

Main Aspects and Impact of 5G-Phase II Projects

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Motivation

- The **focus of 5G research** so far has been largely **on the required advances in network technologies**: spectrum, radio access, SDN, NFV and cloud infrastructure, flexible management and control architectures and development and operations systems
- ? to investigate on how to implement **5G networks and how they can be exploited by advanced media applications** to realise the benefits of low latency, high bandwidth and flexible dynamic configuration.

Technical challenges for advanced apps

- Application of **SDN and NFV concepts** to media applications **to flexibly and dynamically embed them as virtual network functions** (in the form of virtual machines, containers or unikernels) within the 5G network and cloud infrastructure using a **serverless computing paradigm**, close to traffic sources and sinks, and **by configuring network paths and virtual slices** to deliver the required network capacity and performance levels **at the network edge**.

SDK and DevOps
environment for
Media Application

to hide the complexity of service development and deployment on the underlying 5G network and distributed cloud infrastructure

service
virtualisation
platform

to orchestrate the deployment and scaling of the media applications, interacting with the underlying network for the dynamic control of the network by applying machine learning and cognitive optimisation techniques

Streaming as
a Service

Media apps in the 5G arena (1/3)

Immersive applications and Virtual Reality

- **Quality of Service (QoS) and Quality of Experience (QoE) are top priorities** in immersive media whereas availability and interaction between users are considered critical challenges that need to be met as they ensure a smooth user experience.



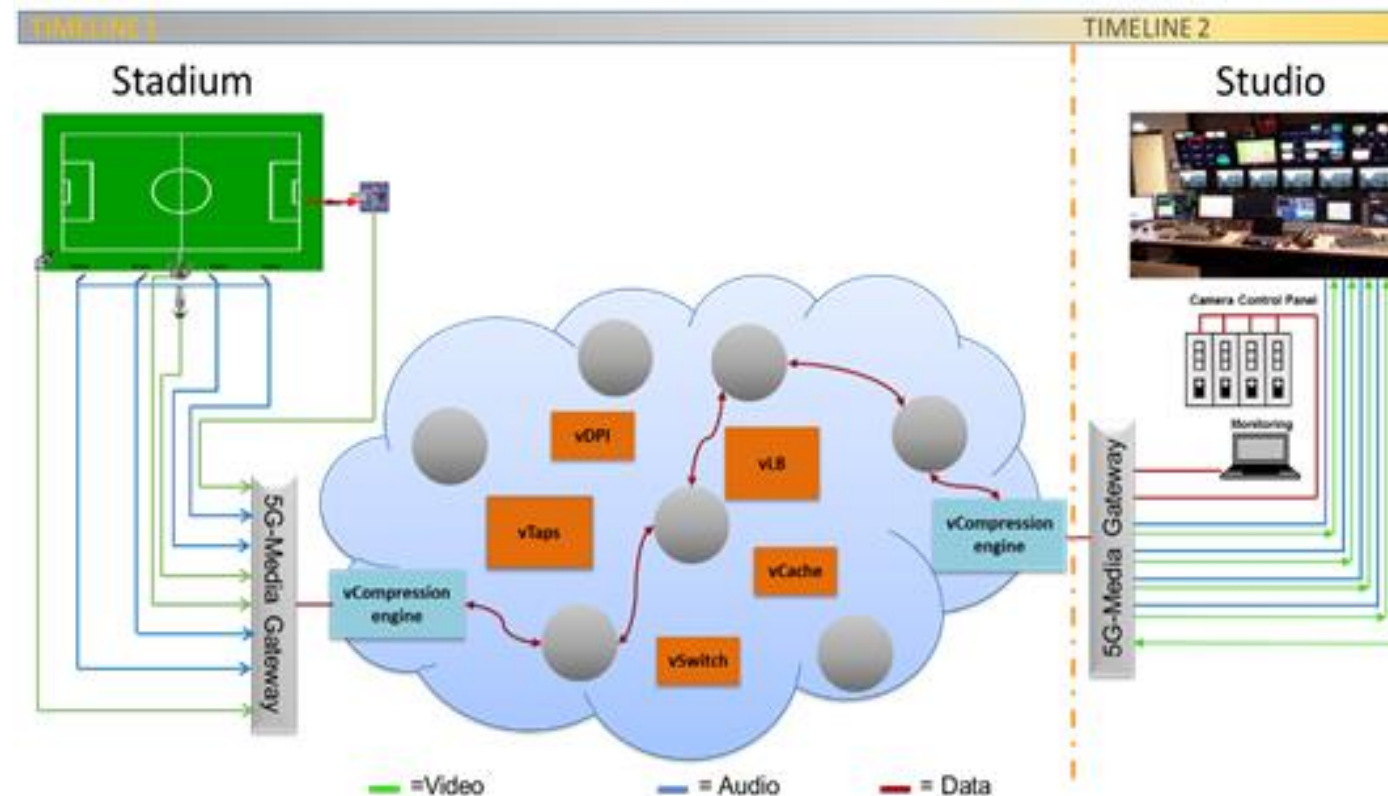
5G MEDIA
challenge

Tele-immersive media scenario

Media apps in the 5G arena (2/3)

Mobile contribution, remote and smart production using user-generated content

- **vEncoding and vCompression engines** have the potential to replace dedicated encoder hardware and the Cognitive Network Optimization together with the QoS-monitoring can help **to overcome** the current **internet best-effort principle** and ensure the required performance needs.

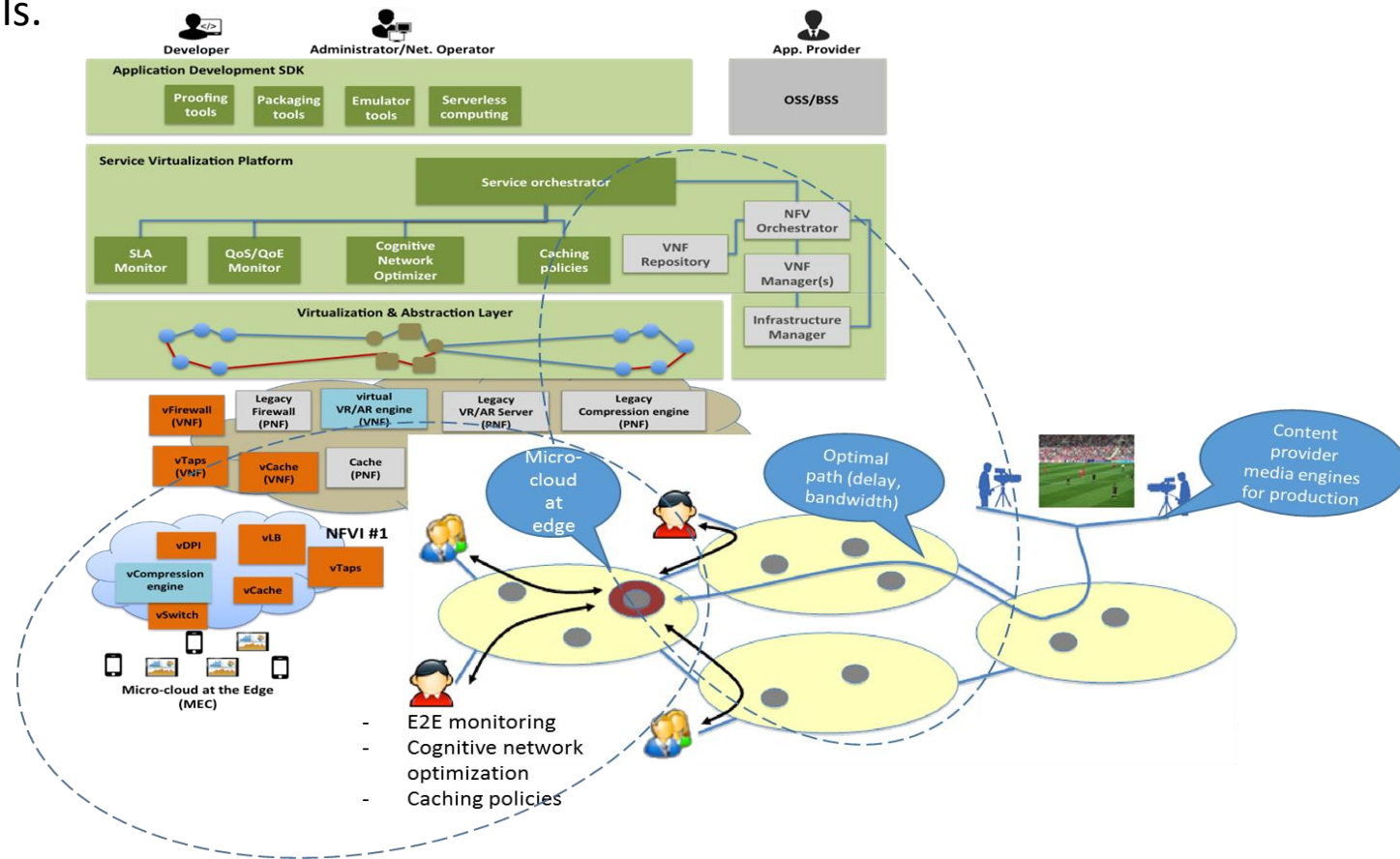


5G MEDIA
challenge

Media apps in the 5G arena (3/3)

Mobile Dynamic and flexible UHD content distribution over Open CDN

- prioritizing a new **NFV flexible network architecture**, which can accommodate **flexible resources and dynamicity in the allocation** of computing resources and cloud-distributed functionalities. **RTVE sport events** are planned to be used as trials.



5G MEDIA challenge

Ideas to achieve advanced apps delivery

- Requirement x **1000 increased capacity**, which corresponds to x10 or x100 increased user data rates.
- **Large number of antenna elements** at small coverage cells, require large BW at front-haul.
- Recent technologies are able to provide higher capacity at **long-haul networks**.
- Need for higher capacity **at front-haul networks**.
- The trend is the segment closest to the user to be supported by 5G wireless communications, while the segment connecting at the RAN and CO, will be supported by Fiber Optic.

Challenges in 5G Infrastructure

- The adaptation of **DRoF & ARoF** techniques over SDM
- **Cost efficient** hardware solutions for **ARoF** transceivers, remote power distribution to RRUs over SDM network from the CO
- **Spatial optical beam forming for ARoF transceivers at the RRU**, and compact SDM splitter and MCF adapters enabling advanced SDM-based ODN designs
- Interfaces between the **SDM media** and the radiating elements in the RRU/RRH sites for advanced massive MIMO and **beam steering solutions** for both DRoF and ARoF
- **SDN control for SDM and NFV orchestration to deploy virtual base-band units (vBBUs)** in the CO as well as slicing for multi-tenancy

