Introduction to Cocoa Programming

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Agenda

- Brief history of Cocoa
- Apple's free Developer Tools
  - Xcode
  - Interface Builder
- Cocoa programming environment
  - Objective-C syntax
  - Cocoa frameworks
- Demos along the way

Cocoa: a brief history...

History of Cocoa API

- Object oriented API from NeXTSTEP / OPENSTEP... 'NS' prefix to class names
- Originally only usable via Objective-C, now accessible from:
  - Java
  - AppleScript
  - Ruby
  - Python
  - ... and others
- GNUstep provides a consistent API for non-Mac flavours of UNIX / Linux
  www.gnustep.org

Apple's Developer Tools

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Apple's Developer Tools

 QuartzDebug	Window refreshing
 OpenGL Profiler	Monitor OpenGL calls
 MallocDebug	Locate memory leaks
 ObjectAlloc	Monitor object allocation
 Thread Viewer	Identify deadlocks / waits
 Spin Control	Identify waits / GUI locks
 Sampler	Monitor performance
 Shark	Monitor performance

Apple's Developer Tools

Xcode

- Code editor
- Compiler / Linker / Debugger
- Support for a variety of languages
- Distributed Build
- Fix and Continue
- Zero link
- Predictive Compile

Apple's Developer Tools

Interface Builder

- Graphical interface designer
- Allows rapid designing of interfaces
- Provides conformance to Aqua human interface guidelines
- Can provide code stubs
- Enables code <-> GUI interaction

Demo:

Building a web browser

Untitled

< > R X http://www.apple.com

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See Steve Jobs, Bono and the Edge webcast in QuickTime.

Cocoa programming environment

Objective-C

- Superset of ANSI C allowing object-oriented programming
  - C code works fine
  - Stored in .h and .m files
  - Can be mixed with other languages
- Syntax is very Smalltalk-like
- Easy to learn entire Obj-C syntax
- Learning entire Cocoa API takes much longer

Other language syntaxes

C	aFunction (aStruct, ..., ..., ...);
C++ (instance)	anObject . aMethod(..., ..., ...);
C++ (pointer)	anObjectPtr -> aMethod(..., ..., ...);
Java	anObject . aMethod(..., ..., ...);

Objective-C syntax

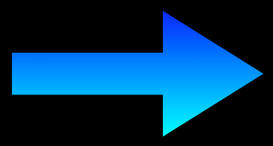
```
[ anObject  aMessage : value1
        with2ndParameter : value2
        and3rdParameter : value3 ] ;
```

Xcode & IB Integration

IBOutlet

Connects code to GUI

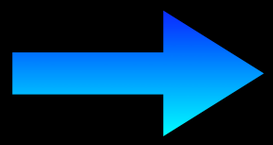
```
IBOutlet id myTextField;
[myTextField
    setFloatValue:123.456];
```



IBOutlet

IBAction

Connects GUI to code



IBAction

```
- (IBAction)zoomIn:(id)sender
{
    [self scaleImageTo:(_scale * 2)];
        //double size
}
```

Objective-C memory

- Obj-C does not have Java's garbage collection
- Obj-C does not have C/C++'s memory headaches either
- Obj-C uses reference counting:

```
[myObject retain]; //increments reference count
[myObject release]; //decrements reference count
[myObject autorelease]; //decrements reference count 'later'
```

Cocoa Frameworks

- Foundation
  - Data types
  - Core technologies
- Application Kit (a.k.a. AppKit)
  - Application architecture objects
  - GUI widgets
- WebKit, OpenGL, CoreAudio, QuickTime, others...

Demo:

Wrapping UNIX in Aqua

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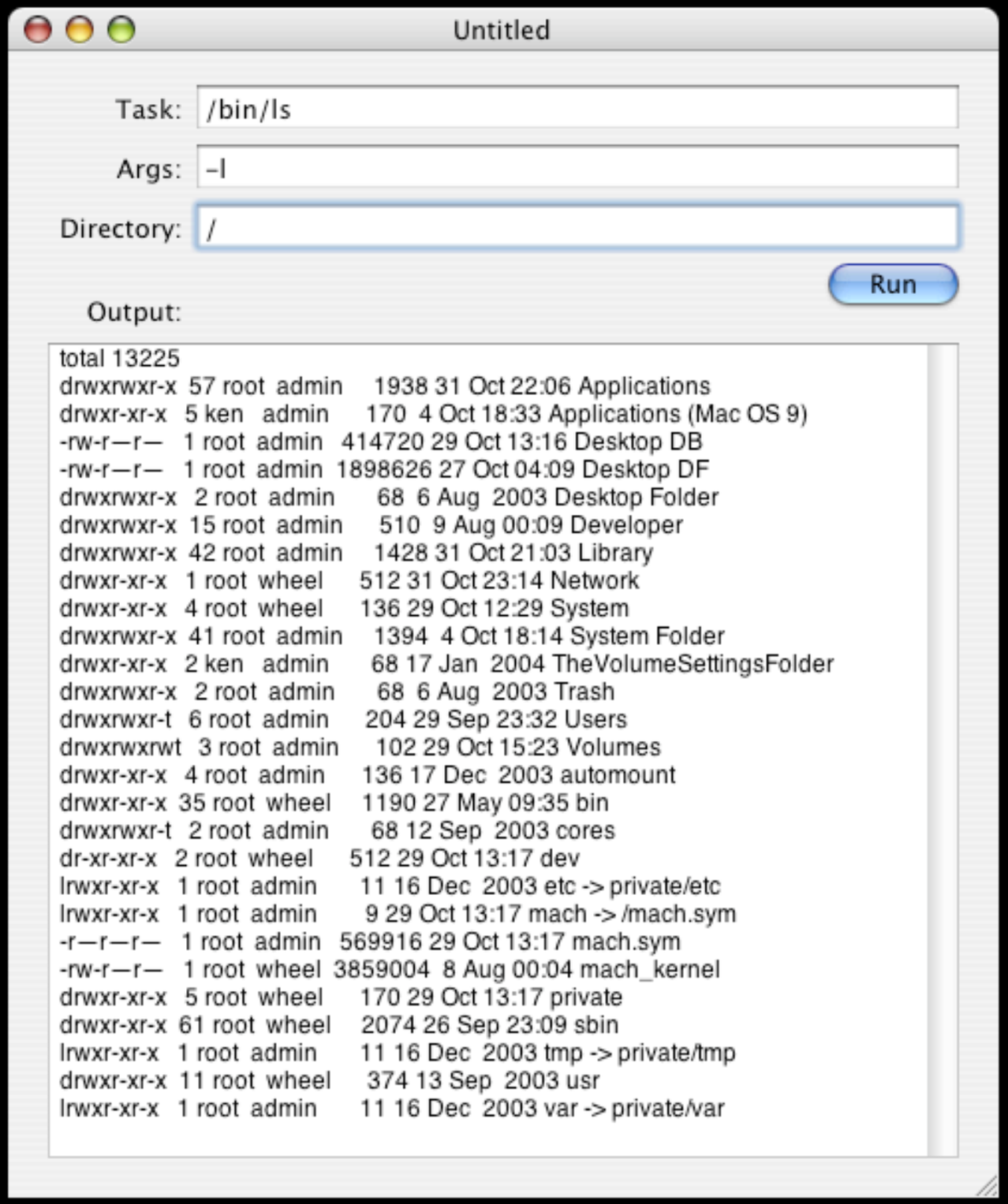

Untitled
Task:
/bin/ls
Args:
-l
Directory:
/
Run
Output:
total 13225
drwxrwxr-x 57 root admin 1938 31 Oct 22:06 Applications
drwxr-xr-x 5 ken admin 170 4 Oct 18:33 Applications (Mac OS 9)
-rw-r—r— 1 root admin 414720 29 Oct 13:16 Desktop DB
-rw-r—r— 1 root admin 1898626 27 Oct 04:09 Desktop DF
drwxrwxr-x 2 root admin 68 6 Aug 2003 Desktop Folder
drwxrwxr-x 15 root admin 510 9 Aug 00:09 Developer
drwxrwxr-x 42 root admin 1428 31 Oct 21:03 Library
drwxr-xr-x 1 root wheel 512 31 Oct 23:14 Network
drwxr-xr-x 4 root wheel 136 29 Oct 12:29 System
drwxrwxr-x 41 root admin 1394 4 Oct 18:14 System Folder
drwxr-xr-x 2 ken admin 68 17 Jan 2004 TheVolumeSettingsFolder
drwxrwxr-x 2 root admin 68 6 Aug 2003 Trash
drwxrwxr-t 6 root admin 204 29 Sep 23:32 Users
drwxrwxrwt 3 root admin 102 29 Oct 15:23 Volumes
drwxr-xr-x 4 root admin 136 17 Dec 2003 automount
drwxr-xr-x 35 root wheel 1190 27 May 09:35 bin
drwxrwxr-t 2 root admin 68 12 Sep 2003 cores
dr-xr-xr-x 2 root wheel 512 29 Oct 13:17 dev
lrwxr-xr-x 1 root admin 11 16 Dec 2003 etc -> private/etc
lrwxr-xr-x 1 root admin 9 29 Oct 13:17 mach -> /mach.sym
-r—r—r— 1 root admin 569916 29 Oct 13:17 mach.sym
-rw-r—r— 1 root wheel 3859004 8 Aug 00:04 mach_kernel
drwxr-xr-x 5 root wheel 170 29 Oct 13:17 private
drwxr-xr-x 61 root wheel 2074 26 Sep 23:09 sbin
lrwxr-xr-x 1 root admin 11 16 Dec 2003 tmp -> private/tmp
drwxr-xr-x 11 root wheel 374 13 Sep 2003 usr
lrwxr-xr-x 1 root admin 11 16 Dec 2003 var -> private/var

NSTask class

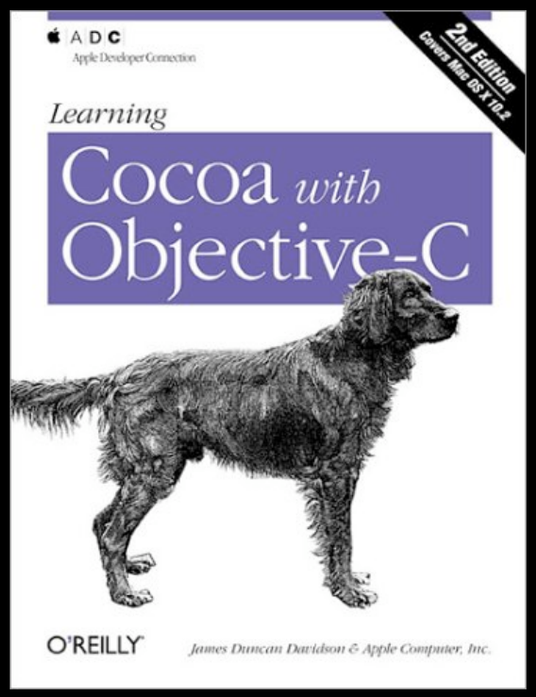
- Allows integration between Cocoa and UNIX commands
- Can be piped together (using NSPipe class)
- Runs command asynchronously
- Doesn’t expand environment variables
  - Doesn’t know about $PATH
  - You have to specify “/bin/”, “/usr/bin/”, “/sbin/” etc.

The Objective-C code

```
- (IBAction)runTask:(id)sender
{
    NSTask *theTask = [[NSTask alloc] init];
    NSString *theOutput;
    NSPipe *outputPipe = [[NSPipe alloc] init];
    NSFileHandle *handle;

    [theTask setLaunchPath:[taskField stringValue]];
    [theTask setArguments:[NSArray arrayWithObject:[argsField stringValue]]];
    [theTask setCurrentDirectoryPath:[directoryField stringValue]];
    [theTask setStandardOutput:outputPipe];
    handle = [outputPipe fileHandleForReading];

    [theTask launch];

    theOutput = [[NSString alloc] initWithData:
        [handle readDataToEndOfFile] encoding:NSASCIIStringEncoding];

    [outputField setString:theOutput];

    [theOutput autorelease];
    [outputPipe autorelease];
    [theTask autorelease];
}
```

Some light reading

Useful Books... Cocoa



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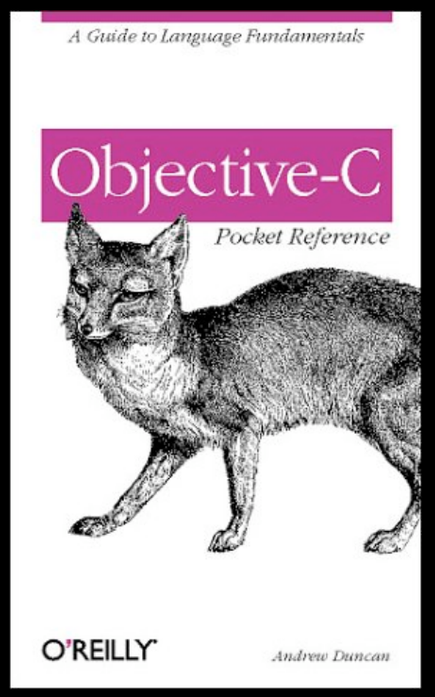

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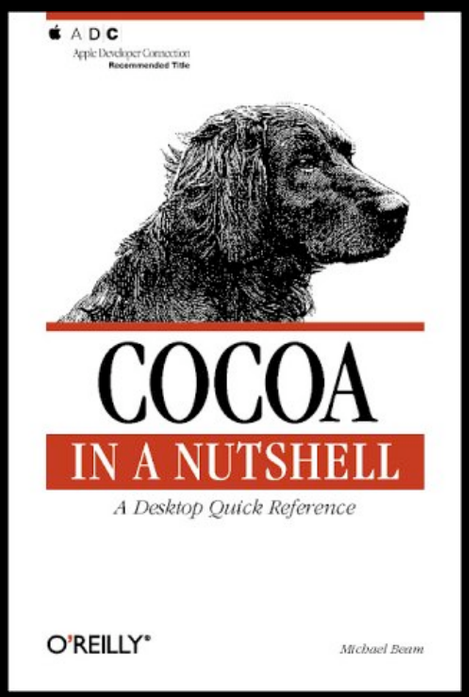

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Q&A

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