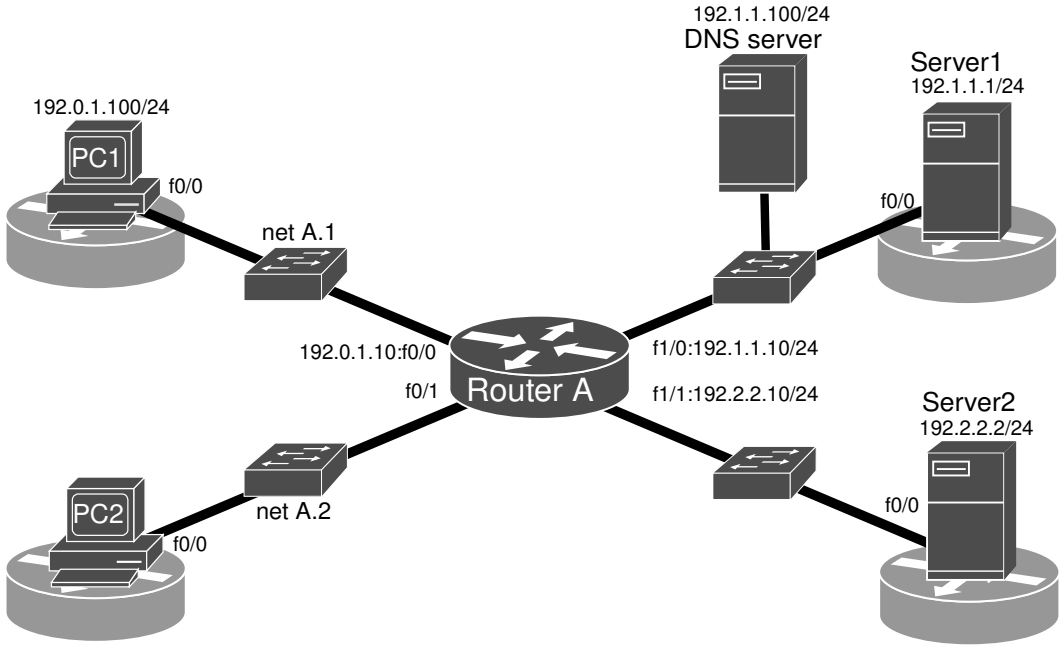
Arquitetura de Comunicações

Laboratory Guide

CDN Deployment with Conditional DNS

Geographically aware DNS Server for CDN Deployment



1. Set up and configure the above depicted network. Server1, Server2, and PCs may be emulated **with routers with disable routing capabilities (do not use VPCS)**. Example for PC1 configuration:

```
PC1(config)#no ip routing                          !disables IPv4 routing
PC1(config)#ip default-gateway 192.0.1.10   !defines default gateway
PC1(config)#ip name-server 192.1.1.100      !defines DNS server
PC1(config)#ip domain lookup                       !domain names should be resolved using DNS
PC1(config)#int f0/0
PC1(config-if)#ip address 192.0.1.100 255.255.255.0
PC1(config-if)#no shutdown
```

Make similar configurations for Server1 and Server2.

The DNS server must be implemented as a virtual Linux server with bind service installed (bind9 package for Debian based distributions). With the VM connect to the internet (attached to NAT), download the file GeoIP.acl (from http://geoip.site/download/MaxMind/GeoIP.acl) and place it on the /etc/bind/ folder of your server:

```
# sudo su
# dhclient
# cd /etc/bind/
# wget http://geoip.site/download/MaxMind/GeoIP.acl
```

Add the VM to GNS3 as a new VirtualBox Template, and add one VM to the project.

Configure DNS Server IPv4 address and gateway:

```
# sudo ip addr add 192.1.1.100/24 dev eth0
# sudo ip route add default via 192.1.1.10
```

Note: Any other server should have installed a DNS server (bind9) with default configuration.

Test full connectivity, and analyze the contents of the file GeoIP.acl. The file contains a set of BIND Access Control Lists that map each IPv4 network of the world with a country prefix. It was constructed based on the GeoIP tools and database from MaxMind.

Basic DNS Server Configuration

2. On the DNS server, load the ACL file to BIND configuration by adding the following line to /etc/bind/named.conf (before the other include directives):

```
include “/etc/bind/GeoIP.acl”;
```

If present, comment the line

```
//include “/etc/bind/named.conf.default-zones”;
```

Restart your DNS server: `service bind9 restart` or `systemctl restart bind9`.

and check its status: `service bind9 status` or `systemctl status bind9`

Note: If the service restart fails, check the syslog file for reason: `tail /var/log/syslog`

3. Assuming that you own the domain **ACServer.com** configure your DNS server to act as a master server (zone) for that domain. Start by creating the definition of the zone, edit the file /etc/bind/named.conf.local (with root privileges) and add the following definitions:

```
zone "acserver.com" in{
  type master; //define the zone as master
  file "/etc/bind/acserver.com.db"; //file with the domain
  records
}
```

Crete DNS records for the domain. By creating the file /etc/bind/acserver.com.db (with root privileges) and add distinct contents:

```
$TTL    604800
$ORIGIN acserver.com.
@       IN      SOA     ns1.acserver.com. adm.acserver.com. (
                        2               ; Serial
                        604800          ; Refresh
                        86400           ; Retry
                        2419200 ; Expire
                        604800 ); Negative Cache TTL
@       IN      NS      ns1.acserver.com.
@       IN      A       192.1.1.1
ns1     IN      A       192.1.1.100
```

Verify if your zone files are correctly defined:

```
named-checkzone acserver.com /etc/bind/acserver.com.db
```

Note: "@" represents the base domain name.

Restart your DNS server:

```
service bind9 restart
```

Start a packet captures on RouterA's f0/0 interface.

Using PC1, test the configuration of your DNS by forcing a DNS query with the following ping command:

```
ping acserver.com
```

Conditional DNS Routing

4. Assuming that you own the domain **ACCDN.com** configure your DNS server to act as a master server (zone) for that domain. Start by creating the definition of the zones conditioned by the views (which are dependent of the client geographic position obtain from the ACL) with the associated *statements* (zone specific parameters), edit the file /etc/bind/named.conf.local (with root privileges) and add the following definitions:

```
view "europe" {
  match-clients { PT; ES; FR; GB; };
  recursion no;
  zone "accdn.com" {
    type master;
    file "/etc/bind/accdn.com-europe.db";
  };
};

view "north_america" {
  match-clients { US; CA; MX; };
  recursion no;
  zone "accdn.com" {
    type master;
    file "/etc/bind/accdn.com-north_america.db";
  };
};

view "other" {
  match-clients { any; };
  recursion no;
  zone "accdn.com" {
    type master;
    file "/etc/bind/accdn.com-other.db";
  };
};
```

5. Create the files /etc/bind/accdn.com-*.db (with root privileges) and add distinct contents.

Example for accdn.com-europe.db:

```
$TTL    604800
$ORIGIN accdn.com.
@       IN      SOA     ns1.accdn.com. adm.accdn.com. (
                        2               ; Serial
                        604800          ; Refresh
                        86400           ; Retry
                        2419200 ; Expire
                        604800 ); Negative Cache TTL
@       IN      NS      ns1.accdn.com.
@       IN      A       192.1.1.1
ns1     IN      A       192.1.1.100
```

Example for accdn.com-north_america.db:

```
$TTL    604800
$ORIGIN accdn.com.
@       IN      SOA     ns1.accdn.com. adm.accdn.com. (
                        2               ; Serial
                        604800          ; Refresh
                        86400           ; Retry
                        2419200 ; Expire
                        604800 ); Negative Cache TTL
@       IN      NS      ns1.accdn.com.
@       IN      A       192.2.2.2
ns1     IN      A       192.1.1.100
```

Example for accdn.com-other.db:

```
$TTL    604800
$ORIGIN accdn.com.
@       IN      SOA     ns1.accdn.com. adm.accdn.com. (
                        2               ; Serial
                        604800          ; Refresh
                        86400           ; Retry
                        2419200 ; Expire
                        604800 ); Negative Cache TTL
@       IN      NS      ns1.accdn.com.
@       IN      A       192.3.3.3
ns1     IN      A       192.1.1.100
```

Verify if your zone files are correctly defined:

```
named-checkzone accdn.com /etc/bind/accdn.com-europe.db
named-checkzone accdn.com /etc/bind/accdn.com-north_america.db
named-checkzone accdn.com /etc/bind/accdn.com-other.db
```

Restart your DNS server:

```
service bind9 restart
```

Start a packet captures on RouterA's f0/0 interface.

Using PC1, test the configuration of your DNS by forcing a DNS query with the following ping command:

```
ping accdn.com
```

Analyze the the content of the DNS packets (server response) and PC1's DNS cache (show hosts).

6. Configure the PC2 and the router as belonging to different IPv4 networks in different world locations, e.g:

US: 12.111.196.0/24, 64.20.253.0/24;

PT: 176.124.252.0/24; 192.112.45.0/24;

BR: 65.205.133.0/24; 192.207.204.0/23;

After each address change, clear PC2's DNS cache (clear host *) **to force new DNS queries.**

Start a packet captures on RouterA's f0/1 interface.

Using PC2, test the configuration of your DNS by forcing a DNS query with the following ping command:

```
ping accdn.com
```

Analyze the the content of the DNS packets (server response) and PC2's DNS cache (show hosts) and correlate them with PC2 network's "world location".

Use the GeoIP.acl file to identify more networks in different countries.