The Mac OS X/Darwin Port: History, Porting, and Suggestions

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- About the speaker
- History of the Port
- Current status
- What the future holds
- Porting issues
- Suggestions for improvement of the porting process
- Questions?

Name
- Dan Williams

Occupation
- Student, Beloit College (Beloit, WI, USA)
- Field of Study: Anthropology / Archaeology

OOo Role
- Pick One:
  - Community Contributor
  - Community Tool
  - Community Slave
- Primary member of the Mac OS X/Darwin team

Other Projects
- NeoOffice contributor, PennMUSH for Macintosh port maintainer, random Archaeological databases
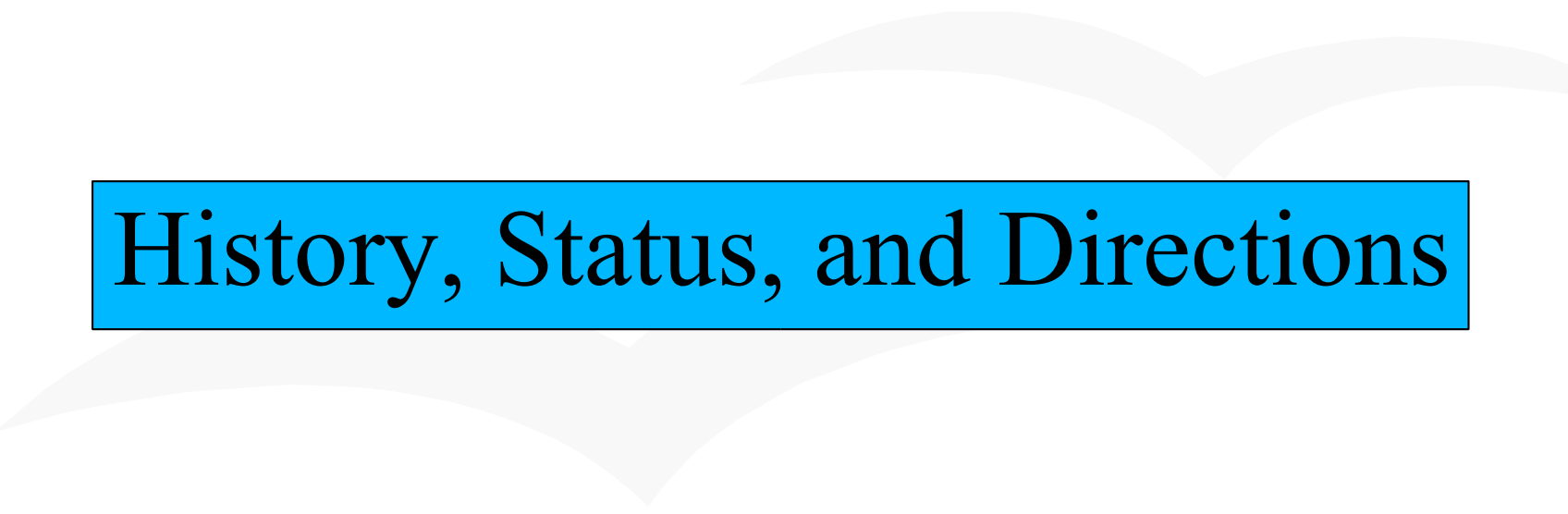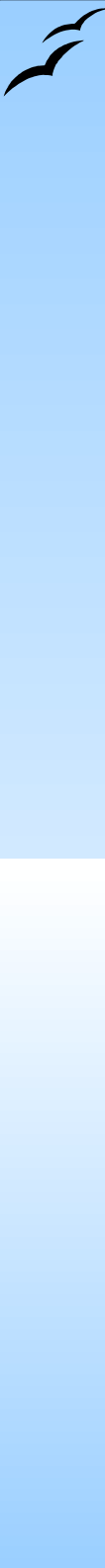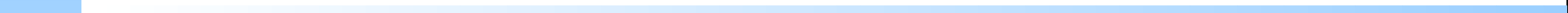
OpenOffice.org Mac OS X/Darwin Port

X11 Port

Quartz Port

Aqua Port

NeoOffice

The Mac OS X/Darwin Port

- # X11 Port
  - Un-Mac-like Windows appearance
  - Leverages display engine of other Unix ports
  - Requires X11 to be installed
  - Bug fixes mostly free
  - Both Mac OS X and Darwin compatible

- # Quartz Port
  - Un-Mac-like Windows appearance
  - Will utilize Cocoa and CoreGraphics
  - "Native"
  - Minimal Mac OS X integration

- # Aqua Port
  - Will be fully Aquafied, normal Mac OS X appearance
  - Will utilize Cocoa and CoreGraphics
  - "Native"
  - Will offer full Mac OS X integration (ie Address Book, Quicktime, etc)

- NeoOffice
  - Fully GPL
  - Test-bed/sandbox for Mac OS X porting concepts
  - Implement more radical code changes
  - A preview of what's to come
  - Not for production use

History, Status, and Directions

- ## Classic Mac OS Port
  - QuickDraw, Appearance Manager
  - Ended with Star Office 3 (?)

- ## Sun Mac OS X Port
  - Targeted to 638
  - Using Mac OS X 10.0, gcc2
  - Not completed by Sun, released to community in April 2001

- ## No Critical Mass
  - No real work done until Fall/Winter 2001
  - Still targeted to 638
  - Everyone else working with 641

- ## Issues: Manpower, toolchain

April	Nov/Dec	Feb	May	July	Oct	Dec/Jan	March
2001			**2002**				**2003**
Release to Community	**Real work begins**	X11 jump-started	WWDC Developer build	Move to 641	Public Beta	Macworld SF Final Beta	Work on Final

The Mac OS X/Darwin Port

OpenOffice.org Conference
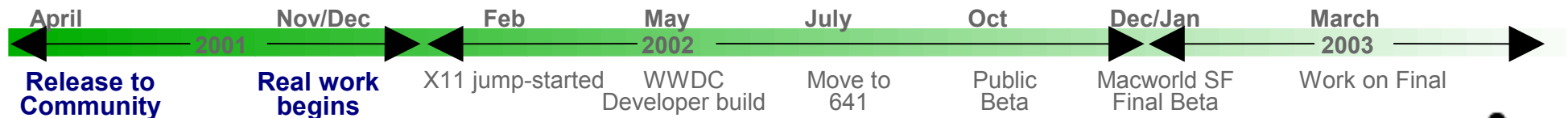
- ## Critical Mass
  - Kevin Hendricks, Scott Hutinger, Ed Peterlin, Dan Williams
  - Sun engineers
  - Still working on Aqua port
  - Targeting Mac OS X 10.1, gcc2

- ## Issues
  - Manpower
  - Toolchain
  - Missing OS functionality

April	Nov/Dec	Feb	May	July	Oct	Dec/Jan	March
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The Mac OS X/Darwin Port

OpenOffice.org Conference
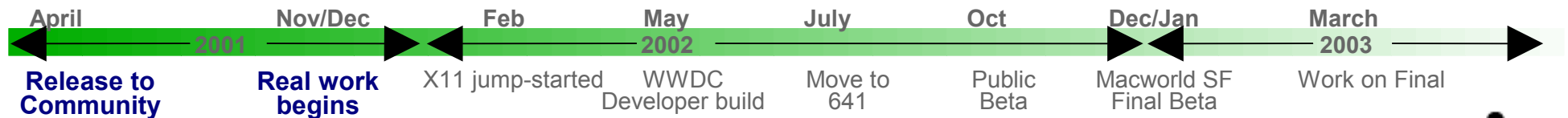
- Spring 2002: Working X11 port
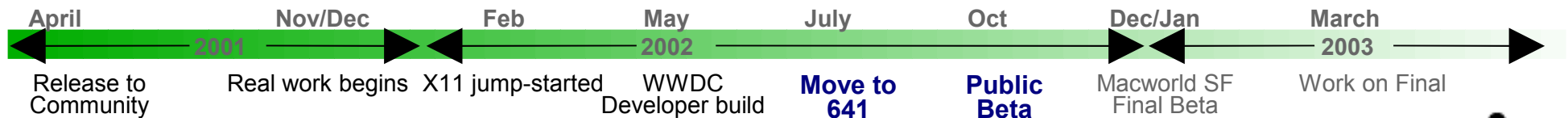 - Most initial X11 patches contributed by Greg Parker
  - Allowed the port to get up and running quickly
  - Leveraged the X11 code from other Unix platforms
  - Graphics code was well-tested
  - Work and progress was not "public"

- WWDC Developer Alpha (X11)
  - Released in May for Worldwide Developer Conference
  - Very unstable, simply a preview

- Issues
  - Toolchain
  - Manpower

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OpenOffice.org Conference
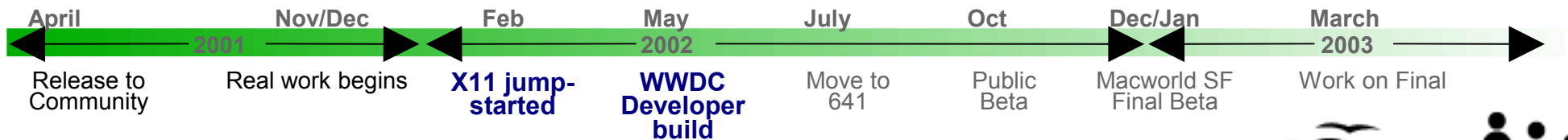
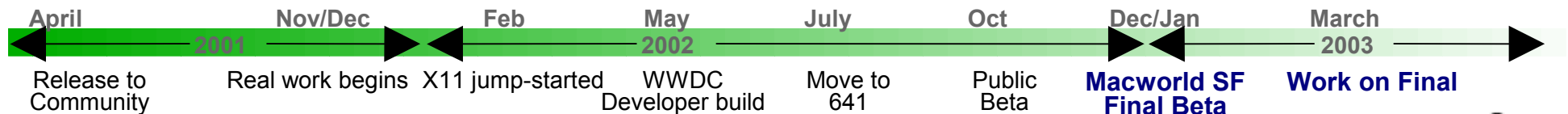- ## Summer/Fall 2002
  - Brought all Mac OS changes from 638c to 641 (OOO_STABLE_1)
  - Created new branch for ports (OOO_STABLE_1_PORTS)
  - Focus still on X11 port, targeting Mac OS X 10.2
  - Public Beta release: based on 641
  - Mac OS X support forums and testing projects started

- ## The NeoOffice project
  - First "Aquafication" of OpenOffice.org
  - Only Ed and Dan; the Sun/Apple media incident
  - Also wanted to play around with Aquafying OOo

- ## Issues
  - Toolchain
  - Manpower

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OpenOffice.org Conference

- January 2003
  - OpenOffice.org attends Macworld San Francisco 2003
    - Thanks to BSD Mall and Chris Coleman
  - Final Beta release
  - Apple's X11 package released

- NeoOffice
 - Migration to CoreGraphics (from Quickdraw)
  - Native Mac menu bars

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- The Apple Toolchain
  - Still using gcc 2
  - Many issues with Apple's gcc 2, workarounds
  - Cannot use gcc 3 at this time due to bugs
  - Can possibly use gcc 3 with next Developer Tools update

- Manpower
  - Only 2 core members of the port
  - A number of other occasional contributors
  - People like Kevin H. and Martin H. who provide Moral Support

- OS Deficiencies
  - Printing support (up to 10.1)
  - Locale support (all)
  - dlopen() not present (all)
  - Threading issues (all)

- ## X11 Port
  - Still based on 641 sources, OpenOffice.org 1.0.1
  - Now has native font support
  - Much better printing support and integration
  - Localized installers
  - Ramp up to X11 Final release

- Quartz & Aqua Ports
  - Don't fully compile
  - Not currently "active"
  - Still use Quickdraw, Carbon, and Cocoa
  - No core changes since Summer 2002

- ## NeoOffice
  - All graphics primitives are now drawn using CoreGraphics
  - "Free" antialiasing of all primitives
  - "Free" text antialiasing
  - Aqua backgrounds, native buttons, and native menus
  - Responsiveness on par with X11 port
  - Working to remove Carbon and Quickdraw code completely
  - Native printing support
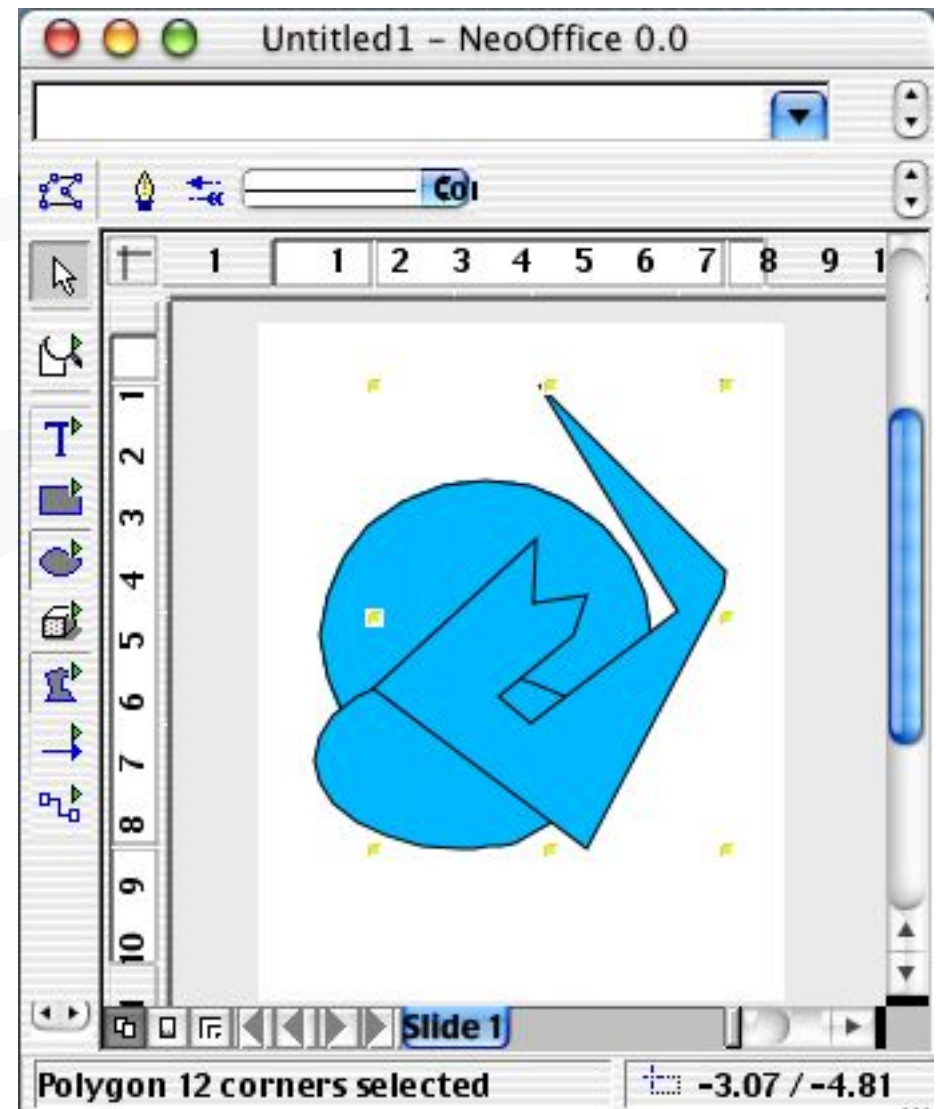
- Move to 644 codebase for all Mac OS X/Darwin ports

- X11 Port Future
  - Final release targeted for Spring 2003 (May)
  - Code freeze very soon
  - 1 month intensive testing period
  - Most likely release venue: WWDC
  - After Final release, X11port will be put in maintenance mode

- ## Quartz Port
  - ### Bring in core changes from NeoOffice
    - CoreGraphics support
    - Removal of much Carbon/Quickdraw code
    - Event handling improvements
    - More efficient window updates
    - Preliminary native printing support
  - ### Leave X11-style UI in place until we have direction

The Mac OS X/Darwin Port

- ## NeoOffice
  - Further CoreGraphics improvements
  - Text handling and input method improvements
  - Performance optimization
  - Event handling cleanups

The Mac OS X/Darwin Port

- Mac User Expectations
  - Mac users expect polish, attention to detail
  - Mac users expect adherence to Human Interface Guidelines
  - Mac users expect a Mac Feel
  - Mac users expect no-hassle installation and operation
  - Example: MS Office 6 vs. MS Office v.X
  - Example: Internet Explorer vs. OmniWeb

- What direction to take for full Aqua port?

- A) Native control emulation with Appearance Manager

- B) Really native controls

- C) Redo interface from scratch

Porting Issues

OpenOffice.org
Conference

General Porting Issues Overview

- Patch management

- Branch management and tracking

- Platform differences

- Manpower

The Mac OS X/Darwin Port

- ## Patch management
  - ### Large number of diverse patches
  - ### Many sources for patches
  - ### Lack of manpower for integration
  - ### Patch testing and control

- ## Branch management and tracking
  - ### More than one concurrent branch (obviously)
    - OOO_STABLE_1 (1.0x)
    - OOO_STABLE_1_PORTS (1.0.1 based)
    - New 644 child/master branches (1.1)
  - ### Tracking branches: "treadmill" or "gerbil" effect
    - Lack of manpower for cross-branch integration and merging at this time

- ## New child/master workspace changes will help a lot

- ## Platform Differences
  - ### Stupid build tools
    - Dan's award for "Most Stupid Build Tool" goes to: Apple's gcc 2
    - Second most stupid build tool: libtool
  - ### OS bugs and omissions
    - NetBSD and OS X: routines in sal/osl/system.c
  - ### API semantics and eccentricities
    - Prototypes and behavior
  - ### Standard file and directory locations
    - Font directories
    - Printing files (PPDs, watchfiles)
  - ### File extensions and other assumptions
    - .so versus .dylib
    - .ttf versus .dfont

Porting Manpower

- OpenOffice.org very large
- Very complex build system
- Intimidating to many

The Mac OS X/Darwin Port

Mac-specific Porting Issues

- The Mac port is more complicated than most

- Apple Build Tools
  - Apple gcc2
    - Static template data member initialization: init-static-template-data script
    - Chokes on nested namespaces
    - Complex C++ templates not handled well
    - All gcc2 problems are currently worked around
      - (We love Patrick Luby)
  - Apple gcc3
    - Problems with STLport, templates, and exception handling frames
    - No workaround currently exists, but using gcc3 would save ~20% on build time

- **Shared Libraries**
  - Mac OS X / Darwin use dylibs
  - Used to be many hardcoded ".so" in code and delivery scripts
  - dlopen() API doesn't exist on Mac OS X

- **Locale**
  - 10.1 / Darwin 5 had no real locale functions
  - 10.2 implements functional BSD locale routines, but don't integrate with OS X
  - Must hook into OS X only frameworks to grab locale using Carbon / CoreFoundation

- **Sound / Input support**
  - Don't have full input method support other platforms do
  - Darwin doesn't have good sound support
  - Have to hook into OS X only frameworks to get sound (NSSound API)

Mac-specific Porting Issues

- ## Fonts
  - ### Mac OS X fonts exist in different directories
    - /Library/Fonts
    - /System/Library/Fonts
    - ~/Library/Fonts
    - Mac OS 9 Font folder
  - ### Fonts have different format and extensions than other Unix
    - dfont, resource-based format
    - Multiple faces in one file
    - Cannot access resource-based fonts using BSD calls
  - ### Had to add Apple kerning support and Unicode character->glyph mapping support for X11 port

- ## X11 Printing
  - ### 10.1 printing SUCKED: print to PDF, then use Acrobat Reader
  - ### 10.2 uses CUPS, much better integration with rest of OS
    - However: incomplete PPD support for cheap printers

- ## X11 Port Installation
  - ### Must use custom installer
    - Thanks to ZeroG and InstallAnywhere
    - Mac users expect a "zero hassle" installation experience
    - Must include X11, Fondu, a window manager, dlcompat, ghostscript as sub-installs
    - Post-install configuration: paper size, font conversions, relocation

- ## Custom Release schedule
  - ### Align releases with big Mac events
    - Worldwide Developer Conference (WWDC)
    - Macworld San Francisco and New York
    - O'Reilly conferences
  - ### Get extra publicity with a custom release schedule

- Making it "Native"
  - Carbon vs Cocoa
  - QuickDraw vs CoreGraphics
  - Currently a mix of all four and that creates many problems
  - Must target toolkit 1 AND toolkit 2

- Event Handling
  - Cocoa vs OOo
    - In Cocoa, events are delivered to their immediate receiver (ie the button, view, etc)
    - In OpenOffice.org, events are not pushed that far up
  - Currently, events are "pulled" from the Cocoa event queue, which is the opposite of how it should work
  - Cocoa expects the event loop to stay in <u>one</u> thread

Aqua-specific Porting Issues

- ## Font Handling
  - Apple Type Services for Unicode (ATSUI) required
  - Completely different API than any other platform
  - Documentation is somewhat dense

- ## Window Backgrounds
  - All drawn objects are "windows" and have backgrounds
  - Not very good bitmap wallpaper support in vcl
  - Object background hierarchy is convoluted
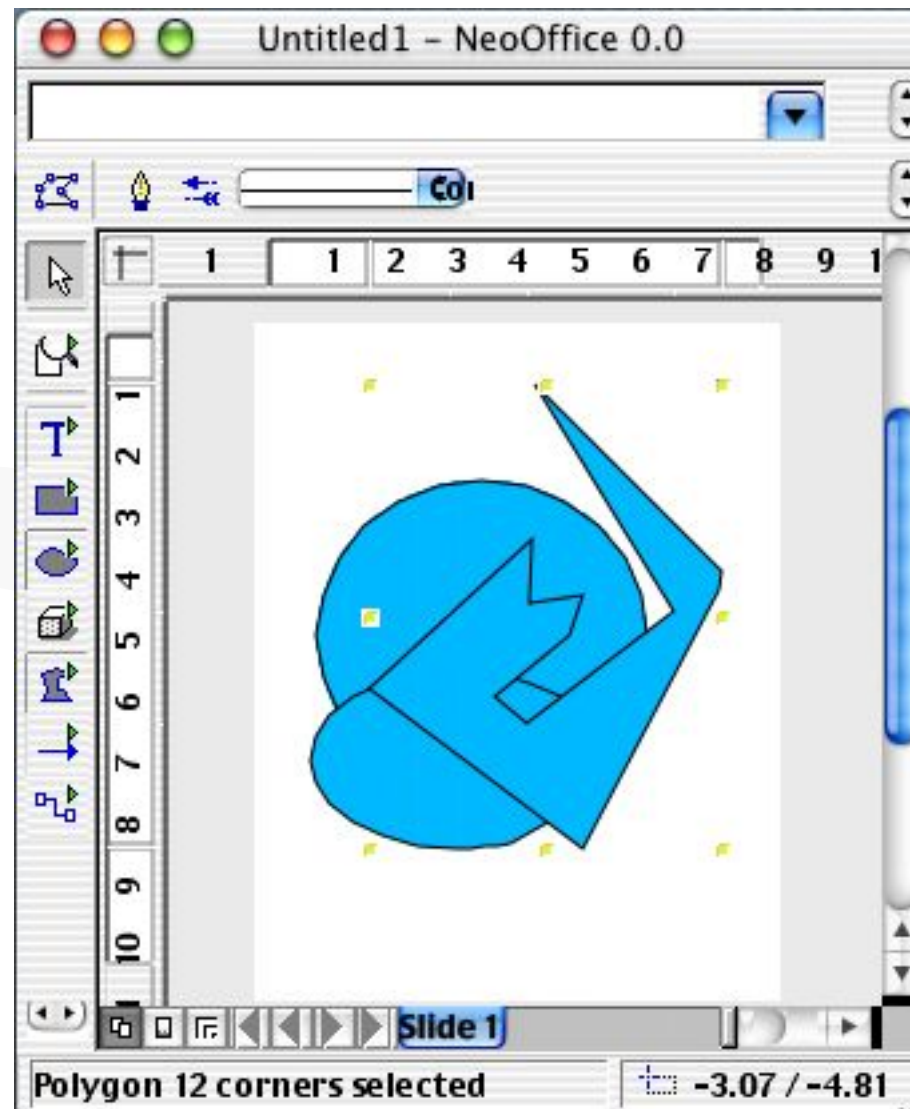 - End result: misaligned pinstripes

Aqua-specific Porting Issues

- Native widgets and Controls: NeoOffice
  - Appearance Manager Bitmap method
    - In current NeoOffice, widgets are drawn as bitmaps using DrawThemeControl()
    - They are not really objects and cannot receive events
    - Fits well with current OOo paradigm and structure
    - Not very smooth or Aqua-like (ie no pulsating buttons, highlights difficult)
  - "Native" control method: NSButton
    - Create all controls as actual Cocoa objects
    - Events are delivered to the object
    - Most object functionality comes for free because they are objects
    - Looks <u>very</u> nice
    - Does not fit well with current OOo structure
    - Must ensure correct instantiation and destruction
    - Requires access to low-level window content frames (NSViews)

- The Radical Idea: InterfaceBuilder
  - Use InterfaceBuilder to lay out the interface from scratch
  - Leverage lots of community IB expertise
  - Mostly keep the current UI layout, but tweak for Mac OS X
  - Would require bridges from IB code to OOo backend code
  - Also require radical organization and code changes for the port
  - Could create a number of different layouts for different audiences
    - "Normal" OpenOffice.org layout
    - Cool, fluid, Aqua layout
    - Simplified "Kids" layout

Suggestions

- ## Workflow suggestions
  - 644 child/master workspaces will help tremendously
  - Allow for major platform-specific additions
    - Must work out correct mechanism to do this
  - Recognize importance of a unified interface *and* a <u>correct</u> native one
  - Heavy community developer/user involvement in decisions
  - Discuss all build/requirements changes with porting teams

- **Effective Communication**

The Mac OS X/Darwin Port

- ## Codebase suggestions
  - ### Reduce duplication of code
    - Fonts: vcl, psprint
    - Locale: tools, sal
    - Strings: tools, sal
    - Unified shared library loading code
  - ### Includes files: conditionalize?
  - ### Special directories: create lists?
    - Fonts, printer files, plug-ins
  - ### Clear, logical object hierarchy for platform-specific code (ie vcl, toolkit2)
  - ### Code for the future, not the least capable platform
  - ### Create mechanisms to allow for major platform differences

- Mac OS X / Darwin port is not just "another Unix"

- A correct port will account for Mac expectations, and integrate with Mac OS X services

- But what's the best way to do that?

- OpenOffice.org: http://www.openoffice.org
- Mac Port Home: http://porting.openoffice.org/mac
- NeoOffice: http://www.neooffice.org
- Mac Port Support Forums: http://www.ooodocs.org

Questions?