

Network Function Virtualization

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June 29, 2014

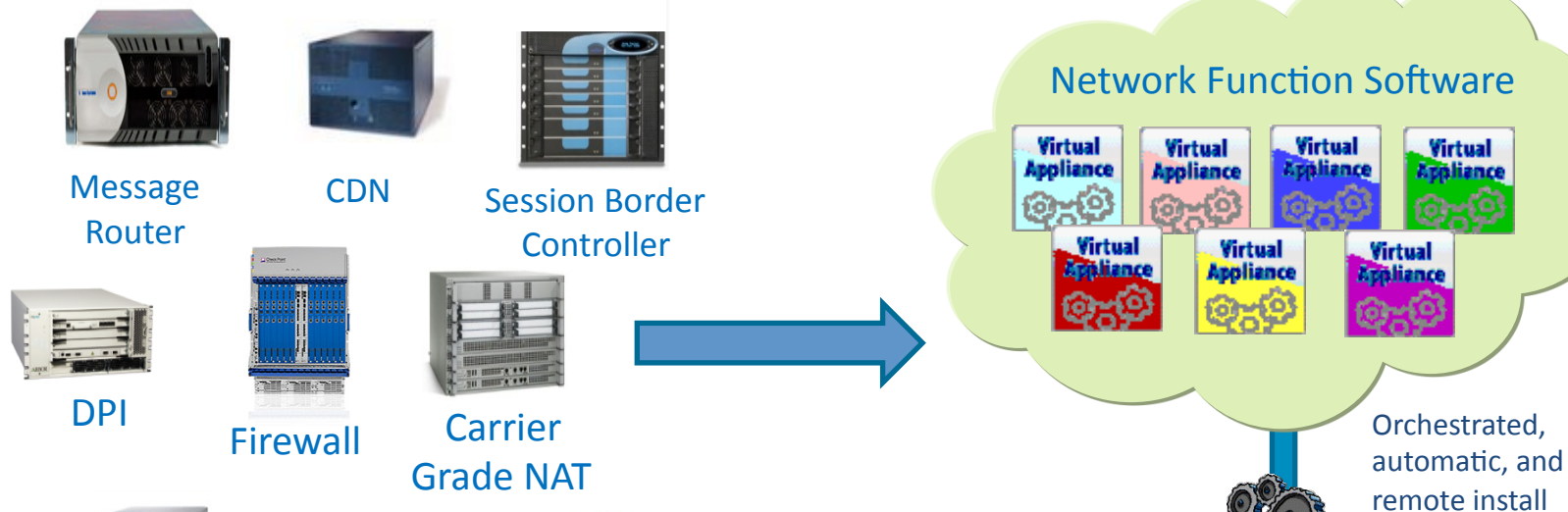
Overview

Run network software on a cloud infrastructure

- Why?
 - Simplify and scale networks: common SW infrastructure, simplify operations
 - Increase growth opportunities by making network more agile and lowering costs
- Technology
 - Decouple SW from HW using virtualization
 - Separation of control and data planes (SDN)
 - Cloud infrastructure

Network Virtualization Approach

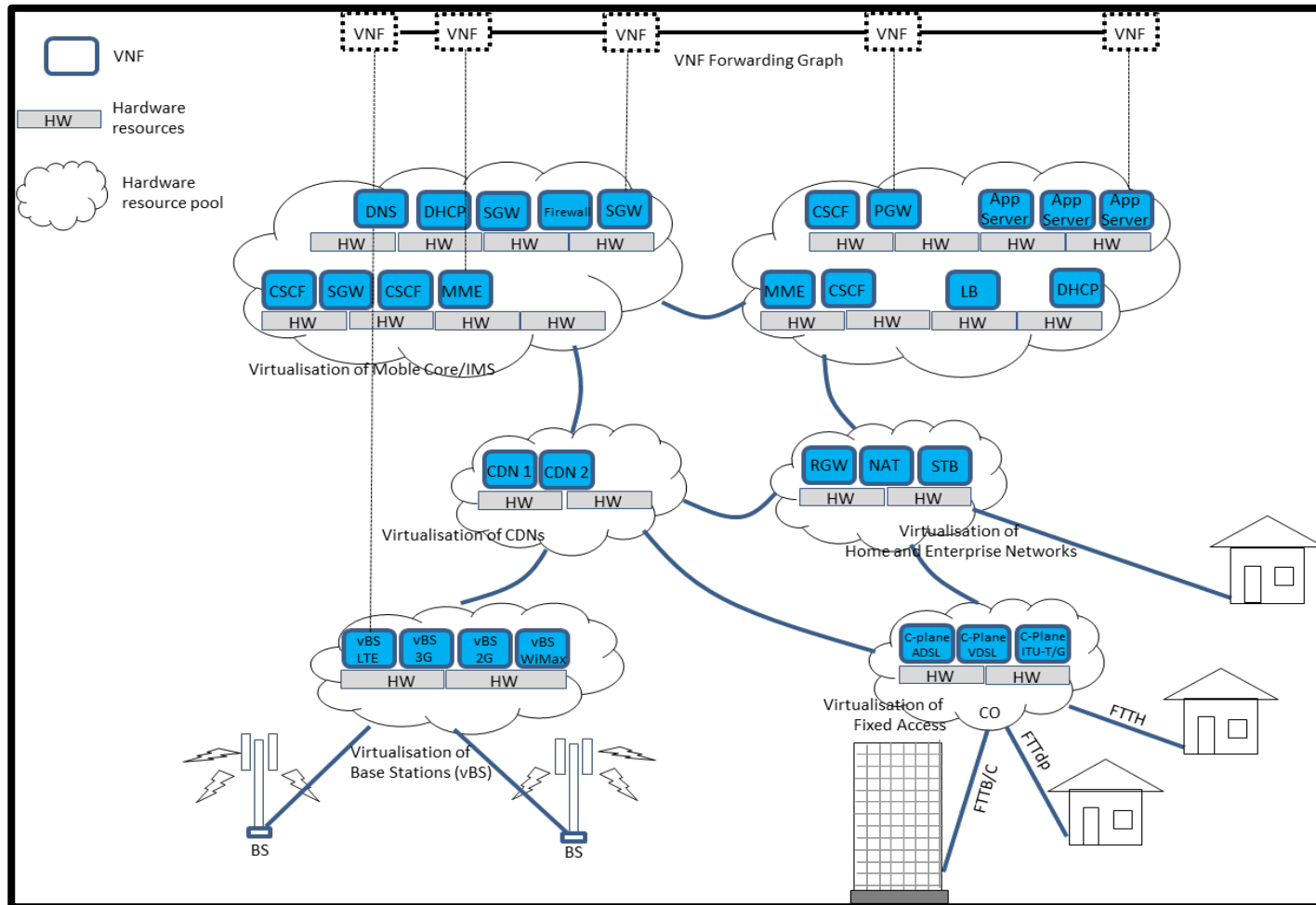
From European Telecommunications Standards Institute (ETSI) NFV Industry Specification Group (ISG), NFV White Paper (WP) Oct. 2012 and White Paper Update (WPU) Sept. 2013.



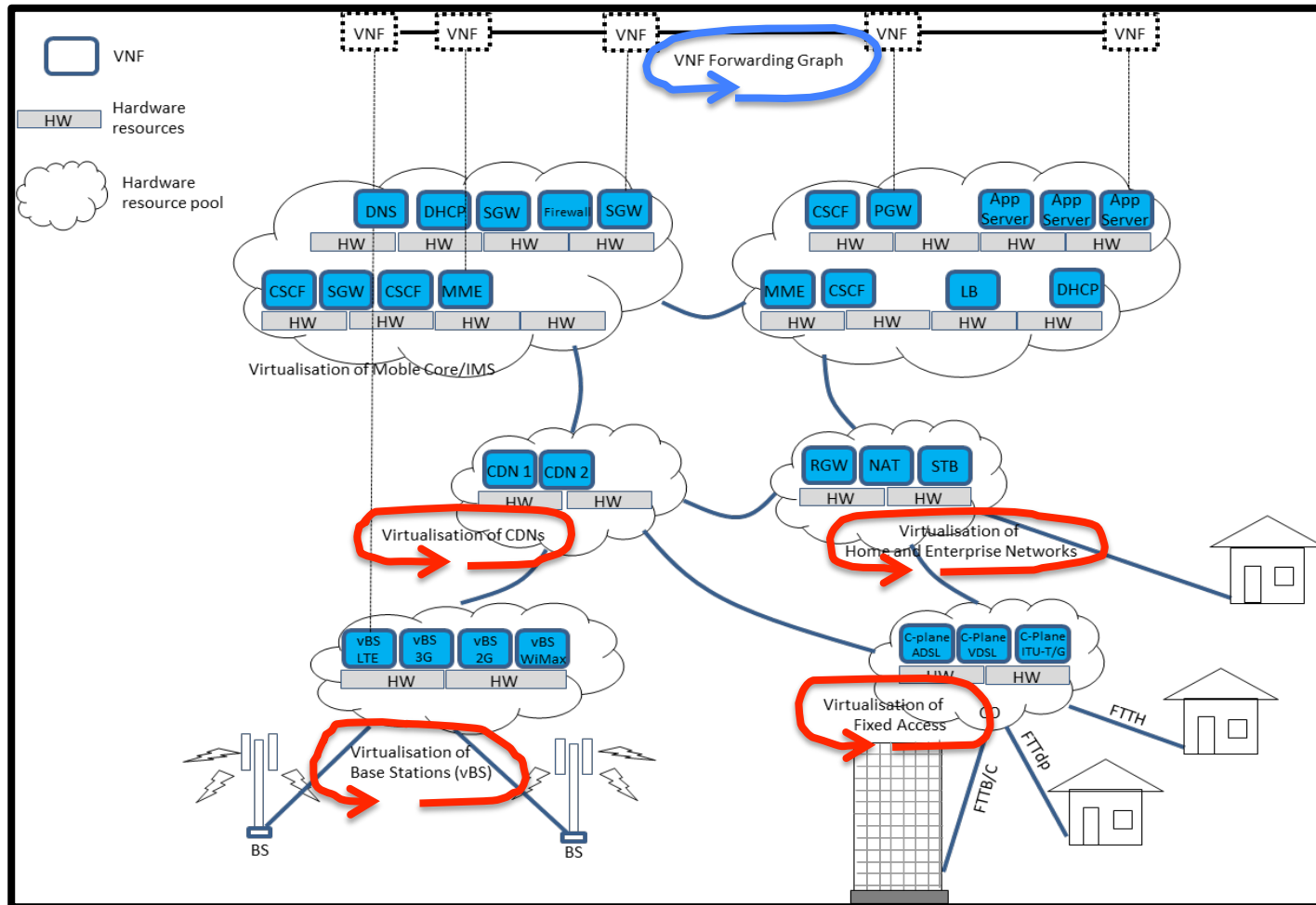
- Fragmented non-commodity hardware.
- Physical install per appliance per site
- Hardware development large barrier to entry for new vendors, constraining innovation and competition

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NFV Use Cases



NFV Use Cases



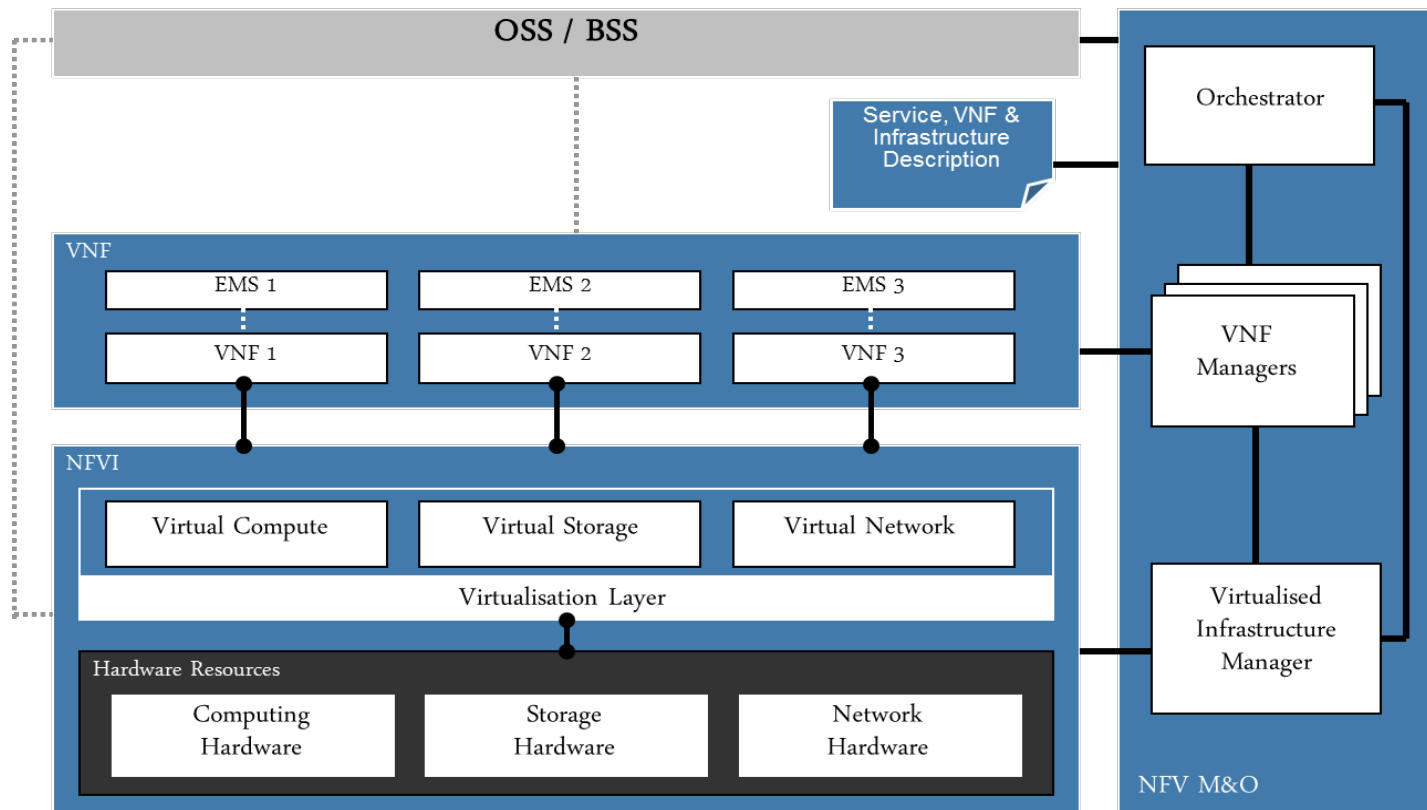
Benefits of NFV

(Examples)

- **Reduced equipment costs and power consumption** through consolidation
- **Targeted service introduction** based on geography or customer sets.
- Services can be **rapidly scaled up/down** as required.
- Enabling a **wide variety of eco-systems** and encouraging openness.
- **Optimizing network configuration and/or topology** in near real time based on the actual traffic/mobility patterns and service demand.
- **Multi-tenancy** allows network operators to provide **tailored services** and connectivity for multiple users, applications or internal systems on the same hardware.
- **Improved operational efficiency** by taking advantage of the higher uniformity of the physical network platform and its homogeneity to other support platforms.

From ETSI NFV ISG WP

Architectural Framework



From ETSI NFV ISG WPU

Architectural Components

- **NFVI (Network Functions Virtualisation Infrastructure)**. The virtual resources required to support the execution of the Virtualised Network Functions. It includes COTS hardware, accelerator components where necessary, and a software layer which virtualises and abstracts the underlying hardware.
- **NFV M&O (Management and Orchestration)**. The orchestration and lifecycle management of physical and/or software resources that support the infrastructure virtualisation, and the lifecycle management of VNFs. NFV Management and Orchestration focuses on the virtualisation-specific management tasks necessary in the NFV framework.

From ETSI NFV ISG WPU

Requirements

ETSI GS NFV 004 V1.1.1 (2013-10)

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ETSI GS NFV 004 V1.1.1 (2013-10)



Network Functions Virtualisation (NFV); Virtualisation Requirements

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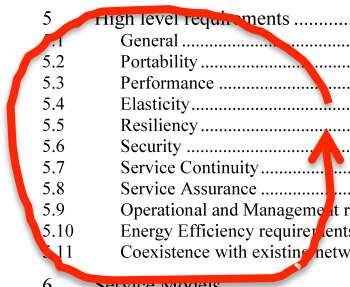
Disclaimer

This document has been produced and approved by the Network Functions Virtualisation (NFV) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG. It does not necessarily represent the views of the entire ETSI membership.

Requirements

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Requirements

(Examples)

[Per.1] The NFV framework shall be able to instantiate and configure any given VNF over the underlying infrastructure so that the behavior...in terms of **performance is conforming to the requirements** expressed in the VNF information model....

[Elas.2] The NFV framework shall be able to provide the necessary mechanisms to allow virtualised network functions to be **scaled with SLA requirements**.

[Elas.5] The NFV framework shall provide the capability to **move some or all VNF components** from one compute resource onto a different compute resource **while meeting the service continuity requirements**.

[Res.6] ... the NFV framework shall support mechanisms to measure the following metrics and **ensure that they are met per SLA**:

- Maximum non-intentional packet loss rate....
- Maximum rate of non-intentional drops of stable calls or sessions....
- Maximum latency and delay variations on a per-flow basis
- Maximum time to detect and recover from faults aligned with the service continuity requirements...
-

[OaM.14] The NFV framework shall be able to manage the assignment of **NFVI resources** to a VNF in a way that resources (compute hardware, storage, network) **can be shared between VNFs**.

From ETSI NFV ISG WPU

Next Generation Infrastructures

Widely recognized that current cloud infrastructures are not directly usable as NFVI

- **OpenStack Summit (Nov. 2013):** “OpenStack and NFV: The Convergence of IT and CT Infrastructure,” speakers from Huawei and Vodafone
- **Vendors:** Ericsson Cloud System, “...open, distributed, telecom-grade platform based on the OpenStack architecture”
- **AT&T:** User Defined Network Cloud initiatives, Cloud QoS