FIREWORKS

Future Internet Research and Experimentation

FIRE OVERVIEW
European Testbeds Projects

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Vision

- "*The Internet only just works*"*!*
- Explore the possible Future(s) of the Internet
  - Realistic view
    - Continuous evolution and change
- The future Internet might be Polymorphic
  - Content, Wireless, DTN, …
  - Many proposals in progress
- How to assess the assumptions and solutions explored by the research projects?
  - Experimentation facility *(+ Network Science)*

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Testbeds for Future Networks: a *History* behind us in

European Commission
Information Society
and Media

- Testbed Projects Landscape
  - Various technological flavours and focus in the different testbeds
  - From infrastructure to services
  - Often limited in scope, time and usage
  - Sustainability!

- GEANT
  - Network Research Infrastructure for Europe
  - Support for e-Science

GEANT2

DANTE

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Main questions?

- Building a Facility, which affordable long-term vision can we develop?
  - No dogmatism! Usage/Cost Trade-off.
- What is a reasonable starting point?
  - Users of the Facility from the origin
- How to study different transition scenarios?
- What are the purposes to be served?
  - System approach, Multidisciplinary, Societal
- What are the facility-specific research & industrial challenges?

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The Facility as one open shared virtualized resource

The Federation concept

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Building FIRE

- Do not start from scratch
  - Too long to make the “utility function” high e
    the short-medium term
  - Initialize with existing testbeds
- Enforce the federation concept to expect a convergence in the long-term
  - Provide some diversity to cover various needs/ communities
  - General and dedicated resources made available
  - Develop incentives for research projects (at large) to experiment with their ideas
  - Lower the entry cost for experimentation

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Facility research challenges

- Federation
  - Inter-operability framework
  - Control plane, resource management, incentives
- Virtualization
  - Run concurrent experiments, support services
- Monitoring
  - Collect data and make them available
- Legal
  - Responsibilities and liabilities, IPR, …
- Benchmarking
  - Assessment of the results produced
- Security
  - Robust and secure facility
- Economics
  - Of the facility, for the users, the operators

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The Federation concept in action

Panlab

OneLab
FUTURE INTERNET TEST BEDS

Federica

GLab
www.german-lab.de

SAC

....

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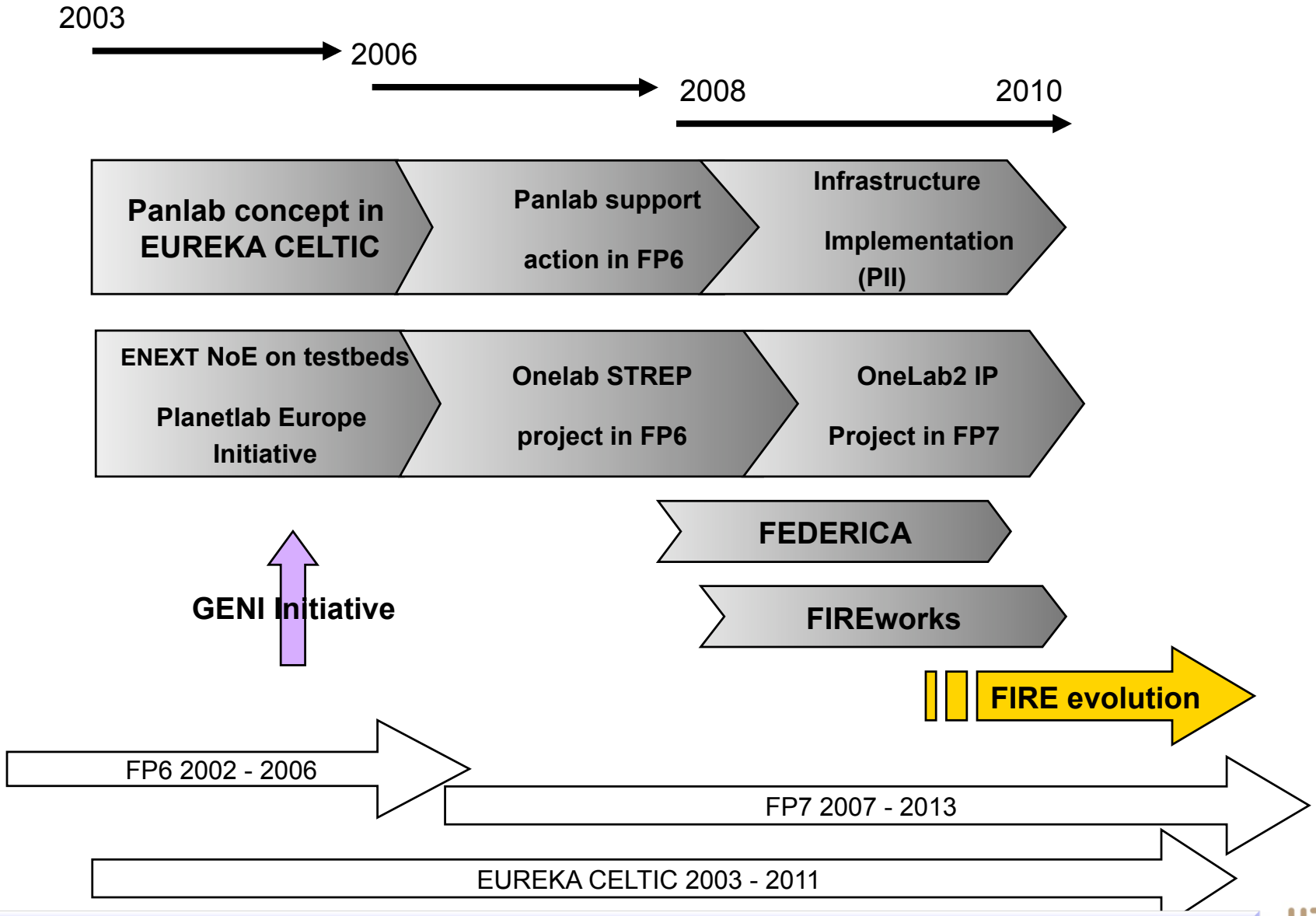
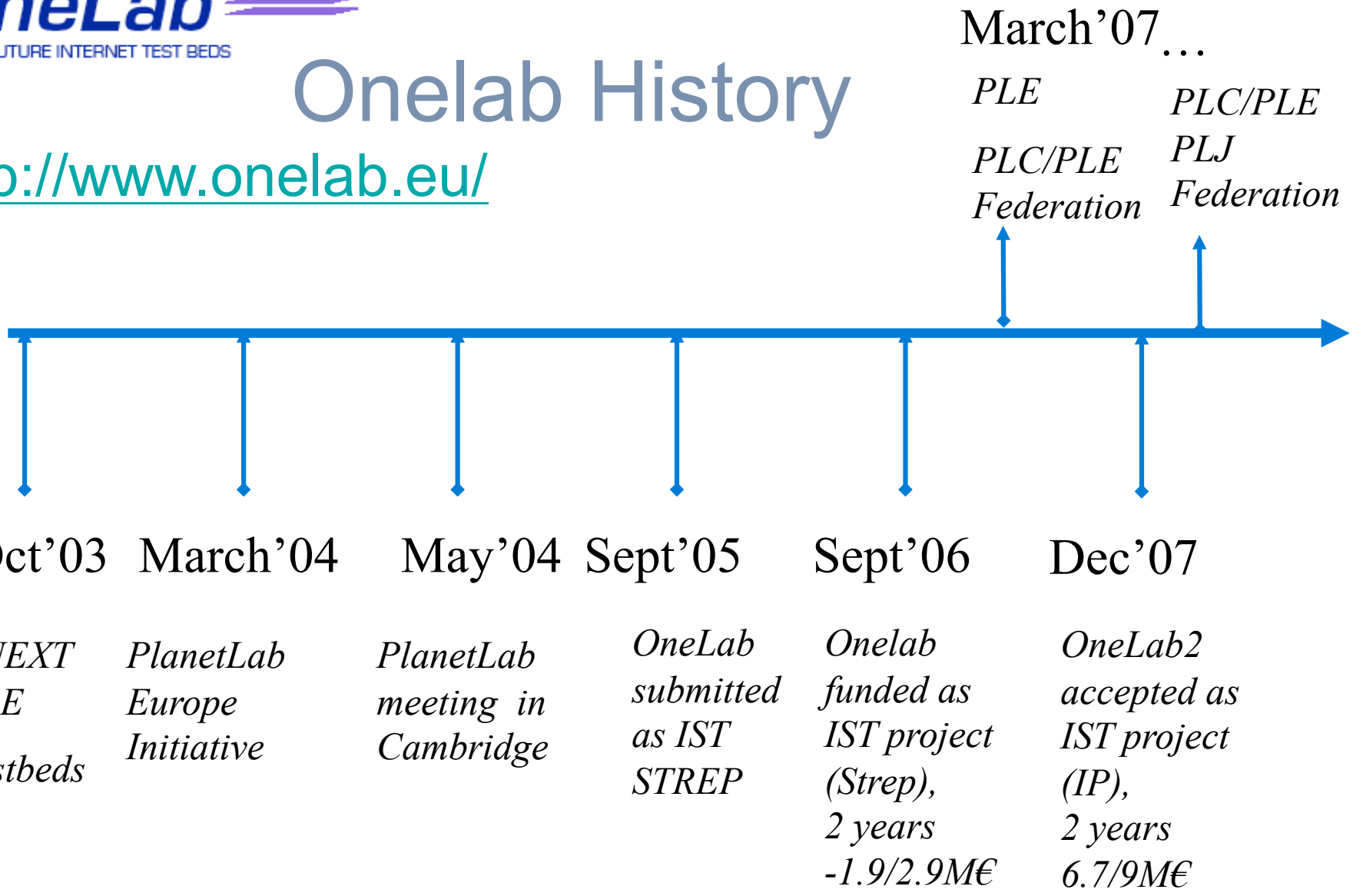
FIRE evolution



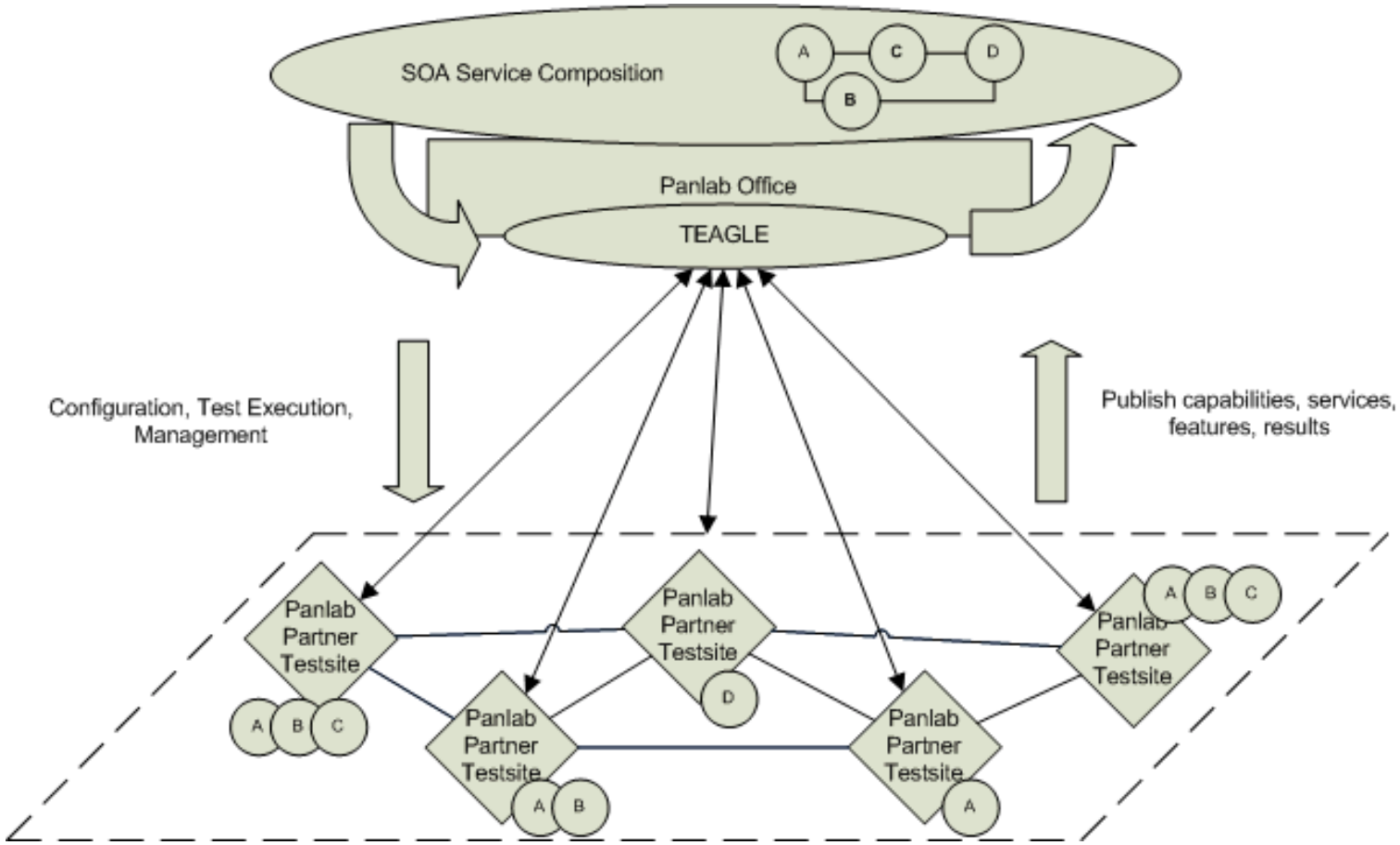
Onelab History

http://www.onelab.eu/



PII Architecture

Common abstract control framework, which enables the interconnection of diverse testbeds



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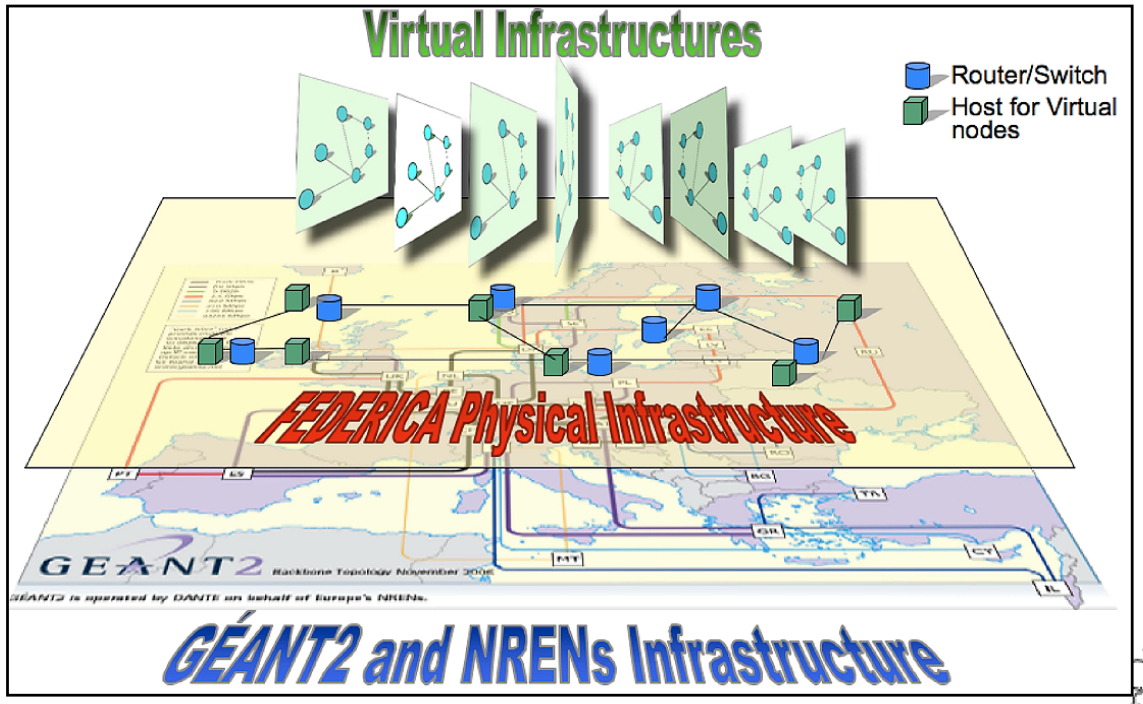
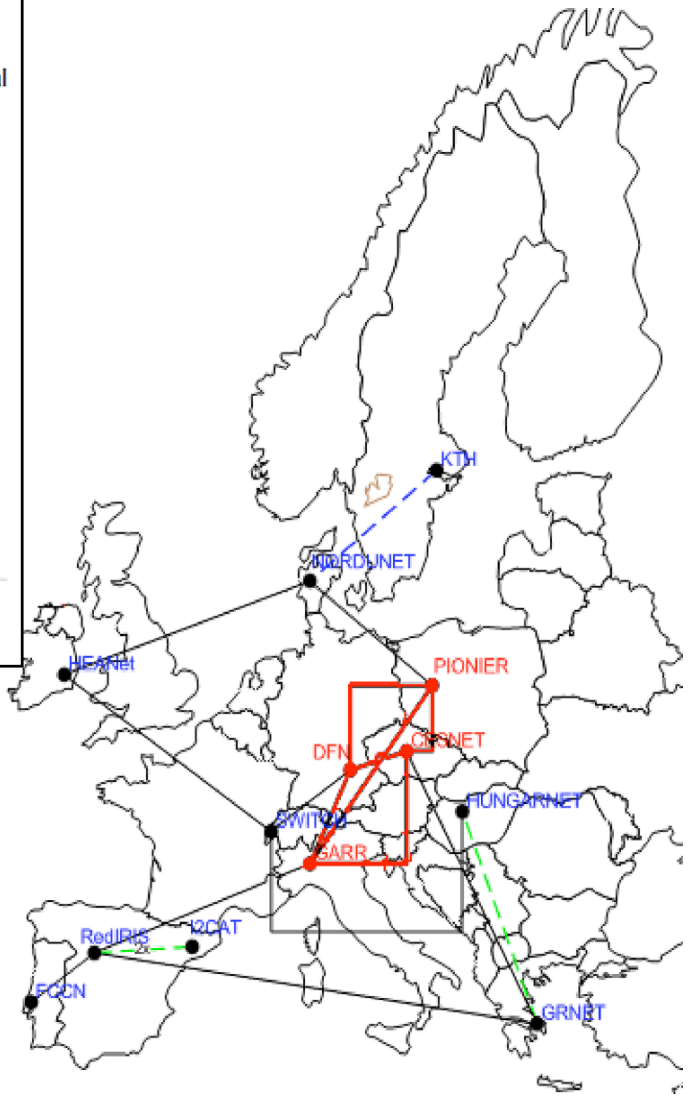
FEDERICA e-Infrastructure





Research Infrastructure FP7 Project, based on stakeholders on network research: NRENs, DANTE, TERENA, end-users and vendors

Based on a mesh of physical Gigabit Ethernet circuits (from NREN/GEANT) and virtualization technology.

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A rough comparison of the FIRE Facility prototypes

	Panlab Pan European Laboratory Infrastructure Implementation	OneLab FUTURE INTERNET TEST BEDS	FEDERICA
Context	• Converged Telecom/ Internet Service & Network Environments • Industry focus	• Distributed system • IP networking • Research focus	• Networking Research • Network technology agnostic environment • GÉANT, NRENs
Platform	• SOA • (e.g. to federate IMS based testbeds among themselves and with others)	• PlanetLab – both public and private versions • Own evolution with Federation	• Gigabit transmission equipment and computing nodes both capable of virtualization
Focus	• Converging network, service platform and application infrastructures • Complete Control over Dedicated Resources • Reproducibility	• Shared Resources • Real World Environment • Applications enduring over time • Partial Control • Variability	• Virtual slices composed of networking and computing resources • Isolation of experiments in slices • Operational environment • Reproducibility & monitoring

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Common Issues

- Federation
  - « Peering » Relationships
  - Resource description
  - Resource Management
  - Control planes
- SLA, Quality assurance of testing activities
- Monitoring, Virtualization
- Customer support
- Gouvernance (inc. Legal, IPR, …)

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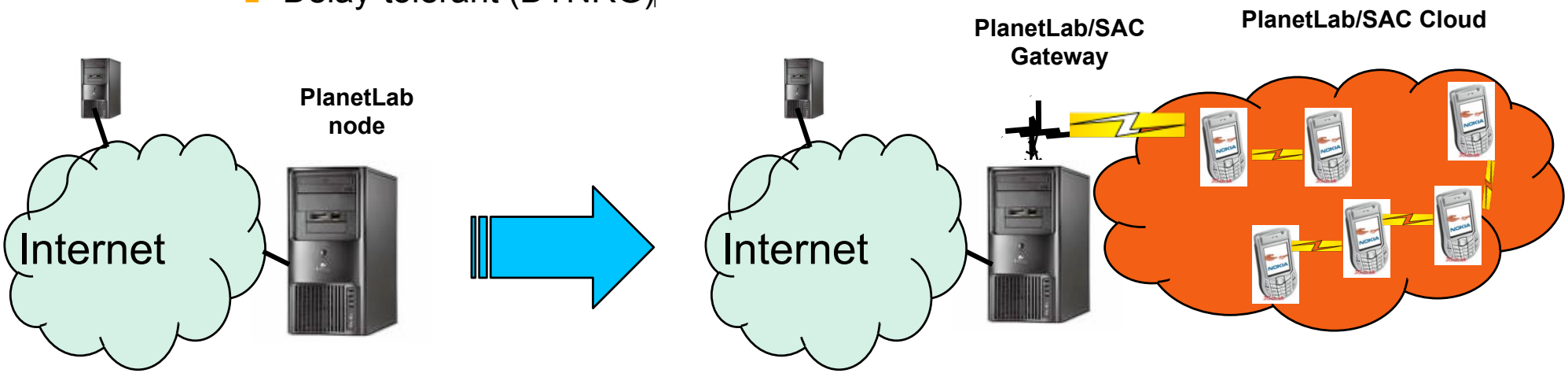
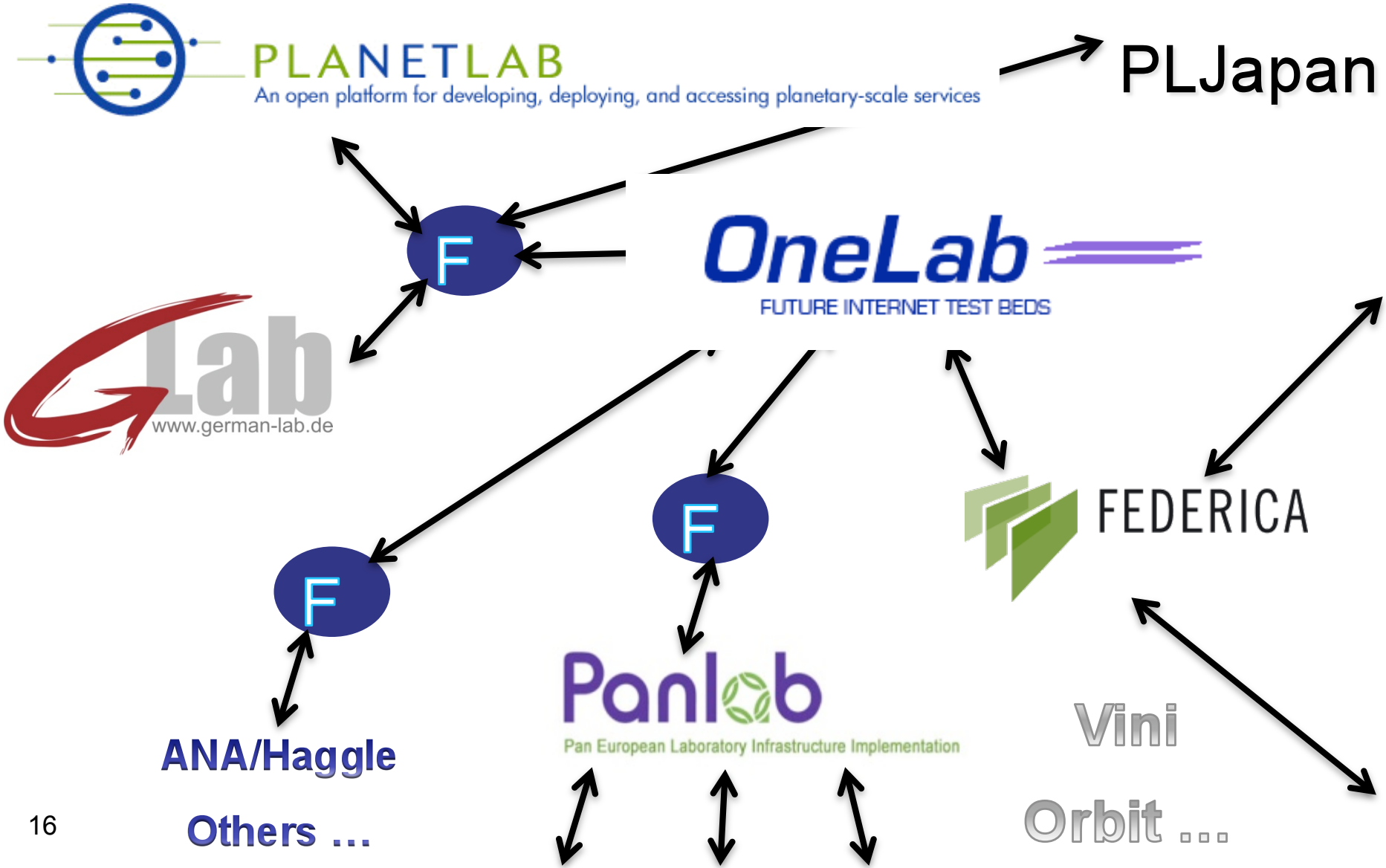
The specific Onelab - SAC Testbed

- **PLE/SAC Gateway**
  - Extends PlanetLab nodes to support SAC **clouds** based on Future Internet network paradigms
    - Autonomic Networks (EU FP6 ANA)
    - Opportunistic (Pocket switched networks – EU FP6 Haggle)
    - Delay-tolerant (DTNRG)



Federation & Test-beds



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Concluding remarks

- Building a facility is a major challenge
  - Complex process
  - High risk, non technical issues (IPR, Legal, …)
  - Should target Industrial & Academic objectives
  - Sustainability
  - Intensive International collaborative effort required
- FIRE is about:
  - Two complementary dimensions (NS & Exp)
  - Not a one size fits all
  - Federation concept
  - Based on an ecosystem, Multi-year, EU objective

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Test-Beds “As close as possible to real life!”

"No, you weren't downloaded.
Your were born."