

Specification Change Orders for the Prototyping Tool

New Menubar, Menus, and Toolbars (gfisher, 19mar03)

The following is the new menu structure for the prototyping tool:

File	Edit	Tools	Structure	Style	View	Help
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Here is an expansion of the menus:

File:

```
New
Open ...
Import ...
Revert
Close
Close All
-----
Save
Save As ...
Save All
-----
Generate ...
-----
Print ...
-----
Exit
```

Edit:

```
Undo
Redo
Repeat ...
-----
Cut
Copy
Paste
Duplicate
Delete
Select All
-----
Find ...
Spell check ...
-----
Command ...
-----
Preferences ...
-----
Mode ->
    Edit
    Run
```

Tools:

```
Drawing Toolbar
Component Toolbar
Property Editor
Script Editor
Slide Show
Explorer
```

Structure:

```

Group
Ungroup
Regroup
-----
Flip Horizontal
Flip Vertical
Rotate 90 Clockwise
Rotate 90 CounterCW
-----
Transform ->
    Precise Move ...
    Precise Stretch ...
    Precise Scale ...
    Precise Rotate ...
    Precise Reshape ...
Arrange ->
    Bring to Front
    Bring Forward
    Send Back
    Send to Back
Align ->
    Left Sides
    Right Sides
    Bottoms
    Tops
    Vertical Centers
    Horizontal Centers
    Centers
    Left to Right
    Right to Left
    Bottom to Top
    Top to Bottom
    Align to Grid
-----
Number of Drawings
Number of Components

```

Style:

```

Font ...
Text Size ->
Text Style ->
-----
Brush ->
    None
    -----
    <-----
    ----->
    <----->
    - - - -
    - - - -
    =====
    Color ...
    Edit ...
Fill ->
    None
    white
    horz lines
    vert lines
    right diag
    left diag
    black
    -----
    Color ...
    Edit ...

```

View:

```

Zoom In
Zoom Out
Normal Size
Center Page
Home
-----
Gridding On[Off]
Show/Hide Grid Lines
Grad Spacing ...
-----
[Show]Hide Drawing
[Show]Hide Components
[Show]Hide Text
[Show]Hide Selection
Show All
-----
[Un]Highlight Hidden
[Un]Highlight Grouping
[Un]Highlight Boxes
-----
Layers ...
Page ...
-----
Windows ->

```

Here are updated tool bars:

Components:

```

Select
Menubar
Button
Text
Slider
List
Table
Box
Pane
Frame
Scroll Bar
More Components:

```

Drawing:

```

Select
Move
Stretch
Scale
Rotate
Reshape
Text
Line
MultiLine
Curve
Ellipse
Rectangle

```

The new menus are a combination of the current jdraw menus, the menus in the current prototyper requirements, plus some additional new commands. Note that some new ". . ." suffixes have been added to some of the items that did not have them before. Also some new item separators have been added. I'll do a full revision of the menu descriptions in Section 2.1 of the prototyper requirements. In the meantime, here's a summary of the changes reflected in the above new menu structure:

- a. The new 'File' menu is a combination of jdraw and prototyper, plus new items. All of the prototyper items are there, with 'Make Prototype' changed to 'Generate ...'. 'Revert', 'Import ...', and 'Print ...' are from jdraw. 'Close All' and 'Save All' are new. They apply to all open canvases, whereas 'Close' and 'Save' apply only to the current canvas.
- b. The new 'Edit' menu is also a combination of jdraw and prototyper, plus new items. 'Duplicate' comes from jdraw, and 'Find ...' comes from the prototyper. 'Spell Check ...' is new; it opens a standard spell check dialog that goes through all of the text in all components and drawings. The commands at the bottom of the current jdraw menu, starting with 'Flip Horizontal', have all been moved to the new 'Structure' menu. The new Edit->Command ... item opens a simple BeanShell editor where the user can type in a scripting command. The 'Preferences ...' item opens a simple preferences editing window which we can discuss at some later point. I'm thinking that it can just be a very simple text-style properties editor, perhaps XML-based. The 'Edit->Mode' command at the end was moved from the current prototyper 'Tools' menu.
- c. The 'Tools' menu is mostly from the current prototyper, with a few modifications. The 'Menu Editor' is changed to a more general 'Property Editor'. The way it works is to display a property editor for the currently selected drawing or component. If the currently selected component is a menu bar or menu, the property editor is a menu editor. There are other specific property editors for other components, which will be simpler versions of the property editors in netbeans. I'll do details of these soon. The "Slide Show" item is new in the 'Tools' menu; it opens a dialog that has the same commands as are as in the current 'Slide Show' menu, but laid out in a dialog. We'll work out the details soon. The 'Navigator' item in the current 'Tools' menu is changed to 'Explorer' in the new menu. Finally, the 'Mode' item in the current prototyper 'Tools' menu has been moved to the new 'Edit' menu.
- d. The new 'Structure' menu comes from the current 'Structure' Edit', and 'Align' menus in jdraw, and the 'View', 'Transform', and 'Align' menus in the prototyper. 'Group' and 'Ungroup' are from jdraw. They apply only to graphics; the Box component is the equivalent of a group for components. The 'Regroup' command is new; it allows the user to run 'Ungroup', change one or more elements of the group, then put them back together in the original group. Conceptually, 'Regroup' *undoes* the most recent 'Ungroup' command, even if there were edits or deletions made in between 'Regroup' and 'Ungroup'. The four 'Flip' and 'Rotate 90' commands were formerly in the jdraw 'Edit' menu. The 'Transform' commands are moved from the jdraw 'Edit' menu and the prototyper 'Transform' menu. The 'Arrange' commands are moved from the jdraw 'Structure' menu and 'Transform->Arrange' prototyper menu. The 'Align' commands are the same as in the current jdraw and prototyper, but they're moved from a top-level menu to a second-level pull-right menu. The 'Number of Graphics' command is from jdraw, and 'Number of Components' does the same thing for components in the prototyper.
- e. The new 'Style' menu has items from the current jdraw 'Text', 'Brush', and 'Pattern' menus, and the current prototyper 'Fill' menu, with some significant reformatting. A 'Text' menu was missing from the prototyper, but should have been there. The first three items in the new 'Style' menu are from jdraw 'Text', with reformatting. Specifically, the inline font-size and text-style items in the current jdraw menu have been put into pull-right menus instead. The 'Style->Brush' and

'Style->Fill' are the current jdraw 'Brush' and 'Pattern' menus. They supersede what's in the current prototyper 'Fill' menu.

- f. The new 'View' menu has items from the jdraw 'Options' menu and the prototyper 'View' menu. 'Zoom In' and 'Zoom Out' are called 'Reduce' and 'Enlarge' in the jdraw 'Options' menu. 'Normal Size' is from jdraw 'Options'. 'Center Page' is new; it puts the current page in the center of the canvas (see below for more on paging). 'Home' is from jdraw; it scrolls the drawing canvas to the upper left corner, so that the vertical scrollbar (if present) is all the way at the top and the horizontal scrollbar is all the way to the left. The 'Hide Drawing' and 'Hide Components' commands are show/hide toggles that do the same thing as the 'Show/Hide' buttons in the toolbars; they've been moved off the toolbars into the menus. 'Hide Text' is new; it's a show/hide toggle for all text graphics, and all text inside components, such as button names and label text. 'Show Grouping' is also new; it puts a light grey rectangle around all groups, including nested groups. The 'Layers ...' and 'Page ...' commands are from the jdraw 'Options' menu. The 'Windows ->' pull right menu has a list of all open canvas windows. (Plus see below for more about how it's different in the prototyper versus jdraw).

An important feature of the new menu layout is that the menus for the prototyping tool are a proper superset of the jdraw menus. Here are the specific differences between the prototyper versus jdraw menus:

- a. There is no 'File->Generate ...' command in jdraw (and the menu separator above it is not there).
- b. There is no 'Edit->Mode' command in jdraw (and the menu separator above it is not there).
- c. There is no 'Structure->Components' command in jdraw.
- d. There is no 'View->Hide Components' command in jdraw.
- e. There is no 'Tools' menu in jdraw.
- f. The first item in the 'View->Windows' menu in jdraw is 'Toolbar', followed by a separator. This is a checkbox menu item that has the same use as the 'Drawing Toolbar' item in the 'Tools' menu of the prototyper. Since jdraw has no 'Tools' menu, the show/hide menu item for it goes in the 'View->Windows' menu.

What this means is that the prototyper acts like a "plug in" to jdraw, the way we discussed in our last meeting.

The new Components toolbar has been reorganized, based largely on a careful analysis of what is provided in the NetBeans GUI builder. A detailed comparison of this toolbar and what netbeans provides is in a separate document.

The new Drawing toolbar is an integration of the current jdraw and prototyper toolbars.

Clarification of Drawing and Component Interaction (gfi sher, 19mar03)

When any drawing initiates within an internal frame, it is constrained to stay within that internal frame. This form of constrained drawing works the same as drawing outside the boundary of a jdraw canvas works now. Namely, when the user drags the mouse outside of the internal frame boundary, the drawing continues, but it cannot be seen outside of the constrained area. If the user leaves the mouse button down while dragging outside but then moves back inside, the drawing continues where it left off. An internal frame should have scroll bars added when a drawn objects goes beyond its boundaries, in the same way that canvas scrollbars work.

When the user performs lassoing, it applies separately to drawing objects and components. Specifically, the lassoing behavior is based on which arrow tool the user has chosen, the one in the drawing tools or the one in the component tools. When lassoing graphics, components are ignored, and vice versa. When the user clicks on a graphic or component, it automatically chooses the arrow tool in the appropriate toolbar. This means that when the user starts lassoing, either graphics or components will be active.

Some Code Generation Ideas (gfi sher, 19mar03)

Here are some basic ideas on how Java code generation can work.

- a. When an align command and group command are followed in immediate succession on a set of components, this successive pair of commands has a special effect. Namely, it places the components in a horizontal or vertical box, with the appropriate alignment.
- b. All of the drawing objects are collected into a single jpeg image and placed in the background of the generated GUI. Any boxes created by align/group command pairs are turned into `javax.swing.Boxes`.
- c. The page layout information in the drawing editor is totally ignored during code generation. This page information is strictly for formatting on a printer.

New name for the Prototyping Tool (gfi sher, 19mar03)

How about "ProtoJ" as the name for the prototyping tool?

Drawing and Component Property Editing (gfi sher, 3par03)

Section 2.5.2 of the requirements provides a very brief description of property editing. In that description, the Property Editor is invoked via the component navigator. In the new command menus, the Property Editor can also be invoked from the Tools menu. This section of the SCOs provides additional details about the function of the Property Editor.

There is a separate property editor window for each different type of component, as well as one for all graphics. To bring up a property editor, the user selects an item on the canvas, and then selects 'Tools->Property Editor'. In response, the system displays a property editor for the selected item, of the general form shown in 1. This is a revised version of the property editor shown in Figure 14 in Section 2.5.2 of the original requirements. When the user selects a different item on the canvas and there is already a property editor displayed for that type of item, then the values in the displayed property editor change to the values of the newly selected item. When the user selects a type of canvas item for which no property editor is currently displayed, then the user must select 'Tools->Property Editor' again in order to make an editor for the selected type of item appear.

The property editor shown in Figure 1 is common to all graphics. Most of the same information for a graphic also appears at the top of the property editor for components, except the 'Rotation' field is replaced with an 'Enabled' radio button, and the 'Grouped' checkbox is missing. For example, Figure 2 is the property editor for a button. The default for 'Enabled' is on. When it's off, the component is greyed out and not enabled in run mode. The property editors for menubar, menu, and menu item are special cases that may not have x/y coordinates or size. For the menubar, there is a 'Position'

Figure 1: Revised Property Editor.

Figure 2: Button property editor.

combobox, with selections top, bottom, left, right and free. If any but 'free' is selected, the 'Location' and 'Size' fields are disabled. For menu, there is a 'Position' combobox with integer selections from 1 to the number of items in the parent menubar, and a last selection of 'pop-up'. If any but 'pop-up' is selected, the 'Location' and 'Size' fields are disabled. For menu item, there is a 'Position' combobox with integer selections from 1 to the number of items in the parent menu.

Additional, type-specific properties appear in the bottom part of each component property editor, separated with a horizontal rule. The following table defines the properties specific to each type of component:

Component	Properties	Notes
Menubar	Menubar tree editor	The menu tree editor is the one shown in Figure 4 in Section 2.2 of the current requirements. Since the menu editor is now part of a property editor, it won't have the other buttons that are shown in the current requirements in Section 2.2. Otherwise, it will work the way it's described in 2.2. Here is a picture:
Menu	Label, Icon, Menu tree editor	The tree editor is the same as that which appears in the menubar editor for the selected pulldown menu. The Label text can be edited by typing in the menu editor. The Icon is the name of a jpeg or gif file, that can be browsed for.

Menu item	Style, Label, Icon	Style is one of Plain Item, Checkbox Item, Radio Button Item, or Separator. The Label text can be edited by typing in the menu editor. The Icon is the name of a jpeg or gif file, that can be browsed for.
Button	Style, Label, Icon	Style is one of Push Button, Radio Button, or Check Box. The Label text can be edited by typing directly in the button, or in the property editor.
Text	Style, Rows, columns, editable.	Style is one of Single-Line or Multi-Line. When Single-Line is selected, Rows is disabled. For multi-line text, scrollbars appear when the height and width settings too small to allow all rows and columns to be visible. For single-line text, scrollbars never appear.
Slider	Style	Style is one of Horizontal, Vertical, Progress Bar, Spinner
List	Rows, editable.	
Table	Rows, columns, editable.	

Box	<div>Orientation, Margins, New Spacer Size.</div>	<p>Orientation is one of horizontal or vertical. Margins are top, bottom, left and right. New spacer size is the size of the spacer inserted when a new component is added to the box. Margins are physically rendered as Spacer components.</p> <p>When a component is moved anywhere within a box, it is snapped into position next to or between the two nearest components. [Need to work out details of where new spacer goes, based on whether new component is added to left (top), mid, or right (bottom) of box.] The binding of components in a box is "loose" in that all components can be individually selected and moved. If component movement remains within the box, the moved component is resnapped to a new position within the box when the move is done. When a component is resized within a box, its neighboring component(s) and the box itself are resized dynamically along with component being resized. When the user moves a box by selecting its border, all of its components move along with it.</p>
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Spacer	Orientation	Orientation is one of horizontal or vertical. Spacers can appear only within boxes. Spacers cannot be individually moved, only resized, which can be done graphically or using a property editor. When a spacer is set to size zero, it shows up as a very small grey spacer icon, which can be difficult to grab. Therefore, the easier way to set the size of a zero-size spacer is to select it (via lasso) and bring up its property editor.
Pane	Style	Style is one of tabbed, split, layered, option.
Frame	Style	Style is one of External or Internal. When there are one or more external frames on a canvas, the canvas itself is considered a desktop. When there are no external frames in a canvas, the canvas is considered a frame. External frames can only be placed directly on the canvas, not inside other components. Internal frames can be placed anywhere in a single-frame canvas, or within other external or internal frames.

Refining Scripting

To view the script editor for a component, the user selects that component and then selects 'Tools->Script Editor'. In response, the system displays a script editing dialog of the form shown in Figure 3. The banner in the script editor window includes the type and name of the selected

Figure 3: Refined script editor.

component. The 'Event' combobox selects the event type to which a script applies. The default is 'Left Mouse Up'. The event types are:

```
Left Mouse Up
Left Mouse Down
Middle Mouse Up
Middle Mouse Down
Right Mouse Up
Right Mouse Down
Left Double Click
Mouse Enter
Mouse Leave
Key Press
```

The body of the script is a segment of executable Java code. The script may access all of the built-in prototyping classes and methods. Typical accesses are to static scripting methods, such as "SlideShow.Next" as shown in Figure 3. The scope of a script code segment is that of a method body within the component instance to which the script is attached. The method itself is anonymous, since no method header or begin/end curly braces appear in the script editor. Within the script scope, the normal Java identifier "this" refers to the instance of the scripted component. Further details of scripting classes and methods are covered in Section ???.

A component has a separate script for each type of event. The tabs along on the button of the script editor provide convenient access to multiple scripts. For example, Figure 4 shows an editor with scripts defined for 'Left Mouse Up' and 'Mouse Enter'.

When the selected event type is 'Key Press', a small text field appears immediately to the right of the 'Event' combobox, as shown in Figure 5.

Any component can have scripts, not just buttons and menu items. If a component has a built-in action for a particular event, the user has the option to select whether or when the built-in action occurs. For example, Figure 6 shows the case where the user is defining a script for 'Left Mouse Down' on a text component. Since text components have a built-in action for left mouse down, namely select a text position, the user must choose whether that built-in action is to occur. When there is a built-in action for a selected event, the system adds the 'Built-in Action' combo box to the right of the 'Event' combobox. The selections are

```
Override
Run script before
Run script after
```

'Override' means the user-defined script completely overrides the built-in action, that is, the built-in

Figure 4: Script editor with two scripts defined.

Figure 5: Script editor for key-press event.

Figure 6: Script editor with built-in script field.

action does not occur. 'Override' is the default selection. 'Run Before' means the user-defined script is run first, and then the built-in action is applied. 'Run After' means the built-in action is applied, then the user-defined script is run afterwards. In the 'Run Before' case, if the script code changes the state of the component such that the built-in action is not applicable, the built-in action will not occur. For example, if the user-defined script deletes the component itself, the built-in action cannot be applied.

If the 'Built-in Action' combobox is present at the same time as the 'Key Press' event type is selected, the 'Keys' text box appears between the 'Event' and 'Built-in Action' comboboxes.

NOTE: We need to fully spell out exactly what constitutes a built-in action and be entirely precise about the possible type of user-defined action that may cause inapplicability of a built-in action. In particular, the normal GUI effects performed on a component, such as highlighting a button when it's pressed, or turning on a radio button, should probably not be considered overridable actions. Probably the best guideline to follow here is how things work in swing in terms of which components have built-in listeners and what those listeners do. In the case of what user actions cause a built-in action to become inapplicable we can hopefully we handle it with a few general cases, starting with component deletion.

Elimination of the Sensitize Tool

We can achieve the same effect as sensitization using a transparent button, as is done in HyperCard. That is, to make any drawn shape appear to be sensitized, place a button over it, set both the fill and pen of the button to 'None', and set the button's label to the empty string. Then write the script for the button as normal.

Fully transparent components can be selected on the canvas using the normal multi-component selection function, 'Edit->Select All', or from the component explorer.

As a test of implementation feasibility, I confirmed that a Java button can be fully transparent and still work. The specific Java implementation to make a JButton named "button" fully transparent is the following:

```
button.setOpaque(false);      // User action is setting Fill to None
button.setBorder(null);      // User action is setting Brush to None
button.setText(null);        // User action is setting label to empty
```

Accessing Canvas-Wide Methods in Scripts

There is a Canvas class defined with static scripting methods that apply to the currently selected canvas. The methods are:

```
GetLastEvent
GetSelection
...
```