

Encode HD video and save over 9.5 minutes

in PowerDirector®



Prepare print preview of a large file and save over 1 minute

in Google Sheets™



Merge audio tracks and save over 30 seconds

in Soundtrap®

Get a faster Chromebook to support your work life and home life

A Chromebook powered by the Intel Core m3-6Y30 processor was faster at home and office tasks compared to an Arm Rockchip processor-based device

The technology you depend on doesn't discriminate between the different areas of your life. You use a smartphone to message friends as well as colleagues; to review your work calendar and your dance card too. When it comes to computers, you deserve a fast device that can offer the same kind of flexibility.

At Principled Technologies, we tested two Chromebooks to see which was faster at tasks we do every day, from working with spreadsheets and documents to watching videos and creating music. We found that a Chromebook powered by the Intel Core m3-6Y30 processor was faster at these tasks than a Chromebook based on an Arm® Rockchip processor.

Faster devices are less frustrating to use—plus, they keep your day flowing so you can focus on the details. With an Intel Core m3 processor-powered Chromebook, you could spend more of your time *doing* instead of waiting.

The following pages describe a fictional scenario in which a person uses the Intel Core m3-6Y30 processor-powered ASUS Chromebook C302 at work and at home. Though the story may be hypothetical, it's based on PT facts. For more detailed testing information, see the [appendices](#) beginning on page 8.

A Chromebook for work and home

Esperanza leads a busy life—both at home and at work. She can't afford to be kept waiting by a slow Chromebook. Fortunately for her, the Intel Core m3 processor-powered ASUS Chromebook C302 is anything but slow. Read on to see how it helps Esperanza throughout her day.



Android™ apps for Chromebooks

Google is rolling out support for Android apps on many Chromebook devices. Being able to install apps from the Google Play™ store opens your Chromebook to new possibilities and functionality you can't get with older or unsupported models.

To learn more about Android apps and the Chromebooks that support them, visit <https://sites.google.com/a/chromium.org/dev/chromium-os/chrome-os-systems-supporting-android-apps>.

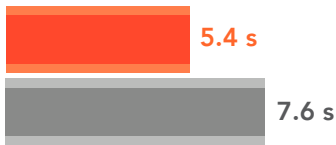
Esperanza's morning tasks

30% less time spent waiting



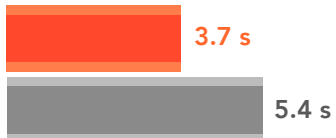
Open a Google Docs file in Google Drive™

Time (sec)
lower is better



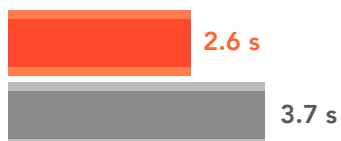
Import a document to be signed in DocuSign

Time (sec)
lower is better



Attach an image to a note in Evernote

Time (sec)
lower is better



Start your workday with a fast Chromebook

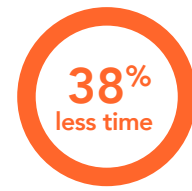
Esperanza arrives at work early Monday morning to handle some administrative tasks before her first set of meetings. She opens a Google Doc™ and begins to plan out her tasks for the day. A coworker passes along some documents for her to sign, so Esperanza saves them from Dropbox and imports them into the DocuSign® app.

Esperanza rounds out her morning by getting a jump start on a status report for one of her projects. She opens a template in Google Slides and hammers away. Just before her meeting, Esperanza gets an idea—inspiration for one of her top-secret creative projects. To make sure she remembers later tonight, she downloads a picture from the Internet and saves it to an Evernote® note before leaving her desk.



Export an imported PDF in Dropbox

Time (sec)
lower is better



Load a report template in Google Slides

Time (sec)
lower is better



G Suite

Employees like Esperanza use the intuitive productivity apps that come with G Suite to facilitate collaboration. To learn more about G Suite, visit <https://gsuite.google.com>. To see how the apps work in action, visit the Google Play store and try them yourself!

Esperanza's afternoon tasks

48% less time spent waiting



Power through the afternoon

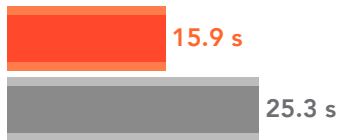
Esperanza's meetings run long, but she gains a ton of valuable information for her upcoming projects. When she gets back to her desk, Esperanza opens up a large Microsoft® Excel® spreadsheet from one of her meetings and makes a couple of tweaks. She then loads a preview of the document before printing it for her records—which takes her 77 fewer seconds than if she'd used a Chromebook based on an Arm Rockchip processor. After retrieving the printed document, Esperanza saves the spreadsheet as an Excel workbook again so she can pass it along to her colleagues that don't use G Suite.

Later that afternoon, Esperanza sets to work planning a new project. She opens up a project proposal template in Google Docs and begins filling out the sections. She gets through a few pages before packing up and heading home.



Open a large Microsoft Excel file in Google Sheets

Time (sec)
lower is better



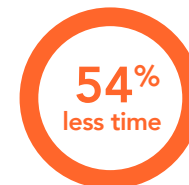
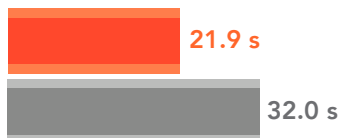
Open a Google Sheets file in Google Drive

Time (sec)
lower is better



Save a large Microsoft Excel file in Google Sheets

Time (sec)
lower is better



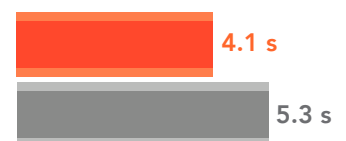
Prepare a print preview in Google Sheets

Time (min)
lower is better



Load a project template in Google Docs

Time (sec)
lower is better



Esperanza's early evening tasks

59% less time spent waiting



Load a featured project in Scratch by MIT

Time (sec)
lower is better



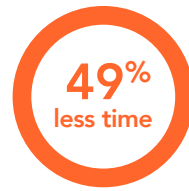
Take it home with you

Esperanza's Chromebook isn't just for work—she often uses it at home as well.

After dinner that evening, Esperanza's daughter wants to show her an animation she created in her coding class. She loads it on her mom's Chromebook six seconds faster than if she'd used a device powered by an Arm Rockchip processor.

That night, after the little one is tucked away in bed, Esperanza begins her second life as a music producer. She remembers the picture she saved in Evernote earlier that morning—something like that would be *perfect* as a cover for her upcoming single.

Esperanza uses the image as a reference to create her own art in Photoshop®. She saves a bunch of the images she created as a collage in Pixlr®. Looking good! She's almost ready for release. All that's left is to export the song she's been working on in the free Soundtrap web app. She merges a couple of tracks before saving and exporting the song.



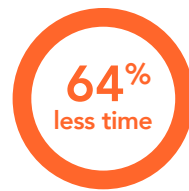
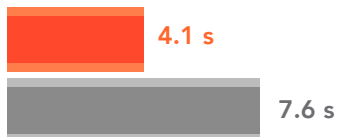
Save an image to a gallery in Adobe® Lightroom® CC

Time (sec)
lower is better



Create a ten image collage in Pixlr

Time (sec)
lower is better



Merge sound tracks in Soundtrap

Time (sec)
lower is better



Esperanza's late evening tasks

83% less time spent waiting



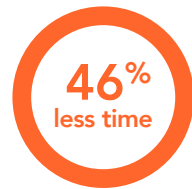
Produce/encode a HD video
in PowerDirector

Time (sec)
lower is better



Produce/encode a SD video
in PowerDirector

Time (sec)
lower is better



Create a 720p 30 FPS movie
in FlipaClip™

Time (sec)
lower is better



End your day with vigor

Esperanza puts out a video performance for each new single she drops. When it comes to video editing on her Intel Core m3 processor-powered Chromebook, she has a ton of options—all of which are much faster than trying to export video from a Chromebook with an Arm Rockchip processor.

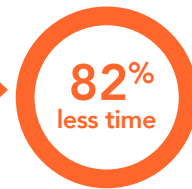
While the video processes, Esperanza decides to check on her social media presence. She creates a Facebook report in Wolfram Alpha® to see how many likes her music has gotten, how many new fans she averages per week, and more.

Esperanza's video exports quickly, leaving time for her to sit and think in silence. Thanks to her Intel processor-powered Chromebook, she's had a great day for both her music and her day job. What will the future hold? Esperanza isn't quite sure, but she wants to be prepared. She starts a new résumé to reflect all she's done this year before closing her Chromebook and going to bed.



Generate a Facebook report
in Wolfram Alpha

Time (sec)
lower is better



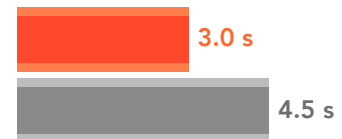
Render a video
in WeVideo™

Time (sec)
lower is better



Load a résumé template
in Google Docs

Time (sec)
lower is better





Esperanza's full day of tasks
77% less time
spent waiting



Conclusion

When shopping for a new device, you need to be sure it can keep up with the various aspects of your life. In our tests, a Chromebook powered by the Intel Core m3-6Y30 processor completed work and home tasks faster than a Chromebook based on an Arm Rockchip processor. Whether you're a project manager, a music producer, a programmer's mom (or all three!), a faster Chromebook like the Intel processor-powered ASUS Chromebook C302 could enable you to finish tasks quickly and with less frustration.

On November 28, 2017, 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 November 30, 2017.

Appendix A: System configuration information

System	ASUS Chromebook Flip C302C	Samsung Chromebook Plus
Processor	Intel Core m3-6Y30	Arm Rockchip OP1 (Rockchip RK3399-C)
Processor freq (GHz)	0.9-2.2	2.0
Processor cores	2	6
Memory (GB)	4	4
Storage (GB)	32	32
Battery type	Li-Ion	Li-Ion
Battery capacity (Wh)	39	39
Display	12.5" 1,920x1,080	12.3" 2,400x1,600
Wireless	802.11 AC	802.11 AC
Bluetooth	4.0	4.0
USB ports	2x USB-C	2x USB-C
System weight (lbs.)	2.65	2.38
OS (version)	62.0.3202.97 (64-bit)	62.0.3202.97 (32-bit)
Build/firmware	Cave.7820.329.0	Kevin.8785.220.0

Appendix B: How we tested

Creating the background workload

To simulate typical Chromebook use, we ran a combination of news, email, chat, document viewing, music, and social media websites in the background. For websites that required accounts, we created test profiles and logged in the users on each device.

1. From the shelf, open Chromebook settings.
2. Navigate to the On Startup section of the settings, and select Open a specific page or set of pages.
3. Select Open a specific page or set of pages, insert the following URLs, and click OK.
 - forbes.com
 - markets.ft.com/data
 - arstechnica.com
 - mail.google.com
 - slack.com
 - drive.google.com
 - docs.google.com
 - youtube.com/feed/music
 - sheets.google.com
 - twitter.com
 - facebook.com
4. Restart the Chromebook. Before testing, navigate through each tab to ensure that both devices have fully loaded all the same content.

Testing each application

Google Slides

Loading a status report template

1. From the Google Play Store, install Google Slides, and pin the app to the shelf.
2. Launch the app from the shelf.
3. Click the red + icon.
4. Click Choose template.
5. Start the timer, and click the Status report template.
6. When the slideshow fully loads, stop the timer.

Google Sheets

Saving a large Google Sheet as Excel document

1. Install Google Sheets from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click Skip to skip the tutorial.
3. Close the app and reopen it by clicking the Sheets icon on the shelf.
4. From the recent files screen, click the test Sheet to open it.
5. Click the menu icon from the top navigation bar.
6. Click Share & export, and click Save As...
7. With Excel (.xlsx) selected, simultaneously start the timer and click OK.
8. When the saving dialog closes, stop the timer.

Preparing a print preview (large document)

1. From the shelf, click the Google Sheets icon to launch the app.
2. From the recent files screen, click the test Sheet to open it.
3. Click the menu icon from the top navigation bar.
4. Click Share & export, and simultaneously start the timer and click Print.
5. When the print preview fully loads, stop the timer.

Opening a large-sized spreadsheet (Excel)

1. From the shelf, click the Google Sheets icon to launch the app.
2. From the recent files screen, and simultaneously start the timer and click the test Excel sheet to open it.
3. When the Excel sheet fully loads, stop the timer.

Google Docs

Loading Project proposal template

1. From the Google Play store, install Google Docs, and pin the app to the shelf.
2. From the shelf, click the Google Docs icon to launch the app.
3. Click the red + icon.
4. Click Choose template.
5. Scroll down to the Work template category.
6. Simultaneously start the timer and click Project proposal (tropic).
7. When the template fully loads, stop the timer.

Loading the resume (serif) template

1. From the shelf, click the Google Docs icon to launch the app.
2. Click the red + icon.
3. Click Choose template.
4. Simultaneously start the timer and click Resume (Swiss).
5. When the template fully loads, stop the timer.

DocuSign

Importing a document to be signed

1. Install DocuSign from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click the blue + icon.
3. Click More to choose the downloads folder location.
4. From the Downloads folder, click the test PDF.
5. Simultaneously start the timer and click Open.
6. When the document appears in the documents list, stop the timer.

Google Drive

Opening a Google Docs document

1. Install Google Drive from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. From the files list, click the test Google Doc and start the timer simultaneously.
4. When the document fully loads, stop the timer.

Opening an Excel Sheet in Google Sheets

1. Launch the app from the shelf.
2. From the files list, click the dropdown menu icon next to the test Excel sheet.
3. Simultaneously start the timer and click Open With.
4. When the sheet fully loads, stop the timer.

Dropbox

Exporting an imported PDF

1. Install Dropbox from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click Sign in with Google.
3. Click Allow to enable offline access.
4. Click the test account.
5. Click Not Now to skip setting up Dropbox on an additional computer.
6. Close and relaunch the app.
7. Click the test PDF document.
8. From the top navigation bar, click the dropdown arrow.
9. Click Export.
10. Click Save to device.
11. From the files screen, change the current folder to Downloads by clicking the hamburger menu icon, and clicking Downloads.
12. Simultaneously start the timer and click Save.
13. When the Export Complete dialog appears, stop the timer.

Evernote – stay organized

Attaching an image to a note

1. From the Google Play store, install Evernote, and pin the app to the shelf.
2. Launch the app from the shelf, and click Continue with Google.
3. Click the test account.
4. Close and relaunch the app from the shelf.
5. Click the green + icon, and click Text Note.
6. Click the attachment icon.
7. Click Photo.
8. Select the test image.
9. Simultaneously start the timer and click Open.
10. When the image fully loads, stop the timer.

PowerDirector

Encoding an HD video

1. From the Google Play store, install PowerDirector, and pin the app to the shelf.
2. Launch the app from the shelf, and select Allow to enable access to device media storage.
3. Click the New Project icon, and enter a name for the test project.
4. Click the Download folder, and click the test footage to insert the footage onto the timeline.
5. Press the layers icon, and select the text icon to insert a title into the beginning of the clip. Name the title “Test HD Video.”
6. Click the Export icon.
7. Click More Output Options.
8. With HD video resolution selected, simultaneously start the timer and click Next.
9. When the video share screen appears, stop the timer.

Encoding an SD video

1. From the shelf, click the PowerDirector Video Editor icon to launch the app.
2. Load the saved test project.
3. Click the Export icon.
4. Click More Output Options.
5. With SD video resolution selected, simultaneously start the timer and click Next.
6. When the video share screen appears, stop the timer.

Adobe Lightroom CC

Saving an image to a gallery

1. Install Adobe Photoshop Mix from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click Get Started.
3. Click Add Photos.
4. Click Allow to enable access to device media storage.
5. Select the test image, and click Add.
6. Close the app and relaunch from the shelf.
7. From the images list, click the test image thumbnail.
8. Click the dropdown menu icon.
9. Click Save to Gallery.
10. Click Highest Available Quality.
11. Simultaneously start the timer and click OK.
12. Stop the timer when the saving completes.

Pixlr

Creating a collage from ten images

1. Install Pixlr from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click I Accept.
3. Click Collage.
4. Click Allow to enable access to device media storage.
5. From the download folder, click each test image, for a total of 10 images to be added to a collage.
6. Simultaneously start the timer and click Next.
7. Stop the timer when the collage fully loads.

WeVideo

Rendering a video

1. Install WeVideo from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. Click the blue + icon.
4. Click Gallery.
5. Click Allow to enable access to device media storage.
6. From the folder browser, select the test footage, and click the green checkmark icon.
7. Click the paper airplane icon.
8. Simultaneously start the timer and click Save with watermark.
9. When the save completes, stop the timer.

FlipaClip

Creating a 720p 30 FPS movie from 90 frames

1. Install FlipaClip from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. Select an age for the test account, and click I Accept.
4. Right click the sample project, and click the pencil icon.
5. Change the frames per second to 30.
6. Click Save Changes.
7. Click the sample project to open it.
8. Add 60 frames for a total of 90 frames.
9. Every 10th frame, add a title.
10. Click the dropdown menu icon.
11. Start the timer, and click Make Movie.
12. When the render completes, stop the timer.

Scratch by MIT

Loading a featured project

1. From the Chrome browser, navigate to scratch.mit.edu.
2. Sign in with the test account.
3. Click on the search bar, and search for "Saturn."
4. Start the timer, and click "Saturn – an AMV."
5. Stop the timer when the flash animation fully loads.

Wolfram Alpha

Generating a Facebook report

1. From the Chrome browser, navigate to wolframalpha.com.
2. Sign in with the test account.
3. Click the search bar, and search for "facebook report."
4. When the search results load, click Analyze My Facebook Data. A prompt will appear to authorize connecting to a Facebook account.
5. Click to continue with the test Facebook account.
6. Start the timer, and click Generate my Report.
7. To ensure consistent behavior across test runs, you must revoke Wolfram Alpha's authorization to use the Facebook account before the next run. To begin this process, log into to the test Facebook account.
8. From the test Facebook account, click the help icon, Privacy Shortcuts, and click See More Settings.
9. From the Privacy Settings and Tools page, click Apps.
10. Click the X icon next to Wolfram Connection, and click Remove.

Soundtrap

Merging tracks in the Dubstep Demo

1. From the Chrome browser, navigate to soundtrap.com.
2. Sign in with the test account.
3. From the landing page, click Enter Studio.
4. From the template selection screen, click Dubstep DEMO.
5. From the horizontal dropdown menu, click Settings, and click Merge Tracks...
6. Check each instrument track to be merged.
7. With all tracks selected, simultaneously start the timer and click Merge.
8. When the merge completes, stop the timer.

This project was commissioned by Intel Corp.



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Benchmark results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown". Implementation of these updates may make these results inapplicable to your device or system.