CHAIN OF RESPONSIBILITY DESIGN PATTERN

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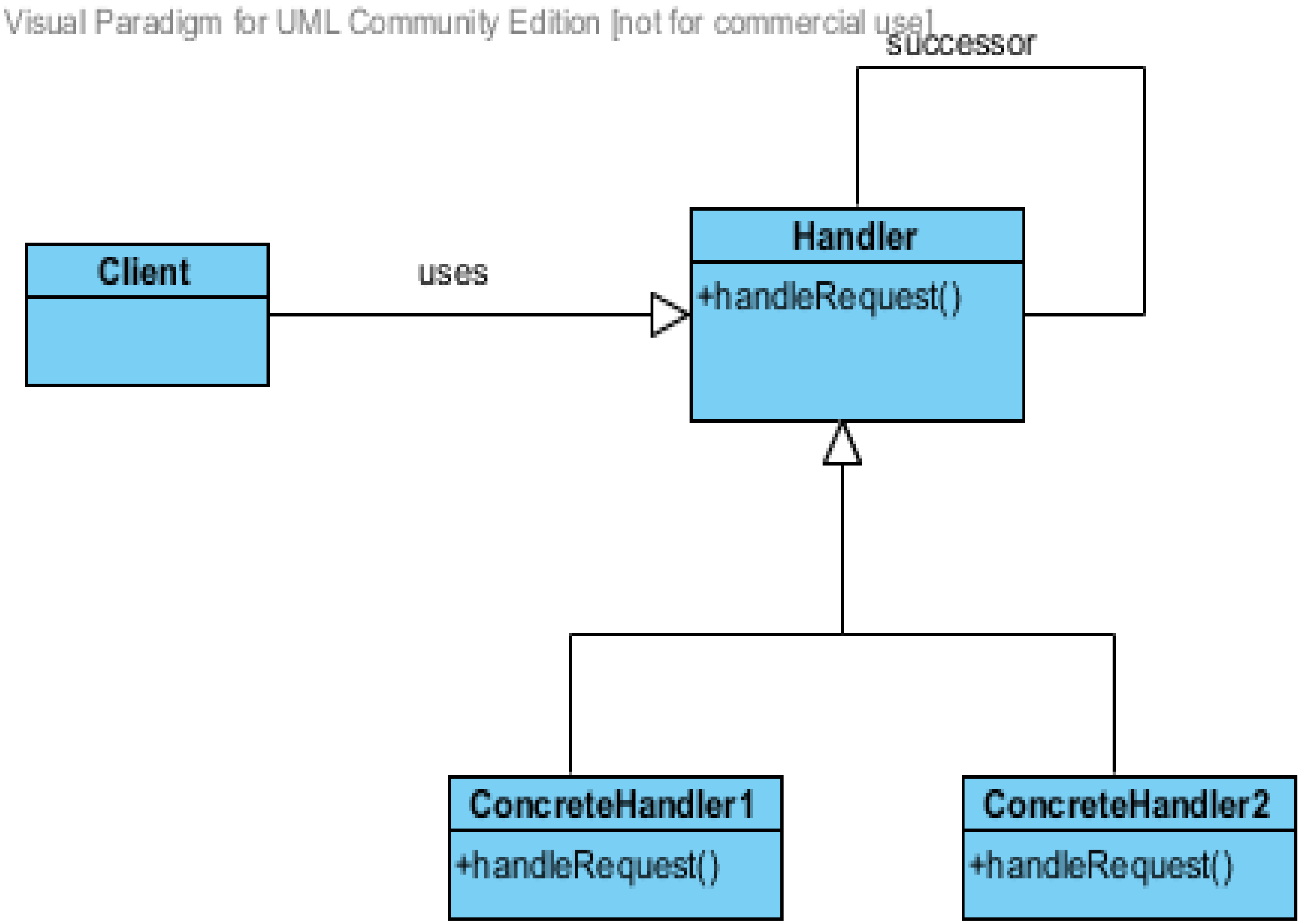
INTENT

- Behavioral pattern
  - Concerned with algorithms and assignments of responsibility between objects
  - Describe the pattern of communication between objects and classes
  - Characterize complex control flow that’s difficult to follow at run time
- Avoid coupling the sender of a request to its receiver
  - By giving more than one object a chance to handle the request
- Chain the receiving objects and pass the request along the chain until an object handles it

IN GENERAL TERMS

- Describes how to handle a single request by a chain of multiple handler objects
- The request has to be processed by only one handler object from this chain
- The determination of processing the request is decided by the current handler
- If the current handler object is able to process the request,
  - then the request will be processed in the current handler
  - Otherwise the current handler object needs to shirk responsibility and push the request to the next chain handler object
- Pattern continues on until the request is processed

GENERAL PATTERN



PROS AND CONS

- Applicability
  - You want to decouple a request’s sender and receiver
  - Multiple objects, determined at runtime, are candidates to handle the request
  - You don’t want to specify handlers explicitly in your code
- Consequences
  - Sender and receiver have not explicit knowledge of each other
  - Receipt is not guaranteed– some request might not get handled
  - The chain of handlers can be modified dynamically

EXAMPLE

- At a University, to purchase new equipment requires prior approval, the level of approval depends on how much money you intend to spend
- For example the chain is:
  - Manager → Lab Director → Department Business Manager → Vice Chancellor of Research
- Chain of responsibility is utilized to check who is responsible to approve your expenditure

EXAMPLE

```
import java.io.*;
abstract class PurchasePower {
   protected final double base = 500;
   protected PurchasePower successor;
   public void setSuccessor(PurchasePower successor)
          this.successor = successor;
          }
   abstract public void processRequest(PurchaseRequest request);
}
class ManagerPPower extends PurchasePower{
   private final double ALLOWABLE = 10*base;
   public void processRequest(PurchaseRequest){
          if(request.getAmount()<ALLOWABLE)
                System.out.println(“Manager will approve
   $”+request.getAmount());
          else
                if (successor !=null)
                   sucessor.processRequest(request);
   }
}
```

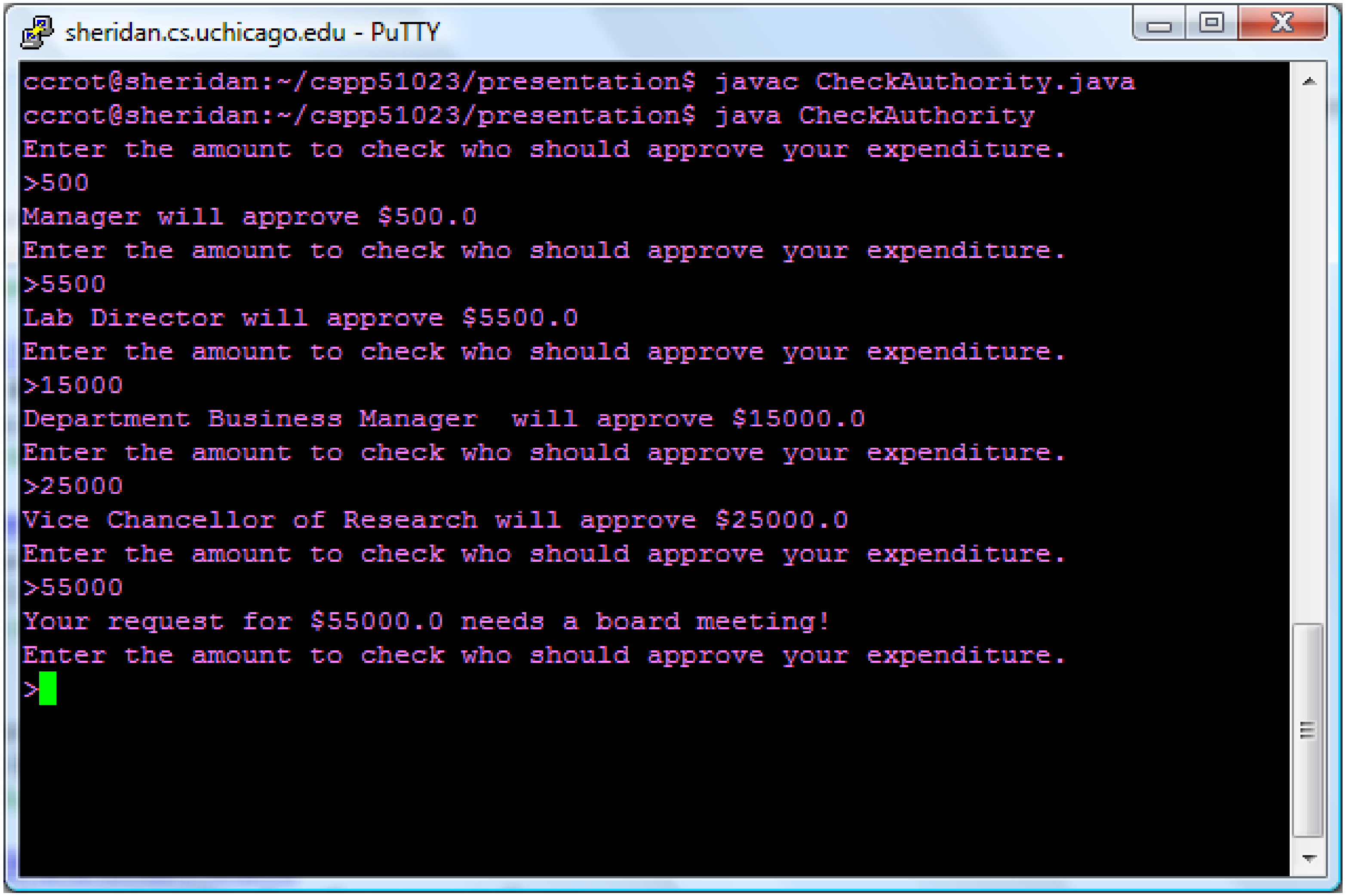
http://www.javacamp.org/designPattern/chains.html

EXAMPLE CONTINUTED

```
class LabDirectorPPower extends PurchasePower {
  private final double ALLOWABLE = 20 * base;
  public void processRequest(PurchaseRequest request ) {
        if( request.getAmount() < ALLOWABLE )
            System.out.println("Lab Director will approve $"+
                 request.getAmount());
        else
             if( successor != null)
                 successor.processRequest(request);
  }
}
//Above class method is copied for
  //Department Business Manager
  //Vice Chancellor of Research
//class PurchaseRequest
  //is a helper class that hold the request information
```

EXAMPLE CONTINUED

```
class CheckAuthority {
   public static void main(String[] args){
//create an object each for Manager, Lab Director, Dept Business Manager and
   Vice Chancellor of Research
   ManagerPPower manager = new ManagerPPower();
   LabDirectorPPower labDirector = new LabDirectorPPower();
   DeptBusinessManagerPPower deptBusManager = new DeptBusinessManagerPPower();
   ViceChancellorOfResearchPPower viceChancellor = new ViceChancellorOfResearchPPower();
//Build the responsibility chain to handle the different requests from the
   client//
   manager.setSuccessor(labDirector);
   labDirector.setSuccessor(deptBusManager);
   deptBusManager.setSuccessor(viceChancellor);
//read input value and send to manager for screening, to see who is able to
   approve request
try{
          while (true) {
            System.out.println("Enter the amount to check who should
          approve your expenditure.");
               System.out.print(">");
          double d = Double.parseDouble(new BufferedReader(new
          InputStreamReader(System.in)).readLine());
          manager.processRequest(new PurchaseRequest(0, d, "General"))
```



```
ccrot@sheridan:~/cspp51023/presentation$ javac CheckAuthority.java
ccrot@sheridan:~/cspp51023/presentation$ java CheckAuthority
Enter the amount to check who should approve your expenditure.
>500
Manager will approve $500.0
Enter the amount to check who should approve your expenditure.
>5500
Lab Director will approve $5500.0
Enter the amount to check who should approve your expenditure.
>15000
Department Business Manager  will approve $15000.0
Enter the amount to check who should approve your expenditure.
>25000
Vice Chancellor of Research will approve $25000.0
Enter the amount to check who should approve your expenditure.
>55000
Your request for $55000.0 needs a board meeting!
Enter the amount to check who should approve your expenditure.
>
```