CS 5523 Lecture 1: Overview of Distributed Systems

- *Course administration and web page*
- *Quick review of operating systems (uniprocessor)*
- *Definition of distributed systems*
- *Implications*
- *Examples*
- *Challenges*

Course administration and web page

- *Syllabus*
- *Course web page: http://vip.cs.utsa.edu/classes/cs5523s2003*
- *Prerequisites*
- *Textbooks (CDK, Stevens I and Stevens II, HC I and HC II)*
- *Programming requirements*
- *Topics and schedule*
- *Access list forms*

Quick review of operating systems

- *Process control*
- *Memory management*
- *Device management*

What is a distributed system?

CDK's Definition:

> *A system in which hardware and software components located on networked computers communicate and coordinate their actions only by passing messages.*

- *Why have distributed systems?*
- *How does this compare with a traditional operating system such as Unix?*
- *What implications does this definition have on implementation?*

Figure 1.1 (CDK)
A typical portion of the Internet

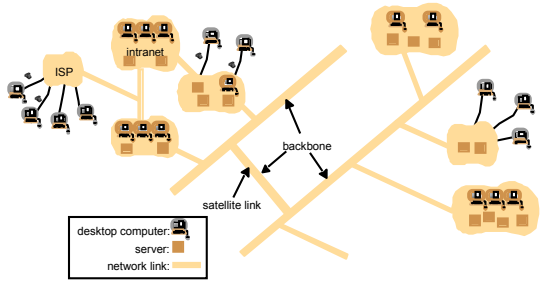


Figure 1.2 (CDK)
A typical intranet

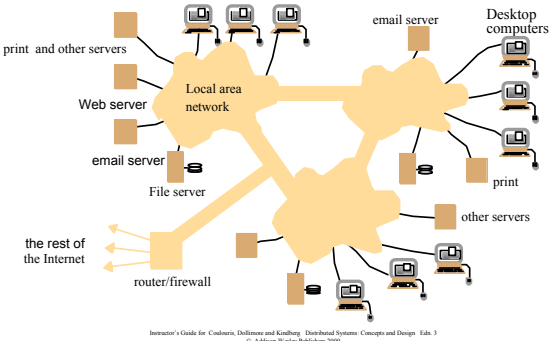
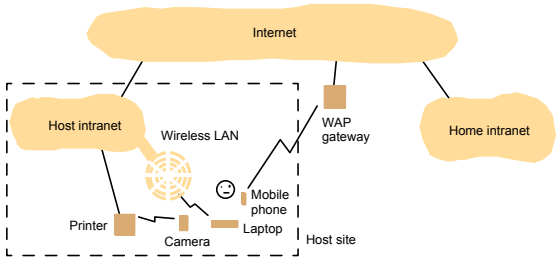


Figure 1.3 (CDK)
Portable and handheld devices in a distributed system



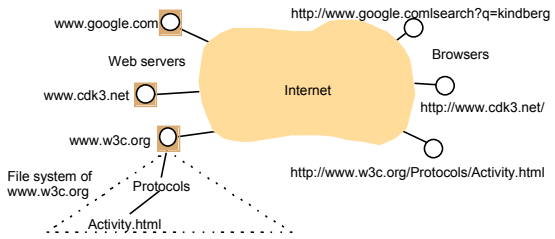
World Wide Web

- *Ultimate distributed system.*
- *Developed in 1989 in CERN Switzerland for document exchange among physicists.*
- *Documents have a hypertext structure.*
- *New resources are located by following these hypertext links.*
- *Uses a client-server model.*
- *A browser (client) on a user machine makes requests and handles the display. New document formats can be handled by plug-ins or helpers without changing the browser software.*
- *The web server only delivers documents and is not concerned with user interfaces or document format.*

Figures 1.5 and 1.6 (CDK)
Computers vs. Web servers in the Internet

Date	*Computers*	*Web servers*	*Percentage*
1979, Dec.	188	0	0
1989, July	130,000	0	0
1993, July	1,776,000	130	0.008
1995, July	6,642,000	23,500	0.4
1997, July	19,540,000	1,203,096	6
1999, July	56,218,000	6,598,697	12

Figure 1.4 (CDK)
Web servers and web browsers



World Wide Web Components

- *HTML (HyperText Markup Language) - specifies the format for for the documents delivered by the server*
- *URL (Uniform Resource Locator) - specifies a resource that is accessible via the web.*
- *HTTP (HyperText Transfer Protocol) - specifies the interaction between browsers and web servers*

HTML format for web documents:

- *Text format so can be created using Text editor or HTML tool.*
- *Uses tags to specify content:*

```
<P> A paragraph </P>
<IMG SRC="Book.gif">
<A HREF="http://www.utsa.edu">UTSA</A>
```

- *The* `<A HREF…..> X</A>` *specifies a link identified by* `X` *in the text.*

URLS:

- *Format*
  scheme: scheme-specific-location
- *Format of scheme-specific-location when scheme is HTTP:*
  http://servername[:port][/pathOnServer][/arguments]
- *Examples*
  `http://www.utsa.edu`
  `http://vip.cs.utsa.edu/classes/cs5523s2001`
  `http://www.google.com/search?q=browsers`

HTTP:

- *Assumes reliable delivery (in practice TCP sockets).*
- *Request-reply protocol:*
  Client initiates with a request (GET)
  Server responds with requested document or an error
- *Content types identify document types for browser.*
- *HTTP 1.0 - need a separate request for each resource*
- *HTTP 1.1 - requests pipelined and served by a single connection.*
- *Executables:*
  CGI (Common Gateway Interface) executes on server
  Java Applets execute on browser

Challenges for distributed systems

- *Heterogeneity*
- *Openness*
- *Security*
- *Scalability*
- *Failure handling*
- *Concurrency*
- *Transparency*

Figure 1.7 (CDK)
Transparencies

Access transparency: enables local and remote resources to be accessed using identical operations.
Location transparency: enables resources to be accessed without knowledge of their location.
Concurrency transparency: enables several processes to operate concurrently using shared resources without interference between them.
Replication transparency: enables multiple instances of resources to be used to increase reliability and performance without knowledge of the replicas by users or application programmers.
Failure transparency: enables the concealment of faults, allowing users and application programs to complete their tasks despite the failure of hardware or software components.
Mobility transparency: allows the movement of resources and clients within a system without affecting the operation of users or programs.
Performance transparency: allows the system to be reconfigured to improve performance as loads vary.
Scaling transparency: allows the system and applications to expand in scale without change to the system structure or the application algorithms.

For next time:

- *Read CDK Chapter 1*
- *Look at Exercises 1.6, 1.7, 1.9, 1.12*
- *BE prepared to discuss assigned questions from Chapter 1*
- *Start reading CDK Chapter 2*
- *Look over Laboratory 1*