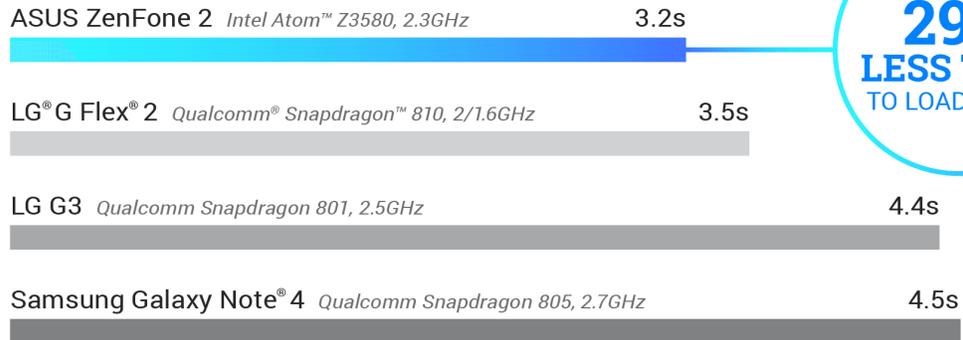




Wait less for the Web

The ASUS® ZenFone™ 2 powered by Intel® loaded Web pages faster than its ARM®-based competitors.



Average page load time for 75 Web sites

When Android™ smartphone users connect to the Internet, they want pages to load quickly and display correctly. With all the different Android smartphones available, how can buyers know which one will deliver the experience they seek?

At Principled Technologies, we compared the Web browsing experience of several Android phones. We looked at how quickly one Intel processor-based device and three ARM processor-based devices could load 75 popular Web pages using the Google Chrome™ 41 browser. We found that the Intel processor-powered ASUS ZenFone 2 loaded 76 percent of the Web sites faster than the ARM-based LG G Flex 2, LG G3, and Samsung Galaxy Note 4 phones we tested.

In addition to measuring page load times, we checked to see if there were any compatibility issues as we navigated the Web sites. We experienced fewer problematic elements with the ASUS ZenFone 2 than with the ARM-based LG and Samsung phones we tested.

As an Android smartphone user, you look for a quick and seamless Web experience. The Intel processor-powered ASUS ZenFone 2 loaded Web sites more quickly and provided an experience with less hassle than the ARM-based Android phones we tested, making it worth checking out.



A BETTER ANDROID WEB EXPERIENCE WITH ASUS & INTEL

Android smartphones are a great way to view Web sites, though they don't all behave the same way. A mobile device that does a speedy job of loading pages while displaying elements correctly can really improve the user experience.

For our comparison of the Web browsing experience that four Android phones provide, we used the top 75 Web sites from Alexa's Top Sites. Not only are these sites popular, but they cover a range of content and topics. To visit these sites, we used Google Chrome 41, the latest version of the popular browser that was available for all the phones we tested. Figure 1 provides details on the devices we tested.

Device	Processor	OS
ASUS ZenFone 2	Intel Atom Z3580	Android 5.0
Samsung Galaxy Note 4	Qualcomm Snapdragon 805	Android 4.4.4
LG G3	Qualcomm Snapdragon 801	Android 5.0
LG G Flex 2	Qualcomm Snapdragon 810	Android 5.0.1

Figure 1: The smartphones we tested.

See [Appendix A](#) for more information about the ASUS ZenFone 2. For detailed configuration information on all the tested devices, see [Appendix B](#). For details on how we tested, see [Appendix C](#), and for detailed results, see [Appendix D](#) and [Appendix E](#).

WHAT WE FOUND

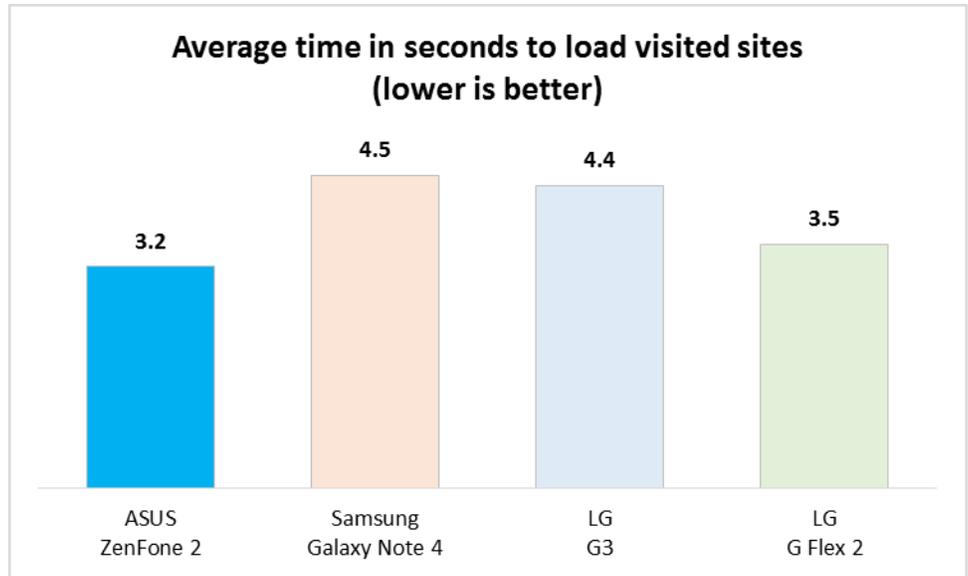
We had a better Web-browsing experience with the Intel processor-powered ASUS ZenFone 2 than with the ARM-based Android phones. The ASUS ZenFone 2 loaded 98.7 percent of the 75 Web sites faster than the Samsung Galaxy Note 4, 94.7 percent of the pages faster than the LG G3, and 80.0 percent of the pages faster than the LG G Flex 2.

After our tested Web sites loaded, we experienced no sluggish behavior with the Intel processor-powered ASUS ZenFone 2. However, we did experience sluggish behavior on the ARM-based Android phones: the LG G Flex 2, the LG G3, and the Samsung Galaxy Note 4.

Time to load Web sites

We averaged the median times that each device took to load each of the 75 Web sites we visited. As Figure 2 shows, we found that the average time of the ASUS ZenFone 2 to load the visited sites was up to 29.1 percent less than the average times of the ARM-based Android phones.

Figure 2: The average time in seconds for each smartphone to load the tested sites. Lower numbers are better.



Problematic behavior

After the pages loaded, some sites presented issues on the ARM-based phones. These issues didn't necessarily impede the functionality of the site, but could distract or frustrate the user—issues such as choppy animations, device detection problems, or re-rendering visual content after scrolling. The following examples represent problems we encountered with the ARM-based phones:

- On the LG G3 and the Samsung Galaxy Note 4, the menu animations on the Outbrain Web site were sluggish.
- The LG G Flex 2 loaded the desktop version of the PayPal® Web site main page rather than the mobile version, forcing the user to scroll horizontally and vertically to see the content.
- On the LG G3 and the Samsung Galaxy Note 4, the visual content on the ESPN® Go main page re-rendered whenever we scrolled on the page.
- With the LG G Flex 2, LG G3, and Samsung Galaxy Note 4, slideshow transitions on the Apple® Web site were sluggish.

See [Appendix D](#) for a complete list of the issues we encountered at each site we visited. Figure 3 shows our findings regarding problems after the test Web sites loaded.

	ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
Percentage of Web sites visited where the smartphone experienced problems	3%	5%	8%	8%
Number of problems experienced	2	4	6	6

Figure 3: The number of Web sites with problems and number of problems we found after loading the Web sites.

CONCLUSION

Whether you're reading articles, catching up with your social network, making travel arrangements, or shopping, using an Android phone to access Web sites should be a quick and hassle-free experience. Waiting longer than necessary for pages to load—and having problems with elements of the pages displaying properly—can be a headache.

If you're in the market for an Android smartphone, choosing an Intel processor-powered ASUS ZenFone 2 can deliver the Web content you want in less time and with smoother browsing overall than on the ARM-based LG G Flex 2, LG G3, and Samsung Galaxy Note 4 phones.

APPENDIX A – ABOUT THE COMPONENTS

About the ASUS ZenFone 2

The ASUS ZenFone 2 has a 5.5-inch Full HD display 403 PPI and the Intel Atom Z3580 2.3GHz CPU. According to ASUS, this is the world's first smartphone with 4 GB of RAM. It has a 13-megapixel camera with f/2.0 and a double, two-color LED flash. At the front, there is a 5-megapixel camera. Learn more about the ASUS ZenFone 2 at www.mgsm.pl/en/catalogue/asus/zenfone2ze551ml/news/Asus-ZenFone-2-ZE551ML.html.

About the Intel Atom Z3580

The 64-bit Intel Atom Z3580 processor is LTE-enabled, with four cores that can reach frequencies of up to 2.33GHz. It has a maximum memory size of 4 GB and maximum memory bandwidth of 12.8 GB/s. Learn more about the Intel Atom Z3580 processor at ark.intel.com/products/81195.

APPENDIX B – SYSTEM CONFIGURATION INFORMATION

Figure 4 provides detailed configuration information for the test systems.

System	ASUS ZenFone 2 (ZE551ML)	LG G Flex 2 (H959)	LG G3 (D855)	Samsung Galaxy Note 4 (SM-N910A)
Processor	Intel Atom Z3580	Qualcomm Snapdragon 810 (MSM8994)	Qualcomm Snapdragon 801 (MSM8974PRO-AC)	Qualcomm Snapdragon 805 (APQ8084)
Processor (GHz)	2.3	2 / 1.6	2.5	2.7
Processor cores	4	4+4	4	4
Memory (GB)	4	2	3	3
Storage (GB)	64	32	32	32
Battery capacity (mAh)	3,000	3,000	3,000	3,220
Display	5.5" (1920 × 1080)	5.5" (1080 × 1920)	5.5" (1440 × 2560)	5.7" (1440 × 2560)
Wireless	802.11 a/b/g/n/ac	802.11 a/b/g/n/ac	802.11 a/b/g/n/ac	802.11 a/b/g/n/ac/r
Bluetooth®	4.0	4.1	4.0	4.0
System weight (lbs.)	0.38	0.32	0.33	0.39
Front camera (MP)	5	2.1	2.1	3.7
Rear camera (MP)	13	13	13	16
OS	Android 5.0	Android 5.0.1	Android 5.0	Android 4.4.4

Figure 4: Detailed configuration information for the tested phones.

APPENDIX C – HOW WE TESTED

Web browsing – Qualitative

On March 27, 2015, we took the list of the top 500 viewed Web sites in the United States from Alexa.com (www.alexa.com/topsites/countries/US) and excluded questionable sites (pornography, phishing, torrents, etc.), sites without any viewable content (such as googleusercontent.com), and non-English language Web sites until we ended up with a list of 75 sites.

Once we had created our list, we visited each of the 75 sites on each of the four phones using Google Chrome 41, looking for any elements of the Web site that did not perform correctly or were missing. We specifically looked at videos, special functions, moving parts, and general site behavior during zooming or scrolling. We noted any issues we found, excluded any that appeared on all of the devices, and calculated a percentage failed by comparing the total sites tested to the number of sites with issues on that device.

Web browsing – Quantitative

In addition to looking at how Web sites functioned once loaded, we timed how long it took each phone to fully load and render each page. We tested each phone three times and report the median result. Between each page's launch and timing, we cleared the browser cache to ensure that the site's content loaded from the Internet rather than the phone's local cache. Starting from the phone's home screen:

1. Press the Android Recents button and clear all running tasks and apps.
2. Launch Google Chrome.
3. Press the Options button.
4. Select Privacy.
5. Press Clear Browsing Data.
6. Ensure the Clear the cache and Clear cookies, site data checkboxes are selected.
7. Press Clear.
8. Press the New Tab button.
9. Type the URL of the Web site to be timed into the address bar.
10. Simultaneously press Go and start the timer.
11. Stop the timer when the Web page is fully rendered and the Chrome loading bar has filled and disappeared. Record the result.
12. Repeat steps 1–11 for each page load time to be collected.

APPENDIX D – WEB PAGE LOAD TIMES

Figure 5 lists the Web sites we visited and median load times for each phone.

Site name	Domain	Median Web page load time (in seconds)			
		ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
About	about.com	3.5	3.46	4.83	5.47
Adobe	adobe.com	7.49	7.94	9.41	8.59
Amazon	amazon.com	1.95	2.59	1.91	2.15
Amazon Web Services	aws.amazon.com	4.04	4.34	5.66	5.53
American Express	americanexpress.com	2.39	2.75	3.32	3.68
AOL	aol.com	4.22	5.07	7.16	6.31
Apple	apple.com	1.79	2.06	2.28	2.72
Bank of America	bankofamerica.com	4.06	3.41	4.63	4.68
Best Buy	bestbuy.com	3.03	3.12	3.98	4.38
Bing	bing.com	0.9	0.97	1.04	1.4
Blogspot	blogspot.com	2.88	3.57	4.41	4.4
Business Insider	businessinsider.com	2.81	2.71	3.65	4.3
BuzzFeed	buzzfeed.com	3.61	4.46	6	5.41
Capital One	capitalone.com	2.41	2.5	3.32	3.55
Chase	chase.com	2.82	3.1	4.63	4.07
CNET	cnet.com	4.66	4.91	6.22	6.78
CNN	cnn.com	5.96	5.22	8.46	7.71
Comcast	comcast.net	5.61	5.22	6.78	7.41
Craigslist	craigslist.org	2.21	2.25	3.04	3.11
Daily Mail	dailymail.co.uk	13.96	19.22	18.07	16.26
Diply	diply.com	1.86	1.94	4.07	4
Disney Go	go.com	4.46	4.88	9.1	9.59
Dropbox	dropbox.com	4.95	5.09	5.38	6.29
eBay	ebay.com	2.04	2.38	2.15	2.81
ESPN Go	espn.go.com	5.8	6.22	9.72	8.45
Etsy	etsy.com	2.33	2.37	2.95	3.44
Facebook	facebook.com	1.66	2.19	1.97	2.28
Flickr	flickr.com	1.75	1.84	2.03	2.69
Forbes	forbes.com	4.8	5.81	7.22	7.58
Fox News	foxnews.com	5.21	5.19	7.67	7.67
GitHub	github.com	1.2	1.19	1.28	2.1
Gmail	gmail.com	3.51	3.84	4.62	4.85
Google	google.com	1.42	1.41	1.66	1.94

Site name	Domain	Median Web page load time (in seconds)			
		ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
Groupon	groupon.com	2.12	2.75	2.97	2.91
Home Depot	homedepot.com	2.19	3.12	3	3.41
Huffington Post	huffingtonpost.com	2.76	3.53	3	4.19
Hulu	hulu.com	4.3	4.81	6.5	6.02
IMDB	imdb.com	3.68	2.76	3.61	3.54
Imgur	imgur.com	2.52	2.75	4.05	3.71
Indeed	indeed.com	1.17	1.38	1.5	2.14
Instagram	instagram.com	1.24	1.28	1.64	1.66
Intuit	intuit.com	3.74	4.44	4.44	5.26
LinkedIn	linkedin.com	1.17	1.22	1.46	1.54
Live	live.com	1.52	1.54	1.78	2.34
Microsoft	microsoft.com	4.13	3.96	5.68	5.54
Microsoft Online	microsoftonline.com	1.5	1.53	1.63	2.08
MSN	msn.com	1.93	1.69	3.09	2.81
Netflix	netflix.com	2.79	2.93	4.08	4.1
NY Times	nytimes.com	6.07	5.56	9.35	9.73
Outbrain	outbrain.com	3.75	4.54	5.68	5.11
Pandora	pandora.com	3.09	2.94	4.69	3.87
PayPal	paypal.com	4.3	7.53	4.27	5.38
Pinterest	pinterest.com	4.41	4.53	6.38	7.15
Reddit	reddit.com	2	2.1	2.69	3.37
Reference	reference.com	2.4	2.66	2.81	3.11
Salesforce	salesforce.com	3.54	3.63	4.34	4.79
Slickdeals	slickdeals.net	2.47	2.69	3.34	3.94
Stack Overflow	stackoverflow.com	1.47	1.56	1.8	2.19
Target	target.com	3.9	4.22	5.16	5.47
Trip Advisor	tripadvisor.com	2.99	3	4.03	3.89
Tumblr	tumblr.com	1.78	1.94	2.4	2.57
Twitter	twitter.com	2.28	2.56	2.84	2.86
UPS	ups.com	2.52	2.75	3.03	3.34
USPS	usps.com	1.2	1.32	1.5	1.79
Walmart	walmart.com	2.1	2.53	2.81	2.66
Washington Post	washingtonpost.com	3.8	3.66	4.67	5.41
Weather	weather.com	11.72	12.39	17.47	15.57
Wells Fargo	wellsfargo.com	1.56	3.31	1.59	1.97

Site name	Domain	Median Web page load time (in seconds)			
		ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
Wikia	wikia.com	3.43	3.93	3.97	4.56
Wikipedia	wikipedia.org	1.01	1.09	1.5	1.54
Wordpress	wordpress.com	0.91	1.25	1.29	1.81
Yahoo	yahoo.com	3.31	3.56	4.81	4.47
Yelp	yelp.com	2.13	2.44	2.96	3.85
YouTube	youtube.com	2.06	1.41	2.03	2.53
Zillow	zillow.com	2.19	2.22	3.5	3.53

Figure 5: Load times of each Web site for the tested devices.

APPENDIX E – WEB SITES AND FINDINGS

Figure 6 on the following pages lists the Web sites we visited and our detailed findings.

Site name	Domain	Date accessed	Problem	Problem category	Does the phone experience the listed problem?			
					ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
About	about.com	4/1/15	None	None	No	No	No	No
Adobe	adobe.com	4/1/15	None	None	No	No	No	No
Amazon	amazon.com	4/1/15	None	None	No	No	No	No
Amazon Web Services	aws.amazon.com	4/1/15	None	None	No	No	No	No
American Express	americanexpress.com	4/1/15	None	None	No	No	No	No
AOL	aol.com	4/1/15	None	None	No	No	No	No
Apple	apple.com	4/1/15	Sluggish slideshow transitions	Visual/Presentation	No	Yes	Yes	Yes
Bank of America	bankofamerica.com	4/1/15	None	None	No	No	No	No
Best Buy	bestbuy.com	4/1/15	Rendering issues on page load	Visual/Presentation	Yes	No	Yes	Yes
Bing	bing.com	4/1/15	None	None	No	No	No	No
Blogspot	blogspot.com	4/1/15	None	None	No	No	No	No
Business Insider	businessinsider.com	4/1/15	None	None	No	No	No	No
BuzzFeed	buzzfeed.com	4/1/15	None	None	No	No	No	No
Capital One	capitalone.com	4/1/15	None	None	No	No	No	No
Chase	chase.com	4/1/15	None	None	No	No	No	No
CNET	cnet.com	4/2/15	None	None	No	No	No	No
CNN	cnn.com	4/2/15	None	None	No	No	No	No
Comcast	comcast.net	4/2/15	None	None	No	No	No	No
Craigslist	craigslist.org	4/2/15	None	None	No	No	No	No
Daily Mail	dailymail.co.uk	4/2/15	None	None	No	No	No	No
Diply	diply.com	4/2/15	Scrolling quickly forces site to re-render	Visual/Presentation	No	Yes	Yes	Yes
Disney Go	go.com	4/2/15	None	None	No	No	No	No
Dropbox	dropbox.com	4/2/15	None	None	No	No	No	No
eBay	ebay.com	4/2/15	None	None	No	No	No	No
ESPN Go	espn.go.com	4/2/15	Scrolling quickly forces site to re-render	Visual/Presentation	No	No	Yes	Yes
Etsy	etsy.com	4/2/15	None	None	No	No	No	No
Facebook	facebook.com	4/2/15	None	None	No	No	No	No
Flickr	flickr.com	4/2/15	None	None	No	No	No	No

Site name	Domain	Date accessed	Problem	Problem category	Does the phone experience the listed problem?			
					ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
Forbes	forbes.com	4/2/15	None	None	No	No	No	No
Fox News	foxnews.com	4/2/15	None	None	No	No	No	No
GitHub	github.com	4/2/15	None	None	No	No	No	No
Gmail	gmail.com	4/2/15	None	None	No	No	No	No
Google	google.com	4/2/15	None	None	No	No	No	No
Groupon	groupon.com	4/3/15	None	None	No	No	No	No
Home Depot	homedepot.com	4/3/15	None	None	No	No	No	No
Huffington Post	huffingtonpost.com	4/3/15	None	None	No	No	No	No
Hulu	hulu.com	4/3/15	None	None	No	No	No	No
IMDB	imdb.com	4/3/15	None	None	No	No	No	No
Imgur	imgur.com	4/3/15	None	None	No	No	No	No
Indeed	indeed.com	4/3/15	None	None	No	No	No	No
Instagram	instagram.com	4/3/15	None	None	No	No	No	No
Intuit	intuit.com	4/3/15	None	None	No	No	No	No
LinkedIn	linkedin.com	4/3/15	None	None	No	No	No	No
Live	live.com	4/3/15	None	None	No	No	No	No
Microsoft	microsoft.com	4/3/15	None	None	No	No	No	No
Microsoft Online	microsoftonline.com	4/3/15	None	None	No	No	No	No
MSN	msn.com	4/3/15	None	None	No	No	No	No
Netflix	netflix.com	4/3/15	None	None	No	No	No	No
NY Times	nytimes.com	4/3/15	None	None	No	No	No	No
Outbrain	outbrain.com	4/3/15	Sluggish menu animation	Visual/Presentation	No	No	Yes	Yes
Pandora	pandora.com	4/6/15	None	None	No	No	No	No
PayPal	paypal.com	4/3/15	Desktop site loaded instead of mobile	Device Detection	No	Yes	No	No
Pinterest	pinterest.com	4/6/15	None	None	No	No	No	No
Reddit	reddit.com	4/6/15	None	None	No	No	No	No
Reference	reference.com	4/6/15	None	None	No	No	No	No
Salesforce	salesforce.com	4/6/15	Scrolling quickly forces site to re-render	Visual/Presentation	Yes	No	Yes	Yes
Slickdeals	slickdeals.net	4/6/15	None	None	No	No	No	No
Stack Overflow	stackoverflow.com	4/6/15	None	None	No	No	No	No
Target	target.com	4/6/15	None	None	No	No	No	No

Site name	Domain	Date accessed	Problem	Problem category	Does the phone experience the listed problem?			
					ASUS ZenFone 2	LG G Flex 2	LG G3	Samsung Galaxy Note 4
Trip Advisor	tripadvisor.com	4/6/15	None	None	No	No	No	No
Tumblr	tumblr.com	4/6/15	None	None	No	No	No	No
Twitter	twitter.com	4/6/15	None	None	No	No	No	No
UPS	ups.com	4/6/15	None	None	No	No	No	No
USPS	usps.com	4/6/15	None	None	No	No	No	No
Walmart	walmart.com	4/6/15	None	None	No	No	No	No
Washington Post	washingtonpost.com	4/6/15	None	None	No	No	No	No
Weather	weather.com	4/6/15	None	None	No	No	No	No
Wells Fargo	wellsfargo.com	4/6/15	Desktop site loaded instead of mobile	Device detection	No	Yes	No	No
Wikia	wikia.com	4/6/15	None	None	No	No	No	No
Wikipedia	wikipedia.org	4/6/15	None	None	No	No	No	No
Wordpress	wordpress.com	4/6/15	None	None	No	No	No	No
Yahoo	yahoo.com	4/6/15	None	None	No	No	No	No
Yelp	yelp.com	4/6/15	None	None	No	No	No	No
YouTube	youtube.com	4/6/15	None	None	No	No	No	No
Zillow	zillow.com	4/6/15	None	None	No	No	No	No

Figure 6: Detailed problems of each Web site experienced by tested devices.

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.

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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.

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