



Tion Thomas EA Graphics Lunch Presentation

Software Engineering Intern
Central Technology Group – Apt
Purdue University – MS '09
Mentor: Anand Kelkar
Manager: Fazeel Gareeboo



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EA Company Overview

- ▣ Founded in 1982
- ▣ Largest 3rd party game publisher in the world
- ▣ Net revenue of \$3.67 billion in FY 2008
- ▣ #1 mobile game publisher (acquired JAMDAT)
- ▣ Multi-Platform philosophy
- ▣ Has/owns development studios all over the globe:
 - Bioware/Pandemic (Bioshock, Mercenaries)
 - Criterion (Burnout, Black)
 - Digital Illusions (Battlefield series)
 - Tiburon (Madden)
 - Valve (Half-Life)
 - Crytek (Crysis)

EA Company Overview cont...

- ▣ 4 Major Brands/Divisions:
 - EA Sports (FIFA, Madden, NBA, NFL, Tiger Woods, NASCAR)
 - EA Sports Freestyle (NBA Street, NFL Street, FIFA Street, SSX)
 - EA (Medal of Honor, C&C, Need For Speed, SIMS, Spore, Dead Space)
 - POGO (Casual web based games)
- ▣ Currently has 4 entries on the top selling franchises of all time list:
 - #3 - Sims (100 million)
 - #5 - Need For Speed (80 million)
 - #7 - Madden (70 million)
 - #9 - FIFA (65 million)

EA Is Unique

- ▣ Sheer size breaks the traditional game developer paradigm
- ▣ Bound by multi-platform technology
- ▣ Long history with titles on almost every console that ever existed
- ▣ Most studios have annual cycles that cannot be broken
- ▣ Both developer and publisher with ownership in many huge studios

Origin Of Tiburon

- ❑ Founded by 3 programmers in Longwood, FL
- ❑ First title was MechWarrior for SNES
- ❑ First Madden title was Madden 96 for Genesis, SNES
- ❑ Acquired by EA in 1998





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How Tiburon Got Madden

- ❑ Originally, EA contracted Visual Concepts to develop first Madden title for Playstation in 1995
- ❑ Game quality was horrible and Madden 96 was never released on Playstation
- ❑ Secretly, Tiburon was working on their own version of PS Madden
- ❑ Demoed it to EA and it was released in 1996 as Madden 97
- ❑ Ironically, Visual Concepts is still EA's biggest rival in sports games (2K sports)

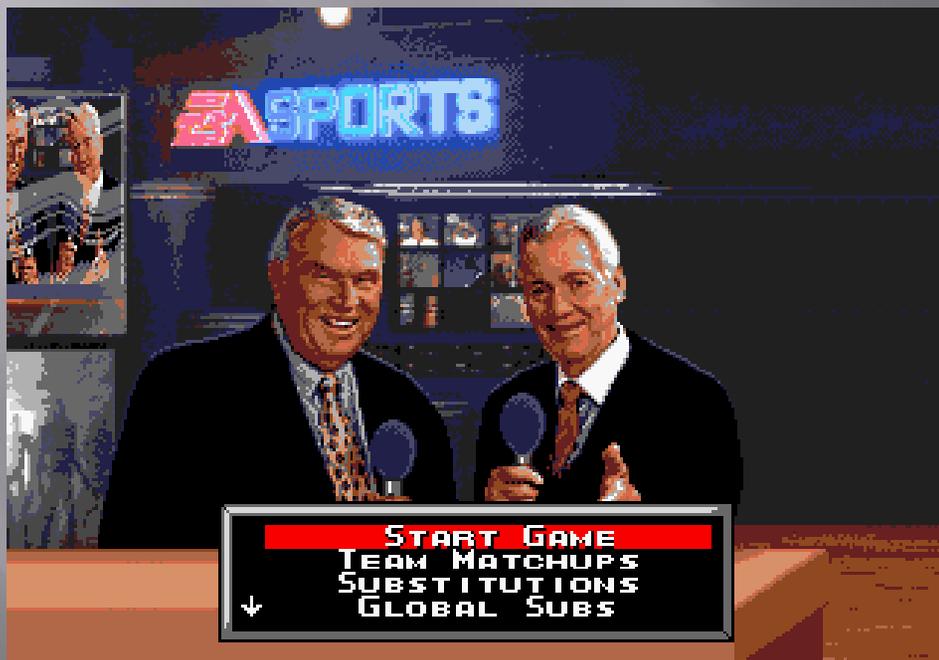
Evolution Of Madden Graphics

Madden 93 (Genesis, SNES)



Evolution Of Madden Graphics

Madden 98 (PSone, Saturn)



Evolution Of Madden Graphics

Madden 2003 (PS2, Xbox, GC)



Evolution Of Madden Graphics



UI Philosophy At EA

- ▣ Remove the programmer from the artist pipeline
- ▣ Enable artists to use tools that are familiar to them (i.e FLASH)
- ▣ Develop core technology that can be used across multiple studios
- ▣ Spreadsheet like interface acceptable because “the consumer hasn’t complained”
- ▣ “If it ain’t broke, don’t fix it”
- ▣ UI limited to 2D graphics

Consistency Across Titles

Madden 07



Madden 09



NHL 09

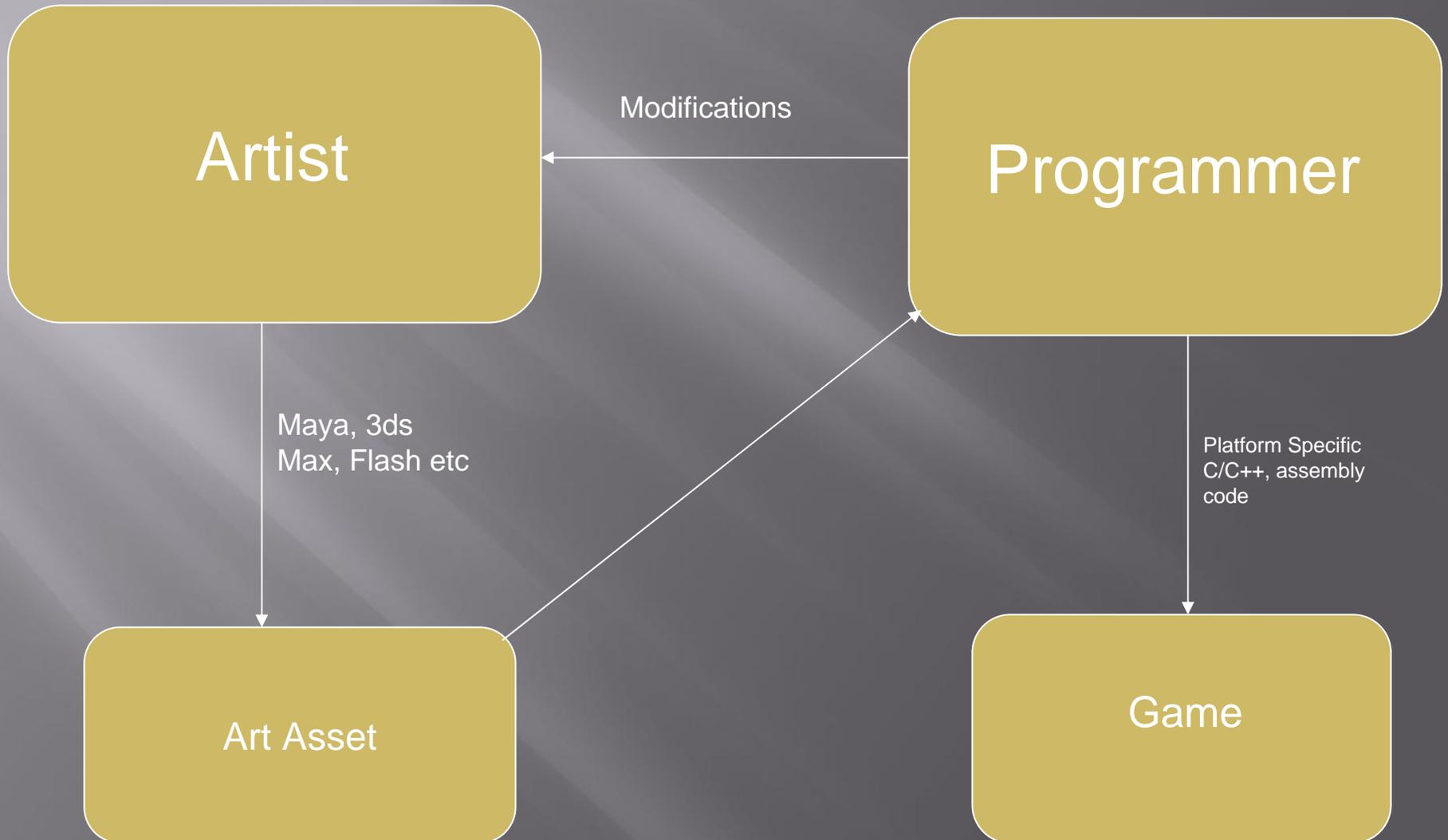


Tiger 09



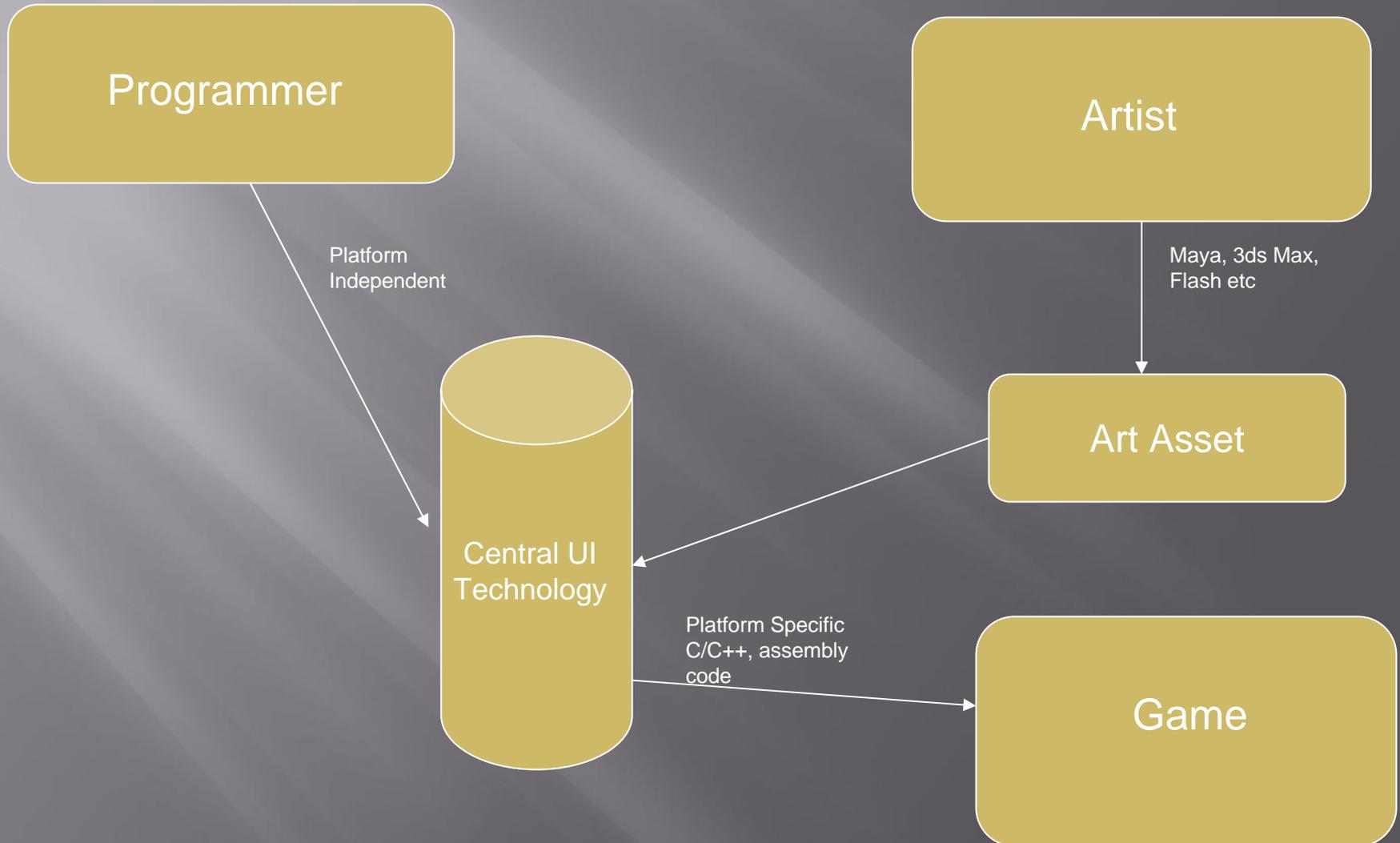
Legacy UI Pipeline

Artist Constrained By Programmer



Current UI Pipeline

Artist Constrained By Programmer



UI Use In EA Games

- Most EA games are heavy on UI
- Madden 's # of menus are above 500
- Performance is more important than design
- UI budget is limited
- UI overhead one of the main reason PS3 Madden 08 could not hit 60fps



Apt UI Technology

- ▣ Apt is a general-purpose Action Script Interpreter/Flash Player originally developed by EAC FIFA team
- ▣ Mature technology that has been around for about 5 years
- ▣ Shipped in over 100 titles and currently in ~40
- ▣ Contains only a subset of the total Flash feature set focusing on those necessary to create a complete user interface for EA games
- ▣ Main benefit is that it uses Flash files as input allowing artists to work with tools they are familiar with while remaining independent of the programmers
- ▣ A faster Action Script interpreter than the Flash interpreter



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Summer Project Overview

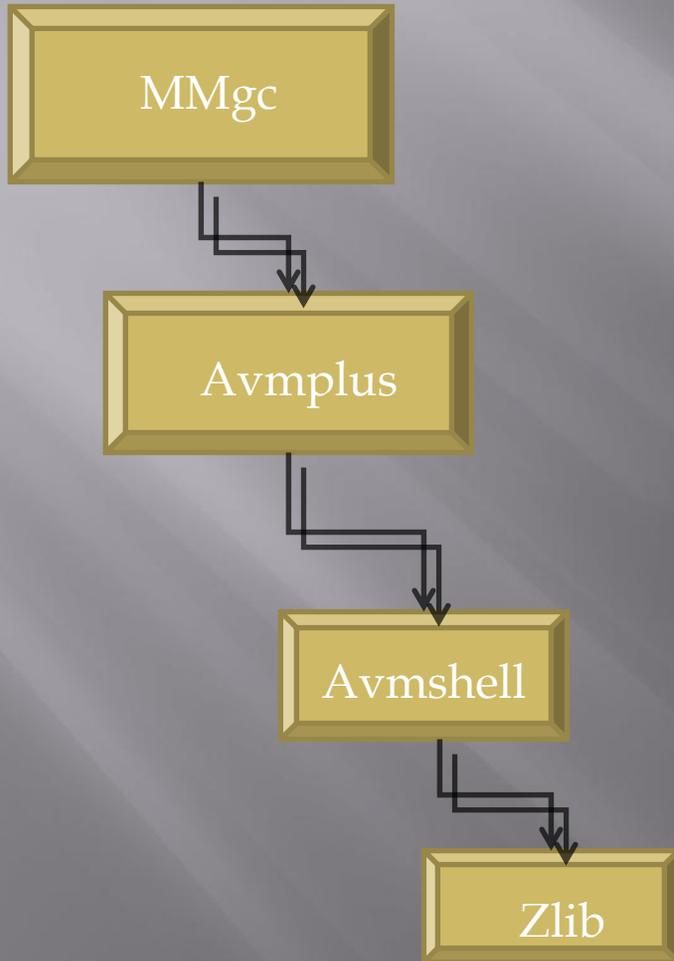
- ▣ Project Description: Port Tamarin (Action Script 3 Virtual machine) to Xbox360 or PS3
- ▣ Action Script 3 (AS3) is new scripting language introduced by Adobe in Flash 9
- ▣ 10x faster than ActionScript2 (AS2)
- ▣ Will facilitate the process of upgrading Apt to be AS3 capable

Tamarin Overview

- ▣ Tamarin is a JavaScript engine written in C++.
- ▣ It currently implements Adobe Action Script 3 (a superset of ECMAScript Edition 3) and is embedded within the Adobe Flash Player 9
- ▣ Open source project
- ▣ Does not have any code specific to Flash and does not know what context it is running in (Flash Player, Mozilla Browser, etc)

Tamarin Overview Cont...

4 Modules (Ordered by relative significance):



- ❑ MMgc – memory management and garbage collection module. All other modules use objects created here. Built as a library
- ❑ Avmplus – core action script interpreter. Platform independent. Built as a library
- ❑ Avmshell – “wrapper” module to instantiate and initialize MMgc and Avmplus modules. Built as .exe program that uses tamarin library files. Apt will effectively replace this module
- ❑ Zlib – module to handle buffer compression. No changes needed for console porting



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Why Is This Project Important to EA?

- Apt currently implements the action script interpreter and Flash Player for AS2
- AS3 has some significant differences from AS2 (new tags, modified byte code, SWF format changes)
- Upgrade will require a significant investment
- Tamarin already interprets the AS3 byte code, Apt will not need significant changes to support Flash 9
- Will potentially reduce the sim side CPU budget for UI by a significant amount, and allow us to use FLEX generated code on the consoles (FLEX generates Action Script 3 code)
- Project is an investigation of best upgrade path to Flash 9. Any evaluation of performance and system integrity with tamarin integration into Apt requires that tamarin be functional on the consoles
- 10x increase in performance with AS3 vs AS2 may be significantly less on consoles due to no Just-In-Time (JIT) Compilation capability

Major Issues

- Tamarin is an open source project!
 - Code is a constantly moving target
 - Several parts of the code are unfinished and/or untested
 - Virtually no design or implementation documentation (tamarin-dev mailing list primary support)
- Tamarin was developed to support numerous platforms resulting in scattered and convoluted code
 - hundreds of `#ifdef` statements, often nested
- Platform specific assembly code embedded throughout the system
 - Windows lead platform: i86 -> PPC – Xenon PPC
 - GCC vs Xenon in-line assembler syntax
 - PS3 Cell conversion will require unique changes

Multi-Platform Development

- ▣ Core philosophy of EA
- ▣ Currently supports mobile, DS, PSP, PS2, Xbox, PS3, Xbox360, Wii, PC
- ▣ Focus is on state-of-the-art game consoles
- ▣ Tends to use 1st “next gen” system as lead development platform
- ▣ Outsources “last gen” titles often including Wii

Multi-Platform Development: Deeper Look

- ▣ Xbox360
 - First “next gen” system released
 - Windows like OS
 - Familiar development environment (MSVS)
 - CPU
 - ▣ 3 symmetrical PowerPC based cores @ 3.2Ghz each
 - ▣ 2 Hardware threads/core (6 total)
 - GPU
 - ▣ ATI x1900 based @ 500Mhz
 - ▣ 48 unified shaders
 - ▣ 10MB eDRAM on daughter die
 - Memory
 - ▣ 512MB unified GDDR3 @ 700Mhz

Multi-Platform Development: Deeper Look

- ▣ PS3
 - Late and not very portable with Xbox360 architecture
 - Custom OS and development environment
 - CPU (Cell processor)
 - 1 PowerPC based PPU and 7 SPEs @ 3.2Ghz each
 - 2 Hardware threads/PPU and 1 each SPE (9 total)
 - 218 GFLOPS
 - GPU
 - Nvidia 7800 based @ 550Mhz
 - 24 pixel shaders / 8 vertex shaders
 - Connected to Cell via huge 35Gb/s bus
 - Memory
 - Main: 256MB XDR @ 3.2 Ghz
 - Graphics: 256MB GDDR3 VRAM @ 700Mhz
- ▣ Wii
 - Slightly more efficient GameCube tech

Why Is Multi-Platform Development So Difficult?

- ▣ PS3 and Xbox360
 - Symmetrical vs Asymmetrical Cores
 - Unified vs discrete memory
 - Unified vs discrete shader pipeline
 - Familiar vs non-familiar development environment
- ▣ Wii
 - Usually requires complete separate development team
- ▣ LIMITED RESOURCES !!

Head-To-Head (Before)

Fight Night Round 3

Madden 07

Xbox360



PS3



Head-To-Head (Now)

Madden 09

Xbox360



PS3



What Have I Learned?

- ▣ Game Development is hard!
 - Technically, consoles have very hard constraints regarding memory and processing time budgets
 - Multi-platform development is non-trivial in this generation
 - EA sports development is further complicated by the yearly cycles to which they must adhere
 - Legal and business issues affect game development tremendously
- ▣ Tamarin Project
 - Gained understanding of the role of UI in game development
 - Increased understanding and knowledge of writing platform independent code
 - Increased debugging skills
 - Gained understanding of PPC architecture
 - Gained experience with the target manager and PRODG debugger for the PS3
 - Increased knowledge about Flash and Action Script
 - Learned what it is like to be a part of an active open source development community

IT WAS A GREAT SUMMER AT TIBURON!!

