



The Standards People

ETSI NFV Conference

Evolving NFV towards the Next Decade
Celebrating the 10th Anniversary of ETSI NFV

NFV Moving Forward

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Recent trends in NFV

Cloudification and containerization in Telecommunication

- Application modernization / evolution with PaaS, Container orchestration
- Service-based architecture, Cloud-Native...

Expansion of scope of network virtualization and new deployments

- RAN virtualization (vRAN)
- Edge computing, public cloud, hybrid cloud

Automation

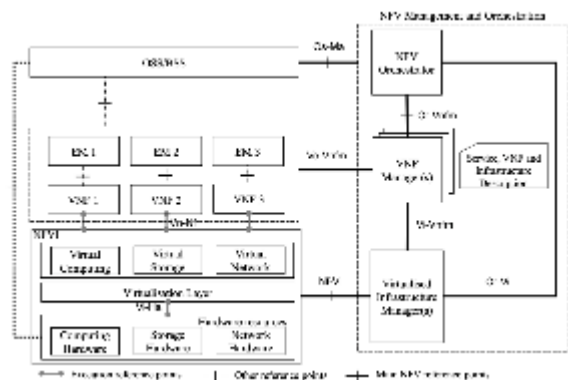
- Closed-loop automation, Autonomous networking, Intent-based networking
- Operation and management by artificial intelligence (AI) and machine learning (ML)

NetDevOps

- Continuous Integration and Continuous Delivery (CI/CD)

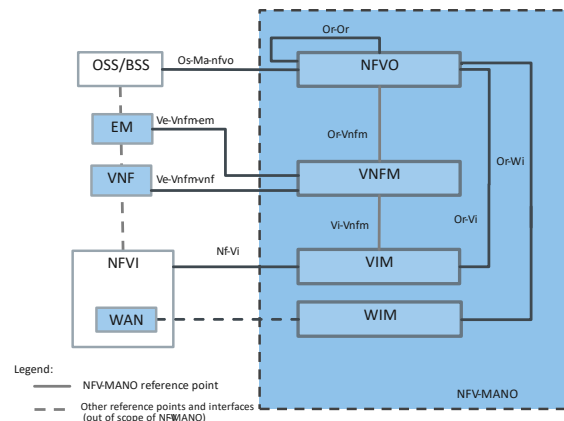
NFV architecture evolution

2013-2017 / Rel 2



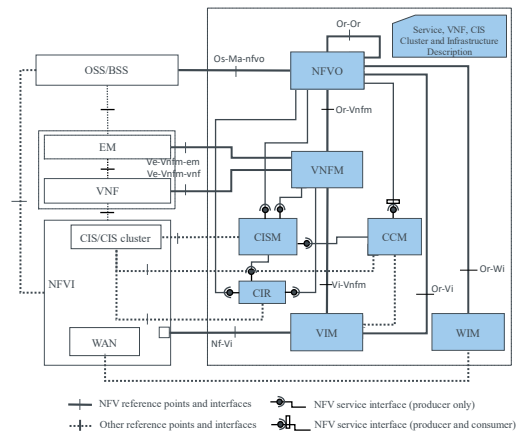
- **interoperability of NFV solutions**
 - VNF Package and VNF and NS Descriptors,
 - Acceleration,
 - Internal and external NFV-MANO interfaces.

2018-2021 / Rel 3



- **feature enriching the NFV Architectural Framework, readying NFV for deployment and operation**
 - Policy framework,
 - VNF snapshot,
 - NFV-MANO management,
 - Multi-site

2023+ / Rel 4



- **orchestration, cloudification and simplification of network deployment and operations.**
 - **Cloud Native, Container-based deployments, Further 5G support,**
 - **Autonomous management and automation,**
 - **Generic OAM functions**

Rel 5

Under discussion

- **consolidation and ecosystem.**
 - **Green NFV**
 - **NFV for vRAN**
 - **Flexible VNF deployments**
 - VNF configuration,
 - SBA concepts,
 - Cloud-native VNF reliability

Rel 6

Call for inputs

ETSI NFV (2013)

MANO Arch (2013)

OPNFV (2014)

ONAP (2016)

ETSI & 3GPP SA5 Alignment (2016)

ETSI ZSM (2017)

ETSI-ONAP Alignment (2018)

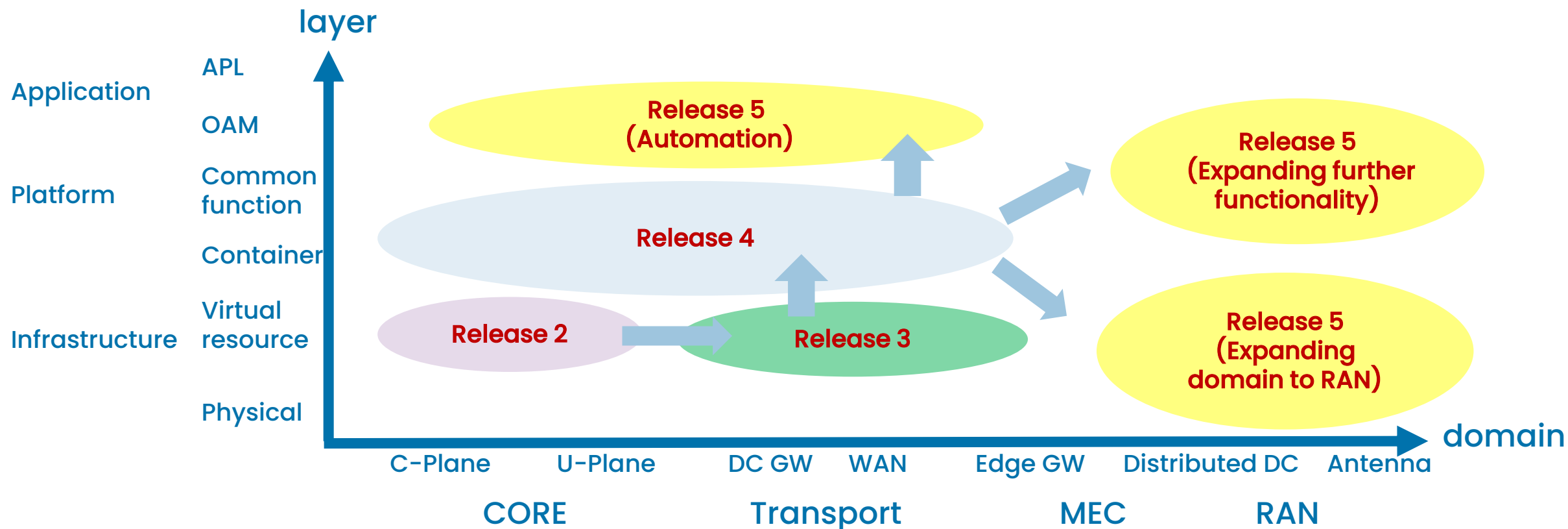
O-RAN (2018)

Nephio (2023)

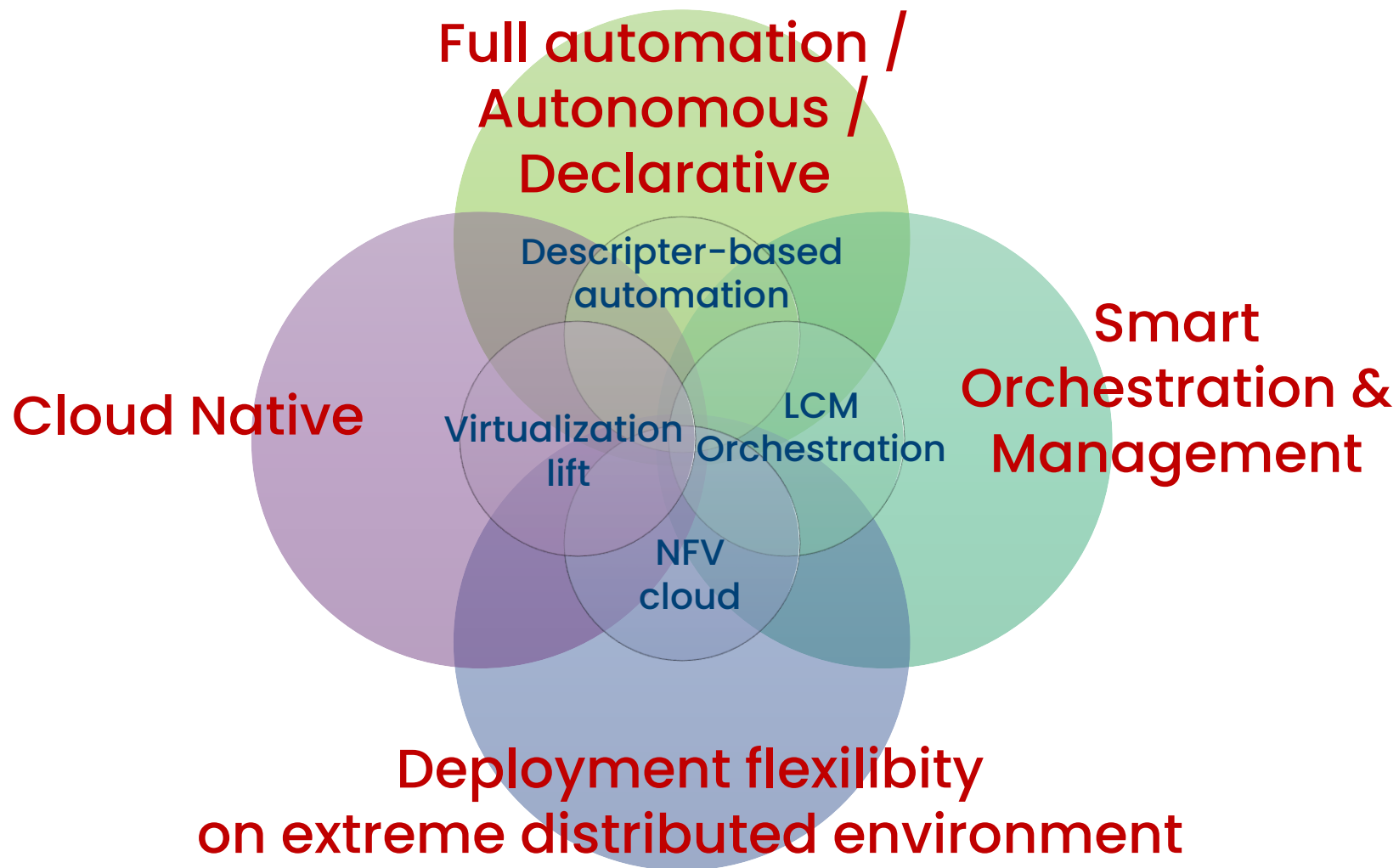
ETSI-ORAN CA (2023)

NFV evolution

- NFV started with the use of VM technology, evolved to container environments, and has evolved to support virtualization of network functions in various areas.
- Cloud Native trends expand our way of working beyond virtualization.



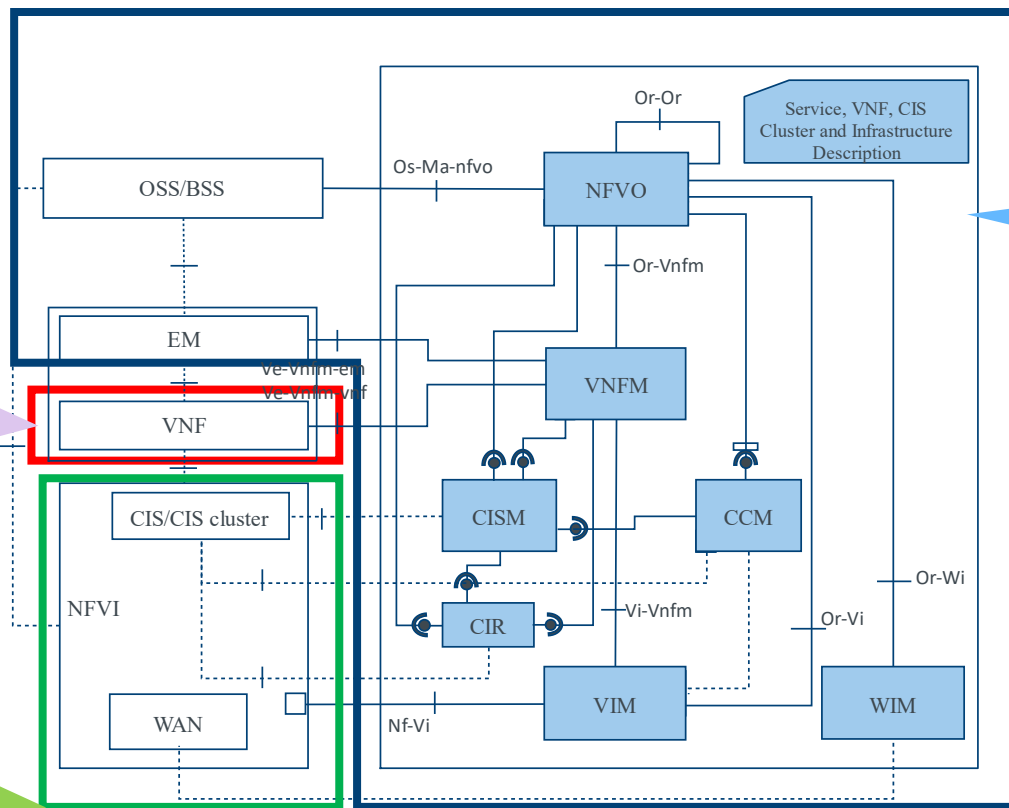
NFV is key to realize network transformation



Rethinking telecom architecture

Application has evolved with state of the art cloud and distributed technology

Infrastructure evolves rapidly



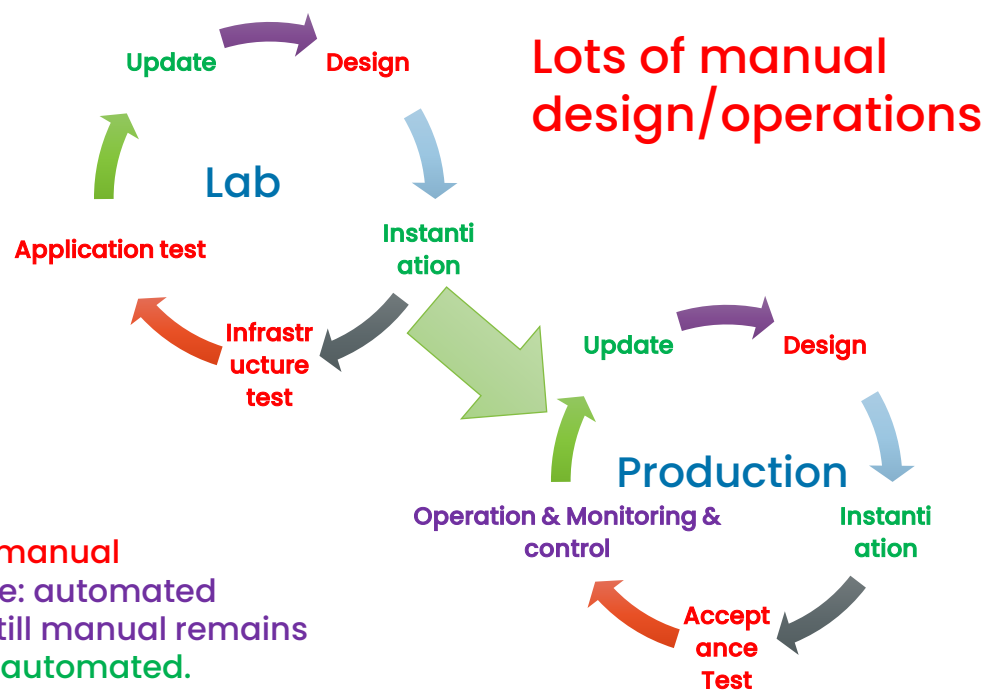
Cloud Native pushes O&M evolution

- +— NFV reference points and interfaces
- - - - - Other reference points and interfaces
- ⊖ NFV service interface (producer only)
- ⊕ NFV service interface (producer and consumer)

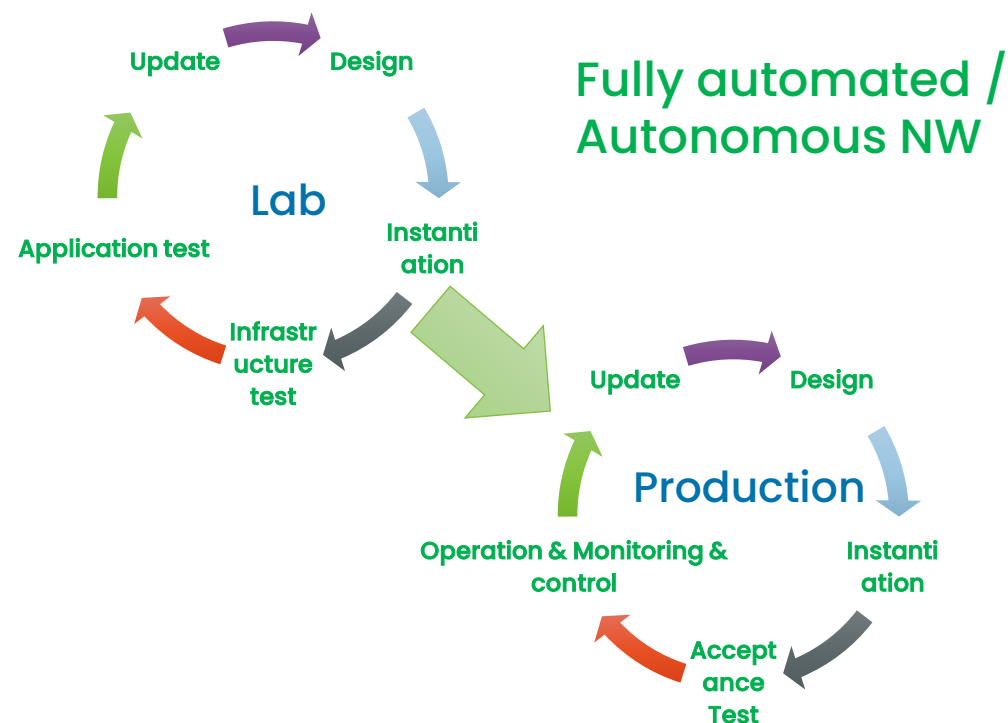
Toward full automation and autonomous NW

- Automation journey is underway
- NFV and virtualization technology are essential way forward

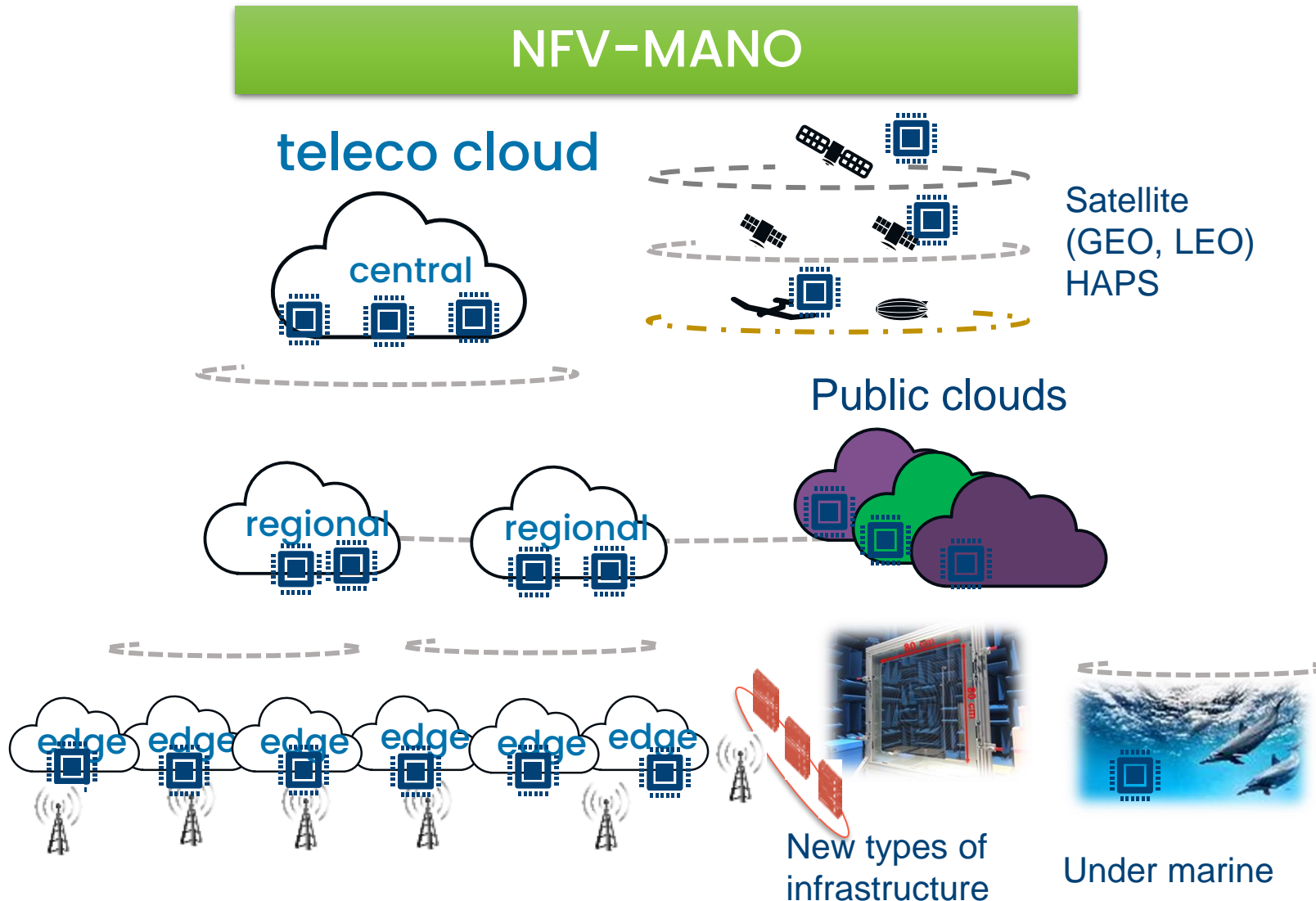
Today



Future



Flexible deployment on extremely-distributed environment

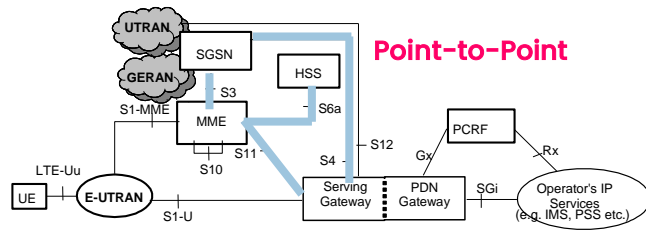


Extension of Management and Orchestration for extremely distributed environment with limited resources

- Multiple virtualization platform
 - Container, VM, Bare-metal
 - Private cloud, Public cloud
- Locations
 - Central, Regional, Edge
 - On-prem
 - Space, Underwater
- New type of infrastructure
 - Satellite, HAPS
 - Vehicle
 - Newly emerging devices

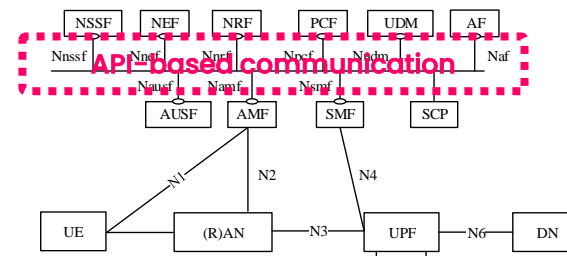
Disaggregation and Cloud Native adaptation in Telecom

NW deployment based on generic usecase



Telecom specific protocols

Customize NW service with the combination of NFs



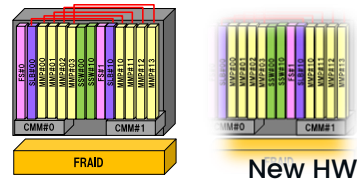
Telecom requirement realization by web-oriented protocol

Future

Under discussion for beyond 5G and 6G

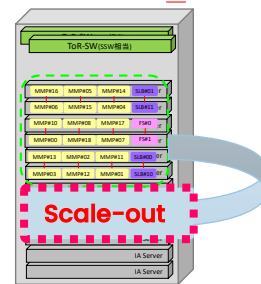


Scale-up in NF appliance



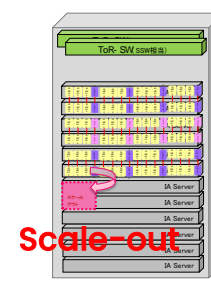
EPC/aTCA

VDU-level scale-out in VM-based VNF



EPC/Telecom cloud (NFV cloud)

Fine-grain scale-out in container-based VNF



5GC/Telecom Cloud (NFV cloud)

Future

Further adaptation using state of the art cloud / networking technology in network functions

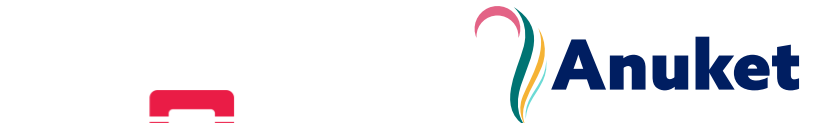
- PaaS
- Serverless / unikernel
- NaaS
- Processing offloading / accelerator
- Green NFV / power reduction



Continue NFV journey for telecommunication transformation



Home of
NFV



Conclusion

ETSI ISG NFV is going to shape future networking based on virtualization technology

- Continuously enhancing the framework while addressing the requirements in the telecom domain
- Applied to telecommunications networks, but also valid for other domains.

ETS ISG NFV welcomes all of you to participate in discussions to shape the future of NFV

- Your inputs and contributions are key for the future

If you want to go fast, go alone. If you want to go far, go together in NFV journey

Where to find further information

NFV Bits on YouTube:

<https://www.youtube.com/user/ETSIstandards>

ETSI NFV drafts and Releases documentation:

<https://docbox.etsi.org/ISG/NFV/Open/>

ETSI NFV published standards:

<https://www.etsi.org/committee/1427-nfv>

ETSI NFV blog:

<https://www.etsi.org/newsroom/blogs/blog-nfv>

ETSI NFV webpage:

<https://www.etsi.org/technologies/nfv>



Thank you for your attention