ESA, ESACOM, and their future part in European Networking

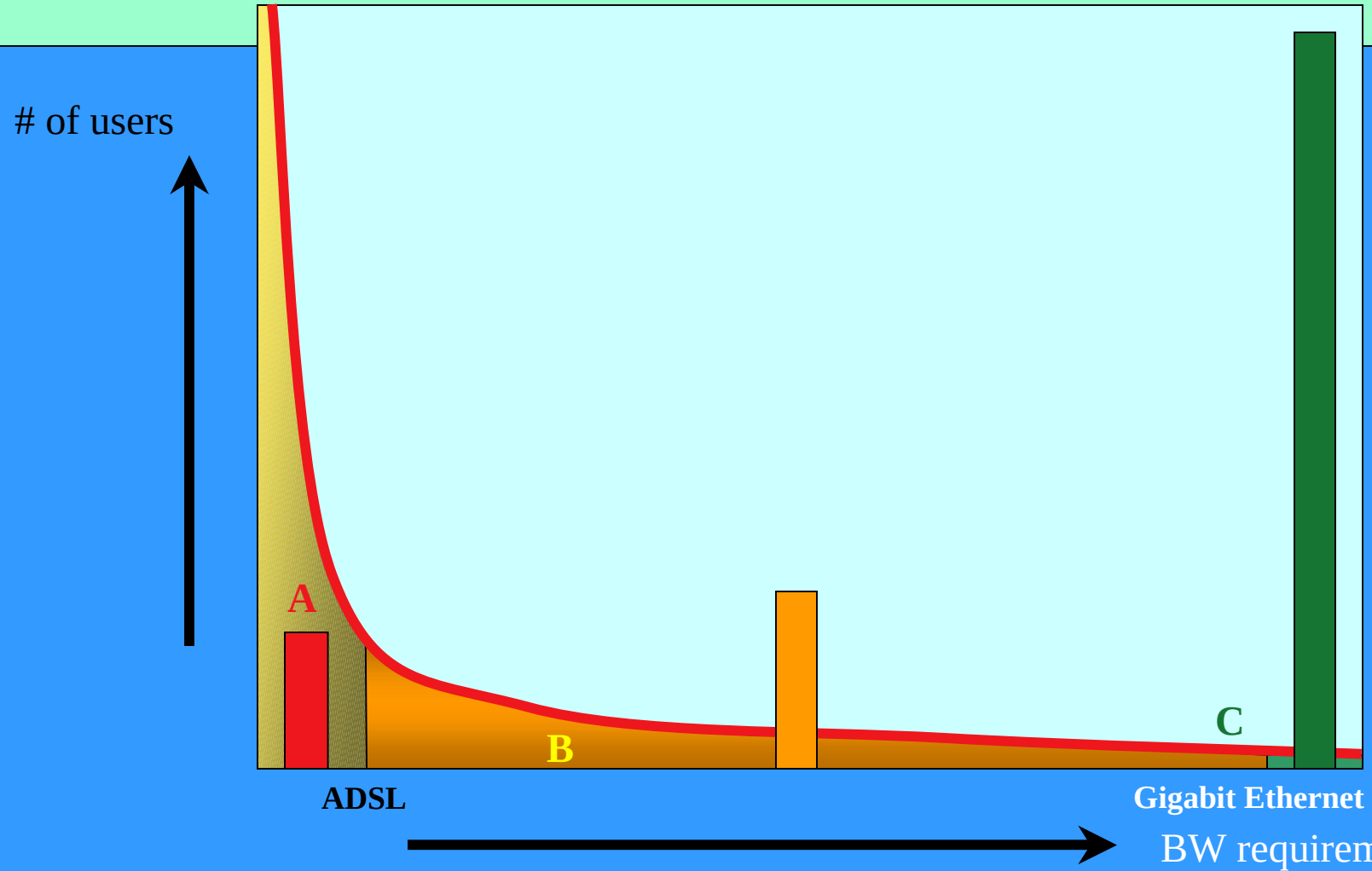
Michael Boele and Stefano Zatti

ESA Information Systems Department

Content

- Networks for the Support of Science
  - Requirements and Reality
- ESA Network Infrastructure – ESACOM
  - Structure, Services and Evolution
- Outlook - Convergence

Know the users and what they want *(from De Laat)*



A -> Lightweight users, browsing, mailing, home use

B -> Business applications, multicast, streaming, VPN's, mostly LAN

C -> Special scientific applications, computing, data grids, virtual-presence

Quiz *(from Ed Seidel):*

What does a Researcher Care about?

- ☐ ~~Theoretical bandwidth, latency, and topology, switches, lambdas, etc~~
- ☑ Application-level features as they **experience** them

– *<u>Guaranteed</u> reliable data transport performance, remote control of instrumentation and experimental apparatus, information searching performance,*

– *<u>Delivered</u> parallel/distributed computational performance,*

– *<u>Functional</u> multicast video/audio for collaboration*

Network Taxonomy (from Ed Seidel)

- ***Production Networks*:** High-performance networks, 24/7 dependablilty (e.g. ESnet, Abilene), for everyone.
- ***Experimental Networks*:** High-performance trials of cutting-edge networks, based on advanced application needs. They MUST
  - be robust, support *application-dictated* software toolkits, middleware, computing and networking.
  - provide *delivered services* on a persistent basis, yet encourage experimentation with innovative/novel concepts.
- ***Research Networks*:** Small-scale prototypes; basic research on components, protocols, architecture. Not persistent, don't support applications.

Scientists Need/Want new generation Experimental Networks for e-Science Apps, and this applies to ESA as well

ESACOM network services

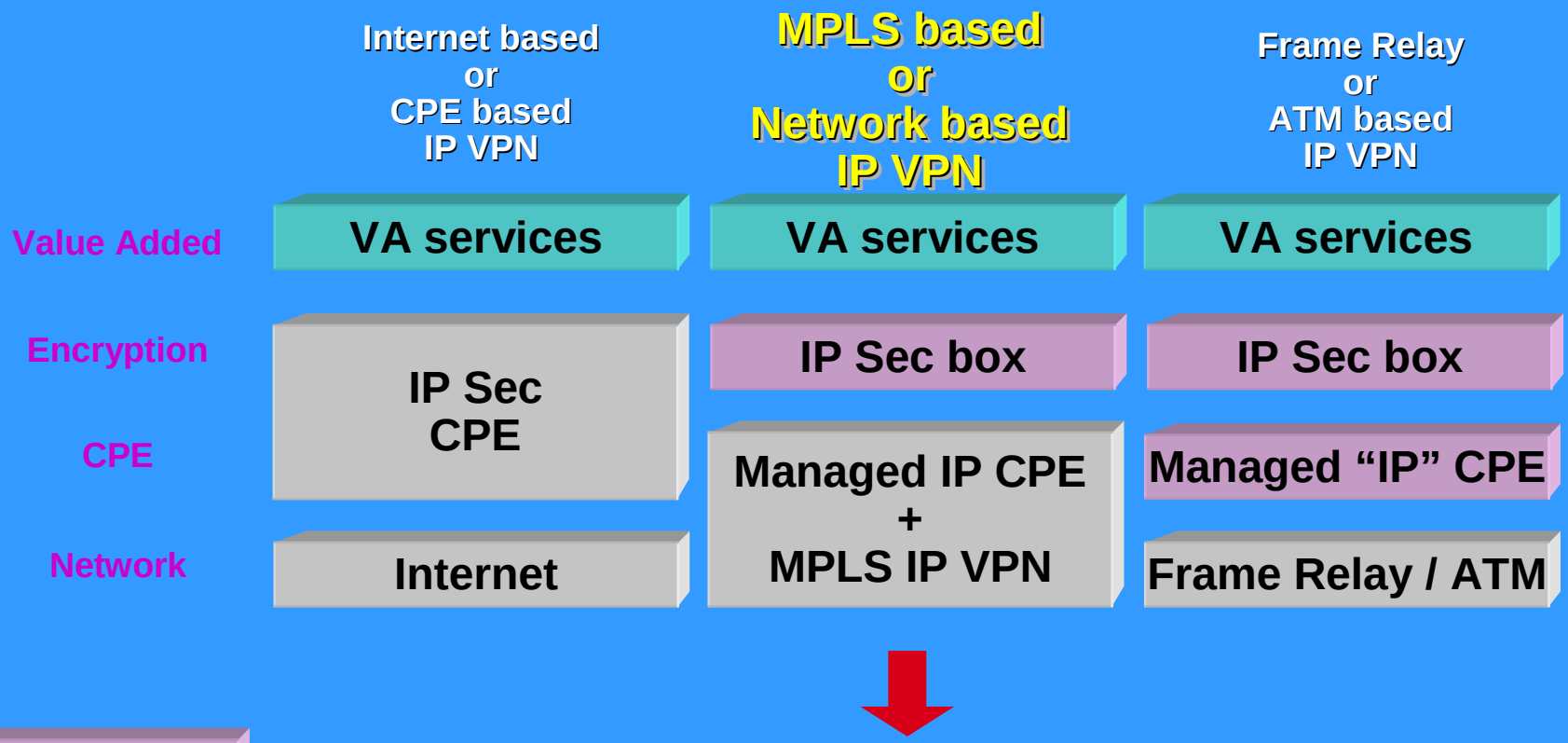
- Provided by ADM-I: the
  ESA Information Systems Department
- Production network:
  ESACOM Information Highway
- Experimental network:
  ESACOM GRID connections

The ESACOM Information Highway

- The new ESA Converged Communications Network, since March 2001
- 30 sites worldwide
- Interconnecting ESA main establishments, offices, ground stations, industrial and agency partners with guaranteed bandwidth and classes of service
- Supports ESA internal business processes and external missions
- A special kind of production network
- Supports all corporate telecommunications needs of the Agency on a single IP-based network infrastructure

What is an IP VPN ?

3 ways to build an IP VPN



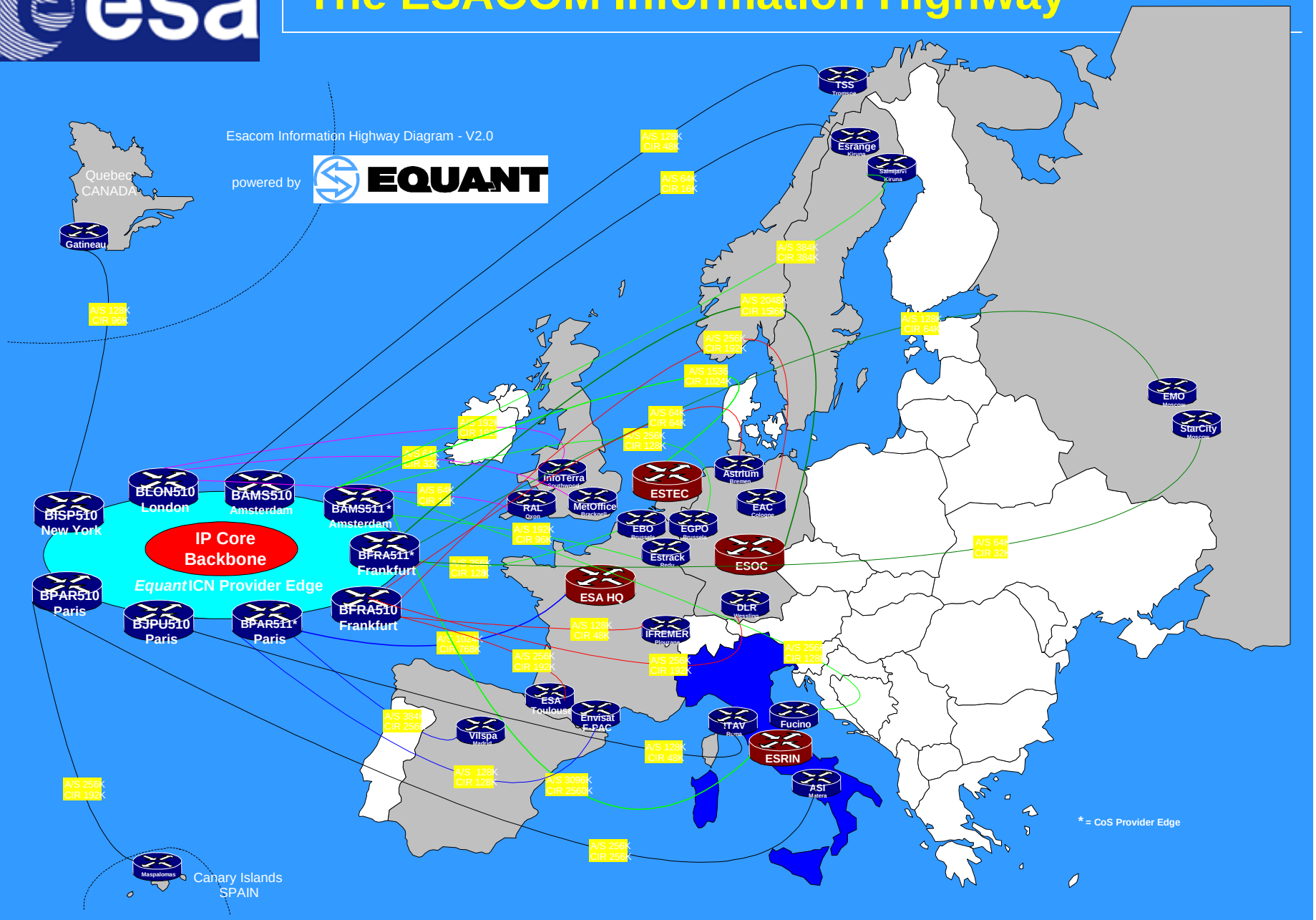
Optional

Mandatory

MPLS (Multi-protocol Label Switching):

- A built-in network infrastructure for enhanced customer IP VPN solutions
- A Flexible solution to introduce high security and Value Added services

The ESACOM Information Highway



The ESACOM Information Highway: Data Services

- Intranet/Extranet Services
  - Three IP Communities on the same IP VPN:
    - ESA Corporate Intranet (15 sites)
    - Earth Observation Community Extranet (11 sites)
    - ENVISAT PDS Community Extranet (7 sites)
- Internet Access Service
  - Corporate Internet Access for business purposes of ALL ESA staff (class B of De Laat' s scheme above), at 4 main ESA establishments (15Mbps total capacity)
- Remote Access Service
  - Based on Equant IP Internet Dial Service

ESACOM Information Highway: Voice/Video Services

- Voice Services
  - VoiP Services for Corporate Telephony (International On-Net and Off-Net Services)
  - Offered at 5 ESA main sites (NL, D, F, I , E) plus 2 Russian Offices
  - 2500+ users

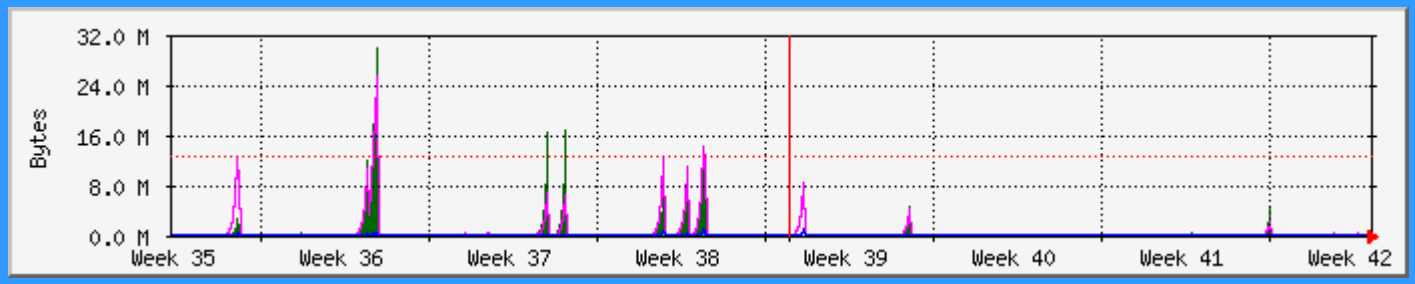
- Video Services
  - Video/IP Conferencing among ESA Video Conferencing Studios
  - Offered on 4 ESA main sites
  - Carrier service only – studios part of Site Services offering

ESACOM GRID connections

- Surfnet in NL, 34 Mbps for ESAGRID
- GARR-B in I, 8 Mbps for EO and ESAGRID
- G-WIN in D, 2 Mbps for OPSnet operational use
- Rediris in E, for Scientific missions ISO and XMM

✓ Limited to the projects who can use these services without affecting corporate users

❖ High capacity, low usage (so far)



Issues and Challenges

- Wide Diversity of Applications Supported
  - Financial, project development, distributed teamwork, satellite data distribution
  - With different requirements and different traffic patterns
  - For different types of users: corporate users, scientific users, space programmes
  - ✓ **Need class of service and differentiated services/charging**
- Challenging and often 'odd' requirements
  - Short-term, quick deployment of connectivity to remote locations (e.g. Baikonur Cosmodrome/KZ, Svalbard island, satellite integration and test sites, space-related events and demonstrations)
  - ✓ **Need capacity to react quickly**

New Requirements Ahead

- A European Space Information Community
  - Evolving to a community of space agencies, industry, academia, user groups, citizens
  - All joined via a far-reaching IP VPN, also over the Internet,
  - ✓**but with guaranteed quality of service and security**
- Policy-based Networking
  - From present Class of Service concept to directory-enabled quality of service management
  - Tighter integration of Service Provider and ESA
  - ✓**QoS Management capability**

New Requirements Ahead

- Managed Services
  - Routing, Remote Access Authentication, Security Management
  - ‘in the cloud’ , ‘off the cloud’
- Multimedia Services
  - Video Streaming for satellite launches, corporate communications
  - desktop videoconferencing,
  - e-learning
- Pervasive Networking
  - Access to IP VPN from any device (PDAs, mobile platforms)
  - Wireless access within and outside the physical enterprise (WLANs, GPRS/UMTS)
  - Always-on and disconnected modes of operations

Conclusions

ESA Customers want guaranteed connectivity services

- ESACOM services are based on service level agreements that are in turn based on outsourced provision of guaranteed services
- Bandwidth requirements are growing exponentially as everywhere else
- ESACOM will increase the use of Internet for corporate traffic via the VPN concept, since Internet bps are cheaper than Intranet ones (and are based on the same MPLS infrastructure anyway)
- ESACOM Experimental networks provision will continue and increase alongside (or just ahead of) the requirements of the projects
- ESACOM pursues within the European network bodies the provision of guaranteed services (QoS) over academic networks, that may make it possible in the future to run production traffic over them

Long-term Goal is to have a converged Network –
carrying both production and experimental traffic with 'guaranteed' QoS
– using various classes of service according to requirement –
and, *if sensible*, to use the research networks as carrier for all services.

Related information on the Web:

ESA Grid Project	http://esagrid.esa.int
ESA Information Service Department – ADM-I	http://adm-i.esa.int
Serenate Study Project	http://www.serenate.org
Terena Association	http://www.terena.nl
Dante – the Provider	http://www.dante.org
Internet 2 Initiative	http://www.internet2.edu
Gridlab Project	http://www.gridlab.org
Access Grid Resouces	http://www-fp.mcs.anl.gov/fl/accessgrid/

Source Presentations of De Laat and Seidel can be seen on the SERENATE page.