# What MIB Document Editors need to know

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# What MIB Document Editors Need to Know About

• SNMP

• the MIB,

• MIB Modules and

• MIB Documents

### Agenda

- SNMP and MIB context/background
- When does it make sense to define a MIB module for a protocol?
- Scope and Content of a MIB document.
- What tools are available to check/review MIB modules?
- What are the I-D checklist items related to MIB documents?
- What is a MIB doctor? When do I need one, and how do I find one?
- How to get MIB expertise in the WG?

# **SNMP** Message Format



- The Varbinds are (your) MIB objects
- Can be from multiple MIB modules
- MIB modules are defined using the SMI (structure of Management Information) data modeling language

# **SNMP** Status and Versions

- SNMP Message Wrappers:
  - SNMPv1
  - SNMPv2c
  - SNMPv3
- SNMP Protocol Operations (PDUs):
  - SNMPv1 Protocol Operations
  - SNMPv2 Protocol Operations
- Structure of Management Information (SMI):
  - SMIv1
  - SMIv2

# SNMP Status – version 1

- SNMPv1 message wrapper
  - no Security,
  - i.e. community string (plain text password)
- SNMPv1 Protocol Operations
  - GET,GETNEXT,
  - SET
  - GETRESPONSE,
  - TRAPv1
- SMIv1 data types
  - MIB Modules in SMIv1 format

# SNMP Status – version 1 (cont)

- SNMPv1 (Full) Internet Standard
  - ===→ but now **HISTORIC**
- RFC1157 (STD 15) === $\rightarrow$  but now **HISTORIC** 
  - Specifies Message Wrapper
  - Specifies Protocol Operations (PDUs)
- SMIv1 (Full) Internet Standard
  - RFC1155 and RFC1212 (STD16)
  - RFC1215 (informational)
- MIB II (Full) Internet Standard
  - RFC 1213 (STD 17)
  - Various Other MIB Documents (Proposed and Draft Stds)

# SNMP Status – version 2c

- message wrapper
  - no Security (community string (plain text password))
- SNMPv2 Protocol Operations
  - Improved PDU error codes, exceptions
  - GET, GETNEXT, GETBULK
  - SET
  - GETRESPONSE
  - TRAPv2, INFORMS
- SMIv2 data types
  - Textual Conventions
  - Conformance
  - MIB Modules in SMIv2 format

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# SNMP Status – v2c (continued)

- SNMPv2c Mixed Standardization Levels
  - RFC1901 experimental === $\rightarrow$  but now **HISTORIC** 
    - Specifies Message Wrapper
  - RFC3416 (STD)
    - Specifies Protocol Operations (PDUs)
  - RFC3417 (STD)
    - Specifies Transport Mappings
- SMIv2 (Full) Internet Standard (STD 58)
  - RFC2578 SMIv2
  - RFC2579 Textual Conventions for SMIv2
  - RFC2580 Conformance Statements for SMIv2
- Various MIB Modules
  - RFC3418 (STD) and many others

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#### **SNMP Status - Architecture**

- SNMP Architecture
  - Modular Approach, Extensible
  - Multiple Security Protocols/Mechanisms
  - View Based Access Control Model
  - Coexistence of multiple SNMP versions
    - Specifically SNMPv1, SNMPv2c, SNMPv3
    - Also future versions (if any)
  - Remotely Configurable via SNMP
    - users and their security mechanisms/secrets
    - access to MIB objects
    - notification destinations and filtering
    - proxy configuration

# SNMP Status – version 3

- SNMPv3 message wrapper
  - Real Message Security
  - User Based Security Model
    - Authentication (SHA-1 and MD5)
    - Privacy (CBC-DES encryption)
  - Allows 3 security Levels
    - not Authenticated, no Privacy (same as SNMPv1/v2c)
    - authenticated but no Privacy
    - authenticated with Privacy
  - Replay protection (limited)
  - Message level error reporting (Reports)
  - Scoped PDU allows for Multiple Contexts

#### SNMP Status – version 3 (cont)

- SNMPv3 (full) Internet Standard (STD 62)
  - RFC3410 Introduction (Informational)
  - RFC3411 Architecture
  - RFC3412 Message Processing
  - RFC3413 Applications
  - RFC3414 User Based Security Model
  - RFC3415 View-Based Access Control Model
  - RFC3416 Protocol Operations
  - RFC3417 Transport Mappings
- SMIv2 (Full) Internet Standard (STD 58)
  - RFC2578 SMIv2
  - RFC2579 Textual Conventions for SMIv2
  - RFC2580 Conformance Statements for SMIv2 2006-July-9 IETF 66

# SNMP Status – version 3 (cont)

- Various MIB Modules (full Internet Standard)
  - RFC3411 SNMP-FRAMEWORK-MIB
  - RFC3412 SNMP-MPD-MIB
  - RFC3413 3 MIB modules
    - SNMP-TARGET-MIB
    - SNMP-NOTIFICATION-MIB
    - SNMP-PROXY-MIB
  - RFC3414 SNMP-USER-BASED-SM-MIB
  - RFC3415 SNMP-VIEW-BASED-ACM-MIB
  - RFC3418 SNMPv2 MIB
  - and many others at various standards levels
- SNMP Co-existence (BCP)
  - RFC3584 SNMP-COMMUNITY-MIB

# SNMP Status – SNMPv3 Features

- Comes with Modular and Extensible Architecture
- Improved SNMPv2 Operations
  - GetBulk, Inform
  - Better error Codes and Exception Codes
- Security and Access Control to MIB objects
- Remote Configuration of SNMP Engine
- Coexistence with SNMPv1 and SNMPv2c

# IETF Information/Data Modeling

- We have SMI as our Data Modeling Language
  - Used to write MIB modules
- Would be good to also do an Information Model first (I.e. BEFORE we write a MIB module)
  - See RFC3444: On the Difference between Information Models and Data Models
  - We (IETF) have no consensus on a formal language to do so (or so I believe)
  - Could be done using plain English too, see RFC3290 (An Informal Management Model for Diffserv Routers) as an example.

#### Summary so far

- We have:
  - SNMP Messages (Snmpv3)
  - SNMP Protocol Operations (PDUs: GET, GETNEXT, GET-RESPONSE, SET, TRAPv2 INFORM) containing varBinds (MIB objects)
  - Structure of Management Information (SMIv2) used to define MIB modules
  - One MIB, composed of many MIB Modules
- MIB document defines one (or more) MIB modules.

# When to define a MIB module for a protocol?

- The Internet Standard for NM is SNMPv3
- That means (a) MIB module(s) needed for devices, protocols and applications that we want to manage with SNMP
- In principle we (IETF) want all new technologies from IETF to be (SNMP) manageable

# When to define a MIB module for a protocol?

- In principle that means MIB work in the technology specific WG
- At a Minimum we want monitoring and notification of faults in functionality.
- Control (write access) is often handy but not mandatory
- Configuration (write and create access) not mandatory, but fine if you want it.

#### MIB Module scope/content

- Specify those MIB objects that operators need/want for:
  - Monitoring
  - Control
  - Configuration
- Think first about what needs to be managed and how such managed objects can help deployment and operations.
- Probably do NOT want to specify objects for debugging protocol implementation.
- Re-use objects and Textual Conventions when possible. See:

- http://www.ops.ietf.org/mib-common-tcs.html

#### MIB Module scope/content

- Be clear in DESCRIPTION clauses so a (new) reader/implementer can properly inplement
- Be clear in DESCRIPTION clauses so all behavior is deterministic (for example persistence of writable objects)
- Add proper/good REFERENCE clauses
- Think about a good (or possibly multiple) MODULE-COMPLIANCE statement(s).
  - Allow for read-only (monitoring) compliance
  - Allow for full (monitoring/control/configuration) compliance
  - Allow for subset compliance if that makes sense.

# Tools to check/review MIB modules

- Mstrip to extract MIB
- SMICng to compile/syntax check
  - Commercial product
- SMIlint to compile/syntax check etc
  - Free, plus mail service
- There are others
- Idnits script: <u>http://ietf.levkowetz.com/tools/idnits/</u>
- <u>http://www.ops.ietf.org/mib-review-tools.html</u>

# Checklist items for MIB documents

• MIB Review Guidelines:

– RFC4181

- Seems a big document (40 pages), but it has a two page step by step list of checkpoints (Appendix A)
- Rest of doc is details and clarifications
  - Good to read through before writing MIB doc
  - Then use Appendix A for checking and rest as reference and explanatory text.

# Checklist items for MIB documents

- 1.) I-D Boilerplate
- 2.) Abstract
- 3.) MIB Boilerplate
  - www.ops.ietf.org/mib-boilerplate.html
- 4.) IPR notice
- 5.) References
- 6.) Security Considerations Section
  - www.ops.ietf.org/mib-security.html

# Checklist items for MIB documents

- 7.) IANA Considerations Section
- 8.) Copyrights
- 9.) Other issues
  - http://www.ietf.org/ID-Checklist.html
- 10.) Technical content
  - Including MIB SYNTAX check (compile)
  - http://www.ops.ietf.org/mib-review-tools.html

#### MIB doctor

- AD Selected SNMP/MIB expert
- Commits to MIB review and Mentoring
- Reviews MIB documents upon AD request or sometimes spontaneous.
  - Can do early review and help/guide
  - Always does a MIB Doctor review after WG Last Call, (preferably) before IETF Last Call
- Can function as a SNMP/MIB Advisor to a WG

#### MIB doctor

- In role as SNMP/MIB Advisor to WG:
  - Is not supposed to be writing the MIB document(s)
  - Is often not very familiar with the technology
  - Can help find other MIB modules/objects for re-use
  - Can help to construct proper MIB tables
- But the WG and MIB document Editor MUST:
  - do the work
  - Must be willing to translate the technology into a Data Model that can be represented in a MIB module.
  - Often that uncovers problems/issues with the protocol and/or technology specification.

# MIB expertise – how to find it

- send a request to OPS AD Dan Romascanu if you need an SNMP/MIB Advisor (copy your own AD)
- Send a request to OPS AD Dan Romascanu if you have a MIB doc ready for MIB Doctor review.
  - Make sure to first check against MIB review guidelines
  - Copy your own AD
- Ask for help on <u>ietf-mib@ops.ietf.org</u> where you may find people with SNMP/MIB skills and interest in your protocol/technology.

# How can I motivate my WG comrades to care about MIB documents?

- Once you know how to do a MIB it is FUN
- It helps to better understand your own protocol or technology
- Users (Operators) of your protocol will be happy to hear it is manageable from the start as opposed to management being an afterthought