5G, CLOUD AND THE SMART GRID

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5G and CLOUD

The 5G core network is called as a “Service-Based Architecture” (SBA), centered on services that can register themselves and subscribe to other services. In practice most implementations of the SBA is focused on virtualized / cloud-native function instantiated on a cloud infrastructure.

5G Network Slicing is seen as a means to implement the requirements of the Smart Grid

Based on the application scenarios of smart grids and the architecture of 5G network slicing, the overall architecture of 5G smart grid design and management is as follows.

The slices of information acquirement of low voltage distribution systems, intelligent distributed feeder automation, millisecond-level precise load control are used to meet the technical specification requirements of different service scenarios. Domain-specific slice management and integrated E2E slice management are used to meet service requirements in these scenarios.

5G, CLOUD and SMART GRID

5G network slices meeting various requirements of different Smart Grid scenarios

Service Scenario	Communication Latency Requirement	Reliability Requirement	Bandwidth Requirement	Terminal Quantity Requirement	Service Isolation Requirement	Service Priority	Slice Type
Intelligent distributed feeder automation	High	High	Low	Medium	High	High	URLLC
Millisecond-level precise load control	High	High	Medium/low	Medium	High	Medium/ high	URLLC
Information acquirement of low voltage distribution systems	Low	Medium	Medium	High	Low	Medium	mMTC
Distributed power supplies	Medium/high	High	Low	High	Medium	Medium/ low	mMTC (uplink) + URLLC (downlink)

Source:: Huawei, 5G Network Slicing for Smart Grids

5G, CLOUD and SMART GRID

On-demand deployment
Network functions are customized according to service requirements.

E2E SLA assurance
5G network slicing provides E2E millisecond-level low-latency guarantee.

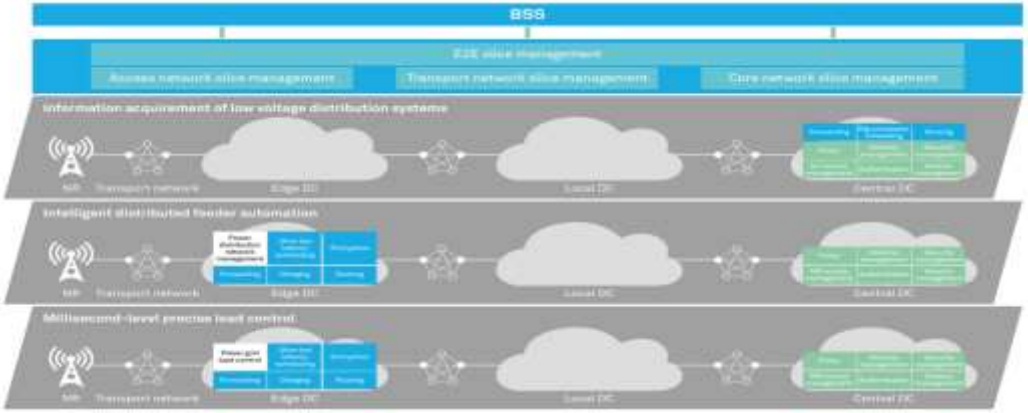
Network slicing

Isolation
Logically isolated dedicated networks are constructed on the shared telecom infrastructures.

Automation
Shared infrastructures, automatic deployment, and automatic O&M reduce costs.

Distribution automation | Power consumption data collection | New energy vehicle | Distributed power supply | Precise load control

5G Network slicing architecture of smart grids



BUT ……..is it that straight forward

The 5G Cloud SHOULD support interoperability for Smart Grid implementation

Cloud - Virtualization Open Source efforts

Too many open source projects out there

Among the main areas that are being developed by the open source groups, the following are still OPEN:

Policy-based resource management, analytics for visibility and orchestration, service verification with regards to security and resiliency.

ONAP - Open Networking Automation Platform

For NFV deployments to move beyond single-function virtualization to broad-scale NFV architecture will require multivendor interoperability, performance at scale and sophisticated orchestration.

Key for adoption is the integration of virtual functions with operations and business support systems (OSS/BSS).

It is anticipated that ONAP's maturation will take many years meanwhile service providers will need to continue to rely on vendor-specific NFV MANO options. More vendor specific implementations will lead to problems of subsequent migration.

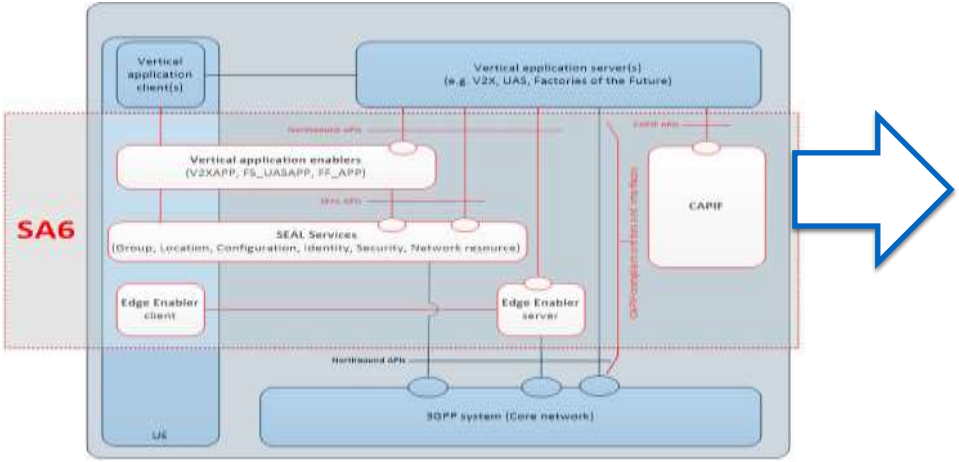
Hypervisors remain popular NFV platform options. Containers are expected to see increased popularity over time -- 2020 and beyond

5G STANDARDS – SMART GRID SERVICE TYPES

Moving towards 3GPP Release 17

Support for Vertices

3GPP SA6 is accelerating work on new verticals - SA6 work on vertical specific enablers are targeted towards services like Smart Grids, Smart Factories.... the Common API Framework (CAPIF) was developed to enable a unified Northbound API framework across 3GPP network functions,



BUT isn't the same thing being achieved by National ICT architectures, IOT Standards

Need for Harmonization

5G AUTOMATION FOE SMART GRIDS

Beyond 3GPP Release 17

Enablers For Network Automation – 5G and Smart Grids

3GPP is working towards Enablers for Network Automation for 5G

The NWDAF (Network Data Analytics Function) as defined in TS 23.503 is used for data collection and data analytics in centralized manner. An NWDAF may be used for analytics for one or more Network Slice.

Data Exchange between Network Analytics and the Smart Grid Analytics tools is critical

THANK YOU