SNMPv1

The Simple Network Management Protocol, version 1

The Protocol

- The original version of SNMP was derived from “Simple Gateway Monitoring Protocol” (SGMP) in 1988
- **RFC1157, STD0015** – *A Simple Network Management Protocol (SNMP)*
- **RFC1155, STD0016** - *Structure and Identification of Management Information for TCP/IP-based Internets*
- **RFC1156** - *Management Information Base for Network Management of TCP/IP-based internets*
- **RFC 1351** – *SNMP Administrative Model*

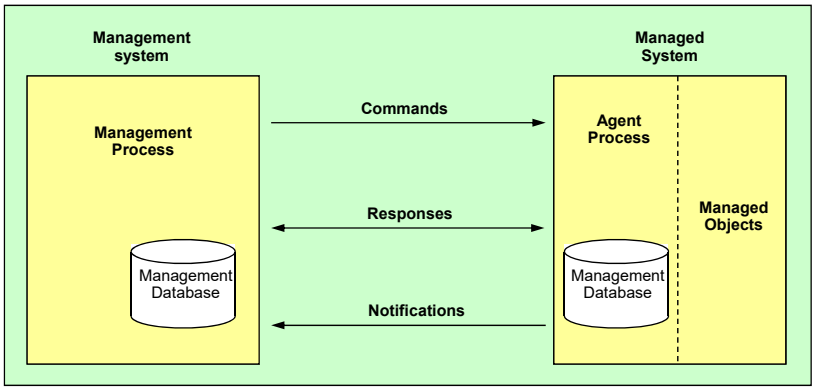
RFC1157
A Simple Network Management Protocol

- *"Structure and Identification of Management Information for TCP/IP-based Internets, which describes how managed objects contained in the MIB are defined as set forth in RFC1155;"*
- *"Management Information Base for Network Management of TCP/IP-based Internets, which describes the managed objects contained in the MIB as set forth in RFC1156"*
- *"The Simple Network Management Protocol, which defines the protocol used to manage these objects, as set forth in this memo*."

The SNMP Architectural Model

- **Entities:**
  - Manager
  - Agent
  - Protocol
  - Management Information
- **Supported Operations:**
  - `Get:` The management station will retrieve the value of an object from the managed station
  - `Set:` The management station will change the value of an object of the managed station
  - `Trap:` The remote station sends, without having been requested, the value of an object to the management station

The SNMP Architectural Model



A Manageable Node

A Manageable Node...

- A system: workstation, mainframe, desktop, printer…
- A router
- A bridge, a repeater, a hub, a network analyzer
- New IoT devices

... is characterized by a set of variables

- Operating Time
- Contact
- Name
- Location
- Number of Interfaces
- etc...

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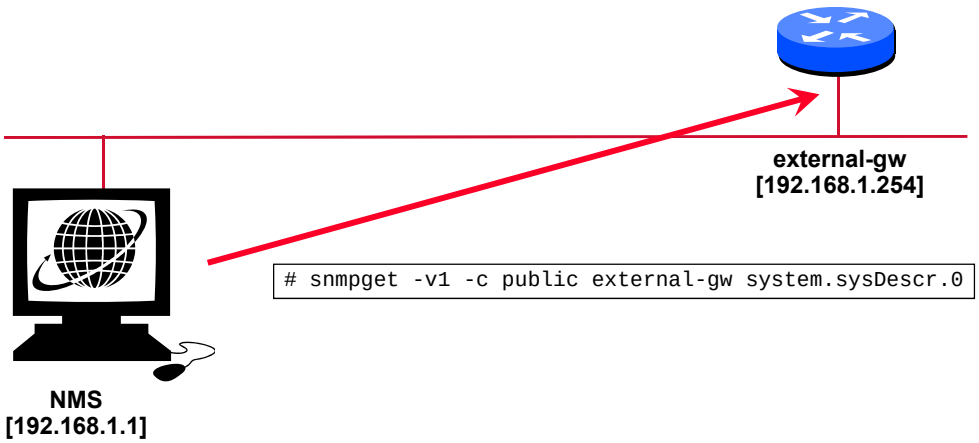
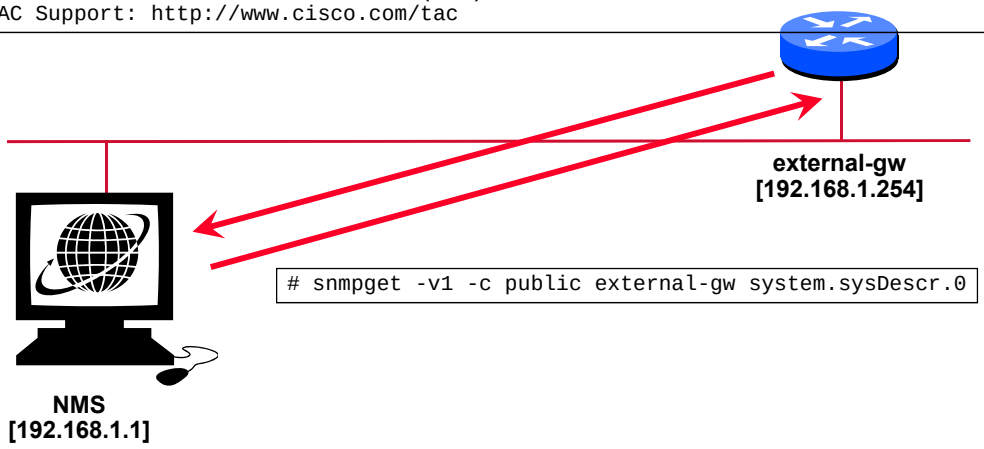
• Operating Time	**SNMPv2-MIB::sysUpTime.0** = Timeticks: (675424418) 78 days, 4:10:44.18
• Contact	**SNMPv2-MIB::sysContact.0** = STRING: Joao Neves
• Name	**SNMPv2-MIB::sysName.0** = STRING: inescp-sw1.inescn.pt
• Location	**SNMPv2-MIB::sysLocation.0** = STRING:
• Number of Interfaces	**IF-MIB::ifNumber.0** = INTEGER: 62
• etc...	**IF-MIB::ifDescr.1** = STRING: GigabitEthernet1/1

Get Operation



Get Operation

```
SNMPv2-MIB::sysDescr.0 = STRING: Cisco Internetwork Operating System Software
IOS (tm) Catalyst 4000 L3 Switch Software (cat4000-IS-M), Version 12.1(8a)EW1,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
```

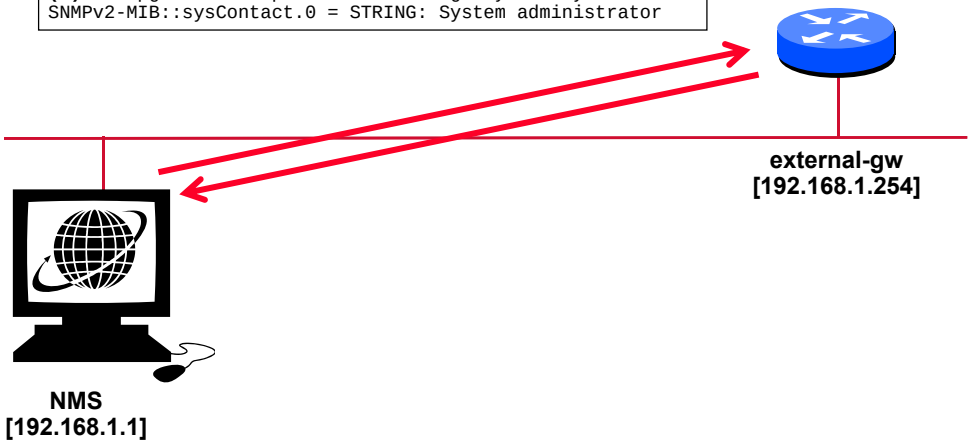



```
# snmpget -v1 -c public external-gw system.sysDescr.0
```


NMS
[192.168.1.1]

Set Operation

```
(1)# snmpget -v1 -c public external-gw system.sysContact.0
SNMPv2-MIB::sysContact.0 = STRING: System administrator
```



NMS
[192.168.1.1]

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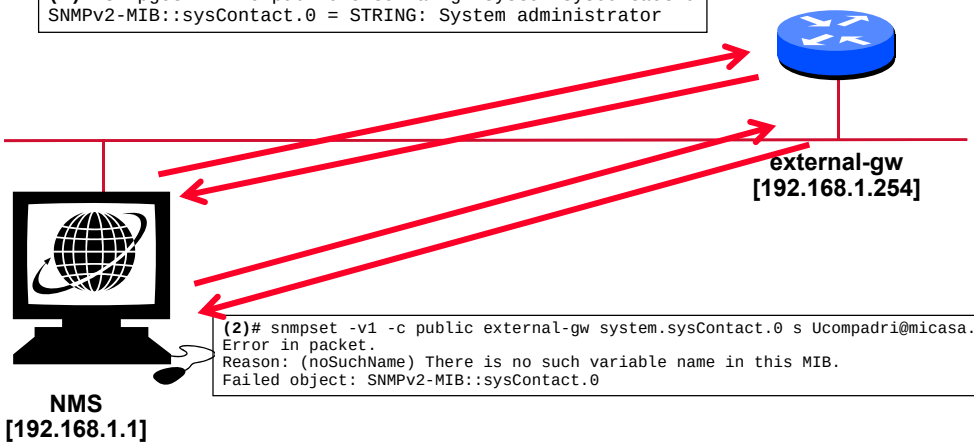
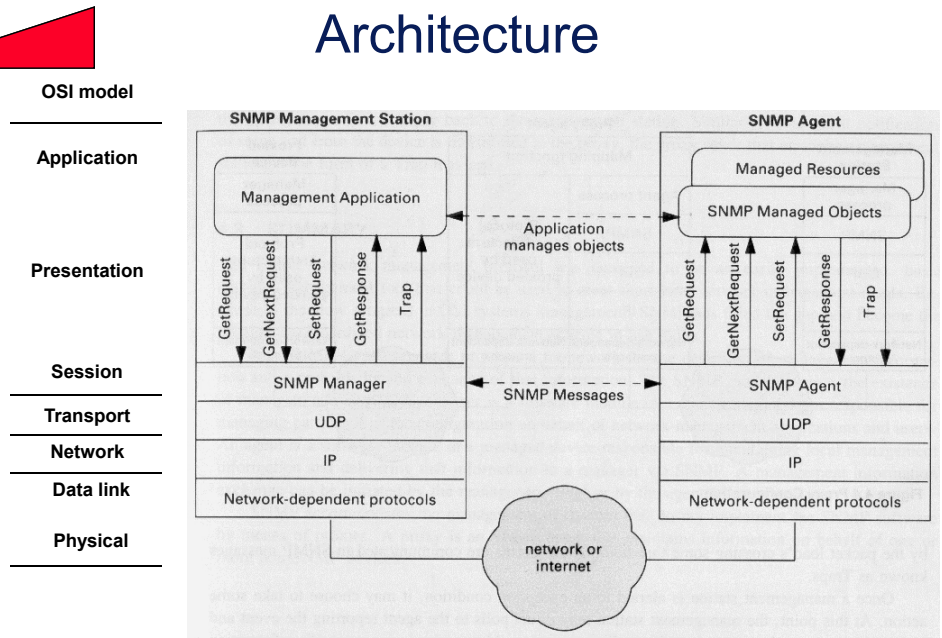



```
(2)# snmpset -v1 -c public external-gw system.sysContact.0 s Ucompadri@micasa.net
Error in packet.
Reason: (noSuchName) There is no such variable name in this MIB.
Failed object: SNMPv2-MIB::sysContact.0
```

NMS
[192.168.1.1]

Architecture



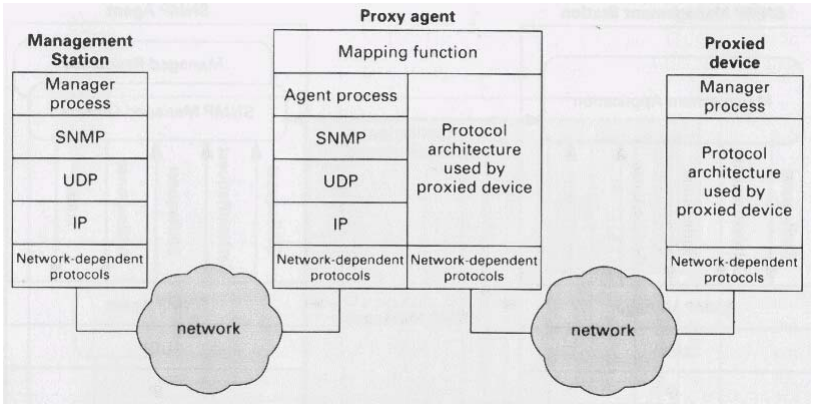
Community Strings

- **Authentication Service –** limit access to the MIB only for authorized stations
- **Access Policy –** give different privileges to different management stations
- **Proxy Service –** a managed station can act as a proxy for other stations

Access Control Policy

- *Read Community string*
  "public"
- *Write Community string*
  "private"
- *Trap Community string*

The Proxy Service

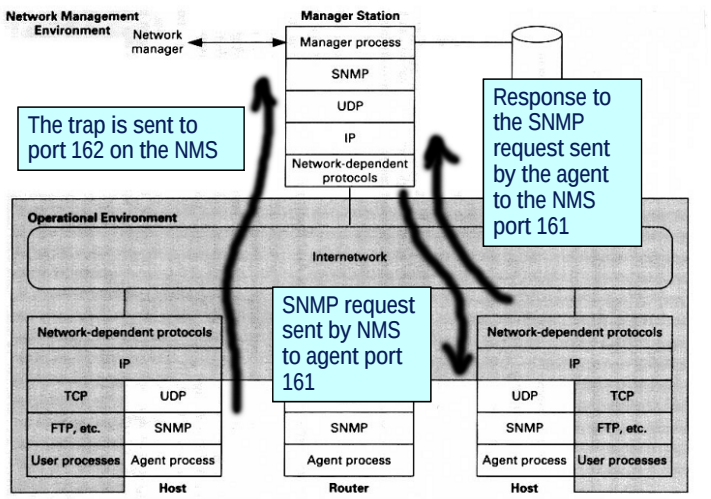


Proxy Interaction

- ***Administrative firewall*** – makes authentication and authorization of requests
- ***Caching Firewall*** – does cache information
- ***Transport Bridging*** – makes the end-to-end connection between the remote system and the NMS
- ***Protocol Translation*** – translates the management protocol

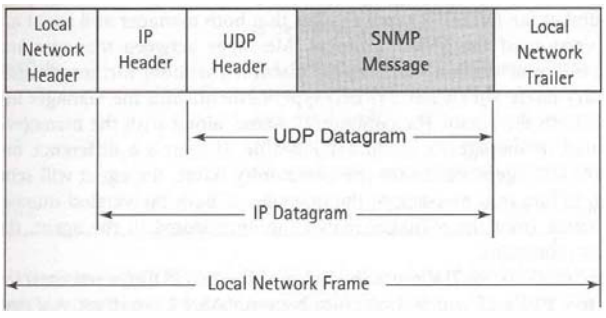
SNMP and TCP/IP

Filtering to be done in the Firewall

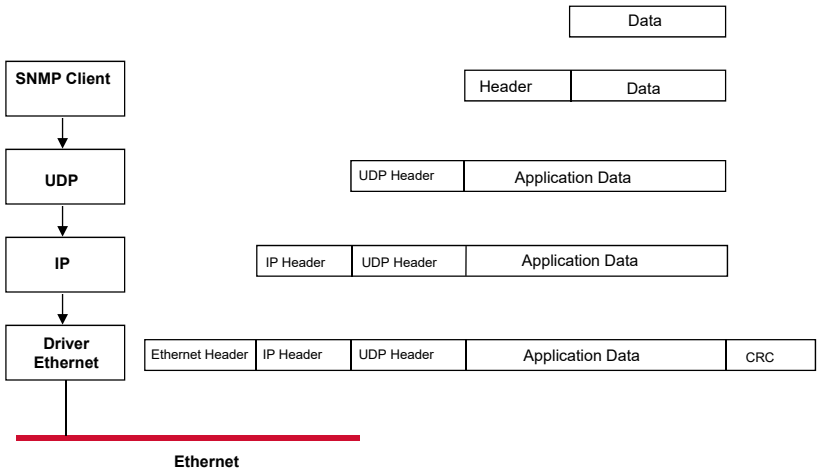


Protocol Data Units (PDU)

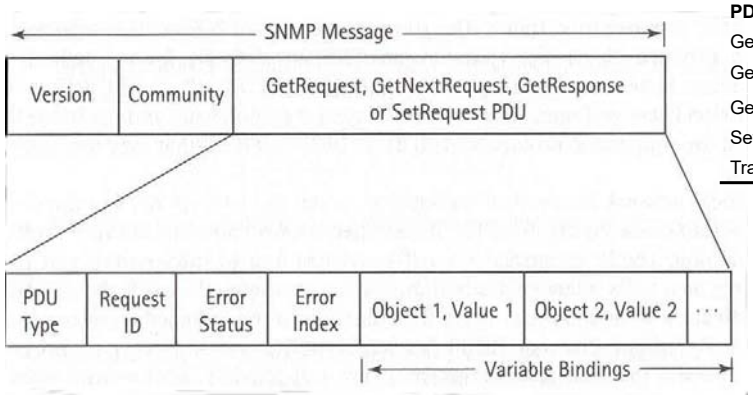
The frame is the unit of information transmitted between two nodes



Encapsulation of data

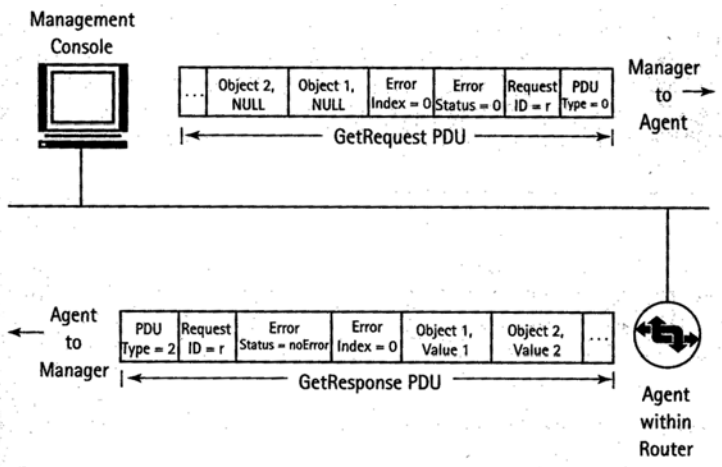


PDUs *Get*, *Set* and *Response*

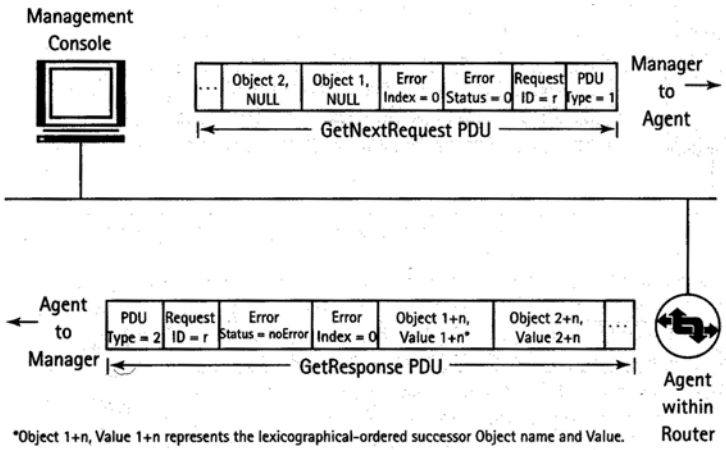


PDU	PDU Type
GetRequest	0
GetNextRequest	1
GetResponse	2
SetRequest	3
Trap	4

GetRequest/GetResponse

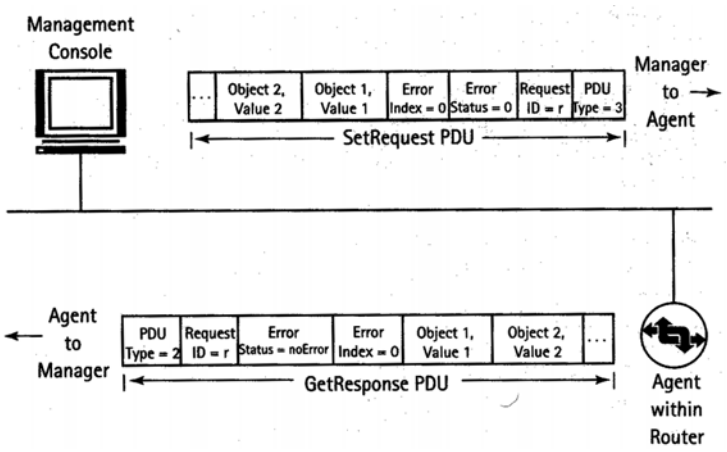


GetNextRequest/GetResponse



*Object 1+n, Value 1+n represents the lexicographical-ordered successor Object name and Value.

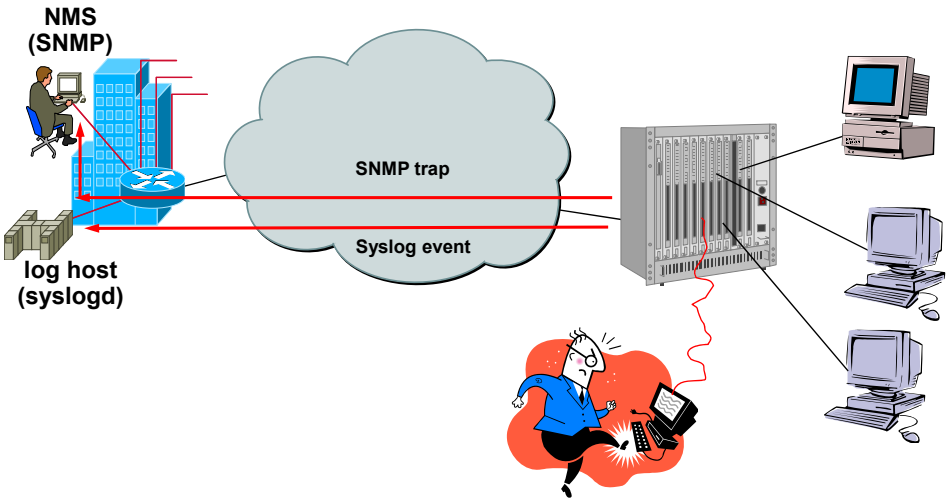
SetRequest/GetResponse



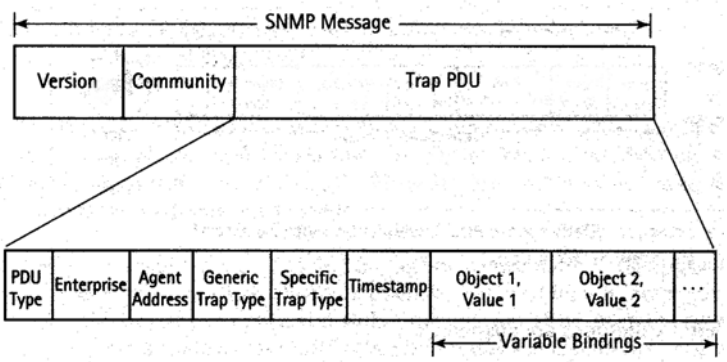
Traps SNMPv1

The trap is the way the agent notifies the NMS that something happened.

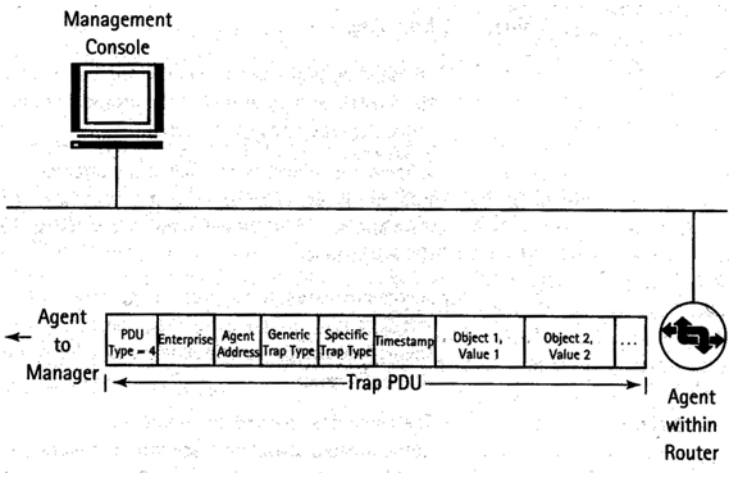
Trap is sent



PDU Trap



Using the Trap PDU



Generic *Trap* Types

- **coldStart (0) –** signifies that the sending protocol entity is reinitializing itself, the `Counters` and `Gauges` values were reset to zero
- **warmStart (1) –** the agent rebooted but the variables did not change
- **linkDown (2)**
- **linkUp (3)**
- **authenticationFailure (4) –** authentication failed in *community string*
- **egpNeighborLoss (5)**
- **enterpriseSpecific (6) –** vendor specific traps

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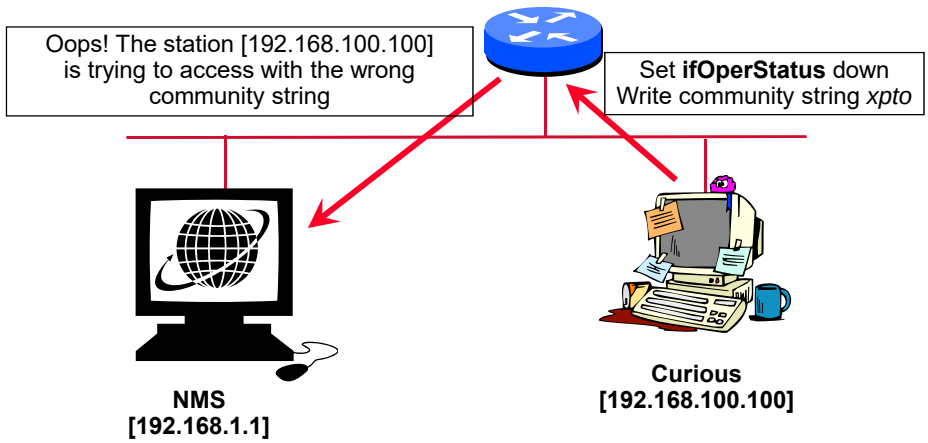
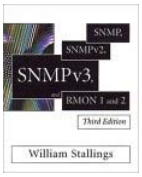
Authentication Failure



Error Messages

0 = noError
1 = tooBig
2 = noSuchName
3 = badValue ← Usually not used, **noSuchName** is equivalent
4 = readOnly
5 = genErr ← Generic answer

Bibliography



• **Stallings, William**
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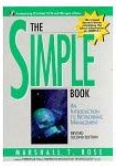

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