

# Java Fundamentals:

## 3. Java GUI

Romi Satria Wahono

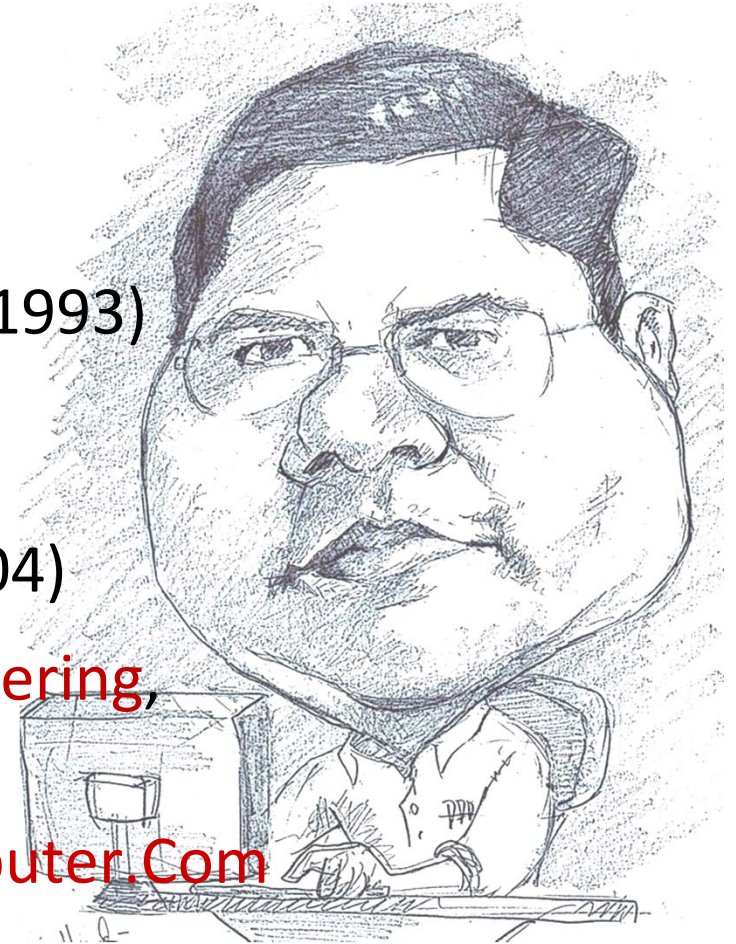
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<http://romisatriawahono.net>

+6281586220090

# Romi Satria Wahono

- **SD Sompok** Semarang (1987)
- **SMPN 8** Semarang (1990)
- **SMA Taruna Nusantara**, Magelang (1993)
- S1, S2 dan S3 (on-leave)  
Department of Computer Sciences  
**Saitama University**, Japan (1994-2004)
- Research Interests: **Software Engineering**,  
Intelligent Systems
- Founder dan Koordinator **IlmuKomputer.Com**
- Peneliti LIPI (2004-2007)
- Founder dan CEO **PT Brainmatics Cipta Informatika**



# Course Outline

1. **OOP Concepts:**  
*Konsep dan Paradigma Object-Oriented*
2. **Java Basics:**  
*Memahami Sintaks dan Grammar Bahasa Java*
3. **Java GUI:**  
*Swing, GUI Component, Event Handling, Pengembangan Aplikasi GUI*
4. **Java Algorithms:**  
*Pengantar Algoritma, Struktur Data, Algorithm Analysis*
5. **Java Advanced:**  
*Eksepsi, Thread, Java API*
6. **Java Database:**  
*Koneksi ke Database, Pengembangan Aplikasi Database*

# 3. Java GUI

# Java GUI

1. **Konsep** Graphical User Interface (GUI) di Java
2. **Komponen** Dasar Swing
3. **Penanganan Kejadian** (Event Handling)
4. Studi Kasus Membangun Aplikasi GUI

# 3.1 Konsep Graphical User Interface (GUI) di Java

# API untuk Aplikasi GUI di Java

## 1. **AWT** (Abstract Window Toolkit):

Library dan komponen GUI (java.awt) yang pertama kali diperkenalkan oleh Java, Sun **tidak merekomendasikan lagi** penggunaan komponen GUI dari AWT

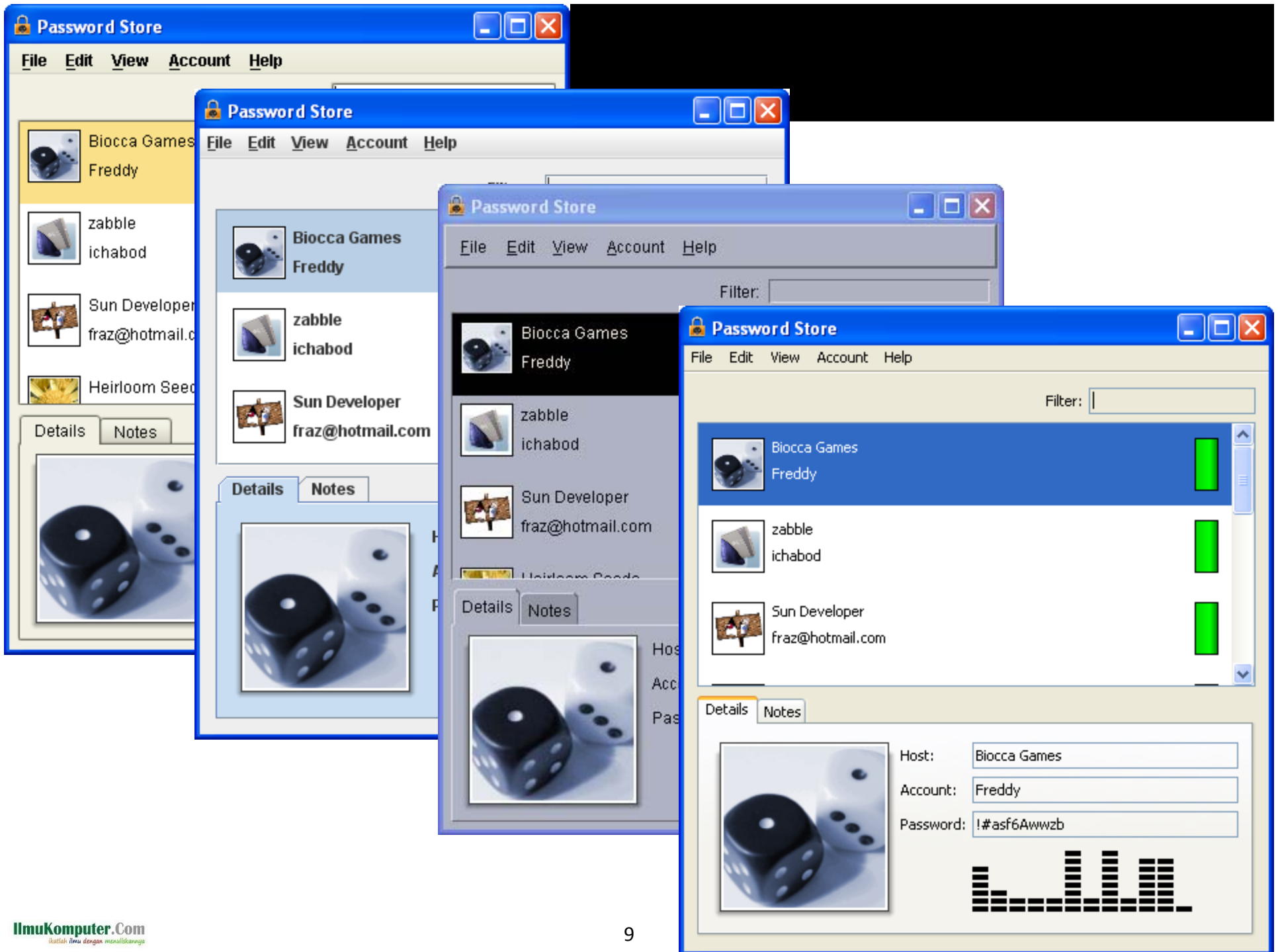
## 2. **Swing or JFC** (Java Foundation Class):

Library dan komponen GUI (javax.swing) terbaru dari Java dan yang **direkomendasikan** Sun untuk pemrograman GUI. Komponen Swing sebagian besar adalah turunan AWT dan lebih lengkap daripada AWT

# Fitur Swing

- **Komponen GUI Lengkap:** button, listbox, combobox, textarea, dsb
- **Pluggable Look-and-Feel:** tampilan GUI dapat diubah sesuai dengan kehendak (tidak perlu mengikuti native sistem operasi)
- **Data Transfer Antar Komponen:** drag and drop, copy and paste
- **Internationalization:** proses desain aplikasi yang memungkinkan aplikasi dijalankan sesuai dengan preferensi tanpa rekompilasi
- **Localization:** proses translasi teks ke bahasa lokal dan menambahkan komponen lokal





**مخزن كلمات المرور** ملف تحرير عرض الحساب تعليمات

تصفية:

Biocca Games : المضيف  
 Freddy : الحساب  
 !#asf6Awwzb : كلمة المرور

**パスワードストア** ファイル(F) 編集(E) ビュー(V) アカウント(A) ヘルプ(H)

Ctrl+Z 復元  
 Ctrl+Y 復元の取り消し  
 Ctrl+X カット  
 Ctrl+C コピー  
 Ctrl+V ペースト

フィルター:

zabble  
 ichabod  
 Sun Developer  
 fraz@hotmail.com

詳細 メモ

ホスト: Biocca Games  
 アカウント: Freddy  
 パスワード: !#asf6Awwzb

## 3.2 Komponen Swing

# Komponen Dasar Swing

1. **Top-Level Container:** kontainer dasar dimana komponen lainnya diletakkan ([JFrame](#), [JDialog](#) dan [Applet](#))
2. **Intermediate Container:** kontainer perantara dimana komponen lainnya diletakkan ([JPanel](#), [JScrollPane](#), [JTabbedPane](#), [JToolBar](#), [JSplitPane](#))
3. **Atomic Component:** komponen yang memiliki fungsi spesifik dan menerima interaksi langsung dari user ([JButton](#), [JLabel](#), [JTextArea](#), dsb)
4. **Layout Manager:** mengatur tata letak dan posisi komponen dalam kontainer ([BorderLayout](#), [BoxLayout](#), [FlowLayout](#), [GridBagLayout](#), [GridLayout](#))
5. **Event Handling:** menangani event yang dilakukan user ([klik mouse](#), [ketik keyboard](#), [perbesar frame](#), dsb)

# Desain Aplikasi GUI dengan Netbeans

Click here to view generated source code

Drag components from this palette onto the form

The screenshot shows the NetBeans IDE interface. The main window displays a GUI design for a pizza application. The design includes a group box for size selection with radio buttons for Small, Medium, and Large. Below this is a text field labeled "Your Price:". To the right, there is a group box for toppings with checkboxes for Pepperoni and Anchovies. The palette on the right lists various Swing components, including JLabel, JToggleButton, JRadioButton, JComboBox, JTextField, JPanel, JScrollbar, JMenuBar, JButton, JCheckBox, ButtonGroup, JList, JTextArea, JTabbedPane, JScrollPane, and JPopupMenu. The properties window for the selected JCheckBox component shows various attributes such as action, background, buttonGroup, componentPopupMenu, font (Dialog 12 Bold), foreground, mnemonic, and selected (checked).

Source Design

Size

Small

Medium

Large

Your Price:

Pepperoni

Anchovies

Palette

Swing

- JLabel
- JToggleButton
- JRadioButton
- JComboBox
- JTextField
- JPanel
- JScrollbar
- JMenuBar
- JButton
- JCheckBox
- ButtonGroup
- JList
- JTextArea
- JTabbedPane
- JScrollPane
- JPopupMenu

jCheckBox1 [JCheckBox] - Properties

Properties Events Code

Properties

action	null
background	[238,238,238]
buttonGroup	<none>
componentPopupMenu	<none>
font	Dialog 12 Bold
foreground	[51,51,51]
mnemonic	
selected	<input checked="" type="checkbox"/>

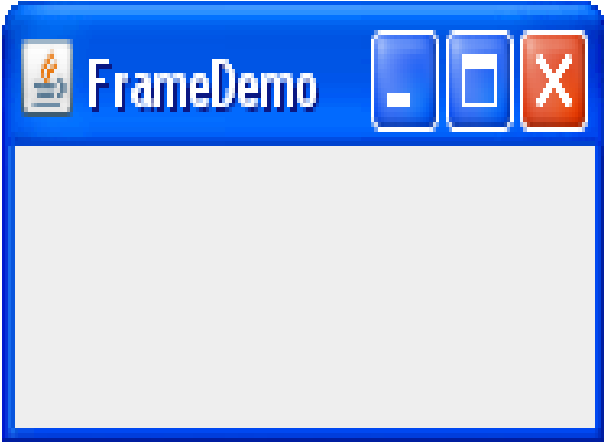
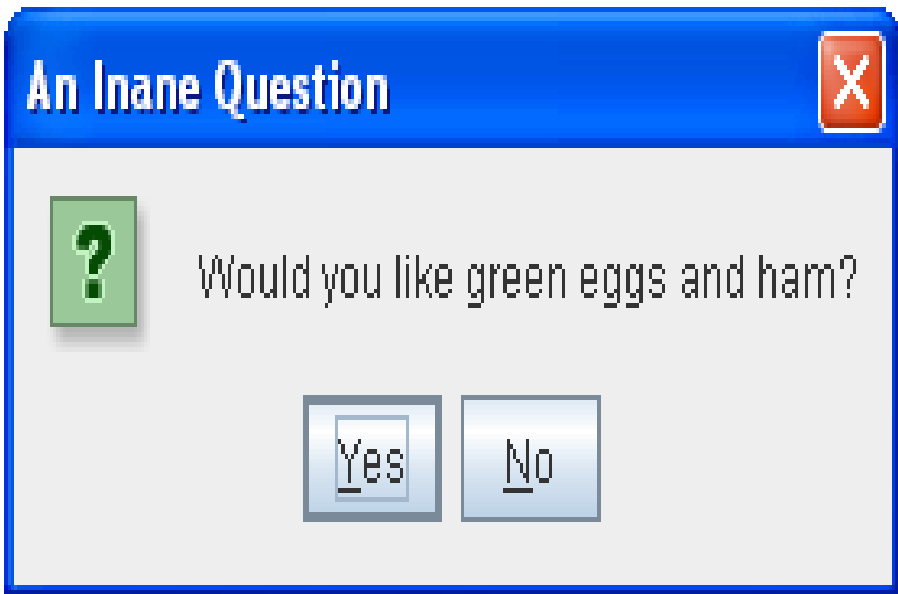
The GroupLayout manages the components on this form

Use this dialog to edit component properties

## 3.2.1 Top-Level Container

JFrame, JDialog, Applet

# Top Level Container



JApplet

JDialog

JFrame

# JFrame

//1. Create the frame

```
JFrame frame = new JFrame("Frame Beraksi");
```

//2. Optional: What happens when the frame closes?

```
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
```

//3. Create components and put them in the frame

//...create emptyLabel...

```
frame.getContentPane().add(emptyLabel, BorderLayout.CENTER);
```

//4. Size the frame

```
frame.pack();
```

//5. Show it

```
frame.setVisible(true);
```



# FrameBeraksi.java

```
public class FrameBeraksi {  
    public static void main(String[] args){  
        JFrame frame = new JFrame("Frame Beraksi");  
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);  
  
        JLabel emptyLabel = new JLabel("Frame Beraksi");  
        frame.getContentPane().add(emptyLabel);  
  
        frame.setSize(400,200);  
        frame.setVisible(true);  
    }  
}
```

# FrameBeraksi2.java

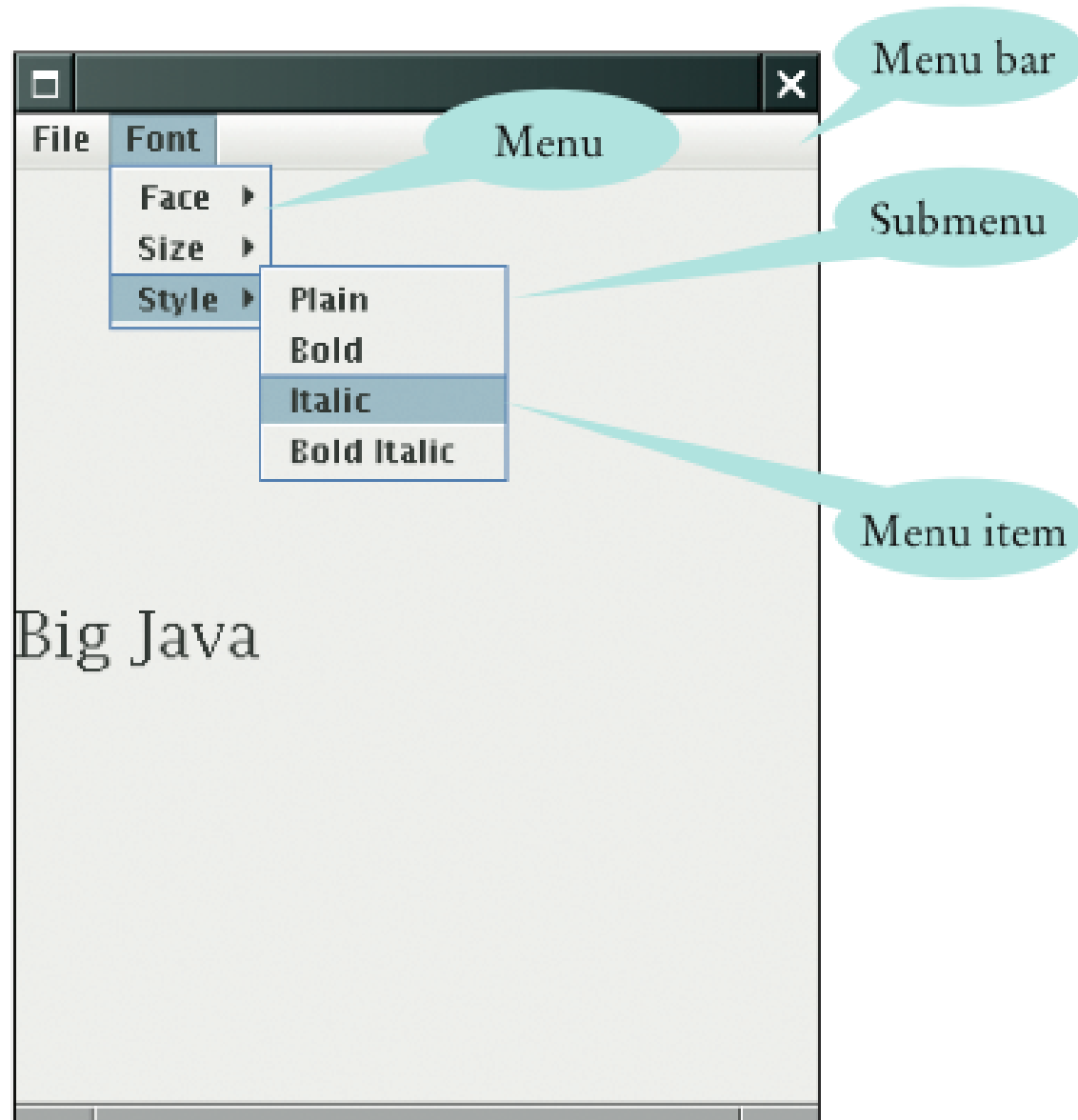
```
import javax.swing.*;

public class FrameBeraksi2 extends JFrame {
    public FrameBeraksi2() {
        super("Frame Beraksi 2");
        setSize(300, 100);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        setVisible(true);
    }

    public static void main(String[] arguments) {
        FrameBeraksi2 frame= new FrameBeraksi2();
    }
}
```

## 3.2.2 Intermediate Container

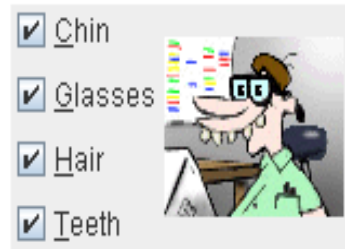
# Menu



## 3.2.3 Atomic Component



[JButton](#)



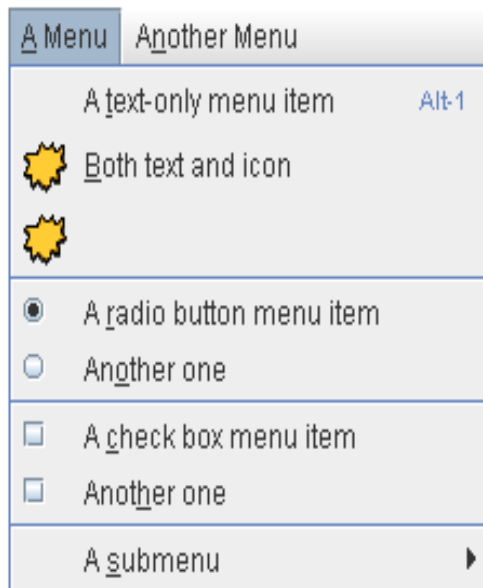
[JCheckBox](#)



[JComboBox](#)



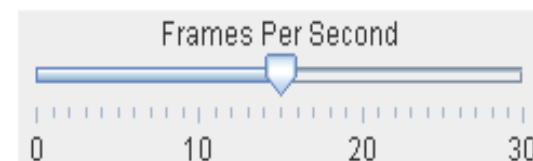
[JList](#)



[JMenu](#)



[JRadioButton](#)



[JSlider](#)



[JSpinner](#)



[JTextField](#)



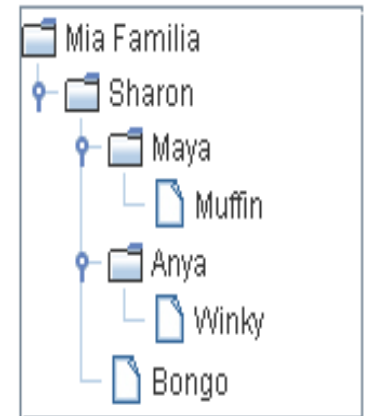
[JPasswordField](#)

Host	User	Password	Last Modified
Biocca Games	Freddy	!#asf6Awwzb	Mar 16, 2006
zabble	ichabod	Tazb!34\$fZ	Mar 6, 2006
Sun Developer	fraz@hotmail.co...	AasW541!fbZ	Feb 22, 2006
Heirloom Seeds	shams@gmail....	bkz[ADF78!	Jul 29, 2005
Pacific Zoo Shop	seal@hotmail.c...	ybAf1 24%z	Feb 22, 2006

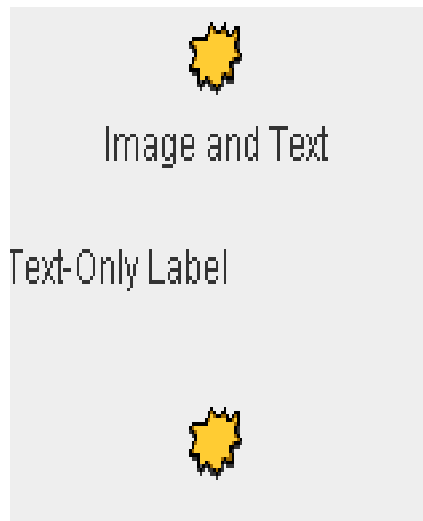
[JTable](#)

*This is an editable JTextArea. A text area is a "plain" text component, which means that although it can display text in any font, all of the text is in the same font.*

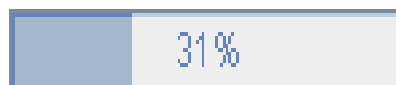
[JTextArea](#)



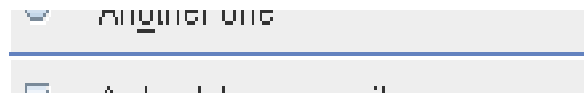
[JTree](#)



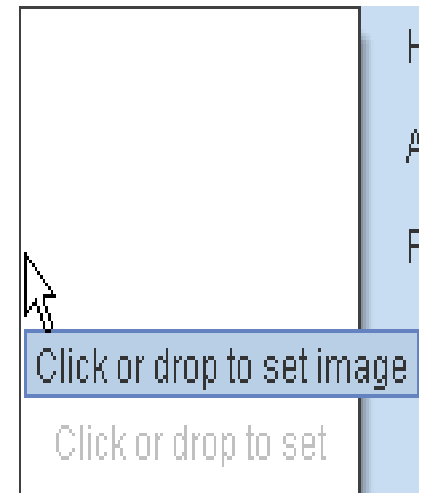
[JLabel](#)



[JProgressBar](#)



[JSeparator](#)



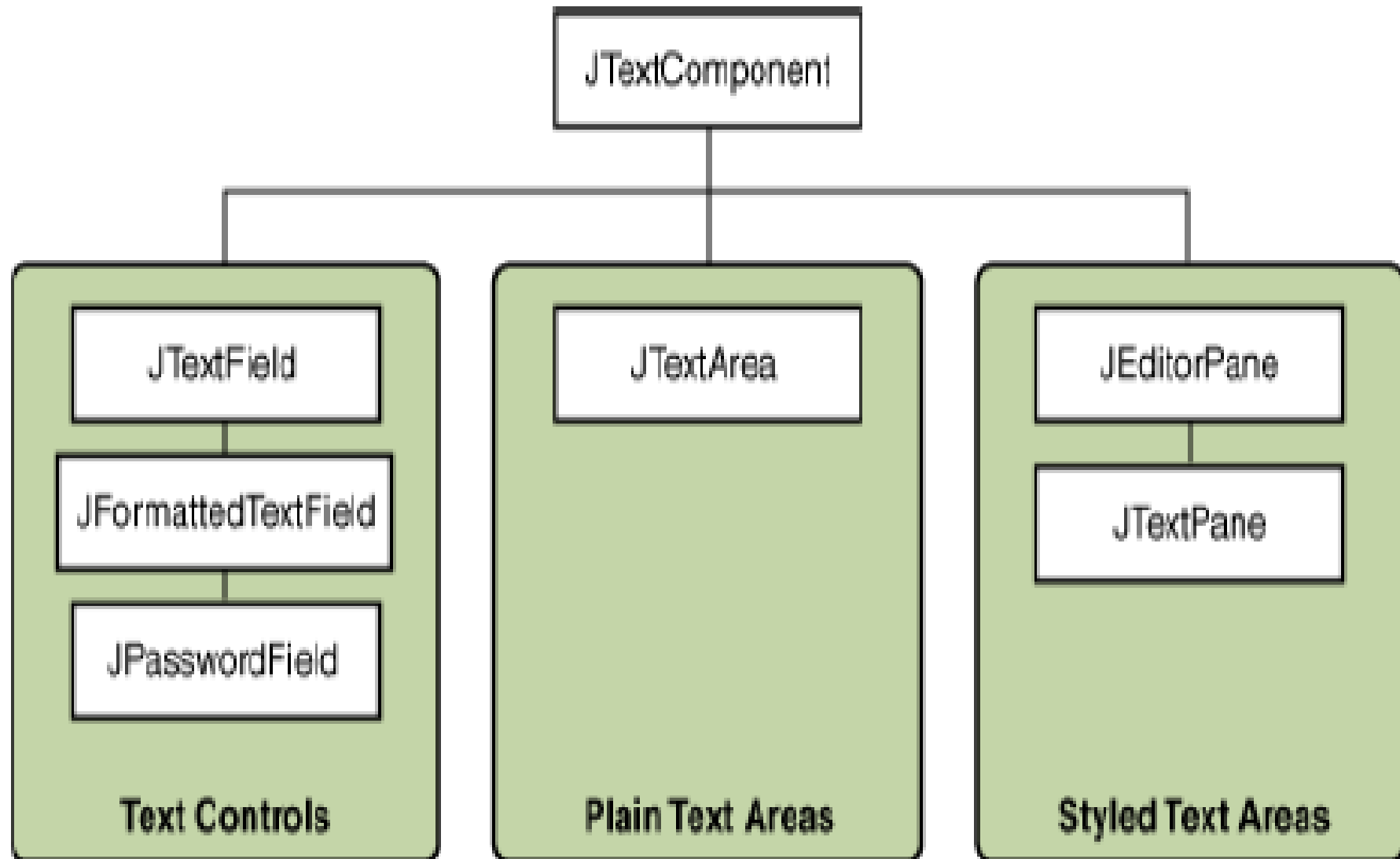
[JToolTip](#)

# Fitur Standard JComponent

- **Tool Tips**: `setToolTipText()`
- **Painting and Borders**: `setBorder()`, `paintComponent()`
- **Pluggable Look and Feel**: `UIManager.setLookAndFeel()`
- **Properties**: `putClientProperty()`, `getClientProperty()`
- **Layout**: `setMinimumSize()`, `setMaximumSize`, `setAlignmentX()`
- **Drag and Drop**: `component .setDragEnabled(true)`
- **Double Buffering**: untuk menghaluskan gambar
- **Key Bindings**: untuk mnemonics dan accelerators



# JTextComponent



# TextSamplerDemo



## Text Fields

JTextField: Hello

JPasswordField: ●●●●

JFormattedTextField: Feb 20, 2007

You typed "hola"

## Plain Text

*This is an editable JTextArea. A text area is a "plain" text component, which means that although it can display text in any font, all of the text is in the same font.*

## Styled Text



This is an uneditable JEditorPane, which was initialized with **HTML** text from a **URL**.

An editor pane uses specialized editor

This is an editable JTextPane, another **styled** text COMPONENT, which supports embedded components...



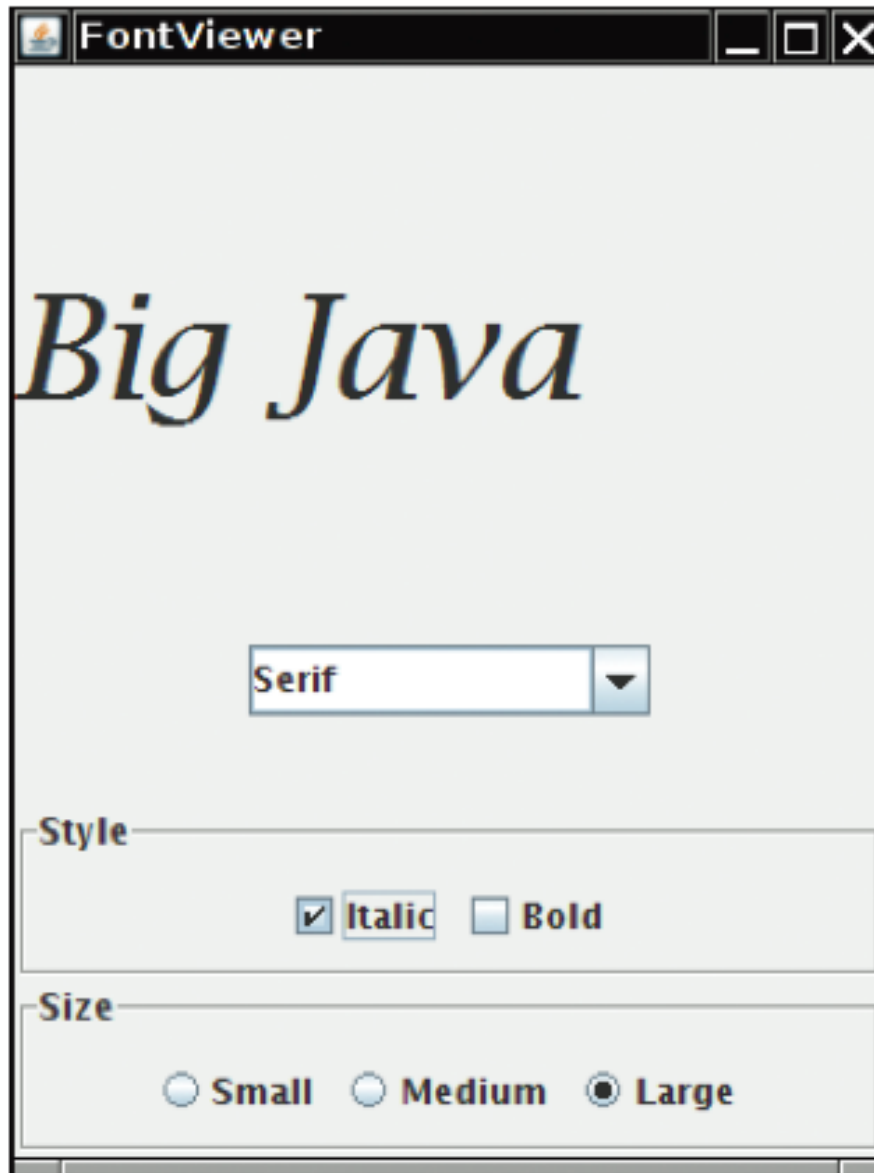
...and embedded icons...



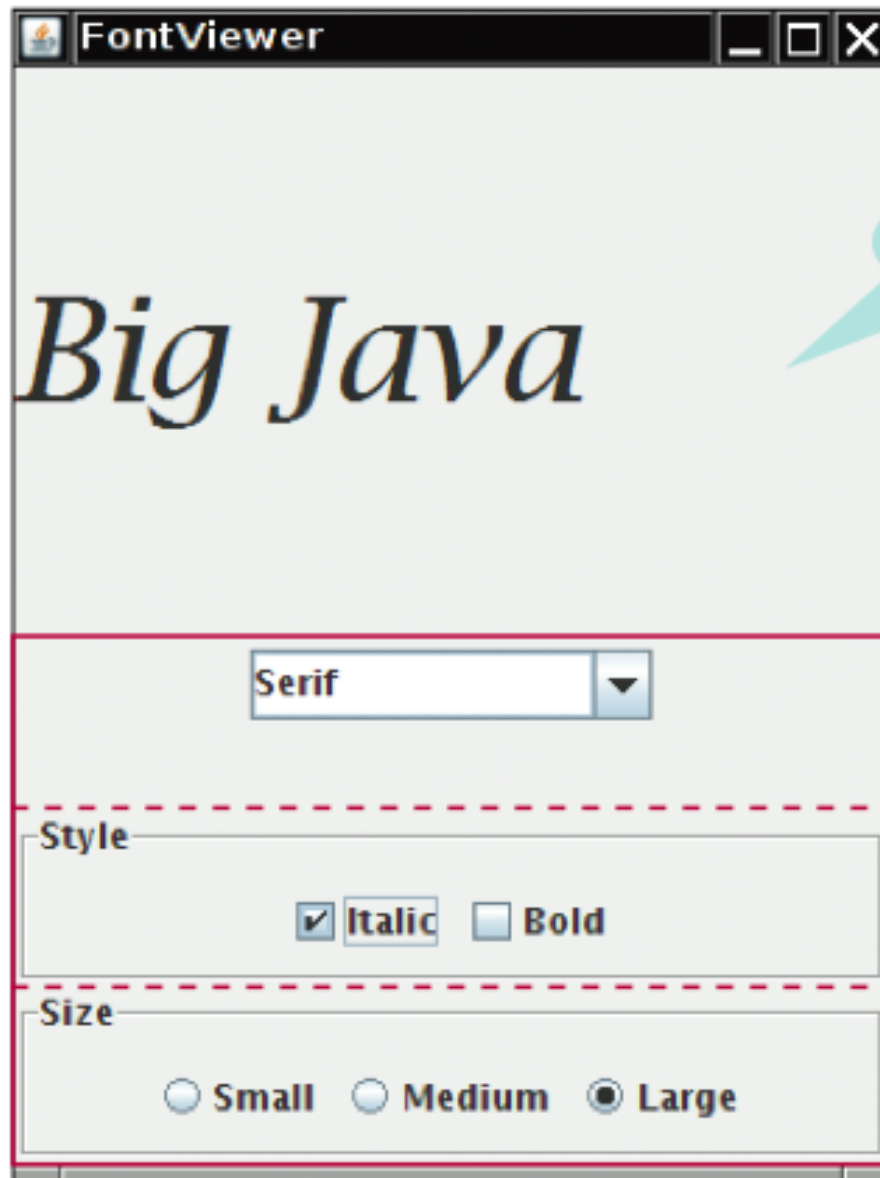
# JButton

```
public class ButtonBeraksi extends JFrame {
    JButton load = new JButton("Load");
    JButton save = new JButton("Save");
    public ButtonBeraksi() {
        super("Button Beraksi");
        setSize(140, 170);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        JPanel pane = new JPanel();
        pane.add(load);
        pane.add(save);
        add(pane);
        setVisible(true);
    }
    public static void main(String[] arguments) {
        ButtonBeraksi button = new ButtonBera
    }
```

# Choice with ComboBox, CheckBox, RadioButton



# Choice with ComboBox, CheckBox, RadioButton



JLabel  
in CENTER position

JPanel  
with GridLayout  
in SOUTH position

## 3.2.4 Layout Manager

# Jenis Layout Manager

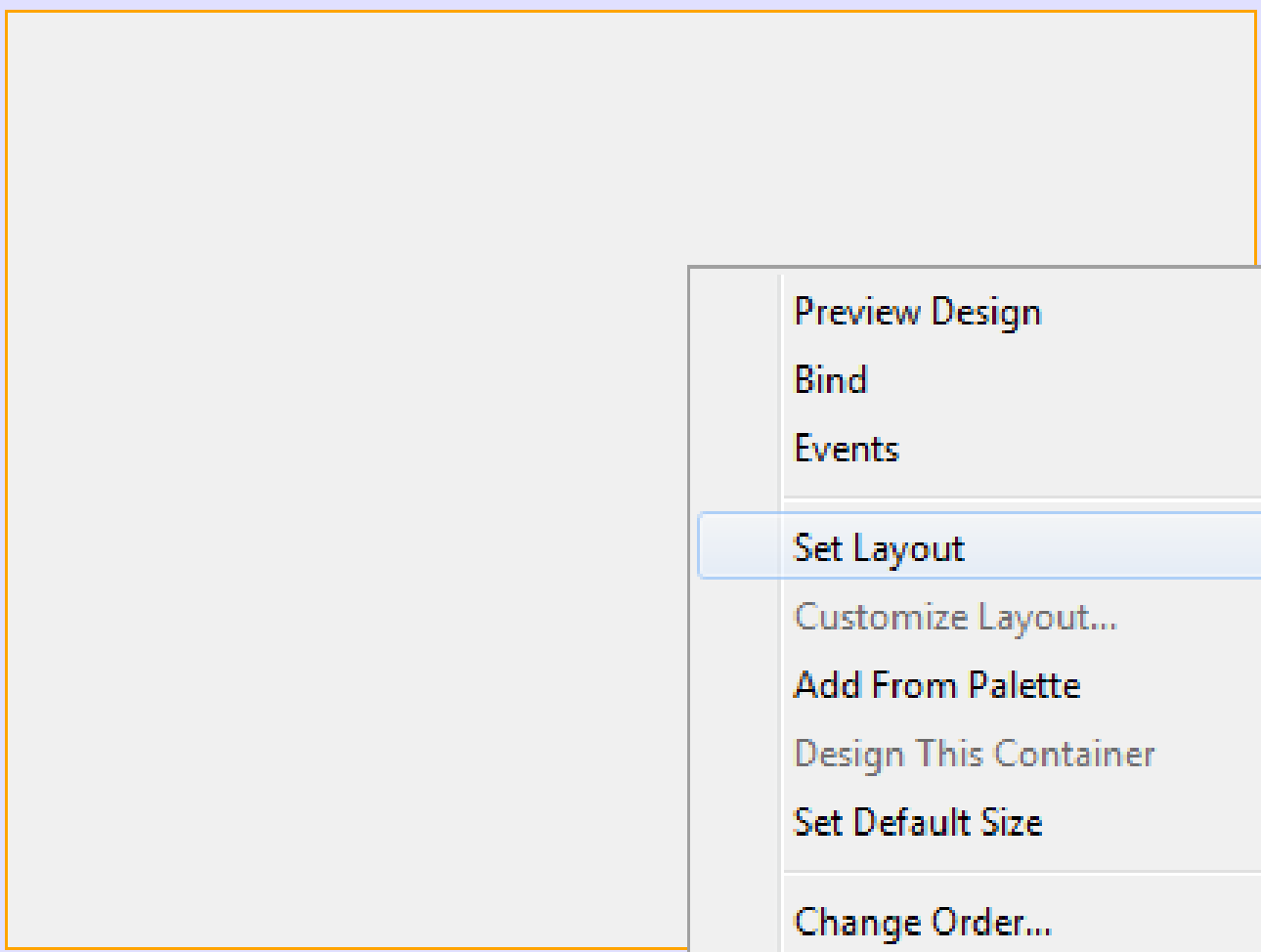
1. Border Layout
2. Flow Layout
3. Grid Layout
4. Grid Bag Layout
5. Box Layout
6. Card Layout

# BorderLayoutBeraksi.java

```
public class BorderLayoutBeraksi extends JFrame {
    JButton nButton = new JButton("North");
    JButton sButton = new JButton("South");
    JButton eButton = new JButton("East");
    JButton wButton = new JButton("West");
    JButton cButton = new JButton("Center");
    JButton( Center );
public BorderLayoutBeraksi() {
    super("Border Layout Beraksi"); setSize(240, 280);
    setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    setLayout(new BorderLayout());
        add(nButton, BorderLayout.NORTH);
        add(sButton, BorderLayout.SOUTH);
        add(eButton, BorderLayout.EAST);
        add(wButton, BorderLayout.WEST);
        add(cButton, BorderLayout.CENTER); }
```

```
public static void main(String[] args) {
    BorderLayoutBeraksi frame = new
        BorderLayoutBeraksi();
    Frame.setVisible(true);
    }
}
```



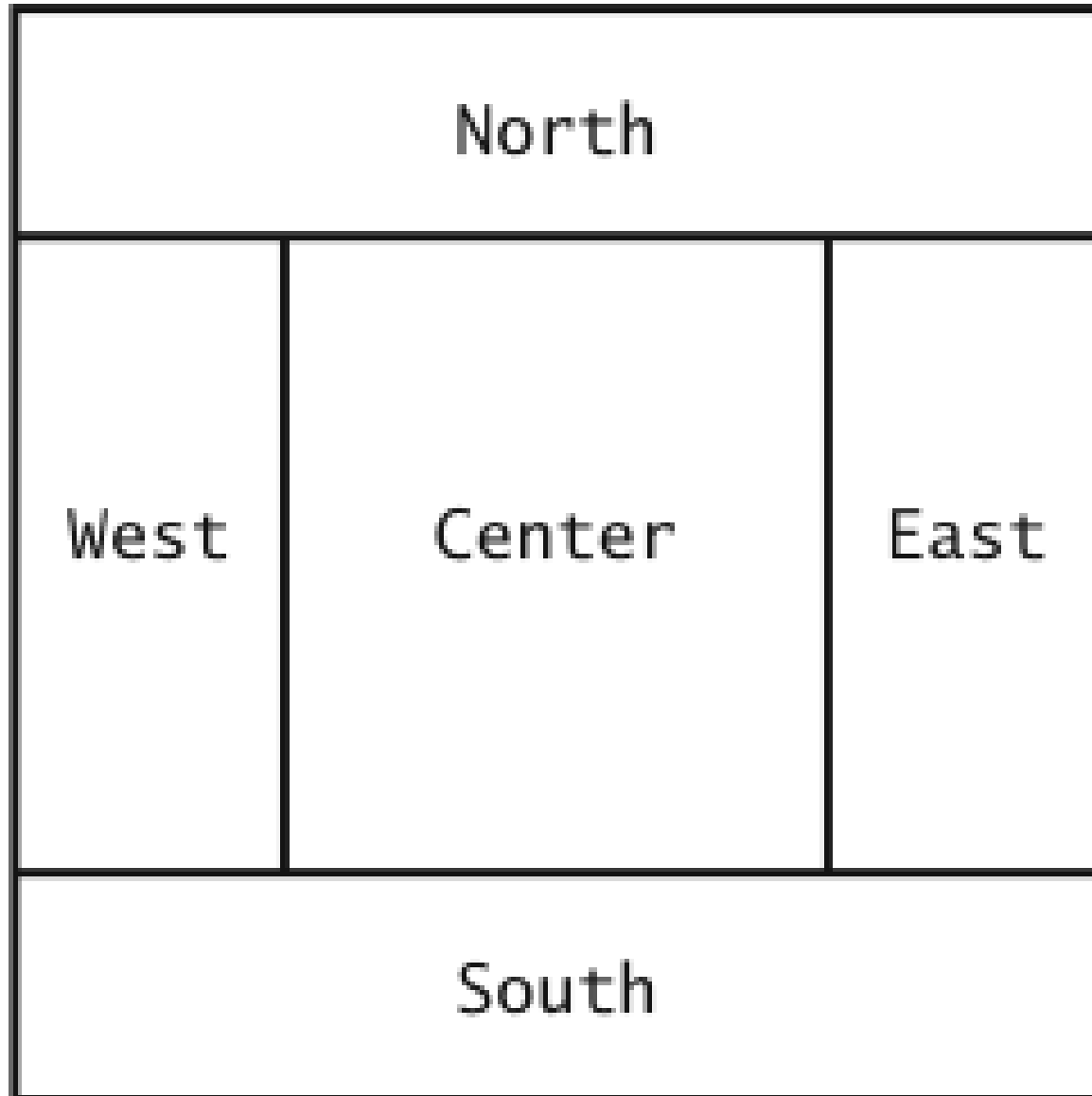


- Preview Design ▶
- Bind ▶
- Events ▶
- Set Layout** ▶
- Customize Layout...
- Add From Palette ▶
- Design This Container
- Set Default Size
- Change Order...
- Copy
- Paste Ctrl+V
- Customize Code
- Properties

- Free Design**
- Absolute Layout
- Border Layout**
- Box Layout
- Card Layout
- Flow Layout
- Grid Bag Layout
- Grid Layout
- Null Layout



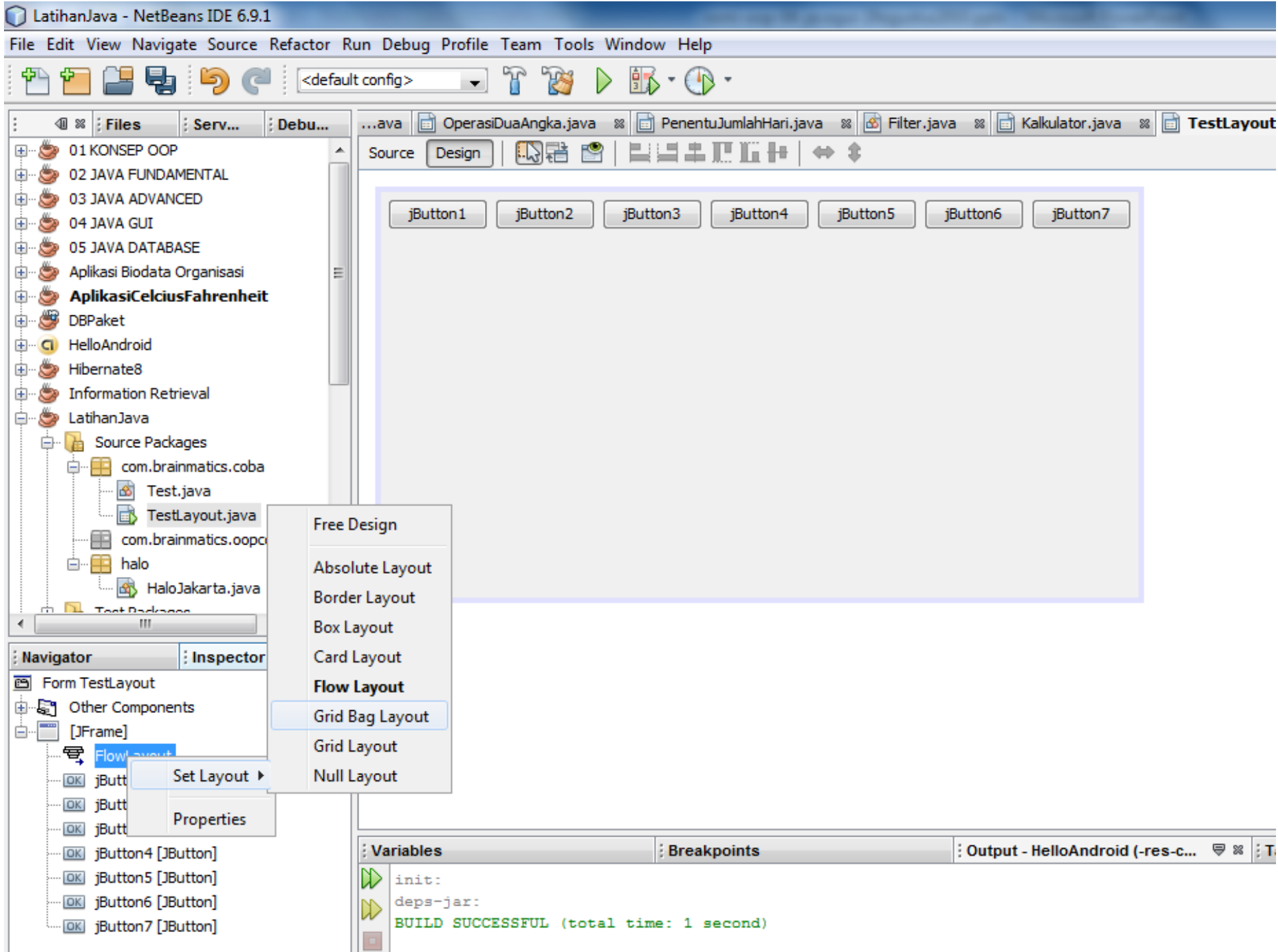
# BorderLayout



# FlowLayoutBeraksi.java

```
public class FlowLayoutBeraksi extends JFrame {  
    JButton a = new JButton("Alibi");  
    JButton b = new JButton("Burglar");  
    JButton c = new JButton("Corpse");  
    JButton d = new JButton("Deadbeat");  
    JButton e = new JButton("Evidence");  
    public static void main(String[] args) {  
        FlowLayoutBeraksi frame = new  
        FlowLayoutBeraksi();  
        JButton f = new JButton("Fugitive");  
        public FlowLayoutBeraksi() {  
            super("Flow Layout Beraksi"); setSize(360, 120);  
            setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);  
            FlowLayout lm = new FlowLayout(FlowLayout.LEFT);  
            setLayout(lm);  
            add(a); add(b); add(c); add(d);  
            add(e); add(f);  
            setVisible(true);  
        }  
    }  
}
```

```
public static void main(String[] args) {  
    FlowLayoutBeraksi frame = new  
    FlowLayoutBeraksi();  
    }  
}
```



LatihanJava - NetBeans IDE 6.9.1

File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help

<default config>

Files Serv... Debu... ...ava OperasiDuaAngka.java PenentuJumlahHari.java Filter.java Kalkulator.java TestLa

Source Design

01 KONSEP OOP  
02 JAVA FUNDAMENTAL  
03 JAVA ADVANCED  
04 JAVA GUI  
05 JAVA DATABASE  
Aplikasi Biodata Organisasi  
**AplikasiCelciusFahrenheit**  
DBPaket  
HelloAndroid  
Hibernate8  
Information Retrieval  
LatihanJava  
Source Packages  
com.brainmatics.coba  
Test.java  
TestLayout.java  
com.brainmatics.oopconcept.ke  
halo  
HaloJakarta.java

Form TestLayout

Other Components

[JFrame]

- FlowLayout
  - jButton1 [JButton]
  - jButton2 [JButton]
  - jButton3 [JButton]
  - jButton4 [JButton]
  - jButton5 [JButton]
  - jButton6 [JButton]

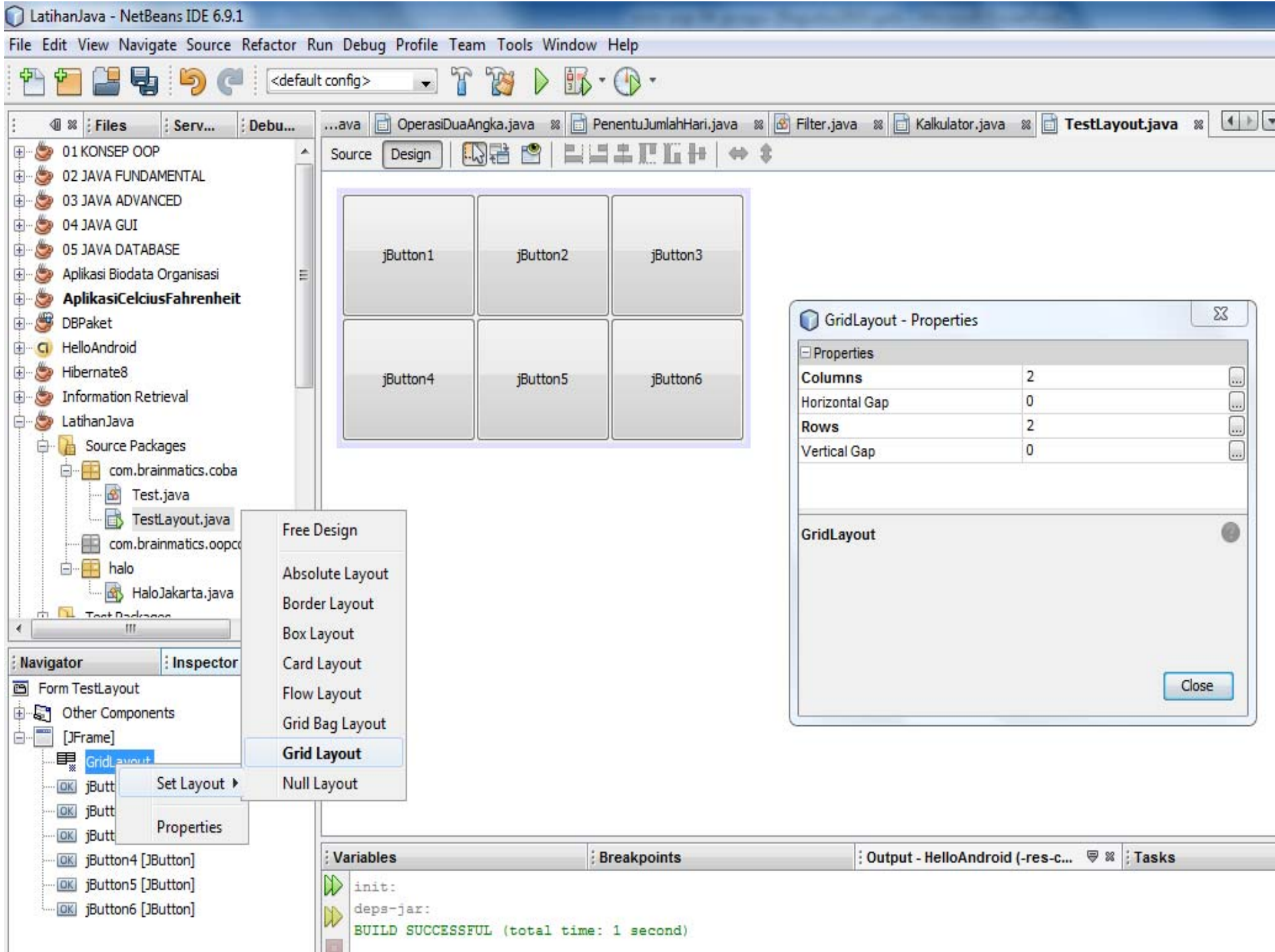
Variables Breakpoints Output - HelloAndroid (-res-c-...)

init:  
deps-jar:

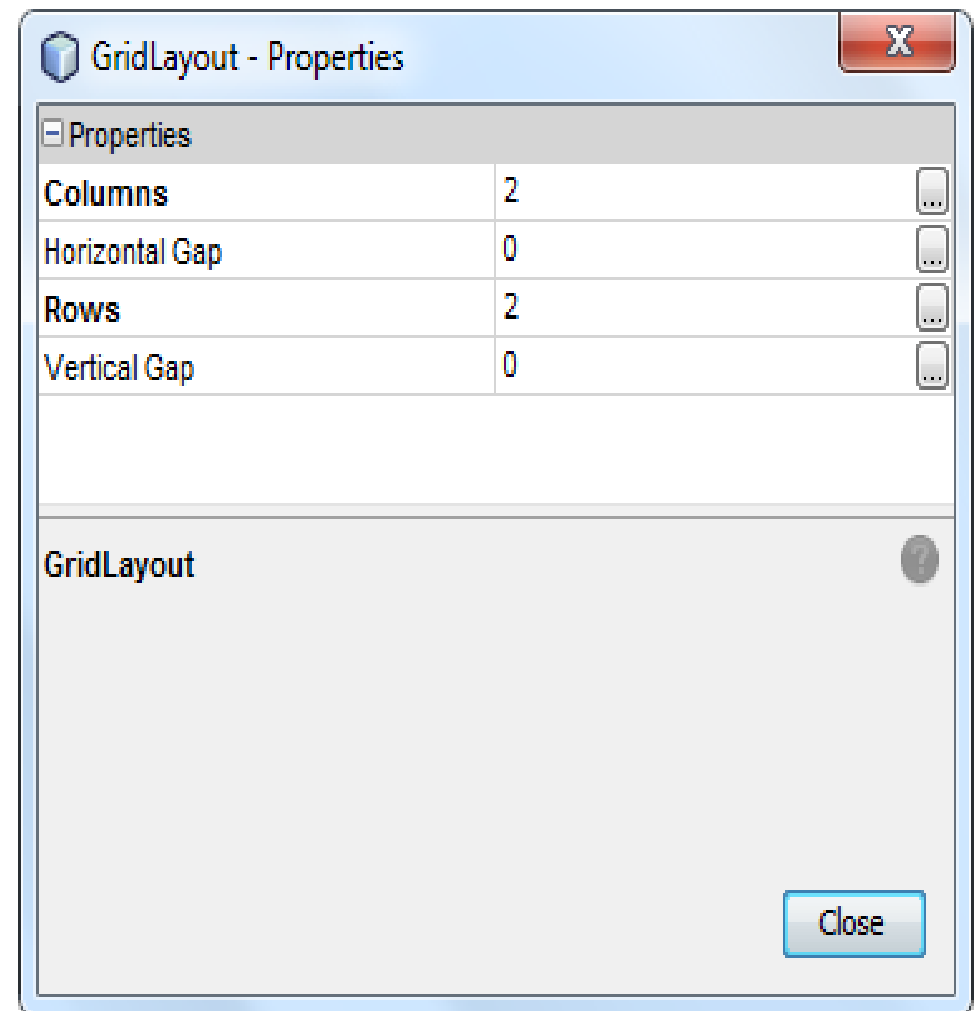
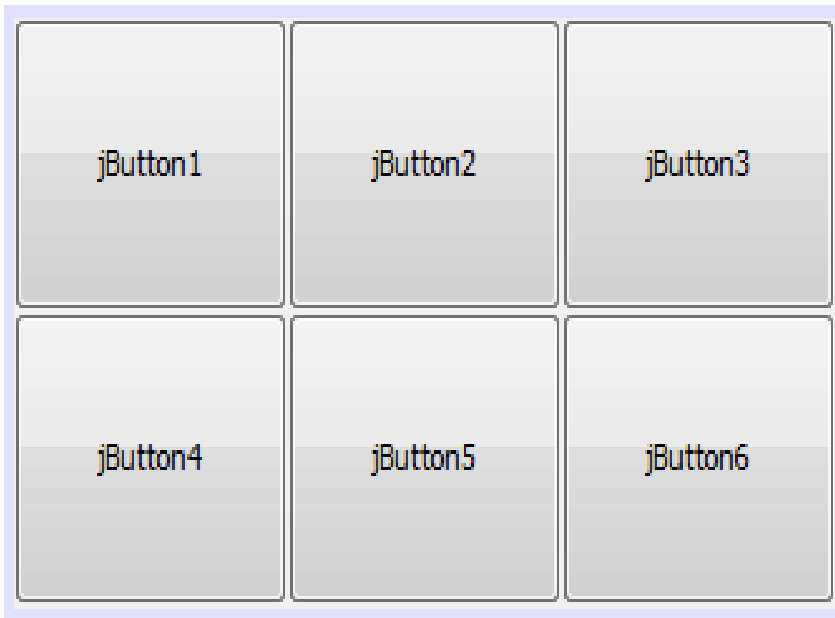
# GridLayoutBeraksi.java

```
public class GridLayoutBeraksi extends JFrame {  
    JButton marcia = new JButton("Marcia");  
    JButton carol = new JButton("Carol");  
    JButton greg = new JButton("Greg");  
    JButton jan = new JButton("Jan");  
    JButton alice = new JButton("Alice");  
    JButton( Alice );  
    JButton peter = new JButton("Peter");  
    JButton cindy = new JButton("Cindy");  
    JButton mike = new JButton("Mike");  
    JButton bobby = new JButton("Bobby");  
  
    public GridLayoutBeraksi() {  
        super(" Grid Layout Beraksi ");  
        setSize(260, 260);  
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);  
        JPanel pane = new JPanel();
```

```
        GridLayout family = new  
        GridLayout(3, 3, 10, 10);  
  
        pane.setLayout(family);  
        pane.add(marcia); pane.add(carol);  
        pane.add(greg); pane.add(jan);  
        pane.add(alice); pane.add(peter);  
        pane.add(cindy); pane.add(mike);  
        pane.add(bobby);  
  
        add(pane);  
        setVisible(true);  
    }  
  
    public static void main(String[] args) {  
        GridLayoutBeraksi frame = new  
        GridLayoutBeraksi();  
    }  
}
```



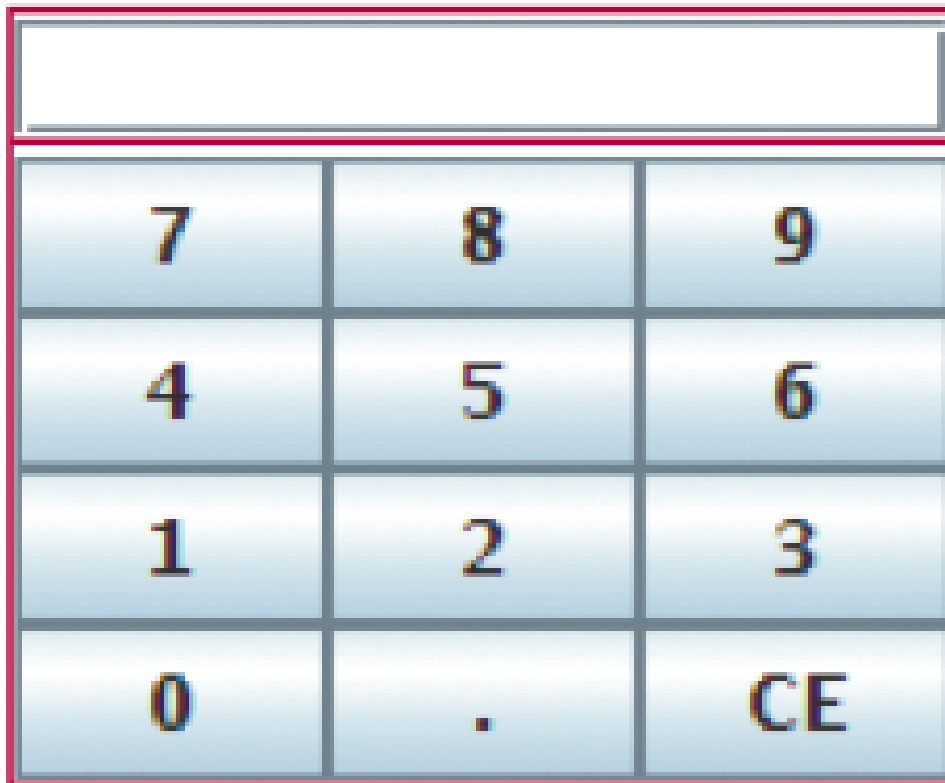




# GridLayout

7	8	9
4	5	6
1	2	3
0	.	CE

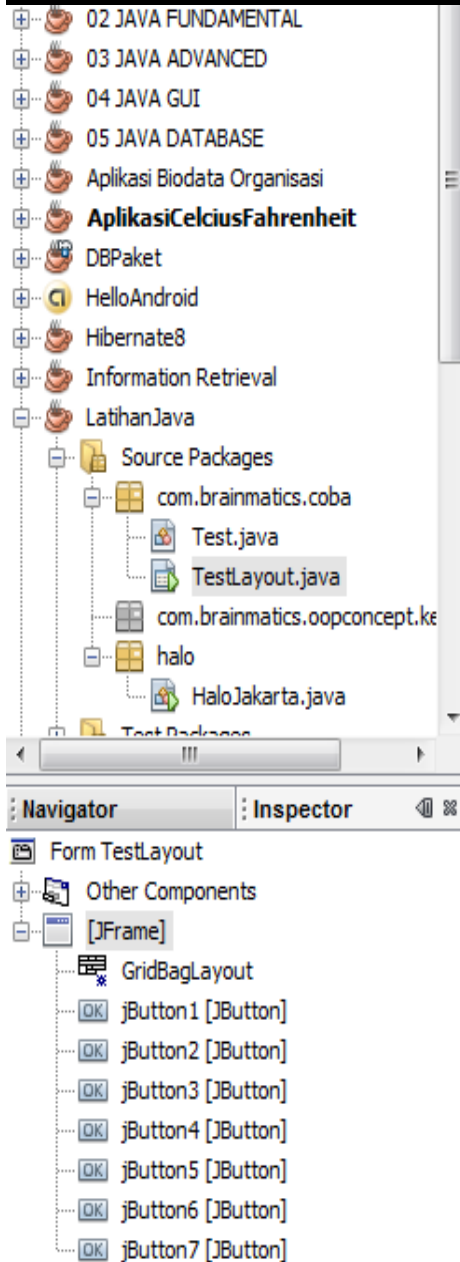
# BorderLayout + GridLayout



JTextField  
in NORTH position

JPanel  
with GridLayout  
in CENTER position

# GridBagLayout

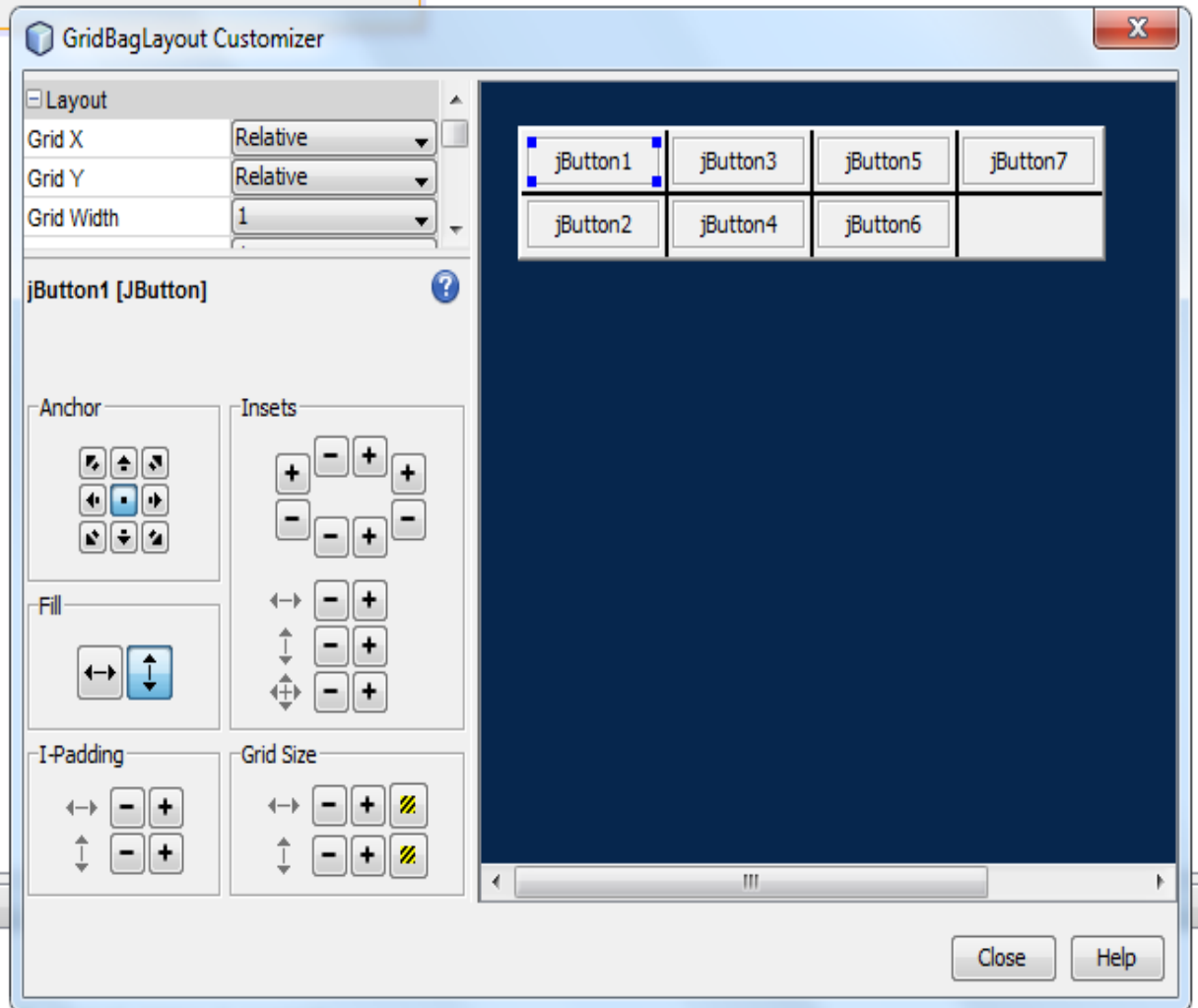
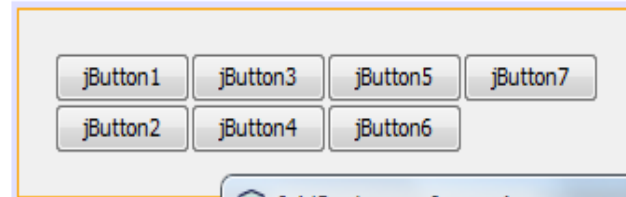


The Navigator view shows a project structure with source packages and files. The Inspector view shows the component hierarchy for the form TestLayout, including a JFrame containing a GridBagLayout and seven JButton components.

- 02 JAVA FUNDAMENTAL
- 03 JAVA ADVANCED
- 04 JAVA GUI
- 05 JAVA DATABASE
- Aplikasi Biodata Organisasi
- AplikasiCelsiusFahrenheit**
- DBPaket
- HelloAndroid
- Hibernate8
- Information Retrieval
- LatihanJava
- Source Packages
  - com.brainmatics.coba
    - Test.java
    - TestLayout.java
  - com.brainmatics.oopconcept.ke
  - halo
    - HaloJakarta.java
- Test Packages

Inspector: Form TestLayout

- Other Components
- [JFrame]
  - GridBagLayout
    - jButton1 [JButton]
    - jButton2 [JButton]
    - jButton3 [JButton]
    - jButton4 [JButton]
    - jButton5 [JButton]
    - jButton6 [JButton]
    - jButton7 [JButton]



The GridBagLayout Customizer dialog box is used to configure the layout of the JButton components. It includes settings for Grid X, Grid Y, and Grid Width, as well as options for Anchor, Insets, Fill, I-Padding, and Grid Size. A preview window shows the resulting layout of the JButton components.

Grid X: Relative  
Grid Y: Relative  
Grid Width: 1

jButton1 [JButton]

Anchor: [Grid of directional arrows]

Insets: [Grid of +/- arrows]

Fill: [Grid of +/- arrows]

I-Padding: [Grid of +/- arrows]

Grid Size: [Grid of +/- arrows and diagonal slash]

Close Help

```
Variables  
init:  
deps-jar:  
BUILD SUCCESSFUL (total time: 1 second)
```

# BoxLayoutBeraksi.java

```
public class BoxLayoutBeraksi extends JFrame {
    public BoxLayoutBeraksi() {
        super("BoxLayoutBeraksi"); setSize(430, 150);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        JPanel commandPane = new JPanel();
        BoxLayout horizontal = new
        BoxLayout(commandPane,BoxLayout.X AXIS);
        commandPane.setLayout(horizontal);
        JButton subscribe = new JButton("Subscribe");
        JButton unsubscribe = new
        JButton("Unsubscribe");
        JButton refresh = new JButton("Refresh");
        commandPane.add(subscribe);
        commandPane.add(unsubscribe);
        commandPane.add(refresh);
        add(commandPane);
    }
}
```

```
public static void main(String[] args) {
    BoxLayoutBeraksi st = new
    BoxLayoutBeraksi();
}
}
```

# CardLayoutBeraksi.java

```
class CardLayoutBeraksi{
    public static void main(String[] args){
        JFrame frame = new JFrame("Card Layout Beraksi");
        JPanel panel1 = new JPanel(); JPanel panel2 = new JPanel();
        JButton button = new JButton("Button dalam panel ke 1");
        JTextArea text = new JTextArea("Text dalam panel ke 2");
        panel1.add(button); panel2.add(text);
        JTabbedPane tab = new JTabbedPane();
        tab.add(panel1, "Tab 1"); tab.add(panel2, "Tab 2");
        frame.getContentPane().add(tab, BorderLayout.NORTH);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.pack(); frame.setVisible(true);
    }
}
```

# 3.3 Penanganan Kejadian (*Event Handling*)

# Event

1. Event adalah kejadian atau **peristiwa yang dilakukan oleh user terhadap user interface** menggunakan peralatan **mouse** dan **keyboard**
2. Setiap objek dapat **dinotifikasi** jika suatu event terjadi sehingga objek tersebut dapat **memutuskan apa yang harus dilakukan** untuk menanggapi (menangani) event tersebut (event handling)
3. Agar suatu objek dapat dinotifikasi tentang suatu event, **objek harus mendaftarkan diri** sebagai **event listener** ke sumber yg menghasilkan event, dan mengimplementasikan **interface listener** yg sesuai



# Proses Penanganan Event (Kejadian)

1. **Komponen harus didaftarkan sebagai pendengar (listener)** dg menggunakan method `addXXXListener()`

```
JButton tombolSelesai = new JButton("Selesai");  
tombolSelesai.addActionListener(this);
```

2. **Meng-implementasi interface listener** atau **meng-extends class adapter** (bisa juga dengan membuat inner class)

1. `class HelloGUI implements MouseListener{}`

2. `class HelloGUI extends MouseAdapter{}` atau

```
class HelloGUI extends JFrame{ class handler extends MouseAdapter{}}
```

3. **Menuliskan code penanganan event** pada method handler

```
MouseAdapter{
```

```
    public void mouseClicked(MouseEvent e){
```

```
        //code penanganan kejadian
```

```
    }
```

```
}
```

# Listener Yang Sering Digunakan

Kategori	Interface	Method
Action	ActionListener	actionPerformed(ActionEvent)
Item	ItemListener	itemStateChanged(ItemEvent)
Mouse	MouseListener	mouseClicked(MouseEvent) mouseEntered(MouseEvent) mouseExited(MouseEvent) mousePressed(MouseEvent) mouseReleased(MouseEvent)
Mouse Motion	MouseMotionListener	mouseDragged(MouseEvent) mouseMoved(MouseEvent)
Key	KeyListener	keyPressed(KeyEvent) keyReleased(KeyEvent) keyTyped(KeyEvent)
Focus	FocusListener	focusGained(FocusEvent) focusLost(FocusEvent)
Window	WindowListener	windowClosing(WindowEvent) windowOpened(WindowEvent) windowActivated(WindowEvent) windowDeactivated(WindowEvent)

# Daftar Listener Lengkap

# Listener (Semua Komponen Swing)

Listener	Deskripsi
ComponentListener	Mendengarkan perubahan size, position, atau visibility dari komponen
FocusListener	Mendengarkan ketika komponen mendapatkan atau kehilangan fokus keyboard
KeyListener	Mendengarkan penekanan tombol keyboard (hanya untuk komponen yang mendapat fokus keyboard)
MouseListener	Mendengarkan penekanan mouse, klik mouse, pelepasan mouse, dan pergerakan mouse
MouseMotionListener	Mendengarkan perubahan posisi cursor mouse pada komponen
MouseWheelListener	Mendengarkan pergerakan roda mouse pada komponen
HierarchyListener	Mendengarkan perubahan hirarki komponen karena kejadian yang berubah
HierarchyBoundListener	Mendengarkan perubahan hirarki komponen karena kejadian pergerakan dan perubahan ukuran

# Listener (Komponen Tertentu) -1-

Component	Action	Caret	Change	Document	Item	ListSelection	Window
JButton	●		●		●		
JCheckBox	●		●		●		
JColorChooser			●				
JComboBox	●				●		
JDialog							●
JEditorPane		●		●			
JFileChooser	●						
JFormattedTextField	●	●		●			
JFrame							●
JList						●	
JMenuItem	●		●		●		

# Listener (Komponen Tertentu) -2-

Component	Action	Caret	Change	Document	Item	ListSelection	Window
JPasswordField	●	●		●			
JProgressBar			●				
JRadioButton	●		●		●		
JSlider			●				
JSpinner			●				
JTabbedPane			●				
JTable						●	
JTextArea		●		●			
TextField	●	●		●			
JTextPane		●		●			
JToggleButton	●		●		●		
ViewPort (JScrollPane)			●				

# Listener API Table -1-

Listener or Adapter	Listener Method	Deskripsi
ActionListener	actionPerformed(ActionEvent)	
AncestorListener	ancestorAdded(AncestorEvent) ancestorMoved(AncestorEvent) ancestorRemoved(AncestorEvent)	
CaretListener	caretUpdate(CaretEvent)	
CellEditorListener	editingStopped(ChangeEvent) editingCanceled(ChangeEvent)	
ChangeListener	stateChanged(ChangeEvent)	
ComponentListener ComponentAdapter	componentHidden(ComponentEvent) componentMoved(ComponentEvent) componentResized(ComponentEvent) componentShown(ComponentEvent)	
ContainerListener ContainerAdapter	componentAdded(ContainerEvent) componentRemoved(ContainerEvent)	
DocumentListener	changedUpdate(DocumentEvent) insertUpdate(DocumentEvent) removeUpdate(DocumentEvent)	
ExceptionListener	exceptionThrown(Exception)	



# Listener API Table -2-

Listener or Adapter	Listener Method	Deskripsi
FocusListener FocusAdapter	focusGained(FocusEvent) focusLost(FocusEvent)	
HierarchyBoundsListener HierarchyBoundsAdapter	ancestorMoved(HierarchyEvent) ancestorResized(HierarchyEvent)	
HierarchyListener	hierarchyChanged(HierarchyEvent)	
HyperlinkListener	hyperlinkUpdate(HyperlinkEvent)	
InputMethodListener	caretPositionChanged(InputMethodEvent) inputMethodTextChanged(InputMethodEvent)	
InternalFrameListener InternalFrameAdapter	internalFrameActivated(InternalFrameEvent) internalFrameClosed(InternalFrameEvent) internalFrameClosing(InternalFrameEvent) internalFrameDeactivated(InternalFrameEvent) internalFrameDeiconified(InternalFrameEvent) internalFrameIconified(InternalFrameEvent) internalFrameOpened(InternalFrameEvent)	
ItemListener	itemStateChanged(ItemEvent)	
KeyListener KeyAdapter	keyPressed(KeyEvent) keyReleased(KeyEvent) keyTyped(KeyEvent)	

# Listener API Table -3-

Listener or Adapter	Listener Method	Deskripsi
ListDataListener	contentsChanged(ListDataEvent) intervalAdded(ListDataEvent) intervalRemoved(ListDataEvent)	
ListSelectionListener	valueChanged(ListSelectionEvent)	
MenuDragMouseListener	menuDragMouseDragged(MenuDragMouseEvent) menuDragMouseEntered(MenuDragMouseEvent) menuDragMouseExited(MenuDragMouseEvent) menuDragMouseReleased(MenuDragMouseEvent)	
MenuKeyListener	menuKeyPressed(MenuKeyEvent) menuKeyReleased(MenuKeyEvent) menuKeyTyped(MenuKeyEvent)	
MenuListener	menuCanceled(MenuEvent) menuDeselected(MenuEvent) menuSelected(MenuEvent)	

# Listener API Table -4-

Listener or Adapter	Listener Method	Deskripsi
MouseListener	mouseClicked(MouseEvent) mouseEntered(MouseEvent) mouseExited(MouseEvent) mousePressed(MouseEvent) mouseReleased(MouseEvent)	
MouseMotionListener MouseMotionAdapter, MouseInputAdapter	mouseDragged(MouseEvent) mouseMoved(MouseEvent)	
MouseWheelListener MouseAdapter	popupMenuCanceled(PopupMenuEvent) popupMenuWillBecomeInvisible(PopupMenuEvent) popupMenuWillBecomeVisible(PopupMenuEvent)	
PropertyChangeListener	propertyChange(PropertyChangeEvent)	
TableColumnModelListener	columnAdded(TableColumnModelEvent) columnMoved(TableColumnModelEvent) columnRemoved(TableColumnModelEvent) columnMarginChanged(ChangeEvent) columnSelectionChanged(ListSelectionEvent)	

# Membangun Aplikasi GUI dengan Netbeans

NetBeans IDE 6.5

File Edit PDF View Navigate Source Refactor Run Debug Profile Versioning Tools Window Help

<default config> Search (Ctrl+I)

Start Page x KalkulatorGUI.java x TambahTambahanGUI.java x NilaiMahasiswaGUI.java x NewJFrame.java...

**Files**

- AplikasiBiodataMahasiswa
- AplikasiDataMahasiswa
- AplikasiKalkulator
- AplikasiPertambahan
- AppJumlahHari
- Calculator
- CelciusToFahrenheit
- Exercises
- Kalkulator
- KonversiSuhu
- Latihan
- Latihan28Pebruari2009
- SistemBiodataMahasiswa**

**Services**

**Navigator**

<No View Available>

**NetBeans IDE 6.5**

**Welcome to NetBeans IDE**

**My NetBeans**

**Get Started**

- Quick Start Tutorial**
- What's New**
- Take a Tour**

**Try a Sample Project**

- Java
- Java Web (Visual JSF)
- Java EE
- Java ME (Ricoch SDK/J)
- PHP
- Groovy
- UML
- NetBeans Modules
- Java Web
- Web Services
- Java ME (MIDP)
- Java ME (BD-J)
- Ruby
- C/C++
- SOA

**Extend Your IDE**

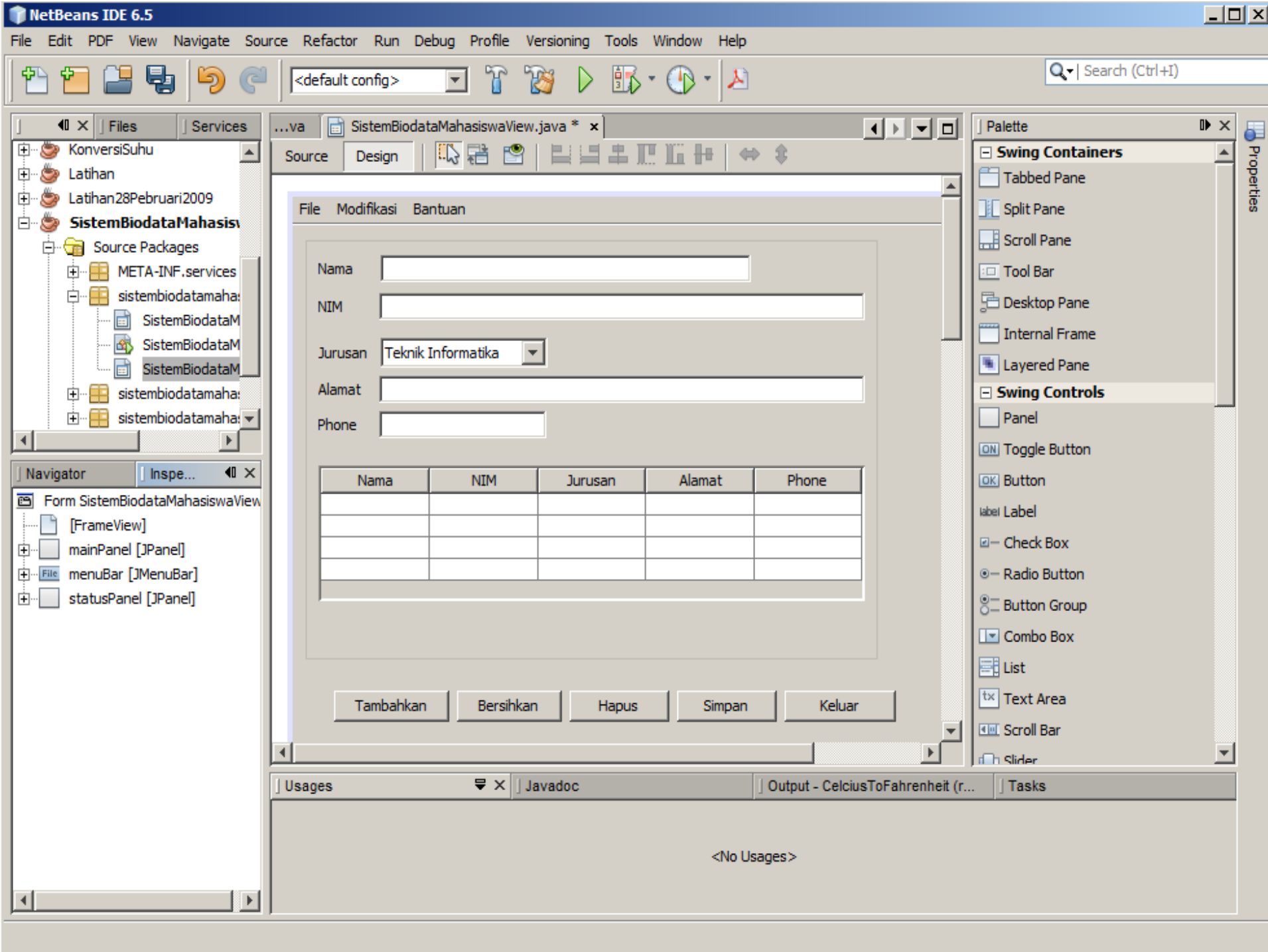
Add any IDE plugins that you have not yet installed and look for other features provided by the NetBeans team and other developers.

**Learn More About**

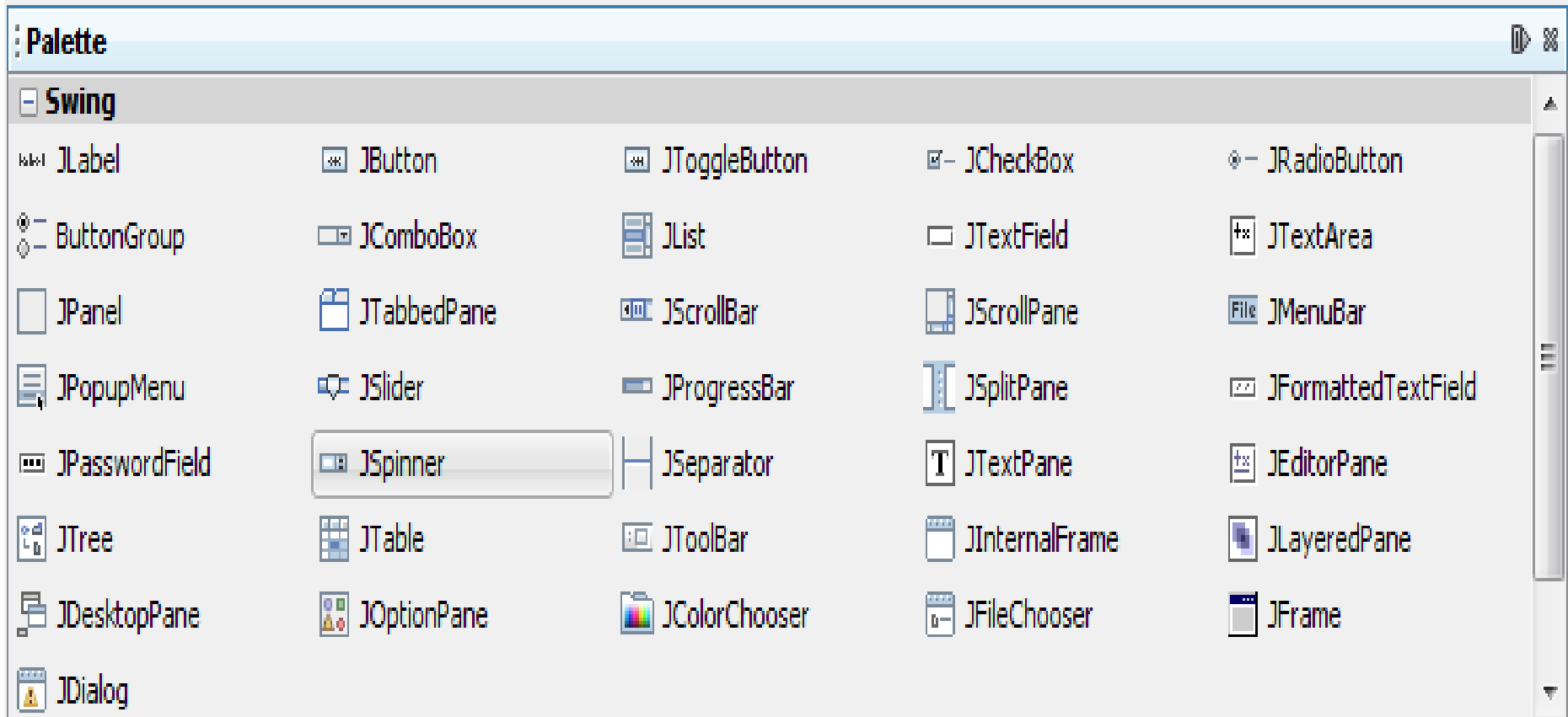
- General Java Programming
- Java Web Apps
- Ruby and Rails
- SOA
- PHP Apps
- Swing GUIs
- Java EE
- Mobile Apps
- UML Modeling

Usages x Javadoc | Output - CelciusToFahrenheit (r... | Tasks

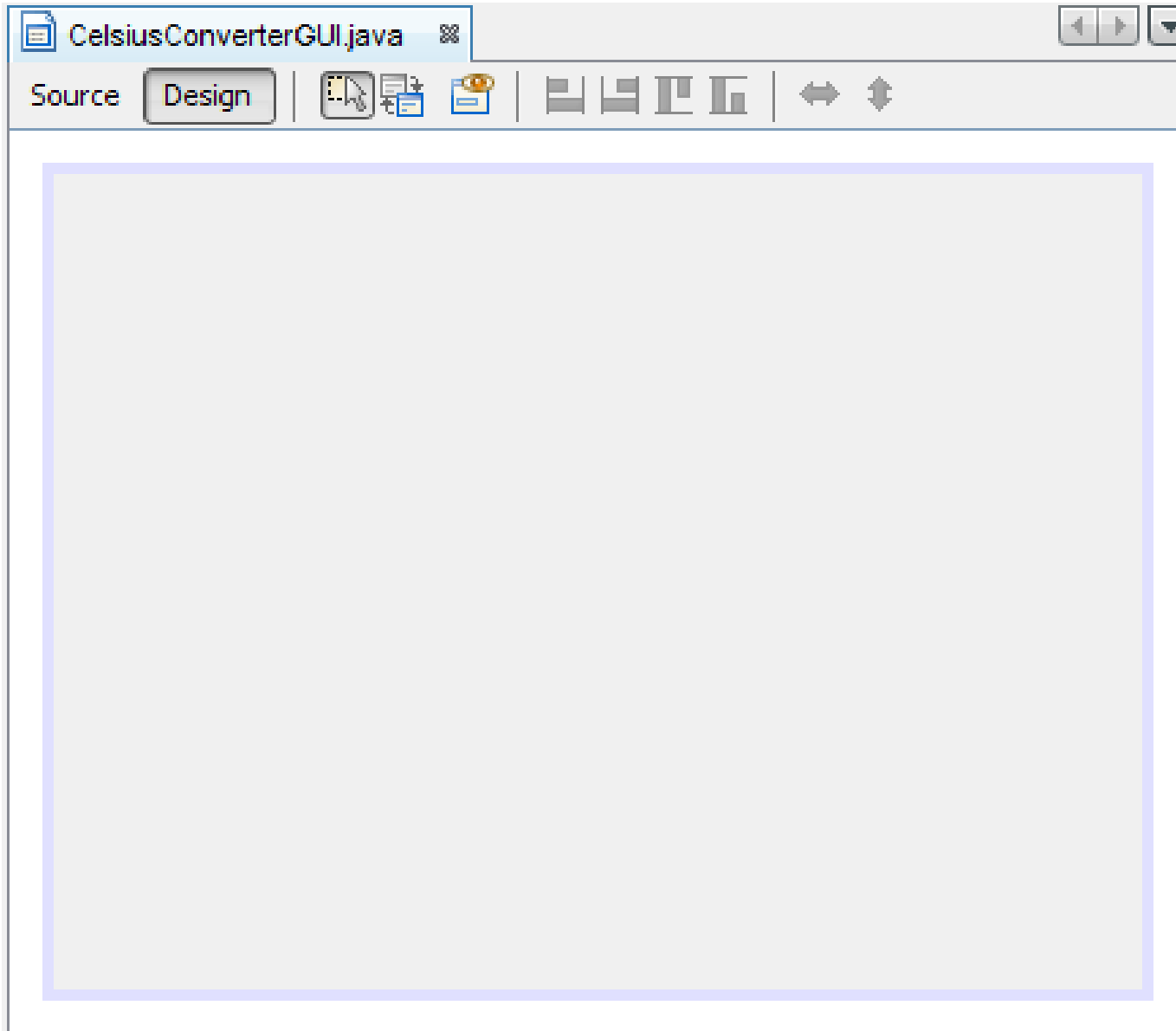
<No Usages>



# The Palette

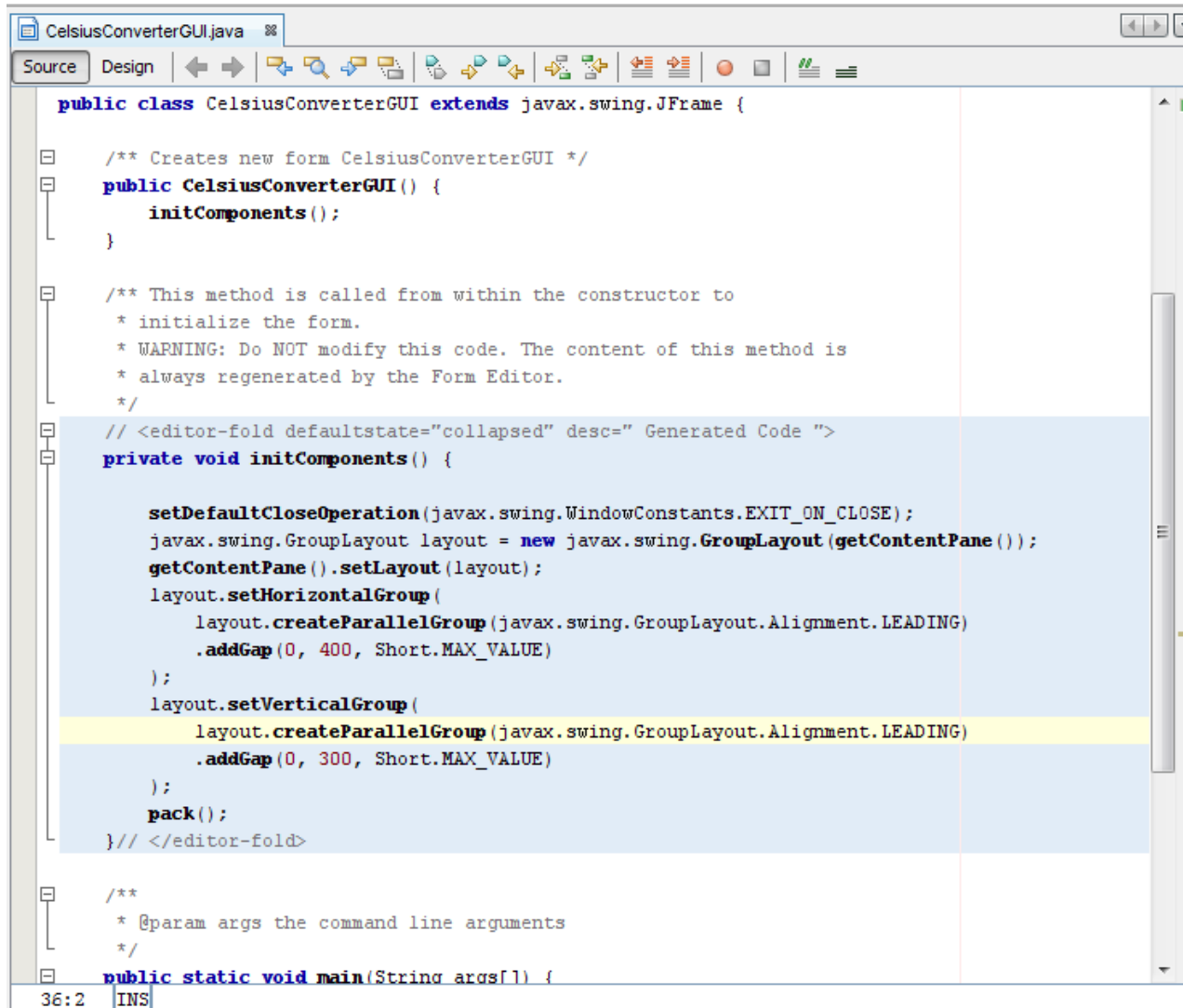


# The Design Area





# The Source Editor



```
public class CelsiusConverterGUI extends javax.swing.JFrame {

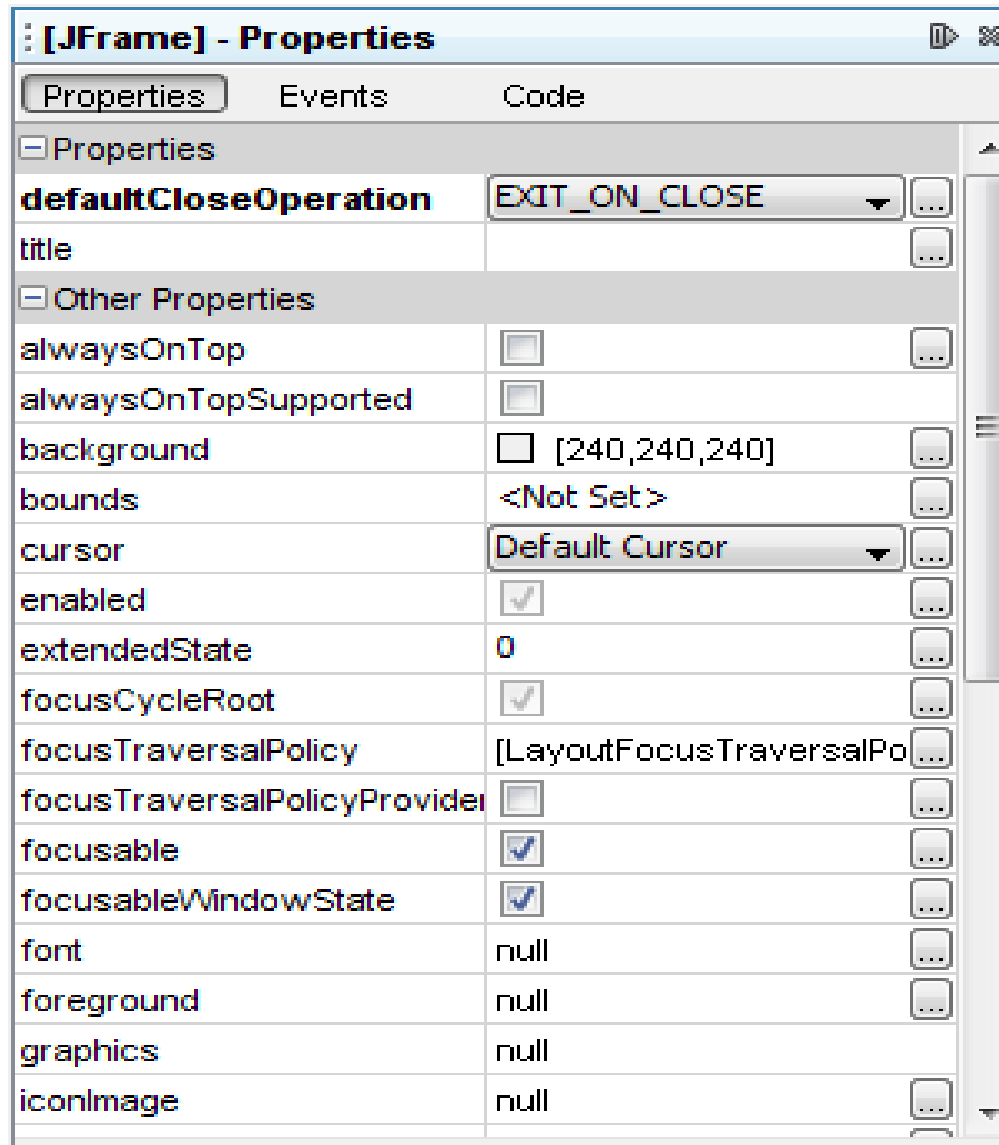
    /** Creates new form CelsiusConverterGUI */
    public CelsiusConverterGUI() {
        initComponents();
    }

    /** This method is called from within the constructor to
     * initialize the form.
     * WARNING: Do NOT modify this code. The content of this method is
     * always regenerated by the Form Editor.
     */
    // <editor-fold defaultstate="collapsed" desc=" Generated Code ">
    private void initComponents() {

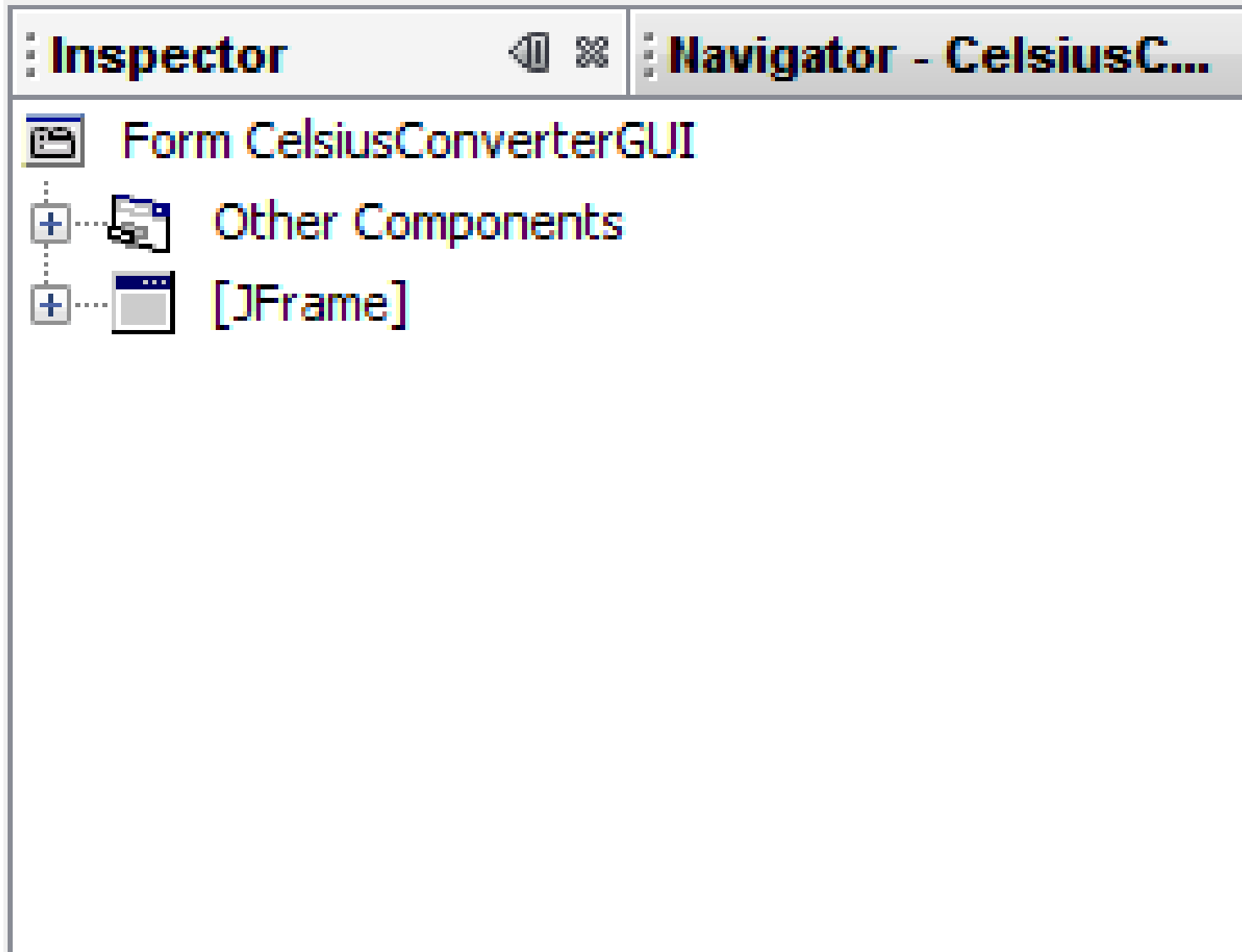
        setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);
        javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
        getContentPane().setLayout(layout);
        layout.setHorizontalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(layout.createSequentialGroup()
                    .addGap(0, 400, Short.MAX_VALUE)
                )
        );
        layout.setVerticalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(layout.createSequentialGroup()
                    .addGap(0, 300, Short.MAX_VALUE)
                )
        );
        pack();
    } // </editor-fold>

    /**
     * @param args the command line arguments
     */
    public static void main(String args[]) {
        36:2 | INS
```

# The Property Editor



# The Inspector



# 3.4 Studi Kasus Membangun Aplikasi GUI

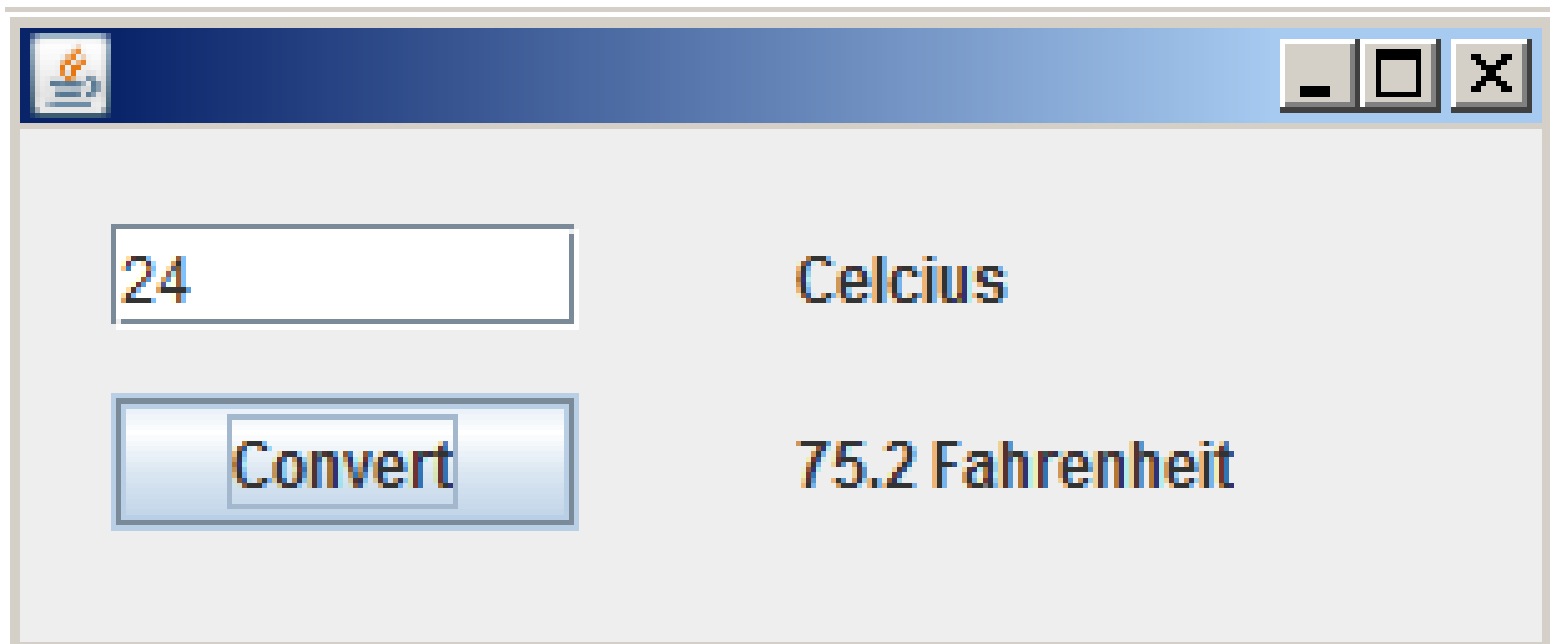
# Studi Kasus Aplikasi GUI

1. Aplikasi Konversi Suhu
2. Aplikasi Pertambahan Dua Angka
3. Aplikasi Penghitungan Jumlah Hari
4. Aplikasi Penampil Gambar
5. Aplikasi Kalkulator
6. Aplikasi Penentu Nilai Mahasiswa
7. Aplikasi Biodata Mahasiswa

# Aplikasi Konversi Suhu

GUI Component: **TextField, Label, Button**

Events: **actionPerformed, mouseClicked**

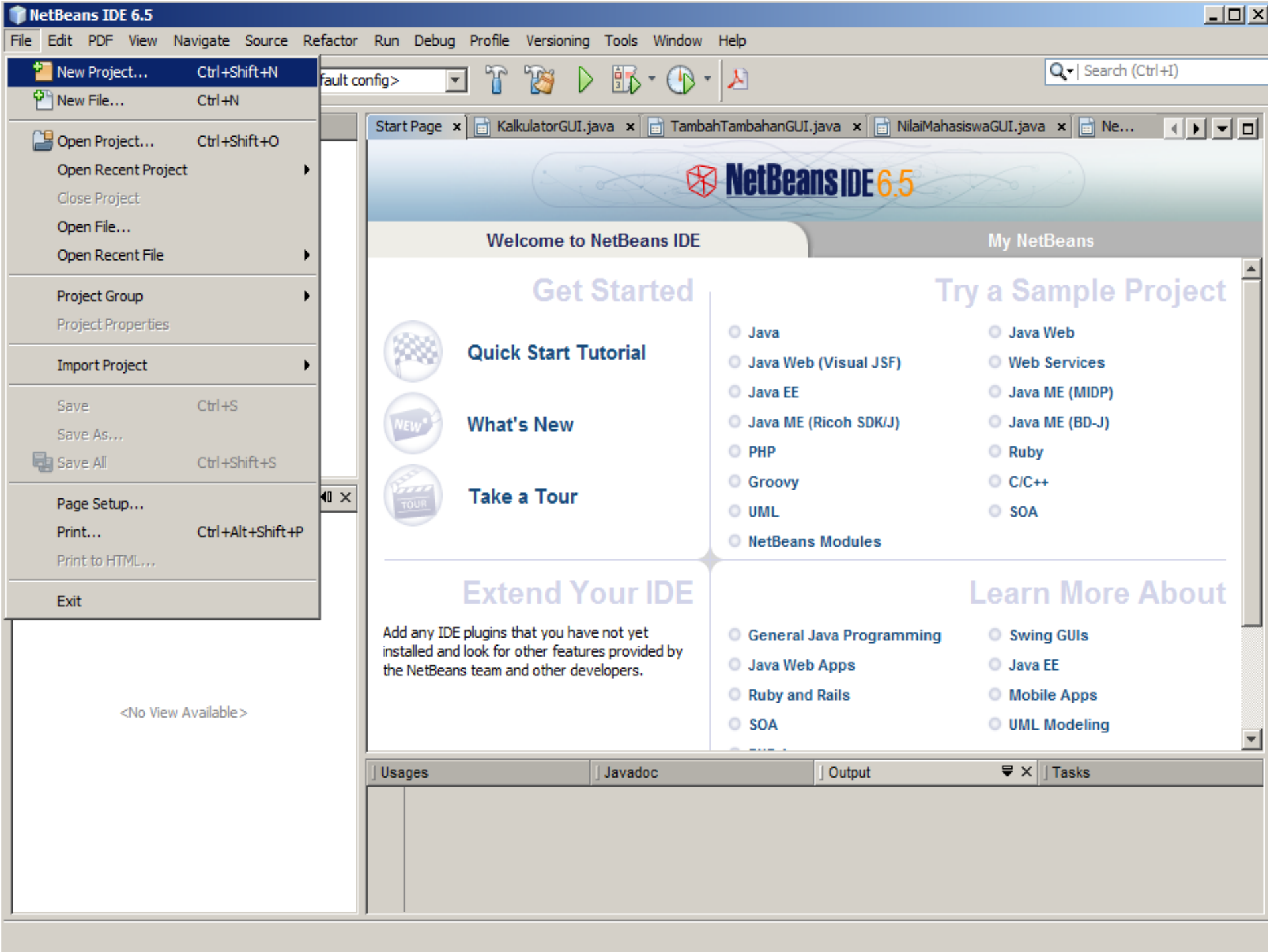


# Algoritma untuk Event Handling

1. Ambil Isi dari textfield, simpan dalam variabel celcius
2. Konversi celcius ke fahrenheit dengan rumus di bawah, dan simpan hasilnya dalam variabel fahrenheit  
$$\text{fahrenheit} = 1.8 * \text{celcius} + 32$$
3. Tempelkan hasil (fahrenheit) ke label fahrenheit (menimpa isi lama)



# 1. Membuat Project Baru



- New Project... Ctrl+Shift+N
- New File... Ctrl+N
- Open Project... Ctrl+Shift+O
  - Open Recent Project
  - Close Project
  - Open File...
  - Open Recent File
- Project Group
  - Project Properties
- Import Project
- Save Ctrl+S
- Save As...
- Save All Ctrl+Shift+S
- Page Setup...
- Print... Ctrl+Alt+Shift+P
- Print to HTML...
- Exit

fault config> [Tool icons] Search (Ctrl+I)

Start Page x KalkulatorGUI.java x TambahTambahGUI.java x NilaiMahasiswaGUI.java x Ne...

# NetBeans IDE 6.5

## Welcome to NetBeans IDE

### Get Started

- Quick Start Tutorial
- What's New
- Take a Tour

### Try a Sample Project

- Java
- Java Web (Visual JSF)
- Java EE
- Java ME (Ricoch SDK/J)
- PHP
- Groovy
- UML
- NetBeans Modules
- Java Web
- Web Services
- Java ME (MIDP)
- Java ME (BD-J)
- Ruby
- C/C++
- SOA

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Add any IDE plugins that you have not yet installed and look for other features provided by the NetBeans team and other developers.

### Learn More About

- General Java Programming
- Java Web Apps
- Ruby and Rails
- SOA
- Swing GUIs
- Java EE
- Mobile Apps
- UML Modeling

<No View Available>

Usages Javadoc Output Tasks

**New Project**

**Steps**

1. Choose Project
2. ...

**Choose Project**

Categories:

- Java
- Java Web
- Java EE
- Java ME
- PHP
- Ruby
- Groovy
- C/C++
- UML
- SOA
- NetBeans Modules
- Samples

Projects:

- Java Application
- Java Desktop Application
- Java Class Library
- Java Project with Existing
- Java Free-Form Project

Description:

**Creates a new Java SE application** in a standard IDE project. You can add a new class in the project. Standard projects use **an IDE-generated Ant build script** to build and debug your project.

< Back   Next >   Finish   Cancel   Help

## 2. Memberi Nama Project

Nama Project: **CelciusToFahrenheit**

Uncheck: **Create Main Class**

### New Java Application

**Steps**

1. Choose Project
2. **Name and Location**

**Name and Location**

Project Name:

Project Location:

Project Folder:

Use Dedicated Folder for Storing Libraries

Libraries Folder:

Different users and projects can share the same compilation libraries (see Help for details).

Create Main Class

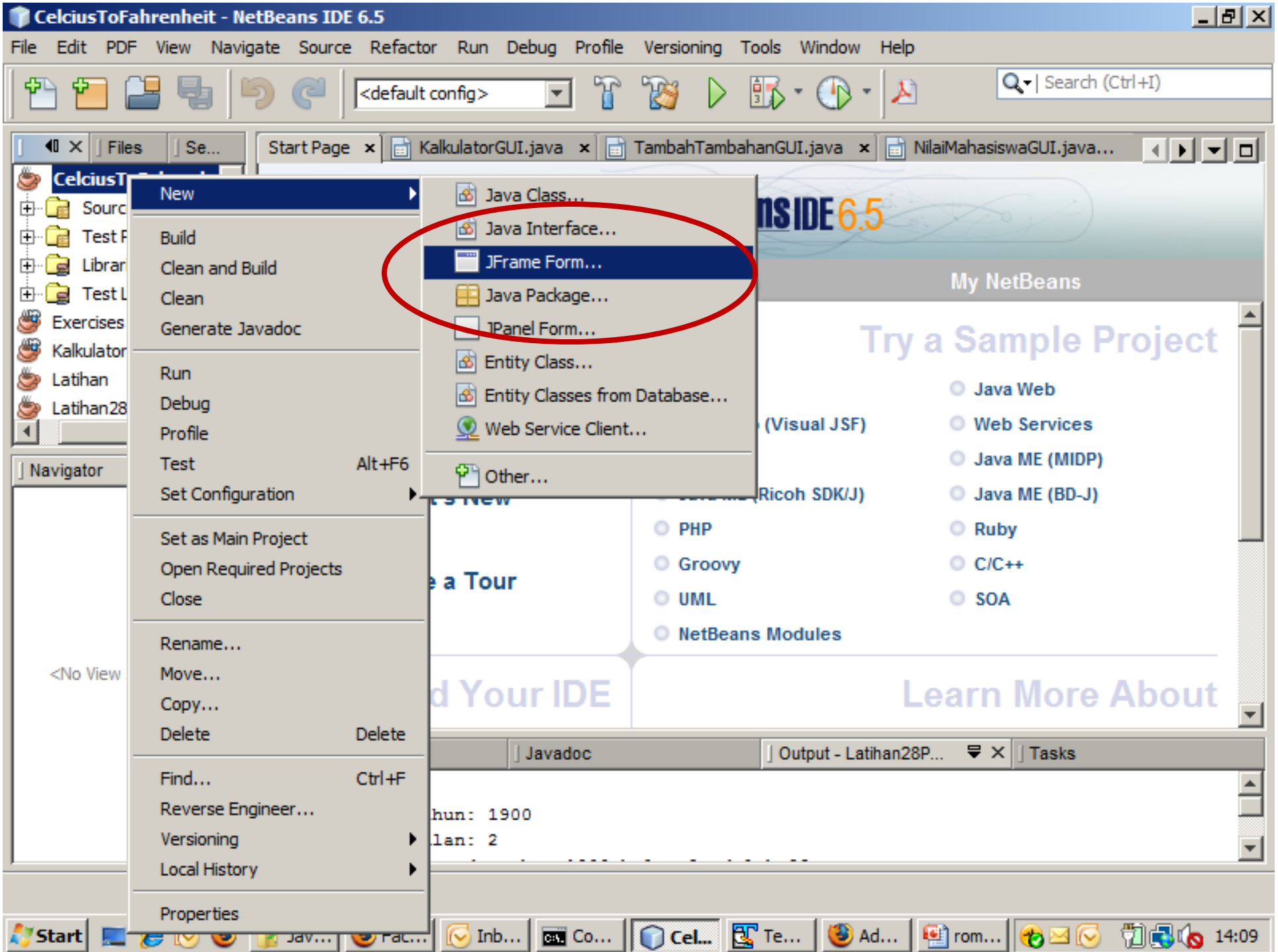
Set as Main Project

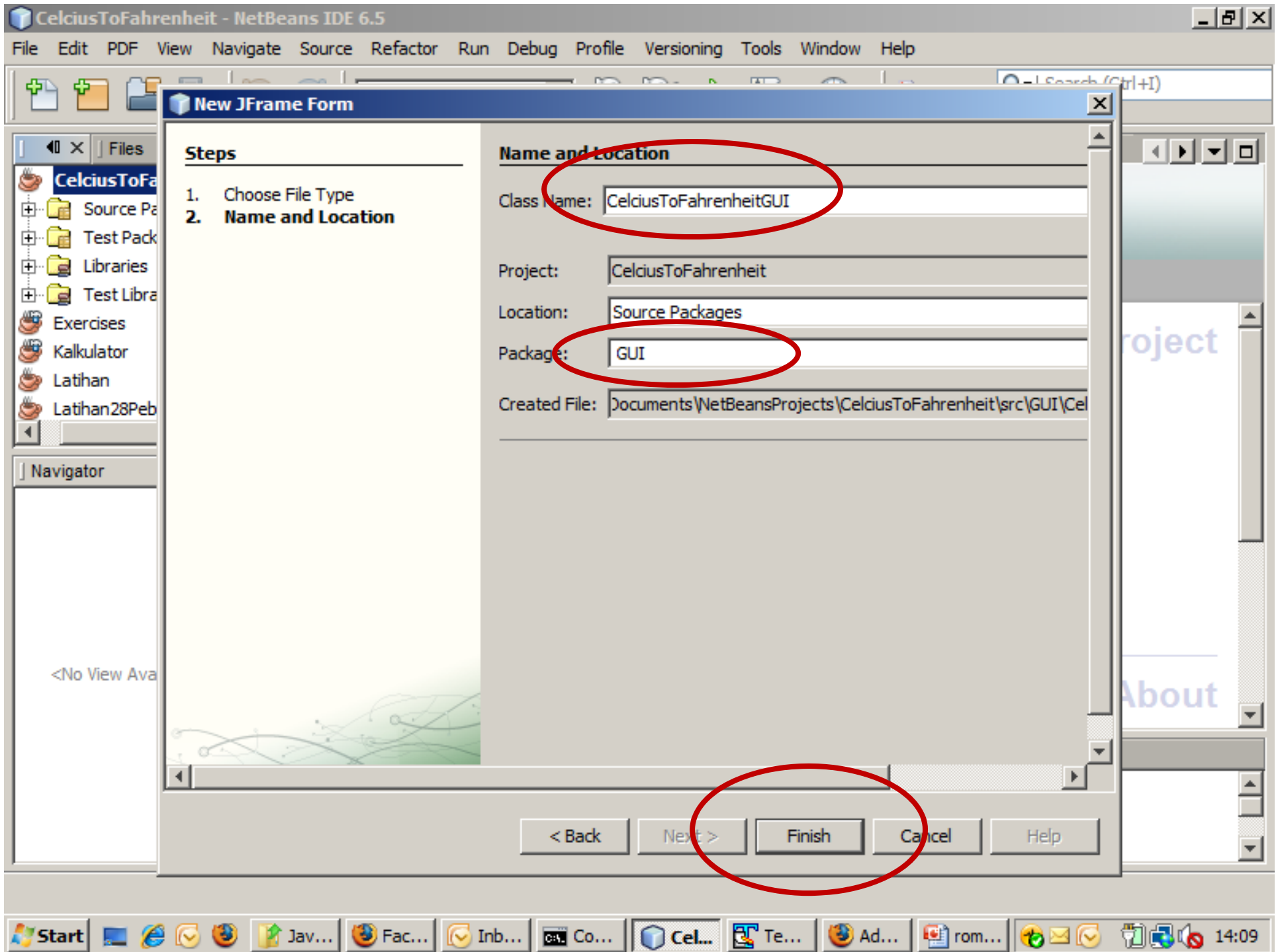
< Back   Next >   Finish   Cancel   Help

# 3. Menambahkan JFrame Form Pada Project

Nama Frame: **CelciusToFahrenheitGUI**

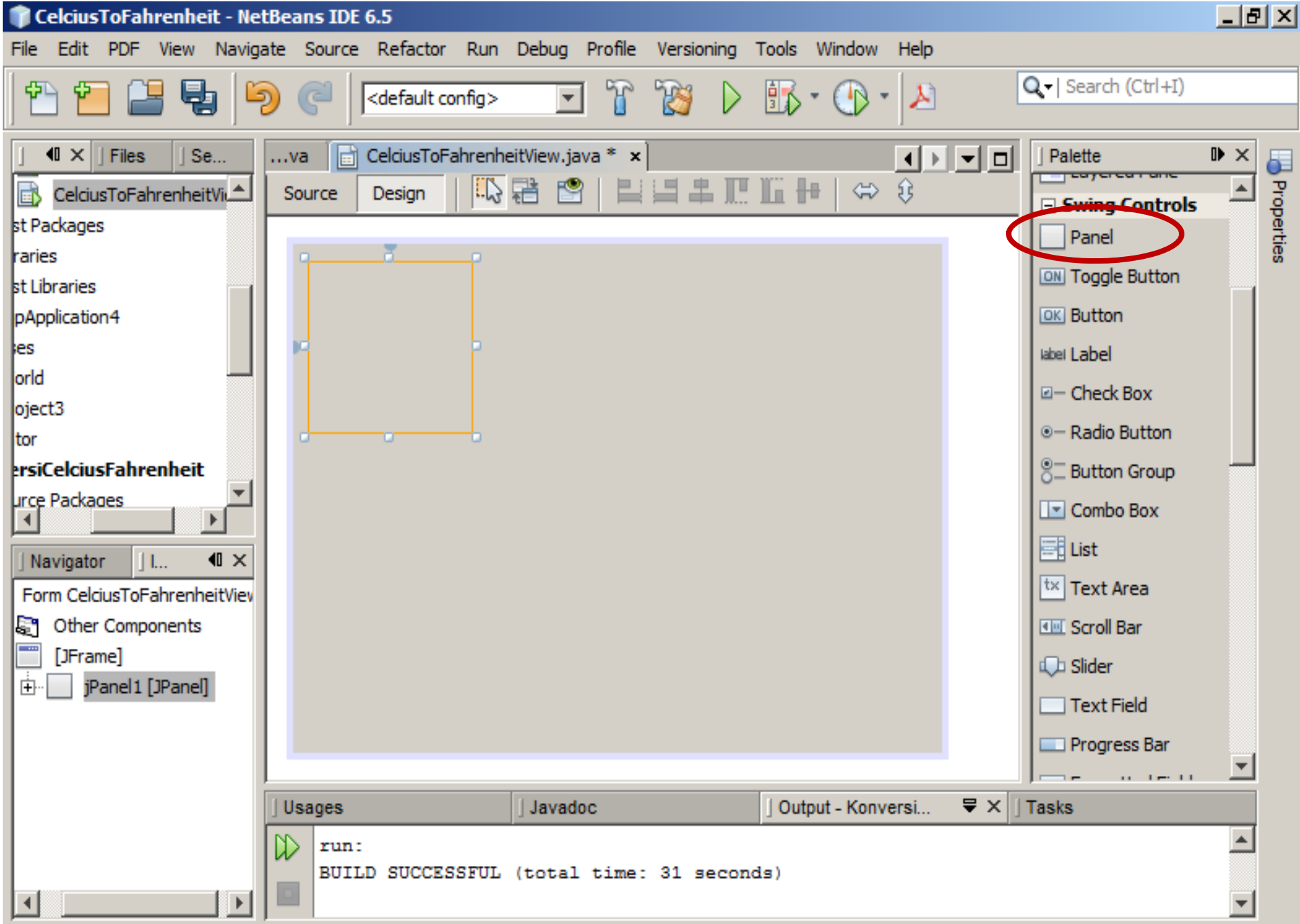
Package: **GUI**

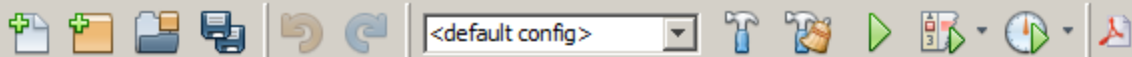






# 3. Menempatkan GUI Component ke Design (Frame)





Search (Ctrl+I)

Project Explorer showing package structure for CelsiusToFahrenheit, including GUI and source packages.

Design view of the GUI showing components: jTextField1, jLabel1, jButton1, and jLabel2. Below the design view is the Usages and Javadoc pane.

Palette showing Swing Containers, Swing Controls, Swing Menus, and Swing Windows. Red circles highlight 'Label', 'Text Field', and 'OK Button'. A tooltip for JComboBox is visible.

```
run:
Masukkan tahun: 1900
Masukkan bulan: 2
```

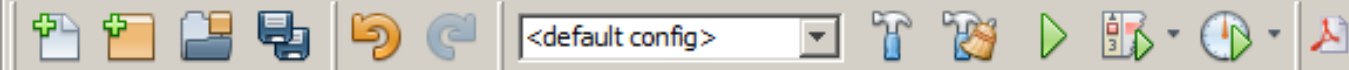
# 4. Mengubah Text dari GUI Component (Edit Text)

JTextField1: Kosongi

JLabel1: Celcius

JLabel2: Fahrenheit

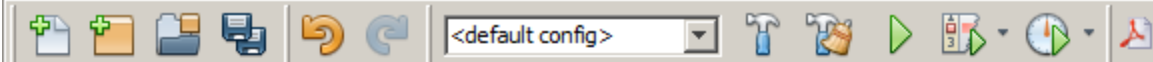
JButton1: Convert



Project Explorer showing a tree structure for 'CelciusToFahrenheit'. The 'GUI' package is expanded, showing 'CelciusToFahrenheitGUI.java'. Below it, 'Other Components' are listed: [JFrame], jTextField1 [JTextField], jButton1 [JButton], jLabel1 [JLabel], and jLabel2 [JLabel].



- Edit Text
- Change Variable Name ...
- Bind
- Events
- Align
- Anchor
- Auto Resizing
- Same Size
- Set Default Size
- Space Around Component...
- Enclose In
- Design Parent
- Move Up
- Move Down
- Cut Ctrl+X
- Copy Ctrl+C
- Duplicate Ctrl+D
- Delete Delete
- Customize Code
- Properties



Project Explorer showing package structure:

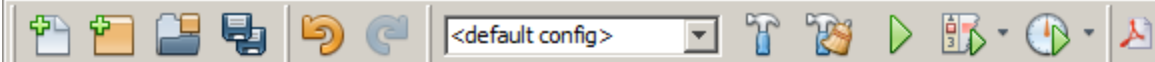
- Source Packages
  - GUI
    - CelciusToFahrenheit
- Test Packages
- Libraries
- Other Components
  - [JFrame]
  - jTextField1 [JTextFie...
  - jButton1 [JButt...
  - jLabel1 [JLabel...
  - jLabel2 [JLabel...

Design view of the GUI with a context menu open over a text field. The menu items are:

- Edit Text
- Change Variable Name ...
- Bind
- Events
- Align
- Anchor
- Auto Resizing
- Same Size
- Set Default Size
- Space Around Component...
- Endose In
- Design Parent
- Move Up
- Move Down
- Cut (Ctrl+X)
- Copy (Ctrl+C)
- Duplicate (Ctrl+D)
- Delete (Delete)
- Customize Code
- Properties

Output window showing the result of a program run:

```
run:  
Masukkan tahun: 1900  
Masukkan bulan: 2
```

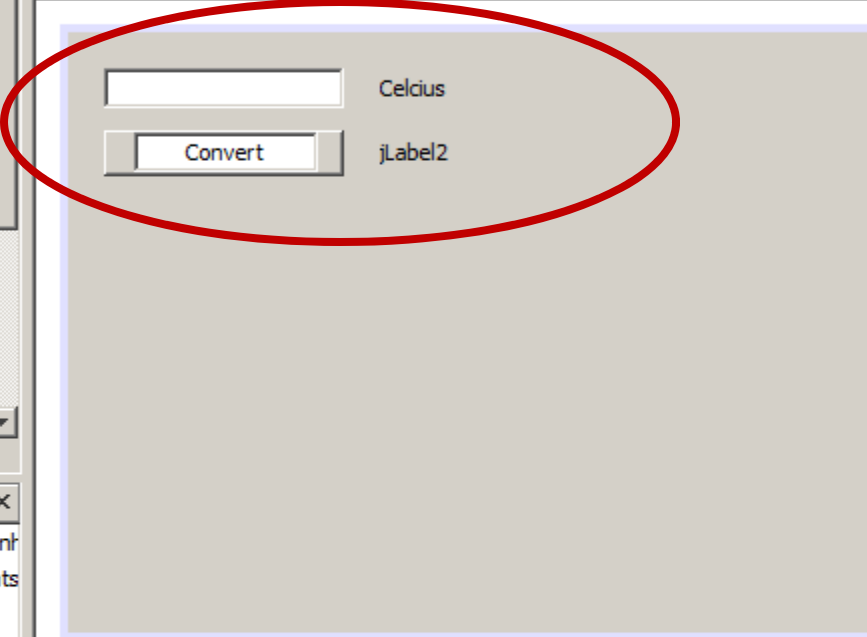


Project Explorer showing package structure:

- Source Packages
  - GUI
    - CelciusToFahrenheit

Component palette:

- Other Components
  - [JFrame]
  - jTextField1 [JText]
  - jButton1 [JButt]
  - jLabel1 [JLabel]
  - jLabel2 [JLabel]



```
run:  
Masukkan tahun: 1900  
Masukkan bulan: 2
```

# 5. Mengubah Nama Variable dari Setiap GUI Component (Change Variable Name)

TextField1: **celciusTextField**

JLabel1: **celciusLabel**

JLabel2: **fahrenheitLabel**

Button1: **convertButton**

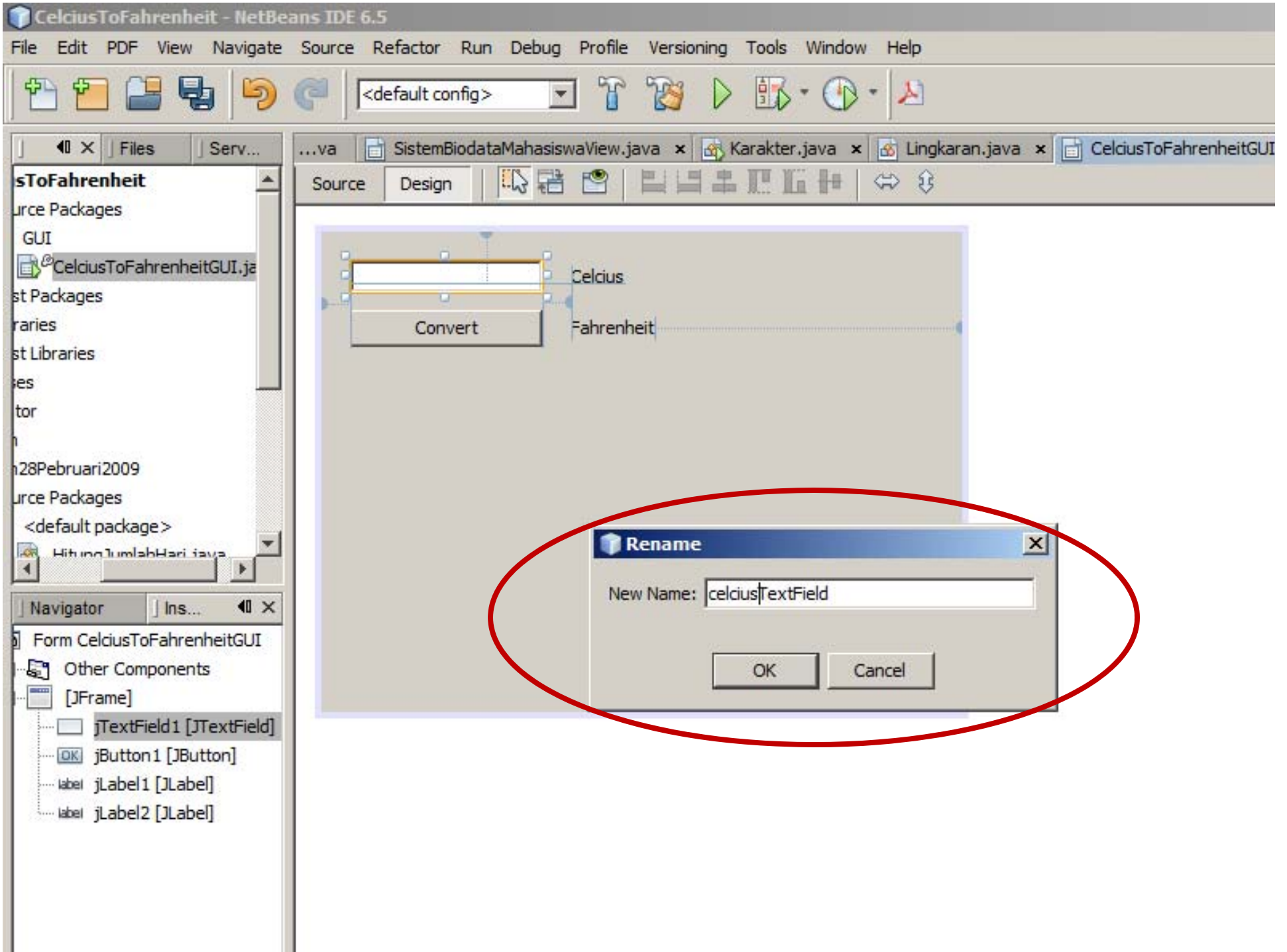


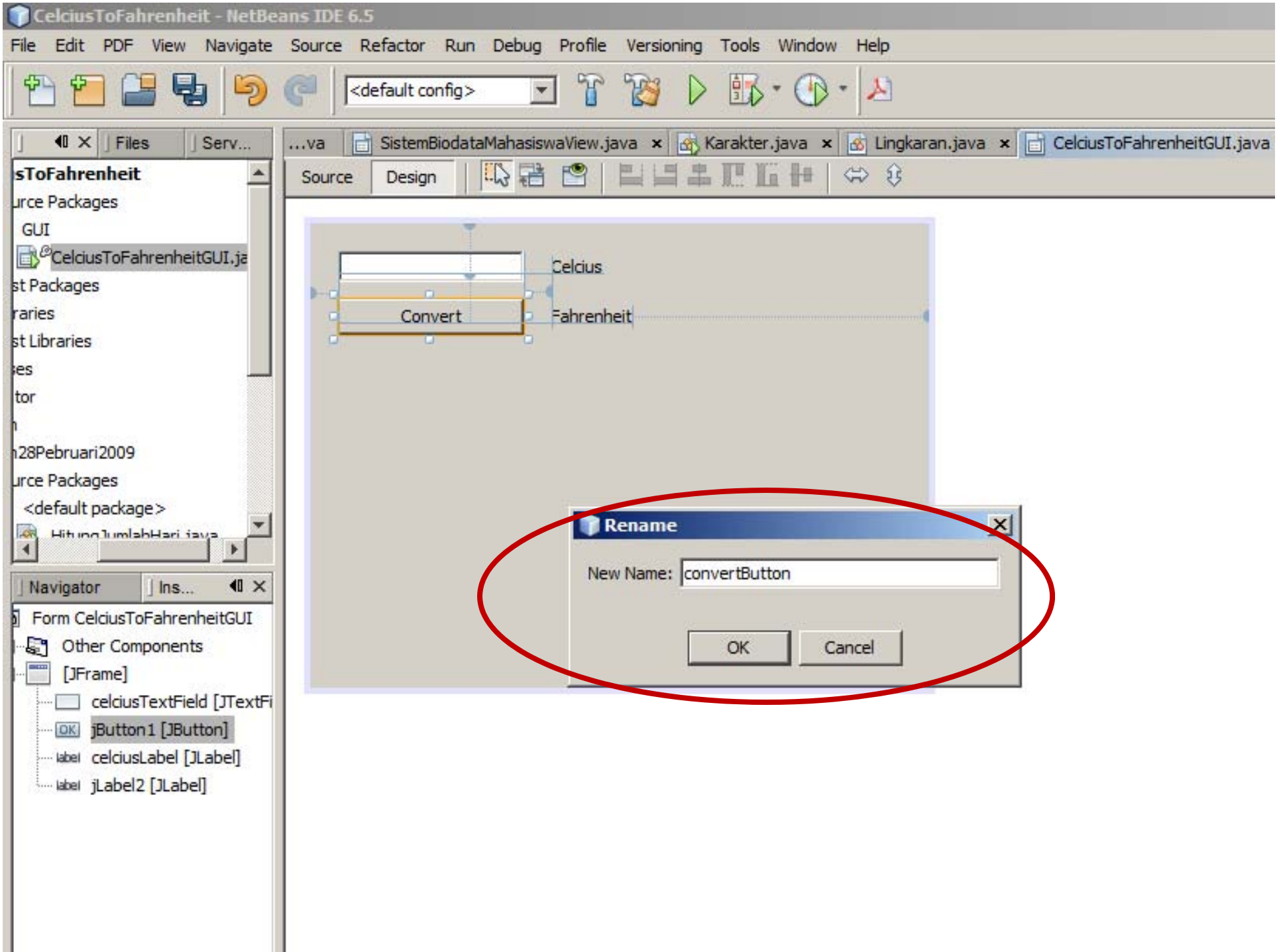
Project Explorer showing package structure for CelciusToFahrenheit GUI.

Navigator showing component tree for Form CelciusToFahrenheitGUI, including JTextField1, JButton1, and labels.

Design view of the GUI with a context menu open over a component. The menu items include Edit Text, Change Variable Name ..., Bind, Events, Align, Anchor, Auto Resizing, Same Size, Set Default Size, Space Around Component..., Enclose In, Design Parent, Move Up, Move Down, Cut, Copy, Duplicate, Delete, Customize Code, and Properties.

```
run:
Masukkan tahun: 1900
Masukkan bulan: 2
```

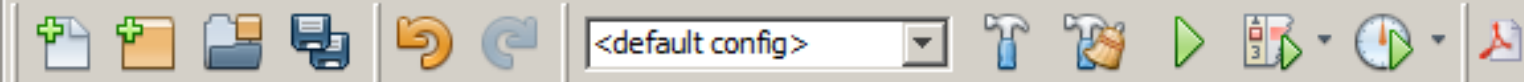




# 6. Rapikan Tampilan Frame Program Kita (Potong Yang Tidak Perlu)

CelciusToFahrenheit - NetBeans IDE 6.5

File Edit PDF View Navigate Source Refactor Run Debug Profile Versioning Tools Window Help



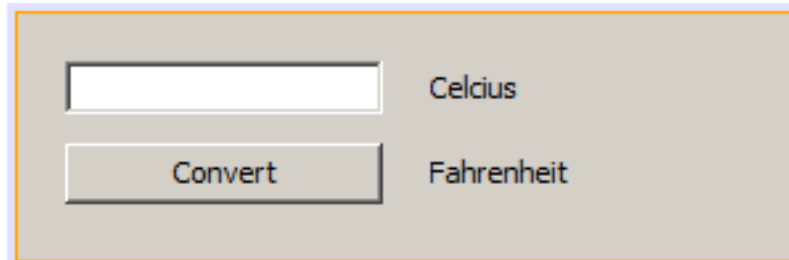
Files | Serv...

**sToFahrenheit**

- Source Packages
  - GUI
    - CelciusToFahrenheitGUI.java
- Test Packages
- Libraries
- Test Libraries
- Resources
- Ant
- 28Pebruari2009
- Source Packages
  - <default package>
  - HitungJumlahHari.java

...va | SistemBiodataMahasiswaView.java x | Karakter.java x | Lingkaran.java x | CelciusTo...

Source | Design



Navigator | Ins... | << x

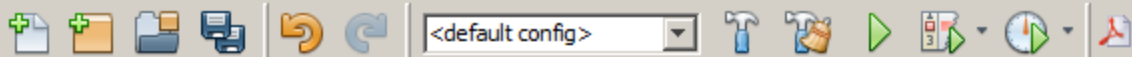
- Form CelciusToFahrenheitGUI
  - Other Components
  - [JFrame]
    - celciusTextField [JTextFi
    - convertButton [JButton]
    - celciusLabel [JLabel]
    - fahrenheitLabel [JLabel]

# 7. Buat Event untuk Convert Button

Klik Kanan Pada Convert Button

Pilih **Event** → **Action** → **ActionPerformed**

atau Pilih **Event** → **Mouse** → **MouseClicked**



Projects Files Services

- CelciusToFahrenheit
  - Source Packages
    - GUI
      - CelciusToFahrenheitGUI.java
  - Test Packages
  - Libraries
  - Test Libraries
  - Exercises
  - Kalkulator
  - Latihan
  - Latihan28Pebruari2009
    - Source Packages
      - <default package >
        - HitungJumlahHari.java

CelciusToFahrenheitGUI... Inspector

- Form CelciusToFahrenheitGUI
  - Other Components
  - [JFrame]
    - celciusTextField [JTextField]
    - convertButton [JButton]
    - celciusLabel [JLabel]
    - fahrenheitLabel [JLabel]

Source Design

Karakter.java x Lingkaran.java x CelciusToFahrenheitGUI.java \* x

Context menu for 'Convert' button:

- Edit Text
- Change Variable Name ...
- Bind
- Events**
  - Action**
    - actionPerformed**
  - Ancestor
  - Change
  - Component
  - Container
  - Focus
  - Hierarchy
  - HierarchyBounds
  - InputMethod
  - Item
  - Key
  - Mouse
  - MouseMotion
  - MouseWheel
  - PropertyChange
  - VetoableChange
- Align
- Anchor
- Auto Resizing
- Same Size
- Set Default Size
- Space Around Component...
- Endose In
- Design Parent
- Move Up
- Move Down
- Cut (Ctrl+X)
- Copy (Ctrl+C)
- Duplicate (Ctrl+D)
- Delete (Delete)
- Customize Code
- Properties

Usages

```
run:  
Masukkan tahun: 1900  
Masukkan bulan: 2
```

## 8. Buat Code untuk Event Handling di Convert Button

```
double celcius = Double.parseDouble(celciusTextField.getText());  
    double fahrenheit = celcius * 1.8 + 32;  
    fahrenheitLabel.setText(fahrenheit + " Fahrenheit");
```



```
22     initComponents ();
23 }
24
25 /** This method is called from within the constructor to
26     * initialize the form.
27     * WARNING: Do NOT modify this code. The content of this method is
28     * always regenerated by the Form Editor.
29     */
30 @SuppressWarnings("unchecked")
31 Generated Code
83
84 private void convertButtonActionPerformed(java.awt.event.ActionEvent evt) {
85
86     double fahrenheit = Double.parseDouble(celciusTextField.getText()) * 1.8 + 32;
87     fahrenheitLabel.setText(fahrenheit + " Fahrenheit");
88
89 }
90
91 /**
92     * @param args the command line arguments
93     */
94 public static void main(String args[]) {
```

# 9. Kompilasi (Build, F11) Project

Files | S...

- ApikasiKalkula
- ApikasiPertam
- AppJumlahHari
- Calculator
- CelciusToFah**
- Source Pac
- GUI
- Test Packa

convertButto...

Members View

CelciusToFahrenheitGUI ::

- CelciusToFahrenheitG
- convertButtonActioP
- initComponents()
- main(String[] args)
- celciusLabel : JLabel
- celciusTextField : JTex
- convertButton : JButt
- fahrenheitLabel : JLab

```
Source Design  
28 * al  
29 */  
30 @Supp  
31 Gener  
83  
84 priva  
85  
86 doub  
87 fahr  
88  
89 }  
90  
91 /**  
92 * @pa  
93 */  
94 public static void main(String args[]) {  
95     java.awt.EventQueue.invokeLater(new Runnable() {  
87:58 | INS
```

Run

- Run Main Project F6
- Test Project (CelciusToFahrenheit) Alt+F6
- Build Main Project F11**
- Clean and Build Main Project Shift+F11
- Batch Build Main Project...
- Set Project Configuration
- Set Main Project
- Generate Javadoc (CelciusToFahrenheit)
- Run File Shift+F6
- Test File Ctrl+F6
- Compile File F9
- Check File Alt+F9
- Validate File Alt+Shift+F9
- Repeat Build/Run: ProgramKonversiSuhu (run)
- Stop Build/Run

Search (Ctrl+I)

rt.event.ActionEve

xtField.getText()

t");

Usages Javadoc Output - ProgramKo... Tasks

run:  
BUILD SUCCESSFUL (total time: 15 seconds)

# 10. Jalankan (Run, F6) Project

Files | S...

- ApikasiKalkula
- ApikasiPertam
- AppJumlahHari
- Calculator
- CelciusToFah**
- Source Pac
- GUI
- Test Packa

Members View

CelciusToFahrenheitGUI ::

- CelciusToFahrenheitG
- convertButtonActi
- initComponents()
- main(String[] args)
- celciusLabel : JLabel
- celciusTextField : JTex
- convertButton : JButt
- fahrenheitLabel : JLab

```
Source Design  
28 * al  
29 */  
30 @Supp  
31 Gener  
83  
84 priva  
85  
86 doub  
87 fahr  
88  
89 }  
90  
91 /**  
92 * @pa  
93 */  
94 public static void main(String args[]) {  
95     java.awt.EventQueue.invokeLater(new Runnable() {
```

Run

- Run Main Project F6
- Test Project (CelciusToFahrenheit) Alt+F6
- Build Main Project F11
- Clean and Build Main Project Shift+F11
- Batch Build Main Project...
- Set Project Configuration
- Set Main Project
- Generate Javadoc (CelciusToFahrenheit)
- Run File Shift+F6
- Test File Ctrl+F6
- Compile File F9
- Check File Alt+F9
- Validate File Alt+Shift+F9
- Repeat Build/Run: ProgramKonversiSuhu (run)
- Stop Build/Run

Search (Ctrl+I)

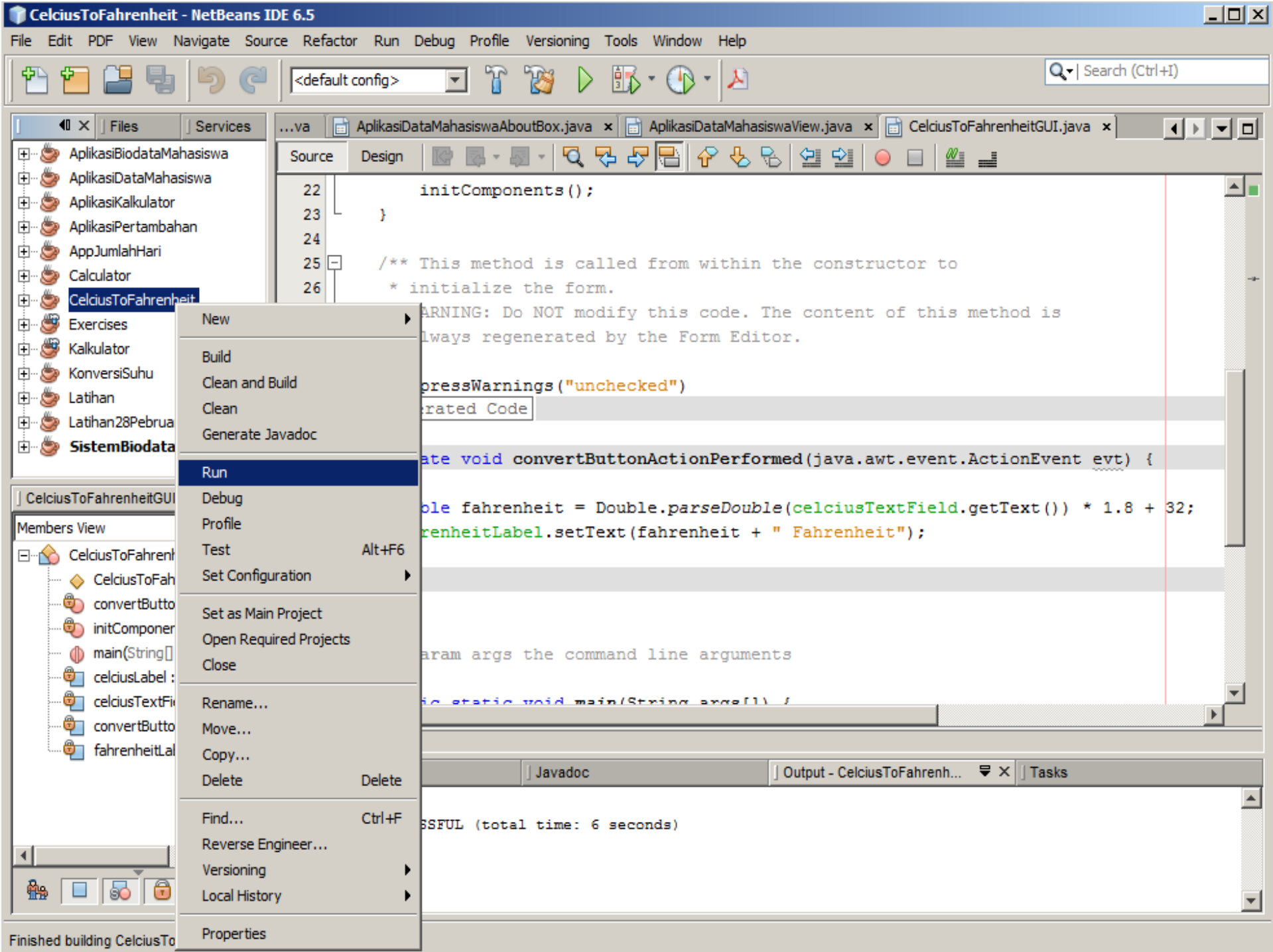
rt.event.ActionEvent  
xtField.getText()  
t");

87:58 | INS

Usages | Javadoc | Output - ProgramKo... | Tasks

run:  
BUILD SUCCESSFUL (total time: 15 seconds)

**Bisa Juga dengan Klik Kanan dan pilih  
Run Pada File Java**



- NetBeans IDE 6.5

Navigate Source Refactor Run Debug Profile Versioning Tools Window Help

<default config> Search (

Services ...va AplikasiDataMahasiswaAboutBox.java x AplikasiDataMahasiswaView.java x CelciusToFahrenheitGUI.java x

Source Design

```
22     initComponents();
23 }
24
25 /** This method is called from within the constructor to
26  * initialize the form.
27  * WARNING: Do NOT modify this code. The content of this method is
28  * always regenerated by the Form Editor.
29  */
30 @SuppressWarnings({
31     "Generated Classes"
32 })
33 private void initComponents() {
34     // ...
35     fahrenheitLabel.setText(fahrenheit + " Fahrenheit");
36 }
37
38 /**
39  * @param args the command line arguments
40  */
41 public static void main(String args[]) {
```

24

Celcius

Convert

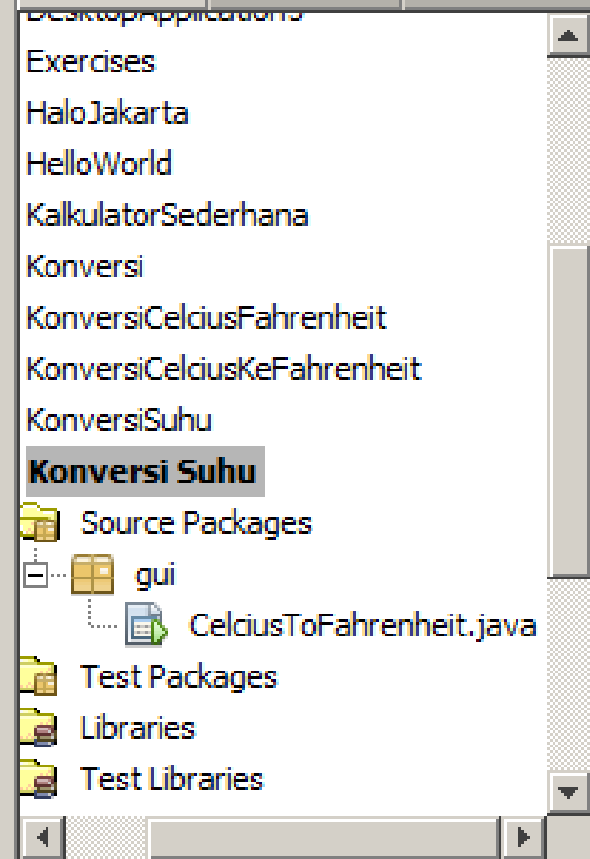
75.2 Fahrenheit



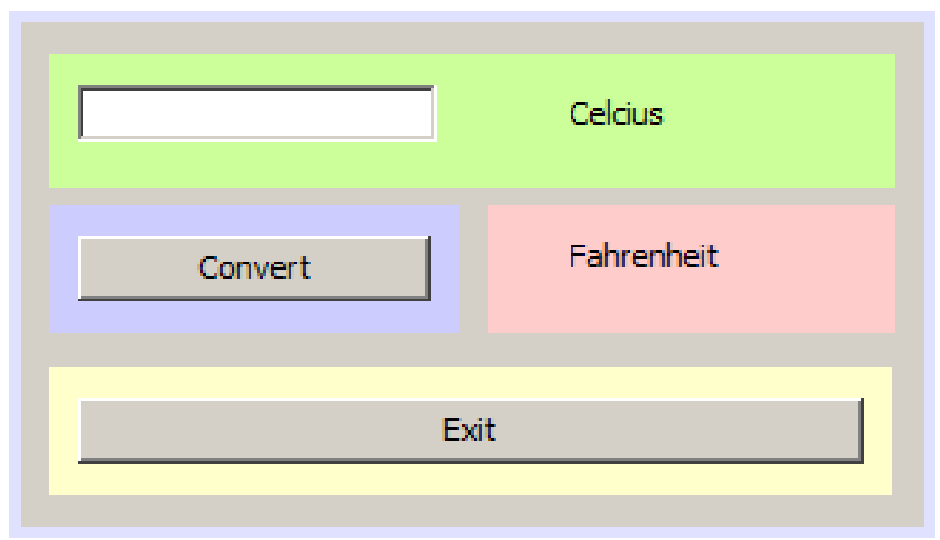
# Memainkan Variable Properties



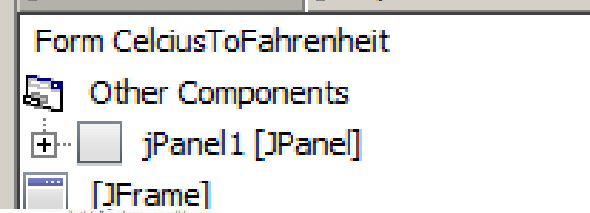
Files Services



...va HaloJakarta.java x Mobil.java x MobilBeraksi.java x CelciusToF

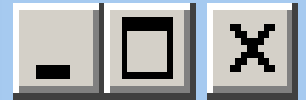


CelciusToFahr... Inspector





# Aplikasi Konversi Suhu



**Celcius**

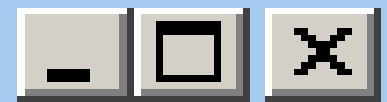
**Convert**

**Fahrenheit**

**Exit**



# Aplikasi Konversi Suhu



**Celcius**

**Convert**

**Fahrenheit**

**Clear**

**Exit**

# Tahapan Membuat Aplikasi GUI

1. Membuat Project baru
2. Menambahkan JFrame Form (top level container)
3. Diatas JFrame diletakkan JPanel (intermediate container)
4. Tempelkan atomic (GUI) component
5. Edit text dari tiap component
6. Edit nama variable dari tiap component (untuk mempermudah coding)
7. Rapikan tampilan dengan mengedit JFrame, JPanel dan mengubah Layout
8. Pilih component yang akan mengelola event dan pilih jenis event sesuai dengan kebutuhan
9. Tambahkan kode di method event yang disediakan

# Rumus Konversi Suhu

- Kelvin = Celcius + 273.15
- Fahrenheit = Celcius \* 1.8 + 32
- Reamur = Celcius \* 0.8
- Kelvin = (Fahrenheit + 459.67) / 1.8
- Celsius = (Fahrenheit - 32) / 1.8
- Reamur = (Fahrenheit - 32) / 2.25
- Celsius = Kelvin - 273.15
- Fahrenheit = Kelvin \* 1.8 - 459.67
- Reamur = (Kelvin - 273.15) \* 0.8
- Kelvin = Reamur / 0.8 + 273.15
- Celsius = Reamur / 0.8
- Fahrenheit = (Reamur - 7.5) \* 24/7 + 32

# Aplikasi Pertambahan Dua Angka

GUI Component: **Panel, Label, TextField, Button**

Logic Programming: **if-else**

Events: **actionPerformed**

Features: **requestFocus, Sistem.exit(0)**

# Aplikasi Pertambahan Dua Angka

Aplikasi Pertambahan Angka

Angka Pertama

Angka Kedua

Hasil

Tambah Hapus Keluar

1. Angka Pertama dan Angka Kedua dimasukkan oleh user
2. Tombol **Tambah** diklik maka akan keluar hasil pertambahan di field ketiga
3. Tombol **Hapus** untuk membersihkan



# Aplikasi Operasi Dua Angka

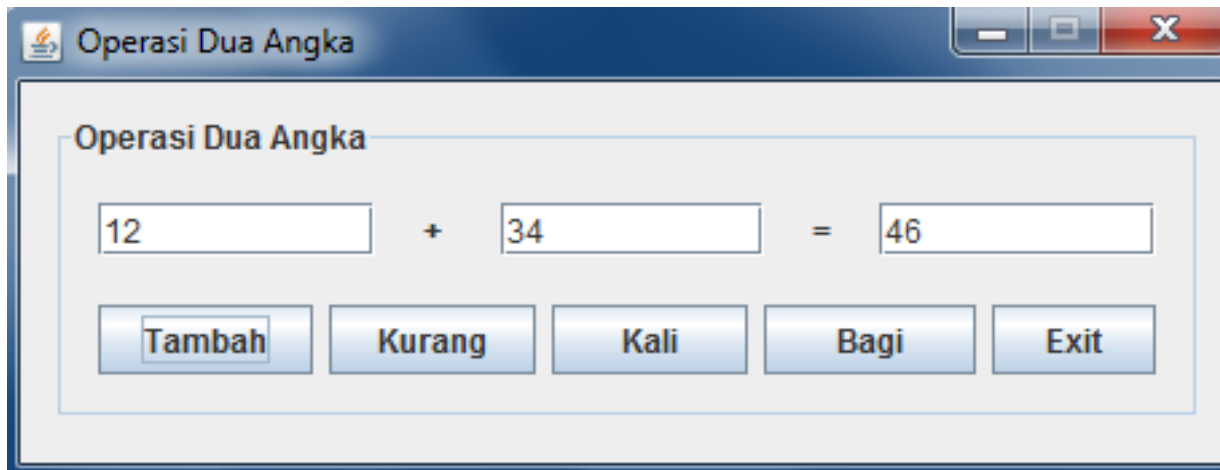
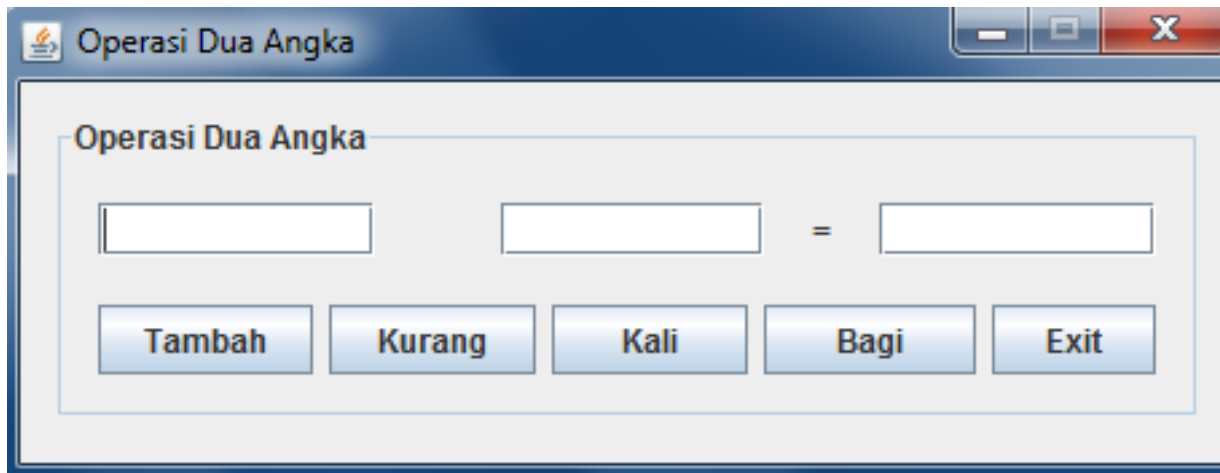
GUI Component: **Panel, Label, TextField, Button**

Logic Programming: **if-else**

Event: **actionPerformed, keyTyped**

Features: **pembuatan method baru**

# Operasi Dua Angka



## Fitur Tambahan:

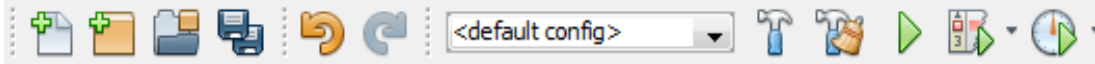
1. Error dialog muncul bila input nilai bukan numerik
2. Gunakan `Event keyTyped` pada `TextField` untuk tampilkan error
3. Memunculkan error dialog:  
`JOptionPane.showMessageDialog(this, "error");`

```
...ava DBConnection.java CelciusToFahrenheit.java CelciusToFahrenheit1.java CelciusToFahrenheit2.java
Source Design [Icons]
188 }
189
190 private void clearButtonActionPerformed(java.awt.event.ActionEvent evt) {
191     celciusTextField.setText("");
192     fahrenheitLabel.setText("Fahrenheit");
193     celciusTextField.requestFocus();
194 }
195
196 private void exitButtonActionPerformed(java.awt.event.ActionEvent evt) {
197     System.exit(0);
198 }
199
200 private void celciusTextFieldKeyTyped(java.awt.event.KeyEvent evt) {
201     char c = evt.getKeyChar();
202     if (! ((Character.isDigit(c) ||
203         (c == KeyEvent.VK_BACK_SPACE) ||
204         (c == KeyEvent.VK_DELETE))
205         )) {
206         getToolkit().beep();
207         JOptionPane.showMessageDialog(null, "masukkan hanya 0-9!");
208         evt.consume();
209     }
210 }
211
212 /**
213  * @param args the command line arguments
214  */
```

```
Source  Design  [Icons]
188      fahrenheitLabel.setText("Fahrenheit");
189      }
190
191      private void exitButtonActionPerformed(java.awt.event.ActionEvent evt) {
192          System.exit(0);
193      }
194
195      private void filterKeyTyped(java.awt.event.KeyEvent evt) {
196          char c = evt.getKeyChar();
197          if (! ((Character.isDigit(c) ||
198                  (c == KeyEvent.VK_BACK_SPACE) ||
199                  (c == KeyEvent.VK_DELETE) )
200              )) {
201              getToolkit().beep();
202              JOptionPane.showMessageDialog(null, "masukkan hanya 0-9!");
203              evt.consume();
204          }
205      }
206
207      private void celciusTextFieldKeyTyped(java.awt.event.KeyEvent evt) {
208          filterKeyTyped(evt);
```

method baru

panggil method



Pro... Files Services

Test Libraries  
KonversiSuhuApp  
Source Packages  
gui  
KonversiSuhuGUI.j  
Libraries  
OOPConcepts  
OperasiDuaAngka  
Source Packages  
gui  
Filter.java  
OperasiDuaAngka(  
Libraries  
SistemATM  
Yoga

Filter.java - Navigator  
Members View  
Filter  
digitFilter(KeyEvent evt)

```
5 package gui;
6
7 import java.awt.event.KeyEvent;
8 import javax.swing.JFrame;
9 import javax.swing.JOptionPane;
10
11 /**
12  * @author Romi Satria Wahono
13  */
14
15 public class Filter{
16     public static void digitFilter(KeyEvent evt) {
17         char input = evt.getKeyChar();
18         if(!((Character.isDigit(input)) ||
19             (input == KeyEvent.VK_BACK_SPACE) ||
20             (input == KeyEvent.VK_DELETE)))){
21
22             new JFrame().getToolkit().beep();
23             JOptionPane.showMessageDialog(null, "error");
24             evt.consume();
25         }
26     }
27 }
```

# class dan method baru

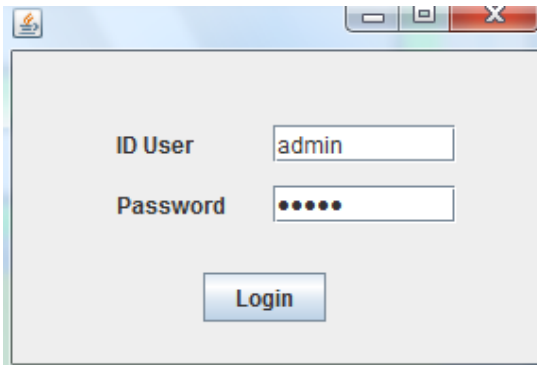
# Aplikasi Penghitungan Jumlah Hari

GUI Component: **Panel, Label, TextField, PasswordField, Button, ComboBox**

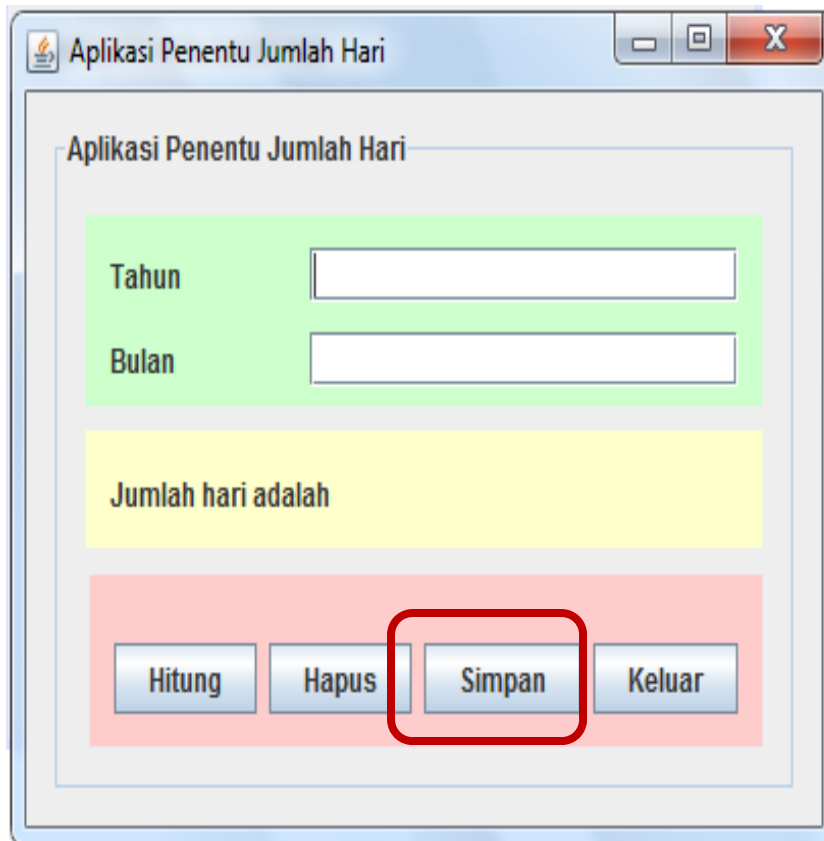
Logic Programming: **if-else, switch**

Event: **actionPerformed, keyTyped**

# Aplikasi Penghitungan Jumlah Hari



ID User: admin  
Password: .....  
Login



Aplikasi Penentu Jumlah Hari

Tahun: [input field]  
Bulan: [input field]

Jumlah hari adalah

Hitung Hapus **Simpan** Keluar

1. Muncul login form, bila ID User dan Password = **admin**, maka aplikasi akan muncul
2. Tombol Hitung diklik, maka akan muncul **jumlah hari** pada bulan dan tahun yang ditunjuk
3. Perhatikan bahwa ada perhitungan **tahun kabisat pada bulan pebruari**
4. Tombol simpan untuk **menyimpan hasil ke file**

Error Dialog:

- 1 Error dialog muncul bila



```
116
117 | private void loginBTActionPerformed(java.awt.event.ActionEvent evt) {
118
119     if((userTF.getText().equals("admin")) &&
120         // (new String(passwordTF.getPassword()).equals("admin")) {
121         (String.valueOf(passwordTF.getPassword()).equals("admin")) {
122         //PenentuJumlahHari pjh = new PenentuJumlahHari();
123         //pjh.setVisible(true);
124         new PenentuJumlahHari().setVisible(true);
125         dispose();
126     }else{
127         JOptionPane.showMessageDialog(
128             null,
129             userTF.getText() +
130             ", password anda salah ",
131             "Pesan Kesalahan",
132             JOptionPane.ERROR_MESSAGE);
133         userTF.setText("");
134         passwordTF.setText("");
135         userTF.requestFocus();
136     }
137 }
138
139 private void userTFKeyPressed(java.awt.event.KeyEvent evt) {
```





PenentuJumlahHari.java LoginForm.java

Source Design

```
262 private void simpanButtonActionPerformed(java.awt.event.ActionEvent evt) {
263     try{
264         // Buat file
265         BufferedWriter out = new BufferedWriter(new FileWriter("jumlahhari.txt"));
266         // Simpan ke file
267         out.write(jumlahhariLabel.getText());
268         // Tampilkan dialog bila berhasil
269         JOptionPane.showMessageDialog(null, "Berhasil Disimpan dalam File");
270         // Tutup output stream
271         out.close();
272     }catch (Exception e){//Catch exception if any
273         System.err.println("Error: " + e.getMessage());
274     }
275 }
276
277 private void keluarButtonActionPerformed(java.awt.event.ActionEvent evt) {
278     System.exit(0);
279 }
280
281 private void hapusButtonActionPerformed(java.awt.event.ActionEvent evt) {
282     jumlahhariLabel.setText("");
283     tahunTextField.setText("");
284     bulanComboBox.setSelectedItem("Januari");
285 }
```

# Ganti TextField menjadi ComboBox

Aplikasi Penentu Jumlah Hari

Tahun

Bulan

Jumlah hari pada bulan Pebruari tahun 1900 adalah 28



PenentuJumlahHari.java



```
226 private void hitungButtonActionPerformed(java.awt.event.ActionEvent evt) {
227     if(tahunTextField.getText().isEmpty()){
228         JOptionPane.showMessageDialog(null, "Error: isian tahun kosong!",
229             "Error: isian tahun kosong!", JOptionPane.WARNING_MESSAGE);
230     }else{
231         int tahun = Integer.parseInt(tahunTextField.getText());
232         int jumlahHari;
233         if(bulanComboBox.getSelectedItem().equals("Pebruari")){
234             if ( ((tahun % 4 == 0) && !(tahun % 100 == 0)) || (tahun % 400 == 0) )
235                 jumlahHari = 29;
236             else jumlahHari = 28;
237         }else if(bulanComboBox.getSelectedItem().equals("April") ||
238             bulanComboBox.getSelectedItem().equals("Juni") ||
239             bulanComboBox.getSelectedItem().equals("September") ||
240             bulanComboBox.getSelectedItem().equals("Nopember")){
241             jumlahHari = 30;
242         }else{
243             jumlahHari = 31;
244         }
245         jumlahhariLabel.setText("Jumlah hari pada bulan " +
246             bulanComboBox.getSelectedItem() +
247             " tahun " + tahun + " adalah " + jumlahHari);
248     }
249 }
```

# Aplikasi Penampil Gambar dengan Button

GUI Component: **BorderLayout, Button, CardLayout**

Logic Programming: **none**

Event: **actionPerformed**

# Penampil Gambar (Button)





04 JAVA GUI - NetBeans IDE 6.9.1

File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help

<default config> Search (Ctrl+I)

Proj... Files Services

04 JAVA GUI

- Source Packages
  - calculator
  - frame
    - FullscreenFrame.java
  - img
  - layout
    - PilihGambarButton.java
    - PilihGambarButtonFullScreen.jav
    - PilihGambarComboBox.java
    - glassfish.jpg
    - javaee.jpg
    - postgresql.jpg
  - login
  - table

Navigator Inspector

Form PilihGambarButton

- Other Components
- [JFrame]
  - BorderLayout
    - buttonPanel [JPanel]
      - FlowLayout
        - glassfishBT [JButton]
        - javaeeBT [JButton]
        - postgresalBT [JButton]
        - exitBT [JButton]
      - imagePanel [JPanel]
        - CardLayout
          - label glassfishLB [JLabel]
          - label javaeeLB [JLabel]
          - label postgresqlLB [JLabel]

Source Design

PilihGambarButton.java FullScreenFrame.java Pilih

Glassfish JavaEE PostgreSQL Exit

Palette

- Swing Containers
  - Panel
  - Split Pane
  - Tool Bar
  - Internal Frame
  - Tabbed Pane
  - Scroll Pane
  - Desktop Pane
  - Layered Pane
- Swing Controls
  - Label
  - Toggle Button
  - Radio Button
  - Button
  - Check Box
  - Button Group

glassfishLB [JLabel] - Properties

Properties	Binding
font	Tahoma 11 Plain
foreground	[0,0,0]
horizontalAlignment	CENTER
icon	glassfish.jpg
labelFor	<none>
text	
toolTipText	null
verticalAlignment	CENTER
Other Properties	
UIClassID	LabelUI
alignmentX	0.0

Output - 04 JAVA GUI (run)

```
run:  
BUILD SUCCESSFUL (total time: 2 seconds)
```

04 JAVA GUI - NetBeans IDE 6.9.1

File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help

<default config> Search (Ctrl+I)

**Projects**

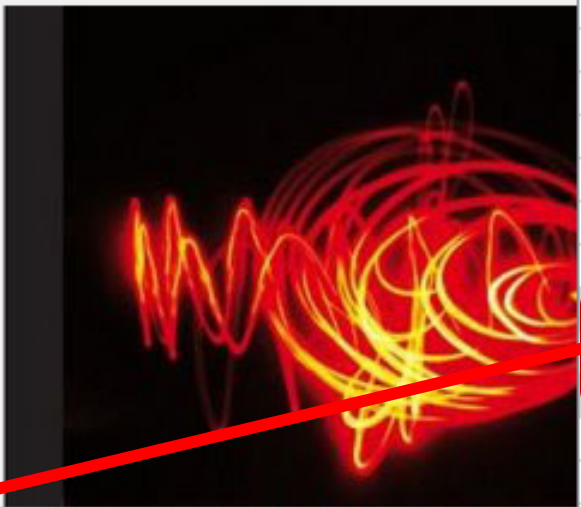
- Source Packages
  - calculator
  - img
  - layout
    - PilihGambarButt
    - PilihGambarCom
    - glassfish.jpg
    - javaee.jpg
    - postgresql.jpg
  - login

**Inspector**

- FlowLayout
  - glassfishBT [JButton]
  - javaeeBT [JButton]
  - postgresalBT [JButton]
  - exitBT [JButton]
- imagePanel [JPanel]
  - CardLayout
    - glassfishLB [JLabel]
    - javaeeLB [JLabel]
    - postgresqlLB [JLabel]

**Source** | **Design**

Glassfish JavaEE PostgreSQL



**glassfishLB [JLabel] - Properties**

Properties	Binding
inheritsPopupMenu	<input checked="" type="checkbox"/>
inputVerifier	<none>
insets	[0, 0, 0, 0]
maximumSize	[316, 400]
minimumSize	[316, 400]
name	null
nextFocusableComponent	<none>
opaque	<input type="checkbox"/>
paintingForPrint	<input type="checkbox"/>
preferredSize	[316, 400]
requestFocusEnabled	<input checked="" type="checkbox"/>
verifyInputWhenFocusT	<input checked="" type="checkbox"/>
verticalTextPosition	CENTER
Layout	
Card Name	0
Accessibility	
Accessible Name	0
Accessible Description	null
Accessible Parent	imagePanel

**Output - 04 JAVA GUI (run)**

```
run:
```

04 JAVA GUI (run) running... 105 | 5

Slide 115 of 132 "Network" 73%



...ava NewJFrame2.java PilihGambarButton.java PilihGambarComboBox.java glassfish.jpg

Source Design

```
104
105 private void glassfishBTActionPerformed(java.awt.event.ActionEvent evt) {
106     CardLayout cl = (CardLayout) (imagePanel.getLayout());
107     cl.show(imagePanel, "0");
108 }
109
110 private void javaeeBTActionPerformed(java.awt.event.ActionEvent evt) {
111     CardLayout cl = (CardLayout) (imagePanel.getLayout());
112     cl.show(imagePanel, "1");
113 }
114
115 private void postgresalBTActionPerformed(java.awt.event.ActionEvent evt) {
116     CardLayout cl = (CardLayout) (imagePanel.getLayout());
117     cl.show(imagePanel, "2");
118 }
119
120 private void exitBTActionPerformed(java.awt.event.ActionEvent evt) {
121     System.exit(0);
122 }
123
124 /**
125  * @param args the command line arguments
126  */
127 public static void main(String args[]) {
```

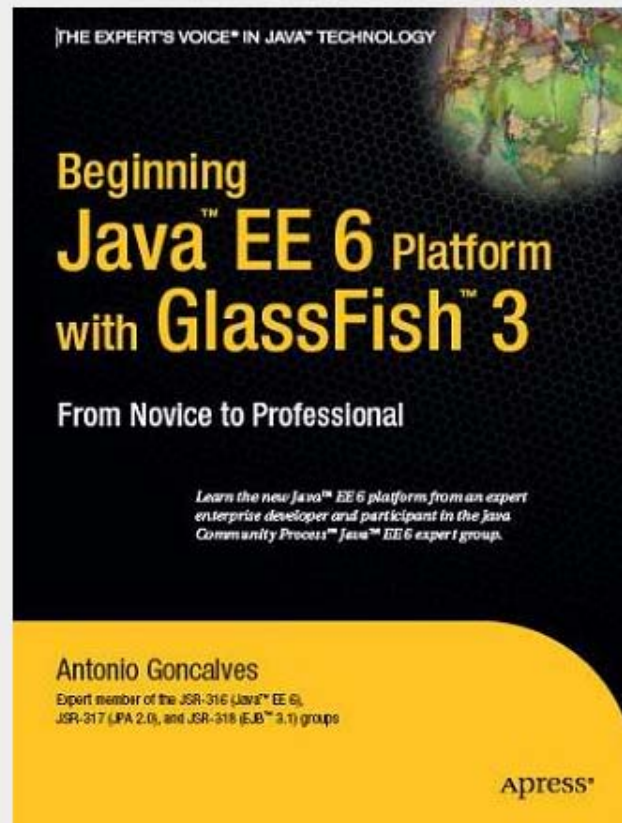


# Aplikasi Penampil Gambar dengan Button (FullScreen Undecorated)

GUI Component: **BorderLayout, Button, CardLayout**

Logic Programming: **none**

Event: **actionPerformed**



```
1
Refactor Run Debug Profile Team Tools Window Help
<default config> Search (Ctrl+I)
ulator.java Main.java PenampilGambar.java PilihGambarButton.java FullScreenFrame.java
public static void main(String args[]) {
    java.awt.EventQueue.invokeLater(new Runnable() {
        public void run() {
            PilihGambarButton fullFrame = new PilihGambarButton();

            GraphicsDevice device =
                GraphicsEnvironment.getLocalGraphicsEnvironment().getDefaultScreenDevice();
            device.setFullScreenWindow(fullFrame);

            fullFrame.setVisible(true);
        }
    });
}

// Variables declaration - do not modify
private javax.swing.JPanel buttonPanel;
private javax.swing.JButton exitBT;
private javax.swing.JButton glassfishBT;
private javax.swing.JLabel glassfishLB;
private javax.swing.JPanel imagePanel;
private javax.swing.JButton javaeeBT;
```

04 JAVA GUI - NetBeans IDE 6.9.1

File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help

<default config> Search (Ctrl+I)

Proj... Files Services ...ava FullScreenFrame.java PilihGambarButtonFullScreen.java

Source Design

Glassfish JavaEE PostgreSQL Exit

calculator  
frame  
  FullScreenFrame.java  
img  
layout  
  PilihGambarButton.java  
  PilihGambarButtonFullScreen.jav  
  PilihGambarComboBox.java  
  glassfish.jpg  
  javaee.jpg  
  postgresql.jpg  
login  
table  
text2speech  
textfield

Navigator Inspector

Form PilihGambarButtonFullScreen  
Other Components  
[JFrame]

Swing Containers  
Panel Tabbed Pane  
Split Pane Scroll Pane  
Tool Bar Desktop Pane  
Internal Frame Layered Pane

Swing Controls  
label Label OK Button

[JFrame] - Properties

Properties	Binding
maximizedBounds	null
maximumSize	[2147483647, 214...
minimumSize	[356, 486]
modalExclusionType	NO_EXCLUDE
name	frame4
preferredSize	[356, 486]
resizable	<input checked="" type="checkbox"/>
state	0
<b>undecorated</b>	<input checked="" type="checkbox"/>
Accessibility	
Accessible Name	
Accessible Description	null
Accessible Parent	<none>

Output - 04 JAVA GUI (run)

```
run:  
BUILD SUCCESSFUL (total time: 2 seconds)
```

# Aplikasi Penampil Gambar dengan ComboBox

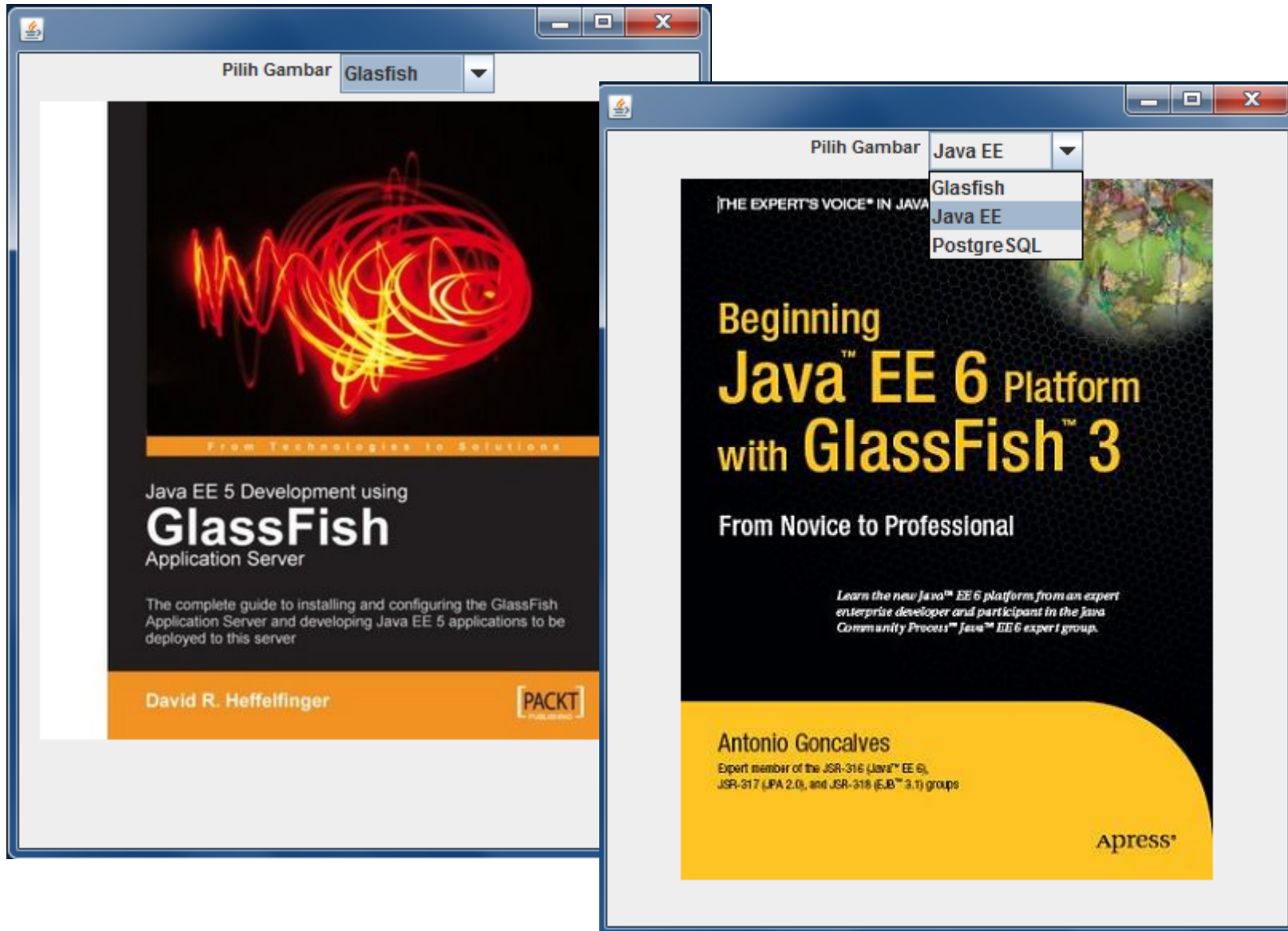
GUI Component: **ComboBox, CardLayout**

Logic Programming: **none**

Event: **itemStateChanged**



# Penampil Gambar (ComboBox)



Source

Design



```
27 -    /** This method is called from within the constructor to
28     * initialize the form.
29     * WARNING: Do NOT modify this code. The content of this method is
30     * always regenerated by the Form Editor.
31     */
32     @SuppressWarnings("unchecked")
33 +    Generated Code
109
110 -    private void pilihanpilihCard(java.awt.event.ItemEvent evt) {
111         CardLayout cl = (CardLayout) (pCardLayout.getLayout());
112         cl.show(pCardLayout, String.valueOf(pilihan.getSelectedIndex()));
113     }
114
115
```

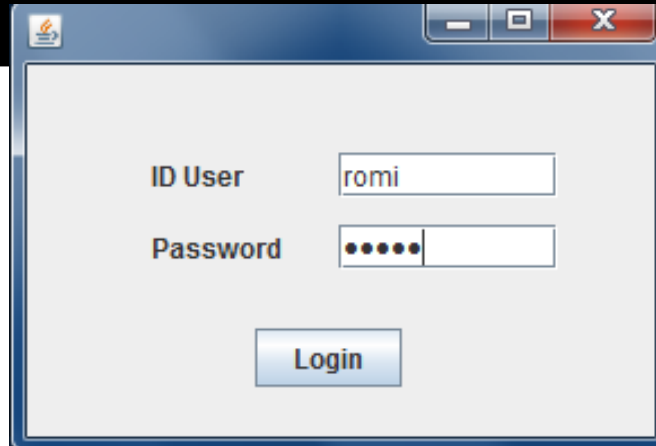
# Login Form dan Konfirmasi Keluar Aplikasi

GUI Component: **TextField, PasswordField, Menu Bar, Menu Item**

Logic Programming: **If-Else**

Event: **KeyPressed**



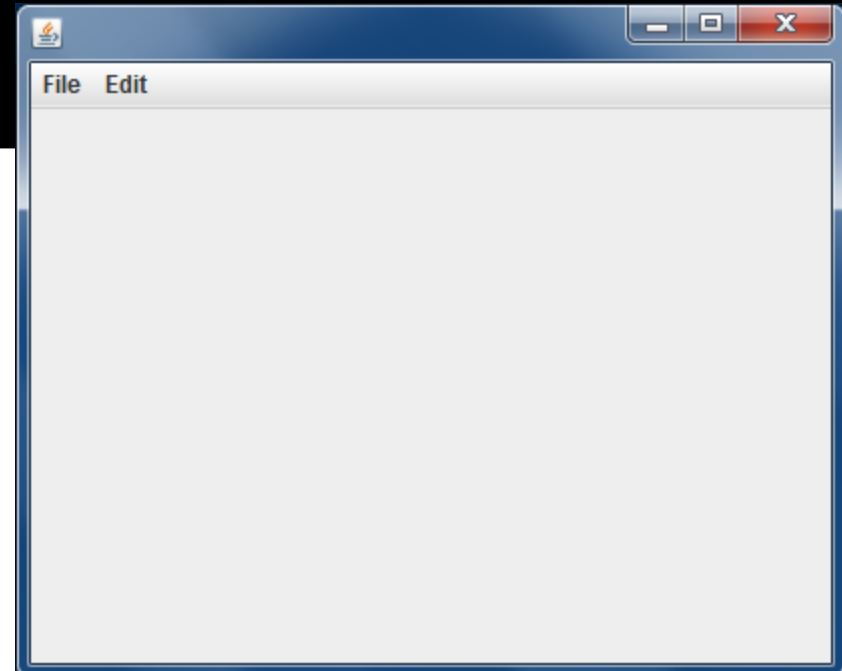


A login form window with a title bar containing a small icon and standard window controls (minimize, maximize, close). The form contains two input fields: "ID User" with the text "romi" and "Password" with five dots. Below the fields is a "Login" button.

ID User

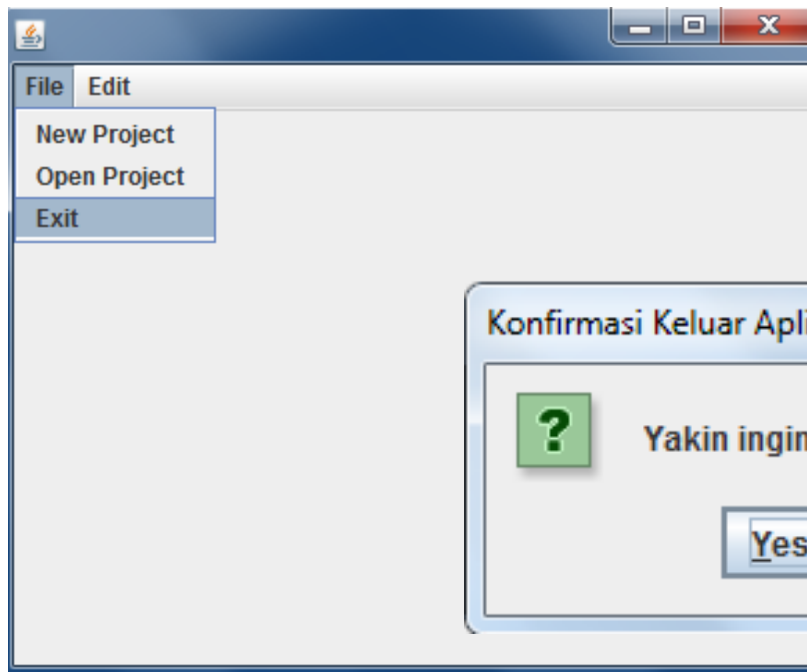
Password

Login



An empty application window with a title bar and a menu bar containing "File" and "Edit". The main area is blank.

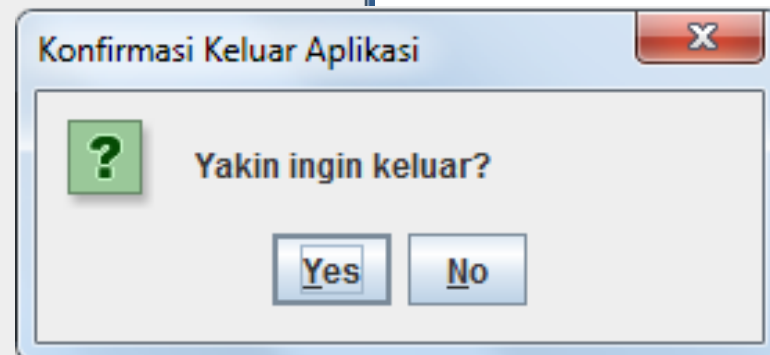
File Edit



An application window with a title bar and a menu bar containing "File" and "Edit". The "File" menu is open, showing "New Project", "Open Project", and "Exit".

File Edit

- New Project
- Open Project
- Exit



A confirmation dialog box titled "Konfirmasi Keluar Aplikasi" with a close button. It contains a question mark icon and the text "Yakin ingin keluar?". Below the text are "Yes" and "No" buttons.

Konfirmasi Keluar Aplikasi

? Yakin ingin keluar?

Yes No

# Aplikasi Penentu Nilai Mahasiswa

GUI Component: **Label, TextField, Button**

Logic Programming: **if-else, switch**

Event: **actionPerformed, keyTyped**

# Aplikasi Penentu Nilai Mahasiswa

Aplikasi Penentu Nilai Mahasiswa

Nama Lengkap

Nilai

UTS

TM

UAS

Hasil

Nama:

Nilai Rata-Rata:

Grade:

Hasil:

Hitung Bersihkan Simpan Keluar

Konfirmasi Keluar Aplikasi

? Yakin ingin keluar?

Yes No

Nilai Rata-Rata:

$$\text{UTS} + \text{TM} + \text{UAS} / 3$$

Grade:

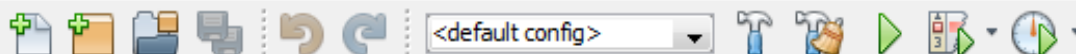
1. 90-: **A**
2. 80-89: **B**
3. 70-79: **C**

Hasil:

1. A-C: **Lulus**
2. D: **Tidak Lulus**

Fitur Tambahan:

1. Error dialog muncul ketika input **nilai bukan numerik**, nilai **tidak antara 0-100**, atau **isian kosong**
2. Konfirmasi ketika **keluar aplikasi**



Files

- layout
- login
- table
- text2speec
- textfield
  - Biodata
  - Celcius
  - Celcius
  - Filter.ja
  - Hitungl
  - Kalkula
  - LoginFc
  - Operas
  - Penent
- Test Packages

Members View

- HitungNilai :: JFrame
  - HitungNilai()
  - bersihButtonActionPer
  - filterKeyTyped(KeyEve
  - hitungButtonActionPer
  - hitungButtonKeyPresse
  - initComponents()
  - keluarButtonActionPer
  - main(String[] args)
  - simpanButtonActionPer
  - tmTextFieldKeyPressec
  - tmTextFieldKeyTyped()

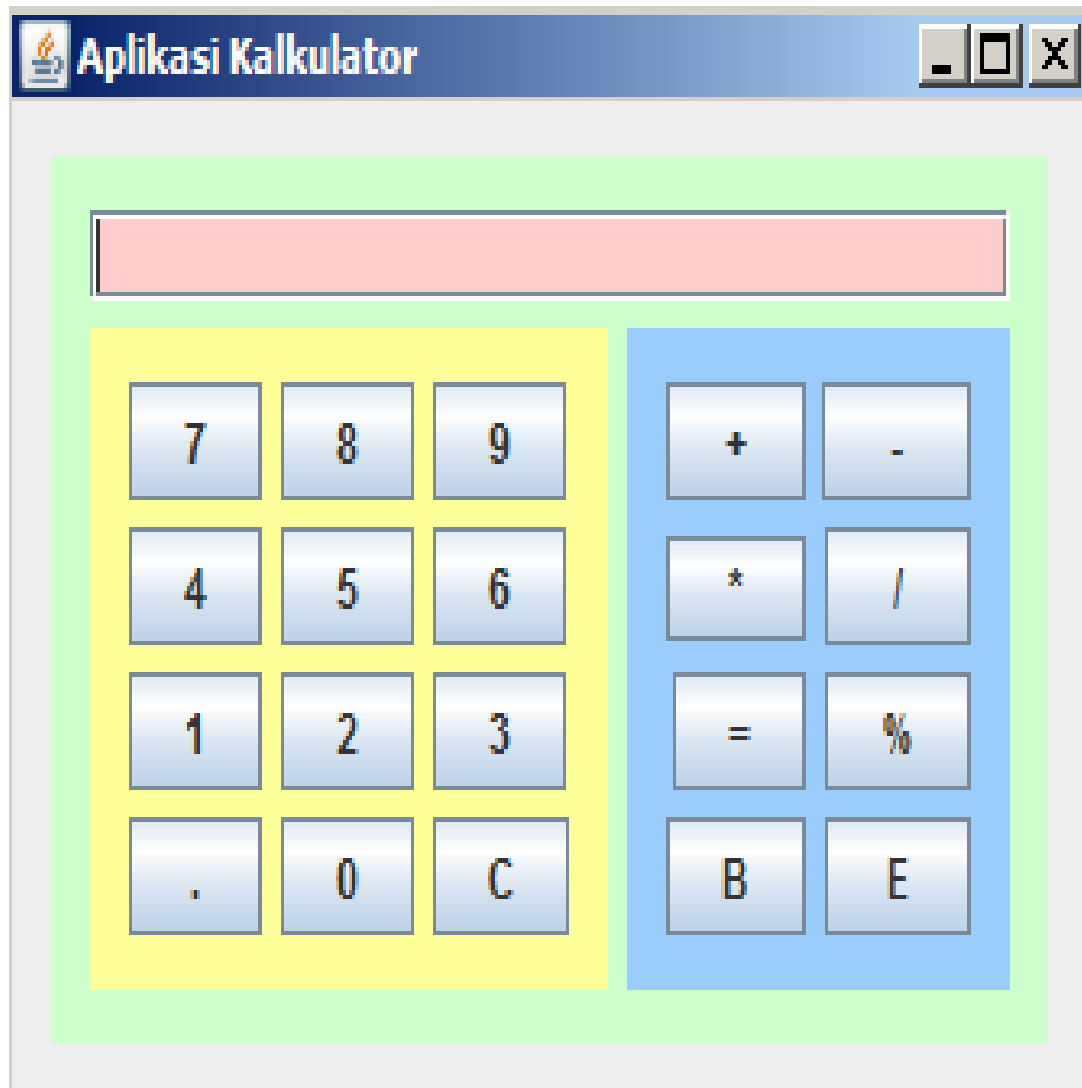
```
384
385 private void keluarButtonActionPerformed(java.awt.event.ActionEvent evt) {
386     int reply = JOptionPane.showConfirmDialog(
387         null,
388         "Loh, Yakin Mau Keluar?",
389         "Konfirmasi Keluar Aplikasi",
390         JOptionPane.YES_NO_OPTION);
391     if (reply == JOptionPane.YES_OPTION) {
392         System.exit(0);
393     }
394 }
395
396 private void simpanButtonActionPerformed(java.awt.event.ActionEvent evt) {
397     try{
398         // Buat file
399         BufferedWriter out = new BufferedWriter(new FileWriter("hitungnilai.txt"));
400         // tampung hasil yang akan disimpan
401         String hasil = namaLabel.getText() + '\n' +
402             nilaiLabel.getText() + '\n' +
403             gradeLabel.getText() + '\n' +
404             hasilLabel.getText();
405         out.write(hasil);
406         // Tampilkan diaglog bila berhasil
407         JOptionPane.showMessageDialog(null, "Berhasil Disimpan dalam File");
408         // Tutup output stream
409         out.close();
410     }catch (Exception e){
411         System.err.println("Error: " + e.getMessage());
412     }
413 }
```

# Aplikasi Kalkulator

GUI Component: **Panel, TextArea, Button**

Logic Programming: **If-Else, Switch**

# Aplikasi Kalkulator



1. Cara bekerja seperti **kalkulator**
2. Tombol yang kita tekan akan muncul di layar
3. Hasil perhitungan akan muncul di layar
4. Keterangan:  
C = clear layar  
B = backspace

# Hints: Tahapan Kerja Kalkulator

7 + 8 = 15  
operandSatu operator operandDua samadengan hasil

1. **operandSatu**: tampilkan angka yg ditekan di layar
2. **operator**:
  1. Ambil yang ada di layar, simpan sebagai variable **operandSatu**
  2. Beri tanda operator apa yg dijalankan (+, -, \*, dst)
3. **operandDua**: tampilkan angka yg ditekan di layar
4. **samadengan**:
  1. Ambil yang ada di layar, simpan sebagai variable **operandDua**
  2. Buat keputusan (if or switch), **operator** apa yang digunakan dan proses apa yg dilakukan

```
if(operator.equals("+")){  
    layar.setText(operandSatu + operandDua);  
}else if(){ ...  
}
```

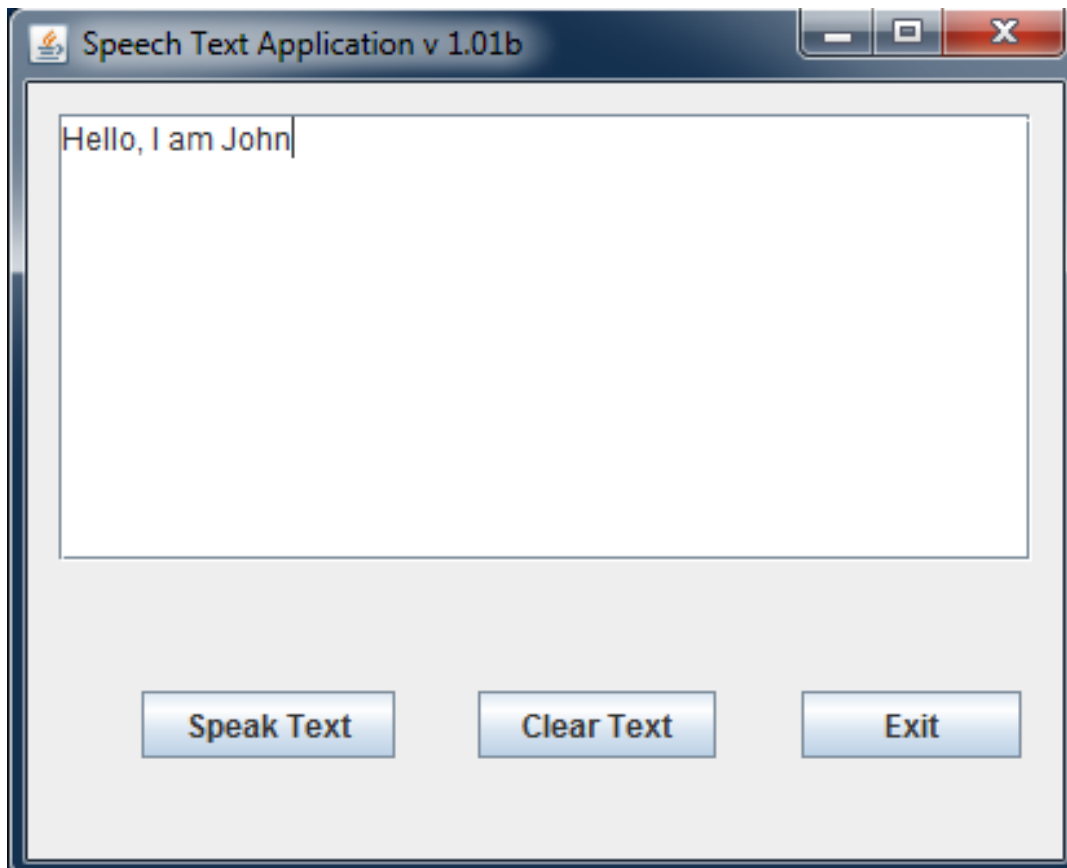
# Aplikasi Text to Voice

GUI Component: **CheckBox, ComboBox, RadioButton, TextArea**

Logic Programming: **If-Else**



# Aplikasi Text to Voice



1. Masukkan text berupa kalimat ke dalam TextArea
2. Ketika tombol Speak Text, maka text yang telah ditulis akan dibuah ke dalam bentuk voice (bisa membacakan)
3. Hints:
  - Gunakan library FreeTTS dari <http://sourceforge.net/projects/freeetts/>

# Aplikasi Biodata Organisasi

GUI Component: **CheckBox, ComboBox, RadioButton, TextArea**

Logic Programming: **If-Else**

# Aplikasi Biodata Organisasi

Basic Application Example

File Tool Help

Nama


Alamat

Pekerjaan PNS

Jenis Kelamin  Laki-Laki  Perempuan

Cetak Tebal  Ya

Cetak Miring  Ya

1. Nama dan Alamat ditulis
2. Pekerjaan (PNS, TNI, Karyawan, Pengusaha) dipilih
3. Jenis Kelamin dipilih
4. Cetak tebal di cek
5. Ketika klik Tampilan, maka data akan ditampilkan di **TextArea** di bawah
6. Tombol Simpan 

# Hints

```
Font tebal = new Font("Arial", Font.BOLD, 12)
```

```
Font tipis = new Font("Arial", Font.PLAIN, 12)
```

```
if(yaTebal.getText().equals("Ya")){
```

```
    hasilTextArea.setFont(tebal);
```

```
}else{
```

```
    hasilTextArea.setFont(tipis);
```

```
}
```

# Aplikasi Biodata Mahasiswa

GUI Component: **Menubar,**  
**MenuItem, Table**

# Aplikasi Biodata Mahasiswa

Sistem Biodata Mahasiswa

File Modifikasi Bantuan

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NIM: 12387

Jurusan: Teknik Informatika

Alamat: Jakarta

Phone: 08158231

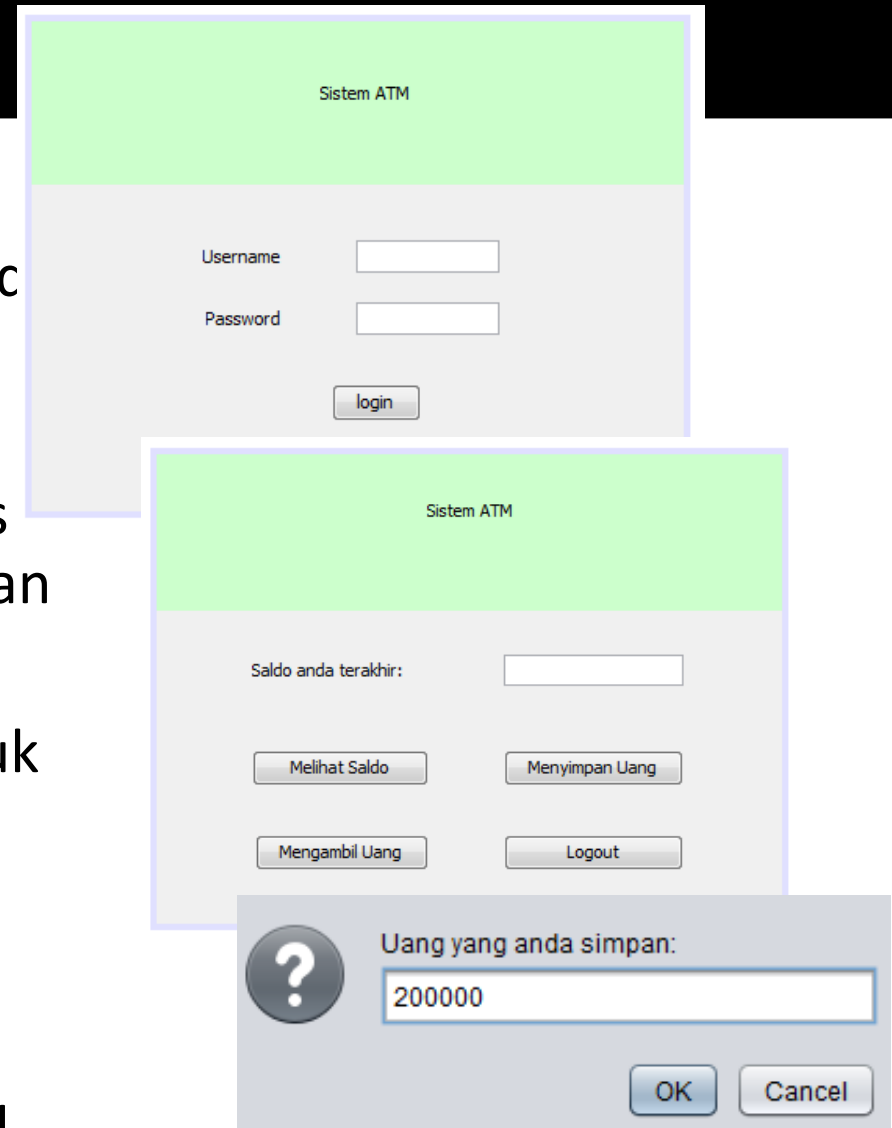
Nama	NIM	Jurusan	Alamat	Phone
Romi Satria W...	12387	Teknik Inform...	Jakarta	08158231

Tambahkan Bersihkan Hapus Simpan Keluar

1. Aplikasi dengan frame lengkap beserta menubar dan menuitem
2. Data diisi kemudian diklik **Tambahkan** maka data akan masuk ke table
3. **Bersihkan**: membersihkan isian di Textfield
4. **Hapus**: menghapus record di table
5. **Simpan**: menyimpan record di file

# Sistem ATM

- Kembangkan aplikasi Bank yang sudah pernah kita bangun, menjadikan Sistem ATM yang berbasis ke GUI
- Gunakan class **Bank.java** sebagai class control yang membantu proses melihat saldo, mengambil uang dan menyimpan uang
- Gunakan perpindahan **frame** untuk MenuLogin dan MenuUtama
- Gunakan **dialog** (**JOptionPane.showInputDialog**) untuk mengambil data pada Menyimpan Uang dan Mengambil Uang



# Konversi Kurs Mata Uang

Konversi Kurs Mata Uang

RP

USD



# Konversi Kurs Mata Uang Lengkap

1 USD = 10800 RP

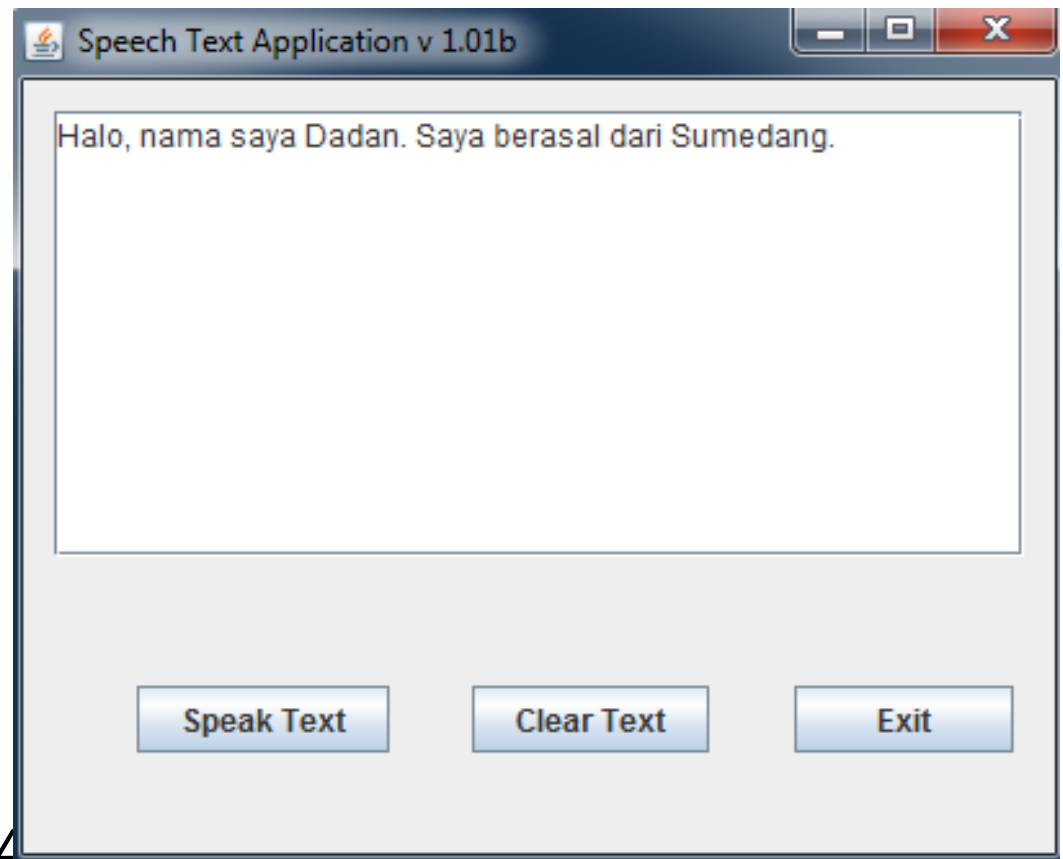
1 EUR = 12737 RP

1 JPY = 99 RP

The screenshot shows a software window with a light green header containing the title "Konversi Kurs Mata Uang Lengkap". The main area has a light gray background. On the left, there is a dropdown menu currently set to "USD", with a list of options: "RP", "USD", "JPY", and "EUR". To the right of this menu is an empty text input field. Further right is another dropdown menu set to "RP", followed by another empty text input field. Below these elements is a button labeled "Konversi".

# Text to Speech

- Searching di Google dengan keyword “Free TTS jar”
- Download library dan masukkan freetts.jar ke dalam direktori libraries dengan **klik kanan** → **add jar/folder**
- Buat user interface design, dan buat event pada tombol Speak Text yang berisi logic code untuk mengeluarkan suara dari text (hanya perlu 4 baris code)



# Tugas

- Kerjakan semua latihan dan tugas yang ada di slide **Java GUI**
- Kirimkan netbeans project yang sudah di zip ke [romi@brainmatics.com](mailto:romi@brainmatics.com) dengan subyek: **[OOP3-Universitas] Nama-NIM**
- Deadline: **2 minggu**
- Meng-copy file orang lain akan menyebabkan **nilai tugas 0**

# Tugas

- Buat program apapun berbasis GUI, yang bisa bikin WOW!
- Gunakan apapun yang ada baik library, third party GUI
- Buat laporan dalam bentuk ppt, dan sajikan di mana letak WOWnya 😊
- Deadline: 2 minggu
- Kirimkan melalui email ke [romi@brainmatics.com](mailto:romi@brainmatics.com) dengan subject: [OOPWow-Universitas] NAMA - NIM

# Referensi

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