The MANTICORE Project: Providing Users with a Logical IP Network Service

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MANTICORE Partners (self funded project)
Agenda

• The MANTICORE Project Vision

• MANTICORE Implementation
  – The IaaS Framework (UCLP Evolution)
  – User Roles
  – Software Architecture

• How does it work: GUI preview

• DEMO at TNC 2008

• Future work: MANTICORE and RPSL
The MANTICORE vision

Each user’s IP network is represented by a different color.

Other user’s IP Network or the Internet
MANTICORE project

• A IaaS Framework based system that provides the User (NOC and/or end user) with the ability to define and configure its own physical and/or logical IP network
Logical IP network

• Logical
  IP network should guarantee route integrity in contrast with point to point links/lightpath/lambdas

• Two Routing Services (RPSL):
  – internal routing (pure internal configuration and making directly connected ports explicit)
  – external routing (other networks, directly connected hosts and propagation of external routing info)
Logical IP Network Service

- Define the edge ports of the IP network
- Define the external Routing Service (policy)
- In case there are preferences on internal transport services, QoS: the internal Routing Service metric
- If available: IP address space
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Infrastructure as a Service
IaaS and Virtualization

- Virtualization consists of representing a physical device/substrate/datapath as a Software entity (P2V).
  - Initially started with PC virtualization (VMWare, VirtualIron, VirtualPC).
  - Provides Isolation.

- IaaS is equivalent of SaaS for hardware devices.
  - Amazon and BlueLock pioneer the IaaS service by renting hardware using proprietary solutions.
  - Users pay to use shared infrastructures.
  - Monthly fees or Pay per use.
  - Long term exchanged compared to on-demand services.
  - Users control/own the infrastructure.
UCLP, Argia and the IaaS Framework

- Two UCLP research programs were put in place by CANARIE to provide a virtualization solution for optical networks starting in 2001
  - UCLP initial goal was to provide end to end paths across domains (DataPath Virtualization)
  - UCLPv2 goals were to create reusable and configurable network blocks (Hardware Partitioning)

- UCLPv2 concepts are evolving into many different Physical to Virtual (P2V) products and R&D projects that are built on the IaaS Framework:
  - Argia -> Product for Optical Networks
  - Ether -> R&D for Ethernet and MPLS Networks
  - MANTICORE -> R&D for physical/logical IP Networks
  - GRIM -> R&D for Instruments and Sensors
Infrastructure Resource Trading (I): Direct Export
Infrastructure Resource Trading (II): Broker Sites
MANTICORE Software Architecture

RPSL may be used to let the GUI specify high level routing policies (internal as well as external) to the IP Network WS.

Transforms the routing configuration abstract description in high level operations that will be invoked in the Router WS over one or more virtual resources.

Transforms the high level operations over one or more virtual resources into specific commands that each particular routing device can understand.

Manager user accounts, get user credentials, authenticate.

User Workspace WS

GUI client(s)

Virtual Resource Services

Represent the physical (ports) or logical interfaces (VLANs, TDM Channels) that users can access.

IP Network WS

Router-WS

Ethernet Resource WS

TDM Resource WS

Netconf

Protocol X

Protocol Y

Juniper device

Other vendor device

Software router
First implementation limitations

- Based on Juniper routers using the Netconf JunOS XML API

- RPSL (will explain later) won’t be used as a means of describing abstract routing configurations (instead, a proprietary simple and limited representation will be used).

- The implementation is a proof of concept, it is not a complete solution: working prototypes of the services will be implemented, but some features and performance optimization will be left for future work.
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Example deployment

- **Two organizations:**
  - **NREN A:** Physical Network Administrator. In this very simple example it operates a network with one physical router.
  - **i2CAT:** Virtual Network Administrator. In this very simple example it will request two logical routers to NREN A.

- **MANTICORE Software deployment**

  **NREN A Server:**
  - User Workspace WS
  - Ethernet Resource WS
  - IP Network WS
  - Router WS

  **i2cat Server:** (optional)
  - User Workspace WS
  - Ethernet Resource WS
  - IP Network WS
When NREN A first launches the GUI client, it must create a new physical network and add all the routers they want to manage to it.
NREN A discovers the physical router II
NREN A PN Admin creates logical routers I

- NREN A admin creates some logical interfaces, two logical routers and assigns these logical interfaces to the logical routers.

- He also creates a logical tunnel between the two logical routers (new LT interfaces are created).
NREN A PN Admin creates logical routers II
Giving permissions to links and interfaces

- NREN A PN Admin creates a resource list (list of resources that can be accessed by NREN A or a 3rd party).
- NREN A PN Admin creates virtual interfaces and virtual links (kind of proxy objects that represent the remotely configurable interfaces and links), and adds them to the resource list.
Exporting resources

• NREN A PN Admin exports the resource list to i2cat (permissions are set on the resources so that i2cat’s users can access and modify the resources on the resource list).

• i2cat APN Admin, launches its GUI Client, logs into the server and downloads the resource list.
i2cat’s IP Network

- i2cat APN Admin creates a new IP Network and adds the resources of the resource list to it.

- Now he can configure the IP parameters of the interfaces, configure IGPs, configure the peering,...

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**BGP configuration**

**OSPF configuration**
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TNC 2008 MANTICORE Demo

- During the TERENA Networking Conference 2008 (Bruges, 19-22 May) at the Juniper booth, the following scenario was demonstrated (using 1 Juniper M7i router):
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• Future work: MANTICORE II
MANTICORE II new features (I)

- Detection of configuration overrides by human users or other automated tools
  - The system will notify the required people

- Performance improvements
  - Be able to group multiple configuration changes into a single commit command (currently every change issues a commit command)

- Support for other manufacturers (i.e. Cisco)
  - Be able to support boxes from distinct manufacturers

- Integration of the enhancements made as part of FP7 FEDERICA project’s activities
  - Support for Linux-based software routers
  - Support for virtual machines
  - Ability to interoperate with IPsphere enabled partners
MANTICORE II new features (II)

- Add more features to the IP Network WS
  - Ability to set up VPNs
  - Ability to set up bandwidth guaranteed paths in the IP Network
- RPSL Implementation
  - See next slide “RPSL in MANTICORE”
- Integration with other IaaS Framework based solutions
  - With Argia (optical networks: TDM, WDM, Fibre)
  - With Ether (Ethernet and MPLS Networks, under development)
- Other? To Be Defined
- If interested you can join the initiative as a partner of Manticore II
RPSL in MANTICORE

- RPSL can be used as a means of describing the external routing policies as well as the IGP configurations (with minor extensions).

- These RPSL descriptions can be taken as an input by the IP Network WS and then generate the high level operations to invoke at the Router WS (remember the architecture picture).

- Implementation status: RPSL RFCs (2622, RPSL and 4012, RPSLng) have been studied, and some preliminary RPSL descriptions for the MANTICORE use cases have been generated. Not implemented yet due to time constraints.
Thanks for your attention! More information:

- **MANTICORE:**
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  - Sergi Figuerola, Coordinator of the Network Technologies Cluster, Fundacio i2cat (sergi.figuerola@i2cat.net)

- **IaaS Framework:**