Introduction to DNS

Networks Administration

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We all use DNS

- If you want to communicate with a remote host over the Internet, you need to know its IP address.
- For example the address for www.op.ac.nz is 202.49.5.68.
- We all know that we use the Domain Name System to find the address for a given name.
- But how does this work, really?

How did we get the name www.op.ac.nz?

- Anything in the .nz zone is overseen by the Domain Name Commission (dnc.org.nz).
- The DNZ delegates the ability to register domain names to various authorised *registrars*.
- An organisation like the the the Polytech registers its desired domain name with a registrar.
- It can then identify hostnames under the domain, like www.op.ac.nz, or it can further divide the zone into subdomains, like ict.op.ac.nz.

How do we get from www.op.ac.nz to 202.49.5.68?

That's a bit more complicated. We have to create a record in DNS. DNS is a

- Distributed,
- Hierarchical,
- Client-server,
- Directory system.

The DNS Hierarchy
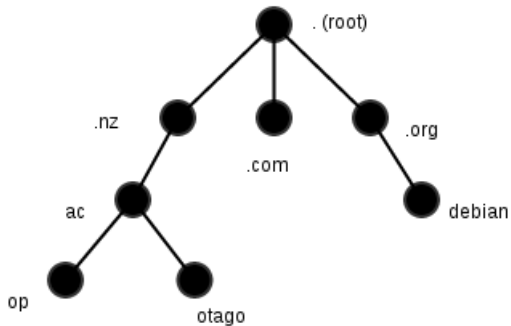
DNS Servers

- To make all this work, we need DNS servers at each level of the hierarchy.
- There are basically two ways in which a server may know the answer to a DNS query:
    1. it may be *authoritative* for the domain in question;
    2. it may perform a *recursive* lookup.
- If a DNS server is not authoritative and it doesn't perform recursive lookups, it will provide a referral to another DNS server that may know the answer.

DNS Clients

- A client machine that needs to perform a DNS lookup uses its *resolver*
- A resolver may be a local service, but typically it is a system library.

The lookup process

Suppose a DNS client makes a recursive query for the address of kate.ict.op.ac.nz, and the server receiving the query is not authoritative and does not have any relevant cached information.

1. It starts by querying a *root* server to find the address of a DNS server that is authoritative for .nz.
2. It queries that server to find one that is authoritative for ac.nz.
3. It queries that server to find one that is athoritative for op.ac.nz.
4. It is finally referred to a server that is authoritative for ict.op.ac.z, and that server responds with an address for kate.

What about reverse lookups?

Suppose we want to find the hostname for 202.49.5.60?

```
kate.ict.op.ac.nz.    The hierarchy goes right-to-left.

202.49.5.60           The hierarchy goes left-to-right.
```

IP addresses don't match the hierarchical structure of DNS.

The solution is to invert the hierarchy of IP addresses.

To find the hostname for 202.49.5.60, we look up 60.5.49.202.in-addr.addr.arpa.

DNS Software

- BIND: The de facto standard DNS server.
- dig, host: client tools useful for inspecting and troubleshooting DNS issues.