

# FEDERICA(@SWITCH)

## An Overview



# SWITCH

Serving Swiss Universities

ERCIM Meeting 16.02.2010

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# Out-line

- What's about FEDERICA
  - Project FEDERICA
  - Technical aspects
  - Status and FEDERICA II
- FEDERICA - Activities@SWITCH
- Discussion

# FEDERICA

## Scope:

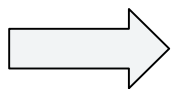
- Create an e-Infrastructure for “Future Internet” research
- Provide virtualized networks / facilitates for end-users,
- Allowing disruptive emulations.

## Objectives:

- Supports research on Future Internet and on virtualization of e-Infrastructure
- European-wide e-Infrastructure - Maintaining, supporting by extending its scope
- Developing tools and services for managing virtual infrastructure
- Enable federated services, e.g. like GENI, GpENI etc.

## How to do:

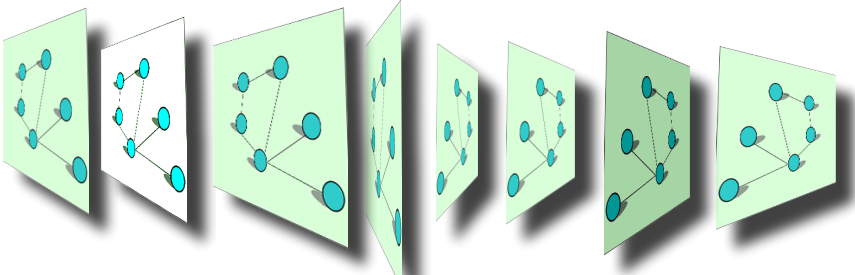
- Employ a mesh of initially up to 1 Gbps MPLS & GigE circuits.
- Install virtualization nodes, open API Routers and switches.
- Develop a tool-bench for managing virtual e2e facilities and the infrastructure itself.






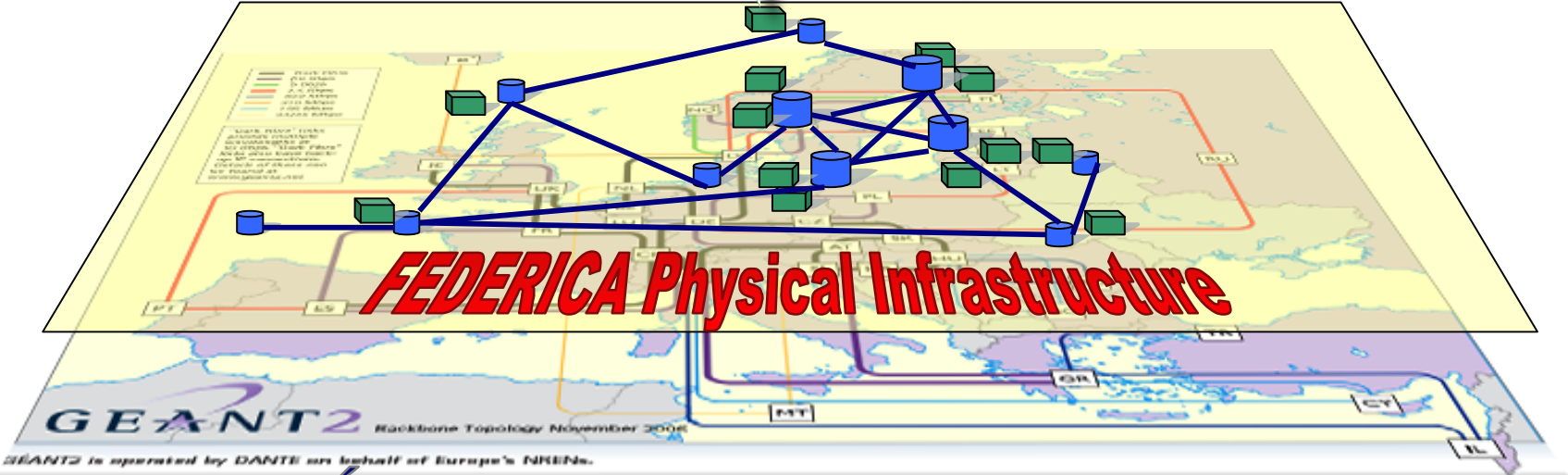
**FEDERICA - an e-Infrastructure on NRENs e-Infrastructure**

# FEDERICA e-Infrastructure

## Virtual Infrastructures (slices)

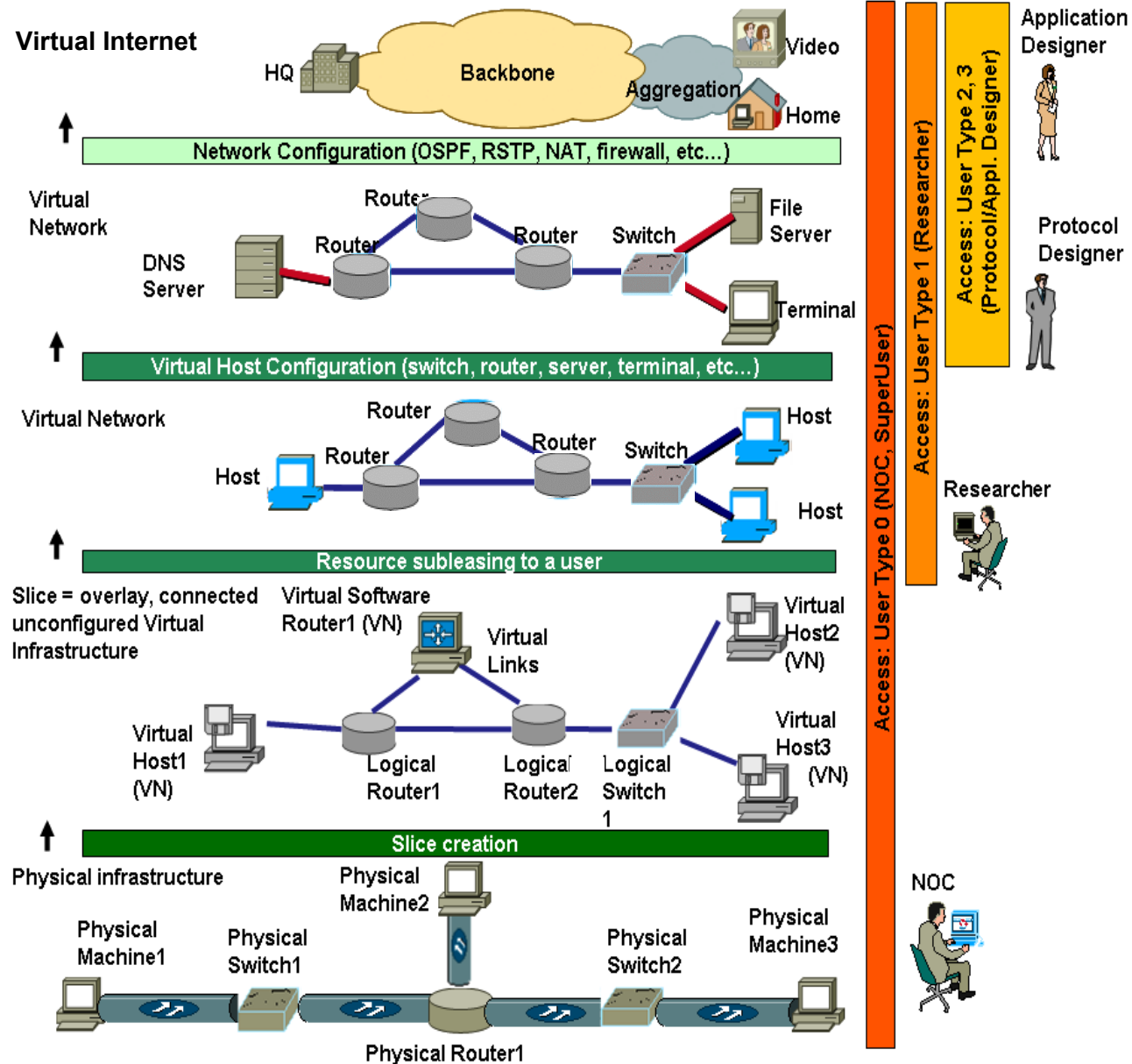


-  Router/Switch
-  Host for Virtual nodes
-  Raw Ethernet 1Gbps (Fiber later)

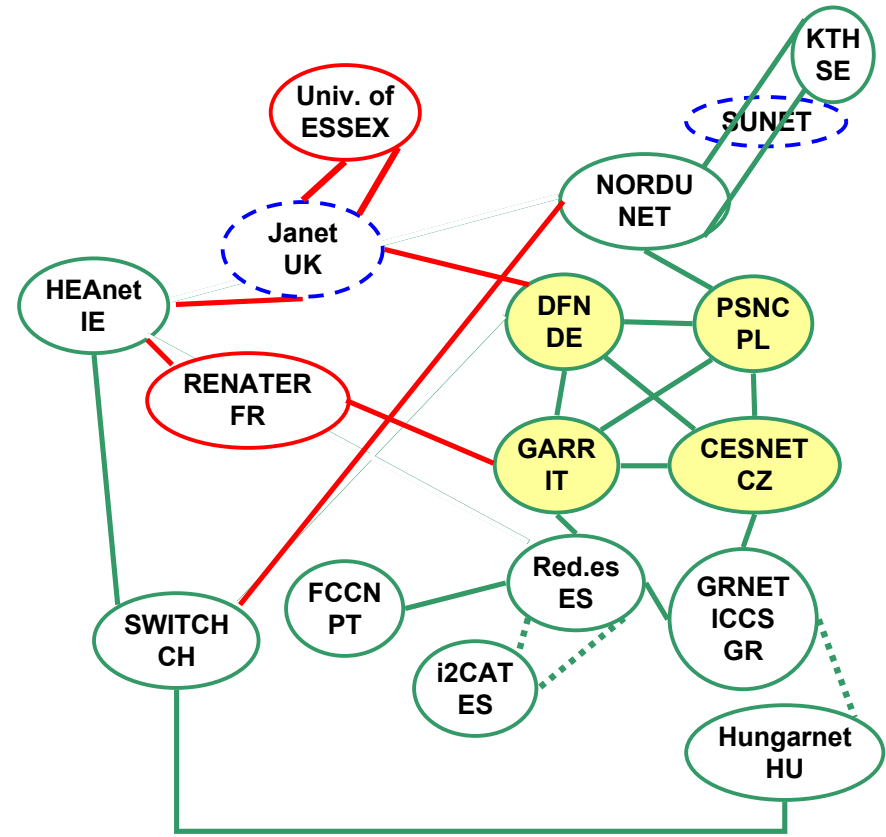
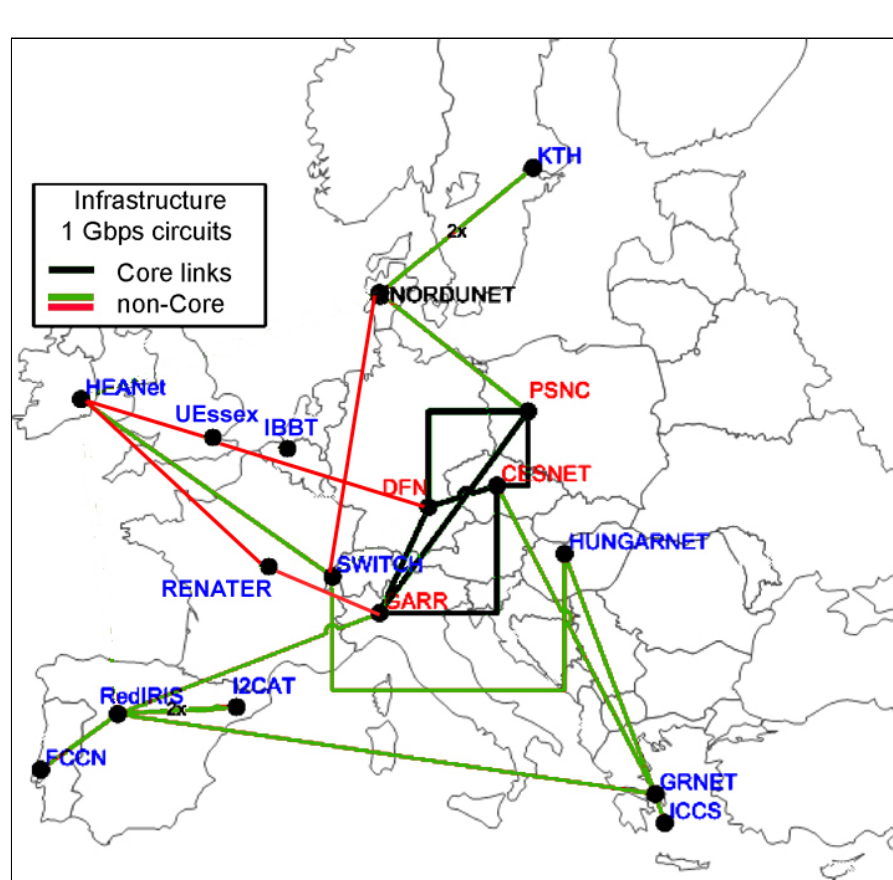


## GEANT2 and NRENs Infrastructure

# From physical to virtual



# Evolution of e-Infrastructure

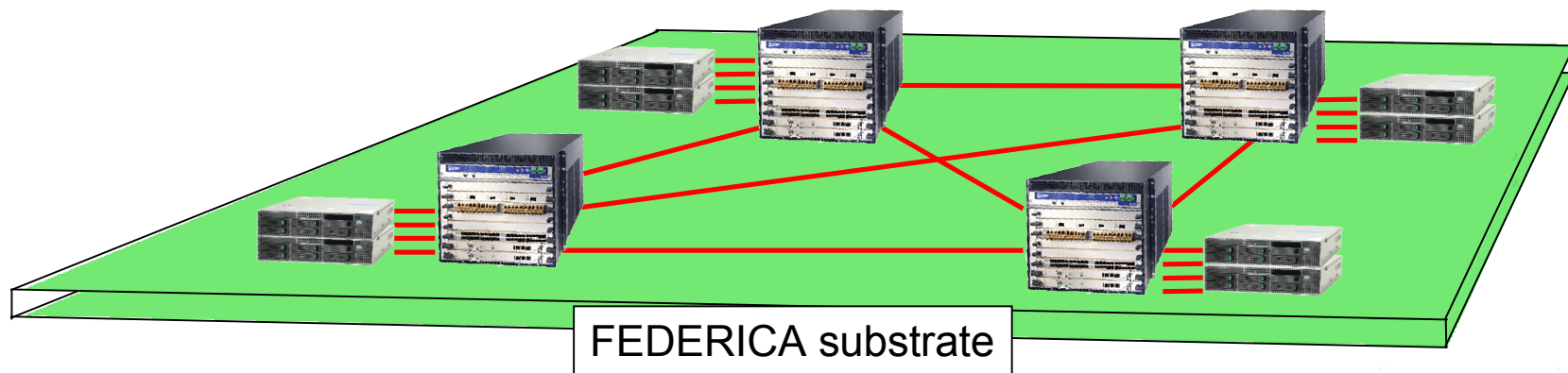


FEDERICA II

# The Core Substrate - HW

Switch: Juniper MX480 Dual CPU, 1 line card with 32 ports at 1Gb Ethernet. Virtual and logical routing, MPLS, VLANs, IPv4, IPv6, 2 of the 4 line cards have hardware QoS capabilities)

V-Nodes: each is a 2 x Quad core AMD @ 2GHz, 32GB RAM, 8 network interfaces, 2x500GB disks, Virtualization SW





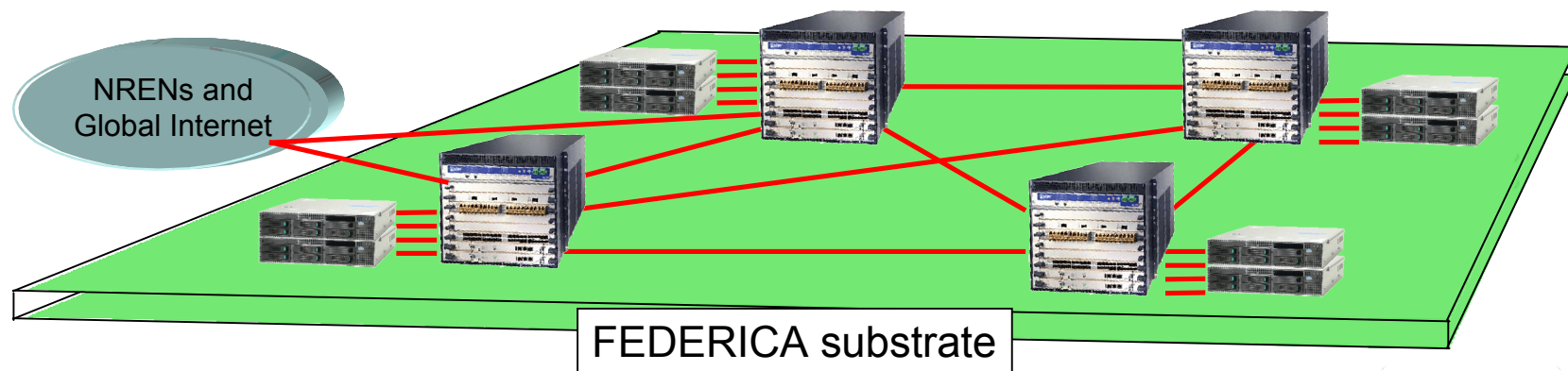
# The Core Substrate - IP

Management plane defined as an IP Autonomous System:

AS: 47630 (public, no transit, peers with GARR, PSNC which announce the AS to GN2 and General Internet) **active**

IPv4: 194.132.52.0/23 (public addresses) **active**

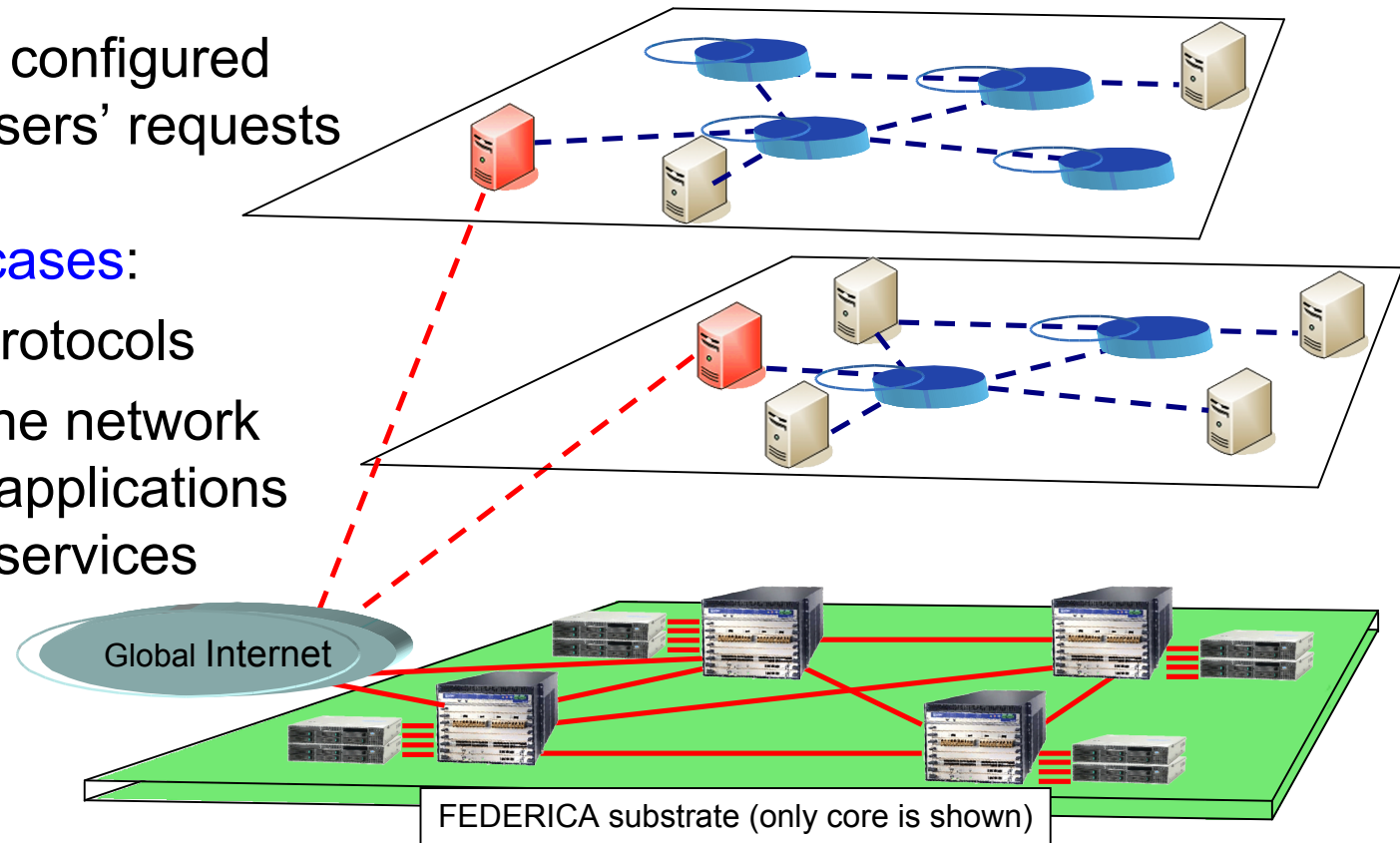
IPv6: 2001:760:3801::/48 (public) (to be configured soon)



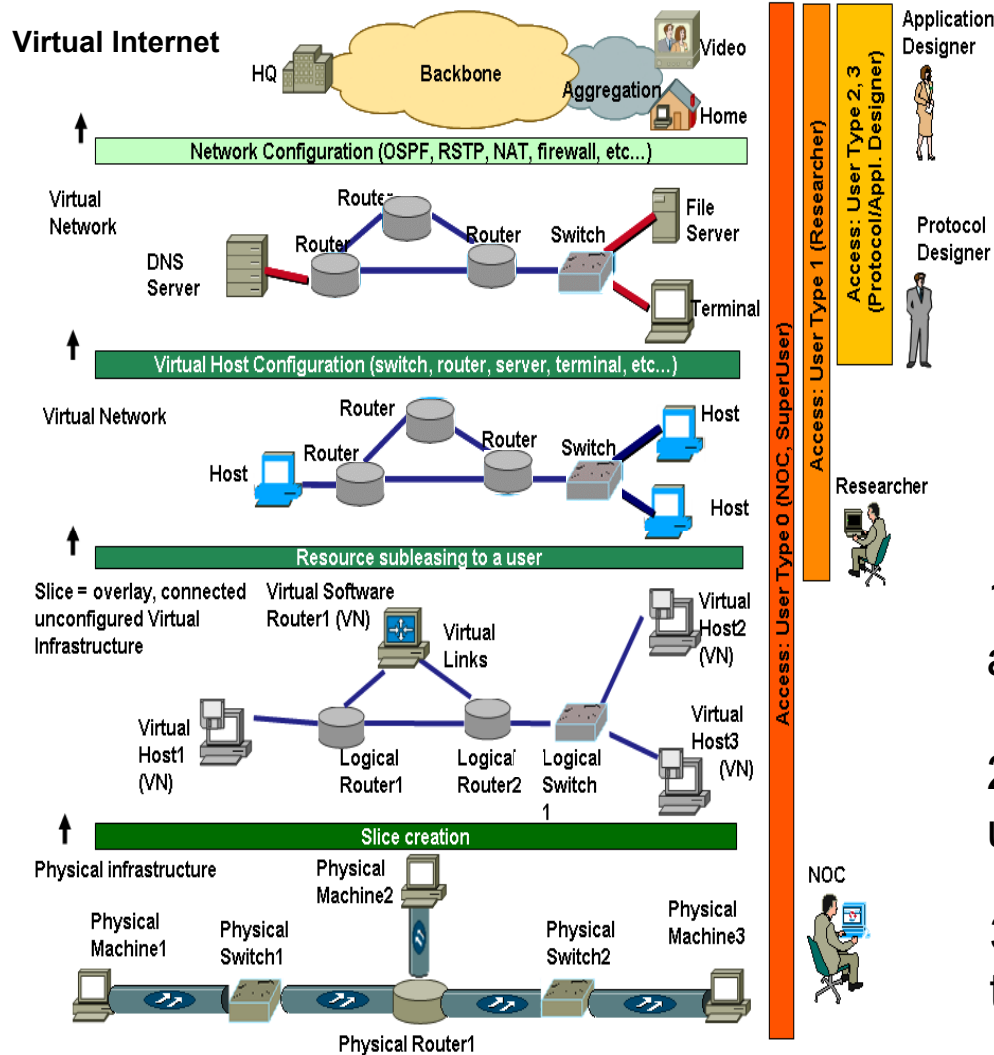


# Offering Slices for any Research

- Using **Virtualization technologies**  
“slices” composed by virtual resources (**circuits, nodes, routers**)
- The slices are configured according to users’ requests
- Possible **use cases**:
  - new **routing** protocols
  - behavior on the network of distributed applications
  - Inter-domain services



# From physical to virtual



## Case Study Slice:

The user requests an Infrastructure made of L2 circuits, un-configured virtual nodes, to test a new BGP version.

## Create :

1. user credentials and authentication and a “Slice”
2. Virtual Gateway to bridge the user from outside into the slice
3. Create resources and connect them as specified by the user

# Service model

The FEDERICA basic service

create “virtual infrastructures” with full user control  
is only lightly dependent on the orchestration.

The project made a choice to support **two requirements of the service** that imply **manual intervention at the beginning** :

- The **UPB** to accept, register, prioritize and counsel the users’ proposals
- The **overall reproducibility requirement** which requires a **manual** mapping from physical to virtual resources.

FEDERICA and FEDERICAII have a goal to increase the level of automation.

# FEDERICA(II) Consortium

(in red the new partners)

## •National Research & Education Networks

- CESNET Czech Rep.
- DFN Germany
- FCCN Portugal
- GARR (coordinator) Italy
- GRNET Greece
- HEAnet Ireland
- NIIF/HUNGARNET Hungary
- NORDUnet Nordic countries
- PSNC Poland
- Red.es Spain
- RENATER France
- SWITCH Switzerland

## •Small Enterprise

- Martel Consulting Switzerland

## •NRENs organizations

- TERENA The Netherlands
- DANTE United Kingdom

## •Universities - Research Centers

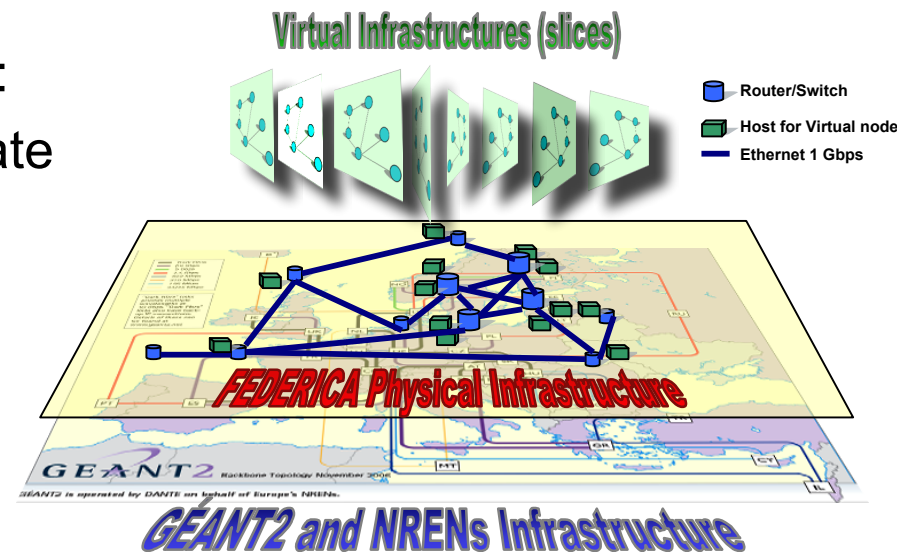
- i2CAT Spain
- IBBT Belgium
- KTH Sweden
- NTUA (ICCS) Greece
- Univ. of Essex UK
- UPC Spain
- PoliTO Italy

## •System vendors

- Juniper Networks Ireland

# FEDERICA II

- The **evolution** of FEDERICA based on **virtualization** allows: researchers a **complete control** of their set of resources (a “slice”) enabling **disruptive experiments** at **all** communication layers over a realistic substrate.
- Particular care is placed in **reproducibility** of the experiments and in the avoidance of **complexity**.
- **Proposed evolution from FEDERICA:**
  - add **optical** resources to the substrate
  - **increase the topology** to outreach more user groups and facilities
  - support **cloud computing** research



# Where will the optical infrastructure be integrated and virtualized?

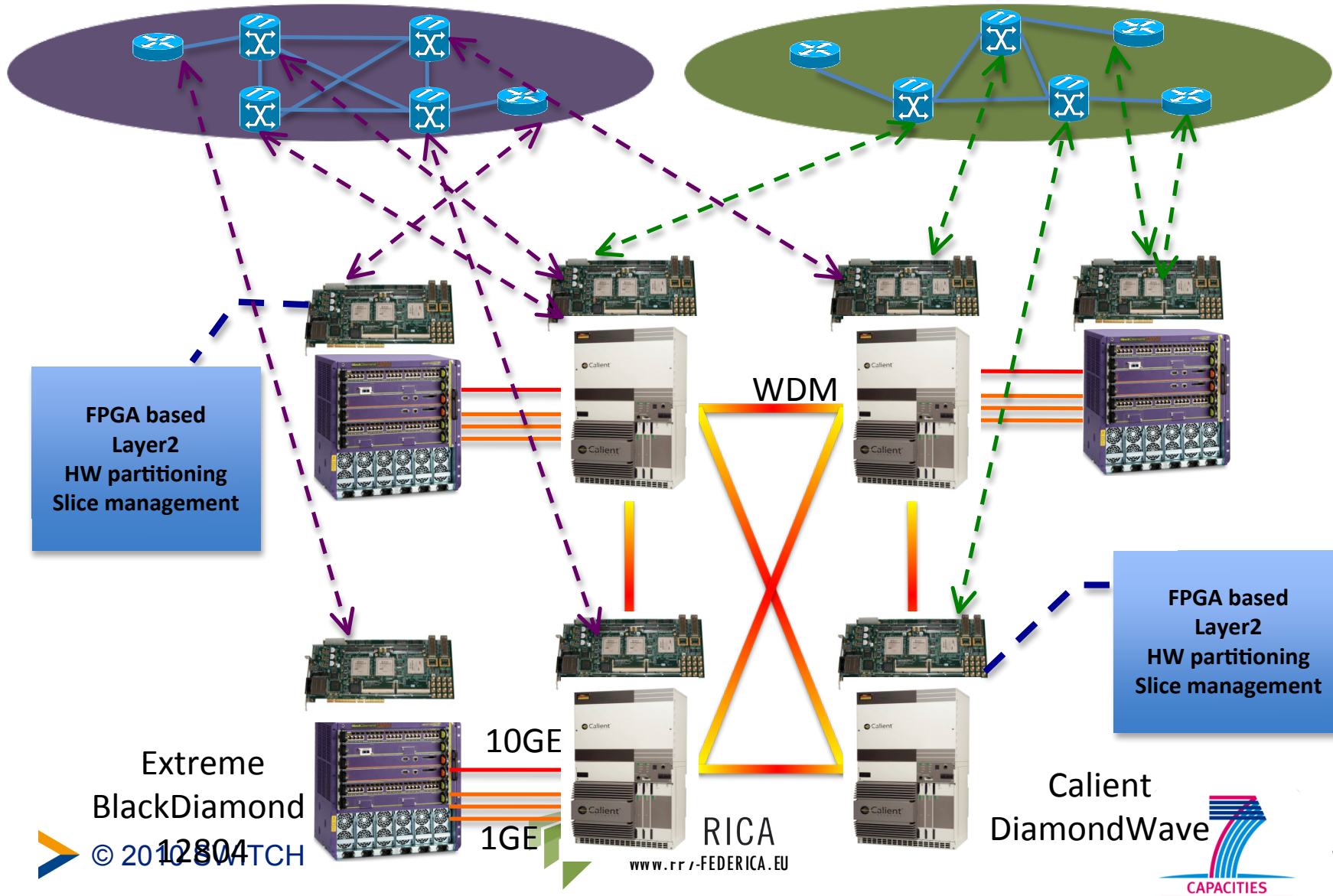
Three Point of Presence (optical islands) with specific hardware and software for the optical layer:

- UEssex (integration by month 6, using a couple of 1 Gbps Ethernet circuits to FEDERICAII, through the support of Janet, the UKNREN).
- IBBT and CESNET (initial integration through Internet and/or tunnels on Internet, then feasibility study of optical integration)
- Fibre and/or wavelength switching capabilities in each PoP
- DWDM ports, fibre ports,
  - 1 & 10 Gb
  - sub-wavelength

# Layer1-layer2 Infrastructure Partitioning example

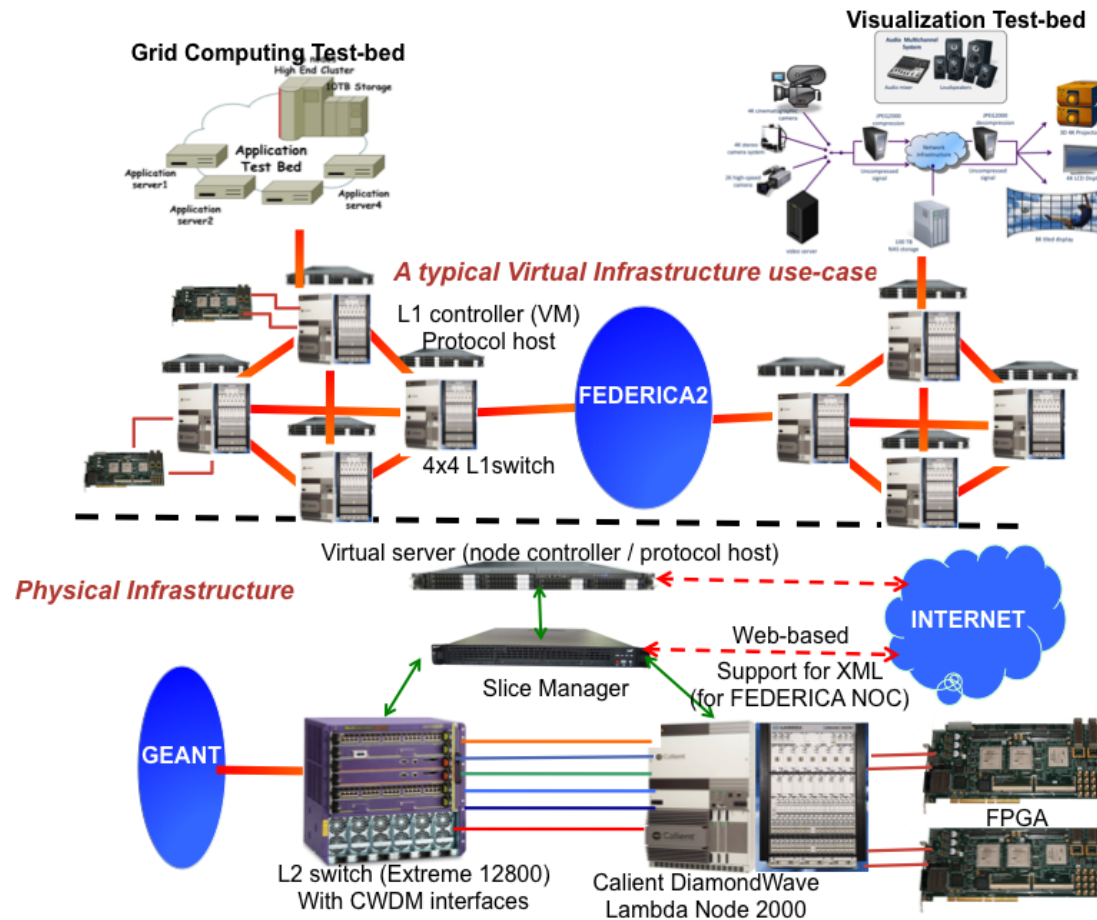
Reconfigurable sliced infrastructure

Reconfigurable sliced infrastructure





# UEssex Island

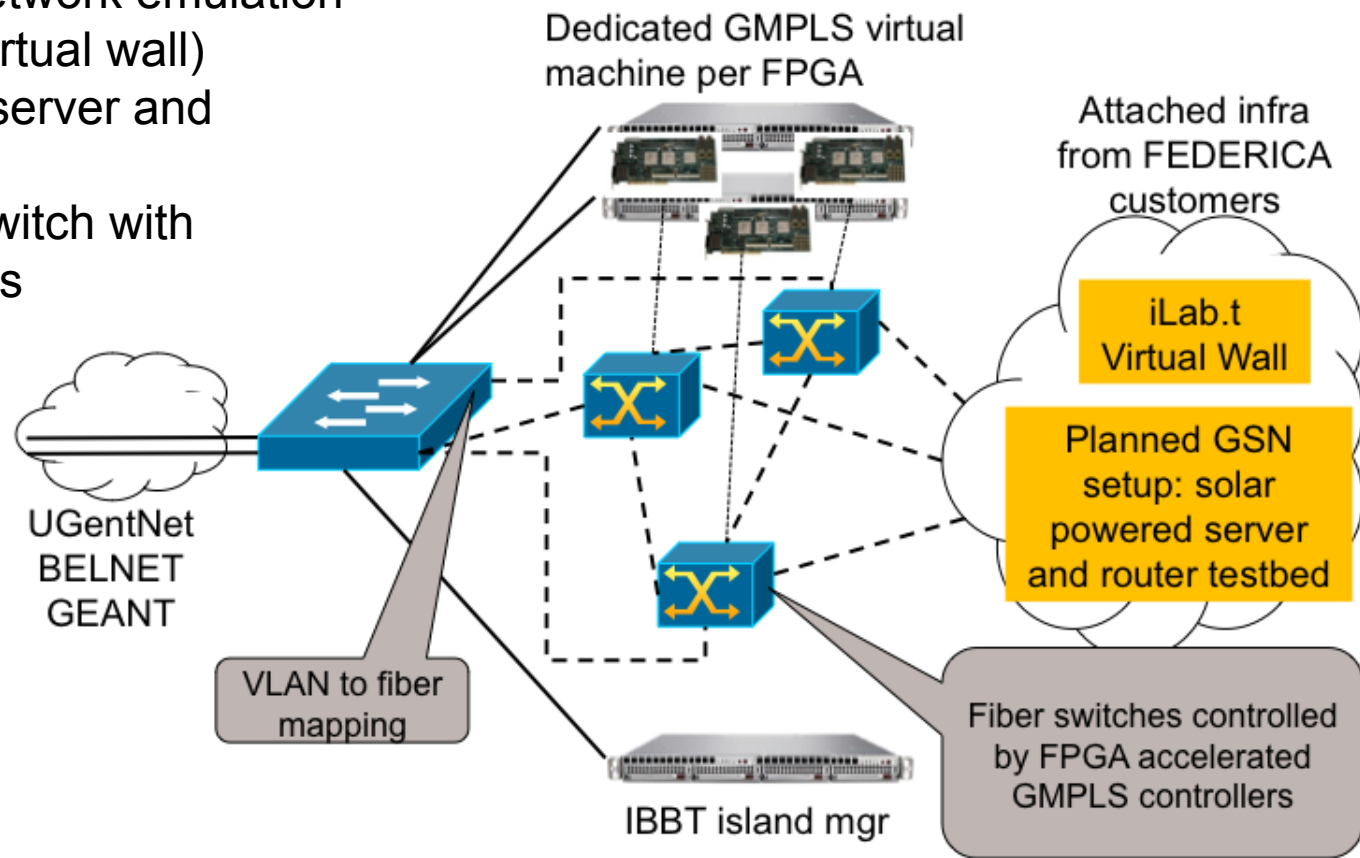


- One 96x96 Fibre switching node (DiamondWave from Calient)
- One lambda (WDM) switching node (LambdaNode2000 from LambdaOptical systems)
- One Carrier Grade Ethernet switch with WDM interfaces (Black Diamond from Extreme Networks) -
- Two high-speed FPGA based network processing element
- Grid Computing test-bed
- Ultra high definition video visualization and streaming test-bed

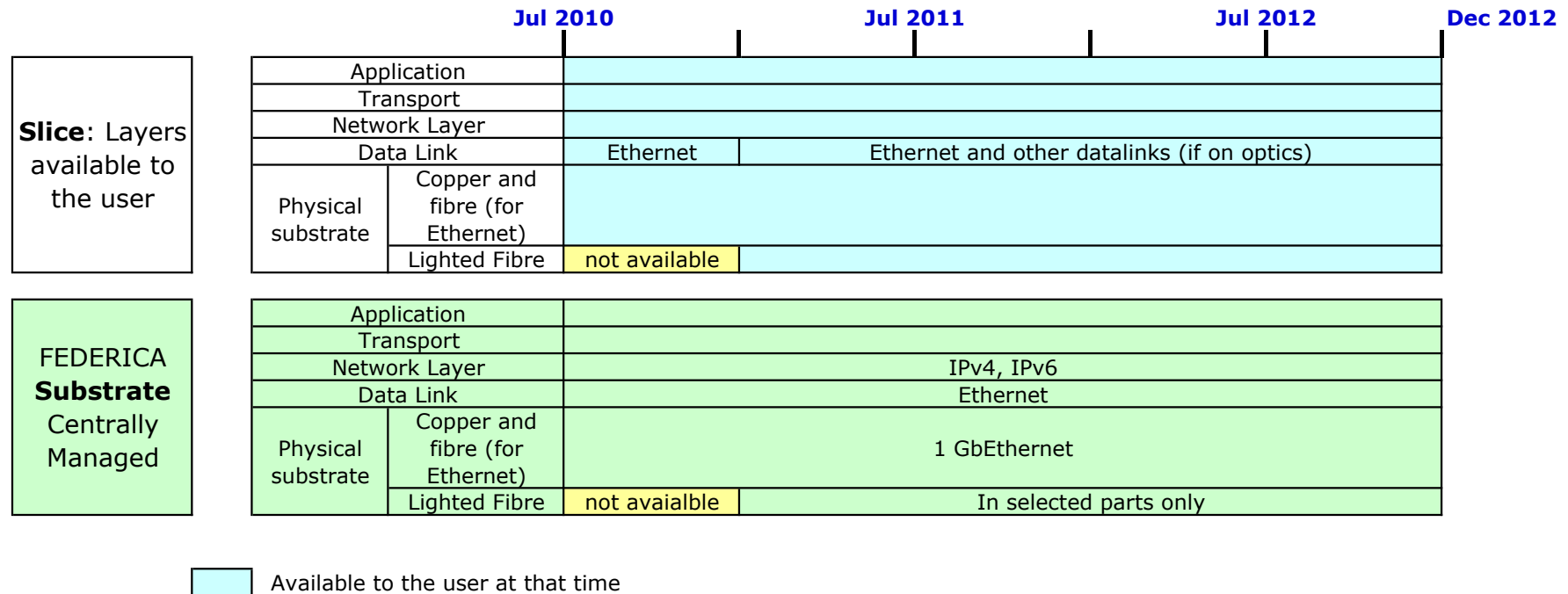
# IBBT Island

IBBT optical island comprises of:

- 3 MEM-based fibre switching nodes controlled by high-speed FPGA
- A large scale network emulation environment (Virtual wall)
- Solar powered server and router test-bed
- One Ethernet switch with optical interfaces



# Project Timeline



The slice offering service will continue from FEDERICA and maintain active the infrastructure for active users. The addition of optical resource in the service will be after month 6.

# FEDERICA@SWITCH

## User Assessment:

Looking for users - (research organizations) they intend to perform an experiment on the FEDERICA-e-infrastructure.

Contact:

SWITCH - <http://www.switch.ch/federica>

Links:

FEDERICA-Web-Page: <http://www.fp7-federica.eu/>

FEDERICA-User-Docu: <http://www.fp7-federica.eu/users/users.php>

NRENs: <http://www.terena.org/compendium>

GEANT2: <http://www.geant2.net>

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