

3GPP TSG SA Plenary #63 Fukuoka Japan
SP-140095

Discussion on NFV Relationship to 3GPP

NEC

NFV&SDN in the context of this contribution:

Software Defined Networks

- Separating out C-plane out of switch/router hardware to enable programmatic control of commoditized switch/router hardware
- **Programmability of networks**
- Providing higher-level abstractions, i.e. hiding implementation details

Network Functions Virtualization

- Running **network functions in virtualization containers on COTS servers**
- **Automation of the lifecycle management** of Virtualized Network Functions, i.e. tasks that have previously been performed by operator's technical staff
- **Orchestration** of network services

NFV and SDN are orthogonal but complementary

- SDN can be one implementation approach for network virtualization in NFV
- This presentation: **NFV Relationship to 3GPP**

How NFV&SDN Impact System Designs

service model:

- from: statically configured chains of network functions (, each potentially applying a given service selectively to subscribers)
- to: programmable, fine-granular (per-application, per-subscriber), dynamic service chains

tenancy model:

- from: single physical box/network shared by multiple tenants
- to: one virtual box/network per tenant

capacity model:

- from: providing capacity with pools of few, high-capacity network functions
- to: providing capacity with a single network function of virtually infinite capacity

scaling model:

- from: growing capacity according to long-term capacity trend
- to: growing and shrinking capacity according to short-term traffic demand

resilience model:

- from: “avoid failure” of any sub-system as recovery is expensive and disruptive
- to: “tolerate failure” of sub-systems, recover quickly with minimal service impact

Driving Forces for Operators Towards NFV&SDN

- Agile, differentiated introduction of new services
 - reducing time-to-market of new services (e.g. sponsored data, application-specific accelerators, sub-networking for different types of users like M2M or premium video users) within days instead of months

- Robust operation
 - fast Mean Time To Recovery through automation

- Decoupling software and hardware procurement and service agreements

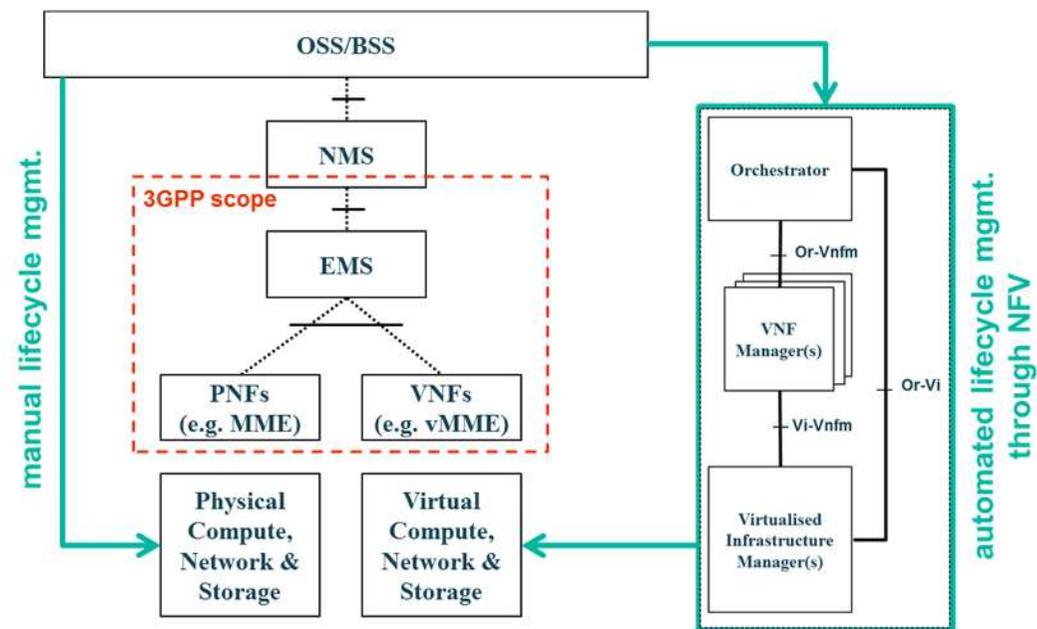
- Increase utilization and reuse of hardware for different purposes

- Scaling of capacity to closely follow capacity demand

Minimalistic View of NFV/SDN Relationship to 3GPP

NFV/SDN is already reality today without need to change 3GPP specs.

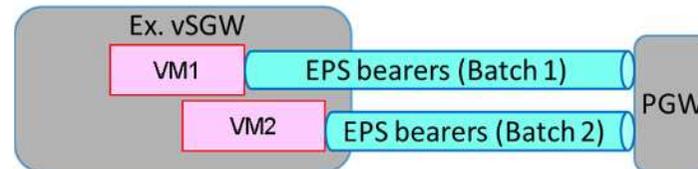
- NFV runs network functions on virtual instead of physical hardware; the necessary adaptations are **vendor implementation issues**.
- NFV automates tasks previously performed by operator's technical staff; these **lifecycle management tasks are orthogonal to 3GPP**.
- SDN techniques may already be used for various purposes **without changing any 3GPP reference points**, e.g.
 - service chaining
 - implementing S/P-GWs with split C- and U-planes
 - flow monitoring
 - ...



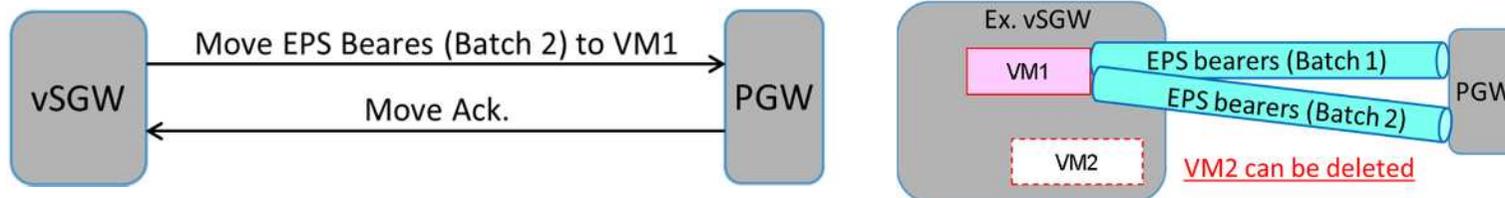
Opportunistic View of NFV/SDN Relationship to 3GPP

Many improvements possible with minor impacts on 3GPP ops & protocols

- VNF instance scale-in and termination is slower and more cumbersome than necessary, due to 3GPP nodes being usually stateful
 - Could study protocol enhancements to improve state transfer.
 - VM can be added but not be deleted due to state handshake with adjacent nodes.



- 3GPP standards can help VM life cycle management, ex. scale out/in.



- Single logical 3GPP nodes may scale-out to virtually infinite capacity.
 - Could study whether MME Pool / SGW Pool concepts can be simplified.
- Cheap to instantiate VNFs or whole EPCs for new tenants.
 - Could revisit tenancy models (e.g. RAN sharing models).

Disruptive View of NFV/SDN Relationship to 3GPP

There are discussions about more disruptive changes to the 3GPP architecture. The benefit of these should be evaluated very carefully.

- Re-organization of control and user planes based on SDN.
 - For example, MME and SGW-C can be merged and SGW becomes pure User plane function box.
- Reuse of commoditized functionality
 - load balancers, DPIs and other functions provided by NFV platforms „as a service“.

Proposed Way Forward

Network Functions Virtualization is here to stay

- Already implemented, providing **cost and flexibility benefits to operators**
- ETSI NFV ISG: framework for **using virtualization productively in carrier networks**
- **3GPP networks are one application domain of NFV** – but not the only one: cannot impose 3GPP-specific mechanisms onto other NFV domains

Easy migration path – enable NFV deployment today

- Mainly an **implementation issue**: virtualized networks can use existing interfaces and inter-work with existing functional elements
- May lead to optimizations, architecture simplifications later

Proposal: **Feasibility Study on Network Virtualization for 3GPP**

- 3GPP-wide study for Release 13 timeframe – possible topics:
 - Smooth migration path and co-existence with non-virtualized system.
 - Minimizing impact on OAM, Convergence/ harmonization with fixed networks
 - Possible RAN impacts
 - Security aspects

Annexes

Annex A: Status of NFV&SDN in SDOs

NFV

- gap analysis to push requirements

3GPP

- SA1: work towards SI on Flexible Mobile Traffic Steering
- SA2: none work/discussions so far, apart from contribution on SDN for SAMOG
- SA5: WI discussions suspended until after NFV#5 (Feb.)

IETF

- WG: Service Function Chaining (SFC)
 - e.g. <http://tools.ietf.org/id/draft-haeffner-sfc-use-case-mobility-00.txt>
- BoF: potentially VNFPool (function pooling and resilience)

BBF

- SGi LAN Service chains use case proposed; expected not to be accepted

ONF

- Mobile&Wireless WG studying OpenFlow extensions for enabling use cases such as OpenFlow-based EPC.