



GSC | 22
MONTREUX, SWITZERLAND





The Standards People

Network & Service Automation with AI

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Cognitive Technologies in the Focus of ETSI

ETSI puts the focus on “cognitive” in the context of standards development activities

Cognitive technologies are considered to be a major technology driver including development in applications

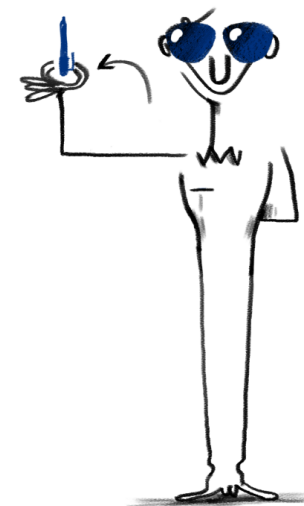
ETSI's Long Term Strategy sets the framework for looking at cognitive technology across the board in ETSI.

‘Cognitive’ defined as: a mental action or process of acquiring knowledge and understanding (The Oxford Dictionary) through thought, experience, and the senses. (in the non-machine context)

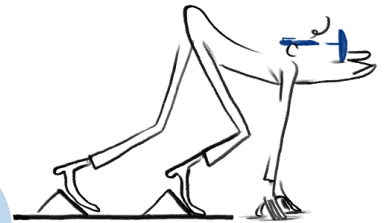
[The] digital transformation of our economies impacts and is influenced by all aspects of life from the way we live, work, care and are cared for, to the way in which we are governed and interact with our governments.

Its influence and impact is expected to penetrate ever wider and deeper, driven by and creating a dynamic and evolving world of digital and cognitive technologies and their applications.

[ETSI Long Term Strategy, p. 6.]



ETSI Roadmap on Artificial Intelligence (AI)



EDUCATION AND AWARENESS

Broad education, information and awareness raising around AI in ETSI

IMPACT ANALYSIS

Technical Bodies analyse possible impact of AI for their scope of work

AI @ ETSI

ETSI TECHNOLOGY ROADMAP

Include AI into ETSI Technology Roadmap

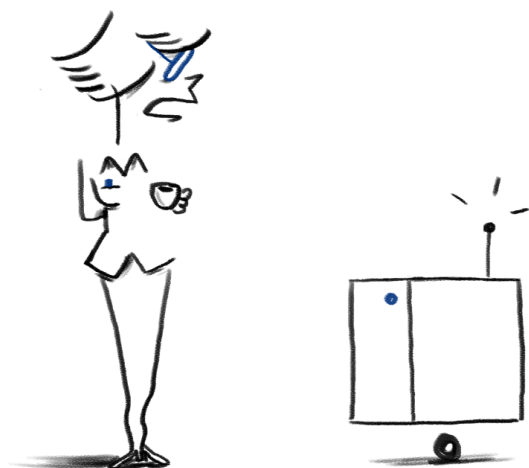
=> Effective mechanisms for addressing AI issues

ACTION PLAN AND IMPLEMENTATION

Identify and agree on actions
Integrate AI into Technical Work Programme

Artificial Intelligence Impacts in ETSI (1/6)

Artificial Intelligence enables the display of behaviour that may be described as intelligent:



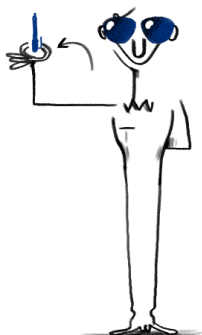
- It may be used to 'select technologies to be applied' in different parts of the network
- It implies that: Artificial Intelligence is used to recommend or make **decisions**
- It links the data collected from existing and new sensors to "**intelligently**" propose and activate the **Best Practice**
- This **Best Practice** implies a learning Phase
 - *Machine Learning*
 - *Rule based Learning (this is predictive; it may not result in evolved learning)*
 - *Interaction and training (assisted or guided learning)*

Are technologies that are expected to be used and cited in our specifications

- Specification includes closed loop control with automated feed-back and learning from the AI experience. This may be direct or via an API or filter.
- Also partially open loop control where operators can interact with AI to improve their Learning and maintain hands-on supervision.
- ETSI Technical Bodies have Proof of Concept activities to validate the realization of the specifications.

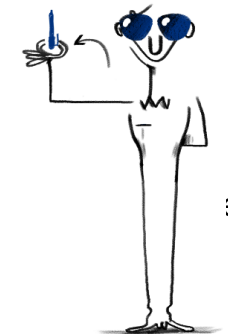
Artificial Intelligence Impacts in ETSI (2/6)

- The Impacts of Artificial intelligence on the ETSI Work-programme are:
 - **ISG ENI (Experiential Networked Intelligence) on using AI to collect and analyse data from existing systems in a cognitive network for network resource optimization using AI:**
 - ENI has specified a set of use cases and requirements, see ENI 001 & ENI 002,
 - ENI is specifying the generic technology independent architecture, for a network supervisory system based on the 'observe-orient-decide-act' control loop model ENI 005
 - Network intelligence Categorization ENI 007
 - Network Administration and day-to-day network optimization to recommend or control the optimised use of resources, using:
 - Closed loop learning and context-aware policies
 - Big data analysis using current and historic records
 - **ISG ZSM (Zero touch network and Service Management) aims to enable automation and allows all operational processes and tasks – delivery, deployment, configuration, assurance, and optimization – to be executed automatically.**
 - The ZSM architecture supports separation of concerns: network domain management and end-to-end service management; both are responsible for fulfillment (orchestration and control), assurance and intelligent automation within their scopes.
 - Network and service intelligence capabilities include data-driven machine learning, artificial intelligence, etc. and can be used to enable adaptive closed-loop management automation at the network and service management levels.
 - The automated decision-making mechanisms (e.g. self-optimization, automated service assurance) can be bounded by rules and policies.



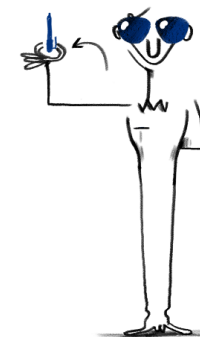
Artificial Intelligence Impacts in ETSI (3/6)

- **ISG MEC (Multi-access Edge Computing) opens the Network Edge to 3rd parties and provides network and context information.**
 - MEC is a key technology for 5G and a core building block for mission and business critical services for all industry segments.
 - Hosting of Applications in the network edge - at optimal location at the right time
 - Information Exposure from the network to the applications: Contextual information such as RAN network information, WiFi network information, Location, etc.
 - AI-based analytics & processing can be used to enable RAN intelligence and allow applications to adapt to the network and service behavior as well as the user experience.
 - Any new service can be added in the framework by following the ETSI MEC API guideline
- **TC ITS (Intelligent Transport Systems) is specifying AI for Automotive Vehicle**
 - Cooperative-ITS (C-ITS) and its evolution to support full autonomous driving including wireless communications dedicated to automotive ITS and Road Transport and Traffic Telematics (RTTT)
 - C-ITS provides connectivity between road participants and infrastructure.



Artificial Intelligence Impacts in ETSI (4/6)

- **ISG NFV (Network Functions Virtualisation) is planning:**
 - Virtualization and Orchestration
 - Network routing and optimisation
- **ISG CIM (cross-cutting Context Information Management):** exchanging data and metadata across systems:
 - NGSI-LD API uses linked open data and property graphs to reference data definitions (ontology)
 - Provisions provenance, licensing, data quality etc to higher-layer AI reasoning
 - AI Gateway applications can better filter from “data lakes” and publish own derived info
- **ETSI partnership project 3GPP:**
 - **TSG SA** (SA1, 2, 5 and 6) working on AI for service management in the new service based architecture
 - **TSG RAN** is studying Radio access technology, IMT2020 including 4G/5G radio integration / AI adaptive antennas / Shared Spectrum bands
- **ETSI partnership project oneM2M:**
 - is studying the use of IoT devices and how they will use AI coordination,
 - needing standards for ontologies and big data processing,
 - including standards for quality of data and tracking of data usage for liability etc.



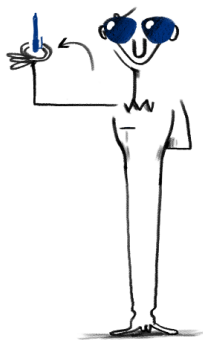
Artificial Intelligence Impacts in ETSI (5/6)

- **TC SES (Satellite Earth Stations & Systems)** is studying: satellite access technology, including advanced LEO system:
 - Satellite in adaptive tracking and handoff
 - Constantly moving satellites in Low Earth Orbit continuously reconfigurable paths
- **TC INT AFI WG : Autonomic Management and Control Intelligence for Self-Managed Fixed & Mobile Integrated Networks** is specifying :
 - Scenarios, Use Cases and Requirements for **Autonomic Management & Control (AMC)** for networks and services powered by **Multi-Layer AI Capabilities**
 - **Generic Autonomic Networking Architecture (GANA)** Reference Model for cognitive and self-management of networks and services
 - **Self-X Features** in Network Elements/Functions (NEs/NFs) and in Management & Control Architectures: **self-configuration, self-diagnosis, self-repair, self-healing, self-protection, self-awareness, etc**
 - **Multi-Layer AMC**: Fast Control-Loops in NEs/NFs & Slow Control-Loops in GANA Knowledge Planes
 - **GANA instantiations** onto various architecture scenarios (e.g. BBF, 3GPP, IMS, Wireless, ..)
 - **Test Methodology and Specifications** for Testing AI algorithms for autonomies



Artificial Intelligence Impacts in ETSI (6/6)

- **TC CYBER (Cyber Security)** is managing the introduction and applicability of AI security techniques
 - **WG QSC (Quantum-Safe Cryptography):**
 - Uses AI technology to rapidly compute Quantum-Safe Crypto-codes
 - Quantum-safe cryptography refers to efforts to identify algorithms that are resistant to attacks by both classical and quantum computers, to keep information assets secure even after a large-scale quantum computer has been built
 - Critical communications maintenance Policy and operation – AI for Secure Communications
- **SC EMTEL (Emergency Communications)** is responsible for the capture of European requirements concerning emergency communication services
 - They foresee the need for using AI as a tool in the near future



A Technical Report is planned for June 2019 to prepare the requirements for communications involving IoT devices in all types of emergency situations, including Emergency calling, Mission critical communications and Public Warning System messaging

- IoT devices and systems could improve the support of such situations by responders or even only rely on device to device communications
- Data fusion / artificial intelligence / machine learning techniques are expected to empower the consolidation of the sensing data and the processing of IoT applications in these situations.

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Questions?

Dirk Weiler
Chairman of the Board, ETSI
Head of Standards Policy, Nokia

