# Certified Capability List

This Capability List is based on a certification session performed by the *TALQ Certification Tool (v2.3.0-update.6) on 2021-04-15 13:26:46.446 +0200.*

The Capability List is a consolidated list of TALQ features which are implemented in a product.

The tool has succesfully performed *67 tests*.

## Product details

| | |
|---|---|
| **Product Name** | PE Smart GW |
| **Company** | Paradox Engineering |
| **Type** | GATEWAY |
| **Notes** | Device and data coordinator of PE Smart Urban Network, providing unparalleled flexibility with IPv6 Edge-router and IPv4 WAN-router functions in a single device, managing all messages / commands between PE Smart CMS and PE Smart Nodes. Supporting data hungry applications as well as local field devices such as sensors and actuators, it acts as the backbone of a truly integrated Smart City infrastructure. |
| **Generated on** | 2021-04-15 13:26:46.446 +0200 |
| **Supported profiles** | • Lighting |
| **Certification performed by app version:** | 2.3.0-update.6 |

## Capability list

# Security

Enabled ✔

# Functions

## Basic

The Basic function describes the properties related to the physical asset to which the logical device is associated, such as identification (assetId) and location information.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | displayName | Display name of the asset. |
| ✔ | assetId | Customer identifier of the asset. If multiple devices have the same assetId it means they belong to the same asset. |
| ✔ | serial | Serial number of the device. |
| ✔ | hwVersion | Hardware revision of the device. |
| ✔ | swVersion | Software version installed on the device. |
| ✔ | installationDate | The installation date of Physical Device. |
| ✔ | location | Latitude, Longitude and Altitude. [DEPRECATED: This attribute has been deprecated and it will be removed in the next MAJOR release. Please use the new LocationSensorFunction.location instead.] |
| ✔ | deviceReset | The physical device containing the logical device was reset. |
| ✔ | softwareUpdating | Indicates software updating is in progress. |
| ✔ | ntpServers | List of NTP servers to use for time synchronization (Hostname or IP address). [DEPRECATED: This attribute has been deprecated and it will be removed in the next MAJOR release. Please use the new TimeFunction.ntpServers instead.] |
| ✔ | ntpSynchPeriod | Number of hours between two time synchronization updates. [DEPRECATED: This attribute has been deprecated and it will be removed in the next MAJOR release. Please use the new TimeFunction.ntpSynchPeriod instead.] |

| | | |
|---|---|---|
| ✔ | currentTime | Current time of the device defined as local time with time zone designator. [DEPRECATED: This attribute has been deprecated and it will be removed in the next MAJOR release. Please use the new TimeFunction.currentTime instead.] |

### Events

| # | Event type | Description |
|---|---|---|
| ✔ | deviceReset | The physical device containing the logical device was reset |

## Communication

The Communication Function contains attributes related to the communication within the ODN, and between ODN devices and Gateways. Although communication within the ODN is outside the scope of the TALQ Smart City Protocol, this Function enables access to a minimum set of configuration and state information of the ODN communication interface in order to facilitate system management from the CMS.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | communicationType | Type of communication technology implemented by the ODN (e.g. power line, wireless). |
| ✔ | logicalAddress | Logical address for communication within the ODN scope (IP address, Short Address, ...). |
| ✔ | altLogicalAddress | Additional logical address used for communication within the ODN, for instance, group communication address (not a TALQ group address). |
| ✔ | physicalAddress | Physical address of the device. For example, IEEE MAC address. This attribute can be used to map between logical and physical devices. The format is specific to the ODN implementation. |
| ✔ | parentAddress | TALQ Address of the parent device, e.g. gateway. It shall point to a specific communication function. |
| ✔ | timeToLive | Number of times a packet can be forwarded within the ODN. |
| ✔ | repeatingEnabled | Describes whether repeating functionality is enabled at the device. |
| ✔ | transmitPower | Transmit power used by the device within the ODN. |
| ✔ | numberOfHops | Number of hops between the gateway and the ODN device represented by the device including this function. |

| | | |
|---|---|---|
| ✔ | communicationQuality | Indicator of the quality of the communication with the device. 100% means good quality. |
| ✔ | communicationFailure | This attribute is updated by the ODN when the communication function is not operating as expected. |

### Events

| # | Event type | Description |
|---|---|---|
| ✔ | communicationFailure | This event is generated by the ODN when the communication function is not operating as expected |

## Gateway

The Gateway function includes the necessary attributes to enable the communication between the CMS and the Gateway according to the TALQ Specification.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | cmsUri | Base URI for TALQ communication that allows the Gateway to access the CMS. Must be an absolute URI. Other URI's for accessing CMS can be relative to this base. |
| ✔ | cmsAddress | CMS UUID address |
| ✔ | gatewayUri | Base URI for TALQ communication that allows the CMS to access the Gateway. Must be an absolute URI. Other URI's for accessing Gateway can be relative to this base. |
| ✔ | gatewayAddress | Gateway UUID address |
| ✔ | retryPeriod | Time duration before the Gateway retransmits a message for which expected response has not been received. [DEPRECATED: This attribute has been deprecated and it will be removed in the next MAJOR release. Please use the new GatewayFunction.gatewayRetryPeriod instead.] |
| ✔ | crlUrn | URI where the Gateway can obtain the Certification Revocation List (CRL). |
| ✔ | vendor | Vendor identification. |

## Lamp Actuator

The Lamp Actuator function includes attributes related to lighting control and it represents the smallest unit for control purposes. In practice, however, a Lamp Actuator function can control

combinations of several lamps and control gear but all in the same way, as if they are all one individual unit.

## Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | outputPort | Identifier of the output port that is controlled by the lamp actuator. |
| ✔ | standbyMode | Defines the behavior of the lamp actuator when output level is set to zero. If OFF, light output level is zero with no power to the lamp control gear. If ON, light output level is zero but power is delivered to the lamp control gear (standby mode). |
| ✔ | cloEnabled | Determines whether a Constant Light Output (CLO) correction factor is used. CLO is used to compensate for lumen output degradation over the life time of the lamp. If CLO is enabled, lamps are dimmed part of the lampType. |
| ✔ | defaultLightState | Sets the default light output for the lamp actuator. This shall be applicable if no other command is active. This attribute shall be set to 100% as default value. |
| ✔ | targetLightCommand | Latest command for the lamp actuator. |
| ✔ | feedbackLightCommand | This attribute reflects the command in effect and it might deviate from the actualLightState due to propagation time or due to internal ODN specific mechanisms to handle the priority of the requests. |
| ✔ | actualLightState | This attribute should reflect the physical state of the light source as much as possible, including factors such as CLO. It may be calculated or measured, depending on the specific ODN implementation, which is outside the scope of this specification. |
| ✔ | maintenanceFactorEnabled | Indicates whether maintenance compensation is enabled. A maintenance factor can be added in addition to the CLO correction factor to account effects of maintenance (e.g. cleaning) of the luminaire on the lumen output. |
| ✔ | maintenancePeriod | Period (Hours) after which maintenance factor is 100%. The assumption is that the maintenance correction factor vs. time curve is linear. |
| ✔ | maintenanceFactor | Initial correction factor applied when the luminaire is cleaned. |

| | | |
|---|---|---|
| ✔ | lastMaintenanceDate | Date when the luminaire was last cleaned (used to reset the maintenance factor). |
| ✔ | calendarID | TALQ Address of the calendar controlling this lamp actuator. If this attribute is empty, the behavior shall be determined by the ODN. If the attribute is invalid, the ODN shall trigger a generic invalid address event and the behavior shall be determined by the ODN. |
| ✔ | invalidCalendar | The lamp actuator function has been allocated a calendar that it cannot implement. |
| ✔ | lightStateChange | Light state has changed. |

### Events

| # | Event type | Description |
|---|---|---|
| ✔ | lightStateChange | Light state has changed |

## Lamp Monitor

The Lamp Monitor function enables monitoring of lamp parameters. A Lamp Monitor function should be associated with a specific lamp/control gear combination. Multiple lamp monitor functions may be implemented by a single device.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | supplyVoltage | RMS supply volts when supplyType is AC, supply voltage (V) when supplyType is DC. |
| ✔ | supplyCurrent | RMS supply current (A) when supplyType is AC, supply current (A) when supplyType is DC. |
| ✔ | activePower | Active power. |
| ✔ | powerFactor | Active power/Apparent power. |
| ✔ | activeEnergy | Cumulative active energy (since installation or counter reset). |
| ✔ | lampPowerTooHigh | Lamp power is greater than expected lamp power + lampPowerTolerance. |
| ✔ | lampPowerTooLow | Lamp power is smaller than expected lamp power - lampPowerTolerance |
| ✔ | lampVoltageTooHigh | Level of lamp voltage (not supply voltage) is greater than highLampVoltageThreshold. |

| | | |
|---|---|---|
| ✔ | lampVoltageTooLow | Level of lamp voltage (not supply voltage) is smaller than lowLampVoltageThreshold. |
| ✔ | lampFailure | The lamp is not operating as it is supposed to (e.g. the lamp is broken). This event shall be used to detect a situation where the lamp (or LED module(s)) should be lit, but produce no light. This could be detected by the current flowing or power consumed. |
| ✔ | currentTooHigh | Supply current is above the highCurrentThreshold defined in the lamp type. |
| ✔ | currentTooLow | Supply current is below the lowCurrentThreshold defined in the lamp type. |
| ✔ | powerFactorTooLow | The power factor is below powerFactorThreshold. |

### Events

| # | Event type | Description |
|---|---|---|
| ✔ | lampFailure | The lamp is not operating as it is supposed to (e.g. the lamp is broken). This event shall be used to detect a situation where the lamp (or LED module(s)) should be lit, but produce no light. This could be detected by the current flowing or power consumed. |

## Electrical Meter

The electrical meter function supports electrical metering capabilities including measurements of voltage, current, power, energy, and power factor. This function may be associated with Luminaire Controllers, Cabinet Controllers or electrical meters installed in switch boxes. ODNs may implement both single phase and three phase meters. Typically meters within a control device will be single phase and stand-alone meters. A street side cabinet may have single phase or three phase meters.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | totalPower | Sum of the active power consumed on phase 1, 2 and 3, or just the power for a single phase meter. |
| ✔ | totalVA | Sum of the apparent power consumed on phase 1, 2 and 3, or just the apparent power for a single phase meter. |
| ✔ | totalVAR | Sum of the reactive power consumed on phase 1, 2 and 3, or just the reactive power for a single phase meter. |
| ✔ | totalActiveEnergy | Total cumulative kWh measured by the meter since installation date (or counter reset). |

| | | |
|---|---|---|
| ✔ | totalReactiveEnergy | Total cumulative kVArh measured by the meter since installation date (or counter reset). |
| ✔ | totalApparentEnergy | Total cumulative kVAh measured by the meter since installation date (or counter reset). |
| ✔ | voltagePhase1Phase2 | RMS Voltage between phase 1 and phase 2. |
| ✔ | voltagePhase2Phase3 | RMS Voltage between phase 2 and phase 3. |
| ✔ | voltagePhase3Phase1 | RMS Voltage between phase 3 and phase 1. |
| ✔ | totalCurrent | Sum of the RMS currents on phase 1, 2 and 3. |

### Events

| # | Event type | Description |
|---|---|---|

## Photocell

A Photocell function models the capabilities of a photocell that can be used for lighting control. This function shall be supported by the CMS and optionally by the ODNs (Gateway).

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | onLevel | Illuminance level at which the photocell switches to on state. |
| ✔ | offLevel | Illuminance level at which the photocell switches to off state. |
| ✔ | photocellOutput | Output state of the photocell. Possible values are ON (means the illuminance level has fallen below the onLevel) and OFF (means the illuminance level has risen above the offLevel). |

### Events

| # | Event type | Description |
|---|---|---|

## Light Sensor

A Light Sensor function models the output of light sensor. This function is optional for both CMS and Gateway, but when supported the requirements in this section shall apply.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | lightLevel | Illuminance level. |

### Events

| # | Event type | Description |
|---|---|---|

## Binary Sensor

A Binary Sensor function can be used to model any sensor that provides a digital, binary output. This function is optional for both CMS and Gateway, but when supported the requirements in this section shall apply.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | level | Sensor Output level. |

### Events

| # | Event type | Description |
|---|---|---|

## Generic Sensor

A Generic Sensor function can be used to model any sensor that provides an analog or multilevel output. This function is optional for both CMS and Gateway, but when supported the requirements in this section shall apply.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | level | Sensor Output level. |

### Events

| # | Event type | Description |
|---|---|---|

## Generic Actuator

The Generic Actuator function includes attributes related to generic control and it represents the smallest unit for control purposes.

### Attributes

| # | Attribute | Description |
|---|---|---|

| | | |
|---|---|---|
| ✔ | defaultState | Sets the default state output for the generic actuator. This shall be applicable if no other command is active. |
| ✔ | actualState | This attribute should reflect the physical state of the source as much as possible. It may be calculated or measured, depending on the specific ODN implementation, which is outside the scope of this specification. |
| ✔ | targetCommand | Latest command for the generic actuator. |
| ✔ | feedbackCommand | This attribute reflects the command in effect and it might deviate from the actualState due to propagation time or due to internal ODN specific mechanisms to handle the priority of the requests. |
| ✔ | calendarID | TALQ Address of the calendar controlling this generic actuator. If this attribute is empty, the behavior shall be determined by the ODN. If the attribute is invalid, the ODN shall trigger a generic invalid address event and the behavior shall be determined by the ODN. |
| ✔ | invalidCalendar | This event is generated when a calendar has been allocated and can not be implemented it. |

### Events

| # | Event type | Description |
|---|---|---|

## Temperature Sensor

The Temperature Sensor function allows a CMS to monitor the temperature in a device and send events in case the value is above/below configurable thresholds.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | temperature | Output temperature. |

### Events

| # | Event type | Description |
|---|---|---|

## Humidity Sensor

The Humidity Sensor function allows a CMS to monitor the humidity in a device and send events in case the value is above/below configurable thresholds.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | humidity | Output humidity. |

### Events

| # | Event type | Description |
|---|---|---|

## Particulate Matter Sensor

The Particulate Matter Sensor function allows a CMS to monitor the PM10, PM2.5 and PM1 in a device and send events in case the value is above/below configurable thresholds.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | pm1 | Level of pm1 measured by the sensor. (micrograms/m3) |
| ✔ | pm2-5 | Level of pm2-5 measured by the sensor. (micrograms/m3) |
| ✔ | pm10 | Level of pm10 measured by the sensor. (micrograms/m3) |

### Events

| # | Event type | Description |
|---|---|---|

## Presence Sensor

The Presence Sensor function allows a CMS to detect presence. This function may be used in Parking Place detectors as well as in dynamic outdoor lighting scenario.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | presenceStatus | Presence status. |

### Events

| # | Event type | Description |
|---|---|---|

## Battery Level Sensor

The Battery Level Sensor function allows to measure the charge of the battery, monitor the battery and send events in case the value is above/below configurable thresholds.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | batteryLevel | Battery level. |

### Events

| # | Event type | Description |
|---|---|---|

## Filling Level Sensor

The Filling Level Sensor function allows to measure how full a container is and send events in case the value is above/below configurable thresholds.

### Attributes

| # | Attribute | Description |
|---|---|---|
| ✔ | containerHeight | Container height (m). |
| ✔ | fillingHeight | Filling container height (m). |
| ✔ | fillingPercentage | Filling percentage. |
| ✔ | containerFull | Indicates the container filling height is above levelHighThreshold. |

### Events

| # | Event type | Description |
|---|---|---|

## Location Sensor*

The Location Sensor Function is used to indicate that an object has changed position attributes configurable by the CMS or based on internal setup of the vendor. For example, a specific location (latitude, longitude) of a device could be defined by the vendor. If the device is equipped with a GPS, it could send a specific event indicating that its position is different to the one defined by the CMS. We might also want to let the configuration to the vendor itself and simply define events notifying the CMS that the default configuration has changed. For example, a garbage bin could have its location defined based on a sensor placed on the floor. If the bin is not above this sensor, the vendor will trigger an event. In this last case, the CMS does not need to configure anything.

### Attributes

| # | Attribute | Description |
|---|---|---|

| | | |
|---|---|---|
| ✔ | location | Location of the device |

### Events

| # | Event type | Description |
|---|---|---|
| ✔ | locationChanged | Triggered when the difference between location and expectedLocation is above locationChangedThreshold |

## Services

### Configuration Service

The TALQ Configuration Service enables discovery and configuration of devices and services

### Options

| # | Option | Value | Description |
|---|---|---|---|
| ✔ | commissioningSupported* | | This ODN can support commissioning from the CMS side. |
| ✔ | devicesPaginationSupported* | | This ODN can support pagination of devices. |

### Control Service

The Control service describes the mechanisms to operate the actuator functions in order to enable schedule based and override control

### Options

| # | Option | Value | Description |
|---|---|---|---|
| ✔ | supportedTypes | • AbsoluteActivePeriod<br>• AstroClockActivePeriod<br>• DynamicControl*<br>• SensorActivePeriod*<br>• AstroAndSensorActivePeriod*<br>• ExternalControlEffect* | Control Program and calendar options supported are defined by announcing support for the given modes |

| | | |
|---|---|---|
| ✔ | ccDateSupport | Indicates the ccDate options supported |
| ✔ | ccDaySupport | Indicates the ccDay options supported |
| ✔ | programSecondsSupported* | Indicates whether the field of seconds is supported in programs. |

### Events

| # | Event Type | Description |
|---|---|---|
| ✔ | invalidCalendar | An invalid calendar has been provided by the CMS to the ODN |
| ✔ | invalidProgram | A control program has been provided by the CMS, which cannot be implemented by the ODN |

## Data Collection Service

The TALQ Data Collection Service is a provision to configure how ODN measurements, status information and events are logged, and when or under what conditions the logged data is transferred to the CMS

### Options

| # | Option | Value | Description |
|---|---|---|---|
| ✔ | supportedModes | • EventRecordingMode<br>• PeriodicRecordingMode<br>• VendorRecordingMode<br>• ImmediateReportingMode<br>• ScheduledReportingMode | Recording and Reporting modes supported |

### Events

| # | Event Type | Description |
|---|---|---|
| ✔ | invalidLoggerConfig | The CMS has provided a data logger configuration that cannot be implemented by the ODN |

### On Demand Data Request Service

This service provides the mechanism to access attributes in the logical devices by requesting attribute values from the ODN

### Group Management Service

This service provides the mechanisms to define and manage groups

#### Options

| # | Option | Value | Description |
|---|---|---|---|

### Test Service

This service provides a mechanism to reduce the human intervention during the certification tests, enabling the certification tests to maximise automation

## Objects

### Event log data

Event log data contains a single event, with eventType and value, in each single log entry. It also includes information about whether the log denotes the start or end of the event. Furthermore additional information can be added with the info attribute.

#### Properties

| # | Property | Description |
|---|---|---|
| ✔ | eventType | Identifier of event reported |
| ✔ | srcAddress | Address of Logical device or function within a logical device which is the source of the event or to which this event applies |

### Command

A command defines a type of control action that can be applied to a function. Commands can be generated by a manual override action or by a control program.

#### Properties

| # | Property | Description |
|---|---|---|
| ✔ | state | Light state to be applied to the lamp actuator |
| ✔ | cmsRefId | CMS reference, which can be used for data logging. The cmsRefId in a Command is a free text to be used by the CMS for any purpose, e.g: to differentiate contexts. It is a token that allows the CMS to match client requests to the original notification. |

*: The Certification Test Tool is designed to provide a high level of confidence that complementary systems can communicate successfully. As both the protocol and the test tool evolve, all mandatory and other core tests are confirmed by comparison with real-life scenarios (plug-fest or similar). Some tests of optional and more peripheral features may not yet have been confirmed in this way; such features are identified with an asterisk (*).

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