The science behind the report:

Get a faster PC with Intel® Optane™ memory

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report "Get a faster PC with Intel® Optane™ memory".

On April 27, 2018 we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears. For older systems, we chose configurations representative of typical purchases of those systems. We concluded hands-on testing on May 1, 2018.

System configuration information

The table below presents detailed information on the systems we tested.

System	Custom CyberPowerPC with 8th Gen Intel Core i5 processor	Custom CyberPowerPC with 8th Gen Intel Core i7 processor
Processor		
Vendor	Intel®	Intel
Name	Core™ i5	Core i7
Model number	8400	8700
Core frequency (GHz)	2.8 – 4.0	3.2 – 4.6
Number of cores	6	6
Number of threads	6	12
Cache	9 MB SmartCache	12 MB SmartCache
Bus speed	8 GT/s DMI3	8 GT/s DMI3
Motherboard		
Vendor	ASUS® PRIME Z370-P	ASUS PRIME Z370-P
Memory		
Vendor	Corsair® Vengeance LPX	Corsair Vengeance LPX
Type	DDR4-3000	DDR4-3000
Speed (MHz)	2,133	2,133

System	Custom CyberPowerPC with 8th Gen Intel Core i5 processor	Custom CyberPowerPC with 8th Gen Intel Core i7 processor
Graphics		
Vendor	Intel	Intel
Model number	UHD Graphics 630	UHD Graphics 630
Resolution	1920 x 1080	1920 x 1080
Driver	Intel 23.20.16.4982 (03/08/2018)	Intel 23.20.16.4982 (03/08/2018)
Storage		
Vendor /type	WD Caviar SATA II 6.0GB/s	WD Caviar SATA II 6.0GB/s
Size	1 TB	1 TB
BIOS setting	Intel RST Premium with Intel Optane™ System Acceleration (RAID)	Intel RST Premium with Intel Optane System Acceleration (RAID)
Storage controller	Intel Chipset SATA/PCIe RST Premium Controller	Intel Chipset SATA/PCIe RST Premium Controller
Driver	Intel Rapid Storage Technology 16.0.2.1086 driver (02/07/2018)	Intel Rapid Storage Technology 16.0.2.1086 driver (02/07/2018)
Operating system		
Vendor	Microsoft®	Microsoft
Name	Windows® 10 Pro	Windows 10 Pro
Build number or version	10.0.16299	10.0.16299
BIOS		
BIOS name and version	American MegaTrends® Inc. 0614 (03/22/2018)	American MegaTrends Inc. 0614 (03/22/2018)

How we tested

We used the industry-standard SYSmark benchmark to determine the impact Intel Optane memory had on system responsiveness.

SYSmark 2014 SE

SYSmark 2014 SE installs the following applications, which its test scripts employ:

- Adobe® Acrobat® XI Pro
- Adobe Photoshop® CS6 Extended
- Adobe Premiere® Pro CS6
- Google Chrome™
- Microsoft Excel® 2013
- Microsoft OneNote® 2013
- Microsoft Outlook® 2013
- Microsoft PowerPoint® 2013
- Microsoft Word 2013
- Trimble SketchUp™ Pro 2013
- WinZip® Pro 17.5

If any of these applications are already on the system under test, they will cause problems with the benchmark due to software conflicts. To avoid any such issues, before we installed the benchmark, we uninstalled all conflicting pre-installed software applications, including different versions of any of the programs SYSmark 2014 SE uses.

Setting up the test

1. Purchase and install SYSmark 2014 SE with default settings from https://bapco.com/products/sysmark-2014-se/.
2. Install the following two SYSmark 2014 SE patches:
    a. SYSmark 2014 SE patch 1 v2.0.1.78
    b. SYSmark 2014 SE patch 1 Hotfix 2 v2.0.1.87
3. Connect an Extech Power Analyzer / Datalogger 380803 via a USB-to-Serial cable to the system under test.

Running the test

1. Launch SYSmark 2014 SE by double-clicking the desktop icon.
2. Enter a Project name.
3. Select 3 Iterations, check the box beside Conditioning Run and beside Process Idle Tasks, and click select Configuration. Use the default SYSmark configuration options and click Save. Verify that the Energy Consumption test is checked and that the correct COM Port is selected.
4. Click Run Benchmark.
5. When the benchmark completes and the main SYSmark 2014 SE menu appears, click Save FDR to save the results.

Our results

We tested several configurations of both 8th Gen Intel Core i5 and i7 processor-powered systems, comparing different sizes of RAM alone to RAM plus Intel Optane memory. Dual channel results use two sticks of RAM while single channel results used only a single stick.

8th Gen Intel Core i7 processor dual channel results, comparing 8GB RAM (2x4GB) + 32GB Intel Optane memory to RAM alone

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	8GB RAM (2x4GB)	8GB RAM (2x4GB) + 32GB Intel Optane memory	% win for 8GB RAM (2x4GB) + 32GB Intel Optane memory
Overall Rating	1,313	1,734	32%
Office Productivity Overall Rating	1,164	1,314	13%
Media Creation Overall Rating	1,870	2,059	10%
Data/Financial Analysis Overall Rating	2,059	2,339	14%
Responsiveness Overall Rating	662	1,430	116%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	16GB RAM (2x8GB)	8GB RAM (2x4GB) + 32GB Intel Optane memory	% win for 8GB RAM (2x4GB) + 32GB Intel Optane memory
Overall Rating	1,331	1,734	30%
Office Productivity Overall Rating	1,161	1,314	13%
Media Creation Overall Rating	1,876	2,059	10%
Data/Financial Analysis Overall Rating	2,087	2,339	12%
Responsiveness Overall Rating	690	1,430	107%

8th Gen Intel Core i5 processor dual channel results, comparing 8GB RAM (2x4GB) + 16GB Intel Optane memory to RAM alone

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	8GB RAM (2x4GB)	8GB RAM (2x4GB) + 16GB Intel Optane memory	% win for 8GB RAM (2x4GB) + 16GB Intel Optane memory
Overall Rating	1,115	1,389	25%
Office Productivity Overall Rating	1,035	1,149	11%
Media Creation Overall Rating	1,593	1,733	9%
Data/Financial Analysis Overall Rating	1,505	1,598	6%
Responsiveness Overall Rating	623	1,171	88%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	12GB RAM (8GB + 4GB)	8GB RAM (2x4GB) + 16GB Intel Optane memory	% win for 8GB RAM (2x4GB) + 16GB Intel Optane memory
Overall Rating	1,109	1,389	25%
Office Productivity Overall Rating	1,031	1,149	11%
Media Creation Overall Rating	1,584	1,733	9%
Data/Financial Analysis Overall Rating	1,479	1,598	8%
Responsiveness Overall Rating	628	1,171	86%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	16GB RAM (2x8GB)	8GB RAM (2x4GB) + 16GB Intel Optane memory	% win for 8GB RAM (2x4GB) + 16GB Intel Optane memory
Overall Rating	1,127	1,389	23%
Office Productivity Overall Rating	1,044	1,149	10%
Media Creation Overall Rating	1,591	1,733	9%
Data/Financial Analysis Overall Rating	1,524	1,598	5%
Responsiveness Overall Rating	638	1,171	84%

8th Gen Intel Core i5 processor single channel results, comparing 4GB RAM + 16GB Intel Optane memory to RAM alone

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	4GB RAM	4GB RAM + 16GB Intel Optane memory	% win for 4GB RAM + 16GB Intel Optane memory
Overall Rating	990	1,296	31%
Office Productivity Overall Rating	983	1,119	14%
Media Creation Overall Rating	1,428	1,580	11%
Data/Financial Analysis Overall Rating	1,458	1,557	7%
Responsiveness Overall Rating	469	1,025	119%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	8GB RAM	4GB RAM + 16GB Intel Optane memory	% win for 4GB RAM + 16GB Intel Optane memory
Overall Rating	1,092	1,296	19%
Office Productivity Overall Rating	1,020	1,119	10%
Media Creation Overall Rating	1,530	1,580	3%
Data/Financial Analysis Overall Rating	1,507	1,557	3%
Responsiveness Overall Rating	606	1,025	69%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	16GB RAM	4GB RAM + 16GB Intel Optane memory	% win for 4GB RAM + 16GB Intel Optane memory
Overall Rating	1,104	1,296	17%
Office Productivity Overall Rating	1,024	1,119	9%
Media Creation Overall Rating	1,546	1,580	2%
Data/Financial Analysis Overall Rating	1,500	1,557	4%
Responsiveness Overall Rating	625	1,025	64%

8th Gen Intel Core i5 processor single channel results, comparing 8GB RAM + 16GB Intel Optane memory to RAM alone

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	4GB RAM	8GB RAM + 16GB Intel Optane memory	% win for 8GB RAM + 16GB Intel Optane memory
Overall Rating	990	1,373	39%
Office Productivity Overall Rating	983	1,144	16%
Media Creation Overall Rating	1,428	1,664	17%
Data/Financial Analysis Overall Rating	1,458	1,621	11%
Responsiveness Overall Rating	469	1,153	146%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	8GB RAM	8GB RAM + 16GB Intel Optane memory	% win for 8GB RAM + 16GB Intel Optane memory
Overall Rating	1,092	1,373	26%
Office Productivity Overall Rating	1,020	1,144	12%
Media Creation Overall Rating	1,530	1,664	9%
Data/Financial Analysis Overall Rating	1,507	1,621	8%
Responsiveness Overall Rating	606	1,153	90%

SYSmark 2014 SE v2.0.1.87 results (Higher is better)	16GB RAM	8GB RAM + 16GB Intel Optane memory	% win for 8GB RAM + 16GB Intel Optane memory
Overall Rating	1,104	1,373	24%
Office Productivity Overall Rating	1,024	1,144	12%
Media Creation Overall Rating	1,546	1,664	8%
Data/Financial Analysis Overall Rating	1,500	1,621	8%
Responsiveness Overall Rating	625	1,153	84%

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