EGPU'S FOR STUDENT/LAB USE

BY: O'RYAN HAMPTON

START OF APPLE EGPU SUPPORT

- Apple started supporting eGPU's natively with High Sierra, released on September 25, 2017
- Mojave added more drivers and the option to prefer an attached eGPU
- Catalina added even more drivers and app level optimization

COMPATIBLE APPLE PRODUCTS

- Any Apple laptop or desktop that runs 10.13.4 or later and has thunderbolt 3 ports

EGPU ENCLOSURES

- There are many supported eGPU enclosures
  - Modular
  - All-in-One
- We are using the Razer Core X Chroma

SOME ALL-IN-ONE EGPU'S RECOMMENDED BY APPLE:

Gigabyte RX 580

Blackmagic eGPU
Radeon Pro 580
Radeon RX Vega 56

Sonnet Radeon Breakaway Puck
RX 570 eGFX
RX 560 eGFX

SOME MODULAR EGPU'S RECOMMENDED BY APPLE

OWC Mercury Helios FX

PowerColor Devil Box

Sapphire Gear Box

Razer Core X

Sonnet eGFX Breakaway box

SUPPORTED GRAPHICS CARDS

- Only AMD graphics cards are supported by Apple in eGPU enclosures
- Nvidia graphics cards are not supported with Apple computers.
- AMD Polaris Architecture:
  - AMD Radeon RX 470, RX 480, RX 570, RX 580, and Radeon Pro WX 7100
- AMD Vega 56 architecture:
  - AMD Radeon RX Vega 56, AMD Radeon RX Vega 64, Vega Frontier Edition Air, and Radeon Pro WX 9100
- AMD Navi RDNA architecture:
  - AMD Radeon RX 5700, 5700 XT, and 5700 XT 50th Anniversary

EGPU FOR STUDENT USE

- Student Checkout eGPU enclosures
- Work stations that students can connect their own device to and have extra graphical power

EGPU LAB USE

- On current machine with USB-C thunderbolt 3 support
- Work Stations

PERFORMANCE: BLENDER

Intel Iris Plus Graphics 645

- Barbershop Interior : 47.30 Minutes
- Bmw27 : 10 Minutes
- Classroom : 32.12 Minutes
- Fishy Cat : 14.48 Minutes
- Koro : 33.04 Minutes
- Pavillon Barcelona : 25.46 Minutes

AMD Readon Pro WX 9100

- Barbershop Interior : 3.21 Minutes (1373.52% Improvement)
- Bmw27 : 7.51 Minutes (33.15% Improvement)
- Classroom : 11.90 Minutes (169.91% Improvement)
- Fishy Cat : 10.30 Minutes (40.58% Improvement)
- Koro : 17.35 Minutes (90.43% Improvement)
- Pavillon Barcelona : 19.48 Minutes (30.69% Improvement)

PERFORMANCE: FINAL CUT PRO

BruceX Test 5k:

- AMD Radeon Pro WX 9100: 20.01 Seconds
- Intel Iris Plus Graphics 645: 53.73 Seconds

- Final Cut Pro supports multiple eGPU’s

PERFORMACE: GEEKBENCH 5

MacBook Pro (13-inch Mid 2019)

51176
Metal Score

Geekbench 5.1.0 Tryout for macOS x86 (64-bit)

Result Information

Upload Date	January 03 2020 11:18 PM
Views	1

System Information

System Information	
Operating System	macOS 10.14.6 (Build 18G103)
Model	MacBook Pro (13-inch Mid 2019)
Motherboard	Apple Inc. Mac-53FDB3D8DB8CA971 MacBookPro15,4
Processor Information	
Name	Intel Core i5-8257U
Topology	1 Processor, 4 Cores, 8 Threads
Identifier	GenuineIntel Family 6 Model 142 Stepping 10
Base Frequency	1.40 GHz
Memory Information	
Size	8192 MB
Frequency	1066 MHz
Type	LPDDR3
Metal Information	
Device Name	AMD Radeon Pro WX 9100

Metal Performance

Metal Score	51176
Sobel	54816 14.2 Gpixels/sec
Canny	48536 3.04 Gpixels/sec
Stereo Matching	197011 278.6 Gpixels/sec
Histogram Equalization	23312 4.11 Gpixels/sec
Gaussian Blur	60452 3.32 Gpixels/sec
Depth of Field	114010 1.32 Gpixels/sec
Face Detection	14350 110.5 images/sec
Horizon Detection	34431 848.7 Mpixels/sec
Feature Matching	13218 273.4 Mpixels/sec
Particle Physics	294283 7838.5 FPS
SFFT	38959 536.6 Gflops

MacBook Pro (13-inch Mid 2019)

6459

Metal Score

Geekbench 5.1.0 Tryout for macOS x86 (64-bit)

Result Information

Upload Date	January 10 2020 11:00 PM
Views	1

System Information

System Information	
Operating System	macOS 10.14.6 (Build 18G103)
Model	MacBook Pro (13-inch Mid 2019)
Motherboard	Apple Inc. Mac-53FDB3D8DB8CA971 MacBookPro15,4
Processor Information	
Name	Intel Core i5-8257U
Topology	1 Processor, 4 Cores, 8 Threads
Identifier	GenuineIntel Family 6 Model 142 Stepping 10
Base Frequency	1.40 GHz
Memory Information	
Size	8192 MB
Frequency	1066 MHz
Type	LPDDR3
Metal Information	
Device Name	Intel(R) Iris(TM) Plus Graphics 645

Metal Performance

Metal Score	6459
Sobel	4752 1.23 Gpixels/sec
Canny	2801 175.3 Mpixels/sec
Stereo Matching	14725 20.8 Gpixels/sec
Histogram Equalization	5600 987.8 Mpixels/sec
Gaussian Blur	7978 438.5 Mpixels/sec
Depth of Field	14799 171.6 Mpixels/sec
Face Detection	5121 39.4 images/sec
Horizon Detection	4836 119.2 Mpixels/sec
Feature Matching	3501 72.4 Mpixels/sec
Particle Physics	23231 618.8 FPS
SFFT	3125 43.0 Gflops

MacBook Pro (13-inch Mid 2019)

50888

OpenCL Score

Geekbench 5.1.0 Tryout for macOS x86 (64-bit)

Result Information

Upload Date	January 03 2020 11:09 PM
Views	1

System Information

System Information	
Operating System	macOS 10.14.6 (Build 18G103)
Model	MacBook Pro (13-inch Mid 2019)
Motherboard	Apple Inc. Mac-53FDB3D8DB8CA971 MacBookPro15,4
Processor Information	
Name	Intel Core i5-8257U
Topology	1 Processor, 4 Cores, 8 Threads
Identifier	GenuineIntel Family 6 Model 142 Stepping 10
Base Frequency	1.40 GHz
Memory Information	
Size	8192 MB
Frequency	1066 MHz
Type	LPDDR3
OpenCL Information	
Platform Vendor	Apple
Platform Name	Apple
Device Vendor	AMD
Device Name	AMD Radeon Pro WX 9100 Compute Engine
Compute Units	64
Maximum Frequency	945 MHz
Device Memory	16.0 GB

OpenCL Performance

OpenCL Score	50888
Sobel	47379 12.3 Gpixels/sec
Canny	31006 1.94 Gpixels/sec
Stereo Matching	226891 320.9 Gpixels/sec
Histogram Equalization	28465 5.02 Gpixels/sec
Gaussian Blur	67813 3.73 Gpixels/sec
Depth of Field	182023 2.11 Gpixels/sec
Face Detection	11930 91.8 images/sec
Horizon Detection	37512 924.6 Mpixels/sec
Feature Matching	13276 274.6 Mpixels/sec
Particle Physics	210871 5616.7 FPS
SFFT	40390 556.4 Gflops

MacBook Pro (13-inch Mid 2019)

7120

OpenCL Score

Geekbench 5.1.0 Tryout for macOS x86 (64-bit)

Result Information

Upload Date	January 10 2020 10:52 PM
Views	2

System Information

System Information	
Operating System	macOS 10.14.6 (Build 18G103)
Model	MacBook Pro (13-inch Mid 2019)
Motherboard	Apple Inc. Mac-53FDB3D8DB8CA971 MacBookPro15,4
Processor Information	
Name	Intel Core i5-8257U
Topology	1 Processor, 4 Cores, 8 Threads
Identifier	GenuineIntel Family 6 Model 142 Stepping 10
Base Frequency	1.40 GHz
Memory Information	
Size	8192 MB
Frequency	1066 MHz
Type	LPDDR3
OpenCL Information	
Platform Vendor	Apple
Platform Name	Apple
Device Vendor	Intel Inc.
Device Name	Intel(R) Iris(TM) Plus Graphics 645
Compute Units	48
Maximum Frequency	1.05 GHz
Device Memory	1.50 GB

OpenCL Performance

OpenCL Score	7120
Sobel	5668 1.47 Gpixels/sec
Canny	4661 291.8 Mpixels/sec
Stereo Matching	14627 20.7 Gpixels/sec
Histogram Equalization	6132 1.08 Gpixels/sec
Gaussian Blur	6300 346.3 Mpixels/sec
Depth of Field	15021 174.1 Mpixels/sec
Face Detection	4988 38.4 images/sec
Horizon Detection	7070 174.3 Mpixels/sec
Feature Matching	4179 86.4 Mpixels/sec
Particle Physics	28321 754.4 FPS
SFFT	2549 35.1 Gflops

PERFORMANCE: AFTER EFFECTS?

- AMD Radeon Pro WX 9100: 9min, 14 Sec
- Intel Iris Plus Graphics 645: 9min, 16 Sec

While we can attach and set the preference for an external graphics card, After Effects is an example of an application that chooses its own graphics card and is bottlenecked by the internal processor.

GAMING PERFORMANCE WITH EGPU'S

- Not all games support eGPU's
- Performance is based on the graphics card and the Computers internal hardware

PERFORMACE: UNIGINE HEAVEN

UNIGINE HEAVEN, BASIC

Unigine Heaven Benchmark 4.0

FPS: **37.3**

Score: **939**

Min FPS: **8.3**

Max FPS: **74.1**

System

Platform:	Darwin 18.7.0 x86_64
CPU model:	Intel(R) Core(TM) i5-8257U CPU @ 1.40GHz (1391MHz) x8
GPU model	Intel Iris Plus Graphics 645 (256MB) x1

Settings

Render:	OpenGL
Mode:	1280x720 2xAA windowed
Preset	Basic

Powered by UNIGINE Engine

Unigine Corp. © 2005-2013

Unigine Heaven Benchmark 4.0

FPS: **98.6**

Score: **2483**

Min FPS: **16.2**

Max FPS: **156.5**

System

Platform:	Darwin 18.7.0 x86_64
CPU model:	Intel(R) Core(TM) i5-8257U CPU @ 1.40GHz (1391MHz) x8
GPU model:	Intel Iris Plus Graphics 6[illegible]5/Radeon Pro WX 9100 (16384MB) x1

Settings

Render:	OpenGL
Mode:	1280x720 2xAA windowed
Preset	Basic

Powered by UNIGINE Engine

Unigine Corp. © 2005-2013

UNIGINE HEAVEN, EXTREME

Unigine Heaven Benchmark 4.0

FPS: **9.8**

Score: **248**

Min FPS: **4.7**

Max FPS: **22.1**

System

Platform:	Darwin 18.7.0 x86_64
CPU model:	Intel(R) Core(TM) i5-8257U CPU @ 1.40GHz (1391MHz) x8
GPU model	Intel Iris Plus Graphics 645 (256MB) x1

Settings

Render:	OpenGL
Mode:	1600x900 8xAA windowed
Preset	Extreme

Powered by UNIGINE Engine

Unigine Corp. © 2005-2013

Unigine Heaven Benchmark 4.0

FPS: **46.9**

Score: **1180**

Min FPS: **9.8**

Max FPS: **87.3**

System

Platform:	Darwin 18.7.0 x86_64
CPU model:	Intel(R) Core(TM) i5-8257U CPU @ 1.40GHz (1391MHz) x8
GPU model:	Intel Iris Plus Graphics 64 5/Radeon Pro WX 9100 (16384MB) x1

Settings

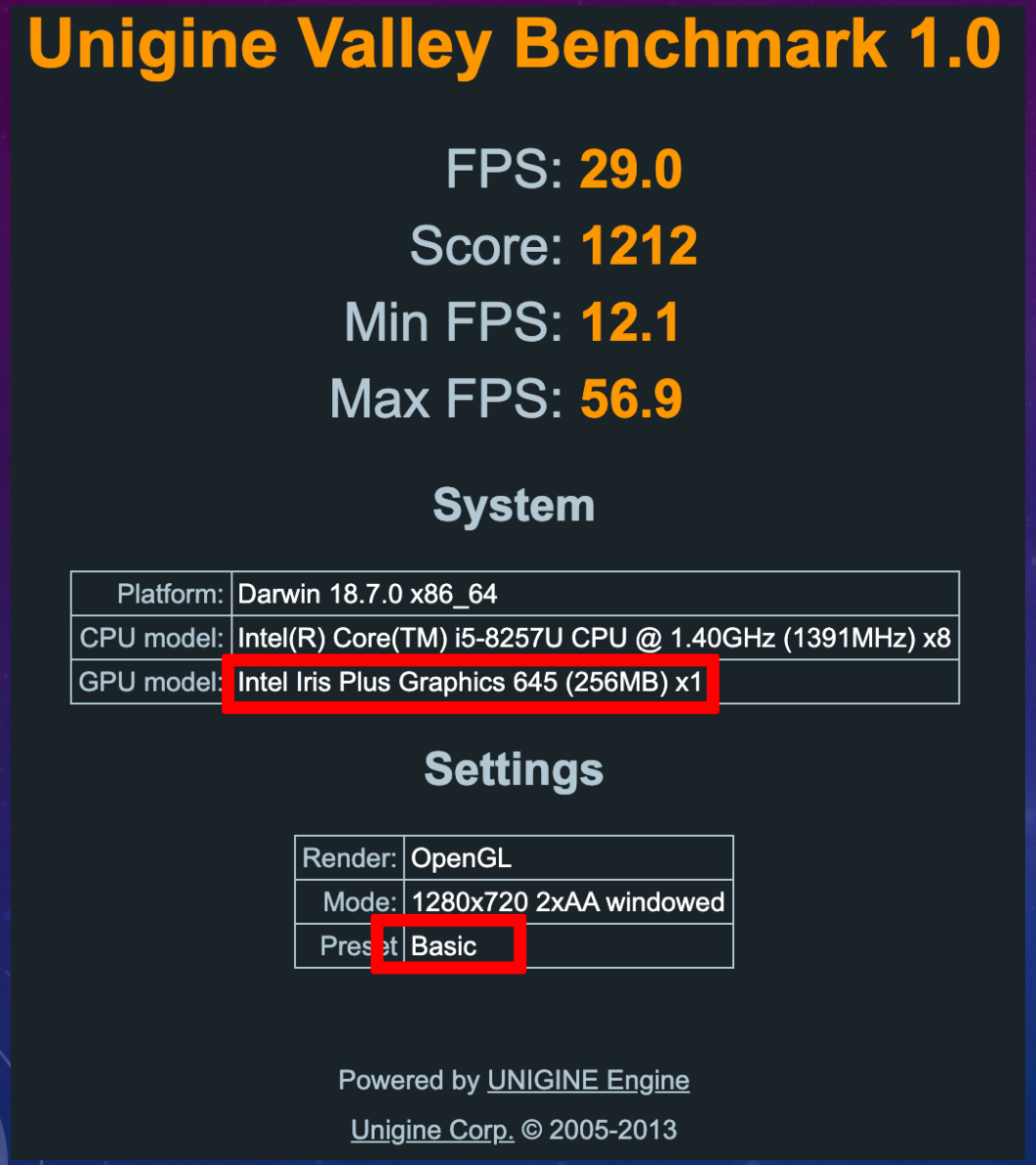
Render:	OpenGL
Mode:	1600x900 8xAA windowed
Preset	Extreme

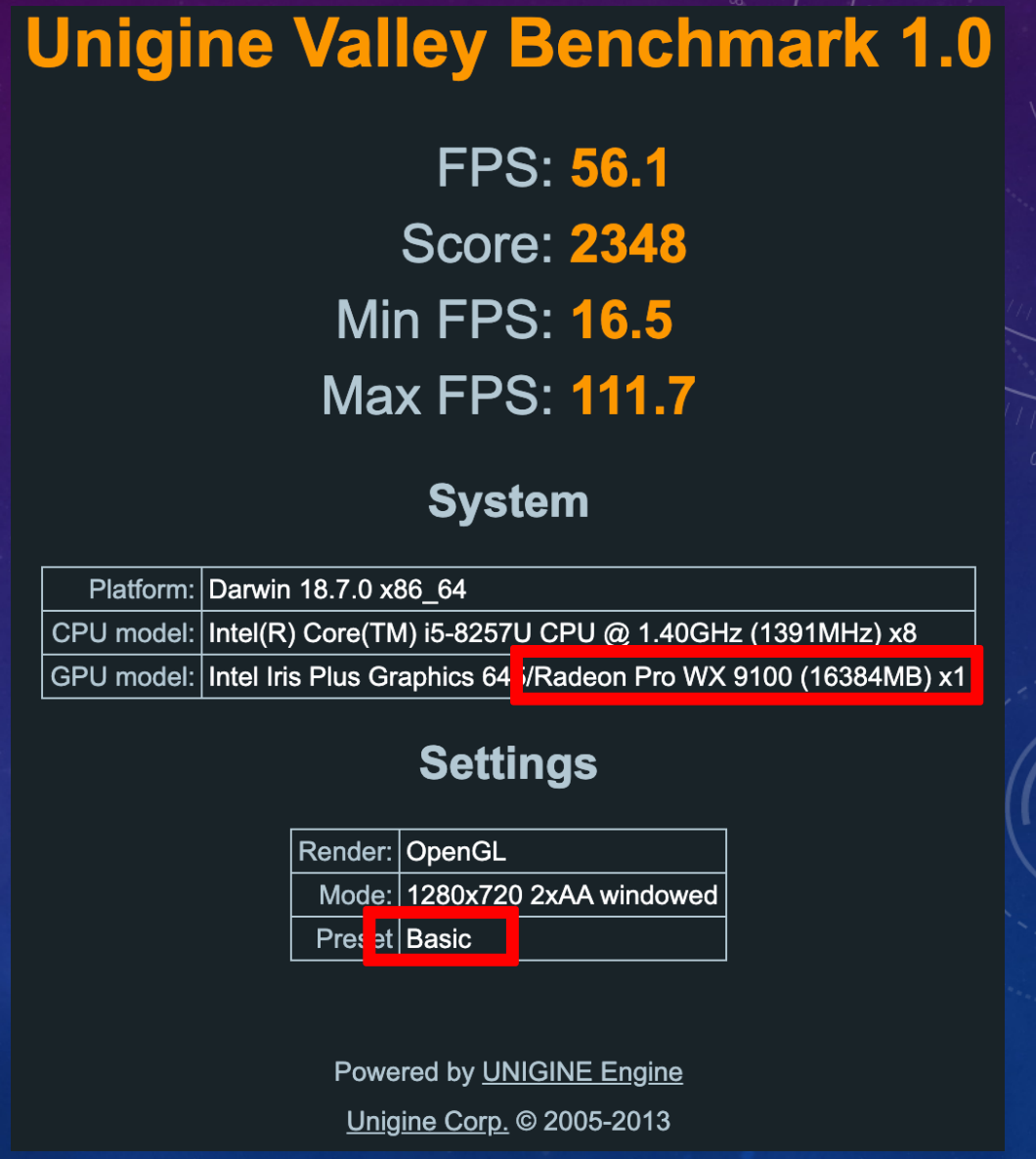
Powered by UNIGINE Engine

Unigine Corp. © 2005-2013

PERFORMACE: UNIGINE VALLEY

UNIGINE VALLEY, INTEGRATED





UNIGINE VALLEY, EGPU

Unigine Valley Benchmark 1.0

FPS: **10.4**

Score: **435**

Min FPS: **6.4**

Max FPS: **17.3**

System

Platform:	Darwin 18.7.0 x86_64
CPU model:	Intel(R) Core(TM) i5-8257U CPU @ 1.40GHz (1391MHz) x8
GPU model:	Intel Iris Plus Graphics 645 (256MB) x1

Settings

Render:	OpenGL
Mode:	1600x900 8xAA windowed
Preset:	Extreme

Powered by UNIGINE Engine

Unigine Corp. © 2005-2013

Unigine Valley Benchmark 1.0

FPS: **41.0**

Score: **1715**

Min FPS: **13.9**

Max FPS: **69.2**

System

Platform:	Darwin 18.7.0 x86_64
CPU model:	Intel(R) Core(TM) i5-8257U CPU @ 1.40GHz (1391MHz) x8
GPU model:	Intel Iris Plus Graphics 64[illegible]/Radeon Pro WX 9100 (16384MB) x1

Settings

Render:	OpenGL
Mode:	1600x900 8xAA windowed
Preset:	Extreme

Powered by UNIGINE Engine

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PROGRAMMING AND OTHER APPS

- Xcode can utilize an eGPU to improve the simulation of devices
- Other compilers do not seem to utilize eGPU’s

- DaVinci Resolve Studio has support for multiple eGPU’s boosting the performance drastically
- Premier Pro Does take advantage of the eGPU, but multiple eGPU’s are not utilized

SECURING THE ENCLOSURES

- We currently plan on using a lock and drilling a small hole just large enough for the lock to fit into in the handle and the frame of the enclosure so that students/patrons cannot pull out the graphics card inside
- This also allows us to attach security cables to the enclosure