Study Objectives

• Alternate Development Methods
Alternate Software Development Methods

- What are alternative software development methods

A. These are software programming or software engineering methods other than Structured methods

B. These are independent of Software Development methodologies

C. Object-Oriented Programming

D. Data-oriented systems development

E. Component-based model

F. All of the above
Structure Method of System Development

- Traditional Method
- Programs written in terms for function or subroutine
- A function can call another function
- Predates Object-Oriented (OO) System Development, but still in use
- “C” and “Pascal” are examples of programming languages which are not OO
Structure Method – Example
Structure Programming – Pseudocode Example

```plaintext
GetGrocery (count, list_topping)

Read the list
Read Count
Drive to Safeway Market
Pick up Grocery

Walk to shelf
Pick up items

GetGrocery (count, topping)
MakeDough ()
Bake ()
Serve ()
```
Alternate Development Method – Object-Oriented System Development

• Object-Oriented Programming Languages (OOP Language)
  – Simula67 (1967); Smalltalk (1970s)
  – C++, Object Pascal, Ada95 (1980s – 1990s)
  – Java (1990s); C# (2000s)

• Objects and Class
  – Objects are constructs with “attributes” and the “methods” that acted on it
  – Before OOP, “Structured” programming was used, where a program was written as a “function” that had a number of instructions that did the things like adding numbers, sort words, retrieve message from email etc.
  – In OOP the same problem is looked at differently. For example, Numbers, Words, or emails can be thought as objects. The objects have attributes like value of the numbers, the words, or the emails. There are “methods” associated with the objects, which act upon the attributes of the objects.
  – Objects can interact with each-other by sending messages.
  – Similar objects with different values can be created by the template of the object, call “class,” which is similar to cookie-cutter
Object-Oriented System Development

• Advantages of OOP
  – Data Encapsulation:
    • allows private attributes of the object not visible outside the object (abstraction)
    • allows implementation of the method to be separated from the signature of the method
  – Inheritance: allows reuse by creating super class and subclass (hierarchy)
Example of OOP using Java

```java
public class Human {
    private String name = "no name"; // the name of this human
    private Human friend = null; // the human's friend

    //This "creates" a new Human
    public Human(String name, Human friend) {
        this.name = name;
        this.friend = friend;
    }
    public Human(String name) {
        this.name = name;
        this.friend = null;
    }
    public Human() {
        this.name = "no name";
        this.friend = null;
    }
    public void sayName() {
        System.out.println("My name is " + this.name);
    }
    public void sayGoodnight() {
        if (friend == null)
            System.out.println("Good night nobody.");
        else
            System.out.println("Good night " + friend.name);
    }
}

public class Main {
    public static void main(String[] args) {
        //create a new human object john
        Human john = new Human("John");
        //create a human object named jane with john as a friend
        Human jane = new Human("Jane", John);
        john.sayName(); //shows 'My name is John'
        john.sayGoodnight(); //shows 'Good night nobody.'
        jane.sayName(); // shows 'My name is Jane'
        jane.sayGoodnight(); //shows 'Good night John'
    }
}
```

Class and Object Relationship
Inheritance
OO Concept

- A good reference (page 1-32)

Alternative Development Methods – Component Based Development

• Component based development is an outgrowth of object-oriented development

• Component types

1. Stand-alone client component: applications that expose services to other software such as MS Word, Excel
2. In-process client component: run from a container such as web browser such as java applet
3. Stand-alone server components: run on the server, and can be invoked using some kind of remote procedure calls such as CORBA, Sun’s RMI, Microsoft DCOM
4. In-process server components: run on the server within containers such as Sun’s EJB or Microsoft MTS
Component Based Development

• Advantages
  – Reduces development time
  – Promotes modularity
  – Promotes reuse
  – Reduces development cost
  – Supports multiple development environments
Modern Component Based Distributed Architecture (week 7)

Client-Server Computing Model had typically multiple clients connecting to the same server that processes the request.
Alternative Development Methods – Web-Based Development

• Web-services based development further simplifies the integration across the components using platform and language independent standards

• Web-services characteristics
  1. XML based
  2. SOAP (Simple Object Access Protocol) defines a standard way of invoking remote object
  3. WSDL (Web Services Description Language) is XML-based representation of the input and output data, along with the service contract to be invoked
  4. UDDI (Universal Description, Discovery, and Integration) is used for the service discovery

• Web-services based integration is today’s de-facto standard
Alternative Development Methods – Software Reengineering

• Software Reengineering allows revamping an existing system by extracting and reusing business logic and program component

• Similar to Business Process Re-engineering (BPR)
Alternative Development Methods – Reverse Engineering

• Involves extracting the business logic and design from the code
• Decompilers are tools used in reverse engineering
• Helps in faster delivery
• Risks involves any current license agreement prohibiting reverse engineering
Question

Which of the following development methodologies is based on knowledge in someone's head, as opposed to traditional requirements?

A. System Development Life Cycle (SDLC)
B. Object-Oriented Programming (OOP)
C. Agile
D. Rapid Application Development (RAD)
OO Concept

• A good reference (page 1-32)

Upcoming Assignments/Tests

1. Group Case Study -2 (Requirements): Mon 11/3 11/10 before the class
2. Group Case Study -3 (Testing): Mon 12/1 before the class

Questions?
Summary of Today’s Class

• OOP
• Alternate Development Methods
• Focus of the Next Class and Reading
• Questions