Domain Name System (DNS)

- DNS is a service that are used by networks applications to translate host names into host addresses
  - DNS allows users to refer to remote hosts by name rather than by address
- Each Internet host is assigned a *name* and an *address*
  - Host names are variable-length, user-friendly
  - Host addresses are fixed-length (32 bits), router-friendly
  - E.g., host name www.cs.iastate.edu has address 129.186.3.6
- Naming System Terminology
  - A *name space* defines the set of possible names
  - A naming system maintains a collection of *bindings of names to values*
    - The naming system returns the *value* when presented with a *name*
    - The *value* is an address in many cases
  - A *resolution mechanism* is a procedure that, when invoked with a name, returns the corresponding value.
  - A *name server* is an implementation of a resolution mechanism that is available on a network and that can be queried by sending it a message
- DNS – the Internet’s naming system
  - DNS is used to translate host names to host addresses
  - DNS employs a *hierarchical* namespace: names consist of multiple components
- Domain names are used to name Internet objects, e.g., ren.cs.iastate.edu
- The DNS hierarchy can be visualized as a tree
  - Each node corresponds to a domain
  - Each leaf corresponds to a host
- The domain hierarchy is partitioned into zones; each zone corresponds to some administrative authority responsible for that portion of the hierarchy
- Information contained in each zone is implemented in two or more name servers (for redundancy) as a collection of resource records
  - Each name server is a program that can be accessed over the Internet
- Name resolution
  - The client program running on each Internet host is initialized with the address of a local name server
    - The local name server has resource records for one or more of the root servers
  - To resolve a name, a client queries the local name server; the local name server queries the remote name servers on the client’s behalf if it cannot resolve the name
  - Local name server performs caching
    - The TTL field in the resource records returned by remote servers indicates how long each record can be safely cached