



Novel Enablers for Cloud Slicing - NECOS

EUBrasilCloudFORUM Concertation Meeting, 18th April 2018
Brasília, Brazil





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Proposal title: Novel Enablers for Cloud Slicing
Activity: EUB-01-2017 RIA



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Agenda



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- Consortium
 - Project overview
 - Partial results
 - Upcoming events
 - Recommendations?

Consortium



Participant No	Part. short name	Participant organization name	Country
1 (Overall Co-ordinator)	UPC	Universitat Politècnica de Catalunya	Spain
2	UCL	University College London	UK
3	TID	Telefónica Investigación y Desarrollo	Spain
4	UOM	University of Macedonia	Greece
5 (Brazil Co-ordinator)	UNICAMP	University of Campinas	Brazil
6	UFSCAR	Federal University of São Carlos	Brazil
7	UFU	Federal University of Uberlândia	Brazil
8	UFPA	Federal University of Pará	Brazil
9	UFRN	Federal University of Rio Grande do Norte	Brazil
10	CPqD	CPqD Telecom Research and Development Center	Brazil
11	UFG	Federal University of Goiás	Brazil

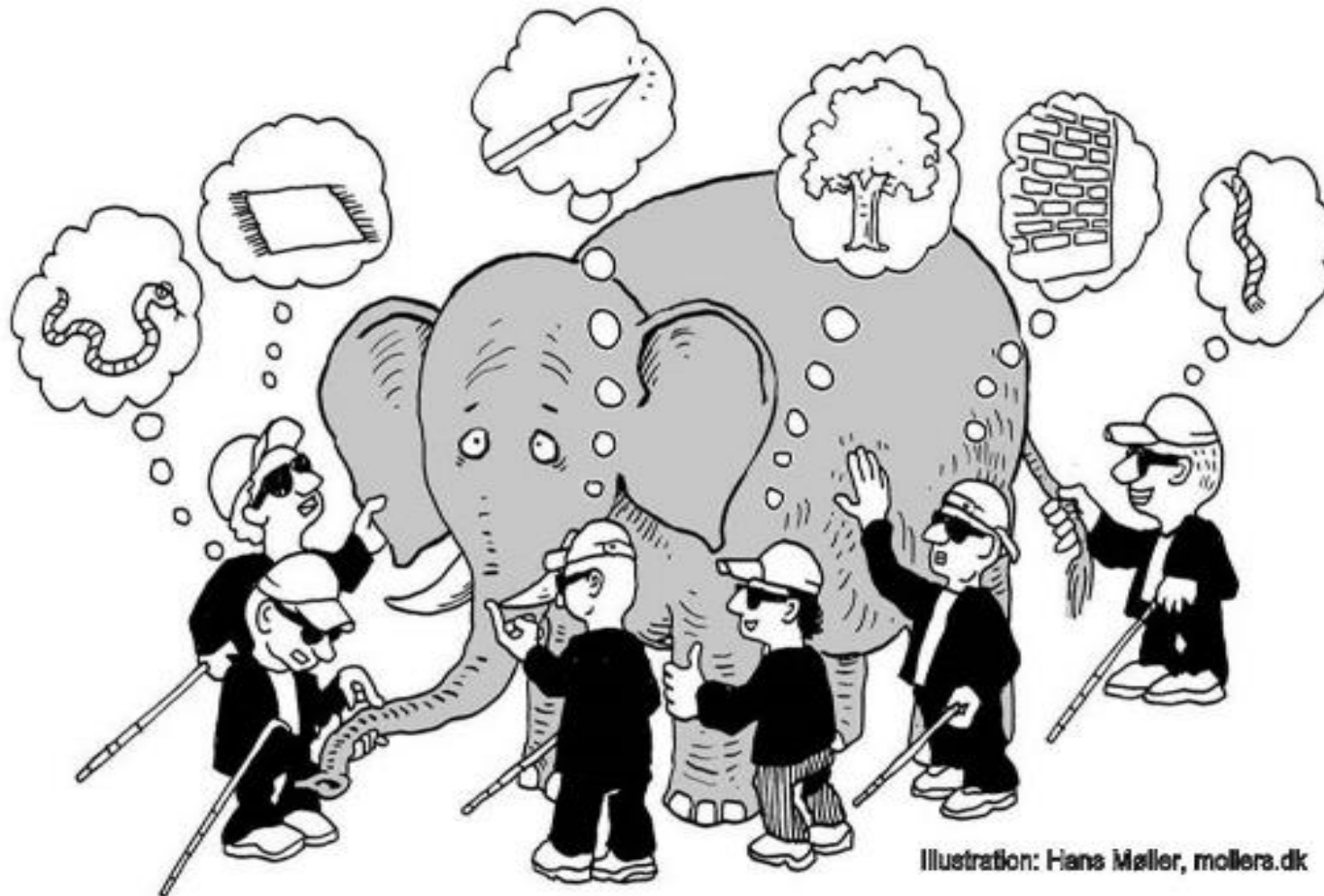
NECOS Objectives



- **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.



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



Network Slicing is a Top Emerging Engineering Networking Problem



Network Slices – Key Characteristics:

- **is mainly an embedded management concept supporting at least one service at a given time.** It also includes coordination/orchestration of network functions and resources.
 - **has dynamic and non-disruptive re-provisioning.**
 - **is a dedicated network part** that is built on an infrastructure mainly composed of, but not limited to, connectivity, storage, and computing.
 - **is concurrently deployed** with isolation guarantees as logical, independent and self-contained, partitioned network functions and resources on a common infrastructure.
 - **is able to dynamically expose**, and possibly negotiate, the parameters that characterize itself. Network slices are configurable and programmable.
 - **it is related to an operator** that sees it as a complete network infrastructure and uses part of the network resources to meet stringent resource requirements.
 - **supports tenants** that are strongly independent on infrastructure.
 - **introduces an additional layer of abstraction** by the creation of logically or physically isolated groups of network resources and (virtual) network functions configurations.
- > a number of related sub-problems need to be addressed by networking research through new protocols/methods or extensions to existing protocols/methods.**

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.

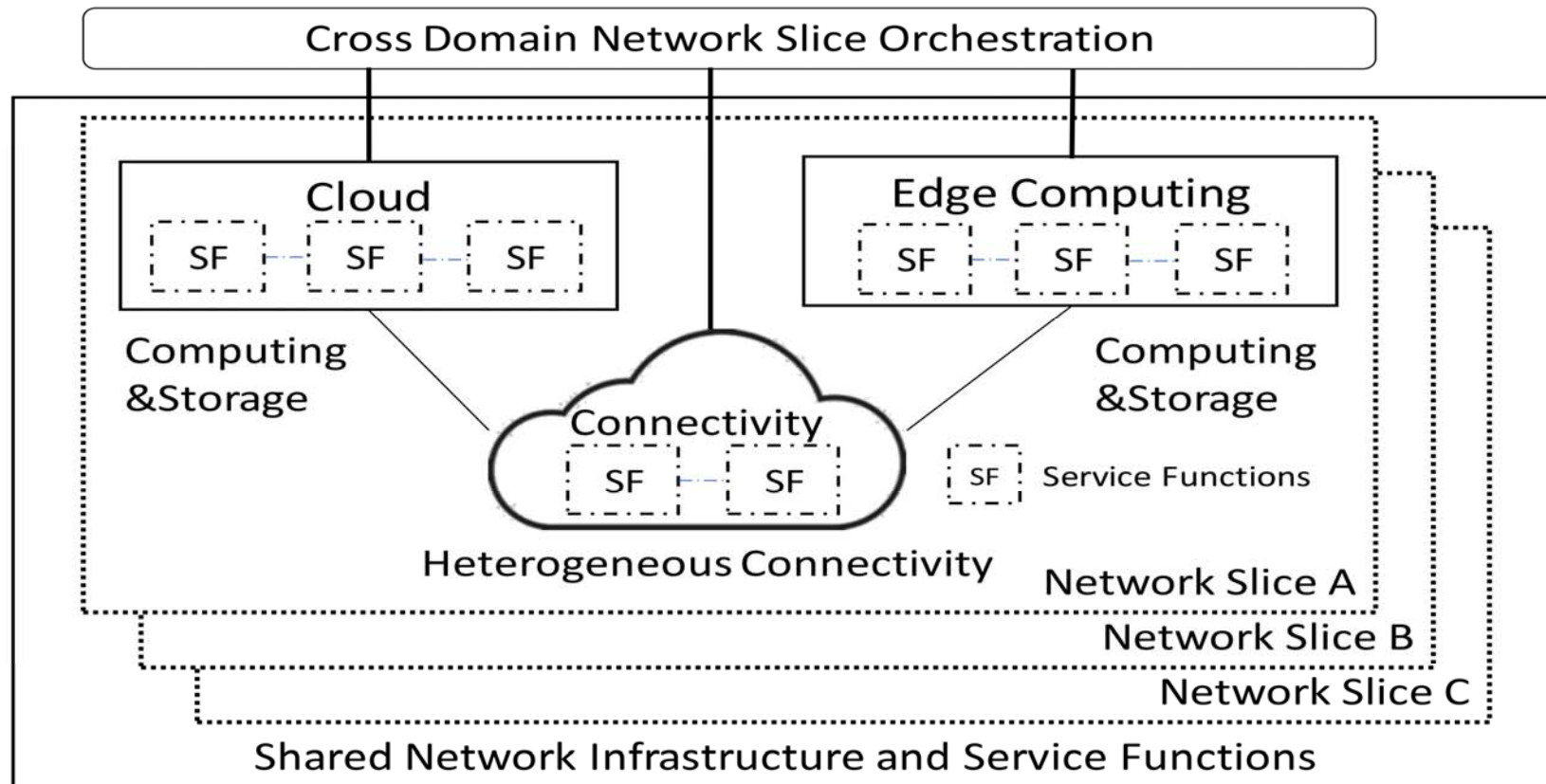
→ A network slice supports at least one type of service.

→ 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.

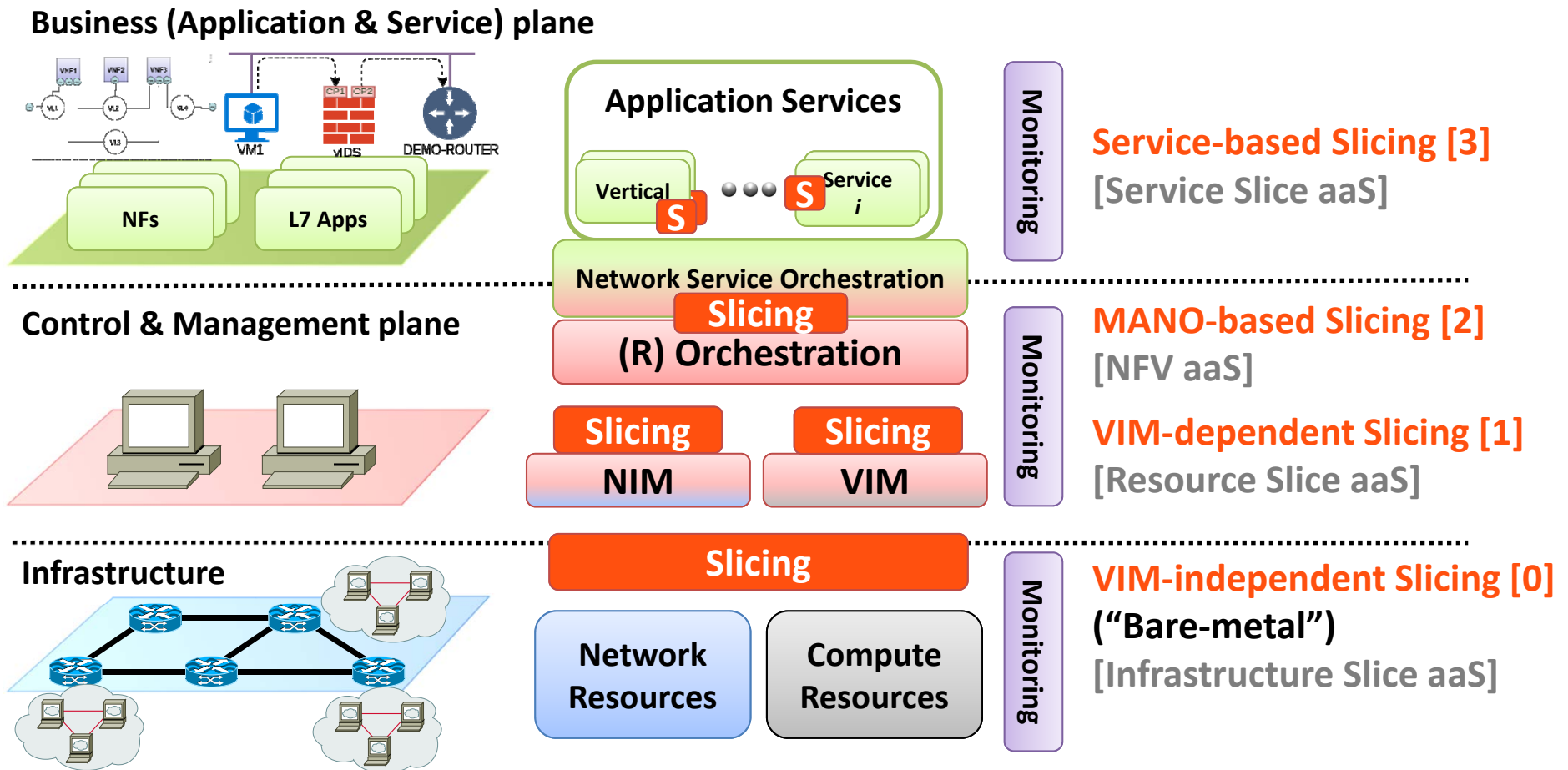
→ Underlays / overlays supporting all services equally (“best effort” support) are not fully representing a Network Slice.

NECOS focus on cross-domain management of network slices in network infrastructure and service functions.

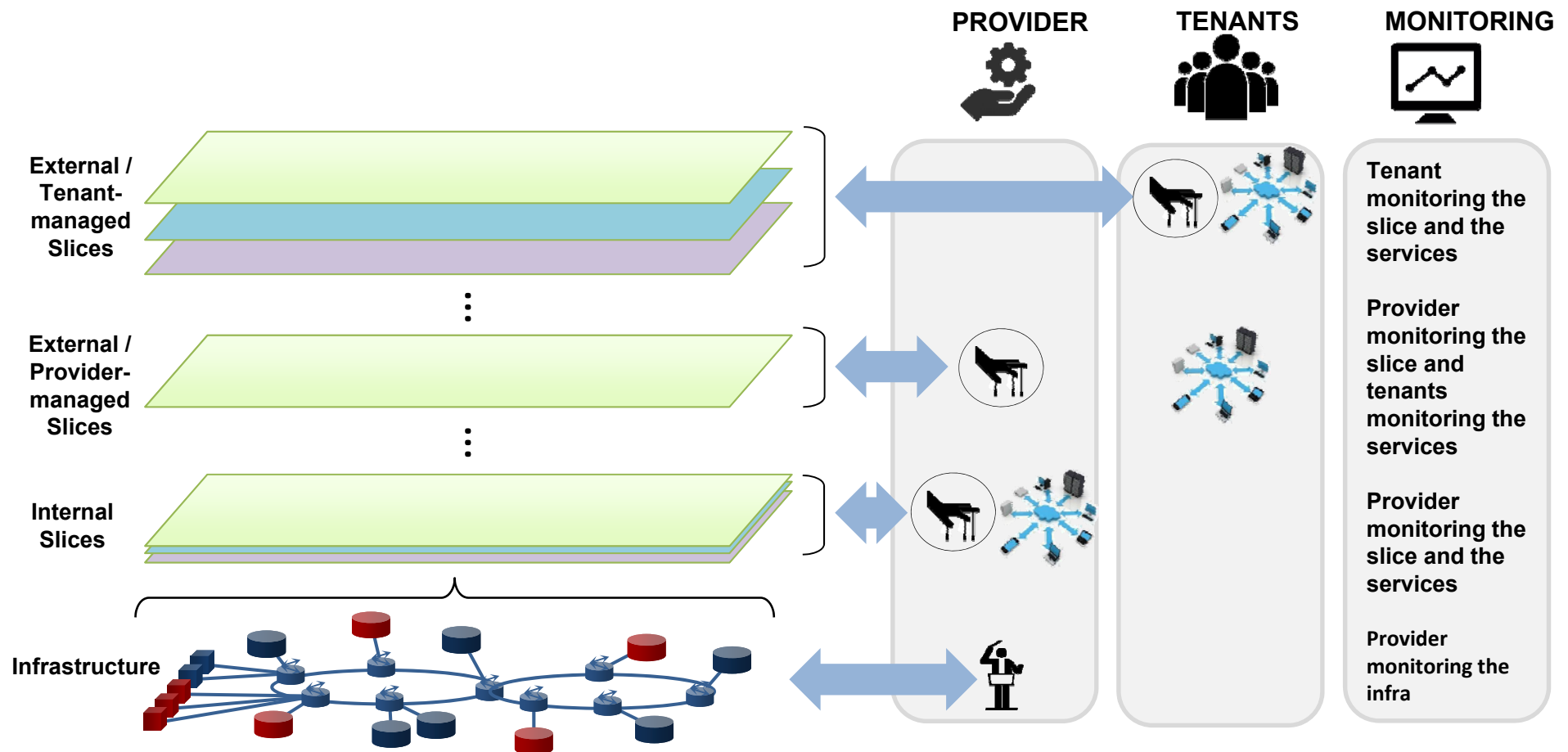




Slicing Models & Approaches

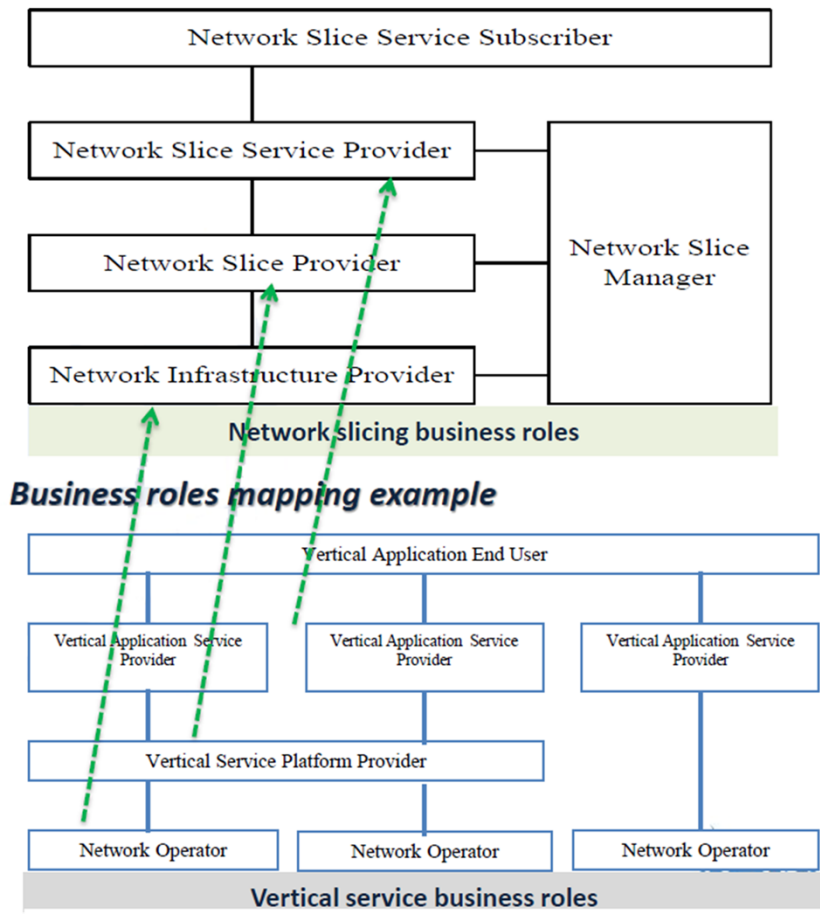


Types of slices and control responsibilities

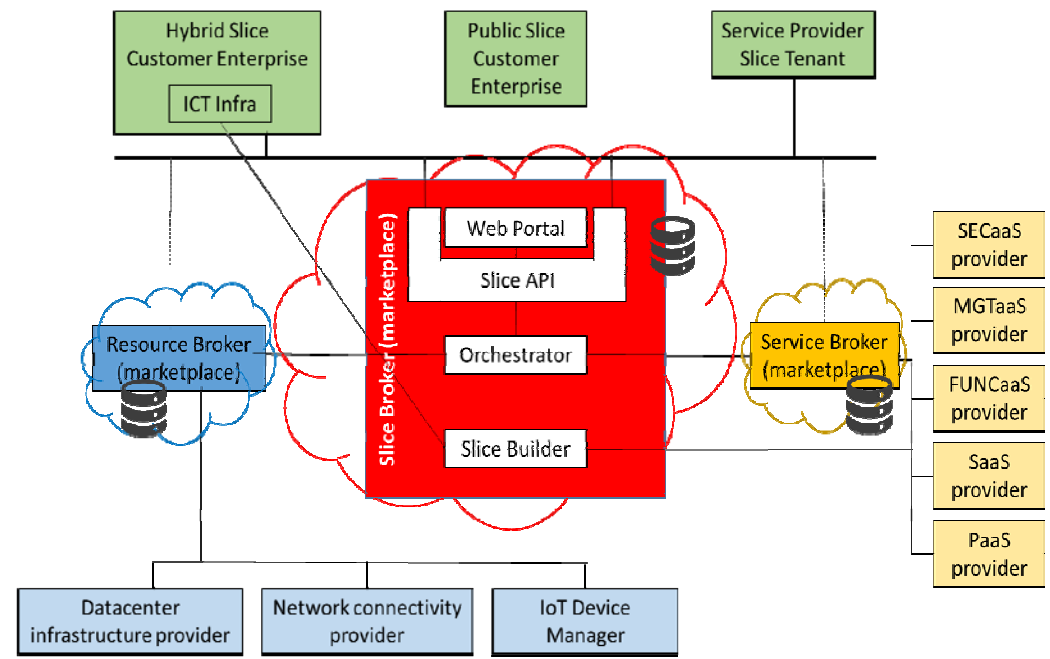


Source: A Network Service Provider Perspective on Network Slicing. Luis M. Contreras and Diego R. López. IEEE Softwarization, January 2018

Network Slicing enables new business models



Source: ITU-T Business model



Source: NECOS

Use Case 1 – Telco-Clouds

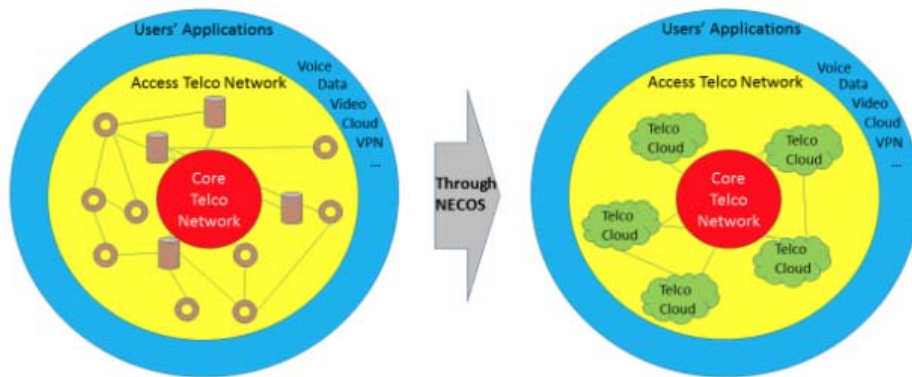


Figure 1.2- The evolution of the Telco's network fostered by the NECOS concept of Telco-Cloud

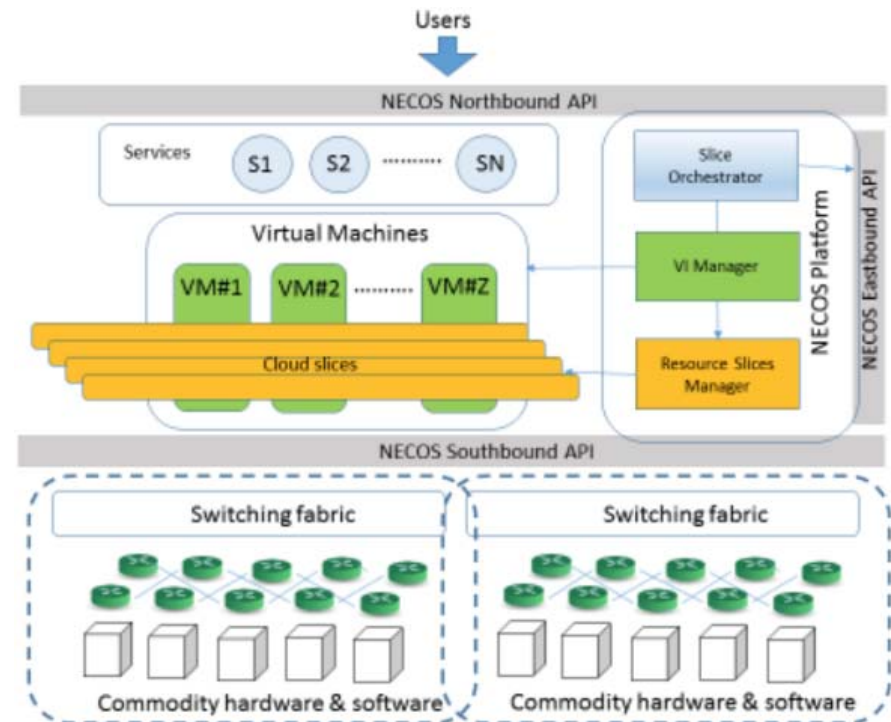


Figure 1.3– Enablers of NECOS driven by Use Case 1

Use Case 2 - Mobile Edge Computing

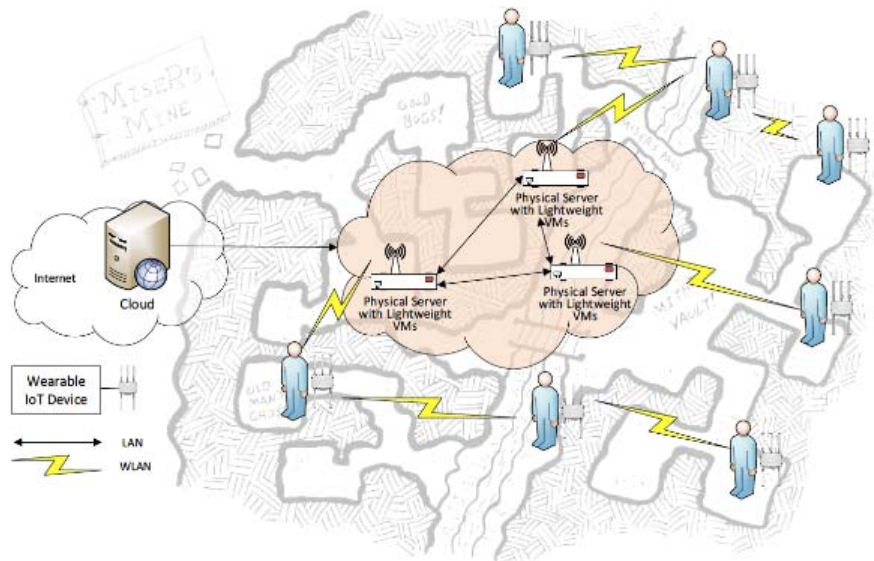


Figure 1.4 - Application point of view of Use Case 2

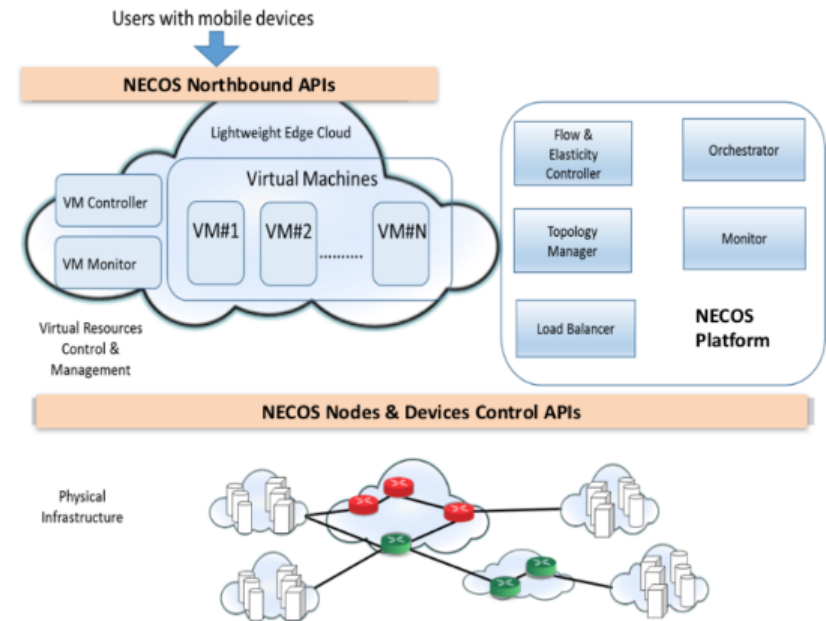


Figure 1.5 - Enablers of NECOS driven by Use Case 2

Kick-Off @ UPC, Barcelona (Nov/17)



2nd F2F GM @ UOM, Greece (Apr/18)



Partial Results



- D1.1: Data Management Plan
- D2.1: Initial definition of use cases
 - Business models considerations include service & slice marketplaces
 - Scenarios: 5G VRAN, vCPE, Touristic services, Emergency
 - Requirements, Critical Success Factors, and KPIs
- Standardization
 - Pushing contributions to IETF COMS BoF (Common Operations and Management of Slices)
- Publications
 - 3 conference + 2 workshop publications
 - 2 conference papers + 3 workshop papers accepted for publication
 - 2 journal submissions
- Presentations
 - E.g., IETF, universities, events,

Upcoming events



- Organization of IEEE Netsoft'18 workshop (Jun/18, Canada)
 - Workshop on Advances in Slicing for Softwarized Infrastructures (S4SI)
 - Presentation of 3 NECOS papers
 - More info: <http://clayfour.ee.ucl.ac.uk/s4si/>
- IEEE Netsoft'18 tutorial on Network Slicing Landscape
 - More info: <http://netsoft2018.ieee-netsoft.org/program/tutorials/>
- IETF COMS BoF (IETF101-Apr/18, IETF102-Jul/18)
- 3rd F2F GM @ UFRN / CSBC18 (Jul/18)
- 4th F2F GM @ Telefonica / Madrid (Oct/18)

- See you @ SBRC 2018 / WRNP (May/18)

Recommendations?

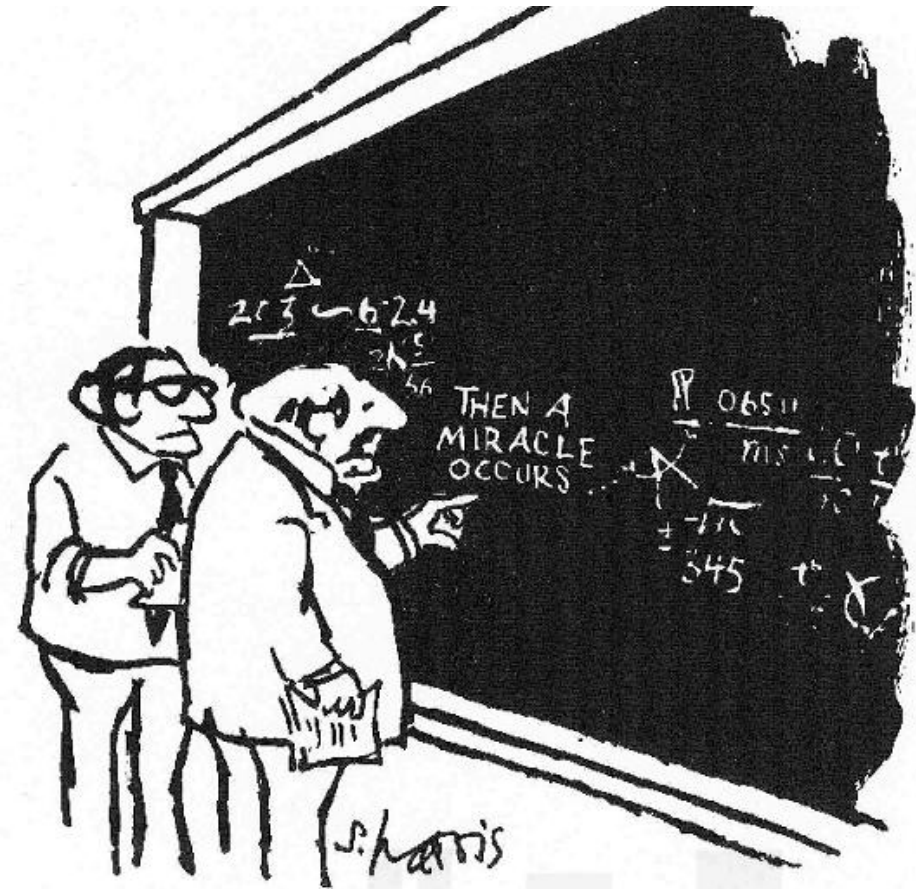


- Slicing involves many-layer / inter-disciplinary research
- Dispersed standardization efforts (risk of fragmentation?)
- Business models enabled by broad Network Slicing may fly only if regulation not only follows but provides the right policies and incentives
 - Beyond infrastructure sharing (e.g. current co-location and radion antenna or access network sharing) to broad resource trading in open win-win marketplaces

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**Thanks!
Obrigado!
(More) Questions?**



“I think you should be more explicit here in step two”