DNS & IPv6

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Agenda

- DNS & IPv6

  – Introduction

  – DNS & IPv6 Status

  – What's next?

- SaudiNIC & IPv6

  – About SaudiNIC

  – How a ccTLD Registry supports IPv6

  – What SaudiNIC has done

  – Conclusion

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Introduction

- **Addresses in Internet?**

86.111.192.10

2001:610:240:0:53:cc:12:193

112.98.56.3

36.98.66.9

2001:503:BA3E::2:30

65.23.12.91

2001:418:1::39

89.119.20.36

201.23.67.8

www.nic.net.sa

86.111.192.10

Internet

I want to access SaudiNIC web site:
~~86.111.192.10~~

10.1.1.201

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Introduction…

- **What is DNS:**
  - Hierarchical distributed naming system for computers, services, or any resource participating in the Internet
  - It serves as the "phone book" for the Internet
    - by translating human-friendly computer hostnames into IP addresses.
  - In other words:
    - It's how people reach your site
    - If it brakes lots of thing will stop

Network Error - Mozilla Firefox

File   Edit   View   History   Bookmarks   Tools   Help

http://www.google.com

G · Google

Network Error (dns_unresolved_hostname)

Your requested host "www.google.con" could not be resolved by DNS.

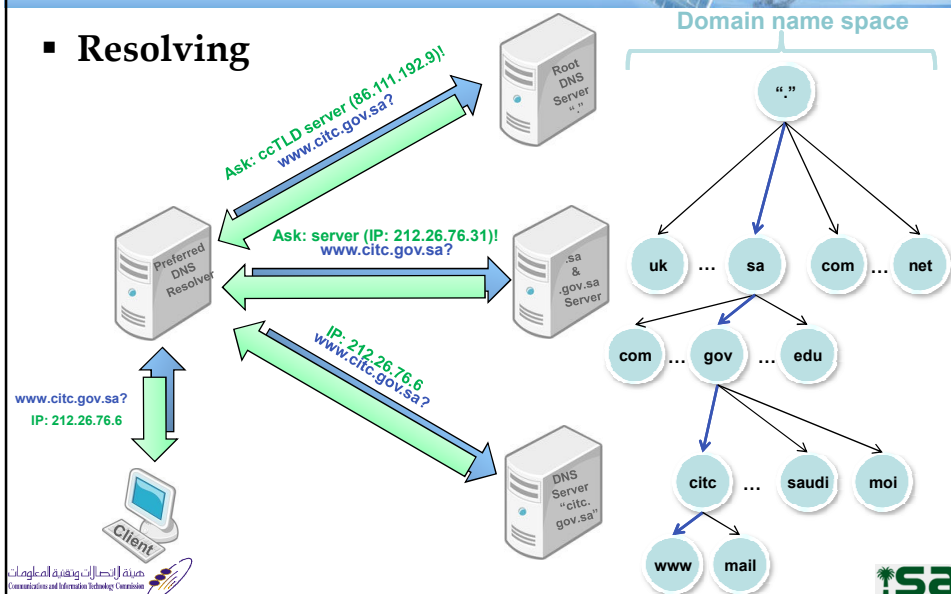For assistance, contact your network support team.

Done

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Introduction…

- **DNS main components:**
  - Domain name space
    - ".", TLD (gTLD, ccTLD), Domains …etc
  - Servers
    - Authoritative (primary/secondary)
    - Resolver
  - Zone-File:
    - Stores some resource records for a particular name space
    - Shared between primary and secondary servers
    - Resource Record (RRs):
      - Data records stored in zone-files by name servers
      - **A** (Address): map host names to address records (Forward DNS lookup)
      - **PTR** (Pointer): Aliases for another location in the domain name space (mainly used for reverse DNS lookups).
      - **NS** (Name Servers): Delegate domain to an authoritative name server
      - Others: MX, SOA, TXT, CNAME ..etc

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Introduction…

- **Resolving**

Domain name space

Ask: ccTLD server (86.111.192.9)!
www.citc.gov.sa?

Ask: server (IP: 212.26.76.31)!
www.citc.gov.sa?

IP: 212.26.76.6
www.citc.gov.sa?

www.citc.gov.sa?
IP: 212.26.76.6

Root DNS Server "."

.sa & .gov.sa Server

DNS Server "citc. gov.sa"

Preferred DNS Resolver

Client

"." — uk … sa com … net
sa — com … gov … edu
gov — citc … saudi moi
citc — www mail

DNS & IPv6 Status

- **DNS status to support IPv6:**
    1. DNS extensions
    2. Software
    3. Resolvers
    4. Root servers

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DNS & IPv6 Status
1- DNS Extensions

- **Adopting IPv6 address records (Forward lookup)**
    - The 'Quad A' Record (AAAA)
        - Similar to 'A' Resource Record for IPv4
        - Holds the IPv6 Record for a host
        - Ignored by most non-IPv6 aware resolvers

Protocol	RR	DNS Mapping (in zone-file)
IPv4	A	www.nic.net.sa. A 86.111.192.10
IPv6	AAAA	www.nic.net.sa. AAAA 2001:610:240::53:cc:12:193

Note: The IP can also be written in this format:
www.nic.net.sa.   AAAA   2001:0610:0240:0000:0053:00CC:0012:0193

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DNS & IPv6 Status
1- DNS Extensions…

- **New label in the DNS tree (Reverse lookup)**
  - A new dedicated reverse tree for IPv6 reverse mapping "ip6.arpa" (similar to "in-addr.arpa" for IPv4)
  - An IPv6 address is represented as a sequence of **nibbles** (4 bits presented by a hexadecimal number) in reverse order, separated by dots ending with the suffix ".ip6.arpa."

Protocol	RR	DNS Mapping (in zone-file)
IPv4	PTR	10.192.111.86.in-addr.arpa. PTR www.nic.net.sa.
IPv6	PTR	3.9.1.0.2.1.0.0.C.C.0.0.3.5.0.0.0.0.0.0.0.0.4.2.0.0.1.6.0.1.0.0.2.ipv6.arpa. PTR www.nic.net.sa.

Note: the IPv6 address is: 2001:0610:0240:0000:0053:00CC:0012:0193

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DNS & IPv6 Status
1- DNS Extensions…
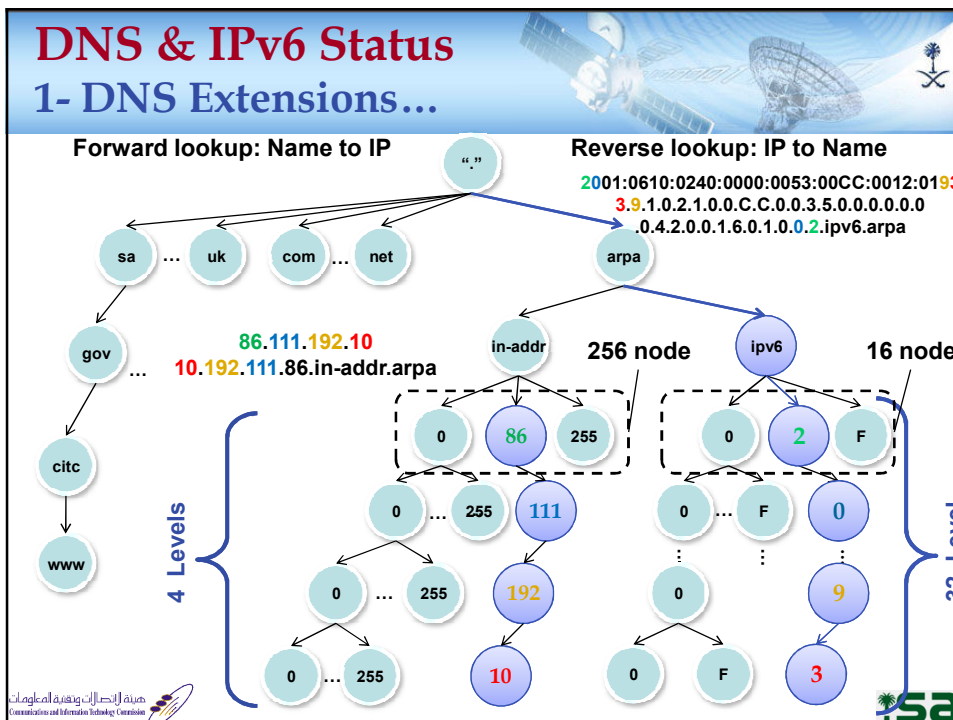
DNS & IPv6 Status
2- DNS Software

Server	IPv6	OS
BIND	Yes (since 9.x)	Windows, Linux/Unix
Microsoft DNS	Yes (Windows Server 2003+)	Windows
NSD	Yes	Linux/Unix
djbdns	Yes (but with a patch)	Linux/Unix
Dnsmasq	Yes	Linux/Unix
Simple DNS Plus	Yes	Windows
PowerDNS	Partial	Windows, Linux/Unix
MaraDNS	Partial	Windows, Linux/Unix
Nominum (ANS, CNS)	Yes	Linux/Unix
Secure64 DNS	No	Appliance
Unbound	Yes	Linux/Unix

Source: http://en.wikipedia.org/wiki/Comparison_of_DNS_server_software

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DNS & IPv6 Status
3- Resolvers

- **Support in Windows:**
  - Windows Vista and 2008 have IPv6 enabled by default
  - Windows XP (SP1):
    - However DNS resolver can't interact with DNS servers over IPv6 transport, It needs IPv4 to query DNS servers

- **Support in Unix distributions**
  - Resolver Libraries support IPv6 (adapted bind)

- **IPv6 Resolver**
  - Will ask for both A & AAAA RRs and will try IPv6 first
    - If it's unable to connect it will fallback to IPv4

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DNS & IPv6 Status
4- Root Servers

- **4-Feb-2008: 6 of 13 root servers can be queried over IPv6, Putting IPv6 on equal footing with IPv4**
  - [a f h j k m].root-servers.net
- **Today 167 of root servers instances/mirrors**
  - 38 IPv6 capable (source: www.root-servers.org)

What's next?

- **Top Level Domains (TLDs) registries and registrars should support IPv6 (e.g. TLD servers and accepting AAAA glue records)**

- **Increase the IPv6 Anycast spared for the root servers around the world (e.g. Middle east)**

- **Promote IPv6 adoption and deployment**

- **Get used to it (Test, Deploy)**

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Communications and Information Technology Commission

SaudiNIC & IPv6

Introduction
About SaudiNIC

- **Administering** the domain name space under **(.sa)** since 1995.
- Operated by Communication and Information Technology Commission (**CITC**) governmental org.
- Coordinating with **regional** and **international** bodies in order to present the local community needs
- Leading the local community effort towards supporting **Arabic language** in DNS
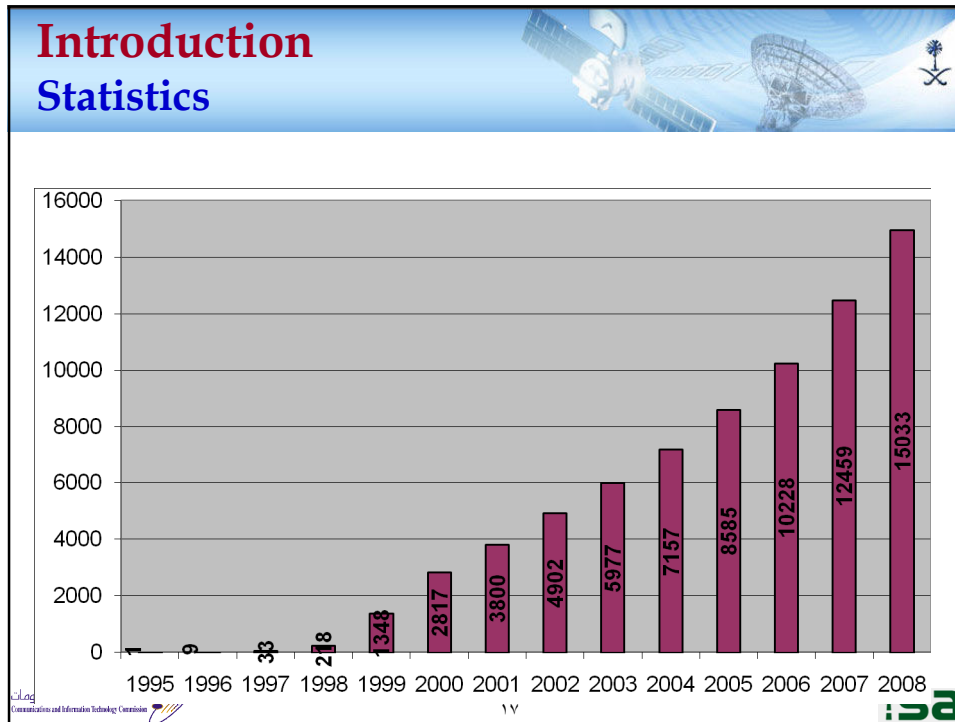
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Communications and Information Technology Commission

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Introduction
Statistics

Introduction
Coming Projects

- **Open registration of domain names directly under "`.sa`" (domain.sa)**
- **Updated Domain Name Regulations**
- **Dispute Resolution Policy (DRP)**
- **IDN.IDN (نطاق.السعودية)**
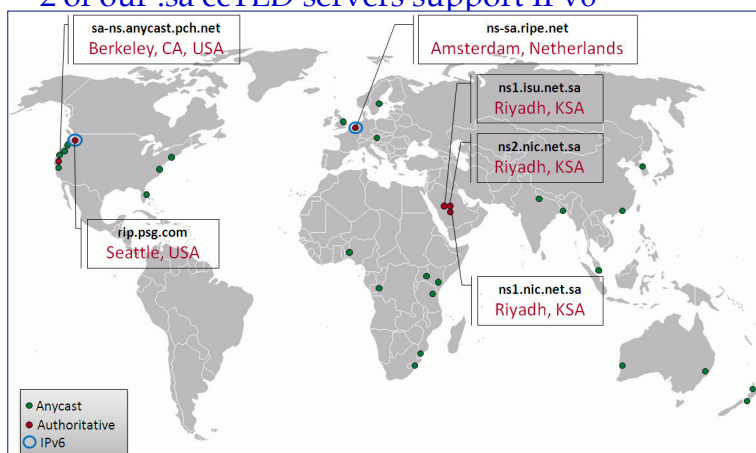- **IPv6 Infrastructure**
- **DNSSEC**
- **Registry–Registrar model**

How a ccTLD Registry supports IPv6?

1. **Name server support**
   – IPv6 support in the ccTLD servers
2. **Registry support**
   – Frontend (e.g. Application form)
   – Backend (e.g. Registry system)
   – Zone-file building (Glue records)
   – Tools and scripts (e.g. Whois)
3. **Infrastructure support**
   – Network devices
   – Servers
   – Services: DNS, Website, Whois, Email …etc
4. **Training and awareness**
   – Registry staff
   – Stakeholders

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What SaudiNIC has done

1. **Name server support**
   – 2 of our .sa ccTLD servers support IPv6

sa-ns.anycast.pch.net
Berkeley, CA, USA

ns-sa.ripe.net
Amsterdam, Netherlands

ns1.isu.net.sa
Riyadh, KSA

ns2.nic.net.sa
Riyadh, KSA

rip.psg.com
Seattle, USA

ns1.nic.net.sa
Riyadh, KSA

- Anycast
- Authoritative
- IPv6

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What SaudiNIC has done...

2. Registry support

- ✓ – Frontend (e.g. Application form)
- ✓ – Registry system
- ✓ – Zone-file building (Glue records)
- P – Tools and scripts (e.g. Whois, DNS checker)
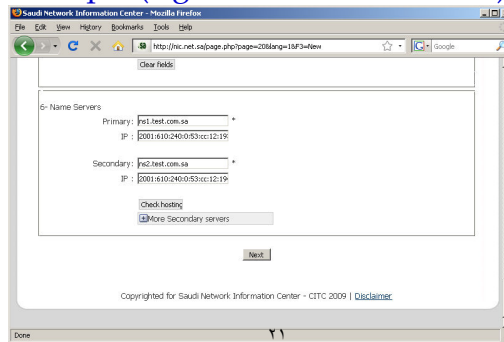
What SaudiNIC has done...

3. Infrastructure support

- ✓ – Equipments and services are IPv6 ready
- ✓ – All software are compliance with IPv6
- ✗ – Network! still waiting!
  - Introduce IPv6 in Saudi Arabia (IPv6 backbone)
  - RIPE enable PI-IPv6 Requests

4. Training and awareness

- P – Registry staff
- P – Stakeholders … (this event ☺)

Conclusion

- **The support of IPv6 in the DNS protocol is quite mature today**
  - Core Specifications and extensions are stable
  - The main needed hardware and software elements are available
  - Integration of IPv6 in a production environment is feasible
- **DNS root servers support IPv6**
  - 6 out of 13 root servers have an IPv6 address
  - 1st IPv6 glue record for a root server added on 29-Jan-2008
- **Many TLD registries already supports IPv6**
  - More than 28 TLD support IPv6
  - E.g. : ccTLD (de, fr, cn, ch, nz, uk…etc) , gTLD(com, net, org, info ,name …etc)
  - 1st IPv6 glue record for a TLD added on 20-Jul-2004
- **SaudiNIC is on their way to fully support IPv6**
  - Adding glue records to any .sa domain name is available now
  - Full support to IPv6: when an IPv6 network is available in SA & PI-IPv6 is enabled by RIPE
- **Still need to support IPv4 & IPv6 in DNS and other services till the transition is completed**
  - Can't convert from transit IPv4 only to transit IPv6 only
  - Dual-stack resolvers and authoritative DNS servers is needed

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Thanks

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Thank you

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