



ETSI SUMMIT ON **5G NETWORK INFRASTRUCTURE**

NFV AS A 5G INFRASTRUCTURE ENABLER

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Outline

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PART 1

ETSI ISG NFV OVERVIEW



What is NFV?

- Network Functions Virtualisation (NFV) is about
 - **Decoupling network functions functionality from infrastructure** and relocating the network functions from dedicated appliances to pools of resources leveraging commodity-of-the-shelf (COTS) hardware.
 - **Softwarization of the network** enabling automation of deployment and operations.
- Enablers for NFV:
 - Compute and network virtualization technologies.
 - Cloud computing.

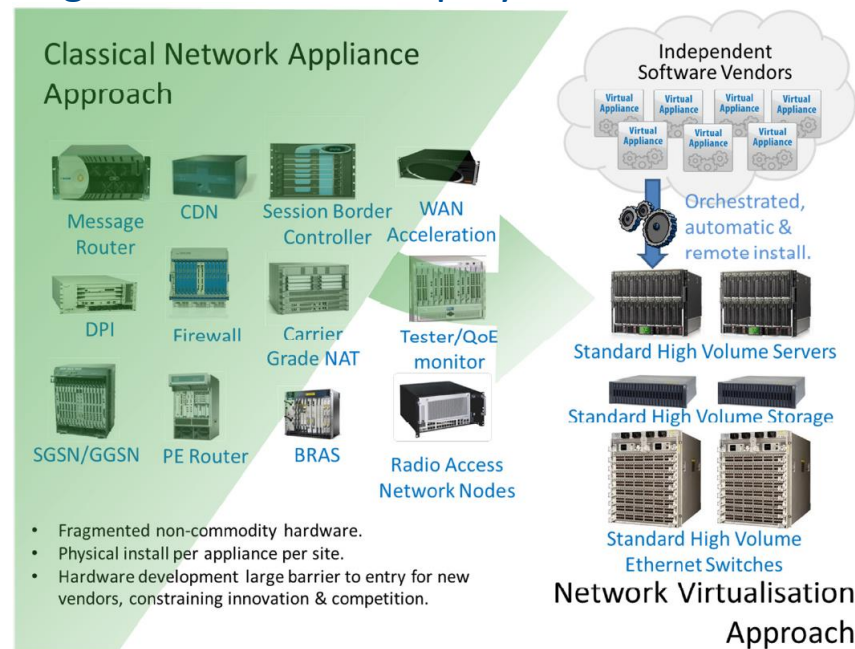


Figure 1: Vision for Network Functions Virtualisation from [1]



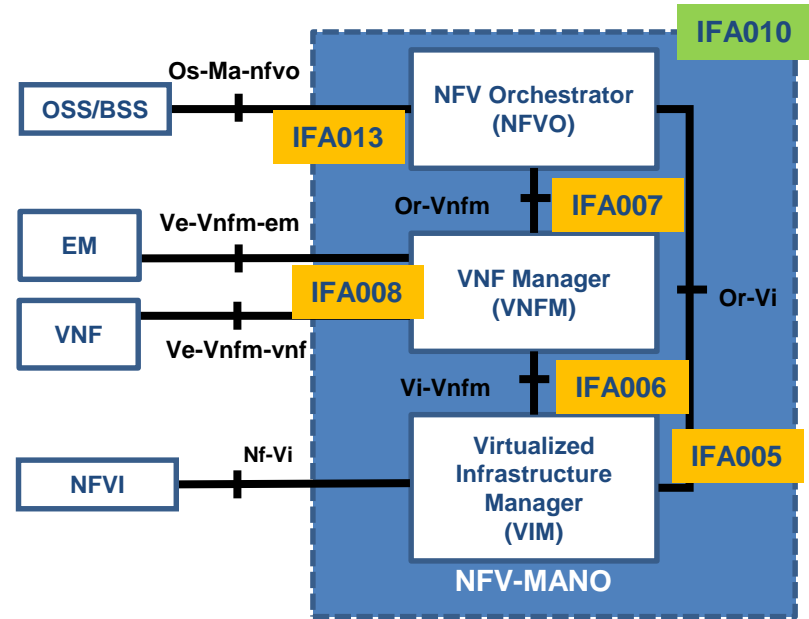
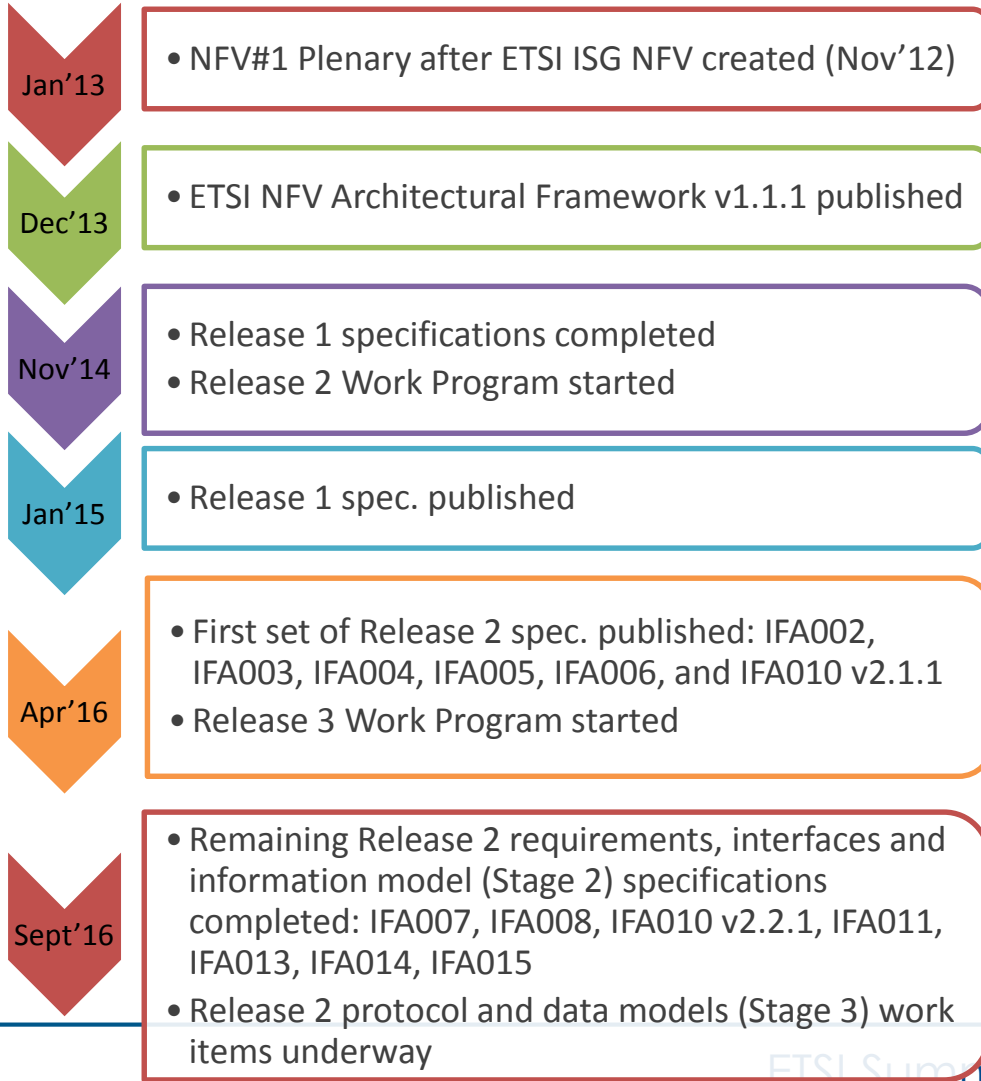
The values of NFV and the ETSI ISG NFV

- A unified (HW and SW) infrastructure, for improved operational efficiency and **reuse of a single platform for different applications, users and tenants.**
- **Increased automation:** deployment, maintenance, etc. of network functions and networks.
- Realizing the **network on demand.**
- Easing “network elasticity”, with scaling features **easily adapting the network and resource usage** to needed capacity.
- **Increased speed of time to market** by minimizing the network operator cycle of innovation.
- With a software-based network **opening ecosystem to new incumbents and bringing innovation.**
- And eventually, **reducing capex and opex.**

ETSI ISG NFV

An **interoperable architecture framework** for the management and orchestration of infrastructure resources, VNF and Network Services (composition of VNFs).

The history of ETSI ISG NFV



Acceleration	IFA002 IFA003 IFA004
Functional Requirements	IFA010
VNF Package and VNFD	IFA011
Network Service Template	IFA014
NFV Information Model Report	IFA015

Plus many other specifications addressing Security, Reliability, Use Cases and other Features



Release highlights of ETSI ISG NFV

Release 1

- Focused on the **feasibility of NFV**.
- Delivered the baseline studies and specifications.
- Set the **NFV Architecture**:
 - Infrastructure,
 - Virtualized network functions (VNF),
 - Integration of the VNFs into Network Services (NS), and
 - NFV Management and Orchestration (NFV-MANO) aspects at different layers.

Release 2

- Focuses on **interoperability of NFV solutions**.
- Details requirements and specification of interfaces and descriptors.
- Realizes the interoperability of solutions based on the NFV Architecture, detailing
 - **VNF and NS Descriptors,**
 - **Acceleration,**
 - **Internal and external NFV-MANO interfaces.**

Release 3

- Focuses on **feature enriching the NFV Architectural Framework**, readying NFV for deployment.
- Features such as:
 - Charging and billing,
 - Licensing,
 - Policy framework,
 - Multi-site,
 - Cloud-native support,
 - Etc.
- Details new requirements and specification of interfaces and descriptors.



Additional Information & Ongoing Work

- More information on Release features:
 - Release 2 Description:
[https://docbox.etsi.org/ISG/NFV/Open/Other/NFV\(16\)000274r5_NFV_Release_2_Description_v11.pdf](https://docbox.etsi.org/ISG/NFV/Open/Other/NFV(16)000274r5_NFV_Release_2_Description_v11.pdf)
 - Release 3 Definition:
[https://docbox.etsi.org/ISG/NFV/Open/Other/NFV\(16\)000229r6_NFV_Release_3_Definition_v050.pdf](https://docbox.etsi.org/ISG/NFV/Open/Other/NFV(16)000229r6_NFV_Release_3_Definition_v050.pdf)
- Ongoing work (drafts) publicly available here:
<https://docbox.etsi.org/ISG/NFV/Open/Drafts/>



PART 2

NFV as a 5G Infrastructure Enabler



5G industry fora

- **5G is being defined** in several organizations and industry fora. Picking some:
 - NGMN's 5G seminal White Paper [2].
 - 3GPP:
 - SA1 TS 22.261 [3] and security studied in SA3's TR 33.899 [8].
 - SA2: studied in TR 23.799 [4], followed by architectural normative work in Rel-15 WI: "5G System – Phase 1" delivering two specifications [5] [6].
 - RAN: with slicing aspects studied in TR 38.801 [7].
 - SA5: studied in TR 28.800 [9], 28.801 [10] and 28.802 [11], leveraging "management of mobile networks that include VNFs", and interworking the 3GPP mgmt. and ETSI NFV MANO architecture.
 - And research and industry forums and partnerships: 5G-PPP, 5GMF, etc.
- **NFV concepts are of particular relevance as 5G enabler.**
 - Examples further developed taken from (see following slides):
 - General concepts as described in NGMN's 5G White Paper [2].
 - Network slicing as specified in 3GPP SA1 TS 26.61 [3].



NGMN's 5G (I)

- Structural separation of network functionality and infrastructure, with programmability offered by SDN/NFV.
- Native SDN/NFV architecture.
- **NFV as technology enabler** for (refer to [2]):
 - Improved business agility.
 - Improved operational sustainability.

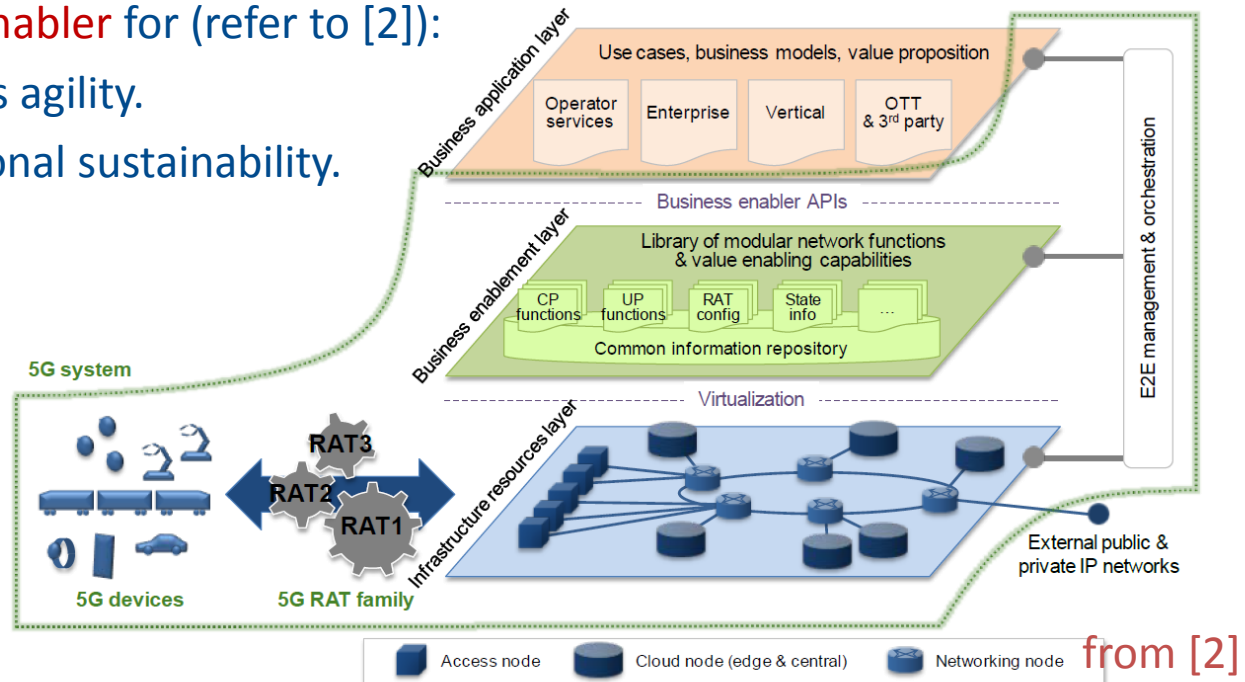


Figure 8: 5G Architecture



NGMN's 5G (II)

NGMN's 5G design principles	Supporting ETSI NFV concepts
"Simply virtualizing functions is not enough."	Lifecycle management and orchestration as provided by NFV-MANO.
Network: C/U-function separation, minimize number of entities.	Flexibility provided by VNF and VNF Component (VNFC).
Operations and management: automation, self-healing, integrated OAM functionality, carrier-grade network cloud orchestration.	Lifecycle management and orchestration features provided by NFV-MANO: NFVO, VNFM and VIM.
Facilitate XaaS	NFVaaS, VNFaaS, NSaaS (*)
Network slicing	[Refer to the following slides...]
Flexible function/service/application allocation	Deployment location constraints, affinity requirements, as part of NS, VNF and VR LCM interfaces and VNFD/NSD.

(* Under development in the ETSI ISG NFV



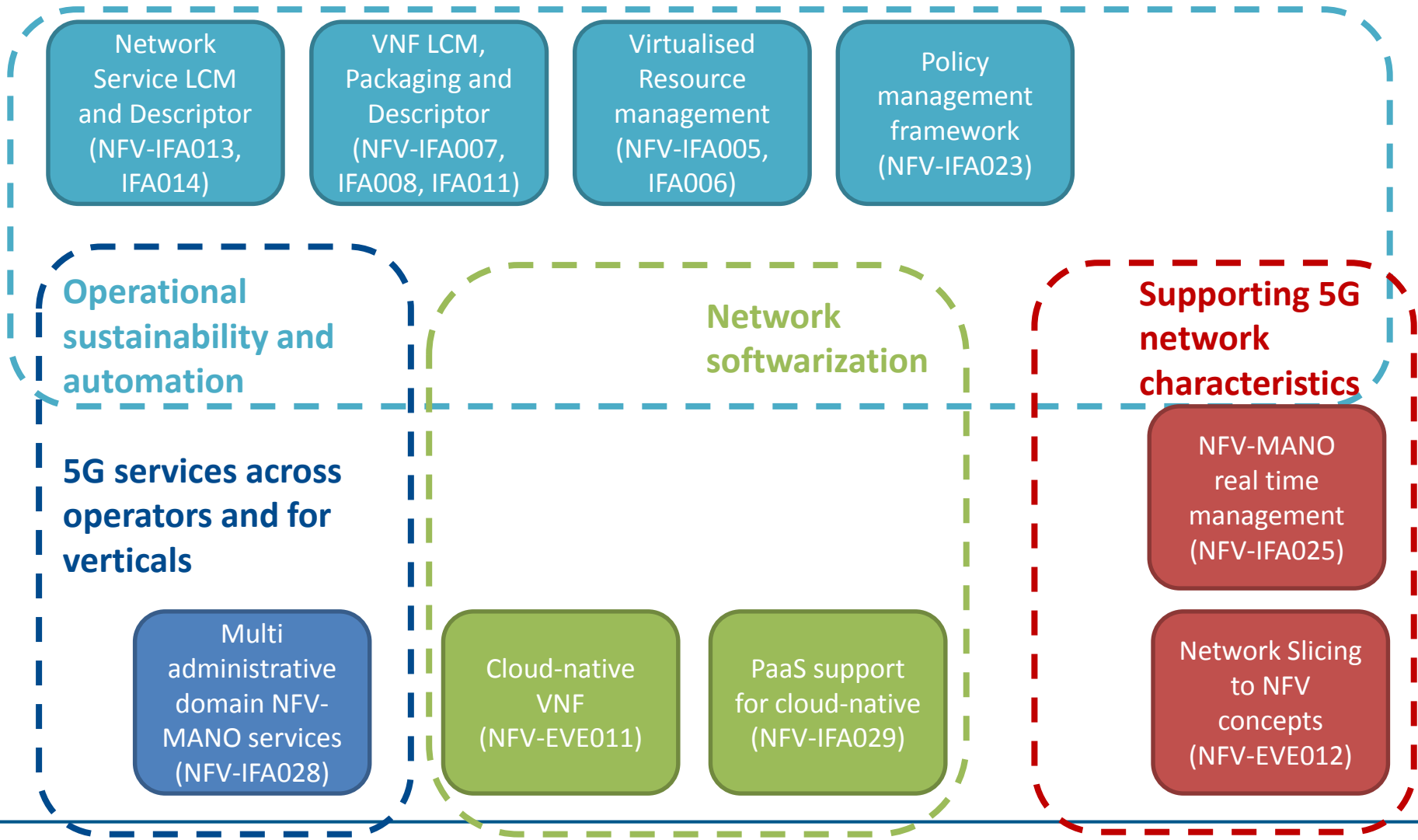
3GPP 5G (network slicing)

3GPP requirements (TS 22.261)	Supporting ETSI NFV concepts
The 5G system shall allow the operator to create, modify, and delete a network slice.	Lifecycle management of Network Services (NS) . (*)
The 5G system shall support the adaptation of capacity , i.e., elastic capacity of a network slice.	Scaling of a Network Service.
The 5G system shall support means by which the operator can add and remove network functions to the network such that they can be used in a network slice.	Lifecycle management of Virtualised Network Functions (VNF) as part of NS LCM.
Traffic and services in one network slice shall have no impact on traffic and services in other network slices in the same network.	Deployment requirements (constraints) set at VNF and NS level through VNFD and NSD , and policies , plus other features such as virtualized resource (VR) reservation, VR quotas, etc.

(*) **Assumption:** the network slice can be mapped to one or more than one NS.

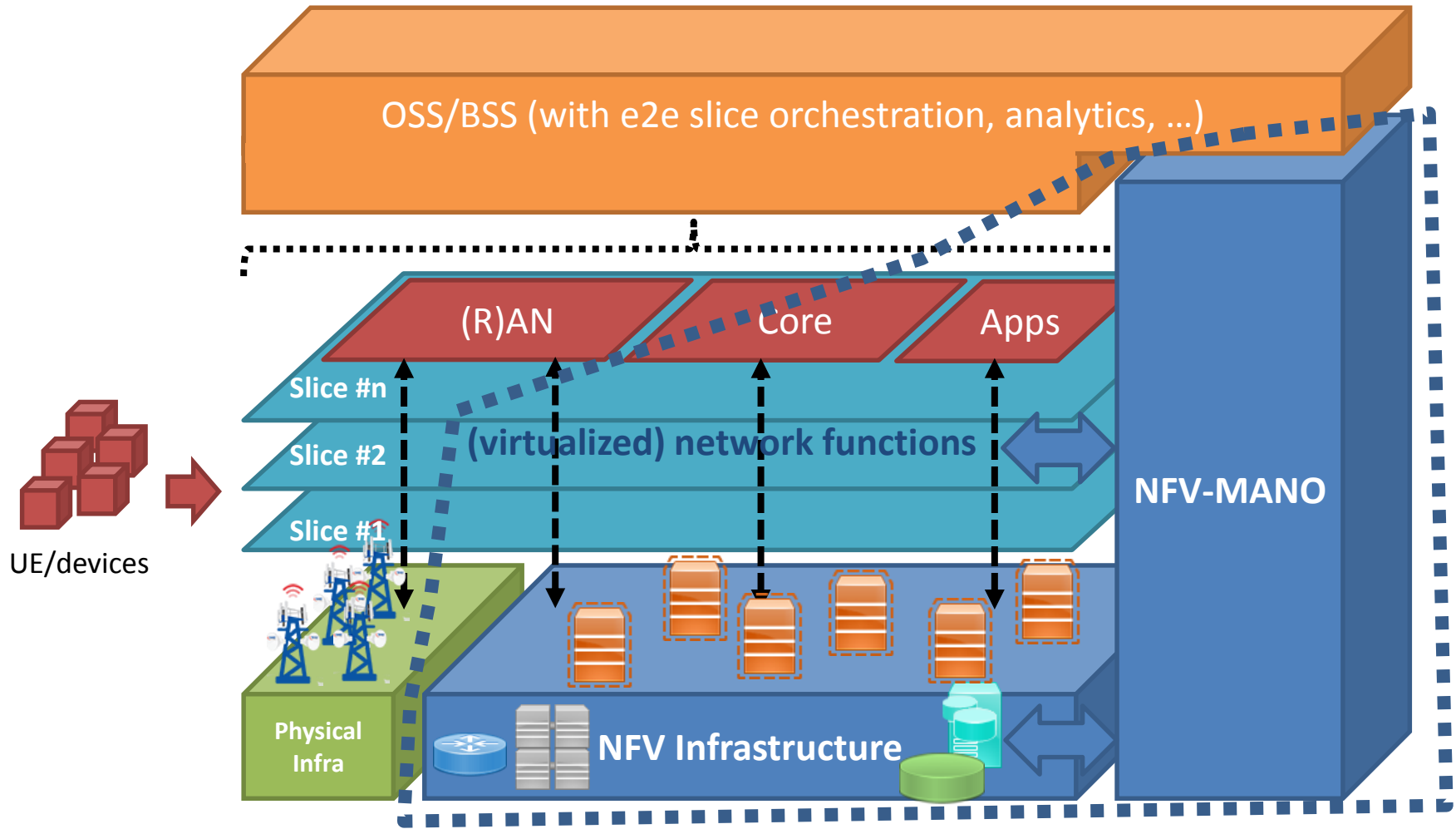


(ISG-defined) NFV relevant features (examples)





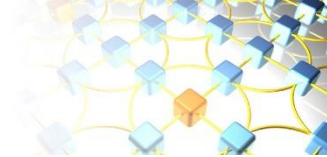
A 5G infrastructure with NFV





Conclusion

- NFV = decoupling network functions functionality from infrastructure & network softwarization.
- NFV is a key enabler for the 5G infrastructure.
- ETSI ISG NFV
 - Provides the interoperable architectural framework for the management and orchestration of resources, VNF and Network Services.
 - Is enhancing the NFV framework to make it more supportive for 5G.



References

- [1] NFV White Paper. Oct. 2012. [Online]. Available at: http://portal.etsi.org/NFV/NFV_White_Paper.pdf
- [2] NGMN, “5G White Paper,” Mar. 2015. [Online]. Available at: https://www.ngmn.org/uploads/media/NGMN_5G_White_Paper_V1_0.pdf
- [3] 3GPP (SA1) TS 22.261 v2.0.0: “Service requirements for the 5G system; Stage 1”.
- [4] 3GPP (SA2) TR 23.799 v14.0.0: “Study on Architecture for Next Generation System”. Dec. 2016.
- [5] 3GPP (SA2) TS 23.501: “System Architecture for the 5G system; Stage 2”.
- [6] 3GPP (SA2) TS 23.502: “Procedures for the 5G system; Stage 2”.
- [7] 3GPP (RAN) TR 38.801: “Study on New Radio Access Technology; Radio Access Architecture and Interfaces”.
- [8] 3GPP (SA3) TR 33.899: “Study on Architecture and Security for Next Generation System”.
- [9] 3GPP (SA5) TS 28.800: “Telecommunication management; Study on management and orchestration architecture of next generation networks and services”.
- [10] 3GPP (SA5) TS 28.801: “Telecommunication management; Study on management and orchestration of network slicing for next generation network”.
- [11] 3GPP (SA5) TS 28.802: “Telecommunication management; Study on management aspects of next generation network architecture and features”.