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CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

Measurement method for energy efficiency of network functions virtualization

Recommendation ITU-T L.1361



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Measurement method for energy efficiency of network functions virtualization

Summary

Recommendation ITU-T L.1361 is intended to define common energy efficiency measurement methods for network functions virtualization (NFV) environments, it does not try to cover all of the different types of VNFs (e.g., firewall, gateway, etc.), but it provides the basis to make an extensible definition.

History

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FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

Network functions virtualization (NFV) changes the traditional telecom network architecture by replacing physical equipment with network functions running on a standard server platform. Three main domains are identified in high-level NFV architecture. The virtualized network functions (VNFs) are the software implementations of network functions which run over the NFV infrastructure (NFVI). NFVI includes any physical and virtualized resources for supporting the execution of the VNFs. NFV management and orchestration (MANO) covers the orchestration and lifecycle management of physical and/or software resources that support the infrastructure virtualization and the lifecycle management of VNF itself. The three decoupled elements, connected through standardized and open interfaces, can be provided by different vendors. VNFs and NFVI are the dominant parts from an energy consumption point of view.

Recommendation ITU-T L.1361

Measurement method for energy efficiency of network functions virtualization

1 Scope

This Recommendation defines the metrics and measurement methods for the evaluation of the energy efficiency of functional components of a network functions virtualization (NFV) environment. Figure 1 shows the NFV function components in the scope of this Recommendation. The NFV functional components include virtual network functions (VNFs) and NFV infrastructure (NFVI) defined in the NFV architecture framework as described in [b-ETSI GS NFV 002]. Management and orchestration (MANO) is not included in the system under test, but will be eventually used as a test environment.

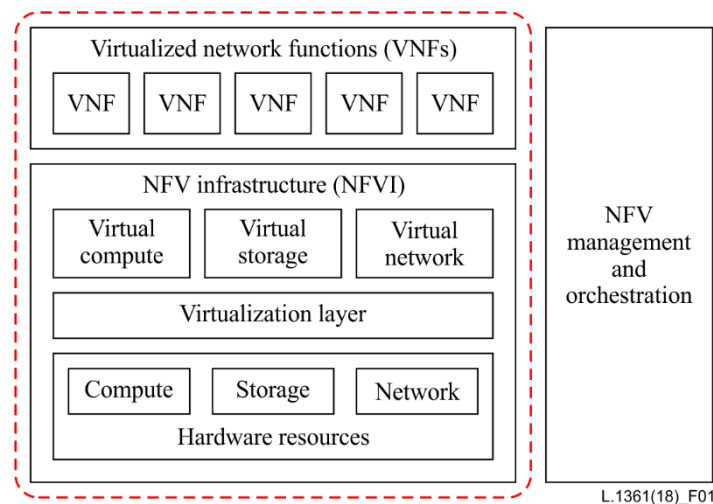


Figure 1 – NFV function components

The measurement method described in the present Recommendation is intended to be used to assess and compare the energy efficiency of single functional components independently in both laboratory testing and pre-deployment testing. Energy efficiency of co-located VNFs sharing same platform resources cannot be compared by using the method defined in the present Recommendation. The scope of this Recommendation is not to define the measurement method in an operational NFV environment.

The present Recommendation is intended to define common energy efficiency measurement methods for NFV environments and not try to cover all different types of VNFs (e.g., firewall, gateway, etc.), but it does provide the basis to make an extensible definition.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T L.1200]	Recommendation ITU-T L.1200 (2012), <i>Direct current power feeding interface up to 400 V at the input to telecommunication and ICT equipment.</i>
[ITU-T L.1315]	Recommendation ITU-T L.1315 (2017), <i>Standardization terms and trends in energy efficiency.</i>
[ETSI GS NFV 003]	ETSI GS NFV 003 V1.2.1 (2014), <i>Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV.</i>
[ETSI EN 300 132-2]	ETSI EN 300 132-2 V2.5.1 (2016), <i>Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment – Part 2: Operated by -48 V direct current (dc).</i>
[ETSI GS NFV-TST 008]	ETSI GS NFV-TST 008 V3.3.1 (2018), <i>Network Functions Virtualisation (NFV) Release 3; Testing; NFVI Compute and Network Metrics Specification.</i>
[ETSI GS NFV-IFA 027]	ETSI GS NFV-IFA 027 V2.4.1 (2018), <i>Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Performance Measurements Specification.</i>

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 network function [ETSI GS NFV 003]: Functional block within a network infrastructure that has well-defined external interfaces and well-defined functional behaviour.

NOTE – In practical terms, a Network Function is today often a network node or physical appliance.

3.1.2 network functions virtualization (NFV) [ETSI GS NFV 003]: Principle of separating network functions from the hardware they run on by using virtual hardware abstraction.

3.1.3 network functions virtualization infrastructure (NFVI) [ETSI GS NFV 003]: Totality of all hardware and software components that build up the environment in which VNFs are deployed.

NOTE – The NFVinfrastucture can span across several locations, e.g., places where data centres are operated. The network providing connectivity between these locations is regarded to be part of the NFV infrastructure. NFVinfrastucture and VNF are the top-level conceptual entities in the scope of network function virtualization. All other components are sub-entities of these two main entities.

3.1.4 network service [ETSI GS NFV 003]: composition of network function(s) and/or network service(s), defined by its functional and behavioural specification.

NOTE – The network service contributes to the behaviour of the higher layer service, which is characterized by at least performance, dependability, and security specifications. The end-to-end network service behaviour is the result of the combination of the individual network function behaviours as well as the behaviours of the network infrastructure composition mechanism.

3.1.5 physical network function (PNF) [ETSI GS NFV 003]: Implementation of an NF via a tightly coupled software and hardware system.

3.1.6 virtualized network function (VNF) [ETSI GS NFV 003]: Implementation of an NF that can be deployed on a network function virtualization infrastructure (NFVI).

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 system under test: One or more function components of NFV being measured.