JSON / HTTP(s) POST
NETIO M2M API protocols docs

Protocol version: JSON Version 2.0

Short summary

JSON / HTTP(s) protocol is a file-based M2M API protocol, where the NETIO device is a HTTP(s) server and the client downloads or uploads one text file document in the json format to control the NETIO power outputs (230V power sockets or IEC-320 power outlets 110/230V).

- For NETIO 4All, the protocol also includes energy metering values.
- The JSON protocol must be enabled first in the WEB configuration of the respective device. For details, see the “NETIO WEB configuration” chapter.
- This protocol is HTTP(s) based. If you want use different port than is used for device web configuration, you can enable and use the M2M HTTP(s) port
- Username and password to access the file is hidden in the HTML header.
  There can be different username & password for the read and write access.
- With write (**netio.json** file upload by http post) the device send you back the current (updated) json answer content in the same structure as the netio.json file.

Supported devices

- NETIO 4All
- NETIO 4 (Energy metering not supported)
- NETIO 4C (Energy metering not supported)

Note: NETIO 4x means all NETIO 4 devices (NETIO 4 / 4All / 4C)

Supported devices and firmware

NETIO 4x firmware – 3.0.1 and later

NOTE: *This document provides basic info about the M2M API protocol.*
Other device functions are described in the product manual.

Quick start with json & NETIO

- **READ function - status**

  Read a **netio.json** file from your NETIO by HTTP(s) **GET**: http(s)://<netioIP>/netio.json
  Example: http://192.168.1.1/netio.json

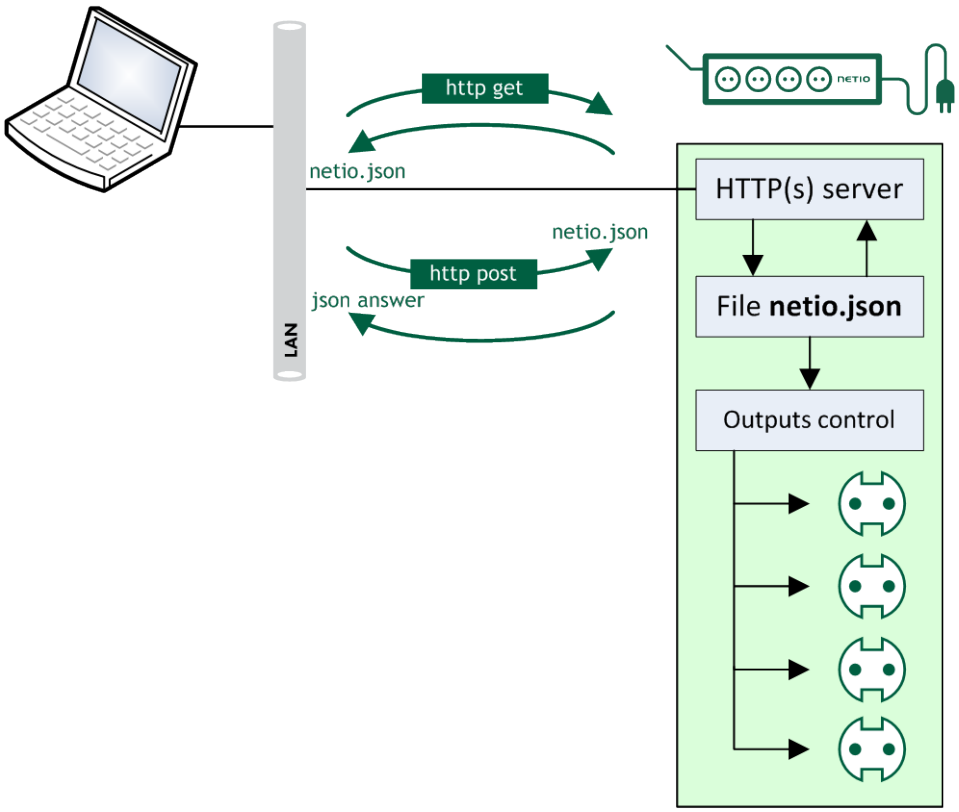
- **WRITE function - control**

  Upload the following json file by HTTP(s) **POST** to: http(s)://<netioIP>/netio.json
  Example: http://192.168.1.1/netio.json

netio.json file (command to switch Power output 1 to ON):

```
{
   "Outputs":[
      {
         "ID":1,
         "Action":1
      }
   ]
}
```

If the netio.json file & command is accepted, then NETIO returns Status Code "200 OK" and status json file.



General NETIO 4x output functions

Output status – “read” function

- **0** – Power **OFF**
- **1** – Power **ON**

Output actions – “write” function

- **0 –** Turn **OFF**
- **1 –** Turn **ON**
- **2 –** Short OFF delay (restart)
- **3 –** Short ON delay
- **4 –** Toggle (invert the state)
- **5 –** No change
- **6 –** Ignored (return value from reading the tag)
  Current output value is in ”State” tag (0 / 1).

Short ON / OFF delay

This command switches a power output On / Off for a defined time. It is useful for example to power-cycle a server with a defined switch-off time, or to switch on a pump for a defined time.

This “short” delay is protected: the power output will remain in the defined state regardless of any other M2M requests received. During this time, the output state can only be changed by pressing the button on the NETIO device and this action cancel M2M short ON/OFF command for the particular output. Other requests to control the particular output are simply ignored and an ERROR logged with reason rejected in a device Log.

The short ON / OFF delay interval can be defined in the device web administration. It is specified in ms (milliseconds) and rounded up to hundreds of miliseconds (0,1s).
This interval can be also defined using some M2M API protocol commands. In that case, it is valid only for a single protocol session (the following short ON / Short OFF command). When the connection is closed or restarted, the interval is reset to the device default value (defined in the web administration for each output).

Security issues

Do not use default usernames and passwords! Keep your Ethernet and WiFi networks secured.

Power-Up outputs state

All outputs are Off during the first 25 to 30 seconds after power-up.
After this time, all outputs are set to the selected state:

- **Last Output state**
  After a power outage, the NETIO device sets each power output to the last stored state of this one output. The current state of each power output (socket/power outlet) is internally stored every 8 seconds.

Note: **Function Scheduler** is checked in Power-Up initialization. When enabled, it can affect one or more power output stated based on current time and date.

Custom based **Lua scripts** can affect output stated too.

HTTP(s) port

There are 2 different HTTP(s) ports:

1) The web administration of the device - HTTP(s).
   Web administration is in the Settings/System (HTTP) or System/Security Settings (HTTPs).

2) Separated HTTP(s) port for the M2M API protocols (XML, JSON, CGI).
   Web administration is in each M2M API protocol settings.

All HTTP(s) protocols (XML / JSON / CGI) share one HTTP(s) port.

Web Configuration	M2M API	
HTTP	HTTP	Possible
HTTPs	HTTPs	Possible
HTTP	HTTPs	Not possible today
HTTPs	HTTP	Not possible today

Energy metering variables

Since NETIO fw 3.0.0 and later, there are 23 variables available for NETIO energy metering.

Parameters for each power output:

Variable	Unit	Description
4x Current	mA	Instantaneous current for the specific power output
4x TPF (True Power Factor)	-	Instantaneous True Power Factor for the specific power output
4x Power	W	Instantaneous power (electrical load) for the specific power output.
4x Energy	Wh	Instantaneous Energy counter value for the specific power output

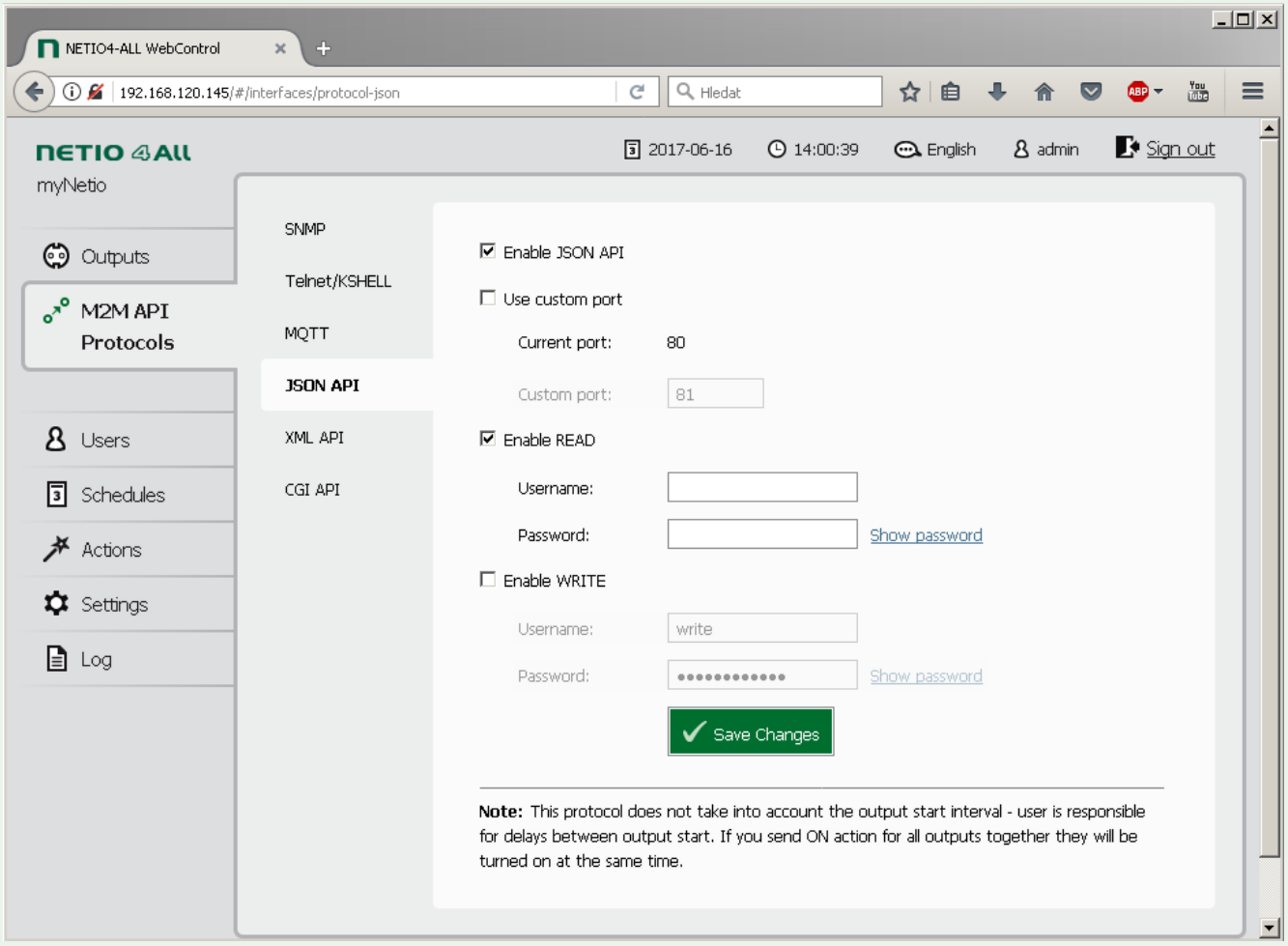
Parameters for the whole NETIO device:

Variable	Unit	Description
1x Voltage	V	Instantaneous voltage
1x Frequency	Hz	Instantaneous frequency
1x Total Current	mA	Instantaneous total current through all power outputs
1x Overall True Power Factor	-	Instantaneous True Power Factor – weighted average from all meters
1x Total power	W	Total Power of all power outputs (device's own internal consumption is not included)
1x Total Energy	Wh	Instantaneous value of the Total Energy counter
1x Energy Start	-	Date and time of the last reset of all energy counters

Note: *Energy metering is not available for all NETIO 4x models.*

NETIO WEB configuration

M2M API protocols can be enabled and configured only over the web administration – select “M2M API Protocols” in the left-hand side menu and then select the “JSON API” tab.



Picture 1 –M2M API Protocols / JSON API settings GUI

- **Enable JSON API** – Enable/disable the M2M API protocol
- **Use custom port** – Check to enable custom port setting
  - **Current port** – Currently used port
  - **Custom port** – Custom port set for XML / JSON / CGI API protocols
- **Enable READ** – Enable READ functionality
  - Username / Password for READ
- **Enable WRITE** – Enable WRITE functionality
  - Username – Username for WRITE
  - Password – Password for WRITE (default: MAC address without colons, lowercase)

Notes

- **The device webserver is restarted after Saving of JSON API settings.**
- Empty Username and Password means no authentication.
- Credentials are sent in the HTTP header, “Basic authentication” is used.
  The username and password can be also provided in the URL -
  http(s)://username:password@<netioIP>/netio.json

NETIO JSON protocol structure

JSON standard: RFC4627
JSON Template: 3 Space Tab

JSON API – READ (status)

HTTP(s) GET request or HTTP(s) POST request (no file or empty file)

GET Request: **http(s)://<netioIP>/netio.json**

READ response (status json file):


```
{
   "Agent": {
      "Model": "NETIO 4All",
      "Version": "3.0.1",
      "JSONVer": "2.0",
      "DeviceName": "myNetio_10",
      "VendorID": 0,
      "OemID": 0,
      "MAC": "24:A4:2C:33:25:E1",
      "Uptime": 110637,
      "Time": "2017-11-03T13:53:38+00:00",
      "NumOutputs": 4
   },
   "GlobalMeasure": {
      "Voltage": 235.8,
      "Frequency": 49.9,
      "TotalCurrent": 20,
      "OverallPowerFactor": 0.22,
      "TotalLoad": 1,
      "TotalEnergy": 965,
      "EnergyStart": "2017-06-23T16:47:53+01:00"
   },
   "Outputs":[
```

```
    {
       "ID": 1,
       "Name": "output_1",
       "State": 0,
       "Action": 6,
       "Delay": 5000,
       "Current": 0,
       "PowerFactor": 0,
       "Load": 0,
       "Energy": 192
    },
    {
       "ID": 2,
       "Name": "output_2",
       "State": 0,
       "Delay": 5000,
       "Current": 0,
       "PowerFactor": 0,
       "Load": 0,
       "Energy": 80
    },
    {
       "ID": 3,
       "Name": "output_3",
       "State": 0,
       "Action": 6,
       "Delay": 5000,
       "Current": 0,
       "PowerFactor": 0,
       "Load": 0,
       "Energy": 196
    },
    {
       "ID": 4,
       "Name": "output_4",
       "State": 1,
       "Action": 6,
       "Delay": 5000,
       "Current": 20,
       "PowerFactor": 0.22,
       "Load": 1,
```

```
            "Energy": 495
        }
    ]
}
```


***Notes**:*
1. Items/values related to metering (Voltage, Frequency, Current, PowerFactor, Load and Energy, etc.) are available only for the NETIO 4All model.

*2. Returned status **netio.json** file contains always "Action" with value "6" for all outputs. This value means "ignore" and works as a placeholder. Output state 0 / 1 is in the **State** value.*

Values description

Global values:

`"Model": "NETIO 4All"`	*Model identification*
`"Version": "3.0.1"`	*Firmware version*
`"JSONVer": "2.0"`	*Protocol version*
`"DeviceName": "myNetio_10"`	*Device name (user defined on web)*
`"VendorID": 0`	*Manufacturer internal use*
`"OemID": 0`	*Manufacturer internal use*
`"MAC": "24:A4:2C:33:25:E1"`	*The main MAC used as a Serial Number*
`"Uptime": 110637`	***[s]** The Uptime value*
`"Time": "2017-11-03T13:53:38+00:00"`	*Date and time of the NETIO device*
`"NumOutputs": 4`	*Number of outputs*
`"Voltage": 235.8`	***[V] I**nstantaneous voltage*
`"Frequency": 49.9`	***[Hz]** Instantaneous frequency*
`"TotalCurrent": 20`	***[mA]** Instantaneous total current through all power outputs*
`"OverallPowerFactor": 0.22`	**[-]** *Instantaneous True Power Factor weighted average from all meters*
`"TotalLoad": 1`	***[W]** Total Power of all power outputs*
`"TotalEnergy": 965`	***[Wh]** Instantaneous value of the Total Energy counter*
`"EnergyStart": "2017-06-23T16:47:53+01:00"`	*Date and time of the last reset of all energy counters*

Values for specific output (example values below are for output 4):

`"ID": 4`	*Output number*
`"Name": "output_4"`	*Output name (user defined on web)*
`"State": 1`	*Output state*
`"Action": 6`	*Output action (6 = Ignored value, use State tag)*
`"Delay": 5000`	***[ms]** Output delay for short On/Off*
`"Current": 20`	***[mA]** Instantaneous current of the output*
`"PowerFactor": 0.22`	***[-]** Instantaneous True Power Factor*
`"Load": 1`	***[W]** Total Power of the output*
`"Energy": 495`	***[Wh]** Instantaneous value of the Energy counter*

JSON API – WRITE (control)

HTTP(s) POST request

ID - number of output

Outputs can be controlled by two options:

1. **Action**: 0 – off, 1 – on, 2 – short off, 3 – short on, 4 – toggle, 5 – no change, (6 – ignore)

2. **State**: 0 – off, 1 – on (Action = 6 required)

Note: ***Action*** *with other value than 6 has higher priority than the* ***State*** *tag.*
State value is not reflected in case Action = 1 to 5.
If you wish to use ***State*** *tag to control an output,* ***Action = 6 is required***.

A json file can be submitted as complete structure (e.g. previously received status json with modified control functions) or partial structure as shown below.

If the json & command is accepted, then NETIO returns Status Code "200 OK" and status json file.

Send command: **http(s)://<netioIP>/netio.json**

Switch Power output 1 to ON by Action tag:

```
{
   "Outputs":[
      {
         "ID":1,
         "Action":1
      }
   ]
}
```

or (State tag value will not be reflected)

```
{
   "Outputs":[
      {
         "ID":1,
         "State":0,
         "Action":1
      }
```

```
   ]
}
```

or by State tag (Action tag must have value 6)

```
{
   "Outputs":[
      {
         "ID":1,
         "State":1,
         "Action":6
      }
   ]
}
```

Switch Power output 2 to ON for 15 seconds, then switch it OFF.

```
{
   "Outputs":[
      {
         "ID":2,
         "Action":3,
         "Delay":15000
      }
   ]
}
```

Command to control more outlets:
Switch Power output 1 to ON, Toggle Output 2 and Switch Output 4 to ON for 15 seconds:

```
{
   "Outputs":[
      {
         "ID":1,
         "Action":1
```

```
      },
      {
         "ID":2,
         "Action":4
      },
      {
         "ID":4,
         "Action":3,
         "Delay":15000
      }
   ]
}
```

Status codes

Status codes	Description
200 OK	User authorized and command received
400 Bad Request	Control command syntax error
401 Unauthorized	Invalid Username or Password
403 Forbidden	Read only
500 Internal Server Error	Internal Server Error or Internal Server not fully started yet (e.g. after setting change or restart)

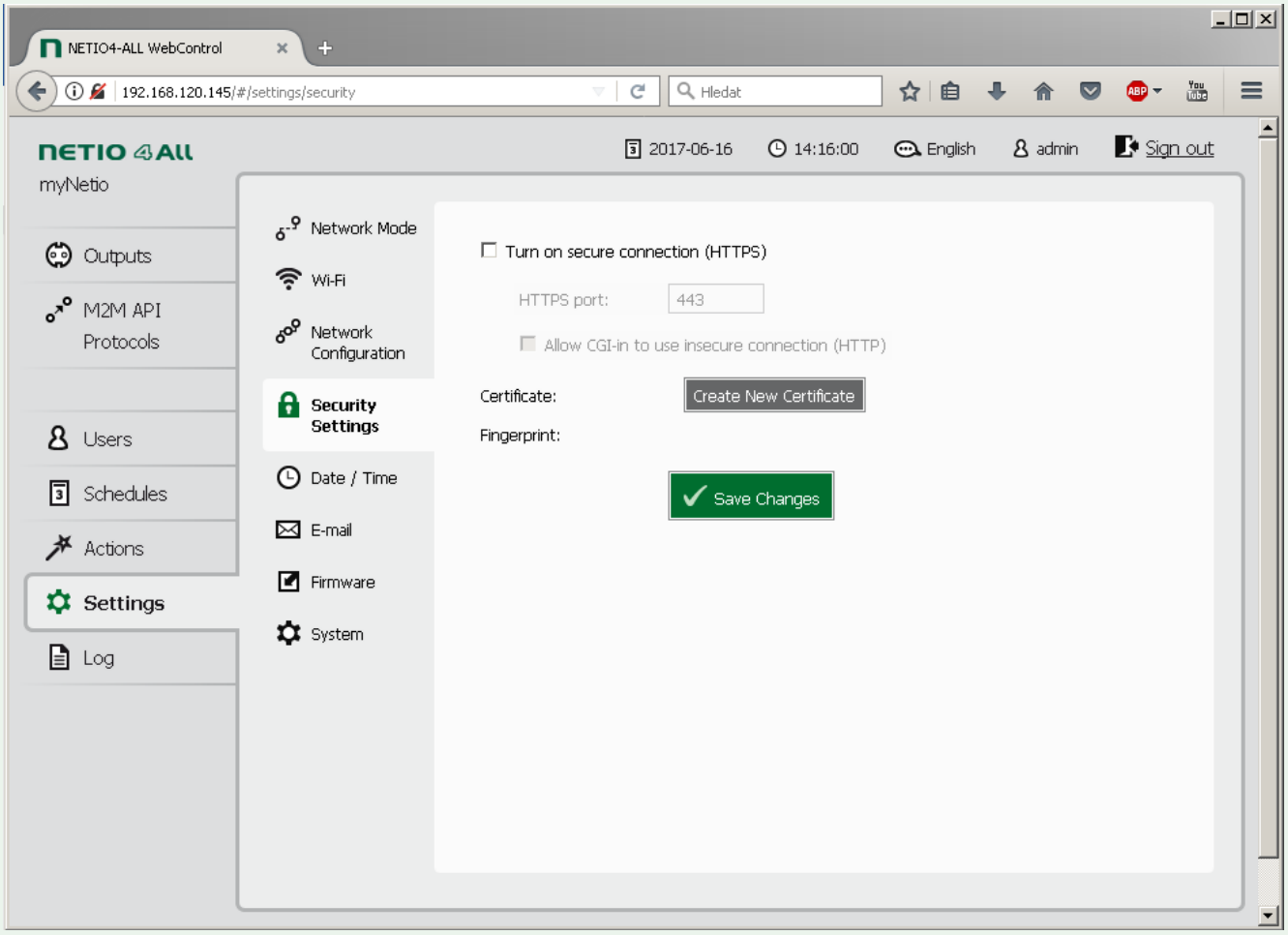
Response syntax for “OK” state:
Status json file as described above in chapter “NETIO JSON protocol structure” / READ

Response syntax for “Error” state:

```
{
   "result": {
      "error": {
         "code": 200,
         "message": "OK"
      }
   }
}
```

HTTPs = secure connection

NETIO can use secure connection (HTTPs) for web administration and HTTP-based M2M API Protocols (JSON, XML, CGI). This security feature can be enabled in the web administration: Settings / Security Settings. After checking “Turn on secure connection (HTTPS)” and saving the changes, only secured (HTTPS) communication will be available for web and HTTP-based protocols. The port for HTTP-based M2M API protocols remains the same as already set.



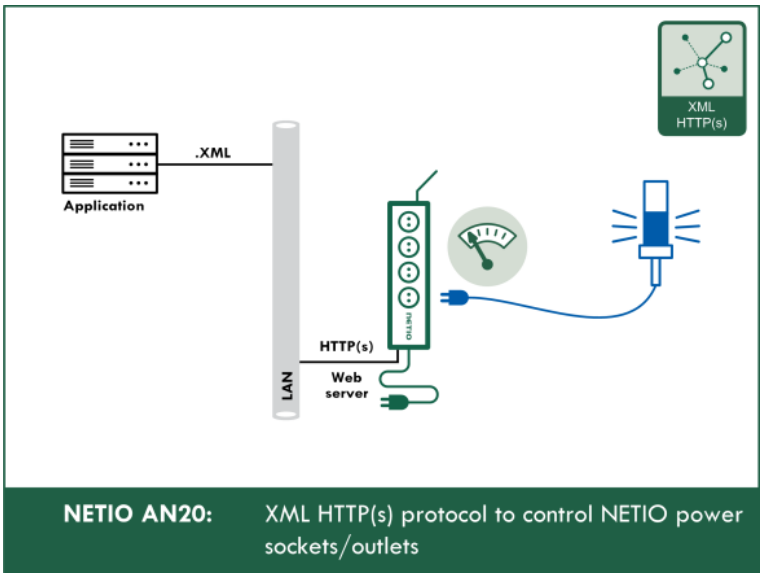
Picture 2 –Security settings GUI

- **Turn on secure connection (HTTPS)** – Enable/disable secure connection for web administration and HTTP-based M2M API protocols (JSON, XML, CGI)
- **HTTPS port** – Port used for the web administration (M2M API protocols use the port set in M2M Protocol settings)
- **Allow CGI-in to use insecure connection (HTTP)** – Enable unsecure connection for CGI-in
- **Create New Certificate** – Generates and immediately installs a new certificate.
- **Certificate** – Info about certificate validity (certificate is generated with one year validity)
- **Fingerprint** – Certificate fingerprint

Examples

AN20: XML HTTP(s) protocol to control NETIO smart power sockets 110/230V

The AN20 Application Note demonstrates how to control NETIO 4x smart sockets using the XML protocol. The XML protocol transfers a text file with a xml structure over http(s). NETIO devices contain built-in tools to easily test the protocol by the user. The XML protocol is supported by all NETIO 4x devices (NETIO 4 / 4All / 4C).



NOTE: JSON / XML file has different structure, but can be used in the same way.

>> Read the AN20 on www.netio-products.com

NETIO 4 – listing of the netio.json file

Note: In the NETIO 4 model, there are no metering values available.

NETIO 4 – status netio.json file


```
{"Agent":{"Model":"NETIO
4","Version":"3.0.1","JSONVer":"2.0","DeviceName":"myNetio","VendorID":0,"
OemID":0,"SerialNumber":"","Uptime":739,"Time":"2017-11-
09T13:18:56+01:00","NumOutputs":4},"Outputs":[{"ID":1,"Name":"output_1","S
tate":1,"Action":6,"Delay":5000},{"ID":2,"Name":"output_2","State":1,"Acti
on":6,"Delay":5000},{"ID":3,"Name":"output_3","State":1,"Action":6,"Delay"
:5000},{"ID":4,"Name":"output_4","State":1,"Action":6,"Delay":5000}]}
```

Document history

Document Revision	Publication Date	Description
1.0	14.11.2017	Initial release - JSON Version 2.0, for FW 3.0.1
1.1	7.12.2017	Documentation optimization - Action 6
1.2	19.12.2017	Keywords added
1.3	31.8.2018	Values description updated
1.4	6.9.2018	Infographic added
1.5	16.10.2018	Minor edits
1.6	23.11.2018	Detailed description about the Action tag implemented