SNMPv2

OVERVIEW:

LIMITATIONS OF SNMPv1

HISTORY OF SNMPv2
  • HIERARCHIES
  • SECURITY

SNMPv2 PROTOCOL OPERATIONS

TRANSPORT INDEPENDENCE

RFCs

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LIMITATIONS OF SNMPv1

- LIMITED ERROR CODES
- LIMITED NOTIFICATIONS
- LIMITED PERFORMANCE
- TRANSPORT DEPENDENCE
- LACK OF HIERARCHIES
- LACK OF SECURITY
HIERARCHIES: ORIGINAL IDEA

MANAGER TO MANAGER (M2M) MIB

- STANDARD MIB APPROACH
- LIMITED FUNCTIONALITY
- RUN-TIME BEHAVIOUR MUST BE DEFINED AT IMPLEMENTATION TIME
HIERARCHIES: STATUS

WORK HAS MOVED TO A SEPARATE DISTRIBUTED MANAGEMENT GROUP (DISMAN)

THREE APPROACHES ARE STANDARDIZED:

- MIB BASED (EXPRESSION, EVENT AND NOTIFICATION LOG MIB)
- SCRIPT BASED (SCRIPT AND SCHEDULE MIB)
- REMOTE OPERATIONS BASED (REMOPS MIB)
SNMPv2 SECURITY: WHAT HAPPENED?

APRIL 1993:
PROPOSED STANDARD
FOUR EDITORS
SECURITY BASED ON PARTIES
FIRST PROTOTYPES APPEARED SOON

JUNE 1995:
PROPOSED STANDARD REJECTED BY TWO OF THE ORIGINAL EDITORS!

AUGUST 1995:
GENERAL AGREEMENT THAT PARTY BASED MODEL WAS TOO COMPLEX!
MANY NEW PROPOSALS APPEARED:
• SNMPv2C: COMMUNITY BASED
• SNMPv2U: USER BASED
• ...

1997:
NEW SNMPv3 WORKING GROUP WAS FORMED
WITH NEW EDITORS
SNMPv2 PROTOCOL OPERATIONS

- `getNext`
- `getBulk`
- `get`
- `set`
- `response`
- `trap`
- `inform`
GET

SIMILAR TO SNMPv1, EXCEPT FOR "EXCEPTIONS"

POSSIBLE EXCEPTIONS:
- noSuchObject
- noSuchInstance

EXCEPTIONS ARE CODED WITHIN THE VARBINDS

EXCEPTIONS DO NOT RAISE ERROR STATUS AND INDEX
GET EXAMPLES

get(7)
response(error-status => noError, 7 => noSuchObject)

get(7.1)
response(error-status => noError, 7.1 => noSuchInstance)

get(7.1.9)
response(error-status => noError, 7.1.9 => noSuchInstance)

get(7.2)
response(error-status => noError, 7.2 => noSuchObject)

get(7.4.0)
response(error-status => noError, 7.4.0 => noSuchObject)

get(7.1.0, 7.4.0)
response(error-status => noError, 7.1.0 => 192.168.101.102, 7.4.0 => noSuchObject)
GET-NEXT

SIMILAR TO SNMPv1, EXCEPT FOR "EXCEPTIONS"

POSSIBLE EXCEPTIONS:
- endOfMibView

EXAMPLE
getNext(7.4.0)
response(error-status => noError, 7.4.0 => endOfMibView)
GET-BULK

NEW IN SNMPv2

TO RETRIEVE A LARGE NUMBER OF VARBINDS

IMPROVES PERFORMANCE!
GETBULK PERFORMANCE

Source: Steve Waldbusser, Carnegie-Mellon University
Figures based on original (party based) SNMPv2

NO SECURITY

WITH AUTHENTICATION

WITH ENCRYPTION
**GET-BULK**

**getBulk** REQUEST HAS TWO ADDITIONAL PARAMETERS:

- non-repeators
- max-repetitions

- THE FIRST N ELEMENTS (non-repeators) OF THE VARBIND LIST ARE TREATED AS IF THE OPERATION WAS A NORMAL **getnext** OPERATION

- THE NEXT ELEMENTS OF THE VARBIND LIST ARE TREATED AS IF THE OPERATION CONSISTED OF A NUMBER (max-repetitions) OF REPEATED **getnext** OPERATIONS
GET-BULK

REQUEST (non-repeaters = N; max-repetitions = M; 
VariableBinding-1; ... ; VariableBinding-N; VariableBinding-(N+1); ... ; VariableBinding-(N+R))

RESPONSE (N-TIMES 
VariableBinding-1; ... ; VariableBinding-N; VariableBinding-(N+1); ... ; VariableBinding-(N+R) 

1st LEXICOGRAPHICAL SUCCESSOR

VariableBinding-(N+1); ... ; VariableBinding-(N+R) 

2nd LEXICOGRAPHICAL SUCCESSOR

VariableBinding-(N+1); ... ; VariableBinding-(N+R) 

3rd LEXICOGRAPHICAL SUCCESSOR

VariableBinding-(N+1); ... ; VariableBinding-(N+R) 

... 

Mth LEXICOGRAPHICAL SUCCESSOR

VariableBinding-(N+1); ... ; VariableBinding-(N+R) 

M-TIMES)
GET-BULK EXAMPLE

getBulk(max-repetitions = 4; 7.1)

response(
    7.1.0 => 192.168.101.102
    7.2.1.0 => printer-1
    7.2.2.0 => 123456
    7.3.1.1.2.1 => 2
)

getBulk(max-repetitions = 3; 7.3.1.1; 7.3.1.2; 7.3.1.3)

response(
    7.3.1.1.2.1 => 2; 7.3.1.2.2.1 => 1; 7.3.1.3.2.1 => 2
    7.3.1.1.3.1 => 3; 7.3.1.2.3.1 => 1; 7.3.1.3.3.1 => 3
    7.3.1.1.5.1 => 5; 7.3.1.2.5.1 => 1; 7.3.1.3.5.1 => 2
)
SIMILAR TO SNMPv1

CONCEPTUAL TWO PHASE COMMIT:
- PHASE 1: PERFORM VARIOUS CHECKS
- PHASE 2: PERFORM THE ACTUAL SET

MANY NEW ERROR CODES ARE DEFINED
## NEW ERROR CODES FOR SETS

<table>
<thead>
<tr>
<th>SNMPv1</th>
<th>SNMPv2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHASE 1:</strong></td>
<td></td>
</tr>
<tr>
<td>badValue</td>
<td>wrongValue</td>
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<td>inconsistentValue</td>
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<td>notWritable</td>
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<td>noCreation</td>
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<td>noSuchName</td>
<td>inconsistentName</td>
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<tr>
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<td>resourceUnavailable</td>
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<tr>
<td>genErr</td>
<td>genErr</td>
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<tr>
<td><strong>PHASE 2:</strong></td>
<td></td>
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<tr>
<td>genErr</td>
<td>CommitFailed</td>
</tr>
<tr>
<td>genErr</td>
<td>undoFailed</td>
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</tbody>
</table>
TRAP

SNMPv1:
- COLD START
- WARM START
- LINK DOWN
- LINK UP
- AUTHENTICATION FAILURE
- EGP NEIGHBOR LOSS

SNMPv2:
- MIBs MAY NOW INCLUDE NOTIFICATION TYPE MACROS
- FIRST TWO VARBINDS: sysUptime AND snmpTrapOID
- USES SAME FORMAT AS OTHER PDUs
EXAMPLE OF NOTIFICATION TYPE MACRO

linkUp  NOTIFICATION-TYPE
OBJECTS   {iflIndex}
STATUS    current
DESCRIPTION "A linkUp trap signifies that the entity has detected that the ifOperStatus object has changed to Up"

::= {snmpTraps 4}
CONFIRMED TRAP

ORIGINALLY TO INFORM A HIGHER LEVEL MANAGER

SAME FORMAT AS TRAP PDU

POSSIBLE ERROR: tooBig
NEW PDU TO SIGNAL PROTOCOL EXCEPTIONS / ERRORS

NO SEMANTICS DEFINED IN SNMPv2
TRANSPORT DEPENDANCE

SNMPv1:
- UDP

SNMPv2:
- UDP
- CLNS (OSI)
- DDP (APPLETALK)
- IPX
SNMPv2 RFCs

COMMUNICATION MODEL

- FULL STANDARD
- RFC 3416, RFC3417

SECURITY MODEL - SNMPv2C:

- COMMUNITY BASED SNMP
- SAME ‘SECURITY MECHANISMS’ AS SNMPv1
  - HISTORIC
  - RFC 1901

SECURITY MODEL - SNMPv2U:

- USER BASED SECURITY (AUTHENTICATION / ENCRYPTION / ACCESS CONTROL)
  - HISTORIC
  - RFC 1909, RFC1910
SNMPv2 - SUMMARY

IMPROVED COMMUNICATION MODEL
• TRAPS HAVE SAME FORMAT AS OTHER PDUS
  • GET-BULK PDU
  • ADDITIONAL ERROR CODES FOR SETS

TWO SECURITY MODELS
• SNMPv2C: COMMUNITY BASED
  • SNMPv2U: USER BASED
  • BOTH ARE NOW HISTORIC

SECURITY AND HIERARCHIES TO SNMPv3 & DISMAN