The Evolution of NFV: Advancing Toward the Telco Cloud

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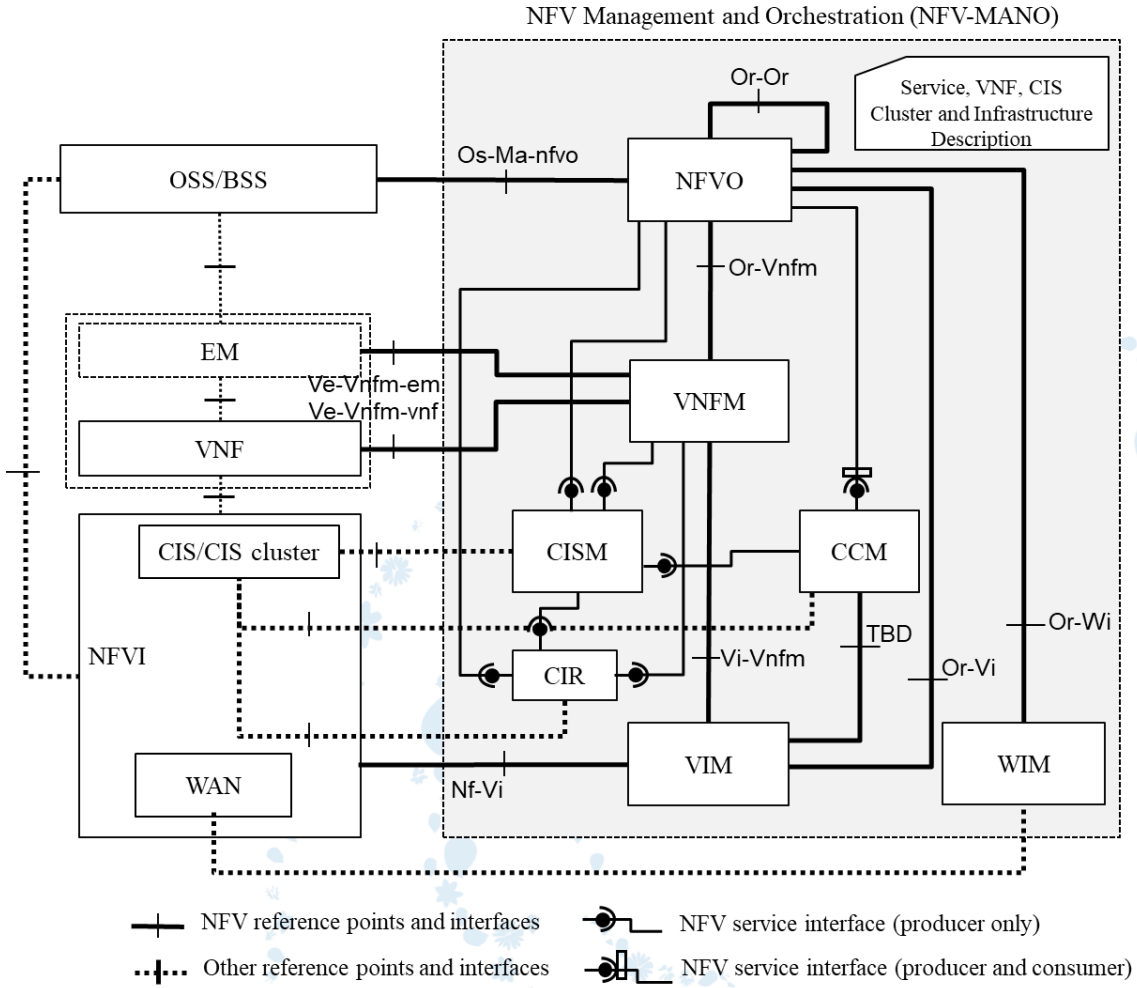
NFV-MANO added value

NFV-MANO core features

- Automation and orchestration of VNFs deployed in VMs and/or containers.
- Orchestration of network services combining VM-based and container-based VNFs.
- Automation functions (MDAF, Intent Management).
- Functions for the management of container clusters and workloads LCM (CISM, CCM).
- Functions for managing virtual and physical infrastructure resources (VIM, PIM).
- Real-time monitoring and analytics.
- Scalability and flexibility.
- Security and compliance support

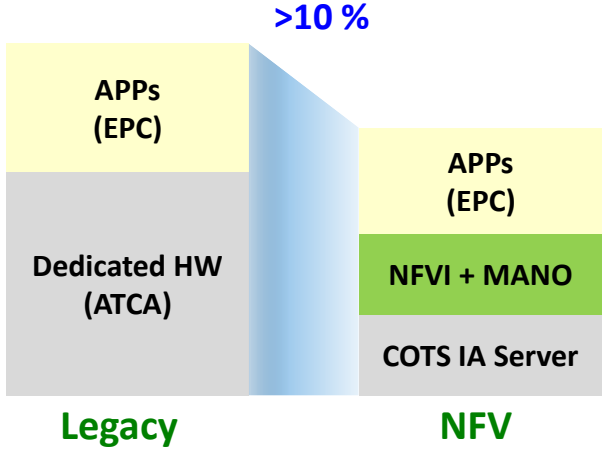
NFV-MANO is complex but implementable



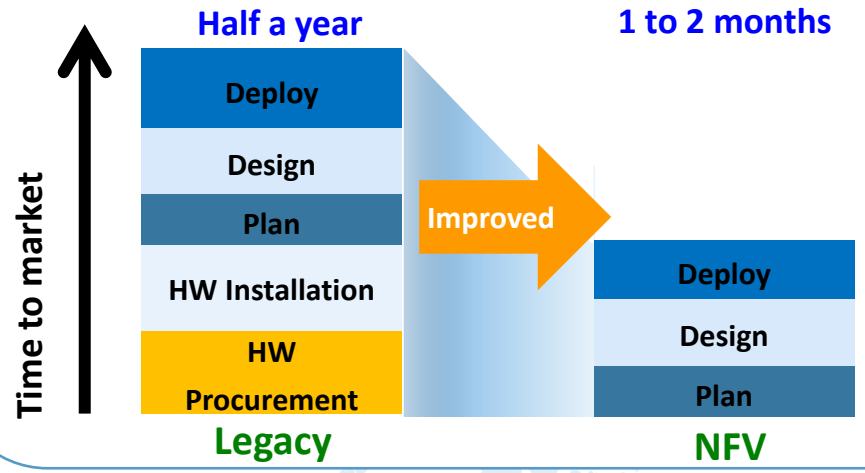
White paper: *The Role of NFV-MANO and Its Added Value*
https://www.etsi.org/images/files/ETSIWhitePapers/ETSI-WP-67-The-Role-of-NFV-MANO-and-Its-Added-Value.pdf

NFV-MANO added value

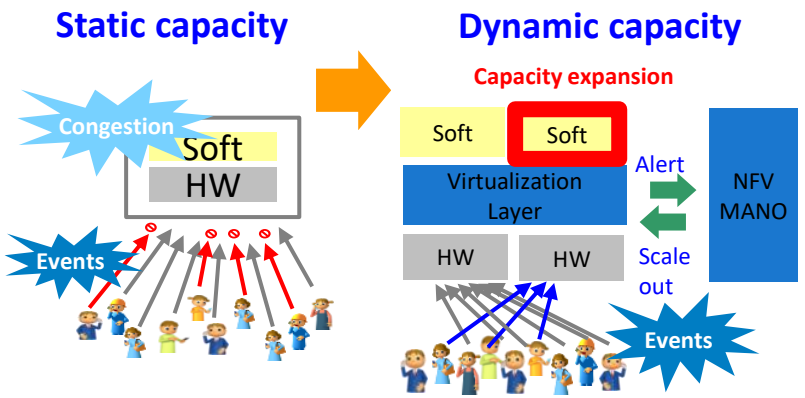
CAPEX reduction



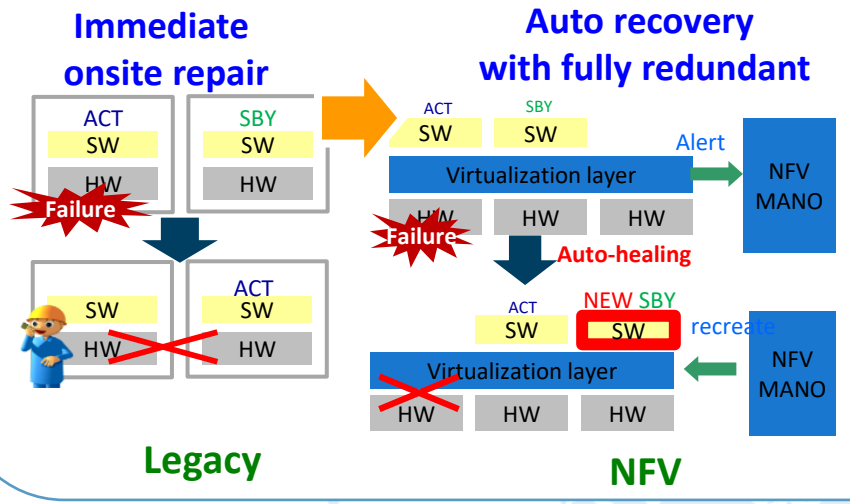
Improve agility



Improved connectivity



Improved reliability



Need for an NFV evolution

- The ecosystem around NFV and Cloud has evolved
  - many new technologies based on cloud-native principles, automation and artificial intelligence (AI), offering additional paths and opportunities for NFV to grow further
- Telco Cloud management and orchestration are inherently complex.
- Different Telco Cloud stakeholders, such as operators, vendors, and application developers, have diverse requirements and varying understandings regarding management and orchestration.

See White Paper “NFV evolution: Towards the Telco Cloud”, March 2025
https://www.etsi.org/images/files/ETSIWhitePapers/ETSI-WP-65-NFV-evolution-Towards_the_Telco_Cloud.pdf

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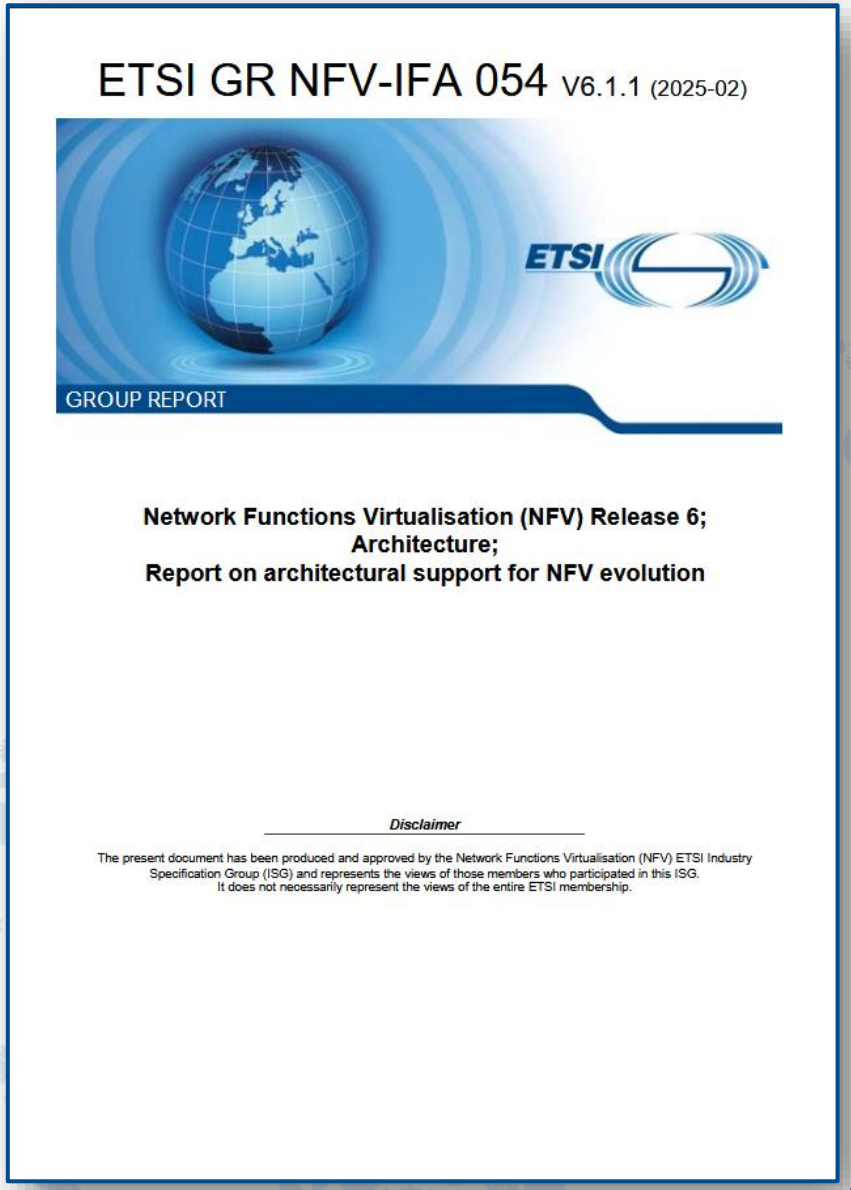
NFV architectural targets related to future trends

- Diversified and heterogenous infrastructure
- Cloud technologies accommodating different types of virtualisation forms
- New telco applications/services running on Telco Cloud infrastructure
- Automation and intelligence in NFV-MANO
- Telco PaaS
- Energy efficiency and carbon efficiency
- Multi-tenancy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GROUP REPORT

Network Functions Virtualisation (NFV) Release 6;
Architecture;
Report on architectural support for NFV evolution

Disclaimer

The present document has been produced and approved by the Network Functions Virtualisation (NFV) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG.
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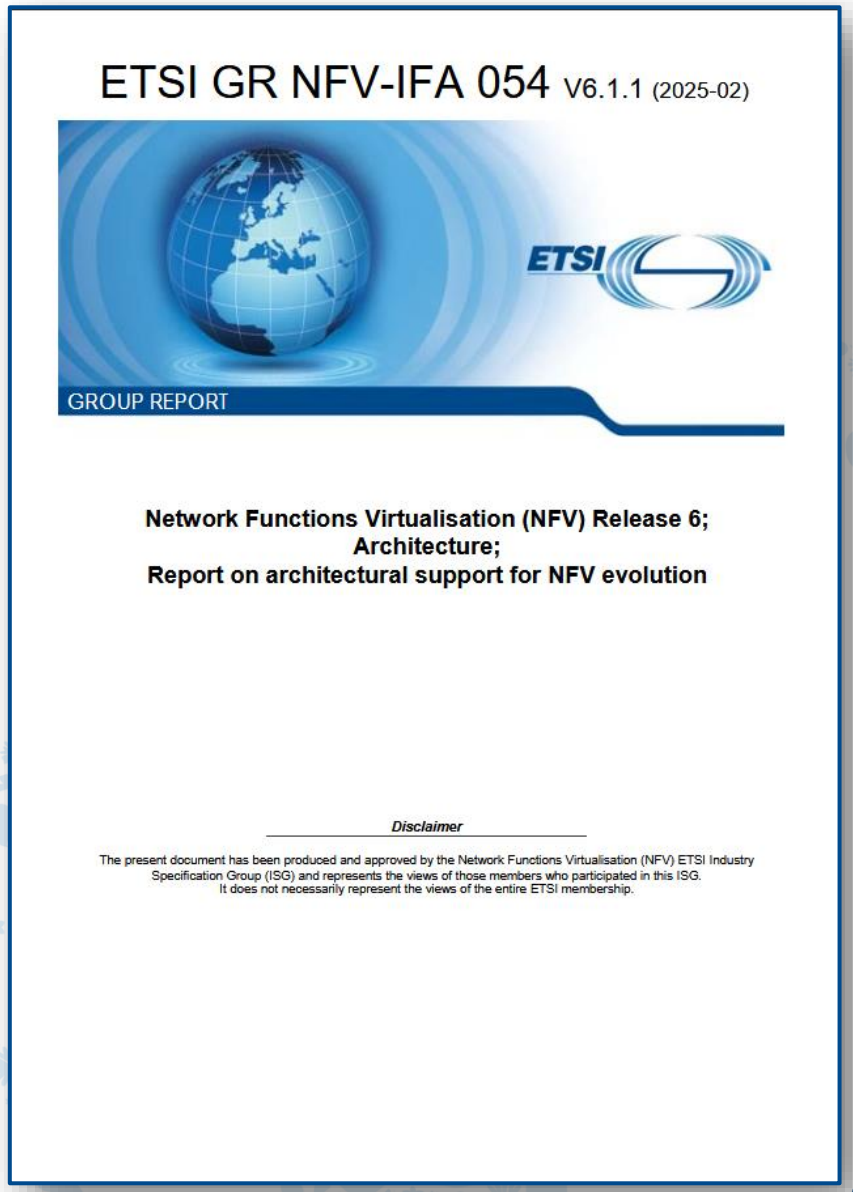
Key architectural principles in NFV evolution

Simplification

- Future NFV-MANO, a more declarative system
- Architectural view hierarchy
- Simplifying open-source integration complexity
- Improved modular design
- Services-driven architecture

Evolution

- Support more new telco cloud applications than the evolved VNFs/CNFs on top of the infrastructure.
- Platform services are more generic, extended, flexible to be customized to certain telco cloud applications.
- Focus more on the architectural functionality than interface.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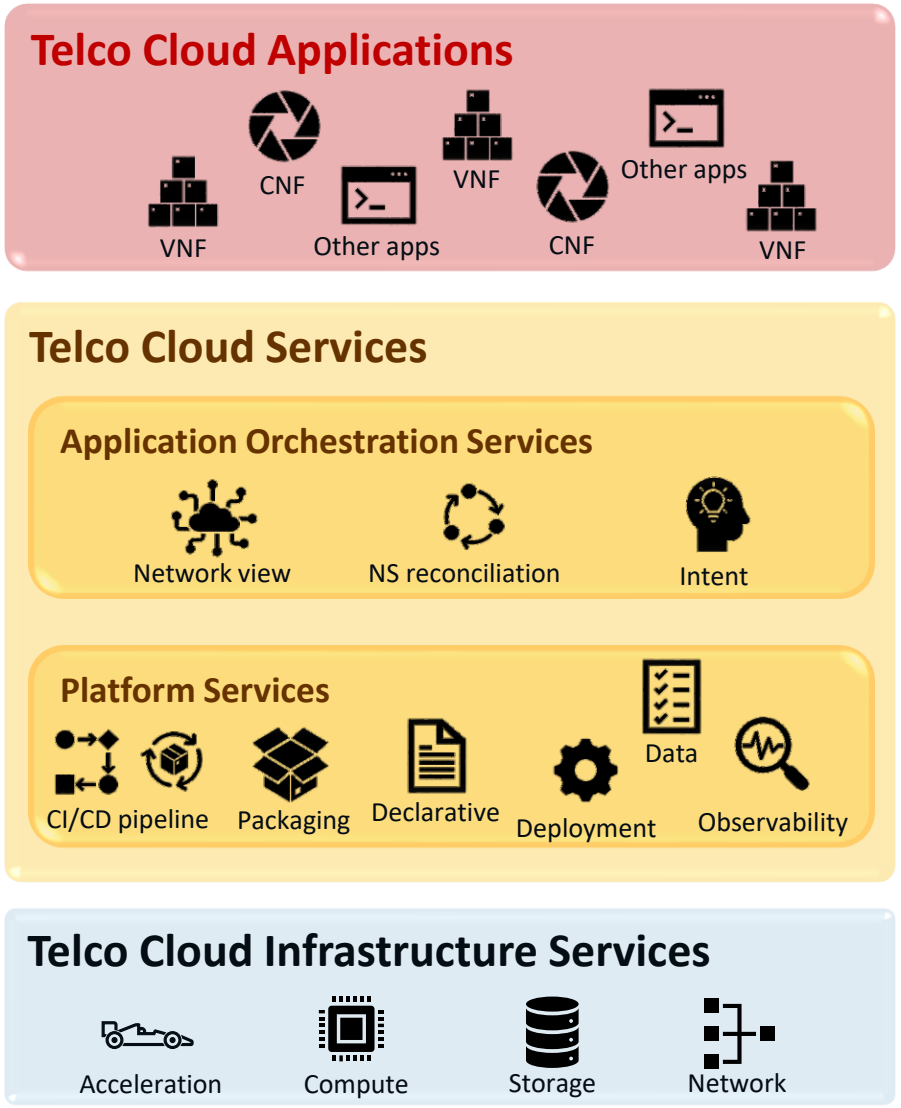
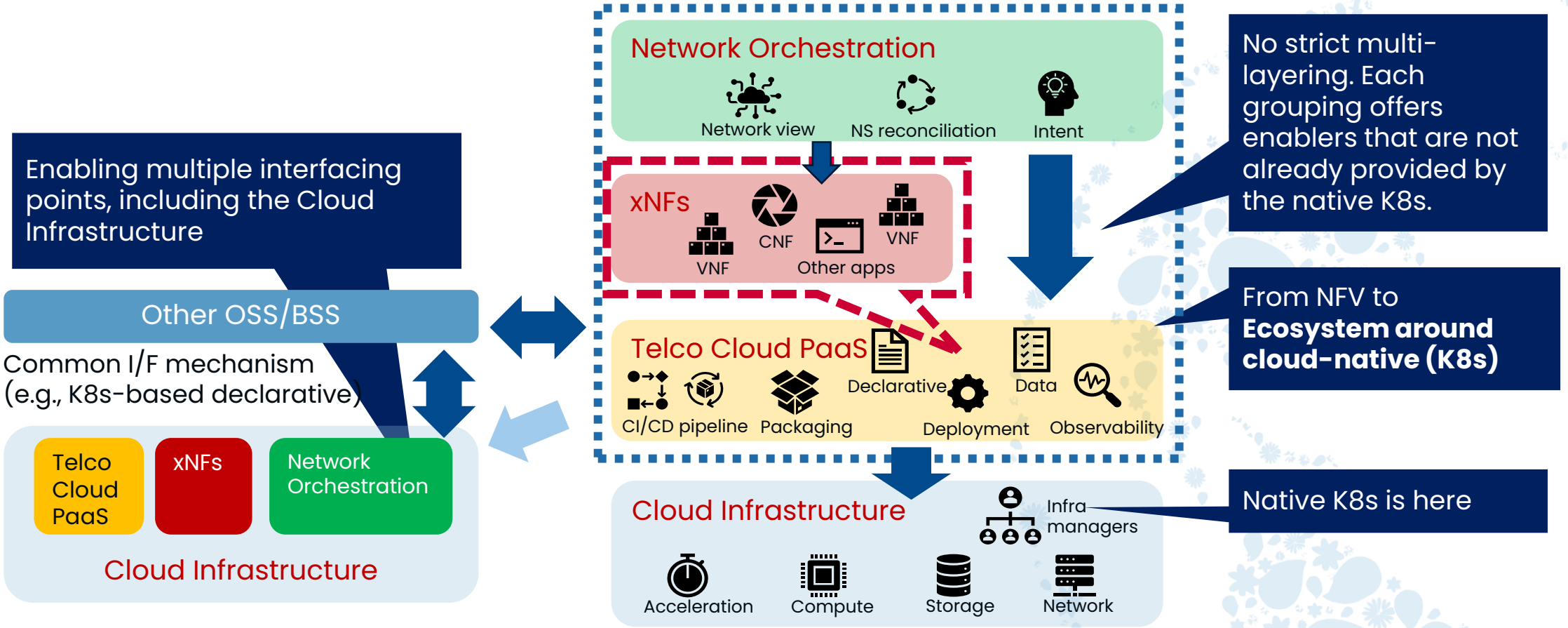
Rethinking NFV: Towards Telco Cloud Framework



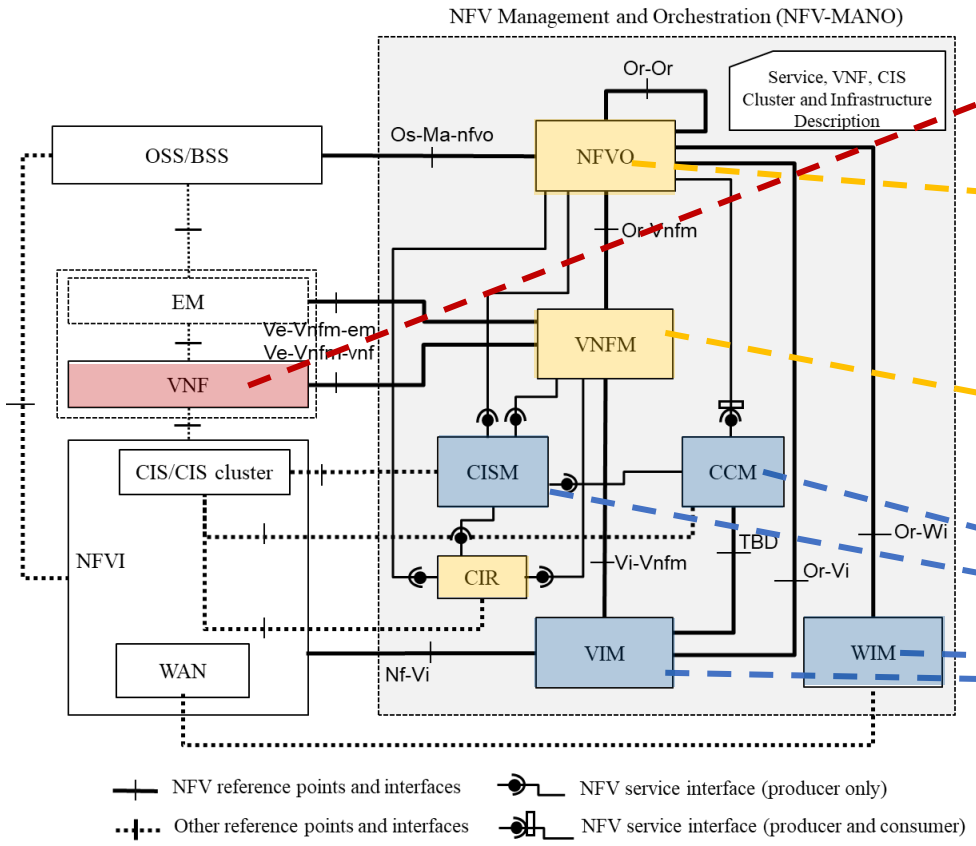
- **Enhance NFV capabilities and scope in framework for declarative management, smarter orchestration, and cloud native technology/components**
- Each architectural block encapsulates the full-stack of functionality
  - Telco Cloud Applications
  - Telco Cloud Services
  - Telco Cloud Infrastructure
- Architectural components expose service interfaces
  - Infrastructure services
  - Platform services
  - Orchestration services
- OSS/BSS communicates Telco Cloud with simplified declarative APIs design.

Vision: an ecosystem around “cloud-native” technologies & solutions

- **An ecosystem leveraging extensively used cloud-native industry solutions such as K8s.**
- **Adding value around the cloud-native ecosystem.**



NFV-MANO to Telco Cloud evolution



Simplify and consolidate interactions across layers

Telco Cloud Applications

VNF · CNF · Other apps · VNF · CNF · Other apps · VNF

Application Orchestration Services

NFVO · IM · MDAF

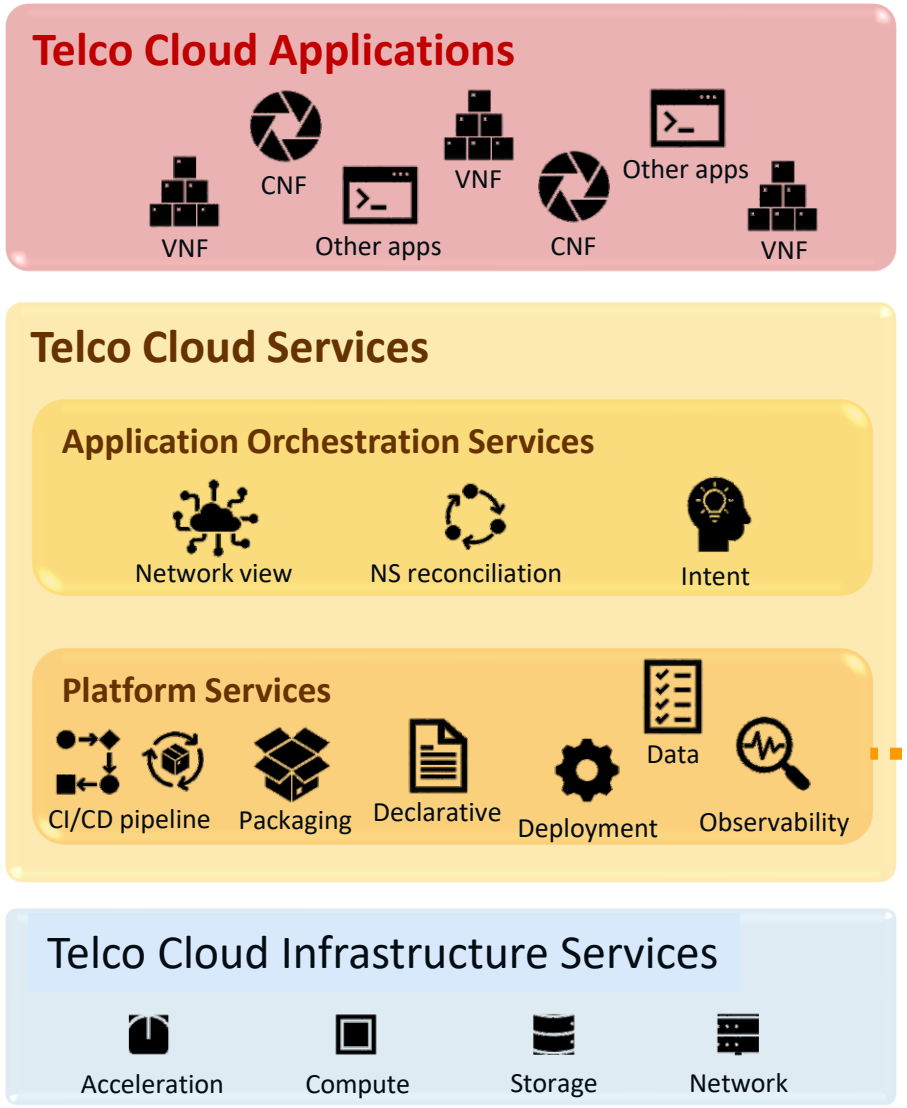
Platform Services

VNFM · VGOAM · CIR · MDAF

Telco Cloud Infrastructure Services

VIM · CISM · PIM · CCM · WIM

Telco PaaS Services



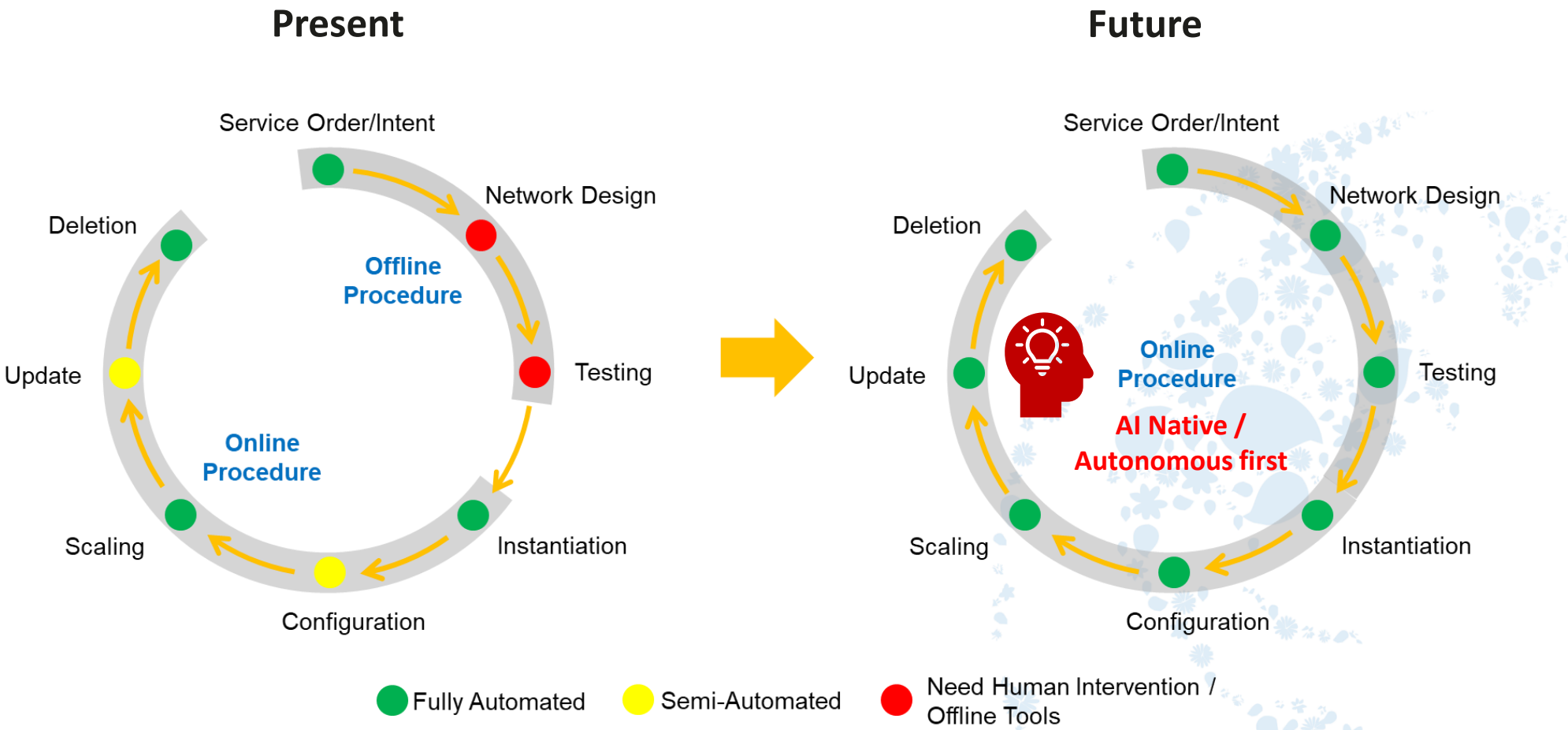
Example Platform Services

Generic OAM functions

Technology Enablers

Principle	Approach
Declarative management APIs	• Simplifying workflows, "infrastructure/management as code," leveraging Kubernetes Resource Model based CRDs for intent expression and reconciliation.
GitOps	• Applying version control best practices for integrating declarative targets, identifying configuration drifts, maintaining consistency.
Resource and service controller-based platforms	• Achieving modularity and flexibility through dedicated controllers managing platform aspects.
Data as code and readable/versatile data models	• Using textual data models as "new code" for versioning, testing, CI pipelines; simplifying descriptors.
Automation and intelligence	• Integrating advanced tools and AI (big data, digital twin) for dynamic deployment, flexible configuration, optimization, decision-making, security.
Observability and security	• Enhanced real-time insights (in-band monitoring), MBSS, AI-driven threat detection for robust protection.

Autonomous networking, AI-native network management and operation



Transition to end-to-end automation

Declarative intent-driven network operations

Traditional Imperative: Command by command, step by step

- Are you OK for initiating a VNF?
- Yes, go on.

- Give this VNF that size of vCPU resource
- OK, get it.

- Find the closet DC to ETSI Building for locating this VNF
- Roger.

- Set its IP address 12.34.56.78
- Copy, will do.

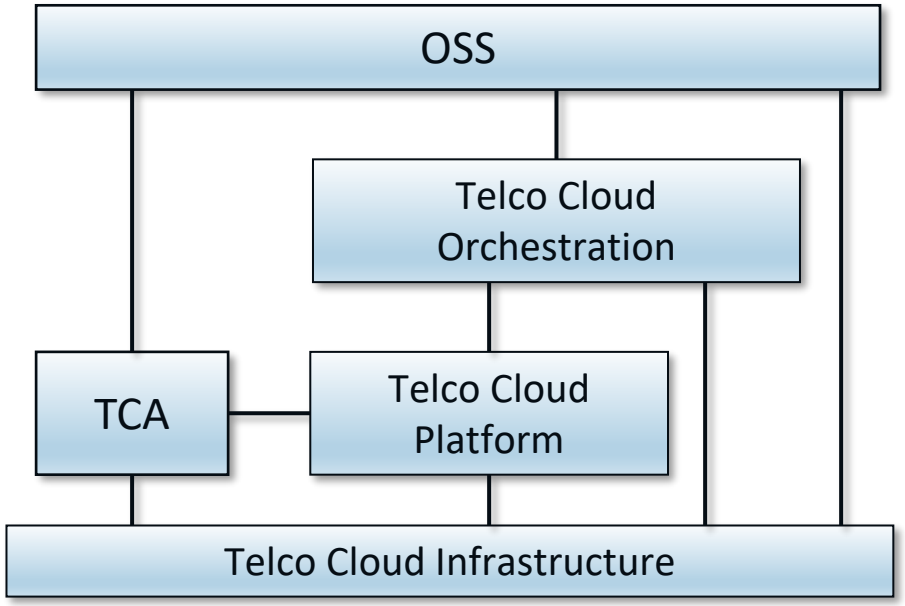
……

Declarative: What to achieve instead of how to do

- I'd like a new VNF with proper resource to improve e-meeting video quality in 300 delegates' mobile devices, ASAP.

- *Sure. Will figure out how to achieve and have it done in 5 minutes*

ETSI NFV Telco Cloud Architecture



The specification development of the new Telco Cloud architectural framework is ongoing work.

Open Discussion points

1. *Telco Cloud Applications (TCA):*
   - "A TCA is a software implementation which realizes an application that can be deployed on the Telco Cloud Infrastructure" (According to NFV006)
   - What about PNFs and what about TC applications deployed on bare-metal?
2. *Management Functions & Management Services*
3. *Representation of multilayer/multiblock functionalities/capabilities*
4. *TCA Descriptor and Packaging*
   - Endorsement of the CRD schema format and the K8S operator paradigm
5. *TC Network Management*
6. *TC Support for Automation*

Summary

- NFV-MANO evolves towards orchestration and management of the Telco Cloud.
- Evolution is about:
  - The design of a new reference architecture
  - Involves splitting/converging functionality and offering declarative management
  - enabling autonomous network operations and energy efficiency
  - integrating heterogeneous infrastructures for deploying diverse applications via cloud-native and AI-native philosophy.

Call for Action

The specification development of the new Telco Cloud architectural framework is ongoing as one of work item in Release 6, your feedback is much appreciated!

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

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Any further questions?

Contact us:

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