



# Yamcs Server API

YAMCS-SA-API-001

October, 15th  
2015

[www.yamcs.org](http://www.yamcs.org)



# **Yamcs Server API**

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# Chapter 1. Web API Configuration

In `yamcs.yaml` define the exposed port. Traffic on this port is multiplexed between web tools such as the REST API, the WebSocket API and the web displays.

```
webPort: 8090
```

In `yamcs.(instance).yaml` activate the `YamcsWebService`.

```
services:
  - [...]
  - org.yamcs.web.YamcsWebService
```

# Chapter 2. REST API

Yamcs provides a RESTful web service allowing remote tools to interface with a growing set of internals.

All operations accept and deliver both JSON and Protobuf. The `.proto` files that define the contract of the REST endpoint are included in the yamcs source code. Using the `protoc` compiler, client code can be generated for Java, Python, C++ and more.

All operations documented in the following pages assume the default *simulator* instance. They also assume that the client is sending and asking JSON messages. However, the server is also capable of reading and writing binary data using Google Protocol Buffers. If -as a client- you are sending in the Protobuf wire format, change the HTTP `Content-Type` header to `application/octet-stream`. If you also want the server to respond with Protobuf messages, set the HTTP `Accept` header to `application/octet-stream`.

## Error Handling

When an exception is caught while handling a REST request, the server will try to give some feedback to the client by wrapping it in a generic exception message like this:

```
{  
  "exception" : {  
    "type": "<short>",  
    "msg": "<long>"  
  }  
}
```

Clients of the REST API should check on whether the status code is `200 OK`, and if not, deserialize the response as a `RestExceptionMessage` instead.

Note that the exception handling still requires more thoughtwork in terms of when we return an applicative exception as part of a 200 response, and when we return an actual exception.

### 2.1. Alarms

## List Active Alarms

Returns a list of current active alarms. For each alarm you get full information on the value occurrence that initially triggered the alarm, the most severe value since it originally triggered, and the latest value at the time of your request.

### HTTP Post to Alarms

```
/{{yamcsInstance}}/api/alarms
```

### Required Parameters

Parameter	Description
-----------	-------------

### Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

### Response

When using Protobuf, the response can be deserialized as `Rest.GetAlarmsResponse`.

Protobuf definition:

```
message GetAlarmsResponse {
    repeated alarms.Alarm alarms = 1;
}
```

### Example

```
curl -XGET http://localhost:8090/simulator/api/alarms?pretty
```

```
{
  "alarms" : [  {
    "id" : 3,
    "triggerValue" : {
      "id" : {
        "name" : "/YSS/SIMULATOR/O2TankTemp"
      },
      "rawValue" : {
        "type" : 2,
        "uint32Value" : 227
      }
    }
  }
]
```

```

    "engValue" : {
        "type" : 2,
        "uint32Value" : 227
    },
    "acquisitionTime" : 1440576556724,
    "generationTime" : 1440576539714,
    "acquisitionStatus" : 0,
    "processingStatus" : true,
    "monitoringResult" : 21,
    "acquisitionTimeUTC" : "2015-08-26T08:08:40.724",
    "generationTimeUTC" : "2015-08-26T08:08:23.714",
    "watchLow" : 10.0,
    "watchHigh" : 12.0,
    "warningLow" : 30.0,
    "warningHigh" : 32.0,
    "distressLow" : 40.0,
    "distressHigh" : 42.0,
    "criticalLow" : 60.0,
    "criticalHigh" : 62.0,
    "severeLow" : 80.0,
    "severeHigh" : 82.0,
    "expirationTime" : 1440576558224,
    "expirationTimeUTC" : "2015-08-26T08:08:42.224"
},
"mostSevereValue" : {
    "id" : {
        "name" : "/YSS/SIMULATOR/O2TankTemp"
    },
    "rawValue" : {
        "type" : 2,
        "uint32Value" : 227
    },
    "engValue" : {
        "type" : 2,
        "uint32Value" : 227
    },
    "acquisitionTime" : 1440576556724,
    "generationTime" : 1440576539714,
    "acquisitionStatus" : 0,
    "processingStatus" : true,
    "monitoringResult" : 21,
    "acquisitionTimeUTC" : "2015-08-26T08:08:40.724",
    "generationTimeUTC" : "2015-08-26T08:08:23.714",
    "watchLow" : 10.0,
    "watchHigh" : 12.0,
    "warningLow" : 30.0,
    "warningHigh" : 32.0,
    "distressLow" : 40.0,
    "distressHigh" : 42.0,
    "criticalLow" : 60.0,

```

```

    "criticalHigh" : 62.0,
    "severeLow" : 80.0,
    "severeHigh" : 82.0,
    "expirationTime" : 1440576558224,
    "expirationTimeUTC" : "2015-08-26T08:08:42.224"
  },
  "currentValue" : {
    "id" : {
      "name" : "/YSS/SIMULATOR/O2TankTemp"
    },
    "rawValue" : {
      "type" : 2,
      "uint32Value" : 223
    },
    "engValue" : {
      "type" : 2,
      "uint32Value" : 223
    },
    "acquisitionTime" : 1440577186414,
    "generationTime" : 1440577169410,
    "acquisitionStatus" : 0,
    "processingStatus" : true,
    "monitoringResult" : 21,
    "acquisitionTimeUTC" : "2015-08-26T08:19:10.414",
    "generationTimeUTC" : "2015-08-26T08:18:53.410",
    "watchLow" : 10.0,
    "watchHigh" : 12.0,
    "warningLow" : 30.0,
    "warningHigh" : 32.0,
    "distressLow" : 40.0,
    "distressHigh" : 42.0,
    "criticalLow" : 60.0,
    "criticalHigh" : 62.0,
    "severeLow" : 80.0,
    "severeHigh" : 82.0,
    "expirationTime" : 1440577187914,
    "expirationTimeUTC" : "2015-08-26T08:19:11.914"
  },
  "violations" : 102
}
]
}

```

## Acknowledge Alarm

### HTTP Post to Alarms

```
/{{yamcsInstance}}/api/alarms/acknowledge/{alarmId}/my/qualified/parameter/r
```

## Required Parameters

Parameter	Description
Body	When using Protobuf, send a request body of type `Rest.AcknowledgeAlarmRequest`.

Protobuf definitions:

```
message AcknowledgeAlarmRequest {
    optional string message = 1;
}
```

## Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

## Response

The response can be deserialized as `Rest.AcknowledgeAlarmResponse`.

Protobuf definition:

```
message AcknowledgeAlarmResponse {
    optional string errorMessage = 1;
}
```

## Example

For example to acknowledge the alarm from the previous example:

```
curl -XPOST
http://localhost:8090/simulator/api/alarms/acknowledge/3/YSS/SIMULATOR/O2TANKTEMP
pretty -d '{"message": "bla bla"}'
```

If you get an empty response, the acknowledge was successful:

```
{ }
```

If the alarm could not be acknowledged, you get a message why that is. For instance:

```
{
  "errorMessage" : "Parameter /YSS/SIMULATOR/O2TankTemp is not in state
of alarm"
}
```



## 2.2. Archive

## Fetch Archive Data

Fetches Parameters, Packets, Processed Parameters, Events and/or Command History from the Yamcs Archive. The API of this method is likely to change in the near future.

### HTTP Post

```
/ {yamcsInstance} /api/archive
```

### Required Parameters

Filters are specified in the request body, and should always include at least a `start` and a `stop` value. These are to be encoded in the internal Yamcs time format (use `TimeEncoding` from `yamcs-api`). We might make this configurable in the future.

Parameter	Description
Body	Request body of type 'Rest.RestDumpArchiveRequest'

Protobuf definition:

```
message RestDumpArchiveRequest {
    // Time specification (assumed Yamcs internal time)
    optional int64 start = 1;
    optional int64 stop = 2;

    // Alternative time specification as UTC strings in ISO8601 format
    optional string utcStart = 9;
    optional string utcStop = 10;

    // At least one of the following request types should be added
    optional yamcs.ParameterReplayRequest parameterRequest=3;
    optional yamcs.PacketReplayRequest packetRequest=4;
    optional yamcs.EventReplayRequest eventRequest=5;
    optional yamcs.CommandHistoryReplayRequest commandHistoryRequest=6;
    optional yamcs.PpReplayRequest ppRequest=7;

    // By default the response will be aggregated on the server and only
    // when fully
    // built be sent to the client. This has a limitation of 1MB though.
    // You can circumvent this limitation by enabling the stream-option,
    // see the
    // wiki for more details on this.
    optional bool stream=8;
}
```

### Optional Parameters

Parameter	Description
stream	<p>In practice the Yamcs archive could be very big. Therefore, responses are by default limited to about 1MB. Anything above will generate a server error. If your client is expected to fetch more data than that, you should use this option.</p> <p>Using this option, the response may contain multiple individually delimited JSON messages, therefore your JSON client does not need to wait for the full response before starting processing. For Protobuf clients, the individual message are prefixed with their byte-size (Protobuf is not a self-delimiting message format).</p>

## Response

Protobuff definition:

```
message RestDumpArchiveResponse {
    repeated pvalue.ParameterData parameterData=2;
    repeated yamcs.TmPacketData packetData=3;
    repeated commanding.CommandHistoryEntry command=4;
    repeated yamcs.Event event=5;
    repeated pvalue.ParameterData ppData=6;
}
```

## Example

```
curl -XGET http://localhost:8090/simulator/api/archive -d '{"start": 1425686400, "stop": 1426636800, "commandHistoryRequest": {} }'
```

### 2.3. Commanding

## Validate Command

### HTTP Post

```
/ {yamcsInstance}/api/commanding/validator
```

### Required Parameters

Parameter	Description
Body	Request body of type `Rest.RestValidateCommandRequest`

Protobuf definitions:

```
message RestValidateCommandRequest {
    repeated RestCommandType commands=1;
}
```

```
message RestCommandType {
    optional string origin=1;
    optional int32 sequenceNumber=2;
    optional yamcs.NamedObjectId id=3;
    repeated RestArgumentType arguments=4;
}
```

```
message RestArgumentType {
    optional string name=1;
    optional string value=2;
}
```

### Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

### Response

Empty response means the command was successfully validated.

If the command has a significance, a response is sent with type `Rest.RestValidateCommandResponse`. It contains the command significance.

Protobuf definitions:

```

message RestValidateCommandResponse {
    repeated commanding.CommandSignificance commandsSignificance = 1;
}

```

```

/* this message is sent as response to validate, in case the
significance is defined for a commands*/
message CommandSignificance {
    enum Level {
        none = 1;
        watch = 2;
        warning = 3;
        distress = 4;
        critical = 5;
        severe = 6;
    };
    required int32 sequenceNumber = 1; //the sequence number of the
command sent
    required Level consequenceLevel = 2;
    optional string reasonForWarning = 3;
}

```

## Example

```

curl -XGET http://localhost:8090/simulator/api/commanding/validator?
pretty -d '
{
    "commands": [
        {
            "id": {"name": "/SIMULATOR/SIMULATOR/SWITCH_VOLTAGE_ON"} ,
            "arguments": [{"name": "voltage_num", "value": "5"}]
        }
    ]
}'

```

```

{
    "exception" : {
        "type" : "BadRequestException",
        "msg" : "Cannot assign value to voltage_num: Value 5 is not in the
range required for the type IntegerDataType name:voltage_num
sizeInBits:32 signed: false, validRange: [1,3], encoding:
IntegerDataEncoding(sizeInBits:8, encoding:unsigned,
defaultCalibrator:null byteOrder:BIG_ENDIAN)"
    }
}

```

## Send Command

### HTTP Post

```
/{{yamcsInstance}}/api/commanding/queue
```

### Required Parameters

Parameter	Description
Body	Request body of type `Rest.RestValidateCommandRequest`

Clients are required to specify a unique `sequenceNumber` for every command. The unicity is not currently enforced by the server, since it's basically there to help the client, and not necessarily the server.

Protobuf definitions:

```
message RestSendCommandRequest {  
    repeated RestCommandType commands=1;  
}
```

```
message RestCommandType {  
    optional string origin=1;  
    optional int32 sequenceNumber=2;  
    optional yamcs.NamedObjectId id=3;  
    repeated RestArgumentType arguments=4;  
}
```

```
message RestArgumentType {  
    optional string name=1;  
    optional string value=2;  
}
```

### Optional Parameters

### Response

Will perform validation first, and if successful will queue the command for further dispatching. As soon as it's queued, you get back an empty JSON object `{ }`.

### Example

```
curl -XPOST http://localhost:8090/simulator/api/commanding/queue -d '  
{
```

```
"commands": [
    {
        "id": {"name": "/SIMULATOR/SIMULATOR/SWITCH_VOLTAGE_ON"} ,
        "arguments": [{"name": "voltage_num", "value": "2"}] ,
        "sequenceNumber": 1
    }
]
}'
```

## 2.4. Mission Data Base

## List Parameters

### HTTP Post

```
/ {yamcsInstance}/api/mdb/parameters
```

### Required Parameters

Parameter	Description
Body	Request body of type 'Rest.RestListAvailableParametersRequest'

Protobuf definitions:

```
message RestListAvailableParametersRequest {
    repeated string namespaces=1; // if not available, all the
        namespaces
}
```

### Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

### Response

Protobuf definitions:

```
message RestListAvailableParametersResponse {
    repeated RestParameter parameters=1;
}
```

```
message RestParameterType {
    optional string engType = 1;
    optional string dataEncoding =2; //TODO
    repeated RestUnitType unitSet = 3;
    optional RestAlarmInfo defaultAlarm = 4;
}
```

```
message RestUnitType {
    optional string unit = 1;
}
```

```
message RestAlarmInfo {
    optional int32 minViolations = 1;
    repeated RestAlarmRange staticAlarmRanges = 2;
}
```

```
message RestAlarmRange {
    optional RestAlarmLevel level = 1;
    optional double minInclusive = 2;
    optional double maxInclusive = 3;
    optional string enumerationValue = 4;
}
```

## Example

Retrieve qualified parameter names:

```
curl -XGET http://localhost:8090/simulator/api/mdb/parameters?pretty
```

```
{
  "ids" : [ {
    "name": "/YSS/SIMULATOR/ccsds-apid",
  }, {
    "name": "/YSS/SIMULATOR/packet-type",
  } ]
}
```

Retrieve parameter aliases for specific namespaces:

```
curl -XGET http://localhost:8090/simulator/api/mdb/parameters?pretty -d
'{
  "namespaces": ["MDB:OPS Name"]
}'
```

```
{
  "ids" : [ {
    "name": "SIMULATOR_ccsds-apid",
    "namespace": "MDB:OPS Name"
  } ]
}
```

## Parameter Info

### HTTP Post

```
/ {yamcsInstance}/api/mdb/parameterInfo
```

### Required Parameters

Parameter	Description
Body	Request body of type `Rest.RestGetParameterInfoRequest`

Protobuf definitions:

```
message RestGetParameterInfoRequest {
    repeated yamcs.NamedObjectId list = 1;
}
```

```
message NamedObjectId {
    required string name=1;
    optional string namespace=2;
}
```

### Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

### Response

Response is of type `Rest.RestGetParameterInfoResponse`.

Protobuf definitions:

```
message RestGetParameterInfoResponse {
    repeated RestParameterInfo pinfo = 1;
}
```

```
message RestParameterInfo {
    optional yamcs.NamedObjectId id = 1;
    optional RestNameDescription description = 2;
    optional RestParameterType type = 3;
    optional string dataSource = 4;
}
```

```
message RestNameDescription {  
    optional string qualifiedName = 1;  
    optional string shortDescription = 2;  
    optional string longDescription = 3;  
    repeated yamcs.NamedObjectId aliases = 4;  
}
```

```
message RestParameterType {  
    optional string engType = 1;  
    optional string dataEncoding = 2; //TODO  
    repeated RestUnitType unitSet = 3;  
    optional RestAlarmInfo defaultAlarm = 4;  
}
```

```
message RestUnitType {  
    optional string unit = 1;  
}
```

```
message RestAlarmInfo {  
    optional int32 minViolations = 1;  
    repeated RestAlarmRange staticAlarmRanges = 2;  
}
```

```
message RestAlarmRange {  
    optional RestAlarmLevel level = 1;  
    optional double minInclusive = 2;  
    optional double maxInclusive = 3;  
    optional string enumerationValue = 4;  
}
```

## Example

Get information about a parameter:

```
curl -XGET 'http://localhost:8090/simulator/api/mdb/parameterInfo?  
pretty&name=SIMULATOR_ccsds-apid&namespace=MDB:OPS Name'
```

The result: **TBW**

Get information about a list of parameters:

```
curl -XGET http://localhost:8090/simulator/api/mdb/parameterInfo?pretty  
-d '{  
    "list": [  
        {"name": "SIMULATOR_ccsds-apid",  
         "namespace": "MDB:OPS Name"}  
    ]  
}'
```

The result: **TBW**

## Dump MDB

### HTTP Post

```
/ {yamcsInstance} /api/mdb/dump
```

### Required Parameters

### Optional Parameters

### Response

Return the entire dump of the mission database. This is a very bad method which we would like to make more RESTful and explorable in the future, but for now it returns a java-serialized dump of `org.yamcs.xtce.XtceDb` for the specified yamcs instance. You'll need a dependency on yamcs-xtce to interpret this dump.

### Example

```
curl -XGET http://localhost:8090/simulator/api/mdb/dump?pretty
```

```
{
  "rawMdb": "<blob encoded as Base64>"
}
```

## 2.5. Parameters

## Single Parameter Value

Retrieve single parameter value.

### HTTP Post

```
/ {yamcsInstance} /api/parameter/{parameter fully qualified}
```

### Required Parameters

### Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

### Response

Response is of type `pvalue.ParameterValue`.

Protobuf definitions:

```
message ParameterValue {
    optional yamcs.NamedObjectId id=1;
    optional yamcs.Value rawValue=2;
    optional yamcs.Value engValue=3;
    optional int64 acquisitionTime=4;
    optional int64 generationTime=5;
    optional AcquisitionStatus acquisitionStatus=6;
    optional bool processingStatus=7;
    optional MonitoringResult monitoringResult=8;

    //to be used as alternative to the ones above for clients that do
    not understand internal yamcs time encoding
    optional string acquisitionTimeUTC = 11;
    optional string generationTimeUTC = 12;

    // Not transferring xtce.FloatRange to proto since we actually
    have some logic there
    optional double watchLow = 13;
    optional double watchHigh = 14;
    optional double warningLow = 15;
    optional double warningHigh = 16;
    optional double distressLow = 17;
    optional double distressHigh = 18;
    optional double criticalLow = 19;
    optional double criticalHigh = 20;
    optional double severeLow = 21;
```

```

        optional double severeHigh = 22;
        optional int64 expirationTime = 23;
        optional string expirationTimeUTC = 24;
    }
}

```

```

message Value {
    enum Type {
        FLOAT = 0;
        DOUBLE = 1;
        UINT32 = 2;
        SINT32 = 3;
        BINARY = 4;
        STRING = 5;
        TIMESTAMP = 6;
        UINT64 = 7;
        SINT64 = 8;
        BOOLEAN = 9;
    };
    required Type type=1;
    optional float          floatValue=2;
    optional double         doubleValue=3;
    optional sint32          sint32Value=4;
    optional uint32         uint32Value=5;
    optional bytes           binaryValue=6;
    optional string          stringValue=7;
    optional int64          timestampValue=8;
    optional uint64         uint64Value=9;
    optional sint64          sint64Value=10;
    optional bool            booleanValue=11;
}

```

```

enum AcquisitionStatus {
    ACQUIRED=0; //OK!
    NOT_RECEIVED=1; //no value received so far
    INVALID=2; //some value has been received but is invalid
    EXPIRED=3; //the parameter is coming from a packet which has not
since updated although it should have been
};

```

```

enum MonitoringResult {
    DISABLED=0;
    IN_LIMITS=1;
    // NOMINAL_LIMIT_VIOLATION=2;
    // NOMINAL_LOW_LIMIT_VIOLATION=3;
    // NOMINAL_HIGH_LIMIT_VIOLATION=4;
    // DANGER_LOW_LIMIT_VIOLATION=5;
}

```

```

// DANGER_HIGH_LIMIT_VIOLATION=6;
WATCH=7;
WATCH_LOW=8;
WATCH_HIGH=9;
WARNING=10;
WARNING_LOW=11;
WARNING_HIGH=12;
DISTRESS=13;
DISTRESS_LOW=14;
DISTRESS_HIGH=15;
CRITICAL=16;
CRITICAL_LOW=17;
CRITICAL_HIGH=18;
SEVERE=19;
SEVERE_LOW=20;
SEVERE_HIGH=21;
}

```

## Example

```

curl -XGET
http://localhost:8090/simulator/api/parameter/YSS/SIMULATOR/BatteryVoltage
pretty

```

```

{
  "id" : {
    "name" : "/YSS/SIMULATOR/BatteryVoltage2"
  },
  "rawValue" : {
    "type" : 2,
    "uint32Value" : 244
  },
  "engValue" : {
    "type" : 2,
    "uint32Value" : 244
  },
  "acquisitionTime" : 1429801967511,
  "generationTime" : 1429801951507,
  "acquisitionStatus" : 0,
  "processingStatus" : true,
  "monitoringResult" : 1,
  "acquisitionTimeUTC" : "2015-04-23T15:12:12.511",
  "generationTimeUTC" : "2015-04-23T15:11:56.507"
}

```

## Multiple Parameters Values

Retrieve multiple parameters values.

### HTTP Post

```
/ {yamcsInstance} /api/parameter/_get
```

### Required Parameters

Parameter	Description
Body	Request body of type `Rest.RestGetParameterRequest`

Protobuf definitions:

```
message RestGetParameterRequest {
    repeated yamcs.NamedObjectId list=1;
    optional bool fromCache=2;
    optional uint64 timeout=3; //if not from cache, wait this time (in
    milliseconds) to receive the parameter
}
```

```
message NamedObjectId {
    required string name=1;
    optional string namespace=2;
}
```

### Optional Parameters

Parameter	Description
pretty	If inserted in the request, the JSON result will be formatted in a human readable manner.

#### Body optional parameters:

By default, the parameters are returned after they have been freshly updated (i.e. no cache).

The `timeout` option indicates how long should wait until the call shall return (with partial or no data).

Instead of the timeout, the `fromCache:true` can be used to retrieve parameters from cache (if available).

See **Yamcs Server Manual** for description on how to configure YProcessor parameter cache.

### Response

Response is of type `pvalue.ParameterData`.

Protobuf definitions:

```

message ParameterData {
    repeated ParameterValue parameter=1;

    // the next three fields are used by the recorder as unique key to
    // store parameters in "rows"
    // and also by the components that provide parameters from
    // external sources
    // the time should roughly correspond to the parameter time but
    // can be rounded for better efficiency
    optional string group = 2;
    optional int64 generationTime = 3;
    optional int32 seqNum = 4;
}

```

```

message ParameterValue {
    optional yamcs.NamedObjectID id=1;
    optional yamcs.Value rawValue=2;
    optional yamcs.Value engValue=3;
    optional int64 acquisitionTime=4;
    optional int64 generationTime=5;
    optional AcquisitionStatus acquisitionStatus=6;
    optional bool processingStatus=7;
    optional MonitoringResult monitoringResult=8;

    //to be used as alternative to the ones above for clients that do
    //not understand internal yamcs time encoding
    optional string acquisitionTimeUTC = 11;
    optional string generationTimeUTC = 12;

    // Not transferring xtce.FloatRange to proto since we actually
    // have some logic there
    optional double watchLow = 13;
    optional double watchHigh = 14;
    optional double warningLow = 15;
    optional double warningHigh = 16;
    optional double distressLow = 17;
    optional double distressHigh = 18;
    optional double criticalLow = 19;
    optional double criticalHigh = 20;
    optional double severeLow = 21;
    optional double severeHigh = 22;
    optional int64 expirationTime = 23;
    optional string expirationTimeUTC = 24;
}

```

```

message Value {
    enum Type {

```

```

        FLOAT = 0;
        DOUBLE = 1;
        UINT32 = 2;
        SINT32 = 3;
        BINARY = 4;
        STRING = 5;
        TIMESTAMP = 6;
        UINT64 = 7;
        SINT64 = 8;
        BOOLEAN = 9;
    };

    required Type type=1;
    optional float          floatValue=2;
    optional double         doubleValue=3;
    optional sint32          sint32Value=4;
    optional uint32          uint32Value=5;
    optional bytes           binaryValue=6;
    optional string          stringValue=7;
    optional int64           timestampValue=8;
    optional uint64          uint64Value=9;
    optional sint64          sint64Value=10;
    optional bool            booleanValue=11;
}

```

```

enum AcquisitionStatus {
    ACQUIRED=0; //OK!
    NOT_RECEIVED=1; //no value received so far
    INVALID=2; //some value has been received but is invalid
    EXPIRED=3; //the parameter is coming from a packet which has not
since updated although it should have been
};

```

```

enum MonitoringResult {
    DISABLED=0;
    IN_LIMITS=1;
    // NOMINAL_LIMIT_VIOLATION=2;
    // NOMINAL_LOW_LIMIT_VIOLATION=3;
    // NOMINAL_HIGH_LIMIT_VIOLATION=4;
    // DANGER_LOW_LIMIT_VIOLATION=5;
    // DANGER_HIGH_LIMIT_VIOLATION=6;
    WATCH=7;
    WATCH_LOW=8;
    WATCH_HIGH=9;
    WARNING=10;
    WARNING_LOW=11;
    WARNING_HIGH=12;
    DISTRESS=13;
    DISTRESS_LOW=14;
}

```

```

DISTRESS_HIGH=15;
CRITICAL=16;
CRITICAL_LOW=17;
CRITICAL_HIGH=18;
SEVERE=19;
SEVERE_LOW=20;
SEVERE_HIGH=21;
}

```

## Example

```

curl -XGET http://localhost:8090/simulator/api/parameter/_get?pretty -d
'
{
  "list": [
    {"name":"/YSS/SIMULATOR/Longitude"},  

    {"name":"/YSS/SIMULATOR/Latitude"},  

    {"name":"/YSS/SIMULATOR/Altitude"}]  

  , "timeout":2000}
}

```

```

{
  "parameter" : [ {
    "id" : {
      "name" : "/SIMULATOR/SIMULATOR/Longitude"
    },
    "rawValue" : {
      "type" : 0,
      "floatValue" : -60.55
    },
    "engValue" : {
      "type" : 0,
      "floatValue" : -60.55
    },
    "acquisitionTime" : 1429799497246,
    "generationTime" : 1429799481242,
    "acquisitionStatus" : 0,
    "processingStatus" : true,
    "monitoringResult" : 1,
    "acquisitionTimeUTC" : "2015-04-23T14:31:02.246",
    "generationTimeUTC" : "2015-04-23T14:30:46.242"
  }, {
    "id" : {
      "name" : "/SIMULATOR/SIMULATOR/Latitude"
    },
    "rawValue" : {
      "type" : 0,

```

```
        "floatValue" : 53.3
    },
    "engValue" : {
        "type" : 0,
        "floatValue" : 53.3
    },
    "acquisitionTime" : 1429799497246,
    "generationTime" : 1429799481242,
    "acquisitionStatus" : 0,
    "processingStatus" : true,
    "monitoringResult" : 1,
    "acquisitionTimeUTC" : "2015-04-23T14:31:02.246",
    "generationTimeUTC" : "2015-04-23T14:30:46.242"
}, {
    "id" : {
        "name" : "/SIMULATOR/SIMULATOR/Altitude"
    },
    "rawValue" : {
        "type" : 0,
        "floatValue" : 39759.0
    },
    "engValue" : {
        "type" : 0,
        "floatValue" : 39759.0
    },
    "acquisitionTime" : 1429799497246,
    "generationTime" : 1429799481242,
    "acquisitionStatus" : 0,
    "processingStatus" : true,
    "monitoringResult" : 1,
    "acquisitionTimeUTC" : "2015-04-23T14:31:02.246",
    "generationTimeUTC" : "2015-04-23T14:30:46.242"
}
}
```

## Set Parameter

### HTTP Post

```
/{{yamcsInstance}}/api/parameter/_set
```

### Required Parameters

Parameter	Description
Body	Request body of type `Rest.ParameterData`

Protobuf definitions:

```
message ParameterData {
    repeated ParameterValue parameter=1;

    // the next three fields are used by the recorder as unique key to
    // store parameters in "rows"
    // and also by the components that provide parameters from
    // external sources
    // the time should roughly correspond to the parameter time but
    // can be rounded for better efficiency
    optional string group = 2;
    optional int64 generationTime = 3;
    optional int32 seqNum = 4;
}
```

```
message ParameterValue {
    optional yamcs.NamedObjectID id=1;
    optional yamcs.Value rawValue=2;
    optional yamcs.Value engValue=3;
    optional int64 acquisitionTime=4;
    optional int64 generationTime=5;
    optional AcquisitionStatus acquisitionStatus=6;
    optional bool processingStatus=7;
    optional MonitoringResult monitoringResult=8;

    //to be used as alternative to the ones above for clients that do
    //not understand internal yamcs time encoding
    optional string acquisitionTimeUTC = 11;
    optional string generationTimeUTC = 12;

    // Not transferring xtce.FloatRange to proto since we actually
    // have some logic there
    optional double watchLow = 13;
    optional double watchHigh = 14;
```

```

        optional double warningLow = 15;
        optional double warningHigh = 16;
        optional double distressLow = 17;
        optional double distressHigh = 18;
        optional double criticalLow = 19;
        optional double criticalHigh = 20;
        optional double severeLow = 21;
        optional double severeHigh = 22;
        optional int64 expirationTime = 23;
        optional string expirationTimeUTC = 24;
    }
}

```

```

message Value {
    enum Type {
        FLOAT = 0;
        DOUBLE = 1;
        UINT32 = 2;
        SINT32 = 3;
        BINARY = 4;
        STRING = 5;
        TIMESTAMP = 6;
        UINT64 = 7;
        SINT64 = 8;
        BOOLEAN = 9;
    };
    required Type type=1;
    optional float          floatValue=2;
    optional double         doubleValue=3;
    optional sint32          sint32Value=4;
    optional uint32         uint32Value=5;
    optional bytes           binaryValue=6;
    optional string          stringValue=7;
    optional int64           timestampValue=8;
    optional uint64          uint64Value=9;
    optional sint64          sint64Value=10;
    optional bool            booleanValue=11;
}
}

```

```

enum AcquisitionStatus {
    ACQUIRED=0; //OK!
    NOT_RECEIVED=1; //no value received so far
    INVALID=2; //some value has been received but is invalid
    EXPIRED=3; //the parameter is coming from a packet which has not
since updated although it should have been
};
}

```

```
enum MonitoringResult {
    DISABLED=0;
    IN_LIMITS=1;
    // NOMINAL_LIMIT_VIOLATION=2;
    // NOMINAL_LOW_LIMIT_VIOLATION=3;
    // NOMINAL_HIGH_LIMIT_VIOLATION=4;
    // DANGER_LOW_LIMIT_VIOLATION=5;
    // DANGER_HIGH_LIMIT_VIOLATION=6;
    WATCH=7;
    WATCH_LOW=8;
    WATCH_HIGH=9;
    WARNING=10;
    WARNING_LOW=11;
    WARNING_HIGH=12;
    DISTRESS=13;
    DISTRESS_LOW=14;
    DISTRESS_HIGH=15;
    CRITICAL=16;
    CRITICAL_LOW=17;
    CRITICAL_HIGH=18;
    SEVERE=19;
    SEVERE_LOW=20;
    SEVERE_HIGH=21;
}
```

## Optional Parameters

### Response

Empty response.

### Example

# Chapter 3. WebSocket API

Yamcs provides a WebSocket-API for subscribing to data. A typical use case would be a display tool subscribing to parameter updates. All operations support binary WebSocket frames encoded using Google Protocol Buffers, as well as textual WebSocket frames encoded in JSON. The choice between Protobuf and JSON is currently determined based on the type of the first received client frame. If it's binary, all further message will be Protobuf, if it's text, all further messages will be in JSON.

## Wrapper

Assuming the default `simulator` instance, WebSocket calls should be directed to a URL of the form `http://localhost:8090/simulator/_websocket`. The frame must contain a text array like this: `[x,y,z,{<request-type>:<request>}]` where:

- `x` is the version of the protocol (currently at 1)
- `y` is the message type. One of:
  - 1 Request
  - 2 Reply
  - 3 Exception
  - 4 Data
- `z` is a sequence counter. Basically this allows clients to couple a response with the original request.

### 3.1. Alarm Notices

The `alarms` resource type within the [[ WebSocket API ]] allows subscribing to alarm updates.

We recommend using the LGPL Java WebSocket client distributed as part of the yamcs-api jar, but if that is not an option, this is the protocol:

#### Subscribe to Alarm Notices

Within the WebSocket request envelope use these values:

```
* request-type alarms  
* request subscribe
```

This will make your web socket connection receive updates of the type `ProtoDataType.ALARM`.

Directly after you subscribe, you will also get the active set of alarms – if any.

Here's example output in JSON (with Protobuf, there's an applicable getter in the `WebSocketSubscriptionData`). Notice how we are first getting an `ALARM` of type 1 (`ACTIVE`) that triggered somewhere before we connected, and only then a further update on that alarm of type 4 (`PVAL_UPDATED`) (because the parameter value was updated).

```
[1,2,3]  
[1,4,0,{"dt":"ALARM","data":{"id":0,"type":1,"triggerValue":{"id":
```

```

{
  "name": "/YSS/SIMULATOR/O2TankTemp", "rawValue": 
  {"type": 2, "uint32Value": 227}, "engValue": 
  {"type": 2, "uint32Value": 227}, "acquisitionTime": 1440576556724, "generationT
  08-26T08:08:40.724", "generationTimeUTC": "2015-08-
  26T08:08:23.714", "watchLow": 10.0, "watchHigh": 12.0, "warningLow": 30.0, "warn
  08-26T08:08:42.224"}, "mostSevereValue": {"id": 
  {"name": "/YSS/SIMULATOR/O2TankTemp"}, "rawValue": 
  {"type": 2, "uint32Value": 227}, "engValue": 
  {"type": 2, "uint32Value": 227}, "acquisitionTime": 1440576556724, "generationT
  08-26T08:08:40.724", "generationTimeUTC": "2015-08-
  26T08:08:23.714", "watchLow": 10.0, "watchHigh": 12.0, "warningLow": 30.0, "warn
  08-26T08:08:42.224"}, "currentValue": {"id": 
  {"name": "/YSS/SIMULATOR/O2TankTemp"}, "rawValue": 
  {"type": 2, "uint32Value": 258}, "engValue": 
  {"type": 2, "uint32Value": 258}, "acquisitionTime": 1440576955780, "generationT
  08-26T08:15:19.780", "generationTimeUTC": "2015-08-
  26T08:15:02.777", "watchLow": 10.0, "watchHigh": 12.0, "warningLow": 30.0, "warn
  08-26T08:15:21.280"}, "violations": 65}}]
[1, 4, 1, {"dt": "ALARM", "data": {"id": 0, "type": 4, "triggerValue": {"id": 
  {"name": "/YSS/SIMULATOR/O2TankTemp"}, "rawValue": 
  {"type": 2, "uint32Value": 227}, "engValue": 
  {"type": 2, "uint32Value": 227}, "acquisitionTime": 1440576556724, "generationT
  08-26T08:08:40.724", "generationTimeUTC": "2015-08-
  26T08:08:23.714", "watchLow": 10.0, "watchHigh": 12.0, "warningLow": 30.0, "warn
  08-26T08:08:42.224"}, "mostSevereValue": {"id": 
  {"name": "/YSS/SIMULATOR/O2TankTemp"}, "rawValue": 
  {"type": 2, "uint32Value": 227}, "engValue": 
  {"type": 2, "uint32Value": 227}, "acquisitionTime": 1440576556724, "generationT
  08-26T08:08:40.724", "generationTimeUTC": "2015-08-
  26T08:08:23.714", "watchLow": 10.0, "watchHigh": 12.0, "warningLow": 30.0, "warn
  08-26T08:08:42.224"}, "currentValue": {"id": 
  {"name": "/YSS/SIMULATOR/O2TankTemp"}, "rawValue": 
  {"type": 2, "uint32Value": 280}, "engValue": 
  {"type": 2, "uint32Value": 280}, "acquisitionTime": 1440576962013, "generationT
  08-26T08:15:26.013", "generationTimeUTC": "2015-08-
  26T08:15:09.011", "watchLow": 10.0, "watchHigh": 12.0, "warningLow": 30.0, "warn
  08-26T08:15:27.513"}, "violations": 66}}]

```

## Unsubscribe

Within the WebSocket request envelope use these values:

```
* request-type alarms
* request unsubscribe
```

This will stop your WebSocket connection from getting further alarm updates.

## 3.2. Event Updates

The `events` resource type within the [[ WebSocket API ]] allows subscribing to event updates.

We recommend using the LGPL Java WebSocket client distributed as part of the yamcs-api jar. But for deeper understanding, this is the protocol:

### Subscribe

Within the WebSocket request envelope use these values:

```
* request-type events  
* request subscribe
```

This will make your web socket connection receive updates of the type `ProtoDataType.EVENT`.

Here's example output in JSON (with Protobuf, there's an applicable getter in the `WebSocketSubscriptionData` ).

```
[1,2,3]  
[1,4,0,{"dt":"EVENT","data":  
{"source":"CustomAlgorithm","generationTime":1440823760490,"receptionTime":  
[1,4,1,{"dt":"EVENT","data":  
{"source":"CustomAlgorithm","generationTime":1440823765491,"receptionTime":  
[1,4,2,{"dt":"EVENT","data":  
{"source":"CustomAlgorithm","generationTime":1440823770490,"receptionTime":
```

### Unsubscribe

Within the WebSocket request envelope use these values:

```
* request-type events  
* request unsubscribe
```

This will stop your WebSocket connection from getting further event updates.

### 3.3. Management Updates

The `management` resource type within the [[ WebSocket API ]] groups general Yamcs info that does not fit under a specific other resource type.

We recommend using the LGPL Java WebSocket client distributed as part of the yamcs-api jar, but if that is not an option, this is the protocol:

#### Subscribe to Management Updates

Within the websocket request envelope use these values:

```
* request-type management
* request subscribe
```

This will make your web socket connection receive updates on the following Yamcs data types (aka `ProtoDataType`):

##### CLIENT\_INFO

Updates on a client that is or was connected to Yamcs. Directly after sending a `management/subscribe` request, you will also get an update for all the clients that are connected at that point. As soon as a client is disconnected, you will also get an update on that.

Here's example output in JSON (with Protobuf, there's an applicable getter in the `WebSocketSubscriptionData`), where there are two anonymous clients connected to a non-secured deployment of Yamcs:

```
[1,2,3]
[1,4,1,{"dt":"CLIENT_INFO","data":
{"instance":"simulator","id":1,"username":"unknown","applicationName":"Un
[1,4,2,{"dt":"CLIENT_INFO","data":
{"instance":"simulator","id":3,"username":"unknown","applicationName":"Un
```

After the empty initial ACK, we receive two data messages, one for each connected client at that point. Notice the `currentClient` field which indicates whether this client info concerns your own web socket session. The `state` field indicates either CONNECTED (0) or DISCONNECTED (1). In case the other user would close its connection, we would thus get an update on that too.

##### PROCESSOR\_INFO

Updates on the lifecycle of Yamcs TM/TC processors. Directly after sending a `management/subscribe` request, you will also get an update for all the processors at that point.

Here's an example output in JSON (with Protobuf, there's an applicable getter in the `WebSocketSubscriptionData`), where there is just one processor `realtime`.

```
[1,2,3]
[1,4,0,{"dt":"PROCESSOR_INFO","data":
{"instance":"simulator","name":"realtime","type":"realtime","creator":"sy
```

## PROCESSING\_STATISTICS

General statistics on processors. For every high-level packet, shows you the current processing time, an increasing data count, and many more info. Updates on this data type are a bit noisier than the client\_info/processor\_info updates, so we might decide to move this out to a different subscription request in the future.

Here's an example output in JSON (with Protobuf, there's an applicable getter in the `WebSocketSubscriptionData`):

```
[1,4,3,{"dt":"PROCESSING_STATISTICS","data":
{"instance":"simulator","yProcessorName":"realtime","tmstats":
[{"packetName":"RCS","receivedPackets":2378,"lastReceived":1438235693322,
 {"packetName":"FlightData","receivedPackets":73718,"lastReceived":1438235693322,
 {"packetName":"ccsds-
default","receivedPackets":2378,"lastReceived":1438235693322,"lastPacketT
 {"packetName":"Power","receivedPackets":2378,"lastReceived":1438235693322
 {"packetName":"DHS","receivedPackets":2378,"lastReceived":1438235693322,"

[1,4,4,{"dt":"PROCESSING_STATISTICS","data":
 {"instance":"simulator","yProcessorName":"realtime","tmstats":
 [{"packetName":"RCS","receivedPackets":2378,"lastReceived":1438235693322,
 {"packetName":"FlightData","receivedPackets":73723,"lastReceived":1438235693322,
 {"packetName":"ccsds-
default","receivedPackets":2378,"lastReceived":1438235693322,"lastPacketT
 {"packetName":"Power","receivedPackets":2378,"lastReceived":1438235693322
 {"packetName":"DHS","receivedPackets":2378,"lastReceived":1438235693322,"
```

## Get Client-Info

Within the websocket request envelope use these values:

```
* request-type management
* request getClientInfo
```

This will return you a *one-time* data frame containing your own client info. The format is exactly the same as for the above described subscription updates.

## 3.4. Streams

The `stream` resource type within the [[ WebSocket API ]] groups low-level publish/subscribe operations on [[ Yamses Streams ]].

The documented operations work on one of the built-in streams (like `tm`, `tm_realtime`, `tm_dump`, `pp_realtime`, `cmdhist_realtime`, etc). Or, if your Yamses deployment defines any other streams, they would work as well.

We recommend using the LGPL Java WebSocket client distributed as part of the yamses-api jar, but for deeper understanding, this is the protocol:

### Subscribe to a Stream

Within the websocket request envelope use these values:

- \* `request-type stream`
- \* `request subscribe`
- \* `data`
- \* With Protobuf: an object of type `Yamses.StreamSubscribeRequest` where at least the `stream` name is filled in.
- \* With JSON: an object literal where at least the `stream` key is set.

Here's a full request example in JSON-notation

```
[1,1,3,{"stream": "subscribe", "data": {"stream": "tm_realtime"}}]
```

We are thinking of maybe adding other options, like a way to limit the data by filtering on one of the stream's columns, but this is pending an actual use case.

As a result of the above call you will get updates whenever anybody publishes data to the specified stream. With Protobuf, the data can be fetched with the `getStreamData()`-method on in the `WebSocketSubscriptionData` object. With JSON, you might see something like this sample output:

```
[1,2,3]
[1,4,0,{"dt":"STREAM_DATA","data":
{"stream":"tm_realtime","columnValue":[{"columnName":"gentime","value":
{"type":6,"timestampValue":1438608491320}}, {"columnName":"seqNum","value":{"type":3,"sint32Value":134283264}}, {"columnName":"rectime","value":
{"type":6,"timestampValue":1438608508323}}, {"columnName":"packet","value":
{"type":4,"binaryValue":"CAEAAAAPQuou2FJFAAAABOcAAAAAAA=="}}]}]
[1,4,1,{ "dt": "STREAM_DATA", "data": {
"stream": "tm_realtime", "columnValue": [{"columnName": "gentime", "value": {"type": 6, "timestampValue": 1438608491320}}, {"columnName": "seqNum", "value": {"type": 3, "sint32Value": 134283264}}, {"columnName": "rectime", "value": {"type": 6, "timestampValue": 1438608508323}}], "type": "STREAM_DATA"}]}
```

```
{
  "type": 6, "timestampValue": 1438608508323} },
  {"columnName": "packet", "value": 
    {"type": 4, "binaryValue": "CAEAAAAPQuou2FJFAAAABOcAAAAAAA=="}}] } ] }
```

In the case we were receiving some simulated data from the `tm_realtime` stream, this is a built-in stream with columns `gentime`, `rectime`, `seqNum` and `packet`. This last column is of binary format (it's the raw TM packet), which is why it is Base64-encoded in the JSON output.

Other streams would have different columns.

## Publish to a Stream

Within the websocket request envelope use these values:

- \* `request-type` `stream`
- \* `request` `publish`
- \* `data`
- \* With Protobuf: an object of type `Yamcs.StreamData` where the `stream` key is set to the targeted stream, and where column-values are added for every column of that stream's definition.
- \* With JSON: an object literal where the `stream` key is set to the targeted stream, and where `columnValue` is an array of `columnName - value` literals.

The provided type has to match the type of the actual stream's definition.

Here's a full publish-request to the `tm_realtime`-stream in JSON-notation. Notice the similarities with the return type on the subscribe-operation.

```
[1,1,3,{"stream":"publish","data": 
  {"stream":"tm_realtime","columnValue": [{"columnName": "gentime", "value": 
    {"type": 6, "timestampValue": 1438608491320}}, 
    {"columnName": "seqNum", "value": {"type": 3, "sint32Value": 134283264}}, 
    {"columnName": "rectime", "value": 
      {"type": 6, "timestampValue": 1438608508323}}, 
    {"columnName": "packet", "value": 
      {"type": 4, "binaryValue": "CAEAAAAPQuou2FJFAAAABOcAAAAAAA=="}}] } ] }
```

As a result of the above call the server will write that data to the requested stream (hence notifying anybody that might be subscribed to that stream), and return with just an empty ACK:

```
[1,2,3]
```