Putting
IPv6
to work

North American IPv6 Summit

Grand Hyatt, Denver, Colorado
September 23-25, 2014

Rocky Mountain IPv6 Task Force
RMv6TF

Network Functions Virtualization (NFV)

Industry Progress and Next Steps

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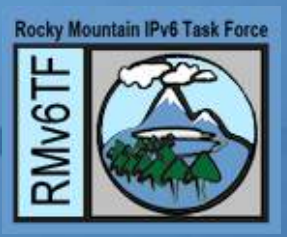


NFV Vision

Classical Network Appliance Approach


Message Router


CDN


Session Border Controller


WAN Acceleration


DPI


Firewall


Carrier Grade NAT


Tester/QoE monitor

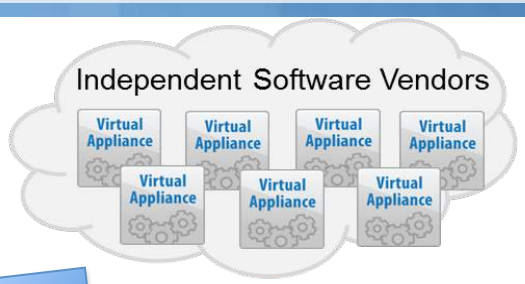

SGSN/GGSN

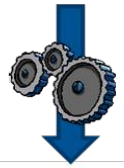

PE Router


BRAS


Radio/Fixed Access Network Nodes

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




Orchestrated, automatic & remote install.


Standard High Volume Servers


Standard High Volume Storage


Standard High Volume Ethernet Switches

Network Functions Virtualisation Approach

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Transformation of Network Hardware

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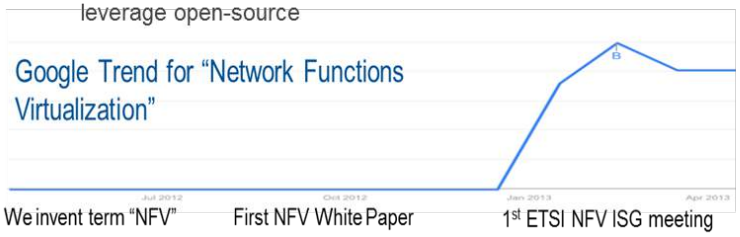
NFV Origins

- **Summer 2011:** Collaborative research (BT and others) confirmed that virtualisation technology has sufficient performance for real-world network work loads
- **April 2012:** Operator discussions on cooperation to encourage industry progress on NFV began at ONS in San Francisco
- **June 2012:** Founding operators met in Paris hosted by Intel, coined new term "Network Functions Virtualisation (NFV)" and agreed to convene a new industry forum
- **September 2012 :** Founding operators met in San Francisco hosted by Orange and decided to parent the new forum under ETSI
- **October 2012:** First joint-operator NFV white paper published as a "call to action". 13 signatories
  - Widely regarded as the seminal paper heralding this new approach for networks.
- **January 2013:** First NFV ISG plenary session hosted by ETSI
- **October 2013:** First NFV ISG documents were released after only 10 months together with a global call for Proof of Concepts.
  - Second joint-operator NFV white paper published. 25 signatories
- **December 2014:** Scheduled release of detailed NFV ISG documents
- **Now underway:** Discussions on what comes next including how to leverage open-source



October 2012: First NFV white paper

16-months

February 2014: Operator strategy shift

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NFV Benefits and Challenges

NFV Benefits

- Flexibility to rapidly, dynamically provision and instantiate services in different locations without new equipment installation. [*Virtualised functions, software download & automatic configuration*]
- Faster time-to-market for new service introduction [*Service prototyping and DevOps organization*]
- Improved operational efficiency by taking advantage of a homogeneous (physical) network platform [*Separate hardware engineering and planning from service specific plans*]
- Reduced costs through leveraging the economies of scale of the IT industry [*Move to "COTS", leverage cloud software and Open-Source software development*]
- Reduced operational costs: reduced power, reduced space, improved network monitoring [*Dynamically consolidate services on equipment during low traffic epochs, virtual probe deployment*]
- ***And stuff we haven't even thought of yet!***

NFV Challenges

- Converging industry understanding of the topic, including terminology and relationship with SDN
- Achieving high performance with portability across different hardware platforms
- Achieving co-existence with bespoke hardware based network platforms
- Managing and orchestrating virtual network appliances while ensuring security & integrity
- Achieving scale benefits through M&O automation
- Integrating multiple virtual appliances from different vendors without incurring significant integration costs (and lock-in)
- Avoiding protracted standards processes and leveraging open-source
- Operator skill and organisation migration to a data-centric network environment
- ***ETSI NFV ISG founded to provide a collaborative environment to address these challenges***

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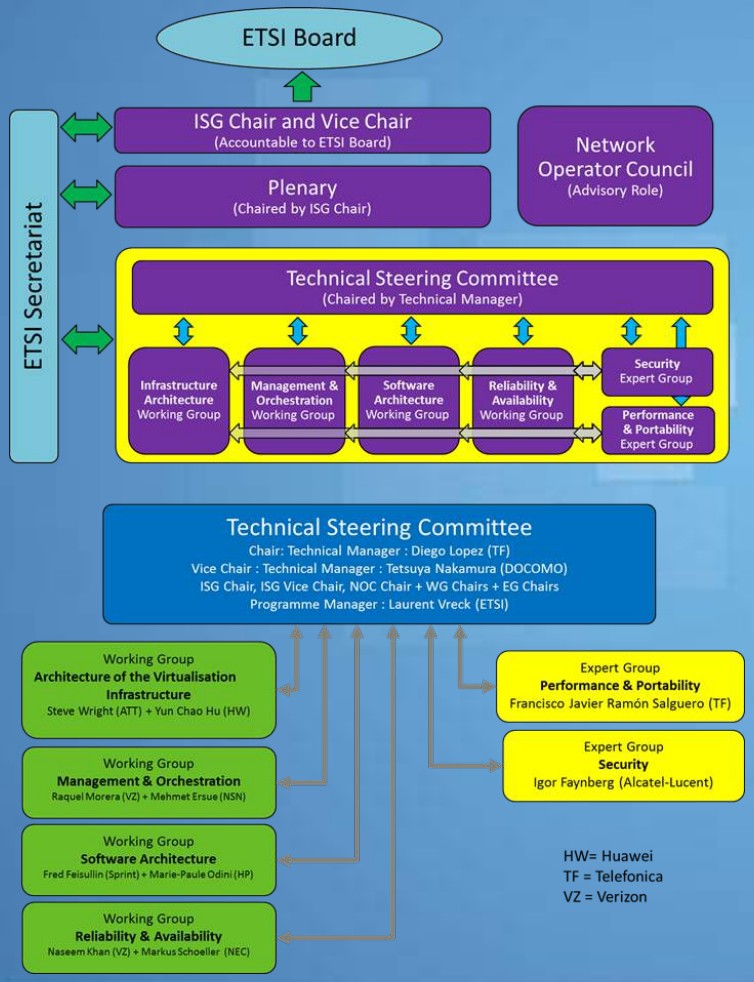
ETSI NFV Industry Specification Group (NFV ISG)



- The ETSI NFV ISG was formed in October 2012 to address the needs of network operators, to develop common approaches to Virtualisation in carrier networks
- It has defined requirements for NFV, developed an architectural framework, identified the gaps in the industry and is working with other organizations to be able to make NFV a reality
- It has open membership with no fees to encourage involvement of smaller players
  - Over 220 companies including 34 service providers
- The NFV ISG is not a standards development body per-se. It provides an umbrella for the industry to converge requirements, share learning and coordinate and drive the wider industry effort to implement NFV
- Limited lifetime: initially 2-years, extended to 2017

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First Outputs Published 10/2013

Formalises the operator uses cases & requirements as outlined in the first NFV white paper. Frames and prioritises the detailed work in the NFV ISG

NFV Use Cases: Describes initial fields of application selected to span the scope of technical challenges being addressed by the NFV ISG.

NFV Requirements: Describes the high level business and technical requirements for an NFV framework including service models.

NFV Architectural Framework: Describes the high-level functional architecture and design philosophy for virtualised network functions and the underlying virtualisation infrastructure.

NFV Terminology: Is a common repository for terms used within the NFV ISG documents and seeks to harmonise terminology used across the industry in relation to NFV.

NFV ISG Proof of Concept Framework: Describes a procedure to encourage growth of the NFV ecosystem through multi-party implementations of Proof of Concept demonstrations (PoCs) and publishing results and learning to the wider industry.

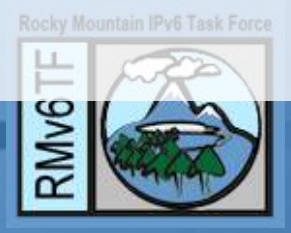
Available from portal: http://www.etsi.org/nfv

Achieving consensus on these documents amongst such a large and diverse group of companies is a major step forward for the industry.

Vendors, especially smaller more innovative players, say that the convergence of network operators' requirements is extremely valuable.

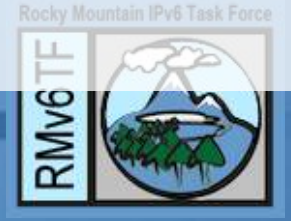
Second NFV ISG Release: 12/2014

- Documents in development
  - ✓**Architecture**: Architectural Framework Revision 2
  - ✓**Infrastructure**: Overview, Use Cases, Compute Domain, Hypervisor Domain, Infrastructure Network Domain, Scalability, Interfaces and Abstractions, Portability and Replicability, Service Quality Metrics
  - ✓**Management**: Management and Orchestration
  - ✓**Performance**: Performance & Portability Best Practices
  - ✓**Reliability**: Resiliency Requirements
  - ✓**Security**: Security Problem Statement, Cataloguing Security Features in Management Software Relevant to NFV, Security and Trust Guidance
  - ✓**Software Architecture**: Virtual Network Function Architecture
- Draft documents now available in the ETSI NFV ISG open area: http://docbox.etsi.org/ISG/NFV/Open/
- Alignment now underway for approval at next NFV ISG plenary, 11/2014
- Release scheduled December 2014



NFV ISG Proof of Concepts (PoC)

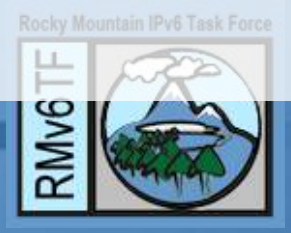
- In October 2013, the NFV ISG issued a framework and call for multi-vendor NFV Proof of Concepts to validate NFV technical feasibility and encourage growth of an NFV ecosystem
  - Vendors work together under supervision of one or more sponsoring network operators
  - Requirements are to provide a public demo plus a report commenting on the relevance and impact on the NFV ISG work
- 23 Proof of Concepts are in progress or have been completed, spanning the scope the scope of NFV ISG use cases and all aspects of the NFV architectural framework
  - Over 50 vendors involved to date
- PoC Framework and reports publicly available: http://www.etsi.org/technologies-clusters/technologies/nfv/nfv-poc
- Next challenge for the NFV ISG PoC Framework will be the journey from technical feasibility to technological maturation and interoperability



Open Platform for NFV (OPNFV)

A new open source initiative for NFV

- Open source is an established IT methodology to drive rapid standardization of software components
  - Open source is complementary to traditional standards development methodology
- Open Platform for NFV (OPNFV) is a new open source project to accelerate open source implementation and interoperability based on the ETSI NFV ISG documents
- Key objectives…
  - Create an open (hardware and software) reference platform to encourage open source development for NFV and validate interoperability for multi-vendor implementations
  - Create a collaborative industry environment for continuous system level NFV integration and test
  - Contribute changes to and influence, upstream open source projects leveraged in the platform (and feedback to the NFV ISG)
  - Use the open implementations to drive an open standard and open ecosystem for NFV solutions
- Project initiated and supported by members of the NFV ISG leadership through the Linux Foundation
- **OPNFV will be launched in the next few weeks!**



Summary

- NFV will transform the design and operations of public and enterprise networks
- NFV leverages cloud virtualization technologies and eliminates reliance on proprietary hardware by using industry standard servers, switches and storage
- NFV is complementary to Software Defined Networks (SDN)
  - SDN increases the utility of NFV and vice-versa
- The ETSI NFV Industry Specification Group is driving industry convergence on end-user requirements
- The Open Platform for NFV (OPNFV) initiative will boost open source implementation and multi-vendor interoperability

Thank you

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