

Becoming Indie

A Professional Game Developer Change To The iPhone

Noel Llopis
Snappy Touch
<http://snappytouch.com>









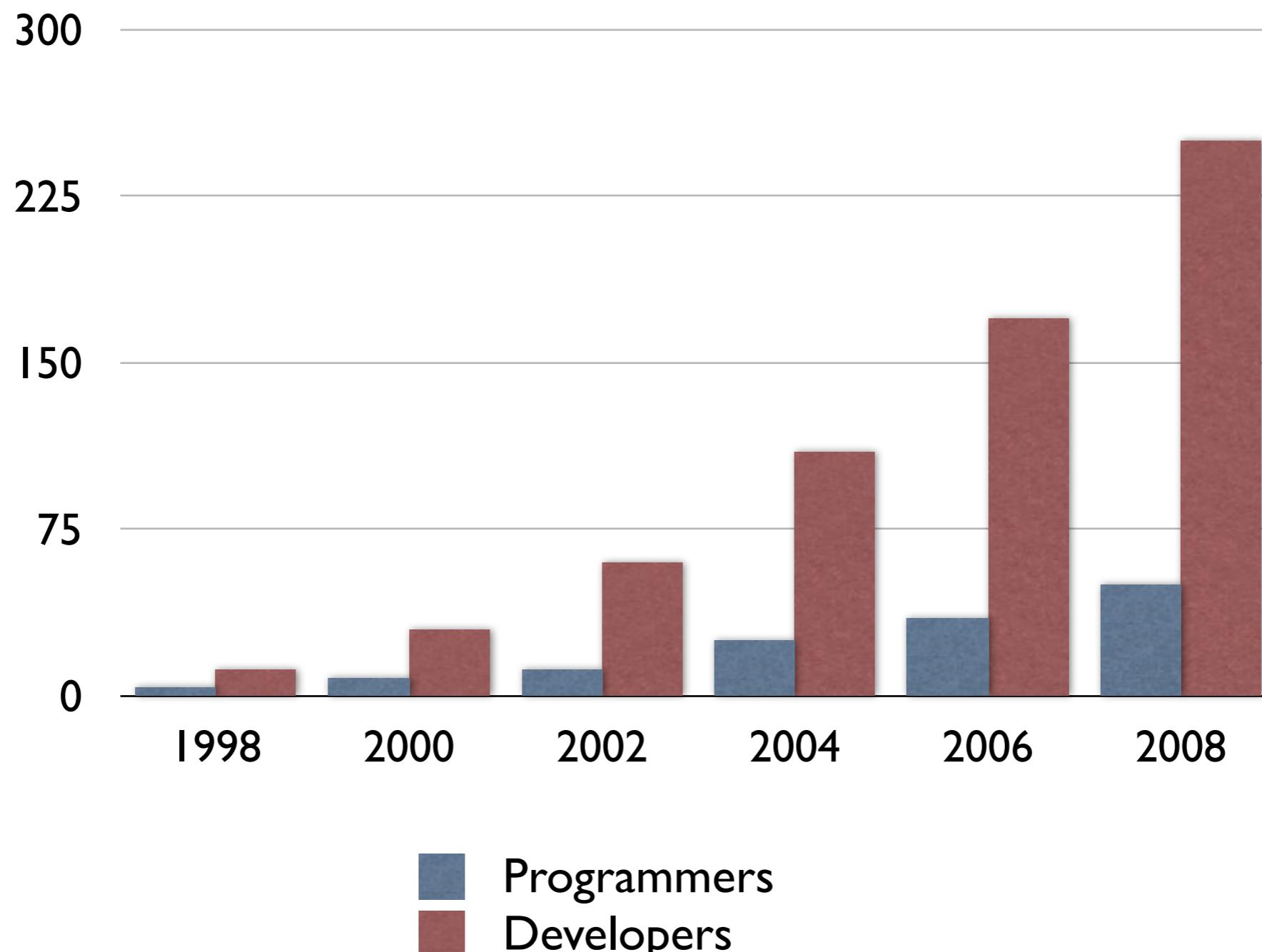
PlayStation 2



PLAYSTATION 3



Team Sizes



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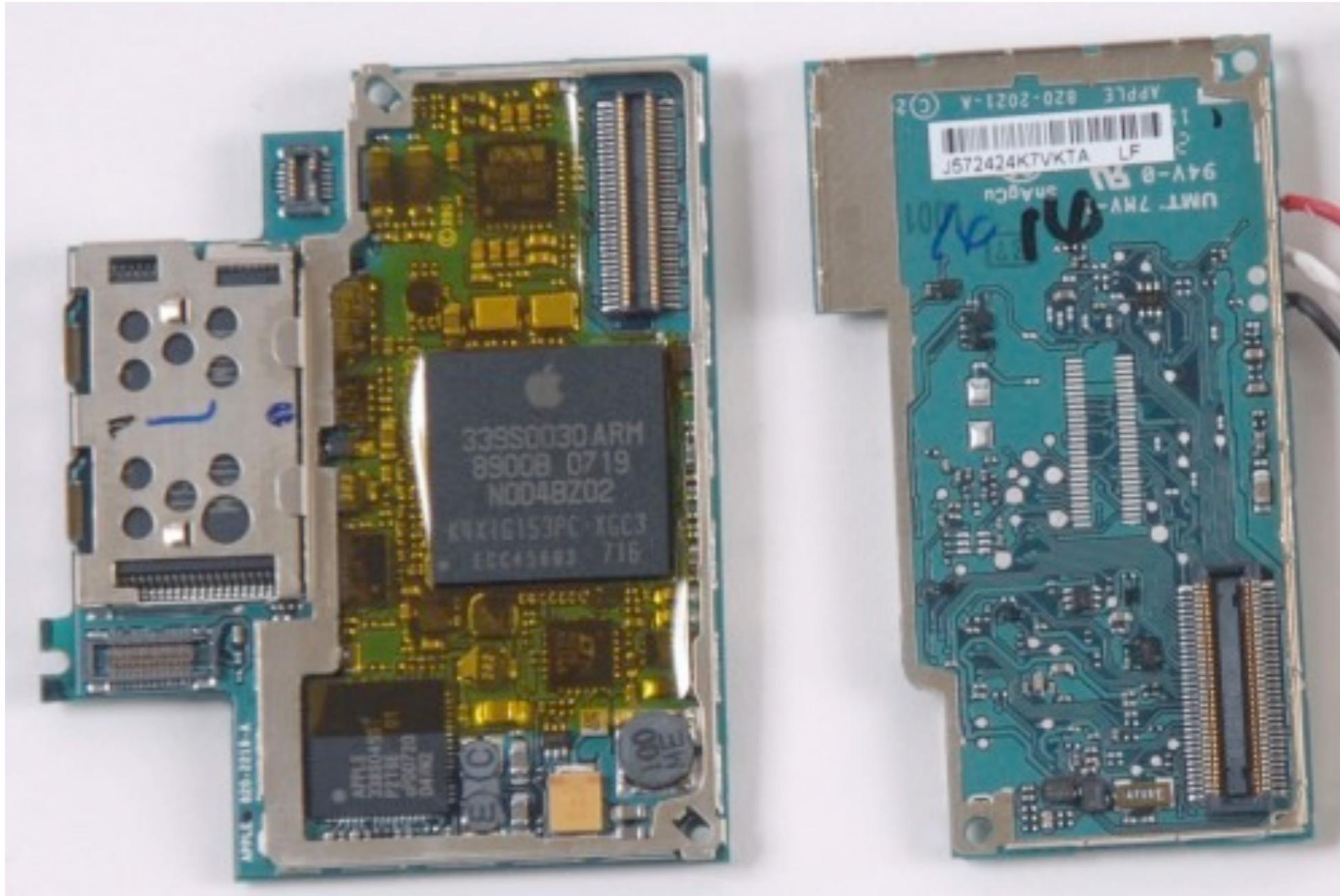
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Part I: What's Inside?



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Hardware Specs



Hardware Specs

- CPU: 32-bit RISC ARM



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- Memory: 128 MB RAM



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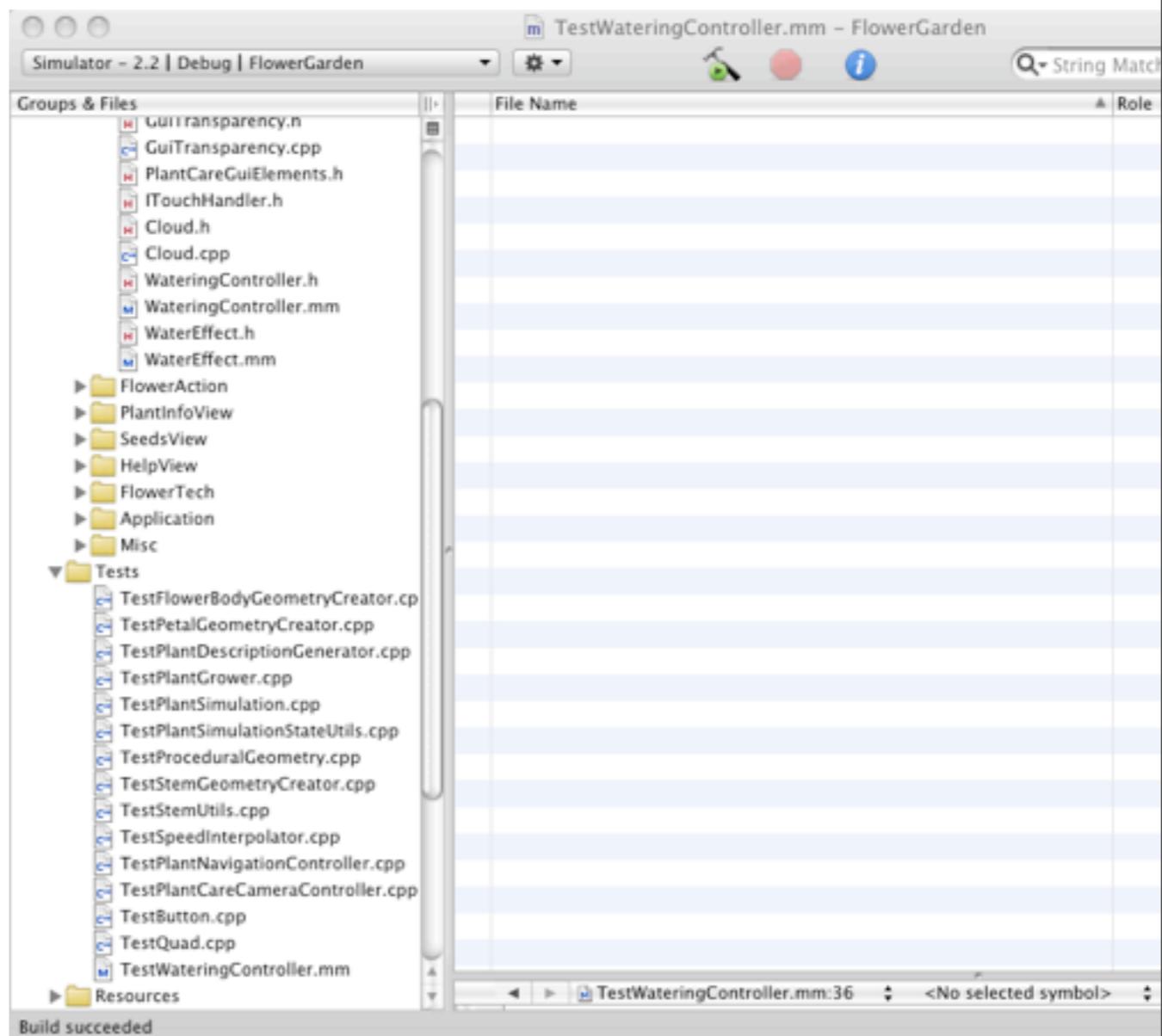


Hardware Specs

- CPU: 32-bit RISC ARM
- Memory: 128 MB RAM
- Graphics: PowerVR MBX Lite
- Extra features: Multi-touch screen, GPS, camera, accelerometer, WiFi, microphone.

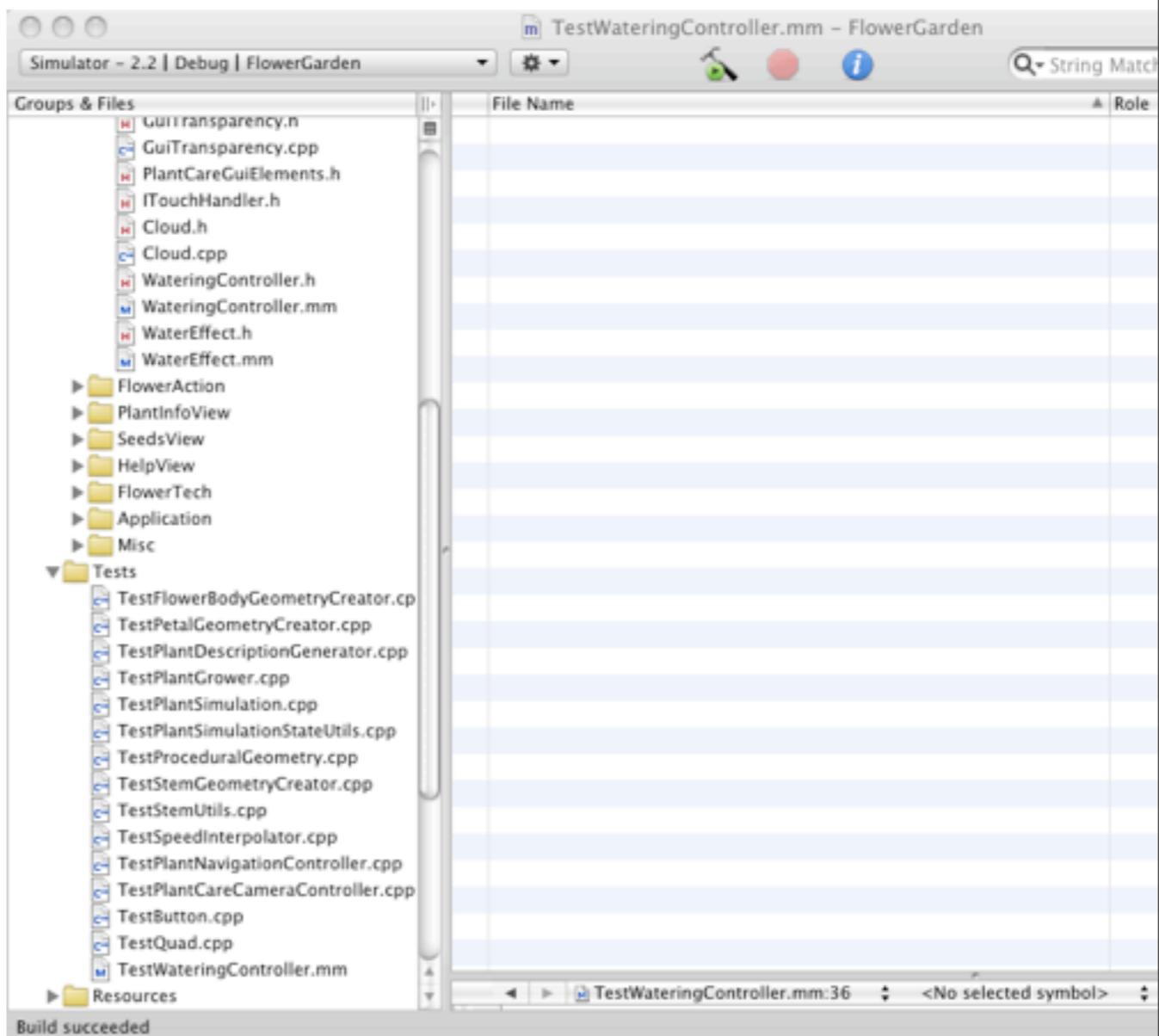


Development Tools



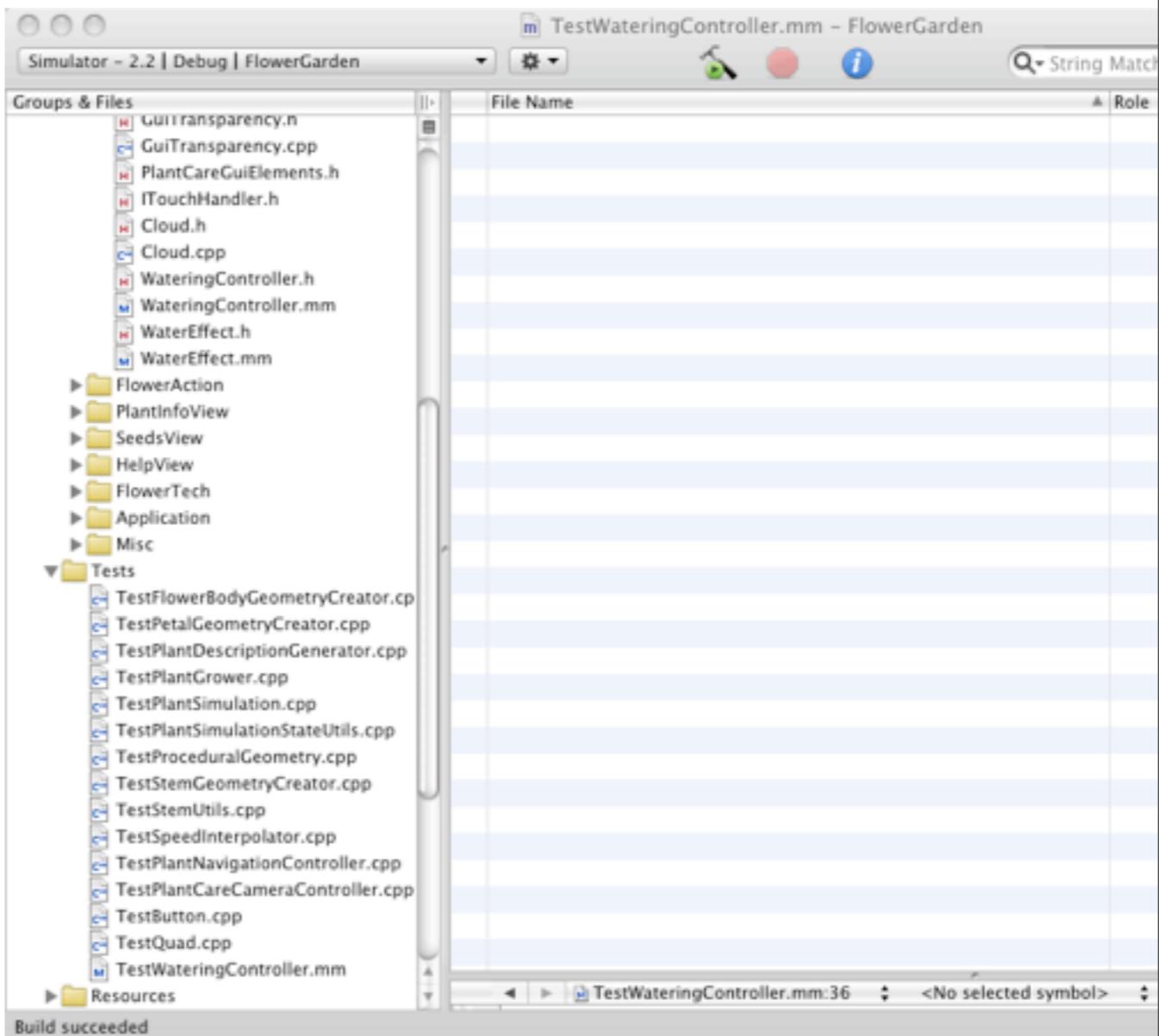
Development Tools

- XCode. Great IDE



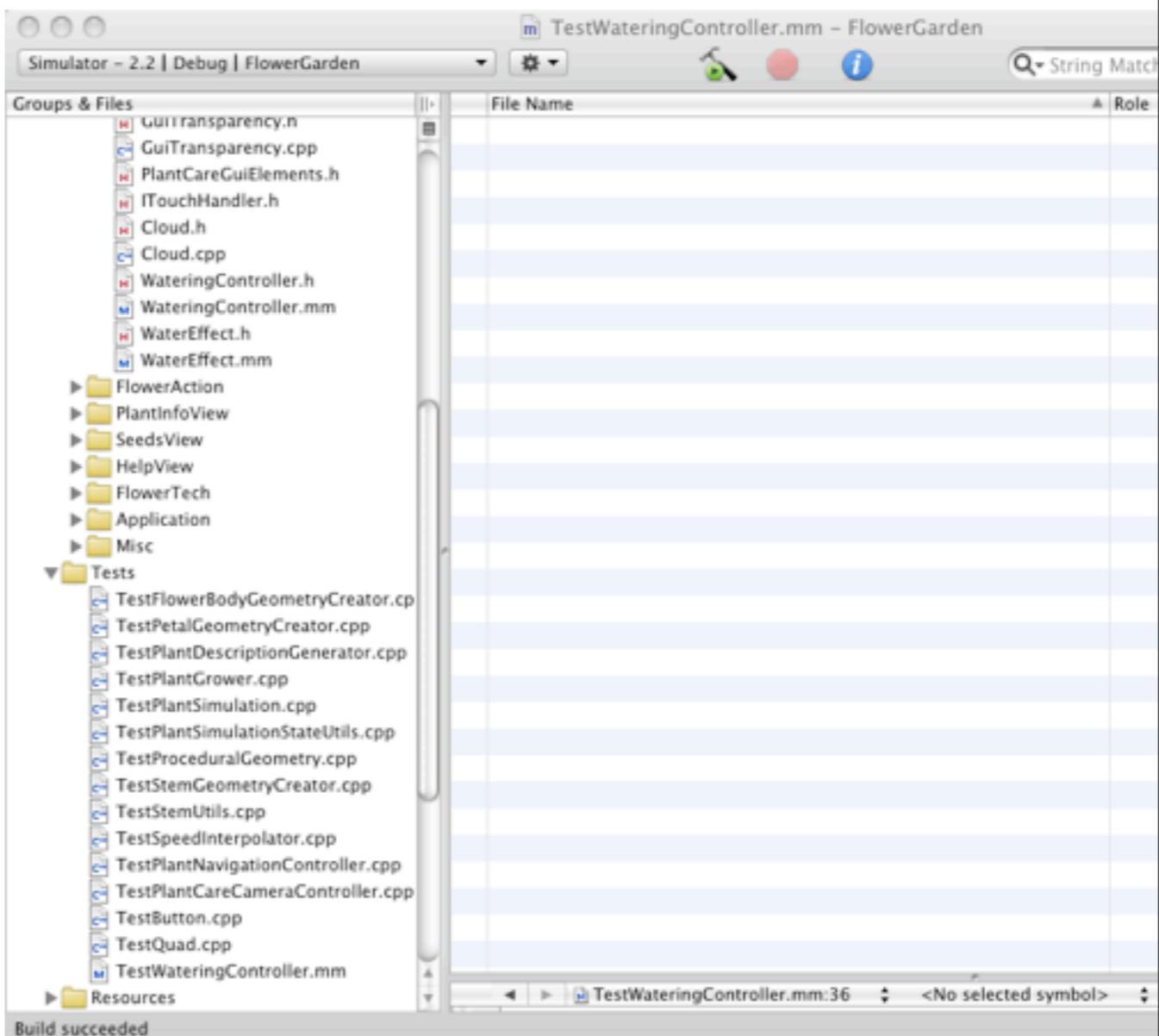
Development Tools

- XCode. Great IDE
- Familiar tools: gcc, gdb



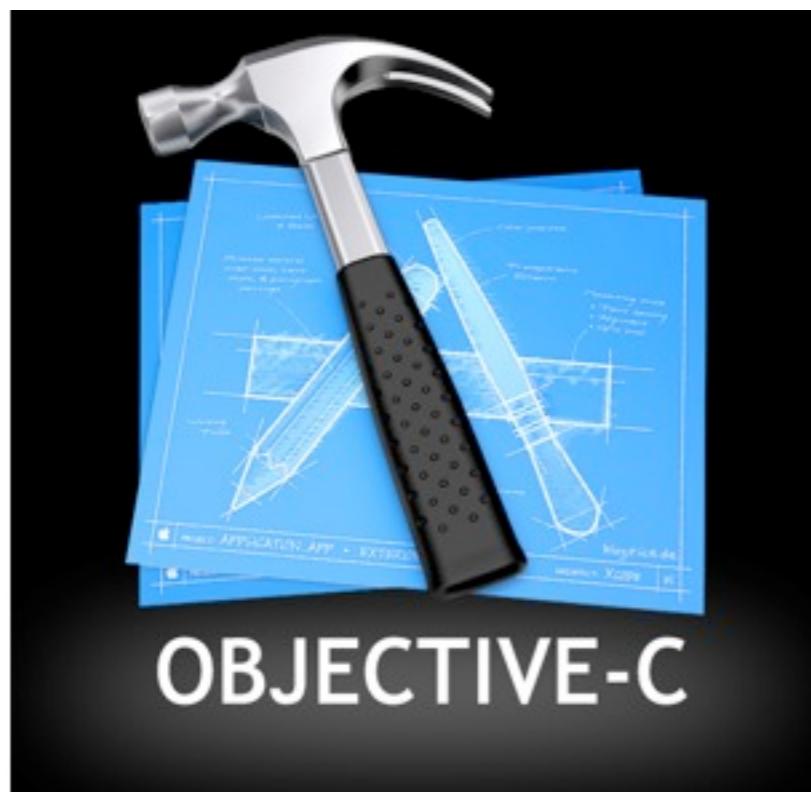
Development Tools

- XCode. Great IDE
- Familiar tools: gcc, gdb
- Great performance and analysis tools: Instruments



Programming Language

Most iPhone-related stuff in Objective C



Programming Language

Most iPhone-related stuff in Objective C



#include <stdio.h>
int main(void)
{
 printf("Hello World!\n");
}
C/C++

... but you can write all C and C++ you want!



Programming language

You can even write assembly if you want!

```
void MyFunction()
{
    // do some stuff
    int value = 57;
    asm volatile (
        "mov %0, %0, ror #1"
        : "=r" (value)
        : "0" (value)
    );
}
```



Unit Testing



Unit Testing

- Any C/C++ unit-testing framework



Unit Testing

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- Biased towards UnitTest++ of course
(<http://unittest-cpp.sourceforge.net/>)



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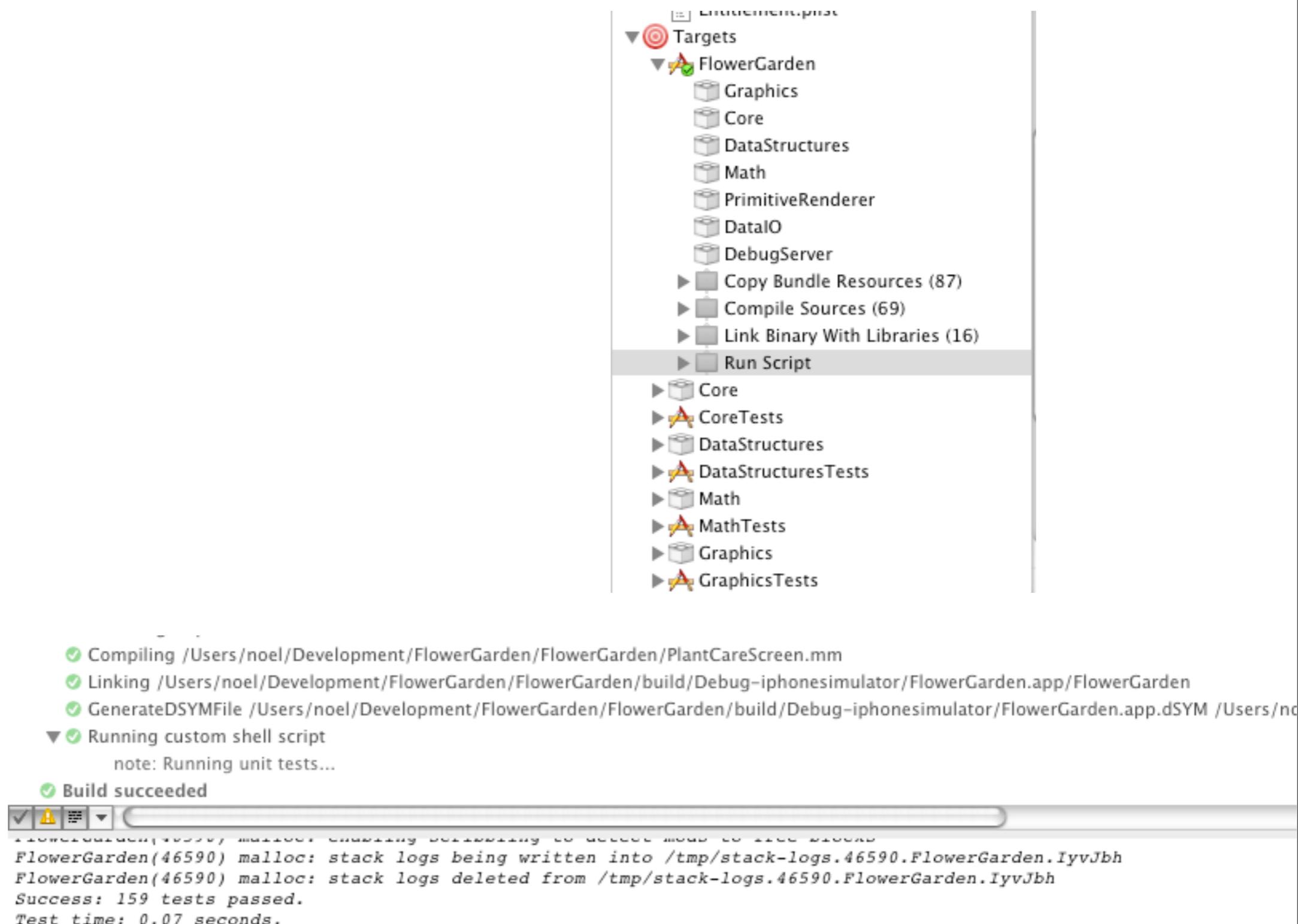


Unit Testing

- Any C/C++ unit-testing framework
- Biased towards UnitTest++ of course (<http://unittest-cpp.sourceforge.net/>)
- How to get it to run as a postbuild step?
- Google toolbox for Mac (<http://code.google.com/p/google-toolbox-for-mac/wiki/iPhoneUnitTesting>)



Unit Testing



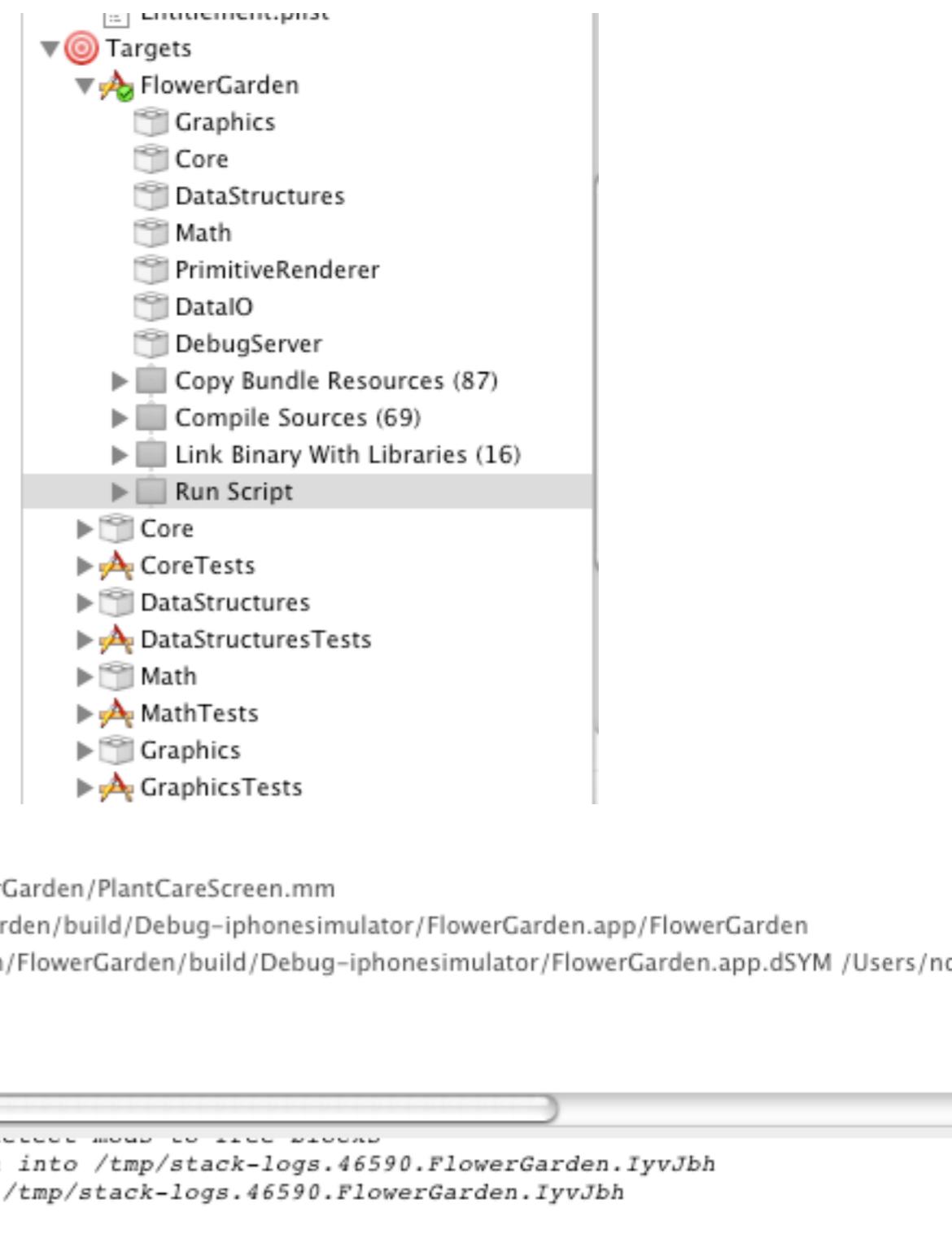
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Unit Testing

- Run script as part of build process.



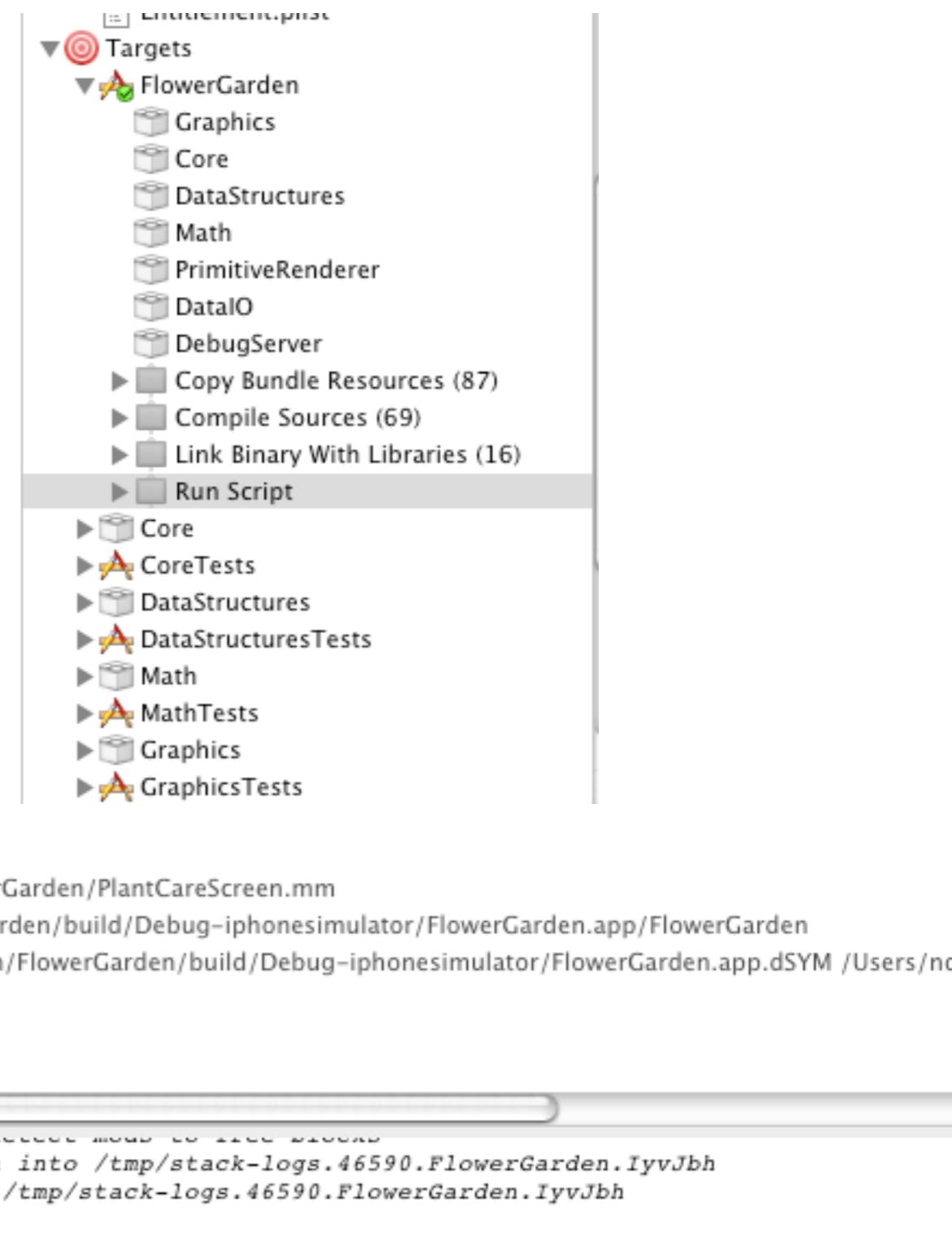
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Unit Testing

- Run script as part of build process.
- Build and you're done.



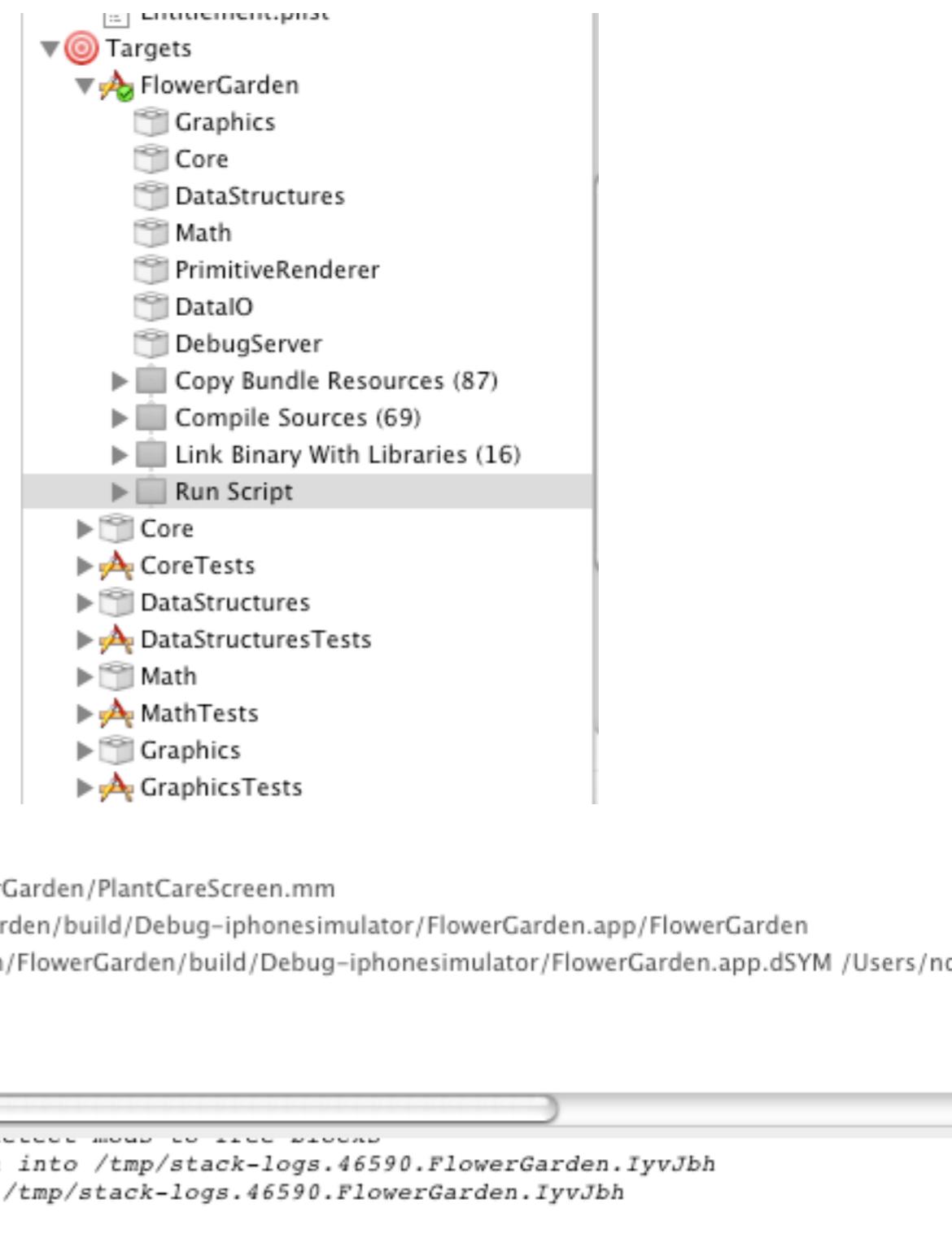
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Unit Testing

- Run script as part of build process.
- Build and you're done.
- Super fast in simulator.



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Unit Testing



Unit Testing

- Also frameworks for Objective C: OCUnit, SenTestingKit



Unit Testing

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- I haven't used them yet



Unit Testing

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- Some people modified UnitTest++ to work with Objective C



Unit Testing

- Also frameworks for Objective C: OCUnit, SenTestingKit
- I haven't used them yet
- Some people modified UnitTest++ to work with Objective C
- Also mock frameworks: OCMock



Build Servers



Build Servers

- Continuous integration was a key practice in large teams.



Build Servers

- Continuous integration was a key practice in large teams.
- Even with a one or two-man team it was extremely useful.

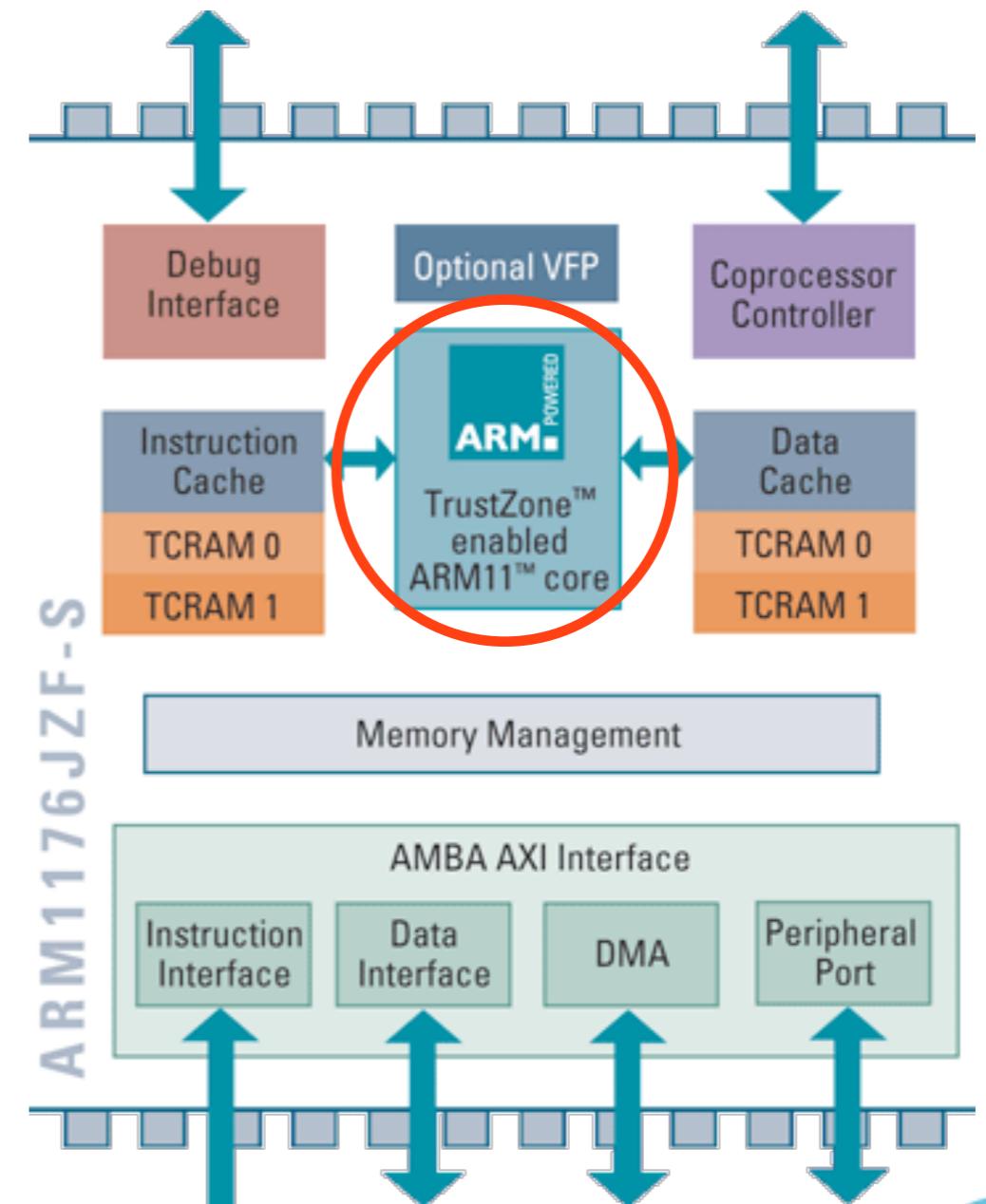


Build Servers

- Continuous integration was a key practice in large teams.
- Even with a one or two-man team it was extremely useful.
- CruiseControl or Hudson



CPU



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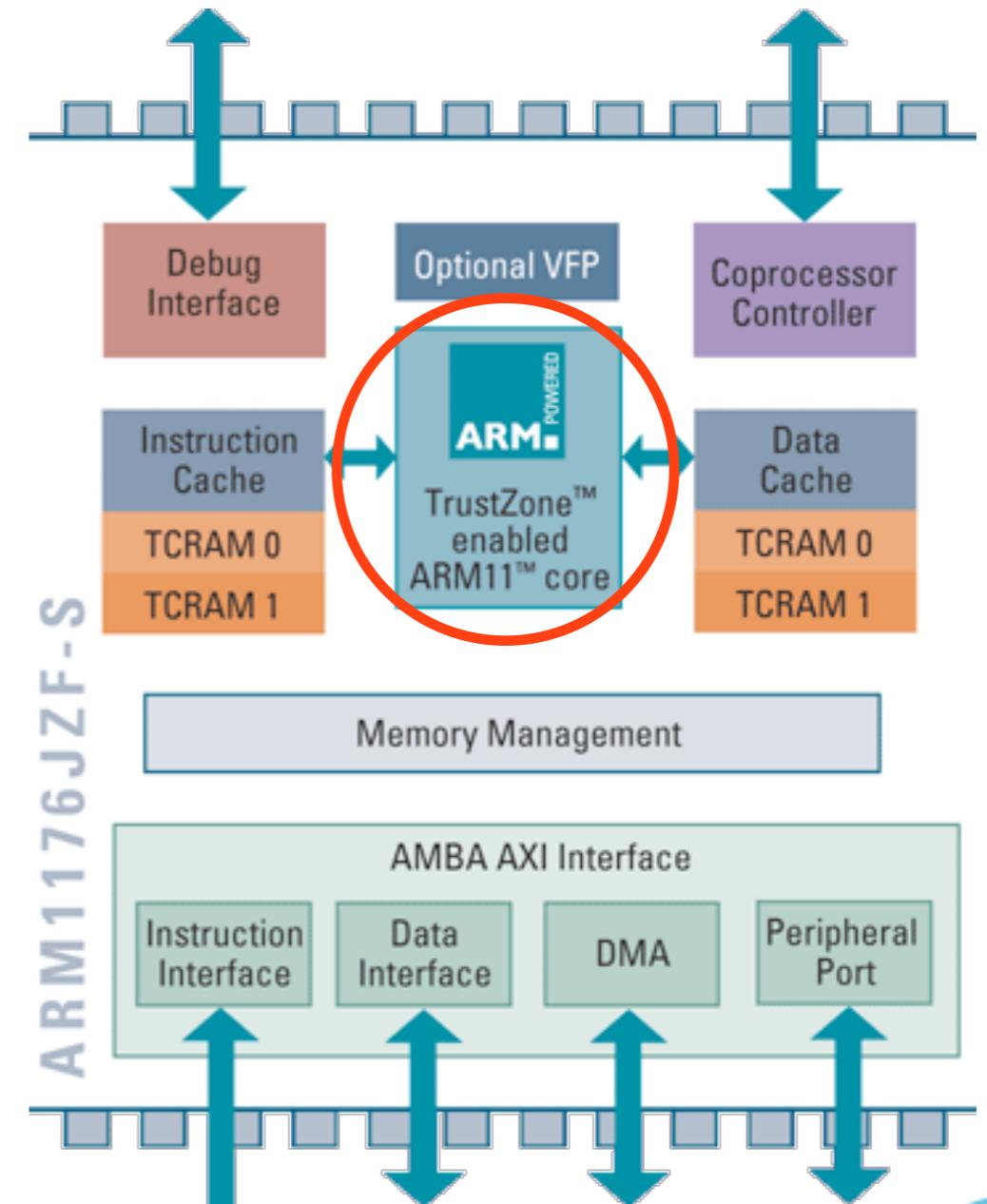
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CPU

- CPU: 32-bit RISC ARM



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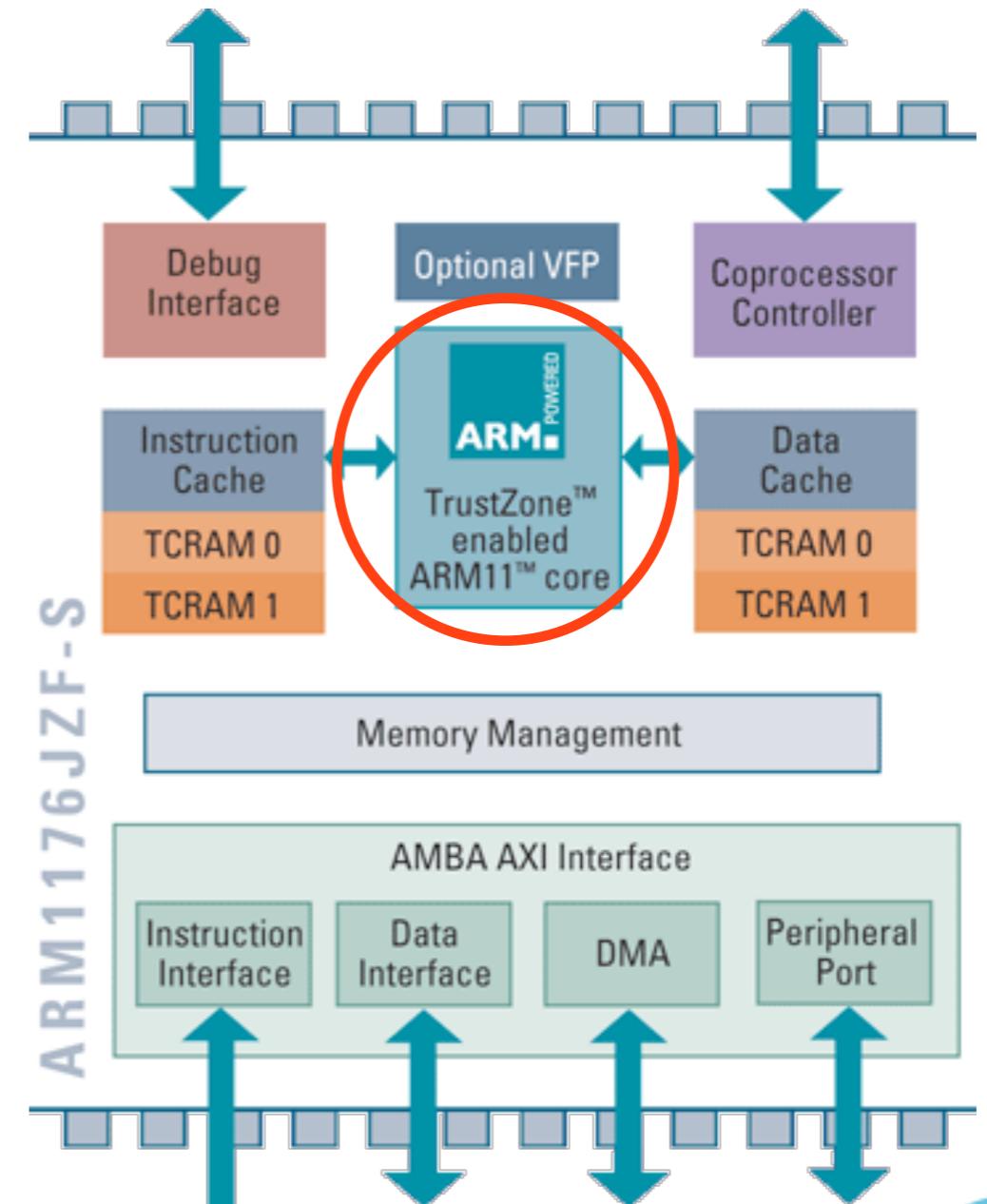
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CPU

- CPU: 32-bit RISC ARM
- iPhone @ 412MHz



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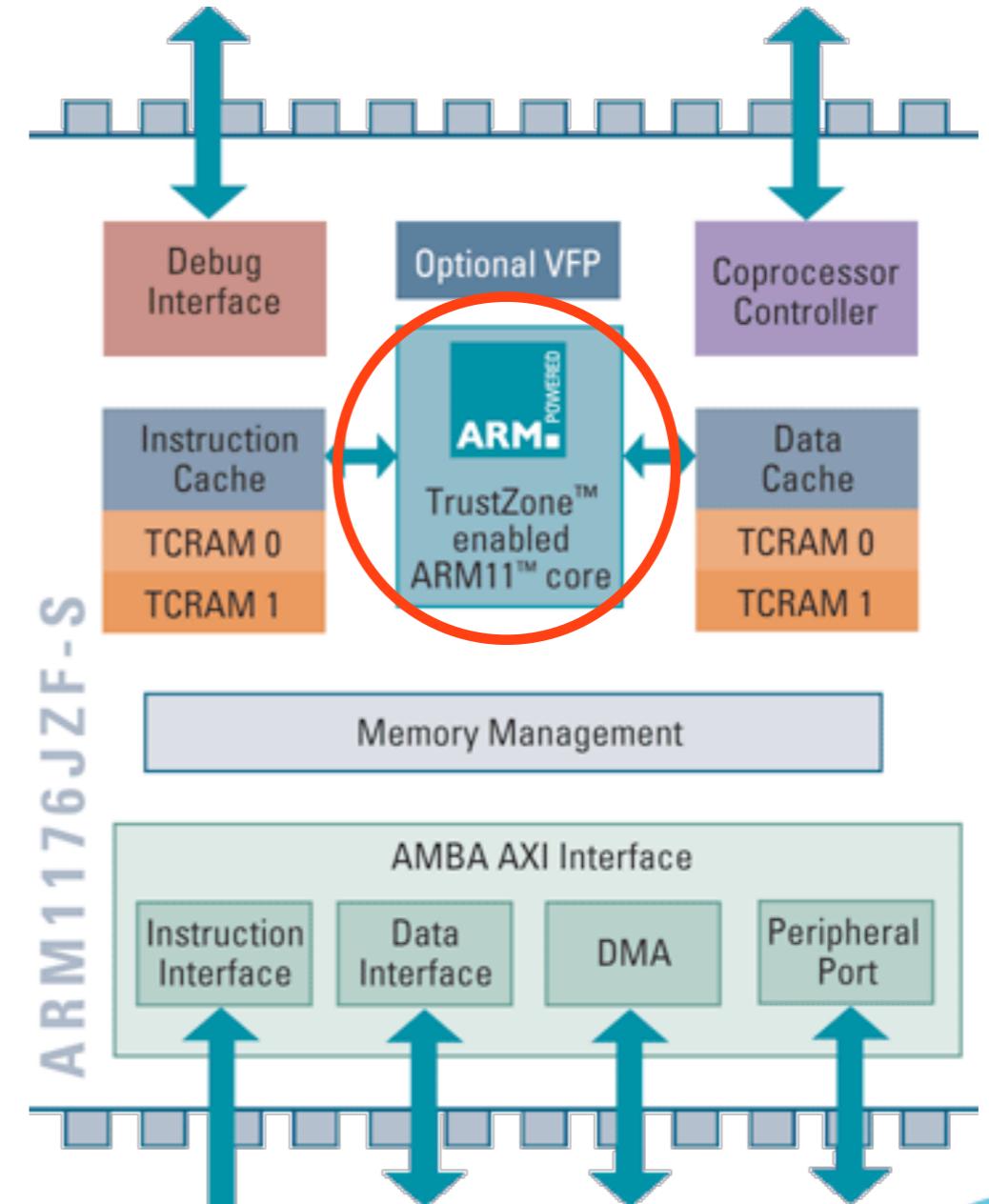
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CPU

- CPU: 32-bit RISC ARM
- iPhone @ 412MHz
- iPod Touch @ 535MHz



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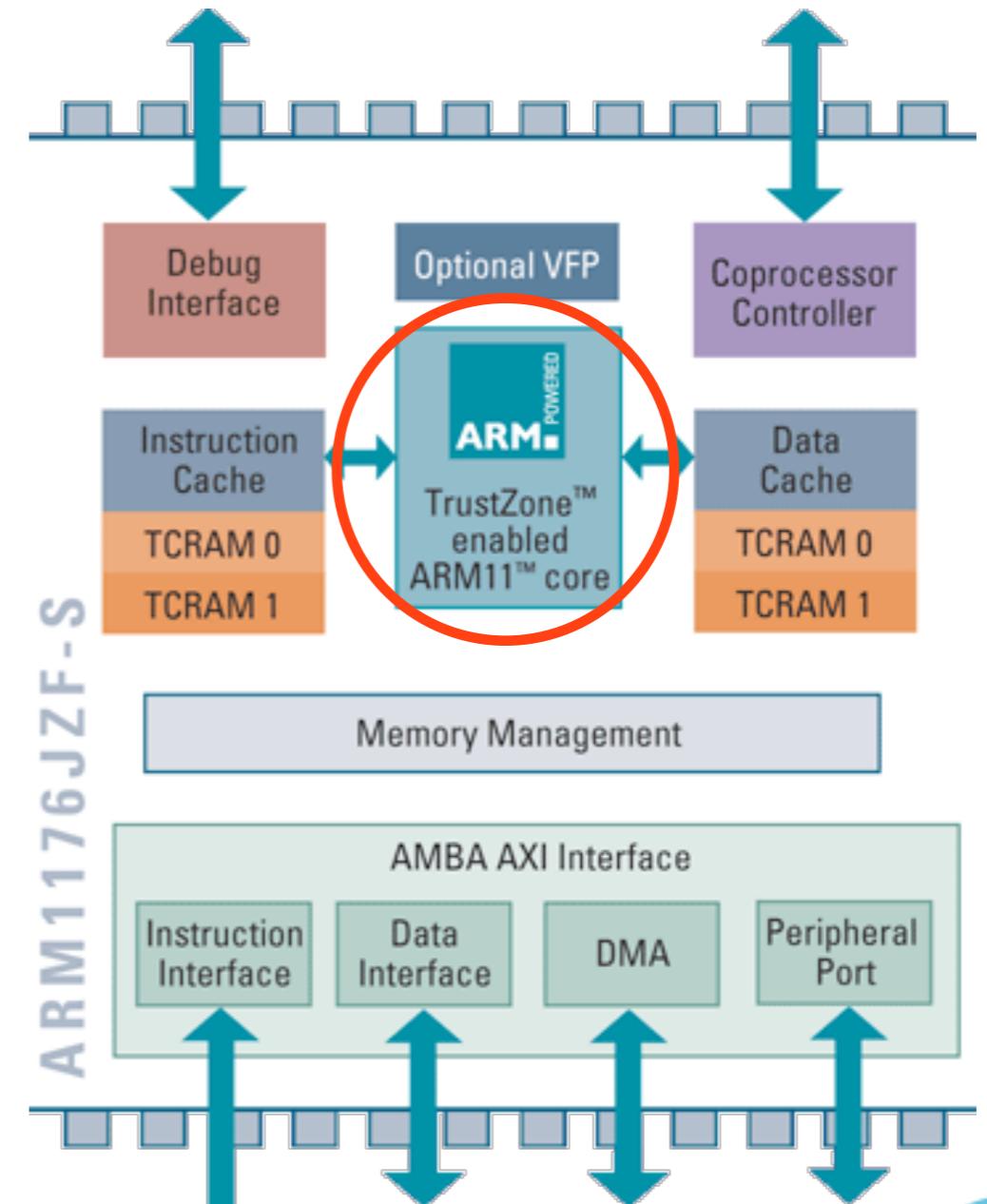
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CPU

- CPU: 32-bit RISC ARM
- iPhone @ 412MHz
- iPod Touch @ 535MHz
- Can go as high as 620MHz



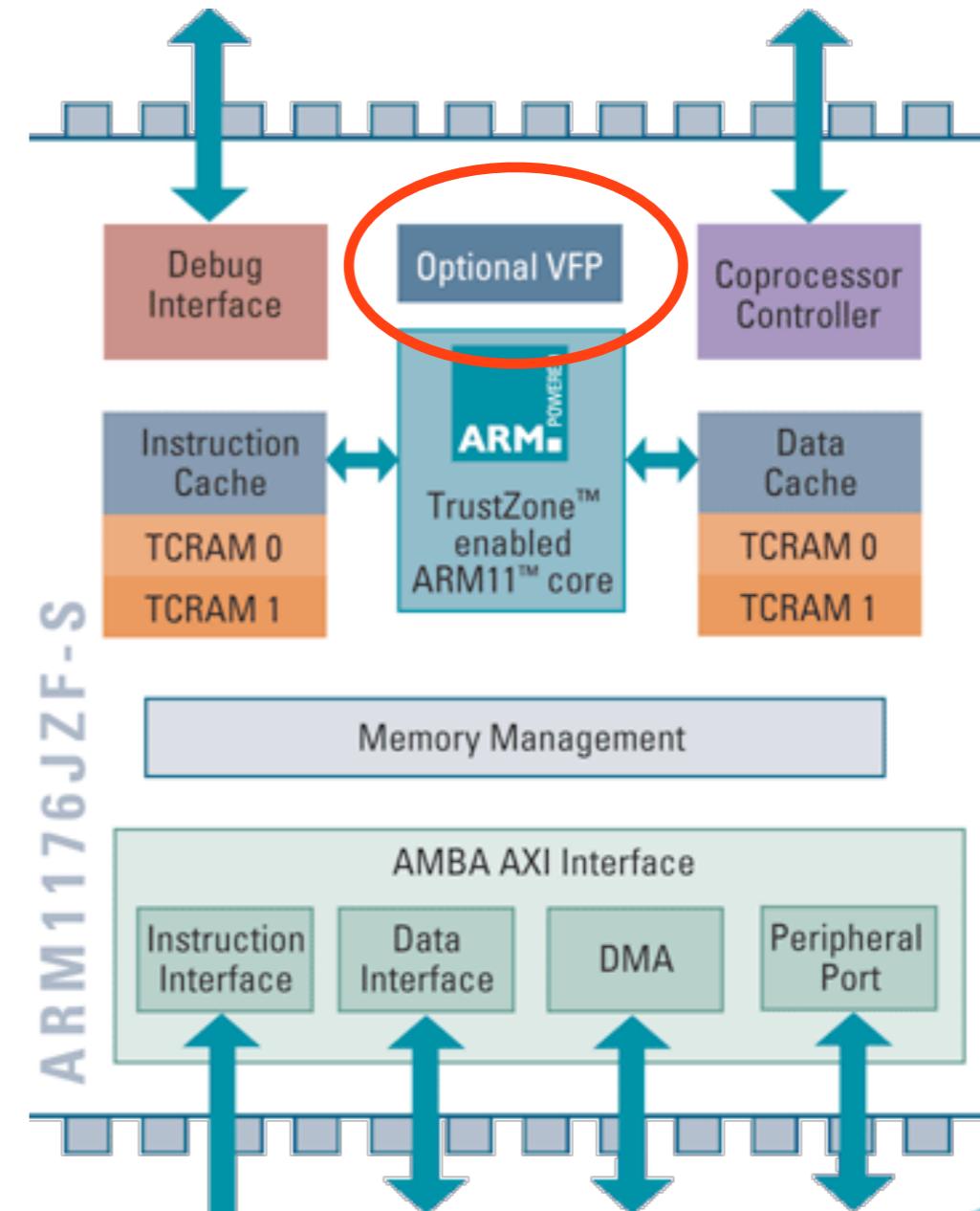
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Floating Point



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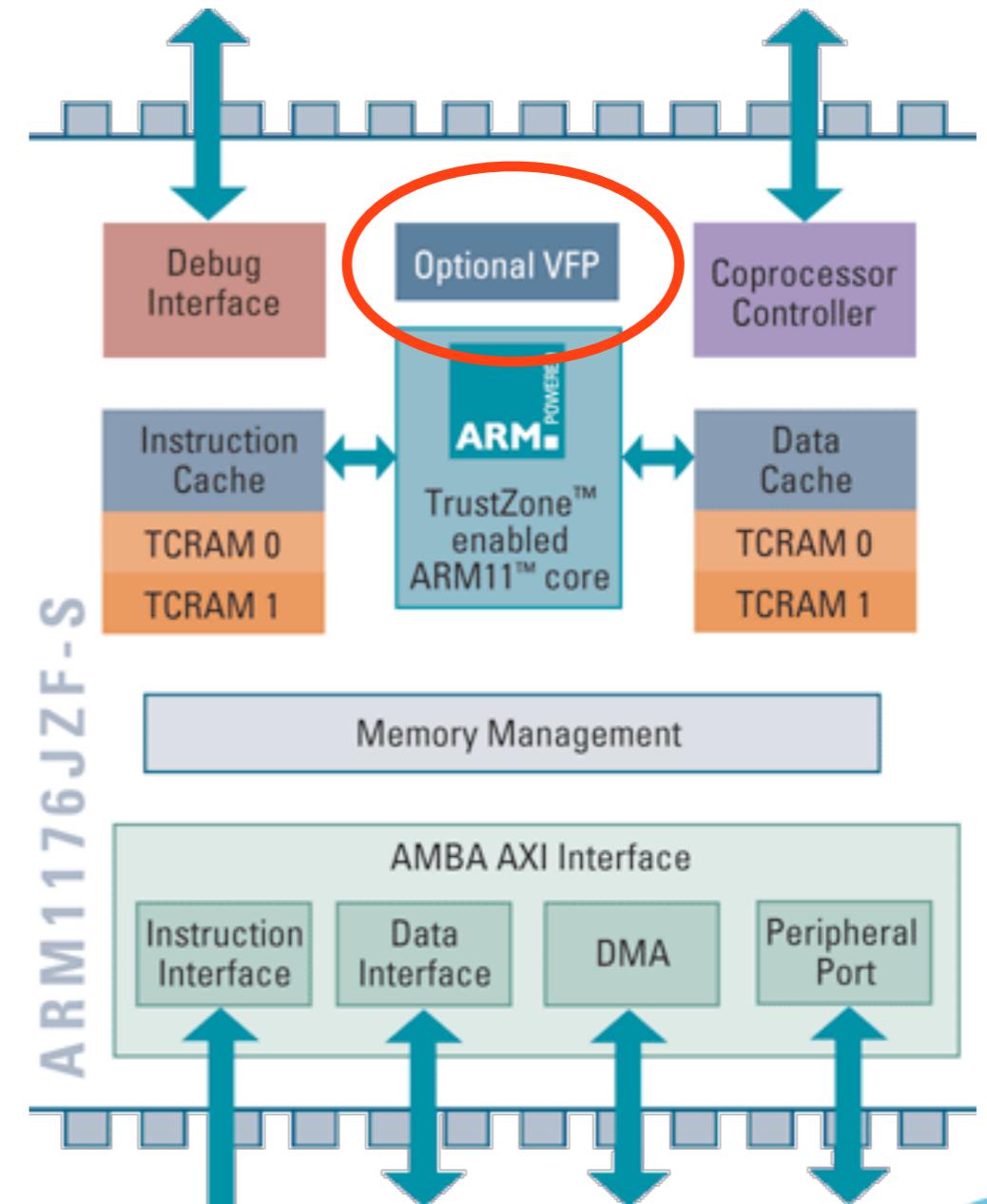
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Floating Point

- The main CPU has no floating point support.



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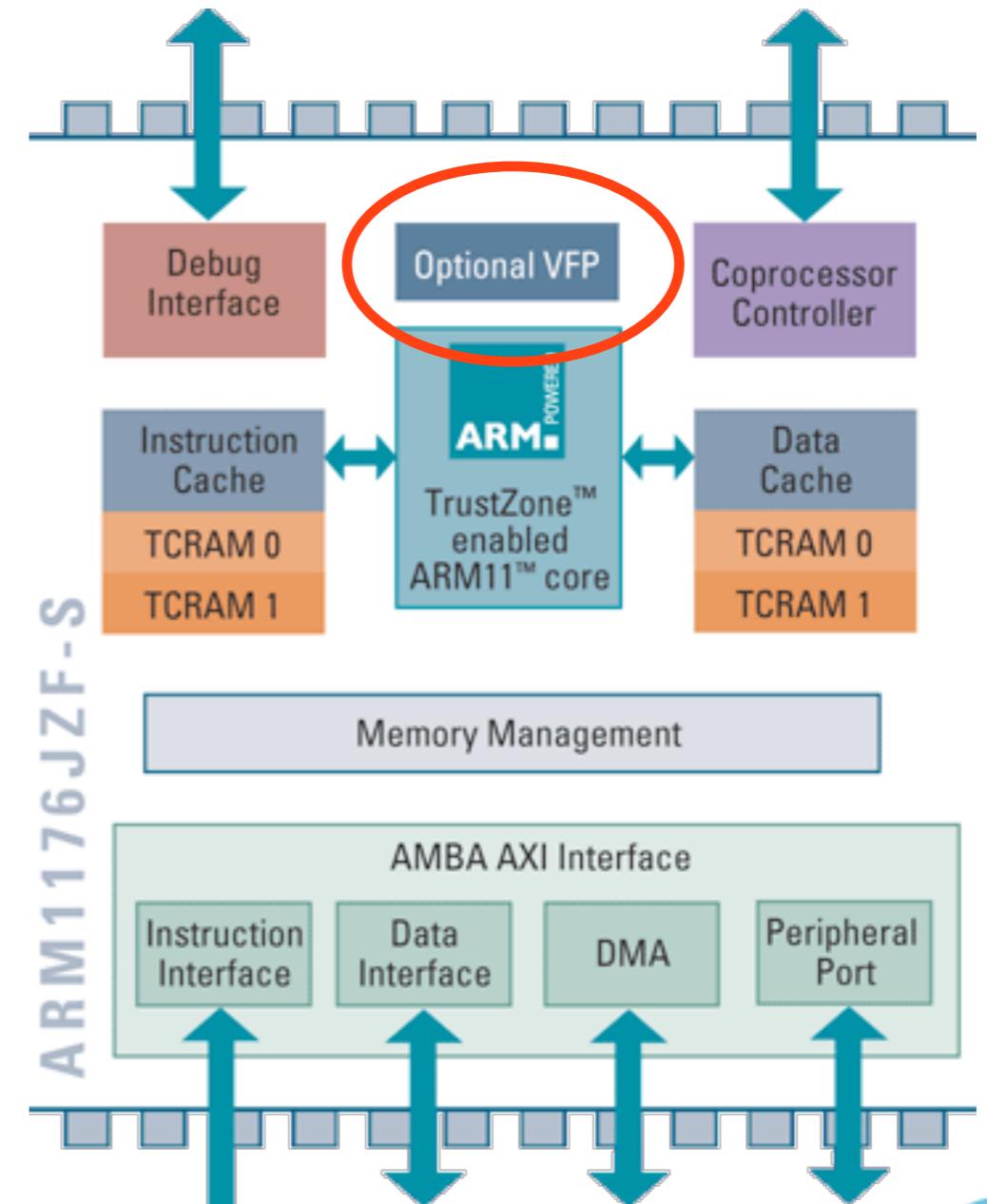
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Floating Point

- The main CPU has no floating point support.
- Compiled C/C++/OC code uses the vector floating point unit for any floating point operations.



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Thumb Mode



Thumb Mode

- CPU has a special thumb mode.



Thumb Mode

- CPU has a special thumb mode.
- Less memory, maybe better performance.



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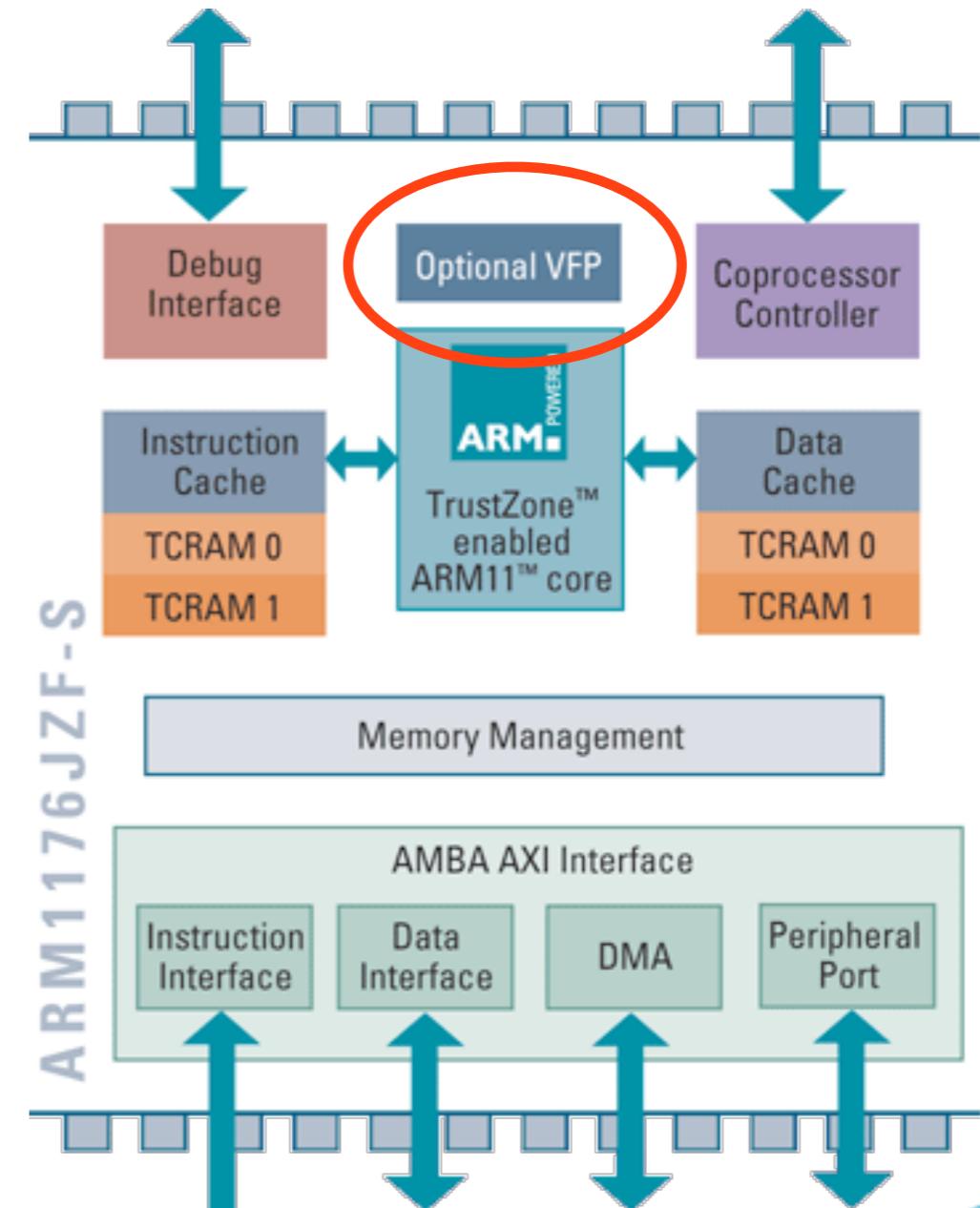


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Show Warnings	<input checked="" type="checkbox"/>
User-Defined	
GCC_C_LANGUAGE_STANDARD	c99
GCC_DYNAMIC_NO_PIC	NO
GCC_OBJC_CALL_CXX_CDTORS	YES
GCC_OPTIMIZATION_LEVEL	0
GCC_PRECOMPILE_PREFIX_HEADER	YES
GCC_PREFIX_HEADER	FlowerGarden_Prefix.pch
GCC_THUMB_SUPPORT	NO
GCC_WARN_ABOUT_MISSING_NEWLINE	YES
GCC_WARN_ABOUT_RETURN_TYPE	YES
GCC_WARN_CHECK_SWITCH_STATEMENTS	YES



Floating Point



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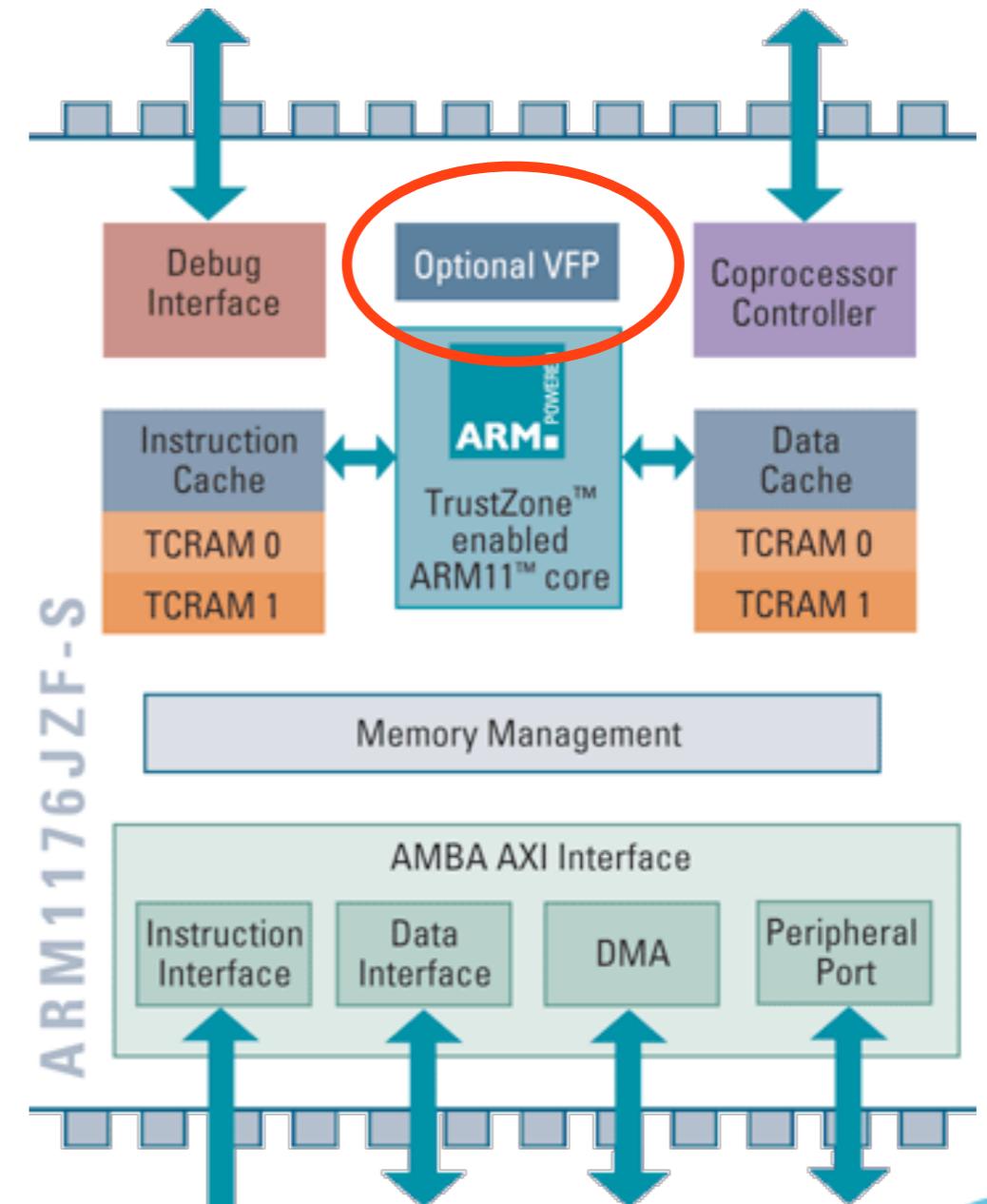
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Floating Point

- The VFP stands for “vector”



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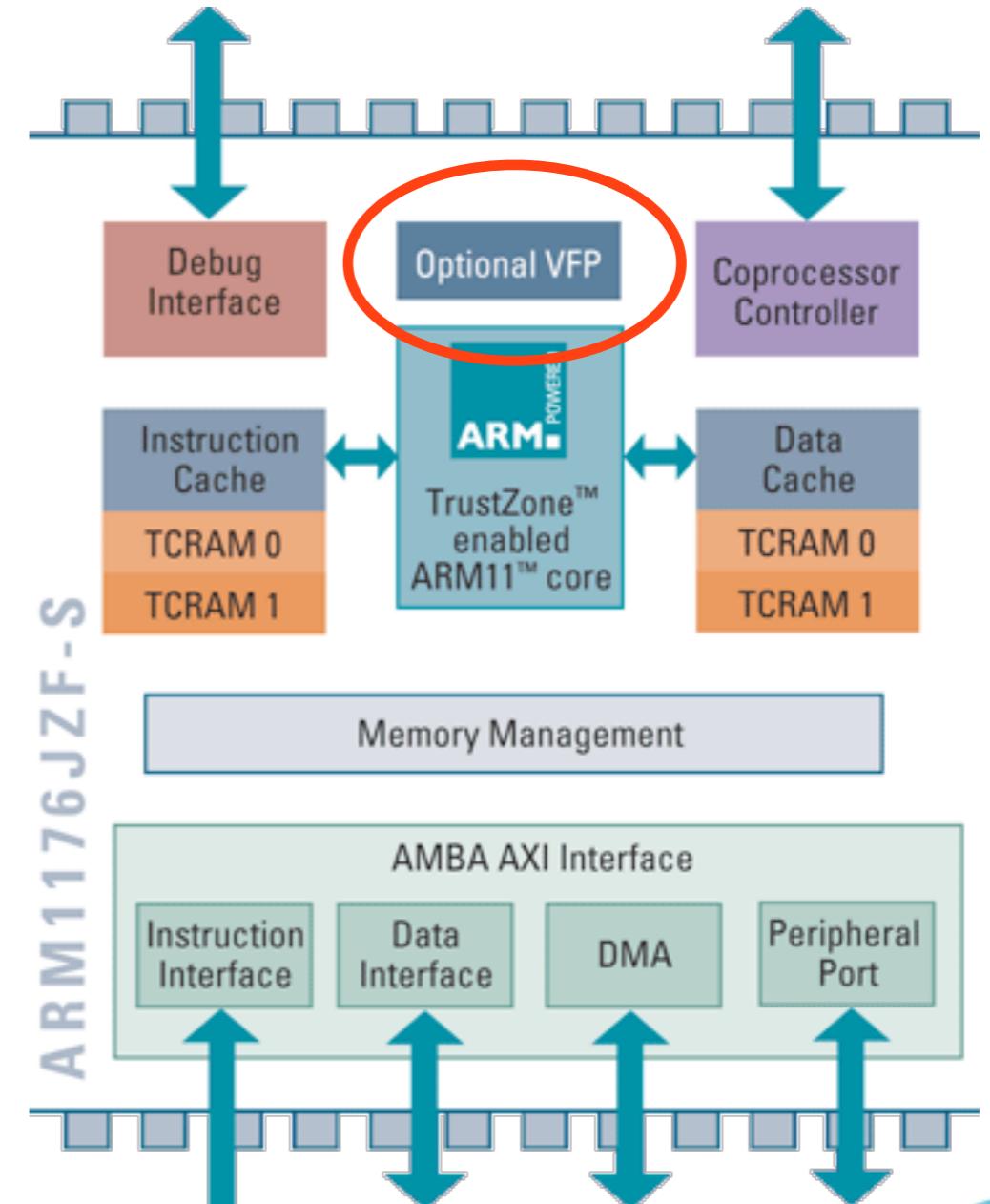
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Floating Point

- The VFP stands for “vector”
- Work on up to four 32-bit floating point numbers at once.



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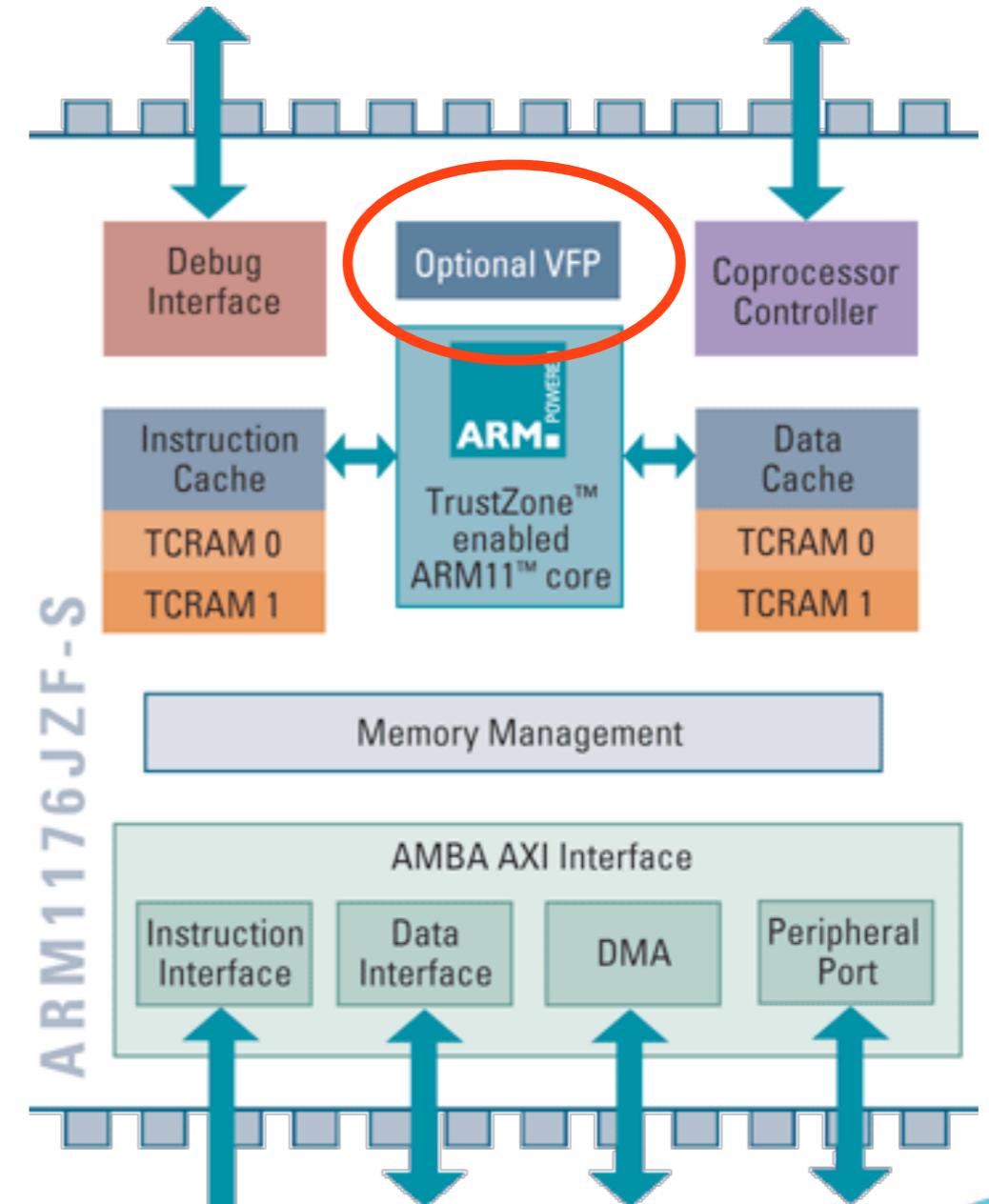
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Floating Point

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- The compiler won’t help you though.



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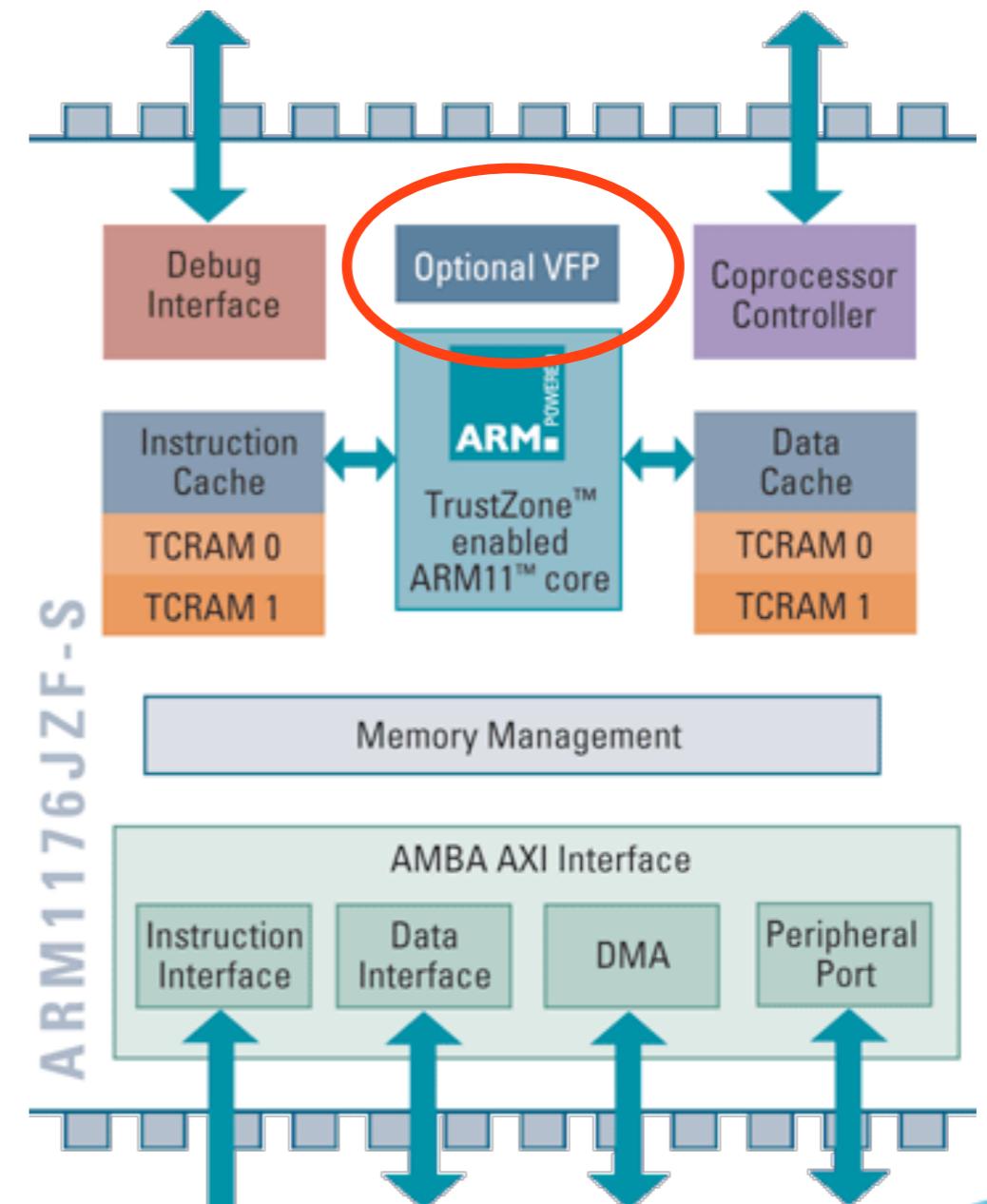
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Floating Point

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- Work on up to four 32-bit floating point numbers at once.
- The compiler won’t help you though.
- See the `vfpmath` library in Google Code



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Memory



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Memory

- 128 MB RAM



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Memory

- 128 MB RAM
- 11 MB for video



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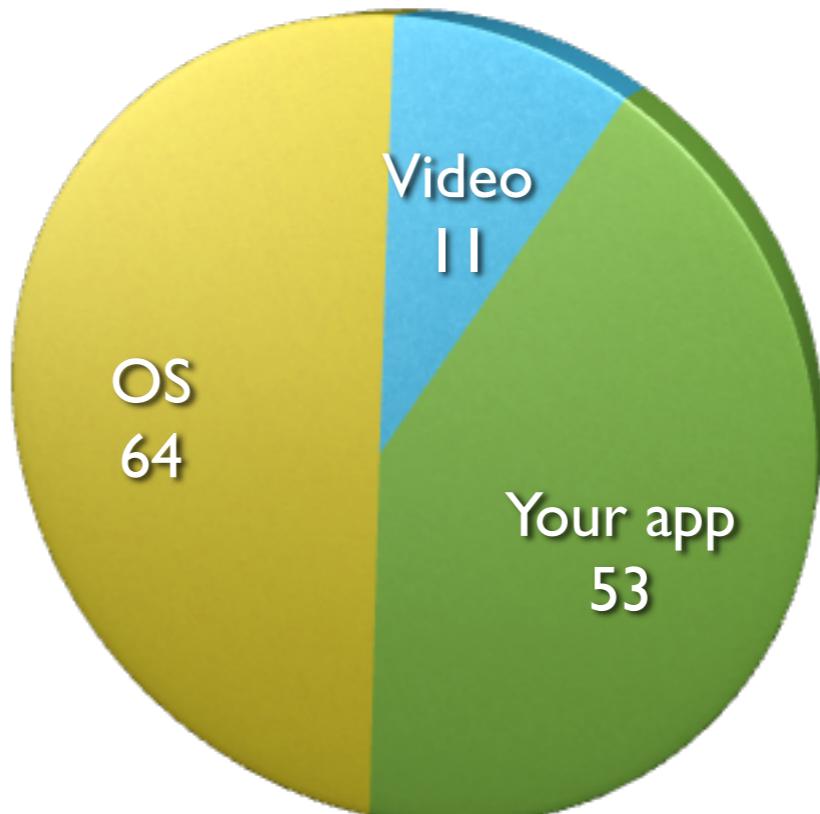
Memory

- 128 MB RAM
- 11 MB for video
- System can use up to half of that.



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Graphics



Graphics

- 320x240 resolution



Graphics

- 320x240 resolution
- OpenGL ES 1.1 API + a few extensions

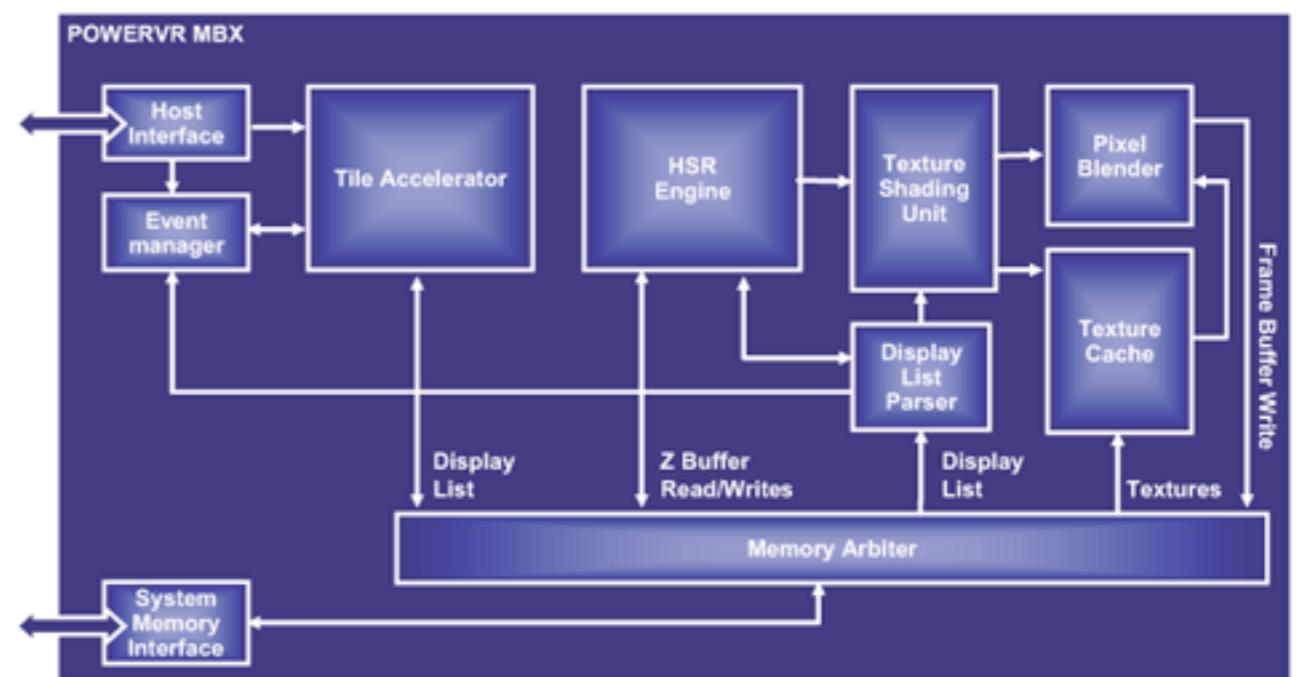


Graphics

- 320x240 resolution
- OpenGL ES 1.1 API + a few extensions
- OpenGL great for 3D but also 2D games with need for performance.



Graphics Hardware



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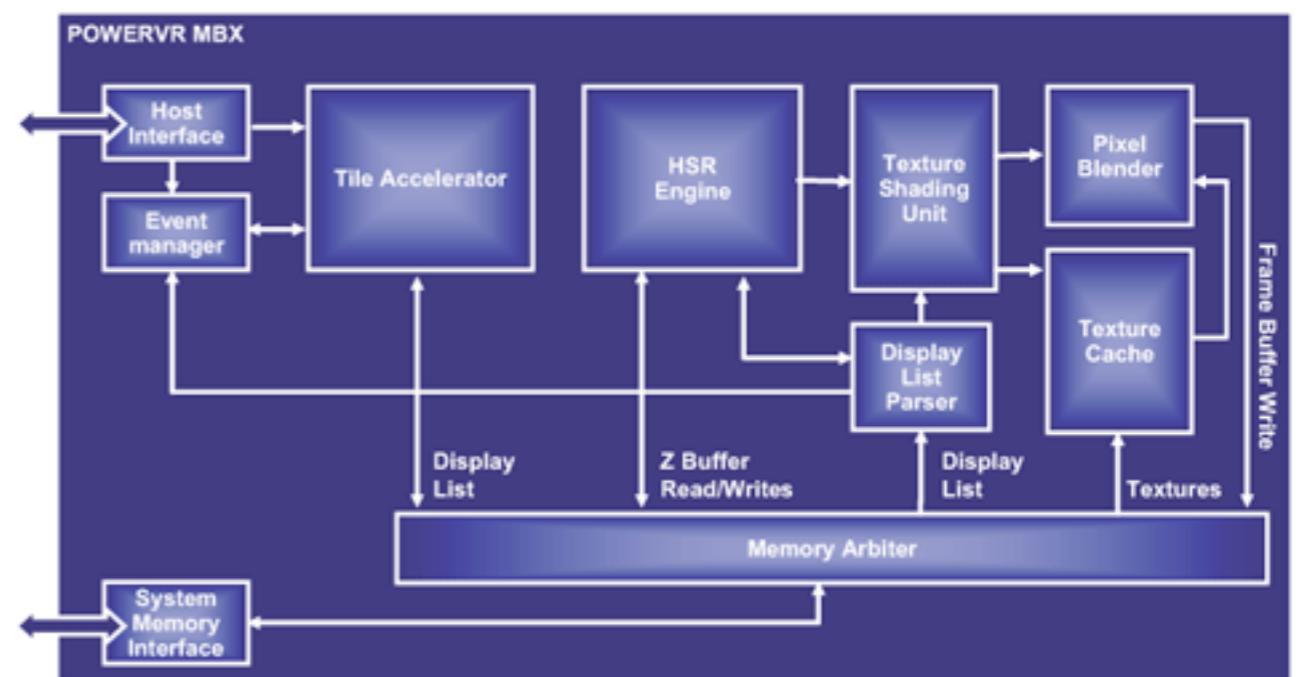
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Graphics Hardware

- PowerVR MBX Lite:
Texturing and
rasterization



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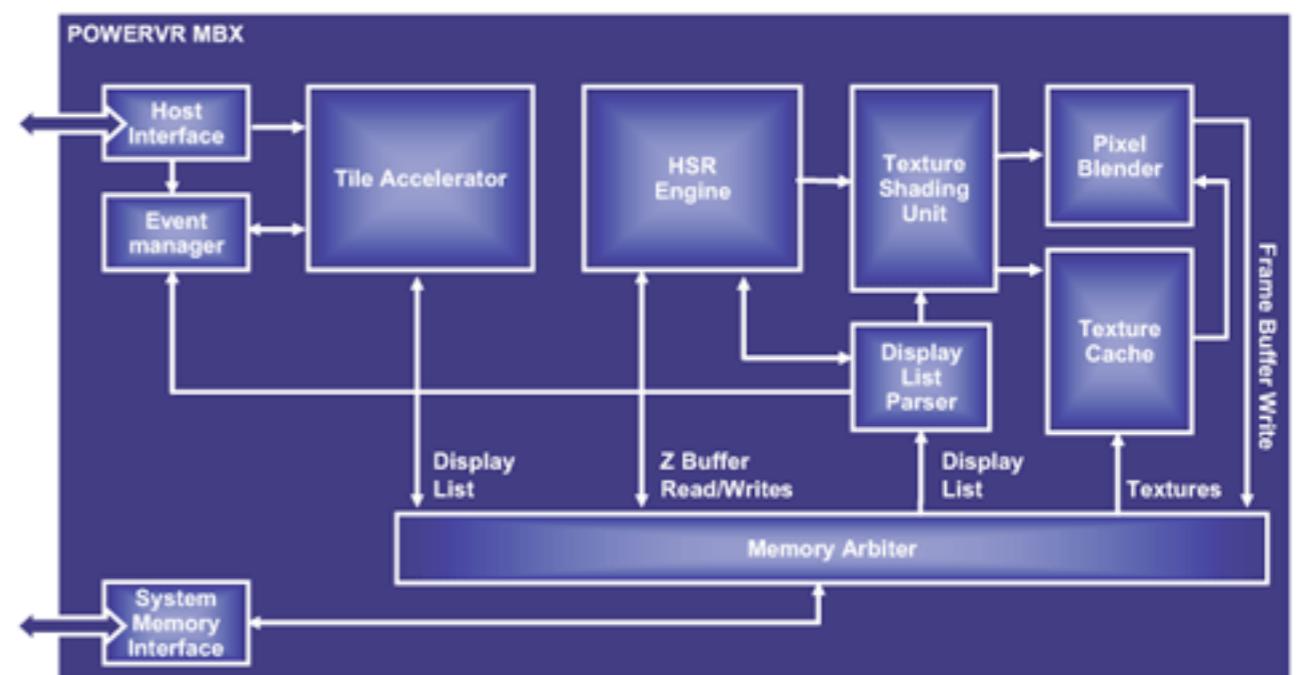
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Graphics Hardware

- PowerVR MBX Lite:
Texturing and
rasterization
- PowerVR VGP Lite:
Vertex processing.



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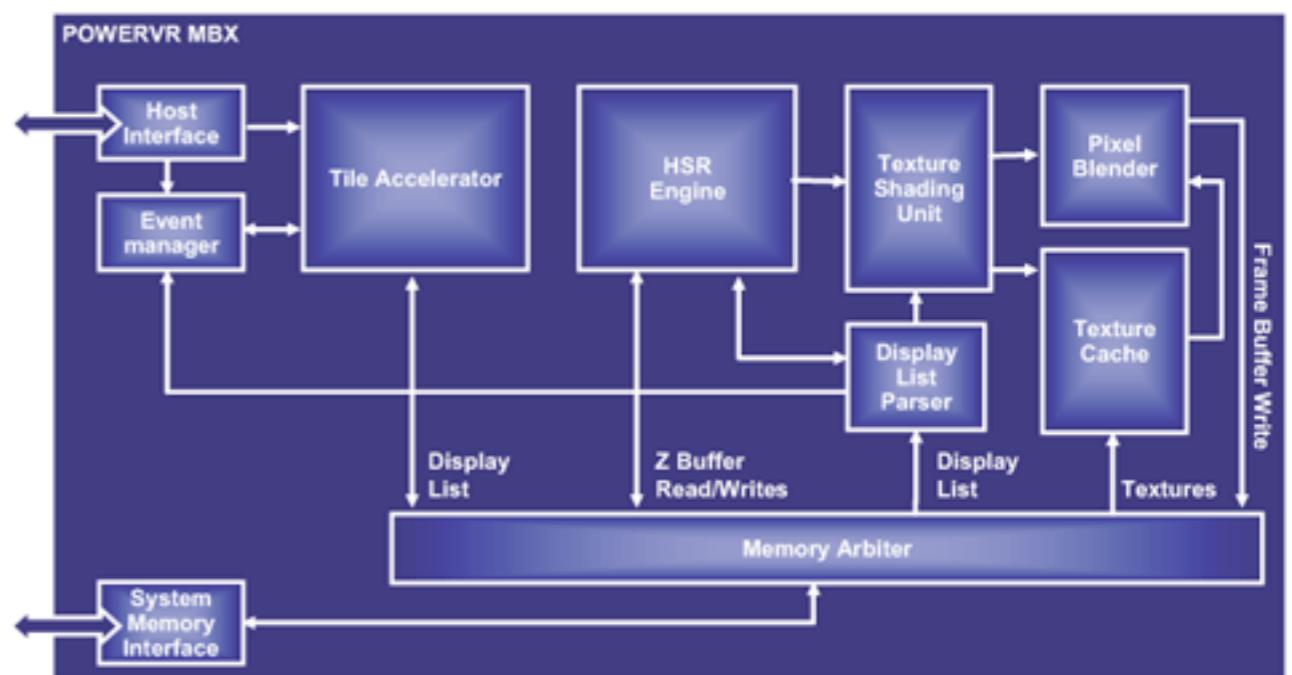
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Graphics Hardware

- PowerVR MBX Lite:
Texturing and
rasterization
- PowerVR VGP Lite:
Vertex processing.
- No shaders!



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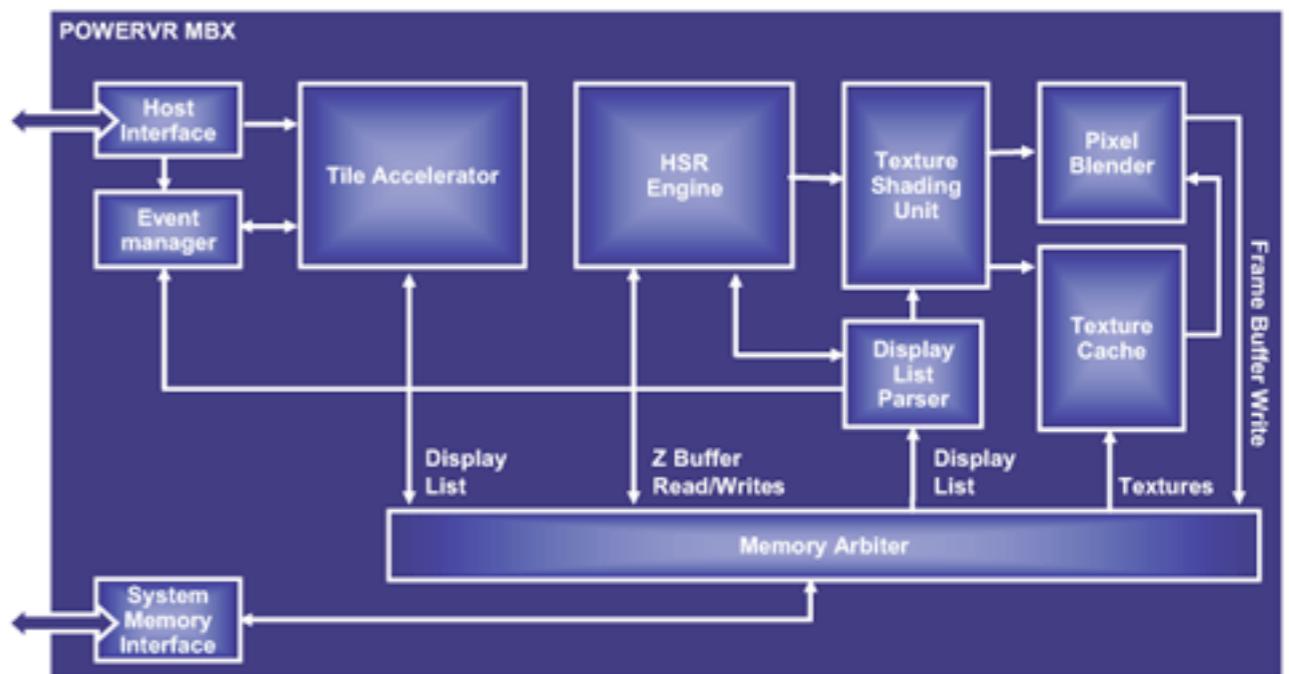
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Graphics Hardware

- PowerVR MBX Lite:
Texturing and
rasterization
- PowerVR VGP Lite:
Vertex processing.
- No shaders!
- Tile-based



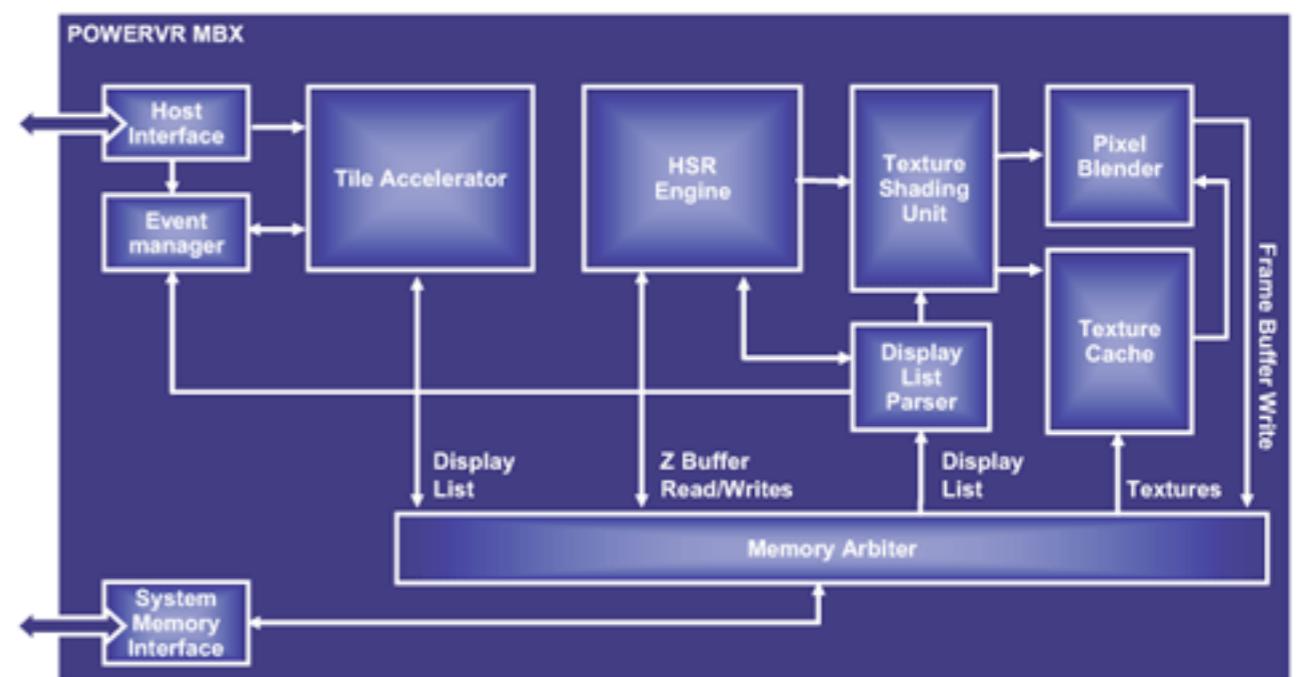
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Graphics Hardware



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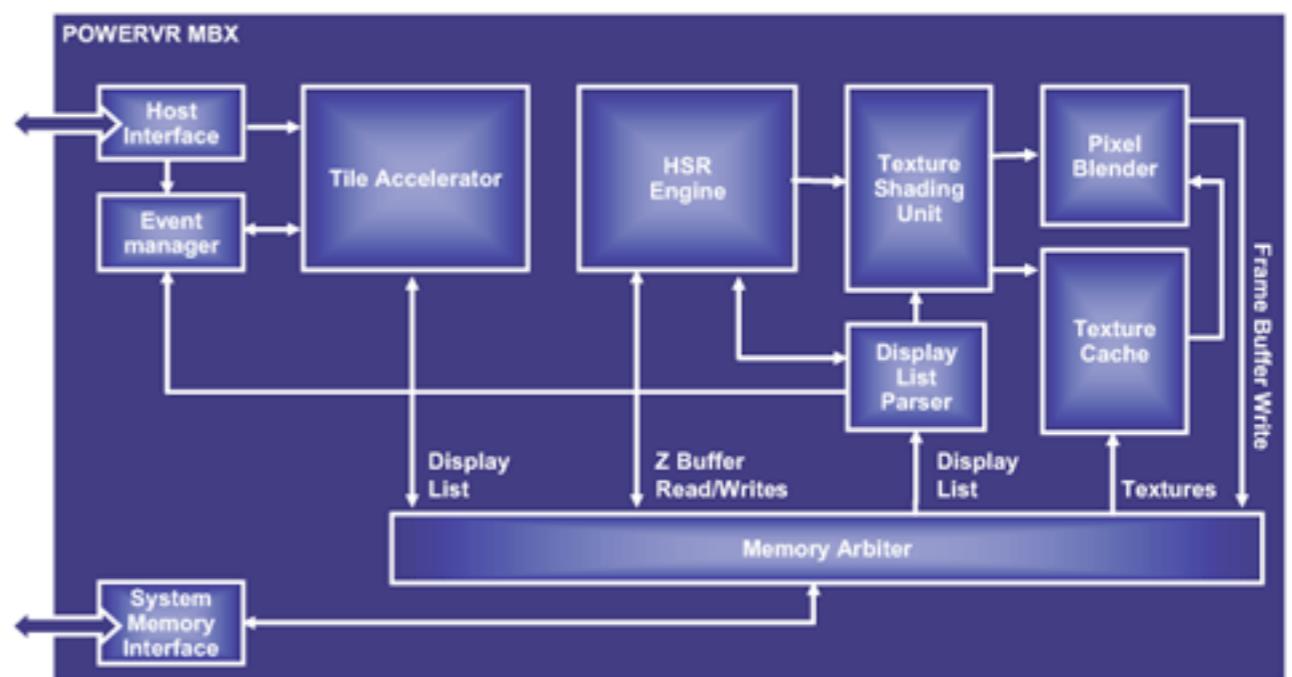
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Graphics Hardware

- Triangles per second:
500K/sec (16K polys per frame at 30fps)



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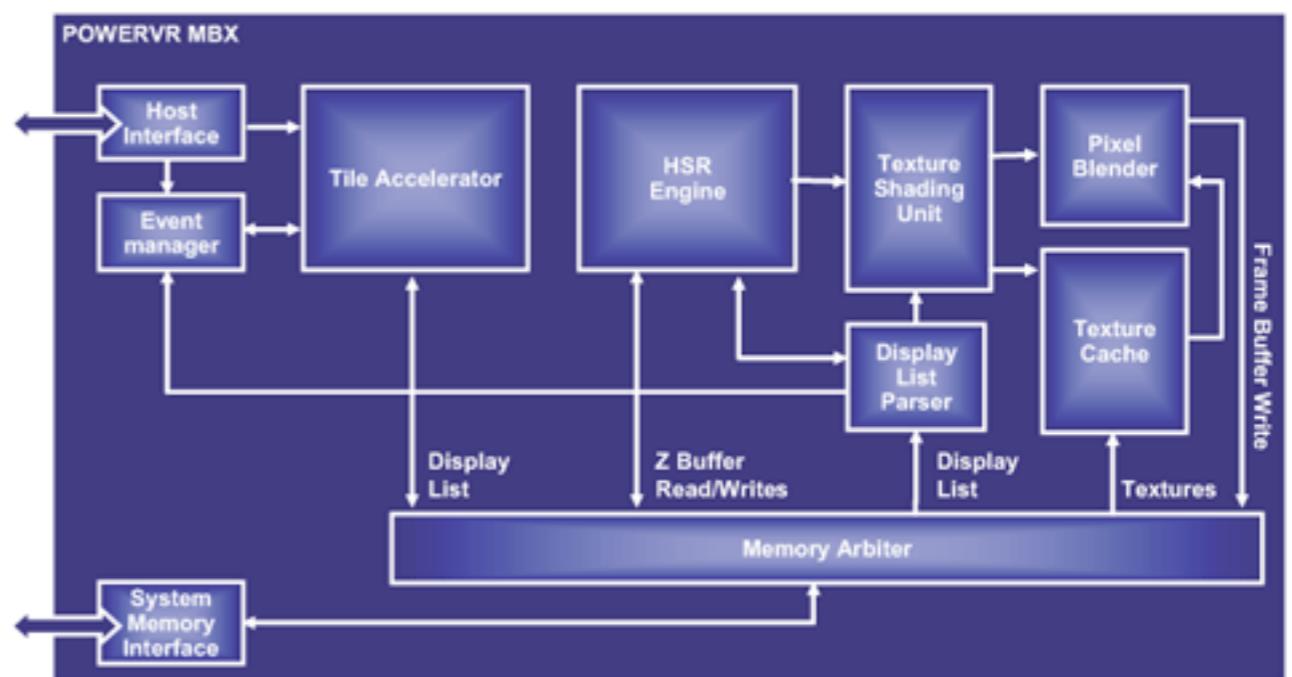
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Graphics Hardware

- Triangles per second:
500K/sec (16K polys per frame at 30fps)
- Fill rate: 25 million pixel per second (5.4 screen redraws per frame at 30fps)



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OpenGL ES Extensions



OpenGL ES Extensions

- Frame buffer objects



OpenGL ES Extensions

- Frame buffer objects
- Memory mapped vertex buffers



OpenGL ES Extensions

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- Point sprites



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- PVRTC texture format



OpenGL ES Extensions

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- Point sprites
- PVRTC texture format

```
#define GL_EXT_texture_filter_anisotropic  
#define GL_EXT_texture_lod_bias  
#define GL_IMG_read_format  
#define GL_IMG_texture_compression_pvrtc  
#define GL_IMG_texture_format_BGRA8888  
#define GL_OES_blend_subtract  
#define GL_OES_depth24  
#define GL_OES_framebuffer_object  
#define GL_OES_mapbuffer  
#define GL_OES_rgb8_rgba8  
#define GL_OES_texture_mirrored_repeat
```



Texture Combiners



Texture Combiners

- Two texture units



Texture Combiners

- Two texture units
- Multi-texturing



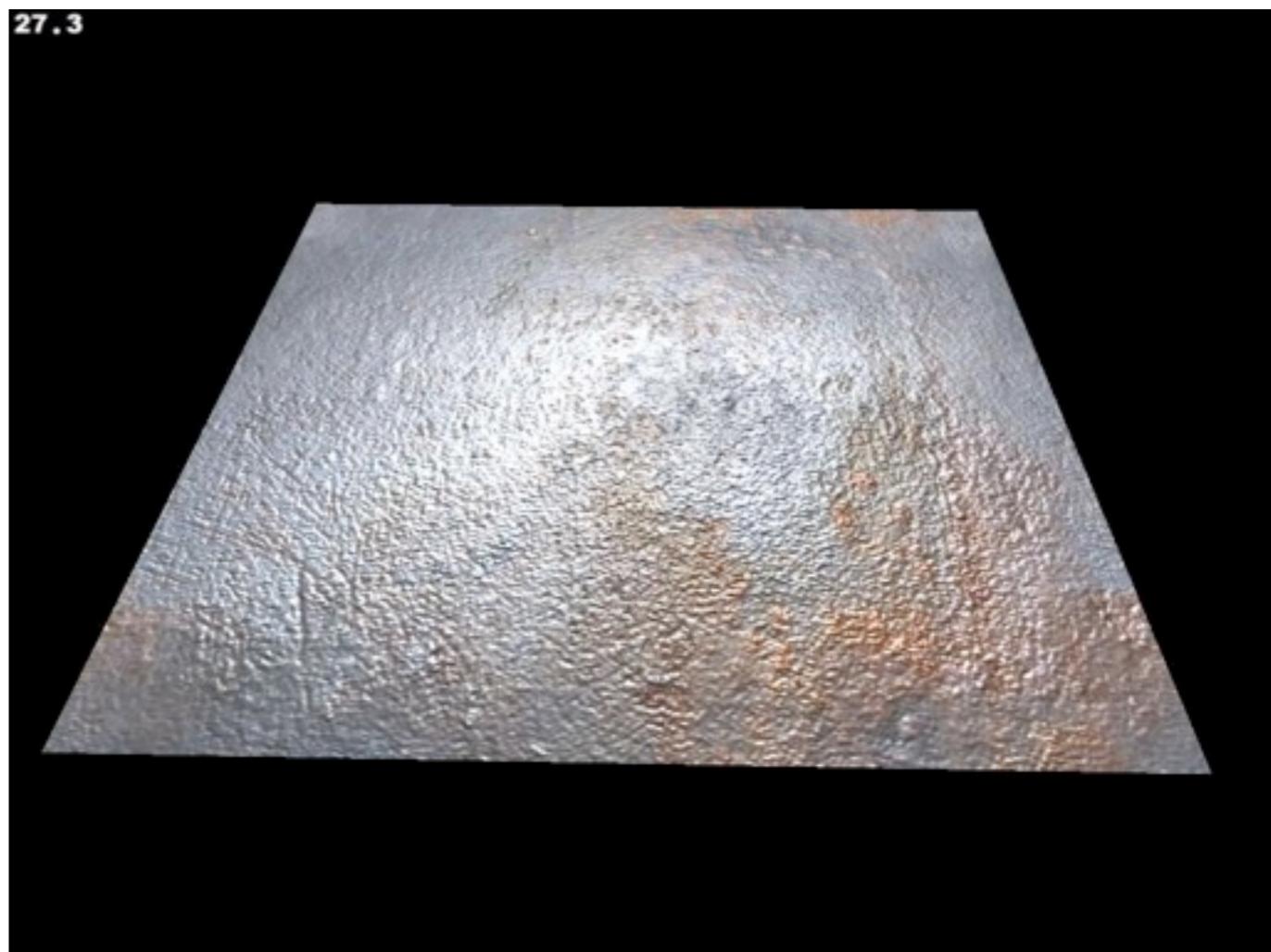
Texture Combiners

- Two texture units
- Multi-texturing
- Per-pixel lighting



Texture Combiners

- Two texture units
- Multi-texturing
- Per-pixel lighting
- Many interesting effects



OpenGL And UIKit



OpenGL And UIKit

- They mix, but not perfectly



OpenGL And UIKit

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- UIKit on top of OpenGL can cause performance issues



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Audio



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Audio

- Several APIs: OpenAL, Audio Sessions, or AVAudioPlayer (2.2 SDK)



Audio

- Several APIs: OpenAL, Audio Sessions, or AVAudioPlayer (2.2 SDK)
- Custom music is huge. Let people play their tunes.



Comparison



Comparison



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Comparison



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Comparison



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Why We ❤ iPhone

	Flash	PC	Consoles	PSN XBLA	Phones	iPhone
Short timeframes	x			?	x	x
Small budgets	x			?	x	x
Unified platform	x		x	x		x
Powerful hardware		?	x	x		x
Great tools	x	x	x	x		x
Large audience	x		x	x	x	x
Easy payments				x	x	x
Direct access to users	x	x				x
Development access	x	x				x





iTunes STORE

Music Genres

Movies

TV Shows

Music Videos

Audiobooks

Podcasts

iTunes Latino

iTunes U

iPod Games

App Store

NEW AND NOTEWORTHY

See All

iSpeak Italian Reference (Reference)

RALPH LAUREN Collection (Lifestyle)

Heavy Mach. Games (Games)

Cleartune - Chromati... Music (Music)

FedEx Mobile for iPhone (Business)

PileUp! Candymania (Games)

Spanish Class 1 - Bu... Education (Education)

House Hunter (Business)

CATEGORIES

Books

Business

Education

Entertainment

Finance

Games

Healthcare & Fitness

Lifestyle

Medical

Music

Navigation

News

Photography

Productivity

Reference

Social Networking

Sports

Travel

Utilities

Weather

WHAT'S HOT

See All

LIGHT BIKE (Games)

ESPN 24/7 CAMERAMAN™ DELUXE (Games)

Tweetie (Social Networking)

TAP FORMS | X (Productivity)

Cover Styler (Entertainment)

FUZE Online Meetings... Made Mobile. (Social Networking)

WHAT'S HOT

See All

Hell's Kitchen™ Games (Games)

Days of Thunder! Games (Games)

Lux DLX Games (Games)

XpenseTracker Finance (Finance)

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QUICK LINKS

Browse

Power Search

Account

Buy iTunes Gifts

Redeem

Support

My Alerts

Complete My Album

TOP PAID APPS

1. iDracula - Undead Awa... Games

2. Pocket God Entertainment

3. ColorSplash Photography

4. Flick Fishing Games

5. SHOOTER - THE OFFI... Games

6. Heavy Mach. Games

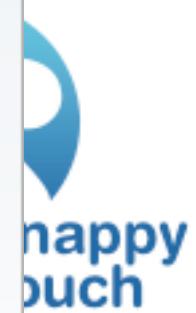
7. Blocked Games

8. Yo Mama Entertainment

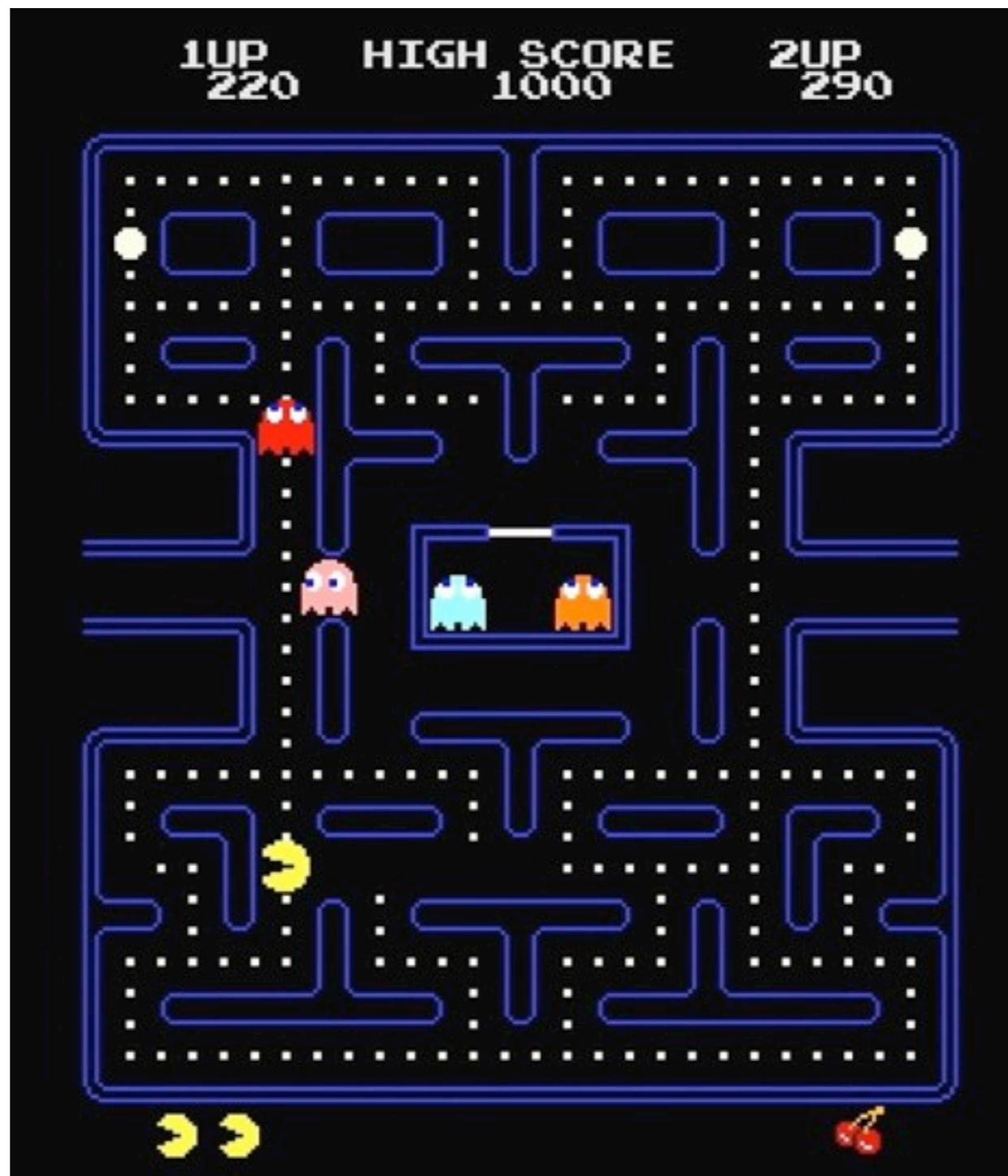
9. Touchgrind Games

10. Infinite SMS: Send/Re... Social Networking

TOP FREE APPS



Part II: Developing Games



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Asset Pipeline



© Rolf Hicker



Asset Pipeline

- Huge deal in large teams



© Rolf Hicker



Asset Pipeline

- Huge deal in large teams
- Not as much of a big deal for a single developer (or small team)



© Rolf Hicker



Asset Pipeline

- Huge deal in large teams
- Not as much of a big deal for a single developer (or small team)
- Put whatever assets in XCode and let it bundle it with the rest of the app.



© Rolf Hicker



Asset Pipeline



Asset Pipeline

- If you have some dedicated artists, or especially contractors, they need to run XCode to see new content.



Asset Pipeline

- If you have some dedicated artists, or especially contractors, they need to run XCode to see new content.
- Set up a small web server locally (simple python script) and have the app try to load from there first.



Baking resources



Baking resources

- You want to bake resources to their final format for fast load times.



Baking resources

- You want to bake resources to their final format for fast load times.
- Textures: texturetool



Baking resources

- You want to bake resources to their final format for fast load times.
- Textures: texturetool
- Sound: afconvert



Baking resources

- You want to bake resources to their final format for fast load times.
- Textures: texturetool
- Sound: afconvert
- 3D models: You're on your own



Assets



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Assets

- iPhone games have much smaller asset sizes than current PC/console games.



Assets

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- Most iPhone games are under 30MB. DVD-based games fill up all 8GB.



Assets

- iPhone games have much smaller asset sizes than current PC/console games.
- Most iPhone games are under 30MB. DVD-based games fill up all 8GB.
- Source assets probably add up to 200-300MB. Makes asset management and version control a lot simpler.



Data-Driven Games



Data-Driven Games

- AAA games with huge teams are almost fully data driven.



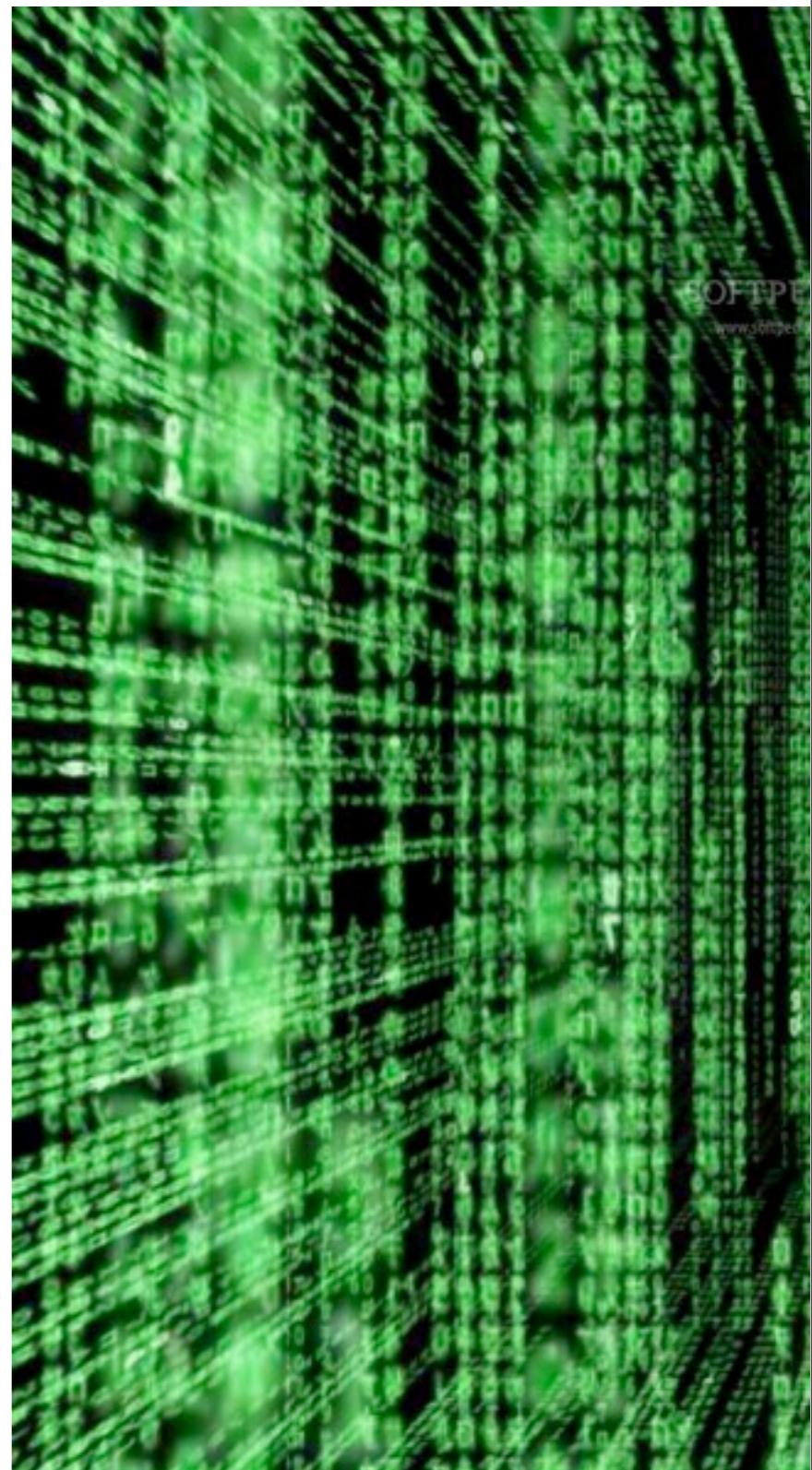
Data-Driven Games

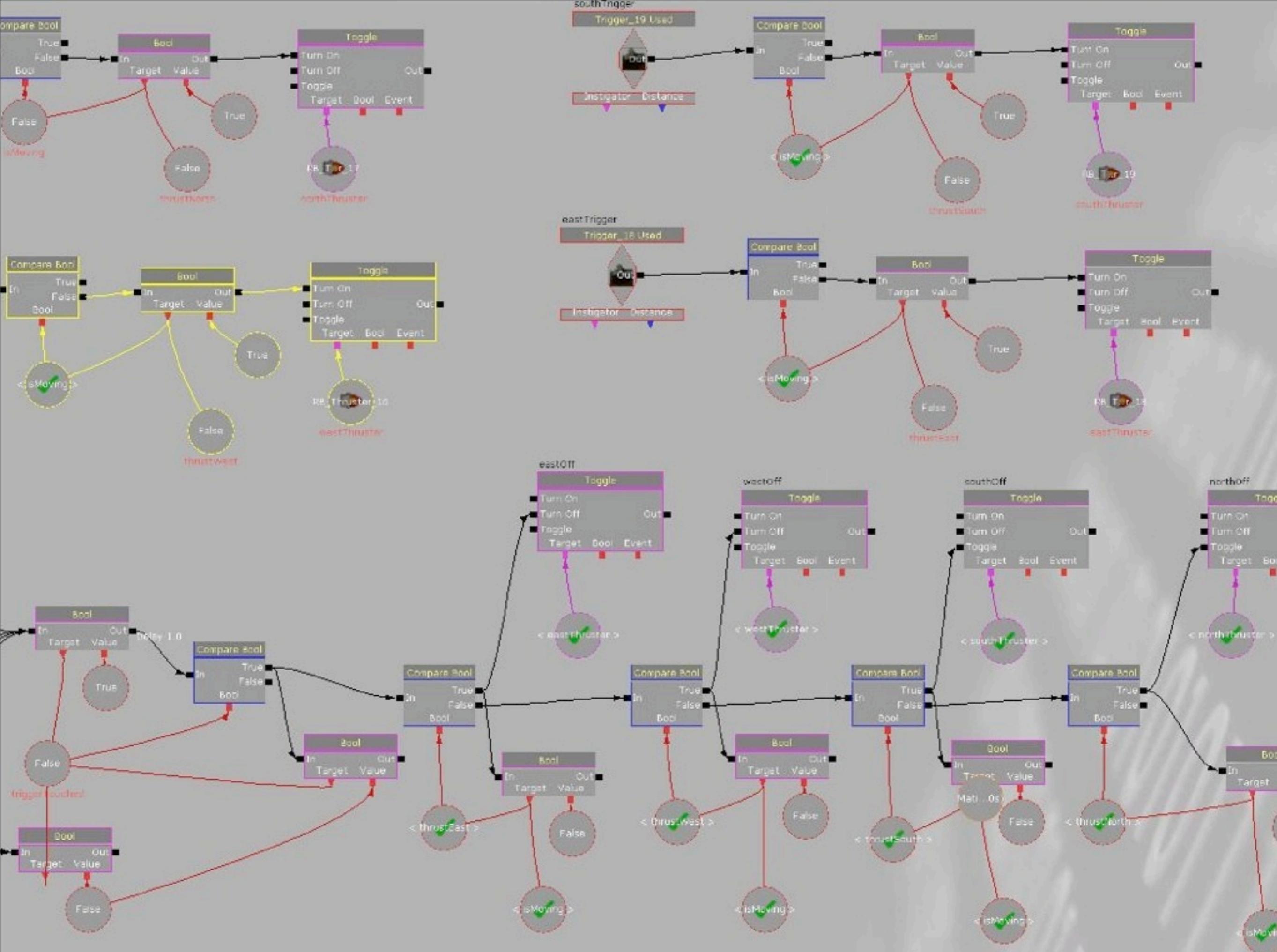
- AAA games with huge teams are almost fully data driven.
- **HUGE** amount of overhead in terms of performance, work, and complexity!



Data-Driven Games

- AAA games with huge teams are almost fully data driven.
- HUGE amount of overhead in terms of performance, work, and complexity!
- Makes sense with 30 programmers and 150 content creators.





Data-Driven Games



Data-Driven Games

- With small iPhone games, not so much.



Data-Driven Games

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- Fast build times, so changing data is easy.



Data-Driven Games

- With small iPhone games, not so much.
- Fast build times, so changing data is easy.
- Expose assets, simple variables, level layout.



More Than Programming



More Than Programming

- Programming is only part of it. You wear many hats!



More Than Programming

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- Designer, of course but also...



More Than Programming

- Programming is only part of it. You wear many hats!
- Designer, of course but also...
- Public relations, producer, testing coordinator, contractor manager, content creator, web developer, video editor, etc, etc.



Content Creation



Content Creation

- Most projects need multiple people for content creation: UI elements, textures, models, animations, audio.



Content Creation

- Most projects need multiple people for content creation: UI elements, textures, models, animations, audio.
- Contracting works well for some of the content.





Integrated SCM & Project Management

Login | Preferences

Home

Trac

Genshi

Babel

Bitten

Posterity

WII

Timelin

Roadmap

Builds Status

[Browse Source](#)

[View Tickets](#)

Ava

{1} All Active Tickets (913 matches)

Results (1 - 100 of 913)

1 2 3 4 5 6 7 8 9 10 →

Ticket	Summary	Component	Version	Milestone	Type	Severity	Owner
#6387	docs about translation	i18n	0.12dev	0.12	task	normal	cboos
#5382	base64 encoding/decoding breaks compatibility with python2.3	plugin/spamfilter	devel	not applicable	enhancement	normal	cboos
#4431	wiki_to_wikidom	wiki system	0.10.3	0.13	enhancement	major	cboos
#886	Add support for Master tickets	ticket system	devel	0.13	enhancement	major	nkantrowitz
#791	login/logout, authentication, and authorization	general	devel	0.13	enhancement	major	cboos
#8088	Allow a WikiFormatted Custom Ticket Field Parse Through the Wiki Engine in Reports, without Using 'Magic' Column Name	report system	0.11.3		enhancement	normal	
#8067	Stopped sync in 0.11.2.1	version control	0.11-stable	0.11.4	defect	major	cboos
#8032	IPBlacklistFilterStrategy defaults require update	plugin/spamfilter	none		task	major	
#8006	Non-Writable Python Egg Cache Directory causes mod_fastcgi to send an error 500 with Apache 2	general	0.11.2.1	0.11.4	defect	major	
#7860	deleted account can still be seen in "assign to" list	admin/console	0.11.1	0.11-retriage	defect	critical	cboos
#7815	server/trac/project/login page redirects to localhost/trac/project	general	0.11.2		enhancement	normal	
#7800	Sorting by age broken in browser view	version control/browser	0.11-stable	0.11.4	defect	normal	rblank

PR



PR

- Creating a great app is half the battle.



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- Extremely time consuming and hard to do effectively.
- Build grass-roots support. Add viral components to your app.



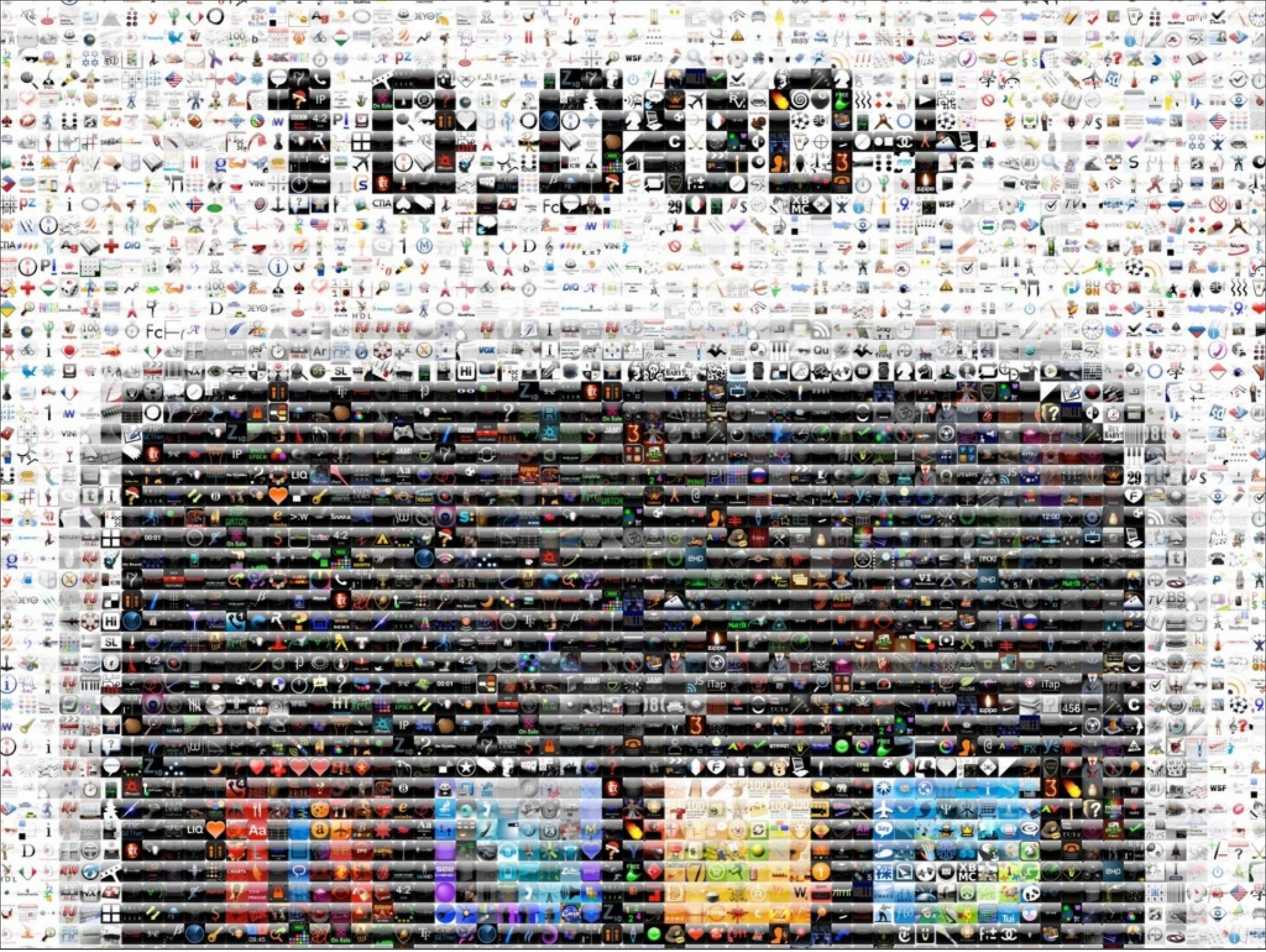
PR

- Creating a great app is half the battle.
- PR is the other half.
- Extremely time consuming and hard to do effectively.
- Build grass-roots support. Add viral components to your app.
- Good reason to use a publisher.



Part III: The Future







San Jose, CA

360|iDev slide to rock

March 2-4, 2009



STAGE 1 L'OI

CHALLENGE ME!!

SOPHITIA

ASTAROTH

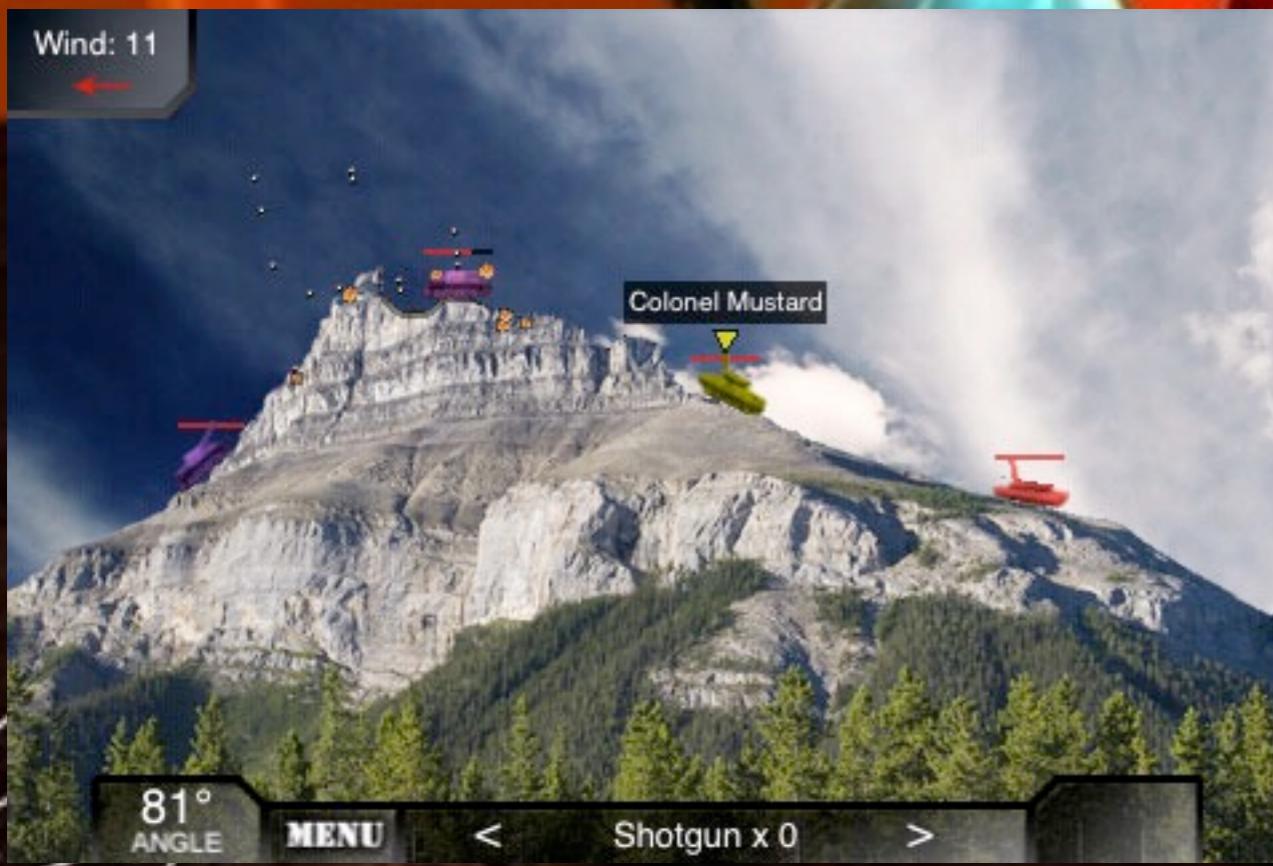


STAGE 1 L'OI

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- The big guys are coming to play.



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March 2-4, 2009



- The big guys are coming to play.
- They'll be able to throw many more resources and make a difference.



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- Rumours of a premium App Store area.



- Rumours of a premium App Store area.
- Big companies + big games
= Bigger price tags



- Rumours of a premium App Store area.
- Big companies + big games
= Bigger price tags
- What will it mean for us indies?





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15+ million iPhones and growing

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Thank you!



Questions?

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Questions?

Slides will be available from my blog Games from Within (<http://gamesfromwithin.com>)

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