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| Source:\* | JaeSeung Song, KETI, [jssong@sejong.ac.kr](mailto:jssong@sejong.ac.kr)  Jaeho Kim, KETI, [kimjh@sejong.ac.kr](mailto:kimjh@sejong.ac.kr)  Minbyeong Lee, Hyundai Motors, [minbyeong.lee@hyundai.com](mailto:minbyeong.lee@hyundai.com) |
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# Introduction

This contribution introduces a new use case for the detection of patterns in video streaming.

In particular, this use case is exerpt from an use case introduced and analysed in ETSI TR 103 674: SmartM2M: Artificial Intelligence and the oneM2M architecture and ETSI TR 103 675: SmartM2M: AI for IoT: A Proof of Concept.

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

## 2.2 Informative references

Clause 2.2 shall only contain informative references which are cited in the document itself.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.x1] ETSI TR 103 674: SmartM2M: Artificial Intelligence and the oneM2M architecture, V1.1.1

[i.x2] ETSI TR 103 675: SmartM2M: AI for IoT: A Proof of Concept, V1.1.1

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

### -----------------------Start of change 2-------------------------------------------

## 7.n Use case #n – Detection of patterns in video streams

*Editor’s Note: The section introduces a AI/ML use case that uses IoT data.*

### 7.n.1 Description

Detection of patterns in video and camera streams enables users to identify scenes, objects, and situations in images uploaded to the service using aims visual recognition based on Artificial Intelligence and Machine learning. Subjects and objects contained in an image are automatically identified, organized and classified into logical categories in order to provide add high added value services in cities such as car vandalism and fire detection.

In this use case, an IoT module will be prototyped for images classification using machine learning and trained data. The IoT module supports multiple classifiers: predefined and custom models. A camera agent will be developed to quickly test the proposed prototype and simplify the integration with real devices within the city. The camera agent reads periodically images from the disk and push them to oneM2M platform. The images could be provided by a real camera or any other external sources.

For potential benefits for oneM2M, this use case introduces visual recognition functions (predefined classifier/custom classifier) on the Common Service Entity ready to be, configured trained and used by an Application Entity, subject to access control policies, to identify relevant scenes, objects, and situations within the city and receive the corresponding notifications.

Figure 7.n.1-1 provides a summary of the associated architecture.



Figure 7.n.1-1: High-level architecture

The following Figure 7.n.1-2 shows a possible resources and attributes to enable pattern recognition service in oneM2M platform.

Diagram

Description automatically generated

Figure 7.n.1-2: A possible resources and attributes to enable pattern recognision in oneM2M

### 7.n.2 Source

ETSI SmartM2M TRs for Artificial Intelligence and the oneM2M architecture [i.x1] and AI for IoT: A Proof of Concept [i.x2]

### 7.n.3 Actors

* Camera: a camera application that streams smart city images to the IoT platform
* Edge node: an IoT edge node perform machine learning model to detect a specific pattern specified in a classifier.
* AI-enabled IoT platform: an IoT platform perform detection of patterns based on developed AI model.
* Admin application: an application creates classifiers for AI/ML training and add training data.
* AI/ML application: an application that perform visual recognition configuration and training. Also the application receives notification related to relevant scenes, objects and situation.

### 7.n.4 Pre-conditions

* There exist a set of data for training.

### 7.n.5 Triggers

* Camera generates a video stream and sends it to the IoT platform.

### 7.n.6 Normal Flow

Figure 7.n.6-1 depicts the entities and main components involved in this use case and the sequence of messages exchanged between them to carry out the functionality need for detection of patterns in video streams in oneM2M platform. The blue boxes show the interactions that are achievable with oneM2M platform without any changes, while the green boxes show new interactions that do not currently exist in oneM2M and need to be specified and implemented for this use case.

* Step 1: All the relevant applications (Admin Application, Image Recognition Service, and Smart city Camera) are registered to the IoT platform.
* Step 2: The Admin Application creates a classifier A, for example, a car vandalism classifer, at the IoT platform.
* Step 3: The Image Recognition Service, which is an AI/ML capable application, train a model based on the given classifier. Then the service updates the classifer in the IoT platform for pattern detection.

Note: If there exist more classifers to be added, steps 2 and 3 are repeated.

* Step 4: The Smart City Camera publishs screenshot image as a content instance inside the container images.
* Step 5: The Image Recognition Service performs pattern recognition for the newly published image and generates visual recognition report.
* Step 6: The Admin Application is notified by the IoT platform with the recognition report.

### 7.n.7 Alternative Flow

None

### 7.n.8 Post-conditions

The AI-enabled IoT platform notifies detected scenes or events to the smart city admin application.

### 7.n.9 High Level Illustration



Figure 7.2.9-1 Conceptual sequence of the detection of patterns in video stream

### 7.n.10 Potential Requirements

1. Predefined-classifier function comes with a predefined and pretrained classifier for Object detection, Object tracking, Semantic Segmentation, Instance Segmentation, etc.
2. Custom classifier classification function allows an application to create its own classifier and train it to implement specific visual recognition use cases.

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