Automating the deployment of 5G Network Slices with ONAP

Veronica Quintuna Rodriguez
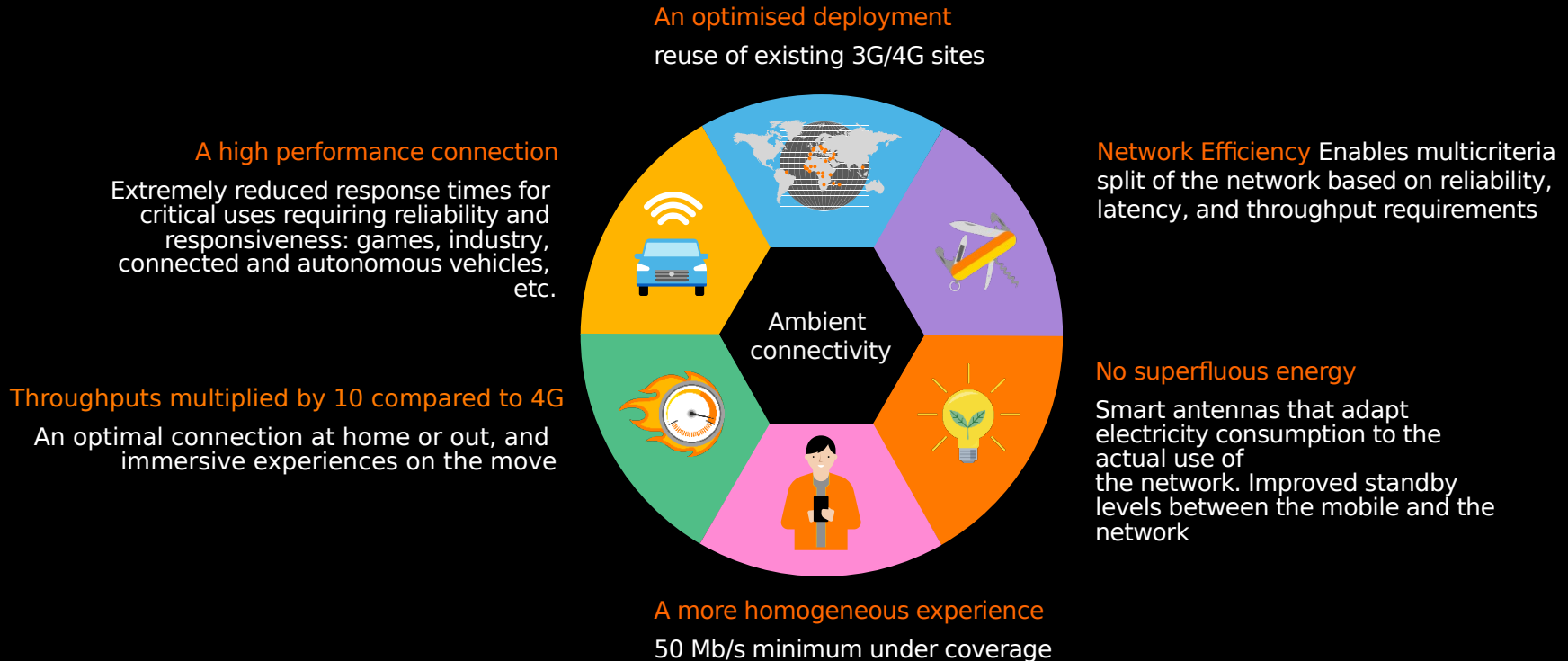
Eric Debeau
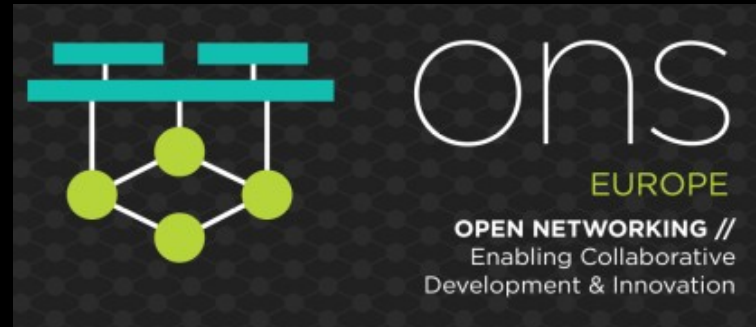
# An agile network, which will allow the emergence of new uses and a significant improvement in the customer experience

An optimised deployment

reuse of existing 3G/4G sites

A high performance connection

Extremely reduced response times for critical uses requiring reliability and responsiveness: games, industry, connected and autonomous vehicles, etc.

Network Efficiency Enables multicriteria split of the network based on reliability, latency, and throughput requirements

Throughputs multiplied by 10 compared to 4G

An optimal connection at home or out, and immersive experiences on the move

No superfluous energy

Smart antennas that adapt electricity consumption to the actual use of the network. Improved standby levels between the mobile and the network

Ambient connectivity

A more homogeneous experience

50 Mb/s minimum under coverage

5G is paving the way for new business models

Network slicing enables network opreators to meet the requirements of vertical industries by providing portions of their networks for specific purposes and/or customers.
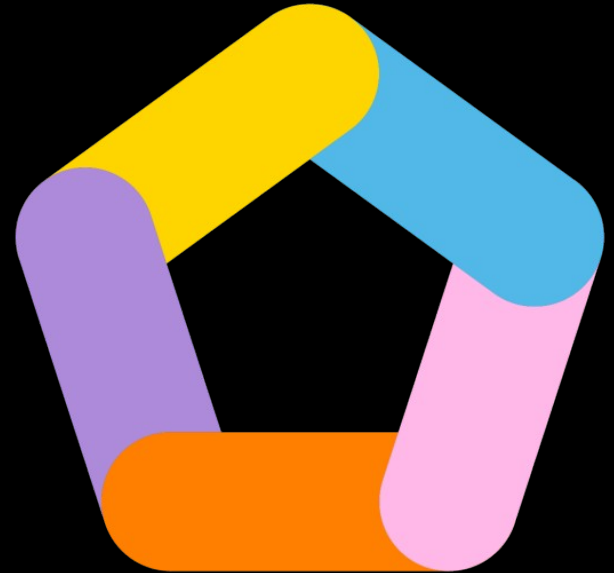
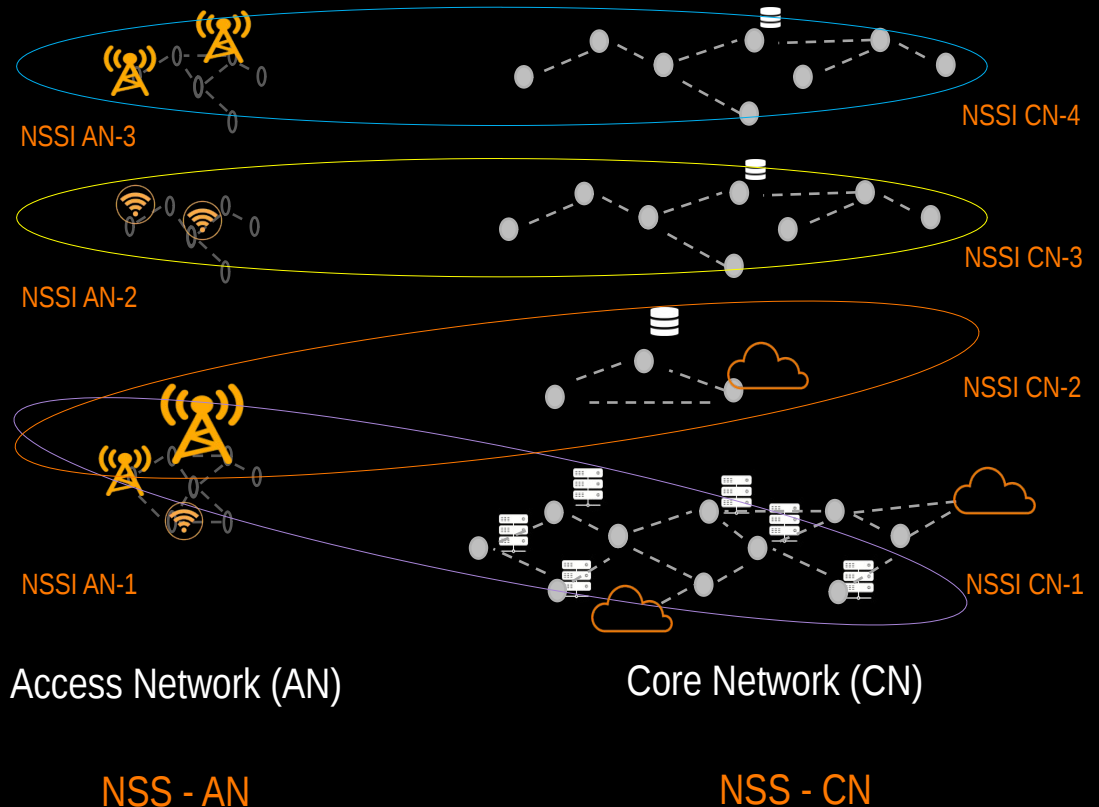# Network slicing: global view

Healthcare Slice

Internet of Things slice

Enterprise X Slice

Mobile Broadband Slice

NSSI AN-3

NSSI AN-2

NSSI AN-1

NSSI CN-4

NSSI CN-3

NSSI CN-2

NSSI CN-1

Access Network (AN)

Core Network (CN)

NSS - AN

NSS - CN

NSSI: Network Slice Subnet Instance,   NSS: Network Slice Subnet

Making a network slice deployable

Enterprise X Slice

Access Network
(shared)

Core Network

Service (VFs) + VIM + Orchestrator

ONAP OPEN NETWORK AUTOMATION PLATFORM
Orchestrator

Slices

Virtual Functions

Physical Infrastructure
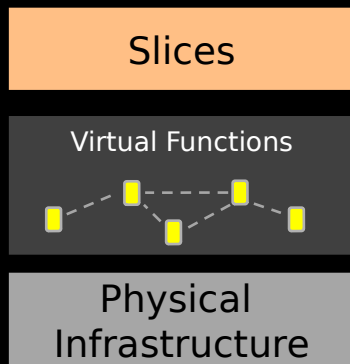
service chaining, policy managment, monitoring
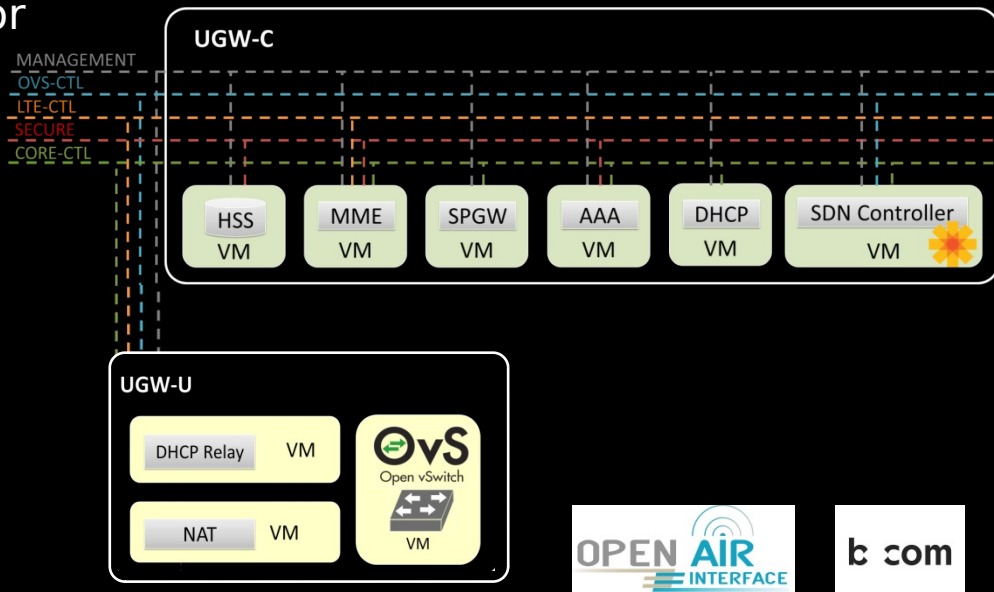
MANAGEMENT
OVS-CTL
LTE-CTL
SECURE
CORE-CTL

UGW-C

HSS VM | MME VM | SPGW VM | AAA VM | DHCP VM | SDN Controller VM

UGW-U

DHCP Relay VM

NAT VM

OvS Open vSwitch VM

OPEN AIR INTERFACE

b:com

Workflow for the slice deployment using ONAP

Enterprise X Slice

Access Network
(shared)

Core Network

Slice design and production

VFs design and packaging (Heat Files, Images)

Cloud OS preparation:

Creating flavors, networks, images in the hosting cloud operating system (Openstack)

Slice deployment

Instantiating services (ONAP)

VNF Validation

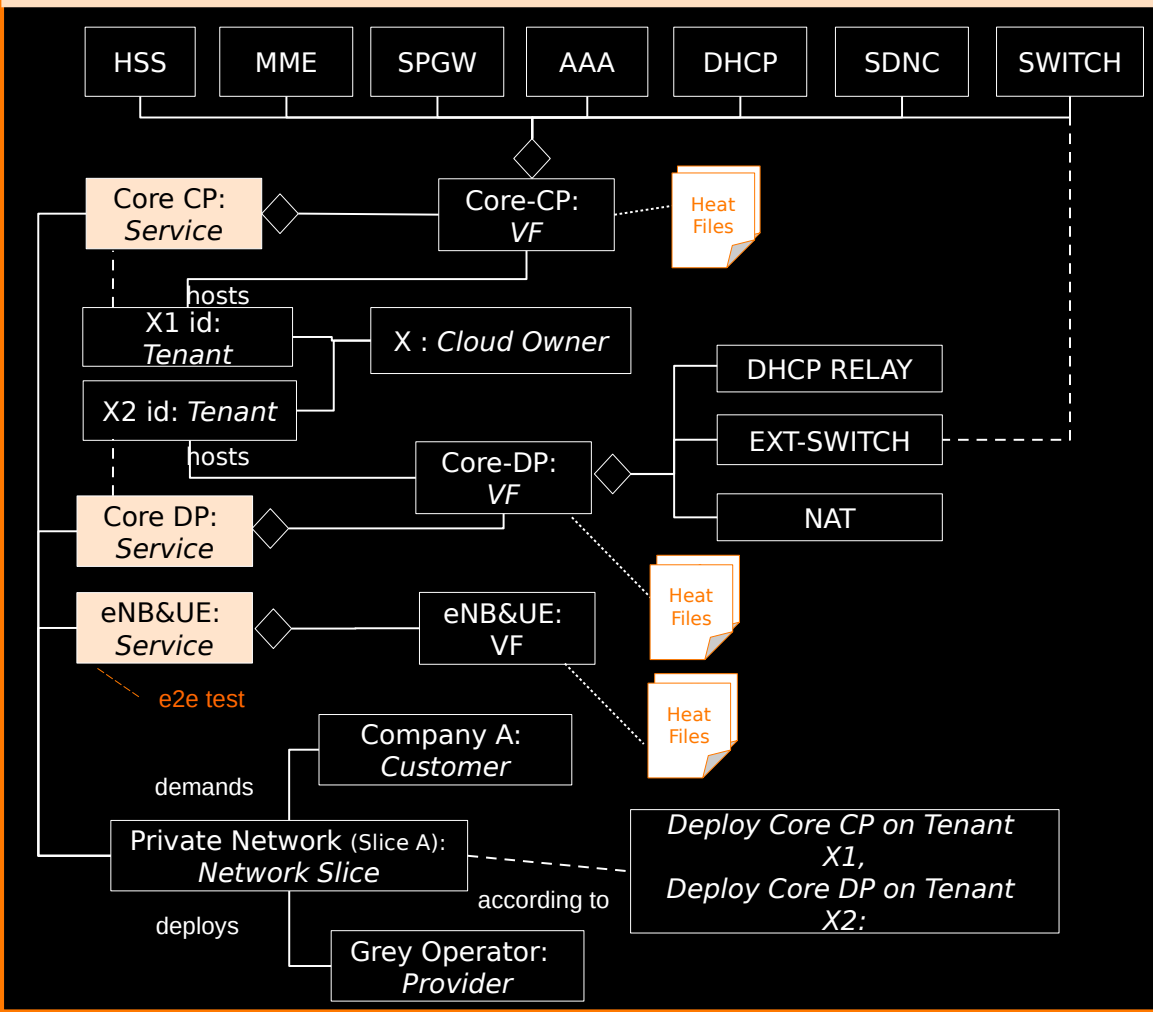Comply with orchestratior requirements and guidelines (VVP - ONAP)

Slice Onboarding

Creating and distributing the services in the Orchestration Platform (ONAP)

Slice design

3GPP & ONAP compliant model:

PrivateMobile Network: (Slice)

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VNF Validation Program (VVP): Main guidelines

Resource	Property	Parameter Name	Value provided by
OS::Nova::Server	-	*vm-type*_server_*index*	-
OS::Neutron::Net	-	int_*network-role*_network	-
OS::Neutron::Subnet	-	int_*network-role*_subnet_*index*	-
OS::Neutron::Port	-	*vm-type*_*vm-type-index*_int_*network-role*_port_*port-index*	-
OS::Nova::Server	image	*vm-type*_image_name	env file
OS::Nova::Server	flavor	*vm-type*_flavor_name	env file
OS::Nova::Server	name	*vm-type*_name_*index*	ONAP
OS::Nova::Server	availability_zone	availability_zone_*index*	ONAP
OS::Neutron::Port	ip_address	*vm-type*_int_*network-role*_ip_*index*	env file

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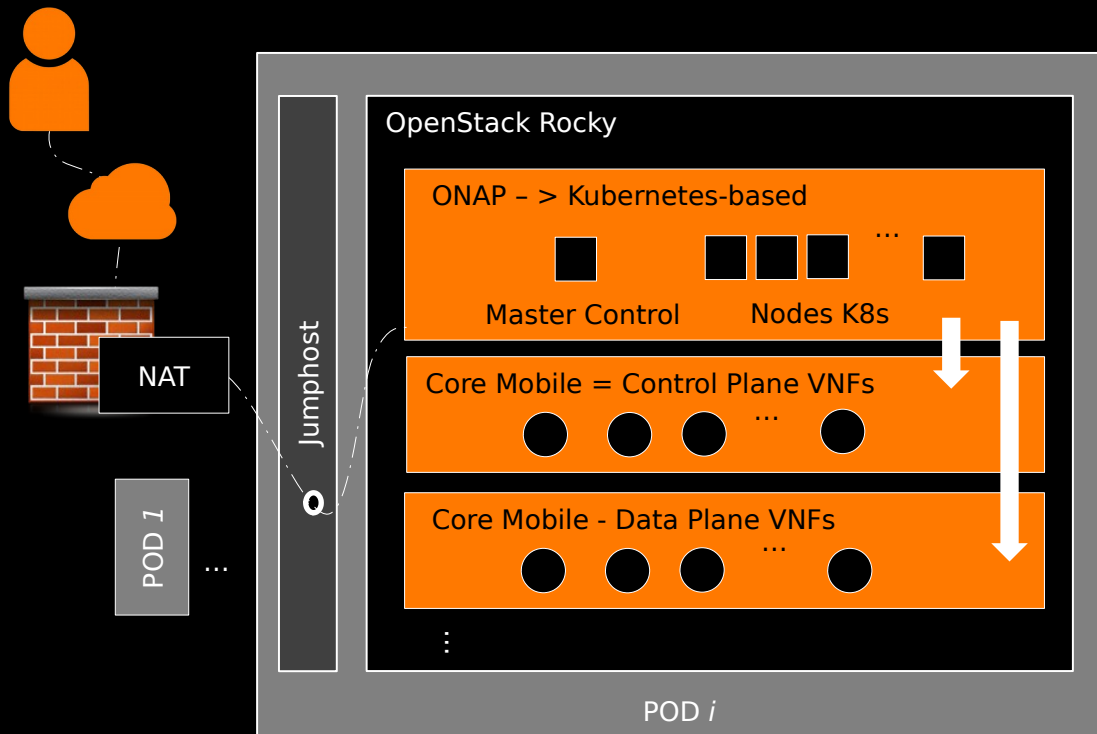
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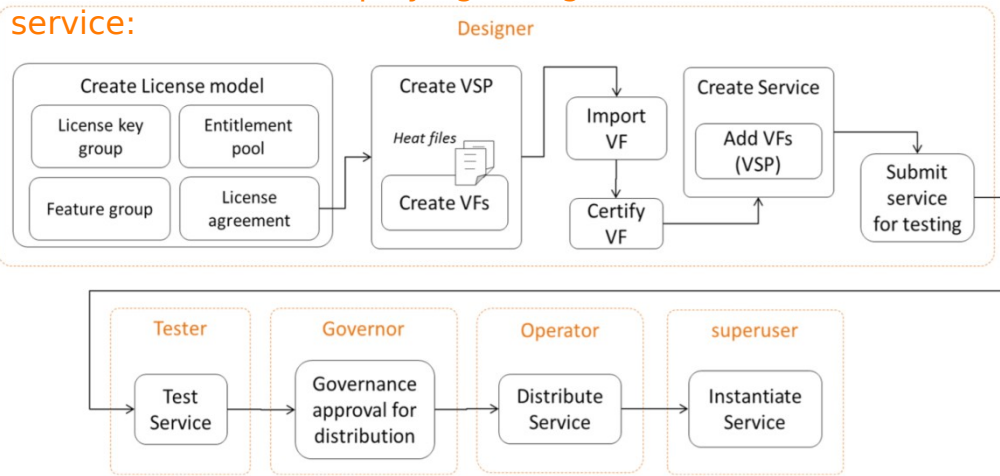
Slice Onboarding

Creating and distributing the services in the Orchestration Platform (ONAP)

Slice onboarding in the Orchestration Platform

Onboarding the proposed network slice requires building three network services in ONAP:

Core Control Plane (CP)
Core Data Plane (DP)
eNB&UE sim (e2e test)

ONAP workflow for deploying a single service:

Deployment Automation:

onap-tests

onboard_vendor()	- Vendor creation
	- Vendor submit: check and update vendor
onboard_vsp()	- VSP creation
	- Heat files upload
	- Heat validation
	- VSP submit: Check and update VSP
	- Create CSAR package
onboard_vf()	- VF creation
	- VF certification
onboard_service()	- Service creation
	- Adding VF from VSP
	- Adding VF from VFC and creating relations
	- Service submission and certification
	- Service approval
	- Service distribution
	- Tosca template download
instantiate()	- Create VNF instances
	- Preloading VNFs in SDNC
	- VF module creation

Automated workflow

ONAP TESTS: https://gitlab.com/Orange-OpenSource/lfn/onap/onap-tests

Onboarded Services (ONAP dashboard)

Connexion - OpenStack D | https://portal.api.simple | Nouvel onglet

Non sécurisé | https://portal.api.simpledemo.onap.org:30225/ONAPPORTAL/applicationsHome

Applications | Welcome - Intr... | Plazza | Gitlab | EDAS Login | FAQLinuxWiki | oai | gitlab.com | Funding & ten... | vim pod4 wef | VNF HEAT Req... | onap

ONAP Portal   Manage   Support

Carlos

Home   SDC

What are you looking for?

SDC
v.1.3.6

HOME   VF: CoreCP0102_VF   Composition

Elements   65

Search...

GENERIC

Database

Database
V.1.0
Type: VFC

Infrastructure

BlockStorage
V.1.0
Type: VFC

CinderVolume
V.1.0
Type: VFC

Compute
V.1.0
Type: VFC

ContrailCompute
V.1.0
Type: VFC

Cp
V.1.0
Type: VFC

Ext Image File
V.1.0
Type: VFC

Ext Local Storage
V.1.0
Type: VFC

V1.0   CERTIFIED   Upgrade Services   Check Out

int_lte_co...   abstract_dhcp   abstract_aaa   abstract_sdnfw

int_mana...   abstract_mme   abstract_hss   int_ovs_c...

abstract_spgwc   abstract_odlc   abstract_switch   int_secur...

security_...   int_core_...

CoreCP0102_VF

CAPABILITIES

REQUIREMENTS

⊞ abstract_hss
⊞ abstract_mme
⊞ abstract_switch
⊞ abstract_odlc
⊞ int_secure_network
⊞ int_ovs_control_network
⊞ abstract_sdnfw
⊞ abstract_aaa
⊞ abstract_dhcp
⊞ int_lte_control_network
⊞ int_management_network
⊞ abstract_spgwc
⊞ security_group
⊞ int_core_control_network

Connexion - OpenStack D

https://portal.api.simple

Nouvel onglet

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ONAP Portal   Manage   Support   Carlos

Home   SDC

What are you looking for?

SDC v.1.3.6   HOME   VF: CoreDP03_VF   Composition

Elements   65

Search...

GENERIC

Database

Database
V.1.0
Type: VFC

Infrastructure

BlockStorage
V.1.0
Type: VFC

CinderVolume
V.1.0
Type: VFC

Compute
V.1.0
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ContrailCompute
V.1.0
Type: VFC

Cp
V.1.0
Type: VFC

Ext Image File
V.1.0
Type: VFC

Ext Local Storage
V.1.0
Type: VFC

V1.0   CERTIFIED   Upgrade Services   Check Out

CoreDP03_VF

CAPABILITIES

int_sgi_network
int_lan_network
security_group
abstract_switch
abstract_nat

REQUIREMENTS

security_group
abstract_switch
abstract_nat
int_sgi_network
int_lan_network
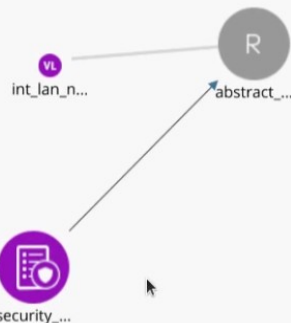
abstract_...   security_...

abstract_...   int_sgi_n...   int_lan_n...

Workflow for the slice deployment using ONAP

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ONAP Portal   Manage   Support

Home   Virtual Infrast...

VID

VID Home

Search for Existing Service Instances

Create New Service Instance

Browse SDC Service Models

VNF Changes

Admin

Subscriber Details for Generic-Vendor (Generic-Vendor)

Filter:

View/Edit	Global Customer ID	Subscriber Name	Service Type	Service Instance Name	Service Instance ID
View/Edit	Generic-Vendor	Generic-Vendor	CoreCP01	CoreCP01-service-instance-SW5ITX	13b85725-147f-439f-83db-b24e9a8219d5
View/Edit	Generic-Vendor	Generic-Vendor	CoreCP0101	CoreCP0101-service-instance-9H7RWY	6a34177f-a8d3-4433-8f5b-6c591ad4ef46
View/Edit	Generic-Vendor	Generic-Vendor	CoreCP0102	CoreCP0102-service-instance-ICO7YF	5057ef6c-e6a3-42d3-acb7-85e0b9e15633
View/Edit	Generic-Vendor	Generic-Vendor	CoreDP03	CoreDP03-service-instance-0RBFRA	8dcb74a3-9f0e-4c64-b285-55897c294270
View/Edit	Generic-Vendor	Generic-Vendor	Enb04	Enb04-service-instance-EGLE1I	eb163ea4-c540-4d33-9f2f-5f64c9aa2e86
View/Edit	Generic-Vendor	Generic-Vendor	ubuntu16	ubuntu16-service-instance-Y38ACQ	3d211d71-717d-49c1-9abb-af0435a241d4
View/Edit	Generic-Vendor	Generic-Vendor	ubuntu16	ubuntu_dashboard	70c38bee-dc13-4a6b-8293-2f8c71380aa0

Jump to page: 1   Results per page: 10 | 25 | 50

End-to-end slice validation

UE — eNB — MME — HSS — SPGW — Bearers ON
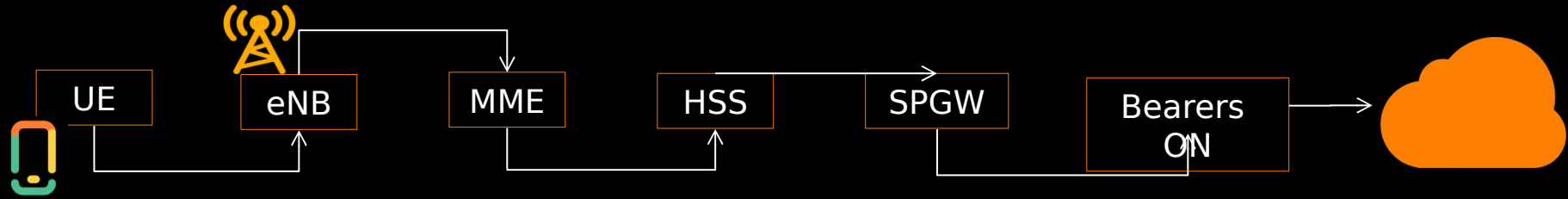
UE attachment, connection and traffic

```
Sending 96b data on connection {----} TCP,#39->172.16.5.13(3868)
================================== STATISTICS ==================

                     | Current Status| Added since last display| Removed

Connected eNBs  |         1      |             0             |

Attached UEs    |         1      |             0             |

Connected UEs   |         1      |             0             |

Default Bearers |         1      |             0             |

S1-U Bearers    |         1      |             0             |

================================== STATISTICS ==================
```

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OPEN AIR INTERFACE

Conclusions and next steps

We have designed, onboarded, and deployed a network slice for a given company using ONAP.

The slice represents a private, customized and independent mobile network (control and data plane).

Various actors are involved in the deployment of a Slice: VFs provider, VFs validator (assuring the orchestrator compliance), Slice designer, Service provider.

Results make true NFV and 5G promises: on-demand networks, tailored services, time to market acceleration.

The slice is basically a network service enriched by monitoring and policy enforcement functions.

Next Steps
Slice Management

SLA negotiation, closed loop implementation, Monitoring and Policy enforcement.

ONAP provides all the tools to implement a slice.

The network slicing management can be performed by a specialized entity inside or outside ONAP.

Thank you

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