Five Ways to Boost Cyber Security with DevOps

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DM18-0387

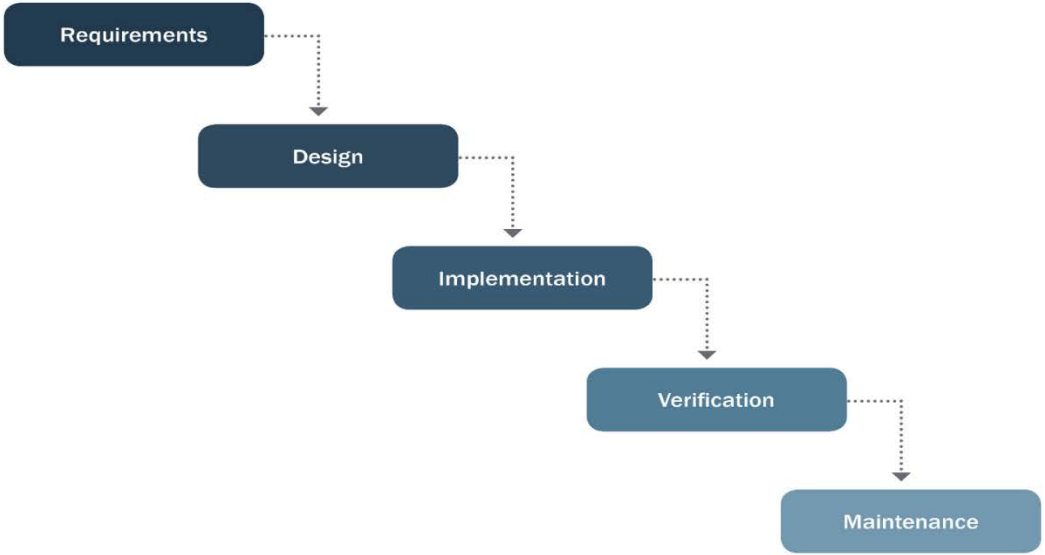
Agenda

- Cross-Team Collaboration
- Unified Data
- Platform Hardening
- Application Security
- Monitoring

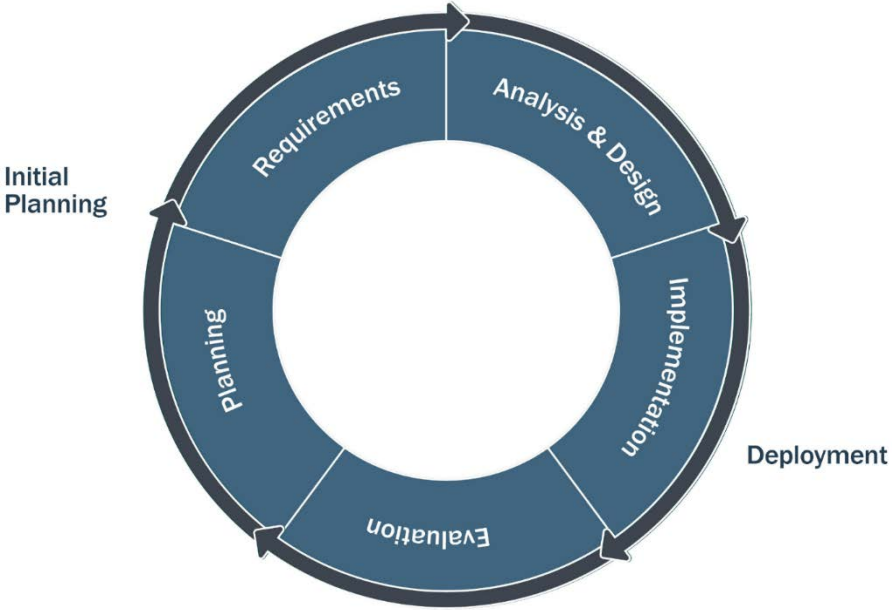
Five Ways to Boost Cyber Security with DevOps

Collaboration

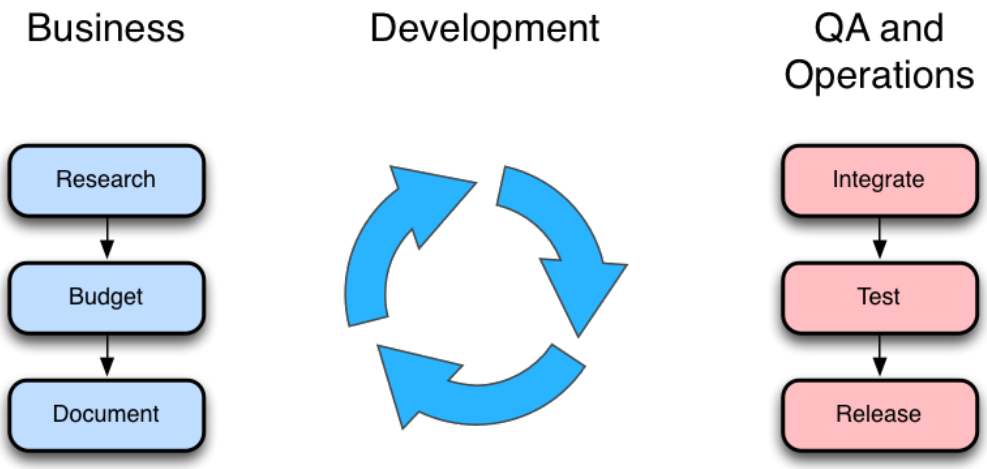
Waterfall



Agile



Water - Scrum - Fall



Jez Humble, https://youtu.be/L1w2_AY82WY
Dave West, http://sdtimes.com/analyst-watch-water-scrum-fall-is-the-reality-of-agile/

Silos Block Collaboration

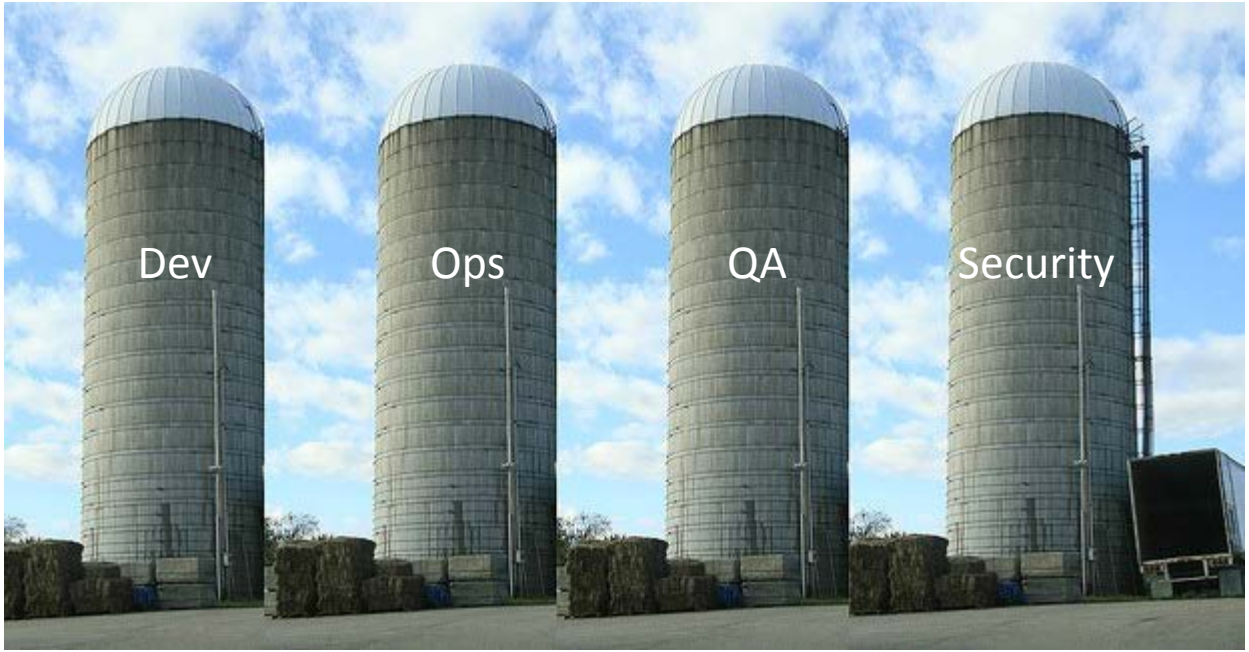
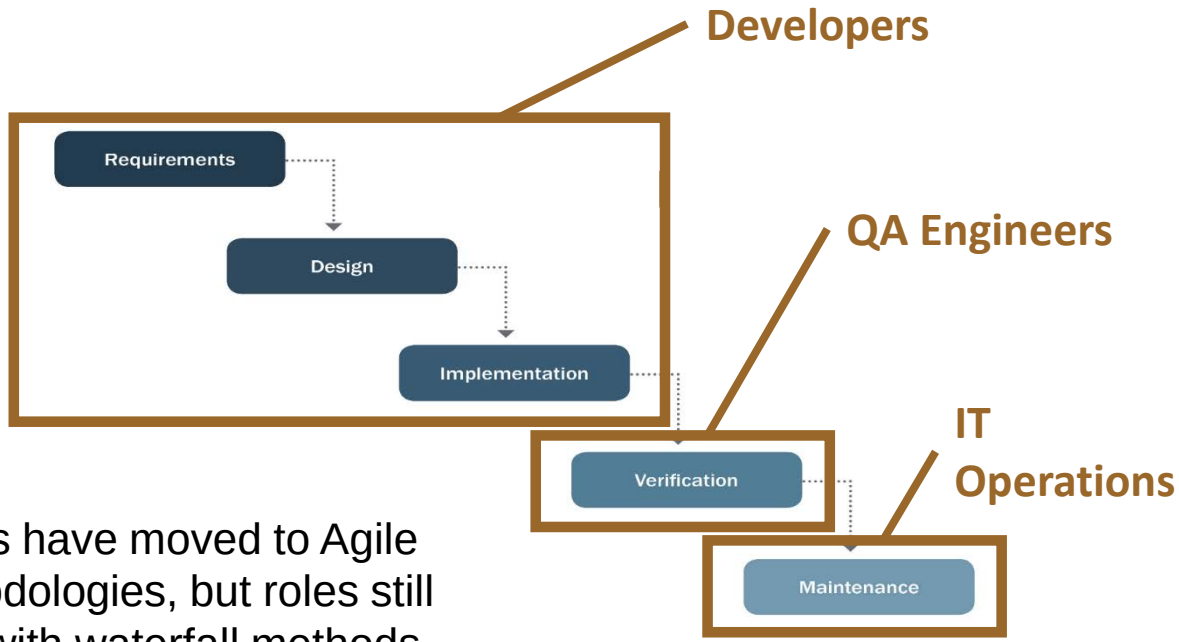


Image Credit: http://images.fastcompany.com/upload/silos-620.jpg

Silos Reinforce Waterfall



Teams have moved to Agile methodologies, but roles still align with waterfall methods

DevOps is an Extension of Agile Thinking

Agile	DevOps
Embrace constant change	**Embrace** constant testing, delivery
Embed Customer in team to internalize expertise on requirements and domain	**Embed Operations** in team to internalize expertise on deployment and maintenance

DevOps Aims to Increase…

…the pace of **innovation**

…**responsiveness** to business needs

…**collaboration**

…software **quality**

DevOps Tenets

- Reduce Silos
- Use Automation as Much as Possible
- Build a Little Test a Little
- Continually Improve
- Linked Data Between Systems

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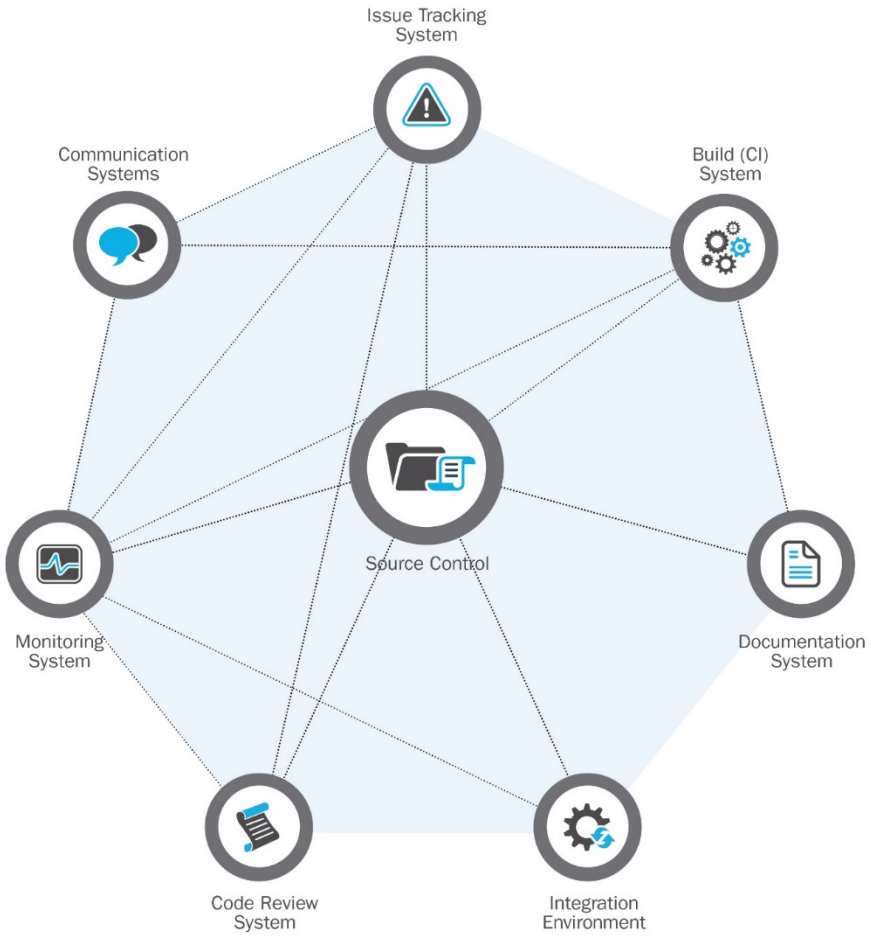
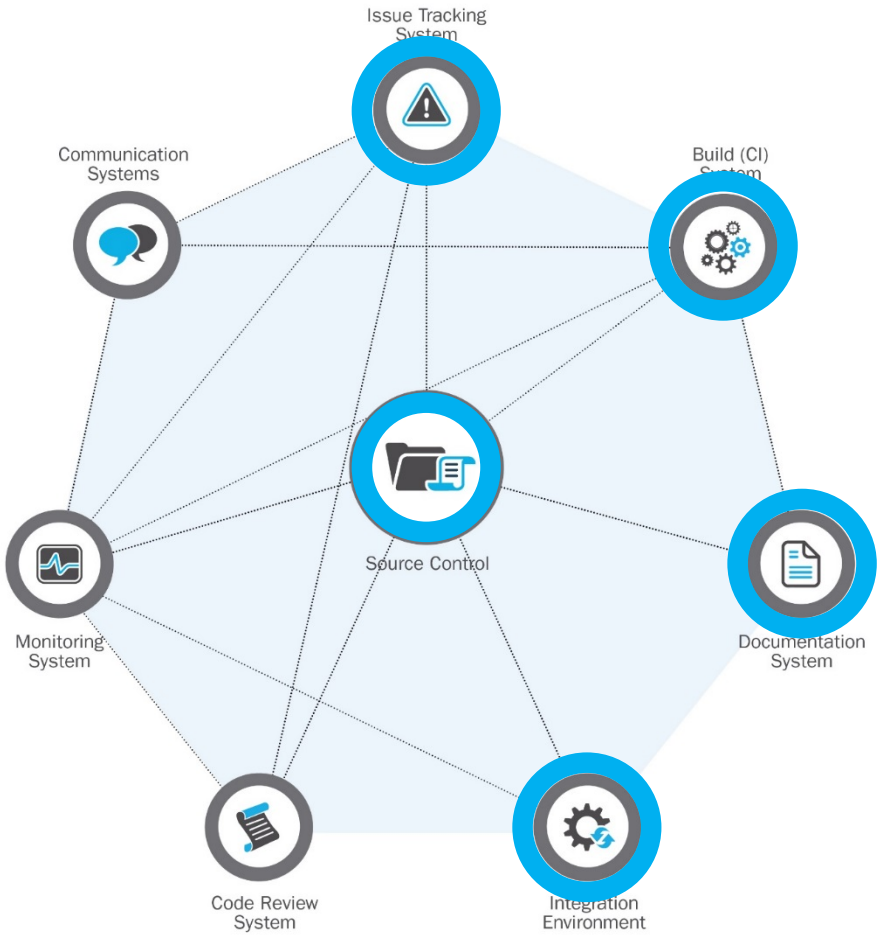
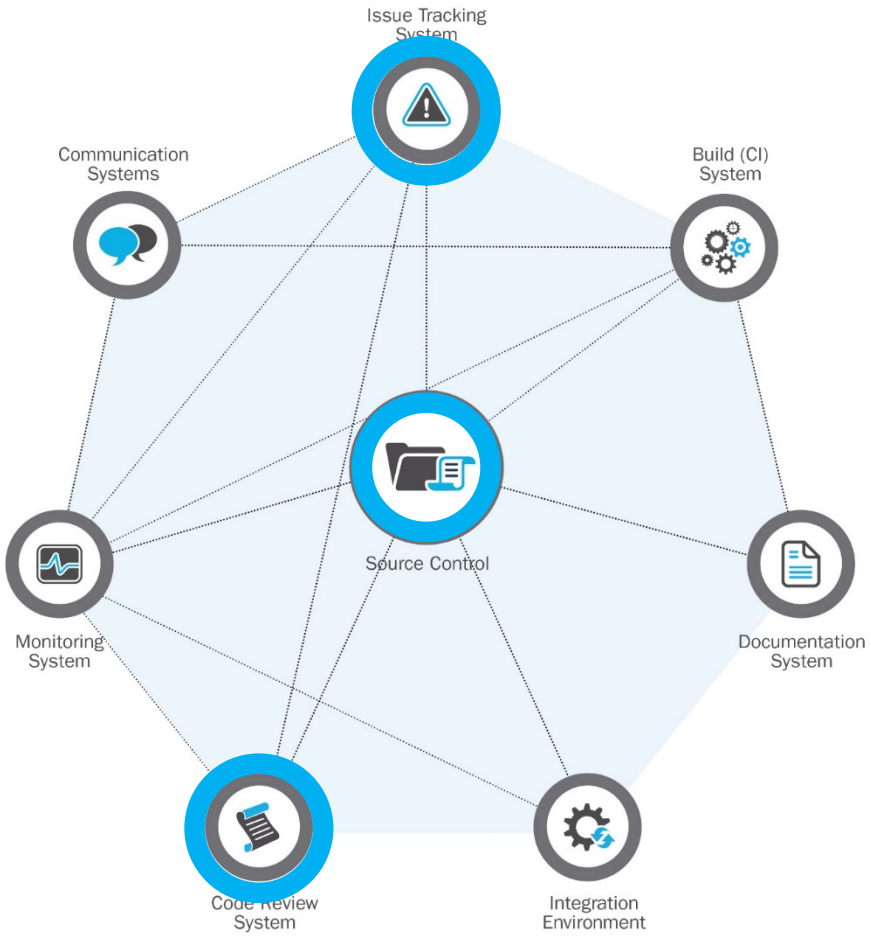
Unified Data



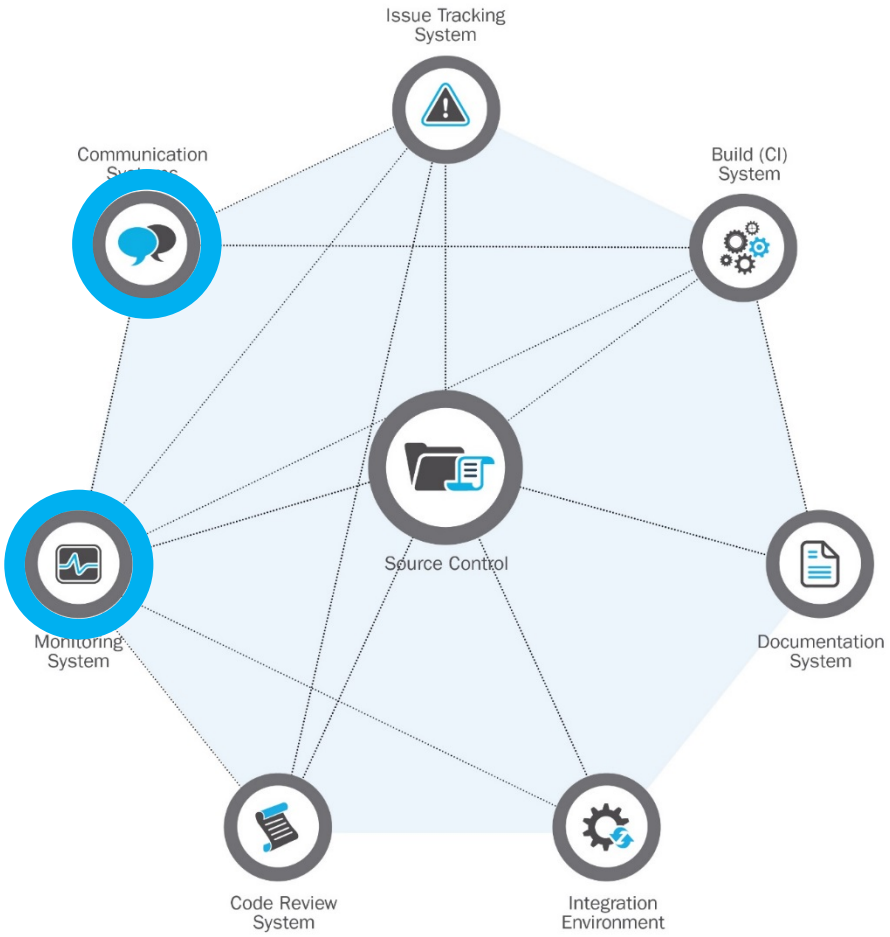
Integration and communication, even among tools, is key to assuring security!



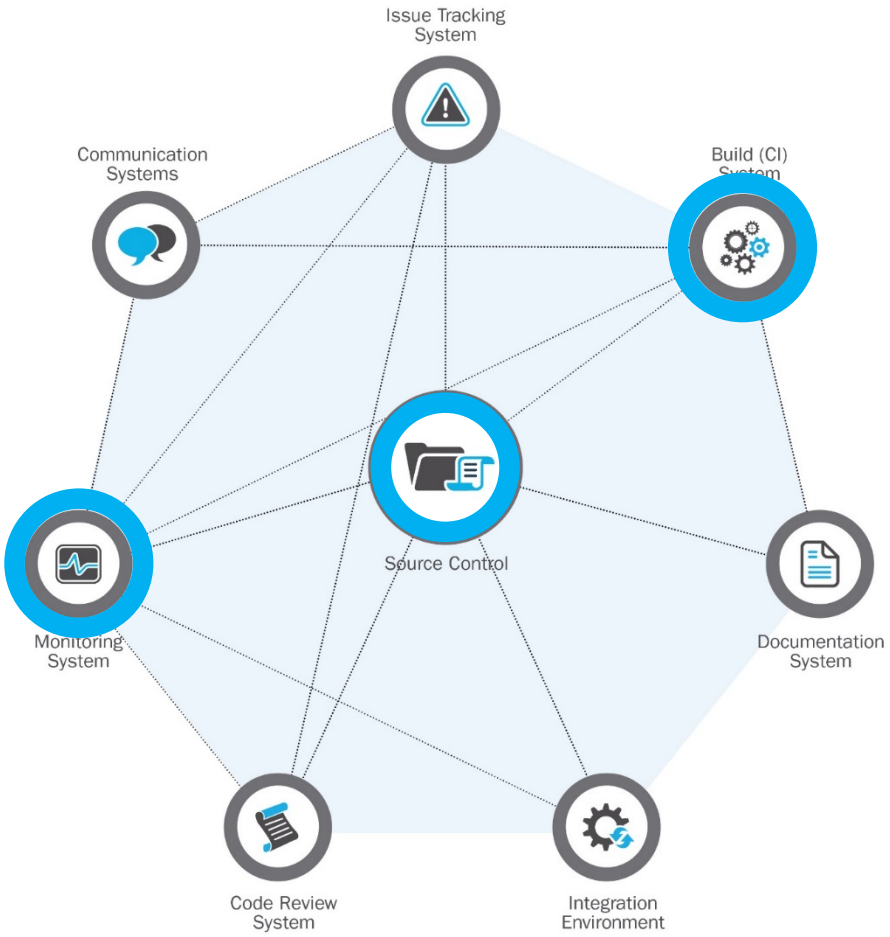
What changed since my last security scan?



Who was involved in a peer review of a change?



Is there unusual activity happening right now?



Do I have this particular vulnerable piece of software deployed in my system?

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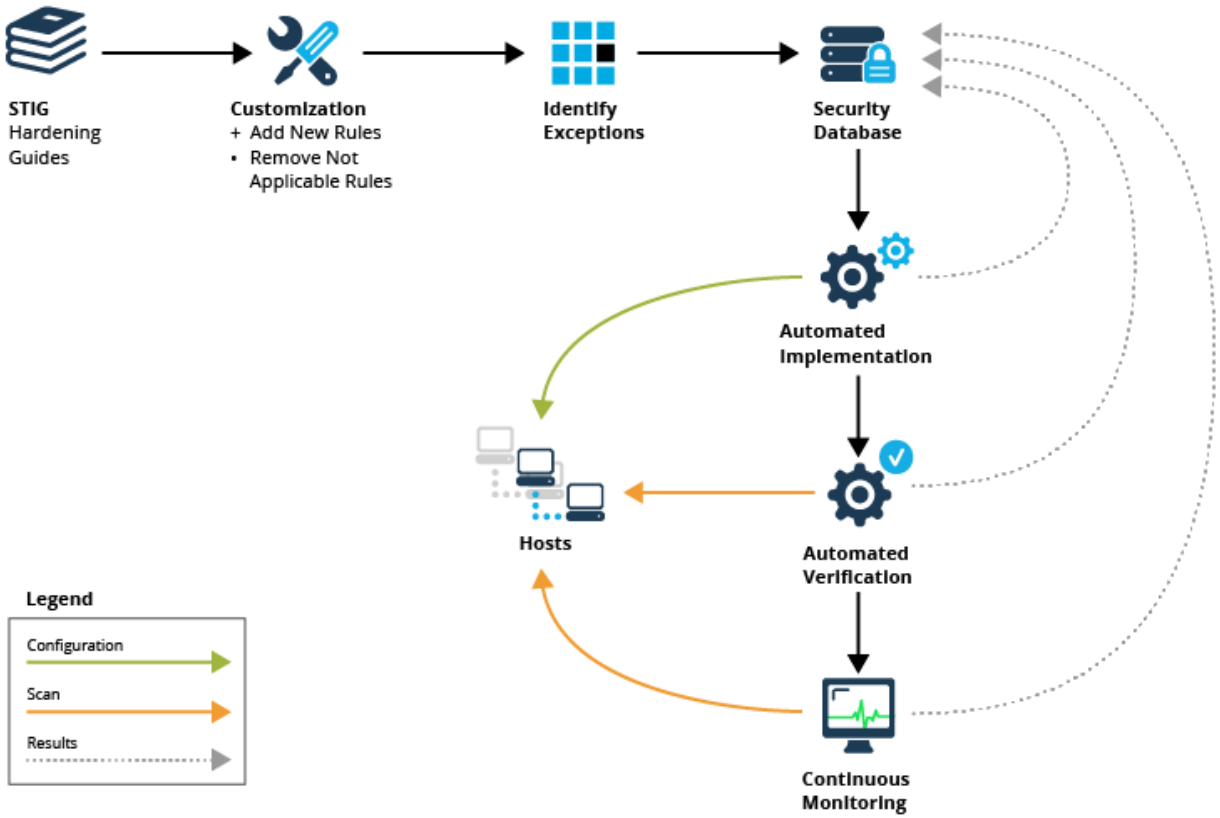
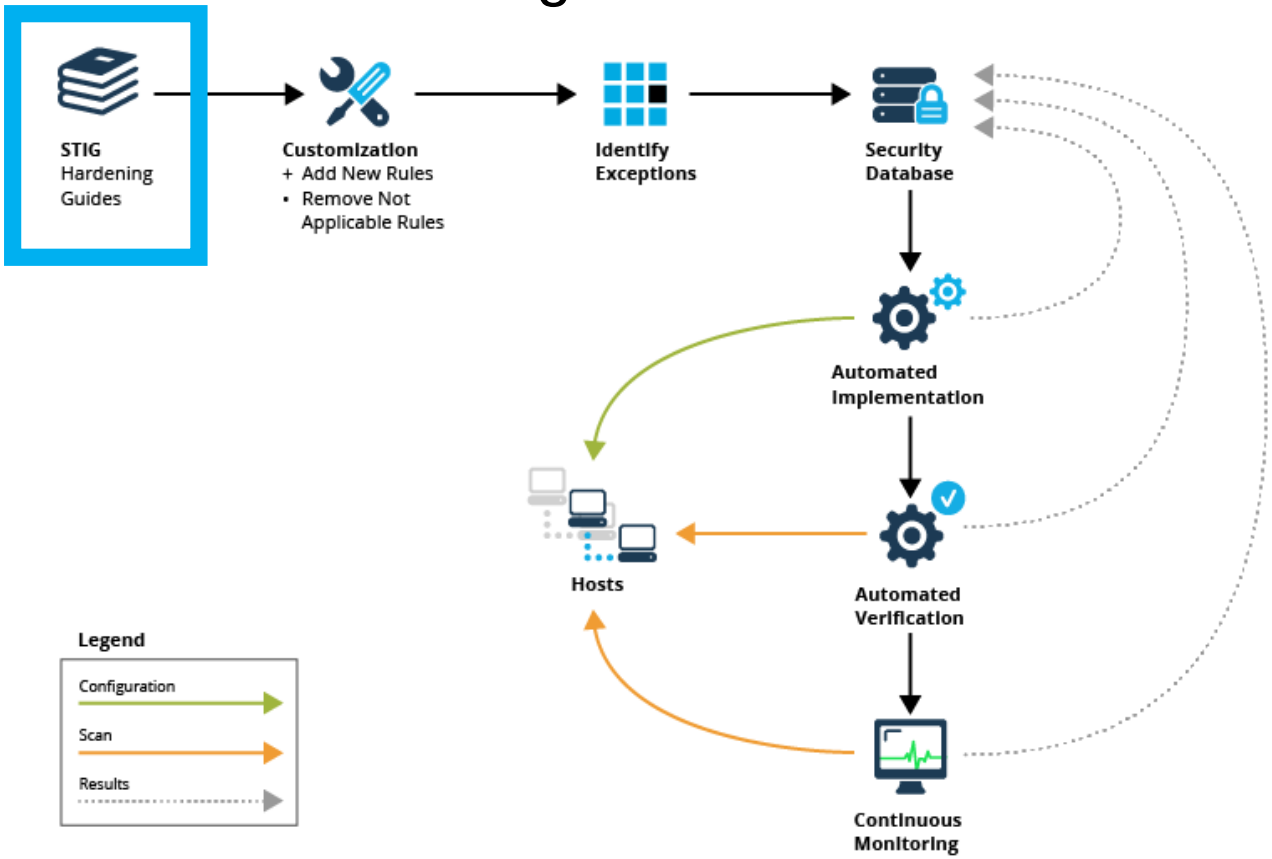
Security Hardening

Platform Hardening Workflow



Platform Hardening Workflow



https://iase.disa.mil/stigs

Covers Various Software & General

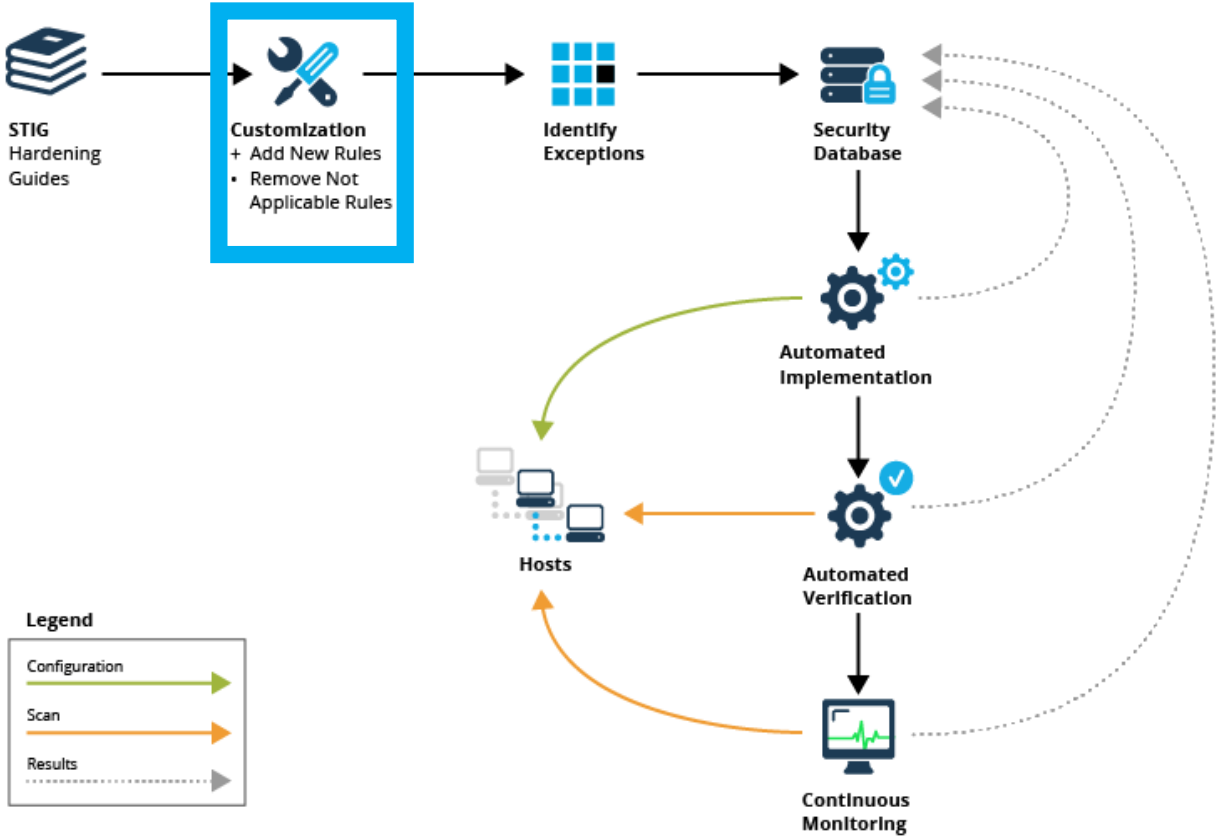
Great Starting Point for Rules

STIG Rule Example

ID	V-38451
Severity	Medium
Title	The /etc/passwd file must be group-owned by root.
Discussion	The "/etc/passwd" file contains information about the users that are configured on the system. Protection of this file is critical for system security.
Fix Text	To properly set the group owner of "/etc/passwd", run the command: # chgrp root /etc/passwd

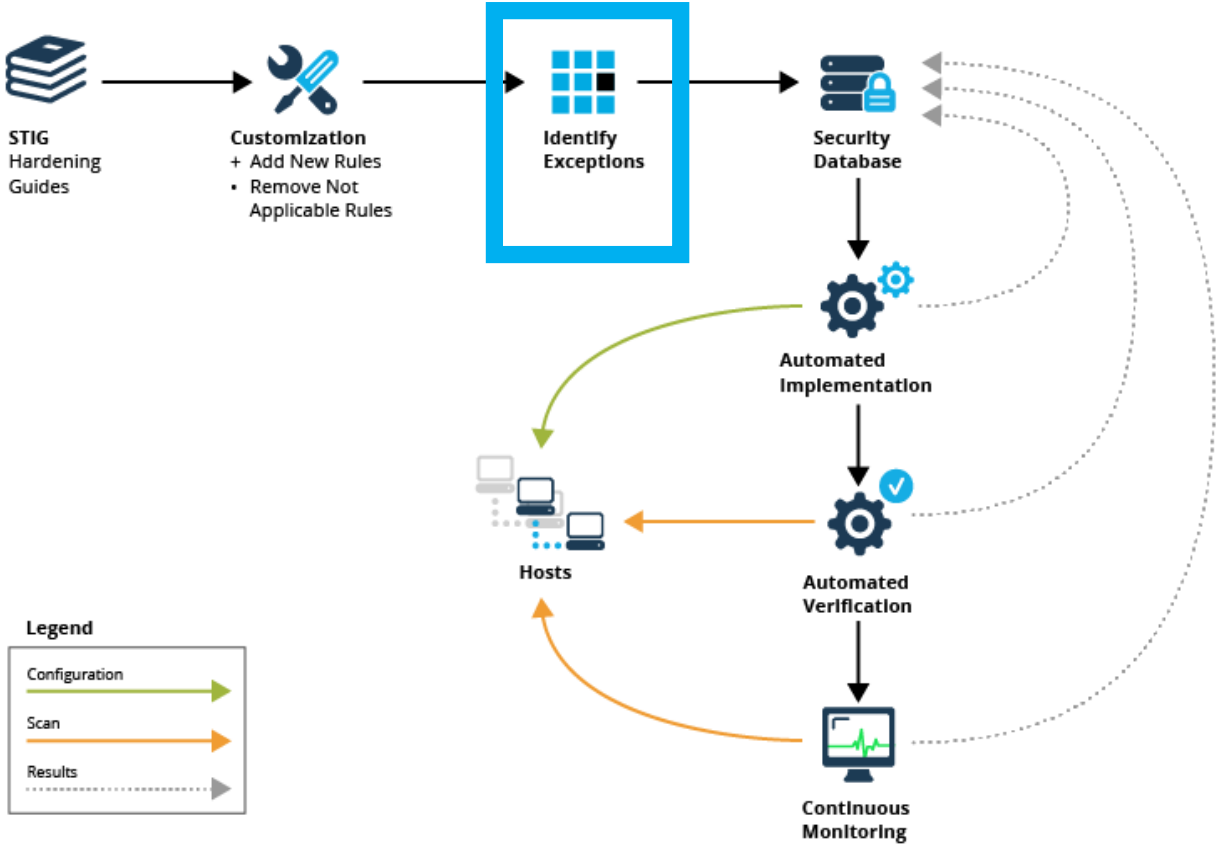
https://www.stigviewer.com/stig/red_hat_enterprise_linux_6/

Platform Hardening Workflow



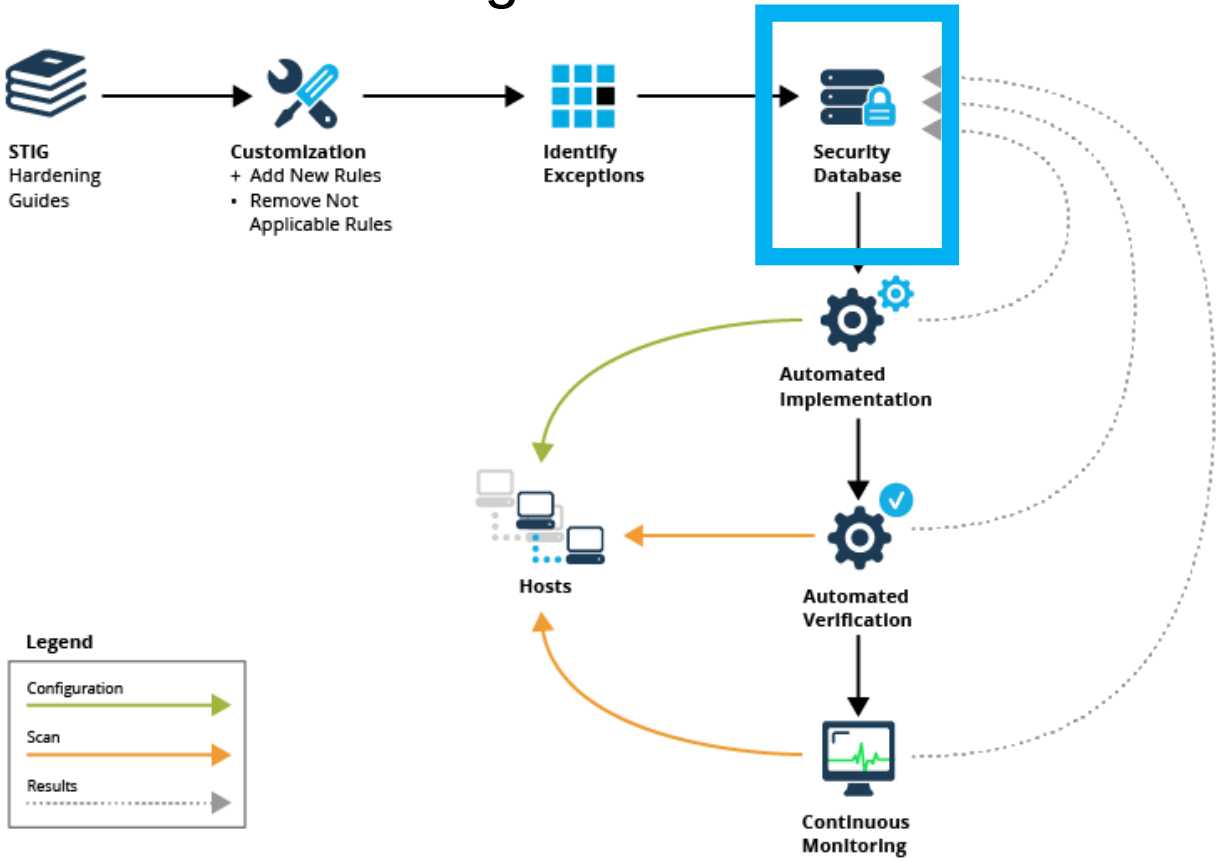
- Add New Rules
- Customize How They Apply to Your System
- Remove Rules that Do Not Apply

Platform Hardening Workflow



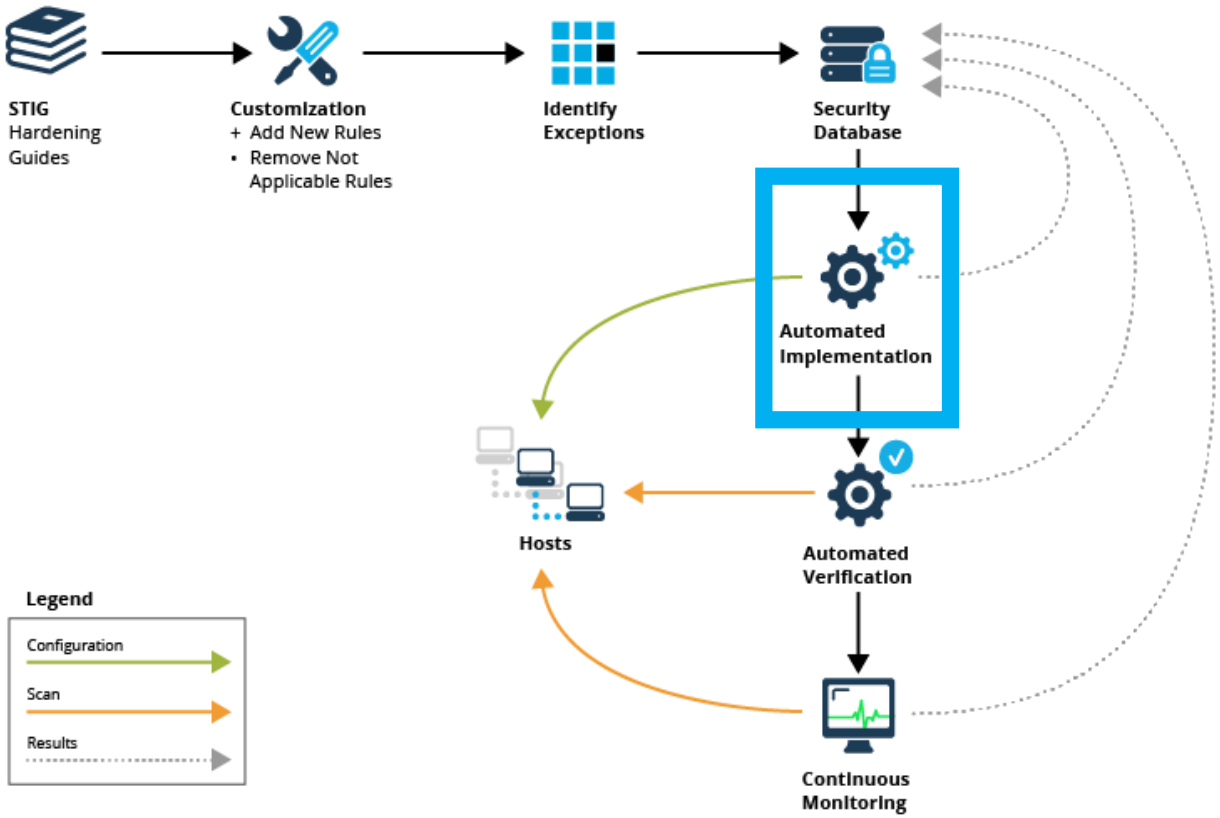
- Rules that apply to certain hosts in the system, but not all

Platform Hardening Workflow



- Persist the plan and results
- Spreadsheets work, but become cumbersome

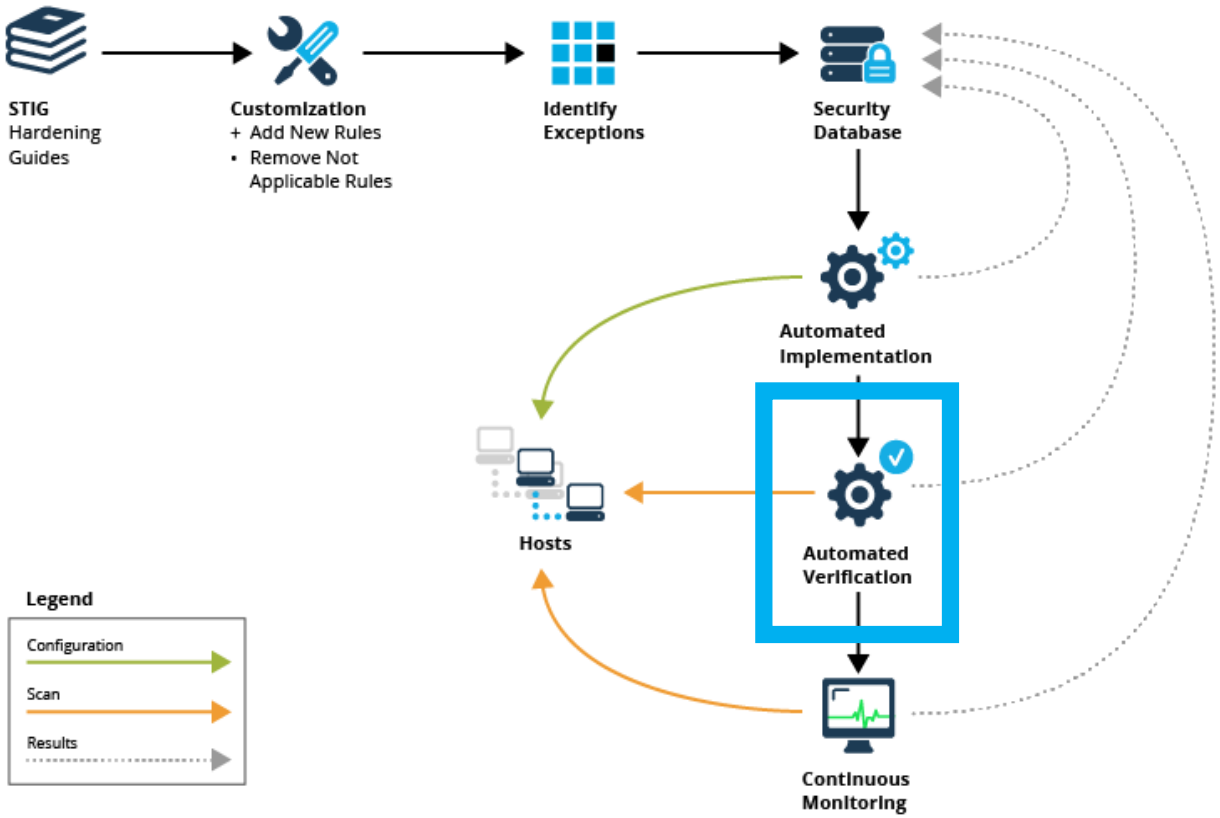
Platform Hardening Workflow



- Store in Source Control
- Practice Orchestration
- Harden and unharden

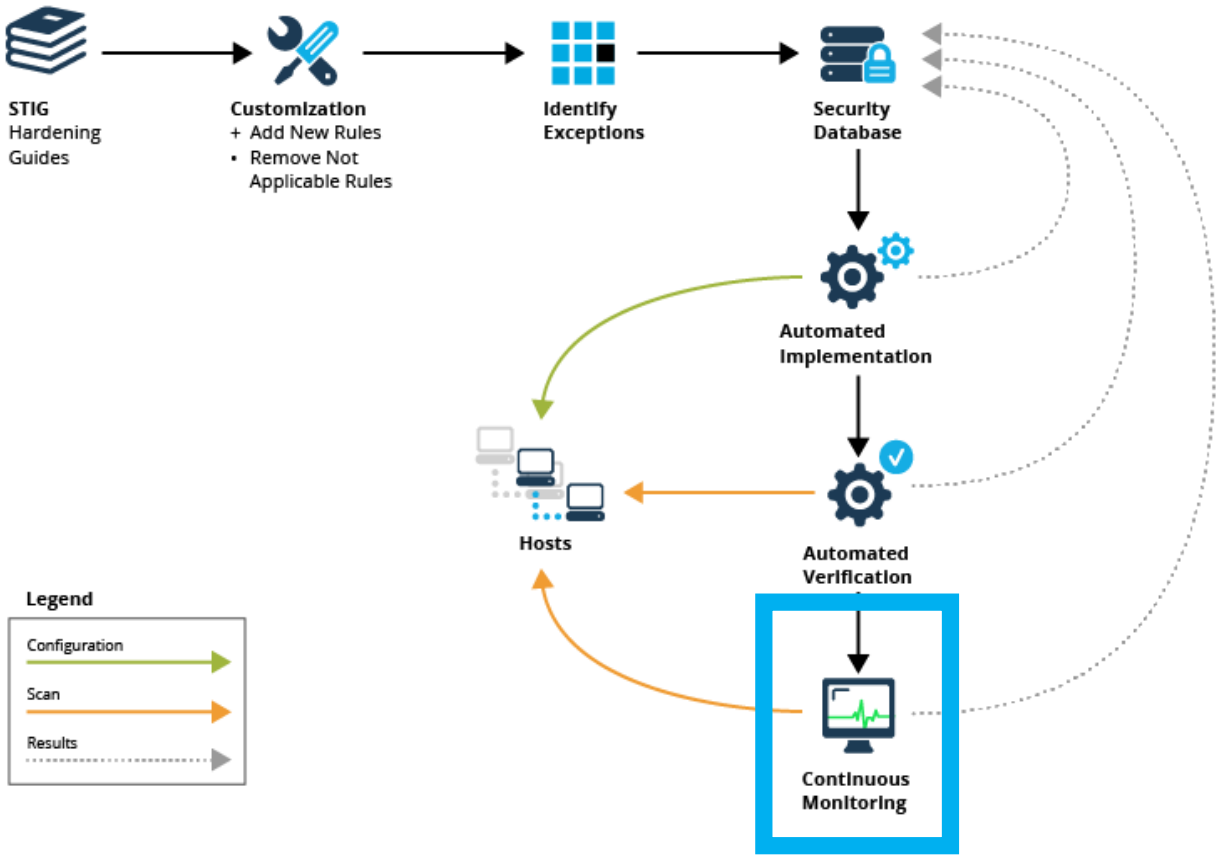
```
file '/etc/passwd' do
  owner 'root'
  group 'root'
  mode 0644
end
```

Platform Hardening Workflow



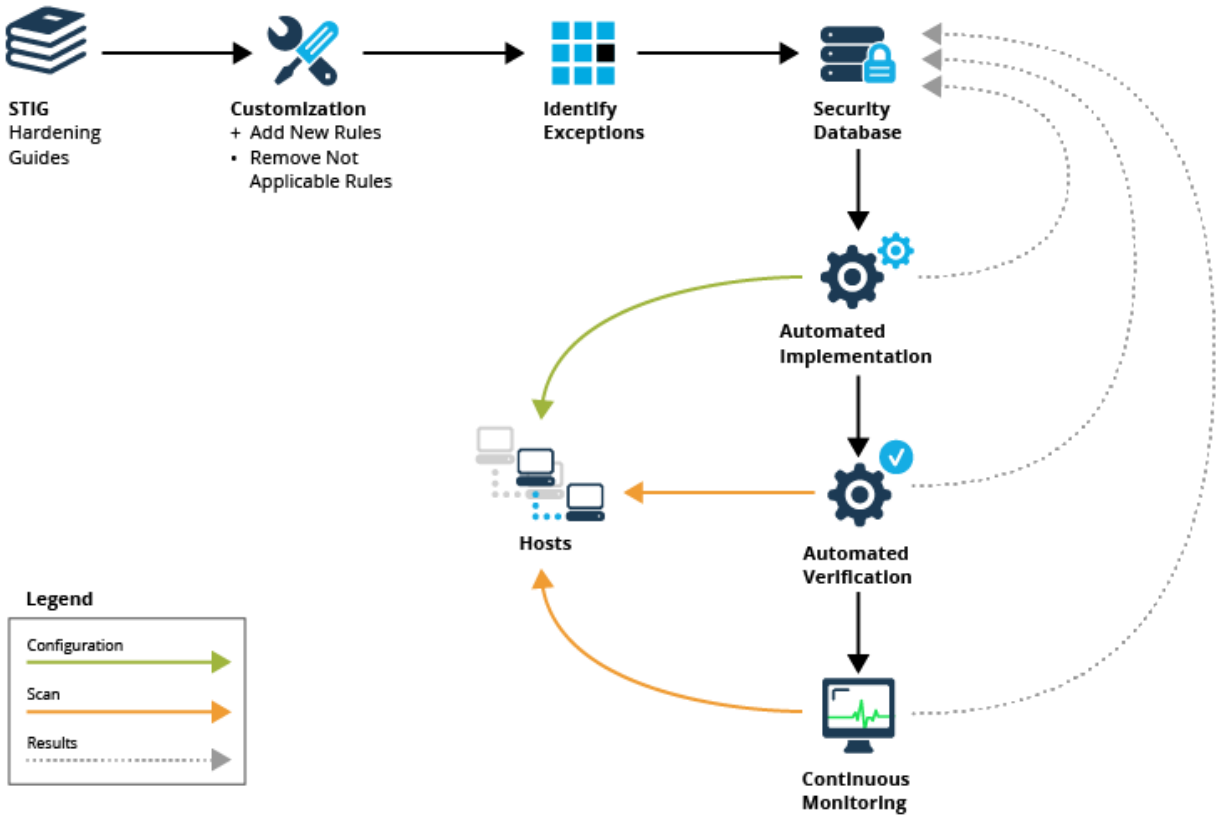
- Scan for vulnerabilities
- Persist Results to Monitor Changes Over Time

Platform Hardening Workflow



- Check for Unexpected Changes
- Integrate with Alerting System

Platform Hardening Workflow



- Start Small
- Harden Development and Test Environments
- Practice Maintenance Activities

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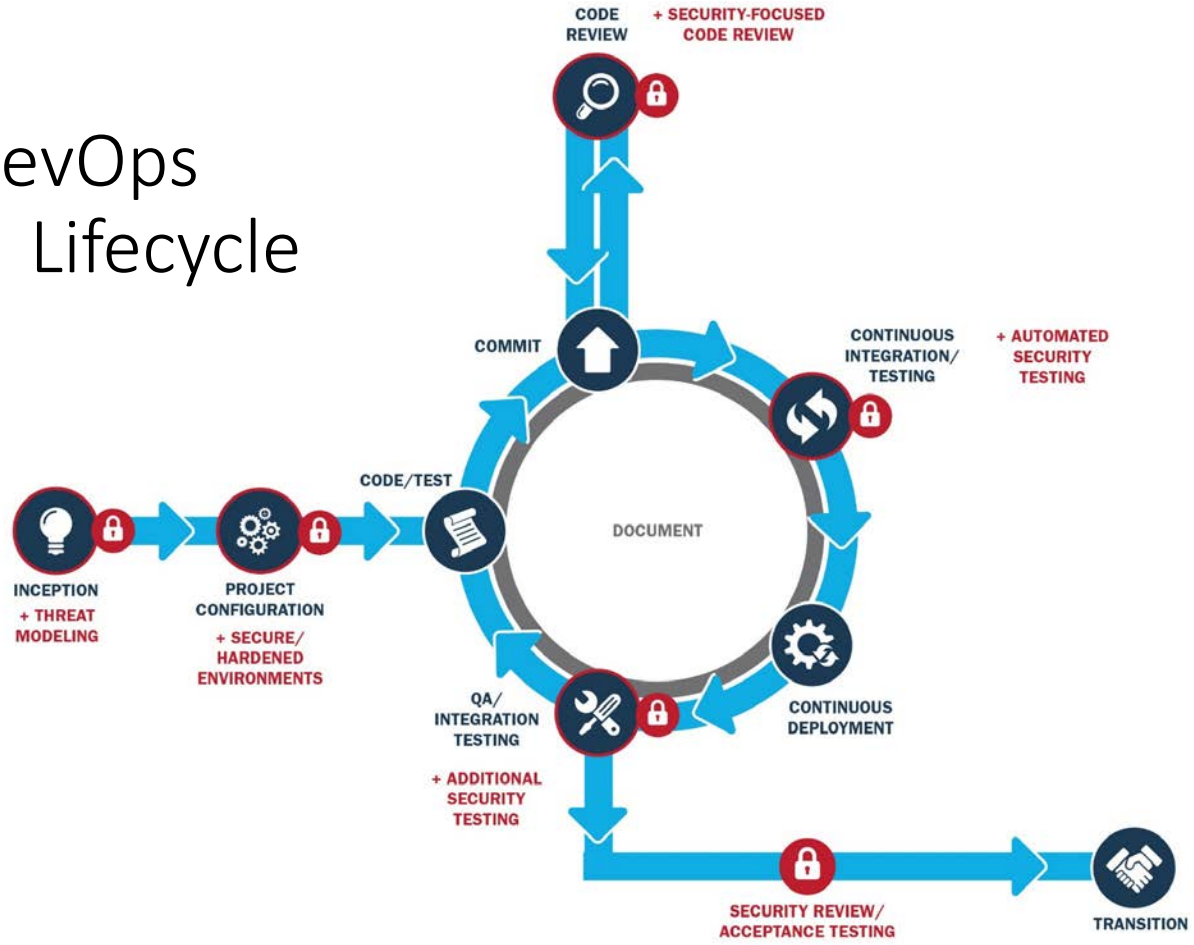
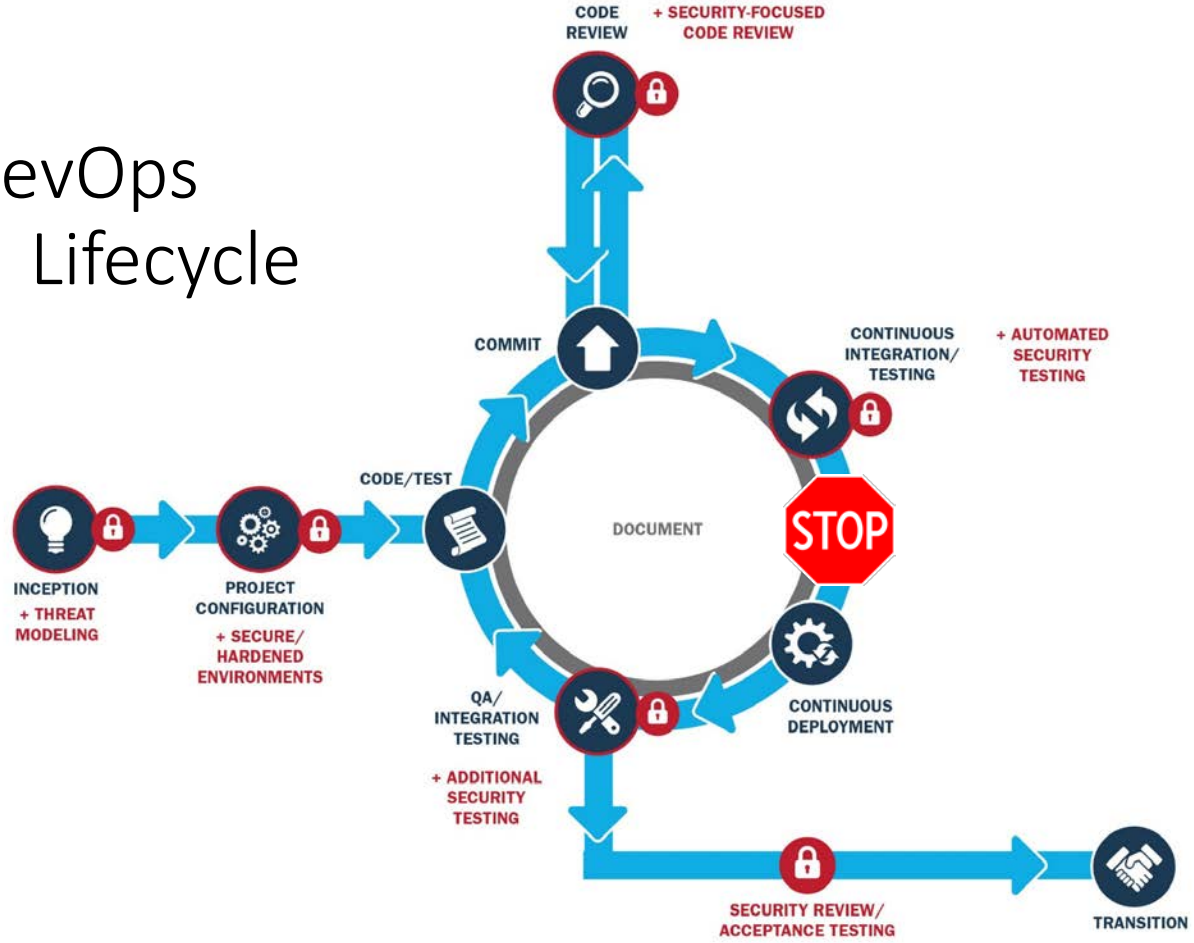
Application Security

Secure

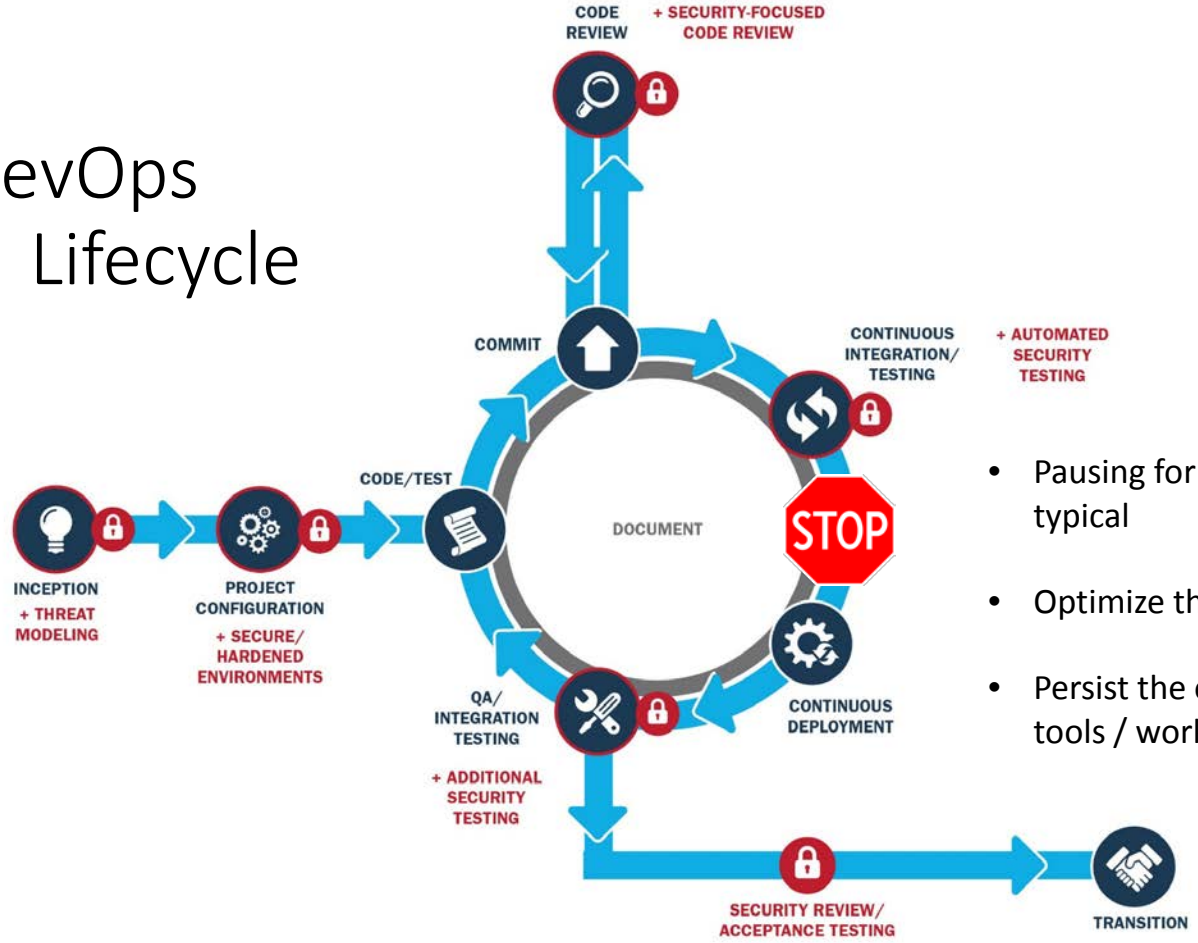
DevOps Lifecycle



Secure DevOps Lifecycle



Secure DevOps Lifecycle



- Pausing for manual steps is typical
- Optimize the manual work!
- Persist the output of any tools / work

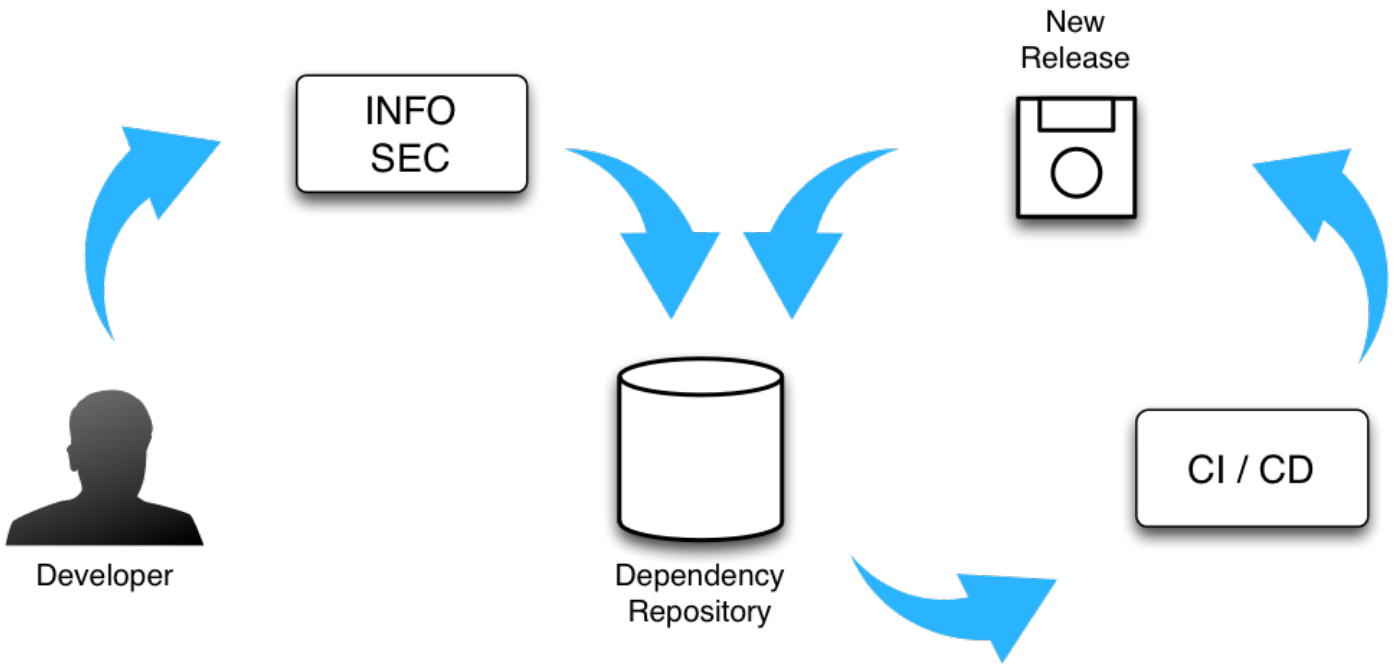
Dependency Management

Due to security, bug fixes, and new features, third-party dependencies keep changing.

Software dependencies can range from a large list of items:

- JavaScript Libraries from npm
- CSS Frameworks
- Python packages from PyPI
- Nuget packages
- Maven JARs
- Operating system packages (glibc/libxml2/libxslt)
- Operating system kernel versions

Dependency Management Workflow



Dependency Management: Why?

Relying on third-party packages repos can be troublesome for many reasons:

- Security and integrity
- “Angry author” scenario
- Archive retention for older packages
- Uptime, connectivity, and speed
- Not suitable for internal or “proprietary” packages

Dependency Management: Security

Typosquatting, a common problem with domain names, is now available in your favorite package manager!

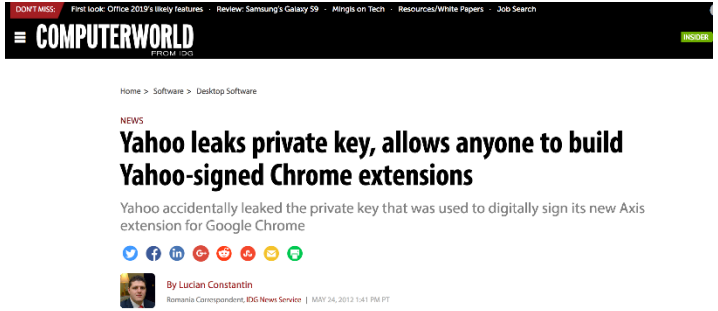
Malicious code was uploaded to PyPI using commonly misspelled package names.

https://bit.ly/2xCTGHT

Dependency Management: More Security

External packaging is signed, so it is okay, right?

In a perfect world, yes. In today's world, maybe not!



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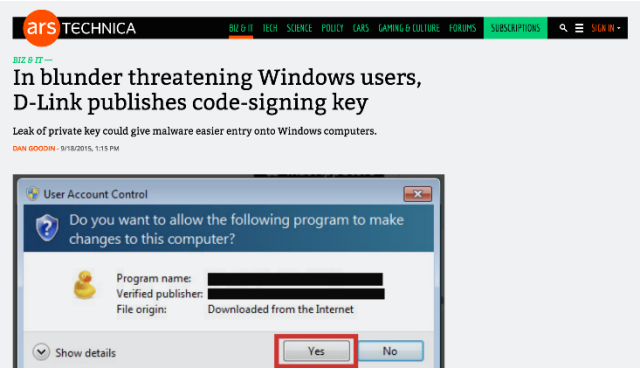


https://bit.ly/2IFHKHH

- D-Link
- Yahoo!
- Linux Mint

Beware of hacked ISOs if you downloaded Linux Mint on February 20th!

FEBRUARY 21, 2016 BY LINUX MINT · 787 COMMENTS

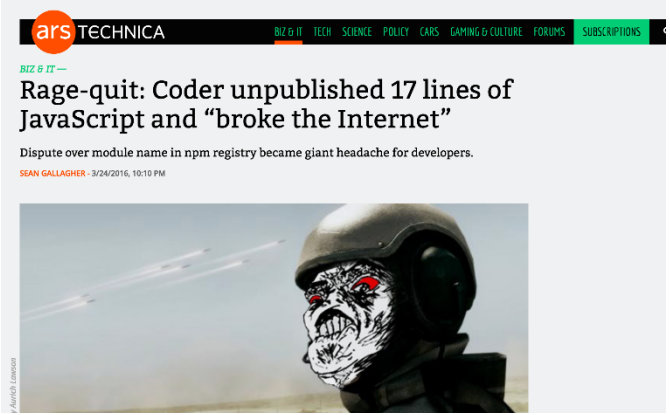
I'm sorry I have to come with bad news.

https://bit.ly/2pxsFzY

Dependency Management: “Angry author”

March 22, 2016 was the day that the Internets broke.

One author decided to remove his JavaScript packages from npm.



https://bit.ly/2pxKDTf

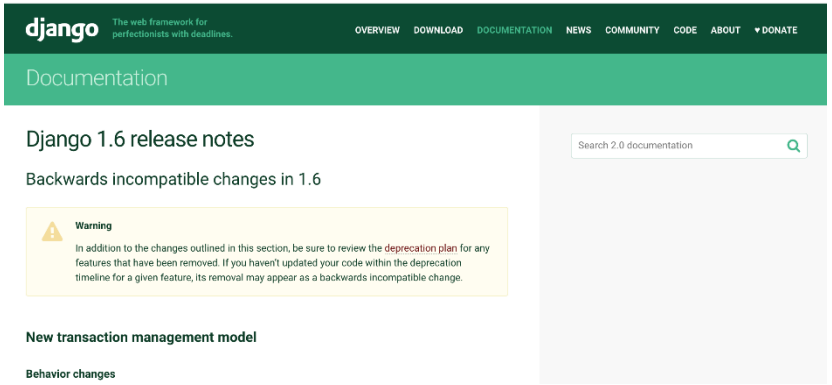
The absence of the left-pad package broke many dependency chains.

The author was within his rights to remove the packages from npm.

Dependency Management: Maintenance Mode

Eventually, project development is completed, leaving a finished product. Two years in the future, it has to be deployed to another server. Do you know where all of your dependencies are stored, because they aren't available from the original external repo!

- Open-source projects generally move very fast or very slow.
- Slow moving projects will have the same version for years as they are feature complete.
- Fast moving projects will often release major version every year, and the API will not be compatible with the previous major release.



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Five Ways to Boost Cyber Security with DevOps

Monitoring

Monitoring: Be the all-seeing eye

Once an application is deployed and running, no news is good news, right? Unfortunately, that is often a metric that is used to measure an application's uptime or functionality.

While everything is "working," the following things are chipping away at your application's security:

- Running out of disk space, memory, or swap space
- HTTP 401, 403, and 500 responses are going unnoticed
- Malicious network probes are trying to find a way into your network
- Malware is trying to find its way out of your network
- Your app dependencies have new security fixes

Monitoring: One Screen to Rule Them All

Collaboration is the key to DevOps, and likewise with monitoring.

- All of your monitoring statistics and alerts need to be visible from one place.
  - Avoids monitoring fatigue
  - Allows easy review of metrics
  - Prevents scrambling for the correct tool
- Most monitoring functionality can be achieved with a combination open-source tools and extended with plugins.

Nagios® ICINGA openNMS®

Along with StatsD/Graphite and ElasticSearch/Logstash/Kibana (ELK)

Monitoring: Storage Space

Storage is relatively inexpensive. However, running of out storage could be costly.

"Things" that burn memory or disk space:

- Logs
- Data / database journals
- Backups
- OS Patches
- Swap / page files
- Message queues
- Core / crash / heap dumps
- User uploads

An out of space or memory issue could be a signal that something is out of the ordinary.

- DoS/DDoS attack
- Coding errors
- Buffer overrun/underrun
- Software exploits
- Malware
- System configuration issue

Monitoring: The HTTP Request

Monitoring request status and the quantity of requests of your application provide a base line measurement. An increase of requests or certain types of requests can indicate problems:

- Password dictionary attacks (HTTP 401)
- Directory traversal attacks (HTTP 401/403)
- Application error or misuse (HTTP 400/500)
- DDoS/DoS - exponential increase in requests (HTTP 401/403/500)
- Code deployment error – decrease in requests or increase in errors

Monitoring: Network

The network is the gateway in and out of your enterprise. State roads and highways have traffic and stoplight cameras. Your network should be no different! Monitoring some items will help you establish thresholds for alerts so to avoid “alert” fatigue.

- Failed DNS lookups
- Proxy bypass attempts
- Destinations dropped by your outbound firewall
- Login failures
- Network intrusion detection

Monitoring: Dependencies

Applications and program libraries are constantly being fixed for security issues. Using a dependency database, you can scrape data feeds for updates or CVEs:

- Nation Vulnerability Database (NVD) https://nvd.nist.gov/vuln/data-feeds
- Python Package Index (PyPI) https://pypi.python.org/pypi?%3Aaction=rss
- node package manager (npm) https://registry.npmjs.org/-/rss
- Nuget https://docs.microsoft.com/en-us/nuget/guides/api/query-for-all-published-packages
- RubyGems https://rubygems.org/gems/package_name/versions.atom
- Packagist (php) https://packagist.org/feeds/releases.atom
- CPAN (perl) https://metacpan.org/feed/recent

Contact Information

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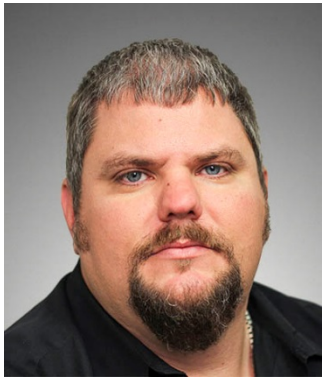

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