WebSocket Server

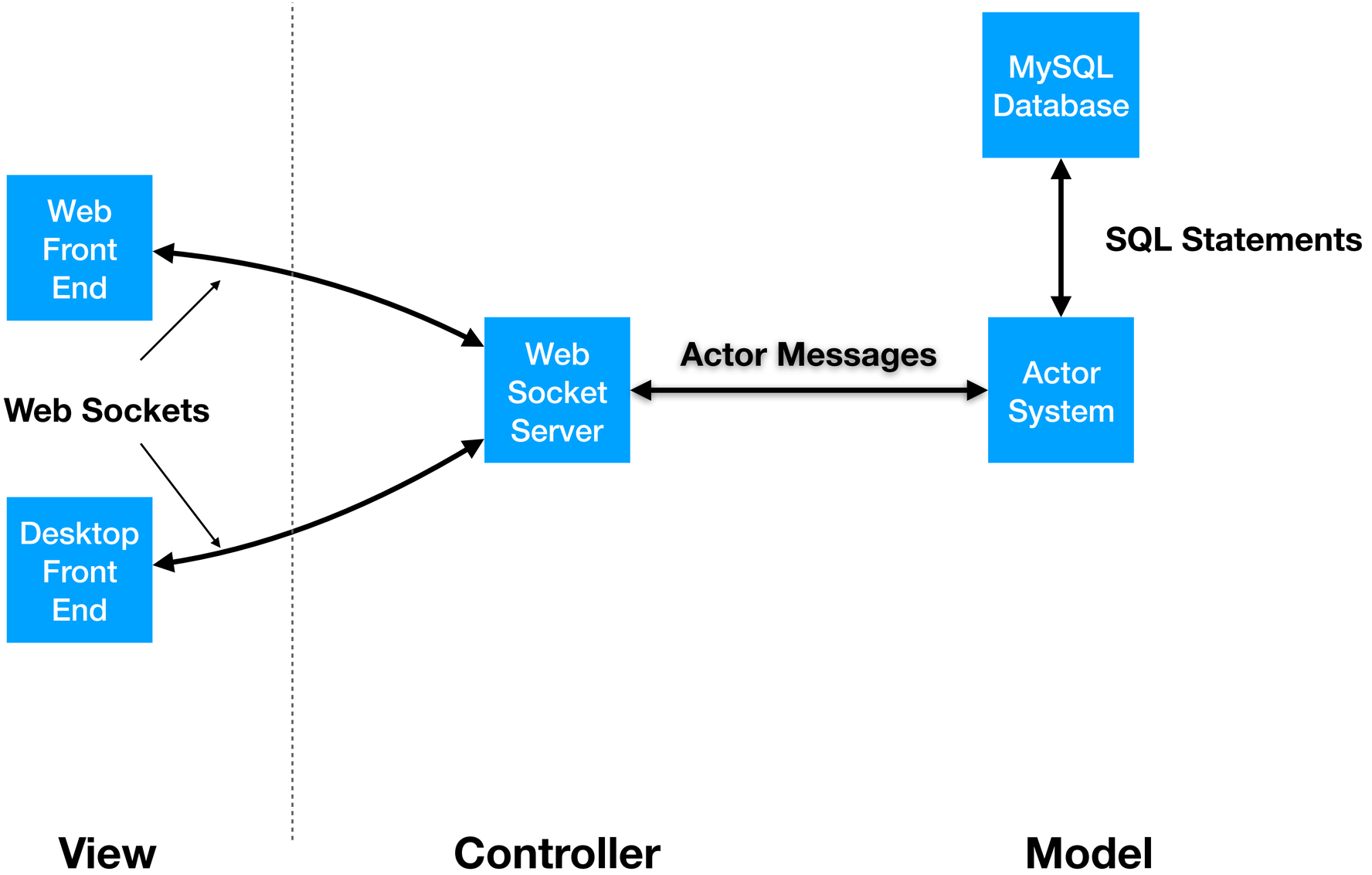
Lecture Question

Task: Write a Web Socket Server that counts the number of messages it receives

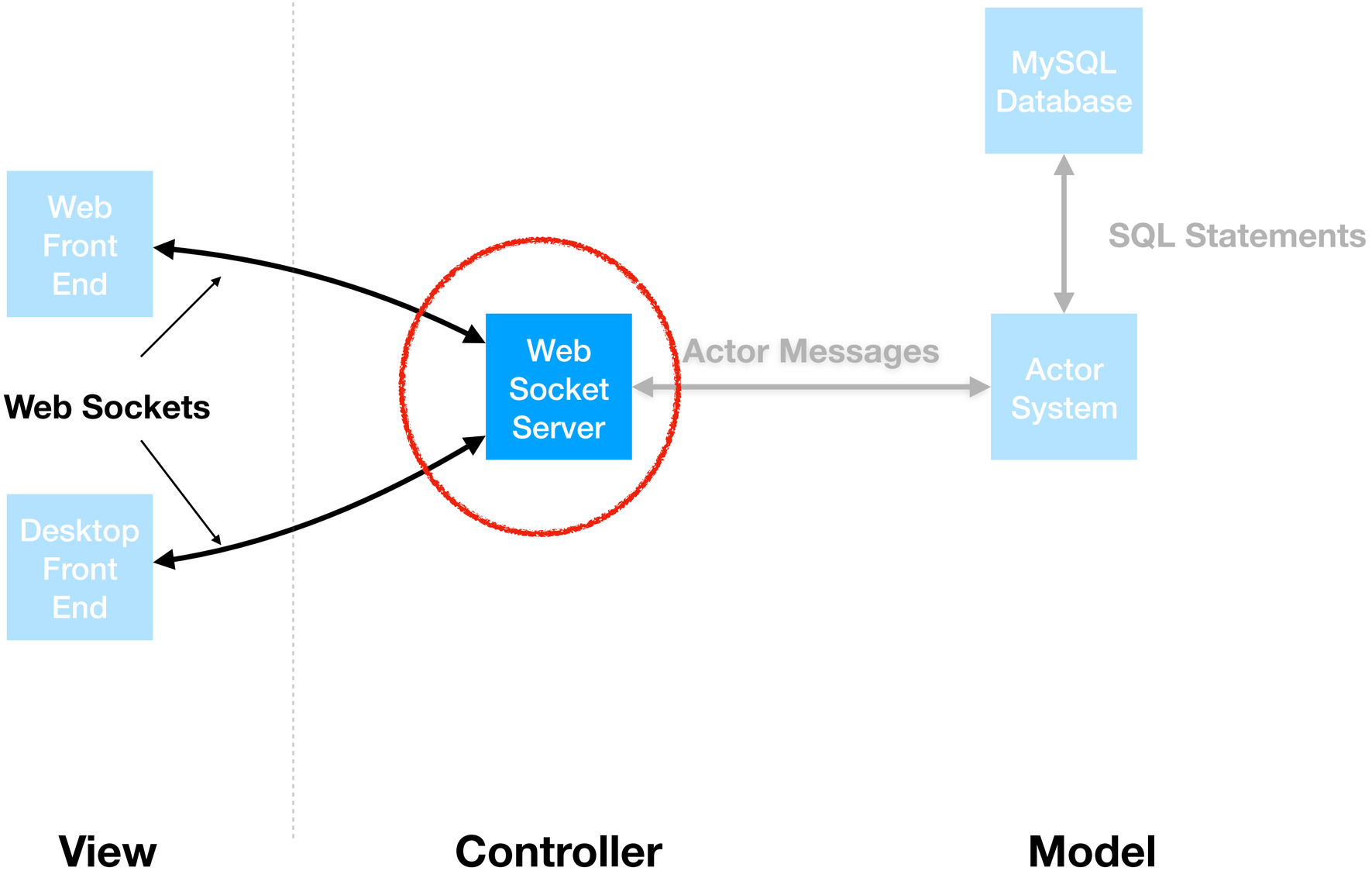
In a package named server, write a class named LectureServer that:

- When created, sets up a web socket server listening for connections on localhost:8080
- Listens for messages of type increment with no data
- Has a method named numberOfMessages that returns (as an Int) the number of times a message of type increment was received

Web App Architecture



Web App Architecture



The Problem

- In CSE115 you used HTTP request/responses to build web apps
- If you wanted more data from the server after the page loads, you used AJAX
  - Server hosts JSON data at certain end points
  - Client makes an AJAX call to retrieve the most current data
- But the server has to wait for a request before sending a response

The Problem

- What if the server wants to send time-sensitive data without waiting for a request?
- In CSE115
  - Built a chat app using polling
  - Client sent AJAX requests at regular intervals
  - Only get updates when AJAX request is sent
- Can use long-polling
  - Server hangs on poll requests until it has new data to send

Web Sockets

- A newer solution (Standardized in 2011)
- Establishes a lasting connection
  - Enables 2-way communication between server and client
- Server can push updates to clients over the web socket without waiting for the client to make a new request

socket.io

- A library build on top of web sockets
- Maintains connections and reconnecting
- Uses message types
  - Similar to actors, except the message type is always a string
- Add listeners to react to different message types
  - Receiving a message is an event
  - Listener code will be called when the event occurs

socket.io Server in Scala

- New library
- Link on the course website
- Dependency included in pom.xml in examples repo

Web Socket Server

- Import from the new library
- Setup and start the server

```
import com.corundumstudio.socketio.listener.{ConnectListener, DataListener, DisconnectListener}
import com.corundumstudio.socketio.{AckRequest, Configuration, SocketIOClient, SocketIOServer}

class Server() {

  val config: Configuration = new Configuration {
    setHostname("localhost")
    setPort(8080)
  }

  val server: SocketIOServer = new SocketIOServer(config)

  server.addConnectListener(new ConnectionListener())
  server.addDisconnectListener(new DisconnectionListener())
  server.addEventListener("chat_message", classOf[String], new MessageListener())
  server.addEventListener("stop_server", classOf[Nothing], new StopListener(this))

  server.start()
}
```

Web Socket Server

- Create a configuration object for the server
- This server will run on localhost port 8080

```
import com.corundumstudio.socketio.listener.{ConnectListener, DataListener, DisconnectListener}
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  server.start()
}
```

Web Socket Server

- Create and start the server
- Use the configuration to tell the library how to setup the server
- Call the start() method to start listening for connections

```
import com.corundumstudio.socketio.listener.{ConnectListener, DataListener, DisconnectListener}
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}
```

Web Socket Server

- Add listeners to handle different event types
- Connect and disconnect listeners to react to clients connecting and disconnecting
- Event listeners for each different message type received from clients

```
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Web Socket Server

- For connect and disconnect
  - Create classes overriding ConnectListener and DisconnectListener
  - Implement the onConnect/onDisconnect methods
- These methods take a reference to the sending socket as a parameter
  - Can use this reference to send messages to the client
  - Usually want to store each reference to send messages later

```
  server.addConnectListener(new ConnectionListener())
  server.addDisconnectListener(new DisconnectionListener())
```

```
class ConnectionListener() extends ConnectListener {
  override def onConnect(client: SocketIOClient): Unit = {
    println("Connected: " + client)
  }
}
```

```
class DisconnectionListener() extends DisconnectListener {
  override def onDisconnect(socket: SocketIOClient): Unit = {
    println("Disconnected: " + socket)
  }
}
```

Web Socket Server

- To receive messages, specify the message type and the class of the message
  - Create classes extending DataListener[message_class]
- For message class we'll use
  - String to receive text data
  - Nothing if it's just a message (Similar to an actor receiving a case object)

```
  server.addEventListener("chat_message", classOf[String], new MessageListener())
  server.addEventListener("stop_server", classOf[Nothing], new StopListener(this))
```

```
class MessageListener() extends DataListener[String] {
  override def onData(socket: SocketIOClient, data: String, ackRequest: AckRequest): Unit = {
    println("received message: " + data + " from " + socket)
    socket.sendEvent("ACK", "I received your message of " + data)
  }
}
```

```
class StopListener(server: Server) extends DataListener[Nothing] {
  override def onData(socket: SocketIOClient, data: Nothing, ackRequest: AckRequest): Unit = {
    println("stopping server")
    server.server.stop()
    println("safe to stop program")
  }
}
```

Web Socket Server

- The DataListeners must implement onData with parameters:
  - A socket reference. Can be used to lookup a user after storing this reference on connection/registration
  - data with type matching the class of the message. This is the content of the message received
  - AckRequest. Not used in this course

```
  server.addEventListener("chat_message", classOf[String], new MessageListener())
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class MessageListener() extends DataListener[String] {
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Web Socket Server

- Use the reference to the Socket to send messages to the client
- Specify the type of the message as a String
- If the message contains data, use a second String

```
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class MessageListener() extends DataListener[String] {
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Web Socket Demo

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