IPv6
An Answer to Build Future Network for the Information Society

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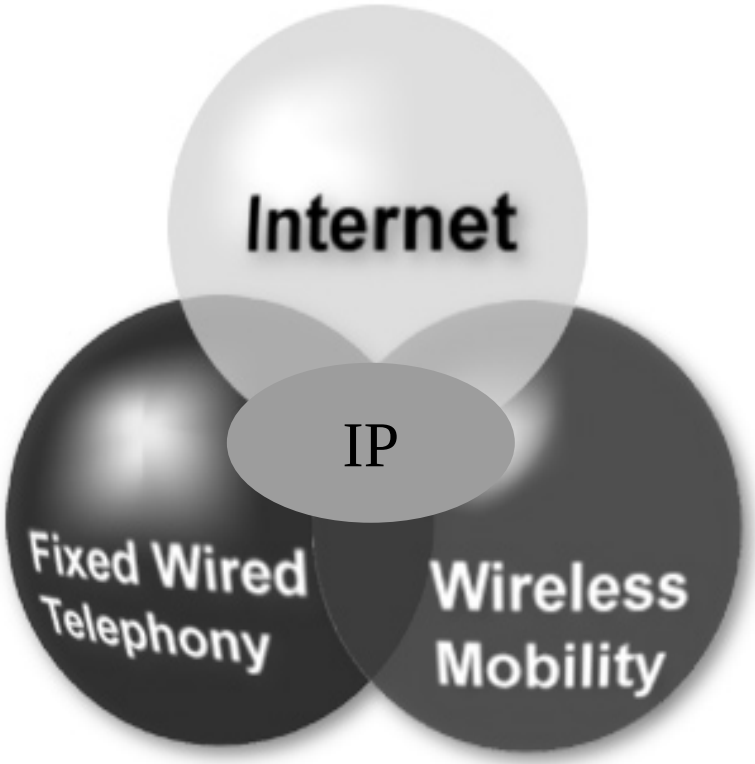
Present Networks

- 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

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

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

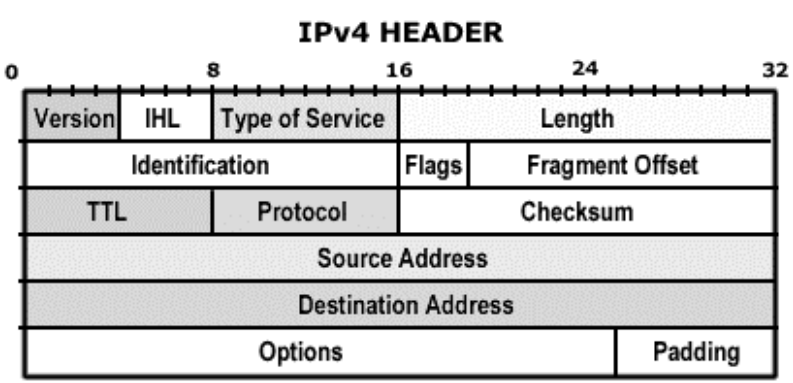
IPv4 vs IPv6

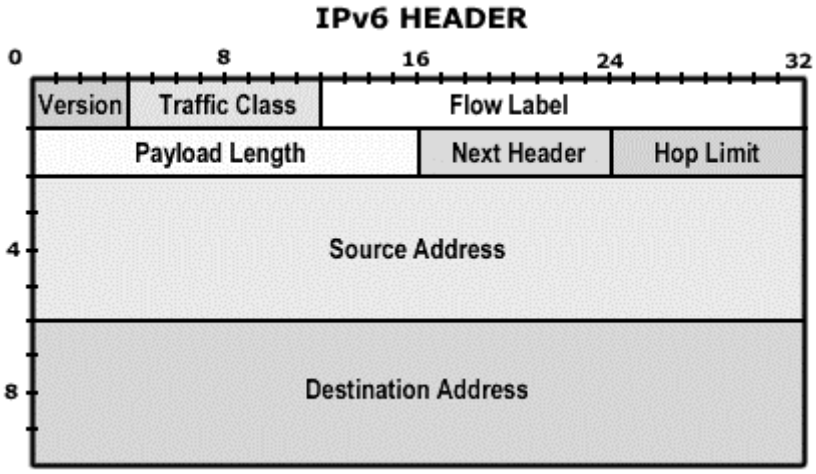
	IPv4	IPv6
• **Address Space Shortage**	**Y**	**N**
• **Security**	**N?**	**Y**
• **Cost of System Management**	⇧	⇩
• **Lack of Capability needed for Next Generation Applications**	**Y?**	**N**

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

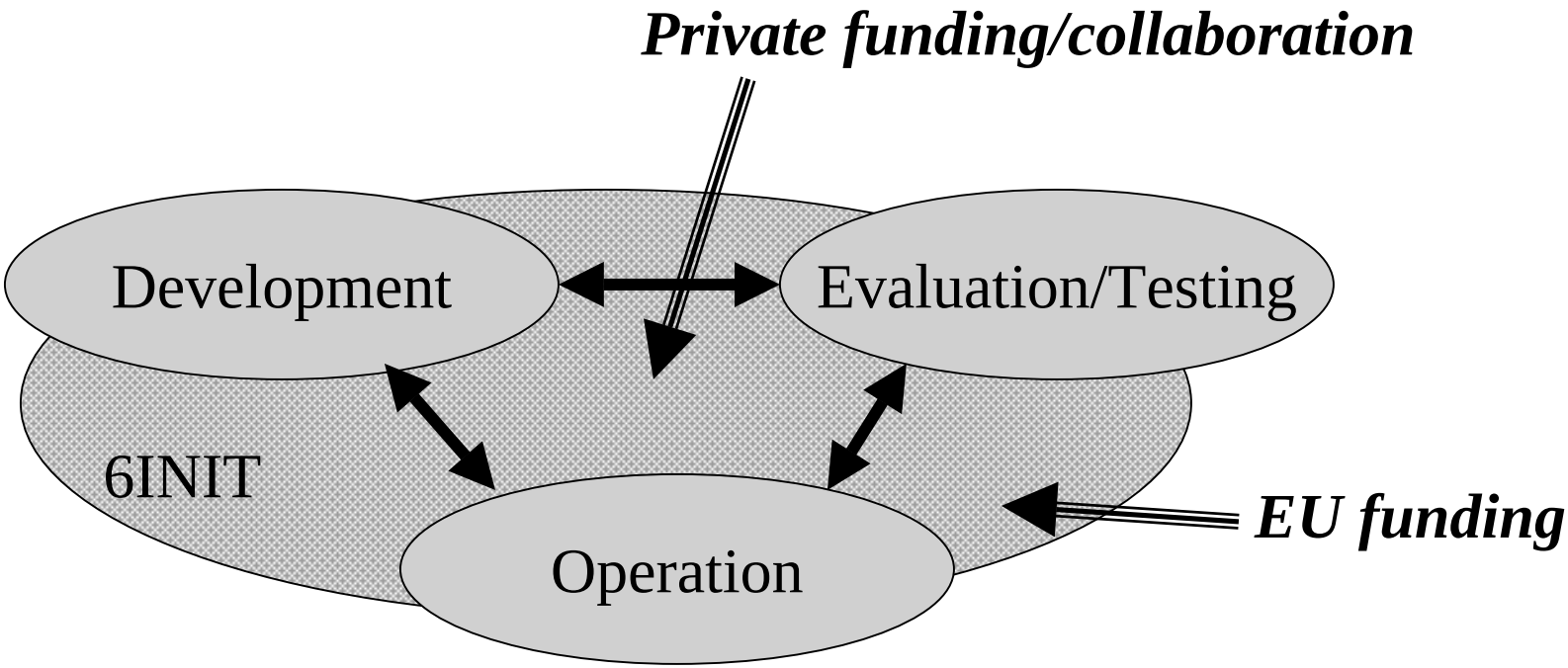




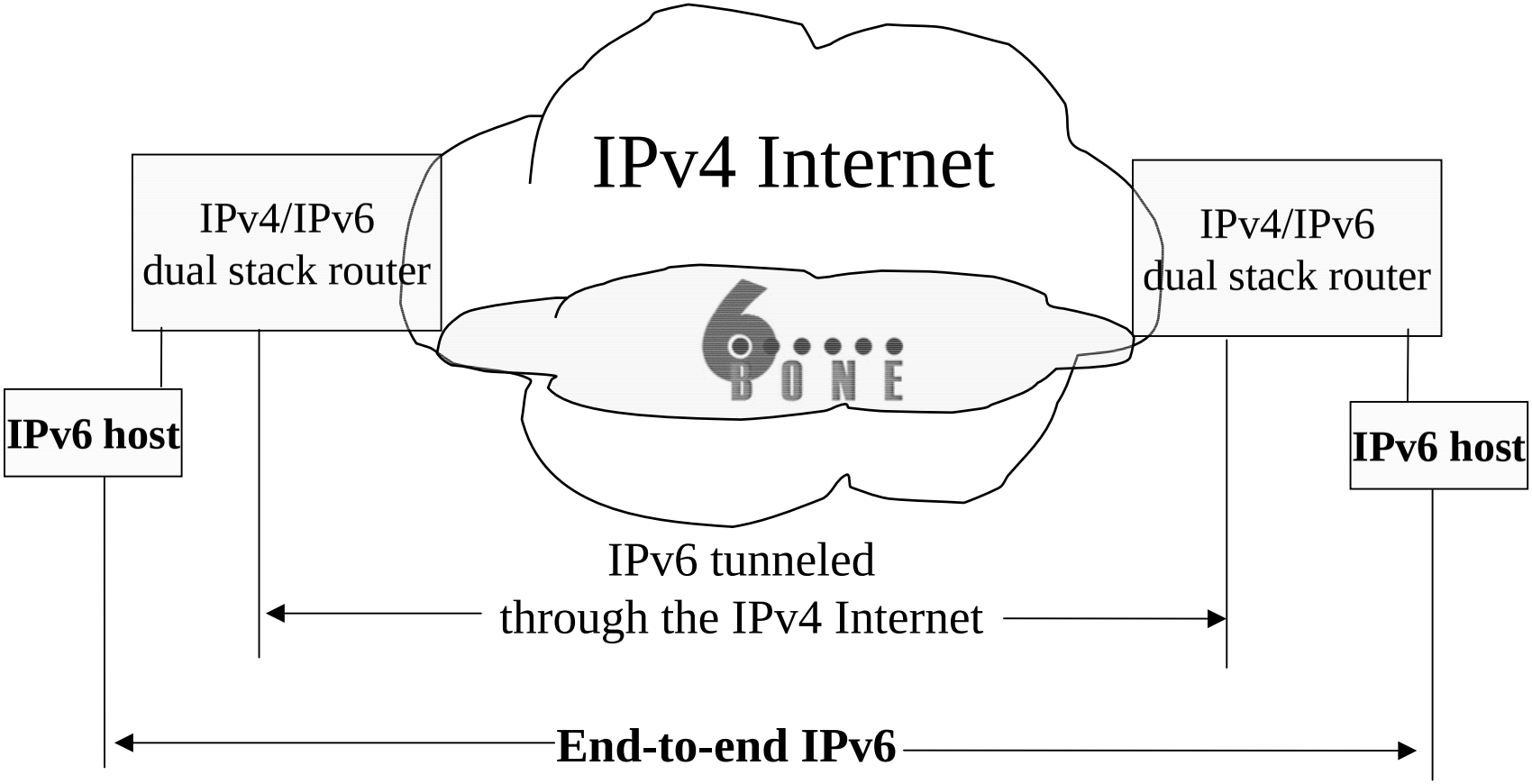
- Variable length
- 14 different fields
- 4 byte addresses

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

6INIT project framework

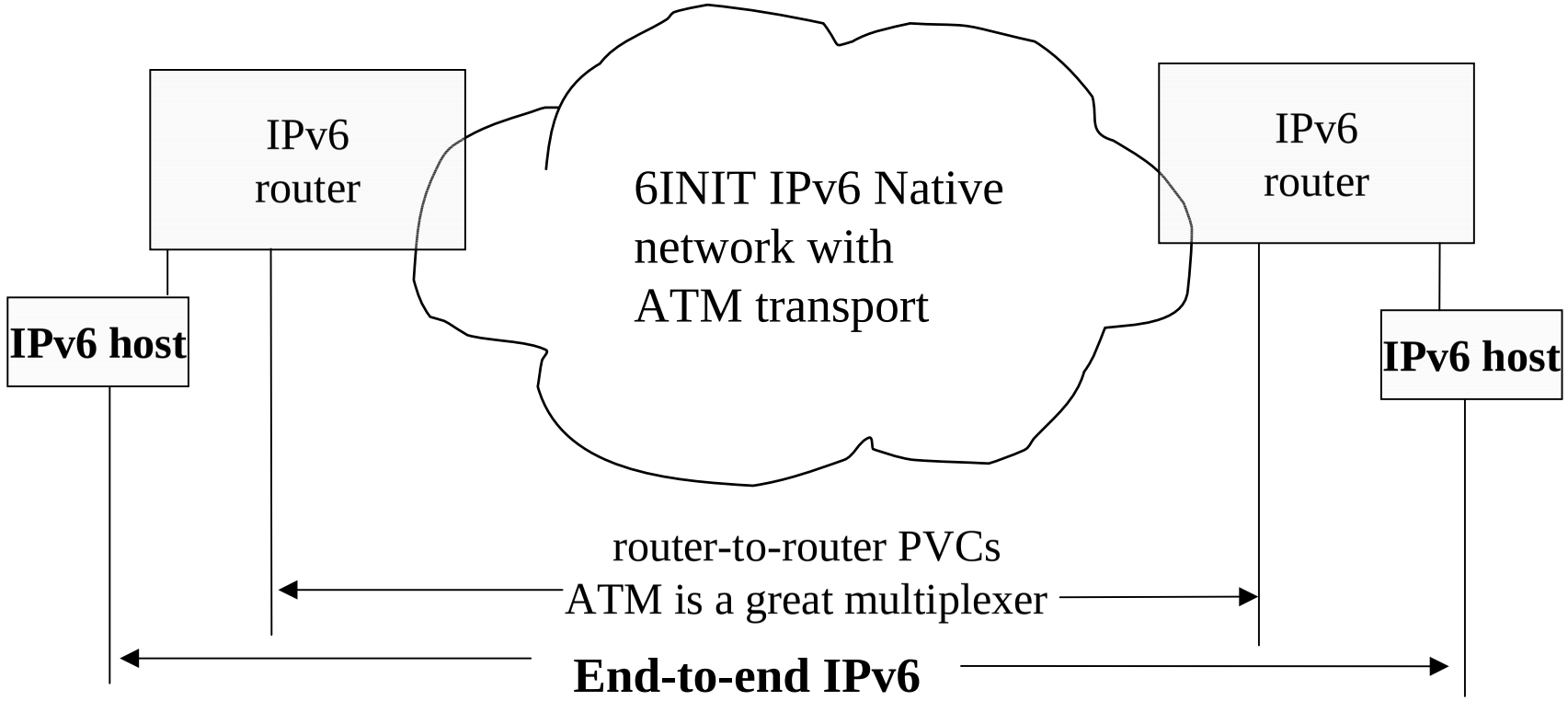


IPv4 and IPv6 networks Interworking



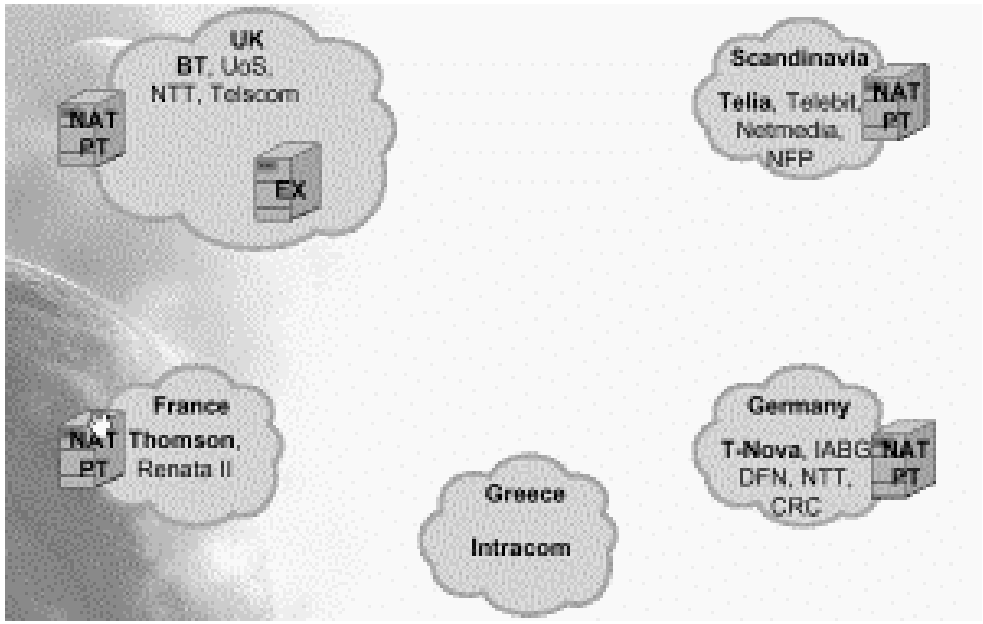
IPv6 Native Services

Initial participants were R&E networks

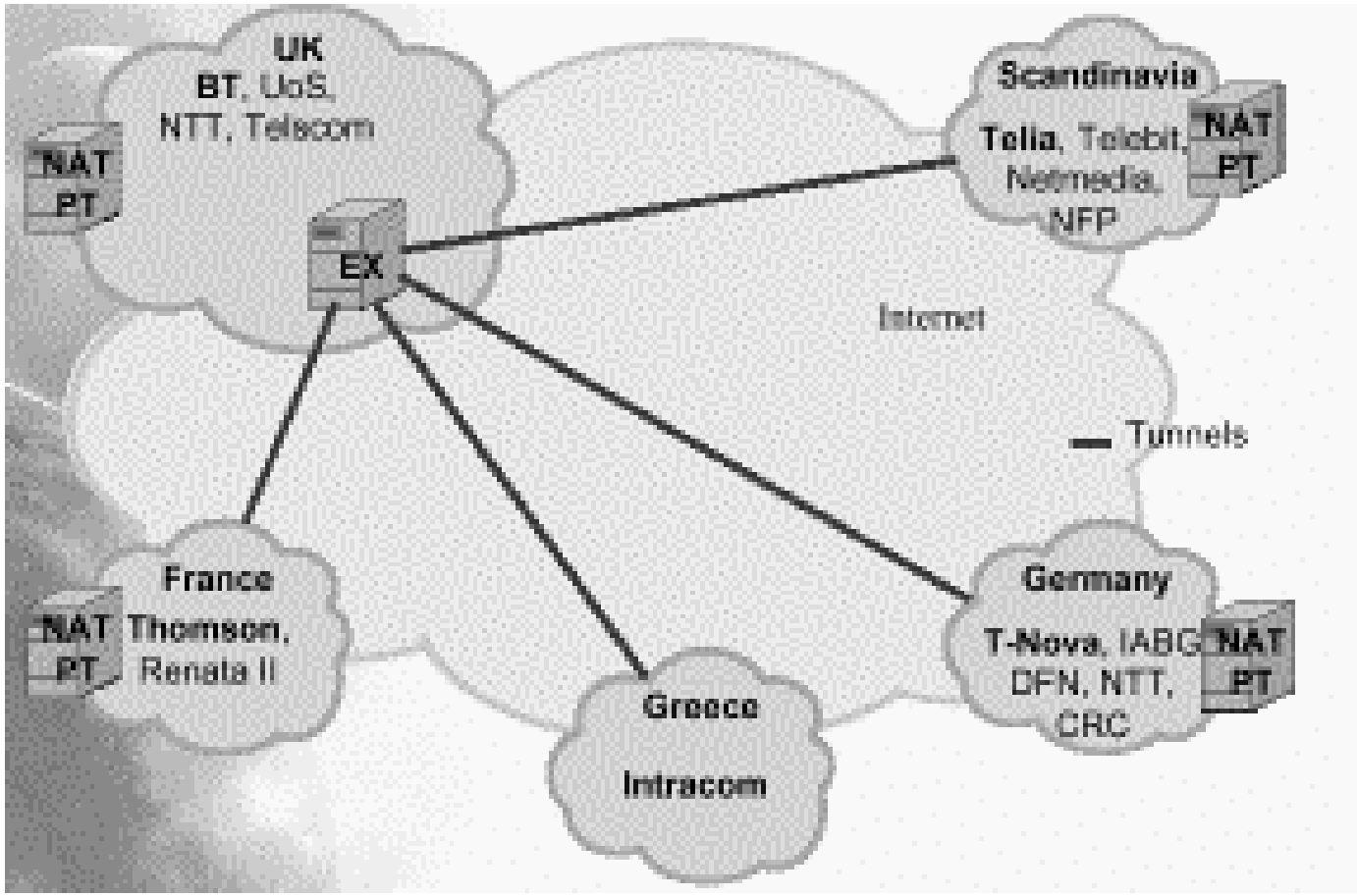


6INIT IPv6 deployment

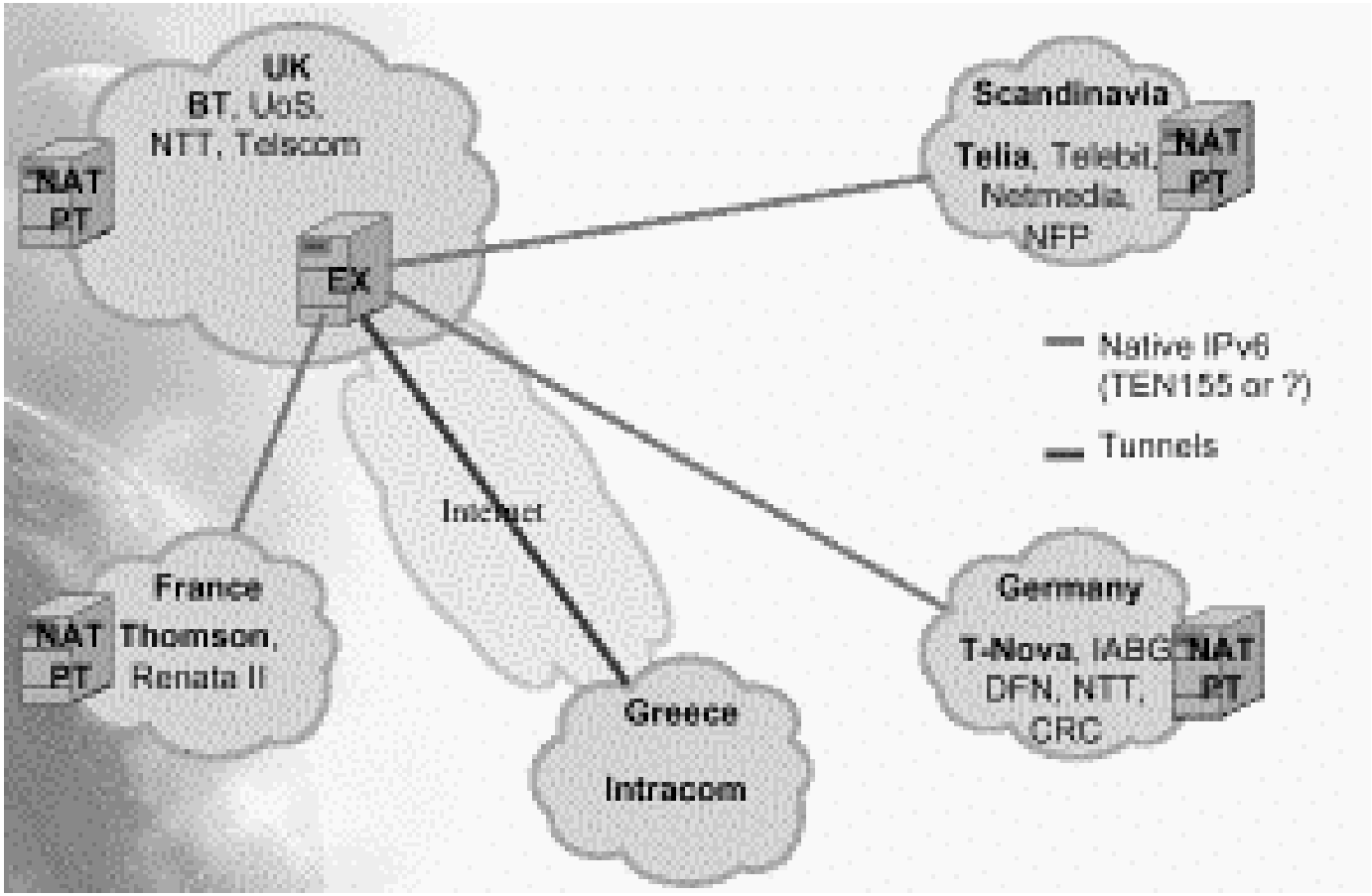
- Deployment is planned in phases>
- Phase 1:



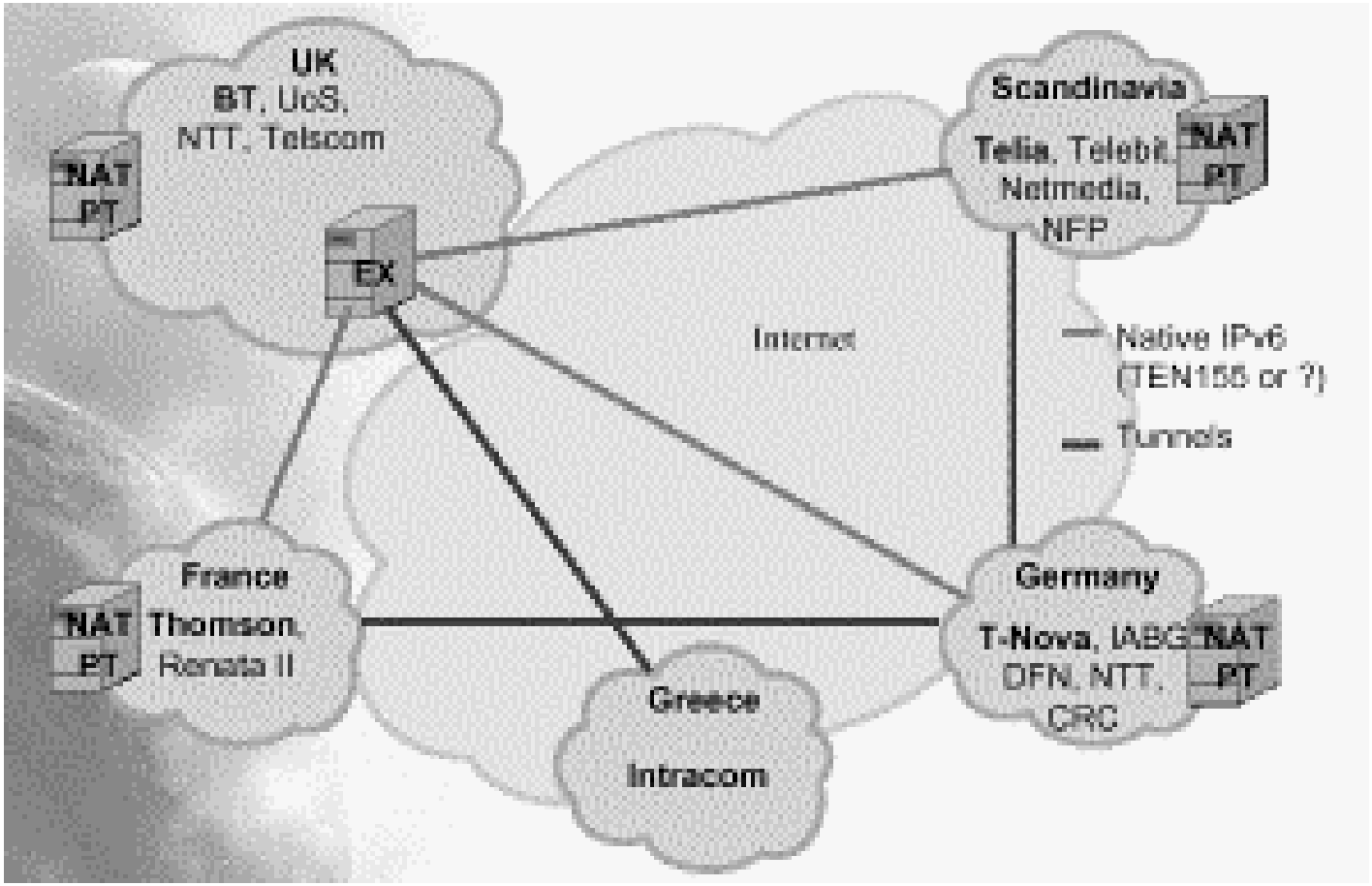
Deployment: Phase 2



Deployment Phase 3



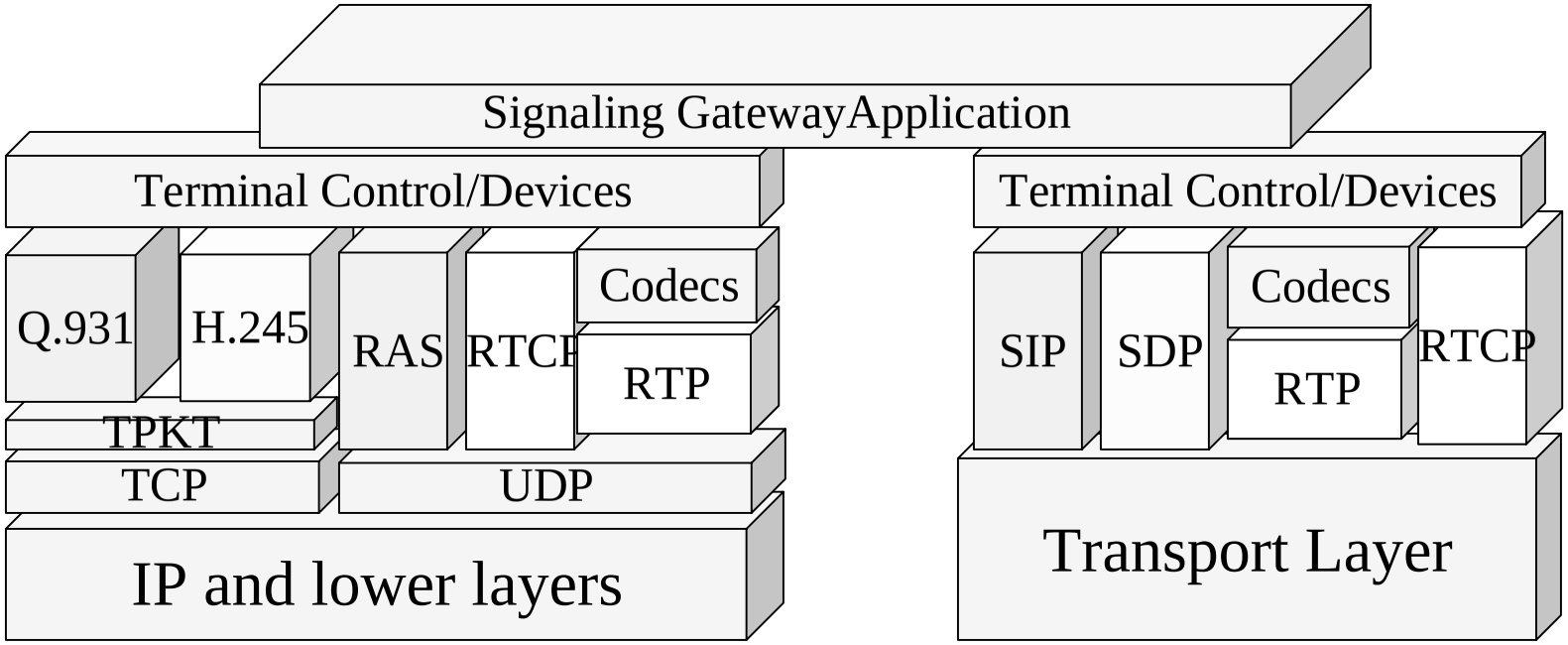
Deployment Phase 4



Applications

- Voice is one of the important applications 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.

H.323 and SIP scenario



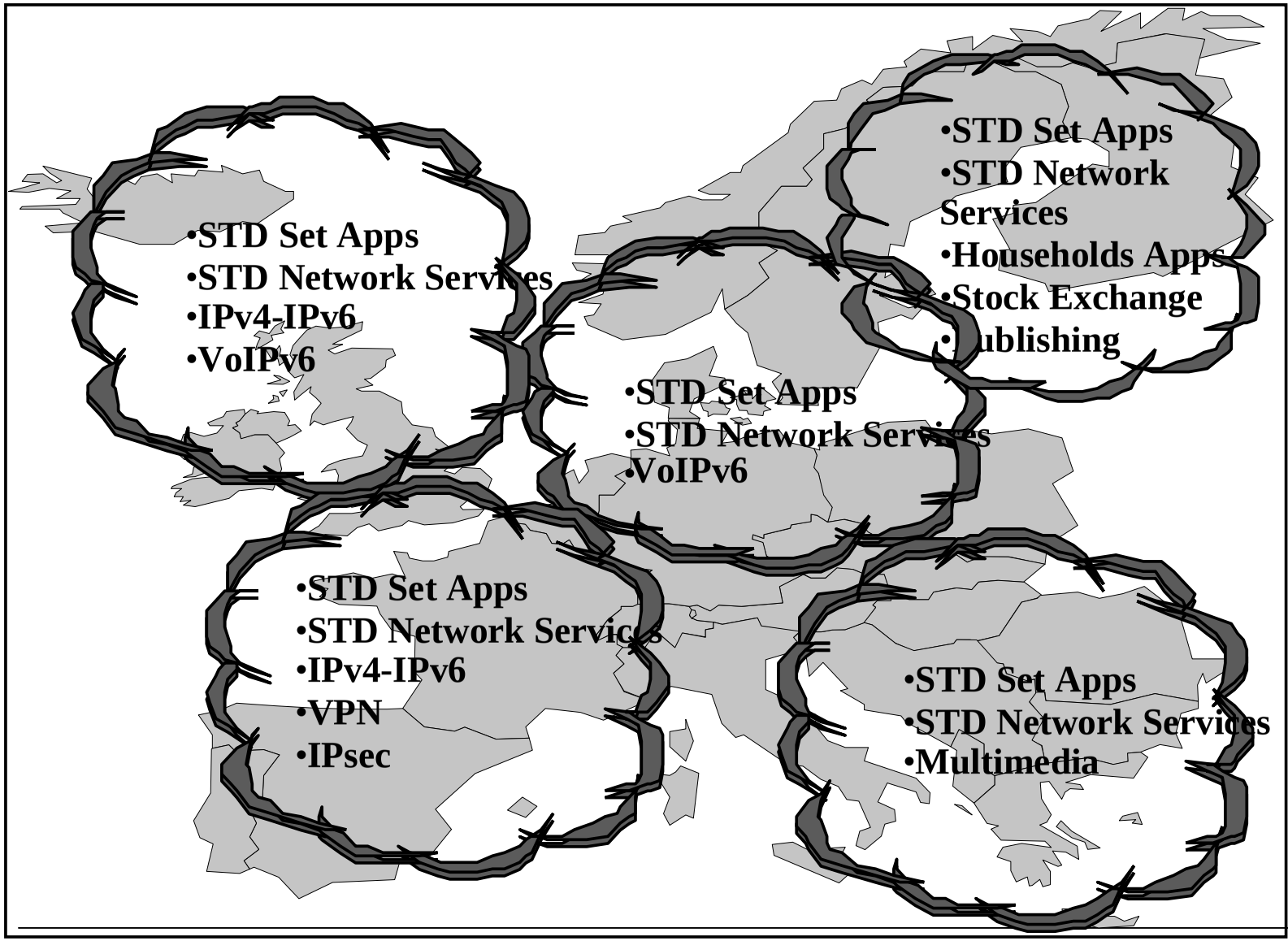
H323 Cloud

SIP Cloud

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

6INIT Network Applications



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.

6INIT CONSORTIUM