

Network Function Virtualization (NFV): Challenges (and Dependability)

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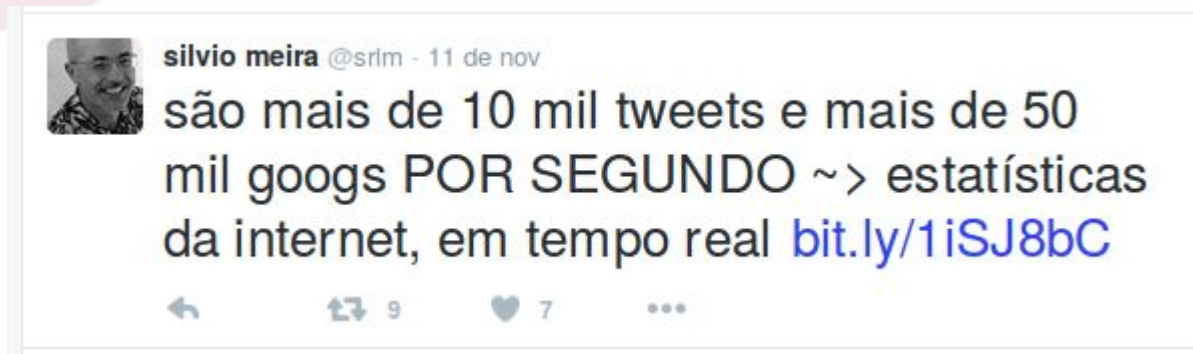
Motivation

- 2020
 - It is expected **32 billions** of devices connected to Internet



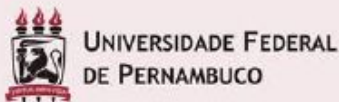
Motivation

- <http://www.internetlivestats.com/one-second>



and more than 2.4000.000 emails/sec

October 22-24, 2012 at the “SDN and OpenFlow World Congress”, Darmstadt-Germany.





Network Functions Virtualisation

An Introduction, Benefits, Enablers, Challenges & Call for Action

OBJECTIVES

This is a non-proprietary white paper authored by network operators.

The key objective for this white paper is to outline the benefits, enablers and challenges for Network Functions Virtualisation (as distinct from Cloud/SDN) and the rationale for encouraging an international collaboration to accelerate development and deployment of interoperable solutions based on high volume industry standard servers.

CONTRIBUTING ORGANISATIONS & AUTHORS

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PUBLICATION DATE

October 22-24, 2012 at the "SDN and OpenFlow World Congress", Darmstadt-Germany.

This white paper is available at the following link: http://portal.etsi.org/NFV/NFV_White_Paper.pdf



Network Function Virtualization

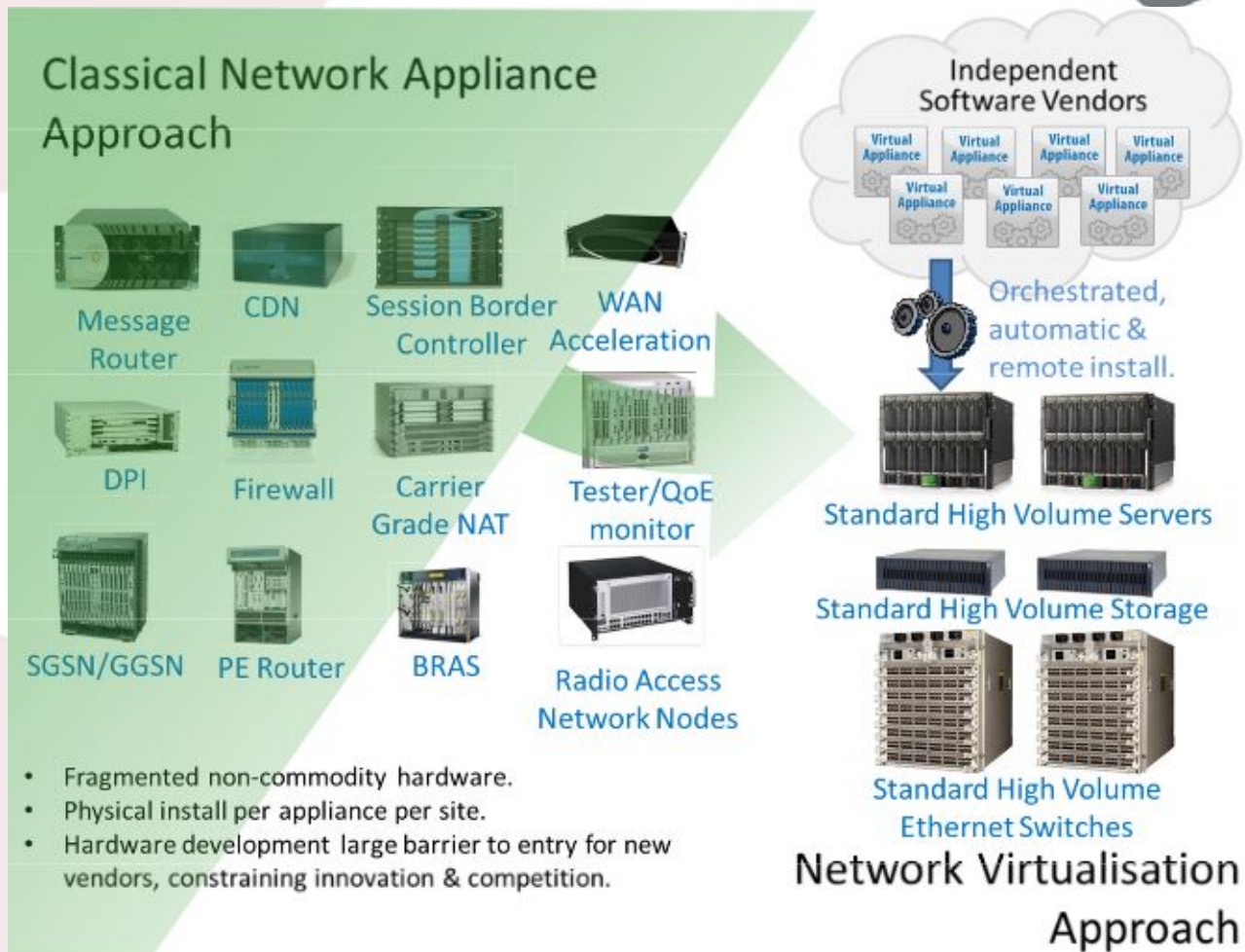


Figure 1: Vision for Network Functions Virtualisation

Network Function Virtualization



- **Network Functions Virtualization (NFV)**
 - It is one of the **most profound paradigm shifts** the networking industry has faced to date.

- **Proven functions, such as:**
 - routing,
 - policy,
 - firewall,
 - DPI, (and many others)

will move from running on dedicated hardware appliances to running on unproven virtualized server platforms in the hope of achieving massive efficiencies.



Network Function Virtualization



- **NFV has drawn significant attention from both industry and academia:**
 - by **decoupling Network Functions (NFs) from the physical devices** on which they run, it has the potential to lead to significant reductions in:
 - **Operating Expenses (OPEX)**
 - **Capital Expenses(CAPEX)**
 - Furthermore:
 - it facilitates the deployment of new services with increased agility and faster time-to-value



Network Function Virtualization



Everything known

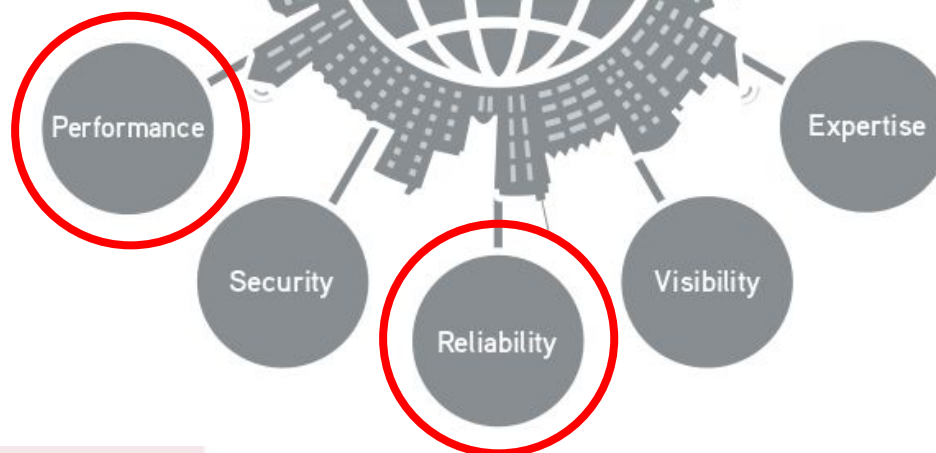
becomes unknown again, and there are risks associated both with moving **too fast**, and **not fast enough**

Network Function Virtualization

Promises →



Challenges →



NFV - State of the Art



A screenshot of a Google Scholar search interface. The search bar contains the text "network function virtualization", which is circled in red. Below the search bar, the results are shown as "Acadêmico" with "Aproximadamente 1.250 resultados (0,15 s)", also circled in red. The first result is a PDF titled "[PDF] ClickOS and the art of network function virtualization" by J Martins, M Ahmed, C Raiciu, and V Olteanu, published in the USENIX Symposium on ... in 2014. The abstract mentions that middleboxes have become a fundamental part of today's networks but come with various problems. The result is cited by 77 articles and has 15 versions. On the left side of the search results, there are filters for "Artigos", "Minha biblioteca", and "A qualquer momento" with sub-filters for "Desde 2015" and "Desde 2014".



NFV - State of the Art



The screenshot shows a Google Scholar search interface. The search bar contains the query **"network function virtualization" + dependability**, which is circled in red. Below the search bar, the results are categorized under **Acadêmico**, with approximately 419 results found in 0.06 seconds. A red circle highlights the text "Aproximadamente 419 resultados (0,06 s)". The first result is titled **Mobileflow: Toward software-defined mobile networks** by K Pentikousis, Y Wang, and W Hu, published in Communications Magazine in 2013. The snippet of the article text is visible, mentioning network function virtualization and reliability. The search interface also includes navigation options like "Web", "Imagens", and "Mais...", and a sidebar with "Artigos" and "Minha biblioteca".

NFV - State of the Art



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- 1 [ClickOS and the art of network function virtualization](#)
[Joao Martins](#), [Mohamed Ahmed](#), [Costin Raiciu](#), [Vladimir Olteanu](#), [Michio Honda](#), [Roberto Bifulco](#), f
April 2014 **NSDI'14: Proceedings of the 11th USENIX Conference on Networked Systems Design**
Implementation



UNIVERSIDADE FEDERAL
DE PERNAMBUCO

MODCS Workshop 2015.2 - NFV
Erico Guedes <eacg@cin.ufpe.br>

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[Xiongzi Ge, Yi Liu, David H.C. Du, Liang Zhang, Hongguang](#)
August 2014 **SIGCOMM '14: Proceedings of the 2014 ACM cc**

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ScienceDirect Journals Books

"network function virtualization" Author name Journal or book title Volume Issue Page  Advance

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NFV - State of the Art



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[Diarmuid Ó Coileáin](#), [Donal O'mahony](#)

May 2015 **Computing Surveys (CSUR)**, Volume 47 Issue 4

Publisher: ACM [Request Permissions](#)

Full text available: [PDF](#) (533.29 KB)

Bibliometrics: Downloads (6 Weeks): 57, Downloads (12 Months): 331, Downloads

Many content distribution architectures offer desirable elements that lead to network congestion, higher content availability, and reduced costs. However utilization in commercial environments ...

Keywords: Accountability, CDN-P2P, caching, content distribution, content information-centric networking, peer-to-peer



Network Function Virtualization: State-of-the-art and Research Challenges

Rashid Mijumbi, Joan Serrat, Juan-Luis Gorricho, Niels Bouten, Filip De Turck, Raouf [Boutaba](#)

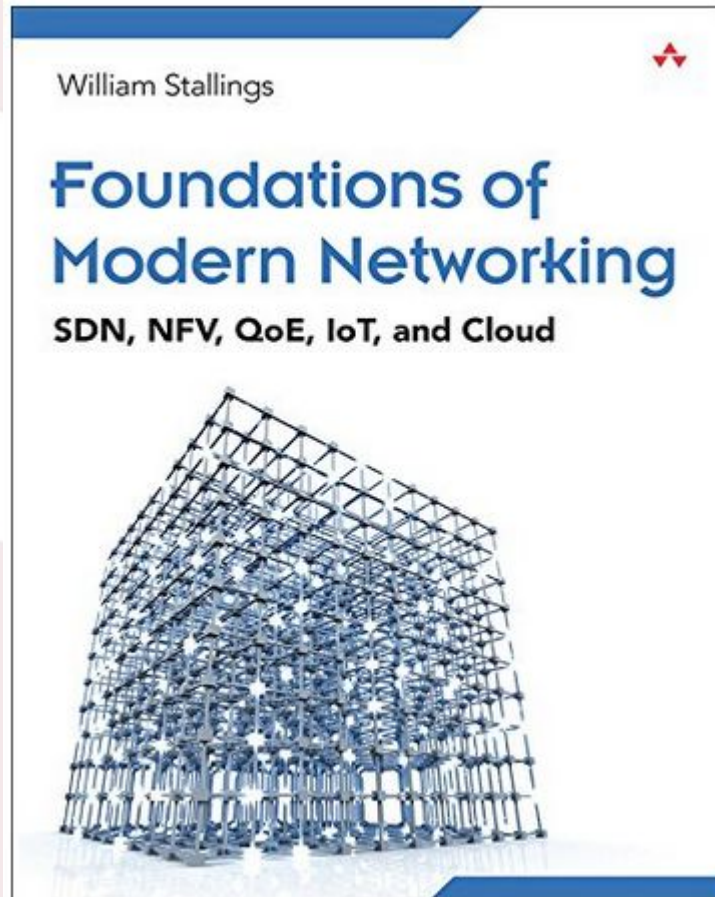
Abstract—Network Function Virtualization (NFV) has drawn significant attention from both industry and academia as an important shift in telecommunication service provisioning. By decoupling Network Functions (NFs) from the physical devices on which they run, NFV has the potential to lead to significant reductions in Operating Expenses (OPEX) and Capital Expenses (CAPEX) and facilitate the deployment of new services with increased agility and faster time-to-value. The NFV paradigm is still in its infancy and there is a large spectrum of opportunities for the research community to develop new architectures, systems and applications, and to evaluate alternatives and trade-offs in developing technologies for its successful deployment. In this paper, after discussing NFV and its relationship with complementary fields of Software Defined Networking (SDN) and cloud computing, we survey the state-of-the-art in NFV, and identify

that due to the high competition, both among themselves and from services being provided over-the-top on their data channels, increasing prices only leads to customer churn. Therefore, TSPs have been forced to find ways of building more dynamic and service-aware networks with the objective of reducing product cycles, operating & capital expenses and improving service agility.

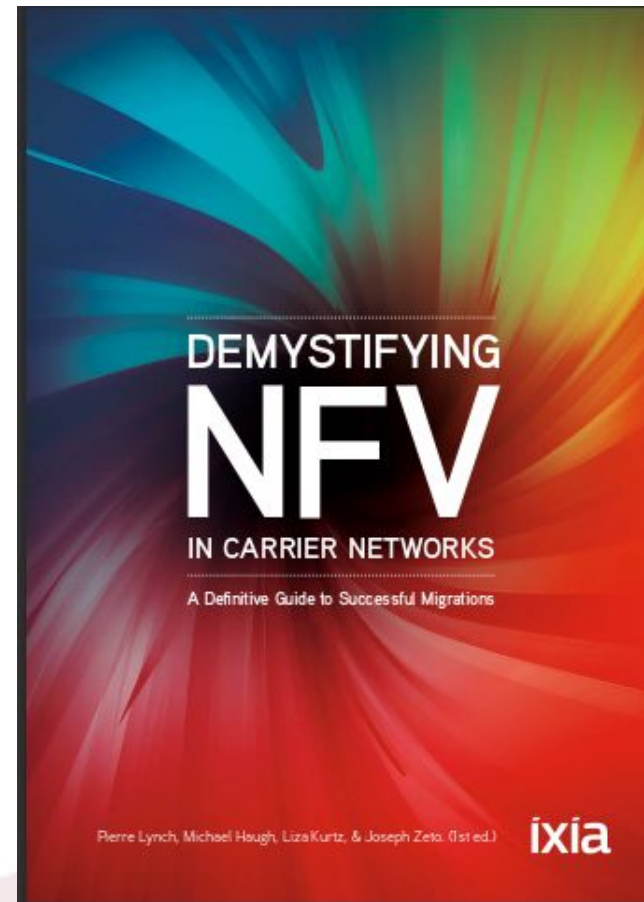
NFV [3], [4] has been proposed as a way to address these challenges by leveraging virtualization technology to offer a new way to design, deploy and manage networking services. The main idea of NFV is the decoupling of physical network equipment from the functions that run on them. This means that a network function - such as a firewall - can be dispatched



NFV - Books



2015, november 08



2013



So...

- **Goals**

- to tackle performance and dependability challenges through the application of models in NFV due to use of virtualization
- to produce recommendations of optimization in NFV environments

Thank you

&

Questions...

