DNS and BIND

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DNS: Backbone of the Internet

- Translates Domains into unique IP Addresses
  - i.e. “dns.google” = “8.8.8.8” & “8.8.4.4”
- Distributed Database of Host Information
- Works seamlessly “behind the scenes”

So what is a “Domain”?

- RFC 920: Domains are Administrative entities
- A unique name
- Can contain subdomain names

Basic Structure

Hierarchical, Tree-like structure

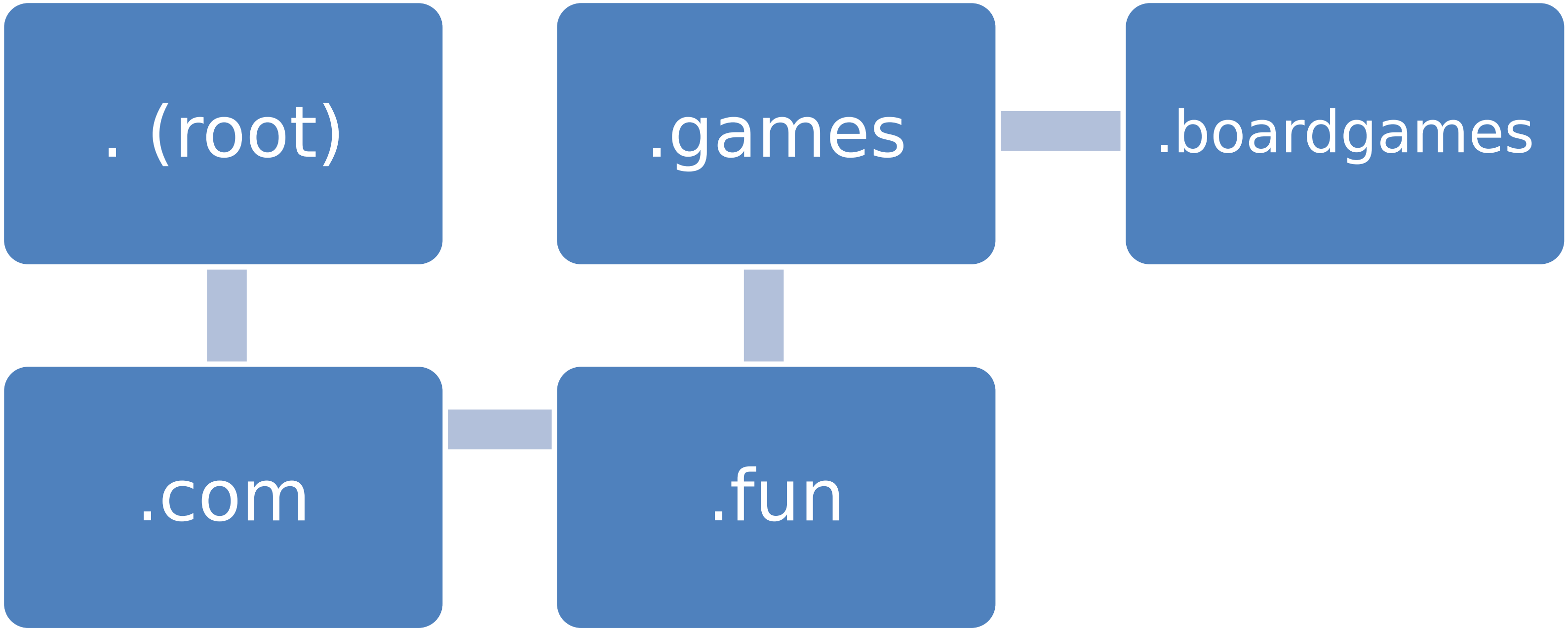
- Made up of individual Nodes

DNS: Series of Delegated Information

A Silly Example...

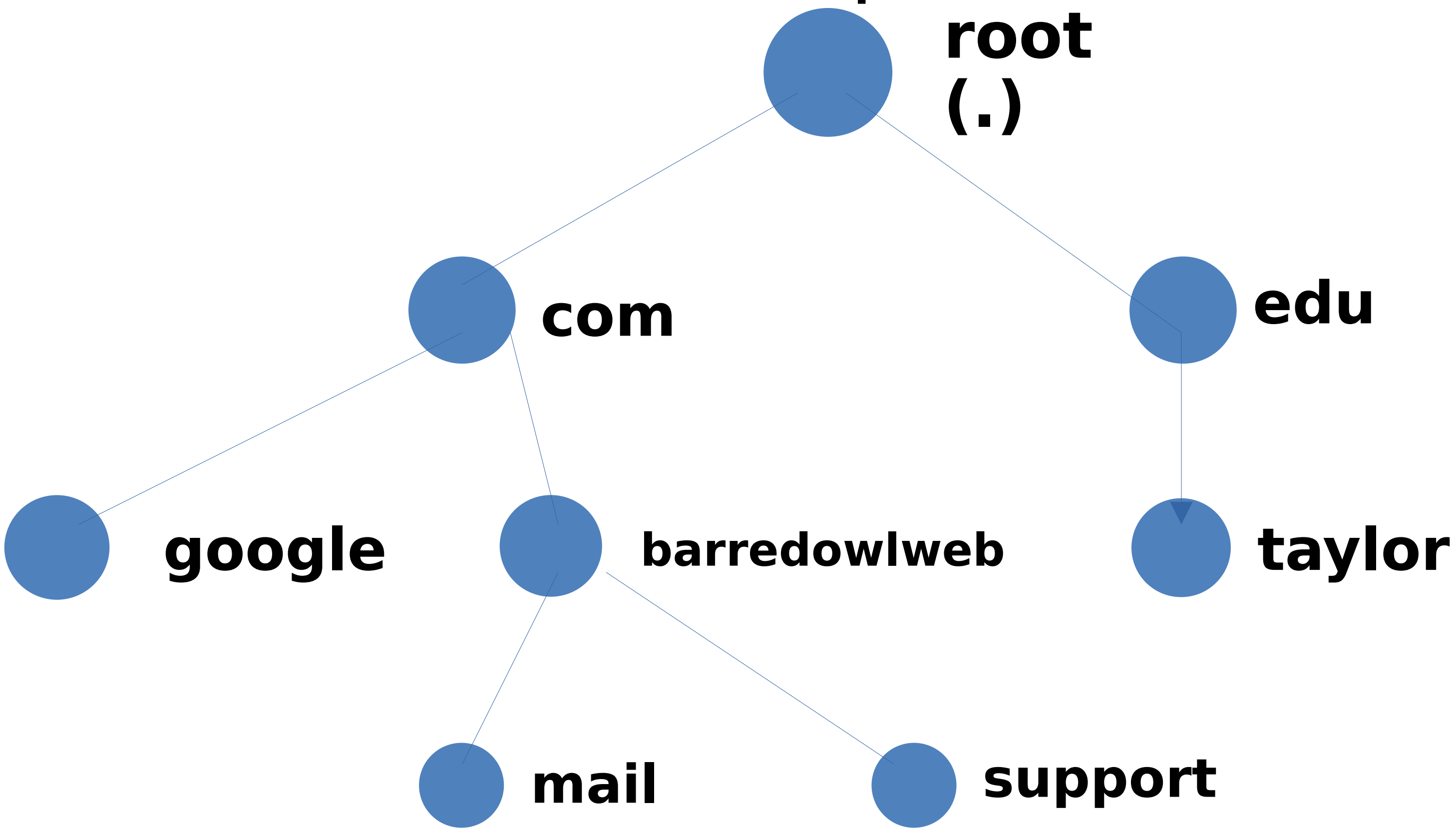
checkers.boardgames.games.fun.com

checkers.boardgames.games.fun.com



Domain Namespace: Another Picture

This “tree” is also called a “domain namespace.”



Components of DNS

- Domain Name Space
- Name Servers (Authoritative Name Servers)
- Resolvers (Caching Name Servers)

DNS Zones

A portion of a Domain Namespace defined by Zone Files (which contain Zone Records)

- Portion of a Domain Namespace that has been administratively delegated
- … Therefore, this information comes from an *authoritative* source (Master Name Server)
- Can be loaded by Slave Name Servers (for backup and redundancy purposes)

Components of Zone Files

- TTL (Time to Live)
  - Tells caching nameservers how long they should cache information from an authoritative source

- The domain administrator’s contact information

- DNS Records

Common DNS Records (Resource Records)

- SOA Record (Start of Authority)
  - Indicates that the nameserver is the best source of info for data within a domain’s zone
- A Record (Address)
  - Directly maps a name to an IP address
- MX Record (Mail Exchanger)
  - Specifies which servers receive email for a domain (and in what order they should be tried)

Common DNS Records (Resource Records)

- NS Records (nameserver)
  - Required
  - Identify which servers are a particular zone’s nameservers
  - Does NOT have to be the same as the zone’s domain

Glue Records: What and Why?

- Solve a circular dependency problem:
  - The TLD delegates DNS requests for “example.com” to the particular authoritative name servers for example.com.
  - But this DNS information is contained within example.com’s nameservers.

- A record that’s served by a DNS server that’s not authoritative for the zone.

Glue Records: How?

- Add IP addresses to your nameservers in your Domain Registrar

- THEN… add NS records AND A records for your authoritative nameservers:

```
        IN      NS      ns1.example.com.
        IN      NS      ns2.example.com.
ns1     IN      A       1.2.3.4
ns2     IN      A       2.3.4.5
```

Anti-Spam Mechanisms

- SPF Records
  - Identifies which IP addresses are allowed to send an email from a certain domain.
- DKIM Records
  - Uses encryption keys to determine if a sending mail server is who it says it is.
- DMARC
  - Specifies what should happen to email if a SPF and DKIM check fails.

Introduction to BIND

Berkeley Internet Name Domain

- Originally developed at University of California Berkeley
- Maintained and supported by ISC (Internet Systems Consortium)
  - https://www.isc.org/software/bind/

Intro to BIND (con’t)

- Most widely used Domain Name Server Software
- Ported to most flavors of UNIX (including Ubuntu, RHEL, and CentOS)
- Can also be run on Microsoft Windows

Configuring BIND (for CentOS)

First, install BIND with: “Yum install bind”

Main config file: /etc/named.conf

Zone file(s) for Master: /var/named/

Zone file(s) for Slave (Caching): /var/named/slaves

BIND's named.conf for Master Name Server

```
Options {
        listen-on port53 { any; };
        allow-transfer        { 2.3.4.5; };
        recursion no;
};
```

BIND’s named.conf for Authoritative Name Server

```
zone “example.com” IN {
        type master;
        file “path-to-zone-file-location”;
};
```

BIND’s named.conf for Recursive Name Server

```
Options {
      recursion: yes;
};
```

A Couple Security Considerations

An Open Resolver is a BAD IDEA

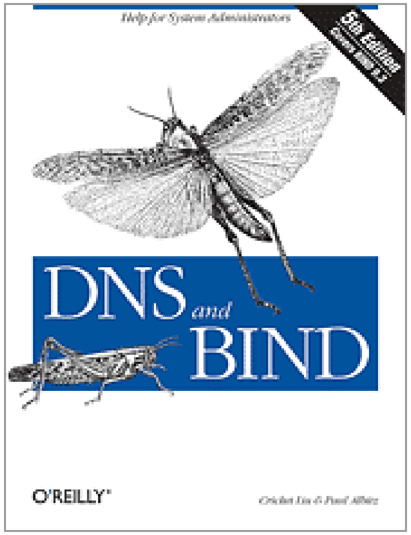
DNS Security Extensions (DNSSEC)

- Digitally signs DNS data so that you are assured its valid. It’s a digital signature,
- No encryption or decryption takes place
- Must be deployed at each step of the lookup process

Recommended Resources

BIND Homepage

- https://www.isc.org/software/bind



O’Reilly’s DNS and BIND

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- RFCs 920, 1034, 1035, 2308
- & their updates - http://tools.ietf.org/html/

- Wikipedia’s List of DNS Record Types: http://en.wikipedia.org/wiki/List_of_DNS_record_types

Recommended Resources (con’t)

Website (Intro to DNS): “How does DNS work?”

- http://cr.yp.to/djbdns/intro-dns.html

- Pingdom’s DNS Check Tool: http://dnscheck.pingdom.com/

MX Toolbox (for testing MX and DNS configuration):

- http://www.mxtoolbox.com/

Recommended Resources (con’t)

DNSSEC – What Is It and Why Is It Important?

- http://www.icann.org/en/about/learning/factsheets/dnssec-qaa-09oct08-en.htm

The End

This presentation was prepared and presented by David White, Founder of Barred Owl Web.

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