

*OpenNaaS: an European Open Source
framework for the delivery of NaaS
An enabler for SDN and NFV*

www.opennaas.org



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The Hilly Landscape

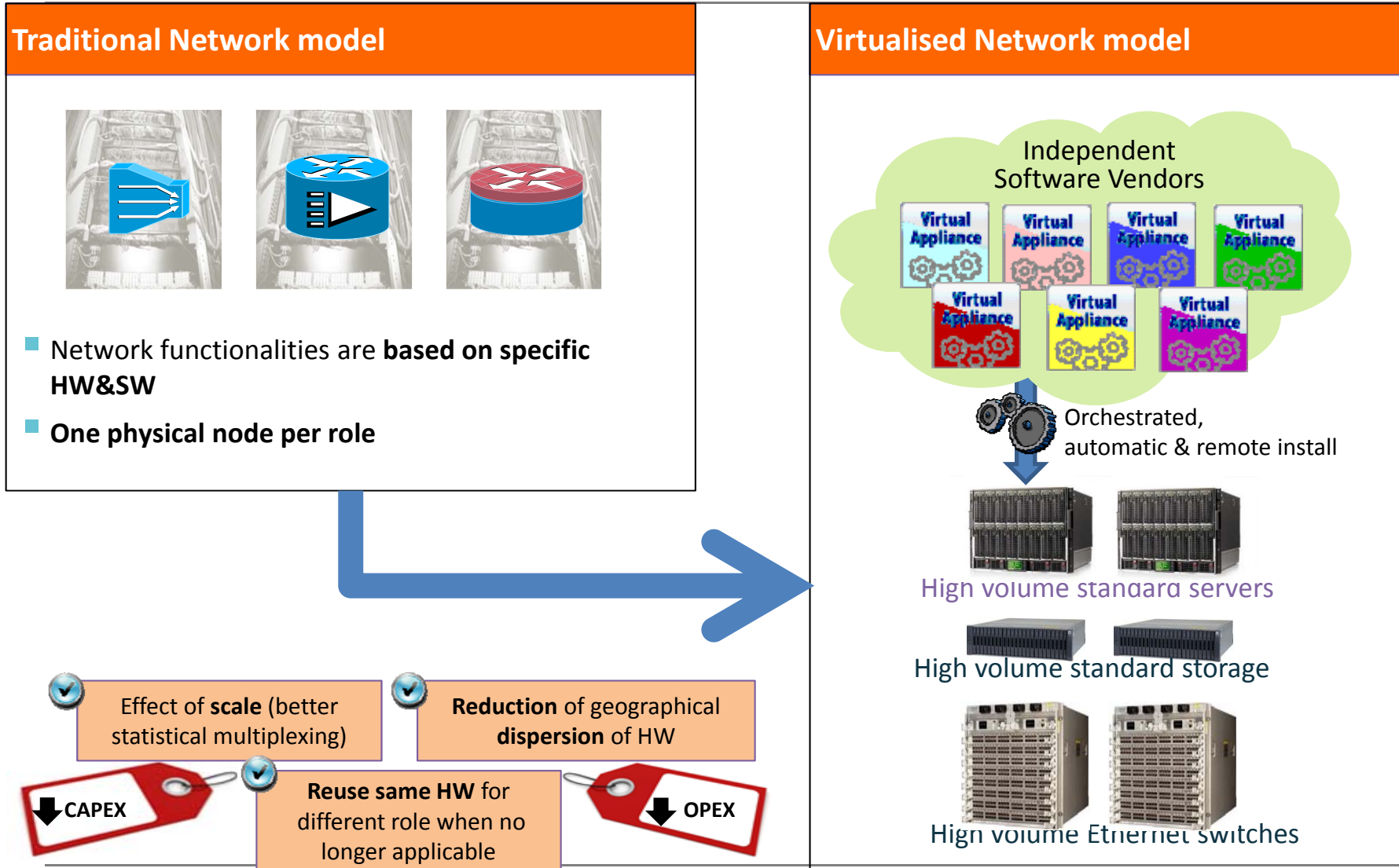
Trends

- High performance industry standard servers shipped in very high volume
- **Convergence** of computing, storage and networks
- New **virtualization** technologies that **abstract** underlying hardware yielding **elasticity, scalability** and **automation**
- **Software-defined networking**
- **Mobility**, explosion of devices and traffic
- **Cloud** services

Challenges

- **Huge capital investment** to deal with **current trends**
- **Network operators** face an **increasing disparity between costs and revenues**
- **Complexity**: large and increasing variety of **proprietary hardware appliances** in operator's network
- **Reduced hardware lifecycles**
- **Lack of flexibility** and **agility**: cannot move network resources where & when needed
- **Launching new services** is difficult and **takes too long**. Often requires yet another proprietary box which needs to be integrated into existing systems

Setting the ground

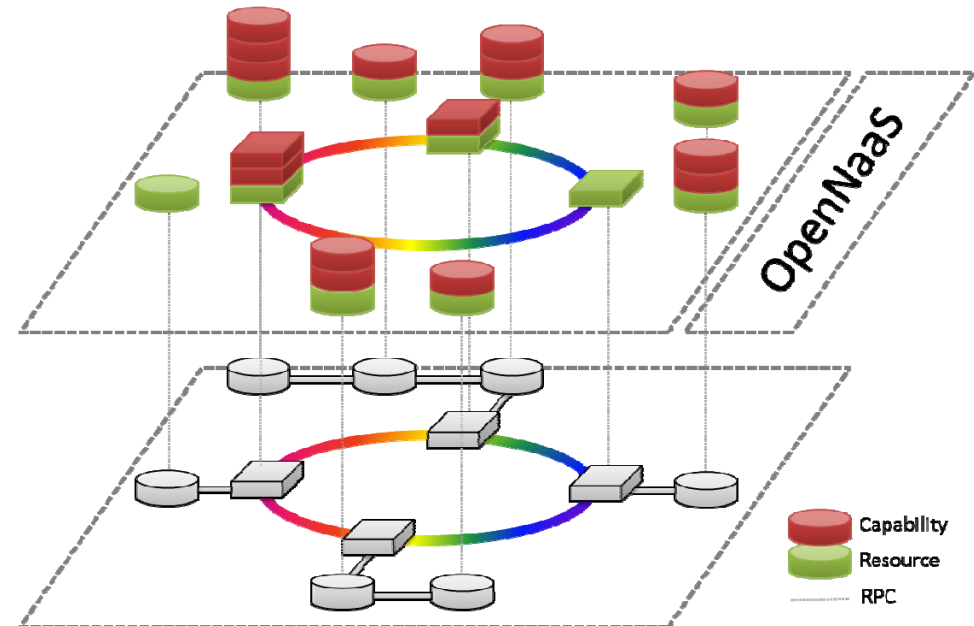


What is OpenNaaS?

- An **Open Source Framework** for:
 1. **Virtualizing/Abstracting** network resources
 2. **Managing** (physical and virtual) **networks**
 3. Deploying **dynamic** network **infrastructures**
 4. Supporting **heterogeneous** network devices
 5. Implementing **multi-tenancy** through slicing
 6. **Offering** the Network as a Service (**NaaS**)

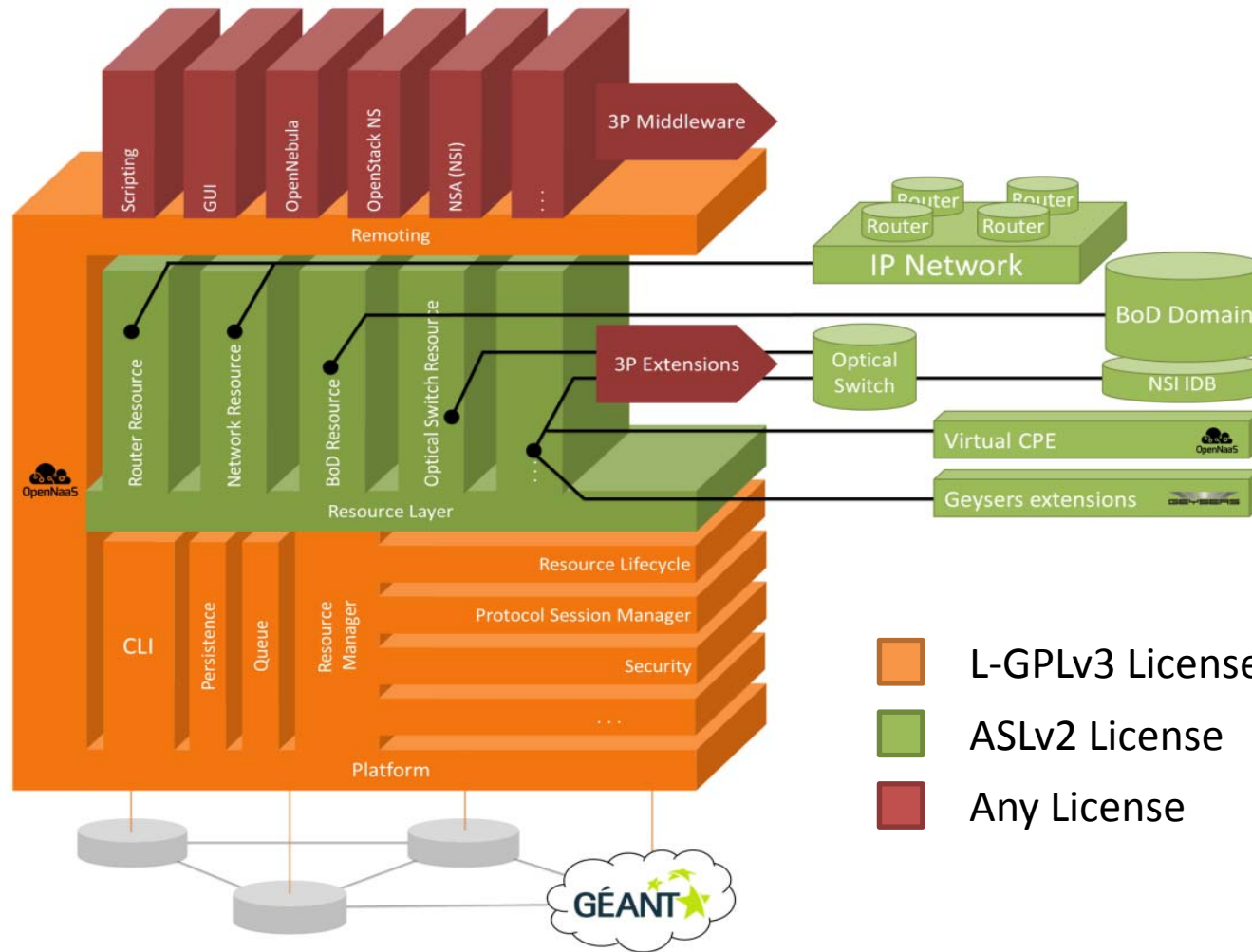
- Robust and extensible open source framework (<http://www.opennaas.org>)
- Network as a Service (NaaS) model for OAMP management of network infrastructures
- Allows building different types of network service
 - Examples:
 - Virtual infrastructure services
 - Virtual CPE
 - Dynamic provisioning (BoD)
 - Holistic integrated approach for network management
- Recursive delegation of access right over managed resources

- **Lightweight Abstracted operational model (HAL)**
 - ✓ 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

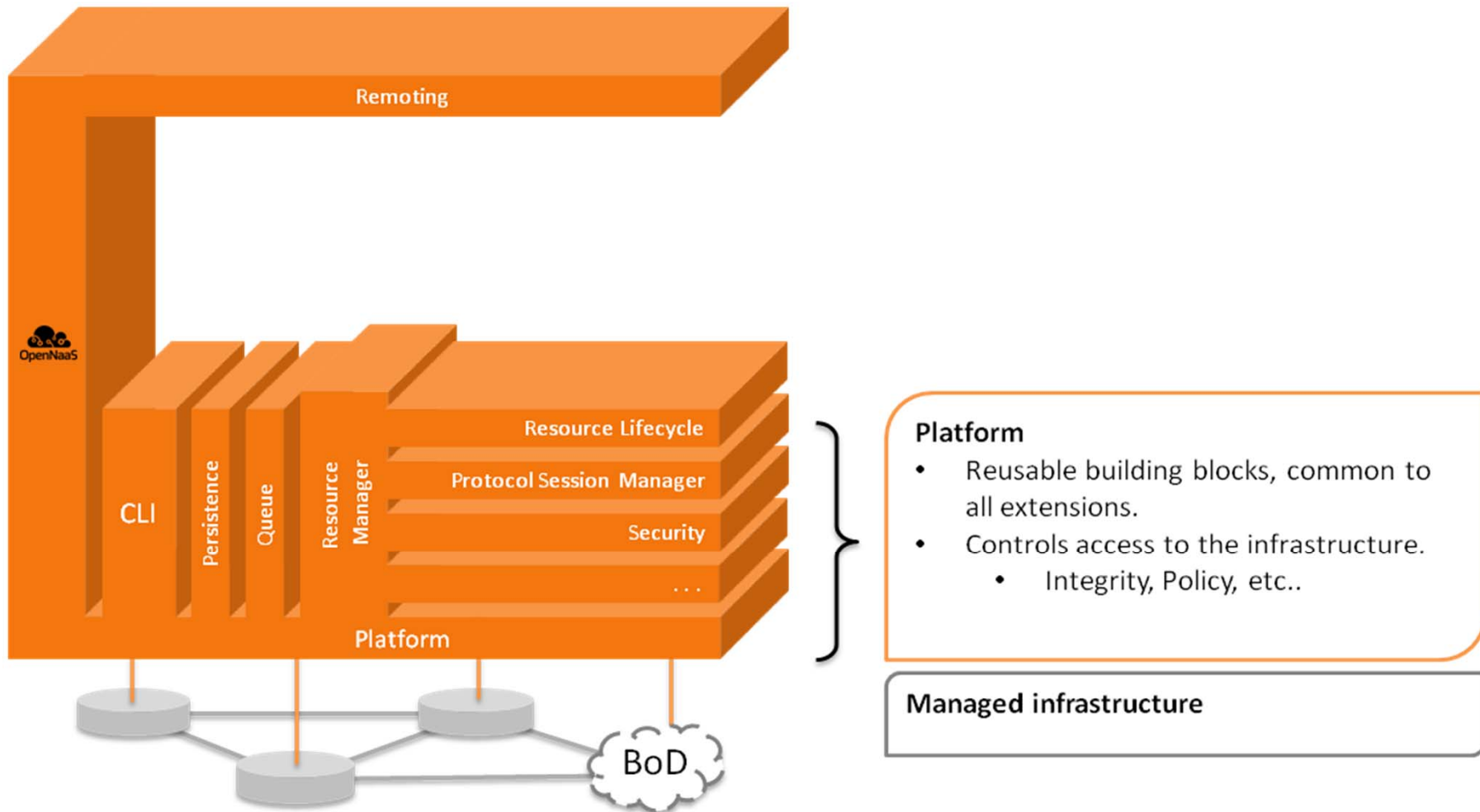


- OpenNaaS allows the creation of a **virtual representation of physical resources** (i.e. network, router, switch, optical device or computing server)
- Virtualization support through **slicing or aggregation**

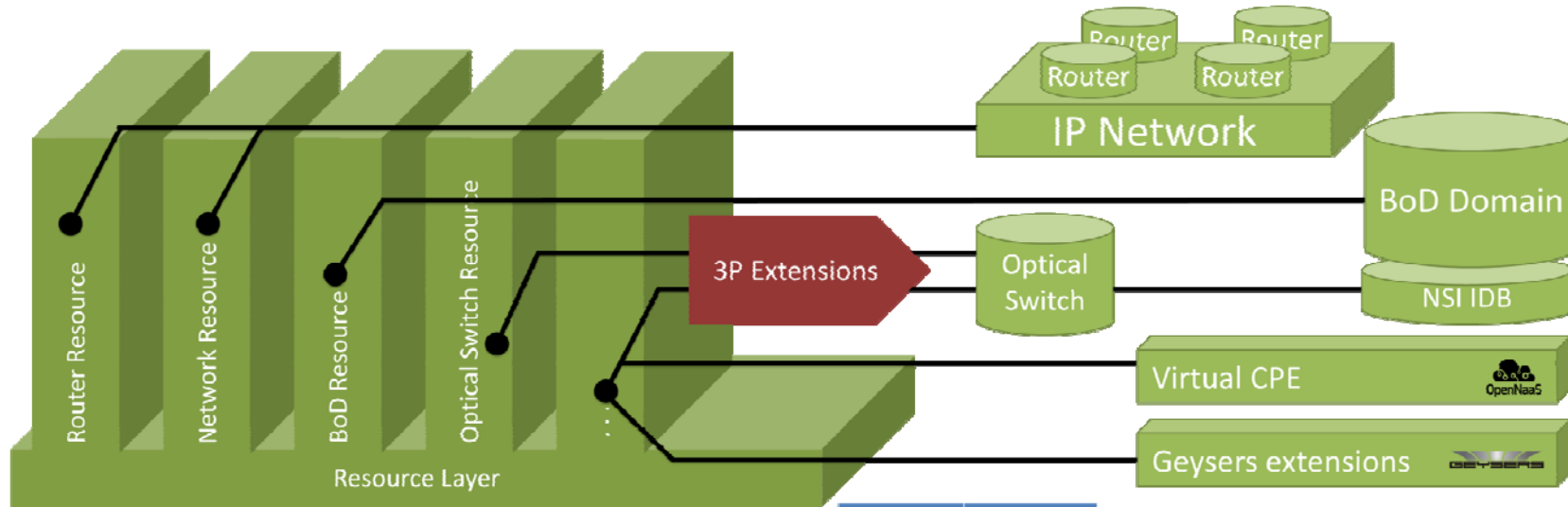
OpenNaaS Architecture



Platform Layer



NaaS Layer

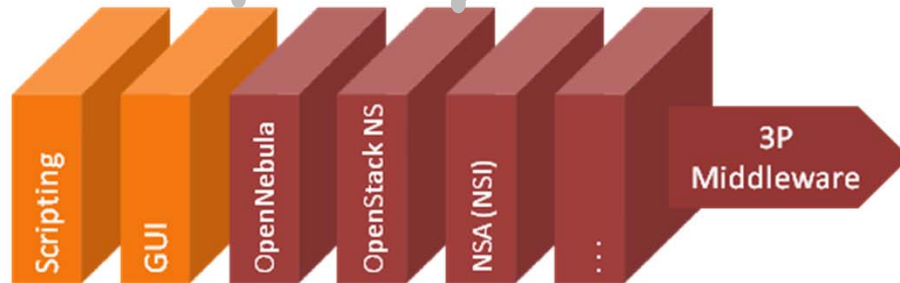
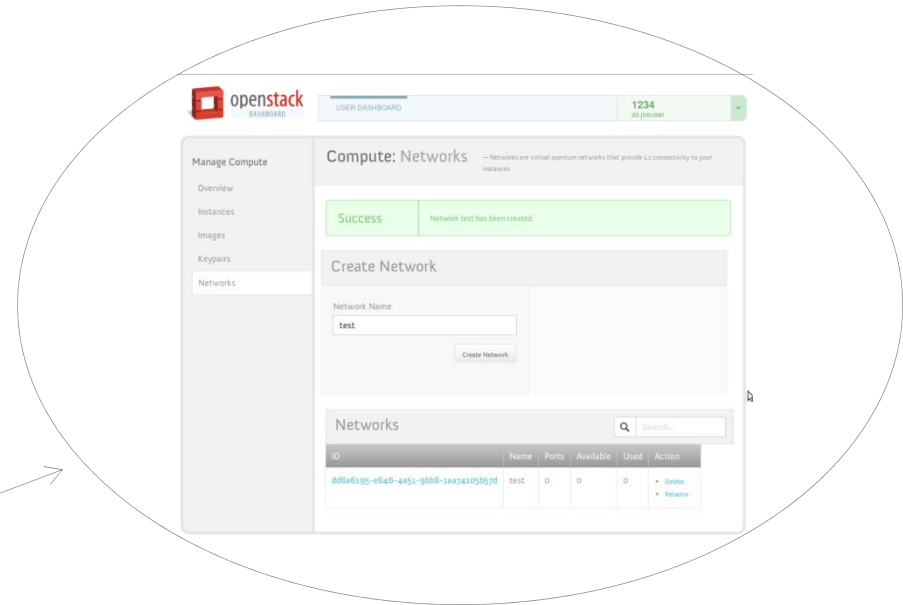
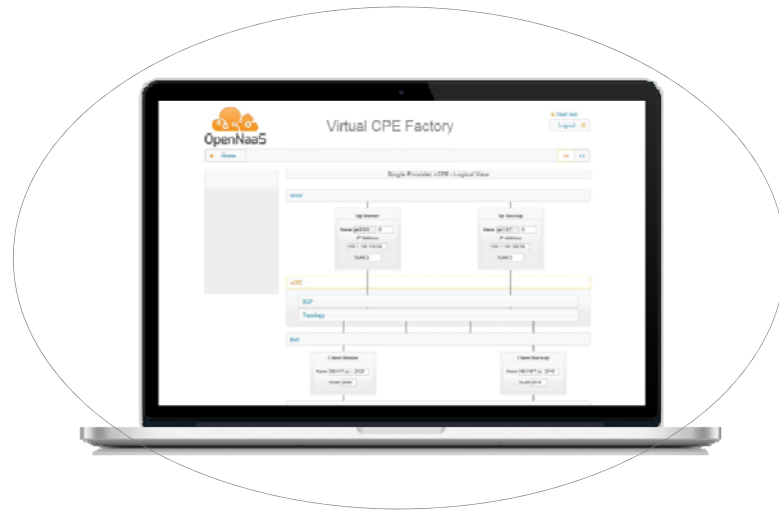


NaaS Layer

- Network HAL abstraction to infrastructure.
- Resources manageable by the user.
 - Access controlled by the Sec. Manager.

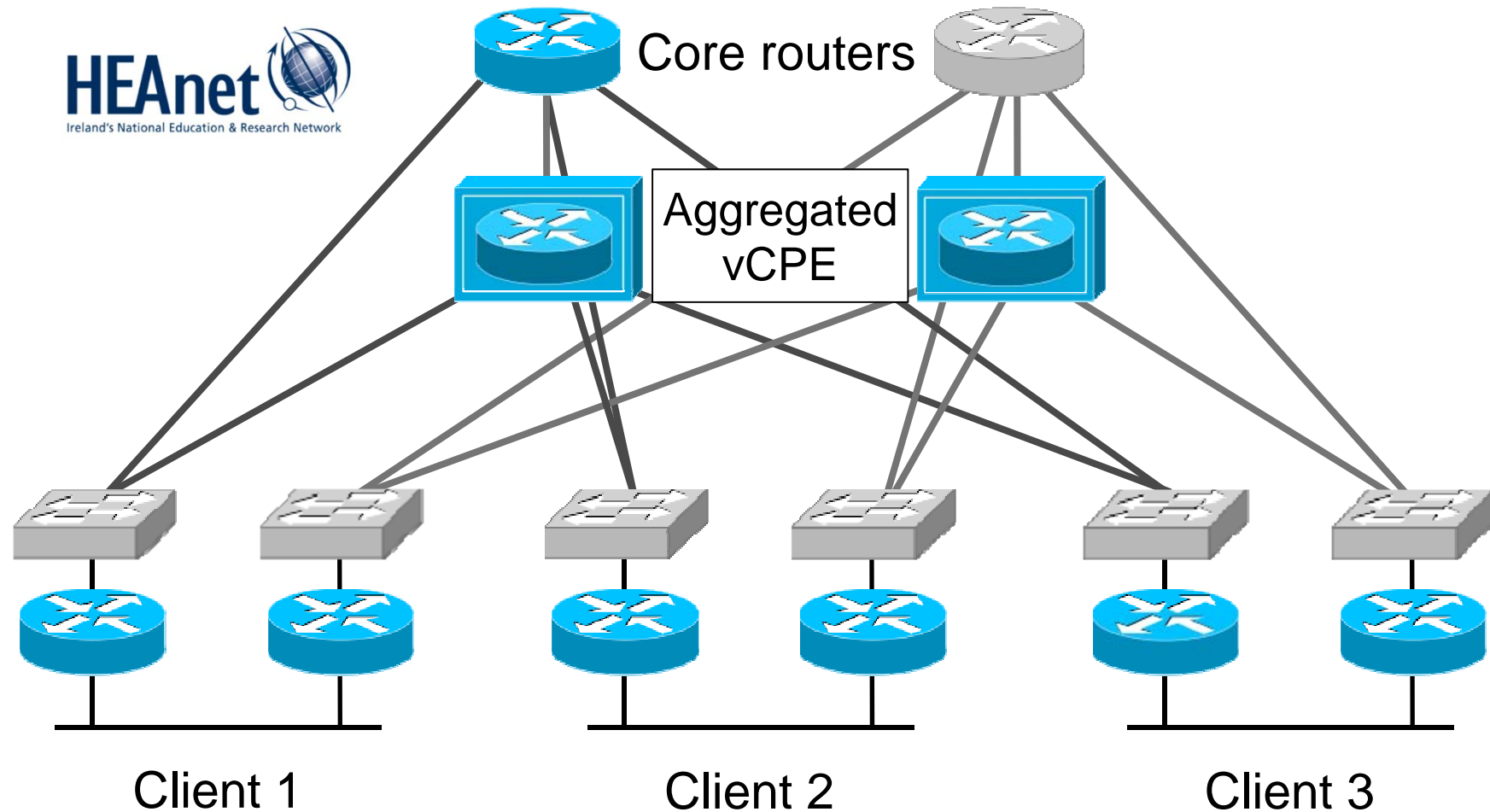
| Resource Type | Capabilities |
|---------------|--------------|
| RESOURCE TYPE | Router |
| | Chassis |
| | IP |
| | GRE |
| | OSPF |
| | OSPFv3 |
| | Static route |
| | VRRP |
| | Queue |
| | PowerSupply |
| | PowerMonitor |
| | PowerMngmt. |
| | BoD |
| | Queue |
| Network | Basic |
| | OSPF |
| | Queue |
| ROADM | |
| Connections | |
| Monitoring | |
| CAPABILITIES | |

| Resource Type | Capabilities |
|---------------|------------------|
| RESOURCE TYPE | ROADM |
| | Queue |
| | PowerSupply |
| | PowerMonitor |
| PowerMngmt | |
| VCPE | Builder |
| | IP |
| PowerNet PDU | VRRP |
| | Management |
| | PDUPowerSupp |
| | PDUPowerMonit |
| PDUPowerMngmt | |
| VNMapper | |
| VNMapping | |
| MAC bridge | VLANaware bridge |
| | Queue |
| | PowerSupply |
| | PowerMonitoring |
| PowerMngmt | |
| OpenStack | |
| QuantumAPIv2 | |
| CAPABILITIES | |



Network Intelligence

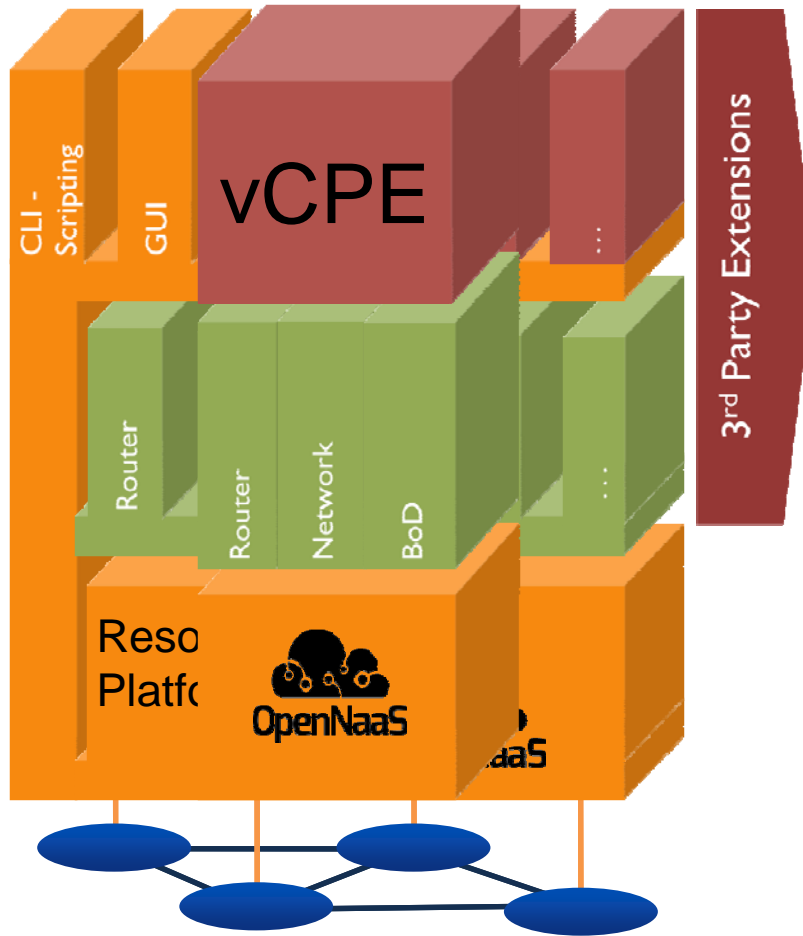
- Integration with Northbound Middleware
 - IaaS/Cloud managers
 - Other NMS.
- The user



Benefits to the Operator/NREN:

- Virtualization of CPE functionalities
- Hardware cost reduction
- Lower maintenance
- On-demand provisioning
- Quick, easy changes
- Automatic inventory
- Automatic Monitoring
- Delegation
- Simpler operation

First pilot to be deployed in HEAnet by mid November(Health Research Board)



OpenNaaS framework

Single instance

i2cat[®] vCPE Business/Use Case (IV): Service template



Virtual CPE Factory

User: admin

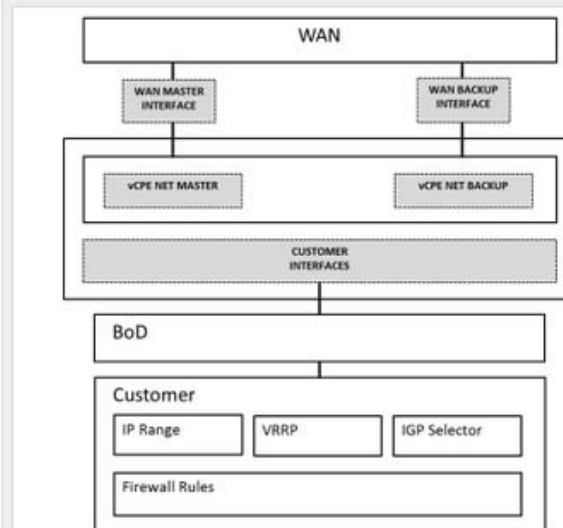
Logout

Home

EN ES

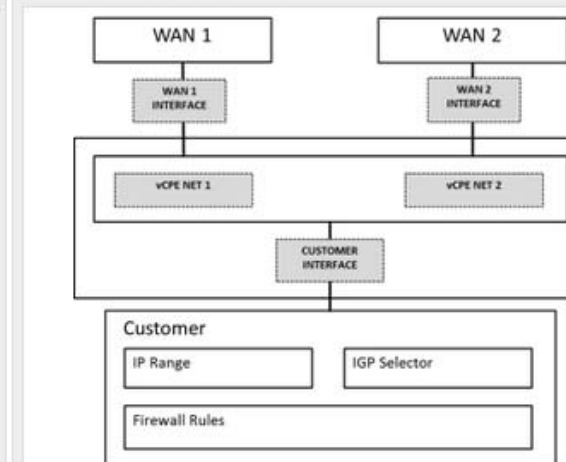
Single Provider vCPE

The demarcation of IP service between a service provider and client is typically performed by Client Premises Equipment. There two connections, one acts as master and the other as a redundant connection. It offers certain degrees of flexibility to the client.



Multiple Network Support

Multiple Network Support emphasis is placed on the defining the demarcation between two providers toward a single user, which happens often to institutions that needs connection to two networks simultaneously with different topologies and technical solutions.



Next



Virtual CPE Factory
User: admin
Logout

Single Provider vCPE - Logical View

WAN

Up Master

Name ge-2/0/0 2

IP Address 193.1.190.133/30

VLAN 2

Up Backup

Name ge-1/0/7 3

IP Address 193.1.190.129/30

VLAN 3

vCPE

BGP

Client AS Number: 65533

NOC AS Number: 65166

Client Prefix: 193.1.190.128/26

Activate

Topology

LR Master

Name lo0 1

IP Address 193.1.190.141/30

LR Backup

Name lo0 1

IP Address 193.1.190.145/30

Down Master

Name ge-2/0/0 1

IP Address 193.1.190.162/28

VLAN 1

Inter Master

Name ge-2/0/1 1

IP Address 193.1.190.137/30

VLAN 1

Inter Backup

Name ge-1/0/7 1

IP Address 193.1.190.138/30

VLAN 1

Down Backup

Name ge-1/0/7 2

IP Address 193.1.190.163/28

VLAN 2

BoD

BoD Master Reservation

Name: HEANET_pc.7235713c.2

VLAN: 1

Cancel Renew

BoD Inter Reservation

Name: HEANET_pc.7235713c.1

VLAN: 1

Cancel Renew

BoD Backup Reservation

Name: HEANET_pc.5ddac8a4.2

VLAN: 2

Cancel Renew

Client Master

Name GEANT_pc. 2020

VLAN 2020

Client Backup

Name HEANET_pc. 2040

VLAN 2040

Client

VRRP

Virtual IP Address: 193.1.190.161

VCPE Name

Owner: Client 1

IP Range: 193.1.190.128/26

IGP selector

OSPF: ON OFF

| Name | Action | Protocol | Source | Destination | Port | |
|------|--------|----------|--------|-------------|------|--------|
| WWW | Allow | TCP | A* | any | 80 | Remove |
| IRC | Block | TCP | A* | any | 6667 | Remove |
| WS | Block | TCP | any | A* | 8080 | Remove |
| | Allow | TCP | | | | Add |

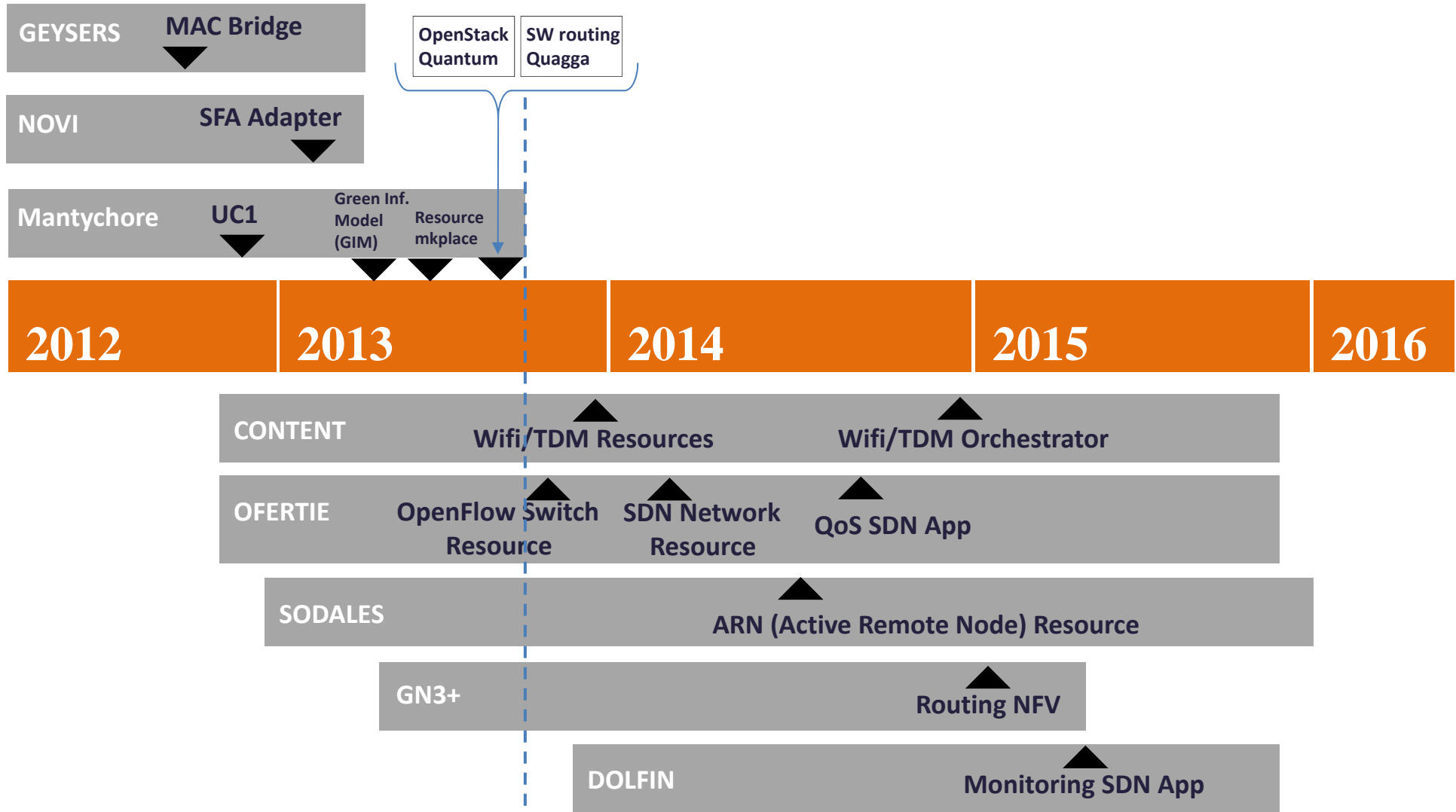
Create

- OpenNaaS Founders are the EC FP7 Mantychore project participants:



- Main goal: **Set-up the Open Source Community**
 - Identify the basis, rules and governance policies for the community
 - Identify the activities, roles and task to be performed by the members
 - Propose a list of different possible memberships, with the implications, responsibilities and benefits of each membership level
 - Support the OpenNaaS Community (www.opennaas.org)
 - Provide a **model** for the OpenNaaS community **sustainability**

Extensions Roadmap by EC FP7 Research Projects



- **Network Functions Virtualisation** is about to **change the network service and industry** landscape over the next 2-5 years (*ref.: Telefonica*)
 - NFV ISG formed under ETSI (Nov. 2012), led by network operators with wide industry participation
- **Strong drivers**
 - Significant CapEx/OpEx benefits leveraging the economies of scale
 - Shorter service cycles
 - And opportunities for new service models
- **Novel ways to architect and operate networks**, spawning a new wave of industry-wide innovation
 - Towards a truly ICT infrastructure
 - Emerging virtual network appliance market
 - Opportunities for new market players
- Numerous fields of **application spanning all domains** already identified
 - vCPE is a significant first step (Business/subscriber vCPE)
 - Evolutionary approach
- The **NaaS** model is a **key enabler for NFV** management and orchestration

- **On demand** provisioning of network resources
- **Recursive delegation** of access right over managed resources
- **Multi-tenancy support** for physical resources.
- **Lightweight operational** model
 - Decoupled from infrastructure-specific details
 - Flexible enough to accommodate different design styles
 - Stable enough so common tools can be build and reused via plugins
 - Security
 - Lifecycle
 - Monitoring
 - Deployment and upgrade
 - Service orchestration
- And **support for evolution**
 - Seamless operation of hybrid infrastructures
 - The NaaS model is a key enabler for NFV management and orchestration

- **SDN** and **NFV** as new paradigms for communications networks
- **OpenNaaS HAL** allows virtualization and a separation of control and forwarding planes **enabling SDN architectures**
- **SDN** protocols (e.g. OpenFlow) **supported as virtual resource drivers**
- Resource management and virtualization make **OpenNaaS** a **modular solution** for implementing **SDN apps** and **enable NFV**
- Different **stakeholders** can benefit from **tailored solutions** implemented with OpenNaaS
- **OpenNaaS** aims at extensibility, scalability and programmability
- **Open solution** for current and future network services management

*Many Thanks !
Moltes Gràcies !*



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