

# Micro-Kernel Architecture using OSGi Framework

Software Architecture – SE3030

Assignment 1

---

## Group Details

### Group Members

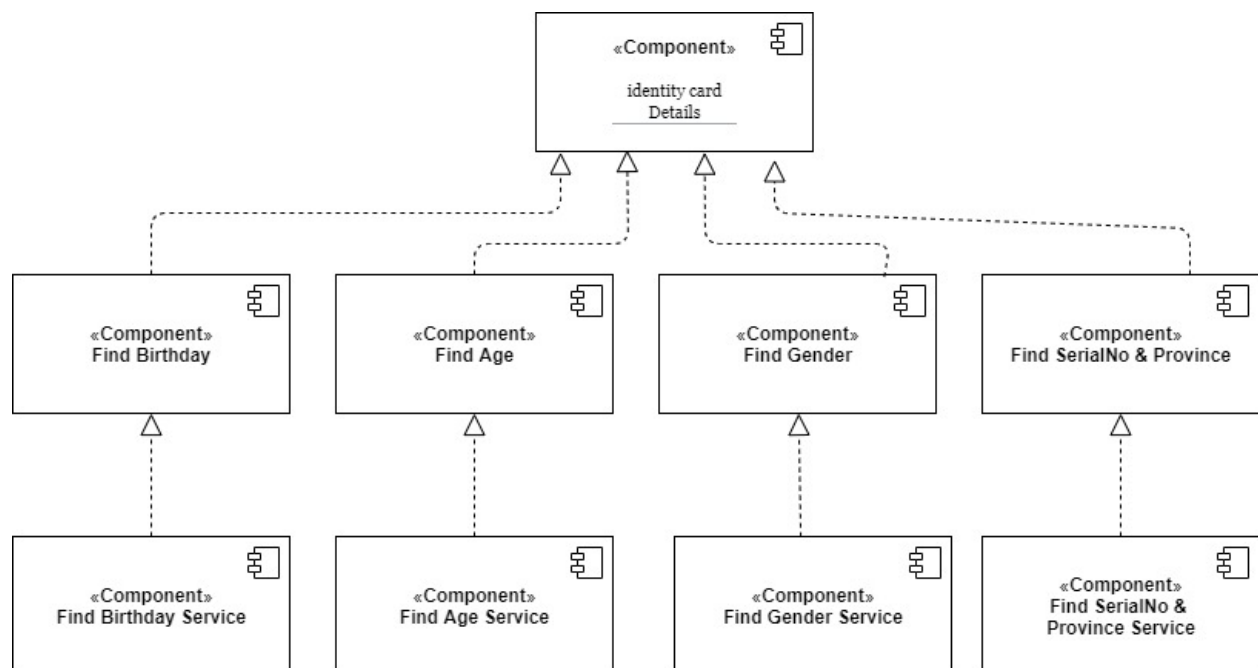
Registration Number	Name with Initials
IT18097634	M.M.C. Ranasinghe
IT18098174	M.A.A. Ahkam
IT18134018	A.M.K. Bojitha Mindula
IT18142310	M.A.I.F. Isma

---

## Person Details Manager

- ID Detail Reader is a simple detail extraction tool that can extract birthday, age, gender and serial number of the record book & province test.
  - ID Detail Reader is developed using Java and Apache Felix OSGi framework, according to the Micro-Kernel architecture.
  - ID Detail Reader contains three tiers, a service tier in which bundles act as producers, a controller tier where bundles act as both producers and consumers and finally a presentation tier which acts as the main consumer.
- 

## Diagrammatic Overview



---

## Manifest Implementations of Bundles

- Find Age

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindAge
4 Bundle-SymbolicName: FindAge
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findage.FindAgeActivator
7 Automatic-Module-Name: FindAge
8 Import-Package: findageservice,
9   org.osgi.framework;version="1.3.0"
10 Bundle-ActivationPolicy: lazy
11 Export-Package: findage
12
```

- Find Age Service

- 

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindAgeService
4 Bundle-SymbolicName: FindAgeService
5 Bundle-Version: 1.0.0.qualifier
6 Export-Package: findageservice
7 Import-Package: org.osgi.framework;version="1.3.0"
8 Bundle-Activator: findageservice.FindAgeServiceActivator
9
```

- Find Birthday

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindBirthday
4 Bundle-SymbolicName: FindBirthday
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findbirthday.FindBirthdayActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: FindBirthday
9 Import-Package: findbirthdayservice,
10 org.osgi.framework;version="1.3.0"
11 Bundle-ActivationPolicy: lazy
12 Export-Package: findbirthday
13
```

- Find Birthday Service

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindBirthdayService
4 Bundle-SymbolicName: FindBirthdayService
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findbirthdayservice.FindBirthdayServiceActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: FindBirthdayService
9 Import-Package: org.osgi.framework;version="1.3.0"
10 Bundle-ActivationPolicy: lazy
11 Export-Package: findbirthdayservice
12
```

- Find Gender

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindGender
4 Bundle-SymbolicName: FindGender
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findgender.FindGenderActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: FindGender
9 Import-Package: findgenderservice,
10 org.osgi.framework;version="1.3.0"
11 Bundle-ActivationPolicy: lazy
12 Export-Package: findgender
13
```

- Find Gender Service

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindGenderService
4 Bundle-SymbolicName: FindGenderService
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findgenderservice.FindGenderServiceActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: FindGenderService
9 Import-Package: org.osgi.framework;version="1.3.0"
10 Bundle-ActivationPolicy: lazy
11 Export-Package: findgenderservice
12
```

- Find Serial Number

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindSerialNumber
4 Bundle-SymbolicName: FindSerialNumber
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findserialnumber.FindSerialNumberActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: FindSerialNumber
9 Import-Package: findserialnumberservice,
0   org.osgi.framework;version="1.3.0"
1 Bundle-ActivationPolicy: lazy
2 Export-Package: findserialnumber
3
```

## Find Serial Number Service

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: FindSerialNumberService
4 Bundle-SymbolicName: FindSerialNumberService
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: findserialnumberservice.FindSerialNumberServiceActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: FindSerialNumberService
9 Import-Package: org.osgi.framework;version="1.3.0"
10 Bundle-ActivationPolicy: lazy
11 Export-Package: findserialnumberservice
12
```

## IdentityCard Main

```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: Identity
4 Bundle-SymbolicName: Identity
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: identity.Activator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: Identity
9 Import-Package: findage,
10 findbirthday,
11 findgender,
12 findserialnumber,
13 org.osgi.framework;version="1.3.0"
14 Bundle-ActivationPolicy: lazy
15
```

## Compile and Create .jar Files

Before compiling, all the packages should be copied to the C drive with respective MANIFEST.MF files inside. Apache Felix OSGi Framework should also be in C drive in order to continue with the compilation process.

- **Find Age Service**

```
C:\Windows\System32\cmd.exe
```

```
Microsoft Windows [Version 10.0.17763.1098]
```

```
(c) 2018 Microsoft Corporation. All rights reserved.
```

```
C:\SA\findageservice>javac -cp C:\felix-framework-4.0.3\bin\felix.jar *.java
```

```
C:\SA\findageservice>jar cfm ageservice.jar MANIFEST.MF
```

- **Find Age**

```
C:\SA\findage>javac -cp C:\felix-framework-4.0.3\bin\felix.jar;C:\SA\findageservice\ageservice.jar *.java
```

```
C:\SA\findage>jar cfm age.jar MANIFEST.MF
```

```
C:\SA\findage>
```

- **Find Birthday Service**

```
C:\Windows\System32\cmd.exe
```

```
Microsoft Windows [Version 10.0.17763.1098]
```

```
(c) 2018 Microsoft Corporation. All rights reserved.
```

```
C:\SA\findbirthdayservice>javac -cp C:\felix-framework-4.0.3\bin\felix.jar *.java
```

```
C:\SA\findbirthdayservice>jar cfm birthdayservice.jar MANIFEST.MF
```

- **Find Birthday**

```
C:\SA\findbirthday>javac -cp C:\felix-framework-4.0.3\bin\felix.jar;C:\SA\findbirthdayservice\birthdayservice.jar *.java
```

```
C:\SA\findbirthday>jar cfm birthday.jar MANIFEST.MF
```

```
C:\SA\findbirthday>
```

- **Find Gender Service**

```
C:\Windows\System32\cmd.exe
```

```
Microsoft Windows [Version 10.0.17763.1098]
```

```
(c) 2018 Microsoft Corporation. All rights reserved.
```

```
C:\SA\findgenderservice>javac -cp C:\felix-framework-4.0.3\bin\felix.jar *.java
```

```
C:\SA\findgenderservice>jar cfm genderservice.jar MANIFEST.MF
```

```
C:\SA\findgenderservice>
```



- **Find Gender**

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.17763.1098]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\SA\findgender>javac -cp C:\felix-framework-4.0.3\bin\felix.jar;C:\SA\findgenderservice\genderservice.jar *.java

C:\SA\findgender>jar cfm gender.jar MANIFEST.MF

C:\SA\findgender>
```

- **Find Serial Number Service**

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.17763.1098]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\SA\findserialnumberservice>javac -cp C:\felix-framework-4.0.3\bin\felix.jar *.java

C:\SA\findserialnumberservice>jar cfm serialnumberservice.jar MANIFEST.MF
```

- **Find Serial Number**

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.17763.1098]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\SA\findserialnumber>javac -cp C:\felix-framework-4.0.3\bin\felix.jar;C:\SA\findgenderservice\genderservice.jar *.java

C:\SA\findserialnumber>jar cfm serialnumber.jar MANIFEST.MF

C:\SA\findserialnumber>
```

- **Find Identity Details**

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.17763.1098]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\SA\identity>javac -cp C:\felix-framework-4.0.3\bin\felix.jar;C:\SA\findage\age.jar;C:\SA\findbirthday\birthday.jar;C:\SA\findgender\gender.jar;C:\SA\findserialnumber\serialnumber.jar *.java

C:\SA\identity>jar cfm IdentityNumber.jar MANIFEST.MF

C:\SA\identity>
```

## Installing Bundles

Following are the steps to install bundles in Apache Felix Gogo in order.

- **Find Age Service & Find Age**

```
g! install file:/C:/SA/findageservice/ageservice.jar  
Bundle ID: 10  
g! install file:/C:/SA/findage/age.jar  
Bundle ID: 11
```

- **Find Birthday Service & Find Birthday**

```
Bundle ID: 11  
g! install file:/C:/SA/findbirthdayservice/birthdayservice.jar  
Bundle ID: 12  
g! install file:/C:/SA/findbirthday/birthday.jar  
Bundle ID: 13
```

- **Find Gender Service & Find Gender**

```
Bundle ID: 13  
g! install file:/C:/SA/findgenderservice/genderservice.jar  
Bundle ID: 14  
g! install file:/C:/SA/findgender/gender.jar  
Bundle ID: 15  
g! install file:/C:/SA/findserialnumberservice/serialnumberservice.jar
```

- **Find Serial Number Service & Find Serial Number**

```
Bundle ID: 15  
g! install file:/C:/SA/findserialnumberservice/serialnumberservice.jar  
Bundle ID: 16  
g! install file:/C:/SA/findserialnumber/serialnumber.jar  
Bundle ID: 17  
g! install file:/C:/SA/identity/IdentityNumber.jar
```

- **Find Identity Details**

```
Bundle ID: 17  
g! install file:/C:/SA/identity/IdentityNumber.jar  
Bundle ID: 18  
g! lb
```

C:\Windows\System32\cmd.exe - java -jar bin/felix.jar

```
g!
g!
g!
g! lb
START LEVEL 1
  ID|State      |Level|Name
  0|Active       |    0|System Bundle (4.0.3)
  1|Active       |    1|Apache Felix Bundle Repository (1.6.6)
  2|Active       |    1|Apache Felix Gogo Command (0.12.0)
  3|Active       |    1|Apache Felix Gogo Runtime (0.10.0)
  4|Active       |    1|Apache Felix Gogo Shell (0.10.0)
g! install file:/C:/SA/findageservice/ageservice.jar
Bundle ID: 10
g! install file:/C:/SA/findage/age.jar
Bundle ID: 11
g! install file:/C:/SA/findbirthdayservice/birthdayservice.jar
Bundle ID: 12
g! install file:/C:/SA/findbirthday/birthday.jar
Bundle ID: 13
g! install file:/C:/SA/findgenderservice/genderservice.jar
Bundle ID: 14
g! install file:/C:/SA/findgender/gender.jar
Bundle ID: 15
g! install file:/C:/SA/findserialnumberservice/serialnumberservice.jar
Bundle ID: 16
g! install file:/C:/SA/findserialnumber/serialnumber.jar
Bundle ID: 17
g! install file:/C:/SA/identity/IdentityNumber.jar
Bundle ID: 18
g! lb
START LEVEL 1
  ID|State      |Level|Name
  0|Active       |    0|System Bundle (4.0.3)
  1|Active       |    1|Apache Felix Bundle Repository (1.6.6)
  2|Active       |    1|Apache Felix Gogo Command (0.12.0)
  3|Active       |    1|Apache Felix Gogo Runtime (0.10.0)
  4|Active       |    1|Apache Felix Gogo Shell (0.10.0)
 10|Installed    |    1|FindAgeService (1.0.0.qualifier)
 11|Installed    |    1|FindAge (1.0.0.qualifier)
 12|Installed    |    1|FindBirthdayService (1.0.0.qualifier)
 13|Installed    |    1|FindBirthday (1.0.0.qualifier)
 14|Installed    |    1|FindGenderService (1.0.0.qualifier)
 15|Installed    |    1|FindGender (1.0.0.qualifier)
 16|Installed    |    1|FindSerialNumberService (1.0.0.qualifier)
 17|Installed    |    1|FindSerialNumber (1.0.0.qualifier)
 18|Installed    |    1|Identity (1.0.0.qualifier)
g!
```

# Running Bundles

It is important that you run the bundles in the following order. (*Producer* bundles first and *Consumer* bundles after)

- **Start Find Age Service**

```
g! start_file:/C:/SA/findageservice/ageservice.jar
```

- **Start Find Age**

```
g! start_file:/C:/SA/findage/age.jar
```

- **Start Find Birthday Service**

```
g!  
g! start_file:/C:/SA/findbirthdayservice/birthdayservice.jar
```

- **Start Find Birthday**

```
g! start_file:/C:/SA/findbirthday/birthday.jar
```

- **Start Find Gender Service**

```
g!  
g! start_file:/C:/SA/findgenderservice/genderservice.jar
```

- **Start Find Gender**

```
g!  
g! start file:/C:/SA/findgender/gender.jar
```

- **Start Find Serial Number Service**

```
g!  
g! start file:/C:/SA/findserialnumberservice/serialnumberservice.jar
```

- **Start Find Serial Number**

```
g!  
g! start file:/C:/SA/findserialnumber/serialnumber.jar
```

- **Start Find Identity Details**

```
g!  
g! start file:/C:/SA/identity/IdentityNumber.jar
```

- **You can use bundle ID to start the bundle as well.**

example: g! start <bundle\_id>

## Sample Screenshots

### Find Age

Find Age Started!

-----

Find Age Started

-----

Please select one of the options.

- 1. Using NIC Number For Find Age
- 0. Back

Select an option : 1

Enter a NIC Number : 972732990V

Age : 22 (year) 5 (month) 23 (day)

-----

Please select one of the options.

- 1. Using NIC Number For Find Age
- 0. Back

Select an option : 1

Enter a NIC Number : 971742526V

Age : 22 (year) 9 (month) 0 (day)

-----

Please select one of the options.

- 1. Using NIC Number For Find Age
- 0. Back

Select an option :

## Find Birthday

Find Birthday Started!

-----

Find Birthday Started

-----

Please select one of the options.

- 1. Using NIC Number For Find Birthday
- 0. Back

Select an option : 1

Enter a NIC Number : 972732990V

Birthday : 1997 / 9 / 29

-----

Please select one of the options.

- 1. Using NIC Number For Find Birthday
- 0. Back

Select an option : 1

Enter a NIC Number : 971742526V

Birthday : 1997 / 6 / 22

-----

Please select one of the options.

- 1. Using NIC Number For Find Birthday
- 0. Back

Select an option :



## Find Gender

-----

Find Gender Started

-----

Please select one of the options.

- 1. Using NIC Number For Find Gender
- 0. Back

Select an option : 1

Enter a NIC Number : 972732990V

Gender :Male

-----

Please select one of the options.

- 1. Using NIC Number For Find Gender
- 0. Back

Select an option : 1

Enter a NIC Number : 945173824V

Gender :Female

-----

Please select one of the options.

- 1. Using NIC Number For Find Gender
- 0. Back

Select an option :

## Serial Number & Province

-----  
Find SerialNumber Started

-----  
Please select one of the options.

- 1. Using NIC Number For Find Serial NUmber
- 0. Back

Select an option : 1

Enter a NIC Number : 972732990V

Serial Number from the Record Book:299

Enter a UpRightSide Number : 3

Your Province :Southern Province

-----  
Please select one of the options.

- 1. Using NIC Number For Find Serial NUmber
- 0. Back

Select an option : 1

Enter a NIC Number : 971742526V

Serial Number from the Record Book:252

Enter a UpRightSide Number : 4

Your Province :Northern Province

-----  
Please select one of the options.

- 1. Using NIC Number For Find Serial NUmber
- 0. Back

Select an option :

## Identity Card Number Using Details Main

```
Find Birthday Service Service Started!  
!SESSION Find Birthday Service Service Started!  
Find Birthday Started!  
Find Gender Service Service Started!  
Find Age Started!  
Find SerialNumber Service Service Started!  
Find Birthday Started!  
Find Age Started!
```

```
-----
```

```
Identity Number Details Started
```

```
-----
```

```
Please select one of the options.
```

1. FindBirthdayActivator
2. FindAgeActivator
3. FindGenderActivator
4. FindSerialNumberActivator
0. Exit

Select no:1

BirthDay Activator Start

```
Please select one of the options.
```

- 1. FindBirthdayActivator
- 2. FindAgeActivator
- 3. FindGenderActivator
- 4. FindSerialNumberActivator
- 0. Exit

```
Select an option : 1
```

```
-----
```

```
Find Birthday Started
```

```
-----
```

```
Please select one of the options.
```

- 1. Using NIC Number For Find Birthday
- 0. Back

```
Select an option : 1
```

```
Enter a NIC Number : 972732990V
```

```
Birthday : 1997 / 9 / 29
```

```
-----
```

```
Please select one of the options.
```

- 1. Using NIC Number For Find Birthday
- 0. Back

```
Select an option : 0
```

```
-----
```

Select no:2

Age Activator Start

```
-----  
  
Please select one of the options.  
  
1. FindBirthdayActivator  
2. FindAgeActivator  
3. FindGenderActivator  
4. FindSerialNumberActivator  
0. Exit  
  
Select an option : 2  
  
-----  
  
Find Age Started  
  
-----  
  
Please select one of the options.  
  
1. Using NIC Number For Find Age  
0. Back  
  
Select an option : 1  
Enter a NIC Number : 972732990V  
Age : 22 (year) 5 (month) 23 (day)  
  
-----  
  
Please select one of the options.  
  
1. Using NIC Number For Find Age  
0. Back  
  
Select an option : 0  
  
-----
```

Select no:3

Gender Activator Start

```
-----  
  
Please select one of the options.  
  
1. FindBirthdayActivator  
2. FindAgeActivator  
3. FindGenderActivator  
4. FindSerialNumberActivator  
0. Exit  
  
Select an option : 3  
  
-----  
  
Find Gender Started  
  
-----  
  
Please select one of the options.  
  
1. Using NIC Number For Find Gender  
0. Back  
  
Select an option : 1  
Enter a NIC Number : 972732990V  
Gender :Male  
  
-----  
  
Please select one of the options.  
  
1. Using NIC Number For Find Gender  
0. Back  
  
Select an option : 0  
  
-----
```

Select no:4

Serial Number Activator Start

-----

Please select one of the options.

1. FindBirthdayActivator
2. FindAgeActivator
3. FindGenderActivator
4. FindSerialNumberActivator
0. Exit

Select an option : 4

-----

Find SerialNumber Started

-----

Please select one of the options.

1. Using NIC Number For Find Serial NUmber
0. Back

Select an option : 1

Enter a NIC Number : 972732990V

Serial Number from the Record Book:299

Enter a UpRightSide Number : 3

Your Province :Southern Province

-----

Please select one of the options.

1. Using NIC Number For Find Serial NUmber
0. Back

Select an option :