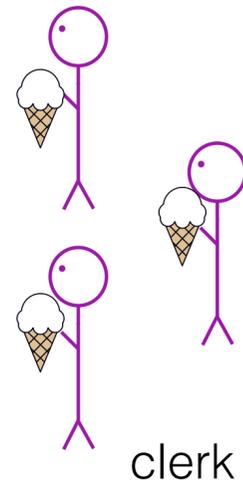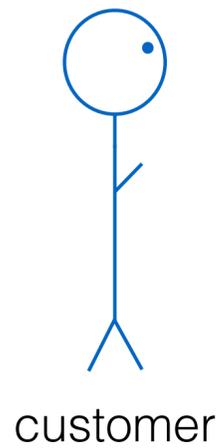# Ice Cream Parlor

CS 110 lab 6
August 5-6, 2021

Ice cream parlor
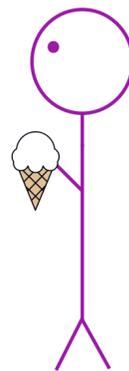
customer

clerk

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)

Ice cream parlor

customer

clerk

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)
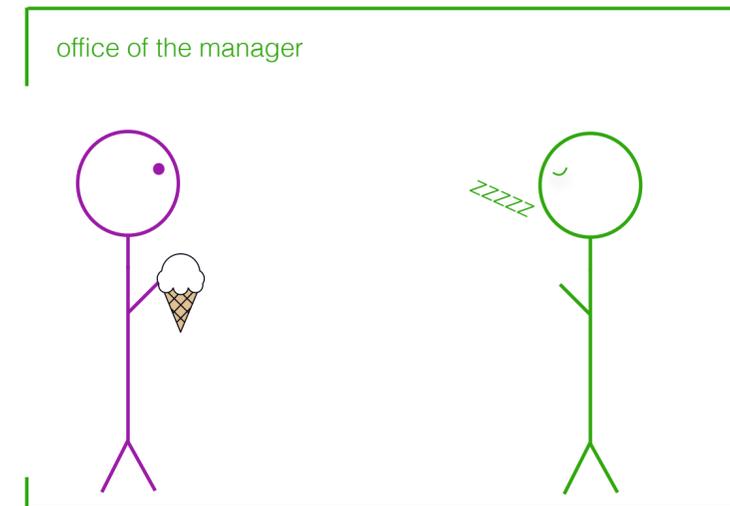
- Make ice cream cone

Ice cream parlor

office of the manager

customer

clerk

manager

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)

- Make ice cream cone
- Go to manager's office
- Wake up the manager and present the cone

- Go to sleep until a clerk requests an inspection

Ice cream parlor

customer

clerk

manager
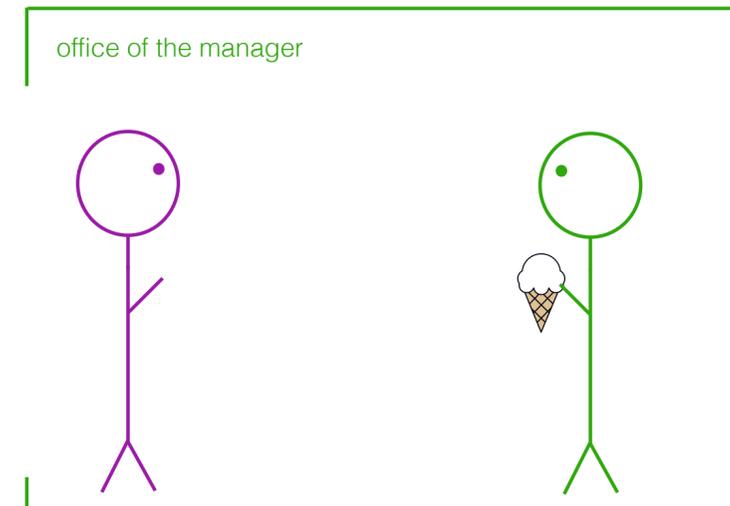
- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)

- Make ice cream cone
- Go to manager's office
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

- Go to sleep until a clerk requests an inspection

office of the manager

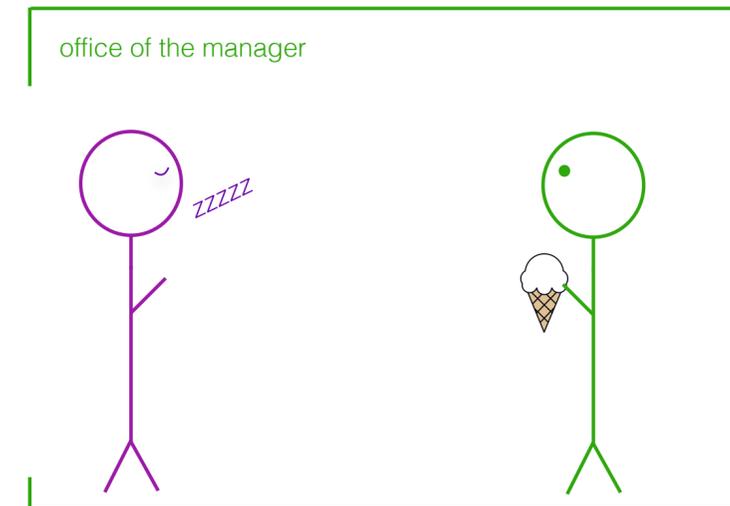# Ice cream parlor

customer

clerk

office of the manager

manager

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)

- Make ice cream cone
- Go to manager's office
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

- Go to sleep until a clerk requests an inspection
- Inspect the cone
- Inform the clerk of the decision
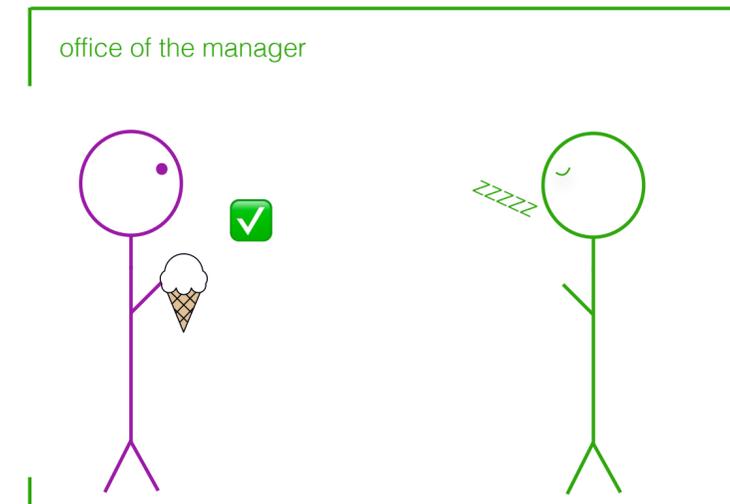- Repeat

Ice cream parlor

customer

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)
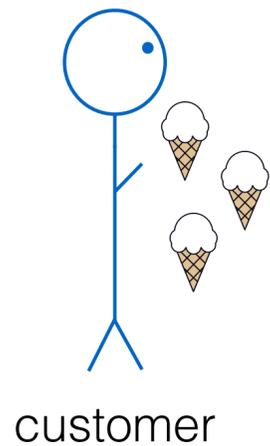
clerk

- Make ice cream cone
- Go to manager's office
- Wake up the manager and present the cone
- Wait for manager's approval or rejection
- Repeat if rejected

manager

- Go to sleep until a clerk requests an inspection
- Inspect the cone
- Inform the clerk of the decision
- Repeat

Ice cream parlor

customer

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone. (customers can create clerks out of thin air in this simulation.)

clerk

- Make ice cream cone
- Go to manager's office
- Wake up the manager and present the cone
- Wait for manager's approval or rejection
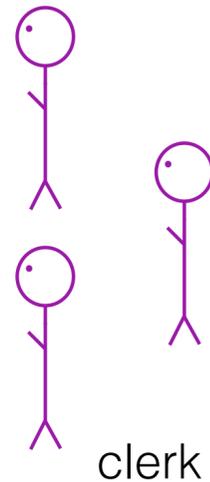- Repeat if rejected

manager

- Go to sleep until a clerk requests an inspection
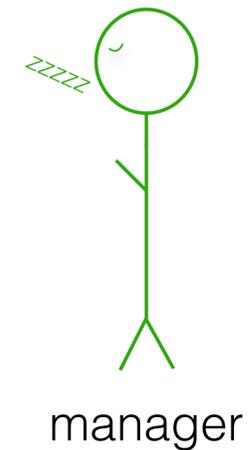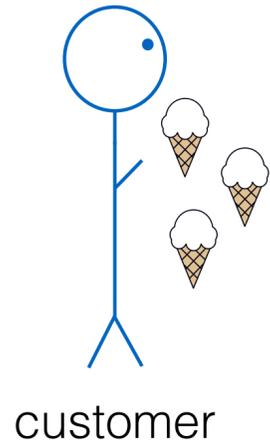- Inspect the cone
- Inform the clerk of the decision
- Repeat

Ice cream parlor

customer

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone.
- Wait for all clerks to finish
- Get in line to see cashier
- Wait until cashier says we're done

clerk

- Make ice cream cone
- Go to manager's office
- Wake up the manager and present the cone
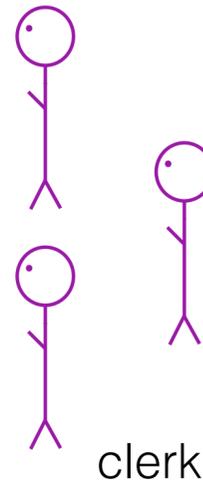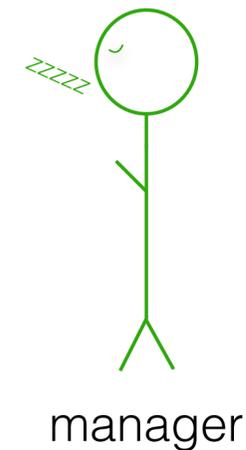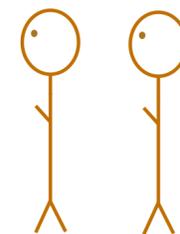- Wait for manager's approval or rejection
- Repeat if rejected

manager

- Go to sleep until a clerk requests an inspection
- Inspect the cone
- Inform the clerk of the decision
- Repeat

cashier

- Wait for customer to get in line
- Ring up that customer
- Tell the customer they can leave

electrician

- Wait until all customers have left
- Fix electrical wiring

Implementation

- For this example, no need to actually pass ice cream cones around
- Going to focus on the synchronization between threads
- Goals:
  - What synchronization primitive should we choose in each situation?
  - How can we break this problem down and implement it in small parts?

Customer <-> Clerk

customer

clerk

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
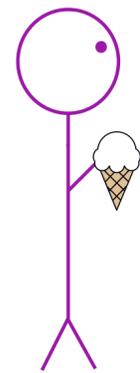- Wait for all clerks to finish making the cones
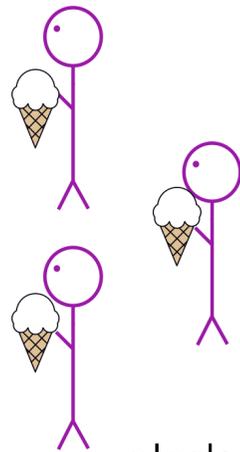
- Make ice cream cone

- Customer:
  - How to summon clerks on demand?
  - How to wait until clerks are finished?
- Can we implement/test this without implementing the clerk yet?
- Clerk:
  - Call `makeCone(coneId, customerId);`

Clerk <-> Manager

office of the manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**

- Go to sleep until a clerk requests an inspection

Clerk <-> Manager

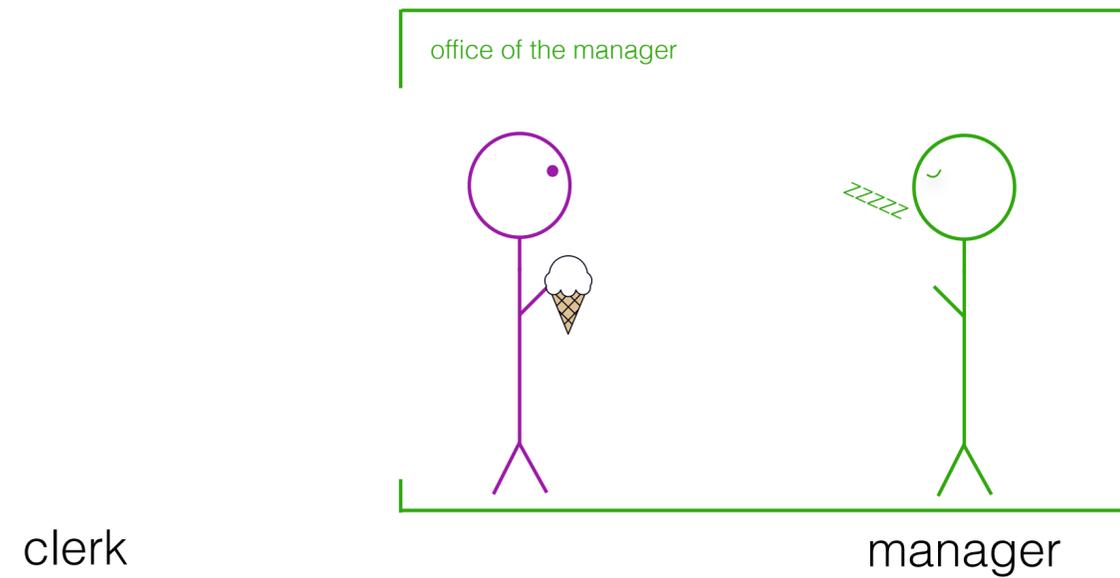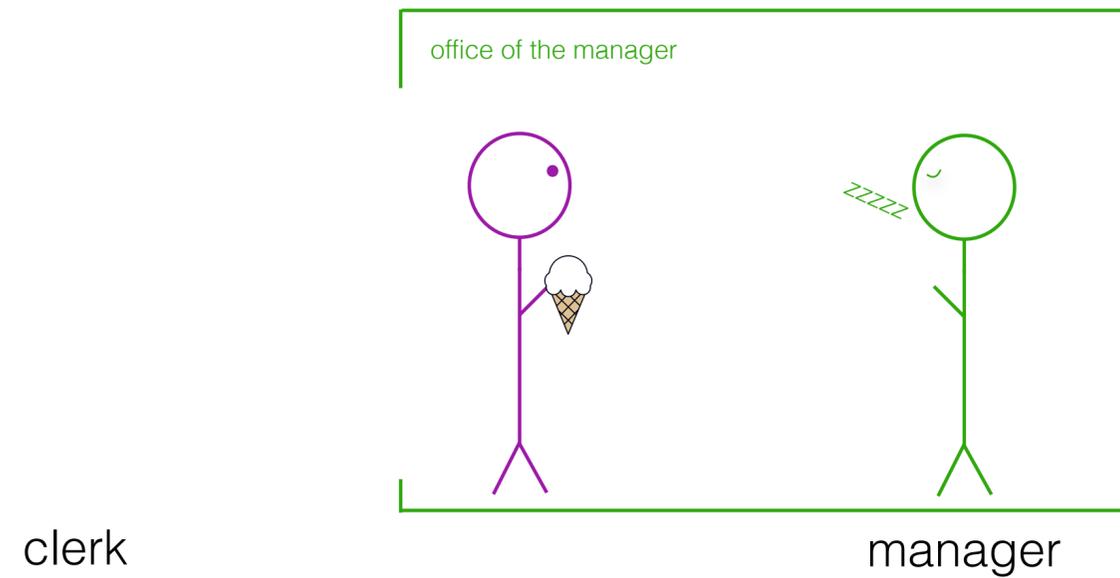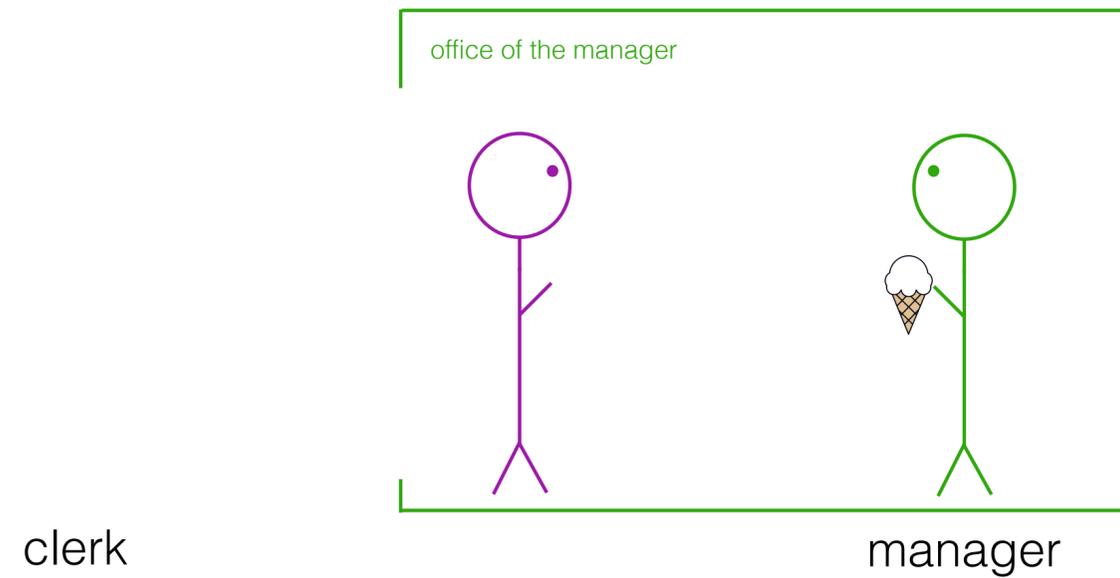office of the manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**

- Go to sleep until a clerk requests an inspection

Clerk <-> Manager

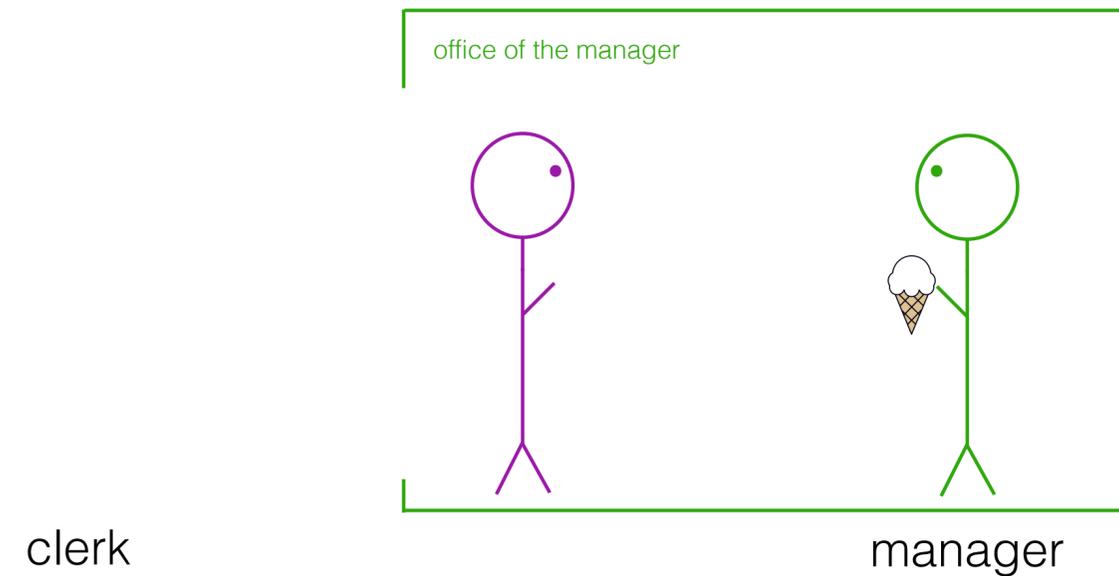office of the manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone

- Go to sleep until a clerk requests an inspection

Clerk <-> Manager

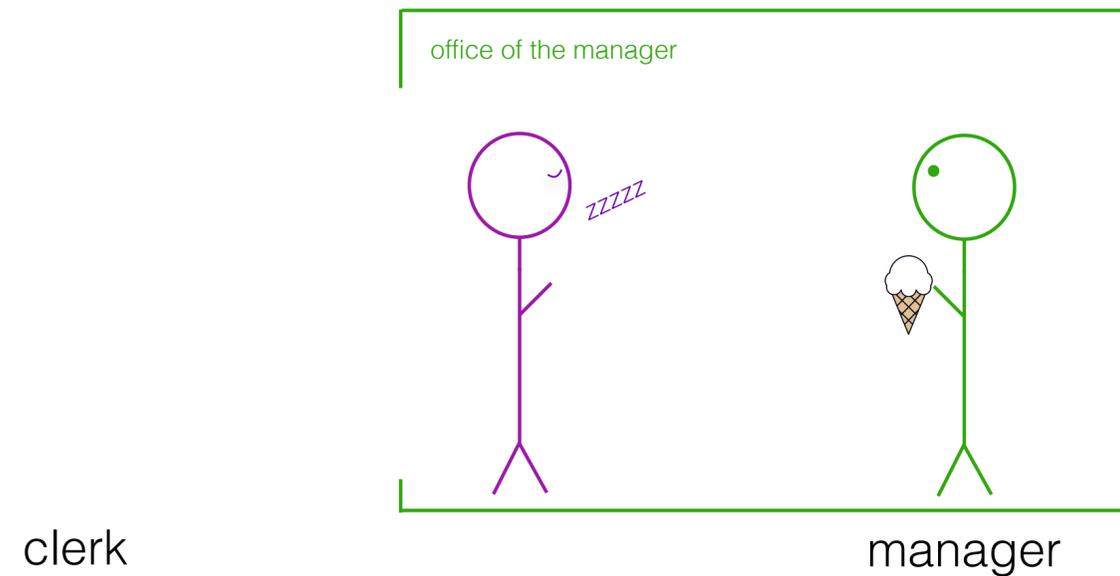office of the manager

clerk

manager

clerk
- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone

manager
- Go to sleep until a clerk requests an inspection

Clerk <-> Manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

- Go to sleep until a clerk requests an inspection
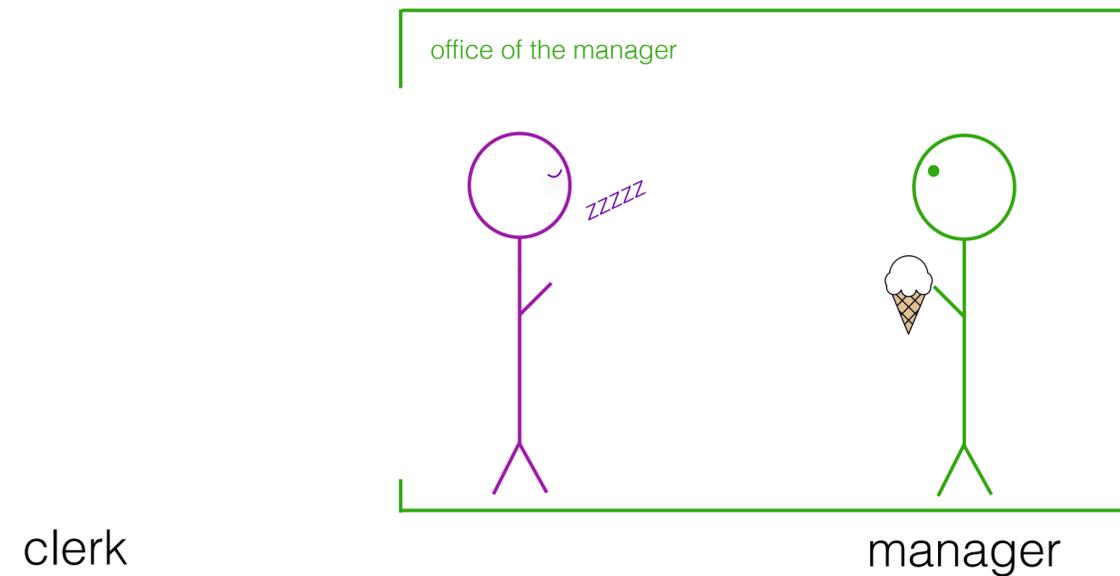
Clerk <-> Manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

- Go to sleep until a clerk requests an inspection

Clerk <-> Manager

office of the manager

zzzzz

clerk

manager

clerk

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

manager

- Go to sleep until a clerk requests an inspection
- Inspect the cone
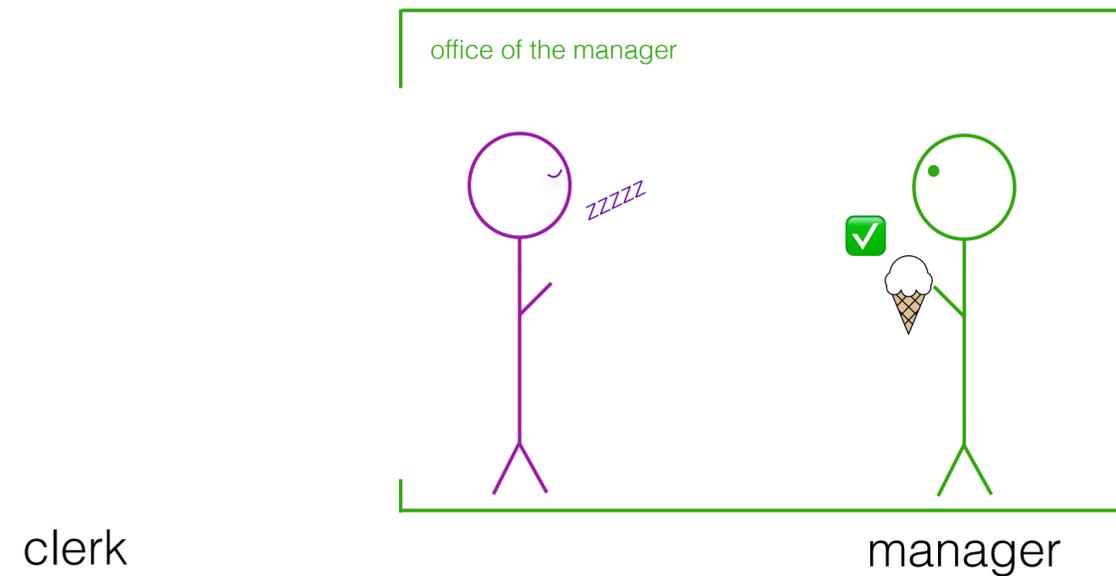- Inform the clerk of the decision

Clerk <-> Manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

- Go to sleep until a clerk requests an inspection
- Inspect the cone
- Inform the clerk of the decision
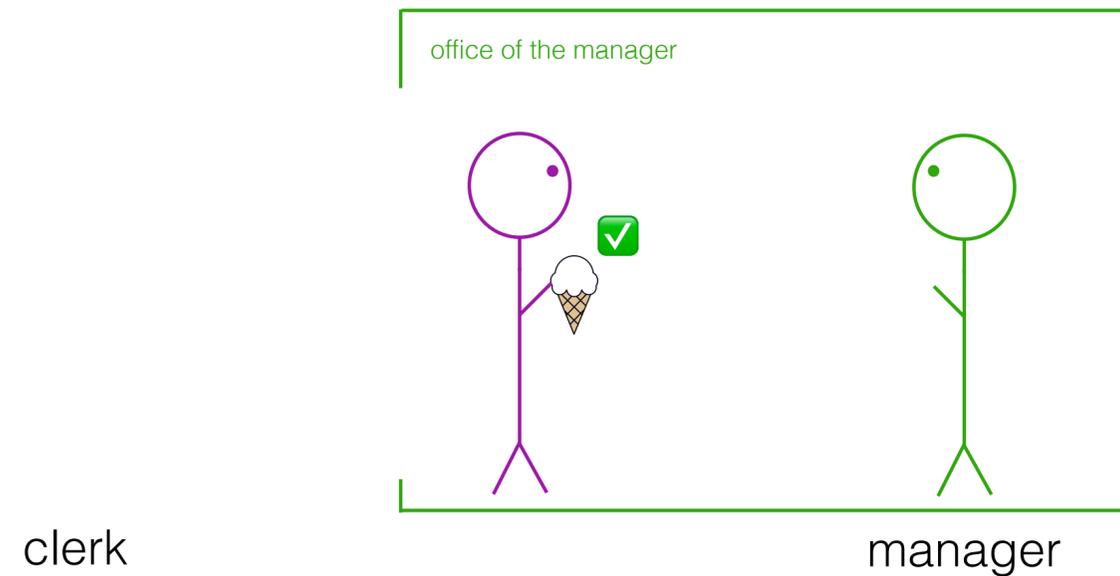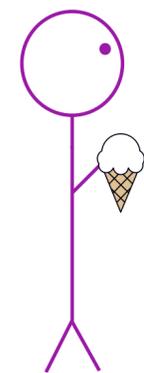
Clerk <-> Manager

office of the manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone
- Wait for manager's approval or rejection

- Go to sleep until a clerk requests an inspection
- Inspect the cone
- Inform the clerk of the decision

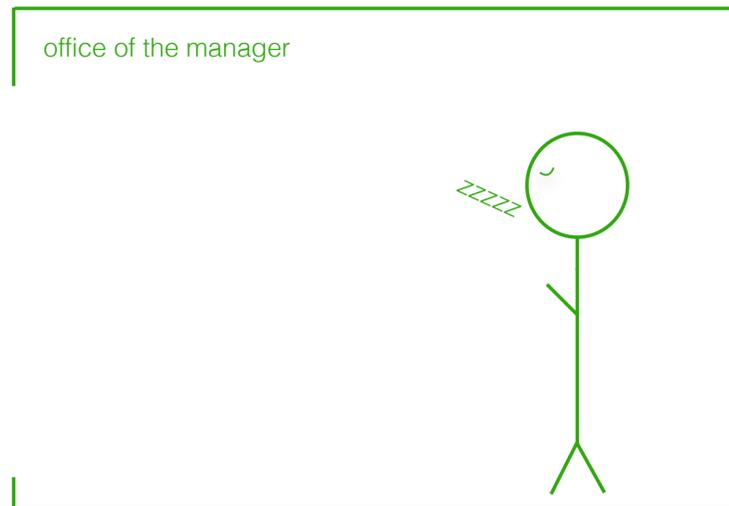# Clerk <-> Manager

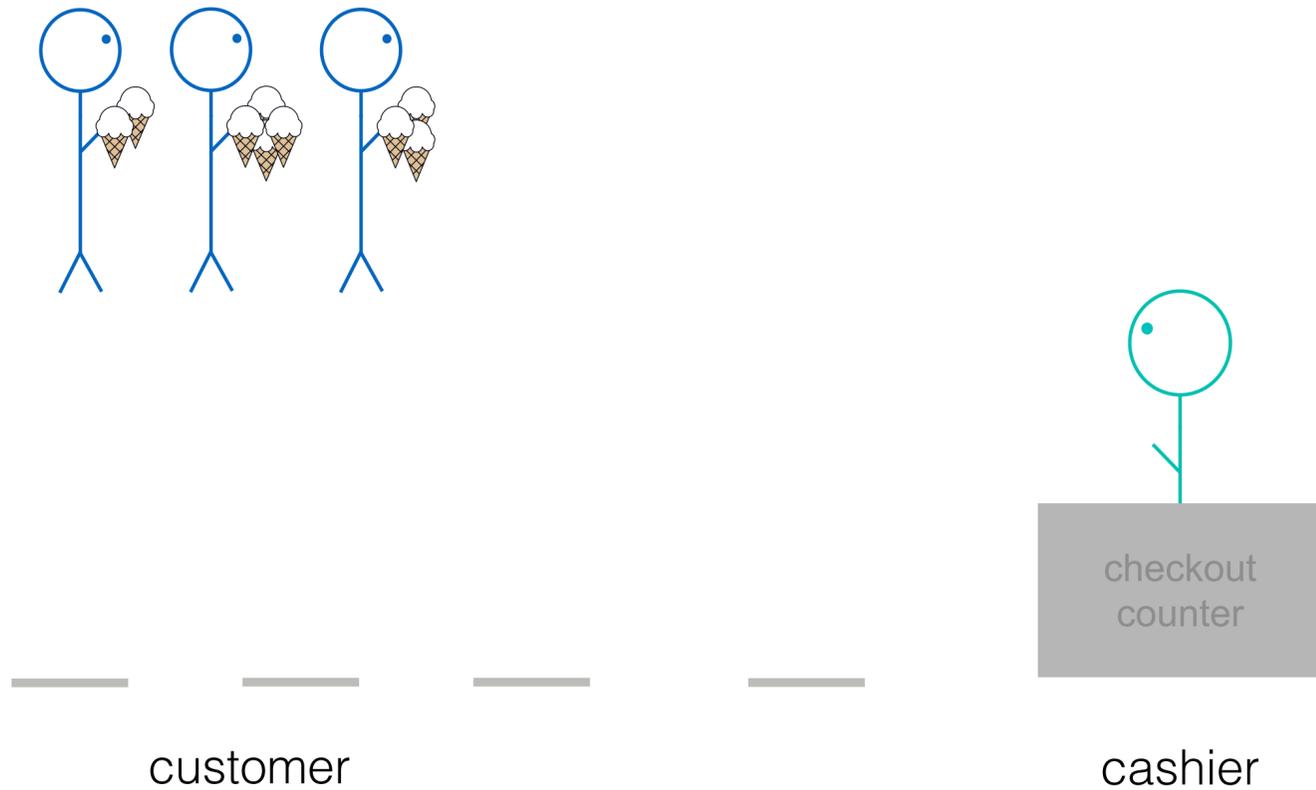office of the manager

clerk

manager

- Make ice cream cone
- Go to manager's office. **Only one clerk in the office at a time.**
- Wake up the manager and present the cone
- Wait for manager's approval or rejection
- If rejected, remake the cone and repeat

- Go to sleep until a clerk requests an inspection
- Inspect the cone
- Inform the clerk of the decision
- Repeat

- Questions:
  - How to have only one clerk in the office at a time?
  - How to have the manager sleep until a clerk needs an inspection?
  - How to have the clerk wait until the inspection is complete?
  - How to communicate the results of the inspection (passed/failed)?
- How can we implement/test as little as possible at a time?
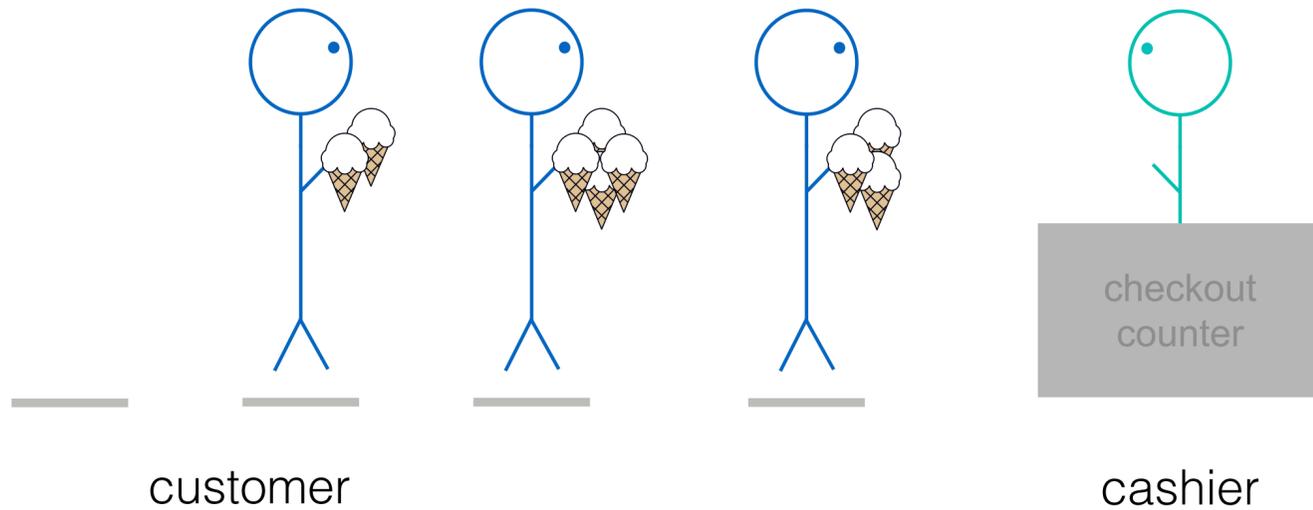
Customer <-> Cashier

customer

cashier

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
- Get in line to see cashier

- Wait for customer to get in line
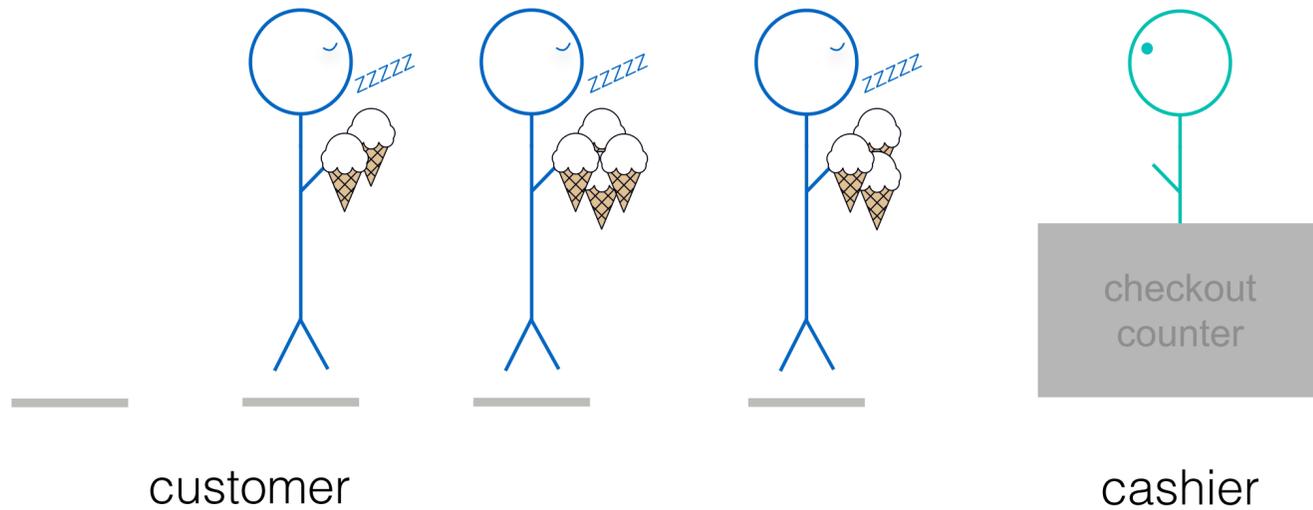
Customer <-> Cashier

customer

cashier

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
- Get in line to see cashier
- Wait until cashier says we're done

- Wait for customer to get in line
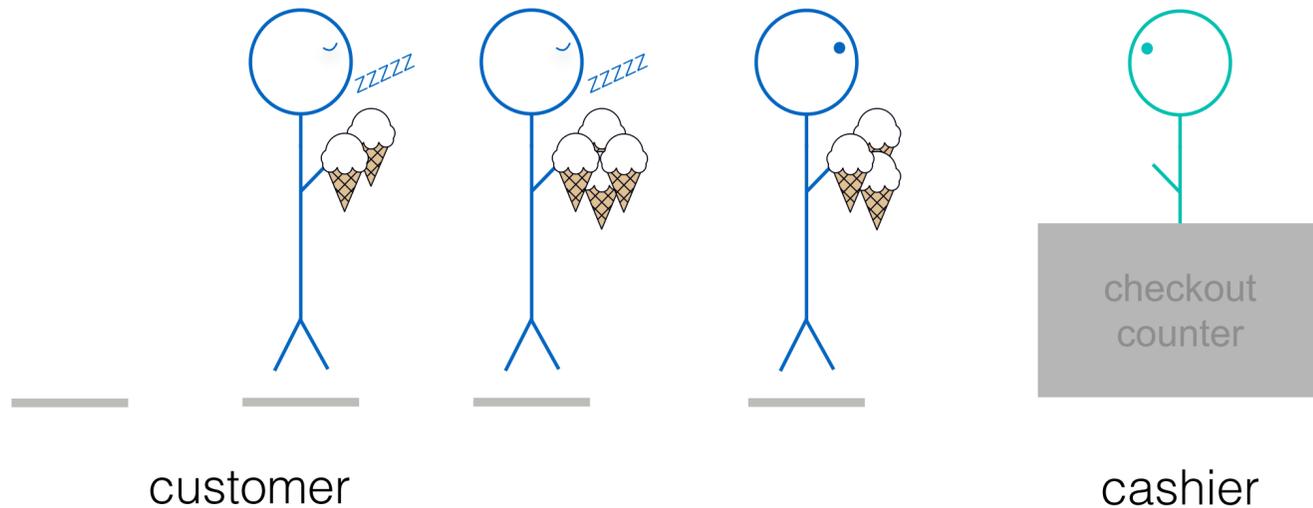
Customer <-> Cashier

customer

cashier

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
- Get in line to see cashier
- Wait until cashier says we're done

- Wait for customer to get in line
- Ring up that customer
- Tell the customer they can leave
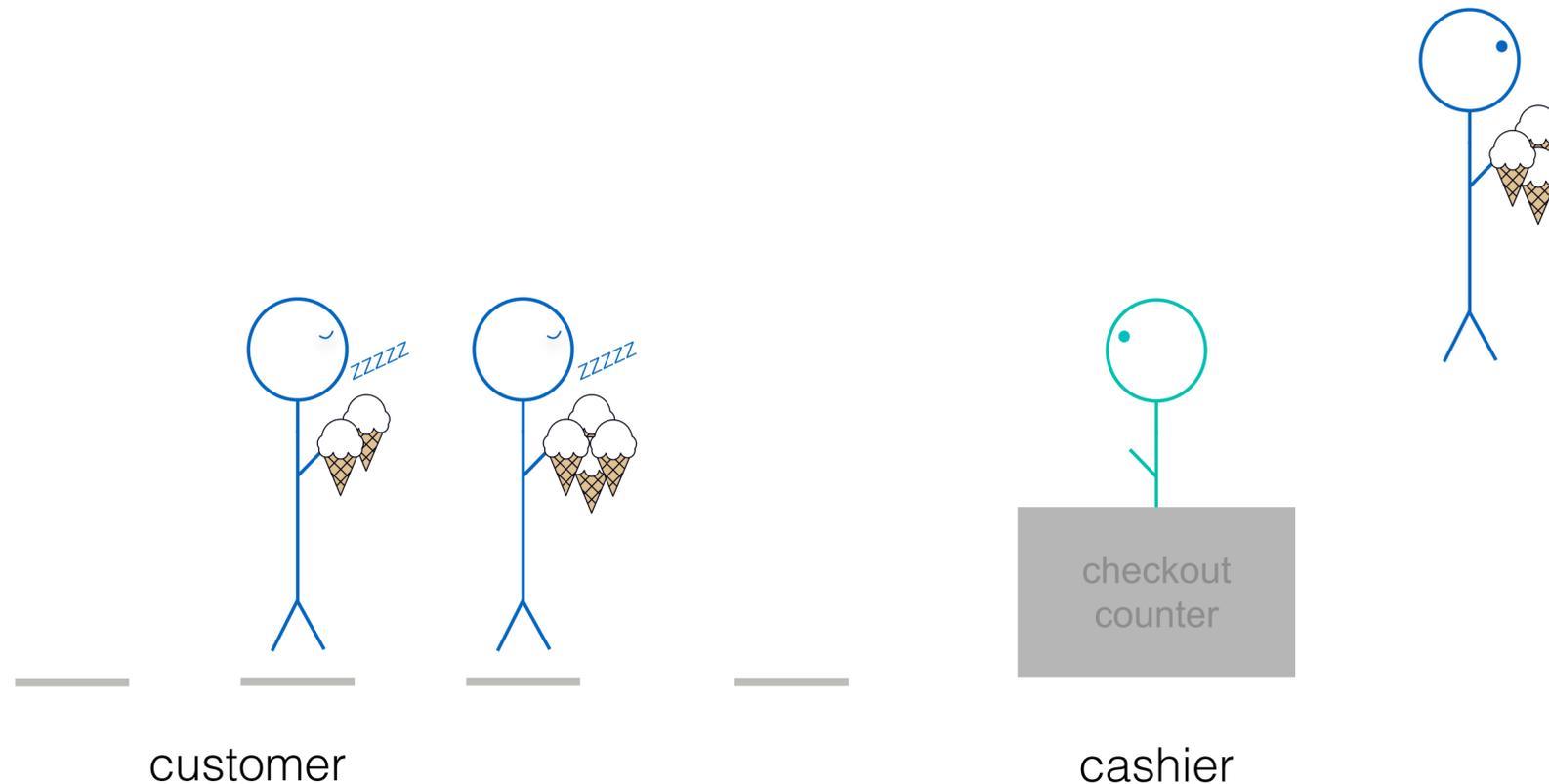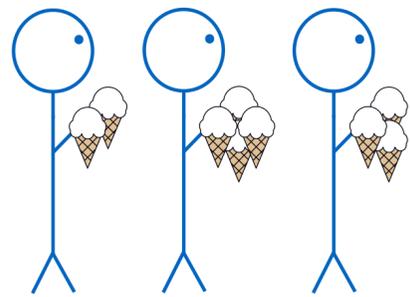
Customer <-> Cashier

customer

cashier

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
- Get in line to see cashier
- Wait until cashier says we're done

- Wait for customer to get in line
- Ring up that customer
- Tell the customer they can leave

Customer <-> Cashier

customer

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
- Get in line to see cashier
- Wait until cashier says we're done

cashier

- Wait for customer to get in line
- Ring up that customer
- Tell the customer they can leave

- Questions:
  - How should customers join the line / store their ordering in line? (How does the cashier know who to help first?)
  - How should the cashier wait until a customer has joined the line?
  - How should the cashier notify a specific customer that they are finished?

Electrician <-> Customers

customers

- Order 1-4 ice cream cones
- Hire a clerk on-demand to make each cone
- Get in line to see cashier
- Wait until cashier says we're done
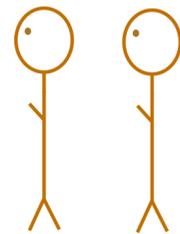
electricians

- Wait until all customers have left
- Fix electrical wiring

- Questions:
  - How should electricians wait until all customers have left the store?