Putting IPv6 to work

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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
- Carrier Grade NAT
- DPI
- Firewall
- 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.

Independent Software Vendors

Orchestrated, automatic & remote install.

- Standard High Volume Servers
- Standard High Volume Storage
- Standard High Volume Ethernet Switches

Network Functions Virtualisation Approach
Transformation of Network Hardware
NFV Origins

- **Summer 2011:** Collaborative research (BT and others) confirmed that virtualisation technology has sufficient performance for real-world network workloads
- **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

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**October 2012: First NFV white paper**

16-months

**February 2014: Operator strategy shift**

- **Financial Times**
  - February 26, 2014

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**Google Trend for “Network Functions Virtualization”**

- We invent term "NFV"  
- First NFV White Paper  
- 1st ETSI NFV ISG meeting
# NFV Benefits and Challenges

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<thead>
<tr>
<th>NFV Benefits</th>
<th>NFV Challenges</th>
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<tr>
<td>• Flexibility to rapidly, dynamically provision and instantiate services in different locations without new equipment installation. (<a href="#">Virtualised functions, software download &amp; automatic configuration</a>)</td>
<td>• Converging industry understanding of the topic, including terminology and relationship with SDN</td>
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<td>• Faster time-to-market for new service introduction (<a href="#">Service prototyping and DevOps organization</a>)</td>
<td>• Achieving high performance with portability across different hardware platforms</td>
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<td>• Improved operational efficiency by taking advantage of a homogeneous (physical) network platform (<a href="#">Separate hardware engineering and planning from service specific plans</a>)</td>
<td>• Achieving co-existence with bespoke hardware based network platforms</td>
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<td>• Reduced costs through leveraging the economies of scale of the IT industry (<a href="#">Move to “COTS”, leverage cloud software and Open-Source software development</a>)</td>
<td>• Managing and orchestrating virtual network appliances while ensuring security &amp; integrity</td>
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<td>• Reduced operational costs: reduced power, reduced space, improved network monitoring (<a href="#">Dynamically consolidate services on equipment during low traffic epochs, virtual probe deployment</a>)</td>
<td>• Achieving scale benefits through M&amp;O automation</td>
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<tr>
<td>• And stuff we haven’t even thought of yet!</td>
<td>• Integrating multiple virtual appliances from different vendors without incurring significant integration costs (and lock-in)</td>
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<td>• Avoiding protracted standards processes and leveraging open-source</td>
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<td>• Operator skill and organisation migration to a data-centric network environment</td>
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<td>• ETSI NFV ISG founded to provide a collaborative environment to address these challenges</td>
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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.
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/](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
- 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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