Departament d'Enginyeria Telemàtica

UNIVERSITAT POLITÈCNICA DE CATALUNYA

Virtual Networks ongoing research and experiences in the Manticore Project, and GEYSERS

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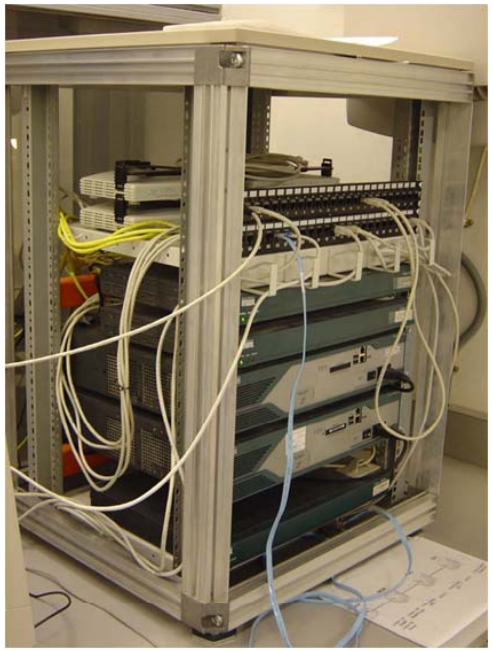
Outline

- Antecedents
  - The Broadband Group
  - Ongoing research
  - Experiences in the Manticore and GEYSERS Project
- To serve the VNRG...

Antecedents. The Broadband Group

- The Broadband Group of the UPC was born in 1993.
- Main goals:
  - Modelling (networks and sources)
  - Services: Video in networking
  - Resource management
    - ATM in the 90's
    - MPLS in the 2000's
    - And research in GMPLS and OBS.

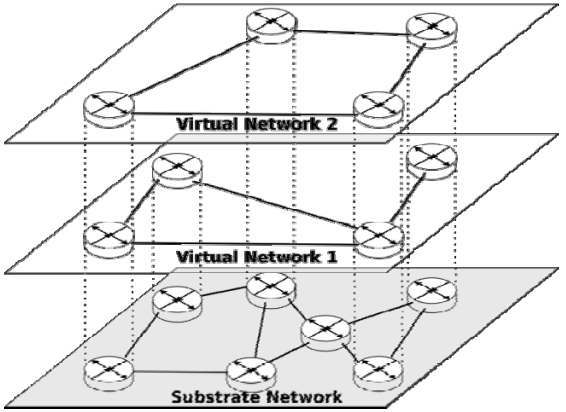


- Currently...
  - From
    - Our previous works in resource management for MPLS (load balancing, multipath packet ordering, multicommodity flow optimization)
    - Envisioning overlay networking for the Future Internet

Research in Virtual Networking (since 2008)

Antecedents. Ongoing research

- Main topics
  - Optimal virtual network mapping over substrate network
    - Optimization
      - CPU and Bandwidth
      - Multiconstraint (based on *path-algebra*)
  - Energy efficiency



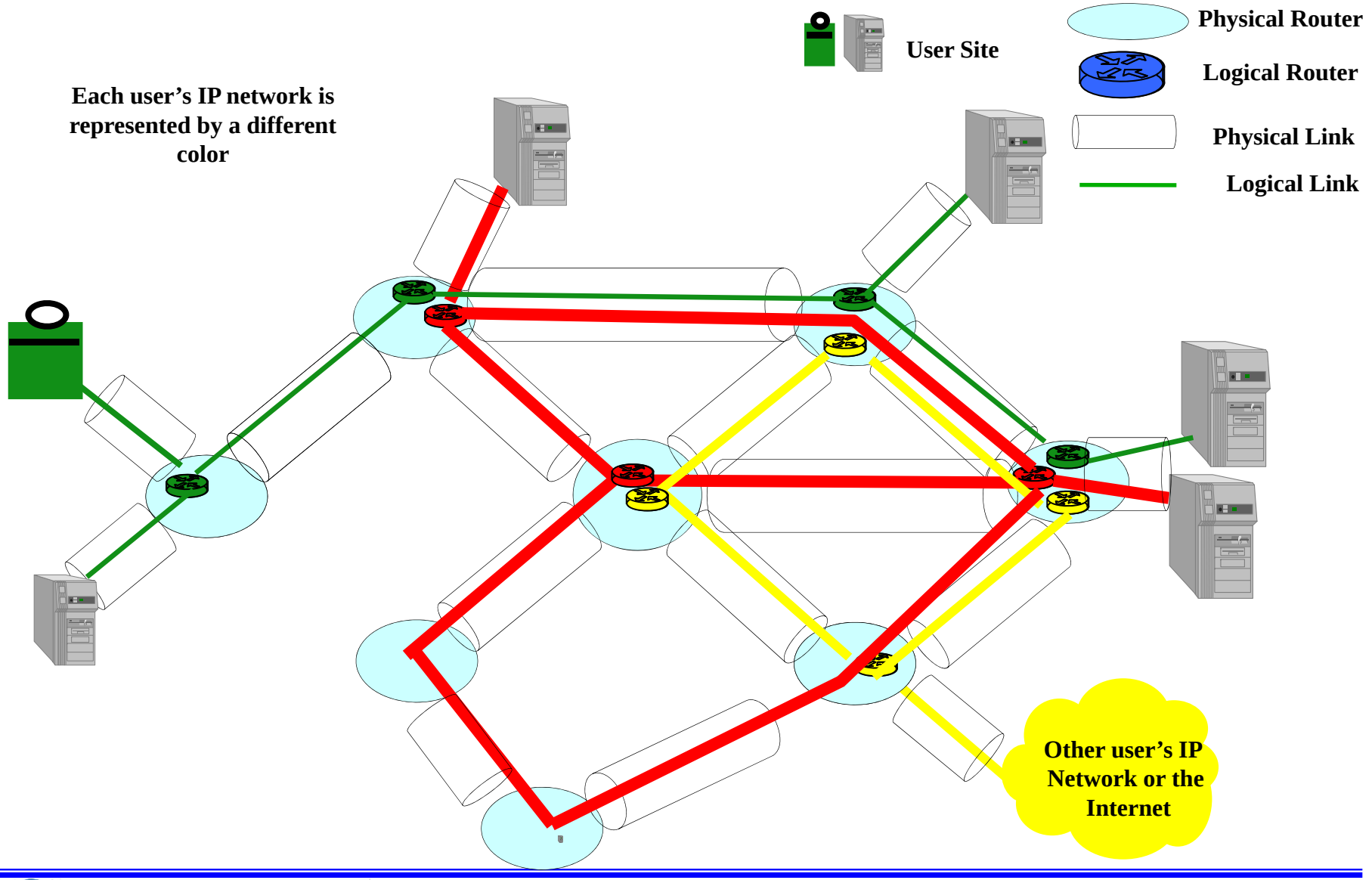
- Publications
  - Recently related published works (since 2009)
    - J. F. Botero, X. Hesselbach, A. Fischer, H. de Meer. Optimization Model and Algorithm for Mapping Virtual Networks with Hidden Hops. To appear in “Springer Telecommunication Systems Journal”. 2010
    - J.F.Botero and X.Hesselbach "The Bottlenecked Virtual Network Problem in Bandwidth Allocation for Network Virtualization". IEEE Latincomm, Medellín, Colombia, September 8-11, 2009.
    - J.F.Botero and X.Hesselbach “Optimization Model for Bandwidth Allocation in a Network Virtualization Environment”. 2nd Euro-NF Workshop. ICT MobileSummit, Santander, Spain, june 2009.
    - X.Hesselbach, E.Grasa, S.Figuerola "Create your own IP network using other people's routers: The Manticore II project". Terena TNC, Malaga, Spain, 2009.
  - Submitted (pending)
    - J.F.Botero, J.R. Amazonas and X.Hesselbach “A new strategy for virtual network mapping optimization based on paths algebra”, Globecom 2010.
    - J. F. Botero, X. Hesselbach, A. Fischer, H. de Meer “Optimal Binary Integer Program Modeling for Virtual Network Embedding Problem”, Performance 2010, to be published in Performance Evaluation 2010.

Antecedents. Experiences in the Manticore Project

- MANTICORE: Providing Users with a Logical IP Network Service.
- MANTICORE Partners (self funded project):

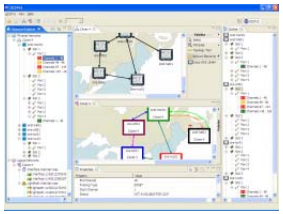
- A Web Service based system that provides the User (NOC and/or end user) with the ability to define and configure of its own physical and/or logical IP network
- IP networks as a Service

The MANTICORE vision



MANTICORE software architecture

RPSL may be used to let the GUI specify high level routing policies (internal as well as external) to the IP Network WS



GUI client(s)

Manage user accounts, get user credentials, authenticate

User Workspace WS

IP Network WS

Transforms the routing configuration abstract description in high level operations that will be invoked in the Router WS over one or more virtual resources

Ethernet Resource WS

TDM Resource WS

. . .

Virtual Resource Services

Represent the physical (ports) or logical interfaces (VLANs, TDM Channels) that users can access.

Transforms the high level operations over one or more virtual resources into specific commands that each particular routing device can understand

Router-WS

Netconf

Protocol X

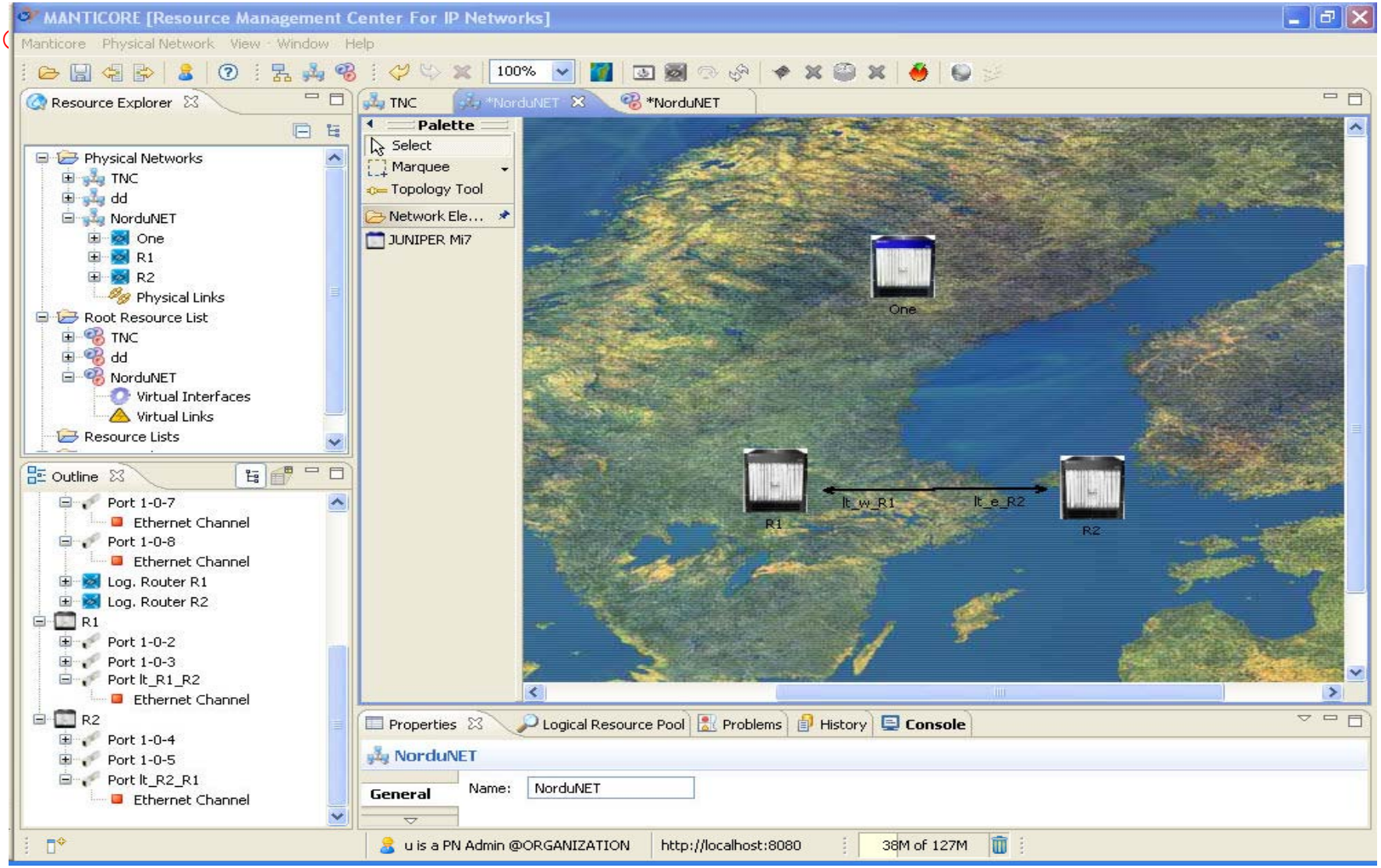
Protocol Y

Juniper or Cisco device

Other vendor device

Software router

MANTICORE: Creation of logical routers instances



To serve the VNRG...
...some answers

- We are interested in network virtualization, more than in host virtualization (but not excluding it)
- *At what level is the VN virtualization?*

  We are open to: per connection or socket, per virtual machine and per process or group of processes, all.
- *Can a single process be a member of more than one VN? (i.e., can a process be a gateway between two different VNs?)*

  Yes, we do not exclude this situation.
- *Can different processes be members of a single VN? (i.e., can the host participate more than once in a single VN ? How do you distinguish between VNs? i.e., how does a virtual machine/process/socket indicate which VN it wants to associate with?)*

  Yes, each process is modeled as a node belonging to the #i virtual network (i € [0..N], for a set of N virtual networks). Each node requests a resource.

What is GEYSERS about?

GEYSERS @ a glance

Instrument: Collab. Project - Large Scale Integr. Project (IP)

Activity: ICT-2009.1.1 The Network of the Future, FP7 Call 4

Project duration: 36 months, start date: January 2010

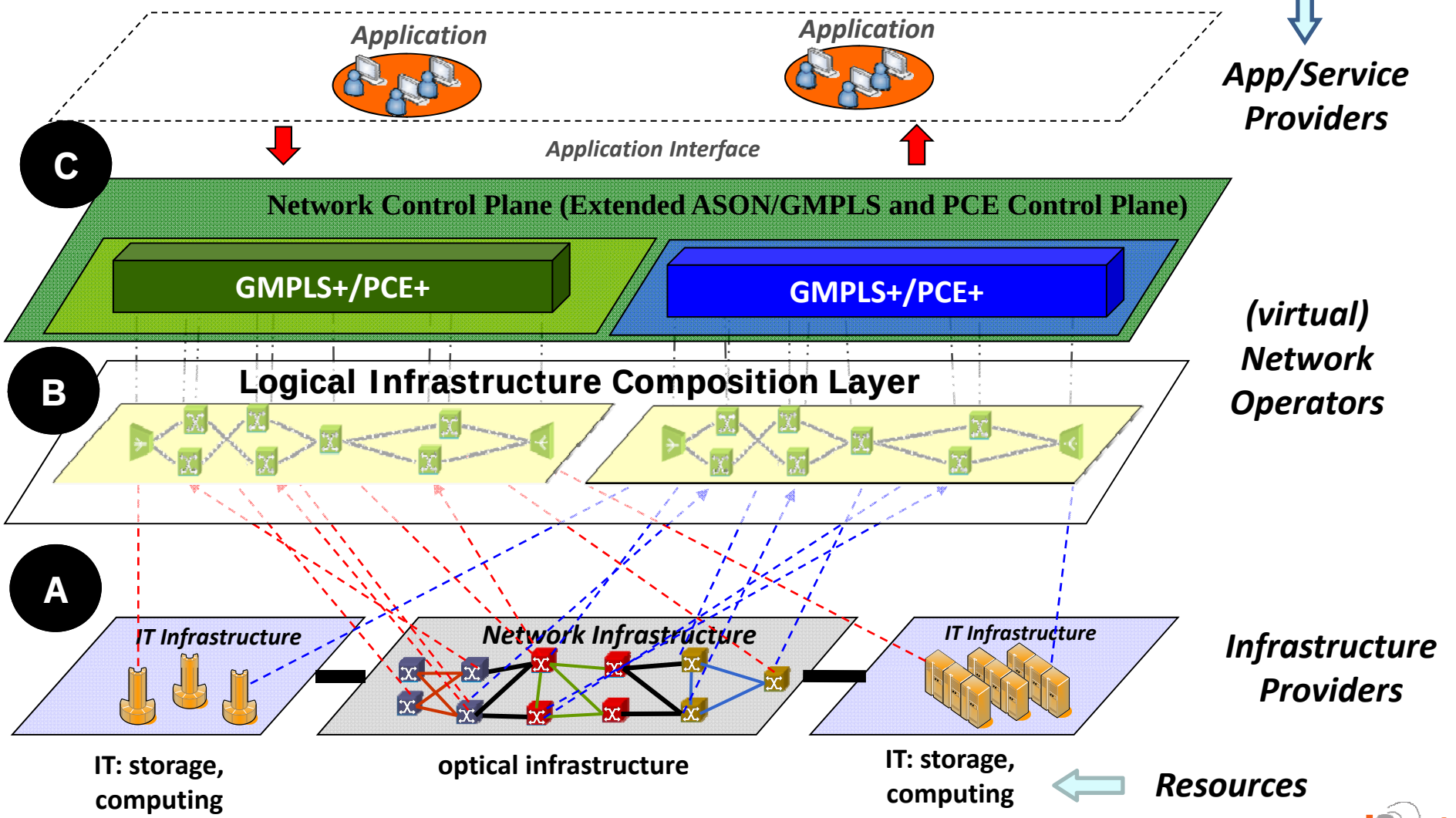
Project budget: 10.433.205€ (*7.035.000€ EC contribution*)

Project resources: 947 person months

Coordinator: Interoute

- An **architecture and tools** for the **composition of logical infrastructures** from physical optical **networks** and **IT** resources
- An **enhanced Network Control Plane** (ASON/GMPLS + PCE) architecture and protocols to use these logical infrastructures to provide advanced transport services coupled with cloud services
- **Business cases** where these two approaches can bring new value to infrastructure providers, network operators and app providers
- Our methodology: architecture **definition, design** and **prototyping, validation** on a real pan-EU testbed

GEYSERS reference model



Current situation

- ITU-T Focus Group on Future Networks
  - Activity Started in June 09 (three meetings done already).
  - Network virtualization is one of the focus: " Framework of Network virtualization" (www.itu.int/oth/T3A050000017/en)
- IRTF NVRG (Network Virtualization Research Group)
  - Newly Created; first VRG meeting at IETF-77 in Anaheim, USA (21-26/03/10)
  - 1. explain/define what we mean by network virtualization 2. explain what they're useful for 3. describe some challenges 4. list some milestones
  - Consider a whole system for virtualized networks and not only single components or a limited set of components;
  - Identifying architectural challenges resulting from virtual networks;
  - Recursive network management of virtual networks;
- OGF: NSI (Network Service Interface), NML (Network Markup Language), OCCI (Open Cloud Computing Interface)

ISOD OGF scope

- The scope of the ISOD RG may include:
  - BCP/taxonomy Resource description from Infrastructure and service provider point of view
  - Defining architecture, LICL, extended UNI and ANI
  - Infrastructure virtualisation issues
  - Provisioned services lifecycle management
  - Requirements to On-demand Infrastructure Services provisioning
  - Use cases for On-demand Infrastructure Services provisioning
  - Security Framework for On-demand Infrastructure Services provisioning

Thanks !

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