Class Announcements

- Database Assignment 1 Due TODAY, 10/20
- Business Paper/Project: Due Tue, 10/27
- (regular) Assignment 3: Due Th, 10/29
- Midterm: 10/22

E-commerce and the Internet

Figure 9-2

The Benefits of Disintermediation to the Consumer

- Digital goods
  - Goods that can be delivered over a digital network
  - E.g., music tracks, video, software, newspapers, books
  - Cost of producing first unit almost entire cost of product: marginal cost of producing 2nd unit is about zero
  - Costs of delivery over the Internet very low
  - Marketing costs remain the same; pricing highly variable
  - Industries with digital goods are undergoing revolutionary changes (publishers, record labels, etc.)

Types of E-commerce

- Business-to-consumer (B2C)
- Business-to-business (B2B)
- Consumer-to-consumer (C2C)
- Mobile commerce (m-commerce)

E-commerce Business Models

- Portal
- E-tailer
- Content provider
- Transaction broker
- Market creator
- Service provider
- Community provider
E-commerce Revenue Models

• Advertising
• Sales
• Subscription
• Free/Freemium
• Transaction fee
• Affiliate

Web 2.0, Social Networking, and the Wisdom of Crowds

• Most popular Web 2.0 service: social networking
  • Social networking sites sell banner ads, user preference information, and music, videos and e-books.
  • Social shopping sites
    • Swap shopping ideas with friends (Kaboodle, ThisNext)
  • Wisdom of crowds
    • Large numbers of people can make better decisions about topics and products than a single person.
    • Prediction markets: peer-to-peer betting markets on specific outcomes (elections, sales figures, designs for new products)

E-commerce Marketing

• Internet provides marketers with new ways of identifying and communicating with customers.
• Long tail marketing:
  • Sell large number of unique items
  • Relatively few of each item sold
• Behavioral targeting: tracking online behavior of individuals on thousands of Web sites.
• Advertising formats include search engine marketing, display ads, rich media, and e-mail.

How an Advertising Network Works

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 who afford proprietary communication links
- Initially order and invoice
- Existed since 70’s

Business-to-Business Electronic Commerce: New Efficiencies and Relationships

- Electronic data interchange (EDI)
  • Major industries have EDI standards that define structure and information fields of electronic documents for that industry.
  • More companies increasingly moving away from private networks to Internet for linking to other firms.
In Class Exercise (Next week)

- Use a laptop or phone and log in to Alibaba.com
- Pretend you are a small business in the US needing cheap products. Do a search, and say what your “story” is.
  - E.g. “We pretend to be a retailer aiming to sell American flags at marked up prices. We’ll search for American flags.”
  - E.g. “We pretend to be a contractor looking for cheap supplies. We’ll search for “toilet.”
  - E.g. “We pretend to be a beach shop selling tourist goods. We’ll search for “sunglasses.”
- How do the prices you get compare to retail prices? Are there minimum quantities to make an order?
- Are the first listings from “gold” suppliers?
- Do these suppliers seem to be large companies or small to medium sized?

Data and information

by

David G. Messerschmitt

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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”
- “1110110101101011011011010110110101”
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>Character</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>
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<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>
<td>00111100</td>
</tr>
<tr>
<td>&lt;=&gt;</td>
<td>x3D</td>
<td>00111101</td>
</tr>
<tr>
<td>&lt;/&gt;&gt;</td>
<td>x3E</td>
<td>00111110</td>
</tr>
<tr>
<td>?&gt;</td>
<td>x3F</td>
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<tr>
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</tr>
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<td>x43</td>
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<td>&lt;I&gt;</td>
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<td>01001001</td>
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<td>&lt;J&gt;</td>
<td>x4A</td>
<td>01001010</td>
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<td>x4B</td>
<td>01001011</td>
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<tr>
<td>&lt;L&gt;</td>
<td>x4C</td>
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<td>&lt;M&gt;</td>
<td>x4D</td>
<td>01001101</td>
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<tr>
<td>&lt;N&gt;</td>
<td>x4E</td>
<td>01001110</td>
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<tr>
<td>&lt;O&gt;</td>
<td>x4F</td>
<td>01001111</td>
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<td>&lt;P&gt;</td>
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<td>x56</td>
<td>01010110</td>
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<td>x57</td>
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<td>x58</td>
<td>01011000</td>
</tr>
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<td>&lt;Y&gt;</td>
<td>x59</td>
<td>01011001</td>
</tr>
<tr>
<td>&lt;Z&gt;</td>
<td>x5A</td>
<td>01011010</td>
</tr>
<tr>
<td>&lt;[&gt;</td>
<td>x5B</td>
<td>01011011</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>x5C</td>
<td>01011100</td>
</tr>
<tr>
<td>&lt;^&gt;</td>
<td>x5D</td>
<td>01011101</td>
</tr>
<tr>
<td>&lt;!&gt;</td>
<td>x5E</td>
<td>01011110</td>
</tr>
<tr>
<td>&lt;_&gt;</td>
<td>x5F</td>
<td>01011111</td>
</tr>
</tbody>
</table>

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

Structure

Interpretation

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

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

Data

Communication to another user or organization

Data processing

Information

Representation

Data

Communication to another user or organization

Data processing

Information
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

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

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

Analog information can be copied, but not regenerated

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

Discrete information can be regenerated

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

\[\begin{align*}
0 + \text{noise} & \rightarrow 0 \\
1 + \text{noise} & \rightarrow 1
\end{align*}\]

Replication of information requires knowledge of representation

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

Replication of information also presumes knowledge of its representation

Replication of information is a representation

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?

A system is decomposed into interacting subsystems

Each subsystem may have a similar internal decomposition
Three elements of architecture

- Decomposition
- Organization
- Functionality
- Responsibility
- Interaction
- 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

- Server/Mainframe
- Local-area network
- Application server

Three-tier client/server

- Client
- Enterprise data server
- Application server

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

Example of Layering: networking

Software Layering
Operating system functions

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

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.

What’s a database?

Database

- File with specified structure
- Example: relational table

A Database

<table>
<thead>
<tr>
<th>Year</th>
<th>City</th>
<th>Accommodation</th>
<th>Tourists</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Oakland</td>
<td>Bed &amp; Breakfast</td>
<td>100</td>
</tr>
<tr>
<td>2002</td>
<td>Oakland</td>
<td>Bed &amp; Breakfast</td>
<td>20</td>
</tr>
<tr>
<td>2002</td>
<td>Oakland</td>
<td>Resort</td>
<td>230</td>
</tr>
<tr>
<td>2002</td>
<td>Berkeley</td>
<td>Camping</td>
<td>12000</td>
</tr>
<tr>
<td>2002</td>
<td>Berkeley</td>
<td>Bed &amp; Breakfast</td>
<td>350</td>
</tr>
<tr>
<td>2002</td>
<td>Berkeley</td>
<td>Resort</td>
<td>20000</td>
</tr>
<tr>
<td>2002</td>
<td>Albany</td>
<td>Camping</td>
<td>520</td>
</tr>
<tr>
<td>2002</td>
<td>Albany</td>
<td>Bed &amp; Breakfast</td>
<td>520</td>
</tr>
<tr>
<td>2003</td>
<td>Oakland</td>
<td>Resort</td>
<td>20</td>
</tr>
<tr>
<td>2003</td>
<td>Oakland</td>
<td>Bed &amp; Breakfast</td>
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<tr>
<td>2003</td>
<td>Albany</td>
<td>Bed &amp; Breakfast</td>
<td>520</td>
</tr>
</tbody>
</table>

Storage Middleware example: DBMS

- Database Management System (DBMS)
  - Manage Multiple databases
  - Allow multiple applications to access common databases
  - Implement standard data “lookup” (query) functions.