| | [**Overview**](http://docs.google.com/overview-summary.html) | [**Package**](http://docs.google.com/package-summary.html) | **Class** | [**Use**](http://docs.google.com/class-use/WindowEvent.html) | [**Tree**](http://docs.google.com/package-tree.html) | [**Deprecated**](http://docs.google.com/deprecated-list.html) | [**Index**](http://docs.google.com/index-files/index-1.html) | [**Help**](http://docs.google.com/help-doc.html) | | --- | --- | --- | --- | --- | --- | --- | --- | | | ***Java™ Platform***  ***Standard Ed. 6*** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [**PREV CLASS**](http://docs.google.com/java/awt/event/WindowAdapter.html)   [**NEXT CLASS**](http://docs.google.com/java/awt/event/WindowFocusListener.html) | [**FRAMES**](http://docs.google.com/index.html?java/awt/event/WindowEvent.html)    [**NO FRAMES**](http://docs.google.com/WindowEvent.html)     [**All Classes**](http://docs.google.com/allclasses-noframe.html) |
| SUMMARY: NESTED | [FIELD](#3znysh7) | [CONSTR](#1t3h5sf) | [METHOD](#4d34og8) | DETAIL: [FIELD](#lnxbz9) | [CONSTR](#qsh70q) | [METHOD](#147n2zr) |

## **java.awt.event**

Class WindowEvent

[java.lang.Object](http://docs.google.com/java/lang/Object.html)  
 [java.util.EventObject](http://docs.google.com/java/util/EventObject.html)  
 [java.awt.AWTEvent](http://docs.google.com/java/awt/AWTEvent.html)  
 [java.awt.event.ComponentEvent](http://docs.google.com/java/awt/event/ComponentEvent.html)  
 **java.awt.event.WindowEvent**

**All Implemented Interfaces:** [Serializable](http://docs.google.com/java/io/Serializable.html)

public class **WindowEvent**extends [ComponentEvent](http://docs.google.com/java/awt/event/ComponentEvent.html)

A low-level event that indicates that a window has changed its status. This low-level event is generated by a Window object when it is opened, closed, activated, deactivated, iconified, or deiconified, or when focus is transfered into or out of the Window.

The event is passed to every WindowListener or WindowAdapter object which registered to receive such events using the window's addWindowListener method. (WindowAdapter objects implement the WindowListener interface.) Each such listener object gets this WindowEvent when the event occurs.

**Since:** JDK1.1 **See Also:**[WindowAdapter](http://docs.google.com/java/awt/event/WindowAdapter.html), [WindowListener](http://docs.google.com/java/awt/event/WindowListener.html), [Tutorial: Writing a Window Listener](http://java.sun.com/docs/books/tutorial/post1.0/ui/windowlistener.html), [Serialized Form](http://docs.google.com/serialized-form.html#java.awt.event.WindowEvent)

| **Field Summary** | |
| --- | --- |
| static int | [**WINDOW\_ACTIVATED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_ACTIVATED)            The window-activated event type. |
| static int | [**WINDOW\_CLOSED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_CLOSED)            The window closed event. |
| static int | [**WINDOW\_CLOSING**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_CLOSING)            The "window is closing" event. |
| static int | [**WINDOW\_DEACTIVATED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_DEACTIVATED)            The window-deactivated event type. |
| static int | [**WINDOW\_DEICONIFIED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_DEICONIFIED)            The window deiconified event type. |
| static int | [**WINDOW\_FIRST**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_FIRST)            The first number in the range of ids used for window events. |
| static int | [**WINDOW\_GAINED\_FOCUS**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_GAINED_FOCUS)            The window-gained-focus event type. |
| static int | [**WINDOW\_ICONIFIED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_ICONIFIED)            The window iconified event. |
| static int | [**WINDOW\_LAST**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_LAST)            The last number in the range of ids used for window events. |
| static int | [**WINDOW\_LOST\_FOCUS**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_LOST_FOCUS)            The window-lost-focus event type. |
| static int | [**WINDOW\_OPENED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_OPENED)            The window opened event. |
| static int | [**WINDOW\_STATE\_CHANGED**](http://docs.google.com/java/awt/event/WindowEvent.html#WINDOW_STATE_CHANGED)            The window-state-changed event type. |

| **Fields inherited from class java.awt.event.**[**ComponentEvent**](http://docs.google.com/java/awt/event/ComponentEvent.html) |
| --- |
| [COMPONENT\_FIRST](http://docs.google.com/java/awt/event/ComponentEvent.html#COMPONENT_FIRST), [COMPONENT\_HIDDEN](http://docs.google.com/java/awt/event/ComponentEvent.html#COMPONENT_HIDDEN), [COMPONENT\_LAST](http://docs.google.com/java/awt/event/ComponentEvent.html#COMPONENT_LAST), [COMPONENT\_MOVED](http://docs.google.com/java/awt/event/ComponentEvent.html#COMPONENT_MOVED), [COMPONENT\_RESIZED](http://docs.google.com/java/awt/event/ComponentEvent.html#COMPONENT_RESIZED), [COMPONENT\_SHOWN](http://docs.google.com/java/awt/event/ComponentEvent.html#COMPONENT_SHOWN) |

| **Fields inherited from class java.awt.**[**AWTEvent**](http://docs.google.com/java/awt/AWTEvent.html) |
| --- |
| [ACTION\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#ACTION_EVENT_MASK), [ADJUSTMENT\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#ADJUSTMENT_EVENT_MASK), [COMPONENT\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#COMPONENT_EVENT_MASK), [consumed](http://docs.google.com/java/awt/AWTEvent.html#consumed), [CONTAINER\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#CONTAINER_EVENT_MASK), [FOCUS\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#FOCUS_EVENT_MASK), [HIERARCHY\_BOUNDS\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#HIERARCHY_BOUNDS_EVENT_MASK), [HIERARCHY\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#HIERARCHY_EVENT_MASK), [id](http://docs.google.com/java/awt/AWTEvent.html#id), [INPUT\_METHOD\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#INPUT_METHOD_EVENT_MASK), [INVOCATION\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#INVOCATION_EVENT_MASK), [ITEM\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#ITEM_EVENT_MASK), [KEY\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#KEY_EVENT_MASK), [MOUSE\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#MOUSE_EVENT_MASK), [MOUSE\_MOTION\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#MOUSE_MOTION_EVENT_MASK), [MOUSE\_WHEEL\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#MOUSE_WHEEL_EVENT_MASK), [PAINT\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#PAINT_EVENT_MASK), [RESERVED\_ID\_MAX](http://docs.google.com/java/awt/AWTEvent.html#RESERVED_ID_MAX), [TEXT\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#TEXT_EVENT_MASK), [WINDOW\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#WINDOW_EVENT_MASK), [WINDOW\_FOCUS\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#WINDOW_FOCUS_EVENT_MASK), [WINDOW\_STATE\_EVENT\_MASK](http://docs.google.com/java/awt/AWTEvent.html#WINDOW_STATE_EVENT_MASK) |

| **Fields inherited from class java.util.**[**EventObject**](http://docs.google.com/java/util/EventObject.html) |
| --- |
| [source](http://docs.google.com/java/util/EventObject.html#source) |

| **Constructor Summary** | |
| --- | --- |
| [**WindowEvent**](http://docs.google.com/java/awt/event/WindowEvent.html#WindowEvent(java.awt.Window,%20int))([Window](http://docs.google.com/java/awt/Window.html) source, int id)            Constructs a WindowEvent object. |
| [**WindowEvent**](http://docs.google.com/java/awt/event/WindowEvent.html#WindowEvent(java.awt.Window,%20int,%20int,%20int))([Window](http://docs.google.com/java/awt/Window.html) source, int id, int oldState, int newState)            Constructs a WindowEvent object with the specified previous and new window states. |
| [**WindowEvent**](http://docs.google.com/java/awt/event/WindowEvent.html#WindowEvent(java.awt.Window,%20int,%20java.awt.Window))([Window](http://docs.google.com/java/awt/Window.html) source, int id, [Window](http://docs.google.com/java/awt/Window.html) opposite)            Constructs a WindowEvent object with the specified opposite Window. |
| [**WindowEvent**](http://docs.google.com/java/awt/event/WindowEvent.html#WindowEvent(java.awt.Window,%20int,%20java.awt.Window,%20int,%20int))([Window](http://docs.google.com/java/awt/Window.html) source, int id, [Window](http://docs.google.com/java/awt/Window.html) opposite, int oldState, int newState)            Constructs a WindowEvent object. |

| **Method Summary** | |
| --- | --- |
| int | [**getNewState**](http://docs.google.com/java/awt/event/WindowEvent.html#getNewState())()            For WINDOW\_STATE\_CHANGED events returns the new state of the window. |
| int | [**getOldState**](http://docs.google.com/java/awt/event/WindowEvent.html#getOldState())()            For WINDOW\_STATE\_CHANGED events returns the previous state of the window. |
| [Window](http://docs.google.com/java/awt/Window.html) | [**getOppositeWindow**](http://docs.google.com/java/awt/event/WindowEvent.html#getOppositeWindow())()            Returns the other Window involved in this focus or activation change. |
| [Window](http://docs.google.com/java/awt/Window.html) | [**getWindow**](http://docs.google.com/java/awt/event/WindowEvent.html#getWindow())()            Returns the originator of the event. |
| [String](http://docs.google.com/java/lang/String.html) | [**paramString**](http://docs.google.com/java/awt/event/WindowEvent.html#paramString())()            Returns a parameter string identifying this event. |

| **Methods inherited from class java.awt.event.**[**ComponentEvent**](http://docs.google.com/java/awt/event/ComponentEvent.html) |
| --- |
| [getComponent](http://docs.google.com/java/awt/event/ComponentEvent.html#getComponent()) |

| **Methods inherited from class java.awt.**[**AWTEvent**](http://docs.google.com/java/awt/AWTEvent.html) |
| --- |
| [consume](http://docs.google.com/java/awt/AWTEvent.html#consume()), [getID](http://docs.google.com/java/awt/AWTEvent.html#getID()), [isConsumed](http://docs.google.com/java/awt/AWTEvent.html#isConsumed()), [setSource](http://docs.google.com/java/awt/AWTEvent.html#setSource(java.lang.Object)), [toString](http://docs.google.com/java/awt/AWTEvent.html#toString()) |

| **Methods inherited from class java.util.**[**EventObject**](http://docs.google.com/java/util/EventObject.html) |
| --- |
| [getSource](http://docs.google.com/java/util/EventObject.html#getSource()) |

| **Methods inherited from class java.lang.**[**Object**](http://docs.google.com/java/lang/Object.html) |
| --- |
| [clone](http://docs.google.com/java/lang/Object.html#clone()), [equals](http://docs.google.com/java/lang/Object.html#equals(java.lang.Object)), [finalize](http://docs.google.com/java/lang/Object.html#finalize()), [getClass](http://docs.google.com/java/lang/Object.html#getClass()), [hashCode](http://docs.google.com/java/lang/Object.html#hashCode()), [notify](http://docs.google.com/java/lang/Object.html#notify()), [notifyAll](http://docs.google.com/java/lang/Object.html#notifyAll()), [wait](http://docs.google.com/java/lang/Object.html#wait()), [wait](http://docs.google.com/java/lang/Object.html#wait(long)), [wait](http://docs.google.com/java/lang/Object.html#wait(long,%20int)) |

| **Field Detail** |
| --- |

### WINDOW\_FIRST

public static final int **WINDOW\_FIRST**

The first number in the range of ids used for window events.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_FIRST)

### WINDOW\_OPENED

public static final int **WINDOW\_OPENED**

The window opened event. This event is delivered only the first time a window is made visible.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_OPENED)

### WINDOW\_CLOSING

public static final int **WINDOW\_CLOSING**

The "window is closing" event. This event is delivered when the user attempts to close the window from the window's system menu. If the program does not explicitly hide or dispose the window while processing this event, the window close operation will be cancelled.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_CLOSING)

### WINDOW\_CLOSED

public static final int **WINDOW\_CLOSED**

The window closed event. This event is delivered after the window has been closed as the result of a call to dispose.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_CLOSED)

### WINDOW\_ICONIFIED

public static final int **WINDOW\_ICONIFIED**

The window iconified event. This event is delivered when the window has been changed from a normal to a minimized state. For many platforms, a minimized window is displayed as the icon specified in the window's iconImage property.

**See Also:**[Frame.setIconImage(java.awt.Image)](http://docs.google.com/java/awt/Frame.html#setIconImage(java.awt.Image)), [Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_ICONIFIED)

### WINDOW\_DEICONIFIED

public static final int **WINDOW\_DEICONIFIED**

The window deiconified event type. This event is delivered when the window has been changed from a minimized to a normal state.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_DEICONIFIED)

### WINDOW\_ACTIVATED

public static final int **WINDOW\_ACTIVATED**

The window-activated event type. This event is delivered when the Window becomes the active Window. Only a Frame or a Dialog can be the active Window. The native windowing system may denote the active Window or its children with special decorations, such as a highlighted title bar. The active Window is always either the focused Window, or the first Frame or Dialog that is an owner of the focused Window.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_ACTIVATED)

### WINDOW\_DEACTIVATED

public static final int **WINDOW\_DEACTIVATED**

The window-deactivated event type. This event is delivered when the Window is no longer the active Window. Only a Frame or a Dialog can be the active Window. The native windowing system may denote the active Window or its children with special decorations, such as a highlighted title bar. The active Window is always either the focused Window, or the first Frame or Dialog that is an owner of the focused Window.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_DEACTIVATED)

### WINDOW\_GAINED\_FOCUS

public static final int **WINDOW\_GAINED\_FOCUS**

The window-gained-focus event type. This event is delivered when the Window becomes the focused Window, which means that the Window, or one of its subcomponents, will receive keyboard events.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_GAINED_FOCUS)

### WINDOW\_LOST\_FOCUS

public static final int **WINDOW\_LOST\_FOCUS**

The window-lost-focus event type. This event is delivered when a Window is no longer the focused Window, which means keyboard events will no longer be delivered to the Window or any of its subcomponents.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_LOST_FOCUS)

### WINDOW\_STATE\_CHANGED

public static final int **WINDOW\_STATE\_CHANGED**

The window-state-changed event type. This event is delivered when a Window's state is changed by virtue of it being iconified, maximized etc.

**Since:** 1.4 **See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_STATE_CHANGED)

### WINDOW\_LAST

public static final int **WINDOW\_LAST**

The last number in the range of ids used for window events.

**See Also:**[Constant Field Values](http://docs.google.com/constant-values.html#java.awt.event.WindowEvent.WINDOW_LAST)

| **Constructor Detail** |
| --- |

### WindowEvent

public **WindowEvent**([Window](http://docs.google.com/java/awt/Window.html) source,  
 int id,  
 [Window](http://docs.google.com/java/awt/Window.html) opposite,  
 int oldState,  
 int newState)

Constructs a WindowEvent object.

Note that passing in an invalid id results in unspecified behavior. This method throws an IllegalArgumentException if source is null.

**Parameters:**source - the Window object that originated the eventid - an integer indicating the type of event.opposite - the other window involved in the focus or activation change, or nulloldState - previous state of the window for window state change eventnewState - new state of the window for window state change event **Throws:** [IllegalArgumentException](http://docs.google.com/java/lang/IllegalArgumentException.html) - if source is null**Since:** 1.4

### WindowEvent

public **WindowEvent**([Window](http://docs.google.com/java/awt/Window.html) source,  
 int id,  
 [Window](http://docs.google.com/java/awt/Window.html) opposite)

Constructs a WindowEvent object with the specified opposite Window. The opposite Window is the other Window involved in this focus or activation change. For a WINDOW\_ACTIVATED or WINDOW\_GAINED\_FOCUS event, this is the Window that lost activation or focus. For a WINDOW\_DEACTIVATED or WINDOW\_LOST\_FOCUS event, this is the Window that gained activation or focus. If this focus change occurs with a native application, with a Java application in a different VM, or with no other Window, then the opposite Window is null.

Note that passing in an invalid id results in unspecified behavior. This method throws an IllegalArgumentException if source is null.

**Parameters:**source - the Window object that originated the eventid - WINDOW\_ACTIVATED, WINDOW\_DEACTIVATED, WINDOW\_GAINED\_FOCUS, or WINDOW\_LOST\_FOCUS. It is expected that this constructor will not be used for other WindowEvent types because the opposite Window of such events will always be nullopposite - the other Window involved in the focus or activation change, or null **Throws:** [IllegalArgumentException](http://docs.google.com/java/lang/IllegalArgumentException.html) - if source is null**Since:** 1.4

### WindowEvent

public **WindowEvent**([Window](http://docs.google.com/java/awt/Window.html) source,  
 int id,  
 int oldState,  
 int newState)

Constructs a WindowEvent object with the specified previous and new window states.

Note that passing in an invalid id results in unspecified behavior. This method throws an IllegalArgumentException if source is null.

**Parameters:**source - the Window object that originated the eventid - WINDOW\_STATE\_CHANGED event type. It is expected that this constructor will not be used for other WindowEvent types, because the previous and new window states are meaningless for other event types.oldState - an integer representing the previous window statenewState - an integer representing the new window state **Throws:** [IllegalArgumentException](http://docs.google.com/java/lang/IllegalArgumentException.html) - if source is null**Since:** 1.4

### WindowEvent

public **WindowEvent**([Window](http://docs.google.com/java/awt/Window.html) source,  
 int id)

Constructs a WindowEvent object.

Note that passing in an invalid id results in unspecified behavior. This method throws an IllegalArgumentException if source is null.

**Parameters:**source - the Window object that originated the eventid - an integer indicating the type of event **Throws:** [IllegalArgumentException](http://docs.google.com/java/lang/IllegalArgumentException.html) - if source is null

| **Method Detail** |
| --- |

### getWindow

public [Window](http://docs.google.com/java/awt/Window.html) **getWindow**()

Returns the originator of the event.

**Returns:**the Window object that originated the event

### getOppositeWindow

public [Window](http://docs.google.com/java/awt/Window.html) **getOppositeWindow**()

Returns the other Window involved in this focus or activation change. For a WINDOW\_ACTIVATED or WINDOW\_GAINED\_FOCUS event, this is the Window that lost activation or focus. For a WINDOW\_DEACTIVATED or WINDOW\_LOST\_FOCUS event, this is the Window that gained activation or focus. For any other type of WindowEvent, or if the focus or activation change occurs with a native application, with a Java application in a different VM or context, or with no other Window, null is returned.

**Returns:**the other Window involved in the focus or activation change, or null**Since:** 1.4

### getOldState

public int **getOldState**()

For WINDOW\_STATE\_CHANGED events returns the previous state of the window. The state is represented as a bitwise mask.

* NORMAL  
  Indicates that no state bits are set.
* ICONIFIED
* MAXIMIZED\_HORIZ
* MAXIMIZED\_VERT
* MAXIMIZED\_BOTH  
  Concatenates MAXIMIZED\_HORIZ and MAXIMIZED\_VERT.

**Returns:**a bitwise mask of the previous window state**Since:** 1.4 **See Also:**[Frame.getExtendedState()](http://docs.google.com/java/awt/Frame.html#getExtendedState())

### getNewState

public int **getNewState**()

For WINDOW\_STATE\_CHANGED events returns the new state of the window. The state is represented as a bitwise mask.

* NORMAL  
  Indicates that no state bits are set.
* ICONIFIED
* MAXIMIZED\_HORIZ
* MAXIMIZED\_VERT
* MAXIMIZED\_BOTH  
  Concatenates MAXIMIZED\_HORIZ and MAXIMIZED\_VERT.

**Returns:**a bitwise mask of the new window state**Since:** 1.4 **See Also:**[Frame.getExtendedState()](http://docs.google.com/java/awt/Frame.html#getExtendedState())

### paramString

public [String](http://docs.google.com/java/lang/String.html) **paramString**()

Returns a parameter string identifying this event. This method is useful for event-logging and for debugging.

**Overrides:**[paramString](http://docs.google.com/java/awt/event/ComponentEvent.html#paramString()) in class [ComponentEvent](http://docs.google.com/java/awt/event/ComponentEvent.html) **Returns:**a string identifying the event and its attributes

| | [**Overview**](http://docs.google.com/overview-summary.html) | [**Package**](http://docs.google.com/package-summary.html) | **Class** | [**Use**](http://docs.google.com/class-use/WindowEvent.html) | [**Tree**](http://docs.google.com/package-tree.html) | [**Deprecated**](http://docs.google.com/deprecated-list.html) | [**Index**](http://docs.google.com/index-files/index-1.html) | [**Help**](http://docs.google.com/help-doc.html) | | --- | --- | --- | --- | --- | --- | --- | --- | | | ***Java™ Platform***  ***Standard Ed. 6*** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
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| SUMMARY: NESTED | [FIELD](#3znysh7) | [CONSTR](#1t3h5sf) | [METHOD](#4d34og8) | DETAIL: [FIELD](#lnxbz9) | [CONSTR](#qsh70q) | [METHOD](#147n2zr) |

[Submit a bug or feature](http://bugs.sun.com/services/bugreport/index.jsp)

For further API reference and developer documentation, see [Java SE Developer Documentation](http://docs.google.com/webnotes/devdocs-vs-specs.html). That documentation contains more detailed, developer-targeted descriptions, with conceptual overviews, definitions of terms, workarounds, and working code examples.

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