

Lab 4: Interfaces

Instruction

1. Click the link provided on CourseVille to create your own repository.
2. Open Eclipse and then “File > new > Java Project” and set project name in this format **2110215_Lab4_2024_2_{ID}_{FIRSTNAME}**
 - Example: **2110215_Lab4_2024_2_6731234521_Kevin**.
3. Initialize git in your project directory
 - **Add .gitignore.**
 - Commit and push initial codes to your GitHub repository.
4. Implement all the classes and methods following the details given in the problem statement file which you can download from CourseVille.
 - You should create commits with meaningful messages when you finish each part of your program.
 - Don't wait until you finish all the features to create a commit.
5. Test your codes with the provided JUnit test cases, they are inside package **test.grader**
 - If you want to create your own test cases, please put them inside package **test.student**
 - Aside from passing all test cases, your program must be able to run properly without any runtime errors.
 - There will be additional test cases to test your code after you submit the final version, **make sure you follow the specifications in this document.**
6. After finishing the program, create a UML diagram and put the result image (**UML.png**) at the root of your project folder.
7. Export your project into a jar file called **Lab4_2024_2_{ID}** and place it at the root directory of your project.
 - Example: **Lab4_2024_2_6731234521.jar**
8. Push all other commits to your GitHub repository

1. Problem Statement : Overdue! All You Can Rush



This lab is based on **Overcooked!** game series by **Team17 Digital**, heavily modified to be playable in command line style.

The basic rule of this game is that you are given a limited kitchen space, and ingredients. You need to serve all the customers' orders before the time runs out.

1.1 Demonstration

Upon starting up the game, you will be greeted by the starting screen, as shown below.

```
=====
Welcome to
Overdue! All You Can Rush
=====
What are you doing?
1) Start Game
2) Quit
=====
>> |
```

Fig 1. Starting Screen

After the game has been started, you will be taken into the main Kitchen screen. Which looks like below.

```

=====
Kitchen Menu
Current Customer
1) Customer: [Well Done Steak, Chopped Lettuce], Remaining Time: 100
Your Hand: Empty
=====
1) Lettuce Crate - Empty
2) Meat Crate - Empty
3) Egg Crate - Empty
4) Bread Crate - Empty
5) Counter - Dish []
6) Counter - Dish []
7) Counter - Dish []
8) Chopping Board - Empty
9) Stove - Pan []
10) Stove - Pan []
11) Bin - Empty
12) Dish Washer - Empty
13) Serve the Customer
=====
What are you going to interact with?
=====
>> |

```

Fig 2. Main Kitchen Screen.

From this screen, you will be able to see the Customer List at the top, denoting their Order, as well as the remaining time. This time will tick down every time you perform an action. Each Customer has different decrement rate. The goal is to serve all the Customer's Order before their time runs out.

To serve a Customer's order, you need to put everything they ordered into the same Dish, hold onto that, and pick serve option. Upon served, the Dish will be cleared and becomes dirty, in which you need to put it into Dish Washer.

To interact with all Kitchen equipment, you simply need to pick said equipment of choice. If your hand is not empty, you will place that object down onto the chosen equipment instead (given that said equipment accept the item that was in your hand). The details for each interaction will be explained later in this document.

2. Implementation Details:

To complete this assignment, you need to understand about **Interfaces**.

This assignment gives you more freedom over how you can implement the solution. There are **more than one** possible way that the final class diagram could look like, so we will **not** provide a class diagram.

There are **four** packages in the provided files: `application`, `entity`, `logic` and `test`.

You will be implementing most of the class in the `entity` package (Only a few classes are provided, you need to implement the rest from scratch)

There are some test cases given in package `test.grader`. These will help test your code whether it will be able to run or not. However, **some conditions are not tested** in these test cases. If you need to test more conditions, please create your own test case in `test.student` package. However, **it is optional and won't be graded**.

You can define any additional number of private (but not public, protected or package) **fields and methods** in addition to the fields and methods specified below. You are encouraged to try to group your logic into private methods to **reduce duplicate code as much as possible**.

Do note that only relevant methods related to logic will be explained.

* *Noted that Access Modifier Notations are listed below*

+ (public)

(protected)

- (private)

Underline (static)

Italic (abstract)

2.1 package logic

This package's content is already provided for you. **You do NOT need to edit anything in this package to complete this assignment.** However, you might need to use these methods to help with your implementation.

2.1.1 Class `InvalidIngredientException` extends `Exception`

A special exception that will be used for a method in the upcoming `LogicUtil`.

You will need to handle this exception as well, more detail later in the document.

2.1.1.1 Constructor

+ <code>InvalidIngredientException(String str)</code>	Initialize the exception object with the message <code>str</code> .
---	---

2.1.2 Class `LogicUtil`

This class provides a lot of useful methods for the game. You only need to use one, though.

2.1.2.1 Methods

+ <u><code>Ingredient createIngredientFromName(String s)</code></u> <u>throws <code>InvalidIngredientException</code></u>	Returns the specified <code>Ingredient</code> object from the input <code>String</code> . It throws <code>InvalidIngredientException</code> if the provided name is invalid.
--	--

2.1.3 Class **Player**

This class represents the player.

2.1.3.1 Fields and Constructors

- Item holdingItem	A field represents the Item that the player is holding. It can be <code>null</code> if a player holds nothing.
+ Player()	Initialize a player object. The player holds nothing at the start.

2.1.3.2 Methods

+ boolean isHandEmpty()	Returns true if the player's hand is empty
+ Item placeItem()	Make player's hand empty and return the <code>Item</code> that player had been holding.
getter/ setter for holdingItem	

2.1.4 Class **StringUtil**

This class provides a useful method for formatting String that you will need in the future.

2.1.4.1 Methods

+ String formatNamePercentage(String name, int percentage)	Returns a <code>String</code> in the following format: "Name (percentage%)" – Ex: "Dish (100%)"
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2.2 package `entity.base`

2.2.1 Abstract Class `Item`

This class is the base class of anything that a player can hold onto.

You do NOT need to modify this class to complete the assignment.

2.2.1.1 Constructor

# <code>Item(String name)</code>	Initialize the <code>Item</code> with the provided name.
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2.2.1.2 Methods

+ boolean <code>equals(Object obj)</code>	This method has been specifically written so that 1. If the other object is <code>Item</code> type, it will compare both items' respective name together. 2. If the other object is <code>String</code> type, it will instead compare the current name with the other <code>String</code> .
+ <code>String toString()</code>	Returns the name of the object

2.2.2 Abstract Class `Ingredient` extends `Item`

This class represents the `Ingredient` that the player can use to cook into dishes.

You do NOT need to modify this class to complete the assignment.

2.2.2.1 Field and Constructor

- boolean <code>isEdible</code>	A field denotes if the <code>Ingredient</code> is edible or not
# <code>Ingredient(String name)</code>	Initialize the <code>Ingredient</code> with the provided name and set it to be inedible by default.

2.2.2.2 Methods

getter/setter for <code>isEdible</code>	
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2.2.3 Abstract Class Container extends Item

This class represents the Container type Item that the player can hold onto. This type of Item can hold a certain number of Ingredients inside.

You do NOT need to modify this class to complete the assignment.

2.2.3.1 Fields and Constructor

- ArrayList<Ingredient> content	The current content of the Container
- int maxCapacity	How many items can be stored in this Container.
- int capacity	How many empty slots left for this Container.
# Container(String name, int capacity)	Initialize the Container fields with respective values.

2.2.3.2 Methods

+ boolean verifyContent(Ingredient i)	A method used for verifying if the Ingredient can be put in this Container or not. Its behavior varies between different type of Containers.
+ boolean addContent(Ingredient i)	Returns true if the specified Ingredient can be added into Container successfully, returns false otherwise. The Ingredient can only be successfully added if 1. The Ingredient can be put in this container (checked using verifyContent method above) 2. The current Container has a space for it.
+ void clearContent()	Clear the content of the Container
+ void transferContent(Container c)	Transfer all the content from Container c Please see the code for more details.
Remaining getter/setters for the fields	

2.2.4 Interface Choppable

This interface defines methods for Ingredient that can be chopped.

2.2.4.1 Method

+ <i>void chop()</i>	This method will be called when the <code>Ingredient</code> got chopped. More information in the upcoming section.
+ <i>boolean isChopped()</i>	Self-explanatory

2.2.5 Interface Cookable

This interface defines methods for Ingredient that can be cooked.

2.2.5.1 Method

+ <i>void cook()</i>	This method will be called when the <code>Ingredient</code> got cooked. More information in the upcoming section.
+ <i>boolean isBurnt()</i>	Self-explanatory

2.2.6 Interface Updatable

This interface defines methods for the object that can update every game step.

2.2.6.1 Method

+ <i>void update()</i>	Updates the information. This method is called every end of game step.
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2.3 package `entity.ingredient`

This package contains implementation of the **concrete** Ingredients. All classes must be created from scratch.

2.3.1 Class **Lettuce** extends **Ingredient**

Implements: Choppable

This class represents a Lettuce type Ingredient, which can only be chopped.

2.3.1.1 Fields and Constructor

- boolean chopState	Keeps track if the <code>Lettuce</code> has been chopped or not.
+ <code>Lettuce()</code>	Initialize the object with the name "Lettuce" It sets to edible, and not been chopped by default.

2.3.1.1 Methods

+ void chop()	Do nothing if the <code>Lettuce</code> has been chopped, otherwise change the state to chopped and the name to "Chopped Lettuce"
+ boolean isChopped()	Returns <code>chopState</code>

2.3.2 Class **Egg** extends **Ingredient**

Implements: Cookable

This class represents an Egg type Ingredient, which can only be cooked.

2.3.2.1 Fields and Constructor

- int cookedPercentage	Keeps track of how "cooked" the <code>Egg</code> is.
+ <code>Egg()</code>	Initialize the object with the name "Egg" Sets the <code>cookedPercentage</code> to 0

2.3.2.1 Methods

+ void cook()	Increase the <code>cookedPercentage</code> by 12 Depending on <code>cookedPercentage</code> , change the name and the <code>isEdible</code> status to the following; 0 < x <= 50: Name = "Raw Egg", it is inedible. 50 < x <= 80: Name = "Sunny Side Egg", it is edible.
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	80 < x <= 100: Name = "Fried Egg", it is edible. x > 100: Name = "Burnt Egg", it is inedible.
+ boolean isBurnt()	Returns true if <code>cookedPercentage > 100</code>
+ String toString()	Returns a formatted string in the format of "<name> (<cookedPercentage>%)" Ex: "Egg (0%)" Please call a method from StringUtil
Remaining getter/setter	

2.3.3 Class **Meat** extends **Ingredient**

Implements: Choppable, Cookable

This class represents a Meat type Ingredient, which can be both be chopped and cooked.

2.3.3.1 Fields and Constructor

- boolean chopState	Keeps track if the <code>Meat</code> has been chopped or not.
- int cookedPercentage	Keeps track of how "cooked" the <code>Meat</code> is.
+ Meat()	Initialize the object with the name "Meat" It sets to not been chopped by default, and sets the <code>cookedPercentage</code> to 0

2.3.3.1 Methods

+ void chop()	Do nothing if the <code>Meat</code> has been chopped or cooked, otherwise change the state to chopped and the name to "Minced Meat"
+ boolean isChopped()	Returns <code>chopState</code>
+ void cook()	Depending on if the meat has been chopped or not, if it's not Increase the <code>cookedPercentage</code> by 10 Depending on <code>cookedPercentage</code> , change the name and the <code>isEdible</code> status to the following; 0 < x <= 50: Name = "Raw Meat", it is inedible. 50 < x <= 80: Name = "Medium Rare Steak", it is edible.

	<p>80 < x <= 100: Name = "Well Done Steak", it is edible. x > 100: Name = "Burnt Steak", it is inedible. If the meat has been chopped, Increase the <code>cookedPercentage</code> by 15</p> <p>Depending on <code>cookedPercentage</code>, change the name and the <code>isEdible</code> status to the following; 0 < x <= 80: Name = "Raw Burger", it is inedible. 80 < x <= 100: Name = "Cooked Burger", it is edible. x > 100: Name = "Burnt Burger", it is inedible.</p>
+ boolean isBurnt()	Returns true if <code>cookedPercentage</code> > 100
+ String toString()	Returns a formatted string in the format of " <code><name> (<cookedPercentage>%)</code> " Ex: "Meat (0%)" Please call a method from StringUtil

2.4 package `entity.container`

This package contains implementation of the **concrete** Containers. All classes must be created from scratch.

2.4.1 Class **Dish** extends **Container**

This class represents a Dish type Container. It can contain four edible Ingredients at maximum, and is necessary to put Ingredients in before serving the customer.

2.4.1.1 Fields and Constructor

- int dirty	The dirtiness of the dish.
+ Dish()	Initialize the object with the name "Dish", with the capacity of 4. Sets <code>dirty</code> to 0
+ Dish(int dirty)	Initialize the object with the name "Dish", with the capacity of 4. Sets <code>dirty</code> to the specified amount

2.4.2.1 Methods

+ boolean isDirty()	Returns true if <code>dirty</code> > 0
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+ boolean verifyContent(Ingredient i)	Returns true if the <code>Dish</code> is not dirty and the <code>Ingredient</code> is edible
+ void setDirty(int dirty)	Set <code>dirty</code> value, if dirty is less than 0, set it to 0 Also, if <code>dirty</code> is greater than 0, set the name to "Dirty Dish", otherwise change the name back to "Dish".
+ void clean(int amount)	Clean the Dish; reduce the <code>dirty</code> by the specified amount
+ String toString()	If the Dish is dirty, returns a formatted string in the format of "<name> (<dirty>%)" Ex: "Dirty Dish (0%)" Please call a method from <code>StringUtil</code> Otherwise, call toString of the superclass
Remaining getter/setters	

2.4.2 Class Pan extends Container

This class represents a Pan type Container. It can contain one Cookable Ingredients at maximum

2.4.2.1 Constructor

+ Pan ()	Initialize the object with the name "Pan", with the <code>capacity</code> of 1.
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2.4.2.1 Methods

+ boolean verifyContent(Ingredient i)	Returns true if the <code>Ingredient</code> is <code>Cookable</code> <u>Hint</u> : instanceof can be used to check if the object has implemented certain interface or not as well
+ void cook()	Call the <code>cook</code> method of all the <code>Ingredients</code> inside, only if the Pan is not empty

	Hint: You can cast the <code>Ingredient</code> to <code>Cookable</code> in order to access their specific methods
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2.5 package `entity.counter`

This package contains implementation of all the Kitchen equipment. There is one base class given, all other classes must be created from scratch.

2.5.1 Class `Counter`

This class represents the Kitchen counter. The player can put any `Item` they are holding onto the counter, and said item can be picked up by the player if their hand is empty.

This class is given, you do not need to modify anything in this class. Although you will need to use these details in the future implementation.

2.5.1.1 Fields and Constructor

- String <code>name</code>	Name of the object, mainly used for displaying
- Item <code>placedContent</code>	The <code>Item</code> that has been placed on the counter, can be <code>null</code> if empty
+ <code>Counter()</code>	Initialize the object with the name "Counter"
+ <code>Counter(Item content)</code>	Initialize the object with the name "Counter" and set the <code>placedContent</code> to the given <code>Item</code>

2.5.1.2 Methods

+ boolean <code>isPlacedContentEmpty()</code>	Returns true if <code>placedContent</code> is <code>null</code>
+ void <code>interact(Player p)</code>	<p>The intended default behavior when the Player interact with the Counter</p> <p>If <code>placedContent</code> is empty, then the player place down the item from their hand. Otherwise, it performs a check for each <code>Item</code> type and react accordingly. See the code for more details.</p>
+ String <code>toString()</code>	Formatting the text properly, mostly used for display

Remaining getter/setters	
--------------------------	--

2.5.2 Class `Bin` extends `Counter`

This class represents the Bin. The player can discard the holding `Ingredient`, or empty the Container they are holding using this object.

2.5.2.1 Constructor

+ <code>Bin()</code>	Initialize the object with the name “Bin”
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2.5.2.2 Methods

+ void <code>interact(Player p)</code>	<p>If the player’s hand is empty, do nothing.</p> <p>Otherwise, check the type of the <code>Item</code> that player is holding.</p> <p>If it is <code>Ingredient</code>, empty the player’s hand.</p> <p>If it is <code>Container</code>, empty said <code>Container</code> instead.</p>
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2.5.3 Class `Crate` extends `Counter`

This class represents the Ingredient Crates. The player can obtain infinite supply of `Ingredient` if they interact with this object while having empty hand.

2.5.3.1 Fields and Constructor

- <code>String myIngredient</code>	The <code>Ingredient</code> that this <code>Crate</code> contains, note that it is stored in the form of <code>String</code>
+ <code>Crate(String s)</code>	Initialize the object with the name “< <code>Ingredient</code> > <code>Crate</code> ” (Example: “Lettuce <code>Crate</code> ” if the parameter is “Lettuce”) and set <code>myIngredient</code> properly

2.5.3.2 Methods

+ void <code>interact(Player p)</code>	If the player’s hand is not empty, or there is a content placed on this <code>Counter</code> , call the base <code>Counter</code> behavior.
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	<p>Otherwise, set the Item that player holds to the new <code>Ingredient</code> object created using <code>createIngredientFromName</code> from <code>LogicUtil</code>.</p> <p>Please note that <code>createIngredientFromName</code> can produce exceptions in case that the given <code>Ingredient</code> name does not exists. <u>In such case, please set the player's hand to <code>null</code>.</u> (Do not <code>printStackTrace</code>, as that will only just shown the error and not correct the behavior)</p>
Remaining getter/setters	

2.5.4 Class `ChoppingBoard` extends `Counter`

This class represents the Chopping Board. The player can place any `Ingredient` onto this object (But not the `Container`). However, if said `Ingredient` is `Choppable`, then it gets chopped as well.

2.5.4.1 Constructor

+ <code>ChoppingBoard()</code>	Initialize the object with the name "Chopping Board"
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2.5.4.2 Methods

+ void <code>interact(Player p)</code>	<p>If there is a content placed on the <code>Counter</code>, call the default <code>Counter</code> behavior.</p> <p>Otherwise, check if the player is holding an <code>Ingredient</code> or not. If it is, call the default <code>Counter</code> behavior, and call the <code>chop()</code> method as well if said <code>Ingredient</code> is <code>Choppable</code>.</p>
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2.5.5 Class `Stove` extends `Counter`

implements `Updatable`

This class represents the Stove. The player can put only the `Pan` on it. This class also updates every player movement step in the game loop, slowly cooking the `Ingredient` that has been put in the `Pan`.

2.5.5.1 Fields and Constructor

+ Stove()	Initialize the object with the name “Stove”
+ Stove(Item content)	Initialize the object with the name “Stove” and set the <code>placedContent</code> to the <code>Item</code> specified

2.5.5.2 Methods

+ void interact(Player p)	If the <code>placedContent</code> is not empty, call the default Counter behavior. Otherwise, check if the <code>Item</code> the player holds is a <code>Pan</code> or not. Call the default Counter behavior if it is.
+ void update()	If the <code>placedContent</code> is a <code>Pan</code> , call the <code>cook()</code> method from the <code>Pan</code> itself.

2.5.6 Class DishWasher extends Counter

implements Updatable

This class represents the Dish Washer. The player can put only the Dirty Dish on it. This class also updates every player movement step in the game loop, slowly cleaning the Dish.

2.5.6.1 Fields and Constructor

+ DishWasher()	Initialize the object with the name “Dish Washer”
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2.5.6.2 Methods

+ void interact(Player p)	If the <code>placedContent</code> is not empty, call the default Counter behavior. Otherwise, check if the <code>Item</code> the player holds is a <code>Dish</code> and is dirty or not. Call the default Counter behavior if it is.
+ void update()	If the <code>placedContent</code> is a <code>Dish</code> , call the <code>clean()</code> method with the amount of 15 from the <code>Dish</code> itself.

Criteria

test.solution.ingredient.EggTest		3.5
	testConstructor	0.5
	testCook	2
	testIsBurnt	0.5
	testToString	0.5
test.solution.ingredient.LettuceTest		1.5
	testConstructor	0.5
	testChop	1
test.solution.ingredient.MeatTest		6
	testConstructor	0.5
	testChop	0.5
	testCookNormal	2
	testCookChop	2
	testIsBurnt	0.5
	testToString	0.25
	testToStringChopped	0.25
test.solution.container.DishTest		6
	testNoParameterConstructor	0.25
	testParameterConstructor	0.25
	testVerifyContent	1
	testVerifyContentInedible	1
	testVerifyContentDirty	1
	testIsDirty	0.5
	testClean	1
	testToString	0.5
	testToStringDirty	0.5
test.solution.container.PanTest		3.5
	testConstructor	0.5
	testVerifyContent	1
	testVerifyContentNonCookable	1
	testCook	1
test.solution.counter.DishWasherTest		6.5
	testConstructor	0.5
	testInteract	0.5
	testInteractNonDish	1.5
	testInteractDish	1.5
	testInteractDirtyDish	1
	testUpdate	1.5
test.solution.counter.StoveTest		5.5
	testConstructor	0.25
	testConstructor1Param	0.25
	testInteract	0.5
	testInteractPan	1.5
	testInteractNonPan	1.5
	testUpdate	1.5
Exception		5
	Handle try/catch	1.5
	Fix the exception properly	1.5
UML		2
test.solution.counter.BinTest		4
	testConstructor	0.5
	testInteract	0.5
	testInteractIngredient	1.5
	testInteractContainer	1.5
test.solution.counter.ChoppingBoardTest		4
	testConstructor	0.5
	testInteract	0.5
	testInteractChoppable	1.5
	testInteractNonIngredient	1.5
test.solution.counter.CrateTest		5.5
	testConstructor	0.5
	testInteract	1.5
	testInteractHandFull	1.5
	testInteractInvalid	2