

SNMP V2

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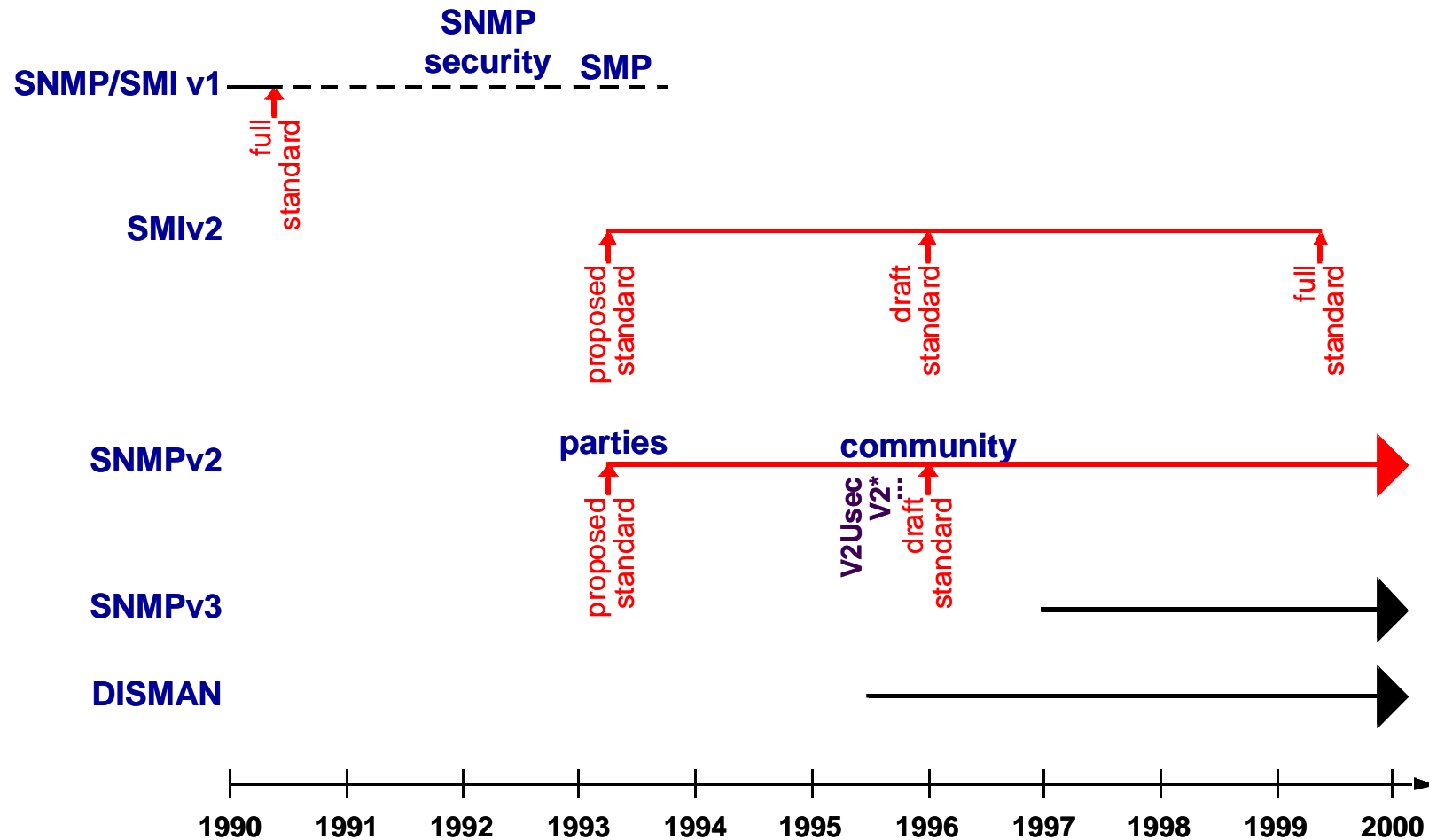
OVERVIEW:

1. LIMITATIONS OF SNMPv1
2. HISTORY OF SNMPv2
 1. • HIERARCHIES
 2. • SECURITY
3. SNMPv2 PROTOCOL OPERATIONS
4. TRANSPORT INDEPENDENCE
5. RFCs

LIMITATIONS OF SNMPv1

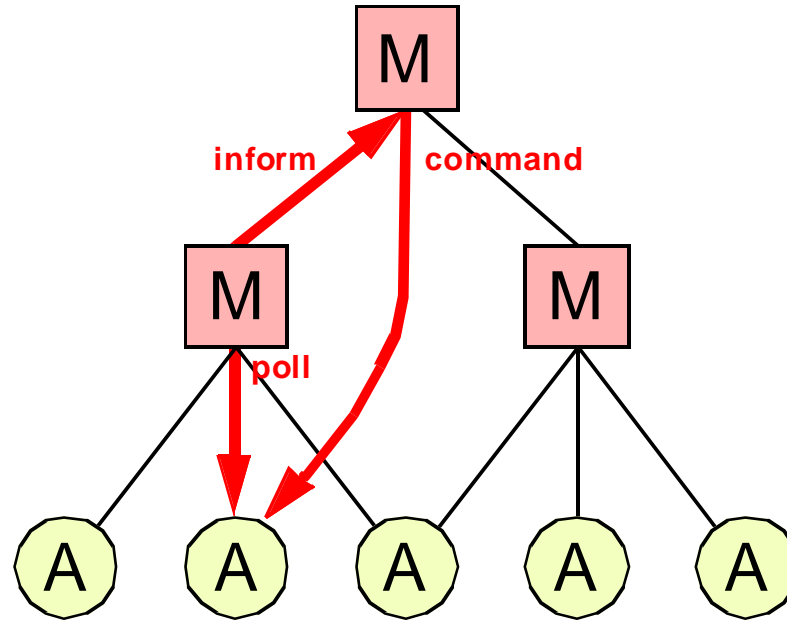
- UNDOCUMENTED RULES
- LIMITED ERROR CODES
 - LIMITED DATA TYPES
- LIMITED NOTIFICATIONS
- LIMITED PERFORMANCE
- TRANSPORT DEPENDENCE
 - LACK OF HIERARCHIES
 - LACK OF SECURITY

HISTORY OF SNMPv2



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!

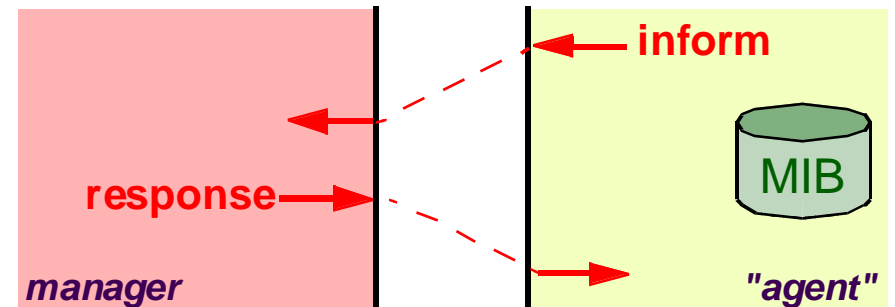
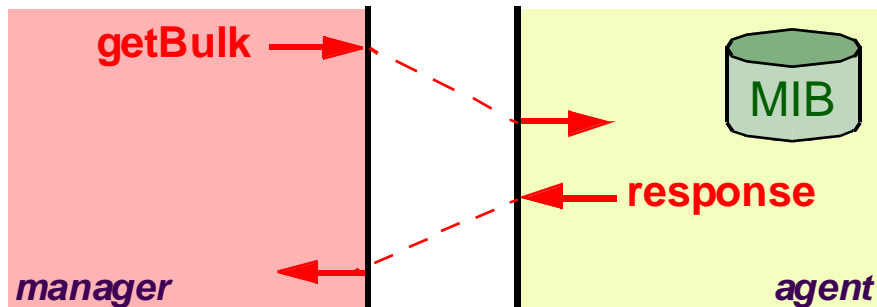
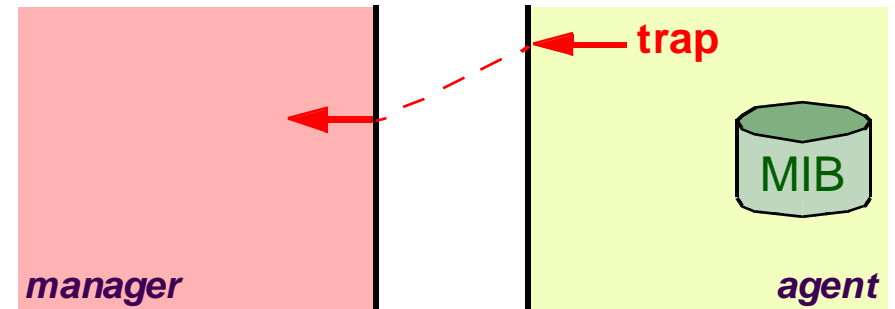
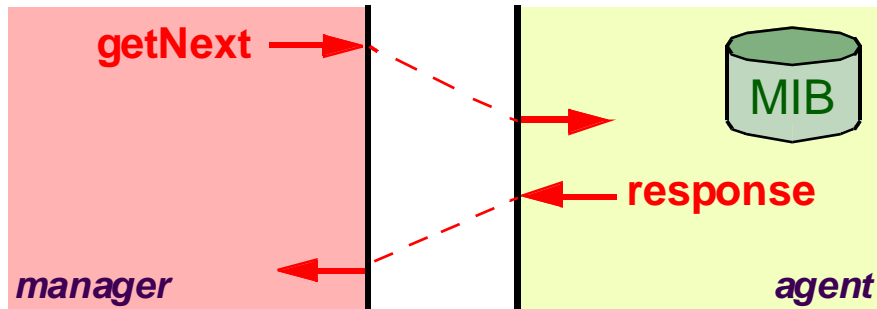
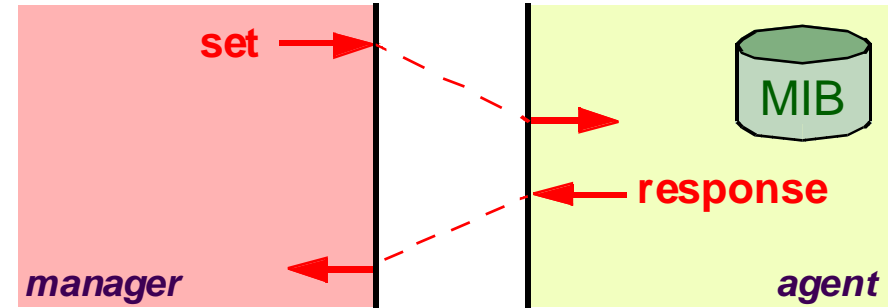
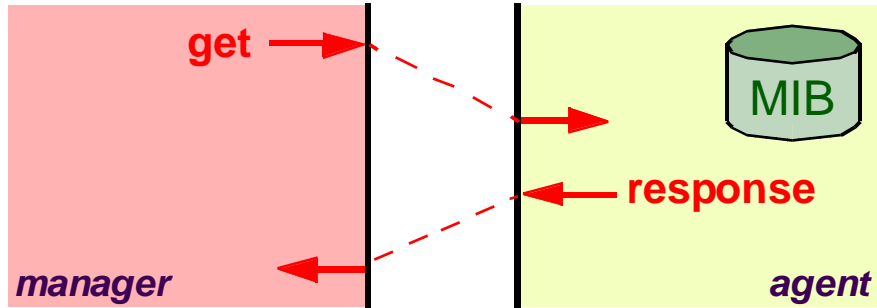
MANY NEW PROPOSALS APPEARED:

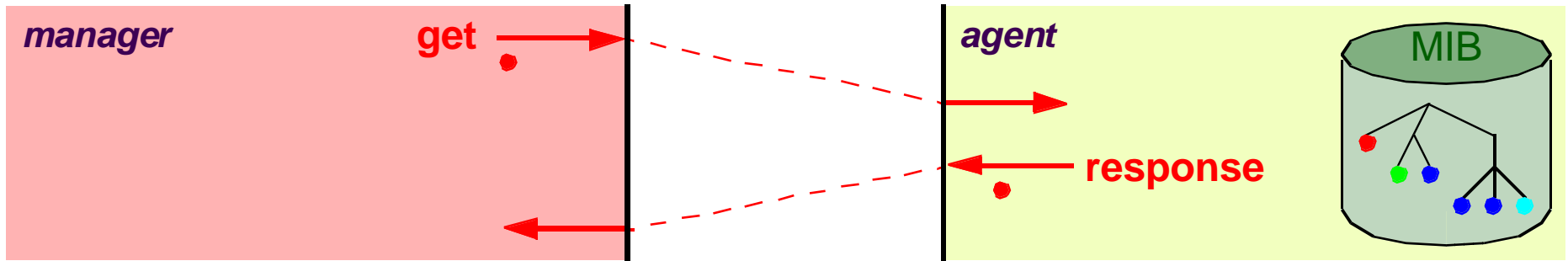
- SNMPv2C: COMMUNITY BASED
- SNMPv2U: USER BASED
- ...

1997:

NEW SNMPv3 WORKING GROUP WAS FORMED
WITH NEW EDITORS

SNMPv2 PROTOCOL OPERATIONS





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(1)  
response(error-status => noError, 1.2 => noSuchObject)
```

```
get(1.1)  
response(error-status => noError, 1.2.0 => noSuchInstance)
```

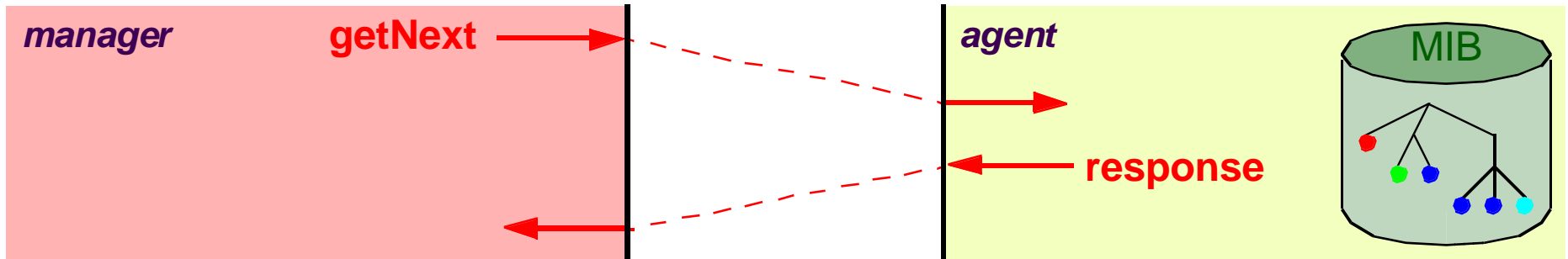
```
get(1.1.9)  
response(error-status => noError, 1.2.0 => noSuchInstance)
```

```
get(1.2)  
response(error-status => noError, 1.4.0 => noSuchObject)
```

```
get(1.4.0)  
response(error-status => noError, 1.4.0 => noSuchObject)
```

```
get(1.1.0, 1.4.0)  
response(error-status => noError, 1.1.0 => 130.89.16.2, 1.4.0 => noSuchObject)
```

GET-NEXT



SIMILAR TO SNMPv1, EXCEPT FOR "EXCEPTIONS"

POSSIBLE EXCEPTIONS:

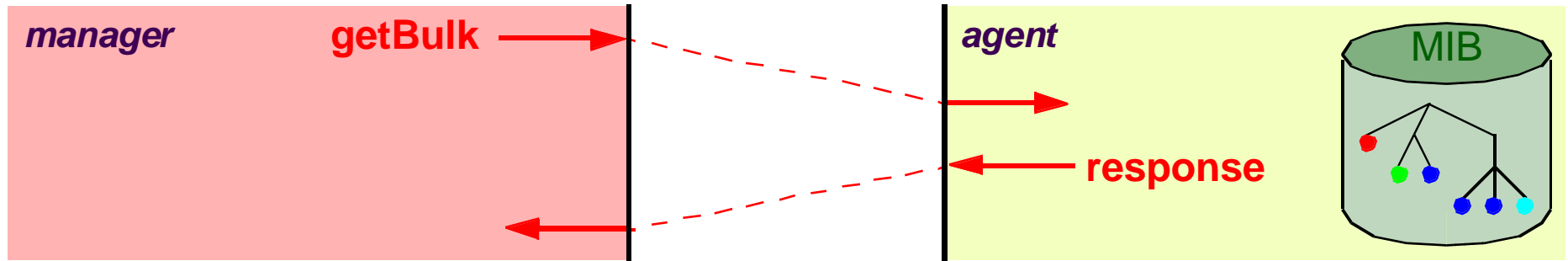
- **endOfMibView**

EXAMPLE

`getNext(1.4.0)`

`response(error-status => noError, 1.4.0 => endOfMibView)`

GET-BULK

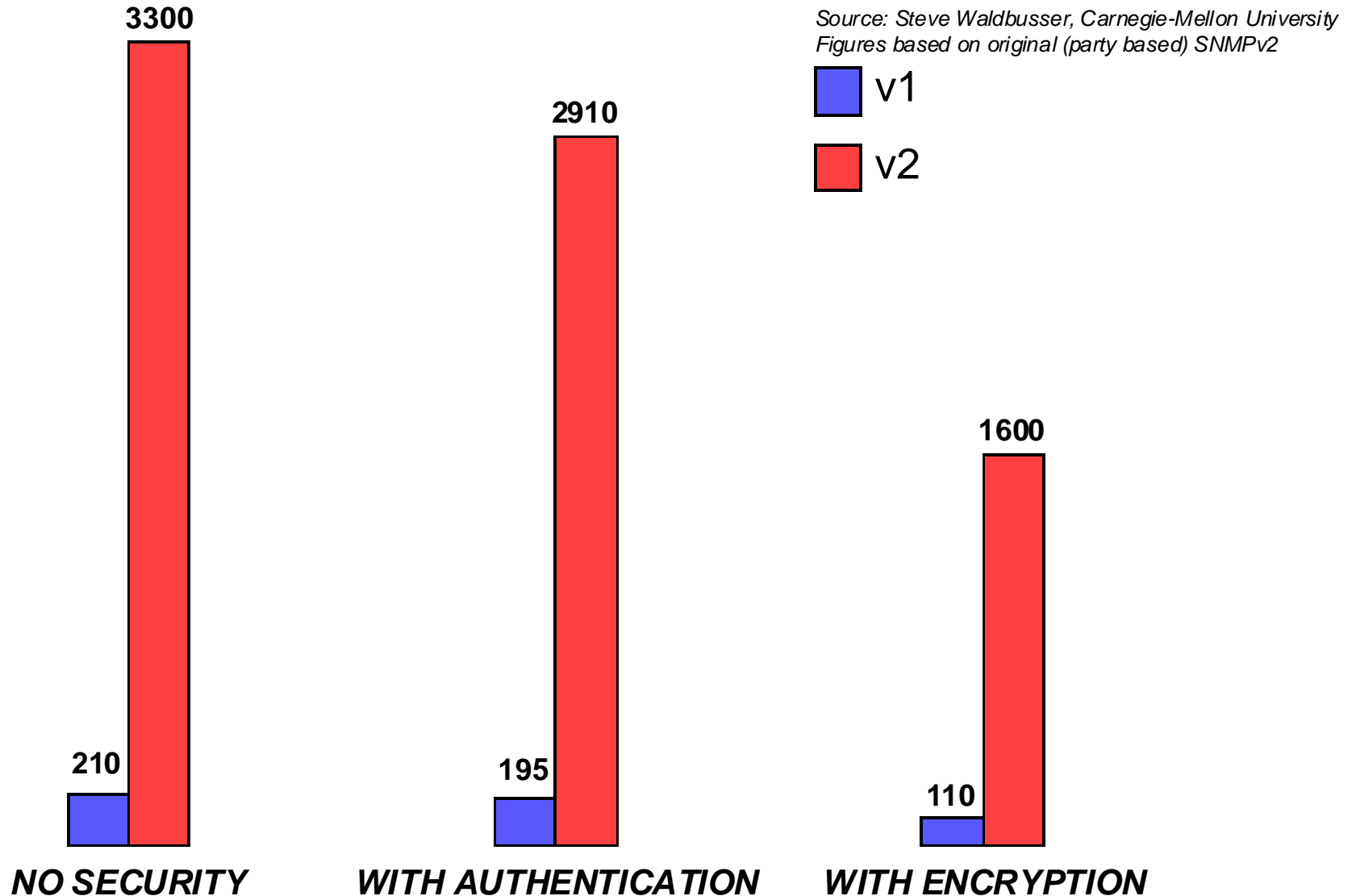


NEW IN SNMPv2

TO RETRIEVE A LARGE NUMBER OF VARBINDS

IMPROVES PERFORMANCE!

GETBULK PERFORMANCE

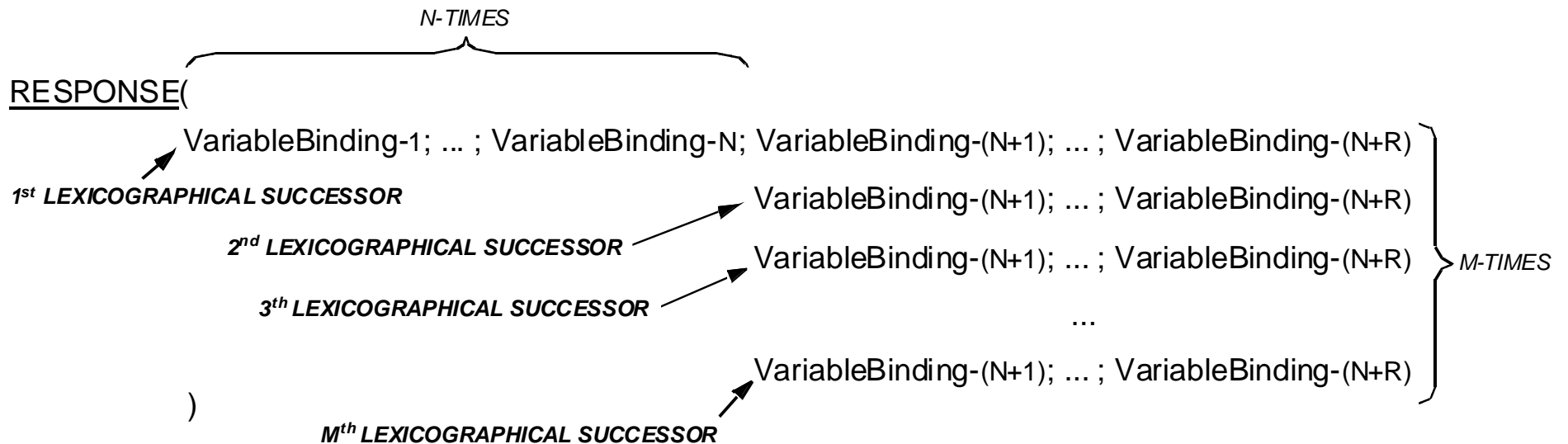


getBulk REQUEST HAS TWO ADDITIONAL PARAMETERS:

- non-repeaters
- max-repetitions

- THE FIRST N ELEMENTS (non-repeaters) 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

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



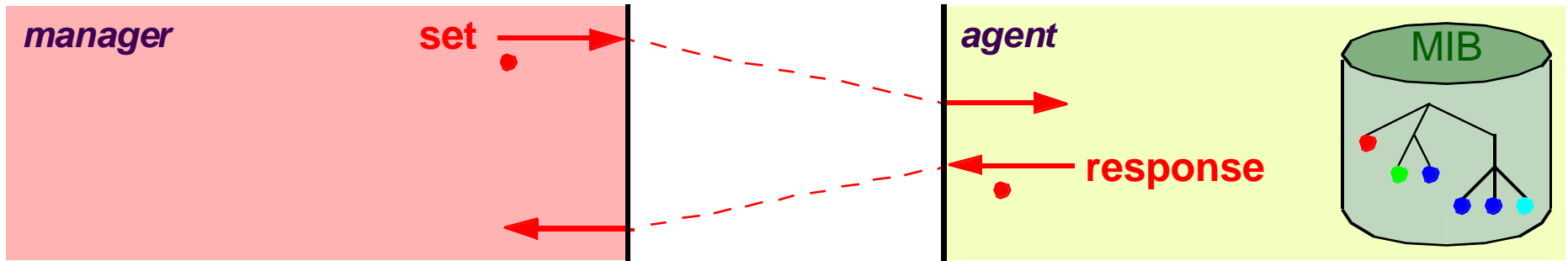
GET-BULK EXAMPLE

getBulk(max-repetitions = 4; 1.1)

response(
1.1.0 => 130.89.16.2
1.2.1.0 => printer-1
1.2.2.0 => 123456
1.3.1.1.2.1 => 2)

getBulk(max-repetitions = 3; 1.3.1.1; 1.3.1.2; 1.3.1.3)

response(
1.3.1.1.2.1 => 2, 1.3.1.2.2.1 => 1, 1.3.1.3.2.1 => 2
1.3.1.1.3.1 => 3, 1.3.1.2.3.1 => 1, 1.3.1.3.3.1 => 3
1.3.1.1.5.1 => 5, 1.3.1.2.5.1 => 1, 1.3.1.3.5.1 => 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

SNMPv1

PHASE 1:

badValue
badValue
badValue
badValue
badValue
noSuchName
noSuchName
noSuchName
noSuchName
genErr
genErr

PHASE 2:

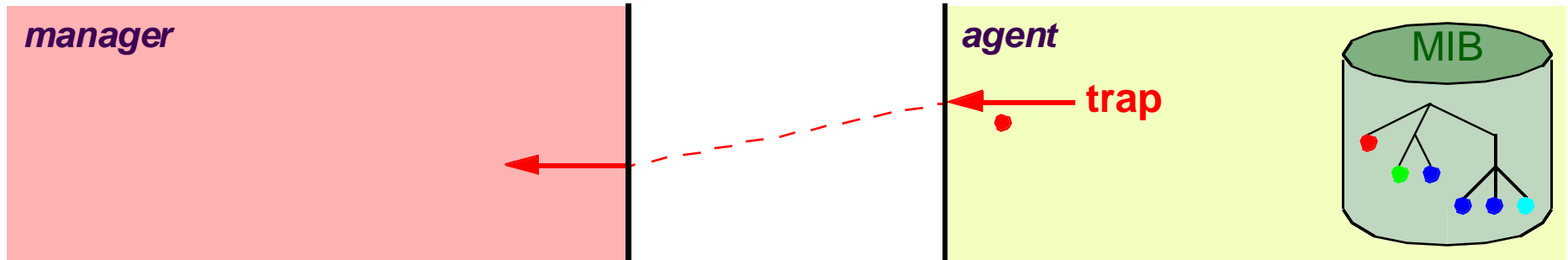
genErr
genErr

SNMPv2

wrongValue
wrongEncoding
wrongType
wrongLength
inconsistentValue
noAccess
notWritable
noCreation
inconsistentName
resourceUnavailable
genErr

CommitFailed
undoFailed

TRAP



SNMPv1:

- COLD START
- WARM START
- LINK DOWN
 - LINK UP
- AUTHETICATION 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

OBJECTS

STATUS

DESCRIPTION

::= {snmpTraps 4}

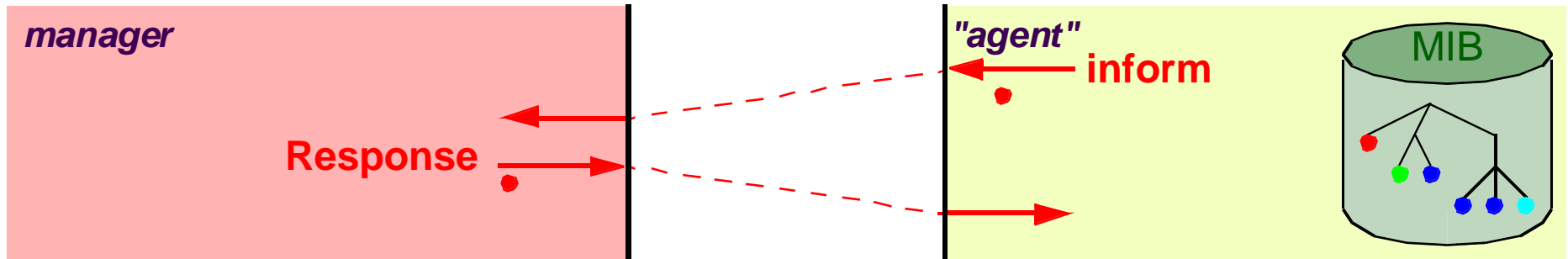
NOTIFICATION-TYPE

{ifIndex}

current

"A linkUp trap signifies that the entity has detected that the ifOperStatus object has changed to Up"

INFORM

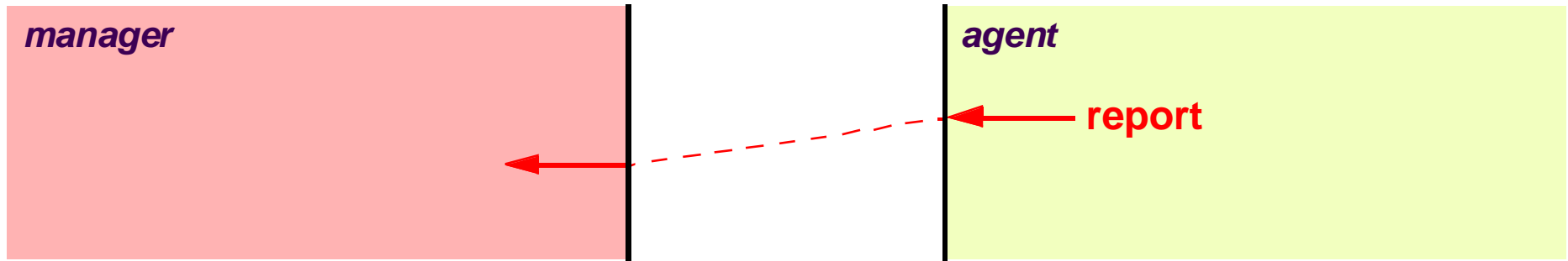


CONFIRMED TRAP

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

SNMPv1:

- UDP

SNMPv2:

- UDP
- CLNS (OSI)
- DDP (APPLETALK)
 - IPX

SNMPv2 RFCs

COMMUNICATION MODEL

- DRAFT STANDARD
- RFC 1905, RFC1906

SECURITY MODEL - SNMPv2C:

- COMMUNITY BASED SNMP
- SAME 'SECURITY MECHANISMS' AS SNMPv1
 - EXPERIMENTAL STATUS
 - RFC 1901

SECURITY MODEL - SNMPv2U:

- USER BASED SECURITY (AUTHENTICATION / ENCRYPTION / ACCESS CONTROL)
 - EXPERIMENTAL STATUS
 - RFC 1909, RFC1910

INFORMATION MODEL:

- STANDARD
- RFC2578, RFC2579, RFC2580

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

INDEPENDENCE OF UNDERLYING TRANSPORT

- MIB-II SPLIT INTO MODULES

SECURITY AND HIERARCHIES TO SNMPv3 & DISMAN

IMPROVED INFORMATION MODEL (SMIv2)

- ADDITIONAL DATA TYPES
- TEXTUAL CONVENTIONS
 - E.G. ROW STATUS
- NOTIFICATIONS