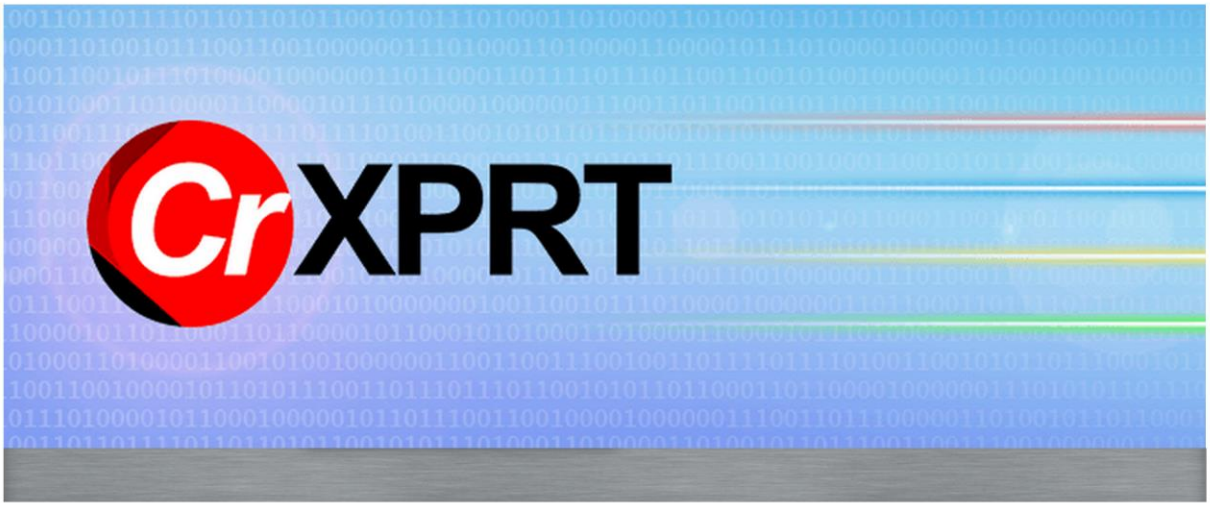
BenchmarkXPRT

BenchmarkXPRT Development Community

Exploring CrXPRT 2015



CrXPRT 2015 is a tool for evaluating the performance and battery life of Chromebooks.

April 06, 2015

CrXPRT

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INTRODUCTION

This paper explains the concepts behind CrXPRT 2015. CrXPRT 2015 is a tool created to evaluate the performance and battery life of Chrome OS based devices—Chromebooks. Like the other XPRT family benchmarks, it is easy to use, runs relatable workloads, and delivers easy-to-understand results.

CrXPRT can complete a performance test in 20 minutes and a battery life test in approximately 3-1/2 hours. Even allowing for additional time to set up the device and charge its battery, you can get a complete set of results easily in a workday. Optional tests such as a battery rundown test that completely discharges the battery take longer to run.

We explain the development guidelines common to all BenchmarkXPRT tools in general, as well as the specific goals and assumptions of CrXPRT 2015. Finally, we discuss the structure of the tests, how CrXPRT calculates results, how to share results, and how to participate in the BenchmarkXPRT community.

DEVELOPMENT PROCESS

We use a unique design methodology. Instead of the closed, bottom-up approach used by many benchmarking efforts, we are using an open, top-down approach that includes the Development Community. Our approach starts by taking input from the community and examining the most common use cases. We then write a Request for Comment (RFC) proposing use cases to incorporate into the application. Once we have the RFC written, we publish it to the community.

The community's input on the RFC guides the drafting of a design document. The design document drives the implementation of the community preview, which we release to the community for input. We make changes based on community input from the preview period and finalize the code to create a general release.

CRXPRT 2015: THE DETAILS

CrXPRT 2015 is a tool for evaluating the performance and battery life of Chromebooks. You have the option of running in Performance Test Mode or Battery Life Mode.

As with BatteryXPRT, the CrXPRT battery life tests complete in under a workday, running for 3-1/2 hours at its default settings. Even allowing for additional time to set up the device and charge its battery, you can run the battery life test and the performance test and get a complete set of results easily in well under a workday. Optional tests, such as a battery rundown test that completely discharges the battery, take longer to run.

That 3-1/2-hour battery life test length is less than the battery life of most batteries. The battery life estimation assumes that the battery under test, for the bulk of its usable life, discharges power in an approximately linear fashion. This is a reasonable assumption for most modern Li-ion batteries.[1] CrXPRT tracks battery levels during the test and uses those results to estimate battery life.

About the performance test

The performance test measures the speed of the Chromebook. Four of the seven performance scenarios (workloads) in the CrXPRT performance test are adapted from the WebXPRT 2013 framework. These workloads mirror

[1] www.technick.net/public/code/cp_dpage.php?aiocp_dp=guide_bpw2_c02_06

the kinds of things you do on the Internet every day and include these HTML5- and JavaScript-based workloads: Photo Effects, Face Detection (JavaScript), Stocks Portfolio Dashboard, and Offline Notes. CrXPRT adds DNA Sequence Analysis using HTML5 Web Worker and JavaScript, 3D Shapes using WebGL technologies, and Photo Collage using Portable Native Client (PNaCl). Table 1 provides further details about each workload.

CrXPRT runs the seven-workload performance suite seven times before calculating the overall score. CrXPRT also reports the individual workload scores. The test takes about 20 minutes to run.

About the battery life test

The battery life test includes all seven workloads from the performance suite, plus video playback, audio playback, and HTML5 gaming scenarios. It also incorporates realistic periods of wait time, for a total of 11 components. The 30-minute workload includes approximately 18 minutes of active workload and the remainder, about 12 minutes, of wait/idle time. The combined work and idle time is always 30 minutes. However, because different devices work at different speeds, the exact amount of idle time will vary by device with faster devices having more idle time and slower devices less idle time. Table 1 describes the battery life workloads in more detail. By default, the test runs seven iterations of the 30-minute battery life and takes 3 hours and 30 minutes to complete. You may also set the test to run for 4.5 hours, 5.5 hours, or until the battery is exhausted. These extended tests require more iterations of the workload than the standard seven-iteration test, but are the same as the standard test in all other respects.

CrXPRT performs two checks during a battery test to reduce the chance of losing time due to a faulty run. First, it checks to make sure the Chromebook is not connected to power. Because checking during the active part of the test might influence the results, CrXPRT checks after each iteration to make sure no one has plugged in the Chromebook during the test. If the Chromebook is connected to power, CrXPRT will report an error and terminate the test.

The second check sees if the Chromebook was manually suspended during the test, as it would be if someone closed the lid. CrXPRT does this by checking the total length of time the iteration took to complete. An iteration should always take 30 minutes. However, if the device is suspended, the duration of the run will be longer. If CrXPRT detects that an iteration lasted more than 33 minutes, it assumes that the device was suspended, generates an error, and ends the test.

The battery life test mode produces an estimated battery life expressed in hours, a separate performance score, individual performance scores for the performance workloads, and a frames-per-second (FPS) rate for a built-in HTML5 gaming component.

Test workloads

Table 1 describes the CrXPRT performance and battery life workloads. All seven workloads from the performance test are included in the battery life test, but the battery life test also includes video playback, audio playback, HTML5 gaming, and wait time components.

Workload	Category	Description	Performance test	Battery life test
Photo Effects	HTML5 Canvas, Canvas 2D, and JavaScript	Measures the time to apply three effects (Sharpen, Emboss, and Glow) to two photos each, a set of six photos total	✓	✓
Face Detection JS	HTML5 Canvas, Canvas 2D, and JavaScript	Measures the time it takes to check for human faces in a set of five photos (low resolution)	✓	✓

Workload	Category	Description	Performance test	Battery life test
Offline Notes	HTML5 Local Storage, JavaScript, AES encryption and asm.js	Measures the time it takes to encrypt, store, and display notes from local storage	✓	✓
Stock Portfolio Dashboard	HTML5 Canvas, SVG, and JavaScript	Measures the time it takes to calculate and display different graphical views of a stock portfolio	✓	✓
DNA Sequence Analysis	HTML5 Web Worker and JavaScript	Measures the time it takes to process eight DNA sequences for ORFs and amino acids	✓	✓
3D Shapes with WebGL	WebGL-based	Measures the time it takes to generate equation-based 3D shapes and display them with WebGL	✓	✓
Photo Collage using PNaCl	PNaCl-based	Measures the time it takes to apply the Sharpen effect to four photos and combine them into a collage (high resolution)	✓	✓
Video Player	Browser-based video playback	Plays a 2-minute 1,080p H.264 video clip in a browser from the local system	-	✓
Music Player	Browser-based audio playback	Plays an audio clip for 3 minutes	-	✓
HTML5-based game	HTML5 Canvas, Canvas 2D, and JavaScript	An impact.js-based game runs for about 2 minutes	-	✓
Wait time	N/A	Device displays a wait page for the rest of the 30-minute cycle	-	✓

Table 1: CrXPRT performance and battery-life test workloads.

SCORING

The CrXPRT performance and battery life test modes produce different scores. The performance test mode produces performance scores only; the battery life test reports battery life and performance scores.

The primary performance test mode result is the overall score that the benchmark calculates. For that score, higher results are better. CrXPRT also reports individual results for the seven performance workloads. These results report the average time (in milliseconds) that it took to run the workload. Because those results are times, lower scores indicate faster performance and are better.

The primary battery-test result is the estimated battery life. For that score, higher results indicate longer battery life and are better. The battery life test also produces performance score based on the seven performance suite workloads, and a frames-per-second rate from the HTML5 gaming scenario. For both of these scores, higher results are better. A detailed results page provides additional information including test's exact duration, starting and ending battery levels for each iteration, and the percentage of battery level drop for each iteration.

CrXPRT includes a margin of error with each score, a measure of the uncertainty of the score. CrXPRT reports the battery life score as a fractional estimate in hours, plus or minus a percentage value, for example 7.73 hours +- 4%. The CrXPRT performance score also reports an estimate plus a margin of error, for example 98 +-2%. Taken together, the score and margin of error express a confidence interval at a 95% confidence level, a common level for this type

calculation.[2] You can interpret the results as saying that, if you were to repeat the test on the same system using the same test procedures, you expect that, 95% of the time, the results would fall within the confidence interval CrXPRT reports. For example, the results would mostly fall within the range of 96 – 100 for the 96 +- 2% result or within about 19 minutes (4%) on either side of the 7.73 battery life result.

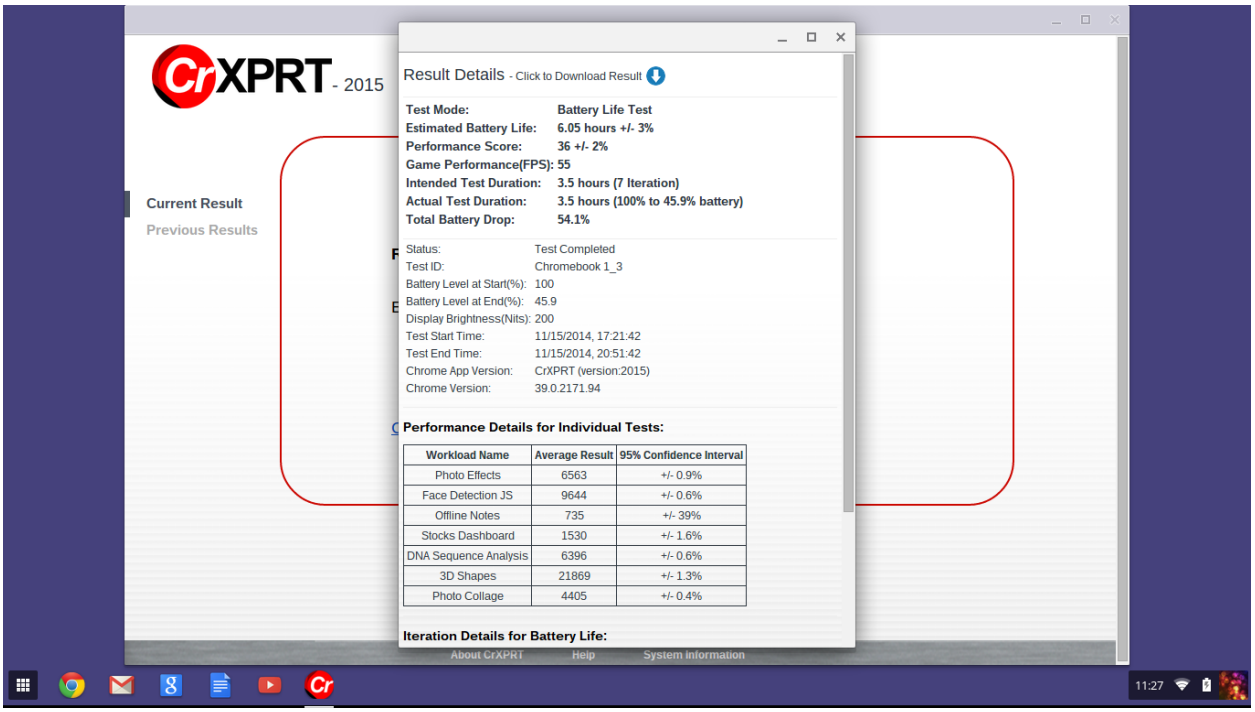

Figure 1: Detailed results for a battery life test.

NOTE: Some Chromebooks report extremely low battery use for the first couple of iterations of the CrXPRT battery life test, as low as 0%. This can cause CrXPRT to report results with a very wide confidence interval, one greater than 15%. At the time of this writing, we are looking at ways to detect and compensate for this. If you see results with a very wide confidence interval, we recommend that you use the rundown test.

The CrXPRT overall performance score and battery life performance result are based on the same seven workloads and may be similar, but the two results are not interchangeable. The individual workloads run in different contexts and under different conditions in the two modes of testing. The battery life test runs the performance workloads in groups of three, with wait times and other tests interspersed between groups, while the performance test runs the workloads sequentially and without breaks for other tasks or wait times. The performance test may run with the device plugged in and with settings for that power state vs. with a possibly different on-battery power during the battery life performance tests. The CrXPRT website results table (principledtechnologies.com/benchmarkxprt/crxprt/2015/results) indicates in the test mode column whether the result is from a battery life or performance mode tests. When comparing systems based on the CrXPRT performance scores, always compare scores from the same test mode.

[2] en.wikipedia.org/wiki/Confidence_interval Also, the Principled Technologies white paper *WebXPRT 2013 results calculation and confidence interval* covers the confidence interval in detail.

Scoring details

CrXPRT runs seven iterations of each workload. After it removes outliers (see below for details), the average duration for each workload along with variance is displayed at 95% confidence level.

Excluding outliers

The CrXPRT performance test runs seven iterations of the seven-workload suite and measures the time it takes to complete the workloads during each iteration. If one of the timed results for a workload stands out as being atypically long, CrXPRT treats it as an outlier and discards it. CrXPRT then calculates the workload results and the overall score using the remaining six results. We will discuss how we identify these outliers later.

With the default settings for the battery life test, CrXPRT runs seven 30-minute iterations and records the amount of battery life remaining before and after each iteration. It calculates the battery-drop percentage during each iteration. It discards high and low outliers among those seven percentages, if any, and uses the results that remain to estimate the device's typical battery life. If you run the battery test with more iterations, CrXPRT uses the same procedure to determine outliers. In that case, more than seven iterations could be used for the calculations.

Statistics we use in CrXPRT results calculations

The CrXPRT calculations are straightforward. There are only a few concepts we use that are beyond basic arithmetic and the confidence intervals that we discussed already. We briefly define those concepts below. A full explanation of these terms is outside the scope of this paper, but the footnotes provide links to pages with more information.

- **Interquartile range (IQR).** The range of values that are in neither the top quartile nor the bottom quartile. Sometimes called the "middle 50." Note: There are several methods of calculating the IQR. We will show the method CrXPRT uses in the calculations below.
- **Arithmetic mean or mean.** What people typically mean by "average," the sum of the values divided by the number of values. In this document, the mean is always an arithmetic mean.[3]
- **Outliers.** A value that is distant from other values. CrXPRT considers any value further than 1.5 times the interquartile range (IQR) below the first quartile or above the third quartile to be an outlier.[4]
- **Standard deviation.** A measure of how dispersed, or spread out, the set of data values is. The lower the standard deviation, the more tightly clustered the data values are.[5]
- **Confidence interval.** CrXPRT reports its results as a confidence interval expressed as a score +- a margin of error using a 95% confidence level. The confidence level is the measure of certainty of the result.
- **Two-tailed Student's t value.** The t value determines the bounds within which the hypothesis (in this case the performance score or battery life estimate) is true.[6] For a performance test workload score, the confidence interval on each side of the score (the 3% in the confidence interval 165 +-3%) has the t value as one of its multipliers.

[3] en.wikipedia.org/wiki/Mean#Arithmetic_mean_.28AM.29

[4] en.wikipedia.org/wiki/Outlier

[5] en.wikipedia.org/wiki/Standard_deviation

[6] en.wikipedia.org/wiki/Student%27s_t-distribution

- **Degrees of freedom.** The t value is determined by the number of degrees of freedom in the results. Degrees of freedom for these results is the number of sample test results minus 1.

Calculating the results confidence interval

CrXPRT uses the same results calculations for the performance scores as does WebXPRT. We discuss confidence intervals and confidence levels in some detail in a WebXPRT paper: principledtechnologies.com/benchmarkxprt/whitepapers/2013/WebXPRT-2013_calculation.pdf.

To compute the confidence intervals at the 95% confidence level, CrXPRT uses the two-tailed Student's t value.[7] For these calculations to be valid, the number of degrees of freedom (the number of sample test results used in the calculation minus 1) must exceed the t value for that number of degrees of freedom.

Figure 2 shows 10 values of the two-tailed Student's t value at the 95% confidence level.[8] It is only when you reach the four degrees of freedom, indicated by the first dark vertical line, that the degrees of freedom exceed the calculated t value. For example in a standard seven-iteration run of a test that could exclude both high and low outliers, the number of iterations could be five, six, or seven. Because the number of degrees of freedom is always one less than the number of iterations, that means the degrees of freedom would be, respectively, four, five, or six.

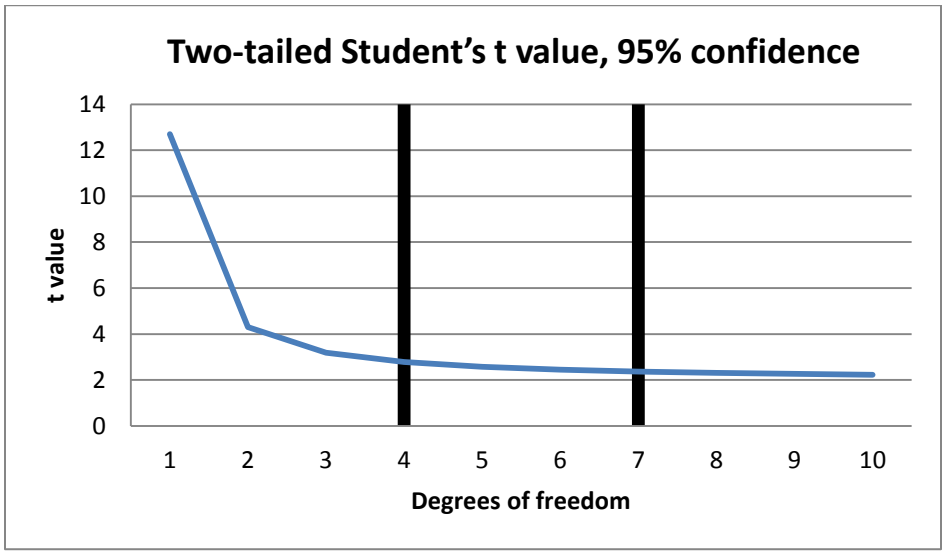

Figure 2: Student's t value for 1 to 10 degrees of freedom.

In the chart above, the higher the t value, indicated by the blue line, the less reliable the estimate will be. As you can see, the reliability is very flat above seven degrees of freedom, which is why seven iterations is the default for CrXPRT. There is a small but acceptable loss of reliability between four and seven degrees of freedom. However, below four degrees of freedom, the confidence goes down rapidly. At three degrees of freedom or lower, the CI becomes so wide that the confidence in the result would be very low and there is the possibility of a much higher variability of the score.

[7] en.wikipedia.org/wiki/Student%27s_t-distribution

[8] www.sjsu.edu/faculty/gerstman/StatPrimer/t-table.pdf

Sample detailed calculation of the expected battery life

CrXPRT calculates its battery-life results the same way as does BatteryXPRT 2014 for Android. The test measures and reports the starting and ending battery capacity levels for each iteration and subtracts them to calculate the drop in battery capacity during each iteration. Based on those results, CrXPRT estimates the time it would take for the battery to drop from 100% to 0%.

Table 2 shows the battery use during each iteration of a seven-iteration CrXPRT test on one test system. That test system saw a battery level drop of 38.8 percent, from a 100% charge to a 61.2% charge over the seven iterations and 3-1/2-hour time of this test. You can see the details for this run at www.principledtechnologies.com/benchmarkxprt/crxprt/2015/details.php?resultid=764

Iteration	Starting battery level (%)	Ending battery level (%)	Battery drop (%)
1	100	100	0
2	100	94	6
3	94	87.6	6.4
4	87.6	81.2	6.4
5	81.2	74.7	6.5
6	74.7	67.9	6.8
7	67.9	61.2	6.7

Table 2: Battery use during seven iterations of CrXPRT.

The calculation of the expected battery life proceeds as shown in Table 3.

Step	Result
Step 1: Identify and exclude any outliers within the battery-drop (%) results	
A: Sort results. Column 1 in Table 4 shows the sorted battery-drop results.	
B: Calculate bottom quartile, Q1, of battery-drop (%) results. CrXPRT uses the median of the lower half of the results for the first quartile (results 1-3). With seven results, Q1, the median of the lowest three results will always be the second sorted result	6
C: Calculate top quartile, Q3, of battery-drop (%) results. CrXPRT uses the median of the upper half of the results for the first quartile (results 1-3). With seven results, Q1, the median of the highest three results will always be the sixth sorted result	6.7
D: Calculate interquartile range. (IQR=Q3-Q1).	0.7
E: Calculate the lower outlier cutoff using the formula Q1 - IQR*1.5. Results far outside the bounds of Q1 and Q2 are discarded as outliers and excluded from further calculations. CrXPRT defines an outlier as a result that is more than 1.5 times the interquartile range (IQR) below the first quartile (Q1) or above the third quartile (Q3). With seven values and because the IQR is based on values 2 through 6, the only values that could possibly be outliers from that IQR are the first and seventh sorted values.	4.95
F: Calculate higher outlier cutoff (Q3 + IQR*1.5)	7.75
G: Discard the lowest sorted result if it is below the lower cutoff. For this data set, we drop iteration 1 because it falls below the lower cutoff.	YES
H: Discard the highest sorted result if it is higher than the higher cutoff. No results in this data set fall above the higher cutoff, so we do not discard any high results.	NO
J: Count the remaining, included runs. Table 4, column B shows included runs.	6

Table 3: Calculating the outliers.

Step		Result
Sorted battery drop (%)	**Battery drop (%) excluding outlier**	
0.0		
6.0	6.0	
6.4	6.4	
6.4	6.4	
6.5	6.5	
6.7	6.7	
6.8	6.8	

Table 4: Sorted results before and after discarding outlier.

We exclude the outliers in further calculations. Table 5 continues the calculations leading to the final expected battery life and confidence interval results.

Step 2: Calculate average battery drop for the included runs (from Column B in table 4)	6.466
Step 3: Calculate the confidence interval	
A: Calculate the variance based on the entire population of included runs (calculated the same as the Excel VAR.P function).	0.0655
B: Calculate the standard deviation of the included battery-drop values (the square root of the variance).	0.256
C: t value for 95% confidence range. The Excel equivalent is TINV(0.05,5) rounded to three decimal places, with 5 being the number of remaining results.	2.571
D: Calculate the 95% Confidence interval delta for the iterations (t value * standard deviation/sqrt(count)).	0.268
E: Calculate minutes for the overall margin of error (+- value) (100 * 30-minute cycle duration * confidence interval delta/ (average battery drop squared).	19.279
Step 4: Calculate estimated battery life	
A: Calculate the number of expected 30-minute iterations based on the average battery drop (100% / average percent drop% for included values).	15.464
B: Calculate estimated battery life (rounded to minutes) (expected iterations multiplied by the 30-minute length of the iterations).	464
C: Convert estimated battery life to hours (estimated battery life / 60).	7.733
D: Convert confidence interval delta to a rounded percentage (confidence interval delta / estimated battery life).	4%
Step 5: Report result, including battery life in hours and the estimated+- margin of error percentage	Expected battery life = 7.73 hours +- 4%

Table 5: Calculating the battery life result.

The calculations are the same for tests with more iterations, though with more iterations, more than one outlier might be removed from the top or bottom. Any values in the bottom or top 25% could be outliers.

With the rundown battery life test, CrXPRT calculates an estimated battery life for a 100% battery drain if the system shuts down with more than 0% battery life remaining. This calculation is different from the one for the fixed-time workloads. We calculate a result of hours of battery life by dividing the lapsed time (in minutes) by 100, multiplying

that result by the percentage battery life used during the test, then converting the result to hours. A rundown test for the same system in the previous example ran for 7.65 hours until the system shut down with 1.7% remaining battery charge. CrXPRT estimates 7.78 hours battery life for that system. CrXPRT does not report a margin of error for the rundown test because the result involves minimal estimation.

The performance score

CrXPRT derives the per-iteration performance scores from the timings of the individual workloads. You can access those timings through CrXPRT's Previous Results screen. To access the workload timings, follow these steps:

1. Navigate to the Previous Results page in CrXPRT.
2. Click the Details link beside the result you wish to analyze.
3. After the Result Details windows appears, press Alt+D.
4. A new window will appear showing the raw workload timings, along with other test information.
5. Copy the raw workload timings to a text file and save the file locally.

It is important to note that the detailed results timings may be less than the timings you would get by subtracting the end time from the start time in the detailed results. That is because the use cases for the battery-test contain some idle time and fixed-rate work, to better mimic real-world behavior. The time spent resting or working at a fixed rate is not included in the performance calculations.

CrXPRT calculates its performance results exactly the same way as WebXPRT. We have covered that process in in the white paper *WebXPRT 2013 results calculation and confidence interval.*[9] We refer you to that paper for the details about the calculations.

This paper has a companion spreadsheet,[10] which shows all the steps for calculating a CrXPRT result for a CrXPRT performance test. A performance test produces seven results for each of the test workloads during a 20-minute test run. We use similar calculations for the performance result tied to the battery life test, but that result includes more data points. Each half-hour iteration of the battery life test runs the set of performance workloads three times. A 3-1/2-hour, seven-iteration test produces 21 results for each test workload, all of which are included in the results calculations. Longer tests produce even more results. A second companion spreadsheet[11] shows the calculations for a 3-1/2-hour test.

We provide a brief summary here of the calculations for the overall performance score and the individual workload results for it. These results in this example are for this set of results for a Chromebook 14 14-q070nr: www.principledtechnologies.com/benchmarkxprt/crxprt/2015/details.php?resultid=823

CrXPRT calculates results for each of the seven performance test workloads based on the time that it took to complete the timed portion of the workload during the seven test iterations. Column 1 in Table 6 shows one set of results for the Photo Effects tests, sorted. Columns 3 and 4 show the results calculations. The first calculations identify any outliers. Column 2 shows the results excluding the outlier identified for these results. For the performance tests, we look only at upper outliers, including all results below the cutoff for those results.

[9] principledtechnologies.com/benchmarkxprt/whitepapers/2013/WebXPRT-2013_calculation.pdf

[10] http://www.principledtechnologies.com/benchmarkxprt/whitepapers/2015/CrXPRT-2015-overall-result-calculation.xlsx

[11] http://www.principledtechnologies.com/benchmarkxprt/whitepapers/2015/CrXPRT-2015-result-calculation-for-battery-life-test-performance-scores.xlsx

Results for seven iterations sorted (ms)	Results excluding any outliers (ms)	Calculations	Calculation results
409	409	First quartile	416
416	416	Third quartile	434
418	418	Interquartile range	18
421	421	Outlier upper cutoff (This omits the 545 result)	461
426	426	Sample variance, [calculations from here on exclude outliers]. The Excel equivalent is the Var.S function.	74.267
434	434	Sample standard deviation (the square root of the variance)	8.618
545		Count (The number of remaining results)	6
		t value for 95% confidence range. The Excel equivalent is TINV(0.05,5) rounded to three decimal places, with 5 being the number of remaining results.	2.571
		Mean (average of the results)	420.667
		Standard error (standard deviation divided by the square root of the count.	3.518
		The radius of confidence interval (equal to the t value * standard deviation/square root of the count)	9.045
		Expressed as a percentage (CI/Mean)	2%
		Reported score: average result and confidence interval	421 +- 2%

Table 6: Calculations for an individual workload performance test result.

The reported result for this example would be the rounded mean and the margin of error. The reported result for this set of results would be 421 +-2%. These results are times and margins of error, so lower scores and smaller margins of error are better.

Like the other members of the BenchmarkXPRT family, CrXPRT uses a calibration system. The calibration system for CrXPRT is the Acer C720-2848 Chromebook running Chrome v34, and you will find timings for the calibration system in the js/statistics.js file. The variable _perfTaskCalibBase stores the calibration data. The spreadsheets accompanying this white paper include those calibration values.

The overall score does not express a time, but is instead the result of a calculation based on the ratio of the individual workload scores of the system under test to those of the calibration system. Through this comparison, it converts the result to a relative measure of performance so that, like the other XPRT benchmarks higher results are better.

The calculations for the performance result for the battery life test uses the same calculations but on a larger set of 21 or more results for each workload. We provide a spreadsheet example for its calculations as well.[12]

[12] http://www.principledtechnologies.com/benchmarkxprt/whitepapers/2015/CrXPRT-battery-life-calculations.xlsx

AFTER RUNNING CRXPRT

Comparing results to the database

You can view results for CrXPRT 2015 at www.principledtechnologies.com/benchmarkxprt/crxprt/2015/results. To find detailed information on any set of scores, click the link under the Source column.

Submitting results

CrXPRT 2015 allows you to submit results to Principled Technologies. Simply click the Submit Result button on the result screen. Fill in a contact email, device name, and model number. The address and comment fields are optional. Then, all you have to do is click Submit.

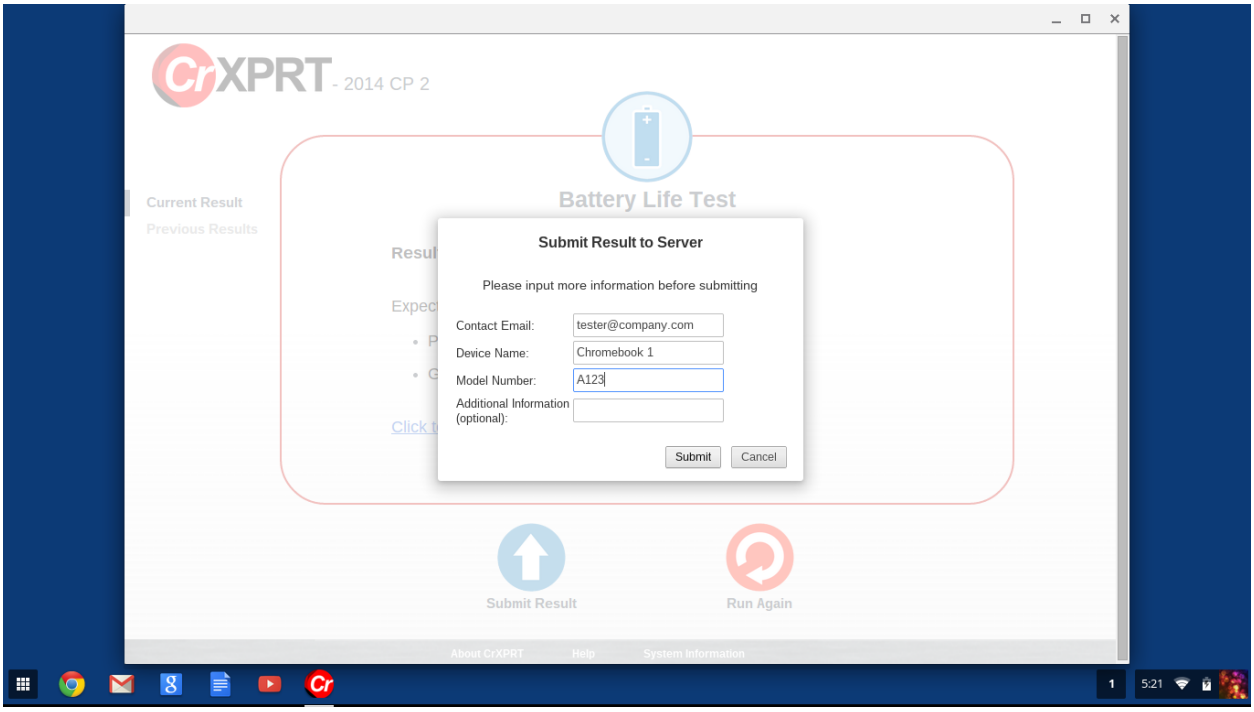

Figure 3: Submitting results after a run.

ABOUT THE BENCHMARKXPRT FAMILY

The BenchmarkXPRT tools are a set of apps that help you test how well devices do the kinds of things you do every day. In addition to CrXPRT 2015, the BenchmarkXPRT suite currently comprises the following tools:

- BatteryXPRT 2014 for Android, an app to measure the battery life of Android-based phones and tablets
- MobileXPRT, an app to test the responsiveness of Android devices
- TouchXPRT, an app to test the responsiveness of Windows 8 and Windows RT devices
- WebXPRT, an online tool to test the Web browsing capabilities of any device with Internet access
- HDXPRT, a program that uses commercial applications to test the capabilities and responsiveness of PCs

We designed the apps to test a wide range of devices on a level playing field. When you look at results from XPRTs, you get unbiased, fair product comparison information.

The community model

We built BenchmarkXPRT around a unique community model. Community membership is open to anyone, and there are many different ways to participate.

Members of the BenchmarkXPRT Development Community are involved in every step of the process. They give input on the design of upcoming versions, contribute source code, and help test the resulting implementation. Community members have access to the source code and access to early releases in the form of community previews.

The community helps us avoid the ivory tower syndrome. Diversity of input during the design process makes the tests more representative of real world activity. Giving community members access to the source code both improves the implementation of the design and increases confidence in the code.

The community model differs from the open source model primarily by controlling derivative works. It is important that the BenchmarkXPRT benchmarks return consistent results. If the testing community calls different derivative works by the same name, the result would be that the test results would not be comparable. That would limit, if not destroy, the tools' effectiveness.

Where can I get more information?

Visit us at CrXPRT.com or follow us on Twitter and Facebook. We announce breaking news on the BenchmarkXPRT blog (available to everyone) and the BenchmarkXPRT forums (available to members only). If you cannot find the answer to your question, or if you need help with CrXPRT, send an email to our team at BenchmarkXPRTsupport@principledtechnologies.com.

WHAT IS THE BENCHMARKXPRT DEVELOPMENT COMMUNITY?

The BenchmarkXPRT Development Community is a forum where registered members can contribute to the process of creating and improving the BenchmarkXPRT family, including CrXPRT. If you are not currently a community member, we encourage you to join! (Yes, that means you – our community is open to everyone, from software developers to interested consumers.) Not only will you get early releases of future versions of CrXPRT, but you will also be able to download the source code (available to members only) and influence the future of the app. Register now, or for more information, see the BenchmarkXPRT FAQ.

CONCLUSION

We hope this paper has answered any questions you may have about CrXPRT. If you have any other questions, or if you have suggestions on ways to improve CrXPRT, please post them on the community forum or e-mail us at BenchmarkXPRTsupport@principledtechnologies.com. For more information, visit us at BenchmarkXPRT.com and CrXPRT.com.

ABOUT PRINCIPLED TECHNOLOGIES

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We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.