Announcements

- Read Messerschmitt Ch 7 for Thursday.
- Folio 2 due Thursday (if you are doing a folio!)
- Database assignment to be issued Thursday
  - Tutorial sessions
  - 2 Nov 2010 Time: 9:00-10:30AM, Soc Sci Room 135
  - 5 Nov 2010 Time: 4:00-5:30PM, BE 109
  - 9 Nov 2010 Time: 9:00-10:30am, social science 135
  - 12 Nov 2010 Time: 4:00-5:30PM, BE 109
Student Talks
Sun Case
(continued)
Sun N-tier case

- What does Sun make?
  - Workstations
  - Servers
  - Software
How Successful had Sun been up to 1998?

- Founded in 1982
- Open Standards Workstation
  - Unix Operating System (Solaris)
  - TCP/IP networking
- 1988 - Revenues $1 billion
- 1993 - Market value $3.0 billion
- 1997 - Jumped from 3rd to 1st in Unix Server Market.
How Successful had Sun been up to 1998?

- 1993 - “The network is the computer.”
- 1994 - Internet explodes in popularity
Microsoft mid to late 90s

- Dominated Desktop software
  - Users familiar with Windows, Office, etc.

- NT servers
  - Fine for small intranets, “not industrial strength”
Sun N-Tier Case

- What is Java?
  - Programming Language
  - Portable between computers with different operating systems
  - Easy to write programs in
  - Easier re-use
  - But, programs are slow
What problems did the micro era produce?

- Desktops are expensive to maintain
  - TCO for windows PC $9900!

- Every PC had a lot of software that had to be maintained
  - Office, Windows, etc...

- Small differences, like the order in which software is installed, could make different PCs behave differently!
Sun’s Vision

- Thin Client model.
- Application Servers with Applications written in Java.
- NCs could retrieve applications from application server as needed.
- Applications compatible with any NC hardware and OS.
- Applications could be fixed, added, updated at the server level, rather than maintaining each PC.
Microsoft Vision

- Keep “fat-client” model
- Add some features to Windows to reduce administration costs
Exhibit 1  Three-tier Architecture

Tier One

Client Applets  Client Hardware

Tier Two

Applets  App Server

Tier Three

Database

United States

JDBC

Applets  App Server

Asia

Client Applets  Client Hardware

Europe

HTTP  RMI

These had to be managed locally. If code needed to be updated, each app server had to be shut down, updated and rebooted.

JDBC: Stands for Java Database Connectivity. It is a programming interface that lets Java applications access a database via the SQL language. RMI: Stands for Remote Method Invocation. It is the method by which a remote Java object from one location can be invoked from other Java virtual machines. HTTP: Stands for HyperText Transport Protocol. It is the communications protocol used to connect to servers on the World Wide Web.
Sun N-tier

Asia

Tier Four

Tier Three

High latency servlet talks back & forth

App Server

Tier Two

Webtop Server

1st time Servlet sent

1st time, applet sent

Tier One

Client

Client

United States

Database

App server talks to central database

If bug found, change code here. Next time, correct applet is sent down

Webtop Server

1st time Servlet sent

Tier Three

Client

Europe

Webtop Server

Client

Client

Client
**Sun N-Tier**

**Step 1:** The user logs into his client and calls down an application. This message is sent to the Application Server.

**Step 2:** An initial applet is sent to the client. At the same time a servlet is sent to the Webtop Server.

**Step 3:** The applet talks back and forth with the Webtop Server via the LAN.

**Step 4:** As new data is received (i.e., a new customer's name) the App Server communicates with the database to update that information.

**Local:** The Webtop Server and client communicate via a LAN.

**Remote:** The database and App Server communicate with the Webtop Server via a WAN.

**Exhibit 3 How the N-tier Architecture Works**
Sun's Performance

Net Revenue

Net income
Today

- 3-tier model common.
- Sun’s version of 4-tier model not-common.
- N-tier model where Webserver and Application Server on separate equipment also common.
- Sun’s hardware business not strong.
  - Linux on cheap PCs most common servers
  - Microsoft desktops replacing Sun workstations
Today

- **Java**
  - Common in Server implementations
    - Example: Java Servlet implementing application logic in a banking application.
  - Often used to push simple applets onto client
  - Not common
    - For “big” desktop applications
    - Office Suite in Java not popular
  - Microsoft is still in business...
What could have Sun done?

- Compete on price with cheap PC servers running Linux?
- Sell a fat-client workstation that runs Windows and is price competitive with Dell, HP PCs, etc...
- Sell workstations at a price premium over PCs, focus on software reliability, run some Microsoft application, build brand cachet.
- Focus on Java based software and IT services for enterprises, withdraw from low-end hardware...
- Something else?