

Understanding SNMP

Motivation

- In small networks with only a few devices confined to a single location, network engineers can individually inspect devices and check for anomalies.
 - However, as the number of devices increases, especially in growing networks with hundreds or thousands of devices, manual device monitoring becomes increasingly difficult.

- Simple Network Management Protocol (SNMP) is a popular technology that lets you monitor network devices such as switches, routers, servers, printers and other IP-based devices from a single management host.
 - Provided the device is SNMP capable, you can configure SNMP, collect information, and monitor any number of devices from a single system.

Uses of SNMP



- Monitoring traffic flowing through the device
- Detecting and notifying faults encountered on network devices
- Collecting device performance data over long periods and identifying trends
- Remotely configuring network devices
- Remotely accessing and controlling network devices

What actually is it?

- SNMP is a standard TCP/IP protocol for network management.
 - Network administrators use SNMP to monitor and map network availability, performance, and error rates.
 - System management software uses SNMP to allow administrators to remotely monitor and manage thousands of systems on a network, often by presenting the data gathered from monitored devices in a snapshot or dashboard view.

By Definition SNMP is...

- Simple Network Management Protocol (SNMP) is a,
 - standard that defines how communication occurs between SNMP-capable devices and defines the SNMP message types.

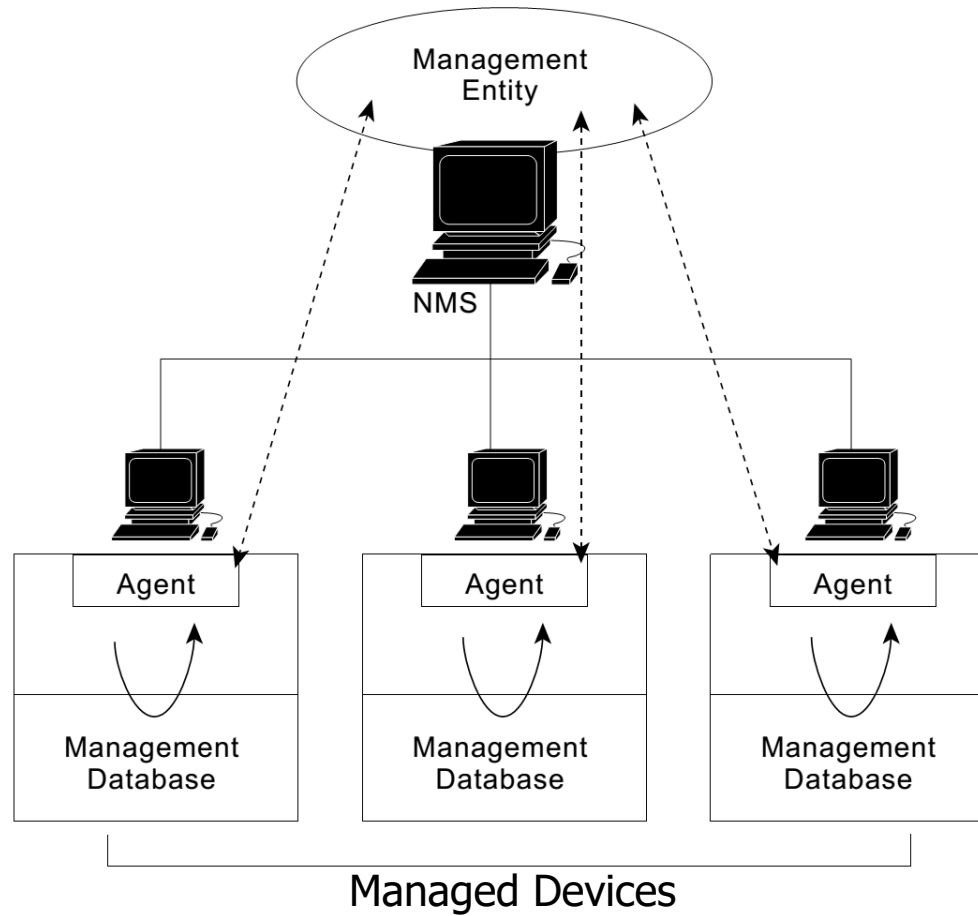
- ▲ OR

- The Simple Network Management Protocol(SNMP) is an application-layer protocol that facilitates the exchange of management information between network devices.

Key Components

- An SNMP managed network consists of three key components:
 - Managed devices
 - ▲ A managed device is a network node that contains an SNMP agent and collect and store management information and make this information available to NMSs using SNMP.
 - Agents
 - ▲ It's a network-management software module that resides in a managed device.
 - ✦ An agent has local knowledge of management information and translates that information into a form compatible with SNMP.
 - Network-management systems(NMSs).
 - ▲ An NMS executes applications that monitor and control managed devices.

SNMP Managed Network Architecture



How it works???

- As networks expand, technologies like SNMP become more useful and essential for network administration.
 - For SNMP to work, network devices make use of a data store called the Management Information Base (MIB).
 - All SNMP compliant devices contain an MIB that consists of information on valid attributes of a device.
 - ▲ Some attributes in the MIB are fixed, while others are dynamic values calculated by the Network Management System (NMS).

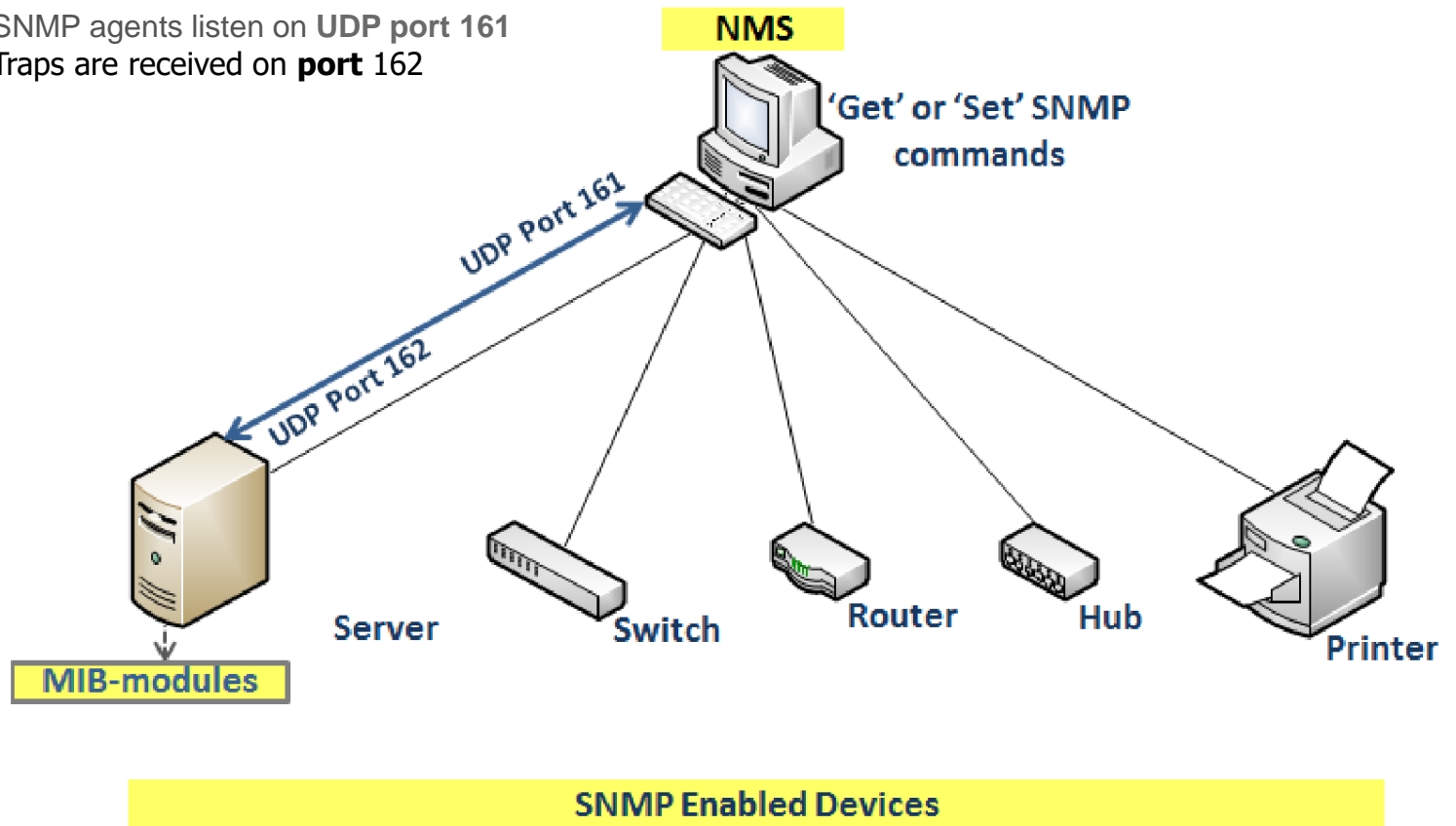
- The SNMP management application together with the PC on which it runs is the NMS.
- This provides the bulk of the processing and memory resources required for network management.
- Therefore, the NMS executes applications that monitor and control managed devices.

SNMP Commands

- Managed devices are monitored and controlled using four basic SNMP Commands:
 - Read
 - ▲ The read command is used by an NMS to monitor managed devices. The NMS examines different variables that are maintained by managed devices.
 - Write
 - ▲ The NMS changes the values of variables stored within managed devices.
 - Trap
 - ▲ The trap command is used by managed devices to asynchronously report events to the NMS.
 - ▲ When certain types of events occur, a managed device sends a trap to the NMS.

Cont...

- SNMP agents listen on **UDP port 161**
- Traps are received on **port 162**



- SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network.
 - Each managed component has a corresponding subagent and MIBs.
 - SNMP-compliant devices listen for PDUs on port 162 and return the data stored in the MIB to the SNMP requesters via port 161. A network can have
- Multiple SNMP managers.

What type of information, NMS Requests???

- Network protocol identification and statistics.
 - Dynamic identification (discovery) of devices attached to the network.
 - Hardware and software configuration data.
 - Performance and usage statistics of network devices.
 - Error and event messages from devices.
 - Application usage statistics.
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■ SNMP Management Model:

— Organization Model

- ▲ Relationship between network element, agent and manager
- ▲ Hierarchical Architecture

— Information Model

- ▲ Uses ASN1 Syntax
- ▲ SMI (Structure of Management Information)
- ▲ MIB (Management Information Base)

— Communication Model

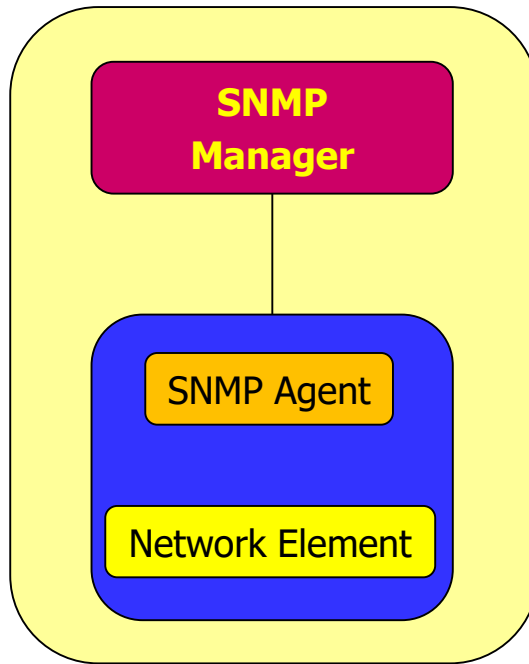
- ▲ Transfer Syntax
- ▲ SNMP Over TCP/IP
- ▲ Comm. Services addressed by messages
- ▲ Security Framework Community based model

Organization Model

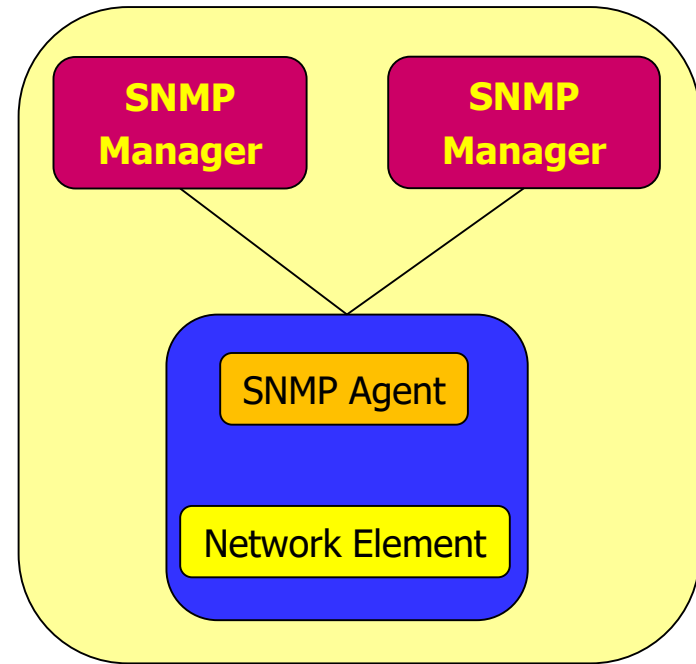
■ Two-Tier Model

- It was an initial SNMP organization model
 - Has agent process,
 - ▲ Which resides in the managed object
 - Network Manager Process
 - ▲ Which resides in NMS and manages the managed objects
 - ▲ Both the agent and manager are software modules.
- ✧ Multiple managers can interact with one agent as well.

2-Tier Models

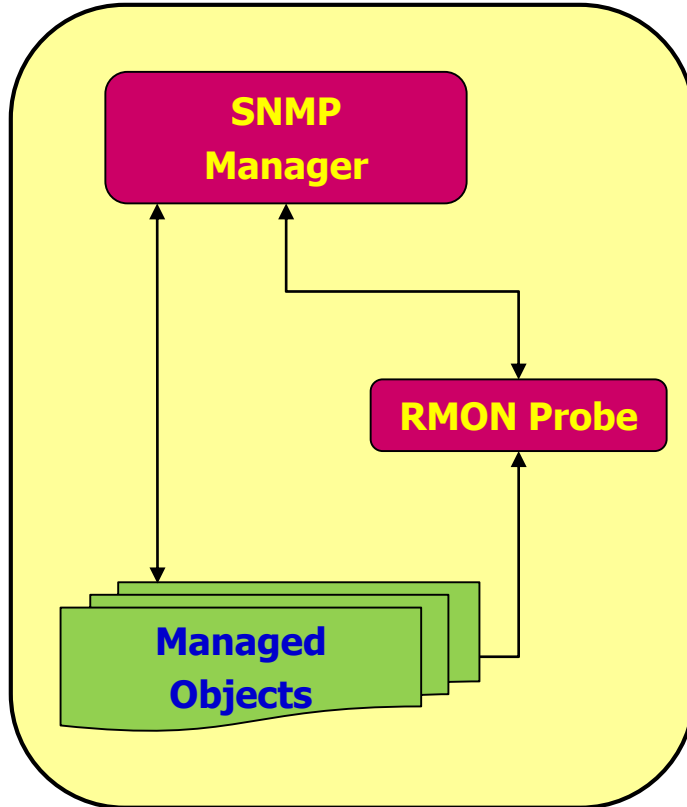


a. One manager – one agent



b. Multiple managers – one agent

Three-tier Model



3-Tier Organization Model

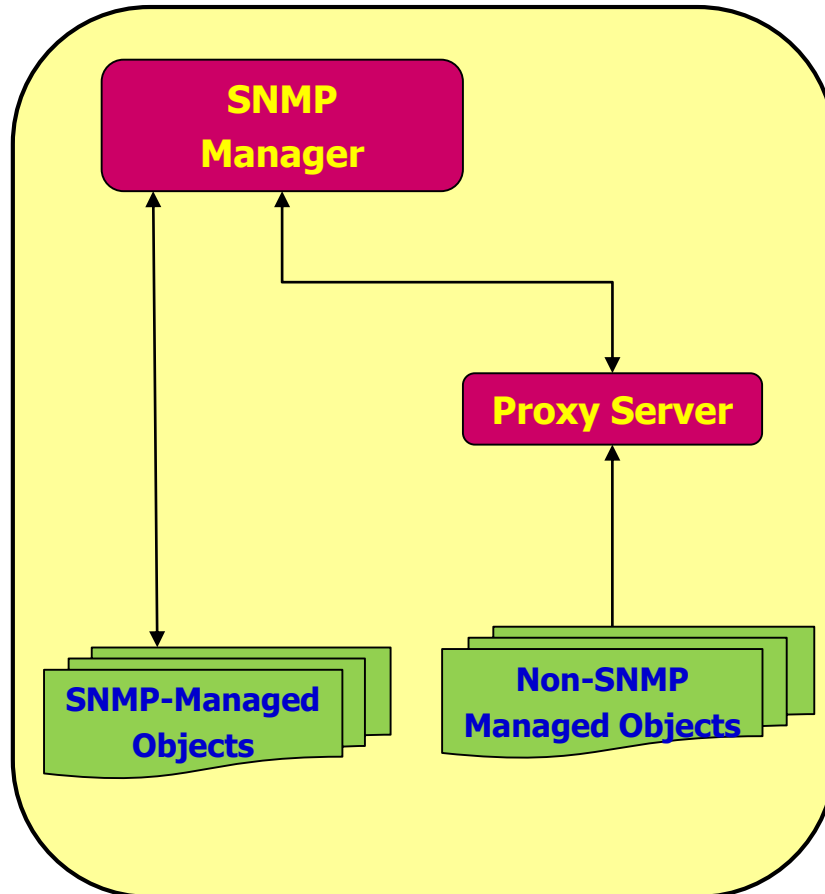
Discussion!!!

Some time we want to get the temporal Data of data traffic in a LAN.

Instead of the network manager continuously Monitoring the events and calculating the info. An intermediate agent called RMON (Remote Monitoring) is used between the managed objects And the network manager.

The network manager can get the data from both the Managed objects as well as from the RMON agent about The managed objects

What if a NE does not have SNMP Agent???



Proxy Server Organization Model

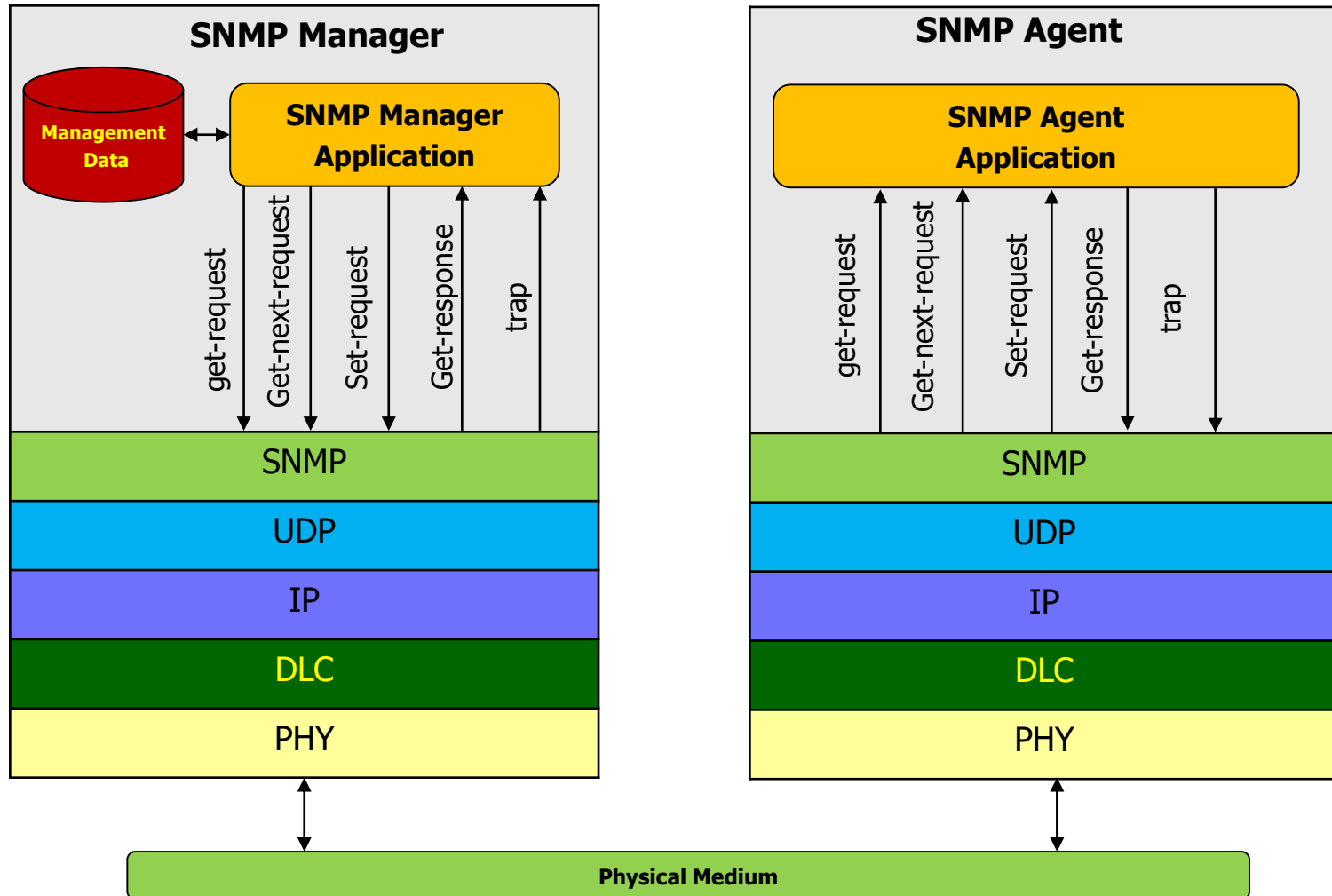
Discussion!!!

This model occurs in many situation, such as legacy systems, management, TMN, managing wireless networks, and so on.

All the these systems are part of overall networks that have to be managed on an integrated basis.

A proxy server at a central location that converts the data into set that is compatible with SNMP and communicates with the SNMP Manager.

System Overview





Thanks