

7th Generation Intel® Core™ Processor Family 30-3-30 Usage Guidelines

- **Purpose**
 - Articulate the value proposition, features and high-level technical specifications for 7th Generation Intel® Core™ processor platforms for the development of marketing messages and go-to-market programs
 - This is the “**family**” level set of features and value proposition that may be common across all 7th Generation Intel® Core™ processor platforms. For specific platform details see the specific platform documents of interest (e.g., Mobile 7th Generation Intel® Core™ processor Selling Guide)
- **Target Audience:**
 - Internal: Field Sales (FAEs/FSEs, RAMs, MDMs, etc.), GMC, Geo Marketing, CMM on need-to-know basis
 - External: OEMs (Marketing), ODMs (Marketing), Retailers, Telcos, ISVs and Intel Marketing Agencies under NDA
 - Not approved for audiences beyond those listed above and not intended as a sell-in or design-win document; for other external customers, please contact Judy Lu (judy.lu@intel.com)

*Note: **Performance data is PRELIMINARY.** Official data will be published closer to final product availability*
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- Document Valid Date: through January 31, 2017

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7th Generation Intel® Core™ Processor Family 30-3-30

Phase 2

Intel Confidential

Document Number: 570555, Revision 1.0

Internet of Things Group

Revision History

Date	Revision	Description
December 2016	1.0	First release

7th Generation Intel® Core™ Processor Family

30 Seconds

New Generation of Performance-Class 7th Gen Intel® Core™ Processors

Intel's Platforms

Innovation to drive exciting experiences, capabilities, and form factors

Performance and Responsiveness

- Double-digit performance gains vs. 6th Generation Platform¹
- Modern Standby and Intel® Ready Mode Technology
- Power efficiency for mobile applications
- Intel® Optane™ memory

Graphics

- 4k graphics improvements
- 10-bit HEVC Enc/Dec
- Integrated HDCP 2.2
- Double-digit performance gains vs. 6th Generation Platform¹

Scalability²

- Re-use board designs from 6th Generation for S/H/U based IoT products.
- DDR4 based designs allow S/H ECC designs on same board as non-ECC designs.
- U/S/H products available to offer wide diversity of TDP for IoT applications/solutions

Extended Supply and Use Conditions

- Long-life availability (7 yrs)³
- SKUs are available to meet rigorous use conditions found in IoT markets including: Industrial, Public Sector, and Health Care.

Security Features⁴

- Hardware-enhanced multifactor authentication
- Security-enabled online transactions and payments
- Memory Protection Extensions

Better Together with Windows® 10

1. Measurements taken on 7th Generation IOTG vs. 6th Generation IOTG Systems. (See slides 14 and 26)
2. H requires new socket/pin compatible PCH (HM175/QM175/CM238). S is compatible with PCH (H110, Q170, C236). U has PCH built into MCP ECC requires C/CM PCH and ECC lanes to be run in board
3. 7 years is measured from initial SKU launched in a product family.
4. No computer system can be absolutely secure

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.

Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit www.intel.com/benchmarks.

7th Generation Intel® Core™ Processor Family

3 Minutes

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New Generation of Performance-Class 7th Gen Intel® Core™ Processors

Intel's Platforms

Innovation to drive exciting experiences, capabilities, and form factors

S²

- LGA package for additional manufacturing flexibility on common platforms
- Quad and dual core SKUs
- Full SKU stack covering brands from Intel® Xeon® to Intel® Core™ i3 processor giving flexibility to match performance, features, and price to application
- TDP options of 80W, 65W, and 35W to fit most thermal designs from performance to low power
- Up to 17%¹ CPU multi-threaded and up to 15%¹ graphics performance improvement
- Embedded use conditions

H²

- BGA package for space constrained performance platforms
- Quad and dual core SKUs covering Intel® Xeon® to Intel® Core™ i3 processors
- TDP options of 45W (with 35W cTDP down), 35W, and 25W gives excellent balance of performance and power
- Up to 13%¹ CPU multi-threaded and up to 17%¹ graphics performance improvement
- Embedded and Industrial use conditions

U

- CPU + PCH multi-chip BGA package for space constrained low power platforms
- Dual core SKUs covering both Intel® Core™ and Intel® Celeron® processors
- 15W TDP with the flexibility of 25W cTDP up and 8.5W cTDP down to fit a wide range of low power designs
- Up to 13%¹ CPU single-threaded and up to 7%¹ graphics performance improvement
- Client use conditions
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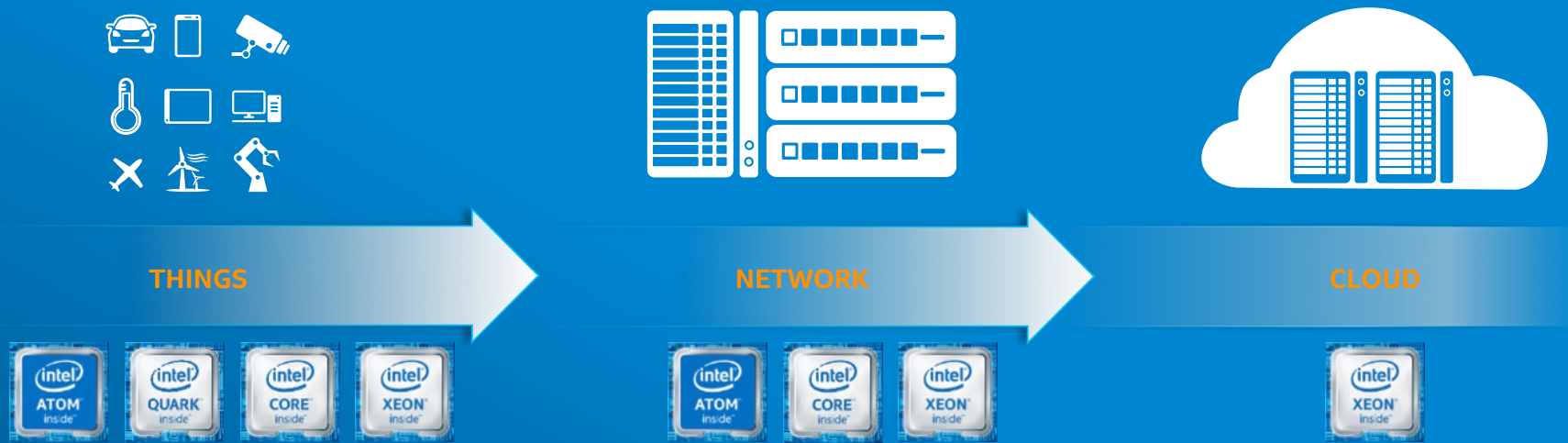
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7th Generation Intel® Core™ Processor Family

30 Minutes

Intel's End-to-End IoT Approach: Things to Cloud



Approach

Create Vertical
Solutions

+

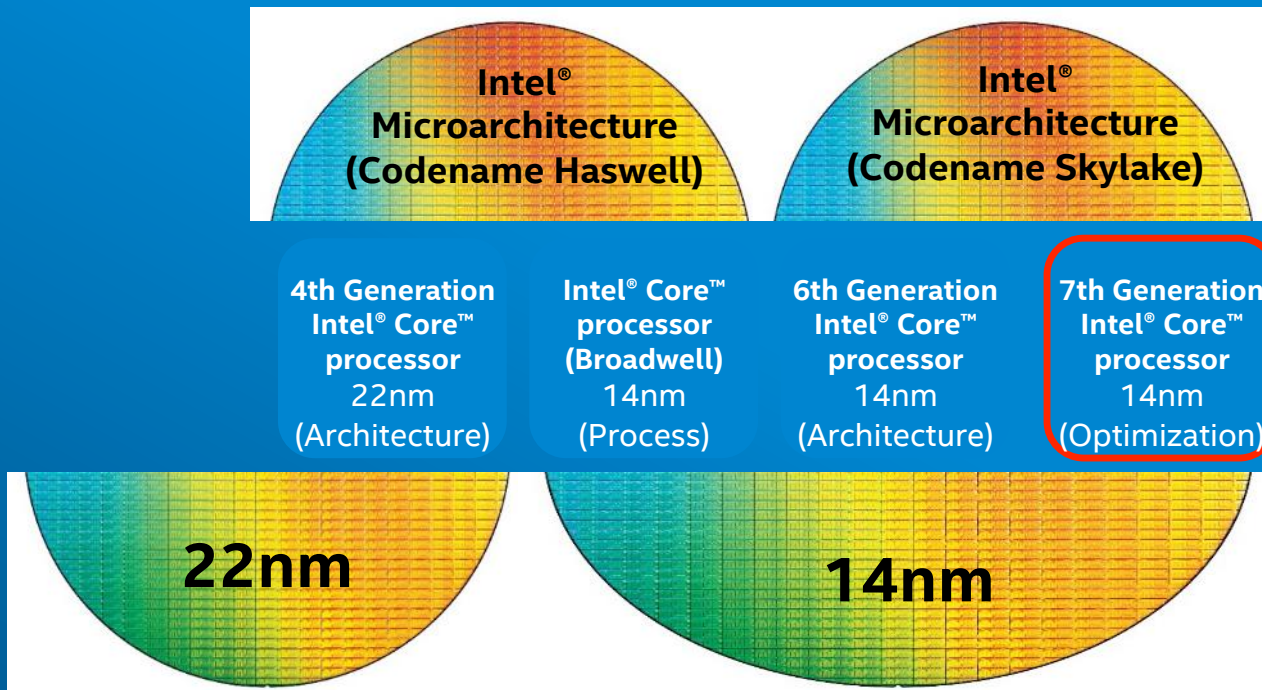
Build on Horizontal
Platform & Products

+

Build Strong
Ecosystem

Process, Architecture, Optimization

7th Gen Intel® Core™ Processors



New Generation of Performance-Class 7th Gen Intel® Core™ Processors

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Amazing Platform Performance and Graphics

H-series [6th Generation versus 7th Generation Intel® Core™ Processor]

- Up to **13%**¹ CPU multi-threaded performance improvement
- Up to **10%**² CPU single threaded performance improvement
- Up to **17%**³ graphics performance improvement

S-series [6th Generation versus 7th Generation Intel® Core™ Processor]

- Up to **17%**⁴ CPU multi-threaded performance improvement
- Up to **12%**⁵ CPU single threaded performance improvement
- Up to **15%**⁶ graphics performance improvement

U-series [6th Generation versus 7th Generation Intel® Core™ Processor]

- Up to **6%**⁷ CPU multi-threaded performance improvement
- Up to **13%**⁸ CPU single threaded performance improvement
- Up to **7%**⁹ graphics performance improvement

1. Measured by Intel on system with Intel® Core™ Processor i7-7820EQ and Intel® Core™ Processor i7-6820EQ using SPECfp2006* (8 copy)
2. Measured by Intel on system with Intel® Core™ Processor i7-7820EQ and Intel® Core™ Processor i7-6820EQ using SPECfp2006* (1 copy)
3. Measured by Intel on system with Intel® Core™ Processor i7-7820EQ and Intel® Core™ Processor i7-6820EQ using 3DMark11*
4. Measured by Intel on system with Intel® Core™ Processor i7-7700 and Intel® Core™ Processor i7-6700 using SPECfp2006* (8 copy)
5. Measured by Intel on system with Intel® Core™ Processor i7-7700 and Intel® Core™ Processor i7-6700 using SPECfp2006* (1 copy)
6. Measured by Intel on system with Intel® Core™ Processor i7-7700 and Intel® Core™ Processor i7-6700 using 3DMark11*
7. Measured by Intel on system with Intel® Core™ Processor i7-7600U and Intel® Core™ Processor i7-6600U using SPECfp2006* (4 copy)
8. Measured by Intel on system with Intel® Core™ Processor i7-7600U and Intel® Core™ Processor i7-6600U using SPECint2006* (4 copy)
9. Measured by Intel on system with Intel® Core™ Processor i7-7600U and Intel® Core™ Processor i7-6600U using 3DMark11*

See the system specifications on slide 26.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.

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Intel® Optane™ Memory



Amazing Performance and Responsiveness

Pairing Intel® Optane™ memory with slower media like that of a HDD or SATA SSD, gives you amazing performance and responsiveness in large capacities



Intelligent Software That Manages Files For You

Intelligent software that continually evolves alongside your computing habits and no end-user file management required

4K UHD and HDR Advocacy

	6th Generation Intel® Core™ Processor (IOTG & CCG 2H'15-1H'16)	7th Generation Intel® Core™ Processor (CCG 2H'16)	7th Generation Intel® Core™ Processor (IOTG & CCG 1H'17)
4K UHD UX	Good User-Generated Content	Better 4K UHD SDR Protected Premium Content	Best 4K HDR Movies With UHD Blue-ray
Content Supported	<ul style="list-style-type: none"> User-generated content YouTube* 	<ul style="list-style-type: none"> 4K movies and TV 	<ul style="list-style-type: none"> 4K HDR movies with UHD Blu-ray²
Platform Media/Display Benefits	<ul style="list-style-type: none"> 4K UHD integrated screens Hardware-robust DRM - HD 4K UHD multi-stream options¹ Fast codec HEVC 8-bit 	Plus: <ul style="list-style-type: none"> 4K UHD high definition Hardware-robust DRM – 4K UHD Security-enabled I/O via eDP; / HDCP 2.2 via LSPCon Fast codec HEVC 10-bit/VP9 	Plus: <ul style="list-style-type: none"> HDR/WCG internal and/or external display Industry standards-based HDR Native HDCP2.2 on HDMI1.4 and DP HDMI2.0a with LSPCon³
Resolution	<ul style="list-style-type: none"> 4K UHD + SDR 	<ul style="list-style-type: none"> 4K UHD + SDR 	<ul style="list-style-type: none"> 4K UHD + HDR + Rec.2020 (WCG)
Consumer Benefit	<ul style="list-style-type: none"> Sharp, crisp, clear imagery and videos for better productivity and entertainment 	Plus: <ul style="list-style-type: none"> Premium content from Hollywood and broadcast companies in 4K UHD 	Plus: <ul style="list-style-type: none"> New visual experience with high dynamic range and wider color spectrum Premium HDR content Blu-ray 4K HDR²

- For max resolutions limitations on multi-display environment, see the screen resolution support slides)
- UHD BD supported on 7th Generation Intel® Core™ processor S, H, U2+3e SKUs only and selected form factors only
- Only the MCA (Mega Chips of America) version of the LSPCON enables HDCP 2.2 and HDMI 2.0a which enables HDR

Rich Visual Experience

New HEVC 10-Bit and VP9 Decode Capability Delivers Efficient and Fluid Playback

6th Generation Intel® Core™ processors

- Up to 1080p
- Premium Content (HEVC 10-bit)
- 4 hours video battery life²
- 4K UHD YouTube streaming
- 4K UHD, 4K 360 YouTube Video (VP9)
- View multiple video streams simultaneously, up to 4K UHD
- Multi-Video Streaming

7th Generation Intel® Core™ processors

- Up to 4K UHD
- HEVC 10-bit & VP9
- **1.75X¹** YouTube* video playback
- Smooth multitasking
- Smooth video playback
- Support for additional formats of 4K UHD and 4K 360 content streams

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2. Length of life measurements based on Intel Reference Platform.

Security-Enable¹ Your Platform

Technologies to Help Secure Your IoT Solution

Security-Enabled¹ Transactions and Payments

- Hardware-enhanced security-enabled technologies¹ such as SGX and Intel Online Connect allow users to keep conduct online transactions and payments without worrying about identity theft or credential loss
- Simplified checkout process using payment services like PayPal*, Visa*, or China Union Pay* which allow the use of personal biometric credentials such as fingerprint for a quick and security-enabled web experience¹

1. No computer can be absolutely secure.

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

Memory Protection

- Identifies errant pointer usage which, if left undetected, puts an application at risk of data corruption or malicious attack via buffer overruns and overflows.
- By adding extensions to the underlying architecture, Intel® Memory Protection Extensions (Intel® MPX) achieves improved performance over software-based solutions.¹

Supply Life and Scalability

Value Props to Support Flexibility and Life Cycle of IoT Solutions

Long-Life Supply Availability

- SKUs on the IOTG roadmap are available for up to 7 years from initial product introduction.¹
- Limited SKUs² are validated/supported to meet more rigorous use conditions required by IOTG markets including:
 - Industrial Manufacturing
 - Public Sector (Aviation)
 - Health Sector

Scalable Platforms

- U/S/H products available to offer wide diversity of TDP (15w – 95w) for IoT applications/solutions.
- Reuse 6th generation board designs with Sunrise Point based PCH³
- DDR4 allows ECC and Non-ECC designs in single board designs on S/H.⁴

1. Life cycle starts from first SKU launched in each product family.

2. See Internet of Things Group (IOTG) Platform Roadmap (CDI:350329) for SKU level details.

3. S platforms (H110/Q170/C236); H platforms (H175/Q175/CM238); U series platforms have premium PCH in MCP. Follow CCE and Design-In guidelines for OS/FW/BIOS requirements)

4. Boards must follow PDG guidelines for ECC routing and pair with Workstation PCH SKUs (C236 for DT; CM238 for MBL)

7th Generation Intel® Core™ Processor + Windows® 10 Enterprise



Productivity

Less waiting, more doing.

Get fast performance with multitasking, application optimization and a familiar interface.



Security-Enabled Features

Strengthen security protection.

Defend your business with hardware and software security features that provide stronger, combined protection against today's sophisticated attacks



Manageability

Peace of mind—anywhere, anytime.

Discover, protect and repair devices remotely, while also future proofing your business with seamless updates

7th Generation Intel® Core™ vPro™ Processors

Streamline productivity with performance for serious business compute, get in front of security threats with hardware-enhanced identity protection, and put time back in the bank with remote manageability.

Premium Performance 7th Generation Intel® Core™ vPro™ Processor Automation	Hardware-Enhanced SECURITY FEATURES Intel® Authenticate Technology Strength	Remote MANAGEABILITY Intel® Active Management Technology (Intel® AMT) Control
BUSINESS APPLICATIONS Intel® Hyper-Threading Technology	HARDWARE VALUE Mitigate risk of software-level attacks	REMOTE DIFFERENTIATION Reduce on-site support costs
MULTITASKING Intel® Speed Shift Technology	POLICY CUSTOMIZATION More new factors from which to choose	WIRELESS IMPROVEMENT Wireless Networking in Intel® AMT
BATTERY LIFE Up to 10 hours for a full work day ¹	SMOOTH DEPLOYMENT Support for SCCM, GPO and ePO	PRO SSD INTEGRATION Intel® Remote Secure Erase

1. Measurements taken on 7th Generation IOTG systems. (See the configuration on slide 26)

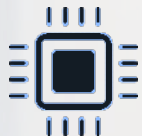
The Ultimate Mobile Workstation

Based on Intel's newest wave of 14nm processors, the Intel® Xeon® processor E3-1500M v6 product family delivers the critical performance and enterprise-grade features that professional power users demand.



Powerful Computing on the Go

Extend beyond the capabilities of standard mobile computers with Intel® Xeon® processor-based mobile workstations.



Error Correcting Code (ECC) Memory

Help protect your system from potential crashes and changes in data.
Catch and correct single-bit errors on the fly to keep workstation applications running reliably and without error.



Workstation-Grade Graphics

Intel® HD Graphics P630 deliver once out of reach entry-level workstation performance and visuals to designers, engineers, and media creators.

Platforms

Retail	Industrial	Public Sector	Digital Security	Health Care	Office Automation
<ul style="list-style-type: none"> Point of Sale Terminals Thin Client Kiosks Digital Signage 	<ul style="list-style-type: none"> Industrial PCs Programmable Logic Controllers Smart Manufacturing 	<ul style="list-style-type: none"> Aerospace Components Defense Systems Smart City 	<ul style="list-style-type: none"> Network Video Recorders (NVR) Monitoring Equipment 	<ul style="list-style-type: none"> CAT scan, MRI Personal monitoring 	<ul style="list-style-type: none"> Office Equipment Commercial Printing
					

Legal Notices and Disclaimers

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Learn more at intel.com, or from the OEM or retailer.

No computer system can be absolutely secure.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase. For more complete information about performance and benchmark results, visit <http://www.intel.com/performance>.

Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

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Benchmark/Workload Descriptions

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. QSV enabled.

3DMark* 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 DX 11 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.

Windows® 10 4K 24fps 10bit HEVC Local Video Playback Component Average Power Disconnect all USB devices, connect to a local WiFi access point and set the screen brightness to 200 nits (disable DPST, set brightness to 200 nits on a white background and enable DPST). Wait for 10 mins for the OS to completely idle. Launch Tears of Steel (4K H265 24fps) video using the Windows Movie & TV App. Measure and calculate average power for the duration of the video. Report 3 run median.

4K VP9 Streaming Workload: Measure time to rundown battery while streaming 4K content from YouTube website: <https://youtu.be/-3nXNnBwI6w>

System Configurations

Battery life and performance measurements on Intel Reference Platform unless otherwise noted

Intel Reference Platform is an example new system. Products available from systems manufacturers will not be identical in design, and performance will vary.

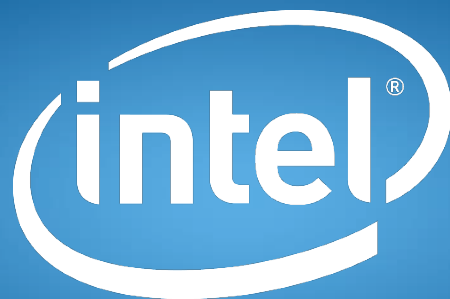
System power management policy: DC balanced for battery life measurements, AC balanced for performance measurements and AC High Performance on 7th and 6th Generation systems. Wireless: On and connected.

7th Generation system configuration:

- Intel® Core™ i7-7820EQ, PL1 = 45w TDP, 4C/8T, Turbo up to 3.7GHz/3.0 GHz, Memory: 2x16GB DDR4-2400, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4458, OS: Windows® 10, CentOS 7.2
- Intel® Core™ i7-7700, PL1 = 65w TDP, 4C/8T, Turbo up to 4.2GHz/3.6 GHz, Memory: 2x16GB DDR4-2400, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4458, Windows® 10, CentOS 7.2
- Intel® Core™ i7-7600U, PL1 = 15w TDP, 2C/4T, Turbo up to 3.9GHz/2.8 GHz, Memory: 2x4GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4495, Windows® 10

6th Generation system configuration:

- Intel® Core™ i7-6820EQ, PL1 = 45w TDP, 4C/8T, Turbo up to 3.5GHz/2.8GHz, Memory: 2x8GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 10.18.15.4256, Windows® 10, CentOS 7.2
- Intel® Core™ i7-6700, PL1 = 65w TDP, 4C/8T, Turbo up to 4.0GHz/3.4GHz, Memory: 2x8GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 10.18.15.4225, Windows® 10, CentOS 7.2
- Intel® Core™ i7-6600U, PL1 = 15w TDP, 2C/4T, Turbo up to 3.4GHz/2.6Hz, Memory: 2x4GB DDR4-2133, Storage Intel® SSD, Display Resolution: 1920x1080. Graphics driver: 21.20.16.4495, Windows® 10



experience
what's inside™