

Web Architecture

Early Internet: client/server architecture

Early protocols

Telnet (now SSH)

FTP (Now SCP/ SFTP)

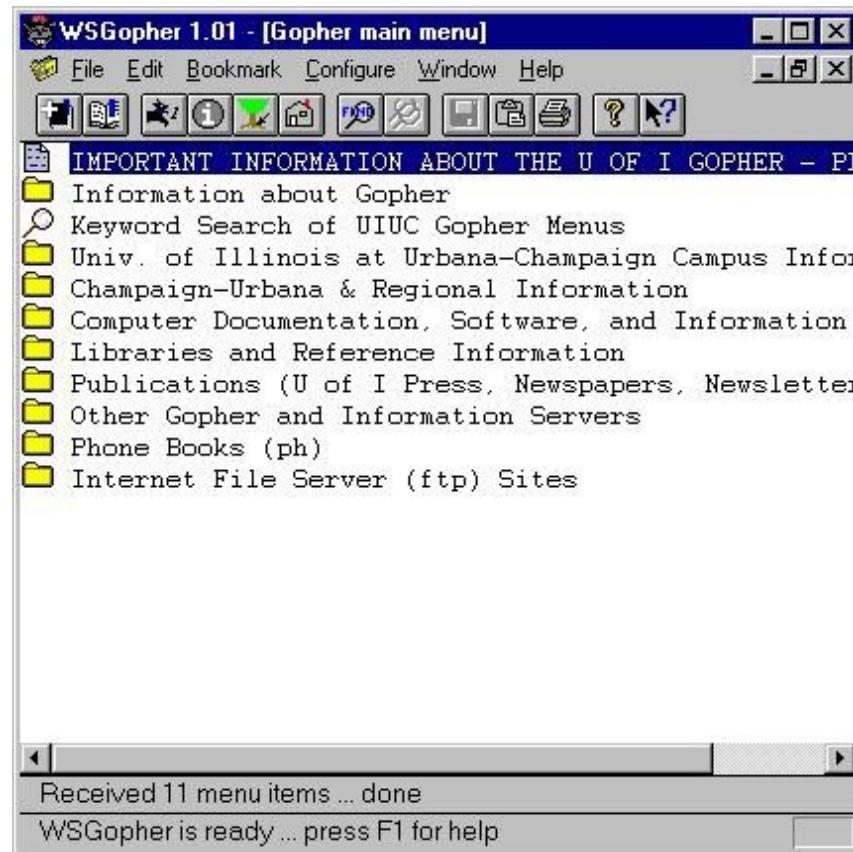
SMTP (now add POP, IMAP)

NFS (also AFS)

Glossary: secure shell, file transfer protocol, secure copy, secure file transfer protocol, simple mail transfer protocol, post office protocol, internet message access protocol, network file system, andrew file system

Early web-like attempts

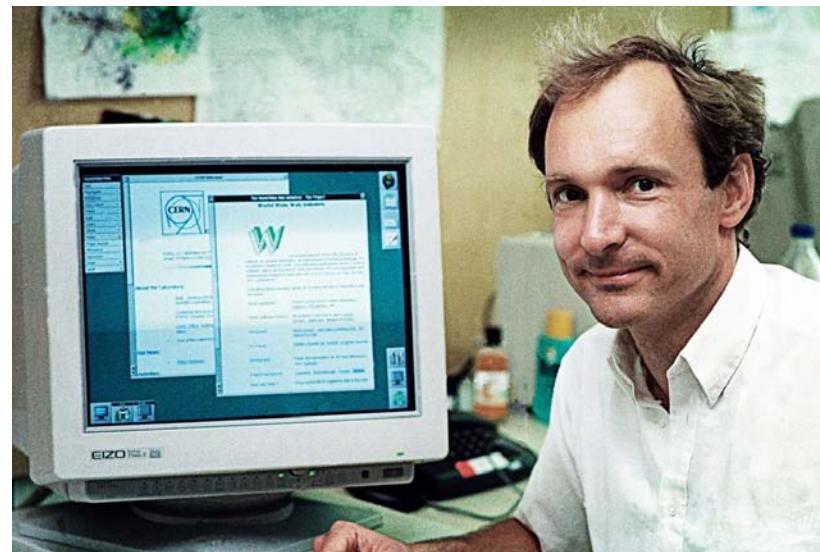
WAIS (ca. '88), WWW (ca. '89), Archie (ca. '90), Gopher (ca. '91), Veronica (ca. '92),



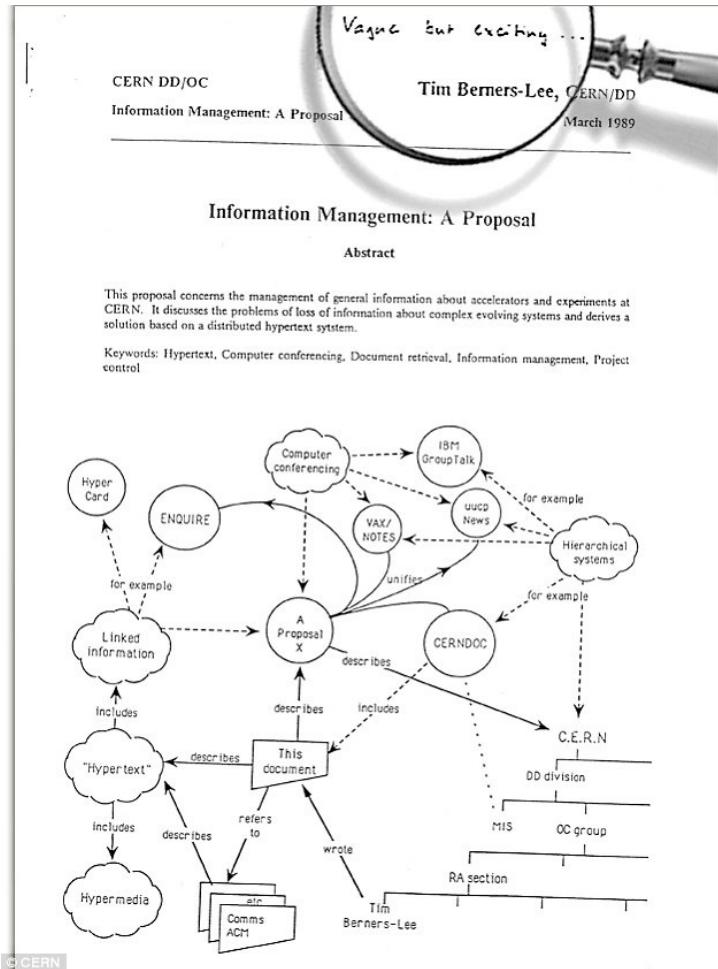
World Wide Web

Conceived by Tim Berners-Lee of
CERN in Switzerland, joined MIT.

WWW combines HTTP and HTML

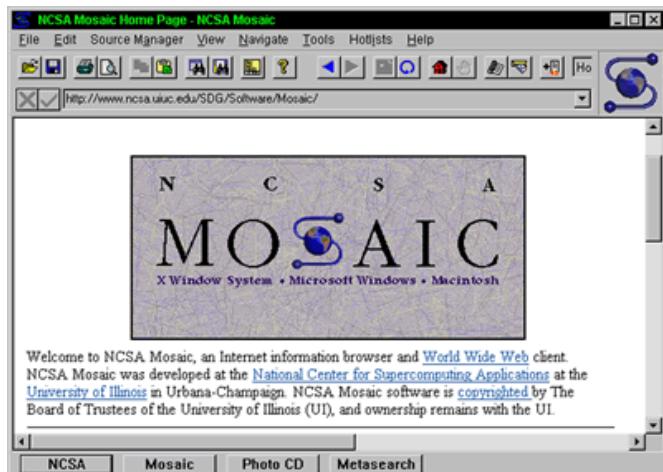


WWW: Boss “Vague but exciting” Web crushes Gopher

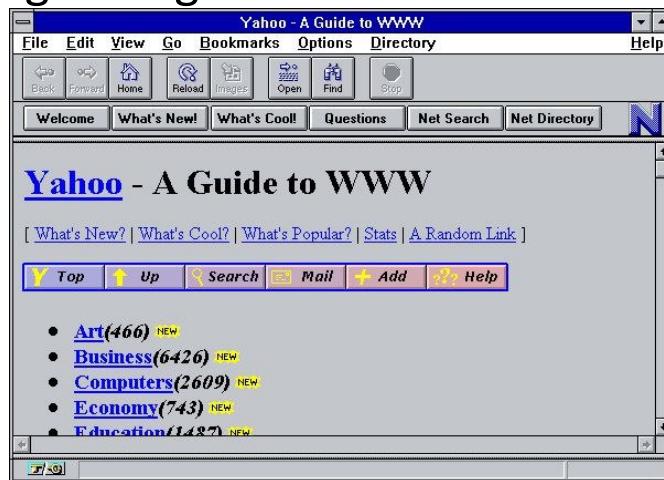


<http://www.dailymail.co.uk/sciencetech/article-2578521/internet-described-vague-exciting-Tim-Berners-Lee-proposed-concept.html>

Mosaic Web Browser



Organizing the world's information



Mosaic Web Browser

Marc Andreessen et al.

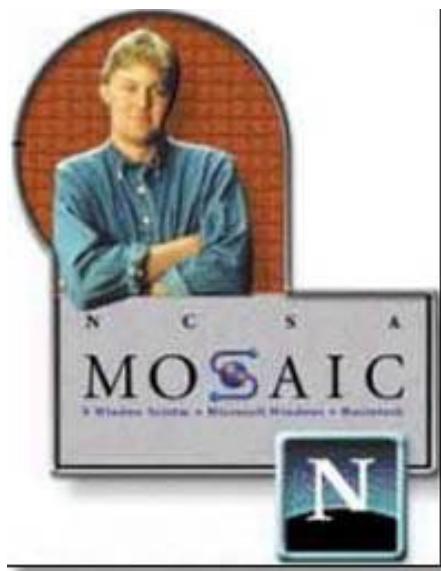
Netscape commercialized, 1994

Netscape creates SSL in 1994

IPO at \$2.9b in 1995

Scripting added in 1995

TLS grows from SSL in 1999



HTTP: Hypertext Transfer Protocol

Core Web request-response protocol

Four phases:

Open connection

Client request

Server response (stateless!)

Close connection

The web in 1994

```
<title>Margaret Sarah  
Honeyman</title>
```

```
<body bgcolor="#CC99FF">
```

```
<h1>maggie</h1>
```

```
<p>
```

Hi. My name is Maggie. How you
spell my name is M-A-G-G-I-E.

I was born in the hospital *(St.
Joe's in Ann Arbor)* a long,
long time ago *(in 1989)*.
When we wrote this, I was four.

...

How you spell my name is M-A-G-
G-I-E.

```
<p>
```

```
<address><i>last updated 9 aug  
94</i></address><p>
```



Errors found while checking this document as HTML 4.01 Transitional!	
Result:	3 Errors, 10 warning(s)
Address :	<input type="text" value="http://maggie.honeyman.org/orig.html"/>
Encoding :	utf-8 <input type="button" value="(detect automatically)"/>
Doctype :	HTML 4.01 Transitional <input type="button" value="(detect automatically)"/>
Root Element:	title

Internet robustness principle:

Be conservative in what you send,
be liberal in what you accept

Arguments for and against

HTTP: Hypertext Transfer Protocol

HTTP Browser (Client) Requests

GET

HEAD

POST

...

Headers

Cookie: ...

Host: ...

If-Modified-Since: ...

Referer: ...

User-Agent: ...

...

HTTP: Hypertext Transfer Protocol

HTTP (Server) Responses

200 OK

304 Document moved

404 Not found

Headers

Set-Cookie: ...

Expires: ...

Location: ...

...

Exercise! Manual browsing.

telnet peter.honeyman.org 80 (connect)

GET /dummy.html HTTP/1.1 (request)

Host: peter.honeyman.org (header)

(blank line)

(if necessary, in terminal,
type Control-] to escape)

What do you see and why?

Server response:

HTTP/1.1 200 OK **(response)**

Date: Mon, 26 Sep 2016 18:02:11 GMT

Server: Apache/2.4.7 (Ubuntu)

Last-Modified: Mon, 26 Sep 2016 18:00:39 GMT

ETag: "c6-53d6ce7d7dfc0" **(headers)**

Accept-Ranges: bytes

Content-Length: 198

Vary: Accept-Encoding

Connection: close

Content-Type: text/html

<!doctype html public "-//W3C//DTD HTML 4.01 Transitional//EN">

<html>

<head>

<meta http-equiv="Content-Type" content="text/html; charset=utf-8"> **(HTML doc)**

<title>dummy</title>

</head>

<body>

NO BODY

</body>

Cookies

HTTP is a “stateless” protocol

Cookies invented as a way to store state on the client that could be used by the server

E.g., identity

Scripting

```
<html>
<body>
    <h1>Multiplication</h1>
    Enter Number 1:<input type="text" id="a1"><br>
    Enter Number 2:<input type="text" id="a2"><br>
    <button onclick="myFunction()">Product</button>
    <p id="a3"></p>
    <script>
        function myFunction(){
            var a=parseInt(document.getElementById("a1").value);
            var b=parseInt(document.getElementById("a2").value);
            var c=a*b;
            document.getElementById("a3").innerHTML=c;
        }
    </script>
</body>
</html>
```

Source: wikipedia

<http://peter.honeyman.org/mult.html>

**Seen in Dan's
postal mail...**



“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 IT

20% off
ONE SINGLE ITEM
OR
ON

NOW
through
1/2/13

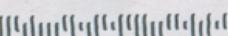
FOR LOCATIONS NEAREST YOU
visit bedbathandbeyond.com and
click on Store Locator or call

**BED BATH &
BEYOND®**

PRSR STD
U.S. POSTAGE
PAID
BED BATH & BEYOND

kind:
B3
11/26-11/28

*****ECRWSH**C-006
G491-01-446-0-154
0162



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

Also excludes Dyson vacuums and Miele

VALID FOR IN-STORE USE ONLY. PRESENT THIS COUPON

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®, Liadó®, Monique Lhuillier, Nambe®, Nautica®, Offreors, Riedel, Shun, Starbucks® Electrics, Swarovski, T-Tech, Vera Wang®, Victorinox Luggage, Vitamix®, Waterford®, Wusthof®, or Zwilling; Arlington®, babybrezza™, Baby Jogger™, BEABA®, 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 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](http://bedbathandbeyond.com/unsubscribe.asp)

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



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

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!

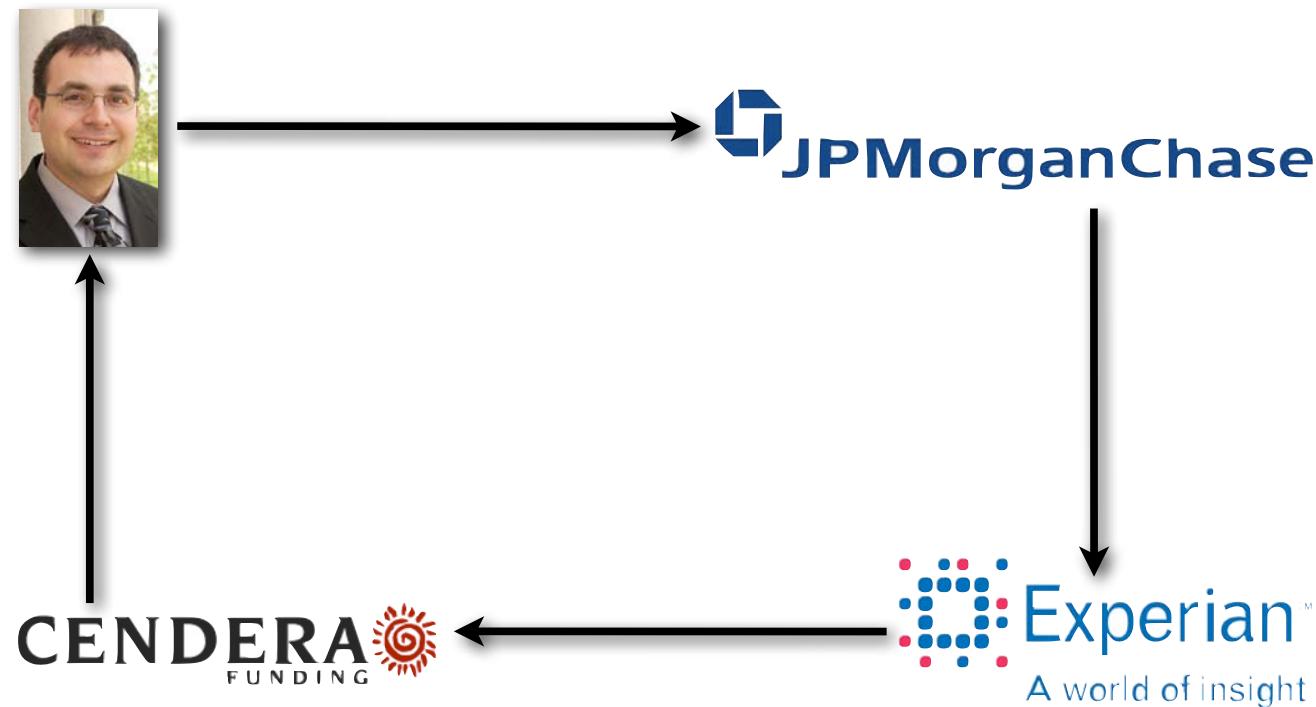
**"To opt out of future
correspondence you may
write to Experian..."**



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



Web Ads: First Party

Simple display ads

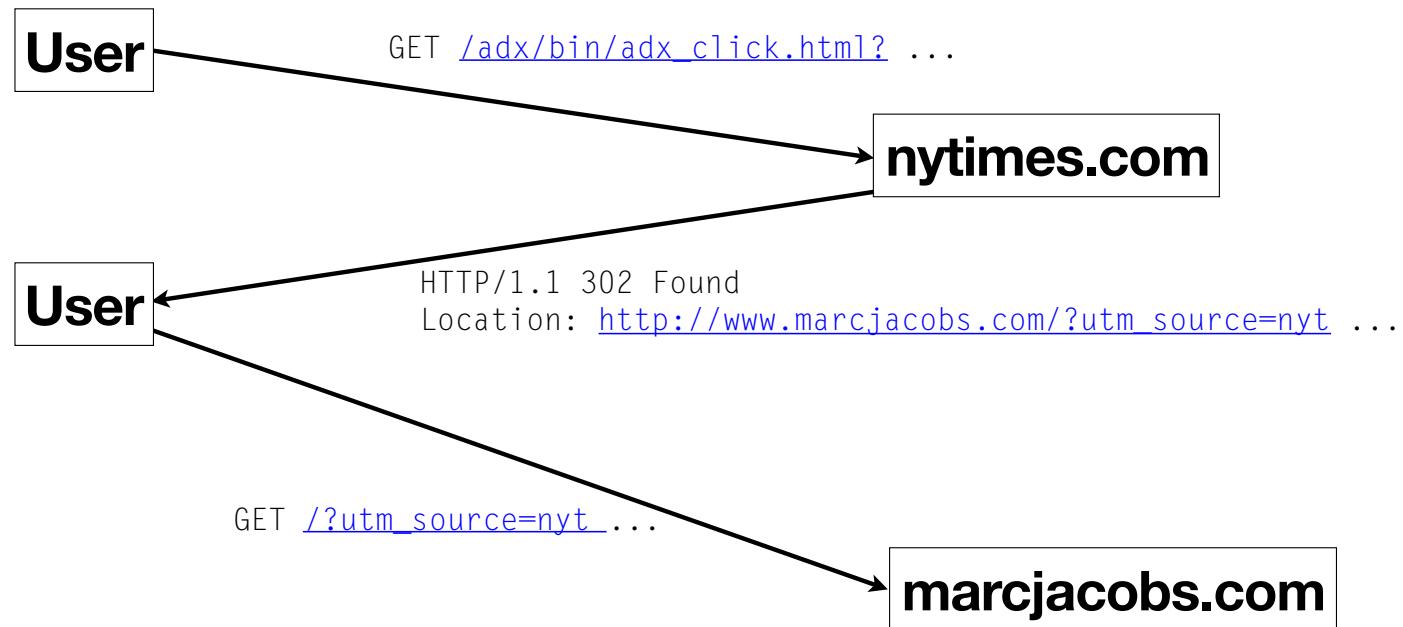
Some web sites host their own ads

```
<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%25  
2Bgift%252Bbox" target="_blank">
```

```
</a>
```

The screenshot shows the top navigation bar of The New York Times website. It includes links for 'HOME PAGE', 'TODAY'S PAPER' (which is highlighted with a black arrow pointing from the previous code snippet), 'VIDEO', 'MOST POPULAR', 'U.S. Edition ▾', and user options like 'Subscribe', 'Digital / Home Delivery', 'Log In', and 'Register Now'. Below the navigation is the iconic 'The New York Times' masthead. At the bottom of the masthead, it says 'Monday, December 3, 2012' and 'Last Update: 10:30 PM ET'. To the left of the masthead is a small rectangular ad for 'MARC JACOBS' featuring a black and white bow tie logo. To the right is another ad for 'Marc Jacobs' cosmetics, specifically a red perfume bottle and its packaging.

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.

The screenshot shows a Google search results page. The search query 'nikon d800' is entered in the search bar. Below the search bar, the 'Web' tab is selected, followed by 'Images', 'Maps', 'Shopping', 'More', and 'Search tools'. A message indicates '60 personal results. 22,100,000 other results.' Below this, a yellow-highlighted section titled 'Ads related to nikon d800' lists two ads:

- Nikon D800 \$2679** 1 (866) 983 2422
www.rutherfordcamera.com/
Available Limited Stock Buy Now Cyber 3 Day Wkend Sale Going on Now
Lens - Photography Accessories - Digital SLR - Digital Camcorders
- Nikon D800 - BestBuy.com**
www.bestbuy.com/
5%-60% Off Select Digital Cameras, And DSLRs, Plus Free Shipping.
Top-Rated - Package Deals - Free Shipping - On Sale

Targeted advertising

Option #2: User profiling

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

More Recommendations for You



OXO Good Grips 3-Piece
Angled...
 (78)
\$19.99
[Why recommended?](#)

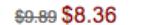


Kindle US Power Adapter
Amazon
 (1,258)
\$19.99
[Why recommended?](#)



Sentinel 3: Homeworld
Origin8 Technologies Ltd.
 (194)
\$2.49
[Why recommended?](#)



OXO SteelL Cocktail Strainer
 (19)
\$9.99 \$8.36
[Why recommended?](#)



2-Year Protection Plan for
Kindle...
Service Net
 (46)
\$29.99
[Why recommended?](#)



Amazon Kindle Touch
Cover, Black
 (641)
\$39.99 \$24.99
[Why recommended?](#)

› [See more recommendations](#)

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

Sponsored  See All



Archangel Alarm Services, LLC
Read our recommendations here at Facebook and view what others are saying about our service...



Archangel Alarm Services

 Like This Page

Houston Real Estate
realestate.marthaturner.com



Make the Best Real Estate Decisions & Let Mary Hale McLean Guide You Every Step of the Way

Palazzo's
private-elist.com



Palazzo's Party Pans are the Perfect Recipe for your Holiday Party!

Need A Chiropractor?



Sitting at a computer all day leads to headaches and neck pain – we can help!

562 people like CORE Chiropractic.

Wells Fargo Student Loans
wellsfargo.com



Wells Fargo can help lower your payments by over \$1,000. Ends December 31. Start today

Online Master's Comp Sci
umflint.edu



Get a master's degree in computer science & information systems completely online at U-M

Fundamentally Toys

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=ao10  
2555489;;~sscs=%3fhttp%3A//at.atwola.com/  
adlink%2F5113%2F786827%2F0%2F225%2FAdId%3D2555489%3BBnId%3D1%3Bitime%3D  
595358030%3Bnodecode%3Dyes%3Bimpref%3D13545953581141452207%3Blink%3Dhtt  
p://www.chooseNISSAN.com/zip.aspx?dcp=zmm.  
78667076.&dcc=47210945.255075316">  
  
</a>
```

The advertisement features a white Nissan Altima sedan centered against a dark background. To the left, text reads "The All-New Nissan ALTIMA®" and "STARTING AT \$21,700". To the right, a "SHOP NOW" button is followed by the Nissan logo and the word "SHIFT-". Below the main image, the AOL Autoblog navigation bar includes links for AOL, AOL Autos, New Cars, Translogic, AutoblogGreen, Autoblog International, Tip Us, Send Feedback, RSS Feeds, About AOL, and the AOL logo. At the bottom, there's a search bar with the placeholder "What Can We Help You Find?" and a red "GO" button.

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 OR **10% off**

ONE SINGLE ITEM ONE SINGLE ITEM

NOW through 1/2/13 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

Barcode: 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 07088
Postmaster: please deliver between 11/26-11/28

PRSR STD
U.S. POSTAGE
PAID
BED BATH & BEYOND

*****ECRWSH**C-006
G 0442 0L G491-01-446-0-154
TRACY VOLZ 0162
OR CURRENT RESIDENT
2210 SHERIDAN ST
HOUSTON TX 77030-2016

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VALID FOR IN-STORE USE ONLY. PRESENT THIS COUPON

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®, Lladro®, 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™, BEABA®, BOB, Bugaboo, Bumbleride™, ERGOBABY®, Foundations®, iCandy®, Maxi-Cosi®, Mountain Buggy, Oeuf, Orbit Baby™, Peg Perego®, petunia pickle bottom®, Phil & Ted's®, 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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Visit bedbathandbeyond.com/circulars.asp

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Offer valid through 12.17.12 BEDBATHANDBEYOND.COM

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

MERRY CHRISTMAS

Terms and conditions apply to gift cards.

ONE SINGLE ITEM **ONE SINGLE ITEM**

NOW through 1/2/13 1/3/13 through 2/4/13

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Valid for in-store use only. Copies not accepted. Limit one coupon. Savings proportionally. The discount cannot be applied to gift cards, shipp
Kosta Boda, Le Creuset®, Lladro®, Monique Lhuillier, Nambe®, Nautica®, O Baby Jogger™, BEABA®, BOB, Bugaboo, Bumbleride™, ERGOObaby®, Four Under Armour®, UPPAbaby®, baby furniture, diapers, wipes, formula, baby

MOBILE Firsttime subscribers get a **20% OFF** or online mobile offer. **Text OFFER to 239663.**
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.

80100 01256 42992 13035
Also excludes Dyson vacuums and Miele

OR CURRENT RESIDENT
2210 SHERIDAN ST
HOUSTON TX 77030-2016

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Ver. 6

What happens if you scan this QRcode with your phone?

CONNECT WITH US

Facebook Twitter Pinterest YouTube

FREE SHIPPING

FREE STANDARD SHIPPING WITH ANY ONLINE PURCHASE OF \$99 OR MORE

Offer valid through 12.17.12 BEDBATHANDBEYOND.COM

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

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



<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/miniajax.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 Headers

```
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=psm5oqtkff8p1gvnbf716dpqm0; 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: _unbg=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/miniajax.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>
```

Body (HTML + JavaScript)

```
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=50bbe60cb7419.09871084.50bbe60cb7512.99318963; 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/miniajax.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
0bbe60cb7512.99318963;

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

JavaScript behaviors

Arbitrary code, running inside your browser

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

```

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 : '')
            };
        });
    }
}

```

Geolocation code

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

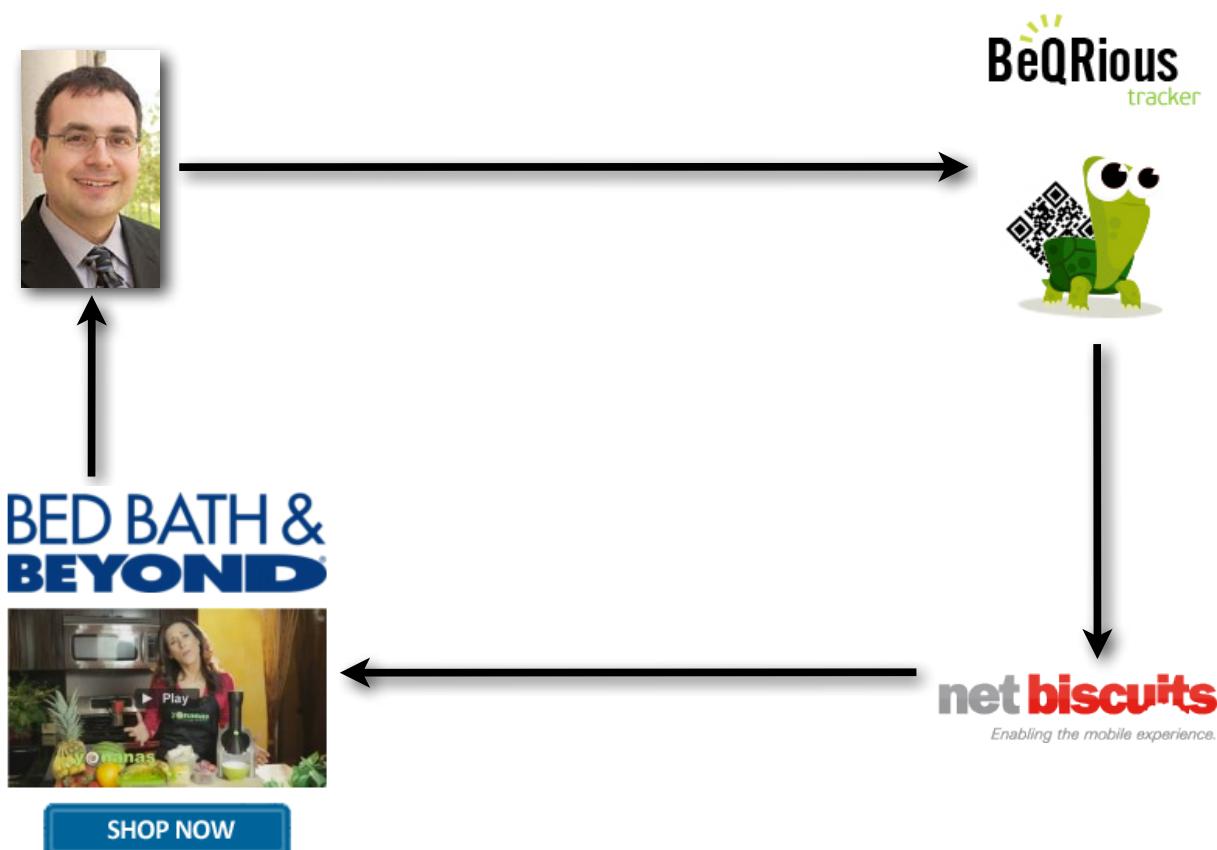
Can't get out of the mailbox?
We all know that emails are the best form of communication with people. Whether you're reading or writing another email you can still be informed about new codes being scanned.



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



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

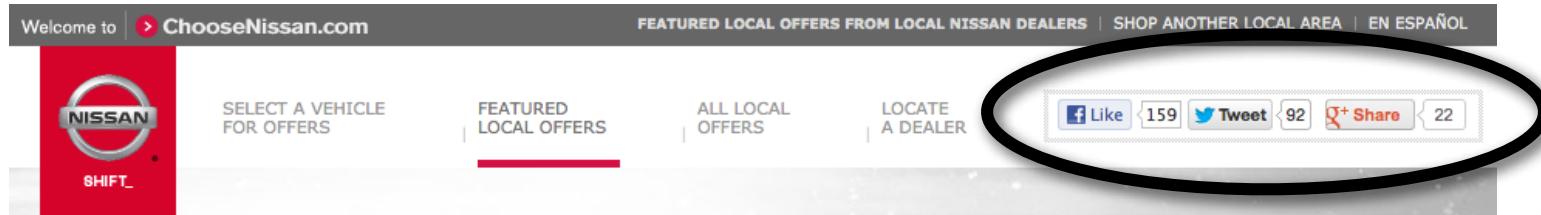
Web sites can easily store and aggregate

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)

The screenshot shows the WIRED.com website with a Ghostery browser extension open. The extension's sidebar lists several third-party scripts found on the page:

- Google Analytics
- LinkedIn Widgets
- Lotame
- Microsoft Atlas
- Omniture

The main content of the website includes a large headline about human evolution, a smaller article about video games, and a navigation bar at the bottom.

GEAR SCIENCE ENTERTAINMENT BUSINESS SECURITY DESIGN OPINION VIDEO INSIDER MAGAZINE SUBSCRIBE

PHOTO GALLERY
The Terrifying, Dazzling Tools of

LARGE AND IN CHARGE
Next Year's 3-D Printers
Promises Big Things... Really

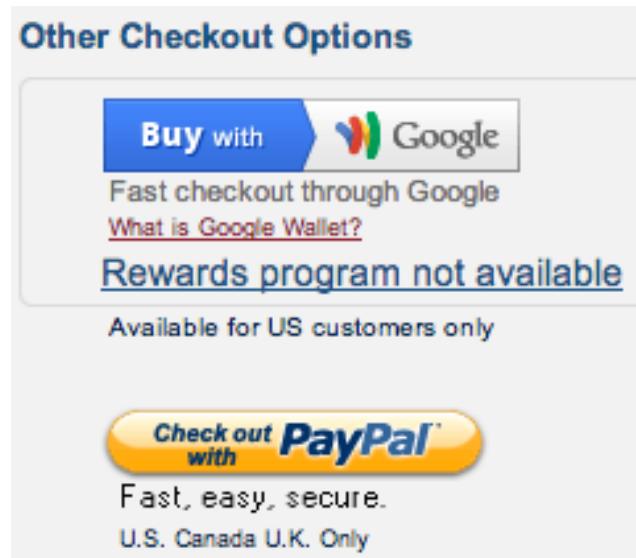
subscribe to
WIRED
PRINT AND DIGITAL

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

So Far:

Crypto

Web Architecture

Next:

[Web attacks and defenses](#)