Introduction to Software Reuse

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Software Reuse

- The use of existing software or software knowledge to build new software

- In the last 20 years, several reuse techniques have been proposed
  - Libraries, objects, components, and so on

- *Open source* initiatives have created a large amount of source code available
Granularity of Reuse

- **Objects and Functions**
  - Most common type of reuse
  - It has been practiced for 50 years

- **Components**
  - Middle-granularity reuse. Examples are architectural components and subsystems

- **Systems**
  - A system can be packed for reuse and, for instance, included into a larger system
  - It usually requires customization
Advantages of Software Reuse

- Expect to decrease time and costs
  - The system may be delivered in shorter time and at lower price

- Increase the product reliability
  - Software was used and tested before

- Use of expert knowledge
  - A way of exchange knowledge

- Follow standards
  - For instance, interface have similar look and feel
Potential Drawbacks

- Maintenance Costs
  - Reused components may become incompatible with others in future versions

- Lack of Tool Support
  - Development environments are not fully prepared to support software reuse

- It is hard to maintain a library
  - You need to find the right software and understand how it works, before reusing
Types of Reuse by Motivation

- Opportunistic Reuse
  - While getting ready to begin a project, the team realizes that there are existing components they can reuse

- Planned Reuse
  - A team strategically designs components so that they will be reusable in future
Planning for Reuse

- Effective reuse requires planning
  - Managers have to be engaged and motivate the whole organization

- Companies focused on a specific domain have advantages
  - It is easier to find reuse opportunities in this case
Several factors have to be considered in planning for reuse:
- Development schedule
- Software lifecycle
- Expertise and knowledge of the team
- Application domain

more in the textbook
Schedule and Lifecycle

- Development schedule
  - In a tight schedule scenario, reuse may speed up software development
  - The learning curve might be a bottleneck

- Software lifecycle
  - Software reuse might be challenge in highly changed code
  - Third-part components may impose maintenance difficulties
Team and Application Domain

- Expertise and knowledge of the team
  - People have to be familiar with the reuse technique
  - Some reuse techniques might be hard to be understood and applied

- Application Domain
  - In some domains, it is easy to find reusable components and libraries
  - Other domains are not so easy
Overview of Reuse Techniques

- Design Patterns
- Architecture Patterns
- Frameworks
- API and Libraries
- Encapsulation of Legacy Systems
- Configurable Applications
- Software Product Lines
- COTS
- Component-based Development
- Generative Programming
- Feature-Oriented Programming
- Aspect-Oriented Software Development
- Model-driven Development
- Service-Oriented Architecture
- Generative Programming
Reuse Techniques (1 of 3)

- **Library and API**
  - Classes and functions that implement common reusable abstractions

- **Design and Architecture Patterns**
  - Patterns are reusable general solutions for recurring problems

- **Application Framework**
  - It is as set of classes that implements the standard structure of an application
Reuse Techniques (2 of 3)

- Components
  - Subsystems that can be integrated to create a new system

- Encapsulation of Legacy Systems
  - Cheap option that wraps a legacy system and defines new interfaces

- Service-Oriented Architecture
  - New systems are developed by sharing common services
Reuse Techniques (3 of 3)

- Aspect Oriented Software Development
  - Reuse technique to support advanced separation of concerns (modularity)

- Software Product Lines
  - Family of applications following a common architecture

- Model Driven Development
  - Code is generated by means of refining domain and application models
Bibliography

  - Chap. 16  Software Reuse