Atom™ -x5/x7 series processor, codenamed Cherry Trail

Steven Tu
Cherry Trail Chief Architect, Senior Principal Engineer, Intel Corporation
Outline

• Cherry Trail SoC architecture product family

• Process generations for mobile product line

• Functional diagram

• Architecture & building blocks:
  - Power & power management: Rails and islands, Dynamics voltage and frequency scaling

• Performance
  - CPU, Graphics, and Media

• Cherry Trail SKUs and Feature set
Cherry Trail SoC Architecture & Product Family

“Cherry Trail” product family
Intel Atom x5-Z8500/x7-Z8700, 17x17 T4 FCBGA, 628 IOs
Intel® Atom™ x5-Z8300, 17x17 T3 FCBGA, 378 IOs

“Braswell” product family
Intel Pentium™ N37xx, 25x27 T3 FCBGA, 641 IOs
Intel Celeron™ N30xx/3100, 25x27 T3 FCBGA, 641 IOs

• The first on Intel 14nm SoC process
• 25% smaller than its predecessor Bay Trail
• 30% more transistors than its predecessor Bay Trail
• >2X more graphics performance than its predecessor Bay Trail
Continues to deliver to Moore’s Law - accelerated Cherry Trail by >1 year on the leading 14nm processor node to meet market demands

The new Intel Atom x5/x7 SoC architecture provides generational improvements: compute performance and battery life, scalability features, versatile form factors
Intel® Atom™ x5 and x7 SoC Platform Block Diagram

- LP-DDR3/DDR3L 1600
- Airmont Dual Core CPU
- 1MB L2
- PCI Express / SDIO 3.0
- Gen 8 3D/2D Graphics Media (decode/encode)
- Security Processor
- I2S
- Low Power Audio Processor
- USB 3.0 xHCI + xDCI
- SD card
- SPI
- USB OTG
- I2C
- SVID
- PMIC
- Embedded DisplayPort
- MIPI-DSI (2x4)
- Display Ctrl
- MIPI-CSI
- UART
- SPI
- Quad IO SPI
- Integrated Sensor Hub
- Camera
- Sensors
- Touch
- Storage
- WiGig

Up to 2K internal display
DP – 25x16/60 HDMI – 4K/30
Camera

- Airmont Dual Core CPU
- 1MB L2
- Security Processor
- I2S
- Low Power Audio Processor
- USB 3.0 xHCI + xDCI
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- WiGig

Intel® XMM™ 726X LTE Modem (motherboard down, M.2 modules)

Wireless Connectivity Wi-Fi® & Bluetooth®

GNSS
NFC

Audio Codec

DRAM
LP-DDR3 3

LP-DDR3/DDR3L 1600
PCI Express / SDIO 3.0
HSUART
I2S
Security Processor
I2C
Low Power Audio Processor
USB 3.0 xHCI + xDCI
SD card
SPI
USB OTG
I2C
SVID
PMIC

Embedded DisplayPort
MIPI-DSI (2x4)
Display Ctrl
MIPI-CSI
UART
SPI
Quad IO SPI
Integrated Sensor Hub
Camera
Sensors
Touch
Storage
WiGig

USB 2.0
USB HSIC
USB SSIC
SD card
I2S
USB OTG
PMIC

Embedded DisplayPort
MIPI-DSI (2x4)
Display Ctrl
MIPI-CSI
UART
SPI
Quad IO SPI
Integrated Sensor Hub
Camera
Sensors
Touch
Storage
WiGig
Memory and SoC Architecture

- Single/Dual x32/x64 ch LPDDR3/DDR3L 1600MHz
- Asynchronous link between System Agent to Memory Controller
- Multiple flexible System Agent arbitration to ensure isochronous traffic and allow maximizing DDR self-refresh time for power management
- Two dual-core AMT module with 1MB L2 each
- GEN8LP direct System Agent connection, max possible memory bandwidth
- Direct imaging and display controller connection to System Agent
# Memory Scalability

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Intel® Atom™ x5-8500/x7-8700</th>
<th>Intel Atom x5-8300</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17x17 T4</td>
<td>17x17 T3</td>
</tr>
<tr>
<td>Memory Type</td>
<td>LPDDR3</td>
<td>DDR3L</td>
</tr>
<tr>
<td></td>
<td>DDR3L¹</td>
<td>LPDDR3</td>
</tr>
<tr>
<td>Connector</td>
<td>Memory Down</td>
<td>Memory Down</td>
</tr>
<tr>
<td>SM Voltage</td>
<td>1.2v/1.35v</td>
<td>1.35v/1.2v</td>
</tr>
<tr>
<td>Speed (MT/s)</td>
<td>1066²/1600</td>
<td>1066²/1600</td>
</tr>
<tr>
<td>Channels/width</td>
<td>2x32¹, 2x64</td>
<td>1x32, 1x64</td>
</tr>
<tr>
<td>Capacity (GB)</td>
<td>1, 2, 3³, 4, 8, 16³</td>
<td>1, 1.5³, 2, 4, 8³</td>
</tr>
<tr>
<td>Max Bandwidth (GB/s)</td>
<td>12.8, 25.6</td>
<td>6.4, 12.8</td>
</tr>
</tbody>
</table>

Notes: 1: support via white paper. 2: Dynamically configured low frequency gear if DDR power saving feature is enabled by the platform configuration. 3: memory parts not Intel Platform Memory Organization's official suggested DRAM part list, may not be validated on Intel reference validation platform boards.
Airmont CPU Architecture and Design Improvements

• Two Dual-Core module with 1MB L2, Max Turbo frequency up to 2.4GHz
• Evolution based on Silvermont
• Optimized for 14nm
• Key IPC improvements
  - Doubled branch predictor array sizes
  - Out-of-order functions
    ▪ Larger Reorder Window
    ▪ Deeper Reservation Stations
    ▪ Deeper Store Buffer
    ▪ More load misses in flight
  - Doubled data TLB size
  - Targeted FP execution improvements
• Support for IDI (process bus) parity
## Silvermont/Airmont Architecture: New Instructions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AES-NI</strong>&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Instructions to perform AES encryption and decryption</td>
<td>• Supports 128, 192, 256 bit keys and all modes of operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mitigates all known software side channel attacks</td>
</tr>
<tr>
<td><strong>PCLMULQDQ instruction</strong></td>
<td>New instruction to improve AES-GCM (Galois Counter Mode) performance</td>
<td>• High Performance Message Authentication</td>
</tr>
<tr>
<td><strong>Intel® Secure Key</strong>&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Provides high quality random numbers to all software</td>
<td>• Harden attack surface</td>
</tr>
<tr>
<td>(RDRAND instruction)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VM Functions</strong>&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Allow VMX non-root to load new EPT pointers</td>
<td>• Hardware assists for security technologies</td>
</tr>
<tr>
<td>(VMFUNC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SSE4.1</strong></td>
<td>47 new instructions</td>
<td>• Primitives for compiler auto-vectorization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Media acceleration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Streaming loads to speed up accesses to device memory</td>
</tr>
<tr>
<td><strong>SSE4.2, POPCNT</strong></td>
<td>7 new instructions</td>
<td>• Accelerated String and Text Processing of Large Data Sets</td>
</tr>
</tbody>
</table>

3 Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see Intel® Advanced Encryption Standard Instructions (AES-NI).

4 No system can provide absolute security. Requires an Intel® Secure Key-enabled platform, available on select Intel processors, and software optimized to support Intel Secure Key. Consult your system manufacturer for more information.
### Silvermont/Airmont Architecture: New Technologies

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel® VT-x2</td>
<td>Extended Page Tables</td>
<td>• Performance improvement by Guest OS being able to modify its own page tables reducing VM exits. Memory savings by eliminating need for shadow page tables.</td>
</tr>
<tr>
<td></td>
<td>Virtual Processor ID support</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unrestricted Guest</td>
<td></td>
</tr>
<tr>
<td>Real Time Instruction Tracing</td>
<td>Real time trace of executing code</td>
<td>• Enhanced Real-Time Hardware Debug</td>
</tr>
</tbody>
</table>
| Intel® OS Guard (SMEP)   | Helps prevent attacks on OS from using application code | • Increased Security  
4 No system can provide absolute security. Requires an Intel® Secure Key-enabled platform, available on select Intel processors, and software optimized to support Intel Secure Key. Consult your system manufacturer for more information. |
| TSC Deadline Timer       | Allows more precise timer interrupts | • Simplifies timer interrupt programming  
• Avoids drift/inaccuracy |
| LBR Filtering            | Last Branch Record Filtering       | • Enhanced Debug                                                         |

4 No system can provide absolute security. Requires an Intel® Secure Key-enabled platform, available on select Intel processors, and software optimized to support Intel Secure Key. Consult your system manufacturer for more information.
GEN8LP Graphics and Media

• Leading features
  • Support DirectX11, OpenGL ES3.0, OpenCL1.2, OpenGL4.3, RS Compute
  • Supports higher precision computes and OpenCL 1.2, natively supports latest texture compression formats like ETC and ASTC-LDR

• Performance & Power
  • >2x performance per watt improvement
  • 4x compute and pixel throughput, 2x texture throughput
  • Power wells for 3D and Media, sub-slice and EU power gating
  • Native 16 bit computes with 2x performance at ISO power
  • Power optimized for UI high ppi workloads
Architecture - GEN8LP Graphics

• EU (Execution Unit)
  - 7 HW threads per EU, 128 “GRF” registers per thread, 32 bytes per “GRF” register
  - Arch register, SMT Instruction Dispatcher
  - 2 floating point units, Branch and messaging unit

• Sub-slice
  - 8 EUs, thread dispatcher, instruction cache, texture/image sampler unit
  - 64 bytes/cycle read bandwidth

• Slice
  - 2 Sub-slices x 8 = 16 EUs.
  - 2x8x7=112 hardware threads
  - L3 data cache, 384KB/slice, 64 byte cachelines,
  - Shared local memory 64KB/Subslice
Architecture - GEN8LP Media

- Major media asserts
  - Multi-format codec engine:
    - video decode (HEVC, H.264, VP8, MPEG2, JPEG etc.)
    - video encode (H.264, VP8, MVC, JPEG, etc.)
  - Video quality engine: Video and imaging enhancement
  - Media sampler: video motion estimation, image enhancement filter, advanced video scalar
- A multi-generation transition for media processing
  - Dedicated media fixed function unit
  - Race-to-halt
  - Fine granularity power management
Notes: 1. requires slightly power increase, not yet official SKU. 2. this requires a DP-to-HDMI convert chip, which converts DP1.1 with HDCP1.4 to HDMI2.0 up to 4k2k @60Hz with HDCP2.2. not yet official SKU. 3. multiple displays configuration may have performance implications depending on resolutions, check platform design guide for details.
“Always On, Always Sensing” and it provides the following functions to support this goal:

- Acquisition / sampling of sensor data
- The ability to combine data from individual sensors to create a more complex Virtual sensor that can be directly used by the firmware/OS.
- Low power operation through clock gating and power gating of parts of the ISH together with the ability to turn sensors off.
- The ability to operate independently when the host platform is shut off
Power Management – Rails and Islands

• Power Rails
  - total 9 rails from PMIC
  - Power states
    ▪ S0: all rails on
    ▪ S0i3/S3: CPU & GPU rails off, SOC & IO rails on
    ▪ S4/S5/RTC: only RTC rail on

• Power Islands
  - Implemented at physical partition cluster level
  - Up to 2 islands and 1 AON island per cluster
  - 40+ clusters
Power Management - DVFS: Dynamic Voltage and Frequency Scaling

• DVFS domain:
  - CPU cores: fine level VID (voltage level ID) control
  - Graphics & Media: fine level VID (voltage level ID) control
  - Imaging processing unit
    ▪ Imaging pipe frequency is driven by use cases
    ▪ Pipeline frequency drives voltage level
  - Display processing unit
    ▪ Resolution drives pipeline frequency, which in turns drives voltage level
  - DRAM DVFS
    ▪ Dynamically switch among 1600, 1066, or 800MHz DRAM frequency, lower DDR Phy voltage level while operating at lower frequency modes, turning off ODT mode while at lower frequency modes
    ▪ DDR PHY frequency is driven by memory bandwidth demand which is drive by use cases
    ▪ DDR PHY frequency may switch from 1600 to 1066 or lower if down switching criteria is met, up switching is also true based if BW demand increases
    ▪ Challenge is to achieve power saving while avoid quality of service disruption during down and up switching, i.e. to ensure no display glitch, camera image distortion, etc.
Application Performance

Cherry Trail offers the same great performance as Bay Trail for Windows Desktop Applications and Web Applications

Source: Intel Corporation

*Other names and brands may be claimed as the property of others

See appendix for configurations details and important disclaimers
Cherry Trail offers ~2X higher 3D Gaming Performance compared to Bay Trail
Media Performance – Video conversion

Cherry Trail is up to 60% faster on video conversion compared to previous generation Bay Trail

Source: Intel Corporation

Cyberlink Media Espresso* Full HD Workload
Time in seconds (lower is better)

- Microsoft Surface 3 (4GB) Intel® Atom™ Processor x7-Z8700 (Cherry Trail) - 104 seconds
- HP Elite Pad Intel® Atom™ Processor Z3795 (Bay Trail) - 167 seconds

See appendix for configurations details and important disclaimers

*Other names and brands may be claimed as the property of others
 Longer battery life while playing full-HD movies and video on Microsoft* Surface 3* with the Intel® Atom™ x7-Z8700 Processor.

Source: Intel Corporation
As measured by Tears of Steel* Video Playback Battery Rundown workload
See appendix for configurations details and important disclaimers
## Intel® Atom™ x5/x7 SoC SKUs & Features

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<thead>
<tr>
<th>Specifications</th>
<th>Intel® Atom™ x5-8300</th>
<th>Intel Atom x5-8500</th>
<th>Intel Atom x7-8700</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario Design Power</strong></td>
<td>2 watts</td>
<td>2 watts</td>
<td>2 watts</td>
</tr>
<tr>
<td><strong>Form Factor</strong></td>
<td>7” to 11.6” tablet, and small screen 2 in 1s</td>
<td>7” to 11.6” tablet, and small screen 2 in 1s</td>
<td>7” to 11.6” tablet, and small screen 2 in 1s</td>
</tr>
<tr>
<td><strong>CPU</strong></td>
<td>Quad core 64-bit Atom x5 Up to 1.84 GHz</td>
<td>Quad core 64-bit Atom x5 Up to 2.24 GHz</td>
<td>Quad core 64-bit Atom x7 Up to 2.4 GHz</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>14nm</td>
<td>14nm</td>
<td>14nm</td>
</tr>
<tr>
<td><strong>Graphics (GPU)</strong></td>
<td>Gen8 12EU, up to 500MHz DirectX 11.1, OpenGL® ES 3.1, OpenCL® 1.2, OpenGL 4.3, RS Compute</td>
<td>Gen8 12EU, up to 600 MHz DirectX 11.1, OpenGL ES 3.1, OpenCL 1.2, OpenGL 4.3, RS Compute</td>
<td>Gen8 16EU, up to 600 MHz DirectX 11.1, OpenGL ES 3.1, OpenCL 1.2, OpenGL 4.3, RS Compute</td>
</tr>
<tr>
<td><strong>Media (Encode/Decode)</strong></td>
<td>HEVC (decode), H.264, VP8</td>
<td>HEVC (decode), H.264, VP8</td>
<td>HEVC (decode), H.264, VP8</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>1x32, 1x64 DDR3L-1600, 1-2GB</td>
<td>2x64 LPDDR3 1600, 2-8GB</td>
<td>2x64 LPDDR3 1600, 2-8GB</td>
</tr>
<tr>
<td><strong>Display Resolution</strong></td>
<td>INTERNAL: 1920x1200 (MIPI®-DSI or LVDS) EXTERNAL: 1920x1080 (HDMI™)</td>
<td>INTERNAL: up to 25x16 (MIPI®-DSI or Embedded DisplayPort™ (eDP)) EXTERNAL: up to 4k2k (HDMI) INTERNAL: up to 25x16 (MIPI®-DSI or eDP) EXTERNAL: up to 4k2k (HDMI)</td>
<td>INTERNAL: up to 25x16 (MIPI®-DSI or eDP) EXTERNAL: up to 4k2k (HDMI)</td>
</tr>
<tr>
<td><strong>Modem (Discrete)</strong></td>
<td>Intel® XMM™ 7260/62 LTE Cat-6 (up to 300Mbps DL, 50Mbps UL for modem-down)</td>
<td>Intel XMM 7260/62 LTE Cat-6 (up to 300Mbps DL, 50Mbps UL for modem-down)</td>
<td>Intel XMM 7260/62 LTE Cat-6 (up to 300Mbps DL, 50Mbps UL for modem-down)</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td>Intel® WLAN, Intel® WWAN (M.2 modules), Intel® NFC</td>
<td>Intel WLAN, Intel WWAN (Intel XMM 726x), Intel NFC</td>
<td>Intel WLAN, Intel WWAN (Intel XMM 726x), Intel® WiGig®, Intel NFC</td>
</tr>
<tr>
<td><strong>Input Output</strong></td>
<td>6xI2C, 2xHSUART, 1xSDIO, 3x12S, SPI®, PCI Express® (PCIe®) 2.0 x1, 1x12C(ISH), 1x12C (NFC) 7xI2C®, 2xHSUART, 1xSDIO, 3x12S, 1xLPC, 1xSPI®, PCIe 2.0 x2, 1x PCIe® (ISH), 1x12C (NFC)</td>
<td>7xI2C®, 2xHSUART, 1xSDIO, 3x12S, 1xLPC, 1xSPI®, PCIe 2.0 x2, 1x PCIe® (ISH), 1xI2C(NFC)</td>
<td>7xI2C®, 2xHSUART, 1xSDIO, 3x12S, 1xLPC, 1xSPI®, PCIe 2.0 x2, 1x PCIe® (ISH), I2C®(NFC)</td>
</tr>
<tr>
<td><strong>USB</strong></td>
<td>1xUSB3 OTG, 2xHSIC, 3xUSB2</td>
<td>1xUSB3 OTG, 3xUSB3®a 2xSSIC, 2xHSIC</td>
<td>1xUSB3 OTG, 3xUSB3®a 2xSSIC, 2xHSIC</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>eMMC 4.51®</td>
<td>eMMC 4.51®</td>
<td>eMMC 4.51®</td>
</tr>
<tr>
<td><strong>ISP / Camera (rear/front)</strong></td>
<td>Up to 8MP Intel® RealSense™ Snapshot</td>
<td>Up to 13MP Intel® RealSense™ 3DCamera</td>
<td>Up to 13MP Intel RealSense 3DCamera</td>
</tr>
</tbody>
</table>

1Max. CPU Burst Frequency for 1 or 2 Cores. Max. CPU Burst Frequency for 3 or 4 cores bursting simultaneously is 1.60GHz
2Additionally, LPDDR3 can be supported on customer designs if needed
3Simultaneous display resolution capabilities may differ.
4General Purpose I2C
5USB 3.0 backward compatible to USB 2.0
6eMMC 5.0 storage devices can be used and are compatible with the eMMC 4.51 storage controller included in the Intel Atom x5/x7

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Scenario Design Power:
- Intel® Atom™ x5-8300: 2 watts
- Intel Atom x5-8500: 2 watts
- Intel Atom x7-8700: 2 watts

Form Factor:
- 7” to 11.6” tablet, and small screen 2 in 1s

CPU:
- Quad core 64-bit Atom x5
- Up to 1.84 GHz

Process:
- 14nm

Graphics (GPU):
- Gen8 12EU, up to 500MHz
- DirectX 11.1, OpenGL® ES 3.1, OpenCL® 1.2, OpenGL 4.3, RS Compute

Media (Encode/Decode):
- HEVC (decode), H.264, VP8

Memory:
- 1x32, 1x64 DDR3L-1600, 1-2GB
- INTERNAL: 1920x1200 (MIPI®-DSI or LVDS)
- EXTERNAL: 1920x1080 (HDMI™)

Display Resolution:
- INTERNAL: 1920x1200 (MIPI®-DSI or LVDS)
- EXTERNAL: 1920x1080 (HDMI™)

Modem (Discrete):
- Intel® XMM™ 7260/62 LTE Cat-6 (up to 300Mbps DL, 50Mbps UL for modem-down)

Modem (Discrete) (Discrete):
- Intel® XMM™ 7260/62 LTE Cat-6 (up to 300Mbps DL, 50Mbps UL for modem-down)

Connectivity:
- Intel® WLAN, Intel® WWAN (M.2 modules), Intel® NFC

Input Output:
- 6xI2C®, 2xHSUART, 1xSDIO, 3x12S, SPI®, PCI Express® (PCIe®) 2.0 x1, 1x12C(ISH), 1x12C (NFC)

Input Output (Discrete):
- 6xI2C®, 2xHSUART, 1xSDIO, 3x12S, SPI®, PCI Express® (PCIe®) 2.0 x1, 1x12C(ISH), 1x12C (NFC)

USB:
- 1xUSB3 OTG, 2xHSIC, 3xUSB2
- 1xUSB3 OTG, 3xUSB3®a 2xSSIC, 2xHSIC

Storage:
- eMMC 4.51®
- eMMC 4.51®

ISP / Camera (rear/front):
- Up to 8MP Intel® RealSense™ Snapshot

---

*Max. CPU Burst Frequency for 1 or 2 Cores. Max. CPU Burst Frequency for 3 or 4 cores bursting simultaneously is 1.60GHz

*Additionally, LPDDR3 can be supported on customer designs if needed

*Simultaneous display resolution capabilities may differ.

*General Purpose I2C

*SPI on Intel Atom x5-8300 and 8500 is multiplexed with other pins. SPI availability is implementation dependent

*USB 3.0 backward compatible to USB 2.0

*EMMC 5.0 storage devices can be used and are compatible with the eMMC 4.51 storage controller included in the Intel Atom x5/x7
Summary

• Continuing based on Moore’s law, Intel accelerated 14nm SOC lead product by more than one year as compare to previous generation Bay Trail SoC

• Cherry Trail SoC and Braswell SoC product family offered generational improvement in graphics performance and power efficiency to customers

• Cherry Trail SoC product family begins to enable PC class gaming in tablet form factor at affordable price points
Glossary

- SoC – System On Chip
- GNSS – global navigation satellite system
- NFC – near field communication
- WiGig – Wireless Gigabit Alliance
- HSUART – high speed UART
- HSIC – high-speed inter-chip
- SSIC – SuperSpeed inter-chip
- MIPI – Mobile Industry Processor Interface
- CSI – Camera Serial Interface
- DP – Display Port
- eDP – embedded Display Port
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(for data marked ‘(e)’): Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

For more complete information about performance and benchmark results, visit http://www.intel.com/benchmarks
Workloads and Configurations

System Configuration:

HP* ElitePad* (1000G2*); SOC: Intel* Atom Z3795* (4C, up to 2.39 GHz); OS: Windows* 8; mem: 4GB; storage: 64GB; display size: 10”, res: 1920x1200; Battery Size: 30 Whr; Default Browser ver: 11.09.9600.17031 ; Chrome Browser ver: 40.0.2214.94; Soft. Build: 6.3.9600 Build 9600 "17196" ; Measured on: 10/02/2014

Microsoft* Surface 3* (4GB); SOC: Intel* Atom x7-Z8700* (4C, up to 2.4 GHz); OS: Windows* 8.1; mem: 2GB; storage: 64GB; display size: 10.2”, res: 1920x1280; Battery Size: 27 Whr; Default Browser ver: IE; Chrome Browser ver:40.0.2214.94; Soft. Build: 1.71.0.x64; Measured on: ??

Workloads:

WebXPRT* 2013 is a benchmark from Principled Technologies* that measures the performance of web applications using four usage scenarios: Photo Effects, Face Detect, Stock Dashboard and Offline Notes. WebXPRT tests modern browser technologies such as HTML5 Canvas 2D, HTML5 Table, HTML5 Local Storage, as well as JavaScript*.

Reported metrics: elapsed time in seconds (lower is better) for each scenario, plus an overall score (higher is better). Scaling efficiencies: CPU dominant (newer browsers are GPU accelerated), sensitive to frequency. Note that WebXPRT is very sensitive to browser type and version. OS support: any OS that supports an HTML5 browser

SYSmark* 2014 is a benchmark from the BAPCo* consortium that measures the performance of Windows* platforms. SYSmark tests three usage scenarios: Office Productivity, Media Creation and Data/Financial Analysis. SYSmark contains real applications from Independent Software Vendors such as Microsoft* and Adobe*. Reported metrics: SYSmark 2014 Rating and a rating for each scenario result (higher is better for all). Scaling efficiencies: CPU dominant, sensitive to frequency, core count and memory. OS support: 32-bit & 64-bit Desktop Windows 7 and 8.

3DMark* 1.2.0 is a benchmark from Futuremark* that measures DX* 9 / OpenGL* ES 2.0, DX 10 and DX 11 gaming performance. There are three main tests: “Ice Storm” for DX 9 / OpenGL ES 2.0, “Cloud Gate” for DX 10, “Sky Diver” for DX11 and “Fire Strike” for DX11 graphics. Reported metrics: Graphics Score (GPU), Physics Score (CPU), Combined Score (GPU & CPU) and an overall 3DMark Score (higher is better for all Scores). Scaling efficiencies: Graphics tests are GPU dominant, sensitive to graphics and CPU frequency, core count and memory. OS support: Desktop Windows*, Android*, iOS* and Windows RT.

GFXBench* 2.7, previously known as GLBenchmark* and DXBenchmark*, is a benchmark from Kishonti Informatics* that measures OpenGL* ES 2.0 and DX* 9 gaming performance. There are three major graphics tests: GFXBench 2.7 T-Rex HD (not compatible with GLBenchmark* 2.5.1) and GFXBench 2.5 Egypt HD. Reported metrics: Frames per second. Scaling efficiencies: Graphics tests are GPU dominant, sensitive to graphics and CPU frequency, core count and memory. OS support: Android*, iOS* and Windows RT.

Cyberlink* Media Espresso* Full HD Workload (in seconds) - Using CyberLink*Media Espresso* 7. The workload file is a 6 minute, ~1GB, 1920x1080p, 23738 kbps, MOV video file that one would have obtained from an iPhone 4S. The file is transcoded to a smaller 1920x1080, 8 Mbps, H.264, .m2ts file for reduced file size during internet transfers or for viewing on a portable device with bit rate such as an iPod.
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