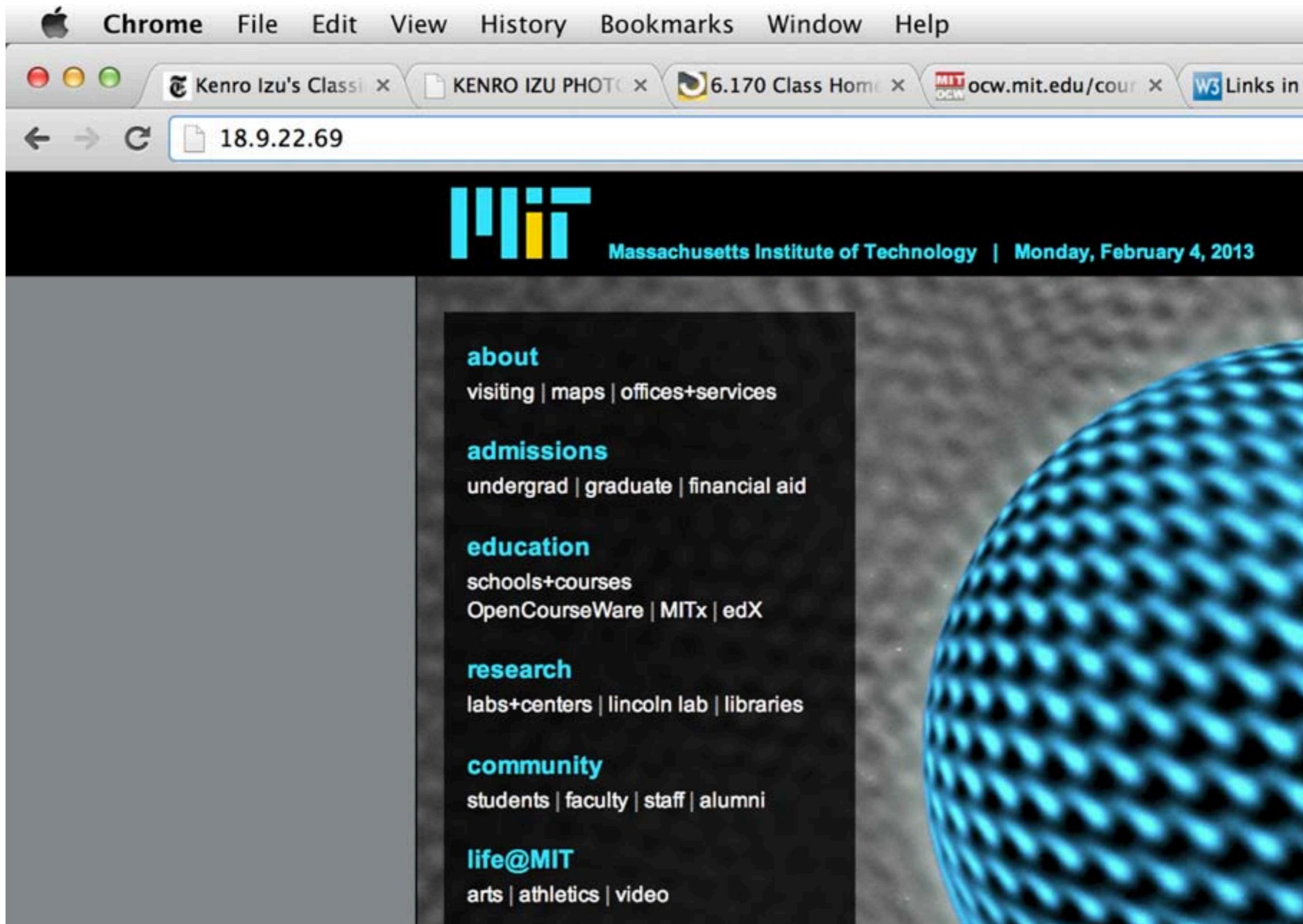# software
## studio

# the domain name system

### Daniel Jackson

# pinging machines

```
[chim:~] dnj% ping google.com
PING google.com (173.194.43.35): 56 data bytes
64 bytes from 173.194.43.35: icmp_seq=0 ttl=251 time=15.752 ms
64 bytes from 173.194.43.35: icmp_seq=1 ttl=251 time=19.017 ms
^C
--- google.com ping statistics ---
2 packets transmitted, 2 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 15.752/17.384/19.017/1.633 ms
[chim:~] dnj% ping mit.edu
PING mit.edu (18.9.22.69): 56 data bytes
64 bytes from 18.9.22.69: icmp_seq=0 ttl=252 time=19.229 ms
64 bytes from 18.9.22.69: icmp_seq=1 ttl=252 time=19.099 ms
^C
--- mit.edu ping statistics ---
2 packets transmitted, 2 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 19.099/19.164/19.229/0.065 ms
[chim:~] dnj%
```

# using IP addresses in URLs?

# why domain names?

## user friendly
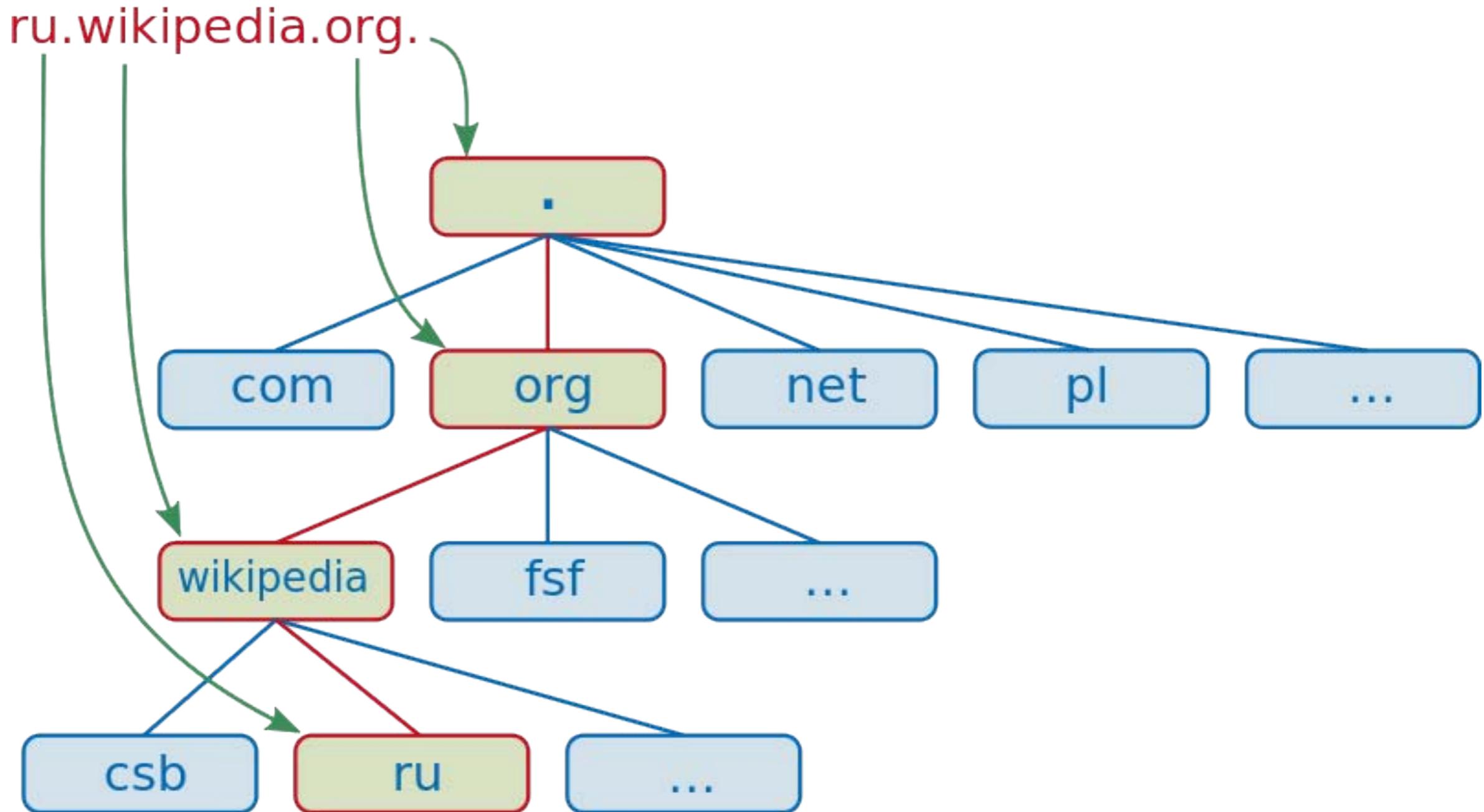› no need to remember IP address

## load balancing
› same name maps to changing IP address

## decoupling
› can move server to different network, ISP, etc
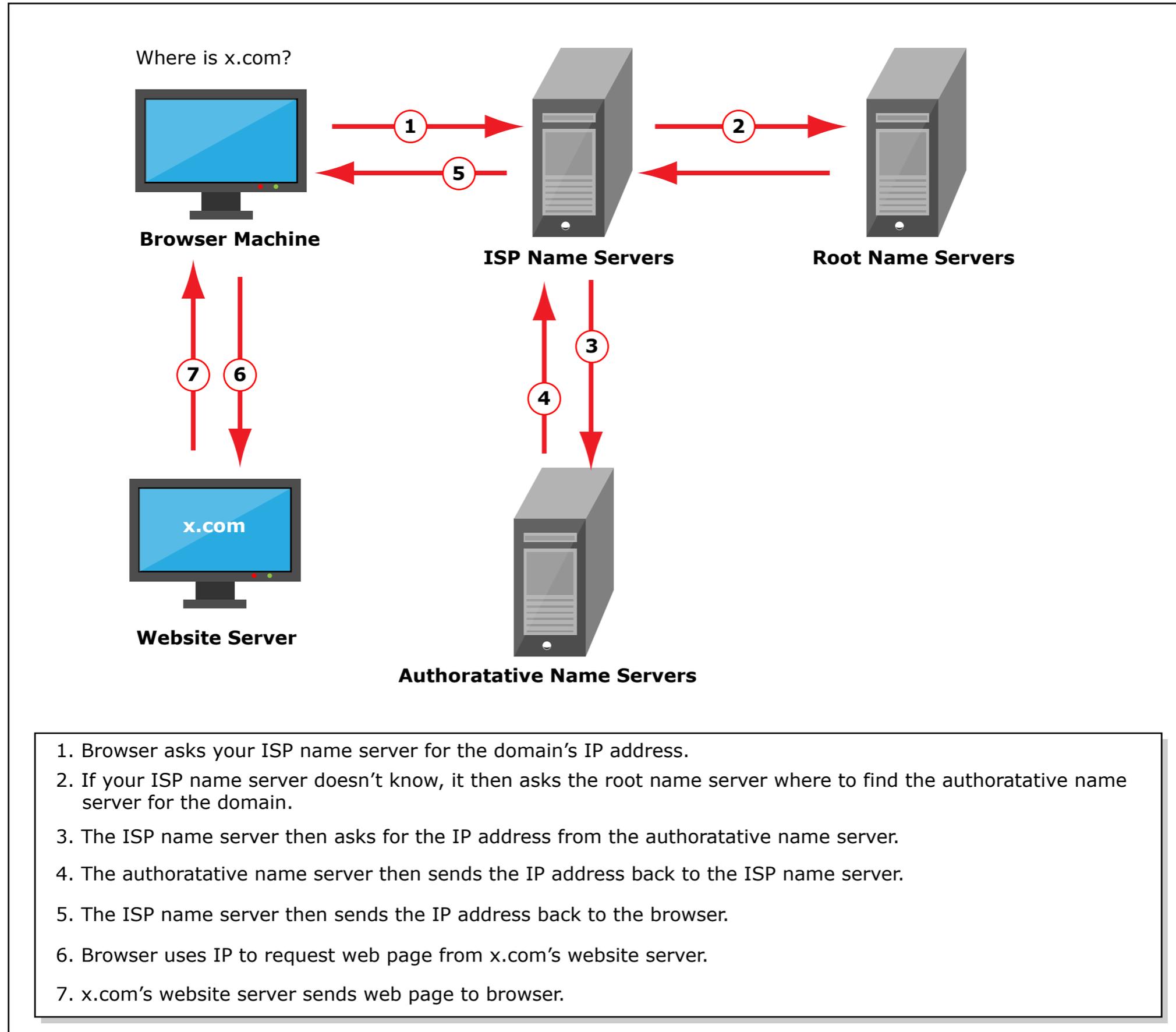
# hierarchical structure

# phone book model

Image of a page in phonebook removed due to copyright restrictions.

# central directory service model

Photograph of rows of cubicles and computers removed due to copyright restrictions.

# distributed directory service model



Where is x.com?

**Browser Machine**

**ISP Name Servers**

**Root Name Servers**

**Website Server**

x.com

**Authoratative Name Servers**

1. Browser asks your ISP name server for the domain's IP address.
2. If your ISP name server doesn't know, it then asks the root name server where to find the authoratative name server for the domain.
3. The ISP name server then asks for the IP address from the authoratative name server.
4. The authoratative name server then sends the IP address back to the ISP name server.
5. The ISP name server then sends the IP address back to the browser.
6. Browser uses IP to request web page from x.com's website server.
7. x.com's website server sends web page to browser.

# more details

**recursive and non-recursive lookups**
› recursive: server fully answers query
› non-recursive: sends back name of next server

**glue records**
› query returns name of server, so need to resolve that
› what if server is in domain being queried?
› glue record: provides IP address is this case

**about 40 record types**
› A: most common; returns IP for domain name
› CNAME: alias to another domain name

# things to know about

**caching**

› name server holds records it heard about from others

› no explicit invalidation; records expire

› so causes delay when name changes

**replication**

› 80 replicas of root name server (2008)

**registrars**

› decentralized since 1999

› registrar causes delay too

**where can I learn more?**

› 6033!

# Educause hacked (January 2013)



R.I.P Aaron Swartz
Hacked by grand wizard of Lulzsec, Sabu
G O D   B L E S S   A M E R I C A
D O W N   W I T H   A N O N Y M O U S

hacked by aush0k and tibitximer

```
Domain Name: MIT.EDU

Registrant:
    Massachusetts Institute of Technology
    Cambridge, MA 02139
    UNITED STATES

Administrative Contact:
    I got owned
    Massachusetts Institute of Technology
    MIT Room W92-167, 77 Massachusetts Avenue
    Cambridge, MA 02139-4307
    UNITED STATES
    (617) 324-1337
    cunt@mit.edu

Technical Contact:
 OWNED NETWORK OPERATIONS
    ROOT
    US
    DESTROYED, MA 02139-4307
    UNITED STATES
    (617) 253-1337
    owned@mit.edu

Name Servers:
    FRED.NS.CLOUDFLARE.COM
    KATE.NS.CLOUDFLARE.COM

Domain record activated:     23-May-1985
Domain record last updated: 22-Jan-2013
Domain expires:              31-Jul-2013
```

6.170 Software Studio

Spring 2013