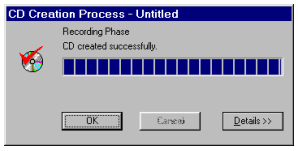
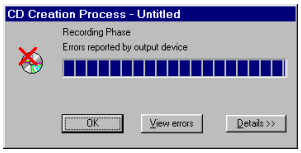
Lecture 13: Toolkits

UI Hall of Fame or Shame?



Source: UI Hall of Shame



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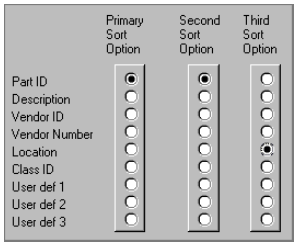


Source: UI Hall of Shame

Today's Topics

- Widgets
- Toolkit layering
- Look-and-feel

Widgets

- Reusable user interface components
  - Also called controls, interactors, gizmos, gadgets
- Widget is a view + controller
  - Embedded model
    - Application data must be copied into the widget
    - Changes must be copied out
  - Linked model
    - Application provides model satisfying an interface
    - Enables "data-bound" widgets, e.g. a table showing thousands of database rows, or a combo box with thousands of choices

Widget Pros and Cons

- Advantages
  - Reuse of development effort
    - Coding, testing, debugging, maintenance
    - Iteration and evaluation
  - External consistency
- Disadvantages
  - Constrain designer's thinking
  - Encourage menu & forms style, rather than richer direct manipulation style
  - May be used inappropriately

Example

- Cheese sandwich delivery
  - Bread (choose one): white, wheat, rye
  - Cheese (choose one or more): swiss, cheddar, provolone, american, brie, goudda
  - Toasted: yes or no
  - Deliver to MIT building (choose one): Baker, EC, Next, Simmons, Stata, ...

Widgets for 1-of-N Choices

- N radio buttons
- N mutually-exclusive toggle buttons
- Drop-down list
- Single-selection listbox

Widgets for 1-of-2 Choices

- Checkbox
- Toggle button

Widgets for K-of-N Choices

- N checkboxes
- N toggle buttons
- Multiple-selection listbox
- 2 listboxes

Widgets for Commands

- Menubar menu item
- Toolbar button
- Context menu item
- Keyboard shortcut
- Push button
- Hyperlink

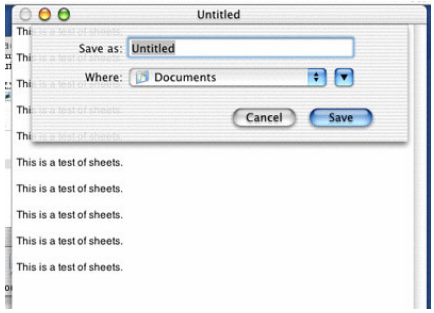
- Action object (aka command)
  - Tooltips on mouseover
  - Enable/disable

Widgets for Window Organization

- Mutually-exclusive panes
  - Tabbed panes
  - Listbox + pane
- Multiple content panes
  - Splitters
- Scrolling content
  - Scroll panes
  - Paging buttons

Widgets for Dialogs

- Modal dialog box
- Modeless dialog box
- Sidebar
- Sheet



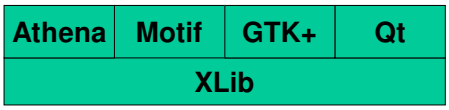
Toolkits

- User interface toolkit consists of:
  - Components (view hierarchy)
  - Stroke drawing
  - Pixel model
  - Input handling
  - Widgets
  - (often) Automatic layout

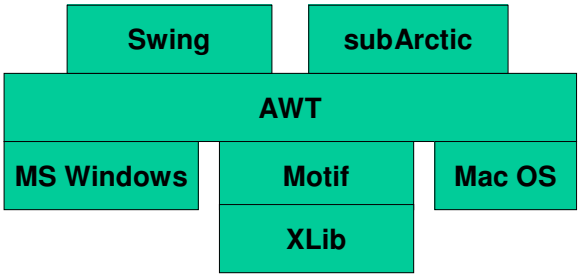
Toolkit Examples

	MS Win	Swing	HTML
components	windows	JComponents	elements
strokes	GDI	Graphics	-- (none)
pixels	bitmaps	Image	inlined images
input	messages -> window proc	listeners	Javascript event handlers
widgets	button, menu, textbox, ...	JButton, JMenu, ...	form controls & links

Toolkit Layering

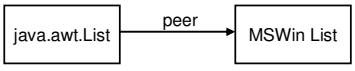


Cross-Platform Toolkit Layering



Cross-Platform Widgets: AWT Approach

- AWT, HTML
  - Use native widgets, but only those common to all platforms
    - Tree widget available on MS Win but not X, so AWT doesn't provide it
  - Very consistent with other platform apps, because it uses the same code

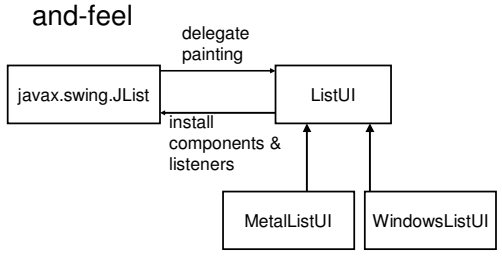


Cross-Platform Widgets: Swing approach

- Swing, Amulet
  - Reimplement all widgets
  - Not constrained by least common denominator
  - Consistent behavior for application across platforms

Pluggable Look-and-Feel

- Swing also reimplements platform look-and-feel



Cross-Platform Widgets: SWT Approach

- SWT
  - Use native widgets where available
  - Reimplement missing native widgets