The Open Light Exchange of the Future

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In the beginning...

From University of Amsterdam, Professor Cees de Laat has, in 2005, envisioned an Open Light Exchange to be modeled as a black box where services were inter-connected at the lowest layer possible.

With new technology available at the fiber optic transmission, a new way of increasing the bandwidth has been introduced. The Optical Coherent transmission model allowed for greater speeds, more dynamic flexibility and limits to be broken once more...

But what is happening with the current infrastructure? Can it still be used as when it was envisioned?

Yes and....
Experiment – “Playing with light” started in 2009 (SC09) and still experimenting in Terena 2012!

Cees de Laat will discuss the open exchange at different layer 0-1-2 which enable further enhancements in bandwidth provisioning and delivery. 2 different video stream will be selectable and will displayed the correct stream when selected.

Here the demo can switch to any of the available waves and show a different video.
New Optical Characteristics are now available

Playing with Light

The ‘Playing with Light’ demonstration features research undertaken by the University of Amsterdam – using Ciena’s technology – on colourless photonic switching. University of Amsterdam is manipulating transmission content at different light frequencies and colors, as well as the use of dynamically reconfigurable photonic devices to provide high-capacity services to media applications. The experiment shows the ability to optimize optical and Ethernet connections according to the type of traffic, content or nature of the application; like selecting a wavelength based optimum service path – similar to tuning into a radio station!

![Diagram of Optical Filter and PIN Diode](image)
An Example of Innovation from UvA!

Imagine controlling the video source using an iPad and without any human intervention over the fiber interconnect...

For additional details:
http://tnc.delaat.net/tnc12/index.html
Future implementation of Open Light Exchanges with Robust Restoration Capability

Coherent Transponder
- Tuneable transmitter & receiver
- Wavelength recolor to access restore path

Colorless, direction independent Add/drop filter
- Any colour on any port
- Any Add/drop port to any ROADM line port

• DWDM line ports impacted by fiber cuts are dynamically re-routed to an alternate fiber path
• Wavelength restoration may include:
  • re-coloring of transponder to shared protection spectrum
SDN Best effort provisioning of L1-L3 with Protection capability and increased survivability

- Switch/Router layer provides primary protection mechanism against all failures including equipment failures and network fiber cuts.
- A Colorless and Directionless photonic layer provides additional survivability by re-establishing switch layer connectivity affected by fiber cuts and may be compatible with SDN ideology.

**Photonic Restoration benefits**

- Returns network to full capacity within minutes rather than hours or days.
- May reduce protection bandwidth requirements in switches and routers.
- Improves network resiliency to multiple cuts.

Photonic restoration provides a cost effective means to increase resiliency in L3/L2/L1 networks.
Evolution example of Playing with Light using Video sources and Sinks

A Software Define Network that could take advantage of the Application Interconnection at Layer 1?
Thank you