



OVERVIEW

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INTRODUCTION

- SNMP GOALS
- SNMP HISTORY

STRUCTURE OF MANAGEMENT INFORMATION

- SMI

MANAGEMENT INFORMATION BASE

- MIB-II

SIMPLE NETWORK MANAGEMENT PROTOCOL

- SNMP



SNMP GOALS

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UBIQUITY

- PCs AND CRAYs

INCLUSION OF MANAGEMENT SHOULD BE INEXPENSIVE

- SMALL CODE
- LIMITED FUNCTIONALITY

MANAGEMENT EXTENSIONS SHOULD BE POSSIBLE

- NEW MIBs

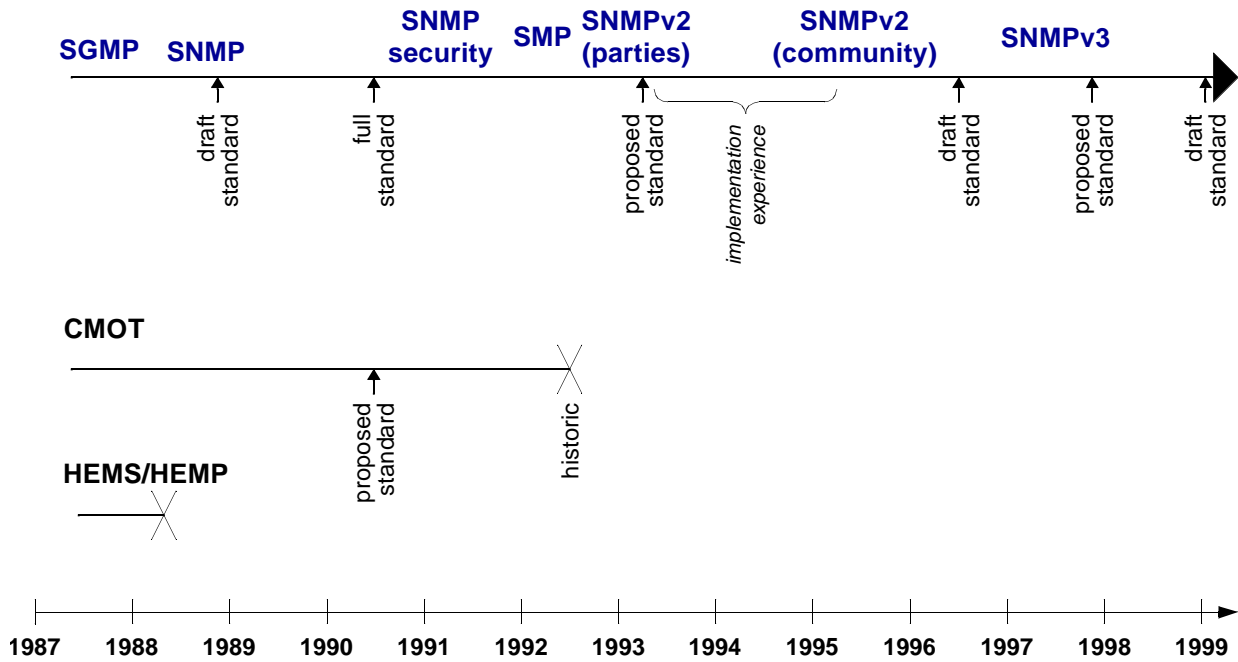
MANAGEMENT SHOULD BE ROBUST

- CONNECTIONLESS TRANSPORT



SNMP HISTORY

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STRUCTURE OF MANAGEMENT INFO

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SMI

STRUCTURE OF MANAGEMENT INFORMATION
RFC 1155, RFC 1212

VERSION 2
RFC 2578, RFC 2579, RFC 2580

MAKES THE DEFINITION OF (NEW) MIBs EASIER



SMI

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MANAGEMENT INFORMATION WITHIN MANAGED SYSTEMS
MUST BE REPRESENTED AS:

- SCALARS
- TABLES

(= TWO DIMENSIONAL ARRAYS OF SCALARS)

THE SNMP PROTOCOL CAN ONLY EXCHANGE
(A LIST OF) SCALARS

DEFINED IN TERMS OF ASN.1 CONSTRUCTS



SMI: DATA TYPES FOR SCALARS

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SIMPLE TYPES

- INTEGER
- OCTET STRING
- OBJECT IDENTIFIER
- NULL

APPLICATION-WIDE TYPES

- IpAddress
- NetworkAddress
 - Counter
 - Gauge
- TimeTicks
- Opaque

SMIv2 NEW TYPES

- Unsigned 32
- Counter 64
 - Bits



MIB-II

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DEFINES THE VARIABLES TO MANAGE THE
TCP/IP PROTOCOL STACK

170 VARIABLES

RFC 1213

NEW:

- RFC 1907 (System info)
 - RFC 2011 (IP)
 - RFC 2012 (TCP)
 - RFC 2013 (UDP)
- RFC 2233 (Interfaces)
 - etc.



DESIGN CRITERIA

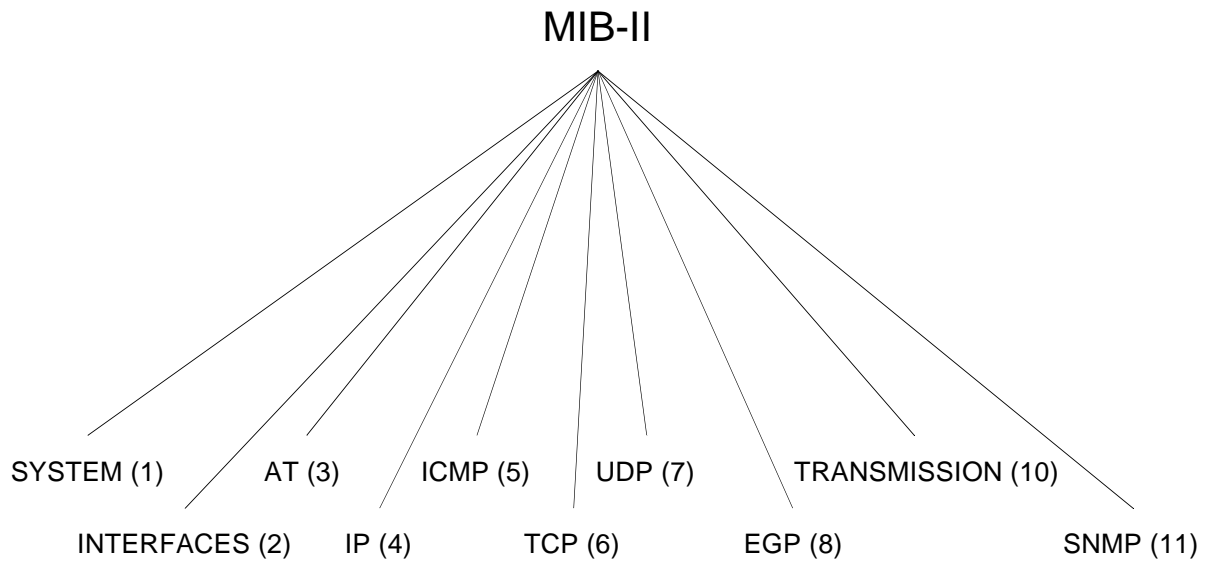
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- ESSENTIAL FOR FAULT OR CONFIGURATION MANAGEMENT
 - ONLY WEAK CONTROL OBJECTS
 - SMALL NUMBER OF OBJECTS
 - AVOID REDUNDANCY
 - EVIDENCE OF UTILITY
- DO NOT DISTURB NORMAL OPERATION
- NO IMPLEMENTATION SPECIFIC ISSUES



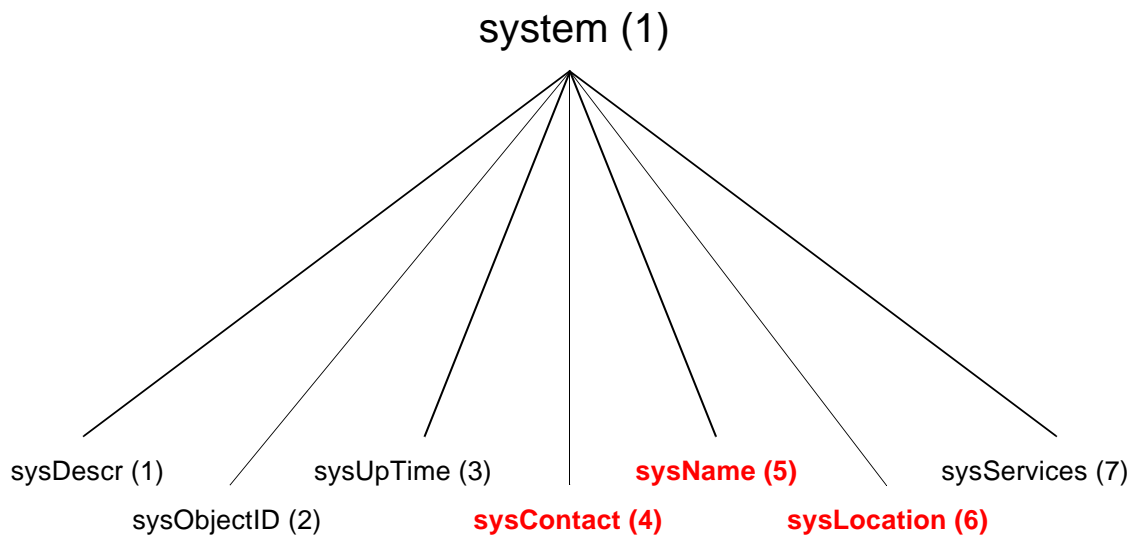
STRUCTURE

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SYSTEM GROUP

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EXAMPLE

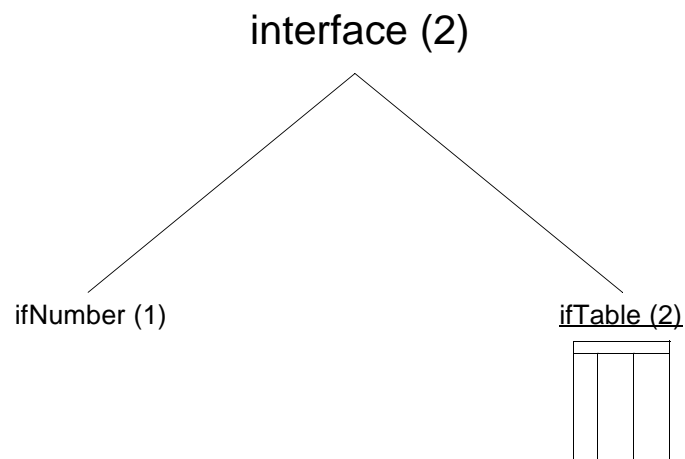
11

sysDescr: **"Cisco Gateway"**
sysObjectID: **1.3.6.1.4.1.9.1.1**
sysUpTime: **37153422** (4 days, 7 h, 12 min, 14.22 s)
sysContact: **"helpdesk@cs.utwente.nl"**
sysName: **"utic01.cs.utwente.nl"**
sysLocation: **"near logica meeting room"**
sysServices: **6** (bridge and router functions)



INTERFACES GROUP

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ifTable

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ifIndex	ifDescr	ifType	ifMtu	ifSpeed	ifPhysAddress	ifAdminStatus	ifOperStatus	ifLastChange	ifInOctets	ifInUcastPkts	ifInNUcastPkts	ifInDiscards	ifInErrors	ifInUnknownProtos	ifOutOctets	ifOutUcastPkts	ifOutNUcastPkts	ifOutDiscards	ifOutErrors	ifOutQLen	ifSpecific	
1																						• →
2																						• →
n																						• →



ifType and ifStatus

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- ifType
- EXAMPLES:

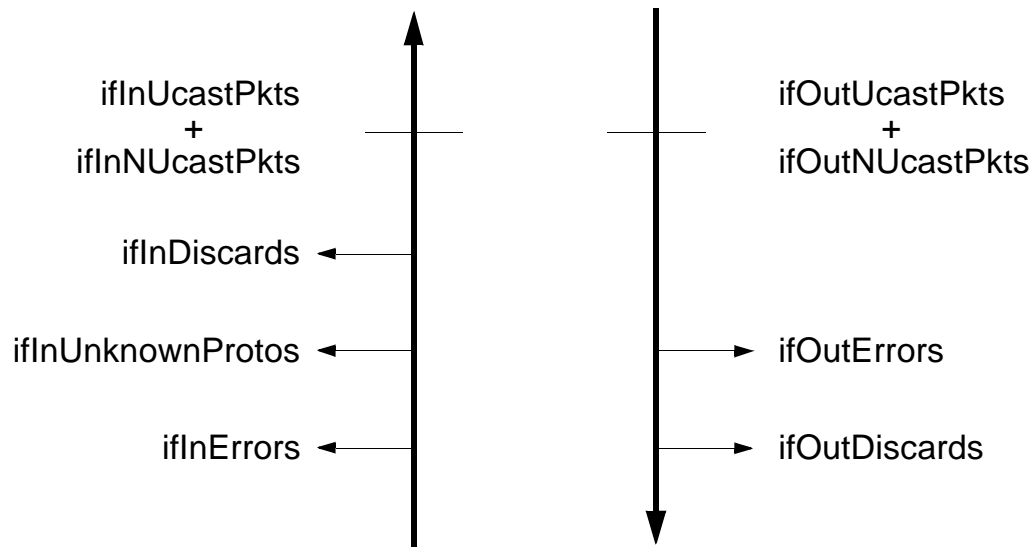
1	Undefined	16	LAPB
6	Ethernet	20	ISDN Basic
7	IEEE 802.3	21	ISDN Primary
8	IEEE 802.4	23	PPP
9	IEEE 802.5	24	Loopback
10	IEEE 802.6	28	SLIP
15	FDDI	32	Frame Relay

- ifAdminStatus / ifOperStatus
 - 1 = up
 - 2 = down
 - 3 = testing



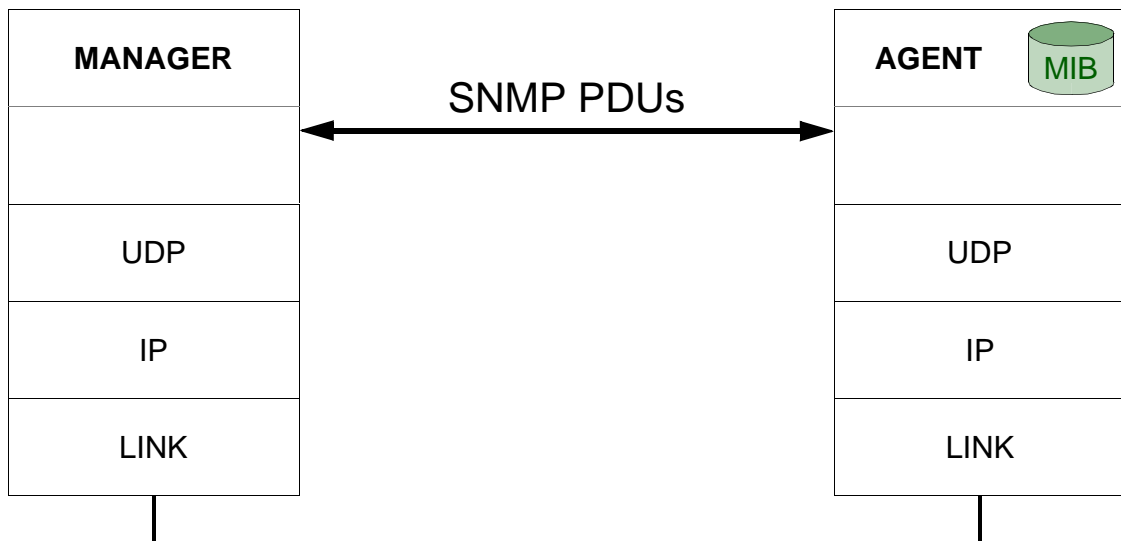
IF PACKET COUNT

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SNMP PROTOCOL

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MESSAGE & PDU STRUCTURE

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variable bindings:

NAME 1	VALUE 1	NAME 2	VALUE 2	NAME <i>n</i>	VALUE <i>n</i>
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SNMP PDU:

PDU TYPE *	REQUEST ID	ERROR STATUS	ERROR INDEX	VARIABLE BINDINGS
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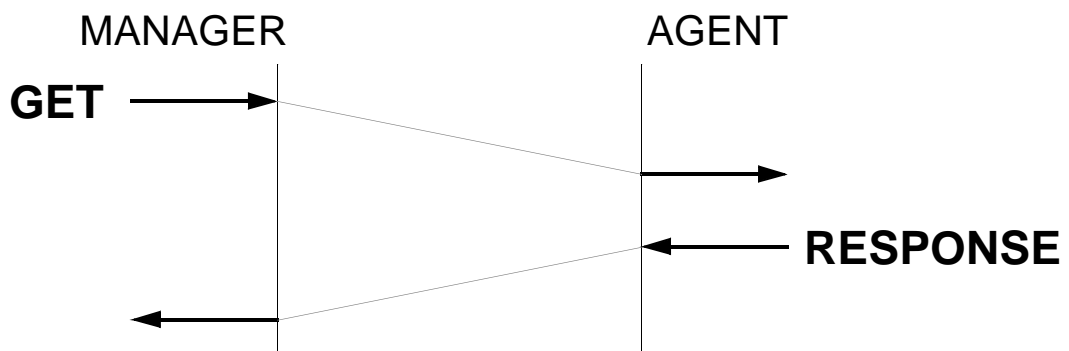
SNMP message:

VERSION	COMMUNITY	SNMP PDU
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GET

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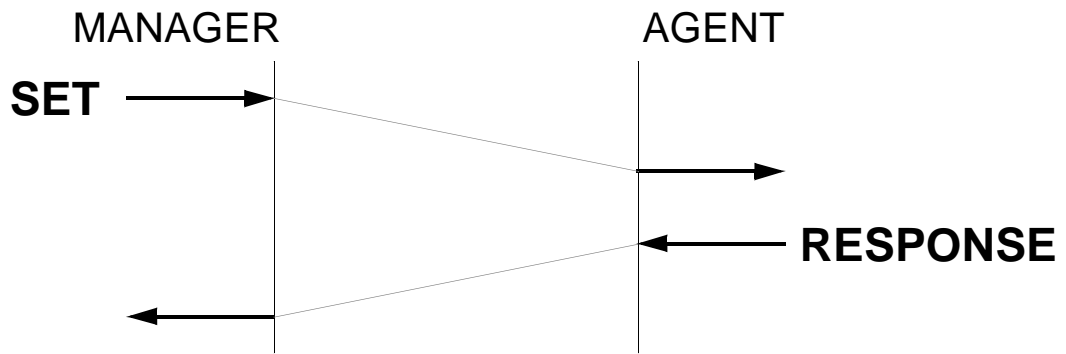


TO REQUEST THE VALUE OF 1 OR MORE VARIABLES



SET

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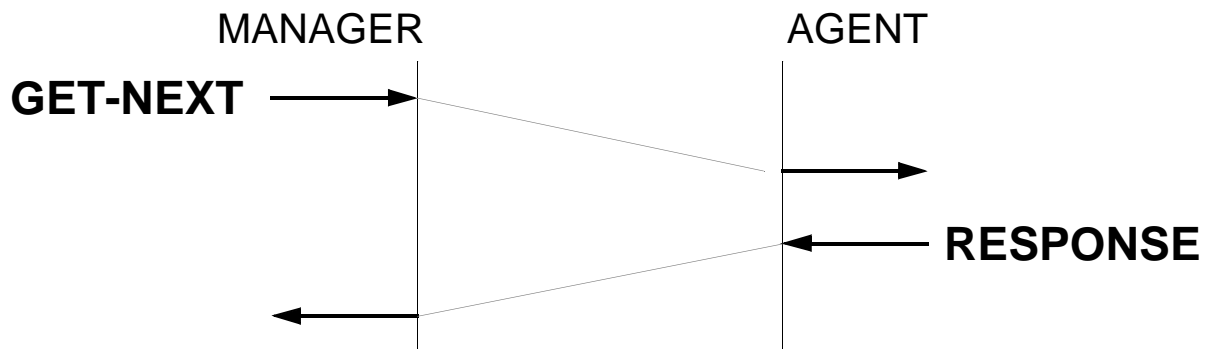


THE SET REQUEST IS
ATOMIC



GET-NEXT

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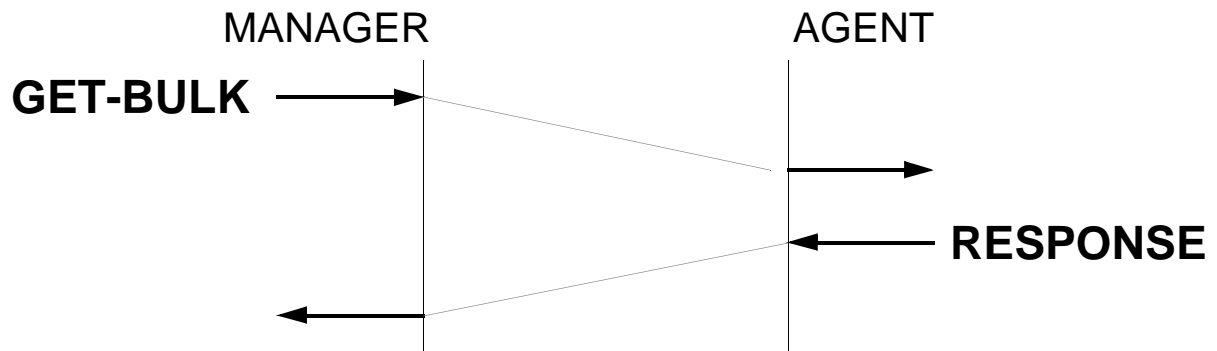


RETRIEVES THE INSTANCE NAME AND VALUE OF THE **NEXT** MIB ELEMENT
TO DISCOVER MIB STRUCTURES
TO RETRIEVE TABLE ROWS



GET-BULK

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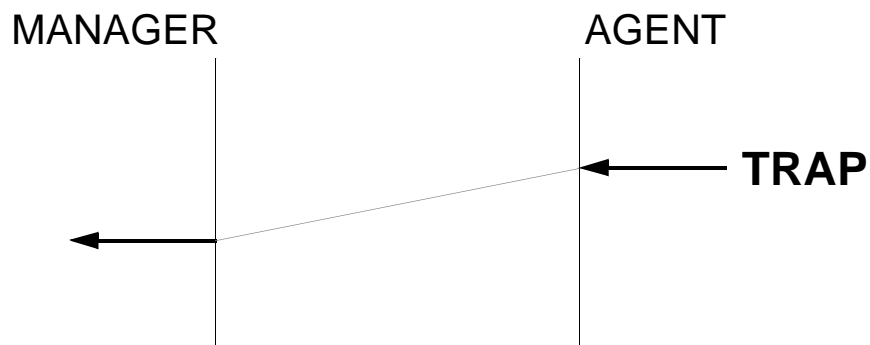


TO RETRIEVE LARGE AMOUNTS OF MANAGEMENT DATA
RESPONSE SHOULD FIT INTO A SINGLE UDP PACKET



TRAP

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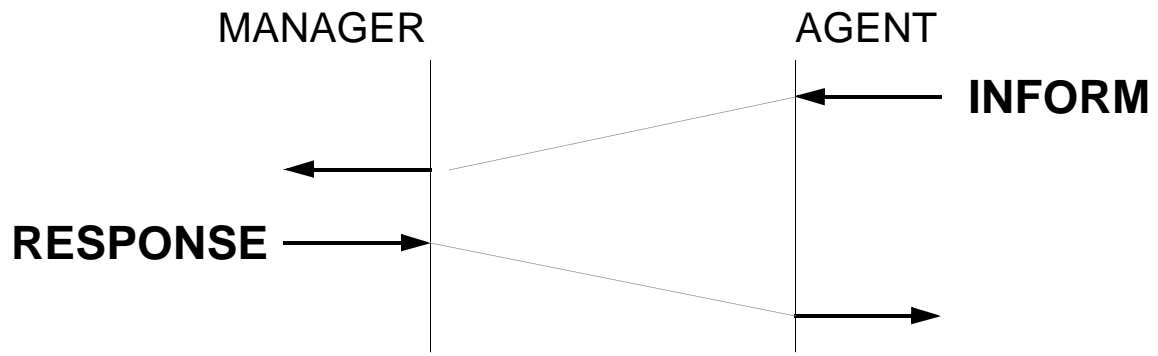
TRAP RECEPTION IS NOT CONFIRMED
(THUS UNRELIABLE)

POLLING REMAINS NECESSARY

AGENTS MAY BE CONFIGURED TO DISCARD TRAPS



INFORM



"CONFIRMED TRAP"

CAN BE USED TO EXCHANGE INFORMATION
BETWEEN MANAGERS