

Teaching Elephants to Dance (and Fly!)

A Developer's Journey to Digital Transformation

bit.ly/teachingelephantsfederal2017

@burrsutter



W A S H I N G T O N

NP

NOT POLITICAL

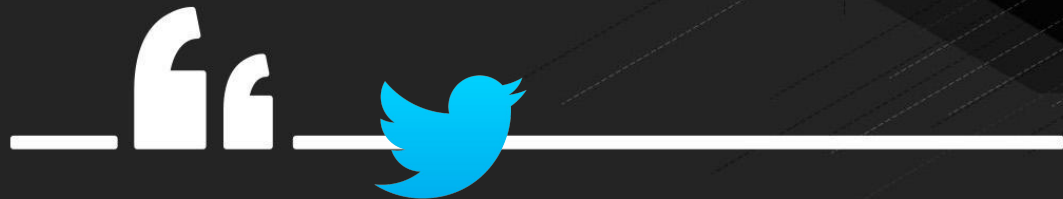
FEDERAL AUDIENCES STRONGLY CAUTIONED

CONTENT CONTAINS PERVASIVE USE OF ELEPHANT REFERENCES IN PARABLES, IDIOMS, AND METAPHORS THAT ARE APOLITICAL BUT MAY NOT BE APPROPRIATE TO UNCAUTIONED VIEWERS.



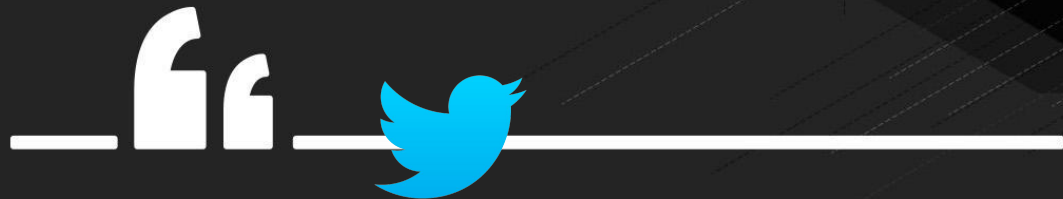






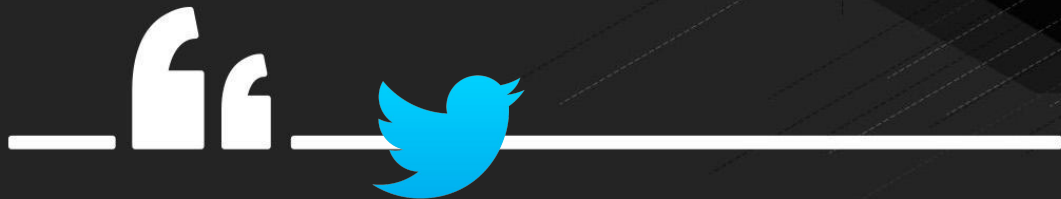
Government will never run the way
Silicon Valley runs, because by
definition, democracy is messy.
Part of government's job, by the way,
is dealing with problems that no one
wants to deal with ...





And that's consistent with this nation,
with who we are ... there aren't a lot of
countries where one of your Founding
Fathers has an idea to fly a kite in a
thunderstorm and helps to fundamentally
change how we think about electricity...





A place where women solved the equations
to take us into space — even though they
weren't always acknowledged. A nation
whose engineers brought us the Internet.
Innovation is in our DNA.

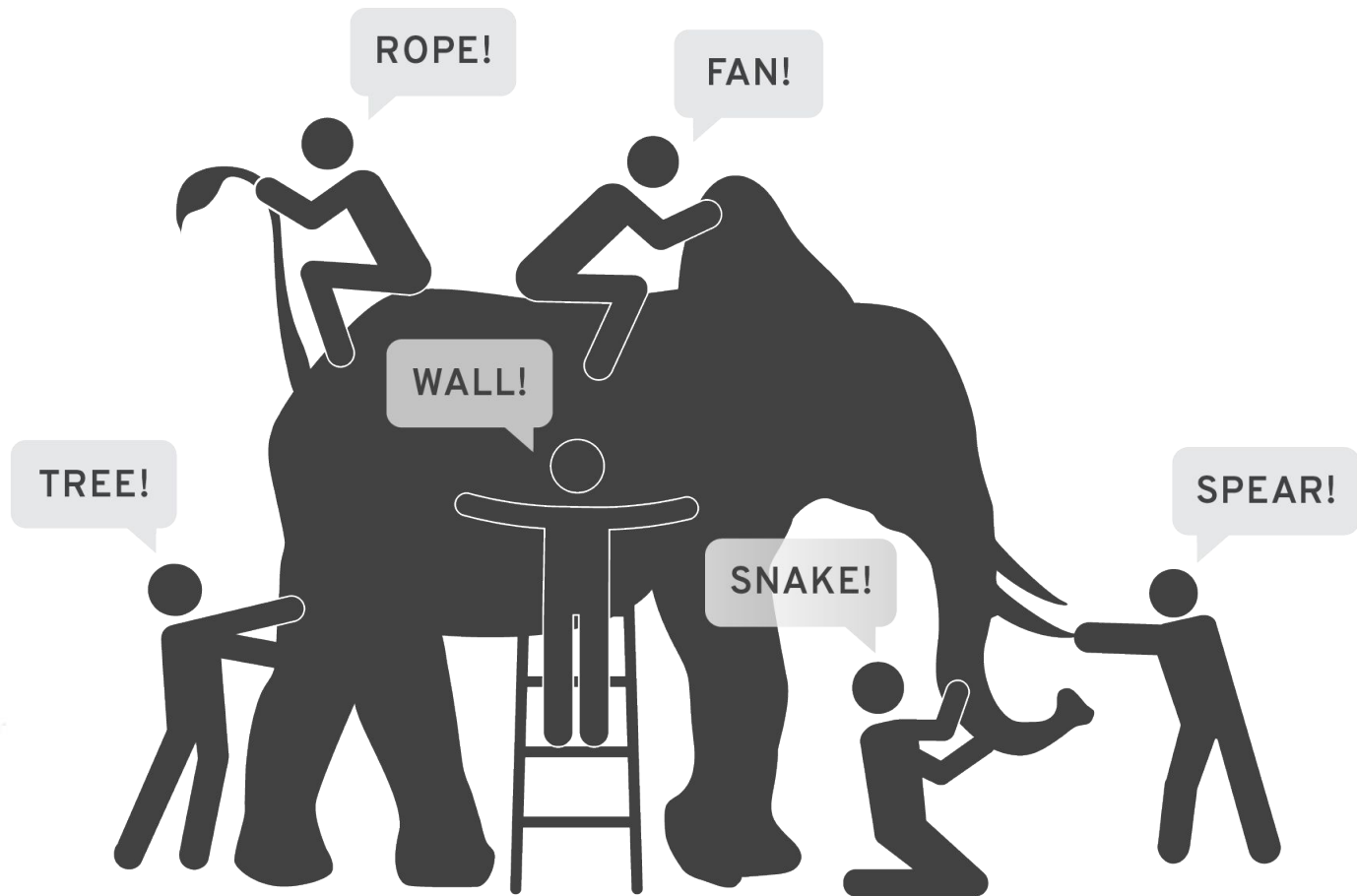
Former President of the United States





6 Blind Men

(and the elephant)





Perspective & Assumptions

What we see depends on ...

Who we are (worldview).

What we're looking for.

Where we're standing.

What we know (or don't).





Burdened and lumbering?



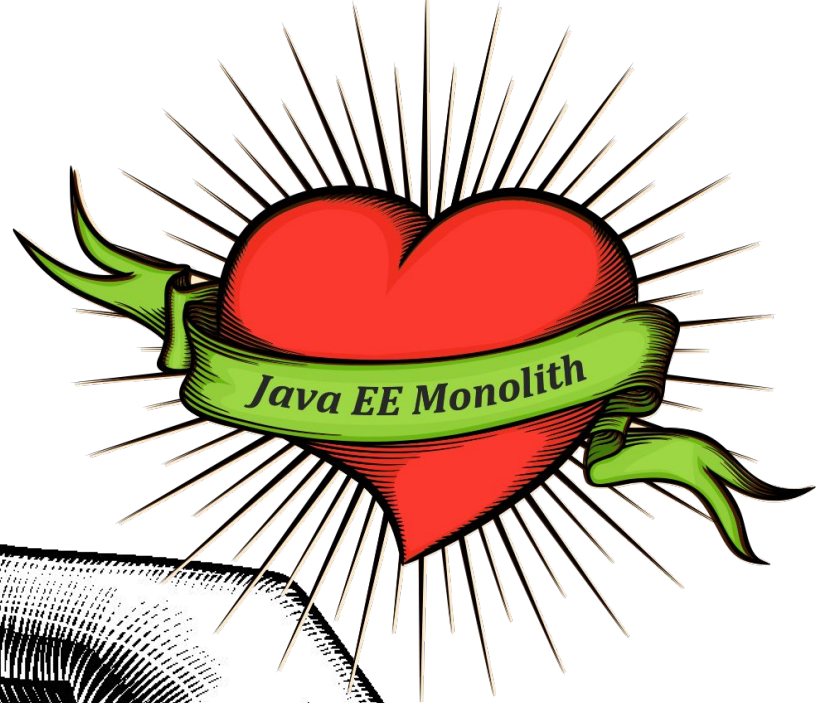
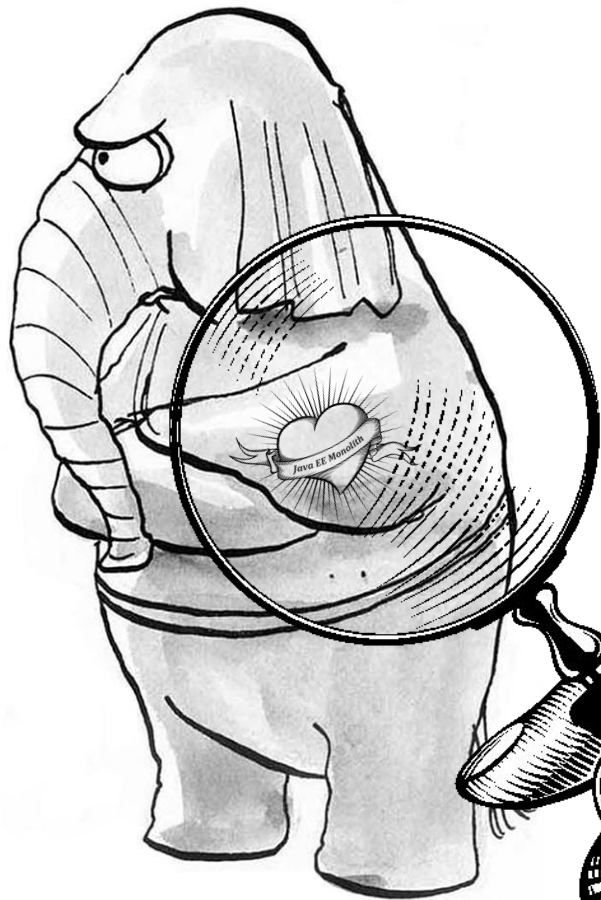
Or remover of obstacles?

A Developer's Reality

What most of us are up against.

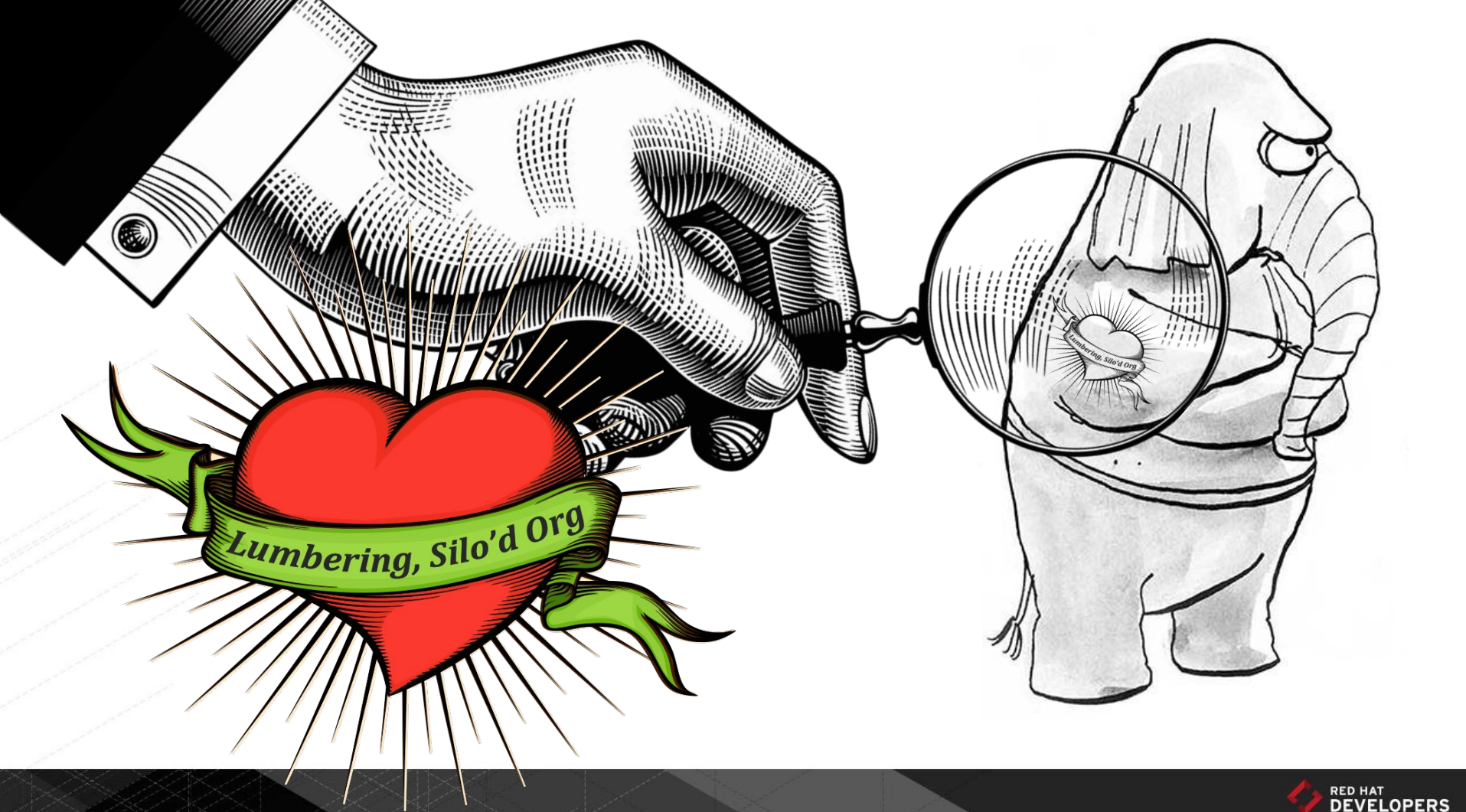


**“I suppose I’ll be the one
to mention the elephant in the room.”**



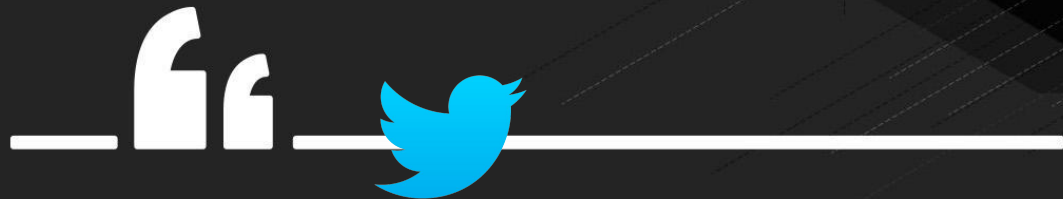


“Unfortunately, there’s another elephant in the room.”





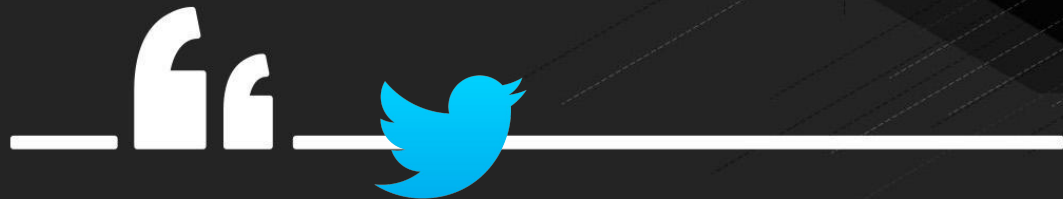
Private Sector Stats



The average life expectancy of a Fortune 500 company has declined from around 75 years half a century ago to less than 15 years today.

Deloitte Shift Index

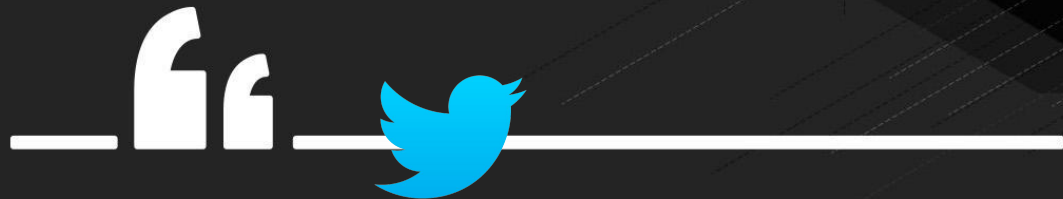




By 2020, more than 75% of the
S&P 500 will be companies
that we have not heard of yet.

Professor Richard Foster,
Yale University, in Lean Enterprise

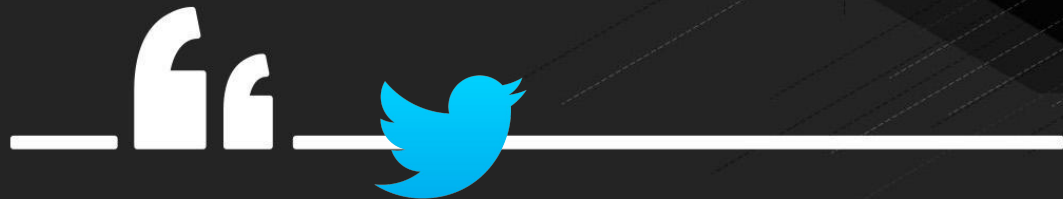




By 2020 every business
will become a digital
predator or digital prey.

Nigel Fenwick,
Forrester Research, 2015

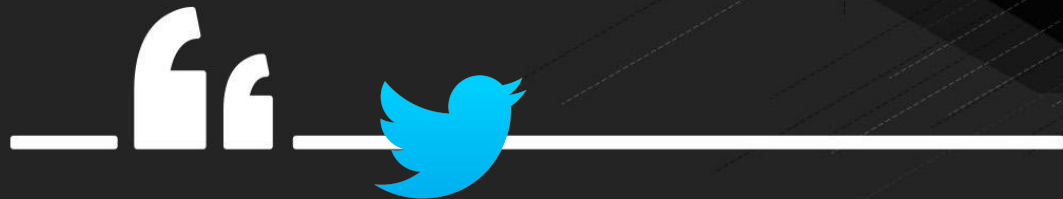




87% of surveyed executives
believe digital technologies
will disrupt their industries ...

MIT Sloan Management Review, 2016

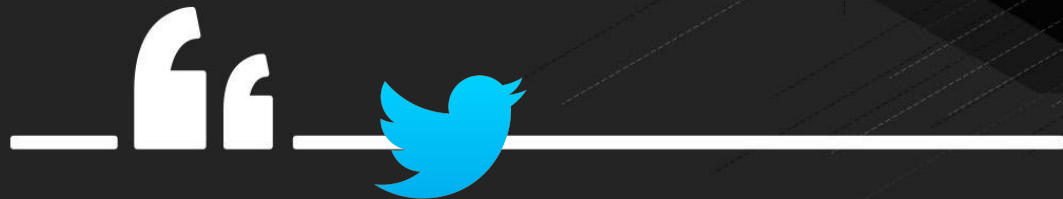




... yet only 44% indicated their organizations were taking appropriate measures to avert disruption.

MIT Sloan Management Review, 2016





Only 11% of organizations across industries indicated their existing in-house talent has the competitive skills necessary for success in the digital economy.

MIT Sloan Management Review, 2016



Private Sector Similarities?

Mission, scale, and the need
for speed (without disruption).

facebook

<http://benbarry.com/project/facebook-little-red-book>

Facebook was not
originally created to
be a company.



Facebook was not
originally created to
be a company.

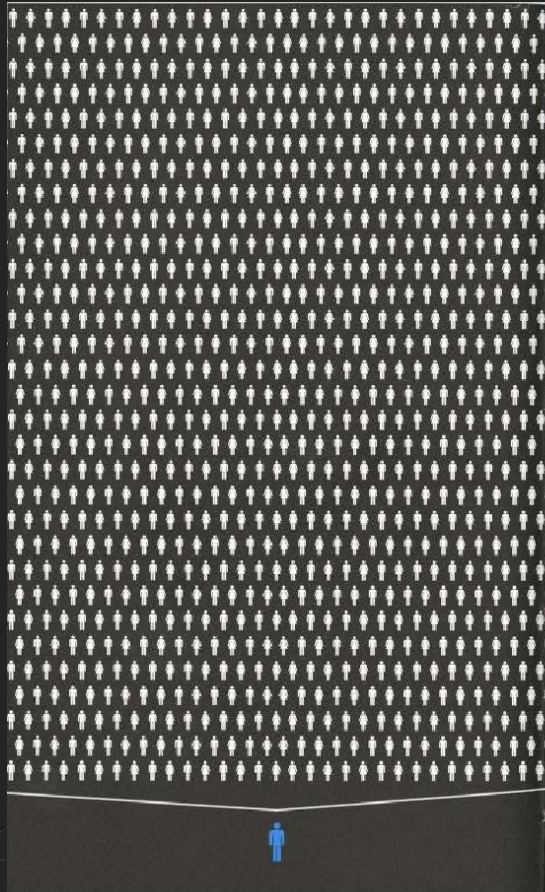
It was built to
accomplish a social
mission—to make
the world more open
and connected.

**CHANGING
HOW PEOPLE
COMMUNICATE**



**WILL ALWAYS
CHANGE
THE WORLD**

Changing how ideas spread changes how society functions, changes how people speak, changes how people live, changes how people tell stories, changes how people fall in love, changes who people consider friends, changes who people consider strangers, changes what being alone means.

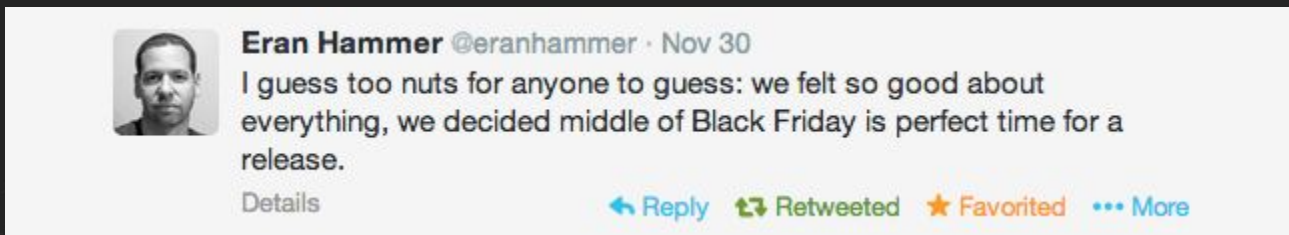


That means each
Facebook engineer is
responsible for approxi-
mately 1,000,000
people using Facebook.



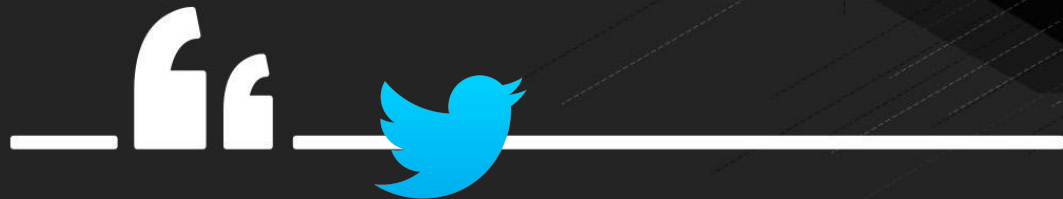
(Public-Sector-Scale) Transformers

On Black Friday (2013) the Walmart servers didn't go over 1% CPU utilization and the team deployed with 200,000,000 users online.



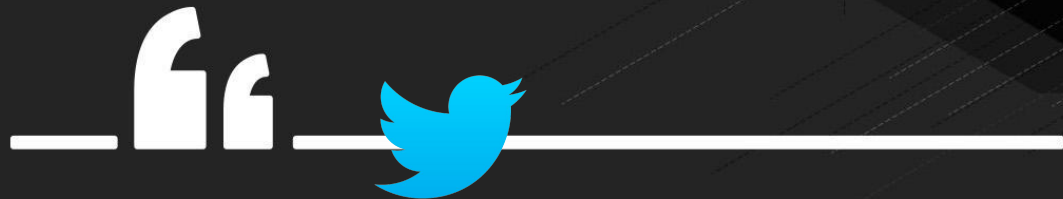
<http://www.nearform.com/nodecrunch/node-js-becoming-go-technology-enterprise/>

NETFLIX



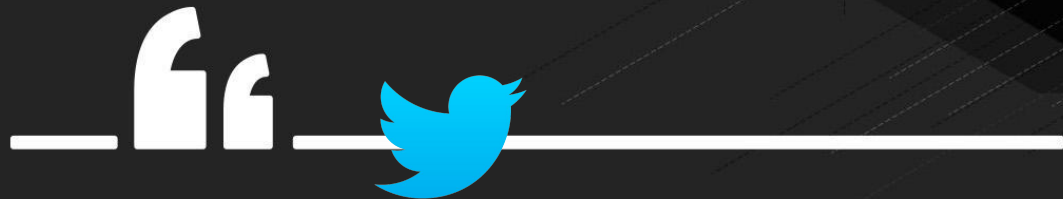
I'm very excited to say we also have a
Chaos Monkey, based on the Netflix model ...
it's a script that causes havoc, basically it
tries to screw things up in production ...





So if one day you're reading the
Washington Post and you see ... that the
Chaos Monkey has shut down the
Department of Homeland Security ...



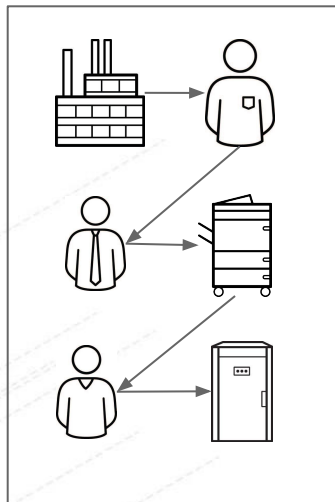


... take it as a success. It will mean
that our DevOps practice is out there.
Mark Schwartz, CIO, U.S. Citizenship
and Immigration Services



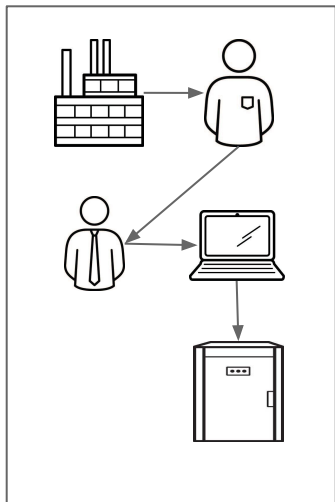
Business & IT: 80s to Future

ChUI



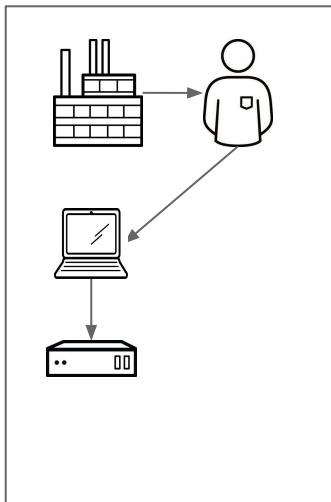
80s

GUI



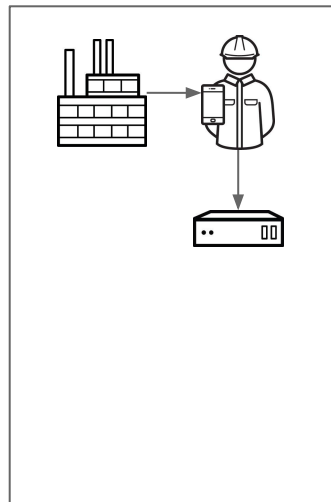
90s

Web



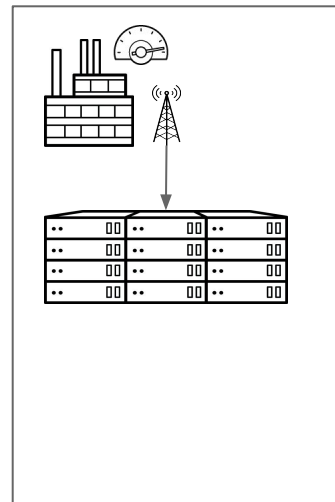
00s

Mobile

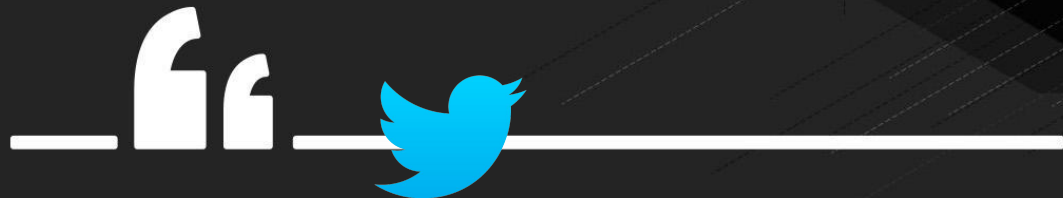


10s

Things



In Need of a Cultural Revolution?



By 2018, 90 percent of organizations attempting to use DevOps without specifically addressing their cultural foundations will fail.

Gartner, *Gartner Highlights 5 Steps to Delivering an Agile I&O Culture*



“

High-performing organizations
are decisively outperforming
their lower performing peers ...

”

200X

200X More Deployments

<https://puppet.com/resources/whitepaper/2016-state-of-devops-report>

24X

24X Faster Recovery from Failure

<https://puppet.com/resources/whitepaper/2016-state-of-devops-report>

3X

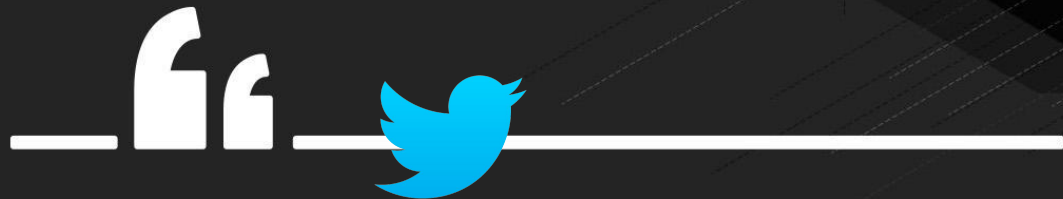
3X Lower Change Failure Rate

<https://puppet.com/resources/whitepaper/2016-state-of-devops-report>

2555X

2555X Shorter Lead Times

<https://puppet.com/resources/whitepaper/2016-state-of-devops-report>



Developer code has
NO BUSINESS VALUE
until it's deployed.



Digital Darwinism

The Developer's Journey



Re-Org to
DevOps



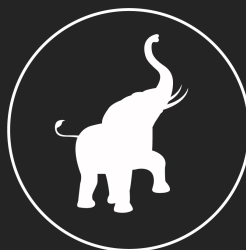
Self-Service,
On-Demand,
Elastic
Infrastructure



Automation
Puppet, Chef,
Ansible,
Kubernetes



CI & CD
Deployment
Pipeline



Advanced
Deployment
Techniques



Microservices
(and flying
elephants!)

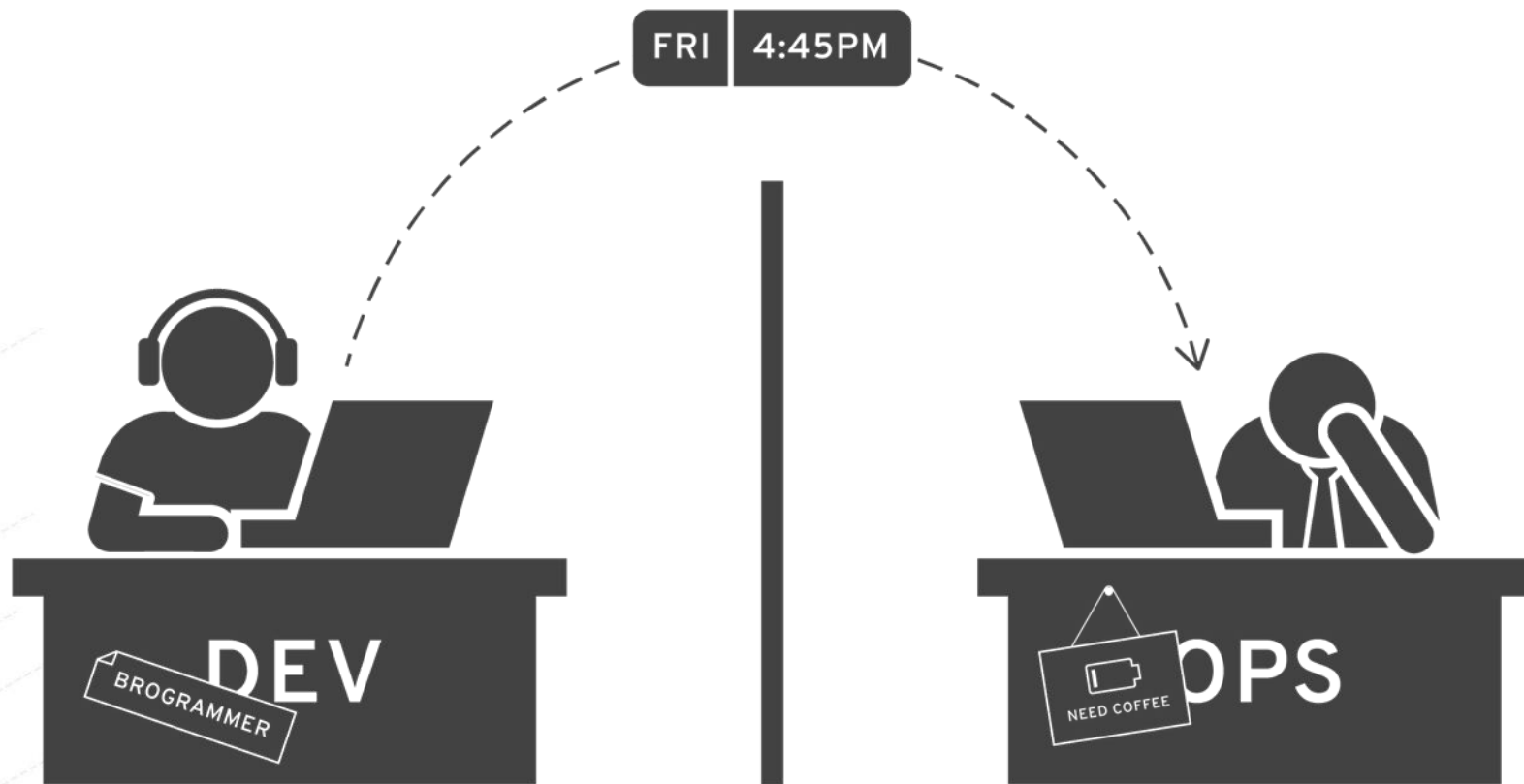


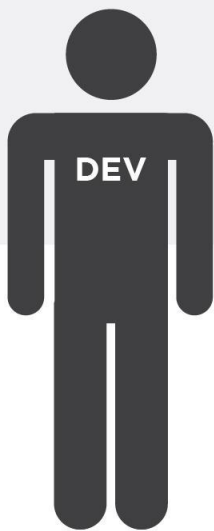
Nº 1 | Re-Org to DevOps



An Ugly Reality?

If this looks familiar, consider changing your ways.





WALL OF CONFUSION





WALL OF CONFUSION

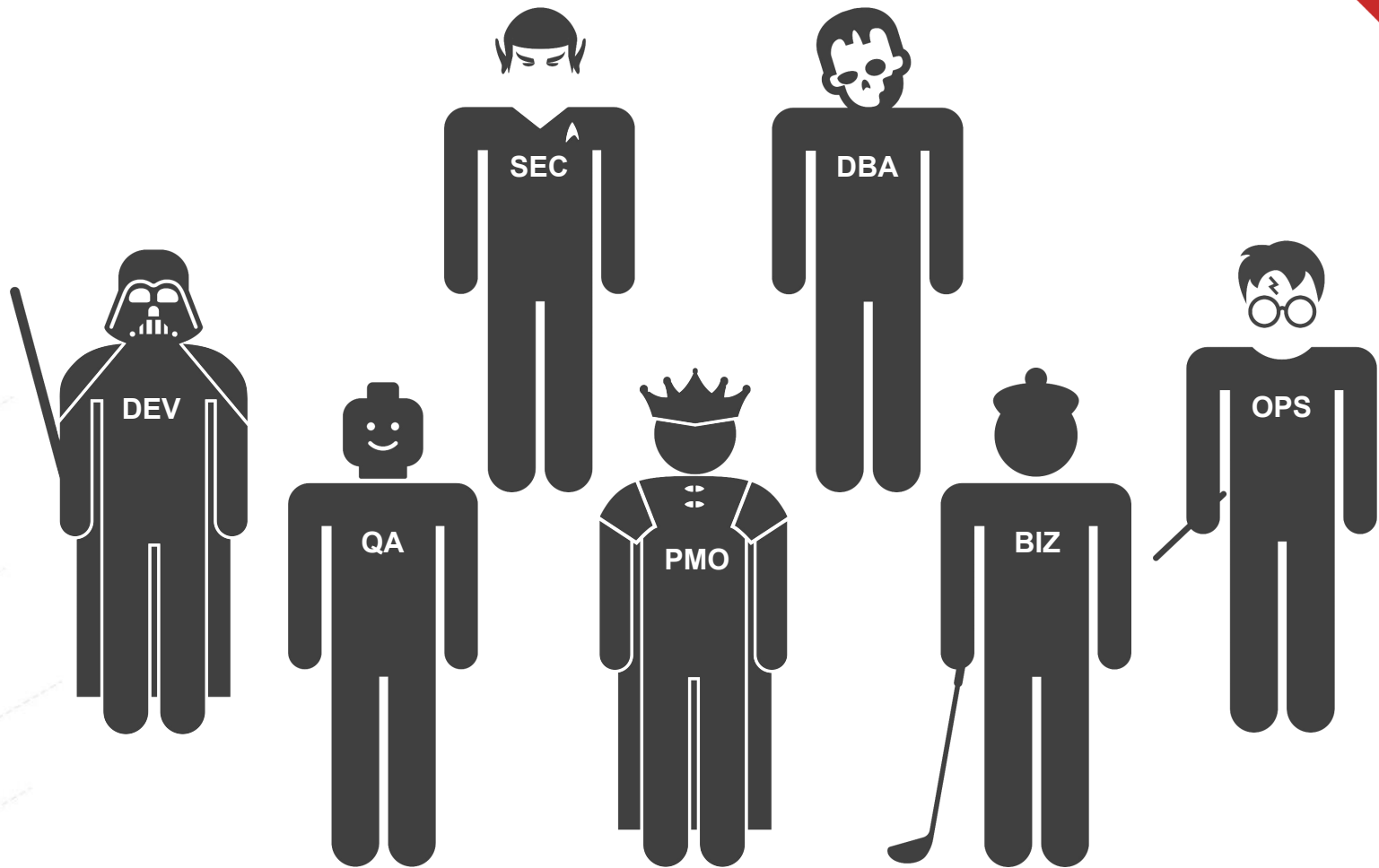


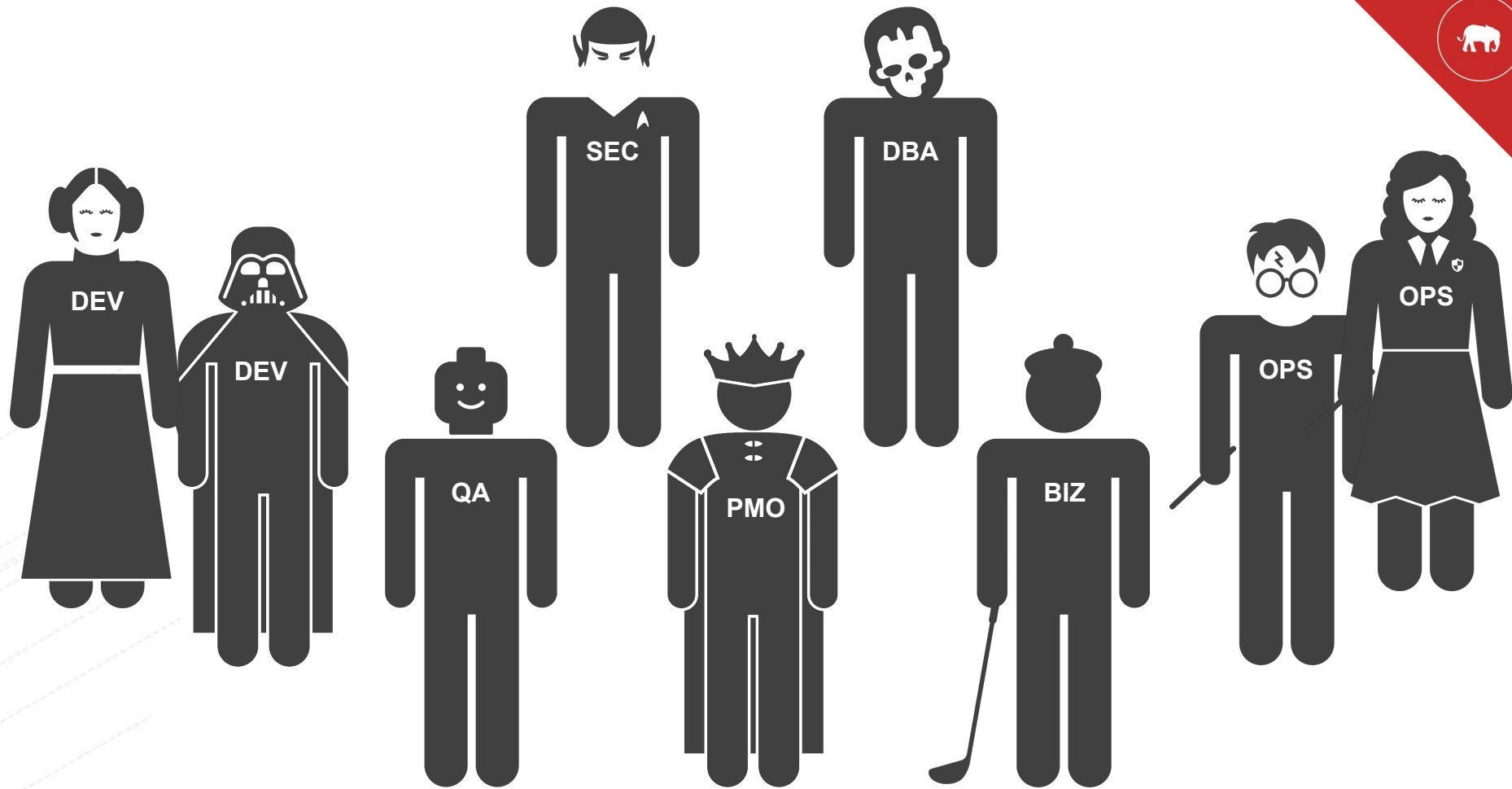




But wait— there's more!

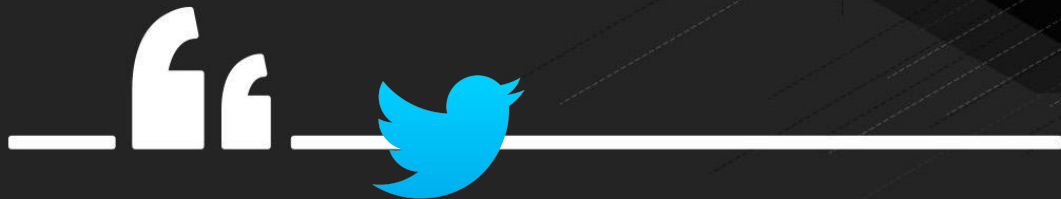
The Extended DevOps Reality/Family











Any organization that designs
a system will inevitably produce
a design whose structure is
a copy of the organization's
communication structure.

Conway's Law

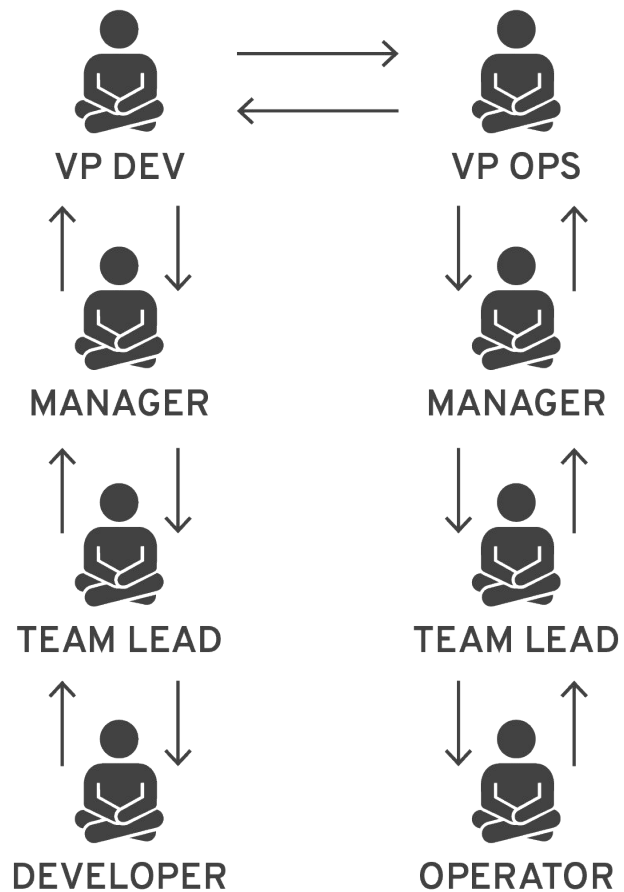


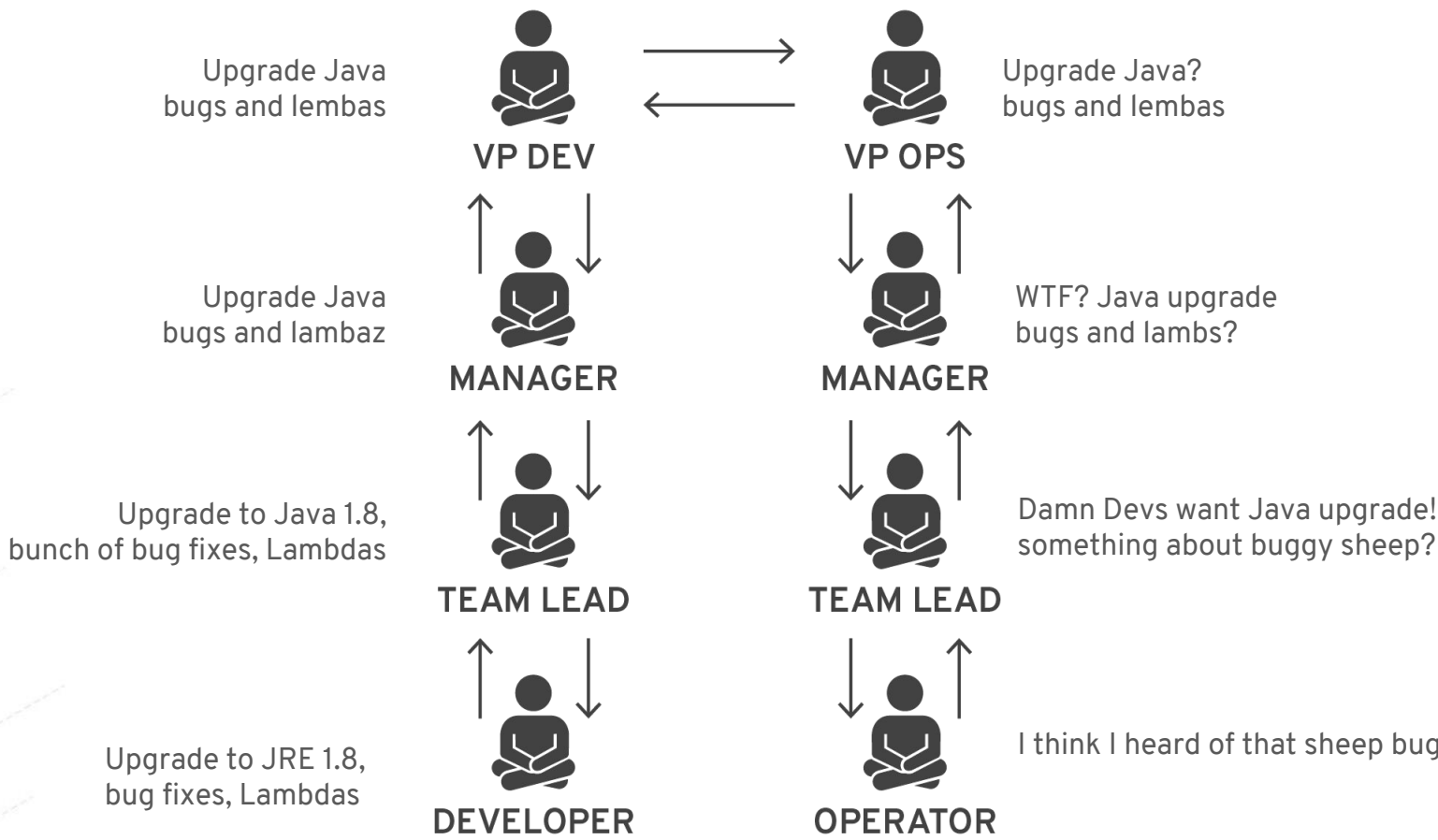


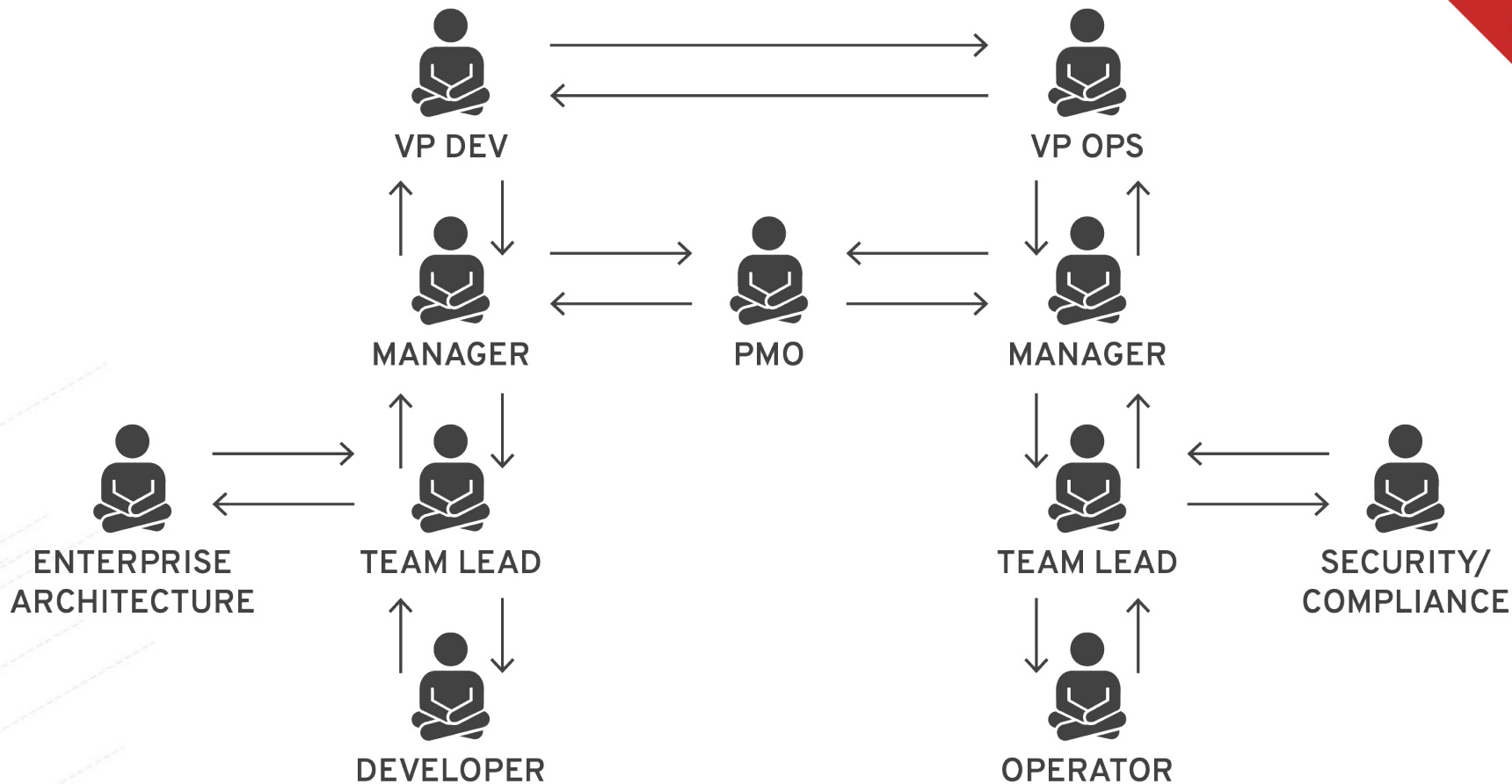
‘Telephone’

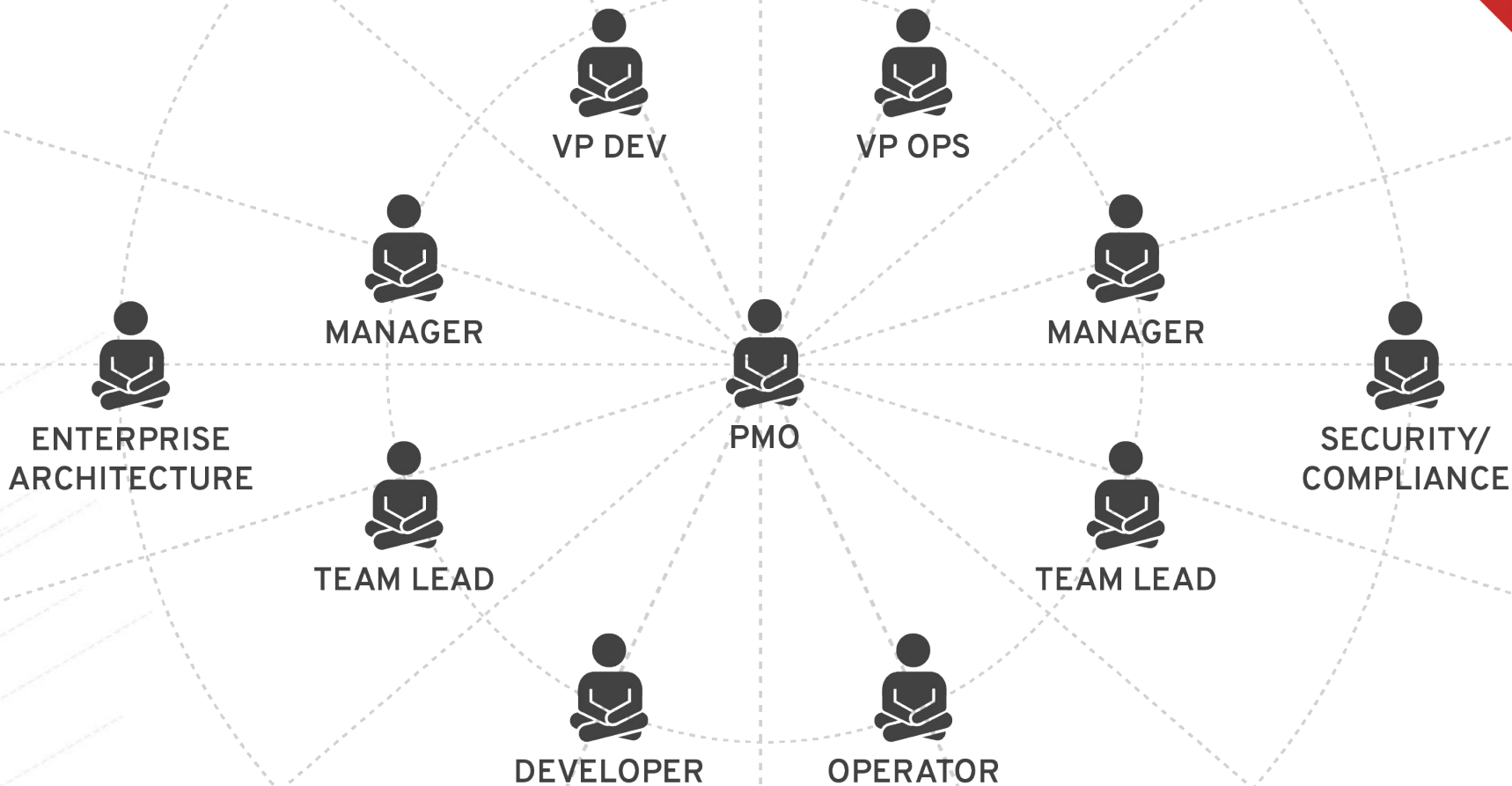
https://en.wikipedia.org/wiki/Chinese_whispers





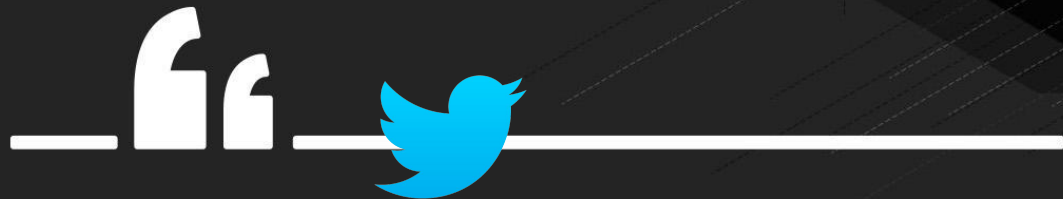








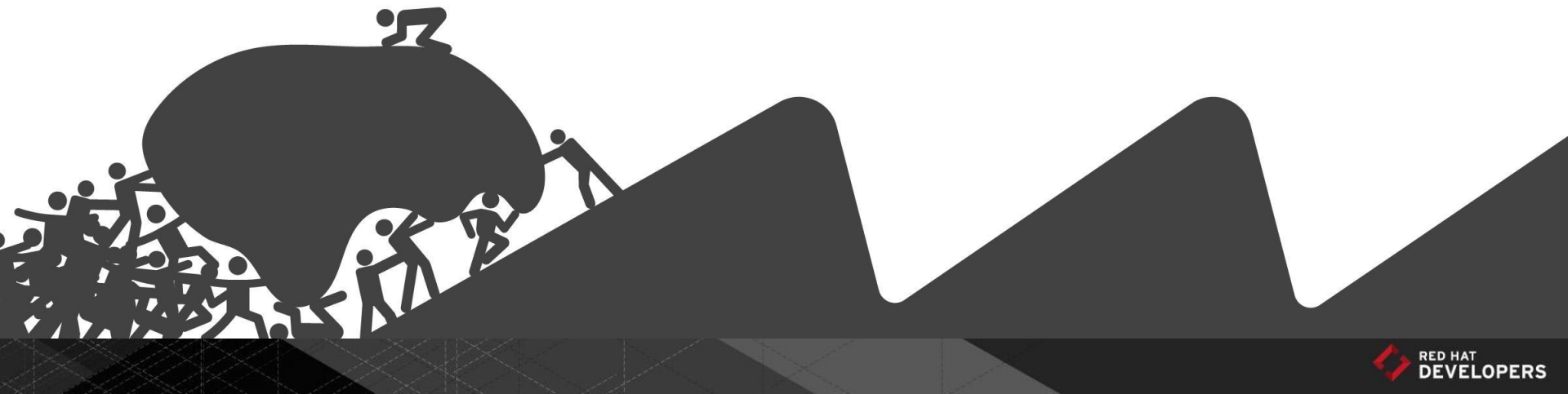
When restructuring
teams yields better
results, it illustrates
once again that ...



... software development is still
mostly a communication problem.
ThoughtWorks Radar











Burr Sutter @bursutter · Feb 16

.@RealGeneKim @botchagalupe How to advise Devs who wish to embrace #DevOps? A fair bit of the current knowledge is Ops oriented

↩ 4 ↻ 2 ❤ 4 📊



Jeffrey Sykes

@sykesjs

+ Follow

@bursutter @RealGeneKim @botchagalupe Got any ops people who might be looking for friends?

9:21 PM - 16 Feb 2017



Stuart Stevenson

@stevenson_sj

+ Follow

@bursutter @RealGeneKim @botchagalupe read the State of devops report 2014. Then 2015 then 2016. But I find 2014 has the core practices

RETWEET

1

LIKE

1



4:34 AM - 17 Feb 2017



↻ 1

❤ 1



Burr Sutter @bursutter · Feb 16

Just sitting in or actually putting hands on? :-)

Dave Neary @nearyd

@bursutter @RealGeneKim @botchagalupe Start by sitting in on a deployment.

↩ 1



Dave Neary

@nearyd

+ Follow

@bursutter Feeling the pain would be a start. I learned a lot on on-site customer visits as a developer.

9:28 PM



Jayme Edwards

@jaymeedwards

+ Follow

@bursutter @RealGeneKim @botchagalupe have them read Continuous Delivery so they can understand how slinging code is MVP of their job!

LIKE

1



8:13 AM - 17 Feb 2017



❤ 1



Part of a clever shop
that files tickets?

How many tickets
does it take?



No 2 | Self-Service, On-Demand, Elastic Infrastructure



How many weeks do you wait for
a new VM to be provisioned?

Why do expensive resources
like developers wait so long for
inexpensive resources like VMs?

Self-Service Means No Tickets

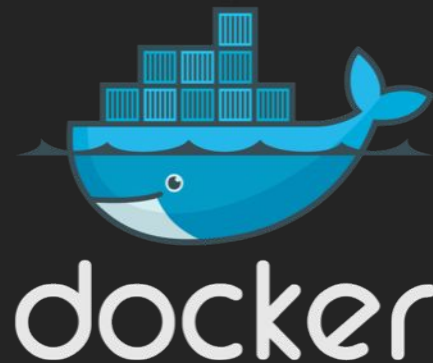




No 3 | Automation: Puppet, Chef, Ansible, Kubernetes



- Phoenix Servers vs. Snowflakes
(<https://martinfowler.com/bliki/PhoenixServer.html>)
- Programmable Infrastructure as Code
- Containers move developers closer to a production environment, even on a laptop
- Address the “But it works on my machine!” issue





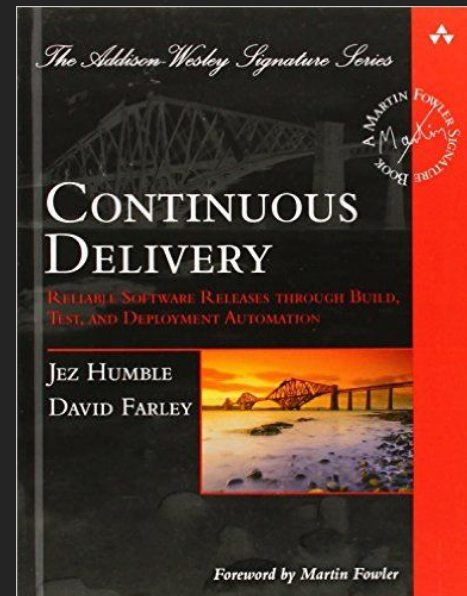
- Datasource
- Version of the JDBC driver
- Configuration of the db connection pool
- JVM settings
- JMS Queues
- Default User/Passwords
- “/” vs. “\”

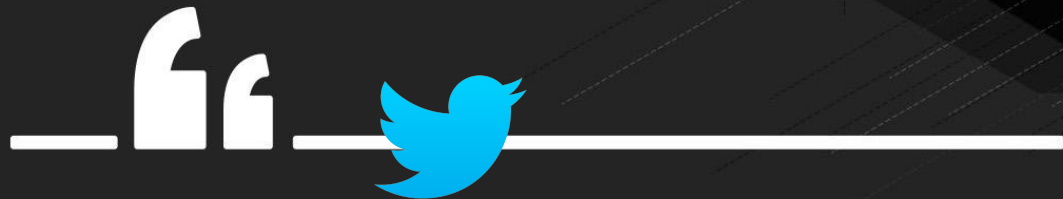


Nº 4 | CI & CD Deployment Pipeline

Jez Humble Continuous Integration

- Software (trunk) is always deployable
- Everyone is checking into trunk daily (at least)—not feature branches
- If the build breaks, it's fixed in 10 minutes (all hands on deck)
- A new engineer can be on-boarded in 1 day—with a production-like environment on the developer workstation
- Deployment is a low-risk, push-button affair





The job of a deployment pipeline
is to prove that the release
candidate is unreleasable.

Jez Humble





Nº

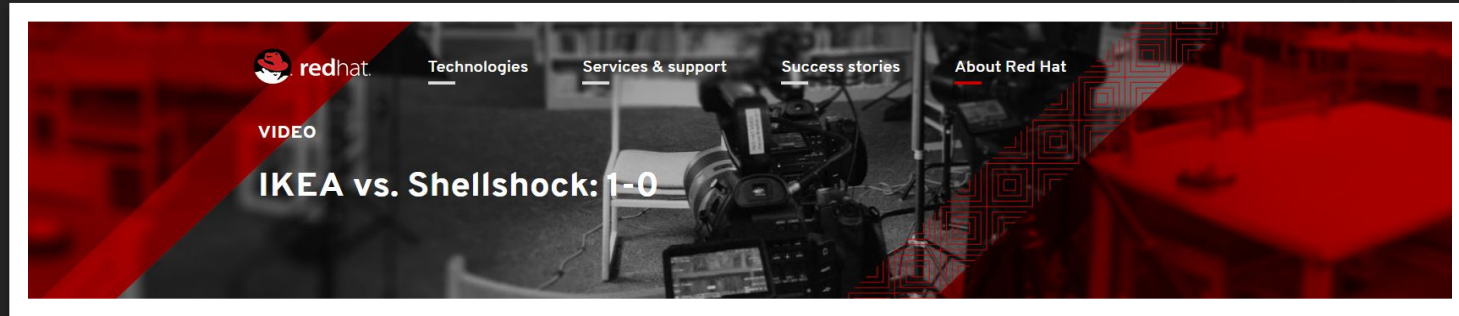
5

Advanced Deployment Techniques

‘Speed Kills!’ vs. ‘Go Fast, Go Safe’



IKEA®



Shellshock <http://www.bbc.com/news/technology-29361794>

<https://www.redhat.com/en/about/videos/ikea-vs-shellshock>



<https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2014-0160>



JDK Vulnerabilities

It was discovered that the Hotspot component of OpenJDK did not properly check arguments of the `System.arraycopy()` function in certain cases.

An untrusted Java application or applet could use this flaw to corrupt virtual machine's memory and completely bypass Java sandbox restrictions. (CVE-2016-5582)

<https://access.redhat.com/security/cve/CVE-2016-5582>

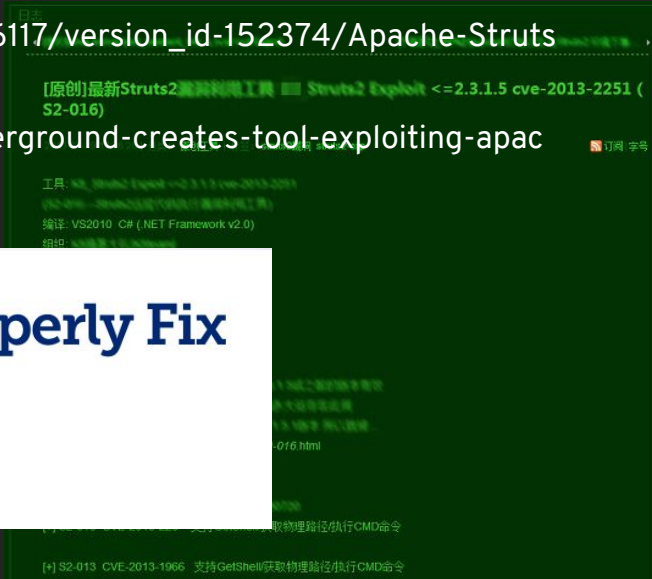


Actually, Slow Kills!

Apache Struts 2—zero-day vulnerability

https://www.cvedetails.com/vulnerability-list/vendor_id-45/product_id-6117/version_id-152374/Apache-Struts-2.3.15.1.html

<http://blog.trendmicro.com/trendlabs-security-intelligence/chinese-underground-creates-tool-exploiting-apache-struts-vulnerability/>



Apache Struts 2.3.16.2 Released to Properly Fix Zero-Day Vulnerability

Users are advised to update their installations as soon as possible



Chinese Underground Creates Tool Exploiting Apache Struts Vulnerability

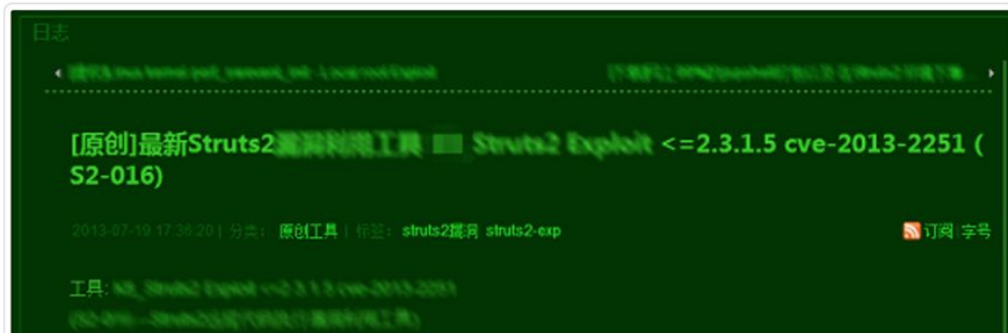
Posted on: August 14, 2013 at 2:07 am Posted in: Exploits, Malware, Targeted Attacks, Vulnerabilities

Author: Noriaki Hayashi (Senior Threat Researcher)



About a month ago, the Apache Software Foundation released **Struts 2.3.15.1**, an update to the popular Java Web application development framework. The patch was released because **vulnerabilities in older versions** of Struts could allow attackers to run arbitrary code on vulnerable servers.

Since then, we've found that hackers in the Chinese underground have created an automated tool that exploits these problems in older versions of Struts. We first confirmed the existence of these tools on July 19; this was only three days after the vulnerabilities were disclosed to the public.





JMX MBean View

MBean Name: **Domain Name:** jboss.web
name: //localhost/jmx-console
J2EEServer: none
J2EEApplication: none
j2eeType: WebModule
MBean Java Class: org.apache.commons.modeler.BaseModelMBean

[Back to Agent View](#) [Refresh MBean View](#)

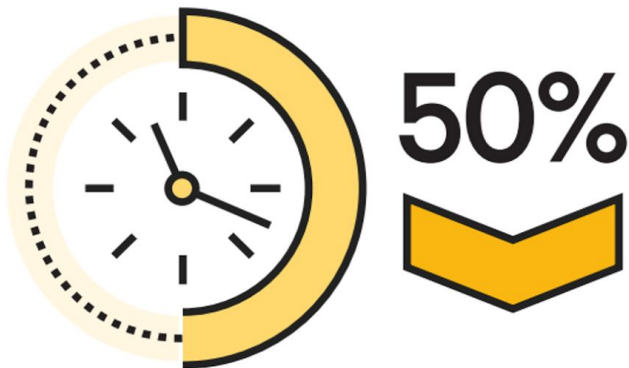
MBean description:

Standard Context Component

List of MBean attributes:

Name	Type	Access	
modelerType	java.lang.String	RW	org.apache.catalina.core.S
allowLinking	boolean	RW	☐ True ☒ False

118K JMX Consoles



**Less time spent
remediating security issues**

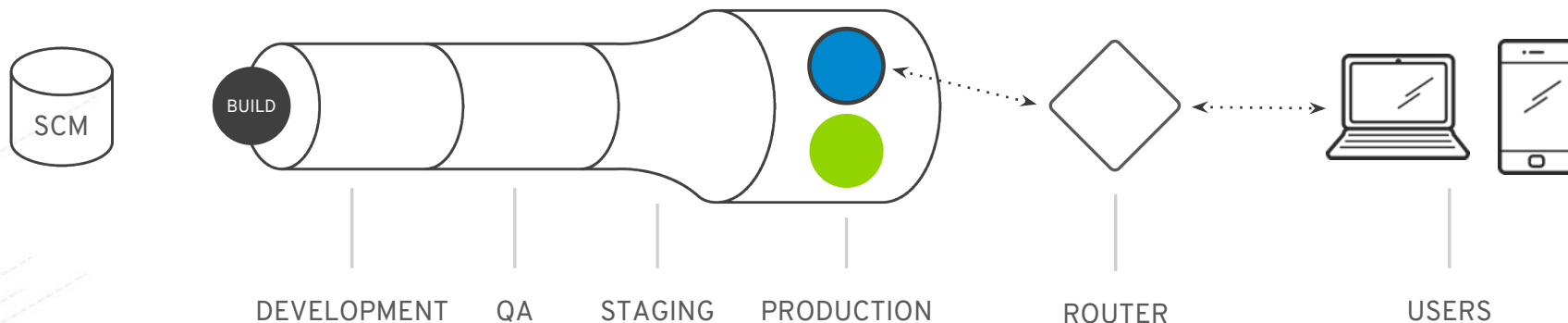
**High-performing teams
spend less time fixing security issues.**

That's because they address security at every stage of the software development and delivery cycle, instead of retrofitting security at the end.

<https://puppet.com/resources/whitepaper/2016-state-of-devops-report>



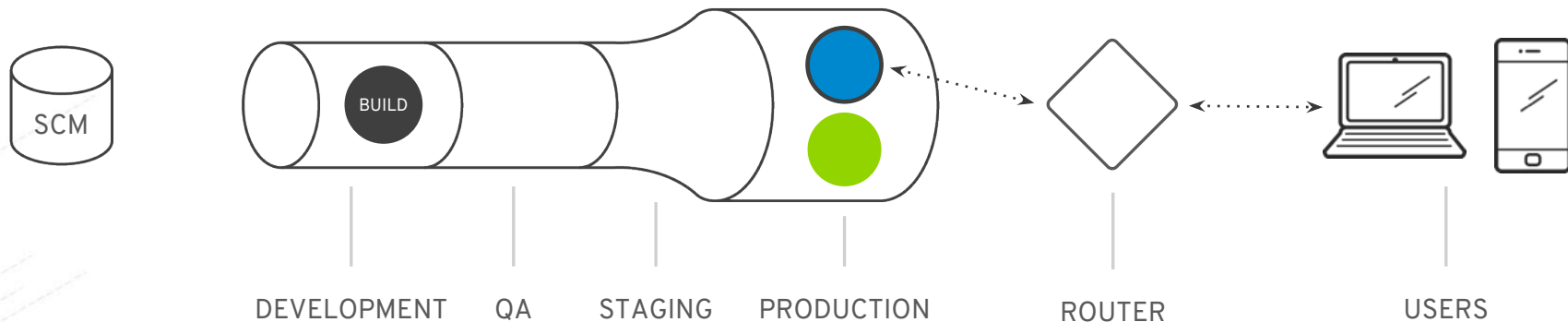
Blue/Green Deployment



Starts with a “git commit and git push”

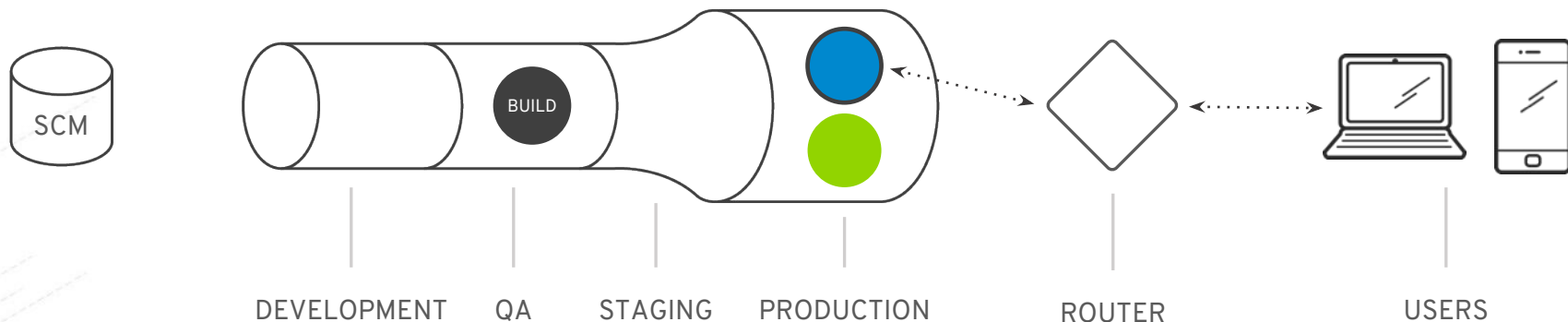


Blue/Green Deployment



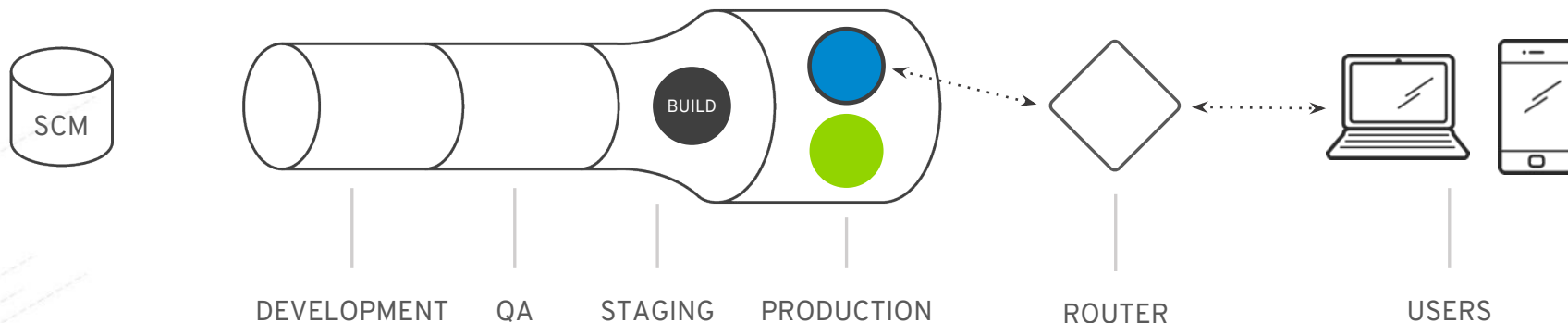


Blue/Green Deployment



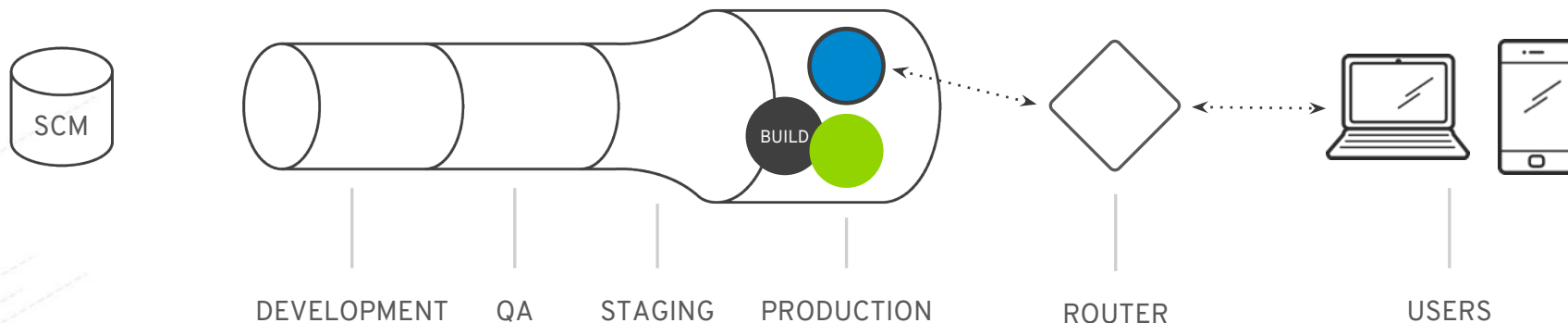


Blue/Green Deployment



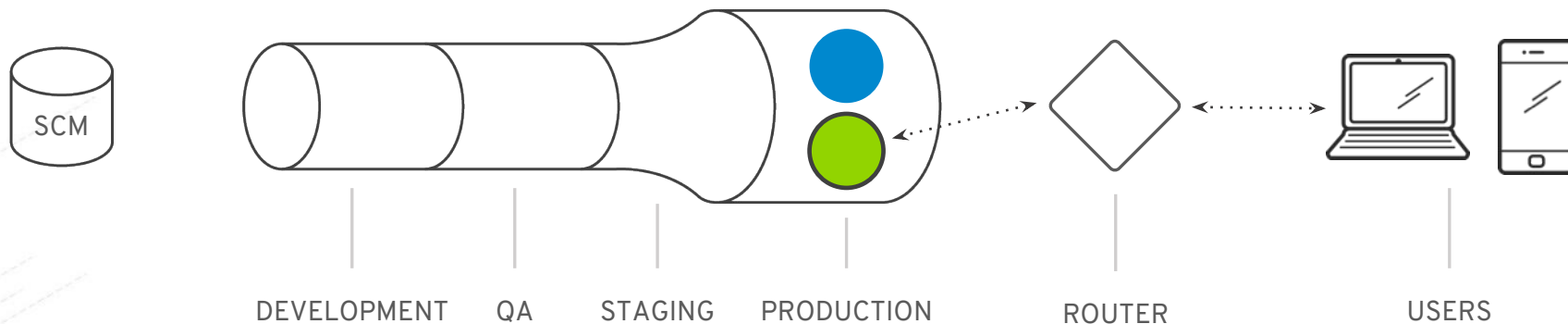


Blue/Green Deployment



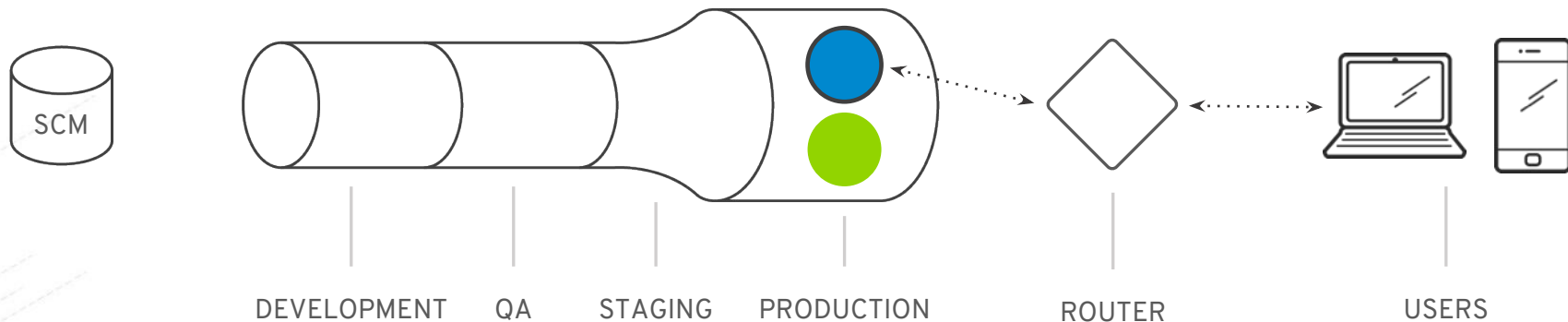


Blue/Green Deployment





Blue/Green Deployment





Nº 6 | Microservices (and flying elephants!)



Why Pipeline?

Code offers no value until it deploys.

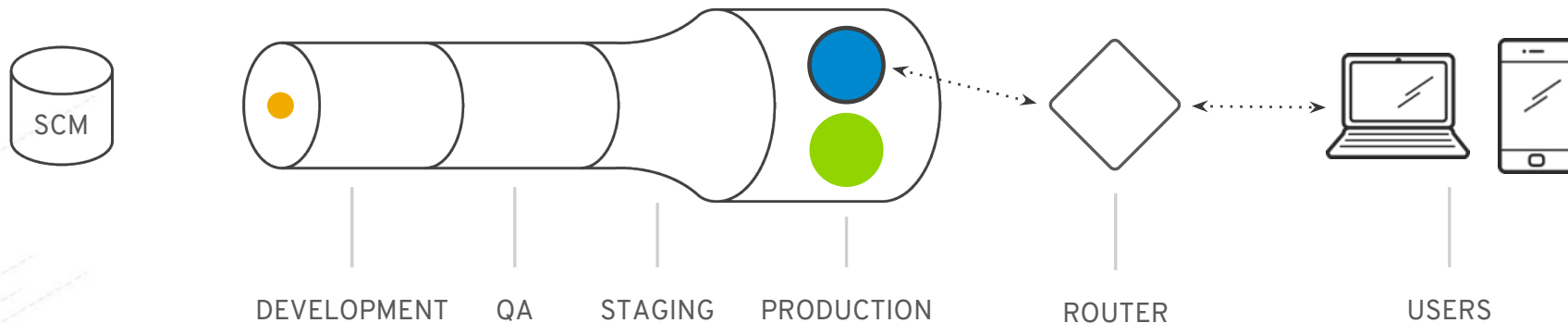


Why Canary Deployments?



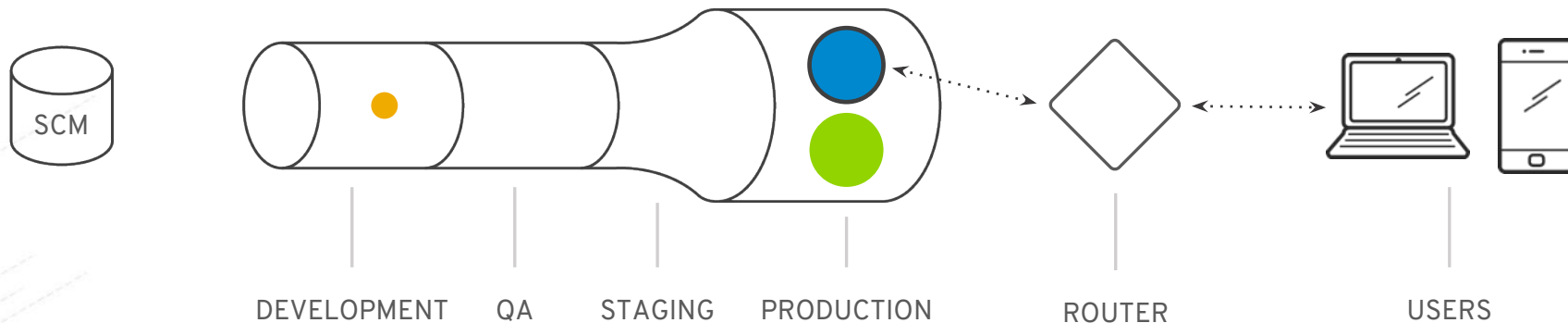


Canary Deployment



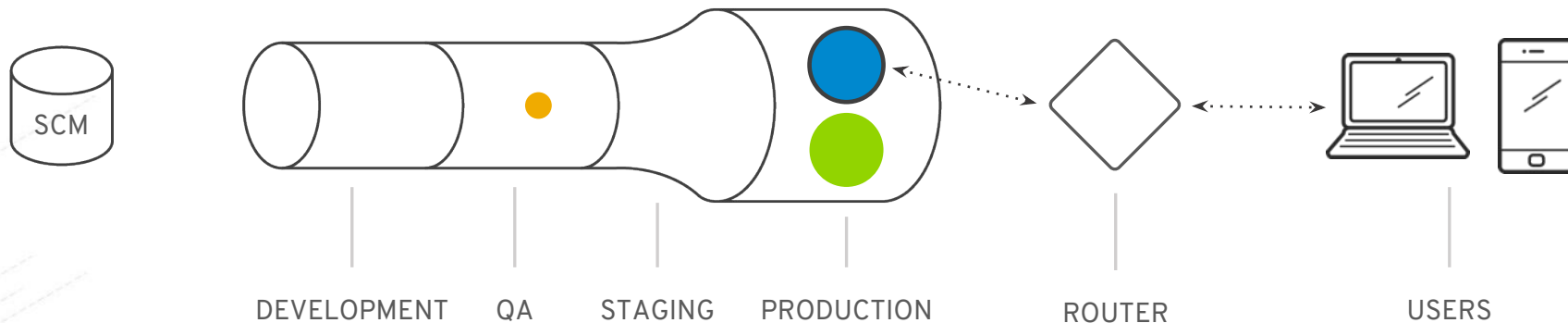


Canary Deployment



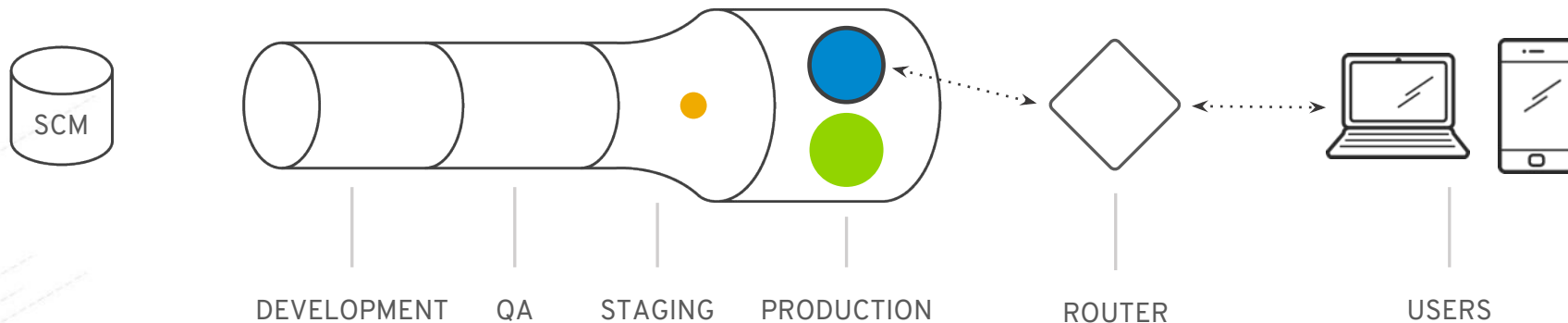


Canary Deployment



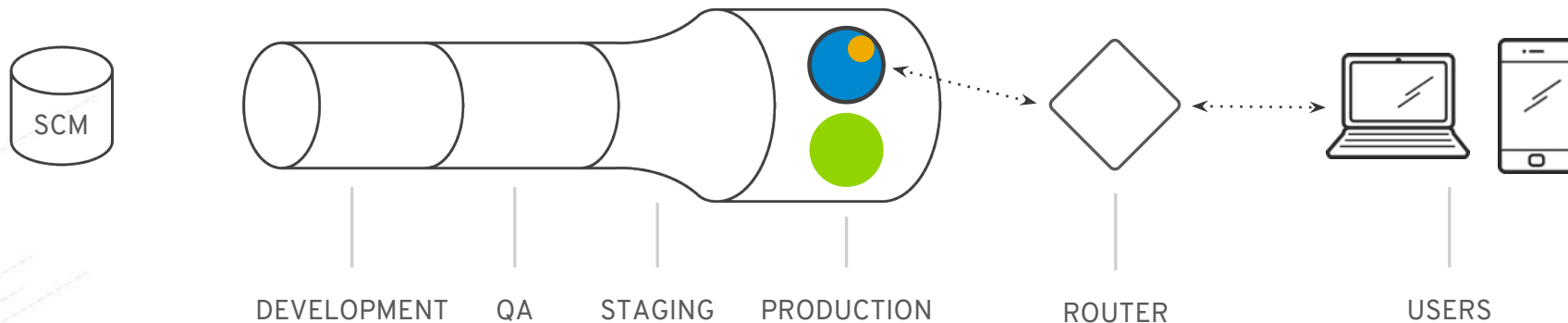


Canary Deployment



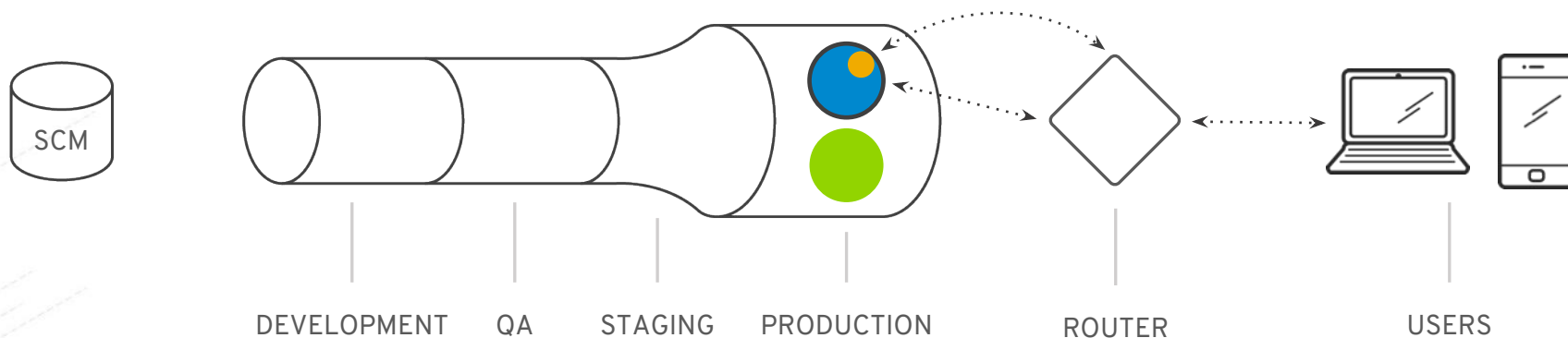


Canary Deployment



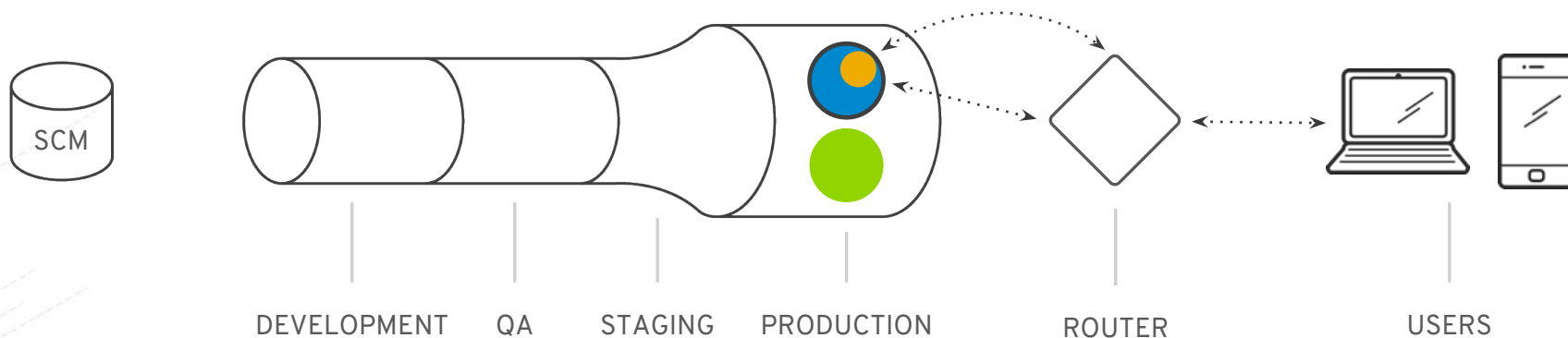


Canary Deployment



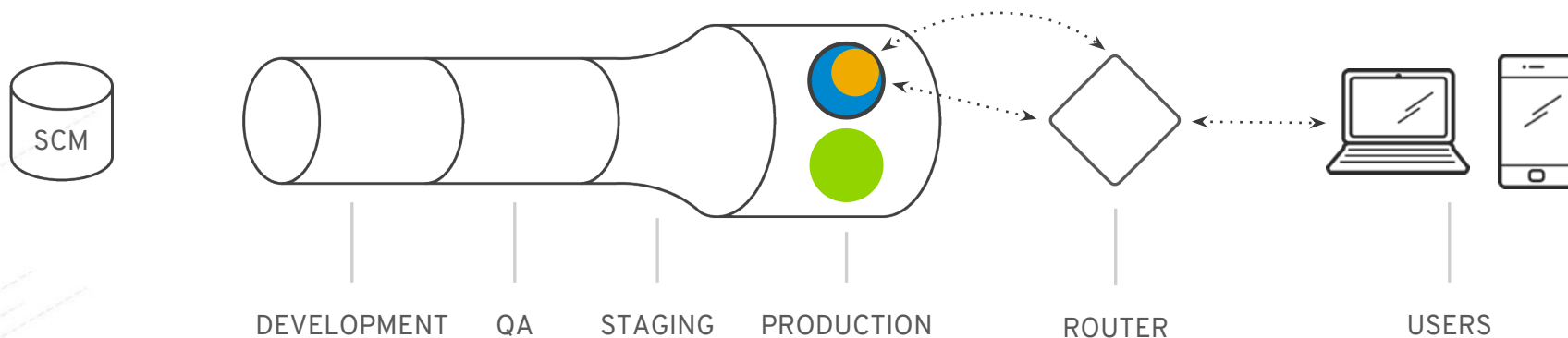


Canary Deployment



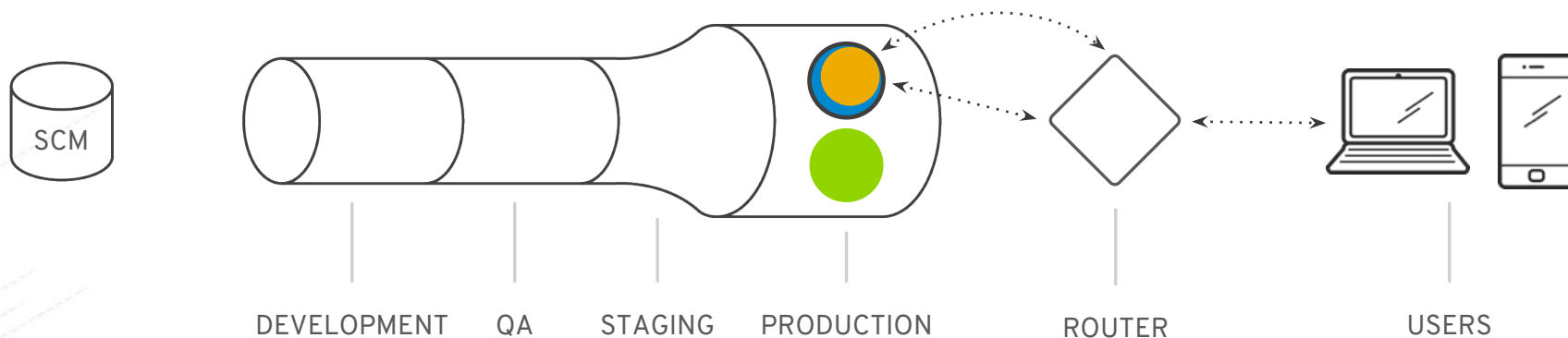


Canary Deployment



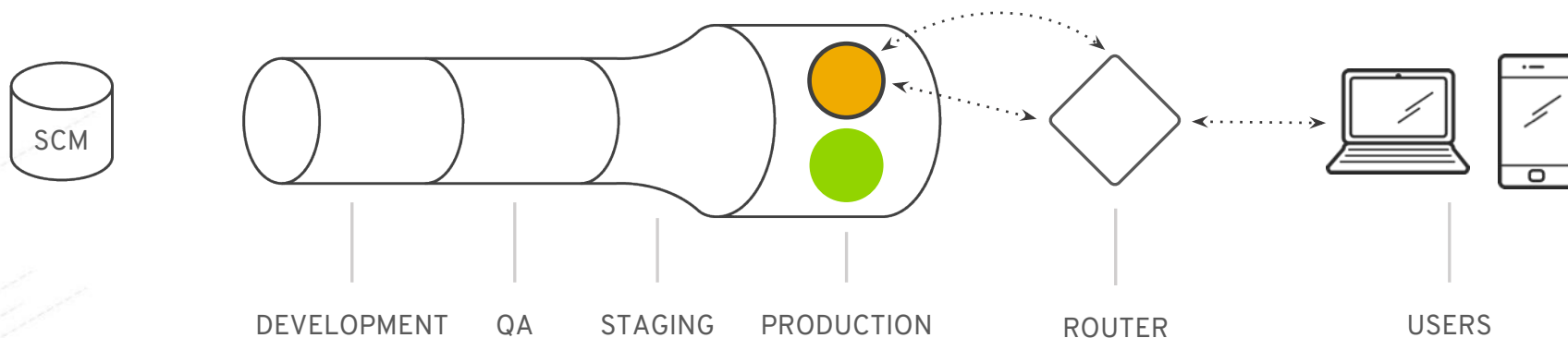


Canary Deployment



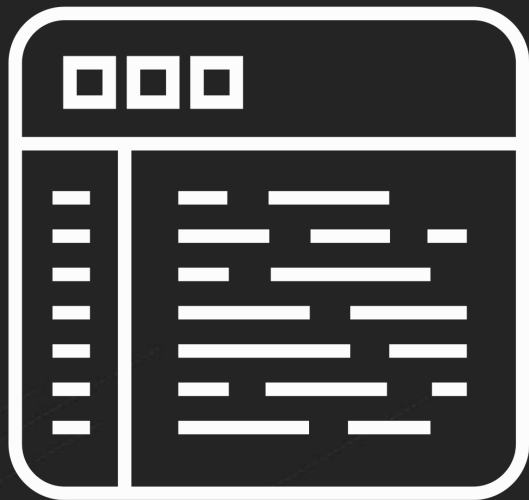


Canary Deployment



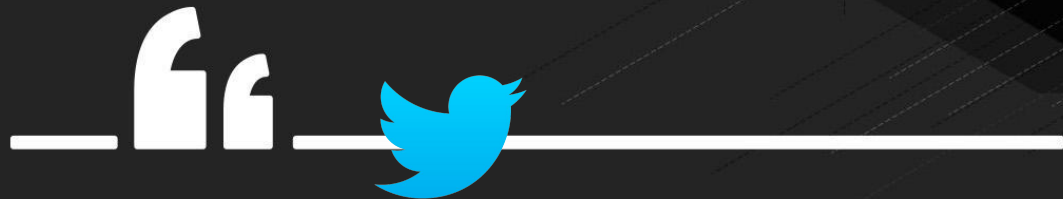


THE BEST CODE



=





Our experience at Microsoft is no different—only about 1/3 of ideas improve the metrics they were designed to improve.

Ronny Kohavi, Microsoft (Amazon)

<http://ai.stanford.edu/~ronnyk/ExPThinkWeek2009Public.pdf>





If you must code, first do no harm!

Developers' Hippocratic Oath

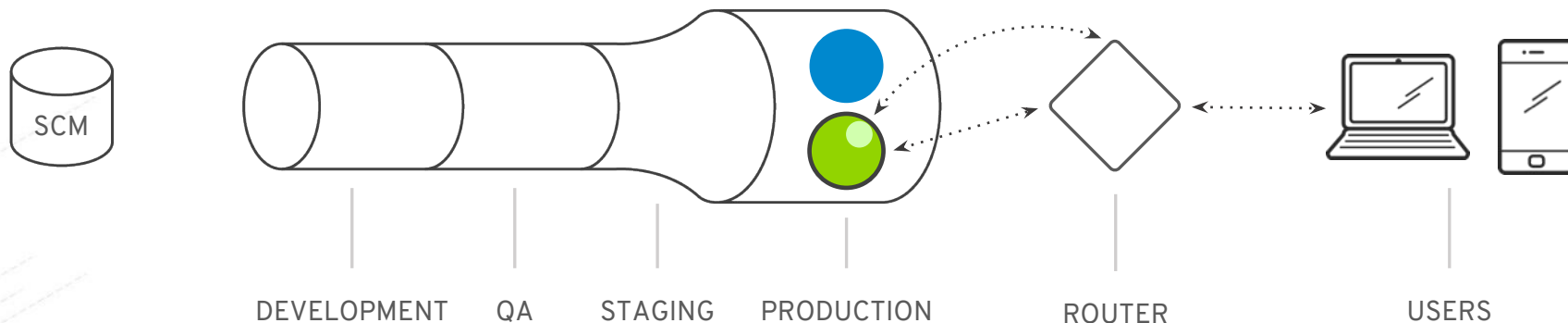


So what's your hypothesis?

In search of the Holy Grail (A/B Testing)



A/B Testing

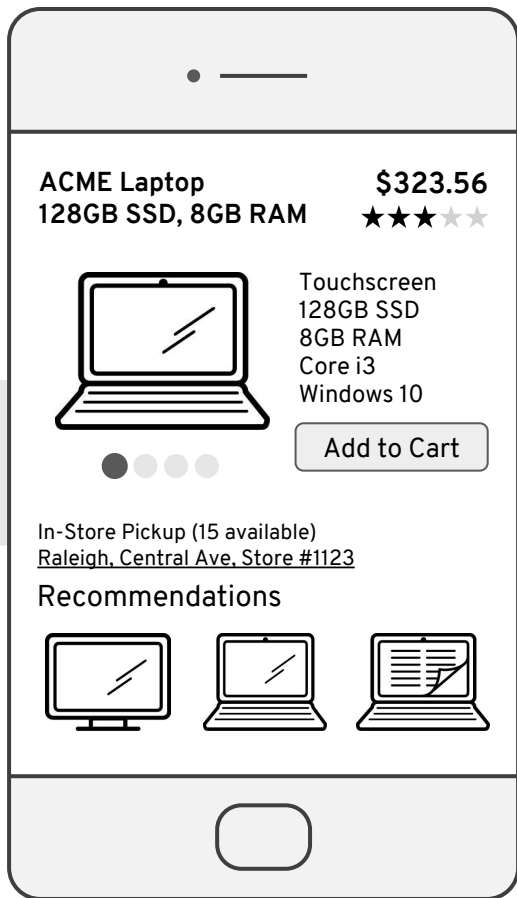


Hypothesis & Experiment (two variants):

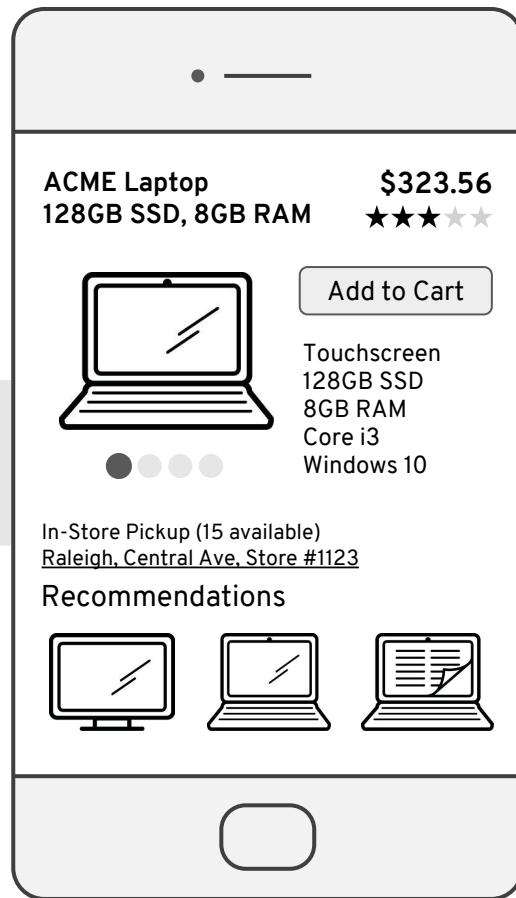
Check-out button placement increase sales conversions for iOS users?



A

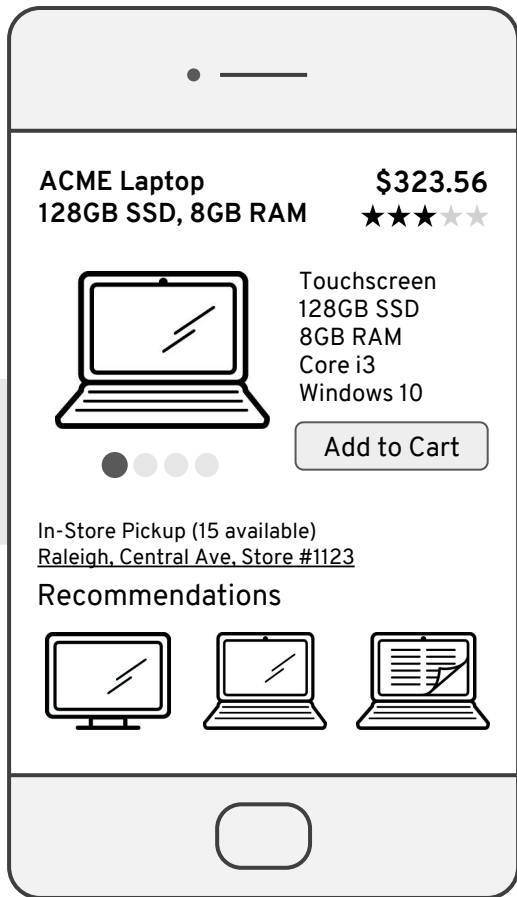


B

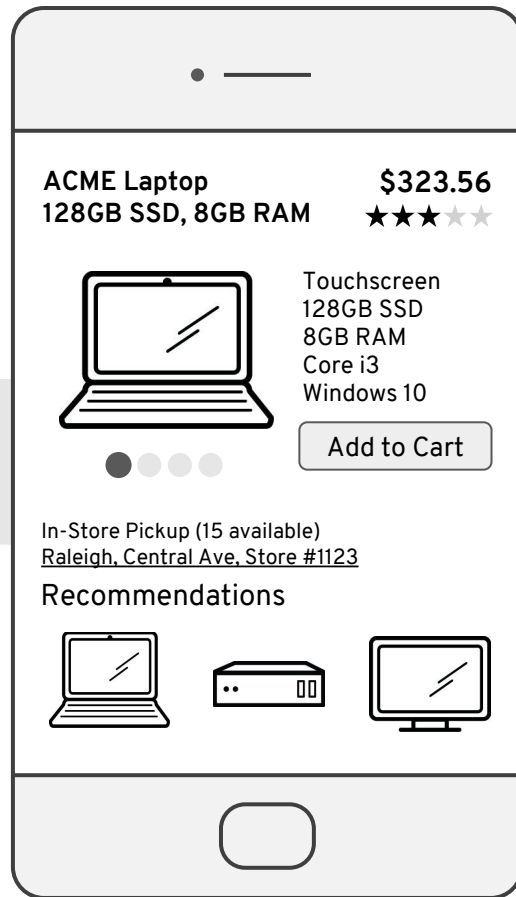




A

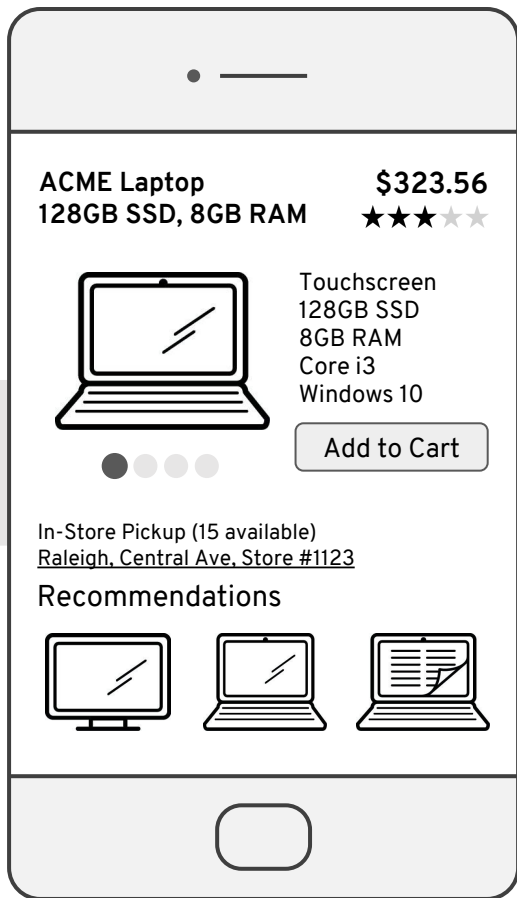


B

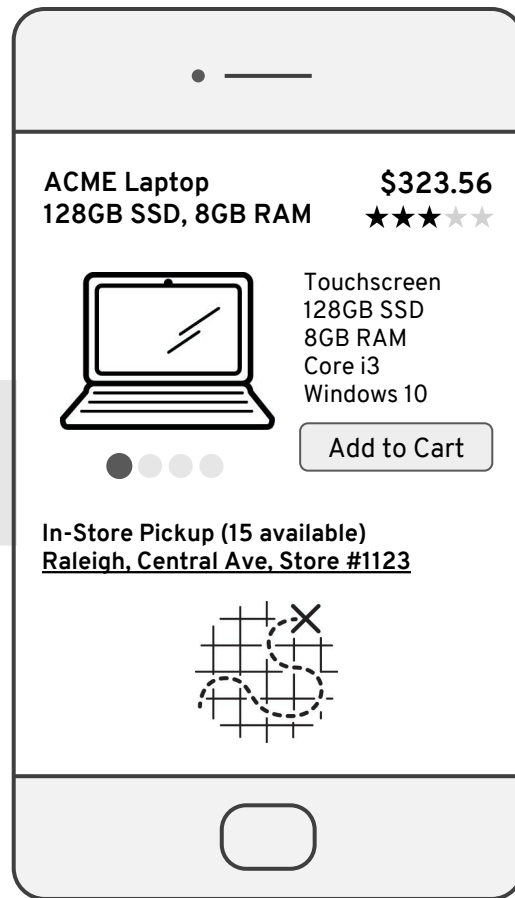




A



B



At 1-week deployment intervals?
Assess whether this meets your needs!



Majestic Monolith

<https://m.signalvnoise.com/the-majestic-monolith-29166d022228#.4skbfc2gj>

<https://developers.redhat.com/blog/2016/10/27/the-fast-moving-monolith-how-we-spiced-up-delivery-from-every-three-months-to-every-week/>



Not yet fast enough?

Shrink your elephant!



“Instead of getting a bigger office,
why don’t we get a smaller elephant?”

java -jar myapp.jar



DropWizard

www.dropwizard.io

JAX-RS API

First to market

DropWizard Metrics

Embeddable servers:
Jetty



Spring Boot

projects.spring.io/spring-boot

Spring API
(@RestController)

'Starter' POMs:
start.spring.io

Embeddable servers:
Tomcat, Jetty, Undertow



WildFly Swarm

wildfly-swarm.io

Java EE 7 APIs

'Starter' POMs:
wildfly-swarm.io/generator

Embeddable servers:
WildFly (Undertow)



Vert.x

vertx.io

Reactive
Async/non-blocking

vertx run myhttp.java

HTTP, HTTP/2, TCP,
UDP, Websockets, etc
out-of-the-box





Failure Happens

Release It!

Design and Deploy
Production-Ready Software



Michael T. Nygard

“

CHAPTER 2: The Exception that Grounded an Airline

The delays were shown on
Good Morning America (complete with
video of pathetically stranded single
moms and their babies) ...





WORLD TIMES

VERIZON OUTAGE CRASHES JETBLUE AIRLINES' ELECTRONICS SYSTEMS, DELAYING FLIGHTS AND BRINGING DOWN ONLINE SITES FOR BOOKING AND CHECK-IN

January 14, 2016. A Verizon data center outage Thursday morning brought down JetBlue's electronic systems, causing flight delays and shutting down the airline's website, along with its online booking and check-in systems.



WORLD TIMES

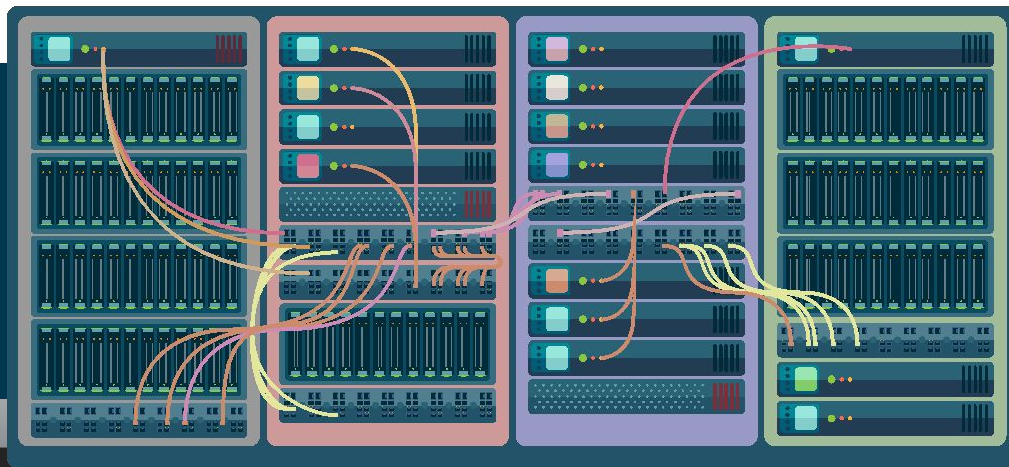
SOUTHWEST AIRLINES SYSTEM OUTAGE BRINGS FLIGHTLINE TO FULL GROUND STOP, DELAYS AND MADDENS PASSENGERS

July 21, 2016. Southwest Airlines has cancelled 1,150 flights since the airline's full ground stop for on Wednesday. The trouble started with a "system outage," and the ground stop lasted for just over an hour.



WORLD TIMES

**DELTA AIRLINES SAYS THE TOTAL BILL FOR
ITS DEVASTATING COMPUTER OUTAGE WILL
COME TO \$150 MILLION, AUGUST 8, 2016**



Digital Darwinism

The Developer's Journey



Re-Org to
DevOps



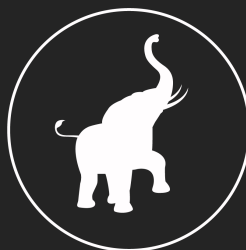
Self-Service,
On-Demand,
Elastic
Infrastructure



Automation
Puppet, Chef,
Ansible,
Kubernetes



CI & CD
Deployment
Pipeline



Advanced
Deployment
Techniques

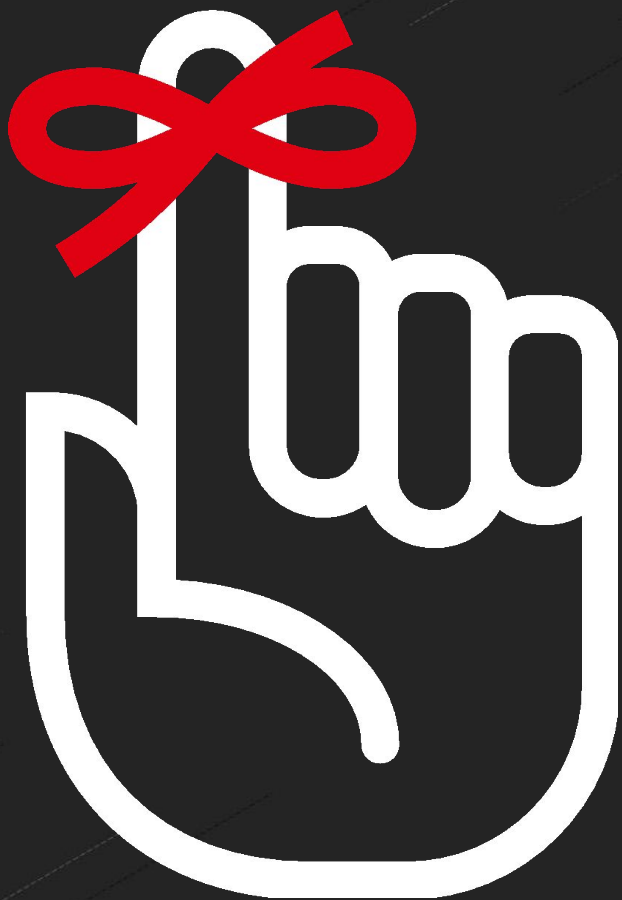


Microservices
(and flying
elephants!)

Some Practical Advice

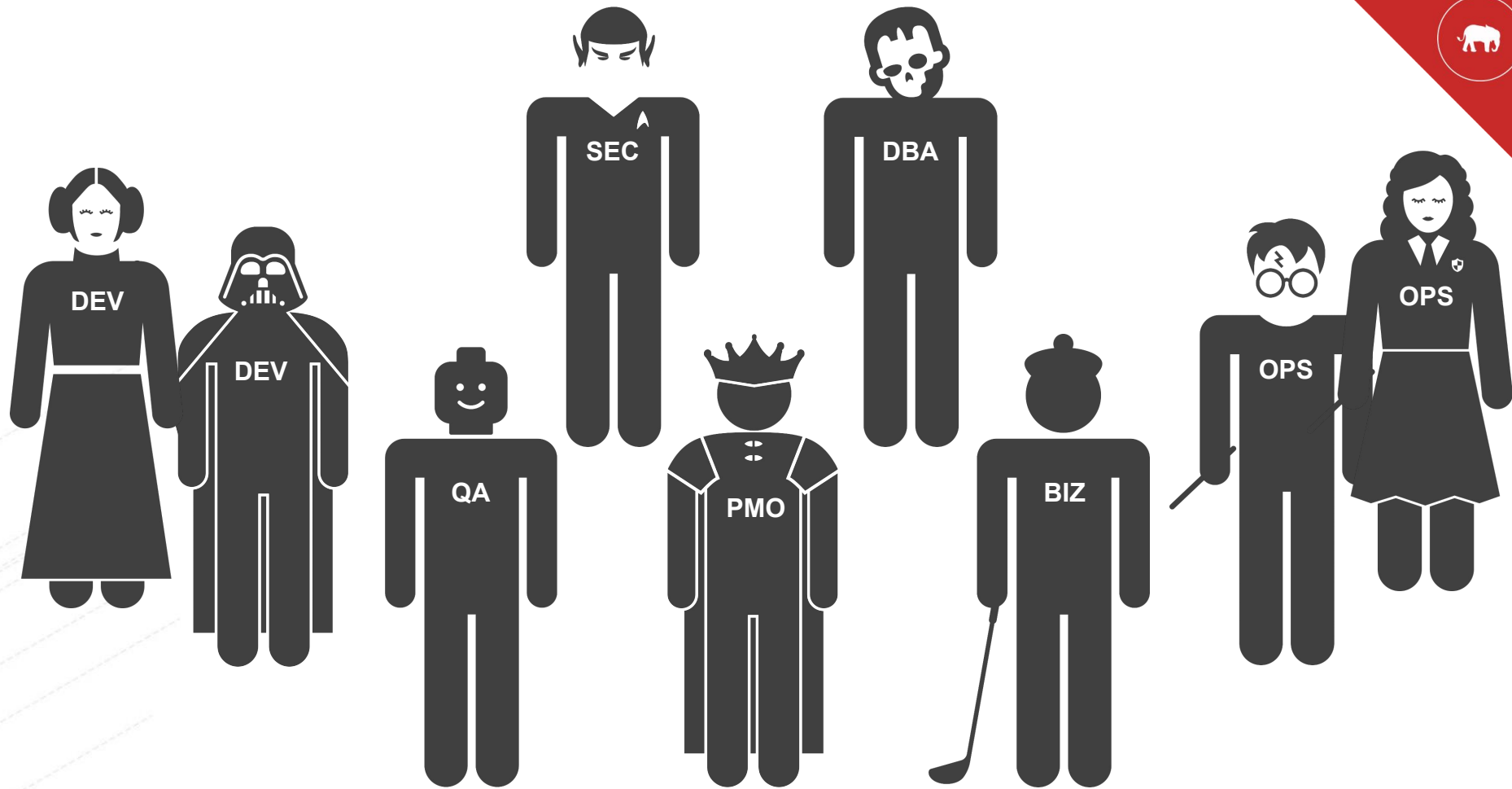


1. Learn Linux, AWS/GCP/Azure, Docker & Kubernetes
2. Start an Email List
3. Every other week Demo Day
4. Opposite every other week Book Club
5. Quarterly Mini-Conference—internal and external presenters
6. Document your Value Stream Map



Organization First

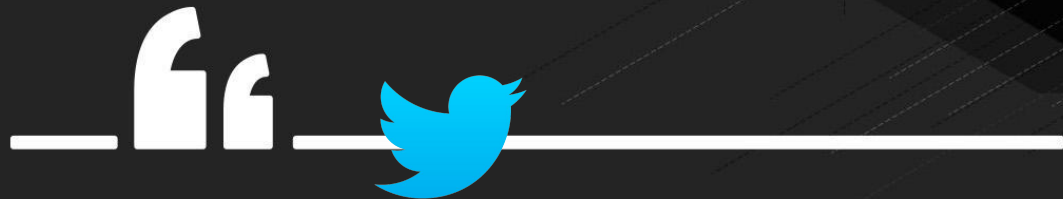
Focus on Team



Continuous Improvement

Life-long Learning

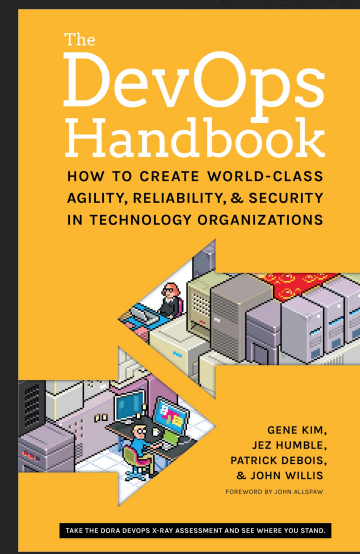
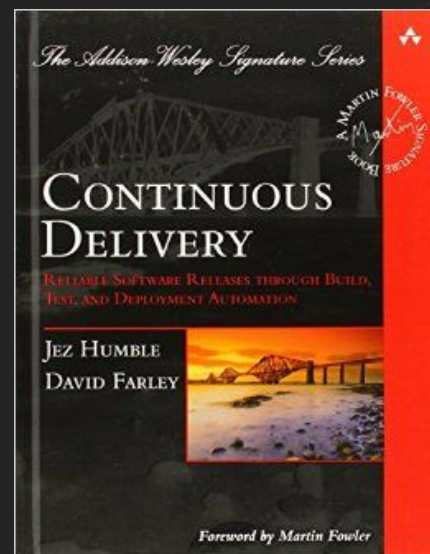
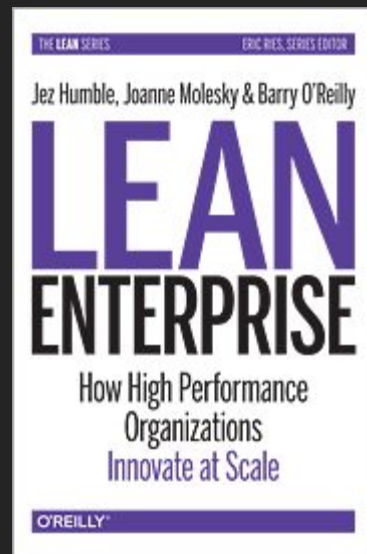
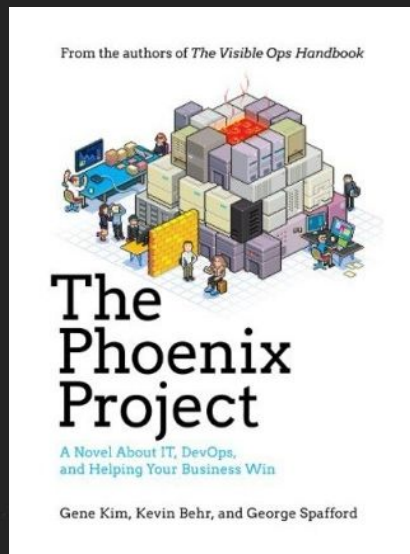
Always Accountable



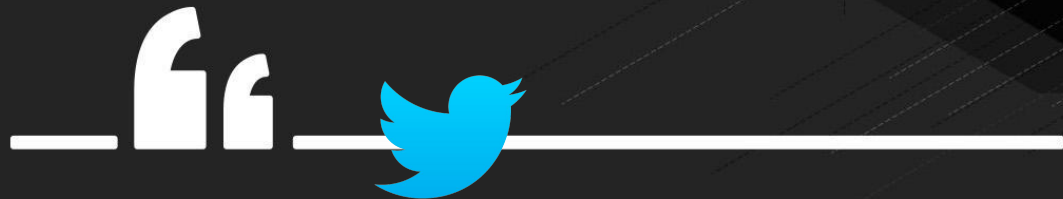
When we are no longer able
to change a situation, we are
challenged to change ourselves.

Viktor Frankl





<https://puppet.com/resources/whitepaper/2016-state-of-devops-report>



First they ignore you, then
they laugh at you, then they
fight you, then you win.

Gandhi



Microsoft  Linux





THANK YOU!



<https://developers.redhat.com/>



<https://twitter.com/rhdevelopers/>



RED HAT DEVELOPERS THANK YOU!



More Information
[@burrsutter](https://twitter.com/burrsutter)