Class announcements
- Assignment 3 due Tuesday
- Reading for next class
  - Messerschmitt Ch 5, Sun Case
  - Suggestion: Read Messerschmitt Ch5 first.
- Student Presentations Tuesday.
  - Stanley Chow (Sun-N Tier Case)
  - Derek Scranton (news)

Student Presentations
- Jordan Lee (News)
- Elisabeth Dakhil (News)

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?

- 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?

- 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

E-commerce, continued...
E-Commerce

- Major Categories
  - Consumer (B2C)
  - Inter-consumer (C2C)
  - Inter-enterprise (B2B)

Consumer e-commerce (B2C)

- What have you bought on the Internet, or what do you buy most often?
- 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
  - Price many options
  - Anonymity
  - Order tracking
- For the Business
  - Global reach
  - Automate order taking (cost savings)
  - Price Discrimination

Inter-Consumer (E-commerce)

- Prime Example
  - E-Bay
- Other examples?
- What value does something like E-bay add over a simple classifieds listing like craigslist?

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

Diagram:

- Tire Manufacturer
- Car Plant
- Steel Mfg.
- Coal Mine
- Iron Ore Mine
- Window Mfg.
SCM

- Thousands of orders per day, each with different requirements!
- Adjusting orders from suppliers constantly according to demand
- Minimal inventories
  - Cut costs
  - Much more sensitive to errors or disruptions
- mass customization requires sophisticated SCM

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

Copyright notice

©Copyright David G. Messerschmitt, 2000. This material may be used, copied, and distributed freely for educational purposes as long as this copyright notice remains attached. It cannot be used for any commercial purpose without the written permission of the author.
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:
- "0101101010101010"  
- "00000111"  
- "11111111111111111111111111110001"  
Note: the terms data and information are not always used consistently!

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>Alphabet</th>
<th>Hex</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;7&gt;</td>
<td>07</td>
<td>00110111</td>
</tr>
<tr>
<td>&lt;8&gt;</td>
<td>08</td>
<td>00111000</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>09</td>
<td>00111001</td>
</tr>
<tr>
<td>&lt;=</td>
<td>0A</td>
<td>00111010</td>
</tr>
<tr>
<td>&lt;-&gt;</td>
<td>0B</td>
<td>00111011</td>
</tr>
<tr>
<td>=&gt;</td>
<td>0C</td>
<td>00111100</td>
</tr>
<tr>
<td>&gt;=</td>
<td>0D</td>
<td>00111101</td>
</tr>
<tr>
<td>&lt;/&gt;</td>
<td>0E</td>
<td>00111110</td>
</tr>
<tr>
<td>&lt;*&gt;</td>
<td>0F</td>
<td>00111111</td>
</tr>
<tr>
<td>&lt;At&gt;</td>
<td>10</td>
<td>01000000</td>
</tr>
<tr>
<td>&lt;A&gt;</td>
<td>11</td>
<td>01000001</td>
</tr>
<tr>
<td>&lt;B&gt;</td>
<td>12</td>
<td>01000010</td>
</tr>
<tr>
<td>&lt;C&gt;</td>
<td>13</td>
<td>01000011</td>
</tr>
<tr>
<td>&lt;D&gt;</td>
<td>14</td>
<td>01000100</td>
</tr>
</tbody>
</table>

Note that this representation is not unique… …this one happens to be a standard (ANSI X3.110-1983)

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 • 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

Representation needs to be standardized

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

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

Discrete information can be regenerated

Replication of information requires knowledge of representation

Implications

Implications (cont'

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.

Three elements of architecture:
- Decomposition
- Organization
- Functionality
- Responsibility
- Interaction

System examples:
Let's quickly look at some system decomposition examples:
- Quick tour of information technology systems

Time sharing:
- Point-to-point wire (no network)
- ASCII terminal (no graphics)
- Mainframe (database and application server)
### Two-tier client/server

- Local-area network
- Server
- Mainframe

### Three-tier client/server

- Client
- 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

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**

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

**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**

---

**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

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

Extranet

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

©Copyright David G. Messerschmitt, 2000. This material may be used, copied, and distributed freely for educational purposes as long as this copyright notice remains attached. It cannot be used for any commercial purpose without the written permission of the author.

Example

Web server
Screen
Web browser
HTML

Application
Operating system
Network
Operating system
File system
Network
Network

File system
Message
Collection of packets
Assembly
Fragmentation

Client
Server
Peer

Client
Server
Peer

Email application

Chat application

Three-tier client/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

Local-area network
Application
logic
Presentation
Note: many clients per application server, several application servers per data server
Shared data