Unit 4

SWING

The Origins of Swing

- Swing did not exist in the early days of Java.
- Rather, it was a response to deficiencies present in Java's original GUI subsystem: the Abstract Window Toolkit.
- The AWT defines a basic set of controls, windows, and dialog boxes that support a usable, but limited graphical interface.
- One reason for the limited nature of the AWT is that it translates its various visual components into their corresponding, platform-specific equivalents, or peers.
- This means that the look and feel of a component is defined by the platform, not by Java.
- Because the AWT components use native code resources, they are referred to as heavyweight

- The use of native peers led to several problems.
- First, because of variations between operating systems, a component might look, or even act, differently on different platforms.
- This potential variability threatened the overarching philosophy of Java: write once, run anywhere.
- Second, the look and feel of each component was fixed (because it is defined by the platform) and could not be (easily) changed.
- Third, the use of heavyweight components caused some frustrating restrictions.

- Not long after Java's original release, it became apparent that the limitations and restrictions present in the AWT were sufficiently serious that a better approach was needed.
- The solution was Swing.
- Introduced in 1997, Swing was included as part of the JavaFoundation Classes (JFC).
- Swing was initially available for use with Java 1.1 as a separate library.
- However, beginning with Java 1.2, Swing (and the rest of the JFC) was fully integrated into Java

Swing Is Built on the AWT

- Although Swing eliminates a number of the limitations inherent in the AWT, Swing does not replace it.
- Instead, Swing is built on the foundation of the AWT.
- This is why the AWT is still a crucial part of Java.
- Swing also uses the same event handling mechanism as the AWT.
- Therefore, a basic understanding of the AWT and of event handling is required to use Swing.

Two Key Swing Features

- As just explained, Swing was created to address the limitations present in the AWT.
- It does this through two key features: lightweight components and a pluggable look and feel.
- Together they provide an elegant, yet easy-to-use solution to the problems of the AWT.
- More than anything else, it is these two features that define the essence of Swing

1. Swing Components Are Lightweight

- With very few exceptions, Swing components are lightweight.
- This means that they are written entirely in Java and do not map directly to platform-specific peers.
- Because light weight components are rendered using graphics primitives, they can be transparent.
- Thus, lightweight components are more efficient and more flexible.
- Furthermore, because lightweight components do not translate into native peers, the look and feel of each component is determined by Swing, not by the underlying operating system.
- This means that each component will work in a consistent manner across all platforms.

2. Swing Supports a Pluggable Look and Feel

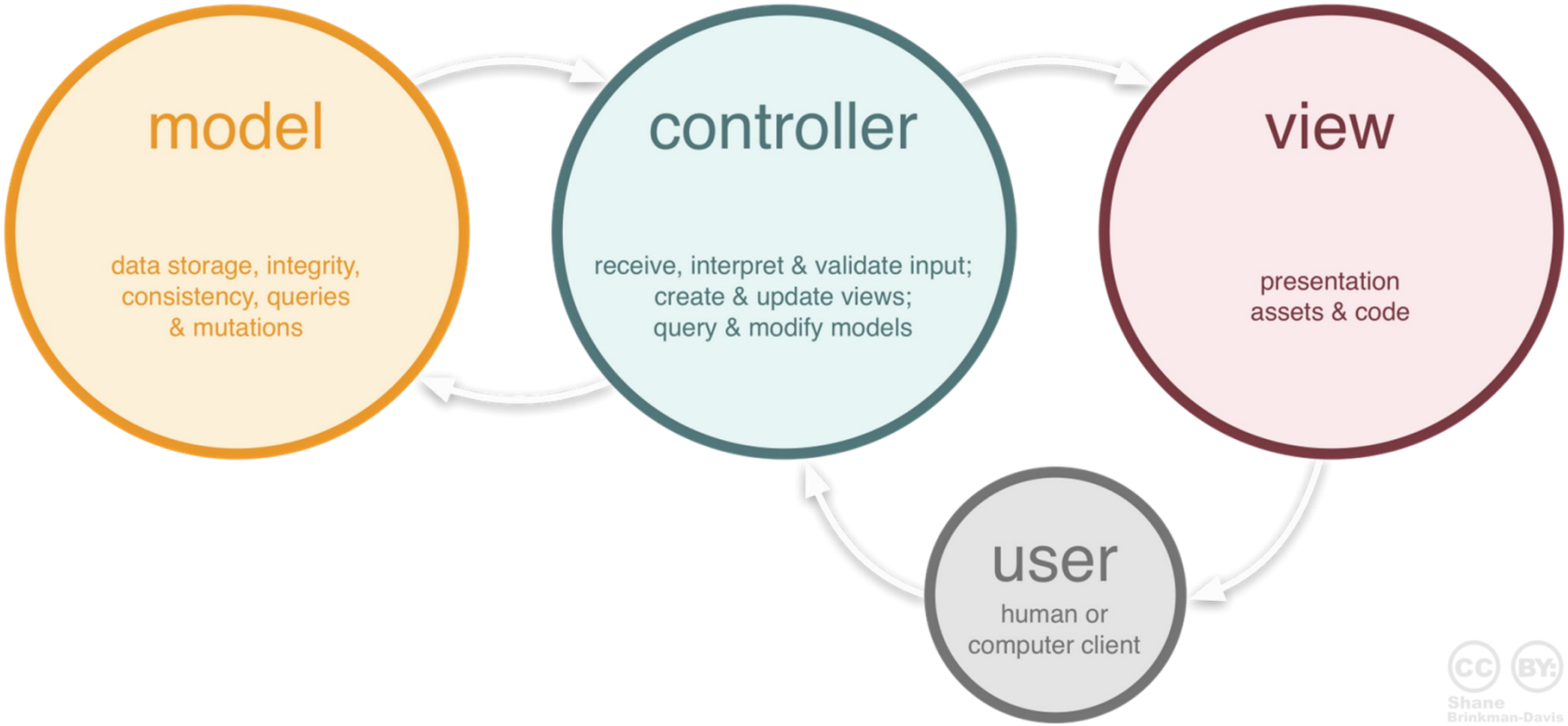
- Swing supports a pluggable look and feel (PLAF).
- Because each Swing component is rendered by Java code rather than by native peers, the look and feel of a component is under the control of Swing.
- This fact means that it is possible to separate the look and feel of a component from the logic of the component, and this is what Swing does.
- Separating out the look and feel provides a significant advantage: it becomes possible to change the way that a component is rendered without affecting any of its other aspects.
- In other words, it is possible to "plug in" a new look and feel for any given component without creating any side effects in the code that uses that component.

- Moreover, it becomes possible to define entire sets of look-and-feels that represent different GUI styles.
- To use a specific style, its look and feel is simply "plugged in."
- Once this is done, all components are automatically rendered using that style
- Pluggable look-and-feels offer several important advantages.
- It is possible to define a look and feel that is consistent across all platforms.
- Conversely, it is possible to create a look and feel that acts like a specific platform.
- For example, if you know that an application will be running only in a Windows environment, it is possible to specify the Windows look and feel.
- It is also possible to design a custom look and feel

- Finally, the look and feel can be changed dynamically at run time.
- Java SE 6 provides look-and-feels, such as metal and Motif, that are available to all Swing users.
- The metal look and feel is also called the Java look and feel.
- It is platform-independent and available in all Java execution environments.

The MVC Connection

- In general, a visual component is a composite of three distinct aspects:·
  - The way that the component looks when rendered on the screen
  - The way that the component reacts to the user
  - The state information associated with the component
- No matter what architecture is used to implement a component, it must implicitly contain these three parts.
- Over the years, one component architecture has proven itself to be exceptionally effective:
- Model-View-Controller, or MVC for short.



- The MVC architecture is successful because each piece of the design corresponds to an aspect of a component.
- In MVC terminology, the model corresponds to the state information associated with the component.
- For example, in the case of a check box, the model contains a field that indicates if the box is checked or unchecked.
- The view determines how the component is displayed on the screen, including any aspects of the view that are affected by the current state of the model.
- The controller determines how the component reacts to the user.

- For example, when the user clicks a check box, the controller reacts by changing the model to reflect the user 's choice (checked or unchecked).
- This then results in the view being updated. By separating a component into a model, a view, and a controller, the specific implementation of each can be changed without affecting the other two.
- For instance, different view implementations can render the same component in different ways without affecting the model or the controller
- Although the MVC architecture and the principles behind it are conceptually sound, the high level of separation between the view and the controller is not beneficial for Swing components.

Components and Containers

- A Swing GUI consists of two key items: components and containers. However, this distinction is mostly conceptual because all containers are also components.
- The difference between the two is found in their intended purpose: As the term is commonly used, a component is an independent visual control, such as a push button or slider.
- A container holds a group of components. Thus, a container is a special type of component that is designed to hold other components. Furthermore, in order for a component to be displayed, it must be held within a container.
- Thus, all Swing GUIs will have at least one container. Because containers are components, a container can also hold other containers.