DNS

Computer networks - Administration 1DV202

DNS

- History
- Who needs DNS?
- The DNS namespace
- How DNS works
- The DNS database
- The BIND software
- Server and client configuration

The history of DNS

- RFC 882 and 883 (1983) and RFC 1034 and 1035 (1987)
- BIND
- Other DNS implementations

Who needs DNS?

- DNS defines
  - A hierarchial namespace for hosts and IP addresses
  - A distributed database of hostname and address information
  - A "resolver" to query this database
  - Improved routing for email
  - A mechanism for finding services on a network
  - A protocol for exchanging naming information

The DNS namespace

- Tree hierarchy
- Each domain represents a chunk of the namespace
  - Top level domains/country codes
    - Domains
      - Hosts/second level domains
        - Hosts/third level domains

DNS tree


com
net
se
de
ru
org
ch
...
Top level domains and country codes
domain
host
cname
sr
lnu
vaxjo
kalmar
svt
aftonbladet
...
se domains
dfm
hv
ny112x01
em02
stu02
afrodite
...
hosts and under domains to lnu.se
www
web01
cs
fileserver
...
hosts and under domains to dfm.lnu.se

Masters of their domains

- Various organizations are masters of the top level domains
- Your own domain must be registered with the correct organization
- Either you can use a DNS server offered by an ISP (or domain registrator) or you can run your own
- A domain must always be served by two DNS servers (RFC1219)

How DNS works

- Delegation
- DNS queries
- Caching and efficency
- The extended DNS protocol

The DNS database

- Resource records
- DNS record types
  - SOA record
  - NS record
  - A (and AAAA) record
  - PTR record
  - MX record
  - CNAME record
  - Other records (LOC, SRV, TXT)

Server configuration

Configuration files
Zone data files

Server configuration

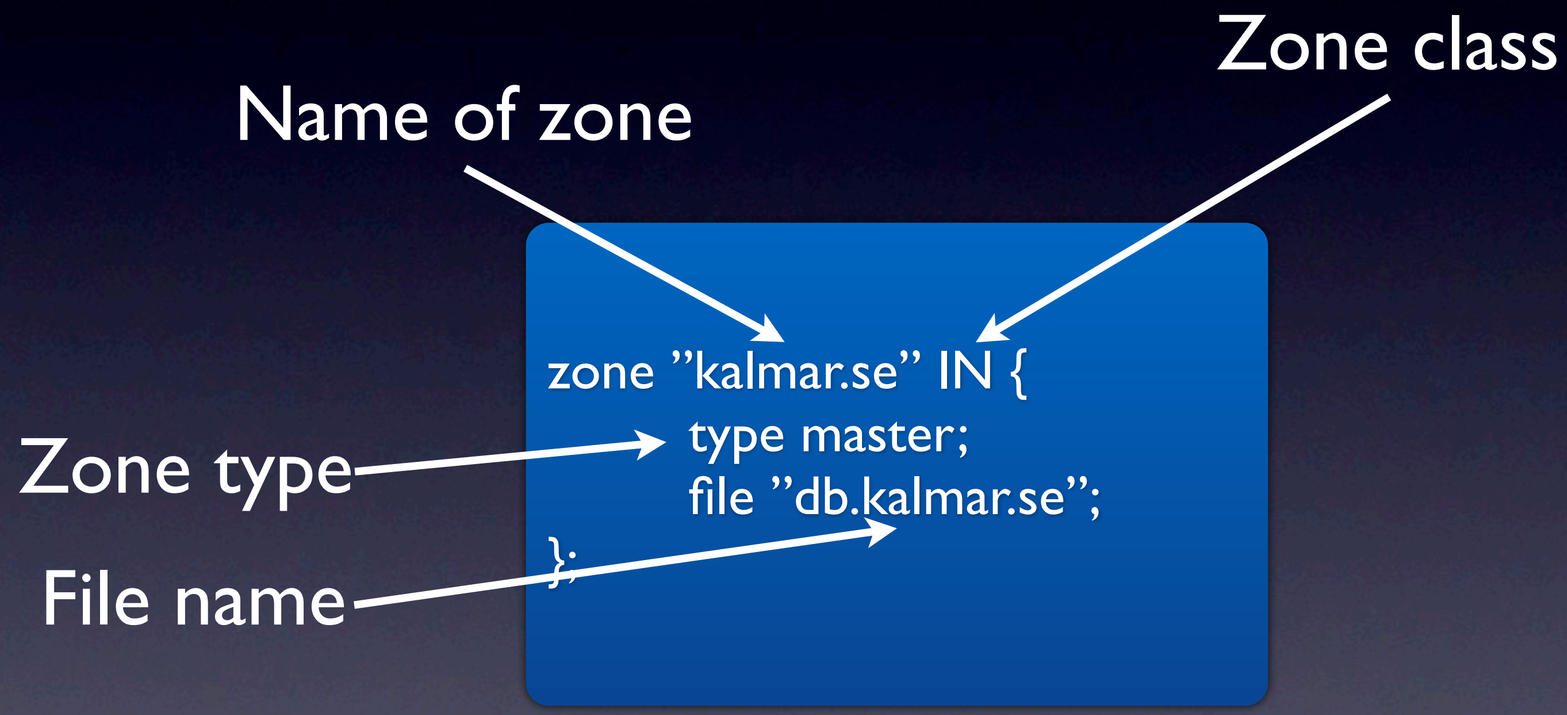
Global span

```
options {
        directory ”/var/cache/bind”;
};


zone ”kalmar.se” IN {
        type master;
        file ”db.kalmar.se”;
};
```

Zone span

Zone management



Data files for zones

```
options {
        directory “/var/cache/bind”;
};
```

Resource Records

- SOA
  - Start Of Authority
- NS
  - Name server
- A
  - FQDN to IP address
- PTR
  - IP address to FQDN
- CNAME
  - Canonical name, alias

SOA - Start of authority

Name of the zone

Zone class

First name server in the zone

Email to the person responsible for the zone

```
kalmar.se. IN SOA dns1.kalmar.se. dnsadmin.kalmar.se. (
        1       ; Serial number
        3h      ; Refresh
        1h      ; Retry
        1w      ; Expiration
        1h      ; Minimum
)
```

NS - Name Servers

```
kalmar.se.    IN    NS    dns1.kalmar.se.
kalmar.se.    IN    NS    dns2.kalmar.se.
```

A - A host address

```
dns1.kalmar.se.          IN    A     192.168.0.1
kvarnholmen.kalmar.se.   IN    A     192.168.0.10
```

PTR - Pointer

1.0.168.192.in-addr.arpa.	IN	PTR	dns1.kalmar.se.
10.0.168.192.in-addr.arpa.	IN	PTR	kvarnholmen.kalmar.se.

CNAME - Canonical name

kvarnholmen.kalmar.se. IN CNAME www.kalmar.se.

Example - kalmar.se

The name servers are found on 192.168.0.1 and 192.168.0.2
The names of these servers are dns1 and dns2
The mail server for the domain is found at 192.168.0.8
The first mail server priority is 10
A secondary mail server is found at 192.168.0.9
The second mail server priority is 20
The IP address space is 192.168.0.0/24

Configuration of the primary name server

```
options {
        directory ”/var/cache/bind”;
};

zone ”kalmar.se” IN {
        type master;
        file ”db.kalmar.se”;
};

zone ”0.168.192.in-addr.arpa” IN {
        type master;
        file ”rev.kalmar.se”;
};
```

The zone data files are located in /var/cache/bind

The name server will be the primary server for both forward and reverse lookups

File names for the two zones

Forward Lookup Zone

```
$TTL 3h

kalmar.se.    IN      SOA     dns1.kalmar.se.     dnsadmin.kalmar.se.    (
              4         ; Serial number
              10800     ; Refresh
              3600      ; Retry
              604800    ; Expiration
              3600      ; Minimum
)

kalmar.se.                  IN      NS              dns1.kalmar.se.
kalmar.se.                  IN      NS              dns2.kalmar.se.
dns1.kalmar.se.             IN      A               192.168.0.1
dns2.kalmar.se.             IN      A               192.168.0.2

kalmar.se.                  IN      MX      10      mail1.kalmar.se.
kalmar.se.                  IN      MX      20      mail2.kalmar.se.
mail1.kalmar.se.            IN      A               192.168.0.8
mail2.kalmar.se.            IN      A               192.168.0.9
```

Reverse Lookup Zone

```
$TTL 3h

0.168.192.in-addr.arpa.  IN   SOA       dns1.kalmar.se.   dnsadmin.kalmar.se.   (
                         4            ; Serial number
                         10800        ; Refresh
                         3600         ; Retry
                         604800       ; Expiration
                         3600         ; Minimum
)

0.168.192.in-addr.arpa.      IN      NS      dns1.kalmar.se.
0.168.192.in-addr.arpa.      IN      NS      dns2.kalmar.se.

1.0.168.192.in-addr.arpa.    IN      PTR     dns1.kalmar.se.
2.0.168.192.in-addr.arpa.    IN      PTR     dns2.kalmar.se.
8.0.168.192.in-addr.arpa.    IN      PTR     mail1.kalmar.se.
9.0.168.192.in-addr.arpa.    IN      PTR     mail2.kalmar.se.
```

named-checkzone

Configure a secondary name server

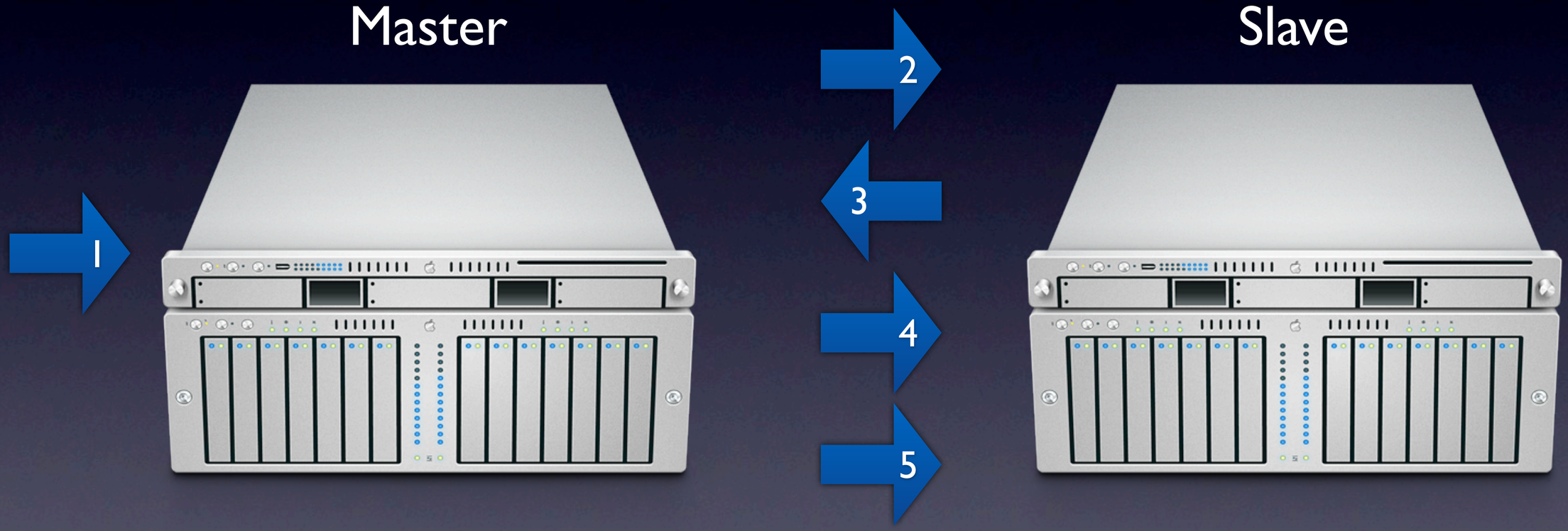
```
zone ”kalmar.se” IN {
        type slave;
        file ”slave.db.kalmar.se”;
        masters {
                192.168.0.1;
        };
};
```

Updating the secondary server

```
kalmar.se. IN SOA dns2.kalmar.se. dnsadmin.kalmar.se (
        1       ; Serial number
        3h      ; Refresh
        1h      ; Retry
        1w      ; Expiration
        1h      ; Minimum
)
```

The name server will try to refresh the zone every three hours

DNS Notify (Zone Change Notification)



DNS Notify forts.

Global level

```
options {
        notify no;
};
```

Zone level

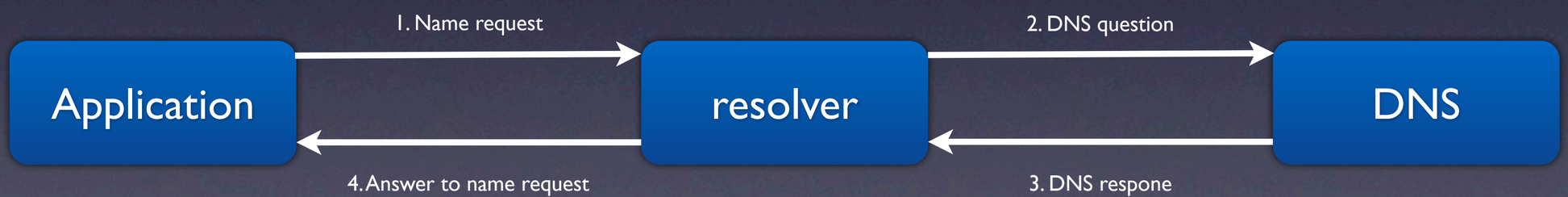
```
zone ”kalmar.se” {
        notify no;
};
```

Name servers not belonging to a zone

```
zone ”kalmar.se” {
        also-notify {
                10.0.0.1;
                10.0.0.2;
        };
};
```

Client configuration

/etc/host.conf
/etc/resolv.conf



/etc/host.conf

order hosts,nis,bind

/etc/resolv.conf

domain
search
nameserver
sortlist

```
domain kalmar.se
search kalmar.se cslab.net
nameserver 10.0.0.1
sortlist 10.0.0.0/255.0.0.0 172.16.0.0/255.255.0.0
```