

IOLO System Mechanic

Performance Testing (February 2019)

Performance Benchmark

Edition 2

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Revision History

Rev	Revision History	Date
Edition 1	Initial version of this report.	21 February 2019
Edition 2	Minor changes for better understanding of test results.	27 February 2019

Executive Summary

PassMark Software® conducted objective performance testing on IOLO's System Mechanic, in Windows 10 (64-bit) in February 2019. This report presents our findings as a result of performance benchmark testing conducted on this product.

The aim of this report is to measure the performance improvements obtained from using System Mechanic (Version 18.5.1.278) to optimize the machine in two different test environments (Laptop with an HDD boot drive and a Desktop with an SSD boot drive). To replicate a typical end user system, both machines were pre-installed with commonly used programs (41), some apps chosen by IOLO (12) and browser add-ons (6).

Testing was performed on both systems using twelve selected performance metrics.

Ten of these tests were conducted before and after repairing the machines with IOLO System Mechanic to obtain a comparison between results. These performance metrics are as follows.

- Boot Time;
- Browse Time;
- Internet Speed;
- Browser Load Time;
- Free RAM Available;
- CPU Usage During Idle;
- File Copy, Move and Delete;
- File Copy USB 3.0 to Disk;
- PerformanceTest Benchmark; and
- Battery Life Improvement (Only tested in laptop environment).

The two other tests were conducted to obtain additional information regarding the System Mechanic application. These performance metrics include:

- Disk Space Recovered; and
- Memory Usage During Idle.

Overall Results

PassMark Software calculated percentage improvements for each test metric upon using the “Repair All” feature on System Mechanic, followed by reviewing and performing other recommendations suggested by the application.

Following are the summarized performance improvements obtained from tests conducted on the two machines:

Test	Percentage Improvement	
	Desktop	Laptop
Boot Time	12% Decrease	7% Decrease
Browse Time	13% Decrease	8% Decrease
Internet Speed	1% Increase	1% Increase
Browser Load Time	10% Decrease	4% Decrease
Free RAM Available	7% Increase	4% Increase
CPU Usage During System Idle	0.7% Decrease (22% Decrease as a percentage change in utilization percentage)	0.8% Decrease (38% Decrease as a percentage change in utilization percentage)
File Copy, Move and Delete	6% Decrease	8% Decrease
File Copy USB 3.0 to Disk	1% Decrease	3% Decrease
PerformanceTest Benchmark	0.3% Increase	0.5% Increase
Battery Life (Discharge Rate)	N/A	7% Decrease

Test	Result	
	Desktop	Laptop
Memory Usage During System Idle	4.1 MB	4.9 MB
Disk Space Recovered	75.32 MB	1464 MB

Note: The observed improvement in performance will be dependent on the hardware and the initial state of the machine. Smaller improvements in performance could be expected if the testing was conducted after a clean installation of Windows whereas a larger improvement in performance could be expected if the machine was initially in a more degraded state.

Performance Metrics Summary

The following test metrics have been selected to highlight certain areas in which the product (IOLO System Mechanic) has an impact on the system performance for end users, particularly areas involving common tasks that end-users perform on a daily basis.

All of PassMark Software's test methods can be replicated by third parties using the same environment to obtain similar benchmark results. Detailed descriptions of the methodologies used in our tests are available as "[Appendix 2 – Methodology Description](#)" of this report.

Benchmark 1 – Boot Time

This metric measures the amount of time taken for the machine to boot into the operating system. With all the various applications installed in an end-user's machine, it is common that multiple programs are launched at Windows startup, adding an additional amount of time and delaying the startup of the operating system. An improvement in boot time essentially means that the system starts up faster.

Benchmark 2 – Browse Time

This metric measures the amount of time taken for a machine to browse through a set of webpages that have been linked together. The browser is cleared each time this test is conducted, prior to the next round of testing to prevent any advantages from caching. The final result for this metric is the average of five rounds.

Benchmark 3 – Internet Speed

This test evaluates the maximum internet speed achieved by the machine. For this, we have used third party speed testing sites such as Google's and OOKLA's Internet Speed Tests. Both the upload and download speeds from both these sites are obtained and included when calculating the average internet speed value. The final results is the total average over five rounds of tests.

Benchmark 4 – Browser Load Time

This metric is one of many methods to objectively measure how much the product improves the impacts the responsiveness of the system. This metric measures the amount of time it takes to launch the user interface of Microsoft Edge. To allow for caching effects by the operating system, both the initial launch time and the subsequent launch times were measured. Our final result is an average of these two measurements.

Benchmark 5 – Free RAM Available

This metric evaluates the change in free RAM once the product completes its repairing process on the machine under observation. The amount of RAM used during system idle provides a good indication of the amount of system resources being consumed by programs on a permanent basis.

Benchmark 6 – CPU Usage during System Idle

The amount of load on the CPU while in an idle state may affect the end user experience as high loads slow down the system. This metric measured the percentage of CPU used when the system is idle. With all the programs installed in the system, it is common that these applications perform tasks in the background even while the system is assumed to be idle, thus slowing down the machine.

Benchmark 7 – File Copy, Move and Delete

This metric measures the amount of time taken to move, copy and delete a sample set of files. The sample file set contains several types of file formats that a Windows user would encounter in daily use. These formats include documents (e.g. Microsoft Office documents, Adobe PDF, Zip files, etc), media formats (e.g. images, movies and music) and system files (e.g. executables, libraries, etc).

Benchmark 8 – USB 3.0 File Copy

This test measures the amount of time taken to copy files from a USB 3.0 drive to a local disk. The data set comprised a total file size of 6.06GB, and the formats used included documents, movies, system files and executables.

Benchmark 9 – PerformanceTest Benchmark

This test measures the machine's overall performance as a finalized score over a range of areas, including CPU, Memory, 3D / 2D video & HDD performance. The benchmarking is performed using PassMark's [PerformanceTest](#) application. The final result is the average of the score obtained over two rounds.

Benchmark 10 – Battery Life Improvement

This test is conducted on the laptop environment to evaluate the improvement in battery life caused by the product. The battery percentage is logged as it diminishes from 100% to 0% (Or until the machine goes into sleep state). The rate of battery loss (Discharge rate) is used for comparison to evaluate the improvement in battery life.

Benchmark 11 – Memory Usage During System Idle

This metric measures the amount of memory (RAM) used by the product while the machine is in an idle state. The total memory usage was calculated by identifying all the processes belonging to the product and the amount of memory used by each process.

The amount of memory used while the machine is idle provides a good indication of the amount of system resources being consumed by the product on a permanent basis. Better performing products occupy less memory while the machine is idle.

Benchmark 12 – Disk Space Recovered

This metric measures the amount of capacity recovered once the product completes its repairing process on the system.

Test Results

The table below shows the averaged final set of results for each performance metric in the desktop environment.¹

Test	Desktop		
	Before System Mechanic	After System Mechanic	Percentage Change (Improvement)
Machine Boot Time (s)	16.32	14.29	12%
Browse Time (ms)	17227.60	14993.20	13%
Internet Speed (Mbps)	374.00	377.48	1%
Browser Load Time (ms)	1298.72	1172.45	10%
Free RAM Available (GB)	5.25	5.61	7%
CPU Usage during Idle (%)	2.97%	2.30%	0.7%
File Copy, Move and Delete (s)	3.75	3.54	6%
File Copy USB 3.0 to Disk (s)	46.02	45.65	1%
Performance Test Score	2372.07	2378.93	0.3%
Battery Life (Discharge Rate) (%/hr)	N/A	N/A	N/A
Memory Usage During Idle (MB)	N/A	4.1	N/A
Disk Space Recovered (MB)	N/A	75.32	N/A

The table below shows the averaged final set of results for each performance metric in the laptop environment.²

Test	Laptop		
	Before System Mechanic	After System Mechanic	Percentage Change (Improvement)
Machine Boot Time (s)	195.66	181.39	7%
Browse Time (ms)	58662.00	53718.00	8%
Internet Speed (Mbps)	370.01	374.52	1%
Browser Load Time (ms)	3818.19	3679.88	4%
Free RAM Available (GB)	4.53	4.72	4%
CPU Usage during Idle (%)	2.08%	1.29%	0.8%
File Copy, Move and Delete (s)	11.52	10.60	8%
File Copy USB 3.0 to Disk (s)	111.81	108.49	3%
Performance Test Score	2143.73	2154.00	0.5%
Battery Life (Discharge Rate) (%/hr)	27.1	25.2	7%
Memory Usage During Idle (MB)	N/A	4.9	N/A
Disk Space Recovered (MB)	N/A	1464.00	N/A

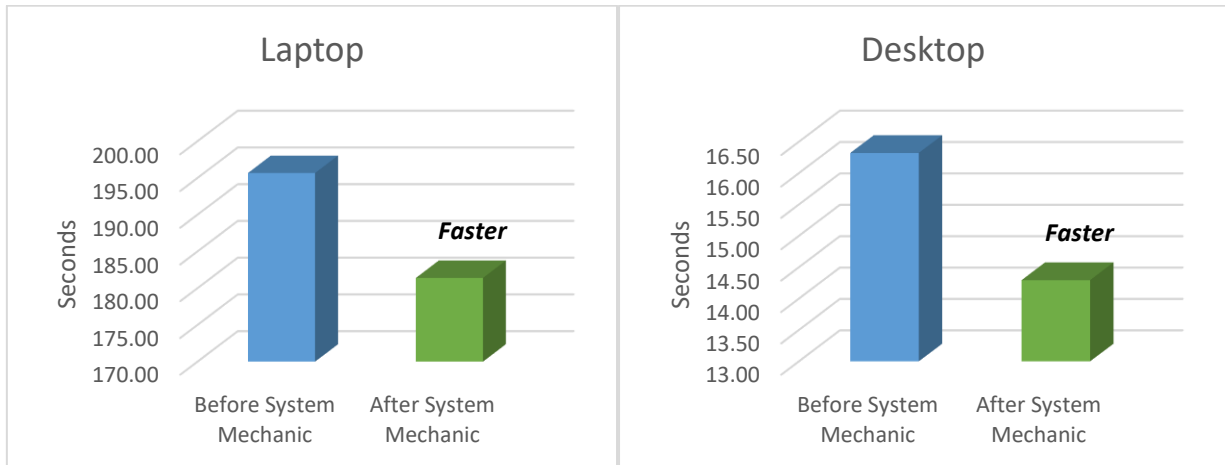
¹ Percentage change (Improvement) for "CPU Usage during Idle" on the desktop can be interpreted as -22% as a percentage change in utilization percentage.

² Percentage change (improvement) for "CPU Usage during Idle" on the laptop can be interpreted as -38% as a percentage change in utilization percentage.

In the following charts, we have highlighted the results before (in blue) and after (in green) repairing both machines with System Mechanic.

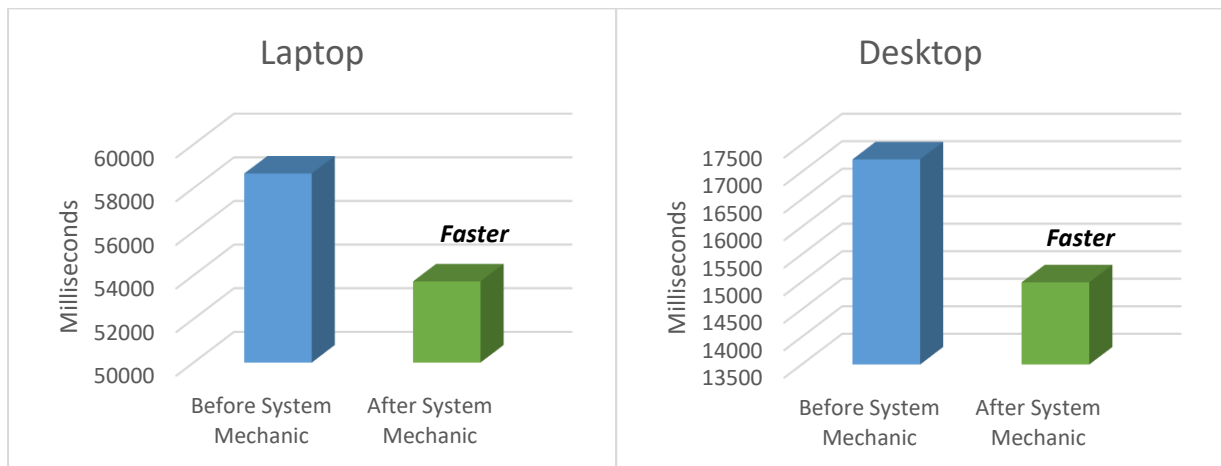
Benchmark 1 – Boot Time

The following charts compare the average time taken for the system to boot (from a sample of five boots) before and after the product repairs each machine. Lower the boot time, better the performance.



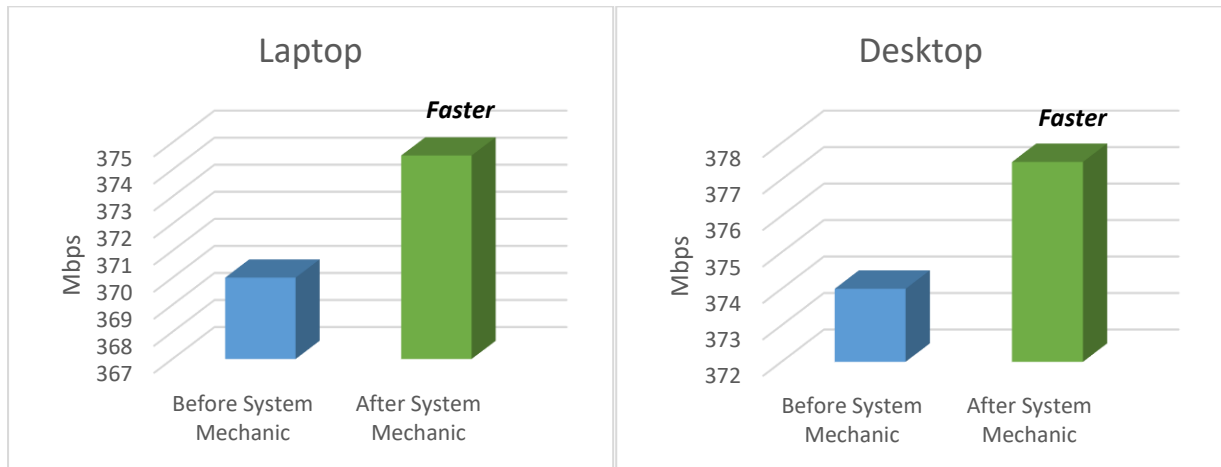
Benchmark 2 – Browse Time

The following charts compare the average time taken to browse over a linked set of webpages before and after the product repairs each machine. Lower the browse time, better the performance.



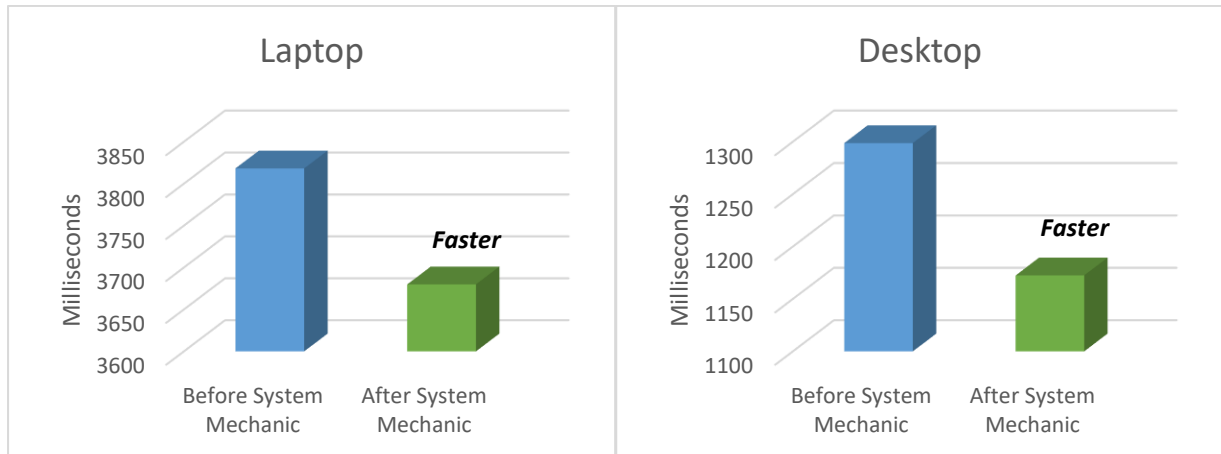
Benchmark 3 – Internet Speed

The following charts compare the average maximum internet speed (Combination of upload and download speeds) achieved by each machine before and after it is repaired. Higher the speed, better the performance.



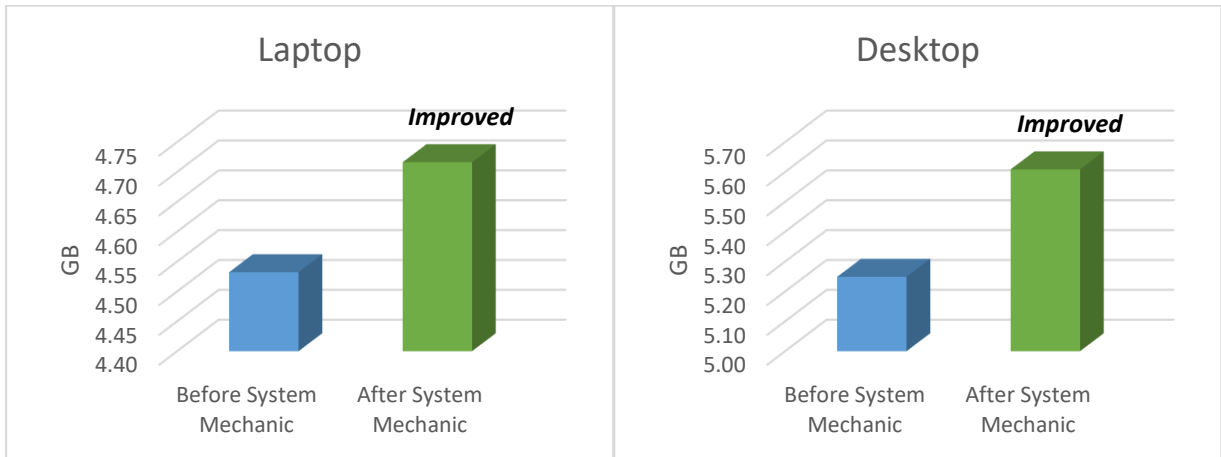
Benchmark 4 – Browser Load Time

The following charts compare the average launch times of the Microsoft Edge after rebooting each machine, before and after the product performs its repairing process. Lower the browser load time, better the performance.



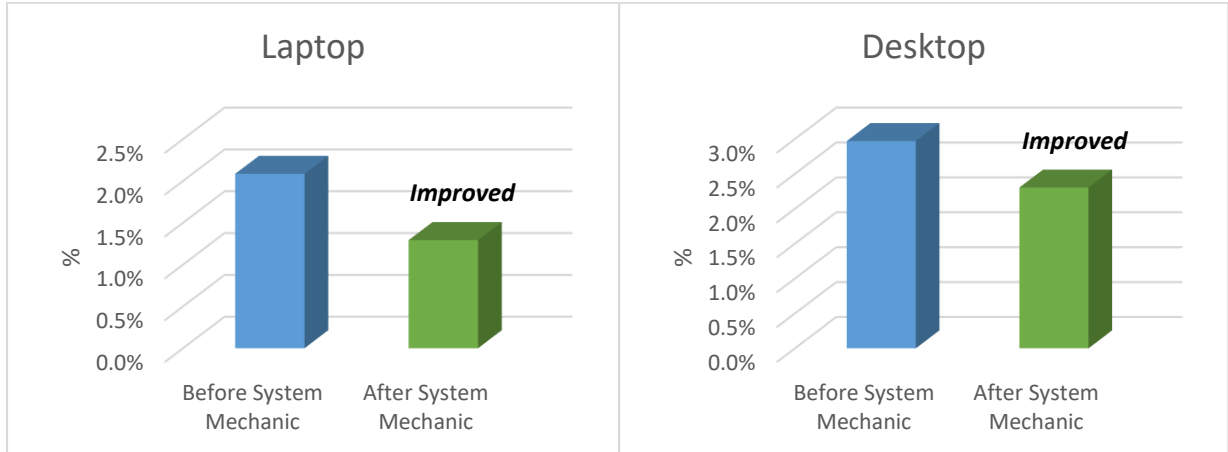
Benchmark 5 – Free RAM Available

The following charts compare the average amount of free RAM available in each machine when the system is in an idle state. Higher the free RAM available, better the performance.



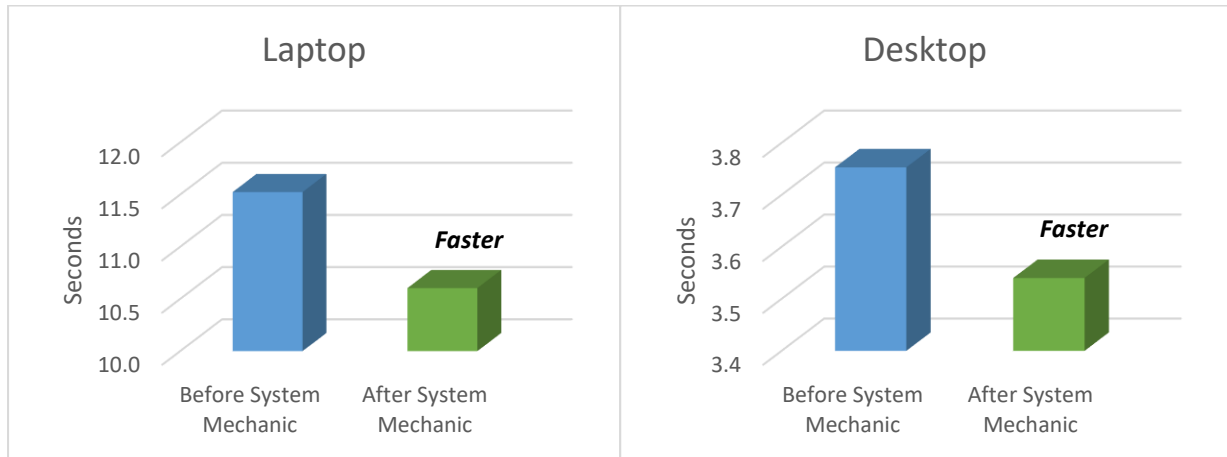
Benchmark 6 – CPU Usage during System Idle

The following charts compare the average CPU Usage when each machine is in an idle state, before and after repairing the system with System Mechanic. Lower the CPU usage, better the performance.



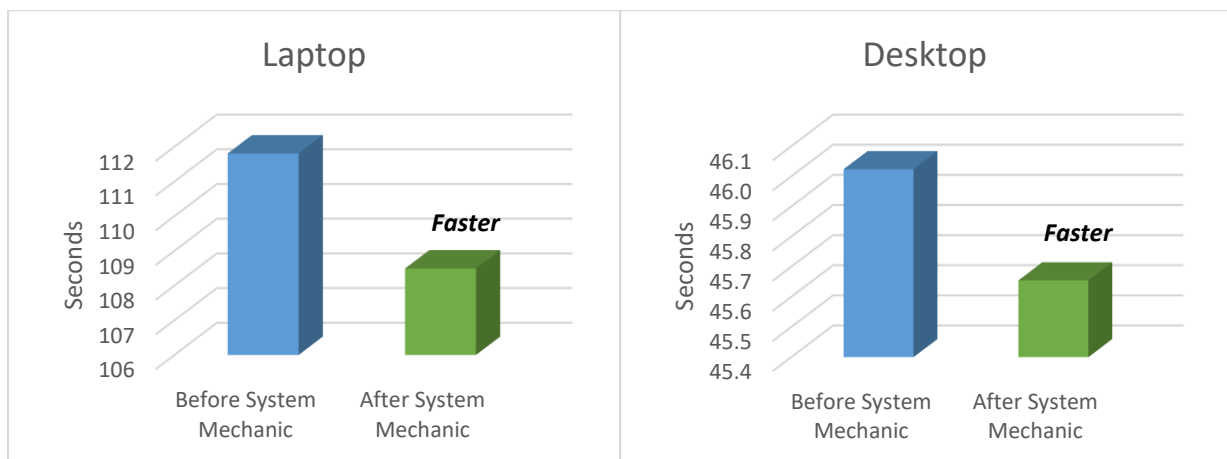
Benchmark 7 – File Copy, Move and Delete

The following charts compare the average time taken to copy, move and delete several sets of sample files on both machines, before and after repairing the system with System Mechanic. Lower the time taken, better the performance.



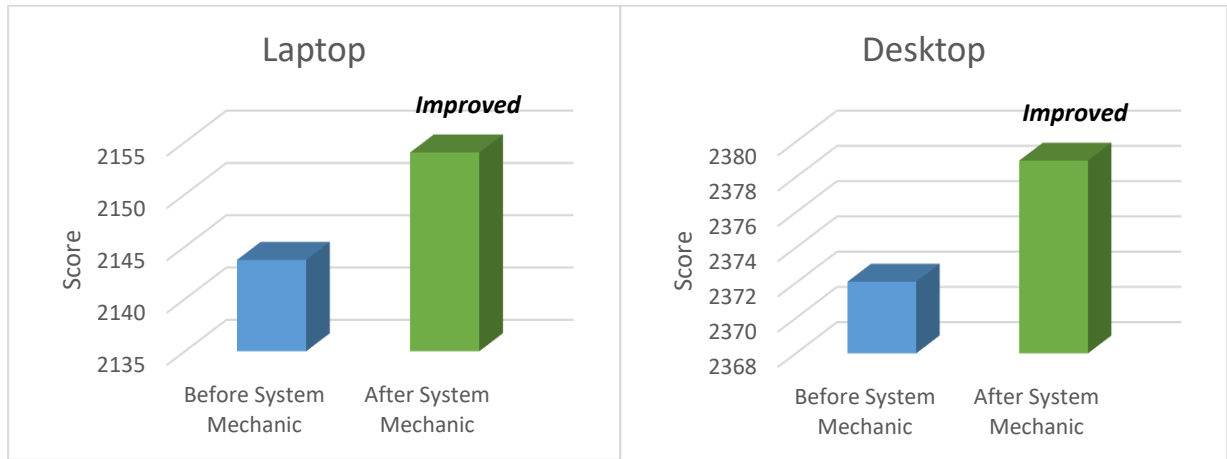
Benchmark 8 – USB 3.0 File Copy

The following charts compare the average time taken to copy a set of files from an external USB 3.0 drive to a local disk, before and after repairing each machine with System Mechanic. Lower the time taken, better the performance.



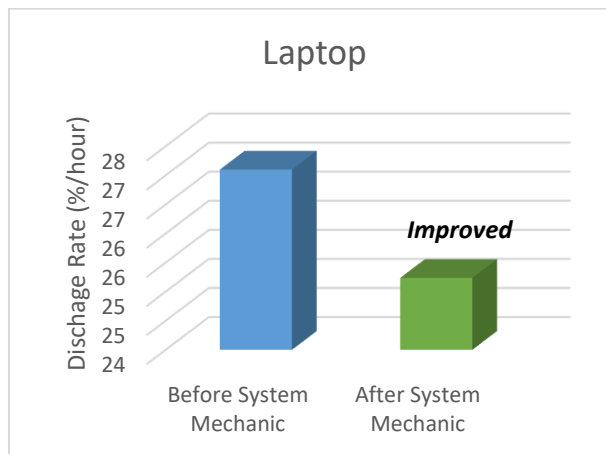
Benchmark 9 – PerformanceTest Benchmark

The following charts compare the benchmark score achieved from Passmark PerformanceTest, before and after repairing each machine with System Mechanic. Lower the score, better the performance.



Benchmark 10 – Battery Life Improvement

The following charts compare the battery discharge rate, before and after repairing the laptop with System Mechanic. Lower the rate, better the performance.



Disclaimer and Disclosure

Disclaimer of Liability

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Disclosure

IOLO funded the production of this report. The testing environments and metrics included in the report were selected by IOLO.

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Appendix 1 – Test Environment

For our testing, PassMark Software used two test environments (Laptop and Desktop) running Windows 10 Pro (64-bit) with the following hardware specifications:

Test Machine 1: Laptop

Model:	HP Envy 15-1067nr Notebook PC
CPU:	AMD Ryzen 5 2500U with Radeon Vega Mobile Gfx
Video Card:	AMD Radeon Vega 8 Mobile Graphics
RAM:	7892MB DDR4
HDD (Boot Drive):	HGST HTS721010A9E630 1000GB
2nd Drive:	Samsung SSD 960 EVO 250GB
O/S:	Windows 10 Pro 64bit

Test Machine 2: Desktop

Model:	Lenovo H50W-50 i5
CPU:	Intel Core i5-4460 CPU @ 3.20GHz 3.20 GHz
Video Card:	NVIDIA GeForce GT 705
RAM:	8GB DDR3 RAM
SSD (Boot Drive):	Samsung 850 PRO 512GB
2nd Drive:	ST1000DM003 1000GB
O/S:	Windows 10 Pro 64bit

State of Clean Image

In order to test the performance benefits of System Mechanic, we installed a set of programs and browser add-ons on top of the clean Windows 10 Home image of both test machines. Common programs were chosen to replicate a typical end user system.

Listed below are 41 commonly used programs, 12 additional application chosen by IOLO and 6 browser add-ons used for testing. It is noteworthy that these applications were installed with their default options:

List of Common Applications:

1. CyberGhost VPN
2. Adobe Acrobat Reader
3. AVG AV (Free)
4. Evernote
5. Aomei Backupper
6. Audials
7. AntiBrowserSpy
8. WonderShare
9. Bluestacks
10. Video Converter Ultimate
11. Lightshot
12. Maxthon Browser
13. McAfee TruKey
14. OverWolf
15. Pluto TV
16. SoundTouch

17. VisualStudio Plus
18. Unchecky
19. Camtasia
20. Synology
21. FreeDownloadManager
22. Glasswire
23. Kodi
24. Steam
25. iTunes
26. Advanced Uninstaller
27. Quicktime
28. Microsoft Office
29. Adobe Flash Player
30. Google Chrome
31. Google Earth
32. Java Runtime
33. VLC Player
34. Skype
35. Dropbox
36. WinRar
37. Notepad++
38. Whatsapp for PC
39. Macrium Reflect
40. uTorrent
41. Daemon Tools Lite

List of Applications chosen by IOLO

1. ICQ
2. Virtual DJ
3. Quickbooks Pro
4. DU Meter
5. Discord:
6. Epson Printer software
7. CyberLink Screen Recorder
8. Startup Faster!
9. SlickRun
10. DigiGuide
11. Power2Go DVD Burning
12. CyberLink Webcam

Browser Add-Ons:

1. Save to Pocket
2. Evernote Web Clipper
3. Translator for Microsoft Edge
4. Nimble Contacts
5. Open in Private
6. Read & Write for Microsoft Edge

Appendix 2 – Methodology Description

Benchmark 1 – Boot Time

PassMark Software uses tools available from the *Windows Performance Toolkit* (as part of the Microsoft Windows 10 ADK obtainable from the [Microsoft Website](#)).

The Boot Performance (Fast Startup) test is run as an individual assessment via the Windows Assessment Console. The network connection is disabled and the login password is removed to avoid interruption to the test. The result is taken as the total boot duration excluding BIOS load time.

For instances where the system never really reaches an idle state (due to background applications running continuously), timing is done manually using a stopwatch.

Benchmark 2 – Browse Time

This test uses javascript to load a list of 103 ‘popular’ websites consecutively from a local server. On each page in the sample data, a few lines of javascript are added to the website’s html to execute the javascript script that loads the next website in the chain. To begin with, once the first website has been loaded completely, the script is executed to load the second website in the chain. Once this has finished loading, the script is executed to then load the third website in the chain. This process is repeated until the final website in the chain has loaded. The start time and end time of this process are recorded and the difference is calculated in seconds to get the final result. For this test, we will use the current version of Chrome. The set of websites used in this test include front pages of high traffic pages. This includes shopping, social, news, finance and reference websites. The Browse Time test is executed five times and our final result is an average of these five samples.

Benchmark 3 – Internet Speed

Internet speed benchmarking will be conducted using the 2 sites listed below:

- 1) OOKLA’s SpeedTest.net – (<http://www.speedtest.net>)
- 2) Google Speed Test (MeasurementLab)

Each of these tests will be run five times before and after running System Mechanic. An overall average for download and upload speeds will be calculated to be included in the compiled set of results.

Benchmark 4 – Browser Load Time

The average launch time of Microsoft Edge interface was taken using *AppTimer*. This test was practically identical to the User Interface launch time test. For each product tested, we obtained a total of fifteen samples from five sets of three Edge launches, with a reboot before each set to clear caching effects by the operating system. When compiling the results, the first of each set was separated out so that there was a set of values for the initial launch after reboot and a set for subsequent launches.

For this test, we have used *Microsoft Edge (Version 42.17134.1.0)* as our test browser.

We have averaged the subsequent launch times to obtain an average subsequent launch time. Our final result for this test is an average of the subsequent launch average and the initial launch time.

Benchmark 5 – Free RAM Available

FreeRAM is a command-line tool which samples the amount of free RAM available every second. From this, **FreeRAM** calculates and displays the average free RAM available for the interval of time for which it has been active.

For this metric, **FreeRAM** was used to measure the free RAM available on average by the system while it is in an idle state (Machine is left alone for 5 minutes before running the tool). The result is calculated as an average five sets of 300 RAM usage samples.

Benchmark 6 – CPU Usage during Idle

CPUAvg is a command-line tool which samples the amount of CPU load approximately two times per second. From this, **CPUAvg** calculates and displays the average CPU load for the interval of time for which it has been active.

For this metric, **CPUAvg** was used to measure the CPU load on average (as a percentage) by the system while an On-Demand Scan is run on a sample data set. The result is calculated as an average five sets of thirty CPU usage samples.

Benchmark 7 – File Copy, Move and Delete

This test measures the amount of time required for the system to copy, move and delete samples of files in various file formats. This sample was made up of 812 files over 760,867,636 bytes and can be categorized as documents [26% of total], media files [54% of total] and PE files (i.e. System Files) [20% of total].

The breakdown of the main file types, file numbers and total sizes of the files in the sample set is shown in the following table:

File format	Number	Size (bytes)
DOC	8	30,450,176
DOCX	4	13,522,409
PPT	3	5,769,216
PPTX	3	4,146,421
XLS	4	2,660,352
XLSX	4	1,426,054
PDF	73	136,298,049
ZIP	4	6,295,987
7Z	1	92,238
JPG	351	31,375,259
GIF	6	148,182
MOV	7	57,360,371
RM	1	5,658,646
AVI	8	78,703,408
WMV	5	46,126,167
MP3	28	191,580,387

EXE	19	2,952,914
DLL	104	29,261,568
AX	1	18,432
CPL	2	2,109,440
CPX	2	4,384
DRV	10	154,864
ICO	1	107,620
MSC	1	41,587
NT	1	1,688
ROM	2	36,611
SCR	2	2,250,240
SYS	1	37,528,093
TLB	3	135,580
TSK	1	1,152
UCE	1	22,984
EXE	19	2,952,914
DLL	104	29,261,568
AX	1	18,432
CPL	2	2,109,440
CPX	2	4,384
DRV	10	154,864
ICO	1	107,620
MSC	1	41,587
NT	1	1,688
ROM	2	36,611
SCR	2	2,250,240
SYS	1	37,528,093
TLB	3	135,580
TSK	1	1,152
UCE	1	22,984
Total	812	760,867,636

This test was conducted five times to obtain the average time to copy, move and delete the sample files, with the test machine rebooted between each sample to remove potential caching effects.

Benchmark 8 – USB 3.0 File Copy

This test measures the amount of time taken to transfer files from an external drive to a local disk via a USB 3.0 connection. The data set comprised of 6,834 files with a total file size of 6.06GB, and the formats used included documents, movies, images, executables and system files. A breakdown of the sample file set is given below:

File Extension	Number of Files	File Size
.dll	1429	627MB
.doc	496	164MB
.docx	324	76MB
.exe	280	1.2GB
.jpg	1564	469MB
.mp3	394	1.06GB
.pdf	567	246MB
.pptx	556	1.06GB
.pst	2	59.1MB
.sys	568	145MB
.xlsx	584	81.0MB
.zip	70	911MB

A total of five runs of this test were performed, with a machine restart between each run. The time taken to transfer files was measured and recorded by CommandTimer.exe. Files were deleted from the local disk once the copy was complete. The final result is calculated as an average of the five samples.

Benchmark 9 – PerformanceTest Benchmark

A well-known synthetic benchmark will be performed using PassMark's **PerformanceTest**. This test measures the overall performance as an overall score over a range of areas, including CPU, Memory, 3D / 2D video & HDD performance.

Benchmark 10 – Battery Life Improvement

This test will only be performed on the laptop (Test machine 1). Preliminary steps will be taken to adjust the default power plan in order to disable sleep/hibernation of the machine. A script will be utilized to place a moderate amount of load on the machine. For example: the machine remains idle for 1 hour and then runs an application called **BurnInTest**. This process is repeated in a loop while **BatteryMon** logs reduction in battery life leading to a 0% battery level.

Benchmark 11 – Memory Usage During System Idle

The **MemLog++** utility was used to record process memory usage on the system at boot, and then every minute for another fifteen minutes after. This was done only once per product and resulted in a total of 15 samples. The first sample taken at boot is discarded.

The **MemLog++** utility records memory usage of all processes. As a result of this, the product's processes need to be isolated from all other running system processes. To isolate a relevant process, we used a program called **Process Explorer** which was run immediately upon the completion of memory usage logging by **MemLog++**. **Process Explorer** is a Microsoft Windows Sysinternals software tool which shows a list of all DLL processes currently loaded on the system.

Benchmark 12 – Disk Space Recovered

Using PassMark's **OSForensics** we created an initial and final disk signature allowing System Mechanic to run its "Repair All" feature in-between these signature captures. These disk signatures recorded the amount of files and directories, and complete details of all files on that drive (including file name, file size, checksum, etc) at the time the signature was taken.

The initial disk signature was taken immediately prior to running the "Repair All" feature. A subsequent disk signature was taken immediately following the repair process. Using **OSForensics**, we compared the two signatures and calculated the total disk space consumed by files that were new, modified, and deleted during this process. Our result for this metric reflects the overall difference in disk size (space recovered) after the execution of System Mechanic.