Database Processing Applications

Standard Database Processing Client/Server Environment

- Queries, Forms, Reports
- Application using Java, C++, or other languages using ODBC (Open Database Connectivity) or JDBC (Java Database Connectivity)
- Stored procedures (programs with embedded SQL code written in languages such as Transact-SQL for SQL Server, PL/SQL for Oracle)
- Triggers (programs which are triggered automatically when certain specified events take place)
Web Database Processing

- Users → Web Client (Browser) → Webserver → Database Server → Database, using CGI (Common Gateway Interface) scripts in a programming language (usually perl, but can be in other languages)

- Popular ways include WAMP (Windows, Apache Webserver, MySQL database, PHP scripting) or LAMP (Linux, Apache Webserver, MySQL database, PHP scripting), or use of JSP (Java server pages) or ASP (Active Server Pages)
Database Processing Applications

Technologies used in Web Database Processing Applications

- Web Client Level: HTML, XML, JSP, ASP, PHP, ...
- Web client to web server: HTTP, SOAP (protocol), WSDL (protocol), ...
- At Web server level: Java, C/C++, Transact-SQL, PL/SQL, ...
- Web server to DBMS: ODBC, JDBC
- At Database Server level: SQL
- At development level: Integrated Development Environments: Eclipse, Visual Studio
XML is a markup language just as HTML, but unlike HTML it enforces discipline through its user-specified grammar (either a Document Type declaration (DTD) or schema).

HTML too has a DTD, but it is given as a standard and cannot be changed by the user. Also, it deals with format and structure of documents, and NOT their content.

On the other hand, in XML, it is possible to extend the grammar to the document contents (through DTDs or schema), hence its name, Extensible Markup Language.
Data in XML is said to be *semi-structured* as opposed to the *structured* data that we have become familiar with till now.

Data in XML is also said to be *self-describing* in that the tags, which describe the data are a part on the document.

On the other hand, the traditional relational database data is not self-describing in that the data and the meta-data (data about the data, such as type declarations, keys, foreign keys, referential integrity constraints, etc., are *NOT* stored together with the data, but are stored separately.)
Database Processing Applications: XML

- DTDs are written in a notation called BNF-notation (Backus-Naur Formalism). BNF is a standard way of specifying the grammar of any natural or computer programming language. XML schemas, on the other hand, are written in XML itself. Therefore, XML-Schema has become very popular; programmers have one less language to learn (no need to know BNF notation).

- ERDs and other data modeling tools are extensively used in the development of XML-Schema.

- XML is becoming popular on the internet, but is not pervasive. This is because XML currently deals with the content well, but the format and structure are currently specified in Cascading Style Sheets (CSS) or in a language Extensible Style Sheet Language (XSL).
While XSL is a standard, none of the current browsers support it. However, current browsers do support a language called Extensible Style Sheet Language Transform (XSLT) which helps transform XML documents into HTML so that they can be displayed on the browser.

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In the long run, XSL may become dominant, but for now we are stuck with XSLT.
WWW consortium has developed a query language called XML-Query. Currently, the browsers do not support it, but will in the future.

So, for now, SQL is the dominant language for databases. This is adequate because most database vendors do provide search facilities on textfiles when one of the attributes in a table is a text file. However, when XML-Query becomes available, it may be adopted side-by-side with SQL.