



Workshop 42  
Leeds, UK  
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# **TERENA, the NRENs, GÉANT & promoting Campus Best Practice**

**Karel Vietsch**

**24/11/1952**

**to**

**23/02/2014**





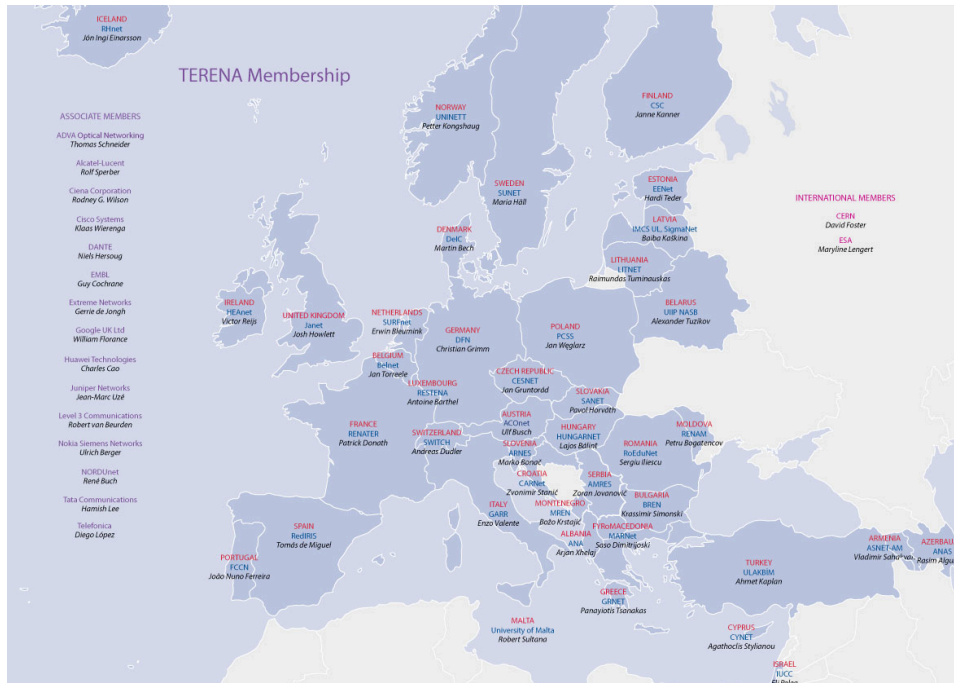
# About TERENA

- › A not-for-profit association of NRENs.
  - › 1986 – RARE: 1994 - TERENA
- › Main goals:
  - › Open grass-roots organisation
  - › Community, Consensus, Collaboration
  - › Explores Technologies and Services
  - › Fostering & Piloting new services
- › Activities:
  - › Task Forces; Projects; Conferences; Training . . . .
- › Major Partner in GN3plus





# TERENA Membership



› 41 European NRENs

› International Members

› includes: CERN; ESA

› Associate Members

› includes 12 commercials

› EMBL; NORDUnet; DANTE



# TERENA Compendium of NRENs

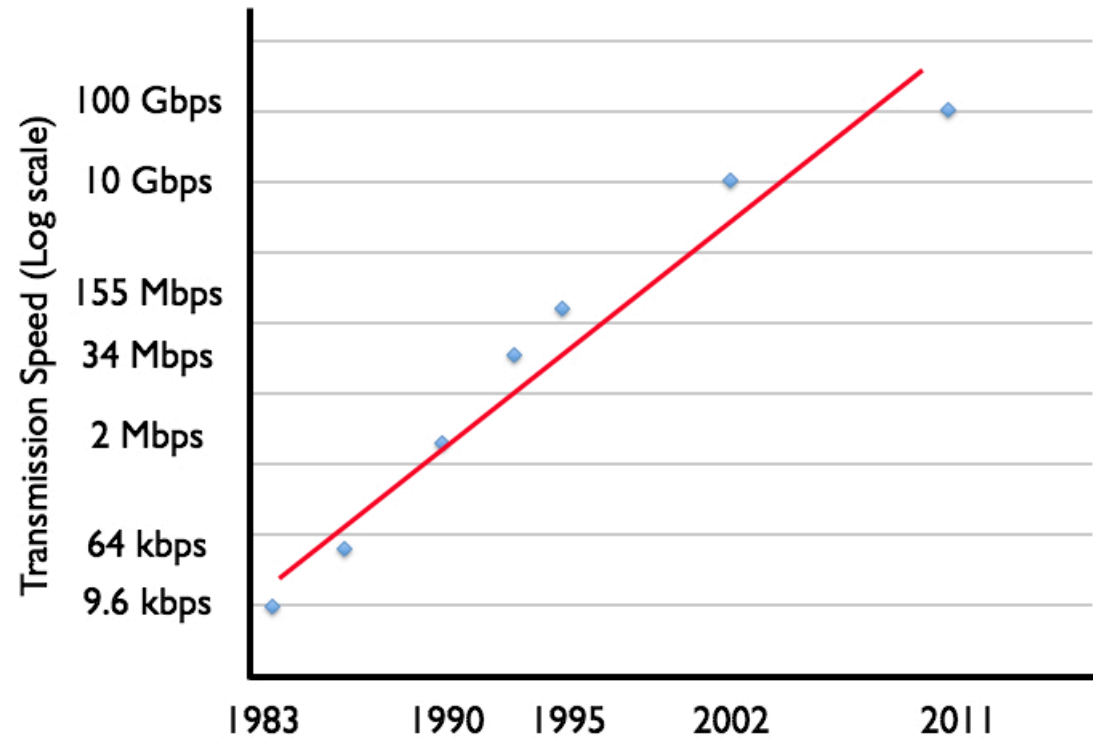


**Thirteen Years of  
Benchmarking**

[www.terena.org/compendium](http://www.terena.org/compendium)

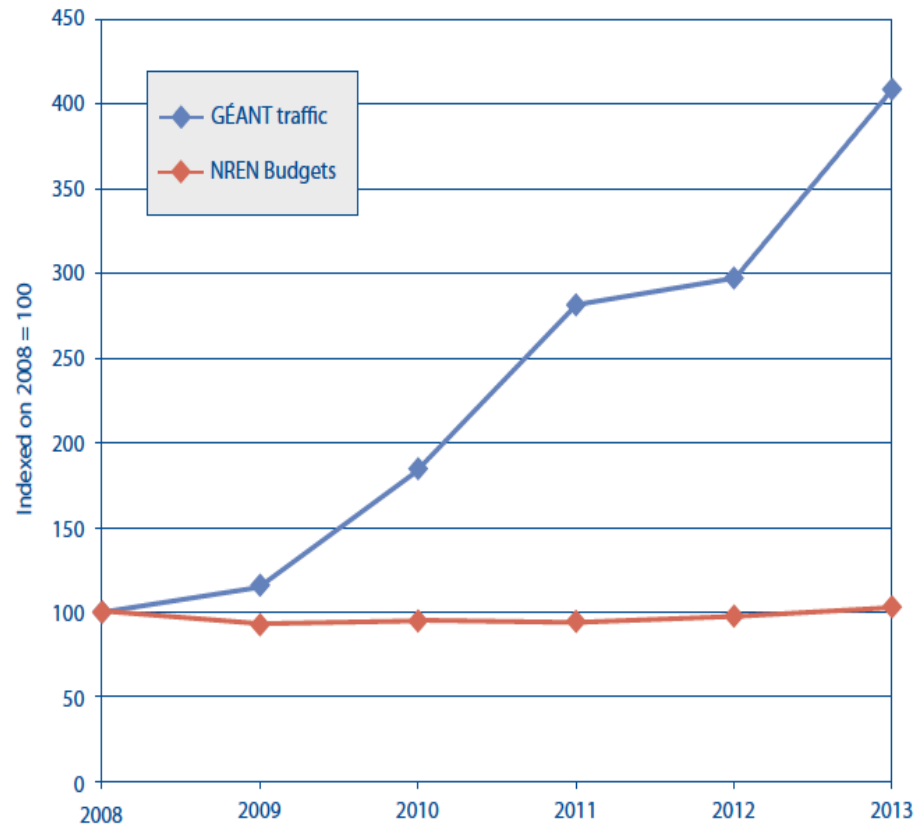


# Growth in Capacity



# Traffic and Budgets 2008-2013

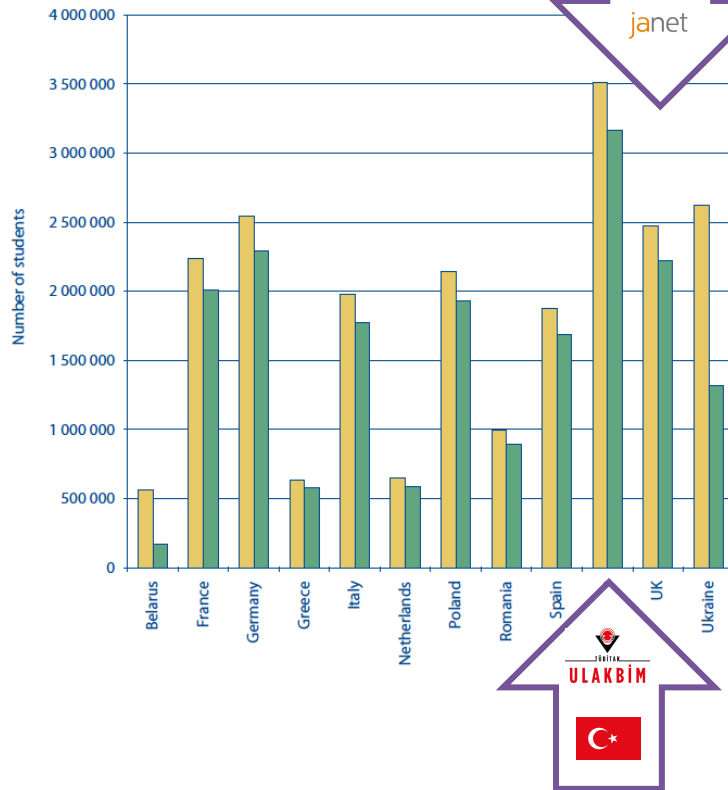
Graph 7.3.6 – Total NREN budgets and traffic growth, 2008-2013, GÉANT partner countries



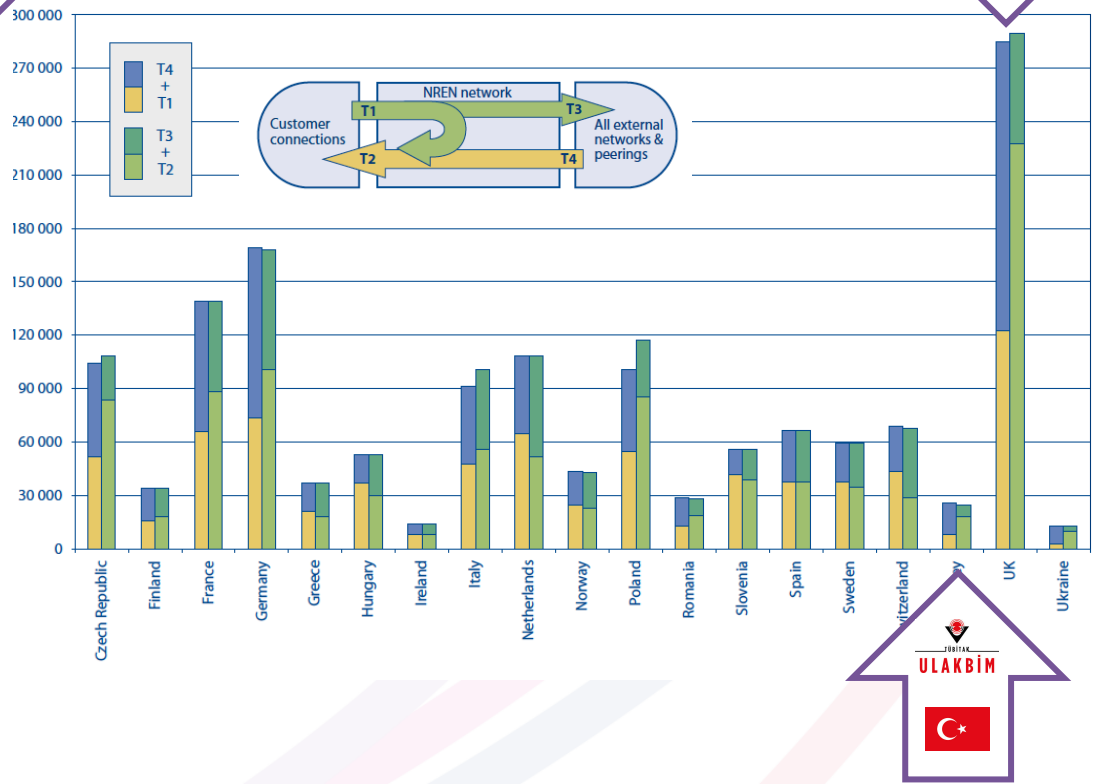


# Benchmarking Users and Bandwidth

Graph 2.3.1 – Numbers of students serviced by an NREN, GÉANT re for countries with > 500 000 students



Graph 4.2.1 – 2012 traffic, T3 > 5000 TB







- › Major Driver for Europe
- › Simpler Governance – Single Voice

- › Global Collaboration
- › NRENs, R&E, Users; Industry
- › Data, Big and Small
- › Federation
- › Mass Mobile Access

A cartoon illustration of a man with brown hair, wearing a blue long-sleeved shirt, holding a large, golden key. The key is oversized, with the head of the key being a large circle. The man is smiling and looking towards the viewer. The background is a light green circle.





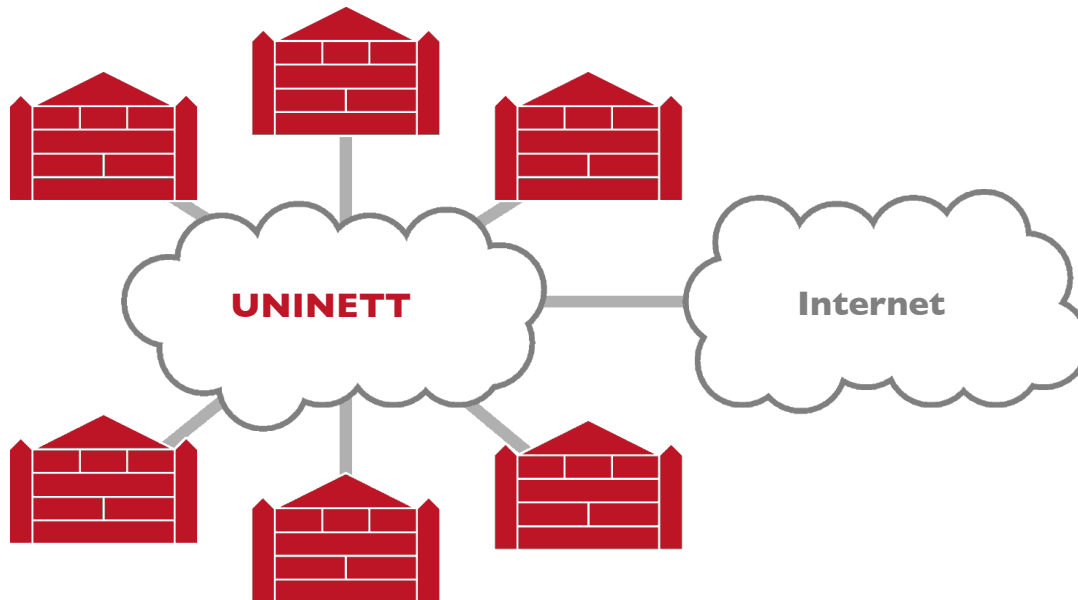
# Important Future NREN Services

- › Demand Aggregation / Brokerage
  - › Commodity service availability is ubiquitous
  - › NRENs add value (AAI, QoS, Contractual, Expertise)
- › Authorization and Authentication AAI
  - › vital to scalable access control
- › Integration of Wi-Fi & cellular data networks
  - › connection of ubiquitous mobile devices
- › Expand the community
  - › Include all of R&E and e-Infrastructure users
  - › **Serving Users at the Campus**





# GigaCampus 2006 – 2009



**Vidar Faltinsen**  
GigaCampus Programme Manager

## GigaCampus Vision

**Provide and coordinate top international  
level campus IT infrastructures**



# GigaCampus Approach

- › **Workshops - share practice**
- › **Working group**
- › **Develop national best practice**
- › **Consulting on campus**
- › **Assistance in implementation**
- › **Procurement**





# Stakeholders

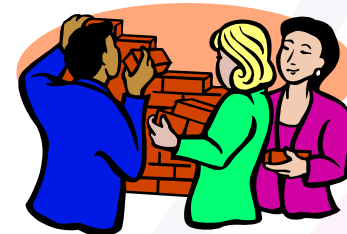
## › The Government

- › Showed responsibility
- › Provided initial funding



## › The NREN (UNINETT)

- › Dedicated campus project team
- › Facilitator
- › Got happy customers



## › The Universities and colleges

- › Participates in working groups
- › Benefits from results





# Campus Best Practice Introduced as a task within GN3



Task Leader:  
Vidar Faltinsen  
UNINETT

- Four countries:
  - Norway (UNINETT)
  - Finland (CSC/Funet)
  - The Czech Republic (CESNET)
  - Serbia (AMRES)





# Campus Best Practices

- Addresses key challenges for European campus networks
- Contributing NRENs organise working groups within their country

- Six areas of focus



- Best Practice Documents
- Workshops



# Campus Best Practice continues in GN3plus



Task Leader:  
Jari Miettinen  
CSC, Finland

- Norway (UNINETT)
- Finland (CSC/Funet)
- The Czech Republic (CESNET)
- Serbia (AMRES)
- France (RENATER)
- Portugal (FCCN)
- Bulgaria (BREN)
- Montenegro (MREN)
- Macedonia (MARNET)







# Physical Infrastructure



**9 BPD published**

- › Generic Cabling Systems
- › Design/layout of ICT rooms
- › Power supply in ICT rooms
- › Cooling in ICT rooms
- › Fire protection in ICT rooms
  
- › AV requirements in lecture halls and meeting rooms
  
- › Overall guidelines for the Design of HE Buildings (ICT and AV)



# Campus Networking



**17 BPD published**

- › Redundant campus network
- › Requirements for edge routers
- › Recommended config of campus switches
- › Recommended HP Procurve setup
  
- › IPv6 migration plan
- › Measuring IPv6 uptake
- › IPv6 autoconfiguration
- › IPv6 and IPv4 multicast setup
- › IPv6 config for HP procurve
  
- › Light paths in campus network
  
- › Virtualization of critical network services



# Wireless



**8 BPD published**

- › Radio planning
- › WLAN design in a controller environment
  - › configuration examples
- › WLAN security (802.1X, encryption)
- › FreeRADIUS to database setup
- › Setting up eduroam with a Cisco controller
- › Configuring HP wireless
- › Legal aspects



# Network Monitoring



**11 BPD published**

- › Requirements for network monitoring
- › Monitoring tools
- › IDS and honeypots
- › Monitoring based on IP data flows
- › Security monitoring with flows
- › Anonymity issues
- › IPv6 monitoring



# Real-time communications



5 BPD published

- › IP telephony best practices across Europe
- › Evaluating SIP performance
- › SIP penetration testing
- › VoIP anomaly detection



# Security



**8 BPD published**

- › Recommended security policy
- › Guidelines for information classification
- › Recommended security architecture
- › Traffic filtering techniques
- › Digital certificate deployment
- › 802.1X in the wired network
- › Cisco Ironport VPN recommendations



# geant.net/cbp

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GEANT > Network > Campus Best Practice > Campus Best Practice Documents Friday 28 Mar 2014 | Time - 15 14

### Best Practice Documents

'Campus Best Practices' work within these technical areas: physical infrastructure, campus networking (including IPv6), wireless, security, network monitoring and real-time communications. Within these areas Best Practice Documents (BPDs) are produced. All BPDs will be published on this page.

**Physical Infrastructure**  
This area addresses the requirements for generic cabling systems on campus, both fibre and twisted pair. The requirements of the infrastructure in telecommunications and server rooms are also with. This includes power supply, ventilation, cooling, and fire protection, as well as general room-plan guidelines. Recommendations for audio-visual (AV) infrastructure in lecture halls and meeting rooms are also covered.  
[Click here to download the document](#)

**Campus networking**  
This area deals with the campus network itself: routers and switches as its basic building blocks. Requirements to both Layer 2 and Layer 3 are Recommendations for a redundant design are. There is a particular emphasis on guidelines for implementing IPv6 on campus. Lightpaths on are also dealt with.  
[Click here to download the document](#)

**Wireless**  
This area focuses on the wireless infrastructure campus. Radio planning, design of the wireless network, security considerations, including the implementation of IEEE 802.11 are covered, as well as requirements and radius setup are dealt with. Cookbooks for controller-based implementation given. Legal aspects are examined.  
[Click here to download the document](#)

**Network monitoring**  
This area focuses on network monitoring of the network. General requirements and framework conditions for monitoring are given. NetFlow/IPFIX analysis is covered. Security monitoring, anomaly detection and behaviour analysis are with. Particular considerations for IPv6 monitoring given. References to a number of open source given, many of which have been developed by

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GEANT > Network > Campus Best Practice > Physical Infrastructure Friday 28 Mar 2014 | Time - 15 15

### Physical Infrastructure

This area addresses the requirements for the generic cabling system on campus, both fibre and twisted pair. The requirements to the infrastructure in telecommunication and server rooms are also dealt with. This includes power supply, ventilation and cooling, fire protection as well as general ICT room plan guidelines. Recommendations for building an AV (audio-visual) infrastructure in lecture halls and meeting rooms is also covered.

**Guidelines for the Design of HE Buildings, ICT and AV Infrastructure**  
This document provides guidance on the role of ICT on campus construction projects and on how ICT personnel in the higher education (HE) sector should proceed in order to safeguard the ICT needs of their respective institutions. New building and major renovation projects within the sector may involve different forms of organisation and staffing. In order to achieve the best possible result, it is important that ICT personnel are involved from the early phases of building projects.

**Requirements for Generic Cabling Systems**  
When setting up a generic cabling system, it is recommended that the latest version of any current cabling standards are used. The standard of workmanship is considered extremely important. Detailed installation documentation is an absolute requirement in new buildings and major renovations, it is important to ensure the allocation of necessary space and pathways in order to enable the establishment of a fully functional IT environment.

**Requirements for the Design of ICT Rooms**  
An important condition for efficient ICT systems is that ICT rooms are of satisfactory quality. ICT rooms need to be optimally located in the building. It is important to carefully analyse the institution's current and future space requirements. Factors related to security, fire resistance, noise, heating, electrical fields, conduit paths, equipment transport, floor loads and any extrinsic general building structures must be carefully considered.

**Power Supply Requirements for ICT Rooms**  
The installation of standby power generators is recommended for essential ICT rooms. A centralised online UPS should be installed to supply all ICT rooms. Main electrical panels supplying essential ICT rooms shall be constructed according to Form 4-b in the EU norm NEN EN 60439-1. The need for overvoltage protection of the distribution grids must be assessed and creation of a single earth potential in ICT rooms is very important.

**CBP Documents**  
Campus Best Practice documents available to download

- Physical infrastructure
- Campus networking
- Wireless
- Network monitoring
- Real-time communications
- Security





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**Dublin, Ireland**  
**"NETWORKING WITH THE WORLD"**  
**[tnc2014.terena.org](http://tnc2014.terena.org)**

**Keynotes:**

Tracy Futhey

Barend Mons

Jelmer Ever

Lord David Puttnam

Stephen Farrell

Martyn Dade-Robertson

The Future of the Global University

Open and Big Science

Future of Education and Research

Learning in a Digital World - No Silver Bullet?

Dealing with Pervasive Monitoring

Hidden Dimensions of the Web







# DANTE and TERENA Preparing for the Future

