ALL <THINGS> JOINED

IoT Server - REST API

API Specification Release 1.1.1

Table of Contents

Revisions History

Rev	Date	Description
1.0	2015-07-13	First API version with device configuration, device configuration variables, real time acquisition of device variables
1.1	2015-12-21	API extension with system information, system variables configuration, real time system variables, historic device data and system variables, real time alarms, alarms history.
1.1.1	2016-12-12	Clarification on device ID generation and Variables ID generation

Introduction

The following naming convention is adopted:

- "Alleantia systems" or "systems" are the Alleantia IoT Scada Server, IoT Gateway appliances and IoT SCADA software products that can be equipped with REST API module
- "Device" is the field device (controller, PLC, sensor etc.) connected to Alleantia systems providing status information or settings through variables. Alleantia systems provide external access to such information through the API.
- "Plant" is the set of all *devices* connected to a *system* representing a plant.
- "Variable" is a unitary information that the field device can provide, either in READ or in WRITE or both permissions.

Alleantia systems provide real time access to the managed information through API REST of different kind:

- **System Information API** – general system information
- **Devices configuration API** – acquisition of field devices configuration connected to the Alleantia system
- **Variables configuration API** – acquisition of field devices variables configuration, plant / machine data configuration and user defined data
- **Data API** – acquisition of actual and hystorical field devices variables values, plant / machine data values. Setting of field device variables values (with WRITE permission).
- **Alarms API** – acquisition of actual and hystorical alarms values.

All API returned data representation use the JSON format.

N.B. Suffix *.json* for each endpoint is void. If omitted, returned data format remains JSON.

SYSTEM INFORMATION API

Endpoint	HTTP Request
/api/v1/info.json	GET

DEVICES CONFIGURATION API

Endpoint	HTTP Request
/api/v1/devices.json	GET

/api/v1/devices/{deviceId}/config.json	GET

Variables configuration API

Endpoint	HTTP Request
/api/v1/devices/{deviceId}/variables/config.json	GET
/api/v1/devices/{deviceId}/variables/{variableId}/config.json	GET
/api/v1/devices/custom/variables/config.json	GET
/api/v1/devices/custom/variables/{variableId}/config.json	GET

Data API

Endpoint	HTTP Request
/api/v1/devices/{deviceId}/variables/data.json	GET
/api/v1/devices/{deviceId}/variables/{variableId}/data.json	GET
/api/v1/devices/{deviceId}/variables/{variableId}/logdata.json	GET
/api/v1/devices/{deviceId}/variables/{variableId}/set.json	GET
/api/v1/devices/custom/variables/data.json	GET
/api/v1/devices/custom/variables/{variableId}/data.json	GET
/api/v1/devices/custom/variables/{variableId}/logdata.json	GET

Alarms API

Endpoint	HTTP Request
/api/v1/alarms	GET
/api/v1/alarms/{alarmId}/config.json	GET
/api/v1/alarms/{alarmId}/data.json	GET
/api/v1/alarms/active.json	GET
/api/v1/alarms/history.json	GET

Hypermedia links

Some responses include hypermedia links used to recover additional information associated to the request. Here follows the hypermedia links structure:

- *rel* – relationship type as defined in RFC 5988, par. 4 “Link relation types”.
- *href* – address to access to recover the information associated to the link.
- *type* (void) – content MIME type.
- *title* (void) – link content description.

System information API

GET /api/v1/info.json

Returns Alleantia system information through a JSON object with the following fields:

- *sn* – unique serial number
- *uuid* – unique system identifier (alphanumeric)
- *hwModel* –hardware model
- *name* – system name (user defined)
- *localDate* – actual system date
- *webAppVersion* – system software version

URL Parameters

Nessuno

Sample Request

Sample URL	http://192.168.1.29/api/v1/info.json
Body	*void*

Sample Reply

<table>
<tr><td><b>Status code</b></td><td>200 OK</td></tr>
<tr><td><b>Body</b></td><td><pre>{
  "sn": "IOTSPI215060600",
  "uuid": "414da140b-1ead-32f8-ae78-adf800fcdc96",
  "hwModel": "IoT Server rev A3",
  "name": "Monitoraggio impianto",
  "localDate": "2015-11-12T17:56:34.831+0100",
  "webAppVersion": "3.0.1"
}</pre></td></tr>
<tr><td></td><td></td></tr>
</table>

Devices configuration API

GET /api/v1/devices.json

Returns a data list to retrieve information on all devices configured in the Alleantia system. The list contains zero or more JSON objects with the following fields

- *id* – device numerical identifier. It is an unique identifier only within a specific ISS system and is only valid for the system that has returned it. ID=1 and ID=2 are reserved to the IoT Server system (for data retrieval and command on IoT Server on-board I/Os), the other are generated automatically If the user subsequently modifies the system configuration, by disabling or removing the device, further calls to this API will no longer provide the device id. If the device is removed and further reinstalled, its ID will change.
- *links* – list of hypermedia links to recover from the system the connected devices and variables configuration information; links already include the *deviceId* parameters required for subsequent calls. The "*rel*" parameter identifies the information type returned by the link
  - *config-device* – device configuration
  - *config-variables* – device variables configuration

The returned list is void if no devices are configured in the system.

URL parameters

None

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices.json
Body	*void*

Sample Reply

Status code	200 OK
Body	

```
[
  {
    "id": 1,
    "links": [
      {
        "rel": "config-device",
        "href": "http://192.168.1.29/api/v1/devices/1/config",
        "title": "Device configuration"
      },
      {
        "rel": "config-variables",
        "href":
"http://192.168.1.29/api/v1/devices/1/variables/config",
        "title": "Device variables configuration"
      }
    ]
  },
  {
    "id": 7,
    "links": [
      {
        "rel": "config-device",
        "href": "http://192.168.1.29/api/v1/devices/7/config",
        "title": "Device configuration"
      },
      {
        "rel": "config-variables",
        "href":
"http://192.168.1.29/api/v1/devices/7/variables/config",
        "title": "Device variables configuration"
      }
    ]
  }
]
```

GET /api/v1/devices/{deviceId}/config.json

Returns the configuration information for device configured in the system; the returned data is a JSON object containing the following fields:

- *id* – device numerical identifier. Same rules applies as for previous API.
- *manufacturer* – name of device manufacturer.
- *model* – device model.
- *version* (optional) – device version.
- *description* –device description (user defined).
- *category* – device category.
- *links* (optional) – list of hypermedia links to recover documents associated to the device.

If the device do not exist, API returns status code “204 - No content” with void body.

URL parameters

deviceId	Device numerical identifier

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/1/config.json
Body	*void*

Sample Reply

Status code 200 OK

Body

```
{
  "id": 1,
  "manufacturer": "Fronius",
  "model": "IG Plus 120 V-3",
  "description": "INVERTER 1",
  "category": "Inverter",
  "links": [
    {
      "rel": "edit-media",
      "href": "http://192.168.1.29/documents/34.pdf",
      "type": "application/pdf",
      "title": "Service manual"
    }
  ]
}
```

Variables configuration API

Used to obtain the device variables configuration (by specifying a deviceId) or for a full plant (multiple devices). This API returns a JSON object (or a list of JSON objects) containing the following fields:

- *id* –numerical identifier for the device or plant variable . Device variable Id is unique only within the specific *deviceId* and is only valid for the IoT Server system that has returned it. Plant variable Id is unique only within the specific system that has returned it. IoT Server generates variables IDs automatically. If the user subsequently modifies the system configuration, by disabling the device variable, further calls to this API will no longer provide the id
- *description* – variable description, assigned by the device producer or the system user customization, if present.
- *dataType* –variable type, values can be "String", "Boolean" or "Numeric".
- *engUnit* (optional) – variable unit of measure.
- *minimum* (optional) – min value that the variable can assume; it is assigned by the manufacturer or system user
- *maximum* (optional) – max value that the variable can assume; it is assigned by the manufacturer or system user
- *link* – hypermedia link to recover the actual variable value. "rel" parameter value is "data".

GET /api/v1/devices/{deviceId}/variables/config.json

Returns a list with the information on variables configuration of a device configured in the system. If the device do not exist, API returns status code "204 - No content" with void body.

URL parameters

deviceId	Device numerical identifier

Query parameters

id (optional)	Variable Id used to filter results

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/1/variables/config.json

Sample URL	http://192.168.1.29/api/v1/devices/1/variables/config.json?id=1&id=2
Body	*void*

Sample Reply

Status code	200 OK

Body

```
[
  {
    "id": 1,
    "description": "Power - NOW",
    "dataType": "Numeric",
    "engUnit": "kW",
    "minimum": 0,
    "maximum": 10,
    "link": {
      "rel": "data",
      "href":
"http://192.168.1.29/api/v1/devices/1/variables/1/data"
    }
  },
  {
    "id": 2,
    "description": "Energy - TOTAL",
    "dataType": "Numeric",
    "engUnit": "kWh",
    "link": {
      "rel": "data",
      "href":
"http://192.168.1.29/api/v1/devices/1/variables/2/data"
    }
  }
]
```

GET /api/v1/devices/{deviceId}/variables/{variableId}/config.json

Returns the information on a variable configuration for a device configured on the system.

If the device or the variable do not exist, API returns status code “204 - No content” with void body.

URL parameters

deviceId	Device numerical identifier
variableId	Numeric Id for the device variable

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/1/variables/9/config.json
Body	*void*

Sample Reply

Status code	200 OK

Body

```
{
  "id": 9,
  "description": "DC voltage - NOW",
  "dataType": "Numeric",
  "engUnit": "V",
  "minum": 230,
  "maximum": 600,
  "link": {
      "rel": "data",
      "href":
"http://192.168.1.29/api/v1/devices/1/variables/9/data"
    }
}
```

GET /api/v1/devices/custom/variables/config.json

Returns a list with the information on variables configuration of the plant configured in the system by user using “custom variable” menu or from application packages like “Energy Pack” or “Machining Pack”..

URL parameters

nessuno

Query parameters

id (optional)	Variable Id used to filter results

Richieste di esempio

Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/config.json
Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/config.json?id=5&id=50000
Body	*void*

Sample Reply

Status code	200 OK

Body

```
[
  {
        "id": 5,
        "description": "Instant power",
        "dataType": "Numeric",
        "engUnit": "kW",
        "link": {
          "rel": "data",
          "href":
"http://192.168.1.29/api/v1/devices/custom/variables/5/data"
        }
      },
      {
        "id": 50000,
        "description": "Integrated Energy",
        "dataType": "Numeric",
        "engUnit": "kWh",
        "link": {
          "rel": "data",
          "href":
"http://192.168.1.29/api/v1/devices/custom/variables/50000/data"
        }
      }
    ]
```

GET /api/v1/devices/custom/variables/{variableId}/config.json

Returns the information on a variable configuration for a plant configured on the system.

If the variable do not exist, API returns status code “204 - No content” with void body.

URL parameters

variableId	Numerico identifier for the plant variable

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/50000/config.json
Body	*void*

Sample Reply

Status code	200 OK

Body

```
{
  "id": 50000,
  "description": "Integrated Energy",
  "dataType": "Numeric",
  "engUnit": "kWh",
  "link": {
    "rel": "data",
    "href":
"http://192.168.1.29/api/v1/devices/custom/variables/50000/data"
  }
```

```
            }
```

Data API

For all these API the returned type is a JSON object containing the following fields:

- *id* – numeric identifier for the device or plant variable.
- *value* – variable value; types can be can be “String”, “Boolean” or “Numeric”.
- *decodedValue* (optional) – where variable values codes for which a decoding is provided to improve the "readability" to the end user (i.e. 0 = OK, 1 = FAULT), this field contains the *value* field decoded.
- *timestamp* – date and time in ISO-8601 format when value was recorded.
- *quality* – boolean value indicating whether the last reading attempt was successful. It indicates if the *value* field contains a current or potentially obsolete information. If the last communication was OK, *quality* field = true; if the last communication was KO, *quality* field = false; the value contains the last value read from the device.

If the response has no errors, body contains JSON object with status code è 200 OK; if the variable requested do not exist in the system configuration, API returns 2 possible responses depending on endpoint return type:

- *Endpoint with return type single data* – returns a status code “204 - No content” with void body:
- *Endpoint with return type list*– returns a status code 200 OK and a void list

N.B. In case the requested variable is not yet available (when a communication between system and the device has not yet occurred), the timestamp field has *null* value and the value field has a default value that the requesting application MUST ignore since the data was not actually collected from the device.

GET /api/v1/devices/{deviceId}/variables/data.json

Returns a list of actual values for the variables of a device configured in the system.

URL parameters

deviceId	Device numerical identifier

Query parameters

id (optional)	Variable Id used to filter results

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/5/variables/data.json
Sample URL	http://192.168.1.29/api/v1/devices/5/variables/data.json?id=24&id=27
Body	*void*

Sample Reply

Status code	200 OK
Body	See below

```
[
  {
    "id": 24,
    "value": true,
    "timestamp": "2015-02-13T16:17:42.831+0100",
    "quality": true
  },
  {
    "id": 27,
    "value": 12.76,
    "timestamp": "2015-02-13T16:17:41.299+0100",
    "quality": true
  }
]
```

GET /api/v1/devices/{deviceId}/variables/{variableId}/data.json

Returns the actual variable value for a device configured in the system.

URL parameters

deviceId	Device numerical identifier
variableId	Numeric Id for the device variable

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/5/variables/3/data.json
Body	*void*

Sample Reply

Status code	200 OK
Body	

```
{
  "id": 3,
  "value": 2561,
  "timestamp": "2015-02-11T15:31:02.404+0100",
  "decodedValue": "FAN FAULT",
  "quality": false
}
```

GET /api/v1/devices/{deviceId}/variables/{variableId}/logdata.json

Return the historical values of a variable of a device configured in the system for a specified time interval.

Returns a void body if there is no data in the specified time interval. The maximum number of returned values is limited to the first 1000.

URL parameters

deviceId	Device numerical identifier
variableId	Numeric Id for the device variable
startTime	Start time for the time interval requested (integer, milliseconds from 1.1.1970 00:00:00.000)
endTime (optional)	End time for the time interval requested (integer, milliseconds from 1.1.1970 00:00:00.000). If not specified, upper limit is current time.

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/3/variables/3/logdata?startTime=0
Body	*Void*

Sample Reply

<table>
<tr><td><b>Status code</b></td><td>200 OK</td></tr>
<tr><td><b>Body</b></td><td><pre>
[
  {
    "value": 1,
    "timestamp": "2015-11-12T16:14:01.713+0100",
    "quality": true
  },
  {
    "value": 3,
    "timestamp": "2015-11-12T16:15:07.162+0100",
    "quality": true
  },
…
</pre></td></tr>
</table>

GET /api/v1/devices/{deviceId}/variables/{variableId}/set.json

Set the value of a writable variable for a device configured in the system.

Response occur if request has been accepted.

NB: request accepted DO NOT imply request completed! Best practice suggest to execute a read request to verify if and when the command was executed.

URL parameters

deviceId	Device numerical identifier
variableId	Numeric Id for the device variable
value	New value for the variable.

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/11/variables/7/set?value=-54.34
Body	*void*

Sample Reply

Status code	200 OK

Body	`{`
	`  "accepted": true,`
	`  "description": "Accepted"`
	`}`

GET /api/v1/devices/custom/variables/data.json

Returns a list of actual variable values for the plant configured in system.

URL parameters

None

Query parameters

id (optional)	Variable Id used to filter results

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/data.json
Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/data.json?id=5&id=50000
Body	*void*

Sample Reply

Status code	200 OK

Body	`[`
	`  {`

```
    "id": 5,
    "value": 0,
    "timestamp": "2015-11-16T10:29:35.182+0100",
    "quality": false
  },
  {
    "id": 50000,
    "value": 2.2757686111111113,
    "timestamp": "2015-11-16T10:29:55.959+0100",
    "quality": false
  }
]
```

GET /api/v1/devices/custom/variables/{variableId}/data.json

Returns the actual variable value for the plant configured in system.

URL parameters

variableId	Numeric identificator of the system variable

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/50000/data.json
Body	*Void*

Sample Reply

Status code	200 OK

Body

```
{
  "id": 50000,
  "value": 2.2757686111111113,
  "timestamp": "2015-11-16T10:31:47.288+0100",
  "quality": false
}
```

GET /api/v1/devices/custom/variables/{variableId}/logdata.json

Return the historical values of a plant variable configured in the system for a specified time interval.

Returns a void body if there is no data in the specified time interval. The maximum number of returned values is limited to the first 1000.

URL parameters

variableId	Numeric id for the plant variable
startTime	Start time for the time interval requested (integer, milliseconds from

	1.1.1970 00:00:00.000)
endTime (optional)	End time for the time interval requested (integer, milliseconds from 1.1.1970 00:00:00.000). If not specified, upper limit is current time.

Sample Request

Sample URL	http://192.168.1.29/api/v1/devices/custom/variables/50000/logdata?startTime=0
Body	*void*

Sample Reply

Status code	200 OK

Body	`[`
	`  {`
	`    "value": 0.05625666666666667,`
	`    "timestamp": "2015-11-12T16:14:02.272+0100",`
	`    "quality": true`
	`  },`
	`  {`
	`    "value": 0.10433305555555555,`
	`    "timestamp": "2015-11-12T16:15:07.367+0100",`
	`    "quality": true`
	`  },`
	…

Alarms API

GET /api/v1/alarms.json

Returns a list of all active alarms in the system. In case there are no active alarms returns a void list

The returned type is a list of JSON objects containing the following fields:

- *id* – alarm numeric id.
- *links* – hypermedia link to recover the configuration of a single alarm. “rel” parameter has “config-alarm” value.

Sample Request

Sample URL	http://192.168.1.29/api/v1/alarms.json
Body	*void*

Sample Reply

<table>
<tr><td><b>Status code</b></td><td>200 OK</td></tr>
<tr><td><b>Body</b></td><td><pre>
[
  {
    "id": 5,
    "links": [
      {
        "rel": "config-alarm",
        "href":
"http://192.168.1.29/api/v1/alarms/5/config",
        "title": "Alarm configuration"
      }
    ]
  },
  {
    "id": 1,
    "links": [
      {
        "rel": "config-alarm",
        "href":
 "http://192.168.1.29/api/v1/alarms/1/config",
        "title": "Alarm configuration"
      }
    ]
  }
]
</pre></td></tr>
</table>

GET /api/v1/alarms/{alarmId}/config.json

Returns the information on an alarm configured on the system.

If the requested alarm do not exist, API returns status code “204 - No content” with void body.

The returned type is a JSON object with the following fields:

- *id* – alarm numeric Id.
- *description* – alarm description
- *link* – hypermedia link to recover the actual alarm value. “rel” parameter has value “data”.

URL parameters

alarmId	Alarm numeric Id

Sample Request

Sample URL	http://192.168.1.29/api/v1/alarms/4/config.json
Body	*Void*

Sample Reply

<table>
<tr><td><b>Status code</b></td><td>200 OK</td></tr>
<tr><td><b>Body</b></td><td><pre>
{
  "id": 4,
  "description": "Input channel 3 sensor error",
  "link": {
    "rel": "data",
    "href":
      "http://192.168.1.29/api/v1/alarms/4/data",
    "title": "Alarm value"
  }
}
</pre></td></tr>
</table>

GET /api/v1/alarms/{alarmId}/data.json

Returns the value of an active alarm configured in the system.

If the requested alarm do not exist, API returns status code “204 - No content” with void body.

The returned type is a JSON object containing the following fields:

- *id* – numeric identifier for the alarm.
- *quality* – alarm quality.
- *alarmed* – alarm value

URL parameters

alarmId	alarm numeric id

Sample Request

Sample URL	http://192.168.1.29/api/v1/alarms/4/data.json

Body	*Void*

Sample Reply

Status code	200 OK

Body	{
	  "id": **4**,
	  "quality": true,
	  " alarmed": **false**
	}

GET /api/v1/alarms/active.json

Returns a list of active alarms in the system.

If the system do not have active alarms the returned list is empty.

The returned type is a list of JSON objects with the following fields::

- *id* – alarm numeric id.
- *eventId* – event identifier (integer; identifies a pair for activation and de-activation time of an alarm event)
- *deviceName* (optional) – device associated to the alarm
- *deviceSection* (optional) – device section associated to the alarm
- *measure* (optional) – variable to which the alarm is associated
- *description* – alarm description
- *onDate* – alarm activation timestamp

URL parameters

None

Sample Request

Sample URL	http://192.168.1.29/api/v1/alarms/active.json
Body	*Void*

Sample Reply

Status code	200 OK

Body	[
	  {
	    "id": 5,
	    "eventId": 166050,
	    "deviceName": "Curr",
	    "measure": "Curr 1",
	    "description": "Test Curr",
	    "onDate": "2015-11-16T11:01:42.883+0100"

```
  },
  {
    "id": 7,
    "eventId": 166051,
    "measure": "Instant Power ",
    "description": "Test VV",
    "onDate": "2015-11-16T11:01:57.462+0100"
  },
  {
    "id": 9,
    "eventId": 166049,
    "description": "Test multi",
    "onDate": "2015-11-16T11:01:42.769+0100"
  }
]
```

GET /api/v1/alarms/history.json

Returns the historical list of the alarms in the system sorted by ascending time. If there are no alarms, returns an empty list. Each item in the list is identified by an eventId; it include an activation time and (if any) a deactivation time. It is possible to specify a eventId range to select only the included alarms. The number of returned alarms is limited to the first 1000 results.

The type returned is a list of JSON objects with the following fields:

- *alarmType* – Alarm type; can be “DEVICE_ALARM” for alarms associated to a device; “SYS_ALARM” for the system alarms; “ALARM” for other alarms.
- *alarmId* (optional) – Alarm identifier (only if *alarmtype* is “ALARM”)
- *eventId* – Event identifier (numero intero, identifies a pair for activation and de-activation time for an alarm)
- *onDate* – alarm activation timestamp
- *offDate* (optional) – alarm deactivation timestamp
- *deviceName* (optional) – device associated to the alarm
- *deviceSection* (optional) – device section associated to the alarm
- *description* –alarm description

URL parameters

startEventId (optional)	Identifier for the first event (included) to start retrieving alarms. If unspecified, starts with the first alarm.
endEventId (optional)	Identifier for the last event (included) to retrieve. If unspecified, ends with the last alarm
includeActive (optional)	Default: “false”: it returns only historical alarms. If “true” returns both active and historical alarms.

Sample Request

Sample URL	http://192.168.1.29/api/v1/alarms/history.json
Sample URL	http://192.168.1.29/api/v1/alarms/history?startEventId=166134&endEventId=166226&includeActive=true
Body	*Void*

Sample Reply

Status code	200 OK

Body

```
[
  {
    "alarmType": "ALARM",
    "alarmId": 9,
    "eventId": 166134,
    "onDate": "2015-11-27T17:10:29.451+0100",
    "deviceName": "Tool",
    "deviceSection": "B1",
    "description": "Tool 3 Alarm"
  },
  {
    "alarmType": "DEVICE_ALARM",
    "eventId": 166135,
    "onDate": "2015-11-30T09:15:03.210+0100",
    "deviceName": "Tool",
    "description": "1"
  },
  {
    "alarmType": "DEVICE_ALARM",
    "eventId": 166226,
    "onDate": "2015-12-17T10:59:15.642+0100",
    "offDate": "2015-12-17T11:30:29.857+0100",
    "deviceName": "MB Write Test",
    "description": "1"
  },
]
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