

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

# Discussion on NFV Relationship to 3GPP

NEC

# NFV&SDN in the context of this contribution:

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## 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

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## 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

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## ■ 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

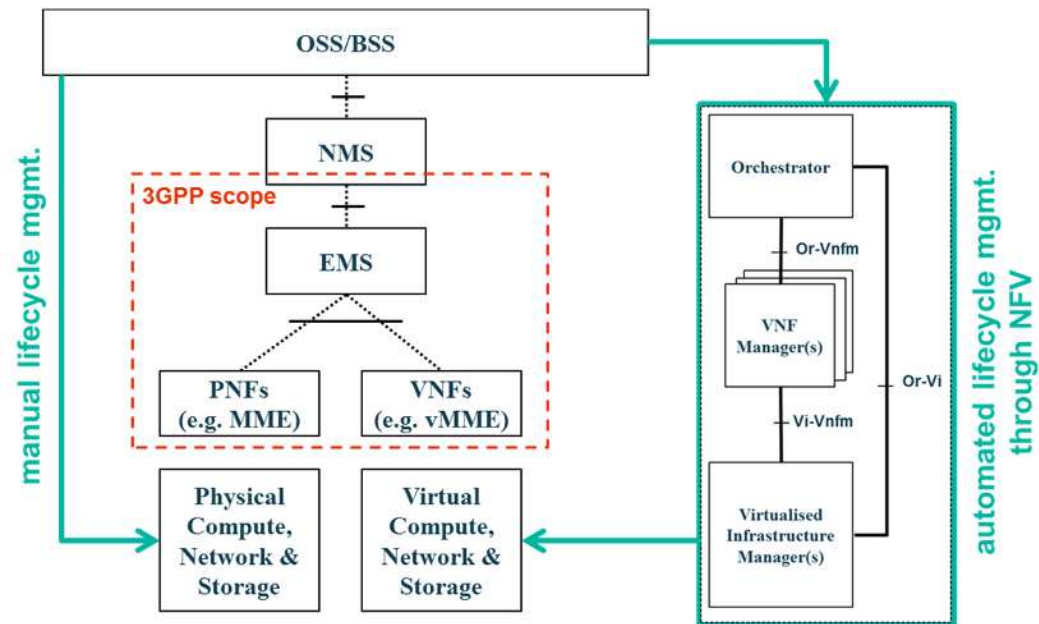
## ■ Increase utilization and reuse of hardware for different purposes

## ■ 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.

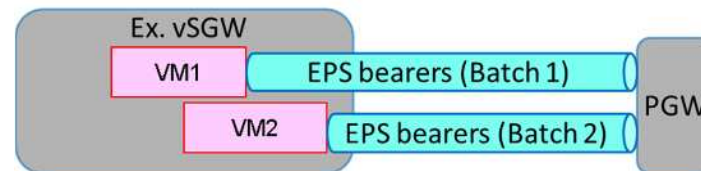
- NFV runs network functions on virtual instead of physical hardware; the necessary adaptations are **vendor implementation issues**.
- NFV automates tasks previously performed by operator's technical staff; these **lifecycle management tasks are orthogonal to 3GPP**.
- SDN techniques may already be 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
  - ...



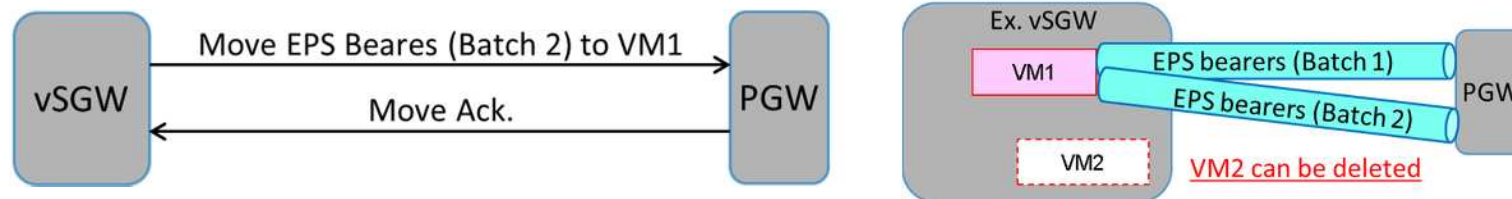
# Opportunistic View of NFV/SDN Relationship to 3GPP

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

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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

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## 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



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# Annexes

# Annex A: Status of NFV&SDN in SDOs

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## 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.