

digitalSTROM System Interfaces

digitalSTROM

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Contents

1	Introduction	5
2	Webservices	6
2.1	JSON	6
2.2	SOAP	6
3	Property Tree	7
3.1	Supported Data Types	7
3.2	/system	7
3.2.1	/system/uptime	7
3.2.2	/system/version	7
3.2.3	/system/EventInterpreter	7
3.2.4	/system/security	7
3.2.5	/system/host	8
3.2.6	/system/js	8
3.3	/config	8
3.3.1	/config/subsystems/Metering	9
3.3.2	/config/subsystems/Apartment	9
3.3.3	/config/subsystems/DSSim	9
3.3.4	/config/subsystems/DSBusInterface	9
3.3.5	/config/subsystems/WebServer	9
3.3.6	/config/subsystems/EventInterpreter	10
3.3.7	/config/geodata	10
3.4	/apartment	11
3.4.1	/apartment/zones	11
3.4.2	/apartment/dSMeters	14
3.5	/usr	15
3.6	/usr/states	15
3.7	/usr/addon-states	15
3.8	/usr/triggers[0..x]	15
3.9	/usr/events[0..x]	16
3.10	/scripts	16
4	Events	17
4.1	Subscriptions	17
4.1.1	Static Subscriptions	17
4.1.2	Dynamic Subscriptions	17
4.1.3	Filter	17
4.2	Event Reference	18
4.2.1	callScene and undoScene	18
4.2.2	buttonClick	19
4.2.3	deviceSensorEvent	19
4.2.4	running	19
4.2.5	model_ready	19
4.2.6	dsMeter_ready	19
4.3	Private Addon Events	20
4.4	Event Handler	20
4.4.1	JavaScript Handler	20
4.4.2	Raise Event Handler	21
4.4.3	High Level Event Handler	21
4.4.4	Action Execute Handler	21
4.4.5	Trigger Handler	21
4.4.6	Sendmail Handler	22

5 System Scripts	23
5.1 States - System States	23
5.1.1 States with apartment-scope	23
5.1.2 States with zone-scope	24
5.1.3 States with group-scope	24
5.1.4 States with device-scope	24
5.2 States - Addonstates	24
5.3 Trigger	25
5.4 Actions	26
5.5 Conditions	28
5.6 Chaining Trigger and Actions	29
5.7 Included scripts - UDA	29
5.8 Included scripts - Solar computer	29
6 Authentication	30
6.1 Configurator and Addons	30
6.2 Applications	30
6.2.1 Getting a Token	30
6.2.2 Approving the token	30
6.2.3 Logging in	30
6.2.4 Using the session token	30
7 Metering	32
7.1 Available Data	32
7.2 Accessing the Data	32
7.2.1 Current Metering Data	32
7.2.2 Time-series Data	32
8 Communication using custom events	33
8.1 Conventions	33
8.2 App to App communication	33
8.2.1 Directly accessing the propertytree	33
8.2.2 raising a event	33
8.3 UI to App communication	33
8.3.1 Directly accessing the propertytree	33
8.3.2 raising a event	34
8.4 App to UI communication	34
9 Device Model Features	35
9.1 Available Model Features	35
10 Single Device Descriptions	55
10.1 Descriptions	55
10.1.1 Events	55
10.1.2 States	55
10.1.3 Properties	55
10.1.4 Measurements	55
10.1.5 Action Descriptions	55
10.1.6 Standard Actions	55
10.2 Translations	55
10.3 Database	55
11 Certification Rules	57

1 Introduction

This document contains instructions how to use and access the digitalSTROM-Server, both for internal addon modules that enhance the system functionality and for external applications.

The application interface itself is defined in two additional documents:

- Webservice via JSON
- Server Scripting

The documents can be downloaded from <http://developer.digitalstrom.org/Architecture>.

Notice This document refers to digitalSTROM system release R1.13.3 from March 2017. Any later release may have additional or removed functionality.

2 Webservices

2.1 JSON

External applications communicate with the digitalSTROM-Server through the JSON API. The full documentation and description of all the available JSON functions and parameters can be found on the digitalSTROM developer website in the dss download directory. Please refer to the document version corresponding to your dSS software release:

<http://developer.digitalstrom.org/download/dss/>

Access is granted with a token based login described in [6](#).

JSON requests to the API are built up like this:

`https://<server ip>:<port>/json/<class>/<function>?<paramter>&<parameter>`

For example this function calls scene 5 on light devices in zone 1307:

`https://10.0.0.2:8080/json/zone/callScene?id=1307&groupID=1&sceneNumber=5&force=true&token=xxxxxxxx`

Not all JSON functions take parameters, for example `json/apartment/getConsumption`.

The JSON formatted reply returns true for "ok" if the digitalSTROM-Server successfully processed the query, and JSON objects and arrays if data was requested.

Example reply (`json/apartment/getConsumption`):

```
{  
    "ok": true,  
    "result": {  
        "consumption": 74  
    }  
}
```

2.2 SOAP

The SOAP interface has been removed.

3 Property Tree

The property tree allows the dSS to expose data to the outside world, it also provides means of communication with internal scripts, serves as a data storage for internal scripts and remote applications (such as smartphone apps or HTML based user interfaces) and also allows limited control over the scheduled events queue.

Each node of the property tree can be either a container, holding further child nodes, or a leaf node, carrying actual data. When you look at the root level, you will see a logical structure of five nodes, each holding specific system properties:

- **/system** - general information about the dSS, information and control of the event queue
- **/config** - configuration of the dSS and its subsystems
- **/apartment** - information about your digitalSTROM installation, here you will see the configured zones, connected meters, devices and their configurations.
- **/usr** - shared dynamic configuration for all Apps (like User-Defined-Actions, system states, triggers ...)
- **/scripts** - internal scripts running on the dSS will show up here by their configured script_id's and can use this area to store data.

3.1 Supported Data Types

The property tree supports three data types:

- **string**: - sequence of characters
- **boolean**: - “true” or “false”
- **integer**: numeric integer value

3.2 /system

The system block covers general information about the dSS and the host it is running on, shows a list of scheduled events in the event queue and allows to cancel them, it also presents security settings such as available users and application tokens.

3.2.1 /system/uptime

This is a leaf node which contains the uptime of the dSS in seconds.

3.2.2 /system/version

This is a container node that holds information about the dSS version, version of the Linux distribution that the dSS is running on, name of the build host and the git revision of the dSS source code.

3.2.3 /system/EventInterpreter

This is a container node that holds information about the event queue of the dSS, providing statistics on processed events and also listing the scheduled events.

Note: removing a scheduled event node will remove the event from the queue and thus prevent its execution.

3.2.4 /system/security

This is a container node that holds information about system users and application tokens.

do we want
document
bad things
happen if we
really do the
wrong ever

/system/security/users Provides information on users available on the system, along with their salt and encrypted password.

/system/security/applicationTokens This is a container node that provides information about enabled application tokens.

/system/security/roles Currently unsupported.

3.2.5 /system/host

This is a container node that provides information about the network interfaces and network configuration of the host on which the dSS is running.

3.2.6 /system/js

This is a container node that provides information about some internal script settings. If the boolean property "timing" is enabled the script interpreter collects load and execution time information for each javascript file.

/system/js/logfiles This node contains a list of internal script log files and their locations on disk. These log files can be downloaded via the JSON API.

3.3 /config

This node holds information about the system configuration. On the top level you will find settings for various directories used by the dSS, like directory where to search for data, webroot of the http server, etc.

Below is a list of directory configuration nodes:

- node name: **datadirectory**
value type: string
description: the data directory of the dSS, most other directories and files will be stored relative to it unless configured otherwise. For example, apartment.xml will be stored in the data directory.
- node name: **configdirectory**
value type: string
description: directory where dSS will search for configuration files like config.xml, subscriptions, etc.
- node name: **webrootdirectory**
value type: string
description: web root directory of the builtin web server
- node name: **jslogdirectory**
value type: string
description: directory where to store log files that are produced by internal JS scripts that are running on the dSS
- node name: **savedpropsdirectory**
value type: string
description: directory where the dSS will save persistent property tree entries or saved properties, configurations of internal scripts will usually be stored here.

Further, configuration of each subsystem is stored under the **/config/subsystems** node. One leaf node, that is present in each subsystem is the **loglevel** node. The log level is stored as a numeric value, the higher the value the less log output is produced, the values have the following meaning:

- loglevel 0: debug

now why we expose encrypted word here? what's the pose of it? what or wh is this salt used?

- loglevel 1: information
- loglevel 2: warning
- loglevel 3: error
- loglevel 4: fatal

Apart from the **loglevel**, another common subsystems node is **enabled**. It's a leaf node containing a boolean value that specifies if the subsystem is currently enabled or disabled.

Note: while each subsystem will show an **enabled** node, not all subsystems can be actually disabled.

3.3.1 /config/subsystems/Metering

This node contains information about the metering subsystem.

Following leaf nodes are available:

- node name: **storageLocation**
value type: string
description: location of the rrd metering databases on disk
- node name: **rrdDaemonAddress**
value type: string
description: URI of the rrd cache daemon, if rrdcached is being used

3.3.2 /config/subsystems/Apartment

This node contains information about the apartment subsystem.

- node name: **configfile**
value type: string
description: location of the apartment.xml configuration file on disk

3.3.3 /config/subsystems/DSSim

Although this subsystem is showed as enabled, it is currently inactive and deprecated, simulation will be implemented outside of the dSS.

3.3.4 /config/subsystems/DSBusInterface

This node contains information about the ds485 bus interface subsystem.

- node name: **connectionURI**
value type: string
description: URI pointing to the ds485 daemon, all communication between the dSS and the connected hardware goes via this interface

Note: if the ds485 connection URI is invalid or if the ds485 daemon is not running, dSS will still start up and try to connect to the given URI repeatedly. However, as long as the connection is not established, you will not see any active devices and you will not be able to control and configure your digitalSTROM installation.

3.3.5 /config/subsystems/WebServer

This node contains information about the built in web server configuration.

- node name: **listen**
value type: string
description: interfaces and ports on which the web server is listening for incoming connections. By default SSL is used, however an "h" behind the port means, that SSL was disabled for the given port and that it is available without encryption.

- node name: **trustedPort**
value type: integer
description: when accessing the dSS via a trustedPort it is enough to provide a valid username in the HTTP Authorization header, the dSS will login this user automatically.
- node name: **webroot**
value type: string
description: location web root directory on disk
- node name: **bindip**
value type: string
description: ip of the interface to which the web server is bound
- node name: **announcedport**
value type: integer
description: port that is announced via avahi/bonjour
- node name: **sslcert**
value type: string
description: location of the web servers SSL certificate on disk
- node name: **sessionTimeoutMinutes**
value type: integer
description: timeout value of the session

why do we
use webrootdir
and webroot?
it seems to
contain critical
data, if this dup-
lication is real
needed

"listen" can
be on multiple
interfaces; so what's
the point?

/config/subsystems/WebServer/files This node contains a list of files that can be downloaded from the dSS. In order to download the file issue an HTTP GET request to the following URL (depending on your setup):

`http(s)://hostip:port/download/filename.extension`

...and what
about the dSS cr-
- ticket 19

3.3.6 /config/subsystems/EventInterpreter

- node name: **subscriptionfile**
value type: string
description: location of the main subscription file on disk
- node name: **subscriptiondir**
value type: string
description: directory where dSS will search for further subscription configurations

3.3.7 /config/geodata

This node contains information on the dSS location as well as sunset and sunrises times, the data is updated automatically when the dSS is running. Following information is available:

- node name: **latitude**
value type: string
description: geographic coordinate of the dSS
- node name: **longitude**
value type: string
description: geographic coordinate of the dSS
- node name: **sunrise**
value type: string
description: time when the sun rises at the given location (see **latitude** and **longitude**)
- node name: **sunset**
value type: string
description: time when the sun sets at the given location (see **latitude** and **longitude**)

- node name: **civil_dawn**
value type: string
description: time of civil dawn at the given location (see **latitude** and **longitude**)
- node name: **civil_dusk**
value type: string
description: time of civil dusk at the given location (see **latitude** and **longitude**)
- node name: **nautical_dawn**
value type: string
description: time of nautical dawn at the given location (see **latitude** and **longitude**)
- node name: **nautical_dusk**
value type: string
description: time of nautical dusk at the given location (see **latitude** and **longitude**)
- node name: **astronomical_dawn**
value type: string
description: time of astronomical dawn at the given location (see **latitude** and **longitude**)
- node name: **astronomical_dusk**
value type: string
description: time of astronomical dusk at the given location (see **latitude** and **longitude**)

3.4 /apartment

This section provides information about your digitalSTROM installation, it lists all available meters and devices, configured zones and more.

3.4.1 /apartment/zones

This node contains a list of zones that are configured in the apartment.

Note: the zone with id zero is a special virtual zone that contains all available devices and all devices that were known to the dSS.

Each **zone** node contains the same set of sub nodes:

- node name: **ZoneID**
value type: integer
description: numeric id of the zone
- node name: **name**
value type: string
description: name of the zone as set by the user

Further, each **zone** node provides the following container nodes: **devices**, **SensorHistory** and **groups**.

/apartment/zones/zoneX/devices The devices node contains a list of individual device nodes, each device node has the following properties:

- node name: **dSID**
value type: string
description: unique digitalSTROM ID, the device dSID
- node name: **present**
value type: boolean
description: flag specifying if the device is currently present in the installation, or if this is a device that is known to the dSS but that is not currently available

- node name: **name**
value type: string
description: name of the device as set by the user
- node name: **dSMeterDSID**
value type: string
description: digitalSTROM id of the meter to which this device is connected
- node name: **ZoneID**
value type: integer
description: numeric id of the zone in which the device resides
- node name: **functionID**
value type: integer
description: function id of the device, for example the class of the device (i.e. yellow, grey, etc.) is encoded in the function id
- node name: **revisionID**
value type: integer
description: revision id of the device which is the encoded firmware version
- node name: **productID**
value type: integer
description: numeric id of the product which identifies the device type and can be decoded to map the human readable product types like KM, TKM, KL and so on.
- node name: **lastKnownZoneID**
value type: integer
description: numeric id of the last known zone, for present devices this will be the same as the ZoneID.
- node name: **lastKnownMeterDSID**
value type: string
description: digitalSTROM ID of the meter to which the device was last connected
- node name: **firstSeen**
value type: string
description: time stamp when the device was seen by the dSS for the very first time
- node name: **lastDiscovered**
value type: string
description: time stamp when the device was last discovered by the dSS
- node name: **inactiveSince**
value type: string
description: time stamp since when the device became inactive, this field only makes sense for devices where the present flag equals to false. For devices that are present this field should be ignored as it will show the unix epoch time.
- node name: **locked**
description: deprecated
- node name: **outputMode**
value type: integer
description: numeric value representing the output mode of the device
- node name: **button**
description: container for button information nodes
 - node name: **id**
value type: integer
description: numeric value representing the id of the button, i.e. zone/area/app

revisionID
productRev
- inconsis
JSON, tick
1916

- node name: **inputMode**
 value type: integer
 description: button input mode configuration value, i.e. 2way-up, 1-way, etc.
- node name: **inputIndex**
 value type: integer
 description: index of the input buttons for this device
- node name: **inputCount**
 value type: integer
 description: total number of input buttons of the physical device
- node name: **activeGroup**
 value type: integer
 description: group in which events from this device are processed
- node name: **setsLocalPriority**
 value type: boolean
 description: this flag indicates the automatic setting of calls in area scenes
- node name: **SensorEvents**
 description: list of sensor events if configured (for example ZWS “verbrauchsmeldung”)
- node name: **tags**
 description: deprecated
- node name: **groups**
 description: container for a list of group nodes, providing the group membership information of the device
- node name: **sensorTable**
 description: this node contains a list of nodes that provide information about sensors that are available for this device
- node name: **modelFeatures**
 description: container for a list of modelFeature nodes overriding/ extending the modelFeatures given in the getModelFeatures JSON call
 content: individual model feature items are represented as boolean nodes with the model feature name as the node name and the boolean value indicating if the feature is turned on or off

/apartment/zones/zoneX/groups/groupX This node contains information on the group, such as the group id and name, last called scene value and a list of devices that are part of the group.

- node name: **group**
 value type: integer
 description: numeric id of the group
- node name: **name**
 value type: string
 description: human readable name of the group
- node name: **scenes**
 description: list of nodes with custom scene names, if scenes have been renamed by the user
- node name: **devices**
 description: container for a list of device nodes that carry information about devices which are part of the group

/apartment/zones/zoneX/groups/groupY/sensor/typeZ Last sensor events that happened in the zone. One node per sensor type event that occurred. The special groupID "0" subtree contains sensor value events independent of a group or application.

- node name: **type**
value type: integer
description: sensor type id
- node name: **value**
value type: double
description: floating point value
- node name: **time**
value type: integer
description: time of last occurrence in seconds since epoch (UTC)
- node name: **timestamp**
value type: string
description: time of last occurrence as local time string

3.4.2 /apartment/dSMeters

This node contains a list of dSMs that are available in the digitalSTROM installation. Each dSM node has the following properties:

- node name: **dSID**
value type: string
description: unique digitalSTROM ID, dSM dSID
- node name: **powerConsumption**
value type: integer
description: current power consumption of the dSM
- node name: **powerConsumptionAge**
value type: string
description: time stamp when the power consumption value was recorded
- node name: **energyMeterValue**
value type: integer
description: current energy meter value in Wh
- node name: **energyMeterValueWs**
value type: integer
description: current energy meter value in Ws
- node name: **energyMeterValueAge**
value type: string
description: time stamp when the energy meter values were recorded
- node name: **isValid**
value type: boolean
description: flag indicating if the dSM has been read out by the dSS
- node name: **present**
value type: boolean
description: flag indicating if the dSM is present in the installation and was found by the dSS
- node name: **energyLevelRed**
description: deprecated
- node name: **energyLevelOrange**
description: deprecated
- node name: **hardwareVersion**
value type: integer
description: version of the dSM hardware

- node name: **armSoftwareVersion**
value type: integer
description: version of the ARM firmware
- node name: **dspSoftwareVersion**
value type: integer
description: version of the DSP firmware
- node name: **apiVersion**
value type: integer
description: version of the dSM API
- node name: **hardwareName**
description: deprecated
- node name: **name**
value type: string
description: name of the dSM as set but the user
- node name: **zones**
description: container node, holding a list of **zone** nodes that represent the zones that are configured on this dSM. The structure of the **zone** nodes is the same as previously described.
- node name: **devices**
description: container node, holding a list of **device** nodes that represent the devices that are connected to this dSM. The structure of the **device** nodes is the same as previously described.

3.5 /usr

This section holds some dynamic configured values, which are configured and used for all Apps globally.

3.6 /usr/states

The system-states are stored in this location. This states are managed by the digitalSTROM server itself in configuration and changing the values. They will be used as a filter for triggering a trigger and when a action-node should be executed.

3.7 /usr/addon-states

Each addon can register own states, these are stored here in a own subnode. This states are controlled by the proper addon by using scription-calls. This states canl be used as a filter for triggering a trigger and when a action-node should be executed.

3.8 /usr/triggers[0..x]

In this location all registered triggers are stored. That triggers can be registered on standardized events; when one of the events are raised, the dSS evaluates the definition found in triggerPath and when all parameters matches and conditions (such as timeframes and system-states) are met, it will raise a Event named relayedEventName with the original path of the trigger, the original parameters of the incomming event and the additionalRelayingParameter.

- node name: **id**
value type: integer
description: internal ID of that trigger-registration. Please don't touch it
- node name: **triggerPath**
value type: string
description: path of the trigger defination, where the matching parameters for the trigger is located. For description of the format please refer to scripting documentation

- node name: **relayedEventName**
value type: string
description: the result event, which will be raised, when the trigger matched the conditions
- node name: **additionalRelayingParameter**
value type: string
description: adding some extra parameters for the relayed event

3.9 /usr/events[0..x]

In this location all User-Defined-Actions are stored. They will be accessible for all other apps and UIs for execute them oder register a trigger on them. The App User Defined Action configure that values and restore of them on startup, so modifying that events should be only done though the UDA-App.

- node name: **id**
value type: integer
description: internal ID of that UDA. Please don't touch it
- node name: **name**
value type: string
description: name of the UDA
- node name: **lastSaved**
value type: int
description: timestamp when the entry is been last saved
- node name: **lastExecuted**
value type: int
description: timestamp when the entry is been last executed via UI
- node name: **actions**
value type: subnode - type action (please refer to the scripting documentation)
description: actions that will be executed
- node name: **conditions**
value type: subnode - type condition (please refer to the scripting documentation)
description: condition which should be met when executed

3.10 /scripts

This is the place where internal JS scripts that are running on the dSS will store their data, the node name of each sub node uses the script id that was configured for the particular script.

4 Events

The digitalSTROM-Server is the central engine to process system events. Internally the server uses an event interpreter to process events and to execute event handlers from extension scripting modules and server addons.

Events originate from different sources:

- digitalSTROM System-Level-Events, originating from the dS485 bus
- digitalSTROM High-Level-Events, raised by dSS Addons
- Externally generated events, received through web service interface
- Server internal and data model related events
- Addon generated events

Events can be connected to an event handler using a subscription mechanism. Events carry context and parameters that allows context evaluation and further processing by the event handler.

The JSON API allows remote applications to register and wait for particular events. The remote call is blocking and will return when the event occur. The returned values contain the same parameters that would be passed to internal event handler.

The JSON API function "/json/event/raise" allows to inject events into the event queue. Required parameter is the event name, optionally additional parameters can be passed.

4.1 Subscriptions

4.1.1 Static Subscriptions

The dSS internal subscriptions to events are configured in the `data/subscriptions.xml`. Custom subscriptions for dSS Addons are placed in separate files in the directory `data/subscriptions.d/`. These binding of scripts to specific events is a static configuration option which is evaluated once at startup of the dSS.

Subscriptions connect a handler to an event source and adds additional parameters that are required for the event handler execution.

The following excerpt shows how to run a script (`data/initialize.js`) on startup:

Listing 1: Subscription Example 1

```
<subscription event-name="running" handler-name="javascript">
  <parameter>
    <parameter name="filename1">data/initialize.js</parameter>
  </parameter>
</subscription>
```

4.1.2 Dynamic Subscriptions

The digitalSTROM-Server JSON and Scripting API allow to dynamically add and remove subscriptions. Those subscriptions are not persistent.

4.1.3 Filter

The event interpreter is able to evaluate filter expressions for subscription. This allows to have an efficient preprocessing of events rather than running all events through a custom JavaScript handler.

The following example checks two conditions and only executes the event handler if both conditions match. The first filter expressions checks for the existence of the event property `phonenumbers`, the second filter compares the event parameter `source` to a given string.

Listing 2: Filter Example 1

```
<subscription event-name="phonecall" handler-name="raise_event">
  <parameter>
    <parameter name="event_name">bell</parameter>
  </parameter>
  <filter match="all">
    <property-filter type="exists" property="phonenumbers" />
    <property-filter type="matches" value="0123456789" property="source" />
  </filter>
</subscription>
```

The second example has a condition to check for a particular scene command and raise a custom event MyAlarm if the scene command value matches "74" (which is a digitalSTROM Alarm System-Level-Event).

Listing 3: Filter Example 2

```
<subscription event-name="callScene" handler-name="raise_event">
  <parameter>
    <parameter name="event_name">MyAlarm</parameter>
  </parameter>
  <filter match="all">
    <property-filter type="matches" value="74" property="sceneID" />
  </filter>
</subscription>
```

4.2 Event Reference

The following sections list the digitalSTROM-Server event classes and their parameters. digitalSTROM system or device level events are detailed in the dS-Basics document.

The common event parameter originDeviceId is either the dSID of the digitalSTROM-Device from where the System-Level-Event has been initiated or one of the following values:

Pseudo originDeviceId	Description
0	Unknown Origin
1	Scripting
2	JSON
3	SOAP
4	Subscription
5	Simulation
6	Test

Table 1: Event Sources

digitalSTROM events and their parameter details are explained in the dS-Basics document. Please refer to the corresponding chapters.

4.2.1 callScene and undoScene

The callScene and undoScene events are raised if the digitalSTROM-Server receives a call scene or undo scene action request. The source of the event may be either the digitalSTROM system, internally generated by dSS Addons or externally injected via remote JSON calls.

Listing 4: Example callScene Event

```
Parameter: 'groupId' = '1'
Parameter: 'sceneID' = '32'
Parameter: 'zoneID' = '4011'
Parameter: 'originDeviceID' = '3504175fe000000000183f2'
```

When originating from the digitalSTROM system this event is delayed by 2 seconds to ensure that only a single appropriate event is raised for consecutive pushbutton tips. To reduce latency effects the digitalSTROM-Meter issues scene calls faster and before the last pushbutton tip takes place.

For special applications the corresponding callSceneBus event is raised as soon as the digitalSTROM-Server receives the system level event from a digitalSTROM-Meter.

4.2.2 buttonClick

The buttonClick event is raised if the digitalSTROM-Server receives a pushbutton tip event from a digitalSTROM-Device configured in the color "Joker" and working in "App Button" mode.

Listing 5: Example buttonClick Event

```
Parameter: 'clickType' = '1'  
Parameter: 'buttonIndex' = '0'
```

When originating from the digitalSTROM system this event is delayed by 2 seconds to ensure that only a single appropriate event is raised for consecutive pushbutton tips.

For special applications the corresponding buttonClickBus event is raised as soon as the digitalSTROM-Server receives the system level event from a digitalSTROM-Meter.

4.2.3 deviceSensorEvent

The deviceSensorEvent event is raised if the digitalSTROM-Server receives a sensor table event form a digitalSTROM-Device. The event parameters refer to the devices property tree entry "sensorEvents/" branch where details and specific names of the event source are stored.

Listing 6: Example deviceSensor Event

```
Parameter: 'sensorIndex' = 'event0'  
Parameter: 'sensorEvent' = 'event0'
```

4.2.4 running

The running event is raised by the event interpreter to indicate system startup. Scripts that need early initialization can make use of this event.

Notice At this time the data model is not synchronized with the digitalSTROM-Meters. If any data model or property tree access is performed it has to be considered that the status of the devices is not up to date.

4.2.5 model_ready

After the initial readout of the connected digitalSTROM-Meters and synchronization of the data model the event model_ready is raised.

4.2.6 dsMeter_ready

The dsMeter_ready event is raised each time a digitalSTROM-Meter is newly connected and the data of its connected devices has been synchronized with the data mode.

Listing 7: Example dsMeter_ready Event

```
Parameter: 'dsMeter' = '3504175fe0000010000012e9'
```

4.3 Private Addon Events

The server scripting addons may provide individual script handler for their privately used events. Those events have to comply to the namespace convention that the event name is prefixed with the unique script_id name.

Rule 1 digitalSTROM-Server Addons that implement private events have to prefix all event names with their own unique addon name.

In the following example the timed-events addon subscribes to the solar computer time updates. The subscription arranges for a new event to be raised with the name **timed-events.config**.

Listing 8: Addon Namespace

```
<subscription event-name="solar_computer.update" handler-name="raise_event">
  <parameter>
    <parameter name="event_name">timed-events.config</parameter>
    <parameter name="actions_default">suntime-reschedule</parameter>
    <parameter name="script_id">timed-events</parameter>
    <parameter name="time">+60</parameter>
  </parameter>
</subscription>
```

4.4 Event Handler

4.4.1 JavaScript Handler

The digitalSTROM-Server has the ability to run scripts using a JavaScript interpreter. The dSS Scripting API includes access to the digitalSTROM data model, the property tree, metering time series, and provides methods to execute digitalSTROM action requests and to raise new events using JSON or Scripting calls.

It is possible to execute several script files in the same context, the order of script execution is defined by the index number that is appended to the filename parameter, it allows to have 1-255 scripts in the same context, "holes" in the enumeration are not allowed. The following example show how to run two scripts in the same context for a given event:

Listing 9: Subscription Example 2

```
<subscription event-name="model_ready" handler-name="javascript">
  <parameter>
    <parameter name="filename1">data/funlibrary.js</parameter>
    <parameter name="filename2">data/initialize.js</parameter>
  </parameter>
</subscription>
```

The following parameters can be passed to a "javascript" event handler. Additional private parameters can be passed by appending "_default" to the parameter name. Existing parameters can be overridden using the "_override" postfix.

Parameter	Description
script_id	unique identifier for the script handler
filename1	path to javascript source file
actions_default	passed to the script as additional parameter default
eventpropertyxyz_override	override default value of eventpropertyxyz

Table 2: Parameter for handler-name="javascript"

The embedding JavaScript interpreter context for a subscription contains additional meta data about the event source and the subscription in the global variable **raisedEvent**:

Listing 10: Variable raisedEvent

```

raisedEvent.name = callScene
raisedEvent.source = [object Object]
raisedEvent.source.set = .zone[4011].group(1)
raisedEvent.source.groupID = 1
raisedEvent.source.zoneID = 4011
raisedEvent.source.isApartment = false
raisedEvent.source.isGroup = true
raisedEvent.source.isDevice = false
raisedEvent.parameter = [object Object]
raisedEvent.parameter.groupID = 1
raisedEvent.parameter.sceneID = 32
raisedEvent.parameter.zoneID = 4011
raisedEvent.parameter.originDeviceID = 3504175fe000000000183f2
raisedEvent.subscription = [object Object]
raisedEvent.subscription.name = callScene

```

The source field is provided as reference to the source of the device. Scripts can evaluate the isApartment, isGroup and isDevice fields to distinguish between the different kinds of digitalSTROM system events.

4.4.2 Raise Event Handler

The raise_event handler allows to propagate an event and forward it to another handler.

```

<subscription event-name="phonecall" handler-name="raise_event">
  <parameter>
    <parameter name="event_name">Mother-in-law-calls</parameter>
  </parameter>
  <filter match="all">
    <property-filter type="exists" property="phonenumbers" />
    <property-filter type="matches" value="0123456789" property="source" />
  </filter>
</subscription>

```

4.4.3 High Level Event Handler

The highlevel handler executes user defined actions. The corresponding actions are stored in a defined format in the */usr/events/* branch of the property tree.

Subscription highlevelevent

Parameter The parameter "id" is used to find the corresponding user defined action in the */usr/events/* subtree, see 5.7.

4.4.4 Action Execute Handler

The action_execute handler executes a sequence of user defined actions. The actions are stored in the property tree path given in the event data.

Subscription action_execute

Parameter The parameter path is used to find the corresponding user defined action in the */usr/events/* subtree, see 5.4. The optional parameter delay has a value in seconds and can be used to defer the event execution and schedule it for a later time.

4.4.5 Trigger Handler

The system_trgger handler is a common evaluator of conditions. The handler has subscriptions to certain system events and then checks registered system triggers in the */usr/triggers/* branch of the property tree. A new event is raised if the conditions within the trigger path do match. Event name and additional parameters are stored in the property tree trigger node.

4.4.6 Sendmail Handler

The sendmail handler formats the raw e-mail text that is then delivered to the host systems mail transfer agent. Depending on the digitalSTROM-Server compile-time configuration the raw text is only written out to a file and further processed by external agents.

Subscription sendmail

Parameter	Description
to	recipients
from	sender
cc	carbon copy recipients
bcc	blind carbon copy recipients
subject	e-mail subject
body	e-mail body text
header	additional mail header lines, seperated by a new line character

Table 3: Parameter for handler-name="sendmail"

Parameter

5 System Scripts

5.1 States - System States

System states are specialized values in the properties. Primary they represent a specific state of the installation like Panic or Holiday. These states can be used in the apps to change the behavior of the system. They are already in use for the presence-simulator system-addon, where the presence-simulator is only in control of the holiday-state and which of the entries in the timed-events system-addon have a condition based on the holiday-state.

System states are controlled by the digitalSTROM system itself and generated based on the actual configuration.

System state values will be stored in /usr/states.

5.1.1 States with apartment-scope

State	Value Range	Change set by	Comment
presence	present, absent	present(call scene 71) absent(call scene 72)	indicates presence or absence of people in the apartment.
hibernation	awake, sleeping	awake(call scene 70) sleeping(call scene 69)	indicates hibernation state of the apartment
daynight	true, false	internal	indicates whether it is night.
twilight	true, false	internal	indicates whether it is twilight.
daylight	true, false	internal	indicates whether it is daylight.
holiday	on, off	internal	indicates people are absent for a longer time.
alarm	1:'active' 2:'inactive'	active (call scene 74) inactive (undo call scene 74)	indicates an active alarm
alarm2	1:'active' 2:'inactive'	active (call scene 83) inactive (undo call scene 83)	indicates an active alarm
alarm3	1:'active' 2:'inactive'	active (call scene 84) inactive (undo call scene 84)	indicates an active alarm
alarm4	1:'active' 2:'inactive'	active (call scene 85) inactive (undo call scene 85)	indicates an active alarm
panic	1:'active' 2:'inactive'	active (call scene 65) inactive (undo call scene 65)	indicates that the user is scared
fire	1:active, 2:inactive, 3:activeMuted	call scene 76 undo call scene 76 /json/apartment/muteFire	fire extended with muted option
fireMuteEnabled	1:'active' 2:'inactive'	/json/states/set	indicates that muted fire option is enabled
wind	1:'active' 2:'inactive'	active (call scene 87) inactive (undo call scene 87)	used to protect devices from wind damage
rain	1:'active' 2:'inactive'	active (call scene 88) inactive (call scene 89)	used to protect devices from rain damage
hail	1:'active' 2:'inactive'	active (call scene 90) inactive (call scene 91)	used to protect devices from hail damage
frost	1:'active' 2:'inactive'	internal (dsm-api generic event)	used to protect devices from frost damage
sunlight direction	direction (North, East, South, West) active, inactive	internal (dsm-api generic event)	indicates an active sunlight direction (North ,East, South, West)
building_service	1:'active' 2:'inactive'	internal (dsm-api generic event)	indicates building service mode

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State	Value Range	Change set by	Comment	
heating_system	1:'active' 2:'inactive'	internal (dsm-api generic event)	indicates heating system state (active: climate control system running, inactive: system off)	
heating_system_mode	1:'active' 2:'inactive'	internal (dsm-api generic event)	change-over signal (active: heating, inactive: cooling)	
heating_water_system	off, cold water, hot water, auto	internal (dsm-api generic event)	indicates the heating water status	

Table 4: States with apartment-scope

5.1.2 States with zone-scope

State	Value Range	Change set by	Comment
zone.<zoneID>.light	1:'active', 2:'inactive'	inactive (call scene 0) active (call scene != 0)	set when light is on or off (called a specific on or off scene)
zone.<zoneID>.heating	1:'active', 2:'inactive'	inactive (call scene 0) active (call scene != 0)	set when heating is configured State is only available when a proper sensor device is present in zone.
zone.<zoneID>.motion	1:'active', 2:'inactive'	internal	set when a motion is detected by any sensor device configured as motion-detector. State is only available when a proper sensor device is present in zone.
zone.<zoneID>.presence	1:'active', 2:'inactive'	internal	set when presence is detected by any sensor device configured as presence-detector. State is only available when a proper sensor device is present in zone.

Table 5: States with zone-scope

5.1.3 States with group-scope

State	Value Range	Change set by	Comment
wind.group<group-id>	active, inactive	internal	state is only available for usergroups configured as shadow group. State is set by any sensor device configured as a wind sensor.

Table 6: States with group-scope

5.1.4 States with device-scope

State	Value Range	Change set by	Comment
dev.<dsid>.<index>	active,inactive, unknown	internal (device input)	state is available for each sensor device (like an AKM). The <index> is for each input of the device

Table 7: States with device-scope

5.2 States - Addonstates

A Addon can also register own states, which are controlled by the app. This states can be queried by other apps, can be used as condition or trigger can be set on but only the registering app can set the specific value.

The Addonstates are stored in </usr/addon-states/<addon-id>>

5.3 Trigger

In the dSS all add-ons are event-driven, so a app can register some js-code when a specific events happens. There are a couple of events, which are generated through the system, mainly per taster-events. It is possible to make a subscription for all of these events, and every time when such a events happened, the scripts runs and make a check against some conditions. But there is a easier way: using a trigger. A trigger acts like a dynamic subscription, which can filter the system-events by it's parameter's, take some other conditions like states or timeframes in account and finally, if all requirements are met, raise a custom event for the app. This prefiltering is done in the server outside the scripting with greater performance and lesser resource impact. The parameter of a trigger must be stored in the propertytree and registered using a script, which is provided by the dss (/usr/shared/dss/data/scripts/system_register_trigger.js):

- `registerTrigger(tPath, tEventName, tParamObj)`: This function register a trigger definition found in `tPath`. When a Event comes and matches to the trigger, a Event with with the name `tEventName` is raised. This relayed event carries all parameter of the original event plus the triggerpath (Parametername `path`) and parameter which are provided in `tParamObj`.
- `unregisterTrigger(tPath)`: This function unregister a trigger, which was defined in `tPath`.

Typical the registering of a trigger is done when the app is initializing or if a new behavior is configured in the app.

The layout of the property-nodes of a trigger is:

- `<basenode>/triggers/0/<triggerdefinition #1>`
- `<basenode>/triggers/1/<triggerdefinition #2>`
- ...

Each triggerdefinition must be places in a subpath `triggers/x` where `triggers` is required and `x` is a arbitrary term. For the triggerdefinition there are many possibilities:

- `zone-scene`: This trigger will react on a scene-call in a zone. This will be typical happen through a taster click on a digitalSTROM-Device. Parameters:
 - `type`: string, must be `zone-scene`
 - `zone`: integer, id of the zone. The zone with the id `0` will be used for apartmentwide scene-calls like bell or panic.
 - `group`: integer, id of the group. The group with the id `0` will be used for apartmentwide scene-calls like bell or panic.
 - `scene`: integer, id of the scene. please refer to the scene-table
 - `dsid`(optional): string, id of a device, which has caused the scene-call. this parameter can be omitted or `-1` to skip the source device filtering.
- `device-scene`: This trigger will react on a scene-call for a device. This will happen, if a local switch on a device has been used. Parameters:
 - `type`: string, must be `device-scene`
 - `dsid`: string, id of a device, which has caused the scene-call.
 - `scene`: integer, id of the scene. please refer to the scene-table. use `-1` as scene-id for triggering on all scene-calls from the device
- `device-sensor`: This trigger will react on a sensor-message of a device. On the 1.5 dS-System a sensor message will come from a consumption message, later there will be more sensoric events. Parameters:
 - `type`: string, must be `device-sensor`

- dsid: string, id of a device, which has caused the scene-call.
- eventid: integer, id of the sensor-event.
- device-msg: This trigger will react on a message from a taster, which is not interpreted by a statemaschine of the dsm. typical that will be black taster configured not to a specific color. Parameters:
 - type: string, must be device-msg
 - dsid: string, id of a device, which has caused the device-message.
 - msg: integer, id of the message.
 - buttonIndex[optional]: integer, id of the button-index of the taster. if this parameter is omitted or -1, it will be ignored
- device-action: This trigger will react on direct action from a button, which is not interpreted by a statemaschine of the dSM. Parameters:
 - type: string, must be device-action
 - dsid: string, id of a device, which has caused the device-message.
 - action: integer, id of the action.
- custom-event: This trigger will react on a custom event, which is raised by a other app or UI. Parameter:
 - type: string, must be custom-event
 - event: string, id of the custom-event
- event: This trigger will react on the event given in the name parameter. All parameters in "/parameter" have to match equally named properties in the event. Extra properties in the event are ignored. Parameter:
 - type: string, must be event
 - name: string, name of the matched event
 - parameter/<name>: string, optional, arbitrary named parameter to match event property
 - parameter/<name1>: string, optional, arbitrary named parameter to match event property

Additional to the trigger-parameter the conditions will first be evaluated, if a trigger is generally enabled. Please refer to conditions section.

5.4 Actions

Beside direct system-calls in the apps or using the JSON, there is a more convenient method to define some actions, which should be executed by digitalSTROM. The definition of the actions is stored in the propertytree and they can be started by raising the action_execute event with the parameter path where the definition of the actions are stored. The dSS-core will execute the actions step by step. When two actions causes dSM-Api calls there might be a small delay to ensure that all calls will be executed. Each step can also have a intentional defined delay to get some delayed actionsequences. Every time when a action should be executed, regardless it is started just now be a event or delayed step from a sequence, which has started earlier, a condition-definition will be evaluated (please refer to Conditions for details on conditions), which finally decides if the particular action should be executed. A condition can disable the execution of the step in a action-sequence, but the whole action-sequence is not been stoped, so later steps of the sequence, which has been delayed might been executed anyhow, if later the conditions has been checked then successfully.

The layout of the property-nodes of a actiondefinition is:

- <basenode>/actions/0/<actionsdefinition #1>
- <basenode>/actions/1/<actionsdefinition #2>

Each action-step must be places in a subpath actions/x where actions is required and x is a arbitrary term. For the actions-step definition there are many possibilities:

- zone-scene: This action will cause a scene-call to a specific zone and group Parameters:
 - type: string, must be zone-scene
 - zone: integer, id of the zone. The zone with the id 0 will be used for apartmentwide scene-calls like bell or panic.
 - group: integer, id of the group. The group with the id 0 will be used for apartmentwide scene-calls like bell or panic.
 - scene: integer, id of the scene. please refer to the scene-table
 - force[optional]: bool, causes a force-call-scene instead of a call-scene. this parameter can be omitted
- device-scene: This action will make a scene-call for a device. Parameters:
 - type: string, must be device-scene
 - dsid: string, id of the target device
 - scene: integer, id of the scene. please refer to the scene-table.
 - force[optional]: bool, causes a force-call-scene instead of a call-scene. this parameter can be omitted
- device-value: This action causes a setOutputValue-action to a device. It is not adviseable to use this action, please prefer scene-calls (like MIN-Scene and MAX-Scene for turning on/off), because this can be executed faster and the system can better keep track of the current room state. At last, the parameter value is bound to a specific behavior of the devices, and it is not guaranteed, that all devices might act on the same manner on that value. Parameters:
 - type: string, must be device-value
 - dsid: string, id of the target device
 - value: integer, 8-Bit value, send directly to the device.
- zone-blink: This action causes a blink-action to a group in a zone. Light devices will blink, shutters will shortly twitch etc. Parameters:
 - type: string, must be zone-blink
 - zone: integer, id of the zone. The zone with the id 0 will be used for apartmentwide calls.
 - group: integer, id of the group. The group with the id 0 will be used for apartmentwide calls.
- device-blink: This action causes a blink-action to device. Light devices will blink, shutters will shortly twitch etc. Parameters:
 - type: string, must be device-blink
 - dsid: string, id of the target device
- custom-event: This action will cause a execution of a custom event. This will not be the direct execution of the action-nodes of a custom event, rather this will raise a new event highlevelevent for requesting and queueing execution (and before evaluation the conditions) of the custom event. So if the conditions of a custom-event prohibits it execution, it will not be executed, regardless if the request comes from a external command or a relaying throught this action-step. Parameter:
 - type: string, must be custom-event

- event: string, id of the custom-event
- url: This action will cause a URL-Request. Both HTTP-Request and HTTPS-Request are possible, but actual only GET-Requests with Parameters in the Query-String are possible. Be aware, when a URL is not accessable, it will slow down the execution of the action seriously. Parameter:
 - type: string, must be url
 - url: string, uri of the request, following the structure <http://www.digitalstrom.org>

Each action-step can have a additional parameter regardless of the type:

- delay: integer, execution delay in seconds from the initial event raising.

5.5 Conditions

The conditions provides a mechanism to manipulate the execution of a action or the evaluation of a trigger. They can be used to define conditions based on system-states or timeframes. Before a trigger is evaluated or a action is executed, all conditions must be checked successfully. If a condition is not defined, it is ignored. The layout of the property-nodes of a condition definition is:

- <basenode>/conditions/<type-of-condition>/...
- <basenode>/conditions/<type-of-condition>/...

This conditions are currently avaible:

- enabled: bool, must be true. If false, the check fails.
- states: defines conditions based of system-states which are located in /usr/state. Multiple states can de specified, which all must be equal to the current states. For each state two parameter must be provided:
 - conditions/states/<X>/name : name of the requested state
 - conditions/states/<X>/value : value of the requested state

There can be more than one definition, the naming of <X> is arbitrary.

- zone-states: defines which last scene in one or more zones/groups must has been called. For each zone-state three parameter must be provided:
 - conditions/zone-states/<X>/zone : id of the zone
 - conditions/zone-states/<X>/group : id of the group
 - conditions/zone-states/<X>/scene : id of the last called scene

There can be more than one definition, the naming of <X> is arbitrary. For successful checking this condition, only one of this zone-states must be equal to the current last called scenes.

- weekdays:string, format comma-seperated with a number for each weekday (0: sunday, 1: monday ...6: saturday)
- time-start:string, format HH:MM:SS. The check fails, if the actual time is before the defined time-string.
- time-end:string, format HH:MM:SS. The check fails, if the actual time is before the required time-string.
- date: define time periods that are checked against the execution time of the action. For each date three parameter must be provided:
 - conditions/date/<X>/start : interval start; ISO date-time string (e.g. "20150707T170000")
 - conditions/date/<X>/end : interval end; ISO date-time string (e.g. "20150707T180000")

- conditions/date/<X>/rrule : ical RRULE specifying the reoccurrence (e.g. "FREQ=DAILY;BYMONTH=7;")

(In the above example the action is only executed between 5 pm and 6 pm in July 2015.)

There can be more than one definition, the naming of <X> is arbitrary. For successful checking this condition, the current date has to be in only one of this date ranges.

5.6 Chaining Trigger and Actions

All trigger, conditions and actions are stored in the property-tree. When defining a action, it must be in a childnode named action resp. trigger. When a trigger matches and raises a relayed event, it provides the original path in the parameter path. To execute a action, you must raise a event with name action_execute and the parameter path. This convention is defined on purpose: by putting a trigger-definition and a action-definition in the same propertytree path and register the trigger with the path and event-name action_execute, a chaining of a trigger with a action is defined and that chain will be executed without using any app-specific script. This chain can be controlled outside by setting parameters like enabled in the conditions. If a delay between triggering event and reaction should be defined, just provide as additional Parameter in the registerTrigger call time=+10 (for a 10 seconds delay). If a more complex logic is needed, the chain can be broken by register the trigger with a other eventname, but the action-definition can also be stored in the same location.

5.7 Included scripts - UDA

UserDefinedActions are named action-sequences (with conditions) which are stored globally in the dss in the /user/event path in the propertytree. The system-addon user-defined-actions is in charge of administration of these actions, so modifying these events with a own app should be not be done per direct property tree manipulation, but by inter-app communication (please refer to App to App communication). The main advantage is, that all addons can utilize this actions as systemwide actions, for example the timed events app list all UDAs for scheduling, and if a own app specify some UDA, they will be accessible through the allready provides timed-events app.

5.8 Included scripts - Solar computer

The solar-computer scripts are some scripts how calculate each day the sunrise, sunset, dawn and dusk time, based on the stored geographic position of the dss and astronomical calculations. The calculated values are stored in /config/geodata/sunrise, /config/geodata/sunset, /config/geodata/civil_dusk and /config/geodata/civil_dawn in a stringpattern pattern of HH:mm:ss. That will done at 3 o'clock and the solar-computer raises a solar_computer.update - event when new calculation should start. If a other app using that values, it is adviceable to schedule a timedevevent right 1 second after that update to get fresh values.

6 Authentication

Notice The digitalSTROM-Server uses a self signed certificate. In order to connect the user must accept that the certificate is not signed by a known authority. For other applications this must be solved by accepting any certificate in your network client.

6.1 Configurator and Addons

The dSS11 configurator and dSS Addons are accessible with the https protocol on TCP port 443. This access method uses the HTTP Digest Authentication.

The configurator itself and addons access the dSS JSON interface over port 443 where certain requests are redirected using a proxy server. For example all URLs starting with /json/ are passed on to the dSS.

6.2 Applications

The dSS is also accessible for external applications through a HTTP based JSON interface on TCP port 8080, likewise using encrypted https. This is the preferred interface for external applications and automation systems interacting with the digitalSTROM-Server.

External applications accessing the dSS should not store passwords at any time. Instead they should request an application-token which has to be activated by the user.

6.2.1 Getting a Token

First an application needs to register itself with the dSS:

```
https://yourdss:8080/json/system/requestApplicationToken?applicationName=readableNameOfApplic
```

Notice When requesting an application token, the application must not be logged in with user-name/password or access the dSS through the default HTTPS port.

6.2.2 Approving the token

Once the token is retrieved and stored, it can be activated from the dSS11 Web Interface. Alternatively, the token can be approved from the application by asking the user for dSS username/password and use this to login:

```
https://yourdss:8080/json/system/login?user=dssadmin&password=mysupersecretpassword
```

This returns a temporary session token, which can be used to enable the application token using this command:

```
https://yourdss:8080/json/system/enableToken?applicationToken=theApplicationToken&token=theTemporarySessionToken
```

6.2.3 Logging in

After the token has been approved the application must obtain a session-token by providing the application token:

```
https://yourdss:8080/json/system/loginApplication?loginToken=theApplicationToken
```

6.2.4 Using the session token

Add the token to the http header, or add "token=yoursessiontokenhere" to each request:

```
https://yourdss:8080/json/apartment/getStructure?token=yourtokenhere
```

The session token has a timeout, but it will be prolonged each time it is used/touched. e.g. on every new request sent to the digitalSTROM-Server.

If the session token timed out the digitalSTROM-Server will return "HTTP 403 - Not Authenticated" and the application must acquire a new session token. The session token timeout and the maximum number of concurrent sessions is configurable and may vary on different digitalSTROM-Server platforms.

The default values are:

- session timeout: 180 seconds
- maximum concurrent sessions: 30

7 Metering

7.1 Available Data

The digitalSTROM-Meters provide the digitalSTROM-Server with power measurements per circuit in one second resolution. The measurements are averaged over different time periods and stored as time-value-pairs (time series) in a Round Robin Database (RRD) per digitalSTROM-Meter. Internally, the digitalSTROM-Server uses the [RRDTool](#) library to store this data.

[Table 8](#) shows the available time series.

Resolution	Number of values	Storage duration
1 second	600	10 minutes
1 minute	720	12 hours
15 minutes	2976	31 days
1 day	370	~1 year
7 days	260	~5 years
30 days	60	~5 years

Table 8: Metering Time Series

There are three different types of time series:

consumption The data points represent the average power used during the previous time slot. The data is represented in floating point numbers and has the unit of Watt [W].

energy The data points represent an energy counter with always increasing values. This type functions like a traditional power/energy meter. The data is represented in floating point numbers and the unit is selectable either Watt × Seconds [Ws] or Watt × Hours [Wh].

energyDelta The data points represent the energy used during the previous time slot. This is equivalent to the “consumption” values multiplied by the time slot duration (resolution). The data is represented in floating point numbers and the unit is selectable either Watt × Seconds [Ws] or Watt × Hours [Wh].

7.2 Accessing the Data

Currently, there is no data aggregation done over multiple digitalSTROM-Meters, so data can only be queried per single digitalSTROM-Meter.

7.2.1 Current Metering Data

The current metering data can be accessed either via the Property Tree (as described in [subsubsection 3.4.2](#)) or the JSON interface or scripting functions.

7.2.2 Time-series Data

The time series data can only be accessed via the JSON interface or scripting functions. By default all available data for the selected type and resolution is returned. The APIs have options to limit the time window that is returned.

Time is represented with UNIX timestamps (seconds since 1970-01-01).

8 Communication using custom events

AddOns on the dSS can be understand as small programms on the dSS with their own capabilities and features. The events, which are consumed by each Addon, are raised globally, so each Addon can raise a event, which can be consumed by each other Addon.

8.1 Conventions

Currently there is no namespace-handling for event-names implemented in the dSS. To avoid naming conflicts, there is the convention to add the script-id of the app before the event name like system-addon-timed-events, where system-addon-timed-events is the script-id and config the specific event.

8.2 App to App communication

There are two ways to get data from one app to another:

- by writing in the propertytree-part of the foreign app
- by raising a well known event, which is consumed by the foreign app

8.2.1 Directly accessing the propertytree

Writing directly in the propertytree of another app might be the easier way, but there are two major drawbacks: there is no direct way to store that changes in the saved properties of the foreign app and the foreign app is not aware of the change in his properties. So these changes are completely dynamical and non-persistent. To make the foreign app to store those changes or just be aware of the changes, the only possibility is to raise an event for the foreign app. Also there must be some special issues regarding access-rights. Currently there is an access-right to properties in the /usr/state subtree using the setStatusValue scripting call.

8.2.2 raising a event

The better way of communication between apps is to raise some events, which are known to be consumed by the foreign app. The advantage of that approach is, that the consuming app will get the desired parameters and it is in the responsibility of the foreign app to store the parameters and react on the changes.

8.3 UI to App communication

A UI of an app is not fixed to a specific app apart from the fact, that a UI is installed with its app. The UI is a rather independently operating part of the app when you look at the interaction between foreground-UI and background-script. So they are asynchronous to each other and the UI must utilize the same methods to communicate with his background app as two apps communicate with each other:

- by writing in the propertytree via json-api
- by raising a event, which is consumed by the background app

8.3.1 Directly accessing the propertytree

Writing in the propertytree is possible, but it has two major drawbacks:

- one value can be set using the json-calls, so parsing multiple parameter results in multiple json-calls and that may have some major performance impact.
- the background app is not aware of any change in the propertytree, so the background-app must poll changes in the propertytree or just wait for an event from the UI. Finally only the background-app can serialize the changes in the propertytree.

Direct writing to the propertytree is not advisable.

8.3.2 raising a event

The UI can also raise with the json-interface a Event with multiple parameters, which can contain all needed values in one call. That event will be processed by the dSS-EventQueue, so using this technique to change data might not result in instant changes if it is compared to directly writing to the propertytree, but if more than a few values must be changed or the background-script must react on that changes (serialize or reinitialize itself), it worth the minor lag in response. The other advantage is, that the background-script is naturally aware of the request and can do appending actions when some data has been changed by serialize them or make a reinitialisation etc. The final advantage when using this method, that a general configuration interface for the app will be specified, which can be used by other apps.

8.4 App to UI communication

There are two methods to get some data from the background-app to the UI and they are both equal preferable depending on the situation.

- The UI uses the property-querying JSON-calls do get data from the dSS. As with all property-tree querying the background app will not be aware, if the UI is querying data from the tree, so that can be used to load some static data oder settings. On the upside, the background-App can store the data asynchronously and the UI can query them at any time. There is also no need for extra coding in the background app. This method is good for getting structure information of the dss or the app and data, which requires no interaction.
- The UI can subscribe to a event, which can be raised by a background app. The UI will start a http-request, which will return data via event-parameters when a event is raised or on time out. This method is usefull when the UI had issued some kind of command to the background app (like save a value) and now it should get a confirmation or answer. When using this technique take in account, that the resources on the dSS is limited, so it is not advisable to open to much http-requests simultaneously and only when needed.

9 Device Model Features

ModelFeatures are used to determine the visibility and (to some extent) the functionality of the Configurator-UI. ModelFeatures are defined per digitalSTROM-Device. The feature attributes are returned on JSON responses as attribute per device.

For each Terminal Block type the digitalSTROM-Server maintains a list of such feature flags. For IP Devices the VDC component provides the list of feature flags for the related devices.

The related service methods to retrieve are:

```
/json/apartment/getModelFeatures
```

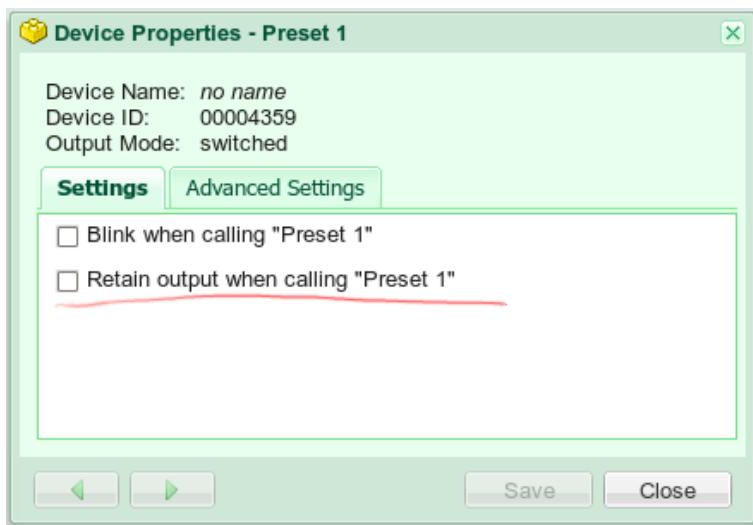
and

```
/json/property/query?query=/apartment/zones/*/devices/*{dSUID,name,HWInfo}/modelFeatures(*)/*
```

9.1 Available Model Features

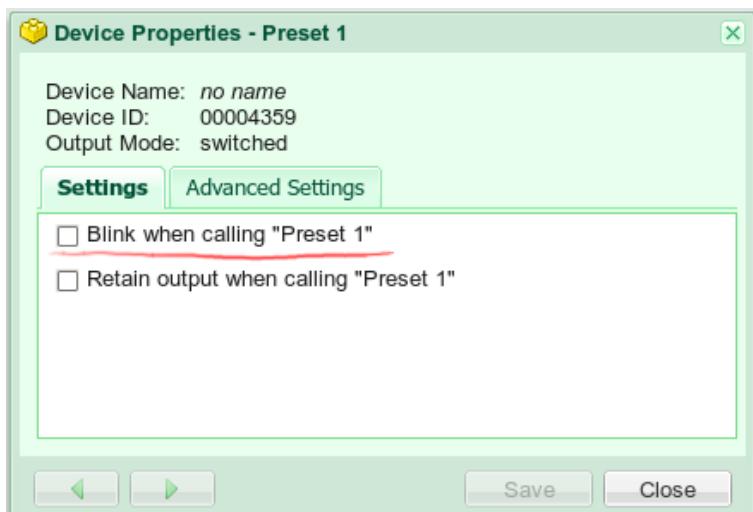
don't care

Show "Retain output when calling scene X" check box in scene properties device configuration.



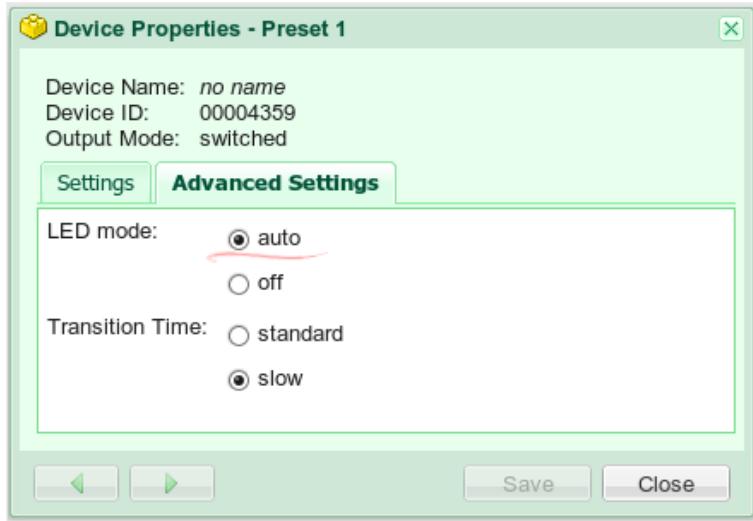
blink

Show "Blink when calling scene X" check box in scene properties device configuration.



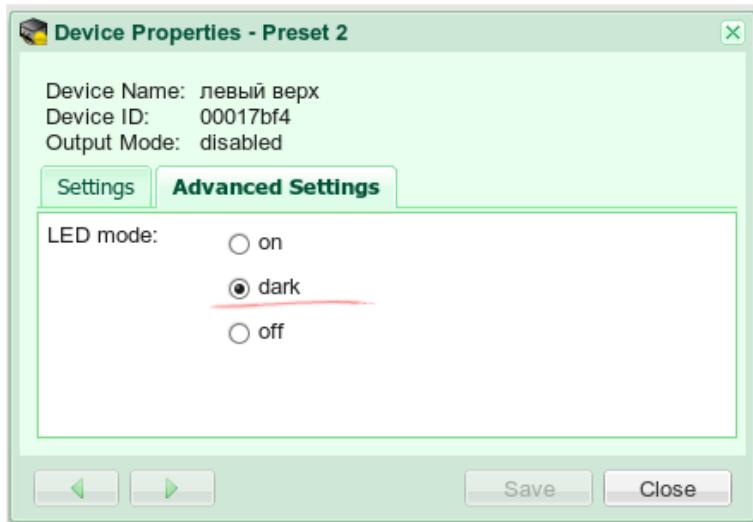
ledauto

Radiogroup "LED mode" in advanced scene properties device configuration supports "auto" mode.



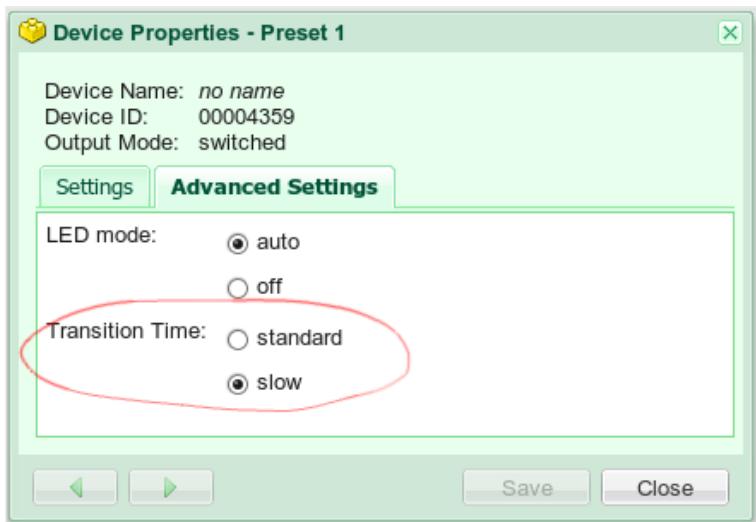
leddark

Radiogroup "LED mode" in advanced scene properties device configuration supports "dark" mode.



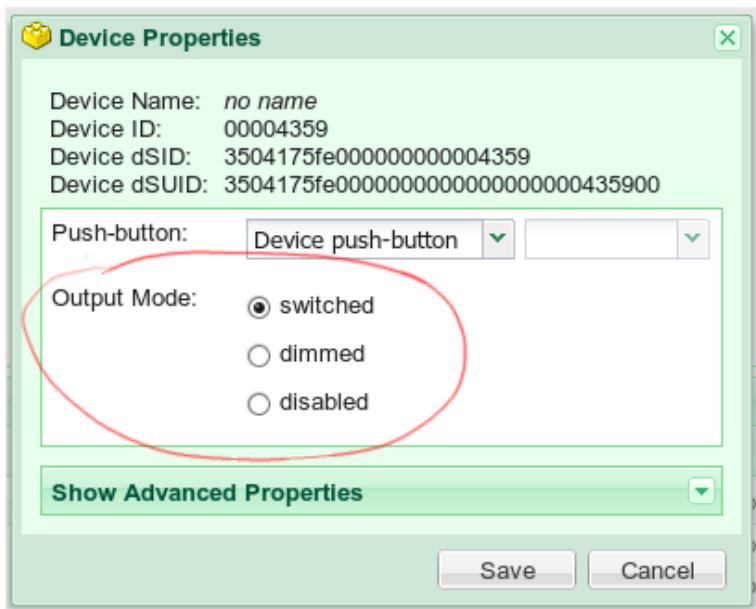
transst

Show "Transition time" radio group in advanced scene properties device configuration dialog.



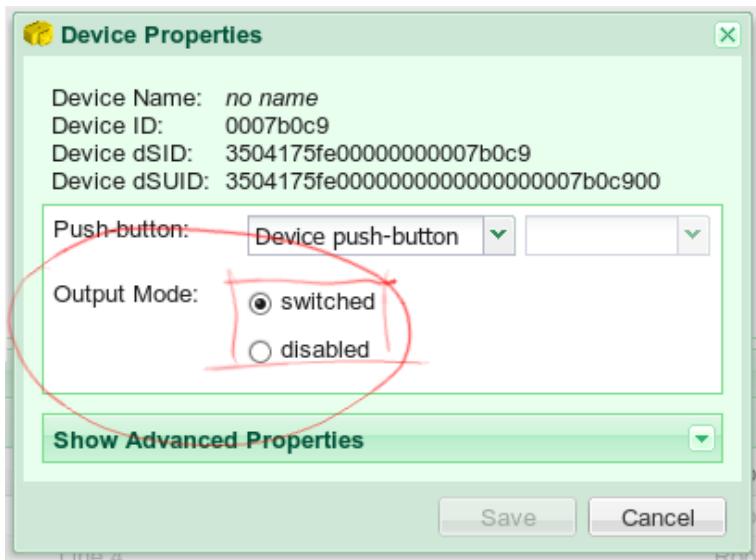
outmode

Show "Output mode" radio group in device properties dialog with "switched", "dimmed" and "disabled" selections. The "switched" parameter for this configuration has a value of 16.



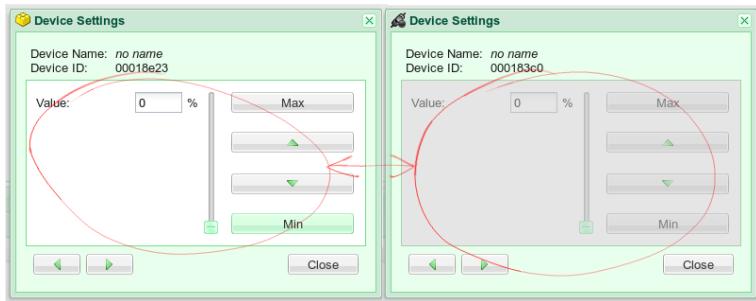
outmodeswitch

Show "Output mode" radio group in device properties dialog with only "switched" and "disabled" selections. The "switched" parameter for this configuration has a value of 35.



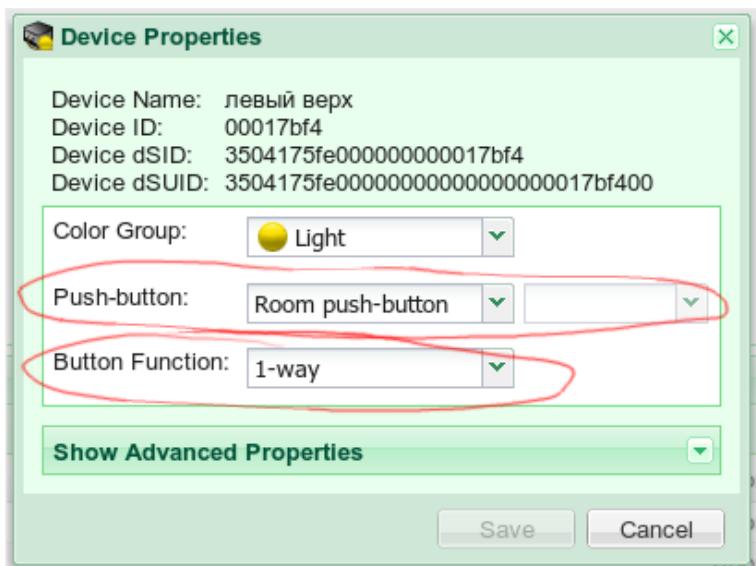
outvalue8

Influences the "Device Settings" dialog, the flag tells the UI that the device has an 8-bit output value, however it has no direct influence on how the device is read out, currently it is only used to decide if the dialog should be enabled (device has an output value) or not. For GR-KL there is a parallel logic which basically signals that the device has "another" output value which is implicitly treated as 16bit and also influences the state of the same dialog.



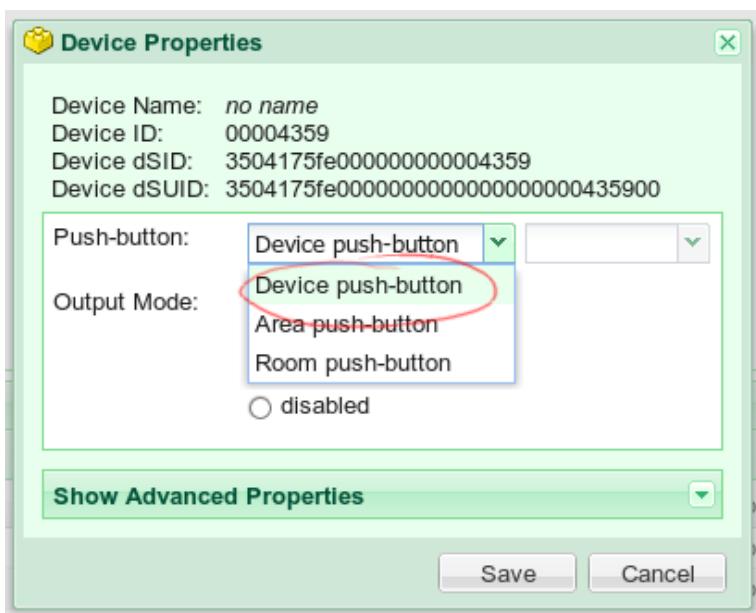
pushbutton

Show push button settings in "Device properties" dialog. Also check if multi-button settings for device pairing must be shown (depends on various other parameters).



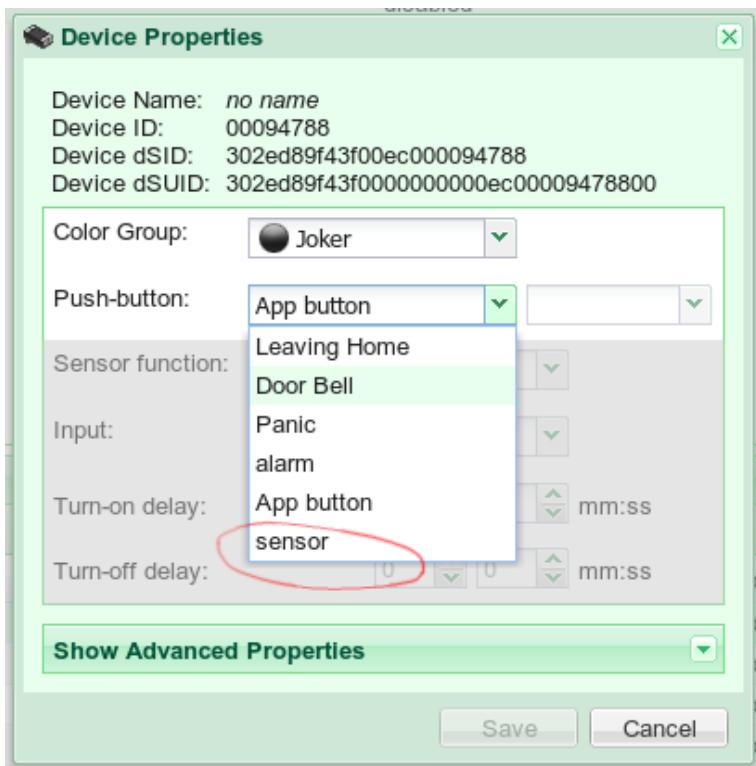
pushbdevice

This flag influences the contents of the "Push-button" drop down list, it makes sure that a "device pushbutton" entry is present.



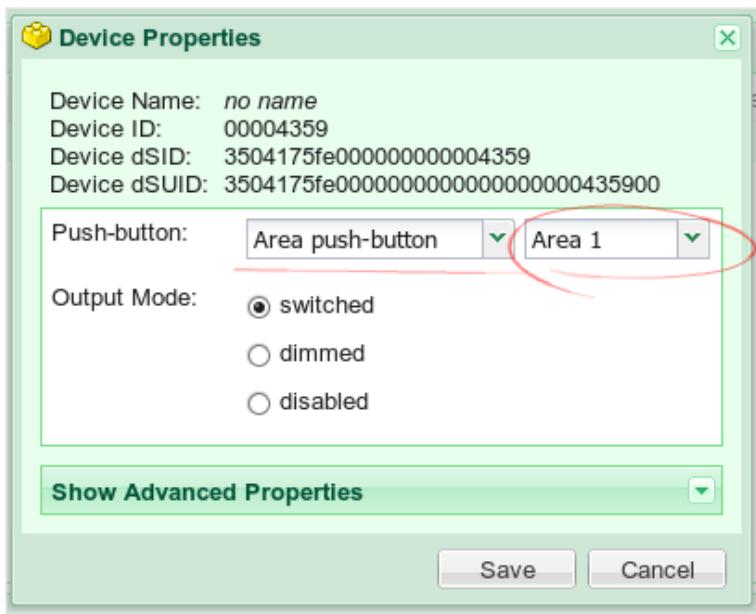
pushbsensor

This flag influences the contents of the "Push-button" drop down list, it makes sure that a "sensor" entry is present.



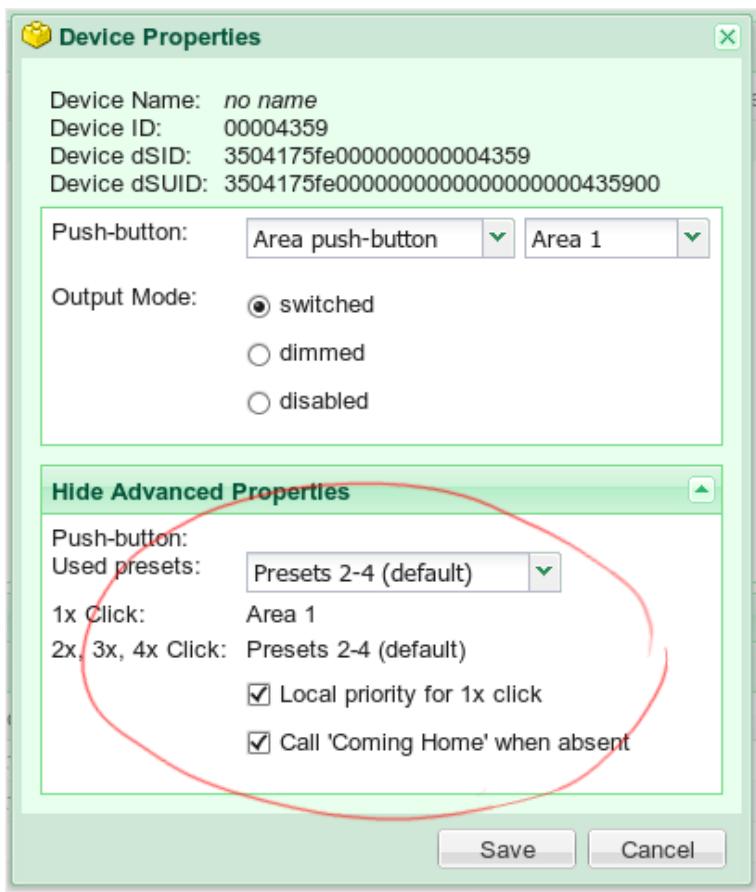
pushbarea

This flag influences the contents of the "Push-button" drop down list, it makes sure that a "Area-pushbutton" entry is present. It also enables the area selection drop down.



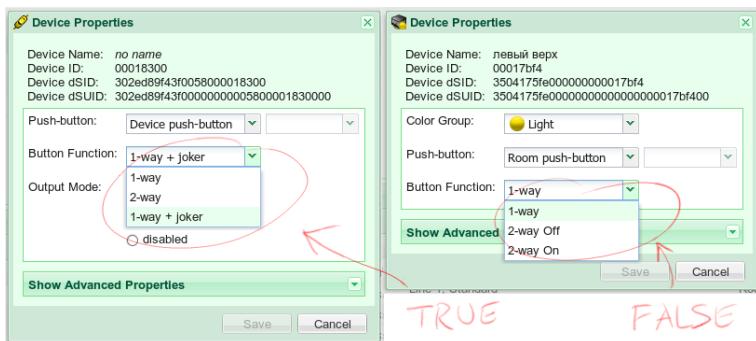
pushadvanced

Enables the advanced push button configuration in the "Device Properties" dialog.



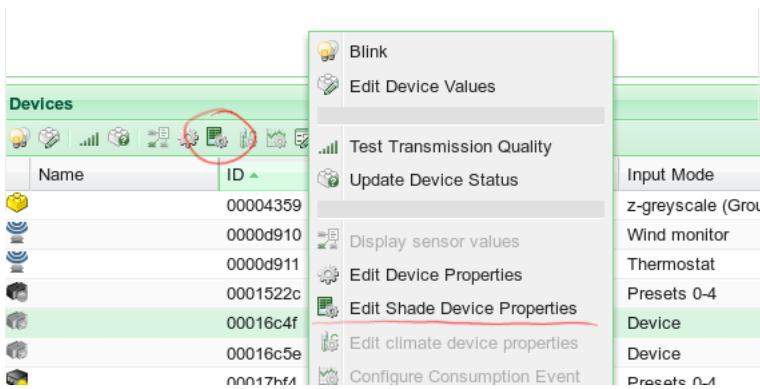
pushbcombined

This flag influences the available items of the "Button-function" settings in the "Device Properties" dialog. When enabled the available items are "1-way" (button input mode "1way_combined"), "2-way" and "1-way + joker". When disabled the items are "1-way" (button input mode "1way"), "2-way off"/"2-way down", "2-way on"/"2-way up".



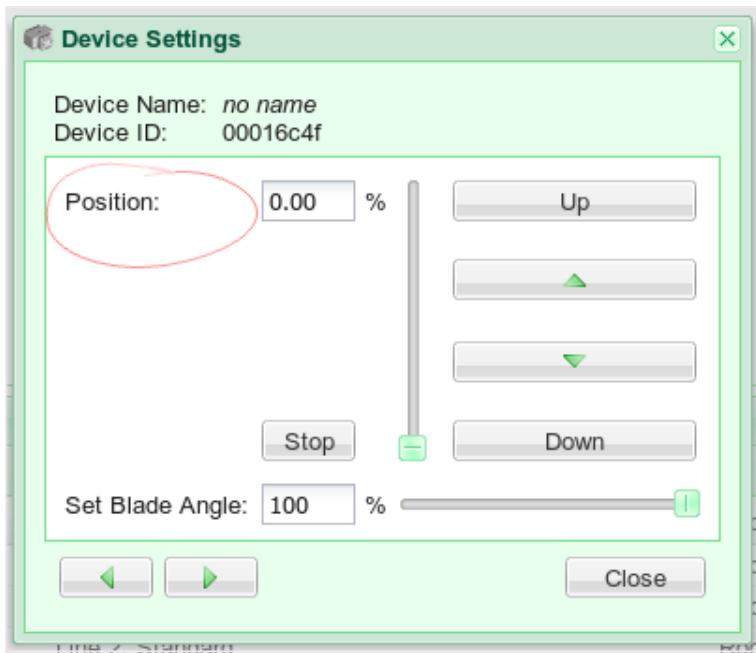
shadeprops

Enables the "Shade Device Properties" dialog for the given device in the "Hardware" tab.



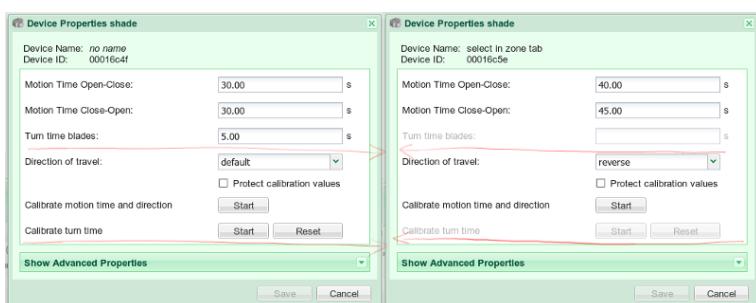
shadeposition

This flag is somewhat logically related to the outvalue8 flag, it influences the behavior of the "Device Settings" dialog. When set, the device values are assumed to have a 16bit resolution, also some labels will show "Position" instead of "Value". The flags outvalue8 and shadeposition are exclusive, it should be noted that when both are false the "Device value" dialog will be shown as disabled.



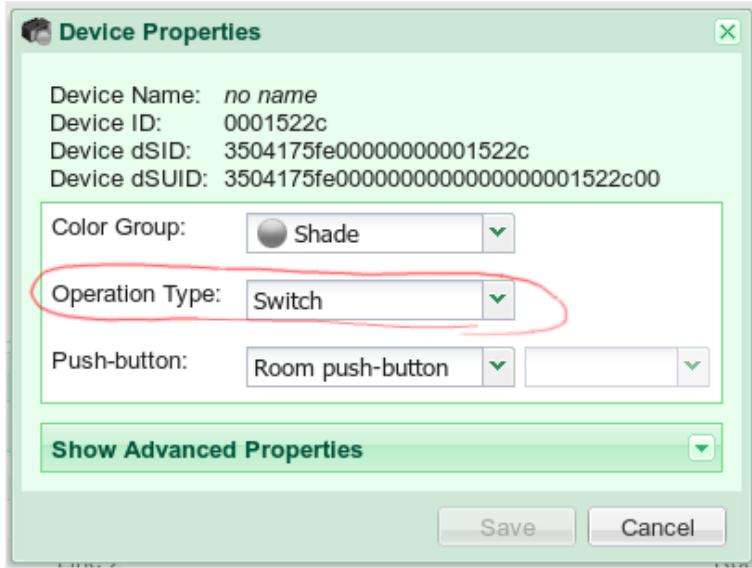
motiontimefins

Shows "Turn time blades" and "Calibrate turn times" options in the "Device Properties shade" dialog.



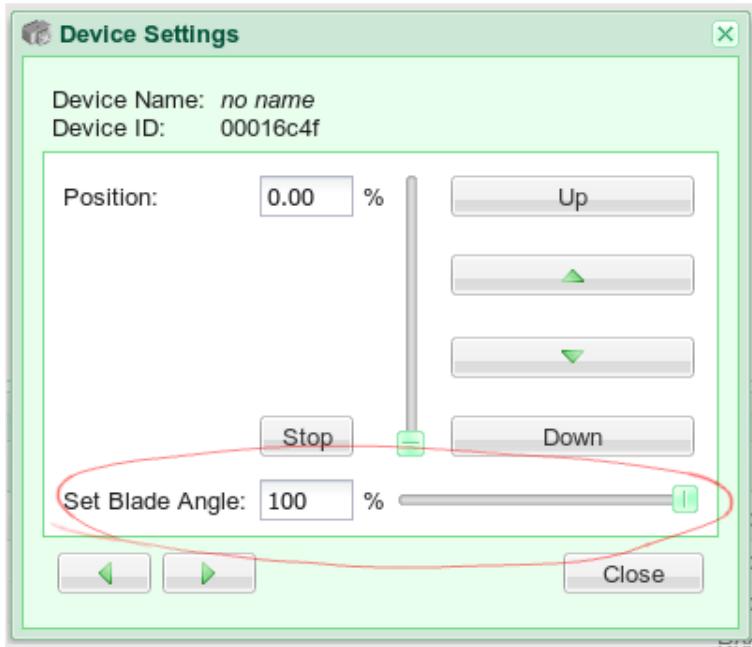
optypeconfig

Show "Operation Type" settings in the "Device Properties" dialog.



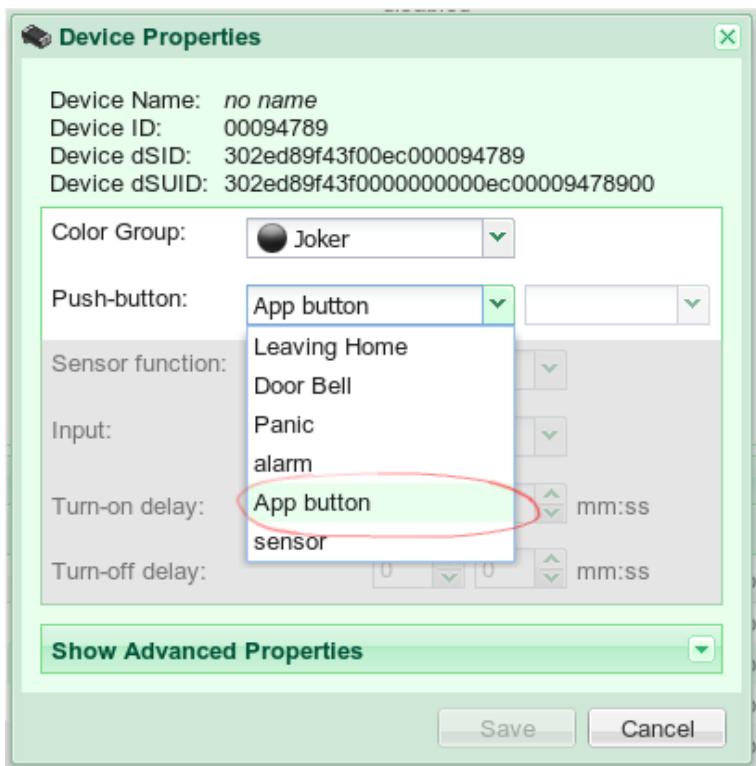
shadebladeang

Show "Set Blade Angle" option in the "Device Settings" dialog.



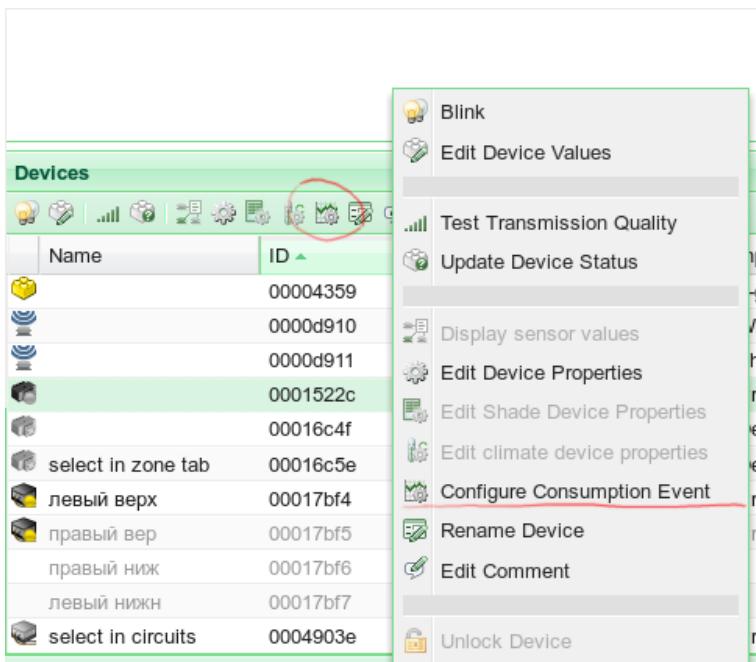
highlevel

This flag influences the contents of the "Push-button" dropdown list, it makes sure that a "App button" entry is present.



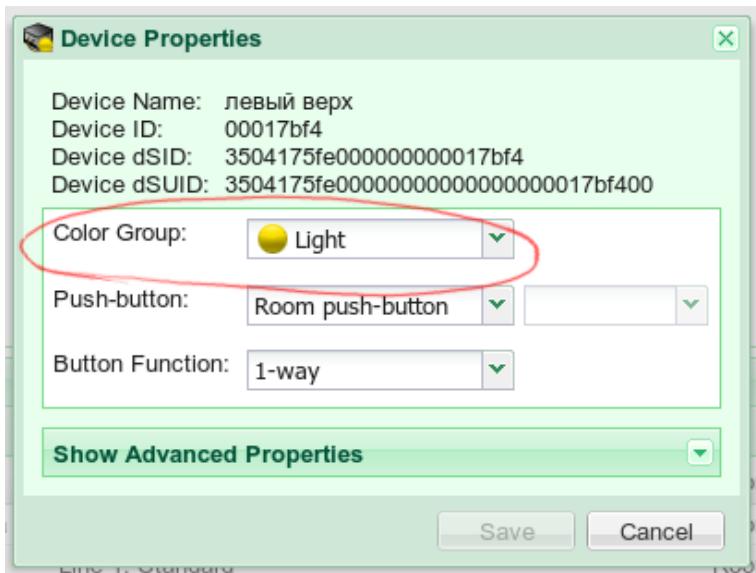
consumption

Enables the "Configure Consumption Event" dialog for the given device in the "Hardware" tab.



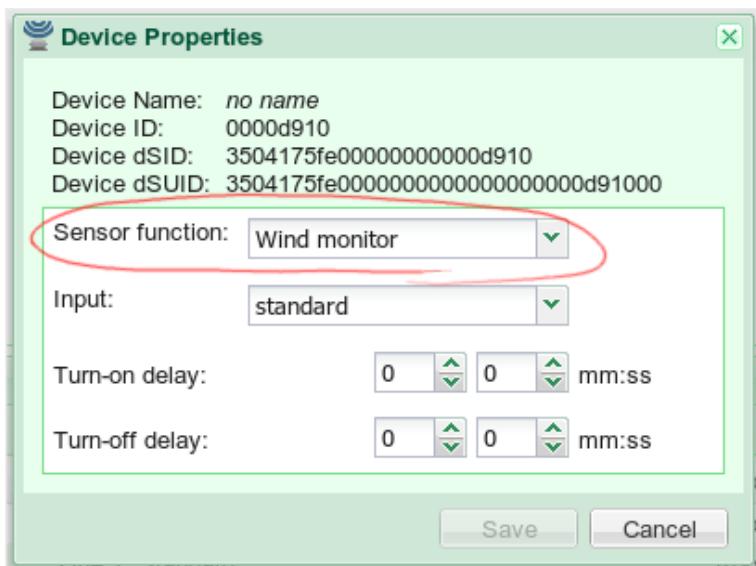
jokerconfig

Show "Joker" configuration settings in "Device Properties" dialog.



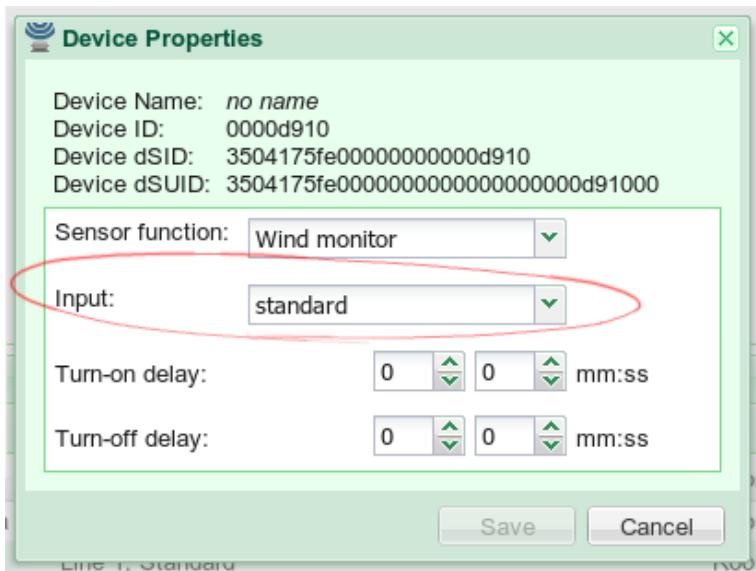
akmsensor

Show "Sensor function" settings in "Device Properties" dialog.



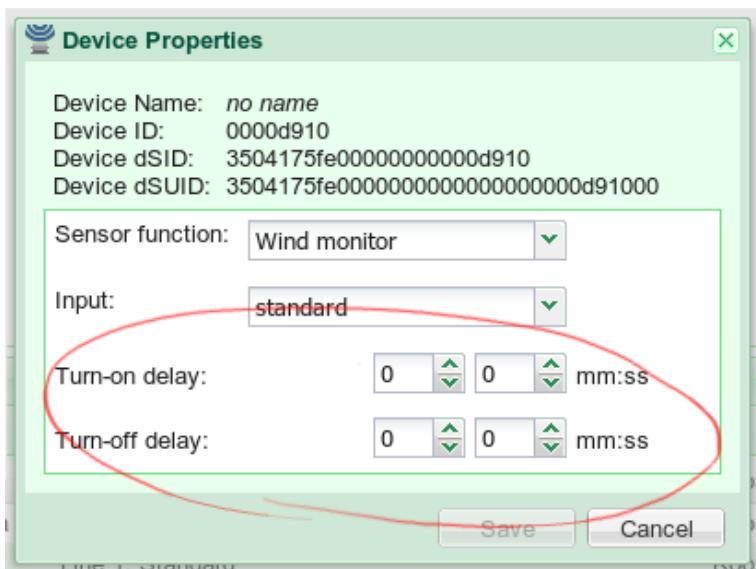
akminput

Show AKM "Input" settings in "Device Properties" dialog.



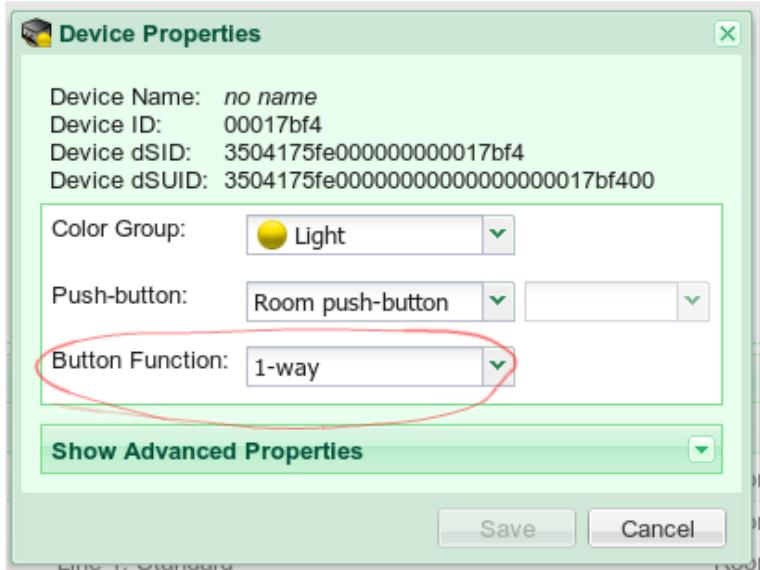
akmdelay

Show AKM "Delay" settings in "Device Properties" dialog.



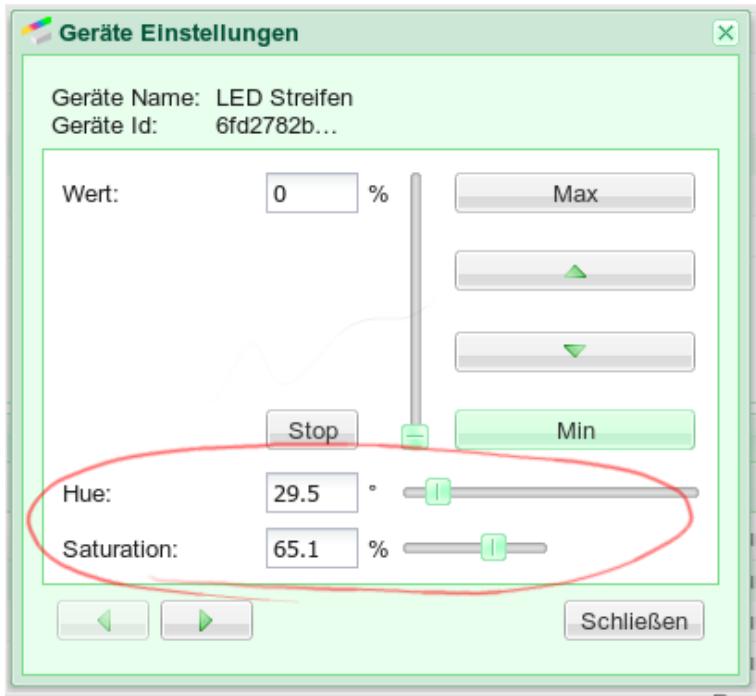
twowayconfig

Shows the "Button function" settings in "Device Properties" dialog, depends on "pushbutton" parameter.



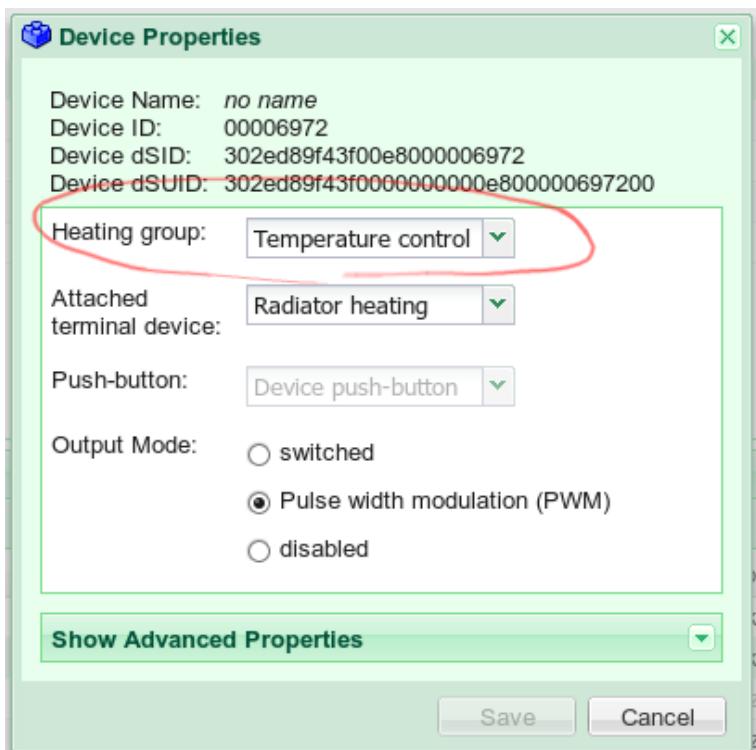
outputchannels

Display "Hue" and "Saturation" setting in the "Device Settings" dialog.



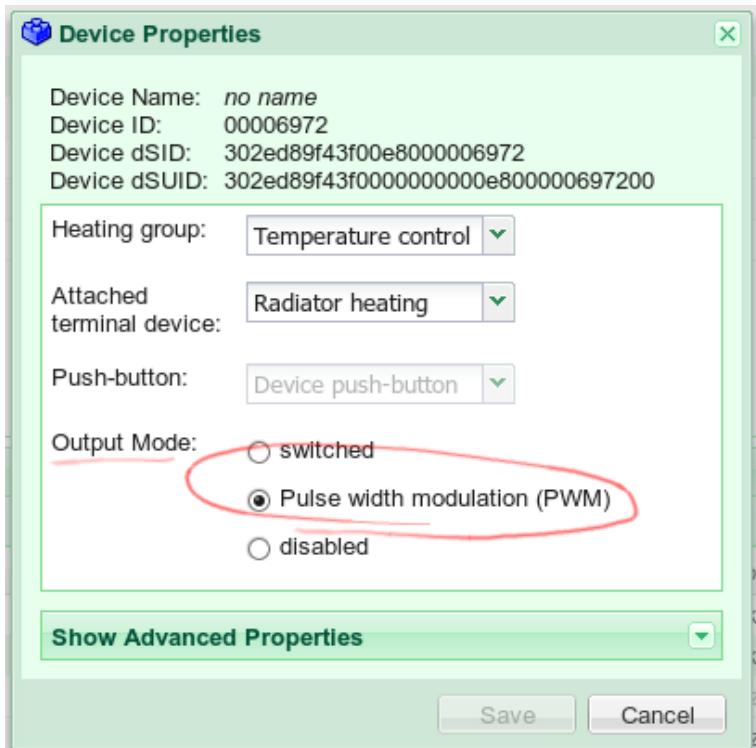
heatinggroup

Shows "Heating group" settings in "Device Properties" dialog.



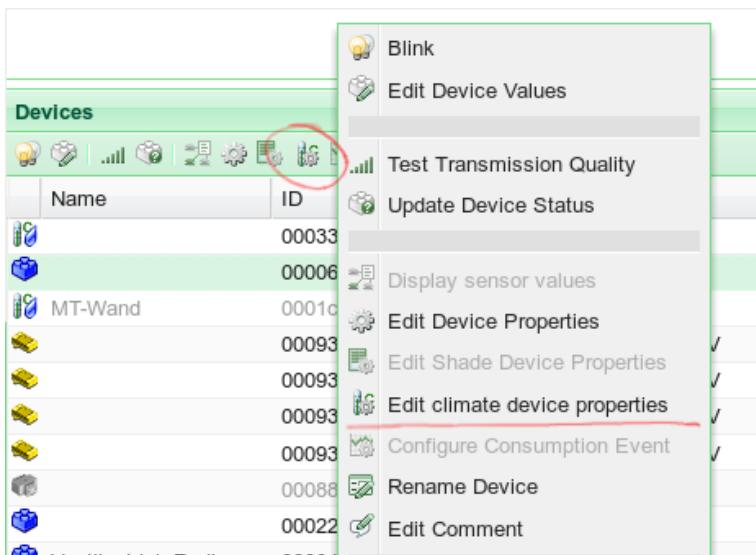
heatingoutmode

Enables the "Output mode" radio group in "Device Properties" dialog and influences its contents. The presented options will be: "switched" (65), "pulse width modulation (PWM)" (64) and "disabled" (0).



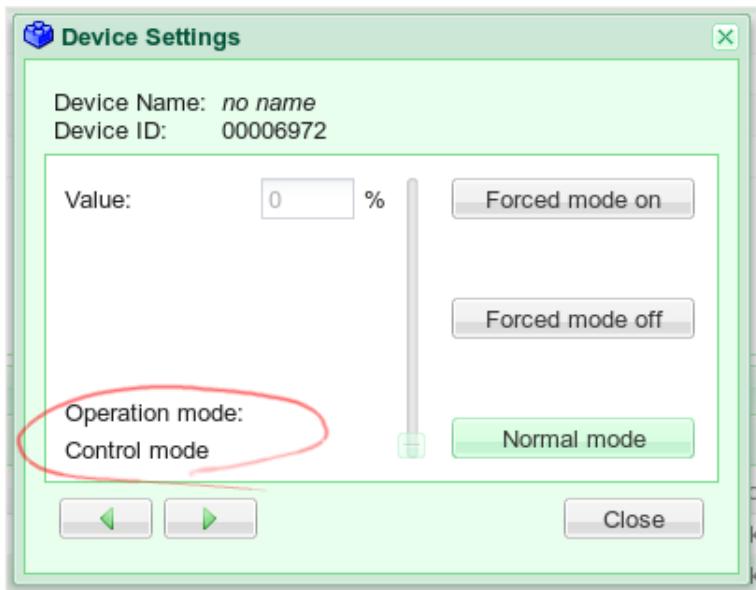
heatingprops

Enables the "Device Properties climate" dialog for the given device in the "Hardware" tab.



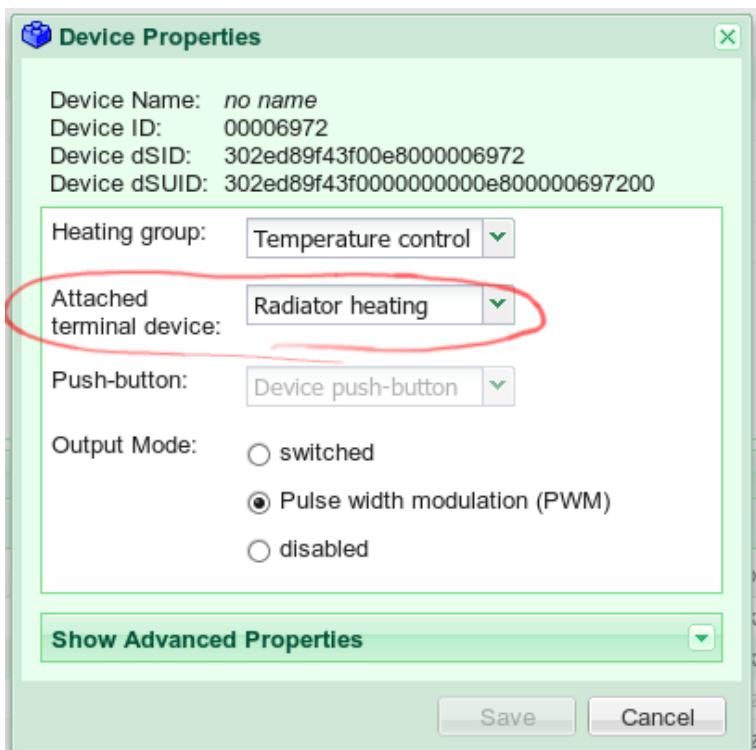
pwmvalue

Read out and display "Operation mode" in the "Device Settings" dialog.



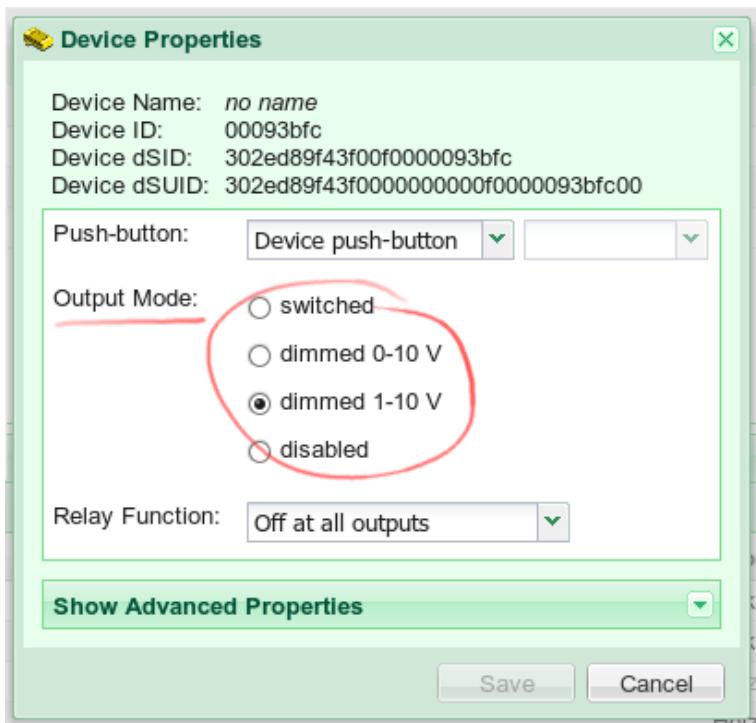
valuetype

Shows "Attached terminal device" settings in "Device Properties" dialog.



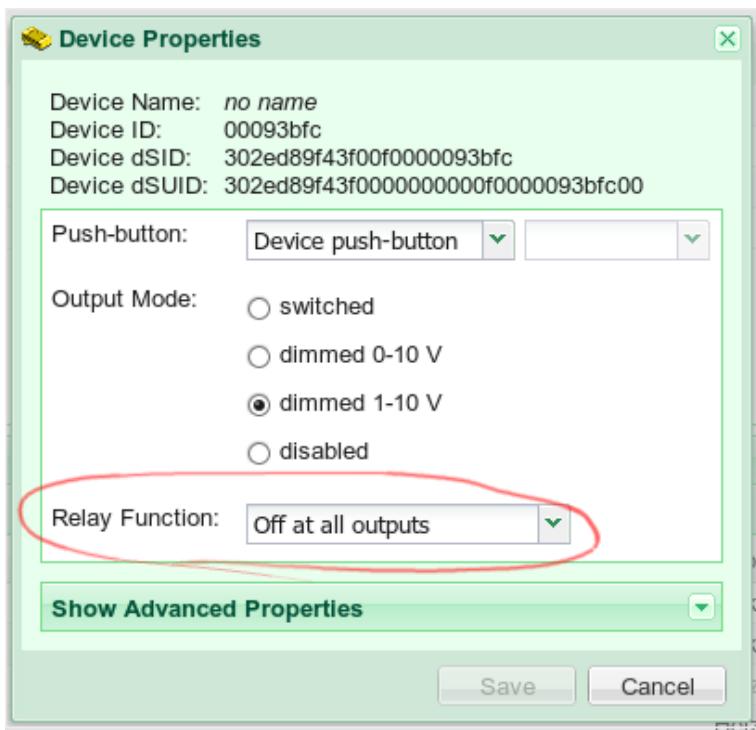
extradimmer

Enables the "Output mode" radio group in "Device Properties" dialog and influences its contents. The presented options will be: "switched" (16), "dimmed 0-10V", "dimmed 1-10V" and "disabled".



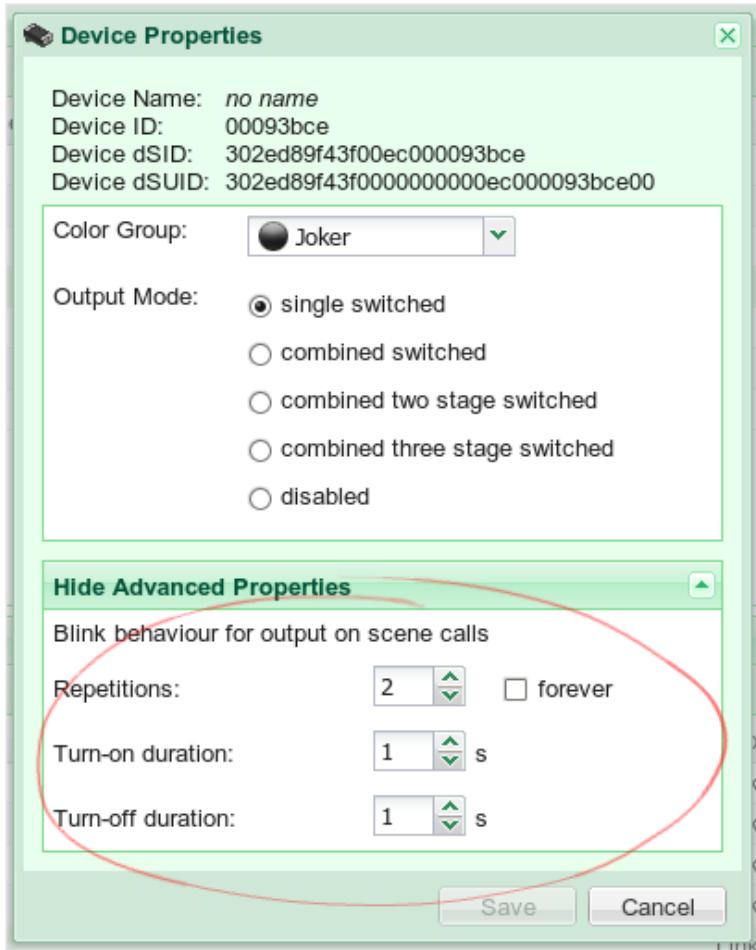
umvrelay

Shows "Relay Function" settings in "Device Properties" dialog.



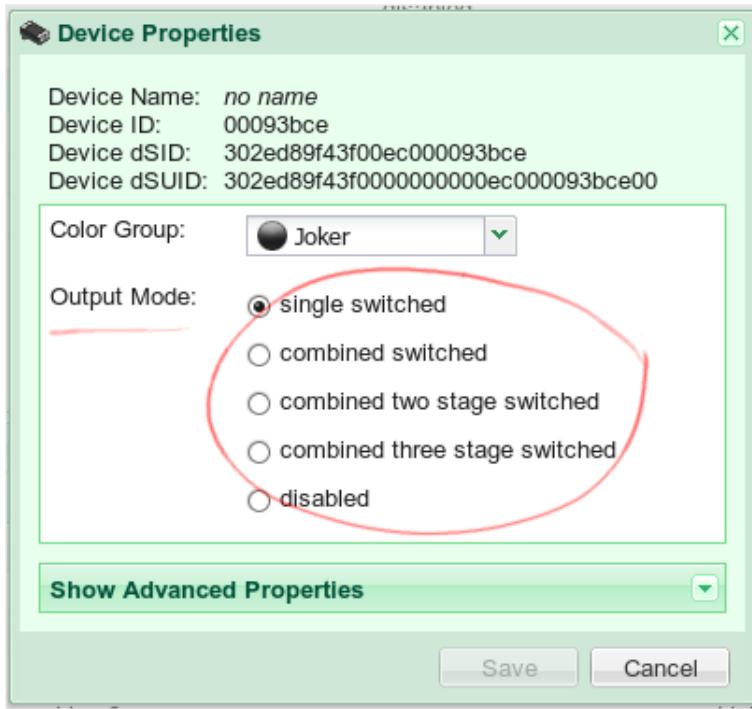
blinkconfig

Shows "Blink behavior for output on scene calls" settings in the advanced "Device Properties" dialog.



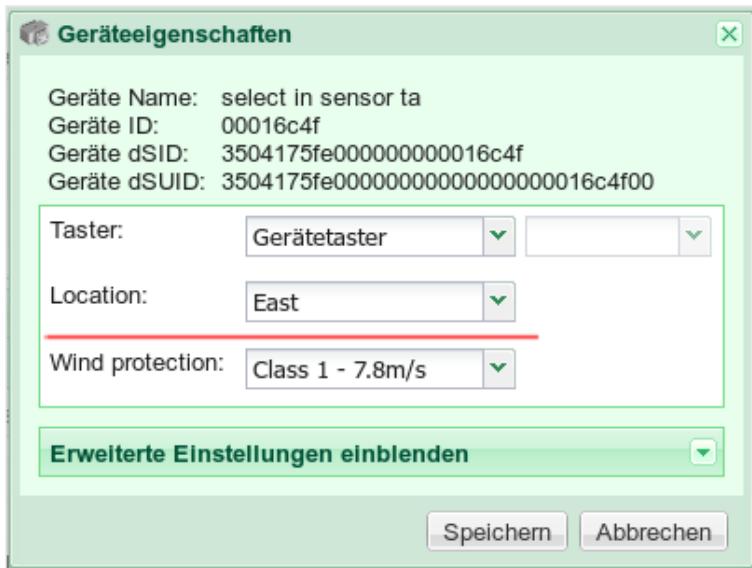
umroutemode

Enables the "Output mode" radio group in "Device Properties" dialog and influences its contents. The presented options will be: "single switched" (35) for all dSUIDs and "combined switched" (43), "combined two stage switched" (34), "combined three stage switched" (38) and "disabled" (0).



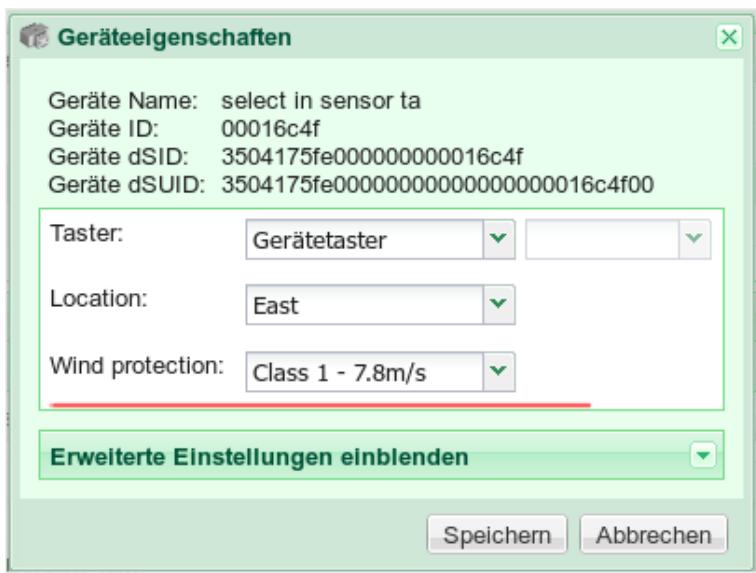
locationconfig

Shows the "Location" configuration dropdown in "Device Properties" dialog.



windprotectionconfig

Shows the "Wind protection" configuration dropdown in "Device Properties" dialog.



impulseconfig

TBD impulseconfig

outmodegeneric

TBD outmodegeneric

outconfigswitch

TBD outconfigswitch

temperatureoffset

TBD temperatureoffset

apartmentapplication

TBD

ftwtempcontrolventilationselect

TBD

ftwdisplaysettings

TBD

ftwbacklighttimeout

TBD

ventconfig

TBD

fcu

TBD

pushbddisabled

TBD

consumptioneventled

TBD

consumptiontimer

TBD

jokertempcontrol

TBD

dimeconfig

TBD

outmodeauto

TBD

dimmodeconfig

TBD

identification

The device can identify itself e.g. with a LED or a speaker. In the UI the “Identify Device” option is enabled.

10 Single Device Descriptions

Extended description data is available for those kind of devices that do not fit into the standard digitalSTROM data model and have additional meaningful events and actions that are to be integrated and orchestrated with digitalSTROM.

Certain attributes of those devices are maintained in a central database. A snapshot of this database is part of the digitalSTROM-Server firmware distribution.

10.1 Descriptions

The descriptions include following attributes:

10.1.1 Events

Events are a list of unique ID's that a particular device may generate. The events do not have parameters, They are meaningful on their own including the full context.

10.1.2 States

Devices may have states that describe the operational status. Each state is defined by an ID and a finite set of values.

10.1.3 Properties

Properties represent parameterized operational values of the device or appliance. Values can be either of the type numeric, enumeration or text. Numerical values include a unit, resolution, minimum and maximum values, enumerations have a list of valid option values.

10.1.4 Measurements

Device measurements are represented by sensoric values. Sensor objects are described by type id, unit and resolution, minimum and maximum values.

10.1.5 Action Descriptions

Action descriptions are like templates and give the base definitions for commands that a device can execute and process. The unique base name of the executable process and the related set of parameters are included. The list of parameters for an action is represented like an array of properties.

10.1.6 Standard Actions

Standard Actions are commands ID's that can be send to the devices and executed. These are kind of predefined commands. Every digitalSTROM device class has a set of device actions that shall be supported.

10.2 Translations

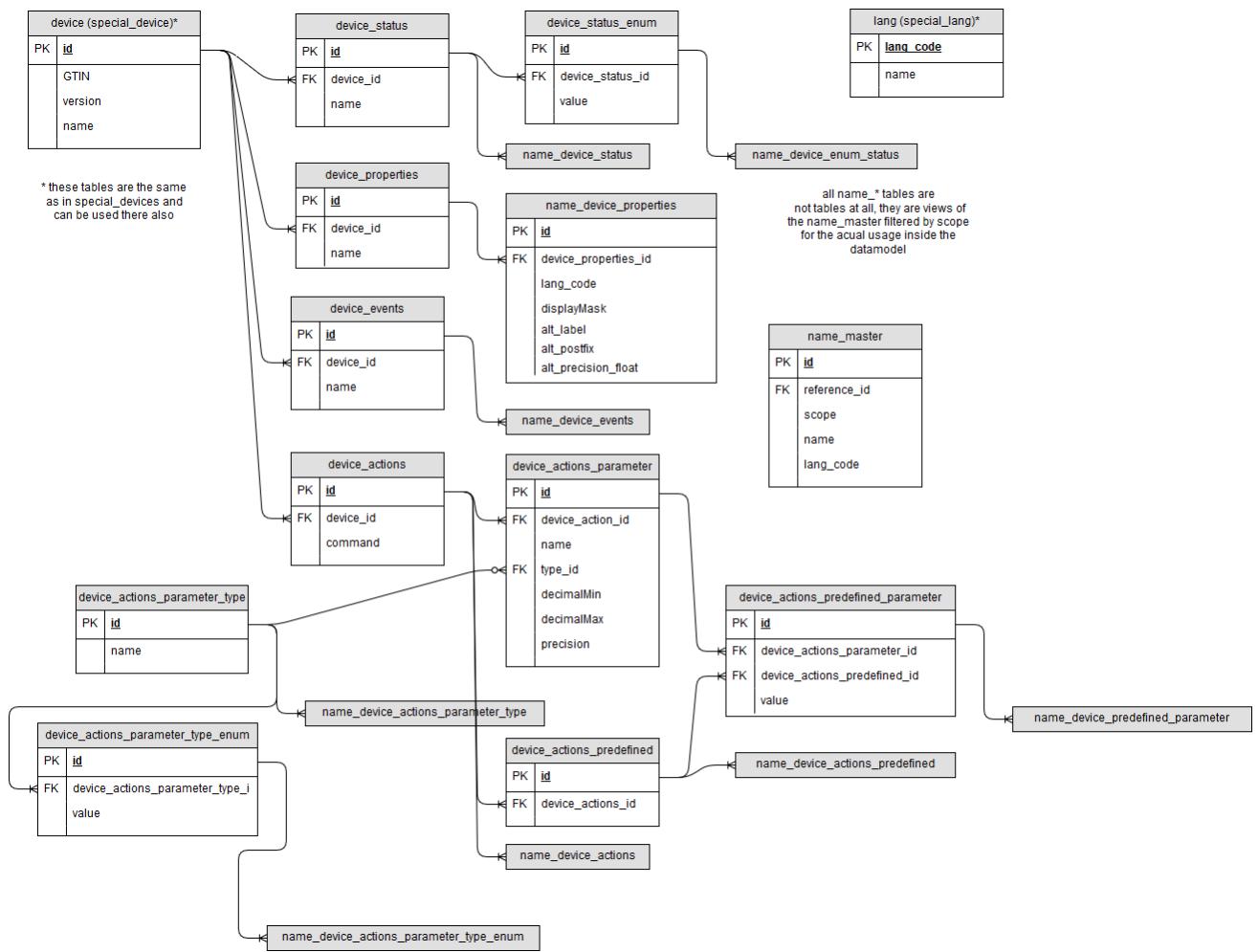
Any item of the descriptions that has a title attribute has translations in all system supported languages.

10.3 Database

The database storing the previously defined attributes is part of the digitalSTROM-Server. Access to this description data is provided to JSON API clients. For API details please read the [Device Info](#) chapter of the dSS JSON documentation.

The key id for queries is the dSUID of a device instance or the GTIN of the product.

The database table organization is described in the following diagram.



11 Certification Rules

Rule 1 digitalSTROM-Server Addons that implement private events have to prefix all event names with their own unique addon name.