

# **GARR**

## **Italian Academic and Research Community**

### **IPv6**

#### **“state of the art”**

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The logo for GARR, consisting of the word "GARR" in a bold, yellow, sans-serif font with a slight 3D effect, positioned above a dark blue, textured, curved shape that resembles a globe or a network map.

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*At the beginning...*

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# *At the beginning*

- ▶ Italian research community in 6bone: a loose presence
- ▶ Ipv6 research only in the labs
- ▶ A fundamental experience
- ▶ GARR gathered the researchers' efforts in the 6NET project
- ▶ A magic evolution during the last 2 years

*Italian participation*  
*in*  
*6net*

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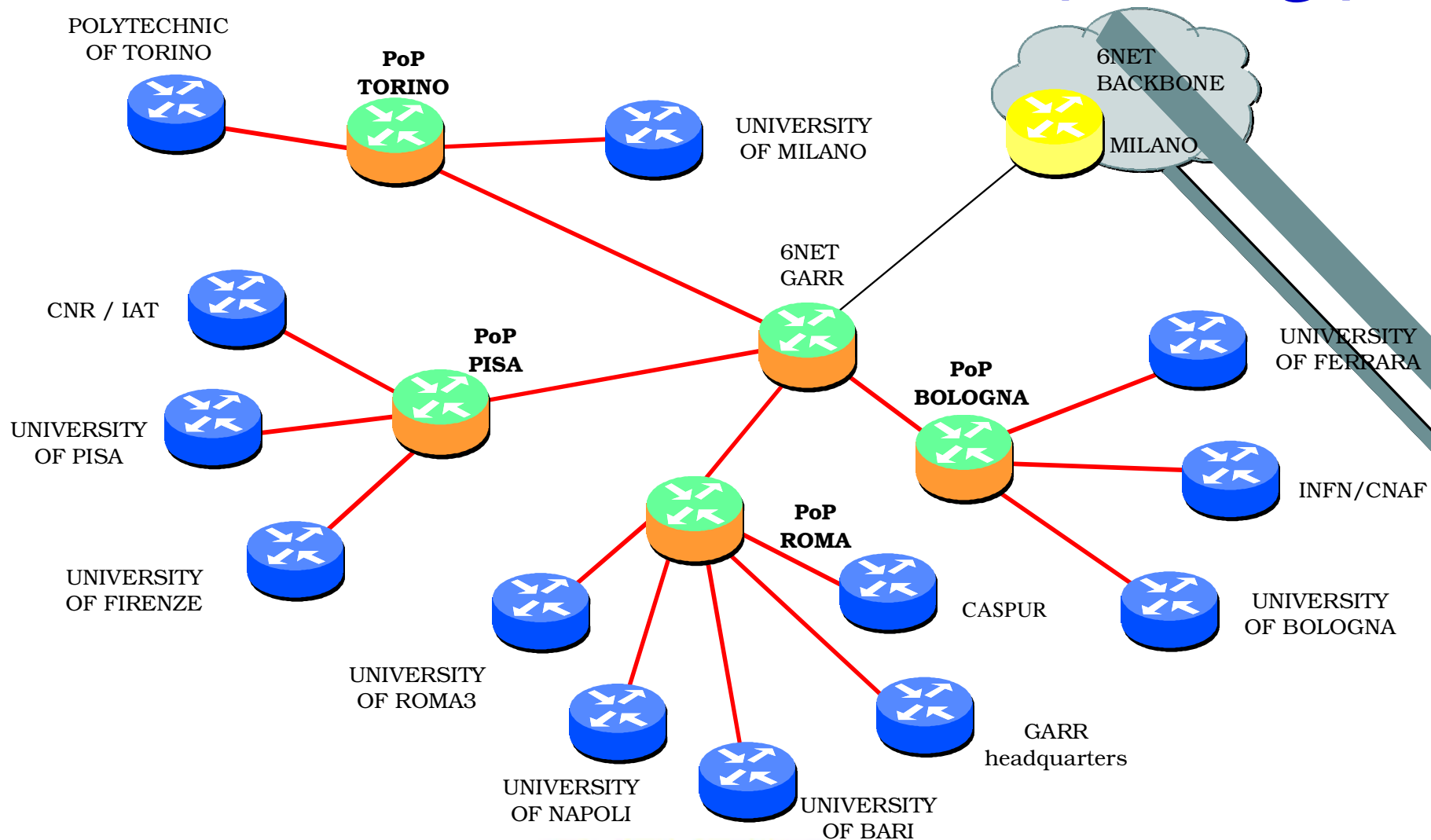
# *GARR in 6NET*

- ▶ A complex participation:  
GARR coordinates 12 local partners
- ▶ We are participate in many activities in the project
- ▶ A native network using ATM pvc
- ▶ Users connected in native mode using dedicated pvc, sometimes dual-stack in users side.

# *Universities and research institutes involved in 6net with GARR*

- ▶ Bologna
  - ▶ INFN CNAF
  - ▶ Università di Bologna
- ▶ Milan
  - ▶ Università di Milano
- ▶ Turin
  - ▶ Politecnico di Torino
- ▶ Pisa
  - ▶ CNR IIT
  - ▶ Università di Pisa
- ▶ Ferrara
  - ▶ Università di Ferrara
- ▶ Florence
  - ▶ Università di Firenze
- ▶ Rome
  - ▶ Università di Roma III
  - ▶ INFN Roma1
  - ▶ CASPUR
- ▶ Naples
  - ▶ Università di Napoli
- ▶ Bari
  - ▶ Università di Bari

# Current Italian 6NET topology



# Naming and addressing

**6net.garr.it** (IPv4 and IPv6)

6net services (web, mailing)

**6net.garr.net** (IPv4 and IPv6)

BackBone P2P, loopbacks

**ip6.arpa reverse resolution**

**Example of User naming:**

cnr.6net.garr.it      CNR / IIT

primary dns CNR      secondary GARR

caspur.6net.garr.it      CASPUR

primary dns CASPUR      secondary GARR

cnaf.6net.garr.it      INFN CNAF

primary dns CNAF      secondary GARR

...

**GARR allocation: 2001:760::/32**

**2001:760::/35 is used for 6NET**

**Example of User Address space allocation:**

<b>ROMA PoP</b>	2001:760::/40
GARR	2001:760::/48
CASPUR	2001:760:2::/48
University of Roma Tre	2001:760:4::/48
University of Napoli	2001:760:6::/48
University of Bari	2001:760:8::/48

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# Info @ ...

► <http://www.6net.garr.it>

The screenshot shows a web browser window with the address bar containing "http://www.6net.garr.it/". The page has an orange header with the text "Un testbed per sperimentare IPv6 nativo per gli utenti della Rete GARR". On the left, there is a dark blue sidebar with a "GARR 6NET" logo and a menu with items: "Progetto", "Documenti", "Link Utili", "News", "IETF, RIPE e altro", and "Area Privata". The main content area has a white background and contains the following text:

**Il progetto italiano 6NET, che vede la partecipazione di Universita' ed Enti di Ricerca collegati alla rete GARR, partecipa al progetto europeo 6NET, finanziato dalla Comunita' Europea al 50% attraverso il programma IST (Information Society Technologies).**

**Perche' IPv6?**

**Queste sono alcune delle motivazioni:**

- La possibilita' di poter utilizzare un numero piu' ampio di indirizzi IP
- L'header del pacchetto IP piu' efficiente ed estendibile
- Le Caratteristiche intrinseche al protocollo:  
Security, Mobility, Multicast, Supporto per la QoS

At the bottom of the page, there is a logo for "6net" with the tagline "A large-scale International IPv6 Network". Below this are logos for "The European Commission Community Research" and "ist information society technologies". A footer line reads: "Ultima modifica web: 16.05.2002 - INDIETRO - HOMEPAGE - II WEB del GARR - This page is maintained by webmaster."

# *The GARR dual-stack Pilot*

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# *Going towards an Ipv6 production network*

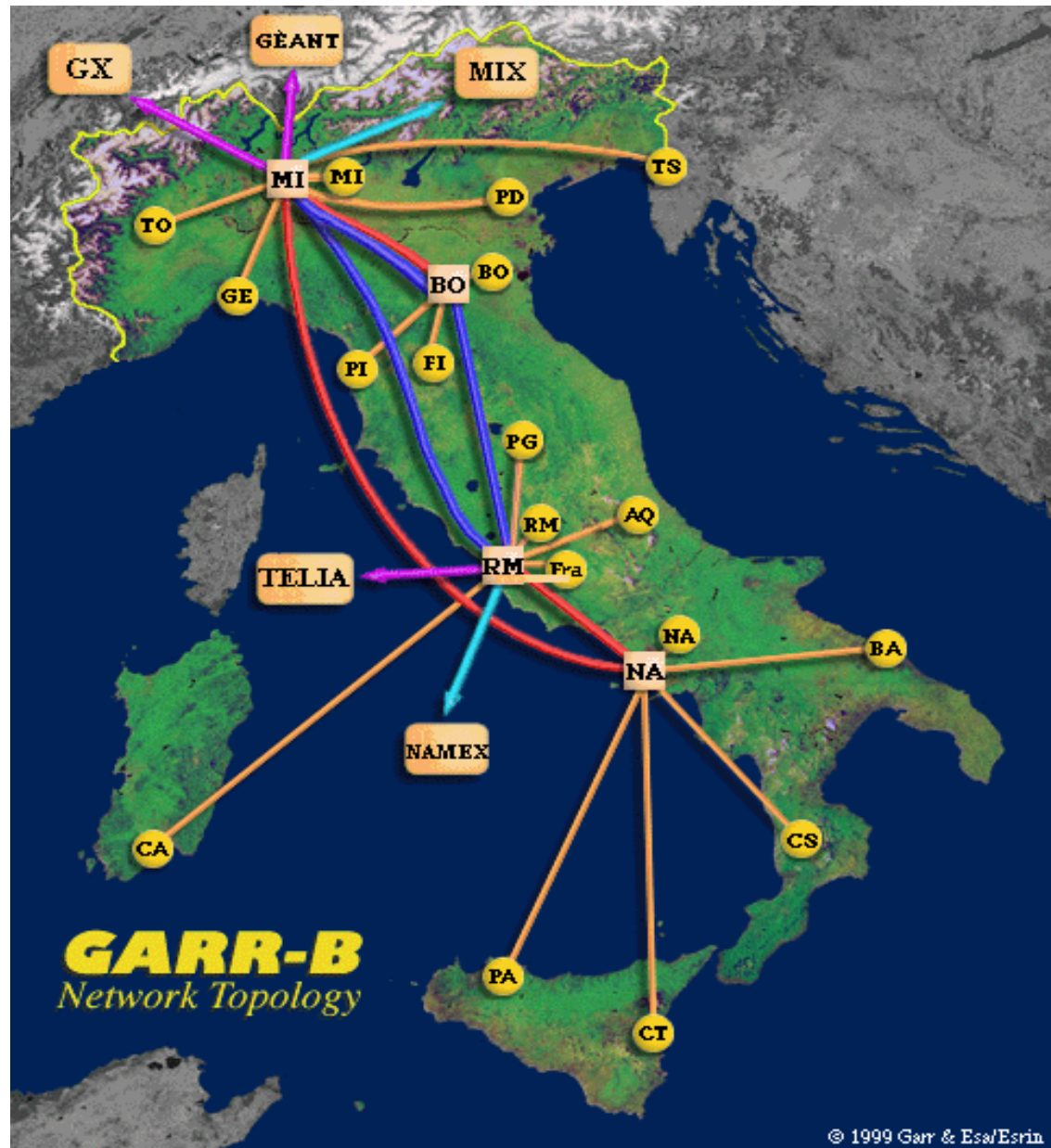
- ▶ We are involved in the Geant Ipv6 TaskForce, following the Geant roadmap
- ▶ Our Pilot plan is in 3 stages:
  - ▶ 1<sup>st</sup> stage: the Network
  - ▶ 2<sup>nd</sup> stage: the Routing
  - ▶ 3<sup>rd</sup> stage: the Users

# 1<sup>st</sup> Stage: Step by step

## 1<sup>st</sup> Step (now)

- ▶ Turn on dual-stack on the Ipv4 production network
- ▶ Core routers are involved
- ▶ Cisco 12XXX and Juniper M20
- ▶ No Users, test with dedicated machines

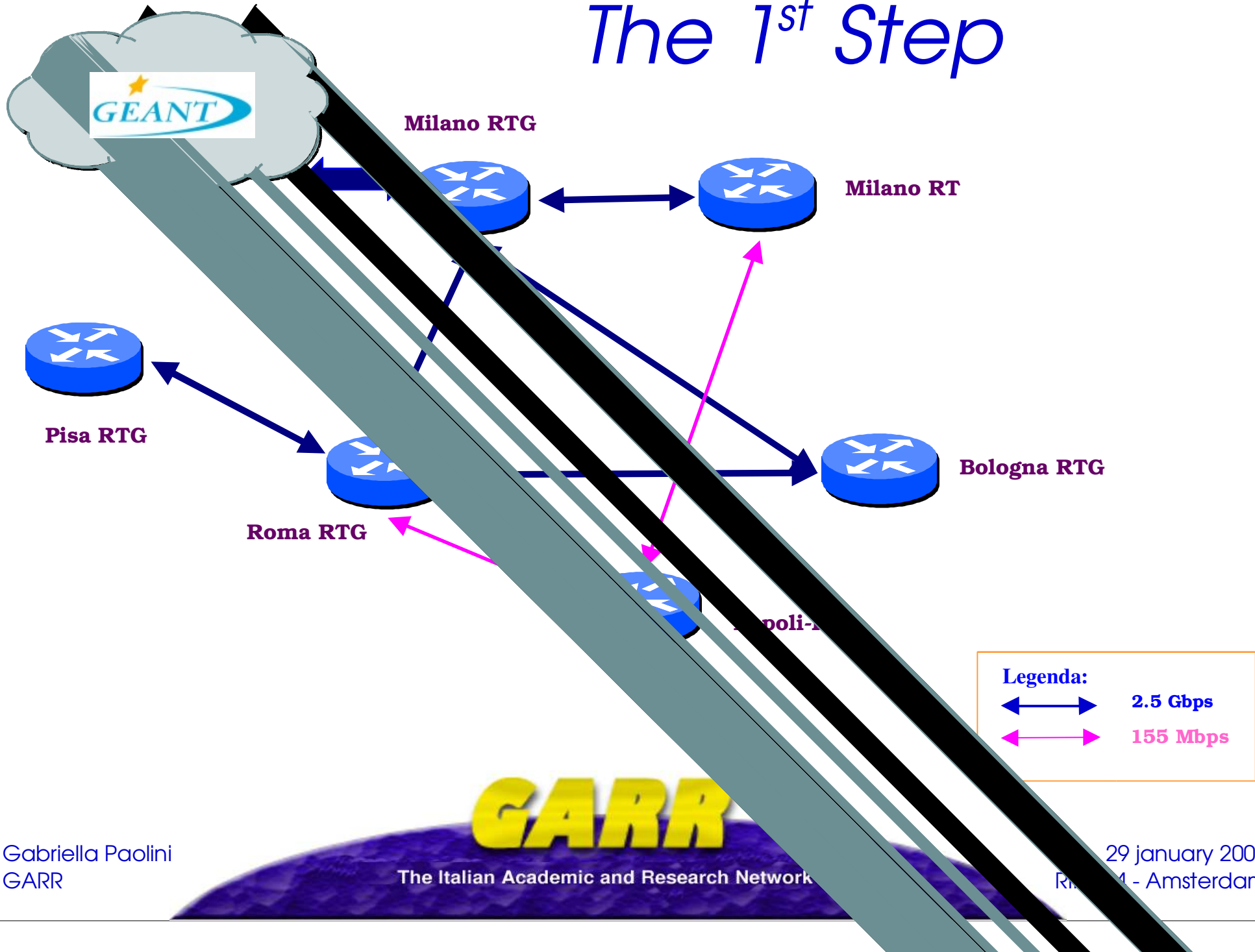
# GARR-B Ipv4 Network



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# The 1<sup>st</sup> Step



# 1<sup>st</sup> Stage: Step by step

## 2<sup>nd</sup> Step (feb 2003)

- ▶ Core 6net circuits will be replaced
- ▶ Geant pilot connection

## 3<sup>rd</sup> Step (Starting from the 2 quarter 2003)

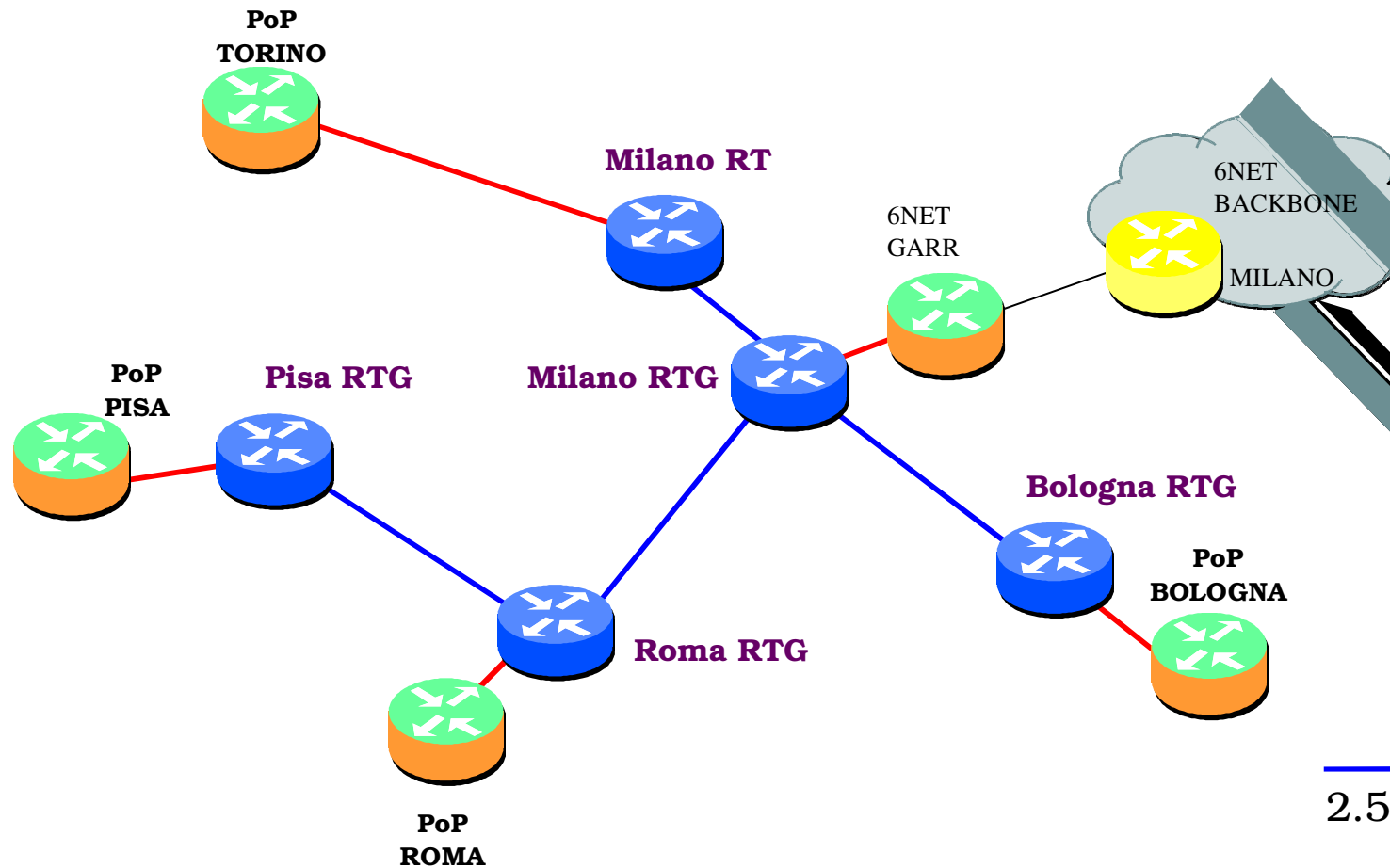
- ▶ The whole network will be involved
- ▶ The risk: Cisco 75XX access routers with high traffic

# *6NET: A peaceful coexistence*

- ▶ Some 155Mbps ATM circuits will be replaced
- ▶ 2.5 Gbps circuits will be used
- ▶ Static routing



# Coexistence



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# Avoiding the waste

2001:760:FFFF::/48 dedicated to routers addressing

- ▶ PoP **/56**
- ▶ Router **/64**
- ▶ Point-to-point **/126**
- ▶ Loopback **/128**
- ▶ Management LAN **/64**

Backbone point-to-point addressing

2001:0760:FFFF:FFFF::/64

# Avoiding the waste

## ▶ PoP:

Roma	2001:760:FFFF::/56
Milano	2001:760:FFFF:0100::/56
Bologna	2001:760:FFFF:0200::/56
Napoli	2001:760:FFFF:0300::/56
Pisa	2001:760:FFFF:0400::/56

## ▶ Addressing examples:

### **Roma RTG**

2001:760:FFFF::/64

2001:760:FFFF:: /128 Loopback

from: 2001:760:FFFF::10/126 point-to-point

### **Roma-Pisa**

2001:760:FFFF:FFFF::0/126

# *In OSPF we trust*

- ▶ OSPFv2 stable and reliable in our IPv4 network
- ▶ Testing of OSPFv3
- ▶ Static routing during the first steps
- ▶ Waiting for a stable Cisco IOS version with OSPFv3 (12.0.(24)S ???)

# BGP

- ▶ Change of BGP command format :  
moving to 'address-family' style
- ▶ BGP v6 should follow BGP v4 topology:  
Core full-mesh and route-reflector-  
client structure
- ▶ Late in the pilot

# *Users & Applications*

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# *Dear students, we want you!*

- ▶ Bologna University switched all students' Computer Science labs to Ipv6; Roma3 is doing the same.
- ▶ We are arranging Ipv6 tutorials inside Universities and Research institutes:
  - ▶ Turin, Rome, Florence: done (~100 attending each one of them)
  - ▶ Bari, Milan: in February and March



# Is Quake the 'Killer application'?

- ▶ No!
- ▶ Need of users' presence
- ▶ No sensible traffic
- ▶ Old version of Quake available for free, no good WAN performance





# *Looking for a 'killer application'*

- ▶ Network Storage environment should be it
- ▶ We have started a collaboration with the University of Tennessee (Logistical Networking Project)
- ▶ We are building an Ipv6 Logistical infrastructure on our current 6net topology.

# How to 'kill'

- ▶ Generating IPv6 traffic without users' presence.
- ▶ Involving IPv4 users with an underlying IPv6 infrastructure. (a web page on a dual-stack server)
- ▶ Building an IPv6 platform for content delivering that it provides an easy service with coherency and replica consistency.



*At any time...*

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