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DT228 2

Software Engineering 2 Assignment

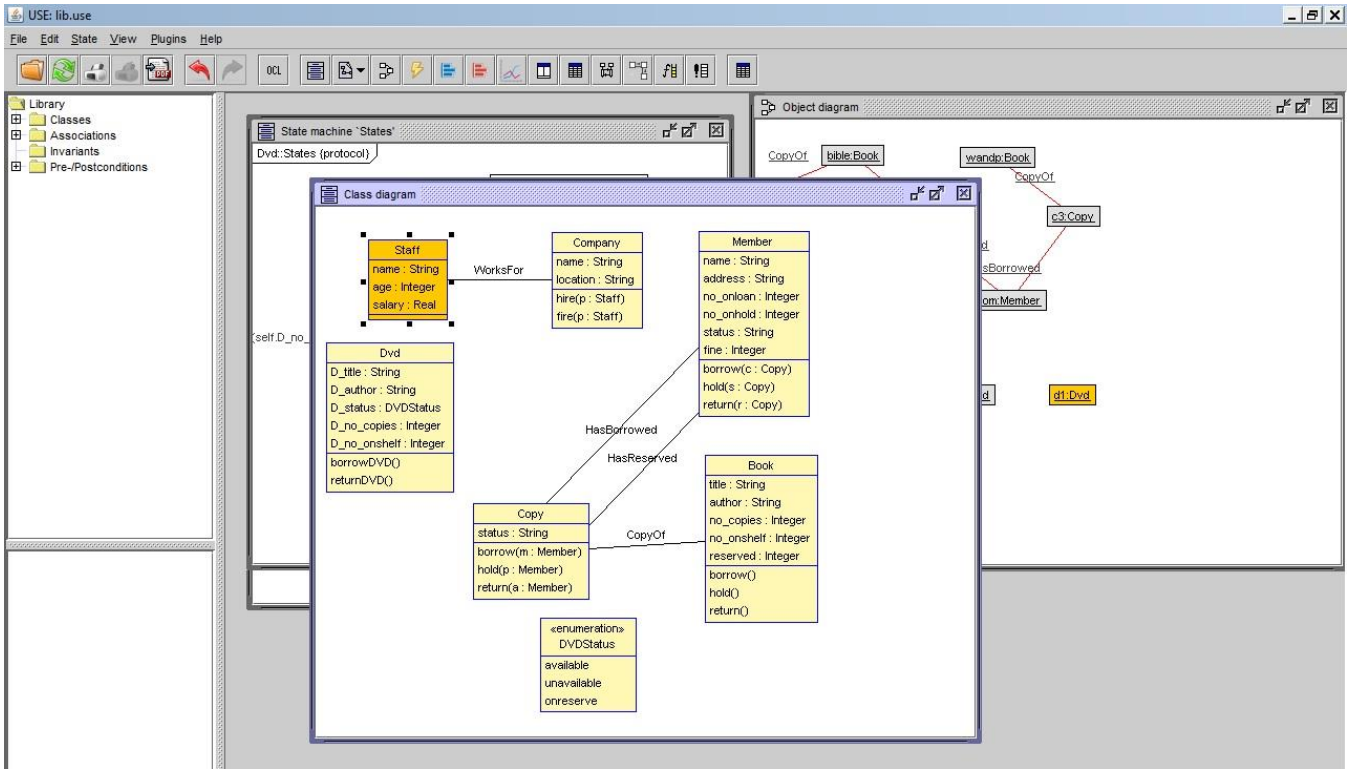
Overview

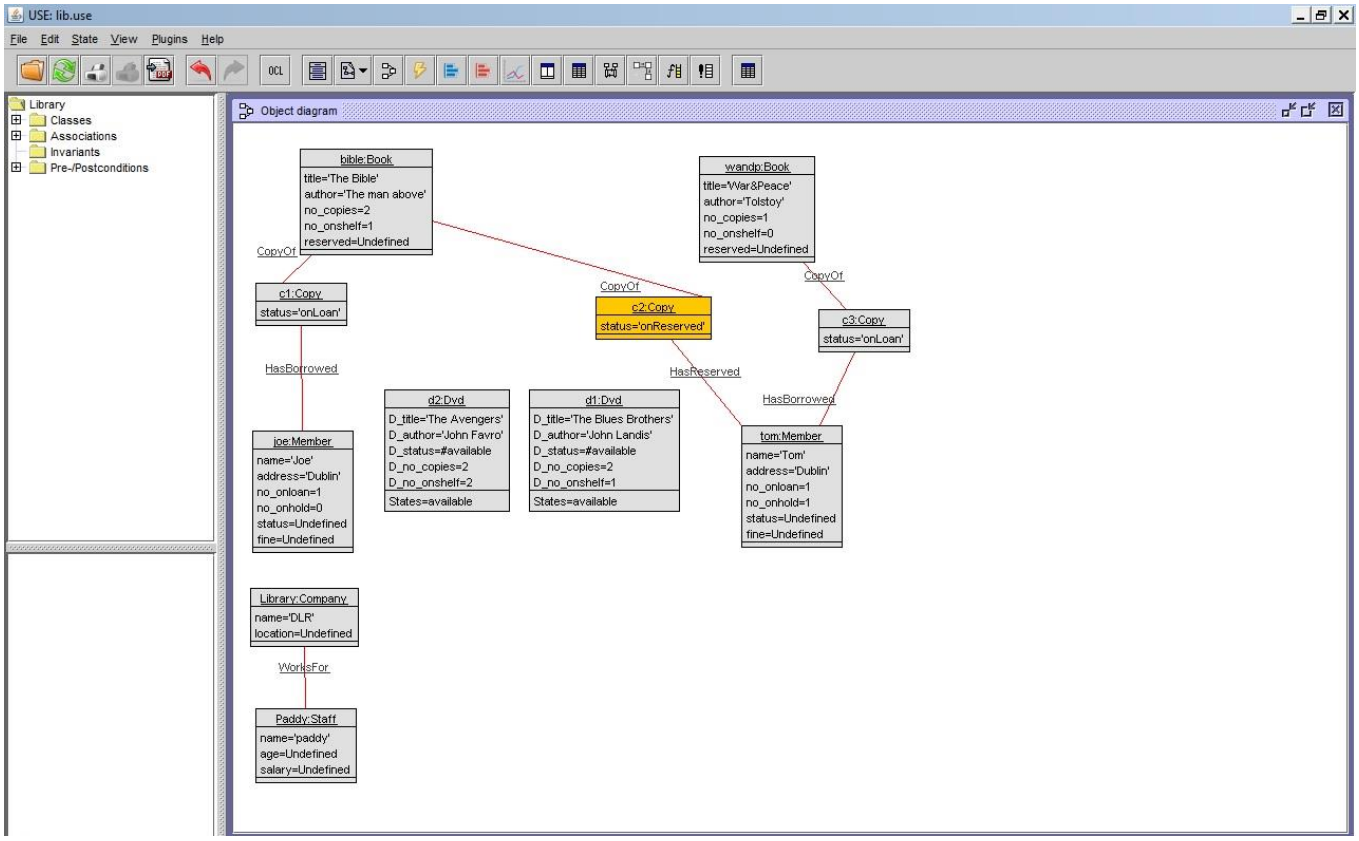
My assignment was an expansion on the Library system that we worked on in the Labs. I made some additional changes and expanded the system to make it more like a real library. I made some changes to the code and added a return and a reserve system to the use model. I also added a dvd rental system to test !openter and !opexit operations and a hiring staff system to uses statemachines. These are some similar expansion on the systems we have worked on in the labs.

The system allows the user to enter some details to create a library system. It allows the user to create the library, add books/DVDS, add members and add staff. They cater to a wide use of systems and vary depending on the task at hand.

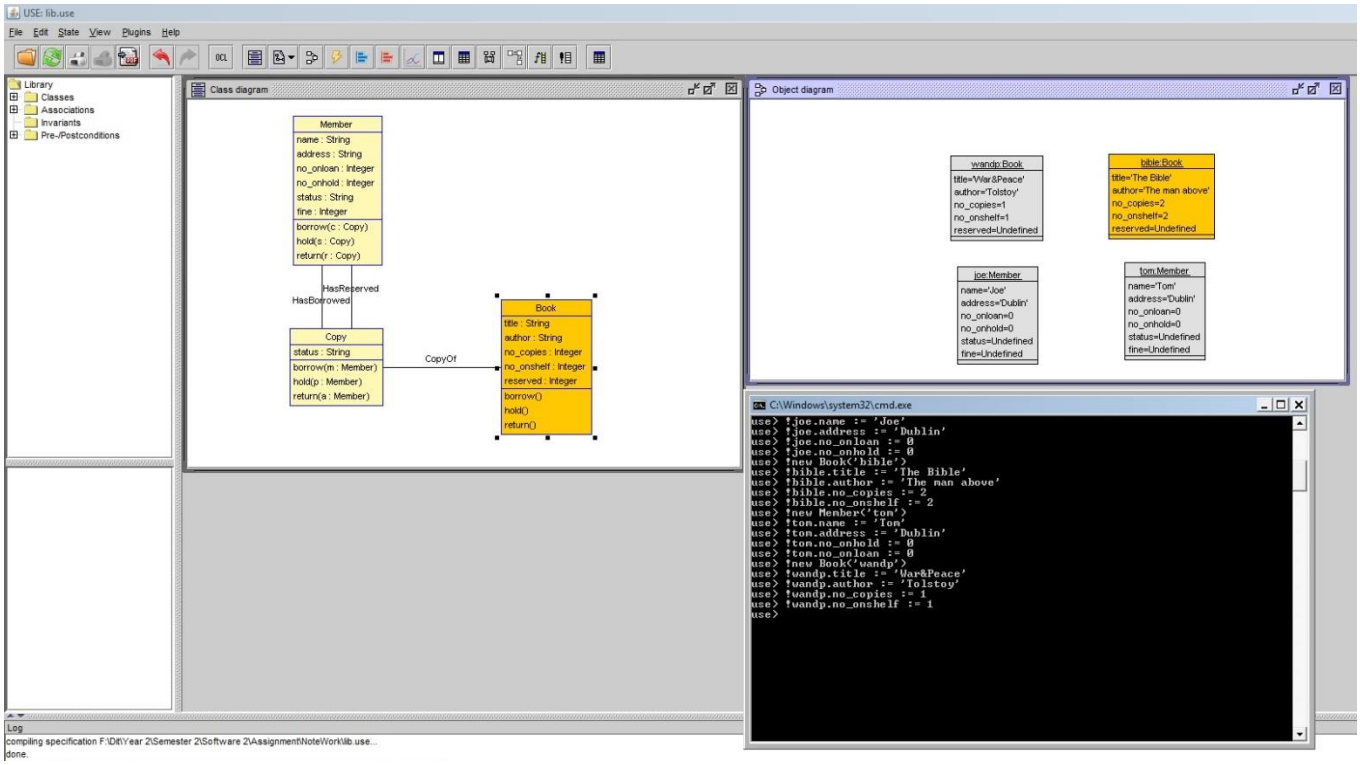
Note: I had to swap between two computers when taking the screenshots, so if they are hard to see I added an images folder with the report.

USE examples

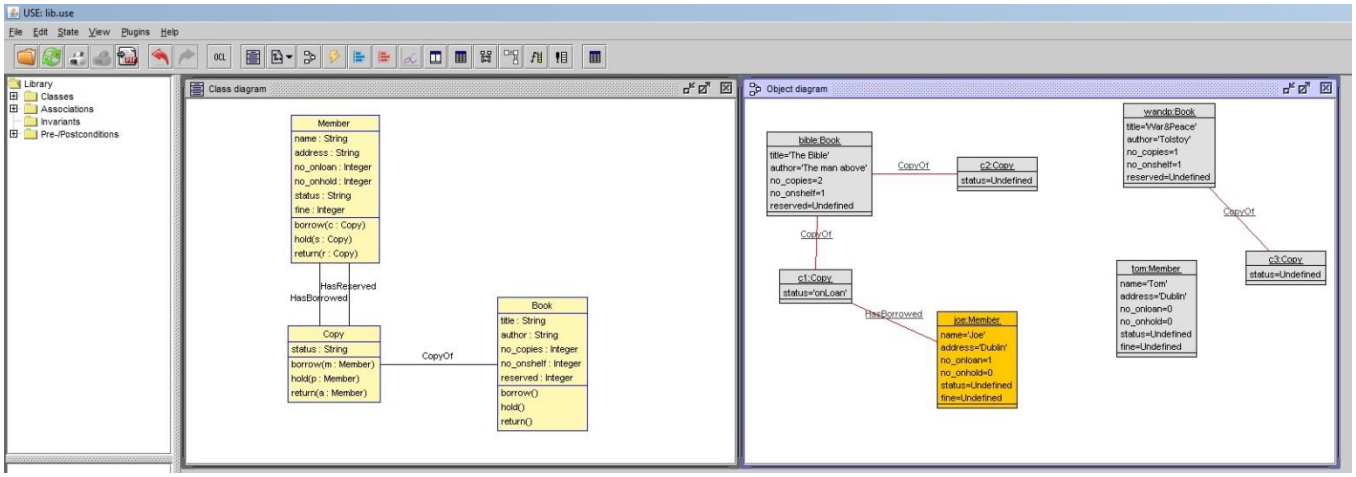




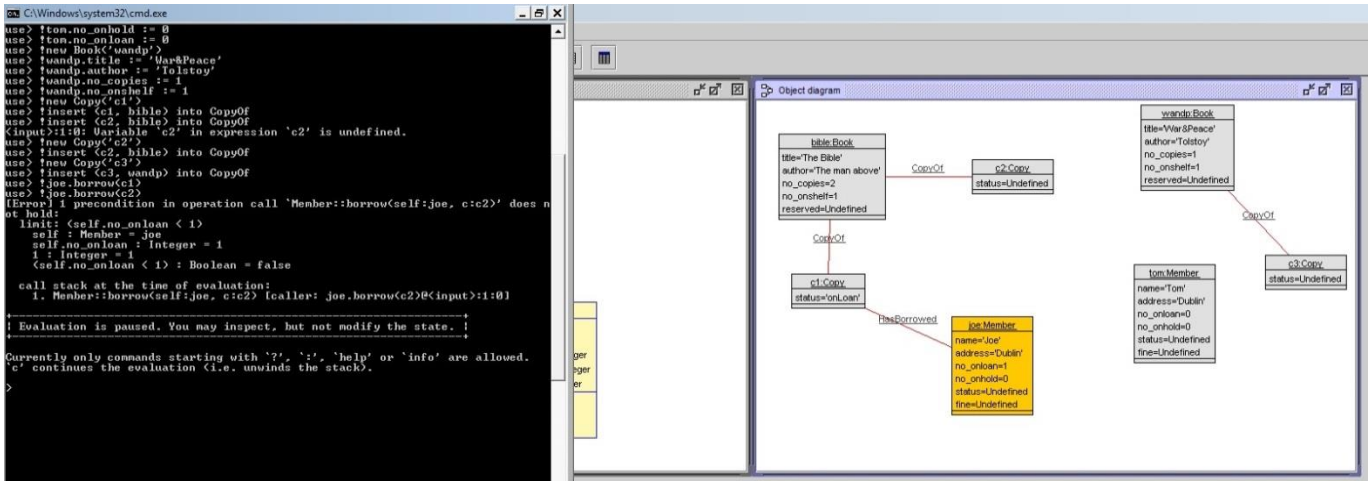
1st was to sort out the soil commands to create a basic object diagram.



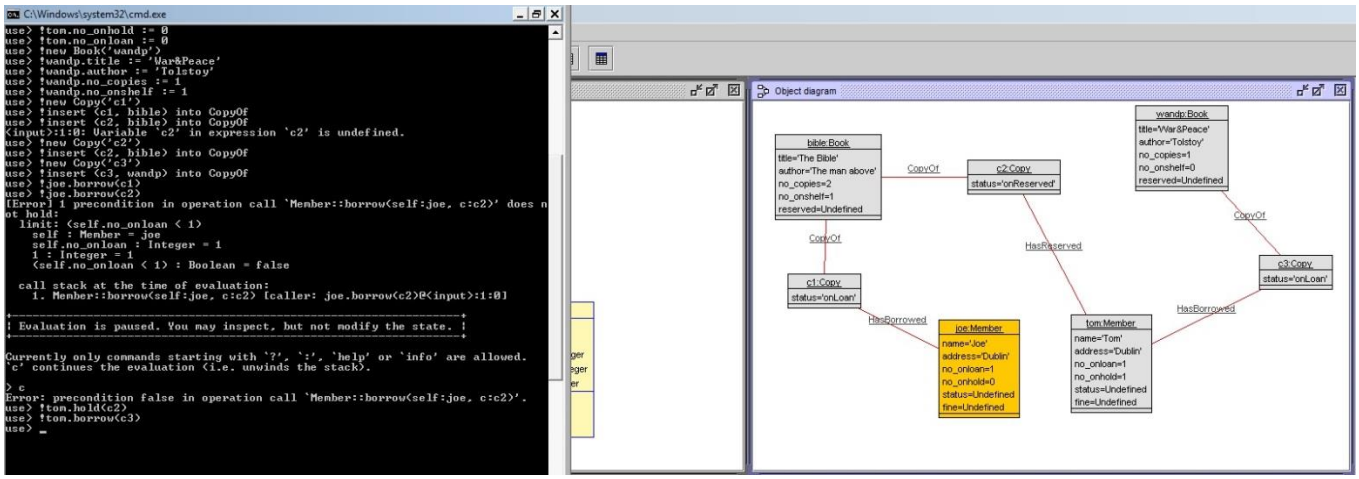
Next I inserted some of the objects together using soil operations.


USE: lib.use
File Edit State View Plugins Help
Library
Classes
Associations
Invariants
Pre-/Postconditions
Class diagram
Member
name : String
address : String
no_onloan : Integer
no_onhold : Integer
status : String
fine : Integer
borrow(c : Copy)
hold(s : Copy)
return(r : Copy)
HasReserved
HasBorrowed
Copy
status : String
borrow(m : Member)
hold(p : Member)
return(a : Member)
CopyOf
Book
title : String
author : String
no_copies : Integer
no_onshelf : Integer
reserved : Integer
borrow()
hold()
return()
Object diagram
bible:Book
title='The Bible'
author='The man above'
no_copies=2
no_onshelf=1
reserved=Undefined
CopyOf
c2:Copy
status=Undefined
CopyOf
c1:Copy
status='onLoan'
HasBorrowed
joe:Member
name='Joe'
address='Dublin'
no_onloan=1
no_onhold=0
status=Undefined
fine=Undefined
wandp:Book
title='War&Peace'
author='Tolstoy'
no_copies=1
no_onshelf=1
reserved=Undefined
CopyOf
c3:Copy
status=Undefined
tom:Member
name='Tom'
address='Dublin'
no_onloan=0
no_onhold=0
status=Undefined
fine=Undefined

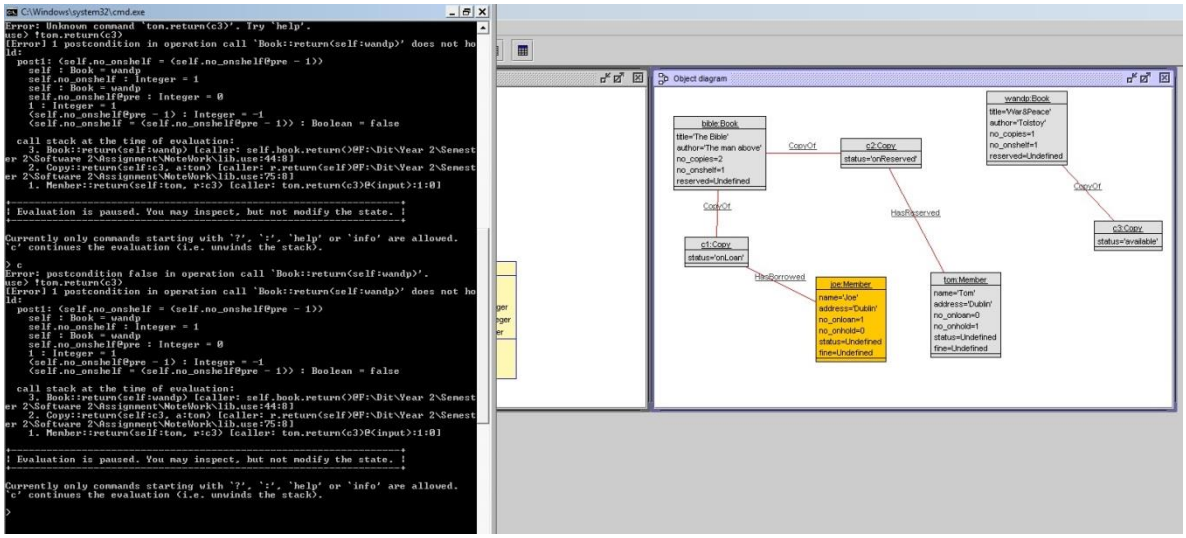
Then tested the operations for a member to borrow a book from the library and then the system would decrement how many books were available. I then showed that he couldn't borrow the same book again.



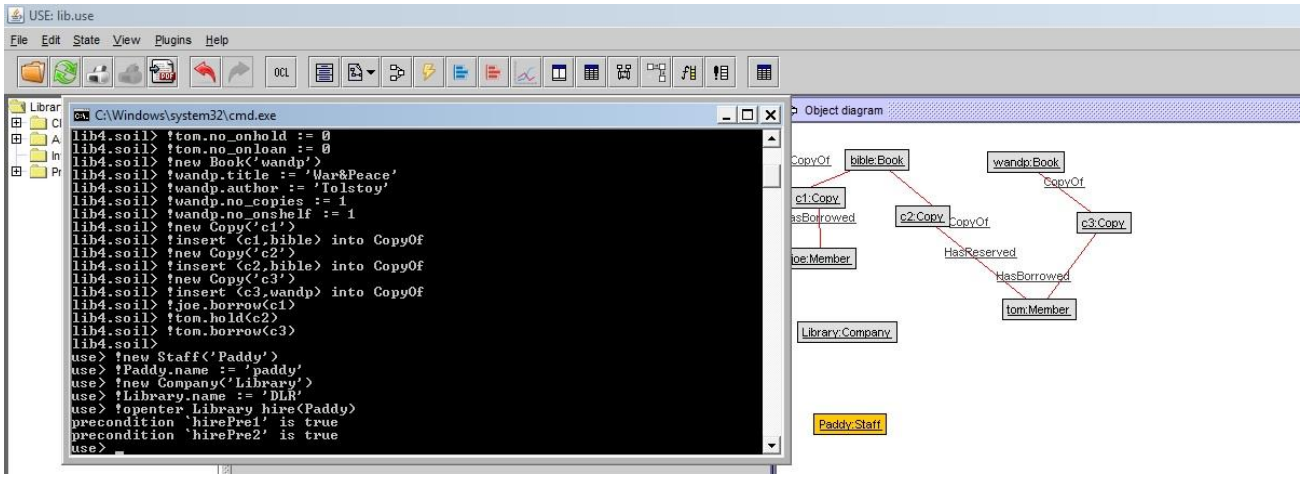
The second member of the library was able to reserve the book, and the book was still in the library but was reserved.



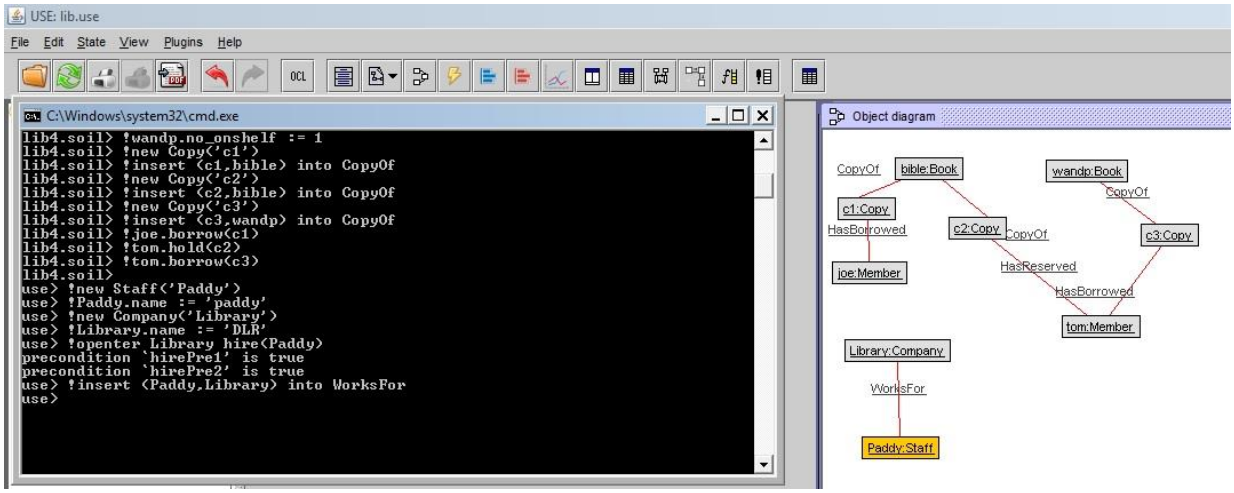
The second member is able to rent the second book, as well as hold the book as reserved.



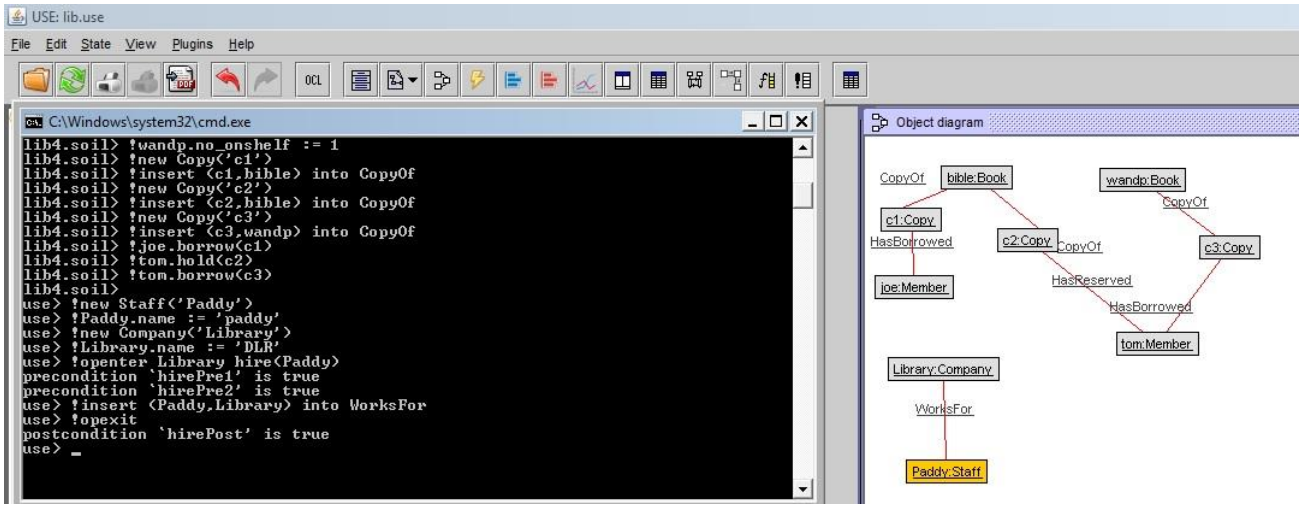
I then tested the return and was able to return the book, and also that it wouldn't allow the member to return a book if they don't have any.



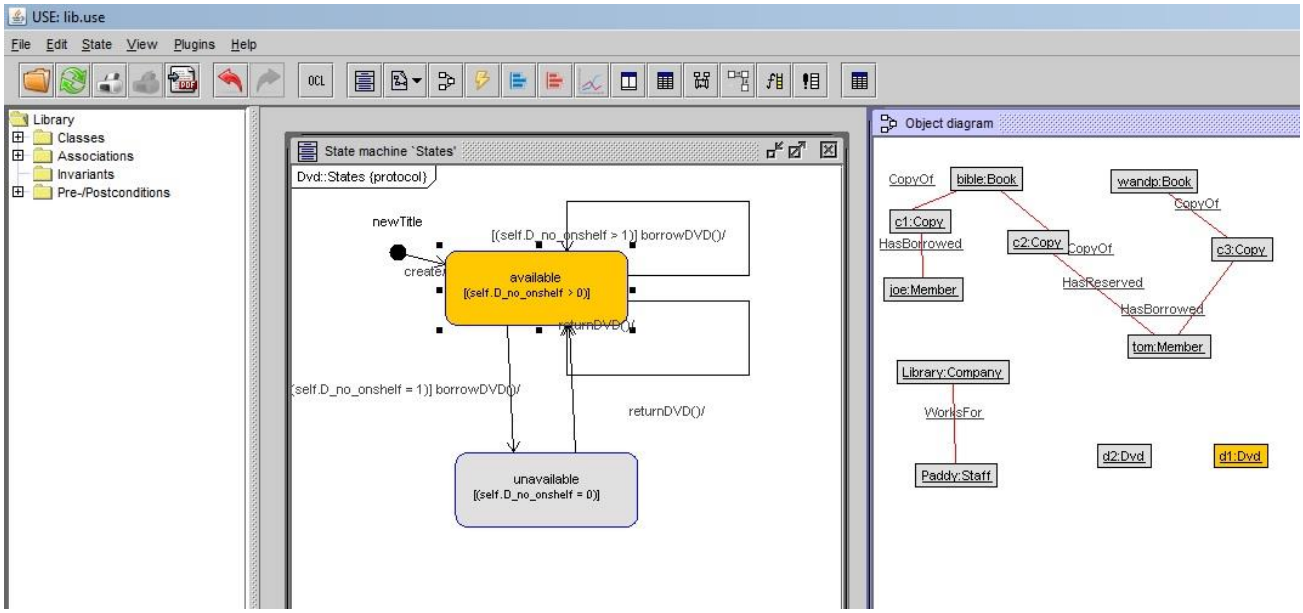
Testing the !openter operation on hiring a new staff member. The conditions showed true that he could be hired.



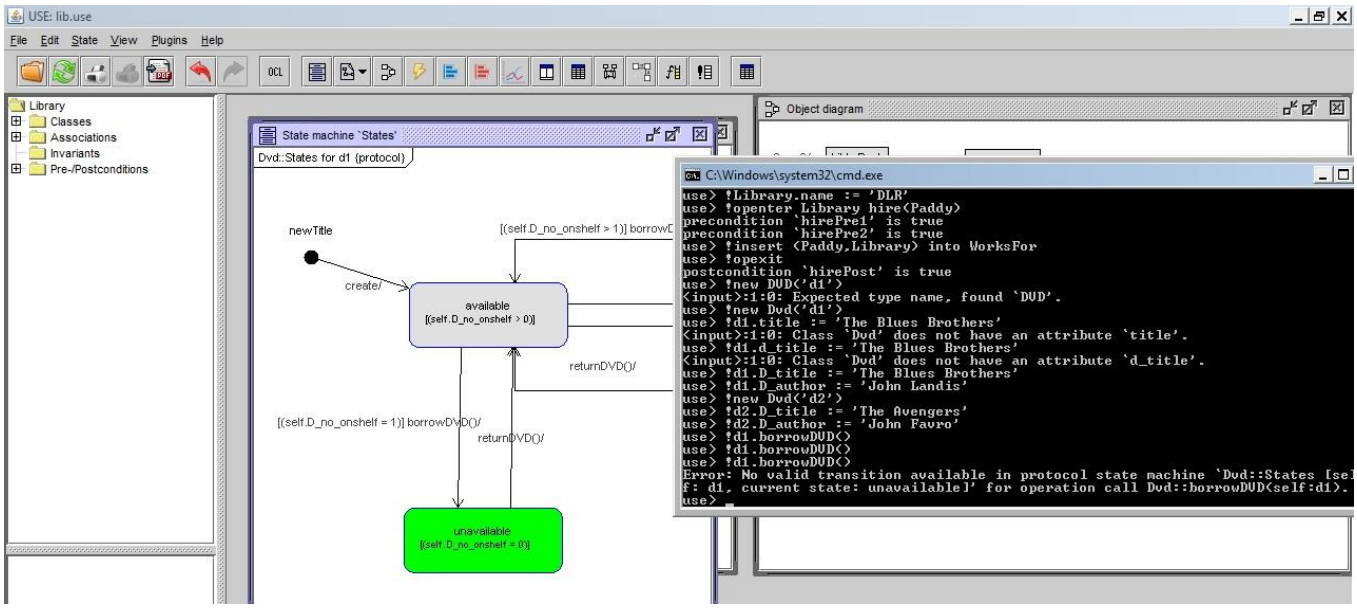
Using the !openter to insert the member into the library.



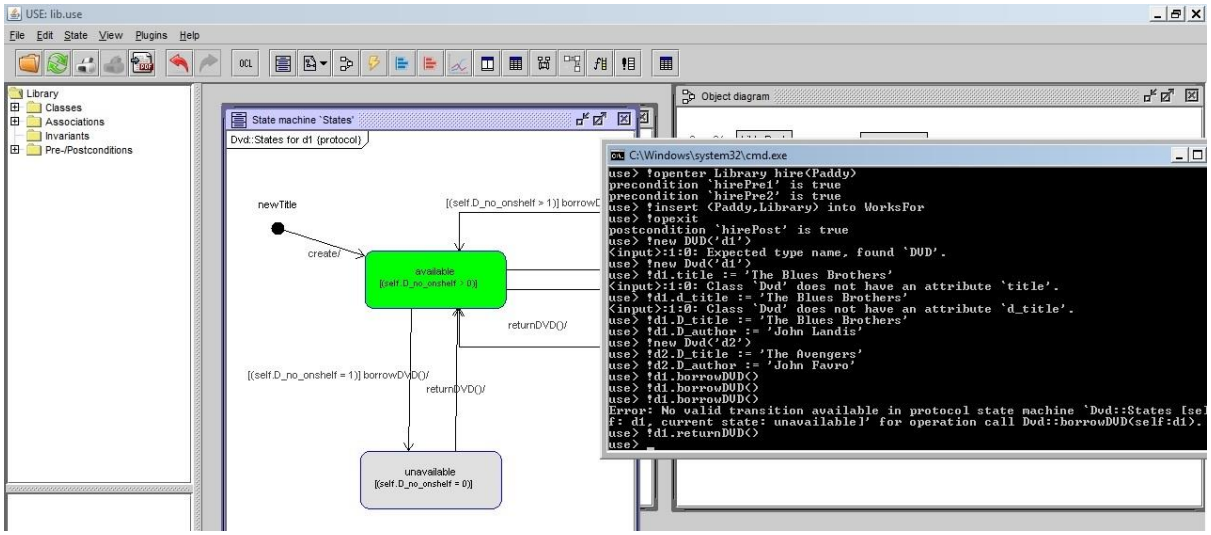
The !opexit proved that the post condition ended up true.



I then generated a statemachine for the DVD system I added.

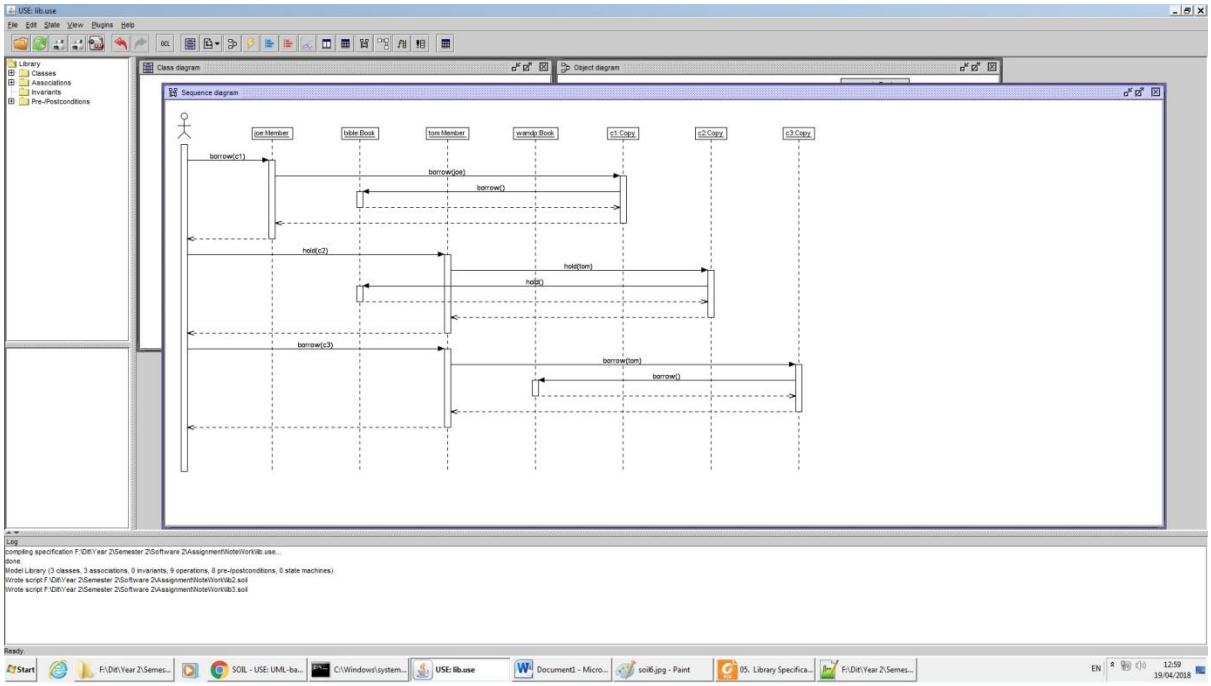


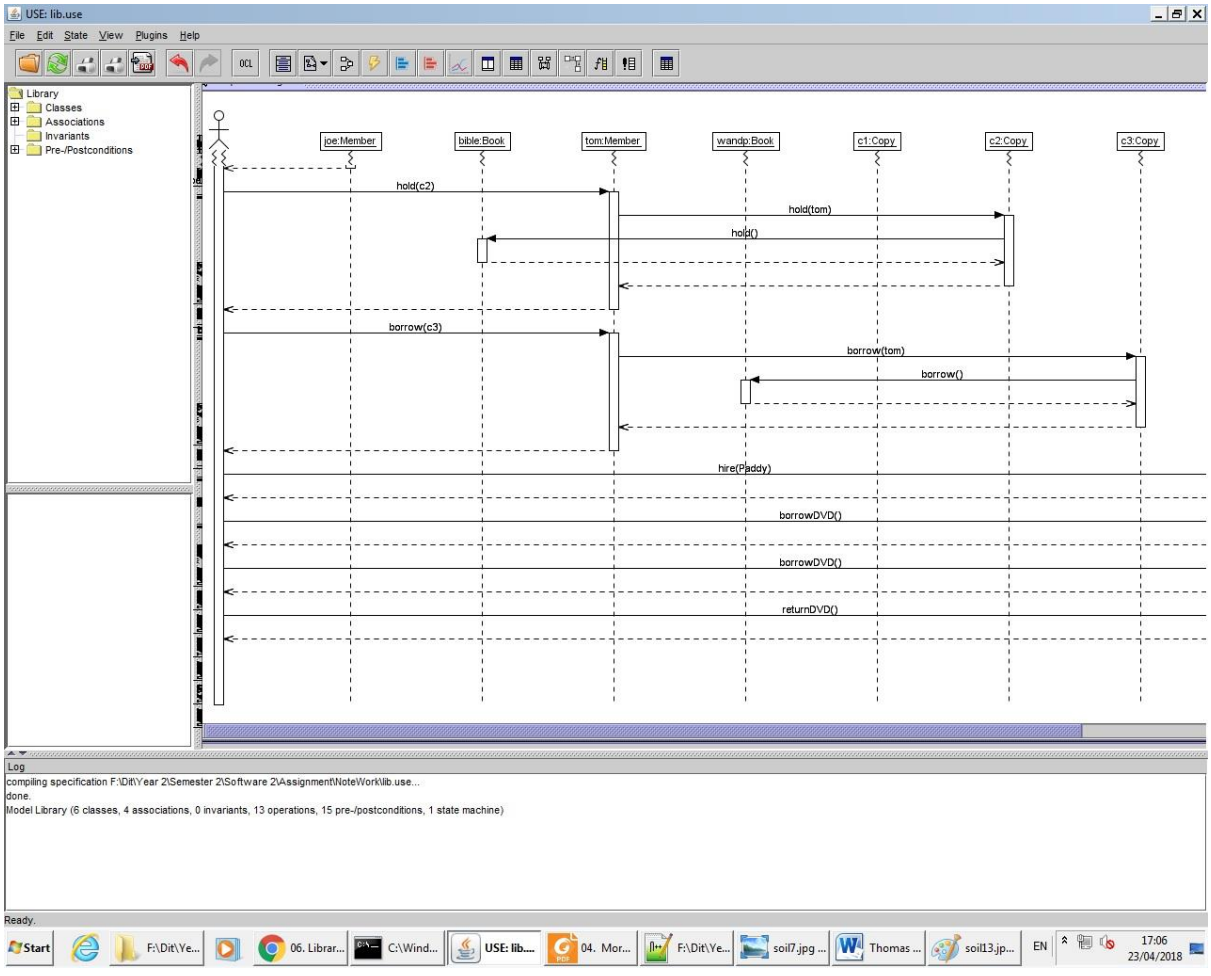
I then showed that the DVD could be borrowed but it couldn't be borrowed more than twice as it the condition is set to two dvds.



I then returned to show that the system was able to remove it and the statemachine changes.

Sequence Diagrams





Use Code

```
model Library


enum DVDStatus { available, unavailable, onreserve}


class Book
  attributes
    title : String
    author : String
    no_copies : Integer
    no_onshelf : Integer
    reserved : Integer
  operations
    borrow()
    begin
       self.no_onshelf := self.no_onshelf - 1
    end
    hold()
    begin
       self.reserved := self.reserved - 1
    end
    return()
    begin
       self.no_onshelf := self.no_onshelf +1
    end
    pre copiesOnShelf: no_copies >0
    post: no_onshelf = no_onshelf@pre - 1
```

```
end


class Copy
  attributes
    status : String
  operations
    borrow( m : Member)
    begin
        self.status := 'onLoan';
        self.book.borrow()
    end
    hold( p : Member)
    begin
        self.status := 'onReserved';
        self.book.hold()
    end
    return( a : Member)
    begin
        self.status := 'available';
        self.book.return()
    end
end




class Member
  attributes
```

```
  name : String
  address : String
  no_onloan : Integer
  no_onhold : Integer
  status : String
  fine : Integer
 operations
  borrow(c : Copy)
  begin
    insert (self, c) into HasBorrowed;
    self.no_onloan := self.no_onloan + 1;
    c.borrow(self)
  end
  hold(s : Copy)
  begin
    insert (self,s) into HasReserved;
    self.no_onhold := self.no_onhold + 1;
    s.hold(self)
  end
  return(r : Copy)
  begin
    delete (self,r) from HasBorrowed;
    self.no_onloan := self.no_onloan -1;
    r.return(self)
  end
end
```

```
class Staff
        attributes
                name : String
                age : Integer
                salary : Real
end

class Company
        attributes
                name : String
                location : String
        operations
                hire(p : Staff)
                fire(p : Staff)
end

association WorksFor between
  Staff[*] role employee
  Company[0..1] role employer
end

association HasBorrowed between
    Member[0..1] role borrower
    Copy[*] role borrowed
end

association CopyOf between
```

```
    Copy[1..*] role copies
    Book[1] role book
end

association HasReserved between
    Member[0..1] role holder
    Copy[*] role held
end

class Dvd
            attributes
                        D_title : String
        D_author : String
        D_status : DVDStatus init = #available
        D_no_copies : Integer init = 2
        D_no_onshelf : Integer init = 2
             operations
        borrowDVD()
        begin
           self.D_no_onshelf := self.D_no_onshelf - 1;
           if (self.D_no_onshelf = 0) then
              self.D_status := #unavailable
           end
        end

        returnDVD() begin
           self.D_no_onshelf := self.D_no_onshelf + 1;
```

```
        self.D_status := #available
    end
    post: D_no_onshelf = D_no_onshelf@pre + 1

statemachines
    psm States
    states
        newTitle : initial
        available       [D_no_onshelf > 0]
        unavailable     [D_no_onshelf = 0]
    transitions
        newTitle ->  available  { create }
        available -> unavailable { [D_no_onshelf = 1] borrowDVD() }
        available -> available { [D_no_onshelf > 1] borrowDVD() }
        available -> available { returnDVD() }
        unavailable -> available { returnDVD() }
    end
 end

constraints

context Member::borrow(c:Copy)
          pre cond5: c.isDefined()
   pre limit: self.no_onloan < 1
   pre cond1: self.borrowed->excludes(c)
   post cond2: self.borrowed->includes(c)
```

```
context Member::hold(s:Copy)
    pre limit: self.no_onhold < 1
    pre cond3: self.held->excludes(s)
    post cond4: self.held->includes(s)

context Company::hire(p : Staff)
  pre  hirePre1: p.isDefined()
  pre  hirePre2: employee->excludes(p)
  post hirePost: employee->includes(p)

context Company::fire(p : Staff)
  pre  firePre:  employee->includes(p)
  post firePost: employee->excludes(p)
```