



Network Virtualization Research Challenges

draft-irtf-nfvrg-gaps-network-virtualization-06

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History

- Individual I-D (draft-bernardos-nfvrg-gaps-network-virtualization)
 - -01 presented in Prague (93rd IETF)
 - -03 presented in Yokohama (94th IETF)
- Adopted as RG document after Yokohama
 - <https://datatracker.ietf.org/doc/draft-irtf-nfvrg-gaps-network-virtualization/>
 - -00 presented in Buenos Aires (95th IETF)
 - -01 presented in Berlin (96th IETF)
 - -03 presented in Seoul (97th IETF)
 - Received extensive review from Kostas
 - -05 presented in Chicago (98th IETF)
 - Received 9 additional reviews (Fabio, Kostas, Evangelos, Rafa, Angeles, Barbara, Jose, Dirk and Gino)

Objectives

- Title: Network Virtualization Research Challenges
- Identify and describe open research challenges for network virtualization
 - Based on gap analysis
 - Propose for new activities in IETF/IRTF that could address some of the challenges
 - Relation to the NFV RG focus areas

I-D structure (I)

1. Introduction
2. Terminology
3. Background
 1. Network Function Virtualization
 2. Software Defined Networking
 3. ITU-T functional architecture of SDN
 4. Multi-access ~~Mobile~~ Edge Computing
 5. IEEE 802.1CF (OmniRAN)
 6. Distributed Management Task Force
 7. Open Source initiatives
 8. ~~Internet of Things (IoT)~~



Updated
according to
review
comments

I-D structure (II)

4. Network Virtualization Challenges
 - 4.1 Introduction
 - 4.2. Guaranteeing quality-of-service
 - 4.2.1. Virtualization Technologies
 - 4.2.2. Metrics for NFV characterization
 - 4.2.3. Predictive analysis
 - 4.2.4. Portability
 - 4.3. Performance improvement
 - 4.3.1. Energy Efficiency
 - 4.3.2. Improved link usage
 - 4.4. Multiple Domains
 - 4.5. 5G and Network Slicing
 - 4.5.1. Virtual Network Operators
 - 4.5.2. Extending Virtual Networks and Systems to the Internet of Things
 - 4.6. Service Composition
 - 4.7. End-user device virtualization
 - 4.8. Security and Privacy
 - 4.9. Separation of control concerns
 - 4.10. Network Function placement
 - 4.11. Testing
 - 4.11.1. Changes in methodology
 - 4.11.2. New functionality
 - 4.11.3. Opportunities
5. Technology Gaps and Potential IETF Efforts
6. ~~NFVRG focus areas Mapping to NFVRG Near-Term work items~~

Updated
according to
review
comments

Interesting
outcome for the
RG to identify
research work
items

Content updates since -05 (IETF 98)

- We got 9 comprehensive reviews
 - Fabio Giust
 - Kostas Pentikousis
 - Evangelos Haleplidis
 - Rafa Marin Lopez
 - Angeles Vazquez-Castro
 - Jose Saldana
 - Dirk von Hugo
 - Barbara Martini
 - Gino Carrozo
- We have update the document, including some new content plus more academic references

Technology Gaps & Potential IETF Efforts

Open network virtualization research areas



Potential IETF/IRTF groups that could address them

Open Research Area	Potential IETF/IRTF Group
1-Guaranteeing QoS	IPPM WG (Measurements of NFVI)
2-Performance improvement	SFC WG, NFVRG (energy driven orchestration)
3-Multiple Domains	NFVRG (multi-domain orchestration)
4-Network Slicing	NVO3 WG, NETSLICES bar BoF (multi-tenancy support)
5-Service Composition	SFC WG (SFC Mgmt and Config)
6-End-user device virtualization	N/A
7-Security	N/A
8-Separation of control concerns	NFVRG (separation between transport control and services)
9-Testing	NFVRG (testing of scaling)
10-Function placement	NFVRG, SFC WG (VNF placement algorithms and protocols)

Relation to NFVRG focus areas

NFVRG focus areas



Open network virtualization research areas

NFVRG Focus Point	Open Research Area
1-Re-architecting functions	<ul style="list-style-type: none">- Performance improvem.- Network Slicing- Guaranteeing QoS- Security- End-user device virt.
2-New management frameworks	<ul style="list-style-type: none">- Separation of control- Multiple Domains- Service Composition
3-Low latency, resource isolation, etc	<ul style="list-style-type: none">- End-user device virt.- Performance improvem.
4-Measurement and benchmarking	<ul style="list-style-type: none">- Separation of control- Guaranteeing QoS- Testing

Next steps

- Authors believe the I-D is ready to go to IRSG
 - Very positive reviews
 - Comments addressed