Computer Network

Lecture-44

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UNIT-5

Domain Name System(DNS)

Domain Name System(DNS)

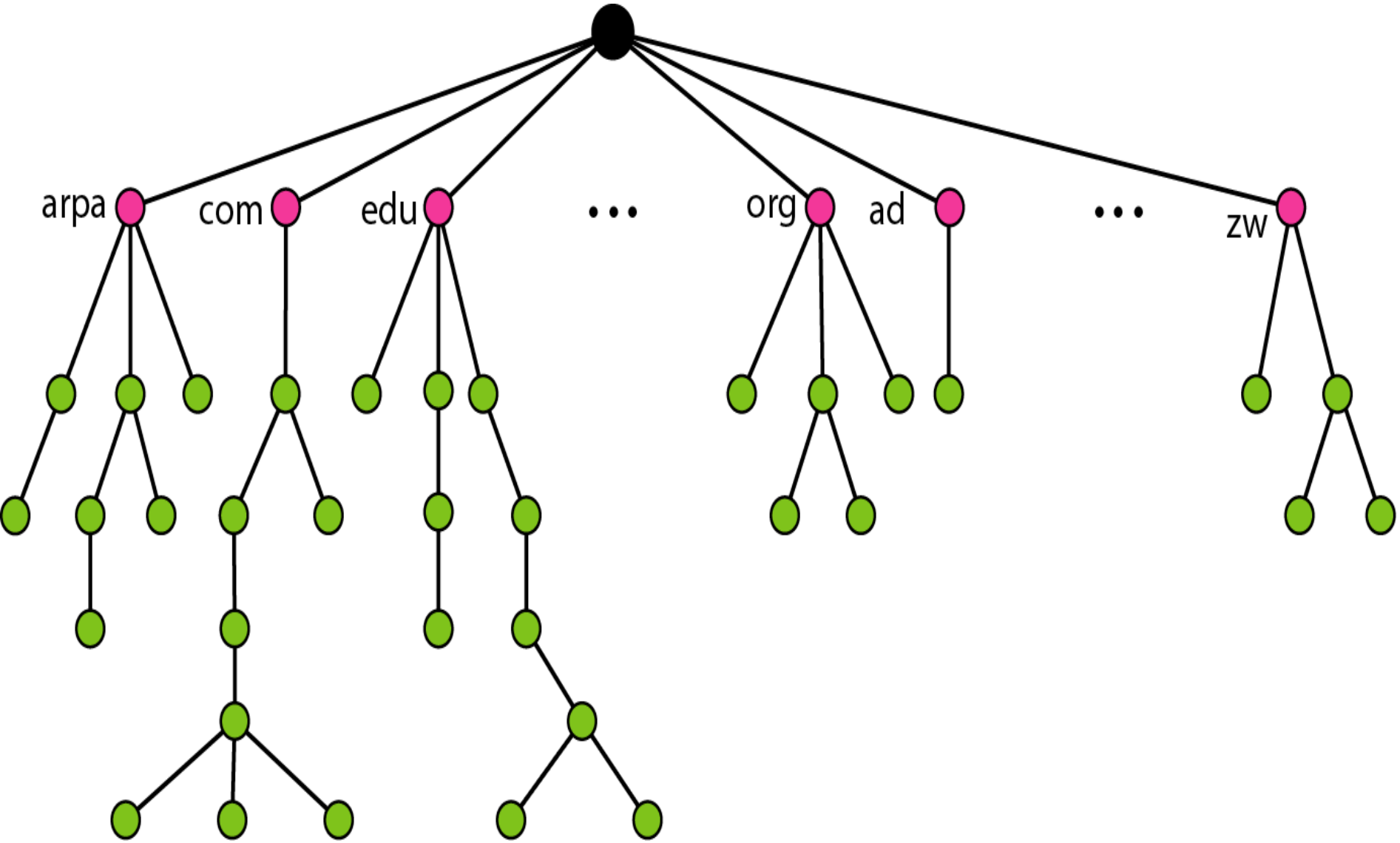
- Domain Name System is a client/server based application layer protocol.
- It translates a domain name (eg. nec.edu.np) into an IP address (eg. 202.37.94.177).
- The DNS has a distributed database that resides on multiple machines on the Internet.

Domain Name System(DNS)

DOMAIN NAME SPACE

- Domain name space is designed in the form of hierarchical name space.
- In this design, the names are defined in an inverted-tree structure with the root at the top. The tree can have only 128 levels: level 0 (root) to level 127.
- It is shown in the following figure:-

Domain Name System(DNS)



Domain Name System(DNS)

Label

- Each node in the tree has a label, which is a string with a maximum of 63 characters.

- The root label is a null string (empty string).

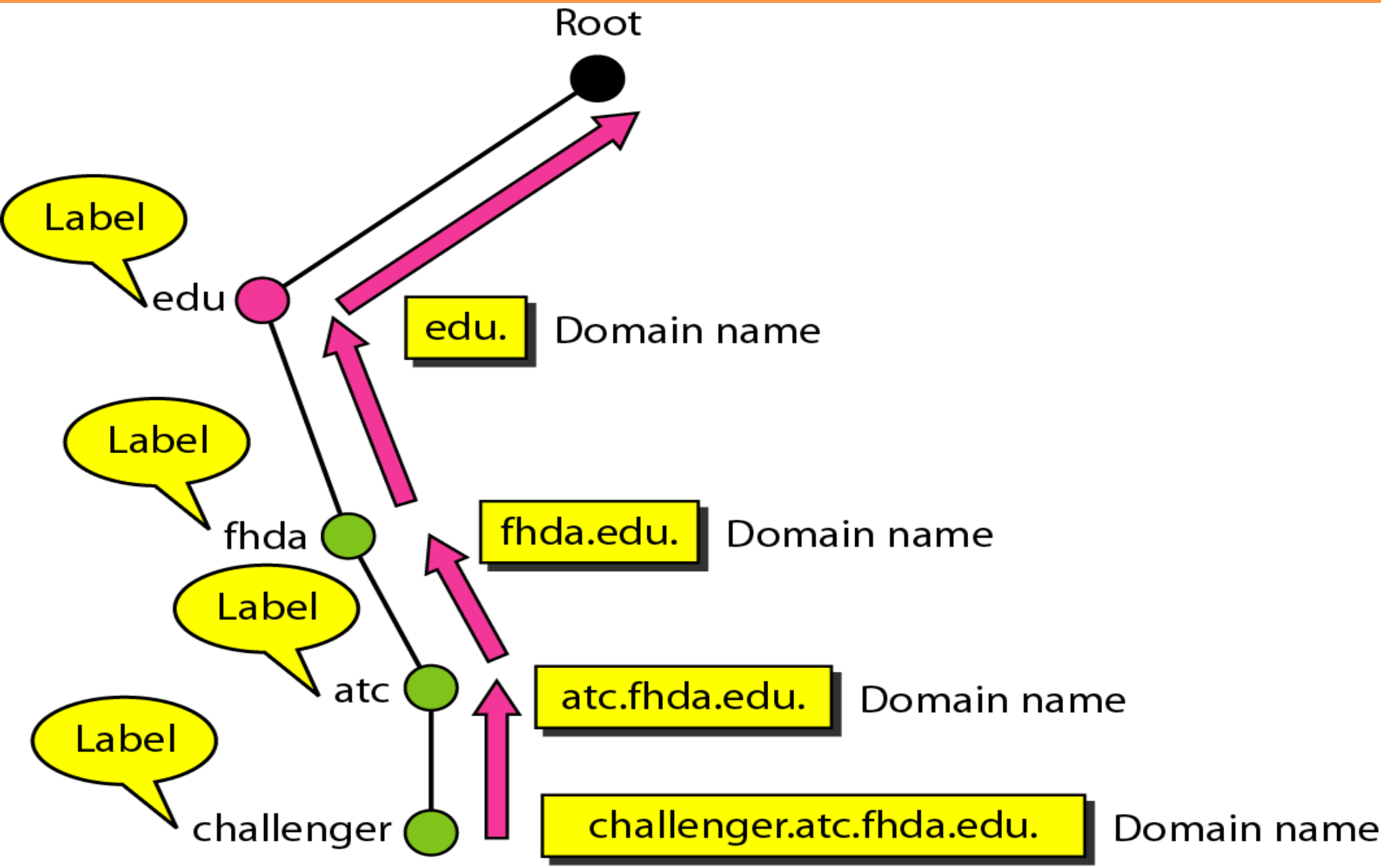
- DNS requires that children of a node (nodes that branch from the same node) have different labels, which guarantees the uniqueness of the domain names.

Domain Name System(DNS)

Domain Name

- Each node in the tree has a 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.
- Following figure shows some domain names.

Domain Name System(DNS)



Domain Name System(DNS)

Fully Qualified Domain Name

If a label is terminated by a null string, it is called a fully qualified domain name (FQDN).

An FQDN is a domain name that contains the full name of a host.

It contains all labels, from the most specific to the most general, that uniquely define the name of the host.

Example: challenger.ate.tbda.edu.

Domain Name System(DNS)

Partially Qualified Domain Name

- If a label is not terminated by a null string, it is called a partially qualified domain name (PQDN).

- A PQDN starts from a node, but it does not reach the root. It is used when the name to be resolved belongs to the same site as the client. Here the resolver can supply the missing part, called the suffix, to create an FQDN. For example, if a user at the jhda.edu. site wants to get the IP address of the challenger computer, he or she can define the partial name

  challenger

- The DNS client adds the suffix atc.jhda.edu. before passing the address to the DNS server.

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FQDN

challenger.atc.fhda.edu.
cs.hmme.com.
www.funny.int.

PQDN

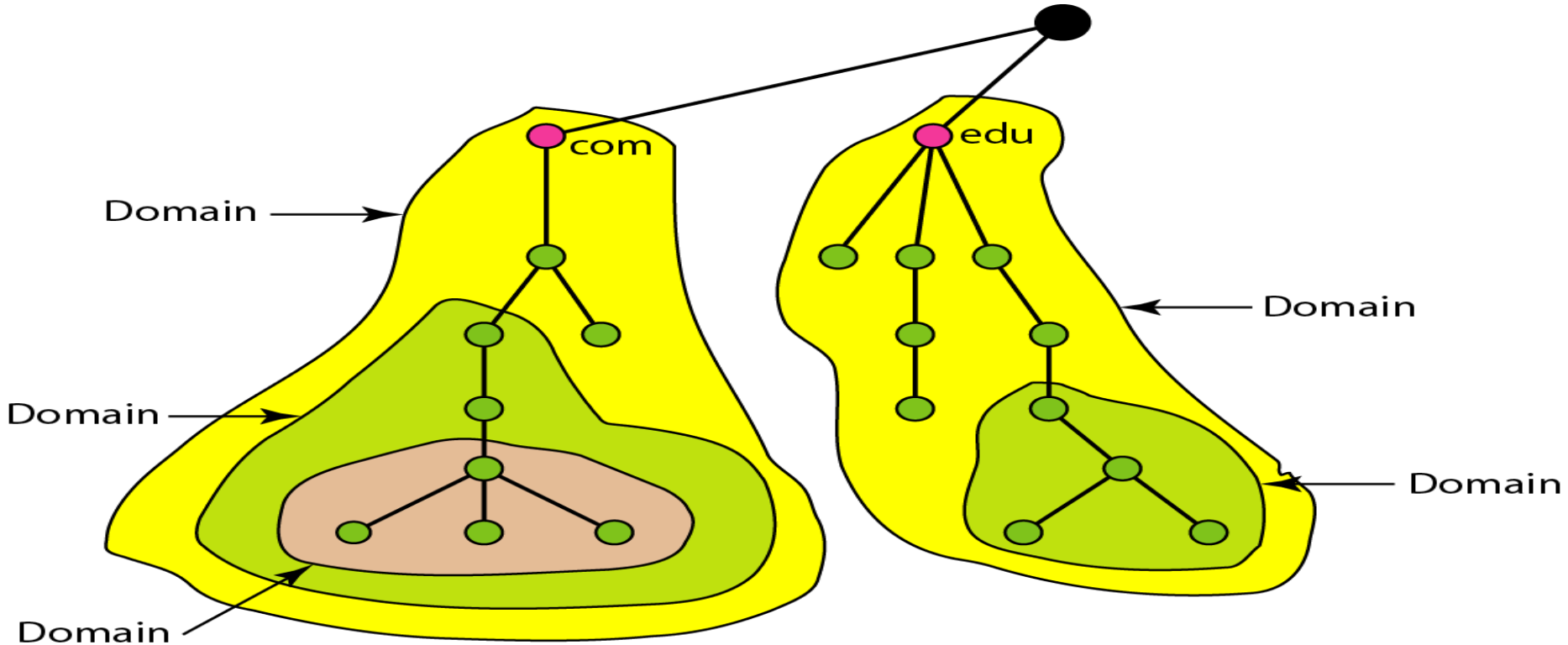
challenger.atc.fhda.edu
cs.hmme
www

Domain Name System(DNS)

Domain

A domain is a sub-tree of the domain name space. The name of the domain is the domain name of the node at the top of the sub-tree. Following figure shows some domains.

Note: A domain may itself be divided into domains.



Domain Name System(DNS)

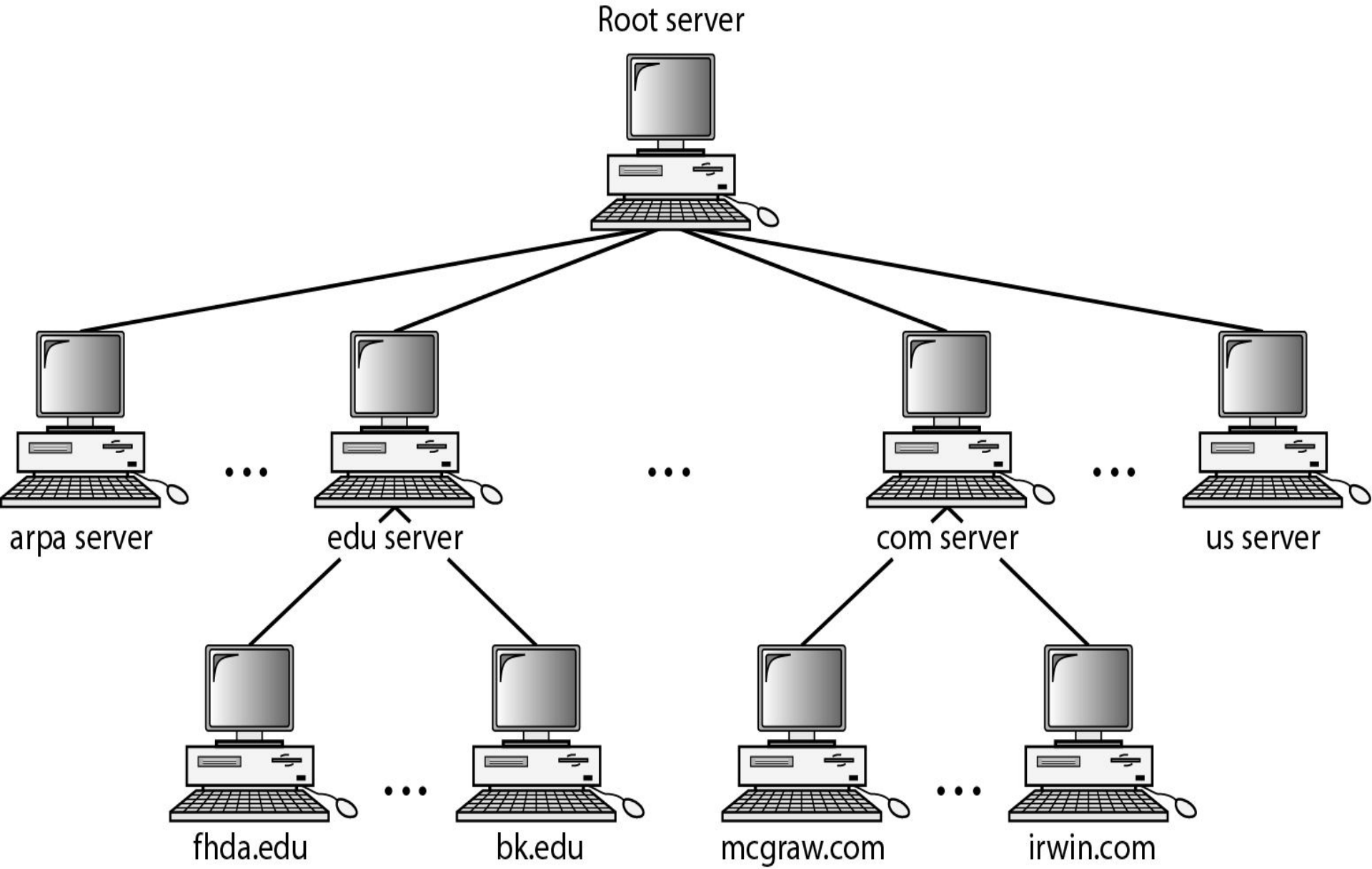
DISTRIBUTION OF NAME SPACE

- It is very inefficient and also unreliable to have just one computer store all domain name space.
- It is inefficient because responding to requests from all over the world places a heavy load on the system.
- It is unreliable because any failure makes the data inaccessible.

Hierarchy of Name Servers

- The solution to above problems is to distribute the information among many computers called DNS servers.
- One way to do this is to divide the whole space into many domains based on the first level.
- Because a domain created in this way could be very large, DNS allows domains to be divided further into smaller domains (subdomains).
- Each server can be responsible (authoritative) for either a large or a small domain. In other words, we have a hierarchy of servers in the same way that we have a hierarchy of names.

Domain Name System(DNS)



Domain Name System(DNS)

Zone

- Since the complete domain name hierarchy can not be stored on a single server, so it is divided among many servers. What a server is responsible for or has authority over is called a zone.

- We can define a zone as a contiguous part of the entire tree.

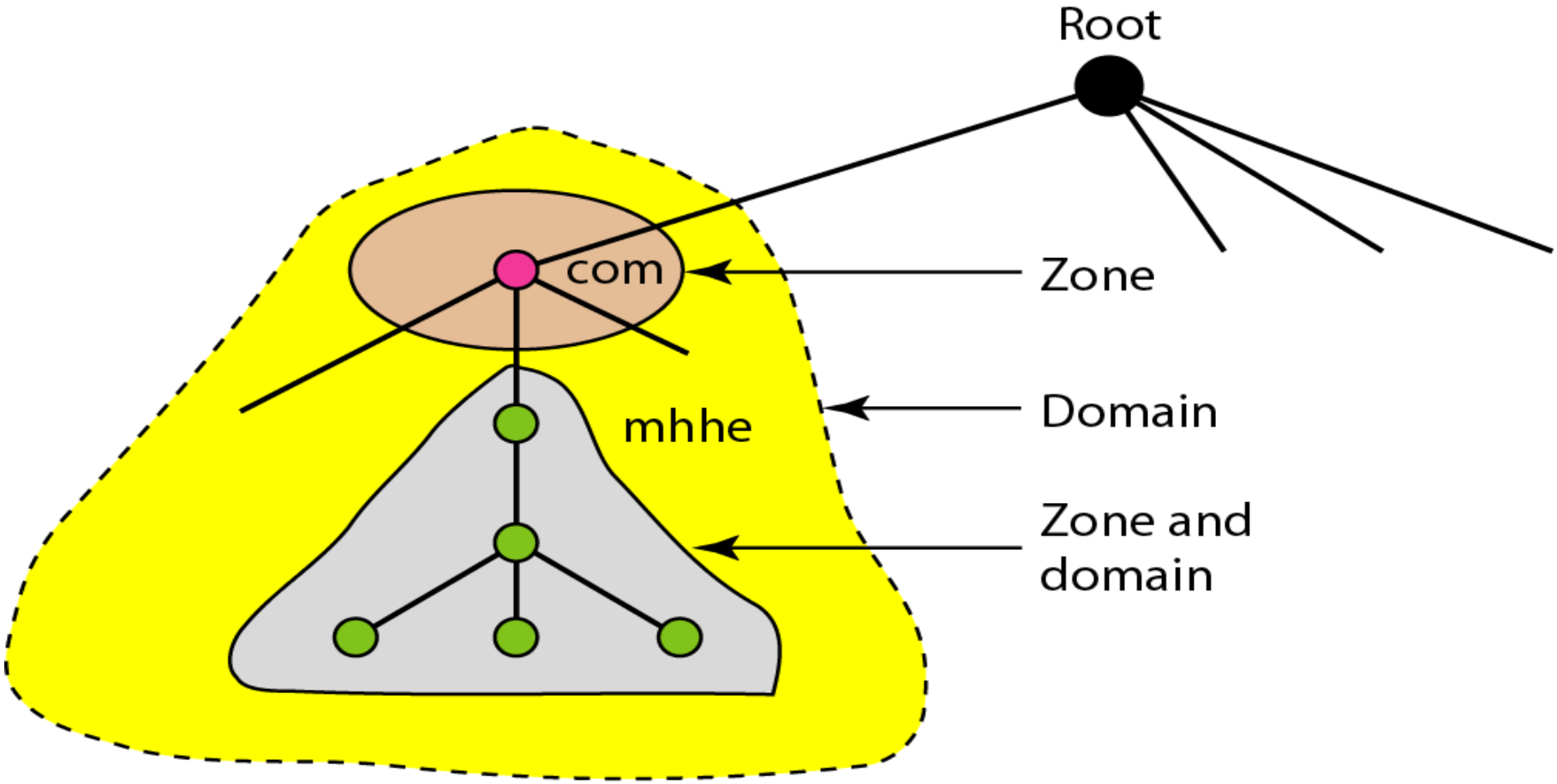
- If a server accepts responsibility for a domain and does not divide the domain into smaller domains, the domain and the zone refer to the same thing.

- The server makes a database called a zone file and keeps all the information for every node under that domain.

- If a server divides its domain into subdomains and delegates part of its authority to other servers, then domain and zone refer to different things.

Domain Name System(DNS)

- The information about the nodes in the subdomains is stored in the servers at the lower levels, with the original server keeping some sort of reference to these lower-level servers.



Domain Name System(DNS)

Root Server

- A root server is a server whose zone consists of the whole tree.
- A root server usually does not store any information about domains but delegates its authority to other servers, keeping references to those servers.
- There are several root servers, each covering the whole domain name space.
- The servers are distributed all around the world.

Domain Name System(DNS)

Primary and Secondary Servers

- DNS defines two types of servers: **primary and secondary**. A primary server is a server that stores a file about the zone for which it is an authority. It is responsible for creating, maintaining, and updating the zone file. It stores the zone file on a local disk.

- A secondary server is a server that transfers the complete information about a zone from another server (primary or secondary) and stores the file on its local disk. The secondary server neither creates nor updates the zone files. If updating is required, it must be done by the primary server, which sends the updated version to the secondary.

- The primary and secondary servers are both authoritative for the zones they serve.

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Note: A server can be a primary server for a specific zone and a secondary server for another zone.

- A primary server loads all information from the disk file; the secondary server loads all information from the primary server.

- When the secondary downloads information from the primary, it is called **zone transfer**.