

CS 635 Advanced Object-Oriented Design & Programming
Spring Semester, 2010
Doc 9 Proxy & State
Feb 17, 2010

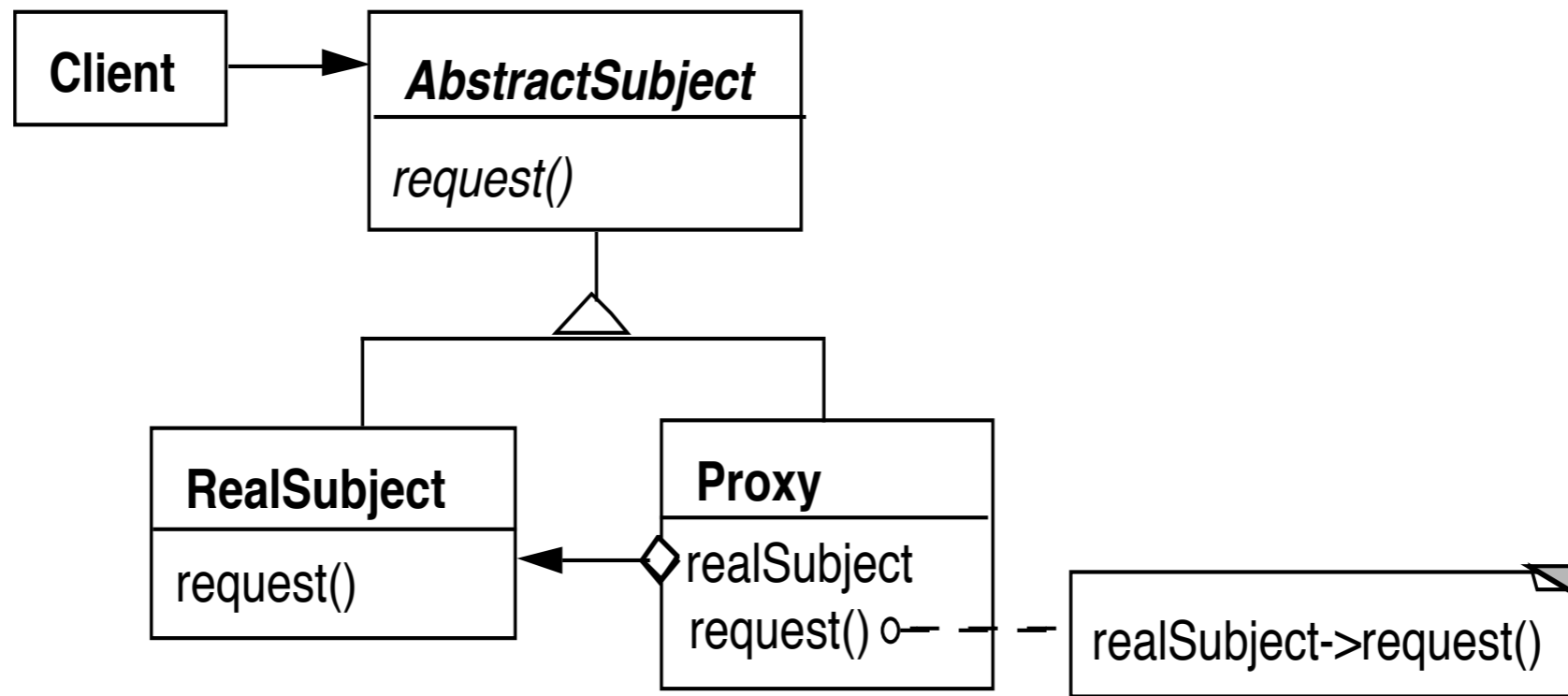
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References

Design Patterns: Elements of Resuable Object-Oriented Software,
Gamma, Helm, Johnson, Vlissides, Addison-Wesley, 1995, pp. 207-218, 305-314

Proxy (Surrogate)

a person authorized to act on behalf of another



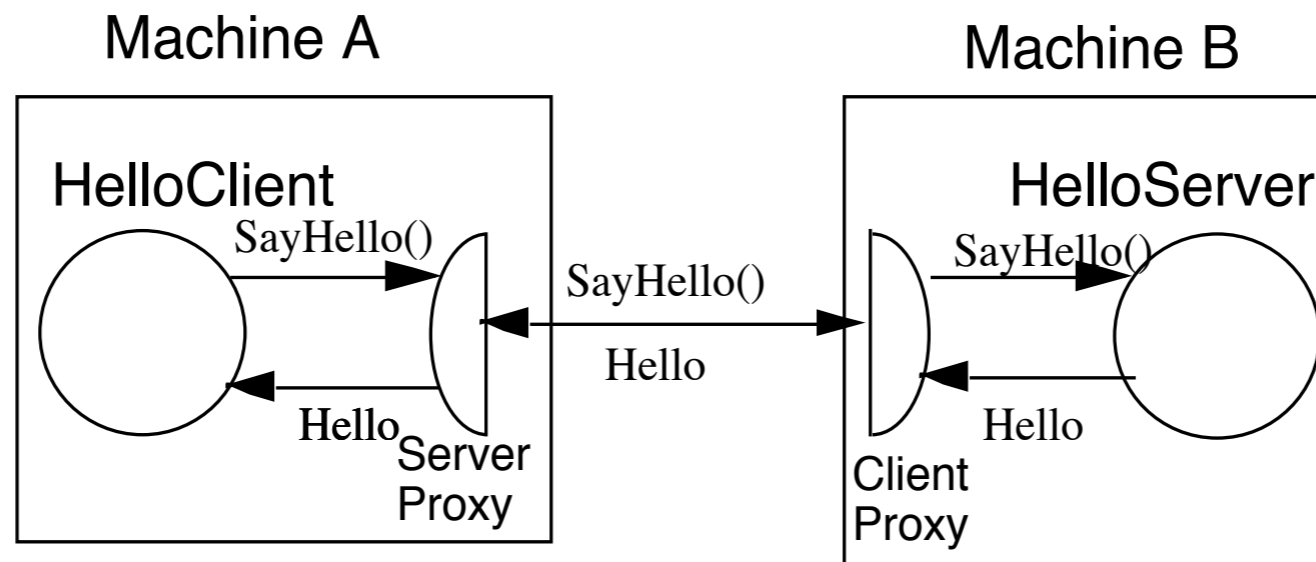
```

class Proxy {
    AbstractSubject realSubject;

    public Foo service(Bar x ) {
        return realSubject(x);
    }
}
  
```

Why do it?

Remote Proxy



```
String server = getHelloHostAddress( args);  
Hello proxy = (Hello) Naming.lookup( server );  
String message = proxy.sayHello();  
System.out.println( message );
```

More General Proxy

```
class Proxy {  
    AbstractSubject realSubject;  
  
    public Foo service(Bar x ) {  
        some preprocessing  
        result = realSubject(x);  
        some postprocessing  
    }  
}
```

Virtual Proxy

Creates/accesses expensive objects on demand

Java's Synchronized List

```
ArrayList notSafe = new ArrayList();  
List threadSafe = Collections.synchronizedList(notSafe);
```

```
static class SynchronizedList {  
    List list;  
    public Object get(int index) {  
        synchronized(mutex) {return list.get(index);}  
    }  
}
```

Java's Unmodifiable List

```
ArrayList notSafe = new ArrayList();  
List noChange = Collections.unmodifiableList(notSafe);
```

```
static class UnmodifiableList {  
    List list;  
    public Object get(int index) { return list.get(index);}  
  
    public Object set(int index, Object element) {  
        throw new UnsupportedOperationException();  
    }  
}
```

Proxy or Decorator?

```
ArrayList notSafe = new ArrayList();
```

```
List noChange = Collections.unmodifiableList(notSafe);
```

```
List threadSafe = Collections.synchronizedList(noChange);
```



Proxy verses Decorator

"Decorators can have similar implementations as proxies"

Proxy controls access to an object

Decorator adds one or more responsibilities to an object

Object subclass: #Proxy **Smalltalk Proxy Trick**

instanceVariableNames: 'target '

classVariableNames: "

poolDictionaries: "

category: 'Whitney-Examples'

Class Method

on: anObject

^super new target: anObject

Instance Methods

doesNotUnderstand: aMessage

^target

perform: aMessage selector

withArguments: aMessage arguments

target: anObject

target := anObject

| wrapper |

wrapper := Proxy on: Transcript.

wrapper open.

wrapper show: 'Hi mom'.

| wrapper |

wrapper := Proxy on: 3.

wrapper + 5.

| wrapper |

wrapper := Proxy on: 'Hi '.

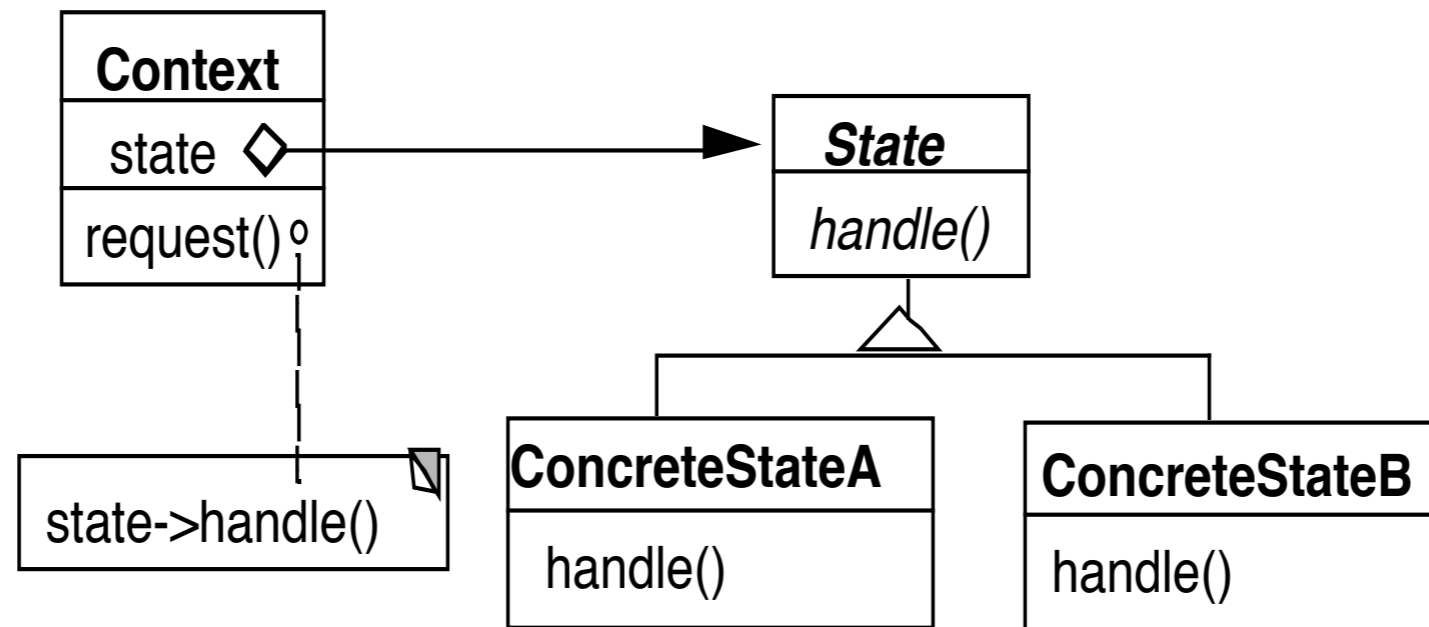
wrapper , ' mom'.

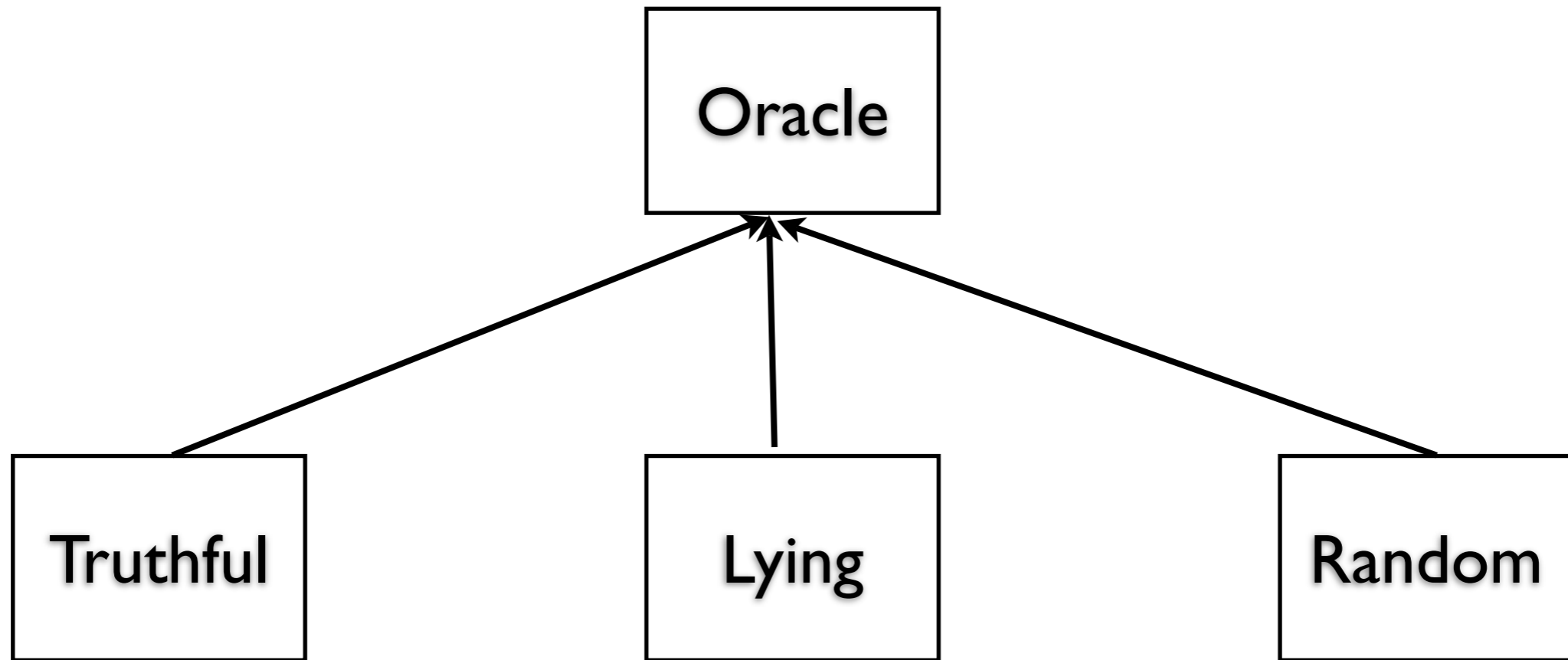
State Pattern

Allow an object to alter its behavior when its internal state changes

The object will appear to change its class

Structure





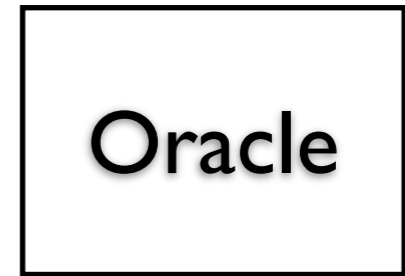
```
Oracle seer = new Truthful();  
seer.willThereBeAFeeIncreaseNextYear();  
seer = new Lying();  
seer.willThereBeAFeeIncreaseNextYear();
```

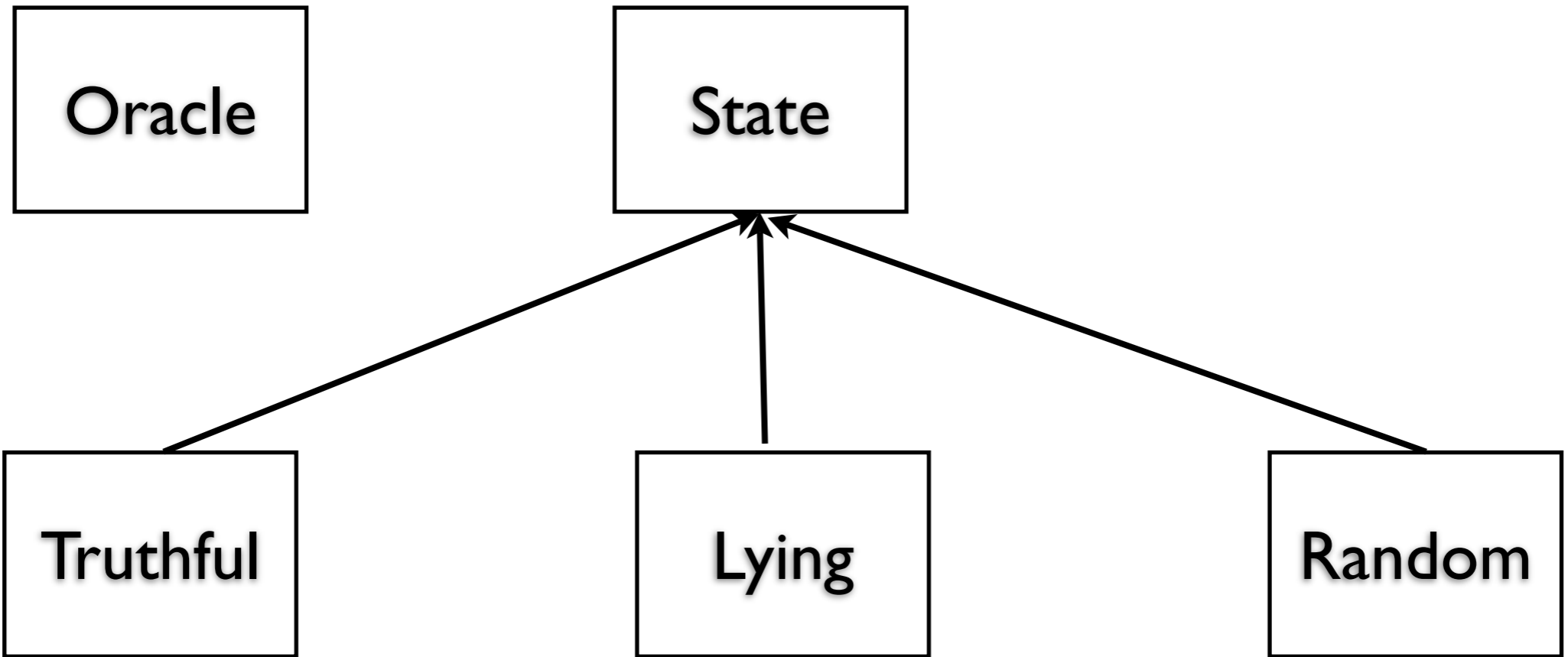


```
public class Oracle {  
    private final TRUTH = "truth";  
    private final LIE = "lie";  
    private final RANDOM = "random";
```

```
    String state = TRUTH;
```

```
    public boolean willThereBeAFeeIncreaseNextYear() {  
        if (state == TRUTH)  
            blah  
        else if (state == LIE)  
            more blah  
        else if (state == RANDOM)  
            random blah  
    }
```





```
class Oracle {
    private State mode = set mode;

    public boolean willThereBeAFeeIncreaseNextYear() {
        return mode. willThereBeAFeeIncreaseNextYear():
    }
}
```

Example: SDChat Server

Commands

"available"

"login"

"register"

"nickname"

"startconversation"

"quit"

"waitinglist"

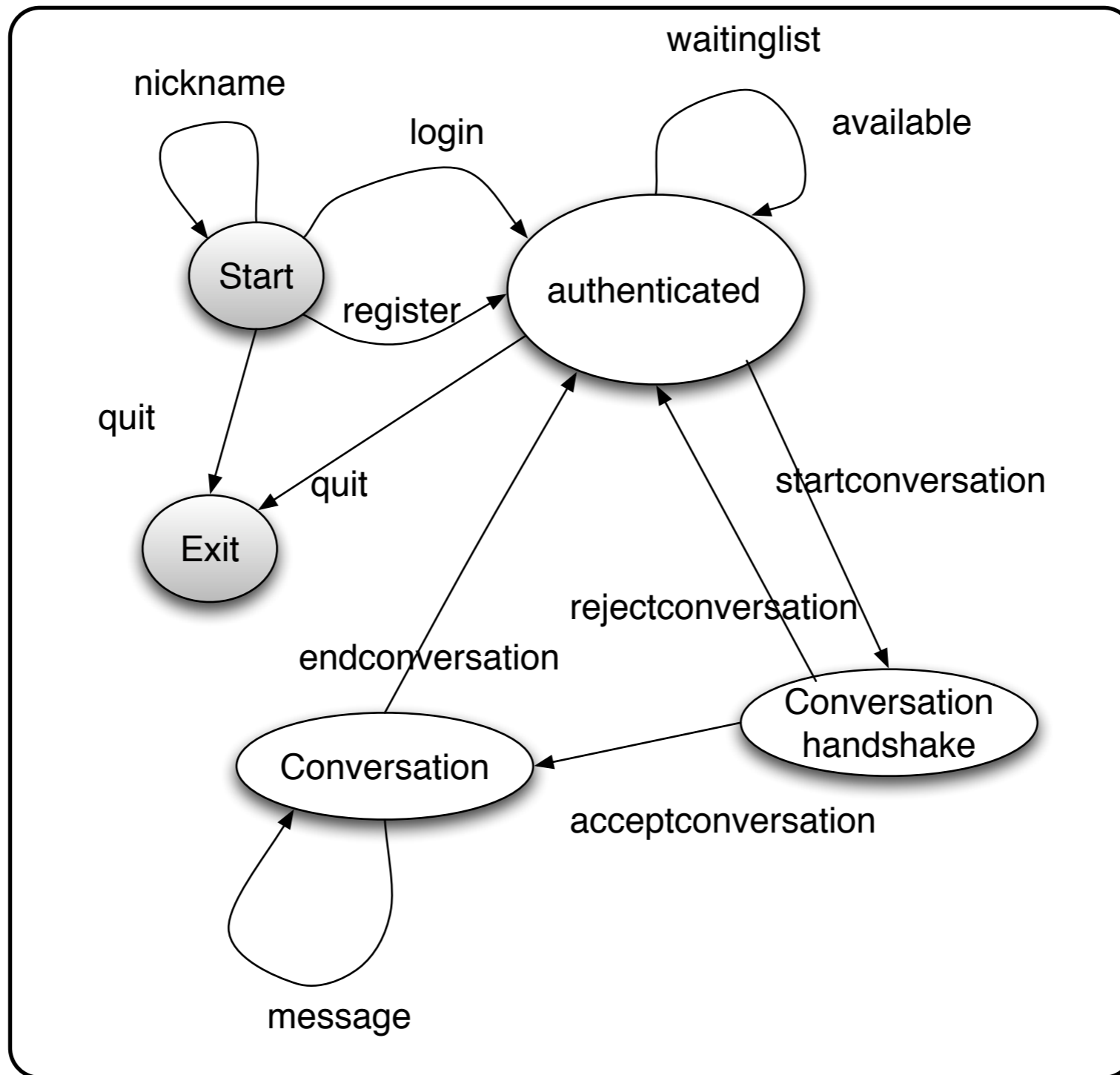
"acceptconversation"

"message"

"rejectconnection"

"endconversation"

Server States



Without States

```
public class SDChatServer {  
  
    String handleNickname(String data) {  
        if (state != START)  
            return someErrorMessage();  
        handle the main case  
    }  
  
    String handleLogin(String data) {  
        if (state != START)  
            return someErrorMessage();  
        handle main case  
    }  
  
    String handleWaitinglist(String data) {  
        if (state != AUTHENTICATED)  
            return someErrorMessage();  
        handle main case  
    }  
}
```

Who defines state Transitions - Context

```
class Context {  
    private AbstractState state = new StartState();  
  
    public Bar foo(int x) {  
        int result = state.foo(x);  
        if (someConditionHolds() )  
            state = nextState();  
        return result;  
    }  
}
```

Who defines state Transitions - States

```
class Context {  
    private AbstractState state = new StartState();  
  
    public void foo(int x) {  
        state = state.foo(x);  
    }  
}
```

What if foo returns a value?

Who defines state Transitions - States

```
class Context {  
    private AbstractState state = new StartState();  
  
    public int foo(int x) {  
        return state.foo(x, this);  
    }  
  
    protected void setState(AbstractState newState) {  
        state = newState;  
    }  
}
```


Sharing State Objects

Stateless state

- State objects without fields

- Can be shared by multiple contexts

Can store data in context and pass as arguments

Large number of state transitions can be expensive

- Only create state once & reuse same object

Changing Class - No Need for Context

Language Dependent Feature
Smalltalk & Lisp

```
class Truthful extends Oracle {  
  
    public boolean foo(int x) {  
        int result = state.foo(x);  
        this.changeClassTo(Random);  
        return result;  
    }  
}
```

State Verses Strategy

Rate of Change

Strategy

Context usually contains just one strategy object

State

Context often changes state objects

State Verses Strategy

Exposure of Change

Strategy

Strategies all do the same thing

Client do not see change in behavior of Context

State

States act differently

Client see the change in behavior