

Mobile Network Evolution trends and challenges

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Orange

Orange's new strategic plan

“Essentials2020” : provide each of Orange customers, wherever they are, an incomparable service experience

To serve this ambition, the Group will leverage five main drivers



To maintain its position as a high-speed broadband leader, Orange will invest more than 15 billion euros in its networks from 2015 to 2018. Orange aims to triple average data speeds compared to 2014 on both fixed and mobile networks by the end of 2018.

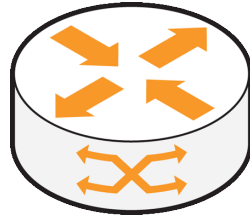
Continuing network modernization: The Group will drive the evolution of its network towards all-IP, the cloud and the virtualization of network functions, as well as preparing for the introduction of 5G.

Accelerating Content Delivery in Mobile Networks with optimization enablers



Content Domain

- **Compression**
- **Adaptation**
- **Caching/Prefetching**



Network Domain

- **Queue/Scheduling**
- **Handover Optimization**
- **Carrier Aggregation**
- **Transport Layer Optim (TCP)**
- **Session Layer Optim (DNS)**



Cross Domain

- **Throughput Guidance**
- **Mobile Data Offload**
- **Mobile Edge Computing**

Our concern: 'Give value to network'

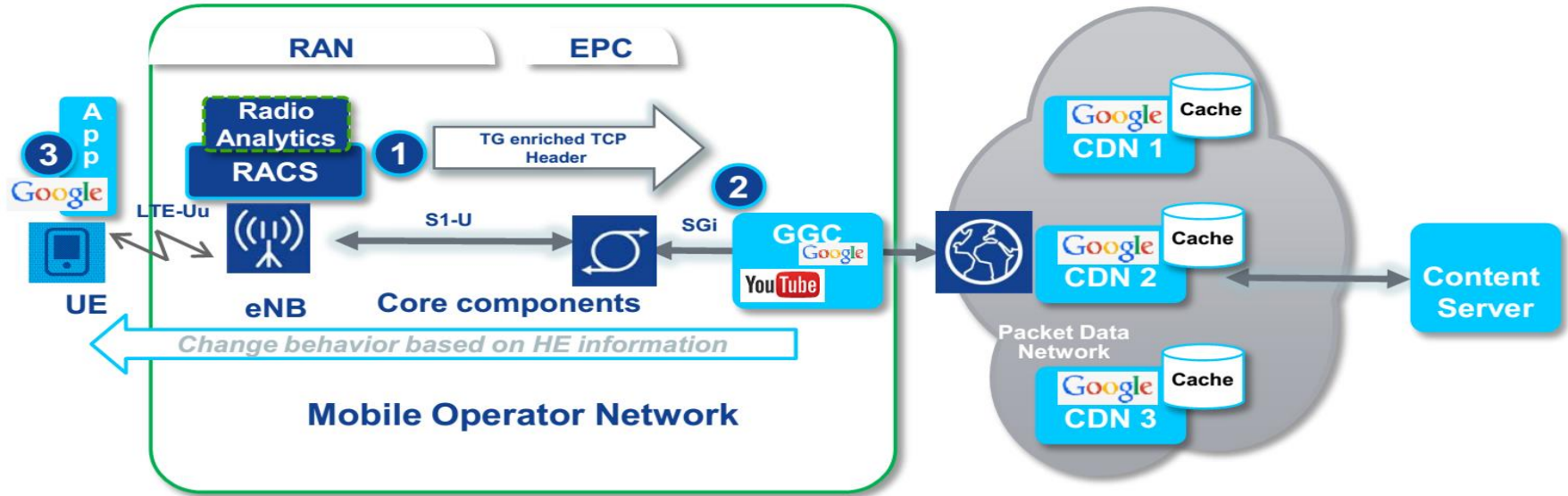


- **Trends: run IT based servers at network edge, applying the concepts of cloud computing**
 - **ETSI proposal: Strong move to integrate telco standards within cloud computing capabilities (NFV, MEC)**
 - **IETF proposal: allow the cellular network to provide near real-time information on capacity available to the TCP server (Throughput Guidance)**
 - **GSMA proposal: business opportunities and monetisation options for MEC**
 - **IEEE proposal: consensus on the architectural framework**
- **Main idea : a new collaborative approach to improve Mobile QoE**
 - **Mobile Edge Computing** provides IT and cloud-computing capabilities within the Radio Access Network (RAN) in close proximity to mobile subscribers.
 - **Application awareness of network state**

Cross Domain

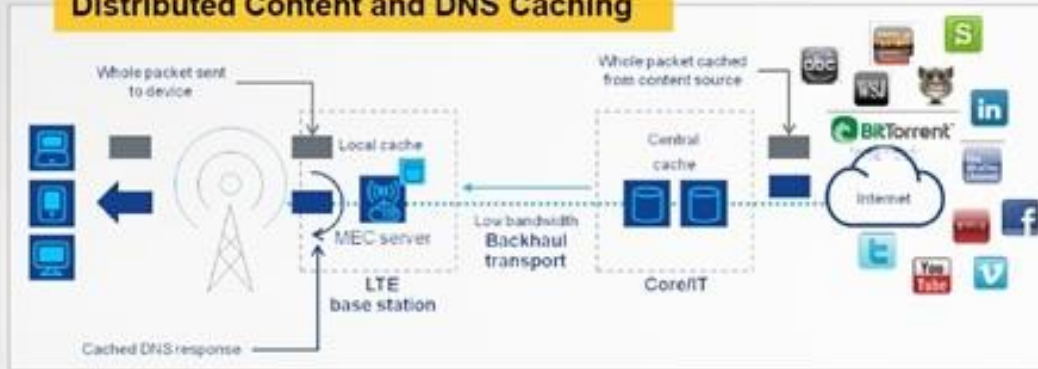
- **Throughput Guidance**
- **Mobile Edge Computing**
- **Google Open Borders (Vodafone, T-Mobile)**
- **Nokia Liquid Apps**
- **Akamai**
- ...

Nokia and Google video delivery optimization POC



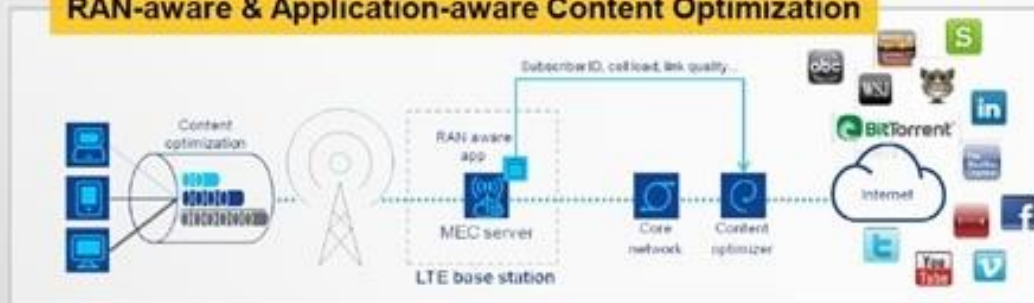
Content distribution & optimization use case

Distributed Content and DNS Caching



- Popular content/data stored at the Base Station
- Backhaul and Transport savings (up to 35%)
- Improved QoE (20% improvement for loading a Web page)

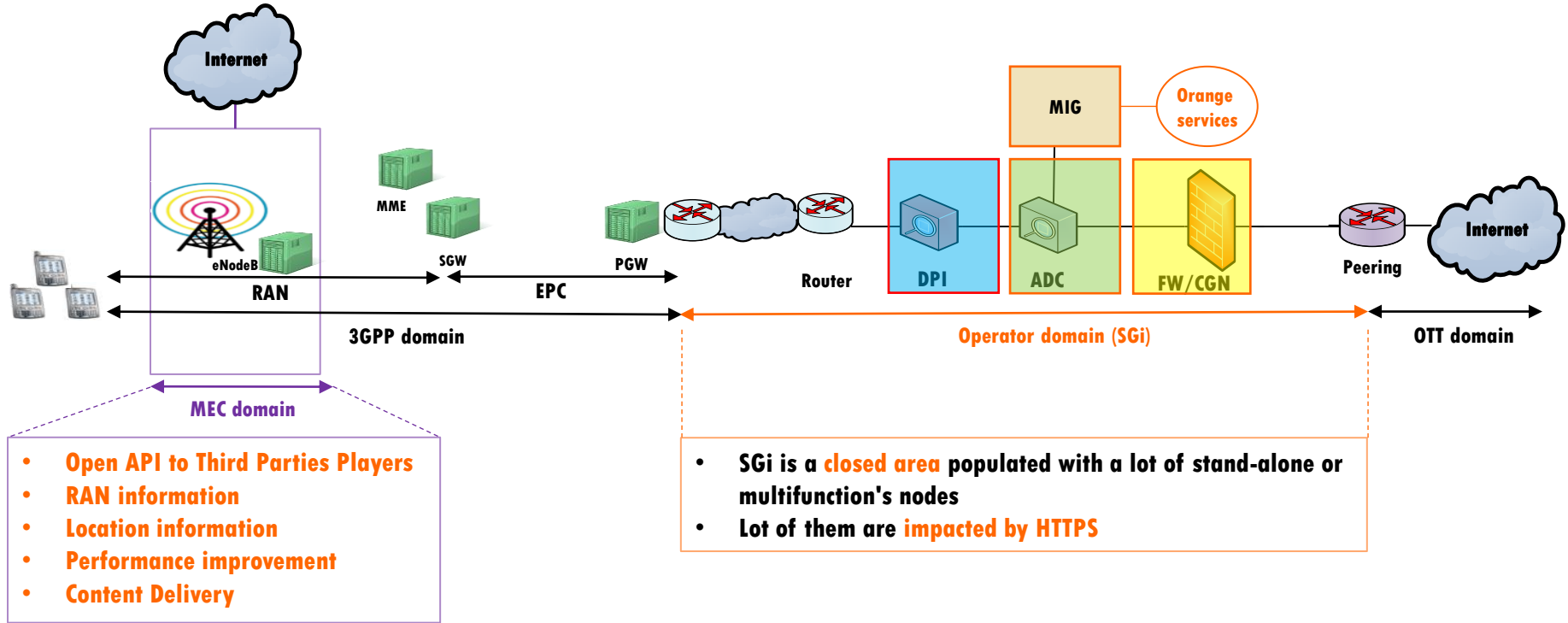
RAN-aware & Application-aware Content Optimization



- Dynamic Content Optimization
- Based on real-time radio conditions or other factors
- Improved video quality and throughput

From centralized to distributed architecture

An opportunity for simplification/new business?



The challenges and areas of investigation

- **A huge change in Mobile Infrastructure Architecture with edge computing but also with**
 - **HTTPS**
 - **L4 evolution from TCP to UDP (QUIC, SPUD, ...)**
- **A lot of work before deciding to move to MEC new trend**
 - **clarify mobility issue**
 - **clarify the real savings (RAN, backhaul, core, interco)**
 - **clarify business models/logic: how to monetize well the mobile QoE improvement?**
 - **clarify possible Net neutrality violation**
 - **clarify the effect on (minimizing) HTTPS impact**
 - **clarify the effect on (minimizing) Transport Layer evolution**

Thank You

