The Domain Name System Overview.

Introduction. DNS overview. How DNS helps us?. Summary

paulino esteban bermudez rodriguez
HC3.0 C/ Velázquez, España.

Contenido

Introduction....2
What is DNS?....2
What is a domain?....4
What is a resource record?....4
The “A” Record....5
The “CNAME” Record....5
The “MX” Record....5
The “MX” Record....5
The “NS” Record....6
What is a Delegation?....6
What is a zone?....6
What is a Name Sever?....6
Iterative vs Recursive Name Servers....7
Some Important Terminology....7
Who runs what?....7
So what does all this mean to you?....7
Accessing a web page....8
Sending an Email....12
Summary....14

Introduction

Brief Presentation

We could spend all Day

Unsure about level of technical expertise

Stop me at any point if you have a query

What is DNS?

Distributed Directory Service

Maps names to values – resource records

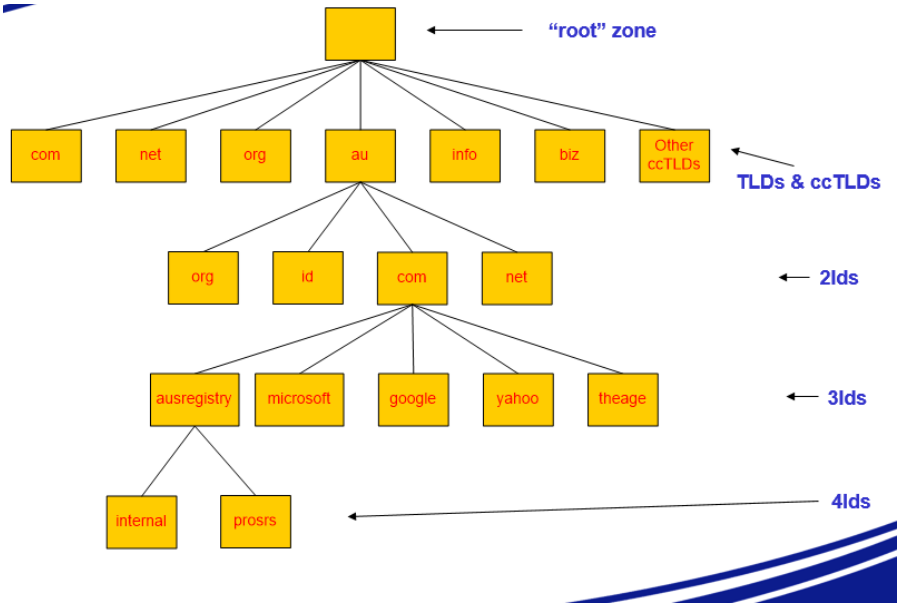
Highly resilient to attack*

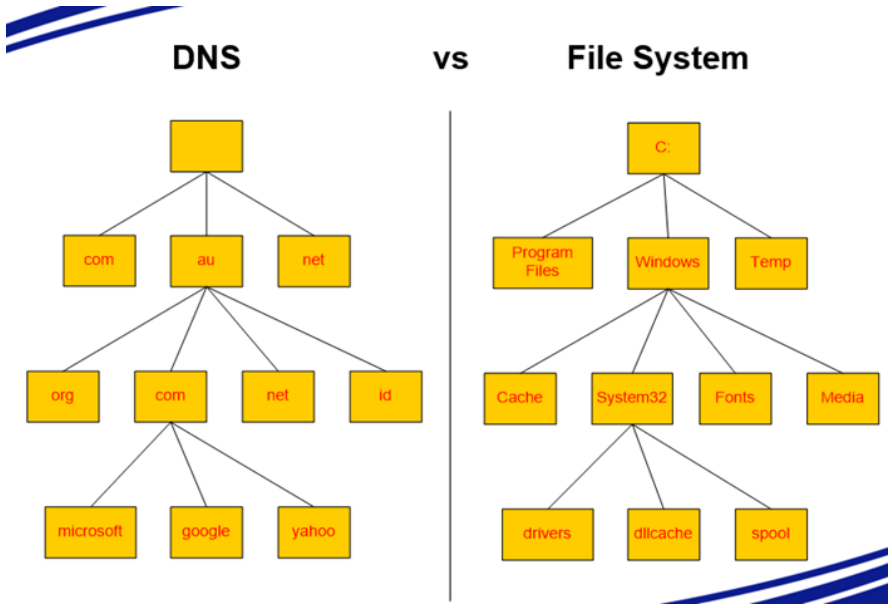
Major backbone of the internet

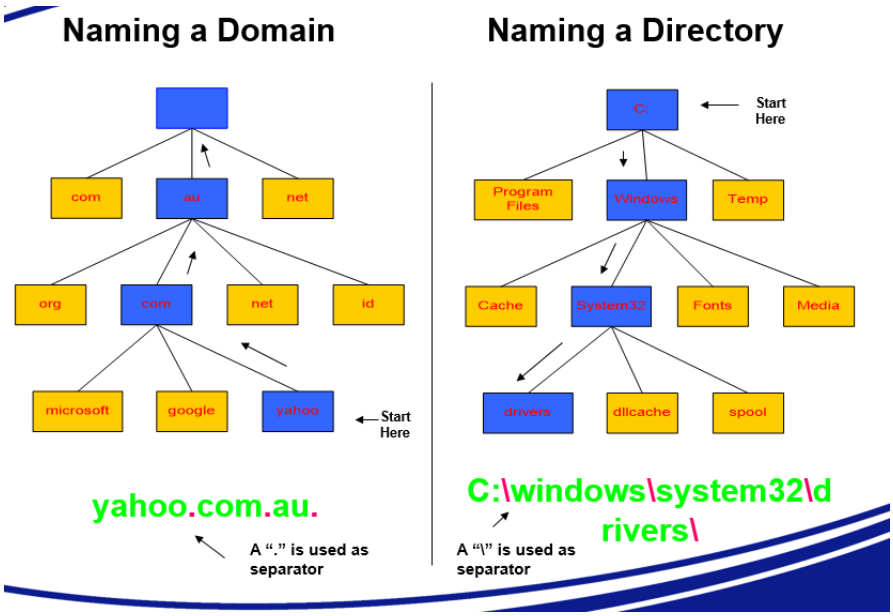
Makes networks human friendly

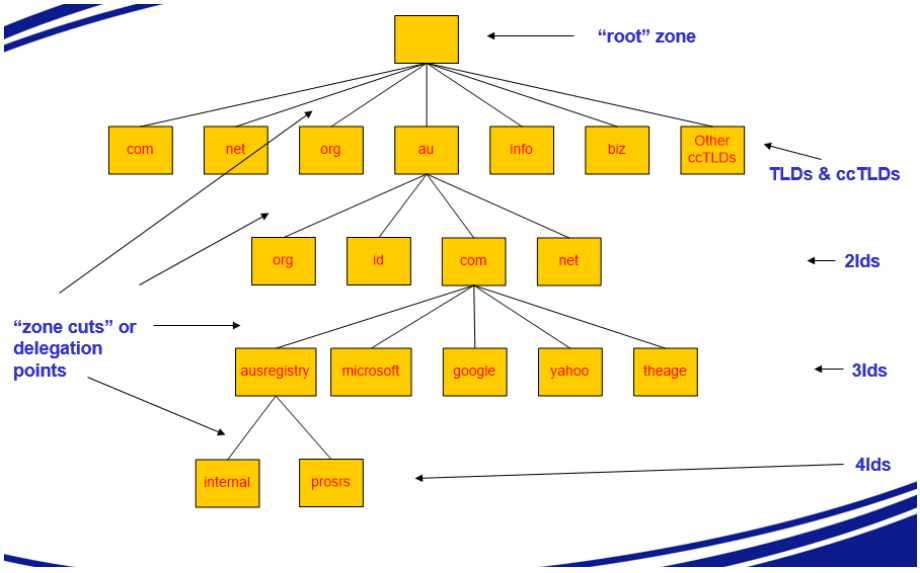
Defined (primarily) in RFC1034 and 1035

*if implemented properly




DNS
vs
File System
com
au
net
org
com
net
id
microsoft
google
yahoo
C:
Program Files
Windows
Temp
Cache
System32
Fonts
Media
drivers
dllcache
spool


Naming a Domain
Naming a Directory
com
au
net
org
com
net
id
microsoft
google
yahoo
Start Here
C:
Start Here
Program Files
Windows
Temp
Cache
System32
Fonts
Media
drivers
dllcache
spool
yahoo.com.au.
A "." is used as separator
C:\windows\system32\drivers\
A "\" is used as separator


"root" zone
com
net
org
au
info
biz
Other ccTLDs
TLDs & ccTLDs
org
id
com
net
2lds
"zone cuts" or delegation points
ausregistry
microsoft
google
yahoo
theage
3lds
internal
prosrs
4lds

What is a domain?

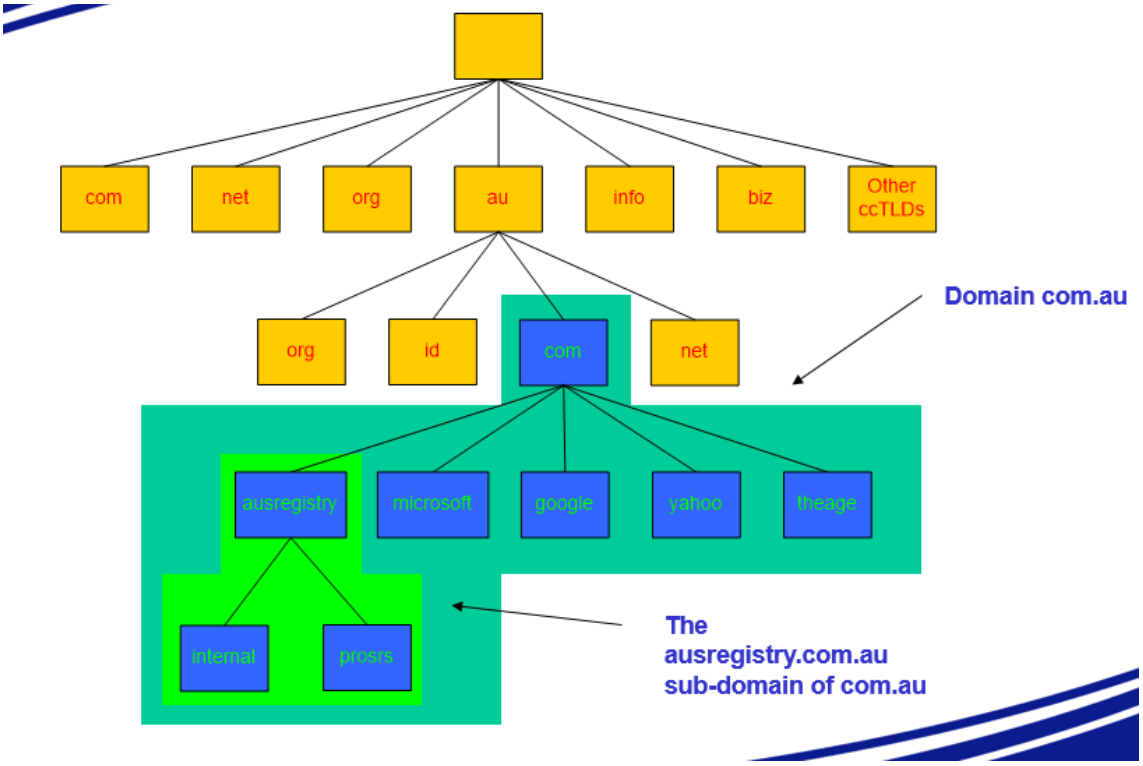
A domain is a sub tree of a larger tree identified by a domain name

Contains resource records and sub-domains

Some resource records point to authoritative server for sub-domains / zones

eg. the root contains pointers to .au

google.com.au is a domain



What is a resource record?

A domain contains resource records

Resource records are analogous to files

Classified into types

Some of the important types are SOA, NS, A, CNAME and MX

Normally defines in “zone files”

The “A” Record

The “Address” record

One or more normally defines a host

Contains an IPv4 Address (the address computers use to uniquely identify each other on the internet)

Eg. The record:

www A 203.18.56.31

In the ausregistry.com.au domain, defines the host uniquely identifiable as “www.ausregistry.com.au” to be reachable at the IPv4 Address 203.18.56.31

The “CNAME” Record

A CNAME defines an alias

The alias will then be resolved, if another CNAME is encountered then the process continues until an A record is found

Eg. The record:

search CNAME www.google.com.

In the ausregistry.com.au domain, defines the name uniquely identifiable as “search.ausregistry.com.au” to be and alias to www.google.com

The “MX” Record

An MX record defines the mail servers for a particular domain

Mail eXchange records hold the name of hosts, and their priorities, able to deliver mail for the domain.

Eg. The record:

ausregistry.com.au MX 10 mail

In the ausregistry.com.au domain, defines the host mail to be the priority 10 mail server for the “ausregistry.com.au” domain

The “MX” Record

An MX record defines the mail servers for a particular domain

Mail eXchange records hold the name of hosts, and their priorities, able to deliver mail for the domain.

Eg. The record:

ausregistry.com.au MX 10 mail

In the ausregistry.com.au domain, defines the host mail to be the priority 10 mail server for the “ausregistry.com.au” domain

The “NS” Record

An NS record defines the authoritative Name servers for the domain.

The “Name Server” records also define the name servers of children domains

Eg. The record:

internal NS ns1.hosting.com.au.

In the ausregistry.com.au domain, defines the host “ns1.hosting.com.au” to be a name sever for the “internal.ausregistry.com.au” sub-domain

What is a Delegation?

Delegation refers to the act of putting NS records in a domain name “delegating” control of a sub-domain to another entity

This entity then has the ability to control the resource records in this sub-domain and delegate further children domains to other entities.

Eg. IANA delegating control of a country code domain to the country

What is a zone?

Its records are held in a database (“zonefile”) and served from an authoritative name server

Zone refers to all the resource records in a domain but not its sub domains, the com.au zone contains delegations records for ausregistry.com.au, but not the resource records for ausregistry.com.au, however all of these records are part of the com.au domain

What is a Name Sever?

Server responsible for answering DNS queries

Exists at all levels of hierarchy

Authoritative name servers hold part of the DNS database

One name server can serve more then one zone

Many name servers “should” serve the same zone

Some name servers are authoritative for certain zones

Iterative vs Recursive Name Servers

Serve two very different functions

Shouldn't mix the two

Generally the DNS your computer points to is recursive

Zones are hosted in iterative name servers

Iterative servers can only answer information they know or have cached

Recursive know how to ask others for information

Some Important Terminology

TLD, ccTLD, 2ld, 3ld …

resolver, name server, iterative, recursive

delegation, authoritative, domain, sub-domain

zone, zone cut, zonefile

start of authority (SOA), TTL, negative TTL, expiry, serial number

primary, secondary

Who runs what?

ICANN/IANA have been granted the power by the US department of commerce to run the root zone.

Root 'zone' is split into all the ISO ccTLD and some other TLD's eg. .com, .net, .info

Domain name Registries are appointed to operate the "major" zones.

Each country elects a delegate whom controls their ccTLD eg in Australia the delegate is auDA.

Modify TLD and ccTLD resource records on behalf of registrants through a system of registrars eg. MelbourneIT.

So what does all this mean to you?

Domain names make large networks such as the internet human friendly

IPv4 address difficult to remember and offer no hint as to whom they belong to.

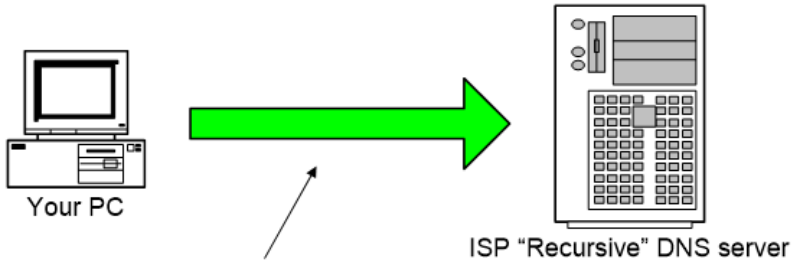
Problem gets worse when you consider IPv6

Allow intelligent systems (eg Mail (SMTP)) to preform tasks automatically

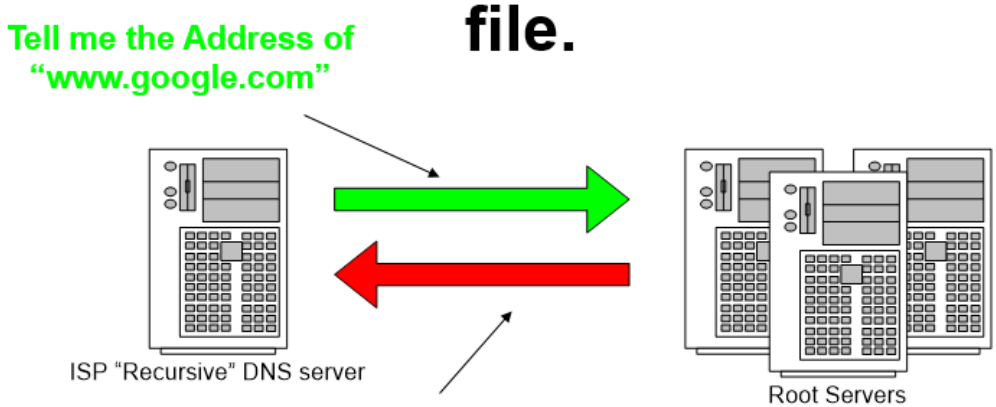
Accessing a web page

You type http://www.google.com into your web browser and hit enter. What happens now?

Step 1: Your PC sends a resolution request to its configured DNS Server, typically at your ISP.

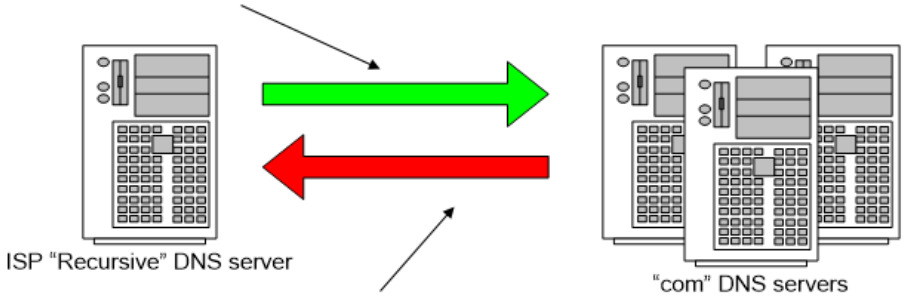


Step 2: Your ISPs recursive name server starts by asking one of the root servers predefined in its "hints" file.



Step 3: Your ISPs recursive name server then asks one of the “com” name servers as directed.

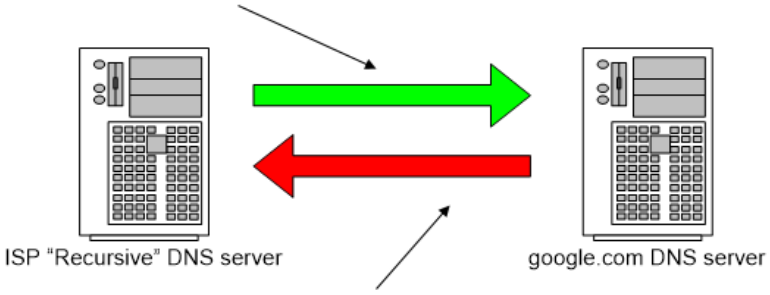
Tell me the Address of “www.google.com”



I don’t know the address but I know who’s authoritative for the ”google.com” domain ask them

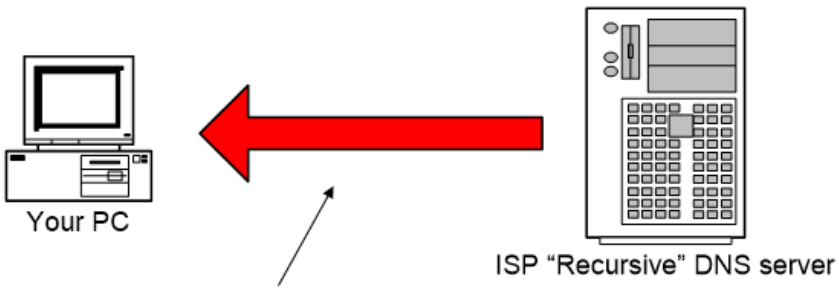
Step 4: Your ISPs recursive name server then asks one of the “google.com” name servers as directed.

Tell me the Address of “www.google.com”



The Address of www.google.com is 216.239.53.99

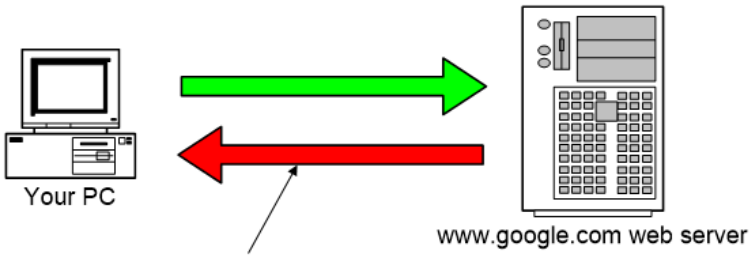
Step 5: ISP DNS server then send the answer back to your PC. The DNS server will “remember” the answer for a period of time.



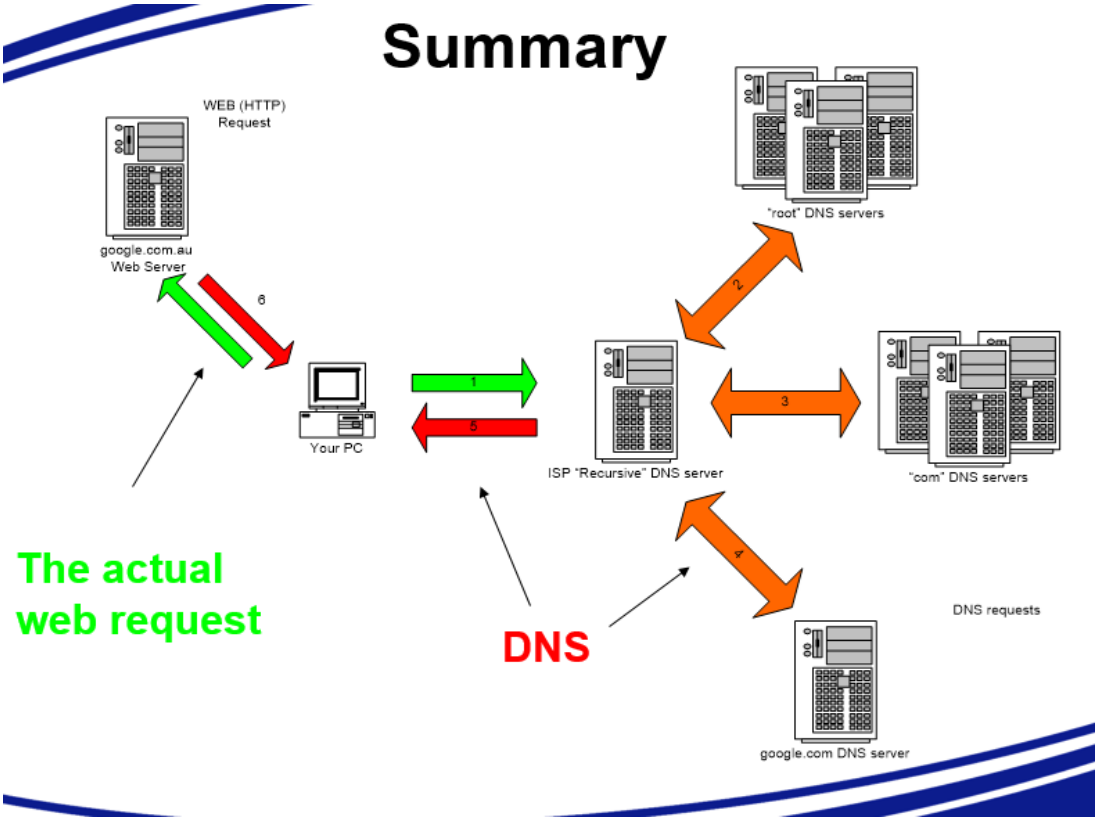
The Address of www.google.com is 216.239.53.99

Step 6: Your PC can then make the actual HTTP request to the web server.

Send me the www.google.com.au web page



Here it is!


Summary
WEB (HTTP)
Request
google.com.au
Web Server
6
Your PC
1
5
"root" DNS servers
2
3
ISP "Recursive" DNS server
"com" DNS servers
4
DNS requests
google.com DNS server
The actual
web request
DNS

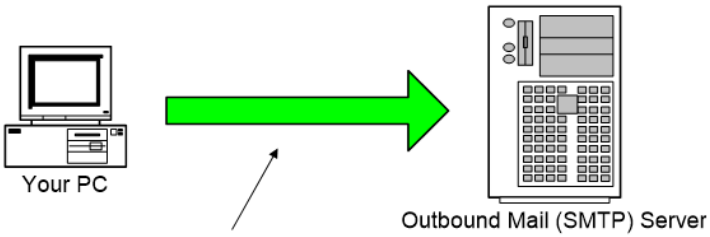
Sending an Email

DNS is not just used in HTTP protocol (web pages)

DNS is involved in almost every protocol in use on the internet

Next example is how DNS facilitates the transfer of electronic mail

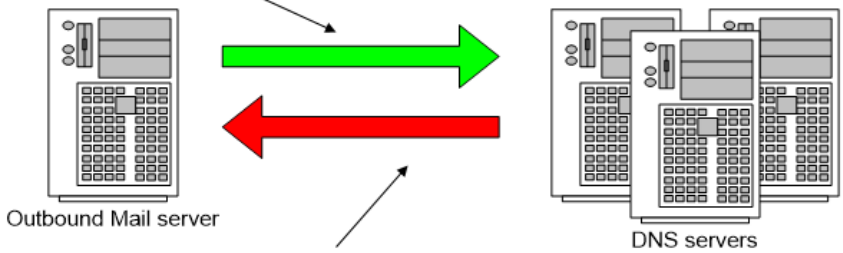
Step 1: Your PC sends the e-mail to its configured outbound mail server. A DNS request similar to the previous example is required to find the address of the mail server.



Please send this message to "someone@example.com"

Step 2: Your mail server follows the same intensive process to find the authoritative servers for "example.com".

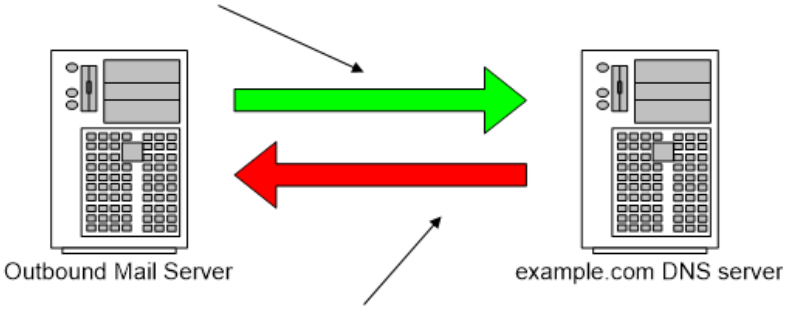
Tell me the name servers for "example.com"



Here are the name servers for "example.com"

Step 3: Ask the “example.com” name server for the list of “Mail eXchangers (MX) for that domain.

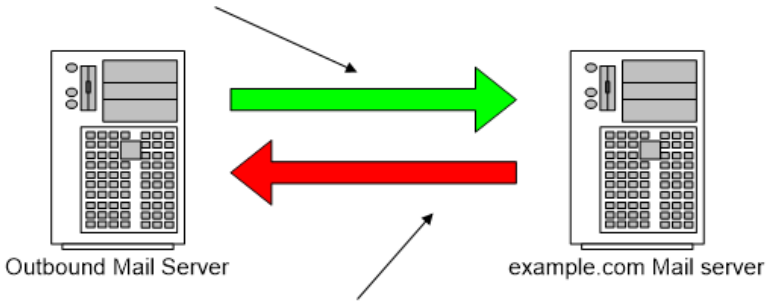
Tell me the MX’s for “example.com”



The MXs are mx10.example.com and mx20.backmail.com

Step 4: Select a Mail server and deliver the mail.

Here is some mail for the “example.com” domain



Mail accepted for delivery

Summary

DNS is integral part in most protocols used on the internet

Makes the internet human friendly for us all

Is the world largest distributed database system

Fits the international model perfectly

In simple terms is a mapping between names and IP addresses.