Miscellaneous: tracking on the web (& start on malware)

CS 161: Computer Security

Prof. Raluca Ada Popa

April 17, 2018

Credit: some slides are adapted from previous offerings of this course or from CS 241 of Prof. Dan Boneh

Miscellaneous topics

- Tracking on the web
- Malware (bots, worms, viruses)
- Bitcoin

All will be covered on exam, you should understand the concepts, but no need to understand the details.

What does a site learn about you when you visit them?

Discuss with your neighbor

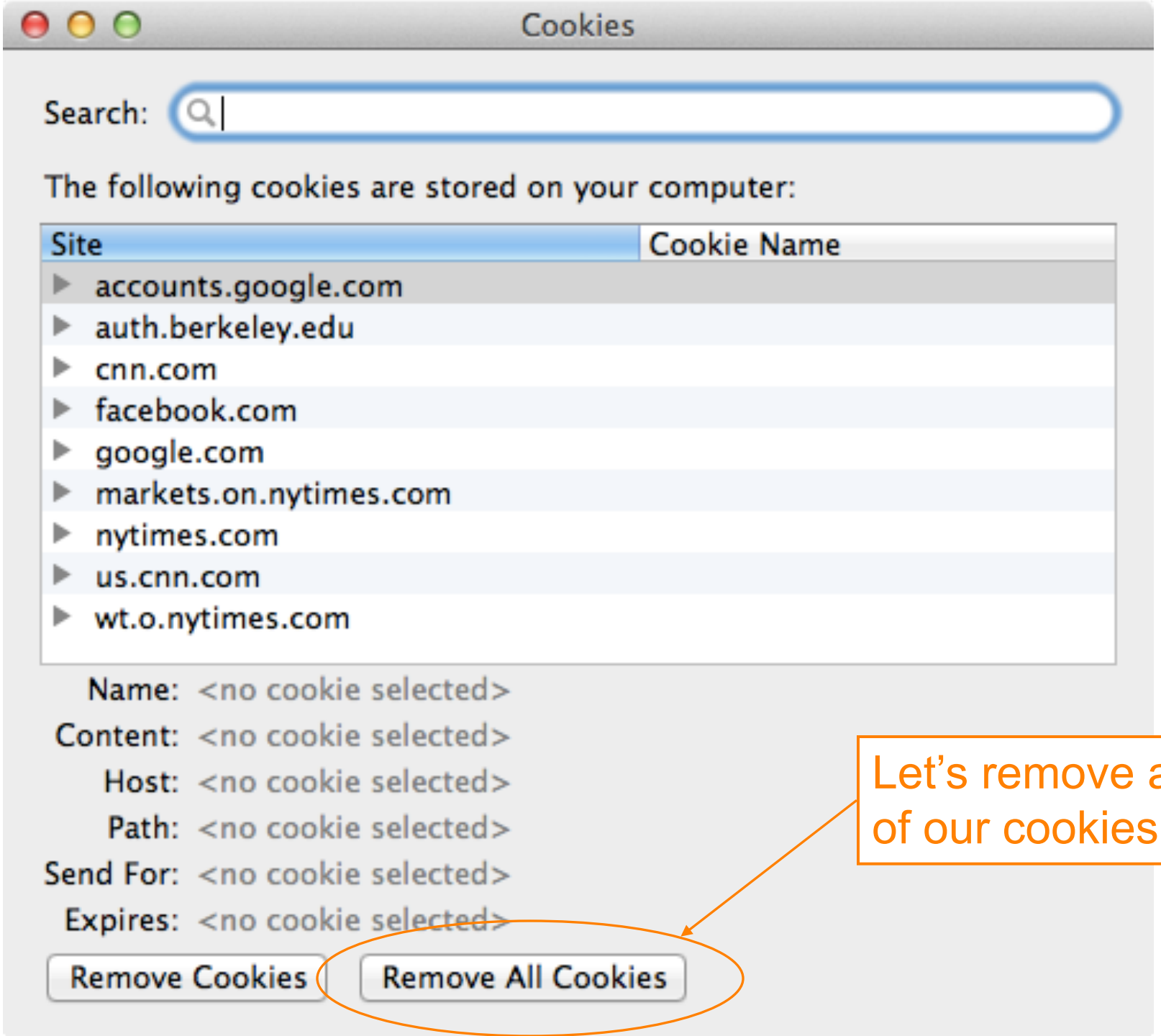
The sites you visit learn:

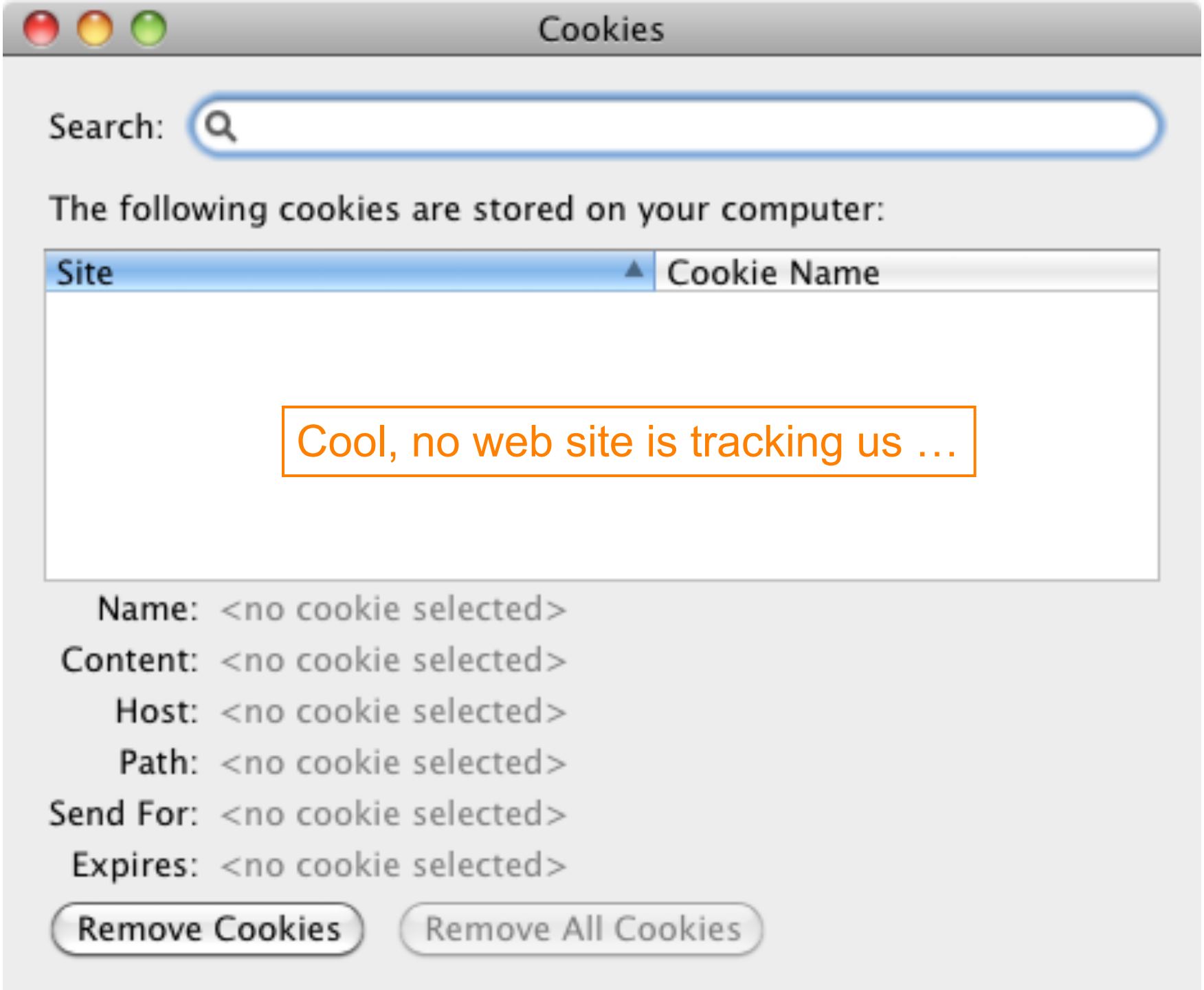
- The URLs you're interested in
  - Google/Bing also learns *what you're searching for*
- Your IP address
  - Thus, your service provider & geo-location
  - Can often link you to other activity including at other sites
- Your browser's capabilities, which OS you run, which language you prefer
- Which URL you looked at that took you there
  - Via the HTTP "`Referer`" header

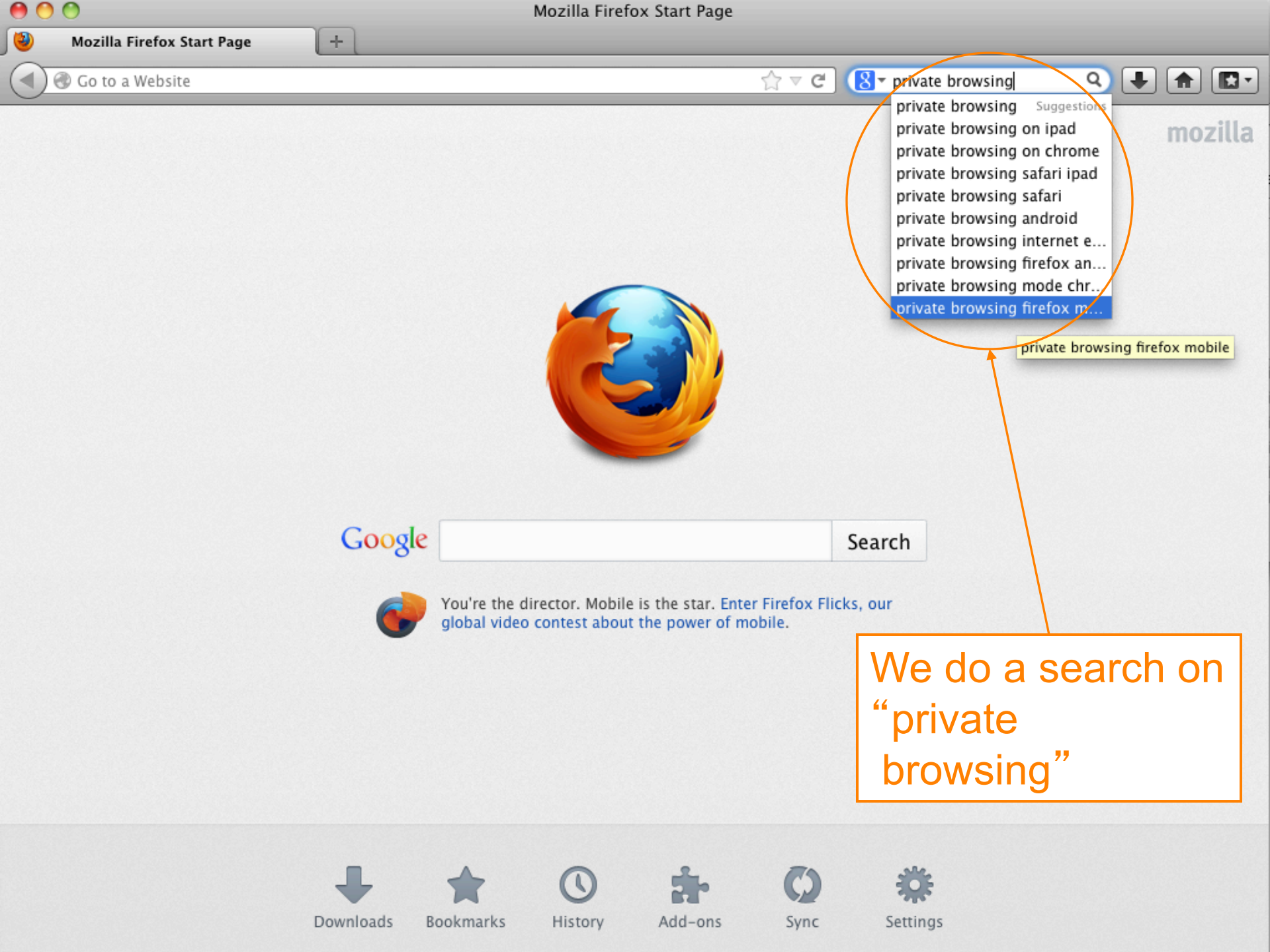
They also learn cookies!

They also learn cookies

Why is that harmful?


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
accounts.google.com
auth.berkeley.edu
cnn.com
facebook.com
google.com
markets.on.nytimes.com
nytimes.com
us.cnn.com
wt.o.nytimes.com
Name: <no cookie selected>
Content: <no cookie selected>
Host: <no cookie selected>
Path: <no cookie selected>
Send For: <no cookie selected>
Expires: <no cookie selected>
Remove Cookies
Remove All Cookies
Let's remove all of our cookies


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
Cool, no web site is tracking us …
Name: <no cookie selected>
Content: <no cookie selected>
Host: <no cookie selected>
Path: <no cookie selected>
Send For: <no cookie selected>
Expires: <no cookie selected>
Remove Cookies
Remove All Cookies


Mozilla Firefox Start Page
Mozilla Firefox Start Page
Go to a Website
private browsing
private browsing Suggestions
private browsing on ipad
private browsing on chrome
private browsing safari ipad
private browsing safari
private browsing android
private browsing internet e...
private browsing firefox an...
private browsing mode chr...
private browsing firefox m...
private browsing firefox mobile
mozilla
Google
Search
You're the director. Mobile is the star. Enter Firefox Flicks, our global video contest about the power of mobile.
We do a search on "private browsing"
Downloads
Bookmarks
History
Add-ons
Sync
Settings

About 30,800,000 results (0.15 seconds)

Private Browsing - Browse the web without saving information about ...
support.mozilla.org/.../**private-browsing**-browse-web-without-saving-inf...
When using a shared computer, **Private Browsing** is great for viewing websites without saving stuff like cookies, temp files and a history of the pages you visit.

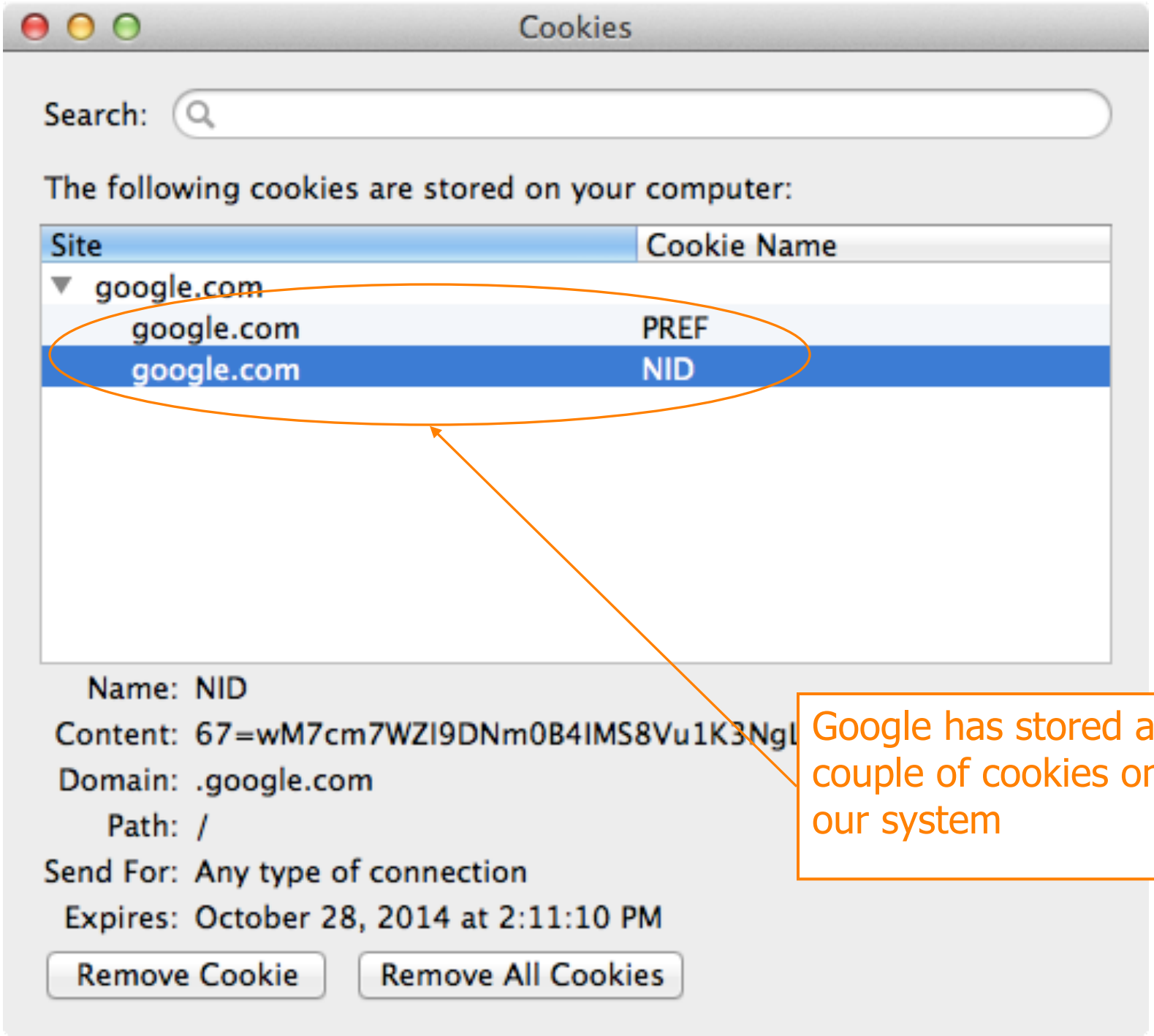
Firefox 20 Launches With Improved **Private Browsing**, New ...

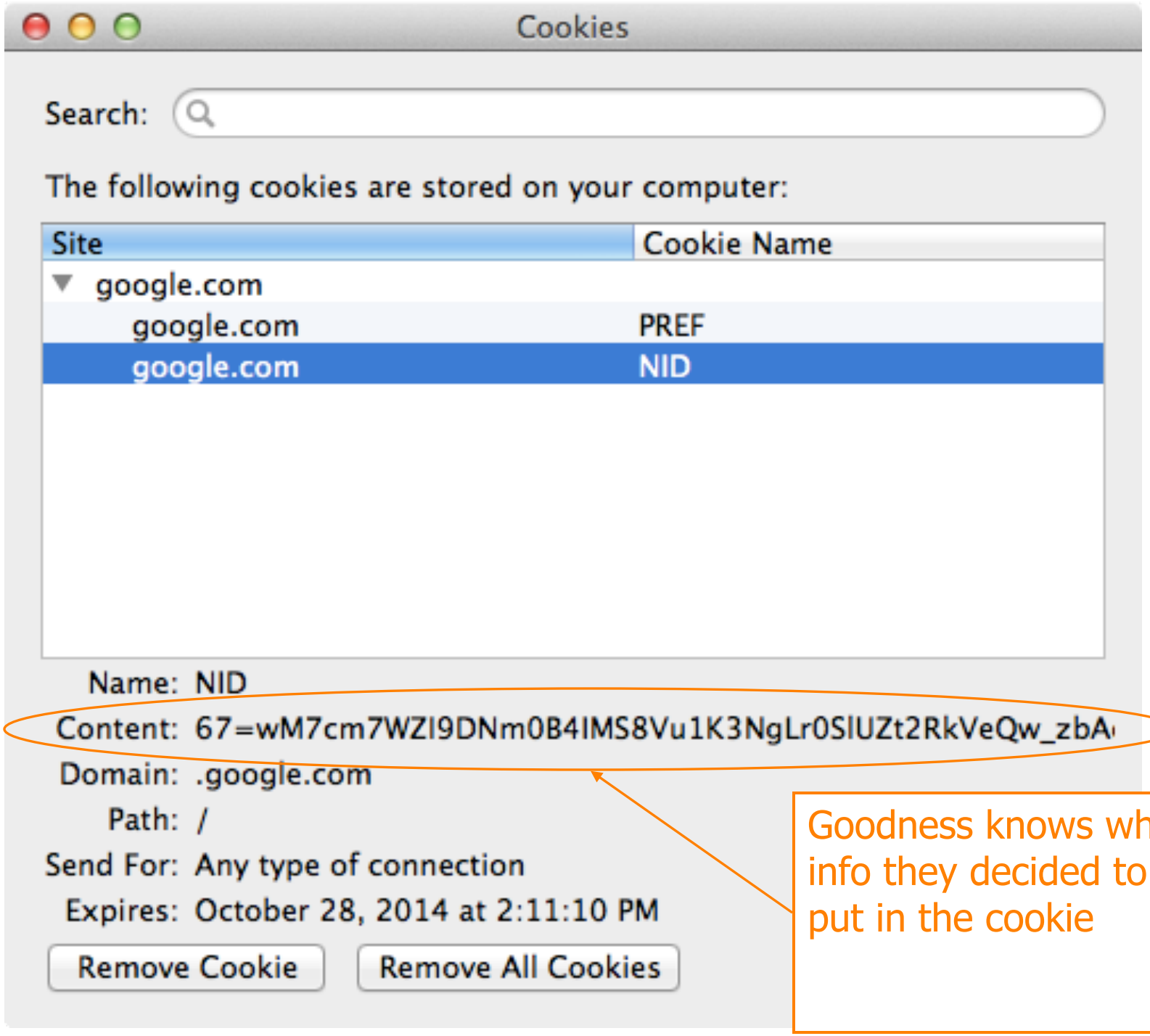
techcrunch.com/.../firefox-20-launches-with-per-tab-**private-bro**...
by Frederic Lardinois - in 18,052 Google+ circles
Apr 2, 2013 – Firefox 20 is now available for download. The emphasis of today's release is on Firefox's **private browsing** mode, which now allows Firefox ...

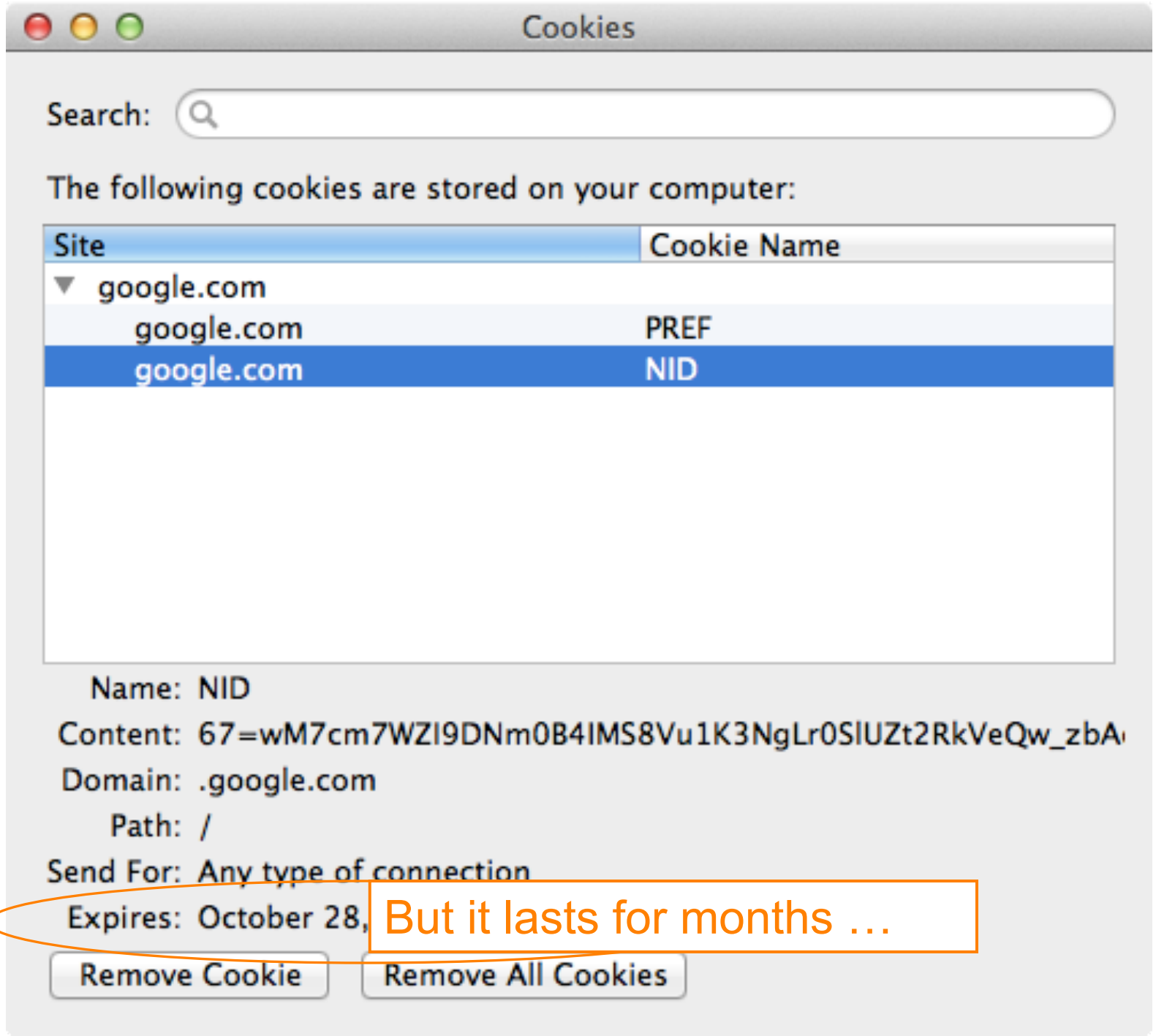
Privacy mode - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Privacy_mode
Internet Explorer 8 in InPrivate mode. Google Chrome in Incognito mode. Privacy mode or "**private browsing**", sometimes informally referred to as "porn mode", ...

Firefox 20 improves **private browsing**, fixes three critical flaws | ZDNet
www.zdnet.com/firefox-20-improves-**private-browsing**-fixes-three-critic...
Apr 3, 2013 – Mozilla has released the latest version of its Firefox web browser which features new enhancement to **private browsing** and fixes a number of ...

Private Browsing - Web Browsers - About.com
browsers.about.com › ... › Web Browsers › Web Browser Glossary › FAQs
The methods for activating **private browsing** mode differ across browsers, operating systems, and device types. These step-by-step tutorials teach you how to ...


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
Name: NID
Content: 67=wM7cm7WZI9DNm0B4IMS8Vu1K3Ngl
Domain: .google.com
Path: /
Send For: Any type of connection
Expires: October 28, 2014 at 2:11:10 PM
Remove Cookie
Remove All Cookies
Google has stored a couple of cookies on our system


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
Name: NID
Content: 67=wM7cm7WZI9DNm0B4IMS8Vu1K3NgLr0SlUZt2RkVeQw_zbA
Domain: .google.com
Path: /
Send For: Any type of connection
Expires: October 28, 2014 at 2:11:10 PM
Remove Cookie
Remove All Cookies
Goodness knows what info they decided to put in the cookie


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
Name: NID
Content: 67=wM7cm7WZI9DNm0B4IMS8Vu1K3NgLr0SlUZt2RkVeQw_zbA
Domain: .google.com
Path: /
Send For: Any type of connection
Expires: October 28,
But it lasts for months …
Remove Cookie
Remove All Cookies

Private browsing

You can turn on a mode called private browsing on your browser

What is this?
Does it protect you against tracking?

private browsing - Google Search

private browsing - Google Search

https://www.google.com/search?q=private+browsing&ie=utf-8&oe=utf-8&aq=t&rls=org.m

private browsing

+You Search Images Maps Play YouTube News Gmail Drive Calendar More

private browsing

Sign in

Web Images Maps Shopping Applications More Search tools

About 30,800,000 results (0.15 seconds)

Private Browsing - Browse the web without saving information about ...
support.mozilla.org/.../**private-browsing**-browse-web-without-saving-inf...
When using a shared computer, **Private Browsing** is great for viewing websites without saving stuff like cookies, temp files and a history of the pages you visit.

Firefox 20 Launches With Improved **Private Browsing**, New ...

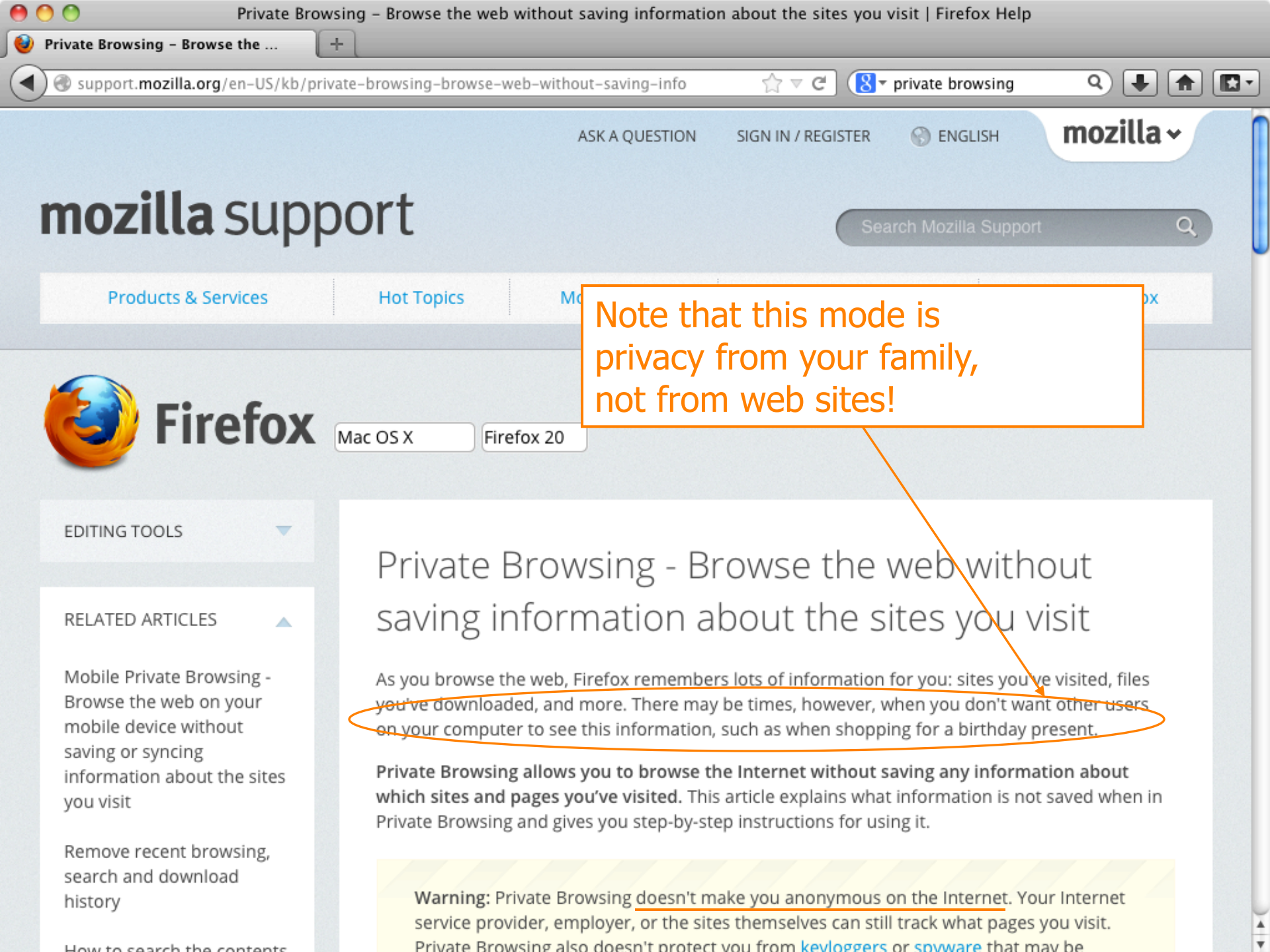
techcrunch.com/.../firefox-20-launches-with-per-tab-**private-bro**...
by Frederic Lardinois - in 18,052 Google+ circles
Apr 2, 2013 – Firefox 20 is now available for download. The emphasis of today's release is on Firefox's **private browsing** mode, which now allows Firefox ...

Privacy mode - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Privacy_mode
Internet Explorer 8 in InPrivate mode. Google Chrome in Incognito mode. Privacy mode or "**private browsing**", sometimes informally referred to as "porn mode", ...

Firefox 20 improves **private browsing**, fixes three critical flaws | ZDNet
www.zdnet.com/firefox-20-improves-**private-browsing**-fixes-three-critic...
Apr 3, 2013 – Mozilla has released the latest version of its Firefox web browser which features new enhancement to **private browsing** and fixes a number of ...

Private Browsing - Web Browsers - About.com
browsers.about.com › ... › Web Browsers › Web Browser Glossary › FAQs
The methods for activating **private browsing** mode differ across browsers, operating systems, and device types. These step-by-step tutorials teach you how to ...

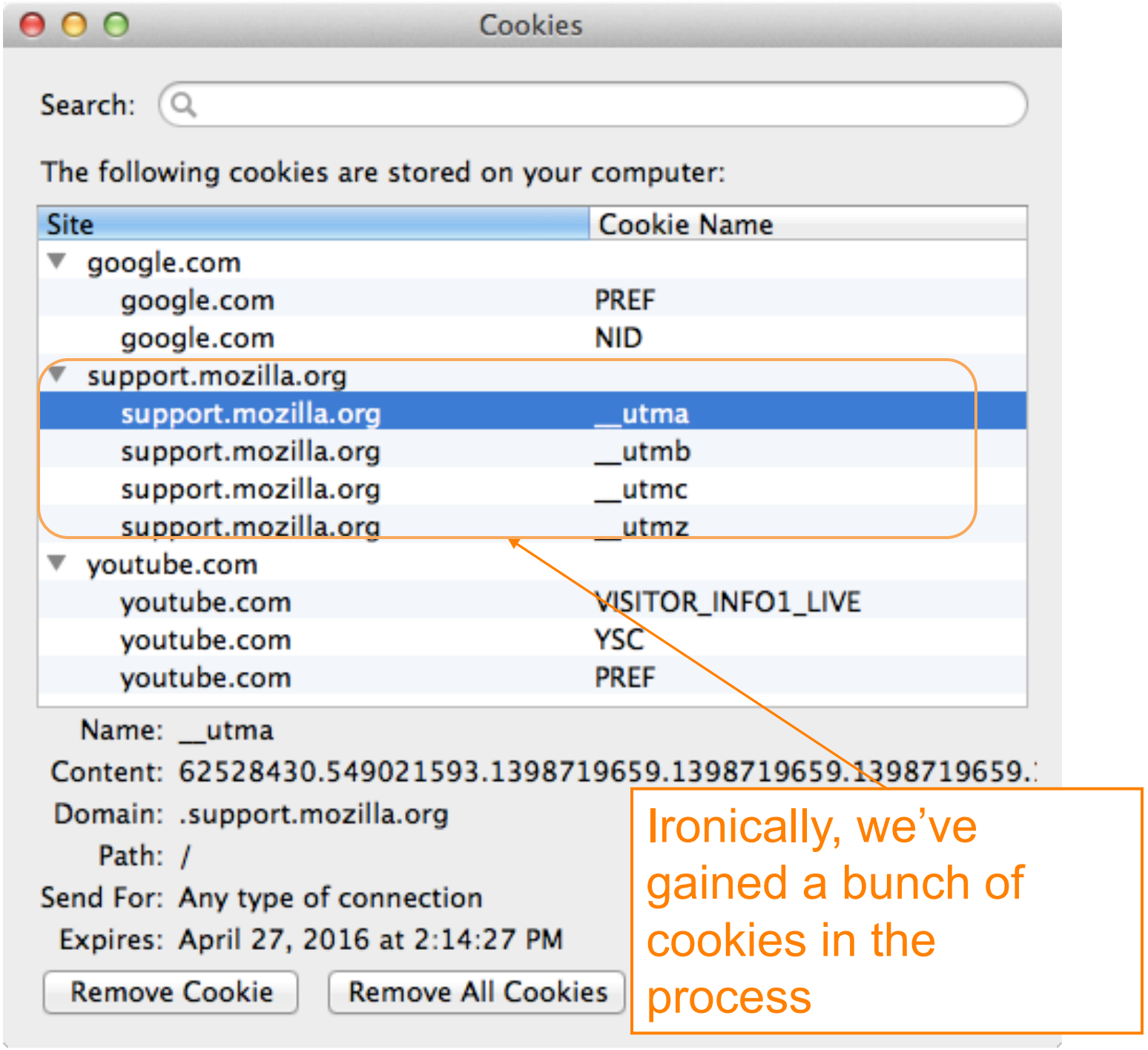
We click on the top result

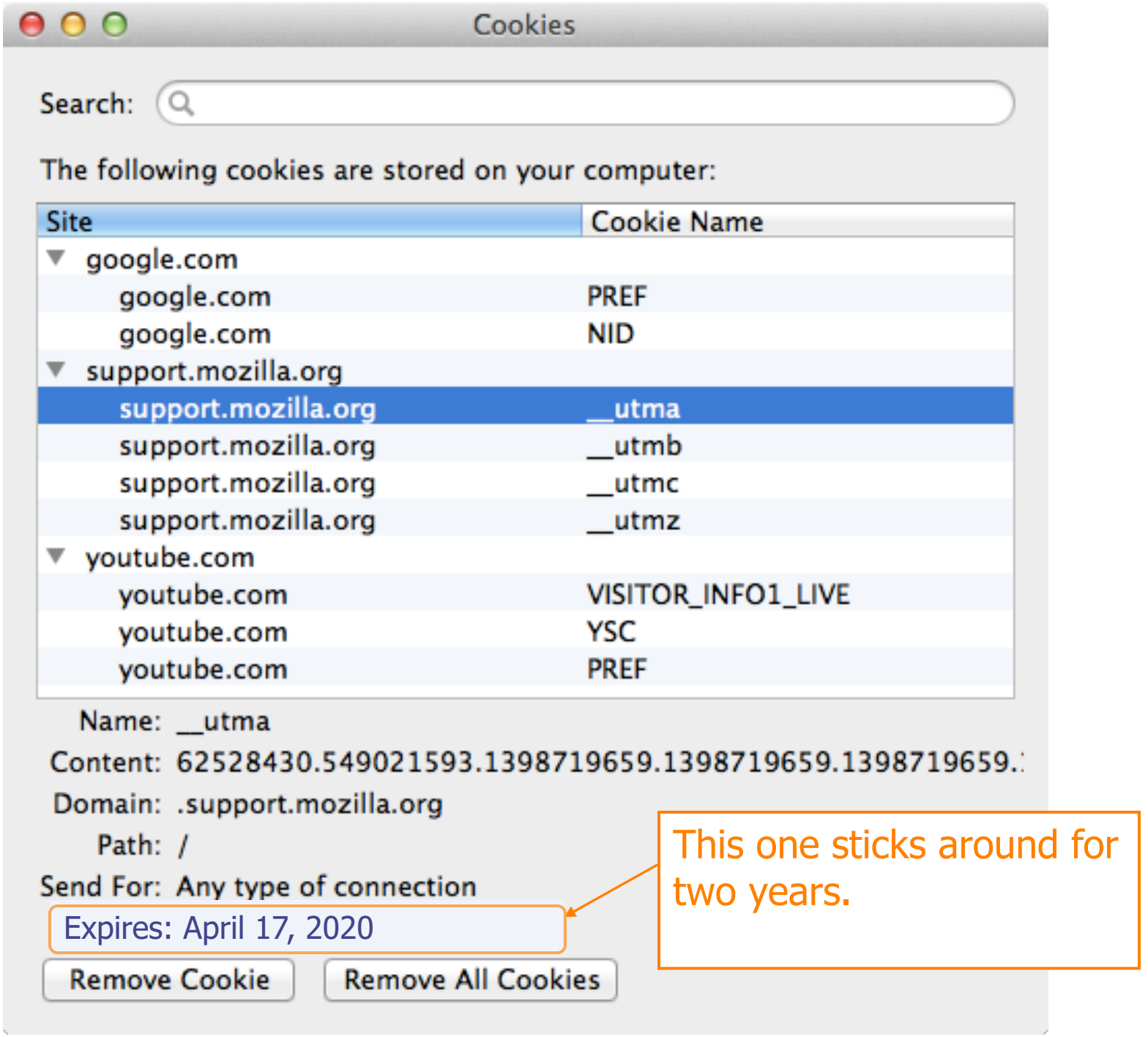

Private Browsing – Browse the web without saving information about the sites you visit | Firefox Help
Private Browsing – Browse the ...
support.mozilla.org/en-US/kb/private-browsing-browse-web-without-saving-info
private browsing
ASK A QUESTION
SIGN IN / REGISTER
ENGLISH
mozilla
mozilla support
Search Mozilla Support
Products & Services
Hot Topics
Firefox
Mac OS X
Firefox 20
Note that this mode is privacy from your family, not from web sites!
EDITING TOOLS
RELATED ARTICLES
Mobile Private Browsing - Browse the web on your mobile device without saving or syncing information about the sites you visit
Remove recent browsing, search and download history
Private Browsing - Browse the web without saving information about the sites you visit
As you browse the web, Firefox remembers lots of information for you: sites you've visited, files you've downloaded, and more. There may be times, however, when you don't want other users on your computer to see this information, such as when shopping for a birthday present.
Private Browsing allows you to browse the Internet without saving any information about which sites and pages you've visited. This article explains what information is not saved when in Private Browsing and gives you step-by-step instructions for using it.
Warning: Private Browsing doesn't make you anonymous on the Internet. Your Internet service provider, employer, or the sites themselves can still track what pages you visit. Private Browsing also doesn't protect you from keyloggers or spyware that may be

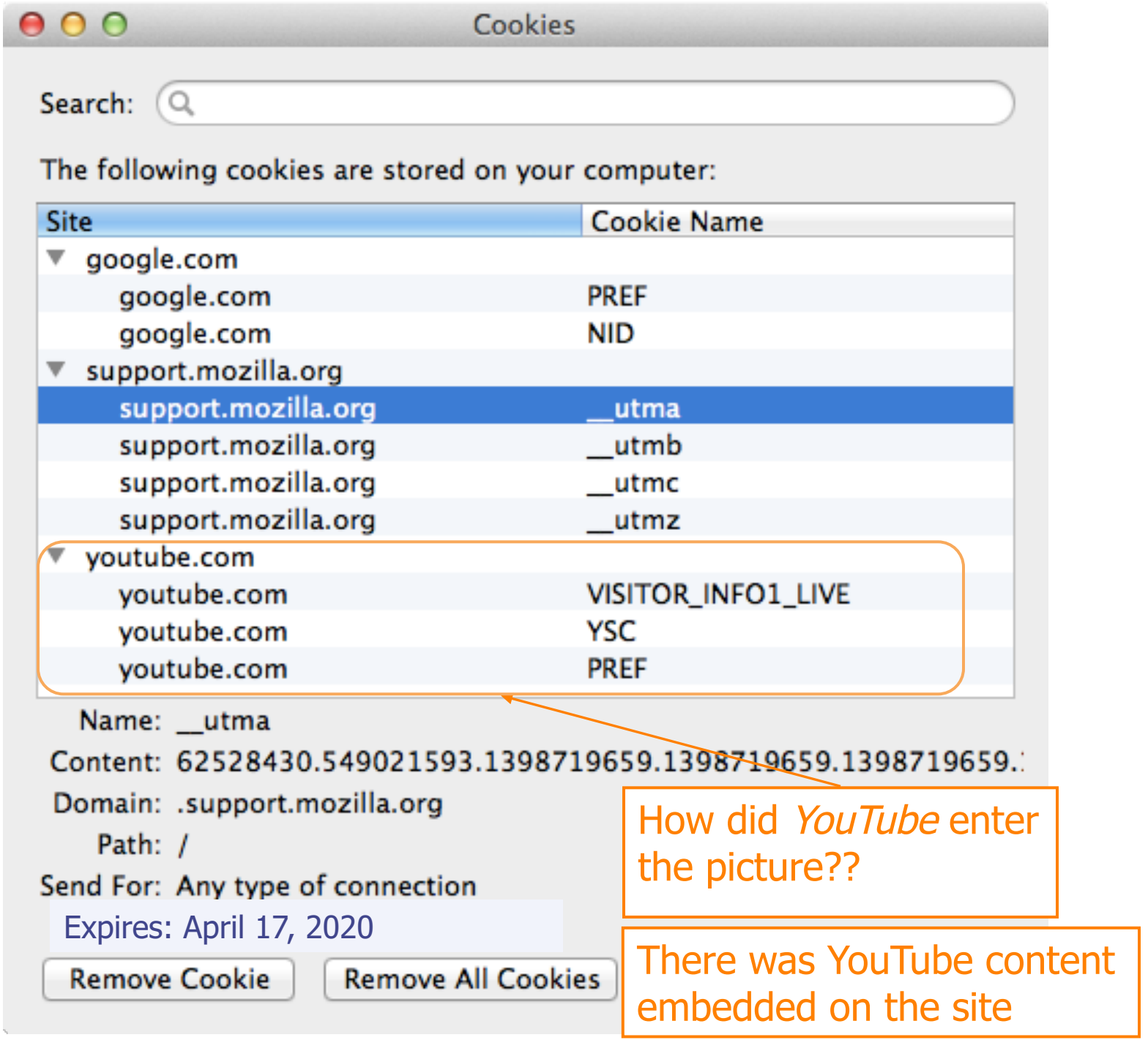
Private browsing

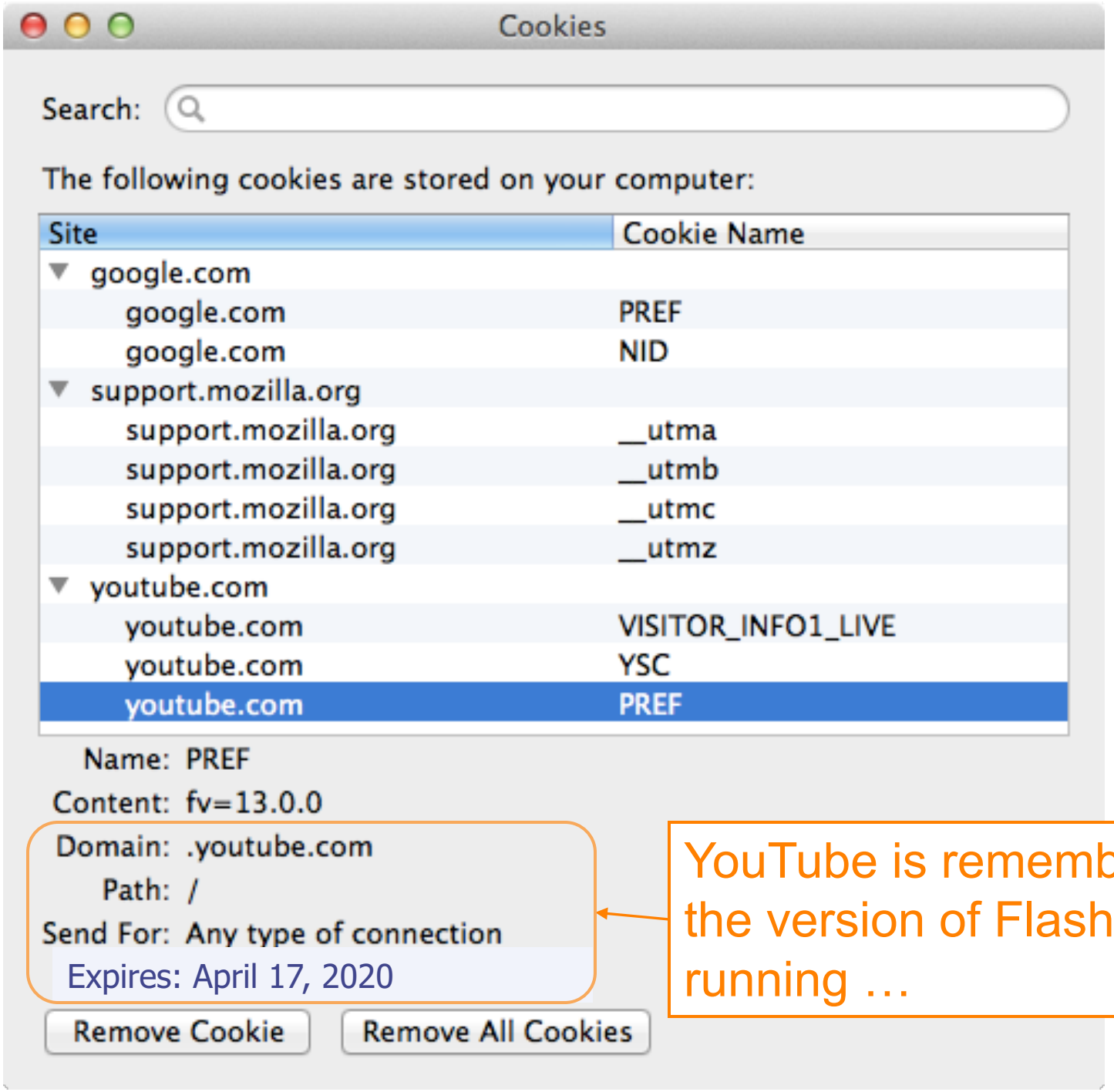
"Private Browsing allows you to browse the Internet without saving any information about which sites and pages you've visited."

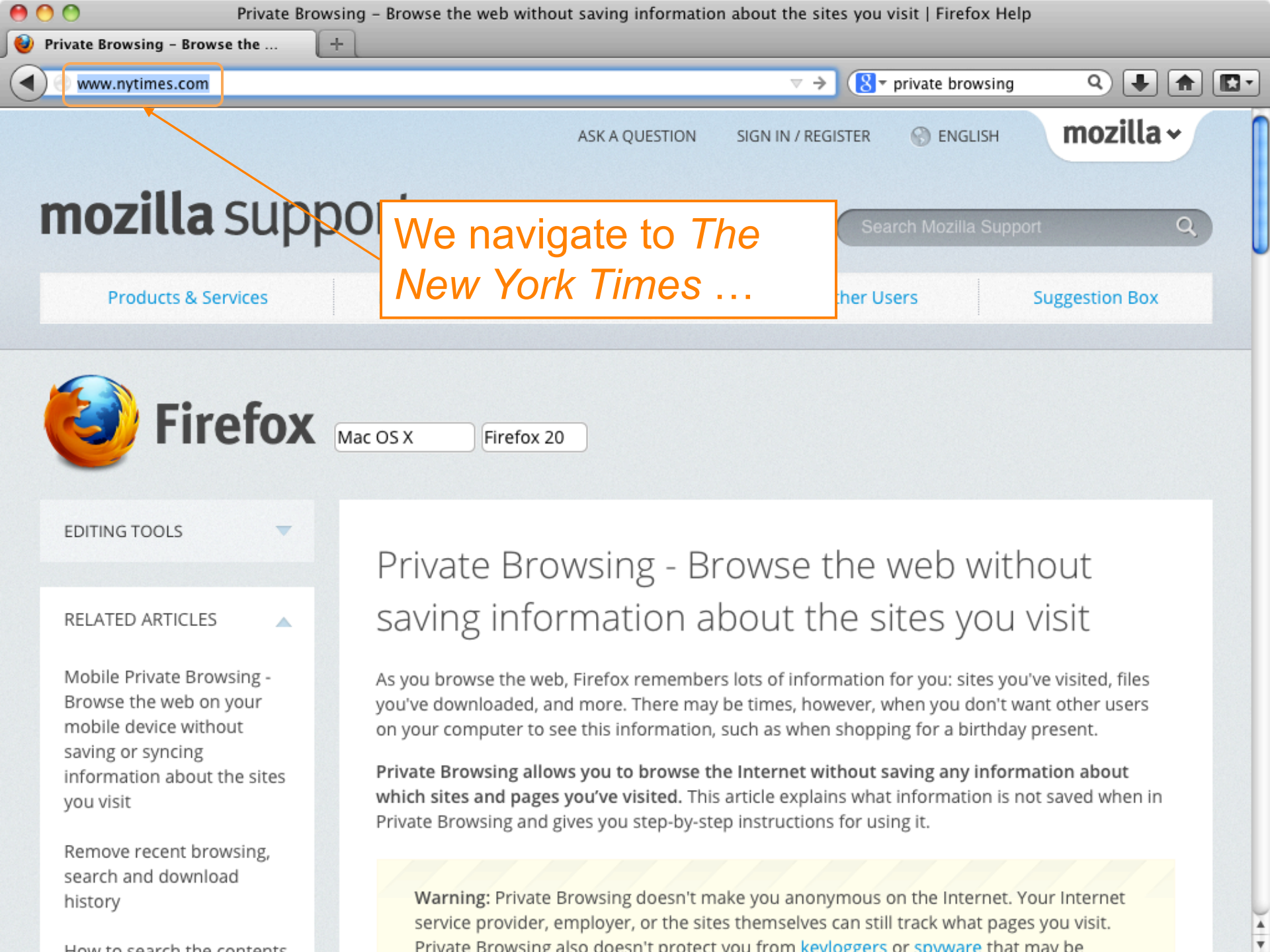
- deletes history of URL visits, passwords, cookies too
- Private Browsing maintains cookies for as long as the private browsing window is open. Once you quit the browser, it gets deleted
  - So still tracked for a good while!


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
support.mozilla.org
support.mozilla.org
__utma
support.mozilla.org
__utmb
support.mozilla.org
__utmc
support.mozilla.org
__utmz
youtube.com
youtube.com
VISITOR_INFO1_LIVE
youtube.com
YSC
youtube.com
PREF
Name: __utma
Content: 62528430.549021593.1398719659.1398719659.1398719659.
Domain: .support.mozilla.org
Path: /
Send For: Any type of connection
Expires: April 27, 2016 at 2:14:27 PM
Remove Cookie
Remove All Cookies
Ironically, we've gained a bunch of cookies in the process


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
support.mozilla.org
support.mozilla.org
__utma
support.mozilla.org
__utmb
support.mozilla.org
__utmc
support.mozilla.org
__utmz
youtube.com
youtube.com
VISITOR_INFO1_LIVE
youtube.com
YSC
youtube.com
PREF
Name: __utma
Content: 62528430.549021593.1398719659.1398719659.1398719659.
Domain: .support.mozilla.org
Path: /
Send For: Any type of connection
Expires: April 17, 2020
Remove Cookie
Remove All Cookies
This one sticks around for two years.


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
support.mozilla.org
support.mozilla.org
__utma
support.mozilla.org
__utmb
support.mozilla.org
__utmc
support.mozilla.org
__utmz
youtube.com
youtube.com
VISITOR_INFO1_LIVE
youtube.com
YSC
youtube.com
PREF
Name: __utma
Content: 62528430.549021593.1398719659.1398719659.1398719659.
Domain: .support.mozilla.org
Path: /
Send For: Any type of connection
Expires: April 17, 2020
Remove Cookie
Remove All Cookies
How did *YouTube* enter the picture??
There was YouTube content embedded on the site


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
support.mozilla.org
support.mozilla.org
__utma
support.mozilla.org
__utmb
support.mozilla.org
__utmc
support.mozilla.org
__utmz
youtube.com
youtube.com
VISITOR_INFO1_LIVE
youtube.com
YSC
youtube.com
PREF
Name: PREF
Content: fv=13.0.0
Domain: .youtube.com
Path: /
Send For: Any type of connection
Expires: April 17, 2020
Remove Cookie
Remove All Cookies
YouTube is remembering the version of Flash I'm running …


Private Browsing – Browse the web without saving information about the sites you visit | Firefox Help
Private Browsing – Browse the ...
www.nytimes.com
private browsing
ASK A QUESTION
SIGN IN / REGISTER
ENGLISH
mozilla
mozilla suppo
We navigate to *The New York Times* …
Search Mozilla Support
Products & Services
ther Users
Suggestion Box
Firefox
Mac OS X
Firefox 20
EDITING TOOLS
RELATED ARTICLES
Mobile Private Browsing - Browse the web on your mobile device without saving or syncing information about the sites you visit
Remove recent browsing, search and download history
Private Browsing - Browse the web without saving information about the sites you visit
As you browse the web, Firefox remembers lots of information for you: sites you've visited, files you've downloaded, and more. There may be times, however, when you don't want other users on your computer to see this information, such as when shopping for a birthday present.
Private Browsing allows you to browse the Internet without saving any information about which sites and pages you've visited. This article explains what information is not saved when in Private Browsing and gives you step-by-step instructions for using it.
Warning: Private Browsing doesn't make you anonymous on the Internet. Your Internet service provider, employer, or the sites themselves can still track what pages you visit. Private Browsing also doesn't protect you from keyloggers or spyware that may be

The New York Times

U.S. Announces More Sanctions Against Russia Over Ukraine

By PETER BAKER and MARK LANDLER

The United States ordered travel bans and asset freezes for seven Russian officials, including two said to be in President Vladimir V. Putin's inner circle, and froze assets for 17 firms.

284 Comments

- **Mayor of Eastern Ukraine City Is Shot**
- **Putin Rival Takes Message to East Ukraine**

TimesMinute

Mohamed Abd El Ghany/Reuters

Egypt Sentences More Than 680 to Death

The Muslim Brotherhood's spiritual leader and hundreds of others were sentenced on charges of inciting or committing violence. Supporters, above, reacted to the verdict Monday.

130 Comments

Chernobyl: Capping a

The Opinion Pages

EDITORIAL

Political Executions in Egypt

It is clear from the sentencing of 680 people to death in a mass trial that the country's judges have become a government tool.

- **Editorial: Smartphones and the 4th Amendment**
- **Krugman: High Plains Moochers**

THE STONE

What Does Buddhism Require?

The reality of rebirth may not be necessary. But believing in it probably is.

- **Gessen: Salon of the Exiled**
- **Op-Ed: The Wire Next Time**
- **Op-Docs | 'Verbatim: What Is a Photocopier?'**

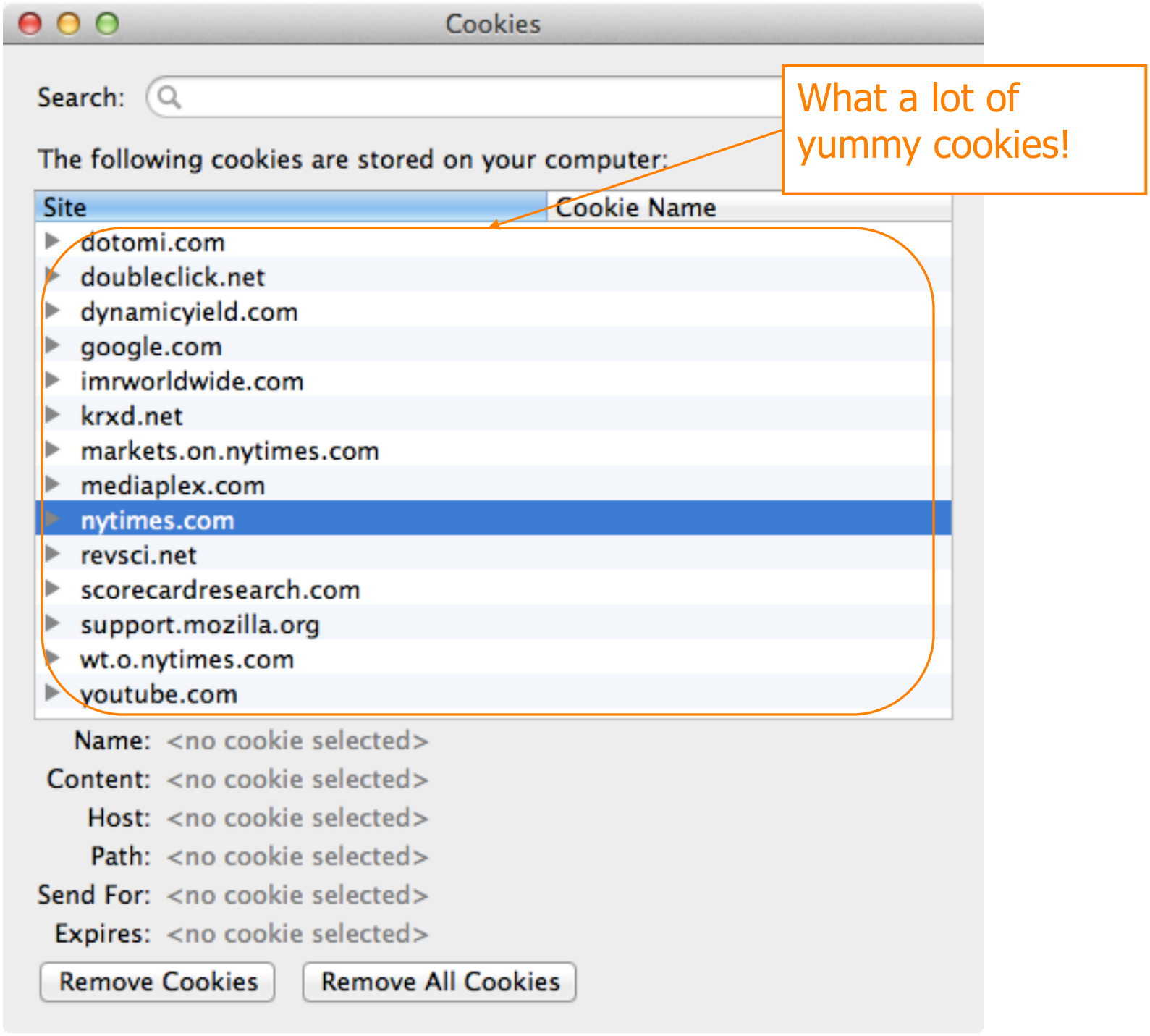
Today's Times Insider

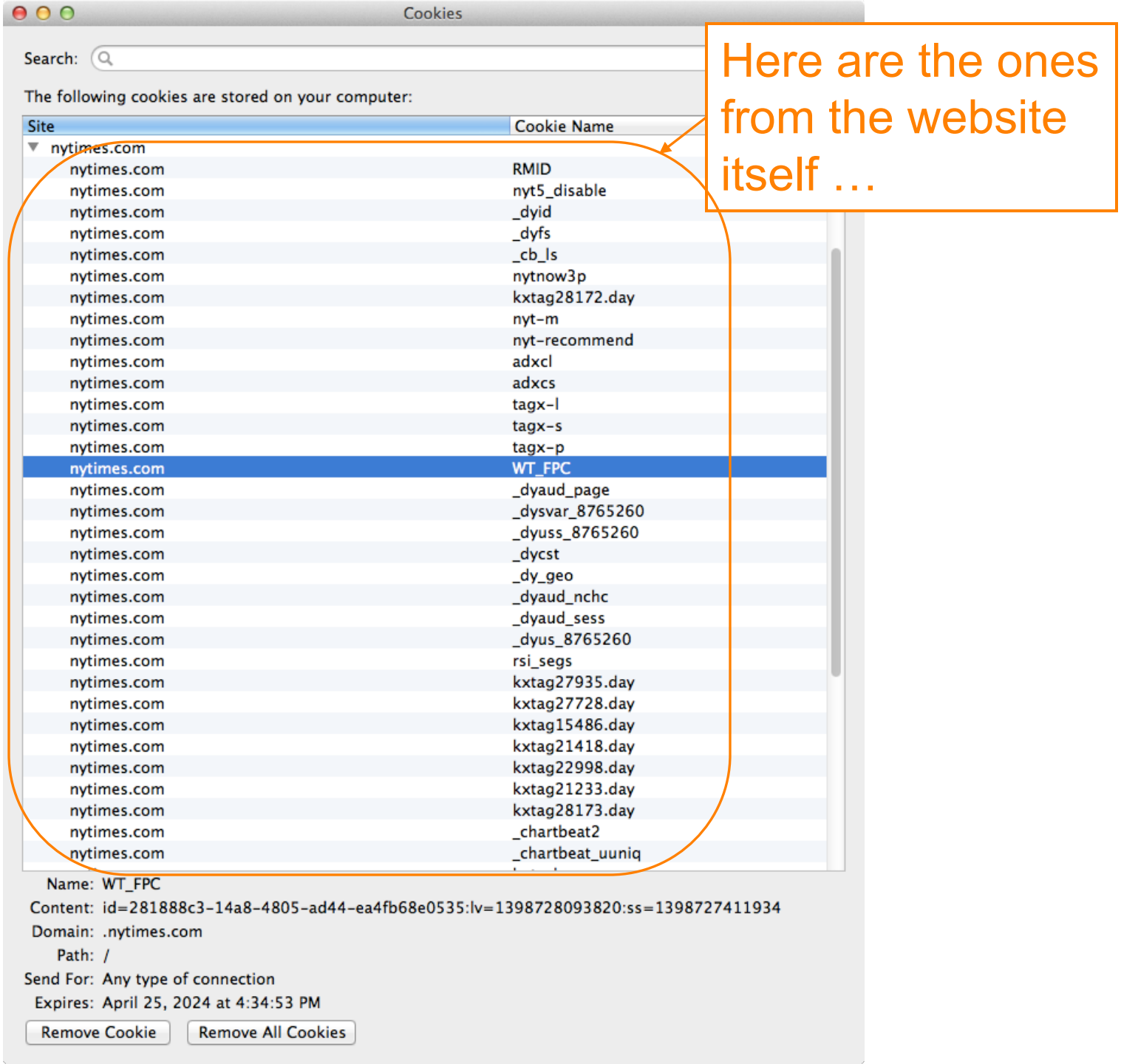
Behind the scenes of The New York Times

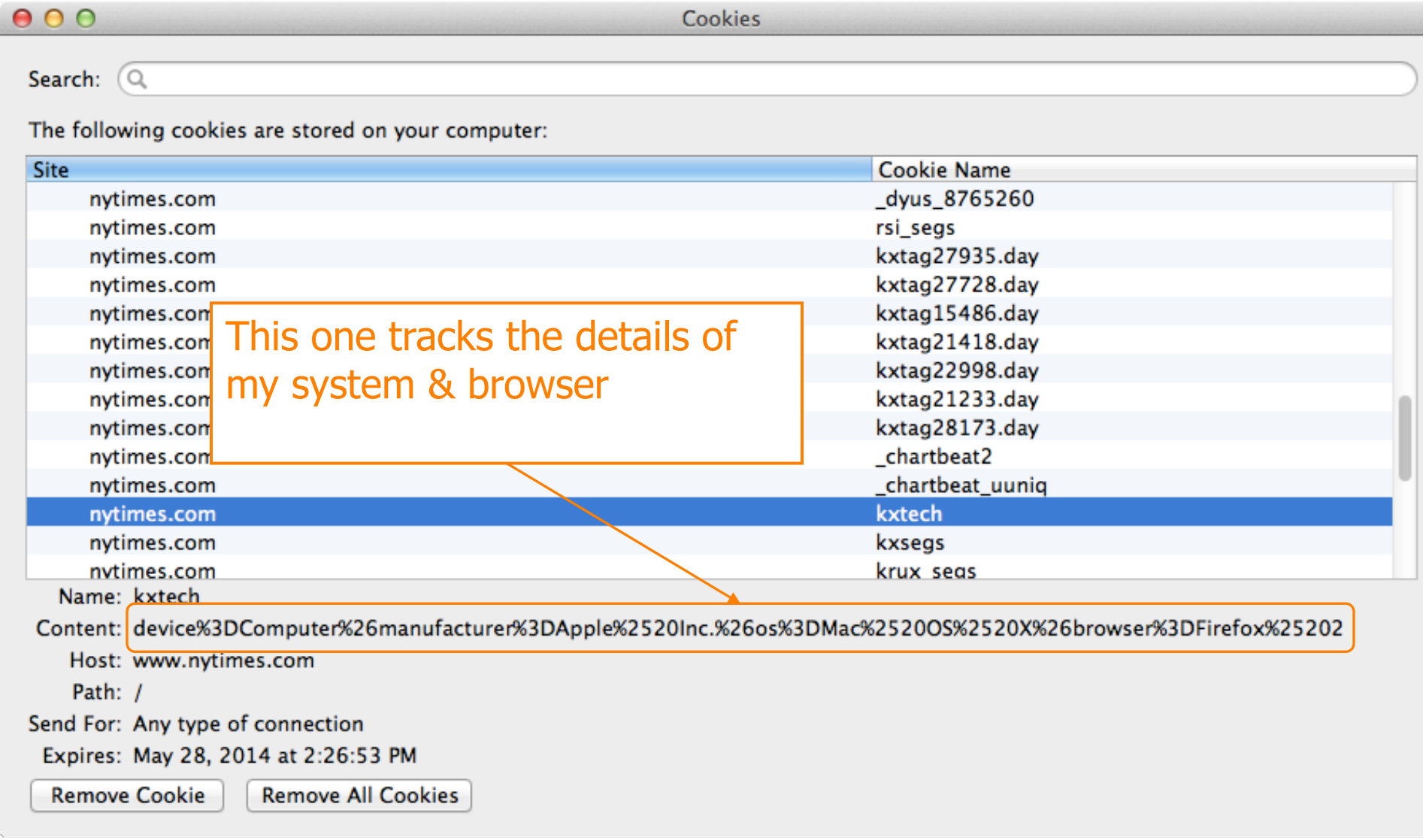
- **Thinking of Wine as Food With Eric Asimov**
- **Introducing Times Insider**

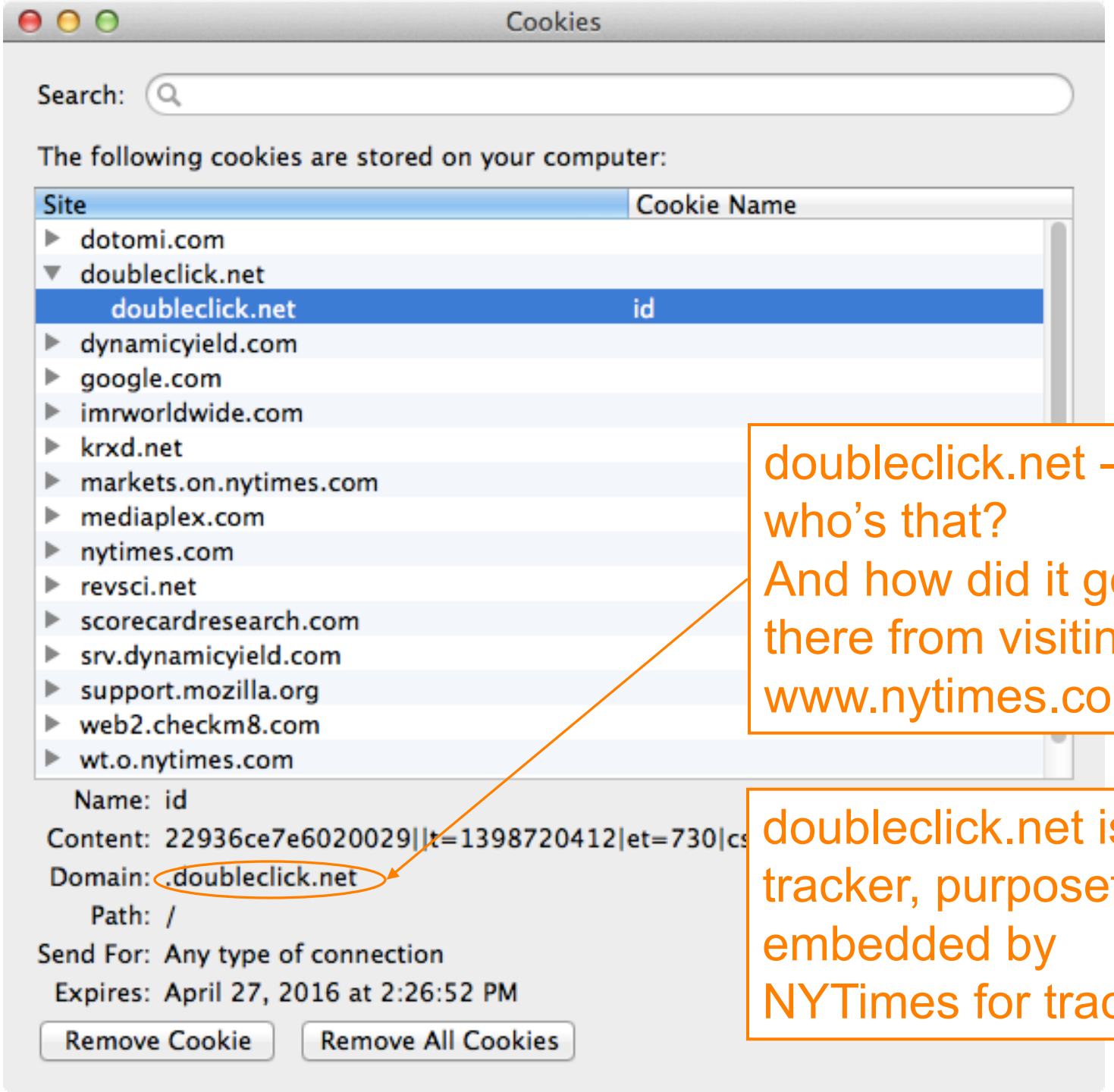
MARKETS » At close 04/28/2014

S.&P. 500 Dow Nasdaq


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
dotomi.com
doubleclick.net
dynamicyield.com
google.com
imrworldwide.com
krxd.net
markets.on.nytimes.com
mediaplex.com
nytimes.com
revsci.net
scorecardresearch.com
support.mozilla.org
wt.o.nytimes.com
youtube.com
Name: <no cookie selected>
Content: <no cookie selected>
Host: <no cookie selected>
Path: <no cookie selected>
Send For: <no cookie selected>
Expires: <no cookie selected>
Remove Cookies
Remove All Cookies
What a lot of yummy cookies!


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
nytimes.com
nytimes.com RMID
nytimes.com nyt5_disable
nytimes.com _dyid
nytimes.com _dyfs
nytimes.com _cb_ls
nytimes.com nytnow3p
nytimes.com kxtag28172.day
nytimes.com nyt-m
nytimes.com nyt-recommend
nytimes.com adxcl
nytimes.com adxcs
nytimes.com tagx-l
nytimes.com tagx-s
nytimes.com tagx-p
nytimes.com WT_FPC
nytimes.com _dyaud_page
nytimes.com _dysvar_8765260
nytimes.com _dyuss_8765260
nytimes.com _dycst
nytimes.com _dy_geo
nytimes.com _dyaud_nchc
nytimes.com _dyaud_sess
nytimes.com _dyus_8765260
nytimes.com rsi_segs
nytimes.com kxtag27935.day
nytimes.com kxtag27728.day
nytimes.com kxtag15486.day
nytimes.com kxtag21418.day
nytimes.com kxtag22998.day
nytimes.com kxtag21233.day
nytimes.com kxtag28173.day
nytimes.com _chartbeat2
nytimes.com _chartbeat_uuniq
Name: WT_FPC
Content: id=281888c3-14a8-4805-ad44-ea4fb68e0535:lv=1398728093820:ss=1398727411934
Domain: .nytimes.com
Path: /
Send For: Any type of connection
Expires: April 25, 2024 at 4:34:53 PM
Remove Cookie
Remove All Cookies
Here are the ones from the website itself …


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
nytimes.com
_dyus_8765260
nytimes.com
rsi_segs
nytimes.com
kxtag27935.day
nytimes.com
kxtag27728.day
nytimes.com
kxtag15486.day
nytimes.com
kxtag21418.day
nytimes.com
kxtag22998.day
nytimes.com
kxtag21233.day
nytimes.com
kxtag28173.day
nytimes.com
_chartbeat2
nytimes.com
_chartbeat_uuniq
nytimes.com
kxtech
nytimes.com
kxsegs
nytimes.com
krux_segs
This one tracks the details of my system & browser
Name: kxtech
Content: device%3DComputer%26manufacturer%3DApple%2520Inc.%26os%3DMac%2520OS%2520X%26browser%3DFirefox%25202
Host: www.nytimes.com
Path: /
Send For: Any type of connection
Expires: May 28, 2014 at 2:26:53 PM
Remove Cookie
Remove All Cookies

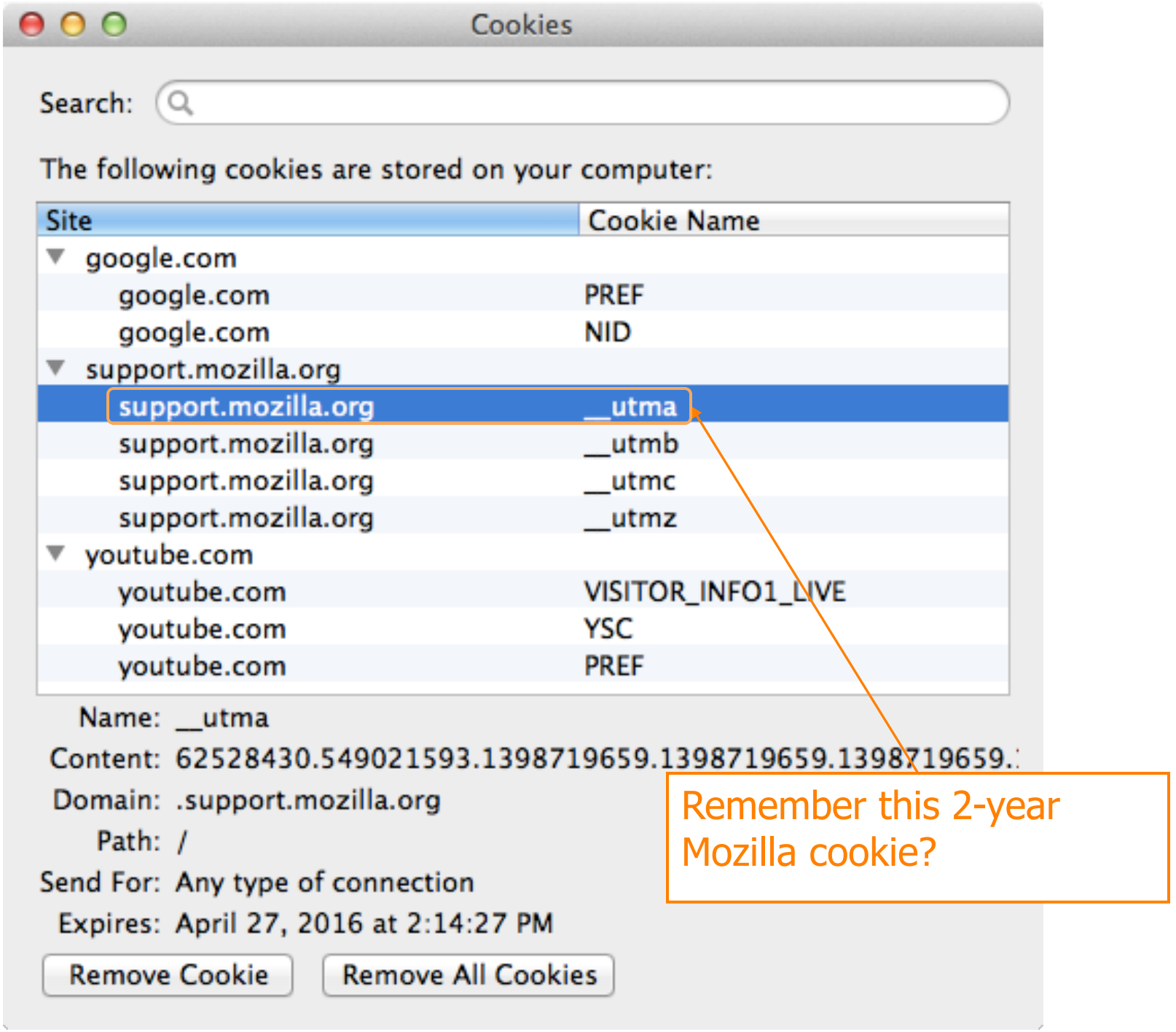

Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
dotomi.com
doubleclick.net
doubleclick.net
id
dynamicyield.com
google.com
imrworldwide.com
krxd.net
markets.on.nytimes.com
mediaplex.com
nytimes.com
revsci.net
scorecardresearch.com
srv.dynamicyield.com
support.mozilla.org
web2.checkm8.com
wt.o.nytimes.com
Name: id
Content: 22936ce7e6020029|t=1398720412|et=730|cs
Domain: .doubleclick.net
Path: /
Send For: Any type of connection
Expires: April 27, 2016 at 2:26:52 PM
Remove Cookie
Remove All Cookies
doubleclick.net - who's that?
And how did it get there from visiting www.nytimes.com?
doubleclick.net is a tracker, purposefully embedded by NYTimes for tracking

Third-Party Cookies

- How can a web site enable a third party to plant cookies in your browser & later retrieve them?
  - Include on the site's page (for example):
    - `<img src="http://doubleclick.net/ad.gif" width=1 height=1>`
- Why would a site do that?
  - Site has a business relationship w/ DoubleClick *
- Why can this track you?
  - Now DoubleClick sees all of your activity that involves their web sites
  - Because your browser dutifully sends them their cookies for any web page that has that img
  - Identifier in cookie ties together activity as = YOU

* Owned by Google, by the way

Moral: you can be tracked by a site even if you do not visit that site


Cookies
Search:
The following cookies are stored on your computer:
Site
Cookie Name
google.com
google.com
PREF
google.com
NID
support.mozilla.org
support.mozilla.org
__utma
support.mozilla.org
__utmb
support.mozilla.org
__utmc
support.mozilla.org
__utmz
youtube.com
youtube.com
VISITOR_INFO1_LIVE
youtube.com
YSC
youtube.com
PREF
Name: __utma
Content: 62528430.549021593.1398719659.1398719659.1398719659.
Domain: .support.mozilla.org
Path: /
Send For: Any type of connection
Expires: April 27, 2016 at 2:14:27 PM
Remove Cookie
Remove All Cookies
Remember this 2-year Mozilla cookie?

Google Analytics

- Any web site can (anonymously) register with Google to instrument their site for *analytics*
  - Gather information about who visits, what they do when they visit
- To do so, site adds a small Javascript snippet that loads http://www.google-analytics.com/ga.js
  - You can see sites that do this because they introduce a "`__utma`" cookie
- Code ships off to Google information associated with your visit to the web site
  - Shipped by fetching a GIF w/ values encoded in URL
  - Web site can use it to analyze their ad "campaigns"
  - Not a small amount of info …

http://www.google-analytics.com/__utm.gif?utmwv=4.9.1&utmn=408493431&utmhn=www.sidereel.com&utme=8(userType)9(LoggedOut)11(2)&utmcs=UTF-8&utmsr=1680x1050&utmsc=24-bit&utmul=en-us&utmje=1&utmfl=10.2 r153&utmdt=Watch Online | American Idol Episodes - American Idol ep 23 - via videobb.com - SideReel&utmhid=72439433&utmr=0&utmp=/American_Idol/season-10/episode-23/links/6541441&utmac=UA-1471387-3&utmcc=__utma=108050432.2066052302.1287459230.1291684208.1291691628.9;+__utmz=108050432.1287459230.1.1.utmcsr=(direct)|utmccn=(direct)|utmcmd=(none);&utmu=QqAAE

http://pubads.g.doubleclick.net/gampad/ads?correlator=1291905478049&output=json_html&callback=GA_googleSetAdContentsBySlotForSync&impl=s&client=ca-pub-7758644218383495&slotname=wlv_728x90_atf&page_slots=wlv_728x90_atf&cust_params=title=American%20Idol&state=loggedout&noautoplay=&cookie=ID=75911ff51976ad00:T=1287459230:S=ALNI_ZMQH1Jqg7Of_neADngl5OGa4VbuCg&url=http://www.sidereel.com/American_Idol/season-10/episode-23/links/6541441&ref=http://www.sidereel.com/American_Idol/season-10/episode-23/search&lmt=1291905477&dt=1291905478069&cc=100&biw=830&bih=772&ifi=1&adk=1569465027&u_tz=-420&u_his=5&u_java=true&u_h=1050&u_w=1680&u_ah=1000&u_aw=1680&u_cd=24&u_nplug=10&u_nmime=88&flash=10.2.153&gads=v2&ga_vid=2067052302.1287459230&ga_sid=1291691698&ga_hid=72439433&ga_fc=true

http://googleads.g.doubleclick.net/pagead/adview?ai=B2b9cRoCZTfuHCtDaqQGpkZXqC_mq7IgCmdXb2CWBvtvXQwAQARgBIMe9rBc4AGDJltGGyKOgGbIBEHd3dy5zaWRlcmVlbC5jb226AQk3Mjh40TBfYXPIAQnaAUhodHRwOi8vd3d3LnNpZGVyZWVsLmNvbS9BbWVyaWNhbl9JZG9sL3NlYXNvbi0xMC9lcGlzb2RlLTIzL2xpbmtzLzY1NDE0NDGYAoAKuAIYwAIByALhm54b4AIA6gIKNDI4NTU5MjM0OJADrAKYA6wCqAMB6AOjCegDmQjoA-YC9QMAAABE4AQB&sigh=1xAuEwn3fOw

Values Reportable via Google Analytics

Affiliation
Billing City
Billing Country
Billing Region
Browser Lang.
Complete URL
Cookie Values
Current Page
Event Tracking
Flash Version
Grand Total
Host Name
Java-enabled
Language Encoding
Order ID
Page Title
Product Code
Product Name
Profile Number
Repeat Campaign Visit
Quantity
Screen Color Depth
Screen Resolution
Shipping Cost
Special Event
Start Campaign Sess.
Tax
Tracking Code Version
Unique GIF ID
Unit Price
User Defined Var
Variations on an Item

Still More Tracking Techniques …

- Any scenario where browsers execute programs that manage persistent state can support tracking by cookies
  - Such as …. *Flash ?*

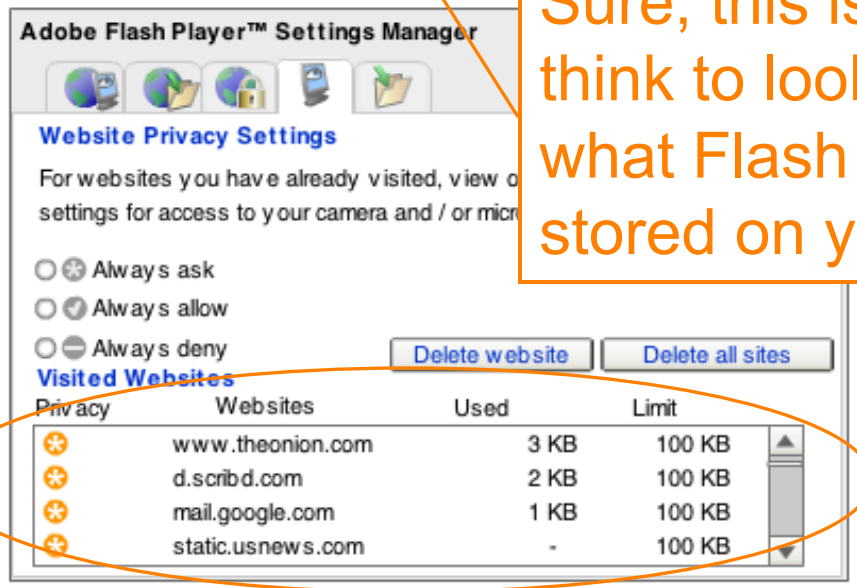
http://www.macromedia.com/support/documentation/en/flashplayer/help/settings_manager06.html

Home / Support / Documentation / Flash Player Documentation /

Flash Player Help

Website Privacy Settings panel

TABLE OF CONTENTS



Sure, this is where you'd think to look to analyze what Flash cookies are stored on your machine

Note: The Settings Manager that you see above is not an image; it is the actual Settings Manager. Click the tabs to see different panels, and click the options in the panels to change your Adobe Flash Player settings.

The list of websites above is stored on your computer o
or change your privacy settings or local storage settings
to this list, or to any of the information that the websites
your computer.

Use this panel to specify privacy settings for any of the
requested permission to use your camera or microphone or to store information on your computer.

My browser had Flash cookies from 67 sites!

Some Flash cookies "respawn" regular browser cookies that you previously deleted!

Internet Explorer bug lets hacker control your PC – Apr. 28, 2014

Internet Explorer bug lets hack...

money.cnn.com/2014/04/28/technology/security/i

facebook "recor

Internet Explorer bug lets hacker control your PC

CNNMoney

By Jose Pagliery @Jose_Pagliery April 28, 2014: 2:27 PM ET

Recommend 4.3k

PHOTO: ANDREW HARRER/BLOOMBERG VIA GETTY

A new bug in Internet Explorer allows hackers to commandeer your computer.

Facebook "Like" button (an IFRAME hosted on facebook.com)

4K TOTAL SHARES

2K	455	206	1K

NEW YORK (CNNMoney)

If you're using Internet Explorer and click on the wrong link, a hacker could hijack your computer.

What does Facebook learn?

- Many pages include a Facebook "Like" button.
- What are the implications, for user tracking?

- Facebook can track you on every site that you visit that embeds such a button, not only when you are actually visit Facebook

From Facebook:

What information does Facebook get when I visit a site with the Like button?

If you're logged into Facebook and visit a website with the **Like** button, your browser sends us information about your visit. Since the **Like** button is a little piece of Facebook embedded on another website, the browser is sending info about the request to load Facebook content on that page.

We record some of this info to help show you a personalized experience on that site and to improve our products. For example, when you go to a website with a **Like** button, we need to know who you are in order to show you what your Facebook friends have liked on that site. The data we receive includes your user ID, the website you're visiting, the date and time and other browser-related info.

Tracking – So What?

- Cookies form the core of how Internet advertising works today
  - Without them, arguably you'd have to pay for content up front a lot more
    - (and payment would mean you'd lose anonymity anyway)
  - A "better ad experience" is not necessarily bad
    - Ads that reflect your interests; not seeing repeated ads
- But: ease of gathering so much data so easily ⇒ concern of losing control how it's used
  - Privacy concerns
  - Large amounts of private data in one place

BIG TECH BACKLASH • 6 hours ago

Trust in Facebook plummets after Cambridge Analytica scandal, Zuckerberg testimony

By **Chris Ciaccia** | **Fox News**

Trendi in Tech

Th rmy is developing
precis guided 155mm r
that a nger range than
shells able to conduct

careerbuilder.com

More Employers Screening Candidates via Social Networking Sites

Five tips for creating a positive online image

Rosemary Haefner, Vice President of Human Resources at CareerBuilder

When you interview, they Know What You've Posted

Gone are the days when all job seekers had to worry about were their résumés and cover letters. Today, those documents remain a staple of the job-search process, but they are joined by a growing phenomenon: social networking.

Forty-five percent of employers reported in a June 2009 CareerBuilder survey that they use social networking sites to screen potential employees, compared to only 22 percent of employers last year. Eleven percent of employers plan to start using social networking sites for the screening process. More than 2,600 hiring managers participated in the survey.

Why employers disregard candidates after screening online

Thirty-five percent of employers reported they have found content on social networking sites that caused them not to hire the candidate, including:

- Candidate posted provocative or inappropriate photographs or information -- 53 percent
- Candidate posted content about them drinking or using drugs -- 44 percent
- Candidate bad-mouthed their previous employer, co-workers or clients -- 35 percent
- Candidate showed poor communication skills -- 29 percent
- Candidate made discriminatory comments -- 26 percent
- Candidate lied about qualifications -- 24 percent
- Candidate shared confidential information from previous employer -- 20 percent

Tracking – So What?

- Cookies etc. form the core of how Internet advertising works today
  - Without them, arguably you'd have to pay for content up front a lot more
    - (and payment would mean you'd lose anonymity anyway)
  - A "better ad experience" is not necessarily bad
    - Ads that reflect your interests; not seeing repeated ads
- But: ease of gathering so much data so easily ⇒ concern of losing control how it's used
  - Content shared with friends doesn't just stay with friends …
  - You really don't have a good sense of just what you're giving away …

Inadvertent information leaking

Consider posting a picture on Twitter

The world can see it, but what more can an outside figure out about you?

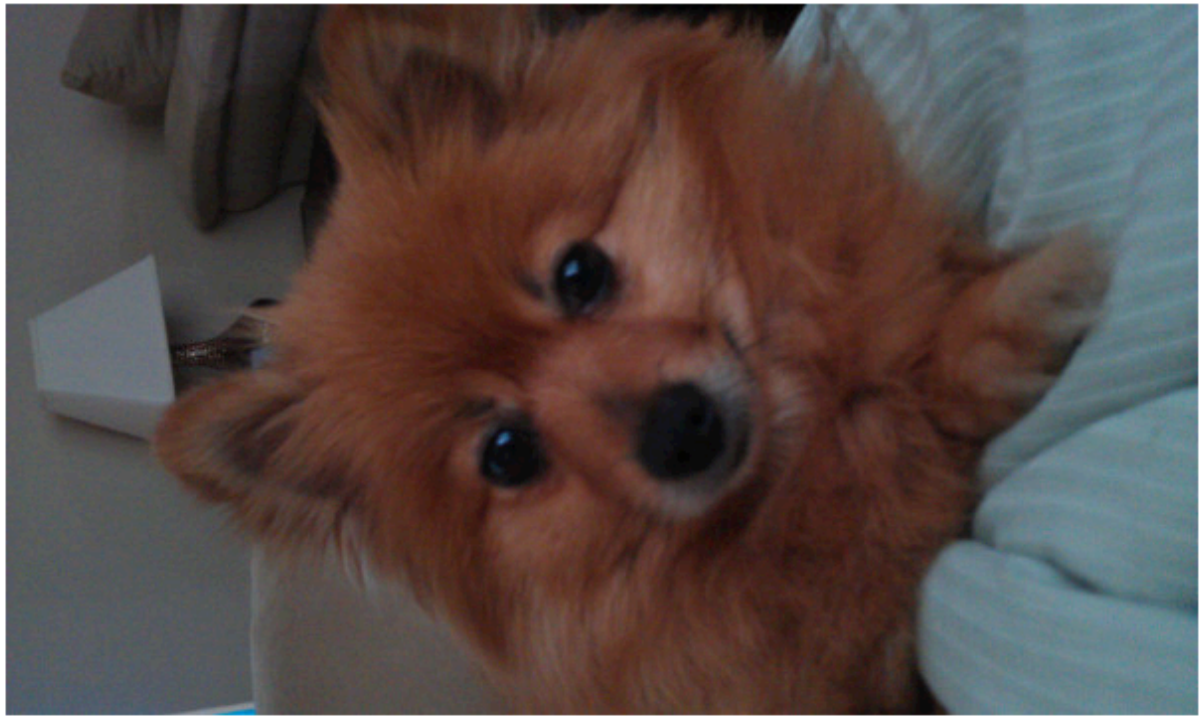
twitpic

Click here to login or create an account ›

Sign in with Twitter

@BritBangert

Brittany Bangert April 5, 2011



Share this photo

Put this photo on your website

Login to leave a comment

Views 11

Events

Photos are tagged with location from the camera

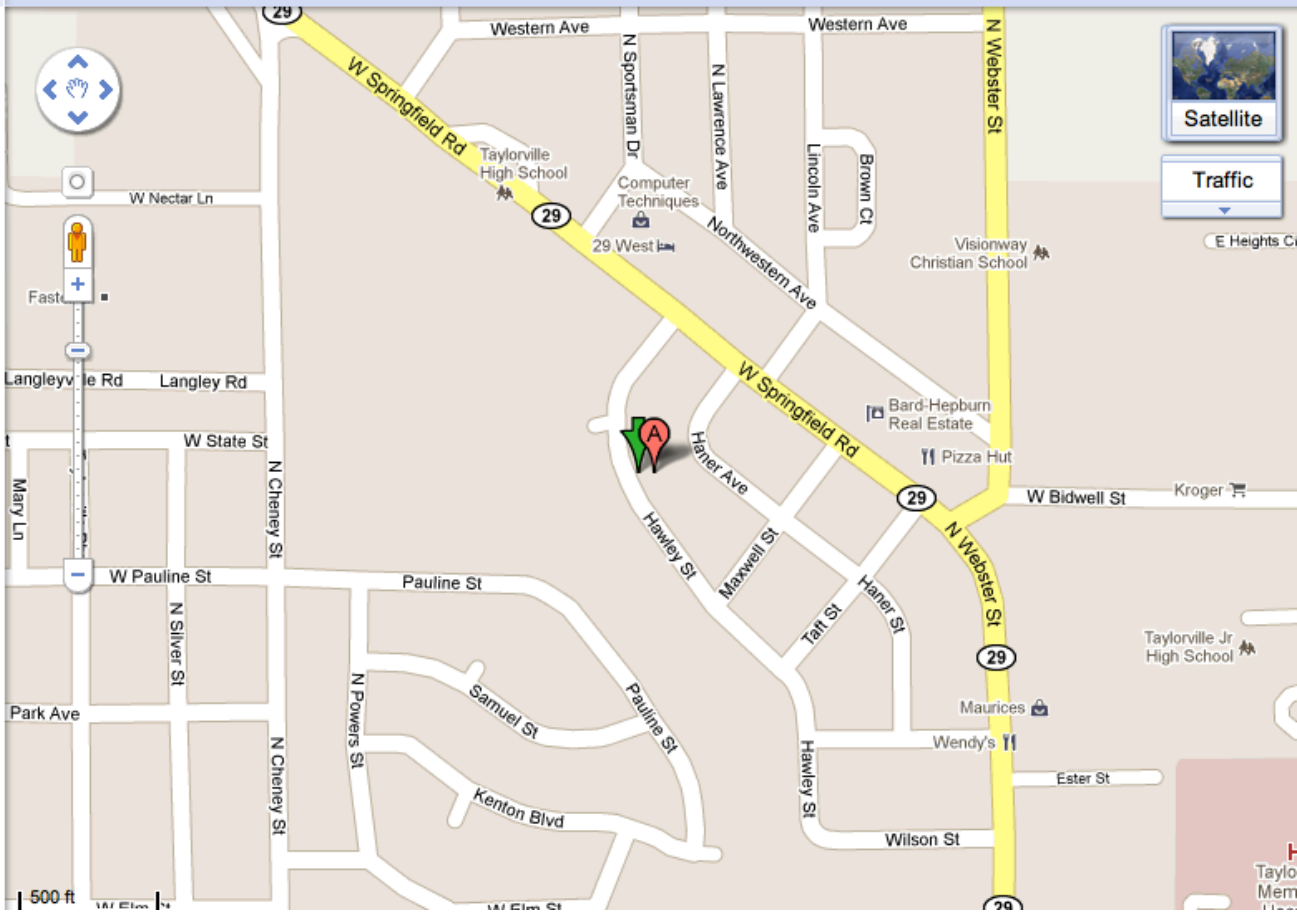
Web Images Videos **Maps** News Shopping Gmail more ▾ Sign in

Google maps 39.5591,-89.3022 Search Maps

Get Directions | My Maps

920 Hawley St
Taylorville, IL 62568

Directions Search nearby more▾



I Can Stalk U

Raising awareness about inadvertent information sharing

Home | How | Why | About Us | Contact Us

Who have we stalked recently?

ICanStalkU was able to stalk RangeLifeEnt at 51 Great Jones St New York NY
1 minute ago · Map Location · View Tweet · View Picture · Reply to RangeLifeEnt

ICanStalkU was able to stalk lnicklasson at http://maps.google.com/?q=57.1344444444,12.7141666667
2 minutes ago · Map Location · View Tweet · View Picture · Reply to lnicklasson

ICanStalkU was able to stalk Welerson13 at http://maps.google.com/?q=-15.7380555556,-47.8986111111
2 minutes ago · Map Location · View Tweet · View Picture · Reply to Welerson13

ICanStalkU was able to stalk BritBangert at 920 Hawley St Taylorville IL
1 minute ago · Map Location · View Tweet · View Picture · Reply to BritBangert

ICanStalkU was able to stalk jiggy_Owla at http://maps.google.com/?q=13.7830055879,100.518500685
4 minutes ago · Map Location · View Tweet · View Picture · Reply to jiggy_Owla

ICanStalkU was able to stalk gcolony at http://maps.google.com/?q=37.7851666667,-122.404166667
4 minutes ago · Map Location · View Tweet · View Picture · Reply to gcolony

Links

- Mayhemic Labs
- PaulDotCom
- SANS ISC
- Electronic Frontier Foundation
- Center for Democracy & Technology

How did you find me?

Did you know that a lot of smart phones encode the location of where pictures are taken? Anyone who has a copy can access this information.
read more

Help me fix this!

Disabling Geo-Tagging on your phone is easy.

How To Gain Better Privacy?

discuss with your neighbor

How To Gain Better Privacy?

- Force of law
  - Example #1: web site privacy policies
    - US sites that violate them commit false advertising
    - But: policy might be "*Yep, we sell everything about you, Ha Ha!*"

The New Yorker's Privacy Policy **(when you buy their archives)**

7. *Collection of Viewing Information. You acknowledge that you are aware of and consent to the collection of your viewing information during your use of the Software and/or Content. Viewing information may include, without limitation, the time spent viewing specific pages, the order in which pages are viewed, the time of day pages are accessed, IP address and user ID. This viewing information may be linked to personally identifiable information, such as name or address and shared with third parties.*

How To Gain Better Privacy?

- Force of law
  - Example #1: web site privacy policies
    - US sites that violate them commit false advertising
    - But: policy might be "*Yep, we sell everything about you, Ha Ha!*"
  - Example #2: SB 1386 (bill in CA legislature)
    - *Requires an agency, person or business that conducts business in California and owns or licenses computerized 'personal information' to disclose any breach of security (to any resident whose unencrypted data is believed to have been disclosed)*
    - Quite effective at getting sites to pay attention to securing personal information
  - Example #3: GDPR law

Security

May 8, 2009 1:53 PM PDT

UC Berkeley computers hacked, 160,000 at risk

by Michelle Meyers

This post was updated at 2:16 p.m. PDT with comment from an outside database security software vendor.

Hackers broke into the University of California at Berkeley's health services center computer and potentially stole the personal information of more than 160,000 students, alumni, and others, the university announced Friday.

At particular risk of identity theft are some 97,000 individuals whose Social Security numbers were accessed in the breach, but it's still unclear whether hackers were able to match up those SSNs with individual names, Shelton Waggener, UCB's chief technology officer, said in a press conference Friday afternoon.

General Data Protection Regulation (GDPR)

New European law (2018) designed to allow individuals to better control their personal data

- Requires consent or strong reason to process and store personal information
- Gives a user the right to know what information is held about them
- Allows a user to request that their information is deleted and that they are 'forgotten'
- Requires that personal information is properly protected.
- … and more

Applies to US companies with European customers too

How To Gain Better Privacy?

- Technology
  - Various browser additions
  - Special browser extensions
  - Tor and anonymizers to hide IP addresses

Browser: “Tracking protection”

Private browsing includes tracking protection

You can choose a blocking list in your Firefox browser for example:

- Basic (default): Blocks third-party trackers based on Disconnect.me. Blocks commonly known analytics trackers, social sharing trackers, and advertising trackers, but allows some known content trackers to reduce website breakage.
- strict: blocks all known trackers, including analytics, trackers, social sharing trackers, and advertising trackers as well as content trackers. The strict list will break some videos, photo slideshows, and some social networks.

Browsers: Do not track flag

You can turn on this flag in your browser

What does it do?
- Tells web servers you want to opt-out of tracking
- It does this by transmitting a Do Not Track HTTP header every time your data is requested from a web server

It does not enforce that there is no tracking, it is up to the web servers whether they decide to track or not

WHY DO NOT TRACK MAY NOT PROTECT ANYBODY'S PRIVACY

By **Geoff Duncan** — June 9, 2012

Some ad companies do provide more generic ads as a result of this flag

Browser extension: Ghostery

User installs browser extension:

1. Recognizes third-party tracking scripts on a web page based on an actively curated database of such scripts

2. Blocks HTTP requests to these sites
   - as a result, Facebook buttons don't even show

3. Users can create "Whitelists" of allowed sites
   - e.g., allow FB button but note that you allow tracking by FB too

But you have to be careful…

Ghostery: A Web tracking blocker that actually helps the ad industry

RICARDO BILTON JULY 31, 2012 7:00 AM

TAGS: COOKIES, EDITOR'S PICK, EVIDON, FEATURED, GHOSTERY, SCOTT MEYER, WEB TRACKING

Press Releases

Carey Chen Joins NVBOTS Board of Directors

- Users can opt-in to sending anonymously data back to Evidon, the parent company, to improve its tracking database
- Evidon sells this data to ad companies..
- Attempted excuse: strategy is transparent, users opt into this

Conclusions

- Third-party apps can track us even if when we don’t visit their website
- Tracking is very common on the web and can collect a lot of data about you
- Some solutions exist, but have caveats

Miscellaneous: malware

Credit for some slides: Damon McCoy and Vitaly Shmatikov

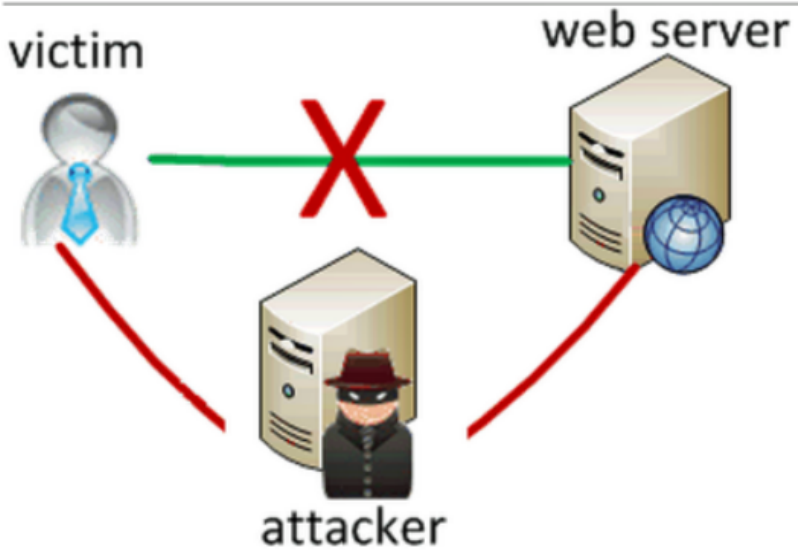
Malware

- Malicious code often masquerades as good software or attaches itself to good software
- Some malicious programs need host programs
  - Trojan horses (malicious code hidden in a useful program), logic bombs (a set of instructions secretly incorporated into a program so that if a particular condition is satisfied they will be carried out, usually with harmful effects), backdoors
- Others can exist and propagate independently
  - Worms, automated viruses
- Many infection vectors and propagation methods
- Modern malware often combines trojan, rootkit, and worm functionality

Lenovo PCs ship with man-in-the-middle adware that breaks HTTPS connections [Updated]

Superfish may make it trivial for attackers to spoof any HTTPS website.

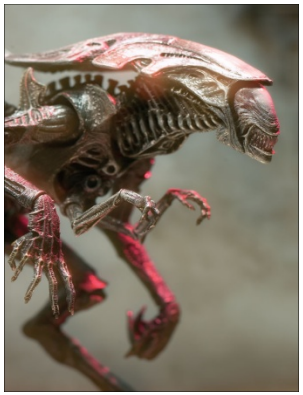
by **Dan Goodin** - Feb 19, 2015 8:36am PST



Viruses vs. Worms

VIRUS

- Propagates by infecting other programs
- Usually inserted into host code (not a standalone program)



WORM

- Propagates automatically by copying itself to target systems
- A standalone program

“Reflections on Trusting Trust”

- Ken Thompson’s 1983 Turing Award lecture
  1. Added a backdoor-opening Trojan to login program
  2. Anyone looking at source code would see this, so changed the compiler to add backdoor at compile-time
  3. Anyone looking at compiler source code would see this, so changed the compiler to recognize when it’s compiling a new compiler and to insert Trojan into it
- “The moral is obvious. You can’t trust code you did not totally create yourself.”

Viruses

- Virus propagates by infecting other programs
  - Automatically creates copies of itself, but to propagate, a human has to run an infected program
  - Self-propagating viruses are often called worms
- Many propagation methods
  - Insert a copy into every executable (.COM, .EXE)
  - Insert a copy into boot sectors of disks
  - Infect common OS routines, stay in memory

First Virus: Creeper

http://history-computer.com/Internet/Maturing/Thomas.html

- Written in 1971 at BBN
- Infected DEC PDP-10 machines running TENEX OS
- Jumped from machine to machine over ARPANET
  - Copied its state over, tried to delete old copy
- Payload: displayed a message "I'm the creeper, catch me if you can!"
- Later, Reaper was written to hunt down Creeper

Polymorphic Viruses

- Encrypted viruses: constant decryptor content followed by the encrypted virus body
- Polymorphic viruses: each copy creates a new random encryption of the same virus body
  - Decryptor code constant and can be detected
  - Historical note: "Crypto" virus decrypted its body by brute-force key search to avoid explicit decryptor code

Virus Detection

1. Simple anti-virus scanners
   - Look for signatures (fragments of known virus code)
   - Heuristics for recognizing code associated with viruses
     - Example: polymorphic viruses often use decryption loops
   - Integrity checking to detect file modifications
     - Keep track of file sizes, checksums, keyed HMACs of contents
2. Generic decryption and emulation
   - Emulate CPU execution for a few hundred instructions, recognize known virus body after it has been decrypted
   - Does not work very well against viruses with mutating bodies and viruses not located near beginning of infected executable

Virus Detection by Emulation

Say you want to detect if F is a virus, but it is polymorphic so you are not sure:

- Run it in a sandbox
- The virus will start decrypting its payload and executing it
- Look at the set of instructions that are executed and see if those match a signature of a known virus

Insight here: check signature at runtime instead of signature of file content (which could be different)

Metamorphic Viruses

- Obvious next step: mutate the virus body, too
- Apparition: an early Win32 metamorphic virus
  - Carries its source code (contains useless junk)
  - Looks for compiler on infected machine
  - Changes junk in its source and recompiles itself
  - New binary copy looks different! [So new instruction sequences]
- Mutation is common in macro and script viruses
  - A macro is an executable program embedded in a word processing document (MS Word) or spreadsheet (Excel)
  - Macros and scripts are usually interpreted, not compiled

Obfuscation and Anti-Debugging

- Common in all kinds of malware
- Goal: prevent code analysis and signature-based detection, foil reverse-engineering
- Code obfuscation and mutation
  - Packed binaries, hard-to-analyze code structures
  - Different code in each copy of the virus
    - Effect of code execution is the same, but this is difficult to detect by passive/static analysis (undecidable problem)
- Detect debuggers and virtual machines, terminate execution

Mutation Techniques

- Large arsenal of obfuscation techniques
  - Instructions reordered, branch conditions reversed, different register names, different subroutine order
  - Jumps and NOPs inserted in random places
  - Garbage opcodes inserted in unreachable code areas
  - Instruction sequences replaced with other instructions that have the same effect, but different opcodes
    - Mutate SUB EAX, EAX into XOR EAX, EAX or MOV EBP, ESP into PUSH ESP; POP EBP

Propagation via Websites

[Moschuk et al.]

- Websites with popular content
  - Games: 60% of websites contain executable content, one-third contain at least one malicious executable
  - Celebrities, adult content, everything except news

Drive-By Downloads

- Websites "push" malicious executables to user's browser with inline JavaScript or pop-up windows
  - Naïve user may click "Yes" in the dialog box
- Can install malicious software automatically by exploiting bugs in the user's browser
  - 1.5% of URLs - Moshchuk et al. study
  - 5.3% of URLs - "Ghost Turns Zombie"
  - 1.3% of Google queries - "All Your IFRAMEs Point to Us"
- Many infectious sites exist only for a short time, behave non-deterministically, change often

Obfuscated JavaScript

[Provos et al.]

```
document.write(unescape("%3CHEAD%3E%0D%0A%3CSCRIPT%20
LANGUAGE%3D%22Javascript%22%3E%0D%0A%3C%21--%0D%0A
/*%20criptografado%20pelo%20Fal%20-%20Deboa%E7%E3o
%20gr%E1tis%20para%20seu%20site%20renda%20extra%0D
...
3C/SCRIPT%3E%0D%0A%3C/HEAD%3E%0D%0A%3CBODY%3E%0
    D%0A
%3C/BODY%3E%0D%0A%3C/HTML%3E%0D%0A"));
//-->
</SCRIPT>
```

"Ghost in the Browser"

- Large study of malicious URLs by Provos et al. (Google security team)
- In-depth analysis of 4.5 million URLs
  - About 10% malicious
- Several ways to introduce exploits
  - Compromised Web servers
  - User-contributed content
  - Advertising
  - Third-party widgets

Trust in Web Advertising

- Advertising, by definition, is ceding control of Web content to another party
- Webmasters must trust advertisers not to show malicious content
- Sub-syndication allows advertisers to rent out their advertising space to other advertisers
  - Companies like Doubleclick have massive ad trading desks, also real-time auctions, exchanges, etc.
- Trust is not transitive!
  - Webmaster may trust his advertisers, but this does not mean he should trust those trusted by his advertisers

Example of an Advertising Exploit

[Provos et al.]

- Video sharing site includes a banner from a large US advertising company as a single line of JavaScript…
- … which generates JavaScript to be fetched from another large US company
- … which generates more JavaScript pointing to a smaller US company that uses geo-targeting for its ads
- … the ad is a single line of HTML containing an iframe to be fetched from a Russian advertising company
- … when retrieving iframe, "Location:" header redirects browser to a certain IP address
- … which serves encrypted JavaScript, attempting multiple exploits against the browser

Not a Theoretical Threat

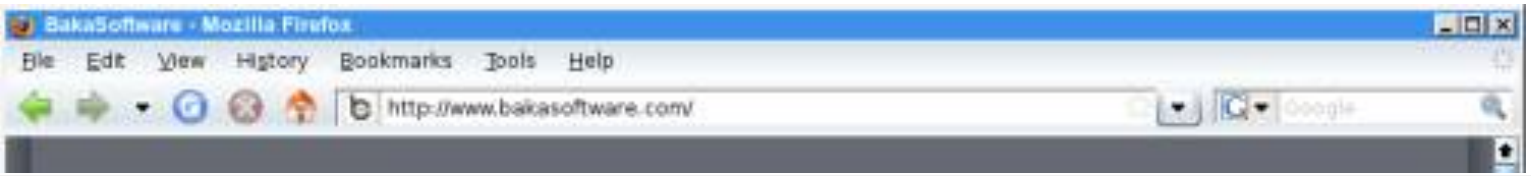
- Hundreds of thousands of malicious ads online
  - 384,000 in 2013 vs. 70,000 in 2011 (source: RiskIQ)
  - Google disabled ads from more than 400,000 malware sites in 2013
- Dec 27, 2013 – Jan 4, 2014: Yahoo! serves a malicious ad to European customers
  - The ad attempts to exploit security holes in Java on Windows, install multiple viruses including Zeus (used to steal online banking credentials)

Social Engineering

[Provos et al.]

- Goal: trick the user into "voluntarily" installing a malicious binary
- Fake video players and video codecs
  - Example: website with thumbnails of adult videos, clicking on a thumbnail brings up a page that looks like Windows Media Player and a prompt:
    - "Windows Media Player cannot play video file. Click here to download missing Video ActiveX object."
  - The "codec" is actually a malware binary
- Fake antivirus ("scareware")
  - January 2009: 148,000 infected URLs, 450 domains

Fake Antivirus



	Сумма, USD					
Loader	Сетапы	Покупки	Покупки	Возвраты	Рефералы	Прибыль
37943	19989	667	29853.86	-436.72	0.00	29417.14
39895	19722	74	5420.64	0.00	0.00	5420.64
41687	18619	384	28148.96	-36.71	0.00	28112.25
38059	16038	249	13908.24	-118.54	0.00	13789.70
39160	15335	176	9726.17	0.00	0.00	9726.17
29968	12076	207	11672.71	0.00	0.00	11672.71
13293	6866	129	6920.81	0.00	0.00	6920.81
18055	8915	157	7557.25	0.00	0.00	7557.25
29642	14802	265	12852.29	0.00	0.00	12852.29
50457	22463	464	21055.29	0.00	0.00	21055.29
338159	154825	2772	147116.22	-591.97	0.00	146524.25

Loads Installs Purchases Total Refunds Net Profit

Source: Joe Stewart, SecureWorks