Welcome to OWASP Bay Area Application Security Summit June 25th, 2008

Mandeep Khera
OWASP Bay Area
mkhera@owasp.org

OWASP

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http://www.owasp.org

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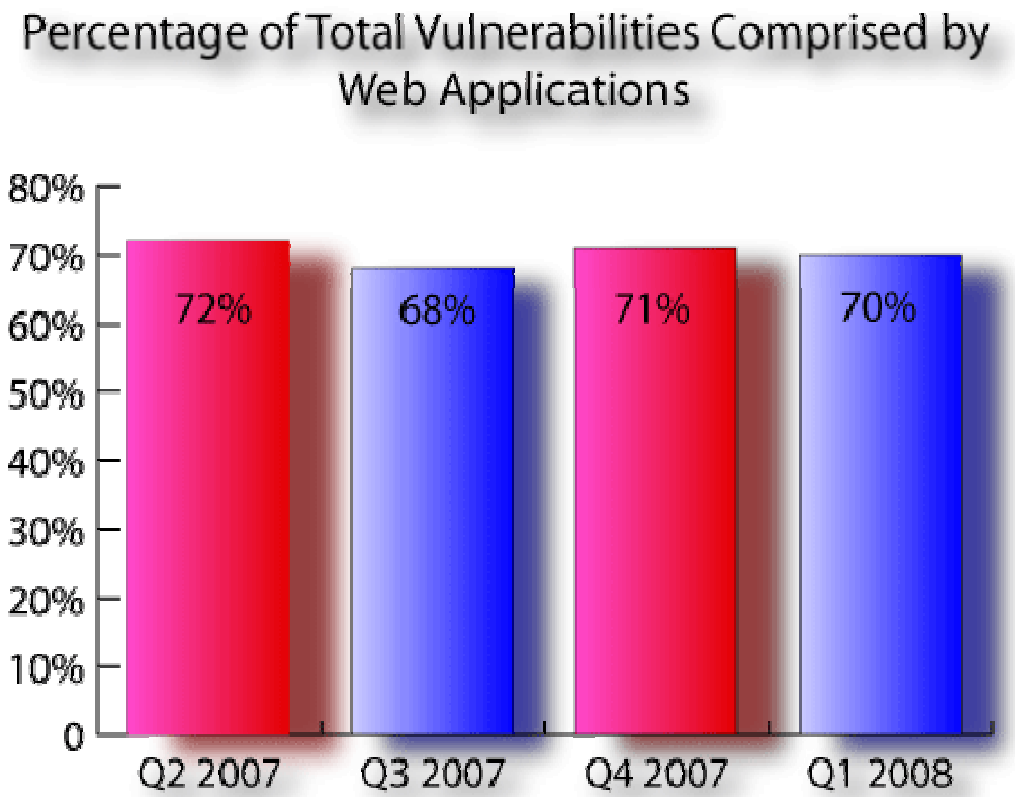
Q1 2008 Web Security Trend's Report



Do you want to be in the news?

The first hacked site

Hackers start early…

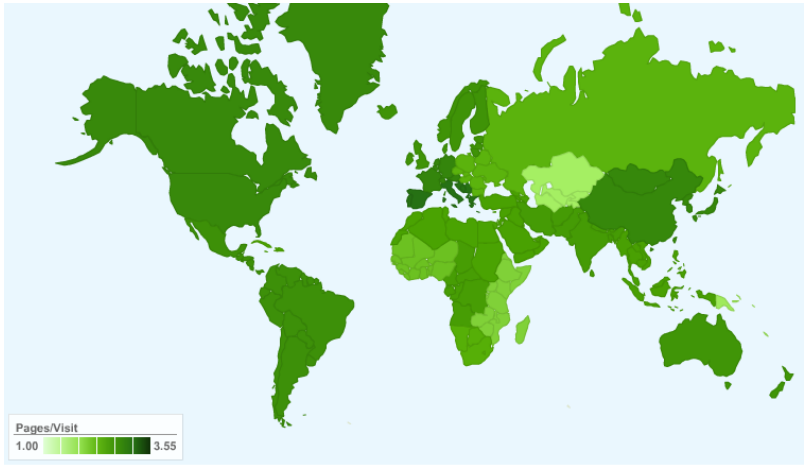
Sophistication of hackers..

No one is spared…

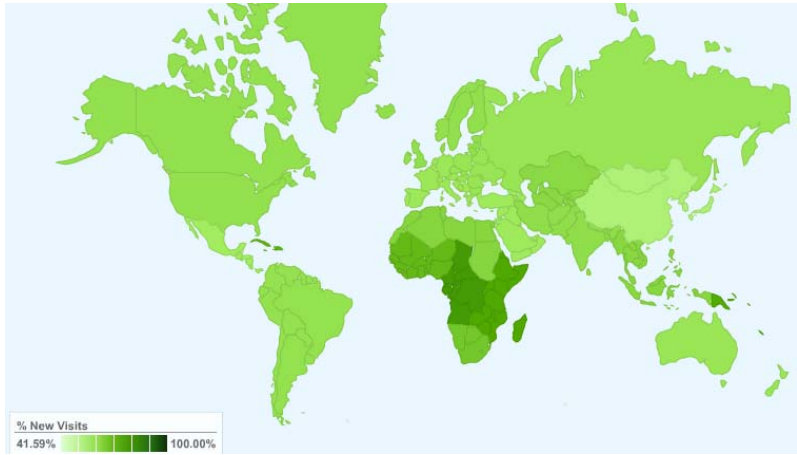
What is OWASP?

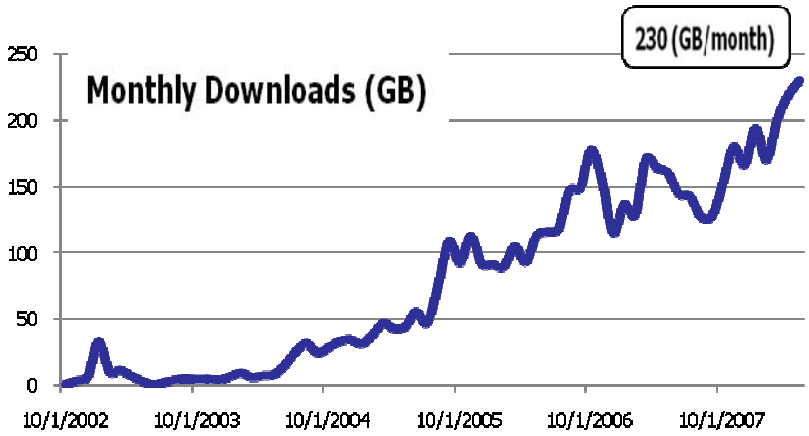
OWASP Main Site Traffic

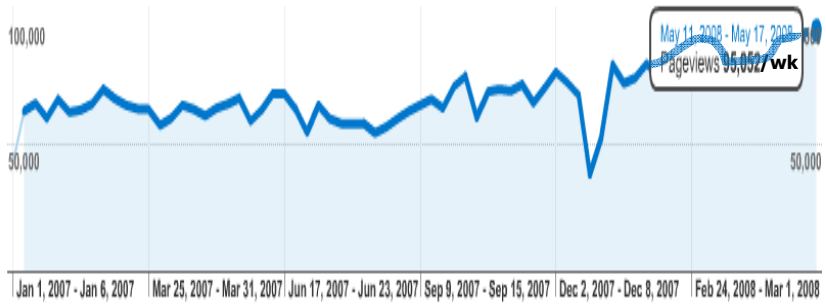
Worldwide Users



Most New Visitors

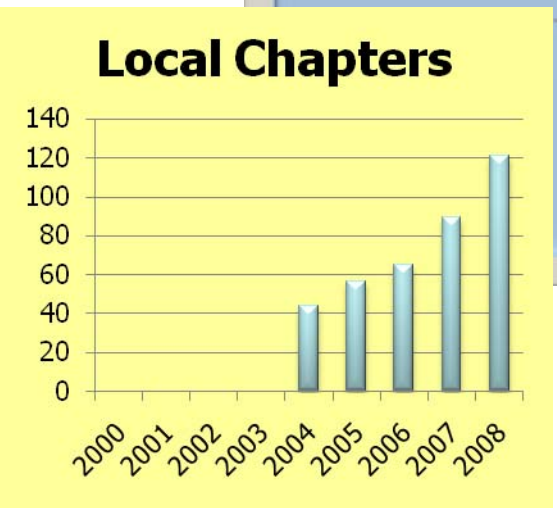






5,022,937 Pageviews

OWASP Worldwide Community



OWASP KnowledgeBase

- 3,913 total articles
- 427 presentations
- 200 updates per day
- 179 mailing lists
- 180 blogs monitored
- 31 doc projects
- 19 deface attempts
- 12 grants

OWASP Membership Benefits

- OWASP Commercial License to use materials without restrictions
- Visibility through inclusion in the member list on the Web site and other promotional materials
- Right to use OWASP trademark
- Significant discounts to attend OWASP conferences and events
- Goodwill
- Chachkes

OWASP Membership

Category	Description	Annual Membership Fee
Individuals	Individuals not as part of a Corporation	$100
Education and Non-Profit	Accredited educations institutions and government approved non-profit organizations	$250
End-user organizations	Small – Less than 100 employees Large – More than 100 employees	$2000 $7000
Consulting Organizations	Organizations that provide security training, consulting etc. Small – Less than 10 consultants, Large – More than 10 consultants	 $3,000 $8,000
Vendor Organizations	Software vendors that sell security products	$9,000

OWASP Bay Area Chapter Plans - 2008

- Leaders:
  - Mandeep Khera, Cenzic – Bay Area Chapter – mkhera@owasp.org
  - Brian Bertacini, AppSec Consulting – South Bay- brian.bertacini@owasp.org
  - Robi Papp, Accuvant – North Bay – rpapp@owasp.org
  - Garrett Gee – East Bay –ggee@owasp.org
- 2008 Plan:
  - Bay Area Chapter meeting – Once every 3-4 months
  - Local Chapter meetings – 1x month, rotating thru each chapter
  - Topics planned – Specific attacks (XSS, Session Hijacking, Cross-Frame Scripting, Cross-Site Request Forgery, etc.), Compliance issues, Metrics, Status on OWASP Projects
- What we need:

Agenda

- 2.00 – 2.10 - Welcome, Bay Area Chapter Overview – Mandeep Khera
- 2.10 – 2.55 - Consumerization of Enterprises – Chenxi Wang, Forrester
- 2.55 – 3.40 – Cross-Site Request Forgery- Collin Jackson, PH.D. Student, Stanford University
- 3.40 – 4.00 - Networking Break
- 4.00 – 4.45 – Google Gadget Security – Tom Stracener, Cenzic
- 4.45 – 5.30 – How Cybercriminals Steal Money – Neil Daswani, Google
- 5.30 – 7.00 – Networking Reception – Food and Drinks

Consumerization of Enterprises: A Security Conundrum

Chenxi Wang, Ph.D.

Principal Analyst

Forrester Research Inc.

Agenda

- Consumerization - groundswell
- Security and control are the inhibitor
- What it means for security professionals
  - As a user
  - As a vendor
- Summary

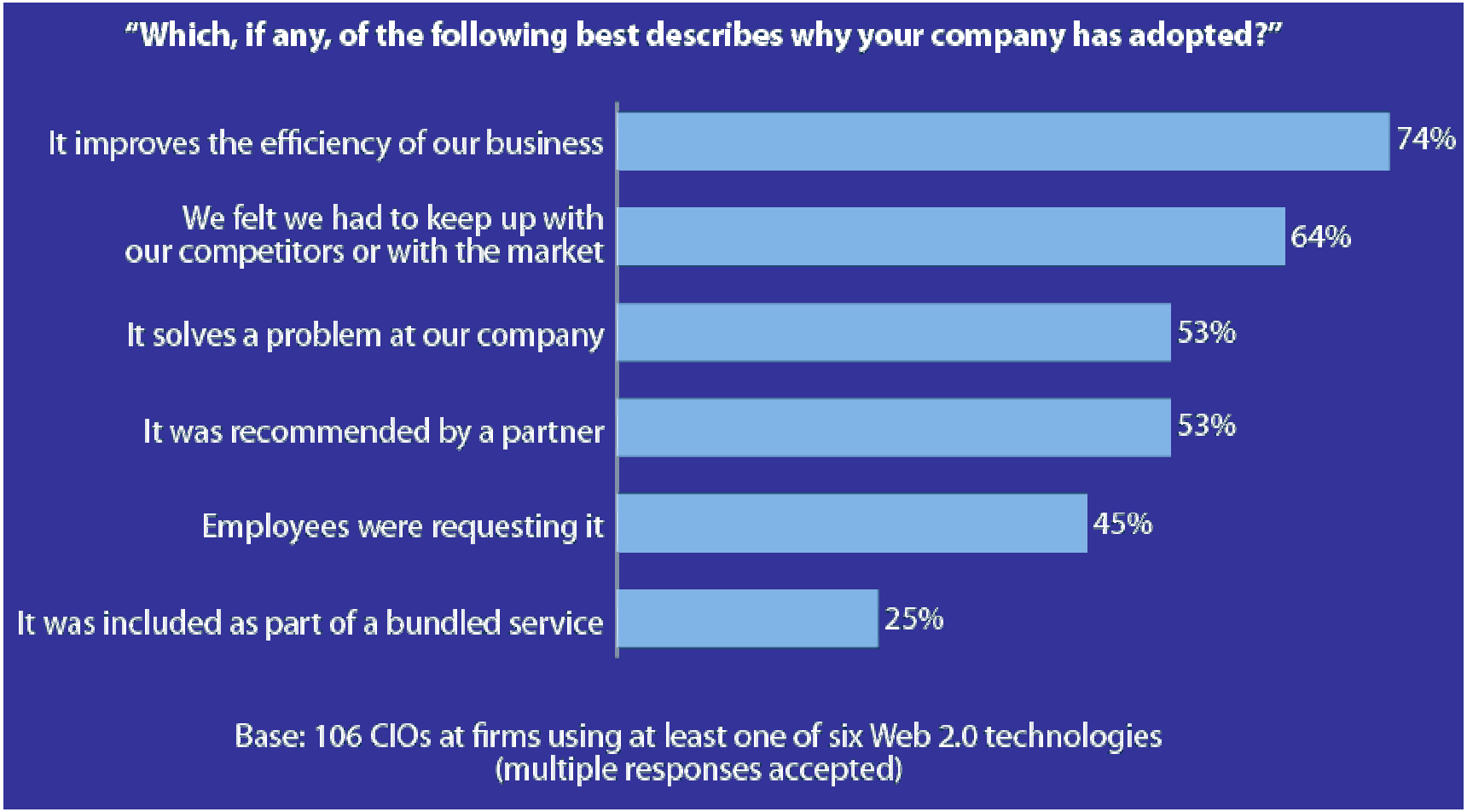
iPhone for enterprises?

- Seamless integration with enterprise apps
  - Synchronization with email, calendars, contacts.
  - Support for live communication or OCS (communication with presence)
- Codeword: work more seamlessly with Microsoft products
- Enable central management of and policy enforcement on iPhone devices
- Remote trouble shooting

CW1 put an iphone pictures

Chenxi Wang, 6/24/2008

The moral of the story: enterprises are increasingly adopting consumer technologies

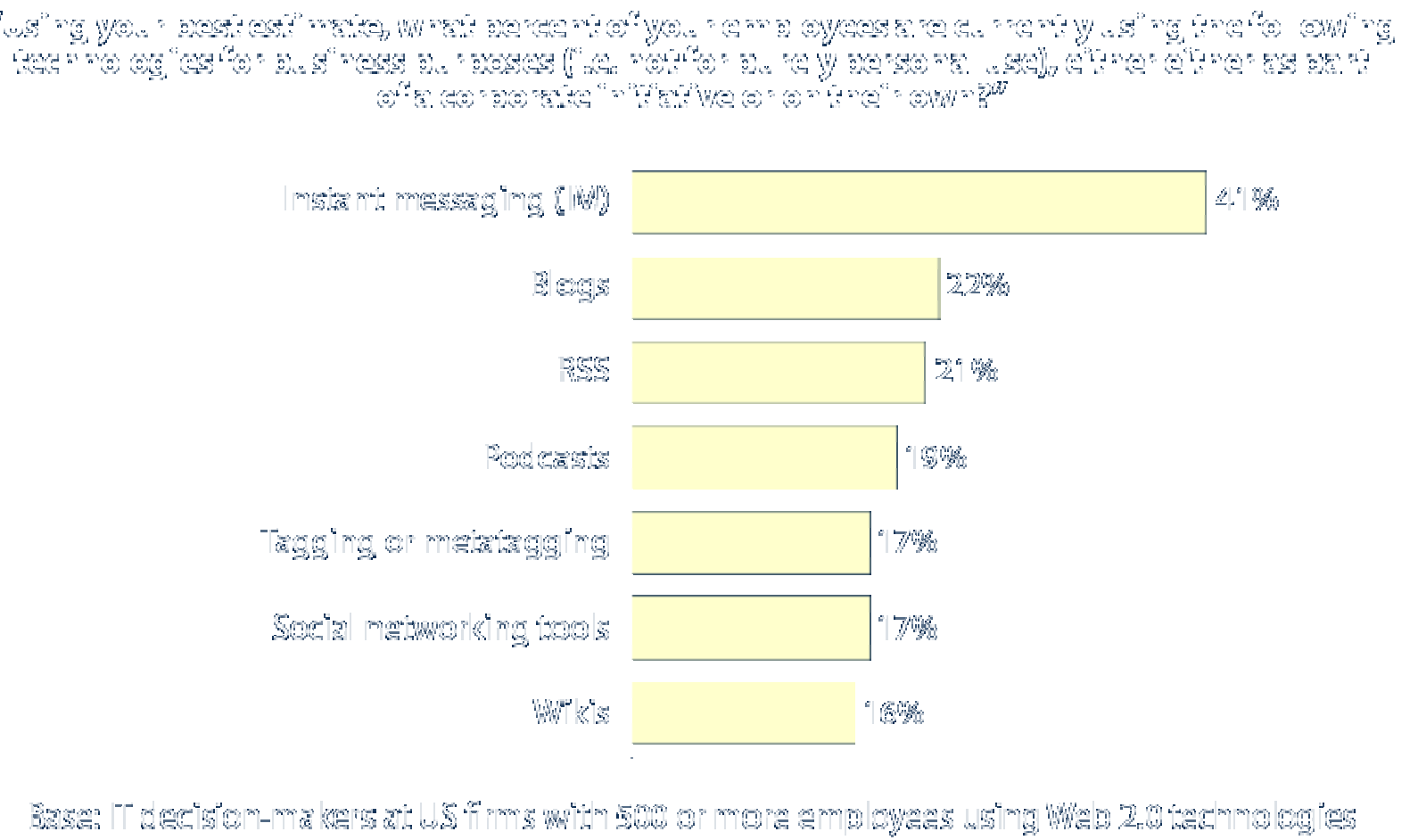


Source: United States CIO Confidence Poll Online Survey

What consumer technologies are being adopted?

- Real-time communication
  - IM, VoIP, web conferencing
  - Unified communication
- Information sharing and collaboration platforms
  - Blog, Wiki, RSS
  - Integrated search
  - Collaborative content portal

IT decision-makers estimate that many employees currently use consumer technologies for business purposes

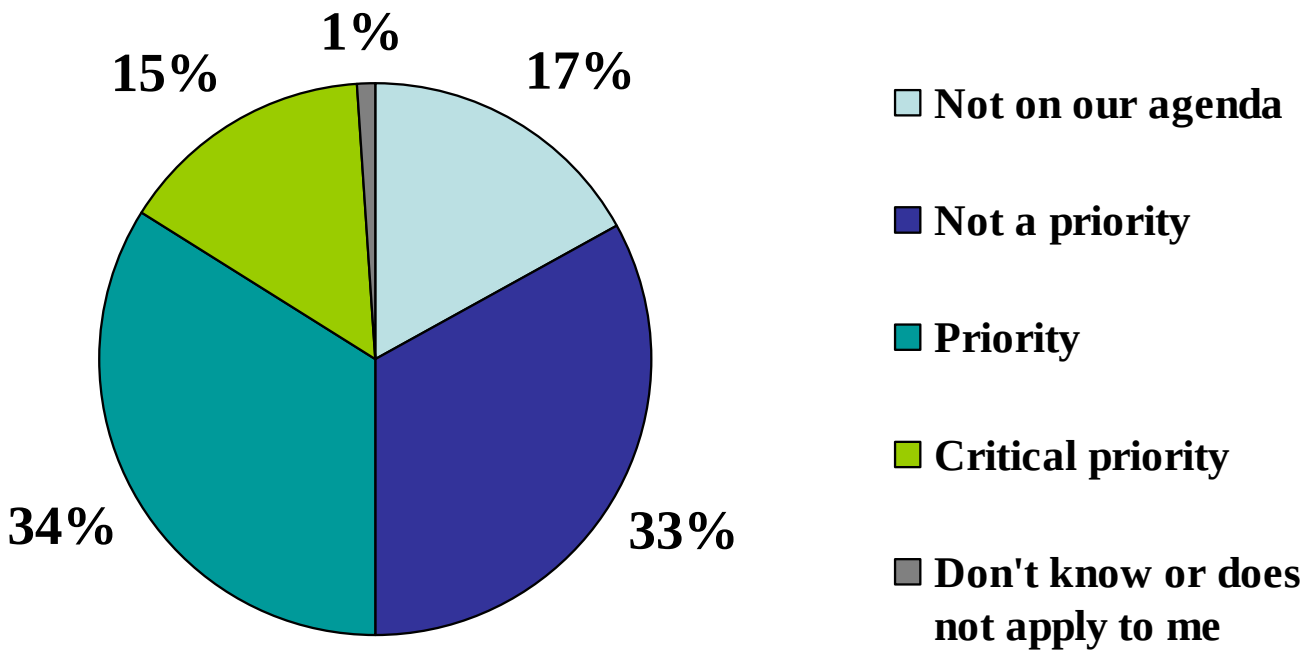


Source: May 2007 North American Enterprise Web 2.0 Online Survey
NOTE: These are preliminary findings and subject to revision

Collaboration has become part of enterprise fabric

"Which of the following are likely to be one of your IT organization's major software technology initiatives for the next 12 months?"

Implement an enterprise collaboration strategy



Near 50% of businesses view it as a priority

Base: 2,252 Software IT decision-makers at North American and European companies
Source: Forrester Enterprise And SMB Software Survey, Q3, 2007

People are building serious apps using collaboration technologies

- Crew portal (mission-critical app)
- Compliance documentation management

AMD
www.amd.com

- AMD Central intranet
- Partner sites (mission critical)
- Microsites

General Mills

- Brand Champions workplace
  - 1,200 marketing pros initially
  - 5,000 in marketing, sales ultimately

But, organizations are wary of consumer technologies

- CIOs tell us
  - #1 concern: security risks
  - Fear of losing control
  - Increased complexity on IT operations
  - RoI isn't necessarily clear

- Employees increasingly expect collaboration, information sharing, and just in time delivery of content
- It is IT's burden to make that happen

Security and control issues are top of mind

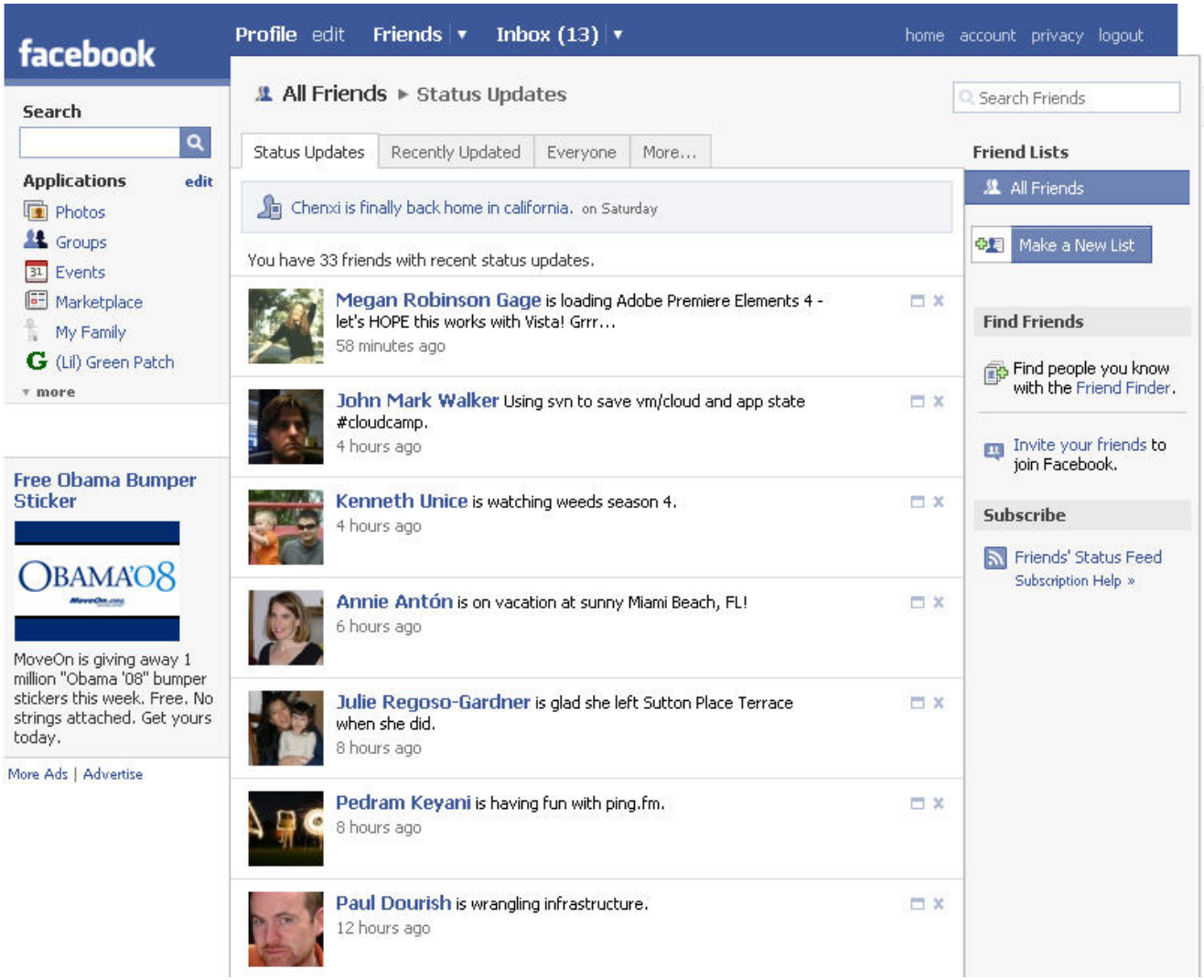
Enterprises' needs for control

- Policy enforcement in a centralized manner, using scalable, auditable, repeatable methods
- Maintain control over information
  - Keep confidential information confidential
  - Proper access control for privacy and security reasons
- Compliance and regulation needs
  - PCI, SoX, GLB, ITAR
- Obtain visibility of activities

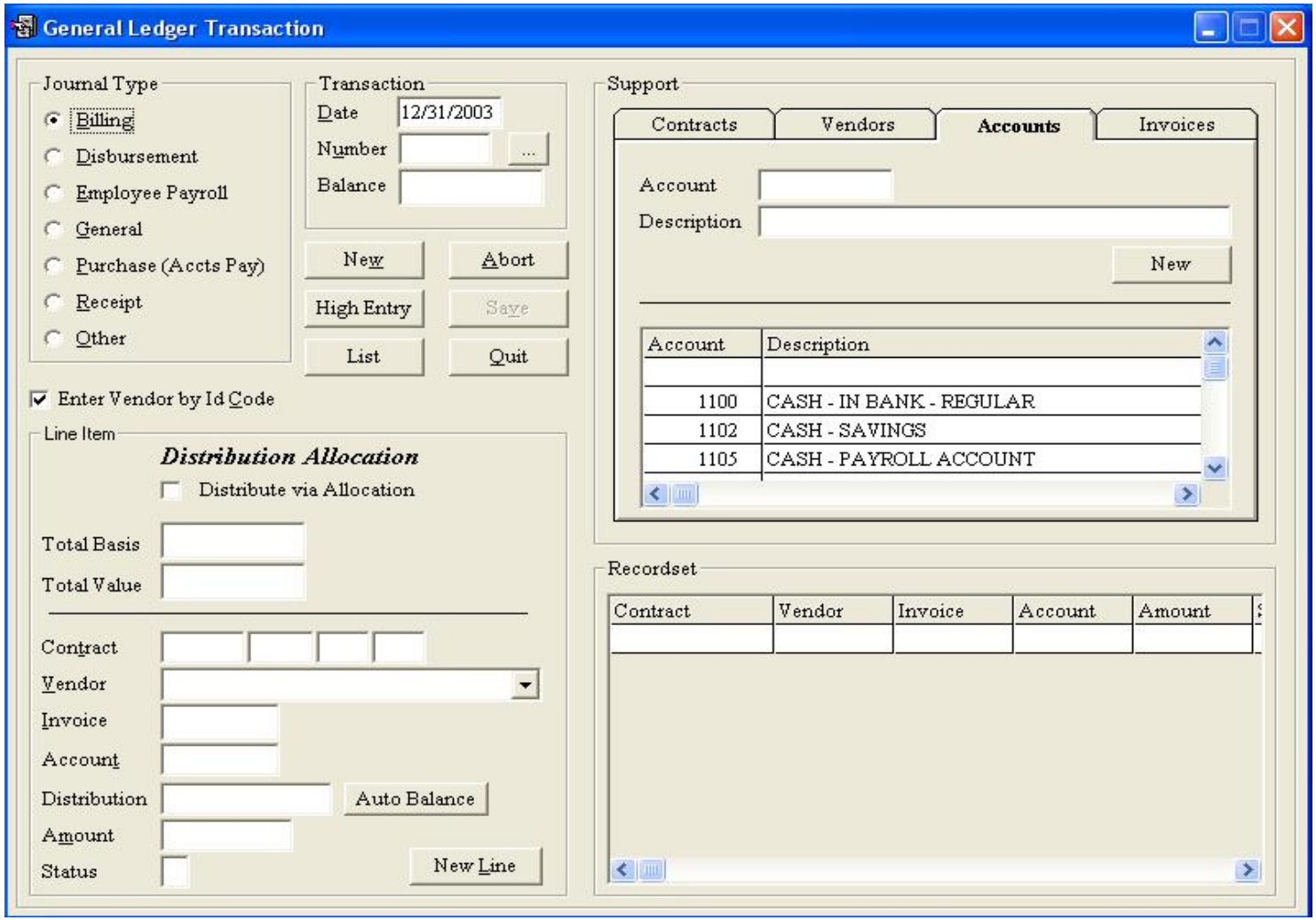
This is in fundamental conflict with the requirements of consumer technologies

- At the core, consumer technologies are about being
  - Convenient
  - Personable
  - Flexible
  - Efficient interaction between individuals, data, and applications

The consumer experience



The enterprise experience



The experience gap will disappear

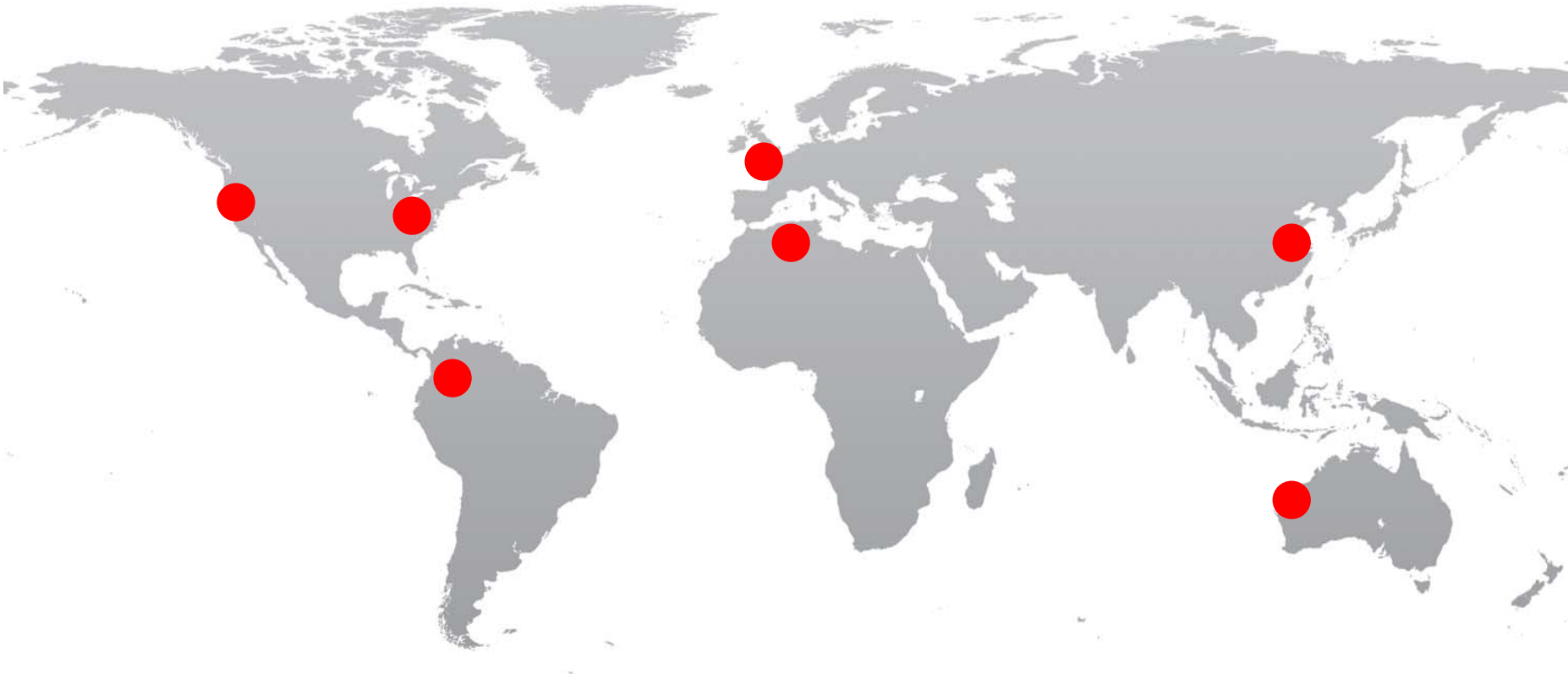
- There is no reason that you have to use disparate systems for consumer vs. enterprise computing
- The consumerization of enterprises is happening

- So facilitate it, mold it, and lead it !

What do you get out of it?

- Enterprises can benefit from increased collaboration and productivity
- Individuals can benefit from convergence of applications, knowledge, and interaction methods
- So meet the future Chenxi

I work with a team located at

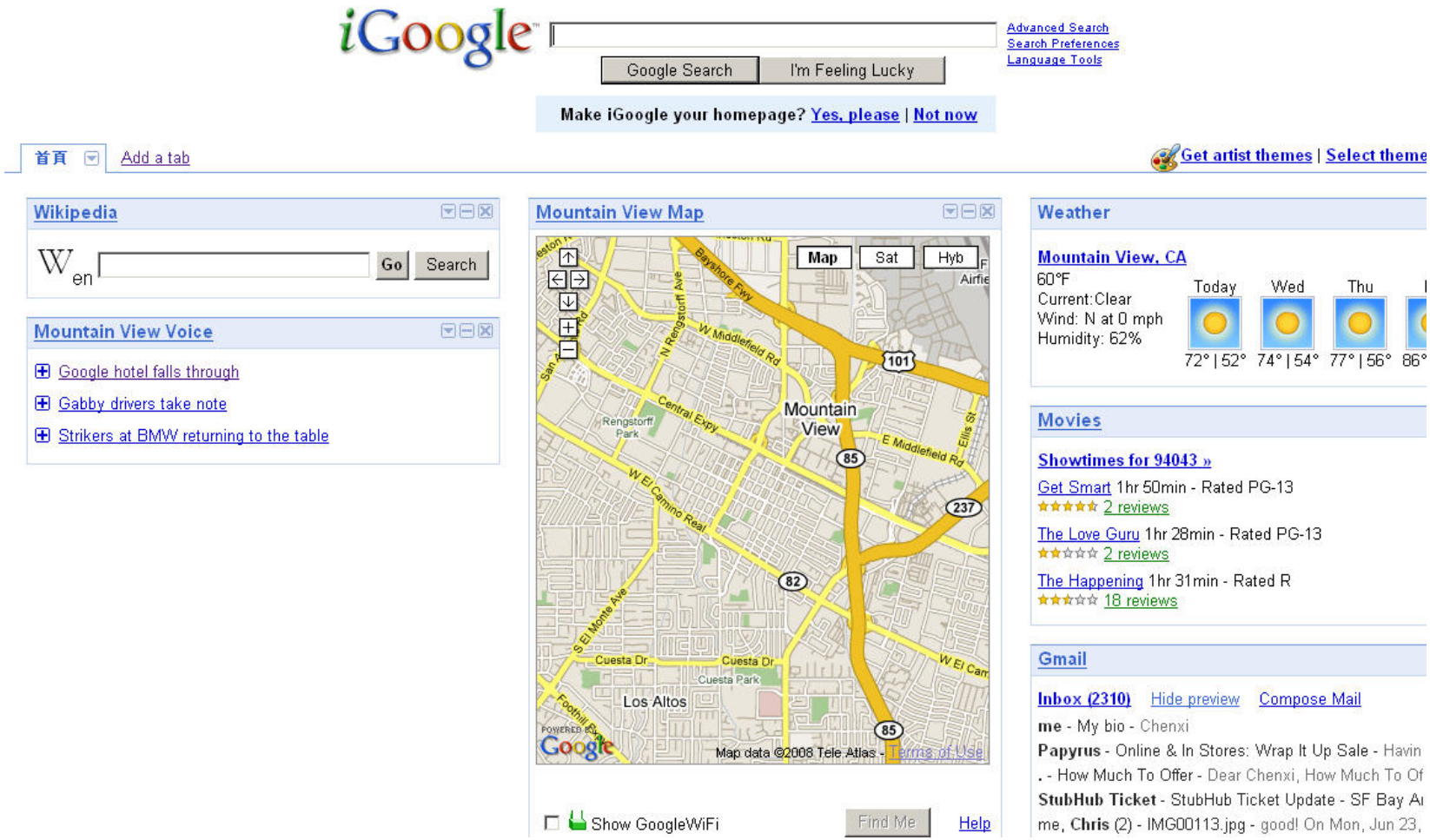


My team has a project blog

- Each member subscribes to the blog via RSS
- Our external partners also subscribe via RSS
- Our team meeting is conducted via web conferencing
  - Also saved via podcast, members in far away timezone are notified when a new podcast becomes available via RSS
- Our team blog is linked to Wikipedia, any unfamiliar terms can be explained with a click of the mouse
- I synchronize my calendar with my remote colleagues, chat with my colleagues via OCS, available also on my iPhone

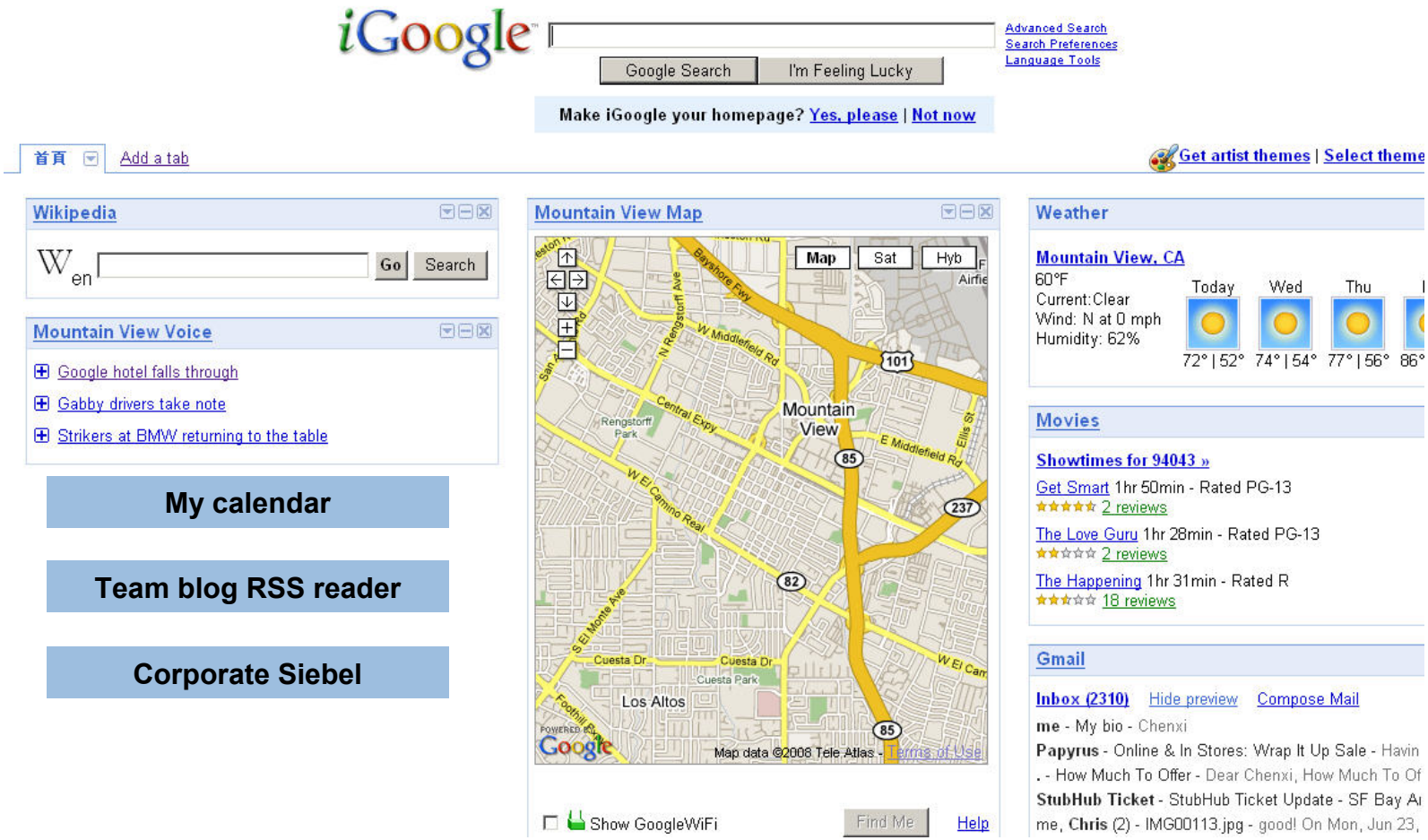


When I open a browser



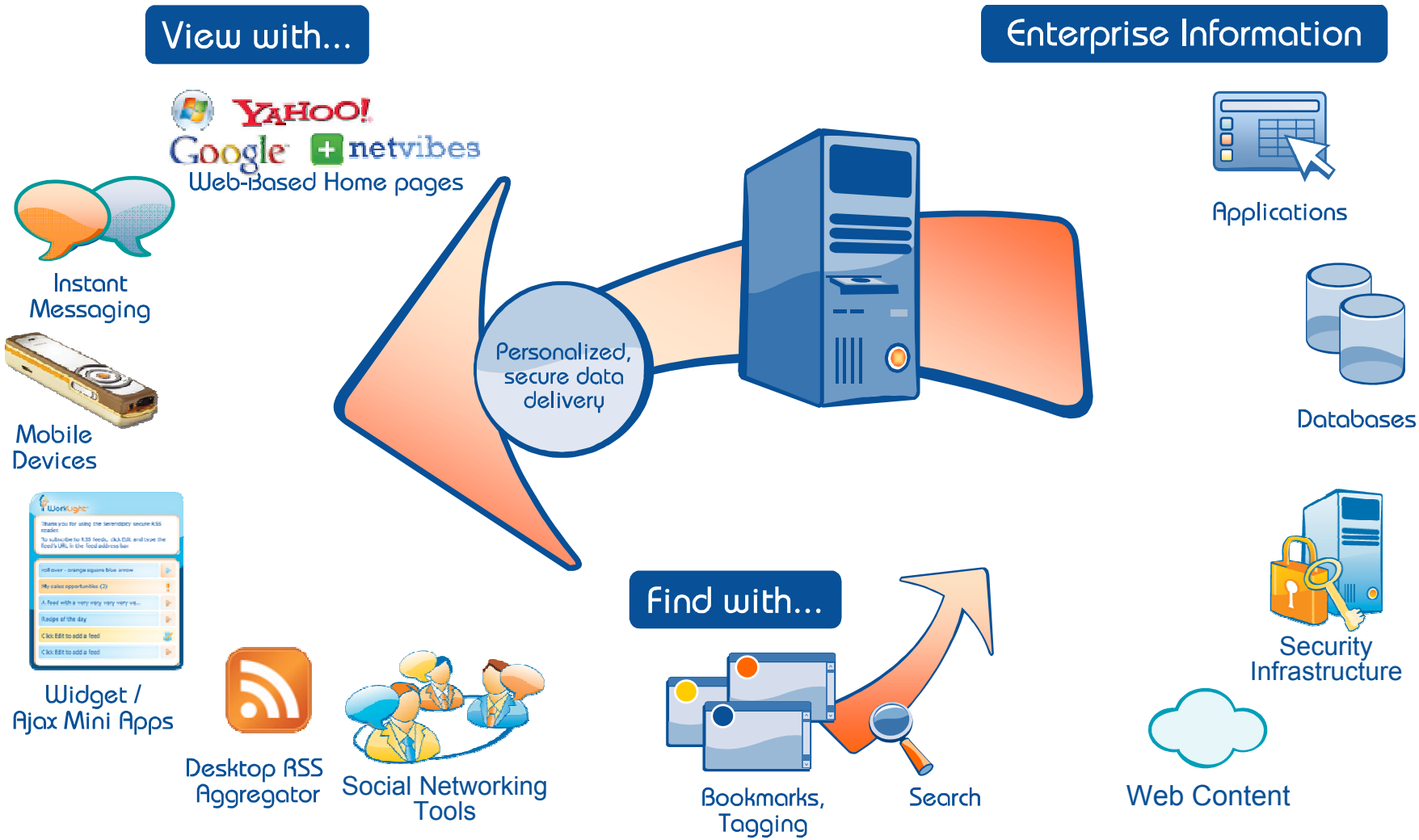
OWASP

I see this …


iGoogle
Google Search
I'm Feeling Lucky
Advanced Search
Search Preferences
Language Tools
Make iGoogle your homepage? Yes, please | Not now
首頁
Add a tab
Get artist themes | Select theme
Wikipedia
Go
Search
Mountain View Voice
Google hotel falls through
Gabby drivers take note
Strikers at BMW returning to the table
My calendar
Team blog RSS reader
Corporate Siebel
Mountain View Map
Map
Sat
Hyb
Mountain View
Los Altos
Show GoogleWiFi
Find Me
Help
Weather
Mountain View, CA
60°F
Current: Clear
Wind: N at 0 mph
Humidity: 62%
Today
Wed
Thu
72° | 52°
74° | 54°
77° | 56°
86°
Movies
Showtimes for 94043 »
Get Smart 1hr 50min - Rated PG-13
2 reviews
The Love Guru 1hr 28min - Rated PG-13
2 reviews
The Happening 1hr 31min - Rated R
18 reviews
Gmail
Inbox (2310)
Hide preview
Compose Mail
me - My bio - Chenxi
Papyrus - Online & In Stores: Wrap It Up Sale - Havin
. - How Much To Offer - Dear Chenxi, How Much To Of
StubHub Ticket - StubHub Ticket Update - SF Bay Ar
me, Chris (2) - IMG00113.jpg - good! On Mon, Jun 23,

My other portal to both consumer and enterprise apps is …

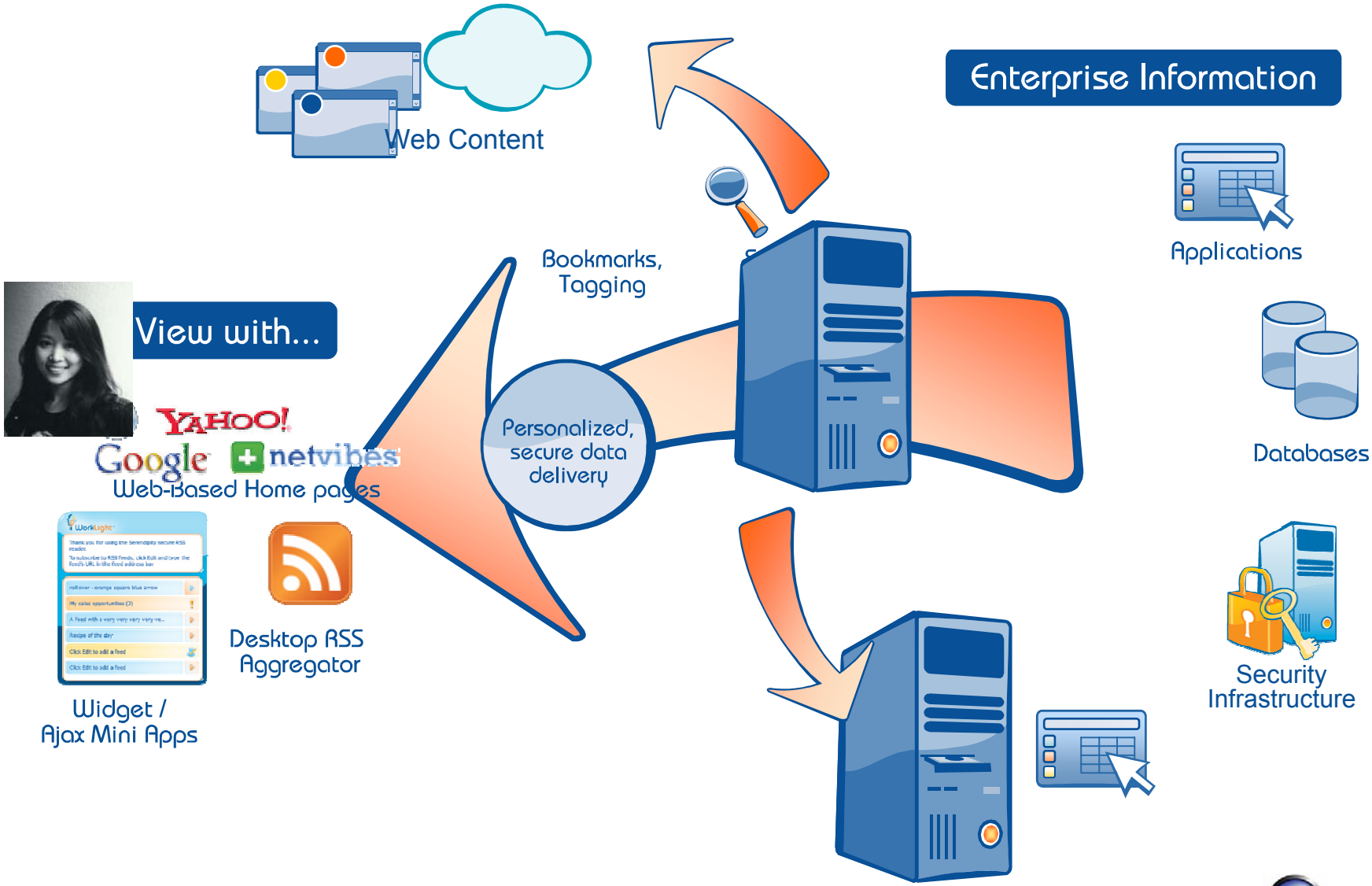
What we need is personalized, secure data delivery



We also need …

- Identity management beyond simple corporate boundaries
  - That means identity management beyond simple corporate boundaries
  - In today's terms, it's about federated identity and support third party SSO tools
  - Tomorrow, perhaps identity is an on-demand evaluation
    - Identity materials (which you possess)
    - Temporal characters (time of the day, previous transactions, etc.)
    - Your GPS info
    - Corporate info (available on demand)
  - To achieve fine-grained access control

Perhaps this is what happens



How far are we to this vision?

Browser based

blogs

wiki's

podcasts

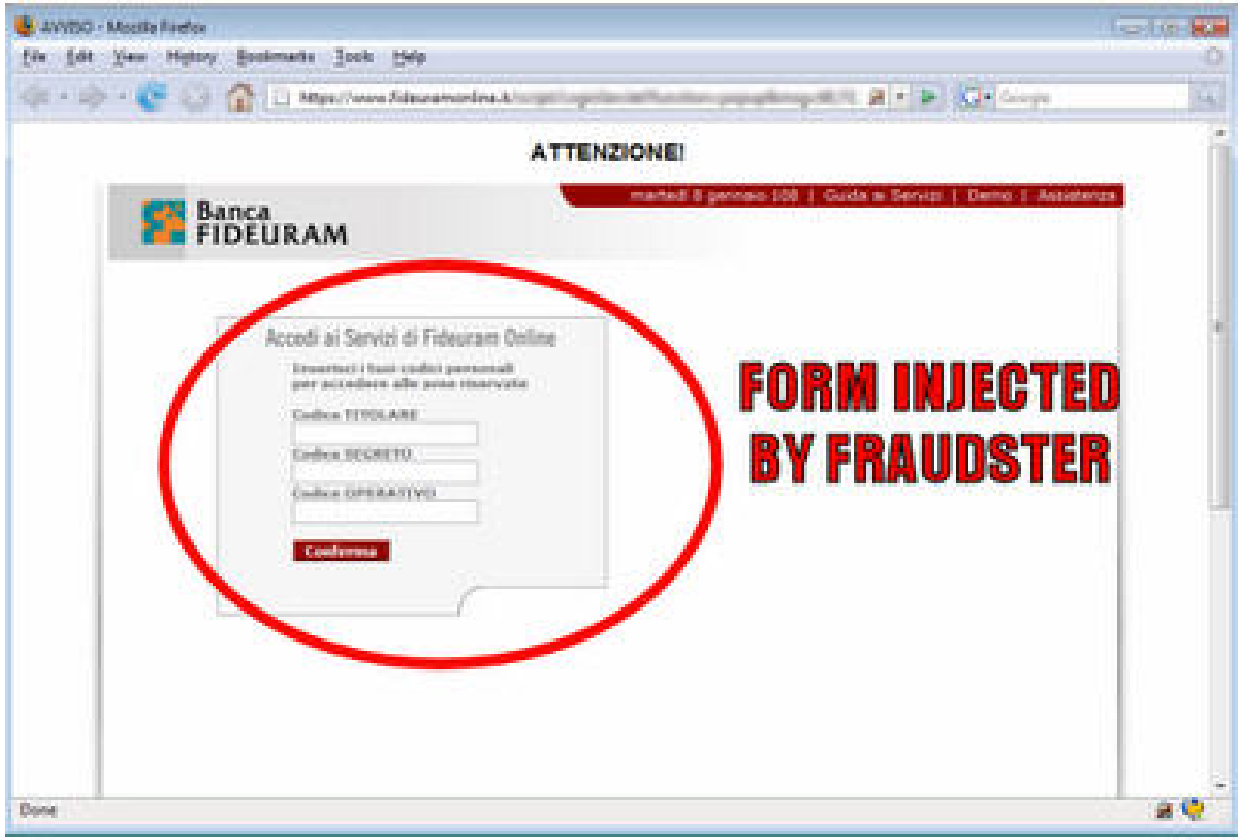
social networking

online **collaboration**

tagging

social bookmarking

We won't get there if we don't solve XSS

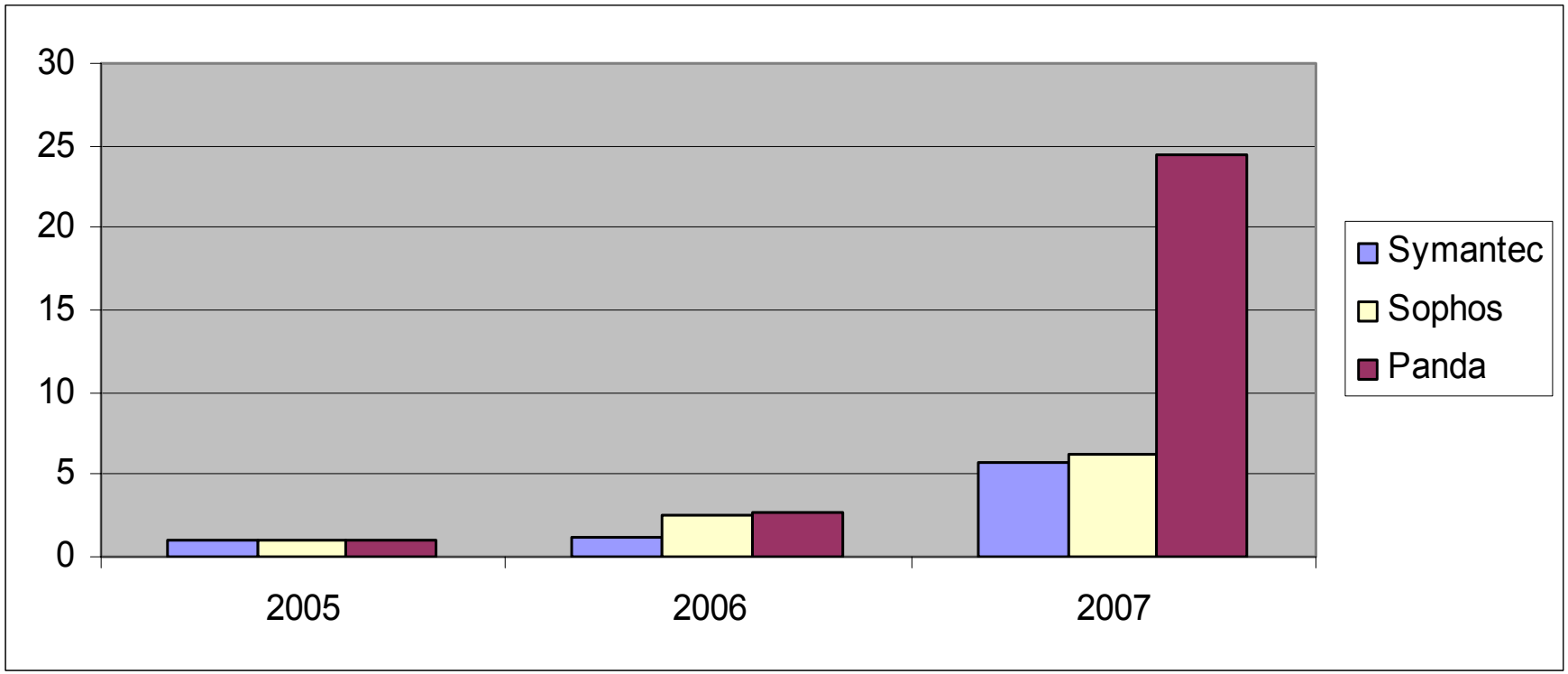


We also won't get there if this continues …

Figure 3: Fraction of search queries that resulted in at least one malicious URL . (7-day running avg.)

Source: February 2008, "All Your iFRAMEs Point to Us," Google technical report.

Or this continues …



Summary

- A single layer of identity management logic across organizations, roles, businesses
- Securer web applications
- Strong policy control capabilities to enforce enterprise content governance
- Seamless support for functionality
- A safer Internet

Thank you

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www.forrester.com

Cross Site Request Forgery
New Attacks and Defenses

Collin Jackson
Stanford University
collinj@cs.stanford.edu
(206) 963-0724

6/25/2008

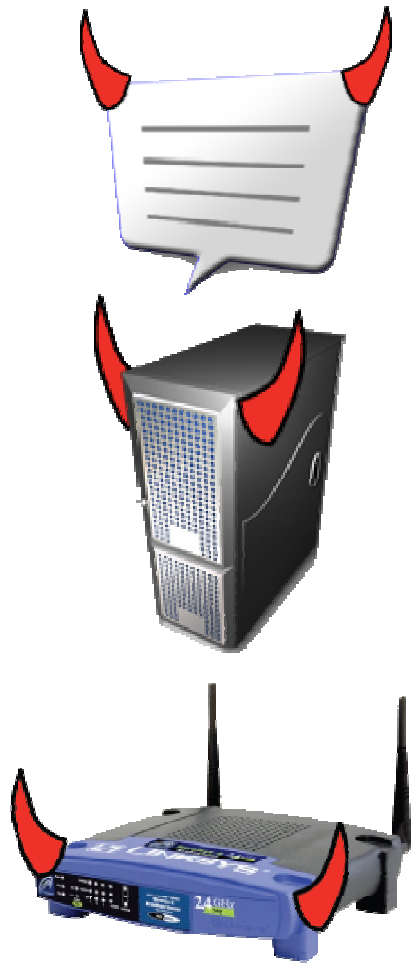
Joint work with Adam Barth and John C. Mitchell

Outline

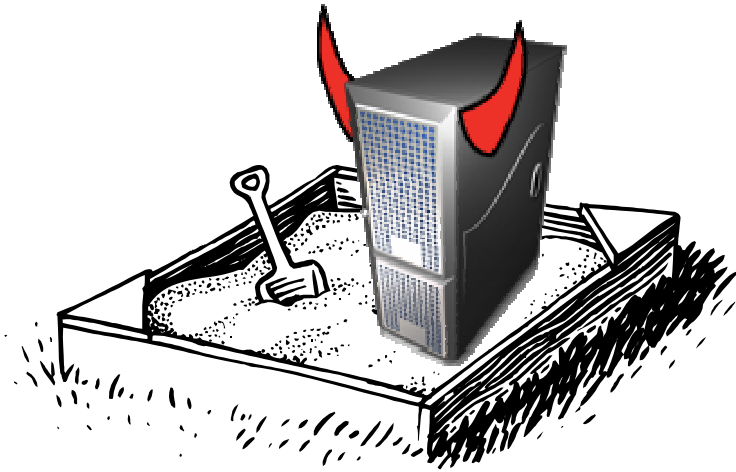
- CSRF Defined
- Attacks Using Login CSRF
- Existing CSRF Defenses
- CSRF Defense Proposal
- Identity Misbinding

Threat Models

- Forum Poster
  - Injects content onto trusted site
  - Sanitized (hopefully)
- Web Attacker
  - Owns https://www.attacker.com
  - Free user visit
- Network Attacker
  - Eavesdrop/corrupt normal traffic
  - Cannot eavesdrop/corrupt HTTPS



Browser vs. Web Attacker



- Isolate sites
- Sites can opt in to sharing information
- Prevent attacker from
  - Abusing user's IP address
  - Reading browser state associated with other sites
  - Writing browser state associated with other sites

Browser Security Policy

- Same-origin policy

```
<iframe src="http://www.bank.com/">
<script>
        alert(frames[0].document.cookie);
</script>
```

- Library import

```
<script src="https://www.verisign.com/seal.js">
```

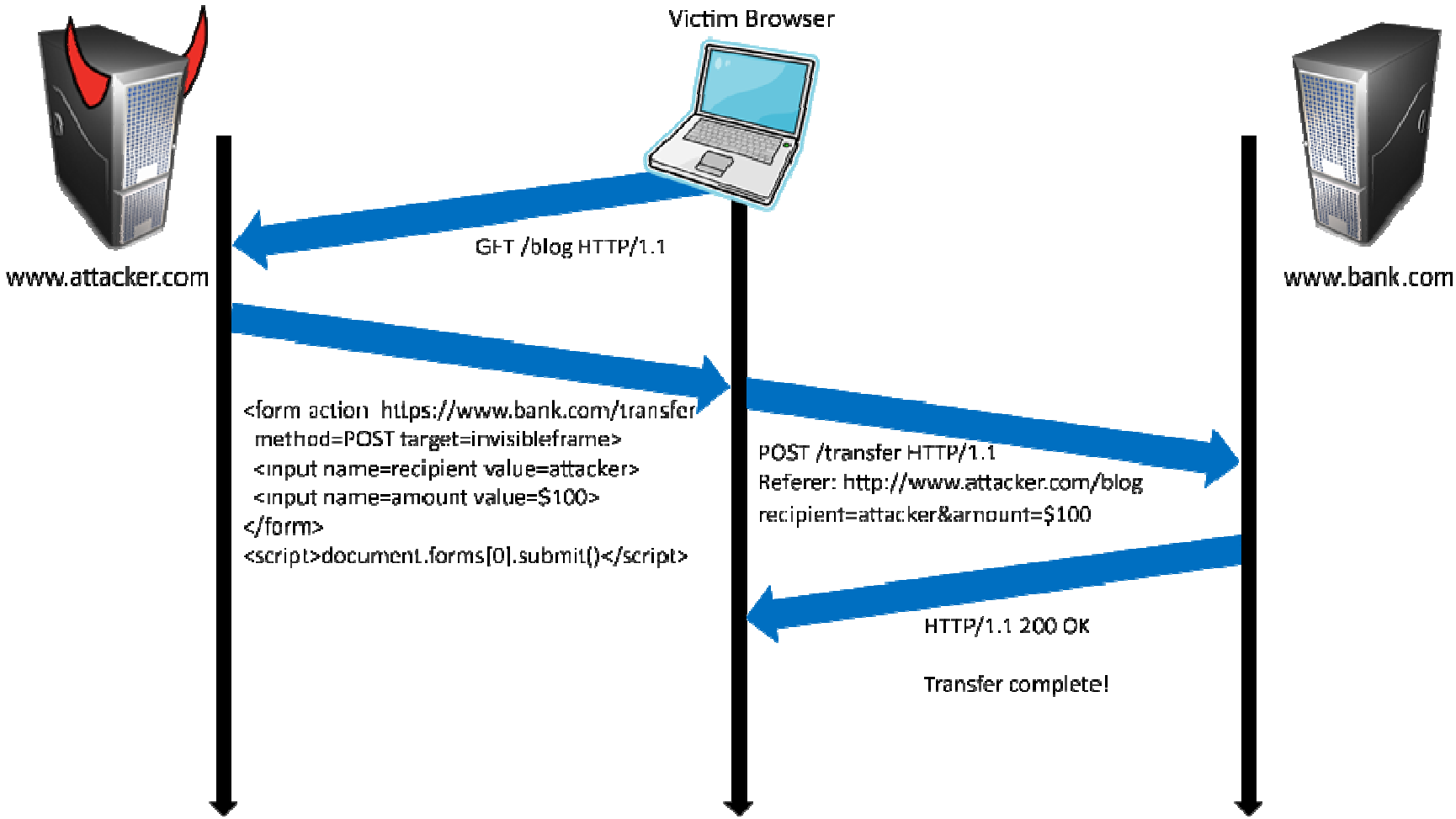
- Data export

```
<form action="https://www.bank.com/login">
```

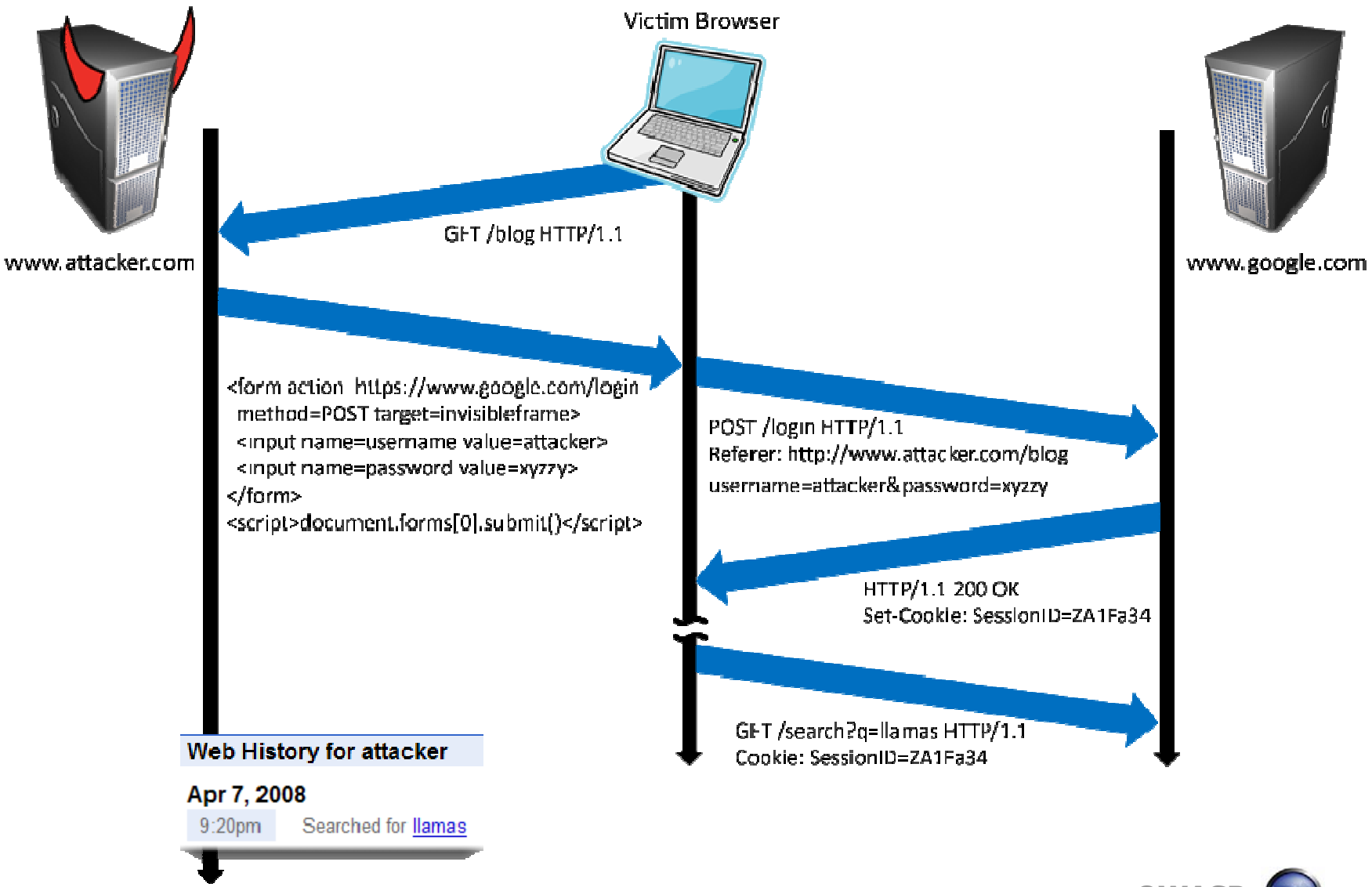
Problems with Data Export

- Abusing user's IP address
  - Can issue commands to servers inside firewall
- Reading browser state
  - Can issue requests with cookies attached
- Writing browser state
  - Can issue requests that cause cookies to be overwritten
- "Session riding" is a misleading name

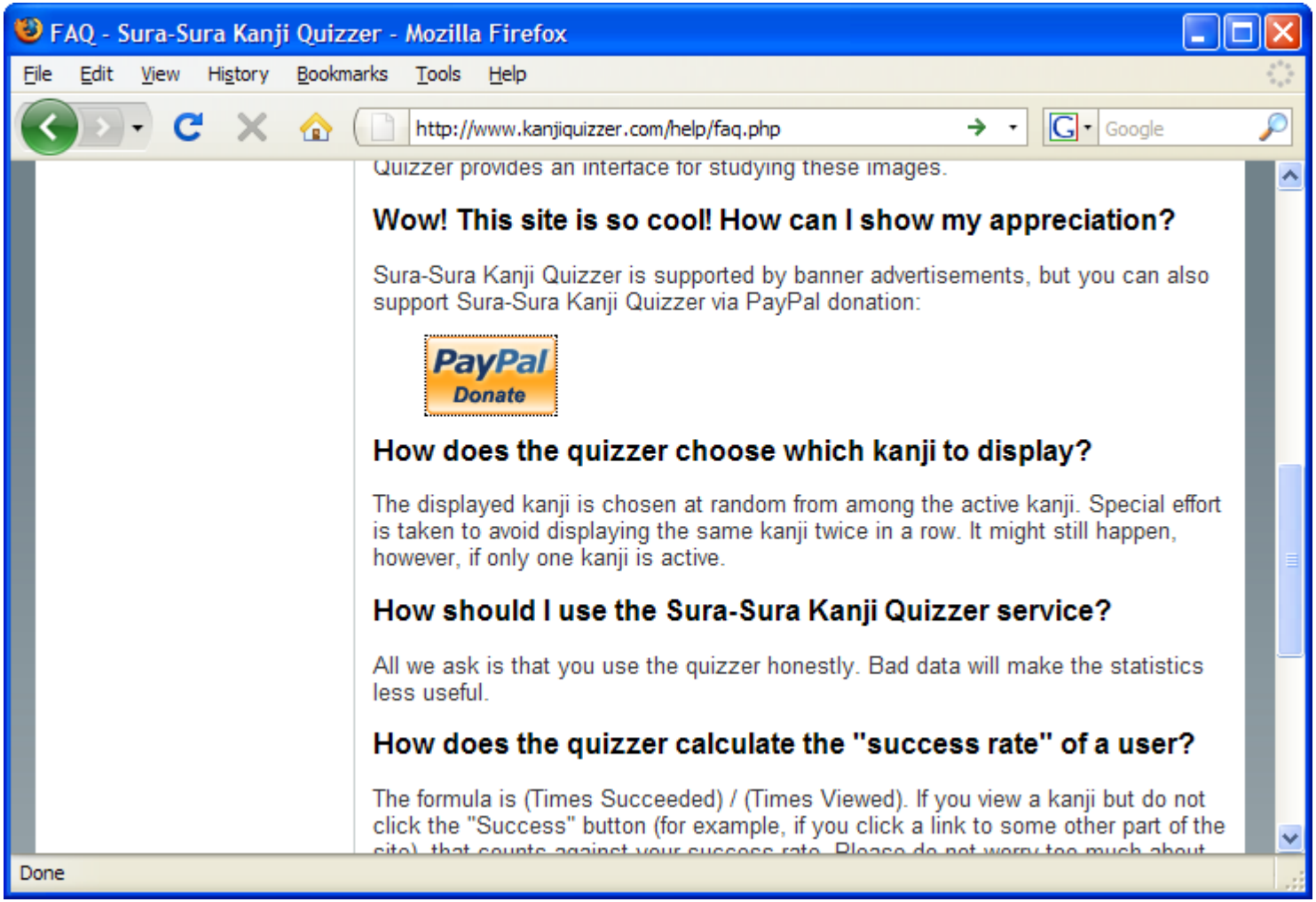
Cross-Site Request Forgery



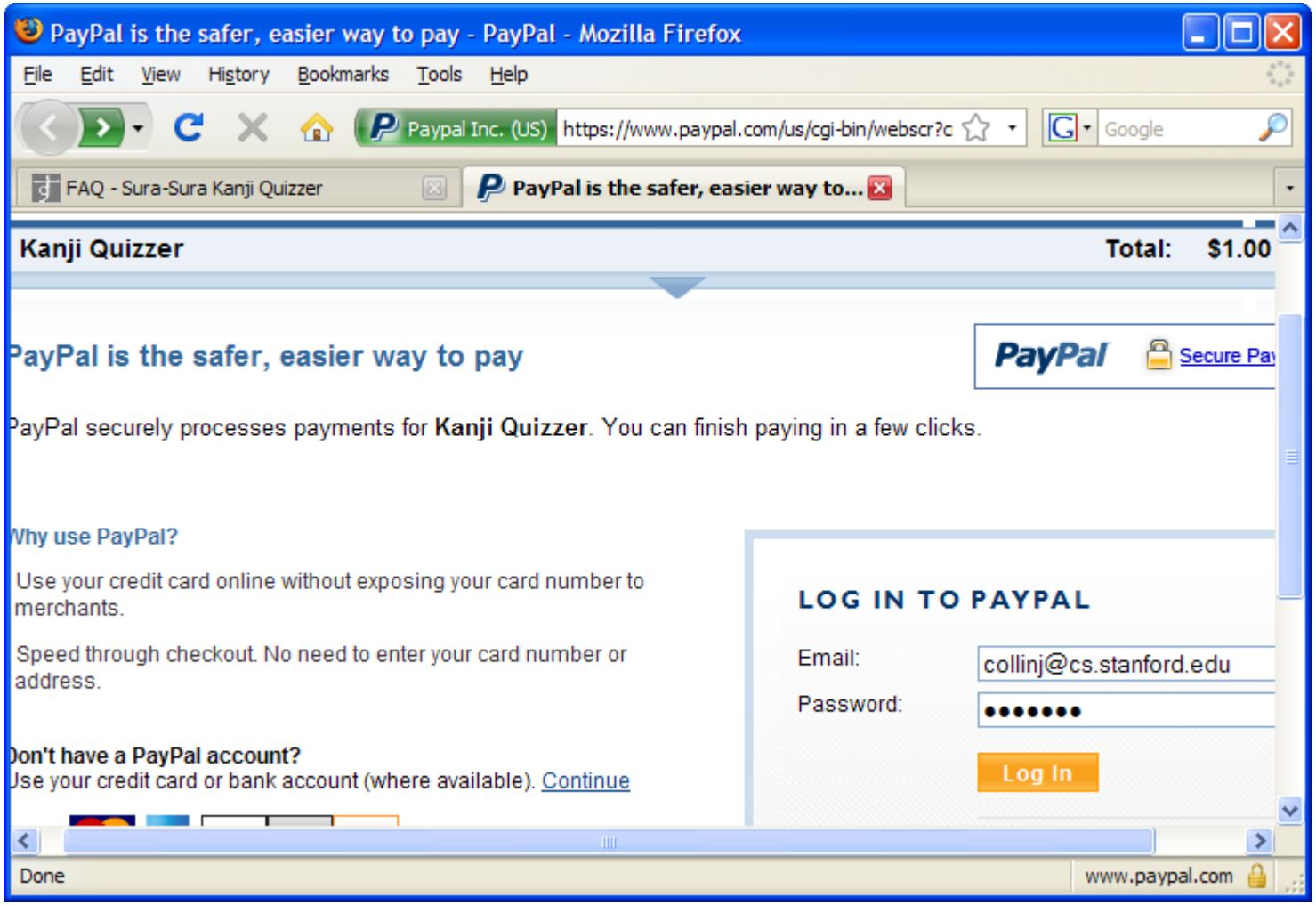
Login CSRF


Victim Browser
www.attacker.com
www.google.com
GET /blog HTTP/1.1
<form action https://www.google.com/login
method=POST target=invisibleframe>
<input name=username value=attacker>
<input name=password value=xyzzy>
</form>
<script>document.forms[0].submit()</script>
POST /login HTTP/1.1
Referer: http://www.attacker.com/blog
username=attacker&password=xyzzy
HTTP/1.1 200 OK
Set-Cookie: SessionID=ZA1Fa34
GET /search?q=llamas HTTP/1.1
Cookie: SessionID=ZA1Fa34
Web History for attacker
Apr 7, 2008
9:20pm
Searched for llamas

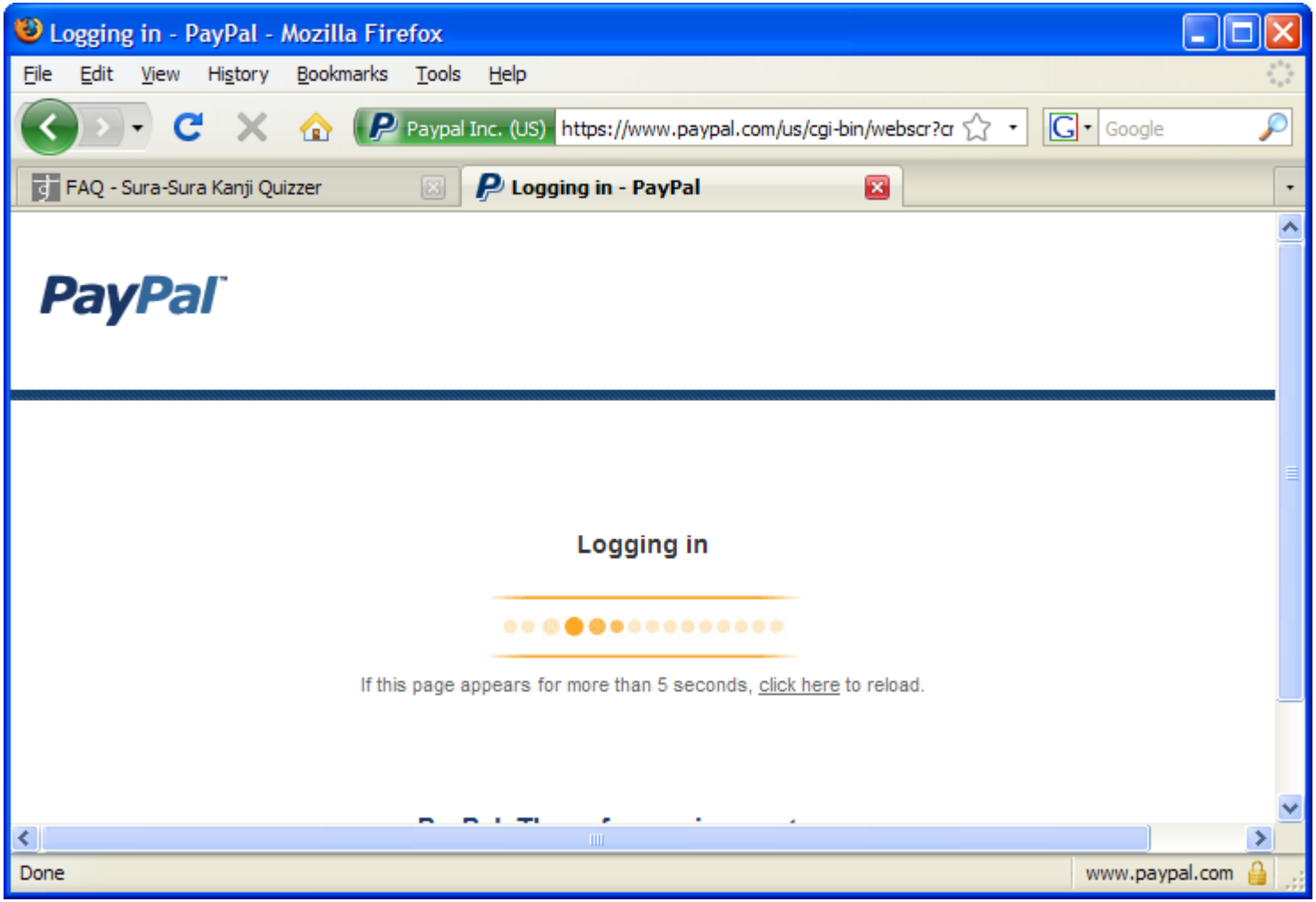
Payments Login CSRF



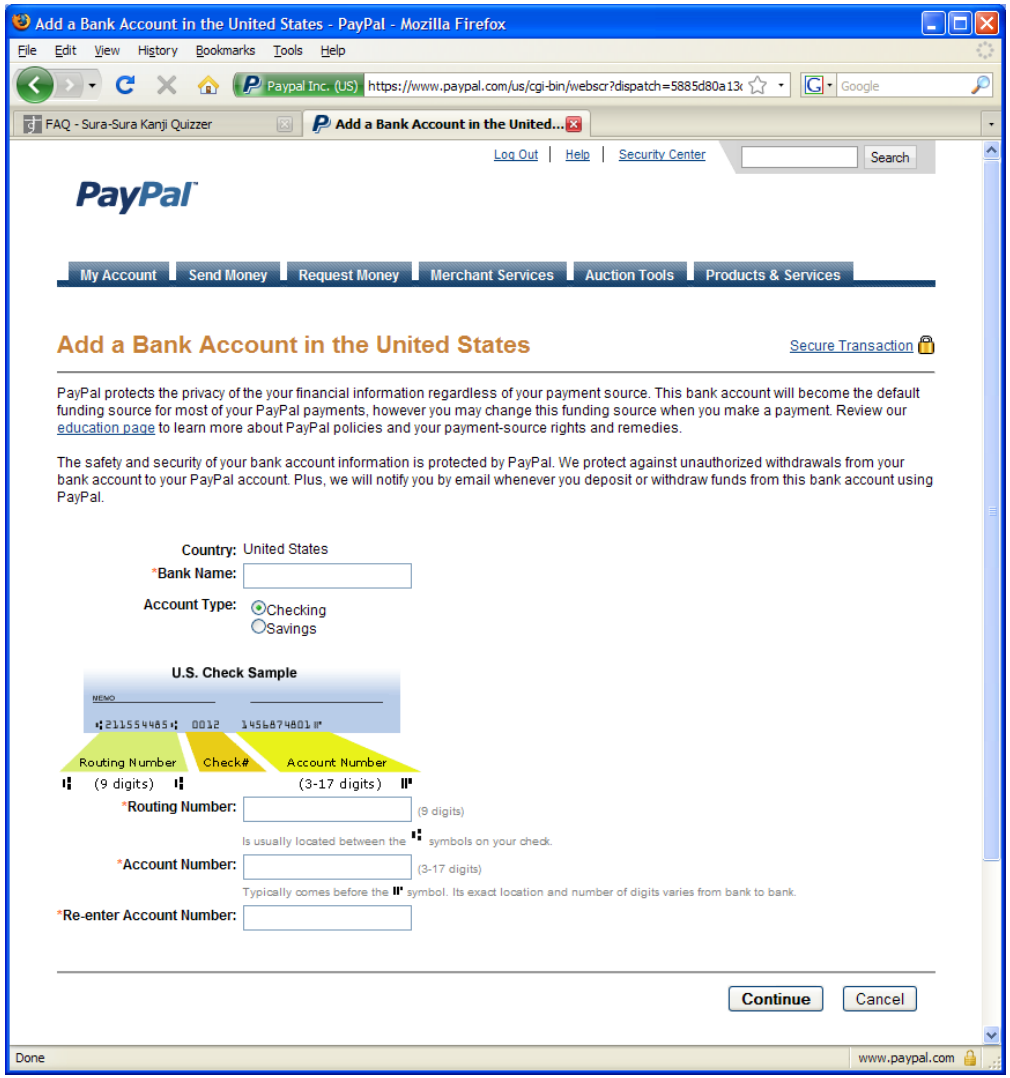
Payments Login CSRF



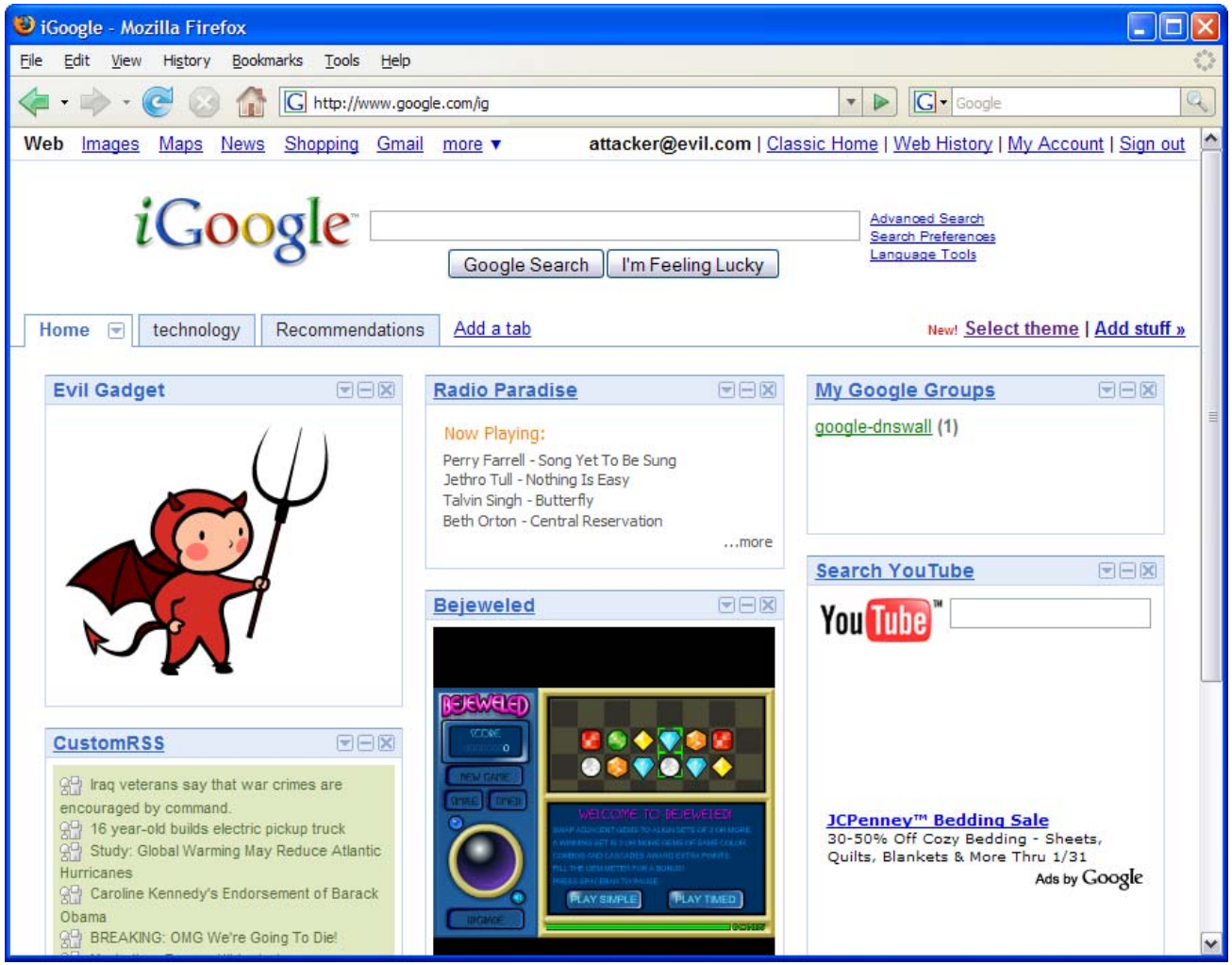
Payments Login CSRF



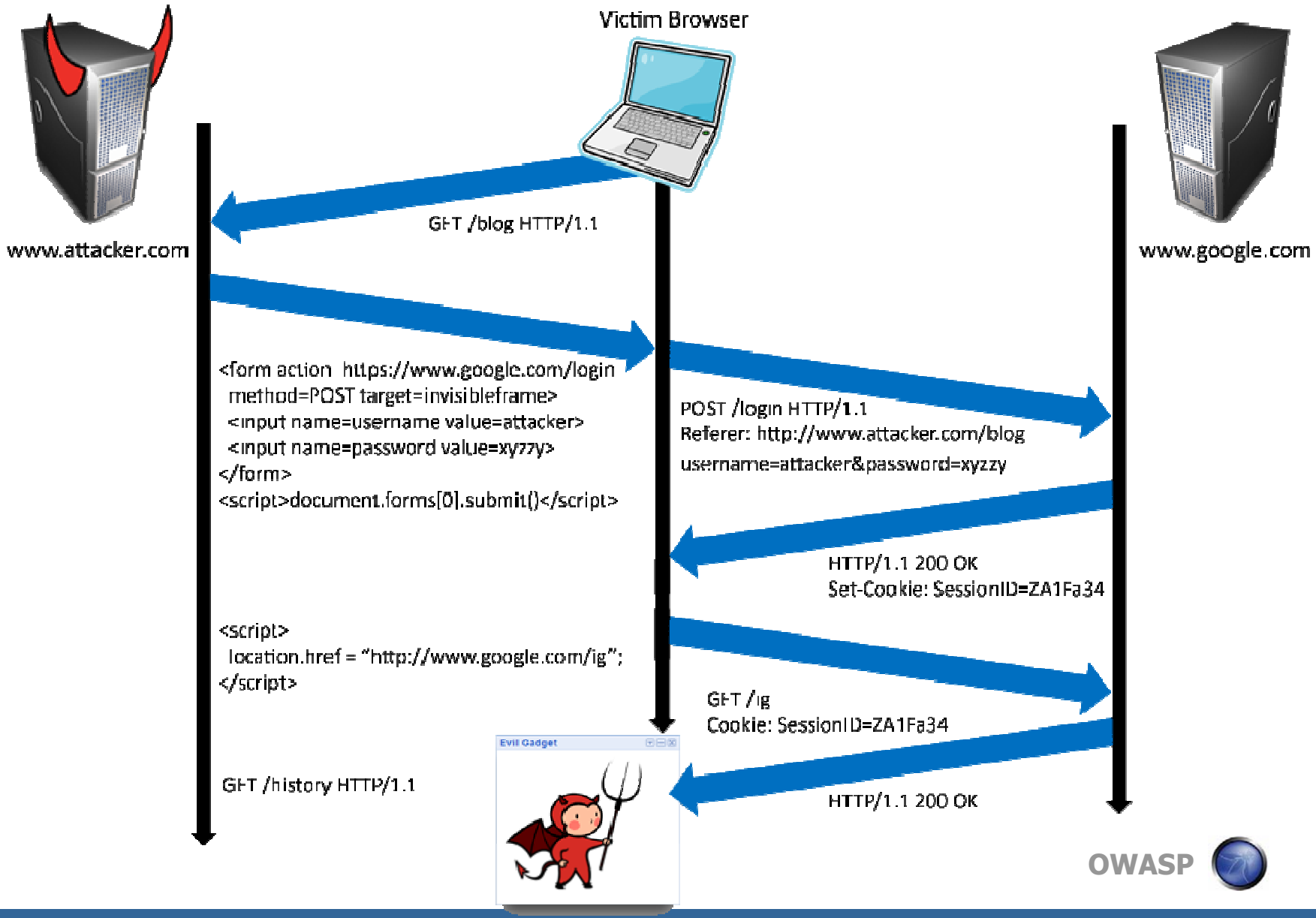
Payments Login CSRF



Inline Gadgets



Using Login CSRF for XSS



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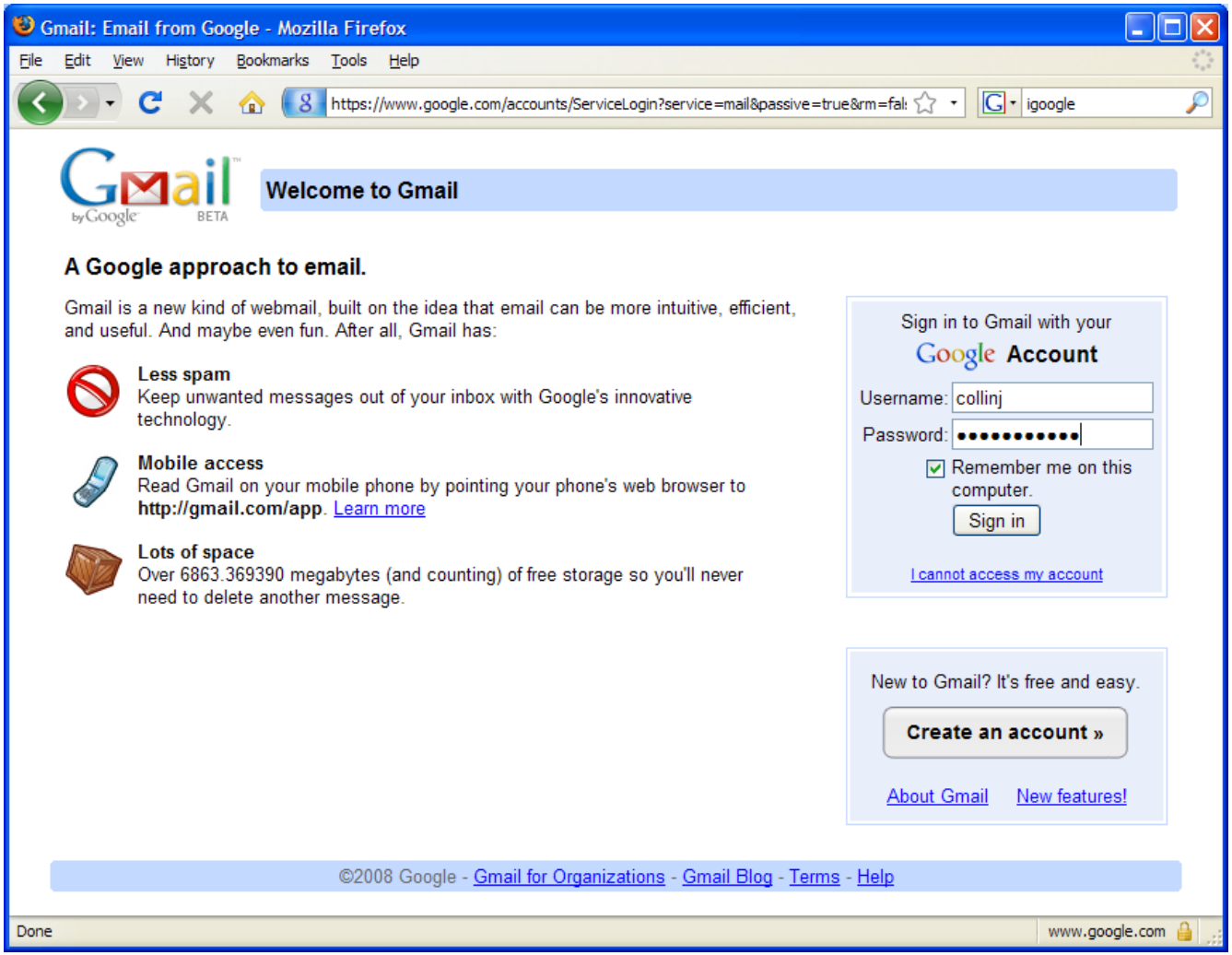
Post-XSS


Gmail: Email from Google - Mozilla Firefox
File Edit View History Bookmarks Tools Help
https://www.google.com/accounts/ServiceLogin?service=mail&passive=true&rm=fal
igoogle
Gmail by Google BETA
Welcome to Gmail
A Google approach to email.
Gmail is a new kind of webmail, built on the idea that email can be more intuitive, efficient, and useful. And maybe even fun. After all, Gmail has:
Less spam
Keep unwanted messages out of your inbox with Google's innovative technology.
Mobile access
Read Gmail on your mobile phone by pointing your phone's web browser to http://gmail.com/app. Learn more
Lots of space
Over 6863.369390 megabytes (and counting) of free storage so you'll never need to delete another message.
Sign in to Gmail with your Google Account
Username: collinj
Password:
Remember me on this computer.
Sign in
I cannot access my account
New to Gmail? It's free and easy.
Create an account »
About Gmail New features!
©2008 Google - Gmail for Organizations - Gmail Blog - Terms - Help
Done
www.google.com

CSRF Defenses

- Secret Validation Token


```
<input type=hidden value=23a3af01b>
```

- Referer Validation


```
Referer: http://www.facebook.com/home.php
```

- Custom HTTP Header

```
X-Requested-By: XMLHttpRequest
```

Secret Validation Token vs. Web Attacker

- Hash of User ID
  - Attacker can forge

```
<input type=hidden value=23a3af01b>
```

- Session ID
  - Save to HTML does allow session hijacking
- Session-Independent Nonce (Trac)
  - Can be overwritten by subdomains, network attackers

- Session-Dependent Nonce (CSRFx, CSRFGuard)
  - Requires managing a state table
- HMAC of Session ID
  - No extra state required

Keeping Secrets in NoForge

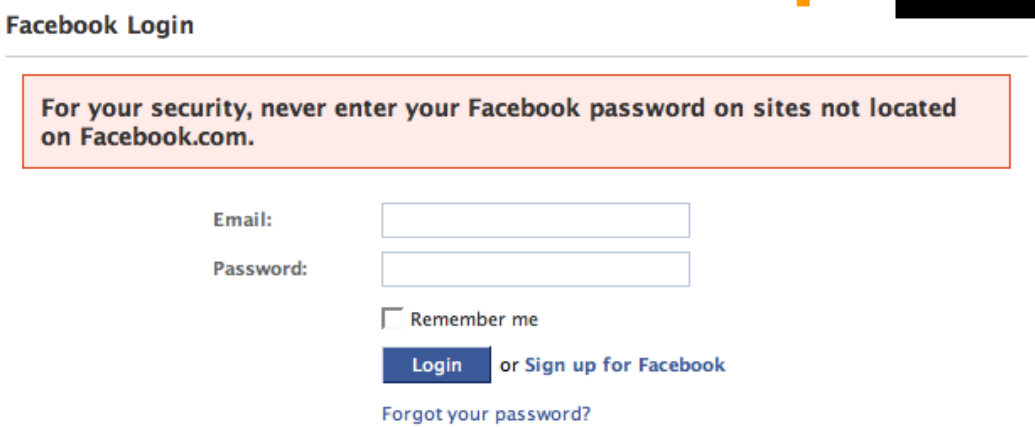
- Parses HTML and appends token to hyperlinks
- Dynamically created HTML lacks token
  - Legacy application may break unexpectedly
- Token appended to all external links
  - Remote site can immediately CSRF referrer
- No login CSRF defense
  - Requires a session before token is validated

Referer Validation

✓ `Referer: http://www.facebook.com/`

✘ `Referer: http://www.evil.com/attack.html`

? `Referer:`



- Lenient Referer checking – header is optional
- Strict Referer checking – header is required

Why use Lenient Referer Checking?

- Referer may leak privacy-sensitive information

  `http://intranet.corp.apple.com/projects/iphone/competitors.html`

- Common sources of blocking:
  - Network stripping by the organization
  - Network stripping by local machine
  - Stripped by browser for HTTPS -> HTTP transitions
  - User preference in browser
  - Buggy user agents
- Site cannot afford to block these users

Lenient Referer Checking vs. Web Attacker


```
ftp://www.attacker.com/index.html
javascript:"<script> /* CSRF */ </script>"
data:text/html,<script> /* CSRF */ </script>
```

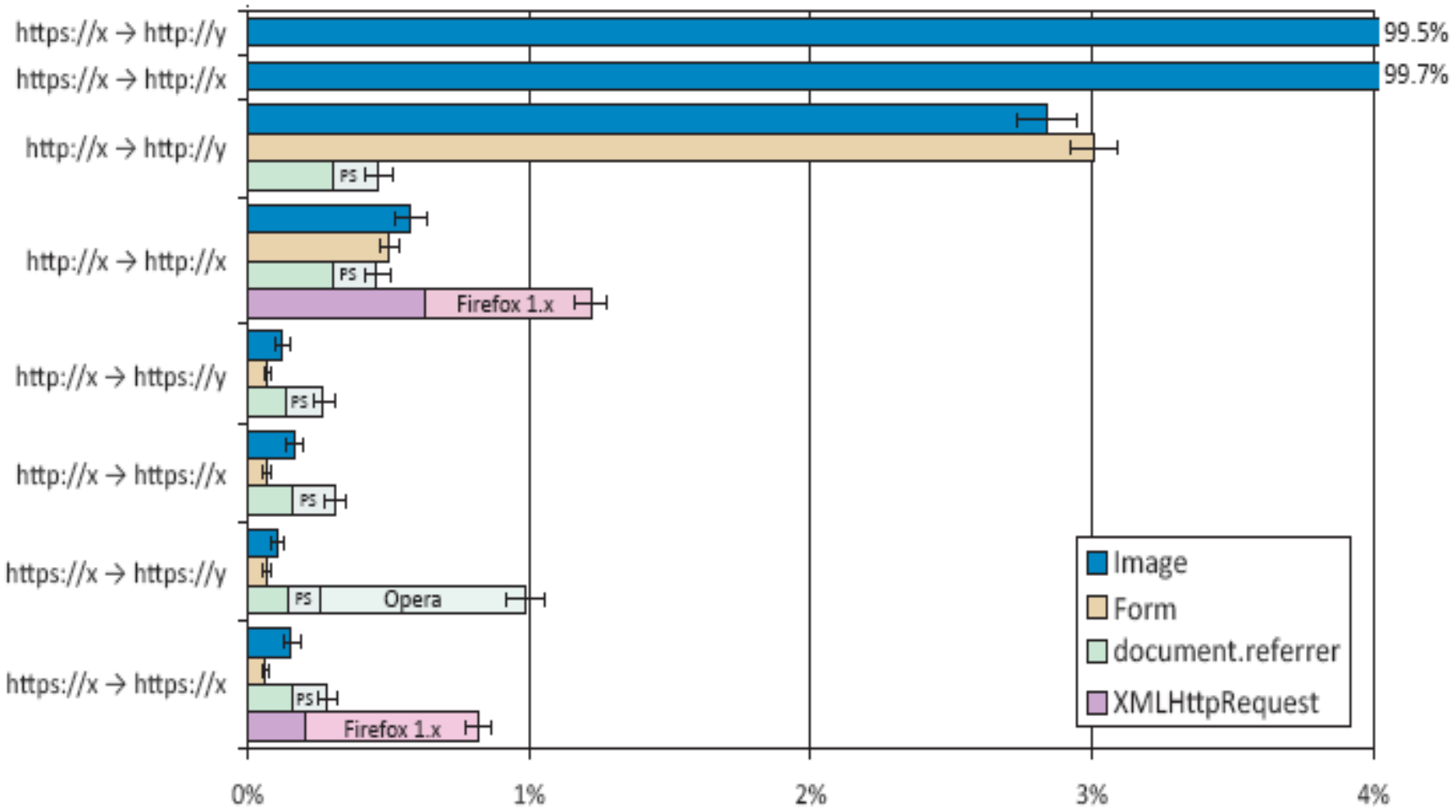
... and many more

Lenient Referer Checking is not secure!

Don't use it!

Is Strict Referer Checking Feasible?

283,945 advertisement impressions from 163,767 IP addresses



Custom Header

- XMLHttpRequest is for same-origin requests
  - Can use setRequestHeader within origin
- Limitations on data export format
  - No setRequestHeader equivalent
  - XHR2 has a whitelist for cross-site requests
- Issue POST requests via AJAX:

```
X-Requested-By: XMLHttpRequest
```

- No secrets required

Can browsers help sites with CSRF?

- Does not break existing sites
- Easy to use
- Allows legitimate cross-site requests
- Reveals minimum amount of information
- No secrets to leak
- Standardized

Proposal: Origin Header

```
Origin: http://www.evil.com
```

- Privacy
  - Identifies only principal that initiated the request (not path or query)
  - Sent only for POST requests; following hyperlink reveals nothing
- Usability
  - Authorize subdomains and affiliate sites with simple firewall rule

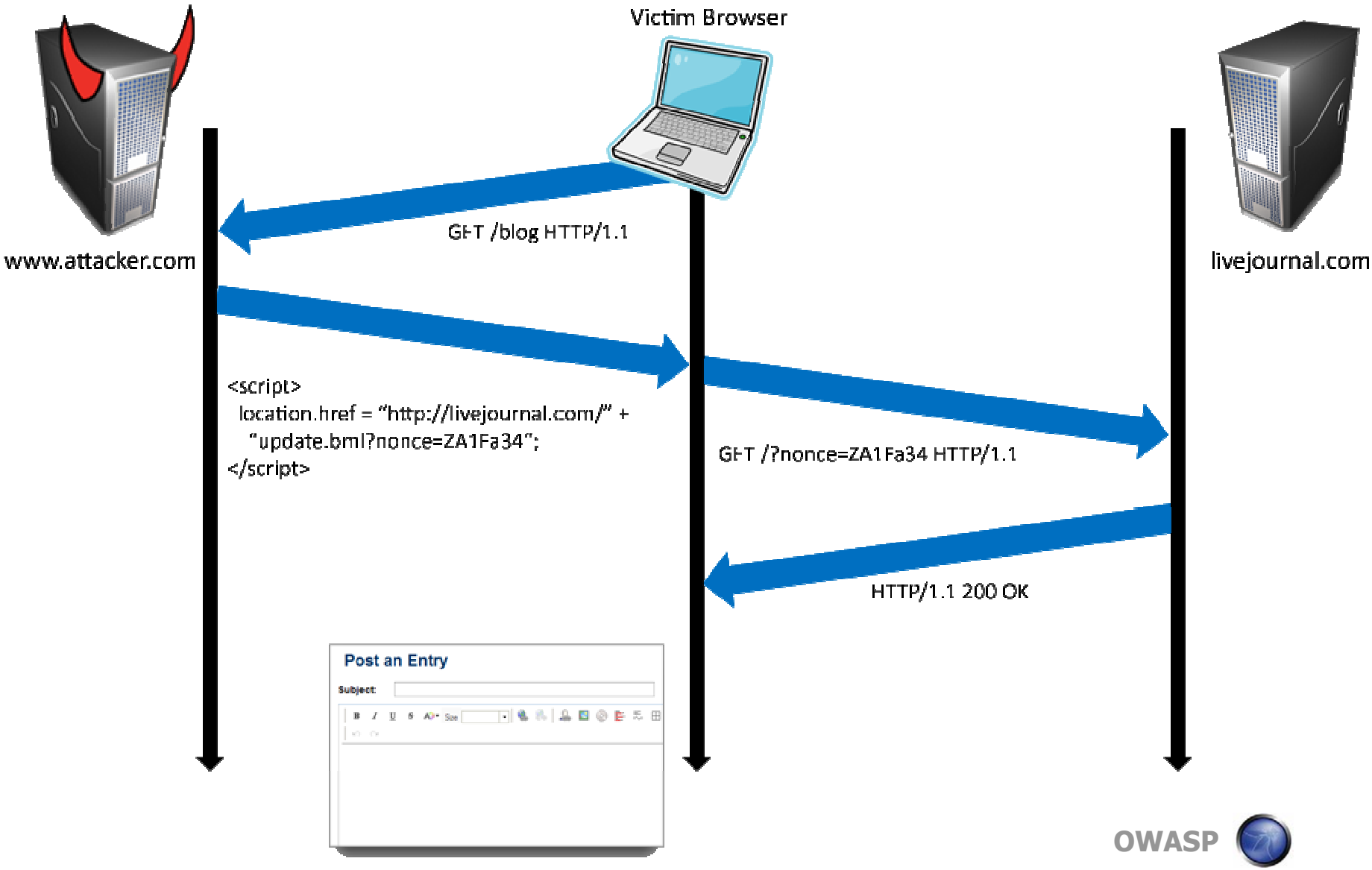
```
SecRule REQUEST_HEADERS:Host !^www\.example\.com(:\d+)?$ deny,status:403
SecRule REQUEST_METHOD ^POST$ chain,deny,status:403
SecRule REQUEST_HEADERS:Origin !^(https?://www\.example\.com(:\d+)?)?$
```

  - No need to manage secret token state
  - Can use redundantly with existing defenses to support legacy browsers
- Standardization
  - Supported by W3C XHR2 and JSONRequest
  - Expected in IE8's XDomainRequest

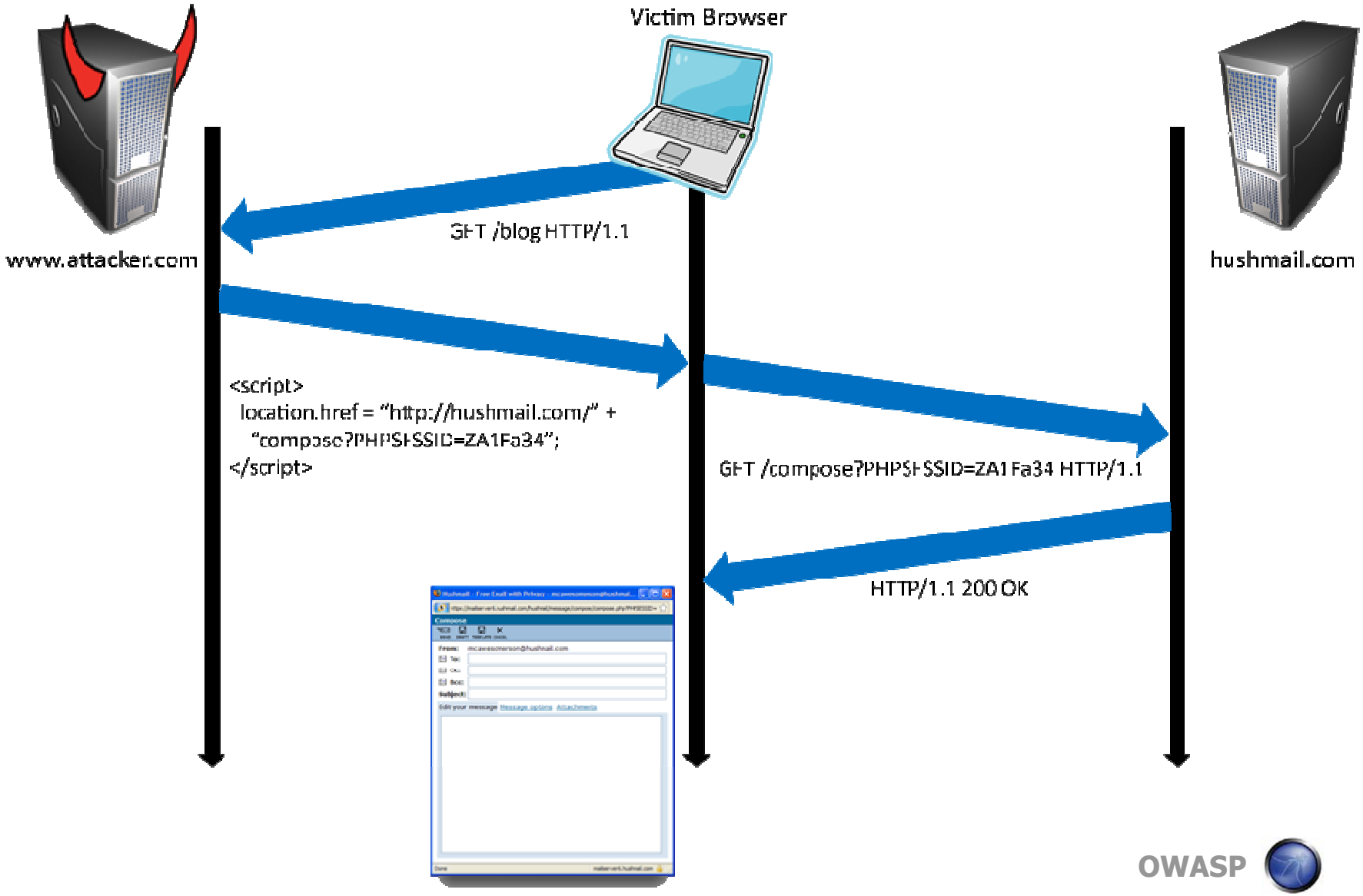
Identity Misbinding

- User is logged in to trusted site as attacker
- Does not always require login CSRF
  - OpenID
  - PHP Cookieless Authentication
  - "Secure" cookies

Web Attacker vs. OpenID

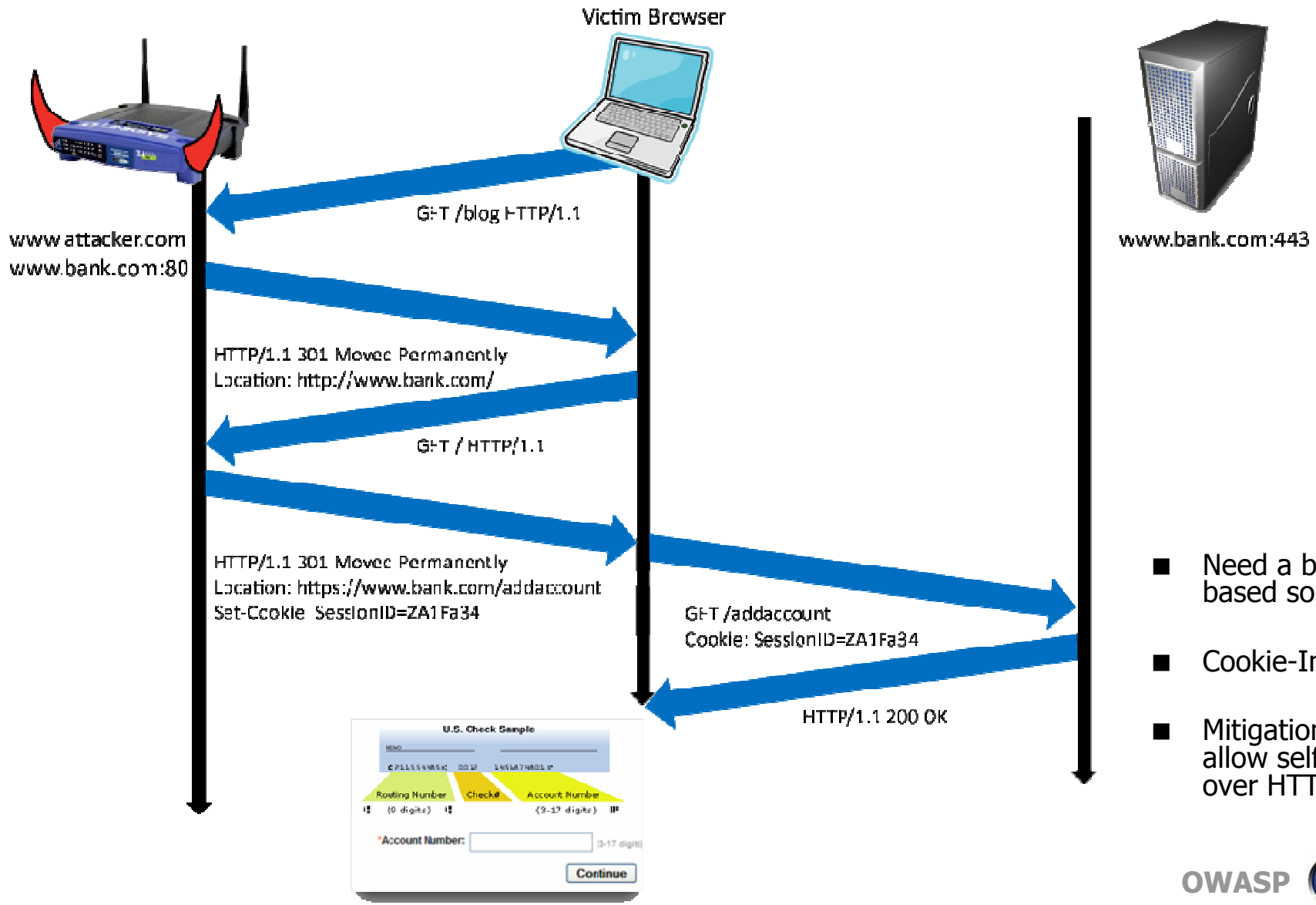


Web Attacker vs. PHP Cookieless Authentication



OWASP

Network Attacker vs. "Secure" Cookies



- Need a browser-based solution
- Cookie-Integrity
- Mitigation: Don't allow self-XSS over HTTPS

OWASP

Conclusions

- Beware of:
  - State-modifying GET requests
  - Login CSRF
  - Lenient Referer checking
  - Sloppy secret token validation
  - OpenID without binding to browser
  - PHP cookieless authentication
  - User opt-in to self-XSS (especially over HTTPS)
- OK:
  - Careful secret token validation
  - Strict Referer checking over HTTPS
  - Custom headers

“How Cybercriminals Steal Money”

Neil Daswani
June 2008

http://www.neildaswani.com/

Cybercriminal Goals

- End goal: $$$
- Average Attacker Profile:
  - yesterday: teenager looking for fame
  - today: organized crime
- Intermediate goals:
  - Data Theft (Identity, credit cards, etc.)
  - Extortion (denial-of-service, blackmail, etc.)
  - Malware distribution (drive-by-downloads, etc.)
- Example: RBN (Russian Business Network):
  - responsible for Storm, MalwareAlarm, much more...

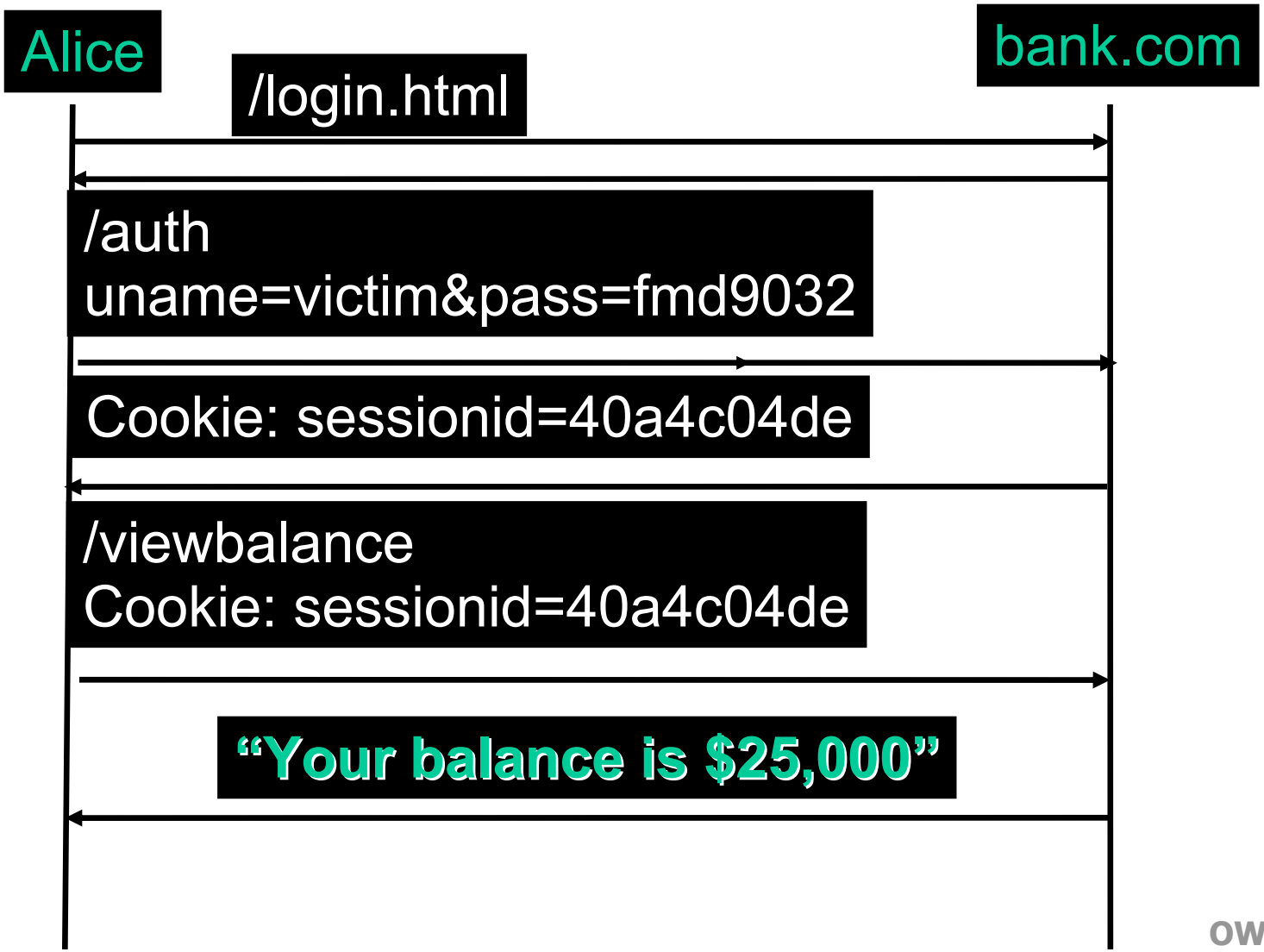
Cross-Site-Request Forgery (XSRF)

Alice is using our ("good") web-application: www.bank.com

(assume user is logged in w/ cookie)

At the same time (i.e. same browser session), she's also visiting a "malicious" web-application: www.evil.org

How XSRF Works



How XSRF Works

XSRF: Write-only

Malicious site can't read info (due to same-origin policy), but can make ***write*** requests to our app!

Can still cause damage

- in Alice's case, attacker gained control of her account with full read/write access!

Preventing XSRF

- Inspecting Referer Headers
  - ok, but not foolproof since it could be forged or blanked (even by legitimate users)
  - can work for HTTPS [BJM '08]
- Web Application Firewall
  - may or may not work because a single request looks authentic to bank.com
- Validation via User-Provided Secret
  - ask for current password for important transactions
- Validation via “Action Token”
  - add special tokens to “genuine” forms to distinguish them from “forged” forms

Cross-Site Script Inclusion (XSSI)

- Can include 3rd-party `<script>` tag
- Static Script Inclusion
  - Enables code sharing, i.e. providing JavaScript library for others to use
  - Including 3rd-party script dangerous w/o control since it runs in our context w/ full access to client data
- Dynamic Script
  - Instead of traditional postback of new HTML doc, asynchronous requests (AJAX) used to fetch data
  - Data exchanged via XML or JSON (arrays, dicts)

XSSI

- Static Script Inclusion

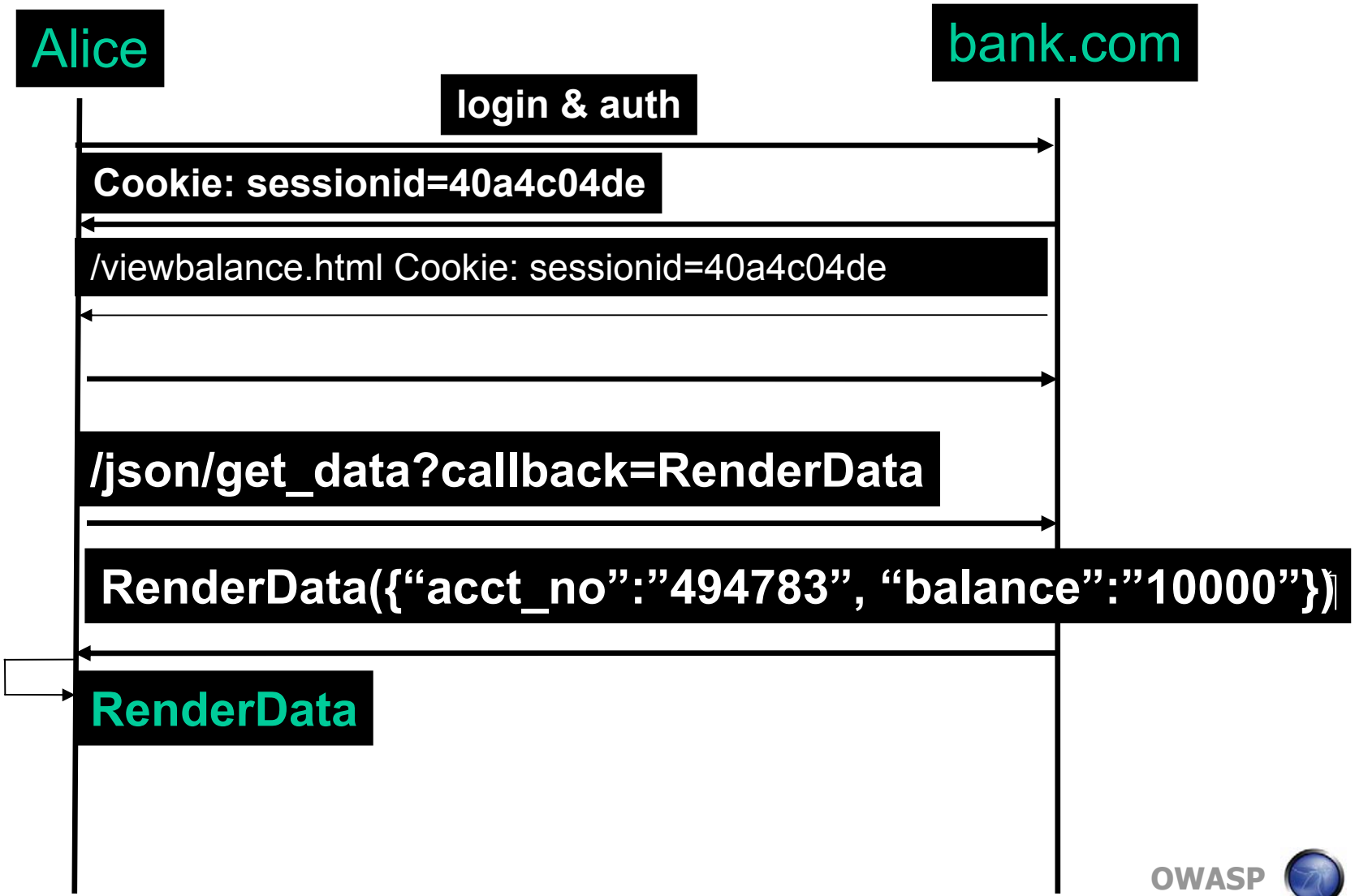
```
<html>
<head>
<title>My Mail</title>
<script src =
      “www.menusite.com/menu.js”>
</script>
</head>
<body>...</body>
</html>
```

XSSI

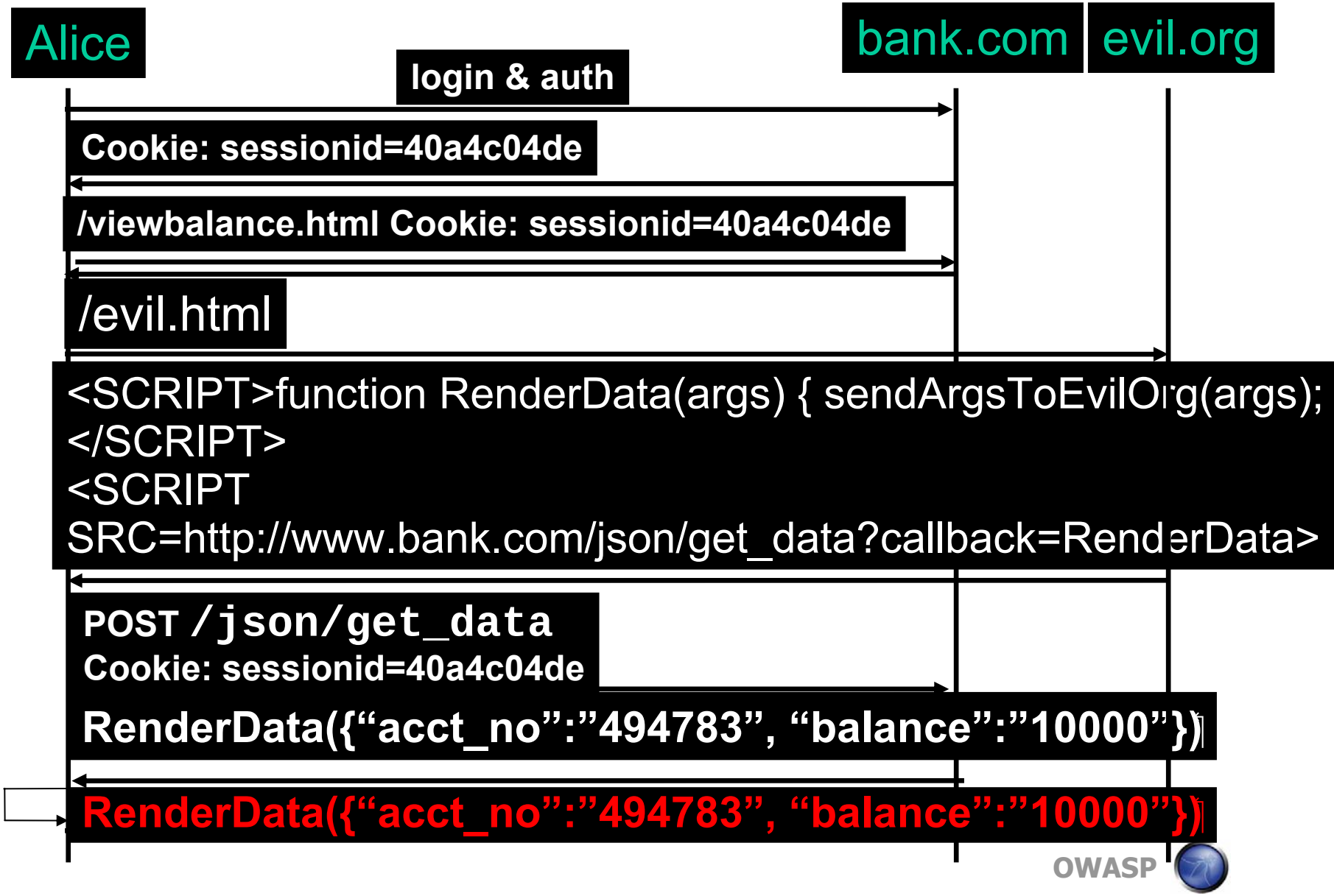
- Dynamic Script Inclusion: viewbalance.html

```
<script>
x = new XMLHTTPRequest ();
x.onreadystatechange = function () {
  eval(x.responseText)
};
x.open (“POST”, “http://www.bank.com/json/get_data?
callback=RenderData”);
x.send ( ... );

function RenderData(data) {
  // render acct no and balance on page
}
</script>
```

How XSSI Works



How XSSI Works



Preventing XSSI

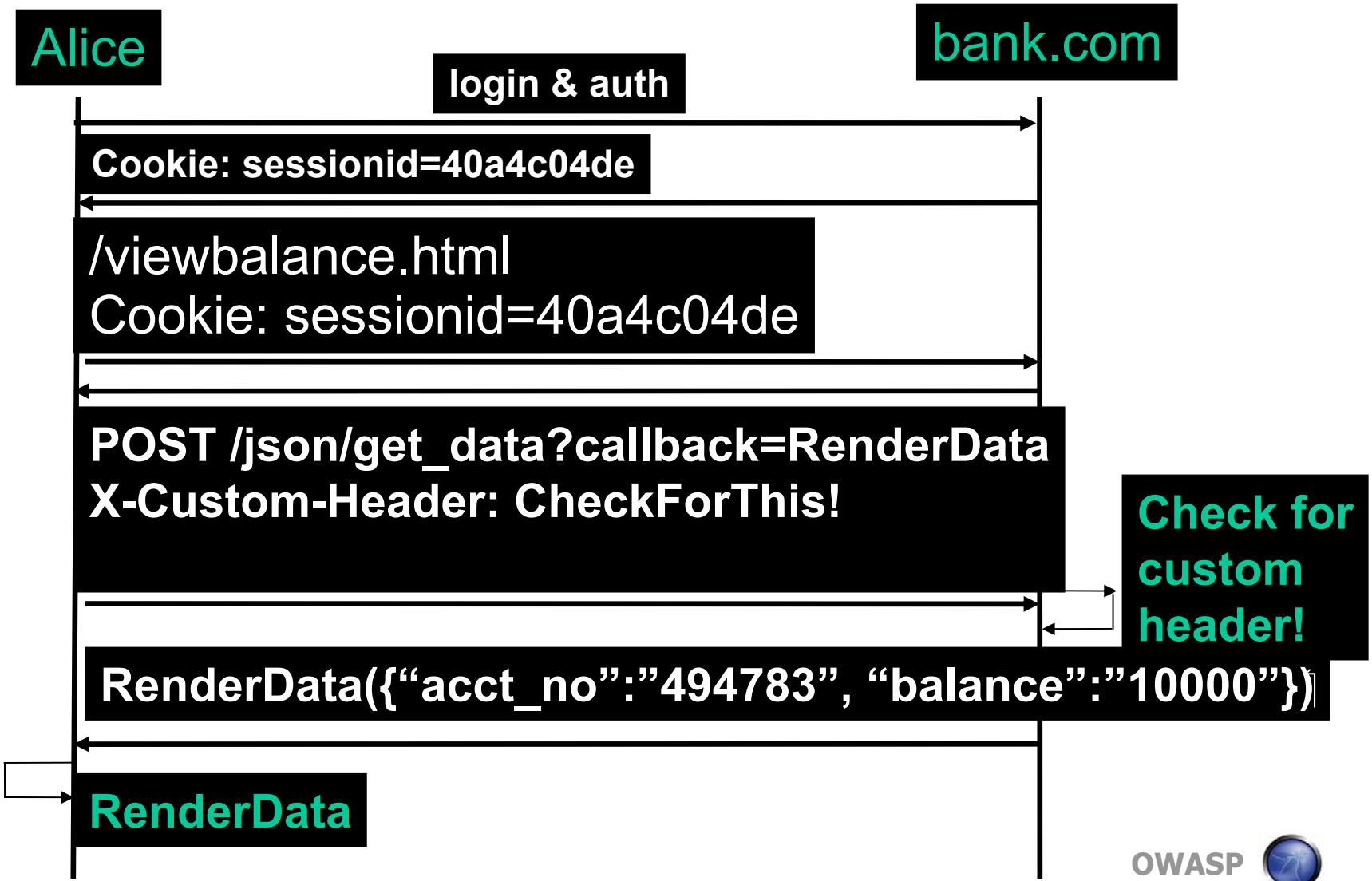
- Apply XSRF Defenses?
  - Inspecting Referer Headers
  - Web Application Firewall
  - Validation vis user secret
  - Validation via “Action Token”
- Additional Defenses
  - Custom HTTP Header
  - while(1);

XSSI Defense: Custom Header

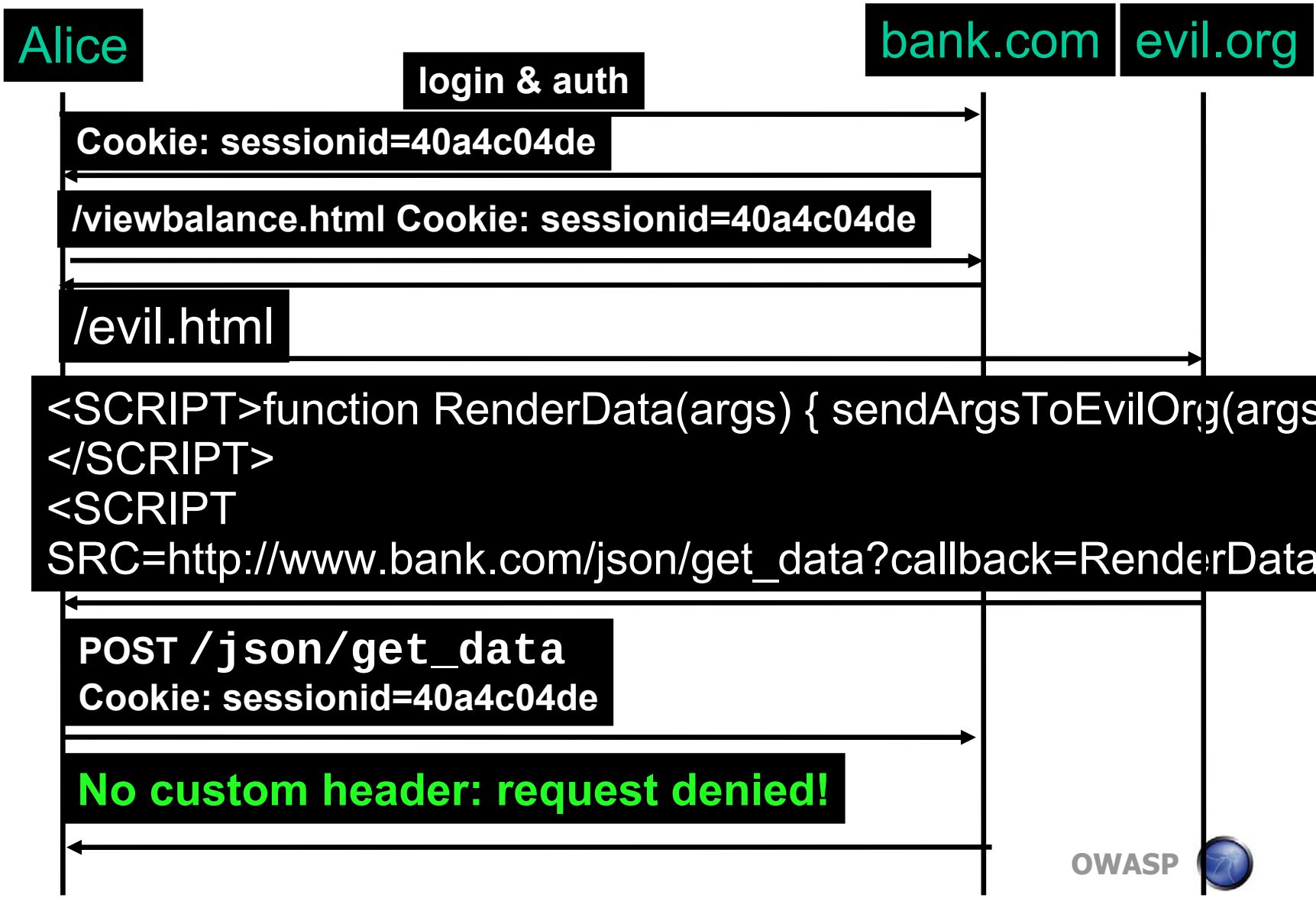
- Dynamic Script Inclusion: viewbalance.html

```
<script>
x = new XMLHTTPRequest ();
x.onreadystatechange = function () {
  eval(x.responseText)
};

x.setRequestHeader("X-Custom-Header: CheckForThis!");

x.open ("POST", "http://www.bank.com/json/get_data?
callback=RenderData");
x.send ( ... );

function RenderData(data) {
  // render acct no and balance on page
}
</script>
```

XSSI Defense: Custom Header



How XSSI Works

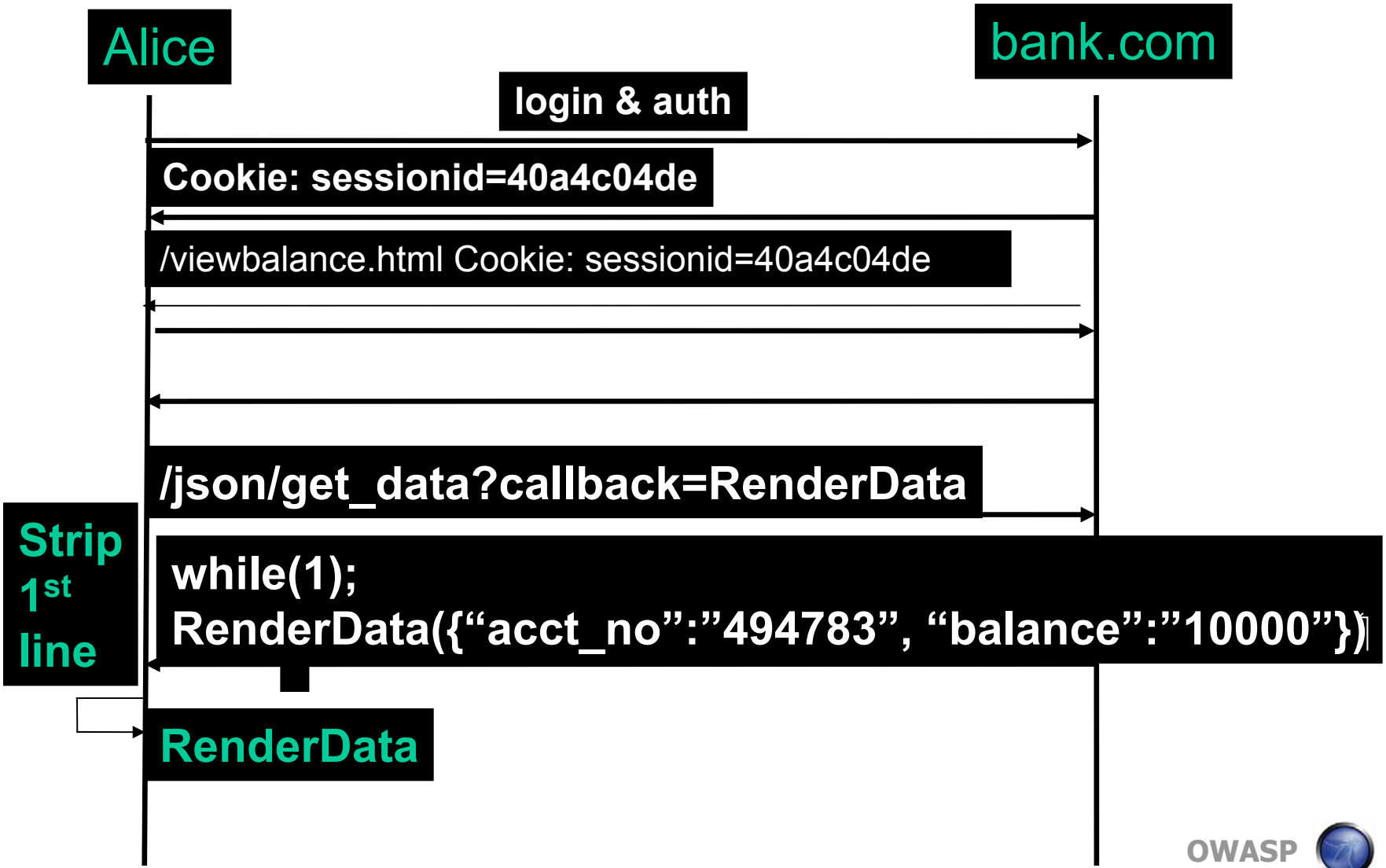


XSSI Defense: while(1);

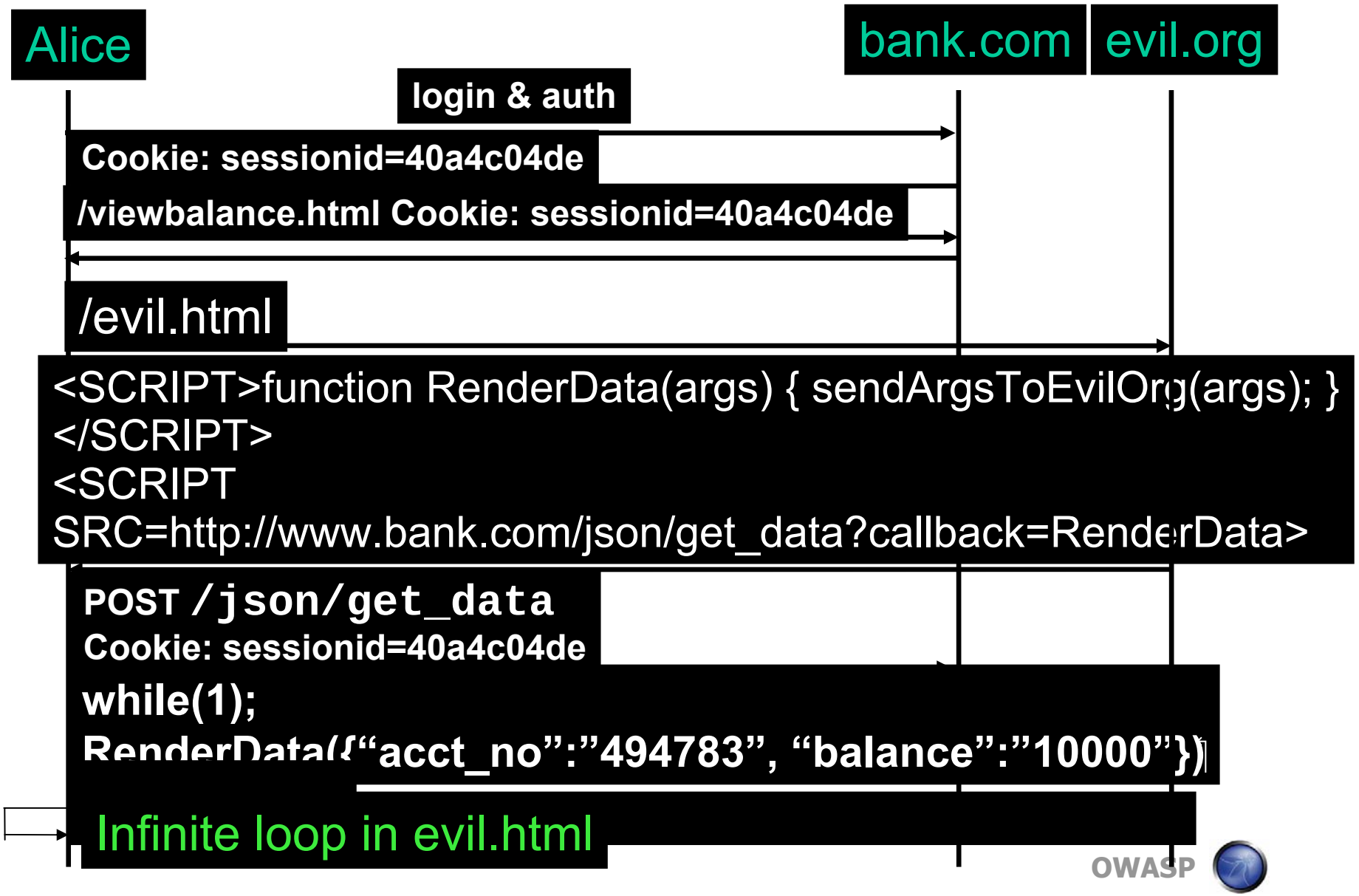
- Dynamic Script Inclusion: viewbalance.html

```
<script>
x = new XMLHTTPRequest ();
x.onreadystatechange = function () {
  command = // 2nd line of x.responseText
  eval(command)
};

x.open ("POST", "http://www.bank.com/json/get_data?
callback=RenderData");
x.send ( ... );

function RenderData(data) {
  // render acct no and balance on page
}
</script>
```

XSSI Defense: while(1);



XSSI Defense: while(1);



Security Training

- Stanford Certification Program
- Books
- code.google.com/edu

Stanford Advanced Security Certificate

- Online (anytime) or On-Campus (one week)
- Required: 3 core courses; 3 electives
- Hands-on labs conducting attacks & constructing defenses
- Security Foundations Certificate also available

Stanford Advanced Security Certificate

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  - Using Cryptography Correctly
  - Writing Secure Code
  - Security Protocols
- ELECTIVES
  - Computer Security Management – Recent Threats, Trends & the Law
  - Designing/Building Secure Networks
  - Emerging Threats and Defenses
  - Securing Web Applications
  - Systems Security
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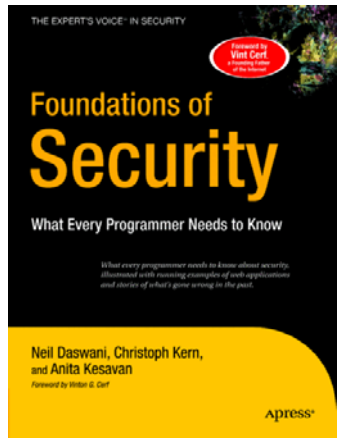
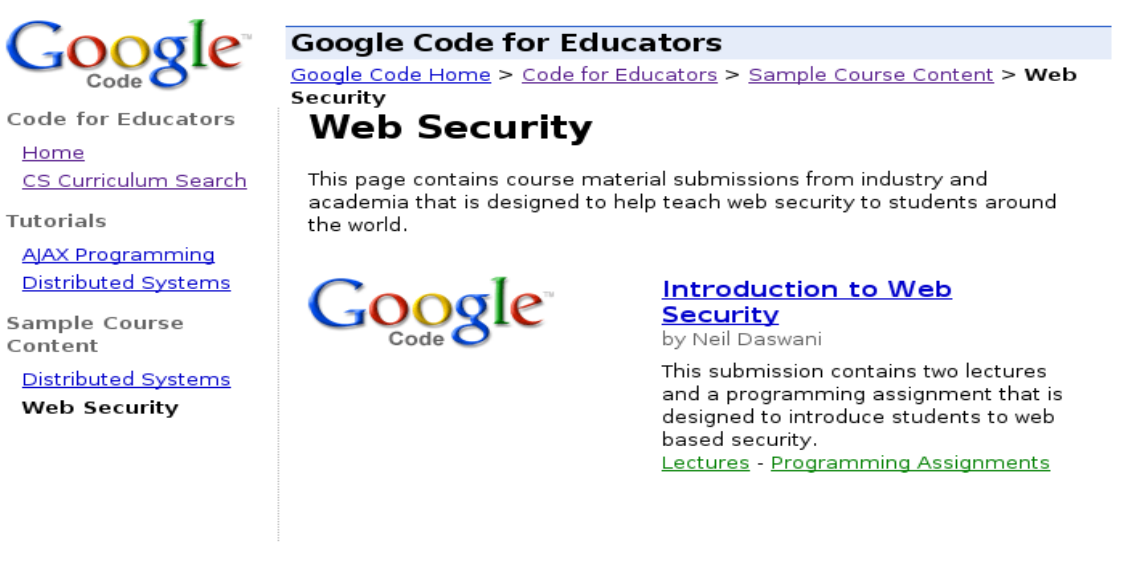
Emerging Threats & Defenses Symposium

Books

- Foundations of Security: What Every Programmer Needs To Know (Daswani / Kern / Kesavan)
- Security Engineering (Anderson)
- Building Secure Software (Viega / McGraw)
- Secure Programming Cookbook (Viega / Messier)



code.google.com/edu: Web Security



- Free & available for external use

To conclude...

- Software security is every engineer's problem!
- Links / Pointers:

  http://www.learnsecurity.com/
  Click on “Resources”

- Neil Daswani
  daswani@cs.stanford.edu
  http://www.neildaswani.com