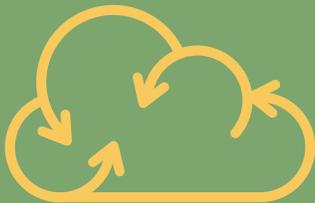




UPLOAD FILES
to Google Drive in up to
53%
LESS TIME

ACCESS FILES FROM
THE CLOUD



up to
4.7X
FASTER

Not all clouds are created equal

A comparison of Google Drive, Microsoft OneDrive for Business, and SharePoint Online

Accessing files from wherever you are is more important than ever in today's evolving work environment. The U.S. mobile worker population is expected to grow from 96.2 million in 2015 to 105.4 million by 2020—representing nearly three-quarters of the total U.S. workforce.¹ Cloud storage lets you share files among users and devices, but long wait times can be annoying and reflect poorly on your business when clients are forced to wait on important information. With the right productivity tools, your team members and clients can access and share files quickly instead of waiting to get work done.

Here at Principled Technologies, we examined how well Google Drive™, Microsoft® OneDrive® for Business, and Microsoft SharePoint® Online actually work when transferring information on the go.

Google Drive was faster than either Microsoft solution, which gives you more time to focus on closing the deal instead of watching the progress bar.

Accomplish more in less time

Business relies on the timely transfer of information, and collaboration suites like G Suite and Microsoft Office 365® can streamline the process.

We looked at how long it took us to upload and download a variety of common file types using both productivity suites. For G Suite, we used Google Drive, and for Microsoft Office 365, we used OneDrive for Business and SharePoint Online. All three tools let you and your colleagues access work files from multiple devices, but how quickly and reliably?

We used laptops and smartphones running multiple operating systems, browsers, and apps to find out.

Transferring information was faster with Google Drive. This means critical information gets into your hands—and your customers' hands—faster.

The clock is ticking...

The following scenarios illustrate real-world situations where using Google Drive, Microsoft OneDrive for Business, or SharePoint Online can make (or break) the day.



Time to play the waiting game

Andre and Stacey, designers for competing ad agencies, both create videos and upload them to the cloud to share the finished products with their clients. They use the same model of MacBook Air®. Because Andre uses Google Drive, he can upload his files in about half the time it takes Stacey using either OneDrive for Business or SharePoint Online.

As our tests show, uploading the video with Google Drive from his MacBook Air makes Andre's video available at least six and a half minutes before Stacey's video. This gives his team a competitive advantage—not to mention the reduction of frustrating wait time on Andre's end.

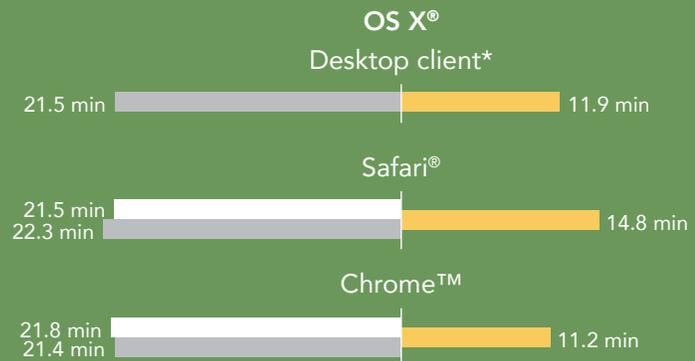
Any of Andre's or Stacey's clients who use Google Drive can also download the video for review in less time than those who use the Microsoft options—up to 58 percent less time.

Because uploading and downloading with the Microsoft products is so much slower, the whole video-sharing process would take Stacy and her Microsoft clients up to 14 minutes longer than it would had they all been Google Drive users.

Upload an MP4 on OS X laptops in up to

48%

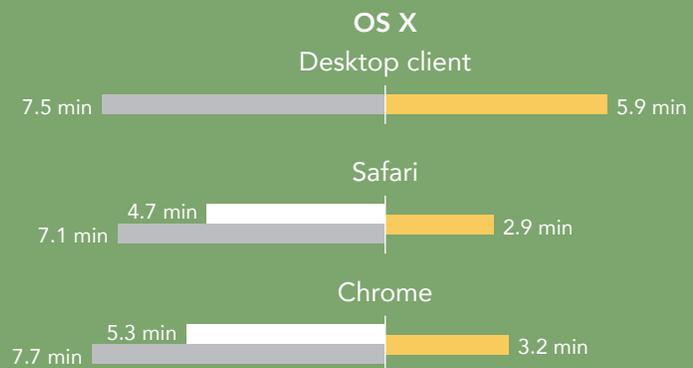
less time
with Google Drive



Download an MP4 on OS X laptops in up to

58%

less time
with Google Drive



□ SharePoint Online ■ OneDrive for Business ■ Google Drive

*A SharePoint desktop sync client was not available at the time of testing.

Knock it out of the park!

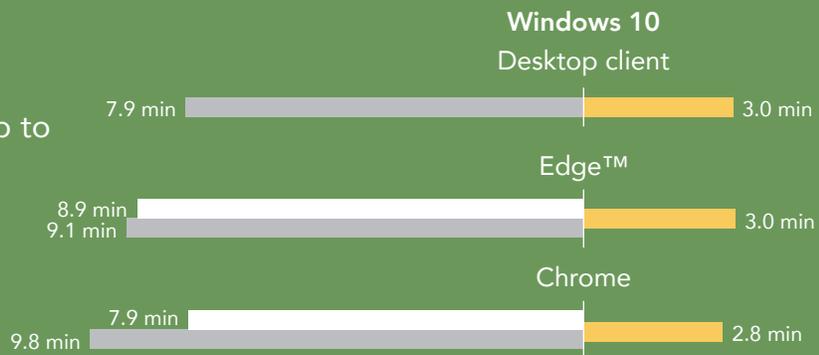
Chondra is an athletic scout for a major league baseball franchise. She and the other scouts on her team go to high school and college games to find their next big star. They film these games, and then upload the videos to a shared G Suite folder. This makes it easier for everyone to evaluate promising athletes.

Our tests show that using Google Drive on her Windows® 10 laptop means Chondra can start assessing a promising player in less than half the time it would take if she were using either OneDrive for Business or SharePoint Online. Using Google Drive also means she waits 7 minutes less every time she downloads a video file.

Once she's evaluated the pile of prospective candidates, uploading her favorites to another folder using Google Drive in the Chrome browser would save Chondra at least 8 minutes per upload compared to the Microsoft options.

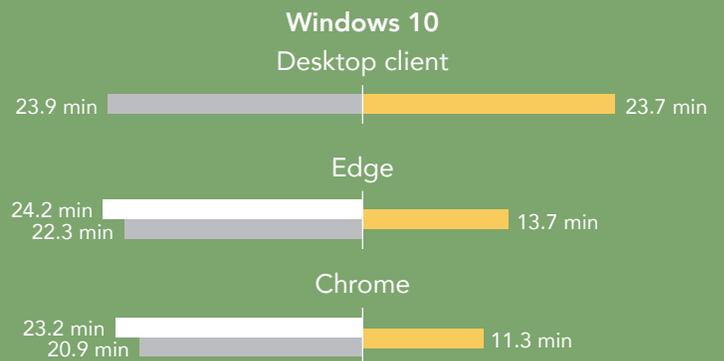
Download an MP4 on Windows 10 laptops in up to

71%
less time
with Google Drive



Upload an MP4 on Windows 10 laptops in up to

51%
less time
with Google Drive



SharePoint Online
 OneDrive for Business
 Google Drive

Revamping product tutorials for clients

Jonathan just transferred from IT development to software sales in his company. His boss tells him to make sure the product tutorials are accurate and up to date before he goes out in the field.

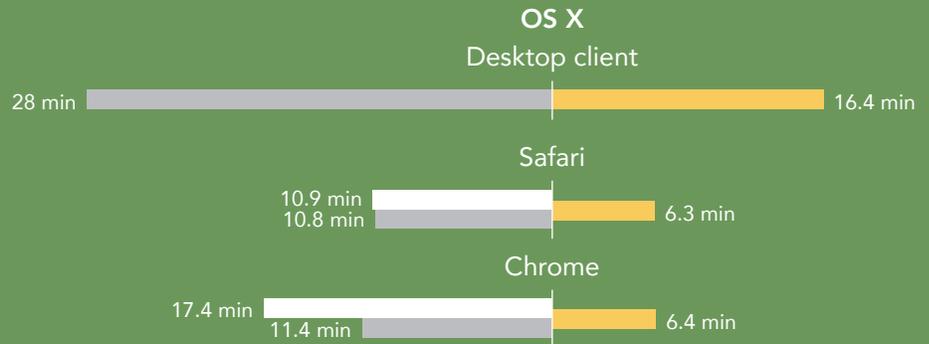
As the data below shows, downloading the product tutorial disk images on his MacBook Air with Google Drive would take Jonathan less than half the time it would have taken him had he used SharePoint Online.

Once he's modified and repacked the disk image, it's time to upload the revised tutorials. Google Drive can save Jonathan up to 25 minutes with this task.

Download an ISO on OS X laptops in up to

63%

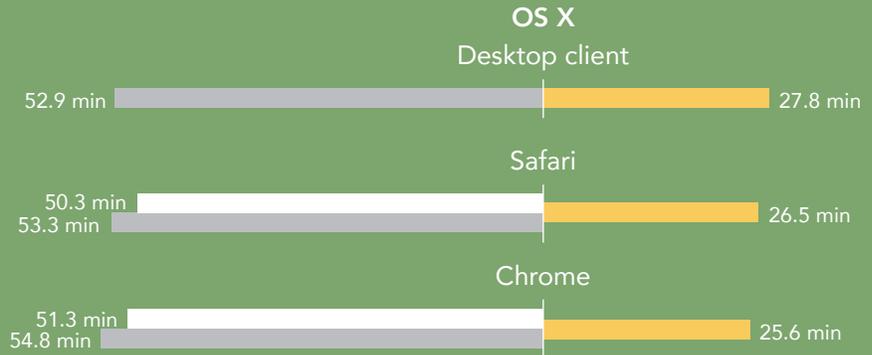
less time
with Google Drive



Upload an ISO on OS X laptops in up to

53%

less time
with Google Drive



SharePoint Online
 OneDrive for Business
 Google Drive

Minimizing the impact of travel on work productivity

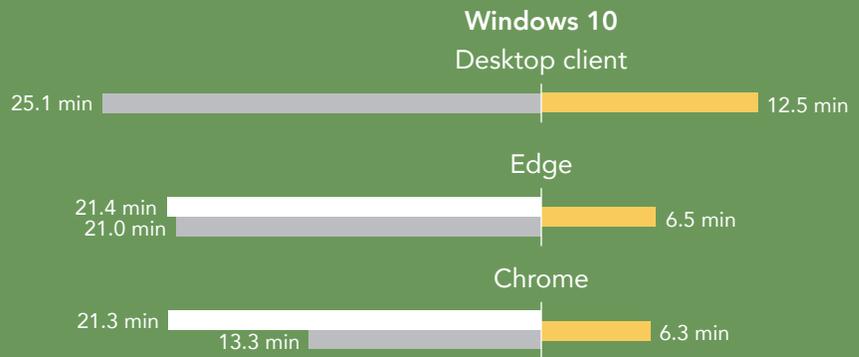
Yuki is a lead application developer. The day before his product is due to launch, he learns that his aging father has been hospitalized and is in critical condition. Yuki goes online to book his flight then rushes home to pack a bag. Once he's at the airport, he has little time before he has to board the plane. He'll use the airport Wi-Fi to download a disk image to his laptop before he takes off, make any necessary changes during his flight, and upload the revised image as soon as he lands.

As the data below shows, getting his hands on this critical file could take just over 6 minutes with Google Drive, compared to as long as 21 minutes with OneDrive for Business or SharePoint Online. Those 15 minutes could be the difference between getting the ISO before he boards the plane or not. If he had been using OneDrive for Business, he would lose all those hours of productivity during the flight.

Once he lands, Yuki could save up to almost half an hour when he uploads the corrected disk image to his team in Google Chrome or Microsoft Edge.

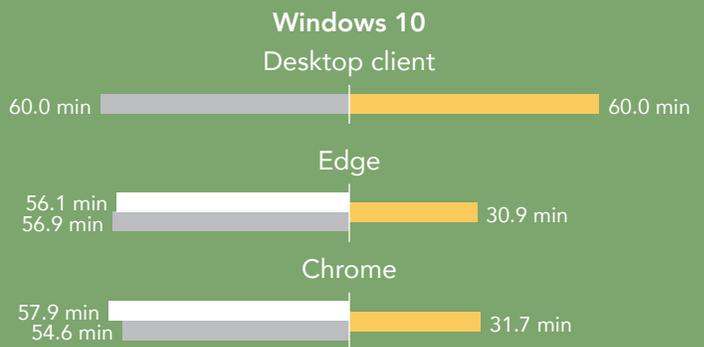
Download an ISO on Windows 10 laptops in up to

70%
less time
with Google Drive



Upload an ISO on Windows 10 laptops in up to

45%
less time
with Google Drive



□ SharePoint Online ■ OneDrive for Business ■ Google Drive

When you're on the go, there's no time to lose...

When Google Drive helps you look at files on your smartphone faster than if you had used Microsoft OneDrive for Business or SharePoint Online, you're ahead of the game. Consider the following scenario.

Faster mobile downloads help an attorney make a stronger case

Amy is an attorney trying a high-profile civil case. She's in a taxi on the way to the courthouse when she thinks of a piece of information she can use in her argument. It's in one of several documents on her firm's Google Drive, so she can look for it using her phone. She can't remember which file it's in, or what to search for, so she opens one file after another, scanning each doc for the info. As the chart below shows, opening a document using Google Drive takes about half the time of doing so with Microsoft tools. Those time savings allow Amy to locate the data point she needs more quickly, and she's able to make a stronger case.

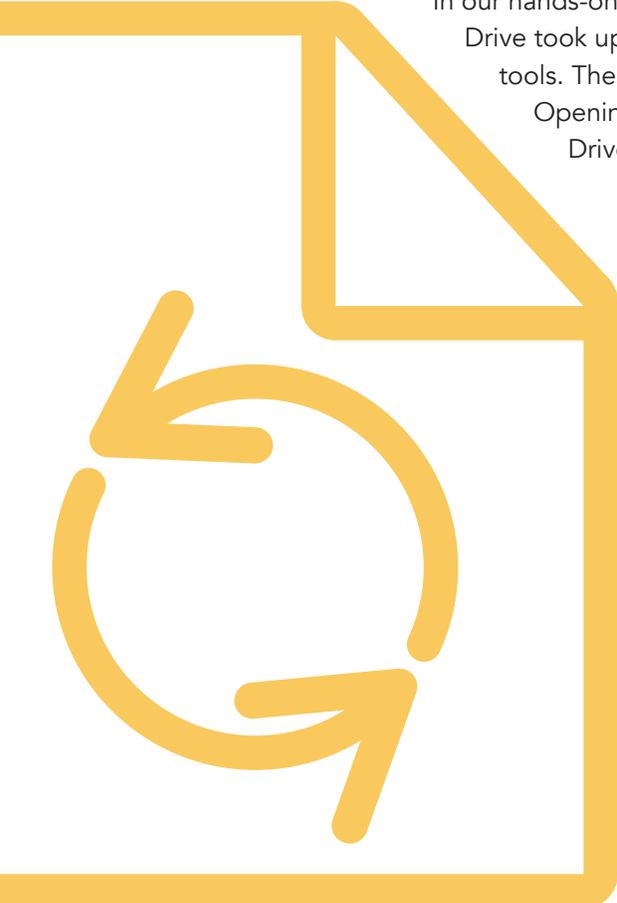


□ SharePoint Online ■ OneDrive for Business ■ Google Drive

*A native Android app for SharePoint was not available at the time of testing.

Conclusion: Stop waiting, start working

File sync and sharing solutions are a great way to streamline the transfer of information—as long as it’s quick. When someone is waiting for an important item to load, even lags of a few seconds are very noticeable. When delays are minutes long, entire projects can grind to a halt as workers strive to find workarounds.



In our hands-on testing with laptops, uploading and downloading files using Google Drive took up to 71 percent less time than performing the same tasks with Microsoft tools. These kinds of delays can translate to frustration as well as lost opportunities. Opening documents on smartphones was also up to twice as fast with Google Drive. These time savings can make a big difference in your work day.

Want to try out the tests yourself? Follow the methodologies at the end of this report.

This is the second report in our five-part series that examines the performance of collaboration and productivity tools from G Suite and Microsoft Office 365. Read the entire series for a complete picture of how the cloud you choose can affect your business.

Additional reports in the “Not all clouds are created equal” series:

[A comparison of Google Docs™ and Microsoft Word Online](#)

[A comparison of Google Hangouts™ and Skype™ for Business](#)

[A comparison of Gmail™ and Outlook®](#)

[A comparison of Google Sites™ and Microsoft SharePoint Online](#)

1 International Data Corporation (IDC) Press Release June 23, 2015. <https://www.idc.com/getdoc.jsp?containerId=prUS25705415>

On June 15, 2016, 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 July 12, 2016.

On September 29, 2016, Google rebranded Google Apps for Work as "G Suite." We completed our testing prior to that rebranding.

Appendix A – What we tested

The table below shows the system information for the mobile devices we tested.

System	Apple® iPhone® 6s Plus	Google Nexus™ 6P
Processor		
Vendor	Apple	Qualcomm®
Model number	A9 + M9 coprocessor	Snapdragon™ 810
Core frequency (GHz)	1.85	1.95 + 1.55
Number of cores	2	8 (4 + 4)
Memory		
Amount (GB)	2 (built-in onboard)	3 (built-in onboard)
Type	LPDDR4	LPDDR4
Graphics		
Vendor	Imagination Technologies®	Qualcomm
Model number	PowerVR® GT7600	Adreno™ 430
Storage		
Amount (GB)	64	64
Type	NAND Flash	NAND Flash
Connectivity		
Wireless internet	802.11ac (802.11a/b/g/n compatible)	802.11ac (802.11a/b/g/n compatible)
Cellular	LTE Advanced	LTE Advanced
Bluetooth	4.2	4.2
Battery		
Type	Lithium-polymer	Lithium-polymer
Size	Integrated	Integrated
Rated capacity (Wh)	10.45	13.11
Display		
Size	5.5"	5.7"
Type	LED-backlit widescreen Multi-Touch	AMOLED widescreen Multi-Touch
Resolution	1,080 x 1,920	1,440 x 2,560

System	Apple® iPhone® 6s Plus	Google Nexus™ 6P
Camera		
Front-facing (MP)	5 (720p FaceTime® HD)	8
Rear-facing (MP)	12 (iSight®)	12.3
Operating system		
Vendor	Apple	Google
Name	iOS	Android
Build number or version	9.3.2	6.0.1
Dimensions		
Height	6.23"	6.27"
Width	3.07"	3.06"
Depth	0.29"	0.28"
Weight (oz.)	6.77	6.27

The table below shows the system information for the laptops we tested.

System	Apple 13" MacBook Air (Early 2015)	Lenovo™ ThinkPad® X1 Carbon
Processor		
Vendor	Intel®	Intel
Model number	Core™ i5-5250U	Core i7-6600U
Core frequency (GHz)	1.6 (up to 2.7GHz Turbo Boost)	2.6 (up to 3.4GHz Turbo Boost)
Number of cores	2	2
Cache	3MB L3	4MB L3
Memory		
Amount (GB)	8 (built-in onboard)	8 (built-in onboard)
Type	LPDDR3	LPDDR3
Speed (MHz)	1,600	1,866
Integrated graphics		
Vendor	Intel	Intel
Model number	HD Graphics 6000	HD Graphics 520
Storage		
Amount (GB)	256	256
Type	PCIe-based flash	PCIe NVMe™ SSD

System	Apple 13" MacBook Air (Early 2015)	Lenovo™ ThinkPad® X1 Carbon
Connectivity/expansion		
Wireless internet	802.11ac (802.11a/b/g/n compatible)	802.11ac (802.11a/b/g/n compatible)
Bluetooth	4.0	4.1
USB	2 x 3.0	3 x 3.0
Thunderbolt	2 x 2	N/A
Video	N/A	1 x HDMI®, 1x Mini DisplayPort
Battery		
Type	Lithium-polymer	Lithium-polymer
Size	Integrated	4-cell
Rated capacity (Wh)	54	52
Display		
Size	13.3"	14"
Type	LED-backlit glossy widescreen display	LED IPS
Resolution	1,440 x 900	1,920 x 1,080
Touchscreen	No	No
Operating system		
Vendor	Apple	Microsoft
Name	OS X El Capitan	Windows 10 Pro
Build number or version	10.11.4	1511, OS Build 10586.318
Camera		
Front-facing	720p FaceTime HD	720p
Dimensions		
Height	0.11" to 0.6"	0.6"
Width	12.8"	13.1"
Depth	8.94"	9.00"
Weight (lb.)	2.96	2.58

Appendix B – How we tested

About our testing

To determine precisely when a file upload or download began and ended when using the native desktop sync client, we used the following indicators:

- The Google Drive icon on both Windows and OS X animates while any kind of file processing is in progress. When you click the icon in the system tray (Windows) or menu bar (OS X), a balloon appears to show which files are uploading/downloading. We started timing as soon as the status text said “Syncing” and a progress bar first appeared. We stopped timing when the status changed to say “Sync complete.”
- The OneDrive for Business icon on both Windows and OS X changes when it is actively syncing files. Similar to Google Drive, when you click on the icon in the system tray (Windows) or menu bar (OS X), a balloon appears to show upload/download status. On OS X, we started timing as soon as the status indicated “Downloading” and stopped timing when the status text said “OneDrive is up to date.” On Windows, we started timing when the status bar’s animated progress bar first appeared and stopped timing when it said “OneDrive for Business is up to date.”

Network infrastructure

For our testing, we used two of each device under test. We connected the two devices in each pair to separate wireless networks. We connected the devices to the 5GHz band of identical, 802.11ac-based TP-Link AC1750 wireless routers. We configured each router identically, but set them to use different channels, to ensure minimum traffic from nearby networks. To minimize the impact of bandwidth performance, we tested Google Drive, Microsoft OneDrive for Business, and SharePoint Online at approximately the same time for each task.

Devices

- Lenovo ThinkPad X1 Carbon (Windows 10)
- Apple 13” MacBook Air (OS X El Capitan)
- Google Nexus 6P (Android 6.0.1)
- Apple iPhone 6s Plus (iOS 9.3)

OS and browser versions

- Windows 10
 - Chrome 51.0.2704.84
 - Edge 25.10586.0.0
- OS X El Capitan
 - Chrome 51.0.2704.84
 - Safari 9.1.1
- Android 6.0.1
 - Chrome 51.0.2704.81
- iOS 9.3.2
 - Chrome 51.0.2704.84
 - Safari for iOS 9.3.2

File corpus (sizes are approximate)

- CentOS ISO: 4.33 GB
- Video (MP4): 1.93 GB
- Folder with 160 images (up to 2.2 MB each): 67.6 MB total
- Folder with 12 PDFs (~25 MB each): 309.7 MB total
- SampleDOCX.DOCX: 1.3 MB
- SamplePPTX.PPTX: 4.4 MB
- SampleXLSX.XLSX: 1 MB

Hardware/software matrix

- Laptop
 - Windows 10
 - Google Drive
 - Google Chrome
 - Microsoft Edge
 - Desktop sync client
 - OneDrive for Business
 - Google Chrome
 - Microsoft Edge
 - Desktop sync client
 - SharePoint Online
 - Google Chrome
 - Microsoft Edge
 - OS X
 - Google Drive
 - Google Chrome
 - Safari
 - Desktop sync client
 - OneDrive for Business
 - Google Chrome
 - Safari
 - Desktop sync client
 - SharePoint Online
 - Google Chrome
 - Safari
- Mobile
 - Android
 - Google Drive
 - Google Chrome
 - Android app
 - OneDrive for Business
 - Google Chrome
 - Android app
 - SharePoint Online
 - Google Chrome
 - iOS
 - Google Drive
 - Safari
 - iOS app
 - OneDrive for Business
 - Safari
 - iOS app
 - SharePoint Online
 - Safari
 - iOS app

Test practices

- We ran each test between two laptops or phones of the same model and using the same browser (when applicable) with different users on isolated networks. On Windows 10, we ran the tests in both Google Chrome and Microsoft Edge. On OS X, we ran the tests in both Google Chrome and Safari.
- On mobile devices, we closed relevant apps and removed them from memory before each test run to ensure consistent behavior.
- For final production testing, we tested each data point until we had three consecutive test runs with satisfactorily low variability between runs to ensure consistency.
- For mobile tests that involved opening or editing a file, our methodology assumed that the source file had already been converted to its respective native format by being opened in Google Docs/Sheets/Slides. We made this assumption to ensure that the measurement time included only the time required to open a file for editing, rather than the time required to convert and open.
- All tests assumed that all necessary users were logged into the respective services prior to testing.
- We ran all tests on a 100Mbps down and 20Mbps up connection.

Running the laptop tests

Uploading a file—desktop sync client

1. Navigate to the Documents folder, and prepare the stopwatch.
2. Right-click the test file, and click Copy.
3. Navigate to the desktop sync folder for the cloud storage solution under test on the local machine.
4. Drag the file or folder to upload over the desktop sync folder and simultaneously start the stopwatch and drop it in the desktop sync folder.
5. When the file has completely uploaded, stop the stopwatch.
6. Record the result.
7. Delete the file from the cloud storage solution under test, and wait for the files to completely sync.

Downloading a file—desktop sync client

1. Quit the desktop sync client for the cloud storage solution under test.
2. Open a browser, and navigate to the browser-based interface of the cloud storage solution under test.
3. Prepare the stopwatch.
4. Click the test file, drag it over the browser-based interface's cloud storage folder, and drop the file.
5. When the file has completely uploaded via the browser-based interface, launch the desktop sync client for the cloud storage solution under test. Click the tray icon to see the progress, wait for the balloon to indicate that the client is downloading, and start the stopwatch when it does.
6. Stop the stopwatch when the file has finished synchronizing to the laptop under test and the application's icon in the system tray or menu bar returns to its default state.
7. Record the result.

Uploading a file—browser-based interface

1. Navigate to the browser-based interface for the cloud storage solution under test.
2. Prepare the stopwatch, and in a local file browser window, select the file(s) to be uploaded.
 - When uploading a folder in Google Drive in the browser, click New, and select Folder upload.
 - When uploading a folder in OneDrive for Business in the browser, click Upload, and select Folder.
 - When uploading a folder in SharePoint Online in the browser, click Upload, and click Browse...
3. Simultaneously start the stopwatch and initiate the folder upload as follows:
 - When uploading a folder in Google Drive or OneDrive in the browser, select the folder in the file browser, and simultaneously start the stopwatch and click Select Folder.
 - When uploading a folder in SharePoint Online in the browser, select the folder, click Open, and simultaneously start the stopwatch and click OK.
4. Watch the progress bar, and when the upload has completed for all files, stop the stopwatch.
5. Record the result.

Downloading a file—browser-based interface

1. Navigate to the browser-based interface for the cloud storage solution under test.
2. Prepare the stopwatch, and select the files to be downloaded.
3. Simultaneously start the stopwatch, and click Download.
4. When the download completes, stop the stopwatch.
5. Record the result.

Running the mobile tests

Opening a file in the mobile app

1. Open the mobile app for the cloud storage solution under test.
2. Prepare the stopwatch, and navigate to the folder containing the file under test.
3. Simultaneously start the stopwatch, and tap on the file under test in order to open it in the native mobile productivity app.
4. When the file fully loads, stop the stopwatch.
5. Record the result.
6. Delete the file to remove it from the cache, close the cloud storage solution app and productivity app, and remove them from memory. Then, re-upload the file via the desktop sync client. This ensures that the file is not cached for subsequent runs.

Opening a file in the mobile site

1. Open the mobile browser, and navigate to the mobile site for the cloud storage solution under test.
2. Prepare the stopwatch, and navigate to the folder containing the file under test.
3. Simultaneously start the stopwatch, and tap the appropriate button in order to open it in the native mobile productivity app.
 - In Google Drive, tap the document first to see a preview, then click the edit icon. Then, simultaneously start the stopwatch and tap the Use the app button.
 - In OneDrive and SharePoint Online, tap the document first to see a preview, then tap the small arrow icon to bring up an icon for the associated productivity app. When you tap the icon, a prompt appears; simultaneously start the stopwatch and press Open.
4. When the file's contents are first visible, stop the stopwatch.
5. Record the result.
6. Delete the file to remove it from the cache, close the browser app and productivity app, and remove them from memory. Then, re-upload the file via the desktop sync client. This ensures that the file is not cached for subsequent runs.

This project was commissioned by Google.



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