Contextual Identity:

Supporting multiple identities on the web

Steven Englehardt

About Me

- Princeton CS PhD Student
- I do web privacy research
- I worked on two Mozilla projects this summer
  - I'll present the second one, which I've been working on for almost 6 weeks.

Github: englehardt
Research: webtab.princeton.edu
Personal: cs.princeton.edu/~ste/

What is Contextual Identity?

We have multiple identities in life.

We have multiple identities in life.

At Work

We have multiple identities in life.

At Work

With Friends

We have multiple identities in life.

At Work

With Friends

With Family

We have multiple identities in life.

At Work

With Friends

With Family

Anonymous Online

We also have multiple identities online.

- Multiple email accounts
- Multiple Facebook profiles
- Different identities on different sites

Why are things this way?

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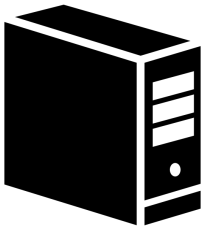
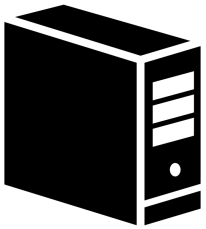
Browser

 example.com

domain	name	value

Why are things this way?

Browser



example.com

Request: example.com

domain	name	value

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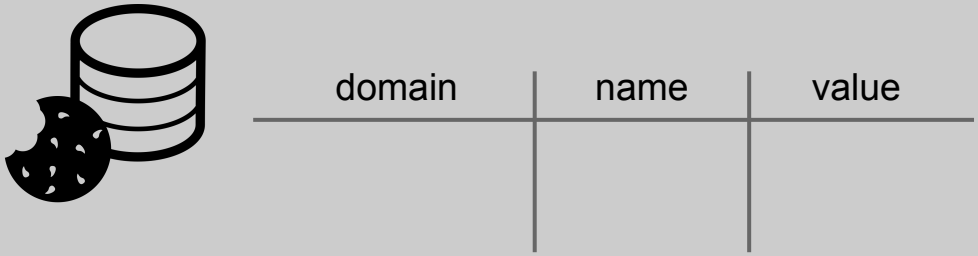

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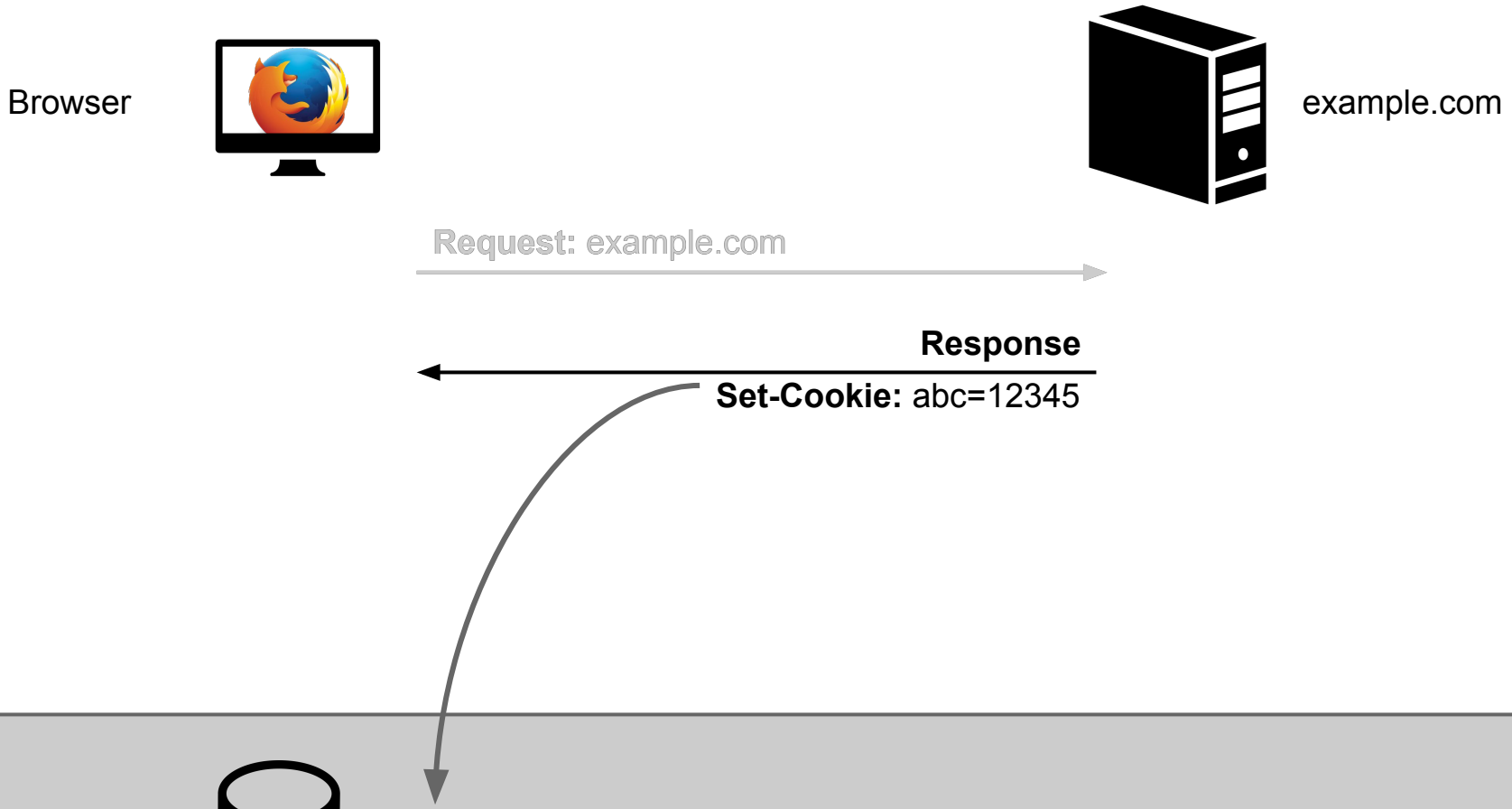

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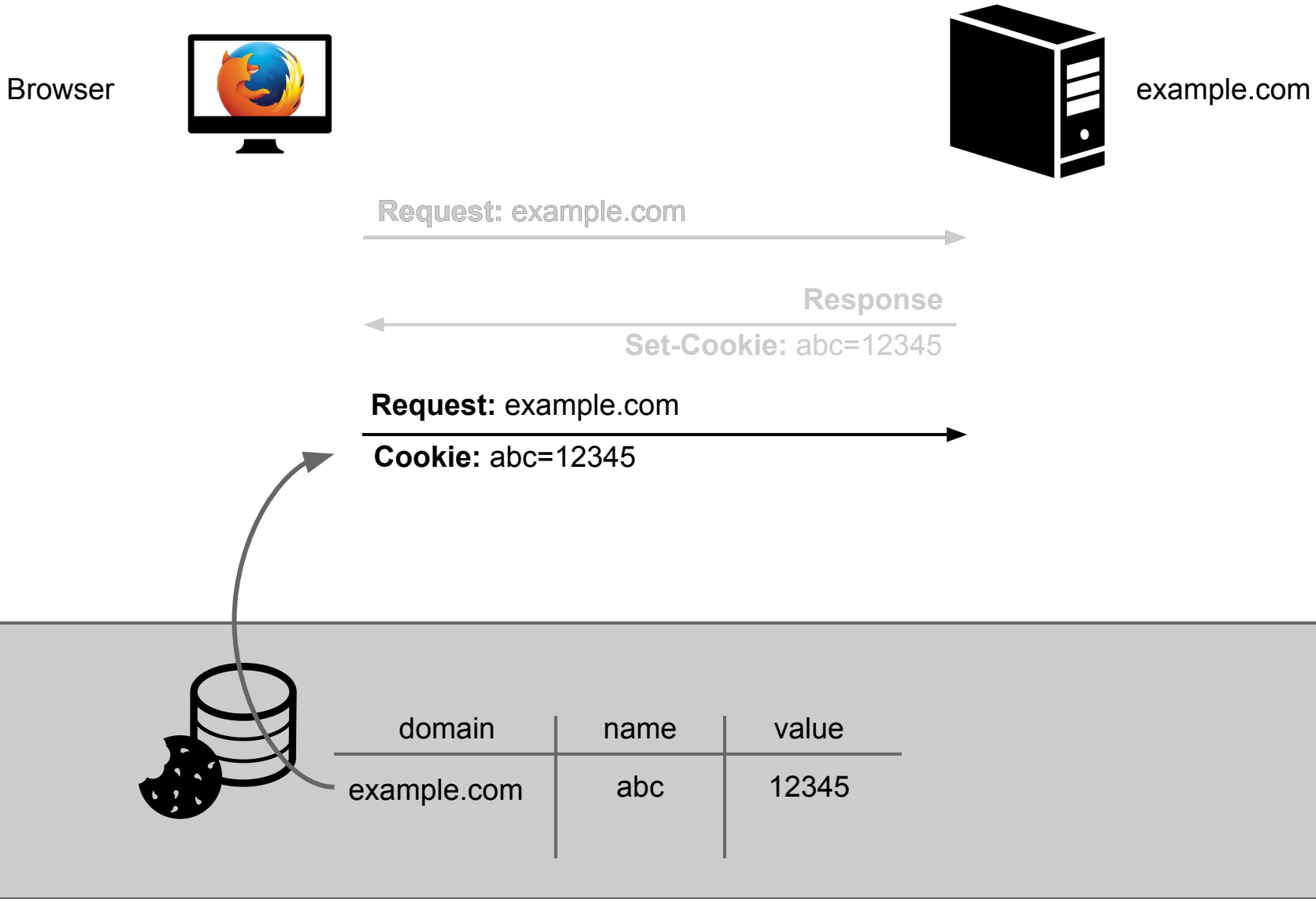

Why are things this way?

Cookies

1. Sent with every request
2. Sent with any request, regardless of the cause of that request
    a. Top level site
    b. Framed site
    c. Redirect

This causes a lot of problems

Privacy

- Tracking
- Cookie syncing

Security

- Clickjacking
- CSRF
- XSS

All of your cookies are in one jar.

All of your cookies are in one jar.

You don’t control when your cookies are sent.

All of your cookies are in one jar.

You don’t control when your cookies are sent.

You can’t have multiple identities.

What can users do?

1. Use Multiple Browsers

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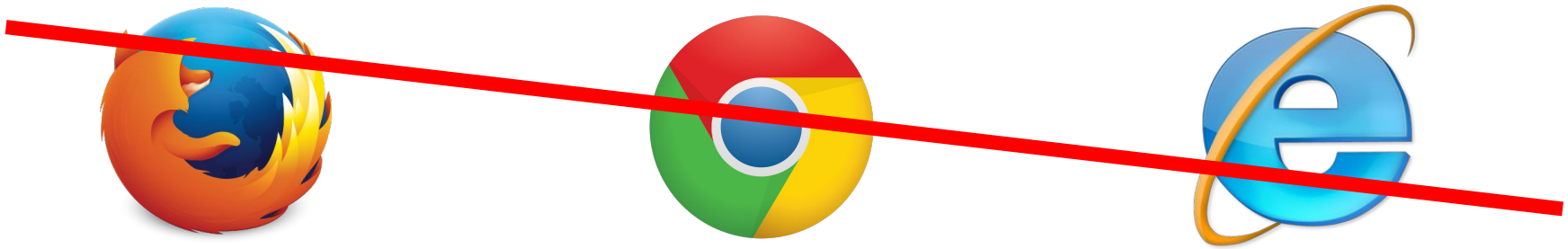
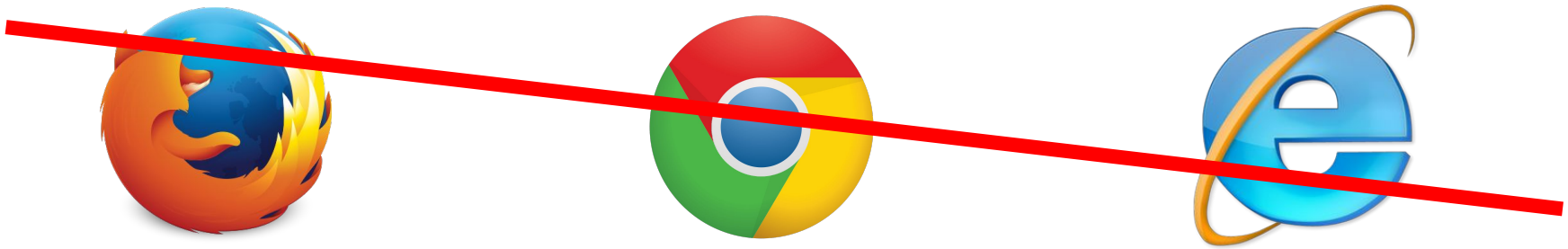


Or rather...

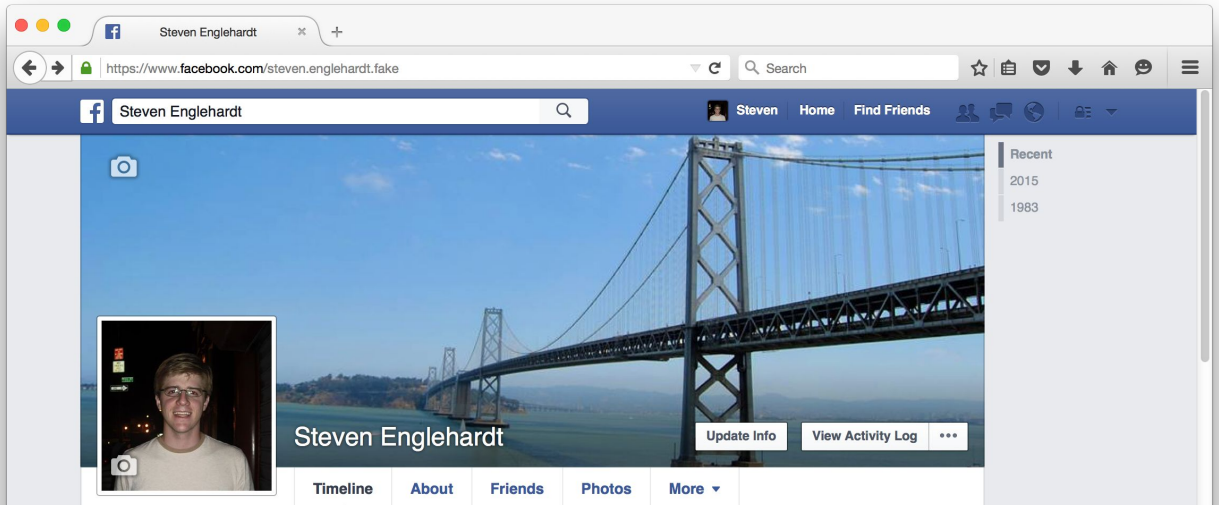
1. Use Multiple Browsers



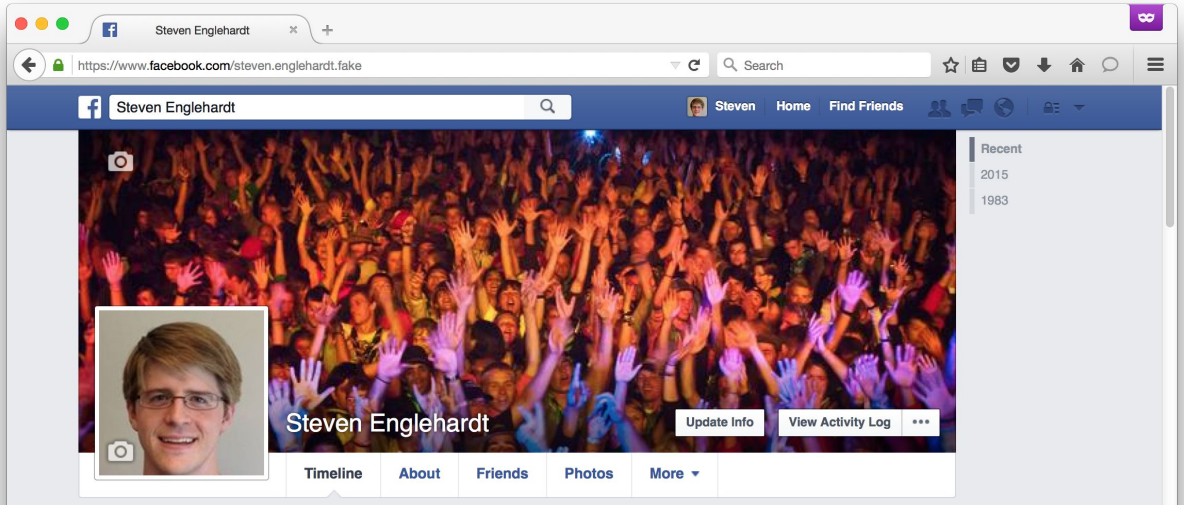
Or rather...

Clunky Experience

2. Private Browsing Mode



Private Browsing



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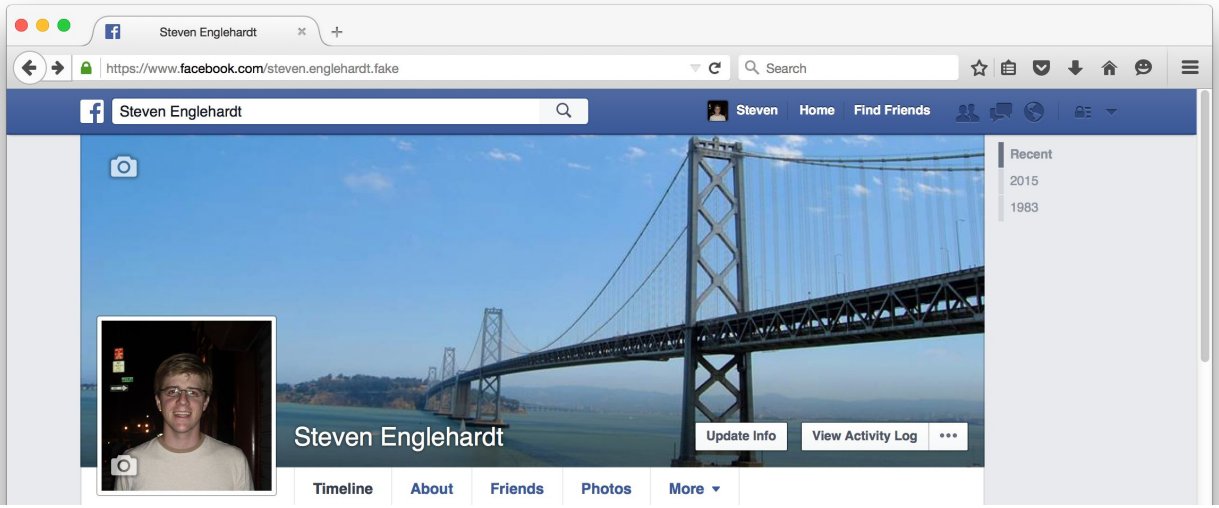
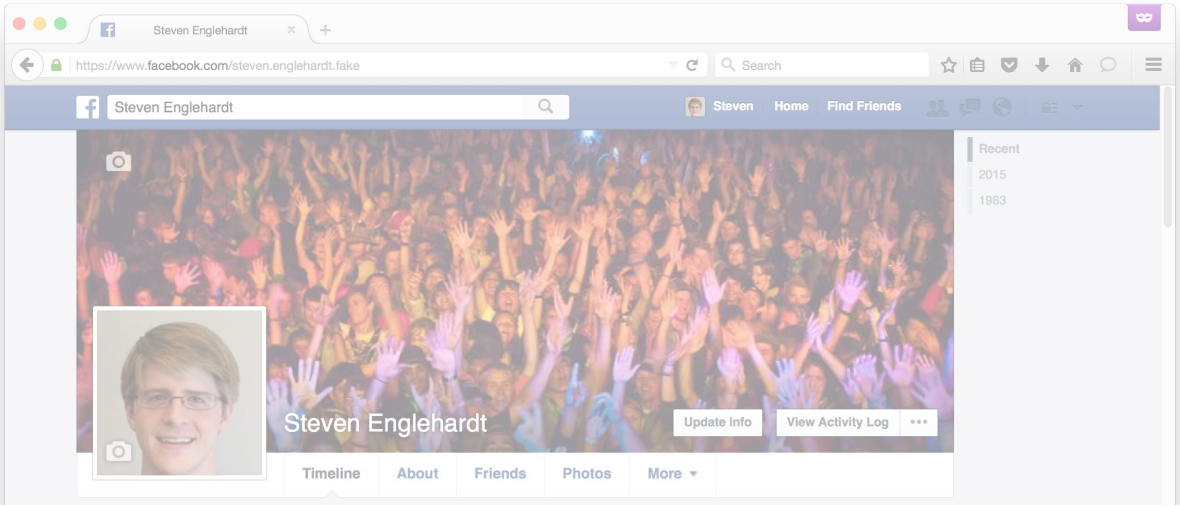
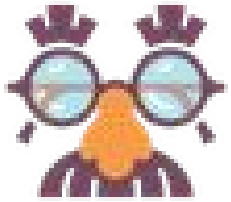


Private Browsing



- Not Persistent
- Re-authenticate (2 factor)
- Only 2 profiles

3. Add-ons that help isolate state



Priv8

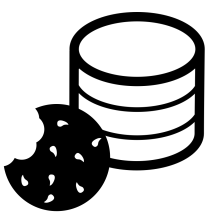
Multifox

What did we do?

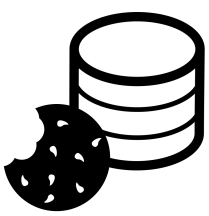
Give users the ability to determine which set of cookies to send

Give users the ability to determine which set of cookies to send

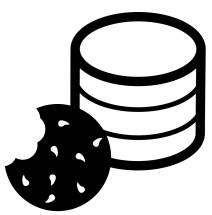
Home



Work

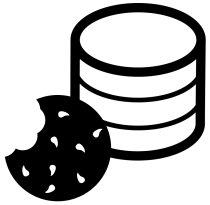


Banking



???

How?



domain	name	value
bugzilla.com	abc	12345
chase.com	def	09876
twitter.com	xyz	00000

How?

domain	userContextId	name	value
bugzilla.com	0	abc	12345
chase.com	0	def	09876
twitter.com	0	xyz	00000

Home
userContextId = 1

gmail.com
buzzfeed.com

Work
userContextId = 2

gmail.com
mozilla.com

Facebook
userContextId = 3

facebook.com

...

But things aren’t so simple...

- ID checks are needed everywhere
  - e.g. cookies, cache, localStorage, ...
  - All origin checks need to be updated

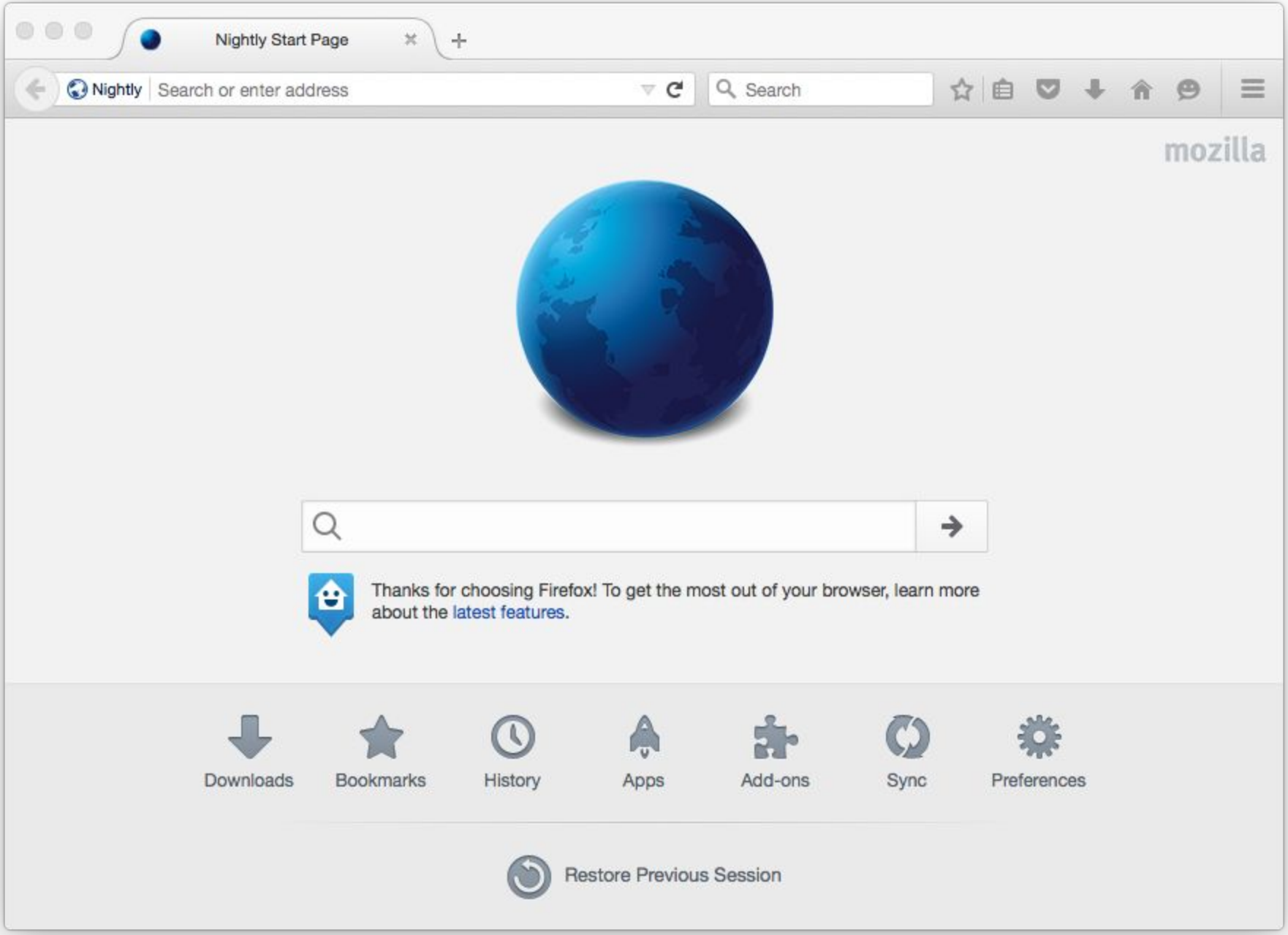
- We’re not the first to need to do this
  - Firefox OS keys storage using AppId

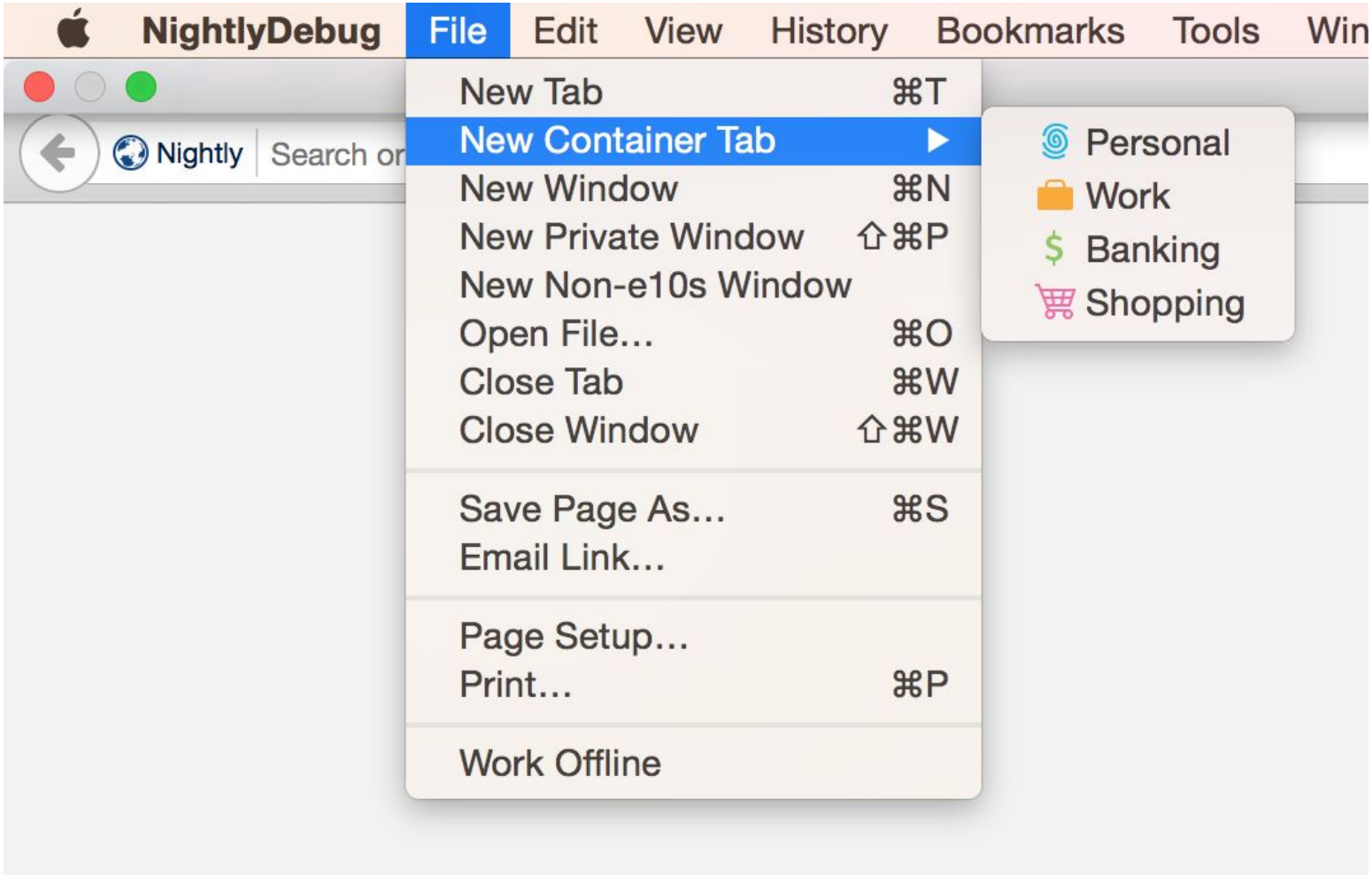
OriginAttributes

```
dictionary OriginAttributesDictionary {
  unsigned long appId = 0;
  unsigned long userContextId = 0;
  boolean inBrowser = false;
  DOMString addonId = "";
};
```

- Origin checks done against the OriginAttributes dictionary/struct, not against individual IDs.
- Ongoing effort led by Yoshi Huang and Bobby Holley

The User Interface


Nightly Start Page
Nightly
Search or enter address
Search
mozilla
Thanks for choosing Firefox! To get the most out of your browser, learn more about the latest features.
Downloads
Bookmarks
History
Apps
Add-ons
Sync
Preferences
Restore Previous Session


NightlyDebug
File
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Bookmarks
Tools
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New Container Tab
New Window ⌘N
New Private Window ⇧⌘P
New Non-e10s Window
Open File… ⌘O
Close Tab ⌘W
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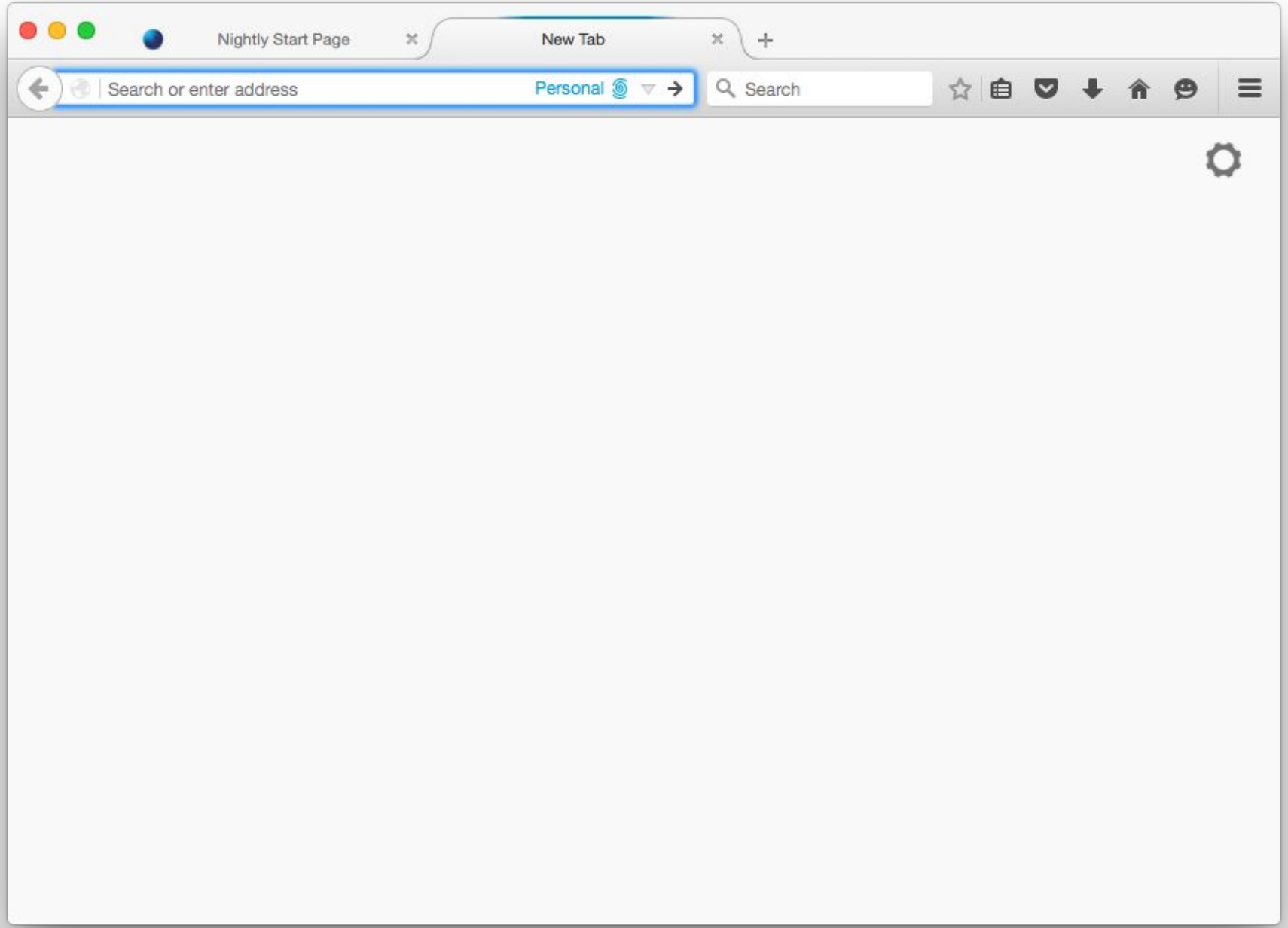
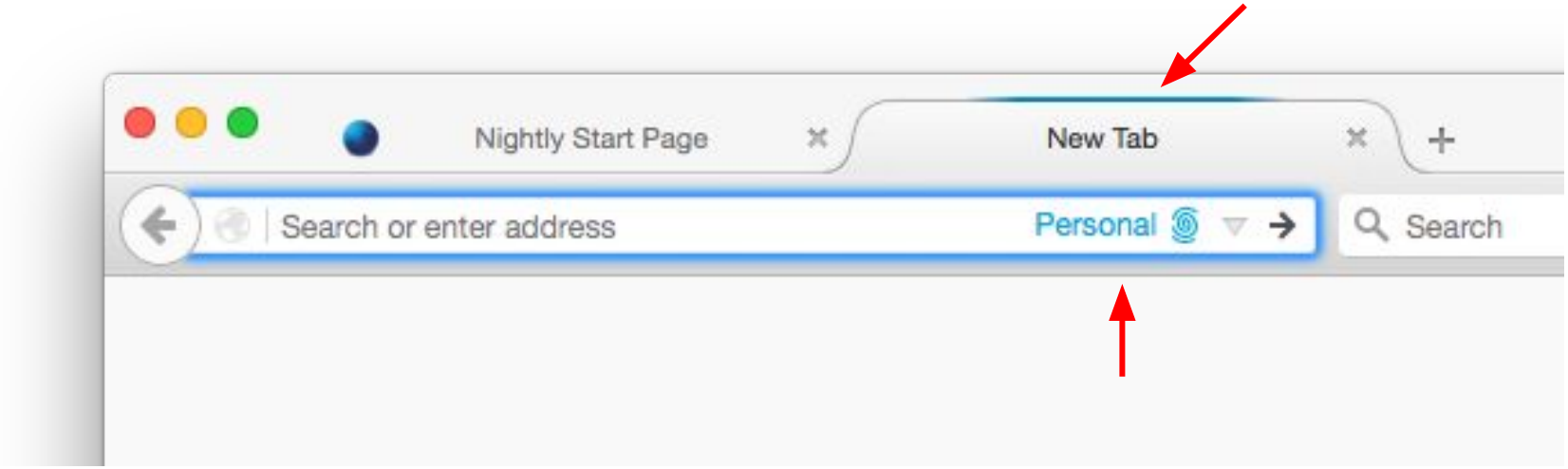
Save Page As… ⌘S
Email Link…
Page Setup…
Print… ⌘P
Work Offline
Personal
Work
Banking
Shopping


Nightly Start Page
New Tab
Search or enter address
Personal
Search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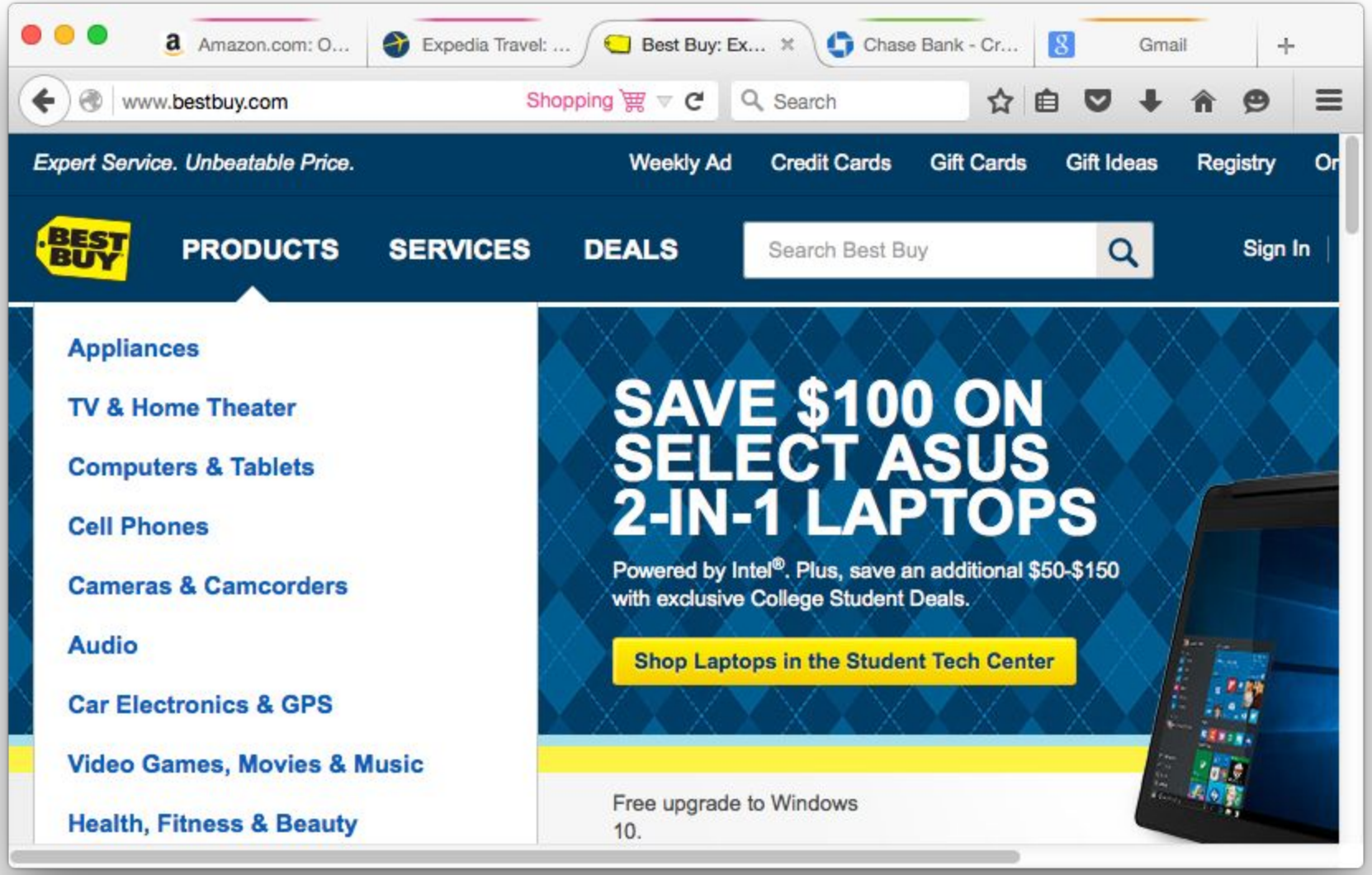
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Expedia Travel: ...
Best Buy: Ex...
Chase Bank - Cr...
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Expert Service. Unbeatable Price.
Weekly Ad
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Gift Cards
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Registry
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Sign In
Appliances
TV & Home Theater
Computers & Tablets
Cell Phones
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Audio
Car Electronics & GPS
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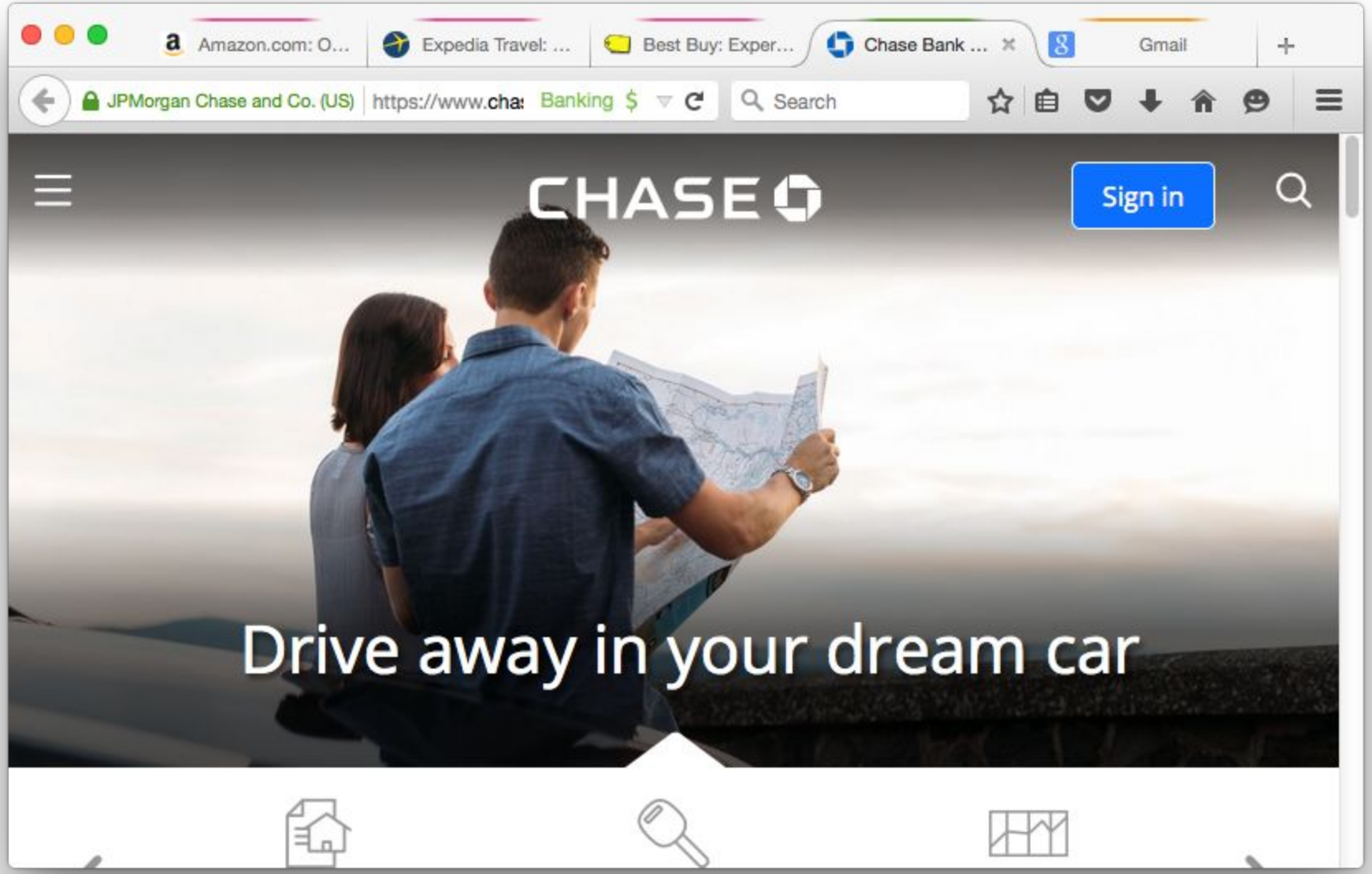
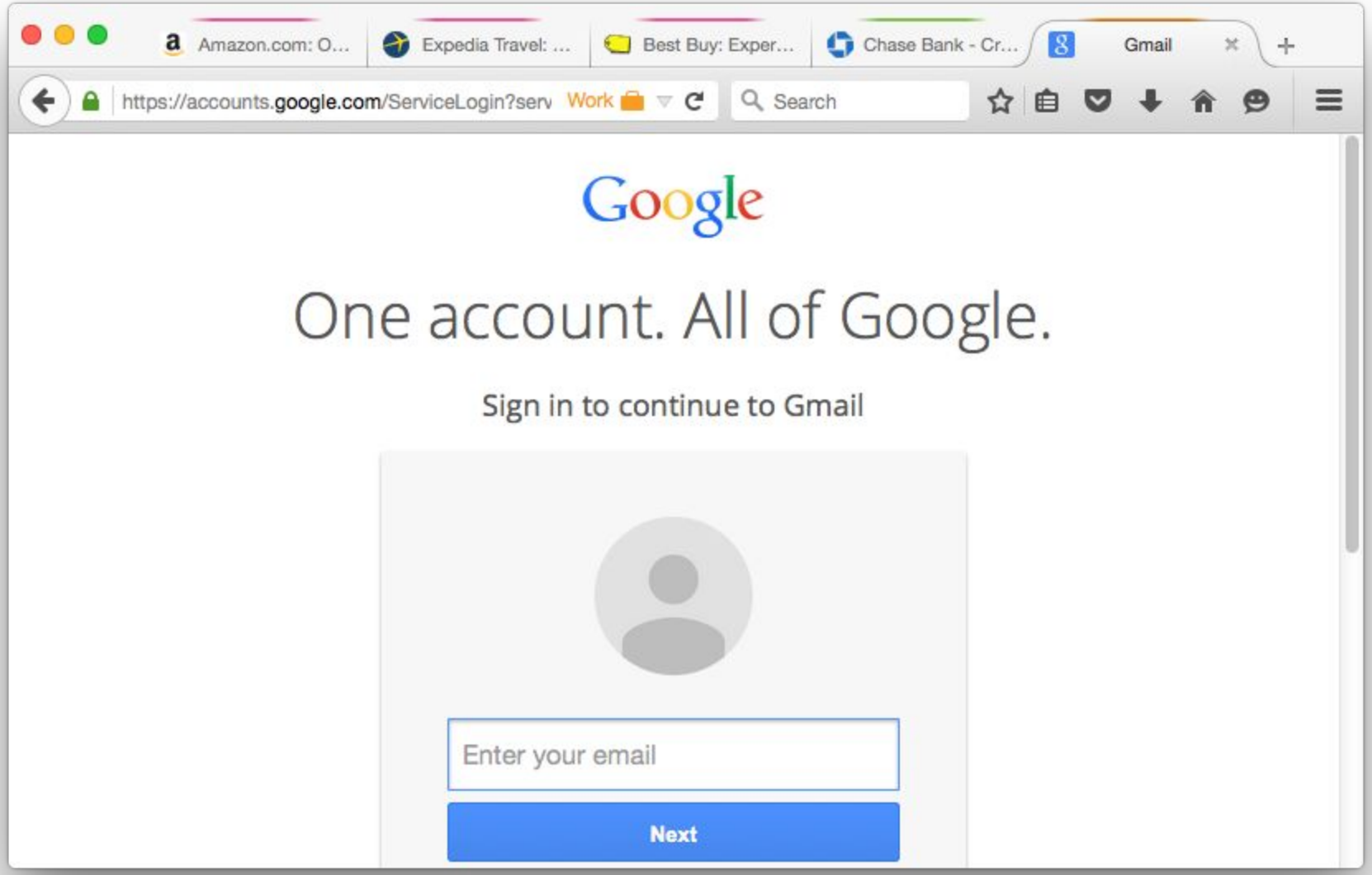
Health, Fitness & Beauty
SAVE $100 ON SELECT ASUS 2-IN-1 LAPTOPS
Powered by Intel®. Plus, save an additional $50-$150 with exclusive College Student Deals.
Shop Laptops in the Student Tech Center
Free upgrade to Windows 10.


Amazon.com: O...
Expedia Travel: ...
Best Buy: Exper...
Chase Bank ...
Gmail
JPMorgan Chase and Co. (US)
https://www.cha
Banking $
Search
CHASE
Sign in
Drive away in your dream car


Amazon.com: O...
Expedia Travel: ...
Best Buy: Exper...
Chase Bank - Cr...
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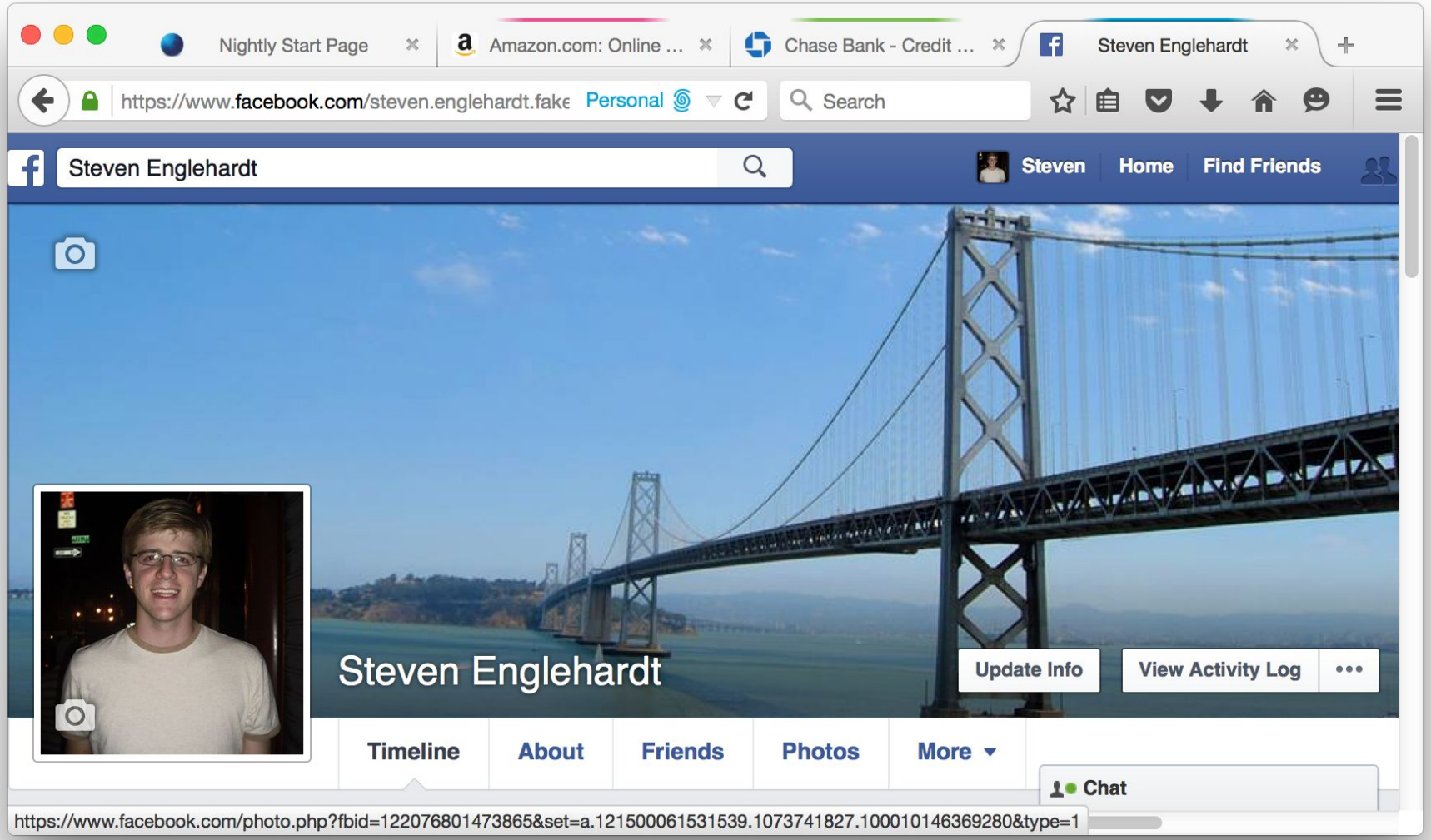
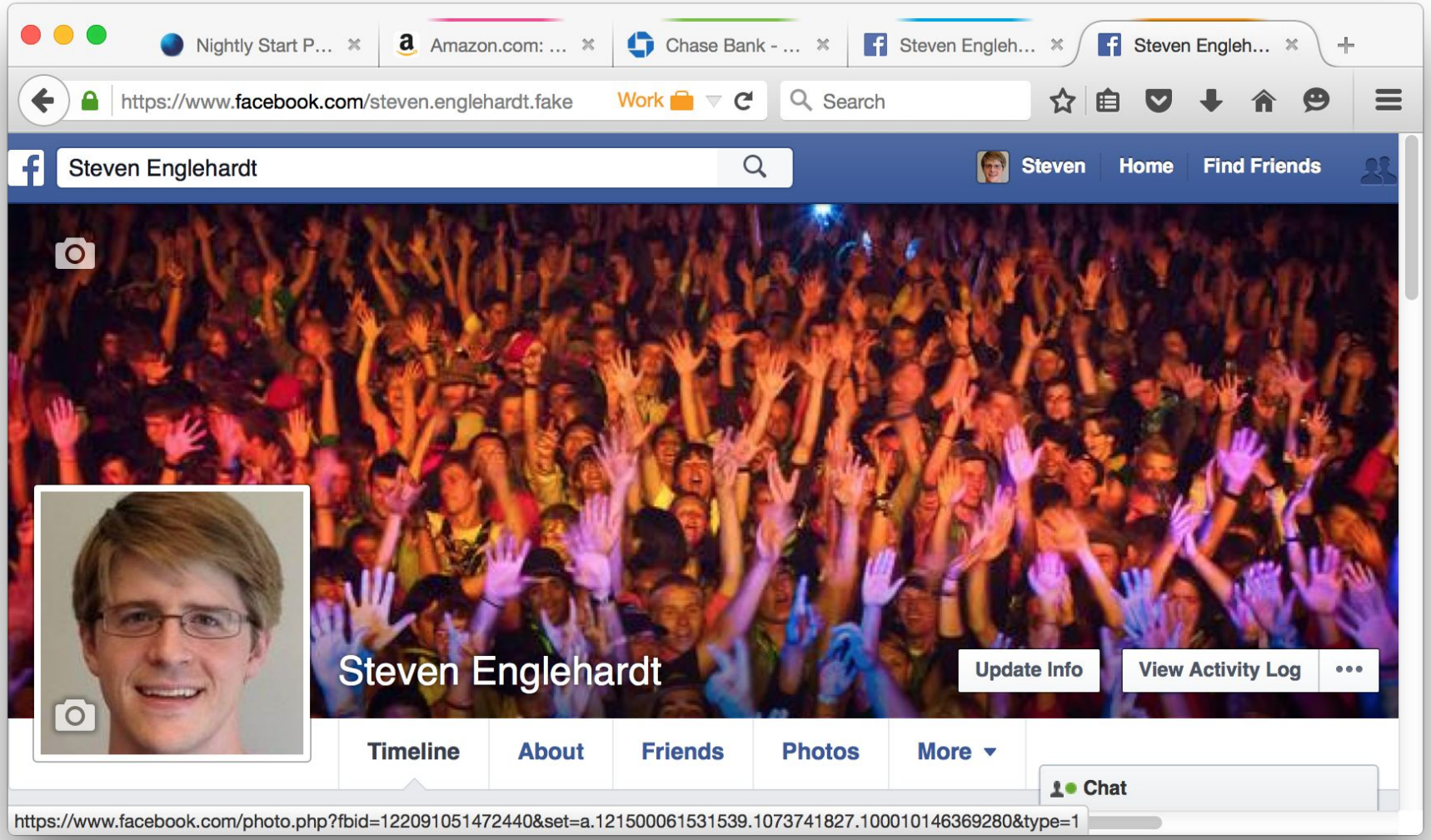
Google
One account. All of Google.
Sign in to continue to Gmail
Enter your email
Next



Desired Functionality



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The Next Steps

1. Prototype behind a pref in Nightly

- `privacy.userContext.enabled`
- *Timeline: next few weeks*

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- userContextID **automatically supported**
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- userContextID **automatically supported**
- *Timeline: next couple months*

3. Iterate on prototype

- Add context management features
- Incorporate user testing
- *Timeline: depends*

I've had a lot of help

- **Mentor:** Tanvi Vyas
- **UX Designer:** Bram Pitoyo
- Monica Chew, Sid Stamm
  - Contextual Identity: Freedom to be All Your Selves
- Entire Content Security Team
- Yoshi Huang, Bobby Holley, and the Firefox OS team
- The University Team

Image assets from the Noun Project:

"Computer" icon by Edward Boatman, "Server" icon by Yazmin Alanis, "Database" icon by Anton Outkine, "Cookie" icon by Rashida Luqman Kheriwala

Find out more

Project Wiki: wiki.mozilla.org/Security/Contextual_Identity_Project/Containers

User Contexts/Containers Implementation: Bug 1191418

OriginAttributes Implementation: Bug 1179985

Github: englehardt
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