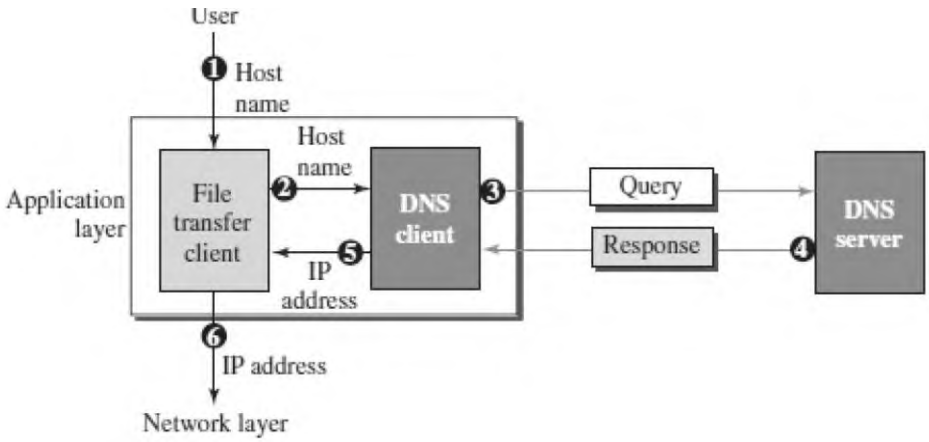
DNS (DOMAIN NAME SYSTEM)

- Domain Name System was designed in 1984.
- DNS is used for name-to-address mapping.
- The DNS provides the protocol which allows clients and servers to communicate with each other.
- Eg: Host name like www.yahoo.com is translated into numerical IP addresses like 207.174.77.131
- Domain Name System (DNS) is a distributed database used by TCP/IP applications to map between hostnames and IP addresses and to provide electronic mail routing information.
- Each site maintains its own database of information and runs a server program that other systems across the Internet can query.

WORKING OF DNS



The following six steps shows the working of a DNS. It maps the host name to an IP address:

1. The user passes the host name to the file transfer client.

2. The file transfer client passes the host name to the DNS client.

3. Each computer, after being booted, knows the address of one DNS server. The DNS client sends a message to a DNS server with a query that gives the file transfer server name using the known IP address of the DNS server.

4. The DNS server responds with the IP address of the desired file transfer server.

5. The DNS server passes the IP address to the file transfer client.

6. The file transfer client now uses the received IP address to access the file transfer server.

NAME SPACE

- To be unambiguous, the names assigned to machines must be carefully selected from a name space with complete control over the binding between the names and IP address.
- The names must be unique because the addresses are unique.
- A name space that maps each address to a unique name can be organized in two ways: ***flat (*or) *hierarchical*.**

Flat Name Space

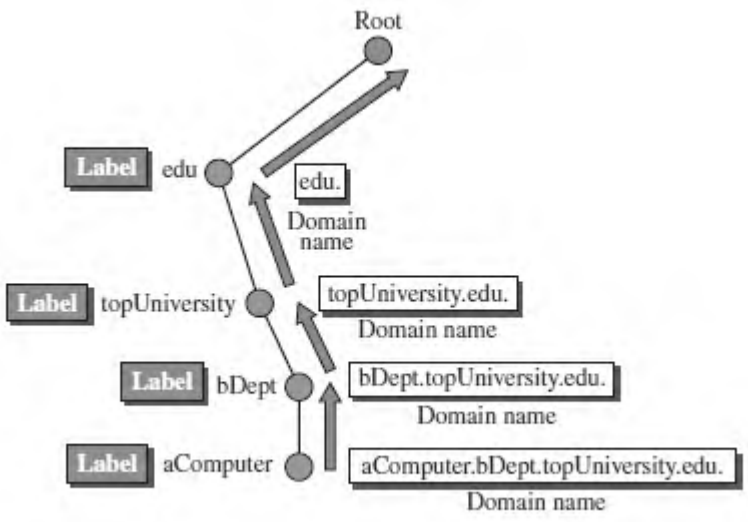
- In a flat name space, a name is assigned to an address.
- A name in this space is a sequence of characters without structure.
- The main disadvantage of a flat name space is that it cannot be used in a large system such as Internet because it must be centrally controlled to avoid ambiguity and duplication

Hierarchical Name Space

- In a hierarchical name space, each name is made of several parts.
- The first part can define the organization, the second part can define the name, the third part can define departments, and so on.
- In this case, the authority to assign and control the name spaces can be decentralized.
- A central authority can assign the part of the name that defines the nature of the organization and the name.
- The responsibility for the rest of the name can be given to the organization itself. Suffixes can be added to the name to define host or resources.
- The management of the organization need not worry that the prefix chosen for a host is taken by another organization because even if part of an address is the same, the whole address is different.

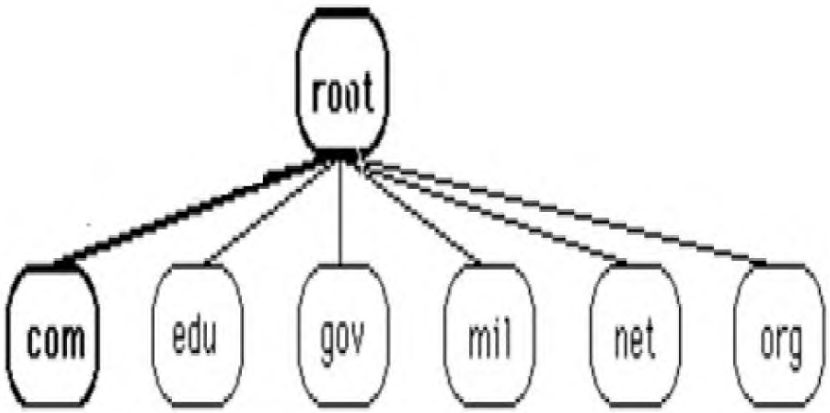
Domain Name

- Each node in the tree has a label called as domain name.
- A full domain name is a sequence of labels separated by dots (**.**)
- The domain names are always read from the node up to the root.
- The last label is the label of the root (null).
- This means that a full domain name always ends in a null label, which means the last character is a dot because the null string is nothing



Generic Domains

- The generic domains define registered hosts according to their generic behavior.
- Each node in the tree defines a domain, which is an index to the domain name space database.
- The first level in the generic domains section allows seven possible three character levels.
- These levels describe the organization types as listed in following table**.**



.COM	Commercial Organizations
.EDU	Educational institutions
.GOV	Government institutions
.MIL	Military groups
.NET	Major network support centers
.INT	International Organizations
.ORG	Nonprofit Organizations

Country Domains

- The country domains section follows the same format as the generic domains but uses two characters for country abbreviations
- E.g.; ***in*** for ***India***, ***us*** for ***United States*** etc) in place of the three character organizational abbreviation at the first level.
- Second level labels can be organizational, or they can be more specific, national designation.

DNS MESSAGES

- DNS has two types of messages: query and response.
- Both types have the same format.
- The query message consists of a header and question section.
- The response message consists of a header, question section, answer section, authoritative section, and additional section

SNMP (SIMPLE NETWORK MANAGEMENT PROTOCOL)

- The **Simple Network Management Protocol (SNMP)** is a framework for managing devices in an internet using the TCP/IP protocol suite.
- SNMP is an application layer protocol that monitors and manages routers, distributed over a network.
- It provides a set of operations for monitoring and managing the internet.
- SNMP uses services of UDP on two well-known ports: 161 (Agent) and 162 (manager).
- SNMP uses the concept of ***manager*** and ***agent***.

SNMP MANAGER

- A manager is a host that runs the SNMP client program
- The manager has access to the values in the database kept by the agent.

- A manager checks the agent by requesting the information that reflects the behavior of the agent.
- A manager also forces the agent to perform a certain function by resetting values in the agent database.
- For example, a router can store in appropriate variables the number of packets received and forwarded.
- The manager can fetch and compare the values of these two variables to see if the router is congested or not.

SNMP AGENT

- The agent is a router that runs the SNMP server program.
- The agent is used to keep the information in a database while the manager is used to access the values in the database.
- For example, a router can store the appropriate variables such as a number of packets received and forwarded while the manager can compare these variables to determine whether the router is congested or not.
- Agents can also contribute to the management process.
- A server program on the agent checks the environment, if something goes wrong, the agent sends a warning message to the manager.

Structure of Management Information (SMI)

- To use SNMP, we need rules for naming objects.
- SMI is a protocol that defines these rules.
- SMI is a guideline for SNMP
- It emphasizes three attributes to handle an object: name, data type, and encoding method.
- Its functions are:

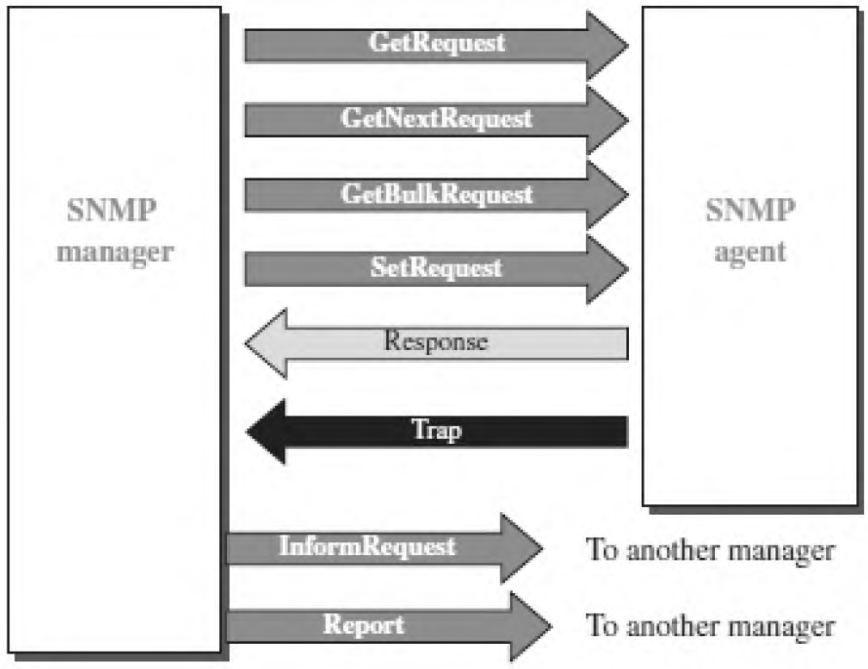
1. To name objects.
2. To define the type of data that can be stored in an object.
3. To show how to encode data for transmission over the network.

Management Information Base (MIB)

The Management Information Base (MIB) is the second component used in network management.

- Each agent has its own MIB, which is a *collection* of objects to be managed.
- MIB classifies objects under groups.

SNMP MESSAGES/PDU



GetRequest

The GetRequest PDU is sent from the manager (client) to the agent (server) to retrieve the value of a variable or a set of variables.

GetNextRequest

The GetNextRequest PDU is sent from the manager to the agent to retrieve the value of a variable.

GetBulkRequest

The GetBulkRequest PDU is sent from the manager to the agent to retrieve a large amount of data. It can be used instead of multiple GetRequest and GetNextRequest PDUs.