



TIM BRASIL

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QoS/QoE in future IoT/5G Networks: A Telco transformation infrastructure perspective.



AGENDA


- THE CONTEXT: UNDERSTANDING THE SCENARIOS
- TECHNOLOGIES, ARCHITECTURES AND CONCEPTS
- FINAL REMARKS

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THE CONTEXT: UNDERSTANDING THE SCENARIOS

IoT Verticals: Many and with different requirements and usage profiles, combined with....




Automation & Monitoring

50 – 500kbps High
Fixed 10 Years




Fleet Management

100s of Kbps Low
10 – 150Km/h ~3 months




Smart Cities

50 – 500Kbps Low
Fixed 10 Years



Security & Surveillance

0.5 – 8Mbps Low
Fixed Connected



Automotive / Telematics

10s of Mbps Low
10 – 150Km/h Vehicle



...a huge numbers of devices

Global Machine-to-Machine Growth and Migration from 2G to 3G and 4G+



THE CONTEXT: UNDERSTANDING THE SCENARIOS

5G Use Cases...



Massive IoT



Ultra low power wearables, pressure,

Connection density: 200.000 /km²

Integrated sensors, e. g. various heart rate or blood

Real-time sensing, data intelligence and real-time Tactile Internet

< 1ms latency

big data to enable

Extreme realtime communications



Emergency & Safety



Public Protection and Disaster Relief e.g. especially for communication authorities and citizens

Resilience & High Availability

THE CONTEXT: UNDERSTANDING THE SCENARIOS

CHALLENGES

Faced with these scenarios with major transformations and differences in the types of services, the challenges that are imposed are:

❑ What are the best technological and architectural choices to provide the better QoS/QoE to all services and:

- Achieve the best return on investment.
- Maintain the operational efficiency.
- Stay competitive.



MAIN NETWORK ATTRIBUTES

- ❑ Programmable / "tunable" capabilities;
- ❑ Automation capabilities;
- ❑ Orchestration capabilities crossing all domains;
- ❑ SW based + COTS HW;
- ❑ Open source SW and HW → No vendor lock-in;
- ❑ Open and Standard APIs → No vendor lock-in;

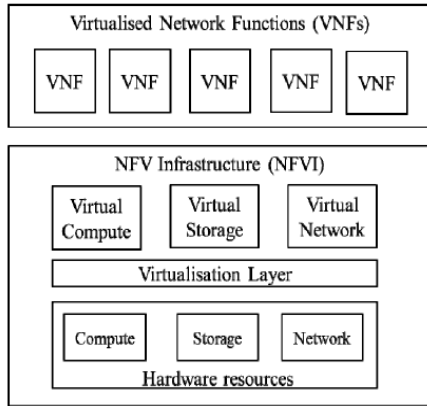


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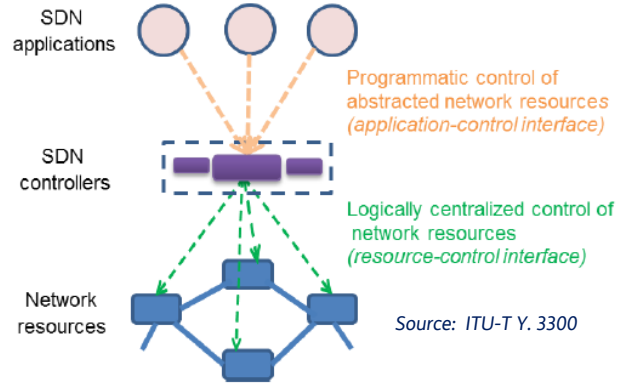
TECHNOLOGIES, ARCHITECTURES AND CONCEPTS

NFV / NFV-I



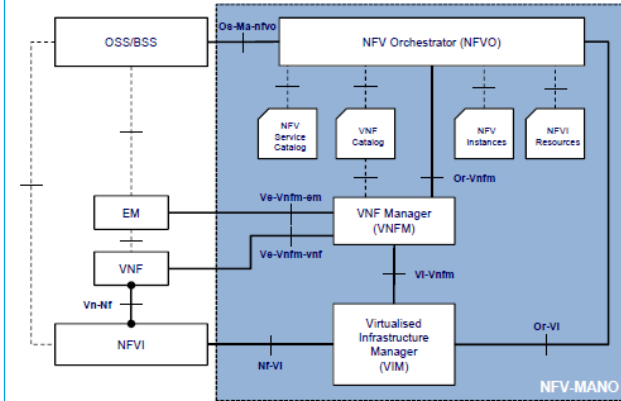
- ❑ Host of VNFs like: vEPC, vC-SGN and v5G –Core functionalities, running in VMs.
- ❑ Some important features/aspects for QoS/QoE to be evaluated when deploy a VNF:
 - DPDK;
 - NUMA;
 - CPU Pinning;
 - Affinity/Anti-Affinity rules;

SDN



- ❑ Separation between Control Plane and User Plane in networking / transport elements.
- ❑ Brings Automation for connectivity tasks.
- ❑ Allows to manage the connectivity with more control in respect with the service.
- ❑ Intra NFV-I (Telco DC) and Inter NFV-I.

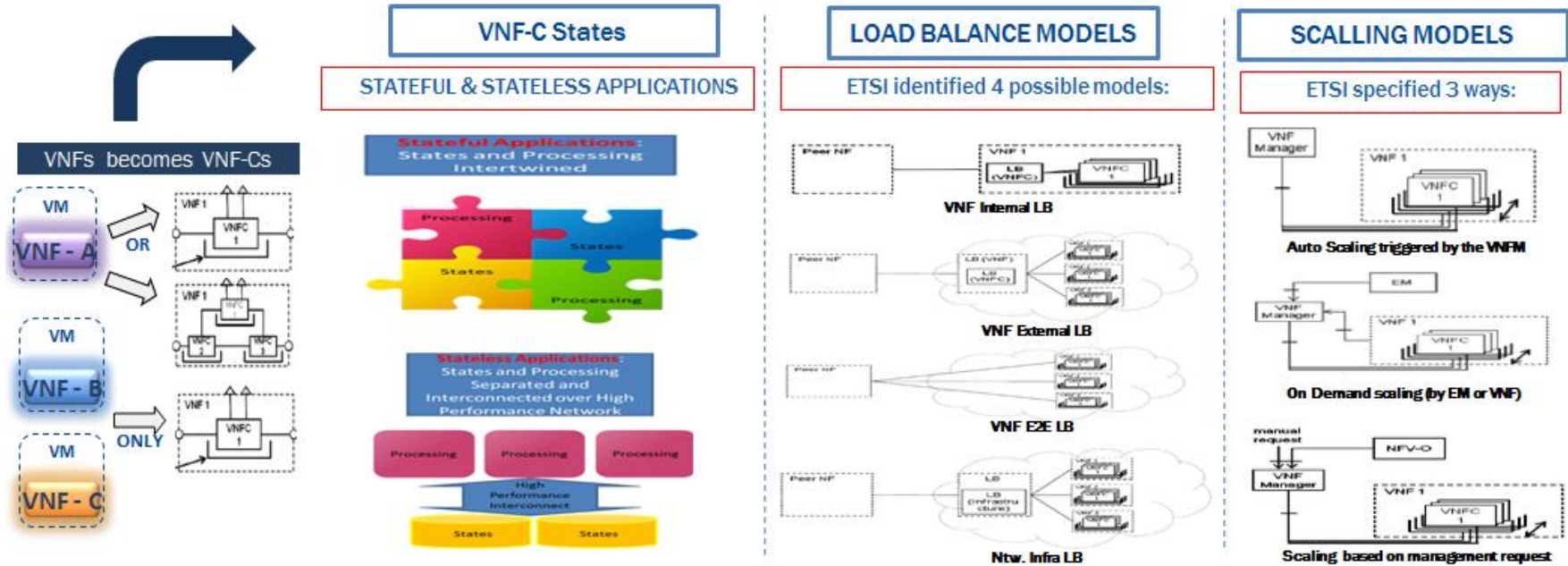
MANO



- ❑ Resource Management;
- ❑ Combined with SDN and other platforms, can provide E2E Service Management.
- ❑ Important open sources initiatives like:
 - ➔ Openstack (VIM);

TECHNOLOGIES, ARCHITECTURES AND CONCEPTS

IMPORTANT CHARACTERISTICS (for HA SERVICE Architectures) THANKS TO THE VNF/VNF-Cs APPROACH

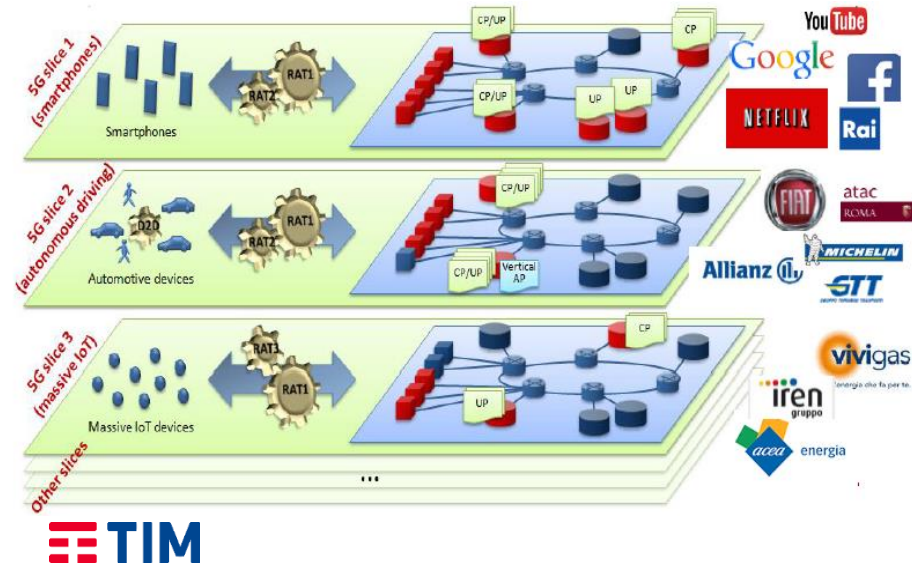


- ❑ Move from a Network Function solution as a “closed” product analysis to a Software Architecture qualification;
- ❑ Promote HA SERVICE architectures, potentially beyond the 99.999%;

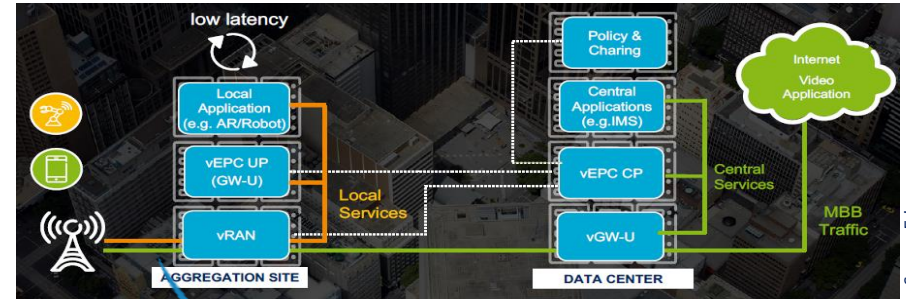
TECHNOLOGIES, ARCHITECTURES AND CONCEPTS

NETWORK SLICING

□ Network Slicing can be seen as a common network, able to provide and expose concurrent, partitioned and self-contained “slices” do support different services in an efficient way and provide the required QoS/QoE for each one.



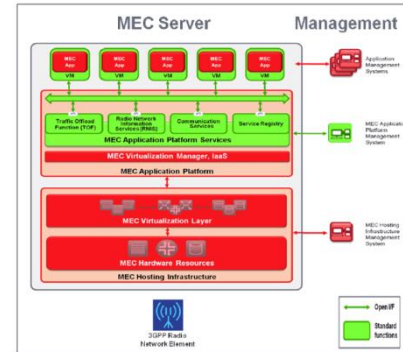
EDGE COMPUTING / M.E.C.



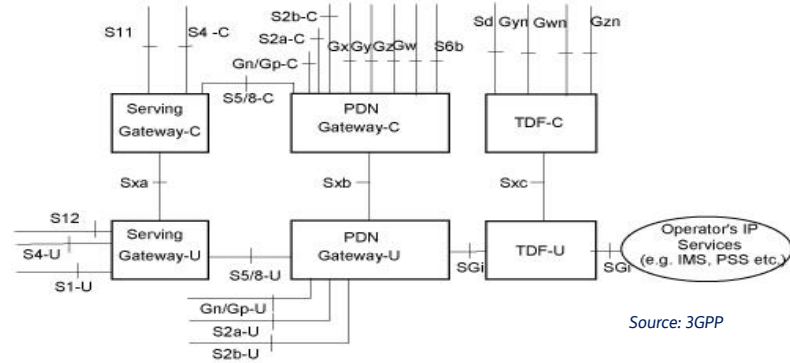
Source: Ericsson

□ Mobile-Edge Computing offers cloud-computing capabilities and an IT service environment at the edge of the mobile network.

□ This environment is characterized by ultra-low latency and high bandwidth as well as real-time access to radio network information that can be leveraged by applications and QoE platforms.



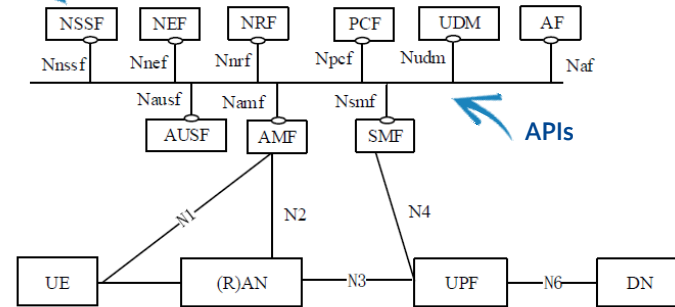
CUPS (Control / User Plane Separation)



- ❑ Separate the User Plane functions from the Control Plane functions, allowing independent scalability, evolution and flexible deployments e.g. centralized location or distributed (remote) location.
- ❑ Support concurrent access to local and centralized services. To support low latency services and access to local data networks, User Plane functions can be deployed close to the Access Network.

5G Core ~ “Microservices”

Ntw. Slice selection



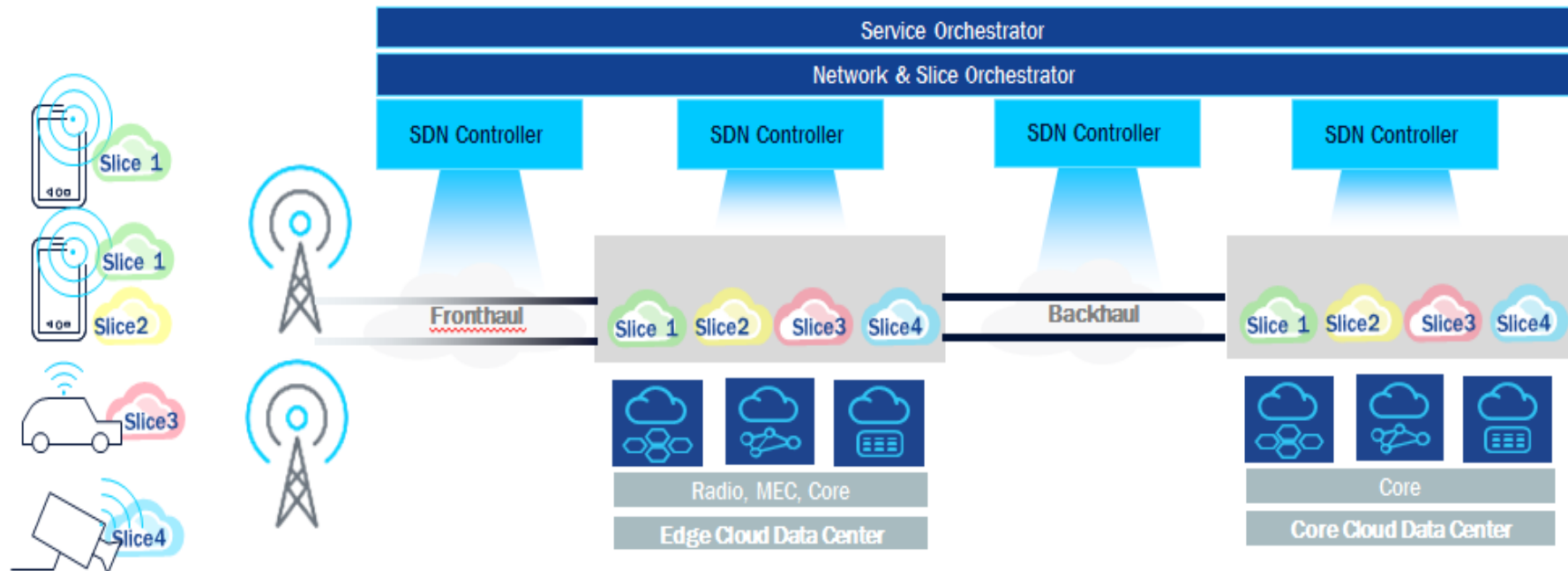
Non-Roaming reference architecture
Service-based interfaces are used within the Control Plane

The development and conceptions in 5G Core architecture are very similar with the microservices architectures in IT. Some benefits of microservices are:

- ❑ Agility and flexibility to change rapidly;
- ❑ Easier to scale => only scale the parts that need it;
- ❑ Right tool for the right job => pick the technology that works best, for example:

- ➔ Containers;
- ➔ “Atomic” Linux distros;

.... all “pieces” together...



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FINAL REMARKS

- ❑ QoS and QoE are pillars of TIM.
- ❑ TIM is preparing its network infra, considering the best technological options for future IoT and 5G networks with focus in QoS and QoE.
- ❑ It has also been establishing partnerships and participating in development forums to explore innovative solutions for telecom infra, aiming to provide the best experience in the use of its network infrastructure and the services supported. As an example, we'd like to share that TIM is the first laboratory in Latin America to be part of the TIP Community Lab.

TIM JUNTA-SE AO TELECOM INFRA PROJECT (TIP) E FUNDA O TIP COMMUNITY LAB

O laboratório para as novas soluções da operadora será o primeiro na América Latina a hospedar o TIP Community Lab

A TIM se juntou ao Telecom Infra Project (TIP), uma iniciativa fundada pelo Facebook, SK Telecom, Deutsche Telekom, Nokia, Intel e outras empresas para a criação de uma nova abordagem para a construção e implantação da infraestrutura de redes de telecomunicação. A TIM está comprometida com a Inovação Aberta e transformará o TIM Lab – seu laboratório para o desenvolvimento de novas tecnologias e soluções – no primeiro TIP Community Lab (“Laboratório Comunitário TIP”) da América Latina.



TELECOM INFRA PROJECT

Thank you
Obrigado
Gracias

