Class announcements

- **Thursday:**
  - Assignment 4 due
  - Messerschmitt Ch 18 (493-512)

- 3rd database tutorial:
  - Friday, May 21st, from 11am-12:30pm

---

Student Presentations

---

Standardization

---

Purpose of a standard?

- Allow products or services from different suppliers or providers to be interoperable

---

Scope of a standard

Included:
- interfaces (physical, electrical, information)
- architecture (reference model)
- formats and protocols (FAP)
- compliance tests (or process)

Excluded:
- implementation
- (possibly) extensions
Some issues

Once a standard is set
- becomes possible source of industry lock-in; overcoming that standard requires a major (~10x?) advance
- may lock out some innovation

In recognition, some standards evolve
- IETF, CCITT (modems), MPEG
- backward compatibility

Types of standards

**de jure**
- Sanctioned and actively promoted by some organization with jurisdiction, or by government

**de facto**
- Dominant solution arising out of the market
- Voluntary industry standards body
- Industry consortium
- Common or best practice

Examples?

Examples

**de jure**
- GSM, ISDN Telephone interface

**de facto**
- Microsoft Windows API (Application Programming Interface)
- Intel Pentium instruction set
- Voluntary industry standards body
- IEEE (Institute of Electrical and Electronic Engineers)
- IETF (Internet Engineering Task Force)
- Industry consortium
- W3C (World Wide Web Consortium)
- SET (Secure Electronic Transactions)
- Best practice
- Windowed GUI

The changing process

- As technology and industry move more quickly, the global consensus standards activity has proven too unwieldy
  - e.g. ISO
- "New age" standards activities are more informal, less consensus driven, a little less political, more strategic, smaller groups
  - e.g. OMG, IETF, ATM Forum, WAP
- Programmable/extensible approaches for flexibility
  - e.g. XML, Java

Reasons for change

- From government sanction/ownership to market forces
- Increasing fragmentation
- Importance of time to market

Greater complexity
- Less physical/performance constraint for either hardware or software

Lock-in

(Particularly open) standards reduce consumer lock-in
- Consumers can mix and match complementary products

Increase supplier lock-in
- Innovation limited by backward compatibility
- e.g. IP/TCP, x86, Hayes command set
### Aside: Network Effects

- The value of owning some products goes up if lots of other people have it too.
  - Examples?
- This phenomenon is called "network effects"
- How do standards influence network effects?

### Network effects

Standards can harness network effects to the industry advantage:
- Revenue \(= (\text{market size}) \times (\text{market share})\)
- Increases value to customer
- Increases competition
  - Only within confines of the standard
  - But forces customer integration or services of a system integrator

### Why standards?

*de jure* are customer driven to reduce confusion and cost

*de facto* standards are sometimes the result of positive feedback in network effects

- Customers and suppliers like them because they
  - increase value
  - reduce lock-in
- Governments like them because they
  - promote competition in some circumstances
  - May believe they can be used to national advantage

### Approaches

- **Consensus**
  - ISO
- **Collaborative design**
  - MPEG
- **Competitive "bake off"**
  - IETF
- **Coordination of vendors**
  - OMG

### Open vs. Proprietary Standards

- Open standard - a standard that is well documented, unencumbered by intellectual property rights and restrictions, and available to any vendor.
- What are the advantages?
- What are the disadvantages?

### Why companies participate

- Pool expertise in collaborative design
  - e.g. MPEG
- Have influence on the standard
- Get technology into the standard
  - Proprietary, with expectation of royalties
  - Non-proprietary
- Reduced time to market
Standards applied to Business Processes?

- Can you standardize business processes?

  Yes!
  - ISO 9000
    - A set of standardized business processes for Quality Management.
    - Supports TQM (Total Quality Management)
  - RosettaNet
    - A set of standardized business processes, and accompanying standardized data interfaces/formats for conducting e-business.

Databases

by
David G. Messerschmitt

Databases

- Treat data as a separate asset
  - May be shared by multiple applications
- Provide protection and integrity features appropriate to mission-critical data
  - Access control
  - Integrity constraints
  - Persistence
  - etc.

Two capabilities

- Aggregation: accessing multiple databases
- Sharing: two or more applications accessing the same databases

Relational table

<table>
<thead>
<tr>
<th>Table</th>
<th>Employee</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name</td>
</tr>
<tr>
<td></td>
<td>Address</td>
</tr>
<tr>
<td></td>
<td>Dept</td>
</tr>
<tr>
<td></td>
<td>Record</td>
</tr>
<tr>
<td></td>
<td>Field</td>
</tr>
</tbody>
</table>

SQL interface

- SQL (Structured Query Language)
  - Presents single abstract interface to the application logic
    - For manipulating, and extracting data from database
  - Standardized, not vendor specific
- Encapsulates various internal details
  - Data partitioning and replication
  - Host mapping
  - File representation
  - etc.
Database operations

“PROJECT”

“SELECT”

Each operation results in a new table

Database Operations

Passengers

<table>
<thead>
<tr>
<th>Name</th>
<th>Dept ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice</td>
<td>1</td>
</tr>
<tr>
<td>Bob</td>
<td>1</td>
</tr>
<tr>
<td>Chris</td>
<td>2</td>
</tr>
</tbody>
</table>

Departments

<table>
<thead>
<tr>
<th>Dept Name</th>
<th>Dept ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Sales</td>
<td>2</td>
</tr>
</tbody>
</table>

JOIN

Fields, columns, attributes

- Entries are simple data types or compositions of those types
  - Integer, string, etc.

Records, rows

Definition

A markup language describes the structure of a document
- Based on tags
- Tags denote structural elements like sections, subsections, figures, etc

Internationally standardized, so application independent

Markup languages

Example: HTML

```
<html>
  <h1>Super Widget</h1>
  <h2>Widgets Incorporated</h2>
  <em>123456789</em>
  <p>$300</p>
</html>
```

Super Widget

Widgets Incorporated

123456789

$300
**Example: XML**

Tags Emphasize what the things mean rather than how to format their Presentation.

```xml
<product>
  <model>Super Widget</model>
  <make>Widgets Incorporated</make>
  <sku>123456789</sku>
  <price>$300</price>
</product>
```

**XML in Ecommerce example**

Supplier Stuff4U
Retailer

```xml
<product>
  <model>Super Widget</model>
  <make>Widgets Incorporated</make>
  <sku>123456789</sku>
  <price>$300</price>
</product>
```

Product info From each Supplier sent in XML

**XML in ecommerce example 2**

Supplier XYZ Manufacturing

```xml
<product>
  <model>Super Widget</model>
  <make>Widgets Incorporated</make>
  <sku>123456789</sku>
  <price>$300</price>
</product>
```

Product info From each Supplier sent in XML

Super widget recognized and managed by SCM software.

**Family lineage**

- **SGML**
  - Emphasizes formatting and presentation of documents
  - Introduced in Early 90s
  - Standardized in mid 80s by ISO

- **HTML**
  - Emphasizes structure of documents

- **XML**
  - Purpose- and industry-specific extensions
  - Proposed in mid 90s

**Break!**

**mySQL Case**
**mySQL student talk**

- MySQL

**mySQL**

What does MySQL make?

How Successful is MySQL?
- Visibility: Fortune magazine, more mentions on www
- Reaction from giants
- Revenue growth 2001 700k, 2002 6.2m, 2003 10m
- Good performance reviews
- Recent SAP alliance
- But Market share tiny: $10 million out of $10 billion market!

Why Success?
- Good Technology
- Large DBMS bloated with features most don’t need
- Innovative OSS model

**mySQL**

How does OSS work?

Two Types of License:
- GPL
  - Free
  - No Support
  - Any software that uses MySQL as a module must itself be made GPL
- Commercial License
  - Support
  - Could be distributed with non-open source software
  - Not Free:
    - MySQL: Classic $250, Pro $495 (for ~ 50 users)
    - Compare to:
      - MSFT: $1150 single proc for 50 users
      - IBM: $33000 single proc for 50 users
      - Oracle: $40000 single proc for 50 users

**Aside**: DB’s in different software stacks

<table>
<thead>
<tr>
<th>General Software Stack</th>
<th>ERP Software Stack</th>
<th>Web Application Software Stack</th>
<th>Banking Software Stack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>SAP</td>
<td>Proprietary Business Logic</td>
<td>Proprietary Banking App</td>
</tr>
<tr>
<td>Middleware</td>
<td>Oracle</td>
<td>Apache Web Server</td>
<td>IBM z/OS</td>
</tr>
<tr>
<td>Operating System</td>
<td>MS Windows</td>
<td>Linux</td>
<td>IBM or other OS</td>
</tr>
<tr>
<td></td>
<td>or other OS</td>
<td>or other OS</td>
<td>or other OS</td>
</tr>
</tbody>
</table>

- Which companies are competitors?
- Which are complimenters?
- Which are both?

**mySQL**

- Which segments of market is MySQL strong in?
  - Large Companies or Small Companies?
  - Web applications or Critical Enterprise data?

- Why would a major enterprise want to pay so much more for an Oracle or IBM DB?

**MySQL: market**

<table>
<thead>
<tr>
<th>Small 20%</th>
<th>Medium 30%</th>
<th>Large 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft</td>
<td>Oracle</td>
<td>Reliability</td>
</tr>
<tr>
<td></td>
<td>IBM</td>
<td>Scalability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longevity</td>
</tr>
</tbody>
</table>

Enterprise wide data 90%

Web Sites 10%

My SQL Cost

How should MySQL grow in order to meet it’s stated goal of getting to $100 million in revenue?

Figure Adapted from: “Teaching Note for MySQL Open Source Database,” 6/1/04, Standard GBA
## My SQL: Growth Strategy

- Lack of Brand identity in this segment
- MySQL lacks the organization to offer support
- Large enterprises have high switching costs

- Not a big enough market to reach stated $100 million goal.

### Market Share

<table>
<thead>
<tr>
<th>Type</th>
<th>Small 20%</th>
<th>Medium 30%</th>
<th>Large 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise-wide data</td>
<td>MySQL</td>
<td>Microsoft</td>
<td>Oracle IBM</td>
</tr>
<tr>
<td>Web Sites</td>
<td>MySQL</td>
<td>Microsoft</td>
<td>Oracle IBM</td>
</tr>
</tbody>
</table>

### Comparison

- Microsoft
- Oracle IBM
- IBM
- MySQL

### Metrics

- Reliability
- Scalability
- Support
- Longevity
- Cost

---

### Maybe?

- Many of these customers already using MySQL with websites
- Less emphasis on global organization
- Leverage SAP alliance
- Up against Microsoft.

- Builds on existing brand and strengths
- Market not so big

### Stay Put?

- Many of these customers already using MySQL with websites
- Less emphasis on global organization
- Leverage SAP alliance
- Up against Microsoft.

- Not a big enough market to reach stated $100 million goal.

---

Figure Adapted from "Teaching Note for MySQL Open Source Database," 6/1/04, Stanford GSB.