FEDERICA
Federated E-infrastructure Dedicated to European Researchers
Innovating in Computing network Architectures

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FEDERICA at a glance

What: European Community co-funded project in its 7th Framework Program in the area “Capacities - Research Infrastructures”
3.7 MEuro EC contribution, 5.2 ME budget, 461 Man Months

When: 1st January 2008 - 30 June 2010 (30 months)

Who: 20 partners, based on stakeholders on network research and management:
11 National Research and Education Networks, DANTE (GÉANT2), TERENA, 4 Universities, Juniper Networks, 1 small enterprise, 1 research centre - Coordinator: GARR (Italian NREN)

Where: Europe-wide infrastructure, open to external connections
Scope: Create an **e-Infrastructure** for (future) Internet research made of network and computing systems, providing virtualized networks/facilities for end-users, allowing **disruptive emulations**. Research in multi-(virtual)-domain **control, management and monitoring**, including **user oriented control**.

Pave the way/create experience for GN3

How: Employ a **mesh** of initially up to 1 Gbps MPLS & GigE **circuits** from NRENs and GEANT2 (using the GN2+ service)

Install **virtualization computing nodes** (capable of hosting e.g. open source routers) and open API **routers** and **switches** in selected FEDERICA PoPs

Develop a **tool-bench** for managing virtual e2e facilities and the infrastructure itself
# FEDERICA Partners

## National Research & Education Networks (11)

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<tr>
<th>Organization</th>
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<tbody>
<tr>
<td>CESNET</td>
<td>Czech Rep.</td>
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<td>DFN</td>
<td>Germany</td>
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<td>FCCN</td>
<td>Portugal</td>
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<td>GARR (coordinator)</td>
<td>Italy</td>
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<td>GRNET</td>
<td>Greece</td>
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<td>HEAnet</td>
<td>Ireland</td>
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<td>NIIF/HUNGARNET</td>
<td>Hungary</td>
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<td>NORDUnet countries</td>
<td>Nordic</td>
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<td>PSNC</td>
<td>Poland</td>
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<td>Red.es</td>
<td>Spain</td>
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<td>SWITCH</td>
<td>Switzerland</td>
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## Small Enterprise

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<td>Martel Consulting</td>
<td>Switzerland</td>
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## NRENs organizations

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<th>Organization</th>
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<td>TERENA</td>
<td>The Netherlands</td>
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<td>DANTE</td>
<td>United Kingdom</td>
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## Universities - Research Centres

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<td>i2CAT</td>
<td>Spain</td>
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<td>KTH</td>
<td>Sweden</td>
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<td>ICCS (NTUA)</td>
<td>Greece</td>
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<td>UPC</td>
<td>Spain</td>
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<td>PoliTO</td>
<td>Italy</td>
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## System vendors

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<td>Juniper Networks</td>
<td>Ireland</td>
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NREN partners provide a European coverage using the GN2+ service and
- allow connection to Univ. and Research centres partners
- Provide “HUB” functionalities and possibility to extend the e-Infrastructure to other countries and projects using physical or logical circuits
- Contribute with tools and specific expertise
FEDERICA Objectives

- **Support the research** on new Internet architectures and protocols
  - create a versatile, scalable, European wide “technology agnostic” infrastructure, separated from the production networks
  - open to host researchers hardware and applications
  - Simultaneous use by more than one research group
  - The user can have full control of the network up the data link (later to lower) layer and access monitoring data

- Develop experience and a model for **managing and using virtual infrastructures** as a combination of networks and systems

- **Exploit** at their best the existing NREN and GEANT networks and available technologies
FEDERICA Objectives (cont)

- Facilitate technical discussion amongst specialist, in particular when based on experimental results and disseminate knowledge and NREN experience
- Provide information for next generation of the NREN networks
- Focus on new multidomain architecture with end-to-end services open to any application type
- Use, Test and advance where possible tools and services being developed by GEANT2 and NREN and the Partners, in particular for end-to-end services
- Enable graceful implementation of new inter-domain service layer (liaising, contributing with standardization, e.g. IETF, ITU-T, OIF, IPsphere)
GÉANT2 and NRENs (35) in Europe

The European NRENs in the last years created diffuse and advanced hybrid networks, offering advanced end-to-end services. GÉANT2 connects them.

This architecture allows the creation of the infrastructure for future Internet and virtualization research in parallel to the production environment.
Phased Approach

- **Layer available to the User**
- **Layer NOT available to the User**

**FEDERICA substrate**

- **Installation**
- **Phase 2**
- **Phase 3**

- **Month 1**
- **Month 9**
- **Month 21**
- **Month 30**

- **Application Layer**
- **Transport Layer**
- **Network Layer**
- **Data Link Layer**
- **Physical Layer**

**Diagrams show the availability of the FEDERICA substrate layers across different phases and months.**
Leverage dark fiber infrastructure and GÉANT2. Use as data link 1Gb Ethernet in a mesh.

Initial network will be composed by 5 PoPs meshed.

Interconnection with other infrastructures and testbed possible.

MPLS L2 LSPs may be added.
Project Activities

Network Activities:
- NA1: Management
- NA2: Building and consolidating the User community
- NA3: Standardization & Liaisons
- NA4: Dissemination and Training

Service Activities:
- SA1: Infrastructure Support
- SA2: Operational User support and Tool bench development

Joint research Activities:
- JRA1: network control and management
- JRA2: novel paradigms and user control
Activities relationship

Tight feedback loop between Users, implementation and research.
FEDERICA - Goals Summary

In scope

- Forum and support for researchers/projects on “Future Internet”. Support of experimental activities to validate theoretical concepts, scenarios, architectures, control and management solutions. Users have full control of their slice
- Provide on European scale network and system agnostic e-infrastructure to be deployed in phases. Provide its operation, maintenance and on-demand configuration
- Validate and gather experimental information for the next generation of research networking also through basic tool validation
- Dissemination and favor cooperation of NRENs and User community
- Contribution to standards in form of requirements and experience

Out of scope

- Extended research, e.g. advanced optical technology developments
- Development and support of Grid applications
- Offer computing power
- Offer transit capacity
Howto issues: 3D Virtual Routing, e.g.
(From J. Navratil, CESNET)
FEDERICA & Next Generation Networks

FEDERICA brings in a specific set of challenges and possible future technologies to cope with:

- **virtualization** in networks
- **Integration** of computing elements in the network to operate the network itself and to provide advanced services
- **Multidomain** integration and service definition for multidomain, multi-(virtual) network communication (avoiding fragmentation and fostering interoperability)
- Focus on **end-to-end** paradigm and user control
- **Horizontal (layered)** approach in network architectures (vs Vertical)
- Control/management plane and monitoring are of paramount importance (integrated vs overlay model still open)
FEDERICA Partners
More information at:

http://www.fp7-federica.eu