OWASP Serbia
A4, A8, A9, A10

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OWASP
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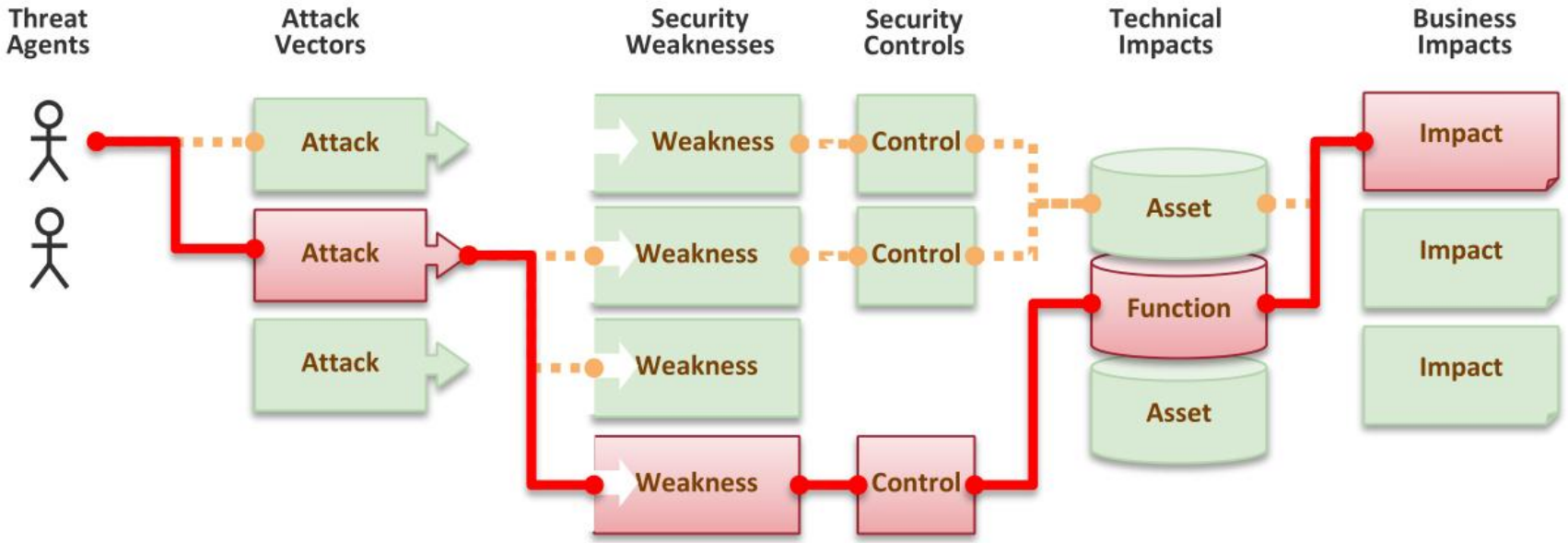
OWASP Top Ten

OWASP Top 10 – 2010 (Previous)	OWASP Top 10 – 2013 (New)
A1 – Injection	A1 – Injection
A3 – Broken Authentication and Session Management	A2 – Broken Authentication and Session Management
A2 – Cross-Site Scripting (XSS)	A3 – Cross-Site Scripting (XSS)
A4 – Insecure Direct Object References	A4 – Insecure Direct Object References
A6 – Security Misconfiguration	A5 – Security Misconfiguration
A7 – Insecure Cryptographic Storage – Merged with A9 →	A6 – Sensitive Data Exposure
A8 – Failure to Restrict URL Access – Broadened into →	A7 – Missing Function Level Access Control
A5 – Cross-Site Request Forgery (CSRF)	A8 – Cross-Site Request Forgery (CSRF)
<buried in A6: Security Misconfiguration>	A9 – Using Known Vulnerable Components
A10 – Unvalidated Redirects and Forwards	A10 – Unvalidated Redirects and Forwards
A9 – Insufficient Transport Layer Protection	Merged with 2010-A7 into new 2013-A6

OWASP Risk Methodology



OWASP Risk Methodology

Threat Agent	Attack Vector	Weakness Prevalence	Weakness Detectability	Technical Impact	Business Impact
?	Easy	Widespread	Easy	Severe	?
	Average	Common	Average	Moderate	
	Difficult	Uncommon	Difficult	Minor	

https://www.owasp.org/index.php/OWASP_Risk_Rating_Methodology

A4 – Insecure Direct Object References

How do you protect access to your data?

- This is part of enforcing proper "Authorization", along with A7 – Failure to Restrict URL Access

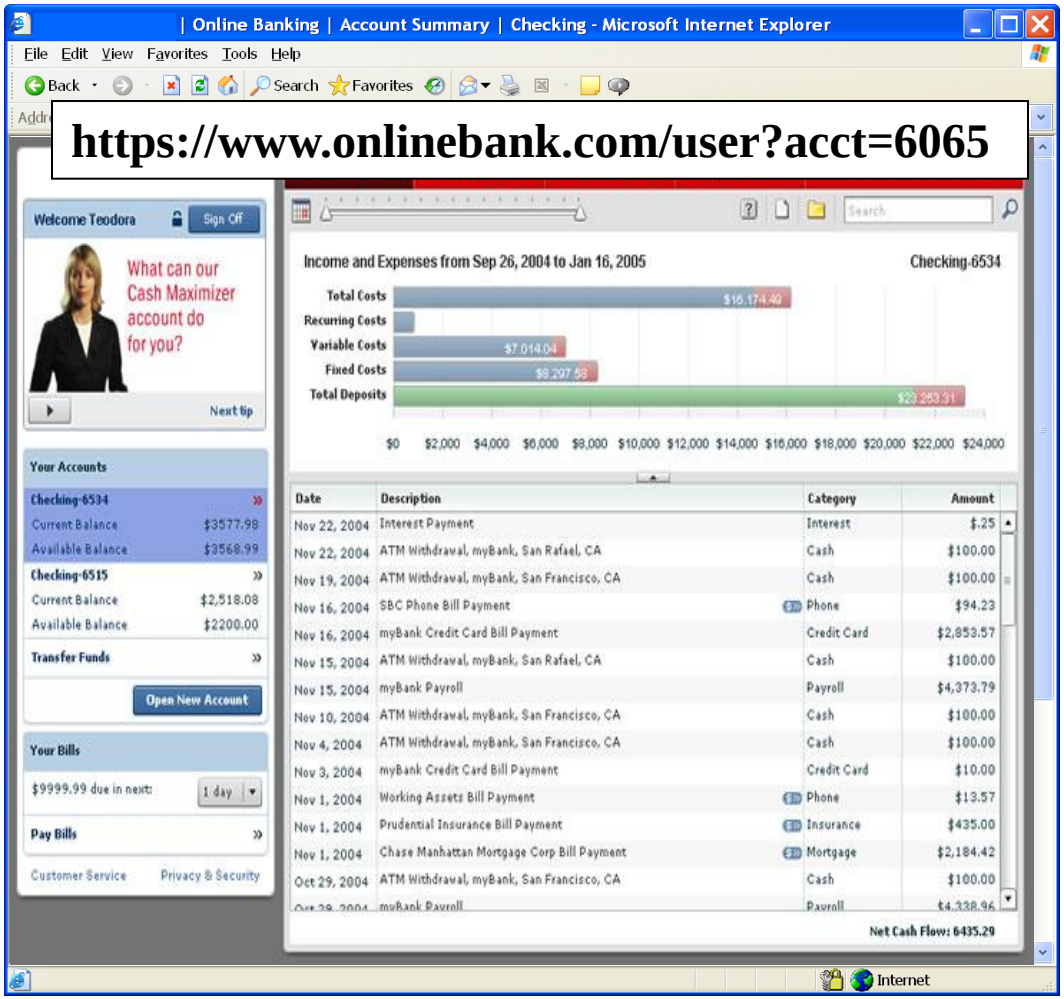
A common mistake …

- Only listing the 'authorized' objects for the current user, or
- Hiding the object references in hidden fields
- … and then not enforcing these restrictions on the server side
- This is called presentation layer access control, and doesn't work
- Attacker simply tampers with parameter value

Typical Impact

- Users are able to access unauthorized files or data

Insecure Direct Object References Illustrated



- Attacker notices his acct parameter is 6065

  ?acct=6065

- He modifies it to a nearby number

  ?acct=6066

- Attacker views the victim's account information

A4 – Avoiding Insecure Direct Object References

- Eliminate the direct object reference
  - Replace them with a temporary mapping value (e.g. 1, 2, 3)
  - ESAPI provides support for numeric & random mappings
    - IntegerAccessReferenceMap & RandomAccessReferenceMap

http://app?file=Report123.xls
http://app?file=1

http://app?id=9182374
http://app?id=7d3J93

Report123.xls

Acct:9182374

- Validate the direct object reference
  - Verify the parameter value is properly formatted
  - Verify the user is allowed to access the target object
    - Query constraints work great!
  - Verify the requested mode of access is allowed to the target object (e.g., read, write, delete)

Demo

A8 – Failure to Restrict URL Access

How do you protect access to URLs (pages)?

- This is part of enforcing proper "authorization", along with A4 – Insecure Direct Object References

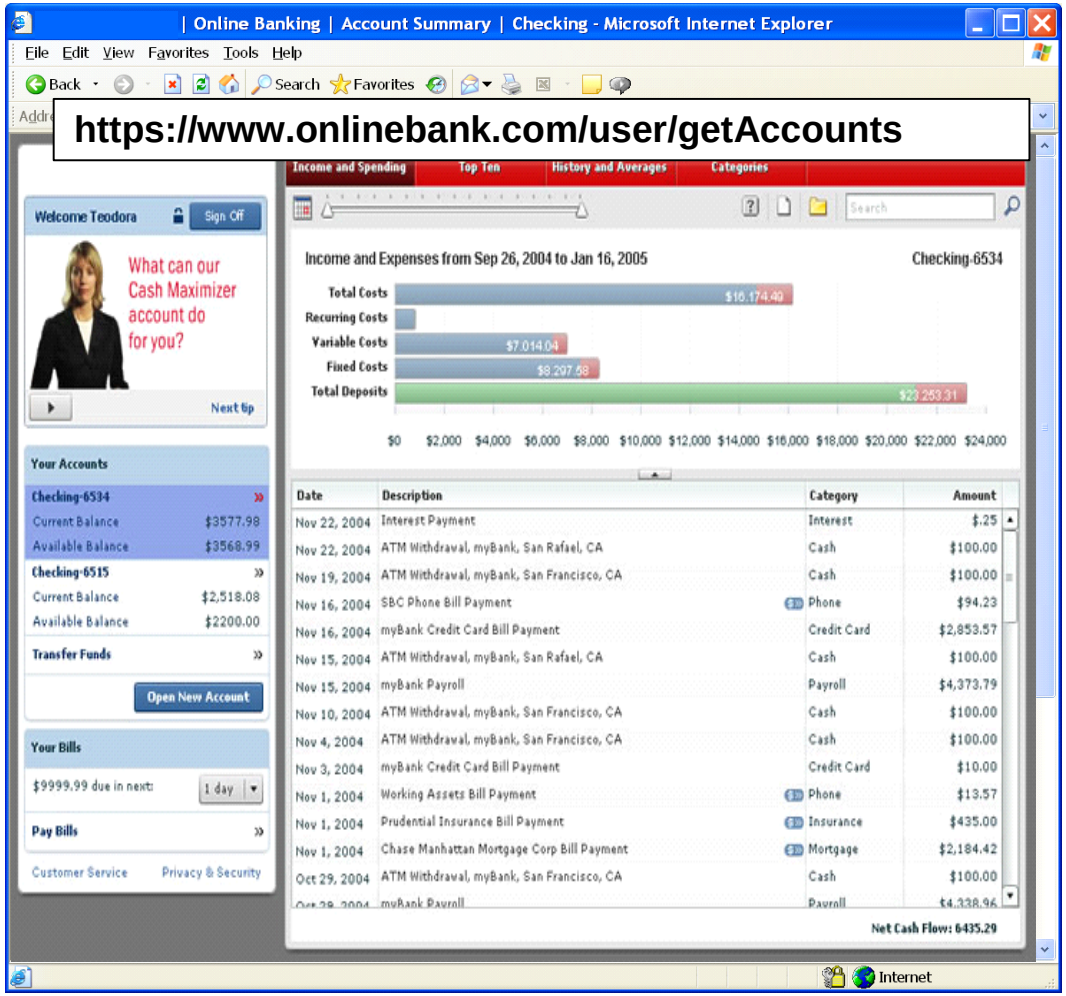
A common mistake …

- Displaying only authorized links and menu choices
- This is called presentation layer access control, and doesn't work
- Attacker simply forges direct access to 'unauthorized' pages

Typical Impact

- Attackers invoke functions and services they're not authorized for
- Access other user's accounts and data
- Perform privileged actions

Failure to Restrict URL Access Illustrated



- Attacker notices the URL indicates his role
  /user/getAccounts
- He modifies it to another directory (role)
  /admin/getAccounts, or
  /manager/getAccounts
- Attacker views more accounts than just their own

A8 – Avoiding URL Access Control Flaws

- For each URL, a site needs to do 3 things
  - Restrict access to authenticated users (if not public)
  - Enforce any user or role based permissions (if private)
  - Completely disallow requests to unauthorized page types (e.g., config files, log files, source files, etc.)
- Verify your architecture
  - Use a simple, positive model at every layer
  - Be sure you actually have a mechanism at every layer
- Verify the implementation
  - Forget automated analysis approaches
  - Verify that each URL in your application is protected by either
    - An external filter, like Java EE web.xml or a commercial product
    - Or internal checks in YOUR code – Use ESAPI's isAuthorizedForURL() method
  - Verify the server configuration disallows requests to unauthorized file types
  - Use WebScarab or your browser to forge unauthorized requests

Demo

A9 – Insufficient Transport Layer Protection

Transmitting sensitive data insecurely

- Failure to identify all sensitive data
- Failure to identify all the places that this sensitive data is sent
  - On the web, to backend databases, to business partners, internal communications
- Failure to properly protect this data in every location

Typical Impact

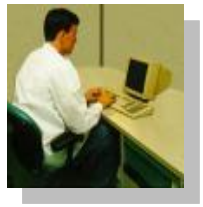
- Attackers access or modify confidential or private information
  - e.g, credit cards, health care records, financial data (yours or your customers)
- Attackers extract secrets to use in additional attacks
- Company embarrassment, customer dissatisfaction, and loss of trust
- Expense of cleaning up the incident
- Business gets sued and/or fined

Insufficient Transport Layer Protection Illustrated

External Victim

Custom Code

Backend Systems



Business Partners

Employees

External Attacker

1

External attacker steals credentials and data off network

Internal Attacker

2

Internal attacker steals credentials and data from internal network

A9 – Avoiding Insufficient Transport Layer Protection

- Protect with appropriate mechanisms
  - Use TLS on all connections with sensitive data
  - Individually encrypt messages before transmission
    - E.g., XML-Encryption
  - Sign messages before transmission
    - E.g., XML-Signature
- Use the mechanisms correctly
  - Use standard strong algorithms (disable old SSL algorithms)
  - Manage keys/certificates properly
  - Verify SSL certificates before using them
  - Use proven mechanisms when sufficient
    - E.g., SSL vs. XML-Encryption
- See: http://www.owasp.org/index.php/Transport_Layer_Protection_Cheat_Sheet for more details

Demo

A10 – Unvalidated Redirects and Forwards

Web application redirects are very common

- And frequently include user supplied parameters in the destination URL
- If they aren't validated, attacker can send victim to a site of their choice

Forwards (aka Transfer in .NET) are common too

- They internally send the request to a new page in the same application
- Sometimes parameters define the target page
- If not validated, attacker may be able to use unvalidated forward to bypass authentication or authorization checks

Typical Impact

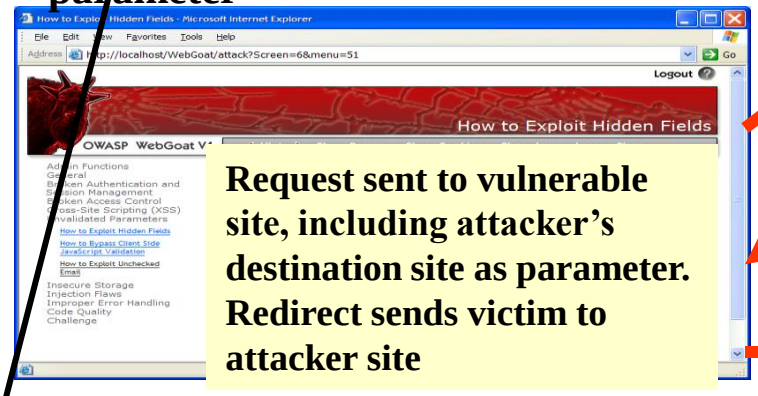
- Redirect victim to phishing or malware site
- Attacker's request is forwarded past security checks, allowing unauthorized function or data access

Unvalidated Redirect Illustrated

1 Attacker sends attack to victim via email or webpage

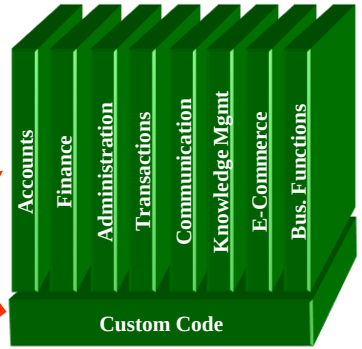
From: Internal Revenue Service
Subject: Your Unclaimed Tax Refund
Our records show you have an unclaimed federal tax refund. Please click here to initiate your claim.

2 Victim clicks link containing unvalidated parameter



Request sent to vulnerable site, including attacker's destination site as parameter. Redirect sends victim to attacker site

3 Application redirects victim to attacker's site



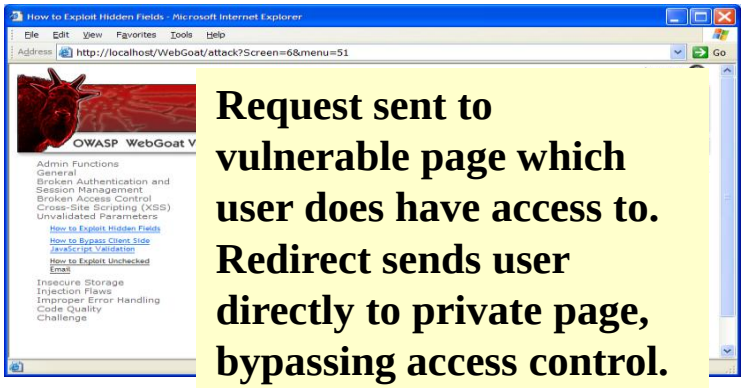
4 Evil site installs malware on victim, or phish's for private information

http://www.irs.gov/taxrefund/claim.jsp?year=2006&... &dest=www.evilsite.com

OWASP

Unvalidated Forward Illustrated

1 **Attacker sends attack to vulnerable page they have access to**



Request sent to vulnerable page which user does have access to. Redirect sends user directly to private page, bypassing access control.

2 **Application authorizes request, which continues to vulnerable page**

Filter

```
public void doPost( HttpServletRequest request,
HttpServletResponse response) {
    try {
        String target = request.getParameter( "dest" ) );
        ...
        request.getRequestDispatcher( target
        ).forward(request, response);
    }
    catch ( ...
```

```
public void sensitiveMethod(
HttpServletRequest request,
HttpServletResponse response) {
    try {
          // Do sensitive stuff here.
          ...
    }
    catch ( ...
```

3 **Forwarding page fails to validate parameter, sending attacker to unauthorized page, bypassing access control**

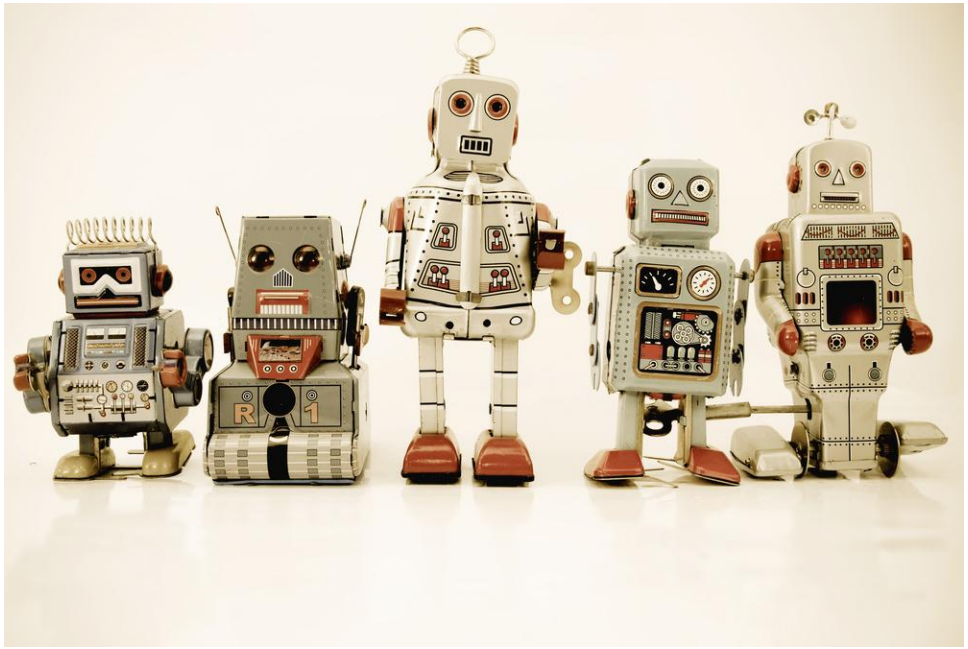
A10 – Avoiding Unvalidated Redirects and Forwards

- There are a number of options
  1. Avoid using redirects and forwards as much as you can
  2. If used, don't involve user parameters in defining the target URL
  3. If you 'must' involve user parameters, then either
     a) Validate each parameter to ensure its valid and authorized for the current user, or
     b) (preferred) – Use server side mapping to translate choice provided to user with actual target page
  - Defense in depth: For redirects, validate the target URL after it is calculated to make sure it goes to an authorized external site
  - ESAPI can do this for you!!
    - See: SecurityWrapperResponse.sendRedirect(URL)
    - http://owasp-esapi-java.googlecode.com/svn/trunk_doc/org/owasp/esapi/filters/SecurityWrapperResponse.html#sendRedirect(java.lang.String)

- Some thoughts about protecting Forwards
  - Ideally, you'd call the access controller to make sure the user is authorized before you perform the forward (with ESAPI, this is easy)
  - With an external filter, like Siteminder, this is not very practical
  - Next best is to make sure that users who can access the original page are ALL authorized to access the target page.

Demo

Diskusija



Hvala

Kontakt

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