Intel HD Graphics for modern workstation applications - No discrete card required

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Graphics Software Engineer
Agenda

- Processor Graphics overview
- Introduction to Intel Xeon processor family
- Performance Improvements of Entry-level Workstation Applications Year over Year
- AutoCAD 2014 – Collaboration and Demonstration
- Proliferation into different form factors
- Trends we are setting – Pixel Sync

We will be giving away 5 SSD’s at the conclusion of this class. Don’t miss your chance to win!
Learn what Intel’s processor graphics can deliver to workstation applications

- Understand the advances in processor graphics technology over the past three generations.
- Intel® Xeon® E3 v3 in entry level workstation Computer Aided Design and Media and Entertainment market with certification of AutoCAD, 3ds Max, Maya and improved performance with key benchmarks CADalyst and SpecAPC.
- Watch demonstration of how Autodesk products can take advantage of all the capabilities of the workstation platform in a desktop environment, while allowing users collaboration and synchronization of drawings by integration between office and the field on the mobile device.
Key learning objectives

At the end of this class, you will be able to:

- Understand capabilities of Intel® HD Graphics offering
- Gain awareness of Intel® Xeon® E3 processor family and its performance
- Learn how Intel’s technology enables collaboration, synchronization, with anytime, anywhere access
Processor Graphics Overview

The Platform Evolves - Intel® HD Graphics

Intel® Core™ and Xeon® technology
Intel HD Graphics Journey

Processor Graphics Leadership

- **Processor, Graphics and Memory Controller in one package**
- **32nm Processor Core**
- **45nm Gfx & Mem Controller**

**Intel® Core™ processor with HD Graphics**

**2nd Gen Intel Core processor with HD Graphics 3000**

**3rd Gen Intel Core processor with HD Graphics 4000**

**4th Gen Intel Core processor with HD Graphics 4600**

- **EUs: 12**
- **EUs: 16**
- **EUs: 20 / 40**

- **APIs: DX 11.0; OGL 3.0; 1.2; OGL 4.2**
- **Sys Mem: 32 GB (1.5 GB video RAM)**
- **7-8x Real Time Transcode**
- **10x Real Time Transcode**

- **Graphics with eDRAM & maximum perf/watt**

- **22nm**

Delivering Leadership Visual Computing Products

- **2010**
- **2011**
- **2012**
- **2013**
- **2014**
## Intel® Processor Comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>Xeon® E3-1200 v3 Product Family</th>
<th>4th Generation Intel® Processors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Core™ i7</td>
</tr>
<tr>
<td><strong>Cache Size</strong></td>
<td>8 MB</td>
<td>Iris™ Pro Graphics 6M [128MB eDRAM]</td>
</tr>
<tr>
<td><strong>Clock Speed</strong></td>
<td>Up to 3.9GHz</td>
<td>Up to 3.8 - 2.6GHz</td>
</tr>
<tr>
<td><strong>Max number of displays</strong></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Max TDP/ Power</strong></td>
<td>84W</td>
<td>Desktop 84 – 35W</td>
</tr>
<tr>
<td><strong>Intel Technologies</strong></td>
<td>Hyper Threading: Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Turbo Boost: Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
# Graphics Comparison

<table>
<thead>
<tr>
<th>Specification</th>
<th>Intel® HD Graphics P4600</th>
<th>Intel® HD Graphics 4x00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional certifications</td>
<td>Certified on 13 applications from Autodesk, Adobe, Solid Works, Bentley and Siemens</td>
<td>No</td>
</tr>
<tr>
<td>Processor Clock Speed</td>
<td>Up to 3.9 GHz</td>
<td>Up to 3.8 GHz</td>
</tr>
<tr>
<td>Execution Units</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Shared L3 Cache</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Graphics Frequency (MAX)</td>
<td>Up to 1350 MHz</td>
<td>Up to 1150 MHz</td>
</tr>
<tr>
<td>ECC Memory</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Max Dynamic Video Memory (Windows* 7 for 1 GB/2 GB/&gt;4 GB System Memory)</td>
<td>256 MB/783 MB/1692 MB</td>
<td>256 MB/783 MB/1692 MB</td>
</tr>
</tbody>
</table>
Intel® Processor Graphics Overview

3D Graphics
- New Supported APIs: DX11.1, OpenCL 1.2, OpenGL 4.2
- Targeting significant YoY 3D performance improvements
- Enhancements to Tessellation, Geometry and Sampler

Display
- 3 Symmetric Display Pipes
- DP v1.2 Support
- User Control Panel Enhancements for New Features

Media
- MVC Full HW Encode/Decode, Better AVC Encode
- Fully accelerated MPEG-2 Encode
- JPEG/MJPEG HW Decode

4th Generation of Processor Graphics with Major New Features
Introduction to Intel® Xeon® Processor Family
Intel Workstation “2013” Portfolio

Delivering the Capability, Capacity, Security and Reliability You Expect from a Workstation

- **Mobile Workstation**
  - Core i7

- **Entry Workstation**
  - Xeon E3 12XX V3
  - Includes processor graphics
  - ECC memory support
  - Expanded feature set

- **Essential Workstation**
  - 1 Socket Xeon E5
  - No processor graphics
  - High performance and IO scalability
  - High core count, larger cache

- **Expert Workstation**
  - Dual Socket Xeon E5
  - Highest performance and maximum memory
Intel® Workstation Platform Summary

Platform

Intel® Xeon® E3-1200 v3

Intel® C220 Series Chipset

Increased CPU Performance
Improved Responsiveness

Memory Error Correction
Data Center Power Manageability

Reliability, Security,
Manageability

Performance

Maximizing node density
Performance/Watt, Cost leadership

Graphics and Media

Performance Density Leadership

Enhanced Media Performance
Enhanced Built-In Visuals

Intel® Workstation platform delivers exciting new capabilities and increased performance
Intel HD Graphics Journey
Delivering Dramatically Improved Media and Graphics Performance and Capabilities


2011 2012 2013 2014

AutoCAD 2nd Gen Intel Core processor with HD Graphics 3000
Inventor 22nm
Revit 3rd Gen Intel Core processor with HD Graphics 4000

22nm

4th Gen Intel Core processor with HD Graphics 4600

Autodesk Certifications
AutoCAD Inventor Revit
3dsMax Maya Showcase SoftImage
Showcase

3dsMax
Maya
Showcase
SoftImage

Available with broad ISV Certification and Optimization
Meets End User Performance and Feature Requirements

Mud Box Motion Builder
Performance Improvements of Entry-level Workstation Applications Year over Year
AutoCAD 2014 – Configuration settings on Intel platform

Enable Hardware Acceleration
AutoCAD Performance Improvement YOY on CADalyst

- **Intel® Xeon® Processor E3-1275v3 vs. Intel® Xeon® Processor E3-1275v2**

Cadalyst® 2012

<table>
<thead>
<tr>
<th>Component</th>
<th>Intel® Xeon® Processor E3-1275v3</th>
<th>Intel® Xeon® Processor E3-1275v2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td><em>1.15</em></td>
<td><em>1.15</em></td>
</tr>
<tr>
<td>3D Graphics</td>
<td><em>1.22</em></td>
<td><em>1.39</em></td>
</tr>
<tr>
<td>2D Graphics</td>
<td><em>1.09</em></td>
<td><em>1.18</em></td>
</tr>
<tr>
<td>Disk</td>
<td><em>1.18</em></td>
<td><em>1.22</em></td>
</tr>
</tbody>
</table>

* Intel® Xeon® Processor E3-1275v3 vs. Intel® Xeon® Processor E3-1275v2

Cadalyst® 2012
**AutoCAD2014 – CADalyst2012**

**Intel HD Graphics 4600 vs. competition entry level card**

### Intel Xeon E3 1275 v3 vs. Quadro K600

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Intel Xeon E3 1275 v3</th>
<th>Quadro K600</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D Graphics Index</td>
<td>919</td>
<td>960</td>
</tr>
<tr>
<td>2D Graphics Index</td>
<td>459</td>
<td>472</td>
</tr>
<tr>
<td>Disk Index</td>
<td>250</td>
<td>260</td>
</tr>
<tr>
<td>CPU Index</td>
<td>369</td>
<td>365</td>
</tr>
</tbody>
</table>

**Individual Dwg Index**

- Intel: 473
- Quadro: 487

**Total Index**

- Intel: 497
- Quadro: 523

**3D Graphics Index score difference is <10%**
AutoCAD performance – Competition data

Results

**AutoCAD 2014 - C2012 3D Graphics Index**

Intel® Xeon® Processor E3 v3 performance

Intel® Xeon® E3 v3 (Haswell) Generation to Generation

Intel® Xeon® Processor E3-1275v2

1.0

Intel Xeon Processor E3-1285 v3

AutoCAD2014 Cadalyst 2012 3D Graphics Index

1.39

SpecAPC – Maya2014

1.28

SpecAPC 3dsMAx2011 GPU Composite

1.18

Adobe Photoshop® CS6 GPU Utility

1.18

Higher is Better
AutoCAD 2014 – Collaboration and Demonstration
AutoCAD 2014 Collaboration & Highlights

- Graphics Certification
  - Your work is critical
  - Graphics must be correct, consistent, reliable
  - Certification involves passing key graphics conformance tests
  - Intel HD Graphics is certified for AutoCAD:
    - AutoCAD 2011-2012: **HD Graphics, HD P4000**
    - AutoCAD 2013: **HD P4000**
    - AutoCAD 2014: **HD P4600/P4700**
  - Visit the Autodesk certification [website](#):
AutoCAD 2014 Collaboration & Highlights

- **Performance**
  - Intel HD Graphics performance is similar to discrete graphics from a few years ago. Passmark [G3D Mark](#):
    - This level performs well for a wide range of 2D/3D DWGs
      - Demo will demonstrate this
    - Performance per watt is unmatched = maximum battery life
      - MacBook Pro w/ Intel graphics = 8 hours battery life
AutoCAD 2014 Collaboration & Highlights

- Demo
  - AutoCAD 2014 + Xeon w/ HD P4600 graphics
  - 3D – Machine, Bath
  - Rendering – Condo
  - Point Cloud – Sailboat (22GB)
AutoCAD 2014 Collaboration & Highlights

- Technology direction
  - Maximize your hardware investment
  - Intel: Increasing # of cores (CPU and GPU), better cores
  - Autodesk: Increasing utilization of those cores
    - CPU cores: Compartmentalize software to run on multiple cores
    - GPU cores: Move more work from CPU to GPU
  - Future = richer, faster graphics experience
Proliferation into different form factors
Maya workstation/ Maya LT tablet Demonstration
Trends we are setting – Pixel Sync
Order-Independent Transparency Approximation with Pixel Synchronization

- Pixel Synchronization: Order Independent Transparency (OIT) using Intel’s extension for pixel synchronization is available on 4th Generation Intel® HD Graphics.

- Demo shows 4 transparency rendering techniques including Pixel Synchronization
  - Alpha Blending
  - Alpha Blending with Alpha to Coverage
  - Adaptive Transparency routine implemented using DX11
  - The OIT algorithm using Intel® 4th Generation Graphics pixel synchronization extension

- Hardware implementation using Programmable Blend with Pixel Shader Ordering.

- Software implementation using specific extension
  GLSL: \textit{INTEL\_fragment\_shader\_ordering}, HLSL: \textit{WriteNewPixelToAoit}
Conclusion

• Intel Processor Graphics performance is increasing at a fast pace.
• Continue to expand software vendor application certification and optimizations.
• Ideal platform for entry level workstation segment market