

## Run longer and complete everyday tasks faster with powerful Dell Latitude Chromebook Enterprise devices

Dell Latitude 5400 and 5300 2-in-1 Chromebook Enterprise devices beat five competitors on metrics including battery life, web browsing, productivity app performance, and serviceability

In the past, business users looking for enterprise-class power have turned to more traditional operating systems. And users looking for a Chrome experience have had to settle for devices with less storage, less RAM, and less powerful processors than traditional PCs. In 2019, Google introduced the first Chromebook™ Enterprise devices in partnership with Dell.<sup>1</sup> These Dell Latitude 5400 and 5300 2-in-1 Chrome devices unite Dell's business-grade Latitude platform with the capabilities of Chrome OS™ for Enterprise. Can these new devices meet the needs of business users?

To find out, we compared the performance of Latitude 5400 and 5300 2-in-1 Chrome devices to that of five other business-class Chromebooks. We tested across a range of performance measures, including battery life, web browsing, performance on common productivity apps, and serviceability. We found that Latitude Chromebooks provided up to 4 hours and 40 minutes more battery and offered up to 2.7 times the performance on common web-based tasks compared to the Chromebooks we tested. These performance wins could increase employee productivity and enable users to stay on the go longer and finish web-based tasks sooner.

Stay on the move longer



Up to  
**4 hours and 40 minutes**  
more battery life\*

Increase productivity



Complete everyday tasks like using Google Slides™ in up to  
**177%** less time\*

Finish web-based tasks sooner



Up to **2.7x** the performance on the Speedometer benchmark\*

*\*compared to the competitor Chromebook devices we tested*

## Latitude Chromebook Enterprise devices

Dell's new Latitude 5400 and 5300 2-in-1 Chrome devices pair traditional Latitude features with Chrome OS for Enterprise. As John Solomon, Vice President of Chrome OS, wrote in an August 2019 blog post, "With Dell's trusted hardware, Chrome's modern OS, and unified endpoint management courtesy of Dell Technologies' Unified Workspace, the Dell Latitude Chromebook Enterprise devices offer a holistic solution that simplifies IT and powers the workforce."<sup>2</sup>

Dell positions their Latitude 5400 and 5300 2-in-1 Chrome devices as the world's "most powerful" Chromebook Enterprise devices.<sup>3</sup> According to Dell, the Latitude 5300 2-in-1 Chrome passed more MIL-STD 810G tests than any other Chromebook Enterprise 2-in-1,<sup>4</sup> while the Latitude 5400 Chrome is the only Chromebook Enterprise device to offer up to 32 GB of RAM.<sup>5</sup> With Chrome Enterprise capabilities integrated from the beginning, these Latitude Chrome devices don't require a separate license, and both devices include one year of Dell ProSupport with Next Business Day Onsite Service.<sup>6</sup>



### About the Latitude 5300 2-in-1 Chrome

This new offering from Dell is a 13-inch convertible device that enables you to use a full-featured PC on the go as a tablet with an optional pen. Dell offers eight different configurations that feature up to an Intel® Core® i7-8665U processor, 16 GB of RAM, and 512 GB of NVMe storage.<sup>7</sup>



### About the Latitude 5400 Chrome

The Latitude 5400 Chrome is a 14-inch business laptop offering from Dell. Users can configure the Latitude 5400 Chrome with up to a quad-core Intel Core i7-8665U processor, 32 GB of RAM, and a 512GB NVMe SSD for ultra-fast storage.<sup>8</sup>

*Images provided by Dell Technologies.*



## How we tested

We measured the performance of two Latitude Chrome devices, each with two different configurations:

### Group 1: Latitude 5300 2-in-1 Chrome

- with an Intel Core i5-8365U processor
- with an Intel Core i7-8665U processor

### Group 2: Latitude 5400 Chrome

- with 8 GB of RAM
- with 16 GB of RAM

We compared the Group 1 devices to the following Chromebooks:

- Lenovo® Yoga® Chromebook C630
- HP Chromebook x360 14
- Google™ Pixelbook™

We compared the Group 2 devices to the following Chromebooks:

- Lenovo Chromebook 14e
- Acer® Chromebook 714

We tested a wide range of performance metrics, including battery life, web-browsing benchmark performance, serviceability, and performance on apps from Google, Microsoft, Adobe, and more. We performed each test three times, then selected the median result. For more details on the configurations and testing methods we used, see the [science behind the report](#).

## Testing battery life

Users of enterprise devices like the Latitude 5300 2-in-1 and 5400 Chrome need assurance that their computer's battery life can support them through their busy workdays and on-the-go lifestyle. We tested battery life using power\_LoadTest, which loads a mix of websites, email, documents, and videos in hour-long iterations until the device's battery dies.<sup>9</sup> For this test, we chose the Latitude 5300 2-in-1 Chrome with a 60WHr battery, which is the largest capacity battery offered, and an Intel Core i5-8365U processor. We chose the best specifications for the competitor devices as well as the Latitude 5400 Chrome, which included 16 GB of RAM and a 68WHr battery. Of the devices we tested, only the Latitude 5400 Chrome provided the option for a 68WHr battery. The Latitude 5300 2-in-1 Chrome lasted for over 12 hours and 42 minutes, outperforming its competitors by up to 56 percent. The Latitude 5400 Chrome processed everyday tasks for over 14 hours and 30 minutes, lasting up to 47 percent longer than the other Chromebooks we tested.



### Testing battery with power\_LoadTest *higher is better (HH:MM)*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i5

12:42

Lenovo Yoga Chromebook C630

Intel Core i5

08:05

HP Chromebook x360 14 G1

Intel Core i7

12:42

Google Pixelbook

Intel Core i7

09:15

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
16GB RAM

14:31

Lenovo Chromebook 14e

4GB RAM

09:51

Acer Chromebook 714 CB714-1WT-5427

8GB RAM

13:26

Stay on the  
move longer

Up to  
**4 hours & 40 minutes**  
more battery\*

*\*compared to the competitor Chromebook devices we tested*

With the better battery life of a Latitude Chrome device, users could:

#### IT decision-makers

**Enhance employee mobility and availability:** Users can stay online and in touch for longer, even when they're on the go

**Increase the satisfaction of employees and executives** who frequently travel and/or work remotely

#### End users

**Stay on the move for longer** with up to fourteen and a half hours of battery life

**Avoid hassle:** Whether you're traveling or working remotely, longer battery life helps you avoid inconveniences like having to work near an outlet or always carry your charger

## Testing performance on common productivity apps

For the performance testing on pages 5-12, we used the Latitude 5300 2-in-1 Chrome with an Intel Core i7-8665U processor because it reflected what an enterprise user looking to maximize performance would use. We tested the Latitude 5400 Chrome with 8 GB of RAM because its memory capacity aligned most closely with the other competitor devices. The Latitude devices outperformed the competitor devices on the majority of our tests; where they did slip to second place, they came within 1.5 seconds of the leading device.

When it comes to productivity apps like those offered by Google and Microsoft, users need a device that helps them complete a broad range of routine tasks quickly and efficiently. We modeled everyday user workflows on several Google apps, measuring how long it took to:

- Open a large Google Docs™ document and export a document to a .docx file
- Create a new Google Sheets™ spreadsheet and open a large spreadsheet
- Create a new Google Slides presentation, open a large presentation, and start a presentation

We then combined these results into the summary “workflow” graphs we present below. For the testing on Google apps, the Latitude Chrome devices completed these everyday tasks in up to 177 percent less time than the other Chromebook devices we tested.



### Google Slides workflow *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i7

7.3 sec

Lenovo Yoga Chromebook C630

Intel Core i5

11.2 sec

HP Chromebook x360 14 G1

Intel Core i7

7.9 sec

Google Pixelbook

Intel Core i7

9.2 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
8GB RAM

7.4 sec

Lenovo Chromebook 14e

4GB RAM

20.6 sec

Acer Chromebook 714 CB714-1WT-5427

8GB RAM

8.1 sec

### Google Docs workflow *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i7

16.2 sec

Lenovo Yoga Chromebook C630

Intel Core i5

20.8 sec

HP Chromebook x360 14 G1

Intel Core i7

17.0 sec

Google Pixelbook

Intel Core i7

24.7 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
8GB RAM

17.0 sec

Lenovo Chromebook 14e

4GB RAM

46.3 sec

Acer Chromebook 714 CB714-1WT-5427

8GB RAM

18.7 sec

Increase  
productivity

Complete everyday tasks like using Google Slides in up to

**177%**  
less time\*

\*compared to the competitor Chromebook devices we tested



### Google Sheets workflow *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
*Intel Core i7*

7.9 sec

Lenovo Yoga Chromebook C630  
*Intel Core i5*

9.2 sec

HP Chromebook x360 14 G1  
*Intel Core i7*

9.0 sec

Google Pixelbook  
*Intel Core i7*

9.0 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
*8GB RAM*

9.7 sec

Lenovo Chromebook 14e  
*4GB RAM*

15.0 sec

Acer Chromebook 714 CB714-1WT-5427  
*8GB RAM*

9.5 sec

Next, we tested the devices' performance on several common productivity apps from Microsoft. We measured how long it took to:

- Create a new document, open a large document, open the print preview of a document, and share a document as a PDF attachment in Microsoft Word
- Open a large file in Microsoft Excel
- Load a large presentation and convert a .ppt file to a PDF in Microsoft PowerPoint

Below, we present the results of this testing, combined and averaged into a single workflow where relevant. Compared to the other Chromebooks we tested, the Latitude Chrome devices offered up to 187 percent better performance.



### Microsoft PowerPoint workflow *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
*Intel Core i7*

6.7 sec

Lenovo Yoga Chromebook C630  
*Intel Core i5*

9.2 sec

HP Chromebook x360 14 G1  
*Intel Core i7*

8.0 sec

Google Pixelbook  
*Intel Core i7*

7.9 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
*8GB RAM*

6.7 sec

Lenovo Chromebook 14e  
*4GB RAM*

11.0 sec

Acer Chromebook 714 CB714-1WT-5427  
*8GB RAM*

7.7 sec

# Complete tasks sooner

# Up to 187%

faster performance on common Microsoft apps like Excel\*

*\*compared to the competitor Chromebook devices we tested*



### Opening a large spreadsheet in Microsoft Excel *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i7

13.6 sec

Lenovo Yoga Chromebook C630  
Intel Core i5

17.1 sec

HP Chromebook x360 14 G1  
Intel Core i7

13.9 sec

Google Pixelbook  
Intel Core i7

19.0 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
8GB RAM

16.2 sec

Lenovo Chromebook 14e  
4GB RAM

46.6 sec

Acer Chromebook 714 CB714-1WT-5427  
8GB RAM

15.7 sec

### Microsoft Word workflow *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i7

18.4 sec

Lenovo Yoga Chromebook C630  
Intel Core i5

22.2 sec

HP Chromebook x360 14 G1  
Intel Core i7

20.0 sec

Google Pixelbook  
Intel Core i7

22.3 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
8GB RAM

25.7 sec

Lenovo Chromebook 14e  
4GB RAM

32.8 sec

Acer Chromebook 714 CB714-1WT-5427  
8GB RAM

24.2 sec

## With the productivity gains from a Latitude Chrome device, users could:

### IT decision-makers

**Increase your employees' output on common productivity tasks:** With faster devices, employees can complete their work faster

**Keep your employees happy** with a Dell Latitude Chromebook Enterprise device that performs well on common Microsoft and Google apps

### End users

**Get your work done sooner,** helping improve your performance at work and freeing up time to finish the other items on your to-do list

**Stay productive** with a device that performs well on a variety of web-based productivity tasks

## Testing browser responsiveness

Browser performance is an important consideration on any device, but it's especially important for Chromebooks, where much of a user's work relies on an internet connection. We ran three industry-standard benchmarks to measure browser responsiveness on the devices we tested (see below for more information about these benchmarks). On the Speedometer 2.0 benchmark, the Latitude Chrome devices offered up to 2.7 times the performance of the five competitor devices. This strong performance continued on the WebXPRT and CrXPRT benchmarks, with Latitude devices outperforming their competitors by up to 165 and 154 percent, respectively.



### Speedometer 2.0 benchmark *higher is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
*Intel Core i7*

130

Lenovo Yoga Chromebook C630  
*Intel Core i5*

105

HP Chromebook x360 14 G1  
*Intel Core i7*

119

Google Pixelbook  
*Intel Core i7*

84

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
*8GB RAM*

119

Lenovo Chromebook 14e  
*4GB RAM*

31

Acer Chromebook 714 CB714-1WT-5427  
*8GB RAM*

109

Finish  
web-based  
tasks sooner

Up to

**2.7x**

the performance on the Speedometer benchmark\*

*\*compared to the competitor Chromebook devices we tested*

### The benchmarks

**Speedometer 2.0:** A browser responsiveness benchmark that uses demo web applications to simulate user actions.

**WebXPRT 3:** A benchmark that shows how well a system handles web-based tasks, such as photo editing and online homework, that real-world users do every day. It includes two AI-based workloads to reflect new kinds of tasks users do on their devices.

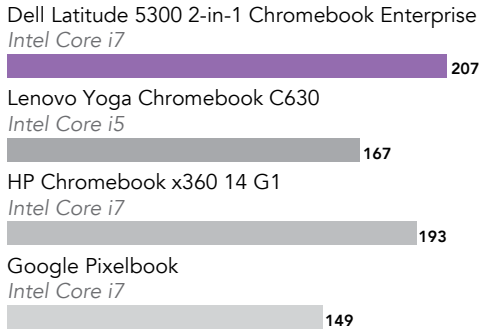
**CrXPRT:** A performance and battery life benchmark application for Chrome OS™ devices. It measures a Chromebook's speed using HTML5- and JavaScript-based workloads designed to simulate everyday tasks.



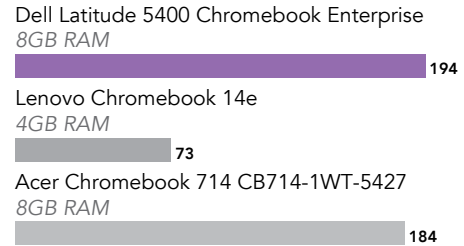


### WebXPRT 3 benchmark *higher is better*

#### GROUP 1

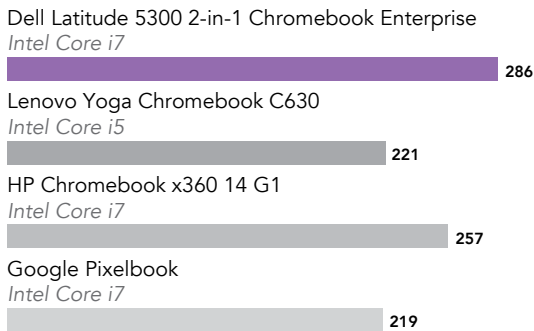


#### GROUP 2

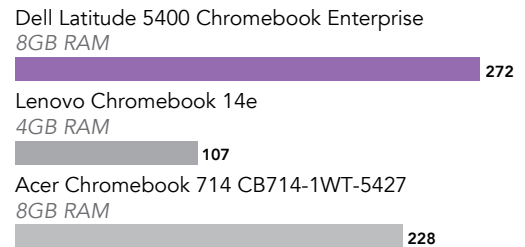


### CrXPRT benchmark *higher is better*

#### GROUP 1



#### GROUP 2



With the web browsing performance gains from a Latitude Chrome device, users could:

#### IT decision-makers

**Increase employees' productivity on web-based activities:** With less time spent waiting for websites and apps to load, employees can spend more time on work that contributes to business growth

**Get more out of your investment:** Our testing demonstrates that users could get more web browsing performance with Dell Latitude Chromebook Enterprise devices than the other Chromebooks we tested

#### End users

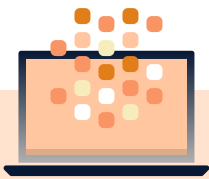
**Complete web-based tasks faster,** freeing up time for other activities

**Enjoy a better user experience** with less lag time

## Testing performance on other common tasks

### Performance on common photo editing apps

To gauge how well the devices could help users complete activities in common photo editing apps, we tested performance on two cloud-based applications, Adobe® Photoshop® Lightroom® and Pixlr. When we measured how long each device took to save an edited image to a gallery in Lightroom, the Latitude 5400 and 5300 2-in-1 Chrome devices both did so in under 5 seconds. The Lenovo Chromebook 14e, by contrast, took over 30 seconds to do the same task. These time increments may seem small, but when users repeatedly complete these tasks, the time savings can add up.



#### Saving an edited image to the gallery in Adobe Photoshop Lightroom *lower is better*

##### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise

Intel Core i7

4.7 sec

Lenovo Yoga Chromebook C630

Intel Core i5

6.6 sec

HP Chromebook x360 14 G1

Intel Core i7

4.9 sec

Google Pixelbook

Intel Core i7

7.1 sec

##### GROUP 2

Dell Latitude 5400 Chromebook Enterprise

8GB RAM

4.3 sec

Lenovo Chromebook 14e

4GB RAM

30.5 sec

Acer Chromebook 714 CB714-1WT-5427

8GB RAM

4.1 sec

#### Creating a collage from 10 images in Pixlr *lower is better*

##### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise

Intel Core i7

3.8 sec

Lenovo Yoga Chromebook C630

Intel Core i5

4.6 sec

HP Chromebook x360 14 G1

Intel Core i7

5.4 sec

Google Pixelbook

Intel Core i7

3.6 sec

##### GROUP 2

Dell Latitude 5400 Chromebook Enterprise

8GB RAM

3.7 sec

Lenovo Chromebook 14e

4GB RAM

8.9 sec

Acer Chromebook 714 CB714-1WT-5427

8GB RAM

4.3 sec

Edit and  
sort photos  
with ease

Up to

6x

the speed saving edited images to a gallery in Lightroom\*

\*compared to the competitor Chromebook devices we tested

## Performance on Linux (Beta)

For those who enjoy the flexibility offered by the Linux platform, Linux (Beta) enables Chromebook users to install and use Linux applications. To measure Linux performance, we tested several applications on Linux (Beta):

- LibreOffice, an open-source suite of office software
- Visual Studio Code, a source-code editing tool
- GIMP, an open-source image editor

When we measured the time it took the devices to install LibreOffice and Visual Studio Code, the Latitude Chrome devices outperformed the competitor devices by up to 112 percent. For GIMP, we measured the time it would take users to install the program and open and export a large photo. Across this workflow, the Latitude 5400 Chrome responded in up to 112 percent less time than the competitor Chromebook devices we tested.



### Installing LibreOffice on Linux (Beta) *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i7

142.9 sec

Lenovo Yoga Chromebook C630  
Intel Core i5

174.7 sec

HP Chromebook x360 14 G1  
Intel Core i7

148.8 sec

Google Pixelbook  
Intel Core i7

226.2 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
8GB RAM

149.1 sec

Lenovo Chromebook 14e  
4GB RAM

315.8 sec

Acer Chromebook 714 CB714-1WT-5427  
8GB RAM

161.9 sec

### Installing Visual Studio Code on Linux (Beta) *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
Intel Core i7

20.5 sec

Lenovo Yoga Chromebook C630  
Intel Core i5

28.5 sec

HP Chromebook x360 14 G1  
Intel Core i7

22.8 sec

Google Pixelbook  
Intel Core i7

27.3 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
8GB RAM

25.5 sec

Lenovo Chromebook 14e  
4GB RAM

29.4 sec

Acer Chromebook 714 CB714-1WT-5427  
8GB RAM

27.6 sec

**Complete  
Linux-based  
tasks sooner**

Up to  
**112%**

better performance in GIMP and LibreOffice\*

*\*compared to the competitor Chromebook devices we tested*

## Linux (Beta)

Linux (Beta) is a feature that enables Chromebooks to install and access a Linux terminal, as well as install and use Linux applications. Linux (Beta) offers flexibility to users looking to install coding and development tools, open source software, or applications that otherwise might not be available on the Google Chrome or Play Store. The Linux environment is also sandboxed, or isolated from the rest of the Chromebook, meaning that Linux apps can't affect the rest of the Chromebook.<sup>10</sup>



### GIMP workflow on Linux (Beta) *lower is better*

#### GROUP 1

Dell Latitude 5300 2-in-1 Chromebook Enterprise  
*Intel Core i7*

194.9 sec

Lenovo Yoga Chromebook C630  
*Intel Core i5*

223.6 sec

HP Chromebook x360 14 G1  
*Intel Core i7*

193.7 sec

Google Pixelbook  
*Intel Core i7*

275.1 sec

#### GROUP 2

Dell Latitude 5400 Chromebook Enterprise  
*8GB RAM*

198.6 sec

Lenovo Chromebook 14e  
*4GB RAM*

421.7 sec

Acer Chromebook 714 CB714-1WT-5427  
*8GB RAM*

235.5 sec

With the web-based performance gains from a Latitude Chrome device, users could:

### IT decision-makers

**Satisfy employees in creative fields** with faster performance on common photo editing programs

**Meet user demands for more flexibility and access to Linux**

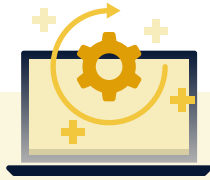
### End users

**Complete graphics-based work in Adobe, Pixlr, and GIMP faster**

**Enjoy the flexibility of the Linux platform**—and access open-source apps—from your Dell Latitude Chromebook Enterprise device

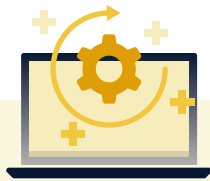
## Serviceability

Changing out common components can help extend the lifespan of a device and give users more flexibility. Of all the devices we tested, only the Latitude Chrome devices allowed users to replace the common components listed below.



### Group 1

	Dell Latitude 5300 2-in-1 Chromebook Enterprise	Lenovo Yoga Chromebook C630	HP Chromebook x360 14 G1	Google Pixelbook
Customer-replaceable SSD	★	×	×	×
Customer-replaceable RAM	★	×	×	×
Customer-replaceable battery	★	×	×	×
Customer-replaceable WLAN	★	×	×	×



### Group 2

	Dell Latitude 5400 Chromebook Enterprise	Lenovo Chromebook 14e	Acer Chromebook 714
Customer-replaceable SSD	★	×	×
Customer-replaceable RAM	★	×	×
Customer-replaceable battery	★	×	×
Customer-replaceable WLAN	★	×	×

## Service devices more easily

Only the Latitude Chrome devices we tested allowed users to replace battery, memory, storage, and WLAN

### With the serviceability of a Latitude Chrome device, users could:

#### IT decision-makers

**Reduce employee downtime** with faster component replacements, helping increase overall productivity

**Save IT and maintenance costs:** Avoid the costs of outsourcing or sending devices back to the manufacturer; your IT team can easily replace HDD, RAM, battery, and WLAN in-house

**Minimize the need for expensive new purchases:** With the ability to replace HDD, RAM, battery, and WLAN, you could extend the lifespan of your employees' devices

#### End users

**Extend the lifespan of your device** with the ability to replace common components as your device ages

**Increase flexibility and allow customization:** Make the modifications you want to the HDD, RAM, battery, and WLAN of your Dell Latitude Chromebook Enterprise device

## Summary: The benefits of using Latitude Chrome devices

**Stay on the  
move longer**

Up to  
**4 hours & 40 minutes**  
more battery\*

**Increase  
productivity**

Complete everyday tasks like using Google Slides in up to  
**177%**  
less time\*

**Complete  
tasks sooner**

Up to  
**187%**  
faster performance on common Microsoft apps like Excel\*

**Finish  
web-based  
tasks sooner**

Up to  
**2.7x**  
the performance on the Speedometer benchmark\*

**Edit and  
sort photos  
with ease**

Up to  
**6x**  
the speed saving edited images to a gallery in Lightroom\*

**Complete  
Linux-based  
tasks sooner**

Up to  
**112%**  
better performance in GIMP and LibreOffice\*

**Service devices  
more easily**



Only the Latitude Chrome devices we tested allowed users to replace battery, memory, storage, and WLAN

*\*compared to the competitor Chromebook devices we tested*



## Conclusion

When it comes to enterprise-level Chromebooks, IT decision-makers and end users alike need a device that balances power with long-lasting battery. We tested Dell Latitude 5400 and 5300 2-in-1 Chromebook Enterprise devices on tasks including battery life, web browsing, productivity app performance, and serviceability. The Latitude Chrome devices outperformed the other business Chromebooks on most of our tests, providing up to 4 hours and 40 minutes more battery life and up to 2.7 times the performance on common web-based tasks. With these Latitude Chrome devices, users could complete work faster, stay mobile longer, and improve productivity.

- 1 John Solomon, "Making the modern OS accessible for every enterprise," accessed December 17, 2019, <https://cloud.google.com/blog/products/chrome-enterprise/making-the-modern-os-accessible-for-every-enterprise>.
- 2 John Solomon, "Making the modern OS accessible for every enterprise," accessed December 17, 2019.
- 3 Dell Technologies, accessed December 17, 2019, <https://www.dell.com/en-us/chromebookenterprise/index.htm>.
- 4 Dell Technologies, "Latitude 5300 2-in-1 Chromebook Enterprise," accessed December 17, 2019, <https://www.dell.com/en-us/work/shop/cty/pdp/spd/latitude-13-5300-2-in-1-chrome-laptop>.
- 5 Dell Technologies, "Latitude 5400 Chromebook Enterprise," accessed December 17, 2019, <https://www.dell.com/en-us/work/shop/cty/pdp/spd/latitude-14-5400-chrome-laptop>.
- 6 John Solomon, "Making the modern OS accessible for every enterprise," accessed December 17, 2019.
- 7 "New Latitude 5300 2-in-1 Business Laptop," accessed December 17, 2019, <https://www.dell.com/en-us/work/shop/tablets-and-2-in-1-laptops/new-latitude-5300-2-in-1-business-laptop/spd/latitude-13-5300-2-in-1-laptop>.
- 8 Dell Technologies, "Dell Latitude 5400 Chromebook Enterprise," accessed December 17, 2019, <https://www.dell.com/en-us/work/shop/dell-laptops-and-notebooks/dell-latitude-5400-chromebook-enterprise/spd/latitude-14-5400-chrome-laptop/>.
- 9 Google, "Power testing," accessed December 17, 2019, [https://chromium.googlesource.com/chromiumos/third\\_party/autotest/+refs/heads/master/client/site\\_tests/power\\_LoadTest/README.md](https://chromium.googlesource.com/chromiumos/third_party/autotest/+refs/heads/master/client/site_tests/power_LoadTest/README.md).
- 10 Chromebook Help, "Set up Linux (Beta) on your Chromebook," accessed December 17, 2019, <https://support.google.com/chromebook/answer/9145439?hl=en>

Read the science behind this report at <http://facts.pt/kl286wj> ►



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This project was commissioned by Dell Technologies.

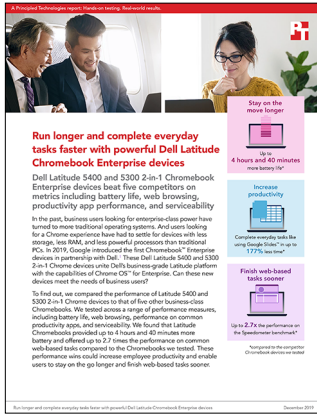


**Disclaimer:**

*The content on the following pages includes appendices and methodologies from our hands-on work.*

*We will publish this content as a separate document linked to the report.*

*We must receive your approval on both the report and this document before taking them public simultaneously.*



The science behind the report:

# Run longer and complete everyday tasks faster with powerful Dell Latitude Chromebook Enterprise devices

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 [Run longer and complete everyday tasks faster with powerful Dell Latitude Chromebook Enterprise devices](#).

We concluded our hands-on testing on December 16, 2019. 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 November 13, 2019 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

## Our results

The tables below present our findings in detail. Note that, where appropriate, we rounded our results for ease of reading (we always round down to the nearest digit). We calculated our “win percentage” and “total” numbers using the original, unrounded results, so they may not always align exactly with the rounded numbers presented here.

Battery testing	Dell Latitude 5300 2-in-1 Chromebook™ Enterprise (Intel® Core® i5)	Google™ Pixelbook™ (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo® Yoga® Chromebook C630 (Intel Core i5)
Testing battery with power_LoadTest				
Median (hour:min:sec)	12:42:09	9:15:37	12:42:20	8:05:42
Dell Latitude win percentage	N/A	37%	0%	56%

Battery testing	Dell Latitude 5400 Chromebook Enterprise (16GB RAM)	Acer® Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
Testing battery with power_LoadTest			
Median (hour:min:sec)	14:31:34	13:26:07	9:51:55
Dell Latitude win percentage	N/A	8%	47%

Productivity app performance testing	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)
<b>Google Slides™ workflow</b>				
Google Slides - Creating new Slides presentation				
Median (sec)	1.7	2.1	1.9	2.5
Google Slides - Opening large Slides presentation				
Median (sec)	3.3	4.0	3.3	5.9
Google Slides - Starting presentation				
Median (sec)	2.3	3.0	2.7	2.7
<b>Total (sec)</b>	<b>7.3</b>	<b>9.2</b>	<b>7.9</b>	<b>11.2</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>25%</b>	<b>8%</b>	<b>51%</b>
<b>Google Docs™ workflow</b>				
Google Docs - Opening large document				
Median (sec)	4.2	6.1	4.5	6.3
Google Docs - Exporting Google Doc to .docx				
Median (sec)	11.9	18.5	12.5	14.5
<b>Total (sec)</b>	<b>16.2</b>	<b>24.7</b>	<b>17.0</b>	<b>20.8</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>52%</b>	<b>5%</b>	<b>28%</b>
<b>Google Sheets™ workflow</b>				
Google Sheets - Creating new Sheets spreadsheet				
Median (sec)	5.5	5.7	6.3	5.9
Google Sheets - Opening large Sheets spreadsheet				
Median (sec)	2.3	3.3	2.7	3.2
<b>Total (sec)</b>	<b>7.9</b>	<b>9.0</b>	<b>9.0</b>	<b>9.2</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>14%</b>	<b>13%</b>	<b>16%</b>

Productivity app performance testing	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
<b>Google Slides workflow</b>			
Google Slides - Creating new Slides presentation			
Median (sec)	1.8	1.6	5.1
Google Slides - Opening large Slides presentation			
Median (sec)	3.4	3.3	8.0
Google Slides - Starting presentation			
Median (sec)	2.1	3.1	7.5
<b>Total (sec)</b>	<b>7.4</b>	<b>8.1</b>	<b>20.6</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>9%</b>	<b>177%</b>
<b>Google Docs workflow</b>			
Google Docs - Opening large document			
Median (sec)	4.6	5.1	8.7
Google Docs - Exporting Google Doc to .docx			
Median (sec)	12.4	13.5	37.5
<b>Total (sec)</b>	<b>17.0</b>	<b>18.7</b>	<b>46.3</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>9%</b>	<b>171%</b>
<b>Google Sheets workflow</b>			
Google Sheets - Creating new Sheets spreadsheet			
Median (sec)	5.7	5.4	7.5
Google Sheets - Opening large Sheets spreadsheet			
Median (sec)	4.0	4.0	7.4
<b>Total (sec)</b>	<b>9.7</b>	<b>9.5</b>	<b>15.0</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>-1%</b>	<b>54%</b>

Productivity app performance testing	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)
<b>Microsoft PowerPoint workflow</b>				
Microsoft PowerPoint - Loading large PowerPoint presentation				
Median (sec)	1.9	2.3	2.2	3.7
Microsoft PowerPoint - Converting .ppt file to PDF				
Median (sec)	4.8	5.5	5.8	5.5
<b>Total (sec)</b>	<b>6.7</b>	<b>7.9</b>	<b>8.0</b>	<b>9.2</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>17%</b>	<b>19%</b>	<b>36%</b>
Microsoft Excel - Opening large Excel spreadsheet				
Median (sec)	13.6	19.0	13.9	17.1
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>39%</b>	<b>2%</b>	<b>25%</b>
<b>Microsoft Word workflow</b>				
Microsoft Word - Creating new document				
Median (sec)	1.6	1.7	1.7	1.6
Microsoft Word - Opening large document				
Median (sec)	2.1	3.4	2.7	2.9
Microsoft Word - Print-previewing document				
Median (sec)	7.1	8.5	7.6	8.0
Microsoft Word - Sharing document as PDF attachment				
Median (sec)	7.5	8.5	7.8	9.5
<b>Total (sec)</b>	<b>18.4</b>	<b>22.3</b>	<b>20.0</b>	<b>22.2</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>20%</b>	<b>8%</b>	<b>20%</b>

Productivity app performance testing	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
<b>Microsoft PowerPoint workflow</b>			
Microsoft PowerPoint - Loading large PowerPoint presentation			
Median (sec)	1.9	2.3	4.1
Microsoft PowerPoint - Converting .ppt file to PDF			
Median (sec)	4.8	5.3	6.8
<b>Total (sec)</b>	<b>6.7</b>	<b>7.7</b>	<b>11.0</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>15%</b>	<b>63%</b>
<b>Microsoft Excel - Opening large Excel spreadsheet</b>			
Median (sec)	16.2	15.7	46.6
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>-2%</b>	<b>187%</b>
<b>Microsoft Word workflow</b>			
Microsoft Word - Creating new document			
Median (sec)	1.5	1.6	2.4
Microsoft Word - Opening large document			
Median (sec)	2.7	3.1	5.7
Microsoft Word - Print-previewing document			
Median (sec)	10.6	10.9	12.6
Microsoft Word - Sharing document as PDF attachment			
Median (sec)	10.8	8.6	12.0
<b>Total (sec)</b>	<b>25.7</b>	<b>24.2</b>	<b>32.8</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>-5%</b>	<b>28%</b>

Browser responsiveness testing	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)
<b>Speedometer v2.0</b>				
Overall score (median)	130.00	84.80	119.00	105.00
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>53%</b>	<b>9%</b>	<b>23%</b>
<b>WebXPRT 3</b>				
Overall score (median)	207	149	193	167
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>38%</b>	<b>7%</b>	<b>23%</b>
<b>CrXPRT 2015</b>				
Performance qualification score (median)	286	219	257	221
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>30%</b>	<b>11%</b>	<b>29%</b>

Browser responsiveness testing	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
<b>Speedometer v2.0</b>			
Overall score (median)	119.00	109.00	31.50
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>9%</b>	<b>277%</b>
<b>WebXPRT 3</b>			
Overall score (median)	194	184	73
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>5%</b>	<b>165%</b>
<b>CrXPRT 2015</b>			
Performance qualification score (median)	272	228	107
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>19%</b>	<b>154%</b>

Photo editing testing	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)
<b>Adobe® Photoshop® Lightroom® - Saving edited image to gallery</b>				
Median (sec)	4.7	7.1	4.9	6.6
Dell Latitude win percentage	N/A	50%	3%	39%
<b>Pixlr - Creating collage from 10 images</b>				
Median (sec)	3.8	3.6	5.4	4.6
Dell Latitude win percentage	N/A	-6%	41%	20%

Photo editing testing	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
<b>Adobe® Photoshop® Lightroom® - Saving edited image to gallery</b>			
Median (sec)	4.3	4.1	30.5
Dell Latitude win percentage	N/A	-3%	610%
<b>Pixlr - Creating collage from 10 images</b>			
Median (sec)	3.7	4.3	8.9
Dell Latitude win percentage	N/A	15%	138%



Linux (Beta) testing	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)
<b>Visual Studio Code - Time to install</b>				
Median (sec)	20.5	27.3	22.8	28.5
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>33%</b>	<b>11%</b>	<b>38%</b>
<b>LibreOffice - Time to install</b>				
Median (sec)	142.9	226.2	148.8	174.7
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>58%</b>	<b>4%</b>	<b>22%</b>
<b>GIMP workflow</b>				
GIMP - Time to install				
Median (sec)	108.9	154.7	104.0	124.3
GIMP - Opening large photo				
Median (sec)	4.1	6.9	4.8	5.1
GIMP - Exporting large photo				
Median (sec)	81.7	113.3	84.8	94.1
<b>Total (sec)</b>	<b>194.9</b>	<b>275.1</b>	<b>193.7</b>	<b>223.6</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>41%</b>	<b>0%</b>	<b>14%</b>

Linux (Beta) testing	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
<b>Visual Studio Code - Time to install</b>			
Median (sec)	25.5	27.6	29.4
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>8%</b>	<b>15%</b>
<b>LibreOffice - Time to install</b>			
Median (sec)	149.1	161.9	315.8
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>8%</b>	<b>111%</b>
<b>GIMP workflow</b>			
GIMP - Time to install			
Median (sec)	85.6	105.2	224.9
GIMP - Opening large photo			
Median (sec)	4.5	4.6	13.2
GIMP - Exporting large photo			
Median (sec)	108.4	125.7	183.5
<b>Total (sec)</b>	<b>198.6</b>	<b>235.5</b>	<b>421.7</b>
<b>Dell Latitude win percentage</b>	<b>N/A</b>	<b>18%</b>	<b>112%</b>

Serviceability testing	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)
Customer-replaceable SSD	Yes	No	No	No
Customer-replaceable RAM	Yes	No	No	No
Customer-replaceable battery	Yes	No	No	No
Customer-replaceable WLAN	Yes	No	No	No

Serviceability testing	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
Customer-replaceable SSD	Yes	No	No
Customer-replaceable RAM	Yes	No	No
Customer-replaceable battery	Yes	No	No
Customer-replaceable WLAN	Yes	No	No

## System configuration information

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

	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i5)	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)
Processor			
Vendor	Intel	Intel	Intel
Name	Core i5	Core i7	Core i7
Model number	8365U	8665U	7Y75
Core frequency (GHz)	1.60-4.10	1.90-4.80	1.30-3.60
Number of cores	4	4	2
Cache	6 MB Smart Cache	8 MB Smart Cache	4 MB Smart Cache
Memory			
Amount (GB)	16	32	16
Graphics			
Vendor	Intel	Intel	Intel
Model number	UHD Graphics 620	UHD Graphics 620	HD Graphics 615
Storage			
Amount (GB)	128	256	512
Type	M.2 PCIe NVMe Class 35 SSD	M.2 PCIe NVMe Class 40 SSD	NVMe SSD
Connectivity/expansion			
Wireless internet	Intel Dual Band Wireless AC 9560	Intel Dual Band Wireless AC 9560	802.11 a/b/g/n/ac, 2x2 (MIMO), dual-band
Bluetooth	5.0	5.0	4.2
USB	1 x USB 3.1 Gen 1 with PowerShare 1 x USB Type-C 3.1 Gen 2 with Power 1 x USB 3.1 Gen 1	1 x USB 3.1 Gen 1 with PowerShare 1 x USB Type-C 3.1 Gen 2 with Power 1 x USB 3.1 Gen 1	2 x USB Type-C
Battery			
Type	Lithium-ion	Lithium-ion	Lithium-ion
Rated capacity (Wh)	60	60	41
Display			
Size (in.)	13.3	13.3	12.3
Resolution	1,920 x 1,080	1,920 x 1,080	2,400 x 1,600
Operating system			
Vendor	Google	Google	Google
Name	Chrome OS™	Chrome OS	Chrome OS
Build number or version	77.0.3865.105	77.0.3865.105	77.0.3865.105

	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i5)	Dell Latitude 5300 2-in-1 Chromebook Enterprise (Intel Core i7)	Google Pixelbook (Intel Core i7)
Dimensions			
Height (in)	0.66-0.76	0.66-0.76	0.4
Width (in)	12.0	12.0	11.4
Depth (in)	8.16	8.16	8.7
Weight (lbs.)	3.0		2.4

	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)
Processor			
Vendor	Intel	Intel	Intel
Name	Core i7	Core i5	Core i5
Model number	8650U	8250U	8365U
Core frequency (GHz)	1.90-4.20	1.60-3.40	1.60-4.10
Number of cores	4	4	4
Cache	8 MB Smart Cache	6 MB Smart Cache	6 MB Smart Cache
Memory			
Amount (GB)	16	8	8
Graphics			
Vendor	Intel	Intel	Intel
Model number	UHD Graphics 620	UHD Graphics 620	UHD Graphics 620
Storage			
Amount (GB)	64	128	128
Type	eMMC	eMMC	M.2 PCIe NVMe Class 35 SSD
Connectivity/expansion			
Wireless internet	Intel Dual Band Wireless-AC 7265	Intel Dual Band Wireless-AC 7265	Intel Dual Band Wireless AC 9560
Bluetooth	4.2	4.1	5.0
USB	2 x USB 3.1 Type-C 1 x USB 3.1 Gen 1	2 x USB-C 1 x USB 3.0	1 x USB Type-C 3.1 Gen 2 with Power 3 x USB 3.1 Gen 1
Battery			
Type	Lithium-ion	Lithium-ion	Lithium-ion
Rated capacity (Wh)	60	56	42
Display			
Size (in.)	14	15.6	14
Resolution	1,920 x 1,080	3,840 x 2,160	1,920 x 1,080

	HP Chromebook x360 14 G1 (Intel Core i7)	Lenovo Yoga Chromebook C630 (Intel Core i5)	Dell Latitude 5400 Chromebook Enterprise (8GB RAM)
Operating system			
Vendor	Google	Google	Google
Name	Chrome OS	Chrome OS	Chrome OS
Build number or version	77.0.3865.105	77.0.3865.105	77.0.3865.105
Dimensions			
Height (in)	0.63	0.7	0.77
Width (in)	12.81	14.2	12.7
Depth (in)	8.93	9.8	8.5
Weight (lbs.)	3.7	4.2	3.24

	Dell Latitude 5400 Chromebook Enterprise (16GB RAM)	Acer Chromebook 714 (8GB RAM)	Lenovo Chromebook 14e (4GB RAM)
Processor			
Vendor	Intel	Intel	AMD
Name	Core i5	Core i5	A4
Model number	8365U	8350U	9120C
Core frequency (GHz)	1.60-4.10	1.70-3.60	1.60-2.40
Number of cores	4	4	2
Cache	6 MB Smart Cache	6 MB Smart Cache	1 MB
Memory			
Amount (GB)	16	8	4
Graphics			
Vendor	Intel	Intel	AMD
Model number	UHD Graphics 620	UHD Graphics 620	Radeon™ R4
Storage			
Amount (GB)	128	64	32
Type	M.2 PCIe NVMe Class 35 SSD	eMMC	eMMC
Connectivity/expansion			
Wireless internet	Intel Dual Band Wireless AC 9560	IEEE 802.11a/b/g/n/ac	Qualcomm 6174 802.11 AC
Bluetooth	5.0	4.2	4.2
USB	1 x USB Type-C 3.1 Gen 2 with Power 3 x USB 3.1 Gen 1	1 x USB 3.1 Gen 1 2 x USB 3.1 Gen 1 Type-C	2 x USB-C 2 x USB 3.0
Battery			
Type	Lithium-ion	Lithium-ion	Lithium-ion
Rated capacity (Wh)	68	52	57

	<b>Dell Latitude 5400 Chromebook Enterprise (16GB RAM)</b>	<b>Acer Chromebook 714 (8GB RAM)</b>	<b>Lenovo Chromebook 14e (4GB RAM)</b>
Display			
Size (in.)	14	14	14
Resolution	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080
Operating system			
Vendor	Google	Google	Google
Name	Chrome OS	Chrome OS	Chrome OS
Build number or version	77.0.3865.105	77.0.3865.105	77.0.3865.105
Dimensions			
Height (in)	0.77	0.7	0.69
Width (in)	12.7	12.7	12.91
Depth (in)	8.5	9.4	8.85
Weight (lbs.)	3.24	3.53	3.27

## How we tested

### Performing the WebXPRT 3 test

1. Open the web browser under test, and go to [www.principledtechnologies.com/benchmarkxprt/webxprt/](http://www.principledtechnologies.com/benchmarkxprt/webxprt/).
2. Click Run WebXPRT 3.
3. At the Ready to test your browser screen, click Continue.
4. Click the Start button.
5. When the test completes, record the results.
6. Repeat steps 1 through 5 two times.

### Performing the Speedometer v2.0 test

1. Open the web browser under test, and go to <https://browserbench.org/Speedometer2.0/>.
2. When the test completes, record the results.
3. Repeat steps 1 and 2 two times.

### Performing the CrXPRT 2015 test

1. Add CrXPRT to Chrome from the Chrome web store: <https://chrome.google.com/webstore/detail/crxprt/hajjjaeaacmnpjpkcfnhohmaijanjf>.
2. Launch CrXPRT.
3. Click Performance Test.
4. Click Start Test. When the test completes, record the results.
5. Repeat steps 2 through 4 two more times.

### Performing the power\_LoadTest test

1. Download the power\_LoadTest extension from [https://chromium.googlesource.com/chromiumos/third\\_party/autotest/+archive/master/client/site\\_tests/power\\_LoadTest.tar.gz](https://chromium.googlesource.com/chromiumos/third_party/autotest/+archive/master/client/site_tests/power_LoadTest.tar.gz).
2. Unpack the power\_LoadTest.tar.gz file.
3. In the extension folder, locate params.js and double-click to open the file. Change the test\_time\_ms variable from the default run time of 1 hour to 18 hours.
4. Navigate to chrome://extensions and click Load unpacked extension.
5. Select the unpacked extension directory from the tar.gz file, and click Open.
6. Set screen brightness to ~80 nits.
7. Set the volume to 10%.
8. Charge the system to 100%.
9. Open a browser window.
10. Unplug the system and click the power\_LoadTest extension. We used a webcam and laptop to capture and time the battery life drain.
11. When the system shuts down, the test is complete. Record the time the system lasted unplugged.
12. Repeat steps 7 through 11 two more times.

## Testing performance with Google Docs

### Opening large document

1. Launch the Docs app.
2. Start the timer, and click the test document.
3. Stop the timer when the test document fully loads.
4. Repeat steps 1 through 3 two more times.

### Exporting Google Doc to .docx

1. Launch the Docs app.
2. Click to open the test document.
3. Click the drop-down menu, click Share & export, and click Save As.
4. Leave the Word (.docx) format selected, start the timer, and click OK.
5. Stop the timer when the document finishes exporting.
6. Repeat steps 1 through 5 two more times.

## Testing performance with Google Sheets

### Creating new Sheets spreadsheet

1. Launch the Sheets app.
2. Click the + button to open the new document dialog.
3. Start the timer, and click New spreadsheet.
4. Stop the timer when the new spreadsheet fully loads.
5. Repeat steps 1 through 4 two more times.

### Opening large Sheets spreadsheet

1. Launch the Sheets app.
2. Start the timer, and click the test document.
3. Stop the timer when the test document fully loads.
4. Repeat steps 1 through 3 two more times.

## Testing performance with Google Slides

### Creating new Slides presentation

1. Launch the Slides app.
2. Click the + button to open the new document dialog.
3. Start the timer, and click New presentation.
4. Stop the timer when the new presentation fully loads.
5. Repeat steps 1 through 4 two more times.

### Opening large Slides presentation

1. Launch the Slides app.
2. Start the timer, and click the test document.
3. Stop the timer when the test document fully loads.
4. Repeat steps 1 through 3 two more times.

### Starting presentation

1. Launch the Slides app.
2. Click to open the test document.
3. Click the play icon.
4. Start the timer, and select Present on this device.
5. Stop the timer when the presentation fully loads.
6. Repeat steps 1 through 5 two more times.

## Testing performance with Microsoft Word

### Creating new document

1. Launch the Word app.
2. Start the timer, and click Blank document.
3. Stop the timer when the document fully loads.
4. Repeat steps 1 through 3 two more times.

### Opening large document

1. Launch the Word app.
2. Start the timer, and click the test document.
3. Stop the timer when the test document fully loads.
4. Repeat steps 1 through 3 two more times.

### Print-previewing document

1. Launch the Word app.
2. Click to open the test document.
3. Click File, start the timer, and select Print.
4. Stop the timer when the Print preview fully loads.
5. Repeat steps 1 through 3 two more times.



## Sharing document as PDF attachment

1. Launch the Word app.
2. Click to open the test document.
3. Click File, and select Share.
4. From the Share dropdown menu, click Share as attachment.
5. Start the timer, and click PDF.
6. Stop the timer when the document finishes exporting.
7. Repeat steps 1 through 6 two more times.

## Testing performance with Microsoft Excel

### Opening large Excel document

1. Launch the Excel app.
2. Start the timer and click to open the test document.
3. Stop the timer when the test document fully loads.
4. Repeat steps 1 through 3 two more times.

## Testing performance with Microsoft PowerPoint

### Loading large PowerPoint presentation

1. Launch the PowerPoint app.
2. Start the timer and click to open the test document.
3. Stop the timer when the test document fully loads.
4. Repeat steps 1 through 3 two more times.

### Converting .ppt file to PDF

1. Launch the PowerPoint app.
2. Click to open the test document.
3. Click File, and select Share.
4. From the Share dropdown menu, click Full Document.
5. Start the timer, and click PDF.
6. Stop the timer when the document finishes exporting.
7. Repeat steps 1 through 6 two more times.

## Testing performance with Adobe Photoshop Lightroom

### Saving edited image to gallery

1. Launch the Adobe Photoshop Lightroom app.
2. Click to select and open the test image.
3. Click the adjustments icon to open the adjustments fly-out menu.
4. From the adjustments menu, click the AUTO button.
5. Click the Share icon.
6. Start the timer, and click Save to Device.
7. Stop the timer when the image finishes exporting.
8. Repeat steps 1 through 7 two more times.

## Testing performance with Pixlr

### Creating collage from 10 images

1. Launch the Pixlr app.
2. Click Collage.
3. Navigate to the test image folder, and click each of the ten test photos to add them to the collage queue.
4. Click Done.
5. Leave the default collage arrangement, click Next, and then click OK to confirm.
6. Click Done.

7. Start the timer, and click Save Image.
8. Leave the default image size (Max), start the timer, and click OK.
9. Stop the timer when the image finishes saving.
10. Repeat steps 1 through 9 two more times.

## Testing performance with Linux (Beta)

### Installing Linux (Beta) feature

1. From the Chrome OS desktop, click the time in the taskbar to open the notification tray.
2. From the notification tray, click the gear icon to open Settings.
3. From Settings, type `Linux` into the search bar.
4. For the Linux (Beta) settings, click Turn On.
5. Once the installation is complete, the device will restart.
6. Repeat steps 1 through 5 two more times.

### Installing Visual Studio Code

1. Before testing, download the latest version of Visual Studio Code from <https://code.visualstudio.com/download> (we selected the .deb 64 bit download), and unpackage the contents in the device's Linux files folder.
2. Launch the Terminal app.
3. Change directory to the folder containing the installation package.
4. Start the timer, and issue the installation command: `sudo dpkg -i code_1.40.2-1574694120_amd64.deb`
5. Stop the timer when installation completes.
6. Repeat steps 1 through 5 two more times.

### Installing LibreOffice

1. Before testing, download the latest version of LibreOffice from [https://www.libreoffice.org/download/download/?type=deb-x86\\_64](https://www.libreoffice.org/download/download/?type=deb-x86_64) (we selected the Linux (64-bit) (deb) download), and unpackage the contents in the device's Linux files folder.
2. Launch the Terminal app.
3. Change directory to the folder containing the installation packages.
4. Start the timer, and issue the installation command: `sudo dpkg -i *.deb`
5. Stop the timer when installation completes.
6. Repeat steps 1 through 5 two more times.

### Installing GIMP

1. Before testing, download the latest version of GIMP from <https://pkgs.org/download/gimp> (we selected the Debian 9 download), and unpackage the contents in the device's Linux files folder.
2. Launch the Terminal app.
3. Change directory to the folder containing the installation package.
4. Start the timer, and issue the installation command: `sudo dpkg -i gimp_2.8.18-1+deb9u1_amd64.deb`
5. Stop the timer when installation completes.
6. Repeat steps 1 through 4 two more times.

### Opening large photo in GIMP

1. Launch the GIMP app.
2. Click File, and select Open.
3. Select the test image, start the timer and click Open.
4. Stop the timer when the image fully loads.
5. Repeat steps 1 through 4 two more times.

### Exporting large photo in GIMP

1. Launch the GIMP app.
2. Click File, and select Open.
3. Select the test image, and click Open.
4. When the image loads, click File, and select Export As...
5. Click the Select File Type dropdown, and choose .PNG.
6. Start the timer and click Export.
7. Stop the timer when the export completes.
8. Repeat steps 1 through 7 two more times.

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