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# Introduction

This contribution proposes a new use case for IoT device replacement.

### -----------------------Start of input 1-------------------------------------------

## 6.x IoT device replacement

### 6.x.1 Description

In the IoT world, there is a particular IoT device that is composed of various parts. Also, many IoT devices have a life cycle such as start, operate, break, fix, re-operate, replace and terminate. Once such components or devices reach their limit, they need to be removed or replaced.

For example, a vehicle contains a large number of components as follows:

* Battery, 6~7 years
* Wiper blade, 1 year
* Oxygen sensor, every 80,000 km
* Tyre position, 5 years
* Timing belt, 80,000 km
* Brake pad, 40,000 km
* Various fuse, whenever there is a failure.

In the case of an electric car, batteries typically have an automotive life of 7-10 years. At the end of that time, their capacity is degraded to 70-80% of their original capacity, and they are less fit for mobility applications. Then such batteris should be replaced with a new battery.

It is very important to know how many replacements happens to such components and devices. Also, when a replacement occurs, the exact time is needed to be recorded. So that the owner of an IoT device or service provider use such information for business purposes.

For example, if many fuse parts have been intensively replaced over a certain period of time, it is suspected that the car is flooded. Also, the car owner can be informed by an IoT service provider about a time to replace a particular component.

There is also a case that the serial number of a device is used as a security key for authentication. In this case, when a device is replaced, new registration or an update of the registration key has to be triggered.

This use case introduces new set of information for the IoT service platform to manage a case where a device is replaced as follows:

* Number of replacements. This information shows how many replacements happens.
* Limited number of replacements. This information shows the maximum amount of replacements that a device can have.
* Replaced time. This information shows when a replacement happened.
* List of IoT applications interested in device replacement. This information contains a list of IoT applications that want to receive a notification about device replacement.
* Conditions for replacement. This information describes where and when a device replacement happens. Various information can be used to describe conditions such as location, time, distance, etc.

### 6.x.2 Source

None

### 6.x.3 Actors

**M2M Service Platform (MSP)**: A company that provides M2M service including entities like gateway, platform and enables the communication between them. The M2M Service Provider also manages information about device replacement. These information can be exposed to IoT applications.

**Car Center**: The center for selling and managing vehicles. The center provides advanced services to its premium customers. For example, the center informs their premium customer when to replace a particular component of their customers’ car to have a safe driving.

**Vehicle**: M2M/IoT enabled Smart Vehicle that can send various measured data to MSP and inform the owner of the vehicle about diagnostic information.

### 6.x.4 Pre-conditions

The Car Center establishes a business relationship with M2M Service Provider in using the gateway, M2M platform and APIs.

The Car Center deploys M2M/IoT sensors and actuators to their vehicles and registers them to M2M Service Provider.

The Car Center runs premium vehicle management service that inform their premium users about various diagnostic information of their car, for example, the lifecycle of each component, when to replace a particular component, how long each component can be used.

### 6.x.5 Triggers

None

### 6.x.6 Normal Flow

1. A Car Center sells a smart vehicle to User A.
2. The vehicle is registered to the IoT platform with various components and information.
3. The Car Center uses a premium service managing diagnostic information from the IoT service provider.
4. User A subscribes a replacement service provided by the Car Center.
5. As time passes, a battery of the vehicle reaches its max lifetime, and the capacity is downgraded to 50% of its original capacity.
6. The IoT platform detects this situation using stored replacement related information such as its max lifetime and a condition for the replacement (i.e., battery capacity is lower than 50%).
7. The IoT platform informs a warning to the car centre that indicates a replacement is needed.
8. The Car IoT application indicates and initiates the replacement procedure with the IoT platform. This request includes which component is needed to be replaced.
9. The IoT platform allows the Car application to replace the given component.
10. The Car IoT application sends information to replace the target component.
11. The IoT platform replace the target component with the new information from the Car IoT application.
12. The IoT platform informs the successful operation of the requested replacement.

### 6.x.7 Alternative Flow

None

### 6.x.8 Post-conditions

None

### 6.x.9 High Level Illustration



Figure 6.x.9-1 High level illustration of device replacement scenario

### 6.x.10 Potential Requirements

This use case scenario can be partially fulfilled by the existing requirement as below.

Table 6.x.10-1 Related exiting requirements

| Requirement ID | Description | Release |
| --- | --- | --- |
| OSR-034 | The oneM2M System shall support seamless replacement of M2M Devices as well as M2M Gateways (e.g. redirecting traffic, connection, recovery, etc.). | Not implemented |

Additionally a new requirement is needed.

Table 6.x.10-2 New potential requirement

| Requirement ID | Description | Release |
| --- | --- | --- |
| OSR-XXX | The oneM2M System shall provide the capability to manage device replacement related information (e.g., number of replacements, max number of replacement, replacement conditions, etc.) | Not implemented |
| OSR-XXX | The oneM2M System shall support mechanisms indicating and triggering device replacement procedures . | Not implemented |

### -----------------------End of input 1---------------------------------------------