**To Advance through Presentation
Use Page Up and Page Down Keys**

99 | Worldwide
Developers
Conference

What We'll Cover

- Status Update
- Technology Roadmap
- MacOS X Graphics Architecture Review
- Quartz Overview
- What you can do now…

Status Update

- Quartz
  - Completely new Window System
  - CoreGraphics—new 2D library

- All Apple technology

- …and more to come!

Quartz Technology Roadmap

- Phase 1: Eliminate DPS
  - New Windowing System and Graphics Lib.

- Phase 2: Propagate and Integrate
  - Printing, ColorSync, QuickTime, Java, UI

- Phase 3: Direct Developer Adoption
  - New Features, SDKs

Mac OS X Graphics Architecture Review
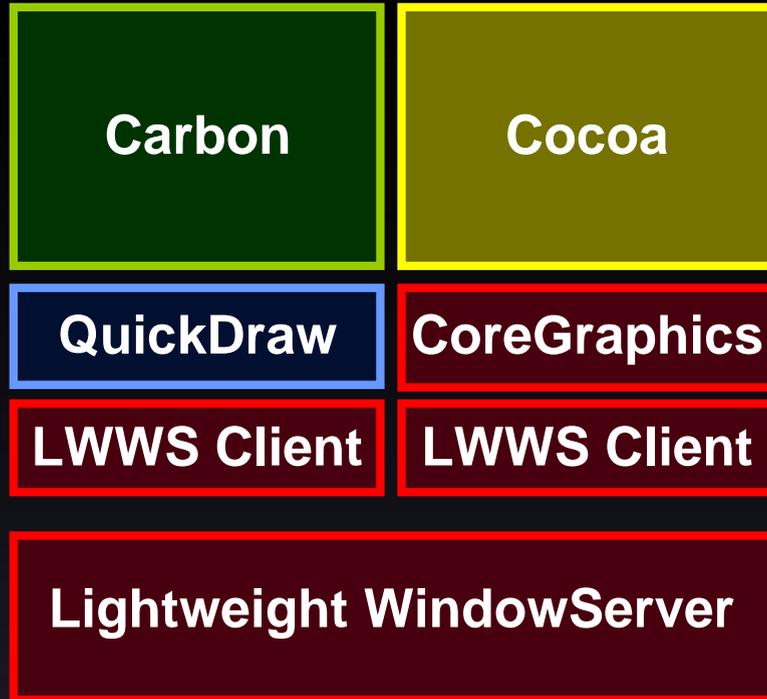
Mac OS 8.x Compatibility	Carbon	Cocoa	Java

Common Services

Core OS

Graphics Services

Carbon	Cocoa

QuickDraw	CoreGraphics

LWWS Client	LWWS Client

Lightweight WindowServer

Window Server Design

- Low level "virtualization" of:
  - Displays, events, cursor
- "Lightweight" (no drawing)
- Arbitrates screen real estate
- Process Manager/Activation component
- Manages off-screens for double buffering
  - Reduces update event traffic

Window Buffering

- Off-screens in shared memory
- Carbon adding support for automatic buffering
- In future systems, this will likely be default
- QuickDraw will maintain dirty area
- WindowManager will flush automatically
- Tell QuickDraw to explicitly flush if necessary

QuickDraw for X

- Part of Carbon Library
- Common Code base w/ Mac OS 8
- Compatibility for Carbon Developers
- Support for double buffering
- Asynchronous drawing
- New acceleration model

Acceleration for X

- Unified Drawing Surfaces w/ 2D and 3D
    - Offscreen VRAM

- Arbitration/Virtualization by WindowServer and Core OS

- Will make use of blended 2D blits

- Flexible gamma correction (blending should always be linear, not sRGB)

CoreGraphics Library

- Portable, device independent 2D graphics library

- Implements PS/PDF imaging model (plus enhancements)

  - Transparency, compositing, soft-masking, effects

- High Level abstractions

- Replacement technology for DPS Graphics

CoreGraphics Details

- Graphical Substrate for Cocoa
    - Useable by Carbon Apps on X as well

- Direct PDF consumption and generation

- Built-in ColorSync and ATS support

- Affine Transformations (3x2)

- Floating Point coordinates

- Anti-aliasing

- Ready for AltiVec

Evolution of Strategy

- Not pursuing "unified" QuickDraw and PDF

- Keep QuickDraw and CoreGraphics conceptually separate

- QuickDraw remains compatible w/Mac OS

- CoreGraphics remains compatible w/PS imaging model

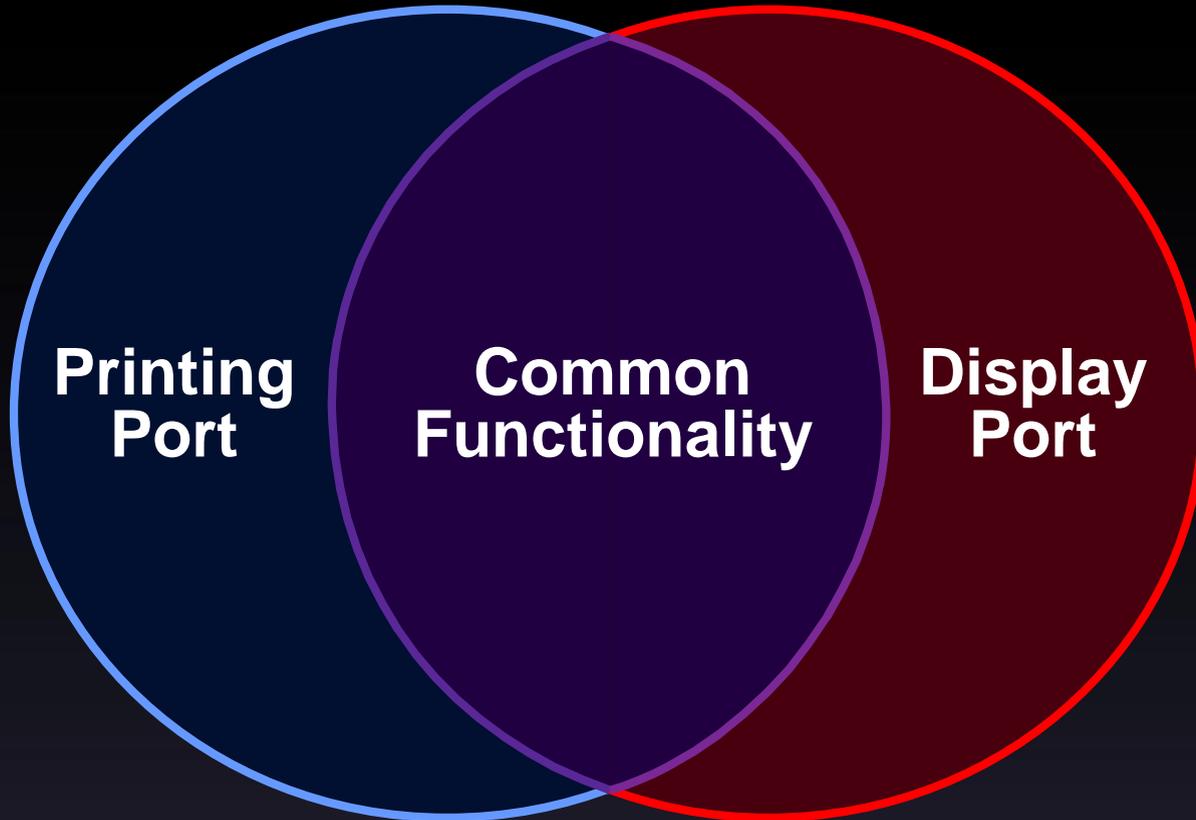- Integration still possible in a variety of ways

Printing on Mac OS

- Today, developers deal with two flavors of grafPort:
    - Display grafPort (provided by QuickDraw)
    - Printing grafPort (provided by Printer Driver, e.g. LW8)

Display vs. Printing

Printing Port   **Common Functionality**   **Display Port**

Printing on Mac OS X

- Display/Printing distinction will continue with Carbon

  - Display grafPort (provided by QuickDraw)

  - "Universal Printing" grafPort (provided by CoreGraphics)

Universal Printing Port

- Bottlenecks implemented by CoreGraphics
- Ability to save directly to PDF
- Consistent graphics model for all printers
- Allows for on-screen preview
- Low-level CG drawing API available when printing
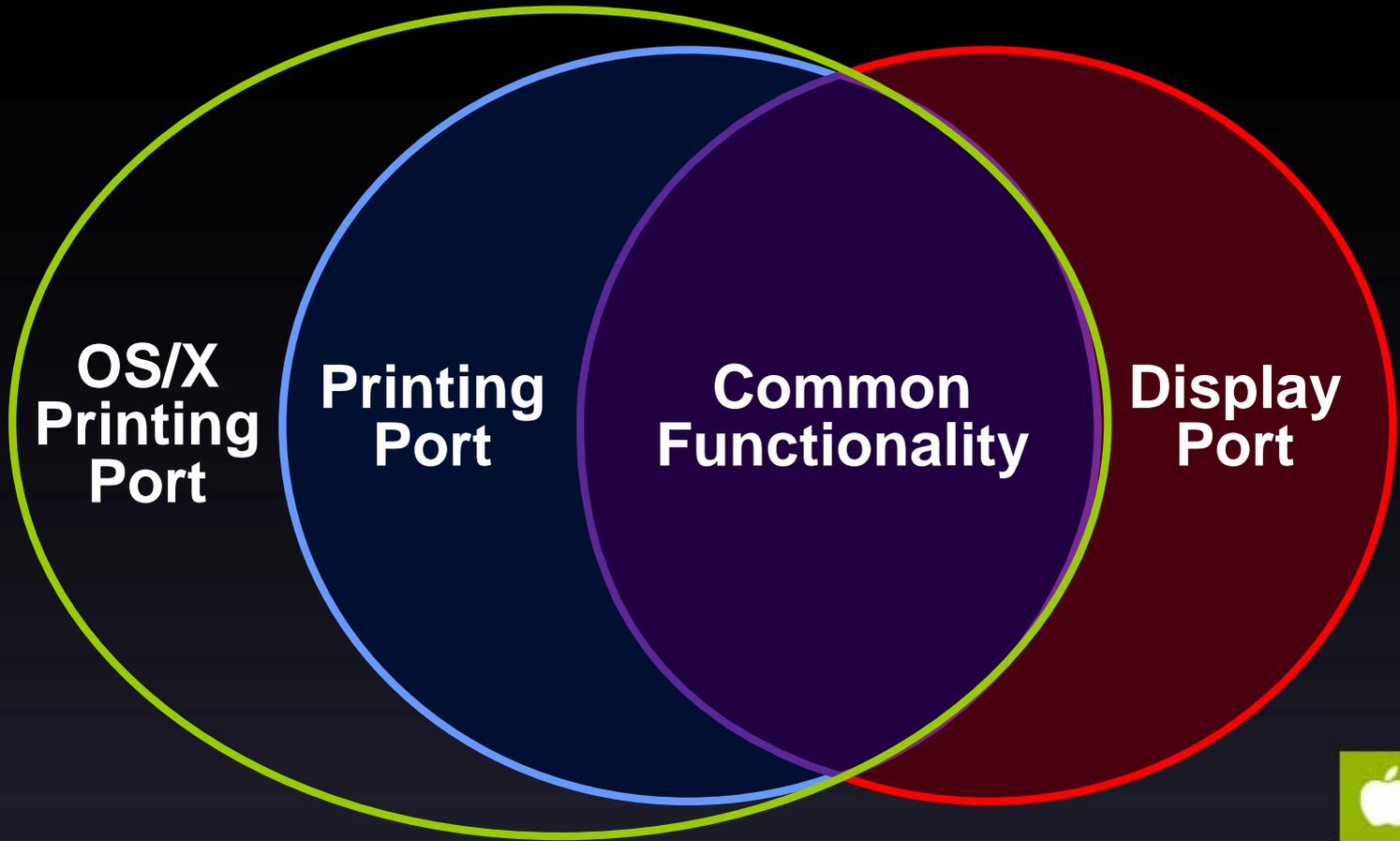- Handles StdPix data (via QT if necessary)
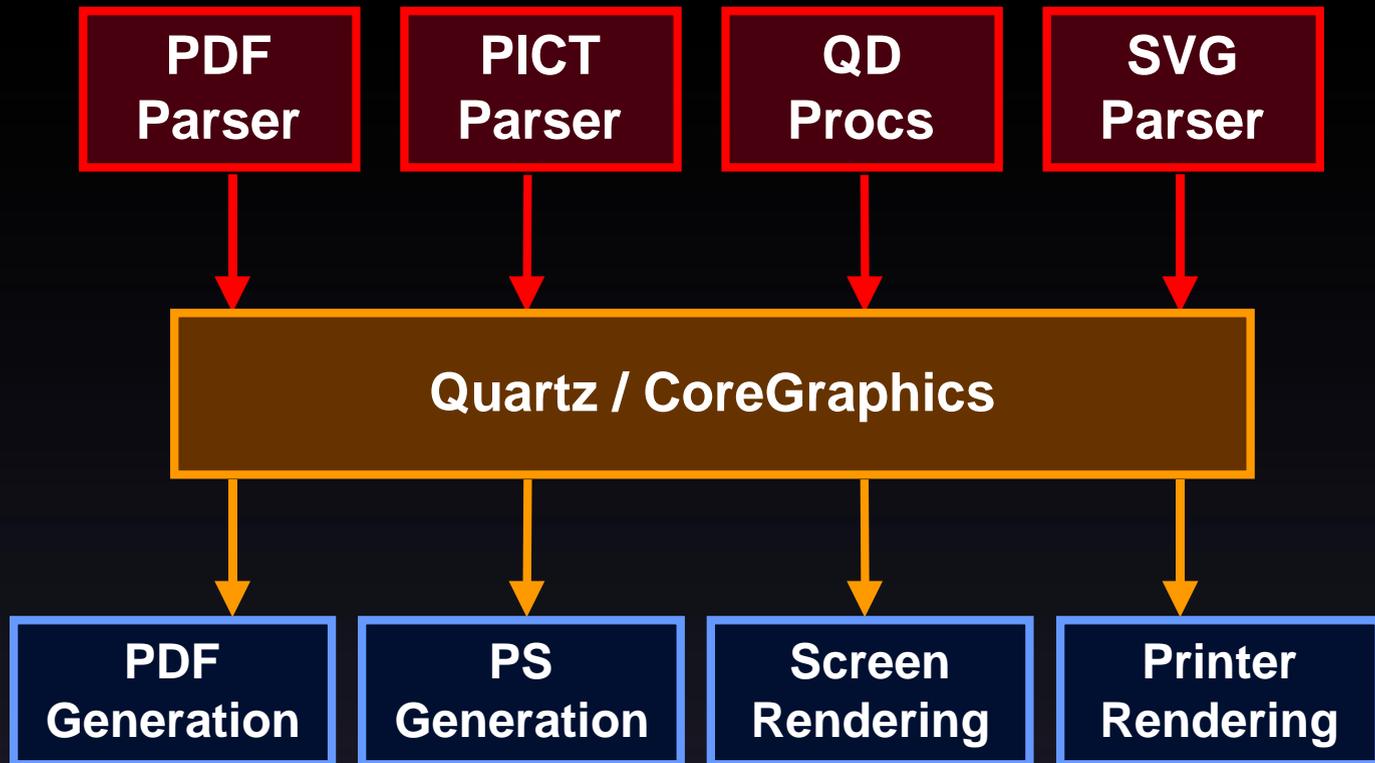
Universal Printing Port

- CoreGraphics grafPort and LW8 have similar limitations
  - Region drawing
  - Complex transfer modes

Printing grafPort

How It Works

PDF Parser

PICT Parser

QD Procs

SVG Parser

Quartz / CoreGraphics

PDF Generation

PS Generation

Screen Rendering

Printer Rendering

Getting Quartz "For Free" in Carbon

- Printing: default Carbon printing code will generate PDF on Mac OS X

- Raster printers can render PDF

- Use QuickTime Graphic Importers

QuickTime Integration

- Adopt Graphic Importers
  - BMP, FlashPix, GIF, JFIF, JPG, MacPaint, Photoshop, PNG, PICT, QTIF, SGI Image, TGA, TIFF

- PDF Codec/Graphic Importer

- SVG Codec/Graphic Importer

- Animation possibilities

SVG Support

- W3C Scaleable Vector Graphics Initiative
- XML namespace for 2D Graphics
- PostScript-like Imaging Model
- Transparency and Alpha Channel Support
- Raster Effect Model (blurs, glows, etc.)
- Spec available at www.w3.org

Quartz Integration

- Drag and Drop PDF
- QuickTime Integration
- ColorSync Integration
- Java2D implementation
- SVG support
- Printer Rasterization Service, Preview
- Boot animation

CoreGraphics API

- Preliminary version in PR1

- Will be refined in the future

- Straightforward mapping from PS/PDF

```
CGMoveTo(cgContext, 10.0, 10.0);
CGCurveTo(cgContext, 20.0, 20.0, 40.0, 50.0, 60.0, 70.0);
CGSetLineWidth(cgContext, 10.0);
CGStroke(cgContext);
```

Quartz Demo

- Only an example of what's possible
- Well designed code works well in the new world
- Yesterday's "rendering tricks" might not be applicable
- Need to learn tomorrow's tricks!

What You Can Do Now...

- "Dot" release for Carbon
- "Major" release for Carbon
- "New" Development for OS/X only

"Dot" Release for Carbon

- Take advantage of QuickTime Graphic Importers

- Make sure your App works with Window Buffering

- Notify QuickDraw when you want to flush

"Major" Release for Carbon

- Factor you rendering code
- Platform libraries will become more sophisticated
- Consider adopting CoreGraphics on X for your print loop
- Graphic Apps: Look at SVG authoring

New Development (Mac OS X only)

- Consider using Cocoa
- Consider using CoreGraphics directly

Summary

- Carbon and Cocoa applications will both take advantage of new graphics architecture "out of the box"

- Currently driving Quartz integration in Mac OS X

- Direct API available for early adopters

- Feedback to:
    graphics-feedback@apple.com

Find Out More...

905 Graphics and Printing Feedback Forum	Hall J2 **Thur., 10:15am**
113 Printing for Mac OS 8 and X	Hall A1 **Wed., 4:00pm**
162 What's New in QuickDraw	Hall A2 **Thur., 10:15am**