Application Layer

Application Layer

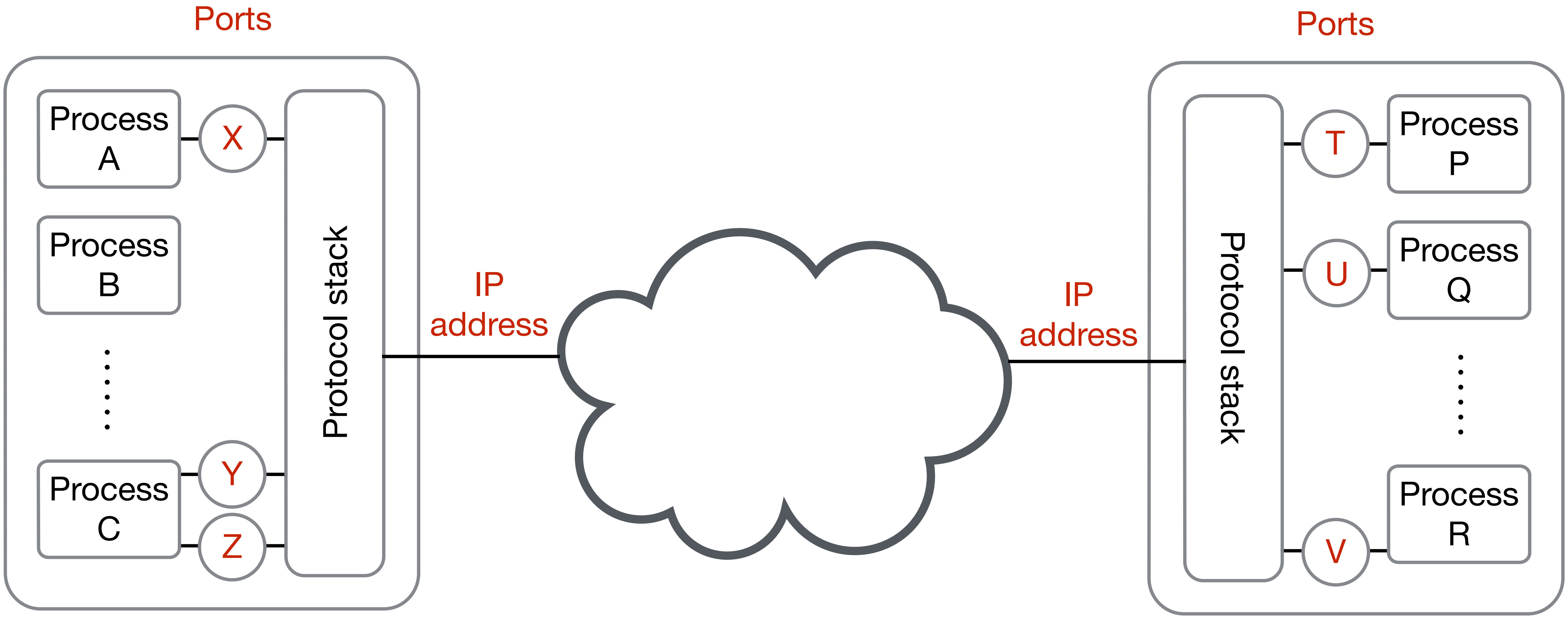
- **Assumptions:**
  - each host (each network interface, actually) has a globally unique id (IP address)
  - each communication endpoint of an application has an id that is unique within the host (port number)
  - underlying network provides reliable connection-oriented or unreliable connection-less service (TCP and UDP)
- Each “communication” is uniquely identified by quadruple of *src/dst IP* and *src/dst port #*

Client and Server

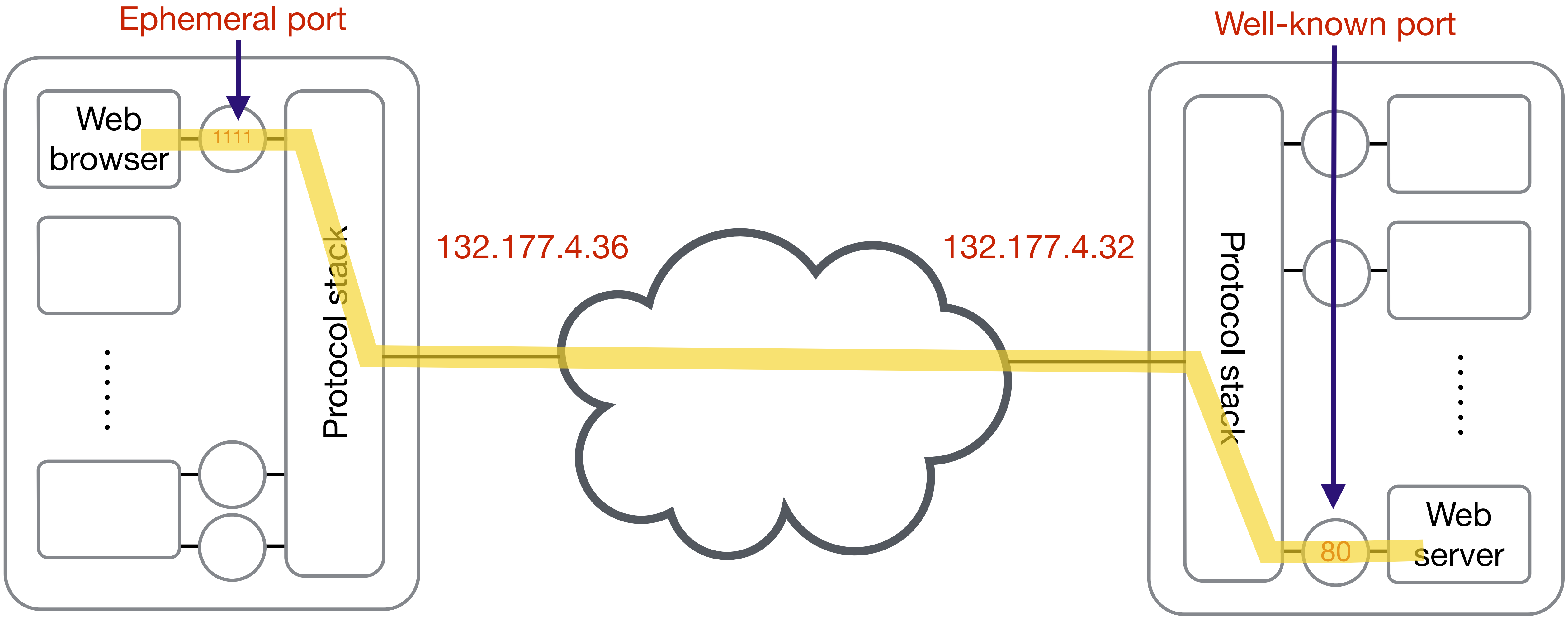
- **Client** (caller)
  - actively opens connection to the server
  - must know server's IP address and port #
  - typically uses *ephemeral* source (local) port number

- **Server** (callee)
  - connects to local port (typically a *well-known* one)
  - waits for clients to connect
  - may handle multiple simultaneous client connections

Client and Server

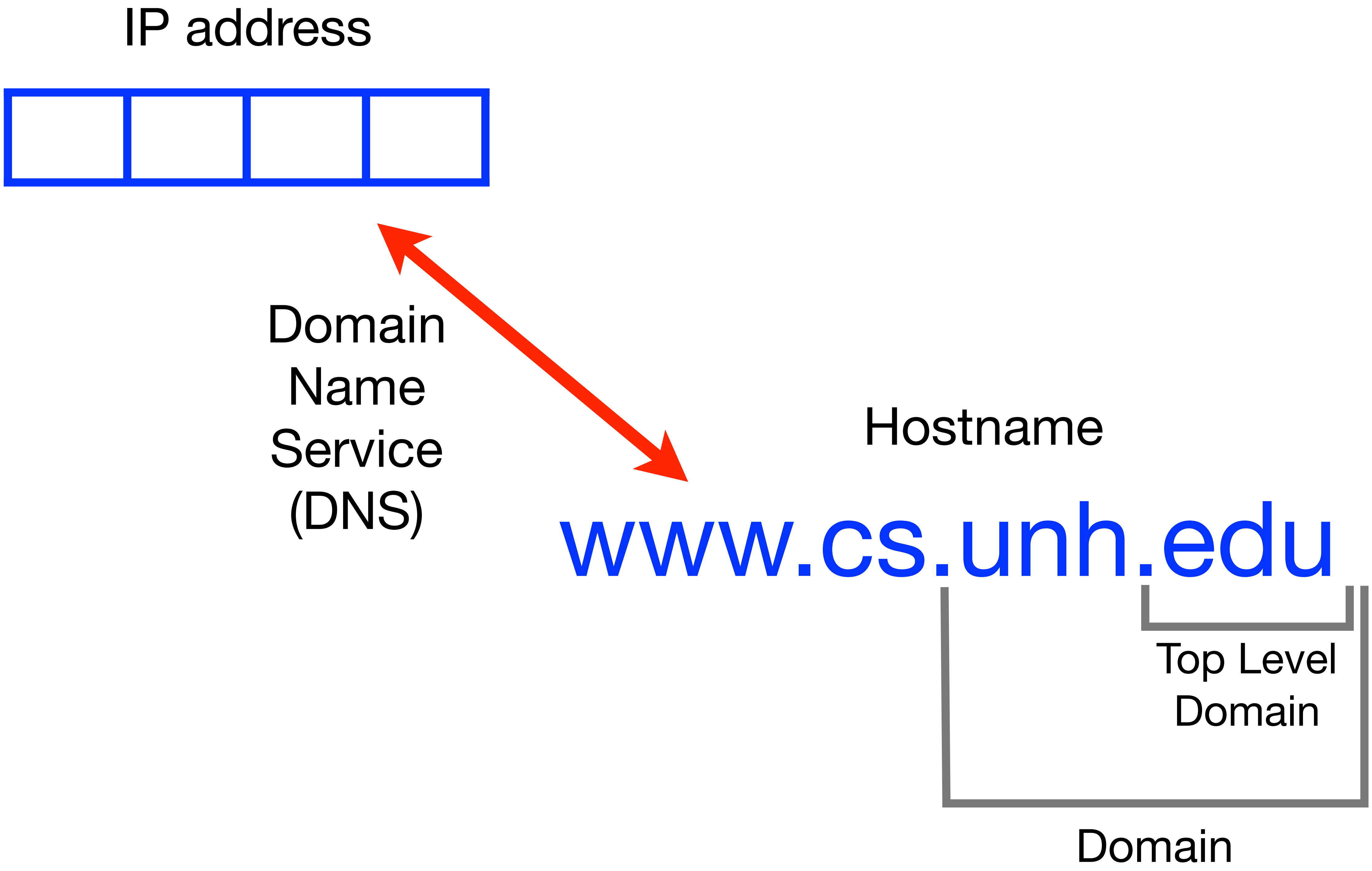


Client and Server



A process (web browser) connected to ephemeral port 1111 on a host with IP address 132.177.4.36 opens connection to a process that listens on well-known port 80 (web server) on a host with IP address 132.177.4.32

Domain Name Service



IP address

Domain Name Service (DNS)

Hostname

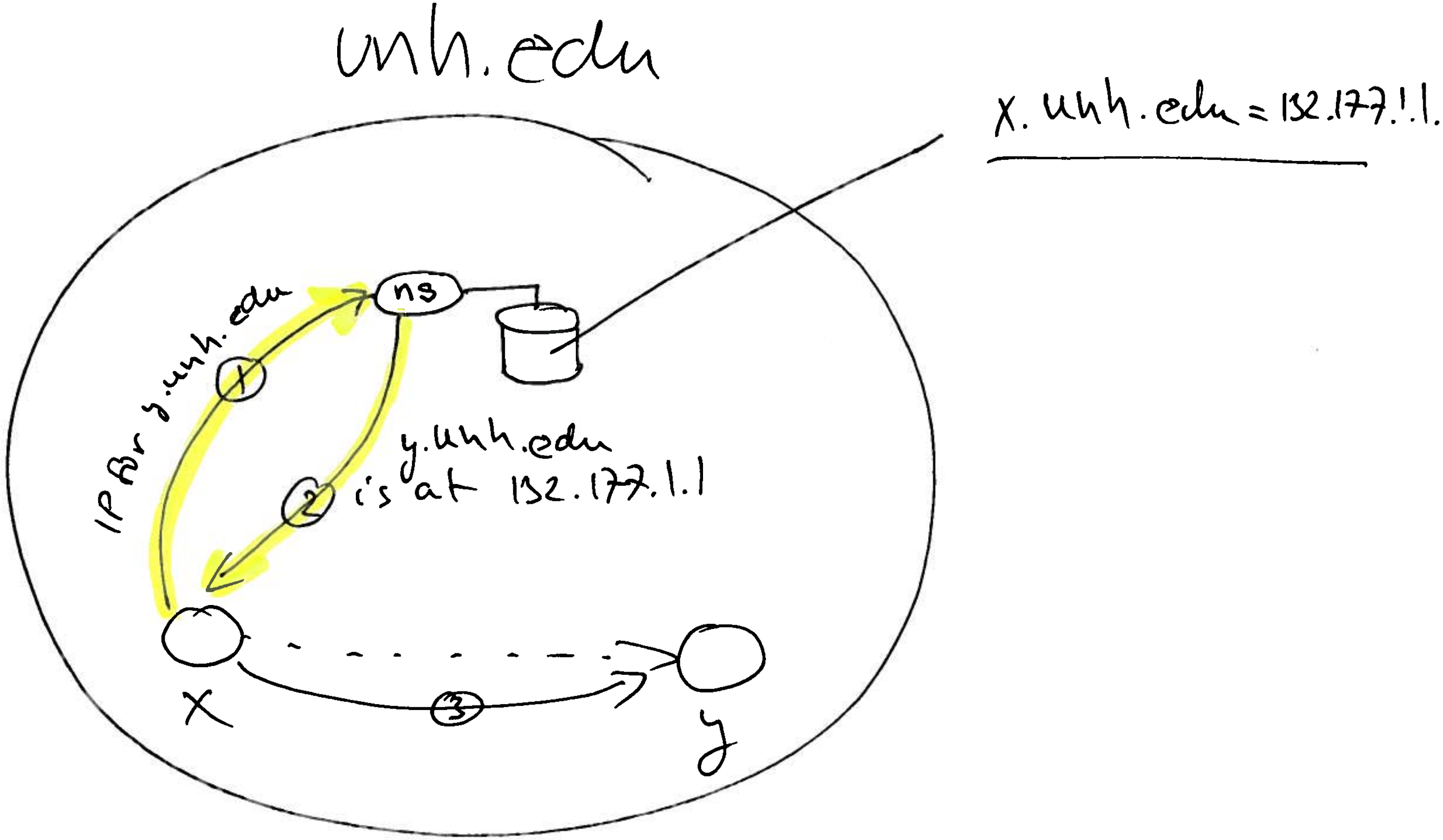
www.cs.unh.edu

Top Level Domain

Domain

Domain Name Service

- Mapping between hostnames and IP addresses:
  - one-to-one, one-to-many, many-to-one, or many-to-many?
  - mapping in both directions
- Possible solutions:
  - centralized database
  - fully distributed database


unh.edu
x. unh. edu = 132.177.1.1.
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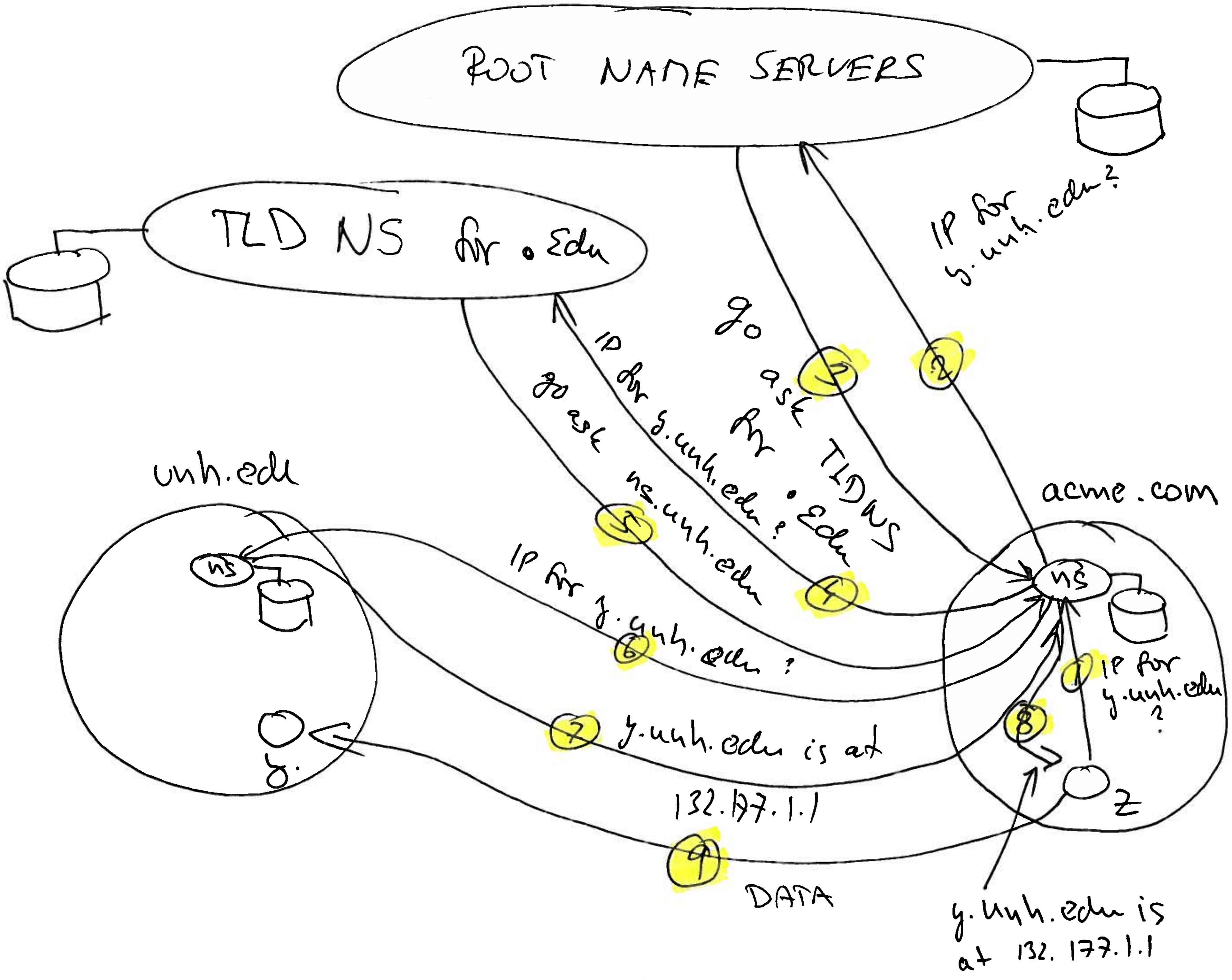
IP for y.unh.edu
1
y.unh.edu
is at 132.177.1.1
2
x
3
y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acme.com
ns
ns
y.
z
1
IP for y.unh.edu ?
2
IP for y.unh.edu ?
3
go ask TLDNS for .Edu
4
IP for y.unh.edu ?
5
go ask ns.unh.edu
6
IP for y.unh.edu ?
7
y.unh.edu is at 132.177.1.1
8
y.unh.edu is at 132.177.1.1
9
DATA