# Module 12

## GUI-Based Applications

# Objectives

- Identify the key AWT components and the events that they trigger
- Describe how to construct a menu bar, menu, and menu items in a Java GUI
- Understand how to change the color and font of a component

# Relevance

- You now know how to set up a Java GUI for both graphic output and interactive user input. However, only a few of the components from which GUIs can be built have been described. What other components would be useful in a GUI?

- How can you create a menu for your GUI frame?

# AWT Components

| Component Type | Description |
| --- | --- |
| Button | A named rectangular box used for receiving mouse clicks |
| Canvas | A panel used for drawing |
| Checkbox | A component enabling the user to select an item |
| CheckboxMenuItem | A checkbox within a menu |
| Choice | A pull-down static list of items |
| Component | The parent of all AWT components, except menu components |
| Container | The parent of all AWT containers |
| Dialog | A top-level window with a title and a border; dialogs can be modeless or modal |
| Frame | The base class of all GUI windows with window manager controls |

# AWT Components

| Component Type | Description |
| --- | --- |
| Label | A text string component |
| List | A component that contains a dynamic set of items |
| Menu | An element under the menu bar, which contains a set of menu items |
| MenuItem | An item within a menu |
| Panel | A basic container class used most often to create complex layouts |
| Scrollbar | A component that enables a user to *select from a range of values* |
| ScrollPane | A container class that implements automatic horizontal and vertical scrolling for a single child component |

# AWT Components

| Component Type | Description |
| --- | --- |
| TextArea | A component that enables the user to enter a block of text |
| TextField | A component that enables the user to enter a single line of text |
| Window | The base class of all GUI windows, without window manager controls |

# AWT Listeners

| Component Type | Act | Adj | Cmp | Cnt | Foc | Itm | Key | Mou | MM | Text | Win |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Button | ✓ | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |
| Canvas | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |
| Checkbox | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Checkbox-MenuItem | | | | | | ✓ | | | | | |
| Choice | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Component | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |
| Container | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| Dialog | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| Frame | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| Label | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |

# AWT Listeners

| Component Type | Act | Adj | Cmp | Cnt | Foc | Itm | Key | Mou | MM | Text | Win |
|---|---|---|---|---|---|---|---|---|---|---|---|
| List | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| MenuItem | ✓ | | | | | | | | | | |
| Panel | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| Scrollbar | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |
| ScrollPane | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| TextArea | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| TextField | ✓ | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| Window | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |

# How to Create a Menu

1. Create a `MenuBar` object, and set it into a menu container, such as a `Frame`.

2. Create one or more `Menu` objects, and add them to the menu bar object.

3. Create one or more `MenuItem` objects, and add them to the menu object.

# Creating a MenuBar

```
1    Frame f = new Frame("MenuBar");
2    MenuBar mb = new MenuBar();
3    f.setMenuBar(mb);
```
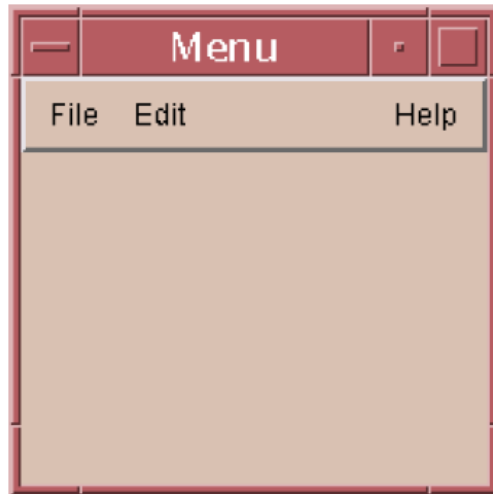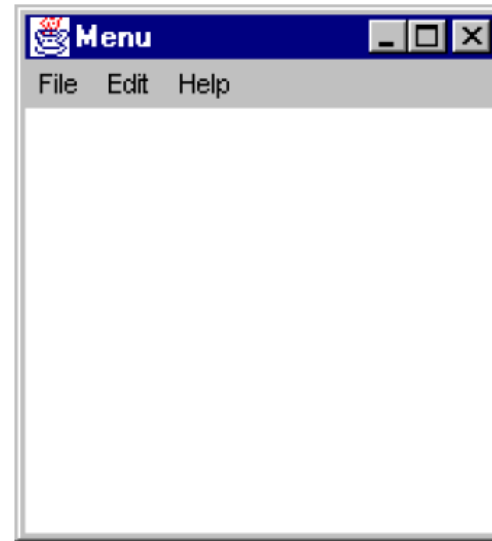


Solaris OS
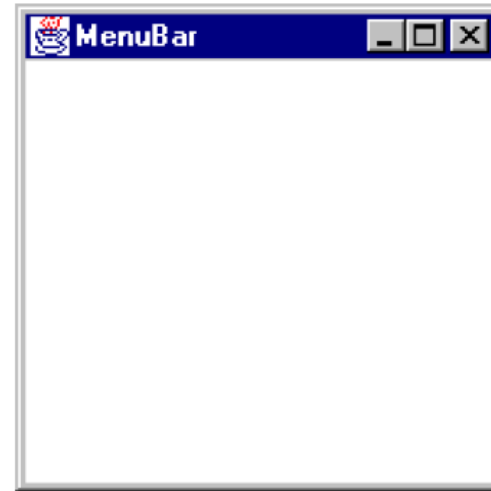


Microsoft Windows

# Creating a Menu

```
1    Frame f = new Frame("Menu");
2    MenuBar mb = new MenuBar();
3    Menu m1 = new Menu("File");
4    Menu m2 = new Menu("Edit");
5    Menu m3 = new Menu("Help");
6    mb.add(m1);
7    mb.add(m2);
8    mb.setHelpMenu(m3);
9    f.setMenuBar(mb);
```

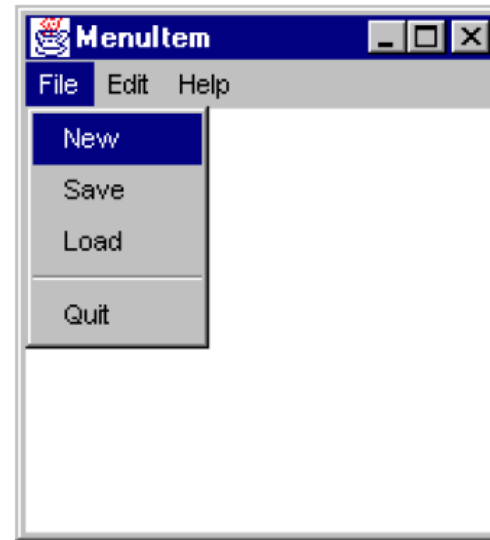# Creating a Menu



Solaris OS



Microsoft Windows

# Creating a `MenuItem`

```
1    MenuItem mi1 = new MenuItem("New");
2    MenuItem mi2 = new MenuItem("Save");
3    MenuItem mi3 = new MenuItem("Load");
4    MenuItem mi4 = new MenuItem("Quit");
5    mi1.addActionListener(this);
6    mi2.addActionListener(this);
7    mi3.addActionListener(this);
8    mi4.addActionListener(this);
9    m1.add(mi1);
10   m1.add(mi2);
11   m1.add(mi3);
12   m1.addSeparator();
13   m1.add(mi4);
```

# Creating a `MenuItem`



Solaris OS
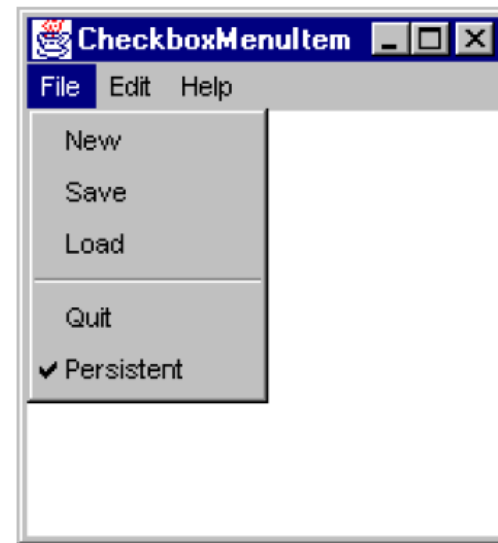


Microsoft Windows

# Creating a `CheckBoxMenuItem`

```
1    MenuBar mb = new MenuBar();
2    Menu m1 = new Menu("File");
3    Menu m2 = new Menu("Edit");
4    Menu m3 = new Menu("Help");
5    mb.add(m1);
6    mb.add(m2);
7    mb.setHelpMenu(m3);
8    f.setMenuBar(mb);
9    .....
10   MenuItem mi2 = new MenuItem("Save");
11   mi2.addActionListener(this);
12   m1.add(mi2);
13   ......
14   CheckboxMenuItem mi5 = new CheckboxMenuItem("Persistent");
15   mi5.addItemListener(this);
16   m1.add(mi5);
```

# Creating a `CheckBoxMenuItem`
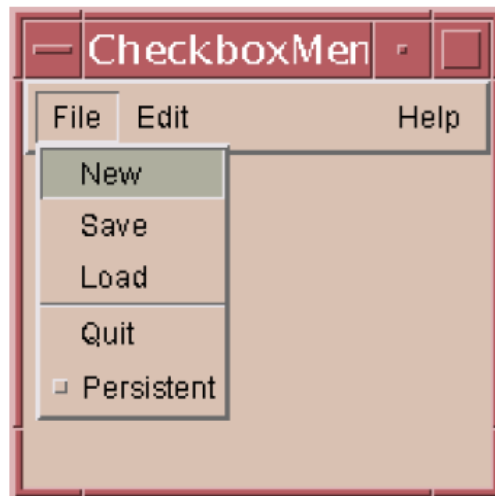


Solaris OS



Microsoft Windows

# Controlling Visual Aspects

Commands to control visual aspects of the GUI include:

- Colors:

  ```
  setForeground()
  setBackground()
  ```

- Example:

  ```
  Color purple = new Color(255, 0, 255);
  Button b = new Button("Purple");
  b.setBackground(purple);
  ```

# J.F.C./Swing Technology

- Java Foundation Class/Swing (J.F.C./Swing) technology is a second-generation GUI toolkit.

- It builds on top of AWT, but supplants the components with *lightweight* versions.

- There are many more components, and much more complex components, including `JTable`, `JTree`, and `JComboBox`.