

# UCLPv2 update TF-NGN TERENA

(CRC, UofO, Inocybe Tech. and i2CAT developments)

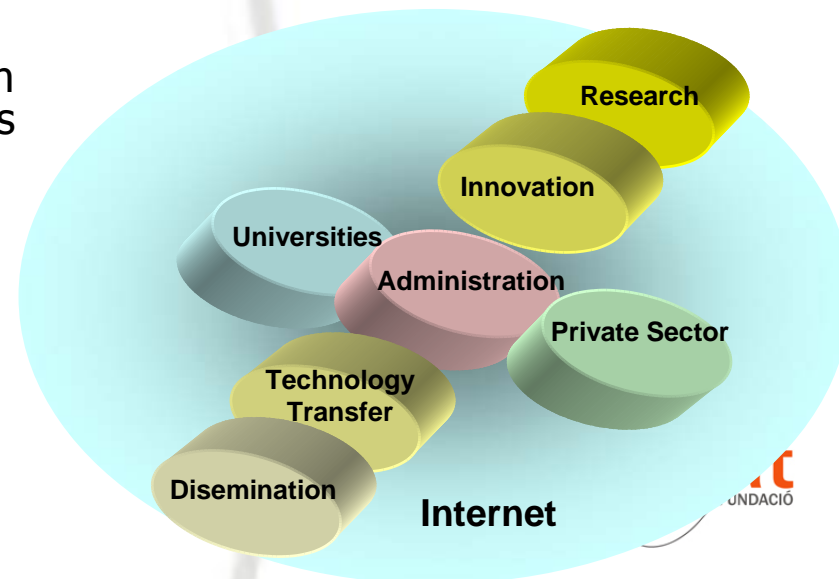
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Fundació i2CAT  
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*Cambridge, January 2005*



# i2CAT Foundation

- ***i2CAT Foundation*** : private non-profit Foundation created by the local government and the UPC (Universitat Politècnica de catalunya)
- ***Funding*** : Department of Research and Universities of the local Government, private sector and pre-competitive projects
- ***Goals*** : boost of Research & Innovation on the Internet second generation environment.
  - Promote advanced networks research and broadband application and increasing its practice.
  - Create new cooperation platforms between the private sector and the university researcher environment.
- ***Model*** : based on the collaboration between the public, private sectors and the universities setting up an innovative Triple Helix model (Loet Leydesdorff)
- **CRC, UofO, Inocybe Tech. and i2CAT** participates in the UCLPv2 development under CANARIE support.



# Driver for user controlled networks

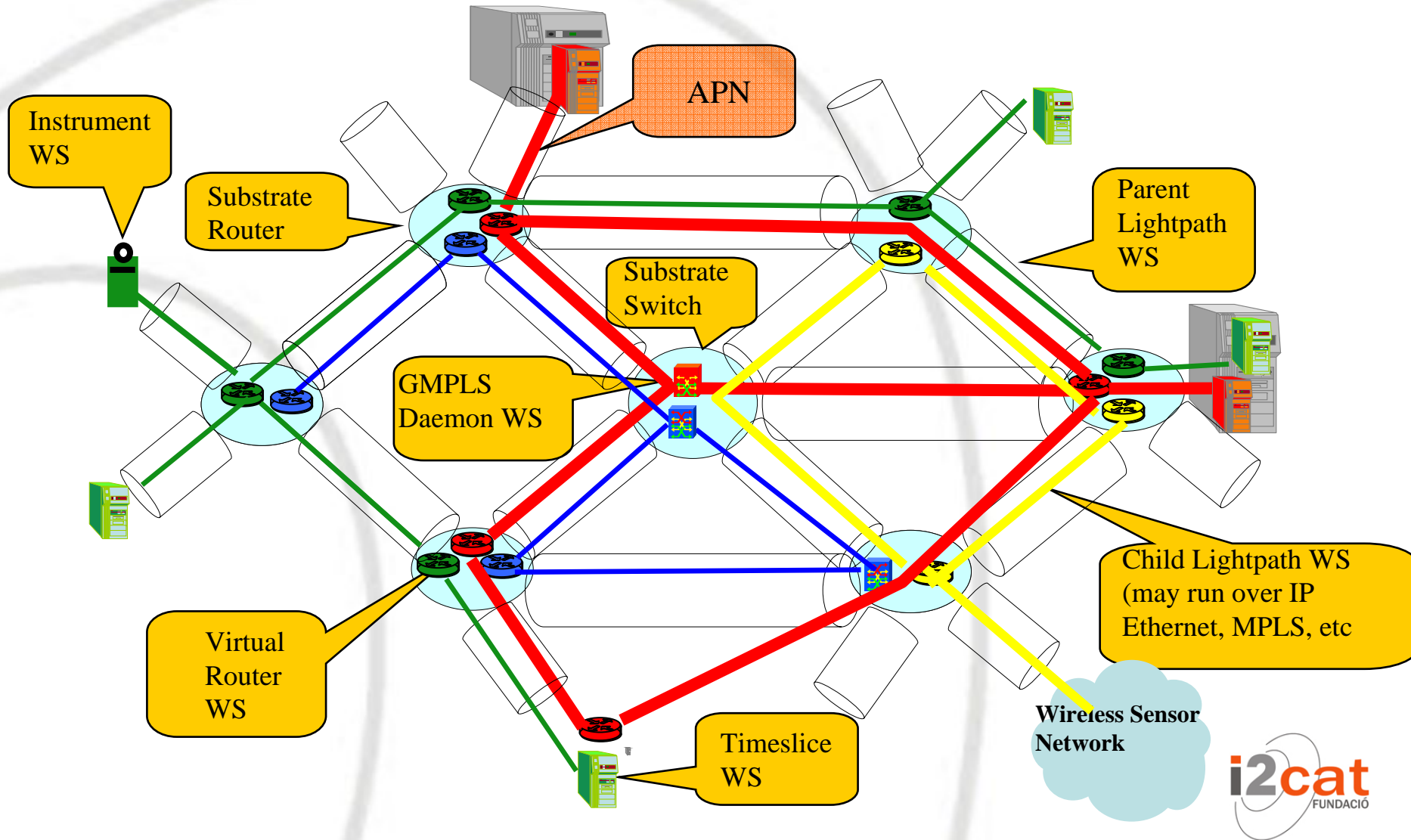
- Increasingly more and more organizations are acquiring their own fiber networks
  - Universities, schools, hospitals, business
- Acquiring fiber in the long haul is very expensive to light and obtain
  - Alternative is to use “dim fiber” –point to point wavelengths
  - But want flexibility to do configuration and change management as with dark fiber
- Increasingly science needs dedicated networks for specific applications and disciplines for high data volume grids
  - Want to be able to manipulate the network in the same way they can manipulate the application
- SOA and networks
  - SOA has the potential to provide the same user control over networks as with applications

# What is UCLP?

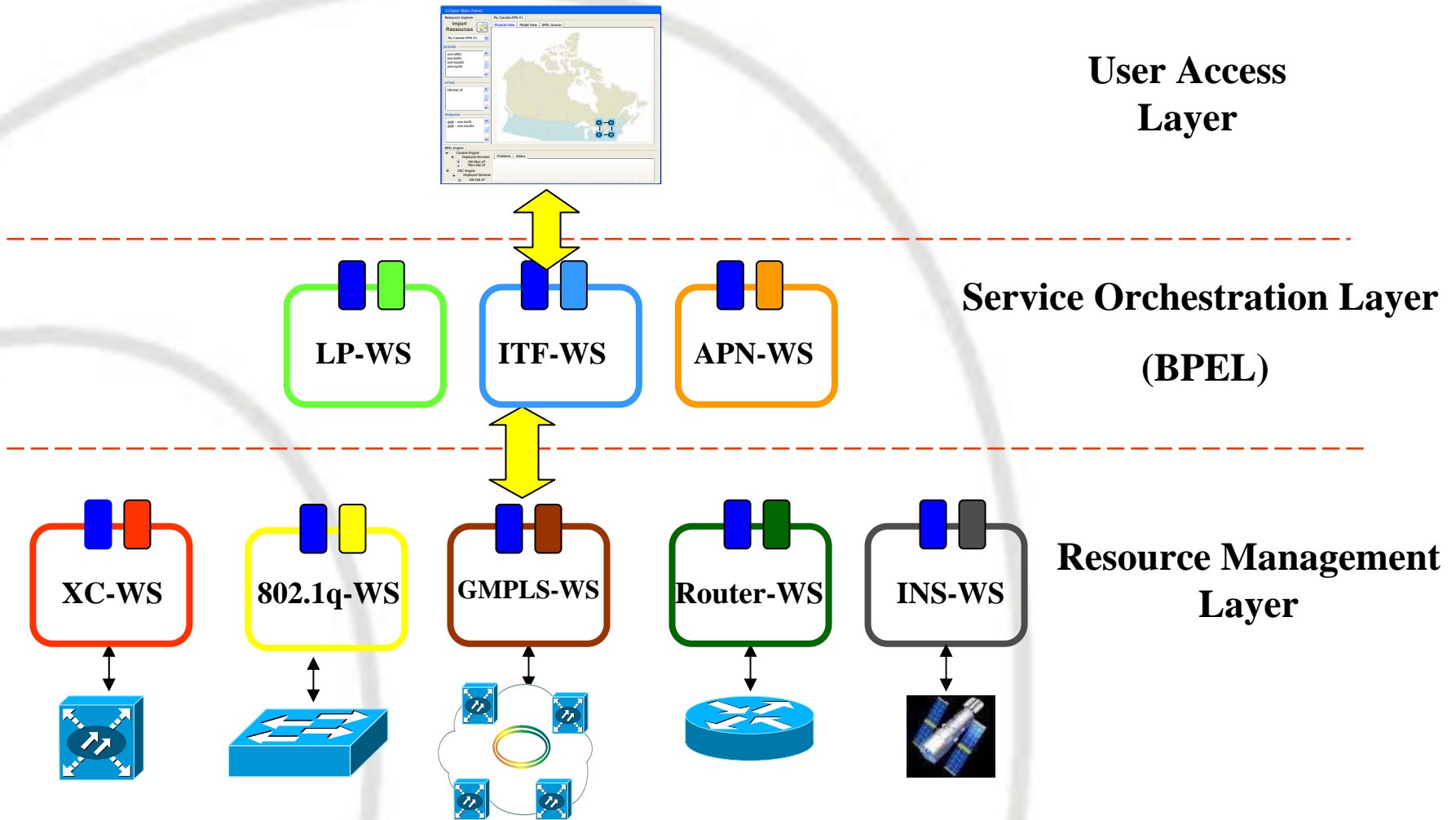
CANARIE

- User Controlled LightPaths – a configuration and provisioning tool built around grid technology using web services
- Third party can concatenate cross connects together from various links, routers and switches to produce a wide area network that is under their control
  - Articulated Private Network (APN)
  - Next generation VPN
- Uses Service Oriented Architecture (SOA) and so network can be integrated with other web service applications
- Extending the network into the application

# UCLP concept



# UCLPv2: High Level "Architecture"



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# Web Services (I)

- **NE-WS (Network Element Web Service)**
  - A family of network element WSs
  - Axis Web Service
  - Different types of NE-WSs exist depending on the network element it is controlling
  - Deployed on carrier's side
- **INS-WS (INstrument Web Service)**
  - Web Service that controls a third party device (sensors, instruments, etc.)
  - Deployed on the APN side



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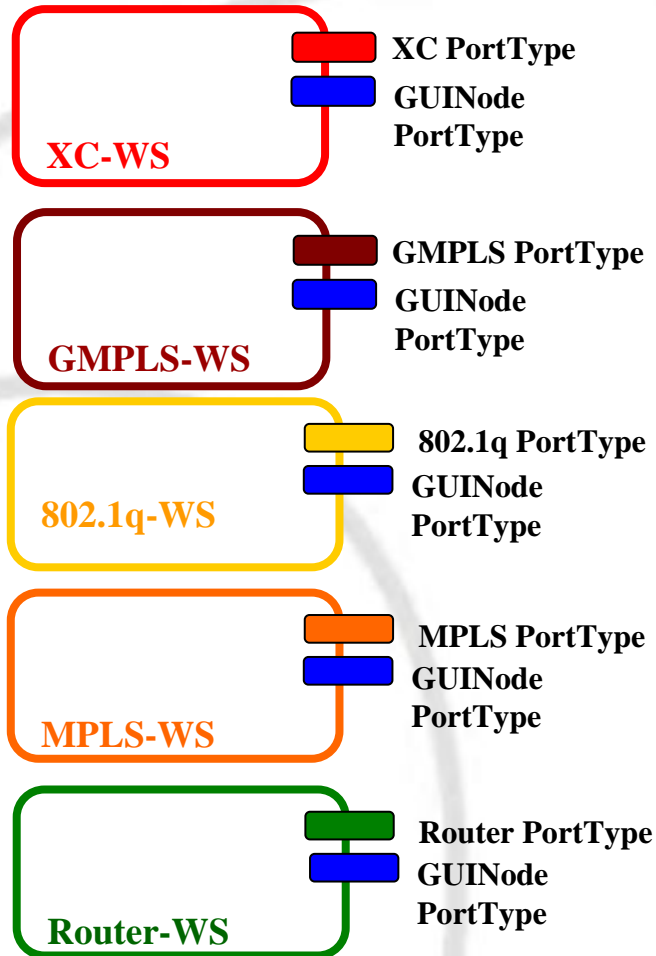
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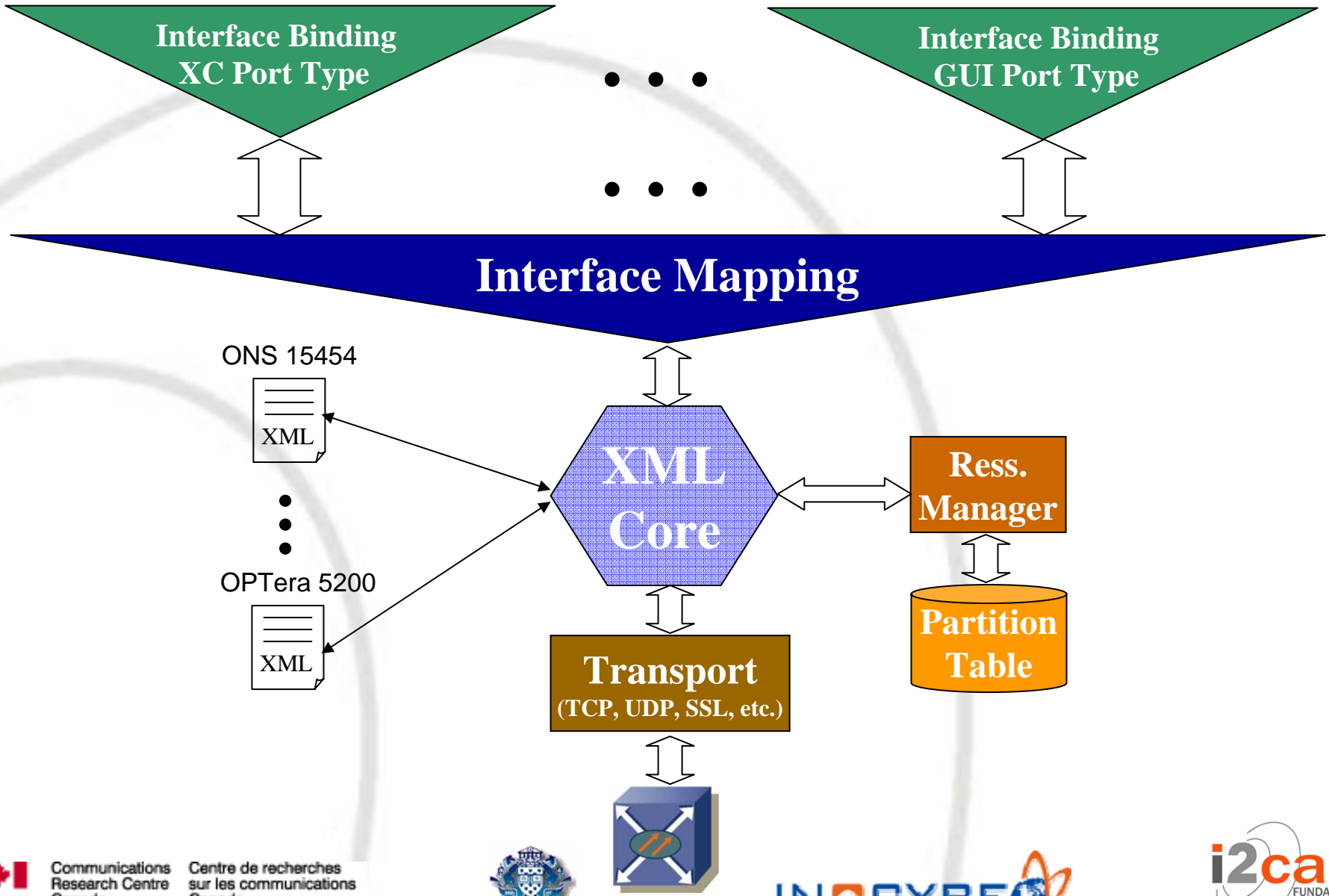
# NE-WS



- XC-WS (**Cross Connect Web Service**)
  - SONET, SDH, Fibre, Lambda Cross Connects
- 802.1q-WS
  - VLAN enabled Ethernet switch
- GMPLS-WS
  - GMPLS Cloud
- MPLS-WS
  - MPLS Cloud
- Router-WS
  - Layer 3 router



# NE-WS family Functional Blocks



# Web Services (II)

- LP-WS (**Light Path Web Service**)
  - An abstraction that represents a link between one or more interconnected resources
  - A BPEL workflow
  - The end points of the LP can be anything that is network enabled
  - Deployed on the carrier's side
- ITF-WS (**InTerFace Web Service**)
  - A BPEL workflow that represents a single resource on a network element
  - Deployed on the carrier's side
- APN-WS (**Articulated Private Network Web Service**)
  - A BPEL workflow script that links together a number of WS from an APN resource list and other sources, including WSs that may be encapsulations of workflows on a host server
  - Deployed on the APN side



# Lighpaths as BPEL Orchestrations

- Lighpaths should be orchestrations because they are logical representations of a flow of operations made on two WS-Enabled nodes
- It will allow internal invocation of instruments or billing gateway when the link is created or setup
- Different layers of services (Switching, VLANs) can be set up at usage time
- The Lighpath workflow can be changed at any time without effecting the WSDL



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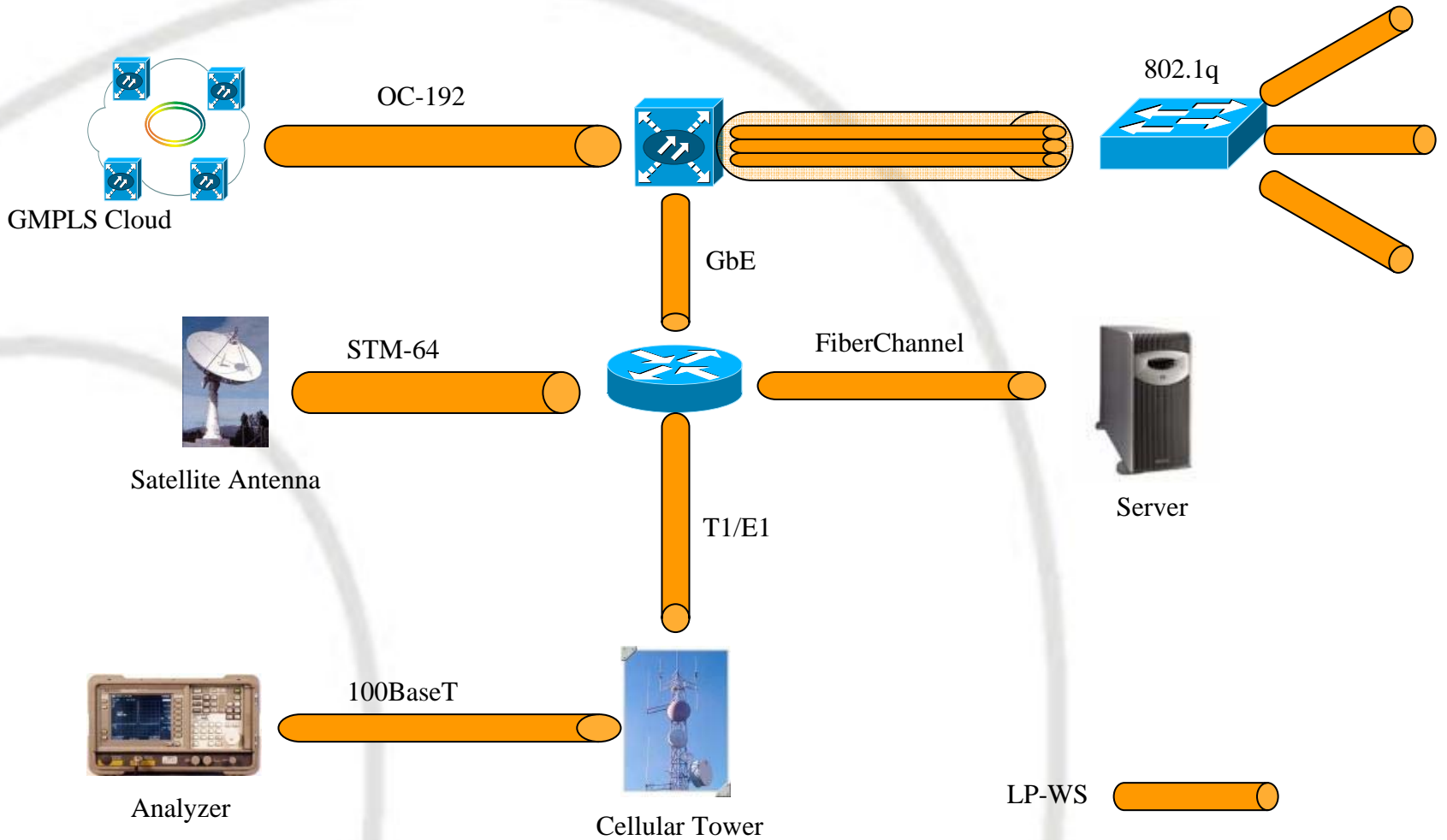
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# Examples of LP-WSs



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# APN-WS

- A workflow script that links together a number of WSs from one or more APN resource list(s) and other sources
- An APN is a single network configuration
- Once an APN is deployed, the topology and bandwidth are fixed
- The most important NEs (the XC-WS) can only be cross connected (startConfig()) or uncross connected (stopConfig)
- A single researcher can have multiple network configurations defined (APNs), and set/undo each configuration when different topologies are needed



# User Roles

- Physical Network (PN) Admin
  - Responsible for provisioning the network and creating **network resources** for APNs to use
- APN Admin
  - Receives APN Resource Lists from PN or APN Admins
  - Responsible for creating the APN network configurations (BPEL) for the users
    - Can partition/bond network resources
  - Can give or sublease its resources to other APNs
- Users
  - Can **use** APN configurations that were created by the APN Admin
  - **Cannot** modify network topologies
  - **Cannot** modify BPEL source

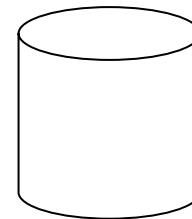


# Security: Implementation Architecture

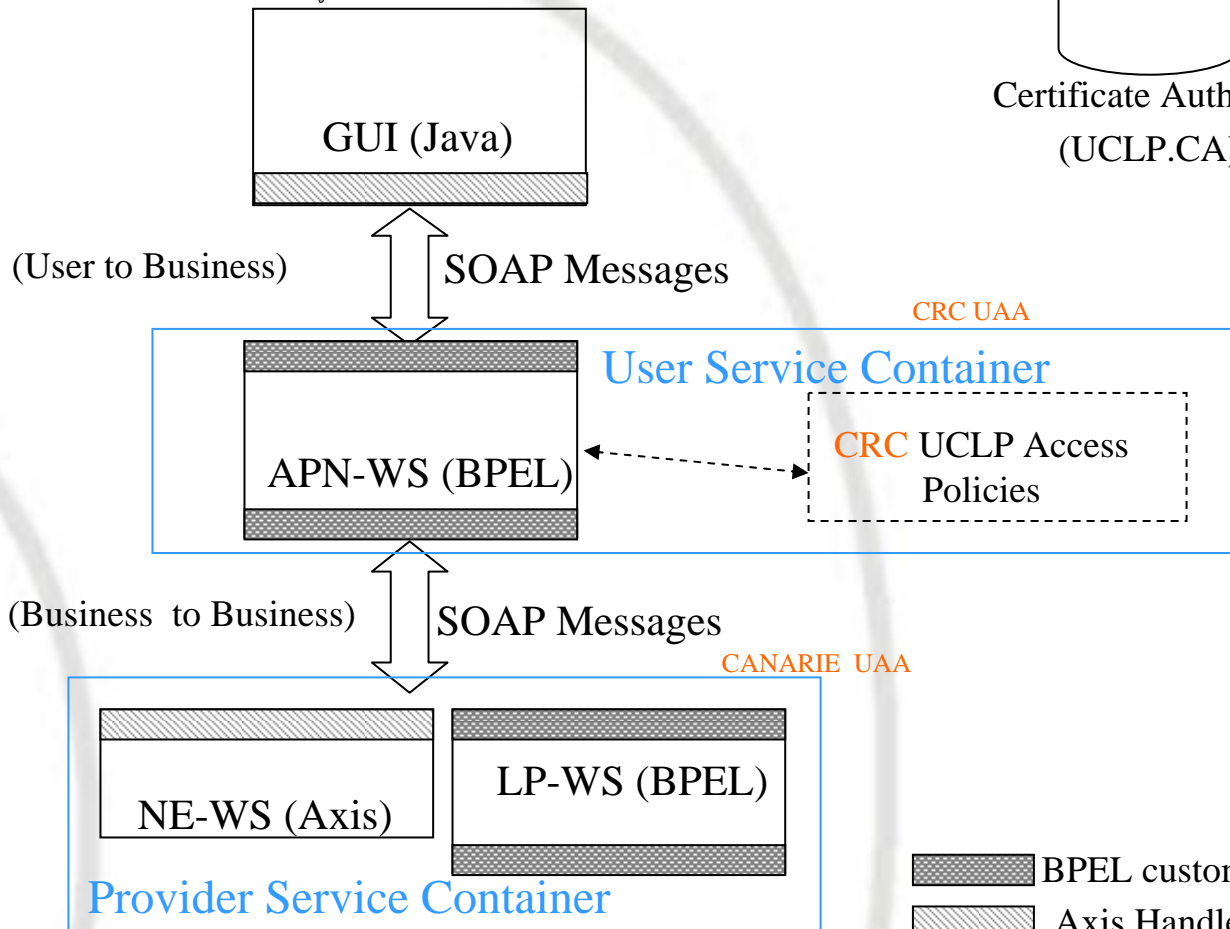
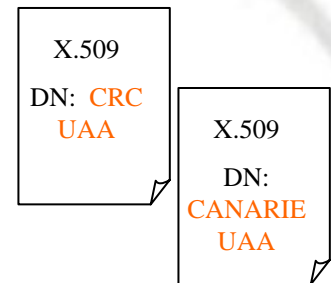
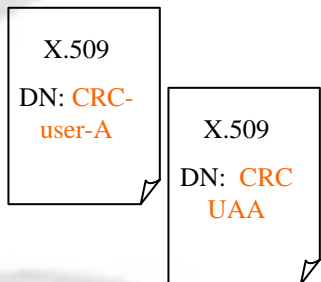
F1



User CRC-user-A



Certificate Authority  
(UCLP.CA)



BPEL customized Handler

Axis Handler



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F1 axis handler?????  
Fi2CAT, 12/01/2006

# UCLP Interoperability

- We must be able to import and export LPs between UCLP systems
  - We must agree on a common PortType that our LP-WSs must implement
  - Must agree on security conventions for accessing the LP-WSs
- As a minimum, we need to be able to import lightpath object WS from other UCLP implementations as well as from instruments WS

CANARIE

NETWORKS > COLLABORATION > RESULTS > RÉSEAUX > COLLABORATION > RÉSULTATS



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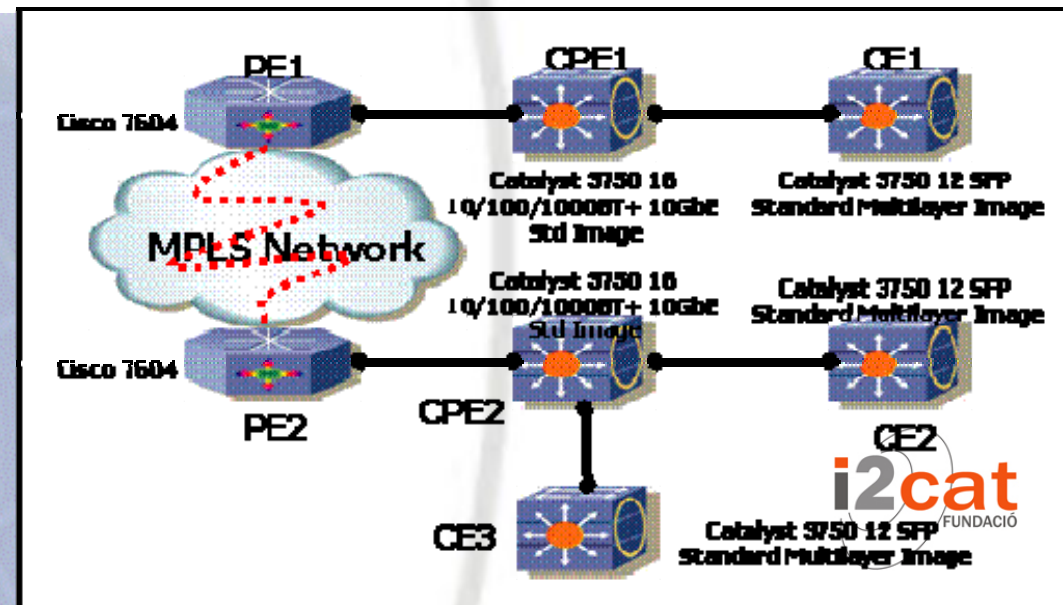
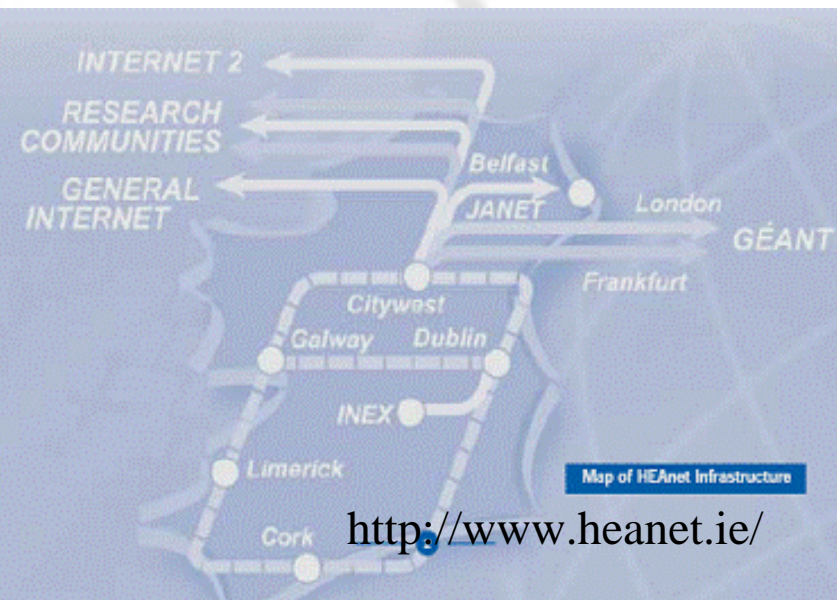
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## UCLP1 HEAnet: Managing Ethernet over MPLS with UCLP

- Establishment of 2 connections types:
  - ERS (Ethernet Relay Service) MPLS connection in VLAN mode using subinterfícies
  - EWS (Ethernet Wire Service) MPLS connection PORT mode with Q-in-Q encapsulation

Test-bed implementation at i2CAT experimental NOC



# More information:

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*Cambridge, January 2005*



# Preliminary Screen Shot

The screenshot displays the Eclipse - UCLP Version 2 Perspective interface. The main workspace shows a map of Canada with several blue server icons connected by red dashed lines, representing a network topology. The interface includes a menu bar (File, Edit, Help), a Resource Explorer on the left, and an Outline on the right. The Resource Explorer shows a tree structure under 'Network Elements' with sub-items like 'ons-tor01', 'ons-ott01', 'Lightpaths', and 'Interfaces'. The Outline shows a tree structure under 'CA\*net 4 - ONSs' with sub-items like 'ons-tor01', 'ons-ott01', 'ons-mon-1', 'Slo: 1', 'Port 1', and 'bandwidth to ons-fre01'. The bottom of the interface has 'Problems' and 'Status' tabs, and a 'DEMO' button is visible in the bottom right corner.



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