RSAConference2018
San Francisco | April 16 – 20 | Moscone Center

NOW MATTERS

SESSION ID: DEV-F01

DOS AND DON'TS OF DEVSECOPS

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CERT | Software Engineering Institute | Carnegie Mellon University
@SecureLifeCycle

Notices

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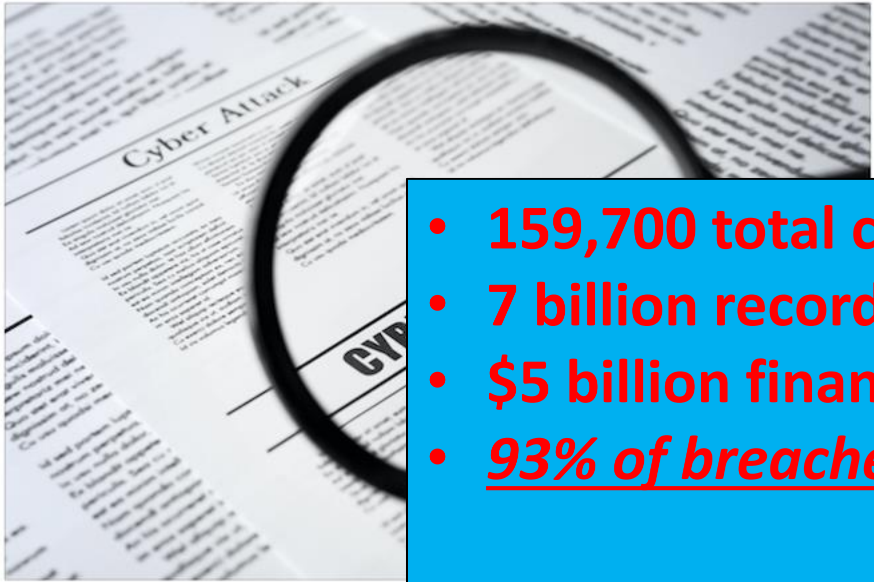
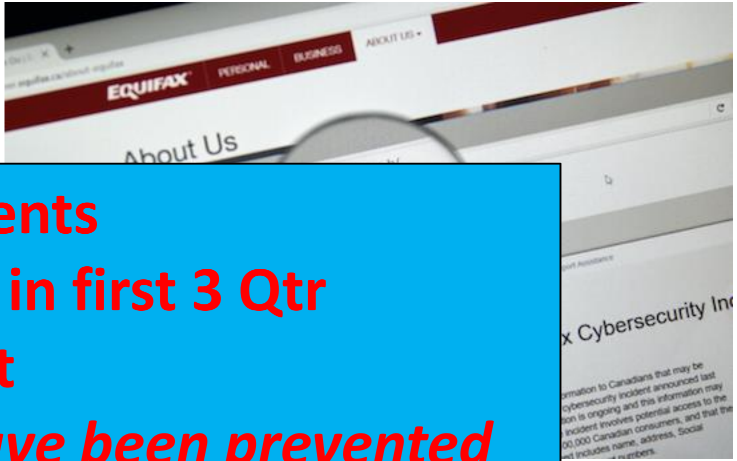
THE FACT!

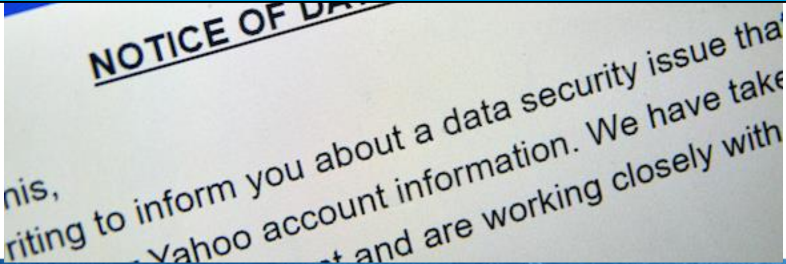
2017 Incident Highlights



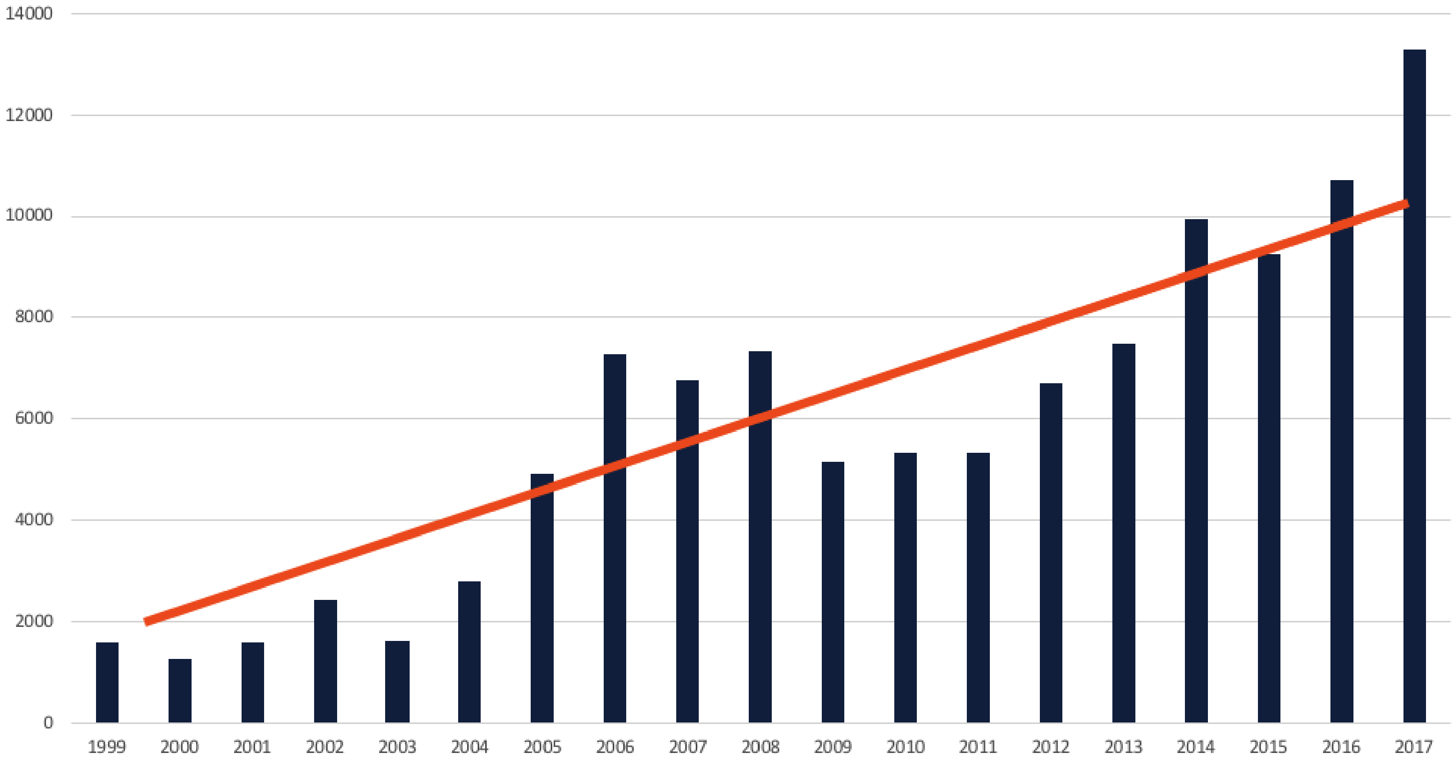


- **159,700 total cyber incidents**
- **7 billion records exposed in first 3 Qtr**
- **$5 billion financial impact**
- ***<u>93% of breaches could have been prevented</u>***

*Online Trust Alliance report 2018


NOTICE OF DA
nis,
riting to inform you about a data security issue tha
Yahoo account information. We have take
and are working closely with

Software Vulnerabilities (CVEs) by Year



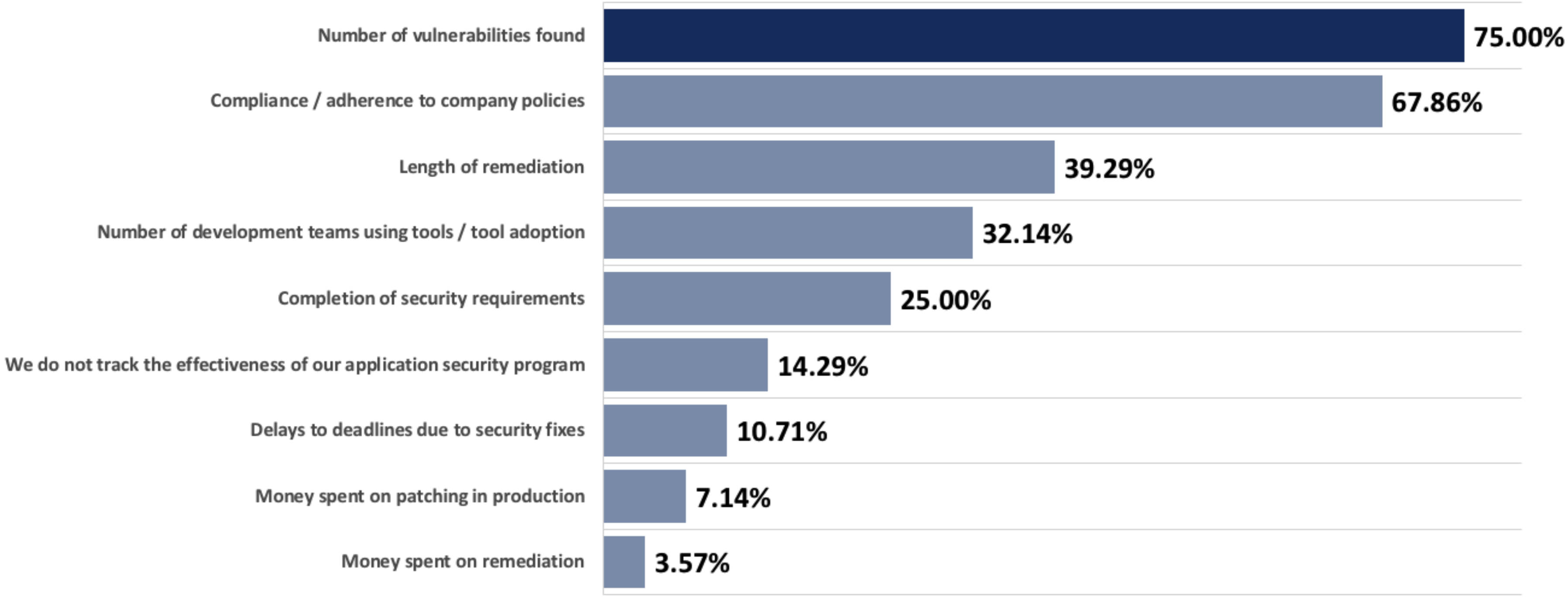
Source: cve.mitre.org as of August 2017

The world we live in..

Software is eating up the world !

Marc Andreessen
https://www.wsj.com/articles/SB10001424053111903480904576512250915629460

How We Manage Software Security - *Application Security Metrics , Financial Institutes*

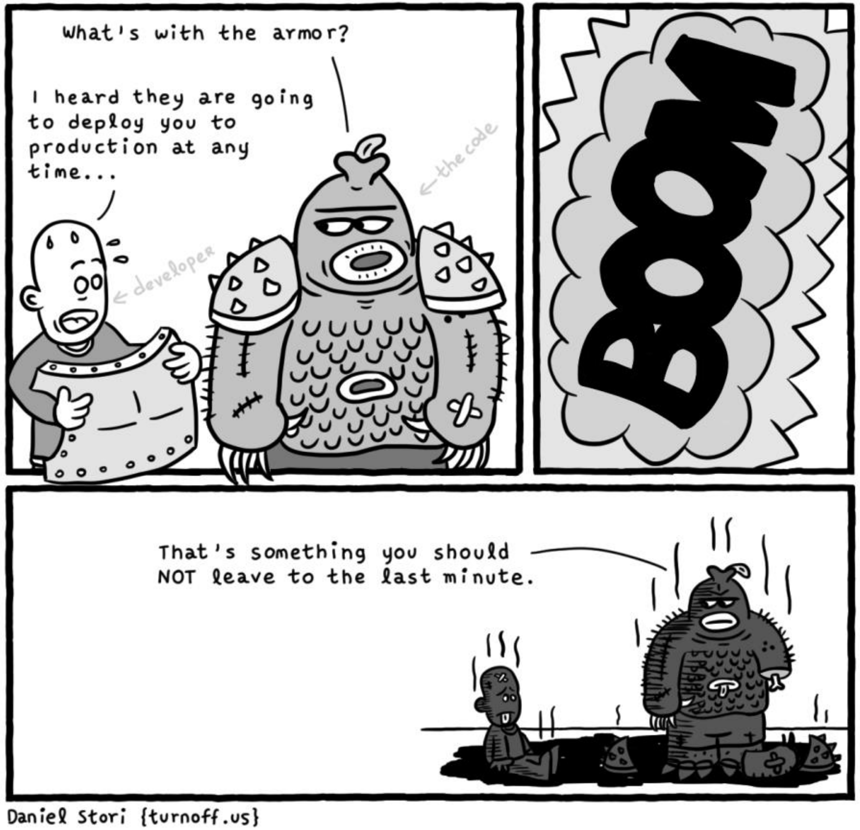


Source: “Managing Application Security”, Security Compass, 2017.

Challenges with Secure Software Development

- Writing code is hard
- Lack of security skills
- Legacy software
- Best practices are insufficient
- Lack of risk focus, lack of audit and control points
- Wrong automated tools
- Unsupervised collaboration
- Emphasis on speed
- Vulnerabilities in deployment pipeline
- Unprotected production environment
- Lack of security requirements traceability

So we all do "Last Minute Security"…


What's with the armor?
I heard they are going to deploy you to production at any time...
← the code
← developer
BOOM
That's something you should NOT leave to the last minute.
Daniel Stori {turnoff.us}

https://dzone.com/articles/last-minute-security-comic

DEVOPS WITH PRINCIPLES

Three Pillars , p^3

DevOps enables “Continuous Everything” on

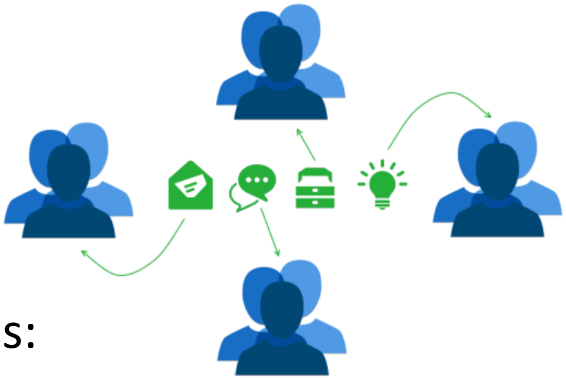
People

Process

Platform

BLUF(Bottom Line Up Front) : People

- Heavy collaboration between all stakeholders
  - Secure Design / Architecture decisions
  - Secure Environment / Network configuration
  - Secure Deployment planning
  - Secure Code Review
- Constantly available open communication channels:
  - Dev and OpSec together in all project decision meeting
  - Chat/e-mail/Wiki services available to all team members

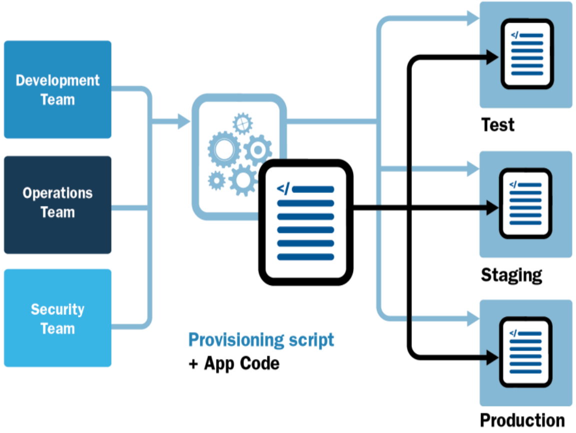


BLUF: Process

- Establish a *process* to enable *people* to succeed using the *platform* to develop secure application
- Such that;
  - Constant communication and visible to all
  - Ensures that tasks are testable and repeatable
  - Frees up human experts to do challenging, creative work
  - Allows tasks to be performed with minimal effort or cost
  - Creates confidence in task success, after past repetitions
  - Faster deployment , frequent quality release

BLUF: Platform

- Where *people* use *process* to build secure software
  - Automated environment creation and provisioning
  - Automated infrastructure testing
  - Parity between Development, QA, Staging, and Production environments
  - Sharing and versioning of environmental configurations
  - Collaborative environment between all stakeholders

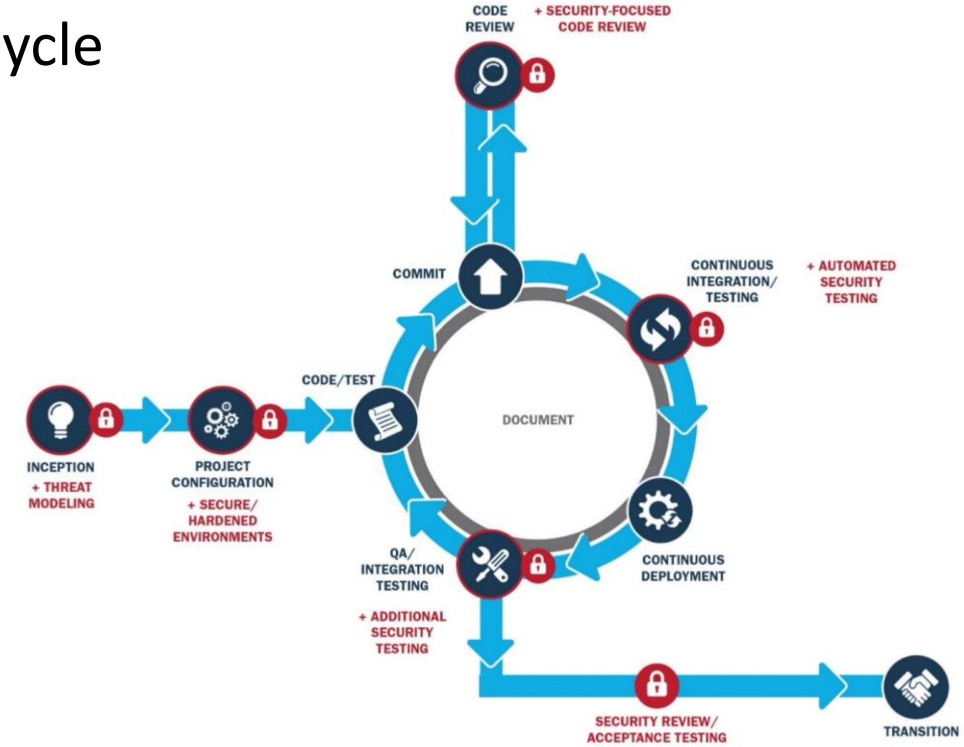


DEVSECOPS

Enhancing SDLC Security

Secure

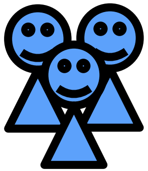
DevOps Lifecycle

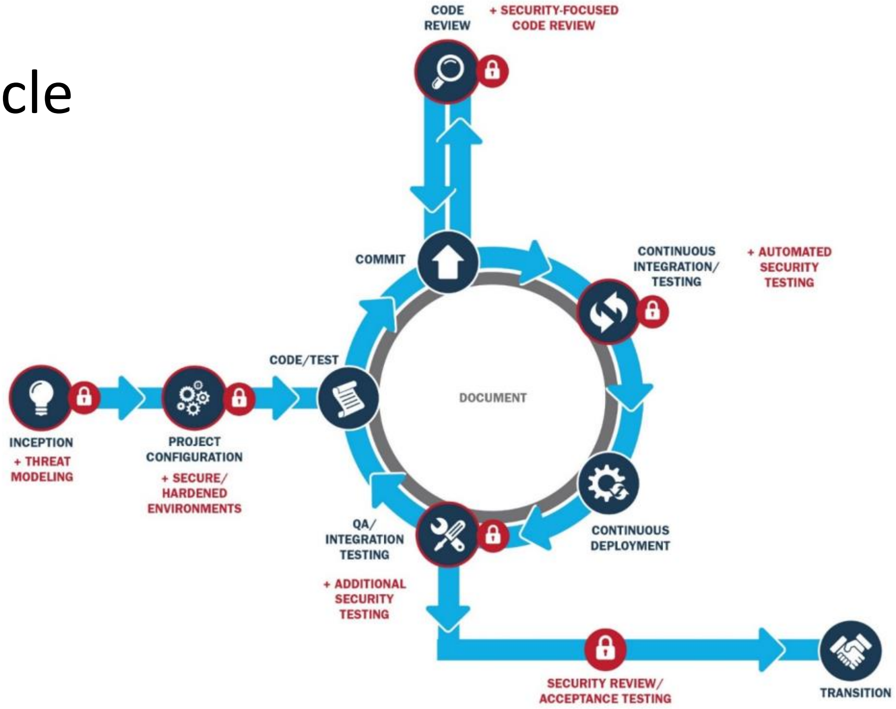

CODE REVIEW
+ SECURITY-FOCUSED CODE REVIEW
COMMIT
CONTINUOUS INTEGRATION/ TESTING
+ AUTOMATED SECURITY TESTING
CODE/TEST
DOCUMENT
INCEPTION
+ THREAT MODELING
PROJECT CONFIGURATION
+ SECURE/ HARDENED ENVIRONMENTS
QA/ INTEGRATION TESTING
+ ADDITIONAL SECURITY TESTING
CONTINUOUS DEPLOYMENT
SECURITY REVIEW/ ACCEPTANCE TESTING
TRANSITION

Security must be addressed without breaking the rapid delivery, continuous feedback model!

Enhancing SDLC Security

Secure
DevOps Lifecycle

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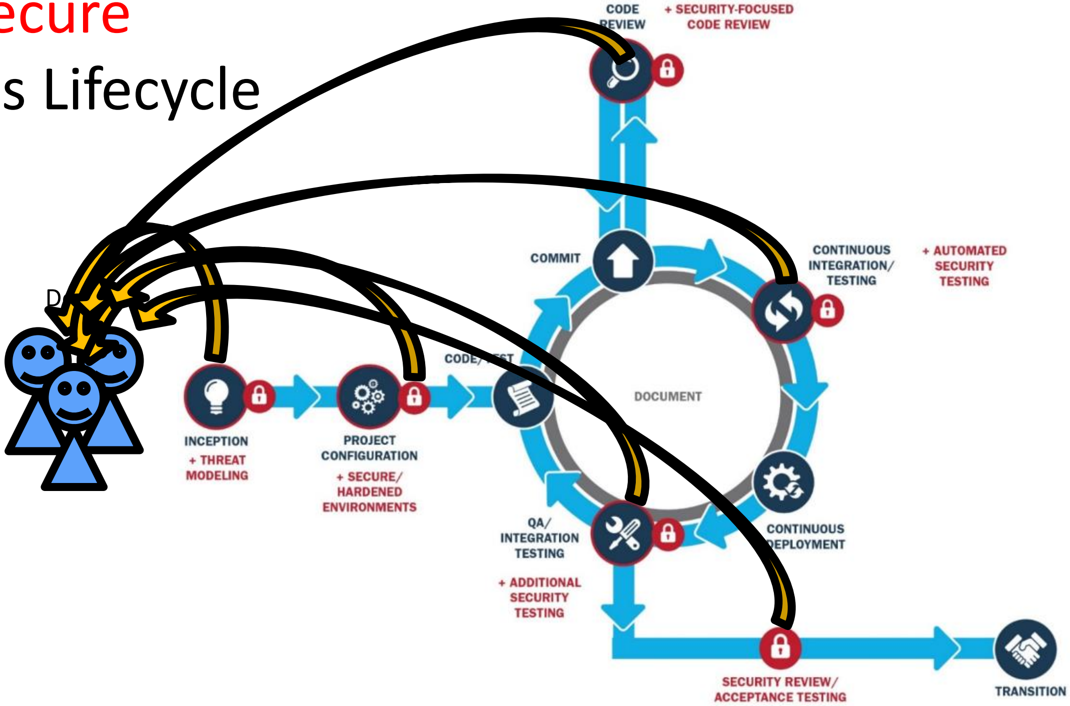
Enhancing SDLC Security


Secure
DevOps Lifecycle
D
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TRANSITION

Continuous Feedback to Developer and **others**

DEVSECOPS

Dos and Don’ts

Automation

- Don’t leave security automation out of your DevOps automation strategy
  - Automated security testing removes human error, infrequent execution, and excuses

✗ Don'ts

- Don’t try to avoid open source with policies, it is coming whether you like it or not!

- InfoSec must maintain awareness of open source vulnerabilities and continuously check for them

Automation

You automate…

✓

Do's

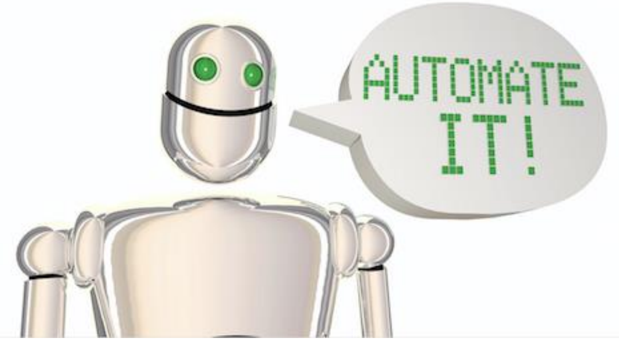
…builds

…functional tests

…deployment

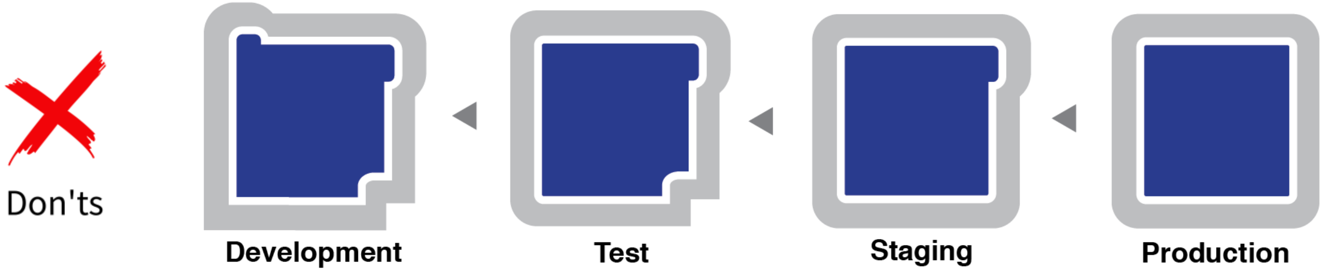
…reporting

…the coffee machine (as we do)



Multiverse: Environment Parity

- When environments are not the same,
  - app may never behave predictably.



- Environment parity (between dev, test, prod) is critical for controlling opportunity for security gaps

Multiverse: Environment Parity

✓

Do's

- Automate manual steps to the extent possible
- Make development environment parity a priority
- Get Ops involved in creating all environments, including Dev
- Focus on providing fast easy-to-use automation tools for ~~developers~~ **everyone** to keep environments in synch

Configuration: IaC

✗

Don'ts

- Uncontrolled configuration changes will lead to an unmanageable, unpredictable, and unrepeatable solution
  - Easy for info security to get out of synch; For example, change in DNS and you have security hole.

✓

Do's

- Avoid the manual quick fix particularly for configuration changes
- Put configuration files under configuration controls

Infiltrator – Insider Threat

✗

Don'ts

- He sneaks in…
- …and alters production …but he works for you!

✓

Do's

- Set up roles and revoke administrative access to manually edit production
- Configure prod environment to alert the entire team when manually accessed. Transparency is key.

Incident:

We have all been there…

Intrusions overnight…

…cascading system failures…

…it's all crashing…

…help…me.....

Response

✗ Don'ts

- But you survive…
  - Glad its over. Going to go sleep for 18 hours…and then back to the normal cycle.
  - When do we analyze what went wrong?
  - How do we prevent similar failures in the future?
  - Just forget it is over!

✓ Do's

- All failures must result in codified change to DevOps process
- Understand exactly what went wrong
- Never let the same failure happen twice
- Propagate fixes across the enterprise
- Ensure that you teach the next generation

Open Source Technology

98% of developers use open source tools (*)

Do you know
what's in your app?

Code we wrote

Code someone else wrote

(*) https://about.gitlab.com/2017/03/03/why-choose-open-source/

Open Source Technology

✗ Don'ts

- Place infosec outside of the dev workflow
- When UI/UX, infosec and accessibility requirements conflict and never get resolved
- Dictate policy to not use open source
- Document-driven checking is not going catch

✓ Do's

- Infosec must enable constant (read: automated) checking for open source vulnerabilities
- Create a centralized private repositories of vetted 3rd party components for all developers
- Establish good product distribution practices
- Minimize variation of components to make things easier (multiple versions, duplicated utility)

- *Prepare for what is coming….*

Continuous Delivery: Rollback

✗

Don'ts

- Once you jump, you can’t return to the plane.
- You are committed. Permanently.
- This is not how we should model our deployments

✓

Do's

- Rollback is essential; Never be left without an escape route to completely working software
- Strive for approaches that support “one button” rollback (e.g, feature flags or A/B)

SLS team GitHub Projects

- Once Click DevOps deployment
  https://github.com/SLS-ALL/devops-microcosm
- Sample app with DevOps Process
  https://github.com/SLS-ALL/flask_api_sample
  - Tagged checkpoints
    - v0.1.0: base Flask project
    - v0.2.0: Vagrant development configuration
    - v0.3.0: Test environment and Fabric deployment
    - v0.4.0: Upstart services, external configuration files
    - v0.5.0: Production environment
- On YouTube:
  https://www.youtube.com/watch?v=5nQlJ-FWA5A

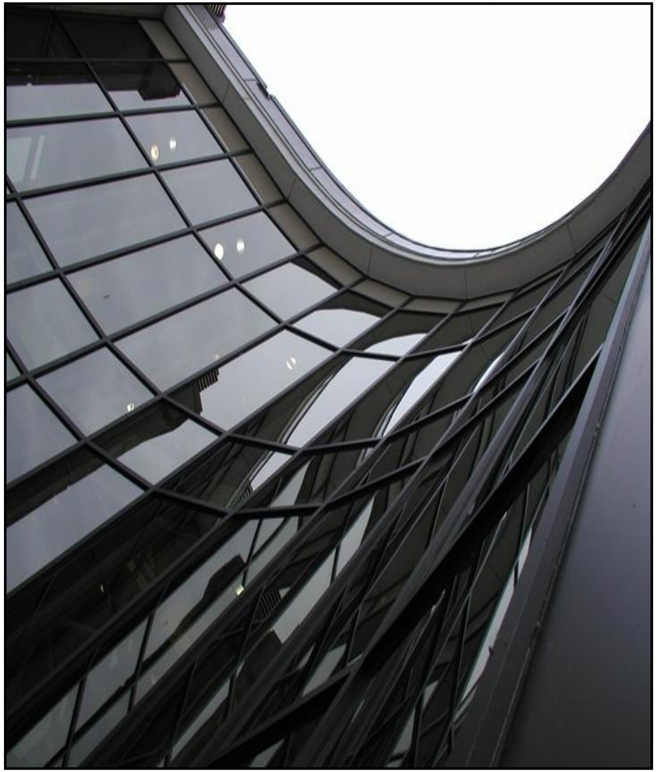
For more information…

- SEI – Carnegie Mellon University
  - DevOps Blog: https://insights.sei.cmu.edu/devops
  - Webinar : https://www.sei.cmu.edu/publications/webinars/index.cfm
  - Podcast : https://www.sei.cmu.edu/publications/podcasts/index.cfm
- DevSecOps: http://www.devsecops.org
- Rugged Software: https://www.ruggedsoftware.org

Let us Apply what we have learned today

- Next week,
  - Change your mindset say “We all are responsible for security” not “You, I or somebody else!”
  - Share what you have learned from failure
- Next Month(s)
  - Start to build Integrated DevOps pipeline
  - Made incremental security integration as part of application lifecycle
  - Measure the results and keep iterating
- By End of 2018!
  - Continuous learning on “how and where we need to improve security of our app”
  - *Use **DevOps** to deploy **secure** application: **DevSecOps***

Any Question?



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@securelifecycle

APPENDIX

DevOps Fundamentals

What is DevOps?

DevOps is a set of principles and practices emphasizing collaboration and communication between software development teams and IT operations staff along with acquirers, suppliers and other stakeholders in the life cycle of a software system [1]

The history of DevOps

- Patrick Debois, “Agile infrastructure and operations: how infra-gile are you?”, Agile 2008
- John Allspaw, “ 10+Deploys per Day: Dev and Ops Cooperation”, Velocity 2009
- DevOpsDays, October 30th 2009, #DevOps term born

[1] IEEE P2675 DevOps Standard for Building Reliable and Secure Systems Including Application Build, Package and Deployment

Who are Dev?

- Follow Agile methodologies
  - Using Scrum, Kanban and modern development approaches
  - Self directing, self managed, self organized
- Using any new technology
  - Each Dev has own development strategy
  - OpenSource,
- Allowed to have
  - Close relationships with the business
  - Software driven economy

Want to deliver software faster with new requirements…

Who are Ops?

- Operations
  - Runs the application
  - Manages the infrastructure
  - Support the applications
- Operations provides
  - Service Strategy
  - Service Design
  - Service Transition
  - Service Operations
  - Secure systems

Want to maintain stability, reliability and security…

DevOps aims to Increase…

…the pace of **innovation**

…**responsiveness** to business needs

…**collaboration**

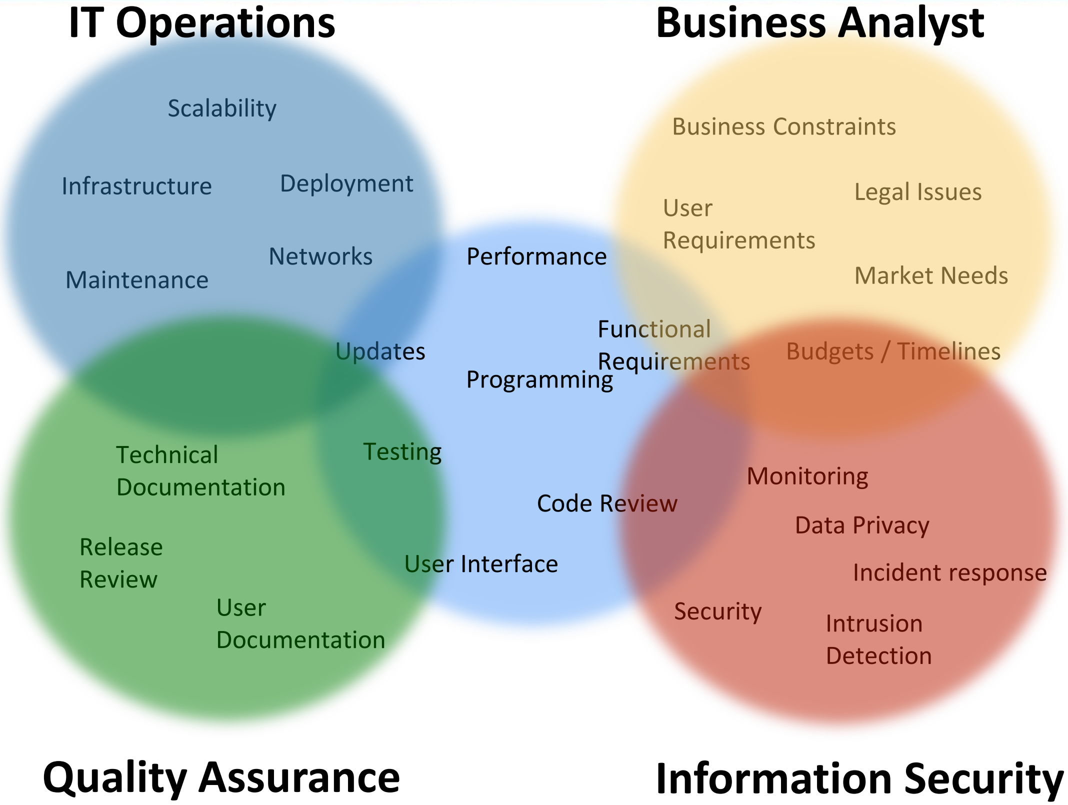
…software **stability and quality**

… continuous feedback

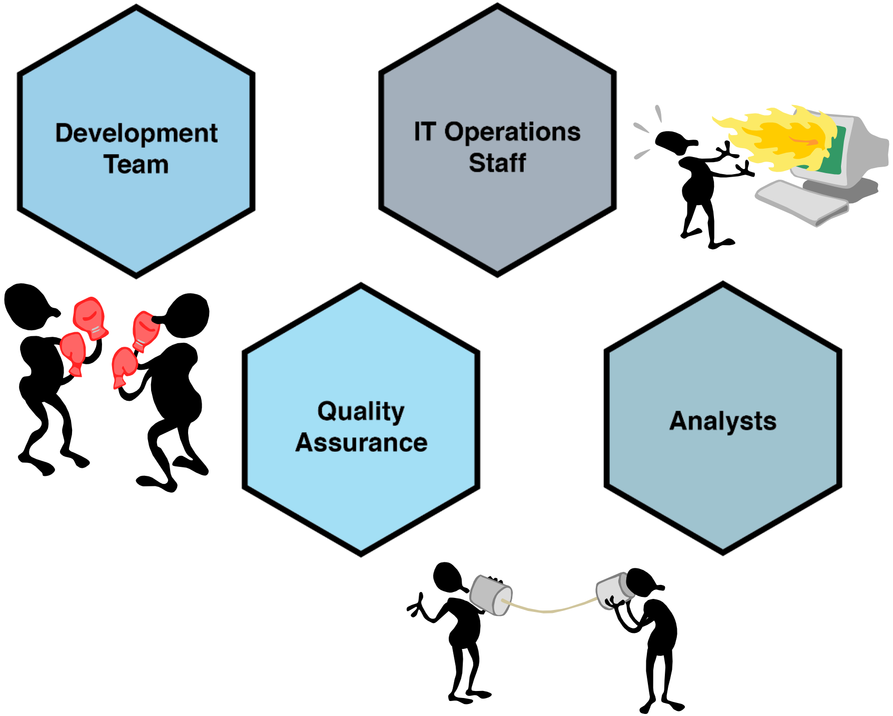
DevOps has four Fundamental Principles

- **Collaboration:** between project team roles
- **Infrastructure as Code:** all assets are versioned, scripted, and shared where possible
- **Automation:** deployment, testing, provisioning, any manual or human-error-prone process
- **Monitoring:** any metric in the development or operational spaces that can inform priorities, direction, and policy

Collaboration: *Many stakeholders*



Collaboration: *Silos Inhibit Collaboration and poor communication*



Development Team

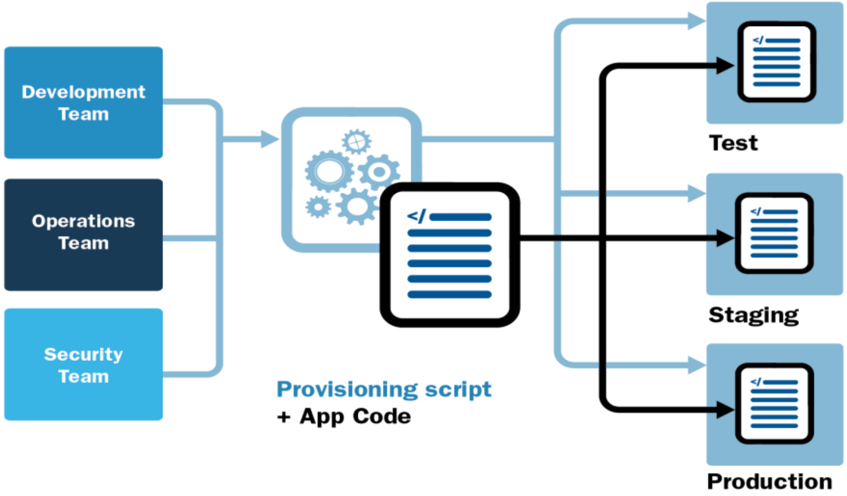
IT Operations Staff

Quality Assurance

Analysts

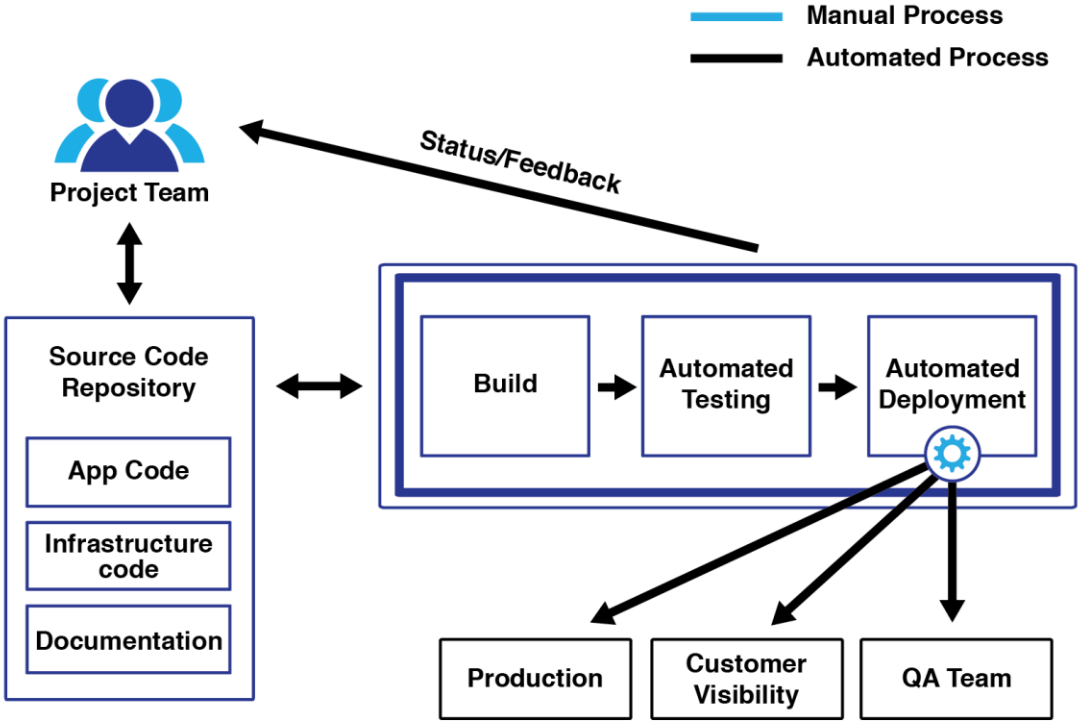
Infrastructure as Code (IaC)

A program that creates infrastructure,

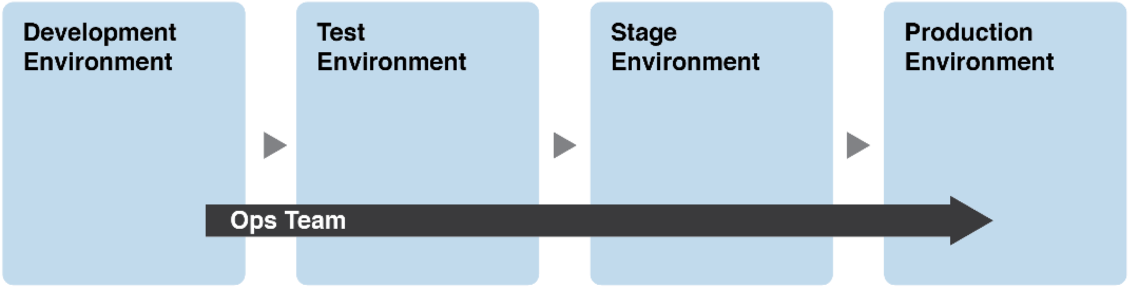


A concretely defined description of the environment is good material for conversation between team members.

Automation : *Continuous Integration (CI)*



Automation : *Continuous Delivery / Deployment (CD)*



Shift Left Operational Concerns Enforced by Continuous Delivery