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# Introduction

This contribution introduces a new use case for supporting Automated Machine Learning.

### -----------------------Start of change 1-------------------------------------------

# 8 Collection and Analysis of Use Cases from ETSI STF 601

## 8.1 Introduction to ETSI STF 601

STF 601 has published TR 103 778 containing use cases where the IoT data and services require data usability The scope of STF 601 focused on the data generated and processed by IoT devices and platforms and consumed by humans or machines (ML/AI) users. Some of these use cases come from oneM2M-TR-0001-V-4.4.0 via response to liaison statement RDM-2021-0042R01. As discussed in a previous RDM meeting, this contribution brings the use cases into TR-0068 to take advantage of the work done by STF 601 and for further exploration in this WG.

## 8.2 Collection of Use Cases from ETSI STF 601

The following use cases are based on several sources, including research, innovation road mapping, and pilot initiatives. The analysis that has already been completed by the Standards Development Organization could be another source of use cases. An example of such analysis may be found in the RDM-2021-0082R01-ML\_AI\_UseCasesFrom\_STF601 (Use cases and applications).  However, this document is still in the works and is subject to change over time.

One approach to analyzing potential service-layer requirements coming from the use of AI to IoT is use-case analysis. Because some AI modules apply to numerous use cases, this research also considers general-purpose capabilities to identify potential 'cross-cutting' requirements. Table 1 presents a collection of use cases to be investigated.

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| --- | --- | --- |
| S.No. | Category | Title |
| 1 | AI for Healthcare Systems | Adoption of an AI-based system for supporting patients |
| 2 | Electronic Health records |
| 3 | AI for Disaster and Emergency Management | Automatic direct emergency call from IoT device |
| 4 | Emergency services teams accessing pre-deployed IoT devices |
| 5 | AI for Industry Management | Monitoring of industrial manufacturing equipment |
| 6 | Monitoring of industrial manufacturing products |
| 7 | AI for Smartphone Security | Intelligent Software Rollouts |
| 8 | AI Driven Networks | Policy-based network slicing for IoT security |
| 9 | AI for Agriculture Management | Fertilization/ Irrigation/ Pest management service |
| 10 | AI for Intelligence in Vehicles | Vehicle Diagnostic & Maintenance Report |
| 11 | Smart Parking |
| 12 | AI for Intelligent Energy Systems | Energy optimization using AI |
| 13 | AI for Safety | Smart safety of workers at building construction site |
| 14 | Machine socialization |
| 15 | AI for Operational Efficiency in Stock Management | Retail inventory management |
| 16 | Vending Machines |
| 17 | AI for Labor Welfare | Crowd Safety and Security |
| 18 | AI for Automation in Fault Tolerance | Predictive maintenance and fault tolerance |
| 19 | Low-connection environments |
| 20 | AI for Smart Cities | Smart Lighting |

Some points to consider:

• The term "Use Case" will refer to two types of objects: "Use Case" will refer to a set of application-level features.

• The "description" concentrates on specific characteristics of the use case. In particular: - A use case is not meant to be adequately documented and to cover all of the aspects that may be connected with it. It is an illustration of a subset of specific components related to the impact analysis and the Proof-of-Concept.

• The "important qualities" refer to the main AI-related features/technologies/that AI could bring to UC development.

## 8.3 Use Case Analysis

### 8.3.1 Use Case A.1: Adoption of an AI-based system for supporting patients

**Description**

Diet and exercise are essential for living a long and healthy life. Indeed, tracking users' eating habits will aid in the prevention of many pathologies, chronic diseases, and cognitive decline. However, motivating people to establish and maintain better lifestyles is a difficult task. Diverting a user away from harmful foods, for example, needs supplying acceptable alternatives. These options can be based on logical food attributes or more abstract ones like the taste. This would be accomplished through a personal device interface that could collect data from the user, wearable sensors, and contextual data. Adapted representations, such as text, speech, video, or graphical alerts, are also used to deliver real-time feedback and notify the user with convincing and motivational messages.

To express all important information such as the number of calories and nutrients ingested in a specific meal, diet-oriented concepts and ontologies in the food domain are required. As a result, a complete description of each food, as well as its qualities, must be provided. Additionally, an intelligent platform would be deployed that would allow professionals to recommend monitoring norms and guidelines for a healthy lifestyle that users should follow to maintain their physical and emotional health. External factors, such as a person eating too much food or performing too little physical activity, would act as a trigger for the system.

**AI/ML Impact**

However, the user provides details about consumed nutrients, and the completed activity using a smartphone app and/or devices such as smartwatches. The system stores the data into a knowledge base and executes machine learning models for identifying possible undesired behaviors by trying to match the user's data with the instructions given in advance by the physician. The system keeps a record of the activities and modifies the policies used to generate the next feedback if the same unwanted event is recognized.

**Analysis**

However, if IoT technology is not developed properly, deployed carefully, and utilized sensibly, it might introduce new safety issues. Data integrity problems in patients' electronic health records (EHRs) and other health IT systems as a consequence of erroneous or missing data are a critical issue in the healthcare industry that can have a significant impact on patients' (and users') health.

Data integrity concerns existed with paper medical records as well, but as EHRs grow more interoperable and hackable, inaccurate data is more readily available, easier to spread, and harder to erase. Data integrity issues include data from one patient appearing in another's record, missing or delayed data transfer, and clock synchronization difficulties between medical equipment and systems. These flaws can cause the AI engine to make incorrect inferences or classifications, resulting in inaccurate information being sent to clinicians and, even worse, putting patients' health at risk.

### 8.3.2 Use Case A.2: Electronic Health records

**Description**

Diagnostic and preventative medicine necessitates having access to a valid and accurate record of a patient's health for as long as possible. Thus, while health gadgets (heart rate monitors, blood pressure monitors, and so on) may be claimed to be vital, they are only critical if the measurements they take are recorded and as mentioned in the use case statement, can identify the context of the data with some accuracy. As stated expressly in Directive 2011/24/EU [i.23] on patients' rights in cross-border healthcare, health records are required to supersede international borders. A health record is a composite document and one of the challenges in defining a health record is establishing the border. Information is essential to build context in the domain of diagnostic medicine. For example, many diseases in their early stages share symptoms, and correctly attributing a symptom to a cause may be the difference between survival and death.

A health record does not have a set beginning and ending time. While a health record exists for an individual from birth, there are aspects of the individual's health that are directly tied to the parents (e.g., genetics) and to the period in the womb that must be linked to the individual's record. Records of health professionals, sites where medical interventions occur (e.g., hospital, clinic), prescriptions prescribed, and so on are all linked to the individual's record.

**AI/ML Impact**

The AI-based system operates in the background, continually constructing a patient context from the content of personal electronic health records and integrating it with external knowledge to assist physicians in their job (e.g., early diagnosis). The physician enters new information into a patient's electronic health record. The AI engine refreshes the patient's digital twin with new information and runs a check method to uncover probable circumstances that lead to the start of a disease. The AI engine recommends to the physician that more verifications be undertaken. The doctor saw that the sugar level in the blood is near to the attention level and prescribed a diet to the patient to prevent nutritional exacerbations.

**Analysis**

However, concerns with the format of such information or network outages, the information supplied by doctors is not correctly kept in the system. When IoT data is used, potential problems are associated with IoT devices that do not offer data at the fine-grained level necessary or do not supply data at all owing to various malfunctions. Furthermore, the sensors are susceptible to false reading difficulties, which might impair the overall data usage of the patient's PHR.

### 8.3.3 Use Case B.1: Automatic direct emergency call from IoT device (Public and Emergency Services Use Cases)

**Description**

When a smoke or temperature detector at a remote area (forest, remote facility, etc.) delivers an emergency alert in case of fire, this use case applies. The IoT gadget sends the emergency call (most likely to local authorities), which sends an alarm to the operator, who then dials 911. However, when the operator tries to check that a fire has ignited, he is unable to conclude that the notification was false. A secondary sensor raises an identical alert thirty minutes later. The operator can now confirm the alarm, but the fire has expanded to tremendous proportions, making it even more difficult to extinguish, and the facility is destroyed. This scenario is suitable for a massive building or a remote location. This use case does not directly relate to someone dialing 911 from their house on a smartphone.

**AI/ML Impact**

The emergency event is detected by the IoT sensor. The sensor generates and sends an emergency message to the IoT platform. The IoT platform receives the emergency message call, recognizes it via a machine learning model as an emergency message, and notifies the operator. The operator retrieves and analyzes the communication before contacting the necessary public safety services and spreading the emergency message. Upon timely action, the fire department arrives early and can control the fire situation.

**Analysis**

Data in the regular flow may be compromised if the system is not properly designed (sensor locations are erroneously specified) or if system maintenance is insufficient to ensure that the sensors are in perfect working order and do not trigger false positives. In the case of a typical flow failure (failed completion), the operator was provided two sets of meaningless data, resulting in a disaster: False alerts as a result of the IoT platform and its sensors not being maintained. The initial sensor's position information was incorrect (probably due to the wrong configuration of the system).This is the same or even more important if the IoT platform is programmed to automatically validate the alarm. The consequences of failing this use case because the data became unusable at some point in time may be very important: forest, remote facility, building destroyed with the potential loss of human/animal lives.

### 8.3.4 Use Case B.2: Emergency services teams accessing pre-deployed IoT devices

**Description**

This use case refers to an emergency in which emergency services (e.g., firemen) require data from IoT devices placed in a smart building, such as smoke/heat detectors, security cameras, and devices in elevator cabins. These data might assist them in better concentrating their operations in the event of a fire, for example, by locating personnel who are still on the scene, areas where the fire is burning, and so on.

Unless there are control rooms (with employees managing the technology), emergency services typically do not have instant access to other IoT devices pre-deployed in a building, such as security cameras. In this situation, the IoT devices are owned by the building administration and management, and only the data they generate is shared with emergency services on demand. Normally, emergency services do not have access to these IoT devices.

**AI/ML Impact**

An emergency service decision-maker requests access to a building's safety system from the authenticating entity. Access is granted by the authenticating entity. The emergency service decision-maker, which is based on machine learning, may acquire IoT device data from the building's safety system via the IoT service platform.

**Analysis**

Sensor data and semantics are given by the building IoT platform Data for security authentication that may restrict emergency services from accessing and using building data. If the emergency response team's devices are not permitted access by the authenticating entity, the completion may fail. The equipment used by the emergency services team is incompatible with the data given by the building's safety system. The gadgets used by the emergency services team misread the data supplied by the building's safety system, reducing the overall efficiency of the rescue operation.

IoT data can be used if the individuals who need to access them have complete access to them. Lack of compatibility at the data level across systems (e.g., undefined semantics) may prevent this data from being used. The implications of failing this use case because the data are worthless, as explained above, may be severe: the building may be fully demolished, perhaps resulting in the loss of human life.

### 8.3.5 Use Case C.1: Monitoring of industrial manufacturing equipment

**Description**

A general purpose of Artificial intelligence in industry and manufacturing is the development or optimization of machinery used for production, manufacturing, and delivery. Additionally, the identification of faults in the manufacturing of a product is a common use of artificial intelligence in industry and manufacturing. A process that manufactures canned food, for example, may identify that a label was not properly placed on the can or that the can was damaged. This can happen at several phases, including "can" manufacture, labeling, packaging in cartons for shipping, loading cartons onto vehicles, stocking products in retail outlets, and delivery from delivery services.

**AI/ML Impact**

Machinery and equipment function in accordance with their intended purpose. The sensors monitor several aspects of the machinery or equipment's operation. The AI/ML system analyzes sensor data to detect and recognize when the equipment is functioning outside of its usual parameters. When the measured parameters of the equipment exceed the "normal" range, a signal or indicator is created for system operators to act on to return the equipment to normal operating range.

**Analysis**

Data that may compromise data usability: data coming from the sensors if data are not generated normally (at the expected time intervals) or corrupted (fail to detect abnormal conditions), there is a risk that the machinery comprising the industrial production line could be damaged or the product that would be generated would be defective.

8.3.6 Use Case C.2: Monitoring of industrial manufacturing products

**Description**

The identification of faults in the manufacturing of a product is a typical use of artificial intelligence in industry and manufacturing. A process that manufactures canned food, for example, may identify that a label was not correctly placed on the can or that the can was damaged. This can happen at several phases, including "can" production, labeling, packing in cartons for shipment, loading cartons into vehicles, stocking items in retail outlets, and delivery from delivery services.

**AI/ML Impact**

Within a supply chain process, products are made or transferred. The sensors collect data on several features of the items. The AI/ML system examines sensor data to detect product features that are outside of typical parameters. When a product's attributes deviate from the "normal" range, a signal or indication is created for system operators to use to take necessary action.

**Analysis**

If sensor data is manipulated, it is possible that buyers would get faulty items, for example, a bag of chips is not fully closed.

8.3.7 Use Case D.1: Intelligent Software Rollouts

**Description**

Although an intelligent software rollout is automated, incorrect data might have effects on the system, and this use case examines such use and the effect. During the life of a key resource, such as a router, its firmware must be updated, not only to support new services or functions but also to correct existing flaws. A firmware rollout can take many months to design and implement in some circumstances. Operators can create distinct policies for different sorts of rollouts and resources by using the Experiential Networked Intelligence (ENI) System. One example is the creation of a hierarchy of parameters for phasing out the rollout, such as client class, geographical location, or time of day. Furthermore, taking dynamic onboarding and DevOps environments into account, the ENI System may be used to establish many sorts of regulations, such as the results of the testing should show a relationship between network function performance (throughput, jitter, and latency) and resource allocation (CPU, RAM, and I/O). Scheduled updates for the enterprise customers must be outside of office hours.

**AI/ML Impact**

The process starts from the network operator development environment, a new software version is instantiated. The program is subjected to a series of tests in the new environment that is set by pre-defined policies in the ENI System, the results of which will be used to produce a software profile. During the testing, the ENI System begins analyzing the behavior via the machine learning strategies of all the collected data from the devices, such as the software version on the PCs, and compares it to the profile of prior software versions. Because the test findings are consistent with earlier versions, the ENI System is ready to initiate the transition of the new version from development to production. The ENI System initiates the transition of the new version from development to production. Upon the completion of the procedure, the ENI System may signal relevant software components, such as OSS/BSS, that the software deployment was successful.

**Analysis**

Data that may compromise data usability: report of the updating process.

User intervention may interrupt the automatic software update. Monitoring of data generated by sensors may produce inconsistency of results which may affect the retries of a failed upgrade. Also forces user intervention whilst update is taking place may give false feedback that installation has been completed which may not be the case. The consequence of the update not happening means that the software was not fully deployed properly, and this is not detected, this suggests inconsistencies in all systems and could mean unfruitful use of resources indirectly financial implications to the organization.

8.3.8 Use Case D.2: Policy-based network slicing for IoT security

**Description**

Smart cities are planned to be created in the near future employing a plethora of IoT devices, with a considerable proportion of them connected through 5G. These gadgets will be crucial in the implementation of numerous services (e.g., civil protection or other services provided by the municipality, where each service will have its target use and different device requirements). To facilitate this large device deployment, network slices will enable their aggregation either by functionality (e.g., security or city operations management support) or by other sorts of lower-level needs, such as low latency and high bandwidth. In this context, the prevention of Distributed Denial Of Service (DDOS) assaults is critical, as these devices are often intended to enable applications/services of social interest.

**AI/ML Impact**

Machine learning is used in the ENI System to recognize certain traffic patterns that indicate DDOS or other types of assaults. This is due to the rising sophistication of such assaults, which makes it more difficult to employ simpler algorithms (for example, pattern recognition) that focus on a set of predetermined information. A DDoS assault manifests itself as unusually sluggish network performance and/or the inability to access a certain group of online sites. When this occurs, the ENI System will be able to recognize and learn from the event utilizing AI approaches. If the new traffic pattern is detected as an attack based on previous experience, the ENI System will be able to initiate necessary reactions from the relevant management components.

**Analysis**

A potential error occurs when ENI data collected from websites or devices, for example, is corrupted in some way, resulting in the ENI system being unable to detect that an abnormal event has occurred (e.g., a website is no longer accessible, or a device's traffic patterns do not correspond to its expected behavior) and carrying out necessary analysis to determine whether the system is under attack or not. Data generated from devices should be made available to the Network Administrator before analysis, so that, if necessary, the Network Administrator can intervene based on their analysis.

8.3.9 Use Case E.1: Fertilization/Irrigation/Pest management service

**Description**

This use case is about a technical solution that provides farmers with next-generation advice by providing a variety of innovative smart agricultural services. Such a technology solution is given as a low-cost service with no technological investment required by farmers, making it accessible to even small farmers. The system is made up of an IoT device infrastructure, a collection of cloud computing services, and a set of smart agricultural advice services. IoT devices function as telemetric autonomous terminals, collecting data from sensors installed in the field and recording atmospheric (air temperature, relative humidity, wind direction and velocity, rain, leaf wetness) and soil parameters (temperature, moisture) as well as controlling irrigation systems.

The cloud service combines IoT data with data from other sources (such as weather forecast services and satellite photos) and translates it into facts using advanced data analysis techniques. The inbuilt Decision Support System (DSS) converts facts into preliminary guidance, which farmers can access via applications and certified agricultural consultants hired by third parties. The advisers are examining and evaluating the material provided to provide final advice and help to the farmers. The advising and support services are given by a combination of software and certified advisors, which includes Fertilization and Irrigation guidance as well as Pest Management/Hazard warnings.

**AI/ML Impact**

The sensors collect environmental data and transfer it to the cloud service. The cloud service takes all of the sensor data and saves it to the internal knowledge graph. The decision support system which is based on machine learning evaluates incoming data in real-time and makes a decision that is recommended for the farmers. Farmers checks if the system has properly established the fertilizer and irrigation systems, or some pest management issues have been found.

**Analysis**

Data that may compromise data usability includes data provided by the satellite, data provided by weather stations and, device and IoT data located in the field. The decision support system is driven by the three types of data mentioned above. If one of the data sources fails to read the values or to provide them promptly, they would become not usable by the system with the risk of having ineffective management of the farming system.

In particular, the IoT devices located in the field are particularly exposed to adverse events (e.g., meteorological ones). This aspect can be mitigated by implementing a redundant network of sensors that can be used both as backup or as confirmation of the read values. This action would increase the overall data usability.

In particular, the IoT devices located in the field are particularly exposed to adverse events (e.g., meteorological ones). This aspect can be mitigated by implementing a redundant network of sensors that can be used both as backup or as confirmation of the read values. This action would increase the overall data usability.

8.3.10 Use Case F.1: Vehicle Diagnostic & Maintenance Report

**Description**

The Vehicle Service Centre needs to notify the car owner of the vehicle's status and to remind them to maintain the vehicle in a timely manner to avoid disaster. As a result, the Vehicle Service Centre must acquire and analyze data from the vehicle on a regular basis. Based on the analysis results, it will alert the vehicle owner, displaying what's wrong with the vehicle in simple language and visuals, as well as some maintenance recommendations.

The ASSIST-IoT project outlined additional detailed examples of this use case in deliverable D3.2 [i.22] (see also clause 5.6.3 for further information about the ASSIST-IoT project): vehicle diagnostics and non-conformance cause identification, vehicle exterior condition inspection and documentation, and verification of fleet emissions in service.

**AI/ML Impact**

The car collects diagnostic data from internal sensors and delivers it to the service center. The diagnostics data includes information from the Engine and Transmission Systems, the Stability Control System, the Air Bag System, the Emission System, the Antilock Brake System, and other systems. The diagnostic data is sent to the "Vehicle Detection M2M Application" by the vehicle service center. This machine learning application collects and analyzes the diagnostic data. The "Vehicle Detection M2M Application" determines that the brake pads require replacement. It searches the maintenance services supplied by the "M2M Application" and obtains the contact information for the company that may supply the components. Finally, the "Vehicle Detection M2M Application" transmits the Diagnostic & Maintenance Report, together with the proposed component providers, to the vehicle owner by email or alert message shown in the vehicle terminal. Based on the Diagnostic & Maintenance Report, the car owner will determine whether or not to maintain his or her vehicle.

**Analysis**

IoT Data that may compromise data usability includes M2M device data provided to Vehicle Service Centre; diagnostics data provided to Vehicle Detection M2M Application. For example, sensor measurements describing the vehicles’ operation may be taken at very high sampling frequencies. Results of the maintenance evaluation which has to be statistically significant, e.g., at a 95% confidence level. Diagnostic & Maintenance Report from Vehicle Resolution M2M application provided to Vehicle Owner: completeness of the vehicle-scanning report, user-friendliness of the defect-identification process, unambiguous identification of the documented vehicle. The Applications behind the Vehicle Service Centre need to be able to determine which parts need to be replaced. The data usability and easy understanding by humans of M2M device data are necessary (translation to natural language when relevant). In the case of AI, data presentation and integrity are important to ensure a valid AI decision.

The vehicle owner (and the service technician) needs to understand how urgent the maintenance is, what needs to be replaced and which part needs to be changed. For example, when receiving information about vehicle lights, it should know what action needs to be performed and on which side of the vehicle it should be done. If the data is misleading (e.g., only mentioning "defective front light" or indicating a hexadecimal code that leads to another part because the system was improperly set up), the technician may not be able to successfully perform the relevant maintenance. The mechanics (technician) needs also to be able to understand how to act on the IoT platform to check the validity of data delivered by sensors (e.g., to identify faulty sensors) and to reset the condition that led to maintenance when it has been fixed. If the report is ambiguous, the mechanics may also order the wrong part. The consequences of failing this use case because the data were unusable may be very important: safety is not fulfilled in the vehicle, and it may lead to an accident with the potential loss of human lives.

8.3.11 Use Case F.2: Smart Parking

**Description**

Smart parking assists in addressing one of the most difficult aspects of driving in cities: locating empty parking places and managing unlawful parking. Parking spots are widely dispersed and may be held by separate providers (e.g., mall parking provider and street parking provider), making it difficult to acquire information at a single location/time. Drivers may use smart parking services to search available parking places, pay parking rates, and even make reservations. Because regular parking services must adhere to the first-come, first-served norm, making parking reservations would be available even dynamically for limited persons such as VIPs or the disabled.

In this use case, a user arrives at a mall but finds that the parking lot is filled. The mall parking provider converts the provisional reservation to a street parking reservation. The automobile driver is provided information on where to park on the street as well as a discount voucher to compensate for the higher parking charge on the street. This site is near a disabled-accessible location. To prohibit parking in designated places, law enforcement officials are also involved.

**AI/ML Impact**

Because the user already specified the mall as the destination, the navigator automatically communicates the user's location to the mall parking provider when the user is near the mall. The mall parking supplier advises the navigator that there are now no available parking spaces. Based on the car's position, which is near the mall, the mall parking provider uses the M2M service platform enabled by machine learning to enquire about the availability of alternative parking spots. Because there are available parking places on the street, the mall parking provider suggests that location. To begin parking, the user approaches the smartphone from a parking meter. The street parking provider, as well as the mall parking provider, are then alerted. As recompense, the mall parking provider provides a discount coupon for parking outside. To finish parking, the user taps the smartphone on the meter. The parking provider on the street charges a price. Through the M2M service platform, the bill with the discount coupon is delivered to the billing provider.

**Analysis**

Parking lot status, location of designated parking space in the street, parking area fee and discount coupon, parking area status (e.g., disabled-only) in the street and the mall, car plate information for example, if a vehicle driver is given confusing or incorrect information regarding available parking areas, he may park in a dynamically assigned disabled-only spot or an already reserved place and be punished. This might be caused by incorrect service configuration if the parking space numbers in the IoT system do not correspond to the actual parking place locations.

The use case also includes a sensor that notifies unlawful parking to a police station. The data given should be accurate and delivered to the cops in a human-readable manner. The implications of failing this use case due to useless or confusing data are moderate: a handicapped person may be unable to park and proceed to the mall, and the owner of another car may be overcharged. This is more about a poor degree of service quality.

8.3.12 Use Case G.1: Energy optimization using AI

**Description**

This use case elaborates on how NFV and AI can be combined to optimize usage of the energy in networks and to also show the consequence if there is no good data usability. The other equipment including switches, routers, storage equipment, and air conditioners takes the other 30 % of the total power consumption. The servers are deployed and running to meet the requirement of peak-hour service, which means the servers are normally at a high power-up state at full time even in non-peak hours. It is possible to move the services to some of the servers and turn the other servers to idle or underclocking state in non-peak hours, with the aim of optimizing the power usage at the DC.

**AI/ML Impact**

The ENI system uses an AI algorithm to build the relations between the network service and its required resources, and the relations between the power consumption and the environment settings including e.g., the location of the running servers, the setting of the cooling system, etc. The ENI system collects and stores information of the virtual networks, including CPU usage, storage usage, and network usage for each VNF, etc. as well as the power consumption information and environmental information.

**Analysis**

The data within the ENI system is received from software sensors, however, if the data is compromised because of a corrupted sensor interface, the data is no longer usable by the machine, or it could also mean that the machining process the wrong data to give false instruction indicating the power does not to be switched to save power. The data are from software sensors, but they still apply here when it comes to data usability.

8.3.13 Use Case H.4: Smart safety of workers at building construction site

**Description**

The main objective of this application is the prevention and near real-time detection of common OSH hazards such as stress, fatigue, overexposure to heat and UV radiation, slips, trips, falls from height, suspension trauma, immobility due to unconsciousness, collision (forceful impact) with heavy equipment, entrapment (unable to evacuate the worksite during an emergency) and improper use of PPE. The OSH manager combines, only a relevant subset of real-time data with information that is manually provided from the entire workforce via existing management and collaboration platforms to assess and report the overall risk status for the construction site. The physiological parameters of the construction workers are being monitored in real-time using wearable sensors to ensure that their health and safety are always protected while at the construction site. The construction workers’ location within the construction site is monitored so that the first responder can be sent in case of an emergency.

When a construction worker requests navigation instructions from his current location to a worksite, he should follow approved walking paths through areas the worker is authorized to access. Within any building construction site, many people with various levels of training and experience, are occupied by several subcontracted companies, interact with each other, operate equipment, or interface with heavy machinery. Construction workers and the project’s OSH manager are provided with relevant information about incidents and potential hazards.

**AI/ML Impact**

The IoT system monitors the weather conditions at the construction site, the exposure of the construction worker to UV radiation, the physiological parameters of the construction worker, and the motion pattern of the construction worker’s body. The IoT system analyses all the collected data from all the construction workers who are present at the construction site and identifies no increased risk of exposure to OSH-related hazards for the construction worker.

The IoT system is aware of the construction worker’s identity and pairs them with their smart PPE. The IoT system tracks the location of the construction worker. The IoT system has not detected any increased risk to the construction worker's health and safety, but they notify the OSH manager by raising an alarm through ASSIST-IoT.

**Analysis**

Lack of usability of the data or compromised data in this use case may result in limited safety for the site workers, which may have strong consequences in case of false negatives (unhealthy conditions are not detected or invalid navigation instructions that drive the worker to a hazardous area). Location and proximity data of workers on site, physiological parameter measurements, weather conditions measurements, personal identification information, training, and medical records, building information, users’ thermal comfort preferences, alerts, and notifications. The BIM should be set up without any ambiguity or invalid information, as this may lead to invalid navigation and put the workers at risk. The user interfaces in the construction worker & device should be easily understandable, whatever the language and reading level of the worker. Data flow from all devices should be secured and respect privacy, as well as guaranteed data integrity.

8.3.14 Use Case H.5: Machine socialization

**Description**

If robot A has cleaned a room, it may inform the other robot that this room has been cleaned, so robot B can move to another room for a clean job. As in the hotel scenario, the robot owners may not tell the robots explicitly that there exists another robot with the same task. If the hotel has only one robot, it must clean rooms one by one. A robot is designed to clean rooms in hotels. For example, after a machine scans a room, it will find out the clean status of that room (clean or dirty), when a robot is cleaning a room after it is cleaned, it will change the status of that room, the information will affect other robots’ behavior because for any other robots it is unnecessary to go to a room that is being cleaned or has been cleaned by another robot. Because the platform may help robots to discover each other, and the platform may initialize a powerful commander to optimize the job with multiple robots. Secondly, a robot should realize what kind of information will affect other robots' behavior, and it should transmit messages to share this information with other co-operators. Thirdly, a robot should know the message interface of other robots.

**AI/ML Impact**

Robot A shares information with robot B and Robot B shares information with Robot A. Robots A and B discover each other (the discovery is performed by themselves or aided by the cloud robot service platform) The cloud robot service platform helps to optimize the task process and helps the robots to cooperate.

**Analysis**

Capabilities of a Robot: when a robot is placed into service, if it does not describe its capabilities correctly then the overall service requests cannot be handled optimally by the cloud robot service platform. cloud robot service platform commands: when a robot is commanded to perform a service, if the command is not recognized then the robot may not be efficiently utilized.

8.3.15 Use Case I.1: Retail inventory management

**Description**

The AI/ML algorithm processes data from the sensors that detect when items are removed from their retail position. When a certain number of products are removed a signal or indicator is generated for the system operators to act upon to take appropriate action.

**AI/ML Impact**

The presence of the following actors/entities as well as their associated roles is envisaged in the current use case: [Device] sensors that can identify the presence and absence of a product in a retail environment. [Human] A monitor, human or automatic, that can react based on the detected anomaly of a product inventory that needs replenishment. Data user/consumer: AI/ML Processing module, Monitor.

**Analysis**

Incorrect classifications from the AI/ML algorithm can lead to false “tasks or jobs” to replenish stock or failure to create a “replenish task/job” depending on the setting this could lead to expensive delays, in the case that a truck delivery must be rescheduled, or not enough trucks allocated to the delivery task.

8.3.16 Use Case I.2: Vending Machines

**Description**

As part of the use case, the provider can limit access to the availability of service for vending machines based on their geographic location. How many products are sold in specified areas during the specified time? The vending machine providers do NOT want the vending machine users to move the machine from the specified area to other locations (potentially for better sales), hence, the providers can control the geographic distribution of their vending machines and make decisions based on data statistics and analysis.

**AI/ML Impact**

After a vending machine successfully registers, it reports data information (for example, the product selling information and the stock information) periodically or for each product sale to the vending machine application platform through the M2M service platform. The vending machine application platform receives the data information report, records the information, and performs data analysis. If the current geographic location of the vending machine is in the permitted area, it allows for the data report. If the current geographical location of the vending machine is in the permitted area, it allows the vending machine to register.

**Analysis**

Data that may compromise data usability: Data from the M2M application, that will include the sensor data about the wrong data information. For example, some users may physically shake the machine and some products are available to users in which case it is not recorded as sales, but it is not available for use.

8.3.17 Use Case J.1: Crowd Safety and Security

**Description**

This use case is about a cloud-based IoT platform supporting a series of applications that can be used to monitor, record, and analyze the environment and consequently predict or identify situations that need attention in a large-scale event such as a concert. The MONICA services include crowd and capacity monitoring, detection of security, health, and safety incidents as well as the location of and communication between staff, visitors, and control center. During the event, the security personnel can monitor the situation using a web-based interface – the MONICA COP which provides an operational picture of the environment in real-time, and which displays notifications in case of any unusual activities.

**AI/ML Impact**

The use case relies on sensors generated by wristbands, CCTV cameras, mobile phones, trackers, and glasses, reporting data to an IoT cloud-based system, which handles incidents, supported by applications that help ensure efficient communication and timely response.

**Analysis**

The applications are primarily based on data from CCTV cameras and crowd wristbands and these data can be compromised if, for example, the attendants of the event do not wear their wrist bands or readings are inaccurate. The consequence, if the data is not correct, means there could be many crowds out of control, and this could become unsafe in the context of large events like football games or concerts.

8.3.18 Use Case K.1: Predictive maintenance and fault tolerance

**Description**

This case is about how the maintenance companies and technicians can use the available information to set a predictive maintenance program for the lift, and how they can use the remote connection with the lift to fix the faults or problems. Furthermore, there are some faults extremely hard to discover and that require a long time to be fixed, so the capability for the maintenance technician to have direct and real-time support by the supplier technician could drastically reduce the out-of-service necessary to fix the fault. Predictive maintenance is the trend in the lift industry even if it has been applied in several industrial sectors for ages. The scope of predictive maintenance is to anticipate the event of a fault, evaluating the fault rate of the single components based on the number of runs of the lift.

**AI/ML Impact**

The remote central control unit AI component detects a data pattern that, with a probability higher than a specified threshold, can lead to a fault or an undesired event. The smart lift IoT ecosystem provides data to the remote central control unit installed within the Maintenance Company premises. The smart lift installation restarted to work and the alert within the remote central control unit disappeared.

**Analysis**

In this case for the maintenance technician, it is extremely hard to discover the fault the best solution is that the technician of the control cabinet supplier connects the lift from the remote position and analyses the faults by the history of the faults recorded and the capability of analyzing the single input and output of the mainboard, he can very quickly identify which landing door causes the fault and understand why the fault appears. With predictive maintenance, the system sends a message to the maintenance company that the lifetime of a component (for example wheel of the doors, pushbutton, etc.) has expired the maintenance company can send a technician to substitute the component with a new one, so the time of substitution could be noticeably short and the possible out of service of the lift avoided.

8.3.19 Use Case K.2: Low-connection environments

**Description**

This use case is inspired by the Lift Predictive Maintenance one with the difference that often, data produced by lift installations can only be saved, retrieved, and exploited locally due to, for example, a network connection that is not always one or given the high bandwidth cost. From the data usability perspective, in this use case, the critical aspect is not related to the grant effective reading from IoT devices, but also to having an effective and efficient data transfer from each lift location and the central data collector. This aspect opens to a more complex scenario where the entire end-to-end pipeline is decentralized and, by assuming to have a central data collector processing all produced data, reasoning and learning operation can be performed in a federated way.

**AI/ML Impact**

The cloud data manager collects data from different installations deployed into low-connectivity environments and aggregates the data within a central data model. The decision support system connected to the cloud data manager detects a data pattern that, with a probability higher than a specified threshold, can lead to a fault or an undesired event. The lift IoT ecosystem provides data to the cloud data manager installed within the lift company premises. The lift IoT ecosystem provides data to the local data manager installed within the local environment. The lift company is alerted, and, in turn, it alerts the maintenance supplier about the undesired event together with the related explanation.

**Analysis**

Hence, any service and activities relying on the quality of the data provided by the IoT ecosystem to the main server can compromise the processing activities of the AI-based predictive system by making it ineffective for addressing the predictive maintenance task.

8.3.20 Use Case L.1: Smart Lighting

**Description**

In huge urban areas, the IoT stage carrying out this utilization case needs to continuously gather the information from many various sensors situated around the city, total them, and feed them to the AI cycle that takes the lighting choice.

**AI/ML Impact**

In large cities, the IoT platform implementing this use case must collect in real-time the data from thousands of different sensors located around the city, aggregate them, and feed them to the AI process that takes the lighting decision. In addition, this use case may help improve the inhabitant's safety (sensitive areas get higher illumination), improve the city maintenance operations, and reduce global energy consumption. Other use cases such as smart waste or environmental monitoring would lead to similar discussion in terms of data usability of the devices and the data they provide.

**Analysis**

Due to the large amount of data to be collected, intermediate platforms aggregating the data from a selected location or selected type of sensors may filter unusual events and facilitate the decision-making process, by reducing its complexity. Interoperability between the devices measuring the sensor data and the platforms aggregating and exploiting the data has a strong impact. They should receive only useful, complete (e.g., no missing data in the flow) and non-redundant data (except where needed). As in all AI use cases, the data presentation, format, and meaning need to be clearly defined at all levels of the processing chain. Lack of usability of the data or compromised data in this use case may have different consequences.

### -----------------------End of change 1-------------------------------------------