

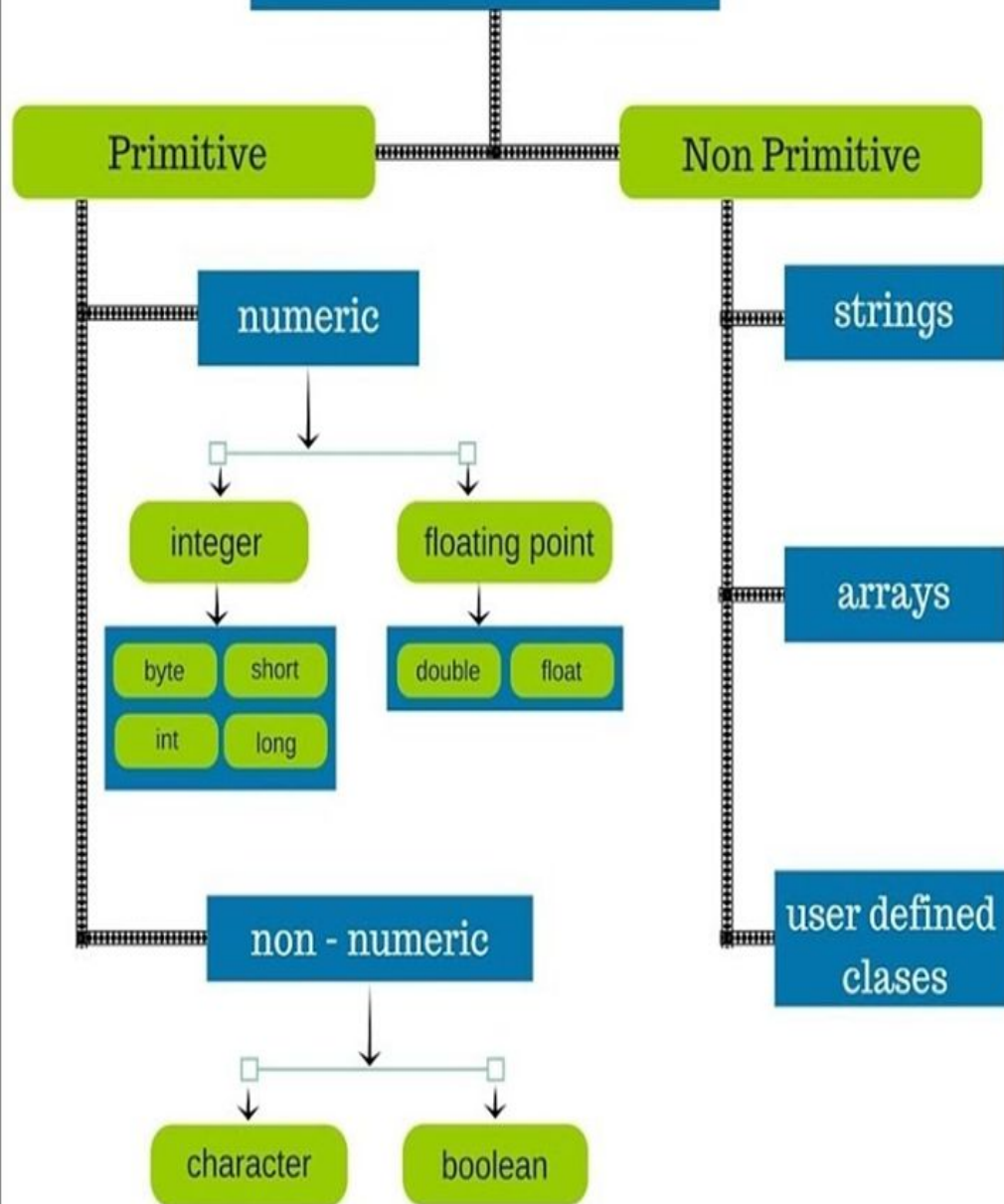
***Aktobe Regional State University  
named after K.Zhubanov .***

# Database

Snassapin T.

T-201

# Data Types



\* A database is an organized collection of data, generally stored and accessed electronically from a computer system. Where databases are more complex they are often developed using formal design and modeling techniques. The database management system (DBMS) is the software that interacts with end users, applications, the database itself to capture and analyze the data and provides facilities to administer the database. The sum total of the database, the DBMS and the associated applications can be referred to as a "database system". Often the term "database" is also used to loosely refer to any of the DBMS, the database system or an application associated with the database. Computer scientists may classify database-management systems according to the database models that they support. Relational databases became dominant in the 1980s. These model data as rows and columns in a series of tables, and the vast majority use SQL for writing and querying data. In the 2000s, non-relational databases became popular, referred to as NoSQL because they use different query languages.

- \* Database management system
- \* Connolly and Begg define Database Management System (DBMS) as a "software system that enables users to define, create, maintain and control access to the database".
- \* The DBMS acronym is sometime extended to indicated the underlying database model, with RDBMS for relational, OODBMS or ORDBMS for the object (orientated) model and ORDBMS for Object-Relational. Other extensions can indicate some other characteristic, such as DDBMS for a distributed database management systems.
- \* The functionality provided by a DBMS can vary enormously. The core functionality is the storage, retrieval and update of data. Codd proposed the following functions and services a fully-fledged general purpose DBMS should provide:
  - \* Data storage, retrieval and update
  - \* User accessible catalog or data dictionary describing the metadata
  - \* Support for transactions and concurrency
  - \* Facilities for recovering the database should it become damaged
  - \* Support for authorization of access and update of data
  - \* Access support from remote locations
  - \* Enforcing constraints to ensure data in the database abides by certain rules

## Flat File Model

	Route No.	Miles	Activity
Record 1	I-95	12	Overlay
Record 2	I-495	06	
Record 3	SR-301	33	

## Relational Model

Activity Code	Activity Name
23	Patching
24	Overlay
25	Crack Sealing

Key = 24

Activity Code	Date	Route No.
24	01/12/01	I-95
24	02/08/01	I-66

## Object-Oriented Model

Object 1: Maintenance Report    Object 1 Instance

Date	
Activity Code	
Route No.	
Daily Production	
Equipment Hours	
Labor Hours	

01-12-01
24
I-95
2.5
6.0
6.0

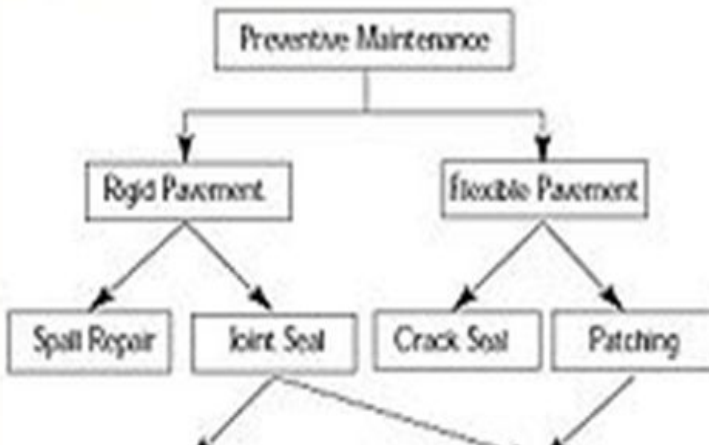
Object 2: Maintenance Activity

Activity Code	
Activity Name	
Production Unit	
Average Daily Production Rate	

## Hierarchical Model



## Network Model





- \* Miscellaneous features
- \* Other DBMS features might include:
  - \* Database logs - This helps in keeping a history of the executed functions.
  - \* Graphics component for producing graphs and charts, especially in a data warehouse system.
  - \* Query optimizer - Performs query optimization on every query to choose an efficient query plan (a partial order (tree) of operations) to be executed to compute the query result. May be specific to a particular storage engine.
  - \* Tools or hooks for database design, application programming, application program maintenance, database performance analysis and monitoring, database configuration monitoring, DBMS hardware configuration (a DBMS and related database may span computers, networks, and storage units) and related database mapping (especially for a distributed DBMS), storage allocation and database layout monitoring, storage migration, etc.
  - \* Increasingly, there are calls for a single system that incorporates all of these core functionalities into the same build, test, and deployment framework for database management and source control. Borrowing from other developments in the software industry, some market such offerings as "DevOps for database".

## \* Classification

- \* One way to classify databases involves the type of their contents, for example: bibliographic, document-text, statistical, or multimedia objects. Another way is by their application area, for example: accounting, music compositions, movies, banking, manufacturing, or insurance. A third way is by some technical aspect, such as the database structure or interface type. This section lists a few of the adjectives used to characterize different kinds of databases.
- \* An in-memory database is a database that primarily resides in main memory, but is typically backed-up by non-volatile computer data storage. Main memory databases are faster than disk databases, and so are often used where response time is critical, such as in telecommunications network equipment.
- \* An active database includes an event-driven architecture which can respond to conditions both inside and outside the database. Possible uses include security monitoring, alerting, statistics gathering and authorization. Many databases provide active database features in the form of database triggers.
- \* A cloud database relies on cloud technology. Both the database and most of its DBMS reside remotely, "in the cloud", while its applications are both developed by programmers and later maintained and used by end-users through a web browser and Open APIs.
- \* Data warehouses archive data from operational databases and often from external sources such as market research firms. The warehouse becomes the central source of data for use by managers and other end-users who may not have access to operational data. For example, sales data might be aggregated to weekly totals and converted from internal product codes to use UPCs so that they can be compared with ACNielsen data. Some basic and essential components of data warehousing include extracting, analyzing, and mining data, transforming, loading, and managing data so as to make them available for further use.
- \* A deductive database combines logic programming with a relational database.
- \* A distributed database is one in which both the data and the DBMS span multiple computers.
- \* A document-oriented database is designed for storing, retrieving, and managing document-oriented, or semi structured, information. Document-oriented databases are one of the main categories of NoSQL databases.
- \* An embedded database\ system is a DBMS which is tightly integrated with an application software that requires access to stored data in such a way that the DBMS is hidden from the application's end-users and requires little or no ongoing maintenance.

- \* Database languages
- \* Database languages are special-purpose languages, which allow one or more of the following tasks, sometimes distinguished as sublanguages:
  - \* Data control language (DCL) - controls access to data;
  - \* Data definition language (DDL) - defines data types such as creating, altering, or dropping and the relationships among them;
  - \* Data manipulation language (DML) - performs tasks such as inserting, updating, or deleting data occurrences;
  - \* Data query language (DQL) - allows searching for information and computing derived information.
- \* Database languages are specific to a particular data model. Notable examples include:
  - \* SQL combines the roles of data definition, data manipulation, and query in a single language. It was one of the first commercial languages for the relational model, although it departs in some respects from the relational model as described by Codd (for example, the rows and columns of a table can be ordered). SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987. The standards have been regularly enhanced since and is supported (with varying degrees of conformance) by all mainstream commercial relational DBMSs.[
  - \* OQL is an object model language standard (from the Object Data Management Group). It has influenced the design of some of the newer query languages like JDOQL and EJB QL.
  - \* XQuery is a standard XML query language implemented by XML database systems such as MarkLogic and eXist, by relational databases with XML capability such as Oracle and DB2, and also by in-memory XML processors such as Saxon.
  - \* SQL/XML combines XQuery with SQL.
- \* A database language may also incorporate features like:
  - \* DBMS-specific configuration and storage engine management
  - \* Computations to modify query results, like counting, summing, averaging, sorting, grouping, and cross-referencing
  - \* Constraint enforcement (e.g. in an automotive database, only allowing one engine type per car)
  - \* Application programming interface version of the query language, for programmer convenience