Class announcements

- Assignment 3 due Thursday
- Reading for next class
  - Messerschmitt Ch 5, Sun Case
  - Suggestion: Read Messerschmitt Ch 5 first.
- Student Presentations Tuesday.
  - Shannun Burt (Sun-N Tier Case)
  - Robert Gutowsky (news)

Class announcements

- Midterm May 9
  - Next week!
  - Study:
    - Terms
    - ReR calculations
    - Case Studies
  - Study guide on website tonight.

Student Presentations

- Ashley Atkins (news)
- Elise Norte (Alibris Case)

Recall, 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

Alibris

- If Interloc is so successful, why change it?
- What will change as Interloc becomes Alibris?
Alibris

- Why did Manley feel they needed the Sparks facility?
- How does the Sparks facility keep them from becoming disintermediated?

Alibris

- Should Alibris actually buy books and fill up the Sparks facility?

Alibris

- What problems is Alibris having with its e-commerce capabilities?
- Why is Alibris having so much trouble setting up simple e-commerce capabilities?
- Is this really that hard??
- Is it rare for a new-software product from an established, reputable vendor not to work properly?

Alibris

- Should Alibris stick with Oracle? Or switch back to Thunderstone?

Alibris

- Should Manley take the "white knight's" offer and fire the whole IT staff??!

Alibris

- Rejects "white knight" offer
- Manley secures another bridge loan
- Goes Live 1998
- Thunderstone's software works ok
- 1 million books at Sparks warehouse by 2000
  - Originally all on consignment from dealers
  - Later, purchases books
- 2002 - Revenue $31 million, loss $7.2 million
- 2003 - Revenue $45.5 million, loss $4.8 million
- March 2004 files for "auction based" IPO
  - May 2004, withdraws IPO after price too low
  - Still Relying on Private Financing
Inter-Enterprise E-Commerce (B2B)

- **Procurement**
  - One enterprise purchases goods or services from another
- **Direct Procurement**
  - Ongoing, consistent, and scheduled procurement
- The relationship between firms involved in direct procurement often called a **Supply Chain**
- The set of problems associated with managing a supply chain is called **Supply Chain Management (SCM)**

### SCM

- Need to manage the procurement of parts
  - Don't run out of any one
  - Don't order too many
  - Order far enough in advance
- Ideally
  - Know in advance
    - # cars
    - features
- **Ideally**

Networked Computing in direct Procurement

- History predates Internet
- **Electronic Data Interchange (EDI)**
  - Exchange order information between firms involved in direct procurement
  - Usually large firms who could afford proprietary communication links
  - Initially order and invoice
  - Existed since 70's
- **Financial EDI (FEDI)** later added EFT payment capability

Networked Computing in direct Procurement

- XML (Extensible Markup Language) is another data interchange format making an impact on inter-enterprise commerce
- We will talk more about this later in the quarter.
Indirect Procurement

- Sporadic purchase of goods and services to support organizational objectives
  - Example: Office Furniture

Data and information

by

David G. Messerschmitt

Key concept

The key commodity manipulated by information technology is information
To be manipulated in a computing/networking environment, information must be represented by data

What is information?

Data

A bit is "0" or "1" — the atom of the information economy
Data is a collection of bits, like
- "010110111010110"
- "0000011"
- "111011011010101011101101010"
Note: the terms data and information are not always used consistently!

Information

From a user (human) perspective...
...recognizable patterns that influence you in some way
(perspective, understanding, behavior...)
In the computing infrastructure, information has a somewhat different connotation as structure and interpretation added to data
Representation

- Take the place of the original
- Equivalent to, in the sense that the original can be reconstructed from its representation
- Often the original can only be approximately reconstructed, although it may be indistinguishable to the user (e.g., audio or video)

ASCII

<table>
<thead>
<tr>
<th>Characters</th>
<th>Hex</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;7&gt;</td>
<td>x37</td>
<td>00110111</td>
</tr>
<tr>
<td>&lt;8&gt;</td>
<td>x38</td>
<td>00111000</td>
</tr>
<tr>
<td>&lt;9&gt;</td>
<td>x39</td>
<td>00111001</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>x3A</td>
<td>00111010</td>
</tr>
<tr>
<td>;&gt;</td>
<td>x3B</td>
<td>00111011</td>
</tr>
<tr>
<td>&lt;&lt;&gt;</td>
<td>x3C</td>
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<td>&lt;=&gt;</td>
<td>x3D</td>
<td>00111101</td>
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<td>&lt;/&gt;&gt;</td>
<td>x3E</td>
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<td>&lt;At&gt;</td>
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</tr>
<tr>
<td>&lt;D&gt;</td>
<td>x44</td>
<td>01000100</td>
</tr>
</tbody>
</table>

Note that this representation is not unique…

…this one happens to be a standard (ANSI X3.419-1983)

A picture

This picture conveys information

This information is represented in this computer, but how?

Representation of picture: image

Expanding a small portion of the picture, we see that it is represented by square pixels…

…300 tall by 200 wide…

…with a range of 256 intensities per pixel

An approximation: 300 • 200 • 8 bits = 480,000 bits (but it can be compressed)

Color picture

A color picture can be represented by three monochrome images…

At the expense of three times as many bits

Terminology

Communication data to another user or organization
Representation needs to be standardized

If the representation is not standardized, the information is garbled!

Communicate data to another user or organization

Regeneration

- Make a precise copy of the data (copy bit by bit)
- If you know the representation, this is equivalent to making a precise copy of the information
- Each such precise copy is called a generation
- Process is called regeneration

Replication of information

- Anything that can be regenerated can be replicated any number of times
- This is a blessing and a curse

Analog information cannot be regenerated

We will never know exactly what the original of this Rembrandt looked like

Discrete information can be regenerated

Regeneration can preserve data (but not its original physical form)

Regeneration is possible for information represented digitally (which is tolerant of physical deterioration)

0 + noise ≈ 0
1 + noise ≈ 1

Replication of information requires knowledge of representation

Replication preserves the integrity of the data, but that is not sufficient

Every .xxx DOS file is a representation
Implications

Digitally represented information can be preserved over time or distance in its precise original form by occasional regeneration
- digital library
- digital telephony
Replication of data is easy and cheap

Implications (con't)

- Replication of information requires knowledge of the structure and interpretation
  - Standardization or some other means
- Extreme supply economies of scale
- You can give away or sell and still retain
- Unauthorized replication or piracy relatively easy

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Architecture

by
David G. Messerschmitt

What is Architecture?

How do you architect a solution?
Three elements of architecture

- Decomposition
- Functionality
- Interaction
- Organization
- Responsibility
- Cooperation

System examples

Let's quickly look at some system decomposition examples

- Quick tour of information technology systems

Time sharing

- ASCII terminal
  - (no graphics)
- Point-to-point wire
  - (no network)
- Mainframe
  - (database and application server)

Two-tier client/server

- Local-area network

Three-tier client/server

- Application server
- Enterprise data server

Inter-organizational computing

- Global internet
Consumer access

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

Emergence

Subsystems are more specialized and simpler functionality
Higher-level system functionality arises from the interaction of subsystems
Emergence includes capabilities that arise purely from that interaction (desired or not)
- e.g. airplane flies, but subsystems can't

Why system decomposition?

- Divide and conquer approach to containing complexity
- Reuse
- Consonant with industry structure (unless system is to be supplied by one company)
- Others?

Networked computing infrastructure

by
David G. Messerschmitt
Layering

- Elaboration or specialization
- Existing layers
- Layering builds capability incrementally by adding to what exists

Simplified infrastructure layering

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

File system

- Hides details of storage equipment from applications

File is:
- Unit of data managed for the benefit of the application
  - Size known, but unspecified structure and interpretation
- Name
- Location in naming hierarchy

Operating system functions

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

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

<table>
<thead>
<tr>
<th>Application</th>
<th>Web server</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>File system</td>
<td>Web browser</td>
</tr>
<tr>
<td>Network</td>
<td>Fragmentation</td>
<td>Collection of packets</td>
</tr>
</tbody>
</table>

Communication middleware

New application-specific communication services
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)

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

<table>
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<tr>
<th>Year</th>
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<th>Tourists</th>
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</tr>
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</table>
The Internet

by
David G. Messerschmitt

What is the Internet

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

Intranet

Private internet
May be connected to Internet
- Firewall creates a protected enclave

Extranet

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

Chat application

Email application

Three-tier client/server

Host architecture

Departments

Application partition

Presentation

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

Shared data

Local-area network

Application logic

Networked Applications

By David G. Messerschmitt

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Email client sends message to server

Later, recipient’s email client retrieves message from server

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