



The Standards People

Nov-2019

ETSI ISG ENI**

Creating an intelligent service
optimization solution

Chairman:	Dr. Raymond Forbes (Huawei Technologies)
Vice-Chairman:	Mrs. Haining Wang (China Telecom)
Vice-Chairman:	Dr. Luca Pesando (Telecom Italia)
Presented by: Secretary:	Dr. Yue Wang (Samsung)
Technical Officer:	Mrs. Korycinska Sylwia (ETSI)
Technical Manager:	Dr. Shucheng Liu "Will" (Huawei Technologies)

Outline

ETSI ISG ENI progress

- Value & Vision
- Introduce the status of ETSI ISG ENI (Experiential Networked Intelligence)
- Network intelligence activities in 2016 - 2019

Business Value & Vision

• Network: Traditional → SDN & NFV → Autonomic Network

Network technology evolution

- Rapidly changing network conditions
- More services, more users

Network intelligence

Network mgmt. and operation evolution

- Human decisions
- Complex manual configuration

Orchestration and operation intelligence

ENI

AI-based Operation & Data Processing

- Network perception and analysis
- Data driven policy
- AI-based closed-loop control

Enhanced network experience

Better customer experience

Improved QoE of service

Increased service value

Improved business efficiency

Reduced OPEX

Increased profit

5G/IoT automation

Better QoE service delivery

ENI Goals and Leadership Team

Core idea: Network perception analysis, data-driven policy, AI based closed-loop control

ETSI ISG ENI founded at 17Q1, Release 1 (2017-2019)

- The ISG ENI focuses on improving the operator experience, adding closed-loop artificial intelligence mechanisms based on context-aware, metadata-driven policies to more quickly recognize and incorporate new and changed knowledge, and hence, make actionable decisions.
- In particular, ENI will specify a set of use cases, and the architecture, for a network supervisory assistant system based on the ‘observe-orient-decide-act’ control loop model.
- This model can assist decision-making systems, such as network control and Interact with the domain orchestration systems, to adjust services and resources offered based on changes in user needs, environmental conditions and business goals.

- Release 1 defined big data-analysis functionality

Extended at 19Q1 into Release 2(2019-2021)

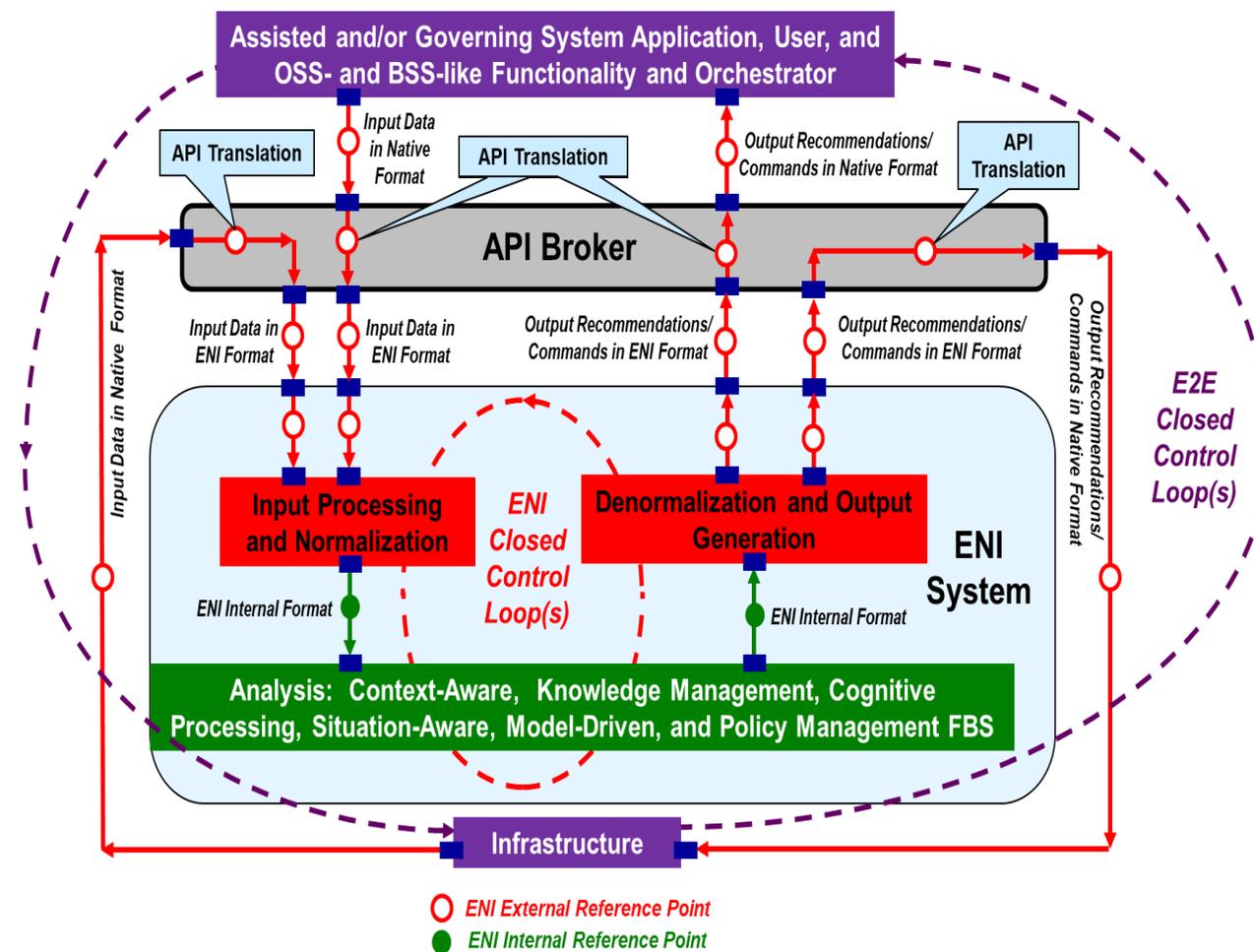
- New Terms of reference included: external reference points, implementation, PoC, plug-tests and open-source relationships.
- Release 2 defines loop control in the real-time network.

The ISG ENI Leadership team

Role	Name (Organization)
Chairman	Dr. Raymond Forbes (Huawei)
Vice Chairman	Mrs. Haining Wang (China Telecom)
Second Vice Chairman	Dr. Luca Pesando (Telecom Italia)
Secretary	Dr. Yue Wang (Samsung)
Technical Officer	Mrs. Sylwia Korycinska (ETSI)
Technical Manager	Dr. Shucheng Liu “Will” (Huawei)
ENI ISG PoC Review Team	Raymond Forbes (Huawei) Sylwia Korycinska (ETSI Technical Officer) Michele Carignani (ETSI CTI) Bill Wright (Redhat) Haining Wang (China Telecom) Luca Pesando (Telecom Italia) Mostafa Essa (Vodafone) Antonio Gamelas (Portugal Telecom)

ENI Requirements & High-Level Functional Arch

Level 1	Level 2
Service and network requirements	General requirements
	Service orchestration and management
	Network planning and deployment
	Network optimization
	Resilience and reliability
	Security and privacy
Level 1	Level 2
Functional requirements	Data Collection and Analysis
	Policy Management
	Data Learning
	Interworking with Other Systems
	Mode of Operations
	Model training and iterative optimization
Level 1	Level 2
Non-functional requirements	Performance requirements
	Operational requirements
	Regulatory requirements
	Non-functional policy requirements



High-Level Functional Architecture Diagram in DGS/ENI-005 (GS ENI 005)

ENI Definition of Categories for AI Applied to Networks



Category	Name	Definition	Man-Machine Interface	Decision Making Participation	Data Collection and Analysis	Degree of Intelligence	Environment Adaptability	Supported Scenario
Category 0	Manual O&M	O&M operators manually control the network and obtain network alarms and logs	How (command)	All-manual	Single and shallow awareness (SNMP events and alarms)	Lack of AI based understanding (manual management and control)	Fixed	Single scenario
Category 1	Assisted O&M	Automated scripts are used in service provisioning, network deployment, and maintenance. Shallow perception of network status and machine suggestions for decision making	How (command)	Provide suggestions for machines or humans and help decision making	Local awareness (SNMP events, alarms, KPIs, and logs)	Limited analysis capability	Limited adaptability to changes	Selected scenarios
Category 2	Partial automation	Automation of most service provisioning, network deployment, and maintenance Comprehensive perception of network status and local machine decision making	How (declarative)	The machine provides multiple opinions, and the machine makes limited decisions	Comprehensive awareness (basic telemetry data)	Deep analysis capability	Limited adaptability to changes	Selected scenarios
Category 3	Conditional automation	In specific environmental and network conditions there is automatic network control and adaptation	How (declarative)	Most of the machines make decisions	Comprehensive and adaptive sensing (such as data compression and optimization technologies)	Comprehensive analysis and knowledge; Short-term forecast capability	Adaptability to significant changes	Multiple scenarios
Category 4	Partial autonomy	Deep awareness of network status; in most cases the network performs autonomic decision-making and operation adjustment	What (intent)	Optional decision-making response	Adaptive posture awareness	Comprehensive analysis and knowledge Long-term forecast capability	Adaptability to significant changes	Multiple scenarios
Category 5	Full autonomy	In all environmental and network conditions, the network can automatically adapt	What (intent)	Machine autonomous decision	Adaptive optimization as a consequence of quality of service deterioration	Autonomic evolution and knowledge reasoning	Adaptability to any change	Any scenario

Autonomy capability continuous improvement

ENI PoC project #1: Intelligent Network Slice Lifecycle Management

AI-based predictor:

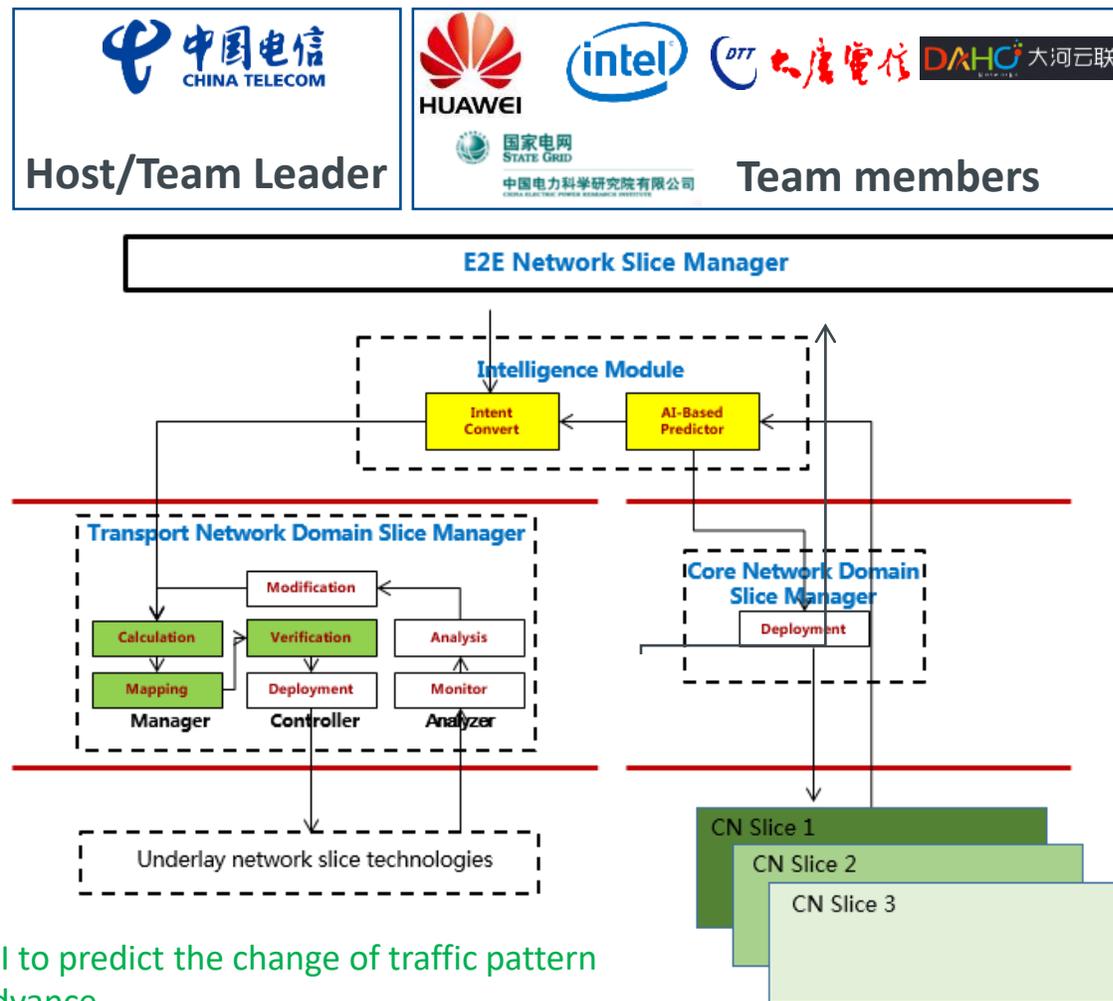
- For generating new scale up/down and converting the intent to suggested configuration.
- LSTM is used for traffic prediction.

TNSM:

- Provides underlay network control to satisfy the network slice requests.
- FlexE and a FlexE-based optimization algorithm are used for underlay network slice creation and modification.

CNSM:

- Provides core network control to satisfy the network slice requests



Showcases:

- Beijing, Sep 19-20, 2018
- Nanjing, Nov 14-16, 2018
- Warsaw, Apr 10, 2019
- Hague, Oct 15, 2019

- ✓ PoC Project Goal #1: Demonstrate the use of AI to predict the change of traffic pattern and adjust the configuration of network slice in advance.
- ✓ PoC Project Goal #2: Demonstrate the use of intent based interface to translate tenant requirements to network slice configuration and intelligent network slice lifecycle management on demand.

Network Intelligence Activities in 2016 - 2019

Past Activities:

- Forum on Network Intelligence, Dec'16, Shenzhen, China
- ENI & SDNIA Joint Forum, Sep'17, Beijing, China
- ENI & H2020-SliceNet Workshop, Dec'17, London, UK
- ENI & 5GPPP MoNArch Workshop, Jun'18, Turin Italy
- ENI & CCSA TC610 AIAN Joint Forum, Sep'18, Beijing, China
- ENI & 5Tonic Joint Workshop, Dec'18, Madrid, Spain
- ENI & Samsung joint Workshop, Apr'19, Warsaw, Poland
- ENI & Altice Lab / Portugal Telecom joint Workshop, Jul'19, Aveiro, Portugal



Forum on Network Intelligence, Dec'16



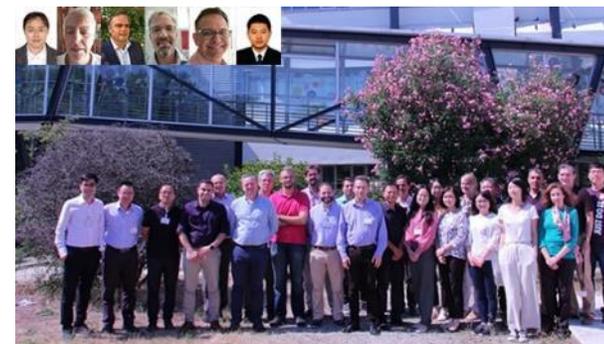
ENI & SDNIA Joint Forum on Network Intelligence, Sep'17



ENI & SliceNet workshop, Dec'17



ENI & Samsung Workshop, Apr'19



ENI & Altice Lab / Portugal Telecom Workshop, Jul'19

ETSI ENI#12 meeting will be hosted by ETSI in France, on Dec 9 - 12,
2019.

You are welcome to join us!

Contact Details:

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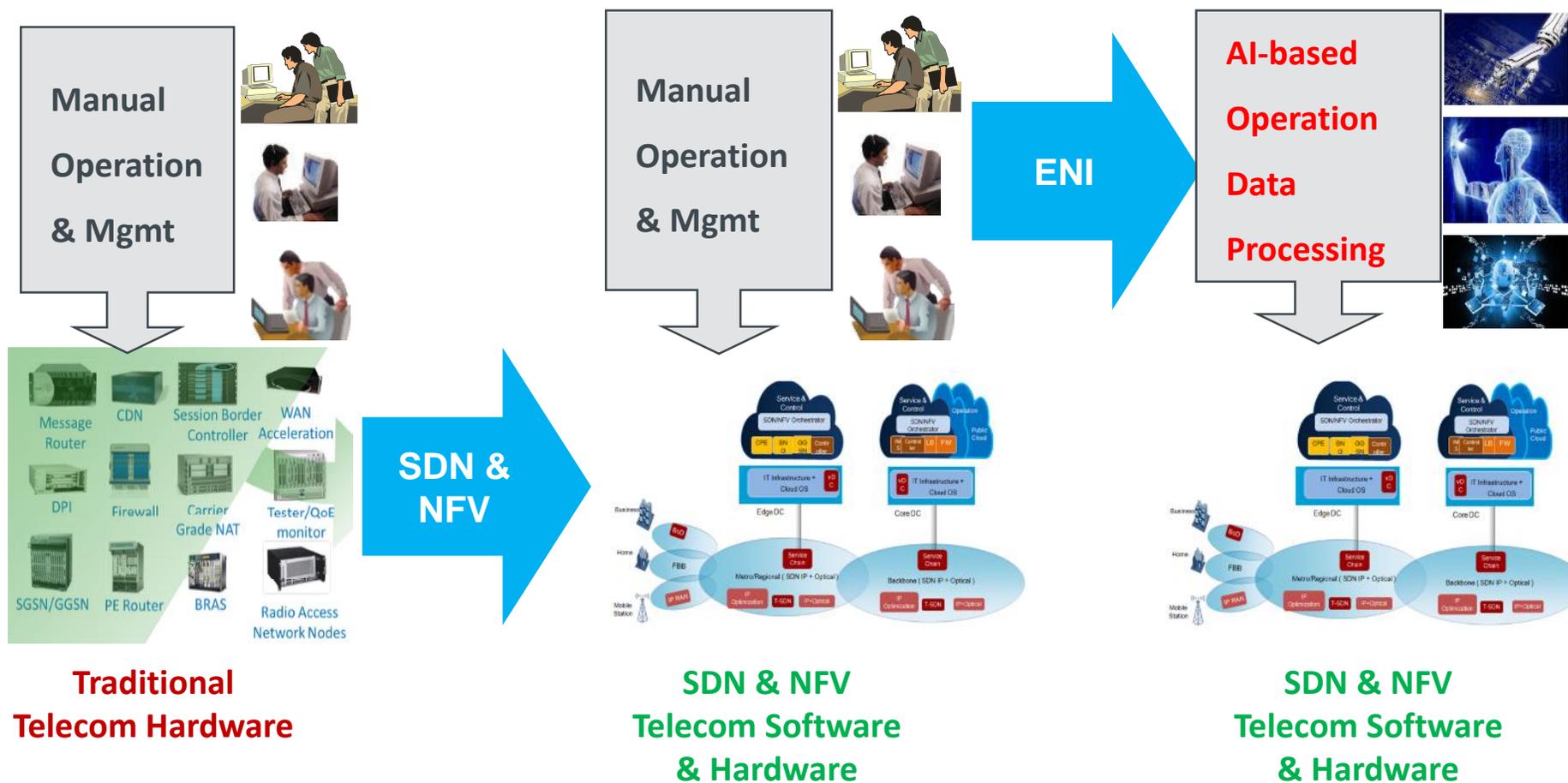
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Acknowledge the assistance of

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Thank you!

ENI Vision



**Traditional
Telecom Hardware**

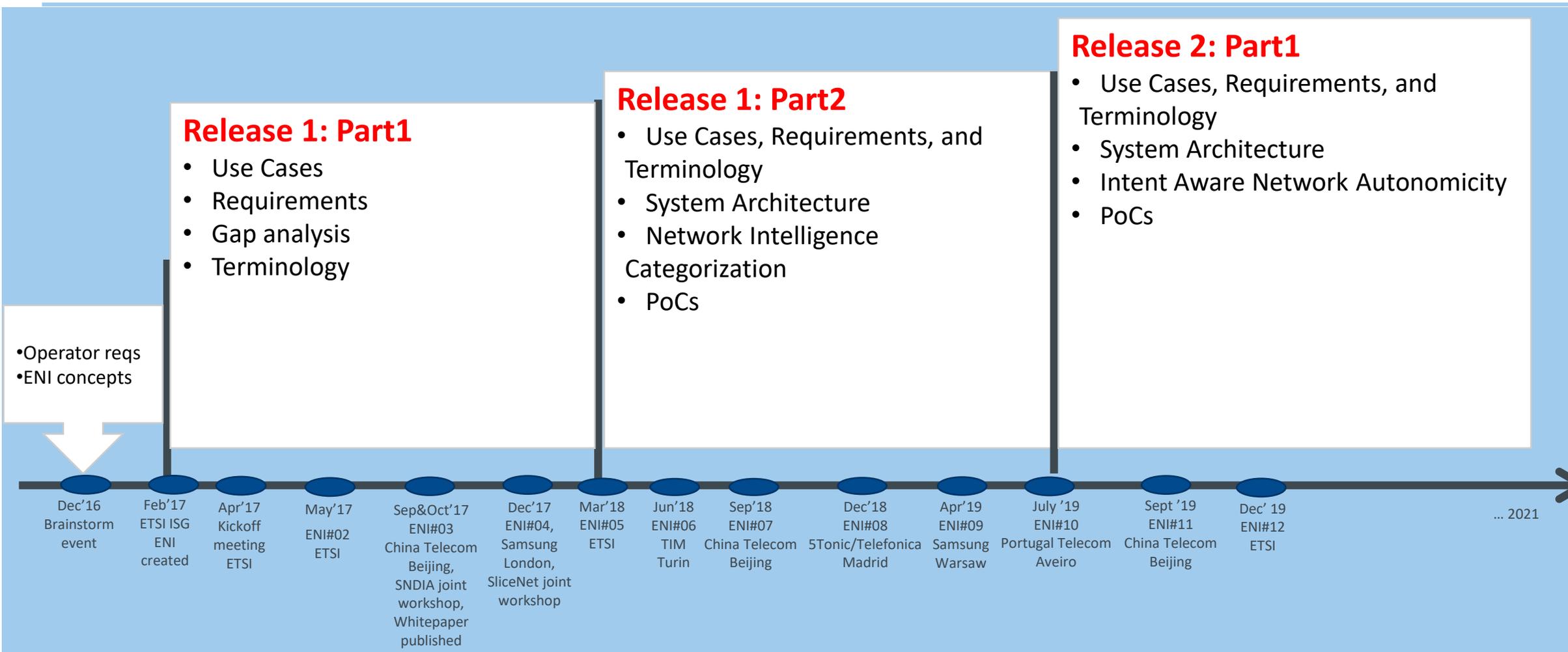
**SDN & NFV
Telecom Software
& Hardware**

**SDN & NFV
Telecom Software
& Hardware**

ETSI ISG NFV

ETSI ISG ENI

ENI Work Plan



Four F2F meetings per year: 19Q4 Hosted by ETSI in Sophia-Antipolis.

Online meeting every week <https://portal.etsi.org/tb.aspx?tbid=857&SubTB=857#5069-meetings>

ENI Published Deliverables & Workplan

Published ENI deliverables:

- [ETSI GR ENI 001 V2.1.1 \(2019-09\)](#) **Published**
Use Cases – Yue Wang (Samsung)
- [ETSI GS ENI 002 V2.1.1 \(2019-09\)](#) **Published**
Requirements – Haining Wang (China Telecom)
- [ETSI GR ENI 003 V1.1.1 \(2018-05\)](#) **Published**
Context-Aware Policy Management Gap Analysis – John Strassner (Huawei)
- [ETSI GR ENI 004 V1.1.1 \(2018-05\)](#) **Published**
Terminology – Yu Zeng (China Telecom)
- [ETSI GS ENI 005 V1.1.1 \(2019-09\)](#) **Published**
System Architecture – John Strassner (Huawei)
- [ETSI GS ENI 006 V1.1.1 \(2018-05\)](#) **Published**
Proof of Concept (PoC) Framework - Luca Pesando (TIM)

Accessible via [Work Item Monitoring - ENI](#)

Ongoing ENI Work Items and Rapporteurs:

- ENI 001 (WI RGS/ENI-0014)
Use Cases (Release 2) – Yue Wang (Samsung)
- ENI 002 (WI RGS/ENI-0015)
Requirements (Release 2) – Haining Wang (China Telecom)
- ENI 004 (WI RGR/ENI-010)
Terminology (Release 2) – Yu Zeng (China Telecom)
- ENI 005 (WI DGS/ENI-016)
System Architecture (Release 2) – John Strassner (Huawei)
- ENI 006 (WI RGS/ENI-012)
PoC Framework (Release 2) – Bill Wright (Redhat/IBM)
- ENI 007 (WI RGR/ENI-011)
Definition of Categories for AI Application to Networks – Luca Pesando (TIM)
- ENI 008 (WI DGR/ENI-0013)
Intent Aware Network Autonomicity – Yannan Bai (China Telecom)
- ENI 009 (WI DGR/ENI-0017)
Definition of data processing mechanisms - Weiyuan Li (China Mobile)