

NETWORK MANAGEMENT

MANAGEMENT PROTOCOL  
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NETWORK MANAGEMENT

**Competencies**

- Name the most common management protocols
- Understand how they are positioned and what their most important distinguishing characteristics are
- Explain management primitives and protocol message structure used with SNMP
- Grasp the reasons for the enormous popularity of the command-line interface (CLI), while appreciating some of the challenges faced by management applications that use it
- Understand how syslog works
- Explain the use of Netflow and IP Flow Information Export (IPFIX)
- Describe the latest trend in management protocols, Netconf

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**SNMP Simple Network Management Protocol**

- SNMP, an application layer protocol, facilitates the exchange of management information among network devices, such as nodes and routers. It comprises part of the TCP/IP suite. System administrators can remotely manage network performance, find and solve network problems, and plan for network growth by using SNMP
  
- Devices that typically support SNMP include routers, switches, servers, workstations, printers, modem racks and more.
- used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.
- consists of a set of standards for network management, including an **application layer protocol**, a **database schema**, and a **set of data objects**.

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**NETWORK MANAGEMENT**

**SNMP Simple Network Management Protocol**

**SNMP Basic Commands**

- **Read** : monitor managed devices
- **Write** : control (change variable value of) managed devices
- **Trap** : - asynchronously report events to the NMS.  
- when types of events occur, agent device sends a trap NMS
- **Traversal operations** : - determine which variables a managed device supports  
- sequentially gather information in variable tables, eg: routing table.

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**SNMP Simple Network Management Protocol**

**SNMP versions**

Function	SNMPv1	SNMPv2c	SNMPv3
Trap Message	Yes	Yes	Yes
GET Message	Yes	Yes	Yes
SET Message	Yes	Yes	Yes
Inform Message	No	Yes	Yes
Secure Encryption	No	No	Yes

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**SNMP Simple Network Management Protocol**

**SNMP versions**

- **SNMPv1**
  - lacking in security and delivery guarantees.
  - easy to implement.
- **SNMPv2c**
  - lacking in security
  - Inform command. Unlike [Traps](#), which are simply received by a manager, [Informs](#) are positively acknowledged with a response message. If a manager does not reply to an Inform, the SNMP agent will resend the Inform.
  - improved error handling
  - improved SET commands
- **SNMP V3**
  - Authentication—Verifying that the request comes from a genuine source.
  - Privacy—Encrypting data.
  - Authorization—Verifying that the user allows the requested operation.
  - Access control—Verifying that the user has access to the objects that are requested.

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**SNMP Simple Network Management Protocol**

**SNMP operations format**

Operation	Description
get-request	Retrieve a value from a specific variable.
get-next-request	Retrieve the value following the named variable. Often used to retrieve variables from within a table. With this operation, an SNMP manager does not need to know the exact variable name. A sequential search gets performed to find the needed variable from within the MIB.
get-response	Reply to a get-request, get-next-request, get-bulk-request, and set-request that an NMS sent.
get-bulk-request	Fills the get-response with up to max-repetition number of get-next interactions, similar to get-next-request.
set-request	Store a value in a specific variable.
traps	Sent by an SNMP agent to an SNMP manager to indicate that some event occurred.

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**SNMP Simple Network Management Protocol**

**SNMP : set request sample ping**

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**How SNMP works**

SNMP is a IETF udp-based network protocol to manage network attached devices, formally **managed devices**, from remote **network management systems (NMS)**.

The managed device software component supporting the protocol, formally called **agent**, is public through **UDP port 161** and allows NMSs:

- Setting data to **managed devices**.
- Getting data from **managed devices**.
- Receiving events from **managed devices**.

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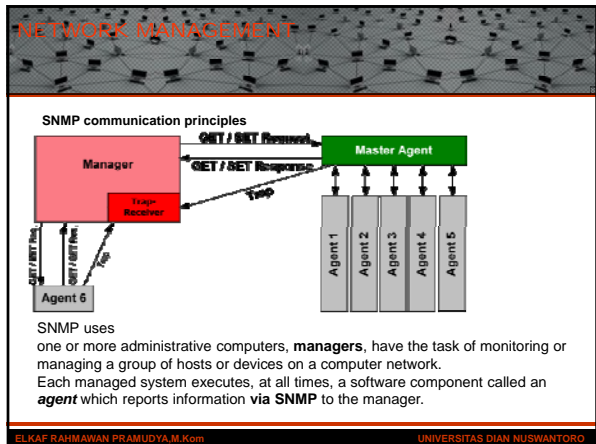
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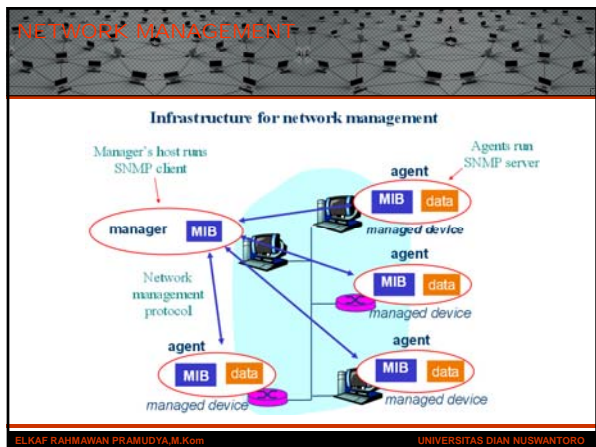
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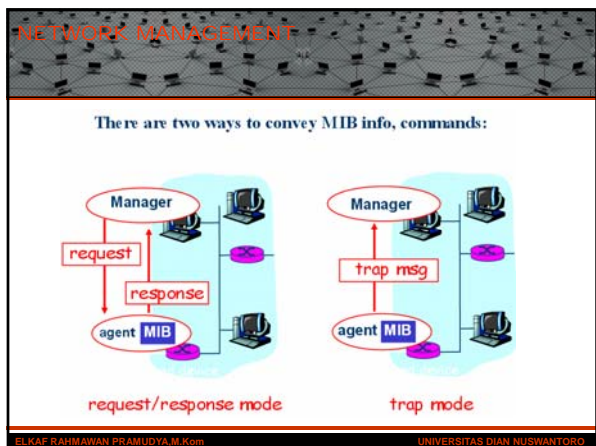
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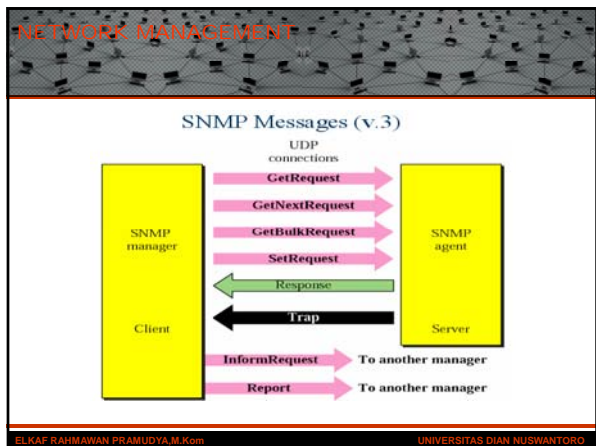
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**Alternative Protocol**

**CLI(Command Line interface)**

CLI is intended for human interaction, it offers many features to make such interactions easier:

- Help functions (typing a ? behind a command to display the list of available command options)
- Autocompletion (needing to type only the first few characters of a command or option that make it unique, and using the Tab key to tell the system to fill in the rest)
- Prompts (enabling you to enter different command modes, and reminding you of that mode by the form that the prompt takes)

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**Example CLI : Configuring an Interface**

```

Cisco
[config] configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface FastEthernet 0/4
Router(config-if)# ip address 192.168.1.10 255.255.255.255
Router(config-if)# no shutdown
Router(config-if)# end
Router#
  
```

**Linux**

```

# mcedit /etc/sysconfig/network-scripts/ifcfg-eth0
# Intel Corporation 82573E Gigabit Ethernet Controller (Copper)
DEVICE=eth0
BOOTPROTO=static
DHCPCLASS=
HWADDR=00:30:48:56:A6:2E
IPADDR=192.168.1.10
NETMASK=255.255.255.0
ONBOOT=yes
  
```

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- **Use of CLI as a Management Protocol**  
 CLI is not a management protocol at all. It is a command-line interface. However, management applications are faced with the problem of how to access certain management functionality at the device. In many cases, not all features are covered through SNMP or other management interfaces. This requires applications (as well as operator-defined management scripts, subsumed in our discussion under management applications) to fall back on what is available, which is generally CLI.

show Management Information Displayed in Table Format

```

Router# show obj neighbors
Capability Codes: R - Router, T - Transit Bridge, B - Source Route Bridge
S - Stub router, H - HSRP, L - LSP, r - Repetitive

Device ID    Local Interface  Neighbor  Capability  Platform  Port ID
-----
JAN02S08791  Fa0 1/24        127      T S         WS-C2948  2/48
JAN02S08791  Fa0 8/2         127      T S         WS-C2948  2/48
JAN02S08791  Fa0 8/1         127      T S         WS-C2948  2/48
JAN02S08791  Gig 1/2         122      T S         WS-C2948  2/48
JAN02S08791  Gig 1/1         122      T S         WS-C2948  2/48
JAN03138184  Fa0 8/8         187      T S         WS-CAM03  2/48
JAN03138184  Fa0 8/9         182      T S         WS-CAM03  2/48
Router#
    
```

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**syslog Overview**  
 syslog : to write system messages to a log file

example of a syslog message:

```

172.19.209.130 000024: *Apr 12 18:01:55.643: % ENV_MON-1-SHUTDOWN: Environmental monitor initiated shutdown
01:14:11: %IPPHONE-6-REG_ALARM: 25: Name=SEP003094C38724 Load=3.2(2.9) Last=Initialized
    
```

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**syslog**

syslog Message Structure According to IETF

Header							Structured Data			Message	
Priority (facility*3+severity)	Version	Time stamp	Host name	App name	Procid	Message ID	SDE 1	...	SDE n	Message	
							ID	param name	value		

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**syslog**

The diagram illustrates the Syslog architecture. It shows a 'Logging Host' and a 'Syslog Relay'. The Logging Host receives 'Syslog messages' and sends them to 'Management Applications'. The Syslog Relay receives 'Syslog messages' and forwards them to 'Syslog receivers'.

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**NETWORK MANAGEMENT**

**Summarizing**

Management Protocol Positioning

User / Application	Humans	Applications
Monitoring	CLI, syslog	SNMP, syslog
Configuration	CLI	Netconf
Data Collection	n.s.	Netflow/SPDX

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**Bibliography**

- ❑ Alexander Clemm, Ph.D., **Network Management Fundamentals**, Copyright© 2007 Cisco Systems, Inc., Cisco Press 800 East 96th Street Indianapolis, IN 46240 USA
- ❑ <http://www.cisco.com/networkers/nw04/presos/docs/NMS-1N02.pdf>
- ❑ <http://monitoringtt.blogspot.com/2010/05/snmp-for-dummies-protocol.html>
- ❑ [http://medusa.sdsu.edu/network/CS596/Lectures/ch23\\_SNMP.pdf](http://medusa.sdsu.edu/network/CS596/Lectures/ch23_SNMP.pdf)

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