

# Introduction to DNS

## Networks Three

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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`?

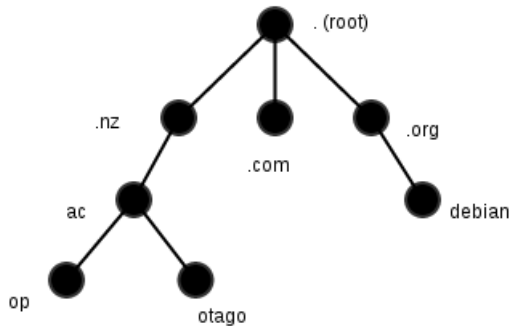
- Anything in the `.nz` zone is overseen by the Domain Name Commission (`dnc.org.nz`).
- The DNZ delegates the ability to register domain names to various authorised *registrars*.
- An organisation like the the the Polytech registers its desired domain name with a registrar.
- It can then identify hostnames 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 authoritative for op.ac.nz.
- 4 It is finally referred to a server that is authoritative for ict.op.ac.nz, 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.arpa.

# DNS Software

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