



# Custom Controls from Scratch

Douglas Heriot

@DouglasHeriot

<http://douglasheriot.com/>

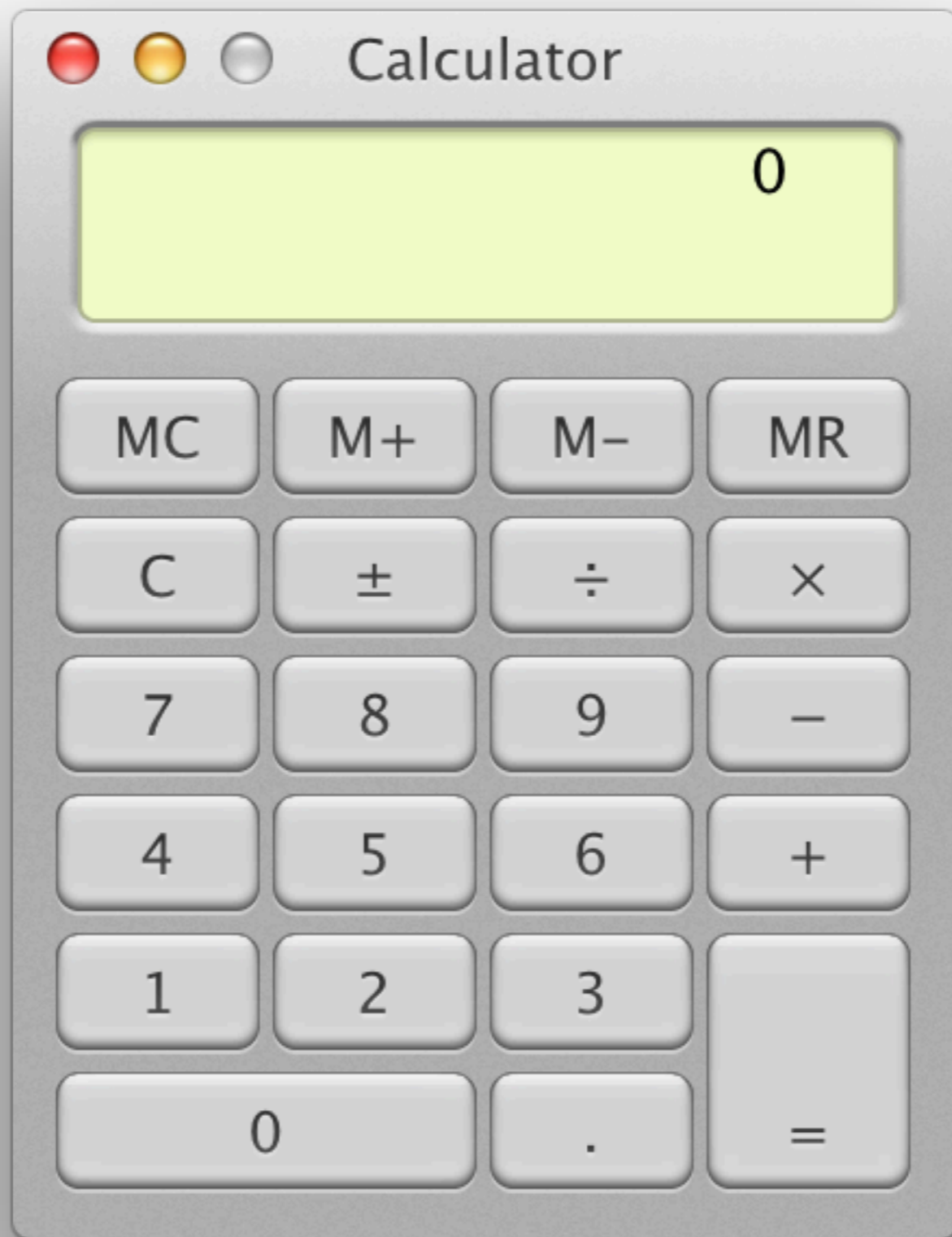


/dev/world/2012



**Why?**





2012

Today

### January

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

### February

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	1	2	3
4	5	6	7	8	9	10

### March

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	29	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

### April

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12

### May

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

### June

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7

### July

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

### August

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

### September

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

### October

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

### November

Sun	Mon	Tue	Wed	Thu	Fri	Sat
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	1
2	3	4	5	6	7	8

### December

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

- Melbourne all-day
- Mid-session break all-day
- /dev/world/2012 all-day
- DevWorld Registration 8 AM
- DevWorld Day 1 10 AM
- DevWorld Dinner 6:30 PM



### Inspector

Library Info Adjustments



ISO 100 f/11 1/100 24mm

Add Adjustment Effects

- White Balance** Auto ↶ ⚙  
Natural Gray ▾  
Warmth: 0.50
- Exposure** Auto ↶ ⚙  
Exposure: 0.0  
Recovery: 0.0  
Black Point: 0.0  
Brightness: 0.0
- Enhance** ↶ ⚙  
Contrast: 0.0  
Definition: 0.0  
Saturation: 1.0  
Vibrancy: 0.0

▶ Ocean Panorama	09:27:01:15	09:27:28:15
▶ Surf Multicam	00:00:00:00	00:00:59:12
▶ Tahiti Landscape	10:34:32:20	10:37:17:02



9 items

100% 01:00

Tahiti Surf Trip

01:00:30:00 | 01:00:35:00

Aerial Tahiti Landscape Boat

Tahiti Surfing Tahiti Surfing Tahiti Surfing

Chaise Lounge Long

03:07 selected



Gallery



# Brushes



Sketching



Inking



Painting



Airbrushing



Textures

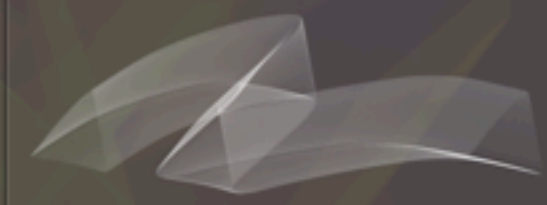


Abstract

Waveform



Triangulum



Membrane



Hexavector



Marble



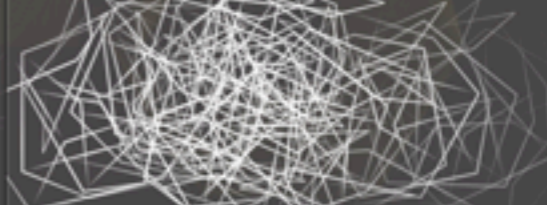
Opticon



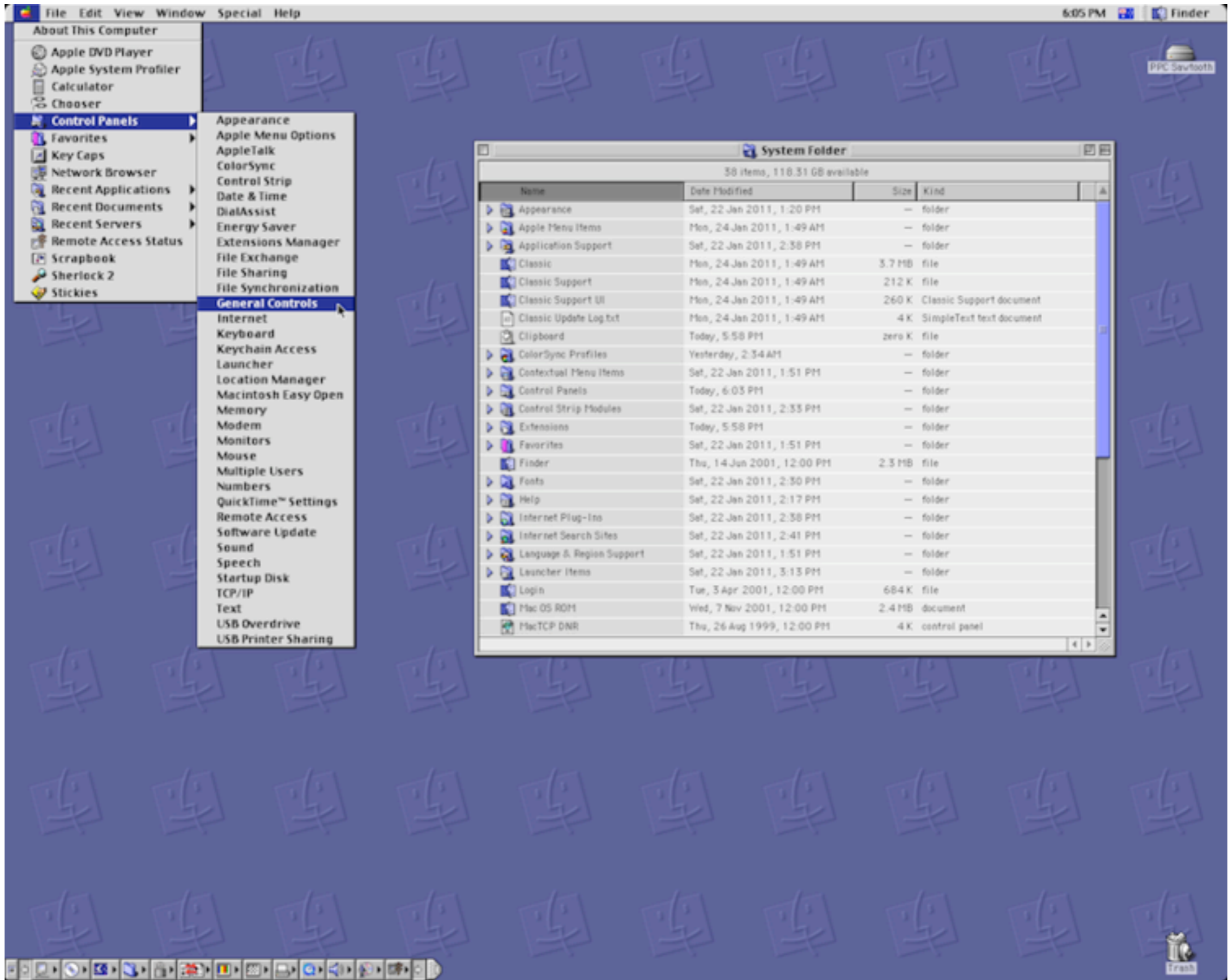
Spicule

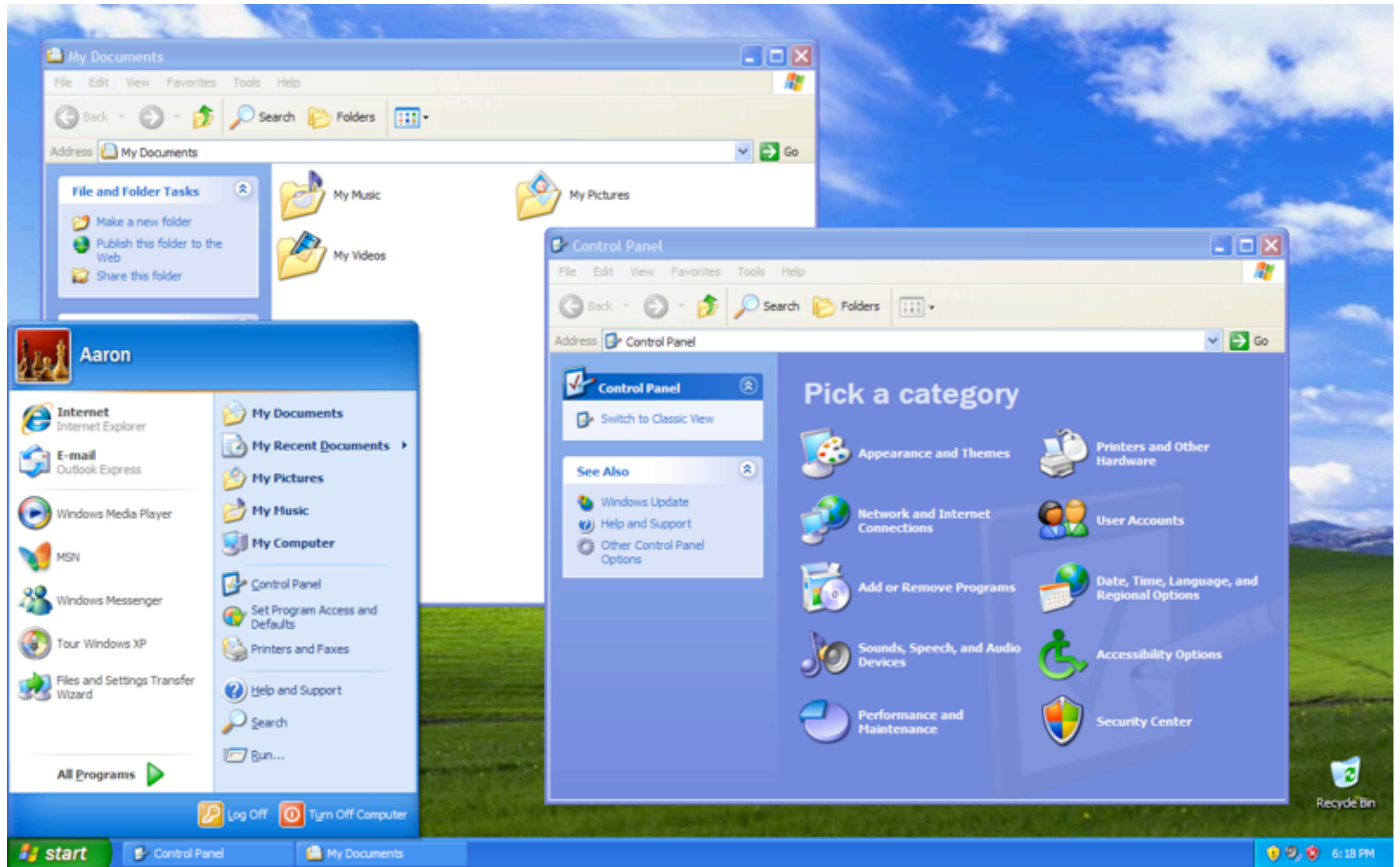


Polygons

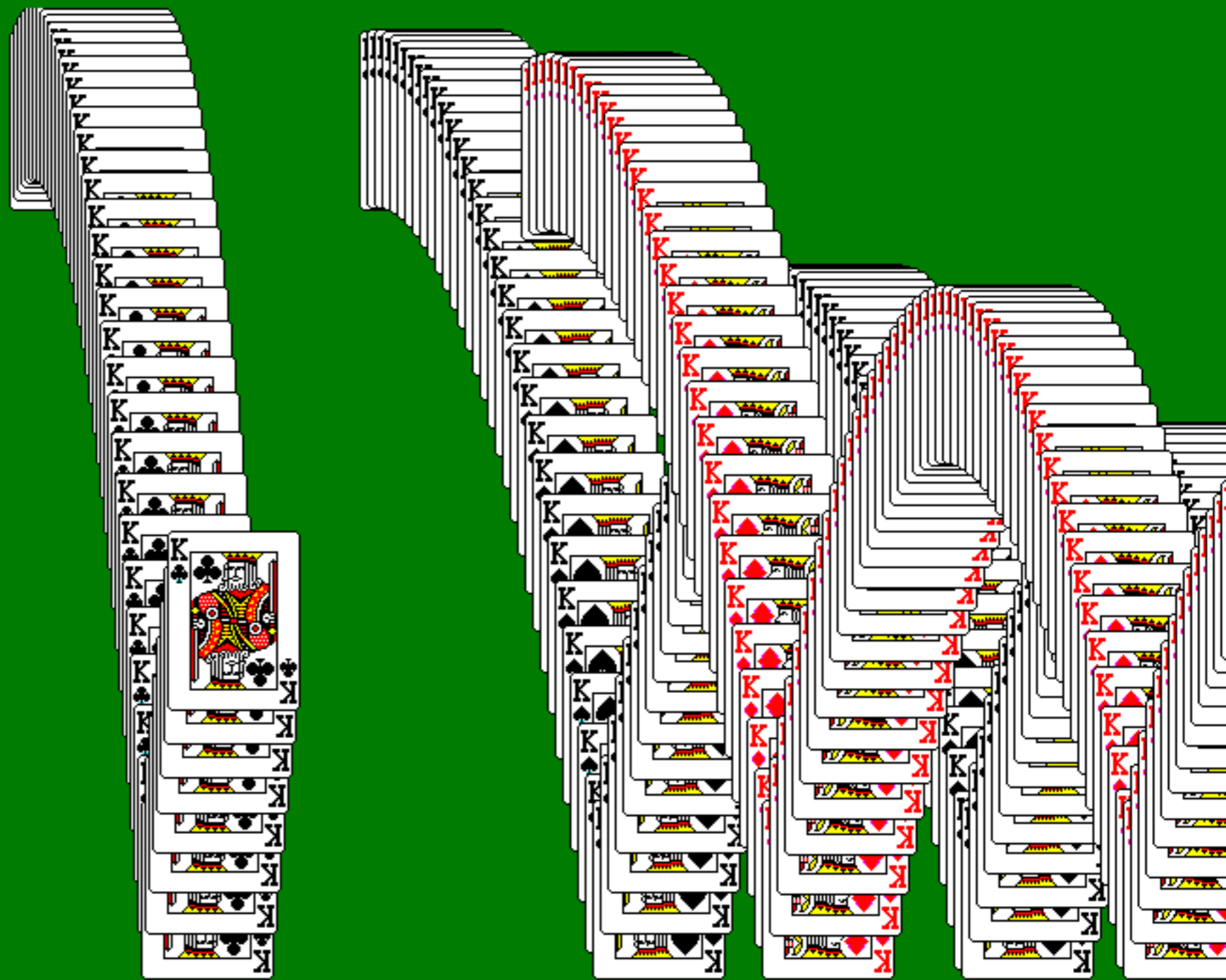


**How?**










- About This Mac
- Get Mac OS X Software...
- System Preferences...
- Dock** ▶
- Location ▶
- Recent Items ▶
- Force Quit...
- Sleep
- Restart
- Shut Down
- Log Out... ⌘⇧Q

Welcome to Mac OS X.pdf

Turn Magnification On

Turn Hiding On ⌘⇧D

Dock Preferences...



Welcome to Mac OS X



midnite

Back View Computer Home Favorites Applications

Desktop Documents Library

Movies Music Pictures

Public Sites

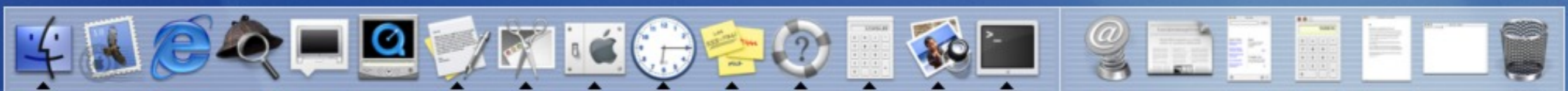
1 of 32

Show All Displays Sound Network Startup Disk

Appearance:  Blue  
for the overall look of buttons, menus, and windows

Highlight color:  Graphite  
for selected text and lists

Click in the scroll bar to:  Jump to next page  
 Scroll to here



Notes

Search:

Empty note area with horizontal lines.



test

Navigation and view controls: back, forward, grid, list, column, icon, settings, refresh, search.

**FAVORITES**

- All My Files
- AirDrop
- Applications
- Desktop
- Documents
- Downloads
- Movies
- Music
- Pictures

**SHARED**

- Butterfly
- Compy

**DEVICES**

- BOOTCAMP
- Dougl...

Desktop

Documents

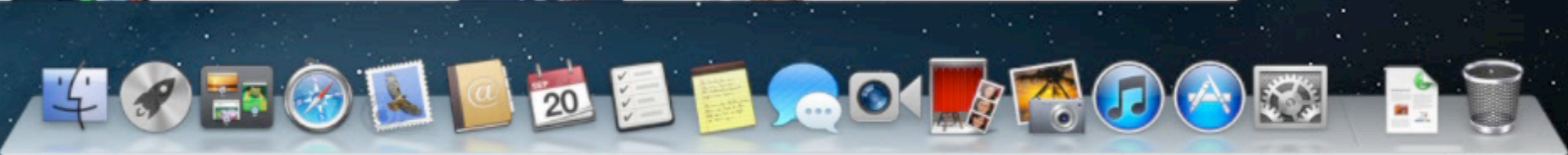
Downloads

Movies

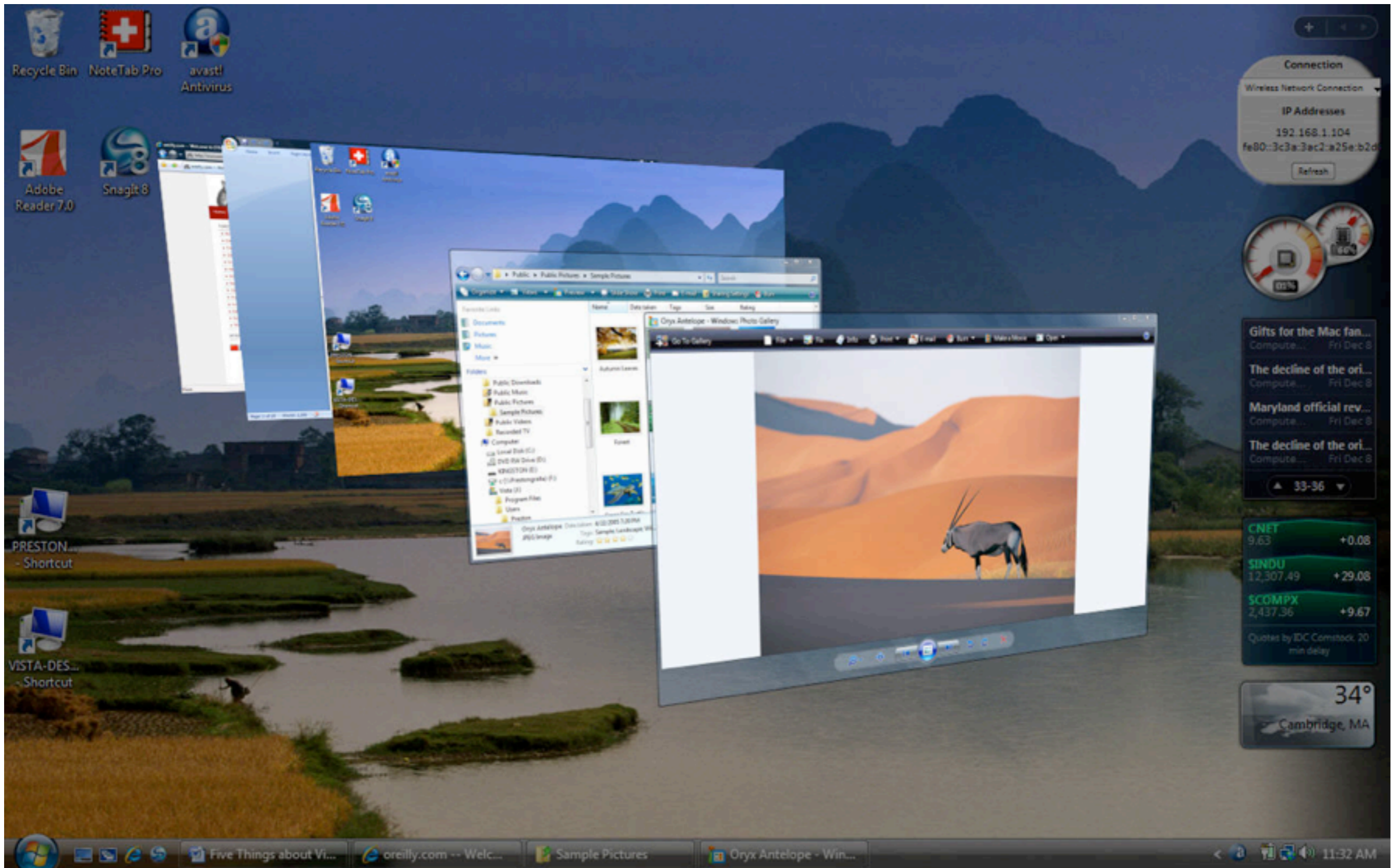
Music

Pictures

Public

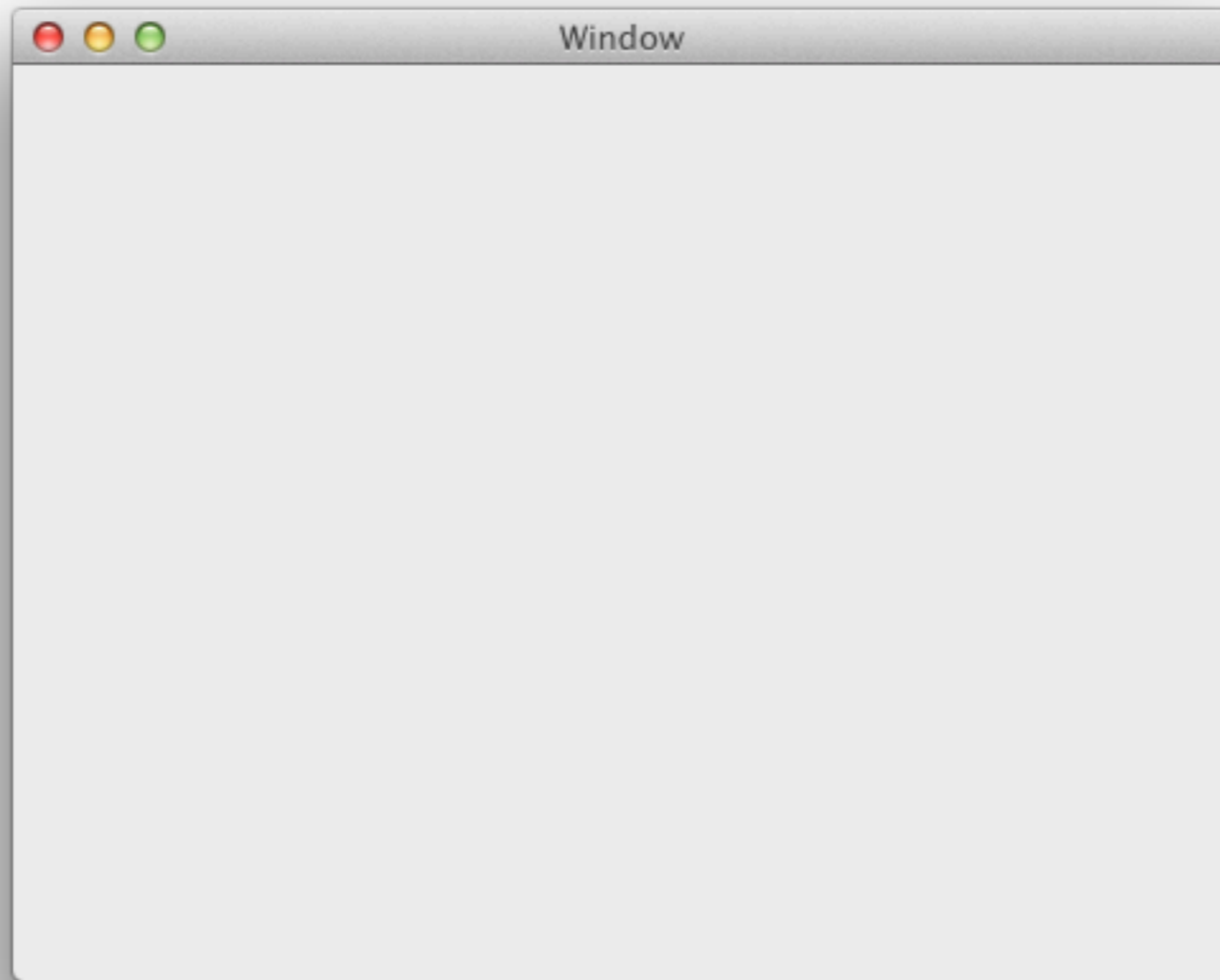




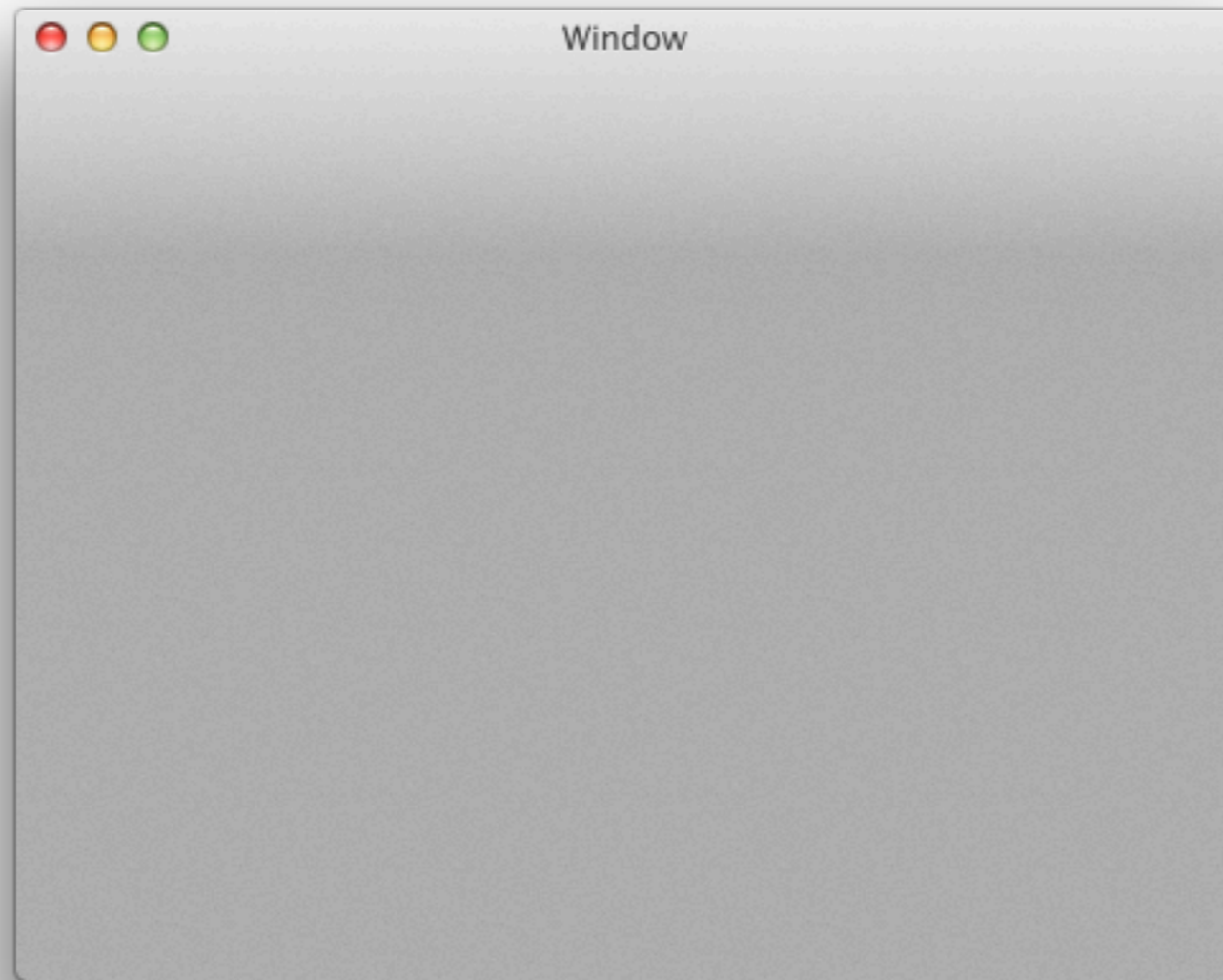


**NSWindow**

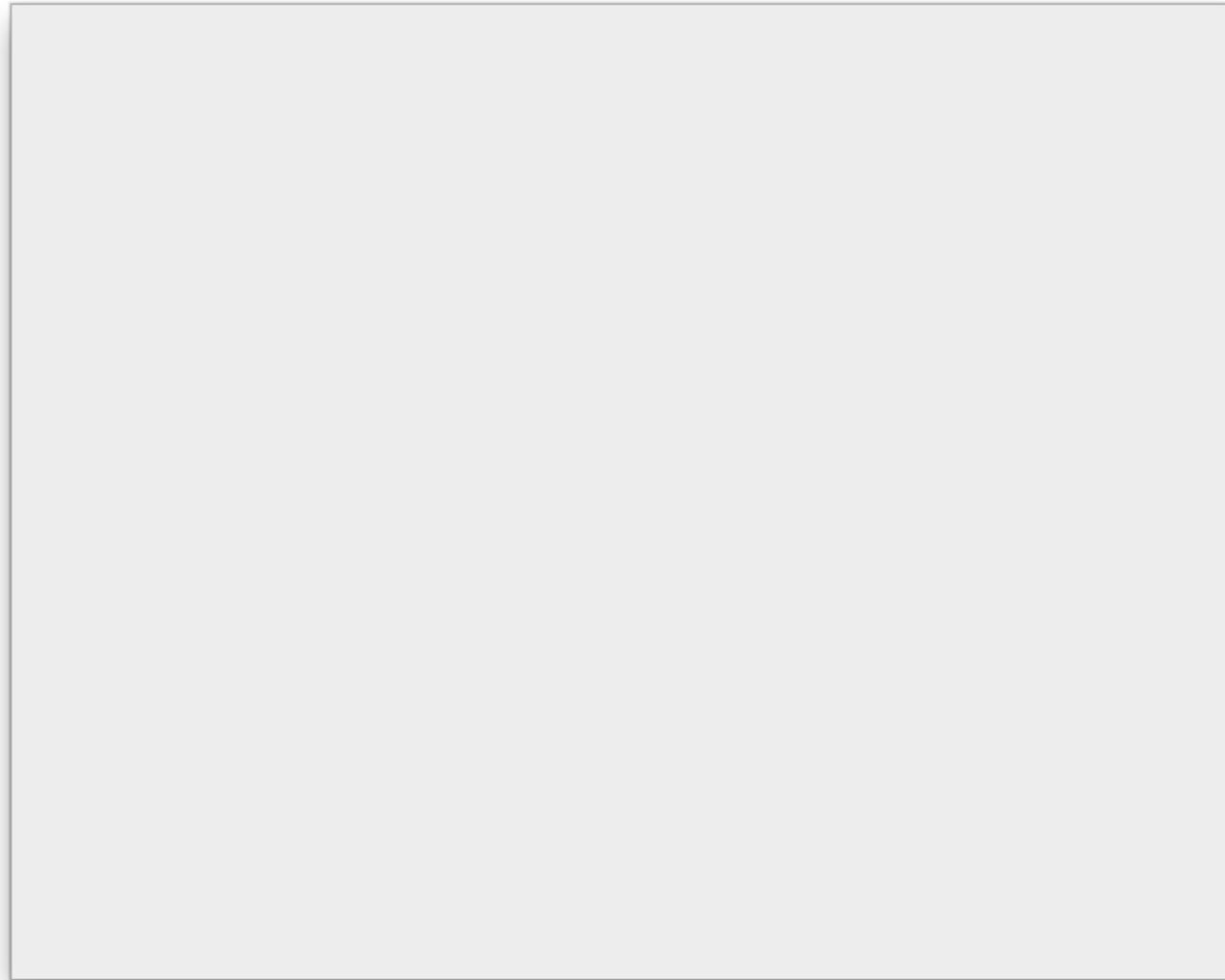
# NSTitledWindowMask



# **NSTitledWindowMask | NSTexturedBackgroundWindowMask**



# **NSBorderlessWindowMask**



**NSBorderlessWindowMask**  
**-setOpaque:NO**

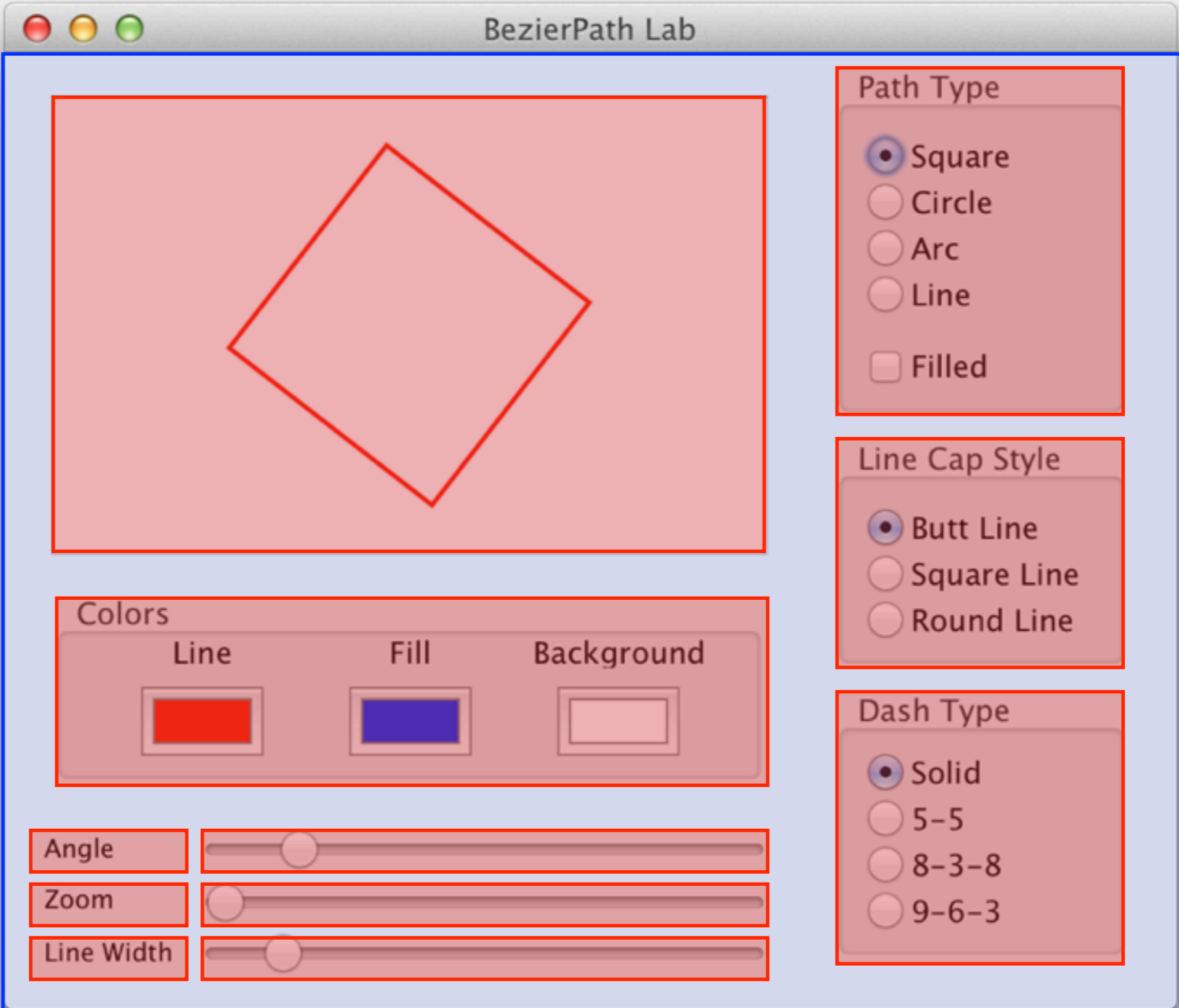
**NSWindow**

NSWindow

**NSView**



- [NSWindow contentView]
- [NSWindow setContentView:]



-drawRect:

**Let's do that**

# **NSTableView**

**Hundreds of  
subviews?**

A large, thick red 'X' is drawn across the text, indicating that the concept of having hundreds of subviews is being rejected or is incorrect.

**NSWindow**

**NSView**

**NSCell**

**Used by NSView to perform drawing and handle events.**

# NSView

– (void)drawRect:(NSRect)dirtyRect



# NSView

- (void)drawRect:(NSRect)dirtyRect

# NSCell

- (void)drawWithFrame:(NSRect)frame  
inView:(NSView \*)controlView

# Scrolling?

`UIScrollView -copiesOnScroll`

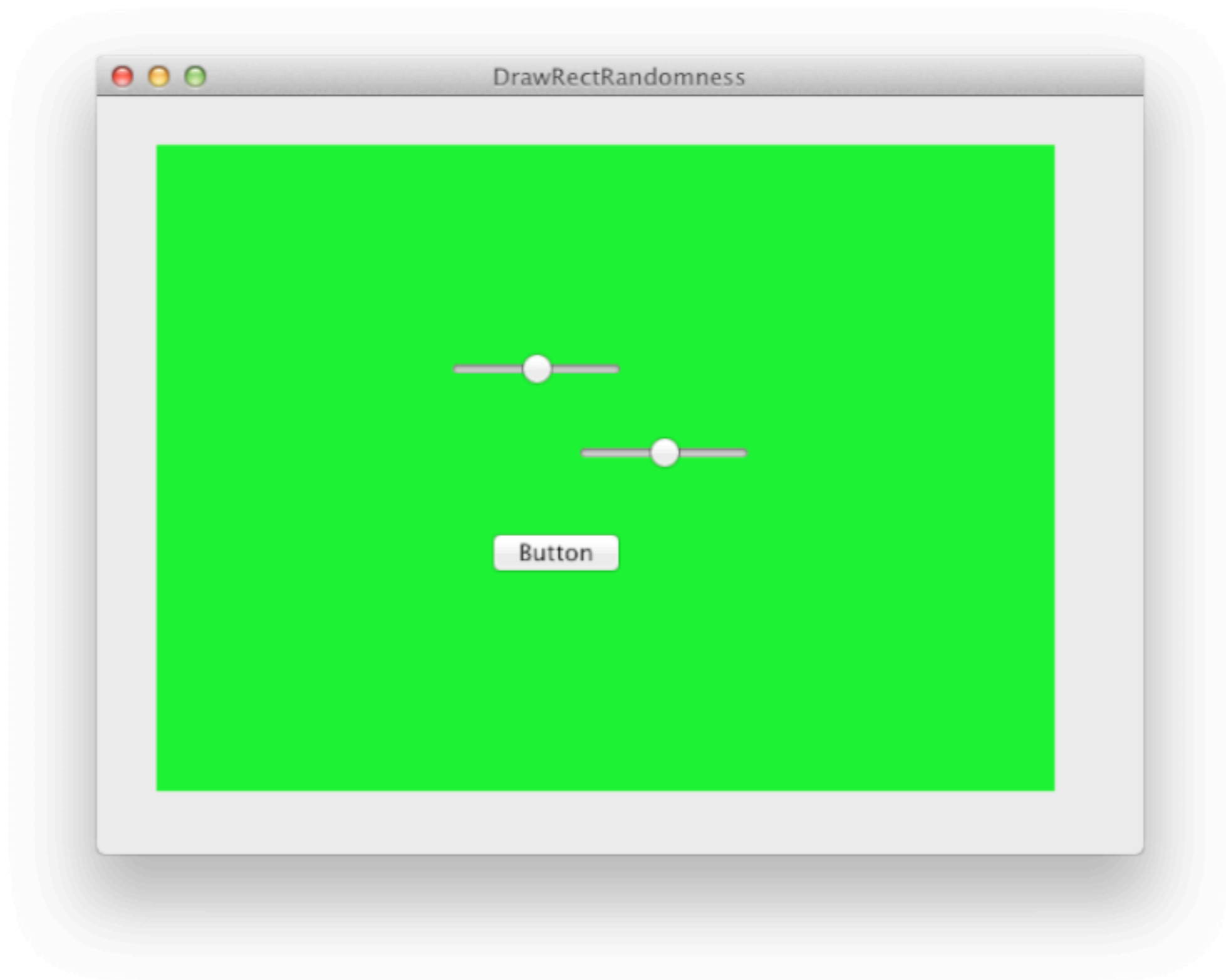
**How do we fix all  
this?**

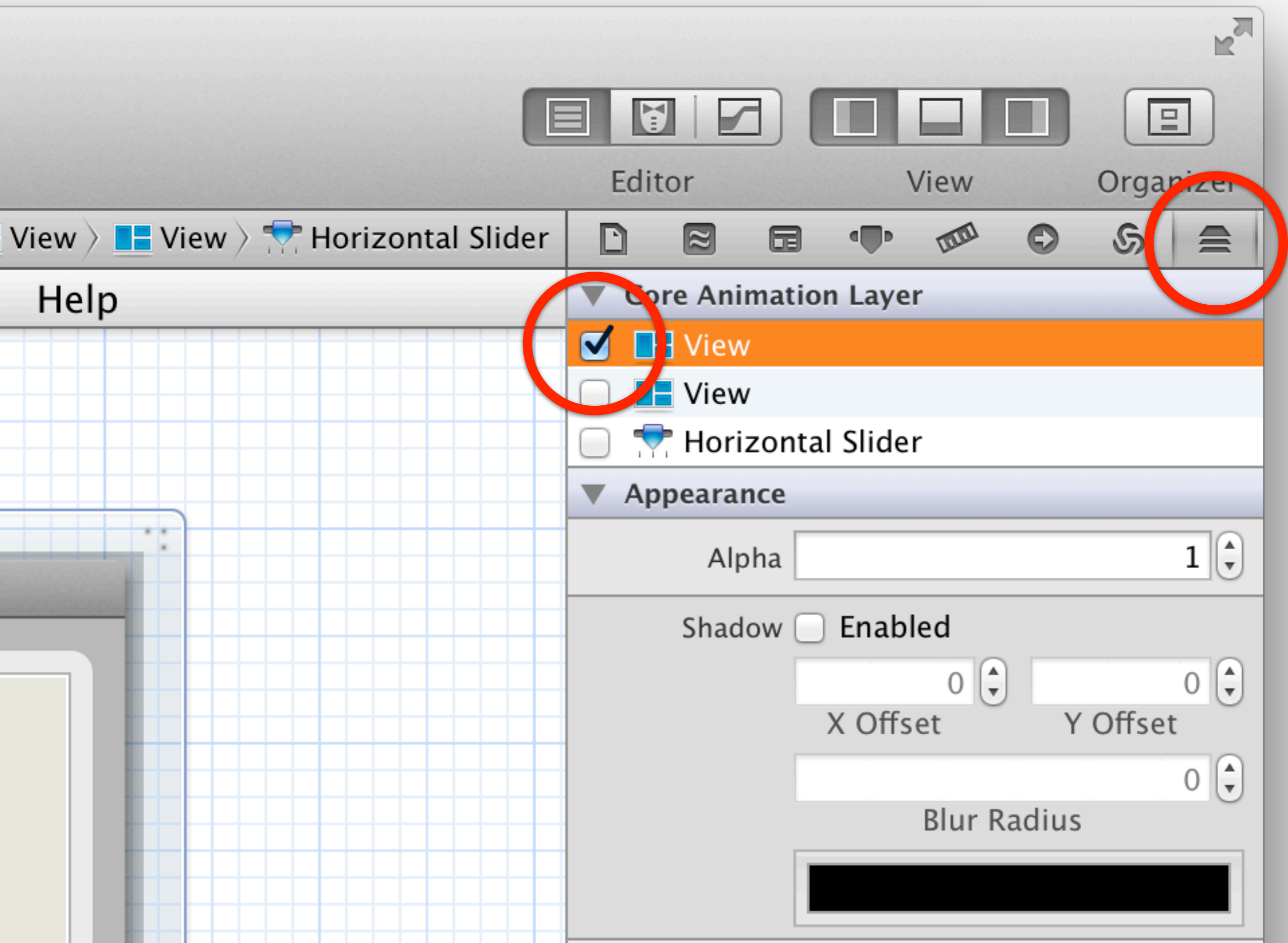


# Core Animation

Introduced in OS X 10.5

# Layers





**Code?**



## Layer-backed view

```
- (id) initWithFrame:(CGRect) frame
{
    if ([super initWithFrame:frame])
        self.wantsLayer = YES;
    return self;
}
```

**CALayer created automatically.  
Don't touch!**

## Layer-hosting view

```
- (id) initWithFrame:(CGRect) frame
{
    if ([super initWithFrame:frame])
        self.layer = [CALayer layer];
        self.wantsLayer = YES;
    return self;
}
```

**You own the CALayer –  
do whatever you want.**

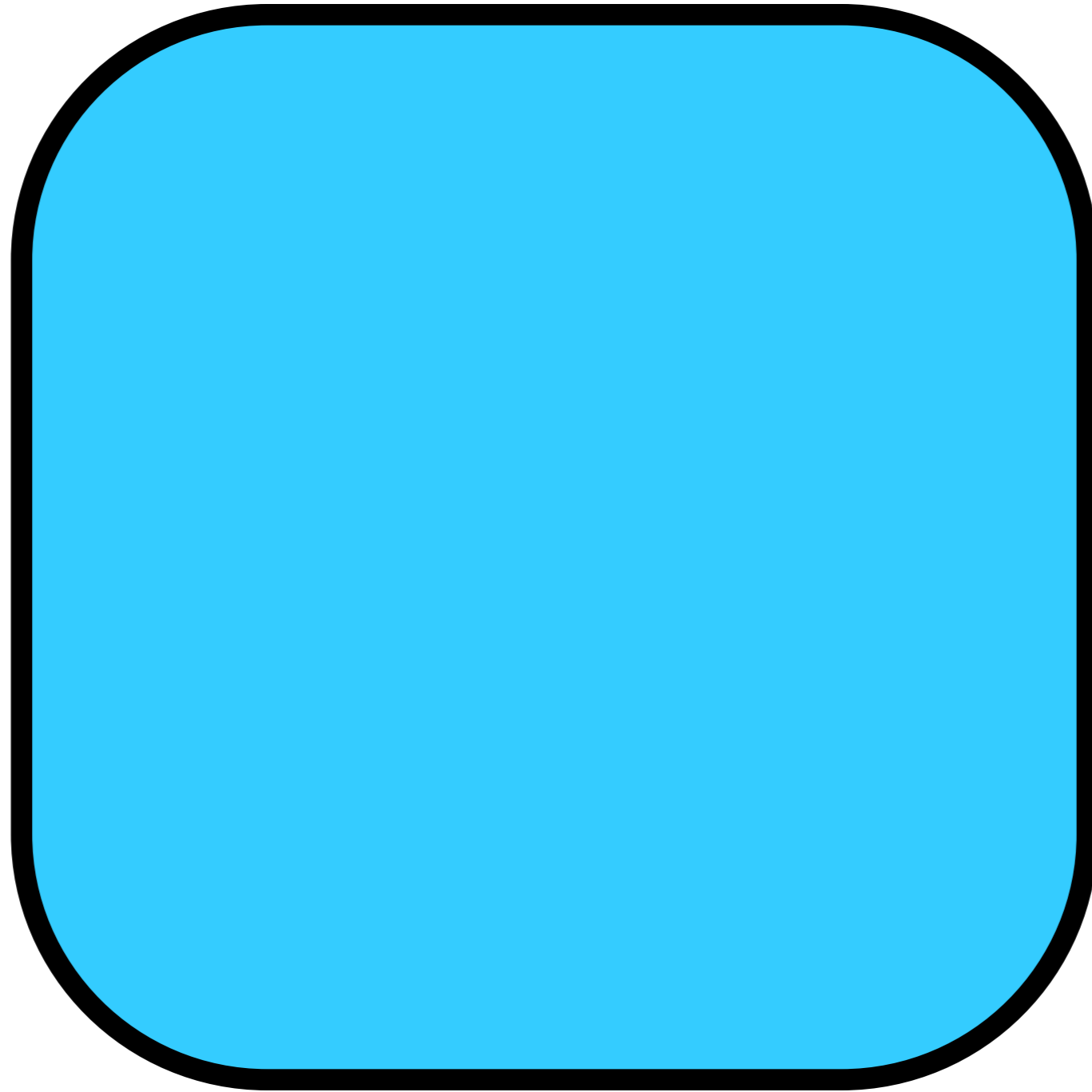
# Layer Properties



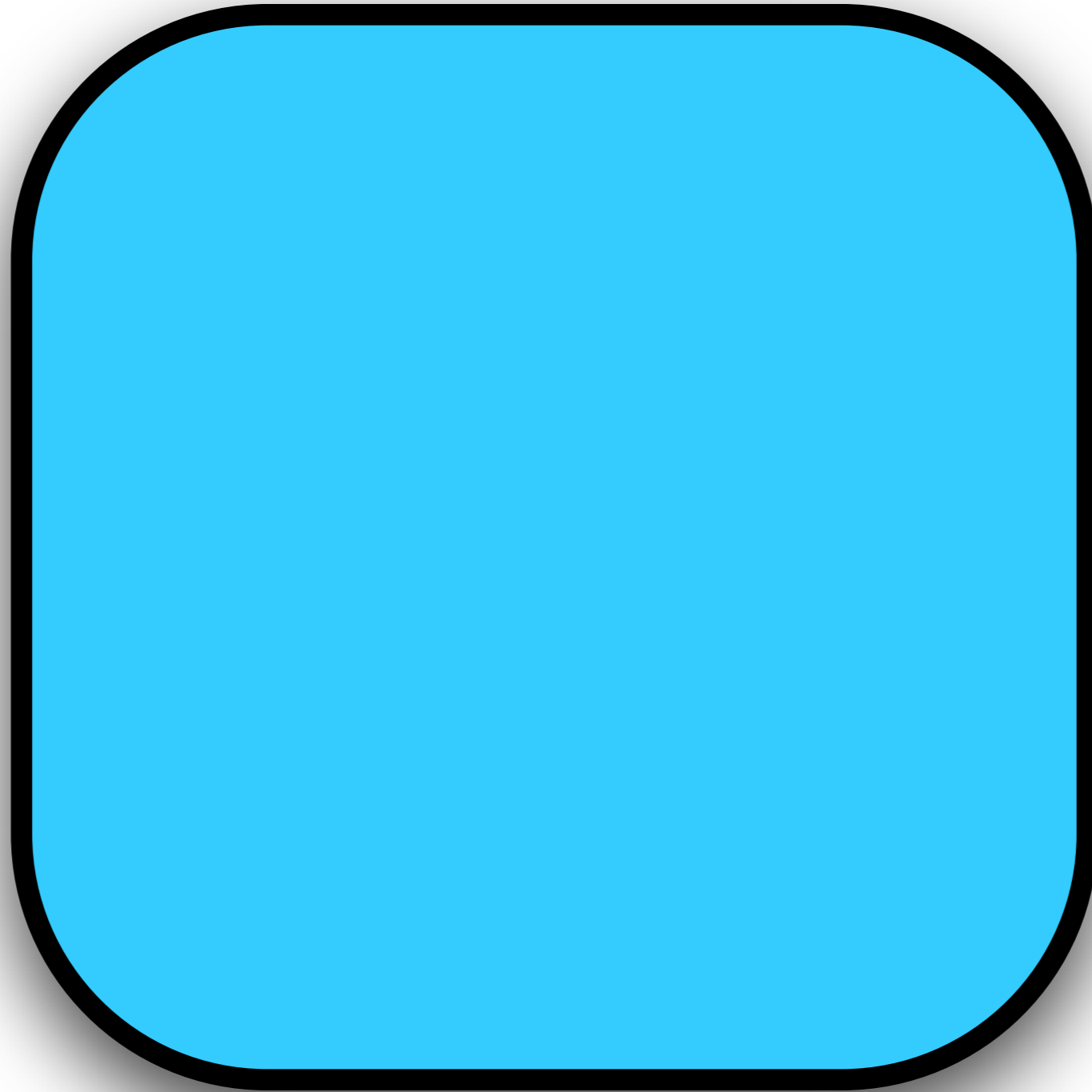
**backgroundColor**



**cornerRadius**



**border**



**shadow**



**contents**



**CAGradientLayer**



# iOS

Much nicer.

**All views are layer-backed.**

Search Cancel

Yesterday

Yesterday

Tuesday

Monday

Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123 microphone space Search

# Table views?

Layer-backed views, stored in a reuse queue.

**Performance**

Instruments

Choose Target

Target



Inspection Range

00:00:00  
Run 0 of 0



View



Library


Instrument Detail

Search

Choose a Template for the Trace Document:

- ios
  - All
  - Memory
  - CPU
  - I/O Activity
  - Graphics
- ios Simulator
  - All
  - Memory
  - CPU
  - File System
- Mac OS X
  - All
  - Memory
  - CPU
  - File System
  - Behavior
- User
  - All

<p>Time Profiler</p>	<p>System Trace</p>	<p>Automation</p>	<p>Energy Diagnostics</p>
<p>Network</p>	<p>System Usage</p>	<p>Core Animation</p>	<p>OpenGL ES Driver</p>

 **Core Animation**

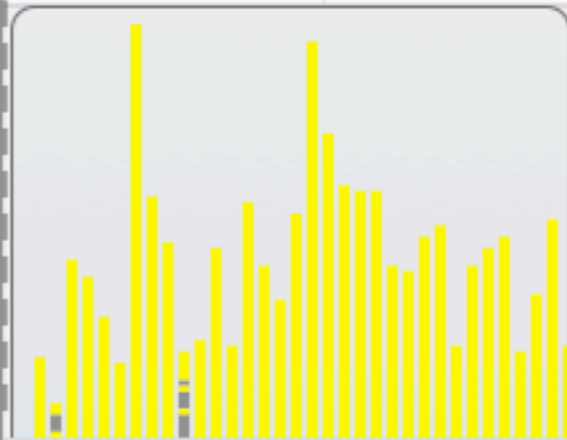
This template measures application graphics performance as well as CPU usage of a process via time profiling.

? Open an Existing File...

Cancel Record Choose



# Time Profiler

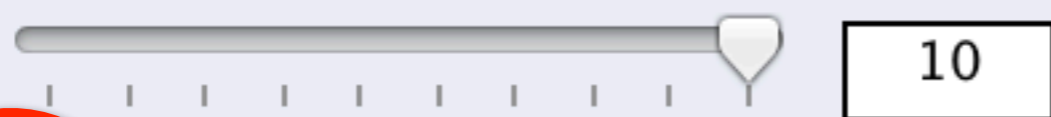


## Core Animation



## Table

### Sampling Rate (1/10th sec)



### Debug Options

- Color Blended Layers
- Color Hits Green and Misses Red
- Color Copied Images
- Color Immediately
- Color Misaligned Images
- Color Offscreen-Rendered Yellow
- Color OpenGL Fast Path Blue
- Flash Updated Regions

### Frames Per Second

Frame	Frames Per Second
0	0
1	0
2	0
3	0
4	0
5	0
6	55
7	0
8	0
9	0
10	0

Personal Hotspot: 1 Connection



Tweetbot



Facebook



Contacts



Messages



Camera



Instapaper



Reeder



Phone



iA Writer



TripView



Music



Notes



Weather Au



Maps



/dev/world



Settings



Safari



Mail



Calendar



Reminders

Personal Hotspot: 2 Connections



Tweetbot



Facebook



Contacts



Messages



Camera



Instapaper



Reeder



Phone



iA Writer



TripView



Music



Notes



Weather Au



Maps



/dev/world



Settings



Safari



Mail



Calendar



Reminders



# Updates

Update All



## Purchases



### SMH

Version 2.1.12  
What's New ▼

UPDATE



### Pocket Weather...

Version 3.2  
What's New ▼

UPDATE



### WolframAlpha

Version 1.4.1.3595247  
What's New ▼

UPDATE

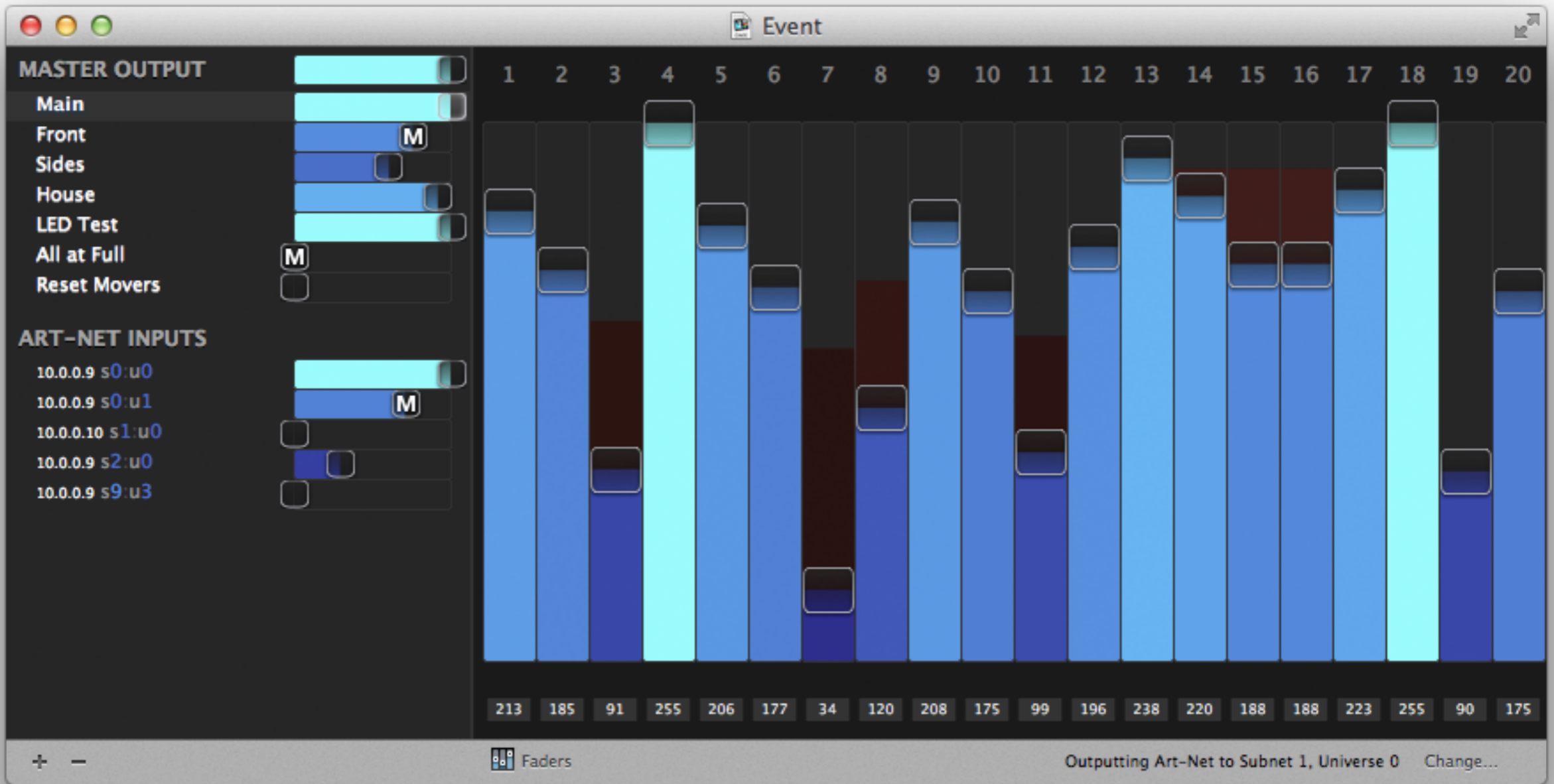
# OS X

Still has the old legacy way.

**Using more views is  
now recommended.**

# **View-based table views**

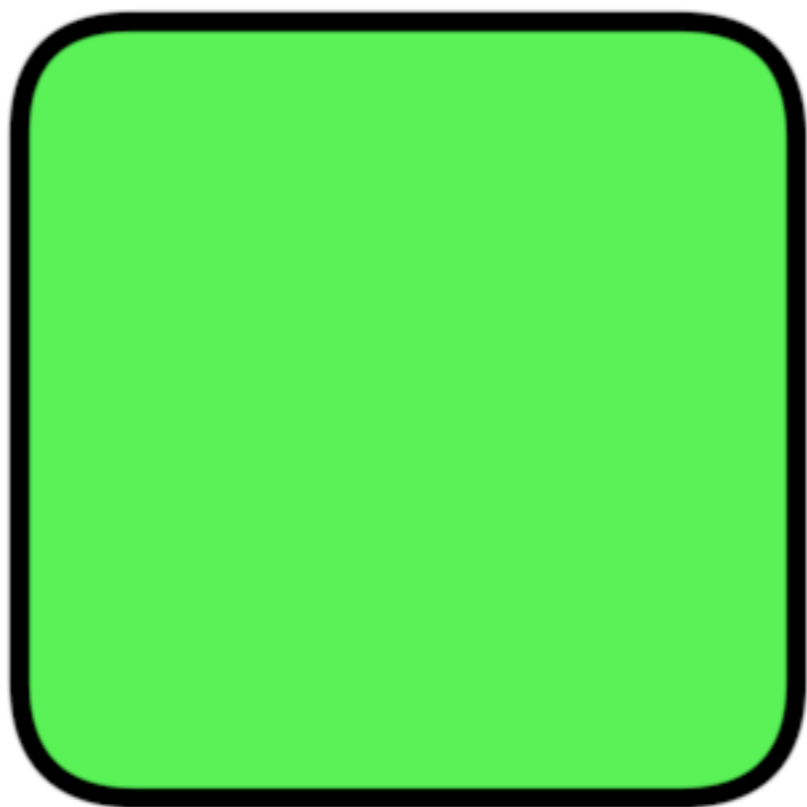






# **9-slice scaling**

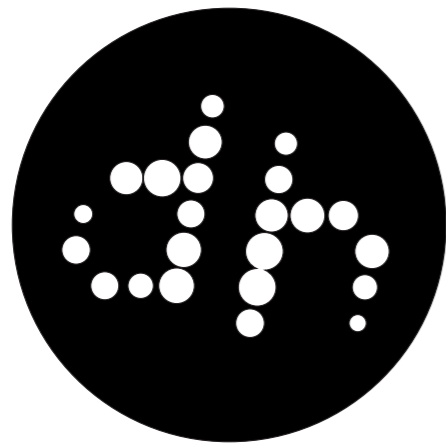






# Where do you start?

- Sketch on paper
- Mockup in Photoshop
- Separate logical moving pieces
- Bitmaps & CA Layer properties
- Event handling



**Douglas Heriot**

<http://douglasheriot.com/>  
douglas@douglasheriot.com  
@douglasheriot

**University of Wollongong**

