Cheat Sheet for comprehensive CompTIA Secure Software Professional

Secure Software Development Lifecycle (SDLC)

Phases of SDLC

- **Planning**: Define project scope, objectives, and risks.
- **Analysis**: Gather requirements and assess security needs.
- **Design**: Create architectural and detailed designs with security in mind.
- **Implementation**: Write secure code and conduct code reviews.
- **Testing**: Perform security testing (e.g., penetration testing, vulnerability scanning).
- **Deployment**: Release the software securely and monitor for issues.
- **Maintenance**: Continuously update and patch the software.

Security Activities in Each Phase

- **Planning**: Risk assessment, security requirements definition.
- **Analysis**: Threat modeling, security impact analysis.
- **Design**: Security architecture, secure design patterns.
- **Implementation**: Secure coding practices, code reviews.
- **Testing**: Security testing, vulnerability assessments.
- **Deployment**: Secure deployment practices, monitoring.
- **Maintenance**: Patch management, continuous monitoring.

Secure Coding Practices

Input Validation

- **Whitelist vs. Blacklist**: Use whitelisting for allowed characters/formats.
- **Sanitization**: Remove or escape dangerous characters (e.g., SQL injection).
- **Length Checks**: Validate input length to prevent buffer overflows.

Output Encoding

- **Context-Specific Encoding**: Use appropriate encoding for different contexts (e.g., HTML, SQL, JavaScript).

- **Escaping**: Escape special characters to prevent injection attacks.

Error Handling

- **Graceful Degradation**: Ensure the application fails securely.
- **Minimal Error Information**: Avoid exposing detailed error messages to users.
- **Logging**: Log errors securely, avoiding sensitive information.

Authentication and Authorization

- **Multi-Factor Authentication (MFA)**: Implement MFA for enhanced security.
- **Role-Based Access Control (RBAC)**: Assign permissions based on roles.
- **Least Privilege**: Grant users the minimum permissions necessary.

Cryptography

Key Concepts

- **Symmetric vs. Asymmetric Encryption**:
  - **Symmetric**: Same key for encryption and decryption.
  - **Asymmetric**: Different keys for encryption and decryption.
- **Hashing**: One-way function to create a fixed-size output (e.g., SHA-256).
- **Digital Signatures**: Verify the authenticity and integrity of data.

Best Practices

- **Use Strong Algorithms**: Prefer AES, RSA, SHA-256.
- **Key Management**: Securely generate, store, and rotate keys.
- **Avoid Homegrown Crypto**: Use well-vetted libraries.

Secure Software Testing

Types of Testing

- **Static Analysis**: Analyze code without executing it (e.g., linting).
- **Dynamic Analysis**: Test running code (e.g., penetration testing).
- **Fuzz Testing**: Provide invalid, unexpected, or random data to detect vulnerabilities.

Tools

- **Static Analysis**: SonarQube, Checkmarx.

- **Dynamic Analysis**: OWASP ZAP, Burp Suite.
- **Fuzz Testing**: AFL, Peach Fuzzer.

Security Policies and Standards

Common Standards

- **OWASP**: Guidelines for secure web application development.
- **ISO/IEC 27034**: Information technology – Security techniques – Application security.
- **NIST SP 800-53**: Security and privacy controls for federal information systems.

Compliance

- **GDPR**: Data protection regulations for EU citizens.
- **HIPAA**: Health Insurance Portability and Accountability Act.
- **PCI DSS**: Payment Card Industry Data Security Standard.

Incident Response and Recovery

Incident Response Plan

- **Preparation**: Develop and maintain an incident response plan.
- **Detection and Analysis**: Identify and analyze security incidents.
- **Containment**: Limit the scope and impact of the incident.
- **Eradication**: Remove the root cause of the incident.
- **Recovery**: Restore normal operations.
- **Post-Incident Activity**: Conduct a lessons-learned review.

Tools and Techniques

- **SIEM**: Security Information and Event Management (e.g., Splunk, ELK Stack).
- **Forensics**: Tools for analyzing compromised systems (e.g., Autopsy, FTK).
- **Backup and Restore**: Regularly back up data and test restore procedures.

Continuous Monitoring and Improvement

Monitoring

- **Log Management**: Centralize and analyze logs (e.g., ELK Stack, Splunk).
- **Real-Time Alerts**: Set up alerts for suspicious activities.

- **Performance Monitoring**: Monitor application performance and resource usage.

Improvement

- **Vulnerability Management**: Regularly scan for and remediate vulnerabilities.
- **Patch Management**: Keep software and systems up to date with security patches.
- **Security Audits**: Conduct regular security audits and assessments.

Tools and Resources

Development Tools

- **IDE Plugins**: Security plugins for IDEs (e.g., SonarLint, Fortify).
- **Version Control**: Use secure version control practices (e.g., Git, GitHub).

Security Libraries

- **Cryptography**: OpenSSL, BouncyCastle.
- **Authentication**: OAuth, JWT.
- **Validation**: Hibernate Validator, Apache Commons Validator.

Learning Resources

- **Books**: "The Web Application Hacker's Handbook," "Secure Programming with Static Analysis."
- **Online Courses**: Coursera, Udemy, Pluralsight.
- **Communities**: OWASP, Stack Overflow, Reddit.

Example Scenarios

SQL Injection Prevention

- **Example Code**:

```
String query = "SELECT * FROM users WHERE username = ?";
PreparedStatement stmt = connection.prepareStatement(query);
stmt.setString(1, username);
ResultSet rs = stmt.executeQuery();
```

- **Explanation**: Use prepared statements to prevent SQL injection.

Cross-Site Scripting (XSS) Prevention

- **Example Code**:

```
<div>Welcome, <%= htmlEscape(user.getName()) %></div>
```

- **Explanation**: Use context-specific encoding to prevent XSS.

Conclusion

- **Summary**: Secure software development requires a holistic approach, integrating security into every phase of the SDLC.

- **Continuous Learning**: Stay updated with the latest security practices and tools.

- **Collaboration**: Work closely with security teams and follow industry standards.

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