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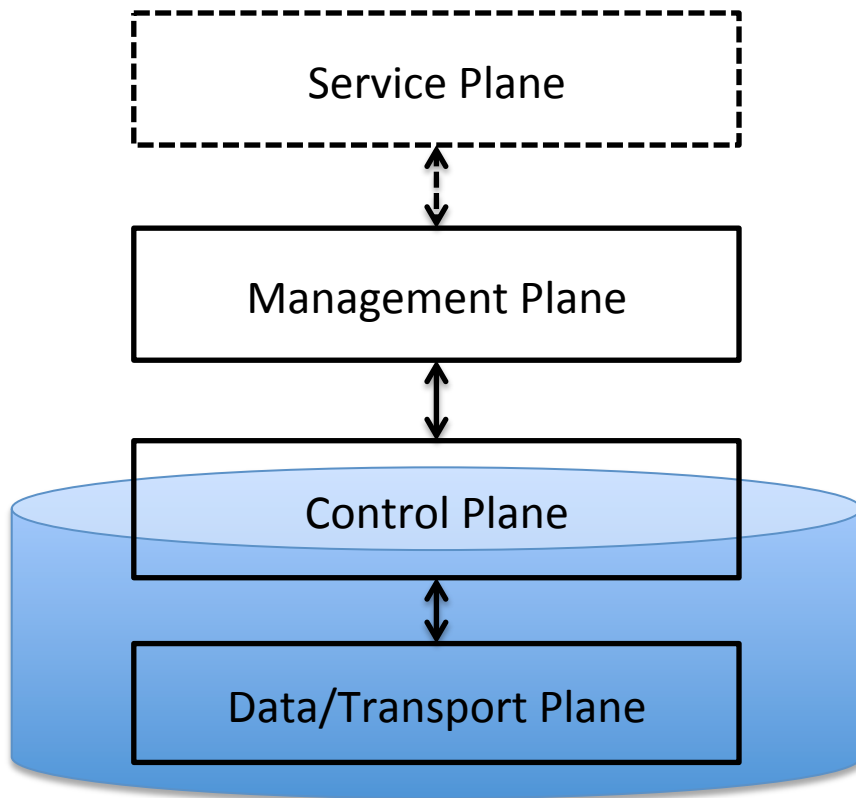
1

NaaS Concept

NaaS Fundamentals

- NaaS is a management model related to network infrastructure servicing based on **resources** and **capabilities**

- The four pillars for NaaS:
  - *Decoupled* network resource mgmt./ctrl. from services delivered
  - *Abstracted* mgmt./ctrl. functions for manipulation in the service stratum
  - *Coordinated* mgmt./ctrl. functions along different strata (x-stratum)
  - *Policed* resource and capabilities access, depending on different resource access rights and ownership patterns

- The previous characteristics confer NaaS technical flexibility and adaptability to Cloud computing-like workflow/business needs

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(Network) Infrastructure Virtualisation

- Nowadays, computer virtualisation is a step ahead of network virtualisation
  - Cloud is built on top of IaaS model:
    - With easy-to-use, public interfaces
    - With a number of virtualisation technologies, with remarkable interoperation capabilities

- Cloud essential characteristics to be addressed:
  - On-demand self-service
  - Extended (virtual) resource manipulation rights
  - Resource pooling
  - Flexibility and elasticity
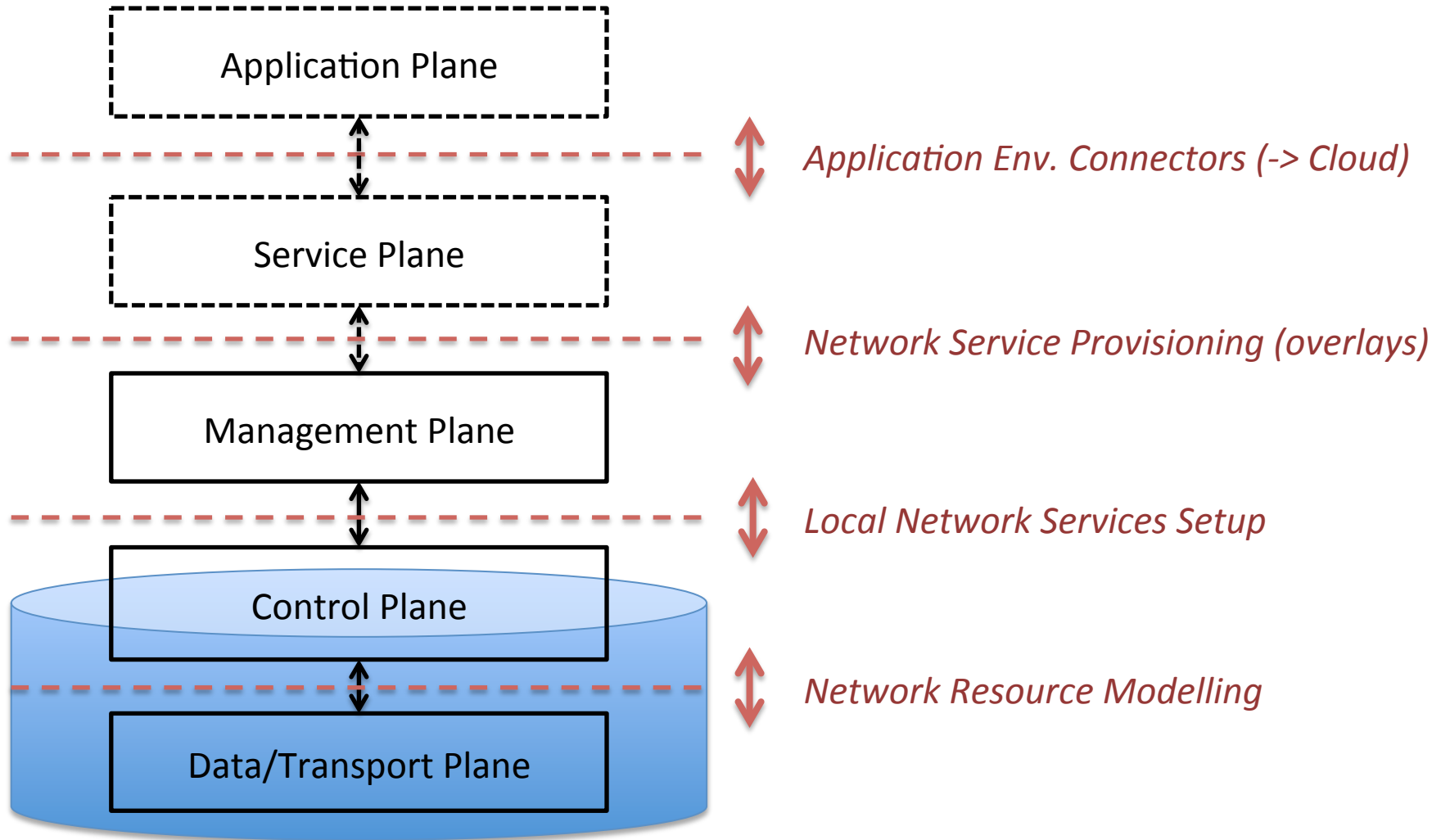 - Dynamic service management

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Simplified NE Model
Vertical Plane Separation

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│       Service Plane         │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
              ↕
┌───────────────────────────┐
│      Management Plane       │
└───────────────────────────┘
              ↕
┌───────────────────────────┐
│       Control Plane         │
└───────────────────────────┘
              ↕
┌───────────────────────────┐
│     Data/Transport Plane    │
└───────────────────────────┘
```
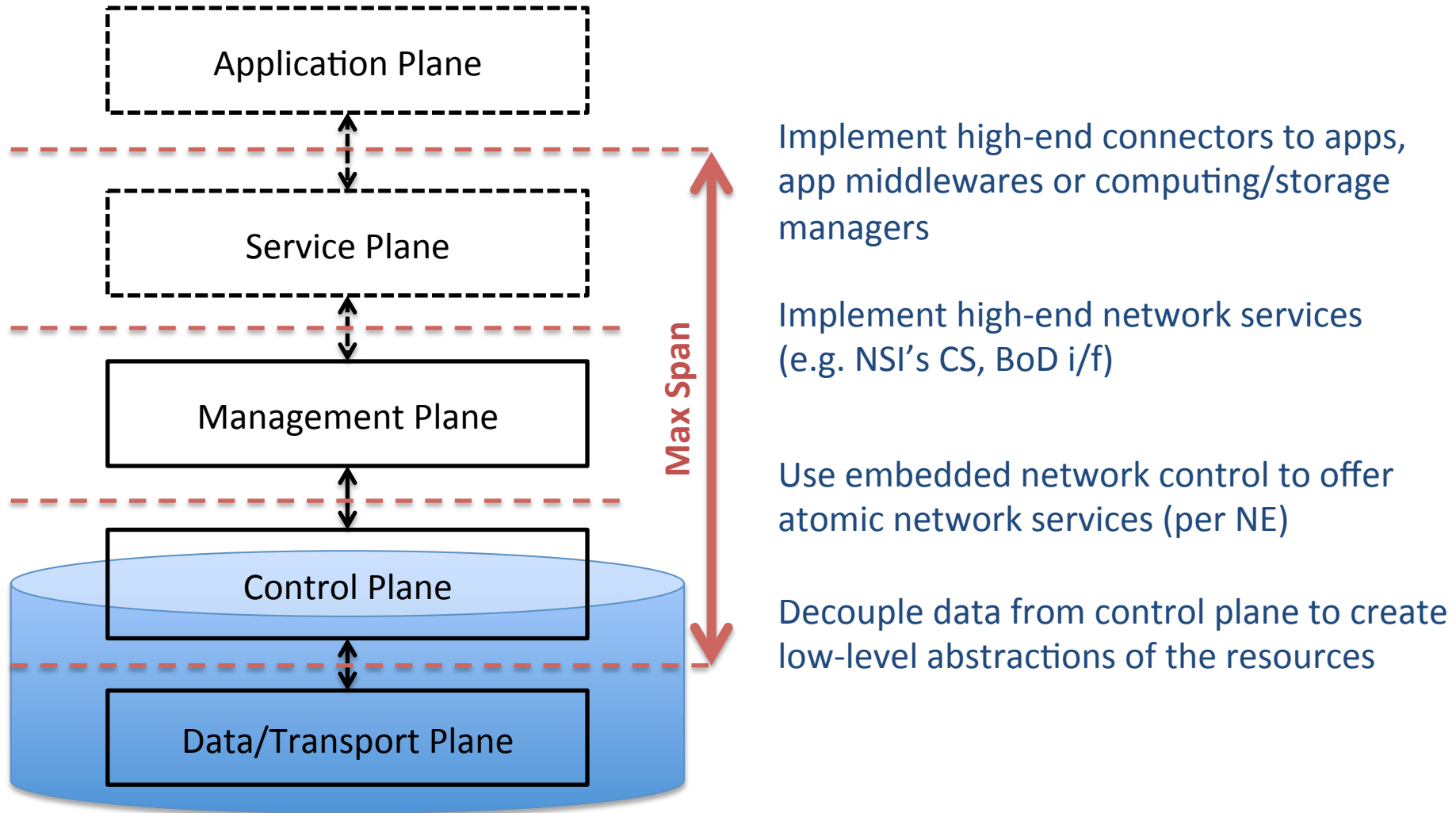
- Where is the *application plane?*

- *Service Plane* is normally replaced by <u>human functions</u> in telco environments

- *Management Plane* abstracts control functions for <u>human interaction</u>

- *Control Plane* can be:
  - In-box (e.g. MPLS)
  - Mixed (e.g. GMPLS w/PCE)
  - Out-box (e.g. OpenFlow)

- *Data/transport Plane* or the plethora of network technologies

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NaaS Decoupling Points

Application Plane

————————————————————— ⇕ *Application Env. Connectors (-> Cloud)*

Service Plane

————————————————————— ⇕ *Network Service Provisioning (overlays)*

Management Plane

————————————————————— ⇕ *Local Network Services Setup*

Control Plane

————————————————————— ⇕ *Network Resource Modelling*

Data/Transport Plane

NaaS Abstraction Levels

Application Plane

Service Plane

Management Plane

Control Plane

Data/Transport Plane

Max Span

Implement high-end connectors to apps, app middlewares or computing/storage managers

Implement high-end network services (e.g. NSI's CS, BoD i/f)

Use embedded network control to offer atomic network services (per NE)

Decouple data from control plane to create low-level abstractions of the resources

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Service Delivery

- FI Architectures adopt service-oriented approach

- IT and Network coordination is a must for ensuring:
  - Full Dynamicity
  - Automation
  - Optimisation
  - Elasticity

- How can infrastructure virtualisation help?
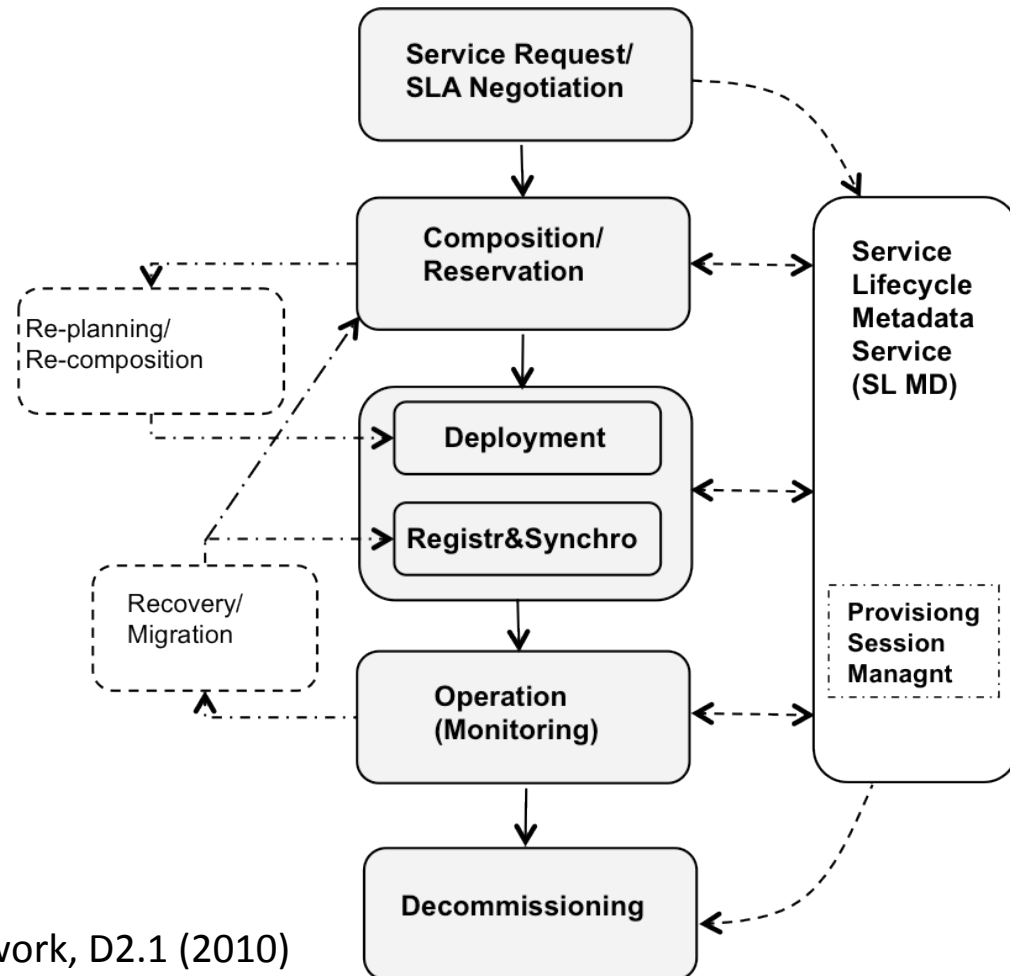
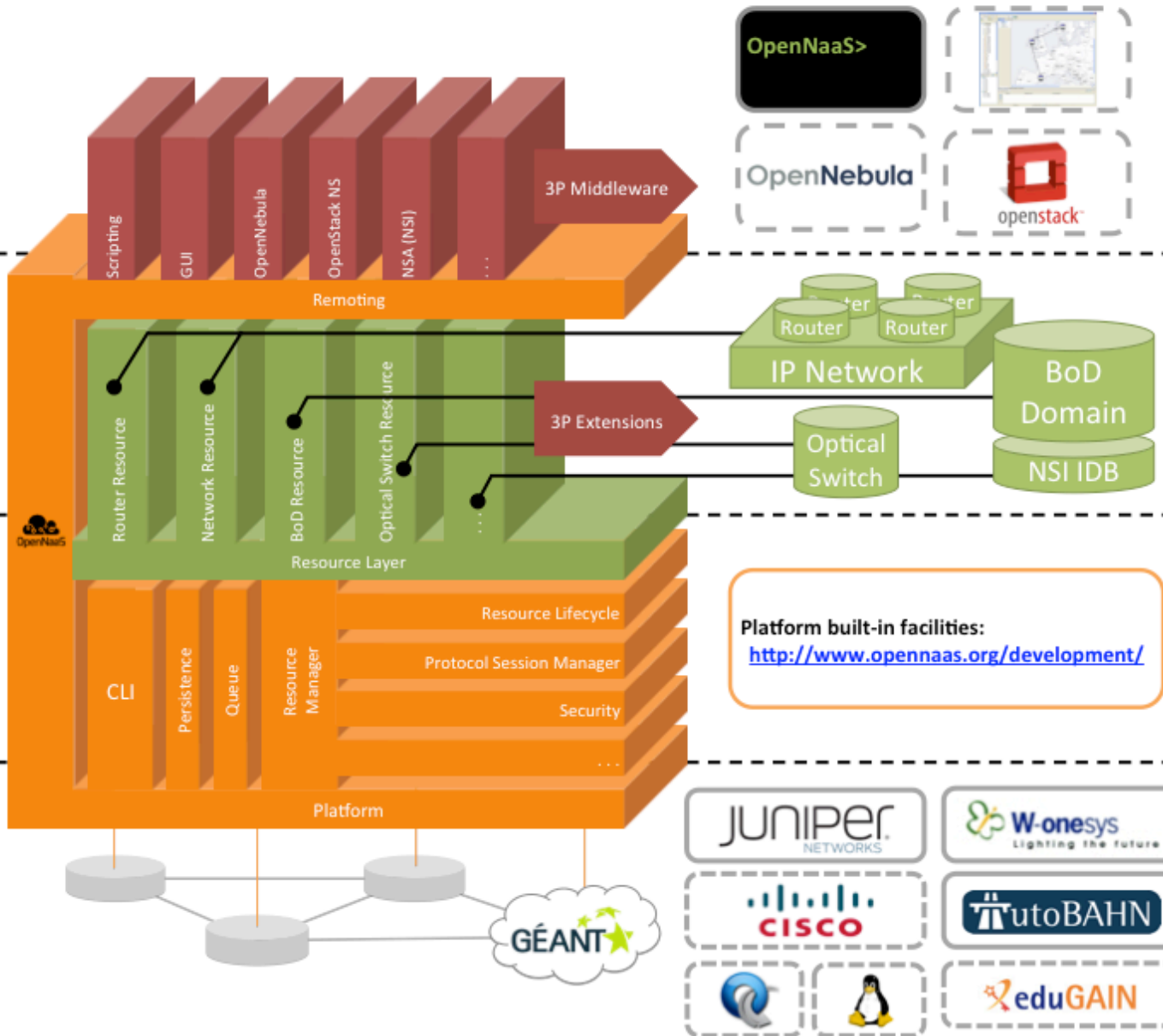Source: GEYSERS Service Delivery Framework, D2.1 (2010)

2

OpenNaaS Framework

OpenNaaS

- **On-demand provisioning** of network resources using web services (commonly user-triggered)

- Recursive **delegation of access rights** over managed resources

- Lightweight and **abstracted operation** model:
  - Decoupled from actual vendor-specific details.
  - Flexible enough to accommodate different designs and orientations
  - Fixed enough so common tools can be build and reused across plugins:
    - Security, Lifecycle, Monitoring, Deployment and Upgrade

- Starting with Layer 3 (IPv4/v6)
  - "Router" resource model
  - "L3 network" resource model

- Complementing with lower layers
  - Layer 2: "GEANT BoD" resource model (AutoBAHN)
  - Layer 1: "ROADM" resource model
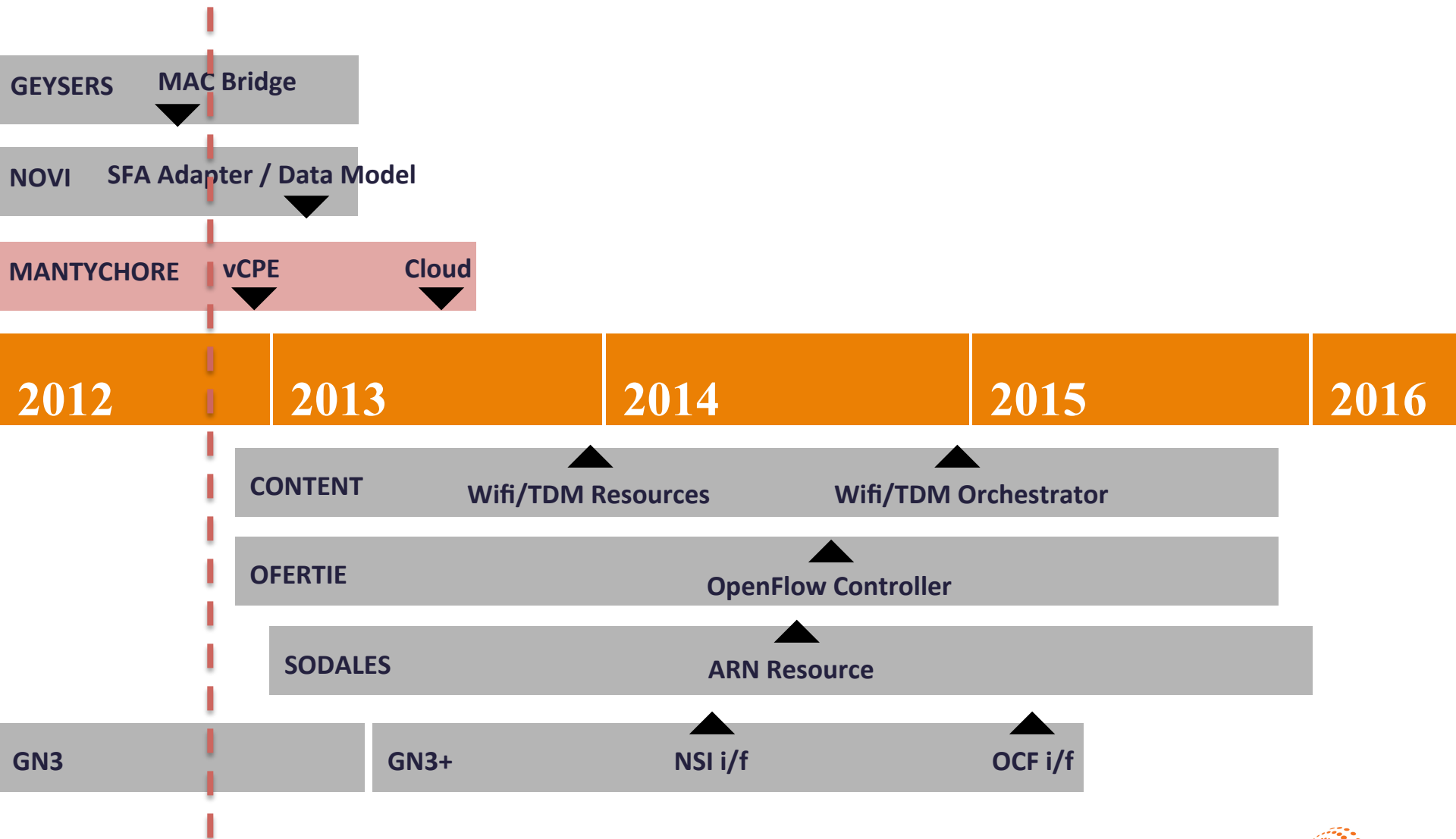
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OpenNaaS Architecture

OpenNaaS v0.13 available!

Platform built-in facilities:
http://www.opennaas.org/development/

Extensions Roadmap

Done	Current	Short-term (<6m)	Mid-Term (>6m)
L1 ROADM			
L2 BoD Domain client • AutoBAHN		**BoD Domain Server** • Porting Harmony IDB	**BoD Domain Server** • NSI interface.
	L2 / L3 Router		
	L3 Network		
			Manager GUI
		Security Manager • SAML Idp	
		Cloud Manager connectors • OpenStack NetworkService drop-in replacement • OpenNebula 3.0	• Energy consumption metrics. • Infrastructure Marketplace.
			OpenFlow Controller

Extensions in Project Lifetimes

GEYSERS	MAC Bridge			

NOVI	SFA Adapter / Data Model			

MANTYCHORE	vCPE	Cloud		

2012	2013	2014	2015	2016

CONTENT	Wifi/TDM Resources	Wifi/TDM Orchestrator

OFERTIE	OpenFlow Controller

SODALES	ARN Resource

| GN3	GN3+	NSI i/f	OCF i/f

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NaaS Use Cases using OpenNaaS

NaaS in NSP interconnection

- **Autonomous** and **uniform management interface** do not only reduce costs...

- ... they are the only way to provide services:
  - SLA publication / query / matching / monitoring
  - Service integration
  - User identification and session handling

- Wholesale services can be provided as well by agreements among independent providers
  - No single chain-of-command
  - **Automated service description** and **offer** matching become essential
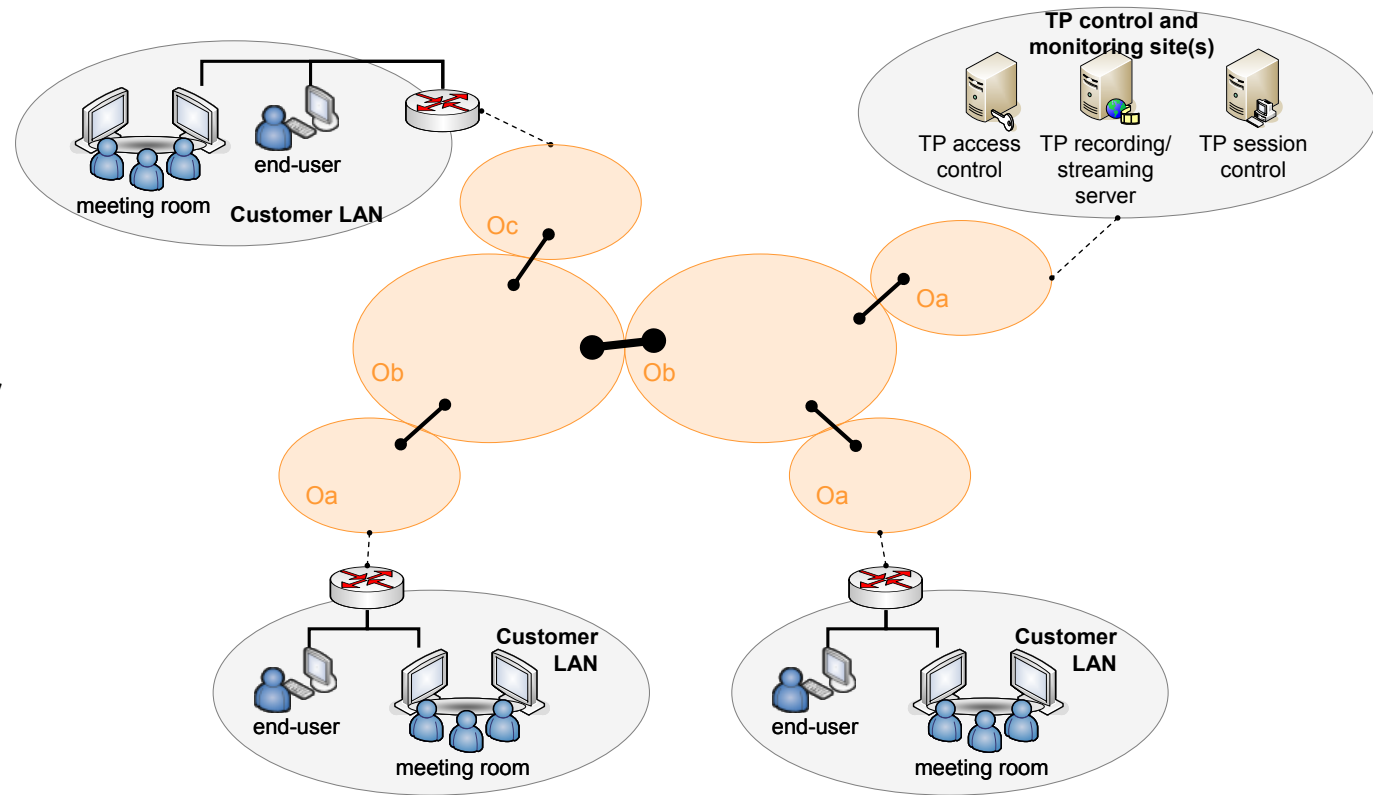
NaaS in Virtual Home-user CPEs

- Virtualise the L3 functionalities within the access network
- A multivendor core enabler for network configuration and provision:
  - Simplify L2/L3 OAM
  - Facilitate new service deployment
  - Enhance reuse of existing infrastructure
  - On-demand user enrolment
- Identity-based services:
  - On-demand provisioning
  - On-demand release
- NaaS itself for advanced users
  - VPN (eGov, eHealth, eScience…)
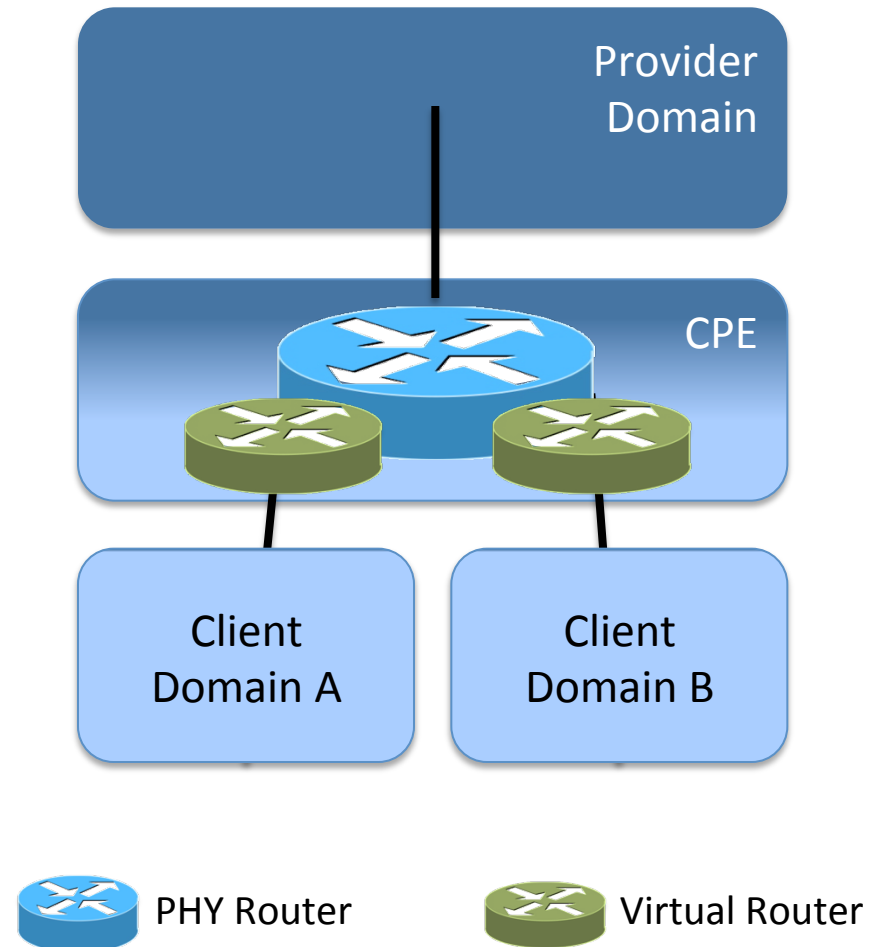 - Enhanced OTT services
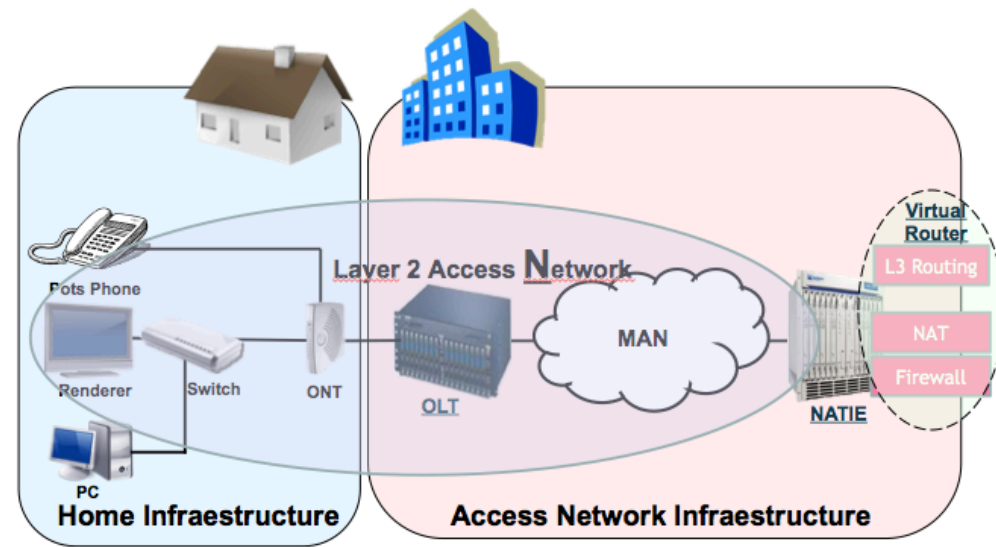
Virtual CPE – Scenario 1

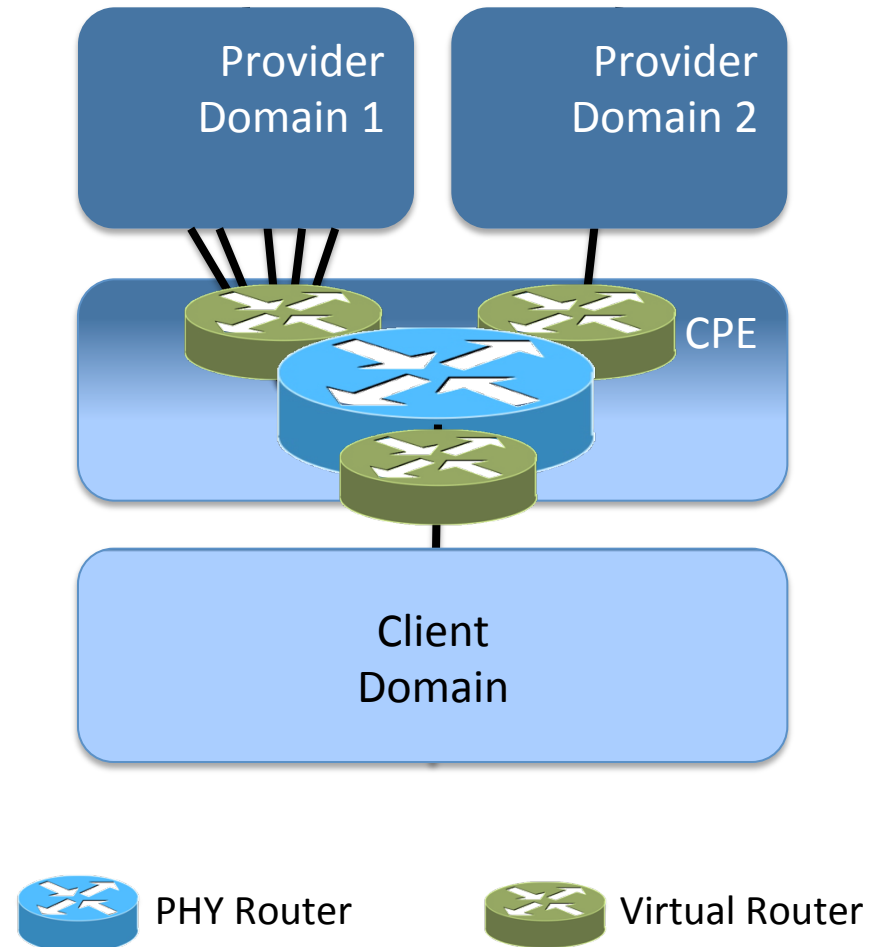In pre-production by December 2012

- Providers enforce parts of the CPE configuration:
  - i.e. BGP policies
- Delegation of partial configuration rights to clients
  - i.e. Internal IGP, firewall, …
- Automated provisioning of new clients
- Reduce need for new hardware deployments

Provider Domain

CPE

Client Domain A

Client Domain B

PHY Router

Virtual Router

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Virtual CPE – Scenario 2.1

In pre-production by December 2012

- Providers enforce parts of the CPE configuration
  - i.e. BGP policies
- Delegation of partial configuration rights to clients
  - i.e. Internal IGP, firewall, …
- Automated provisioning of access to provider LSP channels
  - Directly or via a VPN
- Reduced need for new hardware deployments
- Reporting to existing accounting infrastructure.

Provider Domain 1

Provider Domain 2

CPE

Client Domain

PHY Router   Virtual Router

Virtual CPE – Scenario 2.2

In pre-production by December 2012

- Providers enforce parts of the CPE configuration
  - i.e. BGP policies
- Delegation of partial configuration rights to clients
  - i.e. Internal IGP, firewall, …
- Automatic provisioning of access to provider LSP channels
  - Directly or via a VPN
- Reduce need for new hardware deployments
- Reporting to existing accounting infrastructure.
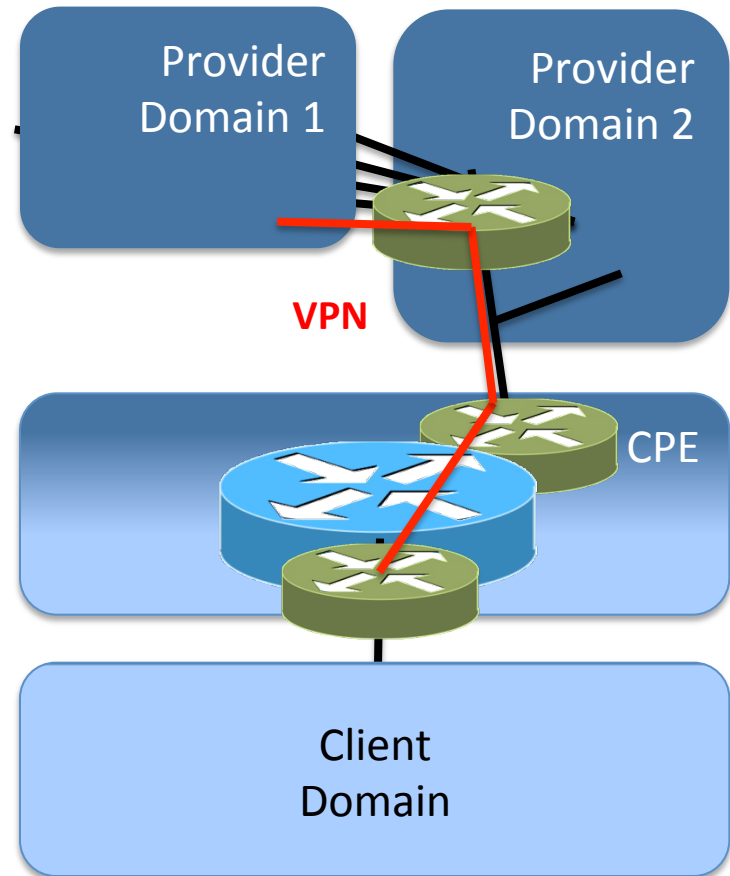
Thank you!

Gràcies!

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janange

www.OpenNaaS.org

www. Mantychore .eu

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BACK UP

Applying NaaS in a Telco Environment

The Promises

- On-demand, real-time service provision

- Flexible operation

- Cost reduction

- Multi-domain management

- Enhanced quality of experience

- Enabling better SLA management

- Reuse and possible trading of spare resources

The Challenges

- Adapt infrastructures to a virtualized approach
  - Look for compelling use cases
  - Align with required updates

- Shape operations
  - Look for efficiency gains

- Redefine processes
  - The collaborative business

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NaaS Lightweigth Abstraction

Capability

Resource

RPC

- On demand (user-triggered) provisioning of network resources

- Recursive delegation of access rights over managed resources

- Lightweight Abstracted operational model.
  - Decoupled from actual vendor-specific details.
  - Flexible enough to accommodate different designs and orientations
  - Fixed enough so that common tools can be build and reused across plugins
    - Security
    - Lifecycle
    - Monitoring
    - Deployment and upgrade

Virt. Mgmt.

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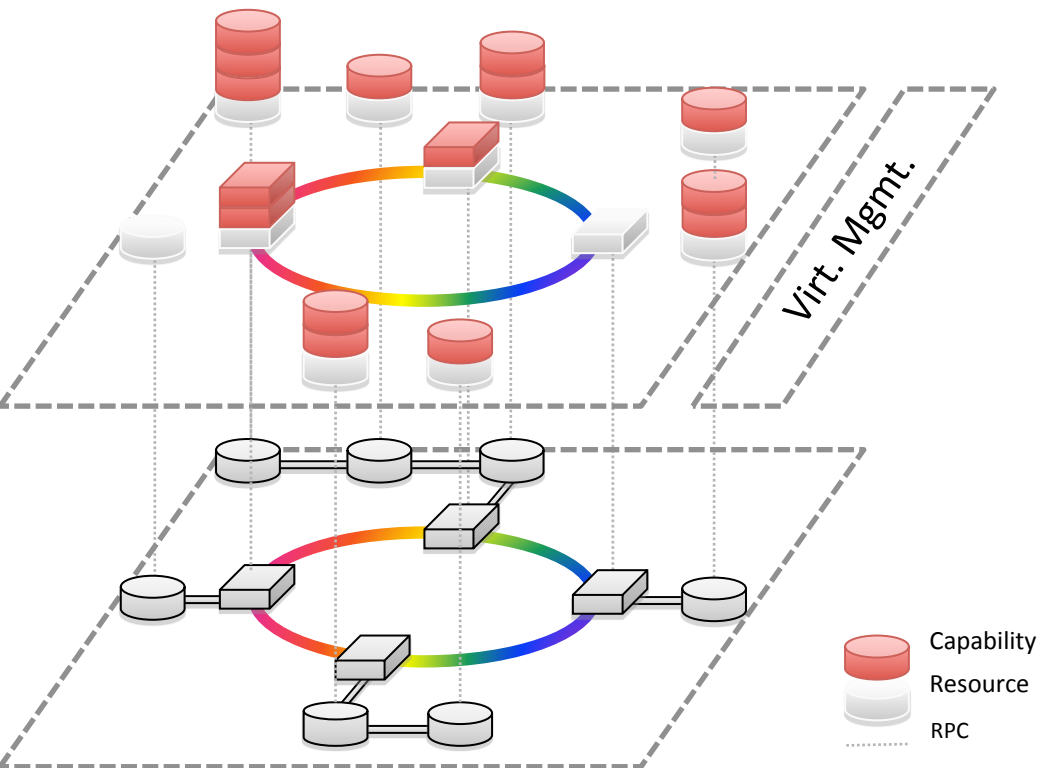
Service layer

- Starting with Layer 3 (IPv4/v6)
  - Router resource model
  - L3 network resource model
- Complementing with lower layers
  - Layer 2: GEANT BoD
  - Layer 1: ROADMs
- Virtual Operational Support Service (VOSS):
  - Name it "Management as a Service"
  - OpenNaaS: Configuration and Activation management
  - Other management layers to be included:
    - Quality
    - Trouble
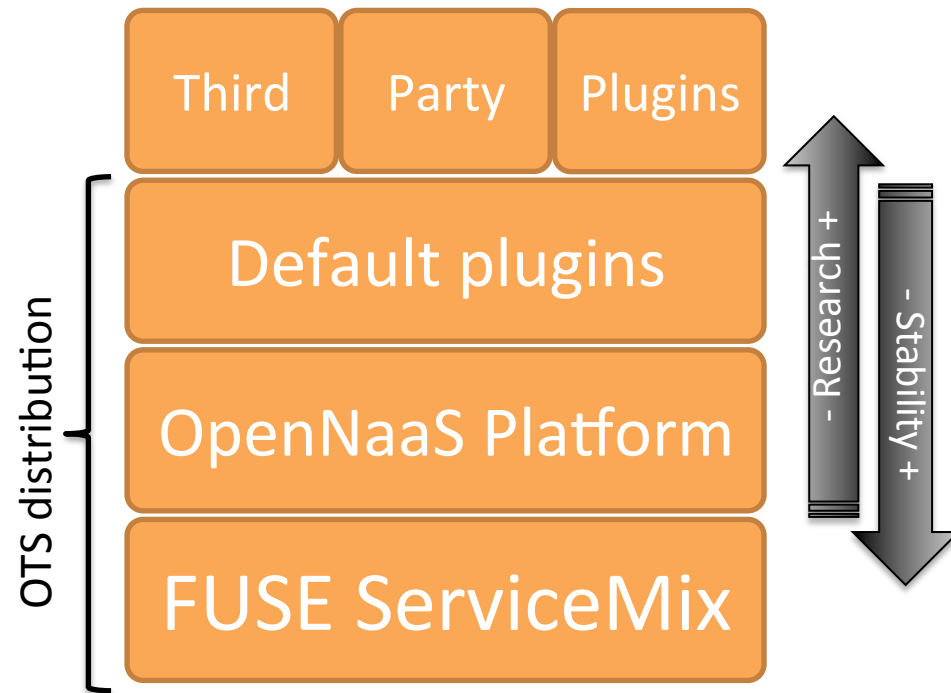   - Policy and
    - Information
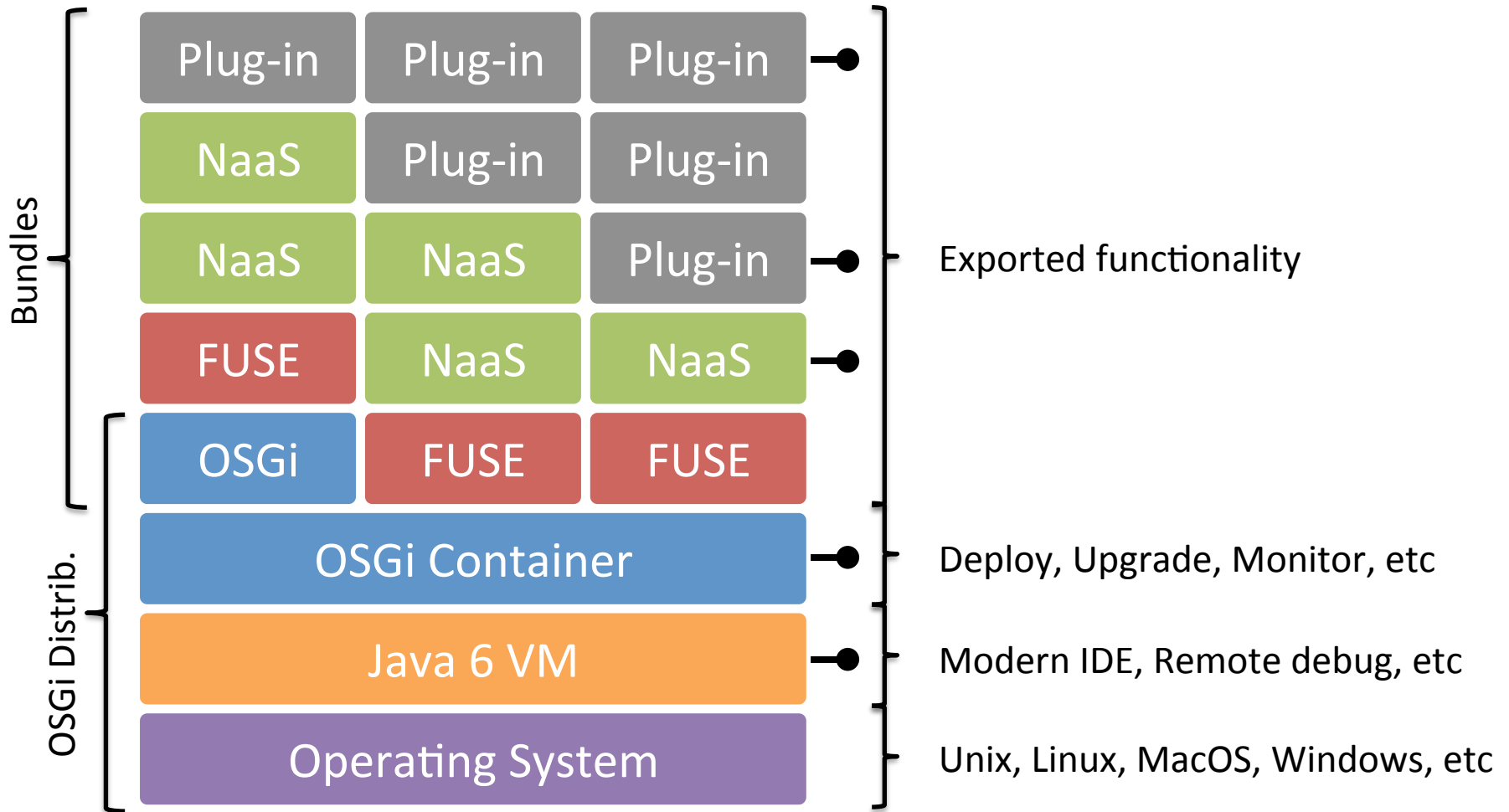
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OpenNaaS Platform Details

- For developers:
  - Modern IDEs available
  - Maven based build system and dependency management
  - Plugin howto documentation
  - Several available open source plugins as reference
  - An open OpenNaaS community
  - Comercial support for underlying technologies

- Leverage building blocks, both using existing resources or for creating new ones.
  - Resource Respository and Manager
  - Protocol Session Manager
  - Standard Capabilities
  - Protocol Endpoints for remoting (SOAP, REST, etc).
  - Platform manager
  - *.apache.org deployment ready libraries.
    - While plugins can chose to use technologies like hibernate, spring or ESB, they don't have to.
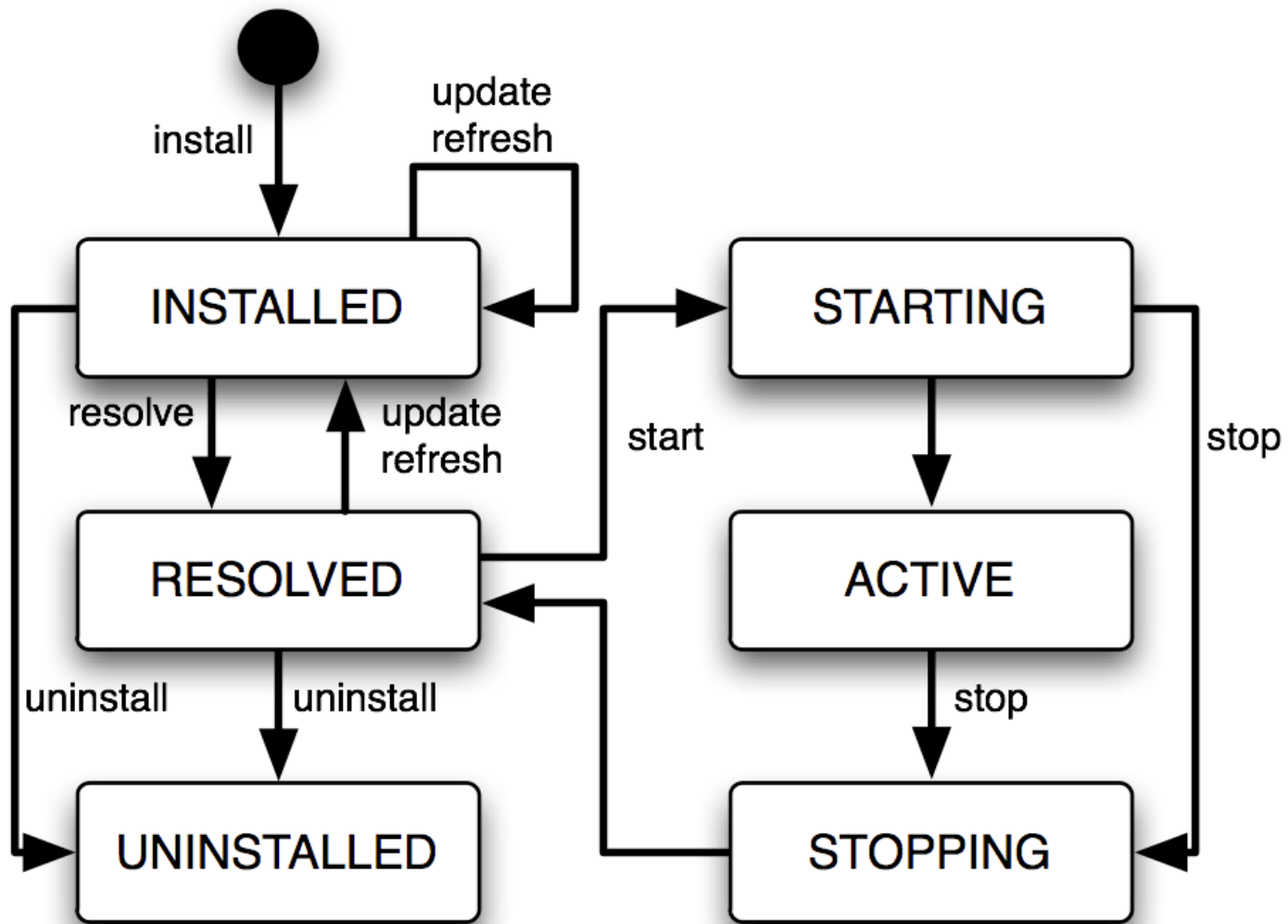
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OpenNaaS Stakeholders

- **Network Operators** with an interest on NaaS:
  - NREN.
  - Cloud Datacenter.
  - New services for ISP's.

- ISV and integrators
  - Swiss Army Knife for middleware-network integration.

- Developers and **network researchers**

OTS distribution

Third	Party	Plugins

Default plugins

OpenNaaS Platform

FUSE ServiceMix

- Research +

- Stability +

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OpenNaaS Component Architecture

Bundles

Plug-in	Plug-in	Plug-in
NaaS	Plug-in	Plug-in
NaaS	NaaS	Plug-in
FUSE	NaaS	NaaS
OSGi	FUSE	FUSE

OSGi Distrib.

Exported functionality

OSGi Container — Deploy, Upgrade, Monitor, etc

Java 6 VM — Modern IDE, Remote debug, etc

Operating System — Unix, Linux, MacOS, Windows, etc

OpenNaaS Bundle Lifecycle

Capabilities Map

Layer3BasicsIPv4

AddStaticRouteCommand

DeleteStaticRouteCommand

ModifyStaticRouteCommand

ConfigureIPv4Command

Layer3BasicsIPv6

AddStaticRouteCommandForIPv6

DeleteStaticRouteCommandForIPv6

ModifyStaticRouteCommandForIPv6

ConfigureIPv6Command

Layer3OSPFIPv4

ConfigureOSPFCommand

DeleteOSPFCommand

ModifyOSPFCommand

Layer3OSPFIPv6

ConfigureOSPFV3Command

DeleteOSPFV3Command

ModifyOSPFV3Command

Layer3Policies

CreatePolicyCommand

DeletePolicyCommand

ModifyPolicyCommand

Layer3BGPIPv4/IPV6

ConfigureEBGPCommand

DeleteEBGPCommand

ModifyEBGPCommand

ConfigureIBGPCommand

DeleteIBGPCommand

ModifyIBGPCommand

Layer3RIPIPv4

ConfigureRIPCommand

DeleteRIPCommand

ModifyRIPCommand

Layer3RIPIPv6

ConfigureRIPngCommand

DeleteRIPngCommand

ModifyRIPngCommand

Queue

AddActionCommand

ExecuteActionCommand

EraseActionCommand

Layer1Chasis

CreateLogicalRouter

DeleteLogicalRouter

GetLogicalRouters

Layer1Information

GetExtraInformation

GetSoftwareInformation

GetInterfacesInformation

Layer2Chasis

CreateSubInterface

DeleteSubInterface

ModifySubInterface

GetPeerUnitParameter

SetVLANTagging

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