

**THE IMPACT OF COOKIE DELETION ON
THE ACCURACY OF SITE-SERVER
AND AD-SERVER METRICS:
AN EMPIRICAL COMSCORE STUDY**

**DR. MAGID ABRAHAM
CAMERON MEIERHOEFER
ANDREW LIPSMAN
COMSCORE, INC.**

JUNE 2007

FOR FURTHER INFORMATION, PLEASE CONTACT:
PRESS@COMSCORE.COM
OR CALL 312.775.6510



Summary of Findings

This paper presents the results of a study of the rate at which cookies are deleted by computer users and examines the impact that cookie deletion has on the accuracy of site-server data for estimating the size of Web site audiences or for measuring the reach and frequency of online advertising campaigns. The study is based on an analysis of the cookie deletion behavior within approximately 400,000 monitored home computers in the U.S. during December 2006.

For the purposes of the study, comScore analyzed the first-party “B cookie” from Yahoo! and the third-party ad server persistent cookie from DoubleClick, each believed to be broadly representative of cookies delivered to the U.S. Internet population and each reaching well in excess of 100 million Internet users every month. The study examines the degree to which Internet users clear these cookies from their computers, thereby causing site-servers to deposit new cookies and potentially leading to overstated estimates of unique users in cookie-based site-server data. It is important to note that Yahoo! and DoubleClick did not participate in this study with comScore. This study by no means implies that Yahoo! or DoubleClick publish site-server data without adjusting for the overstatement caused by cookie deletion.

The results of the study reveal that approximately 31 percent of U.S. computer users clear their first-party cookies in a month (or have them cleared by automated software), with an average of 4.7 different cookies being observed for the same site within this user segment. Prior independent studies conducted by Belden Associates in 2004, by JupiterResearch in 2005 and by Nielsen/NetRatings in 2005 also concluded that cookies are deleted by at least 30 percent of Internet users in a month.

Using the comScore U.S. home sample as a base, an average of 2.5 distinct cookies was observed per computer for Yahoo! This finding indicates that, because of cookie deletion, a server-centric measurement system which uses cookies to measure the size of a site’s visitor base will typically overstate the true number of unique visitors by a factor of up to 2.5x, which is to say an overstatement of up to 150 percent. Similarly, the study found that an ad server system which uses cookies to track the reach and frequency of an online ad campaign will overstate reach by a factor of up to 2.6x and understate frequency to the same degree. The actual magnitude of the overstatement depends on the frequency of visitation to the site or exposure to the campaign.

The relative accuracy of site-server data versus panel data for measuring Web site audiences has been hotly debated for some time, with server-based estimates of unique visitors often being quoted as higher than those provided by panel data. The results of the comScore study show that, without significant and careful adjustments for cookie deletion, site-server data can grossly overstate the number of unique visitors to a site and, as such, are simply not a reasonable surrogate for measuring the true number of people that visit a site.



Introduction to comScore

For more than seven years, comScore has served as an industry-leading provider of insight into Web-wide behavior and users' attitudes. comScore derives its information and analysis from a representative panel of more than two million Internet users worldwide who have provided explicit permission for comScore to install its patented measurement technology on their computers, and through a patented data collection system, allow comScore to monitor their online browsing, buying and other transactional activity across the entire World Wide Web.

comScore panelists also participate in attitudinal research by completing targeted questionnaires provided by comScore, which allows comScore to provide a fully integrated understanding of online behavior and its attitudinal drivers. Armed with this information, comScore provides more than 700 clients with actionable information and analysis that help improve business decision-making.

Cookie Overview

To clearly understand how comScore is able to evaluate consumers' cookie management practices, it is important to have a baseline perspective of how cookies work.

What is a Cookie?

Cookies are small text files stored on a user's computer that contain a collection of name-value pairs designating different types of information for that user. These text files are associated with a specific domain (e.g. aol.com or amazon.com, etc.), and can only be accessed or modified by that specific domain.

The domain may use the cookie to store a variety of information. Domains have full discretion over the type of information stored and the number and types of name-value pairs used to organize that information. One of the name-value pairs is used to identify a browser so that a repeat visitor using that browser is recognized. All name-value pairs stored by a specific domain are typically stored in a single cookie file in a user's browser "cookie store," which is a specific location that the browser uses to store cookies.

Browser Applications Manage Cookies

Cookies are objects used by the browser application, not the operating system, the ISP, or the Internet. Cookie stores are places where the Internet Explorer and Firefox software store information requested by Web sites and permitted by Web users.

Importantly, each browser maintains a unique cookie store. Internet Explorer and Firefox maintain separate cookie stores. So, a single user who accesses the same domain using two different browsers



will have two separate cookies – one for each browser (the AOL Proprietary browser uses the same store as IE). Independent cookie stores also exist for each Windows account or Windows log-in. For example, two people sharing an XP computer with distinct log-ins will have independent cookie stores.

Cookies are Transactional Objects

Cookies are dynamic objects that are routinely read and modified by sites as users interact with content. On each page request, the site's server will ask the browser to deliver any cookie information for that site. This can be termed the "get cookie" event.

If a cookie is present in the active cookie store for the domain and has not expired, the browser will return all information stored in the cookie file (cookies can be set to a specific page or location, but this is not common – cookies are usually associated with a specific domain). This action typically preserves any unique identifier passed to the site-server by the browser.

If a cookie is not present in the active cookie store or has expired, no name-value pair is returned to the site from the browser during the "get cookie" event. The site will then typically request that a new version of the cookie be set by the browser (the "set cookie" event). The new request will typically require the site to establish a new unique identifier.

If a browser is configured to reject cookies, no name-value pairs will be found during the "get cookie" event. The site may still initiate the "set cookie" event, but the browser will not store this information.

Cookie Applications

There are no rules or standards for how sites may implement cookie tracking beyond the HTTP protocol. This leads to widely varying practices for similar purposes and a wide range of applications. The most common application allows the retention of users' log-in information, or configures the site to "remember" the user each time they return. Another common application is to retain user preferences, carrying prior configuration settings into subsequent sessions.

Cookies are also used by extended cross-site networks involved with content that appears on a page, most notably advertising networks that deliver ads. Extended networks use cookies associated with specific objects on the page delivered under a third-party domain. These applications allow for tracking ad impressions across different sites and, in some cases, inform the decisions of what ad should be delivered.

Cookie Deletion

Cookie deletion refers to the removal of cookies from a user's computer.

Cookie deletion may occur when:

- Users manually delete cookies from their user files
- Users delete cookies using browser functions such as 'Internet Options' in IE 6.0
- Users run security protection programs that expunge cookies



Users may also enable their Web browser settings to reject cookies. The Internet Advertising Bureau (“IAB”) has published research showing that 12 percent of users reject cookies. While this dynamic serves to increase the overstatement of unique visitors in site-server logs, it should be noted that browsers that were set to reject cookies were not included in this comScore study.

The key impact of cookie deletion is that a single PC user may be counted as multiple visitors by server-based counting methods. The following example illustrates how a single user who deletes his cookies twice during the course of one month and visits a site four times, would register three unique cookies in the site-server log data and therefore be over-counted as three unique visitors to that site.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	<p>- Site Reads 3 distinct cookies - Same visitor is counted 3 times</p>				

First-Party vs. Third-Party Cookies

Cookies associated with a site delivering content directly requested by the user are known as first-party cookies. Such cookies are typically used to directly improve the user experience with the site, and, to some extent, the user knowingly leverages these cookies when they intentionally navigate to the site.

Third-party cookies typically operate in the background, associated with objects delivered within the context of a larger Web page, but not directly requested by a user. These cookies may be associated with advertising, embedded content, hosted-content, or rich media applications managed by a third-party domain. Third-party cookies may be set by intermediate activity occurring between rendered page views, such as a request for an advertisement that appears on the page that is served by a third-party. Many applications of third-party cookies provide means for tracking activity across a broad network.

Many third-party cookies are deemed “tracking cookies,” a term that carries with it the stigma of privacy risk. As such, many automated cookie management applications will flag or automatically delete cookies that have been determined to be tracking cookies.



Cookie Overview Links

Additional information on cookies, their applications, and related technical detail may be found at the following locations:

http://en.wikipedia.org/wiki/HTTP_cookie

<http://www.howstuffworks.com/cookie.htm>

<http://www.cookiecentral.com/faq/>

Methodology

Overview

The comScore study aims to determine the degree to which individual web users may be over-counted when measured by the values of unique identifiers established by cookies. The objective is to determine the overall rate at which Internet users reset their cookies. The unit of analysis is the individual user (i.e. the consumer) and not a specific Web site or cookie.

There are generally two types of unique identifiers based on cookies:

- Log-in cookies that reflect the unique cookie identifier verified by user log-in
- Passive cookies that reflect the unique cookie identifier passively set and maintained by a site without user log-in or verification.

The core distinction between these two types of unique cookie identifiers is how the site reacts when the cookie is not found on a page request. For log-in cookies, the site will either deliver a generic form of the site, or prompt the user to log in, after which it will reset the cookie identifier with that user's unique identifier value. This value will be consistent over time, derived from the user's account. Passive unique cookie identifiers lack the benefit of a verification event to re-establish a user's unique identifier. If the site does not find a value for the passive unique identifier on page request, it will establish and set a new value.

This study evaluates the persistence of passive unique cookie identifiers over time to estimate the overall rate of cookie reset activity. As noted earlier, computers in the comScore panel which are set to reject all cookies were excluded from the study.

Data Collection

In general terms, comScore's core audience measurement technology observes all open Internet requests. A typical page or object request will include all associated cookie information, termed here as the "get cookie" event. The comScore technology can be configured to extract specific name-value pairs from the cookie information included in these events. All observations of specified name-value pairs are then stored along with a panelist identifier and a timestamp. These cookie name-value pair observations are collected for all defined name-value pairs for all active panelists.

For purposes of this study, comScore analyzed a passive first-party unique identifier cookie for a major Web property (Yahoo!) and a passive third-party unique identifier cookie for a major ad server



(DoubleClick). Each cookie is believed to be representative of cookies delivered to the U.S. Internet population and each reaches well in excess of 100 million Internet users per month. These two cookies were selected to maximize reach across the Internet user base to provide as complete a view as possible of consumers' overall cookie management behavior. The study is based on activity observed within approximately 400,000 home computers during the month of December 2006. This sample was statistically weighted to represent the U.S. home Internet user population along key geo-demographic variables.

Cookie Duplication & Preservation Methodology

The error in estimates of unique visitors derived from passive cookie identifiers is proportional to the degree to which there are multiple identifiers for an individual user. Any case where an individual user delivers multiple cookie identifiers to the same Web site will inflate the counting of that individual as a unique person. The degree of overestimation depends on how many cookie IDs are delivered to the Web site for that single user.

The aggregate error in unique visitor estimates from site-server data depends on visitation frequency to the site and on the time frame. At the one extreme, a site with only one-time visitors would have exactly one cookie per visitor and, as a result, the number of unique cookies equals the number of unique users. Over the course of a month, an individual user may have many distinct cookie IDs, but over the course of a single week, that same the number of distinct IDs is likely to be lower, and so is the overstatement. Conversely, a single user could be over-counted many more times over a one year period.

This study aims to measure the extent to which comScore observed multiple cookies per machine for the same site over the course of the month of December 2006.

To assess the "uniqueness" of each of the cookies in the study during the month, the full time series of observed identifier values was evaluated for each individual comScore panelist. Within this time series, the baseline assumption was that the initial cookie identifier would be preserved throughout the month; the first value observed would equal the last value observed. Should the base assumption be satisfied, the conclusion that cookie-based tracking is a flawless measure of unique visitors would be accurate.

If a new identifier value appeared in this time series and persisted for the remaining observations, the initial cookie was determined to have been not preserved. If an individual time series showed subsequent changes in the cookie value, these changes were tabulated, yielding an estimate of the number of distinct cookie identifier values delivered to the Web site by that individual panelist.

One distinct pattern did emerge during analysis that warranted treatment. Because cookie stores are affiliated with specific browsers, it is possible to deliver multiple cookies to a Web site from a single computer, should a user access the site using different browsers. In a small subset of cases oscillating patterns were observed, where two or more values would alternate throughout the time series for an individual panelist. Any panelist displaying an oscillating pattern was classified as "preserved," since cookies were observed to be persistent despite their duplication.



This treatment yielded two groups: panelists whose cookie identifiers were preserved, and those whose cookie identifiers were not preserved. The relative size of these groups for each cookie provides a measure of overall consumer propensity to preserve cookies and the unique identifiers within them.

Within the non-preserved group, the tabulation of distinct cookie observations per panelist provides a measure of the impact of duplication error on aggregate unique visitor estimates. Within the preserved group, the site-server would count each computer with multiple cookies as multiple unique visitors.

Behavioral Cookie Deletion Analysis

First-Party Cookie Deletion

Using the total comScore sample as a basis, an average of 2.5 distinct first-party cookies were observed per computer for the site being examined. This indicates that Web-site server logs that count unique cookies to measure unique visitors are likely to be exaggerating the size of the site's audience by a factor as high as 2.5, or an overstatement of 150 percent. The actual magnitude of the overstatement will depend on the frequency of visitation to the site. The more frequently the site is visited, the greater the degree of over-statement.

First-Party Cookies			
	Percent of PCs	Average Cookies per PC	Percent of Total Cookies
All PCs	100.0%	2.5	100.0%
Preserved*	69.3%	1.5	41.8%
1+ Resets	30.7%	4.7	58.2%
1 Reset	16.1%	2.0	12.8%
2 Resets	5.1%	3.0	6.1%
3 Resets	2.5%	4.0	4.0%
4+ Resets	7.1%	12.5	35.3%

* Preserved designation includes PCs where two or more distinct cookie values were observed alternating throughout the observation period. Such oscillating patterns reflect the use of multiple browsers, or multiple accounts on a PC, and do not reflect reset events.

Approximately 31 percent of U.S. Internet users cleared their first-party cookies during the month. Within this user segment, the study found an average of 4.7 different cookies for the site. Among those computers where cookie resets occurred, it was most common to observe one reset (16 percent of all PCs). However, for the 7 percent of computers on which four or more cookie resets occurred, the average number of cookies observed was 12.5 and these cookies accounted for 35 percent of all cookies observed in the study. In other words, a relatively small segment of PC users engaging in "serial cookie deletion" has the potential to dramatically inflate cookie-based site server log data.



Third-Party Cookie Deletion

comScore's analysis of third-party cookies revealed an average of 2.6 distinct cookies per computer in the month, indicating a similar rate of overstatement as the first-party cookies. For those computers where at least one cookie reset occurred, the number of third-party cookies observed (5.5) was slightly higher than first-party cookies (4.7).

Third-Party Cookies			
	Percent of PCs	Average Cookies per PC	Percent of Total Cookies
All PCs	100.0%	2.6	100.0%
Preserved	73.0%	1.5	42.6%
1+ Resets	27.0%	5.5	57.4%
1 Reset	13.6%	2.0	10.6%
2 Resets	4.2%	3.0	4.9%
3 Resets	2.2%	4.0	3.5%
4+ Resets	7.0%	14.2	38.4%

The degree of overstatement will vary with the frequency of exposure to the campaign. The higher the frequency, the higher the degree of overstatement.

These findings mark a departure from the conventional wisdom, which says that third-party cookie deletion rates should be higher than first-party cookie deletion rates – primarily due to the use of security protection programs (SPPs). The belief is that those who use SPPs are likely to selectively remove third-party cookies, which are generally deemed more invasive and less useful than first-party cookies, while preserving their first-party cookies. To further analyze this issue, comScore compared the first-party versus third-party cookie deletion rates within computers with an active SPP.

The Impact of Security Protection Programs on Cookie Deletion

Despite the overall similarity in cookie deletion rates between first-party cookies and third-party cookies for the total sample of PCs, comScore's examination of the cookie deletion rates on computers with active SPPs did reveal some notable differences between first-party and third-party cookies.

The rate of first-party cookie deletion among computers with an active SPP mirrored that of the total sample, with 2.5 first-party cookies observed per computer. The "serial deleters" accounted for 7 percent of PCs and 36 percent of the total number of different first-party cookies observed among computers with an active SPP – virtually identical to the findings among the total sample.



Active SPP: First-Party Cookies			
	Percent of PCs	Average Cookies per PC	Percent of Total Cookies
All PCs	100.0%	2.5	100.0%
Preserved	68.4%	1.5	40.5%
1+ Resets	31.6%	4.7	59.5%
1 Reset	16.7%	2.0	13.4%
2 Resets	5.2%	3.0	6.3%
3 Resets	2.7%	4.0	4.3%
4+ Resets	7.0%	12.6	35.6%

However, the third-party cookie deletion rate was noticeably higher, with an average of 3.0 third-party cookies observed on computers with an active SPP. The higher deletion rate is partially attributable to the impact of the “serial deleters,” who accounted for 10 percent of PCs and 43 percent of all third-party cookies observed on these computers.

Active SPP: Third-Party Cookies			
	Percent of PCs	Average Cookies per PC	Percent of Total Cookies
All PCs	100.0%	3.0	100.0%
Preserved	62.6%	1.6	34.0%
1+ Resets	37.4%	5.3	66.0%
1 Reset	17.2%	2.0	11.4%
2 Resets	6.4%	3.0	6.4%
3 Resets	3.9%	4.0	5.2%
4+ Resets	9.9%	13.1	43.1%

Prior Research into Cookie Deletion

It should be noted that previous studies have also found high rates of cookie deletion. Specifically, Belden Associates (2004), JupiterResearch (2005) and Nielsen/NetRatings (2005) observed at least 30 percent and as many as 47 percent of users deleting their cookies in a month. The Belden and Jupiter studies relied on a survey research methodology while the Nielsen/NetRatings study was based on behavioral research:

<http://www.poynter.org/column.asp?id=31&aid=64373>

<http://www.jupitermedia.com/corporate/releases/05.03.14-newjupresearch.html>

<http://publications.mediapost.com/index.cfm?fuseaction=Articles.san&s=28883&Nid=12855&p=297686>

http://www.netratings.com/press.jsp?section=ne_press_releases&nav=1#



Belden's conclusions from its study are particularly relevant to the current comScore study:

- Log-file data with respect to unique visitor counts are wrong.
- Sites have far fewer visitors than reported, but much greater frequency.

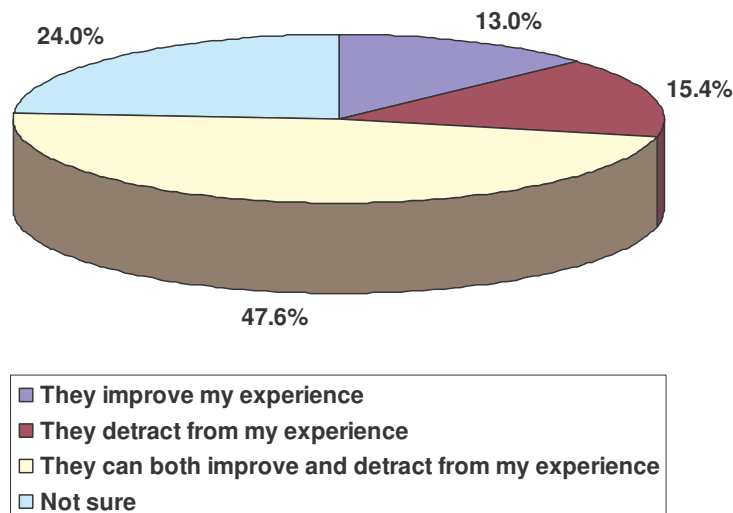
Cookie Deletion Survey

In order to gain an additional layer of knowledge, comScore conducted a survey of 500 of its panelists, questioning them about their knowledge, attitudes and behaviors with respect to cookies. Their responses revealed several interesting insights about how Internet users respond to, and interact with, cookies on their computers and validated the findings of the comScore behavioral analysis.

Attitudes Towards the Presence of Cookies

Since the early days of the Internet, cookies have often carried a negative stigma, for creating unwanted computer “clutter” and as a potential privacy concern. As part of its survey, comScore asked respondents several questions aimed at better understanding Internet users' current attitudes towards cookies. One such question asked respondents how the presence of cookies on their computers affected their user experience.

How does the presence of cookies on your computer affect your user experience?



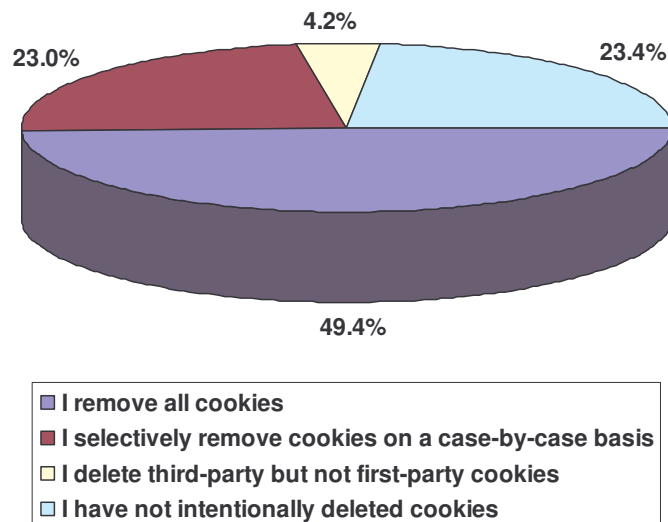
Despite cookies' sometimes negative image, comScore found that the prevailing attitude towards their presence on users' computers was neutral. Specifically, nearly half (47.6 percent) indicated that they believed cookies both improved and detracted from their user experience. Of those who took a position, almost as many (13.0 percent) believed cookies improved their overall experience as indicated that cookies detracted from their experience (15.4 percent). Approximately a quarter of respondents were not sure how cookies impacted their user experience.

First-Party vs. Third-Party Cookie Deletion

As discussed earlier, the results of comScore's behavioral analysis demonstrated surprisingly similar rates of cookie deletion for first-party and third-party cookies, running counter to the conventional wisdom. In order to verify this finding, comScore questioned survey respondents about their cookie deletion habits.

Respondents were first asked if they knew the difference between first-party and third-party cookies. Only 29.8 percent indicated that they understood the difference, while the remaining 70.2 percent said they either did not know the difference or were not sure.

When deleting cookies, which of the following best describes how you remove them?



Based on these responses, it is not surprising that when asked which method best described how they went about deleting their cookies, only 4.2 percent reported deleting third-party but not first-party cookies. The results are consistent with those from comScore's behavioral analysis and confirm that the overall difference in first-party and third-party cookie deletion rates should be minimal. The most common deletion behavior, as indicated by nearly half of respondents (49.4 percent), was the removal of all cookies.



Conclusions

comScore's study revealed the following key findings:

- Approximately 31 percent of users delete their first-party cookies in a month. This finding is consistent with the results of previous studies conducted by Belden Associates in 2004, by JupiterResearch in 2005 and by Nielsen/NetRatings in 2005. These studies found cookie deletion rates of at least 30 percent and as high as 47 percent.
- First-party and third-party cookie deletion rates are generally similar, with 2.5 different first-party cookies observed per computer for a given site in a month as compared to 2.6 third-party cookies.
- On computers with active security protection programs installed, third-party cookie deletion rates are somewhat higher (3.0 cookies per PC) than first-party cookie deletion rates (2.5 cookies per PC).
- "Serial cookie deleters" have a profound impact on inflating site-server logs because, while accounting for just 7 percent of computers, they contribute approximately 35 percent of observed cookies.
- Because of the high rate of cookie deletion, a server-centric measurement system which uses cookies to measure the size of a site's visitor base will typically overstate the true number of unique visitors by a factor of up to 2.5x.
- Similarly, the study found that an ad server system which uses cookies to track the reach and frequency of an online campaign will overstate reach by a factor of up to 2.6x and understate frequency to the same degree.

Implications

The implications of cookie deletion are far-reaching, affecting both site-centric analytics and ad server analytics, and ultimately leading to inaccuracies for those choosing to rely solely on server-based data.

Cookie deletion leads to the following inaccuracies in site-centric measurement:

- Overstatement of unique visitor counts
- Understatement of repeat visitor counts
- Understatement of conversion rates

Cookie deletion leads to the following inaccuracies in ad server measurement:

- Overstatement of reach
- Understatement of frequency



In order to address these issues for those companies affected by cookie deletion, comScore is currently considering a product offering based on comScore data that would enable sites and ad servers to adjust their server log data to correct for cookie deletion for their particular sites.

Other Sources of Discrepancies between Server-Based and Panel-Based Data

While cookie deletion is the most significant driver of inflated unique visitor counts in server logs, there are other factors that may contribute to discrepancies between server-based and panel-based data.

Unfiltered International Traffic

Oftentimes, site operators fail to remove International traffic from domestic Web server logs and subsequently end up comparing their site-based worldwide traffic to panel-based U.S. estimates. The table below shows the number of U.S. and world-wide visitors to a variety of U.S. properties, as measured by comScore's World Metrix service. The data show that International traffic is substantial at many sites and that this can lead to an overstatement in site-server estimates of U.S. visitors of as much as 5x if the International traffic is not excluded.

Index of Worldwide to U.S. Unique Visitors (Age 15+)			
March 2007			
Property	Total Unique Visitors (000)		
	U.S.	WW	Index
Yahoo! Sites	120,268	476,256	396
Time Warner Network	114,873	272,011	237
Microsoft Sites	110,152	526,999	478
Google Sites	108,466	528,005	487
eBay	74,571	256,270	344
Fox Interactive Media	75,028	151,203	202
Amazon Sites	47,525	149,643	315
Wikipedia Sites	44,790	212,171	474
Ask Network	43,310	111,427	257
New York Times Digital	39,437	75,057	190
Viacom Digital	35,488	83,358	235
Weather Channel, The	34,263	43,813	128
CNET Networks	29,311	129,384	441
Gorilla Nation	26,529	68,628	259
AT&T, Inc.	26,270	30,011	114
Apple Computer, Inc.	25,847	109,988	426
Expedia Inc	26,529	58,498	221
Adobe Sites	25,422	105,955	417
CBS Corporation	25,842	31,800	123
Wal-Mart	24,519	31,405	128



Cookie Blocking

The IAB has reported that approximately 12 percent of browsers are set to block cookies completely. This estimate has been confirmed by independent comScore observation using its sample of U.S. home computers. If site operators, in attempting to count computers set to block cookies, follow the methods described in the appendix of the “IAB Ad Impression and Audience Measurement Guidelines” (2004), they would estimate unique visitors from these PCs by counting unique combinations of the IP address and a user agent string. Unfortunately, the result is tremendous inflation in unique visitor counts in site-server data, since comScore’s research shows that the typical home PC averages 10.5 different IP addresses in a month. This will lead to multiple unique combinations of IP addresses and user agents, and therefore result in site-server data counting multiple unique visitors from the same PC. In effect, the cookie blocking group can be a far bigger problem than the group deleting cookies because it can create substantially more inflation in audience counts in server log data. The following table summarizes the frequency distribution of the number of distinct IP addresses per computer during a one month time period, as measured by comScore:

Frequency Distribution of Distinct IP Addresses per PC U.S. Home Computers January 2007	
Number of Distinct IP Addresses per PC	Percent of PCs
Total	100.0%
1	36.6%
2	11.7%
3	6.6%
4	4.9%
5	3.5%
6-10	10.3%
11-25	12.7%
26+	13.7%

Summary

Assuming that proper Web traffic hygiene such as filtering “bots” and internal traffic is conducted correctly, it’s possible to explain most differences between panel-based data and server-based data with the following simple equation:

$$\text{Difference} \approx (\text{Inflation Due to Cookie Deletion} + \text{Inflation Due to Cookie Blocking}) * \text{Inflation due to unfiltered International Traffic}$$

Due to the multiplicative nature of these effects, the overall inflation can reach 10x or more. For example, a site that has a 2.5x cookie deletion inflation and 4.5x inflation due to international traffic will have a staggering overall inflation of 11.25x in its counting of unique visitors.



Industry Experts Weigh in on comScore's Cookie Deletion Study

"Panel-based measurement is needed to accurately measure the size and characteristics of a site's online audiences," said Richard Castellini, Vice President of Consumer Marketing at CareerBuilder.com. "The comScore study quantifies the magnitude of the discrepancy one can encounter using log files and highlights the significance of this issue to our industry."

"The comScore study clearly demonstrates the limitations of measuring Internet audiences based on cookies," commented Mohanbir Sawhney, McCormick Tribune Professor of Technology at the Kellogg School of Management, Northwestern University. "To measure audiences more accurately, it is important to link visits to unique individuals, not unique cookies. As privacy programs become more entrenched, cookie-based audience counts will get even more unreliable."

"In 2005 while at JupiterResearch, I reported the results of a survey showing that 39 percent of Internet users claimed to delete their browser cookies on a monthly basis," said Eric T. Peterson, well-known web analytics consultant and author of *Web Analytics Demystified*. "The data from the comScore study, especially the findings regarding first-party cookies, clearly highlight the risk to cookie-based measurement. The comScore study emphasizes that site operators need to be extremely careful when calculating and reporting unique visitor counts from server log data, questioning both the technology they use and their underlying assumptions about cookie deletion rates among their site visitors."

"This is truly a crucial study from comScore," said Bill Cook, PhD, Senior Vice President for Research and Standards at the Advertising Research Foundation. "Reach and frequency metrics are the cornerstone of any media plan, and given the size of the discrepancies that can occur when counting cookies instead of people, the study underscores the importance of panel-based measurement. For the advertising community, an accurate understanding of reach and frequency within a given target audience is vital."

"This important comScore study confirms what many of us have always suspected," commented David Verklin, CEO of Carat Americas. "Cookies are just not an accurate enough method to calculate site visits and upon which to base audience metrics."

"The integration of Internet advertising into multimedia marketing plans requires accurate reach and frequency data," remarked Karen Francis, Chairman and CEO of Publicis & Hal Riney. "It's clear from the comScore study that cookie-based counts from site server logs are not necessarily providing the level of accuracy that is required."

"Cookie-based data are still a valuable resource, but this important study certainly underscores the fact that an accurate, multidimensional picture of consumer behaviors must be compiled from multiple sources," said Jeff Marshall, Senior Vice President, Digital Managing Director at media agency Starcom USA. "Digital media has a well-deserved reputation for enhanced accountability for media plans, but advertisers and their agencies should always examine all media from a variety of angles and with different tools and panel-based sources to enhance the value and validity of accountability reports."



“The comScore study confirms that relying on cookie counting alone for audience measurement can result in inflated unique visitor counts,” said Curt Viebranz, CEO of TACODA. “That’s why TACODA is working with comScore to enhance and validate our cookie data with comScore’s panel data.”

“DoubleClick is actively addressing the potential impact of cookie deletion on site-server data,” said Sean Harvey, DoubleClick Sr. Product Manager, DART Platform.



About comScore

comScore, Inc. is a global leader in measuring the digital world. This capability is based on a massive, global cross-section of more than 2 million consumers who have given comScore permission to confidentially capture their browsing and transaction behavior, including online and offline purchasing. comScore panelists also participate in survey research that captures and integrates their attitudes and intentions. Through its proprietary technology, comScore measures what matters across a broad spectrum of behavior and attitudes. comScore analysts apply this deep knowledge of customers and competitors to help clients design powerful marketing strategies and tactics that deliver superior ROI. comScore services are used by more than 700 clients, including global leaders such as AOL, Microsoft, Yahoo!, Verizon, Best Buy, Tribune Interactive, ESPN, Fox Sports, Nestlé, Starcom USA, Universal McCann, the United States Postal Service, Merck and Expedia. For more information, please visit www.comscore.com.

