Adblock Plus Efficacy Study

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Abstract – Online advertising represents the economic foundation for much of the Internet's content; however, it also represents a significant cost to individual and enterprise users who must pay to download the ads to their platforms in order to view them. The present study rates the effectiveness of Adblock Plus – an open source, ad-blocking Internet browser extension – in reducing network data requests. Ultimately, there is a 25.0% reduction in bytes downloaded, a result that increases to 40.0% when video traffic is considered in isolation. The implications of these results for enterprise users are also considered.

Introduction

Online advertisements constitute an important part of the Internet ecosystem, forming the economic lifeblood of many of the largest global technology companies such as Google and Facebook. In 2014 alone, Internet advertising revenue in the United States totaled $49.5 billion dollars, representing a 16% jump from 2013 [1]. This source of funding is extremely important for Internet content providers as other revenue models, such as paywalls, have met with limited success. The San Francisco Chronicle, for instance, dropped its paywall after only four months [2]. However, while many users recognize the role that online advertising plays in maintaining the free consumption of online content, advertising can nonetheless be intrusive and represent a significant drain on network resources.

Online advertisements are problematic not only for individual users, but also for corporate users whose online presence can be substantial. In the public sector, universities are increasingly adopting online learning and communication as part of curriculum and collaboration, Massive Open Online Courses being one of the more recent iterations [3]. Beyond e-learning activities, the daily online activity of thousands of employees and tens of thousands of students means that the impact of online advertisements can be substantial, both in terms of the number of individual users affected, but also in terms of the physical infrastructure and personnel required to handle data flows directly related to online advertisements.

A number of browser extensions have been developed to stop network requests for unwanted content such as online advertisements. These are based either on URL blocklists, such as Adblock Plus, Disconnect, and Ghostery, or on heuristics, such as Privacy Badger [4], [5], [6], [7]. Adblock Plus is an open source Internet browser extension developed by Wladimir Palant in 2006. It has since grown to the most popular add-on for Mozilla

Firefox and Google Chrome and as such forms the object of the present study [8].

Purpose of the Study

While the present popularity of Adblock Plus represents a certain vindication of its ad-blocking model, there is a lack of technical studies on its effectiveness. The purpose of this study then is an attempt to fill this knowledge gap and evaluate the effectiveness of Adblock Plus in an enterprise environment and document any reduction in network traffic.

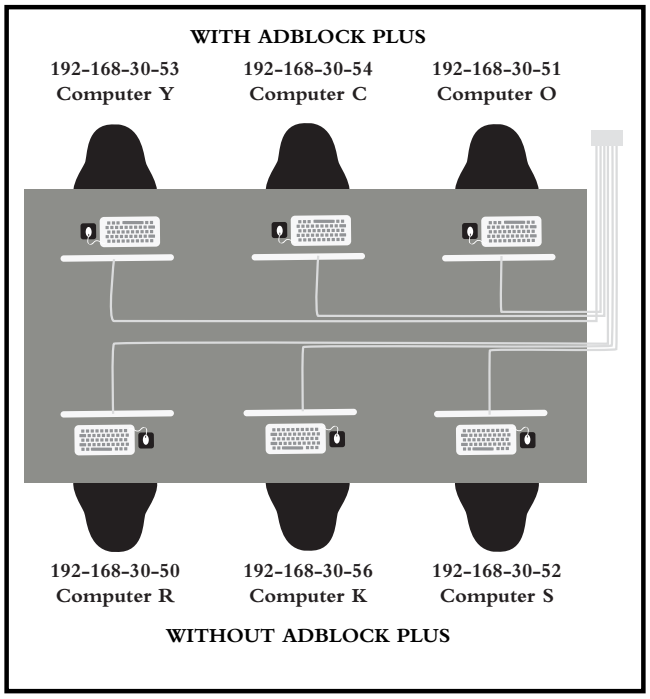

Figure 1: Terminal Testing Configuration

Test Methodology

Adblock Plus works by detecting traffic coming from ad servers and either blocks the actual browser requests, or prevents the ad from rendering. The browser extension accomplishes this by screening out incoming traffic from user-defined filter lists. Out of the box, Adblock Plus has two filter lists enabled: an ad-blocking list based on a selected language and a list of Acceptable Ads, that is ads that meet a certain definition of unobtrusiveness [4]. All testing was conducted with Adblock Plus in its out-of-the box, default configuration,

Phase I of the study was a simple before and after, asynchronous measurement of Adblock Plus in a real-world, enterprise setting. An endpoint (Computer O, see Figure 1) was placed on Simon Fraser University's network. The endpoint was connected to a switch, loaded with Cisco Netflow, where all traffic to the endpoint traversed the switch. Netflow data, including source and destination, was collected and logged every five minutes on a machine running Manage Engine's Netflow Analyzer. The traffic was analyzed and reports were generated by the same application.

Student volunteers were instructed to mimic surfing to a designated basket of URLs (see Table I) as they might perform research for a paper, as well as casual surfing (news). They were required to spend at least 5-15 minutes on each site.

youtube.com	buzzfeed.com
bild.de	cbs.com
gamestar.de	yelp.com
cnn.com	espn.com
shopping.com	msn.com
bloomberg.com	dailymail.co.uk
spiegel.de	skysports.com
ebay.com	imgur.com
nytimes.com	imdb.com
mashable.com	techcrunch.com
yahoo.com	alibaba.com
huffingtonpost.com	reuters.com
digg.com	cnet.com
washingtonpost.com	thesun.co.uk
reddit.com	stackoverflow.com
abcnews.go.com	bbc.com

Table 1: Basket of URLs Visited

After reviewing the data, it became clear that a more rigorous test was required in order to fully evaluate the effectiveness of the browser extension. Even without the benefit of a Netflow switch to capture the data, it was clear that Adblock Plus produced a noticeable reduction in online advertisements; however, asynchronous testing introduced variability in the browsing behaviour

of the student volunteers over the different testing periods (i.e. students exhibited different browsing behaviour during different parts of the university term). Ultimately, this eroded the comparability of the before and after data sets, and therefore between with- and without-Adblock Plus data sets.

In response to these concerns, we proceeded with a synchronous test. Phase II involved multiple machines divided into those running Adblock Plus (Computers Y, C, and O; see Figure 1) and those without Adblock Plus (Computers R, K, and S; see Figure 1). All machines were part of a flat network with gateway provided by a Palo Alto VM-100 firewall. The Palo Alto firewall provides application layer visibility into network traffic. Since all traffic traversed the firewall this methodology provided extremely accurate data analysis on the type and volume of traffic. Students were again instructed to mimic surfing to a designated basket of URLs (Table I) as they might perform research for a paper, casual surfing (news). They were required to spend at least 5-15 minutes on each site.

This synchronous configuration represented an improvement over Phase I because there was a reduced variability in browsing behaviour between student volunteers.

Test Results

Phase I of the testing was conducted over December 5, 2014 to December 24, 2014 using 6 student volunteers. Computer O was used by student volunteers for 2 weeks with Adblock Plus (December 5-15, 2014) and for 2 weeks without any ad-blocking applications (December 16-24, 2014). As discussed above, while there was a noticeable reduction in the appearance of online advertisements, the presence of different testing periods reduced the comparability of the with- and without-Adblock Plus data sets. Asynchronous testing was therefore rejected in favour of synchronous testing.

Phase II of the testing was conducted from March 15, 2015 to May 1, 2015 with 103 students participating. Phase II revealed some interesting results. For the purposes of analysis, we selected two computers with the most web traffic, one with Adblock Plus (Computer Y) and one without any ad-blocking technology (Computer S).

Computer "S"

Application	App Category	Sessions	Bytes
http-video	media	873	13.1G
ssl	networking	62.2k	9.6G
web-browsing	general-internet	403.1k	7.4G
flash	general-internet	9.6k	2.7G
rtmp	media	112	1.4G
dropbox	general-internet	516	646.9M
rss	general-internet	7.4k	242.7M
cnn-video	media	48	227.1M
facebook-base	collaboration	9.4k	174.5M
http-audio	media	69	170.4M
speedtest	general-internet	13	164.0M
gmail-base	collaboration	242	115.1M

Without Adblock Plus

Figure 2: Computer S - Without Adblock Plus

Computer "Y"

Application	App Category	Session	Bytes
ssl	networking	46.8k	12.5G
web-browsing	general-internet	107.8k	6.8G
http-video	media	78	402.2M
apple-update	business-systems	37	363.9M
teamviewer-base	networking	89	221.1M
hp-jetdirect	business-systems	19	165.7M
skype	collaboration	136	150.0M
lpd	business-systems	2	123.8M
vimeo-base	media	122	117.5M
flash	general-internet	1.0k	110.7M
rtmp	media	181	102.2M

With Adblock Plus

Figure 3: Computer Y - With Adblock Plus

As expected, there was a noticeable decrease in online advertisements experienced by student volunteers. This decrease was driven by a substantial drop in the number of web-browsing sessions and was associated with a drop in the amount of data downloaded by the web browser. Web-browsing sessions for Computer S (no ad-blocking software) were 403.1k, while Computer Y (with Adblock Plus) recorded only 107.8k, representing a 73.3% decrease in the number of sessions. Network data usage, decreased by 0.6G or 8.1%.

The results were even more pronounced when the cumulative results for all three computers running Adblock Plus were compared against the three computers with no ad-blocking software (see figure 4-1). Computers running the Adblock Plus browser extension saw a 25.0% decrease in associated total data usage during web-browsing sessions.

LAB TRAFFIC TOTALS

	WEB-BROWSING SESSIONS	BYTES
Without Adblock Plus		
Computer S	403.1k	7.4G
Computer K	11.0k	453.2M
Computer R	26.2k	1.5G
	TOTAL	**9.6G**
With Adblock Plus		
Computer Y	107.8k	6.8G
Computer C	7.1k	120.9M
Computer O	10.2k	330.3M
	TOTAL	**7.2G**
Traffic Reduction +/-		**-2.4G**
		25%

Figure 4-1: Lab Traffic Totals

The trend was even more pronounced when http-video sessions were taken in isolation. Looking again at the cumulative results for the computers running Adblock Plus and those with no ad-blocking software (excluding Computer S, see note), testing revealed a 40.0% decrease in total data usage (see figure 4-2).*

LAB TRAFFIC TOTALS

	HTTP-VIDEO SESSIONS	BYTES
Without Adblock Plus		
Computer S	**	**
Computer K	158	508.6M
Computer R	59	657.5M
	TOTAL	**1.166G**
With Adblock Plus		
Computer Y	78	402.2M
Computer C	4	20.8M
Computer O	20	311.5M
	TOTAL	**.700G**
Traffic Reduction +/-		**-466M**
		40%

** **Computer S featured extraordinary amount of video traffic which proved to be an outlier in the data. Thus we removed it to ensure fairness.**

Figure 4-2: Lab Traffic Totals

Ultimately, in filtering out online advertisements, Adblock Plus significantly reduced network data usage.

Discussion

These findings have important consequences for not only universities, but also for any enterprise user with large data demands. Universities and enterprise users rely both on an internal network, but also on commodity networks to connect them to the World Wide Web. Therefore, the decrease in network data usage has the potential to generate substantial savings across several fronts.

* The http-video data total for Computer S was uncharacteristically high (13.1 G) compared to the other computers and was therefore excluded from these calculations as an outlier.

(1) Reduced network data demand means that an internal network running Adblock Plus would have lower infrastructure costs than a comparable network without Adblock Plus. This would also mean lower maintenance and staffing costs as well.

(2) Reduced network data demand would also translate into lower commodity network costs as less data overall would be downloaded from external network sources.

(3) Reduced network data demand may indicate lower energy costs. There is some evidence – not tested here, but it is consistent with our findings – that using Adblock Plus may reduce overall energy costs, which when scaled to large networks could be substantial [9].

These three fronts combined could represent significant savings for universities, especially when one considers the reported decrease in video data usage. With global video IP traffic projected to increase to 79% of all web traffic by 2018, up from 66% from 2013 levels, these savings could be significant indeed [10].

These potential savings, however, are limited by the fact that Adblock Plus needs to be installed onto an individual machine's browser in order to function [11]. This presents some difficulties from the perspective of a network administrator. In addition to student lab and staff computers, whose maintenance and administration falls under the responsibility of the network administrator, there are also a growing number of machines that do not. Students and staff are increasingly using their own laptops, tablets, and smartphones to wirelessly access universities' networks. It is not clear how one could push Adblock Plus to these machines. From a network administration standpoint, it would be simpler if the ad-blocking software could be moved from the Internet browser to the network infrastructure itself, such as a wireless router that was under the direct control of the network administrator.

Nevertheless, the reduction in network data usage revealed in this study is intriguing and calls for further investigation. This study will need to be replicated on a larger scale to confirm the results. Moreover, it would be interesting to quantify network data usage rates across other ad-blocking software, to see if these results are typical.

Finally, in addition to the various benefits of a decrease of in network data usage, administrators of large data networks are removing distractions. While a rigorous test showing distraction levels caused by ads would be the subject of another paper, it is clear that conserving human attention would be a boon to any business or organization.

Authors/Organizations

Costa Dedegikas is currently the Technology Manager at the SNF New Media Lab at Simon Fraser University and Director of Ready Labs. With over twenty years of experience managing and consulting on various e-learning initiatives, he has an extensive background in brand identity development, interactive design, and educational design. Mr. Dedegikas has also overseen the development of many successful online learning platforms (LMSes), interactive media, as well as educational and cultural mobile applications.

Arvind Parmar is a graduate of the University of Mumbai, with a degree in Electronic and Telecommunications. As a programmer analyst he has worked in IT development, before moving into infrastructure and network management. He currently runs a boutique IT consulting firm called 0 Footprint Technologies and is an associate at Ready Labs and SNF New Media Lab.

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Christopher Dickert is a graduate of Simon Fraser University, with an MA in History. He has an extensive background in technical writing and process documentation from working in the wireless telecommunications industry, as well as a large research and editing portfolio accumulated over many years as an independent consultant. Mr. Dickert is currently a communications professional working at the Stavros Niarchos Foundation Centre for Hellenic Studies at SFU.

Ready Labs Inc. and SNF New Media Lab

Thanks to a series of grants beginning in 2003, the SNF New Media Lab has developed an extensive technology portfolio that is at the forefront of mobile, e-learning technology. With over 10 years and $5 million in research and development, the SNF New Media Labs' products are used at the Secondary School and University level for online content delivery. Most recently, its flagship platform is currently being used as the anchor technology in a $2.5 million SSHRC grant for the instruction and preservation of First Nations languages and culture.

In 2013, the Simon Fraser University Innovation Office recognized the commercial potential of this technology and spun-out Ready Labs, an educational technology company with significant expertise in education, educational technology and mobile engineering.

Simon Fraser University

As Canada's engaged university, SFU is defined by its dynamic integration of innovative education, cutting-edge research and far-reaching community engagement. SFU was founded almost 50 years ago with a mission to be a different kind of university—to bring an interdisciplinary approach to learning, embrace bold initiatives, and engage with communities near and far. Today, SFU is a leader amongst Canada's comprehensive research universities and is ranked one of the top universities in the world under 50 years of age. With campuses in British Columbia's three largest cities — Vancouver, Surrey and Burnaby — SFU has eight faculties, delivers almost 150 programs to over 30,000 students, and boasts more than 130,000 alumni in 130 countries around the world.

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