Advanced Web Technologies

TICT3132

Department of Information & Communication Technology,
Faculty of Technological Studies,
University of Vavuniya

Lecturer In-charge : Ms. K. Keerththana (Lecturer Prob.)

Lecture – 02

WWW+URL+DNS

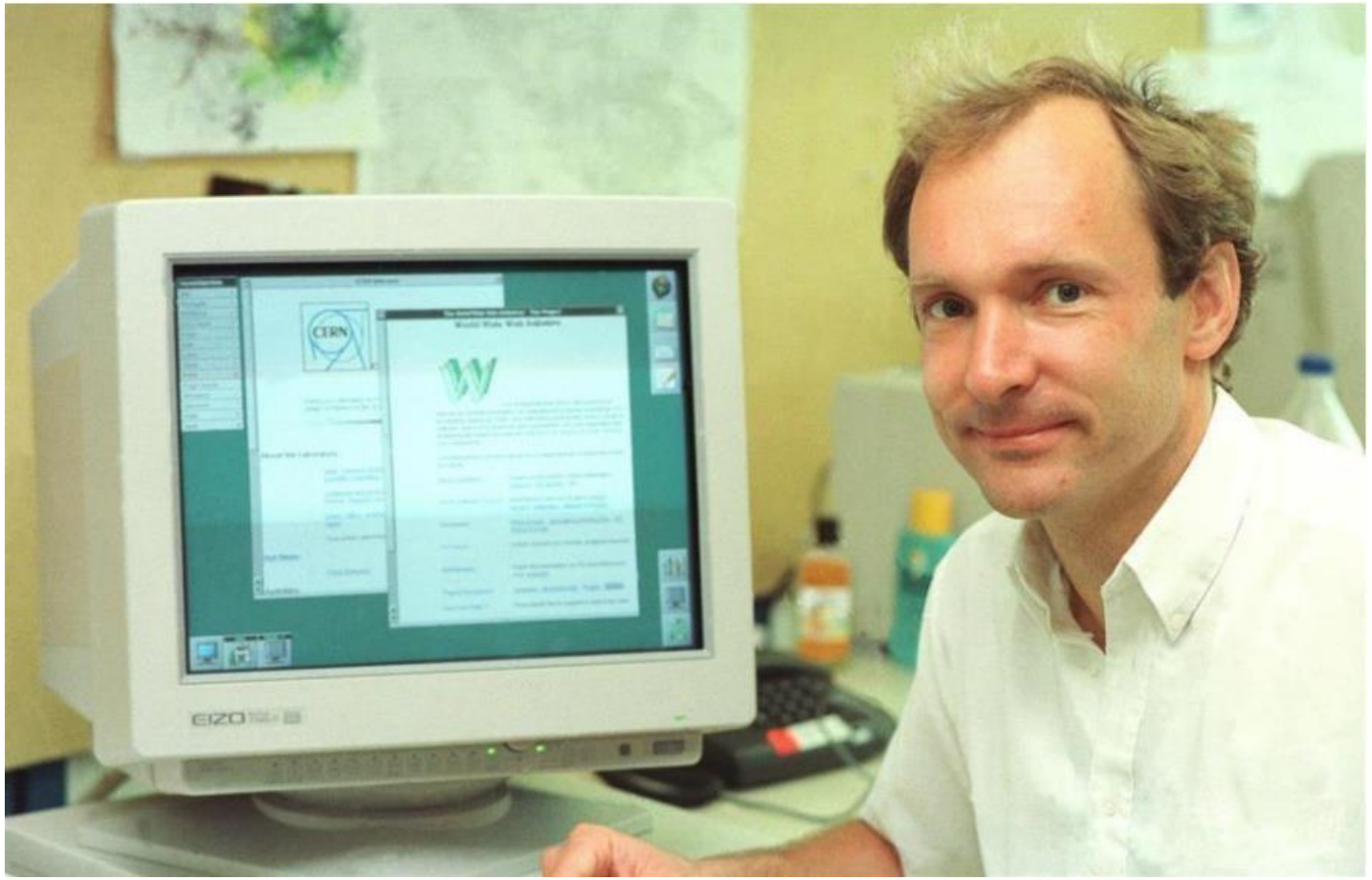
World Wide Web (WWW, W3)

- It is an information space where documents and other web resources.
- Identified by URIs.
- Accessed via the Internet.
- Interlinked by hypertext links.

World Wide Web (WWW, W3)

- Hypertext documents are commonly called web pages.
- Webpages may contain links to images, video, and software components that are rendered to users of a web browser application, running on the user's computer.
- Embedded hyperlinks permit users to navigate between web pages.
- When multiple web pages are published with a common theme or within a common domain name, the collection is usually called a web site.

Tim Berners-Lee, a British scientist, invented the World Wide Web (WWW) in 1989



Evolution of the Web

- Web 1.0 (**Read Only Web**)
- Web 2.0 (**Read Only Web**)
- Web 3.0 (**The Semantic Web**)
- Web 4.0 (**The Semantic Web**)

Web 1.0

- It is first generation of web, it allows only read the information from web
- It is simply an information portal where users passively receive information without being given the opportunity to post reviews, comments, and feedback.
- It is era of static websites and representation of static content

Web 2.0

- It allows only read and write
- Allows users to interact more freely with each other.
- Encourages participation, collaboration, and information sharing.
- Applications are YouTube, Facebook, Wiki, etc.

Web 3.0

- It is open, intelligent, with semantic web technologies, distributed data sources, natural language processing, machine learning.
- In include transforming the web into database, a move towards making content accessible by multiple non-browser applications, the leveraging of artificial intelligence technologies.
- Technologies – RDF,XML,URI,API

Web 4.0

- It is intelligent learning
- Self learning
- Self organizing
- Connects all devices in the real and virtual world in real time

Web 5.0

- It is emotionally connection web between humans and computers.
- Now, web is emotionless, and it does not perceive our feelings and emotions.

Web browser

- application used to access and view websites
- Communicates with web servers using Hypertext Transfer Protocol (HTTP).
- Delivers web pages or websites in a human understandable format.
- They also have the ability to display other protocols and prefixes
  - secure HTTP (HTTPS)
  - File Transfer Protocol (FTP)
  - email handling (mailto:)
  - files (file:)
- Example:

Uniform Resource Locator (URL)

Every document on the Web has a unique address

- Example : https://vau.ac.lk/

scheme://host:port/path?query-string#fragment-id

URL Elements

- **Scheme name**(http://, https://, ftp://, and mailto://)
- **Host name**(www.facebook .com)
- **Port Number** (HTTP - port 80, HTTPS - port 443)
- **Path**(http://www.ce.pdn.ac.lk/research/embedded-systems/)
- **Query String**
- **Fragment identifier**

Domain Name System

Purpose of Naming

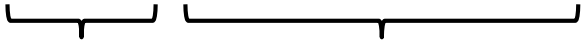
- Addresses are used to locate objects.
- Names are easier to remember than numbers.
- You would like to get to the address or other objects using a name.
- DNS provides a mapping from names to resources of several types.

Domain Name System

- The Domain Name System (DNS) is the Internet's system for mapping alphabetic names to numeric.

Internet Protocol (IP) addresses

www.example.com



Host name **Domain name**

- DNS resolution maps **www.example.com** into an IP address (such as **192.0.2.1**).

Domain Name

- Domain name is a way to identify and locate computers connected to internet.
- No two organizations can have same domain name
- A domain name always consists of two or more components separated by periods called dots (.)

EXAMPLE: **www.yahoo.co.in, www.facebook.com** etc.

- Once a domain has been established subdomains can be created within the domain
- EXAMPLE: The domain for the large company could be "**Vni.com**" and within this domain subdomains can be created for each of the company's regional office.
- Eg: **Bombay.vni.com**

Domain Delegation

- Domain delegation gives an organization authority for a domain.
- Having authority for a domain means that the organization's network administrator is responsible for maintaining the DNS database of hostname and address information for that domain.
- A group of domains and subdomains for which an organization has authority is called a zone.
- All host information for a zone is maintained in a single, authoritative database.

Domain Delegation

- For example, the companya.com. domain is delegated to Companya, creating the companya.com. zone. There are three subdomains within the companya.com. domain: chicago.companya.com, washington.companya.com, providence.companya.com.
- The companya administrator maintains all host information for the zone in a single database and also has authority to create and delegate subdomains.

Domain Delegation

- For example, Companya's Chicago location has its own network administrator. The companya.com administrator delegates the **chicago.companya.com** zone to the Chicago location and no longer has authority over it. Companya now has two zones: **companya.com** and **chicago.companya.com**.
- **companya.com**, which has authority over **companya.com**, **washington.companya.com**, and
- providence.companya.com zones
- **chicago.companya.com**, which has authority over the **chicago.companya.com** zone

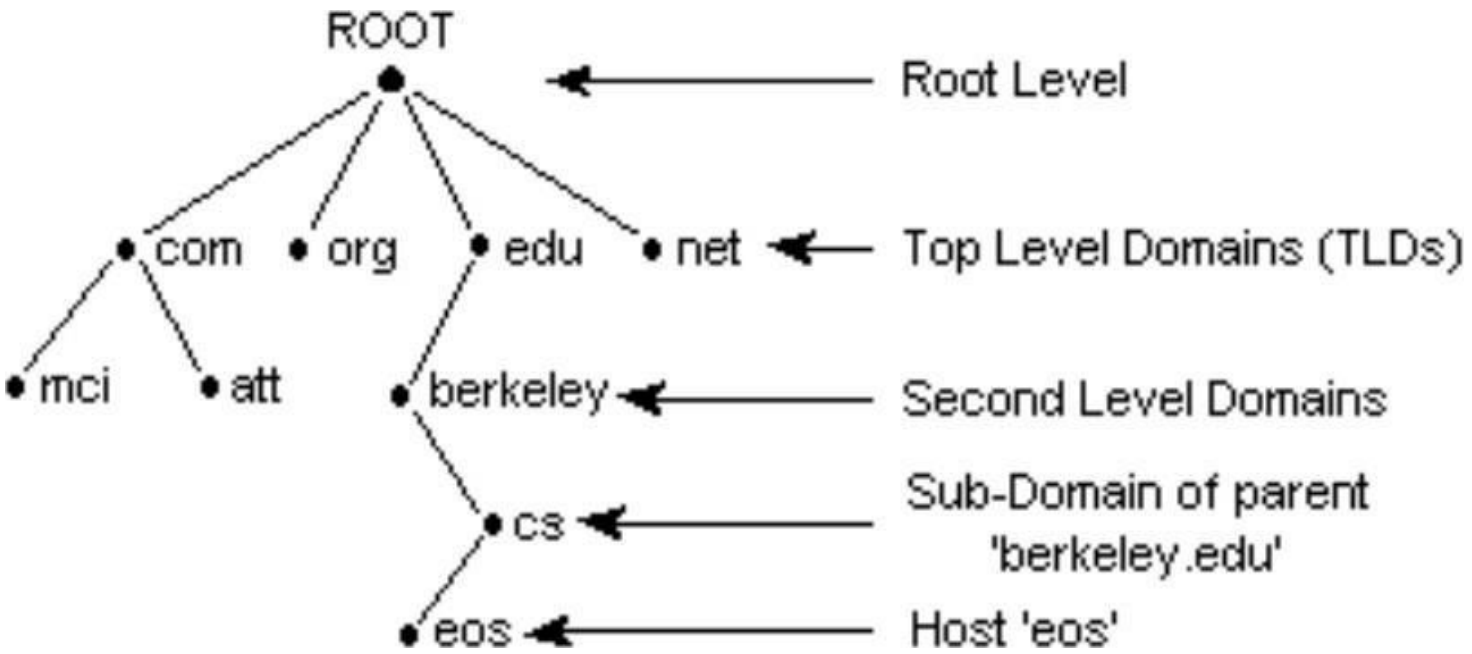
DNS Hierarchy

- The DNS hierarchy, also called the domain name space
- It is an inverted tree structure.
- The DNS hierarchy tree has a single domain at the top of the structure called the root domain – indicated by the “.”

DNS Hierarchy

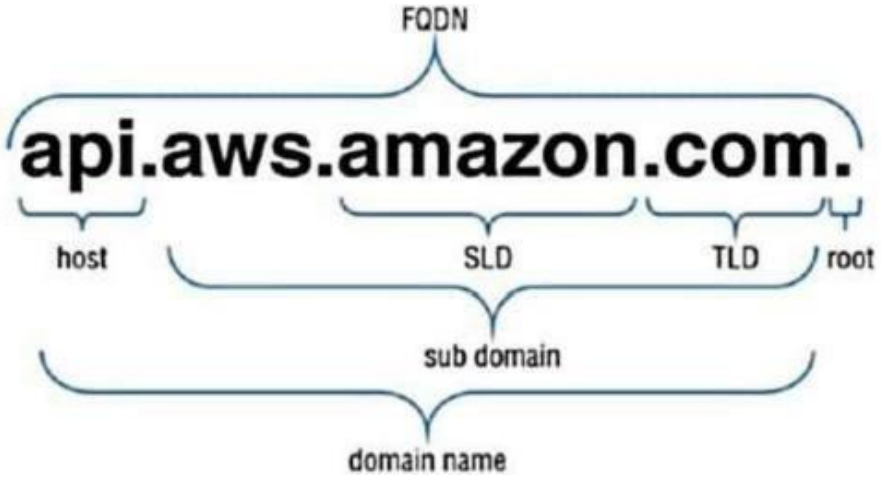
- The DNS hierarchy is comprised of the following elements:
  1. Root Level
  2. Top Level Domains
  3. Second Level Domains
  4. Sub-Domain
  5. Host

DNS Hierarchy

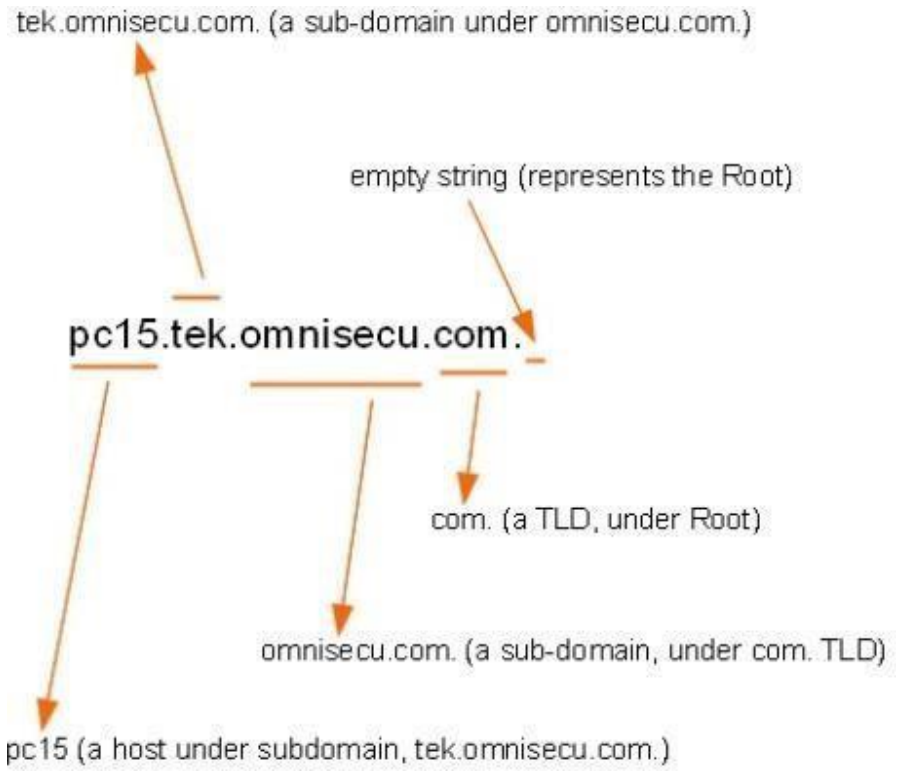


What is a Fully Qualified Domain Name or FQDN?

- The most complete domain name that identifies a page, host, server or any other online resource.
- A domain name that specifies its exact location in the DNS hierarchy tree; it specifies all domain levels, including the Top-Level Domain and the Root Level.

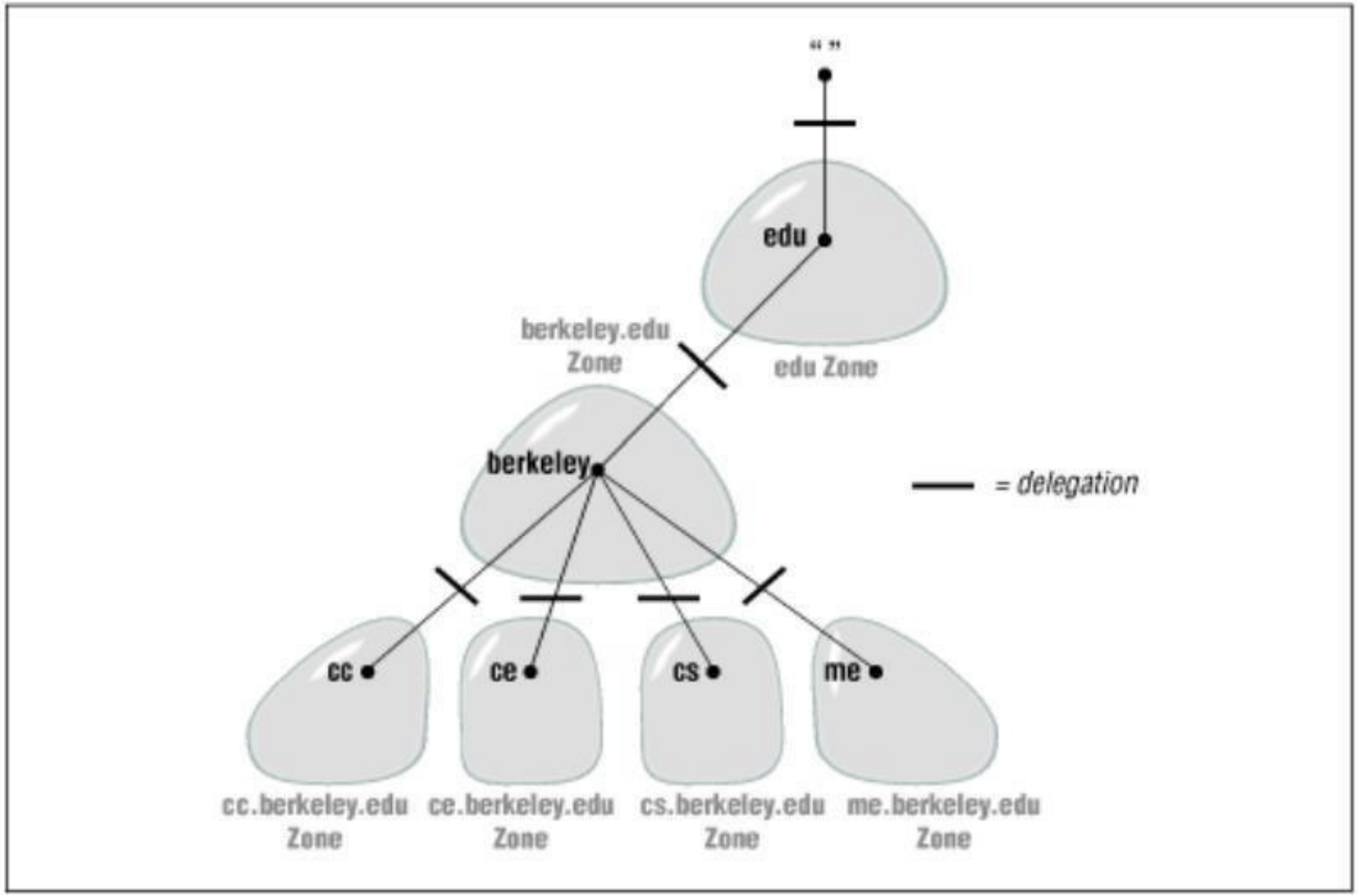


What is a Partially Qualified Domain Name or PQDN?



- A Partially Qualified Domain Name (PQDN) is used to specify a portion of a domain name, normally the host portion of it. A Partially Qualified Domain Name (PQDN) starts with a host name, but it may not reach up to the root.

- Example of Partially Qualified Domain Name (PQDN) pc15.


" "
edu
berkeley.edu
Zone
edu Zone
berkeley
= delegation
cc
ce
cs
me
cc.berkeley.edu
Zone
ce.berkeley.edu
Zone
cs.berkeley.edu
Zone
me.berkeley.edu
Zone

Organizational or Generic Domains

- Indicates primary function of the organization or their generic behaviour

Most commonly used top level domains are:

.com	for commercial organization	www.yahoo.com
.net	for networking organizations	www.zedge.net
.gov	for government organizations	www.newjersey.gov
.edu	for educational organizations	www.uducause.edu
.org	for non-commercial organizations	www.eklavya.org
.mil	for military organizations	www.dod.mil
.int	for international organizations	www.itu.int

Geographical or Country Domains

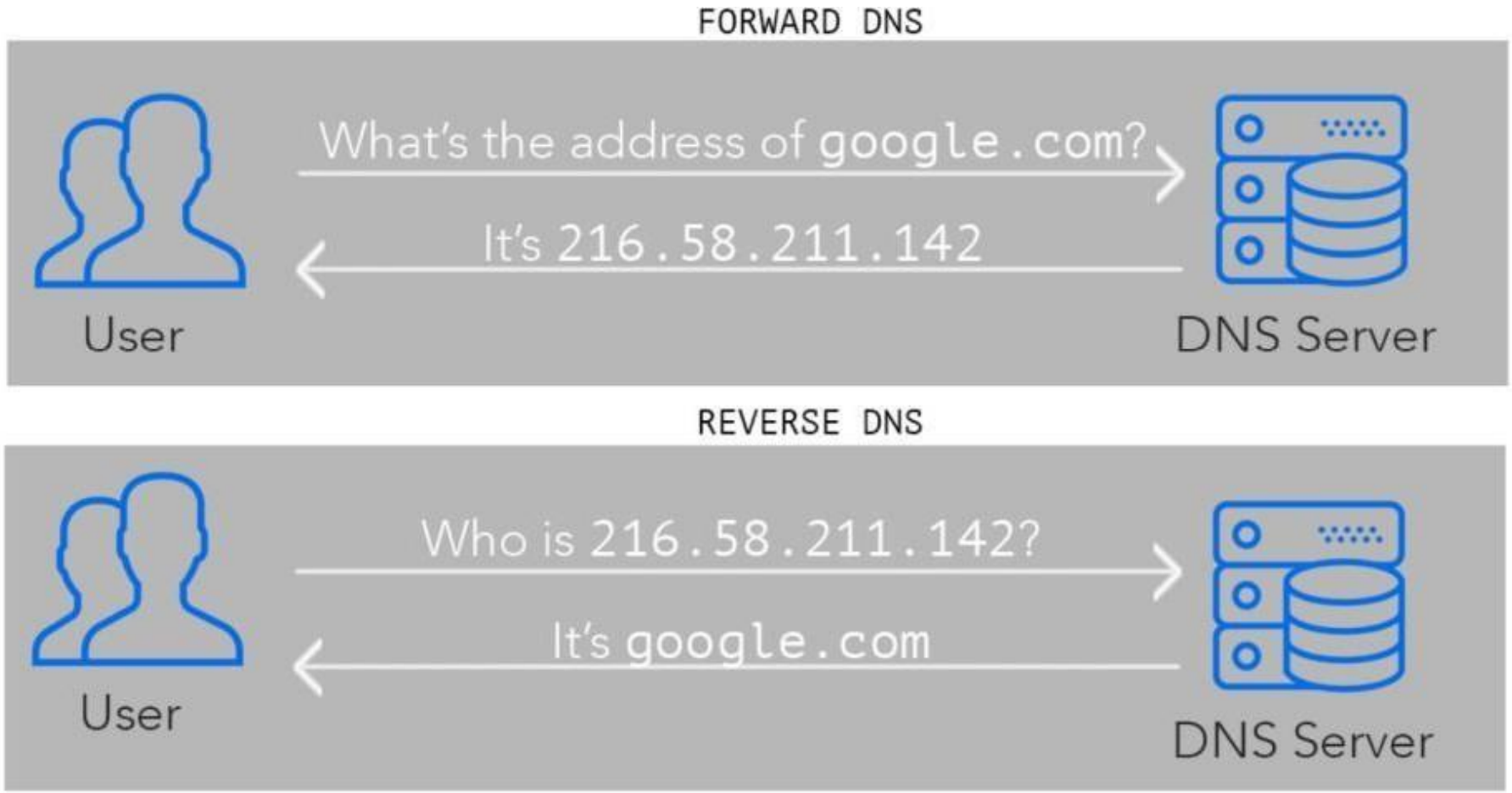
- It consists of two characters which represents different countries/regions all around the world
- These codes have been standardized by International Standard Organizational (ISO)
- EXAMPLE:

.in	India
.jp	Japan
.us	United States
.fr	France
.it	Italy
.cn	China
.au	Australia

Reverse Domains

- It is a special domain name in-addr.arpa that is used translate the IP address to fully qualified domain name.
- EXAMPLE:

1.4.220.134 in-addr.arpa will return **sunc.scit.wlv**. Here **1.4.220.134** is the IP address that is mapped to its name **sunc.scit.wlv.at.uk** with the help of in-addr.apra domain


FORWARD DNS
What's the address of google.com?
It's 216.58.211.142
User
DNS Server
REVERSE DNS
Who is 216.58.211.142?
It's google.com
User
DNS Server

- Each domain name has a corresponding IP address.
- When the user types the domain name in the address bar, the corresponding IP address is supplied. Such a translation is possible with the help of system called DNS (DOMAIN NAME SYSTEM).

DEFINITION:

- "DOMAIN NAME SYSTEM is a collection of the databases that contain information about domain names and their corresponding IP address."

Features of DNS

- Global Distribution
- Scalability
- Dynamicity
- Reliability
- Loose Coherency

Global Distribution

- Data is maintained locally, but retrievable globally
- No single computer has all DNS data
- DNS lookups can be performed by any device

Scalability

- No limit to the size of the database
- One server has over 20,000,000 names
- No limit to the number of queries
- 24,000 queries per second handled easily
- Queries distributed among masters, slaves, and caches

Dynamicity

- Database can be updated dynamically
  - Add/delete/modify of any record
- Modification of the master database triggers replication
  - Only master can be dynamically updated
  - Creates a single point of failure

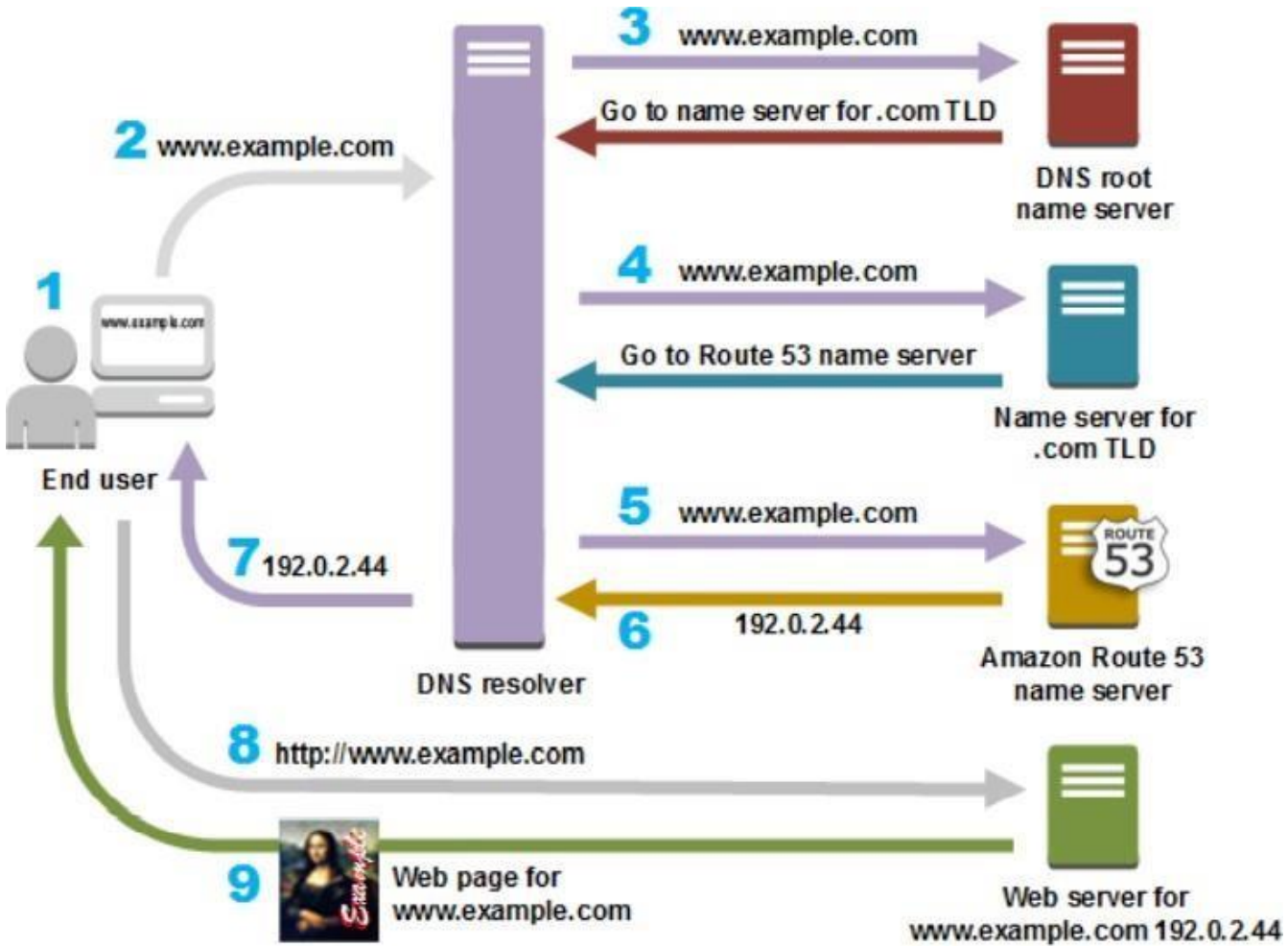
Reliability

- Data is replicated
- Data from master is copied to multiple slaves
- Clients can query
- Master server
- Any of the copies at slave servers
- Clients will typically query local caches

Loose Coherence

- The database is always internally consistent.
- Each version of a subset of the database (a zone) has a serial number.
- The serial number is incremented on each database change.
- Changes to the master copy of the database are replicated according to timing set by the zone administrator.
- Cached data expires according to timeout set by zone administrator.

DNS Resolving Process



DNS Resolving Process

- A user opens a web browser, enters **www.example.com** in the address bar, and presses Enter.
- The request for www.example.com is routed to a DNS resolver, which is typically managed by the user's Internet service provider (ISP), such as a cable Internet provider, a DSL broadband provider, or a corporate network.
- The DNS resolver for the ISP forwards the request for **www.example.com** to a DNS root name server.
- The DNS resolver for the ISP forwards the request for **www.example.com** again, this time to one of the TLD name servers for .com domains.
- The name server for **.com** domains responds to the request with the names of the four Amazon Route 53 name servers that are associated with the **example.com** domain.
- The DNS resolver for the ISP chooses an Amazon Route 53 name server and forwards the request for **www.example.com** to that name server.

DNS Resolving Process

- The Amazon Route 53 name server looks in the **example.com** hosted zone for the **www.example.com** record, gets the associated value, such as the IP address for a web server, **192.0.2.44**, and returns the IP address to the DNS resolver.
- The DNS resolver for the ISP finally has the IP address that the user needs. The resolver returns that value to the web browser. The DNS resolver also caches (stores) the IP address for example.com for an amount of time that you specify so that it can respond more quickly the next time someone browses to example.com. For more information, see time to live (TTL).
- The web browser sends a request for **www.example.com** to the IP address that it got from the DNS resolver. This is where your content is, for example, a web server running on an Amazon EC2 instance or an Amazon S3 bucket that's configured as a website endpoint.
- The web server or other resource at **192.0.2.44** returns the web page for **www.example.com** to the web browser, and the web browser displays the page.