

**The Nature and Extent of Crutchfield's Internet Activities in Ohio to
Establish and Grow its Market with Ohio Consumers**

Ashkan Soltani

September 25, 2014

TO: Christine T. Mesirov, Assistant Attorney General; Ohio Attorney
General's Office

RE: Expert Report Pertaining to *Crutchfield, Inc. v. Testa*, Ohio Board of
Tax Appeals Case Nos. 2012-926, 2012-3068, and 2012-2021

FROM: Ashkan Soltani, Soltani L.L.C.

Introduction

This document is my expert report prepared for use in the above-referenced appeal of assessments of Commercial Activity Tax issued by the Tax Commissioner of Ohio to Crutchfield, Inc. The Ohio Tax Commissioner has engaged me to provide expert factual evidence concerning the strategies and technologies generally utilized by internet retailers, and used by Crutchfield, Inc. in particular, and to provide factual and opinion evidence concerning Crutchfield's internet marketing activities from July 01, 2005 through June 30, 2012. The following pages represent my own work product, based on my own investigation, findings and opinions/conclusions.

This report represents my best efforts to address:

- I. The technological tools utilized by internet sellers generally, and Crutchfield particularly, for establishing and growing a consumer market in the digital age.
- II. How these tools function and are used by Crutchfield to interact with consumers in Ohio across various digital platforms, including internet websites, email communications, and mobile applications.
- III. Whether, for the 2005 through 2012 audit period, Crutchfield extensively utilized such data tracking and technological tools on an interactive basis with Ohio consumers.
- IV. Whether Crutchfield's use of these tools during the audit period enabled Crutchfield, as an out of state retailer, to establish, grow and maintain its market in Ohio.

How the Web Works

Browsing the web is more like having an in-person conversation than it is like watching a television set; the Internet is a two-way interaction between users and a company's webserver (the computers that host Internet content) and the servers of their partners. The mechanics of accessing content online require some exchange of information between your computer and servers that host the content of the websites you visit via the HTTP protocol; the underlying language of the web. Part of this conversation is that the server identifies your computer and accesses a series of details about your preferences in order to send you the correct content. Just by being online, users reveal quite a bit of information about themselves.

The information exchanged in this initial interaction provides the website with data that can uniquely identify you for the course of that visit, but is less reliable over multiple visits to a site. As a result, developers have created several other tools that identify a user over multiple visits and these same tools can also be used by 3rd parties to follow users around the web. In order to better understand the nature of these tools, it's useful to observe what the conversation between a user's computer and a website's server looks like.

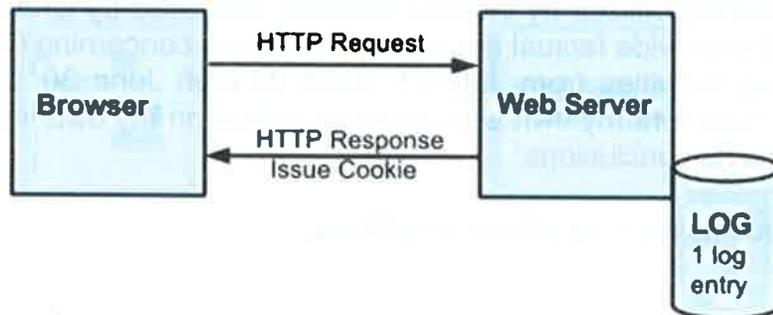


Figure 1. An interaction between a browser and a web server via the HTTP Internet protocol. This figure shows a cookie being issued and a log entry created.

When you connect to the Internet, your computer initiates the conversation by identifying itself to the site you requested. The computer sends the Internet protocol (IP) address associated with your computer (something like 50.193.152.115) to the server of the site you want to view. An IP address tells the website where to send its response to your request, similar to how a street address tells someone how to get in touch with you. This exchange happens via a complicated set of routing and lookup tables, but for the purpose of this exercise all we need to understand is that the IP address is your computer's way of identifying its address to a website's server in order to receive the content you requested. Much like a street address, a computer's IP address can reveal its

location. For example, the screenshot below shows my approximate location based on my computer's IP address, identifying me within a few hundred feet of my office. This information is automatically available to the website/service and can be used to make inferences about their visitors/customers, such as what portion come from which state, much like a telephone area code can automatically reveal the caller's geographic area (although in the case of IP addresses, it provides much more precision).

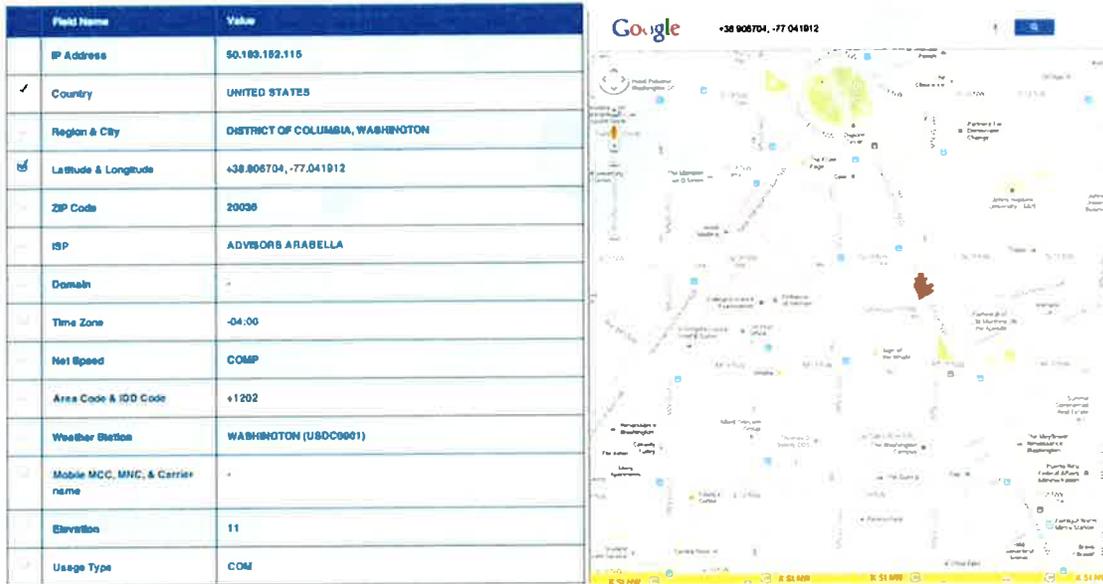
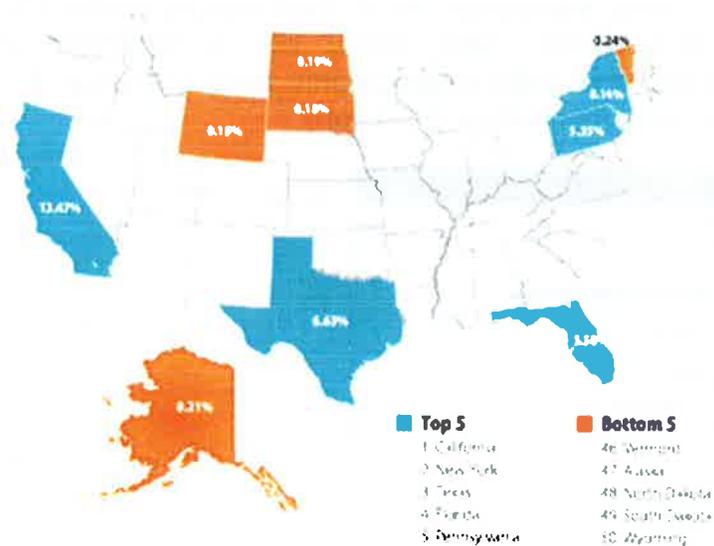


Figure 2. IP addresses can often accurately show the location of a user.

Q3 2012 Ecommerce Traffic by State



© Crutchfield Jan 17 2014 - 01:29:17

Figure 3. Example geographic report from the Crutchfield productions (Monetate EQ3 2012 – P6) indicating sales based on traffic to each state. Monetate allows Crutchfield to “Understanding where a visitor is “right now” [which] can lead to building lucrative customer segments, while enhancing the user experience for visitors who don’t expect to be treated like every other person.” Note: sales figures are from Q3 2012 and is shown to demonstrate geographic tools available to Crutchfield.

Browser information, such as IP addresses and language, can also be used to customize content for the user. Once you’ve declared your visit to a website, your computer will request to view the content of the specific page you requested.

The words and images of a website appear to be delivered to the user nearly instantaneously, but the conversation between a user’s computer and the website’s server is several complicated steps long. In general, each object on a page is requested and issued individually. Although the website dynamically generates content, the page itself is “assembled” in the user’s computer. The user’s computer downloads software code from the website and executes it “client side” on the user’s system in order to generate the webpage.

Assembling Crutchfield.com

The conversation between a user's computer and a website varies depending on the site, but the underlying interaction follows a strict protocol. The details of what specifically the site asks the user's computer to assemble can be seen if you look under-the-hood at the conversation with the server. For example, when we first visit the Crutchfield website (shown below) the following conversation takes place:

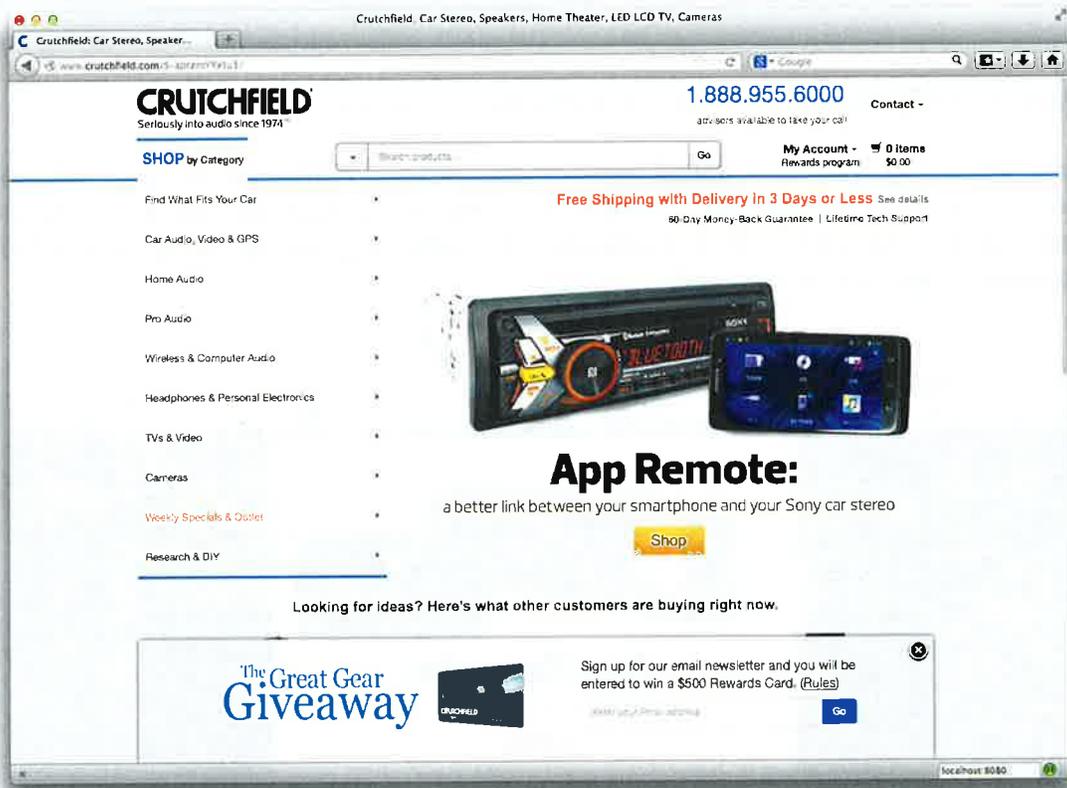


Figure 4: Crutchfield.com

First, your computer responds to a few basic requests from the server about your computer, including which user-agent and what language you are using.

```
2014-04-08 17:57:34 GET http://www.crutchfield.com/
text/html 132B 158.49kB/s

Request                                     Response
Host:                                       www.crutchfield.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.9; rv:27.0) Gecko/20100101 Firefox/27.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: keep-alive
No content
```

Figure 5. HTTP request for Crutchfield.com

Second, the webserver sends your computer a combination of content (words and software code) to display on the page.

```
2014-04-08 17:57:34 GET http://www.crutchfield.com/S-aprz=YYktu3/
+ 200 text/html 20kB 227.68kB/s

Request Response

</a>
</li>
```

Figure 6. HTTP Response from Crutchfield.com server.

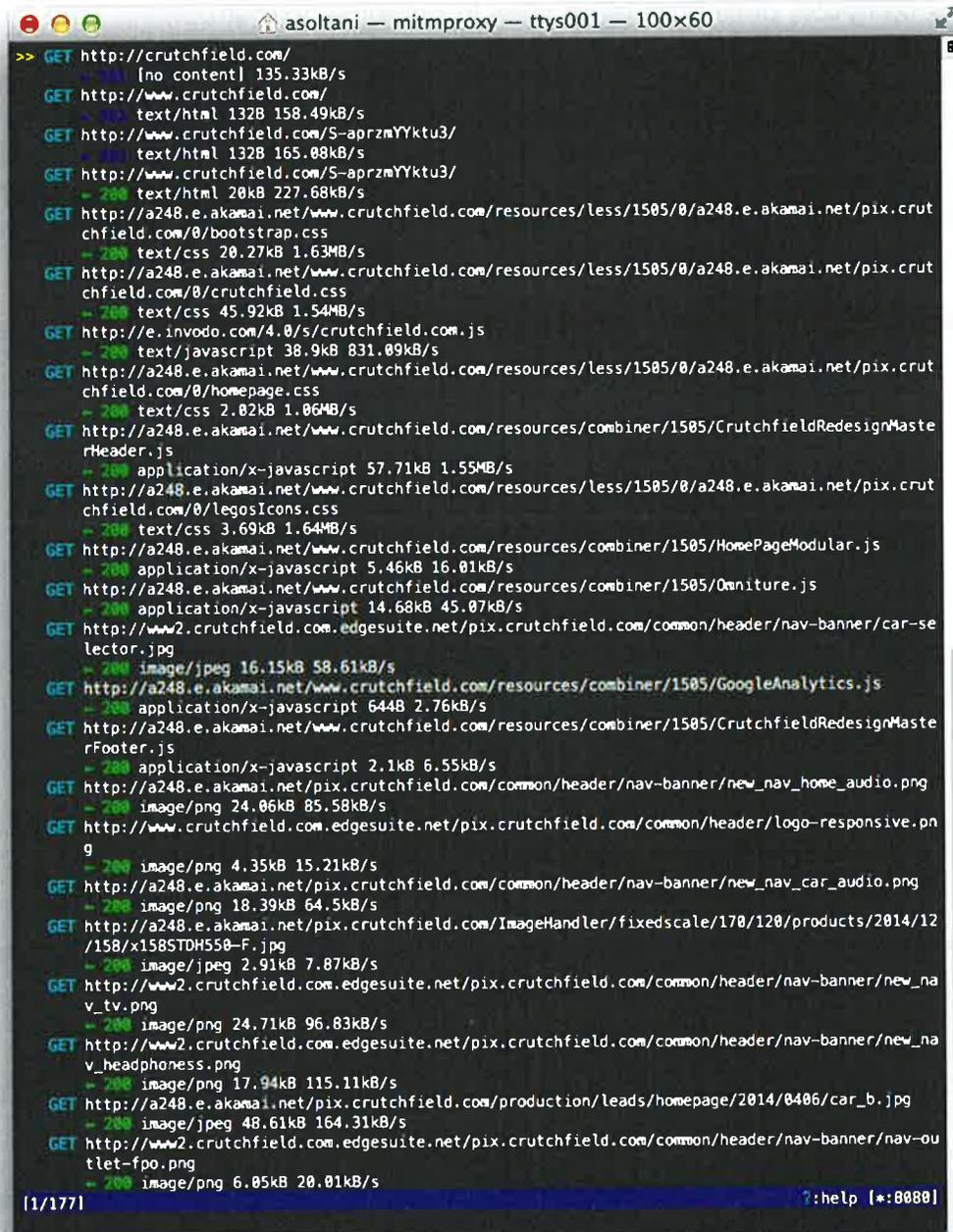
Then, the server sends a list of instructions to your computer to “get” additional elements (fonts, images, etc.) from the website’s servers as well as other locations on the web¹. For example, the following image is downloaded in response to the above request:



Figure 7. Actual image requested above (advertisement for an App Remote)

¹ In this case, the website hosting the image is operated by the content service provider Akamai Technologies.

The Crutchfield home page also instructs the computer to “get” an additional 177 assets (images/text).



```
asoltani — mitmproxy — ttys001 — 100x60
>> GET http://crutchfield.com/
    [no content] 135.33kB/s
GET http://www.crutchfield.com/
    text/html 132B 158.49kB/s
GET http://www.crutchfield.com/S-aprzMYYktu3/
    text/html 132B 165.08kB/s
GET http://www.crutchfield.com/S-aprzMYYktu3/
    text/html 20kB 227.68kB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/less/1505/0/a248.e.akamai.net/pix.crutchfield.com/0/bootstrap.css
    text/css 20.27kB 1.63MB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/less/1505/0/a248.e.akamai.net/pix.crutchfield.com/0/crutchfield.css
    text/css 45.92kB 1.54MB/s
GET http://e.invodo.com/4.0/s/crutchfield.com.js
    text/javascript 38.9kB 831.09kB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/less/1505/0/a248.e.akamai.net/pix.crutchfield.com/0/homepage.css
    text/css 2.02kB 1.06MB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/combiner/1505/CrutchfieldRedesignMasterHeader.js
    application/x-javascript 57.71kB 1.55MB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/less/1505/0/a248.e.akamai.net/pix.crutchfield.com/0/legosIcons.css
    text/css 3.69kB 1.64MB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/combiner/1505/HomePageModular.js
    application/x-javascript 5.46kB 16.01kB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/combiner/1505/0/niture.js
    application/x-javascript 14.68kB 45.07kB/s
GET http://www2.crutchfield.com.edgesuite.net/pix.crutchfield.com/common/header/nav-banner/car-selector.jpg
    image/jpeg 16.15kB 58.61kB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/combiner/1505/GoogleAnalytics.js
    application/x-javascript 644B 2.76kB/s
GET http://a248.e.akamai.net/www.crutchfield.com/resources/combiner/1505/CrutchfieldRedesignMasterFooter.js
    application/x-javascript 2.1kB 6.55kB/s
GET http://a248.e.akamai.net/pix.crutchfield.com/common/header/nav-banner/new_nav_home_audio.png
    image/png 24.06kB 85.58kB/s
GET http://www.crutchfield.com.edgesuite.net/pix.crutchfield.com/common/header/logo-responsive.png
    image/png 4.35kB 15.21kB/s
GET http://a248.e.akamai.net/pix.crutchfield.com/common/header/nav-banner/new_nav_car_audio.png
    image/png 18.39kB 64.5kB/s
GET http://a248.e.akamai.net/pix.crutchfield.com/ImageHandler/fixedscale/170/120/products/2014/12/158/x1585TDH550-F.jpg
    image/jpeg 2.91kB 7.87kB/s
GET http://www2.crutchfield.com.edgesuite.net/pix.crutchfield.com/common/header/nav-banner/new_nav_tv.png
    image/png 24.71kB 96.83kB/s
GET http://www2.crutchfield.com.edgesuite.net/pix.crutchfield.com/common/header/nav-banner/new_nav_headphones.png
    image/png 17.94kB 115.11kB/s
GET http://a248.e.akamai.net/pix.crutchfield.com/production/leads/homepage/2014/0406/car_b.jpg
    image/jpeg 48.61kB 164.31kB/s
GET http://www2.crutchfield.com.edgesuite.net/pix.crutchfield.com/common/header/nav-banner/nav-outlet-fpo.png
    image/png 6.05kB 20.01kB/s
[1/177] ? :help [*:0088]
```

Figure 8. Subsequent request by the browser to get images and other code, as instructed by the Crutchfield home page. This image shows 20 of the 177 assets (images/code) that the Crutchfield page instructed our browser to download.

The website you see is a result of your computer interpreting commands from a server on how to layout and assemble the web page. As a result, a website is essentially a mosaic of content from around the web²; each page is an amalgamation of content delivered from that site's servers and a list of elements that your computer pulls from other sites in response to instructions from the site.

As shown in Figure 8 above, many of the images from the Crutchfield website are served by a Content Distribution Network (CDN) known as Akamai. Crutchfield contracts with Akamai to host these assets on their behalf, as Akamai's hosting is often faster and geographically closer to the user than Crutchfield's own servers. For many Crutchfield users, these images can come directly from servers located in Ohio.³

For example, in some tests, connecting to **a248.e.akamai.net** may route the user to a server physically located in Columbus, Ohio (IP address: 192.232.17.178).

² Recall that one of the first Internet browsers was named "Mosaic"—this was to indicate that users are seeing a mix of content.

³ Those states and provinces include British Columbia, Florida, Indiana, Massachusetts, Michigan, Minnesota, Missouri, North Carolina, Ohio, Oklahoma, Texas, Virginia, and Wisconsin.

"In Ohio, helping students reach their educational and business goals on the Internet is our first priority," said Doug Gale, director of OARnet, which provides Internet connectivity to many of the Ohio colleges and universities. "By placing Akamai servers in our network, we have experienced much faster download times to our end users and have seen an improvement in meeting the demands of our fast growing network. We are pleased to join Akamai on the forefront of delivering a better Internet."

Akamai Broadens Server Deployment to Include Over 300 Key University and Educational Networks", April 5, 2000

http://www.akamai.com/html/about/press/releases/2000/press_040500d.html

IP Address	192.232.17.178
Location	 UNITED STATES, OHIO, COLUMBUS
Latitude & Longitude	39.987232, -83.043863 (39°59'14"N 83°2'38"W)
Connection	OARNET
Local Time	14 Apr, 2014 10:10 AM (UTC -04:00)
Domain	OAR.NET
Net Speed	(DSL) Broadband/Cable
IDD & Area Code	(1) 614
ZIP Code	43212
Weather Station	COLUMBUS (USOH0212)

Figure 9. Crutchfield assets hosted on Akamai's server are physically located in Columbus, Ohio.

The User's Experience

The content is assembled from "everywhere" around the web, but it is customized uniquely to you and your situation based on the information available to the company creating the page. Most of the content comes from the "1st party" website, meaning the site you chose and whose URL is at the top of the page (in this case, Crutchfield.com), but some of the content is delivered from "3rd parties." Third parties are firms other than the original website that are allowed (by the 1st party) to place advertisements and/or tracking mechanisms on the webpage (i.e. Crutchfield.com). Unfortunately for the user, there is typically no indication to the user which elements on the page are directly from the 1st party's server and which were pulled from other locations on the web. But the distinction is clear when you look at the details of the conversation with the server.

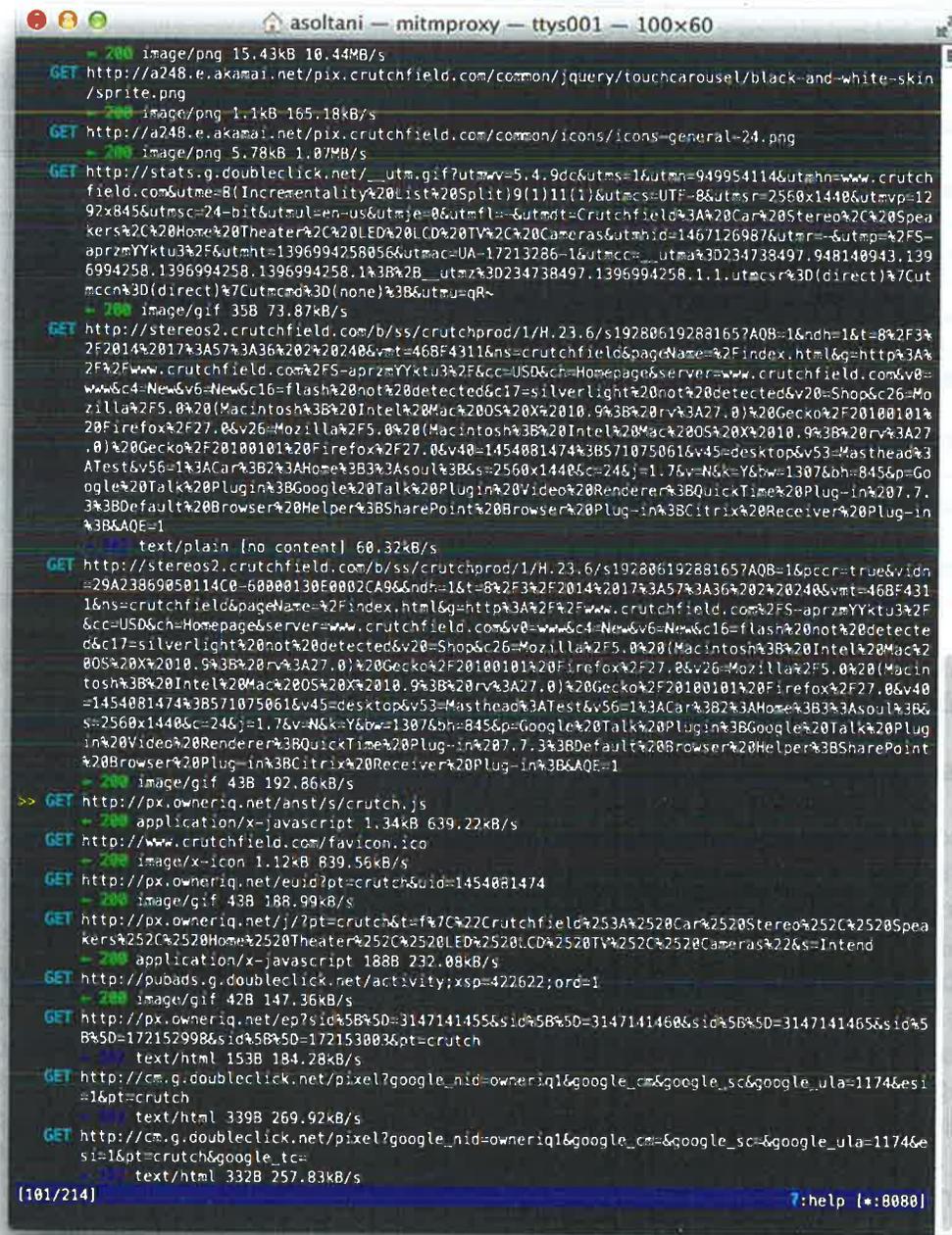


Figure 10. Some 3rd party requests to online analytics and ad networks from Crutchfield.com, specifically Google Doubleclick and OwnerIQ.

Remember that the website(s) know your IP address, approximate location, language and other details that can be used to identify you among all the site's visitors. Typically, each step of this conversation between your computer and the website is logged on the website's server, along with the information about the webpage. This provides the company with a massive amount of data on how users interact with their site and it can use this to adjust the content both in general and in order to appeal to specific users.

Identification and tracking

The basic conversation between the webserver and user's computer reveals information that can be used to approximately identify the user, but this is often not specific or consistent enough to be used for long-term tracking of individuals. For example, an IP address can reveal where the user's computer is when it accesses the site, but IP addresses aren't reliable by themselves to identify a specific user for a long period of time because they often change every few days for home users. Additionally, multiple computers can share one IP address, as is the case with most standard home networks. Your computer also tells the server information the server needs to correctly format the content. For example it will let the server know what type of browser you are using, your language preferences, and whether or not you accept java script. This information allows the website to customize content appropriate for your device (correct language or layouts), but can also be used to uniquely identify you for short periods of time.⁴ However, because neither of these methods is consistent or reliable, developers have created other ways to uniquely identify an individual computer and track users. The most common tracking tool is a cookie.

⁴ There are techniques known as "browser fingerprinting" which allow websites to uniquely track you for longer periods of time – but these require additional information from your browser, such as the types of plugins and fonts you use. Peter Eckersley, "How Unique Is Your Web Browser?" Electronic Frontier Foundation <https://panoptickick.eff.org/browser-uniqueness.pdf>

Hits and Commerce - hit_data.tav

Column Name	Column Description	Data Type	Key	Example / Lookup
hit_time_gmt	Time of hit in GMT. Uses the Unix timestamp (epoch time from 1/1/1970). Set by Omniture's servers	int(11)		1096614122
service	pe or as - type of hit coming through. The page_event column gives the same information, but in more detail. Deprecated	char(2)		ss
accept_language	The accept language header from the browser	varchar(20)		en-us,en-gb;q=0.62,es
date_time	Time in readable format in Time Zone specified by Report Suite ID. Set by Omniture's servers.	datetime		3/26/11 00:14:1
visit_high	Part 1 of the visitorID. The combination of two visitor IDs (visit_high and visit_low) creates a unique visitor ID	bigint(20) unsigned		4.69511E+18
visit_low	Part 2 of the visitorID. The combination of two visitor IDs (visit_high and visit_low) creates a unique visitor ID	bigint(20) unsigned		7.20509E+17
event_list	Comma separated list of numeric IDs representing events passed in from the customer	text	FK	see Event Lookup
homepage	Homepage flag, whether or not this page was the user's homepage	char(1)		N
ip	IP address of user's computer, from users ISP	varchar(20)		67.112.89.14
page_event	Page event ID, the type of hit that is sent in the request. Lookups provided for type of event (normal,download,exit,custom)	tinyint(2) unsigned		10
page_event_var1	(Related to the page_event column, it is the URL of the download link, exit link or custom link picked)	varchar(255)		http://www.omniture.com/support/
page_event_var2	If you have individually named your link, this column contains the link name.	varchar(100)		homepage_buy
page_type	page type variable (only used for error pages)	varchar(20)		errorPage
page_url	The URL of the pageview. The address of the page in the address bar of the browser	varchar(255)		http://www.omniture.com/search/search_results.htm
pagename	The name of the page (if set)	varchar(100)		search_results
product_list	The product list as passed in through the javascript. This column is kept as passed in	text		Computers:HP Pavilion;1:1000;2000;201;Office Supp
user_server	Custom traffic variable for servers.	varchar(100)		[Custom]
channel	Custom traffic variable for site sections (channels)	varchar(100)		[Custom]
prop1	Custom traffic variable 1	varchar(100)		[Custom]
prop2	Custom traffic variable 2	varchar(100)		[Custom]
prop3	Custom traffic variable 3	varchar(100)		[Custom]
prop4	Custom traffic variable 4	varchar(100)		[Custom]
prop5	Custom traffic variable 5	varchar(100)		[Custom]
prop6	Custom traffic variable 6	varchar(100)		[Custom]

10/03/2011 12:11 PM

Prepared for: Alyson Murphy - Crutchfield

Page 1 of 9

Crutchfield Jan 17 2014 - 000247

Figure 11. Examples of data received Crutchfield receives from Omniture including browser type, IP address, and the current page the user is visiting. (Source: Crutchfield Productions "jbare Att.4.PDF")

First Party Cookies

The most widespread method for identifying and tracking website visitors is to install cookies on their computers. Cookies are typically small text files installed on a user's hard drive during a visit to allow the webserver to store information about the user. For example, cookies are used to remember the items in your shopping cart so that they are still there when you re-visit the site, even if you close the window without checking out. However, cookies can store a wide variety of information about individuals. Anything a website learns about a particular user, including search histories, location history (based on IP addresses), names of the books they looked up, etc. can be stored in a cookie. Most often developers rely on cookies to easily and reliably create a unique identifier for a user. In this case, the content of the cookie could be any string of letters/numbers that could be used to uniquely identify a user (as long as nobody else has that same one), for example 123456789 or your email address (john.doe@email.com).

```

2014-04-08 18:32:04 GET http://www.crutchfield.com/S-aprzMYYktu3/
- 200 text/html 20kB 156.34kB/s

Request Response
Host: www.crutchfield.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.9; rv:27.0) Gecko/20100101 Firefox/27.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Cookie: SESSIONID=aprzMYYktu3; SYSTEMID=571075061; SESSIONDATE=04/08/2014 17:58:00; .ASPXA
NONYMOUS=ZyUoYweKzWEkAAAAHTI3NDM2ZDIzjF=0S00YDFLLTjYtAtYjFLZGFUjY5ZTQzN-VYmZs4j
M06GQL_emLzVzeM7BM1; s_cc=true; cname=www; s_nr=1396995584700;
s_ria=flash%20not%20detected%7Csilverlight%20not%20detected; s_sq=%5B%5B%5D%5D;
__utma=234738497.948140943.1396994258.1396994258.1396994258.1;
__utmb=234738497.4.10.1396994258; __utmc=234738497;
__utmz=234738497.1396994258.1.1.utmcsr=(direct)|utmcmd=(none);
__utmv=234738497.11=Incrementality%20List%20Split=1=1;
s_vi=[CS]v1|29A23869050114C0-60000130E0002CA9[CE]; preferredView=list
Connection: keep-alive
Cache-Control: max-age=0
No content

```

Figure 12. Examples of cookies used by Crutchfield.com

Cookies are set during the conversation between a user's browser and the webserver that we observed earlier. They are proprietary to the site that installed them—the information they contain can only be accessed by the site that originally set the cookie. Once the cookie is installed on a user's computer, it is automatically sent to the site each time that individual user subsequently visits that site (along with some other cookies used to facilitate the browsing session). When the server sees that cookie, it knows to log your activity with the information it collected the last time that cookie was active on the site. Every time you visit the site it will know that you are that same person, even if it doesn't necessarily know your name.

The combination of the browser information (IP address, language, user agent) that your computer provides to a website to identify itself and the information stored in cookies (past browsing activity, product preferences) is used to customize the content you see. Cookies can be used to store information (such as your search history) directly on your hard drive or they can store a form of ID that provides a link between each of your separate visits. When the cookie stores information locally, the user could delete the file and its contents would be unavailable to the website that set the cookie. But when information is stored on a company's server instead, users don't have access to it. For example, if a user in Ohio visits a website whose servers are in Mountain View, California, the website might install a unique ID cookie and then store the data associated with that ID in their servers in CA. Deleting the cookie in that case will only remove the ability for the site to continue to identify you as that same visitor, but information logged on your previous visits is still on their server and can be reconnected via some additional technical measures or if you re-identify yourself to that site, say by logging in.

Third Party Cookies

Not all of the content issued to a user is directly from the 1st party site (the one appearing in the URL); some of it comes from 3rd parties. Sometimes the 3rd parties are used to provide media (such as images/video content) – but more often 3rd parties provide advertising and tracking elements. As with 1st party tracking, 3rd parties also use cookies to identify and track users' interactions – referred to as 3rd party cookies. Unlike 1st party cookies, the information stored by 3rd party cookies is not collected by the site noted in the URL (the site the user visited), but rather by a separate company.

Recall that the browser transmits information requested by a specific cookie *only* to the website that set the cookie. This is known as the “same-origin policy” and means that a 3rd party can't access the content of a cookie on a user's experience or follow that unique ID as it browses. This effectively limits the information a company collects to interactions between the user and that company directly-- much like a traditional brick and mortar store. However, since a webpage is comprised of content from a variety of sources, multiple websites are able to set cookies and track a user's activity on a page. If one company has a cookie set on several of the pages you visit, they can end up with a fairly extensive record of where you have been as well as what you looked at.

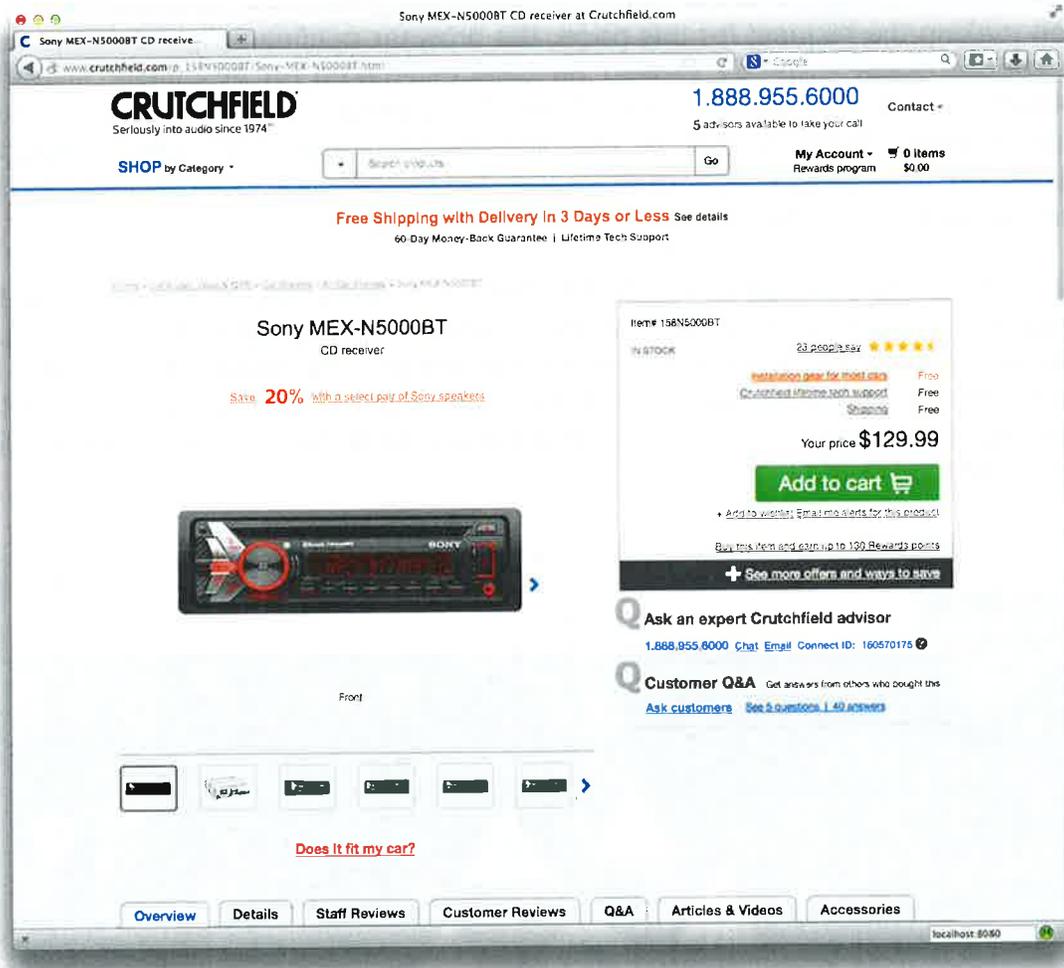


Figure 13. Crutchfield product page for a Sony MEX-N5000BT Car Stereo

```

2014-04-08 18:33:59 GET http://pubads.g.doubleclick.net/activity;xsp=422622;ord=1
- 200 image/gif 42B 194.12kB/s
Request Response
Host: pubads.g.doubleclick.net
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.9; rv:27.0) Gecko/20100101 Firefox/27.0
Accept: image/png, image/*;q=0.8,*/*;q=0.5
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Referer: http://www.crutchfield.com/p_158N5000BT/Sony-MEX-N5000BT.html
Cookie: id=2236db9191010015||t=1396994260|et=730|cs=0022131040c995ab9921569a8c
Connection: keep-alive
Cache-Control: max-age=0
No content

```

Figure 14. An example of 3rd party tracking request to an invisible tracking pixel from Doubleclick.net, Google's advertising network revealing the product we're browsing on Crutchfield's product page.

When we load the Crutchfield product page for Sony MEX-N5000BT Car Stereo, the company's website instructed the user's browser to load an invisible tracking

element from Google's Doubleclick.net advertising network. You can see that, when making the request for this page, the browser notifies sellpoints.com about the specific page currently viewed on Crutchfield.com (in this case 'Sony-MEX-N5000BT.htm' which represents the "Sony CD Receiver Model N5000BT"). As a result, doubleclick.net is able to see and create a log of the user's browsing activity on Crutchfield.com (associated to Doubleclick id=2236db9191010015, including some of the health products he's interested in.

However, as you can see in Figure 11, there is no indication to the user that this transaction is taking place behind the scenes. Additionally, this is just one example of the third-party tracking on this page. The result of browsing the Crutchfield.com product page generated connections to 7 3rd party websites, including a number of analytics and tracking networks including Doubleclick, Invodo, and OwnerIQ.

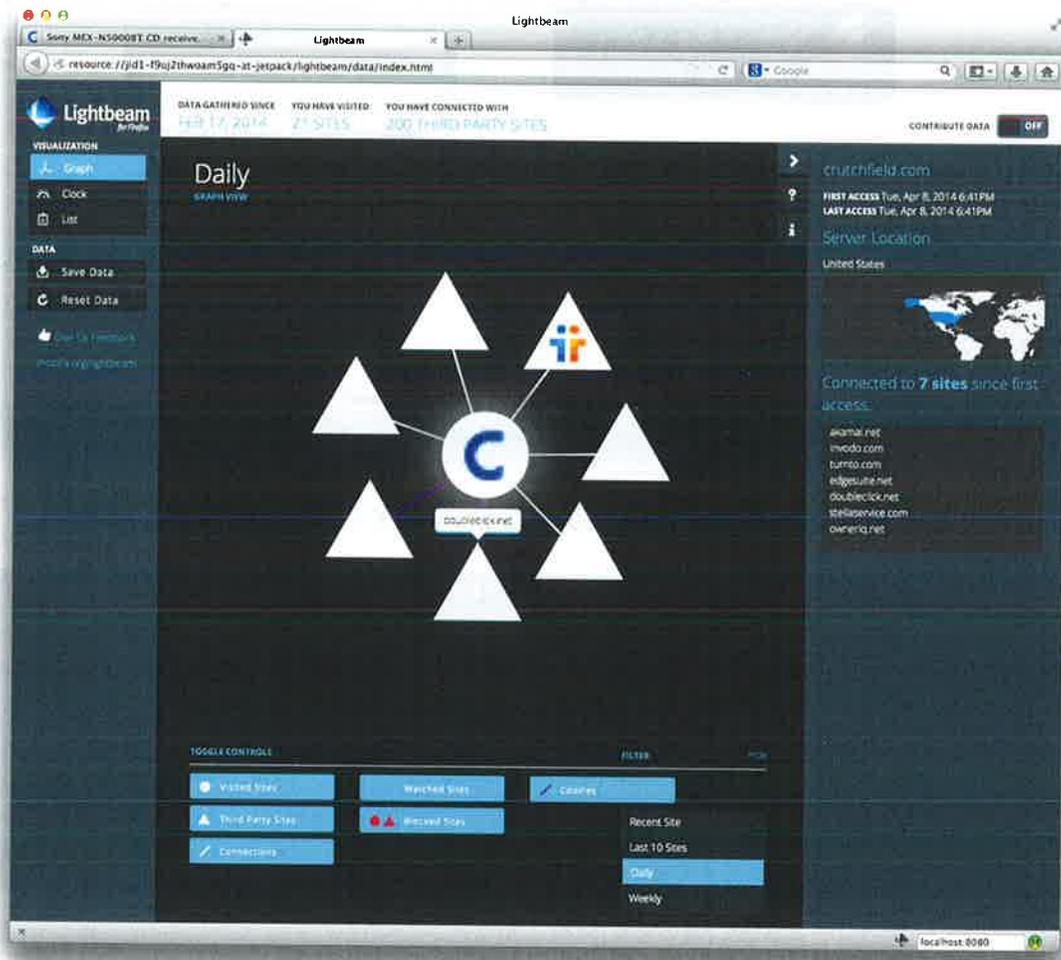


Figure 15: Lightbeam reveals 7 tracking tools on Crutchfield's page. (Lightbeam is a browser plug-in developed by Mozilla that allows users to see how many tracking elements are present on webpages they visit.)

The Mobile Environment

The mobile tracking and advertising environment is similar to what you experience when you use a computer. The browser of a mobile phone works the same way as a browser on your desktop; cookies are issued and unique users are identified through the same process of request-response. As a result, there will be cookies in the mobile environment, much like in a browser.

Many retailers also offer mobile applications which consumers can download to their smartphones. These apps often perform the same content and function as a website and can be tailored to an individual's preferences (or information). For example, mobile apps often have access to precise GPS location information that can be used to localize content (e.g. regional ads). Mobile platforms also provide persistent identifiers, such as the unique device identifier (UDID) and Identifier for Advertisers (IFA) in Apple products and the DeviceID in Android products, which serve the same role as cookies (to uniquely track individuals). Unlike cookies however, these are very difficult to remove/reset.



Figure 16: Screenshot of the Crutchfield mobile 'app' which allowed customers to download and view Crutchfield's catalog to their mobile device.

The Value of Data

The goal of these efforts to identify and track individuals is the basis of much of the Internet economy. Originally, cookies were a way for sites to identify and remember their customers from visit to visit. For example, a first party site might have set a cookie for their logged-in users in order to remember what items they had added to their shopping cart. But tracking technology has become more varied in design and use over time, and the uses for these tools are much broader now than they used to be. There are now a number of ways that companies can use data about their customers to add value to their business, and a number of businesses that provide advertising services to companies. For example, analytics, A/B testing, retargeting, and behavioral advertising all allow merchants and marketers to extract value from data collected from their users.

Analytics:

Analytics is the systematic, computational analysis of customer data to reveal behavioral patterns of customers. For example, Figure 3 (above) is an example of the geographic insights that can be learned from website analytics-in this case the bulk of the traffic on that site comes from Michigan. However, sites need more sophisticated tools than just IP addresses to uniquely identify a visitor (remember that IP addresses can be shared between a household). So in order to parse-out an individual's behavior websites use additional tracking technologies. For example, cookies can be used to generate data about a specific user, even those that are not logged into the website, and monitor their behavior (e.g. how long they stay on a particular page and what links they click). This allows the website to correlate the activity of a single user and follow where on the site they visit, how long they visit a section of the website (such as a particular brand of electronics) and know what presentation methods work best. Then information about the users expressed preferences can be mined to tailor the website specifically to them.

Analytics can be limited in scope to the first-party website, or can combine information collected about the user as they travel among sites other websites (such as demographic information, interests, etc.). Third party analytics firms are exceedingly commonplace as their functionality is often more sophisticated than what an individual company could build in-house, and in some cases (like Google analytics) offered for free. Retailers can also customize the third-party analytics tools to meet their needs. For instance, they can make the analytics 'aware' of the types of products and actions available on their site (i.e. I'm an electronics retailer and this is what a checkout/purchase looks like on my site) and use that information as a competitive advantage in their sales.

A/B Testing:

Websites also determine what content to serve by monitoring the latent preferences expressed by their users. These preferences are typically determined using a method called A/B testing. A/B testing is the use of competing versions of the same content to determine which has a greater appeal to the visitors. The goal is to gain insights about the most effective way to describe or display content (effectiveness being determined by number of clicks received). An example of this would be a news website displaying two different slogans for the same product within very close proximity to each other and observing which one does better with visitors.

Crutchfield engaged in A/B testing with at least one vendor during the time period. (Paypal – Production: crutchfield---a-b-testing.PPTX.)

Retargeting:

Retargeting is another way to use data collected from users to generate value and increase sales. Retargeting works by collecting data about what products or services a given user has previously seen in the past and then attempt to present the same content (re-target) to them at a later time or a different website. This is done by tracking an individual as he browses, and tailoring the ad content based on the previous pages he visited. In fact, this technology often provides ads directly for the one of the pages the user just left. For example, if you visit a retail page but don't buy anything and then continue on to a news site, the ads you see on that page may be for the retail page you had just visited. This is a way of redirecting the users attention back to the original page to complete the transaction. Because this involves multiple sites, this is another natural opportunity for companies to contract with third-party firms to retarget their visitors.

Criteo provides a "Personalized banner" defined as "Any banner or creative ad used to promote [Crutchfield's] products or services. Each display banner or creative ad will be personalized for each individual user using Criteo's Personalized Retargeting Technology." (Production: Crutchfield-T&C 4_2_10.PDF.)

Behavioral Advertising:

Finally, the amount of data collected about an individual can be used to build a profile of their preferences and habits. Sites collect and trade in user profiles that allow them to tailor content and advertising to the user. When your browser first requests a page, the website is able to identify some attributes about you and respond with content specific to those attributes as we described above. That could mean displaying the right language or showing weather conditions appropriate to your location. That could also mean showing product recommendations or advertising suited to what you've looked at in the past. For

example, if a company knows you previously bought a new television, they might use that information to advertise television-related accessories. As we saw earlier, each page is assembled by your browser with content that can be unique to you—in this sense, the website is the “salesman” tailoring his advertising pitch in response to your signals (inside your browser) as a potential buyer.

The mobile environment works in much the same way. Applications have the same distinction between 1st and 3rd party; the developer of the app is the 1st party and the 3rd party is the advertising and tracking ecosystem. In fact, many of the players are the same and have adapted their techniques to work in the mobile space as well by using mobile “cookies” and device identifiers.

Email

In addition to the personalization of websites and mobile apps, companies tailor email messages to their customers. They do that based on their customers’ previous browsing habits and shopping history as well as from data purchased about them from data-brokers, such as demographic data about interests and income. This information is often extremely detailed and allows tailoring of the message down to the specific product, wording, and even time (e.g. morning vs. evening) based on their time zone.

Storing Content on the User’s Computer (Cache)

When a user visits a website like Crutchfield.com, the website transmits code and images to the user’s computer via the user’s current Internet connection. Often, the code and images are stored on the user’s hard drive in order to improve the website performance (e.g. how quickly the product pages load). This stored content is referred to as the browser cache.

For example, the following screenshot shows an example of the assets stored on the user’s computer after visiting Crutchfield.com. Just from a single visit to the Crutchfield homepage (no product subpages), there are a total of 110 assets (images and computer code) totaling around 1.3 megabytes of content that were stored on the user’s computer.

Additionally, the tracking cookies described above are also stored persistently on the user's computer in order to enable tracking on subsequent visits. Some of these cookies are installed directly by Crutchfield.com as 1st party cookies and some of them are installed as the result of an arrangement between Crutchfield and 3rd party tracking companies. It is possible for a user to find out what 3rd parties Crutchfield allowed to install cookies on his computer, but it is not immediately obvious just by looking at the webpage.



Figure 19: Some of the 3rd party cookies installed on Crutchfield.com.

A more in-depth view of the cookies installed by Crutchfield shows that there are a total of 20 cookies set by Crutchfield and their 3rd party advertising and analytic networks.

```

sqlite> select * from moz_cookies;
10|crutchfield.com|0|0|.ASPXANONYMOUS|ZyUoYweKzwEkAAAAHTI3NDM2ZDItZjFmOS00MDFLLTljYTAtYjFLZGFUMmY5ZT
QzN-VYmZs4jMd6GQL_emLzVze47BM1|www.crutchfield.com|/|1402994256|1396995577062274|1396994255029409|0|
1
26|owneriq.net|0|0|apq|.3147141455.3147141460.3147141465.172152998.172153003|.owneriq.net|/|1554674
260|1396995577851491|1396994260261815|0|0
27|owneriq.net|0|0|rpq|.owneriq.net|/|1554674260|1396995577851491|1396994260261932|0|0
28|owneriq.net|0|0|si|4502806591000816268|.owneriq.net|/|1554674260|1396995577851491|139699426026197
2|0|0
31|doubleclick.net|0|0|id|2236db9191010015||t=1396994260|et=730|cs=002213fd48c995ab9921569a8c|.doubl
eclick.net|/|1460066260|1396995577233850|1396994260945230|0|0
32|owneriq.net|0|0|gguid|CAESEKGC493__Tpuoy-4iX9gtns|.owneriq.net|/|1399586261|1396995577851491|139
6994261126710|0|0
33|google.com|-2|0|PREF|ID=51a33b136882f4c3:TM=1396994359:LM=1396994359:S=NfZeIi8TTLbuka2u|.google.c
om|/|1460066359|1396994359370328|1396994359370328|0|0
71|crutchfield.com|0|0|cname|www|.crutchfield.com|/|1396997384|1396995584699781|1396994256345031|0|0
72|crutchfield.com|0|0|s_nr|1396995584700|.crutchfield.com|/|1399587584|1396995584700567|13969942563
45320|0|0
73|crutchfield.com|0|0|preferredView|list|www.crutchfield.com|/|1397600384|1396995584810770|13969955
84250839|0|0
85|crutchfield.com|0|0|__utma|234738497.948140943.1396994258.1396994258.1396994258.1|.crutchfield.co
m|/|1460067584|1396995584954704|1396994258049684|0|0
86|crutchfield.com|0|0|__utmb|234738497.4.10.1396994258|.crutchfield.com|/|1396997384|13969955849549
76|1396994258051502|0|0
87|crutchfield.com|0|0|__utmz|234738497.1396994258.1.1.utmcsr=(direct)|utmccn=(direct)|utmcmd=(none)
|.crutchfield.com|/|1412763584|1396995584955535|1396994258052270|0|0
88|crutchfield.com|0|0|__utmv|234738497.1=Incrementality%20List%20Split=1=1|.crutchfield.com|/|1460
067584|1396995584955893|1396994258054244|0|0
89|crutchfield.com|0|0|s_vi|[CS]v1|29A23869050114C0-60000130E0002CA9[CE]|.crutchfield.com|/|14600675
85|1396995585177216|1396994258890827|0|0
90|crutchfield.com|0|0|SESSIONID|aprzmYYktu3|.crutchfield.com|/|1428531586|1396995585429529|13969942
54568238|0|0
91|crutchfield.com|0|0|SYSTEMID|571075061|.crutchfield.com|/|1428531586|1396995585429789|13969942545
68492|0|0
92|crutchfield.com|0|0|SESSIONDATE|04/08/2014 17:58:00|.crutchfield.com|/|1428531586|139699558542993
3|1396994254568556|0|0
95|owneriq.net|0|0|ss|2uhu3v.2xmdzs.2uhu3q|.owneriq.net|/|1554675586|13969955860808009|13969942602617
08|0|0
96|owneriq.net|0|0|p1|3147141465.3147141460.3147141455|.owneriq.net|/|1554675586|13969955860808066|13
96994260262009|0|0
sqlite> select count(id) from moz_cookies;
20

```

Figure 20: The Crutchfield.com homepage installs 20 cookies—some hosted by the site itself and some by 3rd party companies.

The content of these cookies, as well as other assets, are stored on the user's computer. Some of the locally stored content helps the website perform better and some of it allows the company to persistently track its users over multiple visits or across many sites. But all of it takes up storage space on the user's computer until the content expires or unless the user clears his cache.

Opinion regarding Crutchfield's activities 2005-2012

I have been asked to present my opinion on whether Crutchfield was involved in the activities described above during the period of July 1, 2005 through June 30, 2012. While I cannot directly examine the websites, web ads, emails, and mobile communication activities at that time, I am able to review archives of their service from 2005-2012 and compare with current practices today. It is my opinion that the evidence suggests Crutchfield employed the use of technologies to expand its business and increase sales in the state of Ohio. I base my opinion on the following:

1. Crutchfield operated a consumer facing ecommerce website with a dynamic, media-rich interface, which typically requires caching on the end user's computer (except in very rare circumstances), during that time period.
2. Crutchfield contracted with Akamai Content Distribution Network to host content closer to the end-user. In some cases, that content was physically hosted in Ohio.
3. My review of the pages stored in the Internet archives reveals that Crutchfield utilized some of the prominent technologies available during that period, including the use of online tracking and analytics code and cookies.
4. Companies with pieces of code on previous versions of this site include: Owner IQ, Google (Analytics and Doubleclick), and Adobe Omniture.
5. Documents released by Crutchfield show that it contracted with firms to provide advertising, analytics, and testing services to the site in order to increase the effectiveness with which Crutchfield could target the website for its visitors. These include Acerno (Akamai), Datanomic (Testimony), Coremetrics (Privacy Policy/Contracts), Google (Contracts), Omniture (Productions/Contracts), Owner IQ (Testimony/Contracts), ShareThis (Contracts), and Yahoo (Contracts)
6. Documents released by Crutchfield show that it contracted with firms such as Epsilon for behavioral targeting technology utilizing Epsilon's proprietary Abacus data (Productions/Contracts). It also relied on Experien and WilandDirect for its cooperative database which include email lists and customer contacts for prospects. (Productions: Experian-Z24.PDF, Wiland.PDF).

Based on what we know from the Wayback Internet, and documents produced by Crutchfield, it seems that the company was engaged in several different tracking as described about throughout the relevant time period.

I've collected screenshots of the code from this website's previous iterations to support these assertions.

```

123 // this performs the AJAX call...
124 $.getJSON("/ISEO-ralcsppd/app/car/CarSelectorHandler.ashx?CarOptionDdl=" + OptionId + '&BaseId=' + baseId + '&GroupId=' + groupId,
function(data, textStatus) {
125
126     if (textStatus == "success") {
127         var omnitureStopText = "";
128
129         // update labels containing results from previous step.
130         if (data.YearDesc != '') {
131             DisplayStop("Year", data.YearDesc);
132             omnitureStopText = "T:OutfitMyCar:Year";
133         }
134
135         if (data.MakeDesc != '') {
136             DisplayStop("Make", data.MakeDesc);
137             omnitureStopText = "T:OutfitMyCar:Make";
138         }
139
140         if (data.ModelDesc != '') {
141             DisplayStop("Model", data.ModelDesc);
142             omnitureStopText = "T:OutfitMyCar:Model";
143         }
144
145         if (data.BodyDesc != '') {
146             DisplayStop("Body", data.BodyDesc);
147         }
148
149         if (data.OptionDesc != '') {
150             DisplayStop("Option", data.OptionDesc);
151         }
152
153         if (data.VehicleId != '0' || data.OptionDesc != '') {
154             omnitureStopText = "T:OutfitMyCar:End";
155         }
156
157         SendClickTagEvent(omnitureStopText);
158
159         if (data.DropDownOptions[1] == undefined) { // car has been selected.
160             window.location = "/ISEO-ralcsppd/App/Car/outfitmycar/car.aspx";
161         }

```

Figure 21: Source code of Crutchfield.com from June 2012 indicates the use of Adobe Omniture

```

if (window.oig_pUser) {
    var oig_user_img = new Image();
    oig_user_img.src = "/web/20120615145820/http://px.owneriq.net/euid?pt=crutchaid="+encodeURIComponent(window.oig_pUser);
}

```

Figure 22: Source code of Crutchfield.com from June 01, 2012 shows the presence of OwnerIQ code on their homepage (OwnerIQ monitors users on the website in order to identify their 'path to purchase' – their clickstream behaviors that reveal how they shop).

Based on this research, I am of the opinion that Crutchfield utilized some of the discussed analytics, advertising, and web serving technologies in order to target and provide services to residents of the State of Ohio. Additionally, they employed Akamai's Content Distribution Network dating back to 2006 in order to be more geographically proximate to visitors in Ohio. While it is difficult to get a complete picture of the tracking technology used in previous versions of this website, these results from the Wayback Internet indicate that that at least three specific pieces of technology were written into the source code for the homepage.

Given their use of Akamai, some of Crutchfield's 'virtual' assets were physically located in Ohio. Additionally, given the nature of website cookies, cached images, and other web elements, Crutchfield assets were nearly guaranteed to have been stored on user's computers in Ohio. Subsequently, information about

users such as their clickstream or browsing activity was collected directly from computers in Ohio. This information can be used to better target and present advertisements and products to residents of Ohio in order to improve Crutchfield's business in the state. It is my opinion that the use of this technology indicates that Crutchfield maintained a virtual presence in the state through consistent local interactions with its citizens and extraction, analysis and use of data about them.