Class announcements

- Folio Article 1 due today
- Assignment 3 due Wednesday

- Reading for next class
  - Messerschmitt Ch 5, Sun Case
  - Suggestion: Read Messerschmitt Ch5 first.

- Student Presentation Wednesday.
  - Alex Becker (Sun-N Tier Case)

EXCLUSIVE: Best Western Pwned, new facts emerging
Thomas Rowley
27 August 2008
ITWire.com

Main Ideas

- Best Western customer information stolen via online booking system for a Berlin hotel.
- Best Western has management software that links all hotels to corporate.
- If someone higher up in Best Western had their login password breached as opposed to an employee at an individual hotel, what would the story look like?

Student Presentations

- Thomas Rowley (News)
- Theresa Mennell (News)

News Folio Presentation

ISM 50
Thomas Rowley
April 27, 2009
Information Stolen

- On August 21st, a Best Western hotel in Berlin had their online booking system hacked into and robbed of customer information including credit card account numbers via login of a compromised employee password.
- The original article was written by a reporter who individually discovered the hack and stated that the breach affected all European customers in the last year, totaling 8 million.
- Statements released by Best Western confirm the breach was limited to Berlin and a total of 10 customers.

Management Software

- Since 1997 Best Western has had all a modern hotel management software program linking all of their world-wide locations to corporate headquarters in Arizona.
- "The hacker did not gain access to Best Westerns central database, where indeed millions of guest data are stored and processed, but to one individual hotels application... Bookings can be made up to 50 weeks prior to arrival date and are logged by booking date." - Stated by BW employee.

Alternative Possibility

- If all it takes is a single password to access consumer information, then Best Western the hacker only obtained the password of a low level employee.
- With over 4000 hotels worldwide and with customer information stored for as long as a year if they book early, what sort of risk is Best Western, and companies that use similar software, exposing their clients to on a regular basis?

Summary of How Article Relates to ISM 50 Concepts

- Information Systems are used to loosely link personal information of millions of individuals and over countless networks across the world.
- The damage control arising form IT issues covered by the press can be very troublesome to businesses, especially when their investment in IT is in the order of millions.
- Perhaps investment in safeguards for information systems are not a large enough and should be evaluated as having a higher share of IT investment cost.

Main Ideas

- What is SUN?
- The Business of the deal
- The reality of the merger, and what it means for both companies
What is SUN?

- An Industry Developer
- Came up with Java, Jini, and utility computing
- Has had an unparalleled vision for identifying industry trends literally “before their time”.
- However SUN has been suffering for quite some time...

What this means for both companies...

- MySQL users very nervous...
- Oracle is a software company that just acquired a hardware company.
- Overall Industry "vibe"

The Business of the Deal

- Oracle purchased for $7.38 billion giving shareholders $9.50 per share.
- Actual offer is about $5.6 billion.
- SUN stock rose 37% on Monday to $9.15 per share.

Midterm Review

- Midterm exam May 6th
- In-class review: 4/27, 4/29, 5/4

Sources


Tips for how to succeed on the midterm:

- Sit down in a quiet place and do all the assigned readings, jotting down words you don’t know to go back and review later
- Attend lecture, to understand what parts of the material will be emphasized. Go to office hours if you need more help.
- Do the homework assignments (in particular H2), and look at any midterm review supplements we provide
Midterm exam covers:

<table>
<thead>
<tr>
<th>Chapter/Case</th>
<th>Page/Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT History</td>
<td>Reader, R. Nolan pp. 3-33</td>
</tr>
<tr>
<td>Bus. I.S. Foundations</td>
<td>Reader, O'Brien I 35-70</td>
</tr>
<tr>
<td>Competing with IT</td>
<td>Reader, O'Brien II 71-93</td>
</tr>
<tr>
<td>Frito Lay Case</td>
<td>Reader       95-115</td>
</tr>
<tr>
<td>Information Management</td>
<td>Textbook     38-50</td>
</tr>
<tr>
<td>IT Applications</td>
<td>Textbook     59-82</td>
</tr>
<tr>
<td>Cisco Case</td>
<td>Reader       117-135</td>
</tr>
<tr>
<td>Electronic Commerce</td>
<td>Textbook     83-98</td>
</tr>
<tr>
<td>Alibris Case</td>
<td>Reader       137-147</td>
</tr>
<tr>
<td>IT Architecture</td>
<td>Textbook     107-132</td>
</tr>
<tr>
<td>Client-Server Computing</td>
<td>Textbook     139-154</td>
</tr>
<tr>
<td>Sun Case</td>
<td>Reader       149-168</td>
</tr>
</tbody>
</table>

O'Brien cases to know:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Page</th>
<th>Lesson or example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Royal Carribean</td>
<td>50</td>
<td>IT systems unproductive without leadership or business process co-design</td>
</tr>
<tr>
<td>2 Cisco Case</td>
<td>53</td>
<td>Virtual manufacturing/SCM exemplar; 70%/120% gross margins</td>
</tr>
<tr>
<td>3 Clarient</td>
<td>68</td>
<td>IROR for an IT project can be 30% to 40%</td>
</tr>
<tr>
<td>4 Hershey</td>
<td>69</td>
<td>Due to complexity, IT projects can fail if rushed or not planned properly</td>
</tr>
<tr>
<td>5 Wesco</td>
<td>73</td>
<td>Example of an e-procurement ERP system that gave a huge ROI</td>
</tr>
<tr>
<td>6 Staples</td>
<td>81</td>
<td>“Clicks and bricks” ecommerce model, all coming together at the cash register</td>
</tr>
<tr>
<td>7 GE</td>
<td>87</td>
<td>Famous example of Total Quality Management (TQM)</td>
</tr>
<tr>
<td>8 Siemens AG</td>
<td>91</td>
<td>Knowledge management makes an agile company: Denmark - Malaysia teams</td>
</tr>
</tbody>
</table>

Alphabet Soup (across, then down):

<table>
<thead>
<tr>
<th>IT</th>
<th>SIS</th>
<th>SCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td>ROI</td>
<td>IROR</td>
</tr>
<tr>
<td>ROR</td>
<td>B2B</td>
<td>B2C</td>
</tr>
<tr>
<td>C2C</td>
<td>HHC</td>
<td>TPS</td>
</tr>
<tr>
<td>CRM</td>
<td>DBMS</td>
<td>SAP</td>
</tr>
<tr>
<td>CEO</td>
<td>CIO</td>
<td>CRP</td>
</tr>
<tr>
<td>TQM</td>
<td>MIS</td>
<td>BPR</td>
</tr>
<tr>
<td>POP (1)</td>
<td>POP (2)</td>
<td>ERP</td>
</tr>
</tbody>
</table>

O'Brien (p. 39): framework for information systems knowledge needed by business professionals

- BPR decisions: streamline or reengineer
- Calculate NPV and make project decisions
- Productivity paradox, text p. 99
- Evaluation of Porter comp. model, strategy
- ERP types: text p. 79
- SIS
- TPS, MIS, DSS
- IT to enable Porter strategies
- IT to benefit Porter value chain
- Management Challenges
  - Architectural
  - Business Applications
  - Developmental Process
  - Foundational Concepts

Review: elements of the Frito-Lay Case

- Many risks; first project of its kind
- Project rollout was complex
- Deployed in three “layers”
- Motivated sales force
- More time for sales force to sell salty snacks
- Reduced accounting errors
- Allowed factories to run at higher capacity = lower costs
- Two years developing back end
- Staged HHC rollout by region
- HHC: example of push IT
- Low cost strategy
- Differentiation strategy

Review: Frito-Lay corporate strategy

- HHC: growth strategy
- Alliances
- Innovation strategies
- Growth strategies
- Alliances
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?

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.

Data

A bit is "0" or "1" — the atom of the information economy.
Data is a collection of bits, like
- "0101110110010110"
- "00000111"
- "111011101010101011101101010110"

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>0100111</td>
<td>00110111</td>
</tr>
<tr>
<td>&lt;8&gt;</td>
<td>01001100</td>
<td>00111000</td>
</tr>
<tr>
<td>&lt;9&gt;</td>
<td>01001101</td>
<td>00111001</td>
</tr>
<tr>
<td>&lt;:&gt;</td>
<td>01001110</td>
<td>00111010</td>
</tr>
<tr>
<td>&lt;;&gt;</td>
<td>01001111</td>
<td>00111011</td>
</tr>
<tr>
<td>&lt;&lt;&gt;</td>
<td>01010000</td>
<td>00111100</td>
</tr>
<tr>
<td>&lt;=&gt;</td>
<td>01010001</td>
<td>00111101</td>
</tr>
<tr>
<td>&lt;/&gt;&gt;</td>
<td>01010010</td>
<td>00111110</td>
</tr>
<tr>
<td>?&gt;</td>
<td>01010011</td>
<td>00111111</td>
</tr>
</tbody>
</table>

Note that this representation is not unique…

…this one happens to be a standard (ANSI X3.110-1983)

### 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)

### Compression example: JPEG and BMP of the 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

- **Information**
  - **Representation**
  - **Communicate data to another user or organization**
  - **Data processing**

- **Data**
**Representation needs to be standardized - examples?**

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

**Information standards build markets, innovation**

- Real time scene
- Webcam video encoder
- WIFI Transmitter
- WIFI Receiver
- PC video decoder
- PC monitor

**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 can preserve data (but not its original physical form)
- Regeneration is possible for information represented digitally (which is tolerant of physical deterioration)
Replication of information requires knowledge of representation.

Every .xxx DOS file is a representation.

Replication of information also presumes knowledge of its representation.

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

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

Architecture

by

David G. Messerschmitt

What is Architecture?

Structure and organizing principles of any system

What does that mean?

How do you architect a solution?

- Understand the higher purpose of the system
- Identify the basic elements of the system
- Decompose into subsystems
- Understand the functions and interactions of the subsystems
- Orchestrate the emergence of the higher purpose
A system is decomposed into interacting subsystems. Each subsystem may have a similar internal decomposition.

Three Elements of Architecture:
- Decomposition: identification of interacting subsystems that make up the higher purpose of the system.
- Functionality: capabilities assigned to each subsystem supporting the overall system purpose.
- Interaction: how the subsystems communicate to support the system purpose.

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

System examples:
Let's quickly look at some system decomposition examples:
- US Government
- Automobiles
- Human anatomy
- A house
- Quick tour of information technology systems

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 its subsystems can't...
Why system decomposition?
- Divide and conquer approach to containing complexity
- Reuse - (VERY important concept!)
- Consonant with industry structure (unless system is to be supplied by one company)
- Others?

Networked computing infrastructure
by
David G. Messerschmitt

Networked computing infrastructure supports common networked application functionality
- Communication across distance
- Communication across time (storage)
- Computation and logic (software)
- Interfaces

Major subsystems of networked infrastructure

Layering

Layering builds capability incrementally by adding to what exists
**Features of infrastructure layering**

- Layering is a type of decomposition
- Each layer is a server to the layer above
- Each layer is a client to the layer below
- Each layer interacts only with the layers above and below it

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**Simplified infrastructure layering**

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

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**Operating system functions**

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

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**File system - part of the OS**

- 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

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**Network equipment**

- Hosts
- Switches
- Backbone links
- Access links

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**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
Packets

- IP packets contain a header followed by variable length data.
- Packet headers contain information about the contents including source, destination, length, and information to aid in reassembling the fragments of the message.

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Length, etc.</th>
<th>DATA</th>
</tr>
</thead>
</table>

Example

Application
- Web server
- Screen

Operating system
- File
- Message

Network
- Fragmentation
- Collection of packets
- Assembly

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

Year City Accommodation Tourists
2002 Oakley Bed&Breakfast 14
2002 Oakley Resort 190
2002 Oakland Bed&Breakfast 250
2002 Berkeley Camping 120000
2002 Berkeley Bed&Breakfast 340
2002 Berkeley Resort 296000
2003 Albany Camping 8790
2003 Berkeley Bed&Breakfast 3450
2003 Berkeley Resort 419000
2003 Berkeley Resort 419000
2003 Berkeley Bed&Breakfast 4560
2003 Berkeley Resort 419000
2003 Albany Camping 7650
2003 Albany Bed&Breakfast 8790
**Time sharing**

- ASCII terminal (no graphics)
- Mainframe (database and application server)

**Two-tier client/server**

- Local-area network
- Server/Mainframe

**Three-tier client/server**

- Client
- Enterprise data server
- Application server

**Inter-organizational computing**

- Global internet

**Consumer access**