

IPv6

The Solution for Universal Future Networks

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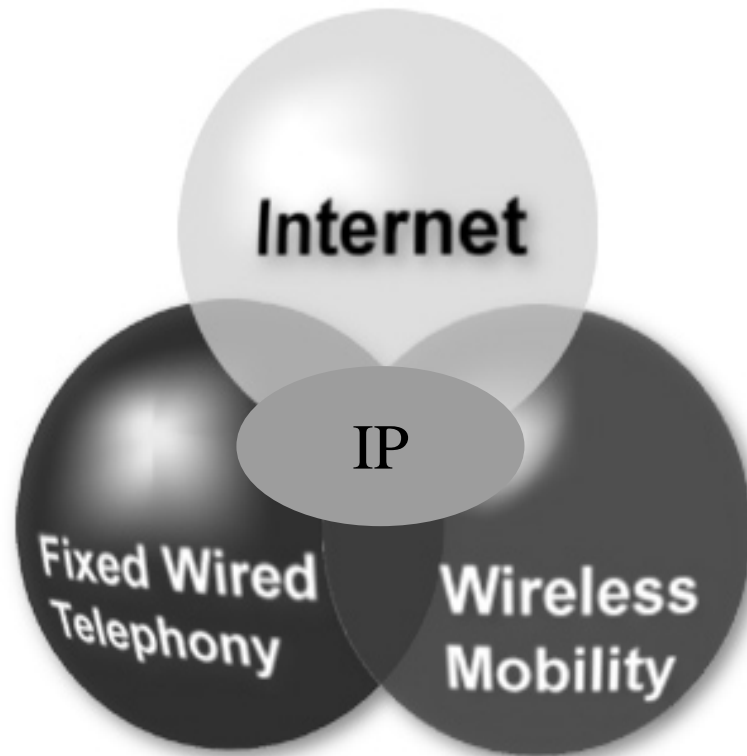
Present Networks

- The networks are fragmented into 2 worlds
 - Telecommunication Networks: fixed, Mobile and Satellite
 - Both Circuit Switched and Packet switched networks which are service specific
 - Data Networks
 - Internet, Intranet and Extranet: all based on TCP/IP based packet networks
 - More specific for computer communication

Present services

- Real time services: Voice and Video
 - High QoS, Delay sensitive
- Data Services: Interactive Web, ftp, e-mail
 - IP based applications

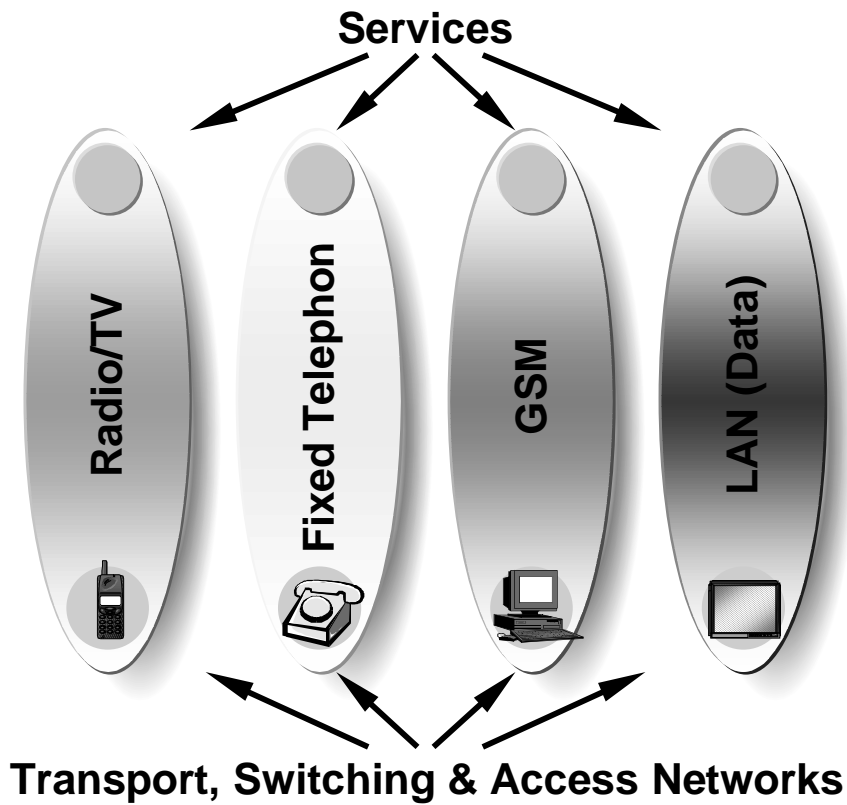
The Future Network



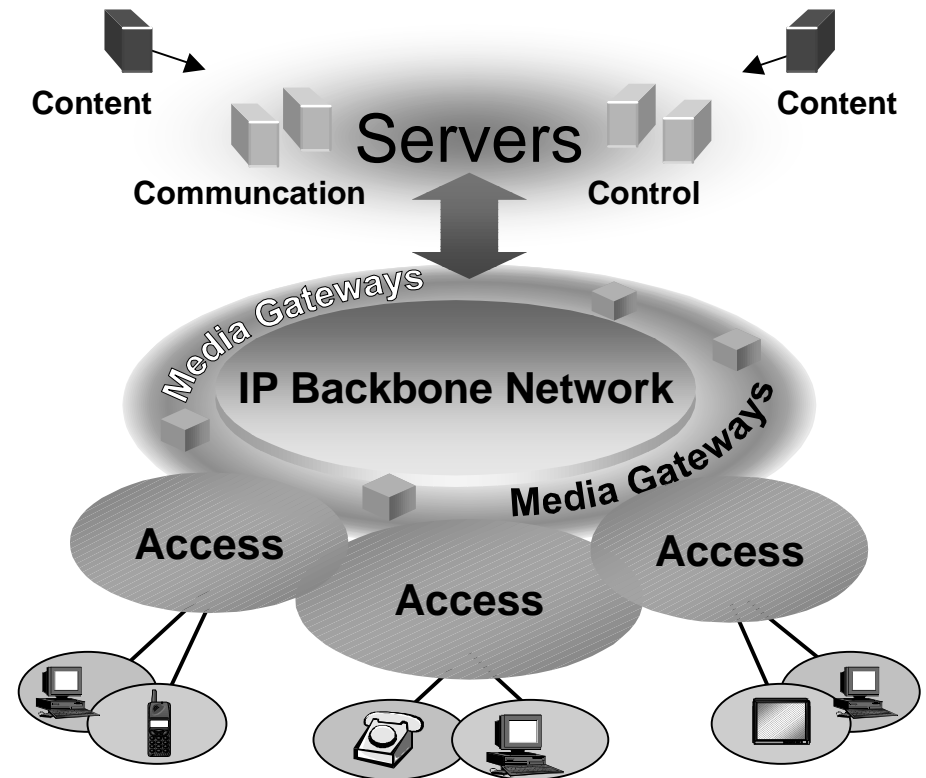
- Different types of network infrastructures are linked through common protocol
- All communication will be based on packets running on circuit, packet and wireless networks
- There will be convergence at service level to reach any one from anywhere at any time

Next Generation Networks

Today
Single-service networks



Future
Multi-service networks



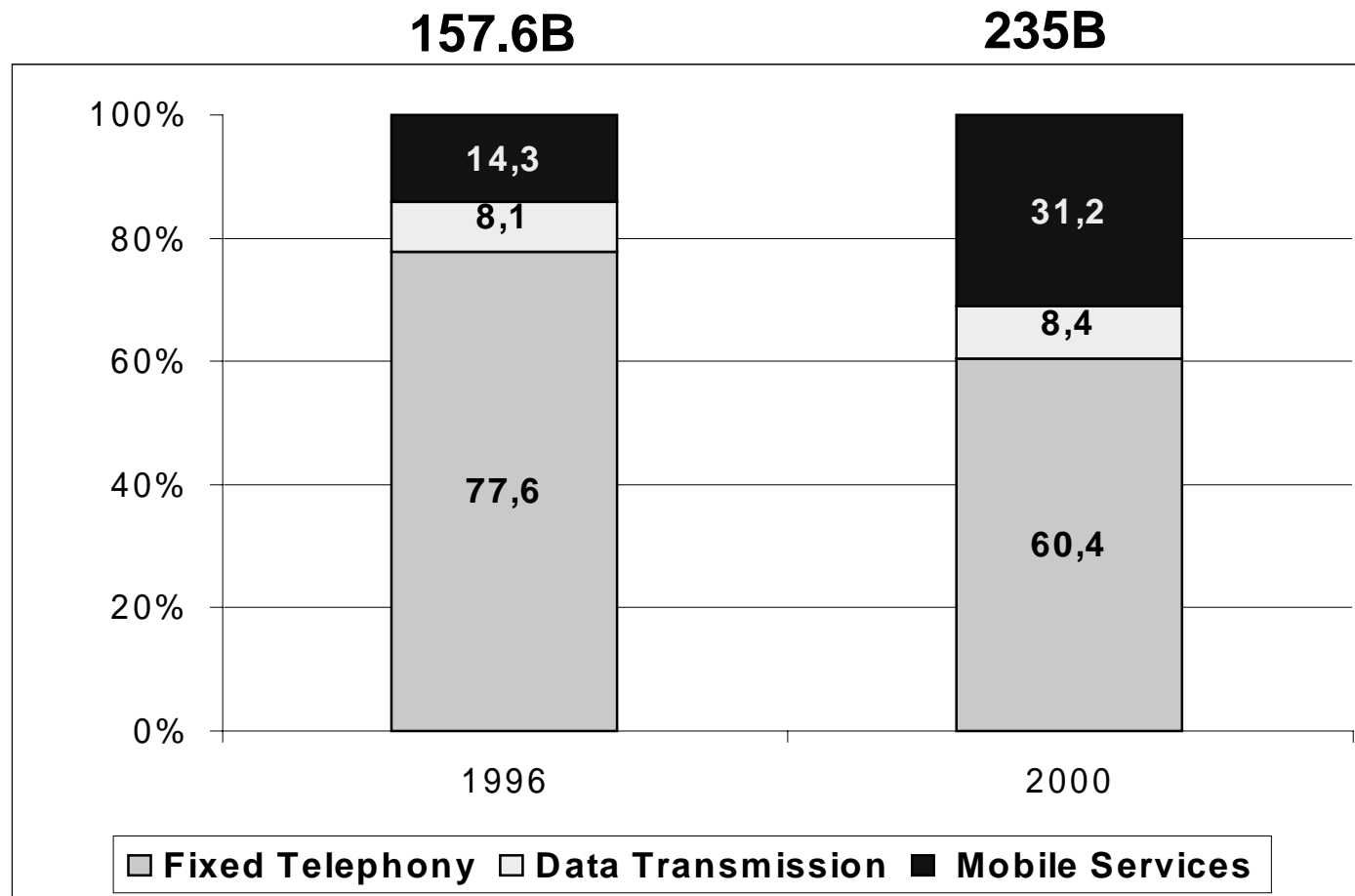
The Telecom Environment

Phone: 125 Years 700 M lines
7 years 700 M lines

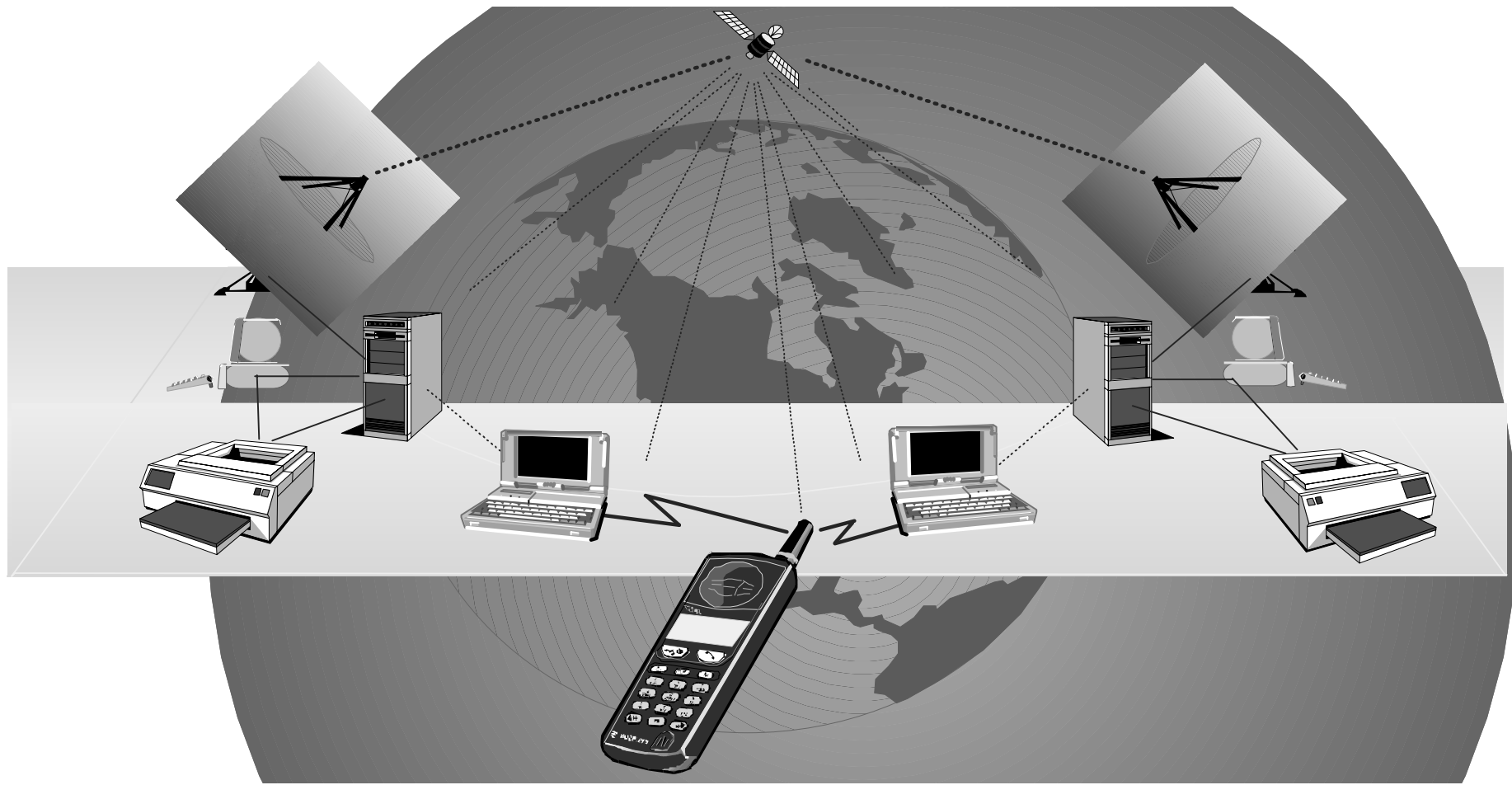
• **World Penetration 12 %**

Internet: 200 M users in
2000

Breakdown of Telecommunications Services Market (EU)



The Interconnected IP World



Problems with current IP (IPv4)

- Addressing

- IPv4 addresses are no longer all globally unique or have indefinite space
 - This requires extra mechanisms (NAT, CIDR), making routing more complicated and causing inefficiency in network utilization
- IPv4 also has no indication of geographical distances which would be useful when optimizing resource allocation for traffic flows
- Large sites need several class C blocks which makes interdomain routing tables grow faster than router memory
- Management of scattered address space is complicated and expensive

Problems with current IP (IPv4)

- Mobility

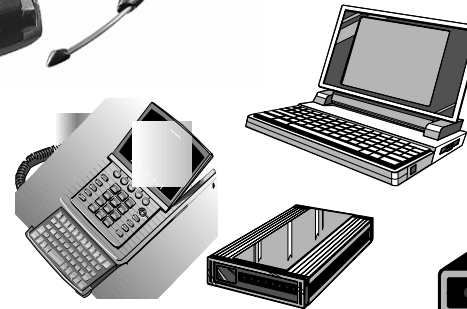
- IPv4 address changes when moving from one network to another
- Existing connections would be torn down in handover situations
- New connections during roaming require extra protocols to relate changed IP address to existing identity in home location register
- With new WAP capable terminals and the introduction of GPRS the number of mobile Internet users will increase rapidly
- Limited address space with IPv4 may run out soon

Problems with current IP (IPv4)

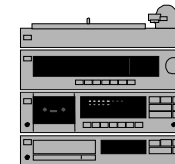
- Home Networking
 - Home networks need large number of IP addresses at device level
- Support for services
 - New services can't reuse the fixed fields of IPv4 packet header
 - No built in security mechanism for IPv4
 - IP level traffic flow indicators would help implement QoS

Address Boom

- Internet Growth**
- + Wireless Growth**
- + Always-On**
- + Info Soft Appliances**
- Σ Internet 2000 is a baby!**



100 IP Adds/person!



Will IPv4 Scale and remain Robust?

- 3 Million Web Sites (est. Jan 1999)
- 700+ Million web pages
- 8000 ISPs worldwide (4700+ in U.S.); numerous new services
- Traffic growth 100-1000%/year reported
- 300 M - 1000 M users by 2002
- Only 2b addresses for 6b humans!

IPv6 Features

- IPv6 has been recognised as the future protocol by IETF, Eurescom, and 3GPP and vendors
 - Uses 128 bit address space
 - Has incorporated flow label for real time traffic
 - Improved security
 - Integrated QoS, multicasting
 - Autoconfiguration
 - Mobile computing features

IPv4 vs IPv6

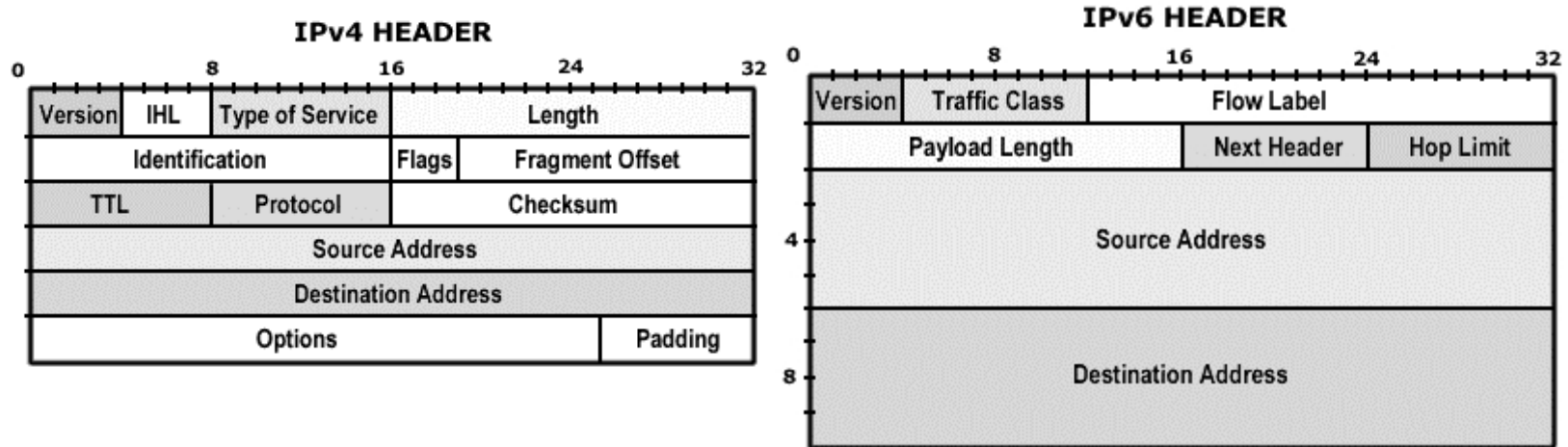
	IPv4	IPv6
• Address Space Shortage	Y	N
• Security	N?	Y
• Cost of System Management	↑	↓
• Lack of Capability needed for Next Generation Applications	Y?	N



IPv6 Requirements

- Requirements
 - Scalability of networks with address space, QoS and security, which are basic features of IPv6 networks
 - Connectivity with existing IPv4 networks is necessary
 - IPv6 should happen from the edges, not from the core.
 - Applications are important for pushing IPv6
 - it has to be transparent to the end user
 - Interoperability with IPv4 has a cost
 - 100% interoperability is not always necessary
 - We need a credible transition story.

IP headers compared



- Variable length
- 14 different fields
- 4 byte addresses

- Streamlined header
- 8 different fields
- Including flow label
- 16 byte addresses
- Fixed length of 40 bytes
- Supports Extension Headers
- No checksum field

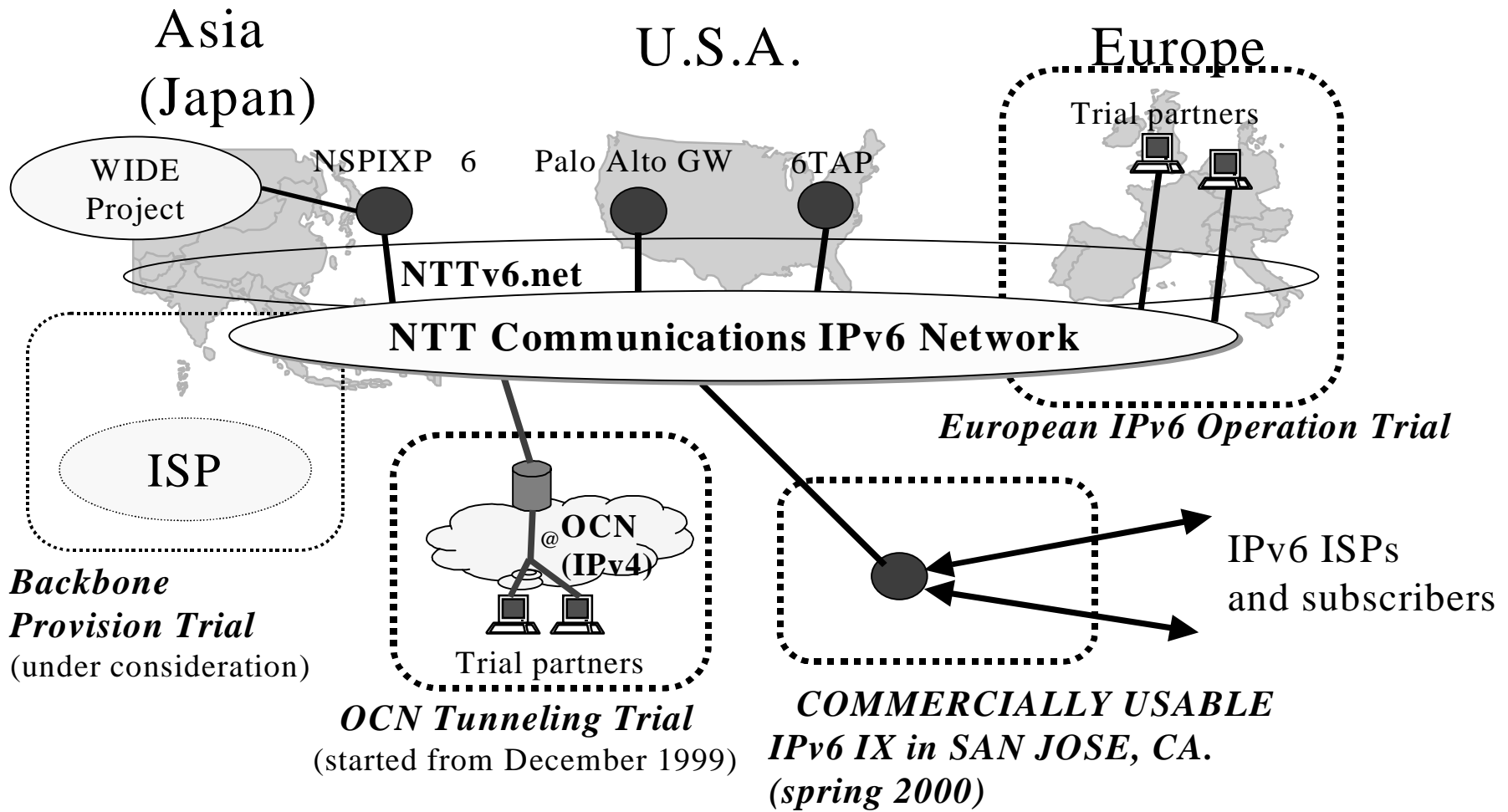
Initiatives of IPv6

- **6REN / 6TAP**
- **6Bone**
- **vBNS IPv6**
- **TAHI**
- **KAME**
- **WIDE**
- **NTTv6net**
- **Military**
- **IPv6 Forum**
- **RNRT**
- **Eurescom**
- **6INIT project**

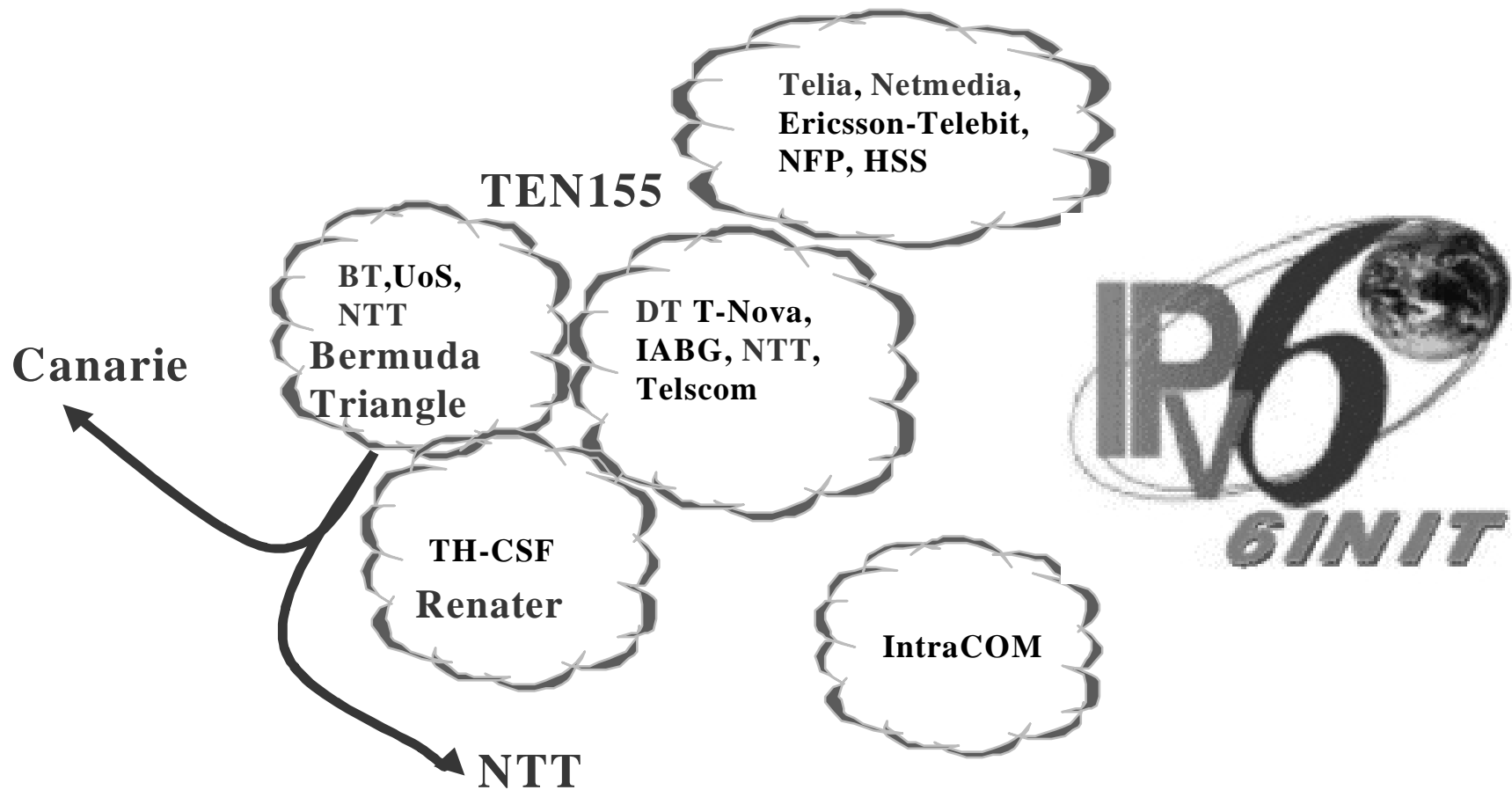
IPv6 Forum

- A world-wide consortium of leading Internet vendors, Research & Education Networks are shaping the IPv6 FORUM, with a clear mission to promote IPv6
- To this end the IPv6 FORUM will
 - Establish an open, international FORUM of IPv6 expertise
 - Share IPv6 knowledge and experience among members
 - Promote new IPv6-based applications and global solutions
 - Promote interoperable implementations of Ipv6 standards
 - Co-operate to achieve end-to-end quality of service
 - Resolve issues that create barriers to IPv6 deployment

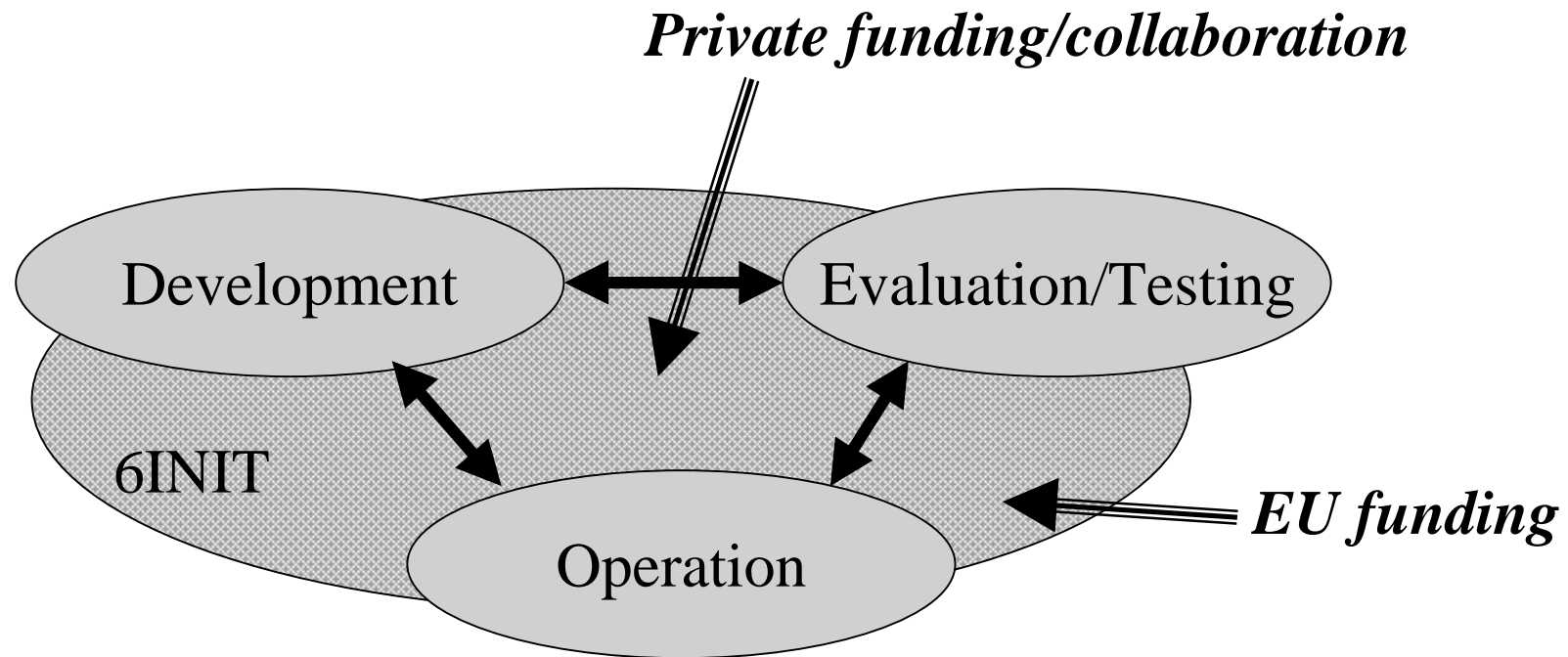
NTTv6net - Japan



EU IPv6 Trials



6INIT project framework



Commission policy

- New IP users Public sector, 3G Mobile etc.
- Timely IPv4-IPv6 transition
- Global IP penetration, incl. Developing Countries
- IPv6 in cooperative research
- Internet Search and Directory services.
- Member States: Next Generation IP in the public administration

Transition to IPv6, when?

No specific date by which IPv4 addresses will have dried up but:

- More internet-enabled applications, devices (WebTV, Palm, wearable computers!)
- Unbalanced distribution of IPv4 addresses (e.g. Japan, China); strong political push!
- Most router vendors support already IPv6 & many operators started already IPv6 trials

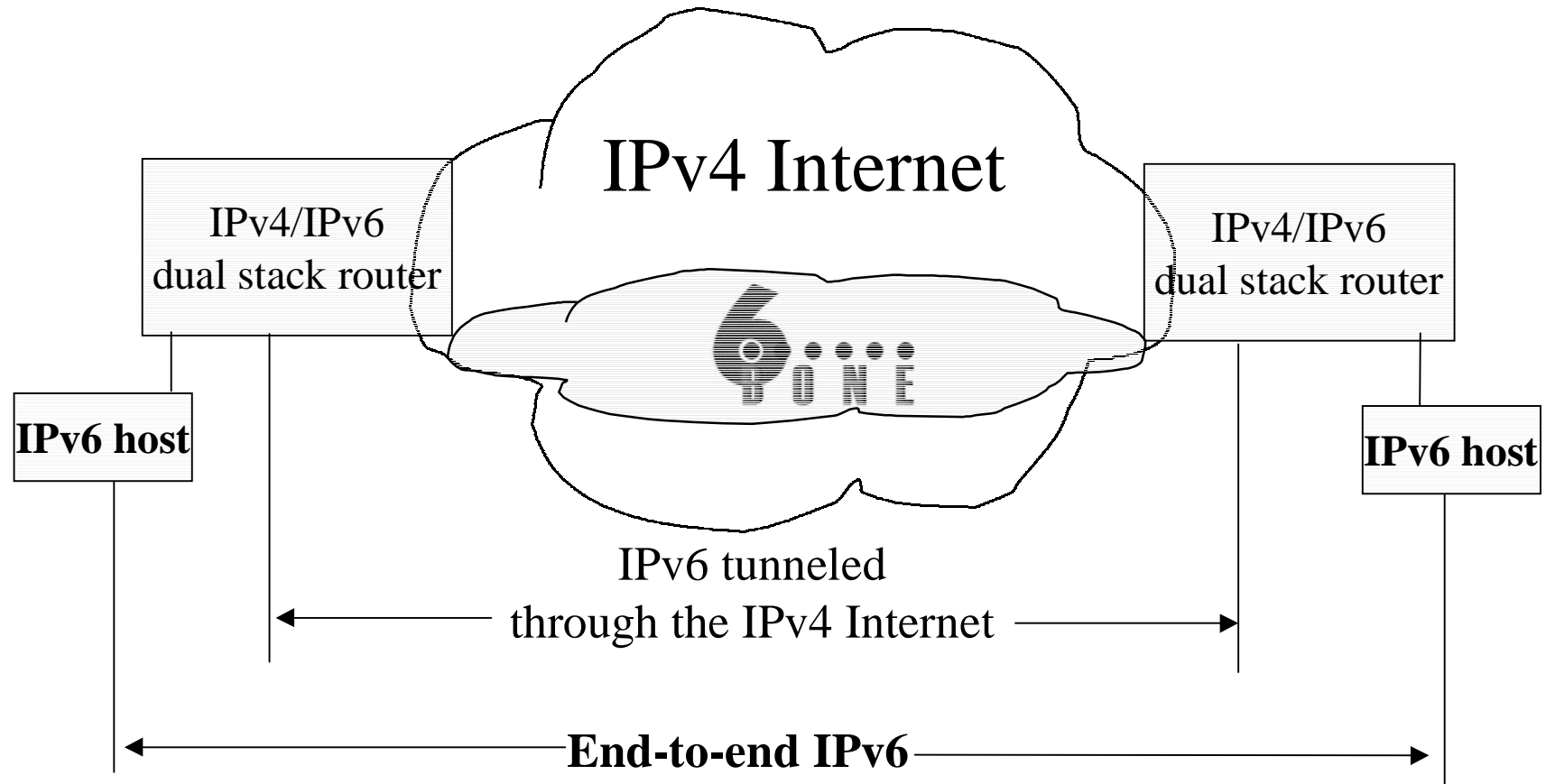
transition to IPv6 is only a matter of time!

Transition to IPv6, how?

IPv6 not compatible with IPv4 (need to interoperate with - or tunnel through - IPv4)

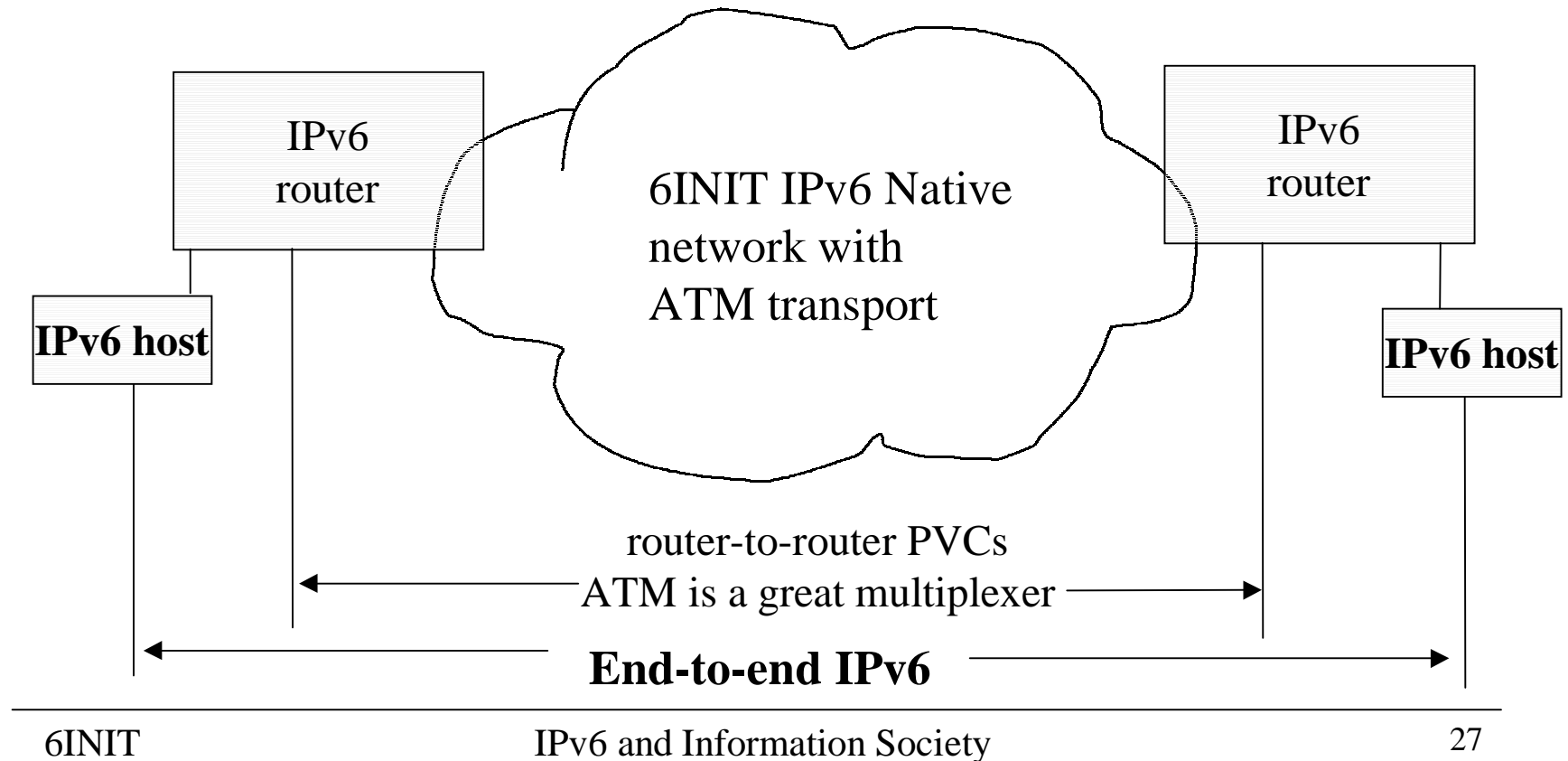
- Two main strategies identified (but still open which will predominate):
 - create entire isolated islands of IPv6 surrounded by oceans of IPv4
 - upgrade individual nodes to support both IPv4 and IPv6

IPv4 and IPv6 networks Interworking



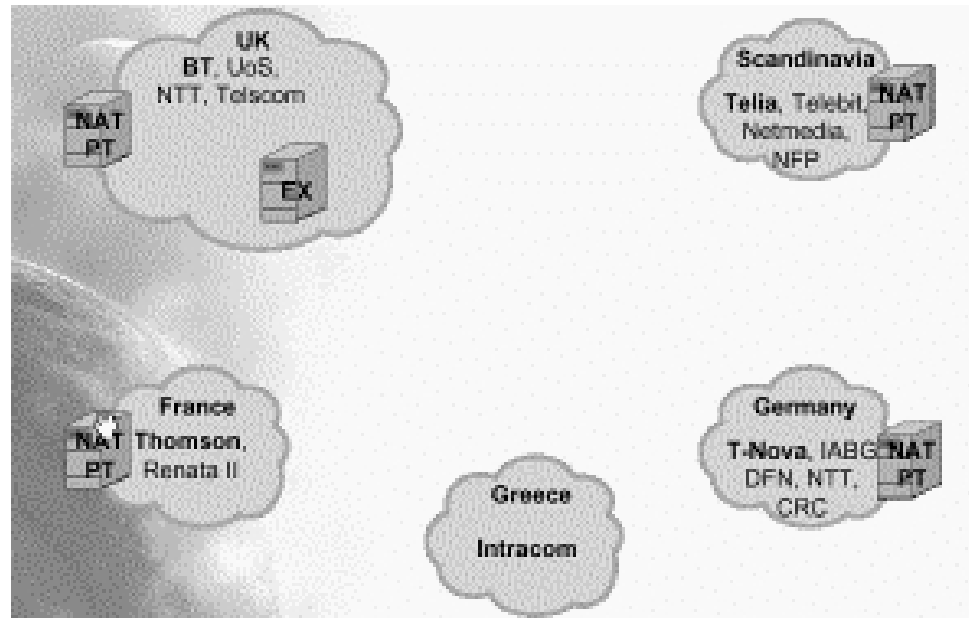
IPv6 Native Services

Initial participants were R&E networks

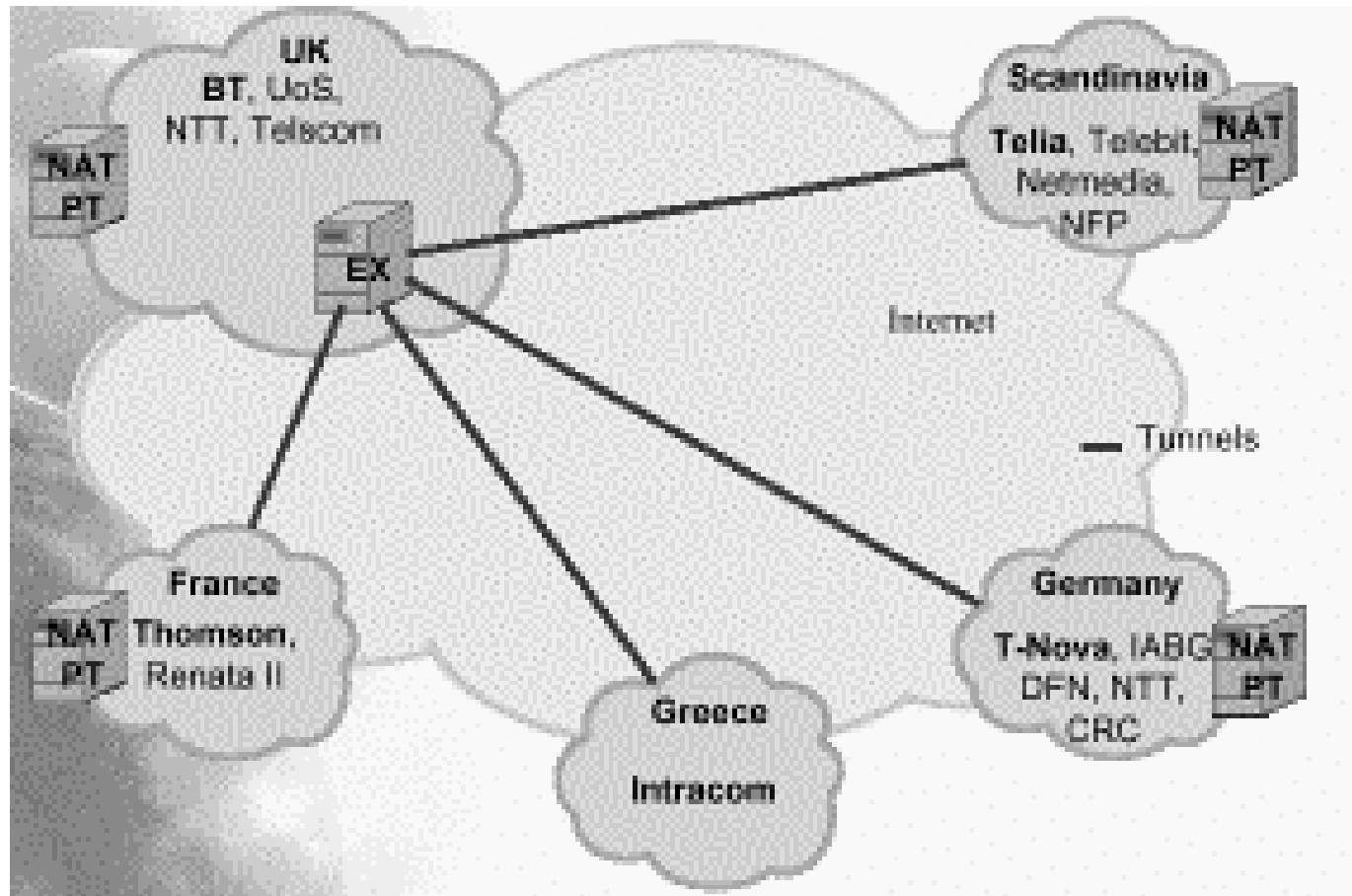


6INIT IPv6 deployment

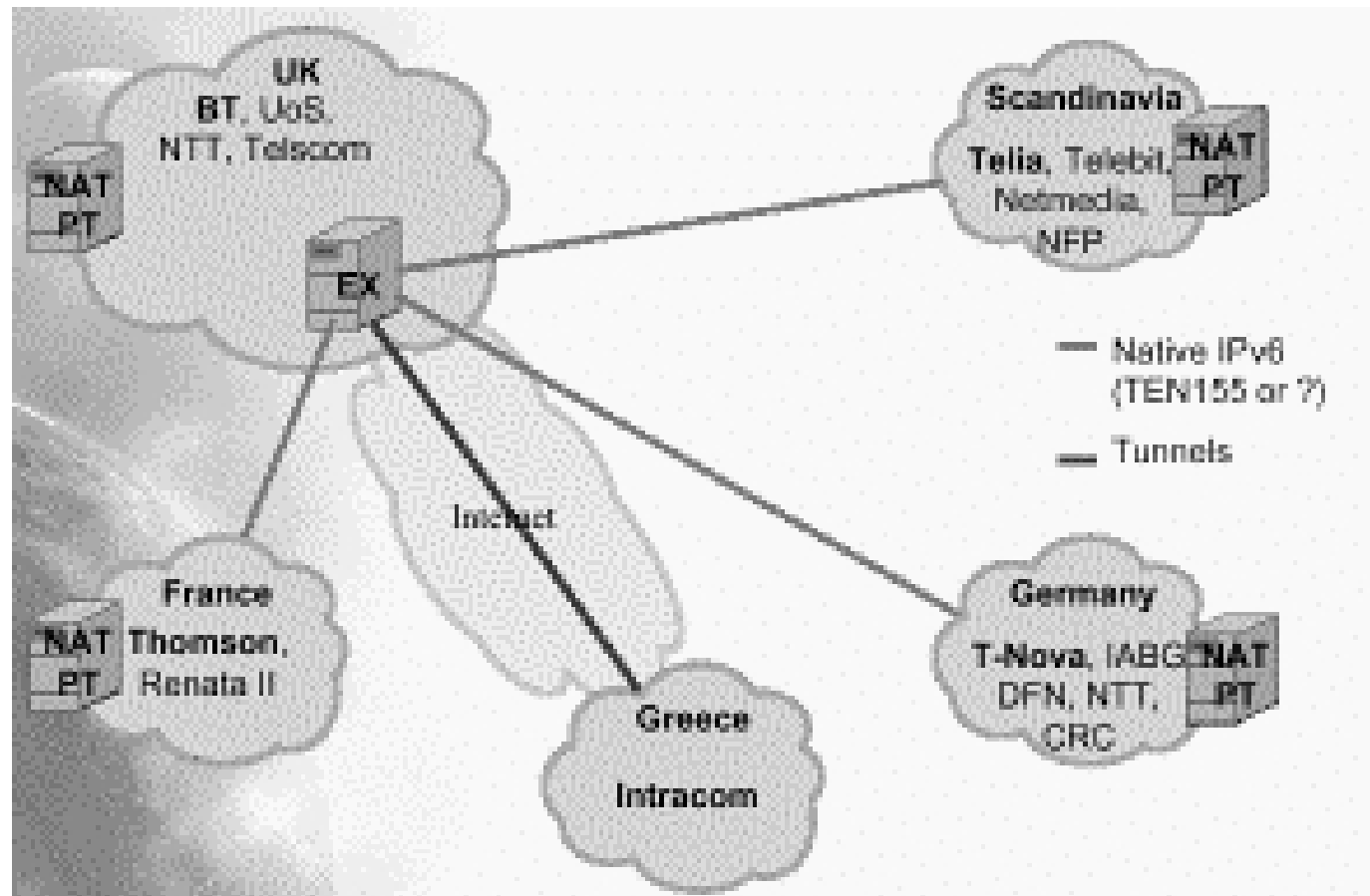
- Deployment is planned in phases>
- Phase 1:



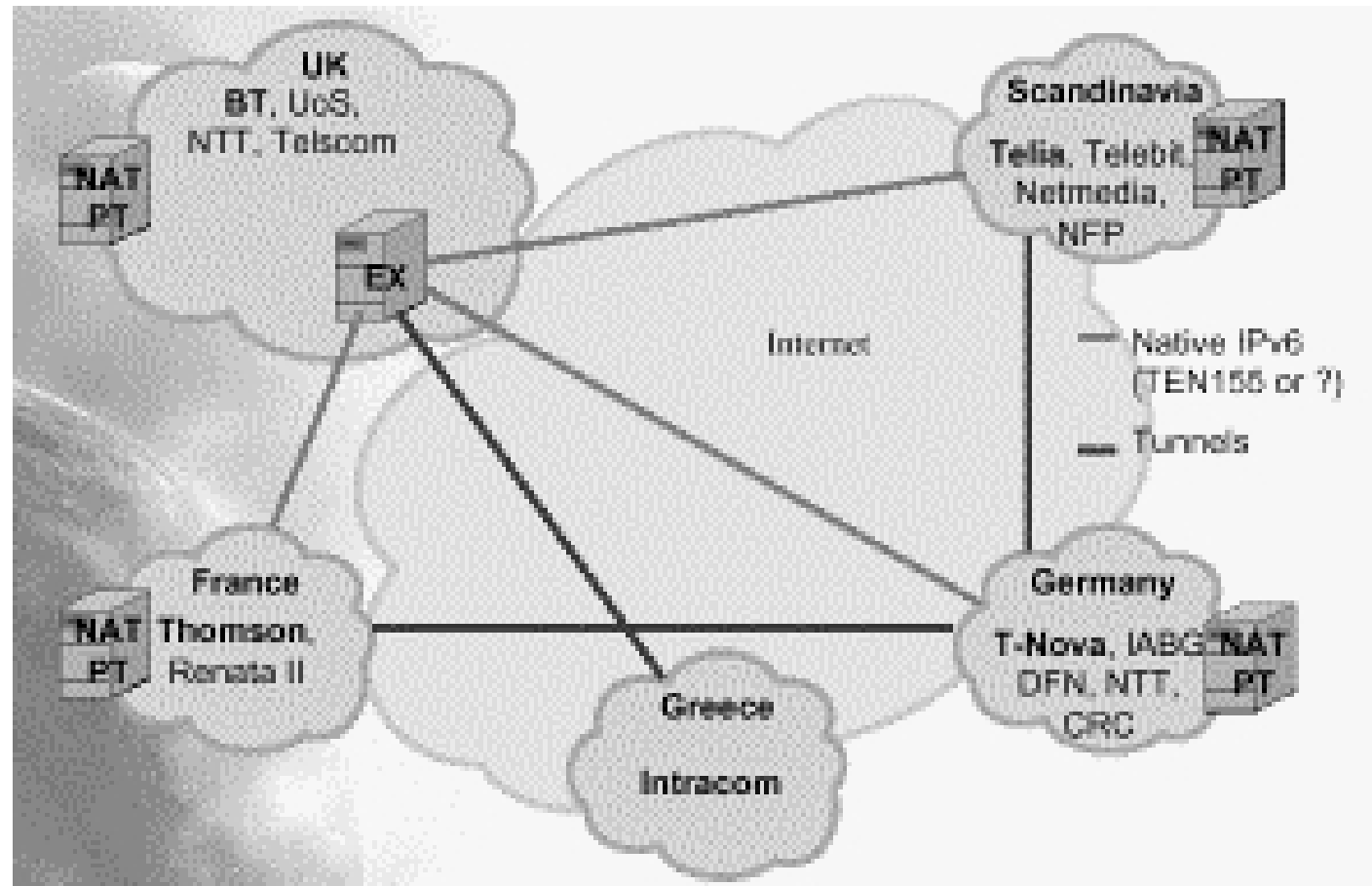
Deployment: Phase 2



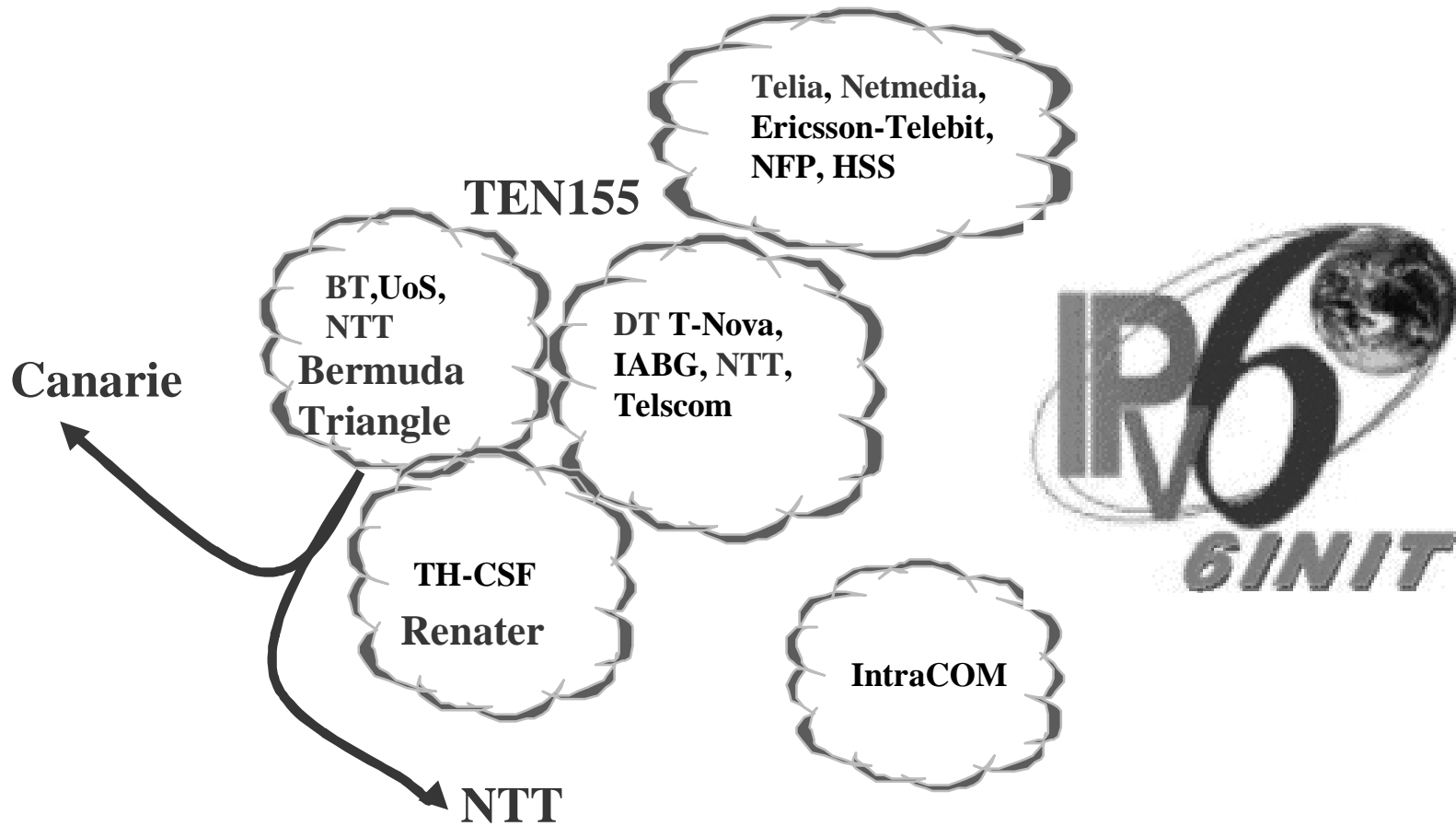
Deployment Phase 3



Deployment Phase 4



From National to EU Trials



The Applications

- We need IPv6 ready applications
 - API is a good bootstrapping mechanisms
- Applications need to inter-operate with IPv4 and IPv6
 - interoperability has a cost
 - 100% interoperability is not necessary
- Interoperability is critical to only few applications
 - mail, web, file servers, ftp, print servers,...
- Use dual stack servers
 - clients are v6 only
 - servers are dual stack hosts

Voice Application

- Voice is one of the important application which will be ported based on H.323 or SIP protocol.
 - H323 is ETSI/ITU standard following interworking with ITU PSTN/ISDN standards
 - SIP is an IETF internet oriented protocol, which is simpler to implement
 - H.323 and SIP interworking is desired.

6INIT Services & Applications

- **Common Services**
 - **Internet applications: mail, ftp, web...**
 - **Multimedia web, audio and video tools**
 - **IP telephony (SIP over IPv6)**
 - **VPN (access routers)**
 - **v4-v6 interoperability (access routers)**
- **Professional applications**
 - **Newspaper printing application**
 - **Direct Online Trading (DOT)**
 - **Multimedia News on Demand (NoD)**

6INIT to demonstrate
**an IPv6-based European Internet
as one of the
Strategic Investments
in the building of the
European Business Future**

Recent announcements

- Both Nokia and Ericsson have adopted IPv6 for their Mobile Internet and M-Commerce
- BT with smartphone have announced the Mobile internet trials
- NTT announced the first international IPv6 ISP
- Microsoft, SUN, CISCO,... have announced their support for IPv6

Conclusions

- IPv6 would be the protocol for the future network solutions with all important features bundled into it
- 6INIT project is leading the European first IPv6 experiments in the framework of IST
- The network and services will be demonstrated with interconnected networks and services across Europe.

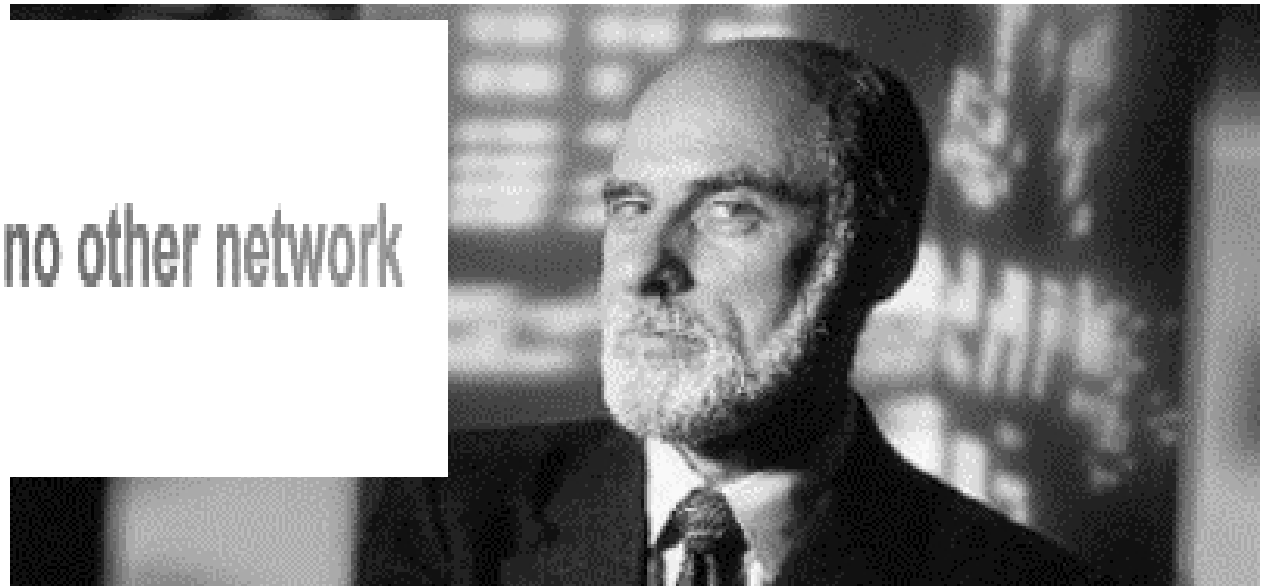
Finally **Yv4**

**The longer the upgrade is postponed,
the costlier it will be and the more
complicated the transition will be !
(compare to Y2K!)**

Time to take-up v6

Statement for the Future

"IPv6 is here and now
So take the internet where no other network
has gone before!"



Vint CERF
Honorary Chairman

Make the BIG BANG Happen!

↳ - IPv6 Compliance & Certification Logo



Thanks to your attention

- We welcome you to join IPv6 Forum and be part of Information Society founding member.
- Important URLs
 - **<http://www.IPv6forum.com>**
 - **<http://WWW.6INIT.org>**

6INIT CONSORTIUM

