

# Software Engineering

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# Sequence diagrams

- ▶ describe the work of the system
- ▶ Objects send messages to other objects. Sequence diagram shows these messages in time.
- ▶ Show:
  - ▶ different processes or objects that live simultaneously: vertical
  - ▶ messages exchanged between these objects: horizontal
- ▶ specificate runtime scenarios

# Components

- ▶ lifeline
- ▶ activation
- ▶ messages



- ▶ an object or role is living
- ▶ the line means this process

End of object



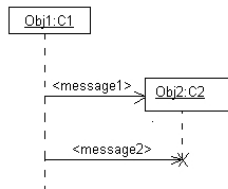
# Activation

Activation is a state. When objects / roles work, objects / roles are controlled by other objects.

# Activation

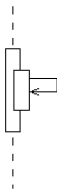


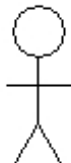
# Construct and destruct





# Recursive activation





- ▶ actor is special object to control other objects.

# Types of messages

- ▶ simple message
- ▶ asynchronous
- ▶ synchronizing
- ▶ rendezvous
- ▶ time-awaiting

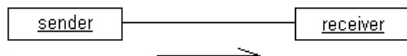
# Simple message

- ▶ Functioncall
- ▶ An active object sends a message to a passive one.
- ▶ The control is given to the passive object.

# Asynchronous messages

- ▶ The sender works on
- ▶ It does not matter when the receiver will get the message
- ▶ for example: sending an email

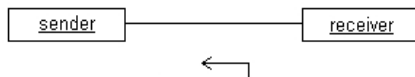
# Asynchronous messages



# Rendezvous messages

- ▶ The receiver is waiting for the message
- ▶ The receiver sets his state waiting.

# Rendezvous messages

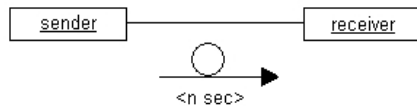




# Time-awaiting messages

- ▶ The sender is waiting for a specific time.
- ▶ For example, phone call.

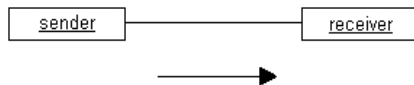
# Time-awaiting messages



## Synchronizing messages

- ▶ The sender sends the message and sets its own state to blocked unless the receiver gets the message.
- ▶ For example, for mutual exclusion

# Synchronizing messages

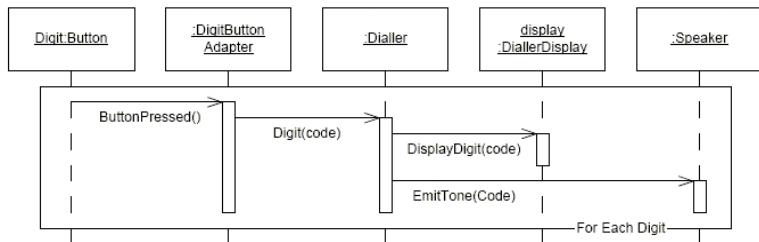


## Example

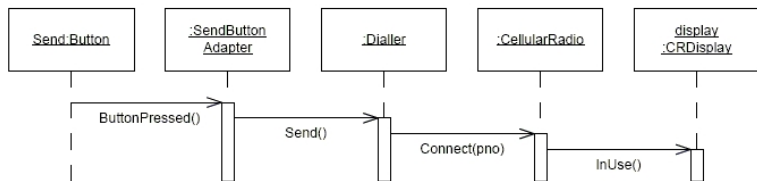
We have a cellphone. We want to make a call. First, we type the phone number.

On the cellphone the digits are button. For each digit in the phone number we press the digits. The digits emits a buttonpressed message to a digitbuttonadapter that sends digit to the dialer. The dialer sends the digit to the display to show it. The dialer also sends the digit to the speaker to makes some noise according to the digit. After we typed the number we press send button. The button emits a buttonpressed message to the proper adapter. The adapter sends this information to the dialer. The dialer wants to connect to the cellularradio, so the dailer send a connect message and gives the phonenumber. After that, the cellularradio sends in inuse message to the display.

# Solution



# Solution

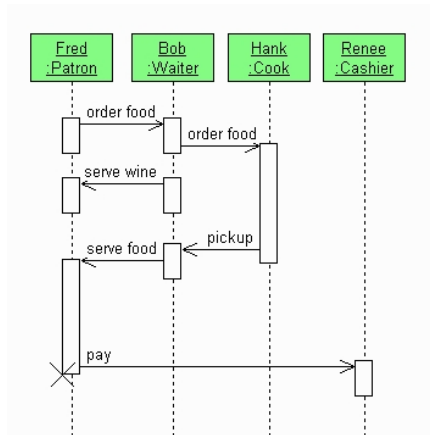


## Exercise

Fred went to a restaurant, so he is a patron. Bob is the waiter, Hans is cook, Renee is cashier. Fred orders food from Bob. After that, Bob orders this food from Hans. Hans starts to cook the food. While Hans is cooking, Bob serves wine to Fred. Fred drinks the wine. When Hans is ready, Hans gives the food to the waiter. The waiter serves the food and patron is eating it. After that Fred pays to Renee and Fred goes out from the restaurant.



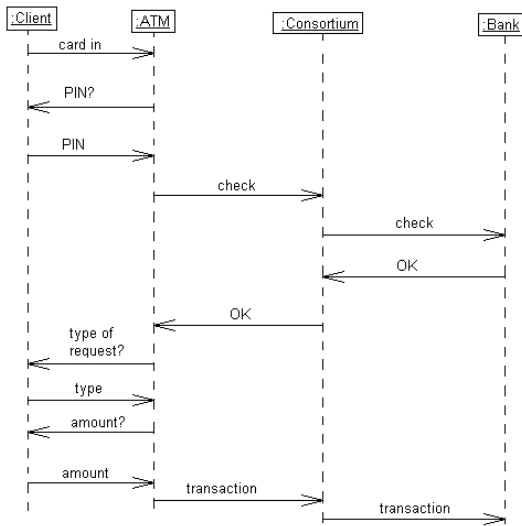
# Solution



## Exercise

A client wants to get money from an ATM. ATMs belong to a consortium. Consortium is in connection with the bank. The client plugs the card into the ATM. The machine asks the client's PIN. The client types the PIN. The machine sends the typed number to the consortium to check if the PIN is correct. The consortium does not know if the PIN is correct, so the consortium sends the PIN to the bank. The bank checks it. The PIN is correct, so the bank sends the acknowledgement back to the consortium. The consortium sends it back to the ATM. The ATM asks the client what type of request he wanted. The client replies it. The machine asks the amount the client wants. The client replies the amount. The ATM sends this transaction to the consortium and the consortium sends it to the bank.

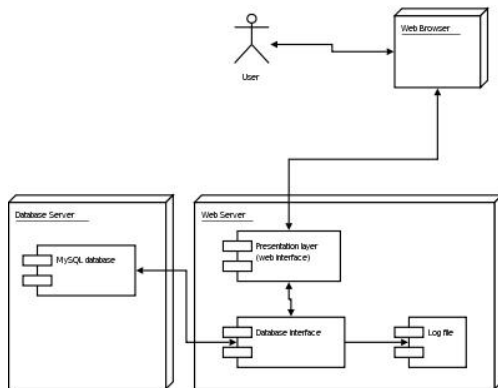
# Solution



# Deployment diagram

- ▶ Describe the topology of the system
- ▶ Hardware resources
- ▶ Associations between the components

# Example - Web application



## Exercise

The system consists of a central server, a database server, 2 PCs, and a printer. The printer is an HP model. The 2 PCs communicate with server via TCP/IP.

# Solution

