Building Applications

Building Applications

Two important application builder programs:

Interface Builder (IB) *- for building the screen interface for the application.*

Project Builder (PB) *- for managing the files needed to build the application.*

This section provides an overview of these two programs. It is not intended to be a tutorial on how to use them.

Interface Builder

Interface Builder (IB) lets the user:

Use ***Application Kit*** objects to design user interfaces.

Inspect/change initial values of objects.

Make ***connections*** between objects.

Test the interface.

Design ***custom objects*** *(subclasses of AppKit objects)*.

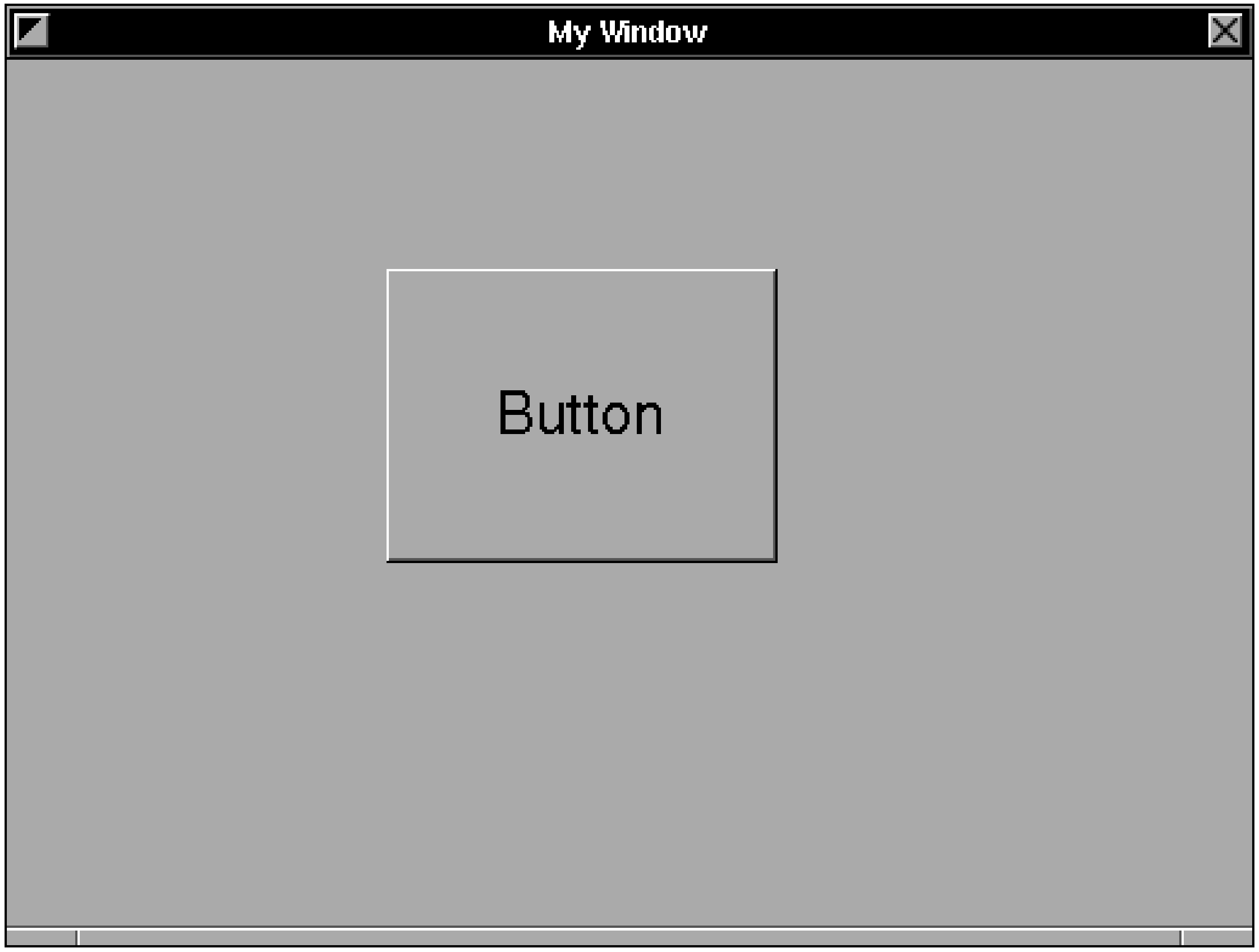
The Application Kit

A library of ***user-interface objects*** that you can select from to be placed into your application's ***window***.

AppKit objects include such items as buttons, sliders, panels, switches, views, etc.

In general, your application will include a number of AppKit objects and one or more subclasses of ***Object*** (containing the logic of your application) and ***View*** (drawing code unique to your application).

Building Applications

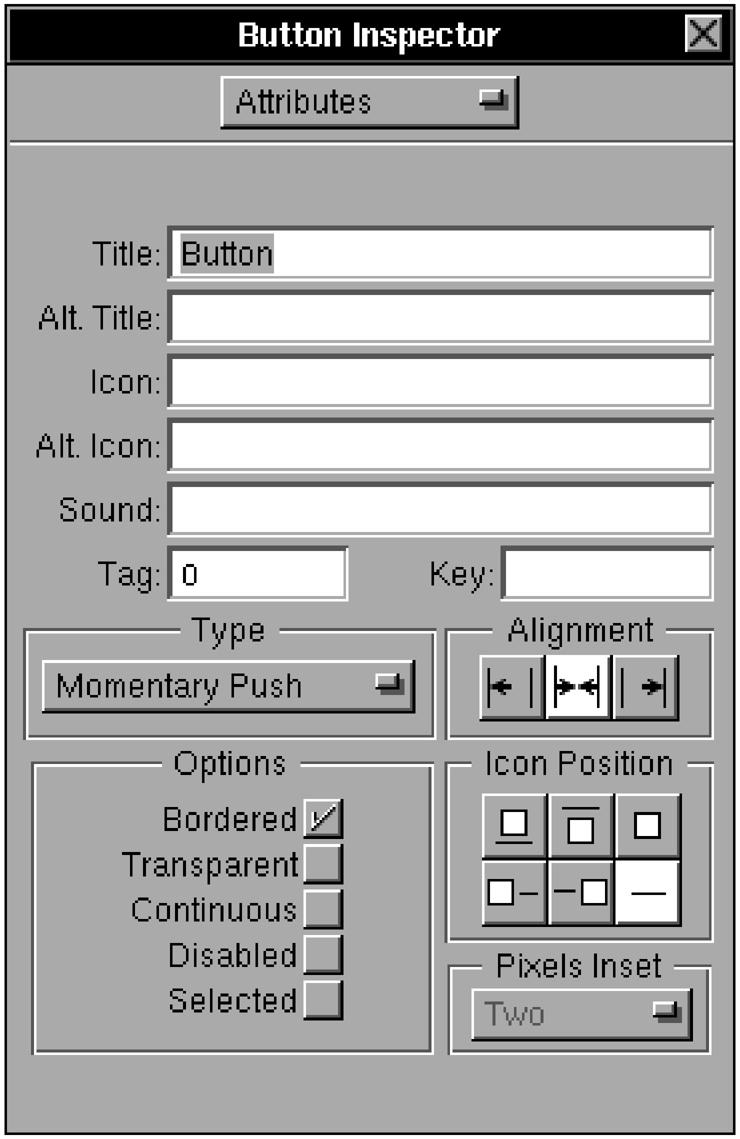


Changing instance variable values

Once an object is added to your application, IB allows you to change the values of many instance variables directly.

For example, changing the size of a button on the screen changes the values of some of the Button object’s instance variables.

Instance variables for objects not easily changed graphically can be changed using the ***Inspector Window***.


Button Inspector

Attributes

Title: Button

Alt. Title:

Icon:

Alt. Icon:

Sound:

Tag: 0

Key:

Type: Momentary Push

Alignment

Options

Bordered [✓]

Transparent [ ]

Continuous [ ]

Disabled [ ]

Selected [ ]

Icon Position

Pixels Inset: Two

Making connections

Interface Builder lets you interconnect objects so they can send messages to one another.

Simply ***control-drag*** from the source object to the destination object, then specify the connection.

Connections are made through an object's ***outlets***.

An ***outlet*** is an instance variable of type **`id`** that is a pointer to the intended receiver of a message.

When your application begins execution, outlet variables are automatically initialized to the **`id`***s of the objects you connect to in Interface Builder.*

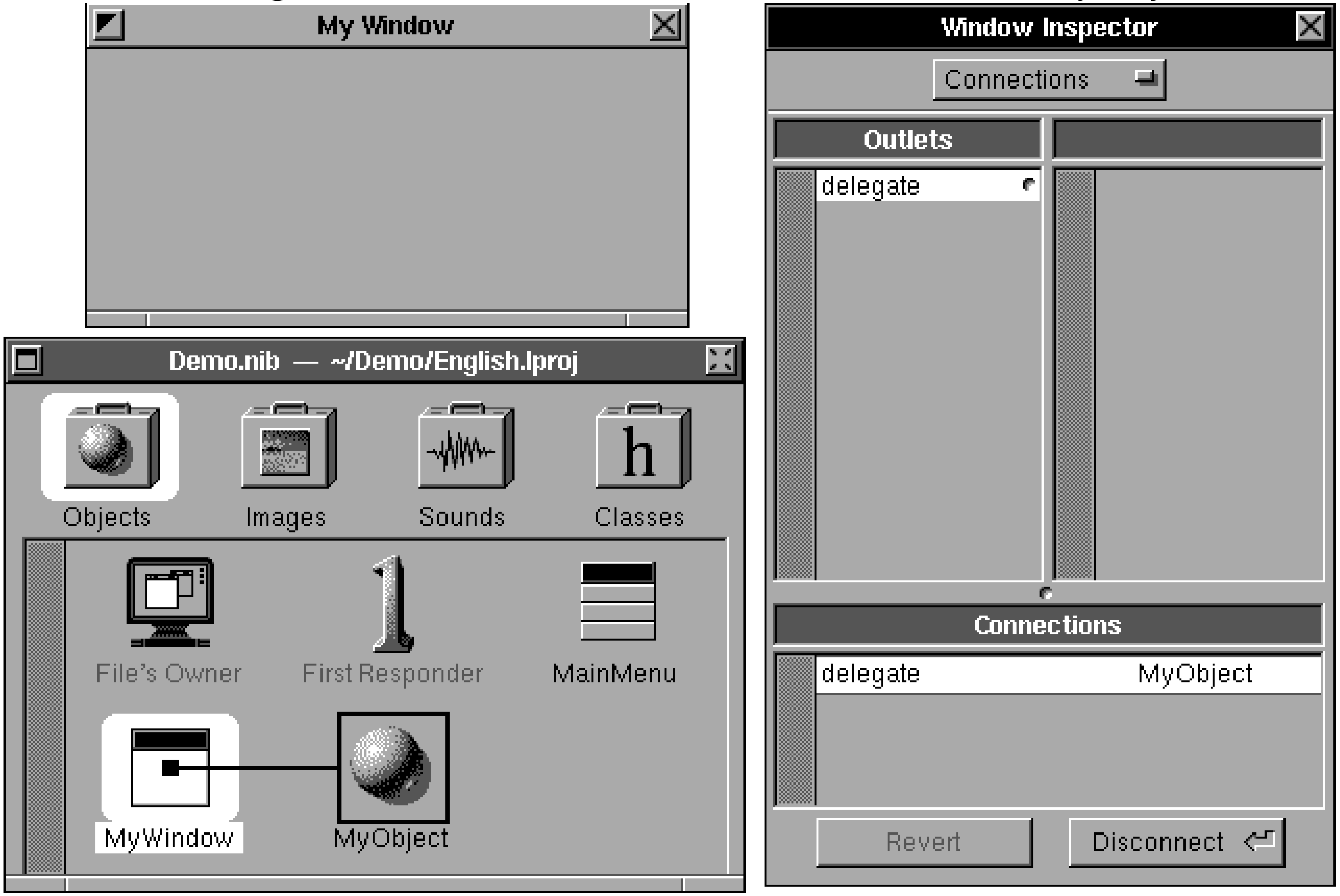
Two types of connections:

1. ***Simple Outlet:*** *Outlet of a non-control object to some other object.*

    Example: a Window object has an instance variable **`delegate`** which needs to be initialized to the **`id`** of the object that is going to be the delegate (so the window can send messages to it).

    In IB the user can ***control-drag*** from the window to the chosen object, and then specify a "connection" for the **`delegate`** outlet.

Window's ***delegate*** outlet is connected to an instance of MyObject:



delegate	MyObject

2. ***Target-Action:*** *Outlet of a control object to the action method of some other object.*

Controls have a special outlet called **`target`** which can only connect to ***action*** methods. The paradigm is:

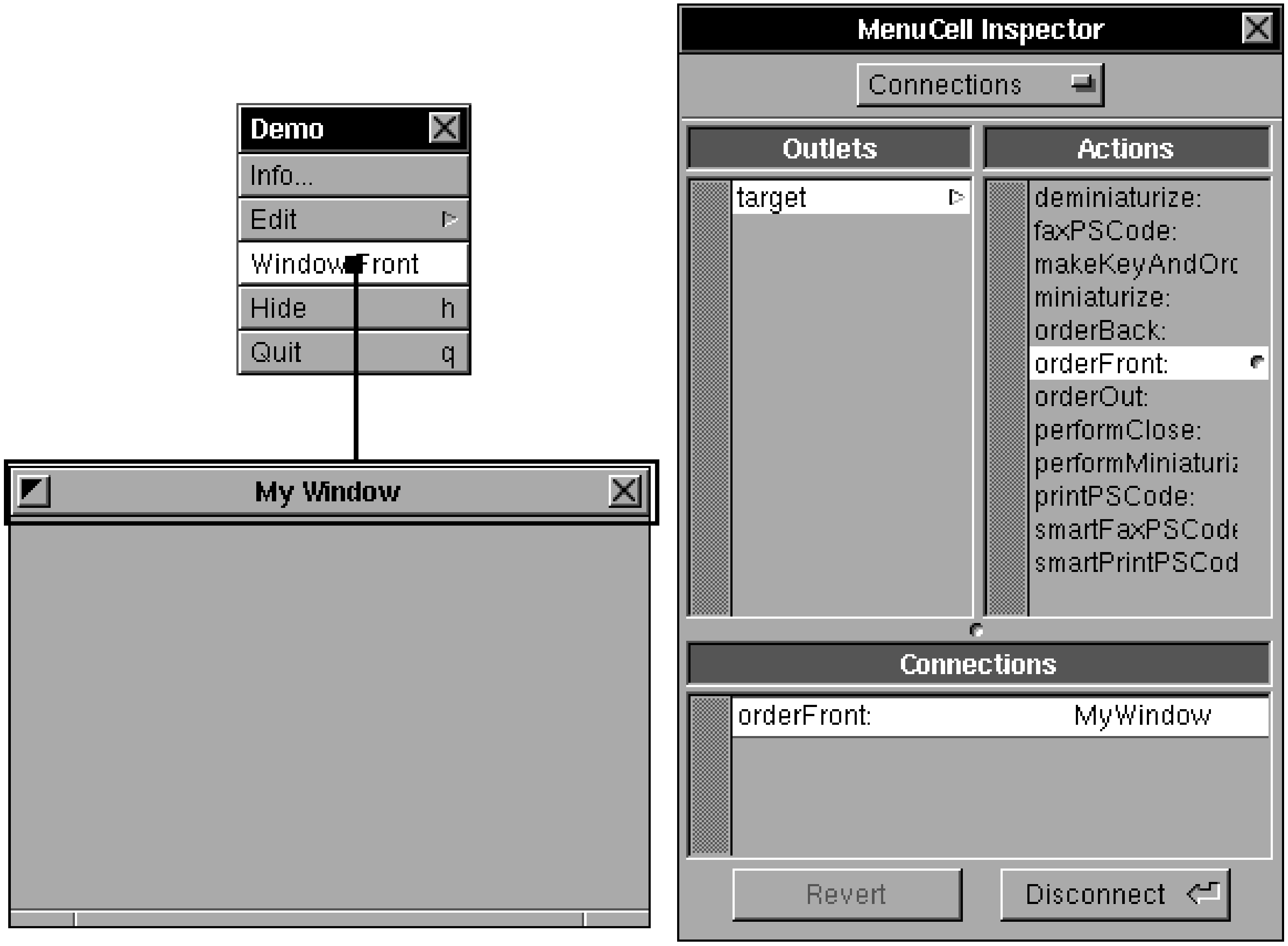
Control sends action message to target:

```
[target actionMethodName:self];
```

Action method is defined in target object:

```
-actionMethodName:sender {
<code to take action>
return self;
}
```

MenuCell's ***target*** outlet connects to Window's ***orderFront:*** action method.



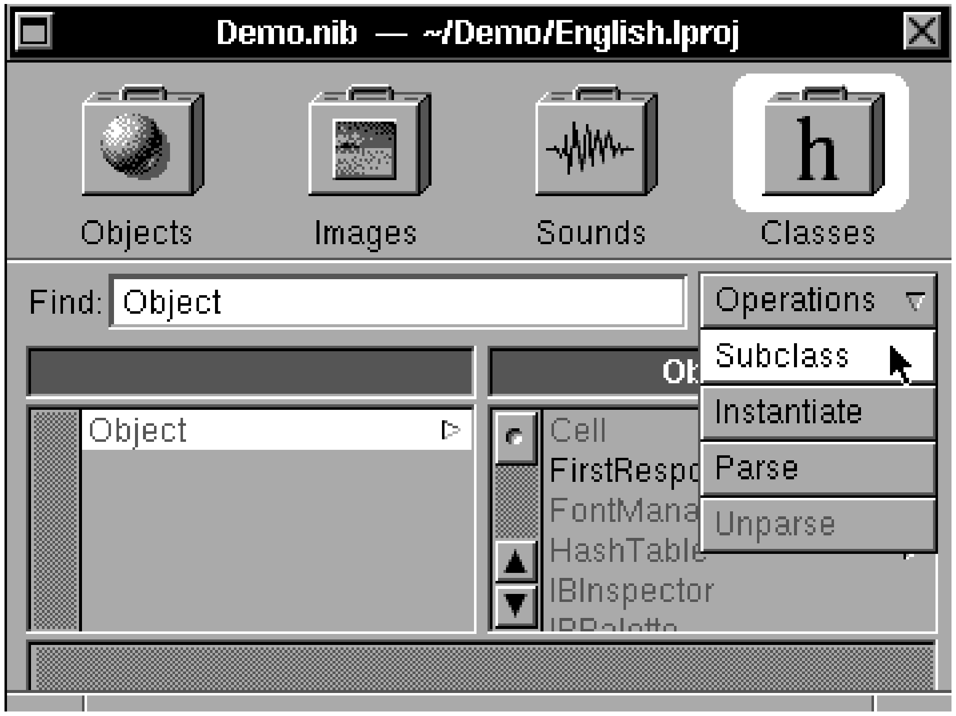
Testing the interface

Interface Builder has a ***test interface*** mode which allows testing of the newly-connected interface objects.

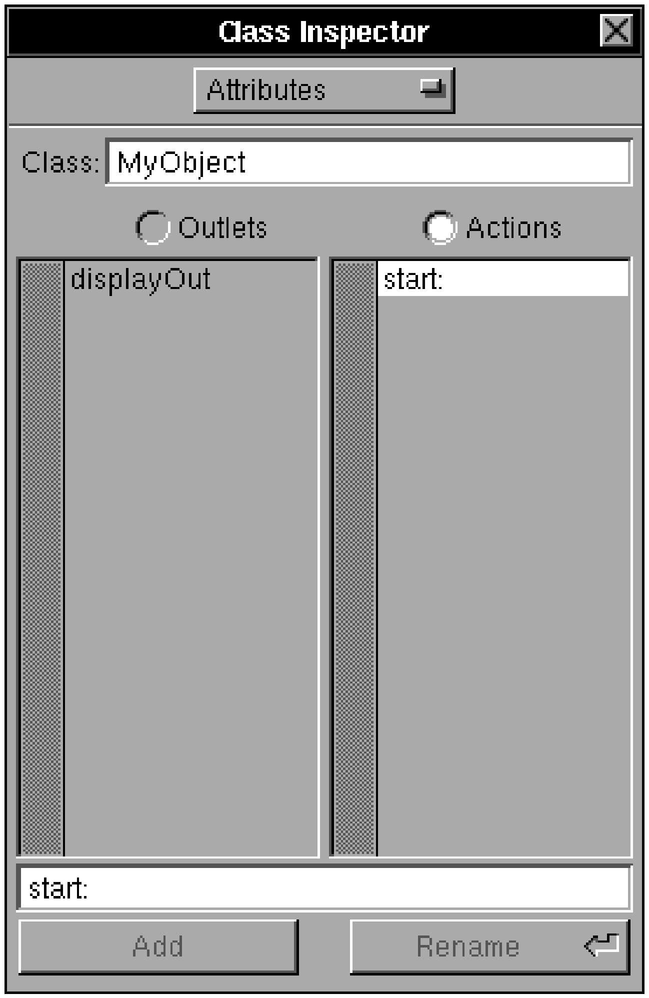
Only the objects obtained from Interface Builder palettes are fully functioning in the test interface mode. New custom objects are not.

Designing custom objects

Interface Builder allows you to specify new ***custom objects*** as ***subclasses*** of AppKit objects or of the root Object class.



Here we define a ***displayOut*** outlet and a ***start:*** action method for the new MyObject class.

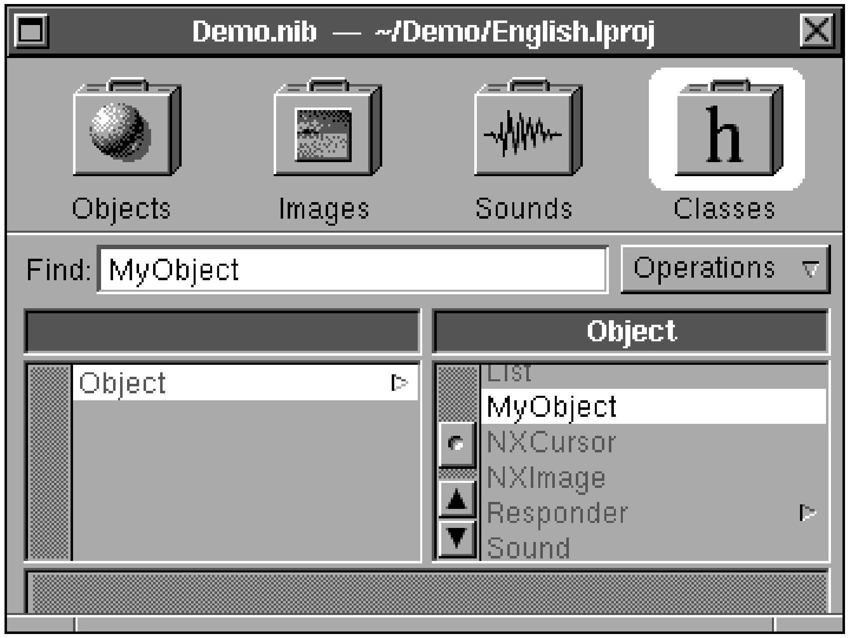


Class: MyObject

displayOut

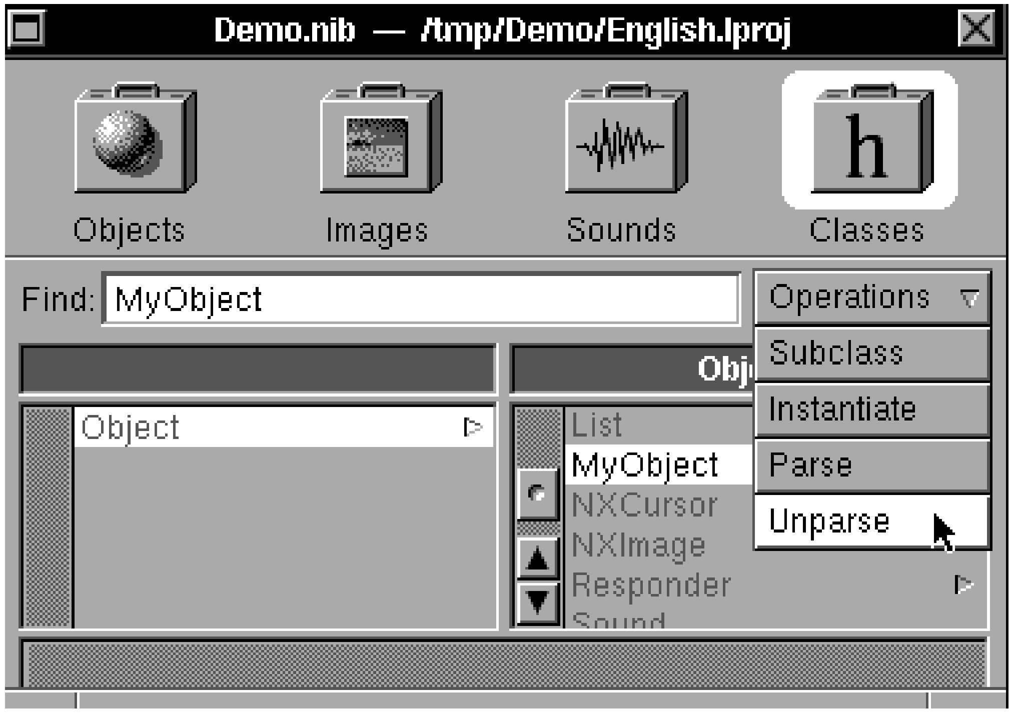
start:

start:



Find: MyObject

IB will ***unparse*** the new class definitions to generate skeleton files of these new classes. The remainder of the class definition must be typed in by the user (using Edit, for example).



The skeleton interface file (MyObject.h) created by the ***unparse*** operation in IB for the MyObject custom object above is:

```
#import <appkit/appkit.h>

@interface MyObject:Object
{
    id   displayOut;
}

- start:sender;

@end
```

The skeleton implementation file (MyObject.m) created by IB for the same custom object is:

```
#import "MyObject.h"

@implementation MyObject

- start:sender
{
    return self;
}

@end
```

The "nib" File

The interface you develop is saved in an Interface Builder file which has a "***.nib***" extension.

The **nib** file contains all of the class information and all specifications for the AppKit objects in the interface.

The **nib** file contains information about how outlets should be initialized, about action messages and their targets, sound and icon data, and a reference to an owner object ("File’s Owner").

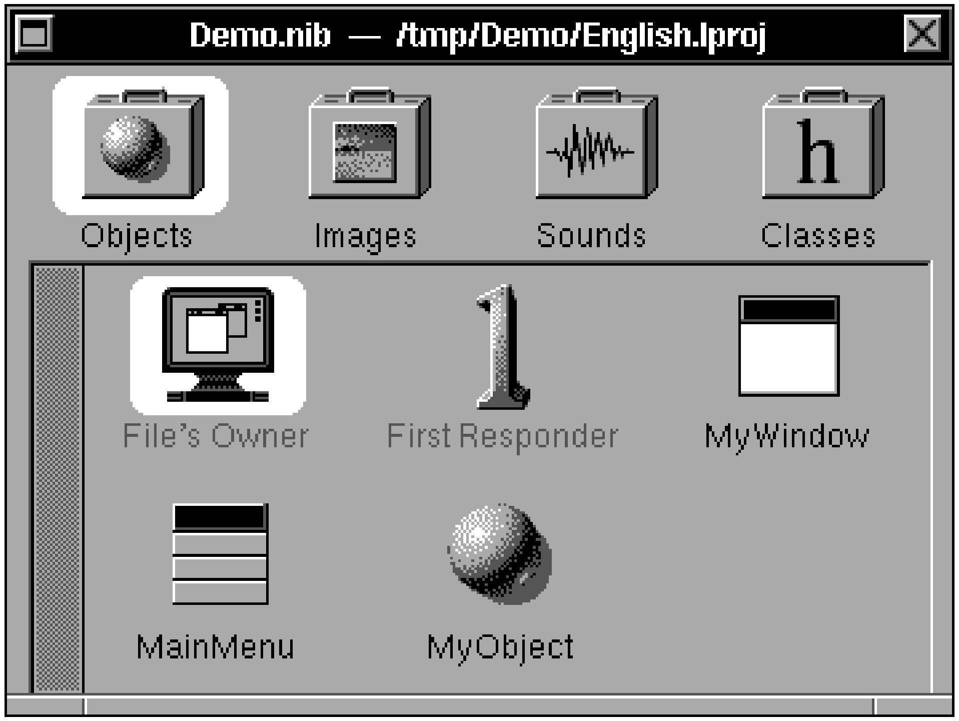
The "nib" File
(continued)

When your application is compiled and built (see Project Builder later), the **nib** file is included in the application’s file package.

When your application is run, your ***Application Object*** creates objects and initializes outlets using information from the **nib** file.

An application can have more than one **nib** file, but only one can be the *main* ***nib*** file (which includes the main menu).

The objects stored in the **nib** file are those in the main window, plus those represented by icons in the File Window:



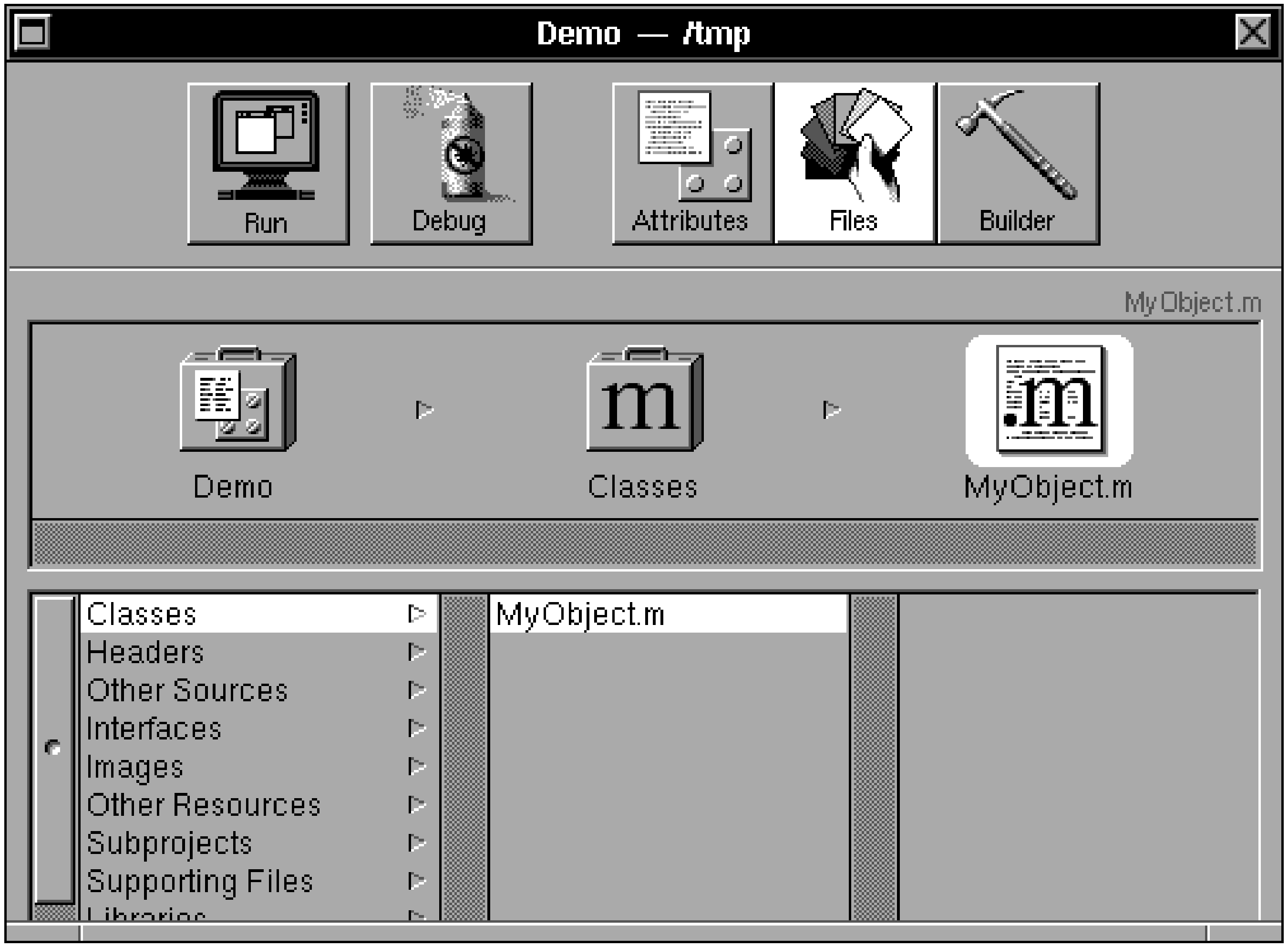
File's Owner is the only object outside of the **nib** file that a connection can be made to. By default, the owner of the **main nib** file is the ***Application Object***.

Project Builder

Project Builder (PB):

Manages in one ***project directory*** all of the files and resources used to build the application. These files include the nib files built in Interface Builder.

Maintains a ***project file*** called ***PB.project*** to organize the files.


Demo — /tmp
Run
Debug
Attributes
Files
Builder
MyObject.m
Demo
Classes
MyObject.m
Classes
Headers
Other Sources
Interfaces
Images
Other Resources
Subprojects
Supporting Files
MyObject.m

Project Builder:

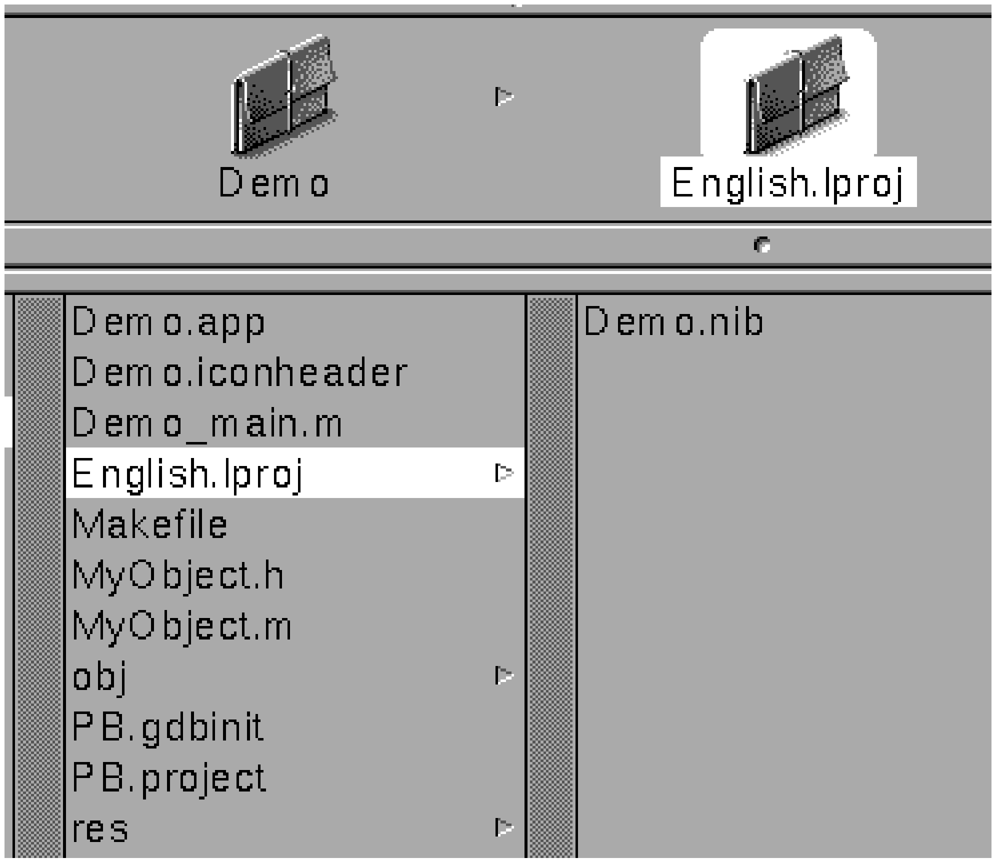
Creates and updates several other files, including:

- the ***Makefile*** for compiling and linking.

- the default ***main file*** containing the ***main()*** function. This function messages the Application object to load the nib file(s).

- the ***icon header file*** (***.iconheader*** extension) containing information about the icons associated with the application and its documents.

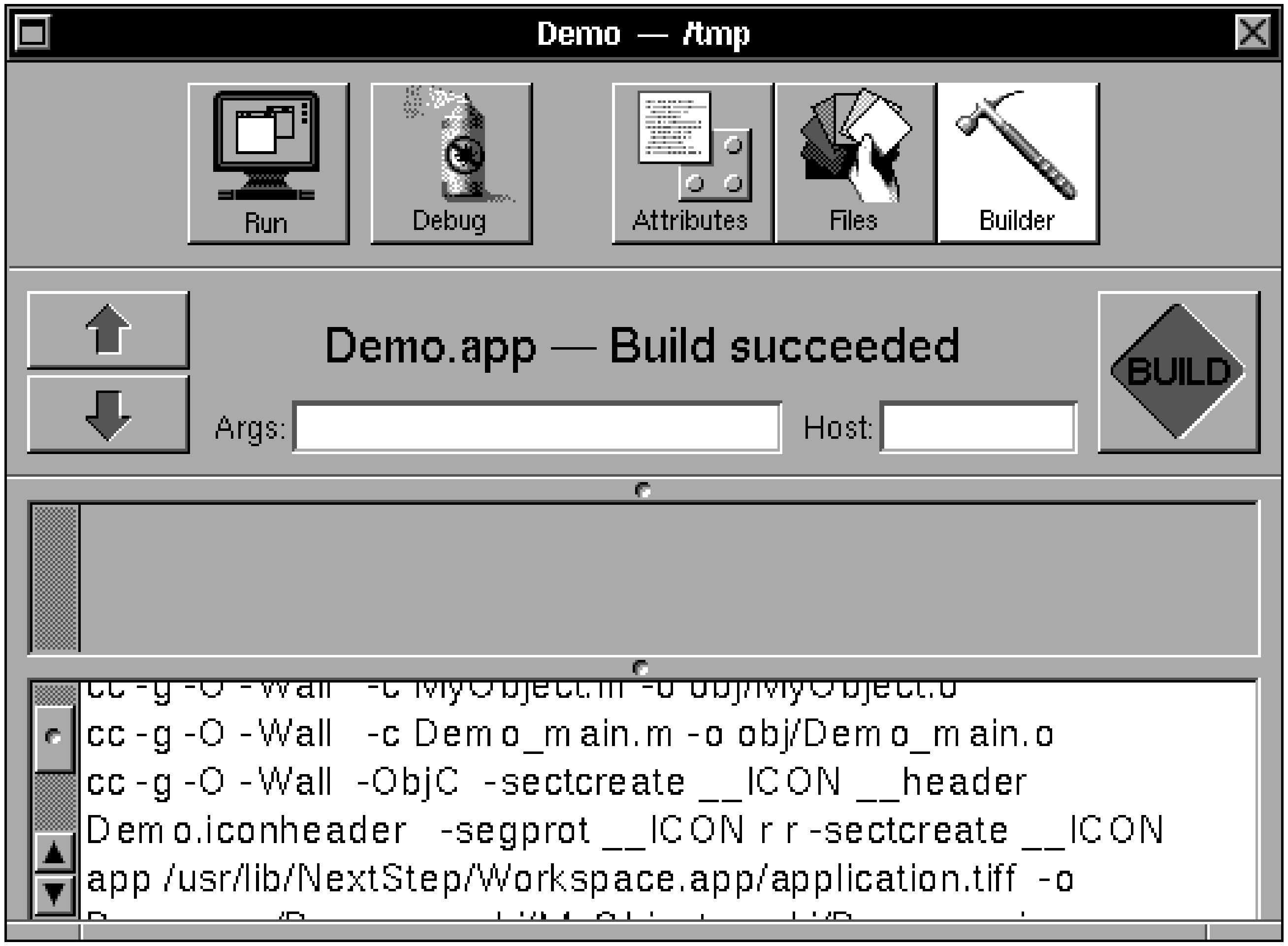
All of these files are kept in the project directory and its subdirectories:



Demo.app
Demo.iconheader
Demo_main.m
English.lproj
Makefile
MyObject.h
MyObject.m
obj
PB.gdbinit
PB.project
res

Demo.nib

Project Builder: ***Builds*** and ***runs*** the application, optionally using the debugger.



```
cc -g -O -Wall   -c Demo_main.m -o obj/Demo_main.o
cc -g -O -Wall  -ObjC  -sectcreate __ICON __header
Demo.iconheader   -segprot __ICON r r -sectcreate __ICON
app /usr/lib/NextStep/Workspace.app/application.tiff  -o
```

Steps for Building Applications

If no custom objects, one main nib:

1) In PB, create a new project and main nib file.

2) Open the nib file in IB and draw the user interface.

2) Make connections in IB.

3) Save IB file.

5) In PB, build and run.

If custom objects, one main nib:

1) In PB, create a new project and main nib file.

2) Open the nib file in IB and draw the user interface.

3) Make connections in IB (between interface objects).

4) Create custom object(s) in IB
- *Subclass Object or View (or some other)*
- *Instantiate custom object*
- *Edit object using Inspector*
- *Add actions and outlets*
- *Make connections to custom object*

If custom objects, one main nib *(cont'd)**:***

5) Unparse custom object

6) Add instance variables to .h file

7) Add code and #import's to .m file

8) Save Files

9) In PB, build and run.

References

NeXT documentation manuals.

NeXTSTEP Applications Programming: A Hands-On Approach, by Simson Garfinkel and Michael K. Mahoney, Spring-Verlag, 1992. The best book anywhere on developing applications under NeXTSTEP.