Docker and Immutable Infrastructure

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Director of Ecosystem Development


What If I told you you
could be 2000 times
faster than your
competitors


What if I told you that
you could be 100
times more reliable
than your
competitors


What if you
could have
both

About Me

Linkedin: https://www.linkedin.com/in/johnwillisatlanta

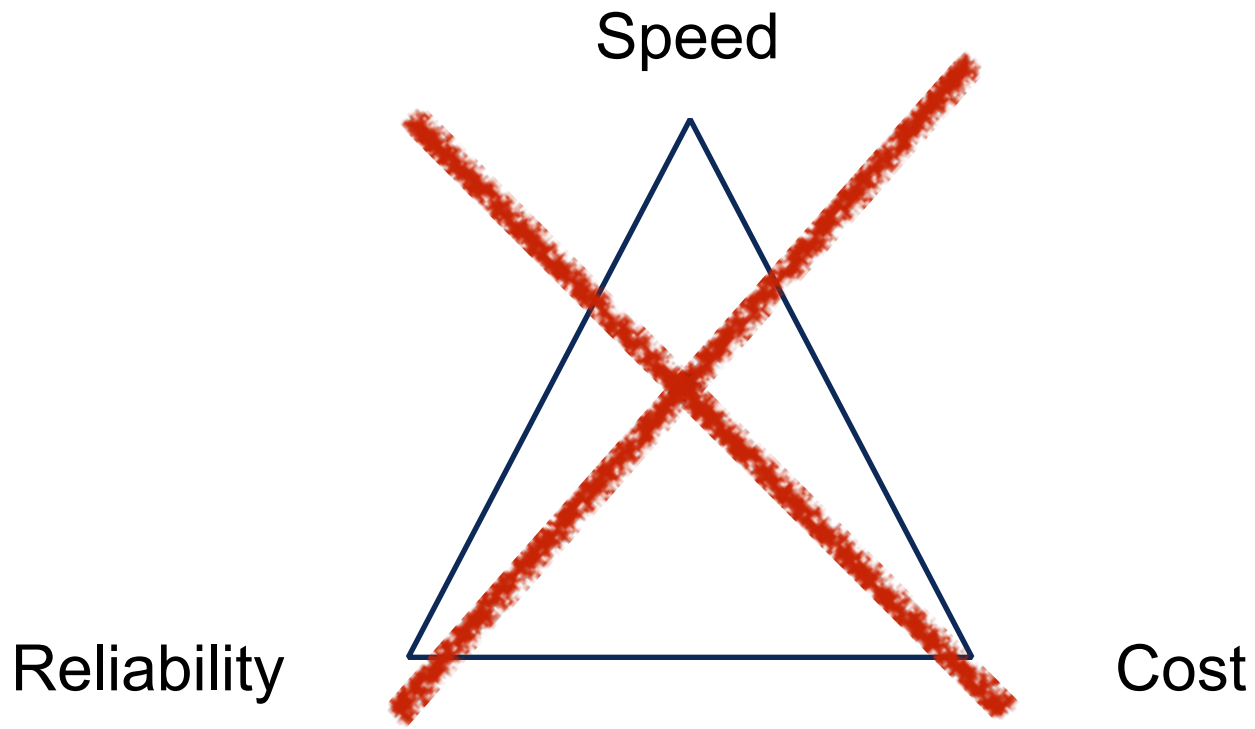
- **One of the founding members of the “Devops” movement.**
- **Author of the “Devops Handbook”.**
- **Author of the “Introduction to Devops” on Linux Foundation edX.**
- **Podcaster at devopscafe.org**
- **Devops Enterprise Summit - Cofounder**
- **Found of Socketplane (Acquired by Docker)**
- **Formally Director of Devops at Dell**
- **Formally Director at Chef**
- **10 Startups over 25 years**

Github: botchagalupe/my-presentations

Twitter: botchagalupe

Webchat: botchagalupe

Conventional Wisdom - Iron Triangle



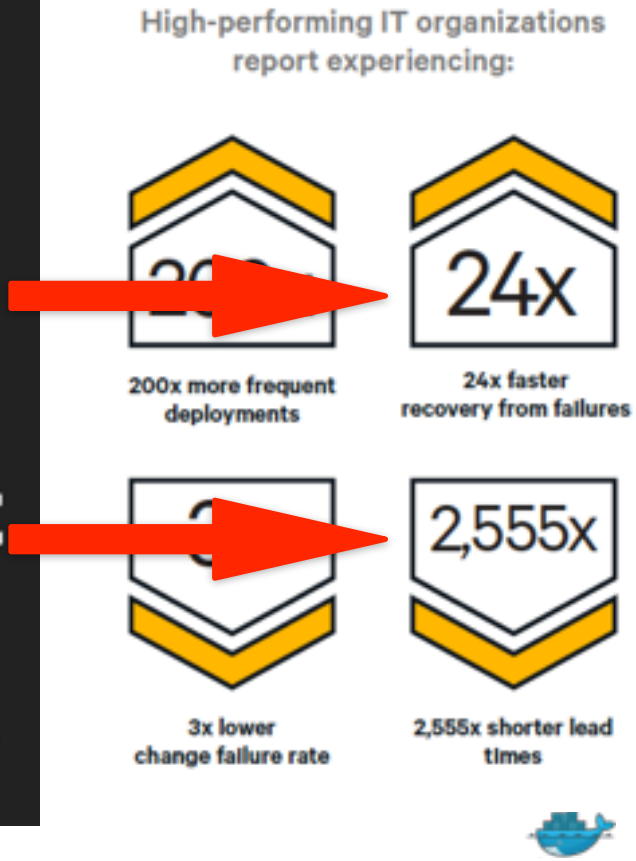
Faster, Effective, Reliable

- Devops (Faster)
- Docker (Effective)
- Supply Chain (Reliable)

Immutable Service Delivery

Devops … faster

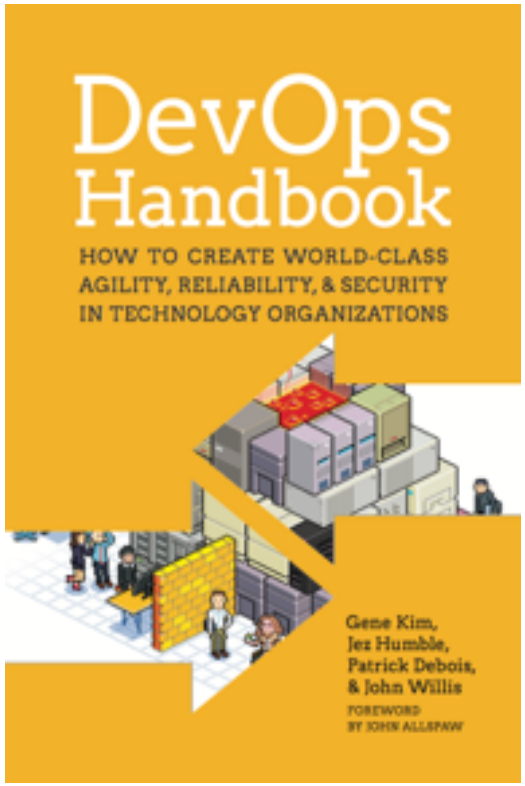
Faster… (Devops Practices and Patterns)



What is Devops?

Devops is a set of practices and patterns that turn human capital into high performance organizational capital.

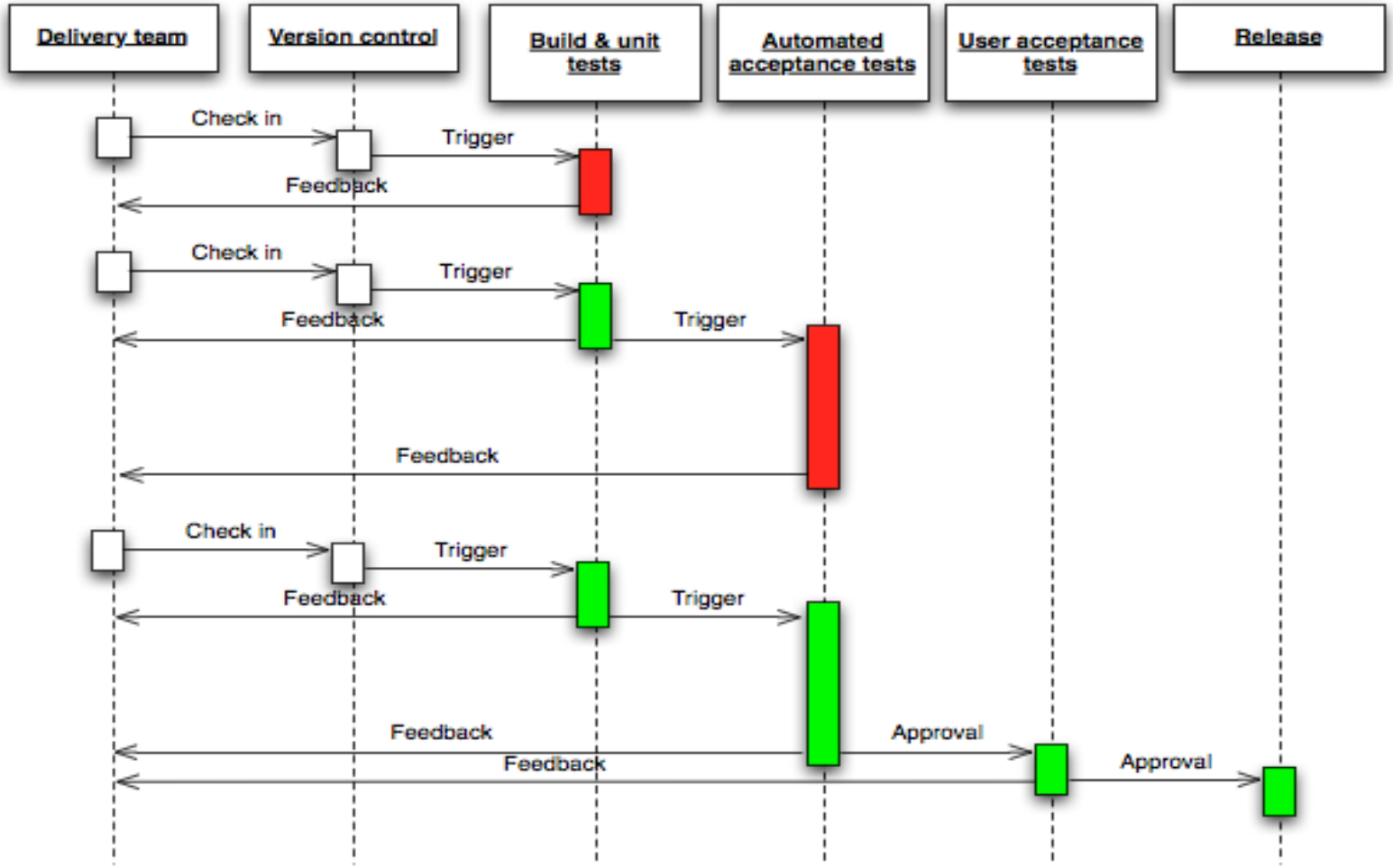
Devops Practices and Patterns



- **Continuous Delivery**
  - Everything in version control
  - Small batch principle
  - Trunk based deployments
  - Manage flow (WIP)
  - Automate everything
- **Culture**
  - Everyone is responsible
  - Done means released
  - Stop the line when it breaks
  - Remove silos

itrevolution.com/devops-handbook

Devops Automated Deployment Pipeline



Source: Wikipedia - Continuous Delivery

Devops Results

Google

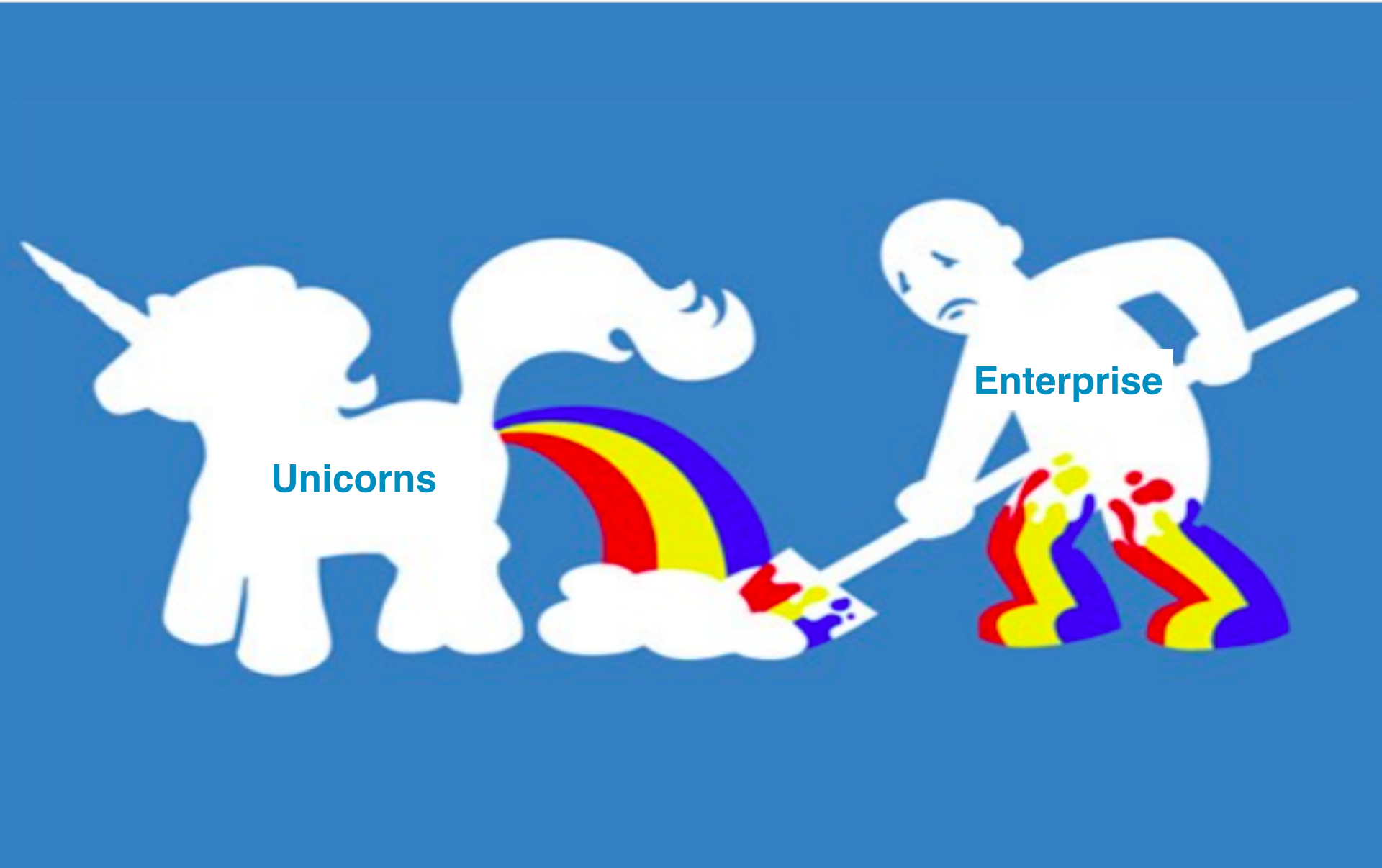
- Over 15,000 engineers in over 40 offices
- 4,000+ projects under active development
- 5500+ code submissions per day (20+ p/m)
- Over 75M test cases run daily
- 50% of code changes monthly
- Single source tree

Devops Results

Amazon

- 11.6 second mean time between deploys.
- 1079 max deploys in a single hour.
- 10,000 mean number of hosts simultaneously receiving a deploy.
- 30,000 max number of hosts simultaneously receiving a deploy

Unicorns and Horses (Enterprises)



Devops Results

Enterprise Organizations

- Ticketmaster - 98% reduction in MTTR
- Nordstrom - 20% shorter Lead Time
- Target - Full Stack Deploy 3 months to minutes
- USAA - Release from 28 days to 7 days
- ING - 500 applications teams doing devops
- CSG - From 200 incidents per release to 18

Docker … effective

Docker Driving the Containerization Movement

Build, Ship, Run Distributed Applications Anywhere

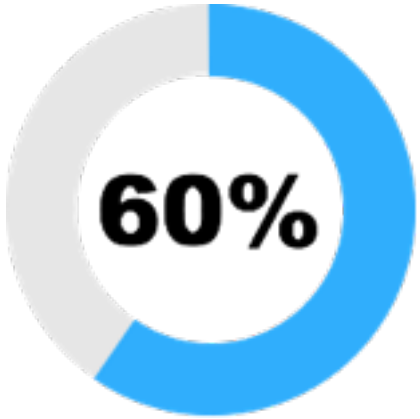
Enables Containers as a Service

- Integrated platform for IT and developers
- Commercial technical support provider (Docker, IBM)

Docker Project Sponsor

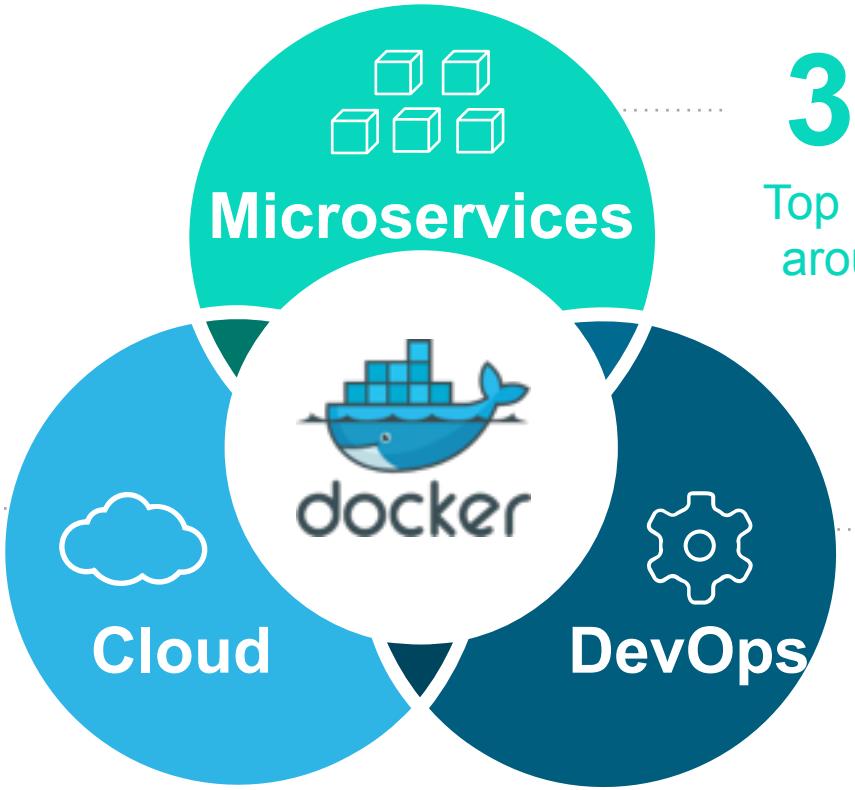
- Primary contributor and maintainer to Docker project
- 4B+ Image Downloads, 2900+ Contributors, 450K+ Dockerized Applications

Docker users running in production



State of Applications Survey - Docker Q1 2016

Driving force behind modern app initiatives



3 out 4

Top initiatives revolve around applications

80%

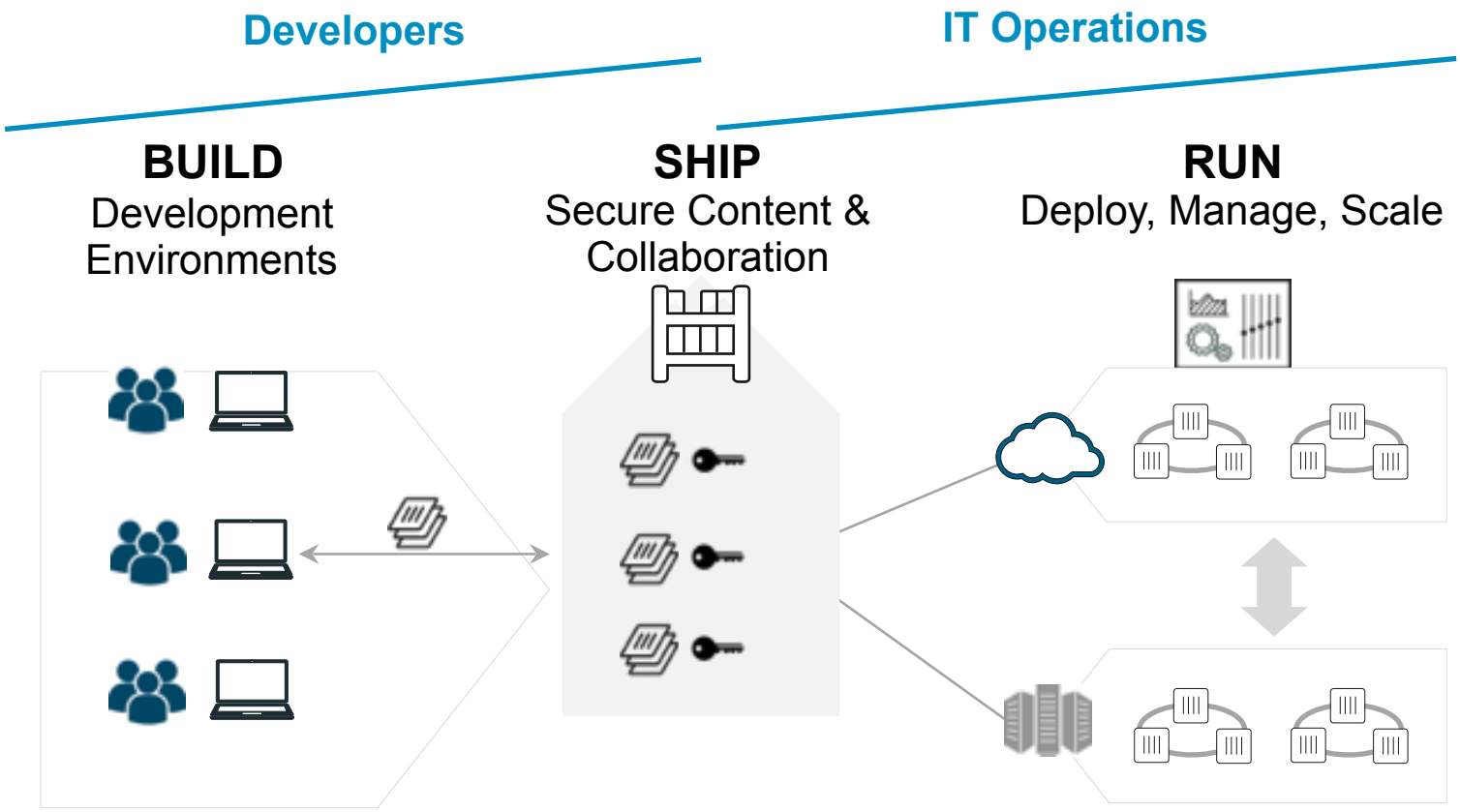
Docker is central to cloud strategy

44%

Looking to adopt DevOps

State of App development Survey: Q1 - 2016

Docker Containers as a Service (CaaS) Workflow



Why Docker?

Meta Points

- Isolation
- Speed
- Light Weight

Introducing Built-in Orchestration in Docker 1.12

Docker 1.12 democratizes orchestration with out of the box capabilities for multi-container on multi-host application deployments. Docker Engine is the uniform building block for a self-organizing and -healing group of nodes.

- “Swarm mode” provides powerful, yet optional ability to create coordinated groups of decentralized Docker Engines (swarms)
- Service deployment API ensures application service consistency and resiliency
- Routing mesh for services provides container-aware dynamic load balancing
- Secure by default with end-to-end encryption across the swarm
- Distributed application bundles declare a stack of services

Docker Results

Riot Games

- 1.25 Million Builds a Year
- 10,000 - 14,000 Containers A Week
- 120 Build Jobs An Hour
- 30% of all Environments are Containerized

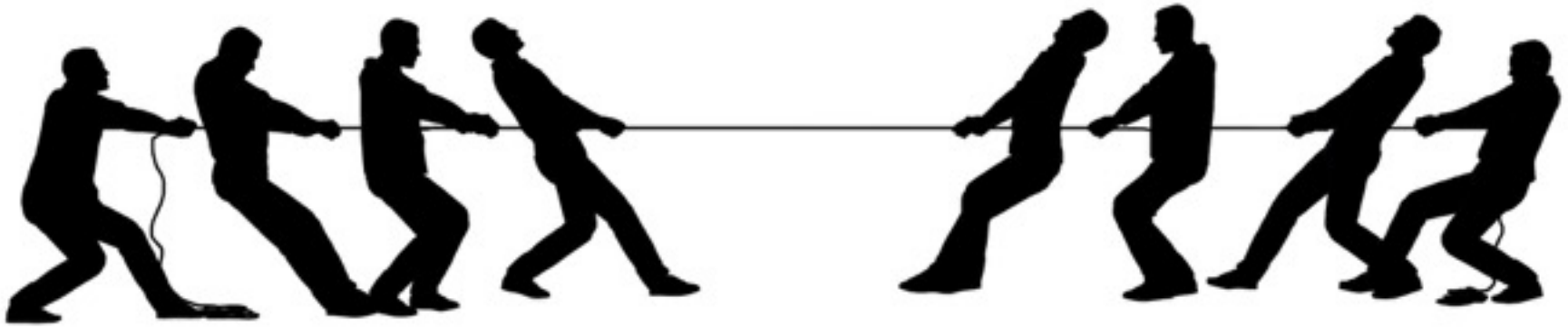
Docker Results

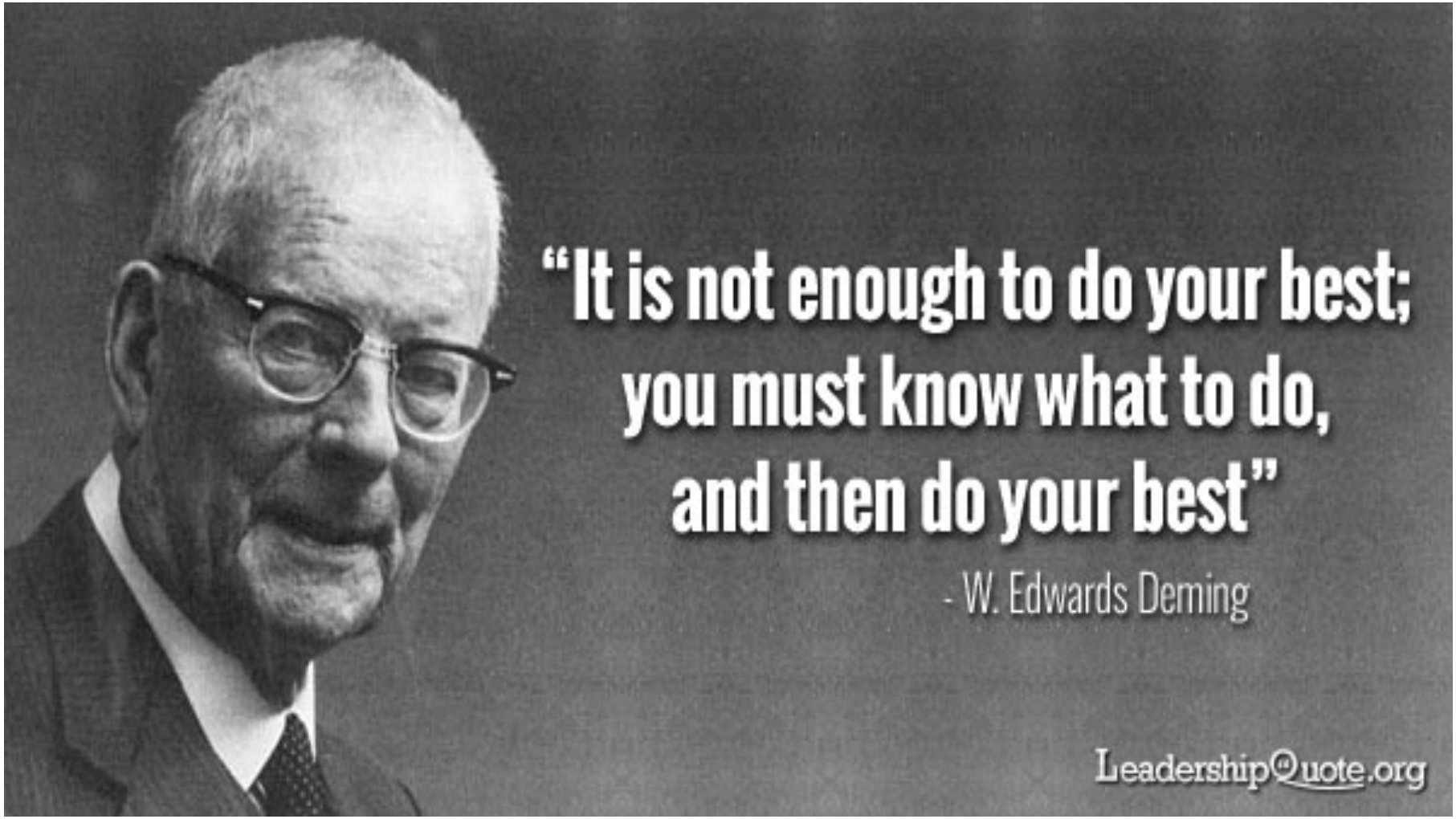
Uber

- 4,000 upgrades per week
- 3,000 builds per week
- 300 rollbacks per week
- Managed more than 600 services in the system

Supply Chain … Reliable

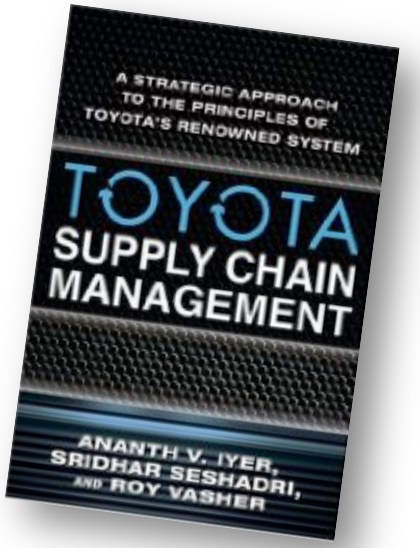
“Raw Innovation” versus “Net Innovation”




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

Supply chain advantage

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



Source: Toyota Supply Chain Management: A Strategic Approach to Toyota's Renowned System, by Ananth Iyer and Sridhar Seshadri

Toyota Production Systems - 4VL

Variety

- Determine your variety of offerings based on operational efficiency and market demand

Velocity

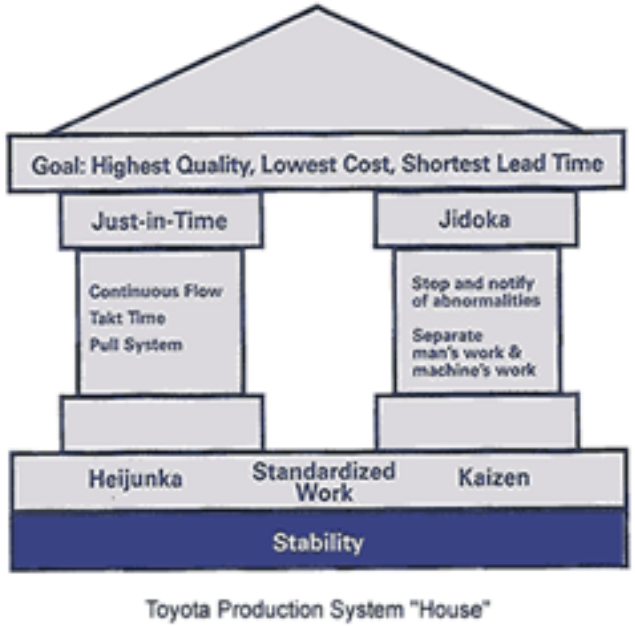
- Maintain a steady flow through all processes of the supply chain

Variability

- Manage inconsistencies carefully to reduce cost and improve quality

Visibility

- Ensure the transparency of all processes to enable continuous learning and improvement



Toyota Production System "House"

Docker and the Three Ways of Devops

docker What is Docker? Use Cases Try It! Install & Docs Br

May 26, 2015

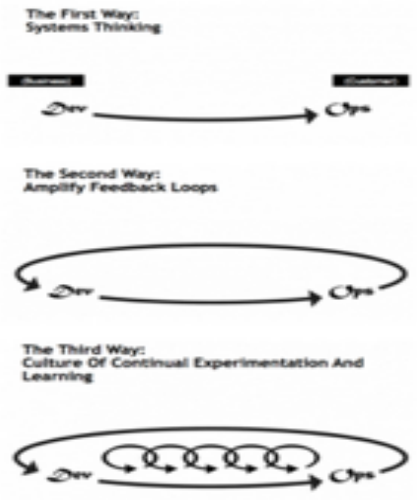
DOCKER AND THE THREE WAYS OF DEVOPS

written by John Willis, Evangelist at Docker

Have you read Gene Kim's *The Phoenix Project*? Some of the principles behind the Phoenix Project and an upcoming book I am co-authoring with Gene (The DevOps Cookbook) have been referred to as the "Three Ways of DevOps". These are particular patterns of applying DevOps principles in a way that yields high performance outcomes.

We assert that the Three Ways describe the values and philosophies that frame the processes, procedures, practices of DevOps, as well as the prescriptive steps.

Gene Kim



Immutable Service Delivery (4VL)

Variety

- Learn faster, Limited frameworks, Limited operating systems, Limit vendors.

Velocity

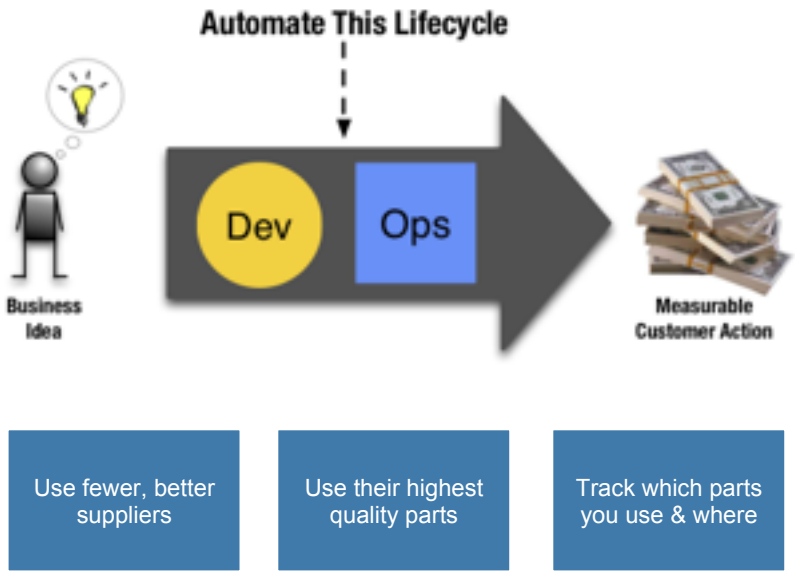
- Small Batch, Small Teams, Microservices and Containers

Variability

- Docker and Immutable Delivery

Visibility

- Automated Testing, Docker Trust, Docker Security Scanning, Bounded Context, Bill of Materials



Software Supply Chain - 4VL

Variety

- **Lean Startup**
- **Minimal Viable Product**
- **Pivot**
- **Build Measure Learn**

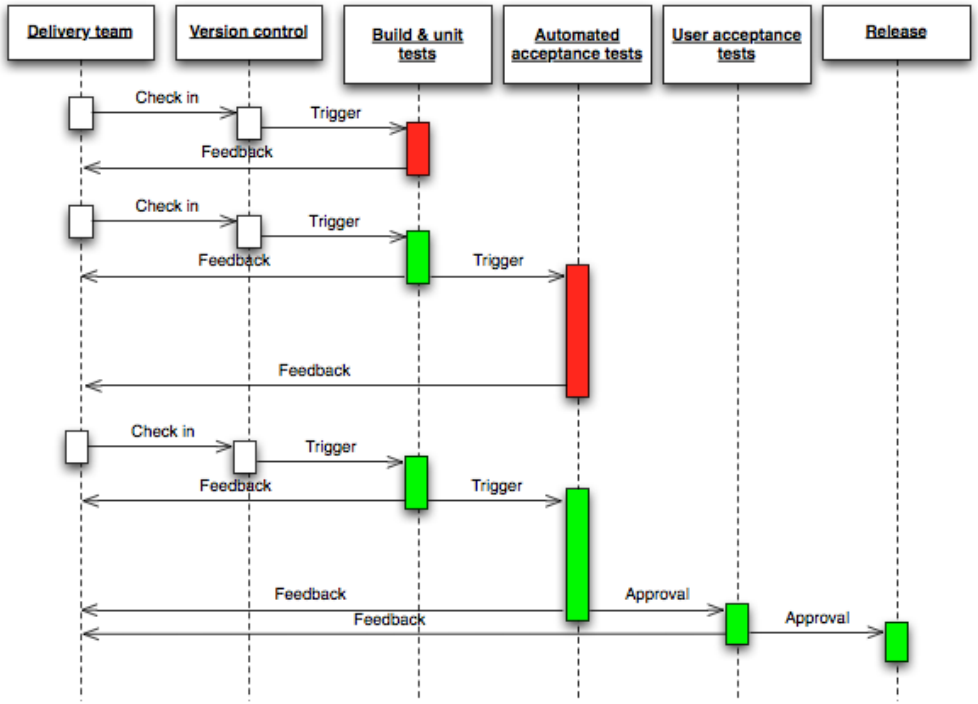
ERIC RIES

- **Customer Development Methodology**

Software Supply Chain - 4VL

Velocity

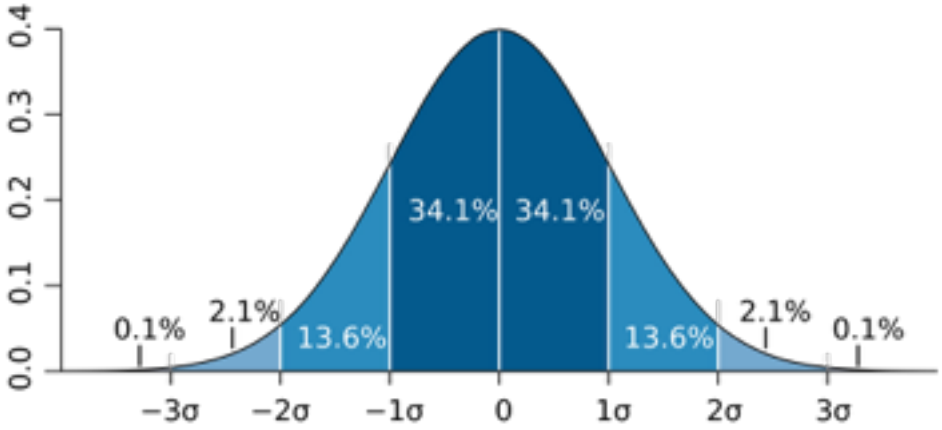
- Developer Flow
- Integration Flow
- Deployment Flow



Software Supply Chain - 4VL

Variability

- Developer Flow
- Integration Flow
- Deployment Flow



Software Supply Chain - 4VL

Visibility

- Containerization
- Microservices
- Small Teams

Software Supply Chain - 4VL

Visibility - Docker - Bill of Material

- **Where and when was it built and why**
- **What was its ancestor images**
- **How do I start, validate, monitor and update it**
- **What git repo is being built, what hash of that git repo was built**
- **What are all the tags this specific container is known as at time of build**
- **What's the project name this belongs to**
- **Have the ability to have arbitrary user supplied rich metadata**

Why Order Matters - Variability

Why Order Matters: Turing Equivalence in Automated Systems Administration

Steve Traugott - TerraLuna, LLC
Lance Brown - National Institute of Environmental Health Sciences

Pp. 99-120 of the *Proceedings of LISA '02: Sixteenth Systems Administration Conference*,
(Berkeley, CA: USENIX Association, 2002).

"The least-cost way to ensure that the behavior of any two hosts will remain completely identical is always to implement the same changes in the same order on both hosts."

Delivery Models

- **Divergence**
- **Convergence**
- **Congruence**

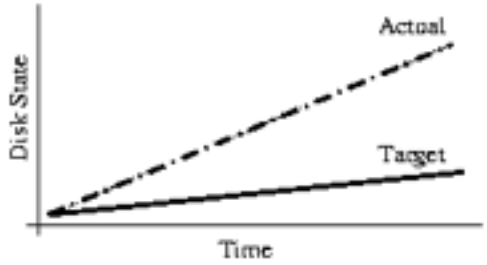


Figure 1: Divergence.

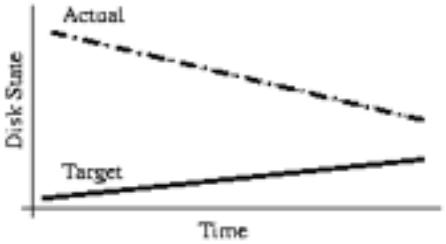


Figure 2: Convergence.

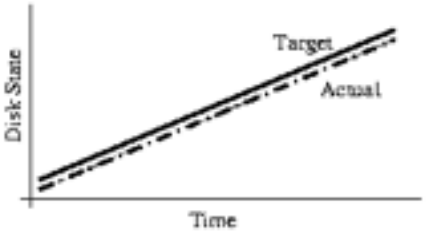


Figure 3: Congruence.

Immutable Delivery Patterns

No CRUD allowed for…

- Packages
- Configuration Files
- Application Software
- Data (RUD)

Immutable Delivery Patterns

"This is how we run our infrastructure. One of the things that developers have to do is provide the commands to start the Docker container, and that's it. This is kind of amazing right? Any EC2 instance that we spin up now, we don't care if you're running Node, Ruby, Scala, Java or if you made up your own programming language. It's absolutely amazing how nice this is. When we compare this to the way we did this in the past, we had one repository that had all of the different scripts to know how to build all of the different applications at Gilt. We have 1000 Git repos and over 300 different applications. We are 7 years old which means we have like 7 different ways of producing applications. There's 25 different ways that we build software at Gilt and it's all captured in a central repo. That was at conflict with where we are going in terms of teams really owning their software and being able to deploy their own services."

Immutable Service Delivery

Large Insurance Company

- Tracks critical and high security defect rate per 10k lines of code
- Started out with (10/10k)
- After applying Devops practices and principles (4/10k)
- After applying Toyota Supply Chain 4VL (1/10k)
- After Docker with Immutable Delivery (0.1/10k)

Immutable Service Delivery

- Devops (Faster)
- Docker (Effective)
- Supply Chain (Reliable)

2000x Faster and 100x Reliable

THANK YOU