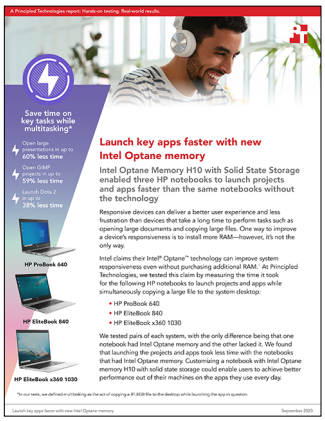

The science behind the report:

Launch key apps faster with new 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 Launch key apps faster with new Intel Optane memory.

We concluded our hands-on testing on June 18, 2020. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on April 27, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

Table 1: Comparison of times (in seconds) to complete each task (while simultaneously copying a 41.8GB file to the desktop) on an HP ProBook 640 system with and without Intel® Optane™ memory.

Task	Without Intel Optane	With Intel Optane	Percentage difference
Launch 89.9MB Microsoft Word file	13.0	5.2	60.0%
Launch 23.2MB Microsoft Excel file	18.5	10.2	44.9%
Launch 180.6MB Microsoft PowerPoint presentation	18.9	7.4	60.8%
Launch 609.7MB PDF document	5.6	4.3	23.2%
Launch 84.9MB GIMP project	58.2	24.9	57.2%
Launch 15.9MB Adobe® Photoshop® project	44.0	27.8	36.8%
Launch 40.6KB Adobe® Premiere® Pro project	53.3	37.6	29.5%
Launch Dota 2	47.8	29.5	38.3%
Launch Path of Exile	12.8	8.1	36.7%

Table 2: Comparison of times (in seconds) to complete each task (while simultaneously copying a 41.8GB file to the desktop) on an HP EliteBook 840 system with and without Intel Optane memory.

Task	Without Optane	With Optane	Percentage difference
Launch 89.9MB Microsoft Word file	14.4	5.6	61.1%
Launch 23.2MB Microsoft Excel file	16.9	10.3	39.1%
Launch 180.6MB Microsoft PowerPoint presentation	17.0	6.8	60.0%
Launch 84.9MB GIMP project	44.8	18.3	59.2%
Launch 15.9MB Adobe Photoshop project	38.3	24.8	35.2%
Launch 40.6KB Adobe Premiere Pro project	47.3	37.6	20.5%
Launch Dota 2	40.2	24.8	38.3%
Launch Path of Exile	11.0	7.7	30.0%

Table 3: Comparison of times (in seconds) to complete each task (while simultaneously copying a 41.8GB file to the desktop) on an HP EliteBook x360 1030 system with and without Intel Optane memory.

Task	Without Optane	With Optane	Percentage difference
Launch 23.2MB Microsoft Excel file	11.5	9.6	16.5%
Launch 180.6MB Microsoft PowerPoint presentation	8.6	5.5	36.0%
Launch 84.9MB GIMP project	24.8	20.6	16.9%
Launch 15.9MB Adobe Photoshop project	30.7	27.8	9.4%
Launch 40.6KB Adobe Premiere Pro project	43.9	40.6	7.5%
Launch Dota 2	33.8	27.6	18.3%
Launch Path of Exile	7.1	5.2	26.8%

System configuration information

Table 4: Detailed information on the HP ProBook 640.

System	HP ProBook 640 G5	HP ProBook 640 G5 (with Intel Optane memory)
Processor		
Vendor	Intel	Intel
Name	Core™ i5	Core i5
Model number	8365U	8365U
Core frequency (GHz)	1.60 – 4.10	1.60 – 4.10
Number of cores	4	4
Cache	6 MB Intel Smart Cache	6 MB Intel Smart Cache
Memory		
Amount (GB)	16	16
Type	DDR4	DDR4
Speed (MHz)	2667	2667
Graphics		
Vendor	Intel	Intel
Model number	UHD Graphics 620	UHD Graphics 620
Storage		
Amount	512 GB	512 GB
Type	M.2 PCIe NVMe	M.2 PCIe NVMe + 32GB Intel Optane H10
Connectivity/expansion		
Wired ethernet	Intel Ethernet Connection I219-LM	Intel Ethernet Connection I219-LM
Wireless ethernet	Intel Wi-Fi 6 AX200	Intel Wi-Fi 6 AX200
Bluetooth	5.0	5.0
USB	3 x USB 3.1	3 x USB 3.1
1 x USB Type-C	3 x USB 3.1	3 x USB 3.1
Battery		
Type	3-cell Lithium Ion	3-cell Lithium Ion
Rated capacity	48 Wh	48 Wh
Display		
Size (in.)	14	14
Type	LED Anti-Glare	LED Anti-Glare
Resolution	1920 x 1080	1920 x 1080
Touchscreen	No	No

System	HP ProBook 640 G5	HP ProBook 640 G5 (with Intel Optane memory)
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	18363	18363
BIOS		
BIOS name and version	HP R72 Ver. 01.03.04	HP R72 Ver. 01.03.03
Dimensions		
Height (in)	.83	.83
Width (in)	13.4	13.4
Depth (in)	9.5	9.5
Weight (lbs.)	3.8	3.8

Table 5: Detailed information on the HP EliteBook 840.

System	HP EliteBook 840 G6	HP EliteBook 840 G6 (with Intel Optane memory)
Processor		
Vendor	Intel	Intel
Name	Core i7	Core i7
Model number	8565U	8565U
Core frequency (GHz)	1.80 – 4.60	1.80 – 4.60
Number of cores	4	4
Cache	8 MB Intel Smart Cache	8 MB Intel Smart Cache
Memory		
Amount (GB)	16	16
Type	DDR4	DDR4
Speed (MHz)	2667	2667
Graphics		
Vendor	Intel	Intel
Model number	UHD Graphics 620	UHD Graphics 620
Storage		
Amount	512 GB	512 GB
Type	M.2 PCIe NVMe	M.2 PCIe NVMe + 32GB Intel Optane H10

System	HP EliteBook 840 G6	HP EliteBook 840 G6 (with Intel Optane memory)
Connectivity/expansion		
Wired ethernet	Intel Ethernet Connection I219-V	Intel Ethernet Connection I219-V
Wireless ethernet	Intel Wi-Fi 6 AX200	Intel Wi-Fi 6 AX200
Bluetooth	5.0	5.0
USB	2 x USB 3.1 1 x Thunderbolt	2 x USB 3.1 1 x Thunderbolt
1 x USB Type-C	1 x HDMI	1 x HDMI
Battery		
Type	Lithium Ion	Lithium Ion
Rated capacity	48 Wh	48 Wh
Display		
Size (in.)	14	14
Type	IPS WLED	IPS WLED
Resolution	1920 x 1080	1920 x 1080
Touchscreen	No	No
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	18363	18363
BIOS		
BIOS name and version	HP R70 Ver. 1.03.04	HP R70 Ver. 1.02.01
Dimensions		
Height (in)	.71	.71
Width (in)	12.84	12.84
Depth (in)	9.22	9.22
Weight (lbs.)	3.27	3.27

Table 6: Detailed information on the HP EliteBook x360 1030.

System	HP EliteBook x360 1030 G4	HP EliteBook x360 1030 G4 (with Intel Optane memory)
Processor		
Vendor	Intel	Intel
Name	Core i5	Core i5
Model number	8265U	8265U
Core frequency (GHz)	1.60 – 3.90	1.60 – 3.90
Number of cores	4	4
Cache	6 MB Intel Smart Cache	6 MB Intel Smart Cache

System	HP EliteBook x360 1030 G4	HP EliteBook x360 1030 G4 (with Intel Optane memory)
Memory		
Amount (GB)	16	16
Type	LPDDR4	LPDDR4
Speed (MHz)	2133	2133
Graphics		
Vendor	Intel	Intel
Model number	UHD Graphics 620	UHD Graphics 620
Storage		
Amount	512 GB	512 GB
Type	M.2 PCIe NVMe SSD	M.2 PCIe NVMe + 32GB Intel Optane H10
Connectivity/expansion		
Wired ethernet	N/A	N/A
Wireless ethernet	Intel Wi-Fi 6 AX200	Intel Wi-Fi 6 AX200
Bluetooth	5.0	5.0
USB	2 x Thunderbolt 1 x USB 3.1	2 x Thunderbolt 1 x USB 3.1
1 x USB Type-C	1 x HDMI	1 x HDMI
Battery		
Type	4-cell Lithium Ion	4-cell Lithium Ion
Rated capacity	56 Wh	56 Wh
Display		
Size (in.)	13.3	13.3
Type	LED Anti-Glare	LED Anti-Glare
Resolution	1920 x 1080	1920 x 1080
Touchscreen	Yes	Yes
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	18363	18363
BIOS		
BIOS name and version	HP R94 Ver. 01.03.05	HP R94 Ver. 01.03.05
Dimensions		
Height (in)	.62	.62
Width (in)	12.04	12.04
Depth (in)	8.07	8.07
Weight (lbs.)	2.78	2.78

How we tested

Launching projects and applications while simultaneously copying a large file to the desktop

Before running these tests, we downloaded and installed all necessary applications. We considered certain applications fully loaded once we could initiate the print screen (or export media) screen, as this marks the beginning of when an application can accept user input. The file we copied was located at C:\Users\[user]\Desktop and had a size of 41.8 GB.

Launching a Word file

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file, and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open large sample Word file.
4. Press ctrl+p until the print screen appears.
5. Stop the timer as soon as the print screen appears.
6. Repeat steps 1-5 two more times.

Launching an Excel file

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file, and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open large sample Excel file.
4. Press ctrl+p until the print screen appears.
5. Stop the timer as soon as the print screen appears.
6. Repeat steps 1-5 two more times.

Launching a PowerPoint presentation

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open large sample PowerPoint file.
4. Press ctrl+p until the print screen appears.
5. Stop the timer as soon as the print screen appears.
6. Repeat steps 1-5 two more times.

Launching a PDF document in Adobe Reader DC

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open large sample PDF document.
4. Press ctrl+p until the print screen appears.
5. Stop the timer as soon as the print screen appears.
6. Repeat steps 1-5 two more times.

Launching a GIMP project

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open the GIMP project.
4. Press ctrl+p until the print screen appears.
5. Stop the timer as soon as the print screen appears.
6. Repeat steps 1-5 two more times.

Launching an Adobe Photoshop project

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open large sample Photoshop project.
4. Press ctrl+p until the print screen appears.
5. Stop the timer as soon as the print screen appears.
6. Repeat steps 1-5 two more times.

Launching an Adobe Premiere project

1. Restart the device, and wait three minutes.
2. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
3. Simultaneously start the timer and open large sample Premiere project.
4. Press ctrl+m until the export media screen appears.
5. Stop the timer as soon as the export media screen appears.
6. Repeat steps 1-5 two more times.

Launching video games while simultaneously copying a large file to the desktop

Before running these tests, we downloaded and installed the Steam app to download and install the games for testing.

Launching Dota 2

1. Restart the device, and wait three minutes.
2. Open Steam.
3. Navigate to Library.
4. Find and click on Dota 2 in the Library.
5. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
6. Simultaneously start the timer and click play in Steam to launch Dota 2.
7. Stop the timer when the "Valve" logo appears indicating the game has fully loaded.
8. Repeat steps 1-7 two more times.

Launching Path of Exile

1. Restart the device, and wait three minutes.
2. Open Steam.
3. Navigate to Library.
4. Find and click on Path of Exile in the Library.
5. From your local file system, copy the large test file and paste it onto the desktop to begin the background file transfer.
6. Simultaneously start the timer and click play in Steam to launch Path of Exile.
7. Stop the timer when the "Grinding Gear Games" logo appears indicating the game has fully loaded.
8. Repeat steps 1-7 two more times.

Read the report at http://facts.pt/eLPfXpr ▶

This project was commissioned by HP.

Principled Technologies®

Facts matter.®