



# Multi-Domain Slice Provision and Federation in MEC and Telco Cloud environments



## Cloudscape Brazil 2018

Trusted Technologies for strong and competitive economies

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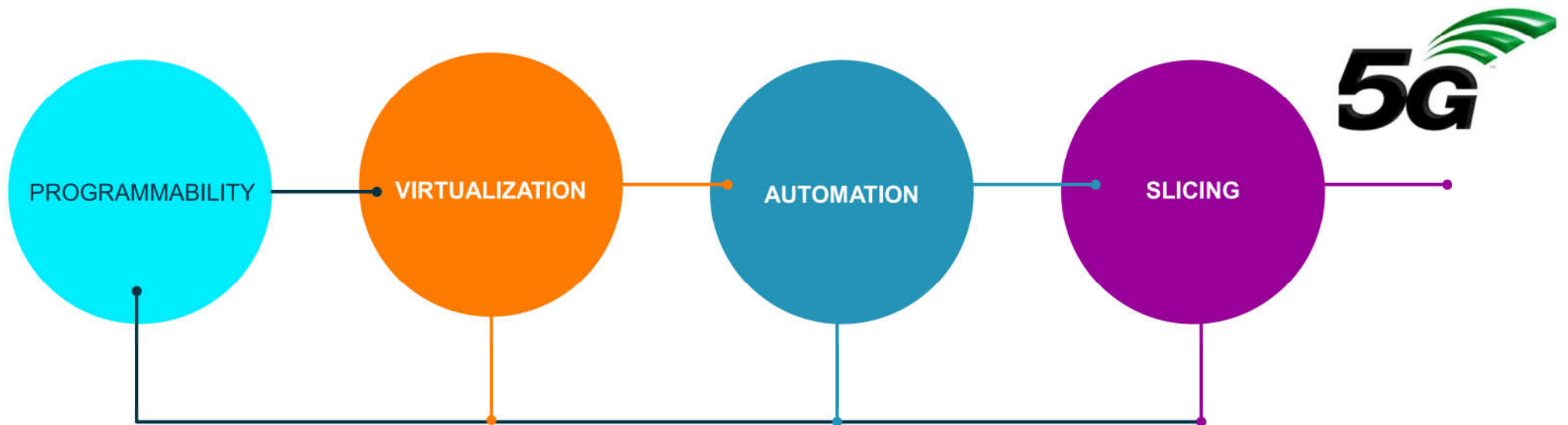


# Consortium

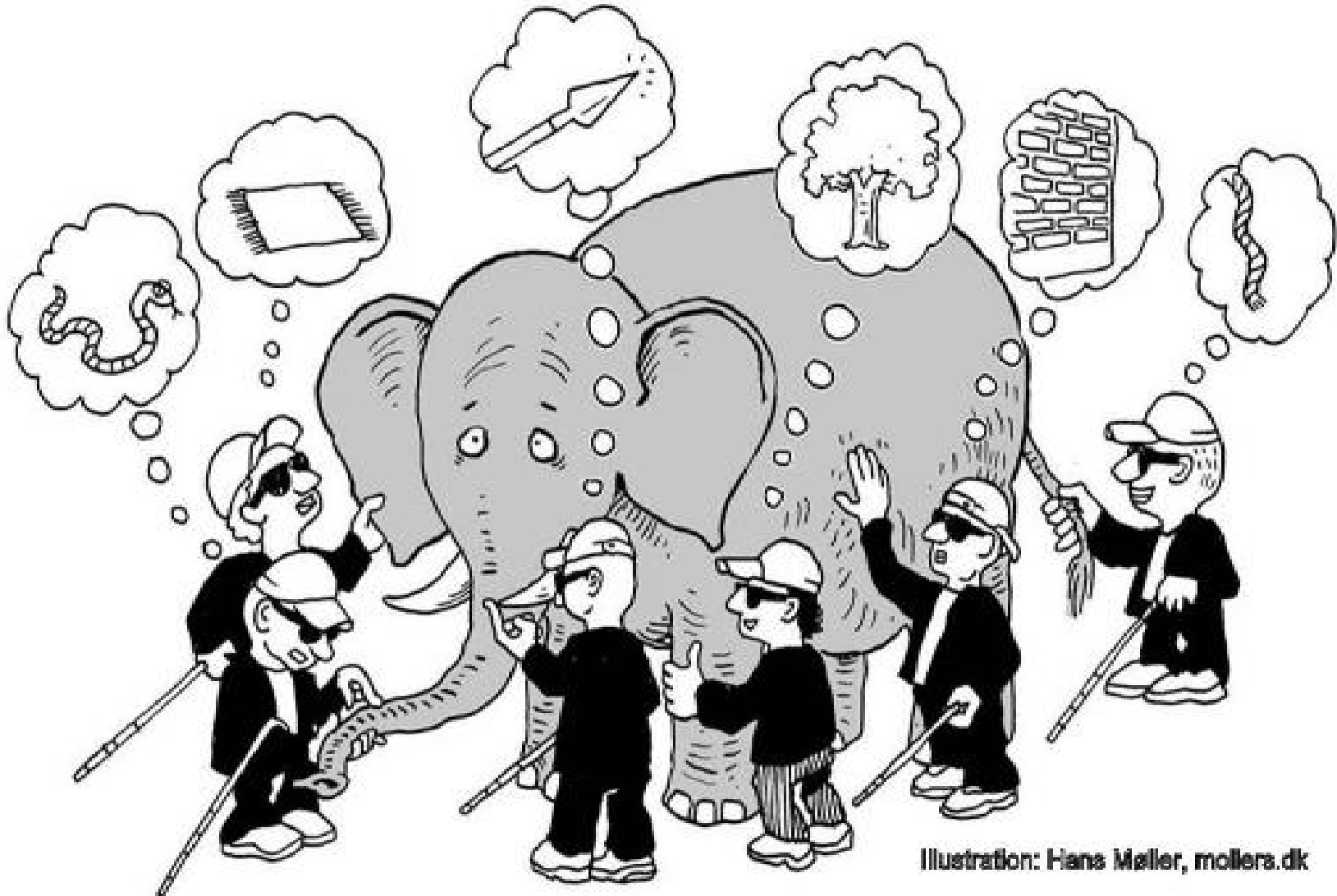


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1 (Overall Co-ordinator)	UPC	Universitat Politècnica de Catalunya	Spain
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10	CPqD	CPqD Telecom Research and Development Center	Brazil
11	UFG	Federal University of Goiás	Brazil

# The Journey



But, wait...., what is a **Slice**?





# What do we mean by Network Slices?

**Network Slice** – A Network Slice is a **managed group of subsets of resources**, **network functions / network virtual functions at the data, control, management/orchestration, and service planes at any given time.**

The behaviour of the network slice is realized via network slice instances (i.e. activated network slices, dynamically and non-disruptively re-provisioned).

A network slice is programmable and has the ability to expose its capabilities.

→ A network slice supports at least one type of **service**.

→ A network slice may consist of **cross-domain components** from separate domains in the same or different administrations, or components applicable to the access network, transport network, core network, and edge networks.

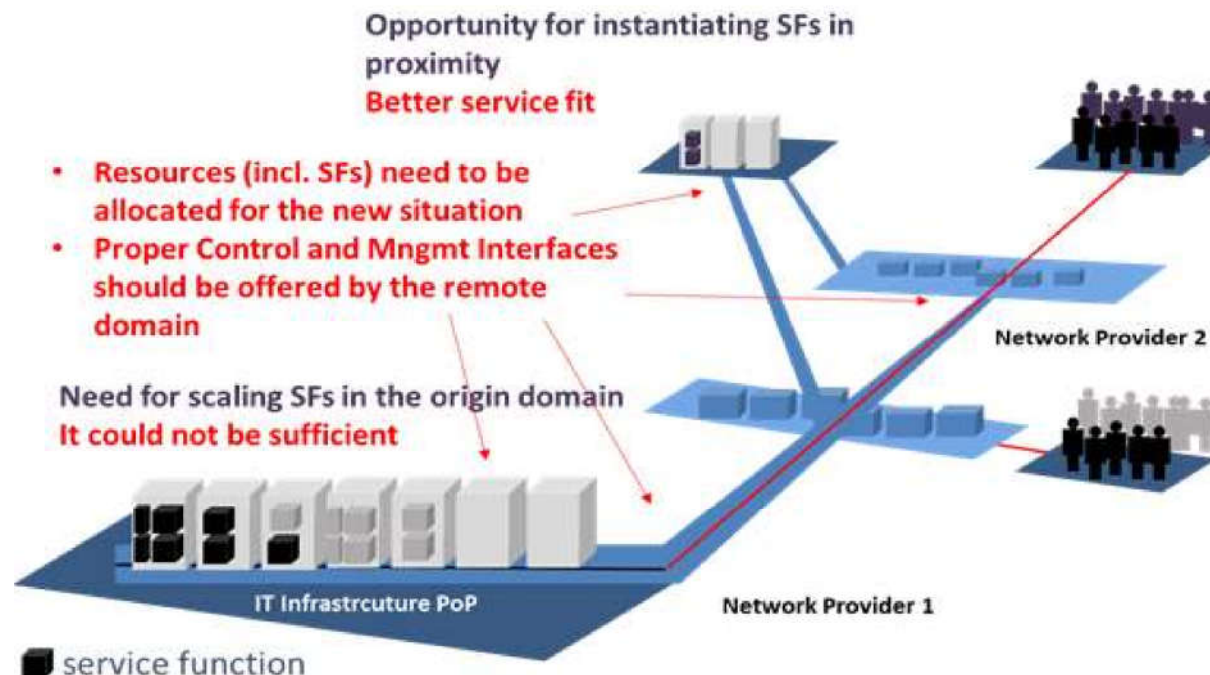
→ A **resource-only partition** is one of the components of a Network Slice, however on its own does not fully represent a Network Slice.

→ Underlays / overlays supporting all services equally (“best effort” support) are not fully representing a Network Slice.

# Next Great Challenge: Multi-Domain Slicing

**Current wholesale and interconnection services and mechanisms are not enough in the era of virtualization and programmability**

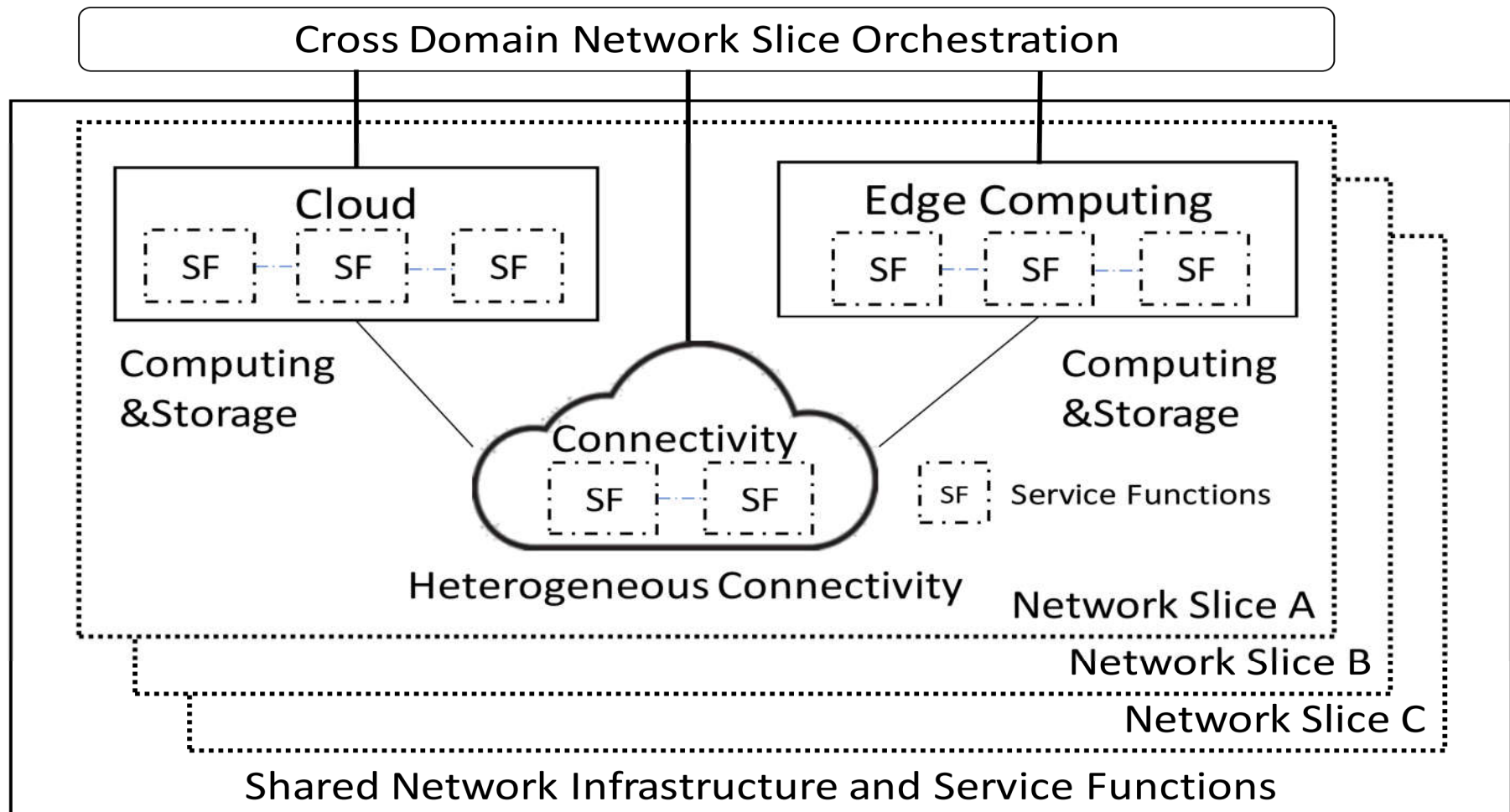
- Vertical customers can request services that lay outside the footprint of their primary provider
  - How to resolve this?
- Dynamic and automated interaction with other providers are needed but ...
  - How we can charge and bill for that service?
  - How we can ensure SLAs among providers?
  - How we can know about the capabilities of other providers for e2e service provision?



# Scope



- Cross-domain management of network slices in network infrastructure and service functions



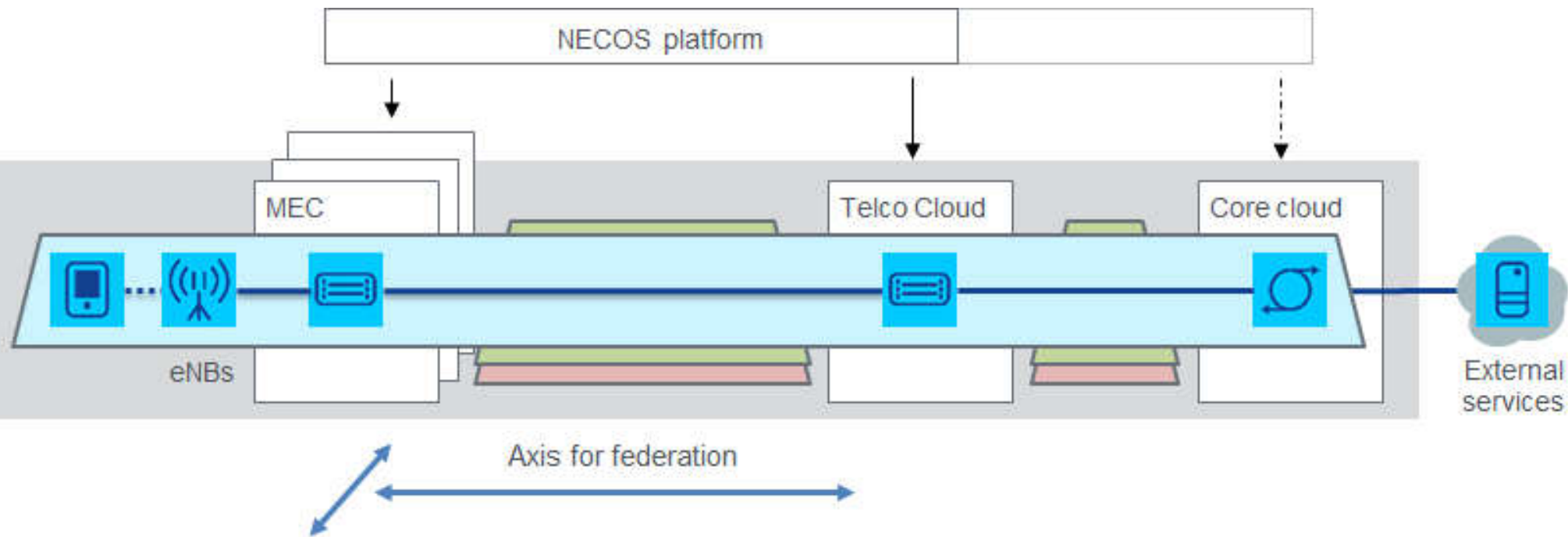
# NECOS Objectives



- **Develop and experiment with Lightweight Slice Defined Cloud (LSDC)**
- **LSDC Key High Level Characteristics:**
  - creating the **Cloud Slice concept** across all of resources in a set of federated data centres.
  - providing a **uniform management** of the currently separated computing, connectivity and storage resources.
- **LSDC Key Enablers:**
  - **new service model – the Slice as a Service** - dynamic mapping of service components to a slice.
  - **easy reconfiguration and adaptation of logical resources** in a cloud networking infrastructure (i.e. accommodate the QoS demand of the Slice).
  - **managed via software for all aspect of the cloud environment** – from the networking between virtual machines to the SLAs of the hosted applications.
  - **use of the Slice as a Service concept for federation:** ability for a specific cloud provider to federate his own infrastructure with other cloud providers with different configurations in order to realize virtualized services.
  - The **main usage of LSDC platform and APIs:** individuals seeking to create a Slice, or other cloud infrastructure providers seeking to form a federated virtual cloud in order to participate in the mechanisms to provide the Slice as a Service.
  - Develop and use two use cases (**Telco Cloud and Mobile Edge Computing**) to derive requirements for the design of the architecture and also to test the developed systems and to demonstrate the validity of the NECOS solution.



# NECOS Use Cases and Scenarios



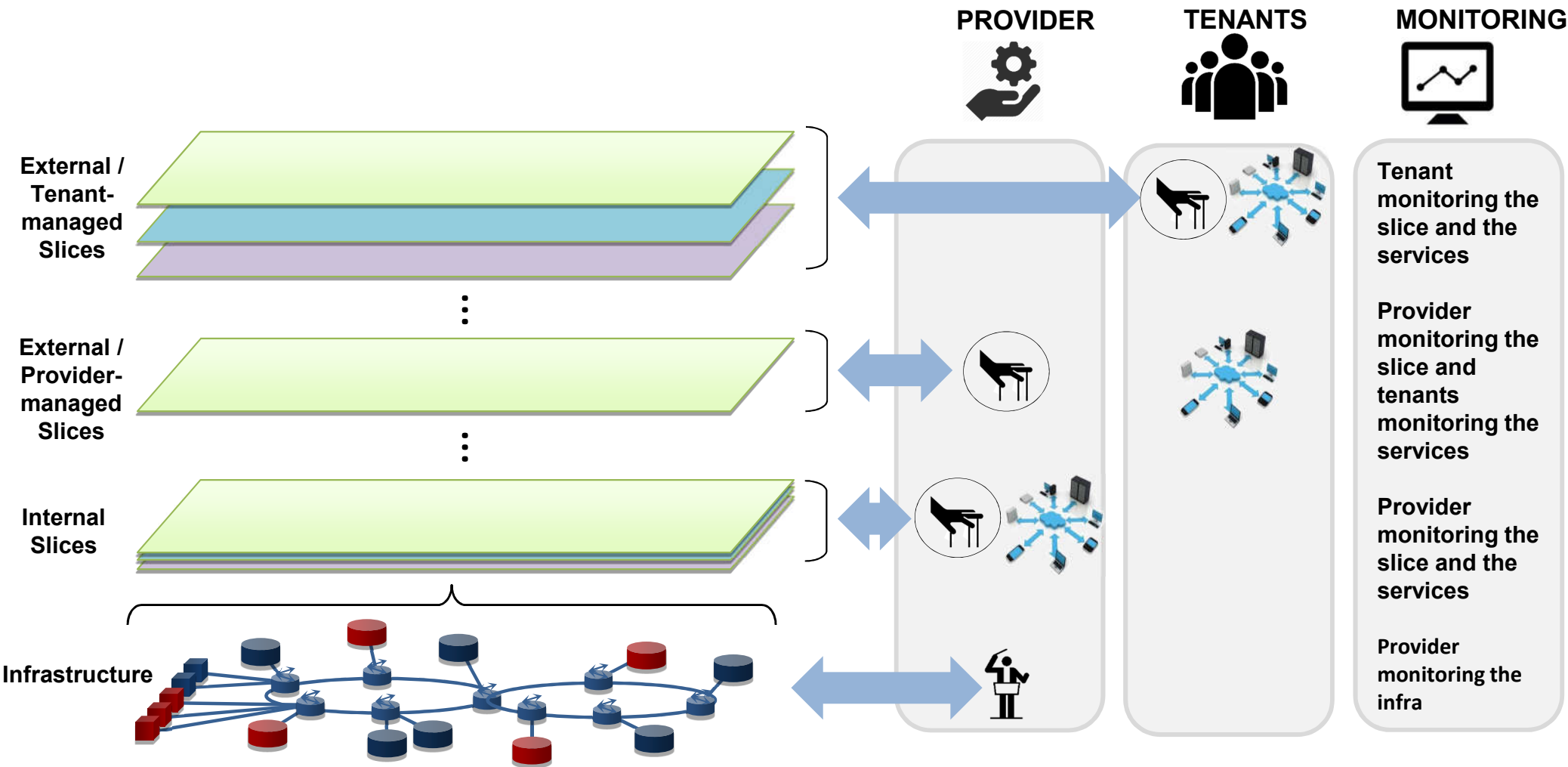
## Provider oriented

- 5G Networks
- vCPE

## End-user oriented

- Touristic services
- Emergency scenario

# Types of Slices and Control Responsibilities

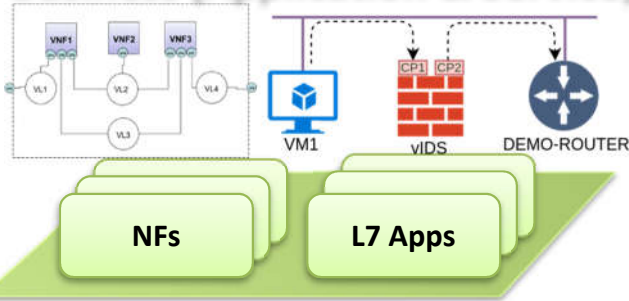




# Slicing Models & Approaches



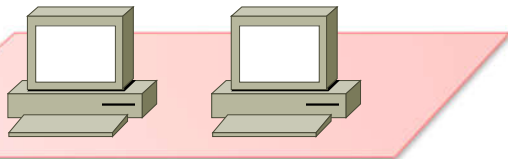
## Business (Application & Service) plane



Monitoring

**Service-based Slicing**  
[Mode 3] [Service Slice aaS]

## Control & Management plane



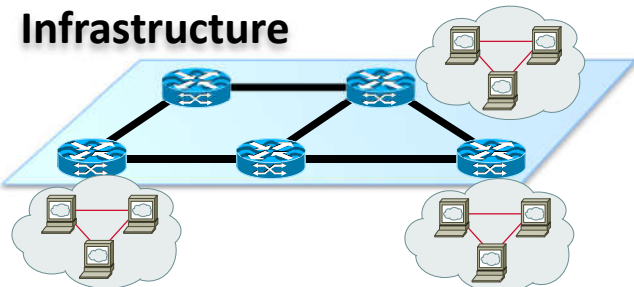
Monitoring

**MANO-based Slicing**  
[Mode 2] [NFV aaS]



**VIM-dependent Slicing**  
[Mode 1] [Resource Slice aaS]

## Infrastructure



Monitoring

**VIM-independent Slicing**  
[Mode 0]  
[Infrastructure Slice aaS]  
("Bare-metal")



# Why slice-ready federation is needed?



- Vertical customers can request **services** that lay **outside the footprint** of their **primary provider**
- Interaction with other providers are needed but ...
  - How we can **charge** and bill for that service?
  - How we can **ensure SLAs** among providers?
  - How we can **know about the capabilities** of other providers for a comprehensive e2e service provision?
- The current interconnection models is **not aware of peer's network resources** (i.e., load conditions, etc)
- All these **environments are static**, requiring long interactions for setting up any inter-provider connection
- **Automation** for both the **interconnection** sessions and the **service deployment** on top of that is needed to reach the goal of **flexibility and dynamicity**

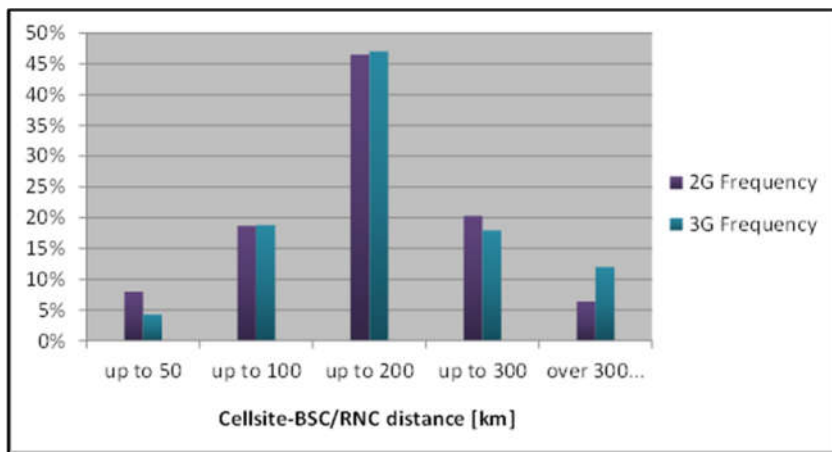
# Size matters



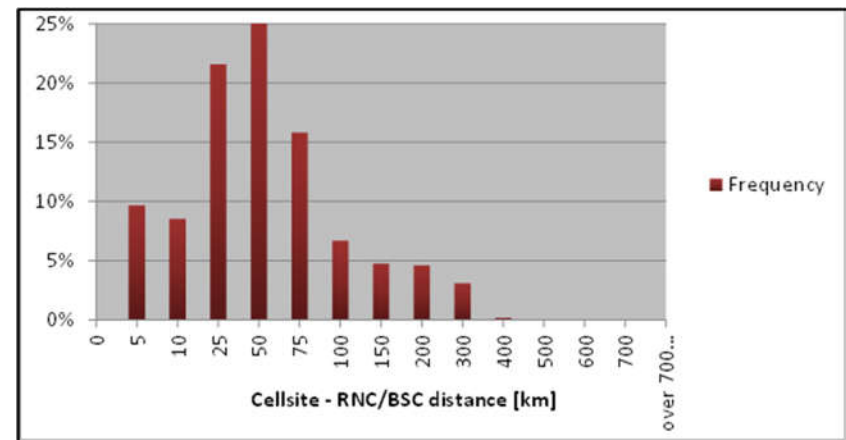
# Providers' infrastructures are not ubiquitous



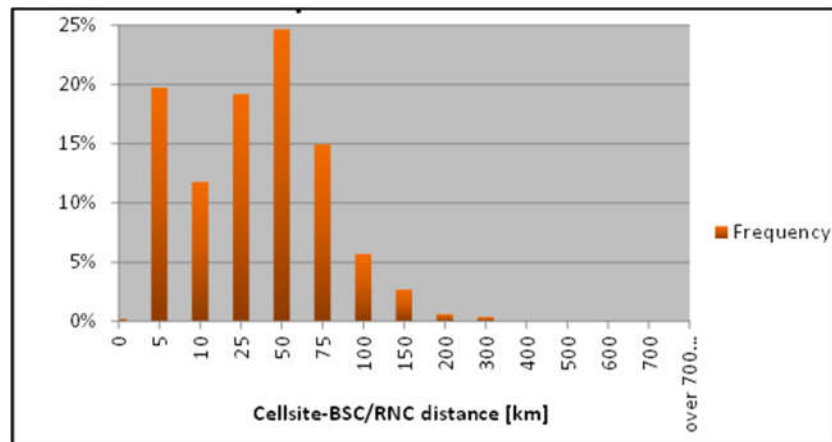
## Operation 1



## Operation 2



## Operation 3



EU – 80% of the nodes < 75 km  
Latam – 75% of the nodes < 200 km

Complementary cloud facilities are required to satisfy service needs

# General Discussion, Q&A



<http://www.h2020-necos.eu/>