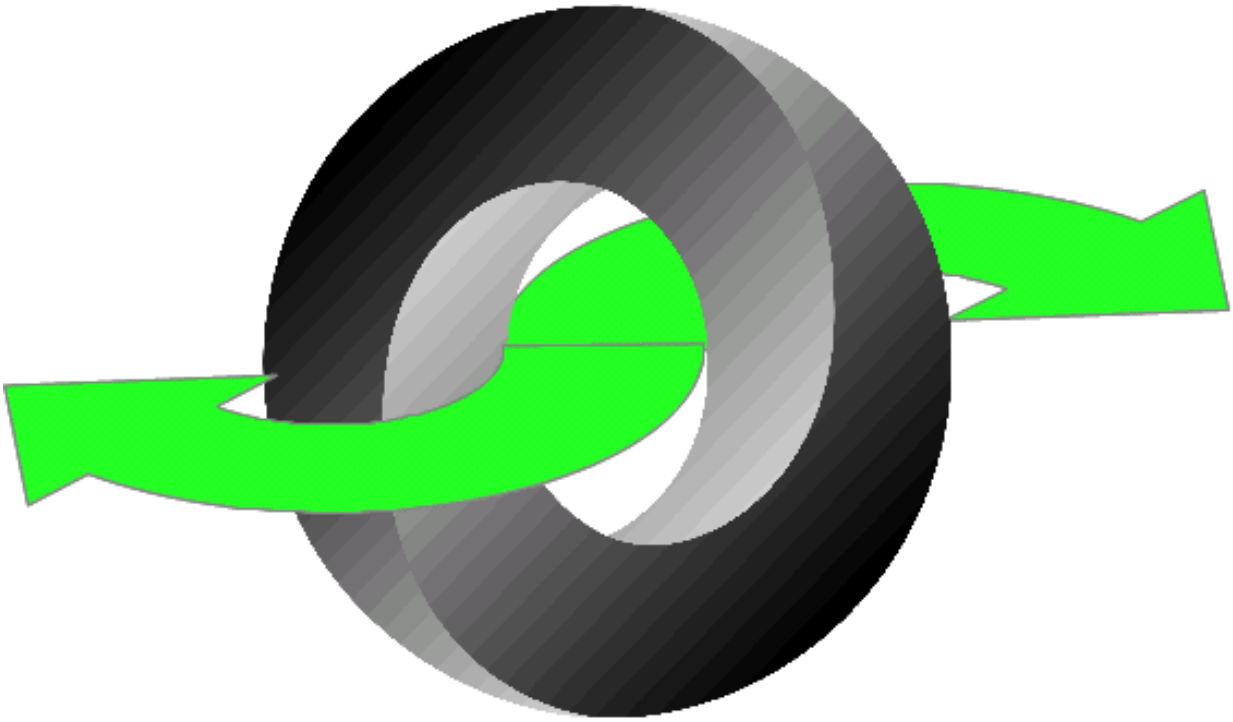
ProMoS DMS JSON Data Exchange



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ProMoS DMS JSON Data Exchange

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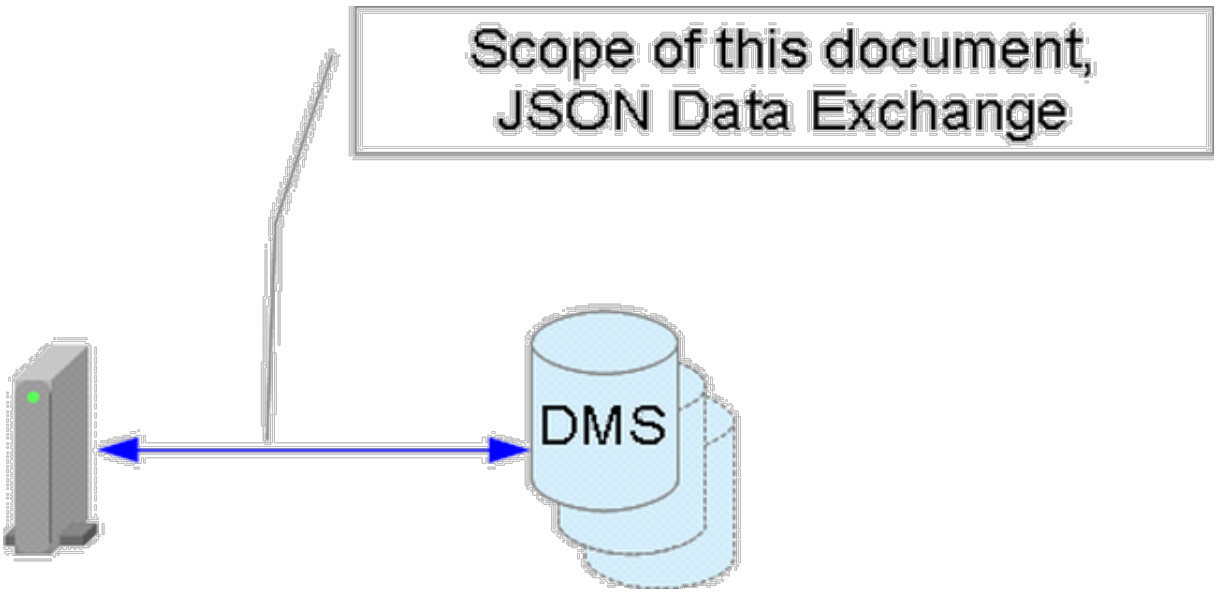
1 Introduction

This document describes the data exchange between an external device and the ProMoS Data Management System (DMS).



1.1 History

Version	Who	Date	Remark
1.0	mst_frem	19.03.2015	First Draft
1.1	mst_frem	23.12.2015	Additional fields and descriptions on WebSocket monitoring
1.2	mst_frem	22.01.2016	Additional description of security mechanism (SSL/TLS, authentication)
1.3	mst_frem	19.02.2016	Changed command "monitor" to "subscribe". New command "unsubscribe". Detailed description on query and tag for subscriptions.
1.4	mst_frem	13.04.2016	New commands and fields for Changelog hasProtData changed to hasChangelog New extInfos "state"
1.5	mst_frem	06.08.2018	New "histDataPast" and "valueOriginal" with request option "showPast" and "showOriginal" for historical data.
1.6	mst_frem	27.02.2020	Optional Parameter "type" in "rename", accurate "type" on "set"
1.7	mst_frem	23.03.2020	Additional showExtInfos "subscriptions" Events on subscribe can also be sent as array, event is echoed in answer extInfos with current "subscriptions" is sent in answer to subscribe and unsubscribe
1.8	mst_frem	16.06.2020	Additional "suppressSetOkObject" on set request Additional array "histData" on set to write historical data Additional object "histData" on delete
1.9	mst_frem	11.06.2023	Additional "state" on set request (ProMoS NG) Additional "pcfErrors" for data points (ProMoS NG) Additional query filters for process control functions (ProMoS NG)

			Additional copy command (ProMoS NG) Additional "limit" and "offset" in get query (ProMoS NG) Additional "first", "last" and "now " for timestamps in get historical data (ProMoS NG) Additional flag "count" in get historical data (ProMoS NG) Additional flag "interpolateMethod" in get historical data (ProMoS NG) Additional show ExtInfos "hasData" (ProMoS NG) Additional filters for changelog data (ProMoS NG) Additional "childs" query Additional "createDefault" Fix delete historical data example Refectorimg of "Change Log", change log read w ith single "changelog" on data point ("get") no more supported (ProMoS NG), replaced by "changelogRead" array. Additional "Alarms" (ProMoS NG) Additional show ExtInfos "alarmGroups" (ProMoS NG) Additional command "balance" Copy command also for ProMoS NT (from Setup 110.9) Additional command "version" (only ProMoS NG) Additional interpolations parameters for "histData" (only ProMoS NG) Additions "interpolateGetTemplates" (only ProMoS NG)

2 General

2.1 Configuration

The communication has to be enabled in the DMS configuration dialogue (communication properties). Default is enabled for http/ws and https/wss.
The port can be configured there also (default: 9020 for http/ws and 9021 for https/wss).

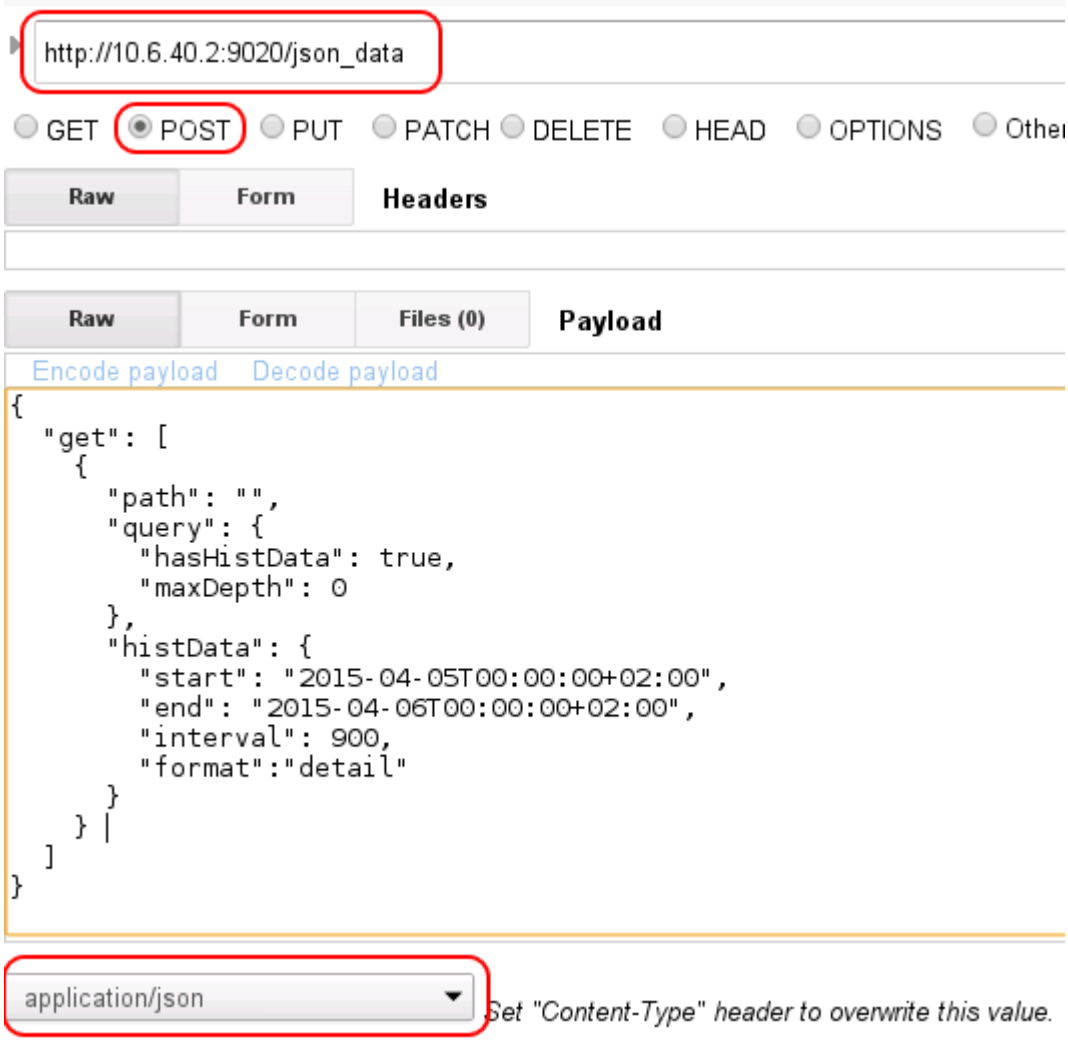
2.2 Tools

There are several tools to test the communication:

- Apache JMeter
  A powerful Java application. Primary for performance measure, but can also be used for any other test cases.
  There is a WebSocket extension, binaries can be downloaded here and dependencies here.

- Java application to test HTTP/RESTful webservices.
  With the binaries here.

- Advanced REST client for Google Chrome
  Easy to use browser plugin.
  Example:



- Simple WebSocket Client for Google Chrome

2.3 Used Technologies

All data transfers are based on JSON structures, see http://en.wikipedia.org/wiki/JSON and http://json.org/

All JSON data have to be UTF-8 encoded.
It is recommended to use real json data types, because for boolean fields - a string "FALSE" will be true!

For the JSON data transport, there are 2 options (both without or with SSL/TLS):

- HTTP(s) POST based, see http://en.wikipedia.org/wiki/POST_(HTTP)
  The JSON data for requests is transferred in the POST body (instead of the standard URL encoded request) to have the same encoding for request and response.

Content type "application/json" is used.

- WebSocket(s) based, see http://en.wikipedia.org/wiki/WebSocket and RFC6455:
  Corresponding to RFC6455, Version 13.

  Fulfilled implementations:
  - PING/PONG and CLOSE control frames.
  - Multiple frames (fragmentation).
  - Masking.

  Specialties:
  - Client must not send masked frames (optional).
  - Larger responses are sent fragmented in frames with max. 8'192 chars of payload data.

  Limitations:
  - Receiving maximum is 4MB (4'194'304 chars) payload data per frame.
  - Receiving maximum is 4MB (4'194'304 chars) per message (summ of fragmented frames).

2.4 Security

2.4.1 Insecure connection

By default, only local clients (from 127.0.0.1) can connect to non secure connections (http/ws).
Due to maximum performance on internal networks, there is no authentication for non secure connections.

Other options see in the following chapters.

2.4.2 Secure connection (SSL/TLS)

By default, all non local clients (not from 127.0.0.1) have to connect over a secure connection (SSL/TLS, https/wss).
The client has to authenticate himself by a certificate or over "Basic access authentication".

When there is no valid client certificate, the server will request a Basic access authentication.

Other options see in the following chapters.

2.4.2.1 Certificates

The server will send a self signed certificate with his domain name, a client certificate is optional requested.

Any received certificate will be verified (issuer is our DMS, valid dates).
The CN (Common Name) of the client certificate will be used to verify the user in the client users list.

On a ProMoS V1/V2 installation this list is located at
"`{INSTALL_DIR}\proj\{PROJECT}\cfg\DMS_JSON_CLIENTS.cfg`", e.g. "`C:\ProMoSNT\proj\promos\cfg\DMS_JSON_CLIENTS.cfg`"

The file contains all allowed client user names (CN) and serial number(s) of the client certificate.
`clientname:serialnumber(s)`

Multiple serial numbers are separated by ",", any valid serial number can be enabled by "*".

Example file content:

```
client1:*
ThirdPartyApp:3,4,5
```

Changes require restart of the DMS.

When the certificate is not present or invalid, the server will continue with Basic Authentication.

2.4.2.1.1 Server certificate

On a ProMoS V1/V2 installation the files are located in "`{INSTALL_DIR}\bin\`":

dms_cert.pem	The server certificate file
dms_key.pem	The server key file
dms_cert.p12	PKCS12 file for import in client app's

To regenerate the files, just remove any of the files above and restart DMS.
The serial will be increased on every generation (see here).

2.4.2.1.2 Client certificate

Example with OpenSSL to generate a client certificate.

1. Create the Client Key

```
openssl.exe genrsa -des3 -out dms_client1.key 4096
```

```
Generating RSA private key, 4096 bit long modulus
..................++.........++e is 65537 (0x10001)
Enter pass phrase for dms_client1.key:***
Verifying - Enter pass phrase for dms_client1.key:***
```

2. Create the Client CSR

```
openssl.exe req -new -key dms_client1.key -out dms_client1.csr
```

```
Enter pass phrase for dms_client1.key:***
You are about to be asked to enter information that will be incorporated into your
certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
```

```
-----
Country Name (2 letter code) [AU]:CH
State or Province Name (full name) [Some-State]:Bern
Locality Name (eg, city) []:Belp
Organization Name (eg, company) [Internet Widgits Pty Ltd]:XYZ
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:client1
Email Address []:client1@some.ch

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

The Common Name (CN) is used as user name to identify the clients certificate.

3. Sign the Client Certificate

```
openssl.exe x509 -req -days 365 -in dms_client1.csr -CA dms_cert.pem -CAkey
dms_key.pem -set_serial 01 -out dms_client1.crt
```

```
Signature ok
subject=/C=CH/ST=Belp/L=Belp/O=XYZ/CN=client1/emailAddress=client1@some.ch
Getting CA Private Key
```

Location of "`dms_cert.pem`" and "`dms_key.pem`" see previous chapter.

4. Convert Client Key to PKCS

```
openssl.exe pkcs12 -export -clcerts -in dms_client1.crt -inkey dms_client1.key -out
dms_client1.p12
```

```
Enter pass phrase for dms_client1.key:***
Enter Export Password:***
Verifying - Enter Export Password:***
```

"`dms_client1.p12`" is ready now to be installed in your browser or application.

Don't forget to insert "client1" in the clients users list.

2.4.2.2 Users/passwords for basic auth

On a ProMoS V1/V2 installation there is a user list required with password hashes:

"`{INSTALL_DIR}\proj\{PROJECT}\cfg\DMS_JSON_USERS.cfg`", e.g. "`c:\ProMoSNT\proj\promos\cfg\DMS_JSON_USERS.cfg`"

The list format must confirm to the UNIX standard for password hashing (passwd / shadow file), see also here.
Entries in the list:
`username:$id$salt$hashed`

Supported id's:

Id	Method
1	MD5 (**not** recommended)
apr1	Apache MD5 (**not** recommended)
5	SHA-256
6	SHA-512

Example file content:

```
test:$6$rounds=5000$6cD3q0iA38D/wZdT$TnCr0f.Tx7qu3.fEWcBdJwRPw2iinIIf9KSGl2OqYW0VpJ4I
username:$6$b21e5c208701eabf$NW1GcytKDLoZdMpTJcGYpd.dZ/2Pgz5KPeZQnRKAeeQbtWn/6rO2u/pR
```

- The password for the user "test" is "test1"
- The password for the user "username" is "testuserpassword"

Changes require restart of the DMS.

Tools to generate crypt(3) password hashes

Online:
https://quickhash.com/ (select Algorithm "SHA-512 /crypt(3) / 6" or "SHA-512 /crypt(3) / 6" or "MD5 / crypt(3) / 1" or "" and salt or no salt for random salt generation)
http://www.cryptgenerator.de/

Command line tools:

```
php -r "print(crypt('password','salt') . \"\n\");"
mkpasswd -m sha-512
python -c 'import crypt; print crypt.crypt("password", "$6$random_salt")'
python3 -c 'import crypt; print(crypt.crypt("password", crypt.mksalt(crypt.METHOD_SHA512)))'
perl -e "print crypt('password','salt');"
ruby -e 'print "password".crypt("salt"); print("\n");'
htpasswd -nd user
openssl passwd -crypt myPassword
echo "select encrypt('password');" | mysql
```

2.4.2.3 Advanced configuration

On a ProMoS V1/V2 installation there is a configuration at the following location to allow advanced configurations:

"`{INSTALL_DIR}\proj\{PROJECT}\cfg\DMS.cfg`", e.g. "`C:\ProMoSNT\proj\promos\cfg\DMS.cfg`"

In the section "SSL" there are the following options:

`Cipher`	List of the preferenced ciphers (recommended default value see in the example below)
`UseSecureTls`	With value 1, only TLS V1.2 is allowed, 0 (**not** recommended) means older TLS versions allowed (default is 1).
`AuthRequired`	Enables (1) or disables (0 - **not** recommended) authentication on secure connections (default is 1).

`DMS_X509Serial`	Serial for next self signed certificates

By default (after first start of DMS) the file contains the following entries in the section "SSL":

```
[SSL]
Cipher=ECDHE-RSA-AES128-GCM-SHA256:ECDHE-RSA-AES256-GCM-SHA384:ECDHE-RSA-AES128-SHA256
UseSecureTls=1
AuthRequired=1
```

Changes require restart of the DMS.

2.4.3 Advanced configuration

2.4.3.1 IP Lists

On a ProMoS V1/V2 installation there is a IP list configuration at the following location to block or allow connections:

"`{INSTALL_DIR}\proj\{PROJECT}\cfg\DMS_JSON_IPS.cfg`", e.g. "`c:\ProMoSNT\proj\promos\cfg\DMS_JSON_IPS.cfg`"

There are 4 sections to block / allow client IP's:
`[nonSSL_Blocked]`
`[nonSSL_Allowed]`
`[SSL_Blocked]`
`[SSL_Allowed]`

First, "xxx_Blocked" is processed and will block any found IP address.
When not blocked, "xxx_Allowed" will be processed and only IP addresses in this list will be allowed.

Below the corresponding section, IP ranges based on CIDR notation (see here) can be defined.
Comments begin with "#" on the first column.

By default (after first start of DMS) the file contains the following entries:

```
# IP list for DMS JSON communication

[nonSSL_Blocked]
# None

[nonSSL_Allowed]
# Any connection from local host
127.0.0.1
# MST portals
192.168.96.0/20
172.18.8.0/23

[SSL_Blocked]
# None

[SSL_Allowed]
# Any connection
0.0.0.0/0
```

Changes require restart of the DMS.

2.5 Base Path

The base path for all data exchanges is "`/json_data`".

2.6 Error Messages

- HTTP-POST:
  You will get usual HTTP response codes and a plain text error message in body in case of fatal errors.

- WebSocket
  You will get a usual WebSocket close messages in case of fatal errors.

2.6.1 Examples

```
GET /json_data HTTP/1.1
Connection: keep-alive
Content-Type: application/json
Host: 10.6.40.2:9020
User-Agent: Apache-HttpClient/4.2.6 (java 1.5)

HTTP/1.1 405 OK
Date: Thu, 19 Mar 2015 14:10:12 GMT
Connection: Keep-Alive
Server: ProMoS DMS/1.0
Transfer-Encoding: chunked
Content-Type: text/html;charset=UTF-8

12
Use POST requests.
0
```

```
WebSocket
  1... .... = Fin: True
  .000 .... = Reserved: 0x00
  .... 1000 = Opcode: Connection Close (8)
  0... .... = Mask: False
  .000 1111 = Payload length: 15
  Payload
    Close: Unsupported Data (1003)
    Reason: Invalid path.
```

2.7 HTTP Example Message

This chapter shows a whole communication stream of a HTTP POST request and response.

All further examples in the next chapters only show the JSON data content (Body for HTTP POST / Payload message data for Websocket).

Request:

```
POST /json_data HTTP/1.1
Connection: keep-alive
Content-Type: application/json
Content-Length: 140
Host: 10.6.40.2:9020
User-Agent: Apache-HttpClient/4.2.6 (java 1.5)

{
  "get": [
    {"path":"EXMPL1:T11:MN:003:Vis:VMC_energy1"},
    {"path":"EXMPL1:T11:MN:003:Vis:VEnergy1V"},
    {"path":"EXMPL1:T11:MN:003:Vis:VMC_power"}
  ]
}
```

Response:

```
HTTP/1.1 200 OK
Date: Fri, 20 Mar 2015 06:53:34 GMT
Connection: Keep-Alive
Server: ProMoS DMS/1.0
Transfer-Encoding: chunked
Content-Type: application/json;charset=UTF-8

160
{
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1",
      "code":"ok",
      "type":"double",
      "value":3.0,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    },
    {
      "path":"EXMPL1:T11:MN:003:Vis:VEnergy1V",
      "code":"ok",
      "type":"double",
      "value":0.0,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    },
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":0.597,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    }
  ]
}
0
```

2.8 Timestamps

All timestamps are ISO 8601 formatted.

Timestamps from DMS:

All transmitted timestamps from DMS are formatted as follows (date/time with millisecond fractions and time offset from UTC):

`JJJJ'-'MM'-'TT'T'hh':'mm':'ss','fff'±'hh':'mm`

Examples (for time zone Europe/Zurich, CET/CEST):
- UTC "2015-03-20T07:49:19,000Z" will be transmitted as "2015-03-20T08:49:19,000+01:00"
- UTC "2015-04-28T07:10:11,000Z" will be transmitted as "2015-04-28T09:10:11,000+02:00" (including daylight saving time offset)

Notes:
- Due to non persistent storage of the time stamp in DMS, the transmitted time stamp can be 'null' after a restart of the DMS.
- Timestamps on nodes with no data (type "none") return 'null'.

Timestamps to DMS:

You can use any valid ISO 8601 format, but it is recommended to use the following format (UTC date/time with millisecond fractions):
`JJJJ'-'MM'-'TT'T'hh':'mm':'ss','fff'Z'`

It is important to add the UTC time zone indicator ('Z') or a time offset from UTC ('±'...), as otherwise the DMS can not evaluate the time zone of the sender!

Example:
- 2015-04-28T07:10:11,023Z
- 2015-04-28T07:10:11Z

2.9 Message Tag

Beside the tag data in every command, it is possible to send a tag object (any valid JSON object - except null) in the request that will be echoed in the response.

Due to better readability these tags are not documented in the following chapters.

Example:
Request:

```
{
  "tag": {
    "reqnr": 1456,
    "flag": true
  },
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power"
    }
  ]
}
```

Response:

```
{
  "tag": {
    "reqnr": 1456,
    "flag": true
  },
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":4.4444,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    }
  ]
}
```

3 Data Points

3.1 Command Overview

Command	Description
get	Read data point value(s).
set	Write data point value(s).
delete	Delete data point(s).
rename	Rename data point(s).
copy	Copy data point(s).
balance	Balance data point(s).
subscribe	Monitoring data point(s). Only for WebSocket connection.
unsubscribe	Unsubscribe monitored data point(s). Only for WebSocket connection.

You can handle as much data points as you want with 1 single request.
Due to performance and available resources, it's recommend to not handle more then 10`000 data points at once.

3.1.1 Identification

Any connected client has to identify him self for commands with write access (Set/Rename/Delete).

This requires the request field "whois".
When a client has authenticated the connection (Certificate or Basic Auth) the "whois" field is optional and the authenticated user name will be used for the corresponding command.

3.1.2 Response Order

The response arrays are ordered in the same manner as in the request.

See also from the JSON specification at http://www.json.org/: "An array is an *ordered* sequence of zero or more values.".

3.1.3 Multiple Commands

It is recommended to use only one command per request!
You can use multiple command in one request, but it is not guarantied that the commands are processed in the desired order.

See also from the JSON specification at http://www.json.org/: "An object is an *unordered* set of name/value pairs".

Example:

Request:

```
{
  "whois":"DriverXY",
  "user":"",
  "set": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "value":4.4444
    }
  ],
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power"
    }
  ]
}
```

could result in:

Response:

```
{
  "set": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":4.4444,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    }
  ],
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":4.4444,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    }
  ]
}
```

or Response:

```
{
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":1.1111,
      "stamp":"2015-03-20T04:23:44,000+01:00"
    }
  ],
  "set": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":4.4444,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    }
  ]
}
```

(where the value in the get response is an **old** value).

3.1.4 String Arrays

In ProMoS NT, Version 1.x/2.x there is a special definition for reading/writing array indexed strings (not available for ProMoS NG):

You can use a string field to store array data and read/write to them with a desired index. First index is starting with 1.

Precondition: There must exist a string with valid starting ('(' or '{') and ending (')' or '}') array indicators. The array elements are separated with ','.

Example:
The string in the data point "`TEST:ARRAY`" is "`(11,12,13,14)`".
Now you can read an indexed value by reading data point "`TEST:ARRAY[2]`" -> this will return the value '12'.
On the other side, you can indexed write by writing on data point "`TEST:ARRAY[4]`" (e.g. value '44'), this will set the string on "`TEST:ARRAY`" to "`(11,12,13,44)`".

Any read outside a existing index will return an error.
Any write outside a valid index (range 1..1024) will return an error.
Any write with a valid index outside a existing index will expand the array and fill newly created index values with 'NULL'.

Default data types are "uint" (DWU). If you desire an other data type, it is necessary to add a suffix after the closing bracket (']') :
- BIT for boolean indexed values.
- BYS / BYU / WOS / WOU / DWS / DWU for (u)int indexed values.
- FLT for double indexed values.
- STR for string indexed values.

Example:
"`TEST:ARRAY`" is "`(T,T,F,T)`".

Reading from "`TEST:ARRAY[2]BIT`" will return true as boolean.

3.1.5 Path Limitation

In ProMoS NT, Version 1.x the maximum length of the data point path is limited to 80 characters!
In ProMoS NT, Version 2.x the maximum length of the data point path is limited to 160 characters!
In ProMoS NG, the maximum length of the data point path is limited to 64'000 characters.
Any attempt to write longer paths will be rejected.

3.2 Get

3.2.1 Example

Request:

```
{
  "get": [
    {"path":"EXMPL1:T11:MN:003:Vis:VMC_energy1"},
    {"path":"EXMPL1:T11:MN:003:Vis:VEnergy1V"},
    {"path":"EXMPL1:T11:MN:003:Vis:VMC_power"}
  ]
}
```

Response:

```
{
  "get": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1",
      "code":"ok",
      "type":"double",
      "value":3.0,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    },
    {
      "path":"EXMPL1:T11:MN:003:Vis:VEnergy1V",
      "code":"ok",
      "type":"double",
      "value":0.0,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    },
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_power",
      "code":"ok",
      "type":"double",
      "value":0.597,
      "stamp":"2015-03-20T07:49:19,000+01:00"
    }
  ]
}
```

Response in case of fatal error:

```
{
  "get": [
    {
      "code":"error",
      "message":"Expected JSON encoded data, but got something else."
    }
  ]
}
```

3.2.2 Querying Path/Value

It is possible to search data point paths and values with query parameters (see here).

For RegEx parameters, Perl 5 syntax and semantics have to be used - corresponding the used library (PCRE in version 8.43). See also PCRE documentation.
For Perl 5 regular expression syntax, read the Perl regular expressions man page.
Extended-Patterns can also be used.

The "path" parameter in the request means the starting data point for the query.

Any query with a resulting data point list size > 100'000 will be aborted and returns a error message.

To get around this, with ProMoS NG it's possible to set a limit and/or offset:

Example:

Request::
- `"limit"` is the maximum records that should be sent (optional, default is internal maximum)
- `"offset"` is the offset, from where the records should begin, can be a number or a string with the starting path (optional, default is 0).

```
{
  "get": [
    {
      "path":"",
      "query": {
        "maxDepth": 0,
        "limit": 100,
        "offset": 0
      }
    }
  ]
}
```

Response:
When limit is reached, the last record contains an object with `"code":"limitReached"`.
- `"message"` can contain e.g. "Chosen limit reached" or "Memory limit reached" (when memory limit reached before the chosen limit).
- `"limit"` contains the number of sent records (can be lower than the chosen limit on memory reached).
- `"nextOffset"` contains the offset for a next request (number or string of the next path, depending on request offset).
Please note that any changes in the DMS tree can influence the result, e.g. when a node was inserted or deleted during the last call!

```
{
  "get": [
    {
      "path":"",
      "code":"ok",
      "type":"none",
      "value":null,
      "stamp":"2015-03-20T07:49:19,000+01:00",
      "readonly":true,
      "hasChild":true
    },
... 99 other objects
    {
      "code":"limitReached",
      "message": "Chosen limit reached",
      "limit": 100,
      "nextOffset": 200
    }
]}
```

3.2.2.1 Example

Request:
(comments just to clarify)

```
{
  "get": [
    { /* get first child path's from the DMS */
      "path":"",
      "query": {
      }
    },
    { /* get all path's from the whole DMS, but without the BMO: tree */
      "path":"",
      "query": {
        "regExPath": "^(?!BMO).*$",
        "maxDepth": 0
      }
    },
    { /* get all path's from the whole DMS, but without BMO: and System: tree */
      "path":"",
      "query": {
        "regExPath": "^(?!(BMO|System)).*$",
        "maxDepth": 0
      }
    },
    { /* get all values on path "Istwert", incl. sub path's */
      "path":"EXMPL1:T11",
      "query": {
        "regExPath": ".*:Istwert",
        "maxDepth": 0
      }
    },
    { /* get all values with content 0 on path "Istwert", incl. sub path's */
      "path":"EXMPL1:T11",
      "query": {
        "regExPath": ".*:Istwert",
        "regExValue": "[0]",
        "maxDepth": 0
      }
    },
    { /* get all values with bool content true on the whole DMS */
      "path":"",
      "query": {
        "regExValue": "true",
        "isType": "bool",
        "maxDepth": 0
      }
    },
    { /* get all values who have historical data from the whole DMS */
      "path":"EXMPL1:T11",
      "query": {
        "hasHistData": true,
        "maxDepth": 0
      }
    }
  ]
}
```

Response with the found data points see this example.

3.2.3 Read Historical Data

It is possible to read out historical data from data points - see also query with "hasHistData".

The resulting response array ("histData") is limited to max. 610'000 entries! This will meet max. ~17 years (with interval 15 minutes) or ~7 days (with interval 1 second).
Refine your period (start/end) or interval to receive the desired historical data.

As an option ("showPast") any changes of value(s) in the past can be requested that occurred in the range between "start" and "end". The results will be sent in an additional response array "histDataPast" in the same format as "histData".

A combination of query and histData is possible, e.g. to read out historical data (1 day) from all historical value data points:

Request:

```
{
  "get": [
    {
      "path": "",
      "query": {
        "hasHistData": true,
        "maxDepth": 0
      },
      "histData": {
        "start": "2015-04-04T00:00:00Z",
        "end": "2015-04-05T00:00:00Z",
        "interval": 900,
        "format":"detail"
      }
    }
  ]
}
```

3.2.3.1 Example, Compact

Request:

```
{
  "get": [
    {
      "path": "System:NT:Perf:SYSTEM",
      "histData": {
        "start": "2015-04-01T00:00:00Z",
        "interval":100
      }
    }
  ]
}
```

Response:

```
{
  "get": [
    {
      "path":"System:NT:Perf:SYSTEM",
      "code":"ok",
      "type":"double",
      "value":0.0,
      "stamp":null,
      "histData":
      [
        {
          "2015-04-03T04:33:20,000+02:00":0.32780084013938906
        },
        {
          "2015-04-03T04:35:00,000+02:00":0.7427386045455933
        },
        {
          "2015-04-03T04:36:40,000+02:00":0.9577777981758118
        },
        {
          "2015-04-03T04:38:20,000+02:00":0.846666693687439
        },
        {
          "2015-04-03T04:40:00,000+02:00":0.7355555295944214
        },
        ...
        {
          "2015-04-17T08:37:40,000+02:00":0.6244444251060486
        }
      ]
    }
  ]
}
```

3.2.3.2 Example, Detail

Request:

```
{
  "get": [
    {
      "path": "System:NT:Perf:DMS",
      "histData": {
        "start": "2015-01-01T00:00:00Z",
        "end": "2015-05-31T00:00:00Z",
        "format":"detail"
      }
    }
  ]
}
```

Response:


```
{
  "get": [
    {
      "path":"System:NT:Perf:DMS",
      "code":"ok",
      "type":"double",
      "value":0.0,
      "stamp":null,
      "histData":
      [
        {
          "stamp":"2015-04-03T04:45:00,000+02:00",
          "value":0.0,
          "state":"ok",
          "rec":"cycle"
        },
        {
          "stamp":"2015-04-03T05:00:00,000+02:00",
          "value":0.0,
          "state":"ok",
          "rec":"cycle"
        },
        {
          "stamp":"2015-04-03T05:15:00,000+02:00",
          "value":0.0,
          "state":"ok",
          "rec":"cycle"
        },
        ...
        {
          "stamp":"2015-06-01T02:00:00,000+02:00",
          "value":0.0,
          "state":"ok",
          "rec":"cycle"
        }
      ]
    }
  ]
}
```


3.2.4 Read Change Log and/or Alarms

In general, change logs and alarms can be called up using direct commands ("changelogRead", "changelogCount", "alarmRead", "alarmCount", see chapters Change Logs and Alarms).

It is also possible to embed these commands in the "get" command.
Difference to the direct command:

- The given path from the "get" command is used as filter (can be overwritten in the "filter" object).
  This means e.g. for counters, you can receive all counters collected from child paths.

- For change logs, the parameter "group" is optional and evaluated from the configuration of the data point (when possible).

The resulting response array is limited to max. 100'000 entries.
Refine your period (start/end, filters) to receive the desired change log.

3.2.5 Request Fields

The "get" array of objects:

Field	Description	Type	M/O
path	The path of the data point you want to read.	string	Mandatory
showExtInfos	Returns optional information's like template, name, unit…. Possible values see here.	array of string	Optional
query	The query object (definitions see below), default is no query.	object	Optional
histData	Definitions for requesting historical data (definitions see below), default is no histData.	object	Optional
changelogRead, changelogCount, alarmRead, alarmCount	Definitions for requesting change logs and/or alarms. See chapters Change Logs and Alarms.	array	Optional
tag	Any data that will be echoed in the response.	*any*	Optional

The "query" object:

Field	Description	Type	M/O
regExPath	The RegEx pattern for the path. Default is none (empty).	string	Optional
regExValue	The RegEx pattern for the value. Default is none (empty). To be sure to find the correct value (e.g. bool, true) use this field in combination with 'isType'.	string	Optional
regExStamp	The RegEx pattern for the timestamp. Default is none (empty). The searched time stamp is composed as described here.	string	Optional
childs	Array of query objects for querying child nodes. All object definitions will be 'AND' linked. Example: `"childs": [{ "pathPart": "_DeviceName", "value": "Device-50012", "valueCompare": "eq" }, { "pathPart": "object-type", "value": "calendar (", "valueCompare": "startsWith" }, { "pathPart": "date-list-jext", "return": true }]`	array of objects	Optional

Field	Description	Type	M/O
	• `pathPart` - string, mandatory The requested child path part. • `value` - mixed, optional Any value to compare. • `valueCompare` - string, optional The compare algorithm, possible values: "eq", "neq", "lt", "lte", "gt", "gte", "in", "nin", "startsWith", "endsWith", "contains", "regex", "jse" (JSEngine - only ProMoS NG) - default is "eq". • `return` - boolean, optional On true, this found data point will be returned. Multiple "return" can be set to true. When no object has "return": true, the root data point is returned when found. For "in" / "nin", the `value` can be a string with multiple values (separated by "|") or an array with mixed values.		
isType	A string containing searched types ("none", "bool", "int", "double", "string"). Default is all types. To request multiple types just separate the strings, e.g. "int,double".	string	Optional
isNotReadonly	Only on ProMoS NG: A Filter for data points that are not read only. Default is false.	boolean	Optional
hasHistData	A Filter for data points with historical data recording. Default is false.	boolean	Optional
hasChangelog	A Filter for data points with change log. Default is false.	boolean	Optional
hasAlarmData	A Filter for data points with alarm data / data recording. Default is false.	boolean	Optional
hasProcessControlFunction	Only on ProMoS NG: A Filter for data points with process control function. Default is false.	boolean	Optional
hasNoProcessControlFunction	Only on ProMoS NG: A Filter for data points with no process control function. Default is false.	boolean	Optional
hasProcessControlFunctionError	Only on ProMoS NG: A Filter for data points with one or more process control function error(s). Default is false.	boolean	Optional
maxDepth	Maximal depth for searching path's recursive. Default is 1 (current path). 0 means no restrictions, all sub paths are searched.	number	Optional
limit, offset	Only on ProMoS NG: See here.		

The "histData" object:

Field	Description	Type	M/O
start	The requested start time stamp for the data (see also here). Only on ProMoS NG: Can also be "first", "last" or "now".	string	Mandatory
end	The requested end time stamp for the data (see also here). Default is the current time stamp. Only on ProMoS NG: Can also be "first", "last" or "now".	string	Optional
interpolateTemplate	The "name" for any interpolate parameters template. Possible templates see here. Any present value from the template will set "interpolateMethod" / "interval" / "filterParams" and "normalizeParams". Other values sent in this request will overwrite these (or you send the character '!' as prefix in "interpolateTemplate" string).	string	Optional
interpolateMethod	Only on ProMoS NG - see table below. Default (on empty "interpolateMethod") is "prevNextLinearFill".	string	Optional
interval	Interval of requested data in seconds. Default is 15 minutes (value 900). Interval 0 means all recorded data (raw values), not interpolated. Only on ProMoS NG: Special intervals: -1 for daily -2 for weekly -3 for monthly -4 for quaterly -5 for half yearly -6 for yearly	number	Optional

filterParams	An array to filter data ranges for the calculation.
	All filter objects are OR conjunctions.
	Objects with:
	- "timeStart" (string - ISO Time): start time on a day for filter duration.
	- "duration" (integer): duration in seconds for "timeStart".
	- "weekDays"(array of integer): timestamp is in this day of week, where 1=Monday to 7=Sunday. Empty means no filter.
	- "months" (array of integer): timestamp is in this month. Empty means no filter.
	- "valueCompare" (string): compare logic, possible values: "eq", "neq", "lt", "lte", "gt", "gte".
	- "value" (double): value to compare with.
	
	Example - Only use data for calculation from 22:00 to 02:00 on every working weekday:
	`"filterParams": [{`
	`"timeStart": "22:00:00",`
		array	Optional

Field	Description	Type	M/O

	`"duration": 7200,`
	`"weekDays": [1,2,3,4,5]`
	`},{`
	`"timeStart": "00:00:00",`
	`"duration": 7200,`
	`"weekDays": [2,3,4,5,6]`
	`}`
	`]`		

normalizeParams	An array to normalize the data first, before the final interpolation.
	Objects with:
	- "method" (string, see interpolateMethod)
	- "interval" (string, see interval)
	- "filterParams" (array, see above)
	Any diff... will be executed first.
	Normalization will only be executed, when the interval is lower or equal to the next interval.
	
	Example - First normalize raw data with prevNextLinearFill to full 15 minute values.
	`"normalizeParams": [{`
	`"method": "prevNextLinearFill",`
	`"interval": 900`
	`}]`
		array	Optional

prospective	By default, all timestamps are sent in retrospective view. Setting "prospective" to true will send the timestamps in prospective view. Example for "start": "2023-03-20T00:00:00,000+01:00" and "interval": -1 (daily): - Retrospective: The values for the timestamp "2023-03-20T00:00:00,000+01:00" contains data from "2023-03-19T00:00:00,000+01:00" until "2023-03-19T23:59:59,9999+01:00". - Prospective: The values for the timestamp "2023-03-20T00:00:00,000+01:00" contains data from "2023-03-20T00:00:00,000+01:00" until "2023-03-20T23:59:59,9999+01:00".	boolean	Optional
format	Can be "compact" or "detail". Default is "compact".	string	Optional
showPast	Option to show value changes in the past (data in the past that were changed or inserted in the time range between start and end). False by default. There will be returned an additional object "histDataPast" in the same format as "histData". Only available on ProMoS V2.x installations.	boolean	Optional
showOriginal	Option to show original value when value was changed. False by default. An additional field "valueOriginal" is added to the "histData" object when data was changed (only available when format is "detail").	boolean	Optional

Field	Description	Type	M/O
	For ProMoS, please consider, that this functionality can be time and memory sensitive!		
limit	Only on ProMoS NG: Limits the result to the defined max entries. When limit is reached, an additional object `"histDataLimitReached"=true` will be returned on response.	number	Optional
count	Only on ProMoS NG: True returns count of records in `"histDataCount"`. Default is false.	boolean	Optional

Interpolation methods (only ProMoS NG):

(Method and parameters are case insensitive)

Method	Description	Possible additional parameters
prevNext	The previous and the next values (aw ay from the interval). "prevNextLinearFill" is the method ProMoS NT sends the values. This can be used for most values - except consumption values.	"Linear" or "Align" and "Fill/FillNull"
prev	The previous value (aw ay from the interval).	"Linear" or "Align" and "Fill/FillNull"
next	The next value (aw ay from the interval).	"Linear" or "Align" and "Fill/FillNull"
minMax	Low est and highest values. Can be used for visualizations.	"Align" and "Fill/FillNull" and "Average"
min	The low est value.	"Align" and "Fill/FillNull"
max	The highest value.	"Align" and "Fill/FillNull"
sum	The sum of the values. Can be used for consumption values.	"Linear" or "Align" and "Fill/FillNull"
meanA	Arithmetic mean of the values.	"Fill/FillNull"
meanG	Geometric mean of the values.	"Fill/FillNull"
meanH	Harmonic mean of the values.	"Fill/FillNull"
meanS	Root mean square (RMS) of the values.	"Fill/FillNull"
median	Median (middle value) of the values. The is a limit of 1'000'000 values to calculate the median.	"Fill/FillNull"
mode	Mode (most frequent) of the values. The is a limit of 1'000'000 values to calculate the Mode.	"Fill/FillNull"
count	The number of data in the interval.	"Fill/FillNull"

Parameters for interpolation methods:

Parameter	Description
Linear	The resulting values are linear interpolated w ith timestamps on the next requested interval timestamp (timestamp aw ay from "start" by interval).
Align	The resulting value timestamps are adjusted to the next requested interval timestamp (timestamp aw ay from "start" by interval).
Fill	Missing values during the requested interval are filled out - depending on the interpolateMethod.

Parameter	Description
FillNull	Missing values during the requested interval are returned as "null". This can be useful for some visual representations, as most tools show then the gap.
Average	Only for "minMax". The average value from the min and max values. Sometimes used for meteorological daily mean temperature calculations (WMO - World Meteorological Organization).

Additional parameters for interpolation methods:

Parameter	Description	Methods and parameters
diff	The difference of the values (can be negative). Parameter to calculate diff first. any other method can be used additionally.	see other Interpolation methods (default is SumLinearFill)
diffCtrUpCleaned	The difference of the values, always positive. Simple well known patterns like counter overflows are corrected. Parameter to calculate diff first. any other method can be used additionally.	see other Interpolation methods (default is SumLinearFill)

Historical data resulting Timestamps:

Timestamps for raw values always represents the exact recording timestamp.

By default, all values are represented in "retrospective" way.
Example: "start" is "2023-04-12T00:00:00.000+02:00" and interval is daily.
For the first interval, all values between 2023-04-11T00:00:00.000+02:00 and 2023-04-11T23:59:59.999+02:00 are enclosed in 2023-04-12T00:00:00.000+02:00.

For "prevNext" (without "Linear") and "minMax" (without "Average") two records are sent as result.
The first record has the exact timestamp with the previous (or min) value and an additional record with the timestamp +1ms with the next (or max) value.

Resulting timestamps for the records without "Linear" or "Align" represents the timestamp of the last value for the calculation.

Resulting timestamps for interpolateMethod's "mean...", "median" "mode" and "count" are always "Align".

Historical data useful links:

- WMO Guidelines on the Calculation of Climate Normals https://library.wmo.int/doc_num.php?explnum_id=4166
- A Comparison of Daily Temperature-Averaging Methods https://etda.libraries.psu.edu/files/final_submissions/13697
- Mean https://en.wikipedia.org/wiki/Mean

3.2.6 Response Fields

The "get" array of objects:

Field	Description	Type	Occurrence

code	The code can be: - "ok": On success. - "no perm": You are not allowed to read this data point. - "not found": This data point doesn't exist on the system. - "error": In case of a fatal error. - "limitReached" (only ProMoS NG, see here)	string	Always
path	The path of the requested data point.	string	When no fatal error
value	The value of the data point.	number, boolean, string, null	On code "ok"
type	The type of the value, can be "int", "double" (a floating point number), "string", "bool" or "none" for nodes (without value).	string	On code "ok"
hasChild	Indicates whenever a data point has one or more child data point(s).	boolean	On code "ok", only, when node has child(s)
stamp	Time stamp of the last change of the value. This field can be 'null', otherwise ISO 8601 formatted (see here).	null, string	On code "ok"
state	Only on ProMoS NG: Sent, when state of value is not "ok", can be "error", "noData" or "pcfError".	string	On code "ok", when state is not "ok"

pcfErrors	Only on ProMoS NG: Detailed information's about process control function errors, eg:
	`"pcfErrors": [`
	`{`
	`"targetNode": "Automat`
	`"msg": "Division by ze`
	`"id": "PRG"`
	`}`
	`]`
		array	On code "ok", when errors pending

readonly	Only on ProMoS NG: Sent as true, when data point is read only.	boolean	On code "ok", when read only
extInfos	Extended information's for this data point, see below.	object	On code "ok", when showExtInfos was requested
message	This field contains an human readable error message in English.	string	Other than code "ok"
histData	An array with historical data records (see below).	array	On code "ok", when histData was requested
changelogRead, changelogCount, alarmRead, alarmCount	Definitions for requesting change logs and/or alarms. See chapters Change Logs and Alarms.	array	On code "ok", when requested

tag	Tag data from request.	*from request*	When existing in request
limit, nextOffset	Only on ProMoS NG: See here.		

The "extInfos" object:

Field	Description	Type	Occurrence
state	The current state of this value, can be "ok", "error" (e.g. communication error to the end device), "noData" or "pcfError".	string	Always
accType	The accurate type information, can be "int8", "uint8", "int16", "uint16", "int32", "uint32", "int64", "double64", "double", "string", "bool" or "none" for nodes (without value). "int64" only on ProMoS NG.	string	Always

subscriptions	Detailed subscription information's for this data point, exan
	`"subscriptions": {`
	`"clients": [{`
	`"tag": "",`
	`"whois": "WSTest",`
	`"host": "127.0.0.1",`
	`"events": ["onChange", "onDelete"]`
	`}],`
	`"processControls": [{`
	`"path": "BN028:Uhr:Minuten",`
	`"function": "EQU"`
	`}]`
	`}`
		object	Always

hasData	Information of any possible data recording. Result array can contain "hasHistData", "hasAlarmData", "hasChangelog" (only ProMoS NG).	array of string	Always
name	For ProMoS 1/2: the content of the topmost NAME data point on this tree.	string	When existing
template	The used template, for ProMoS 1/2: the content of the topmost OBJECT data point on this tree.	string	When existing
unit	Any present unit information.	string	When existing
comment	Any present comment.	string	When existing
changelogGroup	Group name for change log.	string	When existing
alarmGroups	Group names for Alarms.	array of string	When existing

The "histData" (and "histDataPast") array of objects for request format "compact":

Field	Description	Type	Occurrence
time stamp	A number object that is named with the corresponding time stamp, e.g.: { "2015-04-03T04:33:20,000+02:00": 0.95 }	number	Always

The "histData" (and "histDataPast") array of objects for request format "detail":

Field	Description	Type	Occurrence
stamp	Time stamp of the historic entry, ISO 8601 formatted (see here).	string	Always

value	The historic value.	number	Always
state	State of this value, can be "ok", "startup" (system start), "comErr" (recorded during communication error) or "inv' (any other error situation).	string	Always
rec	Record reason, can be "cycle", "change", "diff" or "unknown".	string	Always
mod	Deprecated (only available on ProMoS NT). Modified flag, can be "modified" (value was modified) OR "past" (value was set in the past). Field is not transmitted when none of these conditions.	string	When existing
stampModified	Deprecated (only available on ProMoS NT). The time stamp, when the value value was modified (inserted in the past or changed). Only appears in "histDataPast".	string	When existing
valueOriginal	Deprecated (only available on ProMoS NT). The original value, before he was modified. Only when request option "showOriginal" is set.	number	When existing
valuesOriginal	Only on ProMoS NG. Array with "stamp" (ISO 8601) and "value" of original values. Stamp is time stamp when value was modified.	array	When requested

3.2.7 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Read Request",
  "description": "Reading one or more data points",
  "type": "object",
  "properties": {
    "get": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point definition",
        "type": "object",
        "properties": {
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "showExtInfos": {
            "description": "Optional request of extented informations",
            "type": "array",
            "items": {
              "type": "string"
            }
          },
          "query": {
            "description": "Optional query parameters",
            "type": "object",
            "properties": {
              "regExPath": {
                "description": "RegEx pattern for the path",
                "type": "string"
              },
              "regExValue": {
```

```
                "description": "RegEx pattern for the value",
                "type": "string"
              },
              "regExStamp": {
                "description": "RegEx pattern for the time stamp",
                "type": "string"
              },
              "isType": {
                "description": "Type filters",
                "type": "string",
                "enum": [ "int", "double", "string", "bool", "none" ]
              },
              "hasHistData": {
                "description": "Filter for data points with historical data",
                "type": "boolean"
              },
              "hasChangelog": {
                "description": "Filter for data points with change log",
                "type": "boolean"
              },
              "hasAlarmData": {
                "description": "Filter for data points with alarm",
                "type": "boolean"
              },
              "maxDepth": {
                "description": "Maximal depth for searching in sub path's",
                "type": "number"
              }
            }
          },
          "histData": {
            "description": "Optional parameters for historical data",
            "type": "object",
            "properties": {
              "start": {
                "description": "Time stamp for start",
                "type": "string"
              },
              "end": {
                "description": "Time stamp for end",
                "type": "string"
              },
              "interval": {
                "description": "Interval in seconds",
                "type": "number"
              },
              "format": {
                "description": "Format for the response",
                "type": "string",
                "enum": [ "compact", "detail" ]
              },
              "showPast": {
                "description": "Flag to show changes in the past",
                "type": "bool"
              },
              "showOriginal": {
                "description": "Flag to show original data",
                "type": "bool"
              }
            },
            "required": ["start"]
          },
          "tag": {
            "description": "Any data, will be echoed on the response",
            "type": [ "object", "array", "number", "string", "boolean"]
```

```
          }
        },
        "additionalProperties": false,
        "required": ["path"]
      },
      "minItems": 1
    }
  },
  "required": ["get"]
}
```

Response:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Read Response",
  "description": "Information about one or more data points",
  "type": "object",
  "properties": {
    "get": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The result code",
            "type": "string",
            "enum": [ "ok", "no perm", "not found", "error" ]
          },
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "value": {
            "description": "The value of the data point",
            "type": ["number", "string", "boolean", "null"]
          },
          "type": {
            "description": "The value type",
            "type": "string",
            "enum": [ "int", "double", "string", "bool", "none" ]
          },
          "stamp": {
            "description": "The timestamp of the last change of the value, ISO
8601",
            "type": ["string", "null"]
          },
          "extInfos": {
            "title": "Extended informations for this data point",
            "type": "object",
            "properties": {
              "template": {
                "description": "The used template",
                "type": "string",
              },
              "name": {
                "description": "The name",
                "type": "string",
              },
              "unit": {
                "description": "Any present unit information",
                "type": "string",
```

```
              }
            }
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "histData": {
            "description": "Array of the requested historical data",
            "type": "array",
            "items": {
              "title": "Historical data",
              "type": "object",
              "properties": {
                "stamp": {
                  "description": "The timestamp of the recorded value, ISO 8601",
                  "type": ["string"]
                },
                "value": {
                  "description": "The value",
                  "type": ["number"]
                },
                "state": {
                  "description": "The recording state",
                  "type": "string",
                  "enum": [ "ok", "comErr", "inv" ]
                },
                "rec": {
                  "description": "The recording reason",
                  "type": "string",
                  "enum": [ "cycle", "change", "diff", "unknown" ]
                }
              }
            }
          },
          "changelog": {
            "description": "Array of the requested change log",
            "type": "array",
            "items": {
              "title": "Change log",
              "type": "object",
              "properties": {
                "stamp": {
                  "description": "The timestamp of the recorded value, ISO 8601",
                  "type": ["string"]
                },
                "text": {
                  "description": "The text",
                  "type": ["string"]
                }
              }
            }
          },
          "tag": {
            "description": "Echo from the request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["get"]
}
```

3.2.8 Short Request

For maximum performance and minimum data size, a short variant of the read request can be used.

The response looks like the normal response.

Note: With this request, the order of the response fields is not guarantied (See also from the JSON specification at http://www.json.org/: "An object is an unordered set of name/value pairs".).

3.2.8.1 Example

Request:

```
{
  "get": [
    "EXMPL1:T11:MN:003:Vis:VMC_energy1",
    "EXMPL1:T11:MN:003:Vis:VEnergy1V",
    "EXMPL1:T11:MN:003:Vis:VMC_power"
  ]
}
```

Response see this example.

3.2.8.2 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Read Request",
  "description": "Reading one or more data points",
  "type": "object",
  "properties": {
    "get": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point path",
        "type": "string"
      },
      "minItems": 1
    }
  },
  "required": ["get"]
}
```

3.3 Set

3.3.1 Example

Request:

```
{
  "whois":"DriverXY",
  "user":"",
  "set": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1",
      "value":4.4565467567867,
      "type":"double"
    },
    {
      "path":"EXMPL1:T11:MN:003:Vis:VEnergy1V",
      "value":-1,
      "type":"double",
      "stamp":"2015-03-11T05:27:39,027+01:00"
    },
    {
      "path":"EXMPL1:TEST:BOOLEAN",
      "value":true,
      "create": true,
      "type":"bool"
    },
    {
      "path":"EXMPL1:TEST:INT",
      "value":44,
      "type":"int"
    },
    {
      "path":"EXMPL1:TEST:STRING",
      "value":"some long example message",
      "type":"string"
    }
  ]
}
```

Response::


```
{
  "set": [
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1",
      "value":3,
      "type":"double",
      "stamp":"2015-03-20T07:49:19,000+01:00"
    },
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003:Vis:VEnergy1V",
      "value":0,
      "type":"double",
      "stamp":"2015-03-11T05:27:39,027+01:00"
    },
    {
      "code":"no perm",
      "path":"EXMPL1:TEST:BOOLEAN",
    },
    {
      "code":"error",
      "path":"EXMPL1:TEST:INT",
      "message":"Data point doesn't exist"
    },
    {
      "code":"error",
      "path":"EXMPL1:TEST:STRING",
      "message":"Data type doesn't match"
    }
  ]
}
```


3.3.2 Write Historical Data

It is possible to write historical data for data points - see also query with "hasHistData".

If there is no historical data configuration in the DMS, there will be created one.

Take care about the size of the request array ("histData"). Especially for data in the past on ProMoS version 1/2 it can take a long time to write a lot of values.
E.g. for 10'000 values it can take about 10 seconds or more.

Request:

```
{
  "whois":"DriverXY",
  "user":"",
  "set": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1",
      "histData":
      [
        {
          "2015-04-03T04:33:20,000+02:00":0.32780084013938906
        },
        {
          "2015-04-03T04:35:00,000+02:00":0.7427386045455933
        },
        {
          "2015-04-03T04:36:40,000+02:00":0.9577777981758118
        },
        {
          "stamp":"2015-04-03T04:37:00,000+02:00",
          "value":0.5,
          "state":"inv"
        },
        {
          "2015-04-03T04:38:20,000+02:00":0.846666693687439
        },
        {
          "2015-04-03T04:40:00,000+02:00":0.7355555295944214
        },
        {
          "2015-04-17T08:37:40,000+02:00":0.6244444251060486
        }
      ]
    }
  ]
}
```

Response:

```
{
  "set": [
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1"
    }
  ]
}
```

3.3.3 Request Fields

Root objects:

Field	Description	Type	M/O
whois	The identification of the sender, e.g. "sDriver".	string	Mandatory (note)

Field	Description	Type	M/O
user	Any logged user name, empty when there is no current user.	string	Mandatory
suppressSetOkObject	When this optional field is true, no response object will be generated on code "ok". This will reduce network traffic and improve performance as the client has not to parse every response object.	boolean	Optional

The "set" array of objects:

Field	Description	Type	M/O
path	The path of the data point you want to write.	string	Mandatory
create	Flag for create datapoint when not existing (default is false).	boolean	Optional
createDefault	Flag for create datapoint when not existing (default is false). The value of an existing datapoint value will not be overwritten.	boolean	Optional
value	The value to write (see note below). To create a node only (without data) you can send "'value":null' (and "'create":true') on a non existing data point.	number, boolean, string, null	Mandatory (when no state and no histData)
state	State to set. Possible states: "ok", "noData" or "error". Default is "ok". (Only available for ProMoS NG). Can be set without any Value.	string	Optional
histData	Historical data to write. Can be in format compact or detailed or mixed. For compact format, "state" = "ok" will be used.	array	Optional
type	The type of the value. The API will check if the value type on control system matches.The type can be "int", "double" (a floating point number), "string", "bool" or "none". For more accurate type definitions in older ProMoS Systems "int8", "uint8", "int16", "uint16", "int32", "uint32" or "double64" can be set. "int" means "int32" for ProMoS NT and "int64" for ProMoS NG. By default, the type is evaluated from JSON data type (see note below).	string	Optional
stamp	ISO 8601 formatted, see also here (default is current time stamp).	string	Optional
tag	Any data that will be echoed in the response.	*any*	Optional

Important notes about types:

The type of the written value is evaluated from the transmitted JSON data type, examples:

Value	JSON type	internal type
"ssttrr"	string	string
true / false	boolean	bool
123	number	int

Value	JSON type	internal type
123.0 / 123.4	number	double

Some JSON data writers will convert a double value without decimals to a JSON value without decimals (e.g. 123.0 will be transmitted as 123)

Due to this fact, it is allowed to write a "int" value (without "type" field) to a "double" data point (e.g. 123).

But: When you create a new value, the server has no chance to evaluate the right value without "type" field.
-> Writing 123 to a non existing data point with "create":true and no "type" field will create a "int" data point.
=> If you want to be sure that a "double" data point is created: use the "type" field with value "double"!

3.3.4 Response Fields

The "set" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success. - "no perm": You are not allowed to write this data point. - "not found": This data point doesn't exist on the system. - "error": Something went wrong while writing to the control system.	string	Always
path	The path of the written data point.	string	When no fatal error
value	The value that you have set.	number, boolean, string, null	On code "ok"
type	The type of the value, can be "int", "double" (a floating point number), "string", "bool" or "none" for nodes without values.	string	On code "ok"
stamp	ISO 8601 formatted (see here).	string, null	On code "ok"
state	Only on ProMoS NG: Sent, when state of value is not "ok", can be "error", "noData" or "pcfError".	string	On code "ok", when state is not "ok"

pcfErrors	Only on ProMoS NG: Detailed information's about process control function errors, eg:
	`"pcfErrors": [`
	`{`
	`"targetNode": "AutomatedTests:Leadfunc`
		array	On code "ok", when errors pending

	`"msg": "Division by zero ('AutomatedTe`
	`"id": "PRG"`
	`}`
	`]`		

readonly	Only on ProMoS NG: Sent as true, when data point is read only.	boolean	On code "ok", when read only
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

3.3.5 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Write Request",
  "description": "Writing one or more data points",
  "type": "object",
  "properties": {
    "whois": {
      "description": "Identification of the sender",
      "type": "string"
    },
    "user": {
      "description": "Username",
      "type": "string"
    },
    "set": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point write definition",
        "type": "object",
        "properties": {
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "create": {
            "description": "Flag to create non existing datapoint",
            "type": "boolean"
          },
          "createDefault": {
            "description": "Flag to create non existing datapoint, an existing
datapoint value will not be overwritten",
            "type": "boolean"
          },
          "value": {
            "description": "The new value of the data point",
            "type": ["number", "string", "boolean", "null"]
          },
          "histData": {
            "description": "Array of historical data to write",
            "type": "array",
            "items": {
              "title": "Historical data",
              "type": "object",
              "properties": {
                "stamp": {
                  "description": "The timestamp of the recorded value, ISO 8601",
                  "type": ["string"]
                },
                "value": {
                  "description": "The value",
                  "type": ["number"]
                },
                "state": {
                  "description": "The recording state",
                  "type": "string",
                  "enum": [ "ok", "comErr", "inv" ]
                }
              }
            }
          },
```

```
          "type": {
            "description": "The value type",
            "type": "string",
            "enum": [ "int", "double", "string", "bool" ]
          },
          "tag": {
            "description": "Any data, will be echoed on the response",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "additionalProperties": false,
        "required": ["path", "value", "type"]
      }
    },
    "minItems": 1
  },
  "required": ["whois", "user", "set"]
}
```

Response::

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Write Response",
  "description": "Information about writing one or more data points",
  "type": "object",
  "properties": {
    "set": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The result code",
            "type": "string",
            "enum": [ "ok", "no perm", "not found", "error" ]
          },
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "value": {
            "description": "The value of the data point",
            "type": ["number", "string", "boolean", "null"]
          },
          "type": {
            "description": "The value type",
            "type": "string",
            "enum": [ "int", "double", "string", "bool", "none" ]
          },
          "stamp": {
            "description": "The timestamp of the last change of the value, ISO
8601",
            "type": ["string", "null"]
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "tag": {
            "description": "Echo from the request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["set"]
}
```

3.4 Rename

3.4.1 Example

Request:

```
{
  "whois":"DriverXY",
  "rename": [
    {
      "path":"EXMPL1:T11:MN:003"
      "newPath":"EXMPL1:T11:MN:002"
    },
    {
      "path":"EXMPL1:T11:MN:003",
      "newPath":"EXMPL1:T11:MN:002"
    }
  ]
}
```

Response::

```
{
  "rename": [
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003"
      "newPath":"EXMPL1:T11:MN:002"
    },
    {
      "code":"not found",
      "path":"EXMPL1:T11:MN:003",
      "message":"Data point doesn't exist"
    }
  ]
}
```

3.4.2 Request Fields

Root objects:

Field	Description	Type	M/O
whois	The identification of the sender, e.g. "sDriver".	string	Mandatory (note)

The "rename" array of objects:

Field	Description	Type	M/O
path	The source path of the data point you want to rename.	string	Mandatory
newPath	The destination path.	string	Mandatory
tag	Any data that will be echoed in the response.	*any*	Optional

type	The type of the new data point. The type can be "int", "double" (a floating point number), "string", "bool" or "none". For more accurate type definitions in older ProMoS Systems "int8", "uint8", "int16", "uint16", "int32", "uint32", or "double64" can be set. "int" means "int32" for ProMoS NT and "int64" for ProMoS NG.	string	Optional

To change only a type of a value use same "path" and "newPath" and the corresponding type,

3.4.3 Response Fields

The "rename" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success. - "no perm": You are not allowed to rename this data point. - "not found": This data point doesn't exist on the system. - "error": Something went wrong while renaming.	string	Always
path	The path of the original data point.	string	When no fatal error
newPath	The renamed path.	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

3.4.4 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Rename Request",
  "description": "Renaming one or more data points",
  "type": "object",
  "properties": {
    "whois": {
      "description": "Identification of the sender",
      "type": "string"
    },
    "rename": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point rename definition",
        "type": "object",
        "properties": {
          "path": {
            "description": "The DMS path to the old data point",
            "type": "string"
          },
          "newPath": {
            "description": "The DMS path to the new data point",
            "type": "string"
          },
          "tag": {
            "description": "Any data, will be echoed on the response",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "additionalProperties": false,
        "required": ["path", "newPath"]
      }
    },
    "minItems": 1
  },
  "required": ["whois", "rename"]
}
```

Response::

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Rename Response",
  "description": "Information about renaming one or more data points",
  "type": "object",
  "properties": {
    "rename": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The result code",
            "type": "string",
            "enum": [ "ok", "no perm", "not found", "error" ]
          },
          "path": {
            "description": "The DMS path to the old data point",
            "type": "string"
          },
          "newPath": {
            "description": "The DMS path to the new data point",
            "type": "string"
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "tag": {
            "description": "Echo from the request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["rename"]
}
```

3.5 Copy

3.5.1 Example

Request:

```
{
  "whois":"DriverXY",
  "copy": [
    {
      "path":"EXMPL1:T11:MN:003"
      "destPath":"EXMPL1:T11:MN:002"
    },
    {
      "path":"EXMPL1:T11:MN:003",
      "destPath":"EXMPL1:T11:MN:002"
    }
  ]
}
```

Response::

```
{
  "copy": [
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003"
      "destPath":"EXMPL1:T11:MN:002"
    },
    {
      "code":"error",
      "path":"EXMPL1:T11:MN:003",
      "destPath":"EXMPL1:T11:MN:002"
      "message":"Could not copy, destPath exists"
    }
  ]
}
```

3.5.2 Request Fields

Root objects:

Field	Description	Type	M/O
whois	The identification of the sender, e.g. "sDriver".	string	Mandatory (note)

The "copy" array of objects:

Field	Description	Type	M/O
path	The source path of the data point you want to copy.	string	Mandatory
destPath	The destination path.	string	Mandatory
tag	Any data that will be echoed in the response.	*any*	Optional

3.5.3 Response Fields

The "copy" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success. - "not found": This data point doesn't exist on the system. - "error": Something went wrong while renaming.	string	Always
path	The path of the original data point.	string	When no fatal error
destPath	The destination path.	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

3.5.4 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Copy Request",
  "description": "Copy one or more data points",
  "type": "object",
  "properties": {
    "whois": {
      "description": "Identification of the sender",
      "type": "string"
    },
    "copy": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point copy definition",
        "type": "object",
        "properties": {
          "path": {
            "description": "The DMS path to the source data point",
            "type": "string"
          },
          "destPath": {
            "description": "The DMS path to the new data point",
            "type": "string"
          },
          "tag": {
            "description": "Any data, will be echoed on the response",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "additionalProperties": false,
        "required": ["path", "destPath"]
      }
    },
    "minItems": 1
  },
  "required": ["whois", "copy"]
}
```

Response::

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Copy Response",
  "description": "Information about copying one or more data points",
  "type": "object",
  "properties": {
    "copy": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The result code",
            "type": "string",
            "enum": [ "ok", "no perm", "not found", "error" ]
          },
          "path": {
            "description": "The DMS path to the source data point",
            "type": "string"
          },
          "destPath": {
            "description": "The DMS path to the new data point",
            "type": "string"
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "tag": {
            "description": "Echo from the request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["copy"]
}
```

3.6 Delete

3.6.1 Example

Request:

```
{
  "whois":"DriverXY",
  "delete": [
    {
      "path":"EXMPL1:T11:MN:003"
    },
    {
      "path":"EXMPL1:T11:MN:003",
      "recursive": true
    },
    {
      "path":"EXMPL1:T11:MN:003:Vis:VEnergy1V"
    },
    {
      "path":"EXMPL1:TEST:BOOLEAN"
    },
  ]
}
```

Response::

```
{
  "delete": [
    {
      "code":"error",
      "path":"EXMPL1:T11:MN:003",
      "message":"Path is not empty"
    },
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003"
    },
    {
      "code":"not found",
      "path":"EXMPL1:T11:MN:003:Vis:VEnergy1V",
      "message":"Data point doesn't exist"
    },
    {
      "code":"ok",
      "path":"EXMPL1:TEST:BOOLEAN",
    }
  ]
}
```

3.6.2 Delete Historical Data

It is possible to delete historical data for data points - see also query with "hasHistData".

Request:

```
{
  "whois":"DriverXY",
  "user":"",
  "delete": [
    {
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1",
      "histData": {
        "start": "2015-04-04T00:00:00Z",
        "end": "2015-04-05T00:00:00Z"
      }
    }
  ]
}
```

Response:

```
{
  "delete": [
    {
      "code":"ok",
      "path":"EXMPL1:T11:MN:003:Vis:VMC_energy1"
    }
  ]
}
```

3.6.3 Request Fields

Root objects:

Field	Description	Type	M/O
whois	The identification of the sender, e.g. "sDriver".	string	Mandatory (note)

The "delete" array of objects:

Field	Description	Type	M/O
path	The path of the data point you want to delete.	string	Mandatory
histData	Object with "start" and "end" timestamp to delete the corresponding range of historical data. When "histData" is set, the main data point is not deleted!	object	Optional
recursive	Flag to delete sub path's (default is false). When you try to delete a data point with existing sub path's and "recursive" is false an error with "message" "Path is not empty" will be returned.	boolean	Optional
tag	Any data that will be echoed in the response.	*any*	Optional

3.6.4 Response Fields

The "delete" array of objects:

Field	Description	Type	Occurrence

code	The code can be: - "ok": On success. - "no perm": You are not allowed to delete this data point. - "not found": This data point doesn't exist on the system. - "error": Something went wrong while deleting.	string	Always
path	The path of the deleted data point.	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

3.6.5 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Delete Request",
  "description": "Deleting one or more data points",
  "type": "object",
  "properties": {
    "whois": {
      "description": "Identification of the sender",
      "type": "string"
    },
    "delete": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point delete definition",
        "type": "object",
        "properties": {
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "recursive": {
            "description": "Flag to delete sub path's",
            "type": "boolean"
          },
          "tag": {
            "description": "Any data, will be echoed on the response",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "additionalProperties": false,
        "required": ["path"]
      }
    },
    "minItems": 1
  },
  "required": ["whois", "delete"]
}
```

Response::

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Delete Response",
  "description": "Information about deleting one or more data points",
  "type": "object",
  "properties": {
    "delete": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The result code",
            "type": "string",
            "enum": [ "ok", "no perm", "not found", "error" ]
          },
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "tag": {
            "description": "Echo from the request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["delete"]
}
```

3.7 Monitor

Monitoring data points is only possible on WebSocket connections!

After loss of a WebSocket connection, all monitoring configurations for the prior connection are cleared, the client is responsible to reconfigure all data point monitoring configurations.

3.7.1 Example

Request:

```
{
  "subscribe": [
    {
      "path":"System",
      "event":"onChange",
      "query": {
        "maxDepth": 0
      }
    }
  ]
}
```

Response:

```
{
  "subscribe": [
    {
      "code":"ok",
      "path":"System",
      "type":"none",
      "value":null,
      "stamp":null,
      "event":"onChange",
      "query": {
        "maxDepth": 0
      }
    }
  ]
}
```

Event Message:

```
{
  "event": [
    {
      "code":"onChange",
      "path":"System:Blinker:Blink0.25",
      "trigger":"<SYS>",
      "type":"bool",
      "value":true,
      "stamp":"2015-05-27T08:13:58,521+02:00"
    },
    {
      "code":"onChange",
      "path":"System:Blinker:Blink0.5",
      "trigger":"<SYS>",
      "type":"bool",
      "value":false,
      "stamp":"2015-05-27T08:13:58,521+02:00"
    }
  ]
}
```

3.7.2 Request Fields

The "subscribe" array of objects:

Field	Description	Type	M/O
path	The path of the data point you want to monitor.	string	Mandatory
query	The query object (see here), default is no query. The query content will be analyzed at the time of the event.	object	Optional
event	Requested event to monitor, can be one or more of "onChange", "onSet", "onCreate", "onRename", "onDelete" or "*". Default is "onChange". Multiple requested events are separated by ',', e.g. "onChange,onRename,onDelete". "*" means all events. Can also be sent as array of strings.	string, array	Optional
tag	Any data that will be echoed in the response and the event.	*any*	Optional

Note:
Multiple subscriptions can be set on the same path with different tag's.
Any subscription on the same path with the same tag (on the same connection) as in a previous subscription will overwrite the previous configuration.

To unsubscribe a monitored data point send "unsubscribe" command with the path and tag used on subscription.

The "unsubscribe" array of objects:

Field	Description	Type	M/O
path	The path of the data point you don't want to monitor anymore.	string	Mandatory
tag	The tag data used on subscription for this data point.	*any*	Optional

3.7.3 Response Fields

The "subscribe" and "unsubscribe" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success. - "no perm": You are not allowed to monitor this data point. - "not found": This data point doesn't exist on the system. - "error": Something went wrong.	string	Always
path	The path of the monitored data point.	string	When no fatal error
query	Echo of any query object from the request.	object	When existing in request
event	Echo of any event from the request.	string, array	When existing in request

value	The current value.	number, boolean, string, null	On code "ok"
type	The type of the value, can be "int", "double" (a floating point number), "string", "bool" or "none" for nodes without value.	string	On code "ok"
stamp	ISO 8601 formatted (see here).	string, null	On code "ok"
extInfos	Extended "subscriptions" information's for this data point (see here).	object	On code "ok"
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

Note:
Take care about the fact, that any (previous configured) "event" message can occur asynchron between the subscribe-request and the subscribe-response!

3.7.4 Event Message - Fields

Any triggered event will be transmitted with a "event" object with one ore more array entries of objects with the following content:

Field	Description	Type	Occurrence
code	The code shows the initiating event trigger ("onChange", "onSet", "onCreate", "onRename", "onDelete")	string	Always
path	The path of the monitored data point.	string	Always
newPath	The renamed path.	string	On code "onRename"
trigger	The trigger of the event. For JSON connections this is the "whois" field from the request (set/rename/delete). For ProMoS 1/2 connections (Pipe/TCP), this is the application name and the connection name (when present) from the corresponding client application (e.g. "GE@PC-WS096"). Other triggers can be: "<SYS>" (internal system operations, e.g. on "System:Time") or "<DMS>" for manipulated data points on the DMS GUI or for data points modified by PLS function.	string	Always
value	The value: - after "onChange", "onSet", "onCreate", "onRename" - before "onDelete"	number, boolean, string, null	Always

type	The type of the value, can be "int", "double" (a floating point number), "string", "bool" or "none" for nodes without value.	string	Always
stamp	Time stamp of the event, ISO 8601 formatted (see here).	string, null	Always
tag	Tag data from the "subscribe" request.	*from request*	When existing in request

Note:
When a data point is renamed, the events "onRename", "onDelete" and "onCreate" will be generated.

3.7.5 JSON Schema

Request:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Monitor Request",
  "description": "Monitoring one or more data points",
  "type": "object",
  "properties": {
    "subscribe": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point monitoring definition",
        "type": "object",
        "properties": {
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "query": {
            "description": "Optional query parameters",
            "type": "object",
            "properties": {
              "regExPath": {
                "description": "RegEx pattern for the path",
                "type": "string"
              },
              "regExValue": {
                "description": "RegEx pattern for the value",
                "type": "string"
              },
```

```
              "regExStamp": {
                "description": "RegEx pattern for the time stamp",
                "type": "string"
              },
              "isType": {
                "description": "Type filters",
                "type": "string",
                "enum": [ "int", "double", "string", "bool", "none" ]
              },
              "hasHistData": {
                "description": "Filter for data points with historical data",
                "type": "boolean"
              },
              "maxDepth": {
                "description": "Maximal depth for searching in sub path's",
                "type": "number"
              }
            }
          },
          "event": {
            "description": "The requested event (or combinations)",
            "type": "string",
            "enum": [ "onChange", "onSet", "onCreate", "onRename", "onDelete", "*" ]
          },
          "tag": {
            "description": "Any data, will be echoed on the subscribe response and
on the event",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "additionalProperties": false,
        "required": ["path"]
      }
    },
    "minItems": 1
  },
  "required": ["subscribe"]
}
```

Response::

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Monitor Response",
  "description": "Information about subscribe one or more data points",
  "type": "object",
  "properties": {
    "subscribe": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The result code",
            "type": "string",
            "enum": [ "ok", "no perm", "not found", "error" ]
          },
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "value": {
            "description": "The value of the data point",
            "type": ["number", "string", "boolean", "null"]
          },
          "type": {
            "description": "The value type",
            "type": "string",
            "enum": [ "int", "double", "string", "bool", "none" ]
          },
          "stamp": {
            "description": "The timestamp of the last change of the value, ISO
8601",
            "type": ["string", "null"]
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "tag": {
            "description": "Echo from the request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["subscribe"]
}
```

Event Message:

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "Event Message",
  "description": "Information about monitor one or more data points",
  "type": "object",
  "properties": {
    "event": {
      "description": "The command",
      "type": "array",
      "items": {
        "title": "Data point value",
        "type": "object",
        "properties": {
          "code": {
            "description": "The event",
            "type": "string",
            "enum": [ "onChange", "onSet", "onCreate", "onRename", "onDelete" ]
          },
          "path": {
            "description": "The DMS path to the data point",
            "type": "string"
          },
          "trigger": {
            "description": "The trigger of this event",
            "type": "string"
          },
          "value": {
            "description": "The value of the data point",
            "type": ["number", "string", "boolean", "null"]
          },
          "type": {
            "description": "The value type",
            "type": "string",
            "enum": [ "int", "double", "string", "bool", "none" ]
          },
          "stamp": {
            "description": "The timestamp of the last change of the value, ISO
8601",
            "type": ["string", "null"]
          },
          "message": {
            "description": "Human readable error message",
            "type": "string"
          },
          "tag": {
            "description": "The echoed tag from subscribe request",
            "type": [ "object", "array", "number", "string", "boolean"]
          }
        },
        "required": ["code"]
      }
    },
    "minItems": 1
  },
  "required": ["event"]
}
```

4 Change Logs

This chapter describes the commands to handle change logs for data points.
Any data point can have a change log, see also "hasChangelog" from the data point query object..

Change logs are grouped by a name, to get all available groups of change logs you can ask them by "changelogGetGroups".

4.1 Command Overview

Command	Description
changelogGetGroups	Get all available change log groups.
changelogRead	Read content of specific change log group.
changelogCount	Get misc counters of specific change log group.
changelogSubscribe	Monitoring changelog(s). Only for WebSocket connection, ProMoS NG.
changelogUnsubscribe	Unsubscribe monitored changelog(s). Only for WebSocket connection, ProMoS NG.

4.2 ChangelogGetGroups

4.2.1 Example

Request:

```
{
  "changelogGetGroups": []
}
```

Response:

```
{
  "changelogGetGroups": [
    {
      "code":"ok",
      "groups": [
        "login",
        "Ereign1",
        "Alarm",
        "Manip1"
      ]
    }
  ]
}
```

4.2.2 Request Fields

The "changelogGetGroups" array:

Empty array.

4.2.3 Response Fields

The "changelogGetGroups" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
groups	All group names available for the changelogRead command.	array of string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

4.3 ChangelogRead

The resulting response array is limited to max. 100'000 entries.
Refine your period (start/end, filters) to receive the desired data.

4.3.1 Example

Request:

```
{
  "changelogRead": [
    {
        "group": "ABS1",
        "start": "2016-02-29T00:00:00Z",
        "end": "2016-03-02T00:00:00Z"
    }
  ]
}
```

Response:

```
{
  "changelogRead": [
    {
      "code": "ok",
      "group": "ABS1",
      "changelog": [
      {
        "id": "BN028:H04:VS:001:ABS_Ein|0|165382260",
        "path": "BN028:H04:VS:001:ABS_Ein",
        "stamp": "2016-02-29T11:48:55,715+01:00",
        "text": "Heizungsventil Aus"
      },
      {
        "id": "BN028:H04:VS:001:ABS_Ein|0|165337860",
        "path": "BN028:H04:VS:001:ABS_Ein",
        "stamp": "2016-02-29T11:42:58,197+01:00",
        "text": "Heizungsventil Ein"
      }]
    }
  ]
}
```

4.3.2 Request Fields

The "changelogRead" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to read (optional, when embedded in "get" command and path is a change log data point).	string	Mandatory
start	The requested start time stamp for the data (see also here). Default is "first". Only on ProMoS NG: Can also be "first", "last" or "now".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last". Only on ProMoS NG: Can also be "first", "last" or "now".	string	Optional
filter	Filter object with the following members, all optional (only ProMoS NG) • `"path"` - string Path to filter - partial match. • `"text"` - string Text to filter - partial match. • `"siteGroup"` - array of numbers • `"user"` - string User entry - partial match.	object	Optional
tag	Any data that will be echoed in the response.	*any*	Optional
limit	Limits the result to the defined max entries. When limit is reached, an additional object `"changelogLimitReached"=true` will be returned on response.	number	Optional
format	Other format than default (only ProMoS NG) - see ProMoS documentation, formats like "#c / #N / #V^NAME / #z(Ein:Aus) / #u" (only ProMoS NG)	string	Optional
locale	Locale in the format "{language lowercase, two-letter, ISO 639}_{country, two-letter, ISO 3166 country code}", e.g. "de_CH" (only ProMoS NG)	string	Optional

4.3.3 Response Fields

The "changelogRead" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
changelog	An array with change log records (see below).	array	On code "ok"
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

The "changelog" array of objects:

Field	Description	Type	Occurrence
id	Unique id for the change log entry (only ProMoS NG)	string	Always
group	The change log group (e.g. "Manip1").	string	Always
path	The path of the corresponding data point.	string	Always
stamp	Time stamp of the log entry, ISO 8601 formatted (see here).	string	Always
text	The log text.	string	Always
siteGroup	The site group (only ProMoS NG for normal changelog)	number	Always
oldValue	Value before change (only ProMoS NG with new dbEngine)	string	Always
newValue	Value after change (only ProMoS NG with new dbEngine)	string	Always
user	User entry, responsible for change (only ProMoS NG with new dbEngine), can also be any internal process or driver	string	When existing

4.4 ChangelogCount

Read counters for the given change log.
Only on ProMoS NG.

4.4.1 Example

Request:

```
{
  "changelogCount": [
    {
        "group": "Manip1",
        "start": "2016-02-29T00:00:00Z",
        "end": "2016-03-02T00:00:00Z"
    }
  ]
}
```

Response:

```
{
  "changelogCount": [
    {
      "code": "ok",
      "group": "Manip1",
      "countTotal": 165
    }
  ]
}
```

4.4.2 Request Fields

The "changelogCount" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to read (optional, when embedded in "get" command and path is a change log data point).	string	Mandatory
start	The requested start time stamp for the data (see also here). Default is "first". Can also be "first", "last" or "now".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last". Can also be "first", "last" or "now".	string	Optional
filter	See here.	object	Optional
tag	Any data that will be echoed in the response.	*any*	Optional

4.4.3 Response Fields

The "changelogCount" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	array of string	When no fatal error
countTotal	Total of resulting entries.	number	On code "ok"
message	This field contains an human readable error message in English.	string	Other than code "ok"

Field	Description	Type	Occurrence
tag	Tag data from request.	*from request*	When existing in request

4.5 ChangelogSubscribe

Any change log group can be monitored by the subscribe command (only for websocket connection on ProMoS NG).

The subscription is unique for the given group, tag and websocket connection. Any further subscription with the same group and tag will override the existing subscription.

After loss of the websocket connection, the client has to re-subscribe.

4.5.1 Example

Request:

```
{
  "changelogSubscribe": [
    {
        "group": "ABS1"
    }
  ]
}
```

Response:

```
{
  "changelogSubscribe": [
    {
      "code": "ok",
      "group": "ABS1"
    }
  ]
}
```

4.5.2 Request Fields

The "changelogSubscribe" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to be informed.	string	Mandatory
start	The requested start time stamp for the data (see also here). Default is "first". Only on ProMoS NG: Can also be "first", "last" or "now".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last". Only on ProMoS NG: Can also be "first", "last" or "now".	string	Optional
filter	See here.	object	Optional

Field	Description	Type	M/O
tag	Any data that will be echoed in the response and event. "group" and "tag" are unique for a subscription.	*any*	Optional
format	Other format than default (only ProMoS NG) - see ProMoS documentation, formats like "#c / #N / #V^NAME / #z(Ein:Aus) / #u"	string	Optional
locale	Locale in the format "{language lowercase, two-letter, ISO 639}_{country, two-letter, ISO 3166 country code}", e.g. "de_CH"	string	Optional

4.5.3 Response Fields

The "changelogSubscribe" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

4.5.4 Event Message - Fields

Any triggered event will be transmitted with a "eventChangelog" object with one ore more array entries of objects with the following content:

Field	Description	Type	Occurrence
code	The code shows the initiating event trigger ("onCreate", "onChange", "onDelete")	string	Always
group	The group of the monitored changelog.	string	Always
trigger	The trigger of the event.	string	Always
changelog	An array with change log records see here.	array	Always
tag	Tag data from the "subscribe" request.	*from request*	When existing in request

4.6 ChangelogUnsubscribe

4.6.1 Example

Request:

```
{
  "changelogUnsubscribe": [
    {
        "group": "ABS1"
    }
  ]
}
```

Response:

```
{
  "changelogUnsubscribe": [
    {
      "code": "ok",
      "group": "ABS1"
    }
  ]
}
```

4.6.2 Request Fields

The "changelogUnsubscribe" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to read.	string	Mandatory
tag	Any data that was used in subscription. "group" and "tag" are unique for a subscription.	*any*	Optional

4.6.3 Response Fields

The "changelogUnsubscribe" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

5 Alarms

All alarm functionalities only for ProMoS NG.

This chapter describes the commands to handle alarm for data points.

Any data point can have one or more alarms, see also "hasAlarmData" from the data point query object..

Alarms are grouped by a name, to get all available groups you can ask them by "alarmGetGroups".

Default alarm groups are: "Alarm" (priority 0-5 in ProMoS NT) and "Service" (priority 6 in ProMoS NT).

5.1 Command Overview

Command	Description
alarmGetGroups	Get all available alarm groups.
alarmRead	Read content of specific alarm group.
alarmCount	Get misc counters of specific alarm group.
alarmAcknowledge	Acknowledge alarm.
alarmSubscribe	Monitoring alarm(s). Only for WebSocket connection.
alarmUnsubscribe	Unsubscribe monitored alarm(s). Only for WebSocket connection.
alarmSubscribeCount	Monitoring alarm counters. Only for WebSocket connection.
alarmUnsubscribeCount	Unsubscribe monitored alarm counters. Only for WebSocket connection.

5.2 AlarmGetGroups

5.2.1 Example

Request:

```
{
  "alarmGetGroups": []
}
```

Response:

```
{
  "alarmGetGroups": [
    {
      "code":"ok",
      "groups": [
        "Alarm",
        "Service"
      ]
    }
  ]
}
```

5.2.2 Request Fields

The "alarmGetGroups" array:

Empty array.

5.2.3 Response Fields

The "alarmGetGroups" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
groups	All group names available for the alarmRead command.	array of string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

5.3 AlarmRead

The resulting response array is limited to max. 100'000 entries.
Refine your period (start/end, filters) to receive the desired data.

5.3.1 Example

Request:

```
{
  "alarmRead": [
    {
        "group": "Alarm",
        "start": "2021-02-29T00:00:00Z",
        "end": "2021-03-02T00:00:00Z"
    }
  ]
}
```

Response:


```
{
  "alarmRead": [
    {
      "group": "Alarm",
      "code": "ok",
      "alarms": [
        {
          "id": "BN028A:H30:MQ:100:GW_LE_Err|1",
          "stamp": "2021-11-03T16:20:48,767+01:00",
          "path": "BN028A:H30:MQ:100:GW_LE_Err",
          "user": "1:web@WebServer:WS096-TCP-127.0.0.1",
          "oldValue": "0",
          "newValue": "1",
          "text": "03.11.21 16:20:48 BN028A:H30:MQ:100:GW_LE_Err Luftqualität
Wohnraum Grenzwert unten erreicht  quit 1:web@WebServer:WS096-TCP-127.0.0.1",
          "siteGroup": 0,
          "group": "Alarm",
          "isPending": true,
          "alarmCfgNr": 1,
          "state": "acknowledged",
          "priority": 2,
          "priorityBACnet": 0,
          "alarmGroup": 1,
          "alarmCollectGroup": 0
        },
        {
          "id": "BN028A:H30:MQ:100:FBr_Err|1",
          "stamp": "2021-11-03T16:20:48,717+01:00",
          "path": "BN028A:H30:MQ:100:FBr_Err",
          "user": "1:web@WebServer:WS096-TCP-127.0.0.1",
          "oldValue": "0",
          "newValue": "1",
          "text": "03.11.21 16:20:48 BN028A:H30:MQ:100:FBr_Err Luftqualität Wohnraum
Fuehlerbruch  quit 1:web@WebServer:WS096-TCP-127.0.0.1",
          "siteGroup": 0,
          "group": "Alarm",
          "isPending": true,
          "alarmCfgNr": 1,
          "state": "acknowledged",
          "priority": 2,
          "priorityBACnet": 0,
          "alarmGroup": 1,
          "alarmCollectGroup": 0
        }
      ]
    }
  ]
}
```


5.3.2 Request Fields

The "alarmRead" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to read.	string	Optional
start	The requested start time stamp for the data (see also here). Default is "first".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last".	string	Optional

Field	Description	Type	M/O
filter	Filter object with the following members, all optional • `"path"` - string Path to filter - partial match. • `"isPending"` - bool Send pending alarms - default is true. • `"isHistorical"` - bool Send historical alarms - default is false. • `"state"` - array of strings Array entries can be "occurred", "acknowledged", "left", "leftAcknowledged". • `"text"` - string Text to filter - partial match. • `"user"` - string User entry - partial match. • `"alarmCfgNr"` - array of numbers For Alarm configuration "AlarmX" • `"priority"` - array of numbers • `"priorityBACnet"` - array of numbers • `"alarmGroup"` - array of numbers • `"alarmCollectGroup"` - array of numbers • `"siteGroup"` - array of numbers	object	Optional
tag	Any data that will be echoed in the response.	*any*	Optional
limit	Limits the result to the defined max entries. When limit is reached, an additional object `"alarmLimitReached"=true` will be returned on response.	number	Optional
format	Other format than default - see ProMoS documentation, formats like "#c / #N / #V^NAME / #z(Ein:Aus) / #u"	string	Optional
locale	Locale in the format "{language lowercase, two-letter, ISO 639}_{country, two-letter, ISO 3166 country code}", e.g. "de_CH"	string	Optional

5.3.3 Response Fields

The "alarmRead" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
alarms	An array with change log records (see below).	array	On code "ok"
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

The "alarms" array of objects:

Field	Description	Type	Occurrence
id	Unique id for the change log entry	string	Always
group	The alarm group (e.g. "Alarm").	string	Always
isPending	True for pending alarm (not historical).	bool	Always
path	The path of the corresponding data point.	string	Always
stamp	Time stamp of the log entry, ISO 8601 formatted (see here).	string	Always
text	The alarm text.	string	Always
user	User entry who has acknowledged the alarm (only ProMoS NG with new dbEngine)	string	When existing
oldValue	Value before change (only ProMoS NG with new dbEngine)	string	Always
newValue	Value after change (only ProMoS NG with new dbEngine)	string	Always
alarmCfgNr	The number of the alarm configuration data point ("Alarmx")	number	Always
state	The state of the alarm, can be "occurred", "left", "acknowledged" or "leftAcknowledged"	string	Always
priority	The alarm priority	number	Always
priorityBACnet	The alarm BACnet priority	number	Always
alarmGroup	The alarm group	number	Always
alarmCollectGroup	The alarm collective group	number	Always
siteGroup	The site group	number	Always
screen	The scada screen name	string	When existing

5.4 AlarmAcknowledge

5.4.1 Example

Request:

```
{
  "whois":"AlarmViewer",
  "user":"mst_xxx",
  "alarmAcknowledge": [
    {
      "id": "BN028:H04:VS:001:Err|1",
      "action": "set",
      "level": "single"
    }
  ]
}
```

Response:

```
{
  "alarmAcknowledge": [
    {
      "code": "ok",
      "group": "",
      "id": "BN028:H04:VS:001:Err|1",
      "action": "set"
    }
  ]
}
```

5.4.2 Request Fields

Root objects:

Field	Description	Type	M/O
whois	The identification of the sender, e.g. "AlarmViewer".	string	Mandatory (note)
user	Any logged user name, empty when there is no current user.	string	Mandatory

The "alarmAcknowledge" array of objects:

Field	Description	Type	M/O
id	The unique id for this alarm (see here).	string	Mandatory
group	The group name of the alarm, e.g. "Alarm".	string	Optional
isPending	True for pending alarm, default is true.	bool	Optional
action	Can be "set" (acknowledge), "reset" (remove acknowledge) or "clear" (mark current alarm as leaved), default is "set".	string	Optional
level	Can be "single" (only this alarm), "allForPath" (all alarms for same path - only for current alarms) or "allForObject" (all alarms for the same object - only for current alarms), default is "single".	string	Optional
tag	Any data that will be echoed in the response.	any	Optional

5.4.3 Response Fields

The "alarmAcknowledge" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request.	string	When no fatal error
id	Echo from the request.	string	On code "ok"

Field	Description	Type	Occurrence
action	Echo from the request.	string	On code "ok"
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

5.5 AlarmCount

5.5.1 Example

Request:

```
{
  "alarmCount": [
    {
        "group": "Alarm",
        "start": "2021-02-29T00:00:00Z",
        "end": "2021-03-02T00:00:00Z"
    }
  ]
}
```

Response:

```
{
  "alarmCount": [
    {
      "code": "ok",
      "group": "Alarm",
      "countTotal": 165,
      "countAlarm":
      {
        "occurred": 32,
        "left": 100,
        "acknowledged": 20
        "leftAcknowledged": 13
      }
    }
  ]
}
```

5.5.2 Request Fields

The "alarmCount" array of objects:

Field	Description	Type	M/O
group	The group name of the alarm you want to count. Empty for all groups.	string	Optional
start	The requested start time stamp for the data (see also here). Default is "first". Can also be "first", "last" or "now".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last". Can also be "first", "last" or "now".	string	Optional
filter	See here.	object	Optional

Field	Description	Type	M/O
tag	Any data that will be echoed in the response.	*any*	Optional

5.5.3 Response Fields

The "alarmCount" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	array of string	When no fatal error
countTotal	Total alarms.	number	On code "ok"
countAlarm	An object with different counters (numbers): • "occurred" Count of all alarms in state "occurred" (new alarm, not acknowledged). • "left" Count of all alarms in state "left" (alarm has left, not acknowledged). • "acknowledged" Count of all alarms in state "acknowledged" (new alarm, acknowledged). • "leftAcknowledged" Count of all alarms in state "leftAcknowledged" (alarm has left, acknowledged - only in historical alarms).	object	On code "ok", only for alarms
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

5.6 AlarmSubscribe

Any alarms can be monitored by the subscribe command (only for websocket connection).

The subscription is unique for the given group, tag and websocket connection. Any further subscription with the same group and tag will override the existing subscription.

After loss of the websocket connection, the client has to re-subscribe.

5.6.1 Example

Request:

```
{
  "alarmSubscribe": [
    {
        "group": "Alarm"
    }
  ]
}
```

Response:

```
{
  "alarmSubscribe": [
    {
      "code": "ok",
      "group": "Alarm"
    }
  ]
}
```

5.6.2 Request Fields

The "alarmSubscribe" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to be informed.	string	Optional
start	The requested start time stamp for the data (see also here). Default is "first". Can also be "first", "last" or "now".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last". Can also be "first", "last" or "now".	string	Optional
filter	See here.	object	Optional
tag	Any data that will be echoed in the response and event. "group" and "tag" are unique for a subscription.	*any*	Optional
format	Other format than default - see ProMoS documentation, formats like "#c / #N / #V^NAME / #z(Ein:Aus) / #u"	string	Optional
locale	Locale in the format "{language lowercase, two-letter, ISO 639}_{country, two-letter, ISO 3166 country code}", e.g. "de_CH"	string	Optional

5.6.3 Response Fields

The "alarmSubscribe" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"

Field	Description	Type	Occurrence
tag	Tag data from request.	*from request*	When existing in request

5.6.4 Event Message - Fields

Any triggered event will be transmitted with a "eventAlarms" object with one ore more array entries of objects with the following content:

Field	Description	Type	Occurrence
code	The code shows the initiating event trigger ("onCreate", "onChange", "onDelete")	string	Always
group	The group of the monitored alarm.	string	Always
trigger	The trigger of the event.	string	Always
alarms	An array with alarm records see here.	array	Always
tag	Tag data from the "subscribe" request.	*from request*	When existing in request

5.7 AlarmUnsubscribe

5.7.1 Example

Request:

```
{
  "alarmUnsubscribe": [
    {
        "group": "Alarm"
    }
  ]
}
```

Response:

```
{
  "alarmUnsubscribe": [
    {
      "code": "ok",
      "group": "Alarm"
    }
  ]
}
```

5.7.2 Request Fields

The "alarmUnsubscribe" array of objects:

Field	Description	Type	M/O
group	The group name of the alarms you want to read.	string	Optional

Field	Description	Type	M/O
tag	Any data that was used in subscription. "group" and "tag" are unique for a subscription.	*any*	Optional

5.7.3 Response Fields

The "alarmUnsubscribe" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

5.8 AlarmSubscribeCount

Any alarm counters can be monitored by the subscribe command (only for websocket connection).

The subscription is unique for the given group, tag and websocket connection. Any further subscription with the same group and tag will override the existing subscription.

After loss of the websocket connection, the client has to re-subscribe.

5.8.1 Example

Request:

```
{
  "alarmSubscribeCount": [
    {
        "group": "Alarm"
    }
  ]
}
```

Response:

```
{
  "alarmSubscribeCount": [
    {
      "code": "ok",
      "group": "Alarm"
    }
  ]
}
```

5.8.2 Request Fields

The "alarmSubscribeCount" array of objects:

Field	Description	Type	M/O
group	The group name of the change log you want to be informed.	string	Optional
start	The requested start time stamp for the data (see also here). Default is "first". Can also be "first", "last" or "now".	string	Optional
end	The requested end time stamp for the data (see also here). Default is "last". Can also be "first", "last" or "now".	string	Optional
filter	See here.	object	Optional
tag	Any data that will be echoed in the response and event. "group" and "tag" are unique for a subscription.	*any*	Optional

5.8.3 Response Fields

The "alarmSubscribeCount" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

5.8.4 Event Message - Fields

Any triggered event will be transmitted with a "eventAlarmCount" object with one ore more array entries of objects with the following content:

Field	Description	Type	Occurrence
code	The code shows the initiating event trigger ("onChange")	string	Always
group	The group of the monitored counters.	string	Always
trigger	The trigger of the event.	string	Always
countTotal	Total alarms.	number	Always

Field	Description	Type	Occurrence
countAlarm	An object with different counters (numbers): • "occurred" Count of all alarms in state "occurred" (new alarm, not acknowledged). • "left" Count of all alarms in state "left" (alarm has left, not acknowledged). • "acknowledged" Count of all alarms in state "acknowledged" (new alarm, acknowledged). • "leftAcknowledged" Count of all alarms in state "leftAcknowledged" (alarm has left, acknowledged - only in historical alarms).	object	Always
tag	Tag data from the "subscribe" request.	*from request*	When existing in request

5.9 AlarmUnsubscribeCount

5.9.1 Example

Request:

```
{
  "alarmUnsubscribeCount": [
    {
        "group": "Alarm"
    }
  ]
}
```

Response:

```
{
  "alarmUnsubscribeCount": [
    {
      "code": "ok",
      "group": "Alarm"
    }
  ]
}
```

5.9.2 Request Fields

The "alarmUnsubscribeCount" array of objects:

Field	Description	Type	M/O
group	The group name of the counters you want to read.	string	Optional
tag	Any data that was used in subscription. "group" and "tag" are unique for a subscription.	*any*	Optional

5.9.3 Response Fields

The "alarmUnsubscribeCount" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": On success.	string	Always
group	Echo from the request	string	When no fatal error
message	This field contains an human readable error message in English.	string	Other than code "ok"
tag	Tag data from request.	*from request*	When existing in request

6 Version

Version information - only for ProMoS NG, ProMoS NT will return code "error".

6.1 Example

Request:

```
{
  "version": []
}
```

Response (ProMoS NT):

```
{
  "version": [
    {
      "code": "error",
      "message": "Unknown command. version"
    }
  ]
}
```

Response (ProMoS NG):

```
{
  "version": [
    {
      "code": "ok",
      "appVersion": {
        "full": "2.22.110.201",
        "major": 2,
        "minor": 22,
        "setup": 110,
        "build": 201
      },
      "setupVersion": {
        "full": "2.22.110.9",
        "major": 2,
        "minor": 22,
        "setup": 110,
        "build": 9
      },
      "app": "DMS",
      "copyright": "Copyright (c) 2022 MST Systemtechnik AG",
      "description": "ProMoS NG Data Management Service",
      "date": "2022-06-23 13:36"
    }
  ]
}
```


6.2 Request Fields

The "version" array:

Empty array.

6.3 Response Fields

The "version" array of objects:

Field	Description	Type	Occurrence
code	The code can be: - "ok": ProMoS NG. - "error": ProMoS NT.	string	Always
message	This field contains an human readable error message in English.	string	Other than code "ok"
appVersion	Detailed version info object	object	When no fatal error
setupVersion	Detailed version info object	object	When no fatal error
app	Application name	string	When no fatal error
description	Application description	string	When no fatal error
date	Application build date	string	When no fatal error

Field	Description	Type	Occurrence
copyright	Copyright string	string	When no fatal error

The "appVersion" and "setupVersion" object:

Field	Description	Type	Occurrence
full	Full version string	string	Always
major	Major number	number	Always
minor	Minor number	number	Always
setup	Setup number	number	Always
build	Build number	number	Always
siteGroup	The site group	number	Always

7 Interpolation Templates

Predefined interpolation parameter templates - only for ProMoS NG.

7.1 Example

Request:

```
{
  "interpolateGetTemplates": []
}
```

Response:


```
{
  "interpolateGetTemplates": [
    {
      "code": "ok",
      "templates": [
        {
          "name": "RawValues",
          "description": "",
          "dataClasses": [
            "any"
          ],
          "usages": [
            "any",
            "BAI"
          ],
          "interpolateParam": {
            "method": "",
            "interval": 0
          }
        },
        {
          "name": "EnergyCounterUp",
          "description": "",
          "dataClasses": [
            "counterUp"
          ],
          "usages": [
            "any",
            "BAI"
          ],
          "interpolateParam": {
            "method": "diffCtrUpCleaned"
          }
        }
      ]
    }
  ]
}
```


7.2 Request Fields

The "interpolateGetTemplates" array:

Empty array.

7.3 Response Fields

The "interpolateGetTemplates" array of objects:

Field	Description	Type	Occurrence
code	"ok" on success.	string	Always
message	This field contains an human readable error message in English.	string	Other than code "ok"
templates	Array of templates.	array	When no fatal error

The "templates" array of objects:

Field	Description	Type	Occurrence
name	Name for the template, can be used for parameter "interpolateTemplate" on requesting historical data.	string	Always
description	Description of the template.	string	Always
dataClasses	Array of strings, can be used to filter out templates to select.	array	Always
usages	Array of strings, can be used to filter out templates to select.	array	Always
interpolateParam	See data request for historical data.	object	When configured
filterParams	See data request for historical data.	array	When configured
normalizeParams	See data request for historical data.	array	When configured