Web Application Security

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7/14/16
# Web Application Attacks – 30% in Edu

30% of data breaches in Education involve web application attacks

<table>
<thead>
<tr>
<th>Description</th>
<th>Any incident in which a web application was the vector of attack. This includes exploits of code-level vulnerabilities in the application as well as thwarting authentication mechanisms.</th>
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</thead>
<tbody>
<tr>
<td>Top industries</td>
<td>Finance, Information, Retail</td>
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<tr>
<td>Frequency</td>
<td>5,334 total incidents (19,389 additional with secondary motivation), 908 with confirmed data disclosure.</td>
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<td>Key findings</td>
<td>The breaches within this pattern are heavily influenced by information gathered by contributors involved in the Dridex botnet takedown. Hundreds of breaches involving social attacks on customers, followed by the Dridex malware and subsequent use of credentials captured by keyloggers, dominate the actions. Defacements are still commonplace and CMS plugins are also a fruitful attack point.</td>
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</tbody>
</table>

*Source: 2016 Data Breach Investigations Report - Verizon*
Breaches per pattern

Figure 18.
Percentage (blue bar), and count of breaches per pattern. The gray line represents the percentage of breaches from the 2015 DBIR. (n=2,260)
Getting started

- **OWASP Top 10**
  - Most common attack vectors and guides for preventing these attacks

- **SANS Security Checklist for Web Application Design**
Demo

SQL Injection

- **Demo:** [http://www.techpanda.org/index.php](http://www.techpanda.org/index.php)

![Login form](image)

- **Username:** Any email address
- **Password:** Any password appended by: 
  
  ```
  ') OR 1 = 1 -- ]
  ```

- Backend logic for checking user ID: 
  ```sql
  SELECT * FROM users WHERE email = "$_POST['email']" AND password = md5("$_POST['password']");
  ```
Demo (con’t)

How it works

```sql
SELECT * FROM users WHERE email = 'email' AND password = md5('password');
```

Supplied values:
- xxx@xxx.xxx
- xxx') OR 1 = 1 -- ]

```sql
SELECT * FROM users WHERE email = 'xxx@xxx.xxx' AND password = md5('xxx') OR 1 = 1 -- ]);
```

```sql
SELECT * FROM users WHERE FALSE AND FALSE OR TRUE
```

```sql
SELECT * FROM users WHERE FALSE OR TRUE
```

```sql
SELECT * FROM users WHERE TRUE
```
How to secure web application

Incorporate security into web application lifecycle

Planning
- Data classification and associated data security requirements

Development
- Authentication and Access control
- Session Management
- Input Validation
- Error Handling

Production
- Patching
- Logging and Monitoring

Validation
- Code review
- Vulnerability scanning

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Web Application Scanning

- Most (All?) campuses provide web application scanning service
  - IBM AppScan
  - Netsparker
  - Qualys
  - Acunetix

- Web application vulnerability scanning tool automatically scans web applications for potential vulnerabilities
  - Quick and automated
  - False positives and false negatives

- Should not be used alone to perform the entire task of securing a web application
Takeaways

- Consider web application security at all points during the web application lifecycle
  - Use the SANS Security Checklist
- Do not trust user input – validate and sanitize (server side a must)
- Scan your web application before go-live, after major changes, and on a regular basis
- Maintenance:
  - Keep server, third-party applications, and library up-to-date
  - Log and monitor server and application activities, and review alerts