

Euro6IX project and Italian IPv6 Task Force



Background information

- Telecom Italia Lab is the research department of Telecom Italia Group
- Working on IPv6 since 1995 and actively contributing to its development and standardization (RFC 3053 on Tunnel Broker mechanism)
- NGNET.IT initiative: first experimental ISPv6 in Italy and one of the first in Europe providing services to residential and business users
- Some more recent initiatives related to IPv6:
 - **IST Euro6IX project** (www.euro6ix.org)
 - **Italian IPv6 Task Force** (www.it.ipv6tf.com)

Euro6IX project: overview

- IST funded project started in 2002 involving seven **European operators** research departments (TILAB for Telecom Italia Group) and European Universities.
- Basic goal was to design and to build an IPv6-only infrastructure to test IPv6 network and application services
- Network features:
 - 7 Nodes, each one is an Internet Exchange
 - Native IPv6 links up to 34 Mbps
 - Multivendor network (basically Cisco, Juniper, Hitachi, 6WIND)

Map of the Euro6IX network

•Main peerings with:

- 6NET
- 6Bone
- Moonv6 (North America)



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Pisa, 11/05/05

Main Euro6IX Goals

Create a network totally based on IPv6 (no tunnel between the nodes) in order:

- To investigate and to test **basic IPv6 features** (routing, transition mechanism, multivendor router interoperability)
- To investigate and to test **advanced IPv6 services** (AAA, DNS, QoS, Mobility, Multihoming, Multicast, Security)
- To analyze **new models for the Internet Exchanges** both from a technical and business model points of view
- To **involve real users** in the experimentation activity
- To **increase IPv6 awareness** across Europe

Internet Exchange Model (1)

- **Traditional model of an Internet Exchange is basically:**
 - a layer 2 infrastructure fully redundant and with high performances
 - ISPs come to in order to exchange their traffic following some routing policies
 - No end-user services are usually provided
 - No IP addresses are provided
 - No layer three services are usually provided
- **All IXes currently deployed are based on this model**

Internet Exchange Model (2)

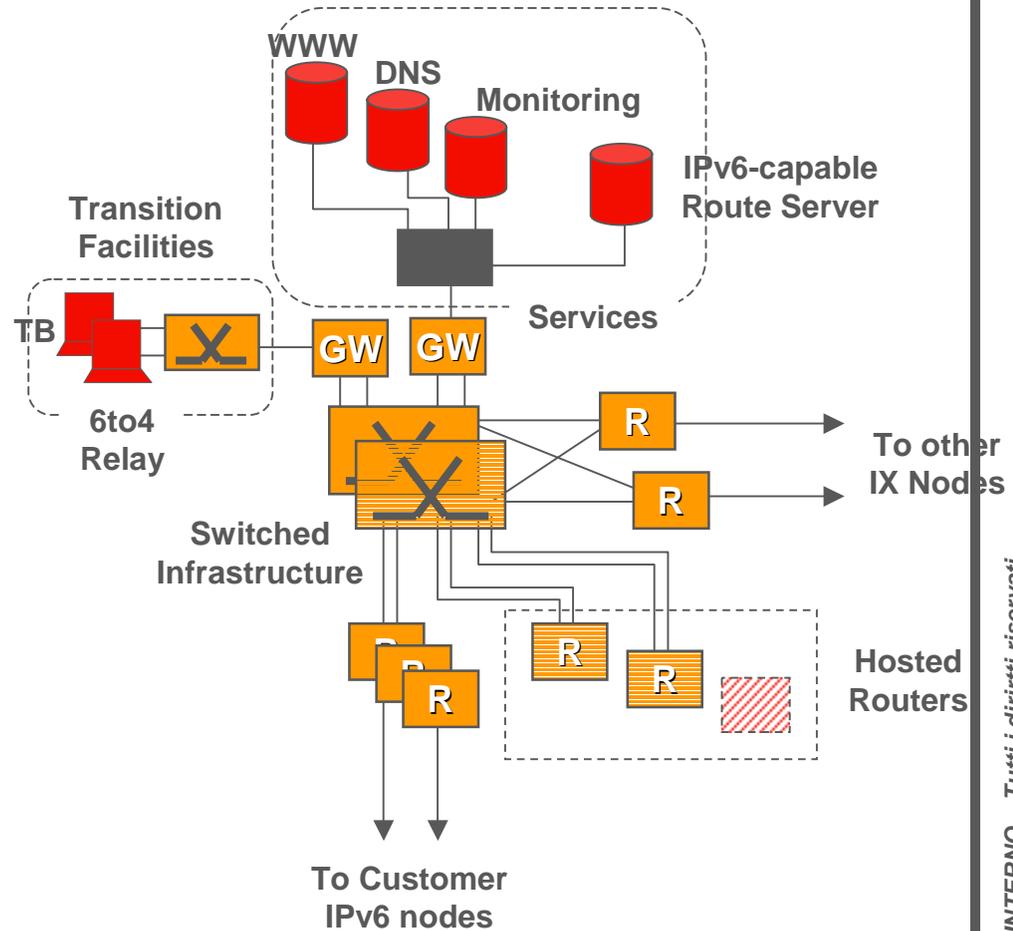
- IPv6 prefixes are Provider Dependent
 - If end user changes Provider, then its addressing space has to be changed
 - Renumbering procedure are being currently studied in IETF
- RFC 2374 proposes an addressing scheme based on some network points, namely Internet Exchange, where renumbering is **not** required and IX allocates addresses to its customers
- We analysed the possibility to define a new model of an Internet Exchange quite different from the traditional model based on the concept that an IX is an aggregation point and it could be the right site to put the servers

Internet Exchange Model (3)

- This model is based on the following considerations:
 - IX could be considered an aggregation point not only for the ISP but also for the customers (e.g. enterprises networks)
 - If we put the services inside the IX all the entities coming to the IX (e.g. ISP and Users) are able to take benefit of this aggregation (e.g. improving the performances when accessing the services)
 - Internet Exchange can provide addresses to its Customers, making easier some operations like renumbering of the networks and multihoming
- Inside Euro6IX network following models have been studied and deployed
 - Model A: traditional IX (only studied)
 - Model B: L2 + NAP
 - Model C: New IX model

Functional Network Architecture of IX

- **Layer 2 Infrastructure**
 - need for high reliability
 - need for high performance
- **Layer 3 Infrastructure**
 - Interconnection with other IXs
- **Application services**
 - As an Internet Data Center
- **Monitoring application**
- **Transition facilities**
 - In order to permit IPv4 users to access to IPv6 Euro6IX network
- **Traditional and next generation customers**



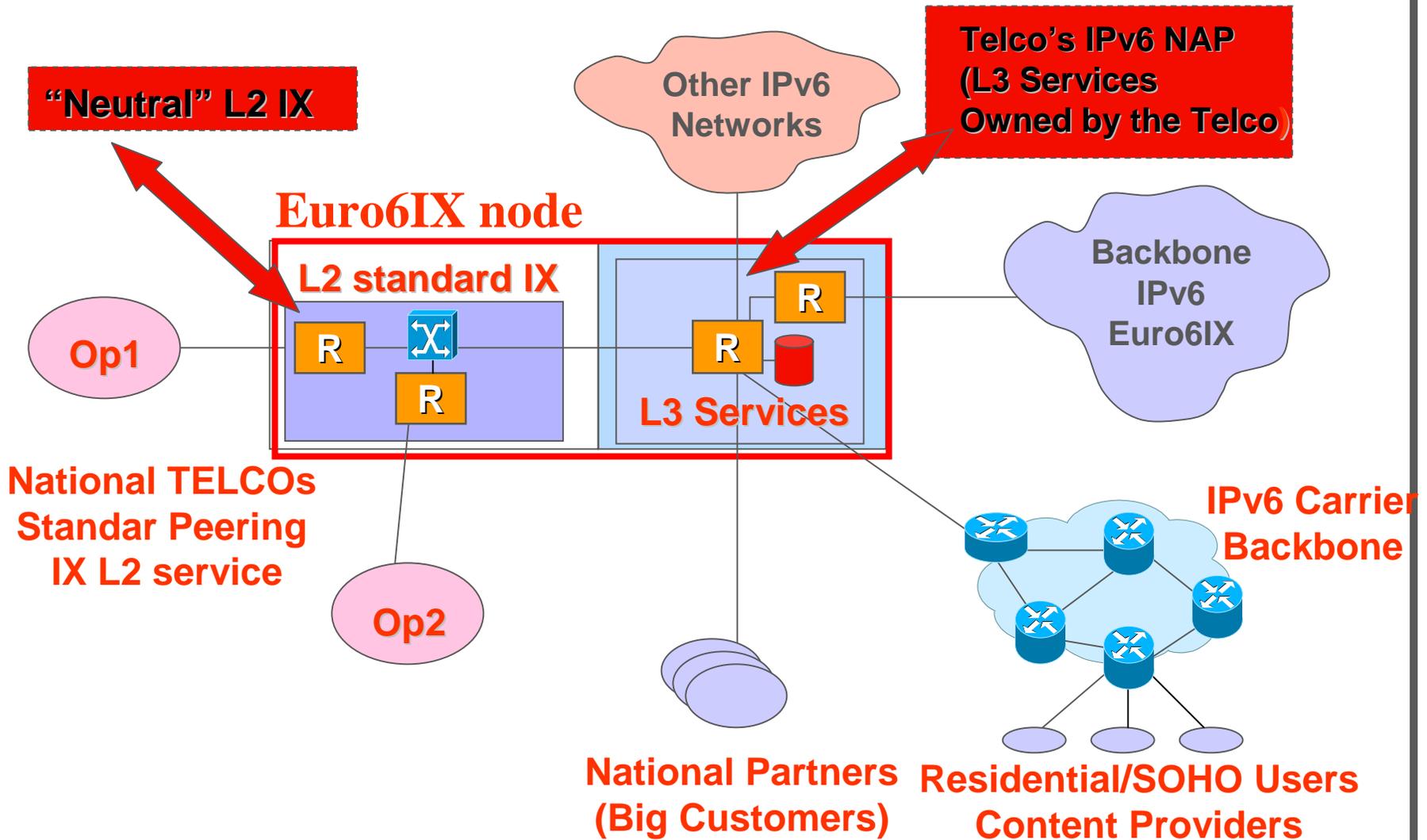
Specification of the internal architecture of each IX node

Internet Exchange: Layered infrastructure characterized by the following main logical blocks

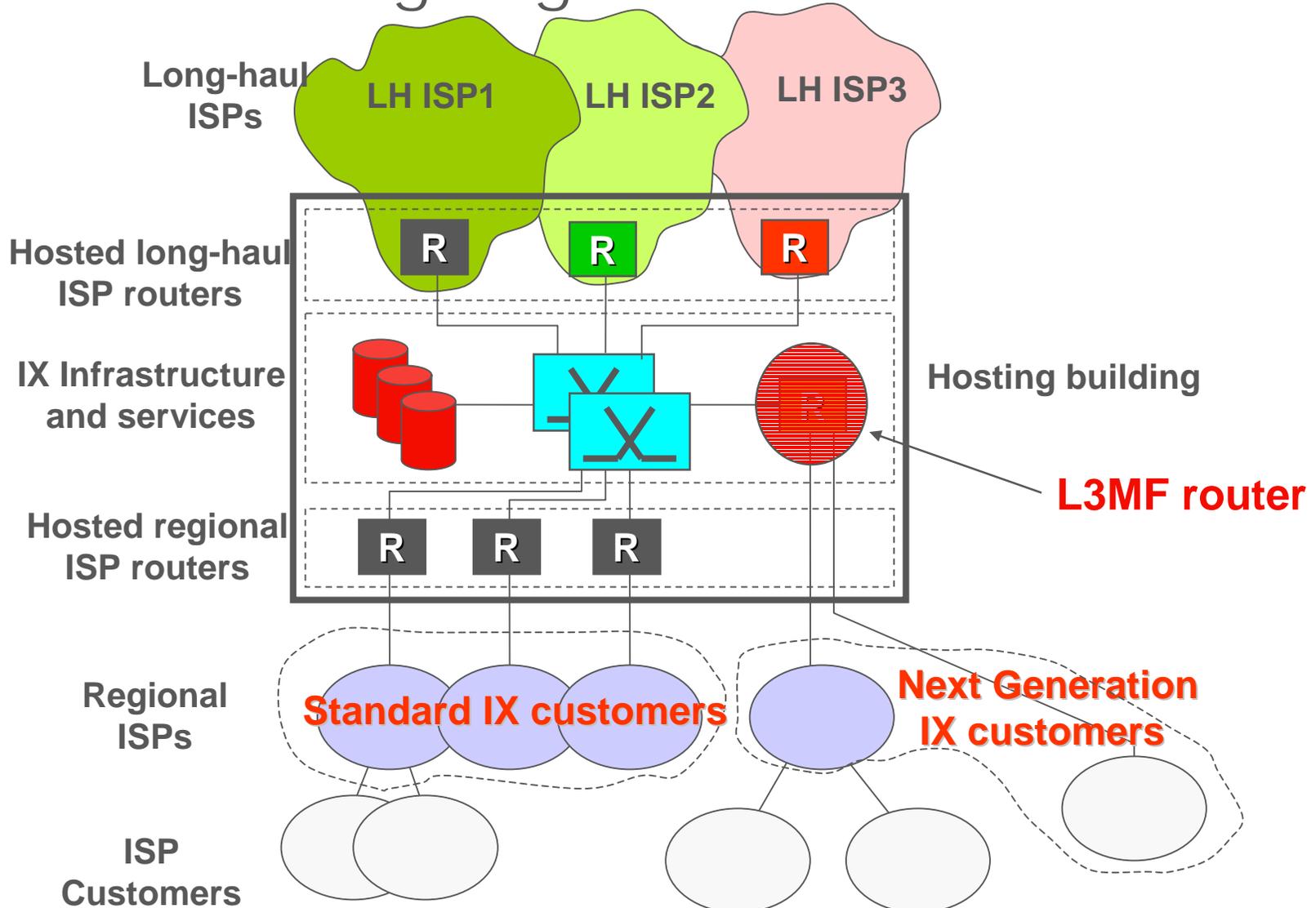
- Layer 2 Infrastructure
- Layer 3 Infrastructure (including Router Equipment and Route Servers)
- Transition Facilities Infrastructure
- Server Farm Monitoring
- Application Services block

Layer 2 Infrastructure: The core of IX is basically a layer 2, high performance switched, fully redundant infrastructure, connecting the various blocks inside the IX. The proposal is that each Euro6IX IX node should consist of at least two Ethernet switches supporting local LAN segments. The IX Backbone Router will have local connectivity using two high-speed interfaces (Fast-Ethernet/Gigabit-Ethernet).

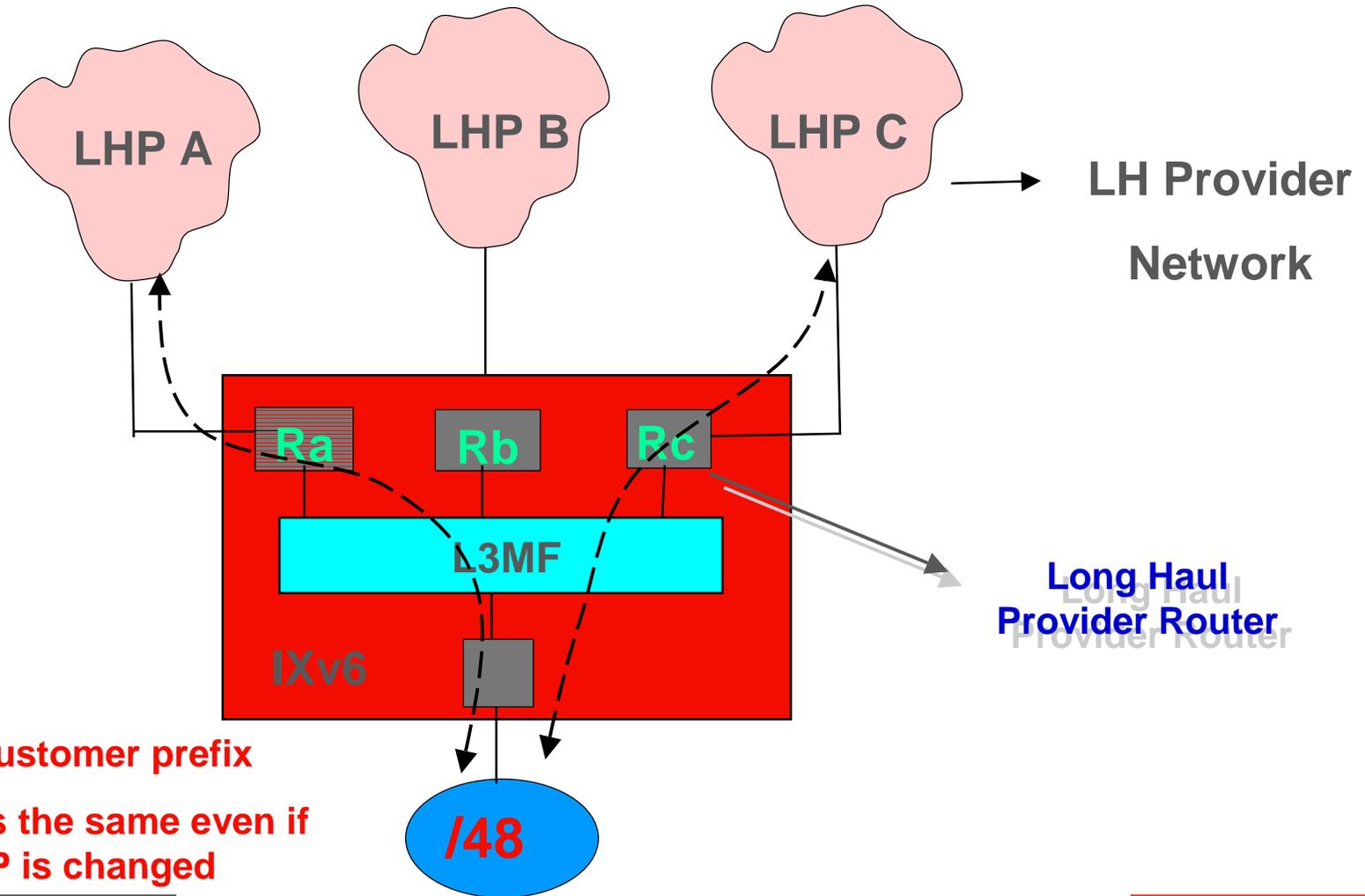
Model B: L2 + NAP



Model C: IX Assigning addresses



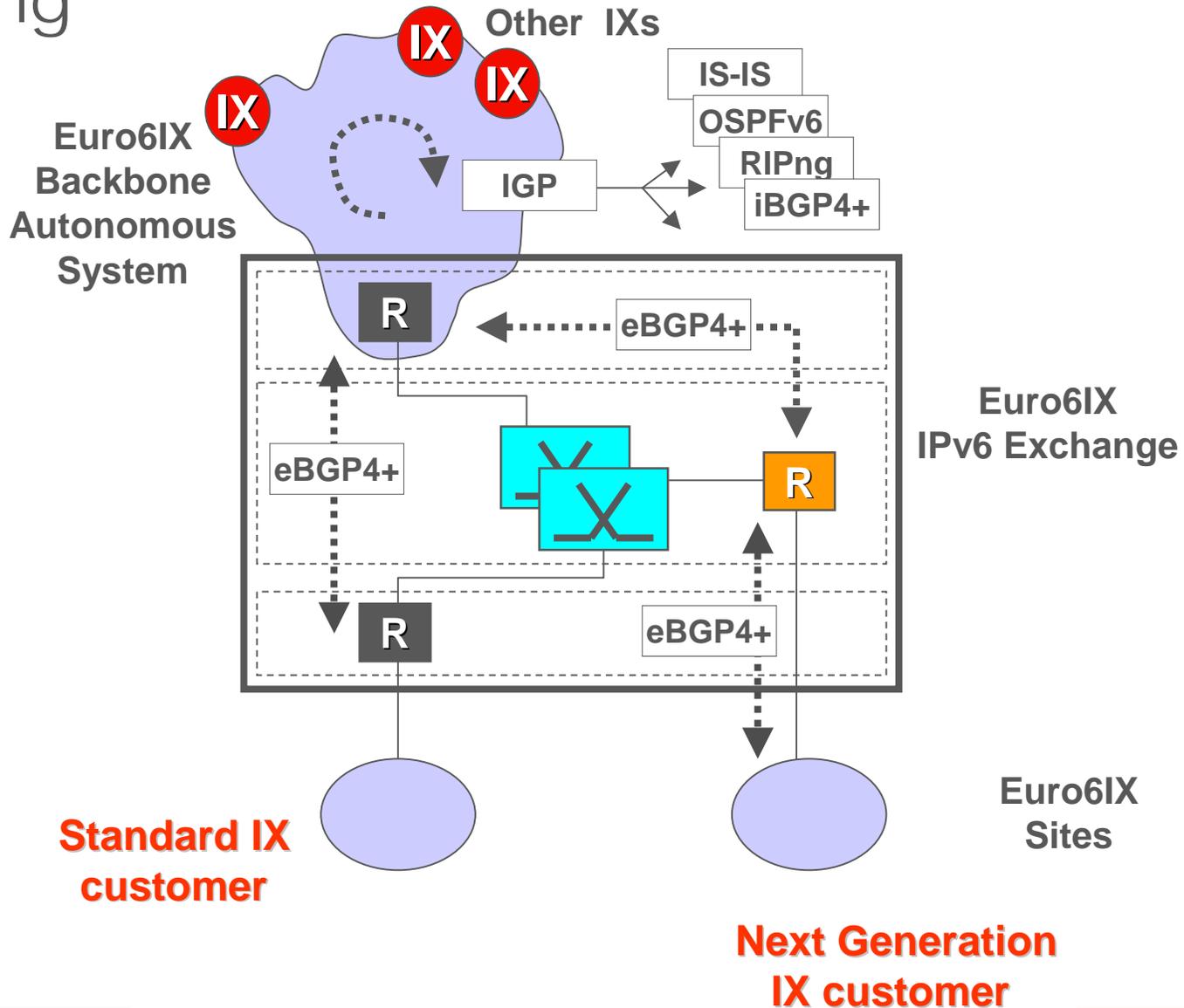
Model C at a glance



NG Customer prefix

Is always the same even if LHP is changed

Routing



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First output: IX providing addresses (1)

- IX customers are not only big ISPs but also, for example, big enterprises
 - They come to the IX to:
 - Exchange IP traffic (like in the traditional IX)
 - To get IPv6 prefixes from the IX owner → **address delegation mechanism provided by an IX**
 - Address delegation mechanism can make simple (even if not totally solve) Long Haul Provider Selection and Multihoming mechanisms
 - Renumbering is not required except for those customers changing IX
- Address delegation mechanism can be deployed by a functionality called **Layer 3 Mediation Function**

First output: IX providing addresses (2)

Next generation IX services

- assignment of provider independent IPv6 addresses to the IX customers (i.e. regional ISPs or companies)

provision of a **L3 “mediation function”**

- the customer uses the addresses assigned by the IX and establishes a BGP4+ peering with the IX
- the customer buys the long-haul service from one (or more) of the long-haul providers connected to the IX
- the IX forwards the traffic generated by the customer only to the long-haul ISPs it subscribed with
- the return path is unpredictable
- proven advantages are
 - the possibility to change long-haul ISP without changing addresses easier support for multihoming

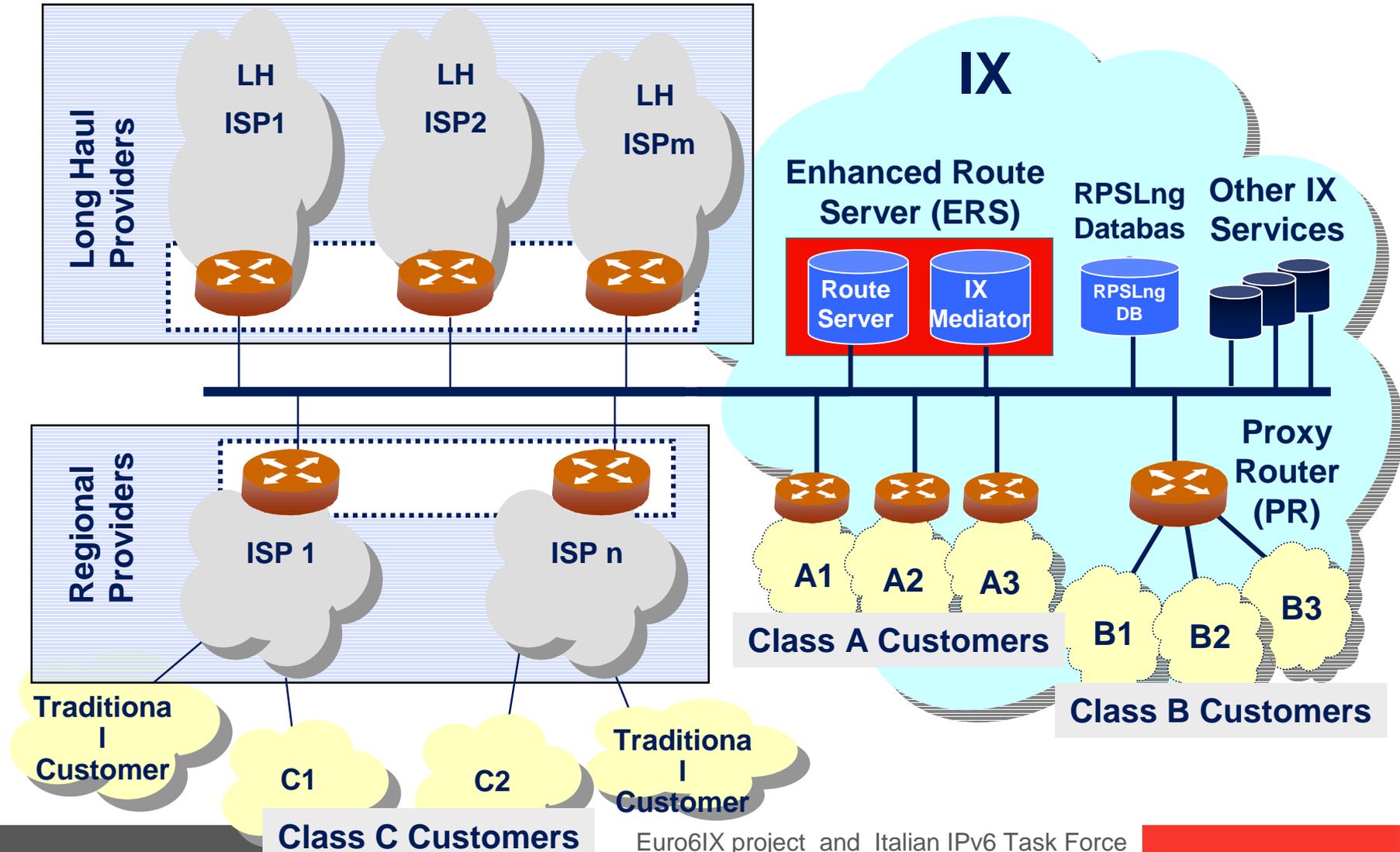
Second output: IX providing services

- **Euro6IX project also identified a different possible role of Internet Exchanges**
 - **IX is considered an aggregation point for the users and the services**
 - **Services can be placed inside the IX location to be provided to the IX customers**
 - **Network services: AAA, Multicast, Route Server, DNS, PBMN**
 - **Application services: Multicast servers, Management server**
 - **Security Services**

Conclusions on IX Models

- A lot of work has been carried out in this direction
- Innovative model but:
 - It does not solve all the problems even if it is really service oriented
 - It is very important try to identify some realistic business model to avoid clashes between traditional IX and new model (above all because all currently deployed IXs use a totally different architectural and business model)
 - Work in progress on this issue in the last part of the project

IX Model to Study IX Allocated Addresses Schemes



Class C Customers

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Class B Customers

Main activities carried out inside Euro6IX (1)

- For a complete list, see our web site at: <http://www.euro6ix.org/repository>
- **Implementation of the IX Model**
 - Both of models previously described have been implemented successfully in an experimental environments and some IX is going to implement in their commercial networks
- **Policy Based Management Network Tool**
 - Tool to centrally manage and monitor the policy inside the IX in a centralized way (for VPN, multihoming, QoS, Security)
- **Route Server**
 - Quagga Route Server implementation for IPv4/IPv6
 - Integrated in quagga since version 0.97
 - RPSLNg database implementations tested (IRRD 2.2 (<http://www.irrd.net>) database)
 - RtConfig patch to support quagga and Route Server based IX configurations

Main activities carried out in Euro6IX (2)

- **Other services/applications developed**
 - Monitoring Tool (Magalia) and IDS system (Topaz)
 - ISABEL application for e-learning (IPv6)
 - P2P software migration to IPv6
 - SIP Audio Client for IPv6 with QoS interaction with the network (with the usage of Premium service where possible)
 - QoS Measurements with BE traffic and Premium traffic (DSCP traffic)
 - Integration of IPv6 Mobility with AAA (using RADIUS and OpenDiameter)
- **Standardization activity**
 - 20+ drafts have been written with Euro6IX contribution on various topics
 - Full list at: http://www.euro6ix.org/documents/e_standardization.php

SSM activity

- **Last year Euro6IX consortium decided to implement SSM in the network**
- **PIM-SSM has been enabled inside some of the IXes (some local tests have been already successfully done)**
- **SSM tests are being currently doing at a global level**
- **Main problem we are facing is the lack of applications supporting SSM.**

Italian IPv6 Task Force (1)

- Kicked off in October 2003 in Milan within the scope of IPv6 European Task Force with the goal:
 - To spread out as much as possible information on IPv6 related issues (through web site, documents and conferences)
 - To monitor the level of IPv6 awareness in Italy
 - To maintain a link with the other European National Task Forces already developed
- Public Mailing List
- Web site: www.it.ipv6tf.org (also IPv6-aware)
- Periodic meetings (two per years, the next one is coming in the early summer)
- At the moment almost 30 partners involved (ISPs, Telcos, Mobile Operators, Internet Exchanges, Universities, Manufactures, Research Centers)
 - Willing to increase this number to raise the awareness of IPv6 in our country (and not only to technical level)

Italian IPv6 Task Force (2)

- **5 Working Groups**
 - Working on different topics: Public Administration, Private Industries, Mobility and Wireless, Dissemination activities, Business Models and Services
- Main result up to now is the Recommendation that is ready and will be delivered soon
- Main activities for this year:
 - Realization of a web site with dissemination goals (coming soon)
 - Participation to public events for dissemination (the next one probably in September)
 - To prepare some technical documents related to IPv6 topics (like transition mechanism and security)
 - To monitor issues and initiatives in Italy interesting for IPv6 in different fields (mobility, home networking, DTT,..)

THANKS!

For further information:

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