

Detailed Design

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Detailed Design

Detailed Design Definition [ISO/IEC 24765]

1. the process of refining and expanding the preliminary design of a system or component to the extent that the design is sufficiently complete to be implemented;
2. the result of the process in (1).

OO Software Detailed Design — How To

Sketch CRC (Class-Responsibility-Collaboration) for each class

UML diagram for system objects and their collaboration

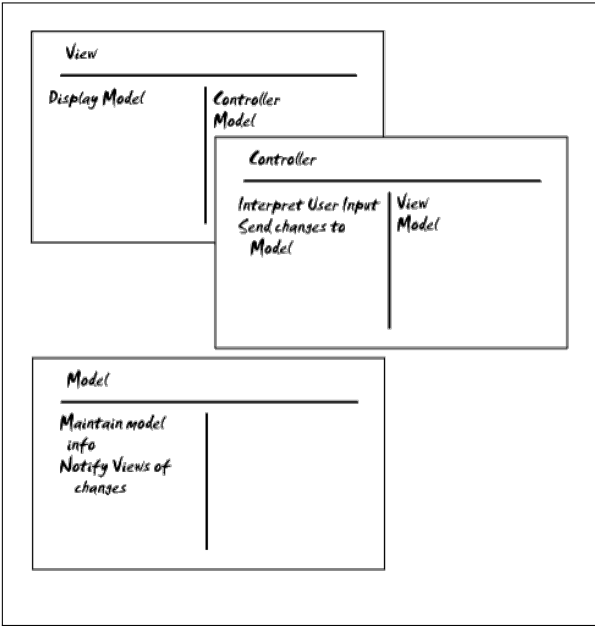
Determine interfaces (ie operations) of each class

Specify contract for each operation

Select algorithms and data structures for each class

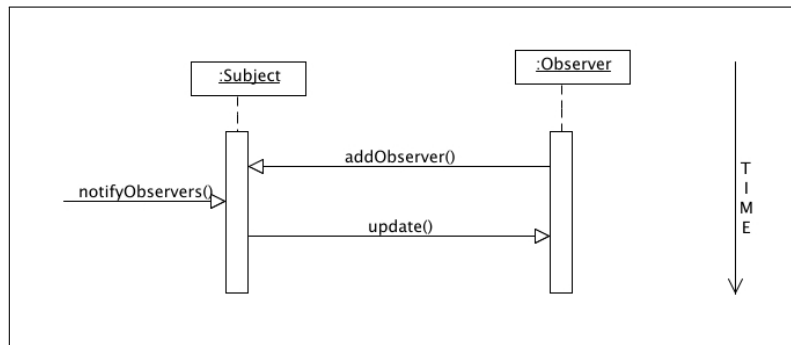
Describe algorithm for each major operation using UML note

Example: CRC Cards for Model-View-Control Architecture



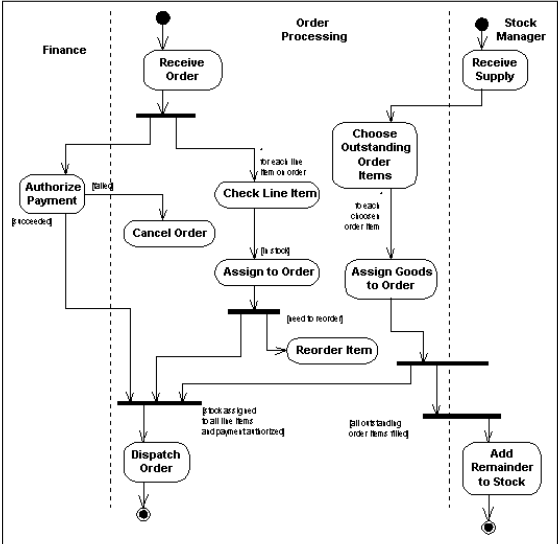
Example: Collaborations in UML

Sequence Diagram for Observer Pattern



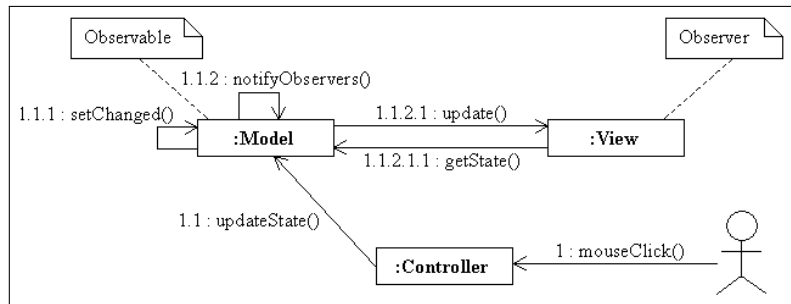
Example: Collaborations in UML

Activity Diagram for Order Processing



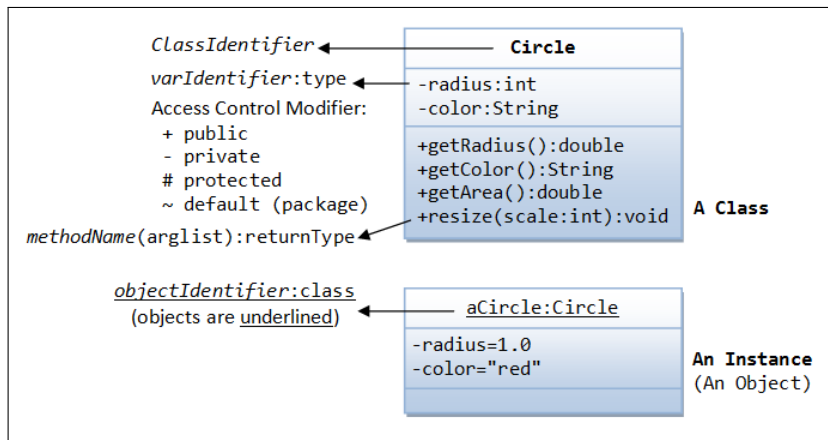
Example: Collaborations in UML

Communication Diagram for Model-View-Control



Example: Class Interfaces in UML

UML Class



Example: Pre-conditions and Post-conditions

```
issueBookToStudent(Student s, Book b)
```

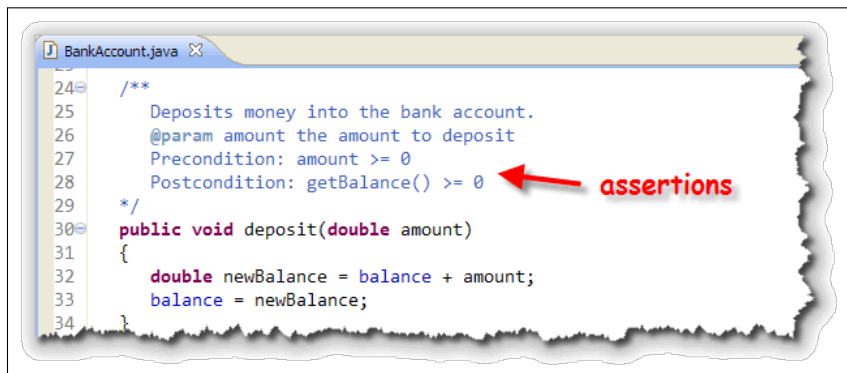
```
pre:
```

1. s is in students, b is in books
2. b is not issued to anyone
3. there are no reservations for b or
if there are reservations for b, e is
the first one

```
post:
```

1. old(students) and students are identical
2. old(books) and books are identical
3. s has been issued the book b
4. there is no reservation of s for b

Example: Java Assertions



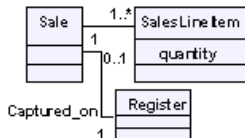
```
BankAccount.java X
24 /**
25     Deposits money into the bank account.
26     @param amount the amount to deposit
27     Precondition: amount >= 0
28     Postcondition: getBalance() >= 0
29 */
30 public void deposit(double amount)
31 {
32     double newBalance = balance + amount;
33     balance = newBalance;
34 }
```

assertions

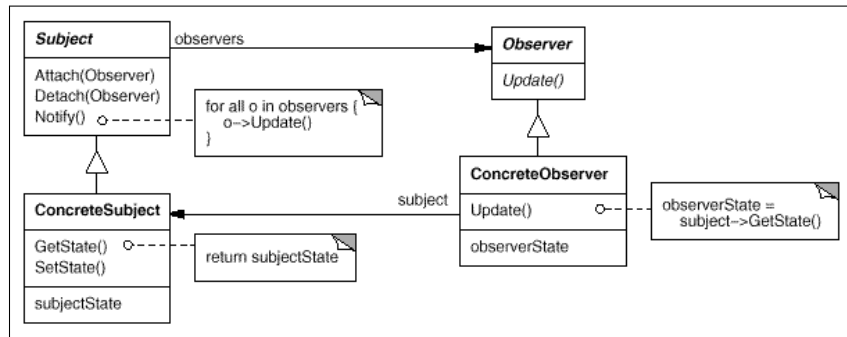
Example: Larman System Operation Contract

Basic Contract Format for Operations

- **Name** enterItem(itemID, quantity)
- **Cross Reference** Use case: Process sale
- **Responsibilities** Record Sale of an item and add it to the sale. Display item description and price.
- **Pre-Conditions** Product itemID is known to the system.
- **Post-Conditions** SalesLineItem corresponding to product itemID was created. SalesLineItem was associated with the sale. Instance.quantity became quantity. Instance was associated with a ProductDescription based on itemID match.



Example: UML Note for Observer Pattern



Data Structures in Libraries

String

Containers or Collections

Vector and Array: indexed by scalar type, often fixed length

Set: no order, no duplicates

List: order, duplicates

Bag (or Multiset): no order, duplicates

Map: relates *“key”* and *“value”* pairs