

# Software Engineering, Databases & Networks

# Software Engineering

# Software = Computer Program?

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No, not just a computer program.

# Software = Computer Program?

- A software consists of:
  - A number of separate programs.
  - Configuration files used to set up the programs.
  - User documentation explaining how to use the system.
  - System documentation describing the system.
  - Web sites containing recent product information.

# Types of Software

## (according to customer type)

- **Generic products** - sold on the open market to any customer (shrink – wrapped software)
  - Examples : word processors, games, drawing packages
- **Bespoke (or customized) products** - commissioned by a particular customer.

# Types of Software

## (according to use)

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- **System software** - software necessary to run hardware
  - Examples: Operating Systems, device drivers
- **Application software** - software that aids the user in working fast and more efficiently
  - Examples: word processors, spreadsheets, calculator etc.

# What is Software Engineering?

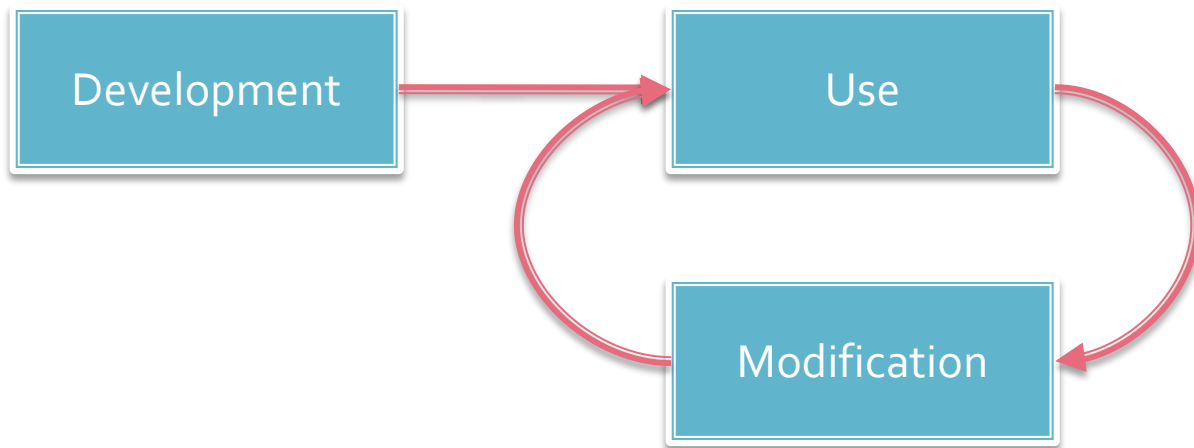
- An engineering discipline which is concerned with all aspects of software production from the early stages of system specification through maintaining the system after it has gone into use.
- Computer science for a computer scientist is an object of study, while for a software engineer it is a tool

# What is Software Engineering?

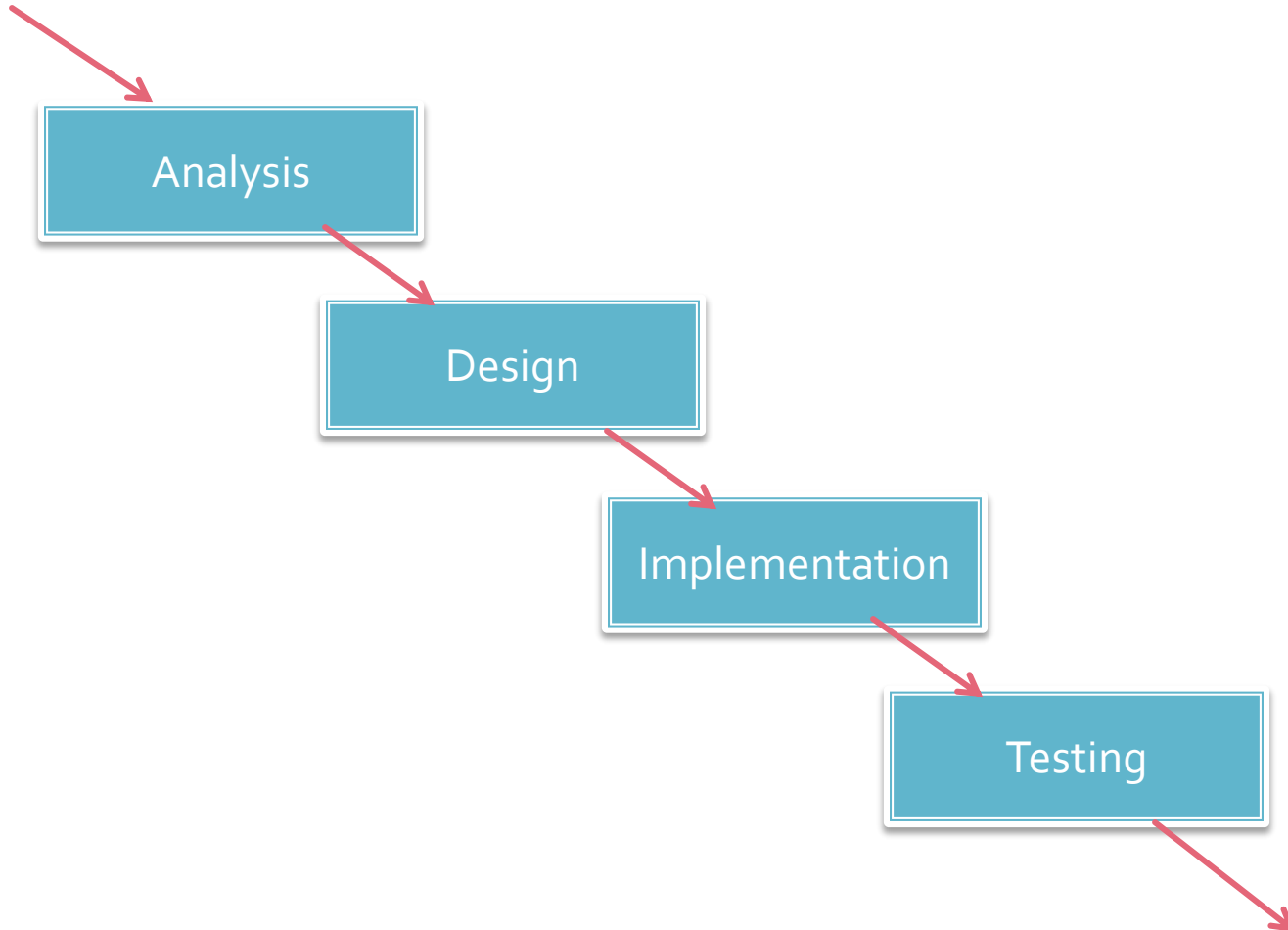
- The goal of researchers in software engineering is to find principles that guide the software development process and lead to efficient, reliable software products.
- Software engineering includes topics such as personnel and project management that are associated with business management.



# Software Life Cycle



# Development Phase



# Development Phase

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- Analysis
  - Specifies what services the proposed system is to provide and to identify any conditions (time constraint, security) on those services.

# Development Phase

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- Design
  - Concentrates on how the system will accomplish the goals.
  - The structure of the software system is established.
  - Creating user interface.

# Development Phase

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- Implementation
  - Involves actual writing of programs, creation of data files.

# Development Phase

- Testing
  - Occurs in two forms
    - **Validation Testing** – confirming that the software system as implemented conforms to the requirements and specifications identified during the original analysis.
    - **Defect Testing** – Identifying and correcting errors.

# Databases

# What is a Database?

- **Database** is a collection of interrelated data
- **Data** are known facts that can be recorded and that have implicit meaning.
- **Database Management System** is a collection of programs that enables the user to create and maintain a database.



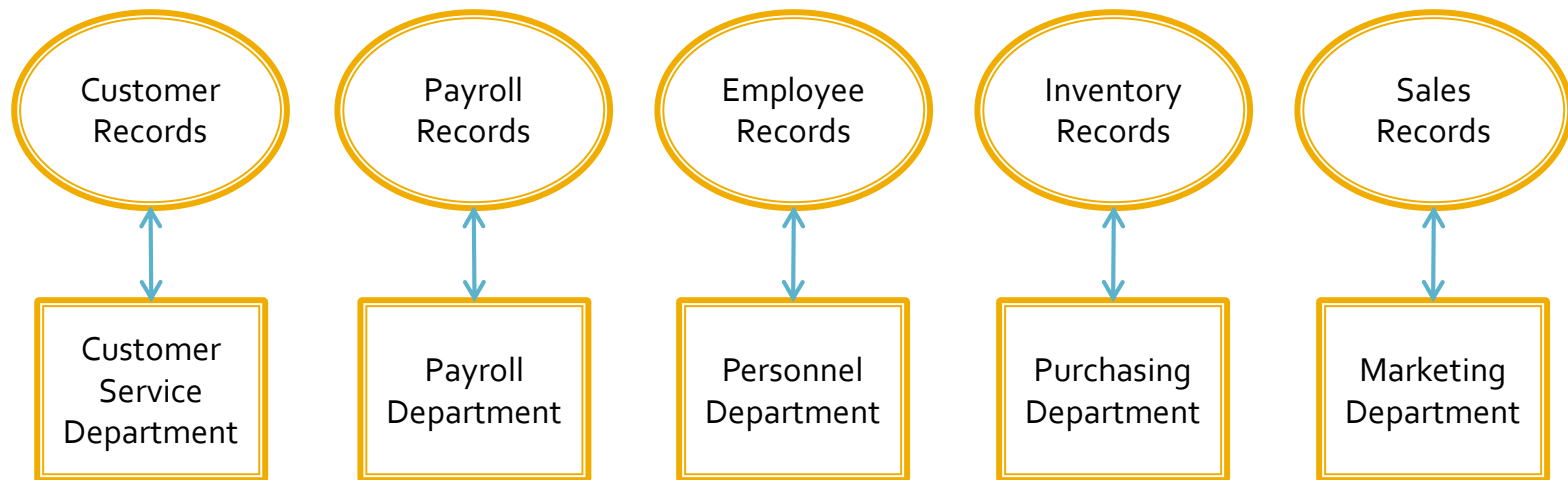
# Example of database

STUDENT	Name	Student Number	Major
	Marie Yvette B. de Robles	2005-47092	BSCS

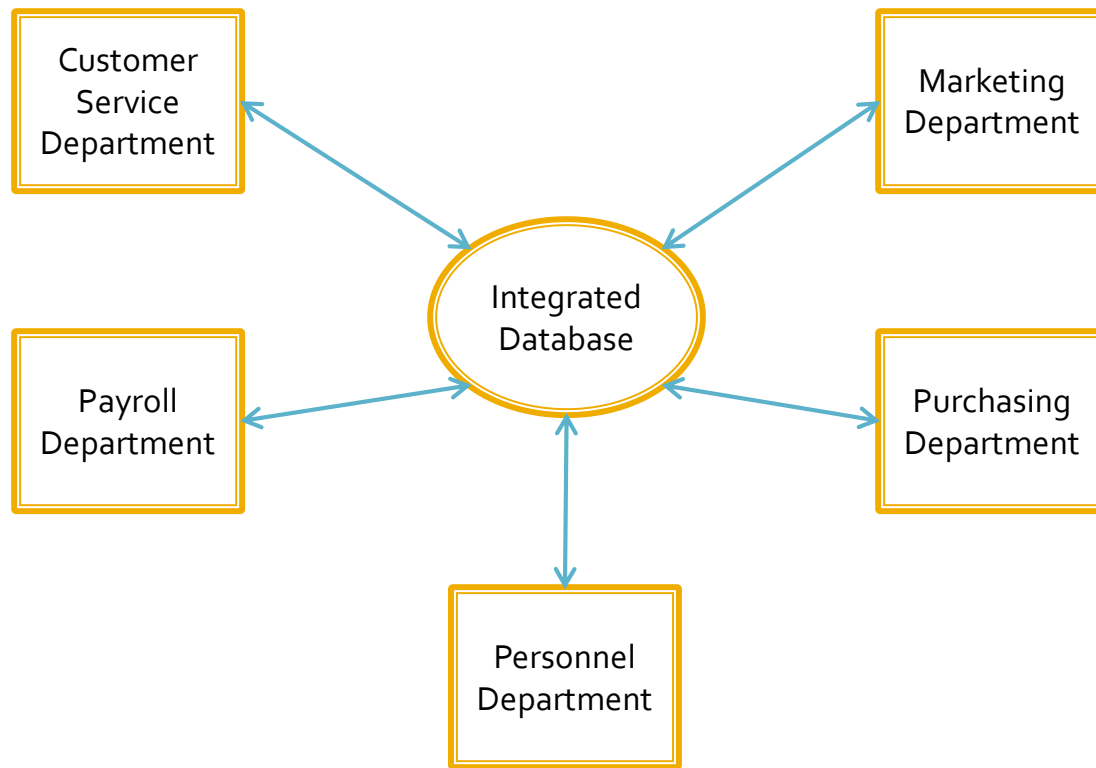
STUDENT_COURSES	Student Number	Course Number
	2005-47092	CMSC 11
	2005-47092	CMSC 123

COURSE	Course Number	Course Title	Department
	CMSC 11	Introduction to Computer Science	ICS
	CMSC 123	Introduction to Data Structures	ICS

# File-oriented information system



# Database-oriented information system



# Purpose of Database

- In the early days, database applications were built on top of file systems
- Drawbacks of using file systems to store data:
  - Data redundancy and inconsistency
  - Difficulty in accessing data
  - Atomicity of updates

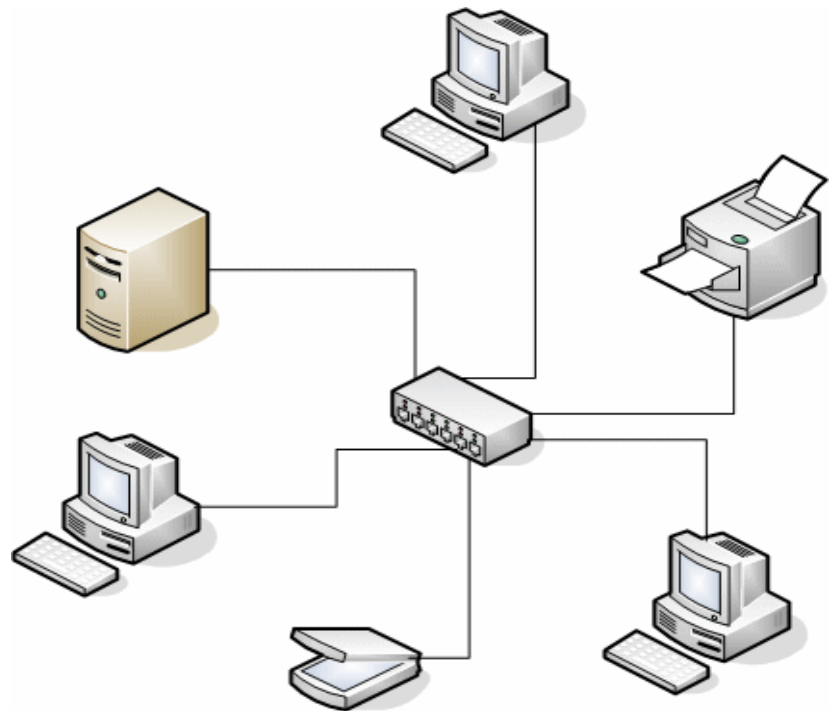
# Applications of Database

- Banking: all transactions
- Airlines: reservations, schedules
- Universities: registration, grades
- Sales: customers, products, purchases
- Manufacturing: production, inventory, orders, supply chain
- Human resources: employee records, salaries, tax deductions

# Networks

# Networks

- Computer network connects two or more autonomous computers.
- The computers can be geographically located anywhere.



# LAN, MAN, WAN

- A network in a small geographical area (like room, bldg., campus) is called **LAN (local area network)**.
- A network in a city is called **MAN (metropolitan area network)**.
- A network spread in a large or wide geographical area (like country or across the globe) is called **WAN (wide area network)**.



# Network Message Sending

- **Point to Point networks**
  - A method of communication where one "point" (person or entity) speaks to another entity.



# Network Message Sending

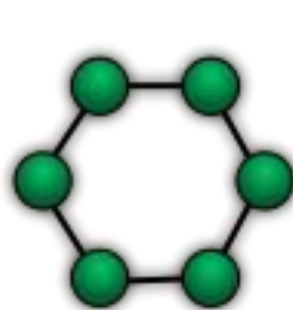
- **Broadcast Networks**
  - A method of sending a signal where multiple parties may hear a single sender.



# Network Topology

- A **network topology** defines the way in which computers, printers, and other devices are connected.
- A network topology describes the layout of the wire and devices as well as the paths used by data transmissions.

# Different network topologies



Ring



Mesh



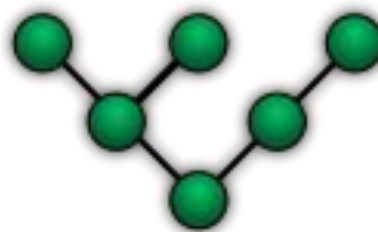
Star



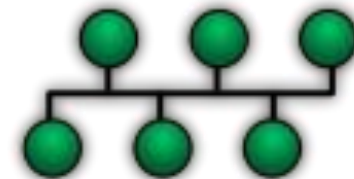
Fully Connected



Line



Tree



Bus

<http://en.wikipedia.org/wiki/File:NetworkTopologies.svg>

# Network Protocol

- A **protocol** is a set of rules that governs the communications between nodes in network.
- Rules include guidelines that regulate the following characteristics of network:
  - access method
  - allowed physical topologies
  - types of cabling
  - speed of data transfer

# Applications of networks

- **Resource Sharing**

- Hardware (computing resources, disks, printers)
- Software (application software)

- **Information Sharing**

- Easy accessibility from anywhere (file, databases)
- Search capability (WWW)

- **Communication**

- Email
- Message broadcast