

Distributed Systems

COMP90015 2023 Semester 1
Tutorial 11

Things to cover today

- Name Services questions
- SSL Demo

Name Service Questions

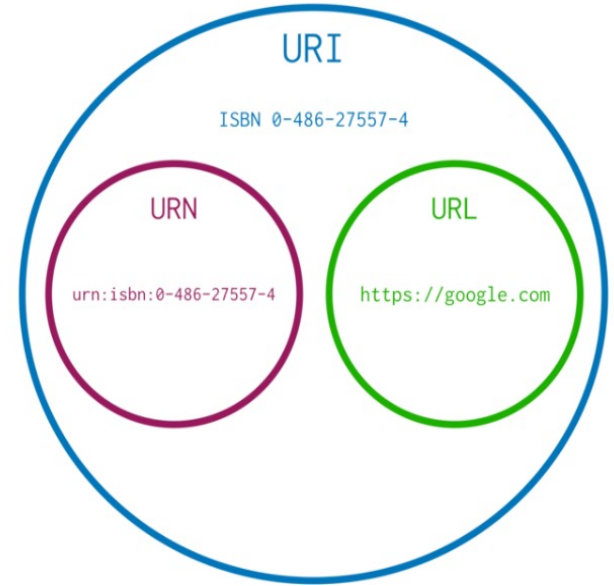
1. Define and discuss the concepts of Uniform Resource Identifiers

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- *Uniform Resource Identifiers* (URLs) are concerned with identifying resources on the Web, and other Internet resources such as electronic mailboxes.
- URLs are intended to allow a generic way of specifying the identifier so as to make it easy for common software to process the identifier. This allows new types of identifiers to be readily introduced and for existing identifiers to be used by a wide variety of different software and services.
- URLs provide ways to locate the resource being named. They clearly suffer if the resource has since changed its name (e.g. broken links in the Web).
 - With specifying type of protocol (how) and remote name (where)

1. Define and discuss the concepts of Uniform Resource Identifiers

- URI (uniform resource identifier) identifies a resource (text document, image file, etc)
- URL (uniform resource locator) is a subset of the URIs that include a network location
- URN (uniform resource name) is a subset of URIs that include a name within a given space, but no location



2. What are Name Services and why do we need them?

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- In a Distributed System, a Naming Service is a specific service whose aim is to provide a **consistent and uniform naming of resources**, thus allowing other programs or services to **localize** them and obtain the required metadata for interacting with them.
- The **major operation** of a name service is to **resolve a name (along with - consistent naming scheme)**, i.e to lookup the attributes that are bound to the name.

2. What are Name Services and why do we need them?

- Name management is **separated** from other services largely because of the **openness of distributed systems**, which brings the following motivations:
 - **Unification**: Resources managed by different services use the same naming scheme, as in the case of URIs.
 - **Integration**: To share resources that were created in different administrative domains requires naming those resources. Without a common naming service, the administrative domains may use entirely different name formats.
- Key benefits
 - Resource localization (resources can be files, webpages, services, databases, etc..)
 - Uniform naming
 - Device independent address (e.g., you can move domain name/web site from one server to another server seamlessly).
 - Naming Services are not only useful to **locate resources** but also to **gather additional information** about them such as attributes (its domain, resource type, etc ..).

3. What is navigation and what are the approaches to navigation?

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- When the name service is distributed then a single server may not be able to resolve the name. The resolve request may need to propagate from one server to another, referred to as *navigation*.
- Classification of different navigation approaches.
 - *iterative navigation* -- The client makes the request at different servers one at a time. The order of servers visited is usually in terms of domain hierarchy. **Always starting at the root server would put excessive load on the root.**
 - *multicast navigation* -- The client multicasts the request to the group (or a subset) of name servers. Only the server that holds the named request returns a result.
 - *non-recursive server-controlled navigation* -- The client sends the request to a server and the server continues on behalf of the client, as above.
 - *recursive server-controlled navigation* -- The client sends the request to a server and the server sends the request to another server (if needed) recursively.

4. What is Domain Name System and in what aspects does it improve on a file-based implementation?

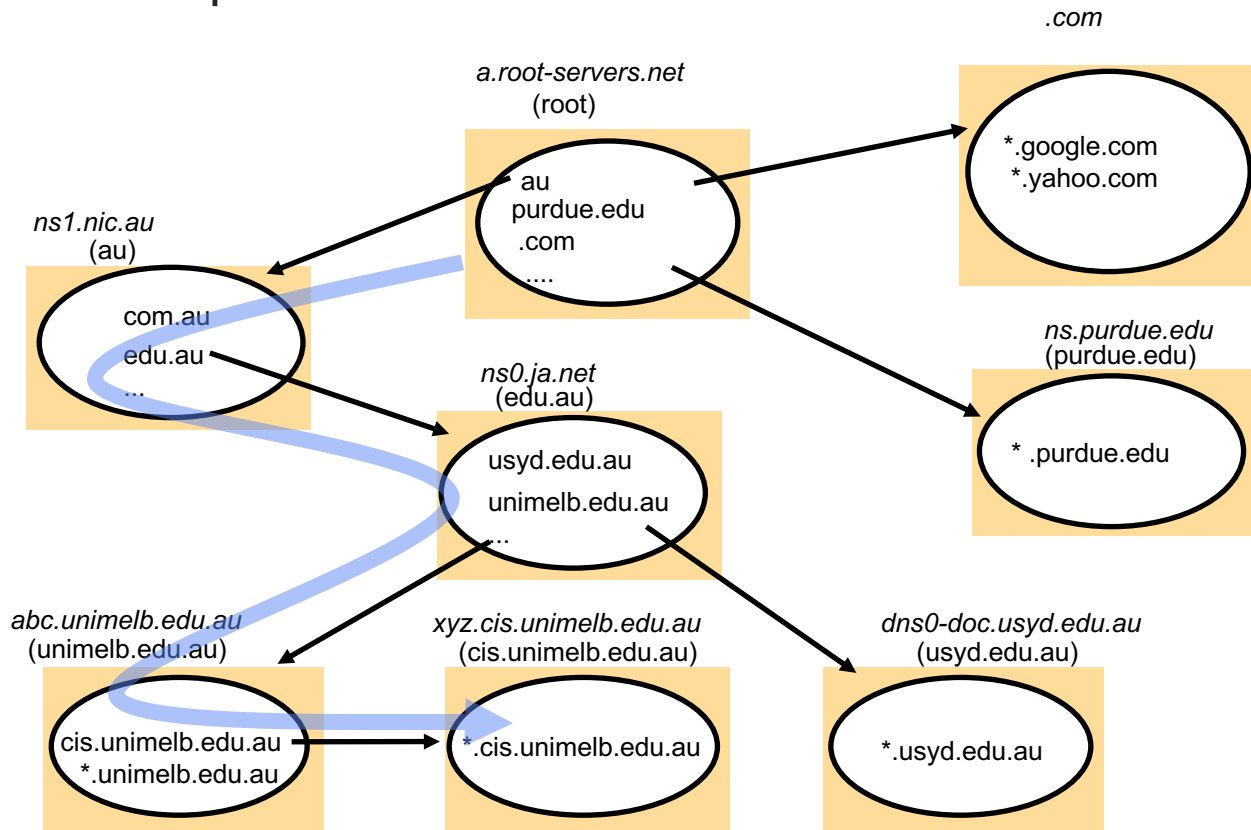
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- The Domain Name System (DNS) is a name service design whose main naming database is used across the Internet.
- Before DNS, all host names and addresses were held in a single central master file and downloaded by FTP to all computers that required them.
- The problems with the original name service included:
 - It did not scale to large numbers of computers.
 - Local organizations wished to administer their own naming systems.
 - A general name service was needed -- not one that serves only for looking up computer addresses.
- DNS is designed for use in multiple implementations, each of which may have its own name space, though in practice the Internet DNS name space is the one in widespread use.

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Note: Name server names are in italics, and the corresponding domains are in parentheses.
Arrows denote name server entries

authoritative path to lookup:
xyz.cis.unimelb.edu.au



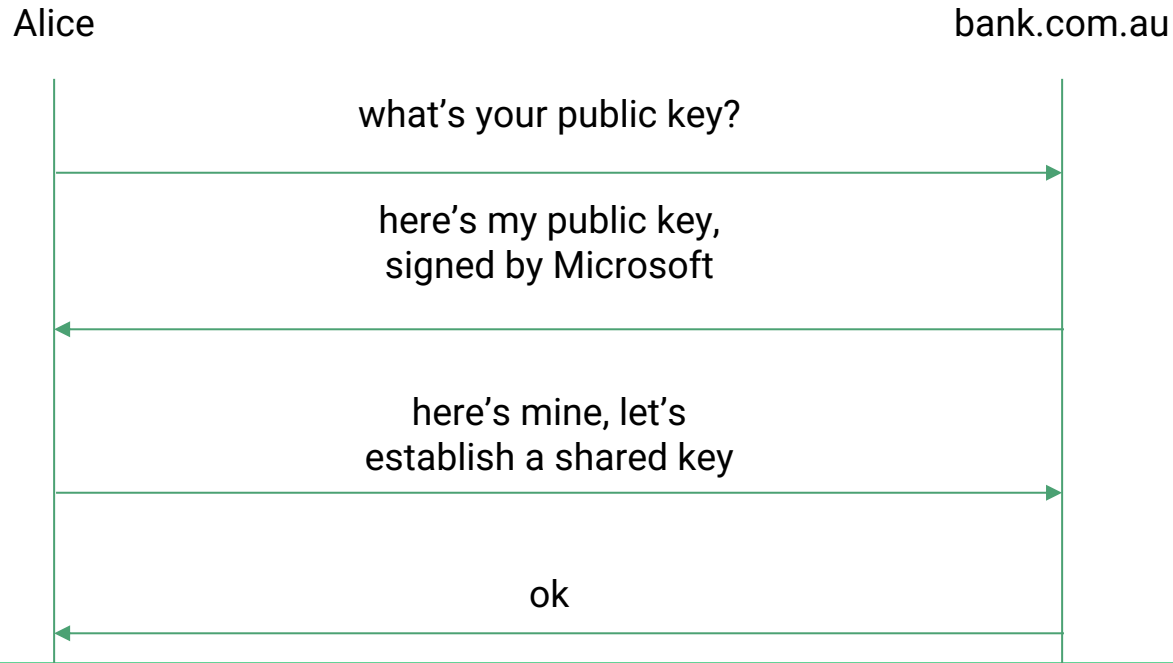
- SSL Demo

Transport Layer Security (TLS)

TLS is a modern protocol that handles this for you. Most communication these days (e.g. HTTPS) uses TLS.

Certificates: here is my public key, and here is a signature from a trusted authority that says it really does belong to me.

Transport Layer Security (TLS)



Transport Layer Security (TLS)

Code demonstration:

Q & A

Best wishes! This is your last tutorial.