6INIT: Lessons Learnt

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Statistics

- 11 plus 2 International sponsoring partners
- 16 months – Jan 2000 to April 2001
- 300 man months
  - ⇒200,000:1 compression for this presentation
- Presentations/demonstrations at:
  - ⇒INET2001, IPv6Forum Seoul …

What did we do?

- **Applications**
  - ⇒Selected a number of applications (major and universal)
- **Network Services**
  - ⇒Listed the network services required to support the selected applications
- **6init Pan European IPv6 network**
  - ⇒Designed and deployed a network to meet the required network services
- **Trials**
  - ⇒Trial the applications on the deployed network
- **Fundamentally an Integration Project**
  - ⇒No major investigations into QoS, Interworking etc, no major developments, no fundamental research

Applications

- **Universal Applications**
  - ⇒ Multimedia web, audio and video tools
  - ⇒ Games: Quake …
  - ⇒ web server/browser …
  - ⇒ Email
  - ⇒ Firewall
  - ⇒ Common Internet Apps: ftp, ping, traceroute, telnet, rlogin …

- **Major Applications:**
  - ⇒ SIP VoIPv6
  - ⇒ Newspaper printing
  - ⇒ Multimedia News on Demand (MNoD)
  - ⇒ Direct Online Trading (erDOT)

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Application Lessons

- **Universal Applications**:
  - ⇒many becoming available
  - ⇒“with care” can be made to work
  - ⇒porting simple applications (MP3 player) not difficult
  - ⇒support across many OS’s appearing
- **Major Applications**:
  - ⇒Many relied on IPv6 JAVA SDK:
    - Delivery of technology from outside the consortium potentially problematic
    - Ingenuity of partners played a key to success

Network Services

- **Required Network Features:**
  - ⇒ Pan European Connectivity
  - ⇒ IPv4/IPv6 Interworking
  - ⇒ Security
  - ⇒ VPN's
  - ⇒ QoS
  - ⇒ DNS
- **To meet these requirement several design decisions had to be made**

Design Decisions

- Dual stack or IPv6 only?
  - ⇒IPv6 Only
- Pan European Connectivity?
  - ⇒Dedicated bandwidth too expensive (TEN155 considered)
  - ⇒Used a combination of:
    - Dedicated, Tunnels, Dialup N-ISDN
  - ⇒Actually aided the project by showing availability/compatibility of different technologies
- Interworking:
  - ⇒NAT-PT as most mature and available technology – has many DNS implications
- Security:
  - ⇒IPsec
- QoS
  - ⇒Very difficult without dedicated bandwidth also only limited support in routers

Network Deployment

Pan European IPv6 Network

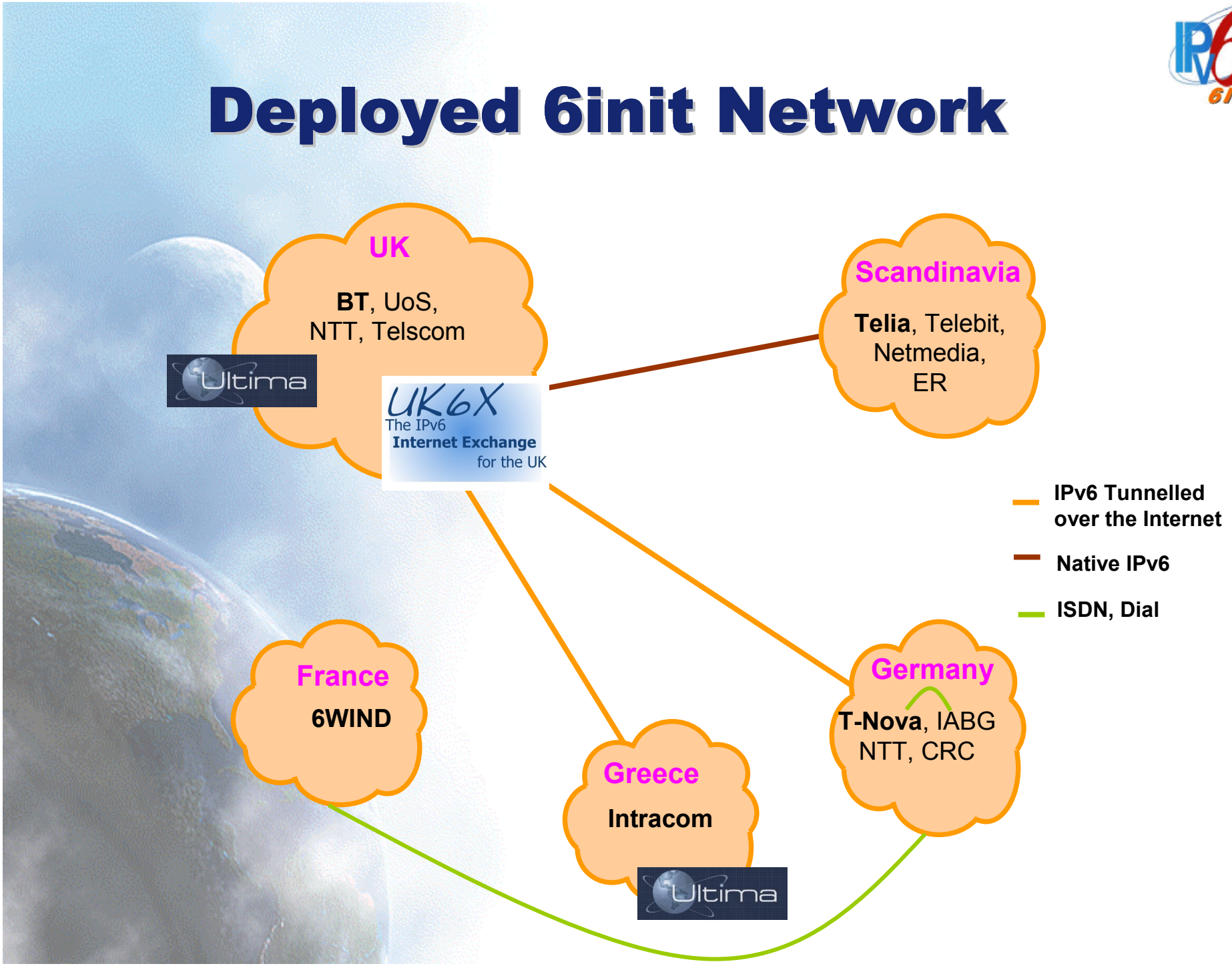
⇒ Based on five regional clusters

- UK 
- France 
- Germany 
- Greece 
- Scandinavia 

⇒ Interconnected via an IPv6 exchange point (UK6X) to form the complete 6init Pan European IPv6 network

Deployed 6init Network

Deployed 6init Network



Deployment Lessons

- Doing it easier than specifying it!
  - ⇒Education?
- Raw bandwidth not available for free!
- Problems mostly around infrastructure: bandwidth, accommodation, compatibility, complexity etc (ie same as IPv4!)
- In general most things worked!

Trials

- Networked worked well:
  - ⇒BGP peerings
  - ⇒DNS in most clusters
  - ⇒Interworking
  - ⇒IPsec
  - ⇒QoS not supported in all routers
- Applications
  - ⇒All parties collaborated in some application trials
  - ⇒Universal applications worked well:
    - –Video Conferencing and Quake interesting
  - ⇒Major application impressive:
    - –Newspaper printing
    - –Multimedia News on Demand (MNoD)
    - –Direct Online Trading (erDOT)

Overall Lessons Learnt

- Project length critical
- Raw interconnection difficult:
  - ⇒Especially when its got to be free
- Dual Stack or IPv6 Only?
- Interworking strategy forces many decisions
- DNS critical
- Porting some applications easy
- There's no substitute for good engineering
- Not considered: OSS, address allocation, access mechanisms, business models, commercial drivers

Task Force Suggestions

- Put in place IPv6 enablers:

  ⇒Encourage education, awareness and training

  ⇒Ensure fundamental research is done

  ⇒Ensure all new applications are IPv6 aware

  ⇒IPv6 Interoperability Technical Guidelines

  ⇒Governmental IT projects (contracts) should have explicit IPv6 future proofing

Thank you – 200,000:1 Compression of the 6init story!

Any Questions?

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