Even Faster:
How Rugged DevOps & SW Supply Chains Attack Developer Waste

Josh Corman
@joshcorman

Conclusions / Apply!

- Idea: A full embrace of Deming is a SW Supply Chain:
  - Fewer/Better Suppliers
  - Highest Quality Supply
  - Traceability/Visibility throughout Manufacturing / Prom & Agile Recall
- Benefits: Such rigor enables:
  - Even FASTER: Fewer instances of Unplanned/Unscheduled Work (**ALSO CONTEXT SWITCHES)**
  - More EFFICIENT: Faster MTTD/MTTR
  - Better QUALITY/RISK: Avoid elective/avoidable complexity/risk
- Urgency: It's OpenSeason on OpenSource
  - And our dependence on connected tech is increasingly a public safety issue
- Coming Actions: "Known Vulnerabilities" Convergence
  - Lawmakers, Insurers, Lawyers, etc. are converging

Who am I?

Joshua Corman

@joshcorman
CTO,
Sonatype

Sonatype

I am The Cavalry


SOURCEfire
QUALYS
ON DEMAND SECURITY
CORETRACE
FORTINET
Akamai
FASTER FORWARD
CONFERENCE
Where The World
Talks Security
SOURCEfire
FORTINET
Akamai
FASTER FORWARD
Where The World
Talks Security

Security is Dead. Long Live Rugged DevOps: IT at Ludicrous Speed…

Josh Corman, Gene Kim

VERY ROUGH 1ST Draft

Session ID: CLD-106
Session Classification: Intermediate

h/t @petecheslock DevOpsDays Austin 2015

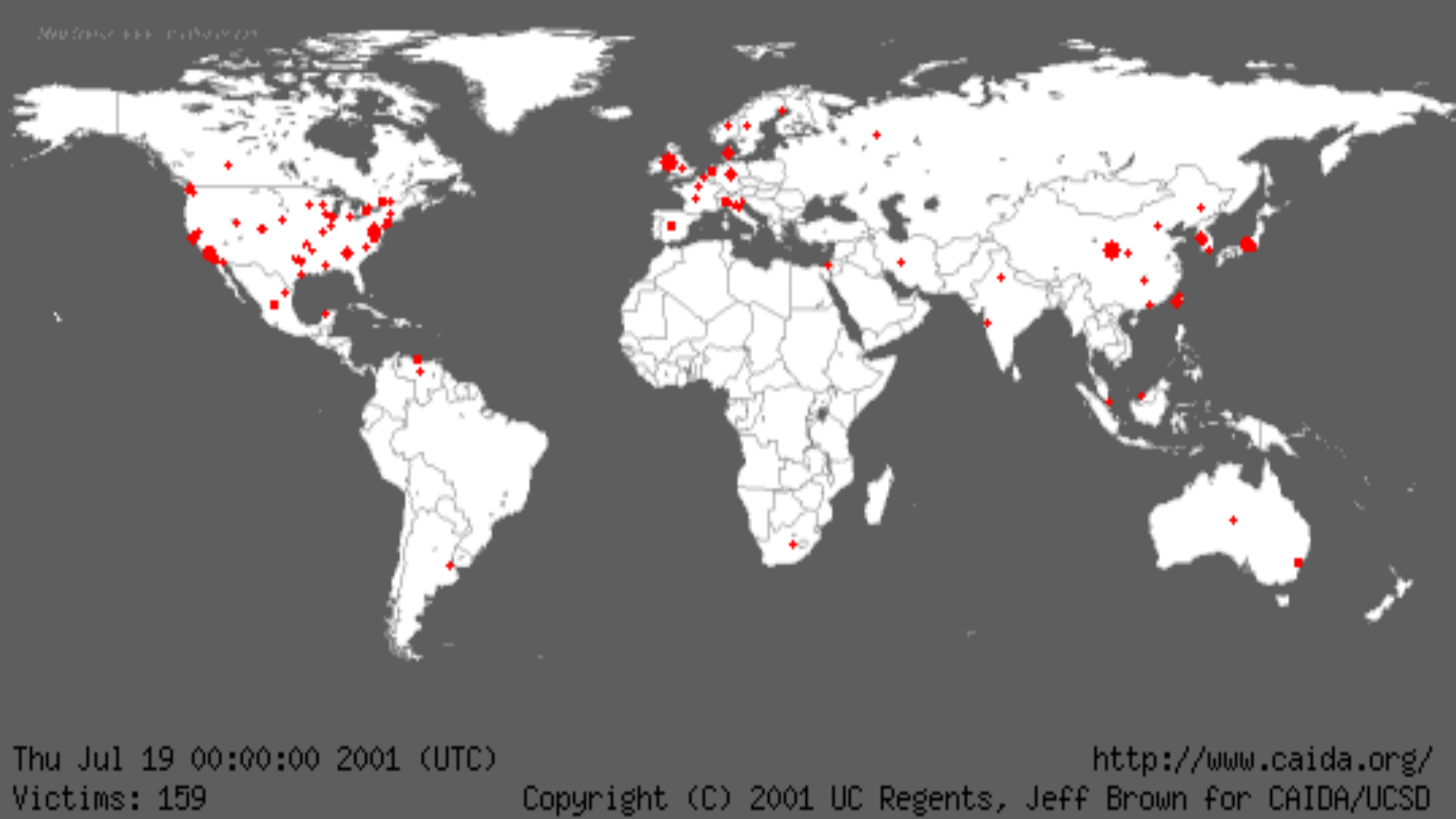

DevOps.com
Where the world meets DevOps
Sonatype
puppet
labs

Rugged DevOps
Going Even Faster
With Software Supply Chains

Gene Kim
Researcher and Author
IT Revolution Press
@RealGeneKim

Joshua Corman
CTO
Sonatype
@joshcorman


@DUIVESTEIN | VISION • INSPIRATION • NAVI
~ Marc Marc Andreessen 2011
SOFTWARE IS EATING THE WORLD


Thu Jul 19 00:00:00 2001 (UTC)
Victims: 159
http://www.caida.org/
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Trade Offs
Costs &
Benefits

Beyond Heartbleed: OpenSSL in 2014

(31 in NIST's NVD thru December)

CVE-2014-3470	6/5/2014	CVSS Severity: 4.3 MEDIUM ← **SIEMENS** *
CVE-2014-0224	6/5/2014	CVSS Severity: 6.8 MEDIUM ← **SIEMENS** *
CVE-2014-0221	6/5/2014	CVSS Severity: 4.3 MEDIUM
CVE-2014-0195	6/5/2014	CVSS Severity: 6.8 MEDIUM
CVE-2014-0198	5/6/2014	CVSS Severity: 4.3 MEDIUM ← **SIEMENS** *
CVE-2013-7373	4/29/2014	CVSS Severity: 7.5 HIGH
CVE-2014-2734	4/24/2014	CVSS Severity: 5.8 MEDIUM ** DISPUTED **
CVE-2014-0139	4/15/2014	CVSS Severity: 5.8 MEDIUM
CVE-2010-5298	4/14/2014	CVSS Severity: 4.0 MEDIUM
CVE-2014-0160	**4/7/2014**	**CVSS Severity: 5.0 MEDIUM ← HeartBleed**
CVE-2014-0076	3/25/2014	CVSS Severity: 4.3 MEDIUM
CVE-2014-0016	3/24/2014	CVSS Severity: 4.3 MEDIUM
CVE-2014-0017	3/14/2014	CVSS Severity: 1.9 LOW
CVE-2014-2234	3/5/2014	CVSS Severity: 6.4 MEDIUM
CVE-2013-7295	1/17/2014	CVSS Severity: 4.0 MEDIUM
CVE-2013-4353	1/8/2014	CVSS Severity: 4.3 MEDIUM
CVE-2013-6450	1/1/2014	CVSS Severity: 5.8 MEDIUM

…

As of today, internet scans by MassScan reveal 300,000 of original 600,000 remain unpatched or unpatchable

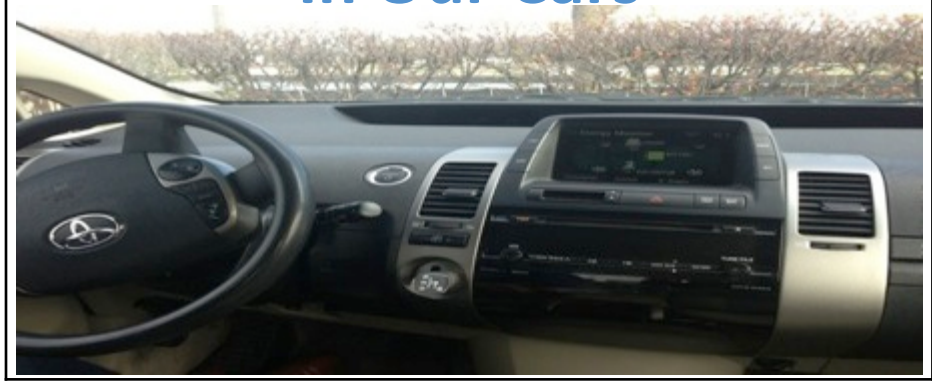
@joshcorman

Heartbleed + (UnPatchable) Internet of Things == ___ ?

In Our Bodies

In Our Homes

In Our Cars



In Our Infrastructure

@joshcorman

ShellShock

{bashbug}

A TALE OF TWO QUAKES

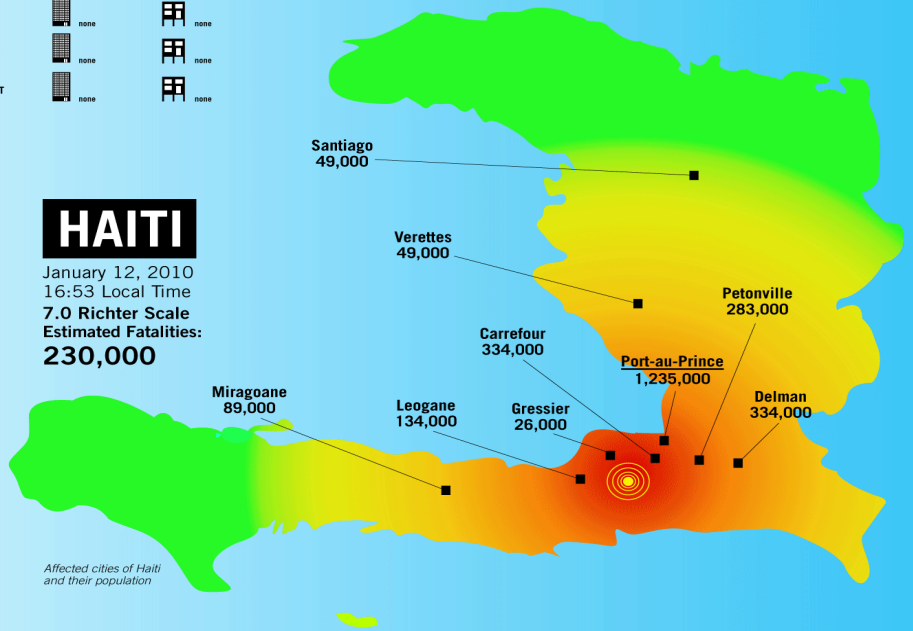
In the span of two months, two massive earthquakes struck in Haiti and Chile. But while the temblor in Chile registered much higher on the Richter scale, the loss of life and damage in Haiti was far more severe. Why is that? Chile—which has experienced serious earthquakes in recent decades—has a robust building code to make sure buildings are earthquake resistant; Haiti has no code to speak of. And a look at both quake's scores on the Modified Mercali Intensity Scale—which is used to measure how earthquakes affect those experiencing them—shows that while Chile's quake may have been stronger overall, Haiti had a larger population and more urban areas hit by more intense and damaging shaking.

MODIFIED MERCALI INTENSITY SCALE

	Shaking	Structural Damage to Resistant Buildings	Structural Damage to Vulnerable Buildings
X	EXTREME	very heavy	very heavy
IX	VIOLENT	heavy	heavy
VIII	SEVERE	moderate/ heavy	heavy
VII	VERY STRONG	moderate	moderate/ heavy
VI	STRONG	light	moderate
V	MODERATE	very light	light
IV	LIGHT	none	none
II-III	WEAK	none	none
I	NOT FELT	none	none

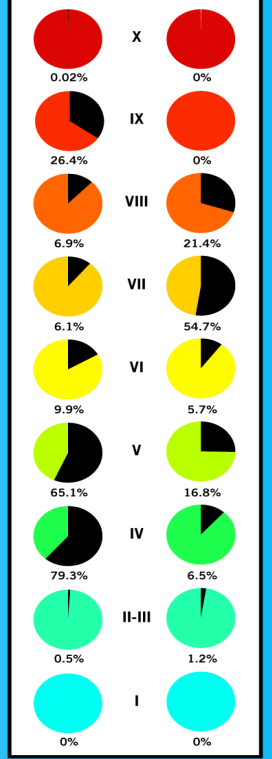
HAITI

January 12, 2010
16:53 Local Time
7.0 Richter Scale
Estimated Fatalities:
230,000



Affected cities of Haiti and their population

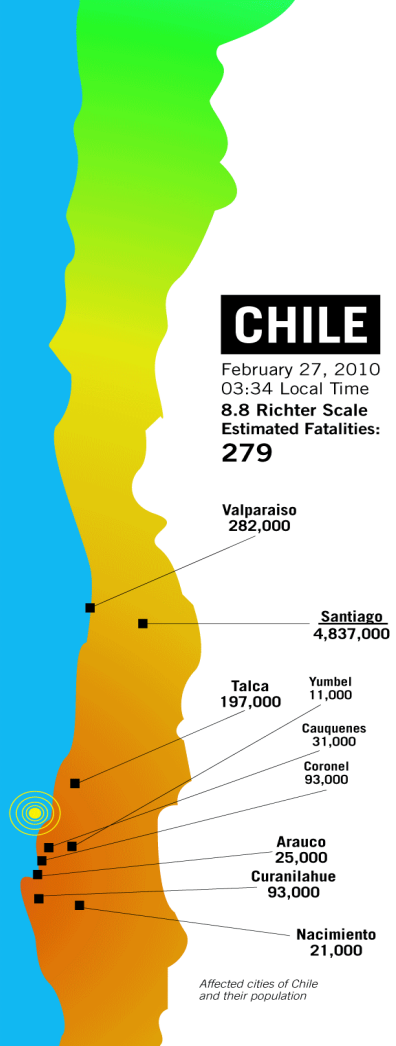
POPULATION AFFECTED
(percentage)



SOURCE U.S. Geological Survey
A collaboration between GOOD and karlssonwilker

CHILE

February 27, 2010
03:34 Local Time
8.8 Richter Scale
Estimated Fatalities:
279



Affected cities of Chile and their population

The Rugged Manifesto

I am rugged... and more importantly, my code is rugged.

I recognize that software has become a foundation of our modern world.

I recognize the awesome responsibility that comes with this foundational role.

I recognize that my code will be used in ways I cannot anticipate, in ways it was not designed, and for longer than it was ever intended.

I recognize that my code will be attacked by talented and persistent adversaries who threaten our physical, economic, and national security.

I recognize these things - and I choose to be rugged.

I am rugged because I refuse to be a source of vulnerability or weakness.

I am rugged because I assure my code will support its mission.

I am rugged because my code can face these challenges and persist in spite of them.

I am rugged, not because it is easy, but because it is necessary... and I am up for the challenge.

I recognize that software has become a foundation of our modern world.

I recognize the awesome responsibility that comes with this foundational role.

I recognize that my code will be used in ways I cannot anticipate, in ways it was not designed, and for longer than it was ever intended.

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I Am The Cavalry

The Cavalry isn't coming… It falls to us

Problem Statement

Our society is adopting connected technology *faster than we are able to secure it*.

Mission Statement

To ensure connected technologies with the potential to impact public safety and human life are *worthy of our trust*.


Medical


Automotive


Connected Home


Public Infrastructure

Why	Trust, public safety, human life
How	Education, outreach, research
Who	Infosec research community
Who	Global, grass roots initiative
What	Long-term vision for cyber safety

Collecting	existing research, researchers, and resources
Connecting	researchers with each other, industry, media, policy, and legal
Collaborating	across a broad range of backgrounds, interests, and skillsets
Catalyzing	positive action sooner than it would have happened on its own

@joshcorman

5-Star Framework

Addressing Automotive Cyber Systems

5-Star Capabilities

- ★ **Safety by Design** – Anticipate failure and plan mitigation
- ★ **Third-Party Collaboration** – Engage willing allies
- ★ **Evidence Capture** – Observe and learn from failure
- ★ **Security Updates** – Respond quickly to issues discovered
- ★ **Segmentation & Isolation** – Prevent cascading failure

Connections and Ongoing Collaborations

Security Researchers

Automotive Engineers

Policy Makers

Insurance Analysts

Accident Investigators

Standards Organizations

https://www.iamthecavalry.org/auto/5star/

5-Star Cyber Safety

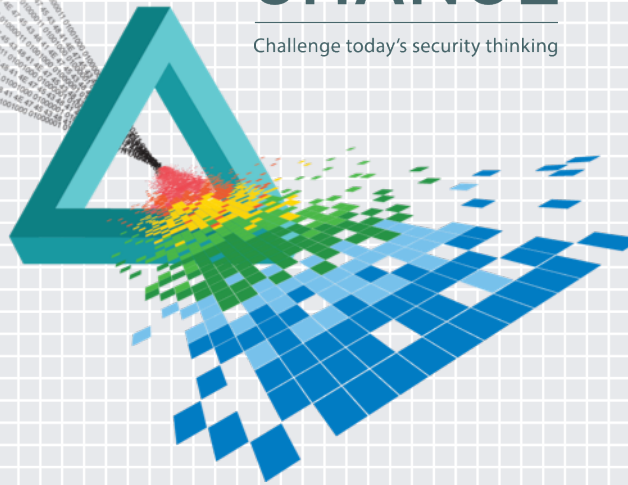
Formal Capacities	Plain Speak
1. Safety By Design	1. Avoid Failure
2. Third Party Collaboration	2. Engage Allies To Avoid Failure
3. Evidence Capture	3. Learn From Failure
4. Security Updates	4. Respond to Failure
5. Segmentation and Isolation	5. Isolate Failure

www.iamthecavalry.org
@iamthecavalry

h/t @petecheslock DevOpsDays Austin 2015

RSAConference2015
San Francisco | April 20-24 | Moscone Center

CHANGE
Challenge today's security thinking

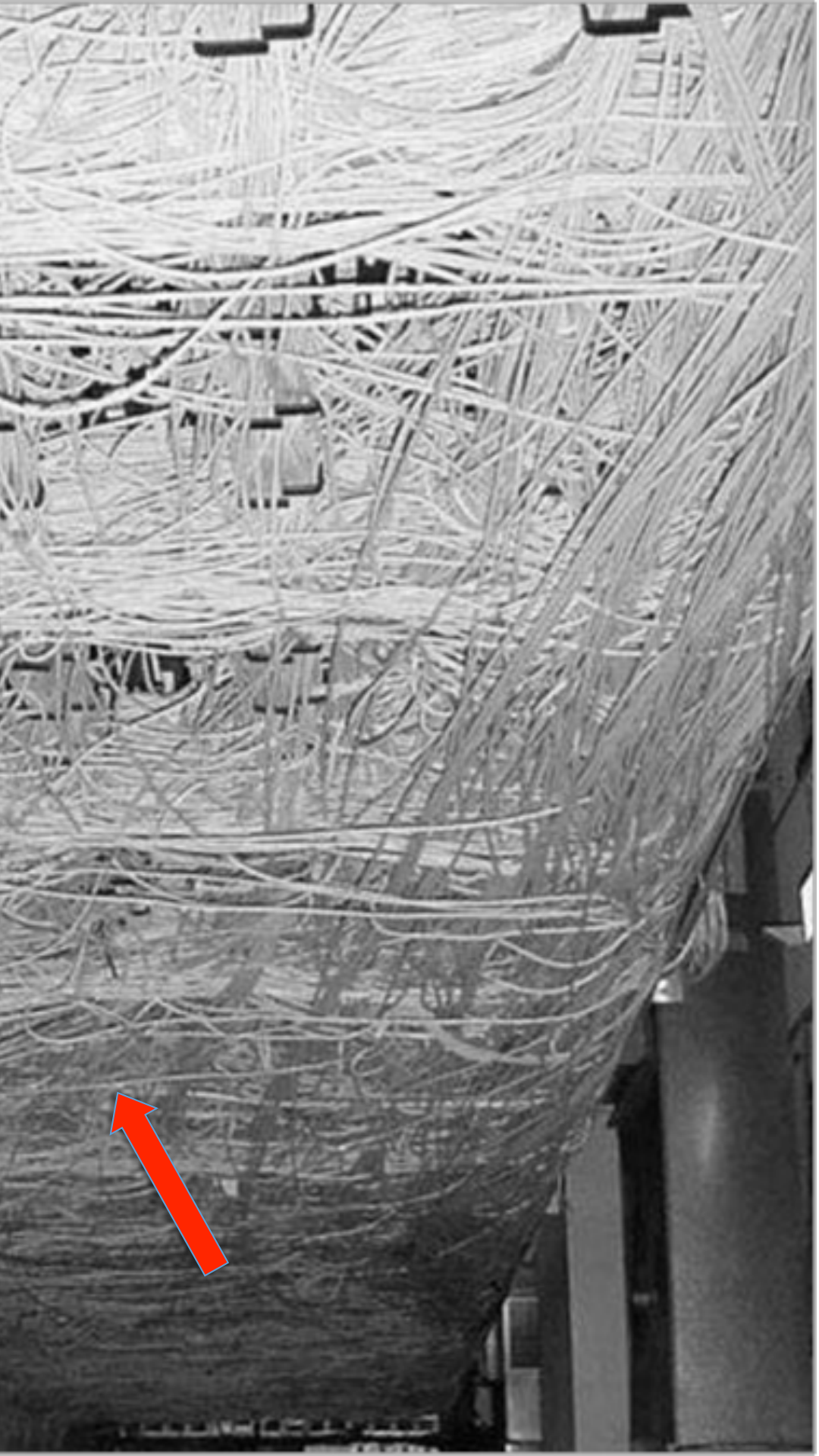


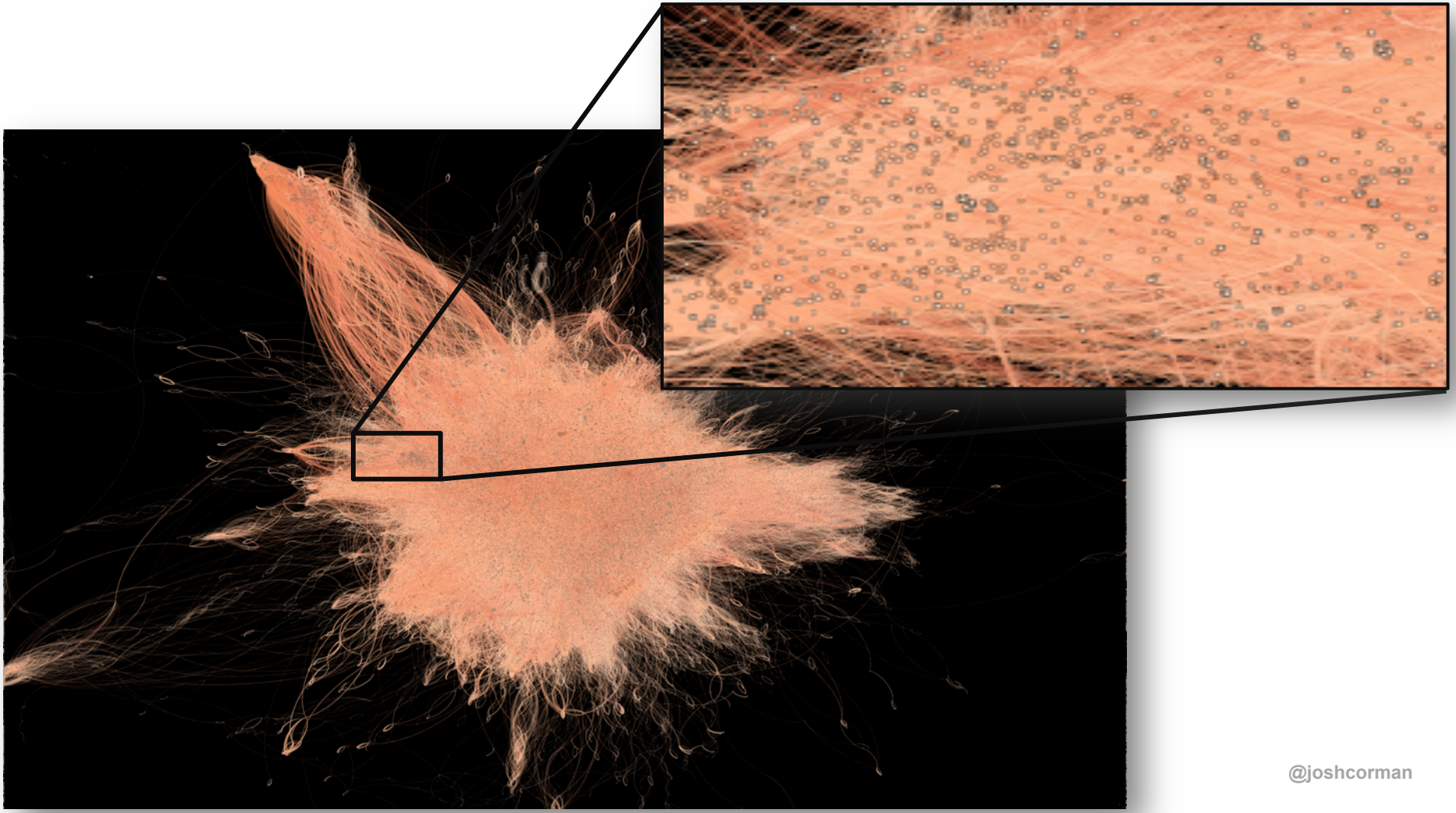
SESSION ID: **ASD-T07R**

Continuous Security: 5 Ways DevOps *Improves* Security

David Mortman
Chief Security Architect & Distinguished Engineer
Dell Software
@mortman

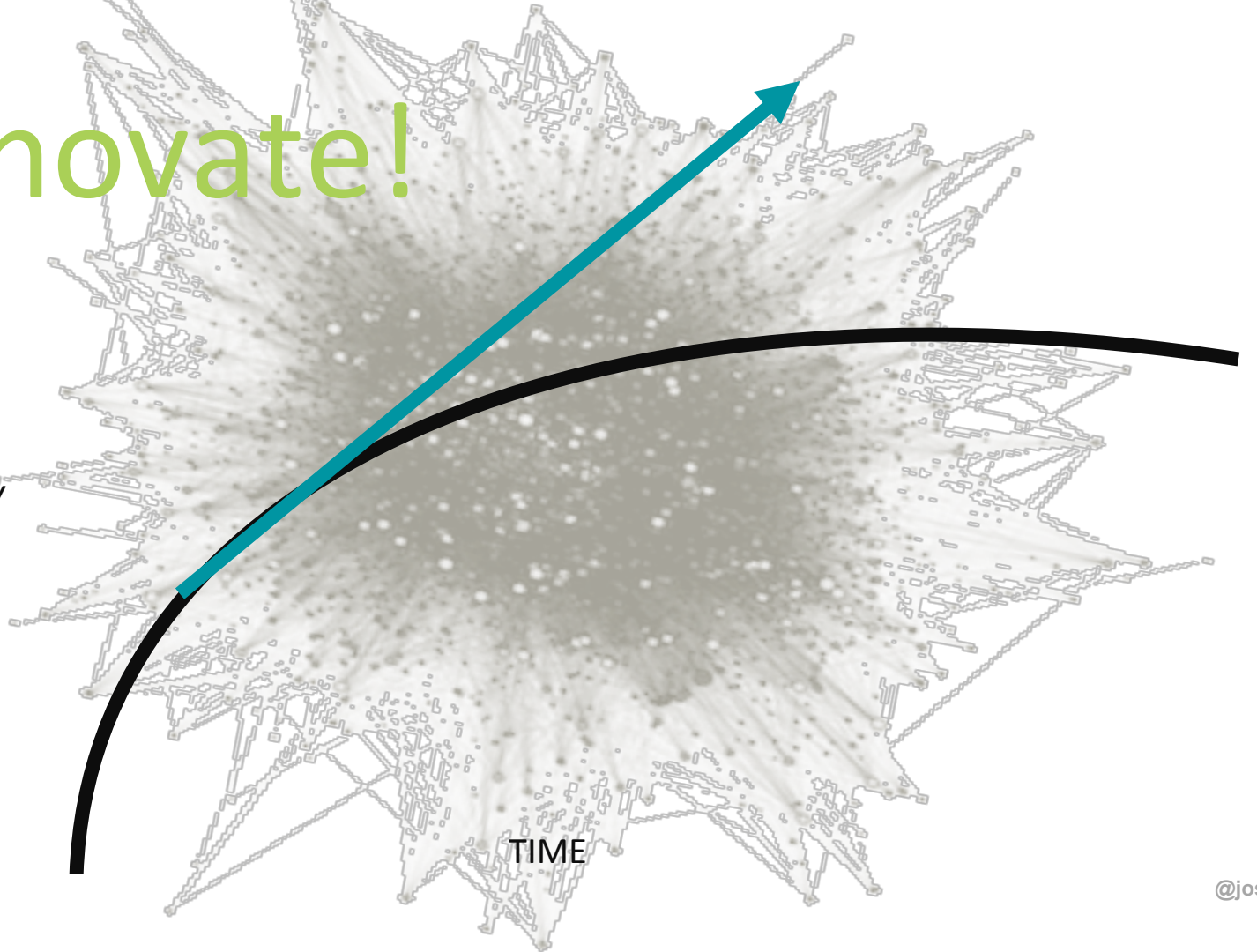
Joshua Corman
CTO
Sonatype
@joshcorman

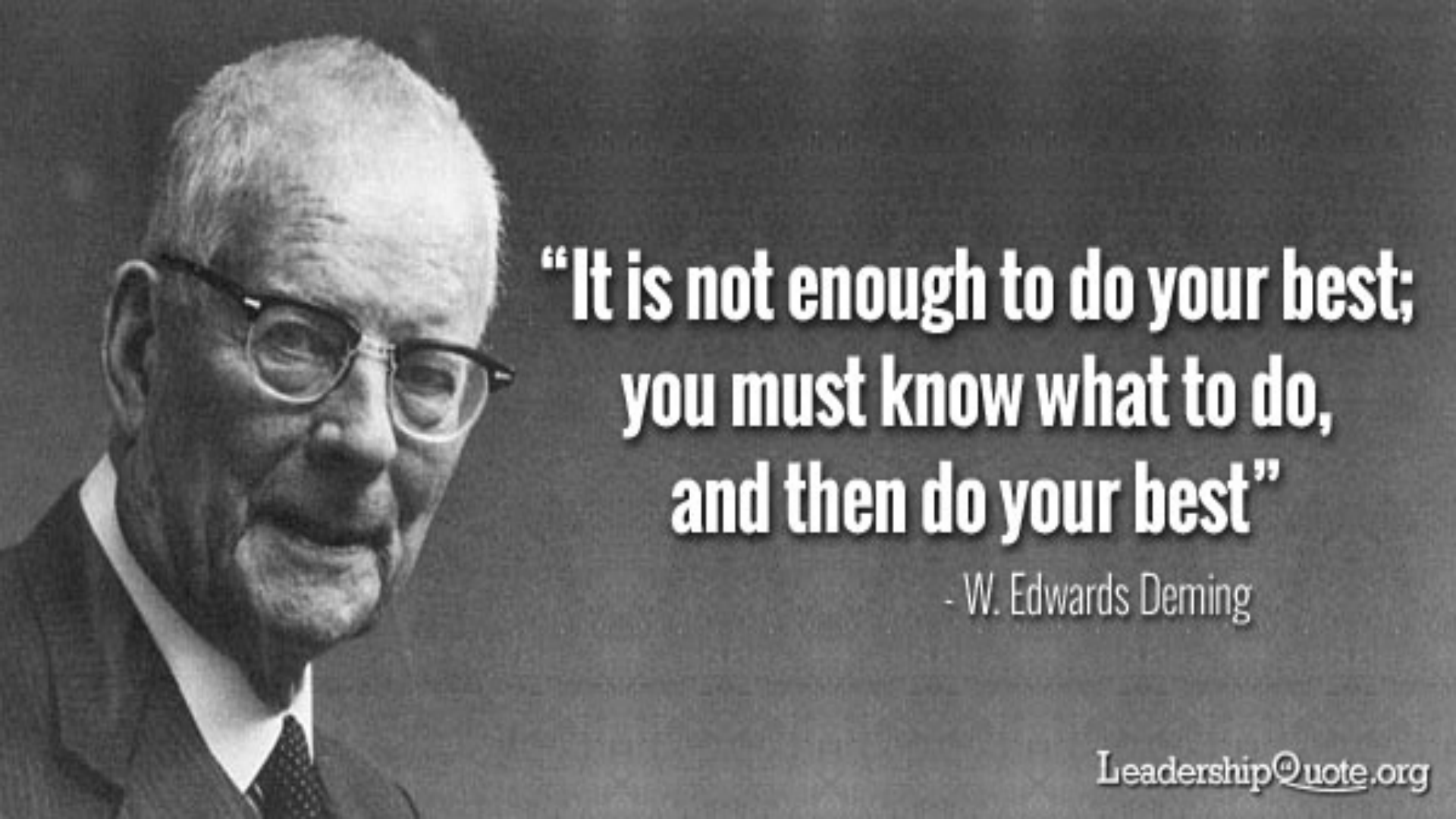




@joshcorman

Innovate!

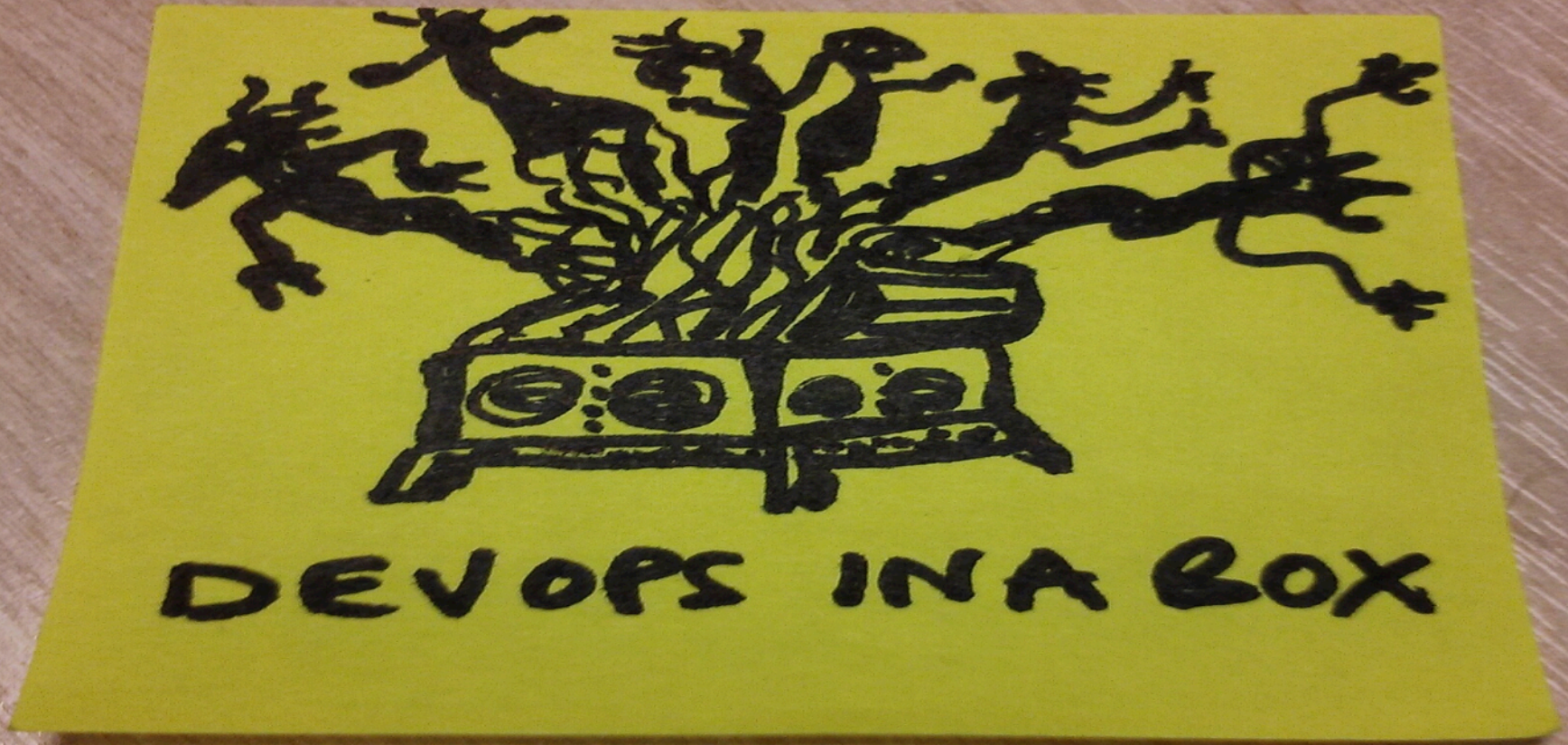



"It is not enough to do your best;
you must know what to do,
and then do your best"
- W. Edwards Deming
LeadershipQuote.org

ON TIME	ON BUDGET	ACCEPTABLE QUALITY/RISK

Agile goats; not goat rodeo. “We need to be agile, but not fragile.” @RuggedSoftware @joshcorman @mortman #RSAC #DevOps

ON TIME. Faster builds. Fewer interruptions. More innovation. 	ON BUDGET. More efficient. More profitable. More competitive. 	ACCEPTABLE QUALITY/RISK. Easier compliance. Higher quality. Built-in audit protection. 
Agile / CI		



It may feel like DevOps is Pandora's Box, but it's open… and hope remains. ;)
@joshcorman @mortman #RSAC #DevOps

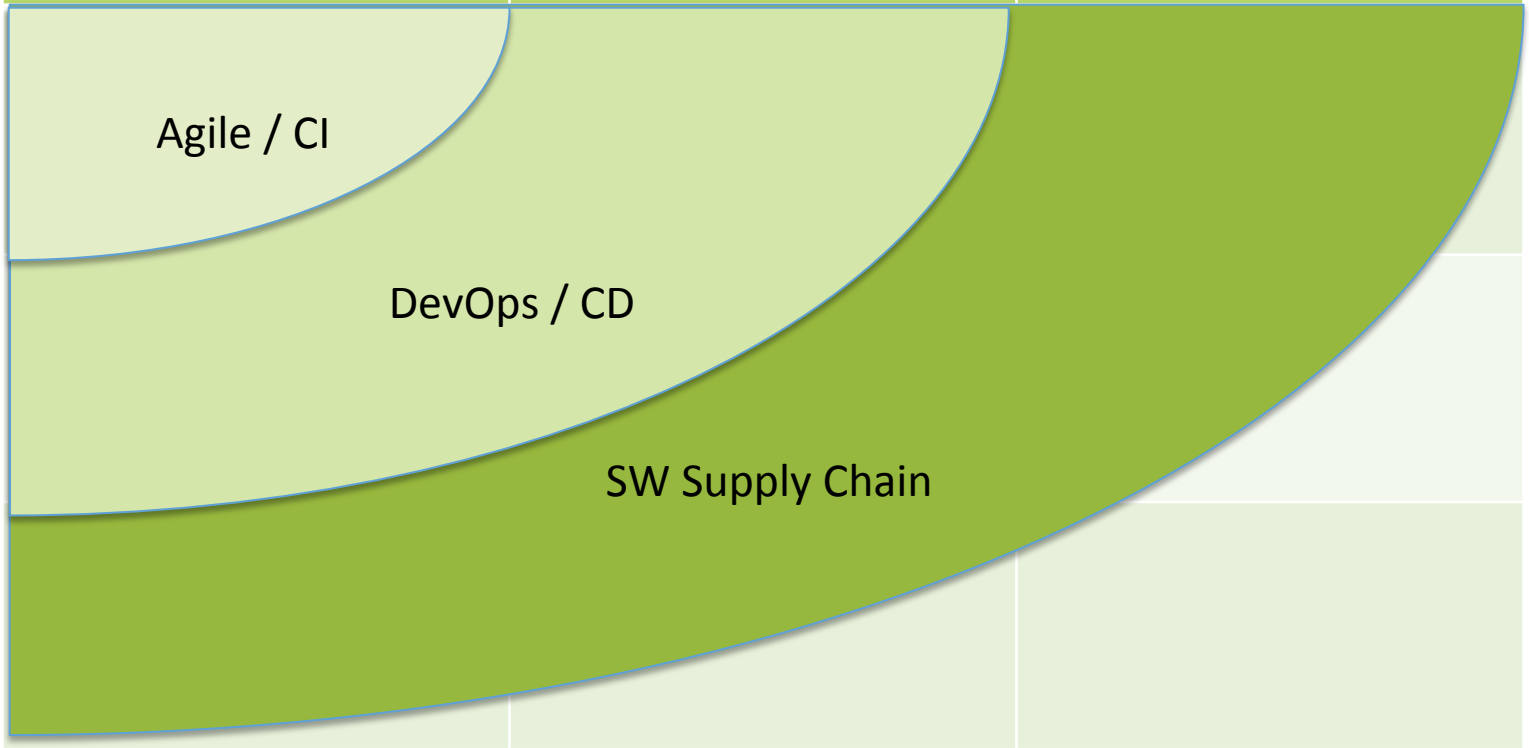
ON TIME. Faster builds. Fewer interruptions. More innovation. 	ON BUDGET. More efficient. More profitable. More competitive. 	ACCEPTABLE QUALITY/RISK. Easier compliance. Higher quality. Built-in audit protection. 
Agile / CI DevOps / CD		


Ford

ON TIME.
Faster builds.
Fewer interruptions.
More innovation.

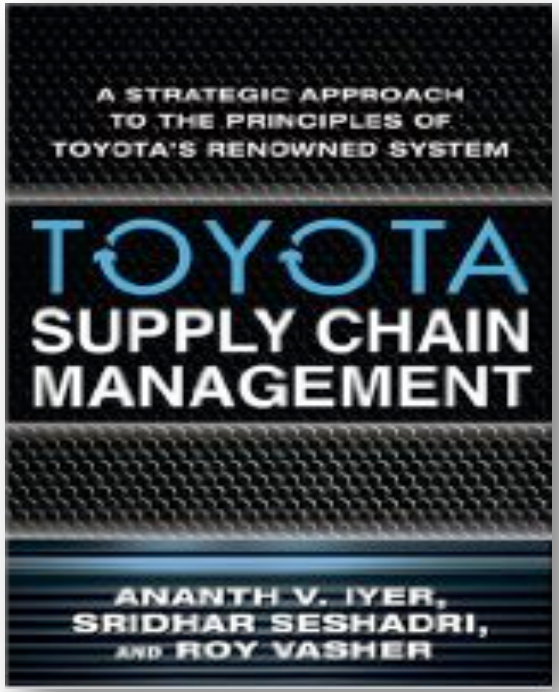
ON BUDGET.
More efficient.
More profitable.
More competitive.

ACCEPTABLE QUALITY/RISK.
Easier compliance.
Higher quality.
Built-in audit protection.

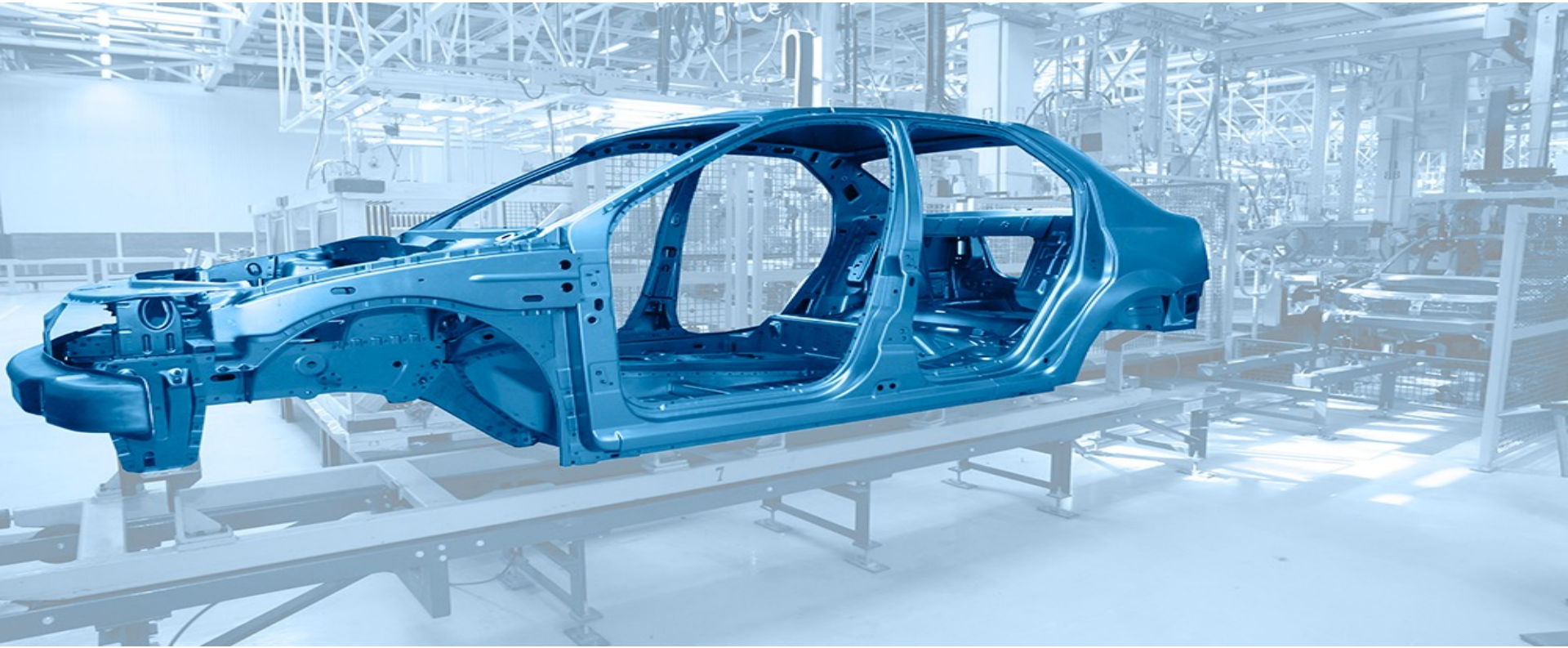


Comparing the Prius and the Volt

	Toyota Advantage	Toyota Prius	Chevy Volt
Unit Cost	61%	$24,200	$39,900
Units Sold	13x	23,294	1,788
In-House Production	50%	27%	54%
Plant Suppliers	16% (10x per)	125	800
Firm-Wide Suppliers	*4%*	*224*	*5,500*



Embrace proven supply chain principles

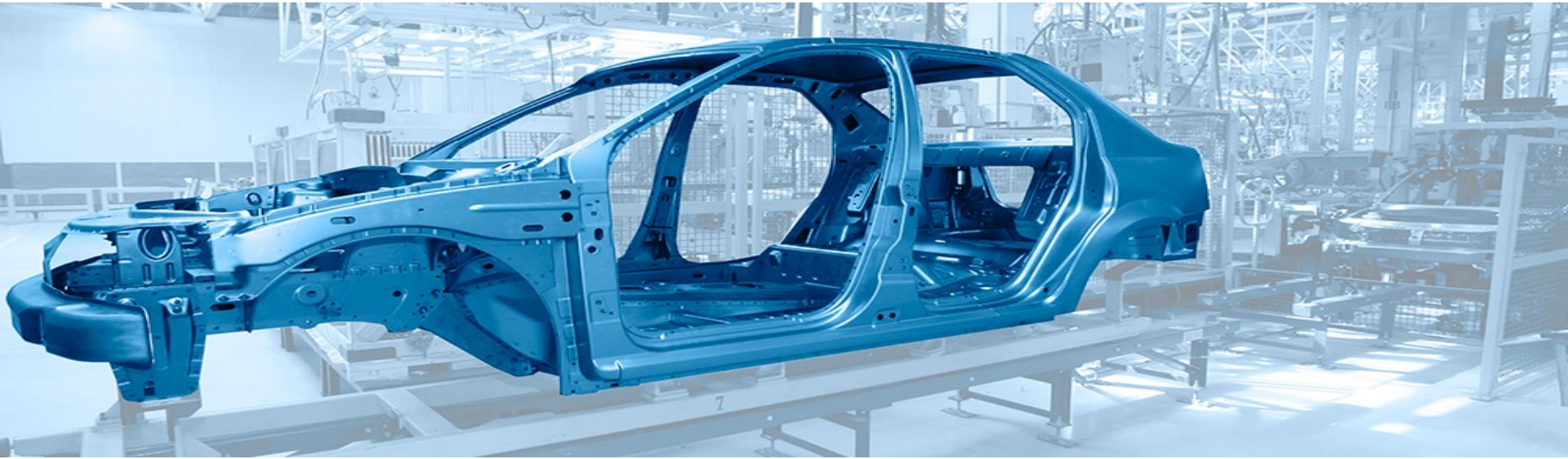


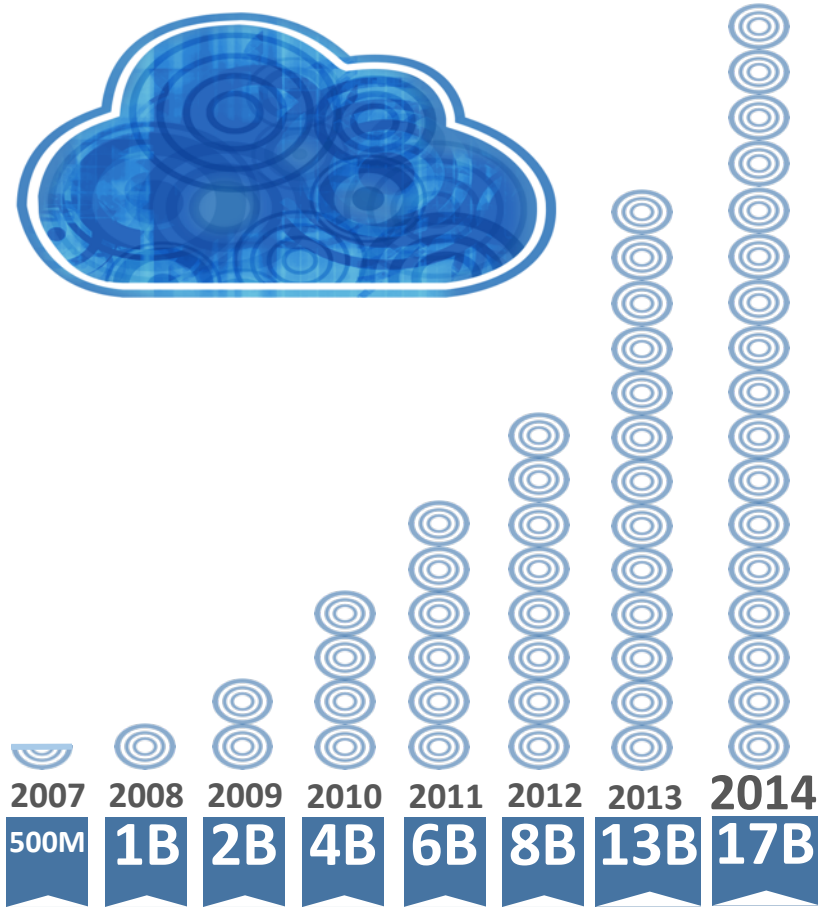
Software Supply Chain Hygiene

Use better & fewer suppliers

Use higher quality parts

Track what you use and where





Open source usage is

EXPLODING

Yesterday's source code is now replaced with

OPEN SOURCE

components

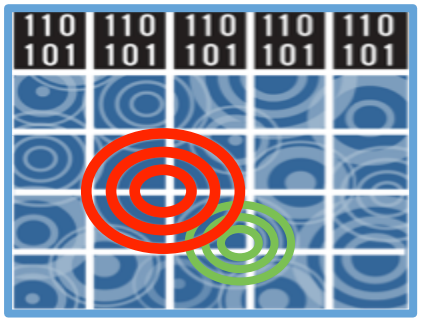
Source: Sonatype, Inc. analysis of (Maven) Central Repository component requests.

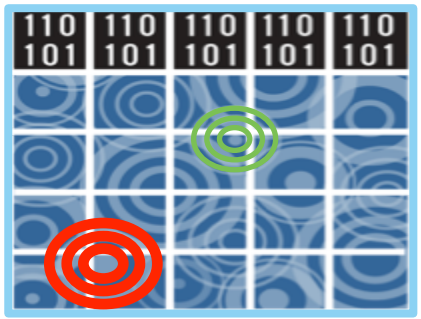
THINK LIKE AN ATTACKER

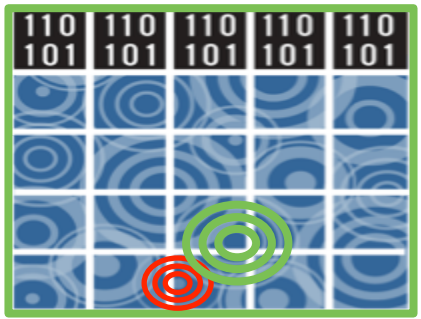
Now that software is

ASSEMBLED…

Our shared value becomes
our shared attack surface



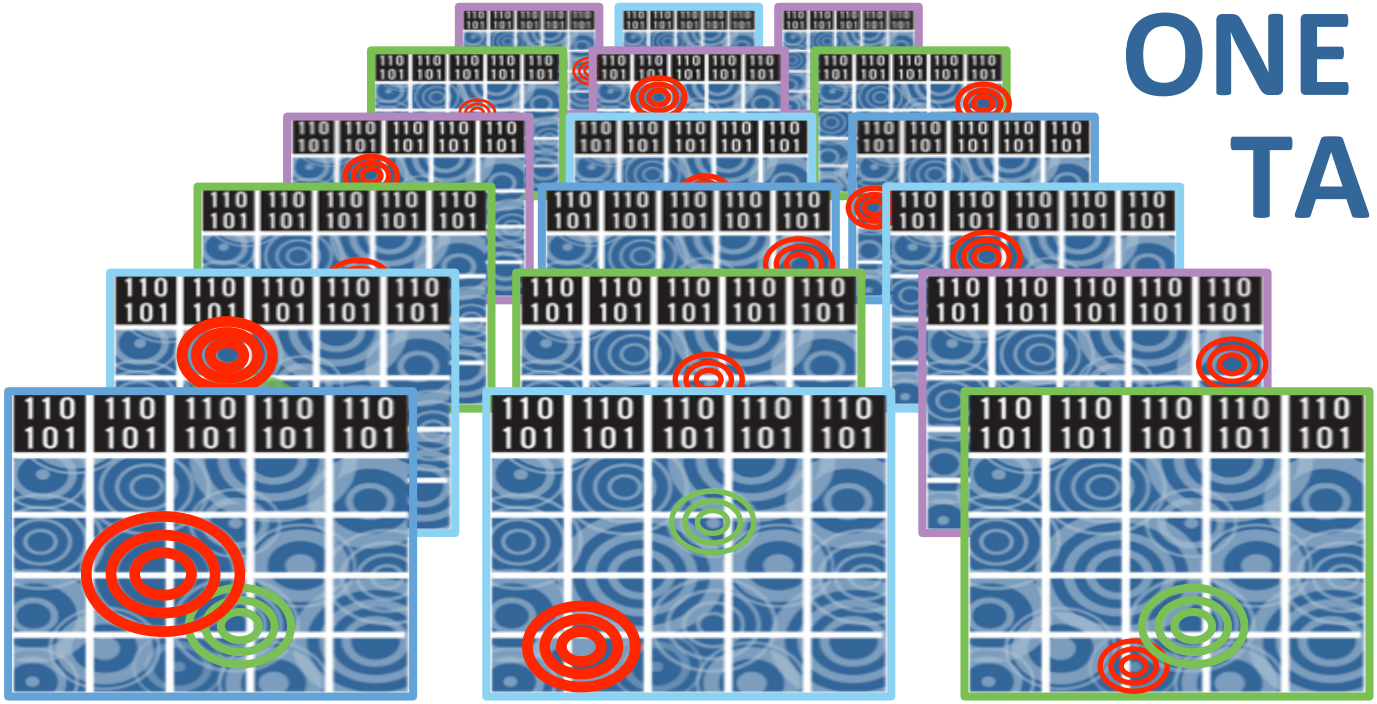




@joshcorman

THINK LIKE AN ATTACKER

One risky component,
now affects thousands of victims



ONE EASY TARGET

@joshcorman

STRUTS

Global Bank

Software Provider

Software Provider's Customer

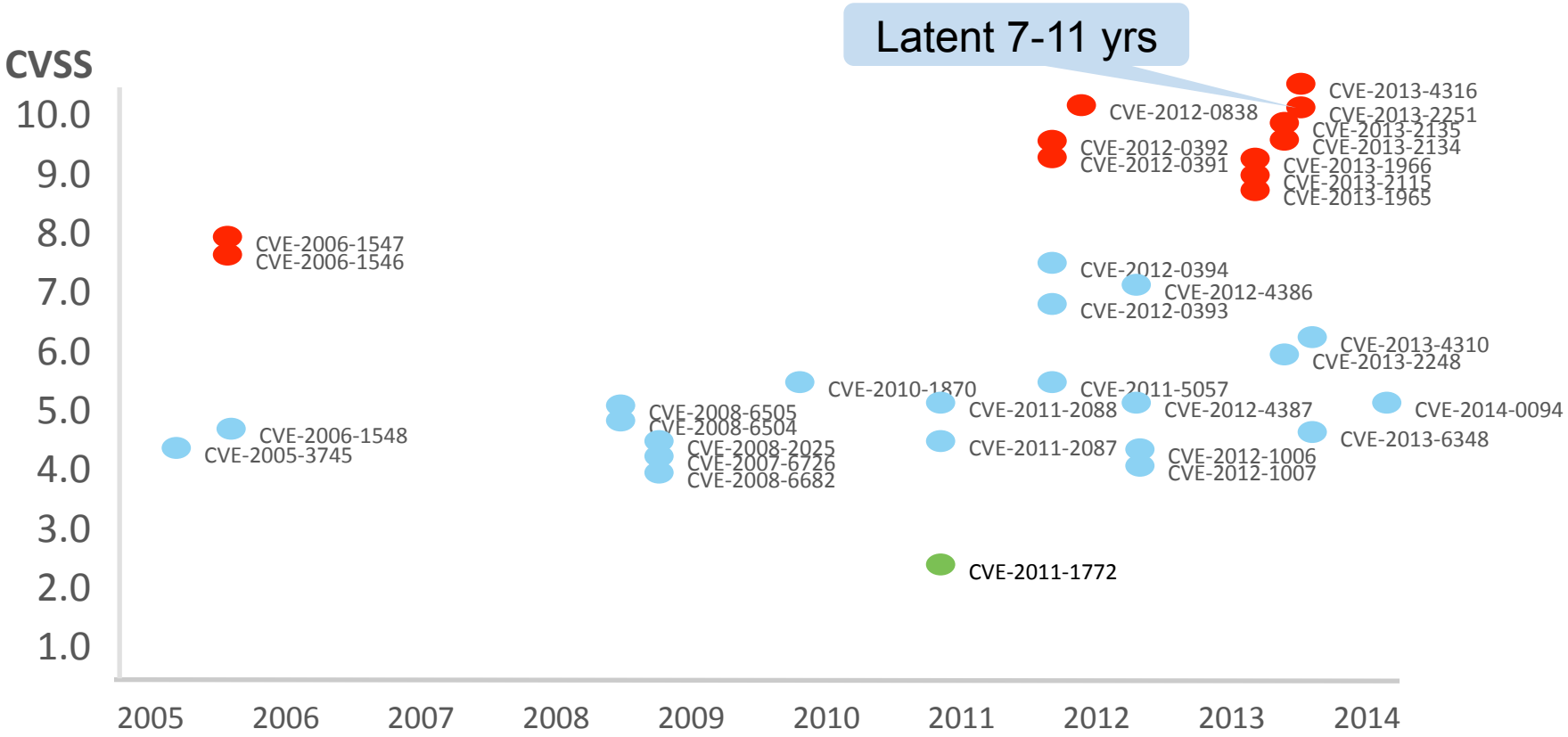
State University

Three-Letter Agency

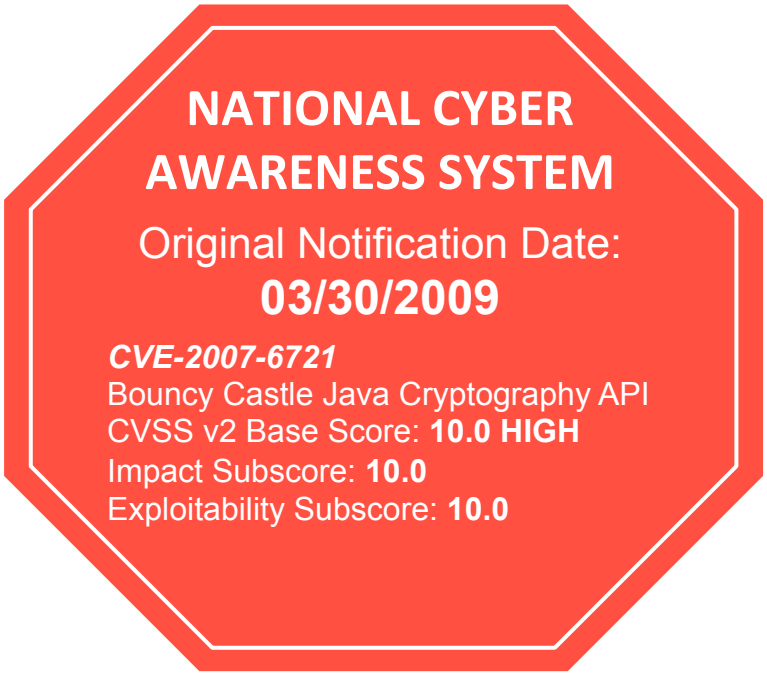
Large Financial Exchange

Hundreds of Other Sites

w/many eyeballs, all bugs are??? Struts



BOUNCY CASTLE



In 2013, **4,000**
organizations downloaded
a version of Bouncy Castle
with a level 10 vulnerability

20,000 TIMES ...

Into **XXX,XXX** Applications...

SEVEN YEARS

after the vulnerability was fixed

HTTPCLIENT 3.X

In December 2013,

6,916 DIFFERENT

organizations downloaded
a version of httpclient with broken
ssl validation (cve-2012-5783)

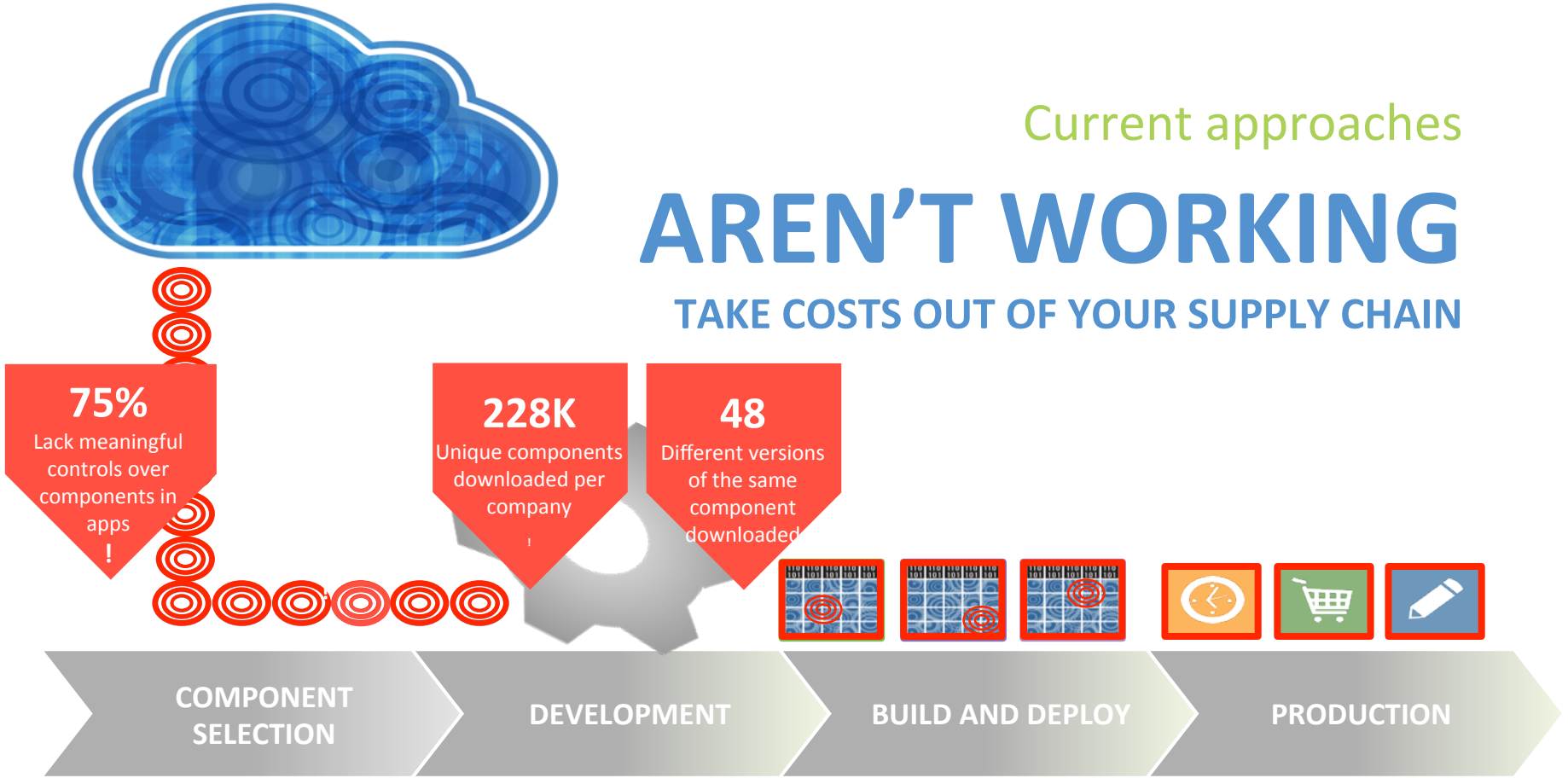
66,824 TIMES ...

More than **ONE YEAR AFTER THE ALERT**

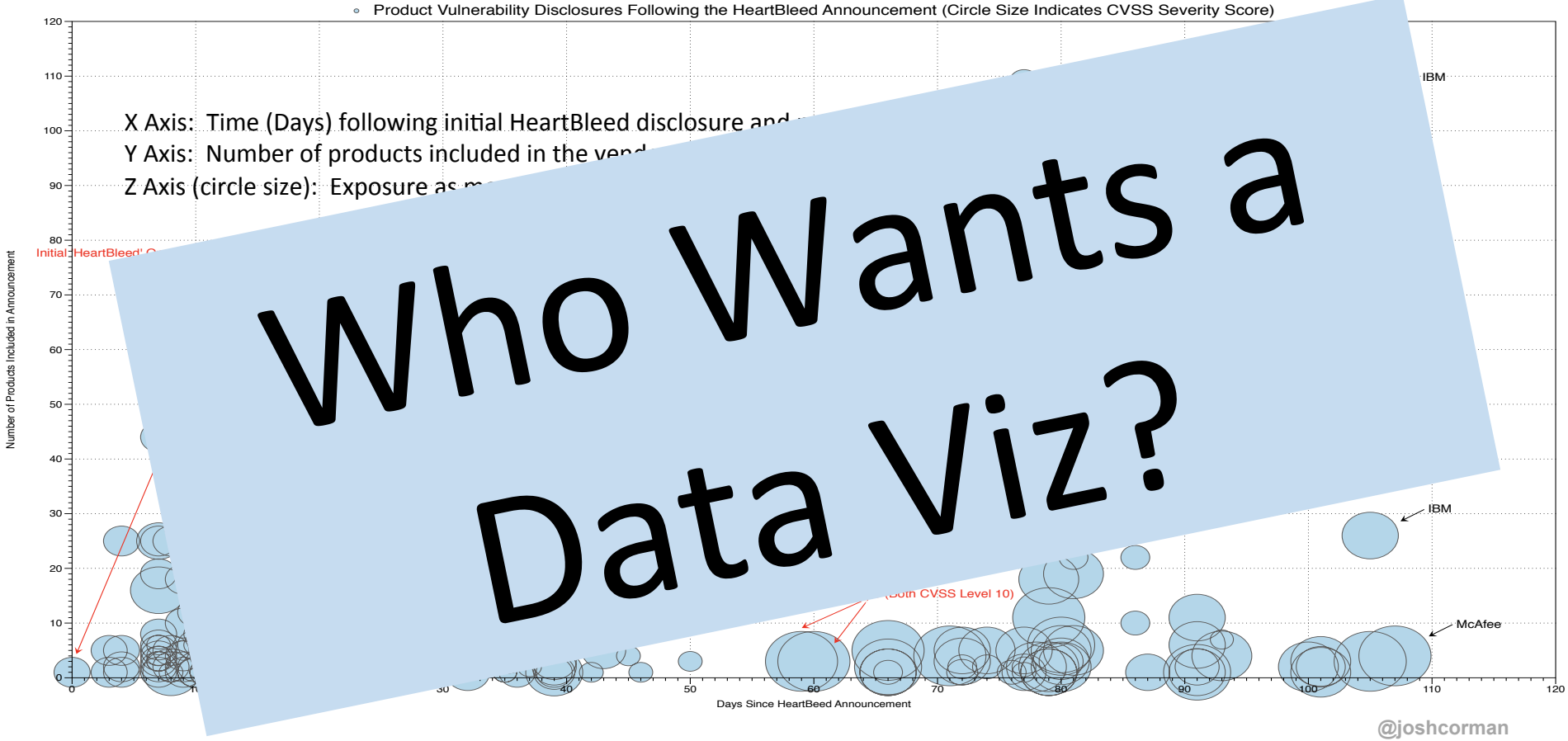
Current approaches

AREN'T WORKING

TAKE COSTS OUT OF YOUR SUPPLY CHAIN



COMMERCIAL RESPONSES TO OPENSSL



Who Wants a Data Viz?

@joshcorman

COLUMNS

Almost Too Big to Fail

DAN GEER AND JOSHUA CORMAN

Dan Geer is the CISO for In-Q-Tel and a security researcher with a quantitative bent. He has a long history with the USENIX Association, including officer positions, program committees, etc. dan@geer.org

Joshua Corman is the chief technology officer for Sonatype. Previously, Corman served as a security researcher and strategist at Akamai Technologies, The 451 Group, and IBM Internet Security Systems. A respected innovator, he co-founded Rugged Software and I Am the Cavalry to encourage new security approaches in response to the world's increasing dependence on digital infrastructure. He is also an adjunct faculty for Carnegie Mellon's Heinze College, IANS Research, and a Fellow at the Ponemon Institute. Josh received his bachelor's degree in philosophy, graduating summa cum laude, from the University of New Hampshire. joshcorman@gmail.com

Both dependence on open source and adversary activity around open source are widespread and growing, but the dynamic pattern of use requires new means to estimate if not bound the security implications. In April and May 2014, every security writer has talked about whether it is indeed true that with enough eyeballs, all bugs are shallow. We won't revisit that topic because there may be no minds left to change. Unarguably:

- Dependence on open source is growing in volume and variety.
- Adversary interest tracks installed base.
- Multiple levels of abstraction add noise to remediation needs.

We begin with two open source examples.

Apache Struts CVE-2013-2251, July 6, 2013 - CVSS v2 9.3
Apache Struts is one of the most popular and widely depended upon open source projects in the world. As such, when this highly exploitable vulnerability was discovered, it was promptly used to compromise large swaths of the financial services sector. While Heartbleed (see below) got full media frenzy, many affected by 2013-2251 learned of the problem from FBI victim notifications under 42 U.S.C. § 10607. The FS-ISAC issued guidance [1] telling institutions (read, victims) to scrutinize the security of third-party and open source components throughout their life cycle of use. It is not noteworthy that an open source project could have a severe vulnerability; what is of note is that this flaw went undetected for at least seven years (if not a lot longer from WebWork 2/pre-Struts 2 code base)—an existence proof that well-vetted code still needs a backup plan.

OpenSSL (Heartbleed) CVE-2014-0160, April 7, 2014 - CVSS v2 5.0
The Heartbleed vulnerability in OpenSSL garnered tremendous media and attacker activity this past April. While only scored with a CVSS of 5.0, it is a "5 with the power of a 10" since sniffing usernames, passwords, and SSL Certificates provides stepping stones to far greater impact. In contrast to the Struts bug above, this flaw was introduced only two years prior, but it, too, went unnoticed by many eyeballs—it was found by bench analysis [2].

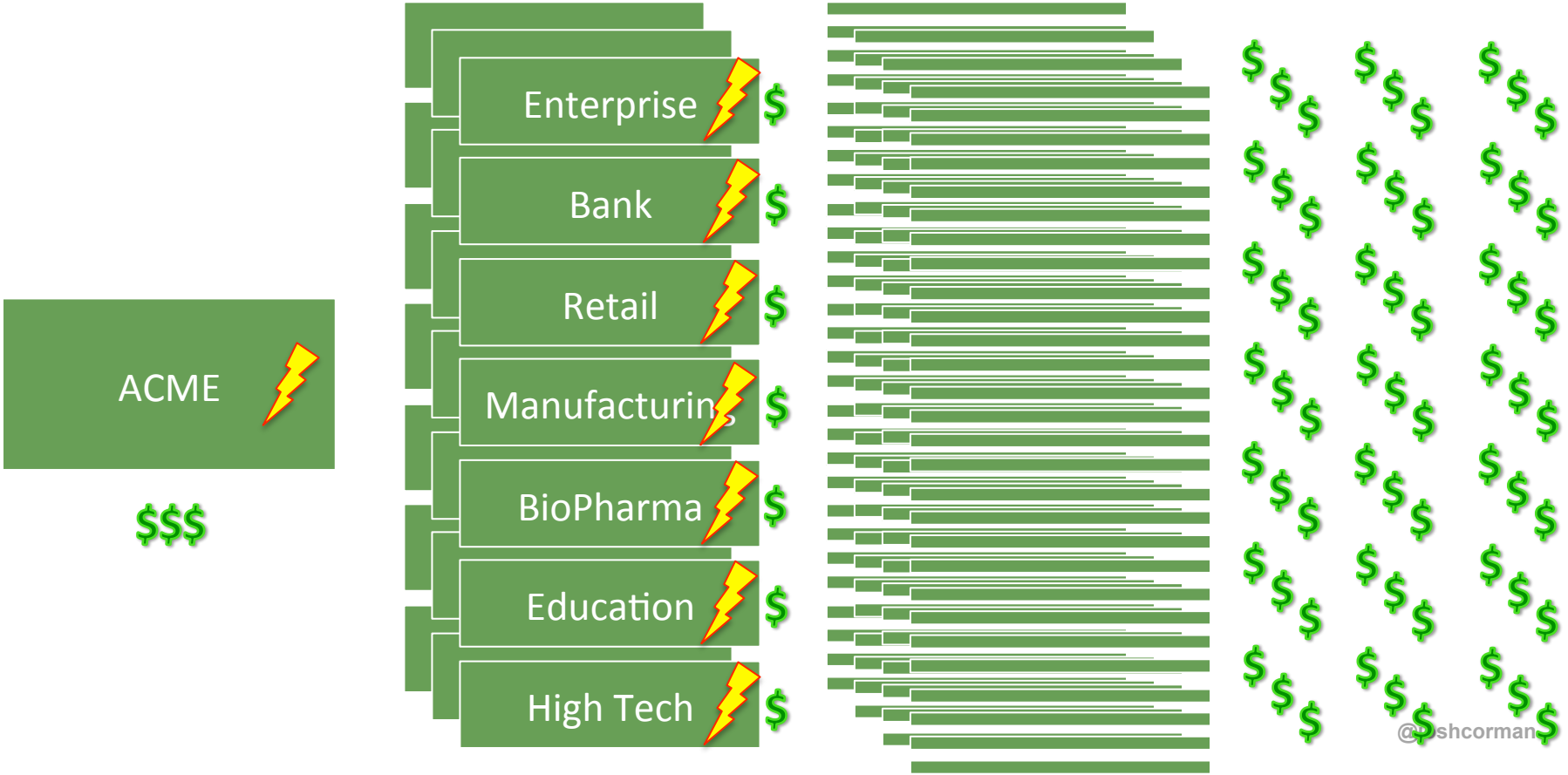
Dependence on Open Source Is Growing

Sonatype, home to author Corman, serves as custodian to Central Repository, the largest parts warehouse in the world for open source components. At the macro level, open source consumption is exploding in Web applications, mobility, cloud, etc., driven in part by increasingly favorable economics. Even (risk averse, highly regulated) government and financial sectors, which previously resisted "code of unknown origin/quality/security," have begun relaxing their resistance. According to both Gartner surveys and Sonatype application analysis, 80–% of modern applications are not so much written as assembled from third-party building blocks. It is the open source building blocks that are taking the field, and not just for commodity applications (see Figure 1).

For the 41%
390 days
CVSS 10s 224 days

https://www.usenix.org/system/files/login/articles/15_geer_0.pdf

TRUE COSTS (& LEAST COST AVOIDERS)



PRESS RELEASES

Reps. Royce, Jenkins to Shore Up Security of Government Used Software

Washington, Dec 4, 2014 | Saat Alety (202-225-4111) | 0 comments

Today, U.S. Representatives Ed Royce (R-CA) and Lynn Jenkins (R-KS) introduced H.R. 5793, the "Cyber Supply Chain Management and Transparency Act of 2014." The legislation will ensure all contractors of software, firmware or products to the federal government provide the procuring agency with a bill of materials of all third party and open source components used, and demonstrate that those component versions have no known vulnerabilities.

"As a house is only as strong as its foundation, it's no wonder cyber attacks are on the rise with reports showing 71 percent of software contains components with critical vulnerabilities," said Rep. Royce. "This bill protects our nation's cyber infrastructure by ensuring the building blocks that make it up are secure and uncompromised."

"I have voiced concerns to the government agencies in charge of healthcare.gov that our nation's cyber infrastructure was vulnerable and not secure," said Rep. Jenkins. "But the problem is not limited to one website; the entire federal government lacks guidelines for website security. This vital legislation will put the appropriate checks and balances in place to ensure that the government has the tools it needs to create a more sound and secure system for taxpayers."

H.R. 5793 “Cyber Supply Chain Management and Transparency Act of 2014”

- Elegant Procurement Trio

1) Ingredients:

- Anything sold to $PROCURING_ENTITY must provide a Bill of Materials of 3rd Party and Open Source Components (along with their Versions)

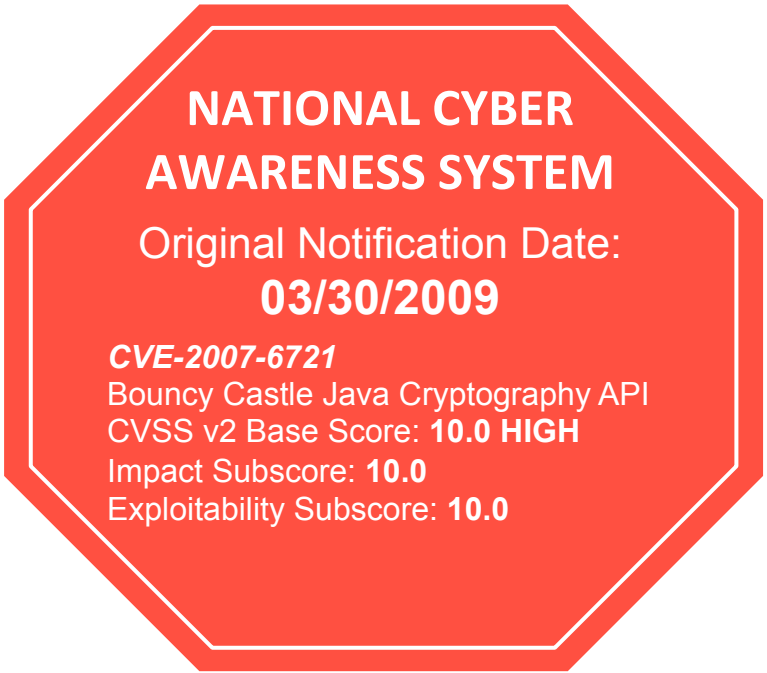
2) Hygiene & Avoidable Risk:

- …and cannot use known vulnerable components for which a less vulnerable component is available (without a written and compelling justification accepted by $PROCURING_ENTITY)

3) Remediation:

- …and must be patchable/updateable – as new vulnerabilities will inevitably be revealed

PROCUREMENT TRIO + BOUNCY CASTLE



In 2013, **4,000**
organizations downloaded
a version of Bouncy Castle
with a level 10 vulnerability

20,000 TIMES ...

Into **XXX,XXX** Applications...

SEVEN YEARS

after the vulnerability was fixed

TWO LITTLE WORDS

KNOWN VULNERABILITIES

Hot off the presses 2015 VZ DBIR

NOT ALL CVES ARE CREATED EQUAL.

If we look at the frequency of exploitation in Figure 11, we see a much different picture than what's shown by the raw vulnerability count of Figure 12. Ten CVEs account for almost 97% of the exploits observed in 2014. While that's a pretty amazing statistic, don't be lulled into thinking you've found an easy way out of the vulnerability remediation rodeo. Prioritization will definitely help from a risk-cutting perspective, but beyond the top 10 are 7 million other exploited vulnerabilities that may need to be ridden down. And therein, of course, lies the challenge; once the "mega-vulns" are roped in (assuming you could identify them ahead of time), how do you approach addressing the rest of the horde in an orderly, comprehensive, and continuous manner over time?

About half of the CVEs exploited in 2014 went from publish to pwn in less than a month.

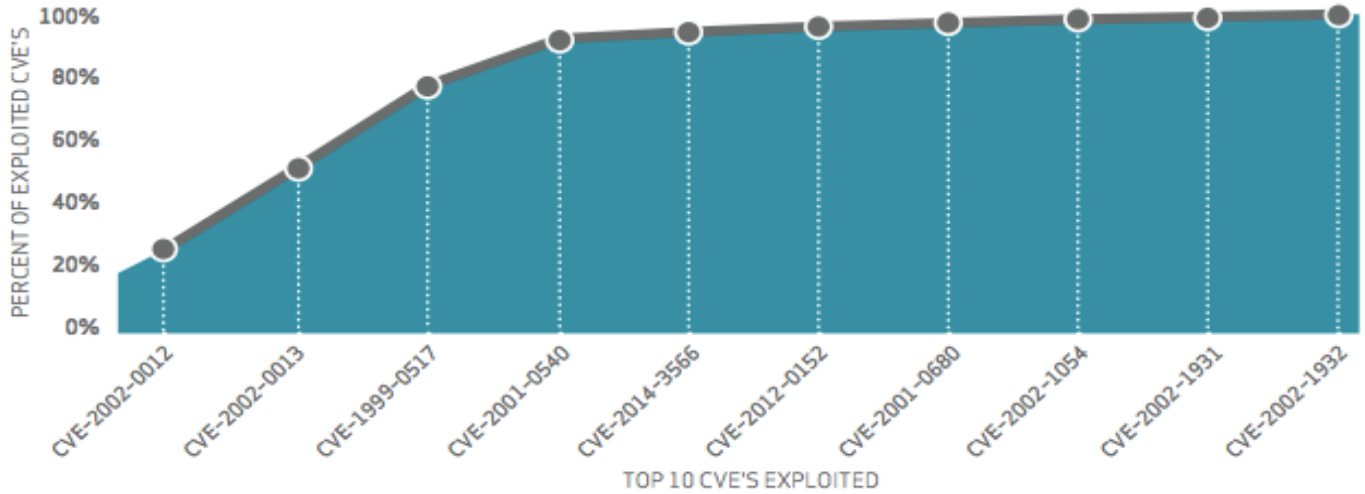
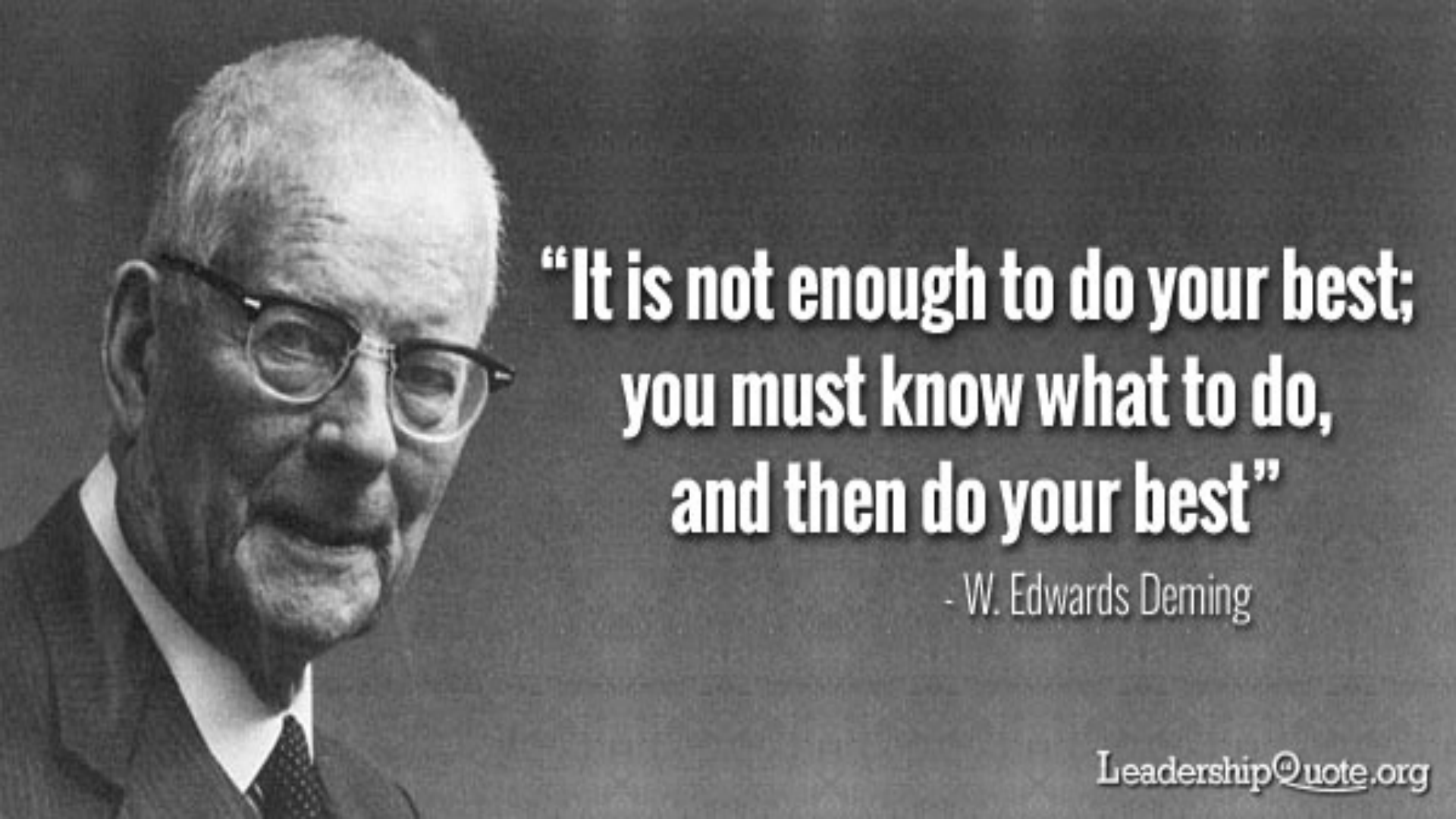
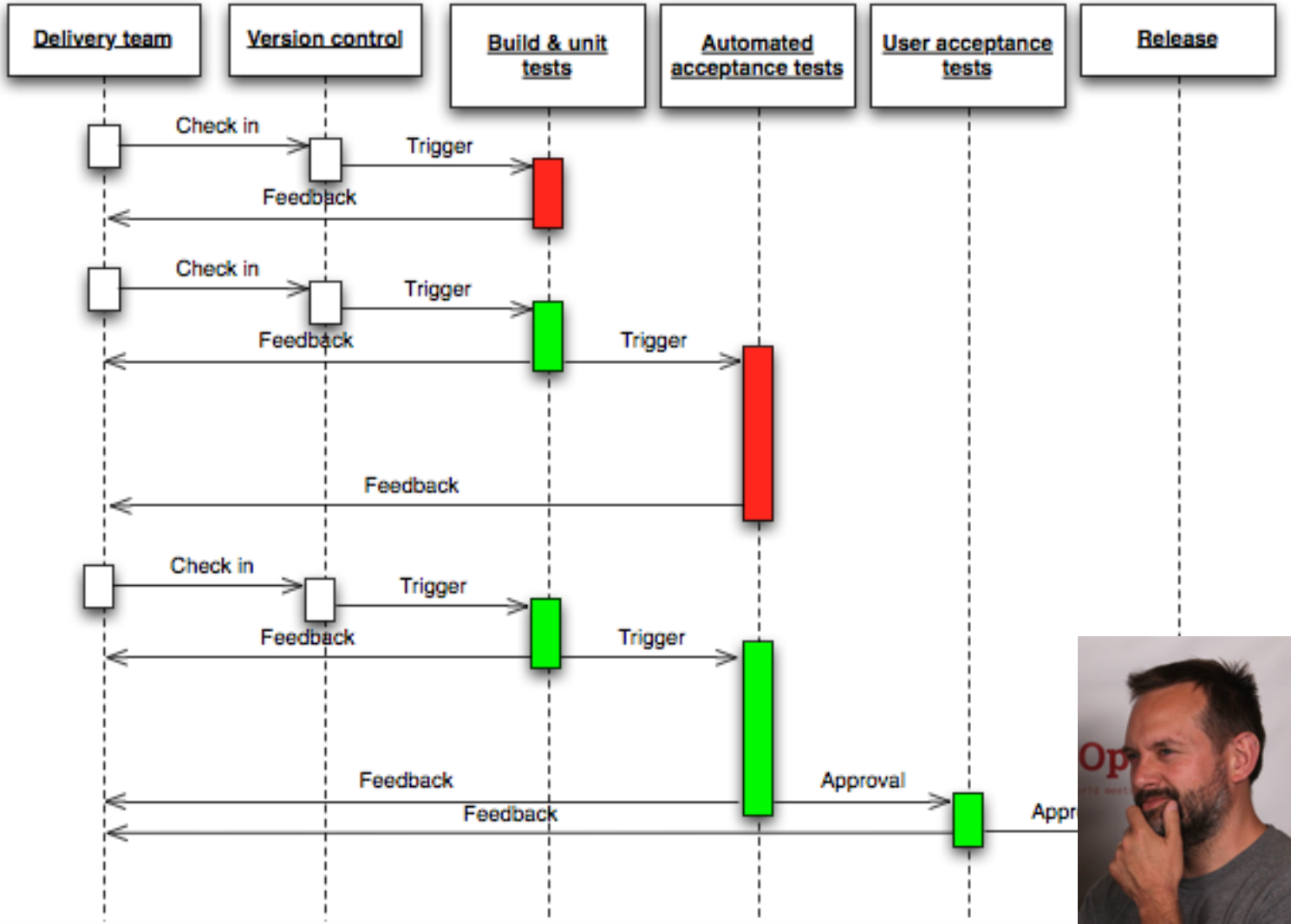


Figure 11.

Cumulative percentage of exploited vulnerabilities by top 10 CVEs


"It is not enough to do your best;
you must know what to do,
and then do your best"
- W. Edwards Deming
LeadershipQuote.org

SW Supply Chain Intelligence Goes Here

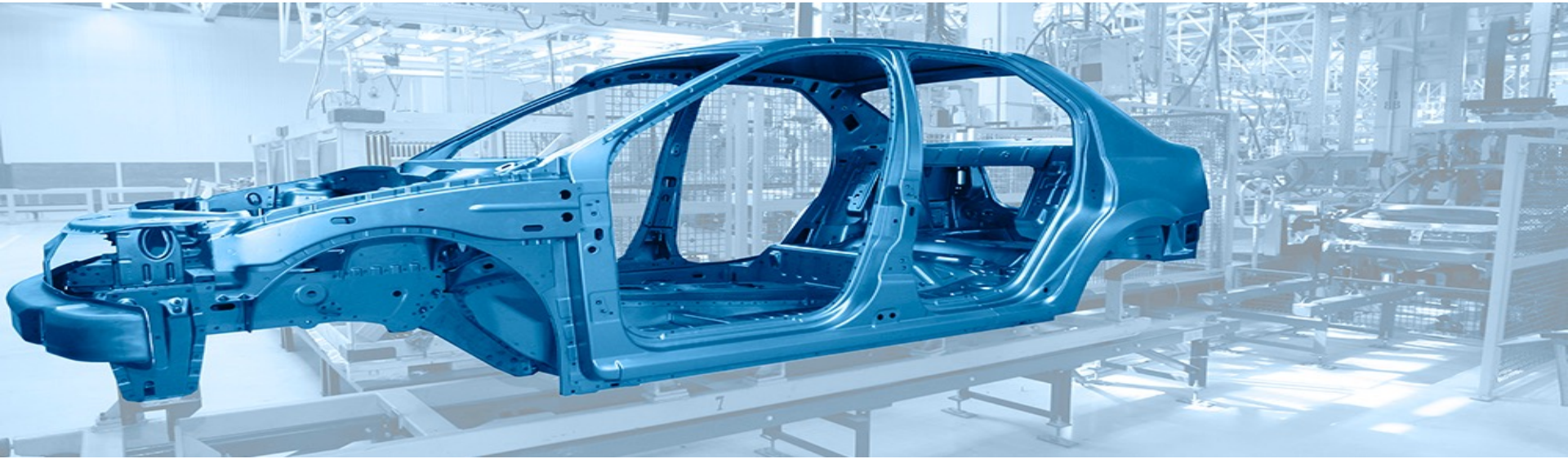


Software Supply Chain Hygiene

Use better & fewer suppliers

Use higher quality parts

Track what you use and where



1) Less Unplanned /Unscheduled Work (and painful Context Switching)

2) Fewer Service Interruptions and Break-Fixes

3) Faster MTTI/MTTR when things do go wrong

> 30% Boost

Conclusions / Apply!

- Idea: A full embrace of Deming is a SW Supply Chain:
  - Fewer/Better Suppliers
  - Highest Quality Supply
  - Traceability/Visibility throughout Manufacturing / Prom & Agile Recall
- Benefits: Such rigor enables:
  - Even FASTER: Fewer instances of Unplanned/Unscheduled Work (**ALSO CONTEXT SWITCHES)**
  - More EFFICIENT: Faster MTTD/MTTR
  - Better QUALITY/RISK: Avoid elective/avoidable complexity/risk
- Urgency: It's OpenSeason on OpenSource
  - And our dependence on connected tech is increasingly a public safety issue
- Coming Actions: "Known Vulnerabilities" Convergence
  - Lawmakers, Insurers, Lawyers, etc. are converging

A TALE OF TWO QUAKES

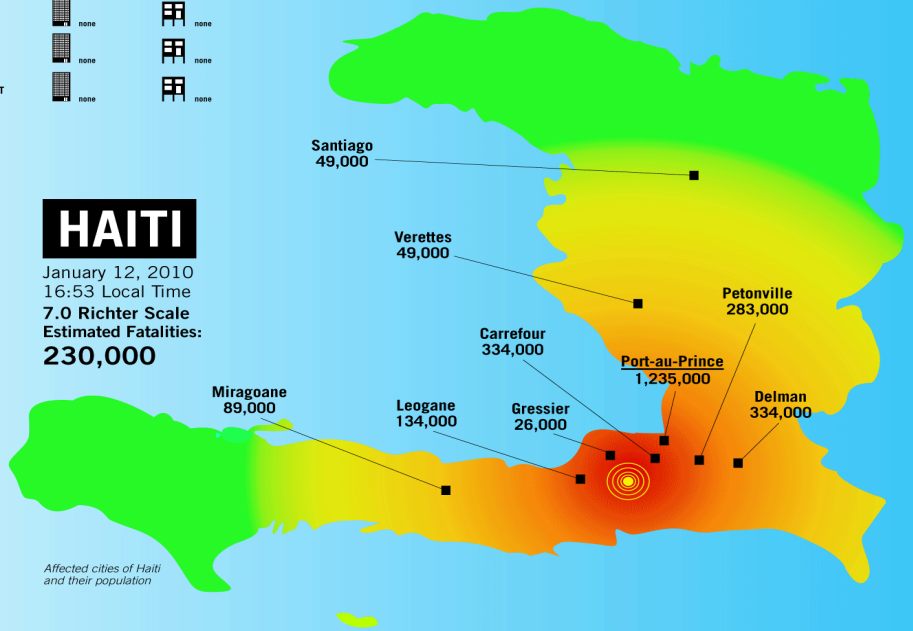
In the span of two months, two massive earthquakes struck in Haiti and Chile. But while the temblor in Chile registered much higher on the Richter scale, the loss of life and damage in Haiti was far more severe. Why is that? Chile—which has experienced serious earthquakes in recent decades—has a robust building code to make sure buildings are earthquake resistant; Haiti has no code to speak of. And a look at both quake's scores on the Modified Mercali Intensity Scale—which is used to measure how earthquakes affect those experiencing them—shows that while Chile's quake may have been stronger overall, Haiti had a larger population and more urban areas hit by more intense and damaging shaking.

MODIFIED MERCALI INTENSITY SCALE

	Shaking	Structural Damage to Resistant Buildings	Structural Damage to Vulnerable Buildings
X	EXTREME	very heavy	very heavy
IX	VIOLENT	heavy	heavy
VIII	SEVERE	moderate/ heavy	heavy
VII	VERY STRONG	moderate	moderate/ heavy
VI	STRONG	light	moderate
V	MODERATE	very light	light
IV	LIGHT	none	none
II-III	WEAK	none	none
I	NOT FELT	none	none

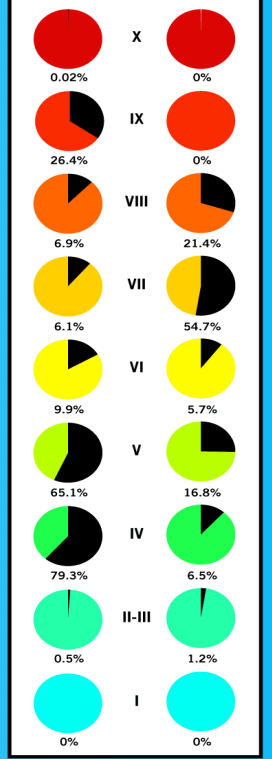
HAITI

January 12, 2010
16:53 Local Time
7.0 Richter Scale
Estimated Fatalities:
230,000



Affected cities of Haiti and their population

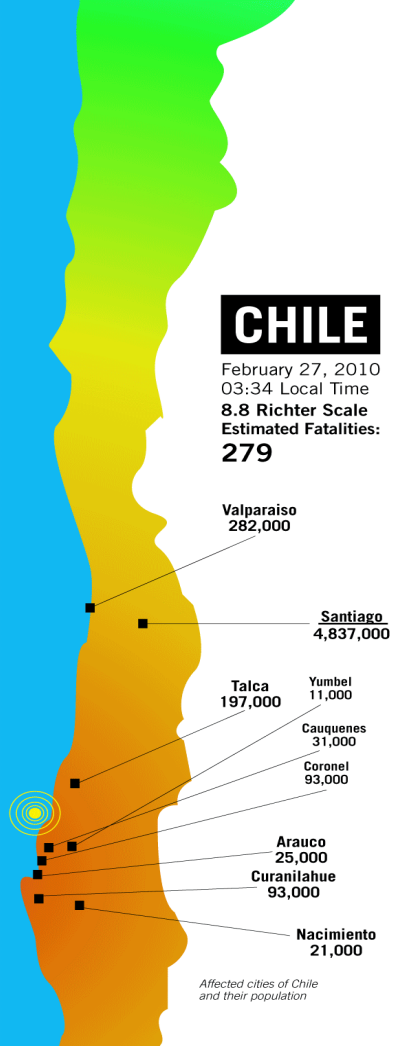
POPULATION AFFECTED
(percentage)



SOURCE U.S. Geological Survey
A collaboration between GOOD and karlssonwilker

CHILE

February 27, 2010
03:34 Local Time
8.8 Richter Scale
Estimated Fatalities:
279



Affected cities of Chile and their population

Even Faster:
How Rugged DevOps & SW Supply Chains Attack Developer Waste

Josh Corman
@joshcorman