INTRODUCTION TO DOMAIN NAME SYSTEM (DNS)

.ng Resellers Entrepreneurship Training

10th April 2019

Introduction

DNS, which stands for Domain Name System, is the mechanism which connects a domain name (yourwebsite.com) to the IP address of the server where the website is hosted.

DNS uses several types of DNS records to achieve different outcomes.

Brief Background

All computers on the Internet, from your smart phone or laptop to the servers that serve content for massive retail websites, find and communicate with one another by using numbers. These numbers are known as IP addresses.

To reach/connected to any computer, website or any resource online you need to know it's IP address.

- o IPv4 => 192.168.20.30
- o IPv6 => 2001:db8:0::25

Brief Background

To explain a little more about how the system works, when you register a domain name, it '*propagates*' the information across all DNS servers. This can take up to 48 hours.

Domain names are organized in hierarchies (levels). They can be registered at any of the levels below the root level. NiRA presently supports registration on three levels either at the second, third or fourth level depending on the registrant choice provided the names conform to NiRA's

Challenges:

o   More and more resources were connected to the Internet.

o   It became difficult to remember the numbers and whom they belong to i.e. IP addressed easy for machines, but difficult for humans

Solution:

• Since it is easier for people to remember names than numbers, there was the need for the IP addresses to be given names **(Name Resolution)** which can easily be remembered.

History

❑ In the 1970's ARPANET introduced name resolution that maps human readable names to IP addresses.

❑ ARPANET's name resolution was achieved using Host file (HOST.TXT).

❑ The hosts file is a plain text file used by an operating system to map hostnames to IP addresses.

❑ On Linux systems, the host file is located in the **/etc/hosts** directory and

❑ On Windows the host file is located in the **C:\Windows\System32\drivers\etc** directory

THE DOMAIN NAME INDUSTRY
ECOSYSTEM
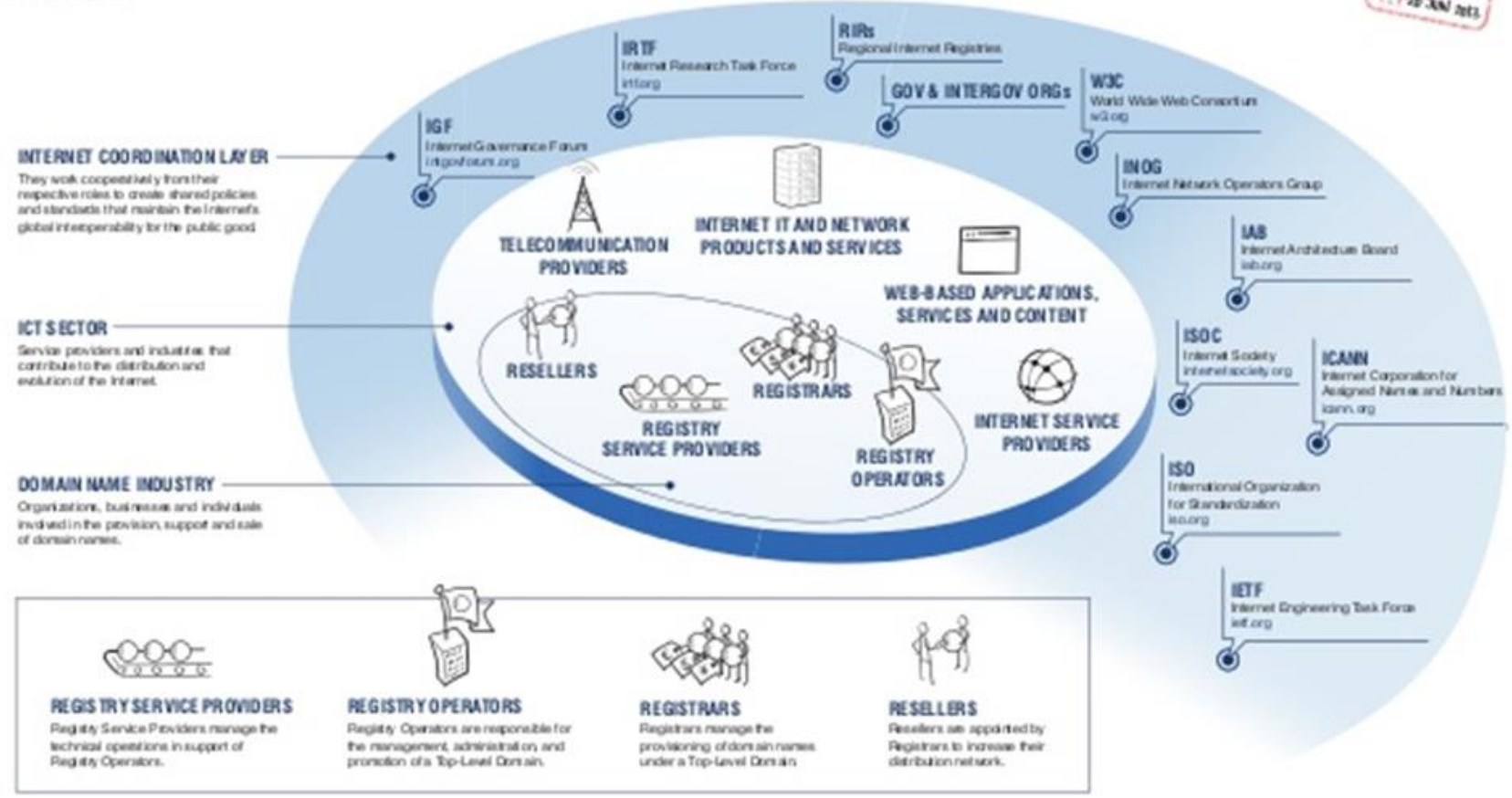
HOW IT WORKS

➢ Each computer on the network maintains a host file.

➢ To access another computer on the network using a name, the host file of the initiating computer must contain a mapping of the IP address of destination computer to its name.

LIMITATIONS OF HOST FILE

➢ Maintained by a single Machine at Stanford Research Institute (SRI)

➢ Manual process which lead to naming contention

➢ Traffic and load

➢ Name Collusion

➢ Synchronization and Inconsistency issue

➢ Not scalable, SRI couldn't handle the load

DNS TO THE RESCUE!!

Discussions started in the early 1980's to address the challenges of host file, which gave birth to the Domain Name System(DNS) by Paul Mockapetris and John Postel.

DNS is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network.

Features:

A Globally scalable, reliable hierarchical distributed database with delegated authority which prevents name collisions

i.e. database maintained locally, but globally available

Top-Level Domain

TLDs are the letters found at the end of an Internet address, such as .ng, .com, .net, or .org. Any TLD that does not represent a country or a territory is known as a generic TLD, or gTLD. The New gTLD Program has enabled hundreds of new top-level domains in ASCII characters and in different scripts (Internationalized Domain Names) to enter into the Internet's root zone since the first delegations occurred in October 2013

The TLD is the furthest portion to the right (as separated by a dot). ICANN distinguishes the following groups of TLDs:

- infrastructure top-level domain (ARPA)

- generic top-level domains (gTLD)

- restricted generic top-level domains (grTLD)

- sponsored top-level domains (sTLD)

- country code top-level domains (ccTLD)

- New top-level domains (TLD)

Domain Namespace

❑ A hierarchical and logical tree structure that starts with the root (.)

❑ Each node represents a domain name separated by a dot as in the case of **switchto.nira.org.ng**
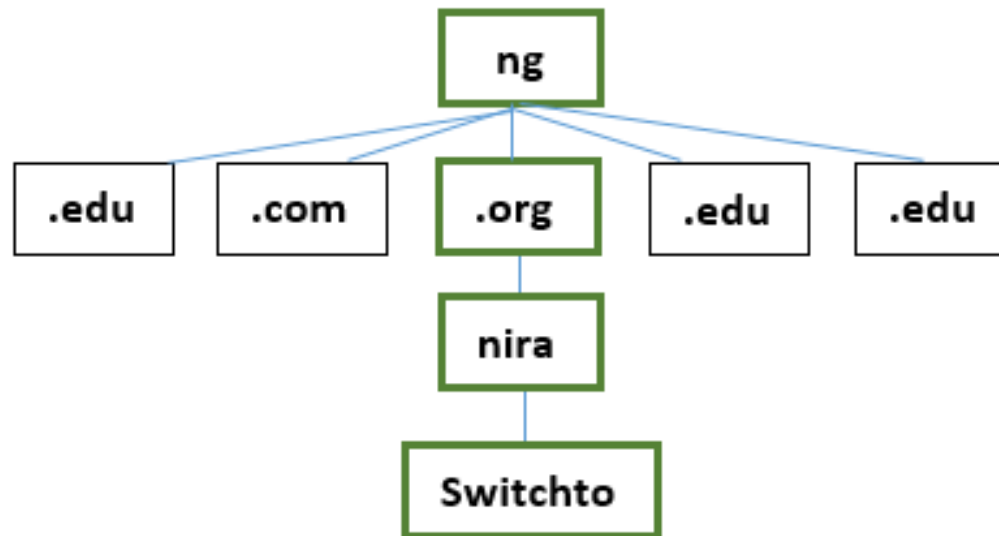
Fully Qualified Domain Names (FQDN)

A fully qualified domain name (FQDN is a DNS domain name that has been stated unambiguously so as to indicate with absolute certainty its location relative to the root of the DNS domain tree.
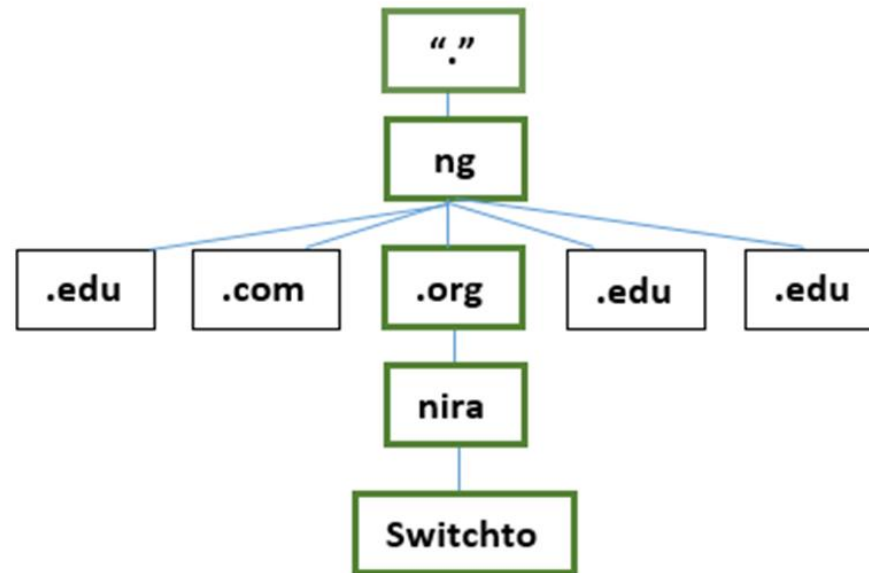
NB: An FQDN ends with a dot.

Syntax of a Domain Name:

❑ Acceptable characters for domain names are 'LDH'

   Letters, Digits and Hyphen

❑ Maximum of 63 characters

NB: Domain Names are not case sensitive.

The Root Zone

The root (the top-most level) of the Internet domain namespace is managed by the Internet Cooperation for Assigned Names and Numbers (ICANN), which delegates administrative responsibility for portions of the domain namespace to various organization.

Beneath the root DNS domain lie the top-level domains.

.ng Zones and Purpose

Domain	Purpose
.ng	Commercial entities and purposes (open)
edu.ng	Higher and Further education and Research Institution (Closed)
name.ng	Personal names (Open)
net.ng	Internet Services/Telecoms Providers' Infrastructure (Closed)
org.ng	Non-For-Profit entities (open)
sch.ng	Other Academic Institutions (Closed and Regional level)
gov.ng	National, Regional, and Local government bodies and Agencies (Closed)
mil.ng	Military and related purposes (Closed)
mobi.ng	For mobile devices meeting .mobi gTLD Standard (open)
.i.ng	General usage (open)
com.ng	Commercial entities and purposes (open)

Levels of Domain Name

Domain names are organized in hierarchies (levels). They can be registered at any of the levels below the root level. NiRA presently supports registration on three levels either at the second, third or fourth level depending on the registrant choice provided the names conform to NiRA's

Component of a DNS: Name Servers

Name servers store information about the zone. They usually answer DNS queries for the zone.

Type of Name servers

Authoritative

Is the authoritative source for all DNS requests made for a designated zone. It has complete knowledge of the zone

Types:

➢ Master – where the data is edited

➢ Slave – where data is replicated to

Characteristics

➢ Does not respond to recursive queries

➢ Does not cache query results

Component of a DNS: RESOURCE RECORDS

➢ A/AAAA: maps hostname to IPV4/V6 address

➢ NS : Name servers for the domain

➢ SOA: Start of authority, used for delegation and management.

➢ PTR: Pointer, maps IP address to name used for Reversed lookup

➢ MX: Mail exchanger used for mail delivery

➢ CNAME: Canonical name/ Alias, maps alternative hostname to real hostname.

➢ TXT: Text allows an administrator to insert arbitrary text into a DNS record

• For more information about DNS Classes & Types visit:

• https://www.iana.org/assignments/dns-parameters/dns-parameters.xhtml#dns-parameters-2

Domain Life Circle

This explain what happens when you register a domain name?

When will it expire – and what happens if it does?
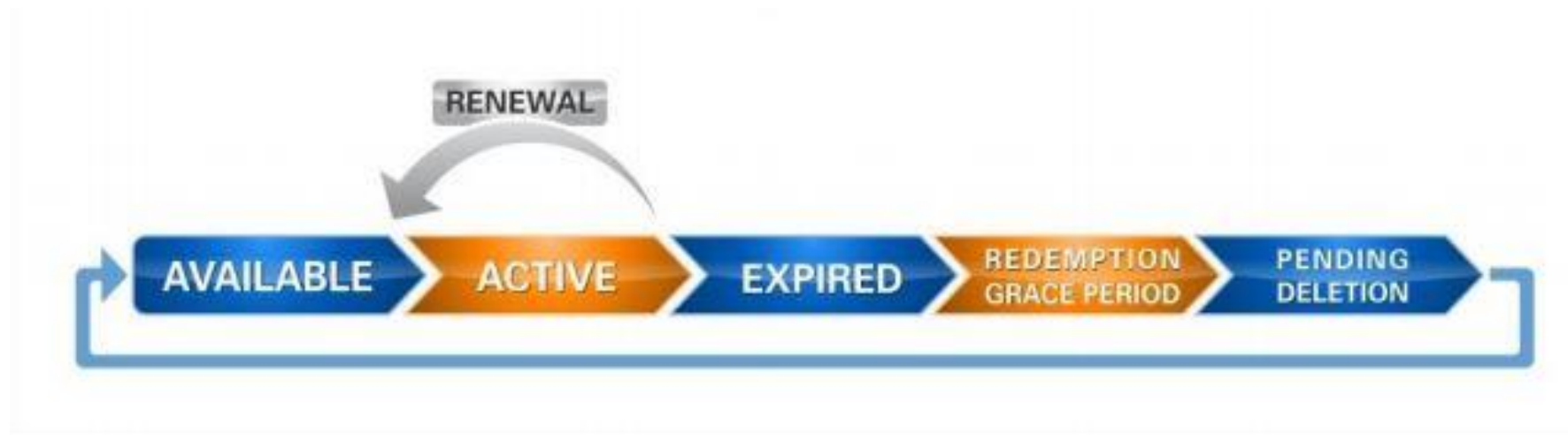
WHOIS Procedure

WHOIS is a query and response protocol that is widely used for querying databases that store the registered users or assignees of an Internet resource, such as a domain name

Whois.nic.net.ng

DNS SECURITY BASICS

Security Issues With DNS

➢ DNS Spoofing / Cache Poisoning

➢ Denial Of Service (DOS)

➢ Man in the middle (MITM) attacks

➢ Packet Sniffing

DNSSEC a solution to the above stated problem

In summary, DNSSEC digitally signs DNS data for authentication and data integrity using a public/private key pair maintained by each zone.

Thank You

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Any Questions?