# ETSI Work on AI for Network and Service Management

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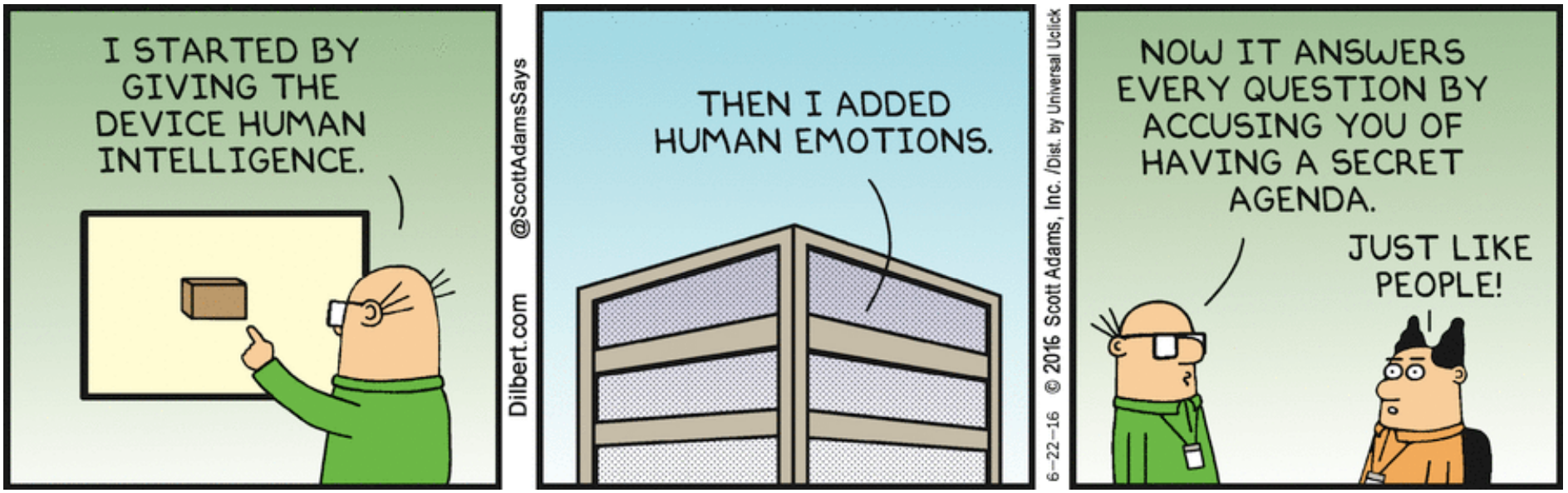
# What Intelligence Requires




- A purpose beyond divergent goals
- Aliment to grow and strengthen
- Guidance from the elder and superior ones

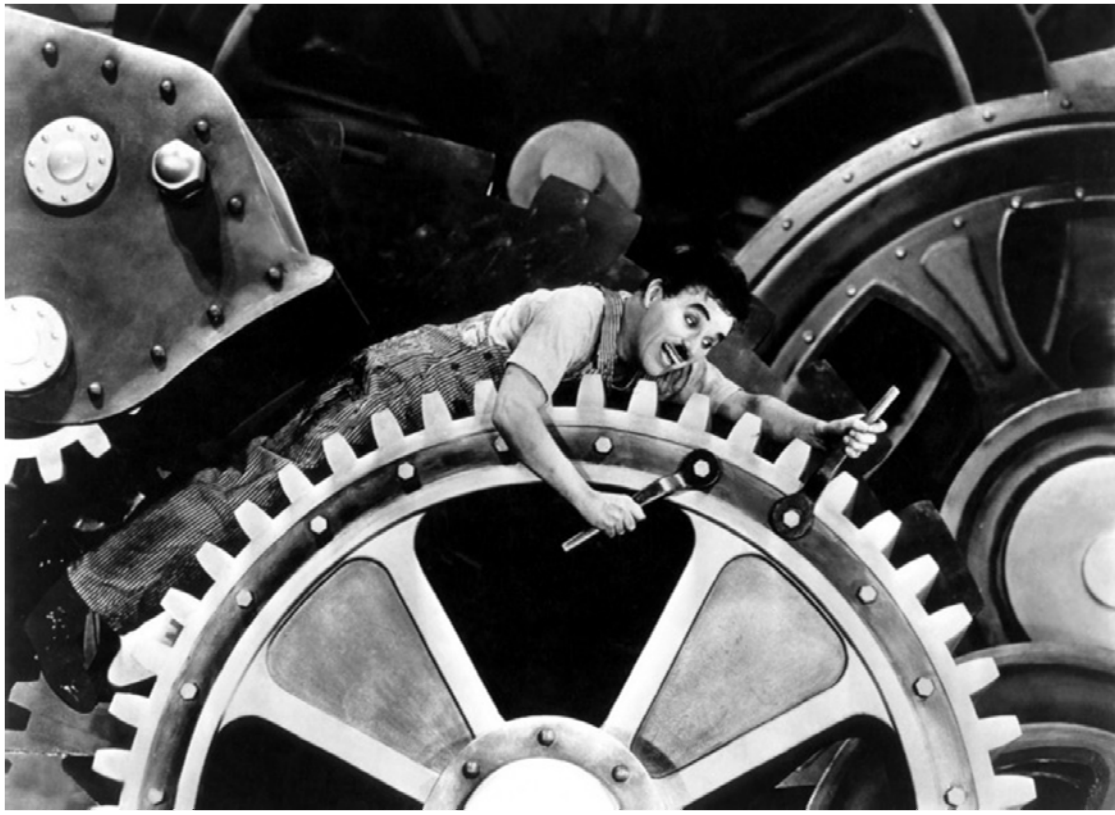
# The Raison D´être: Automation

Taking advantage of the Software Network

- Elasticity
- Homogeneity
- Programmability
- Abstraction

Leveraging the evolutionary factors

- NFV / SDN /. . .
- Former experiences applying AI
- Adapted to the networking environment



# ETSI ISG ZSM

14 founding members


Key objective

Enable future operational processes and tasks to be executed automatically, end-to-end

Goal

Accelerate the definition of the end-to-end service management architecture, spanning both legacy and virtualized network infrastructures

Formed under the auspices of the ETSI ISG

Industry convergence

Facilitate collaboration with the relevant open-source projects, standardization bodies and fora

Interoperability

Provide a common foundation to enable a diverse ecosystem of open source groups to produce interoperable solutions

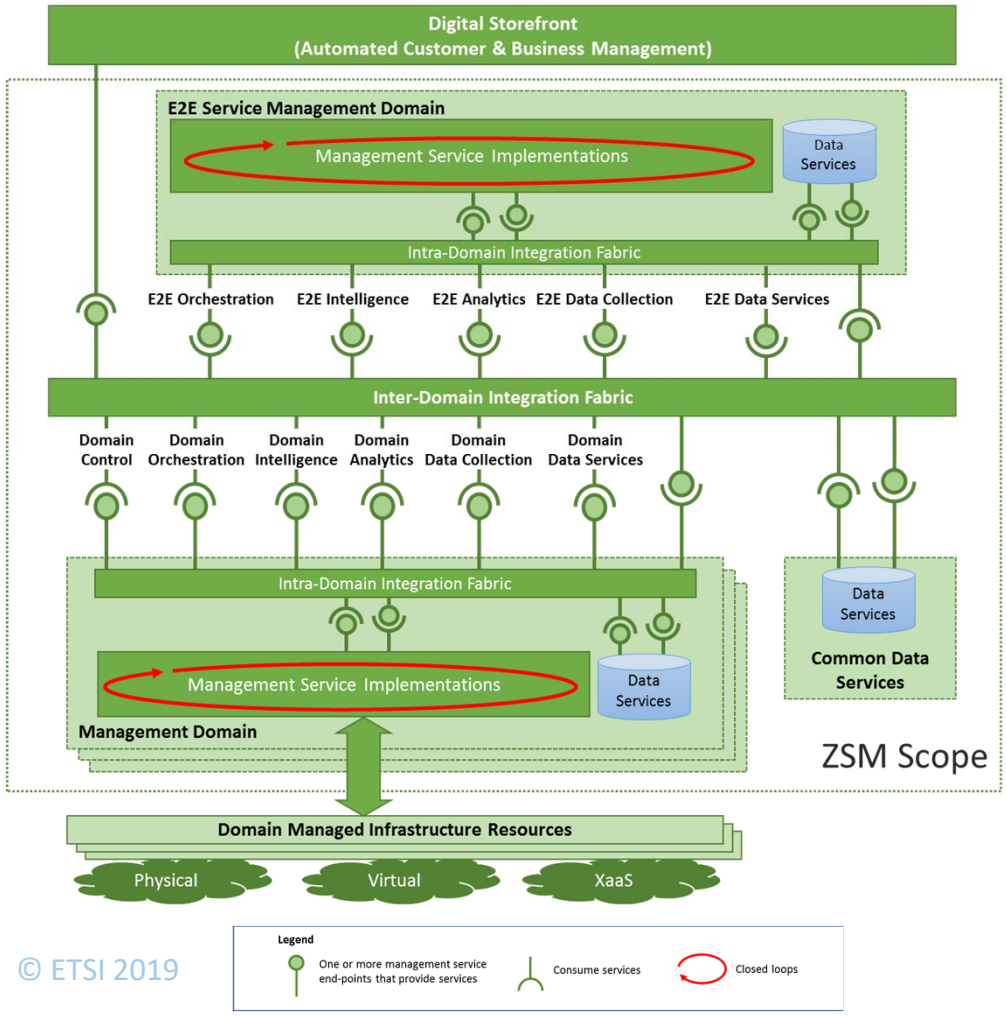
# ZSM Status

- Seven active Work Items:
  - ZSM 001: Requirements based on documented scenarios
  - ZSM 002: Reference Architecture
  - ZSM 003: End to end management and orchestration of network slicing
  - ZSM 004: ZSM Landscape
  - ZSM 005: Means for Automation
  - ZSM 006: Proof of Concept Framework
  - ZSM 007: Terminology


65 members; 19 operators

The ZSM drafts are publicly available via the ZSM open area

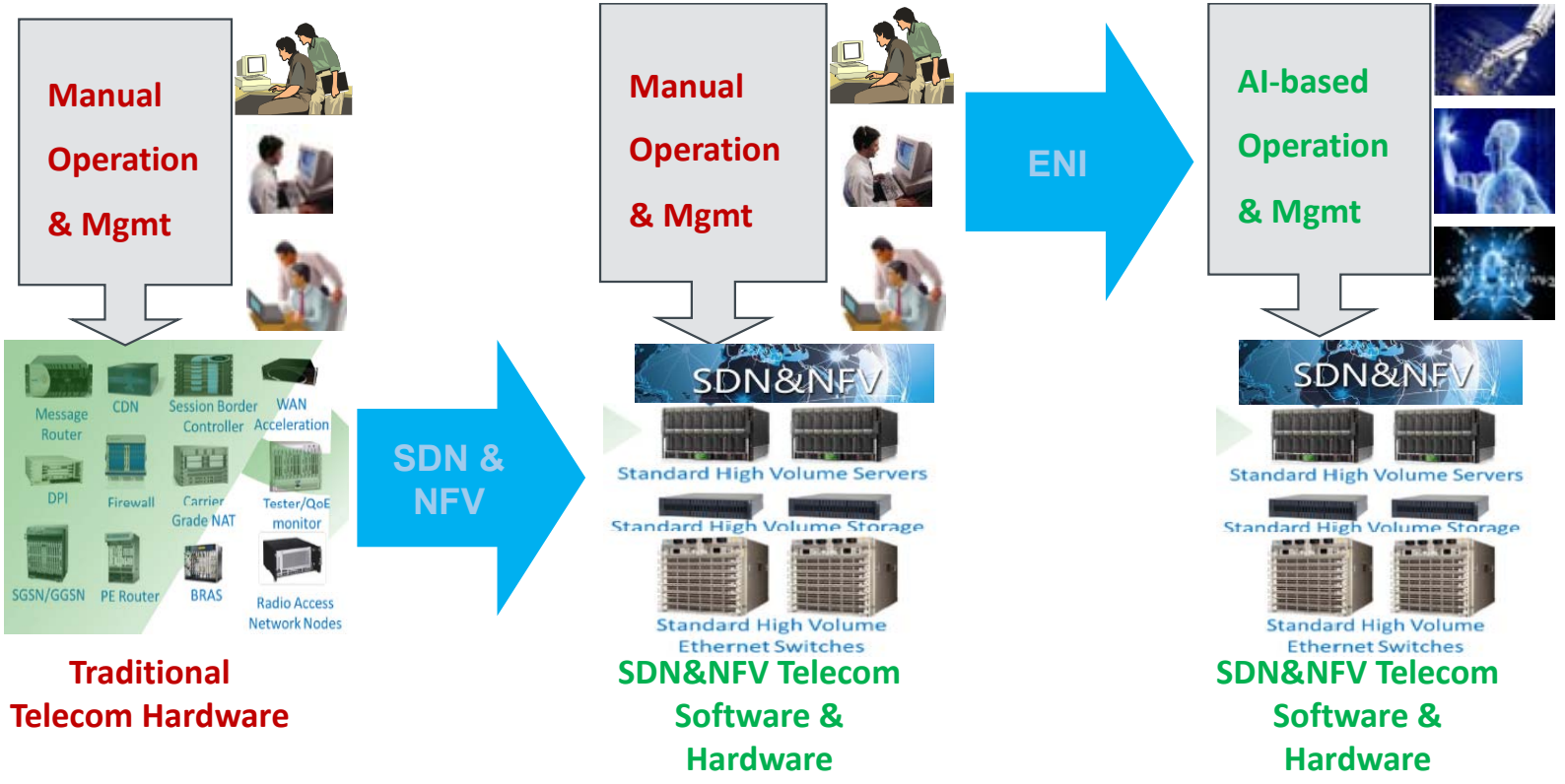
# ZSM Reference Architecture




## Architectural principles:

- Modular, flexible, scalable and extensible service-based architecture
- Separation of concerns: network domain management and end-to-end cross-domain service management; resources in multiple domains can be managed separately.
- Support of open interfaces
- Support of model-driven service and resource abstraction
- Support of intent-based interfaces
- Enablement of adaptive closed-loop management automation, where the automated decision-making mechanisms can be bounded by rules and policies
- Support of stateless functional components
- Design for failure

# Experience, Food for Thought




Many AI mechanisms proposed

- But not demonstrated in operational conditions

Heavily dependent on training, testing and operational data

- Data processing is essential

And the network invariants, very different from other application spaces

- Topology
- Flow
- Integration

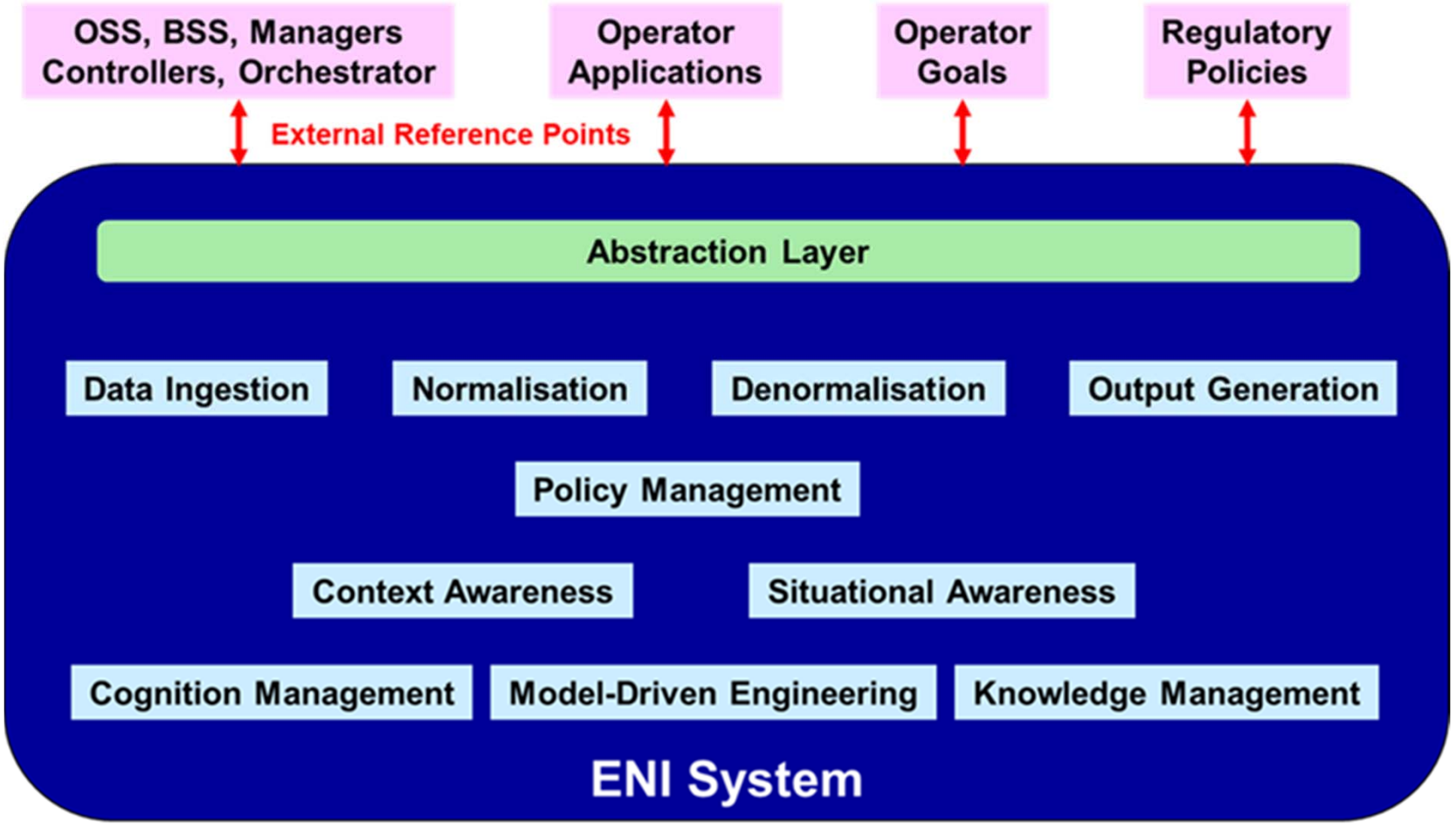
# The ENI Community and Goals


**Network perception analysis, data-driven policy, AI based closed-loop control**

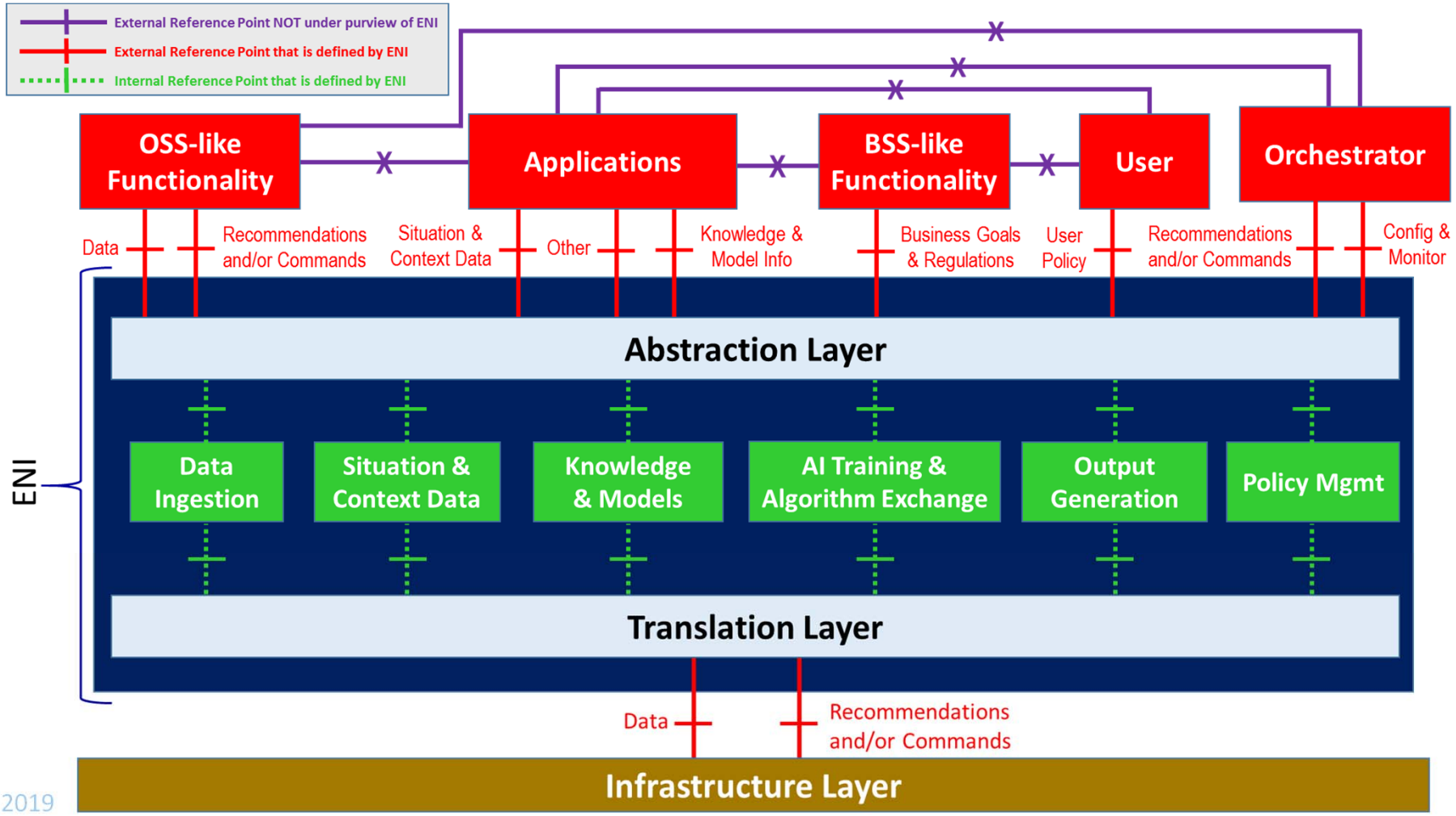
- Add closed-loop artificial intelligence mechanisms based on context-aware, metadata-driven policies to more quickly recognize and incorporate new and changed knowledge
- Specify a set of use cases, and the architecture, for a network supervisory assistant system based on the 'observe-orient-decide-act' control loop model
- Use this model to assist decision-making systems, such as network control and management systems, to adjust services and resources offered based on changes in user needs, environmental conditions and business goals

Extended into ENI Release 2, 2019-2021 – the Terms of Reference now include: implementation, PoC, plug-tests and open-source relationships

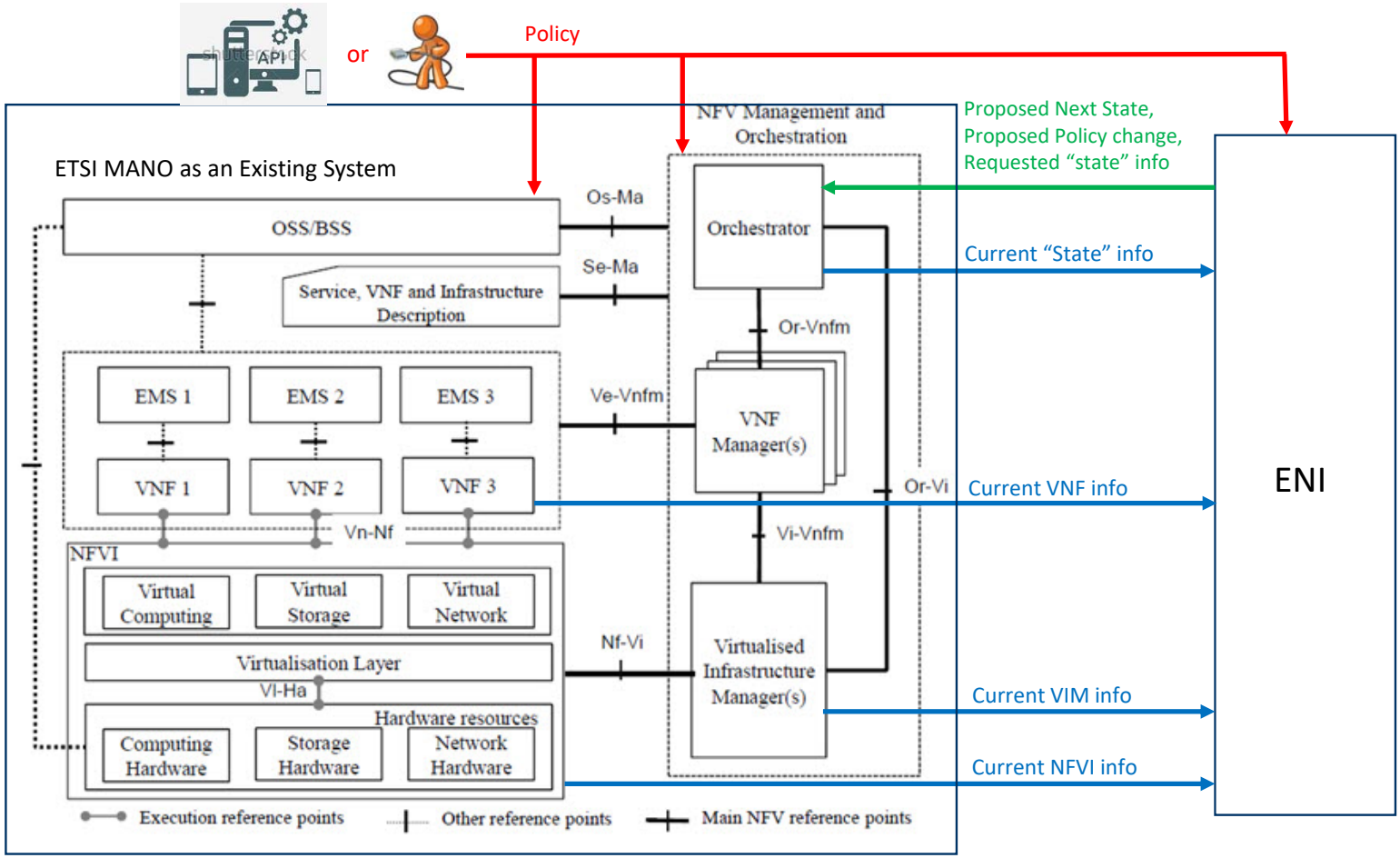
# From the Conceptual ENI Architecture…



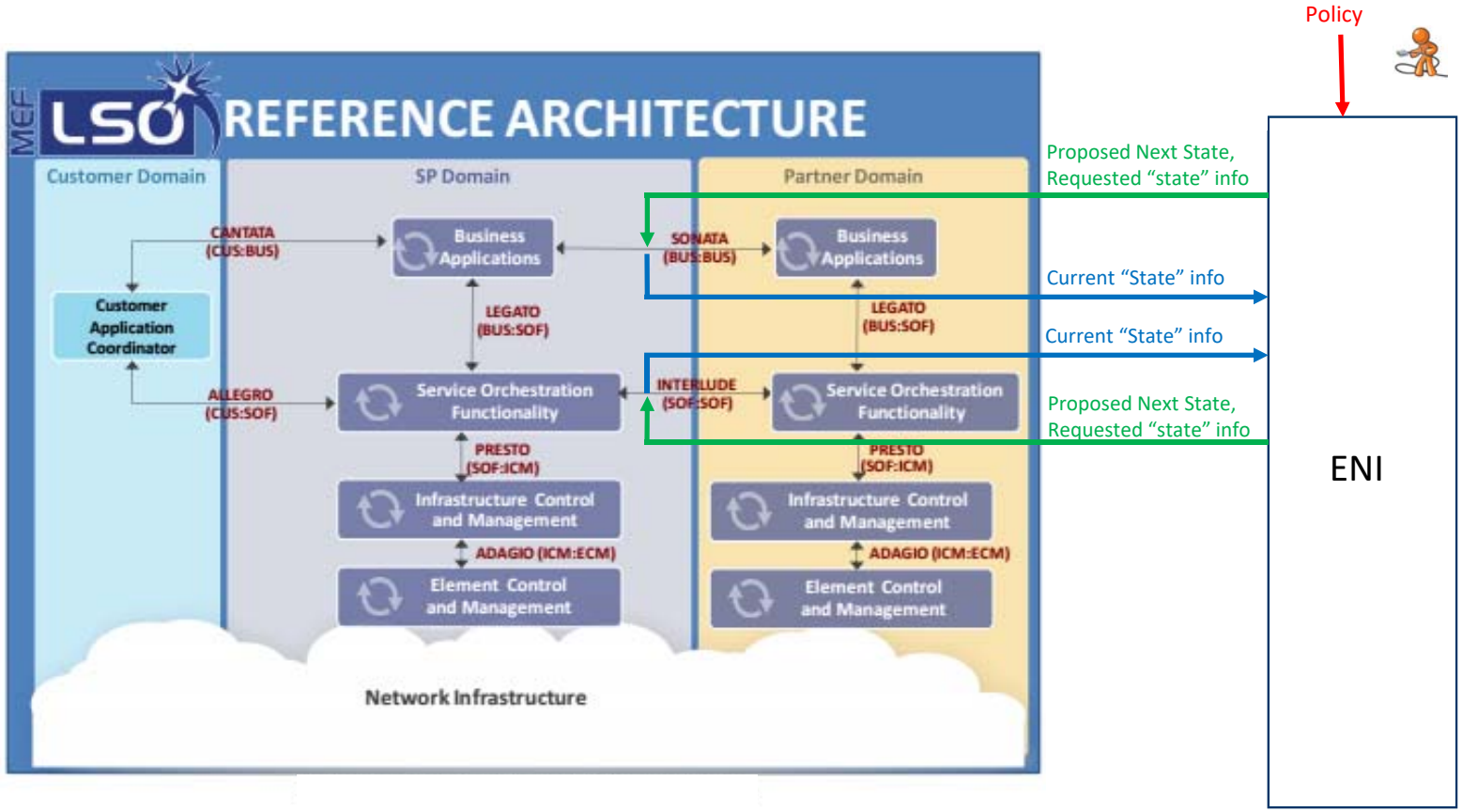
# … To an Initial Reference Architecture



# ENI Assisting MANO



# ENI Assisting MEF LSO



# Keeping the Human in the Loop

- Integrated development environments
  - Supporting a dialectic way
- Open collaborative experimentation
  - Support data generation
- IAI
  - Intelligible audit track: the who, the what, the when
- And SAI
  - Deal with adversarial AIs
  - And consider *circuit breakers*

# A Time of Transition