

Welcome

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# Carbon on Mac OS X

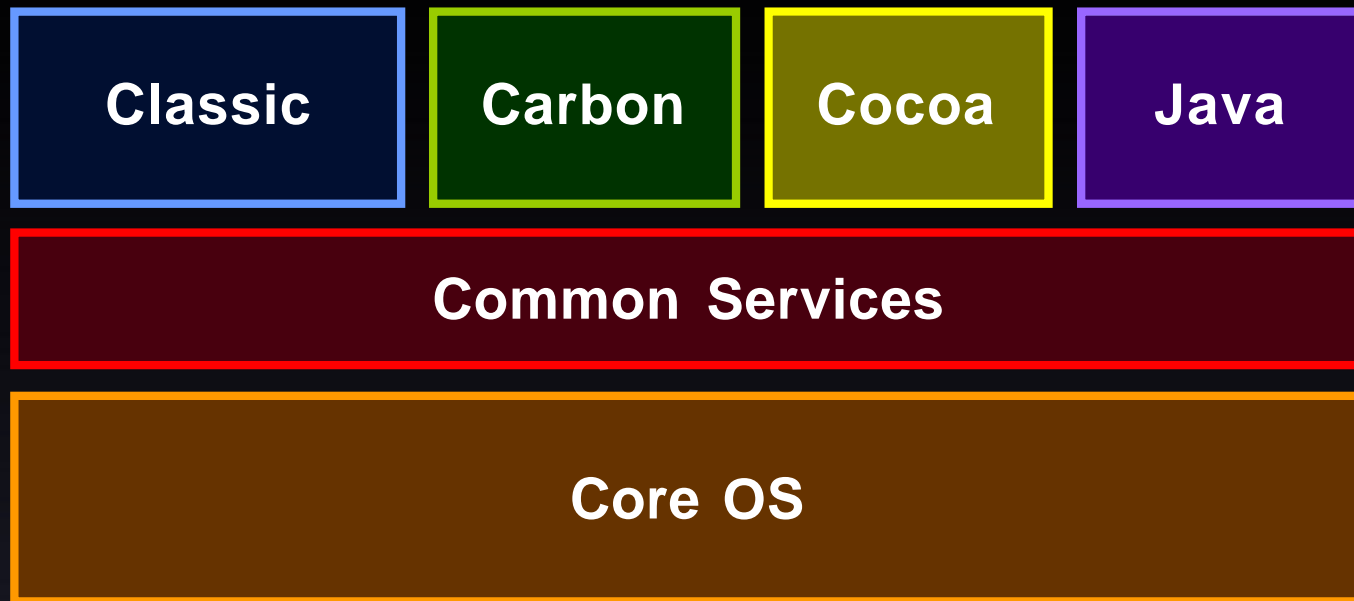
John Iarocci  
Manager, Carbon Team

# What's in This session?

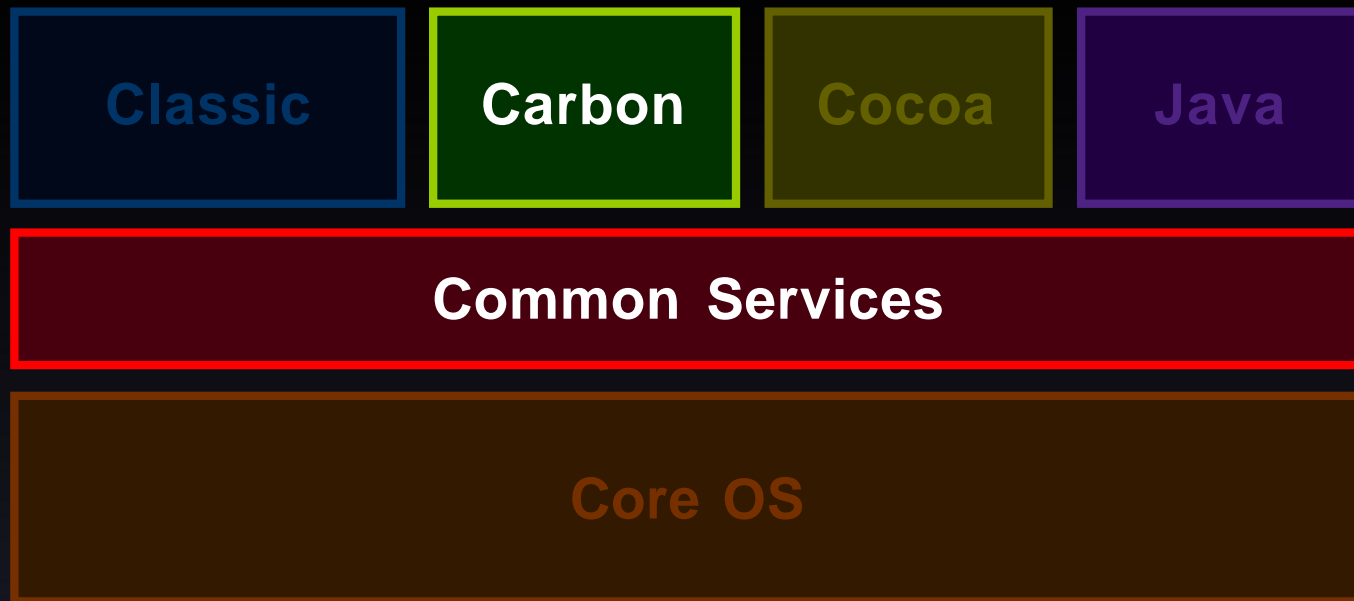
- Carbon Technologies on Mac OS X
- Development on Mac OS X



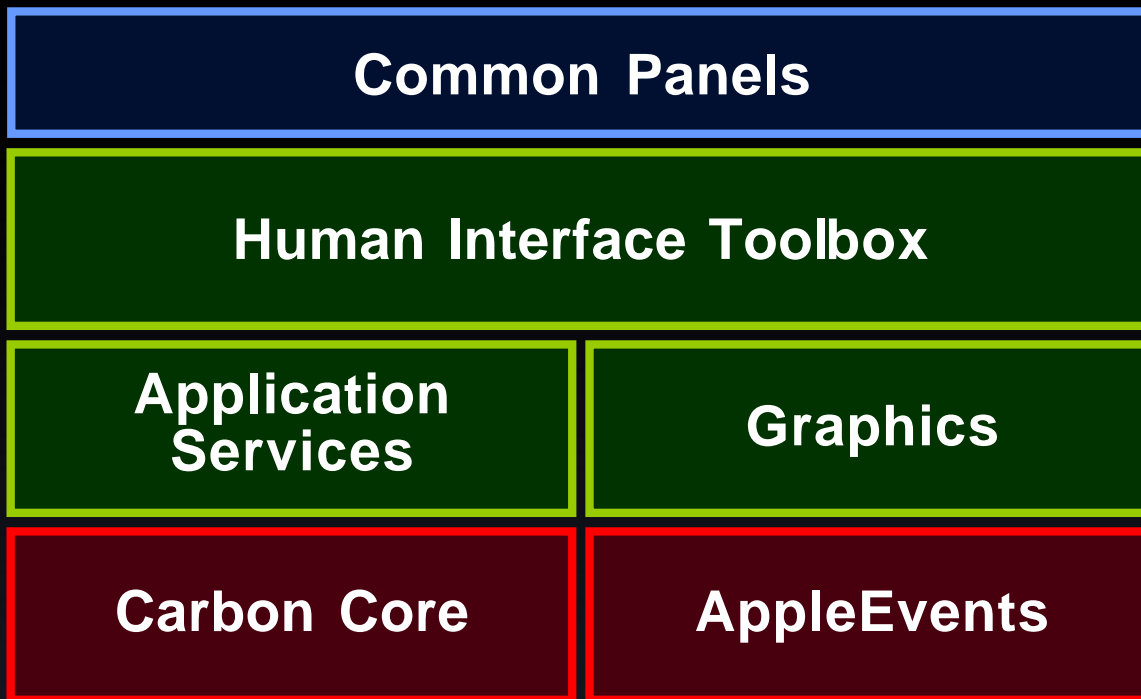
# Mac OS X Architecture



# Mac OS X Architecture



# Carbon Architecture



# Runtime on OS X

- Developer Preview release supports both TOC and GOT Runtimes
- TOC Runtime
  - Pointer to TVectors
  - Data offsets determined at runtime
- GOT Runtime
  - Pointer to code
  - Data offsets fixed at link time



# Code Loading

- Two code loaders supported on OS X
  - Both have similar features
- CFM and Dynamic loader (dyld):
  - PEF shared libraries
  - Mach-o shared libraries (dylibs)





# Comparing CFM & dyld

- Two-level namespace
  - Important for plug-ins
- Link-time
  - Dummy libraries vs. everything
- Run-time
  - Lazy-initialization is a “good thing”



# Mixed Mode

- There's no 68k, why is there Mixed Mode?
- Required
  - To switch between runtimes
  - To enable single-binary CFM app

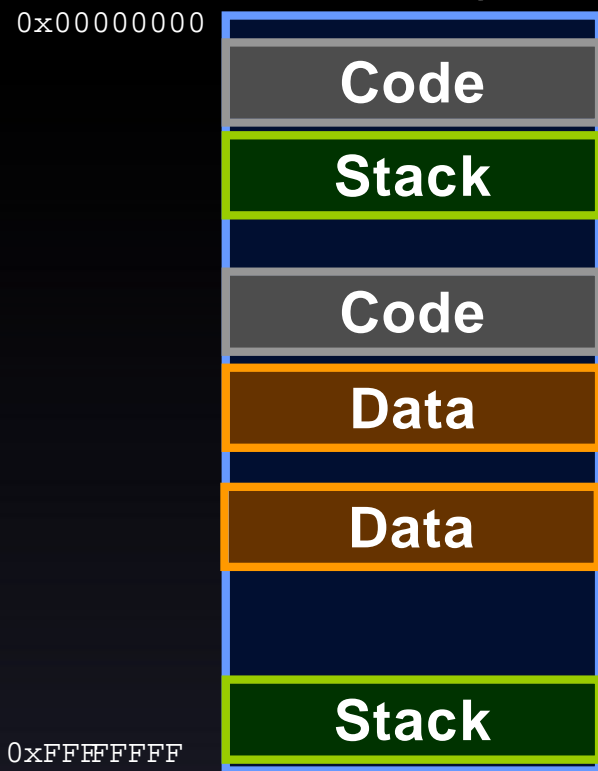


# Code Sample

```
void SillyCompletionRoutine()  
{  
    ioUPP = NewIOCompletionUPP(myCompletionRoutine);  
    .  
    .  
    .  
    InvokeIOCompletionUPP(ioUPP );  
    .  
    .  
    .  
    DisposeIOCompletionUPP(ioUPP);  
}
```



# Memory Model



- Code and read-only data is shared
- Every thread gets a stack with guard pages
- Page zero (LowMem) not accessible
- 4 GB address space



# Memory Management

- Test at runtime for sparse VM
  - `gestaltMemoryMapSparse`
- Runtime behavior of Memory Manager
  - Zones are no longer supported
  - Purging
    - Purge procs are not called on X
  - Relocation
    - Only when `SetHandleSize` is called



# File Manager on OS X

- Support for UFS, NFS, & SMB (Samba)
- Async I/O doesn't run at interrupt level
- New HFS extensions fully supported in Carbon
- Working directories and device access not supported



# Threading with Carbon

- Thread Manager
  - Cooperative scheduling only
- MultiProcessing API
- All threading layered on pthreads
  - Shared libraries can assume pthreads
- A simple Carbon app is single-threaded



# Thread-safe Services

- MultiProcessing APIs
- File Manager
- Open Transport
- BSD services:
  - malloc()
  - POSIX file APIs
  - Sockets





# AppleEvents

- Available outside of Carbon
  - Few APIs are Carbon-only
- AEDescs are opaque
- Standard AppleEvents used in all Application environments
  - ‘oapp’, ‘odoc’, ‘pdoc’, ‘quit’
  - Basis for AppleScript



# Extension Replacement

- Carbon
  - Background-only applications using AppleEvents
- OS X
  - IOKit driver (see “I/O Kit: Mac OS X’s Driver Model”)
  - File system plug-ins



# Carbon Porting Strategy

- Carbon on OS X Development
  - LiteCarbonLib on OS 8.x
  - 3 choices on OS X
    - CFM app on X
    - Cross compile with Metrowerks IDE
    - Natively built with ProjectBuilder



# Not in Developer Preview of OS X

- QuickTime
- Sound Manager
- Speech Manager
- Display Manager
- AppleScript
- ColorSync
- Text Services Mgr
- Text Encoding



# Development Choices

- CFM-based or Mach-o based application
- Development Tools
  - ProjectBuilder—Mach-o based application
  - Metrowerks IDE—CFM or Mach-o based application
- Debuggers
  - ProjectBuilder and gdb
  - Metrowerks Debugger (via gdb)



# CFM-based Application

- Build with Mac OS 8.x tools
- Link against LiteCarbonLib on OS 8.x
- Transfer application to OS X
- Debug
  - Metrowerks Debugger (and gdb)
  - ProjectBuilder (and gdb)



# Mach-o Application (Cross Compiled)

- Cross compile with Metrowerks IDE
  - Use Mach-o compiler and linker plug-ins
- Debug with ProjectBuilder and gdb



# Mach-o Application (Natively Compiled)

- Build with ProjectBuilder
  - Use egcs compiler
- Debug with ProjectBuilder and gdb





# Development Setup

- Single Machine
  - Cross-compiling
  - Native building
- Two machine
  - Remote debugging
  - Telnet session



# Summary

- Lots of development choices
- Start Carbonizing today!
  - Begin on OS 8.x
  - Try your app on OS X



# Related Sessions

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**117 Mac OS X Kernel**

Hall A1  
Wed., 9:00am

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**108 Core Foundation Overview**

Hall 2  
Wed., 1:00pm

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**109 HLTB: Carbon Changes  
and Additions**

Hall 2  
Fri., 10:15am

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**110 HLTB: The Carbon  
Event Model**

Hall 2  
Fri., 1:00pm

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**111 Core Foundation Plug-ins**

Hall A1  
Fri., 4:00pm

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# Related Sessions (Pt. 2)

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**105-R Carbon Overview**

Hall C  
Fri., 9:00am

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**107-R Carbon on Mac OS 8**

Hall C  
Fri., 1:00pm

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**121 ProjectBuilder for Mac OS  
X**

Hall A1  
Thur., 2:30pm

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**122 Dev. Tools for Mac OS X**

Hall A1  
Thu., 4:00pm

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**610 Open Transport in Carbon**

Hall A2  
Fri., 10:15pm

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Q&A



Think different.<sup>TM</sup>



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