MOPS

1 Inhalt

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3 Introduction

MOPS (MIB oriented protocol service) is a protocol based on HTTP to transfer MIB data (Management Information Base). The content of the HTTP message is XML, see section Data Format. MOPS is a stateless protocol.

4 Motivation

Nowadays SNMP as a Network Management Protocol is ubiquitous. Therefore MOPS is designed to allow an easy transition from MIB based SNMP implementations. While SNMP uses UDP as a transport protocol and a binary data format, MOPS allows lightweight client frameworks built around HTTP to access MIB information. Moreover the protocol offers significant performance improvements: SNMP packets are limited to the maximum transmission unit (MTU), the largest frame size allowed for a single frame on your network. Therefore requesting large chunks of data results in a series of requests/responses, which is critical in networks with high latency or high packet loss. MOPS does not underlie such size restrictions and therefore the complete request is transferred before being processed by the server. Having complete requests allows the server to optimize data processing, such as setting locks on a database, pipelining operations, etc.

5 Protocol Flow

The abstract Mops flow illustrated in Figure 1 describes the interaction between the Client and Server and includes the following steps:

1) The client requests the MOPS data from the server and authenticates by presenting credentials with Basic Authentication.

2) The resource server validates the credentials, and if valid, serves the request.

6 Message Types

This protocol is based on HTTP/1.1. The client and the server exchange HTTP request/response messages. This section defines the message types in detail.

6.1 MOPS Request Message

Method:

Resource: /mops

Header:

Content:
See section Data Format.

6.2 MOPS Response Message

Header:

Content:
See section Data Format.

7 Data Format

The data format is modelled as XML-Schema, see MOPS XML Schema (mops.xsd).

The format is based on Netconf which defines a basic RPC structure to modify the configuration data of an SNMP agent. The netconf:rpcOperationType is substituted with mib:mibOperation. The netconf:rpcResponseType is substituted with mib:rpcResponseType. The section represents a mapping from SNMP/MIB data to MOPS/XML data.

7.1 Protocol Operations

- get-config
- edit-config

7.1.1 get-config

Request data from the MOPS server.

7.1.1.1 Request

Request message.

Required data:

Source: Name of the configuration datastore being queried

- running-config

MIBData: This element contains the requested MIB data. See schema documentation for details.

7.1.1.2 Response

Response message to a Request data from the MOPS server.
Request.

MIBData: This element contains the requested data. The response must contain all requested elements in order. Elements may contain error attributes, see Error Handling.

7.1.1.3 Examples

7.1.1.3.1 Scalar Request

Example to request *sysDescr*.0:

Request

Response

7.1.1.3.2 Table Request

Example to request ifAdminStatus for all entries:

Request

Response

7.1.2 edit-config

Set data on the MOPS server in the running-config. The element of a specifies which entry should be updated. To be compatible to SNMP, if the set fails with an error, further processing stops.

7.1.2.1 Request

Request message.

Required data:

MIBData: This element contains the MIB data to be modified. See schema documentation for details.

7.1.2.2 Response

RPC ok element, if the processing contains no error. In case of an error, the response contains all elements until the element causing the error. The error element is the last element which contains the error code, see Error Handling.

7.1.2.3 Examples

7.1.2.3.1 Scalar Update

This example set the value for sysLocation.0 to the hex value 0x4D (character “M”).

Request

Response

7.1.2.3.2 Table Update

This example set the value for ifAdminStatus.5 to the value 2 (down).

Request

Response

7.1.2.3.3 Table Create

An element is required to execute a create statement.

Add an entry to the vacmViewTreeFamilyTable.
The index of the new entry is “1.65.3.1.3.6”, the new entry is created with 5 (createAndWait).

Request

Response

7.1.2.3.4 Table Delete

Delete an entry from the vacmViewTreeFamilyTable.
The index of the entry is “1.65.3.1.3.6”, the entry is deleted with 6 (destroy).

Request

Response

7.2 Mapping of SNMP data types

Name	Mapping	Example
OCTET STRING	Hex value, blank as separator	“41 43”
NUMBER	Number	“3”
OBJECT IDENTIFIER	Object Identifier	“1.3.6”
IP ADDRESS	Ip Address (Host notation)	“127.0.0.1”

8 Request Processing

The MOPS server must process nodes of a MOPS request in order of request appearance.

9 Error Handling

Any other method except “POST” of a request results in a reply with a status code 405 “Method Not Allowed” response. This response must contain the parameter with “Allow: POST”

A syntax or a semantic error in the data section of a request results in a reply with a status code 400 “Bad Request”. The data should contain a text with some hints to the error.

Context-sensitive errors are returned in the MOPS response. elements may contain an attribute.

10 SNMP Extended Error Handling

To support extended error handling, the parameter can be returned in the response element.

11 Security considerations

11.1 Authentication

MOPS utilizes HTTP Basic Authentication.
The MOPS request must include the basic authentication credentials to access the protected resource.

If the request is successful, the first line of the response is:

If access to the resource (/mops) is forbidden, the response is:

11.2 Authorization

Authorization to specific objects may be restricted by the underlying SNMP security model (e.g. VACM). The response elements may contain the error *NoSuchAccess* in that case.

11.3 Transport Security

Security depends on the transport protocol (HTTP or HTTPS). HTTPS with TLS is recommended.

12 Appendix

12.1 MOPS XML Schema (mops.xsd)