

Course Introduction

Syllabus
Class Web-site
Class Description

PC Hardware

Outline

- <https://canvas.saddleback.edu>
- Canvas Modules
 - Top Down Due Every Monday
- Syllabus
- Three Tricks for Doing Well in Class
- Overview of Class
- Week 2 Assignments Expo/Project

Class Web-site - Public

- Canvas Integration
<https://cim.saddleback.edu/cimp3>
- Always check class detail dates "on schedule"
 - Notice elect P/NP & drop W date (vary a lot)
 - drop w/out W set by state (always about 2 weeks)
- Office Hours Schedule On-line
- Wednesday 11 AM Webcasts
- Short-cut links
 - <https://cim.saddleback.edu/cimp3>
 - <https://cim.saddleback.edu/canvas>
<https://canvas.saddleback.edu>

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Canvas Modules (Click Home)

- Everything is Due Monday, Expires Wednesday
 - Class usually ends on Wednesday
- Course Navigation Complete Canvas Module Top Down
 - Videos or Webcasts to Watch
 - Usually Discussion post
 - Usually Quiz or Test to Complete
 - On some internal links depending on browser
Right^click open in new tab
- Strategy Game Sequence
 - Can Complete this before Due Date

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Complete Each Module Top Down

22FA_CIMP3_19890 > Modules

2022 Fall SC

Home

- Announcements
- Discussions
- Grades
- Quizzes
- People
- Syllabus CIMP3
- Webcasts Wednesday 11 AM
- Projects
- Syllabus
- Chat
- Student Connect
- Online Library Resources

Due Monday 08/29 Expires Wednesday 08/31 Read Me First Complete All Items

- Watch an Orientation/Intro to Projects Webcasts Viewed
- Complete these 5 steps (Right-Click Open Link in New Tab) View
- Questionnaire Step 3 (Password is Student Number/StudentID)
- Post your two favorite games, platform, and your specific age or if you want your age range and also Reply to another students post Aug 29 | 10 pts | Contribute
- View Syllabus View
- View Schedule
- Consider Applications Developer Cert/Degree (Not Math Programming Oriented)
- Quiz 0 Intro/Orientation 10/10 Aug 29 | 10 pts | Submit

Due Tuesday 09/06 Game Expo/Conference Convention & Previous Project Post Read Me 2nd Complete All Items

1st Module Read Me First

View Course Stream
View Course Calendar
View Course Notifications

To Do

- Post your two favorite games, platform, and your specific age or if you want your age range and also Reply to another students post INTRODUCTION TO VIDEO GAME DESIGN-19890 10 points | Aug 29 at 11:59pm
- Quiz 0 Intro/Orientation 10/10 INTRODUCTION TO VIDEO GAME DESIGN-19890 10 points | Aug 29 at 11:59pm
- Expo Conference Analysis INTRODUCTION TO VIDEO GAME DESIGN-19890 10 points | Sep 6 at 11:59pm
- Not Ready for Fall/22 Discuss and Rank Previous Top Project Presentations INTRODUCTION TO VIDEO GAME

Complete Each Module Top Down

22FA_CIMP3_19890 > Modules

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Due Tuesday 09/06 Game Expo/Conference Convention & Previous Project Post Read Me 2nd Complete All Items

1st Module Read Me First

Items Checked off when completed - Work Top Down

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- Expo Conference Analysis INTRODUCTION TO VIDEO GAME DESIGN-19890 10 points | Sep 6 at 11:59pm
- Not Ready for Fall/22 Discuss and Rank Previous Top Project Presentations INTRODUCTION TO VIDEO GAME

Complete Each Module Top Down

22FA_CIMP3_19890 > Modules

2022 Fall '20

Home

Announcements

Discussions

Grades

Webcasts
Wednesday 11 AM

Projects

Syllabus

Chat

Student Connect

Online Library Resources

Due Monday 08/29 Expires Wednesday 08/31 Read Me First Complete All Items

- Watch an Orientation/Intro to Projects Webcasts
- Complete these 5 st...
- Questionnaire Step 3 (Pass)
- Post your two favorite games, platform, and your specific age or if you want your age range and also Reply to another students post
- View Syllabus
- View Schedule
- Consider Applications Developer Cert/Degree (Not Math Programming Oriented)
- Quiz 0 Intro/Orientation 10/10

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To Do

- Post your two favorite games, platform, and your specific age or if you want your age range and also Reply to another students post
- Quiz 0 Intro/Orientation 10/10
- Expo Conference Analysis
- Not Ready for Fall/22 Discuss and Rank Previous Top Project Presentations

Syllabus

- Numerous Online Tests/Quizzes – 35%
 - Repeat Quizzes – Learning Quizzes
 - Take Online Tests only Once
 - Take Quizzes/Tests Right After Covering Class Material
- Project – 45%
 - You will have to Present your Project
 - Make sure you have a Microphone
 - Blue Snowball is recommended.
- Assignments 20%
 - Critical thought discussion board post
- How to Do Well?
 - First Not Skip a Discussion board 20%

Second: Quizzes/Tests Secrets of Successful Students

- Watch Listen and Read Webcasts
- Google It is dangerous 1 of 6
see Strategy discussion board
- Print Viewgraphs, Take Notes
- Review Notes
- Quizzes/Tests Warnings
 - Cover a lot, have Tricky Questions,
 - Decent amount of questions above basic remembering
 - Not an Easy 90%

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Forewarning

- PC/HW & Game Development covers a lot of material, not all Trivia
- Other Three Quizzes: The History of Video Games, Strategy Games, & Game Genres Watch Videos

Project	Quizzes	Discussion	
45%	35%	20%	100%
96%*.45	+ 75%*.35	+100%*.20 =	90%
95%*.45	+ 70%*.35	+ 95%*.20 =	87%
85%*.45	+ 70%*.35	+ 90%*.20 =	81%
80%*.45	+ 60%*.35	+ 90%*.20 =	75%

- Project 45% Grade (if you skip project elect Pass/NP)

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Easy A if You Play Your Cards Right

- Third Trick Pick a Project You Want to Do
 - Those who are Good are surpassed
 - By Those who work hard
 - Those who work hard are surpassed
 - By Those who love what they are doing
- Easy to do Well on Project, if You Pick something you want to do

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Summary Quiz

- Class Grade Consists of ____ Items
 - These Items are:

 - (T/F) We have On-line Videos?
-
- Go to Canvas Work Through 1st Module

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Game Class Descriptions

- Game Design
 - High Level Discussion on Designing Games
- Introduction to Video Games – Overview
- Game Programming
 - Lots of Toolkits Available for Writing Toy Games
- Game Development
 - 1 Year of C++/C# Programming

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This Class

- Bridges The Gap
 - College Learn Computers/HW/SW etc.
 - For Fun Talk About Games, Strategies, etc.
 - Correlate Basic Intermediate Discussion on Computers/HW/SW Perspective to Video Games
 - Evolution Parallel One Another (First Few Lectures)
 - Design Macro View of Tools, Technologies, & Successful Games
- Entertainment Technology Evolving College Discipline
 - UCI has Computer Video Game Design Major
- What do we Cover? Class Schedule
- Good 1st Class on Entertainment Technology
- General Computer Knowledge (CIM1)
- So You Want to Write Computer Game Programs

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Game Programming

- Class Project Using Language of Choice
 - <https://www.thefreecountry.com/sourcecode/games.shtml>
 - May want a easy to use library
 - More experience consider actual Game Engine
- Programming Languages Used for Games
 - Cimw 160 JavaScript, Cimp 220 Android
 - Cimp 8a Python, Cimp7a/cimp7b Java
- Consider Applications Developer Cert/Degree

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Game Development

- Game Development
 - CS Department C++ "C#" Sequence
 - Pursue a BS Degree
 - Concentration Physics, Graphics, AI, etc.
- West Coast – several strong programs
 - USC, UCLA, UCI, Fullerton (Private Schools quick to at on degree)
- Alternate Path
 - Graphics Artists, Audio Specialists, or Story Teller
 - Become Game Designer After Years in Industry

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Reader Quiz

- What Does This Class Cover?
- What Do You Need Prior Taking Game Development Course?
- Writing Computer Games is Fun & Easy?

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Remaining Orientation

- Review Canvas
- Week 2 Assignments
 - Discuss Expo Assignment
 - Project Ranking
- Go Over Projects Titles

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PC Hardware

Microprocessor Evolution
Solving CPU Wait State Problem
Typical PC HW
PC Gaming System
GPU Revolution
VoIP

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Last Decade of 20th Century 90s

- Era of Technological Breakthrough
 - Internet → World Wide Web Overnight
 - Human Genome Sequence
 - High Speed Home Computer → Game Industry
- Went From Conception → Product 6 Months
- Wait a Year or Two (closer to three now)
Get Twice as Much for Half Price
- Laid Foundations for 21st Century

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Twice as Much for 1/2 Price

House 3000 Sq. Ft		Pentium Extreme CPU
\$1,000,000	Cost	\$1000
\$300,000	1 Yr.	\$300
\$100,000	2 Yr.	\$100
550sq ft Camper Desert \$200,000		GeForce 6800 AGP 256MB \$200 – Yr. Ago 128MB
2000 sq. feet Beach Front	2 Yr.	GeForce 12000 PCI 512MB

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21st Century

Twice as Much in One Year – Not Anymore

Chip	Year	Cost
Ryzen 7 3700x – Zen2	2019/Q3	\$329
	2020/Q3	\$279
	2021/Q3	\$289
Ryzen 7 5800x – Zen4	2021/Q3	\$399
21st QUALCOMM Snapdragon 820	Q4/14	
Snapdragon 835 10nm	Q2/17	40% Faster
Snapdragon 855 7nm		45%
Snapdragon 888	Q1/21	
Snapdragon 895	Q4/21	20%

What was The Technological Break thru of the 20th Century?
We were getting wait a year get twice as much for 1/2 price

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Microprocessor

The Technological Breakthrough of 20th Century

CPU Evolution

- Mainframe – CPU Entire Room
- Mini – CPU was on a Board
- Microprocessor – CPU single Chip
 - Eventually used Everywhere
 - Routers, Cell Phones, PC, Cars, etc.
- Recurring CPU Theme: Smaller, Faster & Less Expensive (Lower Power Requirements) (Cray 1 end 70s 5 tons – iPad II)
- What About 1st & 2nd Ten Years of 21st Century

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First 20 Years of 21st Century

- CPU Theme Continues
 - Faster, Smaller & Less Expensive “Less Power”
 - CPU in PC Only to Era of Intelligent Devices
 - Cell Phones, iPod, Blackberry, PC is Becoming Obsolete
- 20th Century CPU One Chip
- 21st Century Entire System on a Chip (SOC)
- Initially Smartphone Multiprocessor 2010
Wearables 2015 –watches/glasses
- 21st Century Breakthrough will be?

– Hint – think of Theme & microprocessor
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21st Century

- Microprocessor → Nanotechnology
- Micro 10^{-6} → Nano 10^{-9}

- Note Chip Fab is Not Breaking new Barriers
- Not, NSF did Estimate 2015 Nanotechnology \$1T Industry
- Silicon or use is becoming the major barrier

- Precursors:
 - Credit Card chips - small cryptography CPU - image is interface
 - Micro media Paper
 - Nanotechnology in Clothing Waterproof
 - Intelligent Nanodevices Decades Away

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Processor Quiz

- What was the Key Breakthrough of 20th Century?

- What Will it Likely be in the 21st Century?

- PC are Being Replaced with _____ .

- Could PC be obsolete in 20years?

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Introduction to Microprocessor

Definitions

- Semiconductor
 - Exhibits Properties of Both Insulator & Conductor
- Insulator
 - Resists Current (Rubber Sheave)
- Conductor
 - Transport Current (Copper Wire)
- Current: Flow of Electronics

Silicon is an Ideal Semiconductor
Silicon Valley

Chip Fabrication Process

- Silicon Wafer (Semiconductor) 6-18"
 - 12" (200mm) Standard Size 2001-Present Day (18" 450mm maybe)
- Insulator Oxide The Top
 - Silicon Dioxide (Glass – Insulator)
- Etch a Pattern (Mask)
 - Cut away according to a Mask Pattern
 - Expose Glass to UV (cuts away part of the layer) Etching Pattern
- Conductor
 - inject (shoot ions) or implant a conductive material
- Polysilicon is a conductor (Grown no implanted)
- <https://www.intel.com/content/www/us/en/history/museum-making-silicon.html>

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Multiple Dies (Chips) on Wafer

- Some are tested Yield how many work
 - If parts of Chip Fail
 - Lower Clock Rate or They Disable (Cache, FPU)
 - Athlon → Sempron; Pentium → Celeron
- As You Perfect the Process Yield Increases
- Remove (die or chip)
 - Insert into a ceramic covering
 - DIP (Dual in Line Packaging)
- Where is Most Fabrication Done?

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Chip Companies

- Fabrication – Taiwanese Based, Why?
 - TSM (Taiwan Semiconductor)
 - UMC (United Micro Electronics) - Stumbling
 - CHRT (Charter Semiconductor)
- Design in the US Fabricated Taiwan (china, Singapore)
 - CPU: IBM, Intel (Has a lot of US Fabs), AMD
 - GPU: NVidia
 - Communication: Broadcom, Qualcomm, Motorola, Samsung
Fabless AMD, Nvidia, Broadcom, QUALCOMM (Skyworks exception)
 - Sound: Creative

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Microprocessor Quiz

- What is a Semiconductors?
- Intelligent Devices are Always getting _____, _____ and less _____.
- Where are Semiconductors Fabricated?
- In Which country are they designed?
- What is the opposite of an Insulator?
- A very common insulator used everywhere is?

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Intel uProcessor Evolution				
YR	uProcessor	Fab	Clock-Rate	Transistors
65				1000 Devices
70				15,000 Devices
72	6502			Apple/Commodore
78	8088 8086		4.7 – 6 MHz	80186 Limited Use
82	286		18Mhz	134,000
86	386 (1st 32 bit x86)		33Mhz	275,000
89	486		33-100Mhz	1.2 Mill
93	Pentium "586"	.8	66Mhz	3.1 Million
95	Pentium Pro			5.5Million
97	Pentium II "686"			7.5Million
00	Pentium IV "786" *	.18	1.5Ghz	42
05	Pentium Extreme	.09	3.4Ghz	105Million (Dual 230M)
08	I7 (7 th Generation) (2010 .032 – 6 Processor)	.045 45nm	3.2Ghz	(Quad 731M), DDR3, Better Architecture

* In 2000 intel predicted Pentium IV would hit 20Ghz by 2010, silicon ceiling

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Processor Language

CPU Language – 4 bit Computer
 1010 Add two numbers
 1010 addressX addressY
 Assembler
 Add x,y;

- CPU Computer Language
- Assembly Language Mnemonic Representation
- Modern Day CPU x86 (32bit) – 64 (64bit)
 - 80386 x86 32 Bit Language of Modern Computers
- 64 bit implies 64 0,1 for each CPU word
- We have more word space than we can use

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Intel Core Evolution (hit ceilings)

yr.	chip	Fab	GHz	Transistors
00	Pentium IV "786"	180nm	1.5Ghz	42
05	Pentium Extreme	90nm	3.4Ghz	105Million (Dual 230M)
08	I7 (7 th Generation) (2010 .032 – 6 Processor)	45nm	3.2Ghz	(Quad 731M), DDR3, Better Architecture
11	I7 2600 Sandy Bridge	32nm	3.4 Ghz	1.16 B – Cores 2-8
15	I7 6700 Broadwell previous 2014 Skylake	14nm	3.7 Ghz	1.75B – quad Cores Cores 4-10
17	I9 7900x "Skylake"	14nm	3.3- 4.3Ghz	Cores 10-18 Ryzen push
21	I9 10900x "comet or coffee" lake	14nm	3.7Ghz	10 Cores

- Core I7/8700 8th Core Generation – Not Really
- 2020 XEON (28 Cores) 14nm/2.5GZ \$1000+

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AMD Generations (skipped k9?)

AMD 586 K5	586
K6-2	686
Athlon/Athlon XP K7 2000	786
Athlon 64 K8 x86-64 Athlon 64 FX (10%+) ~02	886 – 8 th Generation Pentium Extreme
Athlon 64 x 2 2006	Dual Core
K10 Phenom 2007	Quad Core, 2.6HZ
Merge CPU/GPU – 2010-2014	Stumbling buy ATI <u>Heat problem</u>
Ryzen (x86 52% faster Zen core)	2017 – Hit over intel

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2019-2020 7nm AMD Ryzen Chip Generation

Year	Chip	Cores	Clock Rate	1/21 NewEgg
XBOX Series X	8x AMD Zen2	8	3.8 Ghz Max	\$500
Playstation 5 12/20	8x AMD Zen2	8	3.5 GHz Max	\$500
7/19	Ryzen 7 3700x	8	3.6GHz-4.4GHz	\$324
12/19	Ryzen 9 3900x	12	3.8Ghz base 4.8Max	\$538
2/20	Threadripper 3990x	64	2.9GHZ – 4.3GHz	\$3989

Zen 1st Generation 14nm; Zen+ 12nm; Zen2 3rd Generation 7nm
 Intel is still at 14nm - Intel's 7nm delayed to 2022
 Zen2 has improved Quad Core Communication; Notice Factor of 4
 The Ryzen 7 3700x is very similar to the custom Game Console Chips
 All Modern day chips x86 32 Bit Instruction; x64 64 Instruction
 Playstation V is specifically an x86-64 AMD Ryzen Zen 2 Chip
 Using NewEgg – Microcenter may have better pricing

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Ryzen 7 3700x Specs \$350/1/21

ModelBrand	AMD	Manufacturing Tech	7nm (ff cmos)
Processors Type	Desktop	64-Bit Support	Yes
Series	Ryzen 7 3rd Gen (Zen2)	Memory Types	DDR4 3200
Name	Ryzen 7 3700X	Memory Channel	2
Model	100-100000071BOX	Virtualization Technology Support	Yes
DetailsCPU Socket Type	Socket AM4	PCI Express Revision	4.0
1331 Input Pins (39x39 grid)		Max Number of PCI Express Lanes	16
Core Name	Matisse	Thermal Design Power	65W
# of Cores	8-Core (8x64=2³*2⁶=2⁹=512 pins ~128input/core)	Date 1st Available	Nov 06, 2019
# of Threads	16		
Operating Frequency	3.6 GHz		
Max Turbo Frequency	4.4 GHz		
L1 Cache	512KB (64K/core) – Closest to Core		
L2 Cache	4MB (512KB/core)		
L3 Cache	32MB		

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Ryzen 9/3900 \$510 1/21 Adding a Quad Core

Brand AMD	Manufacturing Tech	7nm
Processors Type Desktop	64-Bit Support	Yes
Series Ryzen 9 3rd Gen	Memory Types	DDR4 3200
Name Ryzen 9 3900X	Memory Channel	2
Model 100-100000023BOX	Virtualization Technology Support	Yes
CPU Socket Type Socket AM4	PCI Express Revision	4.0
same as 3700x 1331 (128x12=1536)	Max Number of PCI Express Lanes	16
Core Name Matisse (same 3 rd Gen)	Thermal Design Power	105W
# of Cores 12-Core	Cooling Device	Heatsink and fan included
# of Threads 24	Date First Available	July 02, 2019
Operating Frequency 3.8 GHz		
Max Turbo Frequency 4.6 GHz (5Ghz ceiling)		
L1 Cache 768KB (64KB/core 64*12=768) Same as 3700x		
L2 Cache 6MB (512KB/core same as 3700x0)		
L3 Cache 64MB (3700X WAS 32MB)		

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Handling Multiple Cores

- Application Level (Design Parallel SW) not easy
- The Operating System
 - SW that makes HW Useable
 - Resource Manager
 - Windows 7-8 1 Version of Captivate would Freeze System @ 25% CPU Usage?
 - Quad core CPU, 1 core 100% to publish videos
 - Windows 8 unable to delete process to other Cores
- Windows 10 What is Happening

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Windows 10 Delegate Tasks

Name	Status	24% CPU	40% Memory	0% Disk	0% Network	1% GPU
Apps (6)						
> Task Manager		0.1%	26.2 MB	0 MB/s	0 Mbps	0%
> Microsoft PowerPoint (32 bit) (2)		0%	38.2 MB	0 MB/s	0 Mbps	0%
> Firefox (13)		1.0%	3,066.0 MB	0 MB/s	0.1 Mbps	1.0%
> AdobeCaptivate (6)		11.0%	960.0 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (3)		12.1%	2,665.0 MB	0.1 MB/s	0 Mbps	0%
> Adobe Acrobat DC (32 bit) (4)		0%	263.7 MB	0 MB/s	0 Mbps	0%
Background processes (99)						

- 2 Captivates at 25%;
- Note 12.5% Ceiling Note 2 at 12%
- I have (AMD 3700x) 8 core systems $1/8 = 12.5\%$

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Five active Adobe Captivates Publishing at Once

Name	Status	65% CPU	35% Memory
Apps (7)			
> Task Manager		0.1%	24.4 MB
> AdobeCaptivate		15.8%	721.9 MB
> AdobeCaptivate (2)		15.6%	647.6 MB
> AdobeCaptivate (6)		0%	828.7 MB
> AdobeCaptivate (6)		13.8%	2,056.7 MB
> AdobeCaptivate (5)		0.8%	723.6 MB
> AdobeCaptivate (4)		16.8%	745.5 MB
Background processes (100)			

- Notice 0% CPU on First Captivate(6)
- Slightly Above 12.5%; Separate Process – Process Explorer

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Can Run 7 Captivates at Once

Processes Performance App history Startup Users Details Services

Name	Status	80% CPU	42% Memory	0% Disk	0% Network	0% GPU
Apps (10)						
> Windows Explorer		0%	86.8 MB	0 MB/s	0 Mbps	0%
> Task Manager		0.1%	25.9 MB	0 MB/s	0 Mbps	0%
> Microsoft PowerPoint (32 bit) (2)		0%	47.4 MB	0 MB/s	0 Mbps	0%
> AdobeCaptivate		12.3%	1,076.6 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (5)		11.8%	695.0 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (2)		12.1%	975.9 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (6)		9.4%	1,031.8 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (6)		10.9%	1,892.8 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (5)		10.8%	1,204.4 MB	0.1 MB/s	0 Mbps	0%
> AdobeCaptivate (4)		10.9%	1,068.7 MB	0.1 MB/s	0 Mbps	0%
Background processes (99)						

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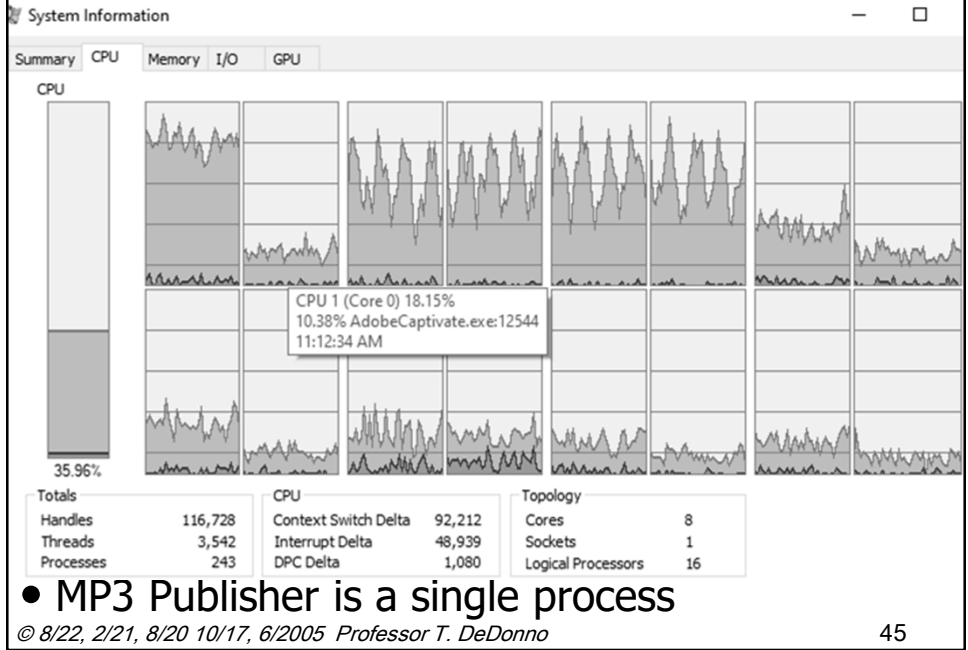
Three Captivate (3) – Notice 14.4%

Name	Status	40% CPU	36% Memory
Apps (8)			
> Adobe Fireworks CS4 (32 bit)		0%	128.3 MB
> AdobeCaptivate (6)		10.9%	627.9 MB
> AdobeCaptivate (6)		12.3%	796.1 MB
> AdobeCaptivate (6)		14.4%	666.7 MB
> Firefox (12)		1.3%	3,298.5 MB
> Microsoft PowerPoint (32 bit)		0%	47.4 MB
> Sysinternals Process Explorer (2)		0.4%	37.0 MB
> Task Manager		0.2%	25.9 MB
Background processes (103)			

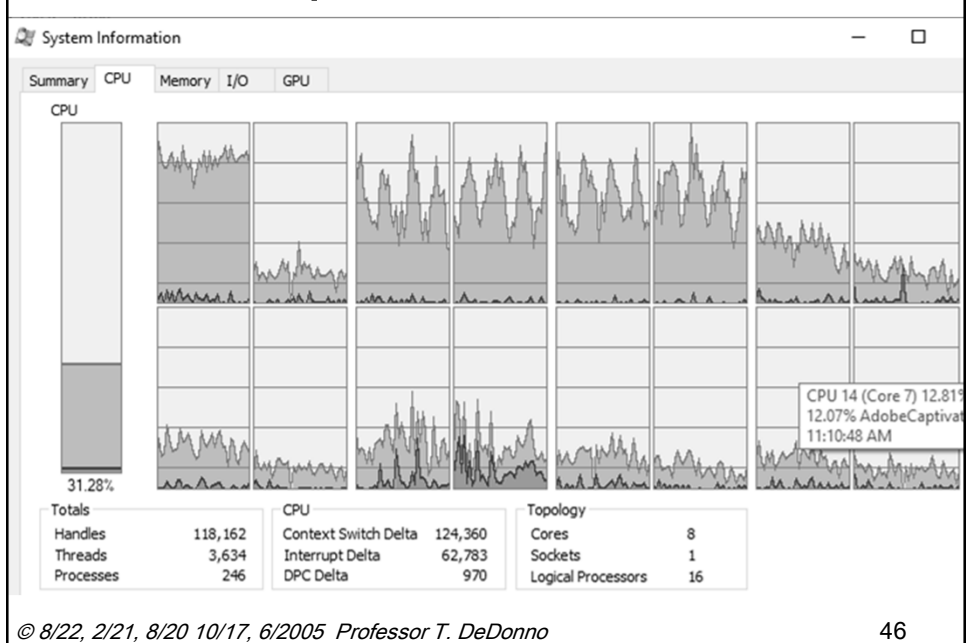
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Process Explorer CPU/Core



Process Explorer CPU/Core



Sub Process Tree

Process Explorer - Sysinternals: www.sysinternals.com [DESKTOP-8H6DJTD,17606]

Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
WebCompanion.exe	< 0.01	67,904 K	102,636 K	688	Web Companion	Lavasoft
AdobeCollabSync.exe		3,692 K	12,152 K	19384	Adobe Collaboration Synchro...	Adobe Systems Incorporated
AdobeCollabSync.exe	0.01	49,264 K	62,760 K	16524	Adobe Collaboration Synchro...	Adobe Systems Incorporated
steam.exe	0.08	39,916 K	73,512 K	9284	Steam Client Bootstrapper	Valve Corporation
steamwebhelper.exe	< 0.01	16,544 K	48,284 K	6828	Steam Client WebHelper	Valve Corporation
steamwebhelper.exe		6,020 K	14,624 K	18420	Steam Client WebHelper	Valve Corporation
steamwebhelper.exe	< 0.01	36,512 K	50,308 K	12896	Steam Client WebHelper	Valve Corporation
steamwebhelper.exe		8,904 K	25,560 K	6268	Steam Client WebHelper	Valve Corporation
steamwebhelper.exe		22,004 K	40,940 K	13084	Steam Client WebHelper	Valve Corporation
steamwebhelper.exe		44,440 K	69,136 K	780	Steam Client WebHelper	Valve Corporation
steamwebhelper.exe		48,260 K	74,856 K	13768	Steam Client WebHelper	Valve Corporation
SSScheduler.exe		1,596 K	488 K	15692	McAfee Security Scanner Sc...	McAfee, LLC
exec.exe		2,092 K	10,696 K	18916	Juno Internet	Juno, Inc.
exec.exe		5,404 K	17,500 K	2660	Juno Internet	Juno, Inc.
POWERPNT.EXE	< 0.01	65,488 K	92,016 K	18848	Microsoft PowerPoint	Microsoft Corporation
AdobeCaptivate.exe	12.27	661,720 K	658,740 K	12544		Adobe Systems Incorporated
CPCEfHelper.exe		32,088 K	32,280 K	10100		
node.exe		20,668 K	31,136 K	18560	Node.js: Server-side JavaScr...	Node.js
conhost.exe		6,300 K	10,760 K	7292	Console Window Host	Microsoft Corporation
CPCEfHelper.exe	0.80	95,596 K	119,116 K	19808		
CPCEfHelper.exe		61,476 K	87,368 K	18756		
AdobeCaptivate.exe	8.98	793,924 K	776,108 K	18752		Adobe Systems Incorporated
CPCEfHelper.exe	< 0.01	34,100 K	32,372 K	12868		
node.exe		20,500 K	31,272 K	8556	Node.js: Server-side JavaScr...	Node.js

Command Line:
 CPCEfHelper.exe -type=gpu-process -channel="18752.0.1568853882\1511312974" -no-sandbox -lang=en-US -log-file="C:\Program Files\Adobe\Adobe Captivate 2019 x64\debug.log" -log-severity=disable -s supports-dual-gpus=false -gpu-driver-bug-workarounds=2.12.23.51.61 -gpu-vendor-id=0x10de -gpu-devi ce-id=0x1d01 -gpu-driver-vendor=NVIDIA -gpu-driver-version=26.21.14.3200 -lang=en-US -log-file=" C:\Program Files\Adobe\Adobe Captivate 2019 x64\debug.log" -log-severity=disable /prefetch:82206241

Path:
 C:\Program Files\Adobe\Adobe Captivate 2019 x64\CPCEfHelper.exe

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Threads Lightweight Process

AdobeCaptivate.exe:12544 Properties

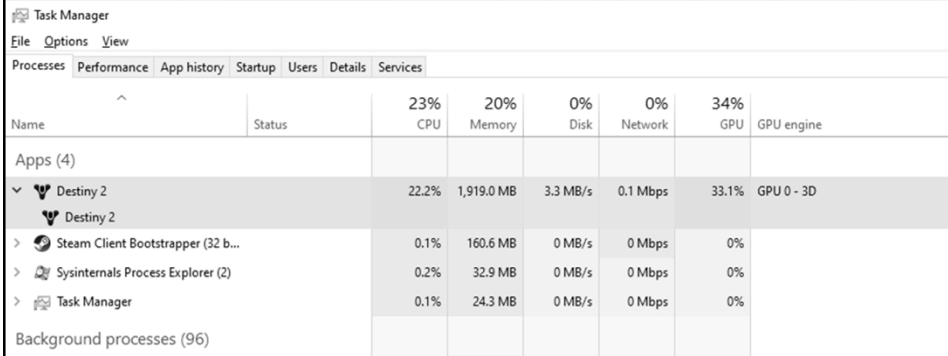
Image Performance Performance Graph GPU Graph Threads TCP/IP Security

Count: 86

TID	CPU	Cycles Delta	Suspend Count	Start Address
14596	6.12	3,640,192,...		MSVCR110.dll!...
8868	1.03	614,661,156		mc_enc_avc.d...
9492	0.34	205,087,284		mc_enc_avc.d...
19408	0.31	183,825,540		mc_enc_avc.d...
5044	0.29	171,211,464		mc_enc_avc.d...
18028	0.28	168,211,908		mc_enc_avc.d...
4212	0.28	167,420,232		mc_enc_avc.d...
6060	0.28	166,039,452		mc_enc_avc.d...
10004	0.27	163,415,664		mc_enc_avc.d...
18728	0.27	163,410,444		mc_enc_avc.d...
15192	0.27	160,556,760		mc_enc_avc.d...
3040	0.27	160,055,244		mc_enc_avc.d...
16324	0.27	159,564,888		mc_enc_avc.d...
10280	0.27	158,580,396		mc_enc_avc.d...
18628	0.26	157,405,248		mc_enc_avc.d...
17656	0.26	156,664,188		mc_enc_avc.d...
13360	0.26	154,930,212		mc_enc_avc.d...
9800	0.12	71,305,884		AdobeCaptivat...
13684	0.10	62,218,080		mc_enc_avc.d...
16336	0.05	27,015,768		autoplay.dll!DI...
17120	0.02	14,829,516		WINMM.dll!Pla...
16864	< 0.01	2,643,372		MSVCR110.dll!...
16376	< 0.01	568,044		MSVCR110.dll!...
6340	< 0.01	18,396		autoplay.dll!DI...
1348				ntdll.dll!LdrAcc...
8272				MSVCR110.dll!...
7676				msocket.dll+0...
7072				libcef.dll!IsSan...
12432				libcef.dll!cef_t...

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Destiny 2

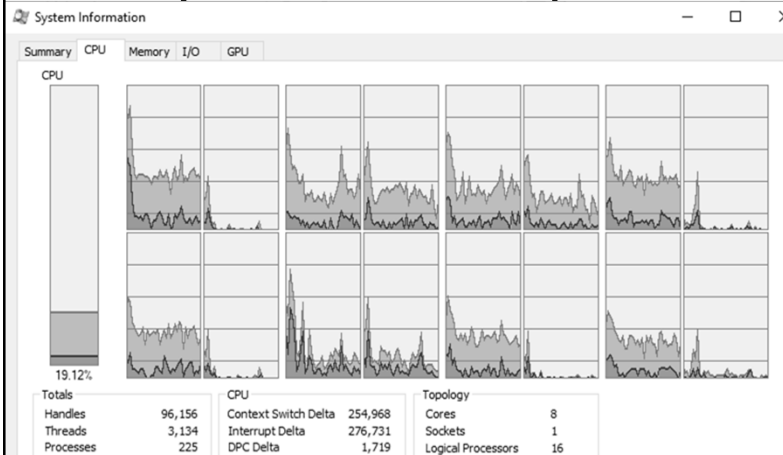


- Destiny Breaks 12.5% Right Away

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Destiny 2 Process Explorer



- Notice Game Superior Multiple Cores
- Hyper threading may be done at Processor Level

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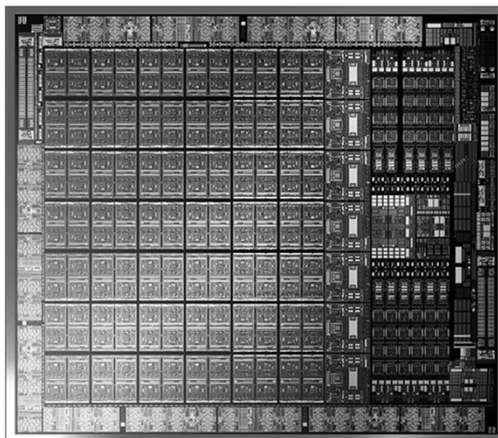
GPU Comparison

Spring/00	.18	25M	Pentium IV .18 42 Million GPU have Larger Dies?
Fall/00	.15	50M	
Fall/01	.13	100M	
Sp/03 NV30	.13	140M	05 Pentium Extreme .09 105M, 230M Dual Core GDDR3 <> DDR3
Sp/04 NV40	.13	220M, GDDR3	
6/2008	.065 76nm	1400M	GeForce GTX 260, Intel 08 45nm and 731M
2015-2017	14nm	1.8B	GeForce 10 Series Same as I9/I7
2020-21 5nm 2022	7nm		10K+ CUDA (Compute Unified Device Architecture) Cores RDNA 2 (AMD uAr/Instruction set)

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GPU NVIDIA GA104 GPU Die



128 CUDA cores per SM, for a total of 4,864,

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GPU 2020

- RDNA-2 GPU MicroArchitecture Instruction Set
- 7nm Fabrication
- Series X and Playstation V use AMD Radeon
- Playstation V GPU Oberon Processor 2304 Cores
GDDR6 – 16 GB – 256 Memory Bus
- Radeon RX 5700 2304 Stream Processor
- Tetra FLOP is Trillion Floating Operations Per Second

System	Clock	Tflop	Compute Units
Series X		12	52 @2.23
Playstation V	2.23Ghz	10.28	36 @2.23GHz
<u>AMD Radeon Pro</u>	\$400+		
<u>Radeon TX 5700</u>	1.8Ghz	8-16	50 \$1000

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Deprecated Game Consoles

- X86-64 Ryzen 12th Generation
- Silicon Has Hit Heat Ceiling
 - +20Years GaAs, Diamond
- 05-20+ Years Parallel Processing at Core Level
- IBM Cell Chip – Used in Playstation III
 - Chips Designed For Interconnection
 - 1 to 256 Cells Chips – One chip for everything
 - Died w Nvidia General Purpose and Intel
- Playstation 4 / 5
 - Use AMD (Accelerated Processing Unit)
 - Note AMD brought ATI
- Next XBOX Project Scorpio AMD (SOC) and Nvidia

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SOC System on a Chip

- Integrate CPU + (Memory, Nic GPU etc.)
 - Goal Integrate Components of Computer
- Leader is Qualcomm Snapdragon 835

Chip 2017 64Bit	GHz	Cores	Comments
Qualcomm snapdragon 835	2.45	8	CPU, GPU, DSP, WIFI, Audio, Note emphasis: 25% Smaller, 35% Less Power than 820
AMD Ryzen 7 1800	3.6	8	Zen core 52% faster – AI Look ahead
Intel I7 8700	3.6	4	I9 is more of a premature Ryzen response

- Samsung Produces the Most Smartphone Chips

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CPU Chip Quiz

- AMD _____ competes against the Intel Pentium.
- A Sempron is faulty Athlon?
- Can you buy a 5GHz CPU?
- GPU stands for?
- Current CPU are getting faster using?

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PC Hardware

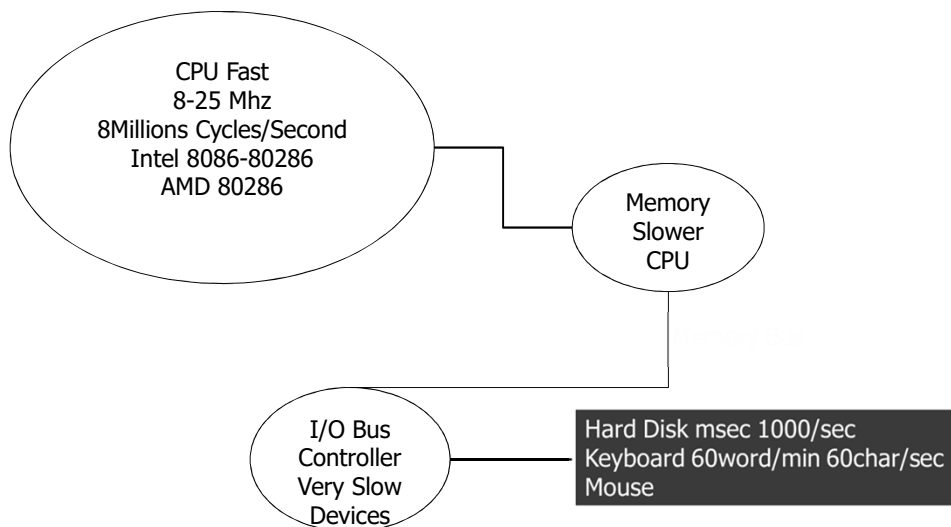
Dealing with Resource Management
CPU >> Memory >> Disk >> Keyboard
CPU is Very Fast & Often Waits on Others

Ways to Deal w this?
Basic PC Hardware

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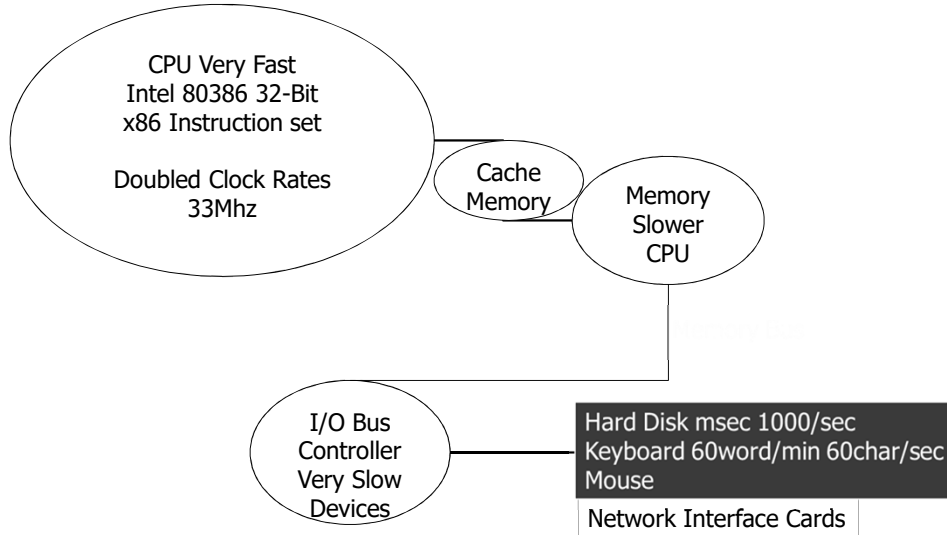
PC Hardware 1980-1985



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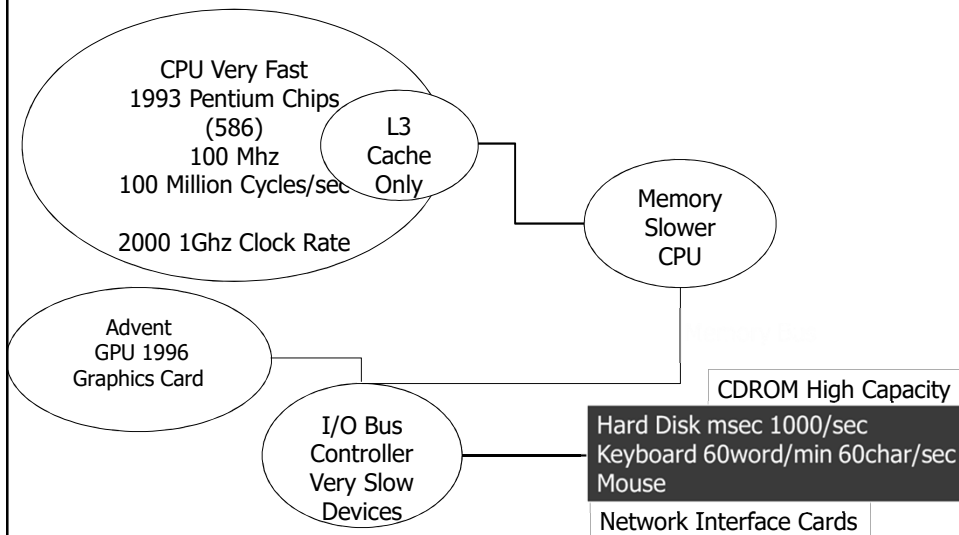
PC Hardware 1985-1990



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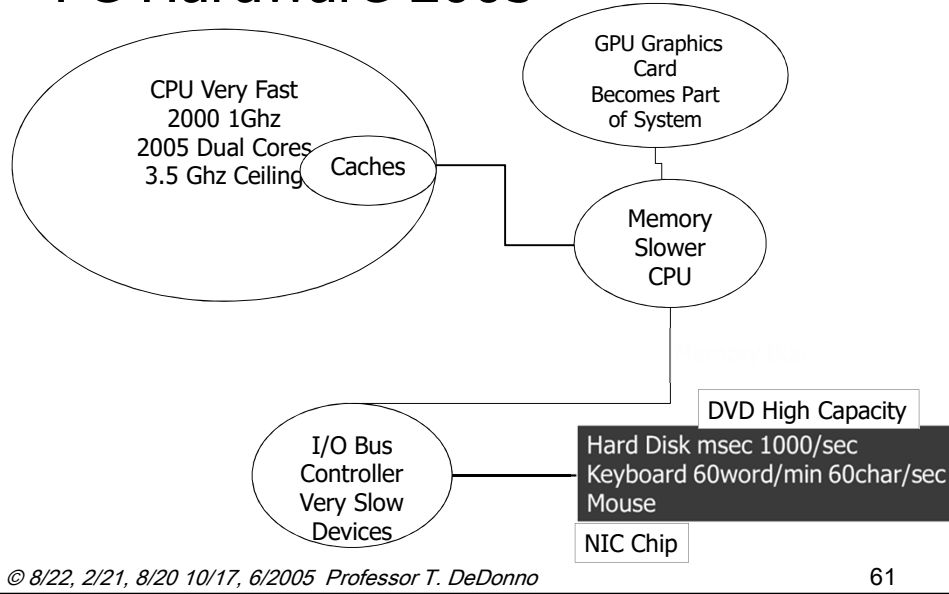
PC Hardware 1996



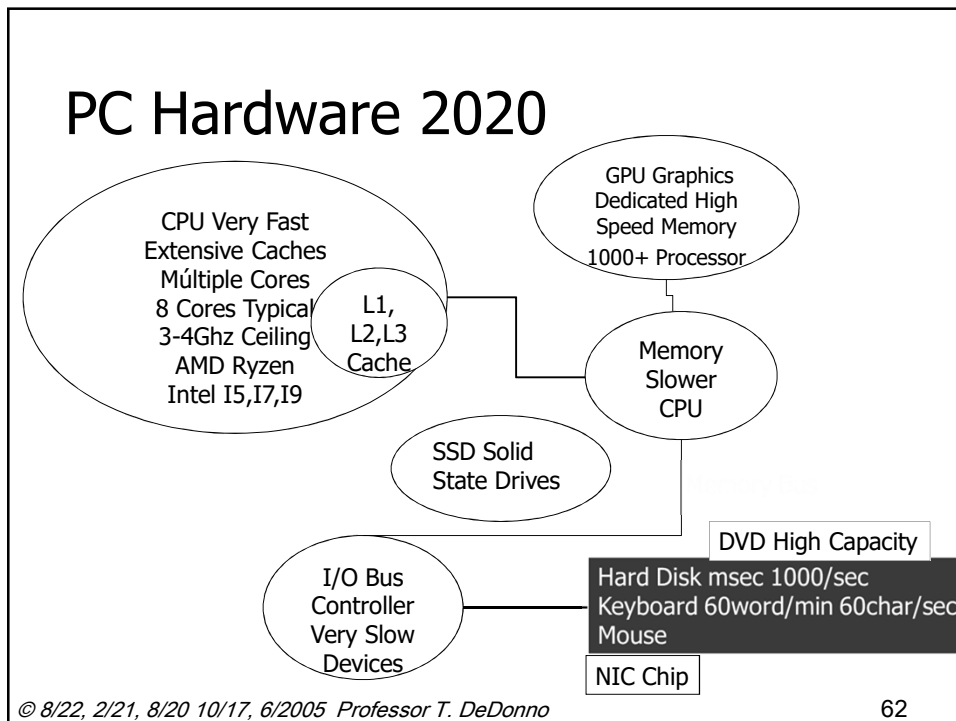
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PC Hardware 2005



PC Hardware 2020



Basic PC Hardware

- Microprocessor/CPU (Hardware)
- BIOS - Firmware
 - Basic Input Output System
- I/O Devices
 - High Speed/Low Speed

Big Speed Discrepancy Microprocessor to I/O Devices

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Keeping CPU Busy

- Prime Objective Effective Resource Allocation
 - Keep CPU Busy

1. O.S. Preemptive Multitasking – Time slice
2. HW Geared Towards Feeding CPU

Year	Chip	GHz	Cores	L1	L2	L3
2017	Ryzen 3700x	3.4	8	368Kx8	4MB	16MB
2002	Athlon 64x	2.4	2	64K	1MB	

L1 is smallest Faster, L2 slower 1 L1/L2 per core, L3 Shared

- Reality – Most PC System Never Tax CPU
 - Good Thing: Most Have insufficient Cooling
 - PS Games Often Push System Threshold
- HW Designs Keep CPU Busy – Standards for Adding Devices

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Original PC

- 8088/8086 4.77Mhz – 8Mhz CPU “Hardware”
- BIOS Chip “Firmware”
- Memory Running at 2Mhz – 8Hz
 - Wait States
- I/O Bus – ISA
 - Industry Standard Architecture
 - 8Bit 4.77Mhz to 8Mhz Bus
 - 16 Bit
- BIOS Bridge Between HW/SW
- One Bus for Both High Speed Memory & Low Speed IO

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BUS Evolution

- High Speed I/O
 - Memory, Cache, Video Card
- Low Speed I/O
 - Disk, Floppy, Keyboard, Mouse
- North Bridge – High Speed – AGP – Memory DDR
- South Bridge – Low Speed
- Next Generation Going Full Circle?
 - Single Bus – Different Speeds PCIx1..x16
 - Hyper transport (latency between bridges)
- Age old Problem Still Remains
 - CPU >> Memory >> Disk >> Mouse, Keyboard

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PCIx1..x16 Kills Two Birds

ISA, EISA, VESA	Industry Standard Architecture
AMR	Audio/Modem Riser (AMR)
PCIx1	Peripheral Component Interconnect
AGPx2,x4,x8	Accelerated Graphics Port
PCI Express x 16	Twice Performance AGPx8
USB	Universal Serial Bus
Disk	
ISA, "SCSI"	Small Computer System Interface
IDE - ATA, 66, 100, 133	Advanced Technology Attachment
SATA	Serial ATA – hot swappable, distance

Excluding DISK/Memory Move Towards Single I/O Standard

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Memory

•FSB Front Side Bus

- Bus Between CPU "Northbridge"
- Highway to Transfer Data into CPU
- 400Mhz—2GHz

Age old Problem Remains

CPU is much faster
than everything else

PC133	133MHz
PC2100	266MHz
PC2700	333MHz
PC3700	466Mhz
PC14900	1866Mz

How do we bridge Memory CPU Latency Delay?

Can CPU Clock Rate Always Increase?

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Solving Memory / CPU Delay

CPU	Freq.	L1 Cache	L2 Cache	FSB	Socket A
Athlon XP 2700+ Thoroughbred	2.17GHz	64KB + 64	256KB	333MHz	462
Athlon XP 3200+ Barton	2.17GHz	64KB + 64	512KB	400 MHz	462
Athlon 64 3200+	2GHz	64KB + 64	512 1MB	Hyper Transport 1.6GHz 754 2 GHz 939	939 754
Althorn 64 X2 4400+	2.2Ghz	64KB + 64	1MB	939 128Bit Memory Bus	939

- Increase Internal Cache on CPU & FSB
- Increase FSB Speed
- Faster Memory DDR → DDR2 → DDR3

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Quiz

- Main Resource Management Problems on PC?
- Future I/O buses will use the ____ express standard.
- To compensate for faster devices the same standard will have transfers rates from ____ to ____ .
- What is the North Bridge?
- BIOS Stands for?

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Deprecated Hyper Transport

- Big Gain Performance - FSB
- Nvidia nForce4 Chips, Why NVidia?
- On AMD 64 Single Chip nForce4
- Intel Pentium Extreme 2 Chips
 - North Bridge: SSP System Platform Processor
 - South : MCP Media Communications Processor

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GPU

- Have Same Problem
 - Need Wider Faster Lanes to Transfer Data
 - More Bandwidth – Faster FSB
- Implementing Hyper Transport
- First to Use Quad DDR, and DDRx2, Dual Channel, DDRx3
- Playstation V has GDDR6
- What is Dual Channel?
- What is Quad DDR aka DDRx4 and DDRx2?

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Increasing Memory Throughput, without Changing Latency

Dual Channel Memory Architecture Read Two DIMMs Simultaneously

Read 1 PC3200 and Second PC3200
400Mhz x 2 = 800MHz

Traditionally Transfer Data Rising Edge
Refresh on Falling Edge

DDR2 :Transfer Rising & Falling Edge
DDR4 :Transfer Data, Rising, Falling, and at Midrange

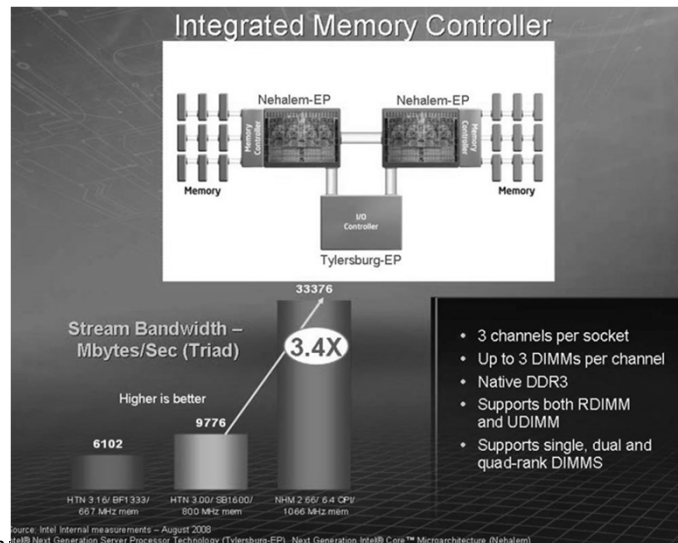
PC133	133MHz
PC2100	266MHz
PC2700	333MHz
PC3700	466Mhz
PC14900	1866Mz

DDR2 Install 2 SDRAM
DDR3 Next Generation of DDR2 (install 3 SDRAM)

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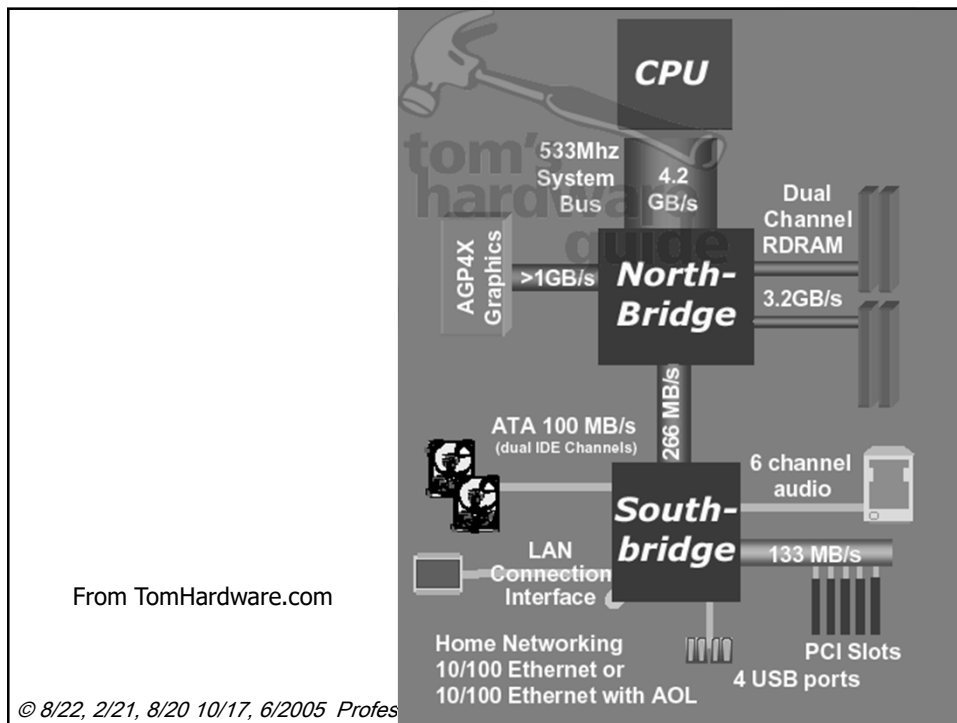
I7 Integrated Memory Controller



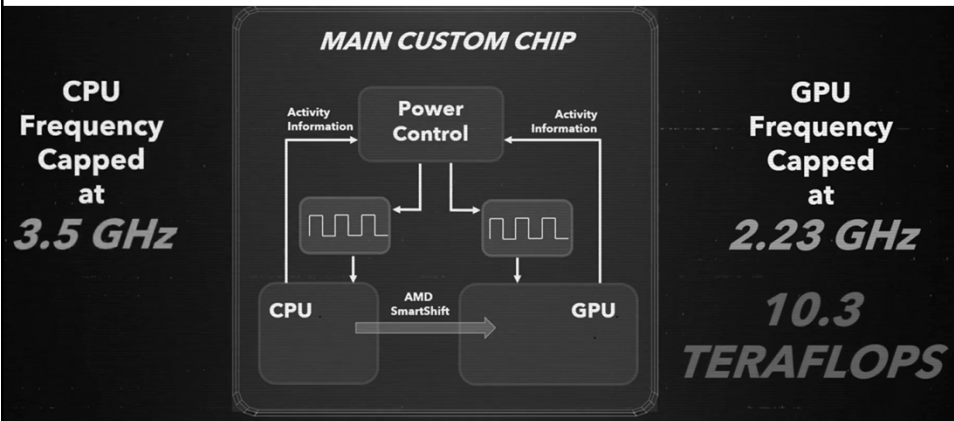
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PC Hardware Schematic Motherboards Audio Chips/Cards



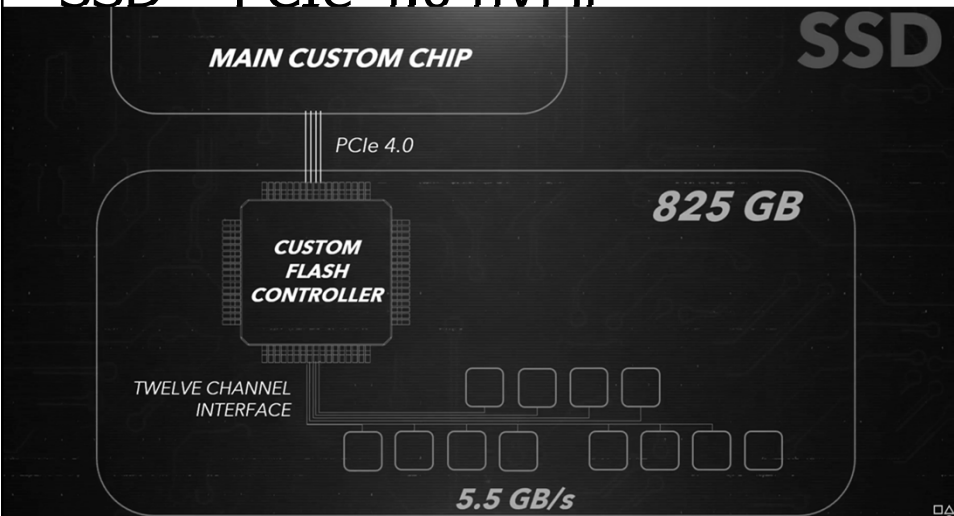
Playstation V



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Playstation V and Series X use SSD – PCIe 4.0 nVMe

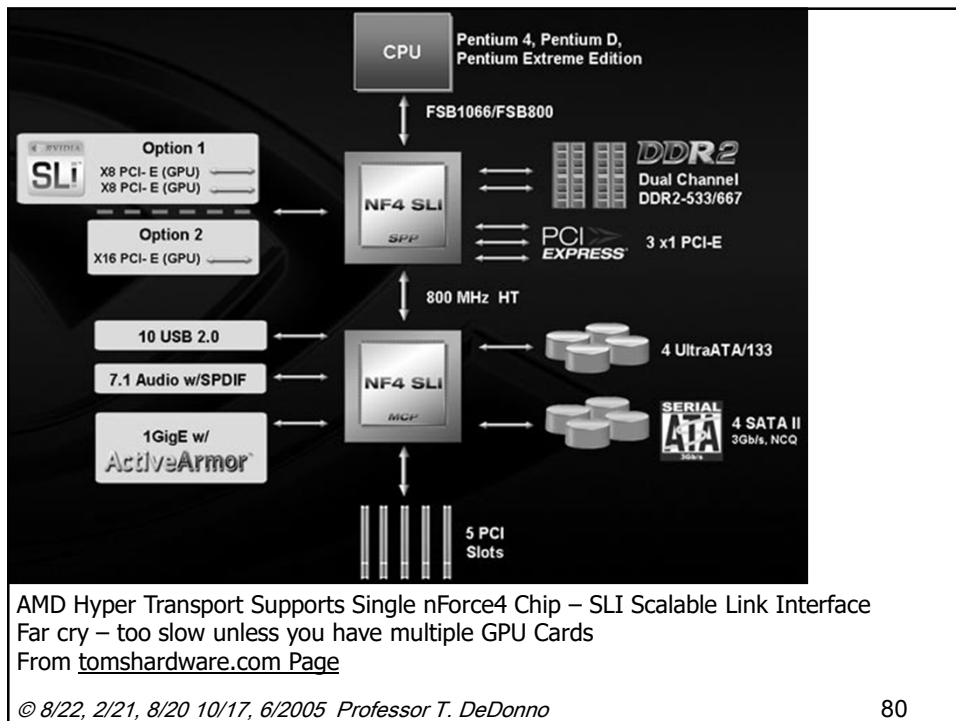


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Playstation Teardown

- M.2 PCI-e 4.0 SSD Interface
- Dual Fans for Cooling CPU/GPU
- Input and Output Cooling for Case
- HD Blue Ray Drive



• 3 Chips NIC, Audio and Firmware Bios

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I7 Motherboard DDR3

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Smart phone

- Black is Battery
- Note Not Many Chips its SOC Qualcomm snapdragon 820

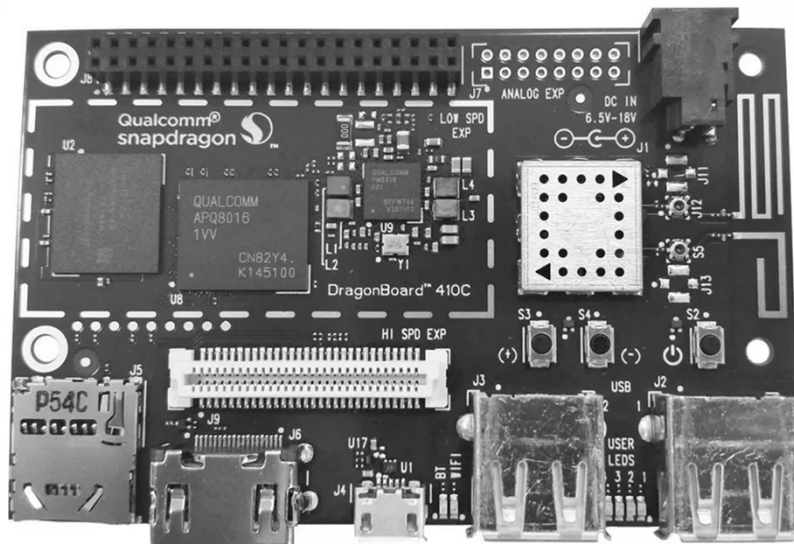


- You tube MotoZ Tear Down
- <https://www.ifixit.com/Teardown/iPhone+7+Plus+Teardown/67384>
- Don't attempt this at home

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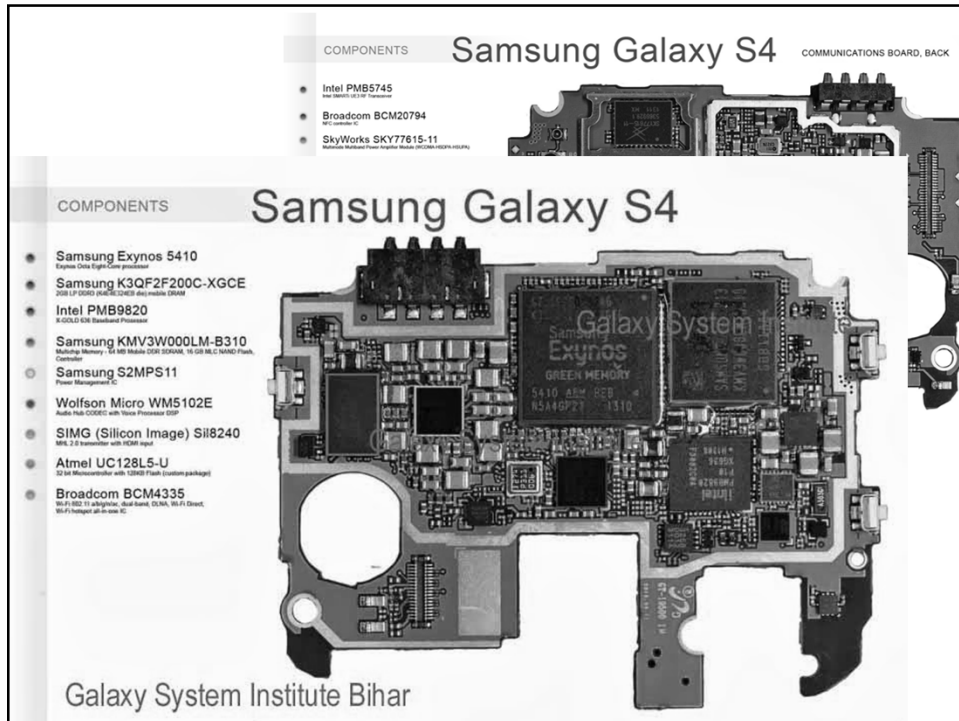
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Dragonboard snapdragon



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Audio

Analog versus Digital
 Sound versus Motion
 Audio Chips (AC'97)
 Sound Cards

Modern Day Sound Chips on Mobo
<http://www.hardwaresecrets.com/how-on-board-audio-works/>

Analog versus Digital

- Analog is Continuous – real World
- Digital is Discrete – Computer On/Off
- Take 30 Pictures/Second
 - You have **30 discrete Digital Pictures**
 - Replayed 10 fps (Frames/Second) Appears Continuous
 - Persistence of Vision 1/10 Second
 - TV 30fps; HDTV 60fps (1920x1080); Flash 12fps
 - 4K is 30fps and 60fps (3840x2160 fit 4 1080P)
 - Games 30-120fps (Liquid effect at 60fps)
 - If fps is too slow likely get Motion sickness playing game
- Sound is also Analog

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Sound versus Motion

- Movie 30 fps
 - Minimal Change Between Frames
 - Ideal for MPEG (Compression)
- Flash 12 fps
 - Uses Equations to Move Objects
- Sound
 - Minimum Repeat Information
 - Record @ 48K fps vs 10 fps
 - Can Have a Repeating Sound Track But...

Sound Doesn't Compress, Why 48Khz?

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Sound

- Sapien – Sapien
 - Audio Range 20Hz .. 22KHz; 40Khz at Birth
 - Best at Midrange
- Sample at 48Khz reproduce at 24Khz
 - 24Khz Nyquist Frequency
 - 48,000 Times a Second Record a Sound
- Sound Card Samples at a least 48Khz
- What is the AC'97 Code C Standard

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AC'97: Audio CodeC Standard

- Introduced in 1996 by Intel
- Combined AD/DA Single Chip Controller
- Standard For Sound Chips on Mobo
 - Popular Sound Chips VIA, Realtech or C-Media
- 48KHz/20Bit Multichannel 5.1
 - New Mobo have 7.1 (SPDIF) 2 SFX Speakers
- 96Khz/20bit Stereo
 - Sample at 96Khz store each sample 20bits
- Most Mobo Have a AC'97 Chip
- Whats Wrong with AC'97 Single Chip Solution?

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AC'97 Single Chip Flaw

2004 Intel HDA

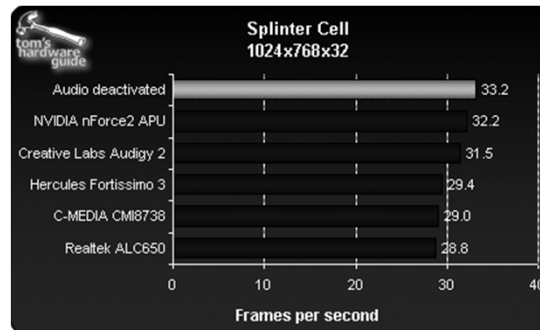
- Audiophile
 - DAC (Digital Analog Converter) is Everything
 - Combine AD/DA to Single Chip
 - Major Sound Quality Compromise
- In 2004 Intel Released Intel High Definition Audio
 - 192Khz/32 bit Quality 8 Channels
 - More Quality Than Speed
- Modern Day Need Sound for Audio Mixing/Recording
 - South Bridge Audio chips are Impressive in terms of Performance

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Deprecated Sound Audio Chip/Card Comparison

- SW Only Solution
 - Major Performance Hit
- Audio Chips
 - Realtek ALC650
 - Media CMI8738
 - 15% Performance Loss
- Nvidia Nforce2 APU & Audigy 2 Sound Card
 - Audio Processing Unit Part of MCP (Media Control Processor)
 - Performance loss of ~4%
 - Nvidia Made Sound Chips for the X-Box



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Deprecated Sound Cards

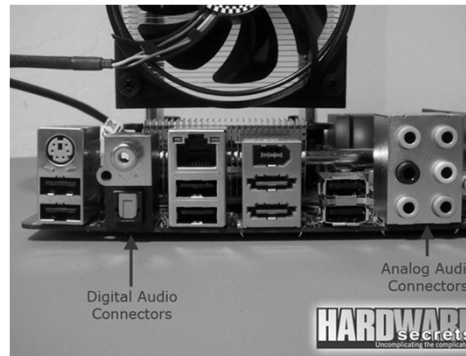
- Some High End Mobo Not Have Sound,
- Performance Gaps have Narrowed
 - Performance Wise Nvidia MCP is a good Choice
 - But lots of Mobo Save Costs by Compromising
- Dedicated Sound Card
 - Increased Overall Performance
 - “Top Quality” (DAC)
 - Additional I/O Connects
 - Recording and audio mixing
- Can still buy Sound Cards

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Current Sound

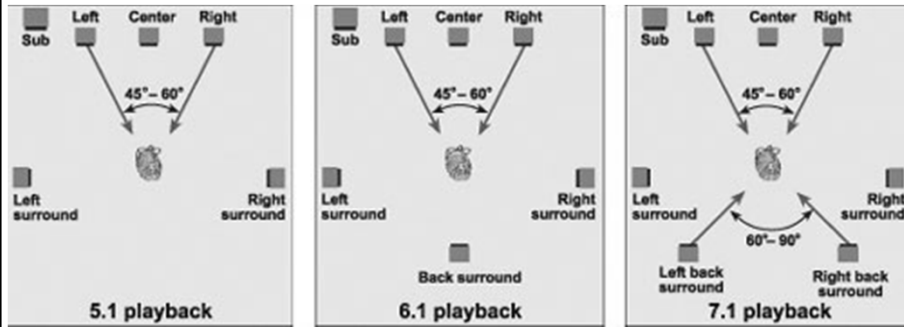
- Digital Input
“HDMI”
Coaxial and Optical
- Analog Universal Colors
 - Pink: Mic in; Blue: Line in **Pink is Microphone**
 - Green: Front speakers out (x2)
 - Black (or dark blue on some older boards): Rear speakers out (x2)
 - Orange: Center/subwoofer out (Center Subwoofer less than 20 hz) 5.1
 - Gray: Middle speakers out (7.1 Sound)
 - From...
 - <http://www.hardwaresecrets.com/how-on-board-audio-works/>



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5.1



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Sound Quiz

- A ___ ___ chip is common on most Mobo.
- What is wrong with a sound chip on Mobo?
- Sound is _____ while computers are _____.
- For Liquid Effects Games often operate at ___ fps?
- HDTV is at _____ fps. Older TV is at _____.
- Why is 1080P and 4K have same fps?

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Types of Speakers

- Subwoofer <40Hz (Woofer 40Hz..100Hz)
 - Large Bass Speaker
 - Handles Low End Frequency
 - Feel the Music but Cannot Hear It
 - Important For Gaming (Gunfire, etc.)
- Midrange (300-5000Hz)
- Tweeter (5Kz-22Khz)
 - High end Metal (High Frequency Sounds)
 - Ability to hear high frequency drops w Age

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Audio Standards

- Dolby Digital 5.1
 - Formerly Known as AC-3 (Audio Compression Standard 3)
 - Lossy compression Standard
 - Loss some quality in compression – Geared Human Ear
 - Five Full Range Speakers
 - Center, Left, Right and Left-Right Rear
 - .1 is the LFE (Low Frequency Effects)
 - 3Hz to 120Hz Sub Woofer
- DTS – Digital Theater Sound
 - Competing Video Standard
- Dolby Atmos (Most Recent Standard)

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THX

- Not a Standard
- But a Quality Assurance Level
- Sound is Reproduced For a Lucas THX Rating

- Ultra THX is one Level Up

- Some Vendors don't Spend Money for Approval
- Klipsch, Logitech have THX Approved Speakers
- Not that Important for Games
- Game Development Audio Specialists

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Speakers

- Technology has Greatly Improved Speakers
- Use to Have to have Big Speakers Big Sound
- Now Small Speakers Have Come a long Way

- Audiophile Notice the Difference
- Gamers Can Often Settle for Less Expensive

- But Place Speakers Correctly &
Pay Attention to Sound Direction

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Major Speaker Brands

- Klipsch Audio Promedia
 - First to Release Ultra THX 5.1 Speaker
- Logitech
- Class Project Sound Cards or Speakers
- <https://www.digitaltrends.com/computing/best-computer-speakers/>

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Speaker Quiz

- For Game Play it is important to pay attention to direction of Sound?
- THX is important to game play?
- Less expensive are sometimes a good compromise for Computer gaming?
- First thing you lose as we age?

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GPU

Skip 1st Section

Video System = Monitor + Adapter

History
2D Accelerators
Silicon Graphics
OpenGL
3dfx/Nvidia

Current 3D Accelerators

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Video System

- Display
 - Recommend CRT Monitor (17"–27")
 - LCD Becoming Popular: But Resolution/Size is Better
 - Moving Towards
 - Large Plasma Displays, HDTV 1920x1080
 - Plasma Displays can get Burn-ins
- Video Adapter or Graphics Card
 - For GUI this is Very Important
 - For Gaming its Critical – Compromise elsewhere

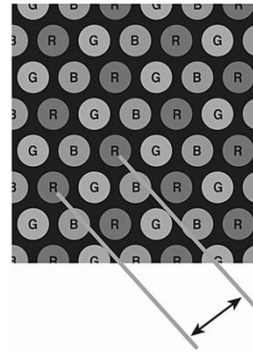
Resolution	CRT	LCD
800x600	15"	15"
1024x768	17"	15"
1280x1024	19"	17"
1600x1200	21"	18"

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Monitor Features

- RGB
 - Three Guns Red Green and Blue
- Dot Pitch
 - Distance Between Phosphors Elements
 - .22 15"; .26 21"
 -
- Non-Interlaced
 - Sweeps Each Line Top to Bottom one at a time
 - Interlaced Sweeps Odd Lines; Then Even Lines



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Scan Rates

- Horizontal
 - Time to Draw one Horizontal Line Across Screen
- Vertical (Up and Down)
 - Time it Takes Top to Bottom Scan
 - Refresh Rate (Refreshing the entire screen)
 - 72Hz and Above is Flicker Free
 - 85Hz VESA (Video Electronics Standard Association)
- Monitor – Video Adapter Determine Display Rates
- Vertical Can Remain Constant
- But Horizontal Must Increase with Resolution
 - 800x600 48KHz; 1280x1024 64KHz.

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Green Monitor

- Have Energy Saving Modes
 - APM (Advance Power Management) BIOS
 - ACPI (Advanced Configuration Power Interface)
- EMF Electro Magnetic Frequencies
 - Two Types of Emission: Electrical and Magnetic
 - ELF (Extremely Low Frequencies)
 - Magnetic May be the Worst
 - VLF (Very Low Frequencies)

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Monitor Quiz?

- RGB stands for?
- Dot Pitch is?
- CRT Monitors should be ___ or larger.
- LCD are crisper but more expensive?

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Video Display Adapters

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PC Graphics

Year	
1970	Text-Based Terminals
1980	DOS Text Based
1985	Macintosh (GUI)
Hercules	Monochrome Graphics
CGA	320x200 16 Colors - Color Graphics Array
EGA	640x480 Standard – Enhanced Graphics Array
VGA	1987 IBM; Analog Display – Lots of Colors
Super VGA (VESA)	800x600 and UP – Video Graphics Array XGA (Extended Graphics Array) – 1990 IBM
3D Accelerators	

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Early 90s

- PC 2D Accelerators are Developed
 - By 1995 All Cards Have Same 2D Performance
- SGI
 - Silicon Graphics Workstations
 - 16MB 24Bit Raster Display
 - 3D Support:
 - Real time Texture Mapping, Z-Buffering
- 1992 OpenGL Standard
 - 3D Graphics Library

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Mid 90s

- SGI Makes Major Move To Super-Computers
 - Super Computer Wane,
 - PC Takes Off – Pentium Real Time Animation
- Engineers Leave SGI Start 3dfx & NVidia
- 3dfx Creates First 3D Graphics Card
 - Voodoo 1 (3D only Card) SLI
 - Voodoo 2 (Faster 3D Card – Had Competition)
 - Implemented “OpenGL” Chip (Super CISC) “Glide”
 - OpenGL HW/SW Implementation is closely guarded secret
 - Unheard of Break-through (RISC)
 - Fast OpenGL Graphics Engine

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Demise of 3dfx

- 3dfx sought to go Mainstream 2D/3D
 - Voodoo Banshee Poor 3D Performance
- Nvidia Had More Solid 2D/3D Card
- 3dfx Lawsuits Against Nvidia Patent Infringements
 - Won the Suits – But Lost the War
- 3dfx Vertical Market - This Failed
- Nvidia Horizontal Market
- Board Did Sell Out
 - Next Generation Chips Came Back Week Later

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Emergence of Nvidia

- Nvidia brought 3dfx
- 3dfx Engineers Moved Up Street to Nvidia
- Nvidia, 3dfx, SGI were all Silicon Valley
- Nvidia Becomes A darling of Wall Street
- NVidia Startup Soon Becomes Worlds Largest
 - ATI Makes a Comeback

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Graphic Cards

- AMD ATI "Radeon" and Nvidia
- Dual Display: Mobo Support Second Monitor
- Cost ~\$100 – \$500 Pricewatch.com

- GPU are often more complex (more cores) than CPU

- GeForce GTX 10 Series
- AMD Radeon "ATI"

- Cryptocurrency using GPU
 - Was Driving up prices and alienating core gamers

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Evolving GPU

- More Complex than CPU
 - Same Manufacturing Transistor Spacing
 - Slower Clock Rate
 - Many more Processors, Cores

- 2008 PCs were becoming Green

- GPU 2010-2015 had special power requirements
- Current GPU are Green Relative Predecessors
- Recent GPU 260W – [GeForce RTX 2080](#)

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Video Cards

- Who are the two major Video card Vendors?
- Who was the first to develop 3D cards?
- Is it important to buy a good card for gaming?

VoIP

Voice Over IP
IP: Internet Protocol

VoIP

- Voice over IP
- IP: Internet Protocol

- Voice over The Internet
 - VoIP: Generally Standard Phone
 - Internet Voice Chat Sessions

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VoIP

- Vonage
 - Many routers now use this
- VoIP Providers
- Free VoIP: Free World Dialup & Skype
 - eBay brought Skype - (Auction VoIP?)
 - Free Long Distance – Restricted Range
 - netTALK
- All Major Bells are Offering VoIP
- Major Players: Vonage, Skype, Cable, Verizon

- IP Phone – Internet – IP Phone
- IP Phone – Internet – VOIP Service Provider – Phone

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IP Chat Session : Roger Wilco

- Download SW & Create a User
- www.gamespy.com
- Need Microphone/Speaker
 - Separate is Best for Game Play
 - Gamers Often Have Sound Card & Audio Chip
 - May Want a Small Headset
 - Project on headsets

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IP Chat Session: Ventrilo

- Superior System
- Setup a Ventrilo Server
- Ventrilo is Open Source
- Entire Voice as a Single Packet
 - Circuit Switching versus Packet Switching
- Current System Have Ample Performance

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VoIP and IM Integration

- Originally System Were Separate
- GAIM <http://gaim.sourceforge.net/>
 - IM Integration
- Siphoned: <http://www.sipphone.com/>
 - 1st to Seek Integration (VoIP & IM)
- Google Talk
<http://www.google.com/talk/developer.html>
- Gizmo <http://www.gizmoproject.com/>
 - Full IM Integration Text and Voice

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Summary

- 8th Generation Core Chips are Emerging
 - AMD Ryzen, Intel "I9"
- High Quality Sound Standard
- 3D OpenGL Display Adapters
 - Came of Age Mid 90's

HW versus Game Evolution

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Date	Event	Game
1960	Hacker Games on Mainframes	Pinball/Pool
1970	Primitive uProcessor – Star Trek Mainframe	Primitive Games
1980	uProcessor Mediocre Performance	Arcade Games with Dedicated Graphics/CPU
1990	32Bit High Performance Processor	Arcade Games Wane PC Games
1995	OpenGL GPU PCs with CD-ROMs	Arcade Obsolete Doom Era
2000	Broadband	On-Line Gaming Era
2006	Multiprocessor Cores "Physics Engines Slow"	More AI/Physics Multiple Enemies
2010	SOC Comes of Age	Smartphones Gradual Death Sporting Games
2020	SOC, More Cores	Mobile and FPS have dominated, Some multiple core usage

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