Types of Database Systems

- The amount of information being collected and stored is almost beyond comprehension - and its growing
- Stored information is being used for more purposes than were conceivable ten (or even five) years ago
- Databases are used at every level of society
  - individuals, small business, national organisations, global corporations, governments...
- They affect many aspects of our everyday lives

Impact of Database Systems

- Critical to business productivity and profitability
- Critical to individual life and safety
- Instrumental in economic and social stability
- Can affect governments
- It essential that information is accurate, up-to-date and consistent
- Not always easy when there are so many databases of so many types storing different versions of similar or the same information

A Brief History of Database Systems

- 3000BC(?) knotted and coloured string, marks on clay
- 2000BC(?) papyrus-based recording
- 200BC(?) paper-based technologies
- 1950 file processing systems
- 1970 hierarchical DBMS, network DBMS (first generation DBMS), Codd’s relational model

- 1980 relational DBMS (second generation DBMS), SQL
- 1990 internet, data warehouses, object-oriented DBMS, distributed databases
- 2000+ more complex data structures, universal servers, centralised databases, content-addressable storage, AI, data mining, mobile technologies, super computers...
Types of Database Systems

- Personal Databases
- Workgroup Databases
- Department Databases
- Enterprise Databases
- Internet, Intranet, and Extranet Databases
- Data warehouses

Personal Databases

- Support single user
- PCs, laptops, personal digital assistants (PDA), mobile phones...
- Improve personal productivity
- Can be difficult to share data of interest to other users
- Used in small organisations when need to share data is unlikely
- MS Access, Oracle Personal, FoxPro...

Considerations for developing personal databases include
- develop in-house vs outside vendor
- developed by end user or IT staff
- data requirements, database design requirements
- which commercial DBMS?
- can data be synchronised with other databases? How?
- who is responsible for data in personal database?

Workgroup Databases

- Workgroups - small teams (typically less than 25 people) collaborating on the same project or application or group of similar projects or applications
- Workgroup database
  - supports collaborative effort
  - allows change tracking, ease of data sharing
  - allows concurrent user updating
- Typically stored on database server and provided to users via a Local Area Network (LAN)

Considerations for developing workgroup databases include
- data management issues - data security, data integrity
- multiple user views, multiple subscribing to databases
- database design optimisation for and between different group members
- how can concurrent access needs be met without compromising data integrity?
- where should processing take place - client vs server?

Department Databases

- Support functional units of an organisation
  - sales, personnel, marketing, manufacturing, accounting
- Contain data necessary
  - to perform functions and processes within specific activity area
  - to answer questions relevant to specific activity area
- Large numbers of users often in geographically dispersed locations
- Possibly the most common type of database
Considerations for developing department databases include:
- design of DB and environment for adequate performance with large number of users and user transactions
- security protecting against unauthorised access to or distribution of sensitive data
- which DB and application development tools are appropriate for complex environment?

Considerations for developing enterprise databases include:
- how should data be distributed throughout the various locations in the organisation?
- how can standards be developed and maintained throughout the organisation for data names, definitions, formats and related issues?
- what do we need to do to ensure successful integration of numerous data sources including legacy systems?

Scope covers an entire organisation (or at least many different departments!)
- Support organisation-wide operations, decision making
- Organisation may have several enterprise databases
  - enterprise DB not truly inclusive of all organisational data
  - single operational DB may be impractical due to performance difficulties, diverse needs, metadata definition problems
- Enterprise Resource Planning (ERP) systems, data warehouses

The proliferation of the Internet has been one of the most significant drivers of technological and business change:
- highly competitive
- improved customer information
- eliminate traditional marketing/distribution channels
- employee relationship management
- direct sales
- ticket booking
- e-auctions, share trades

Need for database support, universal data access
- Internet provides easy connection across multiple platforms
- Browser-based applications utilise standard interface - lower development costs
- Web-enabled databases allow users to ask unique and specific questions and receive answers based on current information
- Online shopping, airline ticket booking, auctions
- These are mostly B2C (business-to-consumer)
Businesses also deal with other businesses B→B
- Traditionally they used electronic data interchange (EDI) as a means to trade information
- Extraverts are internet-enabled but access is not universal
- utilise XML to provide standard format
- They allow businesses to gain limited access to and use of each others information
- Fosters relationships via more efficient exchanges
- Often gives access to part of company intranet

Extranets are internet-enabled but access is not universal – utilise XML to provide standard format
- They allow businesses to gain limited access to and use of each others information
- Fosters relationships via more efficient exchanges
- Often gives access to part of company intranet

Businesses often use internet technology to create internal private networks - intranets
- Allow exchange and management of information within an organisation
- HR, financial, programs, training, news...
- Only internal access to data is allowed
- Can be used to connect to internet
- Requires additional technology to restrict external access

Considerations for developing web-enabled databases include
- the type of technology used to link web applications to client databases (middleware, protocols...)
- the measures and technology necessary to ensure security and privacy (firewalls, passwords, encryption...)
- the staggering amount of data generated via the internet
- maintenance of data quality in environment where data sources are external

Types of Database Users
- Naive users
  - unsophisticated
  - interact via application programs
  - fill in forms, view reports
- Application programmers
  - usually computer professionals
  - use methodologies, tools, languages (3GL, 4GL) to create interfaces

Sophisticated users
- interact with DBMS without program interface
- use database query language via a query processor
- use online analytical processing tools, data mining tools

Specialised users
- who write specialised programs outside traditional DBMS
- computer-aided design (CAD) systems, knowledge-based systems (KBS), expert systems, complex data type storage systems, environment-modelling systems

References