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# Introduction

This contribution introduces a new use case for vanishing IoT sensor.

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

## 7.2 Use case #x – Vanishing IoT Devices

### 7.2.1 Description

There are sensors that do their job and disappear, similar to a disposable sensor. Such a sensor can be called a "Vanishing sensor". For example, suppose a system measures the temperature of a jet engine's exhaust gas to determine the engine's efficiency. In this case, a vanishing sensor can be installed in the exhaust path where the highest heat of the jet engine is discharged. When the jet engine turns on, the vanishing sensor measures temperature as long as possible before it burns out after a few minutes. However, the temperature in the exhaust path of the jet engine is still essential for the safe operation of the machine.

In order to keep measuring the temperature in the exhaust path, typically, other temperature sensors in a safe location around the engine are used. The last measurement recorded just before the vanishing sensor burned out due to high heat can be used as a reference value for the adjacent sensors measuring in a safe location. The high heat inside the engine can be measured by using the mathematical correlation between the last measured value of the vanishing sensor and the values measured at a safe location. This can virtually recreate the sensor in the exhaust path.

Vanishing sensor has the following three different statuses:

* measuring its value (physically located in a place)
* measuring its value using reference sensors (physically vanished but still working)
* vanishing permanently

In order to manage vanishing sensors throughout their lifecycle, the IoT platform behaves differently. For example, When a sensor physically exists, all the measurements from the sensor are appropriately stored based on the actual measurement value. When the sensor vanishes, the value from adjacent sensors can be used to derive the actual value at the place where the sensor was installed. IoT platform uses a pre-defined mathematical equation to derive such value.

### 7.2.2 Source

### None

### 7.2.3 Actors

* Vanishing temperature sensor: Sensors deployed in a place where extreme environment, e.g., high temperature or pressure, so disappears after operating for a certain amount of time.
* Normal sensor referencing a vanishing sensor: Sensors deployed adjacent to a vanishing sensor provide reference measurement.
* IoT platform: An IoT platform that manages data from vanishing and adjacent referencing sensors.

### 7.2.4 Pre-conditions

* The cloud IoT platform is aware of the relationship between vanishing sensors and their adjacent referencing sensors.
* The cloud IoT platform can generate measurement value from a vanishing sensor even it vanishes through a pre-defined mathematical equation.

### 7.2.5 Triggers

Some sensors do their measurement and disappear because of the extreme operating environment, e.g., high temperature and pressure. However, the measurement of where such sensors were deployed may be essential. In this case, the IoT platform generates a measurement of such a place even after these sensors disappear through adjacent sensors that provide reference values.

### 7.2.6 Normal Flow

Figure 7.2.6-1 illustrates the high-level flows of the managing sensors vanishing after operating for a certain amount of time but still need to generate its measurement.

* Step 001: IoT sensors (i.e., Sensor-A for vanishing type and Sensor-B for normal type) in a jet engine are installed and measuring temperatures. IoT sensors send measured values to the IoT platform.
* Step 002: Sensor-A vanishes because of the jet engine's extremely high temperature.
* Step 003: When Sensor-B generates a new measurement, the IoT Platform stores the new measurement from the reference sensor. Then IoT platform checks the status of the vanishing sensor.
	+ If the sensor does not vanish and has generated its new measurement, the IoT platform does nothing.
	+ If the sensor vanishes, then the IoT platform applies a pre-defined equation to the measurement of the reference sensor (i.e., Sensor-B). For example, if the measurement of Sensor-B is "100" and the pre-defined equation is "multiply 2", then the generated value for Sensor-A becomes 200.

Finally, the IoT platform generates a temperature value for Sensor-A and stores the value to the corresponding resource for Sensor-A.



Figure 7.2.6-1 A normal flow for managing sensnors vanishing in extreme environment

### 7.2.7 Alternative Flow

None

### 7.2.8 Post-conditions

None

### 7.2.9 High Level Illustration



Figure 7.2.9-1 The relationship between values from a normal sensor and vanishing sensor

### 7.2.10 Potential Requirements

1. The oneM2M System shall be able to generate measured data from sensors that vanish after operating for a certain period because of the extreme environment (e.g., high temperature or pressure) using measurements from adjacent sensors.

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