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UPDATED

SAP: Session (Fixation) Attacks and Protections

(in Web Applications)

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Outline

- Session management and web security
- Session fixation
  - Discovery and exploitation (for pen-testers)
- Case studies
  1. Joomla! open-source CMS
  2. Commercial web application server (updated)
  3. World's leader in business software (SAP)
- Conclusions and future research

Sessions in Web Applications

- A web session is a sequence of HTTP request and response transactions associated to the same user
- Modern and complex web applications require to retain information or keep the state of each user for the duration of multiple requests
- Sessions provide the ability to establish variables, such as access rights and localization settings, which will apply to every and each interaction a user has with the web application until she terminates her session

Session Management in Web-Apps

- HTTP is a stateless protocol (RFC2616)
- Session tracking capabilities built on top of HTTP (session IDs or tokens)
- Key & core component of web-apps:

Are there any security risks? ☺

OWASP Top 10 2010

- The Top 10 Most Critical Web Application Security Risks:

OWASP Top 10 – 2007 (Previous)	OWASP Top 10 – 2010 (New)
A2 – Injection Flaws	A1 – Injection
A1 – Cross Site Scripting (XSS)	A2 – Cross-Site Scripting (XSS)
A7 – Broken Authentication and Session Management	A3 – Broken Authentication and Session Management
A4 – Insecure Direct Object Reference	A4 – Insecure Direct Object References
A5 – Cross Site Request Forgery (CSRF)	A5 – Cross-Site Request Forgery (CSRF)
<was T10 2004 A10 – Insecure Configuration Management>	A6 – Security Misconfiguration (NEW)
A8 – Insecure Cryptographic Storage	A7 – Insecure Cryptographic Storage
A10 – Failure to Restrict URL Access	A8 – Failure to Restrict URL Access
A9 – Insecure Communications	A9 – Insufficient Transport Layer Protection
<not in T10 2007>	A10 – Unvalidated Redirects and Forwards (NEW)
A3 – Malicious File Execution	<dropped from T10 2010>
A6 – Information Leakage and Improper Error Handling	<dropped from T10 2010>

http://owasptop10.googlecode.com/files/OWASP Top 10 - 2010.pdf

OWASP Top 10 2010 – A3

A3 Broken Authentication and Session Management

Threat Agents	Attack Vectors	Security Weakness		Technical Impacts	Business Impacts
———	Exploitability AVERAGE	Prevalence COMMON	Detectability AVERAGE	Impact SEVERE	———
Consider anonymous external attackers, as well as users with their own accounts, who may attempt to steal accounts from others. Also consider insiders wanting to disguise their actions.	Attacker uses leaks or flaws in the authentication or session management functions (e.g., exposed accounts, passwords, session IDs) to impersonate users.	Developers frequently build custom authentication and session management schemes, but building these correctly is hard. As a result, these custom schemes frequently have flaws in areas such as logout, password management, timeouts, remember me, secret question, account update, etc. Finding such flaws can sometimes be difficult, as each implementation is unique.		Such flaws may allow some or even all accounts to be attacked. Once successful, the attacker can do anything the victim could do. Privileged accounts are frequently targeted.	Consider the business value of the affected data or application functions. Also consider the business impact of public exposure of the vulnerability.

WASC Threat Clasification v2.0

- WASC-18: Credential & Session Prediction
  - Session ID disclosure and/or interception
  - Session ID prediction or brute-forcing
  - *Session hijacking (sidejacking)*
- WASC-37: Session Fixation
- WASC-47: Insufficient Session Expiration

http://www.webappsec.org/projects/threat/

Session Fixation

- Discovered and/or publicized at the end of 2002 by Mitja Kolšek
  - Obtaining vs. “Fixing” a valid session ID
- The attacker fixes the session ID before the victim logs in to the target web-app
- Types: permissive and strict session mgmt.
- State-of-the-art (after 9 years)?

http://www.acrossecurity.com/papers/session_fixation.pdf

What Session Fixation Should Be?

Obsession &
An habit of activity or practice

http://daretobedomestic.blogspot.com/2010/07/fixation-friday-fitness-and-arms.html

Session Fixation Discovery

- Evaluate session tracking pre and post-authentication (and compare)
  - Identify the session ID transport or exchange mechanism (web interception proxy)
  - Get a valid session ID (pre/post-authentication)
  - Fix the session ID playing the victim user role
  - Authenticate into the target web-app
  - Analyze the response post-authentication

Same session ID, or no session ID, in the response?

Session ID Exchange (1)

- Multiple mechanisms are available in HTTP to maintain session state
- Session ID sent as a…
  - Cookie (standard HTTP header)
  - URL parameter (URL rewritting) – RFC 2396
  - URL argument: GET request (URL rewriting)
  - Body argument: POST request
  - Hidden form field (HTML forms)
  - Proprietary HTTP header

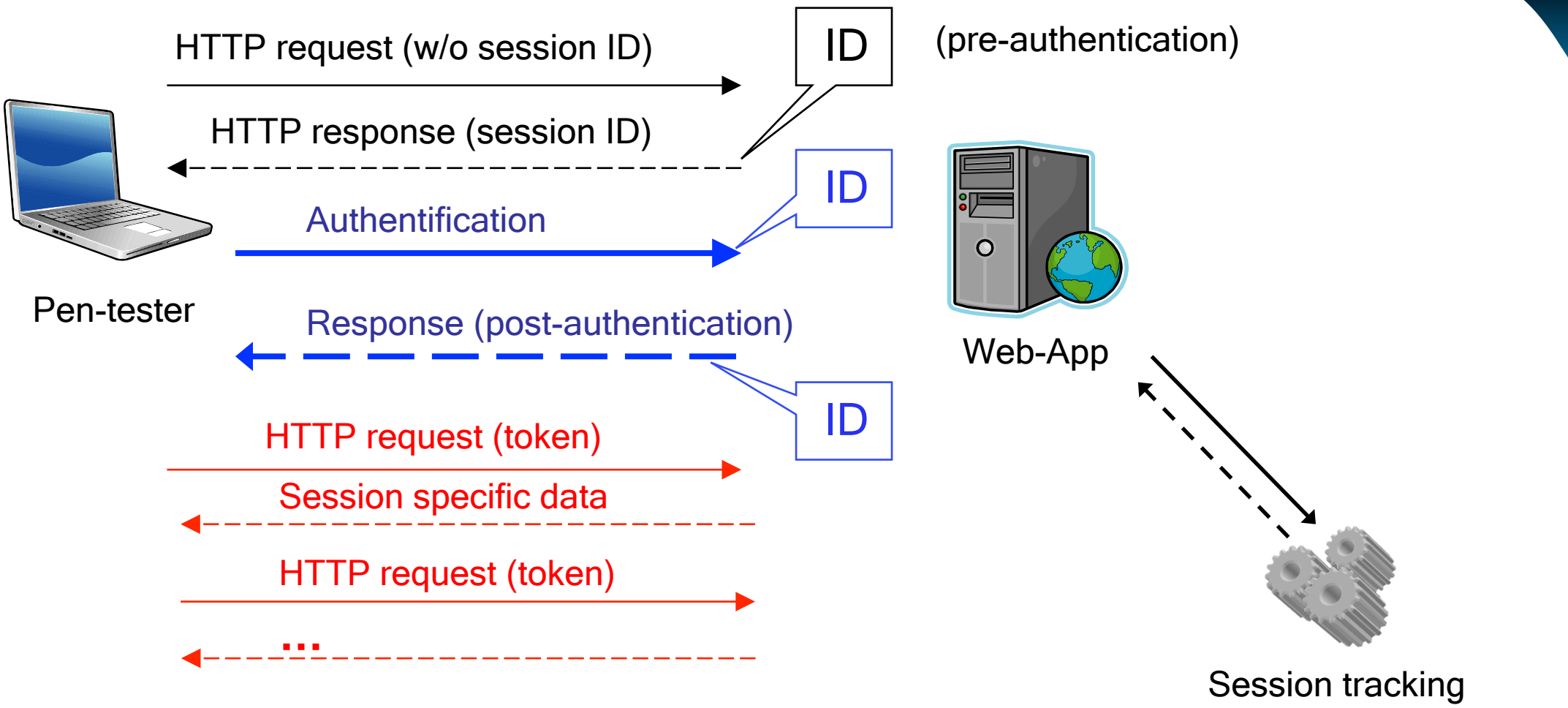
Session ID Exchange (2)

- Cookie (standard HTTP header):
  - `Cookie: id=012345; …`
- URL parameter: (*URL rewriting*)
  - https://portal.example.com/private;id=012345?...
- URL argument (GET request):
  - https://portal.example.com/private?id=012345&…
- Body argument (POST request):
  - `id=012345&…`
- Hidden form field (HTML):
  - `<INPUT TYPE="HIDDEN" NAME="id" VALUE="012345">`
- Proprietary HTTP header:
  - `Portal-Session-ID: id=012345`

Session ID Exchange Used vs. Accepted

- Method used by the application vs. method(s) accepted by the application
- Example:
  - Application uses cookies to exchange IDs, but also acepts session IDs in URLs
    - Can use both: automatic URL rewriting
    - Clients w/o cookie capabilities or not accepting them
  - Session ID disclosure
  - Facilitates session fixation attacks

Session Fixation Discovery Summary



Authentication or any application privilege level change

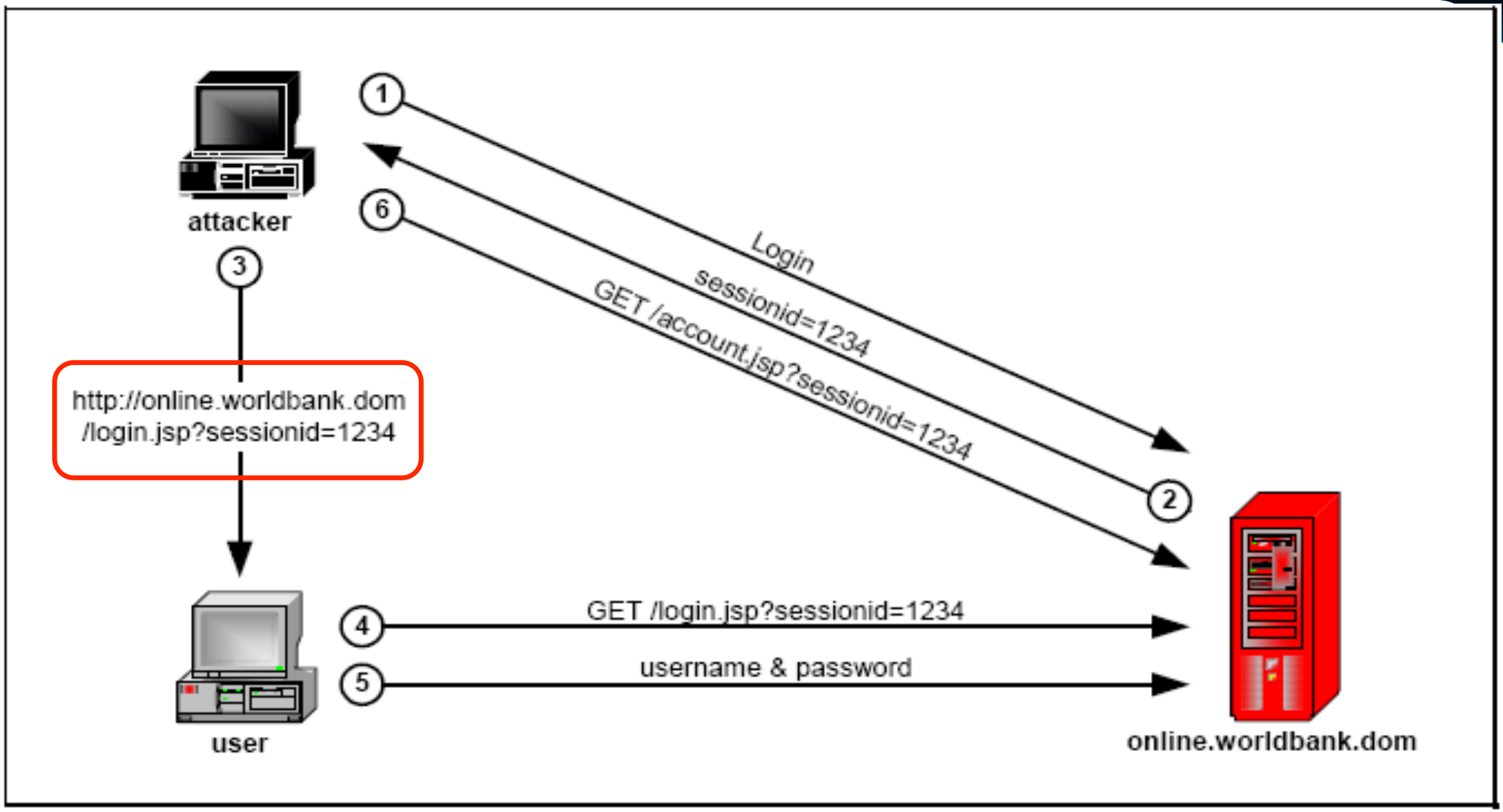
The Attacker is After the…

http://www.fullsailbrewing.com/client/session-landing-page3.png

Session Fixation Exploitation

- Active attack for session hijacking and user impersonation
  - Targeted attacks against sensitive users
  - Indiscriminate attacks as any legitimate user
- Unauthorized access (or privilege escalation attacks) as victim user
- Fixation and exploitation phases
  - Wait till the victim user authenticates

Session Fixation Attacks



http://www.acrossecurity.com/papers/session_fixation.pdf

Attack Vectors (1)

- Web references or links (URLs):
  - Social engineering tricks: entice user to follow the link with the attacker's session ID

https://portal.example.com/private**;sessionid=012345**?...

- HTTP meta tags (e.g. cookies):
  - Cannot be disabled in web browsers

https://portal.example.com/**<meta%20http−equiv=Set-Cookie%20content="SESSIONID=012345;%20path=/;...">**

- Untrusted client shared environments

Attack Vectors (2)

- Web traffic interception & manipulation:
  - MitM attacks over unencrypted HTTP traffic to add or replace legitimate session IDs
  - Any exchange mechanisms (single request)

Set-Cookie: **SESSIONID=012345; expires=Friday, 17-May-13 18:45:00 GMT; ...**

- Cross-subdomain cooking: (design)
  - "domain" cookie attribute from vuln servers

DNS

Set-Cookie: **SESSIONID=012345; domain=.example.com; ...**

Attack Vectors (3)

- HTTP response splitting:
  - Inject session IDs (as HTTP headers)
  - E.g. HTTP redirection

REQ: https://portal.example.com/login**\r\nSet-Cookie: SESSIONID=012345\r\nDummy-Header:**

RESP:

```
HTTP/1.1 302 Found
Server: Vulnerable Server 1.0
Location: https://portal.example.com/login
Set-Cookie:SESSIONID=012345
Dummy-Header: /login
…
```

Attack Vectors (4)

- Cross-Site Scripting (XSS):
  - Set the session IDs through JavaScript
  - Target web applications (or subdomain apps)
  - Persistent and reflective XSS

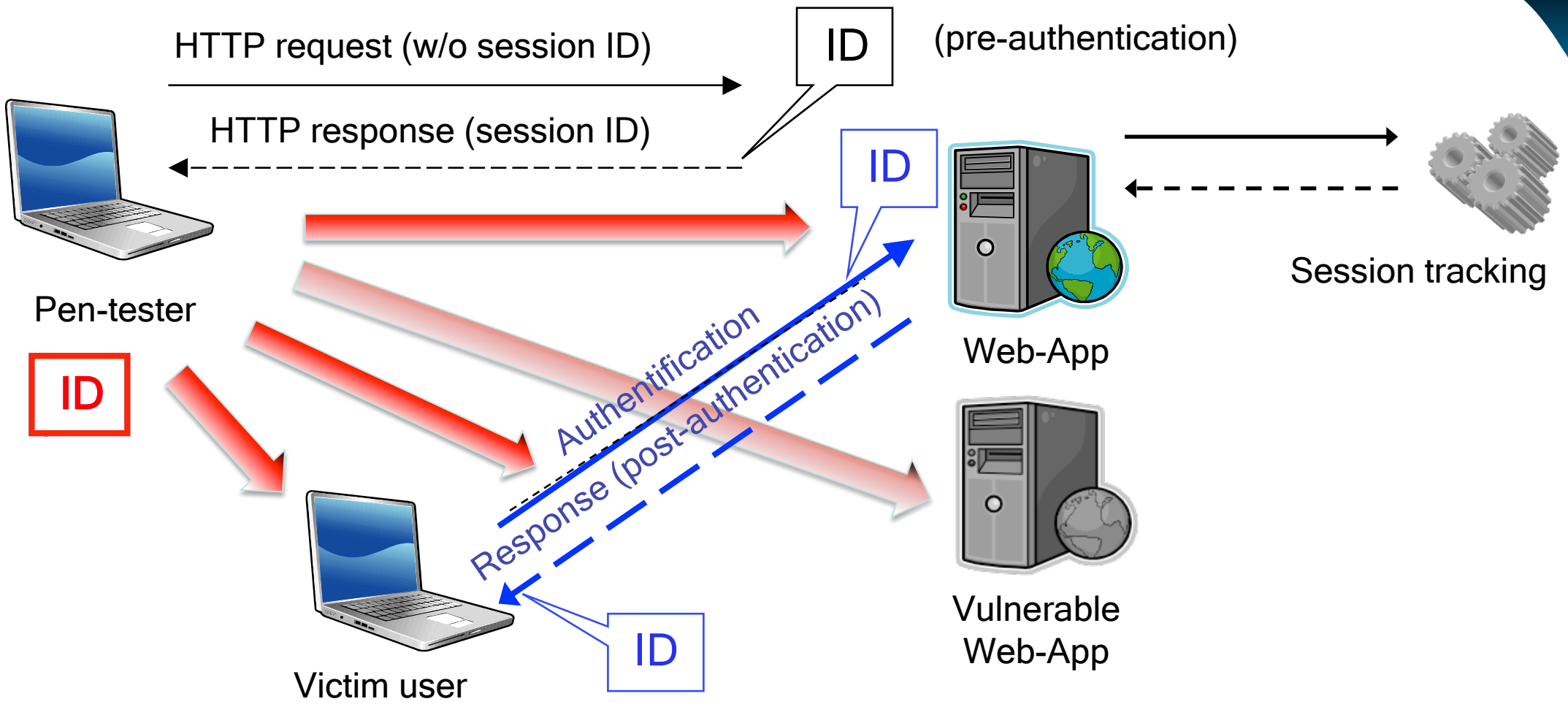
https://portal.example.com/search?q=**<script>**
document.cookie="SESSIONID=012345;%20path=/;
%20domain=.example.com";</script>

- SQL injection:
  - Session management database (subtle attacks)

Session Fixation Benefits

- Bigger attack window
  - Initial fixation occurs pre-authentication
  - Victim user authenticates (long time afterwards)
  - Attack is exploited post-authentication (active)
- Extended attack lifetime
  - Persistent cookies (e.g. 10 years)
  - Web application terminates the session
  - Session ID remains on the user browser waiting for the session to be resumed (or re-launched)

Session Fixation Exploitation Summary



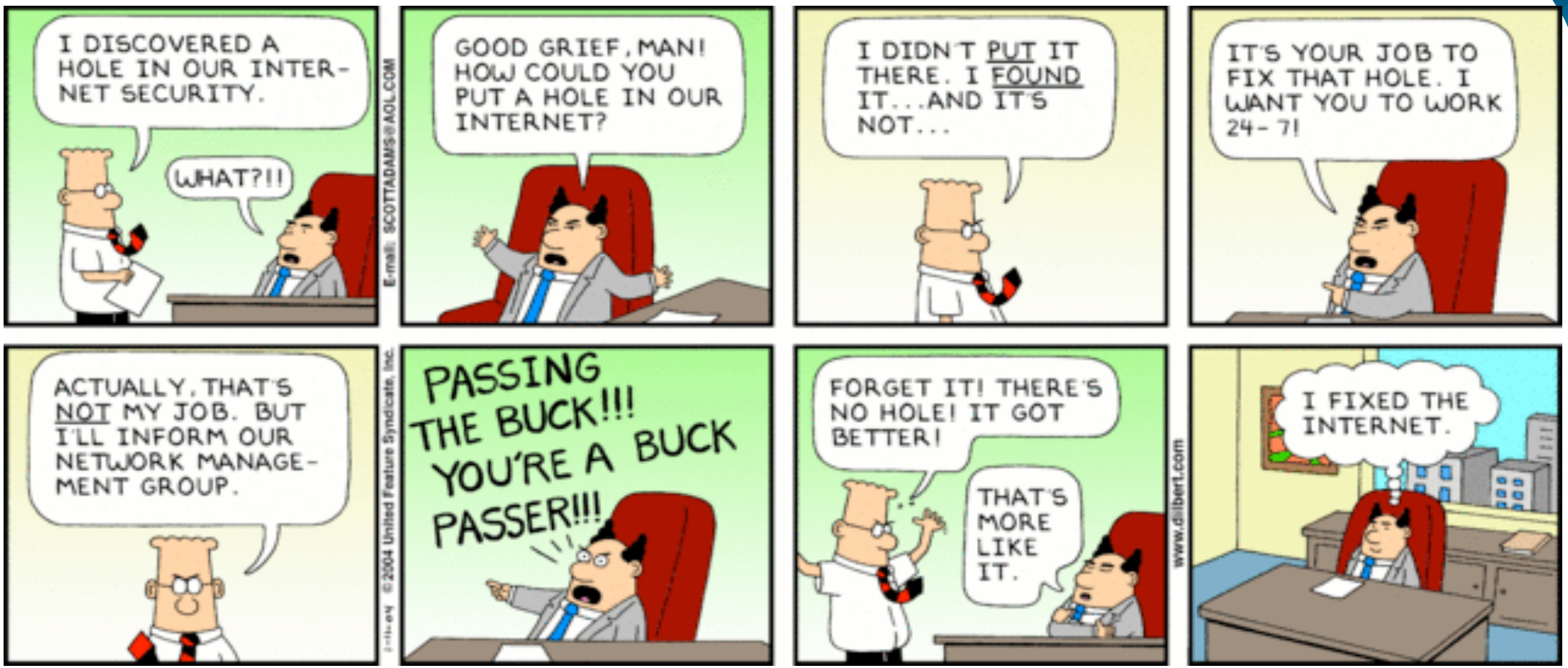
Attack vector(s): combined & target dependant

Case Studies

Three Case Studies

- From real-world penetration tests
  - Past two years: 2009-2010
  - Three different session fixation vulnerabilities on three separate target web environments
- How they were discovered & exploited
- Real impact
- Vulnerability disclosure timeline
- Protections

Discovering Security Vulnerabilities



http://dilbert.com/dyn/str_strip/000000000/00000000/0000000/000000/00000/0000/300/376/376.strip.sunday.gif

Case Study #1
Joomla! Open-Source CMS

#1 Summary

- Session fixation in Joomla!, a widely used open-source CMS
- Affected versions: 1.5.x – 1.5.15
- Vulnerability ID: 20100423 (TAD-2010-001)
- Notified: November 2009
- Release date: April 2010

First “sessation fixation” vuln ☺

Google SSL beta

http://developer.joomla.org/security/news/309-20100423-core-sessation-fixation.html

#1 Discovery and Exploitation

- Target HTTPS-only web application
  - Public & private sections (registered users)
  - Built-in Joomla! core session management
  - Authentication: e-National ID card or user/pass
- MD5 hashes for session ID and value
  - Ignore it: meaning & purpose are not required
  - Discovered through a blackbox pen-test but…
  - Source-code available: whitebox pen-test

#1 Impact

- Open-source CMS
  - Non-profit organizations, academic institutions, and non-business related and …
  - … business critical web-applications
    - Commercial companies and governments
    - Standalone, source-code customizations, and other frameworks (internally and publicly)
- All 1.5.x Joomla! versions up to 1.5.15
  - Depending on criticality of web application

#1 Vulnerability Disclosure Timeline

- Lessons learned from vulnerability notifications, handling, and disclosure
  - Definitely, open for improvement!!
- Advisory says reported on March 25, 2010, when it should say Nov 2009
- “The Seven Deadly Sins of Security Vulnerability Reporting” blog post

http://blog.taddong.com/2010/08/seven-deadly-sins-of-security.html

#1 Protections

- Web applications based on Joomla! must upgrade to the latest Joomla! version (1.5.16 or later)

Case Study #2
Commercial Web Application Server

UPDATED

#2 Summary

- Session fixation vulnerability on a web-app based on Oracle/Bea WebLogic Portal/Server
  - HTTP vs. HTTPS misbehavior
- Affected versions: “J2EE web-apps”
- Vulnerability: Misconfiguration
- Notified: December 2010
- Release date: Today! - March 2011

Others?

J2EE web application deployment best practices

#2 Discovery and Exploitation (1)

- Complex & recently redesigned web-app
- Public section + private section (auth)
- Java-based cookie (JSESSIONID)
  - Pre-authentication
  - "domain" & "path" attributes

+50 chars & random

Set-Cookie: **JSESSIONID=Fz5f…qMqI; domain=.example.com; path=/**

- Authentication (POST & HTTPS & cookie):

https://portal.example.com/private/miPortal

#2 Discovery and Exploitation (2)

- Successful authentication (post-auth):

Set-Cookie: **_WL_AUTHCOOKIE_JSESSIONID=G4ID…vQ14; path=/; secure**

- Any previous value is renewed
  - _WL_AUTHCOOKIE_JSESSIONID
- Very common scenario: two cookies
  - Pre-auth (unsecure): always (www, portal, etc)
  - Post-auth (secure): portal only (SSL) & renewed

Session ID (authenticated users) = JSESSIONID + _WL_AUTHCOOKIE_JSESSIONID

#2 Discovery and Exploitation (3)

- All links from “www” to “portal” are HTTPS
  - But HTTP is also allowed in “portal”
- What is used for session ID verification when accessing “authenticated resources”?
  - Common sense: both cookies (! in reality)
- HTTPS behavior:
  1. Both cookies: OK
  2. JSESSIONID bad: redirect to login & renewed
  3. AUTH_JSESSIONID bad: 401 Basic?

Missing or expired

#2 Discovery and Exploitation (4)

- HTTP behavior:
  - Once authenticated, HTTPS requires both
  - HTTP only makes use of JSESSIONID
- All resources available through HTTP ☹ 1
- JSESSIONID is enough to associate the web request (HTTP) to an auth session 2
- Remember, JSESSIONID is not renewed
- Discovered on WebLogic Portal version 10.3

Even simpler attacks as JSESSIONID is disclosed via HTTP

#2 Impact

- Three possible scenarios:
  - *High*: commercial web-app server found vulnerable (all web-apps)
  - *Mid*: vulnerability due to misconfiguration of the commercial web-app server

    How easy is to introduce the wrong setting?
  - *Low*: only the specific web-app it was discovered in is vulnerable
- Even if not 0-day, subtle sample of HTTP(S) and session management misconfiguration

WebLogic HTTPS Enforcement (1)

- web.xml:

```
<user-data-constraint>
   <description>SSL not required</description>
   <transport-guarantee>NONE</transport-guarantee>
</user-data-constraint>
```

- HTTPS is not enforced by WebLogic
  - User dependent: “http://” or “https://” links
  - NONE: HTTPS not enforced (HTTP allowed)
  - CONFIDENTIAL: Ensure confidentiality
  - INTEGRAL: Ensure integrity

SSL
TLS

WebLogic HTTPS Enforcement (2)

- HTTPS on the web or web-app server(s)?
  - Apache 2.2.x vs. WebLogic Portal 10.3
- If HTTPS is not enforced by the WebLogic configuration (“NONE”), then:
  - Because resources are available though HTTP
  - …and therefore, the secure cookie will never be sent by the web browser
    - _WL_AUTHCOOKIE_JSESSIONID
  - …JSESSIONID is the only ID required to associate requests to authenticated sessions

WebLogic HTTPS Enforcement (3)

- Be careful with the exceptions in web.xml:

```
<web-app> …
 <security-constraint>
  <web-resource-collection>
   <web-resource-name>All</web-resource-name>
    <url-pattern>/</url-pattern>
   </web-resource-collection>
   <user-data-constraint>
    <transport-guarantee>CONFIDENTIAL</transport-guarantee>
   </user-data-constraint>
 </security-constraint>
 <security-constraint> …
    <url-pattern>/public/*</url-pattern>…
    <transport-guarantee>NONE</transport-guarantee>
   …
</web-app>
```

Default is NONE for all: url-pattern = *

#2 Vulnerability Disclosure Timeline

- Vendor notified in early December 2010
  - Quick analysis & limited target information
  - Conclusion: Specific to target environment
- Mid-February 2011: full configuration details
  - Re-analyzed for confirmation
- Early/Mid-March 2011:
  - Conclusion: HTTPS misconfiguration & lack of session ID regeneration (developer's hands)

Web-app source code for in-depth analysis and ratification?

#2 Protections (1)

- Separate public & private web environments
  - Server, IP, hostname, and domain
  - Session management infrastructure
- Pen-testers must try this!! (lessons learned)
  - HTTP vs. HTTPS inconsistencies
  - Session management verifications (# cookies)
    - Even if available only through HTTPS?
- Security-related developer's documentation improvements (session fixation & HTTPS)

Credit: Oracle April 2011 CPU

#2 Protections (2)
HTTPS Secure Cookie

- Default in config.xml (even if not defined):

```
<WebServer Name=”server” AuthCookieEnabled="true"/>
```

- WebLogic server instance sends a new secure cookie for protected resources:
  - _WL_AUTHCOOKIE_JSESSIONID
- Securely access **HTTPS resources** in a user session (even initiated using HTTP)

It is mandatory to set both settings: <transport-guarantee> (for SSL/TLS) and AuthCookieEnabled (default)

#2 Protections (3) Authentication Options

- Programmatic authorization/security:
  - Developer custom code via login() API
    - E.g. weblogic.security.services.Authentication.login(h);
  - Must take into account ID regeneration manually
- Declarative authorization/security:
  - WebLogic built-in authentication (Servlet Container) - E.g. <auth-constraint>
  - JSESSIONID is automatically regenerated after authentication

http://download.oracle.com/docs/cd/E13222_01/wls/docs103/security/thin_client.html

#2 Protections (4)
WebLogic Session Fixation

- WebLogic Server provides the following API to regenerate the session ID after a successful authentication:

```
ServletAuthentication.generateNewSessionID(request);
```

- Security on the web developer's hands
- Documentation must include best practices
  - Will be added as a result of this discovery

http://download.oracle.com/docs/cd/E11035_01/wls100/javadocs/weblogic/servlet/security/ServletAuthentication.html

#2 Protections (5)
HTTPS & Auth Enforcement

- Set both simultaneously in web.xml:

```
<web-app> …
  <security-constraint>
    <web-resource-collection>
      <web-resource-name>All</web-resource-name>
        <url-pattern>/</url-pattern>
      </web-resource-collection>
1   <user-data-constraint>
        <transport-guarantee>CONFIDENTIAL</transport-guarantee>
      </user-data-constraint>
2   <auth-constraint>
        <role-name>authenticateduser</role-name>
      </auth-constraint>
  </security-constraint>
  <login-config>
    <auth-method>FORM</auth-method>…
</web-app>
```

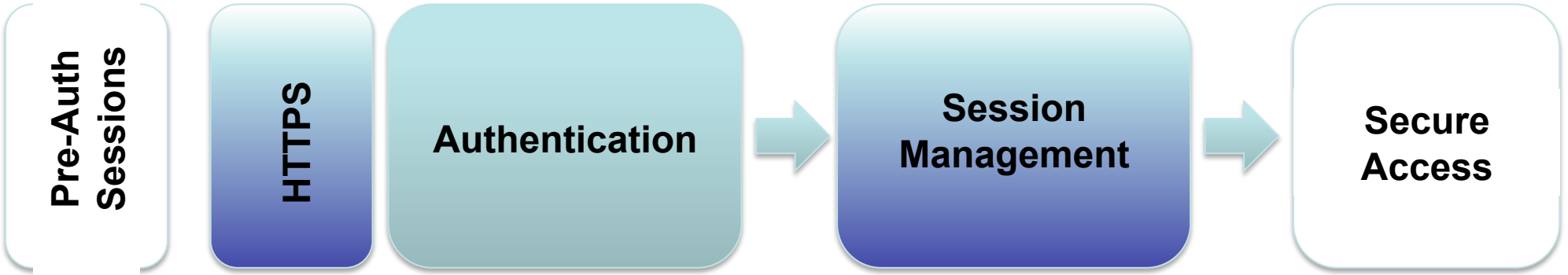
User-data & auth constraints

#2 Protections (6) Summary

- Too many options & too much flexibility!
- Recommended best practices:
  - All sensitive resources must be protected by HTTPS (and not accessible via HTTP) at the web application server level (e.g. WebLogic)
    - Use the default secure authentication cookie
  - Enforce HTTPS & authentication altogether
  - Java servlets must invalidate the session (thus renew the session ID) just after completing authentication
    - Programmatically or declaratively (default)

#2 Protections (7) Automatic?

- Could we thoroughly link the custom web-app authentication code and session management capabilities to always enforce HTTPS and session ID renewal?
  - Default framework behavior vs. developer's code
  - At the industry level (specifications & implementations)



How to securely link these three components?

#2 Protections (8) Industry standards

Open to != interpretations

- Java Servlet Specification (J2EE) - Defaults
  - Sessions have an application scope
    - Share the same session
    - “7.3. Session Scope” (Java Servlet Spec v3.0 – pg.57)
  - Requirement: HTTP & HTTPS on the same app
  - Standard document description (.XML)
    - Independent authentication and encryption elements
  - Specifications vs. security best practices
    - Not all combinations are desired
  - It is all about protected resources!!

Authentication
Encryption
Session mgmt.

See also “Java Servlet Spec” for case #3 on whitepaper

Case Study #3
World's Leader in Business Software

#3 Summary

- Session fixation in the SAP J2EE Engine affecting the core SAP NetWeaver platform
- Affected versions: 6.40 - 7.20
- Vuln ID: SAP Security Note 1310561 (TAD-2011-002)
- Notified: July 2009
- Release date: December 2010 (SAP SMP)

https://websmp130.sap-ag.de/sap/support/notes/1310561

#3 Discovery and Exploitation (1)

- Large penetration test (net, web-app, wi-fi)
- Some of the target servers were the Intranet website and the SAP systems
  - Critical business processes and activities
- This website contained a link (used by employees) to the SAP Portal (HTTP)
  - http(s)://intranet.example.com (NTLM auth)
  - http://portal.example.com (SAP NW Portal)
- SAP Portal redirects to HTTPS version

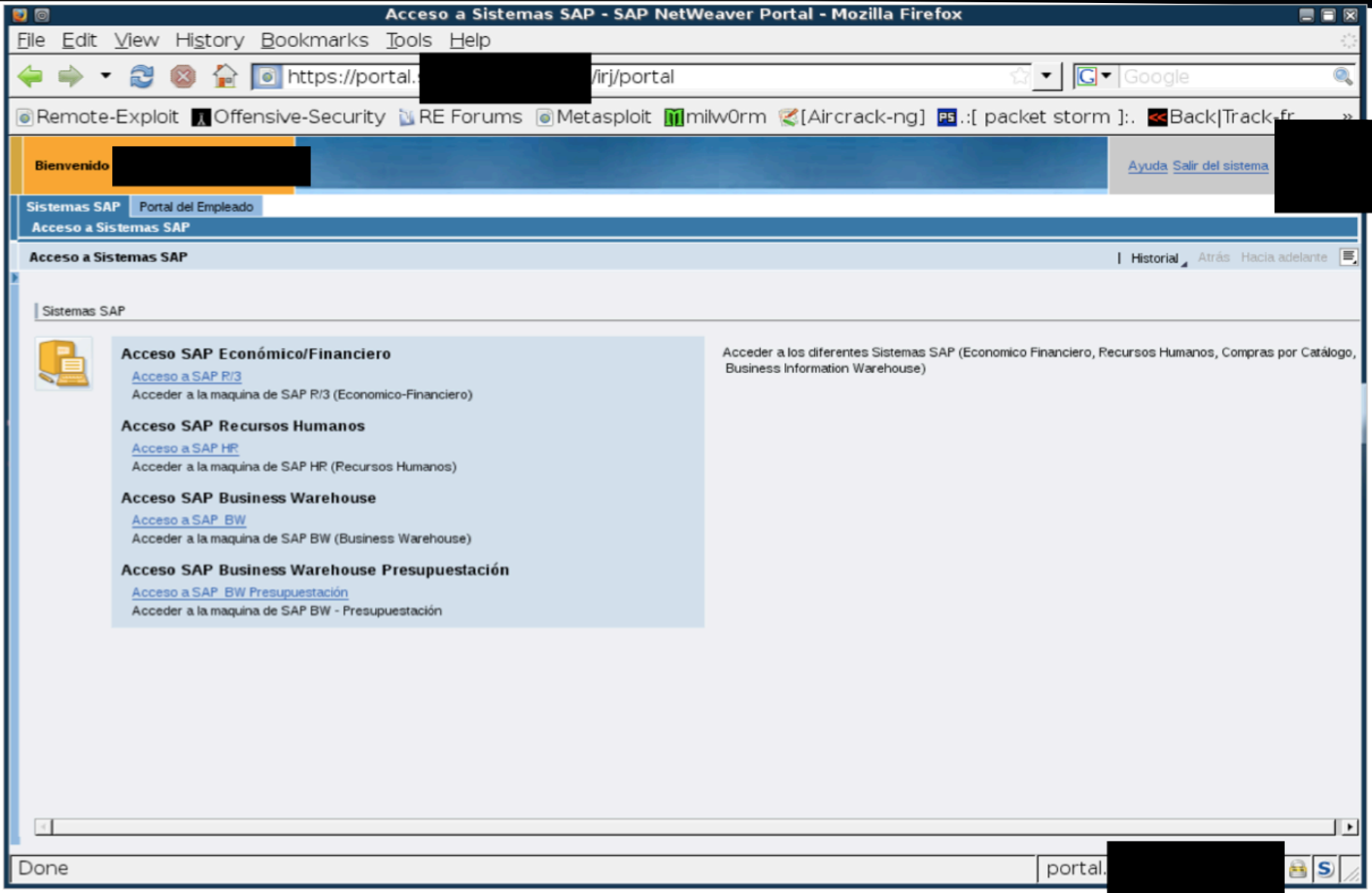
#3 Discovery and Exploitation (2)

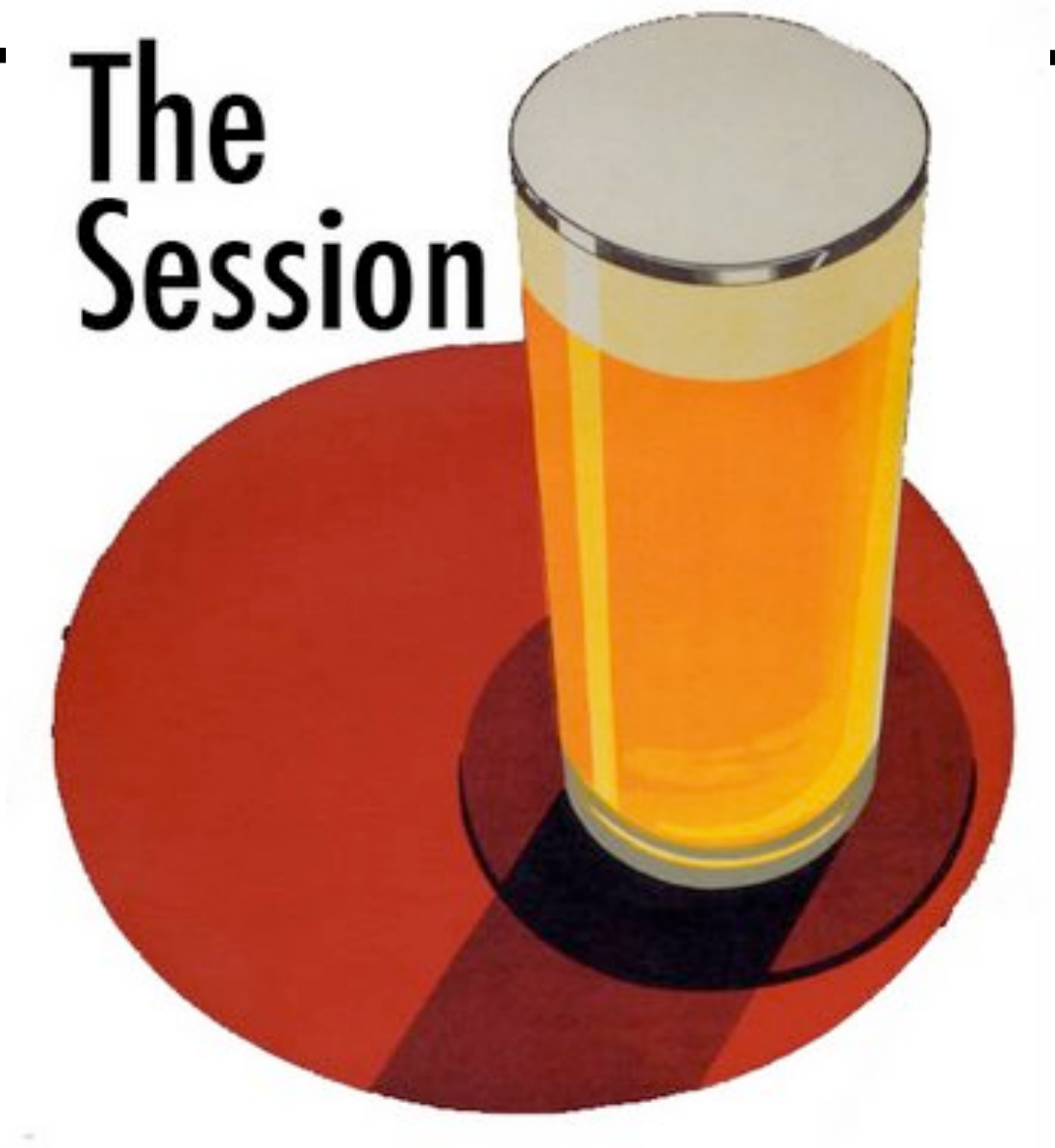
- HTTP 307: “Temporary Redirect”
  - https://portal.example.com/irj/portal
- The common & “innocent” HTTP redirection discloses all the session cookies: (network traffic)
  - saplb_*, PortalAlias & JSESSIONID
- Even if the reference is HTTPS, the lack of the “secure” attribute makes possible to MitM it and relay fictitious HTTP to HTTPS (e.g. SSLstrip)
- Target SAP Portal supported client-based digital certificates (smart card ID) or user/password auth

#3 Discovery and Exploitation (3)

- Pen-tester obtains a valid session ID (pre)
- The session ID is “fixed” in the victim browser (ARP poisoning & traffic control)
  - MitM by injecting the session ID in the cookie headers of the HTTP response (307 redirect)
- The user authenticates in the SAP Portal
  - Session ID does not change (session fixation)
- Pen-Tester gets full access to victim’s session (business critical data and actions)

#3 Discovery and Exploitation (4)





http://4.bp.blogspot.com/_qu-NsGz9y5E/SdfD1QbBY5I/AAAAAAAABX0/cyMTSOyME-A/s400/The_Session_Logo.jpg

#3 Discovery and Exploitation (5)

- Attacker only had to reuse the following specific set of target cookies:

Cookie:
saplb_*=(J2EE01234567)01234567;
PortalAlias=portal;
JSESSIONID=(J2EE01234567)
ID0123456789DB01234567890123456789End;
MYSAPSSO2=AjEx…(*very long string*)…ewCw%3D;
SAPWP_active=1

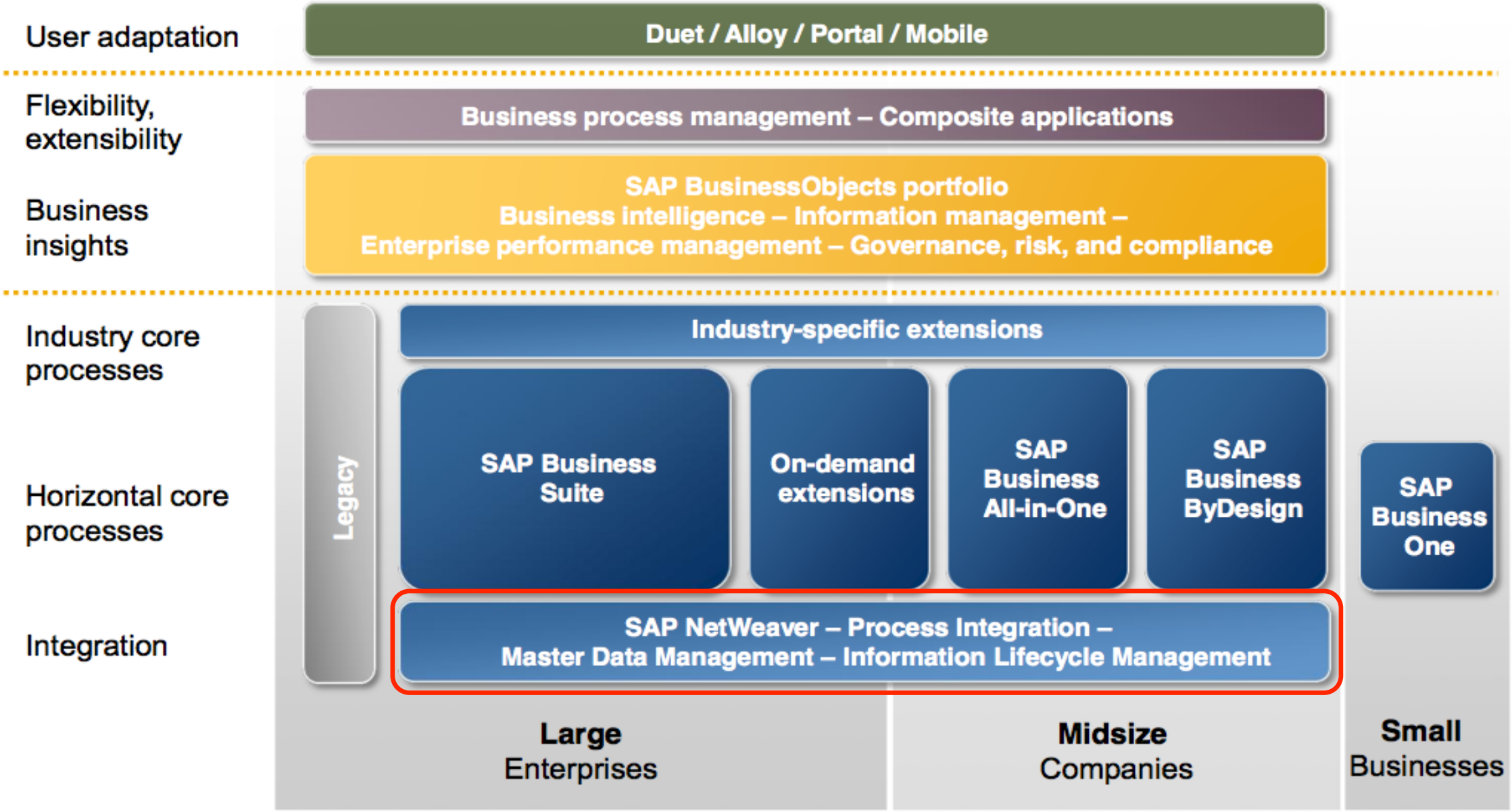
#3 Discovery and Exploitation (6)

- SAP NW Portal version 6.4.200607310245:
  - `Server: SAP Web Application Server (ICM)`
  - `Server: SAP J2EE Engine/6.40`
  - `PortalVersion:"6.4.200607310245”`
- SAP Portal session IDs available pre-authentication
- Post-authentication, session IDs do not change (session fixation)
- Choose targets selectively (business role)

#3 Impact (1)

- Hijack any SAP user (or admin) session
  - Unauthorized access to SAP Portal and other SAP applications and modules
  - SAP NetWeaver is SAP's integrated technology platform & technical foundation for all SAP apps
  - Key business users (target core business)
- Real-world impact: who could be affected?
  - SAP AG: world's leader in enterprise biz SW
  - +109,000 customers in 120 countries
  - +140,000 installations & +2,400 cert partners

SAP Architecture



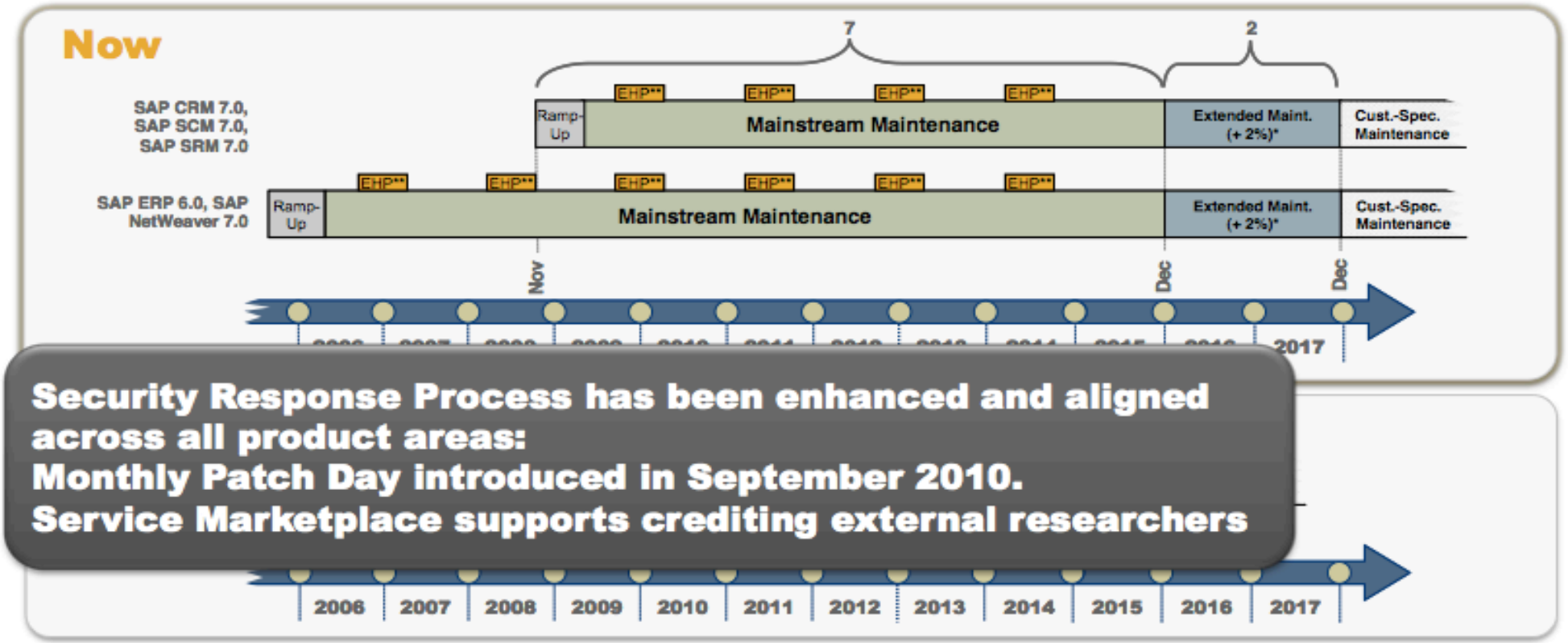
#3 Impact (2)

- Direct impact of software-based and web services-based business activities of thousands of organizations and companies worldwide
- Session fixation might impact web-app design
  - In-depth architecture analysis & 3rd-parties & redesign
  - Minor change can break other components
  - E.g. User impersonation between applications
    - SSO (Single Sign On) or session management tricks
  - E.g. Software components that receive and use IDs
    - Without capabilities to discern if it is valid or not

Bypass the most advanced authentication mechanisms

#3 Impact (3)

- SW maintenance & support strategy: 7-2
  - 7 years mainstream + 2 years extended
  - Fixes for new & legacy versions (production)



#3 Vulnerability Disclosure Timeline (1)

- Complexity of modern web architectures and broad vulnerability scope = 1,5 years
- Reported on early July 2009 & ratified
  - First deadline: 2 months (best case scenario)

+2,5

- Mid Sep'09 difficulties identified (stability)

+4

- Nov'09: estimated release on Jan/Feb'10
  - Responsible disclosure (plans) & real impact
  - Initial technical solution being tested

Meanwhile environments remain vulnerable…

#3 Vulnerability Disclosure Timeline (2)

- +7 End Jan'10: solution still not available
  - Issue escalated internally
  - Several months required (all affected releases)
- +9 Mar'10: fixes for all cases expected +Sep'10
  - Issues found on legacy releases
  - Partial fixes for specific CUs under evaluation
- +13 Aug'10: meeting date for Nov'10 (disclosure)
- +18 Dec'10: vuln & fix releases (CUs & partners)
- +21 Mar'11: implementation time of 3 months

SAP Disclosure Guidelines (1)

- SAP disclosure guidelines details:
  - Published after this specific finding
  - "Since **the integrity and security of business operations is crucial for businesses in all industries**, SAP as a provider of **business software** is absolutely committed to maintaining the highest possible level of security within its products."
  - What is the right balance between full security and fast disclosure?

Other researchers can find it:
!= motivations (see case #1)

SAP Disclosure Guidelines (2)

- Fix and vuln disclosure details and timing:

PLEASE GIVE SAP SUFFICIENT TIME TO DEVELOP SUITABLE FIXES

- Fixing security vulnerabilities can be a long and arduous process as we work to develop a patch, ensure its compatibility with all relevant software versions, run comprehensive tests to ensure that the fixes run well and do not have any side-effects, and provide it to our customers.
- As a vendor of business software we provide security fixes not only to the latest version but also for many older versions of our software products. This means that we need to develop and thoroughly test feasible patches for a broad range of product versions, which can take time.

PLEASE DO NOT PUBLICIZE VULNERABILITIES UNTIL SAP CUSTOMERS HAVE HAD TIME TO DEPLOY FIXES

- The deployment of patches for SAP enterprise systems is usually more complicated than a software upgrade on a consumer PC. Depending on the nature of the vulnerability, the deployment of patches often is not only done by an automated update; in some cases it requires manual configuration work in the system.
- Some of our customers also have regular patching cycles, for instance on a monthly or a quarterly basis.
- In light of these circumstances, we ask all security researchers to give SAP customers sufficient time to implement patches in their SAP systems. As a rule of thumb, we suggest respecting an implementation time of three months. We ask all security researchers to not disseminate any kind of information or tools that would help to exploit the vulnerability during that time.

New SAP security program: highlight security notes, periodic releases & credit

Is the all or nothing approach the right approximation?

#3 Protections (1)

- Monthly Patch Day (since Sep'2010)
- SAP ACK to security researchers:

Taddong, Raul Siles, SAP Security Note 1310561

- SAP Security Note 1310561
  - December 2010
  - https://websmp130.sap-ag.de/sap/support/notes/1310561 (SAP Service Marketplace)

Third oldest #id, after 1175239 (related) & 1151410

http://www.sdn.sap.com/irj/sdn/index?rid=/webcontent/uuid/c05604f6-4eb3-2d10-eea7-ceb666083a6a

#3 Protections (2)

- Enable “SessionIdRegenerationEnabled”
  - SAP Security Note 1310561
  - Web Container Service property
  - Two cookies required to identify sessions: JSESSIONID & JSESSIONMARKID (“secure”)
  - The new “secure” session ID is renewed on every successful login
  - Disabled by default but…
  - Enabled in +7.11 SP06 & all SPs 7.20 & 7.30
  - Specific scenarios may require extra steps

#3 Protections (3)

- Use HTTPS-only links & remove HTTP support in SAP Portal
- Enable “SystemCookiesHTTPSProtection”
  - SAP Security Notes 1019335 & 1020365
  - HTTP Provider Service property
  - Sets the “secure” attribute for session and load balancing cookies (JSESSIONID & saplb)
  - Available in 6.40 SP21 & 7.0 SP14
  - Disabled by default

Vendor conservative settings & backward compatibility. Security teams!!

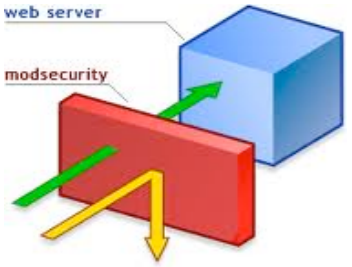
#3 Protections (4)

- Enable “SessionIPProtectionEnabled”
  - Web Container Service property
    - Manages J2EE web components
  - HTTP session cannot be accessed from different IP addresses. Only requests from the IP addr that started the session are processed
  - Disabled by default
  - If front proxy or load balancer is used
    - Configure the “ClientIpHeaderName” property of the HTTP Provider Service (e.g. relay “X-Forwarded-For” header)

Conclusions

Session Fixation Protections

- Renew session ID after privilege level changes
- Lack of link between authentication and session management capabilities (best practices only)
  - Web developer's hands (e.g. PHP or Java or .NET…)
- Limit accepted session tracking mechanisms
- HTTPS everywhere
- Session ID available only post-authentication
- Bind session ID to other user properties
- Isolate critical web-apps on its own domain
- Very restrictive cookie attributes

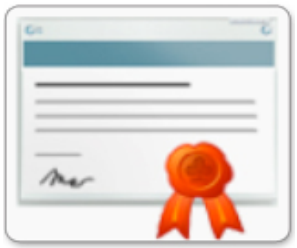


Conclusions (1)

- Session fixation still prevalent in 2010
  - Open-source projects, commercial web application frameworks, and mission critical business platforms
- Thousands of critical and business-related web environments affected worldwide
- Entry point to get unauthorized access to business critical data and infrastructures
  - Targeted, criminal, and corporate espionage
- Multiple exploitation methods available

Conclusions (2)

- Session attacks can bypass even the most advanced authentication mechanisms
- Session ID is equivalent to…
  - Password
  - Passphrase
  - Digital certificates
  - Smart cards
  - Fingerprint
  - Eye retina



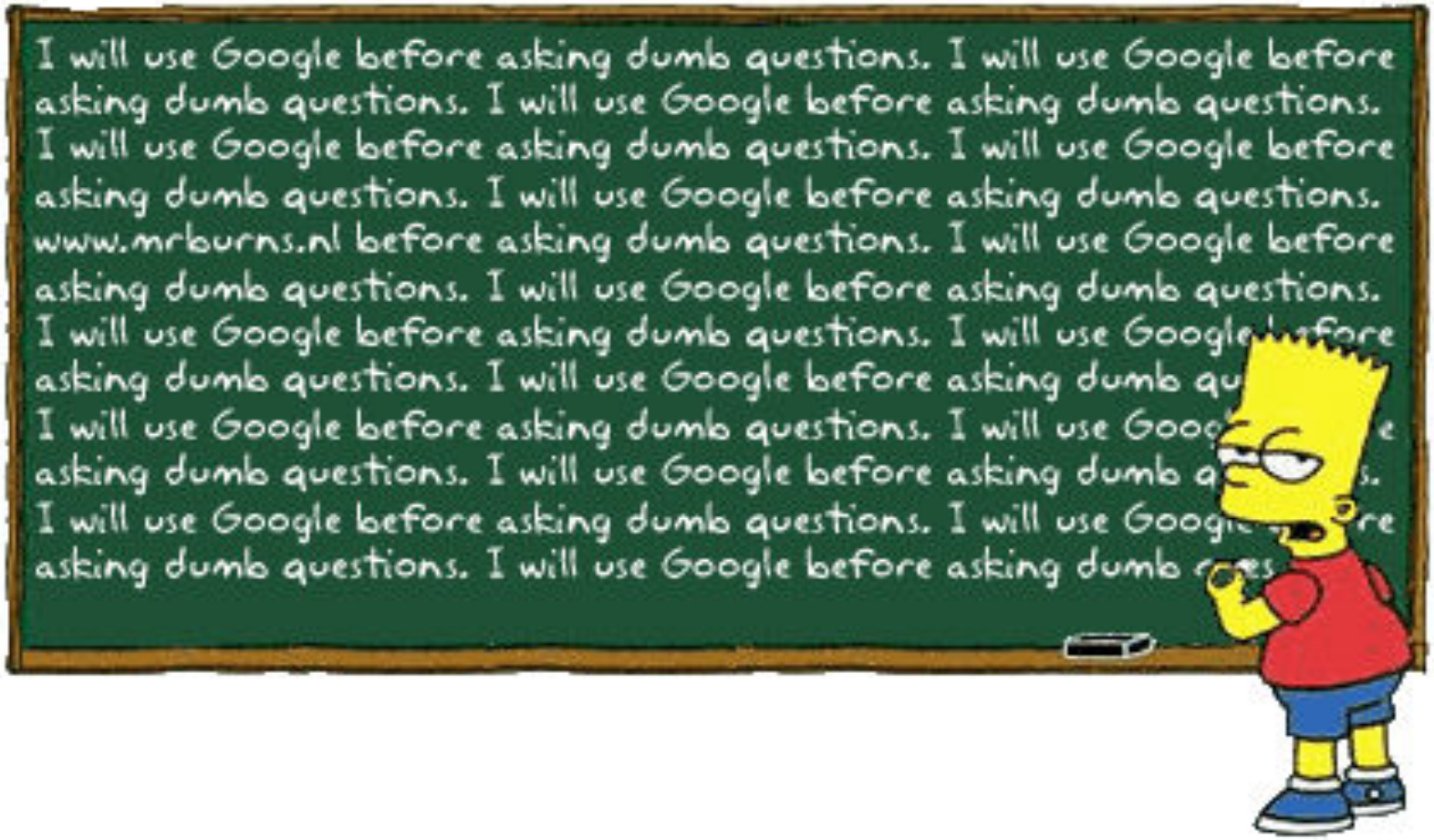
Conclusions (3)

- Impact on the web-app design and on multiple modules (and 3rd-party components)
  - Complexity of web-apps and core nature of session management infrastructures
  - Minor misconfiguration introduces vulnerability?
  - How easy is to fix session fixation?
  - Plan and test early in design and development
- Promote (continuous) testing for session fixation flaws, development awareness, and improve vulnerability handling and disclosure

Future Research

- Session fixation state-of-the-art on the wild
  - Widely used Internet services and selected sample of critical web applications
  - Valid user account on the target web-app
- Manual techniques vs. semi-automated tool for discovery and basic exploitation
  - Automate verification and extend testing
- Authentication and privilege level changes

Questions? ☺

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