TIM 50 - Business Information Systems

Lecture 10

Instructor: Terry Allen
UC Santa Cruz
10/28/2011

Outline

- Announcements
- Review Alibris Case Study
- Information Technology
- Student Presentations
- Client-Server Architecture
- The SUN N-Tier Architecture
Announcements

- Assignment 3 will be posted next week

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Review - Alibris

- A start-up to sell used books on the Internet.
- Interloc, Alibris' predecessor, functioned like a classified ads page for book dealers
- **Alibris changing Interloc’s model**
  - Actually sell the books
  - Charge a fee per sale (instead of per listing)
  - Intermediary strategy
    - Buy books from dealers
    - Ship to warehouse
    - Re-pack, consolidate order, ship to customer
Architecture

What is Architecture?

How do you architect a solution?
A system is decomposed into interacting subsystems

Each subsystem may have a similar internal decomposition

**System Architecture**

- **System**: A composition of subsystems that cooperate to accomplish some purpose

- **Sub-system**: An element within the system that performs some well-defined action on behalf of that system
Three properties of architecture

Decomposition
Organization
Functionality
Responsibility
Interaction
Cooperation

Time sharing

ASCII terminal (no graphics)

Mainframe (database and application server)

Point-to-point wire (no network)

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Two-tier client/server

Email application

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**Chat application**

Chat clients send user’s typing to server
Chat server aggregates typing from all users and sends to all clients
Other user’s clients display aggregated typing from chat server

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**System integration**

**Architecture**

- -> subsystem implementation
- -> system integration

Bring together subsystems and make them cooperate properly to achieve desired system functionality
- Always requires testing
- May require modifications to architecture and/or subsystem implementation
Why system decomposition in subsystems?

- Divide and conquer approach to reduce complexity
- Reuse components
- In accordance with industry structure
- Others?

Networked computing infrastructure
**Infrastructure Layering**

- Infrastructure decomposed into layers
- Each layer
  - depends on the layer below
  - provides services to the layer above
  - Only interacts with layers immediately above or below

- E.g software is “riding on top of” equipment
  - Software itself is also layered

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**Simplified infrastructure layering**

<table>
<thead>
<tr>
<th>Application</th>
<th>Middleware</th>
<th>Operating system</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributed object management</td>
<td>Database management</td>
<td>File system</td>
<td>Storage peripherals</td>
</tr>
<tr>
<td>Network software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network equipment</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Communications</td>
<td></td>
<td></td>
<td>Storage</td>
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**Simplified infrastructure layering**

- **Application**
  - Distributed object management
  - Network software
  - Network equipment
- **Middleware**
  - Database management
  - File system
  - Storage peripherals
- **Operating system**
  - Communications
  - Storage
- **Equipment**

**Operating system functions**

- Graphical user interface (client only)
- Hide details of equipment from the application
- Multitasking
- Resource management
  - Processing, memory, storage, etc
  - etc
File system (OS)

- Hides details of storage equipment from applications
- Enables services such as creating/accessing files
- A File is:
  - Collection of data managed for the benefit of the application
    - E.g. word document, excel spreadsheet
    - Size known, but unspecified structure and interpretation
  - Name
  - Location in naming hierarchy

Network equipment
Messages and packets

Simplest network communication service is the message
- Smallest unit of communicated data meaningful to application
- Size, but unknown structure and interpretation
- Analogous to file in storage

Internally, the network may fragment a message into packets, and reassemble those packets back into a message

Example

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Simplified infrastructure layering

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Middleware Functions

- **Capabilities that can be shared by many applications, but that is not part of OS**
  - Example: Database Management System (DBMS)

- **Hide details of OS from application**
  - Java Virtual Machine

- **More purposes we’ll talk about later.**
Communication middleware

- Location independence
  - makes distributed application look similar to centralized

- Many possible other functions

Storage middleware

- Database
  - File with specified structure
  - Example: relational table
  - Oriented toward business applications

- Database management system (DBMS)
  - Manage multiple databases
  - Basis of online transaction processing (OLTP)
A Database

<table>
<thead>
<tr>
<th>Year</th>
<th>City</th>
<th>Accommodation</th>
<th>Tourists</th>
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<tbody>
<tr>
<td>2002</td>
<td>Oakley</td>
<td>Bed&amp;Breakfast</td>
<td>14</td>
</tr>
<tr>
<td>2002</td>
<td>Oakley</td>
<td>Resort</td>
<td>190</td>
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<td>2002</td>
<td>Oakland</td>
<td>Bed&amp;Breakfast</td>
<td>340</td>
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<tr>
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<td>Oakland</td>
<td>Resort</td>
<td>230</td>
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<tr>
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<td>Berkeley</td>
<td>Camping</td>
<td>120000</td>
</tr>
<tr>
<td>2002</td>
<td>Berkeley</td>
<td>Bed&amp;Breakfast</td>
<td>3450</td>
</tr>
<tr>
<td>2002</td>
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<td>Resort</td>
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<tr>
<td>2002</td>
<td>Albany</td>
<td>Camping</td>
<td>8790</td>
</tr>
<tr>
<td>2002</td>
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<td>3240</td>
</tr>
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<td>2003</td>
<td>Oakley</td>
<td>Bed&amp;Breakfast</td>
<td>55</td>
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<tr>
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<td>Resort</td>
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<td>Bed&amp;Breakfast</td>
<td>280</td>
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<tr>
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<td>Bed&amp;Breakfast</td>
<td>4560</td>
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<tr>
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<td>Camping</td>
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<tr>
<td>2003</td>
<td>Albany</td>
<td>Bed&amp;Breakfast</td>
<td>6750</td>
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</tbody>
</table>

• The DBMS enables updating and searching the database

• QUERIES
  • E.g. "How many B&B are there in Berkeley?"
  • E.g. “What accommodation did most tourists visiting Oakley preferred?”

Some DBMS functions

- Logical structure separated from physical structure
- Platform independence
- Implement standard queries
- Access from multiple users/applications
- Manage data as asset separate from applications
The Internet

Intranet

*Private* internet

Often connected to Internet

- Firewall creates a protected enclave

Global Internet
An Extranet is composed of

- Intranets connected through an unprotected domain (typically the Internet)
  - Encryption and other security technologies used to
    - protect proprietary information
    - prevent imposters, vandals, etc

Communication between intranets encrypted.
What is the Internet?

- An internet is a “network of networks”
  - Interconnect standard for LAN’s, MAN’s, and WAN’s
- Internet = the major global internet
- A private internet is called an intranet
- An extranet is an interconnection of intranets through the Internet
Extranet

Consumers, field workers, etc.

Internet

Intranet

Lock icon indicates this is an extranet
Certificate is the server’s credential

Questions

What business purposes do nomadic workers serve?
Mobile?
What advantage does direct Internet access have over long distance telephony?
Ideas and examples
(Chapters 4-5)

by
David G. Messerschmitt

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Example

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Peer to peer

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Three-tier client/server

Presentation

Note: many clients per application server, several application servers per data server

Host architecture

Client

Web browser

HTTP

Web server

Application logic

Databases and DBMS

Application partition

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B2C Examples

- Amazon.com
- Travelocity
- Fry's Electronics
- Apple
- Barnes & Noble Booksellers
- Zappos.com
- Nordstrom
- buy.com

Consumer e-commerce (B2C)

- What are the advantages and disadvantages compared to a retail store or direct mail catalog?
Some Advantages

- **For the Consumer**
  - Check prices at many vendors with minimal effort
  - Anonymity
  - Mass customization
  - Order tracking
  - Recommendations

- **For the Business**
  - Global reach
  - Automate order taking (cost savings)
  - Price Discrimination

Sun Case
Java Applets

- Key feature of Java

- **Applets**: chunks of Java code
  - Initially enabled animations on web pages
  - Later used to facilitate e-commerce applications, in cellular phones, etc.

- Applets are downloaded through the browser
  - Only what and when was needed
  - No need to keep a copy on client!

- Servlets: Applets that run on Webtop servers

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Sun N-Tier

![Diagram of Sun N-Tier Architecture](image)

- **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.

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*Exhibit 3*: How the N-tier Architecture Works
What would you do...

- If you were in the executive board of Microsoft?