

Sri Lanka Institute of Information Technology



Modern Topics in IT (IT4020)

Assignment 01- Modular development

Telecommunication System

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Table content

1.Introduction.....	3
2.Methanology.....	4
2.1. System diagram.....	4
3.Internet Service.....	5
3.1 manifest implementation.....	5
3.2 producer installation and consumer installation & running services.....	6
3.3. Sample screenshots of its behavior & outputs.....	8
4.Call Service.....	9
4.1 manifest implementation.....	9
4.2 producer installation and consumer installation & running services.....	10
4.3. Sample screenshots of its behavior & outputs.....	12
5.SMS Service.....	14
5.1 manifest implementation.....	14
5.2 producer installation and consumer installation & running services.....	15
5.3. Sample screenshots of its behavior & outputs.....	17
6.Loan Service.....	19
6.1 manifest implementation.....	19
6.2 producer installation and consumer installation & running services.....	20
6.3. Sample screenshots of its behavior & outputs.....	22

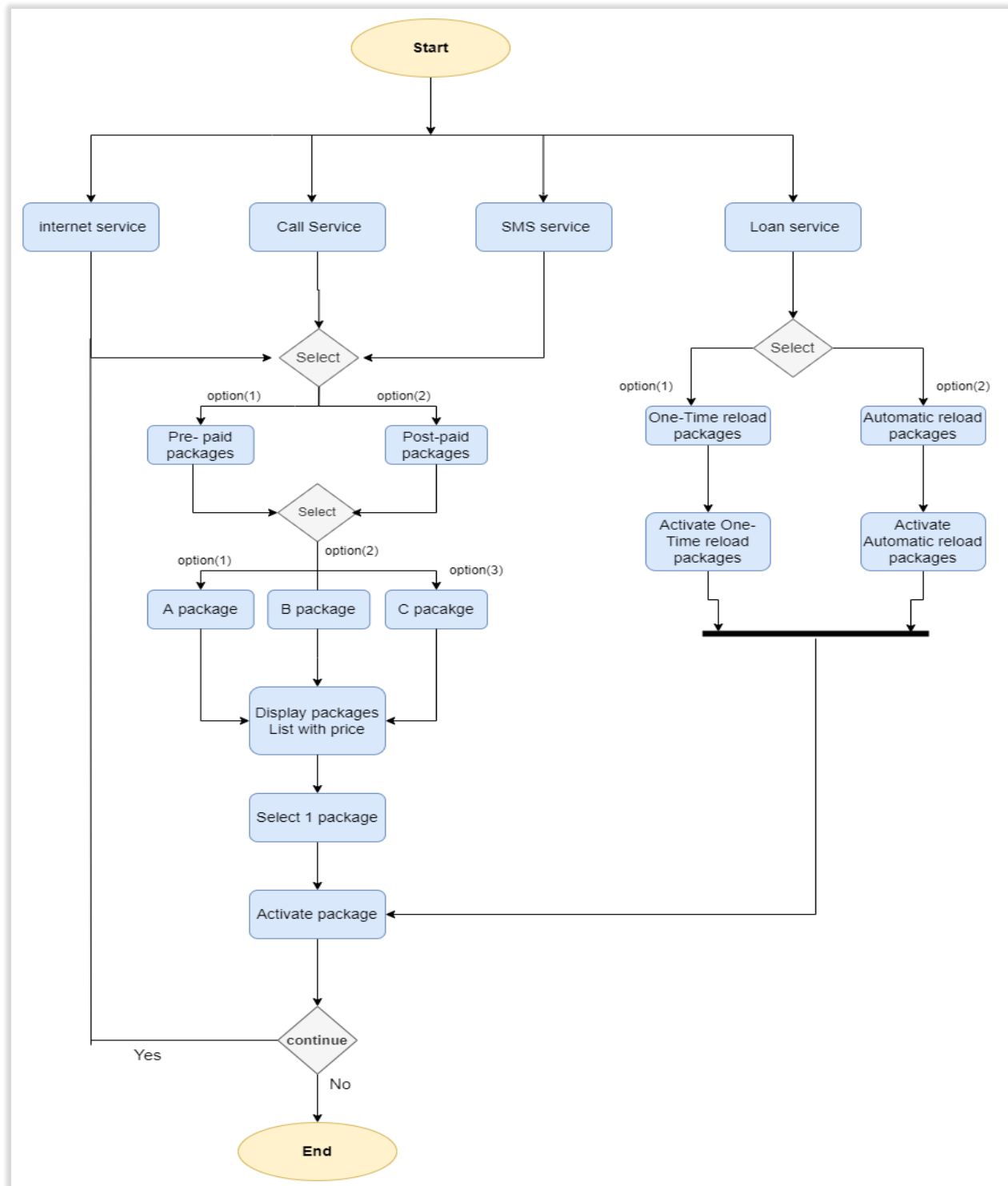
1.Introduction

The OSGi, formerly known as the **Open Service Gateway Initiative**, is an open standards organization founded in March 1999. It is a Java framework for developing (remotely)and deploying modular software programs and libraries. OSGi makes it possible to define the dependencies of each individual module with the others. It enables users to control the lifecycle and dynamically change each component of the system. Most essentials concepts are publisher and subscriber.

For modern topics in information technology module assignment 01, we have done the Telecommunication system according to OSGI framework. Internet Service, Call Service and SMS service and loan service are the producers of this system. The consumers are internet service subscriber, call service subscriber, SMS service subscriber and loan service subscriber. We used Equinox OSGI framework to our system.

2.Methanology

2.1 system diagram



3. Internet Service

(IT19209944 - Aluvihare W.B.W.M.R.U.P.U)

3.1. Manifest implementation

Internet service publisher

```
InternetPublisher ×
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: InternetPublisher
4 Bundle-SymbolicName: InternetPublisher
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: internetpublisher.Activator
7 Export-Package: internetpublisher
8 Import-Package: org.osgi.framework;version="1.10.0"
9 Bundle-RequiredExecutionEnvironment: JavaSE-15
10
11
```

Internet service subscriber

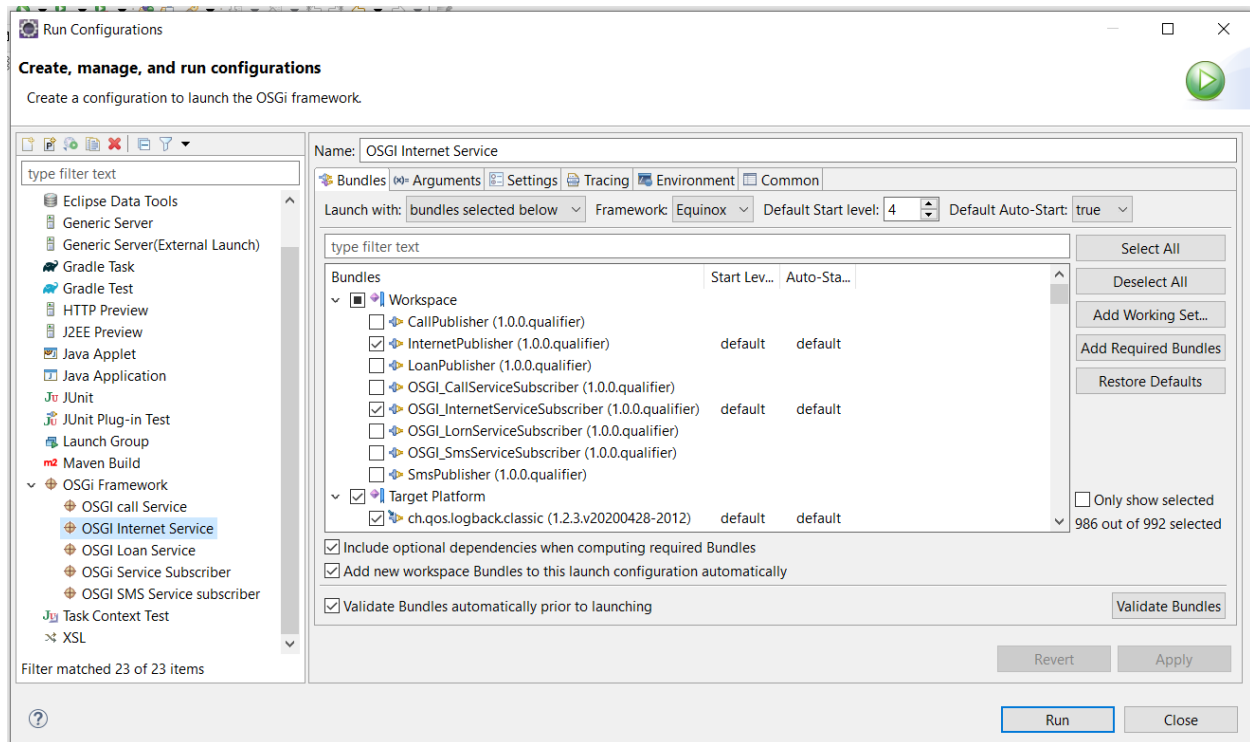
```
OSGI_InternetServiceSubscriber ×
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: OSGI_InternetService_Subscriber
4 Bundle-SymbolicName: OSGI_InternetServiceSubscriber
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: osgi_internetervicesubscriber.Activator
7 Import-Package: internetpublisher,
8   org.osgi.framework;version="1.3.0"
9 Bundle-RequiredExecutionEnvironment: JavaSE-15
10
```

3.2. Producer installation and consumer installation & running services.

Commands

Run configuration

- Select MANIFEST.MF => run as =>run configurations.
- Select only internet service publisher bundle and internet service subscriber bundle.
- Rename it as “OSGI internet service”.
- Click on “**Apply changes**”
- Click on **Run**.



Activate bundles

```
Console X
OSGI Internet Service [OSGi Framework] C:\Program Files\Java\jdk-15.0.2\bin\javaw.exe (Mar 19, 2022, 7:13:59 PM)

osgi>
osgi>
osgi> ss
"Framework is launched."

id      State      Bundle
0       ACTIVE     org.eclipse.osgi_3.17.100.v20211104-1730
          Fragments=681
1       ACTIVE     org.eclipse.equinox.simpleconfigurator_1.4.0.v20210315-2228
2       ACTIVE     InternetPublisher_1.0.0.qualifier
3       ACTIVE     OSGI InternetServiceSubscriber 1.0.0.qualifier
4       ACTIVE     ch.qos.logback.classic_1.2.3.v20200428-2012
          Fragments=606
5       ACTIVE     ch.qos.logback.core_1.2.3.v20200428-2012
6       RESOLVED    ch.qos.logback.slf4j_1.2.3.v20200428-2012
          Master=978
7       ACTIVE     com.google.gson_2.8.8.v20211029-0838
8       ACTIVE     com.google.guava_30.1.0.v20210127-2300
9       ACTIVE     com.google.guava_27.1.0.v20190517-1946
10      ACTIVE     com.google.guava_21.0.0.v20170206-1425
11      ACTIVE     com.google.javascript_0.0.20160315.v20161124-1903
12      ACTIVE     com.google.protobuf_2.4.0.v201105131100
13      ACTIVE     com.ibm.icu_67.1.0.v20200706-1749
14      ACTIVE     com.jcraft.jsch_0.1.55.v20190404-1902
```

Start services

```
osgi> start 2
Start Internet Publisher Service!
osgi> start 3
Start Internet Subscriber!
```

Stop services

```
osgi>
osgi>
osgi> stop 2
StopInternet Publisher Service!

osgi> stop 3
Stop Internet Subscriber!
```

3.3 Sample screenshots of its behavior & outputs

```
Console x
OSGI Internet Service [OSGi Framework] C:\Program Files\Java\jdk-15.0.2\bin\javaw.exe (Mar 19, 2022, 7:13:59 PM)
WARNING: Using incubator modules: jdk.incubator.foreign, jdk.incubator.jpackage
Start Internet Pulisher Service!
Start Internet Subscriber!

*****
*****
***** Welcome to Dialog Internet Service *****
*****
*****

*****
***** Internet Main Menu *****
*****
*****
Prepaid Package          (1)
PostPaid Package         (2)
*****

Enter Your Package      :1

*****
***** Prepaid Category *****
*****
*****
4G Packages             (1)
3G Packages             (2)
Unlimited Packages       (3)
*****

Enter Your Package      :2

*****
***** Prepaid 3G Price List *****
*****
*****
3G Any Time    20 GB      Rs. 700.00 (1)
3G Any Time    90 GB      Rs. 2500.00 (2)
3G Any Time    200 GB     Rs. 5500.00 (3)
*****

Enter Your Package      :2

*****
*****
***** Your Prepaid 3G Package Activate Successfully. *****
*****
*****

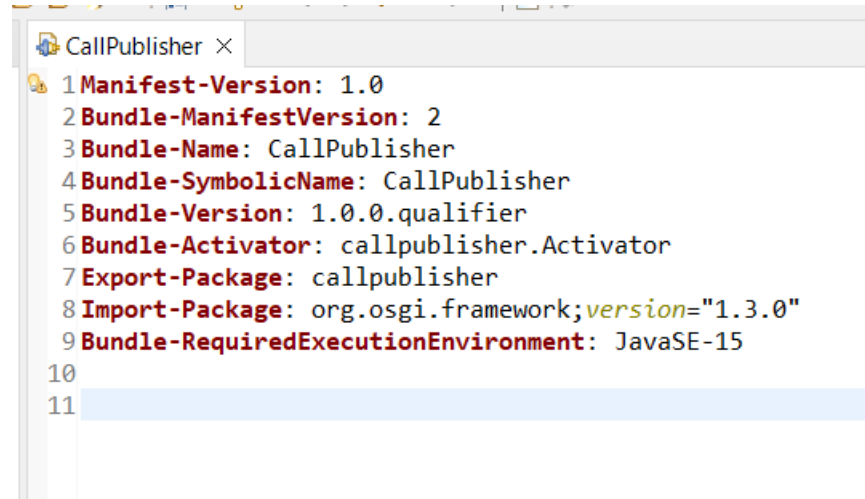
Do you want to activate another internet package ? (Y/N)
n
Thank you, join with us again !
osgi>
```


4.Call Service

(IT19207964 – Weerasooriya K.T.N)

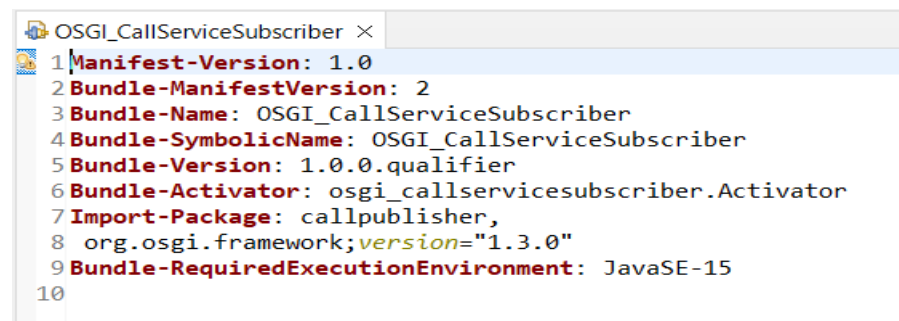
4.1Manifest implementation

call service publisher



```
CallPublisher ×
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: CallPublisher
4 Bundle-SymbolicName: CallPublisher
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: callpublisher.Activator
7 Export-Package: callpublisher
8 Import-Package: org.osgi.framework;version="1.3.0"
9 Bundle-RequiredExecutionEnvironment: JavaSE-15
10
11
```

call service subscriber



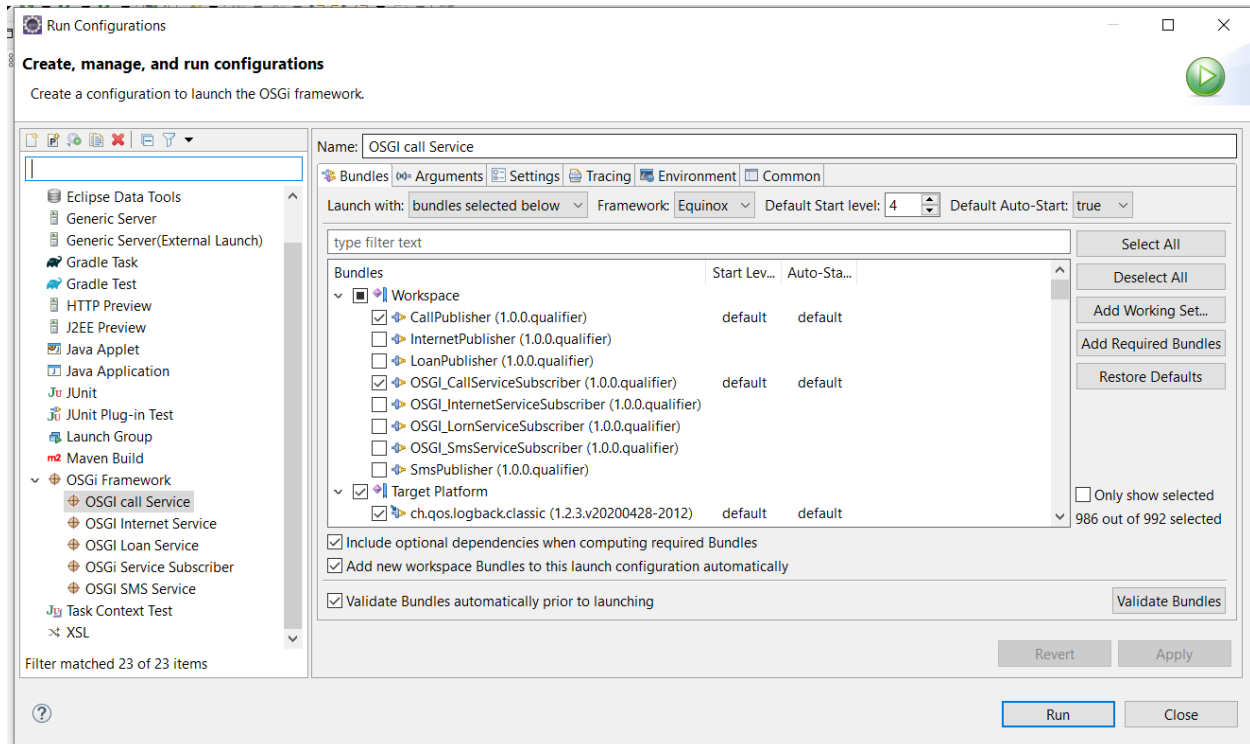
```
OSGI_CallServiceSubscriber ×
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: OSGI_CallServiceSubscriber
4 Bundle-SymbolicName: OSGI_CallServiceSubscriber
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: osgi_callservicesubscriber.Activator
7 Import-Package: callpublisher,
8   org.osgi.framework;version="1.3.0"
9 Bundle-RequiredExecutionEnvironment: JavaSE-15
10
```

4.2. Producer installation and consumer installation & running services.

Commands

Run configuration

- Select MANIFEST.MF => run as =>run configurations.
- Select call service publisher bundle and call service subscriber bundle.
- Rename it as “OSGI call service”.
- Click on “**Apply changes**”
- Click on **Run**.



Activate bundles

```
Console ×
OSGi call Service [OSGi Framework] C:\Program Files\Java\jdk-15.0.2\bin\javaw.exe (Mar 19, 2022, 7:56:10 PM)

osgi>
osgi>
osgi> ss
|"Framework is launched."

id      State      Bundle
0       ACTIVE      org.eclipse.osgi_3.17.100.v20211104-1730
          Fragments=681
1       ACTIVE      org.eclipse.equinox.simpleconfigurator_1.4.0.v20210315-2228
2       ACTIVE      CallPublisher_1.0.0.qualifier
3       ACTIVE      OSGI_CallServiceSubscriber_1.0.0.qualifier
4       ACTIVE      ch.qos.logback.classic_1.2.3.v20200428-2012
          Fragments=606
5       ACTIVE      ch.qos.logback.core_1.2.3.v20200428-2012
6       RESOLVED    ch.qos.logback.slf4j_1.2.3.v20200428-2012
          Master=978
7       ACTIVE      com.google.gson_2.8.8.v20211029-0838
8       ACTIVE      com.google.guava_30.1.0.v20210127-2300
9       ACTIVE      com.google.guava_27.1.0.v20190517-1946
10      ACTIVE      com.google.guava_21.0.0.v20170206-1425
11      ACTIVE      com.google.javascript_0.0.20160315.v20161124-1903
12      ACTIVE      com.google.protobuf_2.4.0.v201105131100
13      ACTIVE      com.ibm.icu_67.1.0.v20200706-1749
14      ACTIVE      com.jcraft.jsch_0.1.55.v20190404-1902
15      ACTIVE      com.sun.el_2.2.0.v201303151357
16      ACTIVE      com.sun.jna_5.8.0.v20210503-0343
17      ACTIVE      com.sun.jna_4.5.1.v20190425-1842
18      ACTIVE      com.sun.jna.platform_5.8.0.v20210406-1004
19      ACTIVE      com.sun.jna.platform_4.5.1.v20190425-1842
```

Start services

```
osgi> start 2
Call Publisher Start!
osgi> start 3
Call Subscriber Start!
```

Stop services

```
osgi> stop 2
Call Publisher Stop!

osgi> stop 3
Call Subscriber stop!
```

4.3. Sample screenshots of its behavior & outputs

```
Call Publisher Start!
Call Subscriber Start!

*****
*****
***** Welcome to Dialog Call Service *****
*****
*****

*****
***** Voice Main Menu *****
*****
Prepaid Package           (1)
PostPaid Package          (2)
*****

Enter Your Package       :
```

```

*****
***** Voice Main Menu *****
*****
Prepaid Package          (1)
PostPaid Package         (2)
*****

Enter Your Package      :1

*****
***** Prepaid Category *****
*****
Daily Packages           (1)
Budget Packages          (2)
Unlimited Packages        (3)
*****

Enter Your Package      :1

*****
***** Prepaid Daily Price List *****
*****
15 min      Rs. 7+ tax  (1)
30 min      Rs. 14+ tax (2)
60 min      Rs. 20+ tax (3)
*****

Enter Your Package      :1

*****
*****
*****
Your Prepaid Daily Package Activate Successfully.
*****
*****

Do you want to activate another caller package ? (Y/N)

```

5.SMS Service

(IT19152110 – Rajapaksha K.D)

5.1 Manifest implementation

Sms service publisher

```
SmsPublisher ×  
1 Manifest-Version: 1.0  
2 Bundle-ManifestVersion: 2  
3 Bundle-Name: SmsPublisher  
4 Bundle-SymbolicName: SmsPublisher  
5 Bundle-Version: 1.0.0.qualifier  
6 Bundle-Activator: smspublisher.Activator  
7 Export-Package: smspublisher  
8 Import-Package: org.osgi.framework;version="1.10.0"  
9 Bundle-RequiredExecutionEnvironment: JavaSE-15  
10
```

sms service subscriber

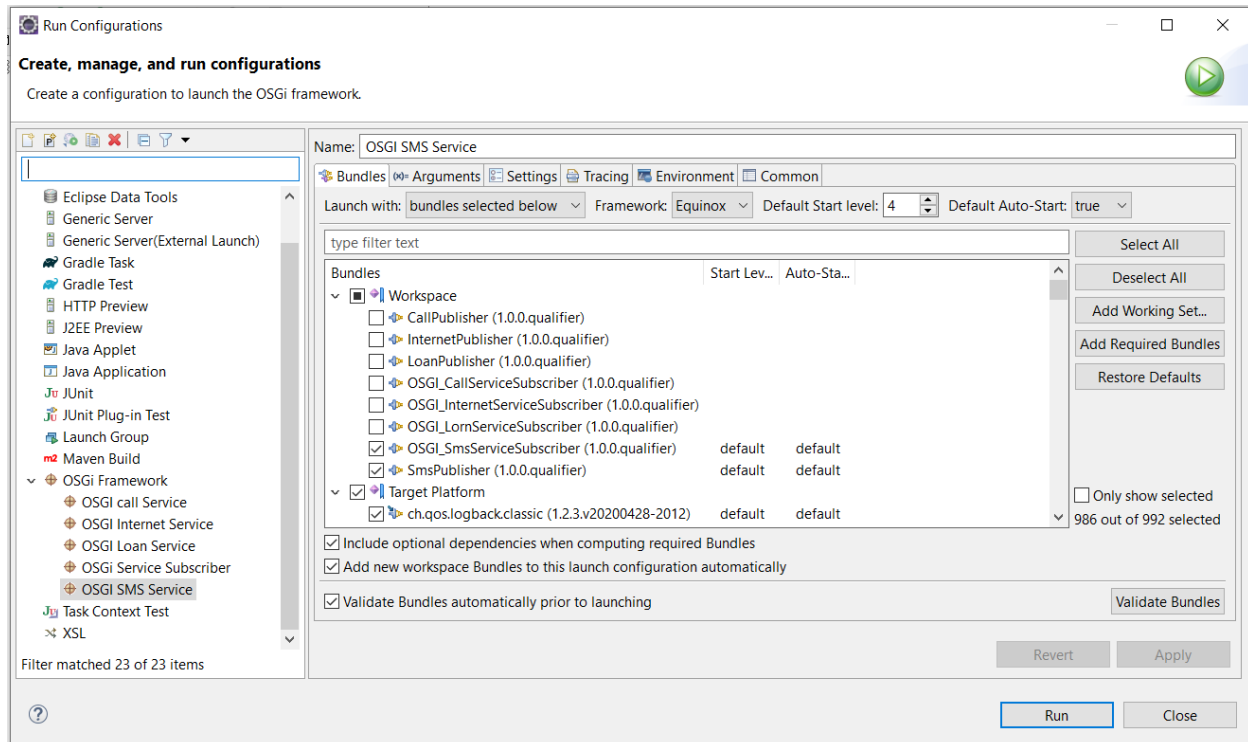
```
OSGI_SmsServiceSubscriber ×  
1 Manifest-Version: 1.0  
2 Bundle-ManifestVersion: 2  
3 Bundle-Name: OSGI_SmsServiceSubscriber  
4 Bundle-SymbolicName: OSGI_SmsServiceSubscriber  
5 Bundle-Version: 1.0.0.qualifier  
6 Bundle-Activator: osgi_smsservicesubscriber.Activator  
7 Import-Package: org.osgi.framework;version="1.3.0",  
8 smspublisher  
9 Bundle-RequiredExecutionEnvironment: JavaSE-15  
10
```

5.2 Producer installation and consumer installation & running services.

Commands

Run configuration

- Select MANIFEST.MF => run as =>run configurations.
- Select sms service publisher bundle and sms service subscriber bundle.
- Rename it as “OSGI sms service”.
- Click on “**Apply changes**”
- Click on **Run**.



Activate bundles

```
Console ×
OSGi SMS service [OSGi Framework]
osgi>
osgi> ss
!"Framework is launched."

id      State      Bundle
0        ACTIVE    org.eclipse.osgi_3.17.100.v20211104-1730
          Fragments=681
1        ACTIVE    org.eclipse.equinox.simpleconfigurator_1.4.0.v20210315-2228
2        ACTIVE    OSGI_SmsServiceSubscriber_1.0.0.qualifier
3        ACTIVE    SmsPublisher_1.0.0.qualifier
4        ACTIVE    ch.qos.logback.classic_1.2.3.v20200428-2012
          Fragments=606
5        ACTIVE    ch.qos.logback.core_1.2.3.v20200428-2012
6        RESOLVED  ch.qos.logback.slf4j_1.2.3.v20200428-2012
          Master=978
7        ACTIVE    com.google.gson_2.8.8.v20211029-0838
8        ACTIVE    com.google.guava_30.1.0.v20210127-2300
9        ACTIVE    com.google.guava_27.1.0.v20190517-1946
10       ACTIVE    com.google.guava_21.0.0.v20170206-1425
11       ACTIVE    com.google.javascript_0.0.20160315.v20161124-1903
12       ACTIVE    com.google.protobuf_2.4.0.v201105131100
13       ACTIVE    com.ibm.icu_67.1.0.v20200706-1749
14       ACTIVE    com.jcraft.jsch_0.1.55.v20190404-1902
15       ACTIVE    com.sun.el_2.2.0.v201303151357
16       ACTIVE    com.sun.jna_5.8.0.v20210503-0343
17       ACTIVE    com.sun.jna_4.5.1.v20190425-1842
18       ACTIVE    com.sun.jna.platform_5.8.0.v20210406-1004
19       ACTIVE    com.sun.jna.platform_4.5.1.v20190425-1842
20       ACTIVE    com.sun.xml.bind_2.3.3.v20201118-1818
21       ACTIVE    com.sun.xml.bind_2.2.0.v20201118-1845
22       ACTIVE    jakarta.el_4.0.0.v20210105-0527
23       ACTIVE    jakarta.enterprise.cdi-api_2.0.2
```

Start services

```
osgi> start 3
SMS Publisher Start
osgi> start 2
Sms Subscriber Start
```

Stop services

```
osgi>
osgi> stop 2
SMS subscriber stop!

osgi> stop 3
SMS Publisher stop!

osgi>
```


5.3. Sample screenshots of its behavior & outputs

Sms Subscriber Start

```
*****
*****
***** Welcome to Dialog *****
*****
*****

*****
***** SMS Main Menu *****
*****
Prepaid Package           (1)
PostPaid Package         (2)
*****
```

Enter Your Package :2

```

***** SMS Main Menu *****
*****
Prepaid Package           (1)
PostPaid Package          (2)
*****

Enter Your Package       :2

*****
***** Postpaid Category *****
*****
Daily Packages           (1)
Weekly Packages          (2)
Unlimited Packages        (3)
*****

Enter Your Package       :2

*****
***** Postpaid Weekly Price List *****
*****
150 min      Rs. 60+ tax  (1)
250 min      Rs. 100+ tax (2)
350 min      Rs. 150+ tax (3)
*****

Enter Your Package       :2
|

*****
*****
Your Postpaid Weekly Package Activate Successfully.
*****
*****

Do you want to activate another SMS package ? (Y/N)

```

6. Loan Service

(IT19047034 – Wijayasinha P.R.)

6.1 Manifest implementation

Loan service publisher

```
LoanPublisher ×
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: LoanPublisher
4 Bundle-SymbolicName: LoanPublisher
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: loanpublisher.Activator
7 Bundle-RequiredExecutionEnvironment: JavaSE-15
8 Automatic-Module-Name: LoanPublisher
9 Import-Package: org.osgi.framework;version="1.3.0"
10 Bundle-ActivationPolicy: lazy
11 Export-Package: loanpublisher
12
```

Loan service subscriber

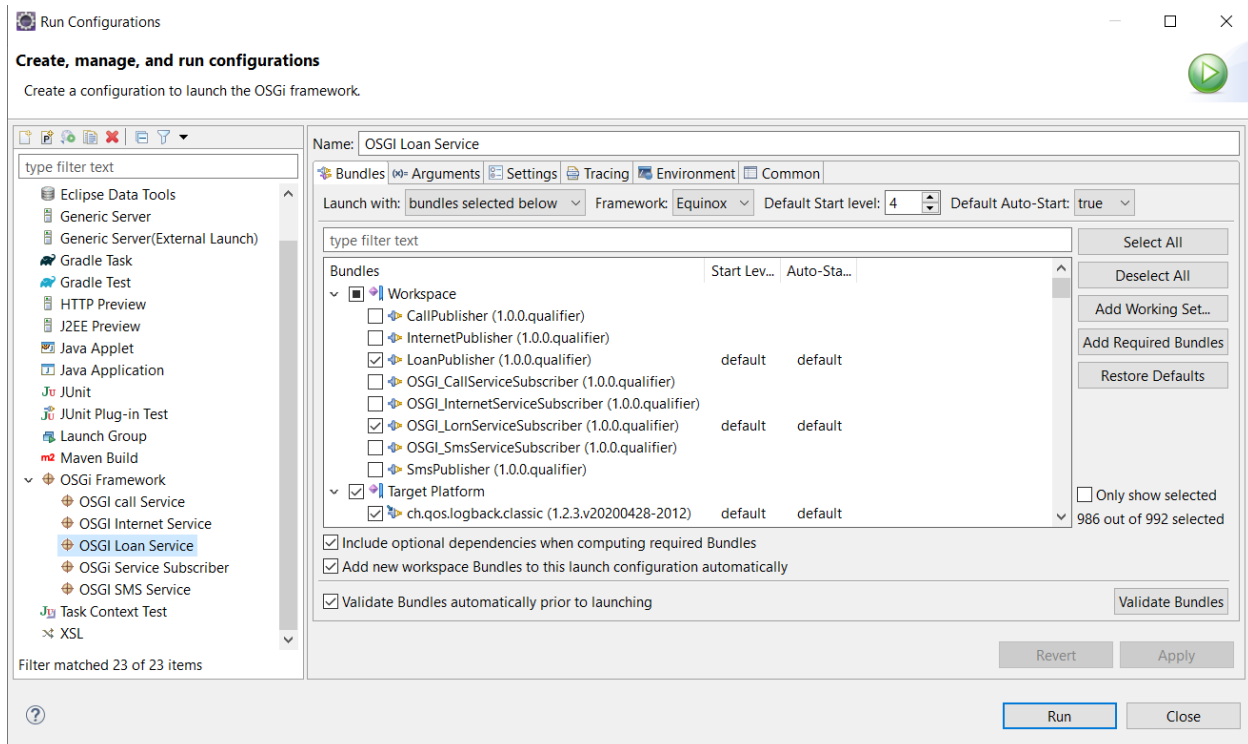
```
OSGI_LoanServiceSubscriber ×
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: OSGI_LoanServiceSubscriber
4 Bundle-SymbolicName: OSGI_LoanServiceSubscriber
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: osgi_loanservicesubscriber.Activator
7 Import-Package: loanpublisher,
8   org.osgi.framework;version="1.3.0"
9 Bundle-RequiredExecutionEnvironment: JavaSE-15
10
```

6.2. Producer installation and consumer installation & running services.

Commands

Run configuration

- Select MANIFEST.MF => run as =>run configurations.
- Select loan service publisher bundle and loan service subscriber bundle.
- Rename it as “OSGI loan service”.
- Click on “**Apply changes**”
- Click on **Run**.



Activate bundles

```
Console ×
OSGi Loan Service [OSGi Framework] C:\Program Files\Java\jdk-15.0.2\bin\javaw.exe (Mar 19, 2022, 8:08:12 PM)

osgi>
osgi>
osgi> ss
|"Framework is launched."

id      State      Bundle
0       ACTIVE    org.eclipse.osgi_3.17.100.v20211104-1730
        Fragments=681
1       ACTIVE    org.eclipse.equinox.simpleconfigurator_1.4.0.v20210315-2228
2       ACTIVE    LoanPublisher_1.0.0.qualifier
3       ACTIVE    OSGI_LoanServiceSubscriber_1.0.0.qualifier
4       ACTIVE    ch.qos.logback.classic_1.2.3.v20200428-2012
        Fragments=606
5       ACTIVE    ch.qos.logback.core_1.2.3.v20200428-2012
6       RESOLVED  ch.qos.logback.slf4j_1.2.3.v20200428-2012
        Master=978
7       ACTIVE    com.google.gson_2.8.8.v20211029-0838
8       ACTIVE    com.google.guava_30.1.0.v20210127-2300
9       ACTIVE    com.google.guava_27.1.0.v20190517-1946
10      ACTIVE    com.google.guava_21.0.0.v20170206-1425
11      ACTIVE    com.google.javascript_0.0.20160315.v20161124-1903
12      ACTIVE    com.google.protobuf_2.4.0.v201105131100
13      ACTIVE    com.ibm.icu_67.1.0.v20200706-1749
14      ACTIVE    com.jcraft.jsch_0.1.55.v20190404-1902
15      ACTIVE    com.sun.el_2.2.0.v201303151357
```

Start services

```
osgi> start 2
Loan Publisher Start!
osgi> start 3
Loan Subscriber Start
```

Stop services

```
osgi> stop 2
Loan Publisher Stop!

osgi> stop 3
Loan Subscriber Stop
```

6.3. Sample screenshots of its behavior & outputs

```
*****
*****
***** Welcome to Dialog Loan Service *****
*****
*****

*****
***** Loan Main Menu *****
*****
One time reload loan          (1)
Automatic reload loan        (2)
*****

Enter Your Package           :1

*****
***** One-time Reload Loan Category *****
*****
Activate One-time Reload Loan (1)
*****

Activate Your Package        :1

*****
*****
Your One-time Reload Loan Package Activate Successfully.
*****
*****

Do you want to activate another loan package ? (Y/N)
```

