COMPUTER SECURITY LAB
RICE UNIVERSITY

Privacy and Tracking on the Internet

Dan S. Wallach
Department of Computer Science
Rice University

Seen in my postal mail...

Celebrating our 59th Year!
CP TOYS
by constructive playthings
FREE
L.L.Bean
100 YEARS
L.L.Bean
SINCE 1912 | HOLIDAY 2012
The Container Store
GODIVA

U.S. Toy Group, LLC
13201 Arrington Rd. • Grandview, MO 64030-1117

PRSRT STD
U.S. POSTAGE
PAID
U.S. TOY
GROUP, LLC

CUSTOMER CODE: B35402350

MEDIA CODE: 22125002

FREE SHIPPING
Buy $69.99 or more
of merchandise online
thru December 24th!
Use coupon code 12141

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TRACY WALLACH
OR CURRENT RESIDENT
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HOUSTON TX 77030-2016

0003
P256
634
509

L.Bean
eport, Maine 04033

PRSRT STD
US POSTAGE
PAID
L.L.Bean, Inc.

F

Current Resident or

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OR TRACY WALLACH
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0007
P085
594
509

SAVE 15%
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Shop with us however you choose | llbean.com | 800-221-4221 | Retail Stores

---

GODIVA
Chocolatier
139 Mill Rock Road East, Suite 2
Old Saybrook, CT 06475

Presorted
Standard
US Postage Paid
GODIVA
Chocolatier

Customer Number

HBP6502G
Key Code

ITDD27
120429

CURRENT RESIDENT OR:
DEL. WINDOW 11/28 - 12/1

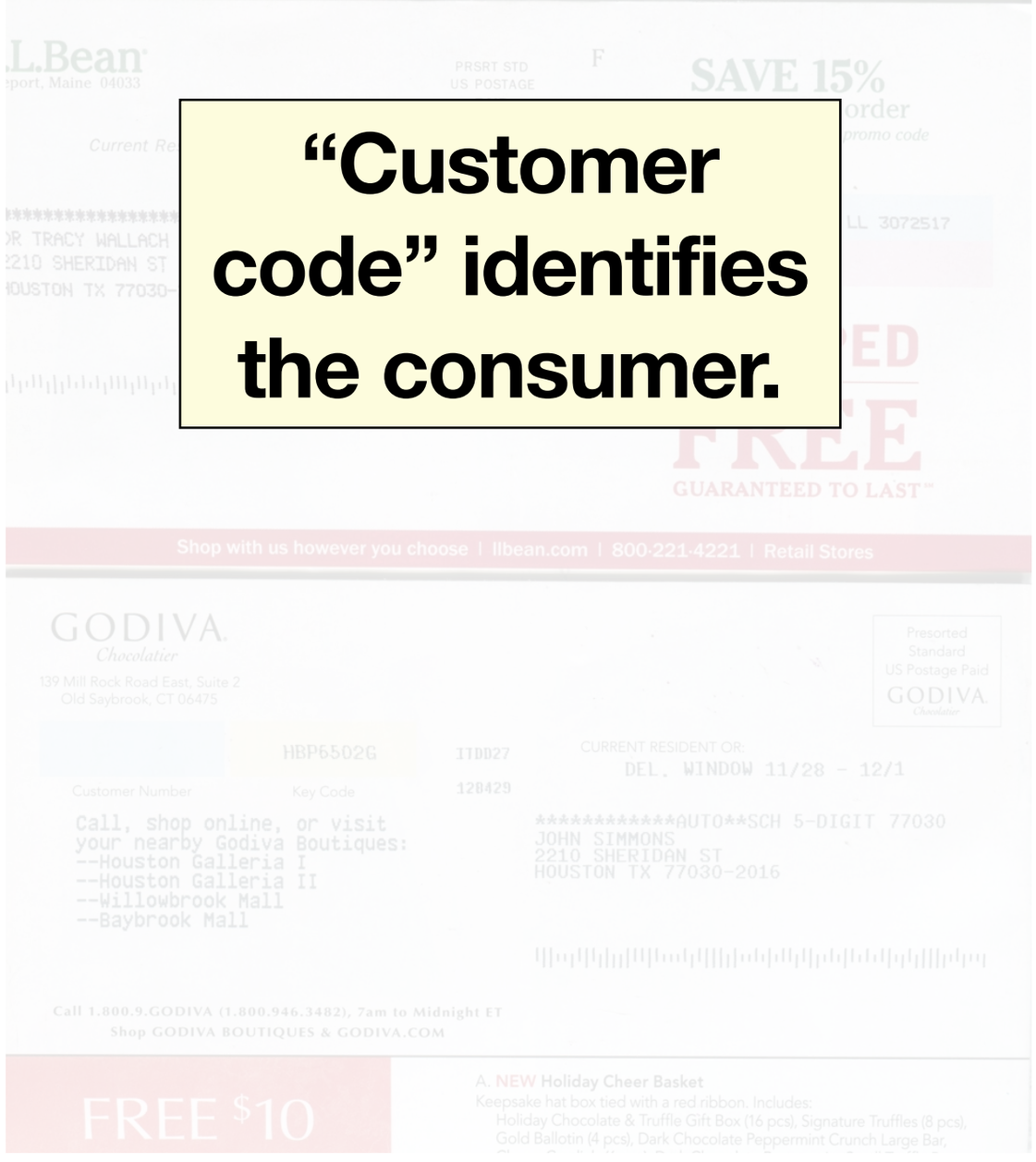
Call, shop online, or visit
your nearby Godiva Boutiques:
--Houston Galleria I
--Houston Galleria II
--Willowbrook Mall
--Baybrook Mall

**********AUTO**SCH 5-DIGIT 77030
JOHN SIMMONS
2210 SHERIDAN ST
HOUSTON TX 77030-2016

Call 1.800.9.GODIVA (1.800.946.3482), 7am to Midnight ET
Shop GODIVA BOUTIQUES & GODIVA.COM

FREE $10

A. **NEW** Holiday Cheer Basket
Keepsake hat box tied with a red ribbon. Includes:
Holiday Chocolate & Truffle Gift Box (16 pcs), Signature Truffles (8 pcs),
Gold Ballotin (4 pcs), Dark Chocolate Peppermint Crunch Large Bar,



“Customer code” identifies the consumer.

“First party” identifiers

Relationships between consumer and vendor

Supermarket “rewards” cards

Vendor-specific credit cards / gift cards

Unique IDs printed on receipts

Credit card numbers *

“First party” identifiers

Relationships between consumer and vendor

Supermarket “rewards” cards

Vendor-specific credit cards / gift cards

Unique IDs printed on receipts

Credit card numbers *

Map consumers to database records

Track your purchasing history

Provide you with targeted advertising and coupons

Big data allows for powerful inferences (e.g., pregnancy)

www.nytimes.com/2012/02/19/magazine/shopping-habits.html

BBC112612

THE SOONER YOU USE IT THE MORE IT'S WORTH!

20% off ONE SINGLE ITEM
NOW through 1/2/13

OR

10% off ONE SINGLE ITEM
1/3/13 through 2/4/13

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1-800-GO BEYOND® (1-800-462-3966)

Please Visit Us At:
3102 Kirby Drive
Houston
(713) 533-0946

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Also excludes Dyson vacuums and Miele

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Beyond any store of its kind.
OFFICES: 650 LIBERTY AVENUE, UNION, NJ 07083

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Postmaster: please deliver between 11/26-11/28

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0162
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2210 SHERIDAN ST
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Valid for in-store use only. Copies not accepted. Limit one coupon, Savings Certificate, special offer or discount (including price match) per item. Coupon must be surrendered at time of purchase; any return of purchase will reduce your savings proportionally. The discount cannot be applied to gift cards, shipping, or sales tax. Offer excludes the following: Alessi, Arthur Court, Breville®, Britto™ Collection, Brookstone®, DKNY, kate spade, Kenneth Cole Reaction Home, Kosta Boda, Le Creuset®, Lladró®, Monique Lhuillier, Nambe®, Nautica®, Orrefors, Riedel, Shun, Starbucks® Electrics, Swarovski, T-Tech, Vera Wang®, Victorinox Luggage, Vitamix®, Waterford®, Wusthof®, or Zwilling; Argington®, babybrezza™, Baby Jogger™, BÉABA®, BOB, Bugaboo, Bumbleride™, ERGObaby®, Foundations®, iCandy®, Maxi-Cosi®, Mountain Buggy, Oeuf, Orbit Baby™, Peg Pérego®, petunia pickle bottom®, Phil & Teds®, Plan Toys®, Quinny®, Svan®, Teutonia®, Under Armour®, UPPAbaby®, baby furniture, diapers, wipes, formula, baby food or portrait studio services.

Ver. 6

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*Message and data rates may apply. Mobile internet access required. Up to 5 msg/month. Text **STOP** to 239663 to cancel. Send **HELP** to 239663 for help.*

EMAIL First-time subscribers get a **20% OFF** one single item e-mail offer for in-store use.
Visit **bedbathandbeyond.com/circulars.asp**

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FREE SHIPPING

FREE STANDARD SHIPPING WITH ANY ONLINE PURCHASE OF $99* OR MORE
Offer valid through 12.17.12 *BEDBATHANDBEYOND.COM*

Free standard shipping on all gift cards when purchased online. Shop in-store or online.
Terms and conditions apply to gift cards.

We gladly accept competitors' coupons for products also available at those competitors.
If you find a lower price at any of our competitors, we will meet that price. Exceptions may apply.

Prices valid only in the contiguous U.S.

If you wish to opt-out of future mailings from us, go to our website at bedbathandbeyond.com/unsubscribe.asp

Use the coupon, connect your purchases to you, *even if you pay cash*.

TRACY VOLZ
OR CURRENT RESIDENT
2210 SHERIDAN ST
HOUSTON TX 77030-2016

80100 01256 42992 13035

I'm refinancing my mortgage and I got this in the mail.

CENDERA FUNDING

November 28, 2012

Dan Wallach
2210 Sheridan St
Houston, TX 77030

Best Terms $1,500 Commitment

We will exceed any competitor's mortgage loan offer or pay $1,500 toward your closing.*

Dear Dan,

You have received this letter as a result of our relationship with the national credit bureaus. We were notified of your recent mortgage inquiry, and in a few short minutes, we would like to provide the opportunity for you to know with certainty that you are getting the most competitive offer for your mortgage.

Cendera Funding is a top tier mortgage bank based in Fort Worth, Texas. We have provided mortgage loan services for 14 years and are licensed in 11 states. We are sure you will enjoy working with a Texas-based mortgage bank where your loan is Processed, Underwritten, Closed and Funded all under the same roof.

Accommodating your needs is our top priority. Loans can be closed in as little as 10 days if necessary, and can even be closed in your home or on a lunch break from work.

Cendera Funding Facts:

- 6th largest FHA lender in The Dallas Fort Worth market.
- 16th largest non-depository mortgage bank in Texas.
- 99.8 percent Excellent Rating on all closed loan client satisfaction surveys.
- We survey EVERY loan we close. Our performance is measured by your great experience.

We are available to speak with you 7 days a week. Please take a moment to call and speak to one of our loan officers today at **888.680.6775** or online: **www.cenderafunding.com** .

My team and I look forward to hearing from you. Here's to your prosperity!

Anthony Aldridge

Anthony Aldridge
Vice President of Sales
NMLS#: 271561

ANTHONY ALDRIDGE

EQUAL HOUSING LENDER

*Best Offer Guarantee will be honored when we have a competing lender's offer dated the same date as the offer from Cendera Funding with an identical product offering, under comparable market conditions. Certain restrictions based upon lending area, and Government programs could apply The Best Offer Guarantee applies to Conventional, FHA, VA and USDA loans only and that can be sold on a correspondent flow basis. This is a pre-screened offer of credit. To opt out of future correspondence you may write to Experian at: Experian Opt Out Request, P.O. Box 505, Woodlyn, PA 79094-0505 or call toll free at 1-888-567-8688.

8509 Western Hills Blvd #100 | Fort Worth, TX 76108
Office: **888.680.6775** | Fax: **817.984.6399**
www.cenderafunding.com

I'm refinancing my mortgage and I got this in the mail.

CENDERA FUNDING

"You have received this letter as a result of our relationship with the national credit bureaus. We were notified of your recent mortgage inquiry..."

all under the same roof.

Accommodating your needs is our top priority. Loans can be closed in as little as 10 days if necessary, and can even be closed in your home or on a lunch break from work.

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- 6th largest FHA lender in The Dallas Fort Worth market.
- 16th largest non-depository mortgage bank in Texas.
- 99.8 percent Excellent Rating on all closed loan client satisfaction surveys.
- We survey EVERY loan we close. Our performance is measured by your great experience.

We are available to speak with you 7 days a week. Please take a moment to call and speak to one of our loan officers today at 888.680.6775 or online: www.cenderafunding.com .

My team and I look forward to hearing from you. Here's to your prosperity!

"To opt out of future correspondence you may write to Experian..."

ANTHONY ALDRIDGE

8509 Western Hills Blvd #100 | Fort Worth, TX 76108
Office: 888.680.6775 | Fax: 817.984.6399
www.cenderafunding.com

“Third party” relationships

“Third party” relationships

JPMorganChase

Experian™
A world of insight

“Third party” relationships

JPMorganChase

Experian™
A world of insight

CENDERA FUNDING

Web Ads: First Party

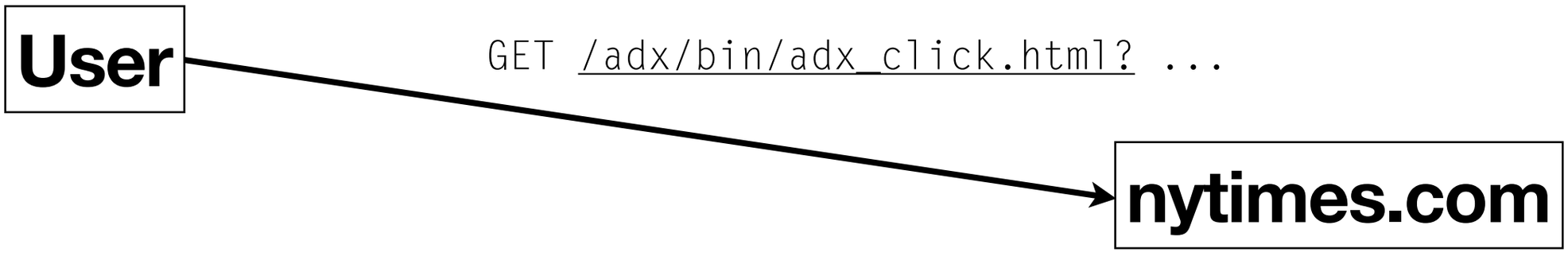
Simple display ads

Some web sites host their own ads

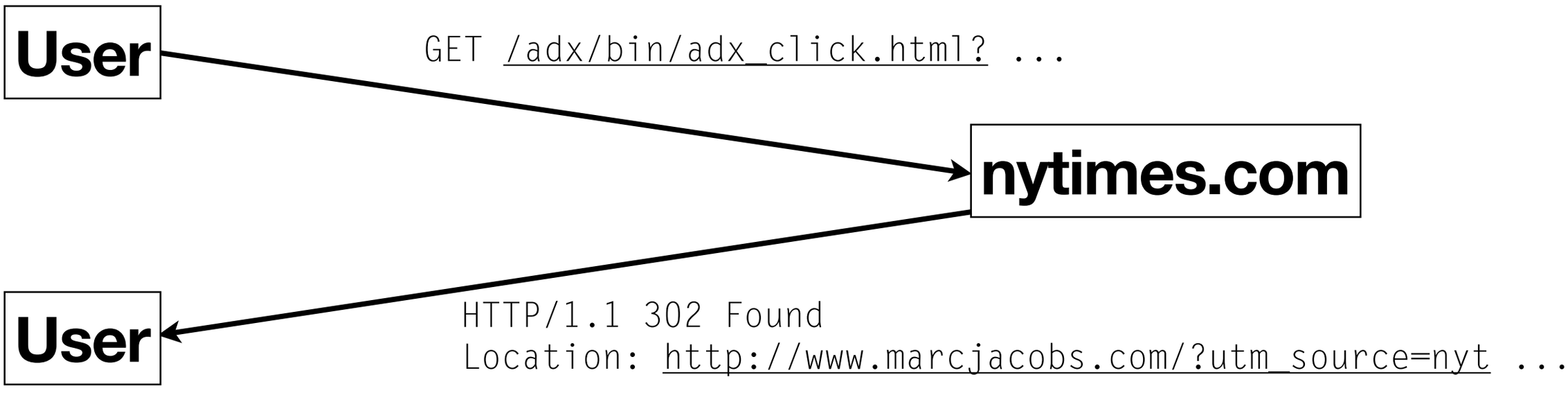
```
<a href="http://www.nytimes.com/adx/bin/adx_click.html?
type=goto&opzn&page=homepage.nytimes.com/
index.html&pos=TopLeft&sn2=ab8a95f5/87622a3f&sn1=3dad24f4/
cd041a16&camp=Marc_Jacobs_2012_1793675-nyt5&ad=NYT_DOT_LEFT&goto=http
%3A%2F%2Fwww%2Emarcjacobs%2Ecom%2F%3Futm%5Fsource%3Dnyt%26utm%5Fmedium
%3Dleft%252Btile%26utm%5Fcampaign%3Ddot%252Bgift%252Bbox"
target="_blank">

<img src="http://graphics8.nytimes.com/adx/images/ADS/32/05/ad.320528/
NYT_DOT_LEFT.jpg" width="184" height="90" border="0"></a>
```

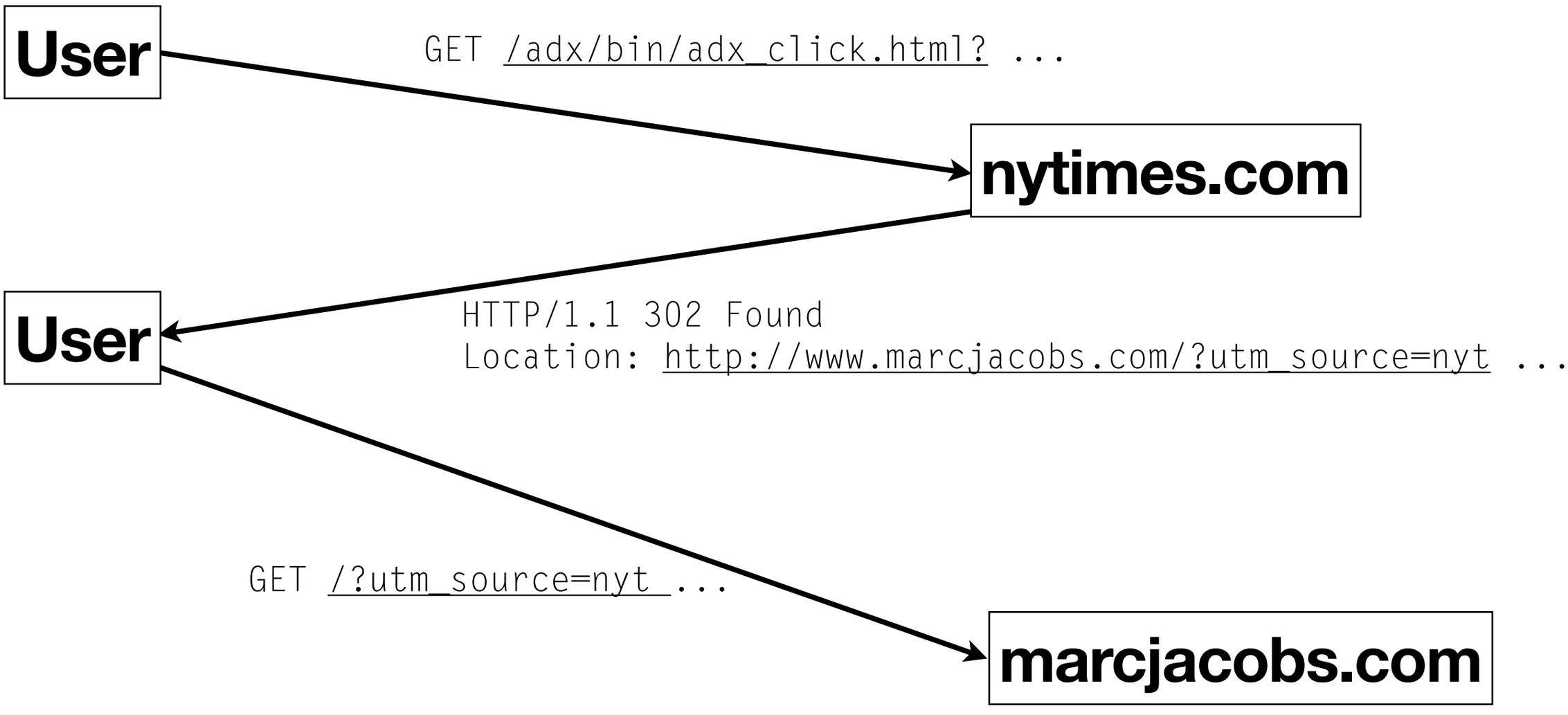
If the user clicks the ad



If the user clicks the ad



If the user clicks the ad

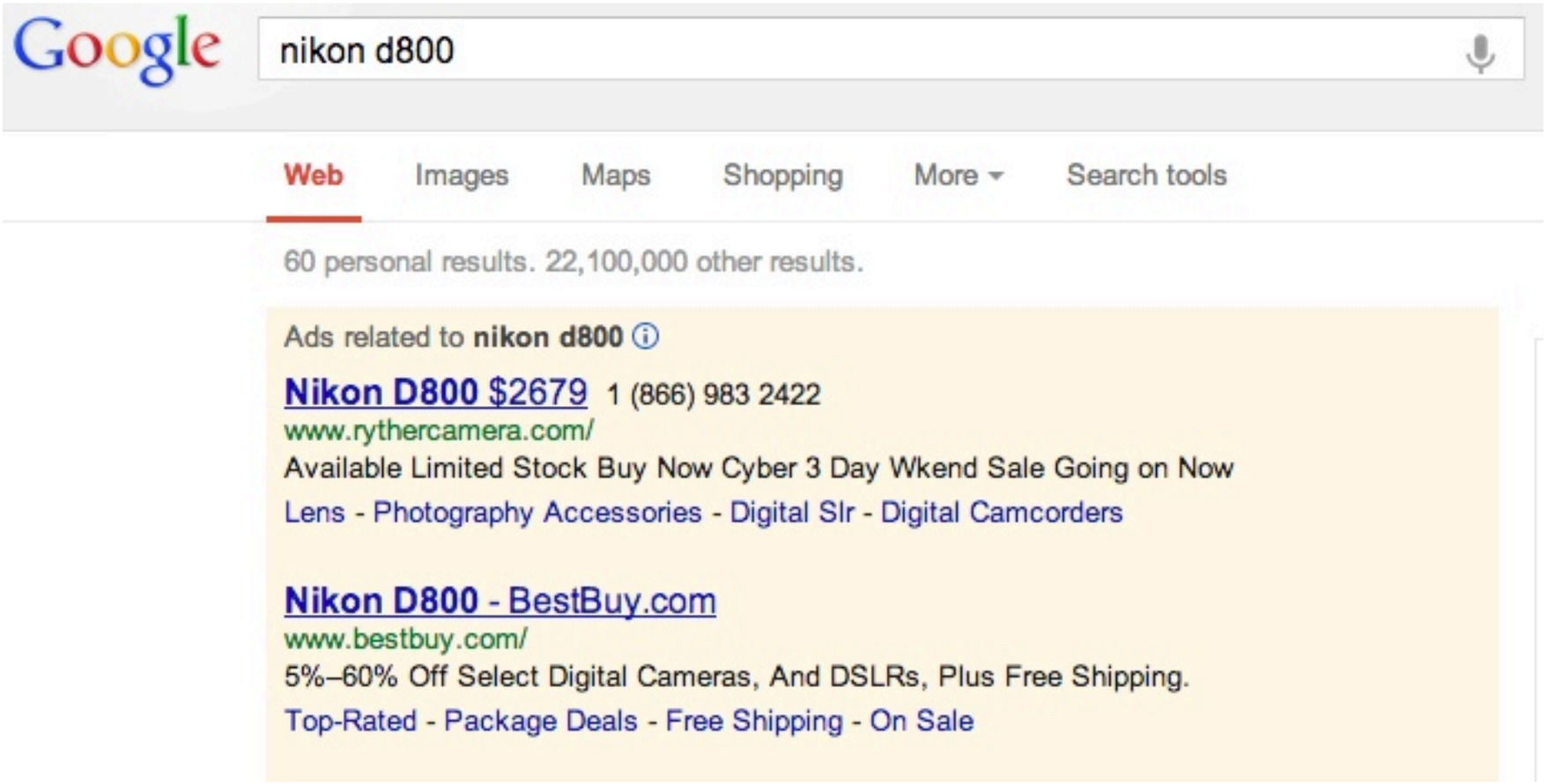


Main web site tells the user's browser to redirect the advertiser, give it credit for the click.

Targeted advertising

Option #1: Search queries.

If a user is searching for a product, they might buy it.



Targeted advertising

Option #2: User profiling

If an advertiser knows something specific about a user, they can customize advertising to them.

Gathering user data?

Volunteered data

Users tell Facebook all kinds of demographics

Users “like” vendors, products, bands, etc.

Measured data

Users’ history of purchases, visited web sites

IP geolocation (accurate to the city, if not better)

Inferred data

Users might be a lot like their friends / neighbors

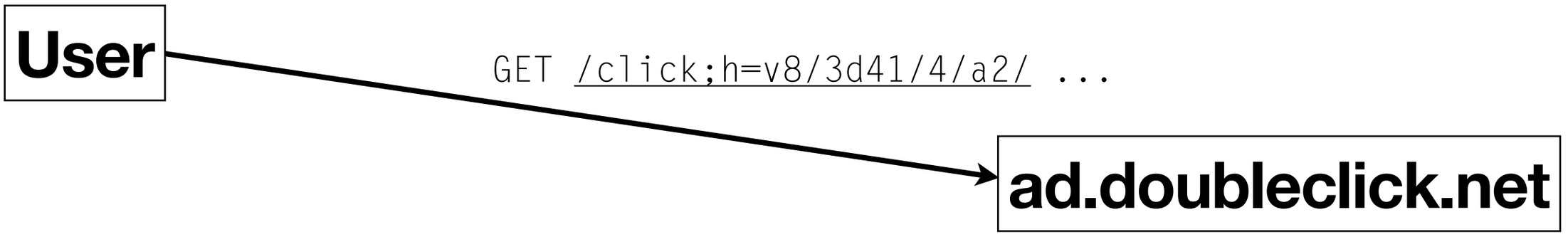
Web Ads: Third Party

Typical 3rd party display ads

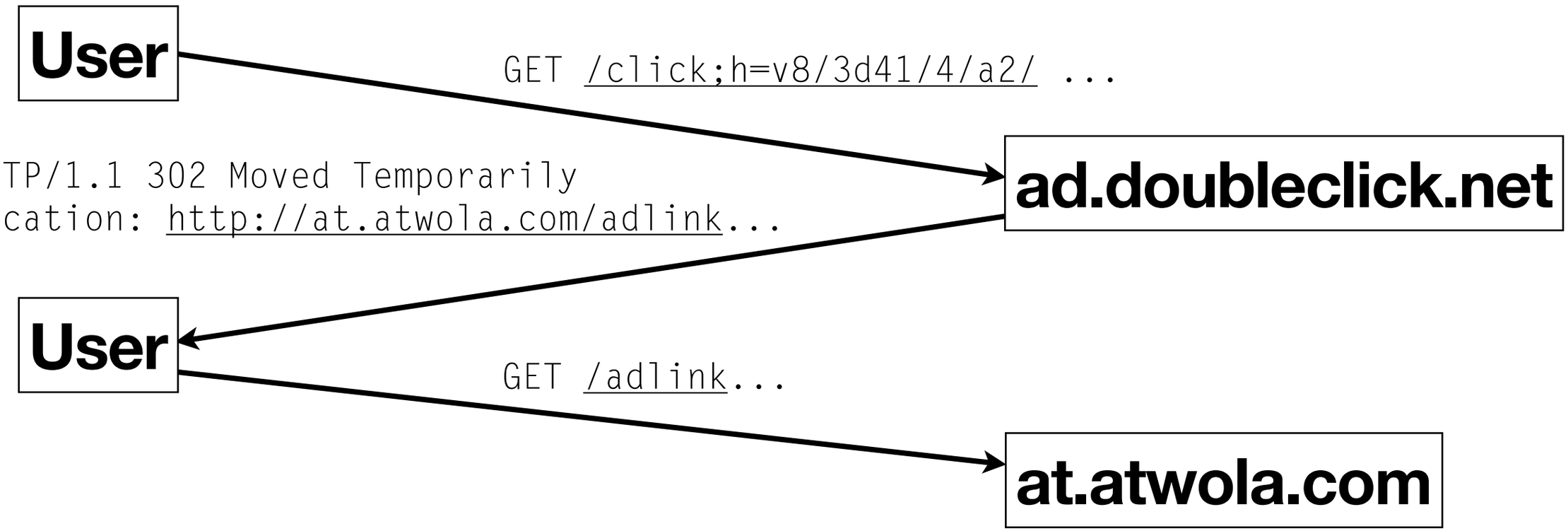
Similar operation to 1st party ads

```
<a target="_blank" href="http://ad.doubleclick.net/click;h=v8/3d41/4/
a2/%2a/g;
255075316;0-0;0;78667076;3454-728/90;47210945/47227088/4;;~okv=;pc=aol
02555489;;~sscs=%3fhttp%3A//at.atwola.com/adlink
%2F5113%2F786827%2F0%2F225%2FAdId%3D2555489%3BBnId%3D1%3Bitime
%3D595358030%3Bnodecode%3Dyes%3Bimpref%3D13545953581141452207%3Blink
%3Dhttp://www.choosenissan.com/zip.aspx?dcp=zmm.
78667076.&amp;dcc=47210945.255075316">
<img src="http://s0.2mdn.net/viewad/1361550/All-New
+Altima_MSRP_728x90.jpg" alt="Advertisement" border="0">
</a>
```

If the user clicks the ad



If the user clicks the ad



If the user clicks the ad

DoubleClick redirects through Atwola then to destination.

Tracking Cookies & Mobile Geolocation

Back to our paper example

BBC112612

THE SOONER YOU USE IT THE MORE IT'S WORTH!

20% off ONE SINGLE ITEM
NOW through 1/2/13

OR

10% off ONE SINGLE ITEM
1/3/13 through 2/4/13

FOR LOCATIONS NEAREST YOU
visit bedbathandbeyond.com and click on Store Locator or call
1-800-GO BEYOND® (1-800-462-3966)

Please Visit Us At:
3102 Kirby Drive
Houston
(713) 533-0946

80100 01256 42992 13035
Also excludes Dyson vacuums and Miele

BED BATH & BEYOND
Beyond any store of its kind.
OFFICES: 650 LIBERTY AVENUE, UNION, NJ 07083

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0162
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Ver. 6

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EMAIL
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Visit **bedbathandbeyond.com/circulars.asp**

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FREE SHIPPING

FREE STANDARD SHIPPING WITH ANY ONLINE PURCHASE OF $99* OR MORE
Offer valid through 12.17.12 *BEDBATHANDBEYOND.COM*

Free standard shipping on all gift cards when purchased online. Shop in-store or online.

Terms and conditions apply to gift cards.

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ONE SINGLE ITEM

NOW through 1/2/13

ONE SINGLE ITEM

1/3/13 through 2/4/13

(713) 533-0946

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Also excludes Dyson vacuums and Miele

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Prices valid only in the contiguous U.S.

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Dole

yonanas

Ice Cream Treat Maker

- Turns frozen bananas and other fruit into a healthy treat that looks and tastes like soft serve ice cream
- Dishwasher safe parts

49.99

To learn more,

Hollywood Popcorn Maker

- Makes up to 8 cups of popcorn
- Marquee header lights up and can be personalized, includes 150 letters
- Includes warming light and pull-out drawer

79.99

ONE SINGLE ITEM

NOW through 1/2/13

ONE SINGLE ITEM

1/3/13 through 2/4/13

80100 01256 42992 13035

VALID FOR IN-STORE USE ONLY. PRESENT THIS COUPON

What happens if you scan this QRcode with your phone?

Dole

yonanas

Ice Cream Treat Maker

- Turns frozen bananas and other fruit into a healthy treat that looks and tastes like soft serve ice cream
- Dishwasher safe parts

49.99

To learn more,

drawer

79.99

http://bqt.co/936647AE1AE6C73

BeQRious
tracker

```
HTTP/1.1 200 OK
Date: Sun, 02 Dec 2012 20:47:28 GMT
Server: Apache/2.2.9 (Fedora)
X-Powered-By: PHP/5.2.6
Set-Cookie: PHPSESSID=psm5ogtkff8p1gvnbf716dpqm0; path=/
Expires: Thu, 19 Nov 1981 08:52:00 GMT
Cache-Control: no-store, no-cache, must-revalidate, post-check=0, pre-check=0
Pragma: no-cache
Set-Cookie: _unbq=50bbbe60cb7419.09871084.50bbbe60cb7512.99318963; expires=Fri, 02-Dec-2022 20:47:28 GMT
Content-Length: 976
Connection: close
Content-Type: text/html;charset=UTF-8

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.2//EN"
"http://www.openmobilealliance.org/tech/DTD/xhtml-mobile12.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    <title>QRCodeTracking</title>
  <meta http-equiv="Content-type" value="text/html; charset=utf-8"/>
  <script type="text/javascript" src="/tracking.js"></script>
  <script type="text/javascript" src="/js/mini.ajax.js"></script>
  <script type="text/javascript" >
    function tagAction(result)
    {
window.location="/936647AE1AE6C73/r";
      //show("content");
      document.body.innerHTML = res;
    }

    var res = null;
  </script>
</head>
  <body>
    <div id="user_action">
    Waiting ...
    </div>
    <div id="content" style="display: none">
    </div>
    <script type="text/javascript" >
      tracking('2957203_db7b71b43a3ad916d08ac54b0b2c86a8');
    </script>
  </body>
</html>
```

```
HTTP/1.1 200 OK
Date: Sun, 02 Dec 2012 20:47:28 GMT
Server: Apache/2.2.9 (Fedora)
X-Powered-By: PHP/5.2.6
Set-Cookie: PHPSESSID=psm5ogtkff8p1gvnbf716dpqm0; path=/
Expires: Thu, 19 Nov 1981 08:52:00 GMT
Cache-Control: no-store, no-cache, must-revalidate, post-check=0, pre-check=0
Pragma: no-cache
Set-Cookie: _unbq=50bbbe60cb7419.09871084.50bbbe60cb7512.99318963; expires=Fri, 02-Dec-2022 20:47:28 GMT
Content-Length: 976
Connection: close
Content-Type: text/html;charset=UTF-8
```

HTTP Headers

Body (HTML + JavaScript)

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.2//EN"
"http://www.openmobilealliance.org/tech/DTD/xhtml-mobile12.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    <title>QRCodeTracking</title>
  <meta http-equiv="Content-type" value="text/html; charset=utf-8"/>
  <script type="text/javascript" src="/tracking.js"></script>
  <script type="text/javascript" src="/js/mini.ajax.js"></script>
  <script type="text/javascript" >
    function tagAction(result)
    {
window.location="/936647AE1AE6C73/r";
      //show("content");
      document.body.innerHTML = res;
    }

    var res = null;
  </script>
</head>
  <body>
    <div id="user_action">
    Waiting ...
    </div>
    <div id="content" style="display: none">
    </div>
    <script type="text/javascript" >
      tracking('2957203_db7b71b43a3ad916d08ac54b0b2c86a8');
    </script>
  </body>
</html>
```

```
HTTP/1.1 200 OK
Date: Sun, 02 Dec 2012 20:47:28 GMT
Server: Apache/2.2.9 (Fedora)
X-Powered-By: PHP/5.2.6
Set-Cookie: PHPSESSID=psm5ogtkff8p1gvnbf716dpqm0; path=/
Expires: Thu, 19 Nov 1981 08:52:00 GMT
Cache-Control: no-store, no-cache, must-revalidate, post-check=0, pre-check=0
Pragma: no-cache
Set-Cookie: _unbq=50bbbe60cb7419.09871084.50bbbe60cb7512.99318963; expires=Fri, 02-Dec-2022 20:47:28 GMT
Content-Length: 976
Connection: close
Content-Type: text/html;charset=UTF-8
```

Cookies

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.2//EN"
"http://www.openmobilealliance.org/tech/DTD/xhtml-mobile12.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    <title>QRCodeTracking</title>
  <meta http-equiv="Content-type" value="text/html; charset=utf-8"/>
  <script type="text/javascript" src="/tracking.js"></script>
  <script type="text/javascript" src="/js/mini.ajax.js"></script>
  <script type="text/javascript" >
    function tagAction(result)
    {
window.location="/936647AE1AE6C73/r";
      //show("content");
      document.body.innerHTML = res;
    }

    var res = null;
  </script>
</head>
  <body>
    <div id="user_action">
    Waiting ...
    </div>
    <div id="content" style="display: none">
    </div>
    <script type="text/javascript" >
      tracking('2957203_db7b71b43a3ad916d08ac54b0b2c86a8');
    </script>
  </body>
</html>
```

Tracking Code

Cookies

Key/value pairs, stored in the browser

Transmitted back to the site that set them

```
Set-Cookie:
_unbq=50bbbe60cb7419.09871084.5
0bbbe60cb7512.99318963;

expires=Fri, 02-Dec-2022
20:47:28 GMT
```

JavaScript behaviors

Arbitrary code, running inside your browser

```
tracking('2957203_db7b71b43a3ad
916d08ac54b0b2c86a8');
```

Geolocation code

```
function tracking(vid) {
  if(vid== -1)
  {
    hide('user_action');
    tagAction();
    return;
  }
  g_vid = vid;
  if (navigator.geolocation){
    setTimeout('errorCallback({code: 4});', 15000); //15sec for user decision
    navigator.geolocation.getCurrentPosition(function(pos){
      if(send) return;
      send = true;
      var a = (pos.address) ? pos.address : {};
      var c = (pos.coords) ? pos.coords : {};
      var params = {
        vid: vid,
        postalCode: ((a.postalCode) ? a.postalCode : ''),
        countryCode: ((a.countryCode ) ? a.countryCode : ''),
        country: ((a.country ) ? a.country : ''),
        region: ((a.region) ? a.region : ''),
        county: ((a.county) ? a.county : ''),
        city: ((a.city) ? a.city : ''),
        street: ((a.street) ? a.street : ''),
        streetNumber: ((a.streetNumber) ? a.streetNumber : ''),
        latitude: ((c.latitude) ? c.latitude : ''),
        longitude: ((c.longitude) ? c.longitude : ''),
        altitude: ((c.altitude) ? c.altitude : ''),
        accuracy: ((c.accuracy) ? c.accuracy : ''),
        altitudeAccuracy: ((c.altitudeAccuracy) ? c.altitudeAccuracy : ''),
        heading: ((c.heading) ? c.heading : ''),
        speed: ((c.speed) ? c.speed : '')
};
```

The pitch

Measure Loyalty

Would you be interested to know how many new users scanned your codes and how many of them scanned them more than once? Now you can, we provide statistics table with both: **unique** and all **return visitors**.

Stay Informed

Can't get out of the mailbox?
We all know that emails are the best form of communication with people. Whether you're reading or writing another email you can still be informed about new codes being scanned.

Share Results

Your marketing campaign is doing well and you want to present results to your boss or a client. Instead of typing the numbers by yourself just use one of the **"export" buttons** to get what you want. Generate files in a variety of formats like **XLS**, **TXT** and **PDF**.

The results

BeQRious
tracker

The results

BeQRious
tracker

net biscuits
Enabling the mobile experience.

The results

BeQRious
tracker

net biscuits
Enabling the mobile experience.

BED BATH & BEYOND

SHOP NOW

Tracking ubiquity

Everybody uses cookies

Easy: associate cookie with where you saw an advertisement

Tricky: associate cookie with your geolocation

Hard: associate cookie with real-world identity

Two kinds of geolocation

IP address says something about location

(ip2location.com reports coordinates 8 miles from my house)

Mobile phones can measure very precise GPS location

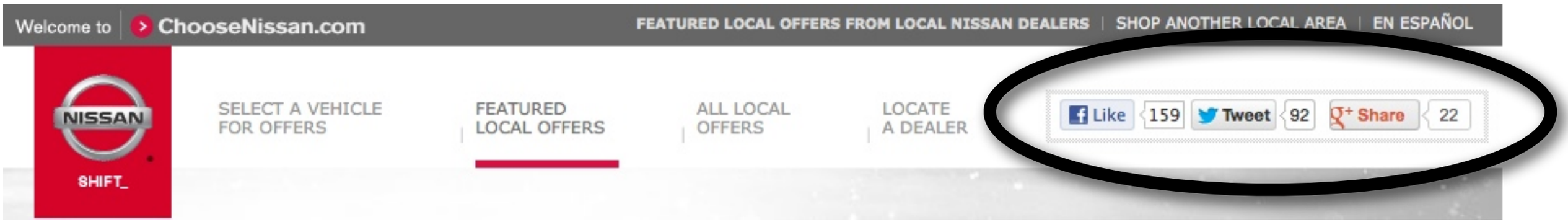
Web sites can easily store and aggregate

3rd party social widgets

If you're logged into your social network

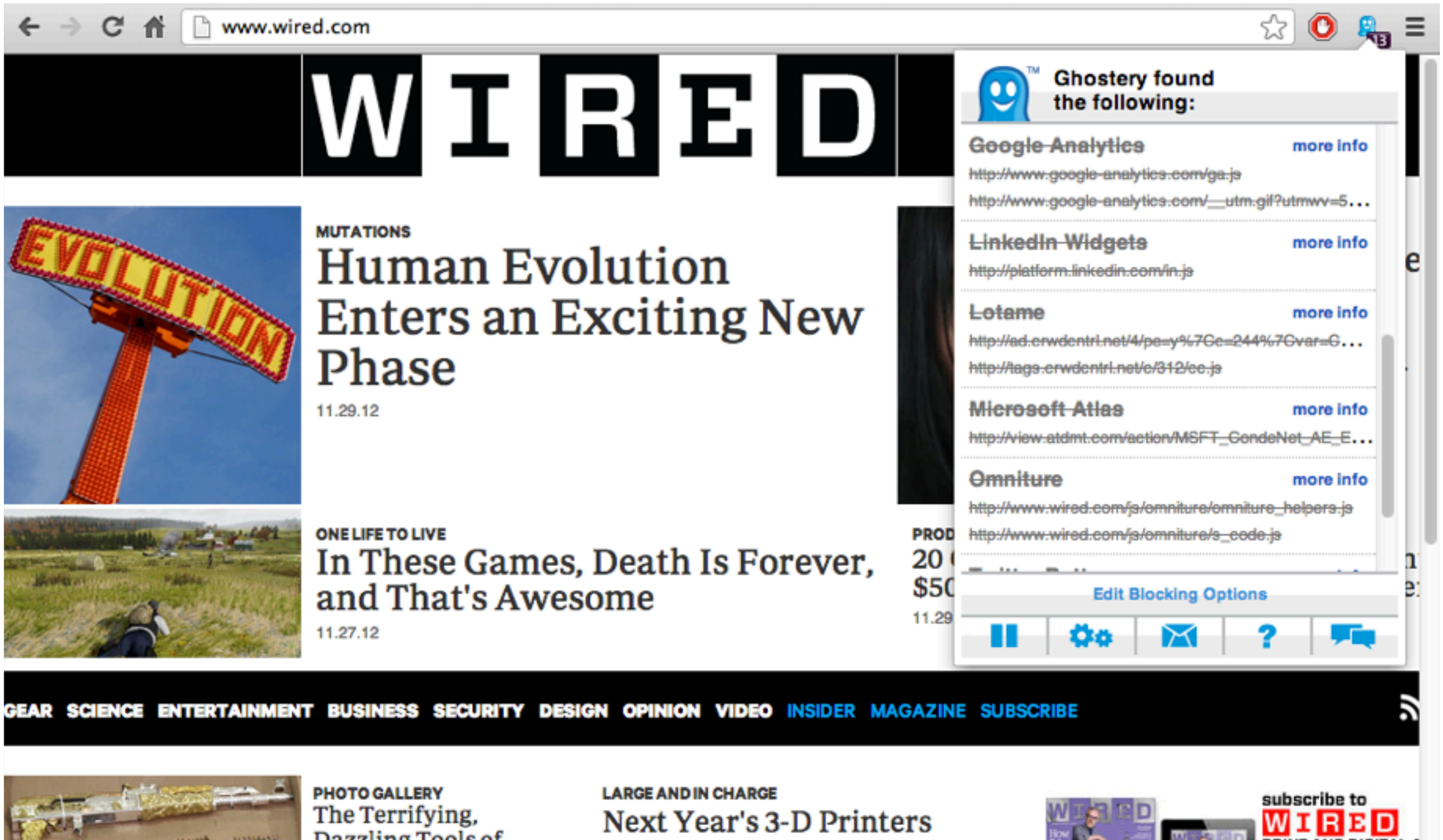
Social network learns where you visited

Social network generates custom content



3rd party web bugs

Single pixel images (like ads but invisible)

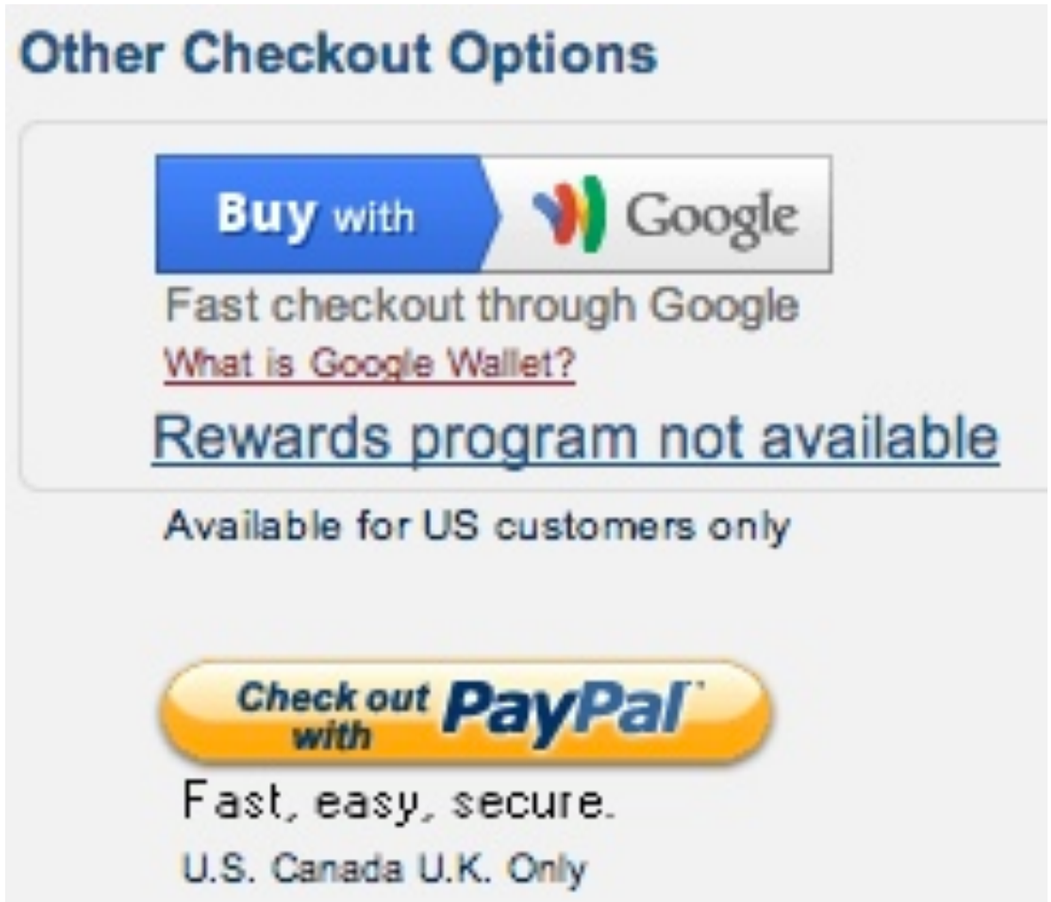


3rd party payment services

Learn everything you buy

Potential security benefit

Web site never learns your credit card number



Leveraging user profiles

1. **User visits a web site**
2. **Web site wants to show an advertisement**
3. **User's (anonymous?) profile put up for auction**
   (based on data from 3rd party aggregators)
4. **Advertisers bid**
5. **Winner's ad is shown to the user**

This happens in milliseconds.

www.nytimes.com/2012/12/02/magazine/who-do-online-advertisers-think-you-are.html

Display Advertising Technology Landscape 12/31/10

ADVERTISERS

Agencies

OmnicomGroup
WPP
PUBLICIS
IPG Interpublic Group
HAVAS
AEGIS
MDC PARTNERS
AKQA LBi
epsilon
icrossing
InnovationINTERACTIVE
MERKLE
at&t Interactive
ReachLocal
yodle
WebVisible

Media Buying Desks

Accuen The Trading Desk
m!g
ViVAKi
CADREON
adnetik
accordantmedia
VARICKMEDIA

Creative Optimization

teracent
TUMRI
adroit
dapper
struq
MIXPO
choicestream
snapads
ipromote
spongecell
AdReady
richrelevance
ADISN

Retargeting

dotomi
criteo
TellApart
Simplifi
crosspixelmedia
Chango
FetchBack
adroll
MAGNETIC

Ad Servers

doubleclick by Google
atlas
Mediaplex
mediamind
pictela
DG
pointroll

Verification

DoubleVerify
adsafe
ANCHOR intelligence
Ad-Juster
TagMan
ADXPOSE
ClickForensics
Adometry
The Media Trust
privacychoice
BETTER ADVERTISING

DSPs

MediaMath
invitemedia
TURN
DataXu
[x+1]
EfficientFrontier
TRIGGIT
XA.NET
thetradedesk
AdBuyer.com
BRANDSCREEN

Media Planning and Attribution

MarketShare
Aperture
aggregate knowledge
COGNITIVE MATCH
M FACTOR
COVARIO
ADCHEMY
CLEARSALE
buysight
visualIQ
vizu
convertro

Measurement and Analytics

OMNITURE
unica
Coremetrics
tracksimple
webtrends
FLURRY
aprimo
Visible MEASURES
tubemogul
comScore
nielsen

appnexus

Ad Exchanges

doubleclick by Google
rightmedia a YahooX company
Advertising.com Ad Desk
ADECN
OpenX
adjug
adBrite
adap.tv
OPERA software
mobclix

DMPs and Data Aggregators

bluekai
exelate
Demdex
krux
quantcast
brilig
bizo
JovianDATA
Red Aril
RapLeaf
AlmondNet
PROXIMIC
LeGO
PEER39
Akamai

Data Suppliers

Experian
ACXIOM
datalogix
QUOVA
TARGUSinfo
eBureau
NETEZZA
IXI
infogroup
SymphonyIRIGroup

Ad Networks

Horizontal

YAHOO!
Google
Microsoft Media Network
Aol.
Tribal FUSION
247 REALMEDIA
audience
ValueClick
Undertone
BurstMedia
cpx interactive
Casale
AdDynamix
traffic marketplace
ADTEGRITY.COM
Brand.net

Video / Rich Media

SAY:
tidaltv
tremor media
o-o-y-a-h-a
SunnyStar
YuMe
brightcove
widgetbox
LiveRail
BBE
BrightRoll
spotXchange
BrainScout
adconion
auditude

Vertical Custom

Sportgenic
TRAVEL
NetShelter
ADIFY
GORILLA ADVISION
jumpSTART
LONGBOARDMEDIA
IDGTechNetwork
Glam
interest
FEDERATED MEDIA

Targeted Networks / AMPs

adsummos
pulse360
media6degrees
CONTEXTWEB
XTEND
specificmedia
33across
radium one
lucidmedia
XGRAPH
LOTAME
rocketfuel
Audience Science
collective
interclick

Performance

epic
VANTAGE MEDIA
VIBRANT
adknowledge
Kontera
moxy media
MARCHEX
LinkShare
neverblue
ADTERACTIVE
Datran Media
hydra
TattoMedia
TheUseful
MediaTrust

Mobile

admob
GOLDSPOT media
phluant {mobile}
mojiva
Jumptap
transpera
Amobee
GREYSTRIPE
Quattro
InMobi
millennialmedia
celtra
crisp
medialets

Sharing Data / Social Tools

facebook
ShareThis
clearspring
tynt
gigya

Yield Optimization

rubicon project
PubMatic
ADMELD

Publisher Tools

Yieldex
fatTail
ShortTail
ufit
YieldBuild
yieldbot
scout analytics
PerfectMarket
METAMARKETS

Ad Servers

doubleclick by Google
apt
247 REALMEDIA
OpenX
ZEDO
ADTECH
AdJuggler
FreeWheel

Media Mgmt Systems

DDS
mediaX
centro
MEDIABANK
facilitate
TRAFFIQ

Ad Operations

operative.
AdPro
Solbright
theorem

PUBLISHERS

AUDIENCE

LUMA Partners LLC

Denotes acquired company

© LUMA Partners LLC 2010

Machinations

OS vendor

The platform has significant control over how different parties can use it.

Peter Kafka

ethics statement | bio | e-mail | RSS | | Follow @pkafka

Is Apple Closing Off the iPhone to Rival Ad Networks?

APRIL 12, 2010 AT 2:35 PM PT Tweet | | | Share | Print

Is Apple, which just launched its own ad network, crippling competitors that want to sell ads on its iPhones and iPads?

That's how some competitors are interpreting a clause in the developer agreement Apple released last week when it announced the new operating system that will power its mobile devices.

They're concerned about language in the contract that seems to ban apps from transmitting data that third-party ad networks would use to track their ads' performance. If they're right, Apple's contract would severely handicap rival "in-app" ad networks–like Google's AdMob–without formally banning them.

"Ads don't exist without analytics," says a mobile ad executive. "Can't measure it, can't bill for it."

The ISP (or corporate IT dept)

Passive surveillance (“deep packet inspection”)

ISPs can observe all unencrypted traffic

ISPs know who you are, where you live

Logging (for law enforcement or forensics purposes)

Active engagement

Blacklisting (sites, like Pirate Bay, or protocols, like BitTorrent)

Transparent proxy caching

Traffic shaping (widely used on college campuses)

SSL termination / reencryption (some corporations)

Attacking whole web sites (e.g., Tunisian attack on Facebook)

ISP advertisement insertion

NebuAd, ISPs sued over DPI snooping, ad-targeting program

NebuAd and a number of ISPs find themselves on the wrong end of a class-action …

by **Jacqui Cheng** - Nov 11 2008, 9:50pm CST

NebuAd, the company behind the highly-controversial behavioral-targeting ad platform, has been targeted itself—by a class-action lawsuit, that is. A suit has been filed in the US District Court of Northern California against the company, as well as a number of ISPs that tested NebuAd's technology, alleging numerous privacy violations, fraud, and unjust enrichment.

NebuAd made news earlier this year when it made a deal to test its deep-packet inspection technology with US cable operator Charter Communications. The idea behind the tech was that the companies would carefully monitor each user's Internet use in order to use that information to show highly-targeted advertising. Needless to say, there was an immediate and extreme outcry over the technology, with some going so far as referring to it as a "man-in-the-middle attack." Users could opt out—if they learned about the trial—but the tracking defaulted to automatic opt-in.

Questions arose as to whether NebuAd's system was even legal in the first place, as a number of advocacy groups criticized the service as an invasion of privacy and said it could even be violating federal wiretap laws. NebuAd, on the other hand, insisted to Congress that everything was on the up-and-up and that the system was collecting no personally-identifying information. Still, skeptics said that, identifying information or not, collecting data the way NebuAd does was in violation of state and federal laws.

The lawsuit accuses NebuAd, Bresnan Communications, Cable One, CenturyTel, Embarq, Knology, and WOW! of all being involved in the interception, copying, transmission, collection,

Click fraud, etc.

Two advertising business models

Pay per view vs. pay per click

Serious incentives for fraud

Display ads to fake users or generate fake clicks ⇒ profit!

Caveat: Fraud pushes down the value of each click

Advertising services must protect themselves

Browser-side mechanisms (iframes, same-origin-policy)

Server-side mechanisms (big data analytics)

Lots of secrecy in how this works.

Privacy technologies

AdBlock Plus / Ghostery / etc.

Delete advertisements and trackers from every web page

Downloadable blacklist rules

Do Not Track

Optional message, sent by browser to every server

Tor (onion routing) and other proxy services

Obscure user's source IP address

Defeat intrusive ISPs (deep packet inspection, etc.)

The Euro cookie rules

Web sites required to notify users about cookies

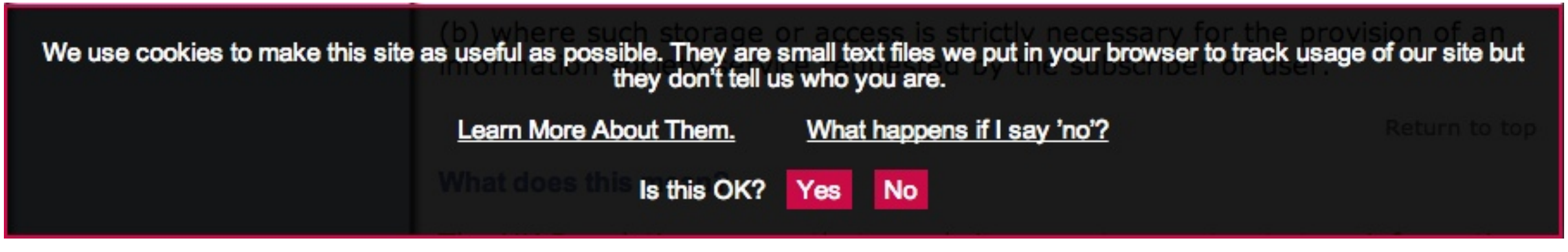
Ostensibly protects user privacy

Users now see these all the time, don't understand them

Web sites face penalties for non-conformance

Details: **www.aboutcookies.org/default.aspx?page=3**

Irony: sites would need to set a cookie to remember your non-cookie preferences, so you don't get asked again.



Cookie complexities

Cookies are a general-purpose mechanism

Fixes the “stateless” nature of the HTTP protocol

Standard way that a web site can remember your actions

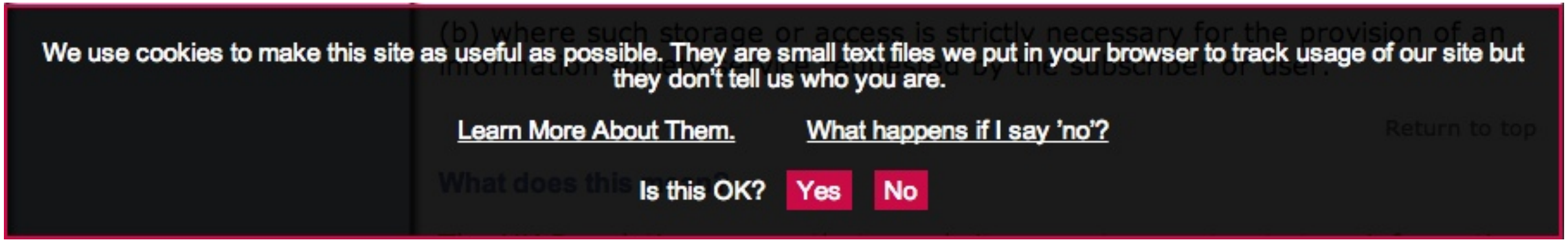
Used for “shopping carts”, user login, etc.

What makes cookies a privacy concern?

Long lifetimes (e.g., the ten year cookie from BeQRious)

Third party sharing (e.g., Omniture cookie when visiting Wired)

Connection to sensitive data (e.g., inferred medical conditions)



Phone/web convergence

Most phone apps use the web within them

In particular, app advertising is just HTML on the inside

Web browsers will support richer web apps

More sensitive permissions, just like phones

Cross-evolution of mechanisms

Android “Intent” system inspiring “web intents”

Mozilla working on Firefox OS (“Boot 2 Gecko”)

App stores

Smartphone security is tricky

Sensitive info available

Fine grained geolocation

User's address book

Phone unique identifiers (IMEI, etc.)

Personal photos

Some apps abuse their access

Smartphone security is tricky

Sensitive info available

Fine grained geolocation

User's address book

Phone unique identifiers (IMEI, etc.)

Personal photos

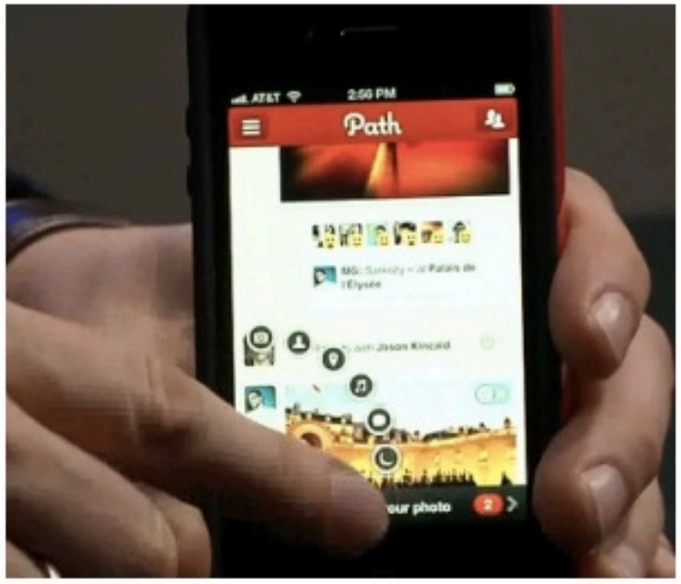
Some apps abuse their access

The Wrong Way: Path Uploads iOS Users' Address Books Without Permission

CHRIS VELAZCO

Tuesday, February 7th, 2012

Comments



What started as a bit of aimless tinkering for developer **Arun Thampi** ultimately unearthed something very surprising about personal life-sharing service Path. As a fan of the app, Thampi took it upon himself to look at the API calls that the app made to Path's service and found that his "entire address book (including full names, emails and phone numbers) was being sent as a plist to Path."

Puzzled, Thampi created an entirely new Path and tried again, only to be faced with the same results. Feel free to try it for yourself if you're curious, as Thampi has written up the test procedures on his blog.

According to a comment left by Path co-founder and CEO Dave Morin, uploading the user's address book is meant simply to connect users with each other. As **VentureBeat** points out, this isn't exactly a secret — the practice is pointed out in the company's **Wikipedia entry**. Still, it's not exactly the easiest information to come across unless you're actively looking for it, especially when no mention of it is made during the initial sign-up process.

When asked why Path didn't give users the choice to opt-in right from the start, Morin responded with the following:

Smartphone security is tricky

When asked why Path didn't give users the choice to opt-in right from the start, [Path CEO] Morin responded with the following:

This is currently the industry best practice and the App Store guidelines do not specifically discuss contact information. However, as mentioned, we believe users need further transparency on how this works, so we've been proactively addressing this.

techcrunch.com/2012/02/07/path-uploads-your-iphones-address-book-to-their-servers-without-a-peep/

If you want to regulate...

Behavior, not mechanism

Cookies are too low level—too many alternatives

HTML5 and Flash persistent storage, hidden form fields, etc.

Smartphone IMEI or other entirely new mechanisms

Behavior, not mechanism

Cookies are too low level—too many alternatives

HTML5 and Flash persistent storage, hidden form fields, etc.

Smartphone IMEI or other entirely new mechanisms

Regulate information flows, not mechanisms

Third-party vs. first-party information sharing

Short vs. long term

How data is aggregated, packaged, and resold

Data source, sensitivity, and attribution

Behavior, not mechanism

Cookies are too low level—too many alternatives

HTML5 and Flash persistent storage, hidden form fields, etc.

Smartphone IMEI or other entirely new mechanisms

Regulate information flows, not mechanisms

Third-party vs. first-party information sharing

Short vs. long term

How data is aggregated, packaged, and resold

Data source, sensitivity, and attribution

Don’t require web sites to bother the user

Do Not Track: browser setting to enable, off by default *

Important policy question: Opt-in vs. opt-out as the default?

Historical note: P3P

Platform for Privacy Preferences, ~10 years old

Web sites would state a machine-readable privacy policy

Browsers would automatically decide if a user liked a policy

Cookies accepted or rejected based on this

Real world didn't like it

E.g., Google's non-policy to work around IE cookie blocking:

```
P3P:CP="This is not a P3P policy! See
http://www.google.com/support/accounts/bin/answer.py?hl=en&answer=15165
for more info."
```

No regulatory enforcement

Lots of details available from Lorrie Cranor (CMU):

lorrie.cranor.org/blog/2012/12/03/p3p-is-dead-long-live-p3p/

Online vs. offline

General-purpose regulations for “online” tracking

Agnostic about particular technologies

“Future proof” as technologies evolve

Knock-on effects with “offline” tracking

Consumer profiling (advertising)

Consumer credit rating

Financial records

Medical records

Criminal records

Tracking is tracking, regardless of where it’s done