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# Network Functions Virtualisation

## ネットワーク機能の仮想化の目指す世界

*NFV ETSI Industry Specification Group*

Kazuaki OBANA

Media Innovation Laboratory,  
NTT Network Innovation Laboratories

# NFVについて

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## ■名称

- Network Functions Virtualisation

## ■組織

- ETSIのISG(Industry Specification Group)として設立

## ■目的

- キャリアNWの要求条件を他の標準化組織にインプット

## ■成果物

- 要求条件に関するドキュメント類

## ■主要立ち上げメンバ

- AT&T, BT, Centurylink, China Mobile, Colt, Deutsche Telekom, KDDI, NTT, Orange, Telecom Italia, Telefonica, Telstra, Verizon

## NFV会合の開催地及び開催予定地

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### 2013

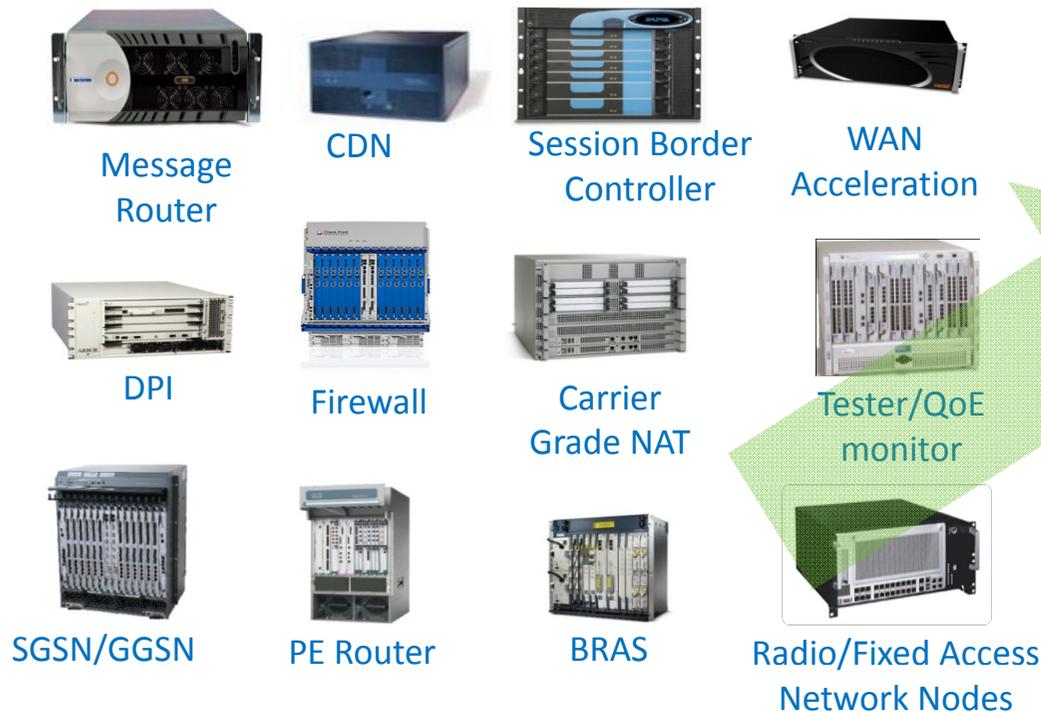
- 1st NFV 1/15-17 in Sophia Antipolis
- 2nd NFV 4/22-23 in Santa Clara
  - 1st Rapp. Meeting 6/17-19 in Sophia Antipolis
- 3rd NFV 7/24-26 in Bonn
  - 2nd Rapp. Meeting 9/11-13 in Waltham
- 4th NFV 10/30-11/1 in Sunnyvale

### 2014

- 5th NFV 2/19-21 in TBD, Spain

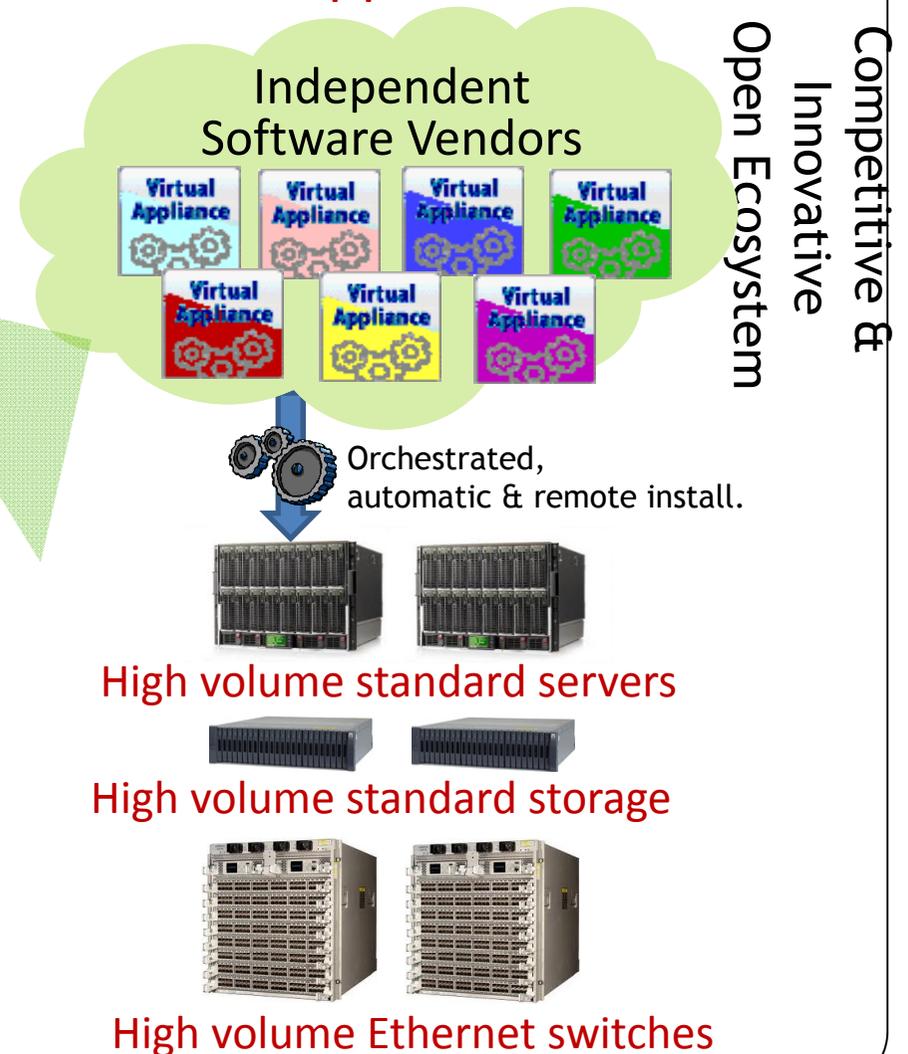
# Network Functions Virtualisation: Vision

## Classical Network Appliance Approach



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

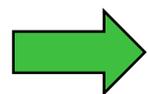
## Network Functions Virtualisation Approach



## Why we believe NFV is the future for Networks

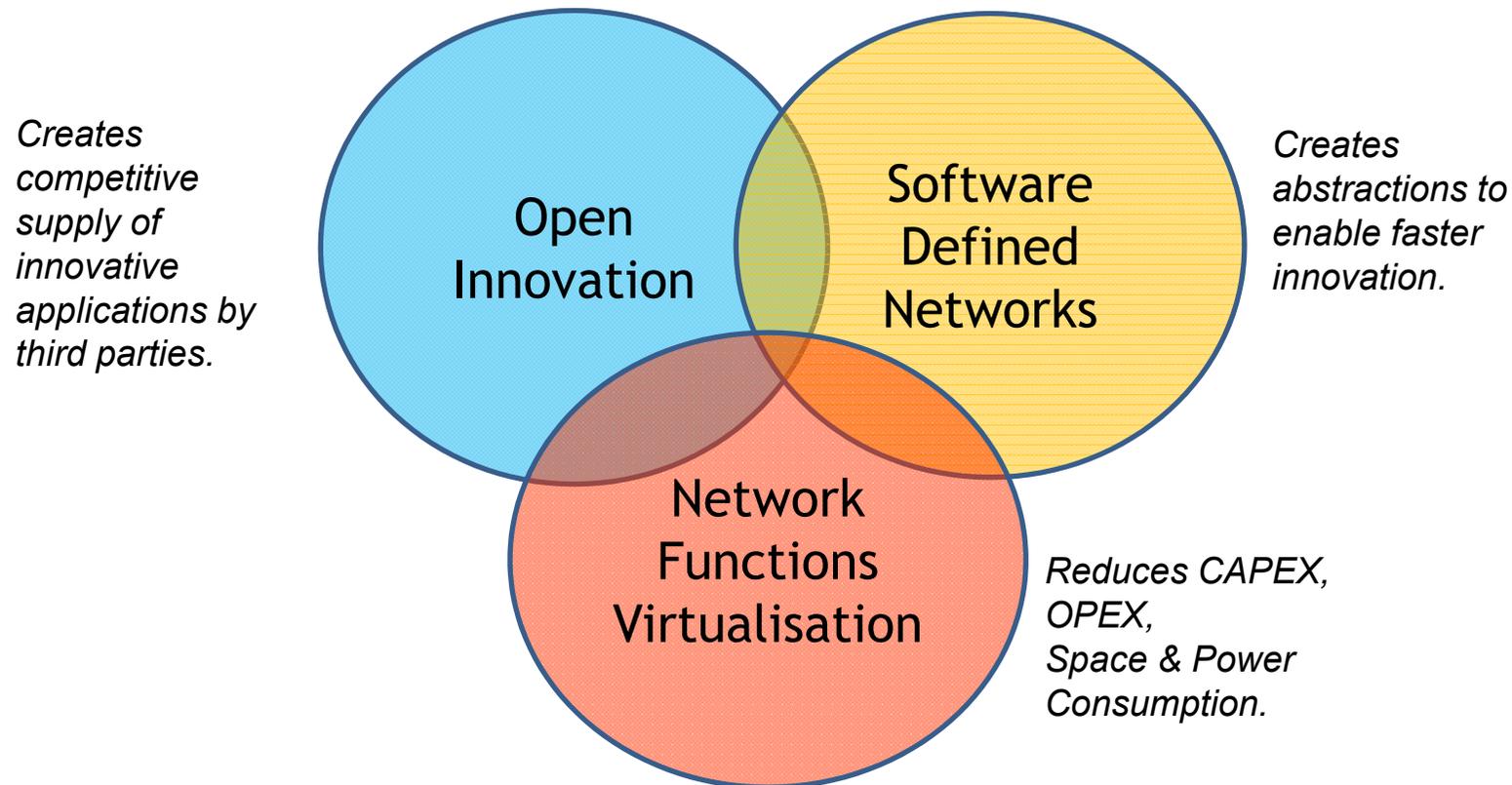
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- Recent tests by network operators and vendors have demonstrated that network functions can operate at the level of several millions of packets per second per CPU core
- This shows that standard high volume servers have sufficient processing performance to cost-effectively virtualise network appliances
  - The hypervisor need not be a bottleneck
  - The OS need not be a bottleneck
- Total Cost of Ownership advantages are a huge driver – they could be scenario specific but expect significant benefits, e.g., energy savings
- Advances in virtualization & server technologies have propelled the importance and use of software in many applications and fields
- A concerted industry effort is underway to accelerate this vision by encouraging common approaches which address the challenges for NFV



ETSI NFV Industry Specification Group

# Strategic Networking Paradigms & SDN



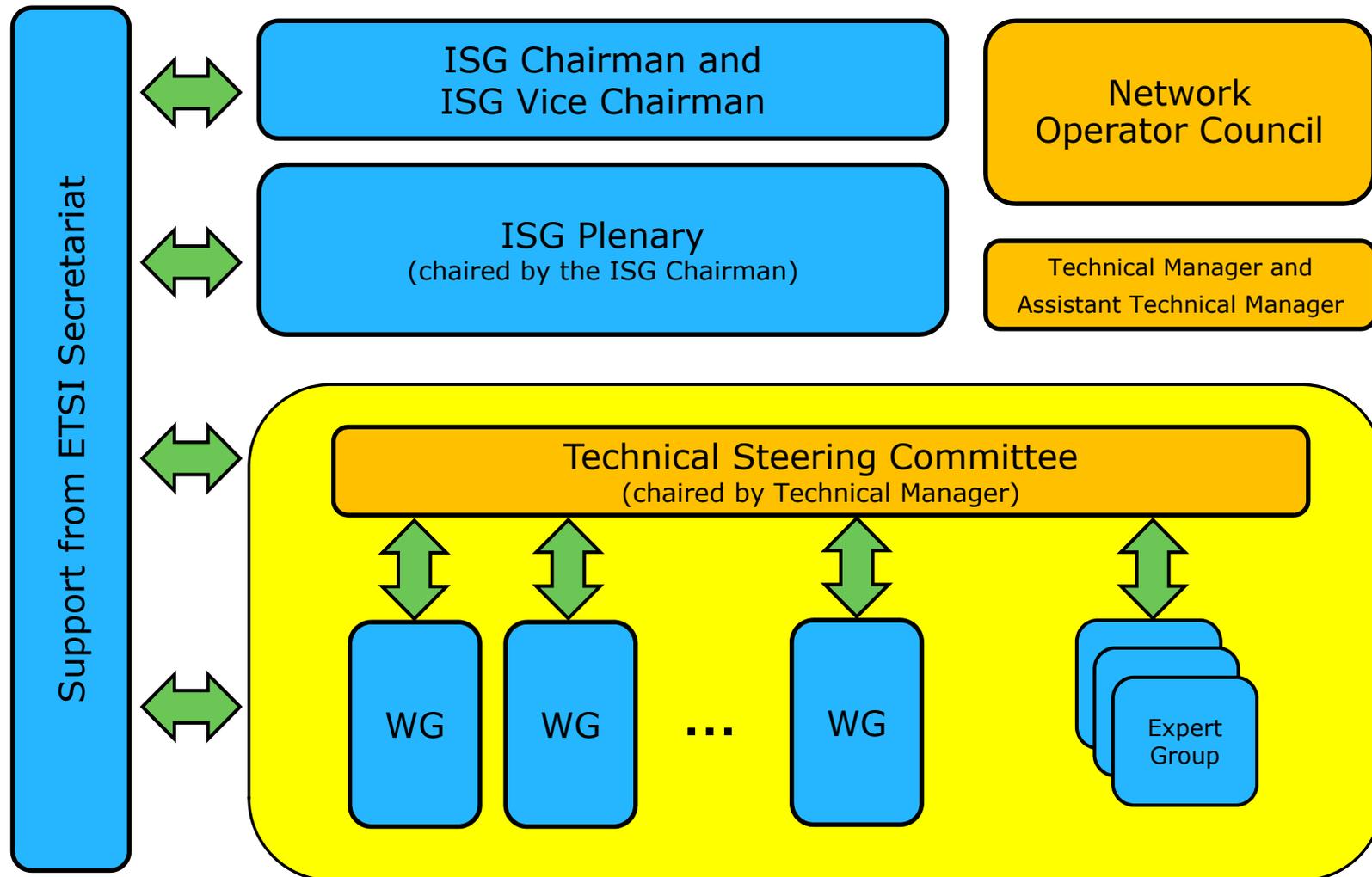
- NFV and SDN are highly complementary, they are mutually beneficial but not dependent on each other (NFV can be deployed without SDN and vice-versa)
- SDN can enhance NFV performance, simplify compatibility, facilitate operations
- NFV aligns closely with SDN objectives to use commodity hardware and standard IT orchestration and management techniques



# ETSI NFV Group

- Global operators-led Industry Specification Group (ISG) under the auspices of ETSI (>20 global network and mobile operators). Wide industry support (> 50 vendors).
- Open membership
  - ETSI members sign the “Member Agreement”
  - Non-ETSI members sign the “Participant Agreement”
- Operates by consensus (formal voting only when required)
- Deliverables: White papers addressing challenges and operator requirements, as input to standardisation bodies
- Face-to-face meetings quarterly
- Currently four (4) WGs and two (2) expert groups (EGs)
  - WG1: Infrastructure Architecture
  - WG2: Management and Orchestration
  - WG3: Software Architecture
  - WG4: Reliability & Availability
- Expert Groups
  - Security
  - Performance & Portability
    - "Proof of Concept" is included
- Network Operators Council (NOC): governing and technical advisory body
- Technical Steering Committee (TSC): WG Chairs + EG Leaders, Technical Managers

# ETSI NFV Organization & Structure



## NFV Working and Expert Groups

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- **Architecture of the Virtualisation Infrastructure** : developing a reference architecture for the NFV Virtualisation Infrastructure. Working domains include: Compute, Hypervisor, Network Infrastructure, Interfaces & Abstractions, Test Access, Scalability, Portability and Replicability.
- **Software Architecture**: developing a classification system for network functions and defining the phases of network evolution towards a fully managed and orchestrated platform, including impact on interfaces, impact on legacy external functions and management systems.
- **Reliability & Availability**: focusing on the aspects related to robustness and resiliency in a virtualised network environment. The scope includes use case analysis and definition of the architecture framework, models, and requirements for network resiliency and service sustainability.

## NFV Working and Expert Groups (Cont'd)

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- **Management and Orchestration** : defining a management and orchestration framework for virtual network functions and the infrastructure these functions run on. Scope includes requirements for orchestration and management, identifying gaps in current standards and best practices, and provide recommendations to fill in the gaps. Topics include: abstraction models and APIs, provisioning & configuration, operational management, interworking with existing OSS/BSS.
- **Performance and Portability**: assessing performance limitations of selected key virtualised network functions representative of different kinds of workloads. It will seek to identify best practices to optimise the performance of different workloads, and investigate how to achieve predictable performance and isolation while assuring portability.
- **Security Expert Group** : to ensure that NFV designs-in security from the start and to ensure security accreditation bodies address NFV. Scope includes both information security and performance isolation. The group is working to engage global security expertise and accreditation institutions and will identify the security deltas introduced by NFV and assign activity to the relevant working groups.

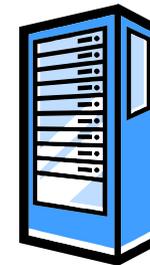
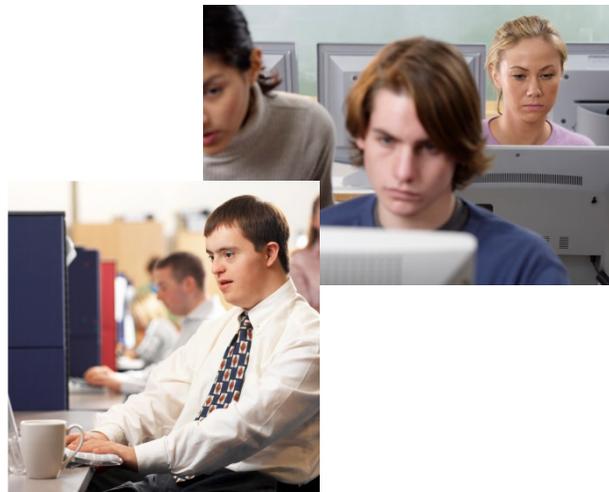
## Benefits of Network Functions Virtualisation

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- Reduced equipment costs through equipment consolidation on high volume industry standard servers leveraging the economies of scale of the IT industry
- Reduced operational costs: reduced power, reduced space, improved network monitoring
- Increased speed of Time to Market by minimising the typical network operator cycle of innovation
- Supports multi-versioning and multi-tenancy of network functions, which allows use of a single physical platform for different applications, users and tenants
- Flexibility to easily, rapidly dynamically provision and instantiate new services in various locations (i.e. no need for new equipment install)
- Improved operational efficiency by taking advantage of the higher uniformity of the physical network platform and its homogeneity to other support platforms
- Software oriented innovation (including Open Source) to rapidly prototype and test new services and generate new revenue streams
- IT-oriented skillset and talent (readily available in global geography, flexible)

# Automating Network Operation and NFV

- To reduce the cost of OPEX and CAPEX:
  - Using commodity equipment which does not have expensive built-in control-plane : mainly CAPEX reducing
  - Using automating network operation : mainly OPEX reducing
- Using commodity equipment is quite suitable for implementing NFV
- If NFV meets automating network operation, it will be more cost-effective system



## Expectation of SDN's potential

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### ■ We already expect SDN for:

- Reduction CAPEX and OPEX
- Reduction Time to Service
- Easy operation and installation
- Inter-operability and inter-connectivity of multi vendors' equipment

### ■ We expect SDN's potential for:

- Controllability through multi-layers including an optical transport layer
- Co-existing with SDN-enabled nodes and SDN-disabled nodes
- Enhanced scalability of centralized control system
- Bringing direct merits to end users