UCLPv2
User Controled LightPaths v2

Sponsored by:

CANARIE

Developed by:

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i2cat FUNDACIÓ

Sergi Figuerola

Panel E ONT3 Workshop

Cluster Coordinator- Fundació i2CAT

sergi.figuerola@i2cat.net

Agenda

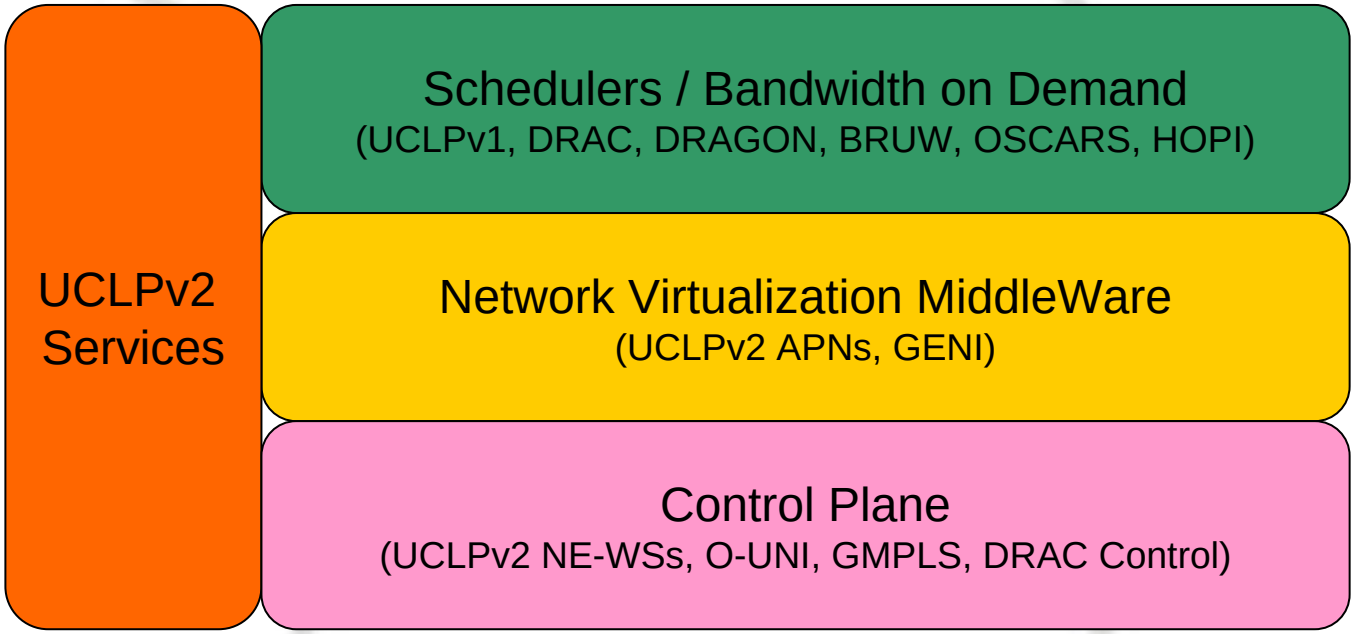
- What is UCLP?
- Architecture
- User roles
- Resource utilization example: use case

What is UCLP?

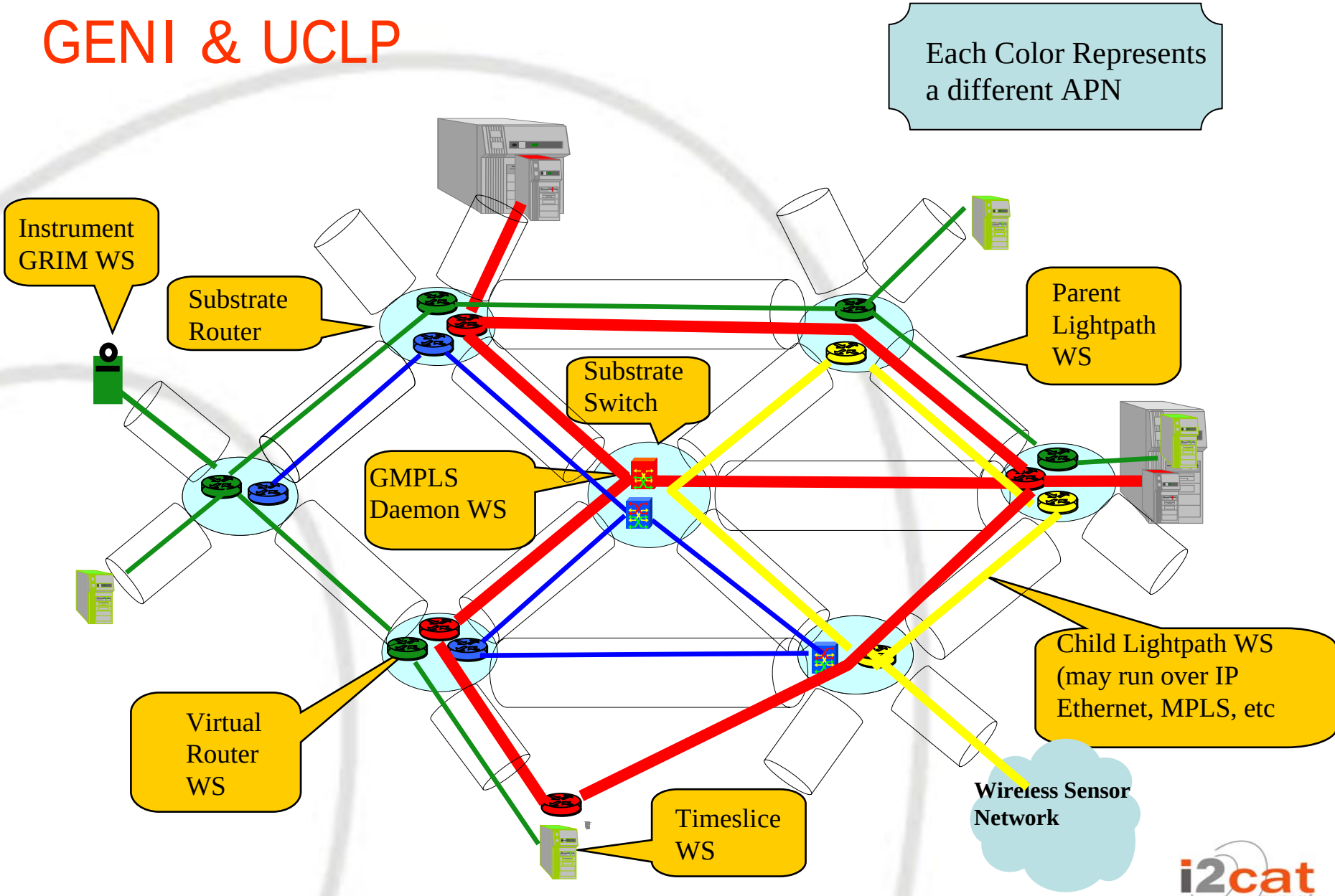
- User Controlled LightPaths – a network virtualization management tool built using web services.
- Allows administration of networks resources and their respective web services.
- Resources can be grouped and given to dedicated individuals or organizations creating Articulated Private Networks (APN).
- Via the service interface, APN owner can establish cross-connections, change bandwidth or lease their resources.
- Allows network resources to be integrated with applications.

UCLP and other Technologies

- UCLP is NOT intended about setting up end to end wavelengths
- UCLP is NOT intended about bandwidth on demand
- UCLP is NOT intended about dynamic circuit switching

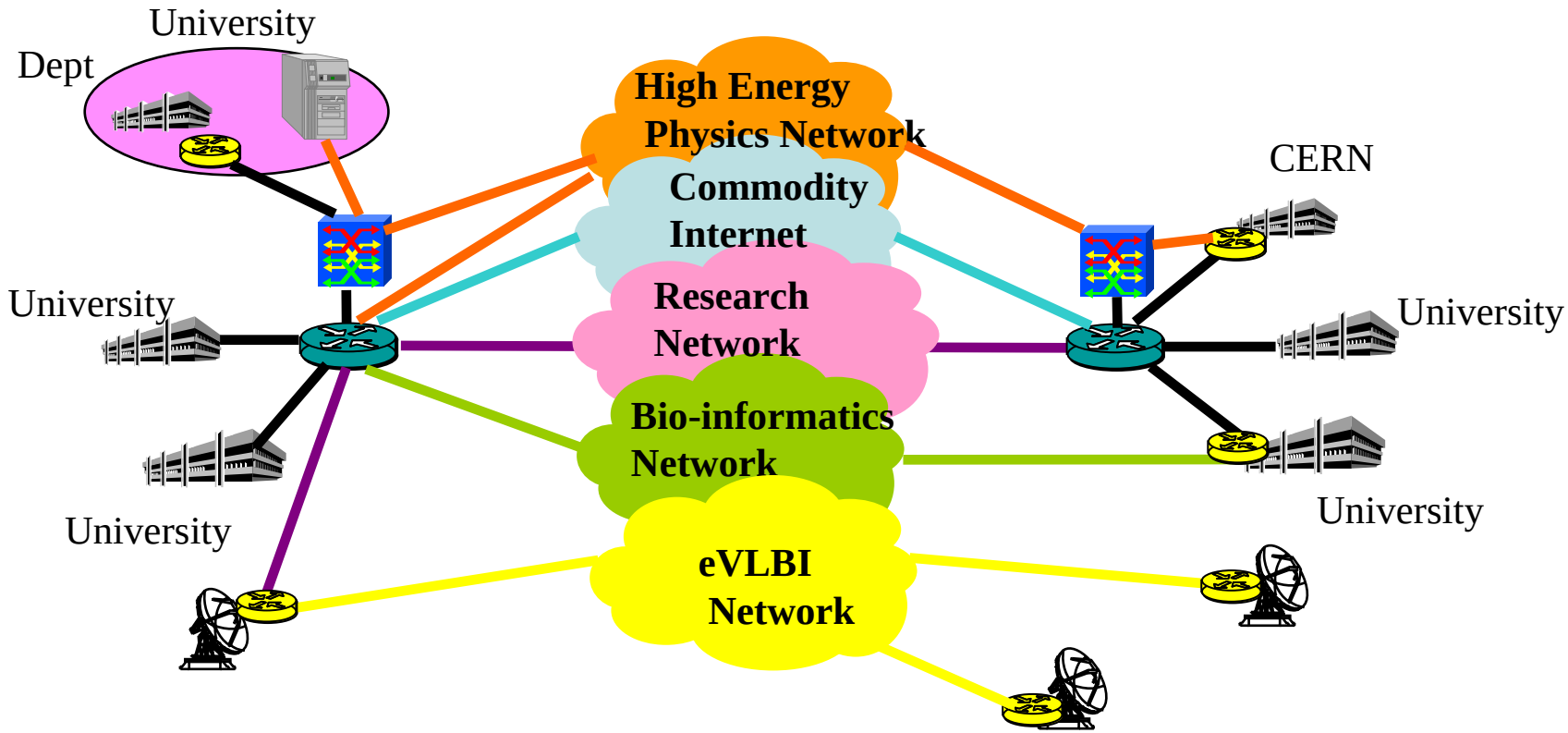


GENI & UCLP


Each Color Represents a different APN
Instrument GRIM WS
Substrate Router
Substrate Switch
Parent Lightpath WS
GMPLS Daemon WS
Child Lightpath WS (may run over IP Ethernet, MPLS, etc
Virtual Router WS
Timeslice WS
Wireless Sensor Network

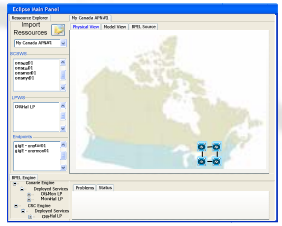
What is an Articulated Private Network?

- APN: Is a set of dedicated resources (Network, Instruments, Sensors) that can be manipulated.



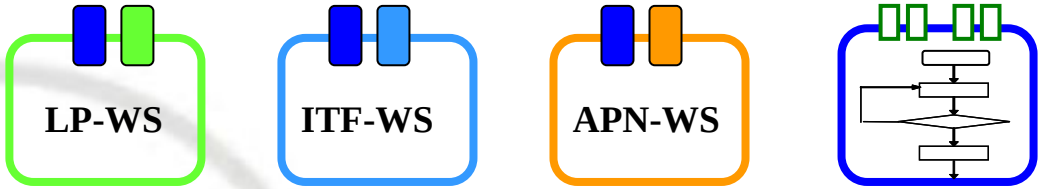
create several parallel application specific networks from a single physical network

UCLPv2: High Level “Architecture”



User Access Layer

(Eclipse RCP) or Flex/Ajax

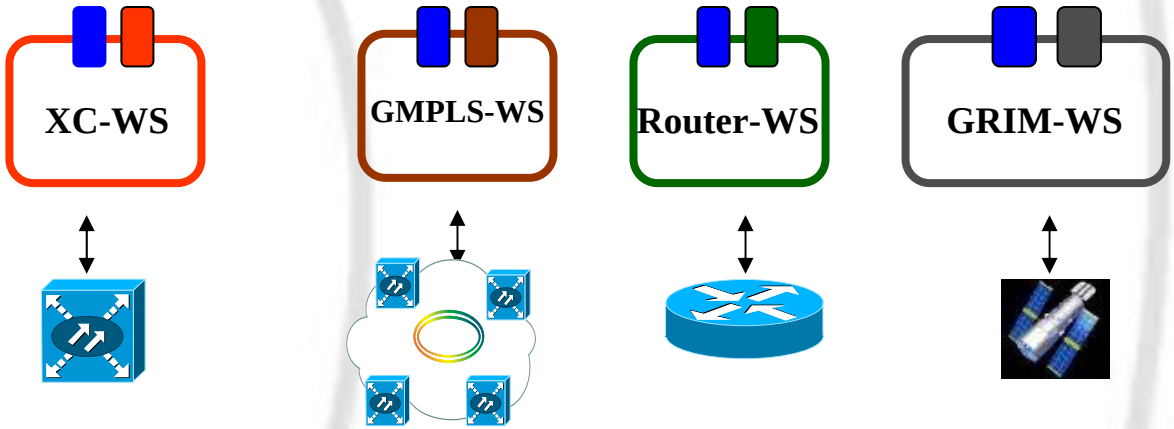


Service Orchestration Layer

(BPEL) or Compiled

Resource Management Layer

(Compiled Web Services)



Network Element Web Service Family

Completed

- XC-WS (Xconnect Web Service): SONET, SDH, GigabitEthernet.

Future Work

- ROADM-WS: Lambda switching web service.
- 802.1q-WS: VLAN enabled Ethernet switch.
- Virtual Router-WS: Virtual router (e.g. Juniper)
- GMPLS-WS: GMPLS Network Cloud.
- MPLS-WS: MPLS Network Cloud.

UCLPv2: User Roles

- Physical Network (PN) Admin (e.g. CANARIE Operator)
  - Responsible for provisioning the network and creating network resources (lightpath and interface web services) for APNs to use

- APN Admin (e.g. network administrator of CERN)
  - Receives Resource Lists from PN or other APN Admins
  - Responsible for creating the APN network configurations for the users
    - Can partition/bond network resources
    - Configurations could be automatically created (On-Demand) via a E2E Routing-WS. (Future work)
  - Can give or sublease its resources to other APNs
- Users (e.g. CERN scientist)
  - Can invoke APN configurations previously created by the APN Admin.
  - Cannot modify network topologies.

Resources Utilization Flow diagram

PN Admin

Abstract Network Resources

Abstract network resources

UCLPv2

UCLPv2 Physical Network View Window Help

Resource Explorer

- Physical Networks
  - canet4
    - ome-cal01
    - ome-edm01
    - ome-win01
    - ons-win01
    - ons-reg01
    - ons-cal01
    - ons-tor01
    - ome-tor01
    - ome-ott01
    - ons-mon01
    - ons-fre01
    - ons-hal01
    - ons-nyc01
    - Physical Links
- Logical Networks
  - canet4
    - Interface Web Serv
    - LightPath Web Serv
    - Connections
- Resource Lists
- APNs

canet4

Palette

- Select
- Marquee
- Topology Tool

Network Elements

- Cisco ONS 15454
- Nortel OME 6500
- Nortel HDXc

Outline

- ome-sas01
  - Shelf 1
    - Slot 1
      - Port 1
        - Ethernet
      - Port 2
      - Port 3
      - Port 4

Properties | Logical Resource Pool | Console

Property	Value
Expiration Date	N/A
Owner	i2CAT
Resource ID	N/A
Status	NOT AVAILABLE FOR UCLP
Type	GigabitEthernet

User gco_admin logged in as PN Admin

Resources Utilization Flow diagram

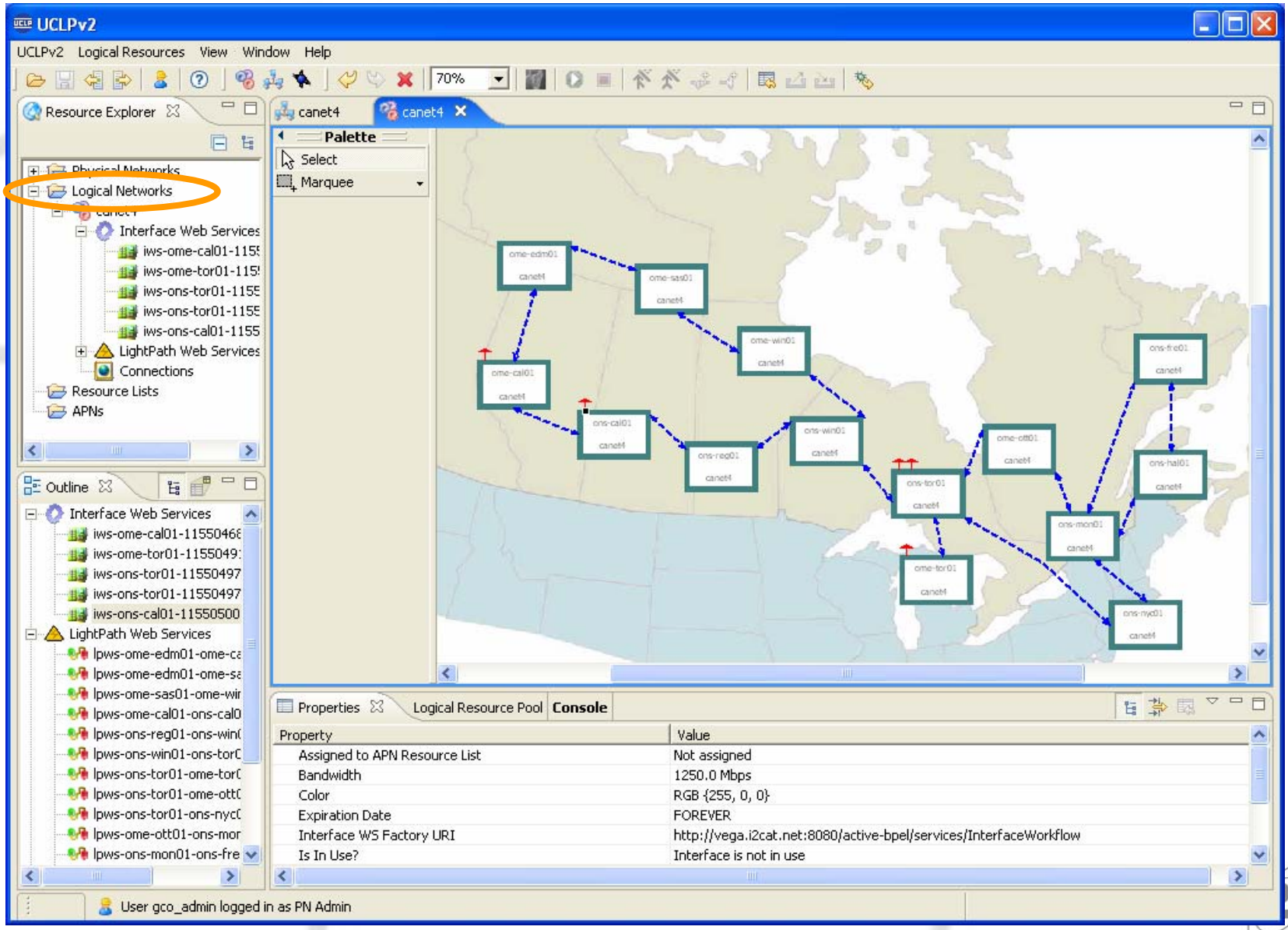
PN Admin

Abstract Network Resources

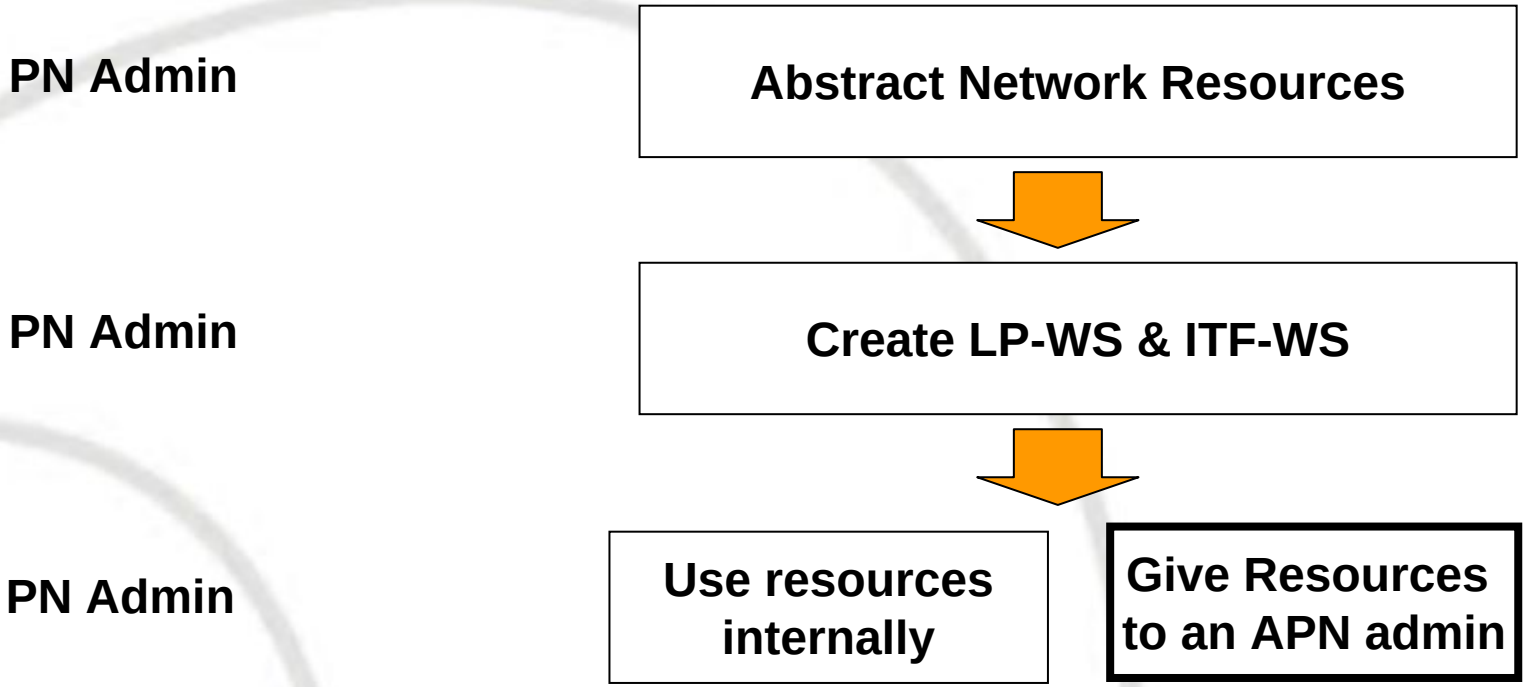
PN Admin

Create LP-WS & ITF-WS

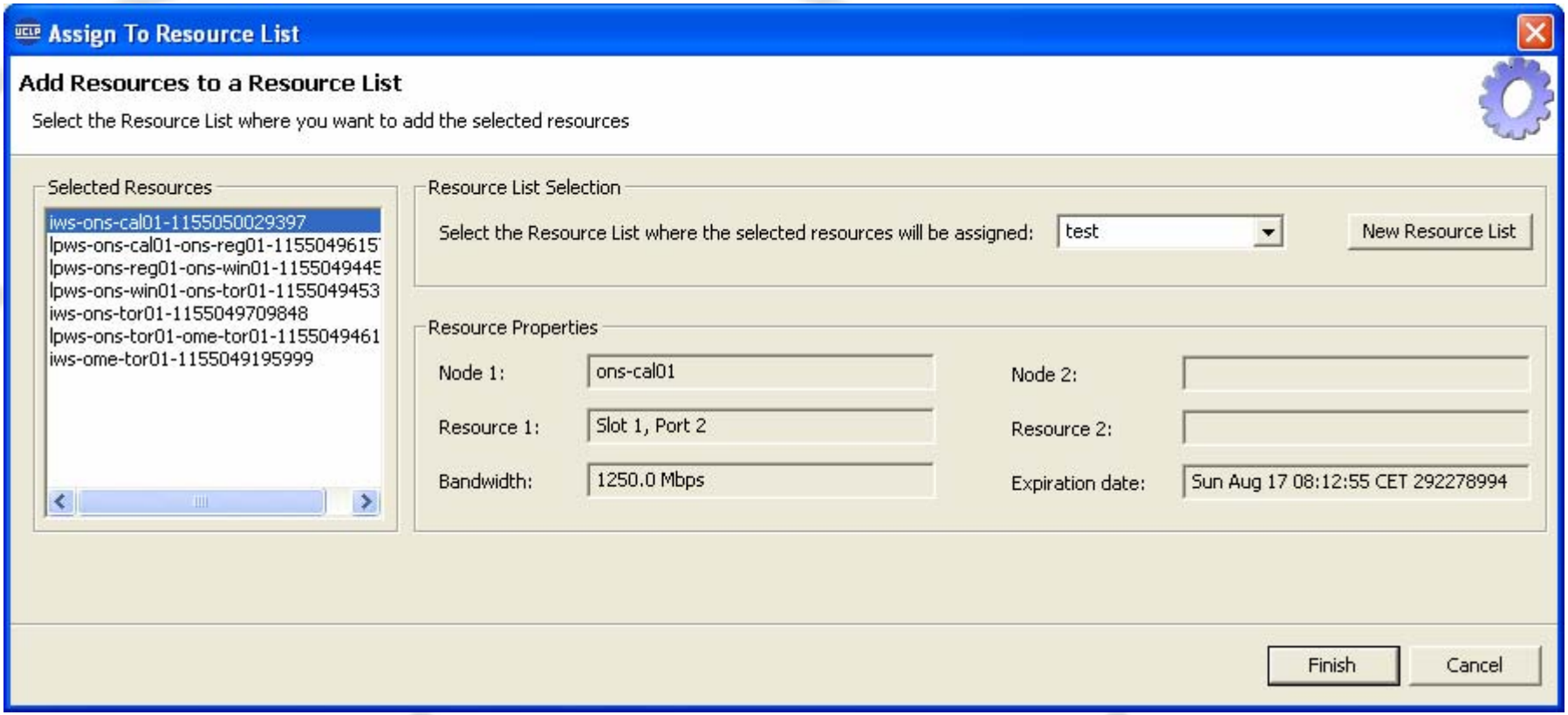
Create LP-WS & ITF-WS



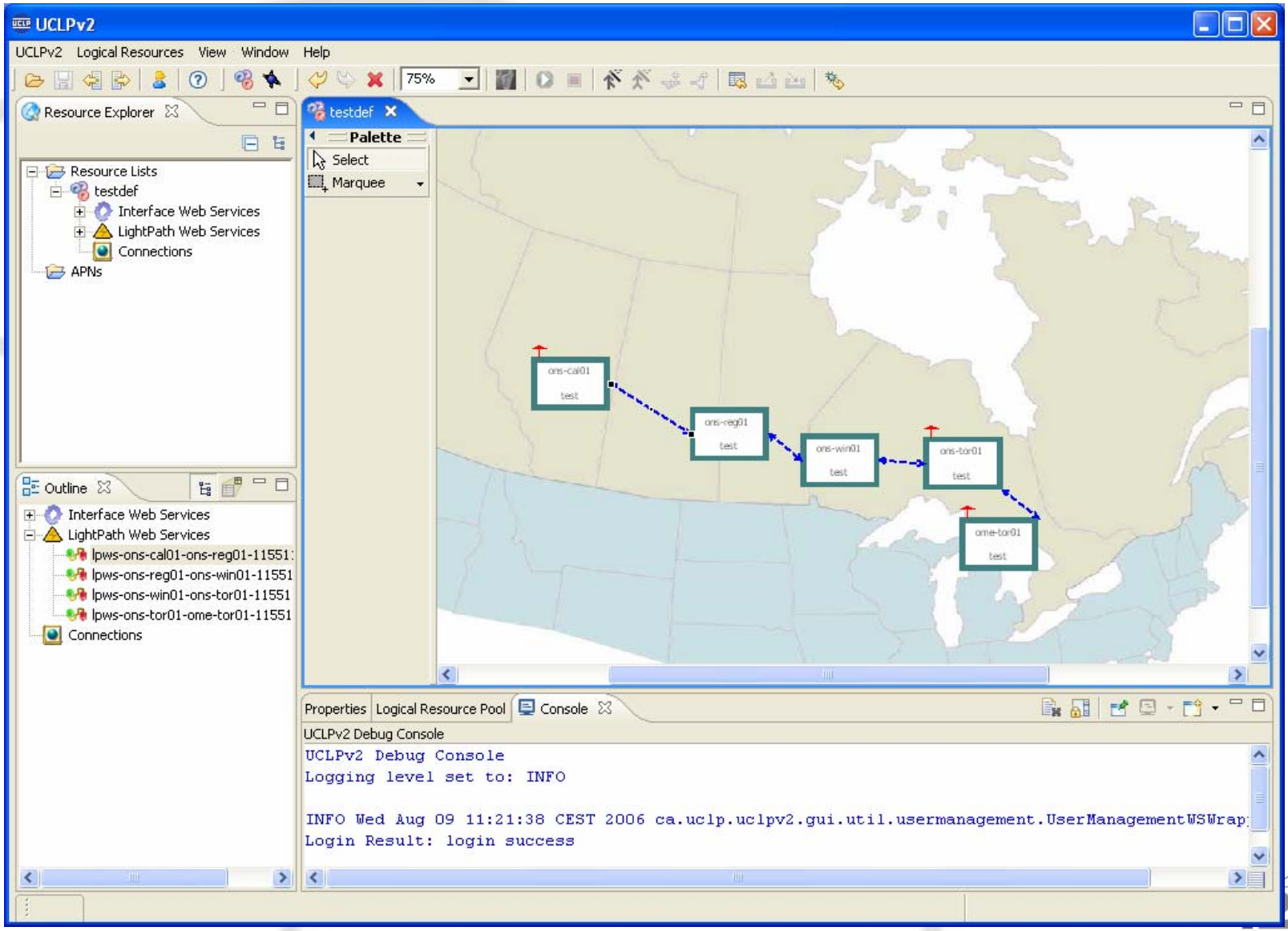
Resources Utilization Flow diagram



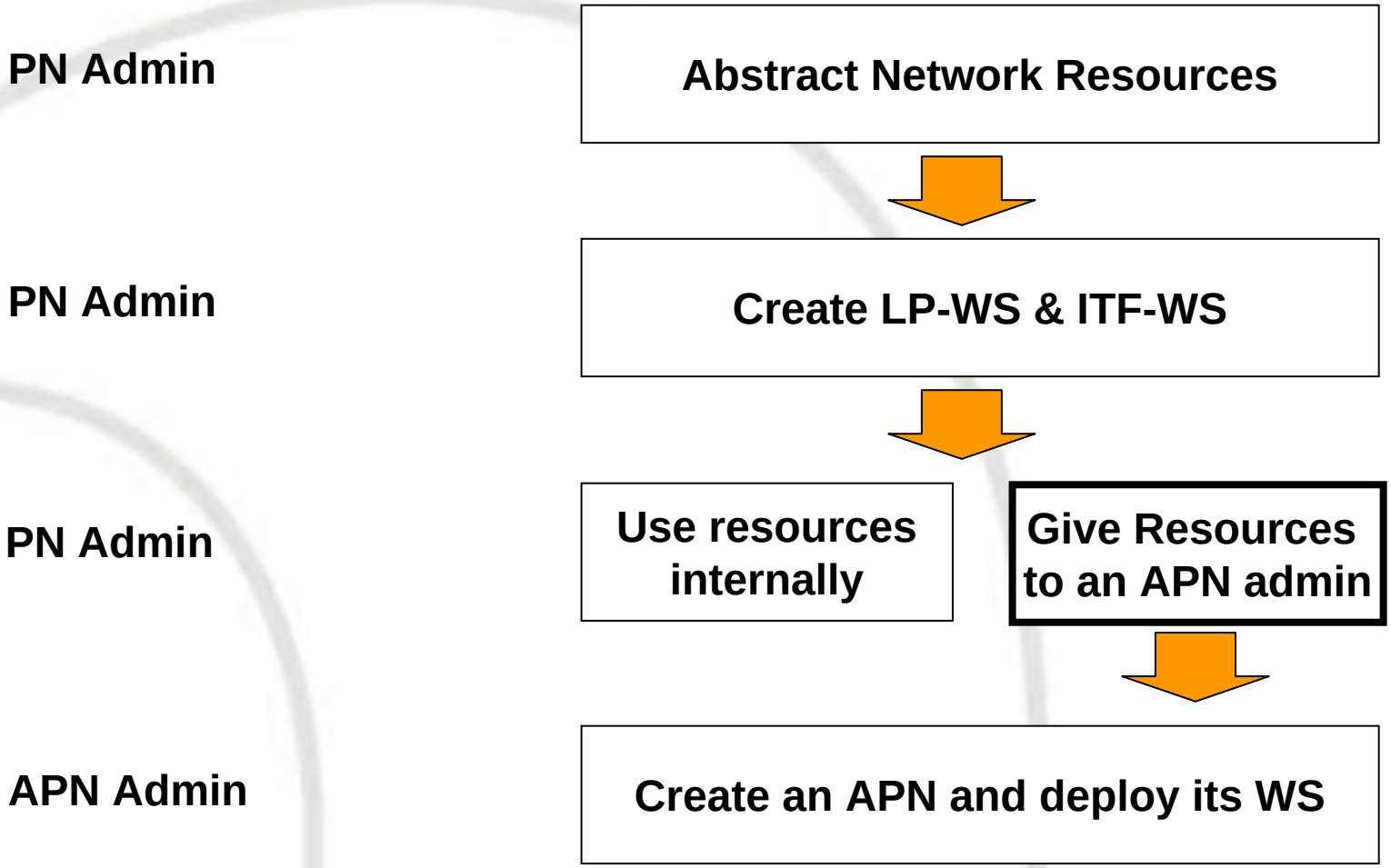
Give Resources to an APN Admin (I)



Give Resources to an APN Admin (II)



Resources Utilization Flow diagram



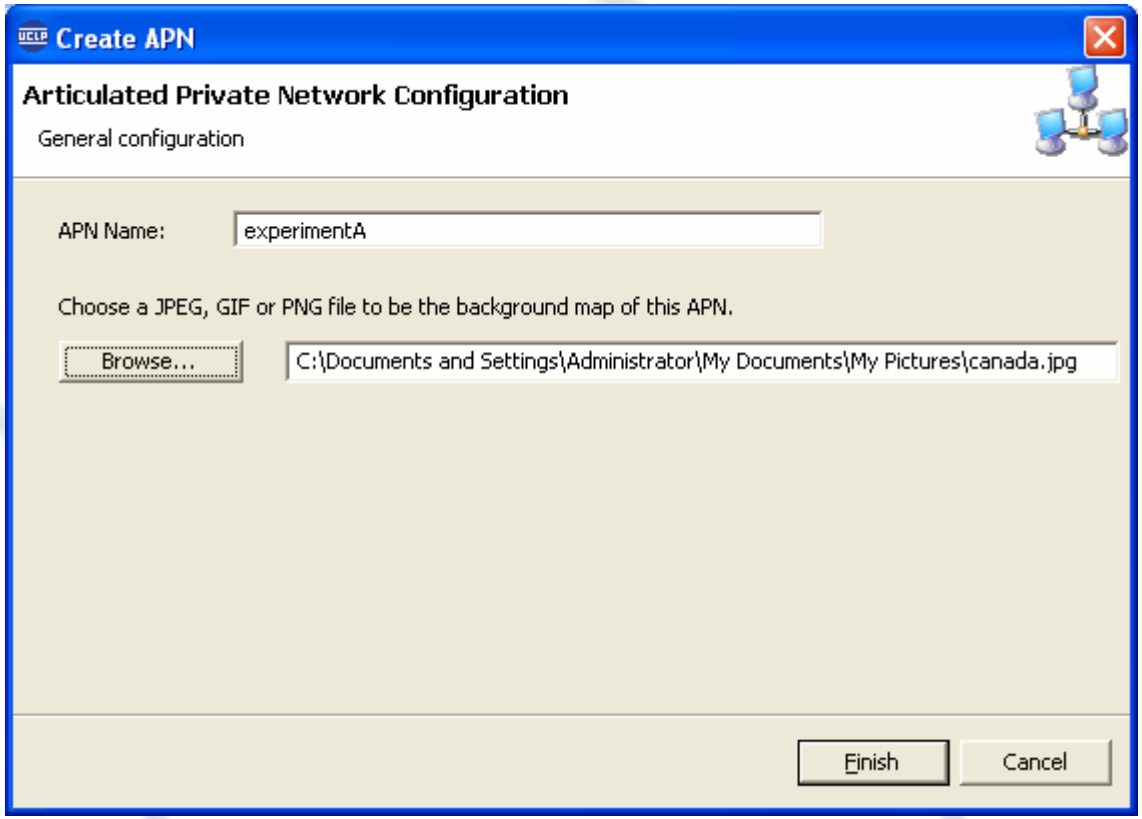
What is an Articulated Private Network-WS?

- An APN-WS is a workflow script (BPEL) that does a predefined set of operations on lightpaths, interfaces and instrument web services. In order to create a specific network topology.

- Once an APN-WS is deployed and running, the topology and bandwidth are fixed
  - If the configuration of the network elements wants to be changed, the APN must be stopped, and a new APN must be created.

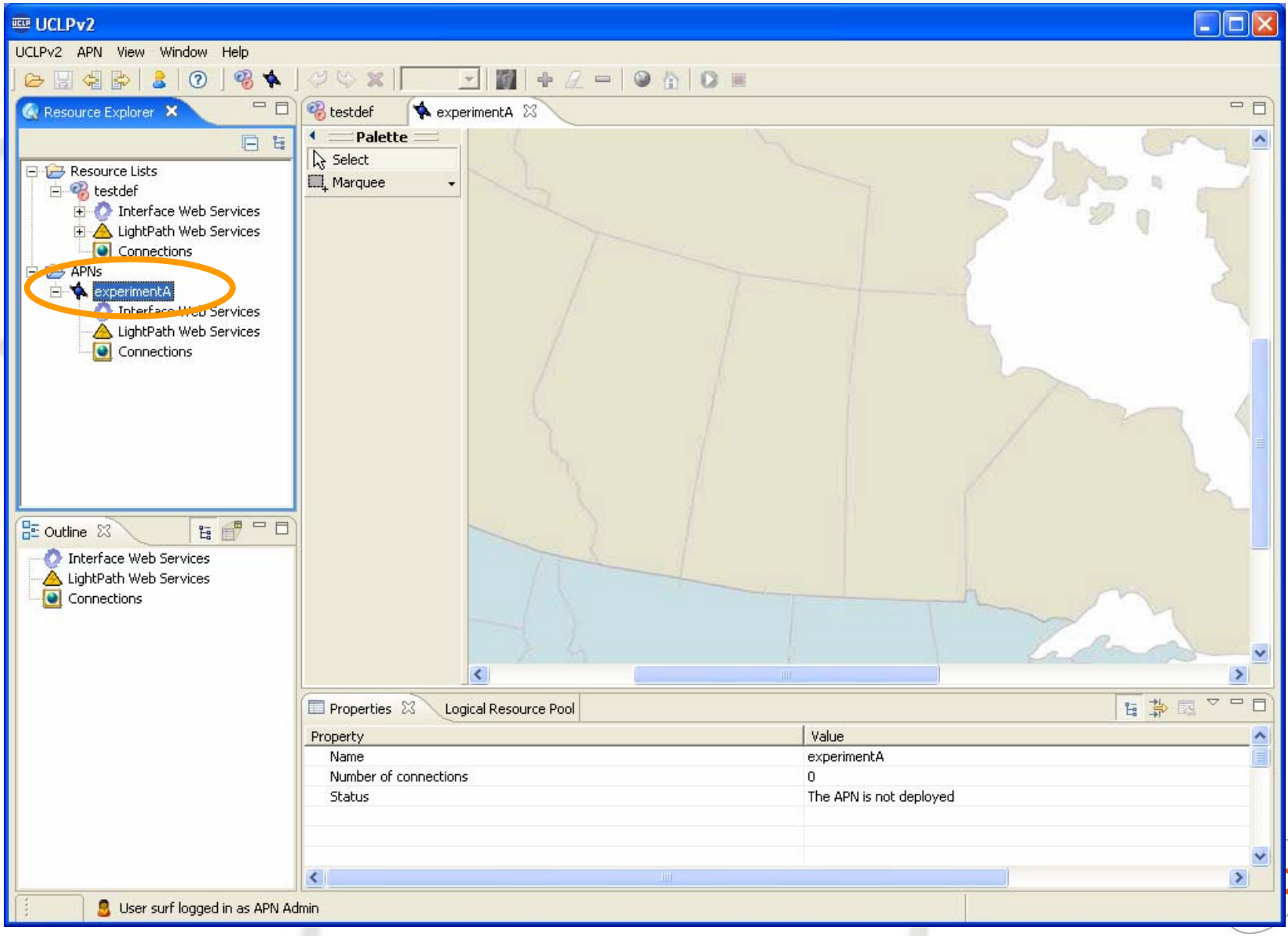
- A single researcher can have multiple APN configurations defined (APN-WSs), and set/undo each configuration when different topologies are needed.

Create an APN and Deploy its WS (I)

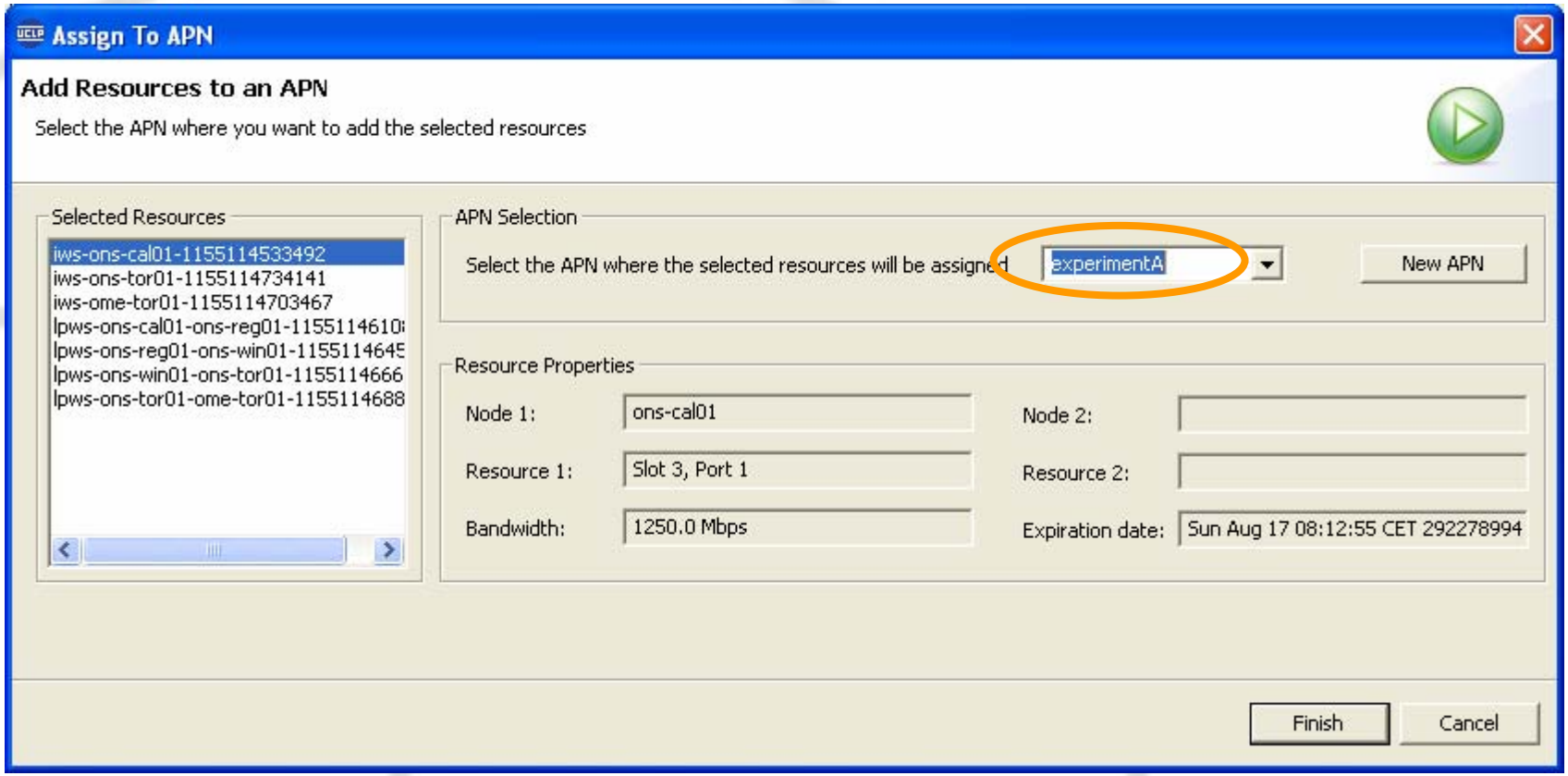


Create the APN (it’s still not a WS!!!)

Create an APN and Deploy its WS (II)

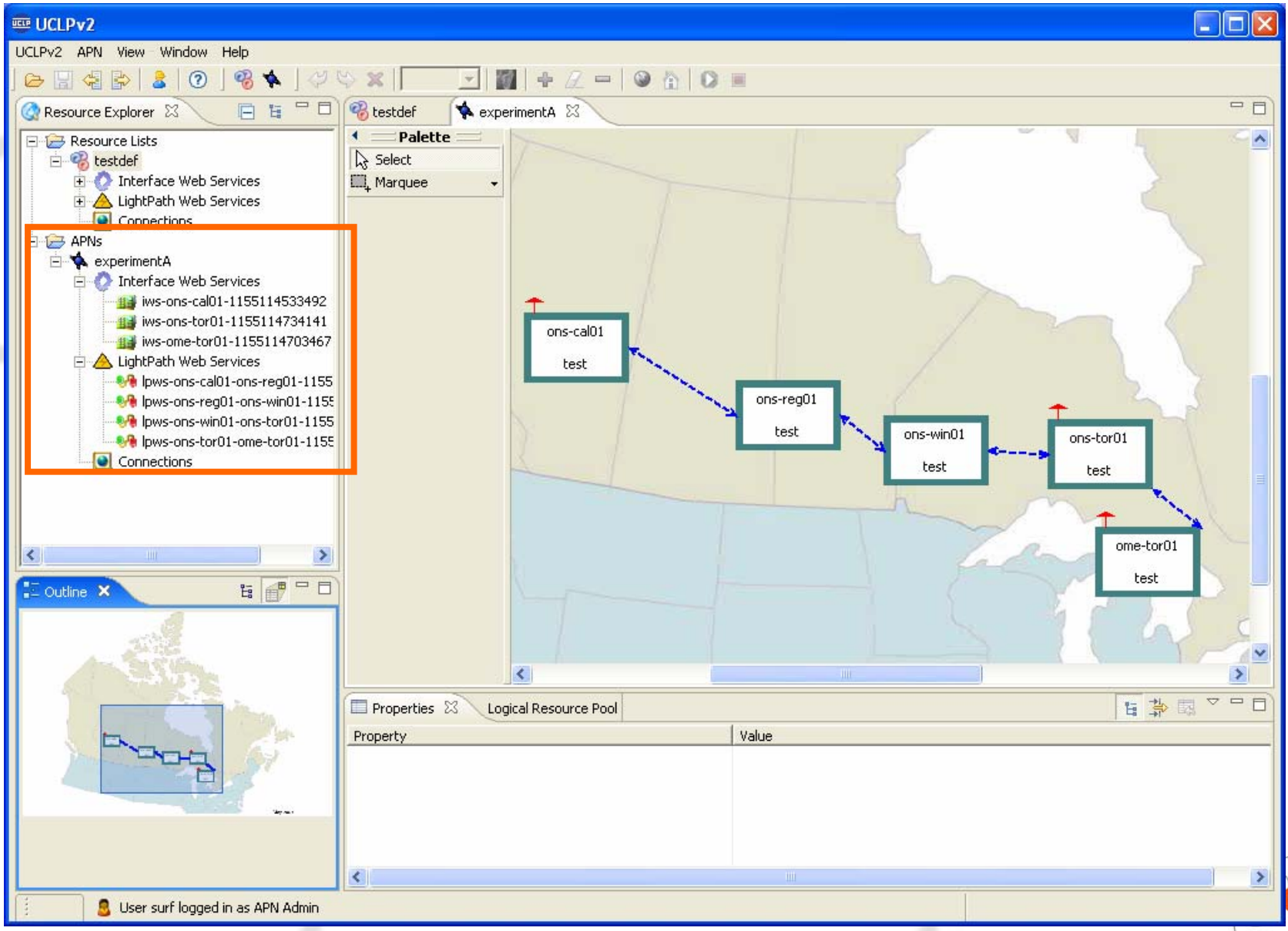


Create an APN and Deploy its WS (III)

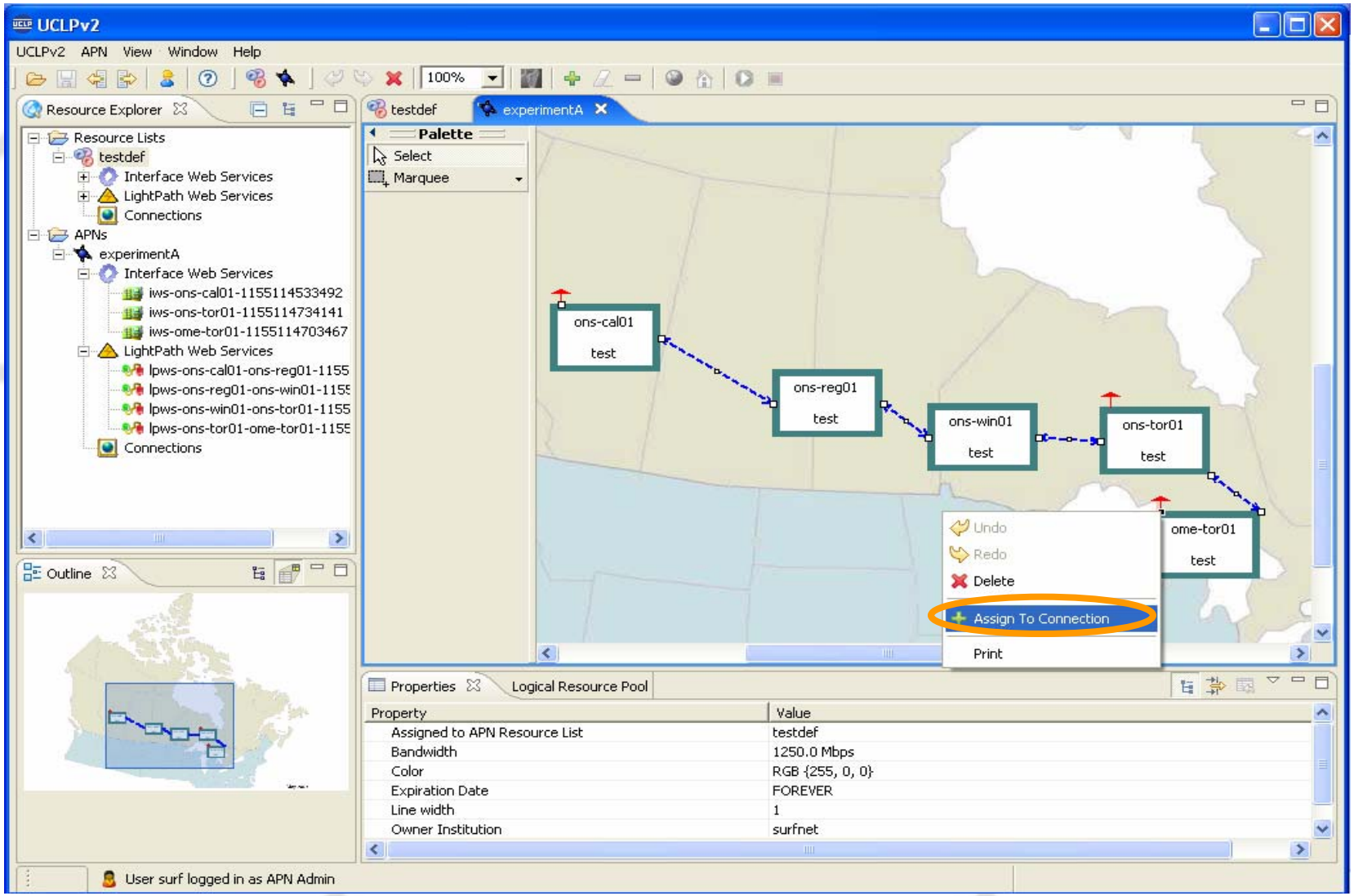


Add resources to this APN, this is assign one or more Resource Lists to this APN

Create an APN and deploy its WS (IV)

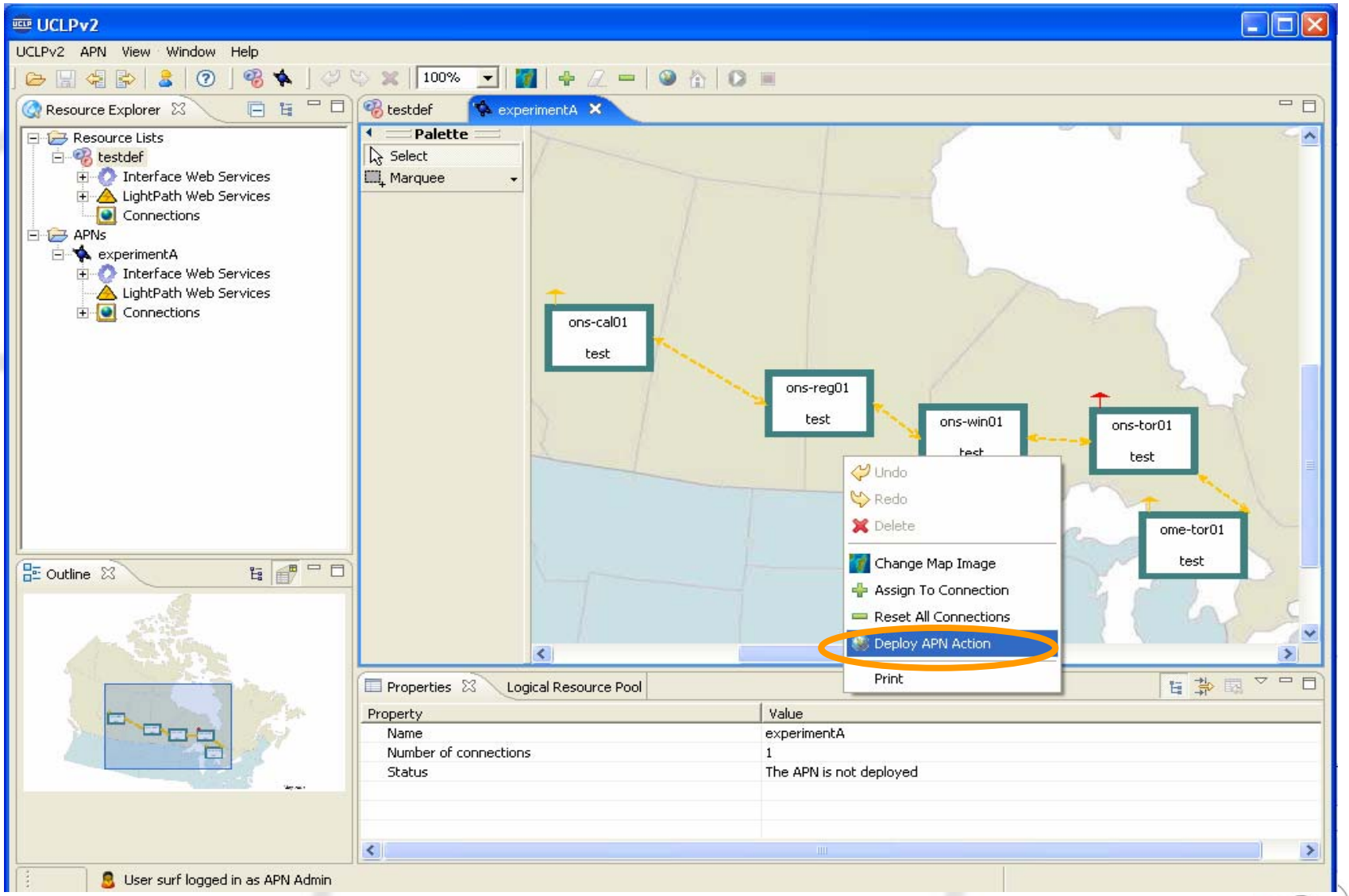


Create an APN and deploy its WS (V)



Configure the APN, this is say which connections will be in place when we'll run the APN

Create an APN and deploy its WS (VI)

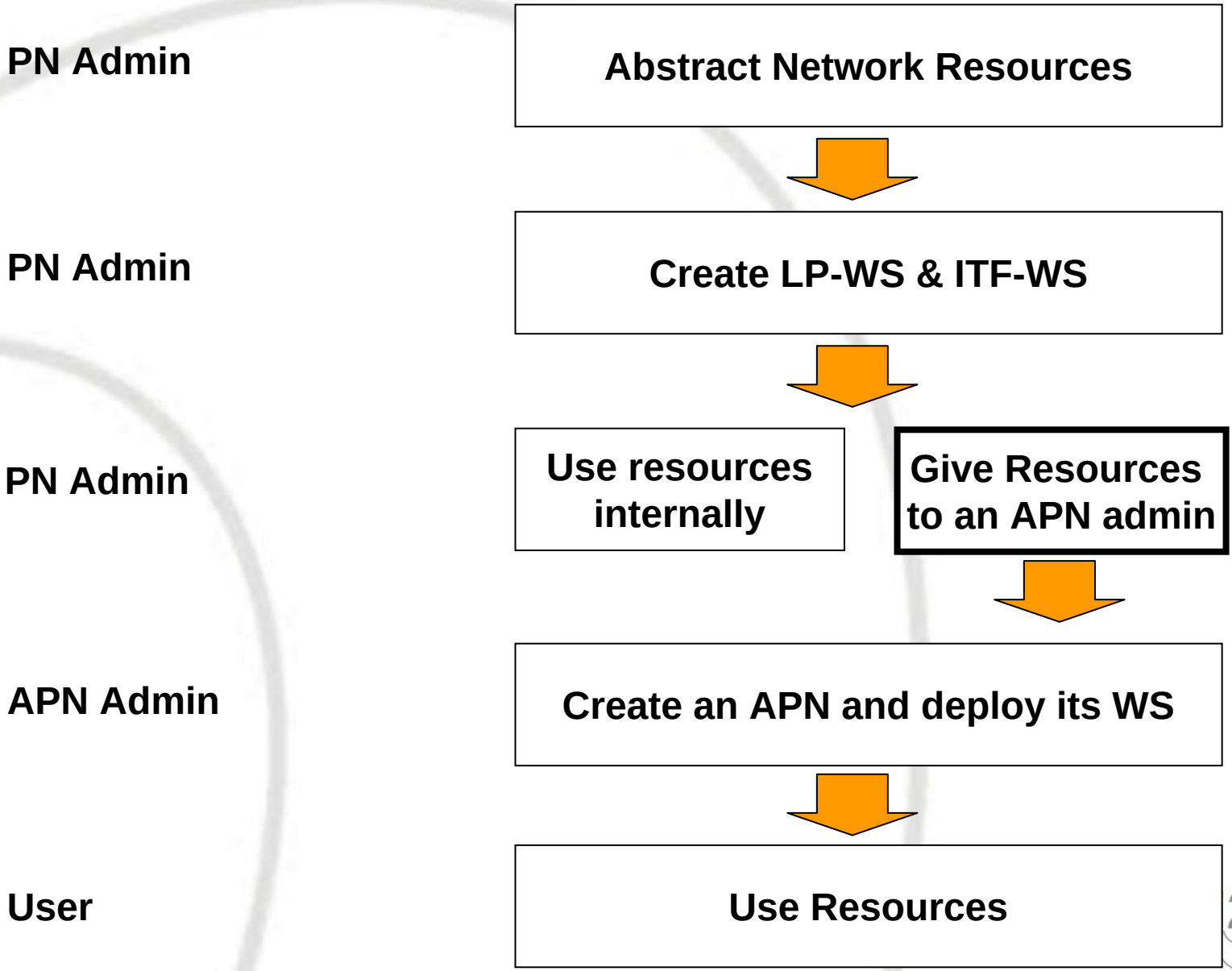


Deploy the APN. Now we have a WS!!

Why use BPEL to implement the LP, ITF and the APN Web Services?

- BPEL provide a means to add in policy checks + accounting easily using Third Party Services.
- BPEL compensation handlers provide a powerful Roll Back mechanism (in case something goes wrong).
- Implementing lightpaths and/or interfaces as BPEL process instances provides more flexbility (we don't care what services are used inside) then having LPs/ITFs as independent Axis Web Services.
- As long as the WSDL interface of a BPEL process remains the same, one can modify the BPEL script then re-deploy the process, without having to recompile or install anything.
- We can create custom APNs on-the-fly, by generating tailored BPEL scripts for the user, so that he can deploy and use the custom APNs outside the UCLP environment.

Resources Utilization Flow diagram



Use Resources

testdef | experimentA

Palette
Select
Marquee

ons-cal01 test
ons-reg01 test
ons-win01 test
ons-tor01 test
ome-tor01 test

Undo
Redo
Delete
Change Map Image
Assign To Connection
Undeploy APN Action
Run APN
Print

Properties | Logical Resource Pool
Property | Value

ons-reg01 test
ons-tor01 test
ome-tor01 test

Undo
Redo
Delete
Change Map Image
Assign To Connection
Stop APN
Print

Properties | Logical Resource Pool | Console

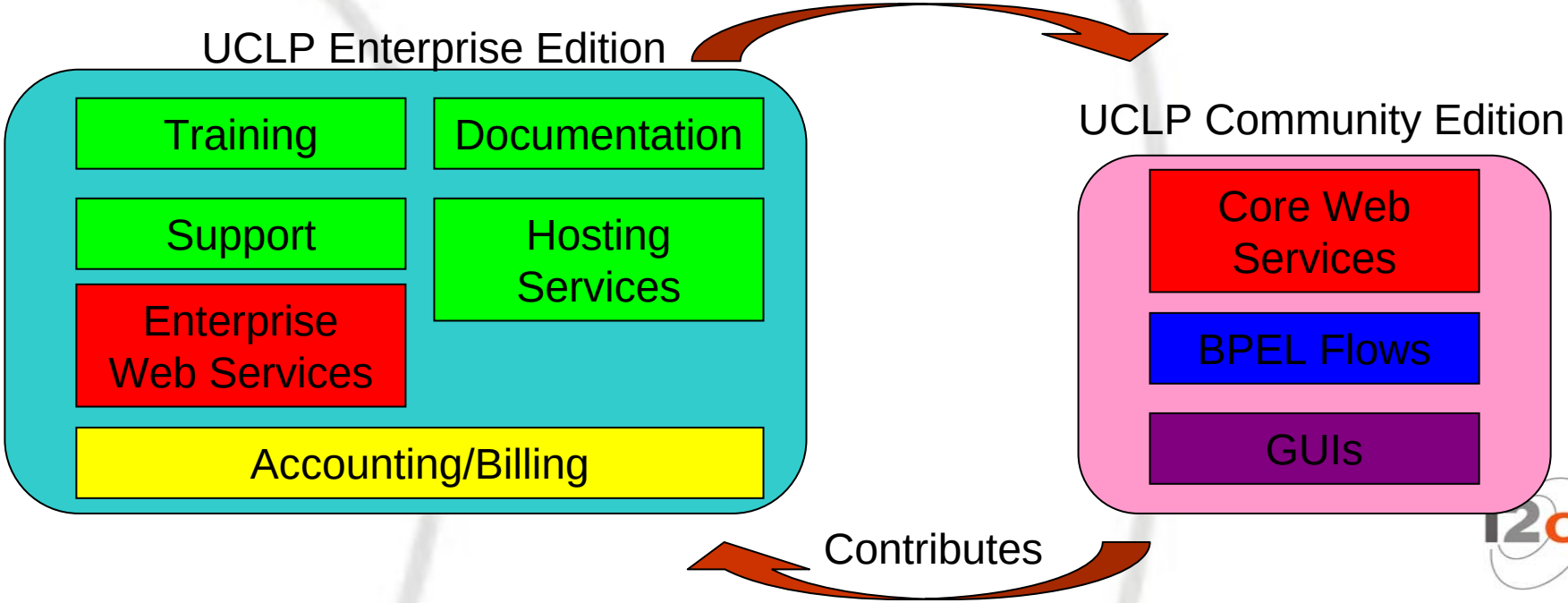
UCLPv2 Enterprise Edition

Features

- Provides appropriate support, training, documentation as well as enhanced security/stability.
- Improved XML Engine editor and Enterprise Web Service
- Built-in Accounting, Billing and Reports.

Expected Release Date Autumn 2007

Business Model



More information:

www.uclp.ca
www.i2cat.net
fundacio@i2cat.net

UCLPv2 support
uclpv2@crc.ca

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