The What and Why of WordPress Security

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TL;DR

Minimizing Risk

What is “Risk”?

- Risk is the intersection of assets, threats, and vulnerabilities.
- Asset
  - People, Property, Information
  - An asset is what we are trying to protect
- Threat
  - Anything that that represents a potential danger to an asset, whether deliberately or by accident
  - A threat is what we’re trying to protect against
- Vulnerability
  - Weakness or holes/gaps in security procedures or program that can be exploited by a threat to affect assets

What is “Risk”?

- Asset = You
- Threat = Rain
- Vulnerability = Hole in your umbrella
- Risk = you getting wet

What is “Risk”?

The potential for loss, damage or destruction of
an asset(s) as a result of a threat exploiting a vulnerability
multiplied by the impact of the threat occurring

Why Education is an Attractive Target

- Network bandwidth and availability
- Rich in hardware infrastructure
- Poor in human resources
- Resistant to blacklisting
- SEO reputation

Why Education is an Attractive Target

- Personally Identifiable Information (PII) / Sensitive Personal Information (SPI)
- Protected Health Information (PHI)
- Confidential Intellectual Property
- Export Controlled Data
- National Security Interest (NSI)

#1: Backups

- What
  - A snapshot of your
    - the files that make up your site
    - database
- Why

#1: Backups

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#1: Backups

- What
  - A snapshot of your
    - the files that make up your site
    - database
- Addresses two types of threats:
  - Data loss/damage
  - Disruption in service/site downtime
- How does it reduce risk?
  - Lowering Impact

#1: Backups

- Bonus points
  - How Often?
  - What should you back up?
  - Types of backups
  - Protection of the backups

#1: Backups

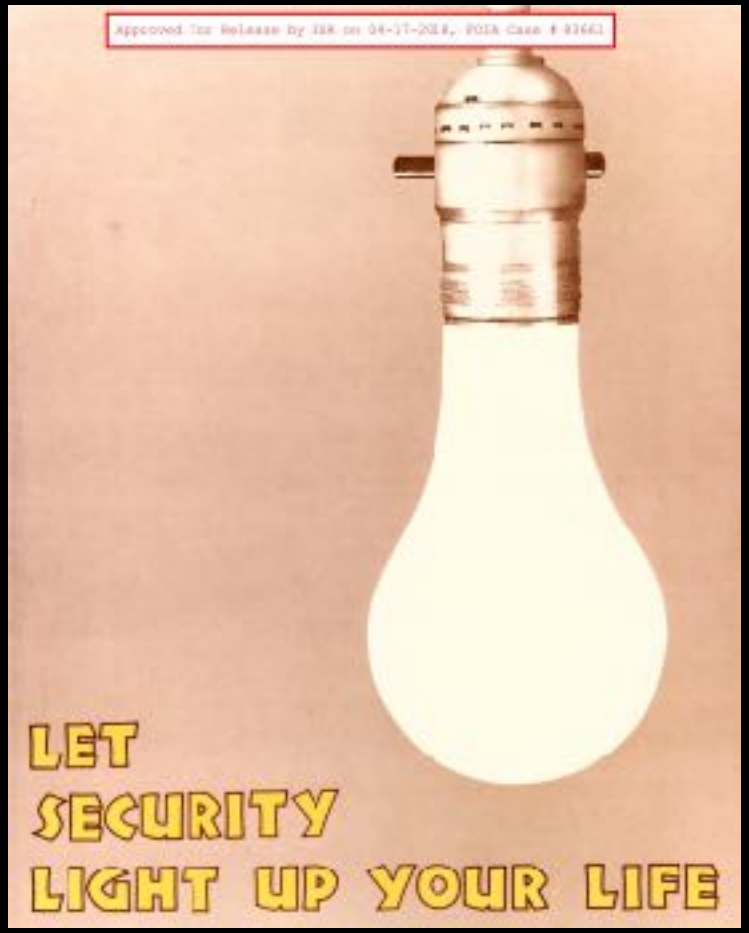
- How Often?
  - Will depend on how much data you're willing to lose or recreate
  - If unsure, start with daily backups and adjust from there
- What should you back up?
  - Ideally
    - contents of the uploads directory
    - database

#1: Backups

- How long should you keep a back up?
  - Depends on how much data you're willing to lose or recreate
  - Start with 3 months and adjust from there
- Backups should be in triplicate
  - Hot backup
  - Cold backup
  - Remote cold/long-term backup

#1: Backups

- Bonus points
  - Protect your backups
  - Don’t keep your back ups in a publicly accessible area
  - Test your backups!



#2: Keep WordPress Up-to-date

- Why/How does it reduce risk?
  - Updates often address security issues
  - Potentially removes an exploitable vulnerability
- How
  - Don’t turn off automatic minor updates*
  - Upgrade and stay on the latest branch release*
- Security principle : *Don’t use components with known vulnerabilities*

* Where possible

#3: Strong Passwords

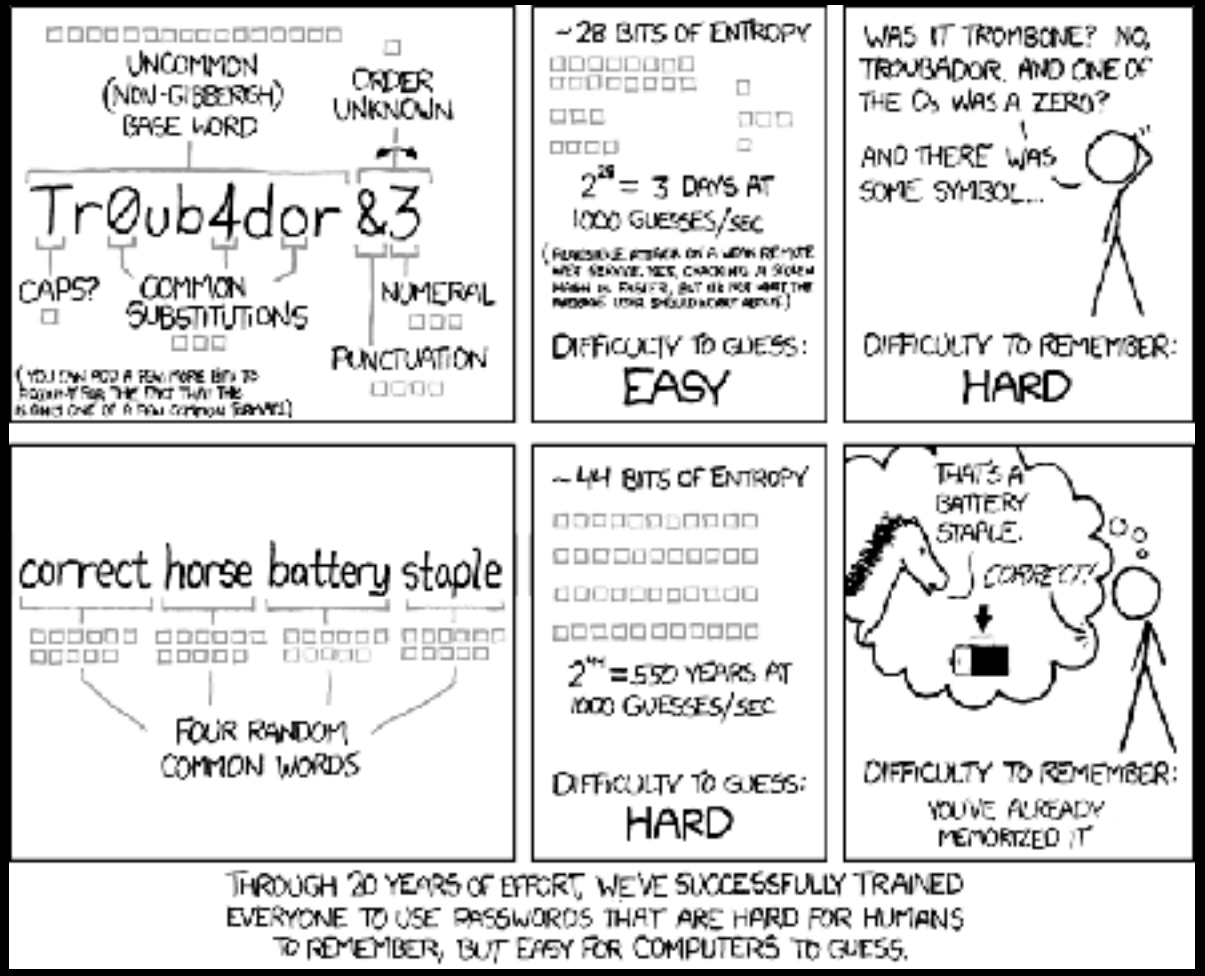
- What
  - Use a password that is long and contains randomized alpha characters, numbers and special characters
  - Does not contain common words in the dictionary
- Why/How does it reduce risk?
  - More difficult for attackers (threat agents) to guess, and, historically, brute force
  - Prevent unauthorized access

#3: Strong Passwords

- Even more important than complexity is length

3 to 4 additional characters has the same entropy (number of possible combinations) as passwords using a more complex set of characters

#3: Strong Passwords



https://xkcd.com/936/

#3: Strong Passwords

But wait!

#3: Strong Passwords

What if we COMBINE them?!

#3: Strong Passwords

Your new password!

MF>E,D4,C!q^m,uSwVh.[2AD+JHsM^6}

Assuming one hundred billion guesses per second will take 6.22 million trillion trillion trillion centuries to brute force

#3: Strong Passwords

- They need to be unique, **for every account, on every site**
  - As of 2017, 7 **billion** credentials have been leaked/exposed
  - Credential stuffing

#3: Strong Passwords

"R=.b8q%P5(fR74cZd3n<srtE?6c{X%`

$;@(:B&%hY^gt&QHV7t.4}y2:nnED:fe

Ah=4Rp9gb{zb5qW!`:K;5=R6]nDXD'PM

?fF*c,Xk&B<`WsCeeVLPNp{*/n5Nn4bC

ZkD=w{)PKG`<Z8*{)&RdjV{$XZ#L:RnA

7E?#!+5+b){CyM,p@r.U;WW6sFM%%5j"

b-46dy+=V-_Vu-8tU=k.*]Ne%/5k2D#e

#3: Strong Passwords

- Use a password manager
- No, really: use a password manager
- Enforce strong, unique passwords for **everyone**
  - Integrate with your institution's single-sign-on system
- Use a strong, *unique,* and **long** password **everywhere**, not just in WordPress

#3: Keep Themes/Plugins Up-to-date

- Why/How does it reduce risk?
  - Similar to WordPress core updates, plugin and theme updates can also contain security fixes, removing potential vulnerabilities
- Bonus points
  - Know what you have installed and **why** you have it installed
  - Remove those that are no longer in use (#6t)
  - Limit your plugin/theme use (#13t)

#4: Hosting Provider

If WordPress is the brain, and your content the heart and soul of your site…

…the hosting provider is the rest of the body

#4: Hosting Provider

- Why
  - Doesn't matter how well you've secured WordPress, if the host is compromised
  - Remains one of the top vectors for compromised sites
- Security principles :
  - *Don't use components with known vulnerabilities*
  - *Establish Secure Defaults / Fail safely*
  - *Separation of Duties/Segmentation*
- Bonus points
  - Know what your host is running and what versions they have installed
  - Engage with the team responsible for hosting and work with them to keep the stack up-to-date

#5: Limit Login Attempts

- What
  - Locks an account or blocks an IP address after so many failed attempts
- Why/How does it reduce risk?
  - Threat is unauthorized access
  - Vulnerability is a weak/common password
  - Reduces the ability of the threat agent to exploit the vulnerability
  - Security principle: *Minimize the attack surface*

What is “Attack Surface”?

- The sum of all paths for data/commands into and out of the application
- Plus all of the code that protects those paths
- Plus all of the data used in the application
- Plus all of the code that protects this data

What is “Attack Surface”?

#5: Limit Login Attempts

- What
  - Locks an account or blocks an IP address after so many failed attempts
- Why/How does it reduce risk?
  - Slows down an attacker from brute forcing/credential stuffing
  - Frees up your site resources
- Bonus points
  - Ensure the method you're using takes into account XMLRPC

#5: Default Credentials

- What
  - Remove or rename the default “admin” account
- Why/How does it reduce risk?
  - In automated attacks, attackers will typically start with the admin account
- Bonus points
  - Remove account enumeration

#6: Two/Multi-Factor Authentication

- What
  - Adds a secondary (or multiple) step that must be completed in order to authenticate
- Why/How does it reduce risk?
  - Adds an extra layer of defense against authentication attacks
  - Security principle: *Defense-in-depth*

#6: File/Directory Permissions

- What
  - Ensure that files and directories are set to the lowest access necessary
- Why/How does it reduce risk?
  - Improper permissions allow an attacker to access restricted files or directories and potentially modify or delete their contents
- Security principle : *least privilege*

Principle of Least Privilege

- Grant necessary permissions required to perform the intended activities
- For a limited time
- But with the *minimum* rights required for the task(s)
- Removing permissions when no longer needed

#6: File/Directory Permissions

- Bonus points
  - Lock down all area of WordPress to read-only except for those areas that specifically require the ability to write
  - Ideally, only the wp-content/uploads directory is writable, and then only writeable by the php process
  - If your environment allows it, set files to only readable (0400) by the owner of the process that php runs under

#6:Remove Unused Themes/Plugins/Users

- What
  - Remove everything that isn't in active use
- Why/How does it reduce risk?
  - Even if a plugin/theme is disabled, the files are still there and are publicly accessible
  - A non-active user is one more account that can be compromised
  - Removes potential vulnerabilities
- Bonus points
  - Make plugin, theme and user audits a routine

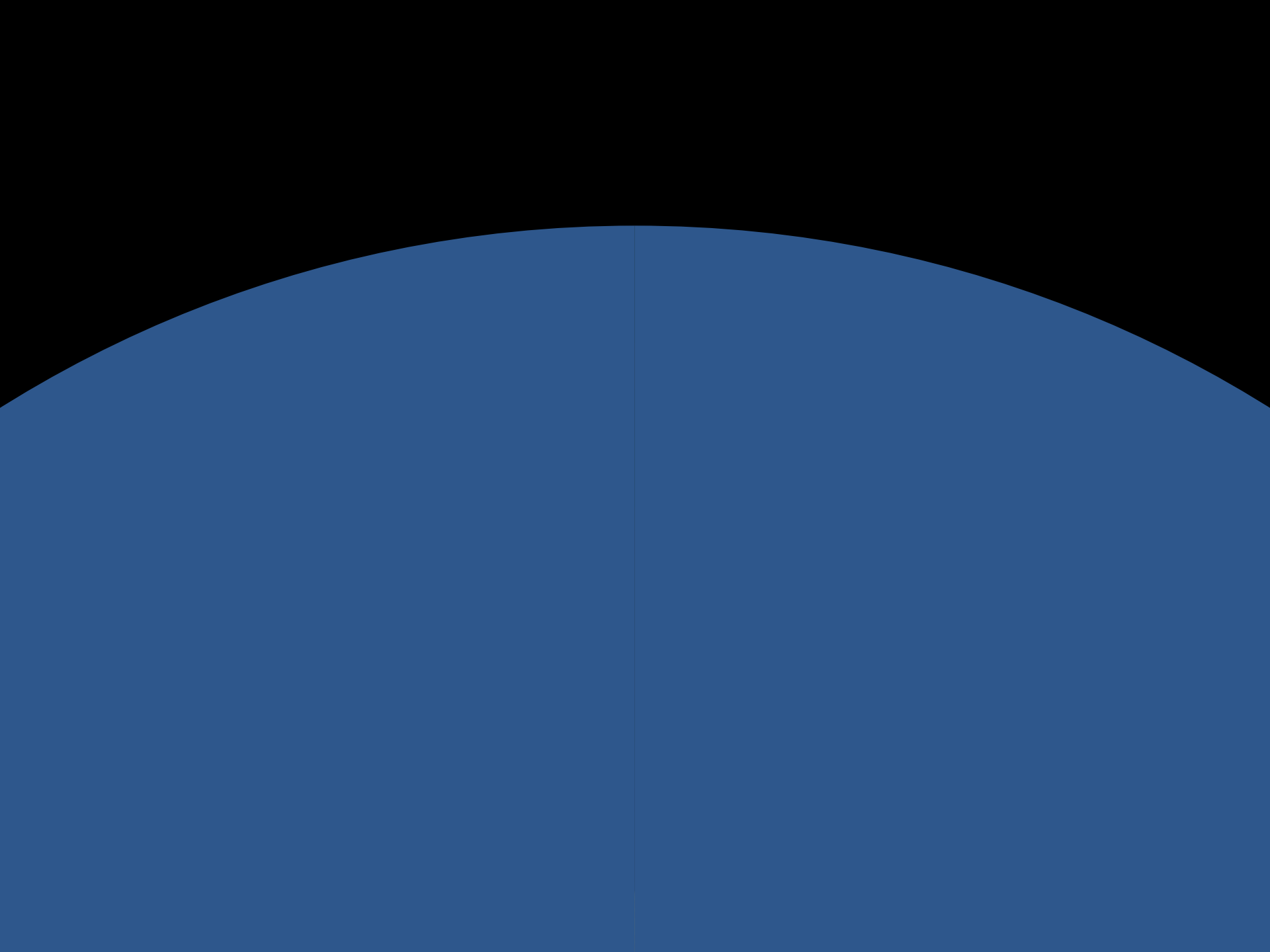
#7: Protect WP-Config.php

- What
  - Add rules to prevent direct access
  - move the file somewhere not publicly accessible
- Why
  - Contains your database credentials and salts
  - Prevents accidental exposure of those assets
- Bonus points
  - Set file permissions to 0400*
  - See #4 Hosting Provider

#7: Protect/Limit Access to Login/Admin Areas

- What
  - Add an extra layer of protection to the login area
    - Basic Access Authentication
    - Captcha
- Why/How does it reduce risk?
  - Similar to 2FA/MFA in that it adds an extra layer
- Security principle: *Minimize attack surface* and *Defense-in-Depth*
- Bonus points
  - Limit access to the login/admin areas to specific IP ranges

64.85.59.68 —> 64.85.0.0/16



#7: Protect/Limit Access to Login/Admin Areas

- Bonus points
  - Limit access to the login/admin areas to specific IP ranges
  - Require users to use a Virtual Private Network
  - Disable XMLRPC if not in use, or limit access to known network ranges

#7: Limit User Roles

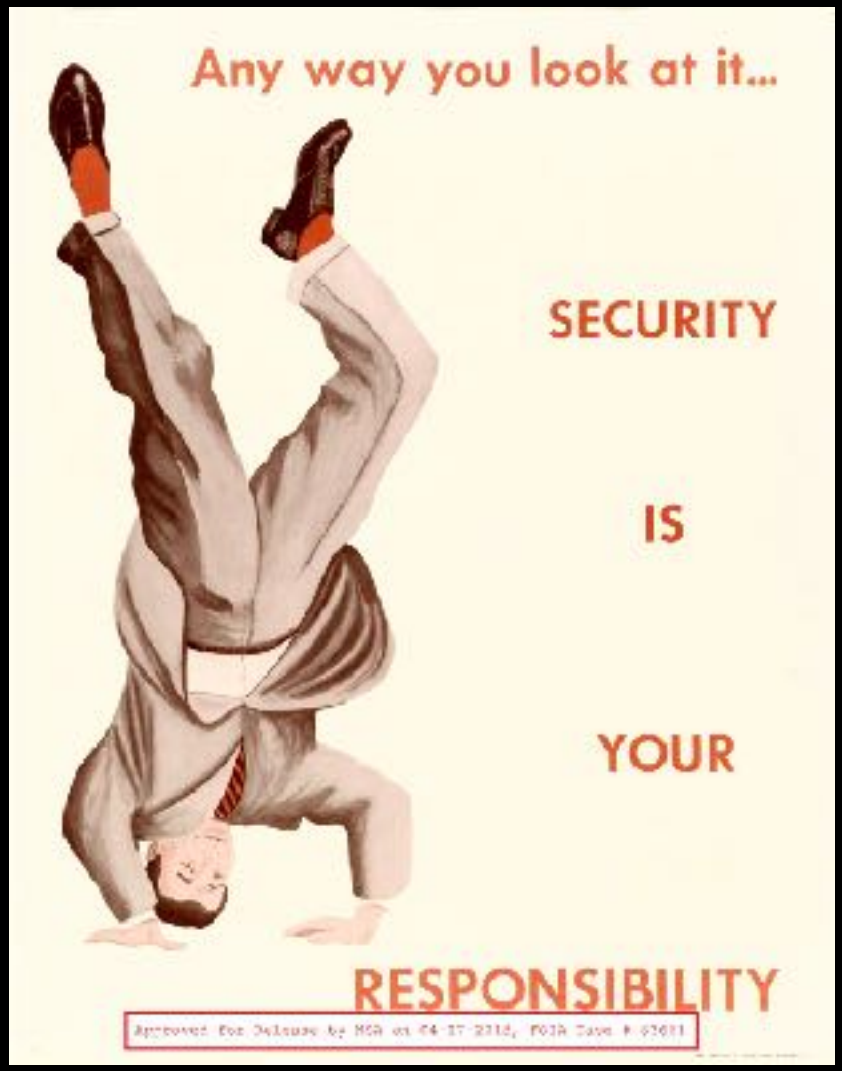
- What
  - Give users the lowest possible role that allows them to complete their tasks
  - Only login with a higher privileged account when performing actions that require elevated privileges
- Security principle: Least privilege
- Why/How does it reduce risk?
  - Minimizes the damage if an account is compromised
  - Reduces the opportunity for a rogue user to inflict damage
  - Reduces the opportunity for someone to make a mistake

#7: Limit User Roles

- Bonus points
  - Create or add custom roles that give you the ability to be more granular with permissions
  - Do routine account audits and remove permissions/roles from accounts that don’t require them

#7: Use a Security Plugin

- What
  - Install a plugin that has been designed to implement multiple “best measures”
- Why/How does it reduce risk?
  - Can make it easier to implement multiple security measures
  - Useful if you’re not comfortable with some of the actions
  - Auditing, Detection, Prevention



#8: Disable File Editing

- What
  - Disable the built-in Theme and Plugin file editor
- Why/How does it reduce risk?
  - Prevents a user from altering Theme/Plugin code from the WordPress dashboard
  - Security principle: *Minimize attack surface*

#9: Trusted Sources

- What
  - Don’t obtain plugins/themes from unknown sources
- Why
  - Code may have been altered/infected

#9: Implement SSL

- What
  - Add a SSL/TLS certificate to your site
- Why/How does it reduce risk?
  - Encrypts the data as it is transferred between your site and the end user
- Security principle: *Minimize attack surface*
- Bonus steps
  - Enforce https over the *entire* site, not just login areas and wp-admin

#10: Do Your Homework on Theme/Plugin Selection

- What
  - Research a theme/plugin before installing
- Why/How does it reduce risk?
  - Every piece of code you add to your system increases your attack surface
  - Every piece of code you add to your system has the potential to introduce new exploitable vulnerabilities

#10: Do Your Homework on Theme/Plugin Selection

"WHAT MAKES WORDPRESS SO INSECURE IS THAT IT'S HIGHLY EXTENSIBLE AND EASY TO USE; WORDPRESS SECURITY ISSUES REVOLVE ALMOST ENTIRELY AROUND THIS EXTENSIBILITY AND EASINESS OF USE."

Tony Perez, @perezbox

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  - Every piece of code you add to your system has the potential to introduce new exploitable vulnerabilities
  - Security principle: Be paranoid, be skeptical

#10: Do Your Homework on Theme/Plugin Selection

~~Jessica~~ Paul, your paranoia is exhausting

#10: Do Your Homework on Theme/Plugin Selection

- Security principle: *Treat all third party code/data as tainted and hostile*
- Bonus steps
  - https://wpvulndb.com/
  - https://php-grinder.com/
  - Run third party code through PHP-CS Security Audit
  - Run local static code analysis

#11

- Web Application Firewall
- Move/Hide Login Location
- Routine Security Scan
- Log actions/activities
- Secure your local machine

Items I believe should be higher in the list

- Block PHP execution (#14t)
- Logging (#11t)
- Segmentation/Isolation (separation of duties)
- Be selective with XMLRPC
  - Remove software/services that aren't actively used
- Limit the number of plugins you use (#13t)
- Monitor for file changes (#12t)
- Stay informed!

Summary

- Always be thinking in terms of how you can reduce risk
- Minimize attack surface area
- Principle of least privilege
- Defense in depth
- Don’t use components with known vulnerabilities
- Be paranoid, be skeptical
  - Treat all third party code/data as tainted and hostile
- Security is a continual process; you’re never “finished”

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  - https://profiles.wordpress.org/gilzow
- Slides: https://github.com/gilzow/whatwhywordpress/

Questions

WHAT QUESTIONS DO YOU HAVE FOR ME?

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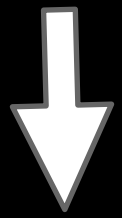
Please be sure to submit session feedback through the WPCampus website. Not only will you earn additional points toward the conference game, you'll also be entered to win a door prize!



https://2018.wpcampus.org/schedule/security-chat-for-everyone/