User Controlled LightPaths version 2

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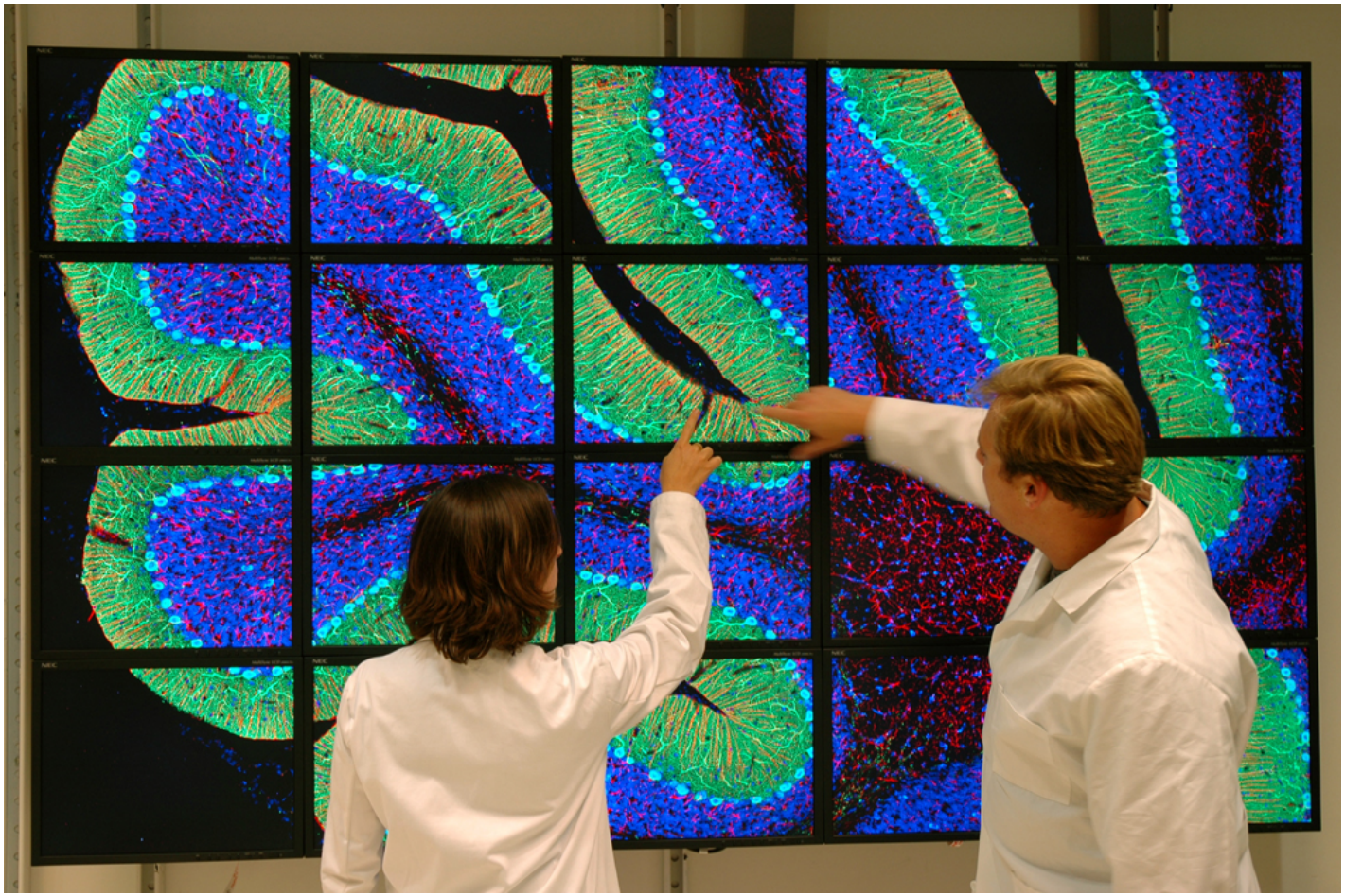
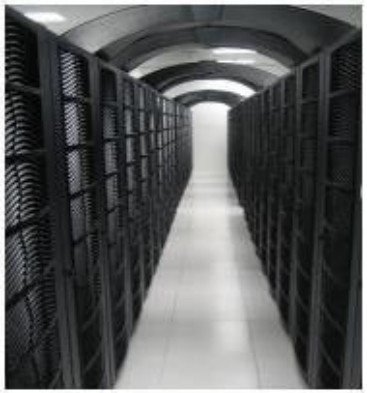
Objectives of our research

- create a working testbed for UCLP
- evaluate the UCLP system
  - design
  - implementation
  - development status
- compare UCLP to DRAC

Tiled Display

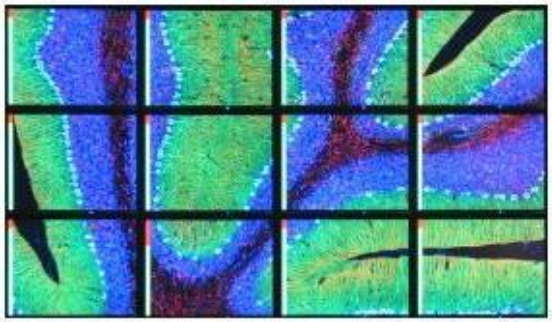


Need Optical Networks



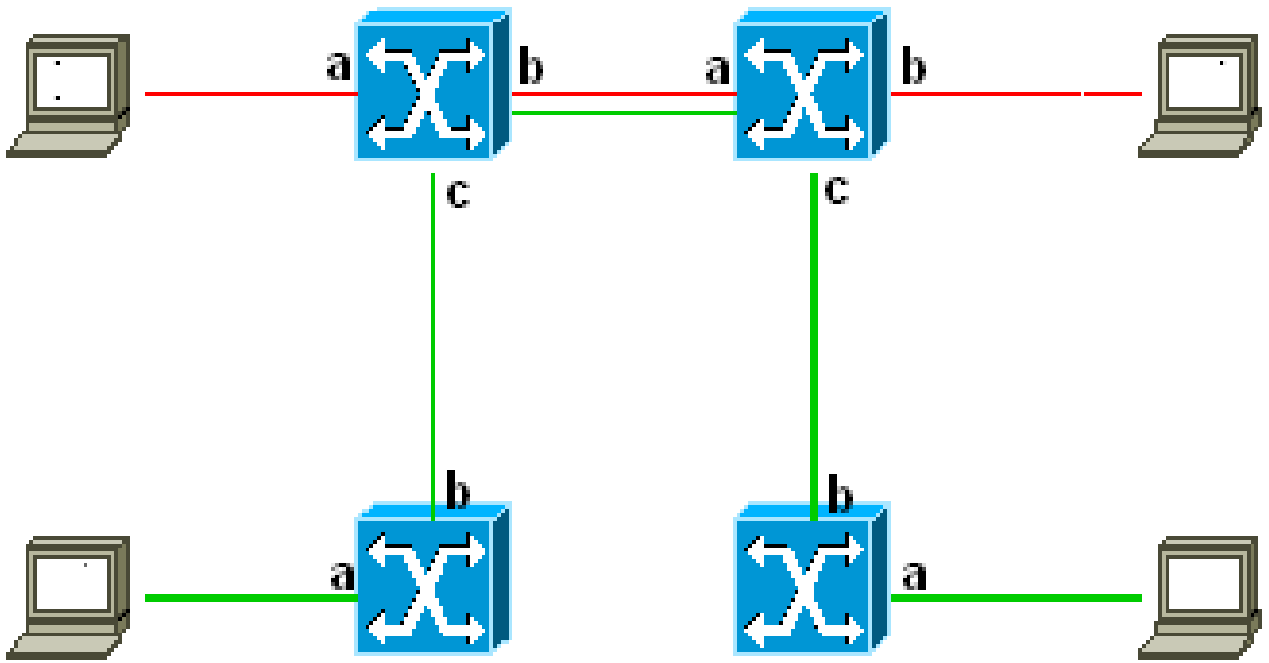
MODEL

RENDER



DISPLAY

Cross Connects and Lightpaths



Lightpaths

Lightpath: a direct connection between two endpoints with

- fixed latency
- fixed bandwidth

Why User Controlled LightPaths?

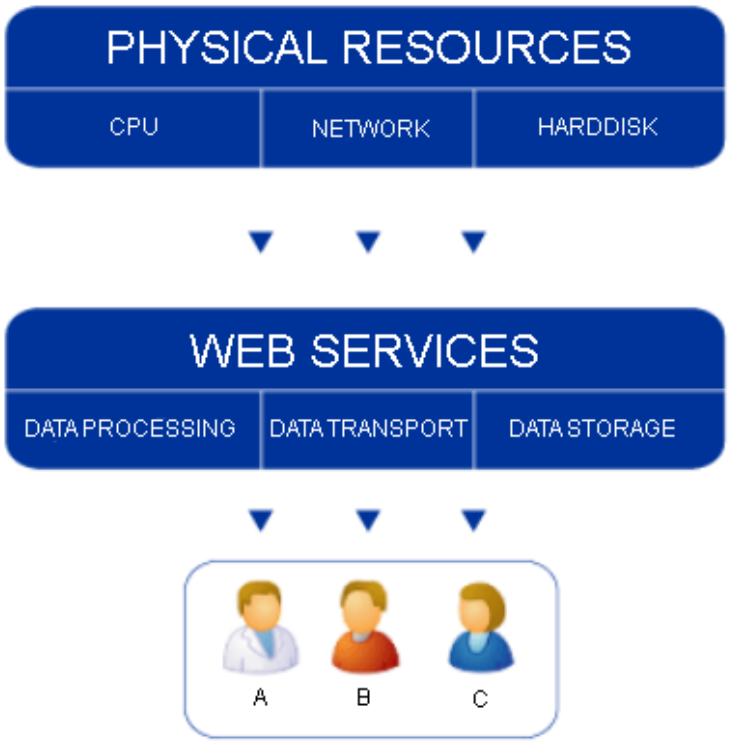
- today: creation of lightpaths involves a lot of administrative effort, and:
- no guarantee the lightpath will be up in time
- research needs more flexibility

UCLP has a generic design (no assumptions about the network), so it can adapt to future insights.

Service Oriented Architecture

In a SOA ....

- Resources are exposed as services.
- Services must be dynamically discoverable.
- Can be invoked remotely.



UCLPv2 Service Oriented Architecture (1)

In UCLP ....

- Defining web services to be able to manage the underlying technology.
- Integrating the network into applications is less complex.
- What does it look like?

UCLPv2 Service Oriented Architecture (2)

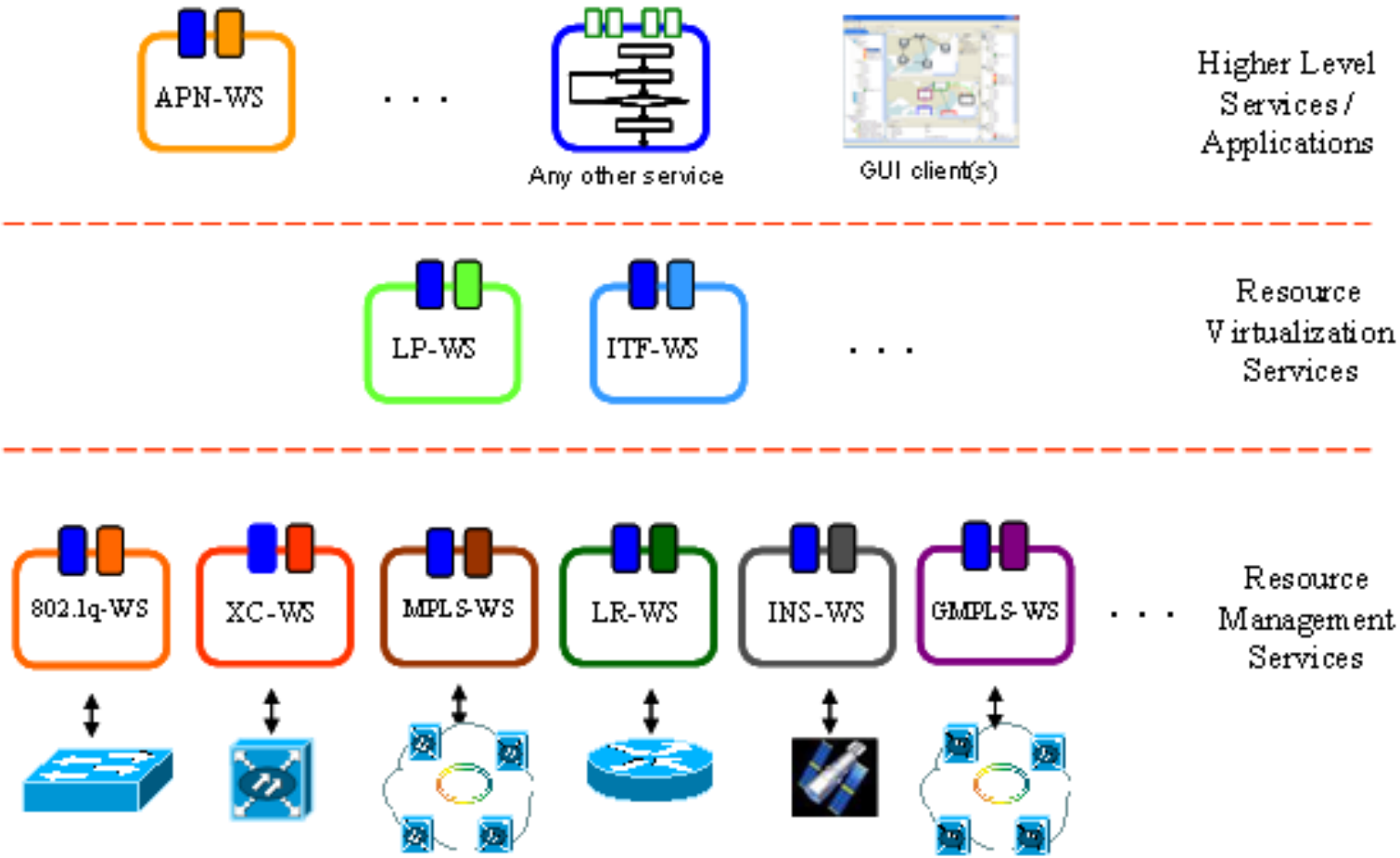
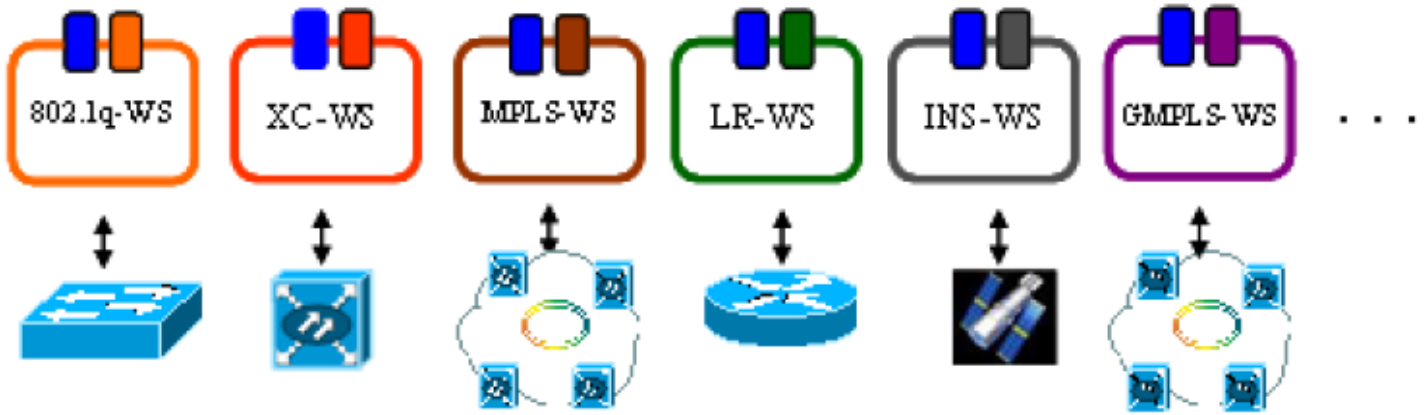


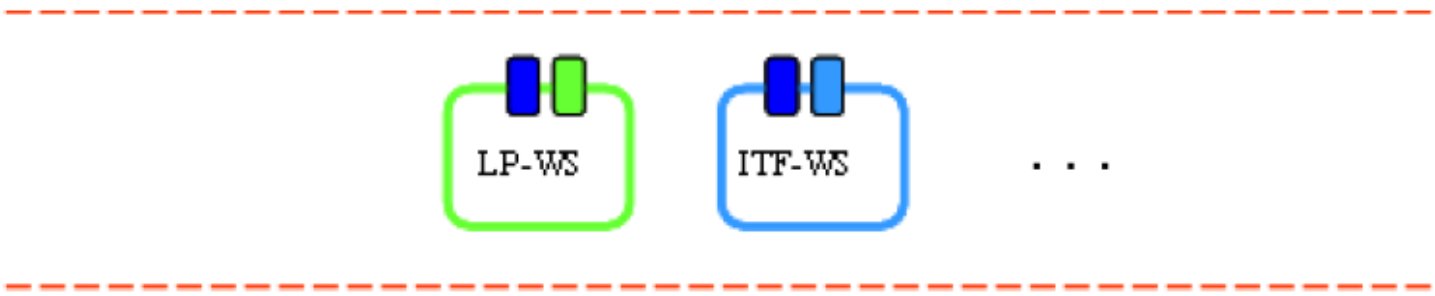
Figure: UCLPv2 Service Oriented Architecture

Lower Layer - Resource Management



- Physical network needs to be defined in UCLP.
- Allocate (parts of) physical resources to be exposed as web services.
  - Physical Links (Lightpaths)
  - Interfaces

Middle Layer - Virtualization Layer



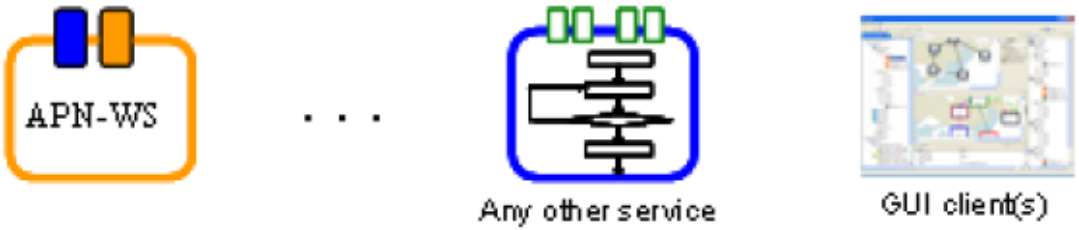
The virtualization layer is there to ....

- Virtualize the underlying technology and represent it as building blocks.
- Expose the building blocks of the system to the Higher Level Services and Applications.

These building blocks are....

- Lightpath Web Services
- Interface Web Services

Top Layer - Higher Level Services and Applications



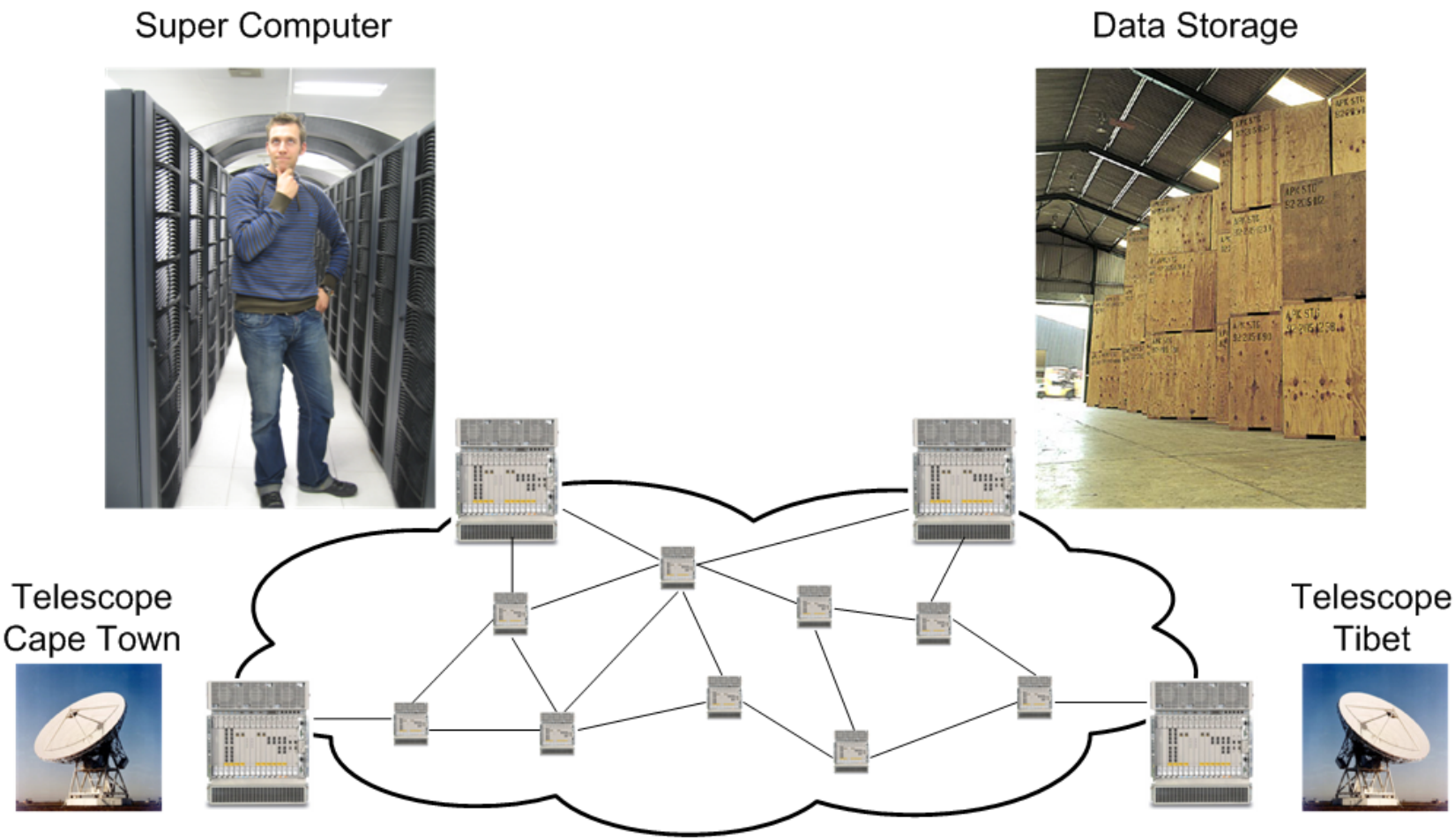
After the virtualization ...

- Underlying technology is hidden from the top layer.
- Building blocks of the system (Lightpath and Interface WS's) can be used to create an Articulated Private Network (APN).

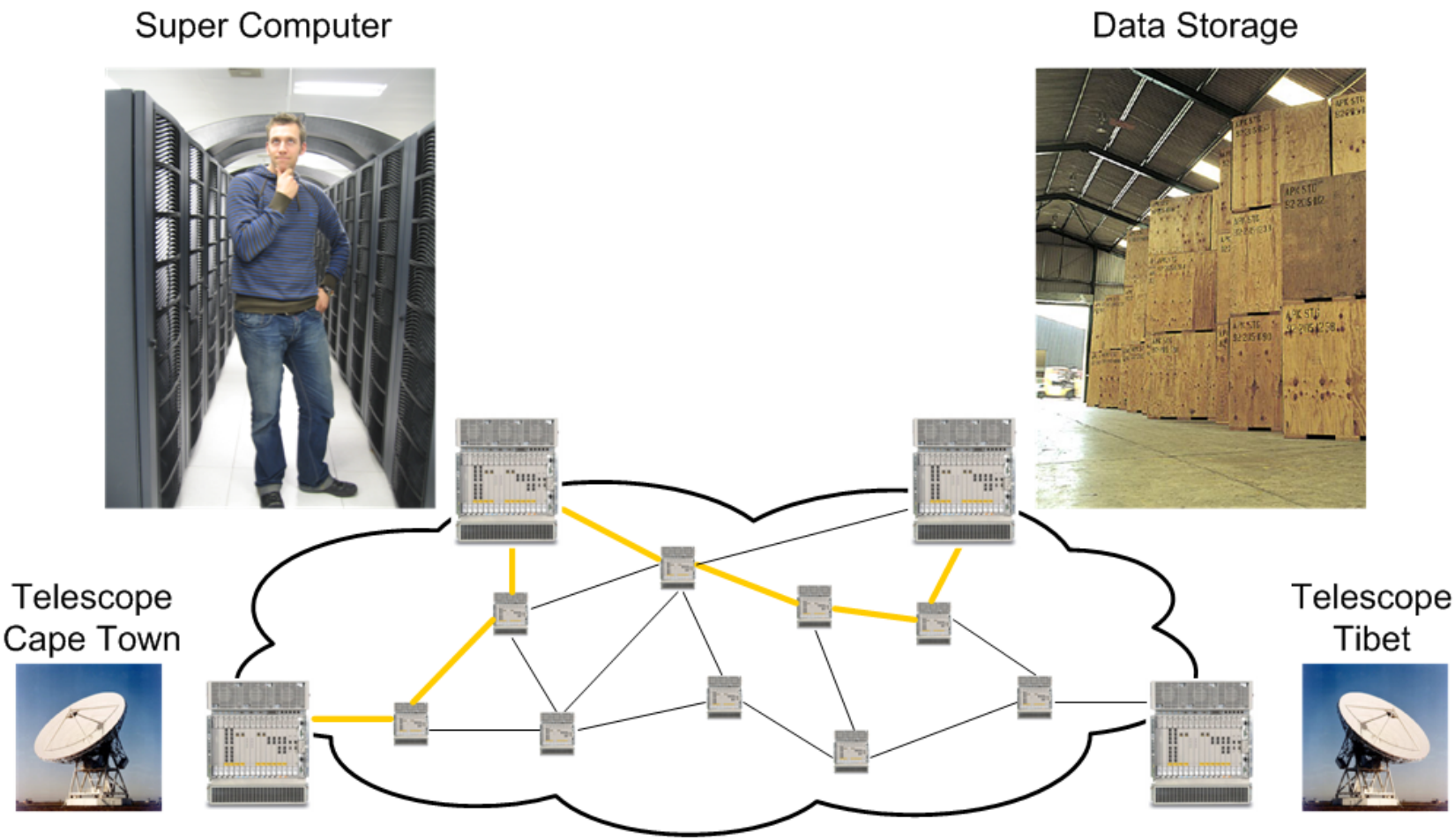
This can be done by:

- End users with the use of a GUI
- Applications

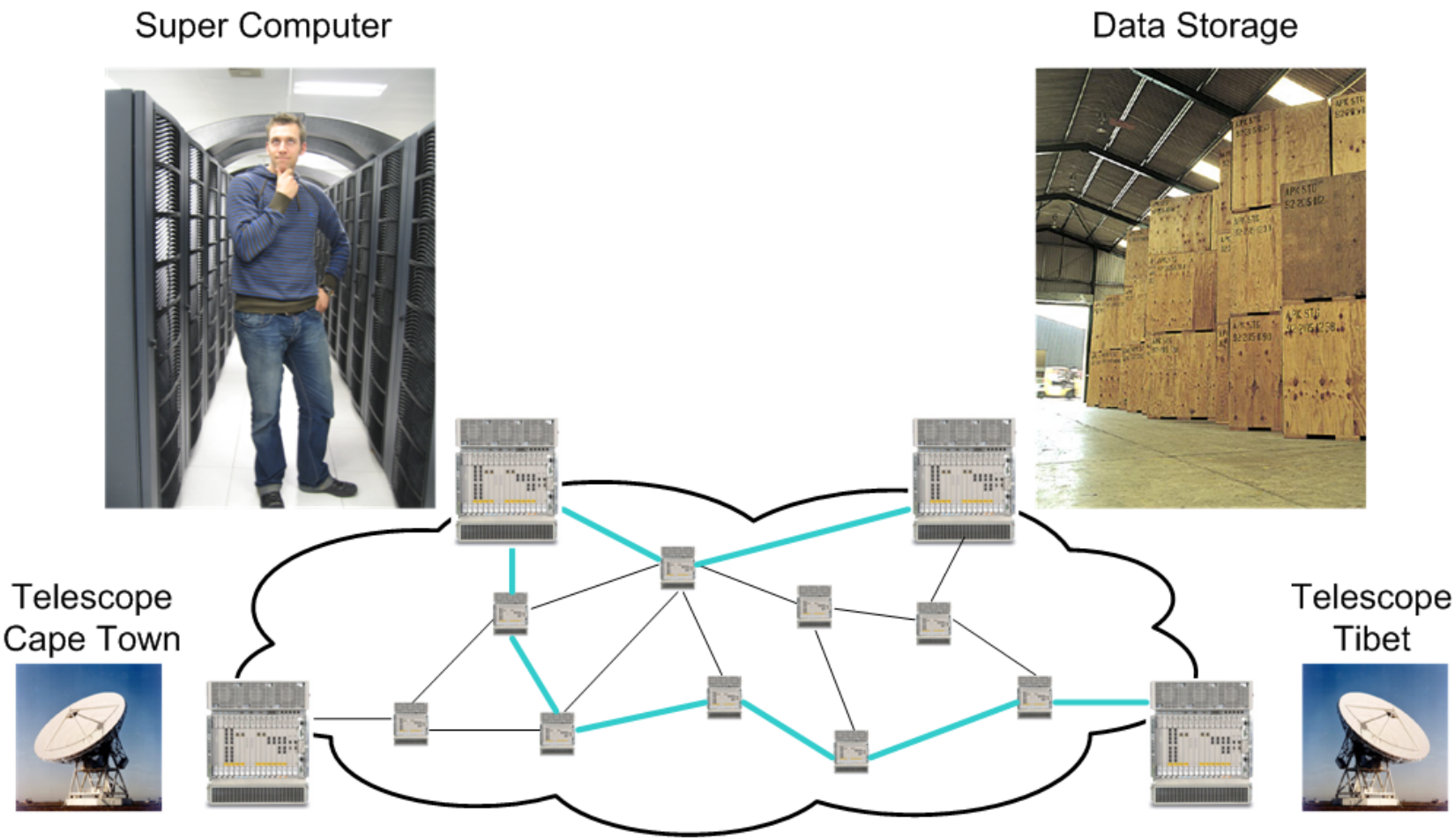
Top Layer - Higher Level Services and Applications



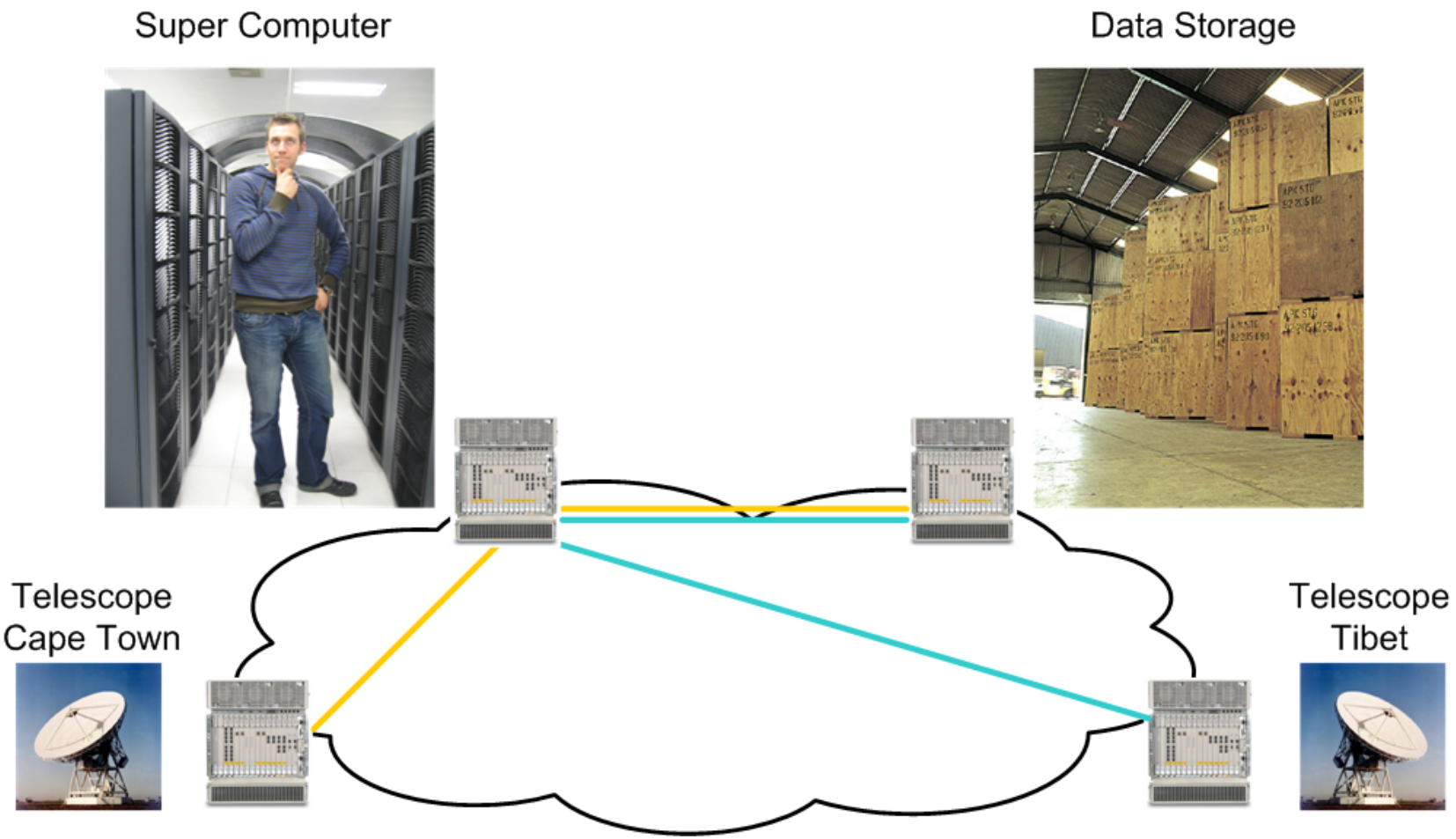
Top Layer - Higher Level Services and Applications



Top Layer - Higher Level Services and Applications



Top Layer - Higher Level Services and Applications



Top Layer - Higher Level Services and Applications

What kind of services could UCLP offer ....

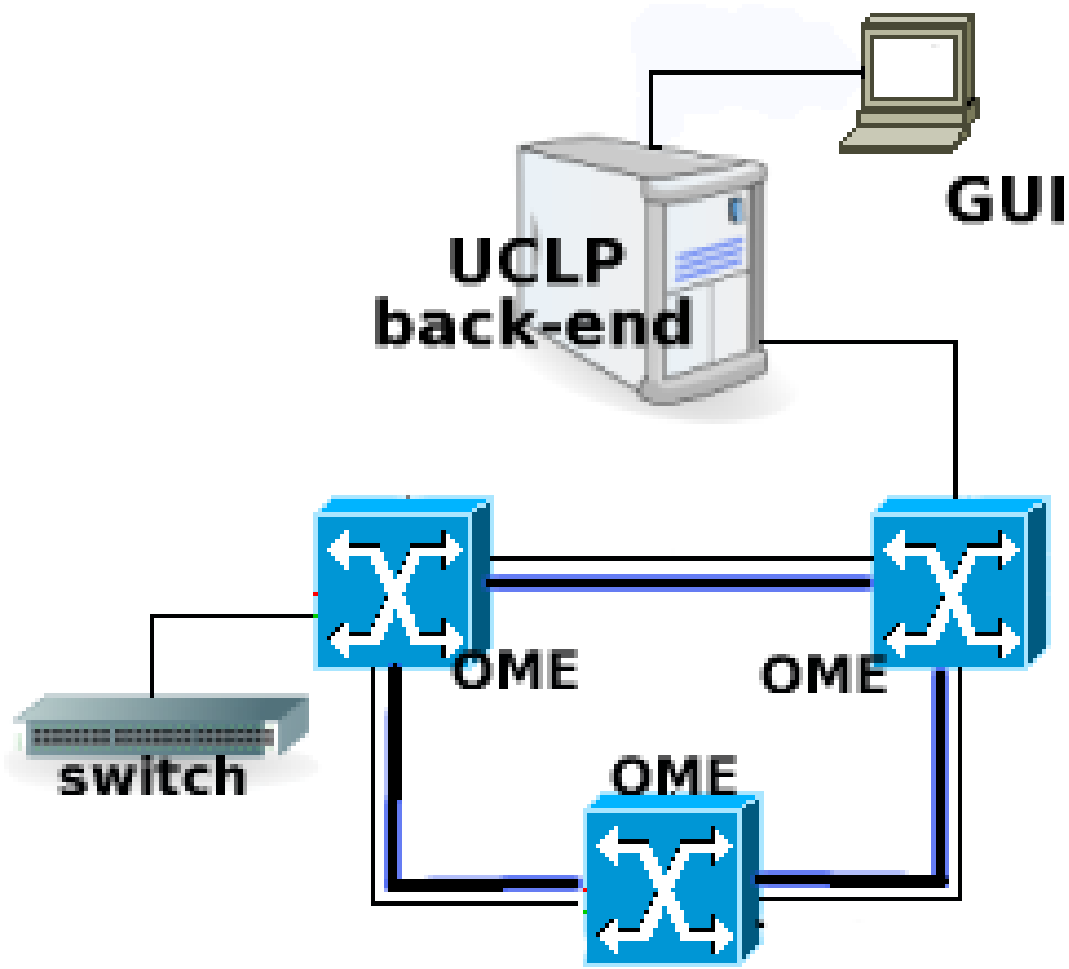
- Bandwidth on demand
- Bandwidth reservation service
- VPN services
- .....

In a nutshell ...

UCLP design principles in a nutshell ....

- UCLP architecture is service oriented (SOA)
- Architecture is divided into three layers
  - Lower layer: Technology dependant and manages the hardware (XC-WS, 802.1q-WS, MPLS-WS).
  - Middle layer: Virtualizes the underlying technology and provides the building blocks to the Top layer.
  - Top layer: Users and applications can use the buildingblocks to create their own dedicated private networks

Testbed



Development Status (1)

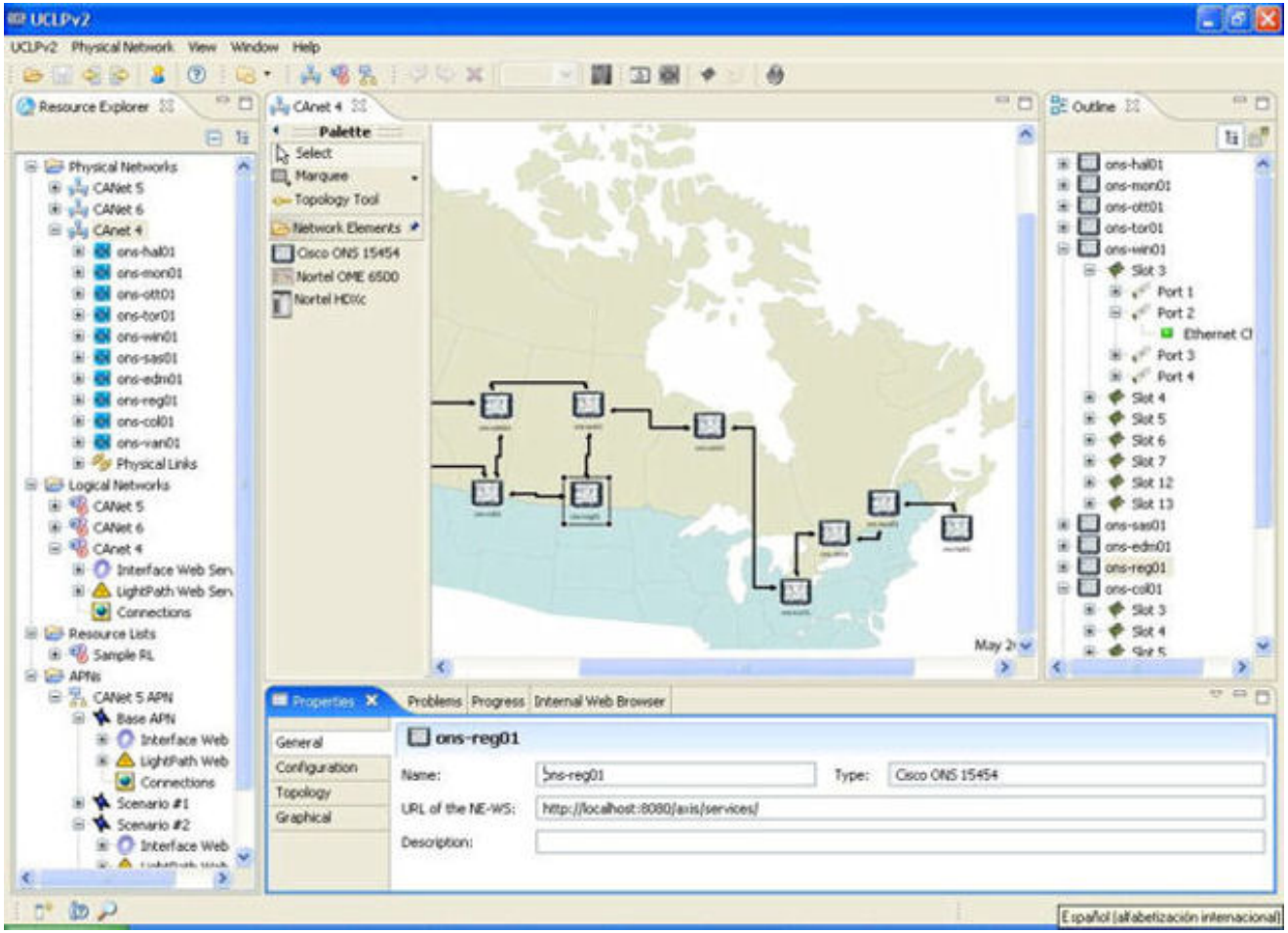
Both version 2.0 and 2.1:

- installation is without problems
- some real issues when using it (see next slide)
- source code and API will be there but aren't yet

Development Status (2)

- UCLPv2.0 hangs (when no XS's?)
- Unclear messages (like a "Java NullPointer Exception" when running an APN in 2.0)
- UCLPv2.1 (pre-release) solves a lot of these
- Nameless cross connects
- UCLP does not have any scheduling module yet
- No VCAT support yet (easy to implement?)

The GUI



Screenshot from user manual

Demo

DRAC – Dynamic Resource Allocation Control

Similarities:

- Service Oriented Architecture
- End user(-process) schedules lightpaths

Differences:

- DRAC is proprietary software; currently only supports Nortel network elements
- DRAC's design seems to be less generic

Conclusions

- created a working testbed for UCLP
- evaluate the UCLP system
  - design: UCLP is service oriented (all kinds of services can be defined)
  - implementation and development status: a nice GUI, system is not production ready
- compare UCLP to DRAC:
  - They both let endusers create lightpaths
  - Both are SOA, but UCLP has a more generic design
  - DRAC has scheduling; is proprietary

Questions

Questions?