

# NET311

## Computer Network Management

### SNMPv2

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# Acknowledgements

- Notes are based on slides of:
  - Network Management: Principles and Practice, 2E, Mani Subramanian.

# Overview

- SNMPv2 major changes
- Get-bulk request and information-request
- SNMP MIB modifications
- Incompatibility with SNMPv1
- Proxy server
- Bilingual manager

# SNMPv2 Major Changes

- Bulk data transfer
- Manager-to-manager message
- Enhancements to SMI: SMIv2
  - Module definitions: MODULE-IDENTITY macro
  - Object definitions: OBJECT-TYPE macro
  - Trap definitions: NOTIFICATION-TYPE macro
- Textual conventions
- Conformance statements
- Row creation and deletion in table
- MIB enhancements
- Transport mappings

# SNMPv2 Major Changes

- Security features, originally to be in SNMPv2 moved to SNMPv3
- Like SNMPv1, SNMPv2 is community-based administrative framework

# SNMPv2 Internet Group

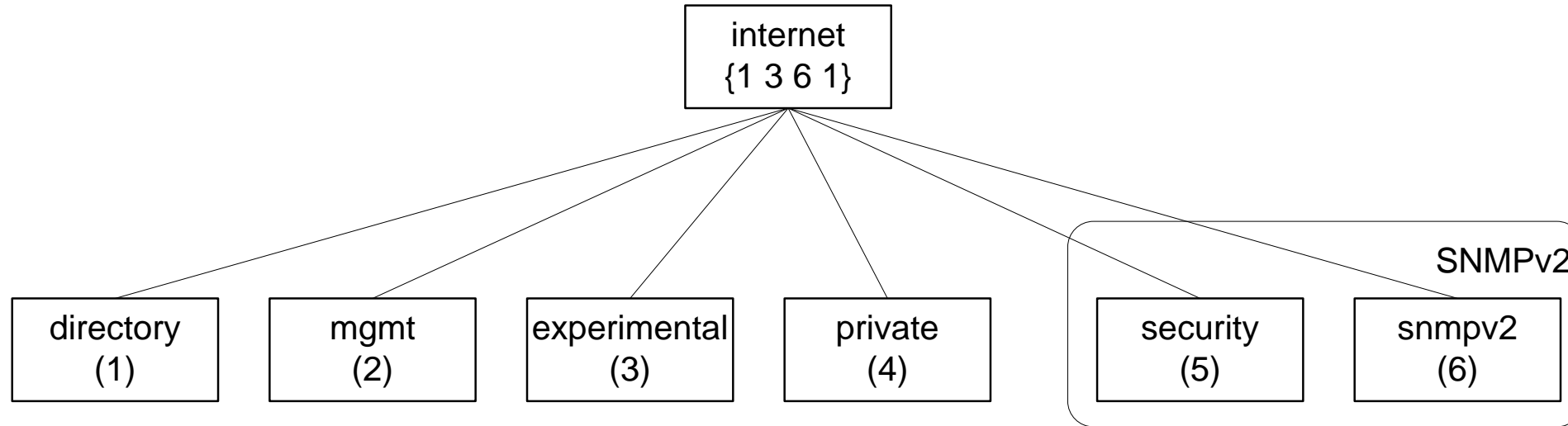
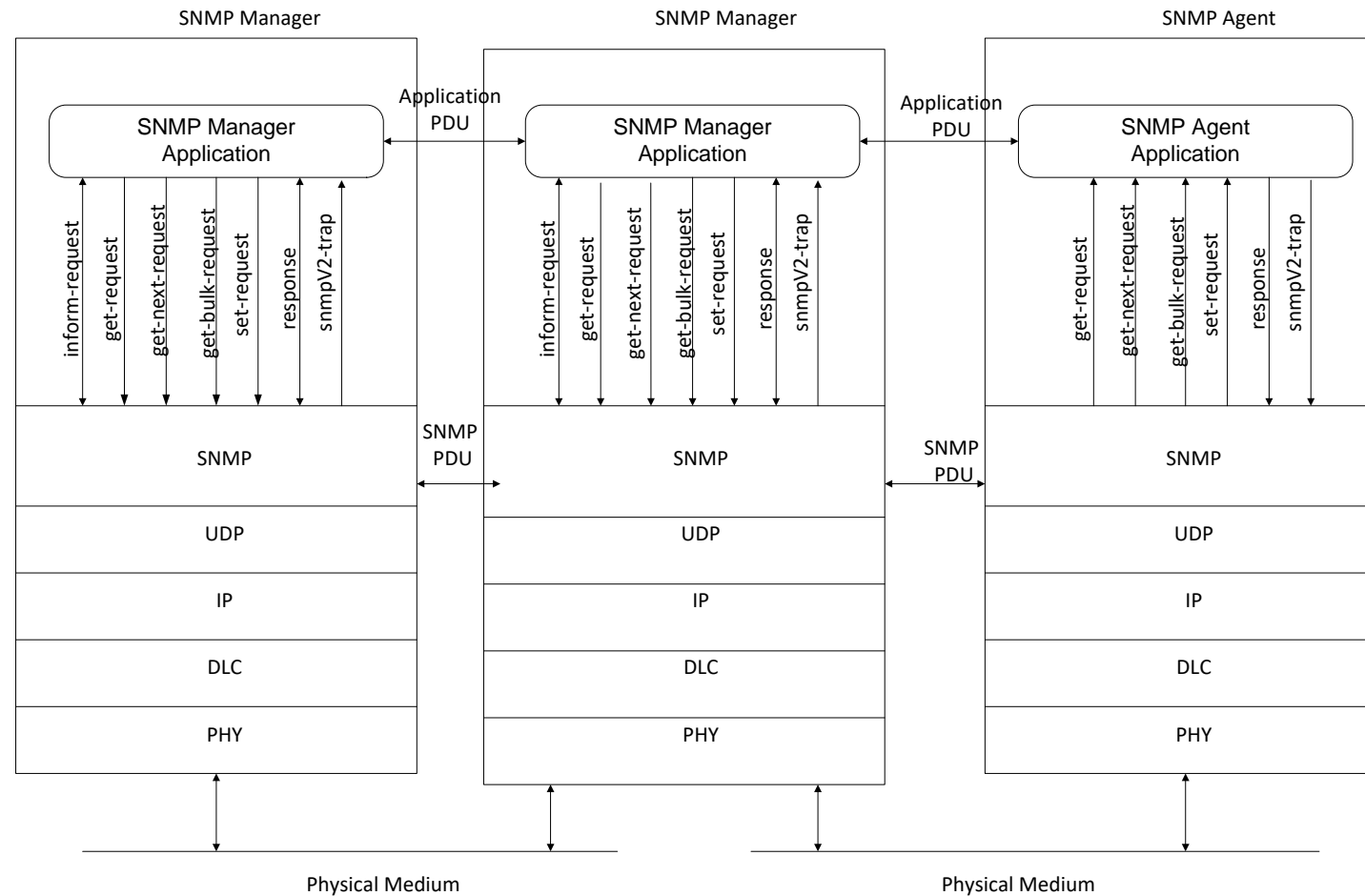


Figure 6.1 SNMPv2 Internet Group

- Objects added to System group
- Extensive modification of the SNMP group
- Additional SNMPv2 group added
- Security group is a placeholder

# SNMPv2 NM Architecture



**Figure 6.2 SNMPv2 Network Management Architecture**

# SNMPv2 New Messages

Message	Comments
inform-request	Manager-to-manager message
get-bulk-request	Transfer of large data
Report	Not used



# SNMPv2 MIB

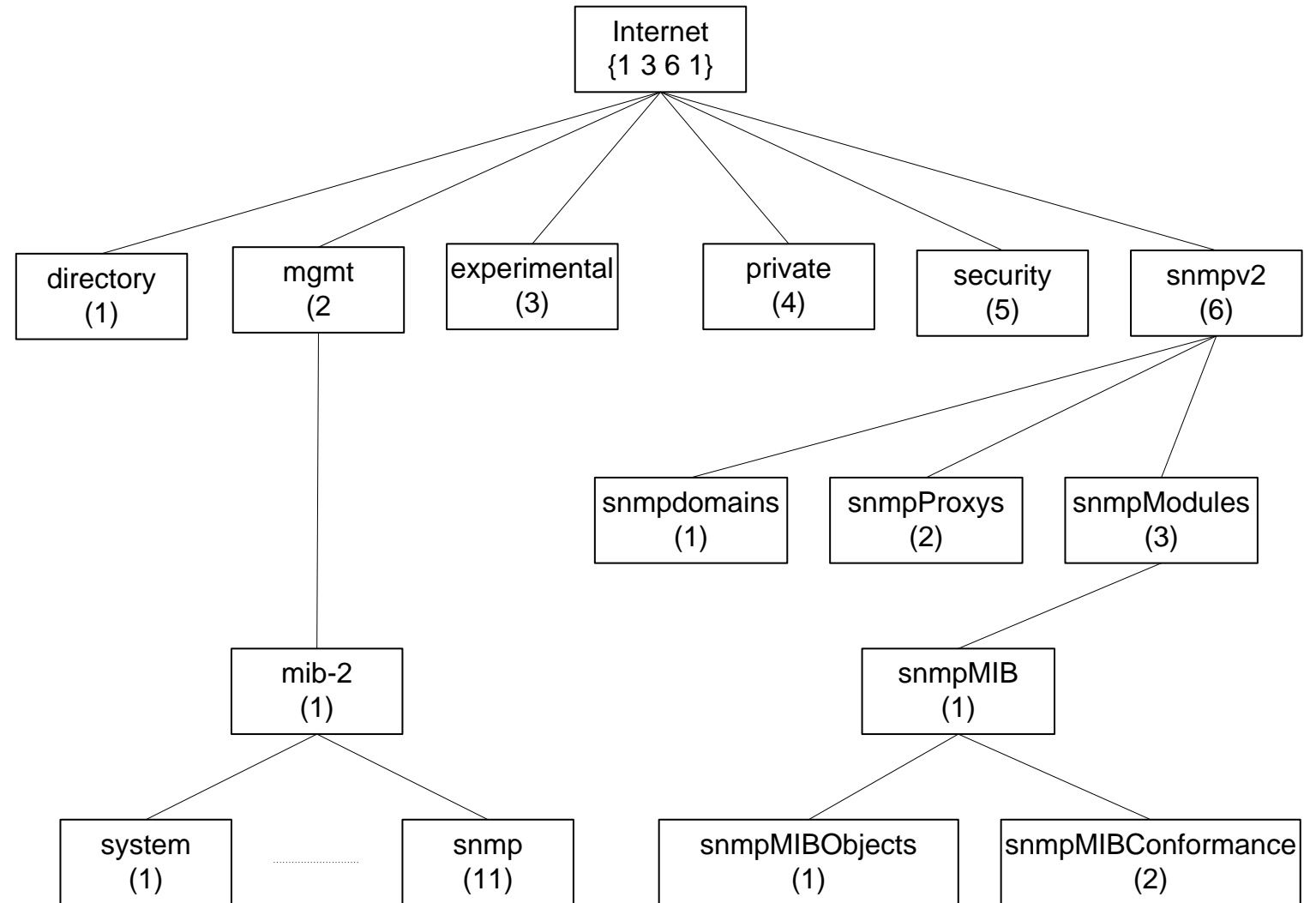


Figure 6.31 SNMPv2 Internet Group

# SNMPv2 MIB

- Security is a placeholder
- System group
  - table sysORTable added that lists resources that the agent controls
- Most of the objects in the SNMPv1 obsoleted
- Object Groups and Notification Groups defined for conformance specifications

# Agent Capabilities

- AGENT-CAPABILITIES macro
- SUPPORTS modules and includes groups
- VARIATION identifies additional features

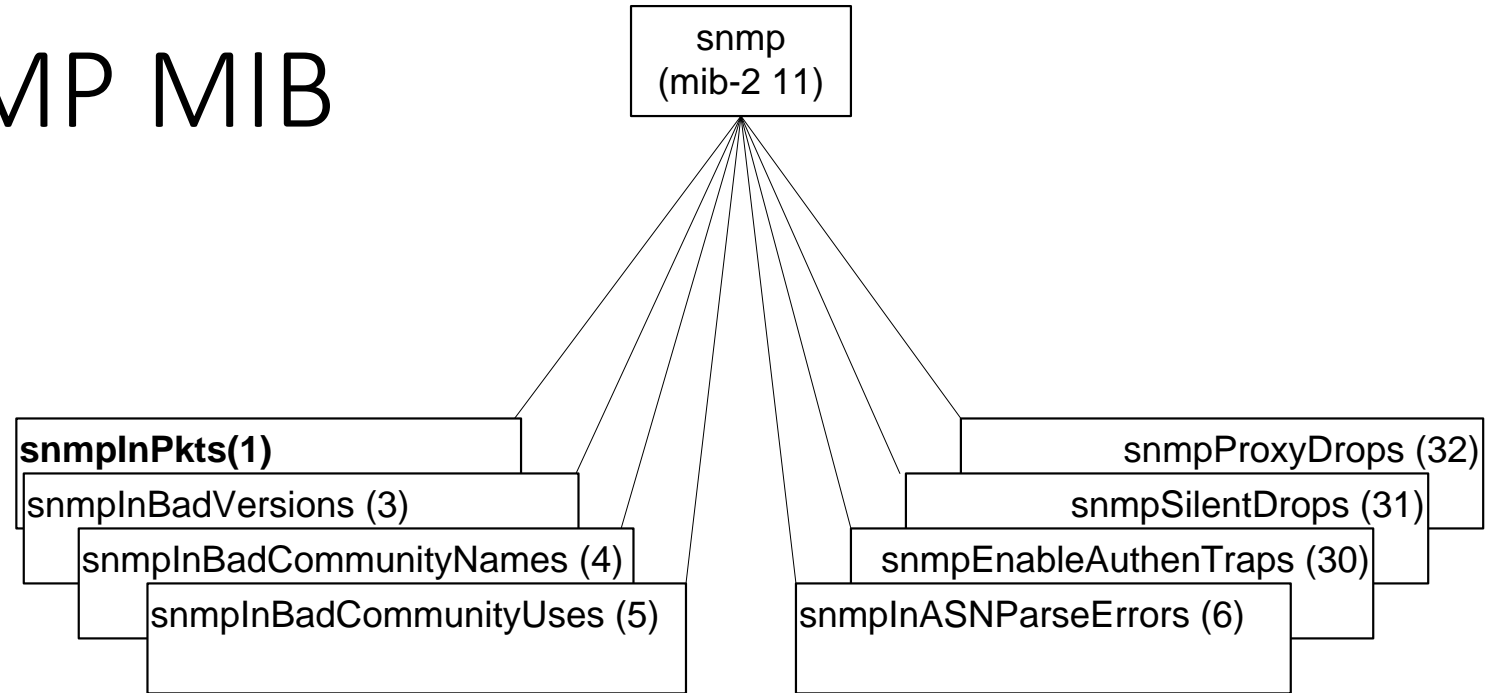
# Agent Capabilities

routerIsi123 AGENT-CAPABILITIES

```
PRODUCT-RELEASE  "InfoTech Router isiRouter123 release 1.0"
STATUS           current
DESCRIPTION      "InfoTech High Speed Router"
SUPPORTS         snmpMIB
                  INCLUDES {systemGroup, snmpGroup, snmpSetGroup,
                             snmpBasicNotificationsGroup }
                  VARIATION coldStart
                        DESCRIPTION "A coldStart trap is generated on all
                                   reboots."
SUPPORTS         IF-MIB
                  INCLUDES {ifGeneralGroup, ifPacketGroup}
SUPPORTS         IP MIB
                  INCLUDES {ipGroup, icmpGroup}
SUPPORTS         TCP-MIB
                  INCLUDES {tcpGroup}
SUPPORTS         UDP-MIB
                  INCLUDES {udpGroup}
SUPPORTS         EGP-MIB
                  INCLUDES {egpGroup}
::= { isiRouter 1 }
```

**Figure 6.30 Example of AGENT-CAPABILITIES Macro**

# SNMPv2 SNMP MIB

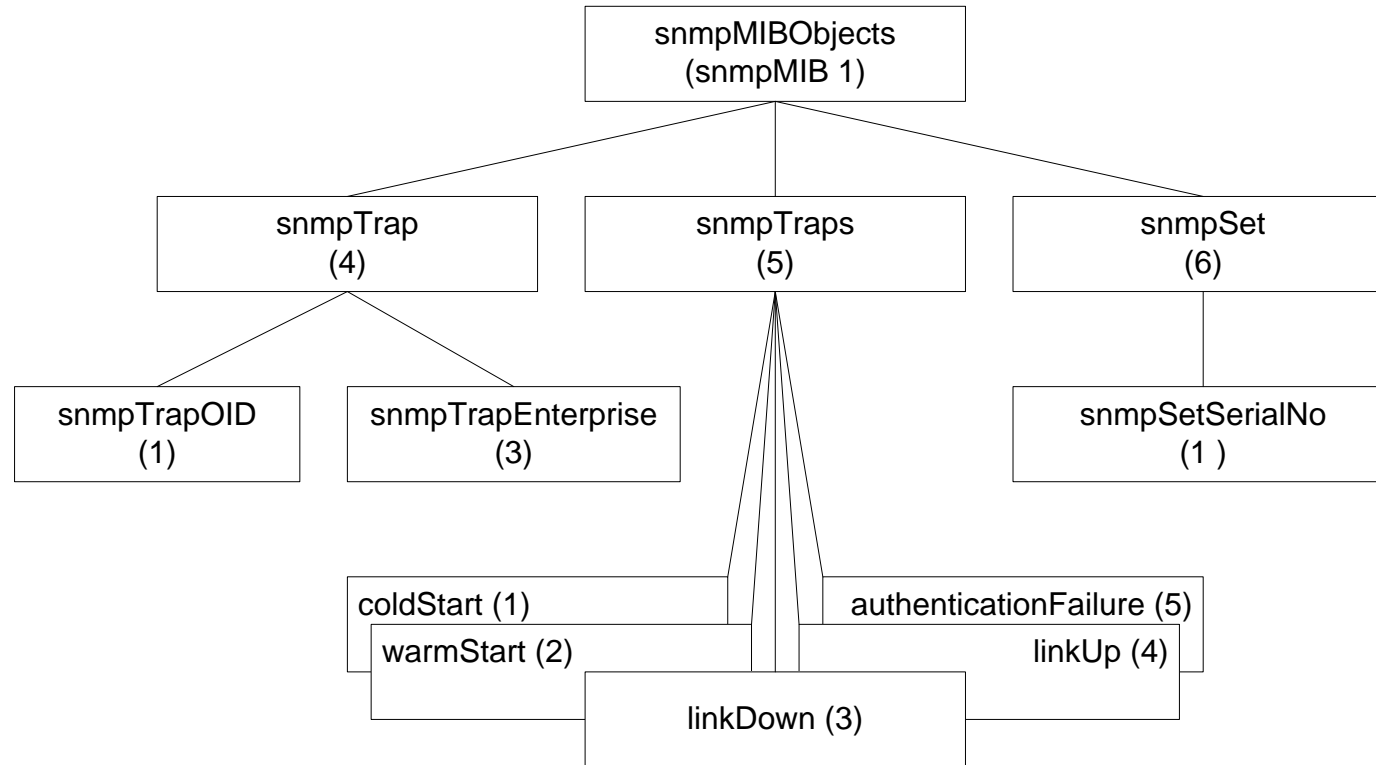


Compare this to SNMPv1 MIB!

SNMP Group Objects	
1,3,6,30,31,32	snmpGroup
4,5	snmpCommunity Group
7,23	not used
2,8-23, 24-29	snmpObsoleteGroup

Figure 6.33 SNMPv2 SNMP Group

# snmpMIBObjects MIB



**Figure 6.34 MIB Modules under snmpMIBObjects**

# SNMPv2 PDU

PDU Type	RequestID	Error Status	Error Index	VarBind 1 name	VarBind 1 value	...	VarBind n name	VarBind n value
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**Figure 6.37 SNMPv2 PDU (All but Bulk)**

Standardized format for all messages

# SNMPv2 PDU Values

Table 6.11

Value	Type
0	Get-Request-PDU
1	GetNextRequest-PDU
2	Response-PDU
3	Set-Request- PDU
4	obsolete
5	GetBulkRequest-- PDU
6	InformRequest- PDU



# SNMPv2 Error Status Values

Table 6.11

Value	Type	Value	Type
0	noError	10	wrongValue
1	tooBig	11	noCreation
2	noSuchName	12	inconsistentValue
3	badValue	13	resourceUnavailable
4	readOnly	14	commitFailed
5	genErr	15	undoFailed
6	noAccess	16	authorizationError
7	wrongType	17	notWritable
8	wrongLength	18	inconsistentName

# SNMPv2 GetBulkRequest PDU

PDU Type	RequestID	Non-Repeaters	Max Repetitions	VarBind 1 name	VarBind 1 value	...	VarBind n name	VarBind n value
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**Figure 6.38 SNMPv2 GetBulkRequest PDU**

## Notes

- Error status field replaced by Non-repeaters
- Error index field replaced by Max repetitions
- No one-to-one relationship between request and response

# Get-Bulk-Request: Generic MIB

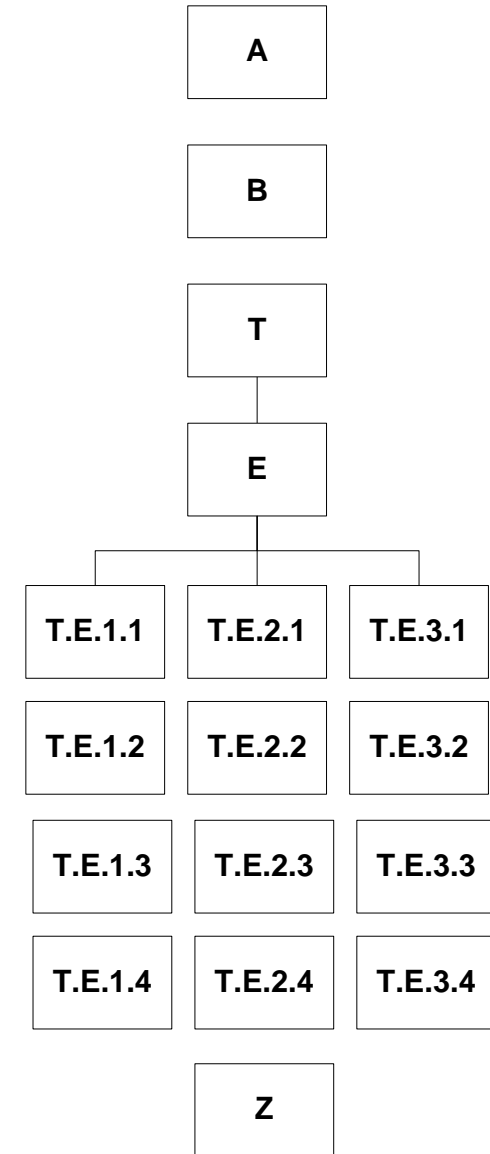
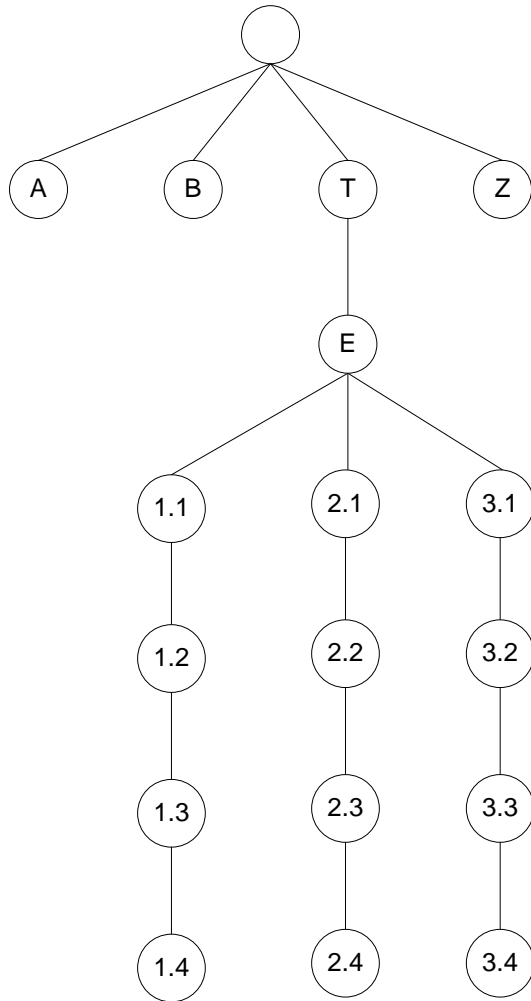


Figure 6.39 MIB for Operation Sequences in Figures 6.40 and 6.41

# Get-Next-Request Operation

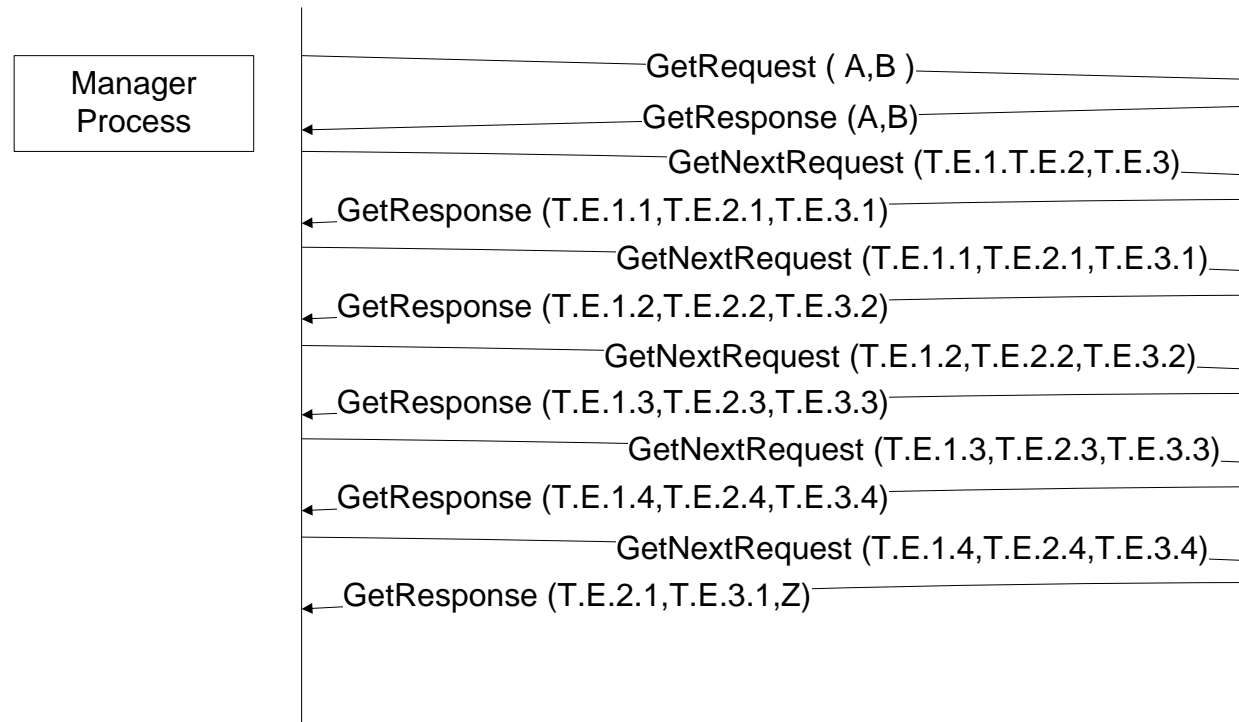


Figure 6.40 Get-Next-Request Operation for MIB in Figure 6.39

# Get-Bulk-Request Operation

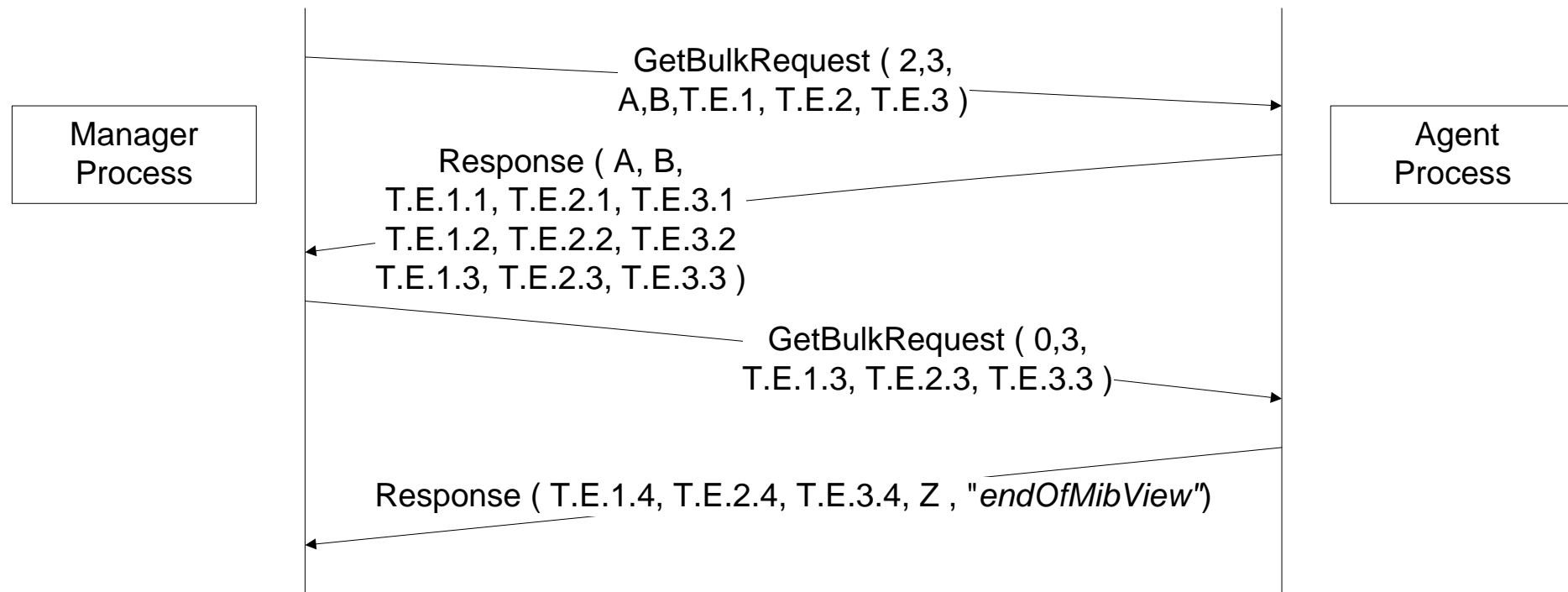
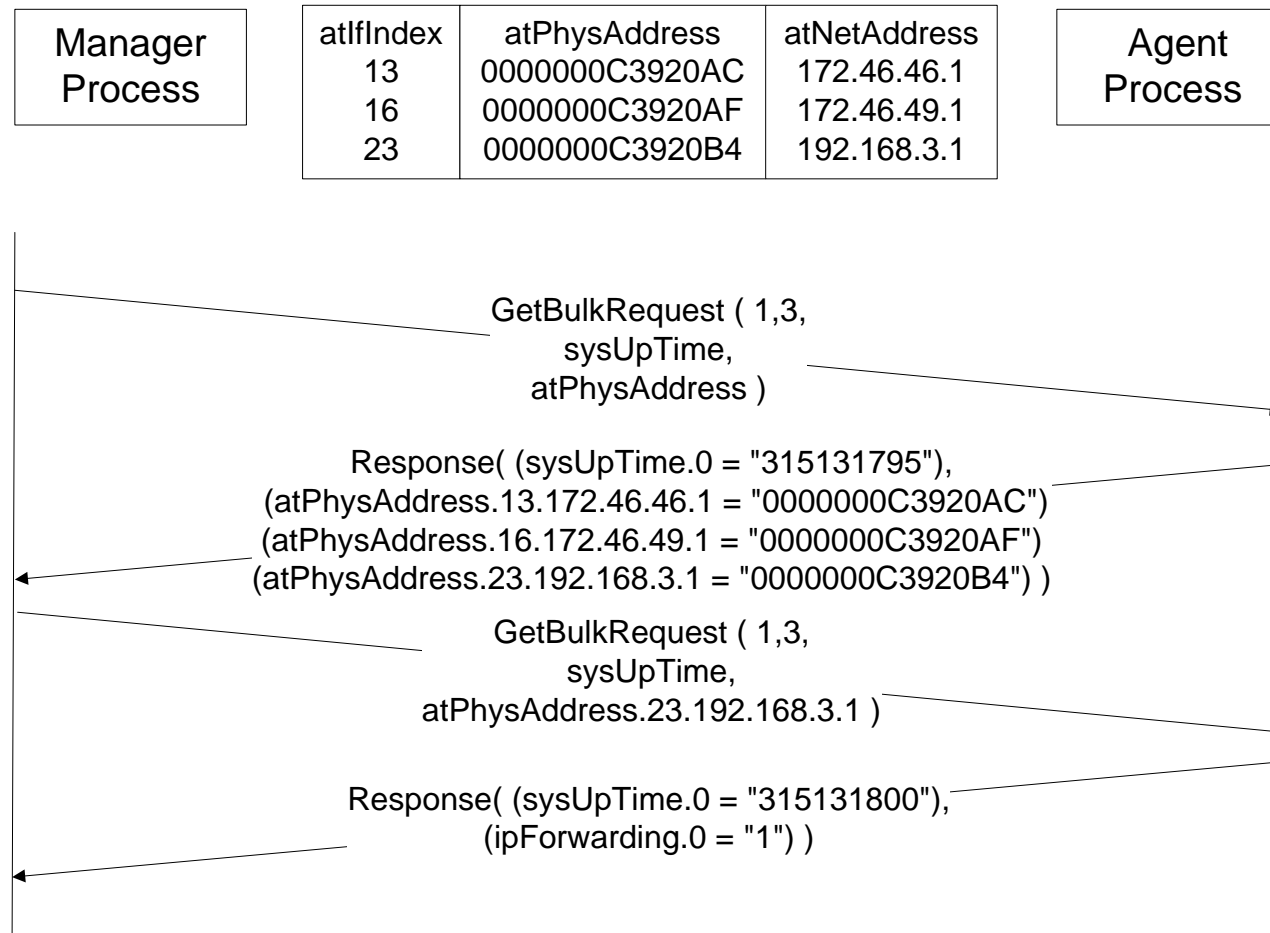


Figure 6.41 Get-Bulk-Request Operation for MIB in Figure 6.39

# Get-Bulk-Request Operation

- GetBulkRequest(2, 3, ..)
  - 2: two non-repetitive objects (A and B)
  - 3: three repetitive instances of columnar objects (TE.1, TE.2 and TE.3)
- GetBulkRequest(0, 3, ..)
  - 3: three more rows of the table
- Response
  - only one row left
  - sends next lexicographic entry Z, error: endOfMibView

# Get-Bulk-Request Example



**Figure 6.42 Get-Bulk-Request Example**

# SNMPv2 Trap

PDU Type	RequestID	Error Status	Error Index	VarBind 1 sysUpTime	VarBind 1 value	VarBind 2 snmpTrapOID	VarBind 2 value	.. .
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**Figure 6.43 SNMPv2 Trap PDU**

## Notes

- Addition of NOTIFICATION-TYPE macro
- OBJECTS clause, if present, defines order of variable bindings
- Positions 1 and 2 in VarBindList are sysUpTime and snmpTrapOID



# SNMPv2 Trap

linkUp NOTIFICATION-TYPE	
OBJECTS	{ ifIndex }
STATUS	current
DESCRIPTION	"A linkUp trap signifies that the SNSMPv2 entity, acting in an agent role, recognizes that one of the communication links represented in its configuration has come up."

**Figure 6.44 Example of OBJECTS Clause in NOTIFICATION-TYPE**

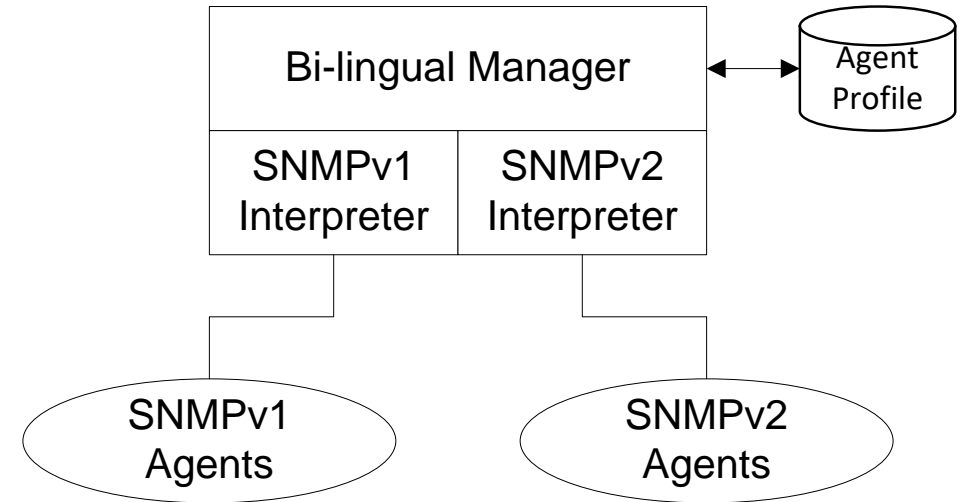
- Addition of NOTIFICATION-TYPE macro
- OBJECTS clause, if present, defines order of variable bindings
- Positions 1 and 2 in VarBindList are sysUpTime and snmpTrapOID

# Inform-Request

- Inform-Request behaves as trap in that the message goes from one manager to another unsolicited
- The receiving manager sends response to the sending manager
- Uses the same Trap PDU format

# Bilingual Manager

- Compatibility with SNMPv1
  - Bilingual Manager
  - Proxy Server
- Bilingual Manager is expensive in resource and operation



**Figure 6.45 SNMP Bi-lingual Manager**

# SNMP Proxy Server

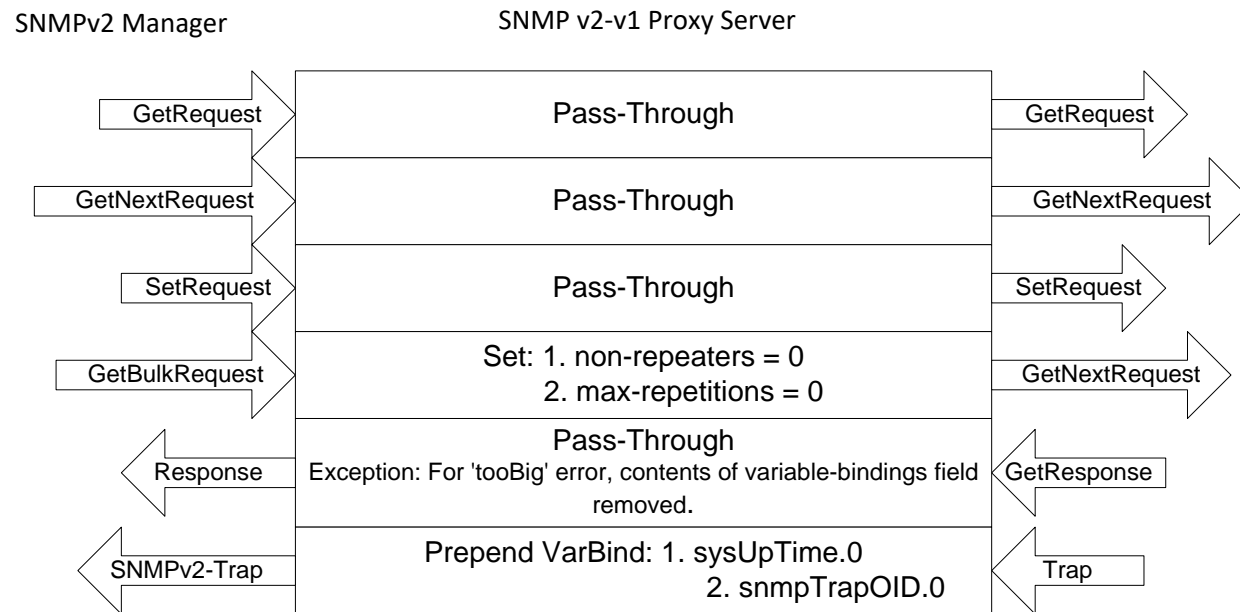


Figure 6.47 SNMP v2-v1 Proxy Server

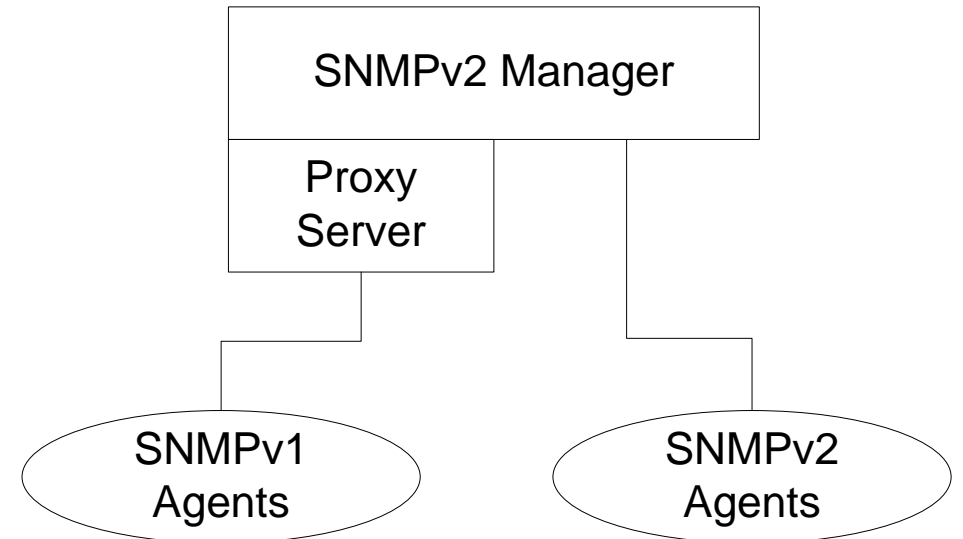


Figure 6.46 SNMPv2 Proxy Server Configuration