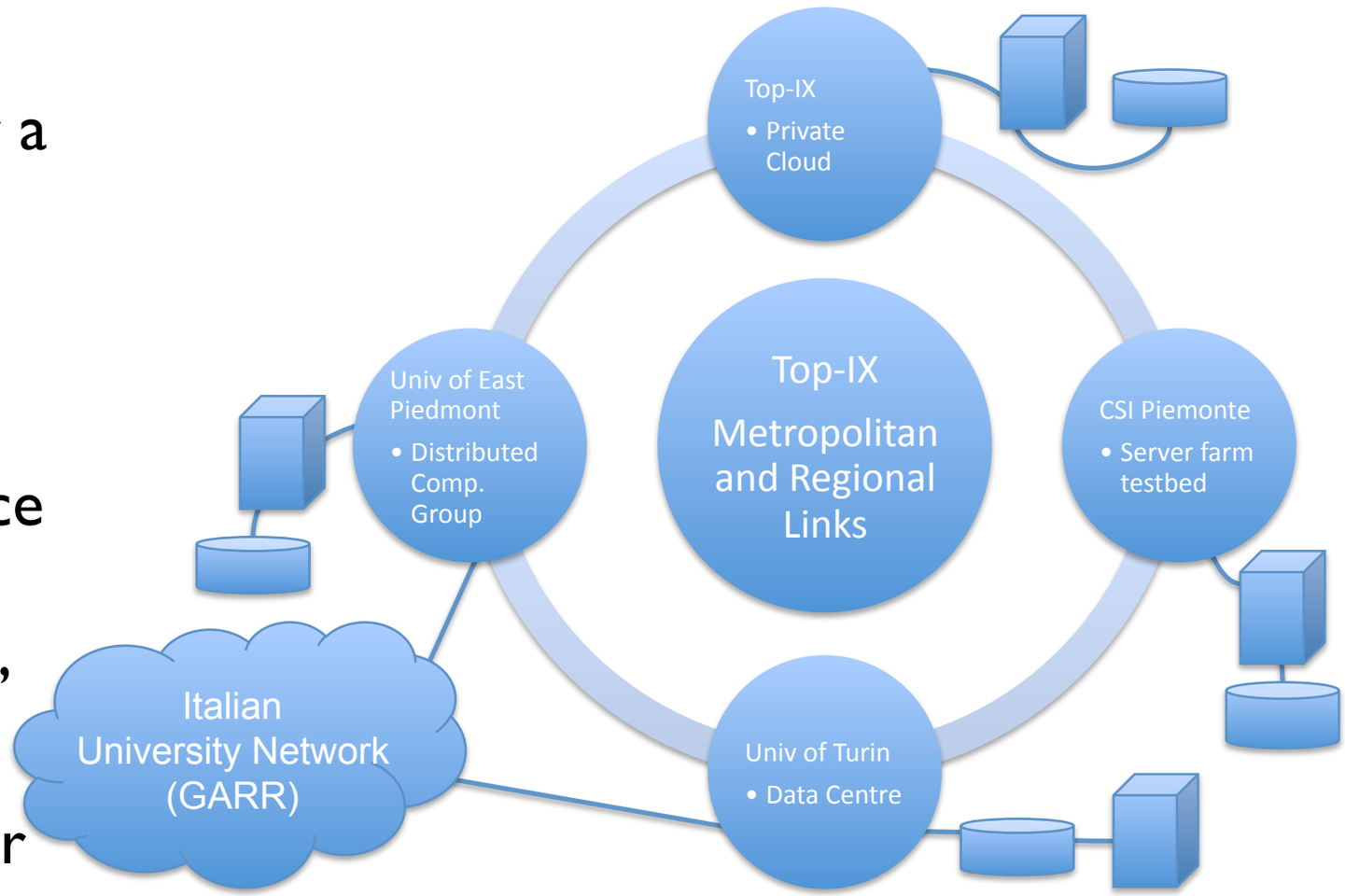
InterCloud eXchange

ICX future steps

- Brokering of physical resources belonging to different Cloud Providers
- Policy reconciliation among different Cloud Providers
- Transparent addressing between different tiers of the same applications running on different Cloud Providers
- Efficient communication among application tiers running on different Cloud Providers
- Transparent access to storage resources

ICX first steps (1)

- Pooling resources (IaaS peering) across different entities (different AS's) over a trusted hi-capacity infrastructure
- Objectives:
  - Gain hands-on experience with existing cloud middleware (CloudStack, Abiquo, …)
  - Share unused capacity for common benefit



ICX first steps (2)

The cloud broker approach (IaaS Exchange):

- Minimum feature-set in the interface (create, destroy)
- Spot-market: selling unused capacity with variable "off-peak" or "peak hour" pricing (energy market model)

Top-IX is participating to the SpotCloud beta program as capacity provider.

- Objectives:
- Put idle capacity to use
- Evaluate the best strategy for infrastructure growth (CAPEX)

Q & A

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