DBMS Infrastructures
and
IT Career Recommendations

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Topics

- Importance of Databases
- Security
- Computing Environments / Infrastructures
- Methodologies for Data access
- Database Scalability
- IT Career Recommendations
Importance of Databases

• Data is a critical element in most businesses
• Pertinent for nearly all MIS professionals
  – Systems and Business Analysts
  – Programmers - to interface / utilize data
  – System Administrators / Network staff – understanding of distributed application needs.
  – Security staff – compliance for Information Assurance
    – CISSP, Security+ certification
  – Domain (end) users – reporting for business requirements
  – Management - business decisions
Importance of Databases (cont)

• Tracking of business activities
• Historical analysis
• Business decisions
• Increasing reliance of data
  – Availability – failover capability
    • (24x7 if needed, based upon need)
  – Accuracy – correct design (constraints) and storage
  – Recoverability – avoid loss of transactions
    • Offsite storage of data and backups
Data Security Concerns

• Regulations – FERPA, HIPAA, Sarbanes-Oxley
• Principle of least privilege
• Mobile data concerns – flash drives, CD, laptops
• Data encryption (e.g. Truecrypt)
  – at rest (on disk)
  – over networks
• Application flaws – reliance on best practices
Computing Environments
Monolithic vs. Distributed / Heterogeneous Environments

• **Monolithic** Mainframe applications and databases residing on a single machine
  – Network traffic mainly to peripherals
  – firewall
  – Troubleshooting somewhat simpler than distributed
  – Older platforms / tools more difficult to work with.
  – Difficult to find trained professionals for systems
Monolithic vs. Distributed / Heterogeneous Environments

- **Distributed** applications residing in a network of Windows, Unix (and other) platforms
  - Network traffic between application, web and database servers.
  - Firewalls between several points
  - Encryption of traffic between nodes where required
  - Troubleshooting connections or performance issues difficult
  - Tools are typically more commonly used, solutions more accessible.
  - Increased availability of trained professionals
Monolithic vs. Distributed / Heterogeneous Environments

- **Heterogeneous** environment
  - Mainframe / Mini computers – ‘ultra’ light client model (simple terminals – green screen)
  - Fat clients (containing business / program logic) – Visual Basic, Power Builder, Access
    - Data sometimes residing on clients
  - Three tier architecture – Web Browser, application Server, Database Server
  - Hybrid approach – utilizing ‘screen scraping’ of mainframe terminals communicating to a web server.
Heterogeneous Environment example
Containing both Monolithic and distributed elements
Image from: http://www.radware.com/Solutions/Enterprise/DataCenter/SOA.aspx
Motivation for using specific environments

- Legacy software – expensive and difficult to migrate from
- Aging computer infrastructures
- Older systems not supported as well, in addition to costly maintenance
- Desired functionality may require newer technology
- Vendor’s solutions availability on newer platforms
Methodologies for accessing Databases
Database Application Interfaces

• SQL Interpreter or GUI application
• Character-based application – COBOL / green screen
• Windows based program (fat client) – VB.NET, Java, C++, etc. Processing on client
• Three tier architecture (thin client – browser), application Server (Jboss, .NET) – application logic - client / processing - server
• Distributed architecture – processing shared between client / server
• Web Server Interfaces – CGI PERL, PHP, C, etc.
• Web Services / XML – Heterogeneous environments
Web Server Interfaces

- Web hosting service (such as Godaddy.com)
- Linux server – Redhat, Fedora, Ubuntu
  - LAMP – linux, apache, MySQL, Perl/PHP
- Apache / Microsoft IIS
- MySQL / MS-SQL
  - Includes an SQL interface
  - Import / export functions for moving data
- HTML / Javascript front end
- PHP
Database Platforms – consider flexible infrastructure for changing requirements

- Mobile (SQLite, SQL Anywhere, MS-SQL Compact, Oracle 9i lite)
- Desktop database (MS access, SQLite)
- Workgroup (MySQL, MS-SQL, Oracle)
- Departmental/divisional (MySQL, MS-SQL, Oracle)
- Enterprise (Oracle, IBM DB2)
- Web Enabled
Database Scalability – demands for availability

• Fault tolerant solutions – assuring 24x7
  – Hot backups
  – Clustered servers for failover, load balancing
  – Expensive

• Lower cost solutions – 24x7 not required
  – System offline for backups
  – No failover
  – Close to full recoverability once system restored
    • Transactions stored in a log file for recovery

• Other configurations – balance between cost and desired functionality
Example Domains

- Financial – Banking
- Retail Sales
- Manufacturing
- Home office – real estate – single agent
- Healthcare
- Law Enforcement
- Education
- Agricultural
- Construction
Exercise: Given each domain, select the appropriate configuration based upon unique challenges

- Database platforms (desktop, mobile, workgroup/departmental, enterprise)
- Database scalability (24x7, less than 24x7)
- Environment (monolithic, distributed, heterogeneous)
- Security needs (minimal, moderate, maximal)
- Type of application (fat client, thin, web based, character based)
- Tolerance of Application Flaws (high, low, moderate)
IT Career Recommendations

- Further your understanding of SQL (beyond a semester)
- Data Modeling
- Data Warehousing, OLAP and Business Intelligence
- Familiarization of multiple Database Platforms – MySQL, Oracle, SQLite, (Microsoft) MS-SQL.
- Programming skills (HTML, PHP, VB, Java, etc.)
- Unix Familiarization / command line environments
- Application Developer / Business Analyst
- Systems Analyst
IT Career Recommendations

- Familiarization of 3 Tier Architecture (LAMP)
  - GoDaddy, other web hosting companies
  - Familiarization of tools / software available from Web Host. Examples: Content MGT Systems – Wordpress, Drupal, Moodle, MySQL, PERL, PHP, ASP, etc.

- Get a domain name and start a website

- IT Methodologies (ITIL)

- Certification in areas of interest (CISSP, Security+, Information Assurance, Oracle, Project Management, ITIL)

- Awareness of available Open Source Software (Orange HRM, etc.)