



Sri Lanka Institute of Information Technology

Software Architecture (SE3030)

Assignment 01 - Micro-Kernel Architecture

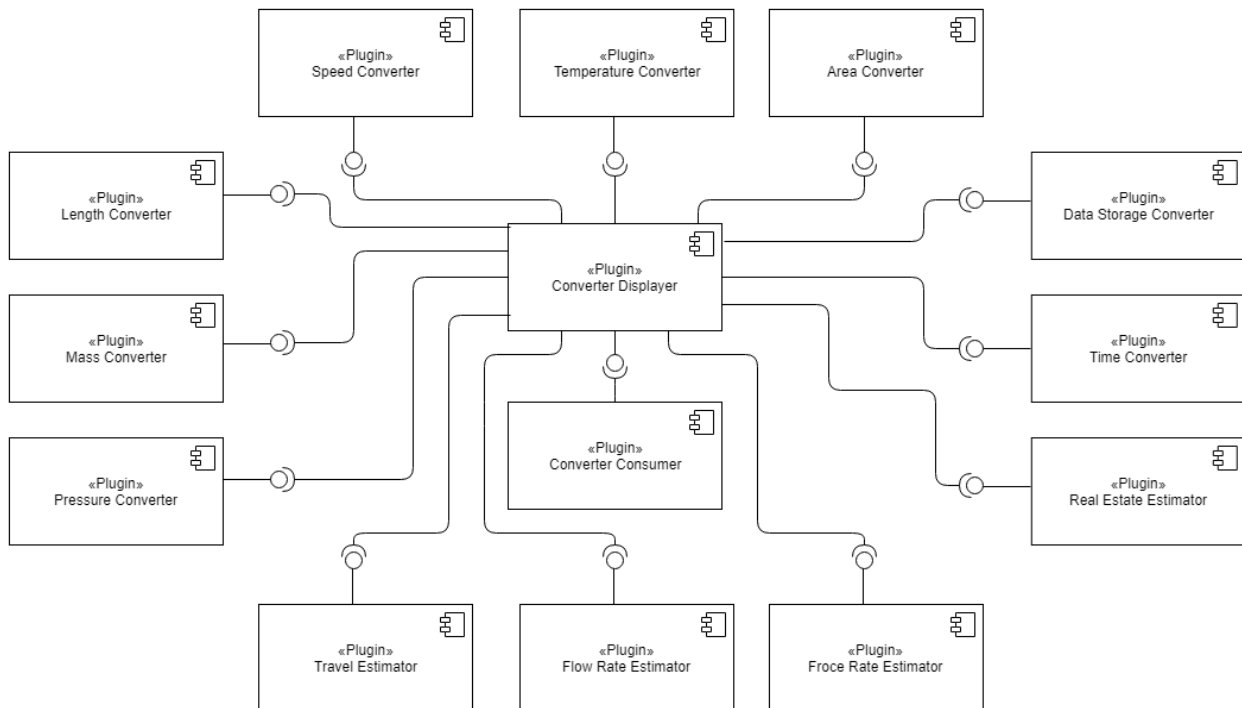
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Introduction

The **Loops' Smart Converter Tool Set** provides a range of Unit Converters for Time, Area, Distance, Mass, Temperature, Pressure, Speed and Data Storage as well as it includes a set of Estimators which were built on previously mentioned set of Units. Estimators include Travel Estimator, Flow Rate Estimator, Real Estate Estimators and Force Rate Estimator. All these different Estimators are performing a set of complex functionalities which hides the chained implementation from the user.



Description

This component diagram consists of 14 plugin components including a core system(Converter Displayer),Service Consumer(Converter Consumer) and Service plug-in modules. Application logic is divided between independent plug-in modules and the basic core system. The core system contains only the minimal functionality required to make the system operational and provide flexible and extensible custom processing logic for application functionalities. The following section includes the functionalities and implementation of each and every Converters and Estimators in **Loops' Smart Converter Tool Set** to interact with user, providing a better experience.

Real Estate Estimator

Real Estate Estimator is the combination of Area Conversion and Real-time Currency conversion, it's been implemented in order to fulfill the feasibility requirement popped up in Real estate business. Requirement is since different part of world uses different Area measuring scales and Currency rate practices in real estate industry, when the business person involved in business across different countries this estimator tool will become handy.

This estimator request input parameters such as input Currency Unit , input Area unit , price of unit area along with output Currency unit and output area unit result is expected. Unique feature about this conversion is we fetch the real time currency conversion online and perform the chain of operation for manipulation.

Flow Rate Estimator

Flow Rate Estimator is the combination of Volume Conversion, Rate Conversion and Time Conversion, it's been implemented in order to fulfill the feasibility requirement arise in Large Production industries. Where we estimate the time, effort and cost required in order to plan the production process in an effective manner. We developed this estimator considering various volume measuring scales that are been widely used in Production industries.

This estimator request input parameters such as input Volume (Centimeter, Meter, Feet), input Volume Flow Rate (Cubic centimeter/second, Cubic Centimeter/minute, Cubic Centimeter/hour) and input Time (Seconds, Minutes, Hours). Unique feature about this conversion is we can independently select any of the two input variables in order to find the result of third argument.

Travel Estimator

Travel Estimator is the combination of Distance Conversion, Speed Conversion and Time Conversion, it's been implemented in order to fulfill the feasibility requirement arise in Large Travel industries. Where we estimate the time, effort and cost required in order to plan the production process in an effective manner. We developed this estimator considering various Travel measuring scales that are been widely used in Travel industries.

This estimator request input parameters such as input Distance (Meter, Kilometer, Mile), input Speed (Meter per Second, Kilometer per Hour , Mile per Hour) and input Time (Seconds, Minutes, Hours). Unique feature about this conversion is we can independently select any of the two input variables in order to find the result of third argument.

Force Rate Estimator

Force Rate Estimator is the combination of Pressure Conversion, Area Conversion and Force Conversion, it's been implemented in order to fulfill the feasibility requirement arise in Large Production industries. Where we estimate the Pressure, effort and cost required in order to plan the production process in an effective manner. We developed this estimator considering various Force Rate measuring scales that are been widely used in Production industries.

This estimator request input parameters such as input Pressure (Pascal, Centipascal, and Decipascal), input Speed (Meter², Centimeter², Millimeter²) and input Force (Newton). Unique feature about this conversion is we can independently select any of the two input variables in order to find the result of third argument.

Area Unit Converter

This is core converter performs a conversion of Area scale from and to Units such as Meter Squared (m²), Kilometer Squared (Km²), Square Feet, Acres, and Hectares .The user interface provides the two drop down list to input the predefined Area units and Two text field where one is used for providing the area amount to be converted and other for displaying converted value.

Time Unit Converter

This is core converter performs a conversion of Time scale from and to Units such as Seconds, Minutes, Hours, and Days .The user interface provides the two drop down list to input the predefined Time units and Two text field where one is used for providing the time amount to be converted and other for displaying converted value.

Speed Unit Converter

This is core converter performs a conversion of Speed scale from and to Units such as Meter per second (ms^{-1}), Foot per second, Kilometer per hour (kmh^{-1}), Miles per Hour, and Knot .The user interface provides the two drop down list to input the predefined Speed units and Two text field where one is used for providing the speed amount to be converted and other for displaying converted value.

Temperature Unit Converter

This is core converter performs a conversion of Temperature scale from and to Units such as Celsius($^{\circ}\text{C}$) , Fahrenheit($^{\circ}\text{F}$) and Kelvin(K) .The user interface provides the two drop down list to input the predefined Temperature units and Two text field where one is used for providing the temperature amount to be converted and other for displaying converted value.

Mass Unit Converter

This is core converter performs a conversion of Mass scale from and to Units such as Gram (g), Kilogram (Kg), Milligram (mg), Metric ton and Pounds .The user interface provides the two drop down list to input the predefined Mass units and Two text field where one is used for providing the mass amount to be converted and other for displaying converted value.

Length Unit Converter

This is core converter performs a conversion of Length scale from and to Units such as Meter (m), Kilometer (Km), Centimeter (cm), Millimeter (mm) and Inches .The user interface provides the two drop down list to input the predefined Length units and Two text field where one is used for providing the length amount to be converted and other for displaying converted value.

Pressure Unit Converter

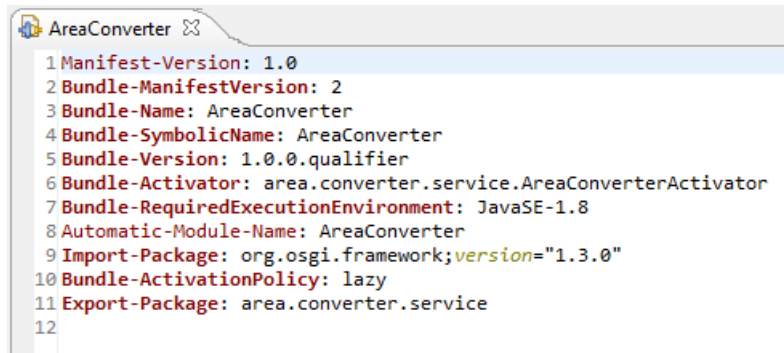
This is core converter performs a conversion of Pressure scale from and to Units such as Gram (g), Kilogram (Kg), Milligram (mg), Metric ton and Pounds .The user interface provides the two drop down list to input the predefined Mass units and Two text field where one is used for providing the mass amount to be converted and other for displaying converted value.

Data Transfer Unit Converter

This is core converter performs a conversion of Data Transfer scale from and to Units such as Meter (m), Kilometer (Km), Centimeter (cm), Millimeter (mm) and Inches .The user interface provides the two drop down list to input the predefined Length units and Two text field where one is used for providing the length amount to be converted and other for displaying converted value.

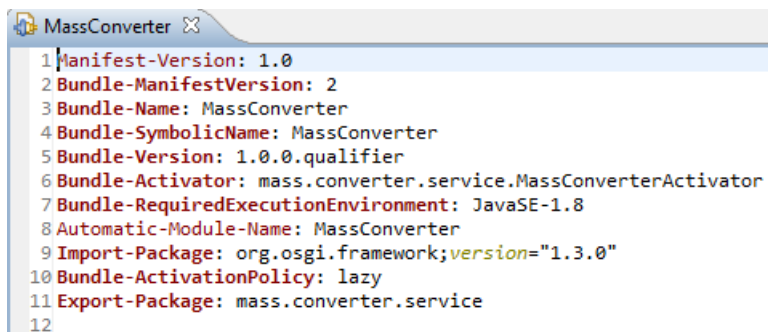
Bundle's Manifest

1. Area Converter Bundle



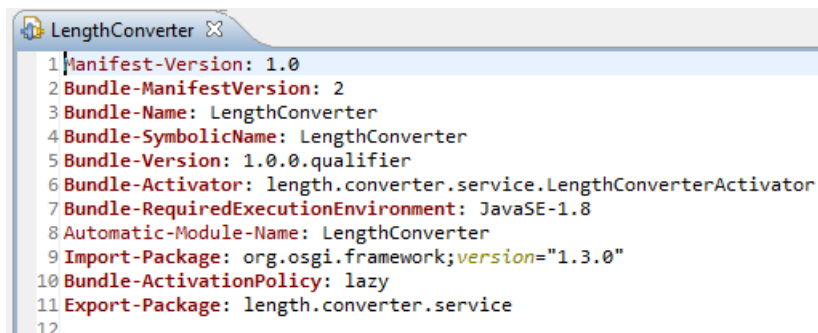
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: AreaConverter
4 Bundle-SymbolicName: AreaConverter
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: area.converter.service.AreaConverterActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: AreaConverter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

2. Mass Converter Bundle



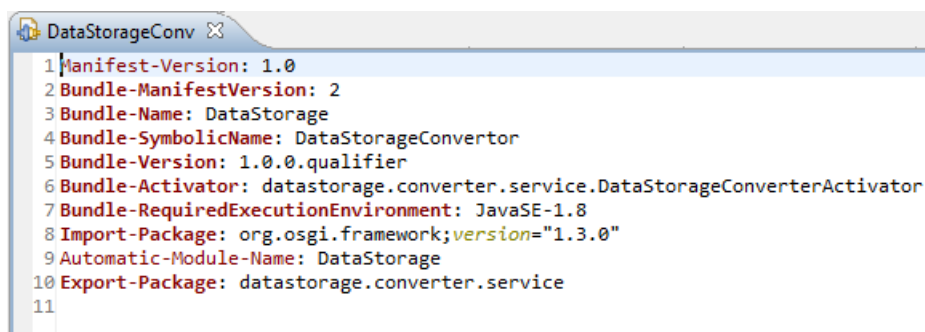
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: MassConverter
4 Bundle-SymbolicName: MassConverter
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: mass.converter.service.MassConverterActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: MassConverter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

3. Length Converter Bundle



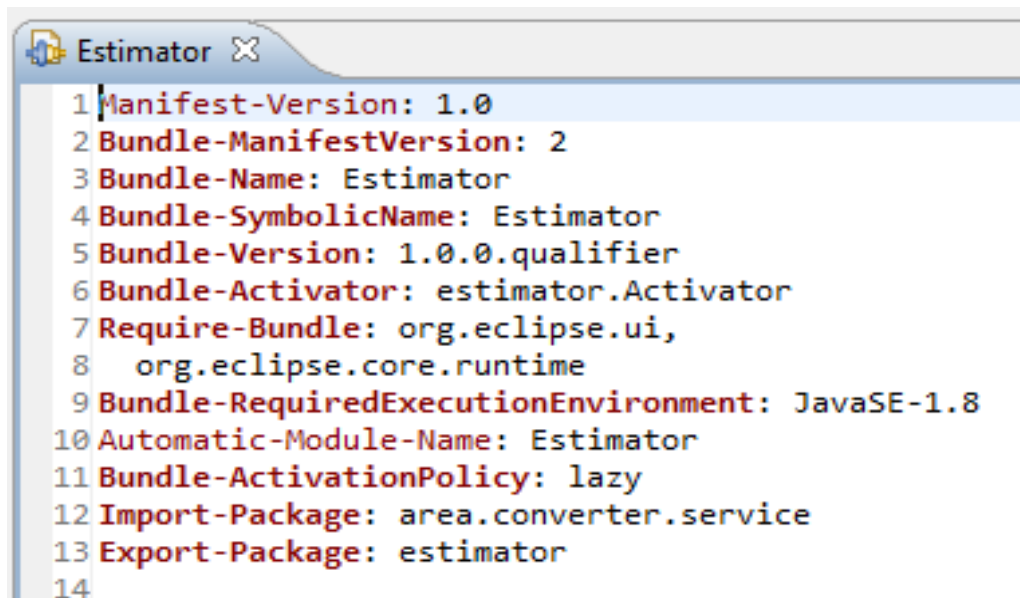
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: LengthConverter
4 Bundle-SymbolicName: LengthConverter
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: length.converter.service.LengthConverterActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Automatic-Module-Name: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

4. Data Storage Converter Bundle



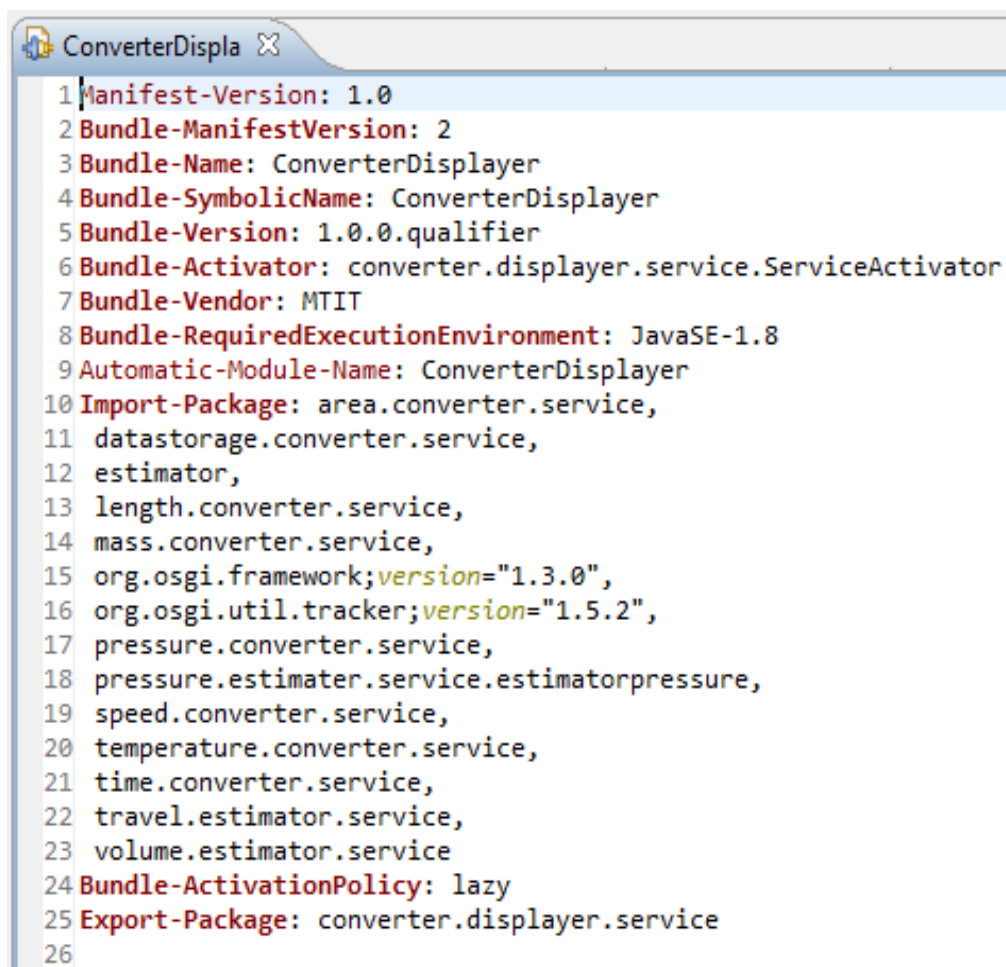
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: DataStorage
4 Bundle-SymbolicName: DataStorageConverter
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: datastorage.converter.service.DataStorageConverterActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Import-Package: org.osgi.framework;version="1.3.0"
9 Automatic-Module-Name: DataStorage
10 Export-Package: datastorage.converter.service
11
```

5. Estimator Bundle



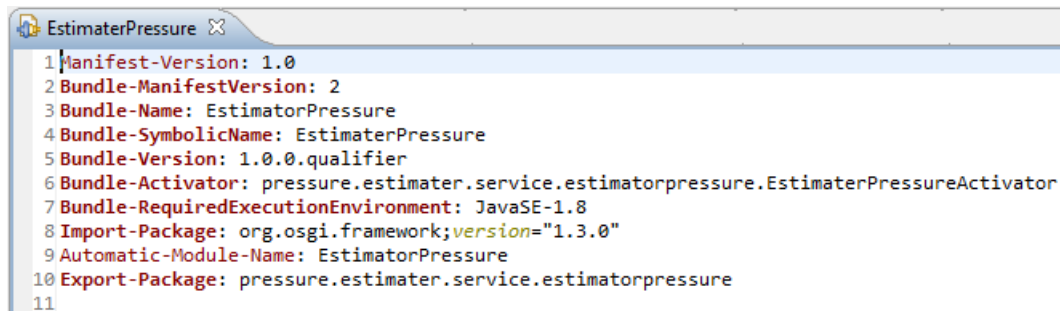
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: Estimator
4 Bundle-SymbolicName: Estimator
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: estimator.Activator
7 Require-Bundle: org.eclipse.ui,
8   org.eclipse.core.runtime
9 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
10 Automatic-Module-Name: Estimator
11 Bundle-ActivationPolicy: lazy
12 Import-Package: area.converter.service
13 Export-Package: estimator
14
```

6. Converter Displayer Bundle



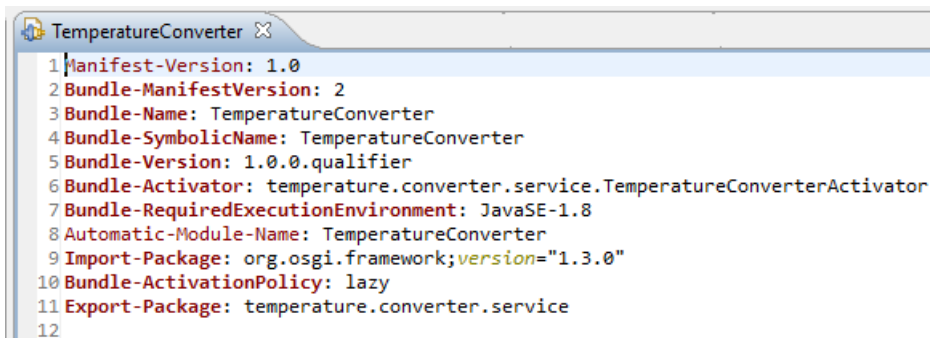
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: ConverterDisplayer
4 Bundle-SymbolicName: ConverterDisplayer
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: converter.displayer.service.ServiceActivator
7 Bundle-Vendor: MTIT
8 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
9 Automatic-Module-Name: ConverterDisplayer
10 Import-Package: area.converter.service,
11   datastorage.converter.service,
12   estimator,
13   length.converter.service,
14   mass.converter.service,
15   org.osgi.framework;version="1.3.0",
16   org.osgi.util.tracker;version="1.5.2",
17   pressure.converter.service,
18   pressure.estimator.service.estimatorpressure,
19   speed.converter.service,
20   temperature.converter.service,
21   time.converter.service,
22   travel.estimator.service,
23   volume.estimator.service
24 Bundle-ActivationPolicy: lazy
25 Export-Package: converter.displayer.service
26
```

7. Estimator Pressure Bundle



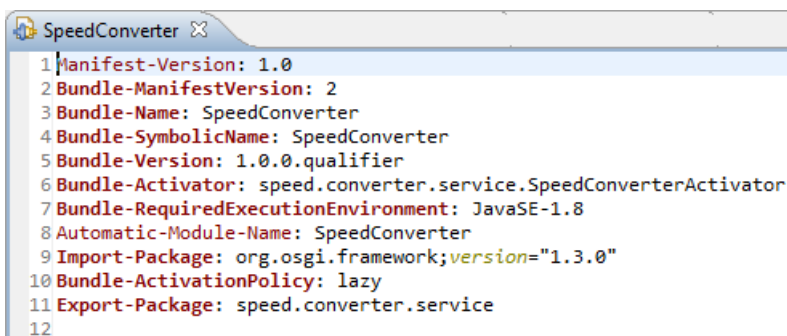
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: EstimatorPressure
4 Bundle-SymbolicName: EstimatorPressure
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: pressure.estimator.service.estimatorpressure.EstimaterPressureActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8 Import-Package: org.osgi.framework;version="1.3.0"
9 Automatic-Module-Name: EstimatorPressure
10 Export-Package: pressure.estimator.service.estimatorpressure
11
```

8. Temperature Converter Bundle



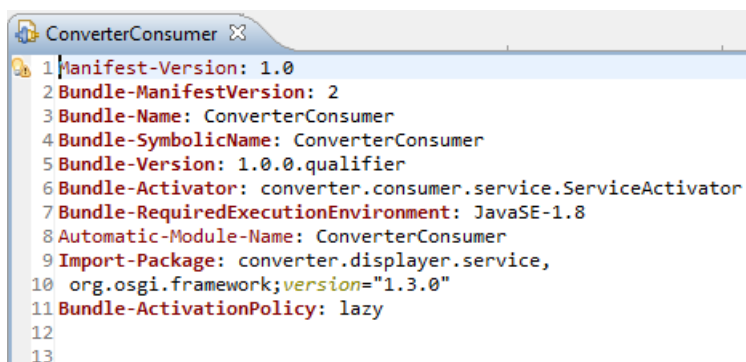
```
1 Manifest-Version: 1.0
2 Bundle-ManifestVersion: 2
3 Bundle-Name: TemperatureConverter
4 Bundle-SymbolicName: TemperatureConverter
5 Bundle-Version: 1.0.0.qualifier
6 Bundle-Activator: temperature.converter.service.TemperatureConverterActivator
7 Bundle-RequiredExecutionEnvironment: JavaSE-1.8
8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

9. Speed Converter Bundle



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

10. Converter Consumer Bundle



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

11. Time Converter Bundle

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

12. Travel Estimator Bundle

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

13. Volume Converter Bundle

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

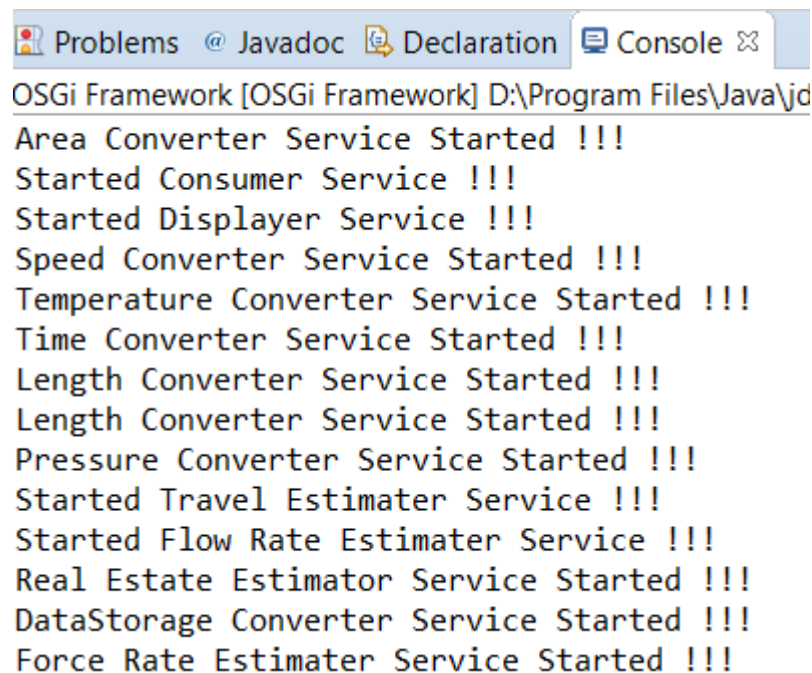
14. Pressure Converter Bundle

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


How Project works with OSGI Plugin Framework

1. Since we use Eclipse Equinox as the OSGi development framework, Eclipse IDE implicitly handles the Bundle management such as Install, Resolve, Start, Stop etc. Therefore we only need to run the bundles as the OSGi framework

Following Figure illustrates the start of bundles in the Project



The screenshot shows the Eclipse IDE's Console window. The title bar includes tabs for 'Problems', 'Javadoc', 'Declaration', and 'Console'. The console output is for the 'OSGi Framework [OSGi Framework] D:\Program Files\Java\jd' and lists the following services starting with '!!!':

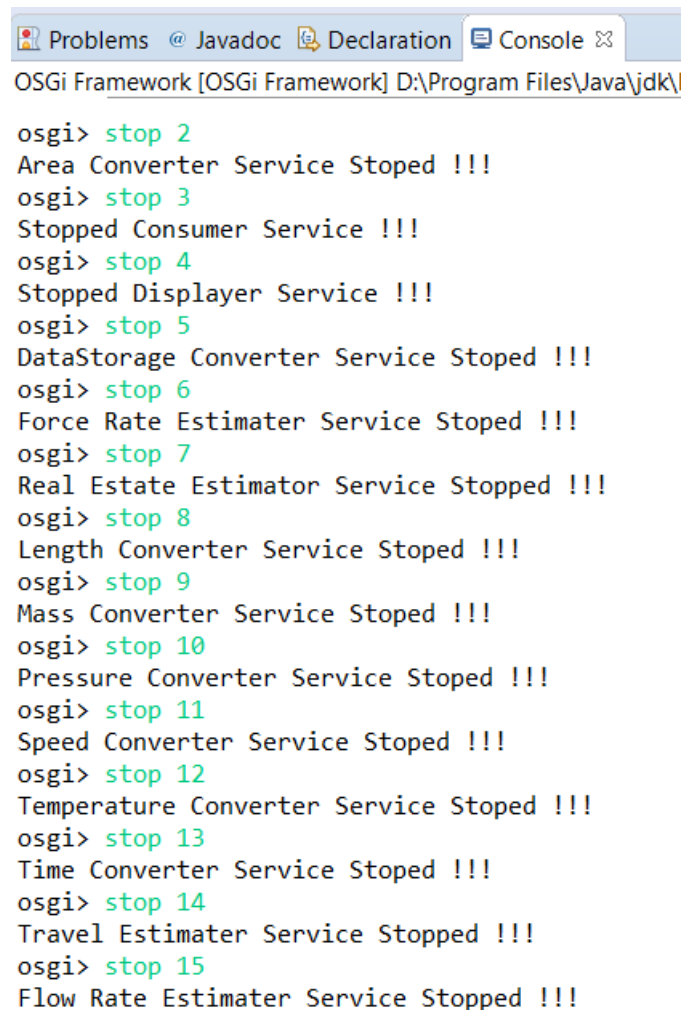
```
Area Converter Service Started !!!
Started Consumer Service !!!
Started Displayer Service !!!
Speed Converter Service Started !!!
Temperature Converter Service Started !!!
Time Converter Service Started !!!
Length Converter Service Started !!!
Length Converter Service Started !!!
Pressure Converter Service Started !!!
Started Travel Estimator Service !!!
Started Flow Rate Estimator Service !!!
Real Estate Estimator Service Started !!!
DataStorage Converter Service Started !!!
Force Rate Estimator Service Started !!!
```

2. Each bundle is independent from each other, so that we can install and uninstall plugin bundles at runtime without affecting the whole system.

This feature allows developing project as separate modules and integrate into the whole system incrementally as requirement arise. Following figure illustrate all the active bundles as soon as project is started

id	State	Bundle
2	ACTIVE	AreaConverter_1.0.0.qualifier
3	ACTIVE	ConverterConsumer_1.0.0.qualifier
4	ACTIVE	ConverterDisplayer_1.0.0.qualifier
5	ACTIVE	DataStorageConvertor_1.0.0.qualifier
6	ACTIVE	EstimatorPressure_1.0.0.qualifier
7	ACTIVE	Estimator_1.0.0.qualifier
8	ACTIVE	LengthConverter_1.0.0.qualifier
9	ACTIVE	MassConverter_1.0.0.qualifier
10	ACTIVE	PressureConverter_1.0.0.qualifier
11	ACTIVE	SpeedConverter_1.0.0.qualifier
12	ACTIVE	TemperatureConverter_1.0.0.qualifier
13	ACTIVE	TimeConverter_1.0.0.qualifier
14	ACTIVE	TravelEstimator_1.0.0.qualifier

Following figure illustrate the how individual plugin bundles can be stopped at runtime



```
OSGi Framework [OSGi Framework] D:\Program Files\Java\jdk\

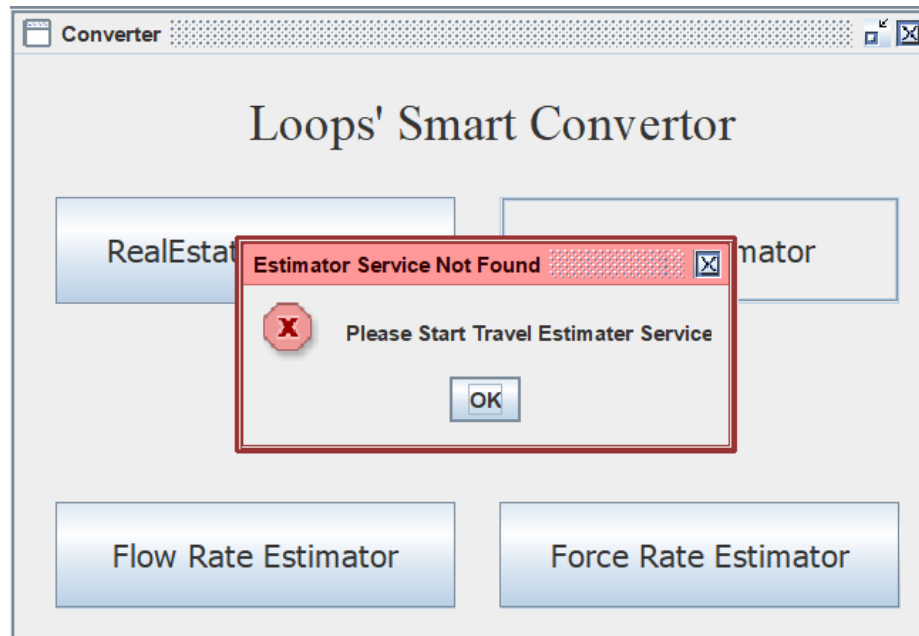
osgi> stop 2
Area Converter Service Stopped !!!
osgi> stop 3
Stopped Consumer Service !!!
osgi> stop 4
Stopped Displayer Service !!!
osgi> stop 5
DataStorage Converter Service Stopped !!!
osgi> stop 6
Force Rate Estimator Service Stopped !!!
osgi> stop 7
Real Estate Estimator Service Stopped !!!
osgi> stop 8
Length Converter Service Stopped !!!
osgi> stop 9
Mass Converter Service Stopped !!!
osgi> stop 10
Pressure Converter Service Stopped !!!
osgi> stop 11
Speed Converter Service Stopped !!!
osgi> stop 12
Temperature Converter Service Stopped !!!
osgi> stop 13
Time Converter Service Stopped !!!
osgi> stop 14
Travel Estimator Service Stopped !!!
osgi> stop 15
Flow Rate Estimator Service Stopped !!!
```

Following figure illustrate the state of plugin bundles when we stop them in runtime

2	RESOLVED	AreaConverter_1.0.0.qualifier
3	RESOLVED	ConverterConsumer_1.0.0.qualifier
4	RESOLVED	ConverterDisplayer_1.0.0.qualifier
5	RESOLVED	DataStorageConvertor_1.0.0.qualifier
6	RESOLVED	EstimatorPressure_1.0.0.qualifier
7	RESOLVED	Estimator_1.0.0.qualifier
8	RESOLVED	LengthConverter_1.0.0.qualifier
9	RESOLVED	MassConverter_1.0.0.qualifier
10	RESOLVED	PressureConverter_1.0.0.qualifier
11	RESOLVED	SpeedConverter_1.0.0.qualifier
12	RESOLVED	TemperatureConverter_1.0.0.qualifier
13	RESOLVED	TimeConverter_1.0.0.qualifier
14	RESOLVED	TravelEstimator_1.0.0.qualifier
15	RESOLVED	VolumeEstimator_1.0.0.qualifier

According to the project implementation, this allows service to be decoupled from the core system without the acknowledgement of client

Following figure show the Exception thrown by the system when client access the service which is being decoupled from the Core system at the run time



Later as per the requirement arise we can again couple the service which are required by the client at runtime.

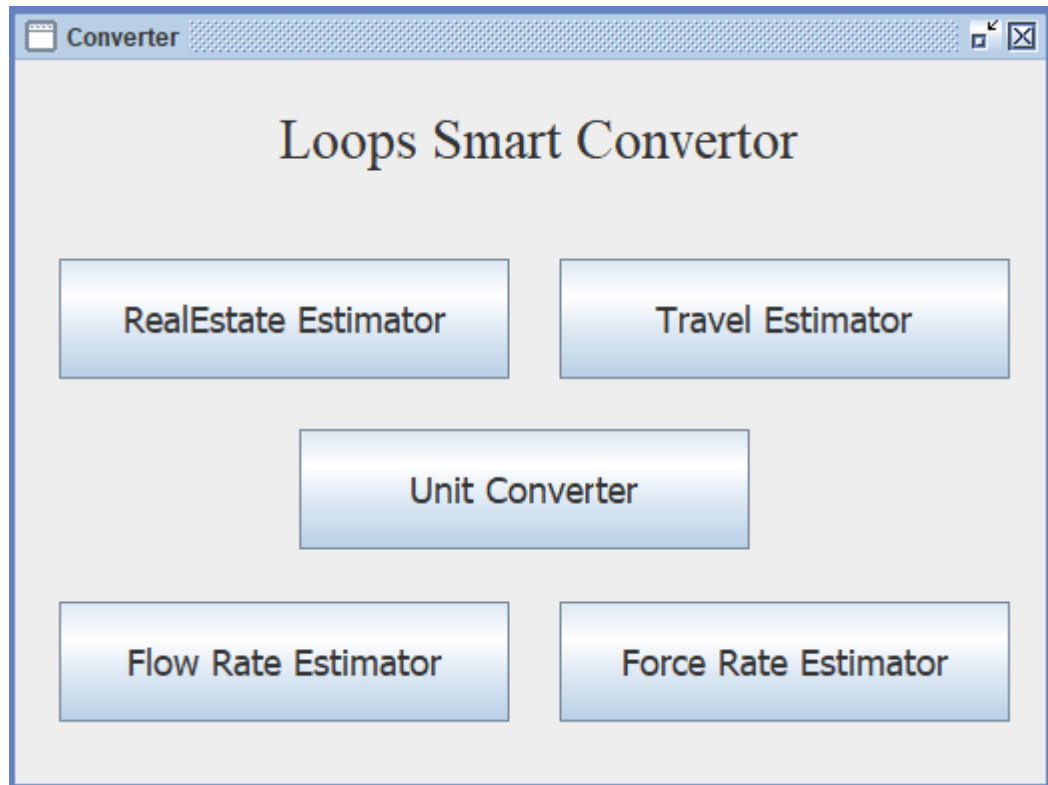
Following figure illustrate how we can start the individual plugin bundles which are being stopped earlier

```
osgi> start 4
Started Displayer Service !!!
osgi> start 3
Started Consumer Service !!!
osgi> start 2
Area Converter Service Started !!!
osgi> start 5
DataStorage Converter Service Started !!!
osgi> start 6
Force Rate Estimator Service Started !!!
osgi> start 7
Real Estate Estimator Service Started !!!
osgi> start 8
Length Converter Service Started !!!
osgi> start 9
Length Converter Service Started !!!
osgi> start 10
Pressure Converter Service Started !!!
osgi> start 11
Speed Converter Service Started !!!
osgi> start 12
Temperature Converter Service Started !!!
osgi> start 13
Time Converter Service Started !!!
osgi> start 14
Started Travel Estimator Service !!!
osgi> start 15
Started Flow Rate Estimator Service !!!
```

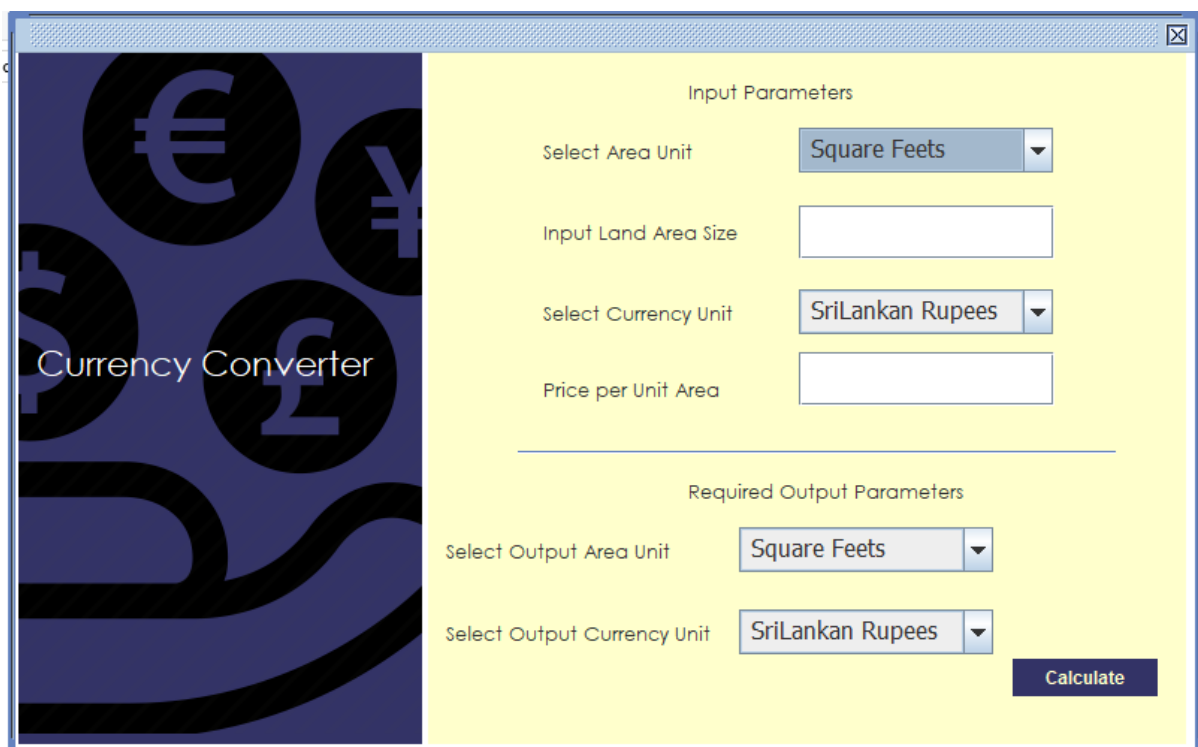
Bundle's Behavior and Outputs

1. Real Estate Estimator

1.1 Run the Application and Select Real Estate Estimator



1.2 Real Estate Estimator UI will be displayed

The screenshot shows the "Real Estate Estimator" UI within the "Converter" window. The interface is split into two main sections. The left section has a dark blue background with large, stylized currency symbols (Euro, Yen, Dollar, Pound) and the text "Currency Converter" in white. The right section has a light yellow background and contains two groups of input fields. The top group, titled "Input Parameters", includes a dropdown menu for "Select Area Unit" (set to "Square Feet"), a text input field for "Input Land Area Size", a dropdown menu for "Select Currency Unit" (set to "SriLankan Rupees"), and a text input field for "Price per Unit Area". The bottom group, titled "Required Output Parameters", includes a dropdown menu for "Select Output Area Unit" (set to "Square Feet") and a dropdown menu for "Select Output Currency Unit" (set to "SriLankan Rupees"). A dark blue "Calculate" button is located at the bottom right of the yellow section. The window has a standard Windows-style title bar with a close button on the right.

1.3 Select the Input Area Parameter Unit and Input the land Area Size

Currency Converter

Input Parameters

Select Area Unit: Square Feet

Input Land Area Size: 100

Select Currency Unit: SriLankan Rupees

Price per Unit Area: 100

Required Output Parameters

Select Output Area Unit: Square Feet

Select Output Currency Unit: SriLankan Rupees

Calculate

1.4 Select the currency unit & input the price per unit area

Currency Converter

Input Parameters

Select Area Unit: Square Feet

Input Land Area Size: 400

Select Currency Unit: SriLankan Rupees

Price per Unit Area: 100

Required Output Parameters

Select Output Area Unit: Square Feet

Select Output Currency Unit: SriLankan Rupees

Calculate

1.5 Select the Output Area Parameter Unit

The screenshot shows a window titled "Currency Converter" with a dark blue background on the left featuring currency symbols (€, \$, £, ¥) and a yellow background on the right for the input and output parameters. The "Input Parameters" section includes: "Select Area Unit" (Square Feet), "Input Land Area Size" (400), "Select Currency Unit" (SriLankan Rupees), and "Price per Unit Area" (100). The "Required Output Parameters" section includes: "Select Output Area Unit" (Square Feet) and "Select Output Currency Unit". The "Select Output Area Unit" dropdown menu is open, showing options: Square Feet, Square Meters, Acres, Hectares, Square Kilometers, and Square Miles. A "Calculate" button is located at the bottom right.

Input Parameters

Select Area Unit: Square Feet

Input Land Area Size: 400

Select Currency Unit: SriLankan Rupees

Price per Unit Area: 100

Required Output Parameters

Select Output Area Unit: Square Feet

Select Output Currency Unit:

Calculate

1.6 Select the Output Currency Unit and Press Calculate button

The screenshot shows the same "Currency Converter" window. In the "Required Output Parameters" section, the "Select Output Currency Unit" dropdown menu is now open, showing options: SriLankan Rupees, US Dollars, Great Britain Pounds, Euro, and Australian Dollars. The "Select Output Area Unit" remains "Square Feet". The "Calculate" button is still visible at the bottom right.

Input Parameters

Select Area Unit: Square Feet

Input Land Area Size: 400

Select Currency Unit: SriLankan Rupees

Price per Unit Area: 100

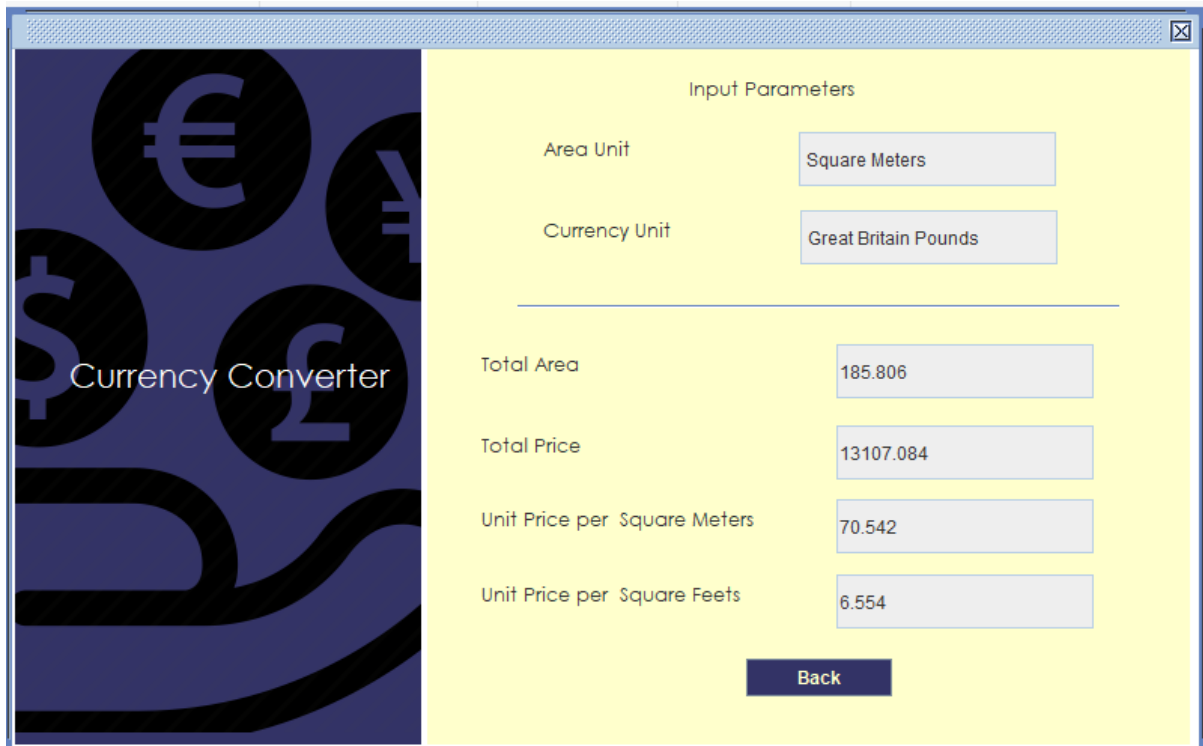
Required Output Parameters

Select Output Area Unit: Square Feet

Select Output Currency Unit: SriLankan Rupees

Calculate

1.7 Display the Output



The screenshot shows a web application titled "Currency Converter". The interface is split into two main sections. On the left is a dark blue sidebar with a pattern of currency symbols: the Euro (€), the Japanese Yen (¥), the US Dollar (\$), and the British Pound (£). The text "Currency Converter" is written in white on this sidebar. The main area on the right has a yellow background. At the top of this area is the heading "Input Parameters". Below this heading are two input fields: "Area Unit" with the value "Square Meters" and "Currency Unit" with the value "Great Britain Pounds". A horizontal line separates the input section from the output section. The output section displays four calculated values in light blue boxes: "Total Area" is 185.806, "Total Price" is 13107.084, "Unit Price per Square Meters" is 70.542, and "Unit Price per Square Feet" is 6.554. At the bottom right of the yellow area is a dark blue button with the text "Back".

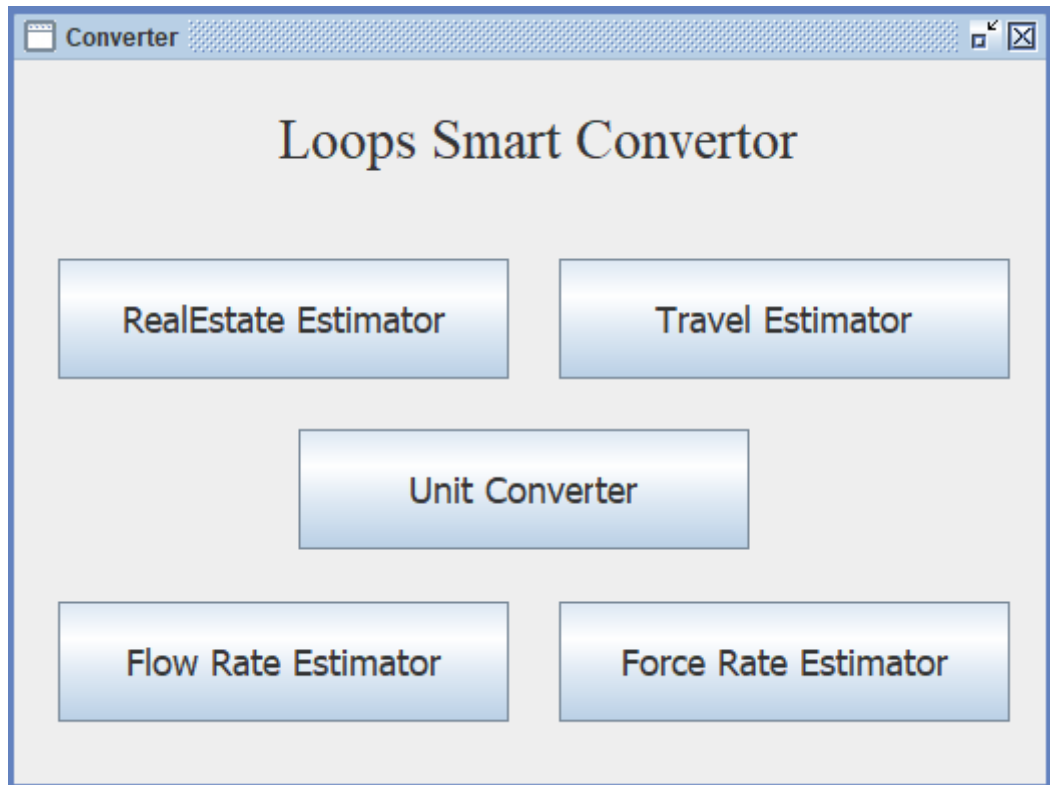
Input Parameters	
Area Unit	Square Meters
Currency Unit	Great Britain Pounds

Total Area	185.806
Total Price	13107.084
Unit Price per Square Meters	70.542
Unit Price per Square Feet	6.554

[Back](#)

2. Travel Estimator

2.1 Run the Application and Select Travel Estimator

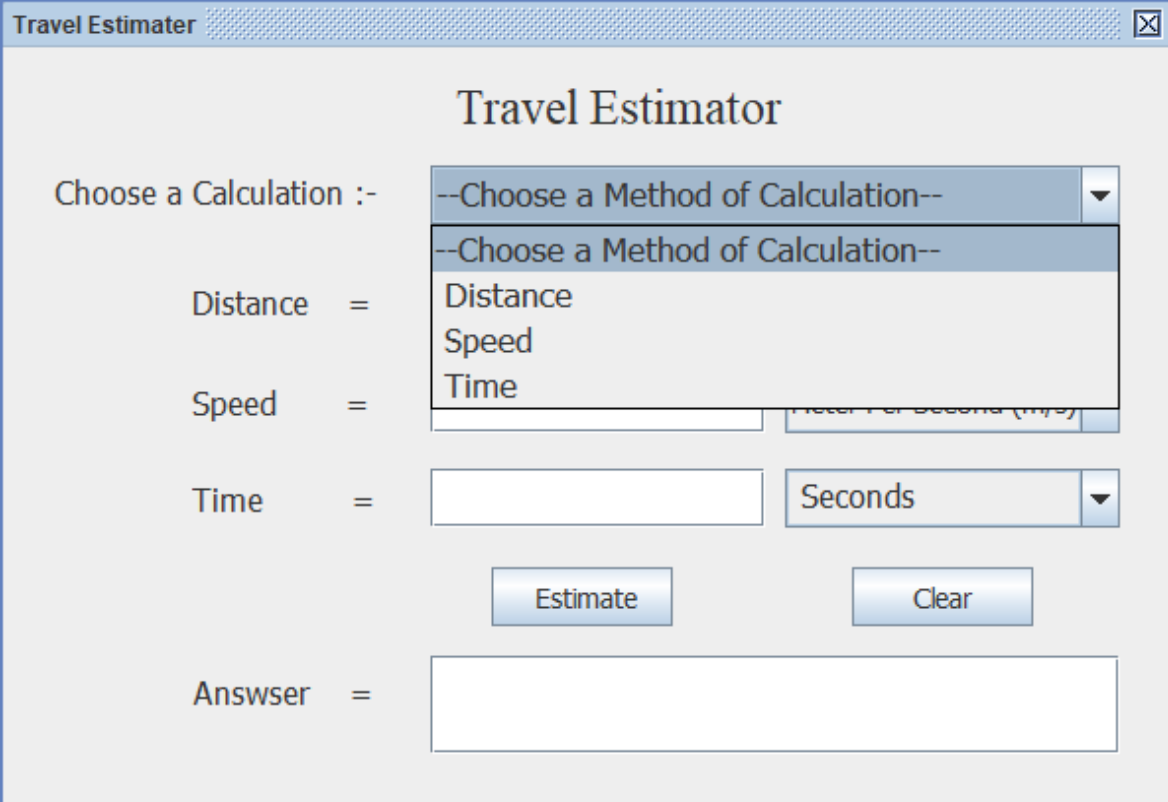


2.2 Travel Estimator UI will be displayed

The screenshot shows a window titled 'Travel Estimator'. The window contains the following elements:

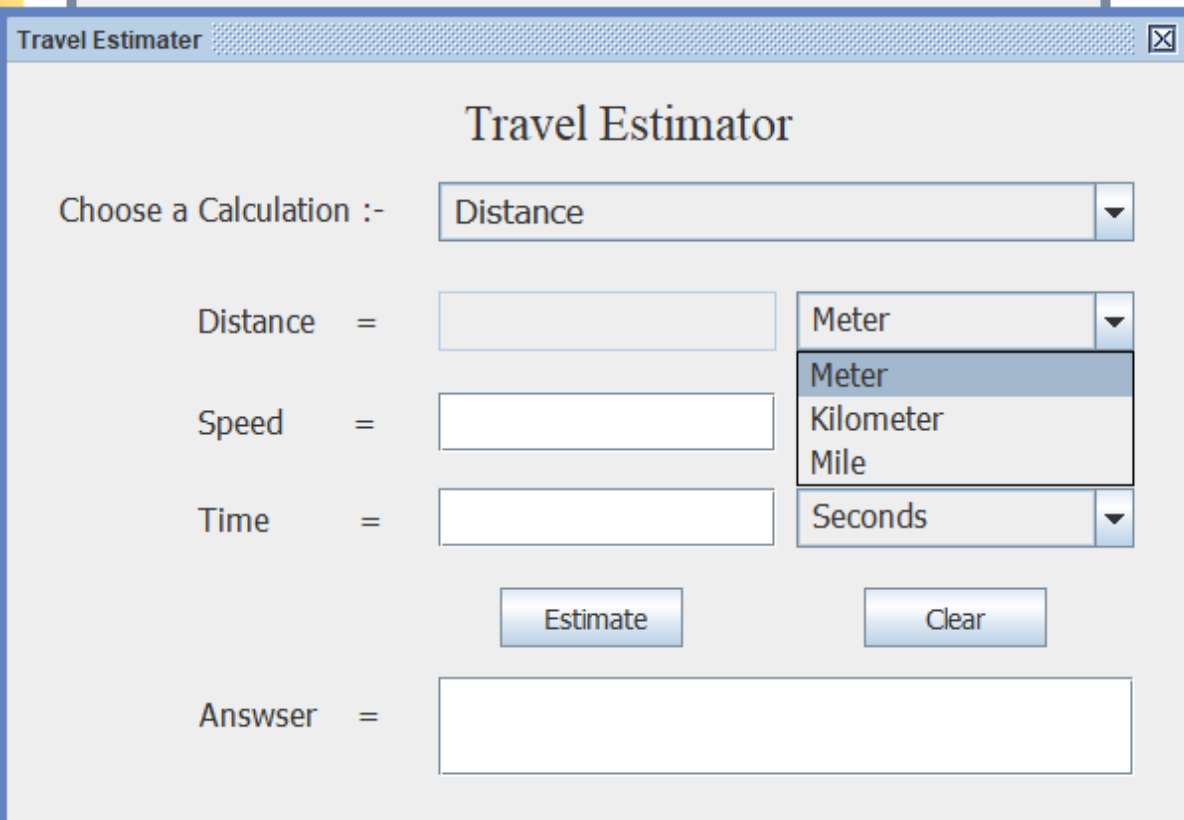
- A label 'Choose a Calculation :-' followed by a dropdown menu with the text '--Choose a Method of Calculation--'.
- Three rows of input fields for 'Distance', 'Speed', and 'Time', each followed by a unit selection dropdown menu. The units are 'Meter', 'Meter Per Second (m/s)', and 'Seconds' respectively.
- Two buttons labeled 'Estimate' and 'Clear'.
- A label 'Answer =' followed by a large text input field.

2.3 Choose the calculation method(e.g. :- Distance)



The screenshot shows the 'Travel Estimator' application window. The title bar is 'Travel Estimator'. The main title is 'Travel Estimator'. Below the title, there is a label 'Choose a Calculation :-' followed by a dropdown menu. The dropdown menu is open, showing the following options: '--Choose a Method of Calculation--', '--Choose a Method of Calculation--', 'Distance', 'Speed', and 'Time'. Below the dropdown menu, there are three input fields: 'Distance =', 'Speed =', and 'Time ='. The 'Time' field has a unit dropdown menu set to 'Seconds'. Below the input fields, there are two buttons: 'Estimate' and 'Clear'. At the bottom, there is a label 'Answer =' followed by a large text input field.

2.4 Select the Output Unit type for Distance



The screenshot shows the 'Travel Estimator' application window. The title bar is 'Travel Estimator'. The main title is 'Travel Estimator'. Below the title, there is a label 'Choose a Calculation :-' followed by a dropdown menu. The dropdown menu is open, showing the following options: 'Distance', 'Speed', and 'Time'. Below the dropdown menu, there are three input fields: 'Distance =', 'Speed =', and 'Time ='. The 'Distance' field has a unit dropdown menu set to 'Meter'. The 'Speed' field has a unit dropdown menu set to 'Meters Per Second (m/s)'. The 'Time' field has a unit dropdown menu set to 'Seconds'. Below the input fields, there are two buttons: 'Estimate' and 'Clear'. At the bottom, there is a label 'Answer =' followed by a large text input field.

2.5 Input the Speed value and Select the Speed Option

Travel Estimator

Travel Estimator

Choose a Calculation :- Distance

Distance = Meter

Speed = Meter Per Second (m/s)

Time =

Estimate Clear

Answer =

Note: The dropdown menu for Speed is open, showing options: Meter Per Second (m/s), Meter Per Second (m/s), Km Per Hour (kph), and Mile Per Hour (mph).

2.6 Input the Time value and Select the Time Option

Travel Estimator

Travel Estimator

Choose a Calculation :- Distance

Distance = Meter

Speed = Meter Per Second (m/s)

Time = Minutes

Estimate

Answer =

Note: The dropdown menu for Time is open, showing options: Minutes, Seconds, Minutes, and Hour.

2.7 Display the Output

Travel Estimator

Travel Estimator

Choose a Calculation :-

Distance

Distance =

Meter

Speed =

10

Meter Per Second (m/s)

Time =

5

Minutes

Estimate

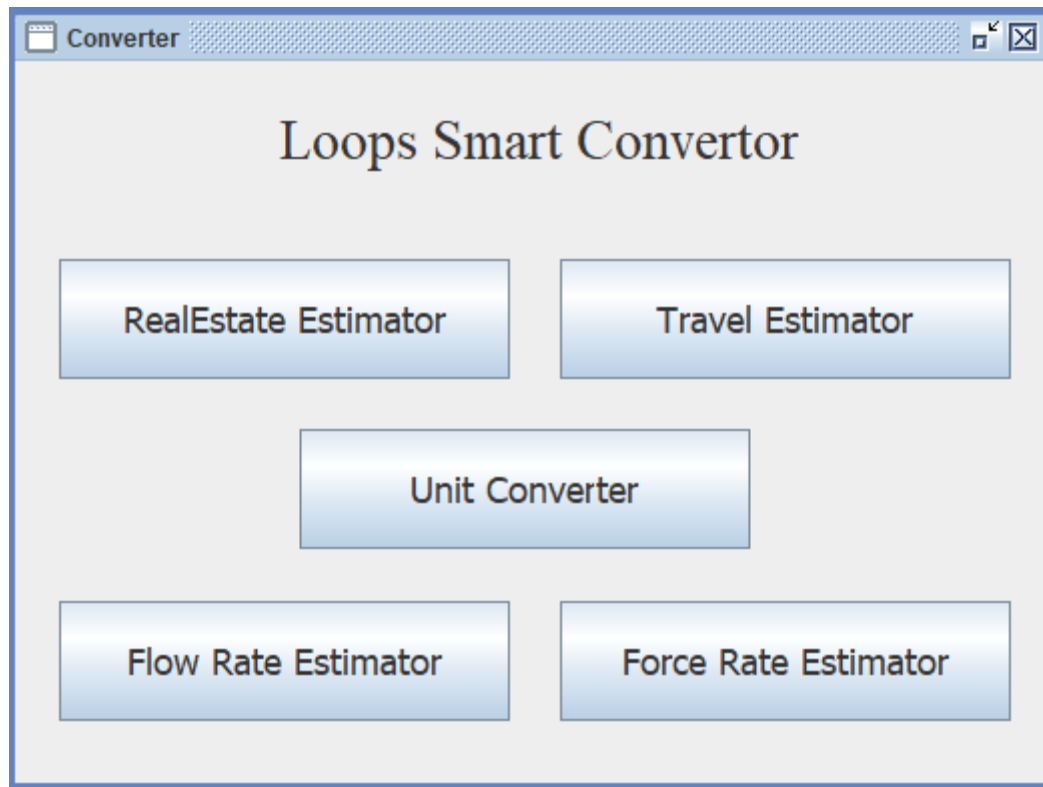
Clear

Answer =

3000.0

3. Flow Rate Estimator

3.1 Run the Application and Flow Rate Estimator



3.2 Flow Rate UI will be displayed

The screenshot shows a window titled "Volume Estimator" with a standard Windows-style title bar. The main content area has a light gray background and is titled "Flow Rate Estimator" in a large, dark serif font. Below the title, there is a label "Choose a Calculation :-" followed by a dropdown menu with the text "--Choose a Method of Calculation--". Below this, there are three rows of input fields. Each row consists of a label, an equals sign, a text input field, and a dropdown menu. The first row is labeled "Volume" and has a dropdown menu with the text "Centimeter". The second row is labeled "Rate" and has a dropdown menu with the text "Cubic centimeters/se...". The third row is labeled "Time" and has a dropdown menu with the text "Seconds". Below these input fields, there are two blue rectangular buttons with white text, labeled "Estimate" and "Clear". At the bottom, there is a label "Answser" (note the typo) followed by an equals sign and a large text input field.

3.3 Choose the calculation method

Volume Estimator

Flow Rate Estimator

Choose a Calculation :-

Volume =

Rate =

Time =

Answer =

--Choose a Method of Calculation--

--Choose a Method of Calculation--

Volume

Rate

Time

Seconds

Estimate

Clear

3.4 Select the Output Volume Unit

Volume Estimator

Flow Rate Estimator

Choose a Calculation :-

Volume =

Rate =

Time =

Answer =

Volume

Centimeter

Centimeter

Meter

Feet

Seconds

Estimate

Clear

3.5 Input the Rate value and Select the Rate Option

Volume Estimator

Flow Rate Estimator

Choose a Calculation :- Volume

Volume = Centimeter

Rate = Cubic centimeters/se...

Time =

Answer =

Cubic centimeters/second
Cubic centimeters/minute
Cubic centimeters/hour

3.6 Input the Time value and Select the Time Option

Volume Estimator

Flow Rate Estimator

Choose a Calculation :- Volume

Volume = Centimeter

Rate = Cubic centimeters/se...

Time = Seconds

Answer =

Seconds
Minutes
Hour

3.7 Display the Output

Volume Estimator

Flow Rate Estimator

Choose a Calculation :-

Volume

Volume =

Centimeter

Rate =

5

Cubic centimeters/se...

Time =

2

Minutes

Estimate

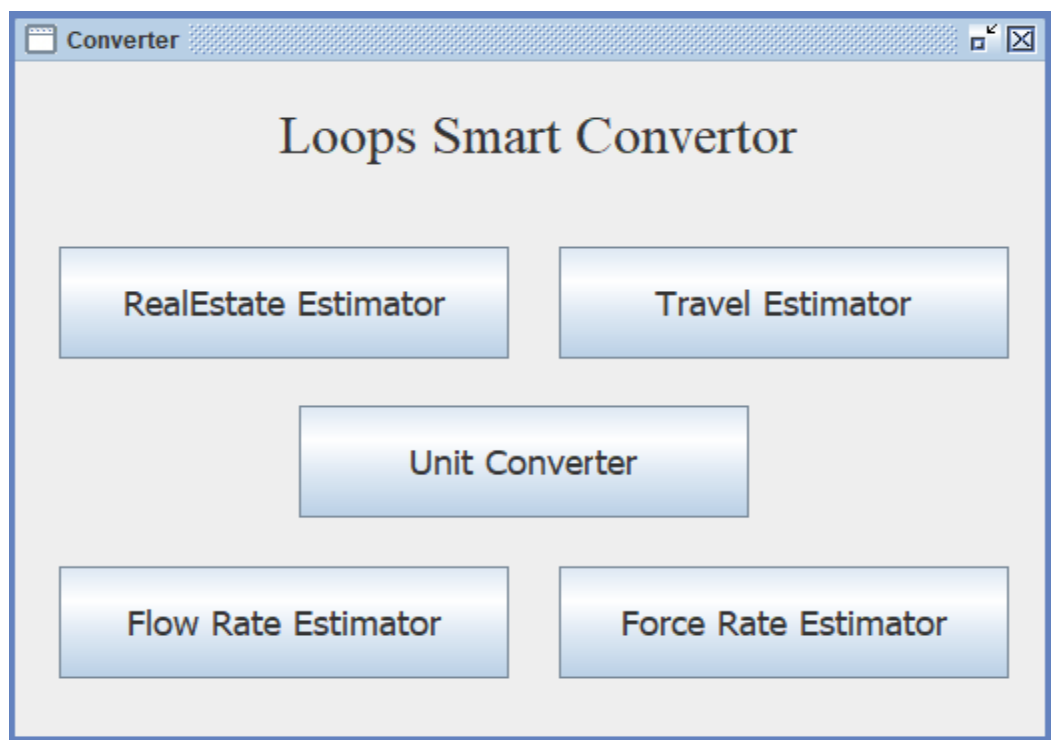
Clear

Answer =

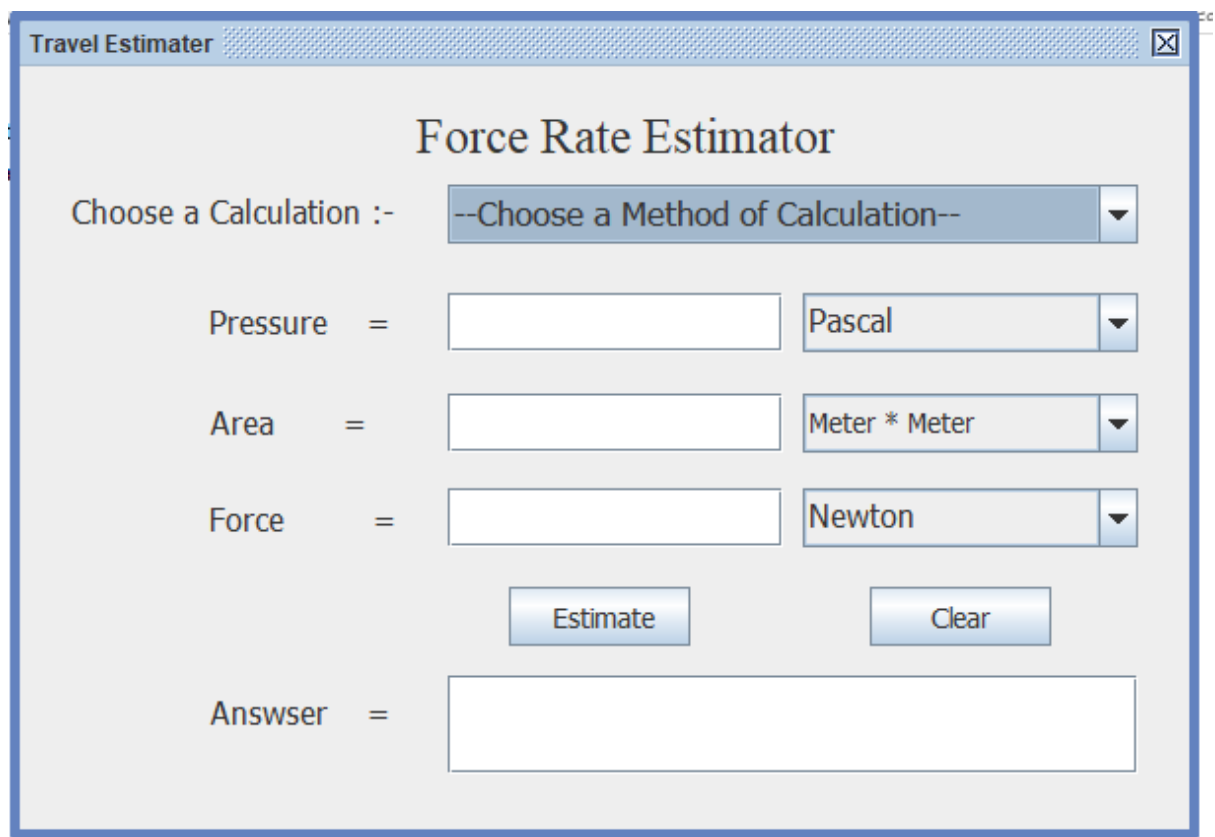
600.0

4. Force Rate Estimator

4.1 Run the Application and Force Rate Estimator



4.2 Force Rate UI will be displayed



4.3 Choose the calculation method

Travel Estimator

Force Rate Estimator

Choose a Calculation :-

Pressure =

Area =

Force =

Estimate

Clear

Answer =

--Choose a Method of Calculation--

--Choose a Method of Calculation--

Pressure

Area

Force

Newton

4.4 Select the Output Pressure Unit

Travel Estimator

Force Rate Estimator

Choose a Calculation :-

Pressure =

Area =

Force =

Estimate

Clear

Answer =

Pressure

Pascal

Pascal

Centipascal

Decipascal

Newton

4.5 Input the Area Size and Select the Area Option

Travel Estimator

Force Rate Estimator

Choose a Calculation :- Pressure

Pressure = Pascal

Area = Meter * Meter

Force =

Estimate Clear

Answer =

3.6 Input the Force value and Select the Force Option

Travel Estimator

Force Rate Estimator

Choose a Calculation :- Pressure

Pressure = Pascal

Area = Meter * Meter

Force = Newton

Estimate Clear

Answer =

4.7 Display the Output

Travel Estimator

Force Rate Estimator

Choose a Calculation :-

Pressure

Pressure =

Pascal

Area =

5

Meter * Meter

Force =

2

Newton

Estimate

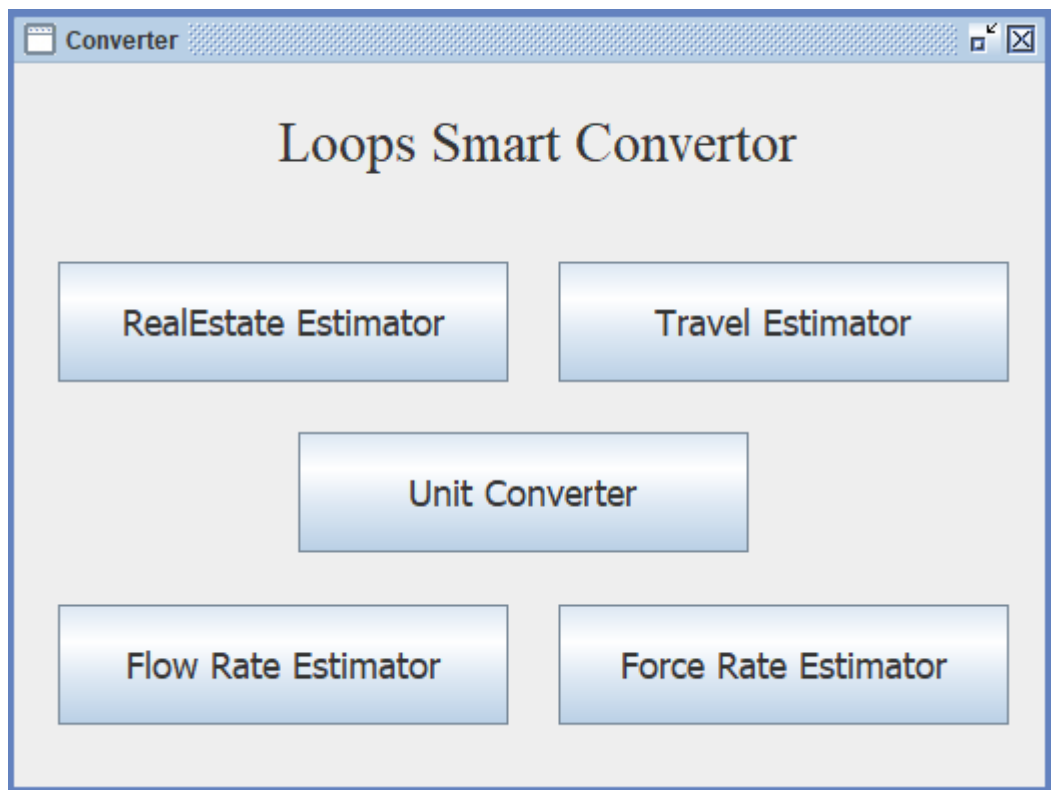
Clear

Answer =

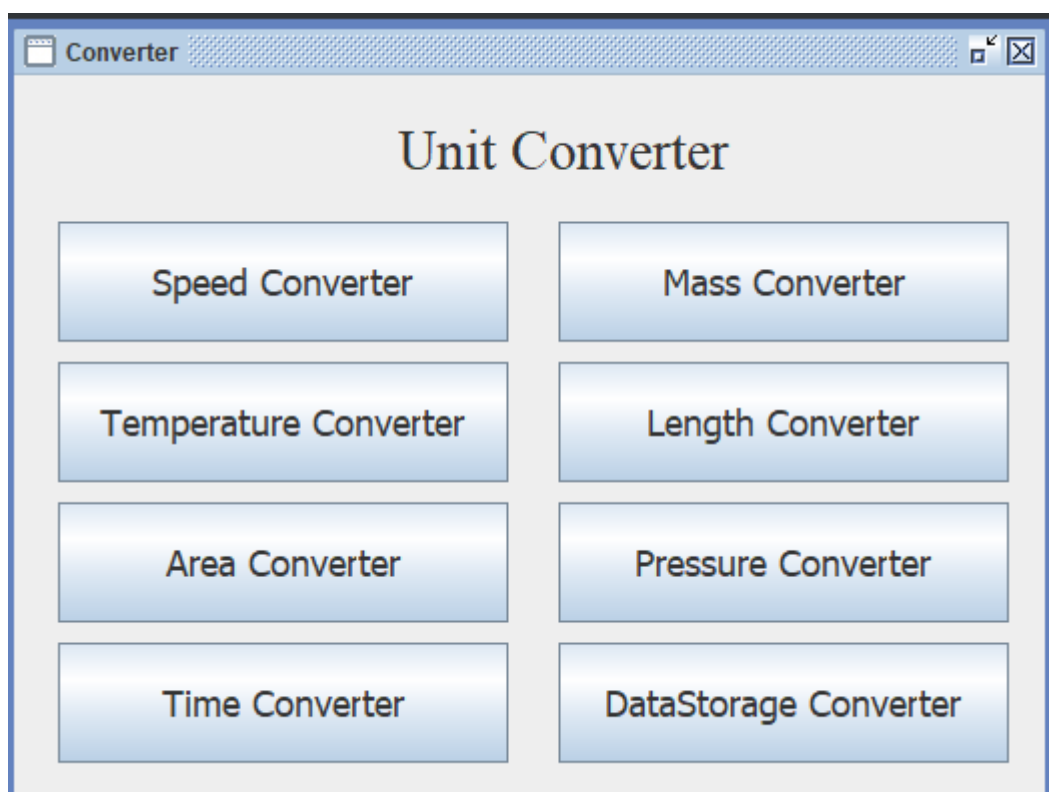
0.4

5. Unit Converter

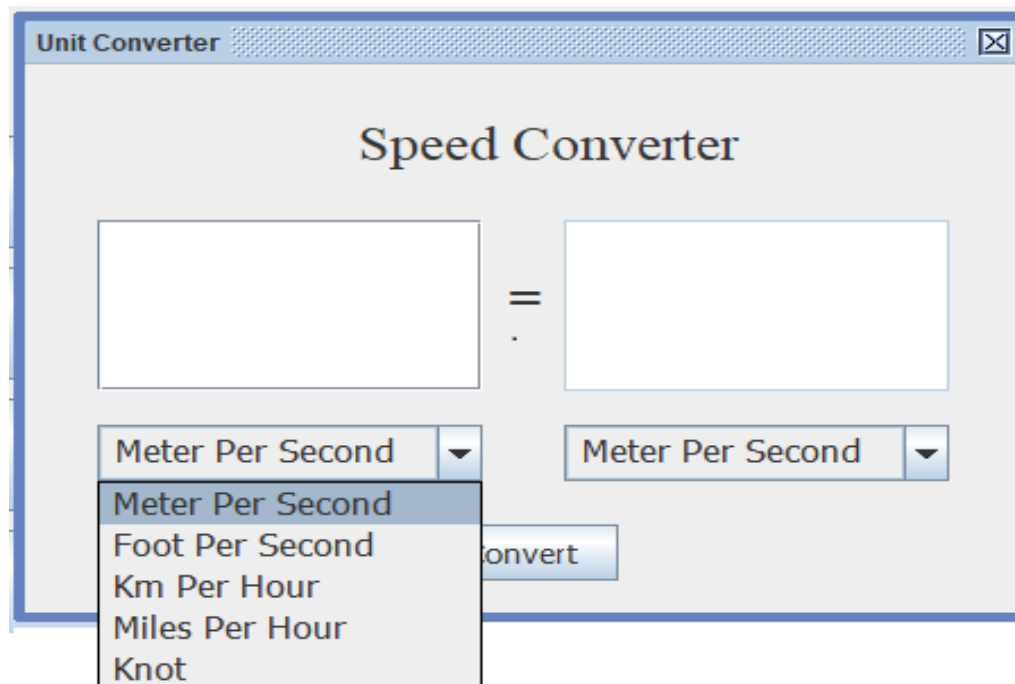
5.1 Run the Application and Unit Converter



5.2 Select anyone of the unit converter (e.g.:- Speed Converter)

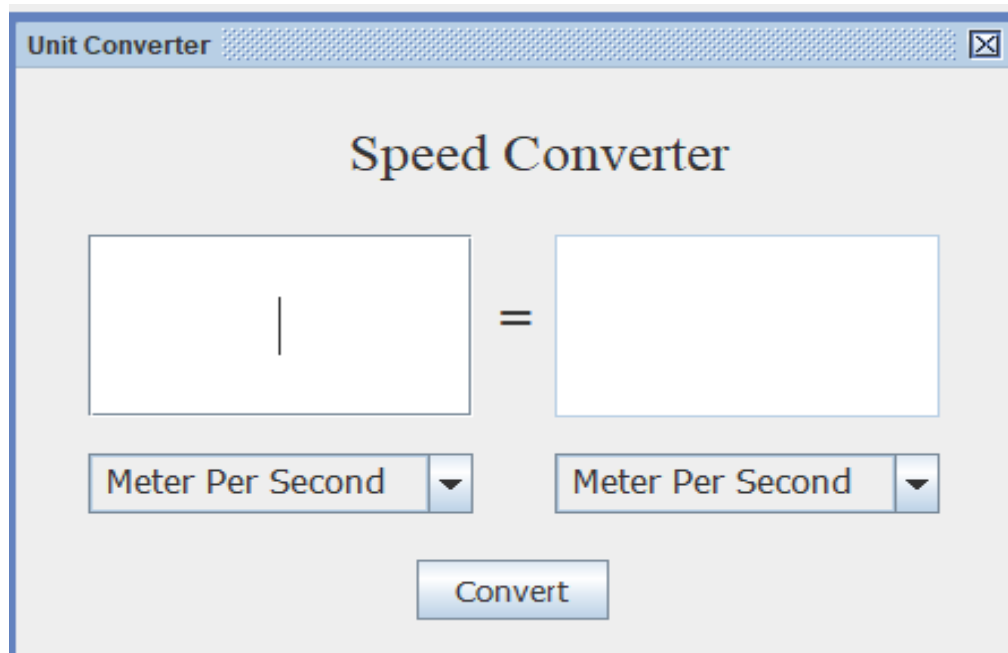


5.3 Select the input conversion scale



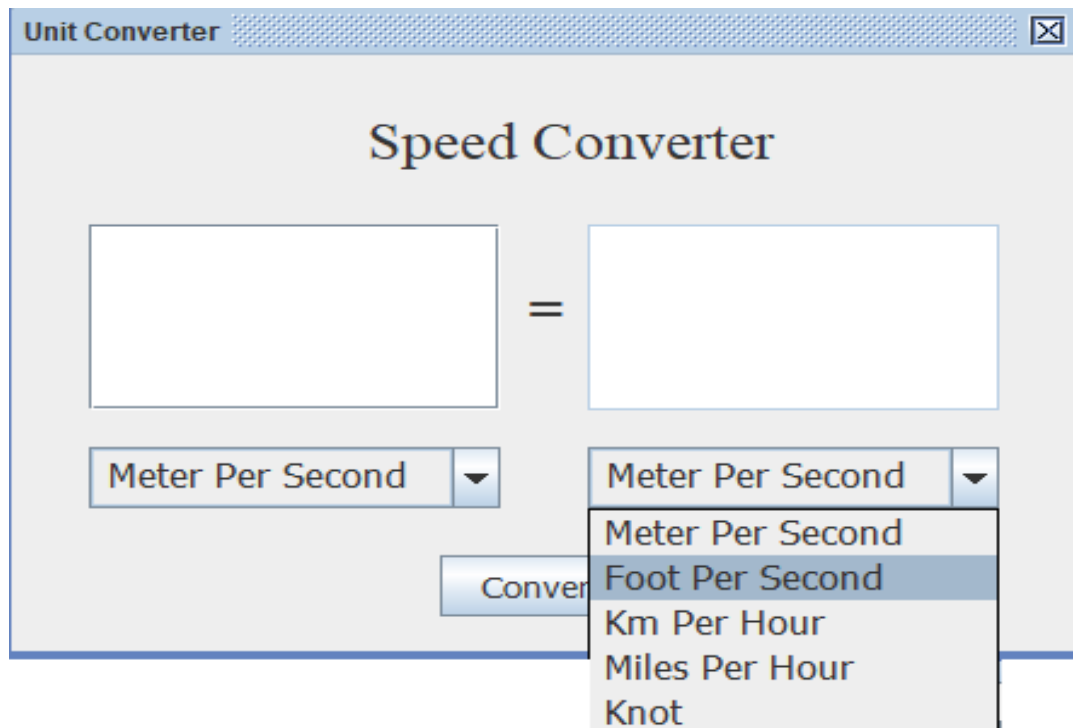
The screenshot shows a window titled "Unit Converter" with a subtitle "Speed Converter". It features two empty text input fields separated by an equals sign. Below the left input field is a dropdown menu currently displaying "Meter Per Second". The dropdown menu is open, showing a list of options: "Meter Per Second", "Foot Per Second", "Km Per Hour", "Miles Per Hour", and "Knot". The "Meter Per Second" option is highlighted. Below the dropdown menu is a button labeled "Convert".

5.4 Input the Value that to be converted



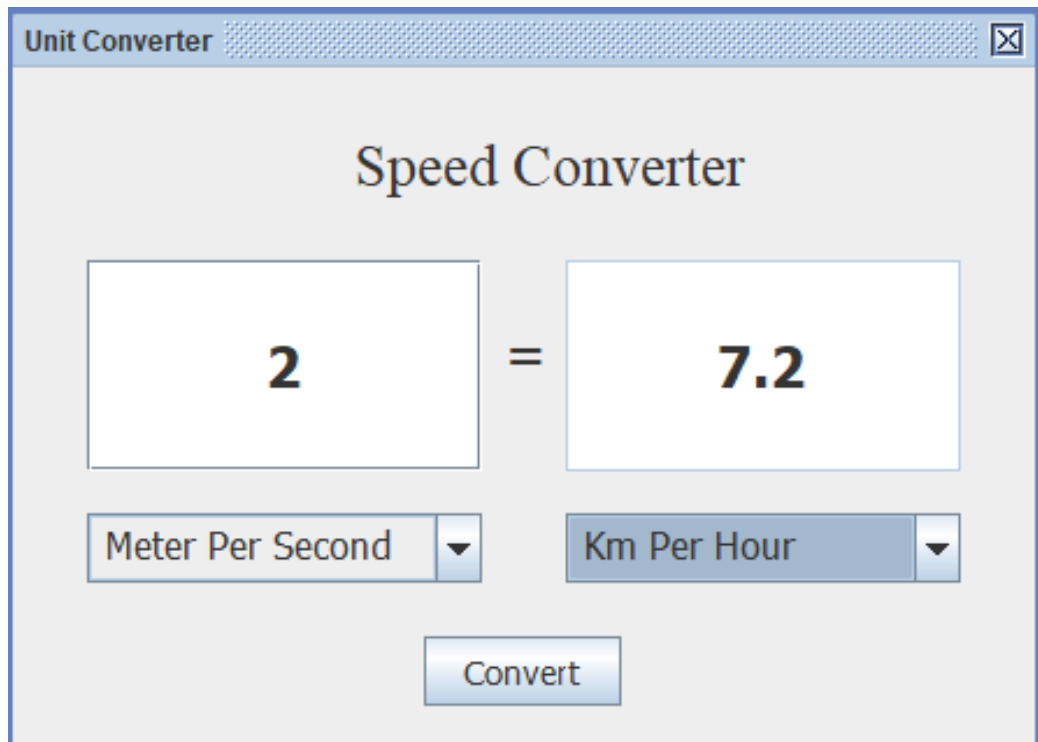
The screenshot shows the same "Unit Converter" window with the subtitle "Speed Converter". The left text input field now contains a vertical cursor, indicating that a value is being entered. The dropdown menu below it still displays "Meter Per Second". The right text input field remains empty. The "Convert" button is still present at the bottom.

5.5 Select the output conversion scale



The screenshot shows a window titled "Unit Converter" with a subtitle "Speed Converter". It features two input fields separated by an equals sign. Below the left field is a dropdown menu set to "Meter Per Second". Below the right field is a dropdown menu that is open, showing a list of units: "Meter Per Second", "Foot Per Second", "Km Per Hour", "Miles Per Hour", and "Knot". A "Convert" button is located between the two dropdown menus.

5.6 Display the Output



The screenshot shows the same "Unit Converter" window. The left input field now contains the number "2". The right output field displays the result "7.2". The dropdown menu for the left unit remains "Meter Per Second", while the dropdown menu for the right unit is now set to "Km Per Hour". The "Convert" button is still present at the bottom.