User Controlled LightPaths version 2

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February 6, 2007
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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

Outline

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Need Optical Networks

MODEL

DISPLAY

RENDER

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Cross Connects and Lightpaths

[Diagram of cross connects and lightpaths]

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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.
In a SOA ....

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

**PHYSICAL RESOURCES**

- CPU
- NETWORK
- HARDDRISK

**WEB SERVICES**

- DATA PROCESSING
- DATA TRANSPORT
- DATA STORAGE

A, B, C
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)

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Service Oriented Architecture
- Lower Layer - Resource Management
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Figure: UCLPv2 Service Oriented Architecture
Physical network needs to be defined in UCLP.
Allocate (parts of) physical resources to be exposed as web services.
  - Physical Links (Lightpaths)
  - Interfaces
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
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

Super Computer

Data Storage

Telescope
Cape Town

Telescope
Tibet
Top Layer - Higher Level Services and Applications

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Telescope Cape Town

Telescope Tibet

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Top Layer - Higher Level Services and Applications

Outlook

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

Screenshot from user manual
Demo
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