

The **FEDERICA** Concept:
Federated **E**-Infrastructure **D**edicated to
European **R**esearchers **I**nnovating in
Computing Network **A**rchitectures

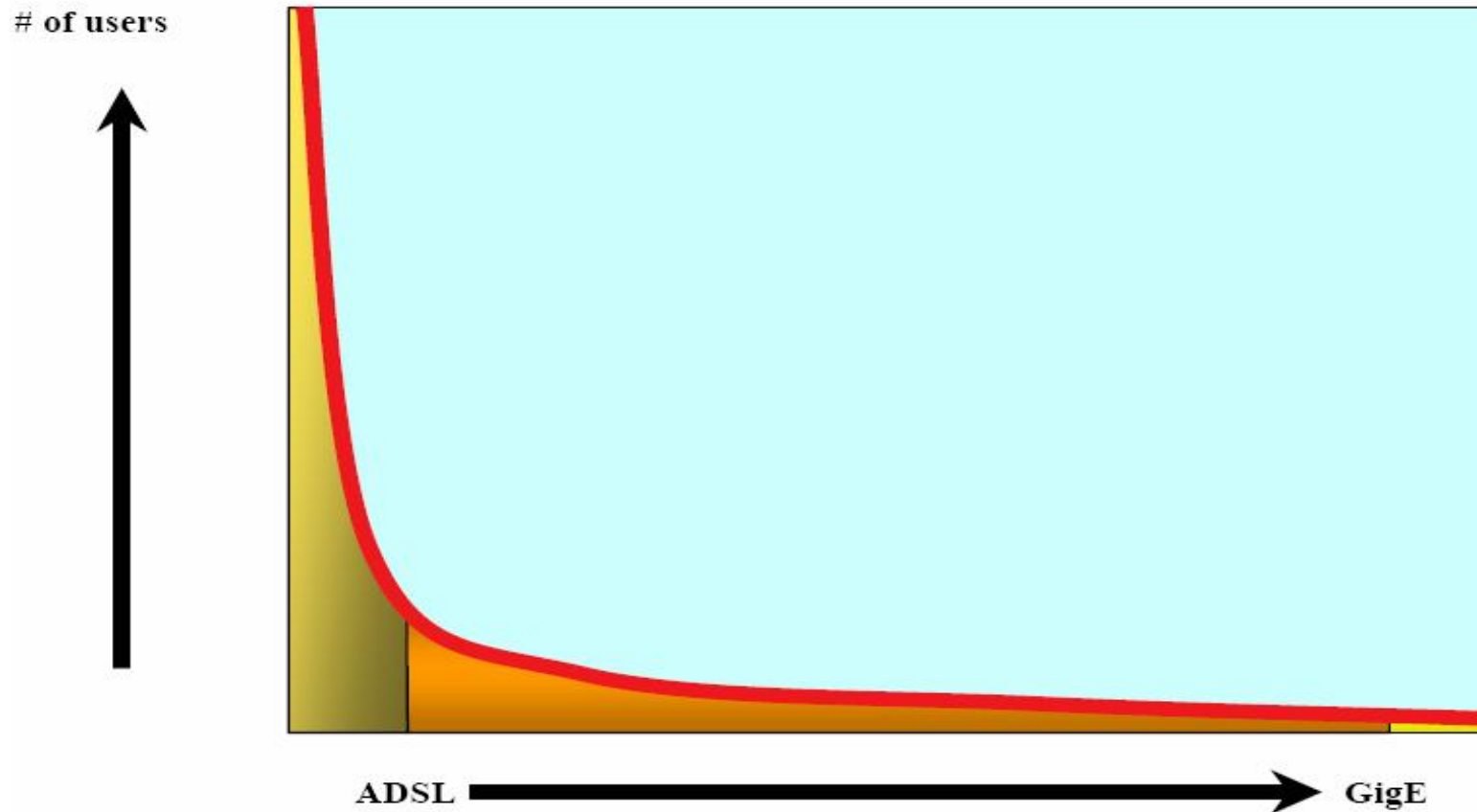
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Do we face a paradigm shift in the use of the Internet?

- Legacy Internet: Best-effort datagram routing, e2e signaling, global connectivity
 - **Producer-Consumer** model
- Trends
 - Zillion nodes (PC's, PDA's, mobile phones, wireless – ad hoc, appliances, sensors....)
 - From traditional ISPs to **Consumer-Consumer** brokerage services:
 - Search engines, content managers e.g. *Google*
 - Peer-to-peer mediators e.g. *Skype*, *e-Bay*
 - Multimedia Content Providers (triple/quadruple-play services, FMC)
- Pressing needs for:
 - Ubiquity, mobility, ambient computing, autonomic architectures: Dramatic increase in address space, routing complexity, requirements for VPN's at all levels
 - e2e security, trust
 - End-User segmentation: QoS/billing classes, **hybrid Packet/Circuit** Switching
 - Business level agreements (aka. the GSM success): Mobility, roaming, federated AAA
- IPv6 may answer many shortcomings (but not all) of the current Internet:
 - Address explosion, routing, support of multicasting, mobility, roaming, multi-homing...
 - Promoted by EU, Japan, China... *not so popular in the USA*
 - Supported by CISCO, MS...
 - Many open issues (DNS, security...)

User Segmentation

SERENATE Study, Cees de Laat, *D. Williams et.al.*



Disruptive Network Research Testbeds & NRENs-GÉANT2

- **US GENI Approach:**
 - Clean slate infrastructure for core and access (including Wireless and Sensor networks)
 - Expect to attract users for emulating realistic scenarios
- **Europe:**
 - Existing hybrid Research & Education networks (**NRENs, GÉANT2**) are ready to support disruptive experiments in parallel to IPv4/v6 & “circuit switched” high-end users, via virtualized/sliced testbed interconnections:
 - WDM, 10 GigE Optical Private Networks, GigE - SDH slicing
 - MPLS, Premium IP VPNs
 - GÉANT is a federal network interconnecting 31 (or 35) NRENs
 - **End-Users are connected (and billed) via their respective NRENs**
 - **Industrial and academic RTD labs (e.g. FIRE supported testbeds) fall within NREN Acceptable Use Policies (AUP's)**
 - **e2e coordination on monitoring and provisioning supported via GÉANT2/NREN tools**
 - Multi-stakeholder interaction needs strengthening: NRENs/GÉANT, Researchers, Vendors, Service Providers

Related EU FP7 Project Lines

- Infrastructure and Testbed funding:
 - 1st Call, ICT Based Infrastructures: *INFRA-2007-1.2.2, e-Infrastructure Deployment serving Scientific Communities* (27 M€ EC Contribution, May 2, 2007)
 - DG INFSO-M, Unit F3, *GÉANT & e-Infrastructures*
 - 2nd Call, Thematic Priority on ICT: *Challenge 3.1, Objective 3.1.2.1, New Paradigms and Experimental Facilities* (40 M€ EC Contribution, Oct. 2007)
 - **F**uture **I**nternet **R**esearch & **E**xperimentation (FIRE) Initiative,
 - DG INFSO-M, New Unit F4, *New Infrastructure Paradigms & Experimental Facilities*
- R&D Projects towards the Network of the Future:
 - 1st Call, Thematic Priority on ICT: *Challenge 3.1, Objective 3.1.1.1, The Network of the Future* (200 M€ EC Contribution, May 2007)

Participation of Multiple Stake-Holders: End-Users, Vendors, Service Providers & NRENs + DANTE + TERENA

If the provision of such e-Infrastructures requires the engagement of the broad ICT community and operators of specific infrastructures (such as the National Research and Education Networks or the operator of Computing or Grid support Centres), the beneficiary communities should be as widespread as possible, tackling all scientific and engineering domains (including the research community on ICT).

RI Workprogramme, p. 7, ICT Based RI

Structure of FEDERICA: (Human) Networking Activities

- Management
- User Requirements of Disruptive Network Research Communities (FP7 FIRE Projects, University and Industrial RTD labs, NREN & Telco tesbeds)
- Standardization & Dissemination (interaction with standards bodies, liaise with conferences, published materials, web sites)
- Training (familiarizing end-users to the FEDERICA virtual infrastructure and toolbench)
- Consolidation and Enlargement of End-User Communities

Structure of FEDERICA: Service Activities

- Virtual Infrastructure Planning & Deployment
 - Topology planning, geared towards FP7 Network of the Future Projects: **Business model for service provisioning?**
 - Slicing of **production** NREN/GEANT substrate à **disruptive** virtualized environment
 - **Installation of Open Source Routers and Protocol Agnostic Switches, isolated from production facilities in selected core NREN & DANTE PoP's**
 - Establishment at the edges of PC clusters aka. **Emulab** (interconnected)
- Adaptation of existing multi-domain **monitoring** & **provisioning** tools to virtualized infrastructures (e.g. GN2 JRA1/3, UCLP etc.) into a Toolbench
- Virtualized Network Operational Support
 - Federated provisioning, e2e monitoring, fault management of virtual resources, AAI
 - Support of the Toolbench (user empowered provisioning, monitoring, visualization, dynamic configuration of user communities....)
 - Federated support of end-user emulation clusters (**Emulab**), testbeds and overlay networks (**PlanetLab**): **OneLab** ?

Structure of FEDERICA: Joint Research Activities

- Integration of novel Network Elements in e2e virtual infrastructures:
 - Protocol Agnostic Switches
 - Logical Open Source Routers
 - Access of API's to researchers, needed for experiments in all protocol planes (data, control, management)
- Adaptation of Control & Management Plane Tools and Protocols for stitching resources in multi-domain, multi-vendor virtual infrastructures
- Development of a **distributed emulation facility** amongst end-user PC clusters for testing & assessing disruptive concepts
- Development of SOA based Virtualization services, orchestrated via Workflow Brokers (BPEL)
- Last Mile Virtualization (wireline, wireless) ?