Laboratory Service

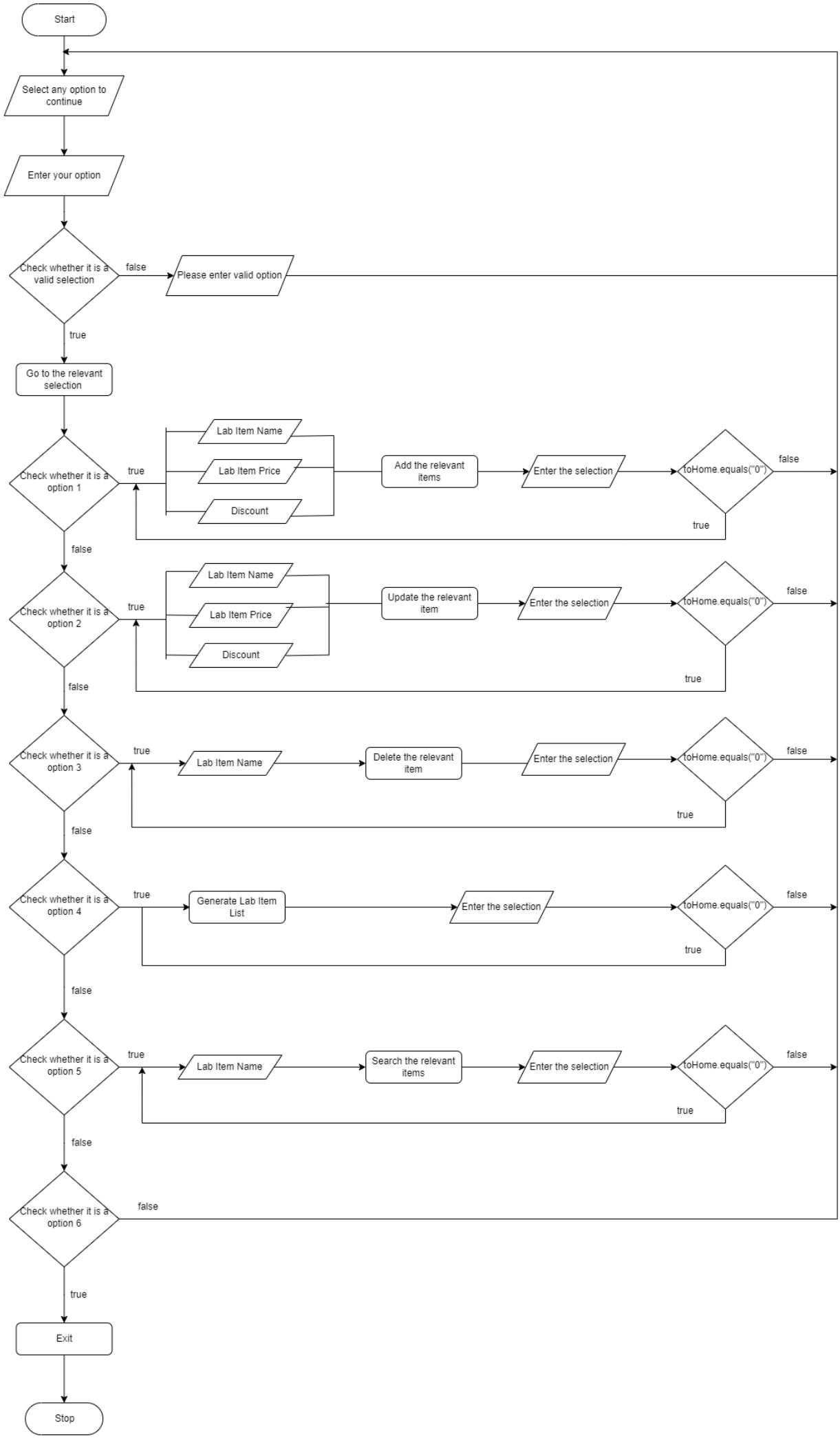
A) -Explain the scenario using a diagram

It is a retail situation in which the Director and Supplier collaborate to purchase and sell laboratory items to their respective laboratories. In this situation, there are one producer and two consumers, they are Director Consumer and a Supplier Consumer. The supplier consumer will then add items to their item list and offer discounts on those items. Director consumer will display the final measured bill. To achieve best practices in OSGI, we expose only the producer service interface rather than the implementation.

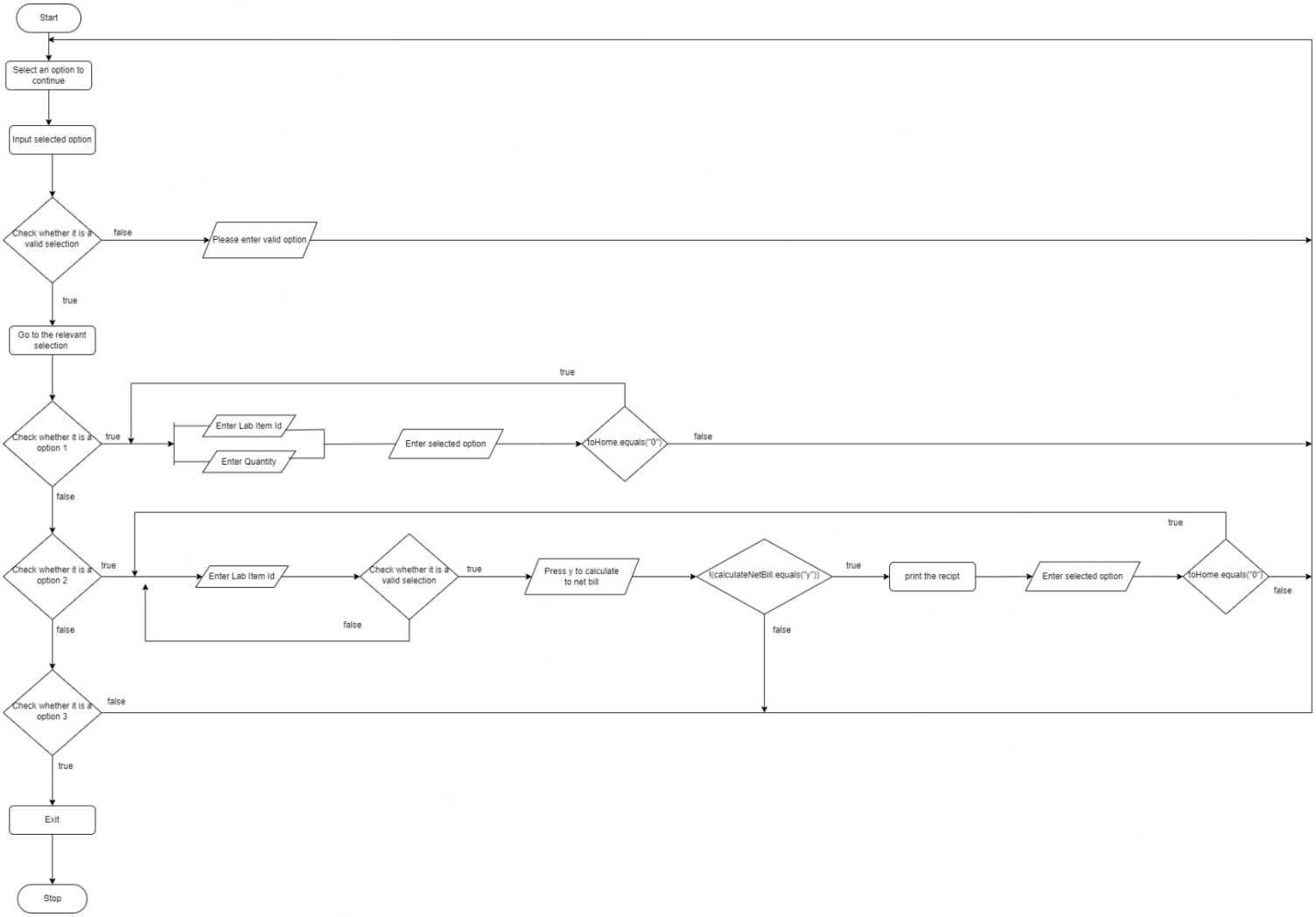
Consumers can work through the interfaces.

FIGUER [01]

The following diagram is workflow of laboratory supplier consumer. There are 6 options of add, update, delete, search items and, supplier can exit by choosing option when necessary. In the process of adding new item to item list, Supplier must input laboratory item name, price, discount which are then save to list. If Supplier input any other input rather than mentioned options, system notify to enter valid option. Then the auto generated id and final price will be calculated by system.


Start
Select any option to continue
Enter your option
Check whether it is a valid selection
false
Please enter valid option
true
Go to the relevant selection
Check whether it is a option 1
true
Lab Item Name
Lab Item Price
Discount
Add the relevant items
Enter the selection
toHome.equals("0")
false
true
false
Check whether it is a option 2
true
Lab Item Name
Lab Item Price
Discount
Update the relevant item
Enter the selection
toHome.equals("0")
false
true
false
Check whether it is a option 3
true
Lab Item Name
Delete the relevant item
Enter the selection
toHome.equals("0")
false
true
false
Check whether it is a option 4
true
Generate Lab Item List
Enter the selection
toHome.equals("0")
false
true
false
Check whether it is a option 5
true
Lab Item Name
Search the relevant items
Enter the selection
toHome.equals("0")
false
true
false
Check whether it is a option 6
false
true
Exit
Stop

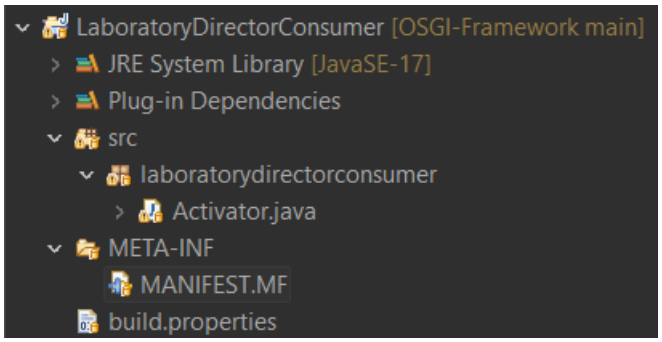
FIGUER [02]



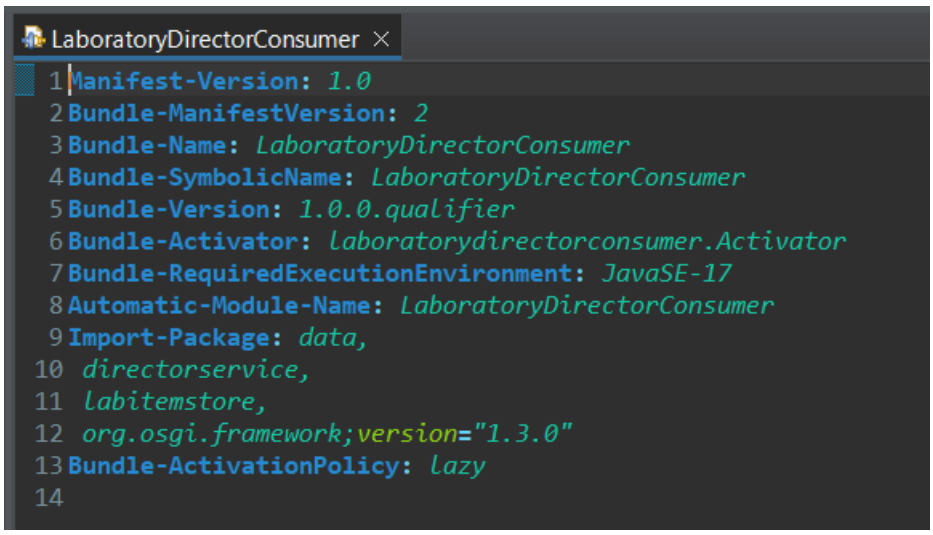
This is the part of the workflow of Director consumer side. Option 1 describes the view of laboratory item list by pressing one. Then by pressing 2 ask Director to enter the name and the quantity, then user can generate the bill which gives the total net price to Director. Director can iterate the process, in the end calculated net bill will be display as subtotal. If the Director wants to exit it can proceed by pressing option 3. If Director selects not related option, then system shows notification to enter a valid option.

B) – Manifest implementation

Director Consumer Manifest

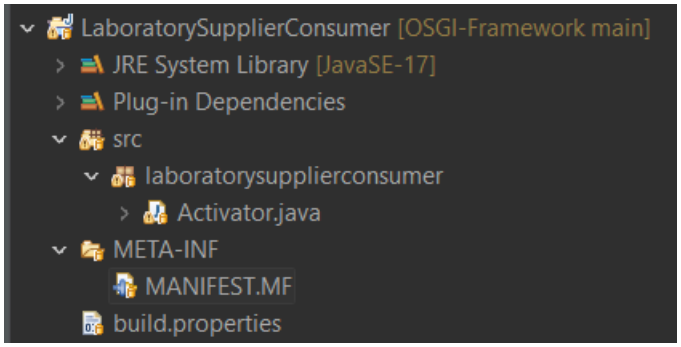


End user of system who are Director consumers will display the bill using the method of DirectorServiceImpl. This bill then prints and present it to the laboratory Director.



This is the Manifest file of Director consumer. Here, imported packages from data, directorservice, labitemstore, org.osgi.framework, and version from this we achieve the services provided by LaboratoryServiceProducer.

Supplier Consumer Manifest



Laboratory item Supplier add items and have the privileged to manage the items and they can make discount to relevant items those details will be labitemstore **labItemsList** in producer.

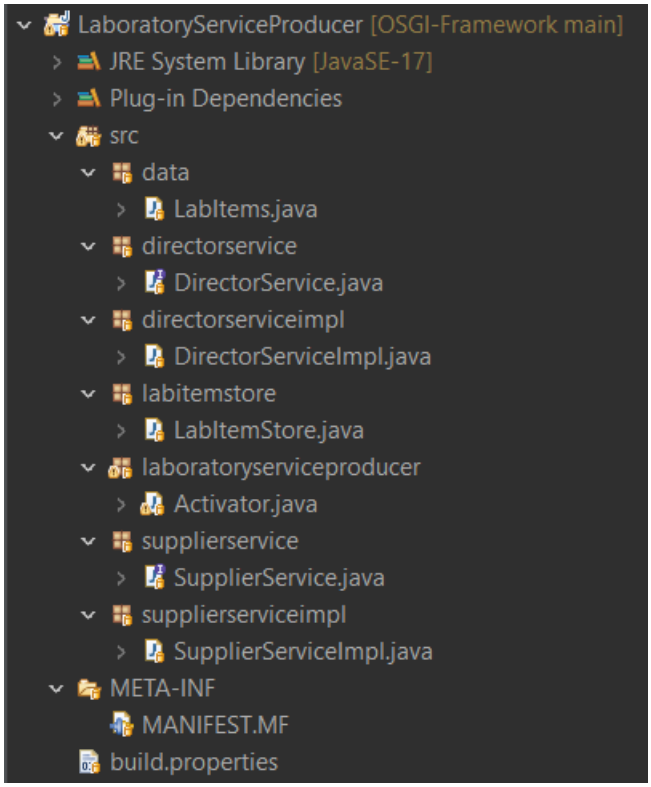
LaboratorySupplierConsumer

```
Manifest-Version: 1.0
Bundle-ManifestVersion: 2
Bundle-Name: LaboratorySupplierConsumer
Bundle-SymbolicName: LaboratorySupplierConsumer
Bundle-Version: 1.0.0.qualifier
Bundle-Activator: laboratorysupplierconsumer.Activator
Bundle-RequiredExecutionEnvironment: JavaSE-17
Automatic-Module-Name: LaboratorySupplierConsumer
Import-Package: data,
 labitemstore,
 org.osgi.framework;version="1.3.0",
 supplierservice
Bundle-ActivationPolicy: lazy

```

In this supplier consumer manifest file, Imported the data, labitemstore, supplierservice, org.osgi.framework from producer.

Laboratory Service Producer Manifest



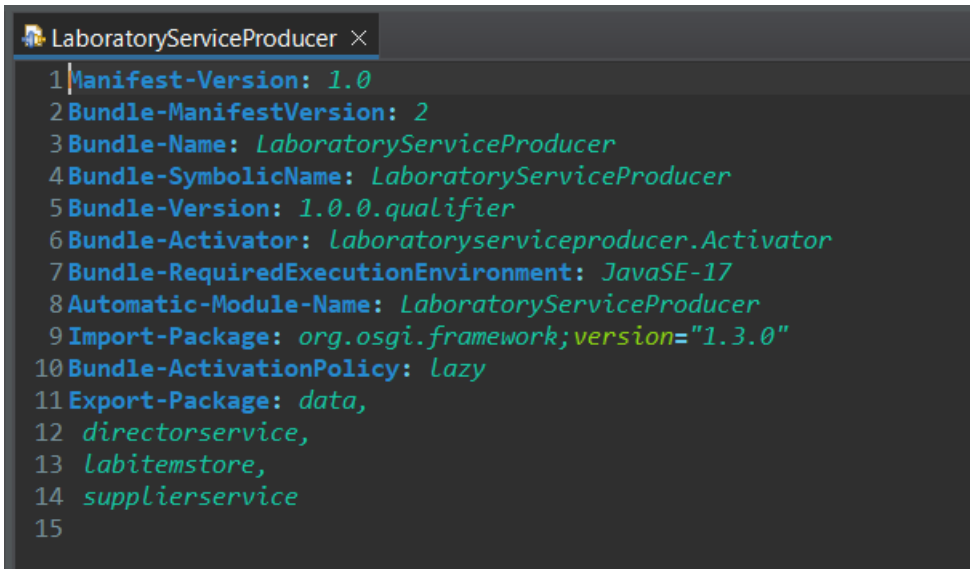
This is producer part of the system. There are two of them which are Director service and Supplier service.

In Director service,

DirectorService is the interface. DirectorServiceImpl is the implementation of the interface. It has calculation algorithms of the bill and implementation of viewing the laboratory item list. Director service will be export from the bundle. Then laboratory director consumer can use those services to do his tasks.

In Supplier service,

SupplierService is the interface and have the CRUD operations to manipulate items. SupplierServiceImpl class will implement the services in supplier services. Supplier service interface will export as a package. Then laboratory item supplier consumer can use those services to do his tasks.



In the manifest file it **imported** the org.osgi.framework package and **exported** the data, directorservice, supplierservice, labitemstore.

Activator has the list of items that's add by the supplier. It has the shared data between the consumer and producer. Items added by the Supplier can be view by the Director.

Data package has the LabItem class which stores the item details.

In the laboratory service producer activator class register the Director service and Supplier service.

C) – All the commands of bundle install and run in OSGI framework

Supplier Consumer Stopped

```
osgi> stop 4
==========LABORATORY SUPPLIER CONSUMER STOPPED==========

osgi>
```

Supplier Consumer Started

```
==========LABORATORY SUPPLIER CONSUMER STARTED==========

----------WELCOME TO SUPPLIER SERVICE----------
Please select any option to continue >>
<< options >>
(1) Add new Lab Item
(2) Update an exsisting Lab Item
(3) Delete an exsisting Lab Item
(4) List Lab Items
(5) Search Lab Item by name
(6) Exit

Enter your option >>
```

Director Consumer Stopped

```
osgi> stop 2
==========LABORATORY DIRECTOR CONSUMER STOPPED==========

osgi>
```

Director Consumer Started

```
==========LABORATORY DIRECTOR CONSUMER STARTED==========
=============LABORATORY SERVICE STARTED=============

----------WELCOME TO BILLING----------
Please select your option for continue >>
--Options--
(1) Available Lab Item List
(2) Made Lab Item Order
(3) Exit

Input selected option >>
```

Laboratory Service Producer Stopped

```
osgi> stop 3
=============LABORATORY SERVICE STOPPED=============
```

Laboratory Service Producer Started

```
osgi> start 3
=============LABORATORY SERVICE STARTED=============
osgi>
```

Listing Bundles

```
osgi> lb
START LEVEL 6
   ID|State      |Level|Name
    0|Active     |    0|OSGi System Bundle (3.17.100.v20211104-1730)|3.17.100.v20211104-1730
    1|Active     |    1|Simple Configurator (1.4.0.v20210315-2228)|1.4.0.v20210315-2228
    2|Active     |    4|LaboratoryDirectorConsumer (1.0.0.qualifier)|1.0.0.qualifier
    3|Active     |    4|LaboratoryServiceProducer (1.0.0.qualifier)|1.0.0.qualifier
    4|Active     |    4|LaboratorySupplierConsumer (1.0.0.qualifier)|1.0.0.qualifier
    5|Active     |    4|ServicePublisher (1.0.0.qualifier)|1.0.0.qualifier
    6|Active     |    4|ServiceSubscriber (1.0.0.qualifier)|1.0.0.qualifier
    7|Active     |    4|Logback Classic Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    8|Active     |    4|Logback Core Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    9|Resolved   |    1|SLF4J API Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
   10|Active     |    4|Jackson-annotations (2.12.1.v20210128-1726)|2.12.1.v20210128-1726
   11|Active     |    4|Jackson-core (2.12.1.v20210128-1726)|2.12.1.v20210128-1726
   12|Active     |    4|jackson-databind (2.12.1.v20210128-1726)|2.12.1.v20210128-1726
   13|Active     |    4|jnr-constants (0.9.15.v20200501-1917)|0.9.15.v20200501-1917
   14|Active     |    4|jnr-enxio (0.25.0.v20200501-1917)|0.25.0.v20200501-1917
   15|Active     |    4|jnr-ffi (2.1.12.v20200513-1859)|2.1.12.v20200513-1859
   16|Active     |    4|jffi (1.2.23.v20211029-0121)|1.2.23.v20211029-0121
   17|Resolved   |    1|jffi (1.2.23.v20211029-0121)|1.2.23.v20211029-0121
   18|Active     |    4|jnr-posix (3.0.54.v20200501-1917)|3.0.54.v20200501-1917
   19|Active     |    4|jnr-unixsocket (0.28.0.v20200501-1917)|0.28.0.v20200501-1917
   20|Active     |    4|jnr-x86asm (1.0.2.v20200501-1917)|1.0.2.v20200501-1917
   21|Active     |    4|Google Auth Library for Java - Credentials (0.20.0.v20200515-2048)|0.20.0.v20200515-2048
   22|Active     |    4|Google Auth Library for Java - OAuth2 HTTP (0.20.0.v20200604-1524)|0.20.0.v20200604-1524
```

Uninstall Director Consumer

```
osgi> uninstall 2
==========LABORATORY DIRECTOR CONSUMER STOPPED==========
osgi> lb
START LEVEL 6
   ID|State      |Level|Name
    0|Active     |    0|OSGi System Bundle (3.17.100.v20211104-1730)|3.17.100.v20211104-1730
    1|Active     |    1|Simple Configurator (1.4.0.v20210315-2228)|1.4.0.v20210315-2228
    3|Active     |    4|LaboratoryServiceProducer (1.0.0.qualifier)|1.0.0.qualifier
    4|Resolved   |    4|LaboratorySupplierConsumer (1.0.0.qualifier)|1.0.0.qualifier
    5|Active     |    4|ServicePublisher (1.0.0.qualifier)|1.0.0.qualifier
    6|Active     |    4|ServiceSubscriber (1.0.0.qualifier)|1.0.0.qualifier
    7|Active     |    4|Logback Classic Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    8|Active     |    4|Logback Core Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    9|Resolved   |    1|SLF4J API Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
   10|Active     |    4|Jackson-annotations (2.12.1.v20210128-1726)|2.12.1.v20210128-1726
```

Uninstall Supplier Consumer

```
osgi> uninstall 4
==========LABORATORY SUPPLIER CONSUMER STOPPED==========
osgi> lb
START LEVEL 6
   ID|State      |Level|Name
    0|Active     |    0|OSGi System Bundle (3.17.100.v20211104-1730)|3.17.100.v20211104-1730
    1|Active     |    1|Simple Configurator (1.4.0.v20210315-2228)|1.4.0.v20210315-2228
    2|Active     |    4|LaboratoryDirectorConsumer (1.0.0.qualifier)|1.0.0.qualifier
    3|Active     |    4|LaboratoryServiceProducer (1.0.0.qualifier)|1.0.0.qualifier
    5|Active     |    4|ServicePublisher (1.0.0.qualifier)|1.0.0.qualifier
    6|Active     |    4|ServiceSubscriber (1.0.0.qualifier)|1.0.0.qualifier
    7|Active     |    4|Logback Classic Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    8|Active     |    4|Logback Core Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    9|Resolved   |    1|SLF4J API Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
   10|Active     |    4|Jackson-annotations (2.12.1.v20210128-1726)|2.12.1.v20210128-1726
```

Uninstall Laboratory Service Producer

```
osgi> uninstall 3
==========LABORATORY SERVICE STOPPED==========
osgi> lb
START LEVEL 6
   ID|State      |Level|Name
    0|Active     |    0|OSGi System Bundle (3.17.100.v20211104-1730)|3.17.100.v20211104-1730
    1|Active     |    1|Simple Configurator (1.4.0.v20210315-2228)|1.4.0.v20210315-2228
    2|Active     |    4|LaboratoryDirectorConsumer (1.0.0.qualifier)|1.0.0.qualifier
    5|Active     |    4|ServicePublisher (1.0.0.qualifier)|1.0.0.qualifier
    6|Active     |    4|ServiceSubscriber (1.0.0.qualifier)|1.0.0.qualifier
    7|Active     |    4|Logback Classic Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    8|Active     |    4|Logback Core Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
    9|Resolved   |    1|SLF4J API Module (1.2.3.v20200428-2012)|1.2.3.v20200428-2012
   10|Active     |    4|Jackson-annotations (2.12.1.v20210128-1726)|2.12.1.v20210128-1726
```

D) – Sample Screen Shots of its behavior and outputs

Add Item 1

```
Enter your option >>
1
Lab Item Name :
Gloves
Lab Item Price :
3000
Discount :
5
Successfully added the Lab Item!!
press '0' to go back to home OR press 'any key' to continue >>
```

Supplier Consumer add item by selecting option 1

Add Item 2

```
Lab Item Name :
Coats
Lab Item Price :
9500
Discount :
8
Successfully added the Lab Item!!
press '0' to go back to home OR press 'any key' to continue >>
```

Supplier Consumer add another item by selecting option 1

Update item 1

```
Enter your option >>
2
Lab Item Name :
Gloves
Lab Item Price :
3500
Discount :
8
Successfully updated the Lab Item!!
press '0' to go back to home OR press 'any key' to continue >>
```

Supplier Consumer can update existing item by selecting option 2

Delete item 1

```
Enter your option >>
3
Enter the Lab Item name :
Gloves
Successfully deleted the Lab Item!!
press '0' to go back to home OR press 'any key' to continue >>
```

Supplier Consumer can update existing item by selecting option 3

List Items

```
Enter your option >>
4
|-----------------------------------LAB ITEM LIST-----------------------------------

Lab Item ID:    Lab Item Name:  Item Price:     Discount (%):           Net Price:
2               Coats           9500.0          8.0                     8740.0

-------------------------------------------------------------------------------------
press '0' to go back to home OR press 'any key' to continue >>
```

Supplier Consumer able to view item list by selecting option 4

Search item by Name

```
Enter your option >>
5
Enter the Lab Item name :
Coats
Lab Item found!!
press '0' to go back to home OR press 'any key' to continue >>
```

Supplier Consumer can search added items by selecting option 5

Director Consumer

Select an Option

```
==========LABORATORY SUPPLIER CONSUMER STARTED==========

----------WELCOME TO SUPPLIER SERVICE----------
Please select any option to continue >>
<< options >>
(1) Add new Lab Item
(2) Update an exsisting Lab Item
(3) Delete an exsisting Lab Item
(4) List Lab Items
(5) Search Lab Item by name
(6) Exit

Enter your option >>
1
```

Director's Available Laboratory Item List

```
Input selected option >>
1
--------------------------------LAB ITEM LIST-------------------------------------
Lab Item ID:    Lab Item Name:  Item Price:     Discount (%):   Net Price:
1               Coat            9500.0          5.0             9025.0

------------------------------------------------------------------------------------
2               Masks           1000.0          10.0            900.0

------------------------------------------------------------------------------------
press '0' to go home OR press 'any key' to contonue >>
```

Ordering Laboratory Item

```
Input selected option >>
2
----------WELCOME TO LAB ITEMS'S ORDERING----------

Enter the Lab Item Id :
1
Enter quantity :
5
press 'y' to calculate net bill OR press 'any key' to continue billing >>
```

Director can lab item id and quantity to order item.

Continue Ordering

```
----------WELCOME TO LAB ITEMS'S ORDERING----------

Enter the Lab Item Id :
2
Enter quantity :
10
press 'y' to calculate net bill OR press 'any key' to continue billing >>
y
```

When he presses ''y'', it proceeds to next step of billing.

Total Bill

```
press 'y' to calculate net bill OR press 'any key' to continue billing >>
y

-------------------------------RECEIPT-------------------------------
Lab Item ID:        Lab Item Name:      Quantity:           Total:
1                   Coat                5                   45125.0
2                   Masks               10                  9000.0
                                                           ----------
Subtotal:                                                   54125.0
                                                           ----------
                                                           ----------
-------------------------------------------------------------------------------
press '0' to go to home OR press 'any key' to continue >>
```

Director will get the calculated total bill.

Exit Director

```
----------WELCOME TO BILLING----------
Please select your option for continue >>
--Options--
(1) Available Lab Item List
(2) Made Lab Item Order
(3) Exit

Input selected option >>
3
osgi>
```

Director can exit the system by selecting the opting 3.