Deploying and using IPv6

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Deploying IPv6 :

IPv6 multicast : the M6Bone

Promoting the deployment and usage of IPv6

Deploying IPv6 :

- France
- Europe : the 6Net project and others
- World-wide

Deploying IPv6 in RENATER :

- **Within the RENATER 3 national backbone :**
  - « native » IPv6 service :
    - Both IPv6 and IPv4 protocol stacks in routers
    - IPv4 and IPv6 packets routed simultaneously in the same links.
  - Connected to world-wide IPv6 services
    - All other Research Networks, some ISPs
  - State of the art limitations :
    - presently, within routers, IPv6 implementations are not as performant (by far) as the IPv4 implementations.
    - Administration (supervising) tools are still very limited... expecting better ones in 2004 – 2005.
  - It works well !

Deploying IPv6 in RENATER :

- **Within regional networks :**
  - A few (10 or so out of 70) already provide an IPv6 service and give access to the RENATER 3 service.
  - Most others are preparing or testing it.
- **Within user sites :**
  - 60 or so sites have started an experimental or pilot IPv6 service (traffic still very small), connected to the RENATER 3 service :
    - Through the regional network
    - Or through IPv6 over Ipv4 tunnelling (encapsulation).

Deploying IPv6 services in France outside of RENATER :

- **ISPs : a few (4 ?) small ISPs offer the IPv6 service**
  - Traffic level : very low, almost no demand.
  - Others, including large ones, are considering and experimenting. They are waiting for customer's demands.
- **GIXes : the SFINX Gix (owned by RENATER) provides IPv6 exchange capabilities.**
  - At least one (small) other GIX also does.

An IPv6 testbed for the European research Community (2002 - 2005)

- one of the largest Internet research projects from the European Commission – 18.4 MEuro
- preparing the Next Generation Internet

6net

http://www.6net.org

Information Society Technologies

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IBM


Cisco Systems
Empowering the Internet Generation℠


SONY


NTT Communications


ETRI


INVENIA
INNOVATION

The 6Net Project : partnership Academic community - Industry

POZMAN

CESNET

GRNET
ΕΔΕΤ

SURFnet

DANTE

Logo

TERENA
TRANS-EUROPEAN RESEARCH AND EDUCATION NETWORKING ASSOCIATION

UKERNA

HUNGARNET

NORDUnet

SWITCH
The Swiss Education & Research Network

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UNINETT

Forskningsnettet
The Danish Research Network
DTU

The 6Net Project : partnership Academic community - Industry

UNIVERSITY of OULU

UNIVERSITÄT WIEN

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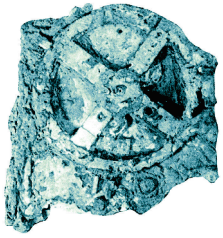
WESTFÄLISCHE WILHELMS-UNIVERSITÄT MÜNSTER

UCL

Telematica Instituut

ulp UNIVERSITÉ LOUIS PASTEUR STRASBOURG



University of Southampton

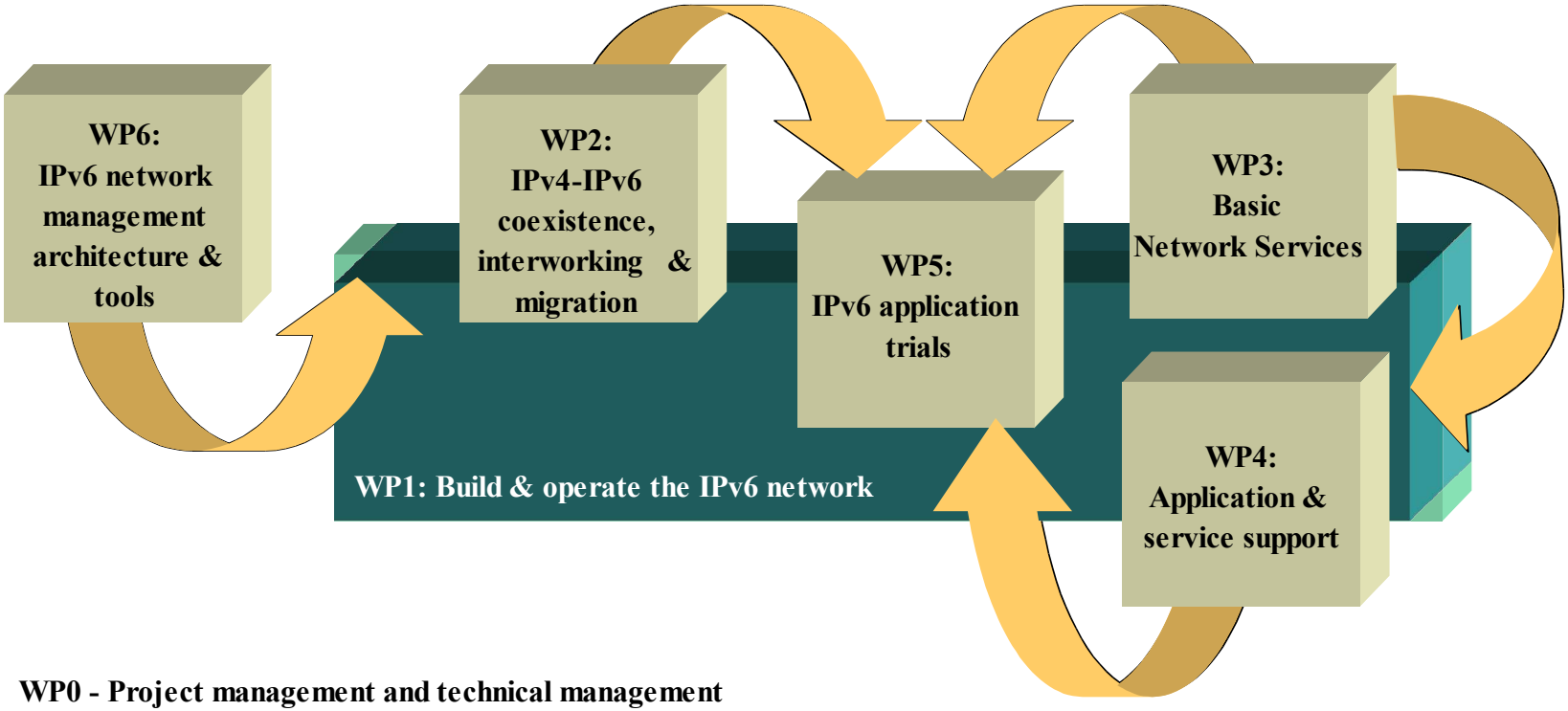
Research Academic Computer Technology Institute

FOKUS

Fraunhofer Institute for Open Communication Systems

ATHENS 2003

The 6Net Project : Project Workflow :



WP0 - Project management and technical management
WP7 - Dissemination and exploitation

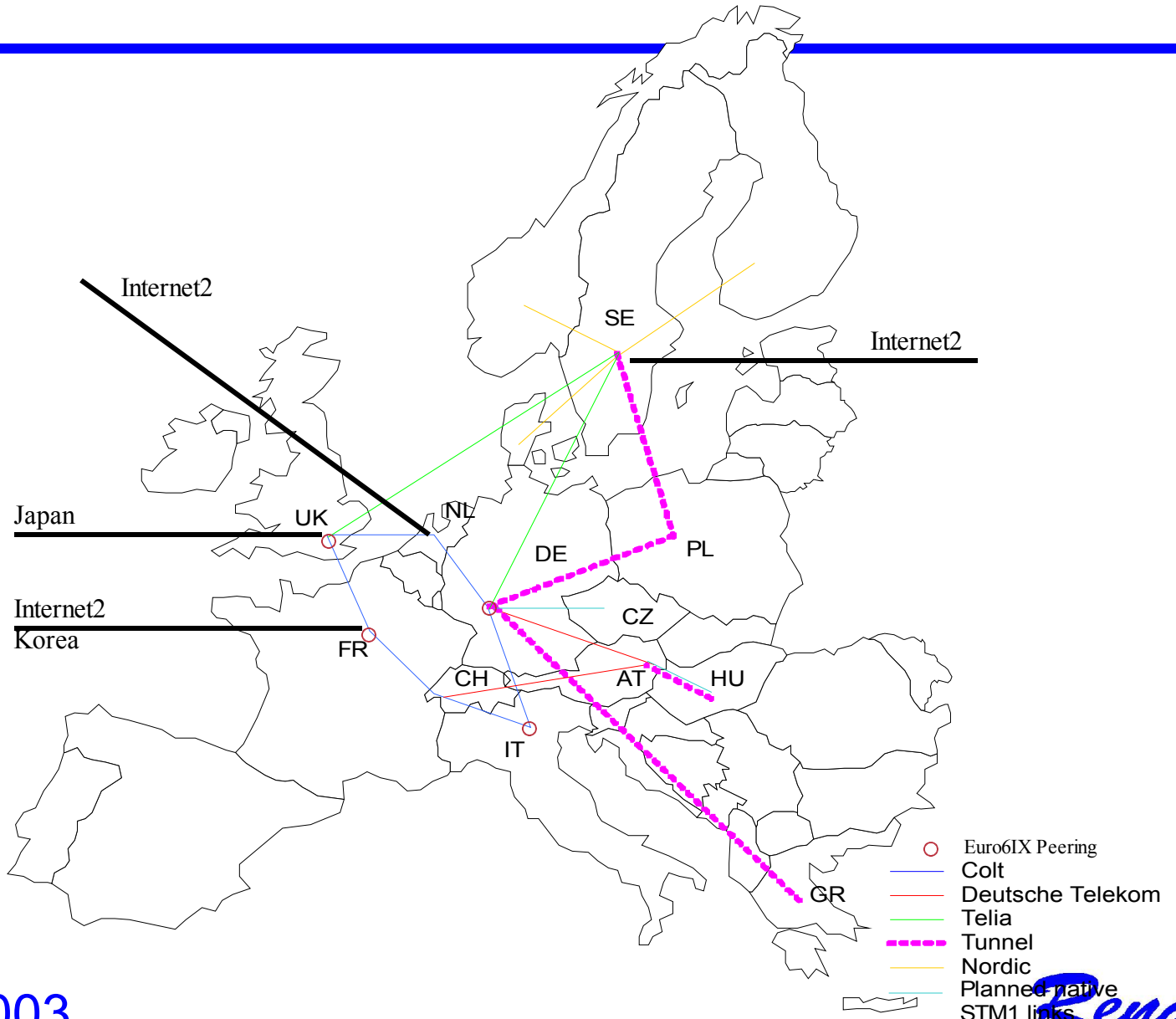
A typical example of how an European project is built and organised

- **WP1 – Expansion of the backbone, tests coordination**
- **WP2 –Transition Tools List, Evaluation**
- **WP3 – OSPFv3, IGP-EGP routing optimization, eACLs, 6PE, Multicast, Load Balancing, Network Security**
- **WP4 – Mobility, Wireless, VPN, VoIP, Multihoming, QoS**
- **WP5 – Video, conferencing, Portals, Gaming**
- **WP6 – MIBv6, Netflow**
- **WP7 - Interconnections with Euro6IX, Abiline – Internet2**
- **WP0 – Continue making all of this work! ;-)**

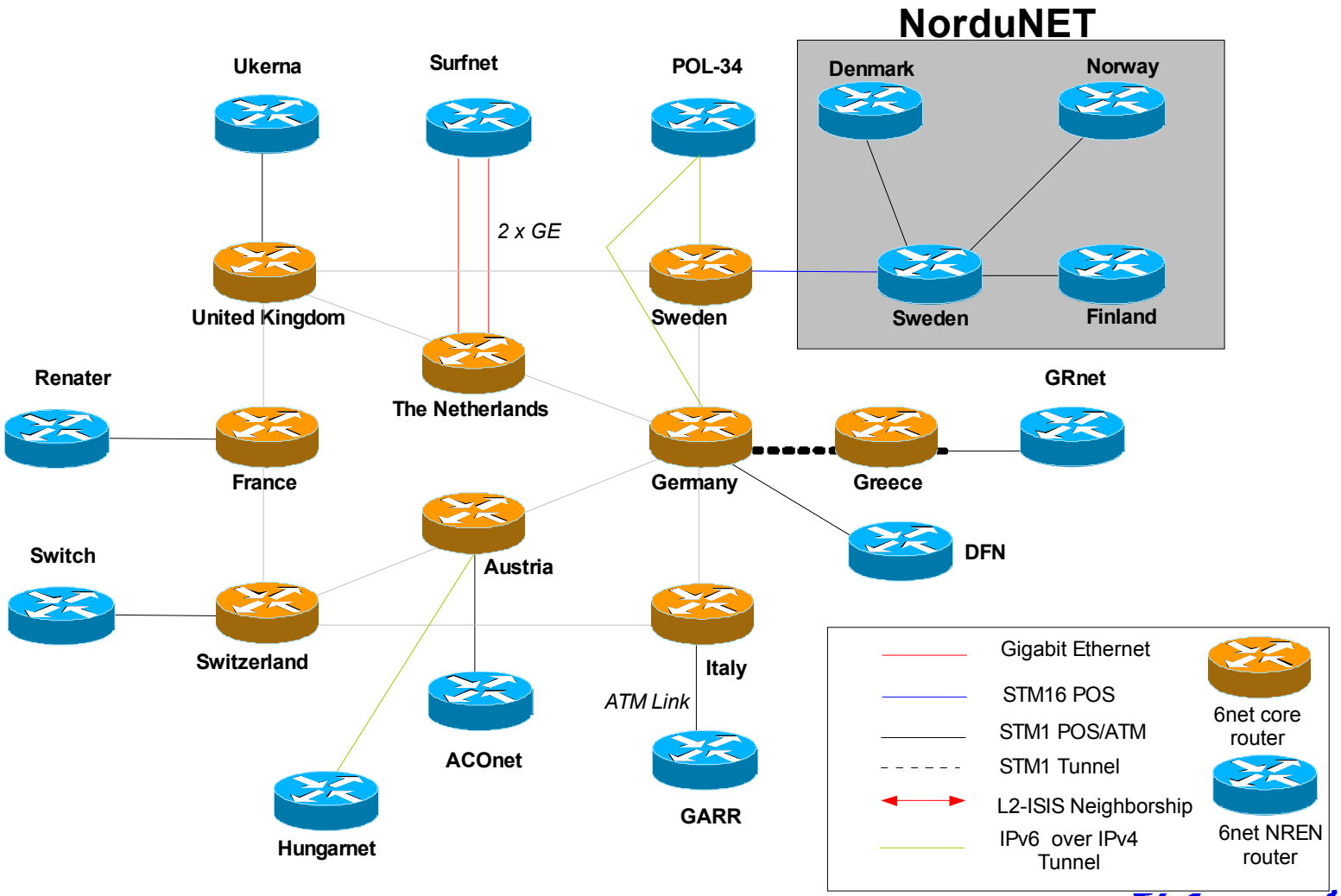
- **Public Deliverables: Cookbooks**

The 6Net Project : core topology :

Up and running



The 6Net Project : layout :



The 6Net Project : layout : a major network node :

Academic community :

- **Most Research Networks now operate a pilot or operational IPv6 service.**
  - Through 6Net (and others), they are interconnected Europe-wide and world-wide.
- **A lot of Universities and Research Centers are connected to it.**
  - Mainly for experimentation, teaching, acquisition of operational expertise.

Industry and business domains :

- **Industrial R&D is interested, for participating in national or European projects**
  - Almost always obtain IPv6 connectivity through the Research Networks.
  - Industry as users (car manufacturers etc),
  - Industry as telecom equipment or software products manufacturers (6WIND etc).
- **Others : not yet active.**
- **ISPs : a few « small » ISPs offer IPv6 services.**

Probably the most active area in the world concerning IPv6 :

- **Japan, Korea, China, Taiwan, Philippines, other countries**
  - Frequently, IPv6 is mandatory for new equipments and even services
- **Because they already suffer from lack of IPv4 addressing space**
- **Academic community,**
- **Also very active : industry and ISPs.**
- **The main market today for IPv6 products.**

Africa : will deploy Internet almost exclusively with IPv6.

- **They have no choice but IPv6 :**
  - Ridiculously small amount of IPv4 addressing space available for African countries
- **Begins in Senegal, Tunisia and other countries**

Are active for IPv6 deployment within the academic community.

- **Cf. University of Guadalajara in Mexique.**

US, Canada : do not have any problem (now or in the foreseeable future) with IPv4 addressing.

- US has 75% of the whole world-wide IPv4 addressing space !

But :

- Telecom equipment manufacturers want to keep their world-wide market leadership
  - Hence are afraid of the industrial development of IPv6 in Asia-Pacific and in Europe.
  - IPv6 now available on all major Research Networks (Internet 2 and others)
  - Some governmental agencies now make IPv6 capability mandatory in call for tenders.
  - Equipment manufacturers now cooperate with European and Asia-Pacific Universities and Research Networks ...

IPv6 multicast :

The M6Bone, an experimental service

- **Developped and coordinated (world-wide) by RENATER**

What is the M6Bone :

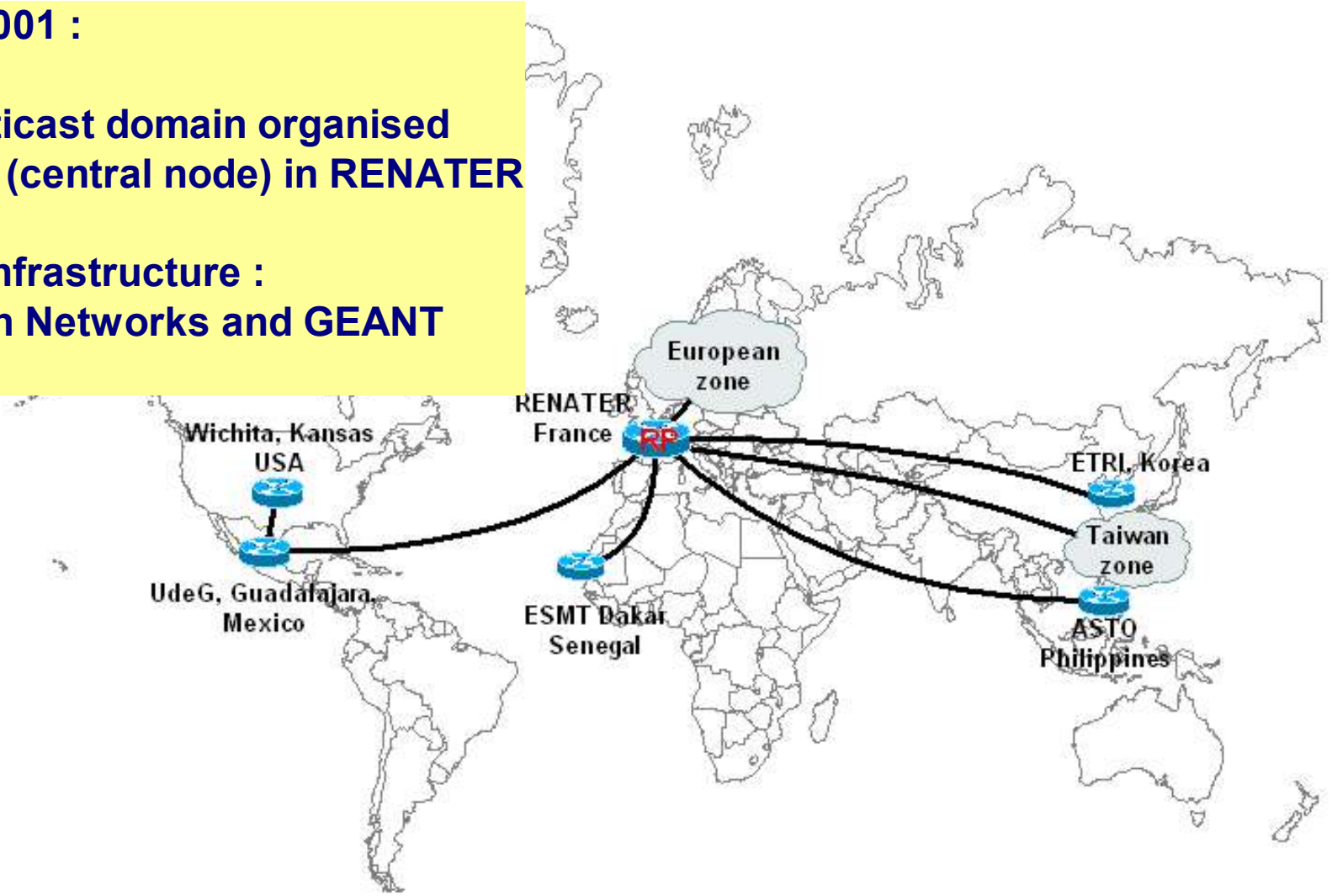
- **An IPv6 multicast experimental service**
  - Started in June, 2001 (Aristote Association, G6 group and RENATER network)
  - More than 60 sites (world-wide) connected today
- **Objectives :**
  - Provide IPv6 multicast world-wide service over the Research Networks infrastructure
  - Develop and test implementations (partnership with IP router manufacturers), contribute to standards
  - Demonstrate an impressive application of IPv6 !

The M6Bone topology : international view :

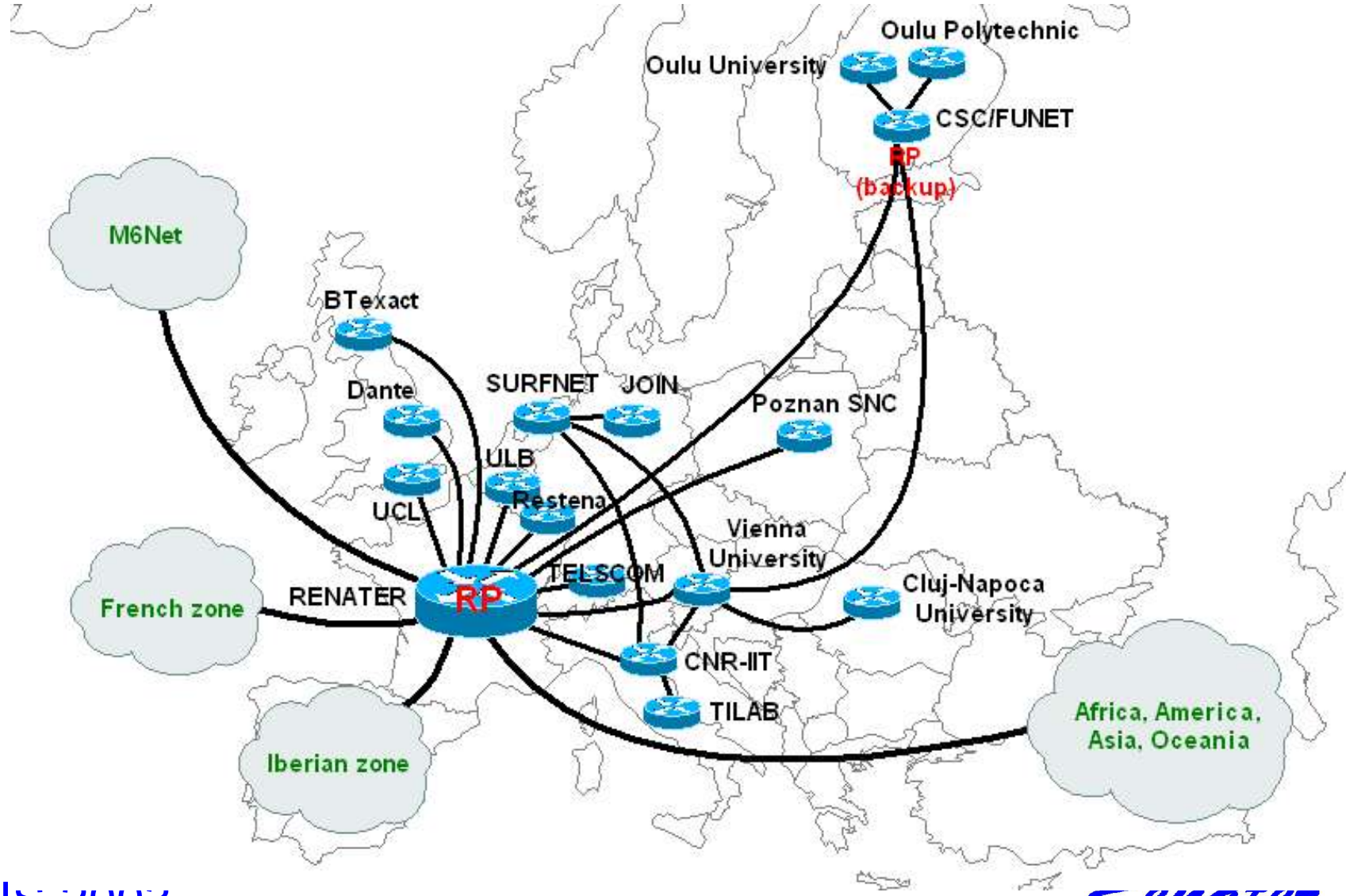
Starting in 2001 :

a single multicast domain organised around a RP (central node) in RENATER

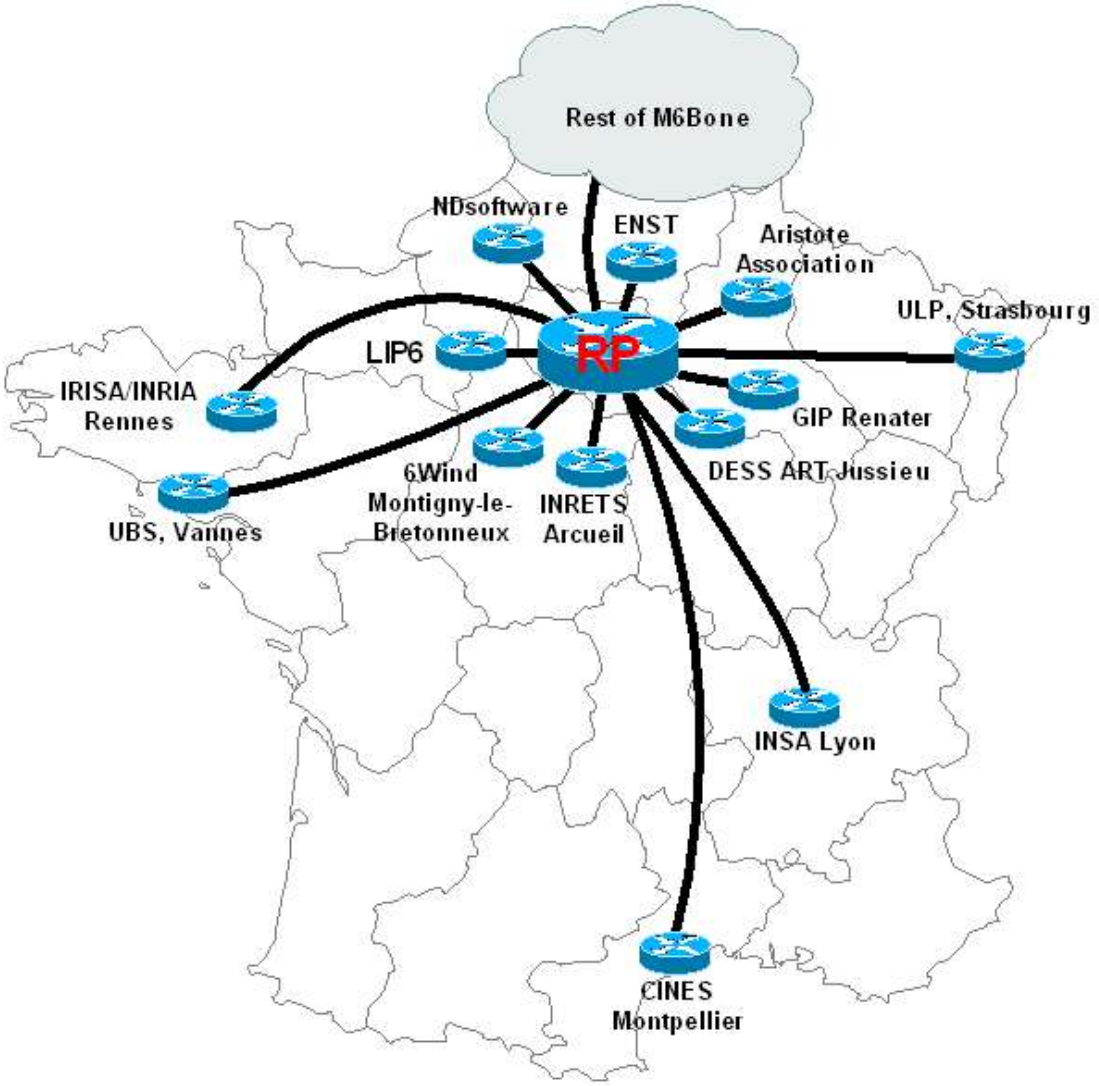
Underlying infrastructure : the Research Networks and GEANT



M6Bone topology : European view :



The M6Bone topology : French view :



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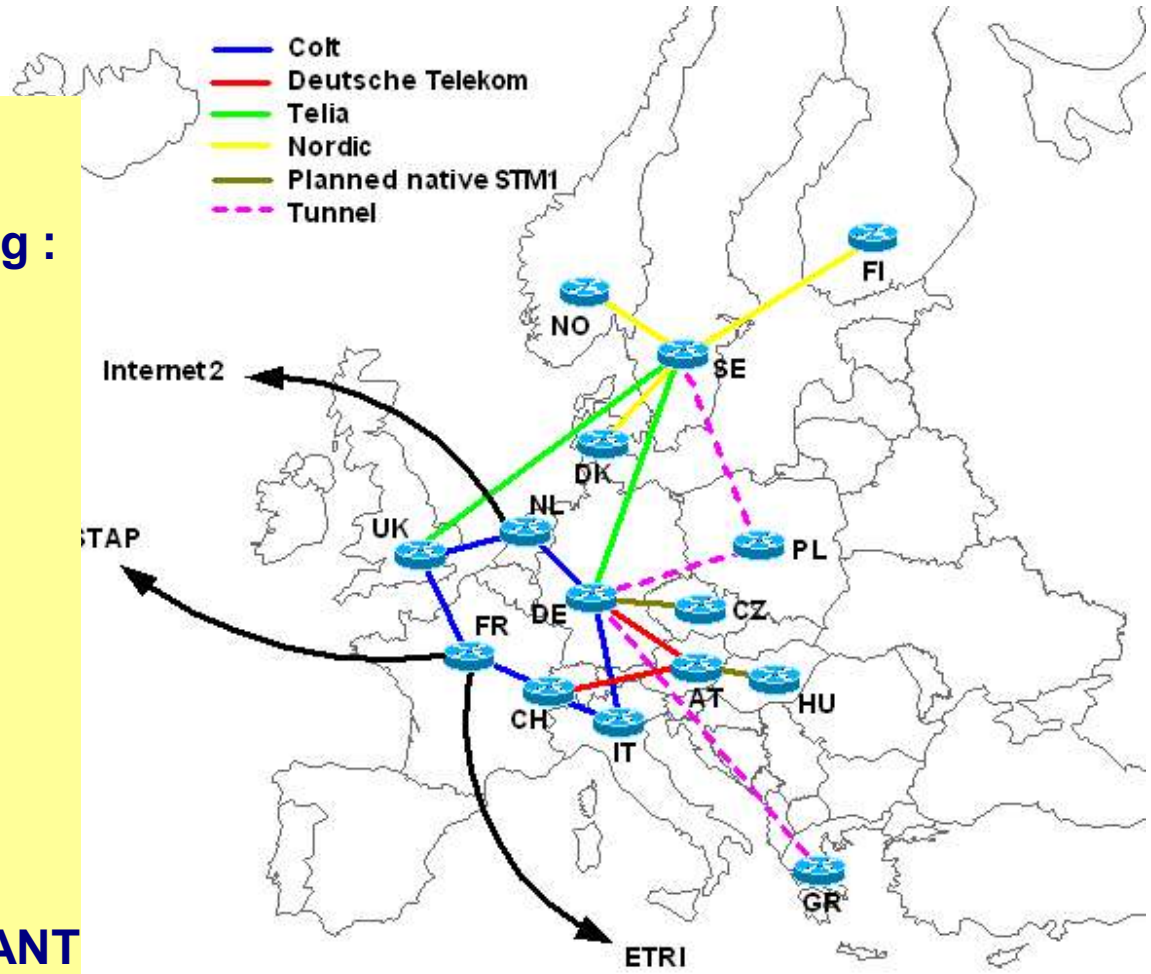
The new M6Bone : 6Net core multicast :

Mid 2003 :
first adequate implementations for inter-domain multicast routing : MRIB, MBGP within CISCO, Juniper, 6WIND routers.
Allow a world-wide modularity (mandatory for growth of the multicast service).

This is the new M6Bone, being set up now within the 6Net European project.

Underlying infrastructure : the Research Networks and GEANT



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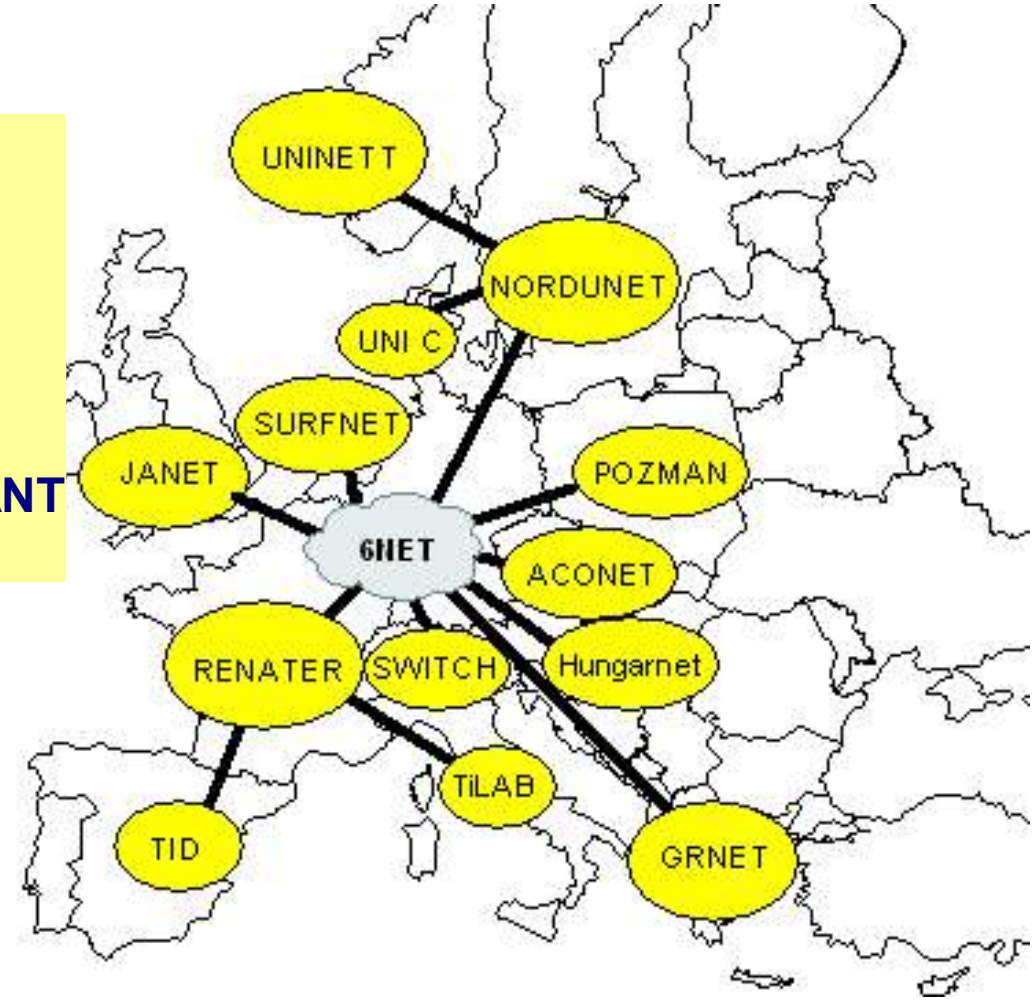
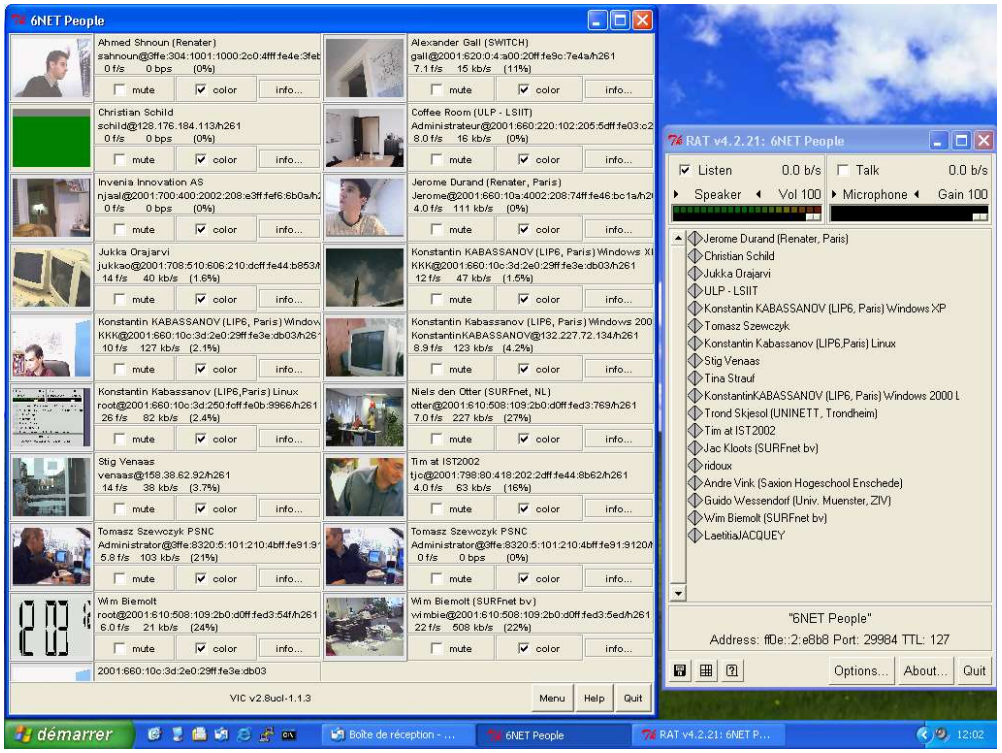
Mid 2003 :

The MBGP domains in the new M6Bone.

Unerlying infrastructure : the Research Networks and GEANT



- Videoconferencing : with « Mbone tools » VIC, RAT...
- Radio broadcast : with Freeamp
- Gateways and reflectors : with V4, with Unicast



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IPv6 multicast : videoconferencing :

Seamless integration (through gateway) of IPv4 and IPv6 multicast

Conference at Dakar, May 2003 with visio over IPv6 multicast... in the office of the President of the République du Sénégal

- **M6bone-team@renater.fr**

- **Web-site : http://www.m6bone.net**
  - Architecture of the network
  - Information about equipment's configuration
  - Subscription form

- **Mailing list : m6bone@ml.renater.fr**
  - More than 140 active and experienced people ready to help you

Promoting the deployment and usage of IPv6 in France :

- **Not so easy ...**
- **Leadership : the academic community and RENATER**

Why :

- **Going to IPv6 is mandatory within the next few years**
- **It is a complex task, it takes time and money,**
  - so waiting till the latest possible time would not be a good strategy for users and user sites
  - Much better (and easier) to start now
- **But network administrators have many other things, possibly more urgent, to do these days**
- **So promotion and incitation must be part of our national IPv6 deployment strategy !**

How : performant IPv6 deployment

- **Native IPv6 backbone services in RENATER 3**
- **Induce regional networks to relay the service to user sites**
- **Allow direct user sites connectivity through V6 over V4 tunnelling (user site – RENATER backbone)**

How : organizing IPv6 conferences :

RENATER and other partners : main IPv6 actors in France :

- **Paris, October 2002 :**
  - 3-days conference (with tutorial) : 200 attendees
- **Caen (Normandy), June 2003 :**
  - 3-days conference (+ turorial and demonstrations + workgroup and Task Force meetings) : over 250 people.

How : the G6 : the work group of French IPv6 high-level experts :

- Participants : 20 people : Research labs, router manufacturers, advanced University network administrators, RENATER.
- Meets every 2 months.
- Activity :
  - Follow state of the art, IETF conferences etc...
  - 5 last years : technical support for preparing and testing the RENATER IPv6 experimental service.
  - Wrote « the » French reference IPv6 book (edited by O'Reilly), and updates it regularly. Also wrote and updates « the » Tutorial...
  - Now reorients towards research and very advanced actions.

How : helping new users : the GN6 workgroup :

- Participants : 30 people : experts, and mainly network administrators of organisms who are starting pilot IPv6 networks connected to RENATER
- Meets every 2 months
- Activity :
  - Transfer of knowledge and expertise, contact point between network administrators (or advanced users) and high-level experts (G6, RENATER)
  - Discussion forum between its members
  - Common exploratory actions : common platform for evaluating IPv6 products, common demonstrations...

How : the IPv6 Task Force France :

- Member of the European IPv6 Task Force
- Participants : 30 people : people in charge (not technically oriented) within industry, ISPs. Universities and research represented through G6 , RENATER, Aristote.
- Meet every 6 weeks
- Activity :
  - Deals with strategic aspects, lobbying towards authorities, European Commision, producing strategic recommendations …

Questions !

- **Answers ?**