SNS COLLEGE OF ENGINEERING

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Department of Information Technology

Course Name – 19IT503 Internet of Things

III Year / V Semester

Unit 5 – DESIGN METHODOLOGY AND FUTURE TRENDS

Topic 2 - SNMP

SNMP

Simple Network Management Protocol

SNMP is a well-known and widely used network management protocol that allows monitoring and configuring network devices such as routers, switches, servers, printers, etc.

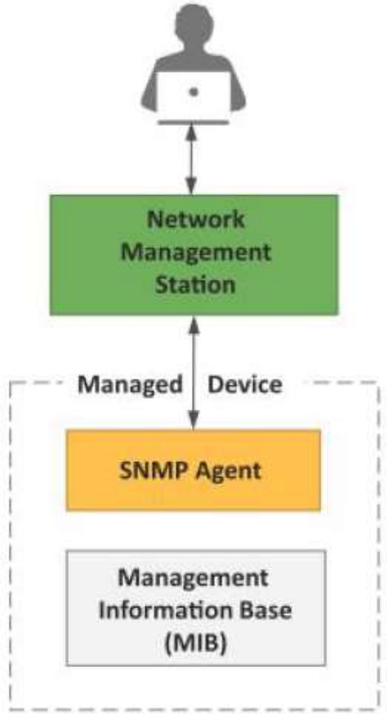
SNMP is an application layer protocol that uses User Datagram Protocol as the transport protocol on ports 161/162.

SNMP component include

- Network Management Station (NMS) or SNMP Manager

Managed Devices

- SNMP Agent that runs on the device
- Management Information Base (MIB)



SNMP

Network Management Station (NMS)
NMS also called as network manager executes SNMP commands to monitor and configure the managed device.

Managed Device
It is the device that is being managed and runs a software called SNMP Agent.

SNMP Agent
It is a management software module installed on a managed device. Managed devices can be network devices like PC, routers, switches, servers, etc. The managed device contains the MIB which has all the information of the device attributes to be managed.

Management Information Base (MIB)
MIBs use the Structure of the Management Information (SMI) notation for defining the structure of the management data.
The structure of the management data is defined in the form of variables which are identified by object identifiers (OIDs) which have a hierarchical structure.
Each agent has its own MIB, which is a collection of all the objects that the manager can manage. MIB is categorized into eight groups: system, interface, address translation, ip, icmp, tcp, udp, and egp. These groups are under the mib object.

SNMP

How SNMP Works?

- The SNMP manager is a host that acts as the client and runs client program, the SNMP agent acts as the server and the MIB acts as the server's database.
- When the SNMP manager asks the agent a question, the agent uses the MIB to supply the answer.
- The agent is used to keep the information in a database while the manager is used to access the values in the database.
- SNMP software agents on network devices and services communicate with a network management system to relay status information and configuration changes.
- The NMS provides a single interface from which administrators can issue batch commands and receive automatic alerts.
- SNMP uses a blend of pull and push communications between network devices and the network management system.
- The SNMP agent, which resides with the MIB on a network device, constantly collects status information but will only push information to the NMS upon request or when some aspect of the network crosses a pre-defined threshold known as a trap.
- Trap messages are typically sent to the management server when something significant, such as a serious error condition, occurs.

SNMP

Message Types

SNMP defines five types of messages: GetRequest, GetNextRequest, SetRequest, GetResponse, and Trap.

GetRequest: The GetRequest message is sent from a manager (client) to the agent (server) to retrieve the value of a variable.

GetNextRequest: The GetNextRequest message is sent from the manager to agent to retrieve the value of a variable. This type of message is used to retrieve the values of the entries in a table.

GETBULK Request: Sent by the SNMP manager to the agent to efficiently obtain a potentially large amount of data, especially large tables. It is introduced in SNMPv2c.

SetRequest: The SetRequest message is sent from a manager to the agent to set a value in a variable.

RESPONSE: Sent by the agent to the SNMP manager, issued in reply to a GET Request, GETNEXT Request, GETBULK Request and a SET Request. Contains the values of the requested variables.

SNMP

Message Types

Trap –

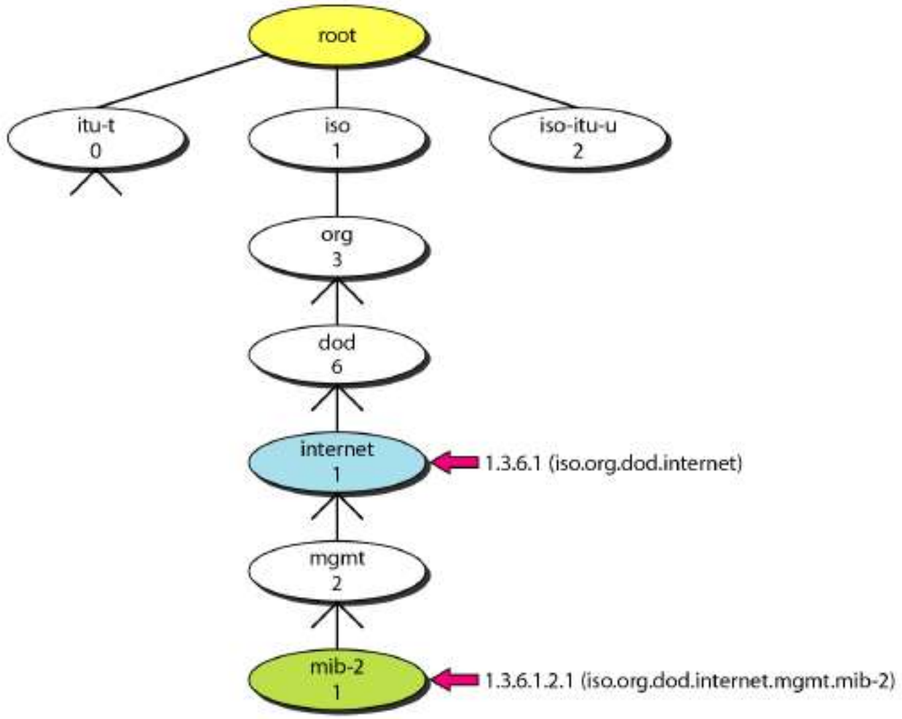
These are the message sent by the agent without being requested by the manager. It is sent when a fault has occurred.

InformRequest –

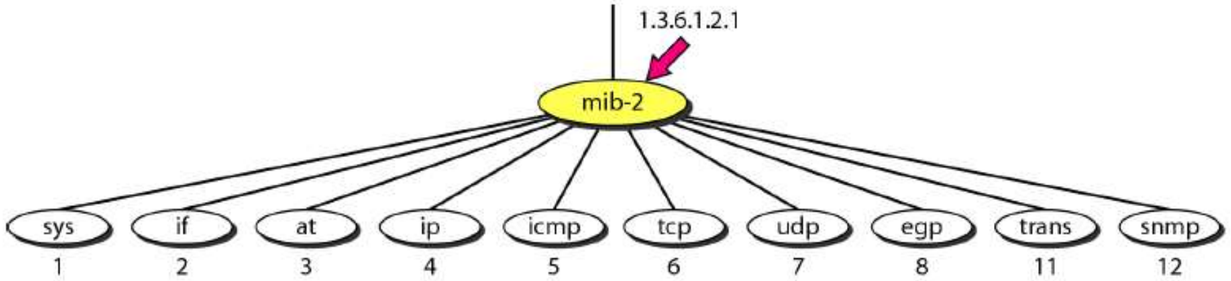
It was introduced in SNMPv2c, used to identify if the trap message has been received by the manager or not. The agents can be configured to send trap message continuously until it receives an Inform message. It is the same as a trap but adds an acknowledgement that the trap doesn't provide.

SNMP

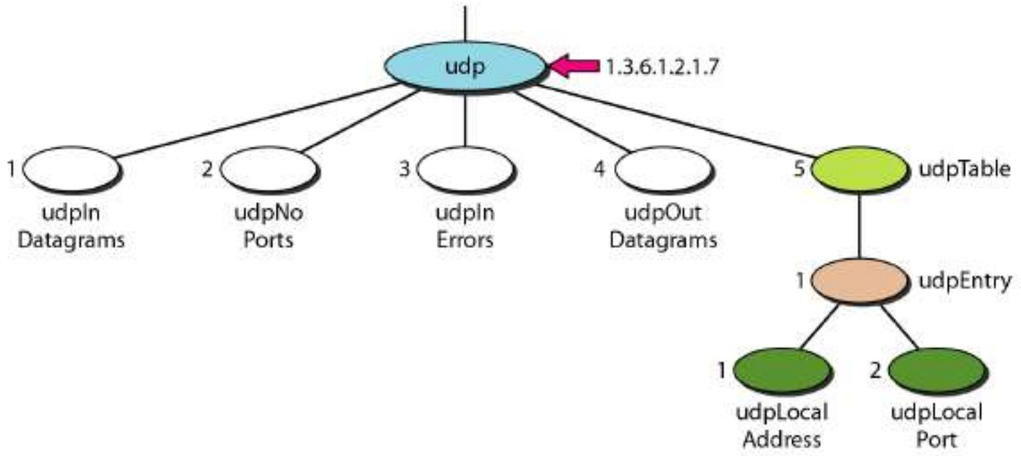
Simple Network Management Protocol



MIB Groups



MIB Variables



SNMP

Limitations of SNMP

- SNMP is stateless in nature and each SNMP request contains all the information to process the request. The application needs to be intelligent to manage the device.
- SNMP is a connectionless protocol which uses UDP as the transport protocol, making it unreliable as there was no support for acknowledgement of requests.
- MIBs often lack writable objects without which device configuration is not possible using SNMP.
- It is difficult to differentiate between configuration and state data in MIBs.
- Retrieving the current configuration from a device can be difficult with SNMP.
- Earlier versions of SNMP did not have strong security features.

Network Operator Requirements

Network Operator Requirements

To address the limitation of SNMP and plan for future enhancement Internet Architecture Board (IAB) provides the following requirements .

- Ease of use
- Distinction between configuration and state data
- Fetch configuration and state data separately
- Configuration of the network as a whole
- Configuration transactions across devices
- Configuration deltas
- Dump and restore configurations
- Configuration validation
- Configuration database schemas
- Comparing configurations
- Role-based access control
- Consistency of access control lists:
- Multiple configuration sets
- Support for both data-oriented and task oriented access control