AT THE HEART OF THE MISSION

NDIA

1919 2019



# 2019 AGILE IN GOVERNMENT SUMMIT

## Integrating Agile Into Government Business Practices

May 8 – 9 | Washington, DC | NDIA.org/Agile

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## WHO WE ARE

The National Defense Industrial Association is the trusted leader in defense and national security associations. As a 501(c)(3) corporate and individual membership association, NDIA engages thoughtful and innovative leaders to exchange ideas, information, and capabilities that lead to the development of the best policies, practices, products, and technologies to ensure the safety and security of our nation. NDIA's membership embodies the full spectrum of corporate, government, academic, and individual stakeholders who form a vigorous, responsive, and collaborative community in support of defense and national security. NDIA is proud to celebrate 100 years in support of our warfighters and national security. The technology used by today's modern warfighter was unimaginable 100 years ago. In 1919, BG Benedict Crowell's vision of a collaborative team working at the intersection of science, industry, government and defense began what was to become the National Defense Industrial Association. For the past century, NDIA and its predecessor organizations have been at the heart of the mission by dedicating their time, expertise and energy to ensuring our warfighters have the best training, equipment and support. For more information visit **NDIA.org**




# ADAPT WORKING GROUP

## AGILE DELIVERY FOR AGENCIES, PROGRAMS & TEAMS

### WHO WE ARE

ADAPT is composed of industry and government representatives who are interested in advancing the adoption of agile methods in software acquisition. The purpose of ADAPT is to facilitate industry-government interaction in policy, legal/contractual and technical areas directly related to understanding, assessing and implementing agile methods in programs, projects and procurements. Such interaction is intended to promote understanding of agile methods, when they are appropriate for use, and how they may be implemented within the context of information system acquisition.

# SCHEDULE AT A GLANCE

## WEDNESDAY, MAY 8

**Registration and Breakfast**
Ballroom Foyer
7:30 – 8:30 am

**General Session**
Ballroom ABC
8:30 – 9:30 am

**Networking Break**
Ballroom Foyer
9:30 – 10:00 am

**General Session**
Ballroom ABC
10:00 – 11:40 am

**Lunch**
Ballroom CD
11:40 am – 12:30 pm

**Concurrent Sessions**
Ballroom AB, Ballroom CD, Room 4ABC
12:30 – 2:00 pm

**Networking Break**
Ballroom Foyer
2:00 – 2:30 pm

**Concurrent Sessions**
Ballroom AB, Ballroom CD, Room 4ABC
2:30 – 5:00 pm

## THURSDAY, MAY 9

**Registration and Breakfast**
Ballroom Foyer
7:30 – 8:30 am

**General Session**
Ballroom ABC
8:30 – 10:00 am

**Networking Break**
Ballroom Foyer
10:00 – 10:30 am

**General Session**
Ballroom ABC
10:30 am – 12:10 pm

**Lunch**
Ballroom CD
12:10 – 1:00 pm

**Concurent Sessions**
Ballroom AB, Ballroom CD, Room 4ABC
1:00 – 3:30 pm

**Summit Concludes**
3:30 pm

Carnegie Mellon University
Software Engineering Institute

**The Leader in Cybersecurity and Software Engineering**

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- data analytics
- incident response
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- cyber workforce development
- blockchain and cryptocurrency
- insider threats
- IT governance
- agile methods
- cloud security

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# EVENT INFORMATION

## WIFI

Network: KelloggHotel WiFi
No password needed, just accept the terms

## SURVEY AND PARTICIPANT LIST

You'll receive via email a survey and list of attendees (name and organization) after the conference. Please complete the survey, which helps make our event even more successful in the future.

## EVENT CONTACT

**Tiffany Milnor**
Meeting Planner
(703) 247-2558
tmilnor@ndia.org

**Dave Chesebrough**
Vice President, Divisions
(703) 247-2597
dchesebrough@ndia.org

## PLANNING COMMITTEE

**Michelle Casagni**
Mitre Corporation

**Richard Cheng**
Excella Consulting

**Dennis Ebersole**
Perspecta

**Mark Fabian**
EndGoal Group

**Will Hayes**
Carnegie Mellon University - Software Engineering Institute

**Suzette Johnson**
Northrop Grumman

**Steve Mayner**
Scaled Agile

**Dave Mayo**
Everware - CBDI

**Ken Mills**
Tasktop Technologies

**Stosh Misiaszek**
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**Scott Sinclair**
Spectrum

**Dan Weikart**
Cprime

**Eileen Wrubel**
Carnegie Mellon University - Software Engineering Institute

**Robin Yeman**
Lockheed Martin

## SPEAKER GIFTS

In lieu of speaker gifts, a donation is being made to the Fisher House Foundation.

## HARASSMENT STATEMENT

NDIA is committed to providing a professional environment free from physical, psychological and verbal harassment. NDIA will not tolerate harassment of any kind, including but not limited to harassment based on ethnicity, religion, disability, physical appearance, gender, or sexual orientation. This policy applies to all participants and attendees at NDIA conferences, meetings and events. Harassment includes offensive gestures and verbal comments, deliberate intimidation, stalking, following, inappropriate photography and recording, sustained disruption of talks or other events, inappropriate physical contact, and unwelcome attention. Participants requested to cease harassing behavior are expected to comply immediately, and failure will serve as grounds for revoking access to the NDIA event.

## ANTI-TRUST

The NDIA has a policy of strict compliance with federal and state antitrust laws. The antitrust laws prohibit competitors from engaging in actions that could result in an unreasonable restraint of trade. Consequently, NDIA members must avoid discussing certain topics when they are together at formal association membership, board, committee, and other meetings and in informal contacts with other industry members: prices, fees, rates, profit margins, or other terms or conditions of sale (including allowances, credit terms, and warranties); allocation of markets or customers or division of territories; or refusals to deal with or boycotts of suppliers, customers or other third parties, or topics that may lead participants not to deal with a particular supplier, customer or third party.

# AGENDA

NDIA reserves the right to change this program at any time without notice

**The purpose of ADAPT is to foster better understanding of how government agencies can employ agile software development methods to provide incremental and modular acquisition of information systems.**

## WEDNESDAY, MAY 8

7:30 am

### REGISTRATION & NETWORKING BREAKFAST
BALLROOM FOYER

8:30 am

### WELCOME REMARKS
BALLROOM ABC

8:40 am

### KEYNOTE ADDRESS
BALLROOM ABC

**Maj. Gen. Patrick C. Higby**
Director, DevOps and Lethality, Office of the Assistant Secretary of the Air Force Acquisition, Technology and Logistics

9:00 am

### DEVOPS AT HARRIS CORP – A CONTRACTOR CASE STUDY
BALLROOM ABC

**Jorge Relea-Gonzalez**
Senior Director, Software Engineering, Harris Corporation

9:30 am

### NETWORKING BREAK
BALLROOM FOYER

10:00 am

### APPLYING EVM TO AGILE PROGRAMS – AN UPDATE
BALLROOM ABC

**John McGregor**
Deputy Director for Earned Value Management, Acquisition, Analytics and Policy, OASD (A)

10:30 am

### PANEL DISCUSSION: PROGRAM MANAGEMENT (EVM) AND AGILE PROGRAMS
BALLROOM ABC

**Andrea Nibert**
Earned Value Management Analyst, Leidos
*Moderator*

**John McGregor**
Deputy Director for Earned Value Management, Acquisition, Analytics and Policy, OASD (A)

**Eric Ferraro**
Professor of Acquisition Management, DAU

**Dr. Ann Wong**
Professor, Executive Acquisition Management CSM, SPC4, DAU

**Dale Gillam**
Division Chair (IPM), Leidos

11:30 am

### SPONSOR LIGHTNING ROUND PRESENTATION
BALLROOM ABC

SCALED AGILE®
Provider of SAFe®

11:40 am

### LUNCH
BALLROOM CD

| | SESSION 1<br>Dave Chesebrough,<br>NDIA<br>**Ballroom AB** | SESSION 2<br>Suzette Johnson,<br>Northrop Grumman Corporation<br>**Ballroom CD** | SESSION 3<br>Eileen Wrubel,<br>Software Engineering Institute<br>**Room 4ABC** |
|---|---|---|---|
| 12:30 pm | **Creating an Effective Agile Acquisition Ecosystem**<br>**Dr. Matt Kennedy**<br>Office of the Comptroller of the Currency, US Department of the Treasury<br>**Makoto Braxton**<br>Director, Contracts and Grants Division, U.S. Department of Health and Human Services (HHS), Assistant Secretary for Preparedness and Response (ASPR), Office of Resource Management (ORM) | **Agile Processes for Hardware Development**<br>21973<br>**Kevin Thompson**<br>cPrime | **Roadmap for RMF in an Agile Environment**<br>22056<br>**Joseph Brouillard**<br>Lockheed Martin<br>**Daniel Almadani**<br>Lockheed Martin |
| 1:00 pm | Abstract presentation from 12:30 – 2pm | **Agile Approach to Assuring the Safety-critical Embedded Software for NASA's Orion Spacecraft**<br>22131<br>**Justin Smith**<br>NASA Independent Verification & Validation<br>**Wes Deadrick**<br>NASA Independent Verification & Validation | **Show Me the Money**<br>22040<br>**Josh Seckel**<br>Deloitte |
| 1:30 pm | | **Migrating a Department of Defense (DoD) Acquisition Program to a Model-Based Environment using a Phased Approach**<br>22021<br>**Gene Rosenthal**<br>Lockheed Martin | **The Agile Program Office: Applying Agile Principles and Practices in a High-Stakes Government Acquisition Environment**<br>22115 + 22069<br>**Maj Matthew Getts**<br>Advanced EHF System Program Office, USAF<br>**Barton Hackemack**<br>Software Engineering Institute, Carnegie Mellon University |
| 2:00 pm | **NETWORKING BREAK**<br>BALLROOM FOYER | | |

## WEDNESDAY, MAY 8

| | SESSION 4<br>Dave Chesebrough, NDIA<br>Ballroom AB | SESSION 5<br>Mark Fabian, Endgoal Group<br>Ballroom CD | SESSION 6<br>Dennis Ebersole, Perspecta<br>Room 4ABC |
|---|---|---|---|
| 2:30 pm | **Scaling Agile to Support Business Agility in IT Infrastructure**<br>22143<br>Melissa Bradshaw<br>Lockheed Martin<br>Beth Linnebur<br>Lockheed Martin | **Applying Lean Agile Concepts within a Program Office's Acquisition Process**<br>22123<br>Timothy Chick<br>Software Engineering Institute<br>David Sweeney<br>Software Engineering Institute | **How to Design and Build Agile Team Rooms that Rock!**<br>22072<br>Dr. Alfred Lorber<br>Sandia National Laboratories<br>Kathryn Aragon<br>Sandia National Laboratories |
| 3:00 pm | **Agile Development in Regulated Industries, Challenges and Opportunities**<br>22039<br>Adam Sandman<br>Inflectra Corporation | **Continuous Modernization – Maintaining Long-Lived Federal Systems**<br>22119<br>Dane Weber<br>Excella | **Revealing the Unobvious Social Norms that Impede Agile Adoption**<br>22124<br>John Ryskowski<br>JFR Consulting |
| 3:30 pm | **Collaboration over Competition Leads to Agility and Collective Success for Intelligence, Surveillance, and Reconnaissance (ISR)**<br>22144<br>Michael Menousek<br>Connexta | **Project Controls as Servant Leadership**<br>22128<br>Robin Pulverenti<br>ADEPT Force Group, Inc.<br>John Johnson<br>ADEPT Force Group, Inc. | **A Real-World Roadmap for Organizational Change**<br>22147<br>Pete Oliver-Krueger<br>LitheSpeed |
| 4:00 pm | **Agile and Cybersecurity – Effective Risk Management is the Key**<br>22129<br>Dr. Carol Woody<br>Software Engineering Institute, Carnegie Mellon University<br>Will Hayes<br>Software Engineering Institute, Carnegie Mellon University | **Adoption of Earned Value Management (EVM) Metrics in Federal Agile Contract – How to Fill the Project Monitoring Gap in Agile Projects**<br>22113<br>Daniel Navarro<br>Abaco Strategy | **Managing Agile Teams: A Servant-Leader Based Approach**<br>22050<br>Scott Grimes<br>Northrop Grumman |

4:30 pm

### Applying Commercial DevSecOps Best Practices to Federal Programs

22095

**Jeff Payne**
Coveros

### Fail-Proof Metrics to Assess Performance of Agile Contracts

22093

**Manjit Singh**
Agilious

### How Does Agile Speed Government Development? Using Behavioral Modeling and Simulation to Explore, Refine, and Validate Government Applications of Agile

22141

**Andrew Moore**
Software Engineering Institute, Carnegie Mellon University

**William Novak**
Software Engineering Institute, Carnegie Mellon University

## THURSDAY, MAY 9

7:30 am

### REGISTRATION & NETWORKING BREAKFAST

BALLROOM FOYER

8:30 am

### WELCOME REMARKS

BALLROOM ABC

8:40 am

### KEYNOTE ADDRESS

BALLROOM ABC

**Dr. Jeff Boleng**
Special Assistant for Software Acquisition, OUSD(A&S)

9:15 am

### FEATURED SPEAKER

BALLROOM ABC

**Sean Brady**
Learning Director for Software Acquisition, DAU

10:00 am

### NETWORKING BREAK

BALLROOM FOYER

10:30 am

### AGILE IN THE AIR FORCE – THE FUTURE OF SOFTWARE DEVELOPMENT

BALLROOM ABC

**Steven Wert**
Program Executive Officer Digital, Air Force Life Cycle Management Center

11:15 am

### DEVOPS DYNAMICS – KEY CONCEPTS FOR HIGH-PERFORMING DEVOPS ORGANIZATIONS

BALLROOM ABC

**Firas Glaiel**
Enterprise DevOps Champion, Raytheon

12:00 pm

## SPONSOR LIGHTNING ROUND PRESENTATIONS

BALLROOM ABC

ATLASSIAN

perspecta

12:10 pm

## LUNCH

BALLROOM CD

| | SESSION 7<br>Ken Mills, Collabnet<br>Ballroom AB | SESSION 8<br>Stosh Misiaszek, Scaled Agile<br>Ballroom CD | SESSION 9<br>Scott Sinclair, Spectrum<br>Room 4ABC |
|---|---|---|---|
| 1:00 pm | **Implementing Agile Program Management to Achieve Mission Success – SMC 2.0**<br>Lt Col Kellie Brownlee, USAF<br>Air Force Space and Missile Systems Center (SMC)<br>Mary Stevenson<br>Stellar Solutions | **Applying an Agile Approach with MBSE**<br>22133<br>Flavius Galiber<br>Northrop Grumman<br>Madeline Pantano<br>Northrop Grumman | **Changing F-22 Culture: Digital Transformation of Old Dogs with New Tricks**<br>22125<br>John Oberkrom<br>Lockheed Martin |
| 1:30 pm | **The Lean Agile Architecture**<br>22140<br>Lisa Henke<br>Radiant Solutions<br>Matthew Reider<br>Radiant Solutions | **Applying Agile and Continuous Delivery to Significant Cyber-Physical Systems**<br>22155<br>Dr. Suzette Johnson<br>Northrop Grumman Corporation<br>Robin Yeman<br>Lockheed Martin | **Agile Test & Evaluation in a SAFe Large Solution Context**<br>22107<br>Jennifer Rekas<br>MITRE<br>Jeff Cook<br>MITRE |
| 2:00 pm | **Agile (SAFe) in Practice - Lessons Learned So Far**<br>22117<br>Keith Korzec<br>Software Engineering Institute, Carnegie Mellon University | **How Do We Measure Impact of Agile Transformations in Non-software Development Programs?**<br>22078<br>Rosa Heckle<br>MITRE | **Beyond IT - Making Your Government Delivery as Agile as Your Development!**<br>21982<br>Claire Atwell<br>Booz Allen Hamilton |
| 2:30 pm | **Adopting AGILE and the Scaled Agile Framework (SAFe) for the Federal Government: A Case Study Application for a Satellite Ground System Acquisition Program.**<br>22112<br>Dr. Roderick Capili<br>National Geospatial Intelligence Agency | **Challenges of Employing Agile DevOps Practices for Embedded Operational Flight Software**<br>22118<br>Shawn Taylor<br>76th Software Maintenance Group, Tinker Air Force Base | **MBSE for Agile Development**<br>22152<br>Thomas Mielke<br>CACI<br>Dr. Brian Gallagher<br>CACI |

3:00 pm

**Sparking Mission Agility with End to End Value Stream Teams**
22101

Bob Payne
LitheSpeed

**Demonstrating the Value of DevSecOps in Government Healthcare Programs**
22114

Matthew Dicks
ManTech

Paul Klinker
ManTech

**Agile and the USMC – MCRISS II Program**
22130

Joe McNeely
Chenega Decision Sciences, LLC

Jason Glavich
(MCRISS)(OSD)

3:30 pm **ADJOURN**




The technology used by today's modern warfighter was unimaginable 100 years ago. In 1919, BG Benedict Crowell's vision of a collaborative team working at the intersection of science, industry, government and defense began what was to become the National Defense Industrial Association. For the past century, NDIA and its predecessor organizations have been at the heart of the mission by dedicating their time, expertise and energy to ensuring our warfighters have the best training, equipment and support.

Reflecting on NDIA's history, we embrace the opportunity to emphasize the need for legal and ethical collaboration among military, government, industry and academia to ensure the defense industrial base is prepared for future challenges and conflicts. Just as the early 20th century was characterized by massive transformation in military capabilities, emerging trends in technology and increasing geopolitical challenges demand new strategies and policies in today's national security landscape.

## Creating an Effective Agile Acquisition Ecosystem

**Kennedy, M. | Braxton, M.**

This presentation will discuss key aspects of creating an effective Agile Ecosystem within your organization. Focusing on the contracting component, we will discuss various Firm-Fixed-Price contracting approaches utilized over a 2.5-year period to rapidly deliver capabilities on an IT Program comprised of over 90 servers, geographically distributed databases, and 14 applications (desktop and web-based) that support the agency's core mission. We will address some of the most commonly asked questions including: availability of templates, contractual deliverables (CDRL's), CLIN structures, and using Performance-based contracting. We will also address future considerations such as incorporating the presented approach to DevOps.

## Implementing Agile Program Management to Achieve Mission Success – SMC 2.0

**Brownlee, K. | Stevenson, M.**

Lt Col Brownlee, Chief of the Future Ground Systems Branch of the Remote Sensing Experiment Ground Division, Remote Sensing Systems Directorate at Los Angeles Air Force Base, California will present her teams application of Agile practices for managing their $2B program. During the presentation, she will layout how they implemented the Lean Agile methodology for program management activities as well as sharing lessons learned and best practices.

## Agile Processes for Hardware Development

21973

**Thompson, K.**

The Agile Hardware Research Project identified the Scrum framework as the appropriate one for managing development of hardware and integrated hardware-software products. Research findings and real-world experiences confirm this prediction, and show how Agile practices must be reformulated to be effective for development of physical products.

## Beyond IT - Making your government delivery as agile as your development!

21982

**Atwell, C.**

Agile development is increasingly popular and often mandated in many government organizations. Anything from services, solutions, logistics, modernization and most commonly IT systems need "agile" development. Agile development in government has not been as challenging as timely delivery to our end users or consumers. Government environments often include a variety of stakeholder, phase gates and other types of compliance that tacked on to the end, after something is developed and before it can be delivered. In this talk, we will help you exam your own environment and the delivery process to manage stakeholders and bring compliance earlier in the development cycle. The ultimate goal is to make our delivery, as agile as our development.

## Migrating a Department of Defense (DoD) Acquisition Program to a Model-Based Environment using a Phased Approach

22021

**Rosenthal, G.**

With the growing need to accommodate fix-priced contracts, be cost affordable, and be faster/agile, the DoD realized the need to transform how systems engineering in being performed. Model-Based Systems Engineering (MBSE) addresses these concerns and can lead to significant cost savings. The DoD System Safety program has been performing safety assessments using a defined set of safety critical functions whenever proposed architecture changes affect safety critical components. These assessments involve generating numerous documents, spreadsheets and analysis. A pilot project was stood up to transition this program to a model-centric program in an effort to transition how systems engineering is being performed. This presentation describes the model-based transition, and discusses the challenges faced along the way.

## Agile Development in Regulated Industries, Challenges and Opportunities

22039

**Sandman, A.**

In this session I would like to discuss my experiences working with clients to apply agile approaches while developing and testing software and systems in industries such as healthcare, medical devices, aviation, and defense.

I shall cover some specific nuances for the different industries – for example how to support FDA CFR Part 11 in life sciences, DO-178B in aviation. We shall also cover the rules, regulations, and reporting requirements, and present ways to harness agile approaches in a regulated environment.

## Show me the Money

22040

**Seckel, J.**

The Agile Manifesto has inspired different interpretations around non-development agile topics. I have been working, living, and now presenting on, the procurement process for the US federal government for the last several years (ranging from $10k to $1.5b), both from the contractor and federal employee perspective -- both sides of the procurement process. I have discerned a framework I have found to be efficient and effective in getting the best value from the contracting process, and that has a higher probability of getting a good fit between the federal agency and the contractor.

This session will examine what these values mean, show examples of where they have provided value (and where they haven't), and give recommendations for adopting these into acquisition processes. By the end of this session, you should be able to speed your procurement process so that applying the modern development techniques provide the value they are intended to provide.

## Managing Agile Teams: A Servant-Leader Based Approach

22050

**Grimes, S.**

Product Owner, Team Member, Scrum Master, Facilitator, Coach, Manager? The Work done by managers of agile teams can decide the success or failure of any agile initiative. The Management team must learn to co-create value for the customer in order to succeed and thrive in today's Agile world. How can management and technical leaders contribute to the success of an agile project at all phases of Agile adoption? How can years of experience, research, and knowledge of management principles be leveraged to meet the Agile goal of providing more value quickly. This presentation will provide a fact-based presentation on leadership, interpreting the results of multiple leadership surveys over the past 30+ years in a way that promotes Agility and empowers teams.

## Roadmap for RMF in an Agile Environment

22056

**Brouillard, J. | Almadani, D.**

Adopting Agile methodologies for Risk Management Framework (RMF) has historically been a waterfall-centric and process-driven approach that presents several daunting challenges. Lockheed Martin shares an experience for integrating Agile principals into a project's cybersecurity processes and cultural fabric to help overcome these challenges. The result provides a cyber resilient system that achieves authorization to operate quickly and maintains a continuous security posture.

## How to Design and Build Agile Team Rooms that Rock!

22072

**Lorber, A. | Aragon, K.**

You've heard that working in an Agile team room increases collaboration, fosters a shared culture and increases team productivity. So, exactly how do you design your own Agile team room to reap the benefits you need? There are many challenges, include gathering all requirements from team members, conveying those to designers and working within all your constraints to finally create a space the team will love. In this presentation, we address many common issues and then help you jumpstart the planning of your Agile team room construction/remodeling project. Through our combined twenty-year history of creating and living in dozens of team rooms, will can provide you with practical advice, examples, and a checklist to move you toward success.

## How Do we Measure Impact of Agile Transformations in Non-software Development Programs?

22078

**Heckle, R.**

With the success of agile in software development, more organizations are beginning to apply agile practices, principles and methods to organizational programs to improve organizational agility. Agile transformation efforts take time, resources, and funding to implement and there is a need to measure their effectiveness before organizations continue to invest the time, money and effort to continue them. While metrics to measure ROI for agile software delivery projects have matured, metrics to measure the ROI of agile transformations in other organizational areas are not clearly defined. This presentation's focus is to open a discussion on identifying metrics that can be used to measure the effectiveness and organizational impact of using agile methods.

## Fail-Proof Metrics to Assess Performance of Agile Contracts

22093

**Singh, M.**

## Applying Commercial DevSecOps Best Practices to Federal Programs

22095

**Payne, J.**

DevSecOps is the practice of integrating security staff, practices and automation into a DevOps delivery process. This presentation discusses DevSecOps best practices and how to best apply them to federal programs. A case study for how one federal customer implemented DevSecOps capabilities will be discussed.

## Sparking Mission Agility with End to End Value Stream Teams

22101

**Payne, B.**

## Agile Test & Evaluation in a SAFe Large Solution Context

22107

**Rekas, J. | Cook, J.**

Case study of a large DoD system of systems agile transformation, describing approaches for right-fitting the test and evaluation process to utilize DevSecOps, abide by SAFe large solution structure, and define effective roles and responsibilities amongst system delivery stakeholders

## Adopting AGILE and the Scaled Agile Framework (SAFe) for the Federal Government: A case study application for a satellite ground system acquisition program.

22112

**Capili, R.**

The Systems Program Office is a Joint Major Systems Acquisitions Program (ACAT-1 equivalent) for a Satellite Ground Station. The program office's primary role is to serve as the "Government As The Integrator" (GATI) for a system-of-systems acquisition effort that will provide user capability and access for several National Technical Means (NTM) systems. In 2015, the program office underwent a major restructuring effort to implement Agile and SAFe methodologies in support of it acquisition efforts and the presentation captures the major lessons learned for implementing Agile to a Major Systems Acquisition Program

## Adoption of Earned Value Management (EVM) Metrics in Federal Agile Contract – How to Fill the Project Monitoring Gap in Agile Projects

22113

**Navarro, D.**

## Demonstrating the value of DevSecOps in Government Healthcare Programs

22114

**Dicks, M. | Klinker, P.**

DevSecOps and Continuous Integration and Continuous Delivery (CI/CD) has increased ManTech's customer satisfaction, and reduced costs and deployment errors. We present two Government project case studies outlining our approach, organizational and technical challenges, and benefits and we examine implications and trends in our future DevSecOps use. Following adoption of DevSecOps, our automated build, test, package, and deploy processes eliminated critical findings and reduced provisioning and deployment errors and times from days to minutes. Responding agilely to emerging threats and risk profiles via DevSecOps for these HIPAA compliant systems allowed us to quickly roll out patches and updates through automated processes.

## Agile (SAFe) in practice - lessons learned so far

22117

**Korzec, K.**

What has made the Scaled Agile Framework (SAFe) / agile a success for some programs has been a curse to others. After several years working with multiple DoD programs on Agile adoption and improving design options earlier in the acquisition cycle, I have observed success stories and failures with programs while implementing SAFe. This talk will focus on some of the pitfalls, recommendations, and DoD specific tailoring for adopting SAFe on your program.

## Challenges of Employing Agile DevOps Practices for Embedded Operational Flight Software

22118

**Taylor, S.**

The push toward Agile and DevOps in the US Air Force software portfolio has reached critical mass. There are multiple examples of successful implementations which put capability into the hands of the war fighter more rapidly than ever before. In order to continue this culture shift into the realm of embedded operational flight software, there are numerous obstacles which will need to be addressed and overcome.

## Continuous Modernization - Maintaining Long-Lived Federal Systems

22119

**Weber, D.**

The federal government maintains some IT systems that are over 50 years old and replaces others with ground-up rewrites after 5 years. There are always trade-offs to be made, but some approaches better fit the uniquely long-lived missions that are served by federal IT systems. Continuous modernization can reduce risk and avoid costs while continuing to accrete value.

## Applying Lean Agile Concepts within a Program Office's Acquisition Process

22123

**Chick, T.**

In this presentation, we will present our experience regarding the adoption of Lean Agile tools and concepts to the Navy Cyber Warfare Development Group (NCWDG) Program Office's Procurement Initiating Document (PID) process. We will quantitatively show how the adoption of Lean Agile tools and concepts has enabled the program office to eliminate waste by optimize the whole, thus delivering faster. We will discuss the approach taken, lessons learned, and the resulting process which builds quality in and creates program knowledge.

## Revealing the Unobvious Social Norms that Impede Agile Adoption

22124

**Ryskowski, J.**

As a result of being human, our behavior is tuned by social traditions (or norms), much of the time without our awareness. Some of these norms are impediments to becoming agile. This talk reveals some less obvious social norms and traditional development fantasies from which one must disengage in order to truly be agile. We get help from Pink Floyd, Mel Brooks, store shelving, requirements dementors, a fun exercise, and more.

## Changing F-22 Culture: Digital Transformation of Old Dogs with New Tricks

22125

**Oberkrom, J.**

Today's fighter platforms must develop and deploy new capabilities more rapidly than in the past to remain relevant in today's warfighting environments; thus, new tools and processes must be adopted to counter frequently emerging threats. The F-22 transformation initiatives LM Aeronautics is implementing include commercial practices development/ training, cloud migration, metrics definition, value stream governance, systems engineering adjustments, tools/IT infrastructure (Continuous Integration / Continuous Deployment pipeline implementation), team structure, rapid hardware prototyping/production, facilities, automated "lights-out" testing, daily builds and single code baseline, streamlined certification processes and a culture change to unleash the workforce to operate in an agile, self-directed manner. The presentation focuses on many of the key initiatives that have been undertaken and the important lessons learned to move the F-22 enterprise toward developing with speed and agility in a frequently adapting warfighter environment.

## Project Controls as Servant Leadership

22128

**Pulverenti, R. | Johnson, J.**

Project Controls, especially Earned Value Management, has a reputation of being cumbersome, non-value-add, and a burden to development teams. This session looks to change your hearts and minds to see that Project Controls can be used as a tool to inform developers, support project managers, and enable executives to better manage portfolios through the importance of Technical Performance Measures and the alignment of Agile Metrics to conventional Key Performance Indicators.

## Agile and Cybersecurity – effective risk management is the key

22129

**Woody, C. | Hayes, W.**

Cybersecurity and agility can be integrated by effective risk management. By understanding the network of risks in the product vision, work can be sequenced to 'burn down' risk that threatens user value including operational viability, with each incremental delivery of working software. Developers and security experts can work together through this approach to product risk management to achieve both agility and cybersecurity.

## Agile and the USMC – MCRISS II Program

22130

**McNeely, J. | Glavich, J.**

## Agile approach to assuring the safety-critical embedded software for NASA's Orion spacecraft

22131

**Smith, J. | Deadrick, W**

This presentation recounts the journey of the Orion Independent Verification and Validation (IV&V) team as they addressed an agile approach being used to develop the software of NASA's next human rated spacecraft. We will discuss a new agile approach to IV&V, characterized by a sharper focus on critical mission capabilities, matched with a method to dynamically 'follow the risk' as the IV&V team adds more compelling assurance in waves. We explain the concrete steps we took, the principles that motivated our choices, and the results we have achieved to date.

## Applying an Agile Approach with MBSE

22133

**Galiber, F. | Pantano, M.**

The combination of Model-Based Systems Engineering (MBSE) and the Agile process aids in the execution of programs that are constantly changing, are highly complex, and contain uncertainties throughout system development. Establishing an Agile MBSE approach allows teams to manage change and uncertainties, manage the complexity of a system, foster multidisciplinary collaboration between cross-functional teams, and provide a central repository model as the source of truth for system information.

## The Lean Agile Architecture

22140

**Henke, L. | Reider, M.**

Agile architecture refers to both the use of agile methods in developing architectures of various types and levels (enterprise, solution, data, etc.) as well as the architecture necessary to integrate multiple activities for agile development on a large scale. This session will address both perspectives of agile architecture and will provide concepts on how to provide lean principles to agile architecture development. Attendees will learn to appreciate the mutually reinforcing roles of lean, architecture and agility.

## How Does Agile Speed Government Development? Using Behavioral Modeling and Simulation to Explore, Refine, and Validate Government Applications of Agile

22141

**Moore, A. | Novak, W.**

Behavioral modeling and simulation (BModSim) techniques provide a means to construct valid, coherent, and executable characterizations of agile software development to answer key questions of agile concepts and application. BModSim can help to - expose the operation of underlying mechanisms that make agile useful in a government program context, - understand exactly how and when different agile approaches create value, and - test the efficacy of software development policy and process before implementation.

These techniques complement data analytic approaches such as machine learning by describing the larger landscape of organizations' application of agile, putting in context diverse results from data analysis, and identifying the most profitable areas for future data collection. The talk describes a BModSim application grounded in available data as an example of building a rigorous foundation to explore, refine, and validate Government applications of agile.

## Scaling Agile to Support Business Agility in IT Infrastructure

22143

**Bradshaw, M. | Linnebur, B.**

The enterprise hosting team at Lockheed Martin has been on a journey to agile at scale for the last several years while also driving cloud platform adoption across the business. The team shares their "Phoenix Project" moment and how they translated team successes into a repeatable framework for enterprise agile transformation, translated Hollywood style!

## Collaboration over Competition Leads to Agility and Collective Success for Intelligence, Surveillance, and Reconnaissance (ISR)

22144

**Menousek, M.**

Employment of an agile development process has demonstrated the ability to rapidly deliver capability. This development model permits rapid identification of technology gaps and offers robust solutions that grow with tomorrow's expanding mission space. Missions grown; through open standards and open source development, solutions are future proof.  Agile software methodologies empower programs to adapt as new risks arise. The advantages of the DoD's Distributed Data Framework, an open and agile architecture, have been demonstrated over 5 years of deployment in operational environments.

## A Real-World Roadmap for Organizational Change

22147

**Oliver-Krueger, P.**

Have you ever rolled out a new technology or a new practice that worked great for one team but fell flat with another? Do you have some teams that just aren't getting any better?

After both succeeding and struggling with multiple teams, I started to notice the pattern, and developed the Agile Team Roadmap™. It maps out 4 levels of industry best practices in Agile, Lean Startup, DevOps, Design Thinking, and Self-Management, and describes why some techniques fail when they were introduced, and what other techniques have to be mastered first. We'll also cover assessment models, and give examples of effective metrics for each level of performance.

## MBSE for Agile Development

22152

**Mielke, T. | Gallagher, B.**

Our presentation will describe how we have established an MBSE/ Agile culture within the company, executed MBSE and Agile for large-scale development, and governed MBSE and iterative development across programs.

## Applying Agile and Continuous Delivery to Significant CyberPhysical Systems

22155

**Johnson, S. | Yeman, R.**

## The Agile Program Office: Applying Agile Principles and Practices in a High-Stakes Government Acquisition Environment

22115 & 22069

**Getts, M. | Hackemack, B.**

Agile methods have been used in software development for some time and are becoming mainstream in the government development community. This presentation illustrates the application of lean/ agile principles and practices in a satellite production and launch operations context.

# BIOGRAPHIES



## DR. JEFF BOLENG

*Special Assistant for Software Acquisition*
OUSD(A&S)

Dr. Jeff Boleng is the Special Assistant for Software Acquisition to the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) where he serves as a key member of the Under Secretary's executive leadership team, providing strategic focus and overall policy guidance on all matters of defense software acquisition. In this role, he leads the formulation of the Department's software acquisition strategy, advises Department leadership on latest best practices in commercial software development, supports the enterprise to build a team of top-tier software engineers, and works to develop modern software skills in the acquisition workforce.

Jeff has a breadth of experience across the Department of Defense (DOD) and the private sector. Prior to joining DOD, he served as the chief technology officer (acting) and deputy chief technology officer at Carnegie Mellon University Software Engineering Institute. Prior to that, he served more than 21 years in the United States Air Force as a cyberspace operations officer and software engineer. In his final assignment with the Air Force, Jeff served as the deputy department head, Department of Computer Science at the United States Air Force Academy.

Jeff is a senior member of both the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE), and he holds PhD and MS degrees in Mathematical and Computer Sciences from the Colorado School of Mines and a BS in Computer Science from the U.S. Air Force Academy.

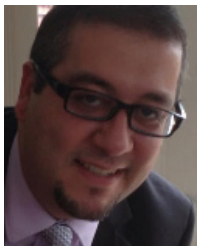
## SEAN BRADY

*Learning Director for Software Acquisition*
Defense Acquisition University

Mr. Sean Brady serves as the Learning Director for Software Acquisition at the Defense Acquisition University. He leads strategy to transform DoD's practices, competencies, training, and workforce- and accelerate the adoption of modern, commercial software development practices across DoD and the DAU curriculum.

Prior to DAU, Mr. Brady served 9 years as the Deputy Director for Software Engineering (SWE), in the Office of the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)), within the Office of the Secretary of Defense (OSD). He led change, provided oversight of 170+ major programs (a $1.7T portfolio), and managed governance of Software Acquisition and Development within DoD. He led SWE oversight on DoD's most complex, highest-visibility defense programs (RD&E > $480M; procurement > $2.79 billion). Mr. Brady is an expert in software parametric statistical analysis and assessing large-scale Agile software development efforts. He informed DoD's senior-decision makers, industry CEOs, and Congress on SWE across Army, Navy, Marine Corps and Air Force programs. His strategic duties include leading policy and guidance development; workforce planning; and outreach to optimize the DoD's SWE capability. He launched DoD's largest acquisition workforce modernization initiative (impacting 200K+ professionals). In addition, he championed OSD's efforts to improve performance measurement practices across DoD and industry.

Prior to his role in the Pentagon, he served in the Army's RDECOM/ARDEC as an Armament Software Engineering Center (ASEC) Special Projects Team Lead and as a Program Manager, Close Combat Systems Project Officer (PO) where he planned and executed high-visibility experimental and rapid fielding programs -- supporting elite special operations and front-line Warfighters. He is the Defense Innovation Board's Software Acquisition workforce co-lead, a member of the Army's Acquisition Corps and has served as a US Delegate to NATO. Mr. Brady holds a Bachelor of Science in Computer and Electrical Engineering from Rutgers University; a Master of Science in Quantitative Software Engineering from Stevens Institute of Technology; is an MBA candidate from the University of Virginia (Class of 2020); and holds a graduate certificate in Entrepreneurship and Innovation from Stanford University.



## FIRAS GLAIEL

*Enterprise DevOps Champion*

Raytheon

Firas Glaiel leads the Raytheon DevOps Center of Excellence. He is a Raytheon Engineering Fellow, in the Raytheon Integrated Defense Systems Software Engineering Technical Staff, with 20 years of experience in software, systems, and engineering management in the areas of Air Traffic Management, Integrated Air & Missile Defense, and C4I (Command, Control, Communications, Computers and Intelligence). Previously, as the Corporate Technology Area Director for Information Systems and Computing (ISaC), he was responsible for the coordination of the technology and research efforts in the ISaC domain across Raytheon businesses. Firas holds a B.S. in Computer Systems Engineering from Boston University, and an M.S. in Engineering and in Management from M.I.T.'s School of Engineering and Sloan School of Management.



## MAJ GEN PATRICK HIGBY, USAF

*Director, DevOps and Lethality*

Office of the Assistant Secretary of the Air Force Acquisition, Technology and Logistics

Maj. Gen. Patrick C. Higby is the Director, DevOps and Lethality, Office of the Assistant Secretary of the Air Force Acquisition, Technology and Logistics. In this role, he devises and implements strategies to responsively combat cybersecurity threats while rapidly delivering cyber/digital/IT capabilities to the point of need.

Prior to this assignment, General Higby was the Director, Cyberspace Strategy and Policy, Office of Information Dominance and Chief Information Officer, Office of the Secretary of the Air Force. As the Cyberspace Operations and Support Career Field Functional Manager, General Higby was responsible for the development of 43,000 officers, enlisted and civilian personnel. He balanced costs and risks for Air Force cybersecurity, as well as led the Air Force in developing cyberspace strategies, policies and enterprise architectures across business, information, weapon system and defense intelligence mission areas.

General Higby was born in the Air Force hospital in Wiesbaden, Germany, and came on active duty in April 1989 as a graduate of the Reserve Officer Training Corps. He previously served in the engineering, intelligence, space, communications and cyber career fields, at base, major command and joint agency levels. He had the opportunity to command at the squadron, group and, twice, at the wing/installation level.

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## JOHN MCGREGOR

*Deputy Director*

Earned Value Management, Acquisition, Analytics and Policy, OASD (A)

Mr. John S. McGregor is the Deputy Director for Earned Value Management in the Performance Assessments and Root Cause Analyses organization in the Office of the Assistant Secretary of Defense for Acquisition. Mr. McGregor's office serves as the Department of Defense focal point for all policy, guidance, and competency relating to Earned Value Management. To facilitate consistent EVM implementation across the Department, Mr. McGregor's office is responsible for the development and communication of DoD EVM policy, guidance and interpretation, as well as for managing the EVM Central Repository as the authoritative source of EVM data for the Department.

Mr. McGregor has established and been recognized for a track record of superior performance and leadership resulting in streamlined operations with increased efficiency and effectiveness. Throughout his career, Mr. McGregor has received several prestigious awards to include: the Department of the Navy Meritorious Civilian Service Award, Office of the Secretary of Defense Award for Excellence, the Navy Commendation Medal (3 Awards), and the Navy Achievement Medal (4 Awards).

During his nearly thirty year career, Mr. McGregor has held various military, contractor, and DoD civilian positions including mission support, program analysis and oversight throughout the entire DoD Acquisition Lifecycle, and policy development . His responsibilities have ranged from air vehicle maintenance and aircraft deployments to budget functions for ship operations programs, to planning, tracking, and control of performance data for major acquisition programs.

Prior to his current position, Mr. McGregor was the Director of the Earned Value Management (EVM) Division of the Cost Engineering and Industrial Analysis Group for the Naval Sea Systems Command (NAVSEA). In this role, Mr. McGregor was responsible for the development and implementation of headquarters oversight policy and processes for Earned Value Management System surveillance and analysis by NAVSEA Headquarters and field activities. He provided oversight and direction for the analysis and use of contractor earned value management data on major acquisition programs and managed the development and implementation of common EVM analysis tools for use by NAVSEA personnel.

Prior to his Director position at NAVSEA, Mr. McGregor was the Lead Earned Value Management Analyst responsible for development and use of mathematical modeling to compile and analyze data for all ACAT 1 programs at NAVSEA, including multi- ship buy scenarios, accelerated and delayed production schedules, industrial base analysis, independent cost estimates, rates analysis, estimates at completion, and numerous cost and schedule profiles. The results of the analysis were used to provide program cost and schedule performance information to Congress, GAO, and OSD.

Mr. McGregor holds a Bachelor's Degree in Business Administration from St. Leo University in Norfolk, Virginia.



## JORGE RELEA-GONZALEZ

*Senior Director, Software Engineering*

Harris Corporation

Jorge Relea is Senior Director, Software Engineering with Harris Corporation, Space and Intelligence Systems in Melbourne, FL. In this role, Mr. Relea is responsible for development of technology and common processes in software and image science, personnel management, and program execution. He has a master's degree in project management from George Washington University and a bachelor's degree in computer engineering from the University of Puerto Rico.



## STEVEN WERT

*Program Executive Officer Digital*
Air Force Life Cycle Management Center

Steven D. Wert, a member of the Senior Executive Service, is Program Executive Officer Digital, Air Force Life Cycle Management Center, Hanscom Air Force Base, Massachusetts. He leads more than 3,500 Airmen, government civilians and support contractors in the acquisition of software and weapons systems and in the standardization and dissemination of agile software development processes throughout the Air Force. PEO digital also executes a $19 billion FYDP portfolio of ACAT, non-ACAT, technology transition and Foreign Military Sales programs. He reports directly to the Service Acquisition Executive and is a milestone decision authority for delegated ACAT-II and all ACAT-III programs in the PEO Digital portfolio.

Wert served as an Air Force officer for nearly 25 years. He led performance engineering on the advanced medium-range air-to-air missile, and he served as program manager for missile integration efforts with the NATO Eurofighter, JAS-39 Gripen and Peace Onyx F-16 programs. Wert later directed the Airborne Warning and Control System Radar Development Team and led the ACAT-I U.S./NATO Radar System Improvement Program.

Wert was on the Air Force Program Executive Officer staff as Director for Surveillance and Control Programs, including the E-3, E-4 and Peace Shield. He subsequently served as Deputy Director for Congressional and Budget Integration, Information Dominance, in the Office of the Assistant Secretary of the Air Force for Acquisition. He was previously assigned to the Electronic Systems Center as executive officer to the commander, and led the Air Force Distributed Common Ground System Program before joining Headquarters Air Force Materiel Command as Deputy Director for Engineering. Following active duty, Wert was employed by SRA International, Inc., supporting the Office of the Air Force Deputy Chief of Staff for ISR. Prior to his current appointment, he was Program Executive Officer for Theater Command and Control, Electronic Systems Center at Hanscom, AFB.

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# 2019 ARMAMENT SYSTEMS FORUM

## Small Arms • Guns, Ammunition, Rockets & Missiles (GARM) • Unconventional and Emerging Armament (UEA)

The 2019 NDIA Armament Systems Forum will focus on **leveraging armament technology integration to achieve modernization, overmatch, and operational readiness**.

The can't miss, high-density agenda features parallel sessions for small arms, GARM, and UEA addressing synergy, communication, and networking opportunities across the entire armament community. This forum will also allow for an expanded number of technical/oral presentations and poster presentations addressing subjects relevant to legacy and evolving future armaments as well an incredible opportunity to interact with the latest technologies available on the exhibit floor.

**June 3 – 6, 2019 | Fredericksburg, VA | NDIA.org/Armaments19**



# DEVOPS AT HARRIS – A CONTRACTOR CASE STUDY


JORGE RELEA-GONZALEZ

Senior Director, Software Engineering

Harris Corporation, Space and Intelligence Systems

# The Need for Speed
## Delivering Software Faster at Harris

"Certainly, as you deploy tools like **DevOps**, it's going to help you develop products which have significant **software content faster**. The concept is basically to be able to **continuously integrate and test** software builds so that you always have a software feature that you can field and market, and that is something that we have not developed. A lot of the defense companies have not, and that is going to compress the cycle time for software pretty substantially. We've seen that in multiple cases where we deployed **DevOps**. As we go out the next 2 to 3 years, by fiscal '21, we think **85%** or **90%** of our new starts will be on **DevOps**. I think it's going to be a key thing, the **compressing overall cycle time** and developing and launching new products."

*William M. Brown, Chairman, President & CEO Harris Corporation*

*Q4 2018 Harris Corp Earnings Call / July 31, 2018*

**DevOps is driven from the highest executive levels at Harris**

### Software Factory Examples

- >50% **Reduction in build & release time**
- >50% **Decrease in cycle time**
- >90% **Increase in release frequency**
- >50% **Efficiency improvement**

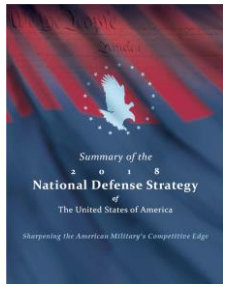
### Program Examples

- 33% **Reduction in onboarding time**
- 58% **Reduction in project defects**
- 30% **Decreased I&T effort**
- 70% **Defect rework reduction**

# The defense software industry is changing rapidly

## DoD is changing how it acquires…

**National Defense Strategy**



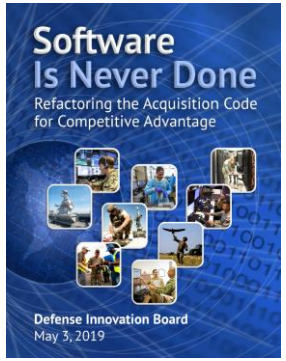

"…streamline rapid, iterative approaches from development to fielding."

**Defense Science Board (DSB) Task Force on the Design and Acquisition of Software for Defense Systems**




https://www.acq.osd.mil/dsb/reports/2010s/DSB_SWA_Report_FINALdelivered2-21-2018.pdf

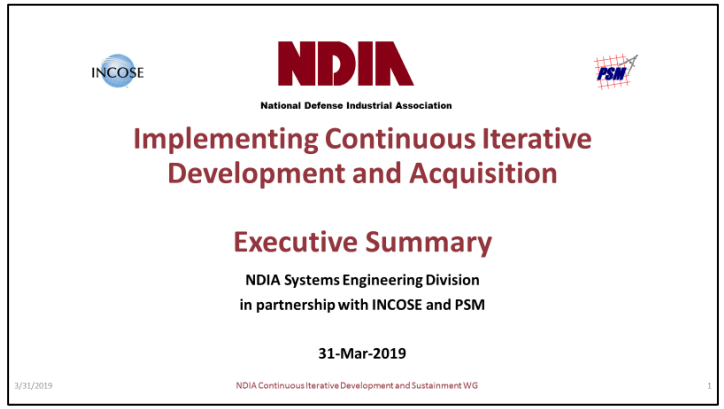
**Defense Innovation Board Software Acquisition and Practices Study**



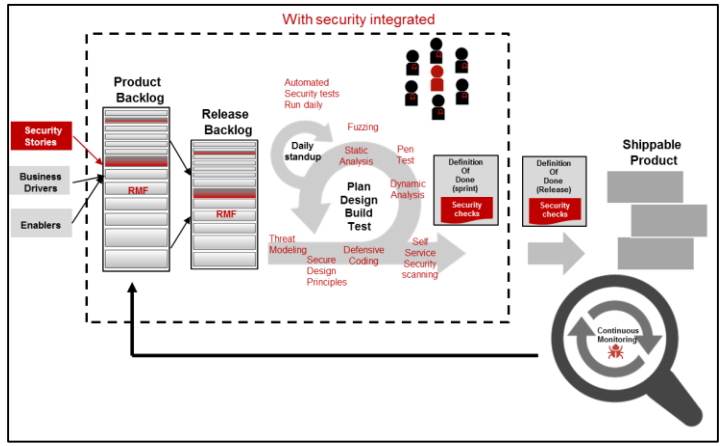

https://innovation.defense.gov/software/

## … industry is changing how we work

•Industry recommendations for implementing DSB findings




http://www.ndia.org/divisions/systems-engineering/studies-and-publications




**Metrics**

Cost, cycle time, defects, rework, …

**Business improvement that affects the bottom line**

**Both DoD and industry see a similar future – and it is DevOps**

# Harris Business Context for DevOps

## Communication Systems

Tactical and airborne radios, night vision technology, and defense and public safety networks

## Space and Intelligence Systems

Complete solutions encompassing advanced sensors and payloads, processing systems, and analytics for global situational awareness, space superiority missions, and Earth insights

## Electronic Systems

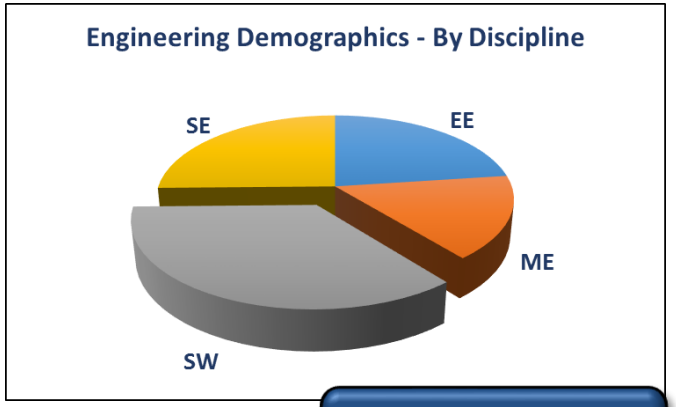
Electronic warfare, avionics, robotics, advanced communications and maritime systems for the defense industry, as well as air traffic management solutions for the civil aviation industry

**Diverse domains, business segments and products**



**Geographically distributed**






**Rapid growth in SW demand**

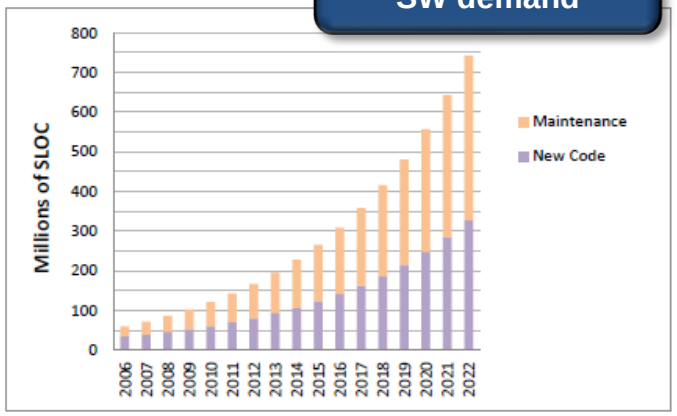



Figure 1. Forecast of DoD Software Demand

Software Productivity Trends and Issues. David Tate, Institute for Defense Analyses. March 2017.
https://www.ida.org/idamedia/Corporate/Files/Publications/IDA_Documents/CARD/2017/D-8367.pdf

**Harris business is increasingly dependent on software across diverse domains – with a motivation for improvement driven by both internal and external factors**

# Challenges

**Changing the culture**

- Legacy to DevOps
- Automation (speed, speed, speed)
- Skill mix, support disciplines
- Industry and government, engagement

**Enterprise metrics in DevOps era**

- Productivity, quality, estimate accuracy, …
- Building new historical DBs for estimates

**Acquisition and contracting**

- Streamlining policies, constraints
- Source code availability vs. IP

**Integrating cybersecurity into SW factory processes and toolchain**

- DevSecOps

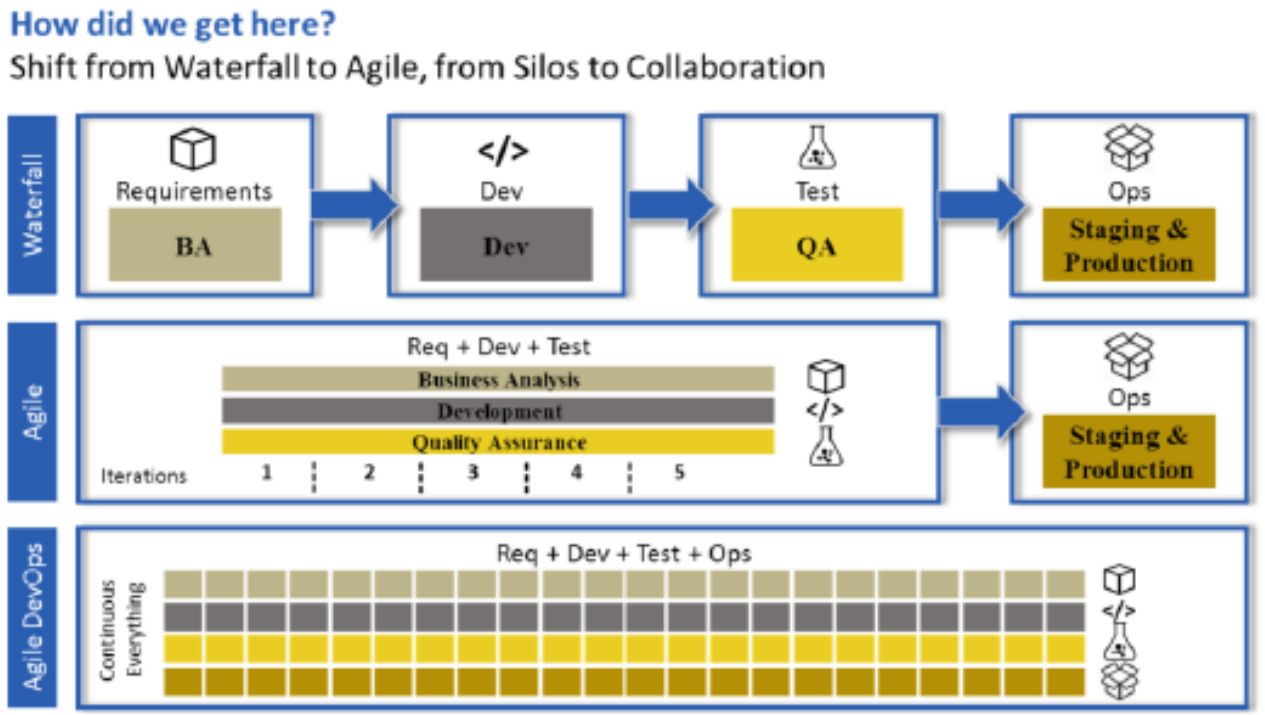



Figure 3. Theories of Software Development[4]

Defense Science Board (DSB) Task Force on the Design and Acquisition of Software for Defense Systems
https://www.acq.osd.mil/dsb/reports/2010s/DSB_SWA_Report_FINALdelivered2-21-2018.pdf

**Breaking past traditions to do business differently**

# DevOps Program Transition Strategy

People | Process | Tools | Training

Assessment | Infrastructure | Transition | Continuous Integration | Continuous Delivery/ Deployment

Internal Ops

**Continuous Enterprise Improvement**

Communities of Practice

Transition status, Training, Mentoring

Measure Results

Build on Success; Rewards and Recognition

COI DIRECTORY
ONLINE HARRIS COMMUNITIES

COI Portal

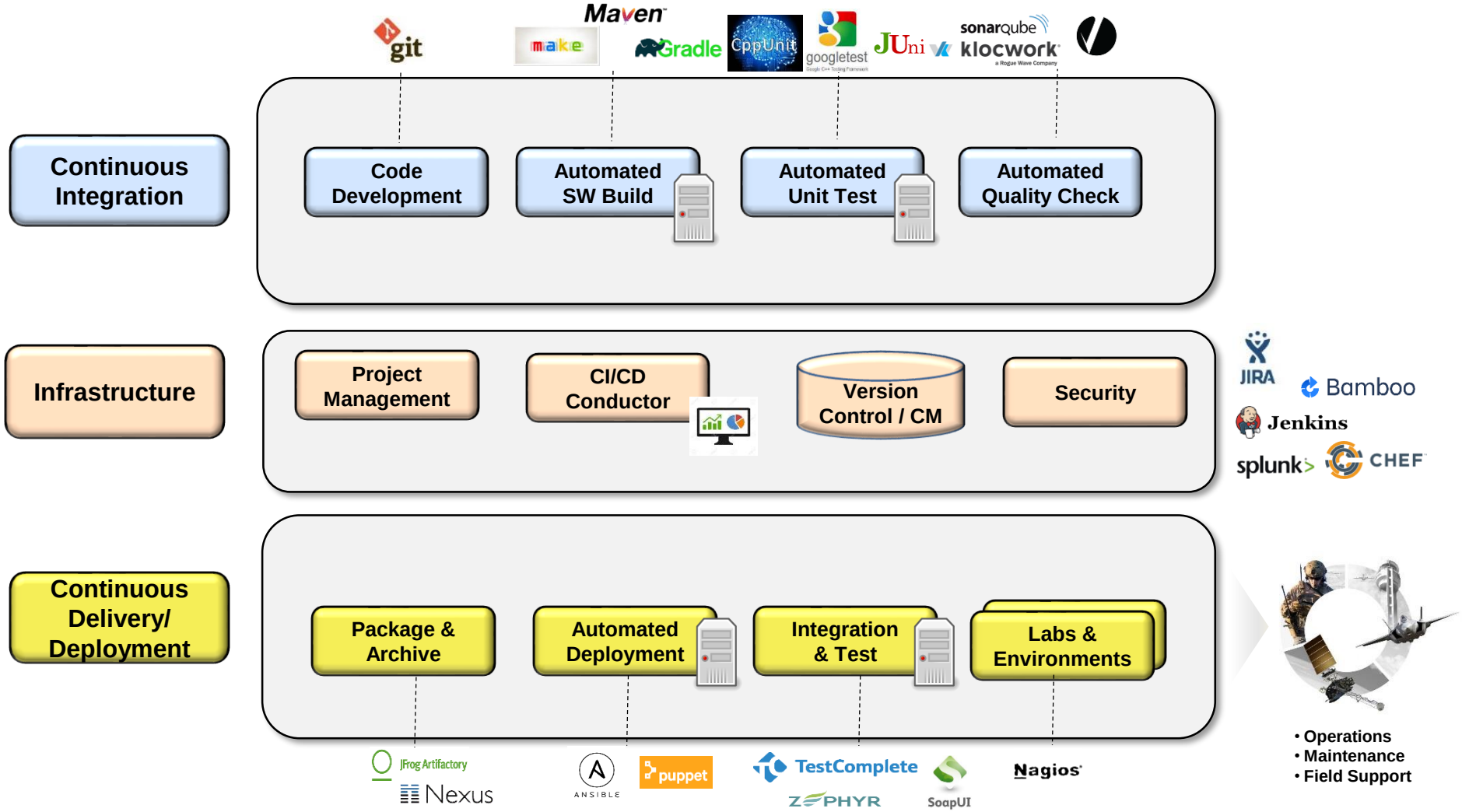
| Program | I | T | CI | CD |
|---|---|---|---|---|
| A | FY19 Q1 | FY19 Q1 | FY19 Q3 | FY20 Q1 |
| B | FY19 Q1 | FY19 Q1 | FY19 Q3 | FY20 Q2 |
| C | FY19 Q2 | FY19 Q3 | FY19 Q4 | FY20 Q3 |
| D | FY19 Q1 | FY19 Q2 | FY20 Q1 | FY20 Q3 |
| E | FY19 Q1 | FY19 Q3 | FY19 Q4 | FY20 Q3 |






**Support programs with their DevOps transition -
Success breeds more success**

# Managing the DevOps Pipeline
## Integrated processes, capabilities, and tools




**Processes are supported by tools, not built around them -**
**plan tool chains for adaptability to change, program needs, and future capabilities**

# Executive Role in DevOps Transition

## Success Factors

- **Establish vision, strategy and objectives**
- **Visible commitment and engaged sponsorship**
- **Investment in infrastructure**
- **Enable software factories**
- **Establish goals and measures (KPIs)**
- **Set expectations for results**

## Implementation Strategy

| | |
|---|---|
| **DevOps advisory board** | • Industry & functional collaboration<br>• Common metrics<br>• Governance |
| **Enterprise DevOps Strategy** | • Software factories<br>• Remove silos<br>• Standard process & objectives |
| **Program Execution** | • Strengthen product quality<br>• Quickly meet customer demands<br>• Shift execution risk left |

**Success starts from the top – at Harris, or at any enterprise**

# Contact Information

**Jorge Relea-Gonzalez**

Senior Director – Software Engineering

Harris Corporation, Space and Intelligence Systems

Melbourne FL

jorge.relea-gonzalez@harris.com

http://www.harris.com/

# DoD IPM and Agile

## May 8, 2019

**Mr. John McGregor**
Deputy Director for EVM
Acquisition Analytics and Policy



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# Agenda

## Topics to be Discussed

- Organization
- EVM and Agile: Integrated Program Management
- Questions


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# AAP EVM Division




https://www.acq.osd.mil/evm



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# EVM Pillars

## Mission

Lead, communicate, and improve Integrated Program Management practices for the Department of Defense by issuing guidance, policies, and procedures that promote visibility and accountability of program cost, schedule, and technical performance.

## Organizational Pillars

### Policy & Guidance

Develop, publish and maintain DoD policy and guidance on EVM application and reporting.

### Communication & Outreach

Inform government and industry stakeholders on EVM policy, reporting and competency.

### Program Interface

EVM applicability determination; assist programs with EVM use and reporting; Resolve interpretive differences in EVM policy.

### IPM Methodologies

Provide guidance and insight into Integrated Program Management (IPM) methodologies, including Agile and Earned Value Management (EVM).

### IPM Data Governance

Manage the EVM-CR as the authoritative EVM data source for ACAT I programs; Maintain data governance for EVM data.

### Functional Leadership

Develop and maintain a competency model which guides training, education and skills for the workforce.

## Vision and Values

We aim to be the most accessible, reliable, innovative, and progressive organization, fostering open communication and transparency for comprehensive Integrated Program Management education, policy, and guidance.

- Innovation
- Consistency / Reliability
- Teamwork
- Precision / Quality
- Integrity / Personal Accountability
- Collaboration



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# Strategic partnerships across the EVM Value Stream

***Our Mission Has Not Changed!***




***Working across DoD Services/Agencies, Federal Agencies, and Industry to facilitate the effectiveness of EVM for joint situational awareness and program decision making***



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# DoD EVM and Agile
# Integrated Program Management


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# Different Perspectives….




**EVM*:** A program **management technique** for measuring program performance and progress in an objective manner

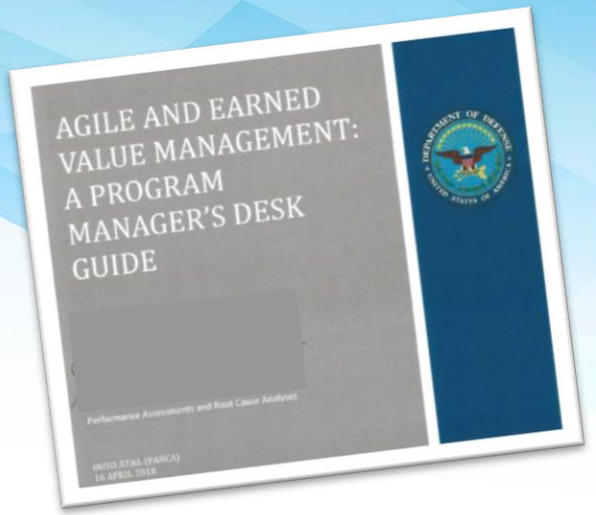
**EVMS*:** An integrated **management system** that integrates the work scope, schedule, and cost parameters of a program in a manner that provides objective performance measurement data

## … a system of systems

***Definitions from the DoD Earned Value Management System Interpretation Guide***

# Continuing iterations on Agile and EVM PM Desk Guide

- Collaborating with DoD Agile pilot team to collect/share best practices on NDAA 873/874 Agile pilot programs
- Identify methods for managing cost and schedule on programs using Agile development methodologies




*A resource for DoD personnel who encounter programs on which Agile philosophies and Earned Value Management are applied*

***"EVM is not tied to any specific development methodology and does not prevent the use of other risk management techniques such as agile development. EVM and agile development are complementary and can be used on the same project. Agile development can be used to incrementally deliver functionality to the customer while EVM provides a standard method for measuring progress." -- OMB Circular A-11***

https://www.acq.osd.mil/evm/resources/Agile_EVM_Home.shtml

# Have the Conversation…

- What Buying?
- How Buying?
- How Manage?

# Regardless of acquisition approach

… Traditional Acquisitions

… Middle Tier Acquisitions

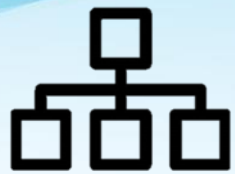
… Other Transaction Authorities

… Agile Development Methods

# Functional Equivalent Processes and Artifacts


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# Program Management Processes



## Organization

- Define work
- Assign resources
- Decompose work scope



## Planning, Scheduling, Budgeting

- Schedule work
- Authorize work
- Define completion criteria



## Accounting

- Record costs
- Summarize costs by element



## Analysis & Mgt Reporting

- Analyze results
- Identify variances
- Summarize performance data
- Implement corrective actions
- Maintain EAC



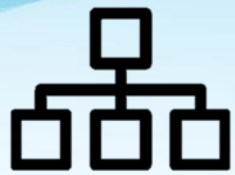
## Change Mgt

- Incorporate changes
- Control changes
- Track changes



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# Typical Program Management Artifacts



## Organization

- Statement of work
- Organization chart
- Resource assignment matrix
- Work Breakdown Structure



## Planning, Scheduling, Budgeting

- Integrated Master Schedule
- Road Map
- Backlog
- Staffing plan
- Development tool
- Work authorization document
- Test plan
- Description of completion criteria



## Accounting

- Time sheets
- Time tracking report
- Cost downloads
- Financial management rate structures



## Analysis & Mgt Reporting

- Dashboards
- Integrated Program Management Report
- Development tool reports
- Corrective action log
- EAC tool report



## Change Mgt

- Change logs
- Change reports
- Comparison dashboards
- Development tool reports



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# Wrap Up

- Continue to work with Government and Industry to identify best practices and processes
- Collecting artifacts to incorporate into policy and guidance documents
- When determining how to manage the program, open communication and transparency are key


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# Questions?



Are there any questions?



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# Contact Us

## Need Help?

Do you have questions about EVM policy and guidance, how to analyze and interpret EVM data, or how to apply EVM policies to a new contract? Contact the AAP EVM Division for answers!

| | |
|---|---|
| EVM Policy Interpretation | General EVM Policy Questions |
| EVM Applicability | EVM Report Tailoring |
| Acquisition Strategies | EVMS Compliance Applicability |

OSD.DODEVM@mail.mil

https://www.acq.osd.mil/evm

## Acquisition Exchange Program

### Program **Summary**

Acquisition, Analytics and Policy (AAP) Acquisition Exchange Program (AEP) provides a unique career-development experience for high-caliber individuals in acquisition and acquisition-related career fields.

### Program **Objective**

The AEP provides experience in the Department's executive-level MDAP decision process and implementation of DoD-wide acquisition policies. The assigned projects offer selected applicants the opportunity to enhance acquisition and senior-level policymaking skills, develop managerial and leadership skills, and prepare for future positions within the acquisition community. This opportunity is open to all career fields.

The AAP AEP provides selected applicants the opportunity to:

- Interact with senior officials within DoD and throughout the Federal Government.
- Develop a thorough knowledge of EVM policy development and execution.
- Enhance the skills needed to prepare, advocate, and revise policy practices and procedures.
- Promote different perspectives within acquisition policy decision-making, while engaging in a career-broadening experience.





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# Agile Acquisition 2.0

## "Contracting for Change"

**Makoto P. Braxton**

**Matthew R. Kennedy, PhD**



# Disclaimer

- The view, opinions, and/or findings contained in this material are those of the author(s) and should not be construed as an official Government position, policy, or decision, unless designated by other documentation
- References herein to any specific commercial product, process, or service by trade name, trade mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring
- This material is furnished on an "as-is" basis. The author makes no warranties of any kind, either expressed or implied, as to any matter including, but not limited to, warranty of fitness for purpose or merchantability, exclusivity, or results obtained from use of the material



# Overview

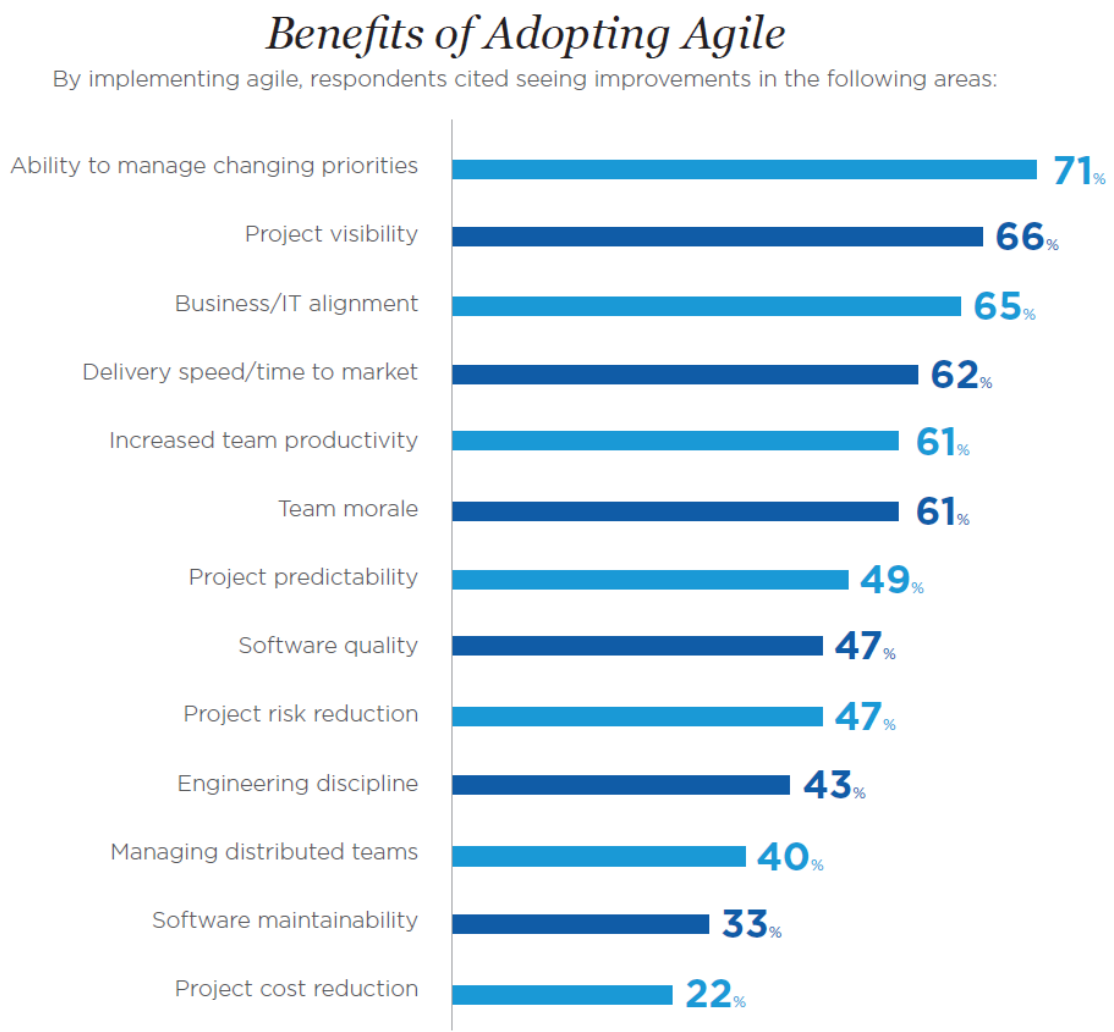
- Agile Ecosystem
- Contractual Flexibility
- Contractual Flexibility Applied (FFP Examples)
- Measuring Value
- Top 5 Questions
- Conclusion/Looking Forward



# Agile Ecosystem



# Benefits of Agile

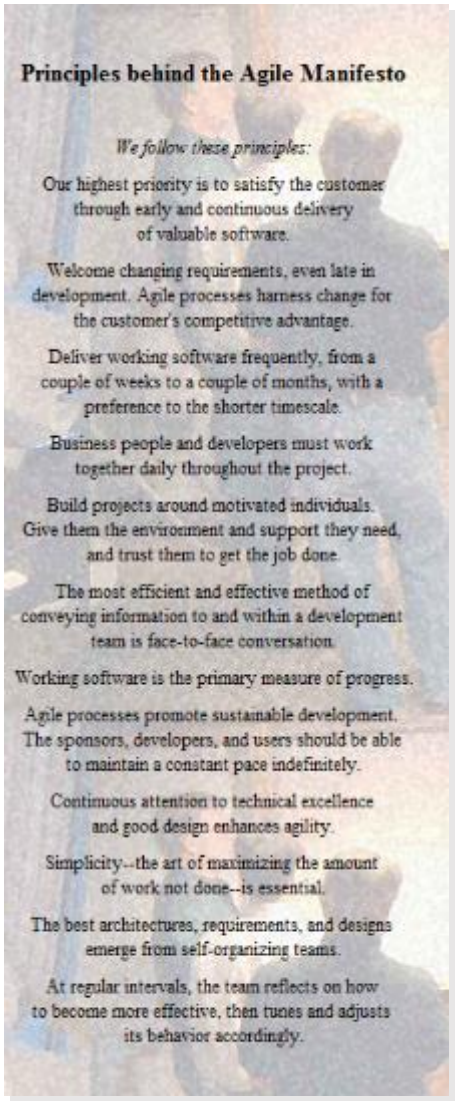



*Respondents were able to make multiple selections.

Source: VersionOne 2017

# Agile Manifesto

- The foundational document for Agile software development
- Signed by 17 software developers in Feb 2001
- Core Values
  - Individuals and interactions over processes and tools
  - Working software over comprehensive documentation
  - Customer collaboration over contract negotiation
  - Responding to change over following a plan

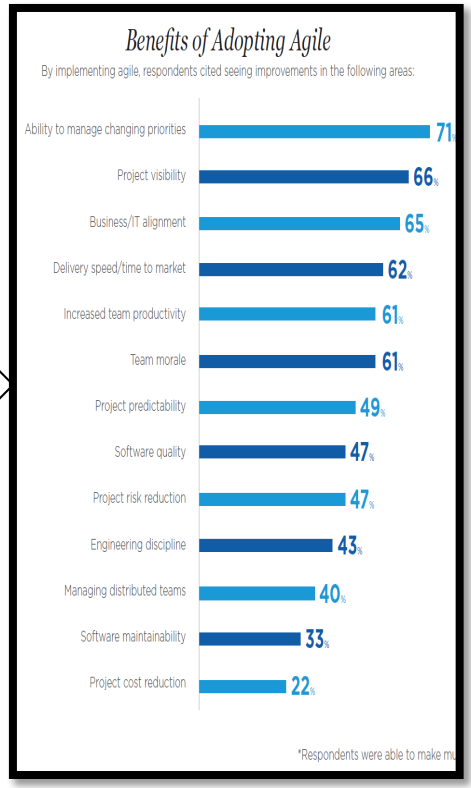



http://agilemanifesto.org/

# The Path to Agility




?





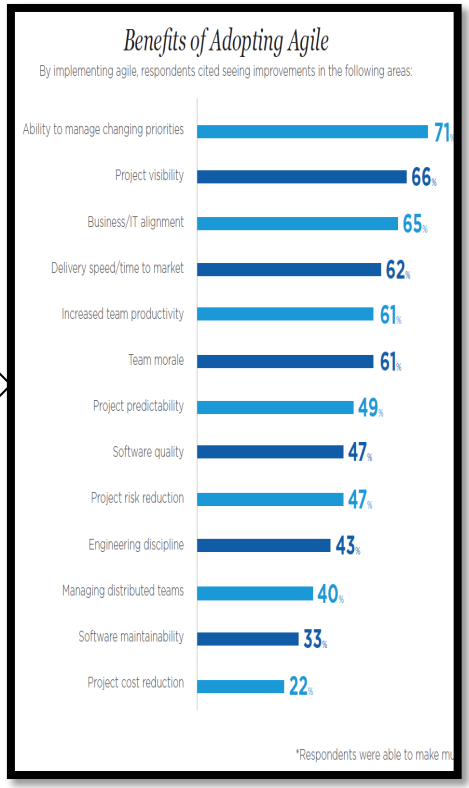
"Culture eats strategy for breakfast" – Peter Drucker

# The Path to Agility










## Organization Culture

**Definition**: a system of shared assumptions, values, and beliefs, which governs how people behave in organizations

**Traditional Example(s):** Primary measure of success is conformance to a plan, top-down control, detailed requirements, develops in stages (Design, Development, Test, etc.), siloed organization/programs

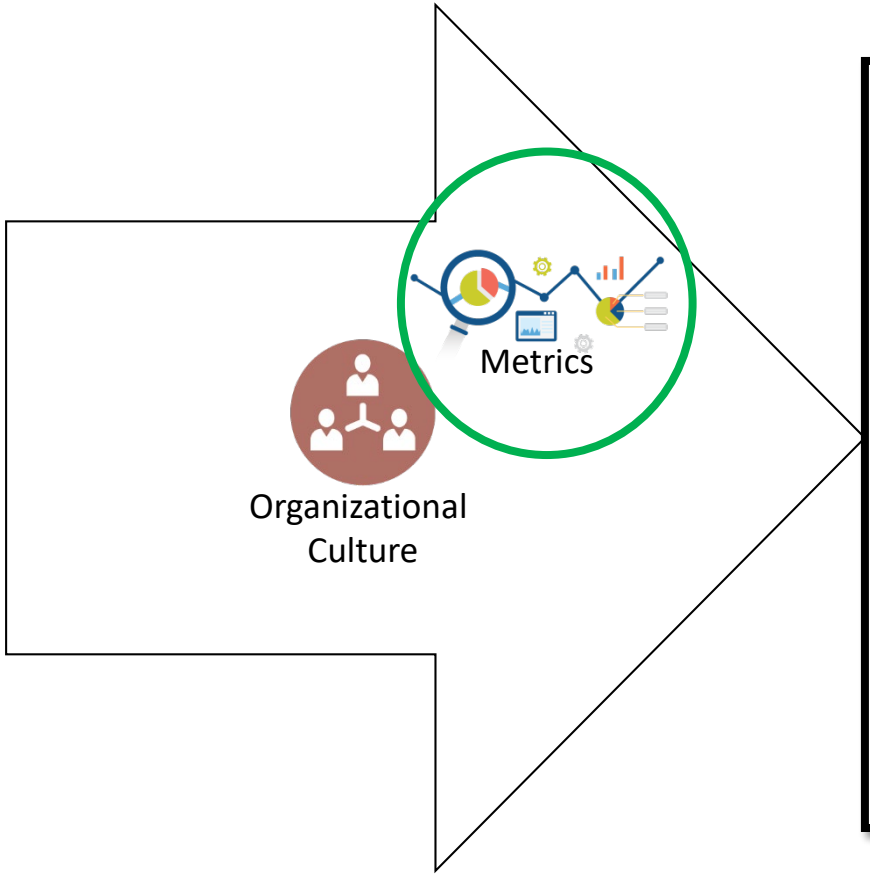
**Agile Example(s)**: Light-weight requirements gathering, continual user involvement, integrated and self-organizing/managing teams, primary measure of success is the continuous delivery of value

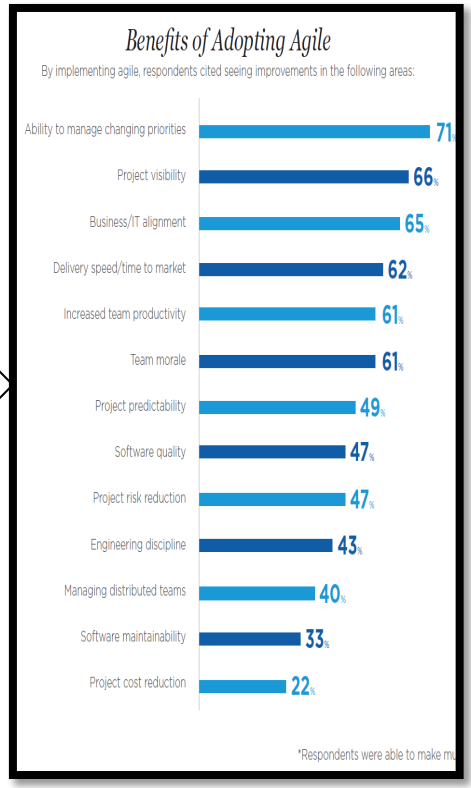


"What gets measured gets done." – UNKN

# The Path to Agility




## Metrics

**Definition**: a standard of measurement by which efficiency, performance, process, quality or progress can be assessed

**Traditional Example(s):** Earned Value Management (EVM), SLOC count, schedule focused measures

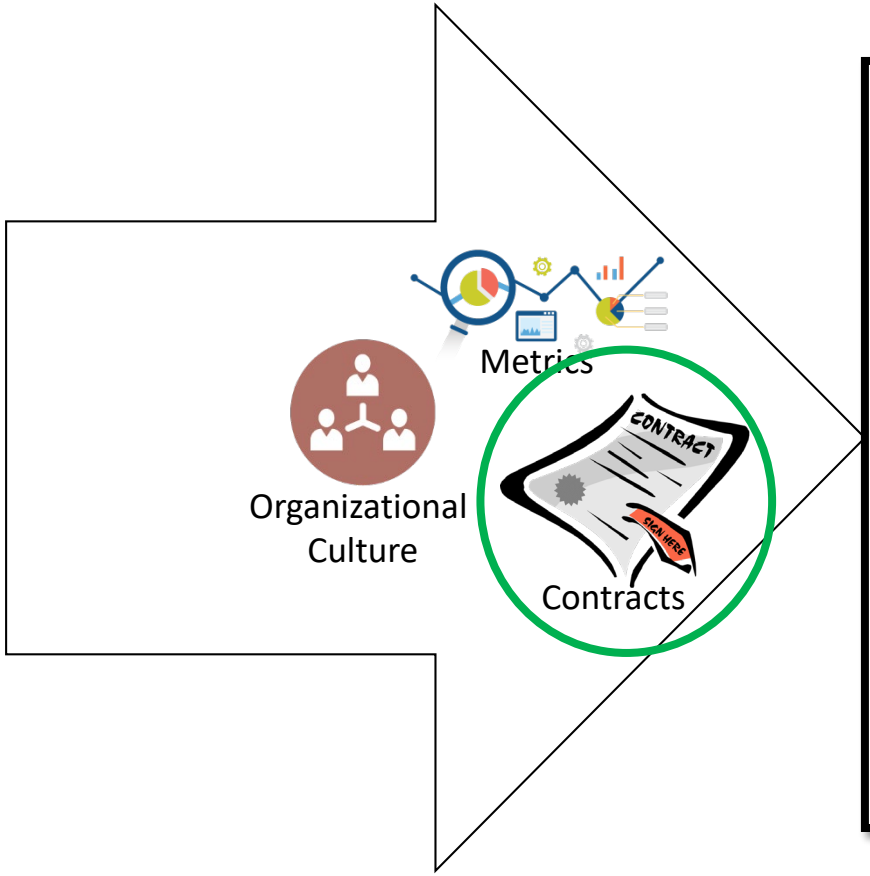
**Agile Example(s)**: Sprint burndown, release burndown, velocity, cumulative flow diagram, lead time, cycle time

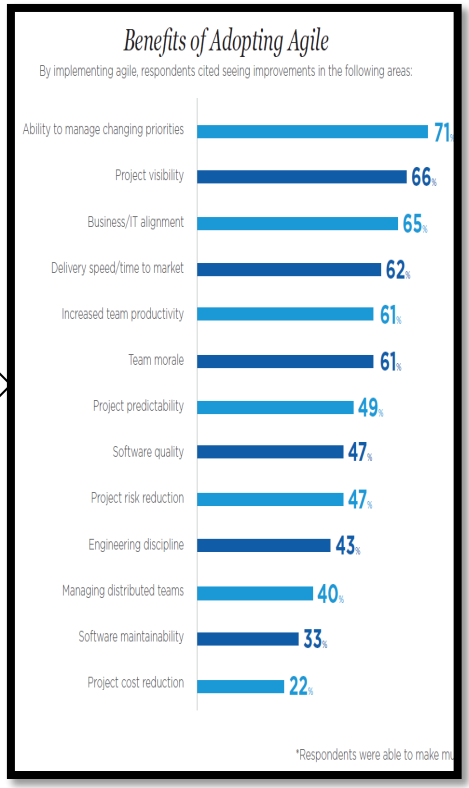


"Change is the only constant in life" - Heraclitus

# The Path to Agility



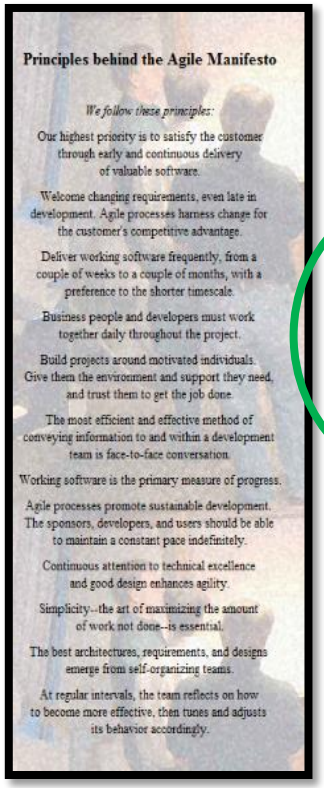

## Contracts

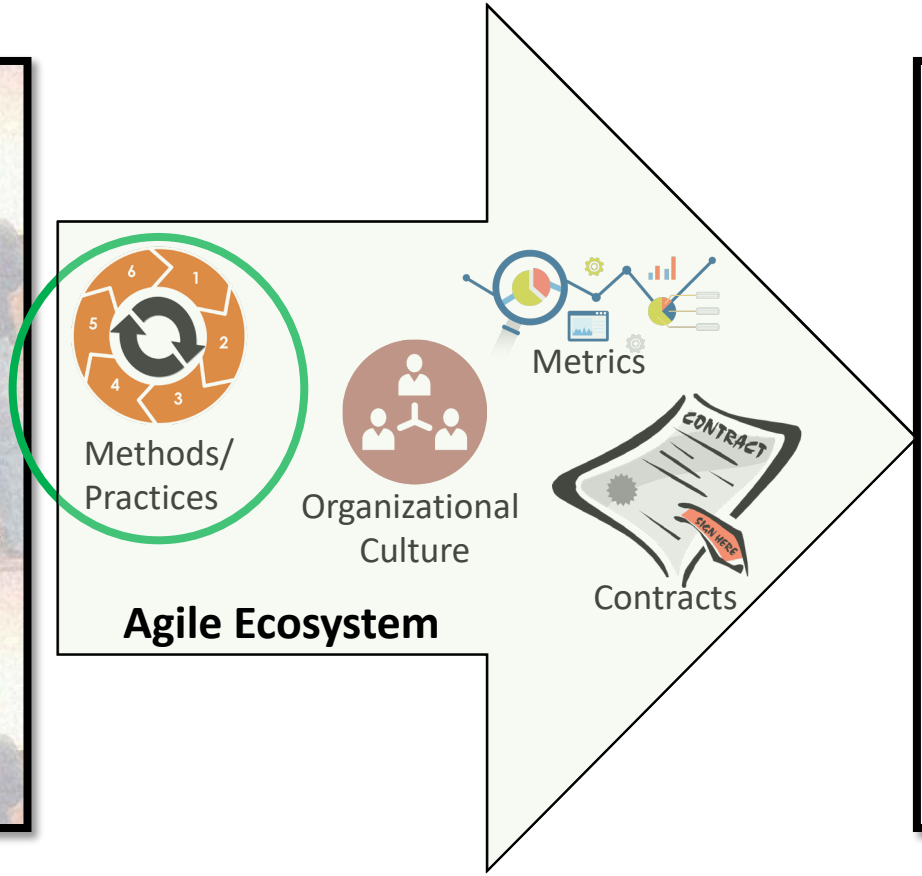
**Definition**: an agreement with specific terms in which there is a promise to do something in return for a valuable benefit

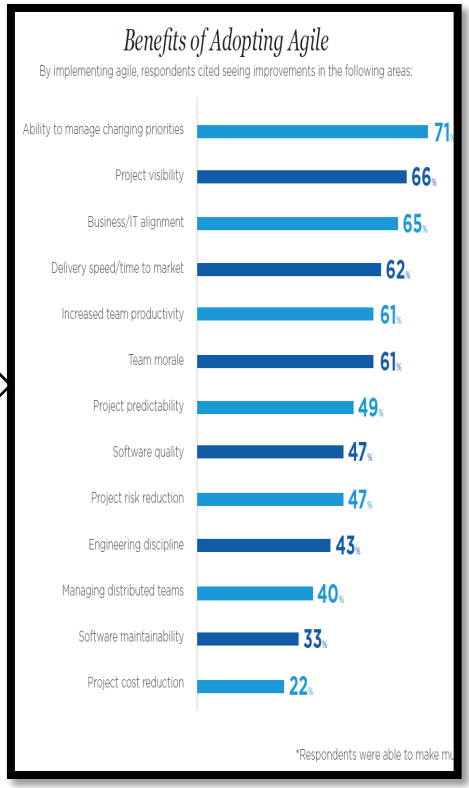
**Traditional Example(s):** Long contract durations with detailed requirements, contract by phase

**Agile Example(s)**: Short-duration contracts, contract for teams/skillsets

# The Path to Agility



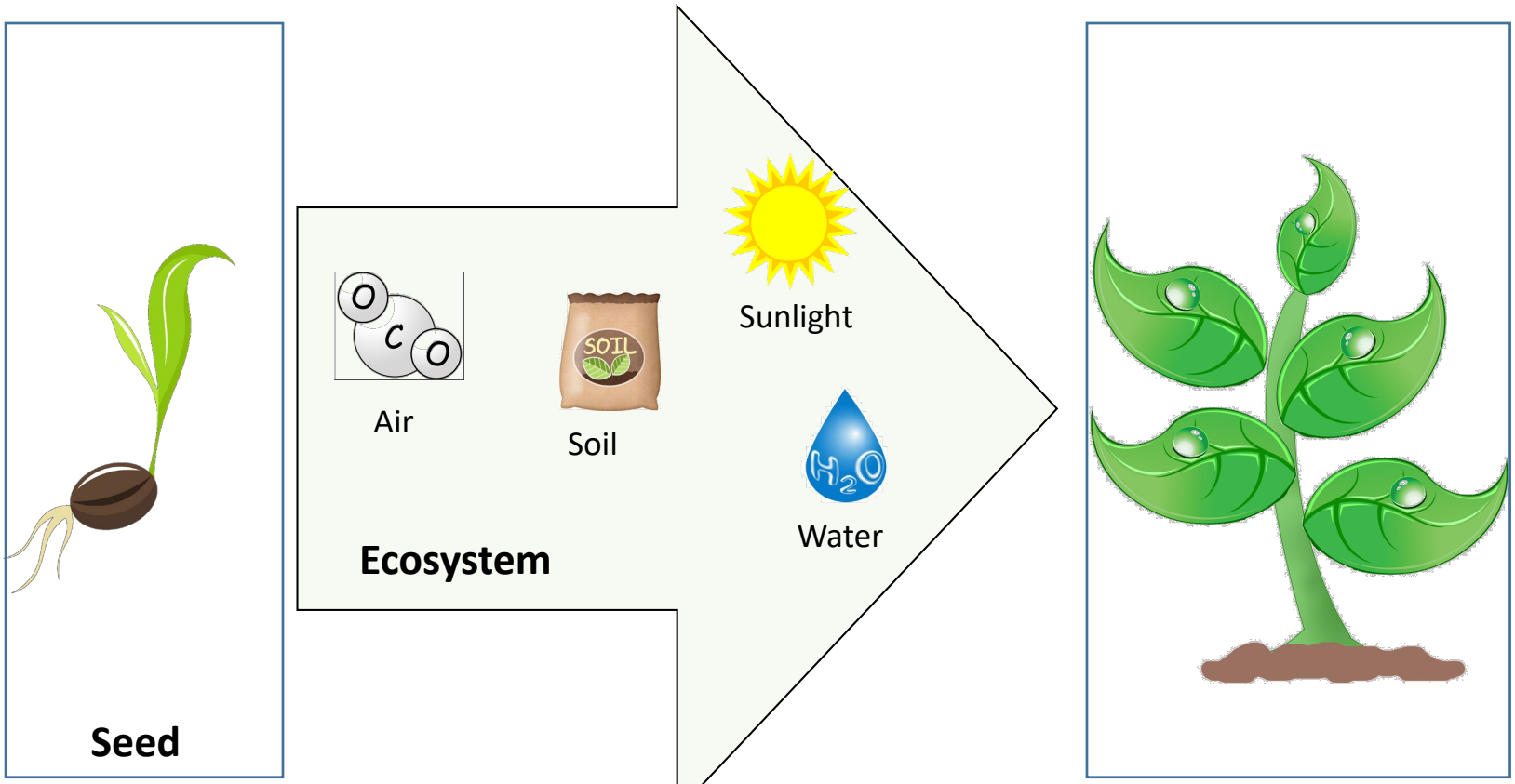

## Methods / Practices

**Definition**: an essential support structure or approach to build something

**Traditional Example(s)**: Waterfall, rational process

**Agile Example(s)**: Scrum, Kanban, SAFe, LeSS, crystal, feature driven development, timeboxing, iterations, increments, daily meeting, definition of done, user stories, epics, dedicated teams

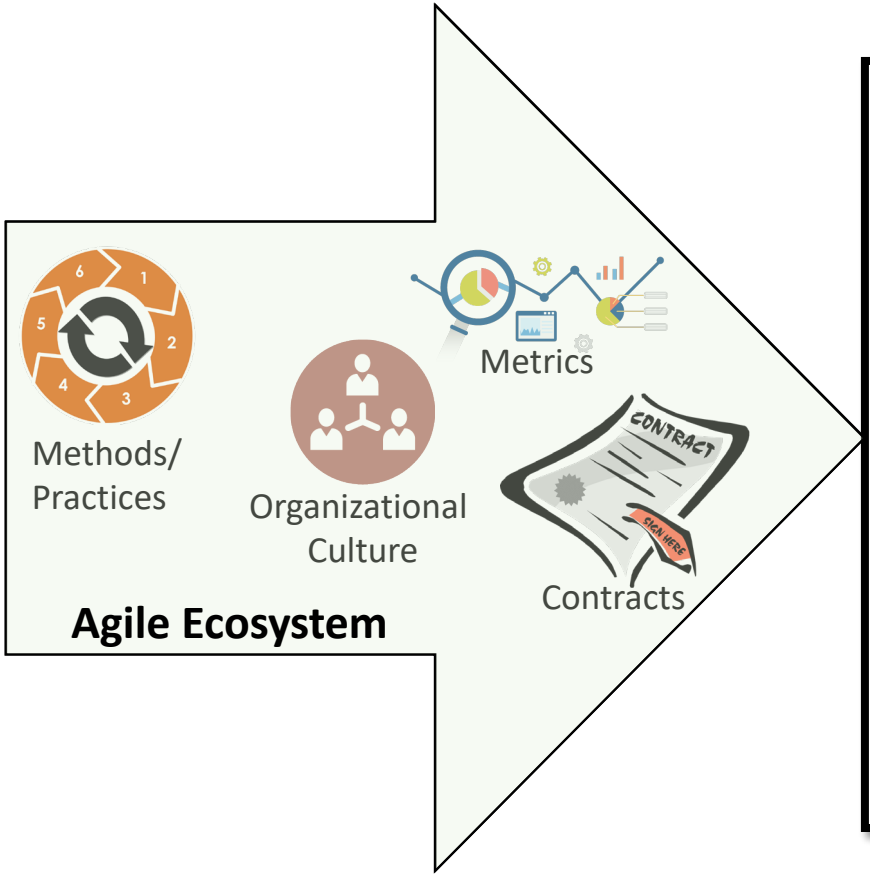
# An “Ecosystem” Analogy

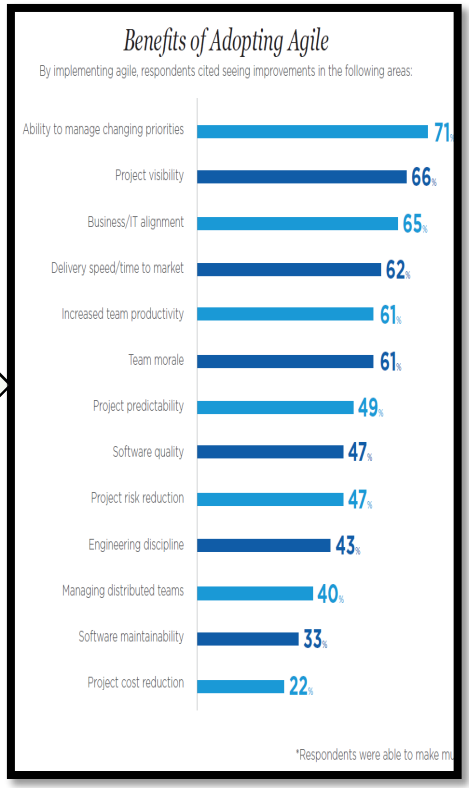



“Sunlight, healthy soil, clean air, and water **all work together** to help a seed become a strong, healthy plant.”

# Agile Ecosystem





# Scrum Overview

Methods/
Practices

- SCRUM is a proven framework for delivering value using agile methods and practices
- Provides actionable, artifacts, roles, and activities which can be measured and analyzed




Government

**Product Owner**

- Key stakeholder
- Represents the business or user community
- Manages the backlog (Requirements)

Government / Vendor

**The Team**

- Cross-functional
- Self-organizing
- Self-managing

Government / Vendor

**Scrum Master**

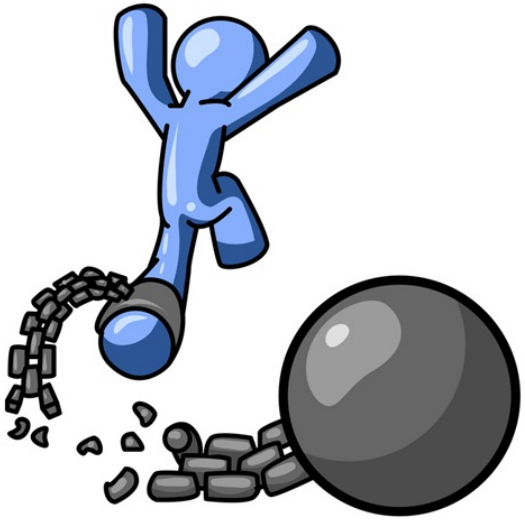
- Removes impediments
- Coach for the team
- Process owner



# Contractual Flexibility

# Contractual Flexibility

- Definition: The contractual freedom for a contract administrator to respond to changing requirements post contract award. Contractual freedom has the objective of reducing or eliminating contract modifications due to unanticipated scope changes, while not incurring unnecessary risk.

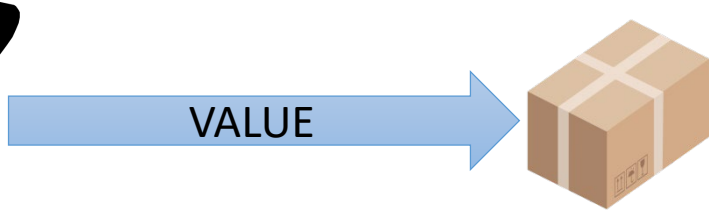


# Traditional vs “Flexible” Contracts

## Traditional Example

1) Detailed requirements with a long contract duration



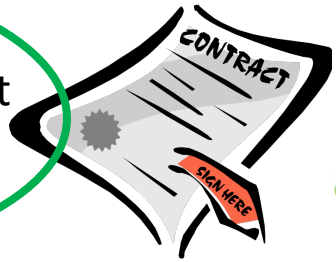




## “Flexible” Examples

1) Detailed requirements with a short contract duration




2) Requirements flexibility post contract award








# A "New" Source Selection Approach

- A new approach using new same system

30 No. 5 Nash & Cibinic Rep. NL ¶ 23

Nash & Cibinic Report
May 2016
The Nash & Cibinic Report
*Competition & Award*

¶ 23. "HIGHEST TECHNICALLY RATED OFFERORS WITH FAIR AND REASONABLE PRICING": A New Source Selection Technique

Ralph C. Nash & Vernon J. Edwards



# Contractual Flexibility Applied (FFP Examples)

# Contracting Requirements

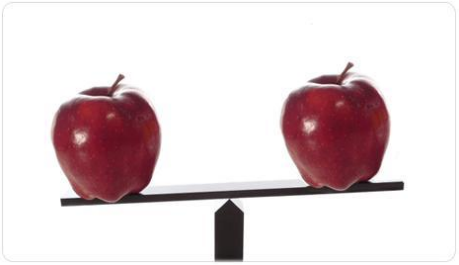
- Operate and maintain a system-of-systems, comprised of over 90 servers, geographically distributed databases, and 14* applications (desktop and web based) that support the agencies core mission
  - The systems are tightly coupled, in that an update to one system may require complimentary updates to 1+ other systems
  - Contain highly sensitive data including personally identifiable information (PII) and range from legacy (15+ years old) applications/architectures and new applications/architectures (< 5-years new)



* 4 Applications selected for pilot, plan to extend Team Concept all 14 application

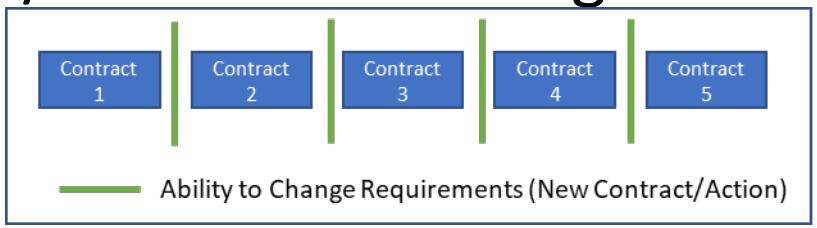
# Contract Background

- Executed through a series of iterations on a BPA over a 2-year period
  - Total Award $13M
- All development was completed by the vendor
- All contracts required the vendor to conform to the Scrum Process (Artifacts and Events)
- All orders were executed with the same:
  - Systems
  - Federal Employees
  - Vendor (4 of 5 Iterations)



# Progression of Contracting Actions

- **Agile Façade (Not Agile)**: Remove traditional terminology (PM, Requirements, etc.) and add agile terminology (Scrum Master, User Stories, etc.)
- **AGILE contracting**: Let multiple short contracts/actions to fulfil a given capability

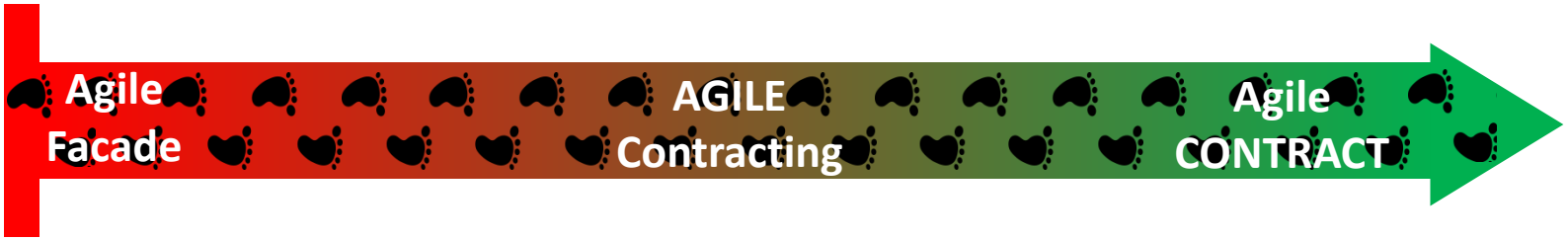



- **Agile CONTRACT**: Provide freedom within a given contract to change requirements





# Agile Contracting Journey




**Expect**:
- Low Requirements Flexibility
- Delays Due to Contracting Actions

**Use When**:
- Immature Agile Processes
- Low Government Involvement
- Teams are New to Agile

**Expect**:
- High Requirements Flexibility
- Little/No Contract Related Delays

**Use When**:
- Mature/Managed Agile Processes
- High Government Involvement (Daily)
- Teams are Skilled Agile Practitioners

# FFP - Release

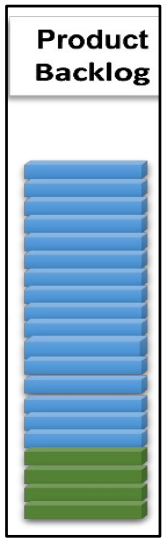
- Requirement: Upgrade a large legacy application to be 508 compliant in one release.  The deliverables were fixed at contract start so there was no flexibility after contract award
- Key Facts:
  - Cost: $1.2M
  - Duration: 9-Months
  - Contract Modifications: 1





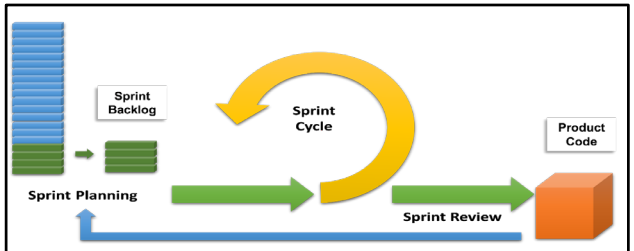
# FFP – User Story

- Requirement: Develop a fixed set of User Stories for a software release. The government could determine NOT to execute a user story (provided work had not started) but could not add user stories
- Key Facts:
  - Total Cost: $234,419.84
  - Low User Story: $850.82
  - High User Story: $71,314.08
  - Contract Modifications: 1



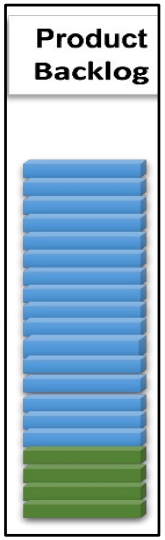






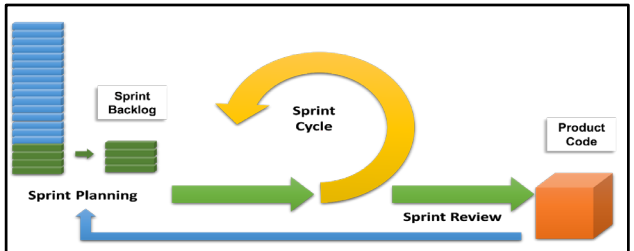
# FFP – User Story (Exchangeable)

- Requirement: Develop a fixed number of user stories over the course of the contract
- This was rolled into a larger CLIN so accurately calculating the cost is not possible
- Key Facts:
  - Cost: $N/A
  - Low User Story: N/A
  - High User Story: N/A
  - Contract Modifications: N/A









# FFP – Complexity Levels

- Requirement: Develop user stories based on contractually defined complexity levels until the “not to exceed” (NTE) amount was reached or additional funds were applied
- The PWS contained complexity levels using “Representative User Stories” and when new backlog items (requirements) arose, the new requirement(s) were assigned a complexity level at the contracted cost
- Key Facts:
  - **Complexity Levels**
    - **Extra Low: $2,205**
    - **Low: $3,383**
    - **Medium: $9,532**
    - **High: $14,863**
    - **Very High: $22,550**






# FFP – Teams

- Requirement: Supply agile teams to **deliver value** within contractually defined technical constraints
- Initial contract cost was 10% less than the previous approach for the same capacity
- Teams are required to be cross-functional
  - Each team member was required to have a minimum of two skill sets (Developer and tester, Technical writer and business analyst, etc.)
  - Specific skillsets were required per team but the vendor proposed the overall team structure(s)





# Responding to Change (Team Approach)

## Option #1: Repurpose Existing Team(s)

| PRO | CON |
|---|---|
| No additional cost<br>Quickest to implement<br>Most efficient | Decreased O+M work |



Operations and Maintenance Team

Enhancement Team

Operations and Maintenance Team

## Option #2: Stand Up New Agile Team(s)

| PRO | CON |
|---|---|
| Minimal impact to O+M<br>Minimal contract overhead | Additional cost<br>Ramp-up time |



Enhancement Team (Optional CLIN)

# Agile Team Considerations

- You have to account for part-time (architects, security personnel, etc..) team support
- Plan for a team ramp-up time to allow for staffing
  - 30-60 days of LH
  - Provide long lead-time when starting a new team
- Success relies heavily on:
  - **Product Owner**
  - An organization with **mature** agile processes




Product Owner



# Measuring Value

# Measuring Performance

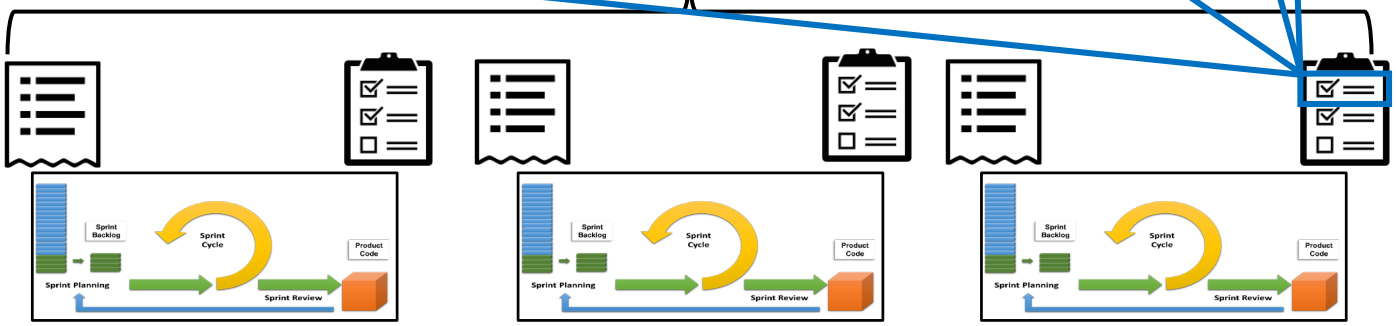
**User Story:** As an Analyst, I want to enter the planned follow-up date, regardless of the commitment date.

**Definition of Done:**

- Help Text updated including 508 Help
- Focused Regression Test
- 508 Test
- System Test
- Updated Requirements
- Updated Test Case / Scripts
- Update EA Design Document
- Coding/Unit Testing
- Print Crystal Report
- Release Notes
- Update EA Data Dictionary

**Acceptance Criteria:**

- Change the label from 'Est. Follow-up Date' to 'Planned Follow-Up'
- Make Planned Follow-Up an editable date field. Use standard date format with calendar
  - 'Planned Follow-Up' must not default to any value.
- Display error message and prevent save if there is a Completed Date but the Planned Follow-Up is missing.
  - **Error message**: *'Planned Follow-Up is required if the Completed Date is entered.'* After user responds to error message attach tooltip icon with associated tooltip text to Planned Follow-Up.
  - **Tooltip text**: *'Planned Follow-Up is required if the Completed Date is entered.'*



# Measuring Performance per Sprint

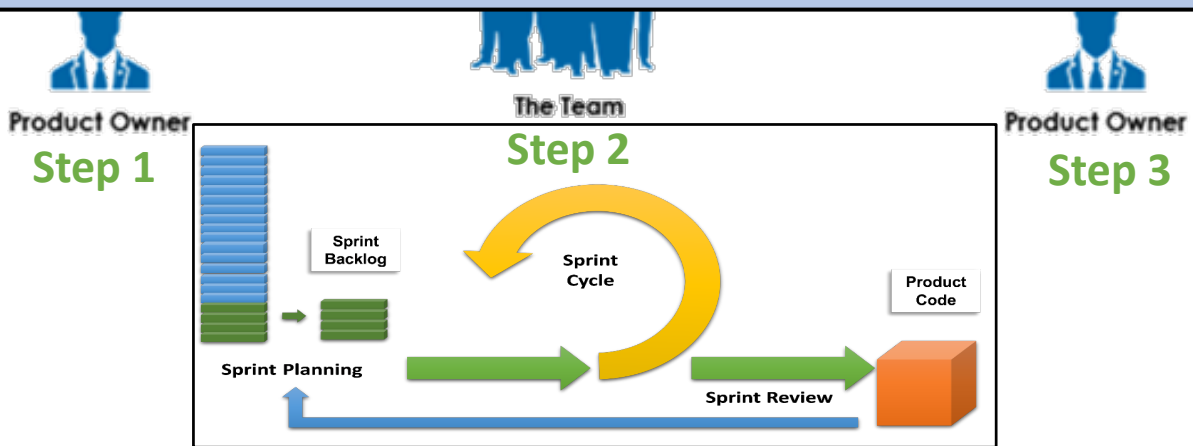
- Step 1: The Product Owner (PO) determines the highest priority user stories from the Backlog and defines Acceptance Criteria for the Sprint

Three typical outcomes at the Sprint Review:

1) The user story is accepted by the PO as it meets the acceptance criteria and Definition of Done (DoD)

2) The user story is rejected by the PO because it DOES NOT MEET the acceptance criteria and DoD specified at the start of the sprint and this may be noted as a vendor performance issue

3) The user story is rejected by the PO but MEETS the acceptance criteria and DoD which does NOT reflect on the vendor performance since this was a requirements specification issue (Rare).



# Increased Transparency

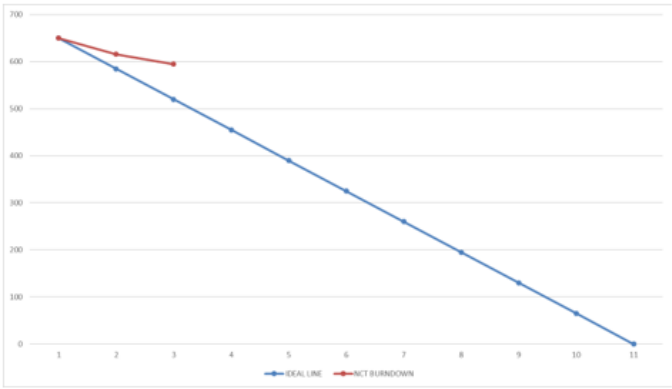
- The delivered value is measured every Sprint (2-weeks)
- Complete transparency into the release status

**[Application Name]**

**Release Summary**

| SPRINT | DATES | PLANNED STORY POINTS | ACCEPTED STORY POINTS* | Comments |
|---|---|---|---|---|
| SPRINT 1 | 7.5.18 – 7.18.18 | 50 | 50 | |
| SPRINT 2 | 7.19.18 – 8.1.18 | 55 | | [Comments Removed] |
| SPRINT 3 | 8.2.18 – 8.15.18 | | | |
| SPRINT 4 | | | | |
| SPRINT 5 | | | | |
| SPRINT 6 | | | | |
| SPRINT 7 | | | | |
| SPRINT 8 | | | | |
| SPRINT 9 | | | | |
| SPRINT 10 | | | | |
| SPRINT 11 | | | | |

*ACCEPTED STORY POINTS REFER TO STORIES THAT HAVE BEEN ACCEPTED BY PRODUCT OWNER




**Snapshot of Current Sprint Items**

- Sprint Planning (Sprint 2) Committed User Stories (Summary)

Sprint 2_SprintPlanning.pc

- Sprint Review (Sprint 2) Accepted User Stories (Summary)
- Sprint Review (Sprint 2) Reject User Stories (Details)

**Release Comments**

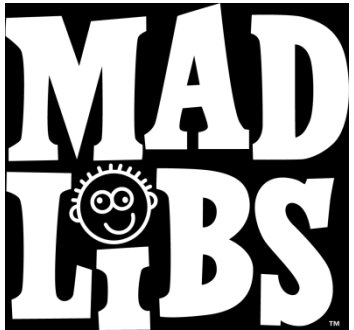
[Comments Removed]



# Top 5 Questions

# Do you have a Template?

- No … BUT we can provide examples of what worked in our unique ecosystem.
  - Every program has multiple aspects that are unique to them, simply filling-in-the-blanks without analyzing your environment will likely cause undesired outcomes. Things to consider:
    - Organization culture
    - Maturity of government oversight personnel
    - Structure of government program oversight
    - Maturity of the vendor pool





# What do the Examples Contain

- Task Summary
- Instructions to Offerors
- CLIN Structure
- Evaluation Criteria

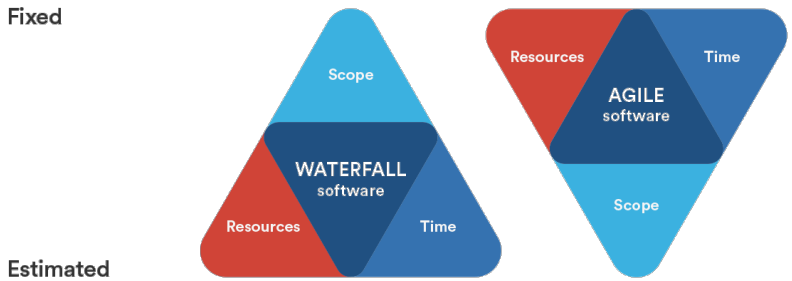
## Technical Landscape

The Vendor is expected to be proficient in the following … As technology evolves, so must the technical expertise and the tools utilized by the Vendor. It's expected the Vendor will evolve as technology evolves throughout the period of performance of the Contract…

| Name | Manufacturer | Function |
|---|---|---|
| .NET Framework | Microsoft | Development Framework |
| Adobe Acrobat Pro | Adobe | Standard OCC-approved PDF software |
| AjaxControlToolkit | Open source | Third party add-in |
| Angular | Open source | A structural framework for dynamic web apps |
| Apache log4net | Apache | Logging service |
| Aspose.cells | Aspose | A third-party tool used to manipulate MS Excel files |

# Why did you use FFP vs LH?

- Enables stable teams
  - 2 x as Productive
- Enables multidisciplinary team members
  - When compared to labor categories
- Focuses more on team outcomes versus individual contributions
- Low contract monitoring overhead, the focus is shifted to helping deliver value
- Provides the same requirements (Scope) flexibility





# What are your Deliverables (CDRLS/DIDs)?

- Very few contractually specified deliverables
  - Most deliverables are included in the User Stories Acceptance Criteria and Definition of Done post contract award
    - This allows us to pay for what we need in-real-time versus what we think we need in the future
- Example Deliverables
  - Rejected user stories
    - If they don't meet the Acceptance Criteria or Definition of Done
  - Team Metrics
    - Velocity
    - Sprint Burndown
    - Release Burnup
    - Committed Story Points vs. Accepted Story Points per Sprint





# What is the CLIN structure?

- Various options

| Agile Teams FFP (CLINS) | | | | |
|---|---|---|---|---|
| **CLIN** | **Description** | **QTY** | **Unit of Measure** | **Price** |
| 0001 (Required) | Agile Teams (5x9-members, 4x7-members, etc.) | 1 | EA | $0.0 |
| 0002 (Optional) | Agile Team (5-members) | n | EA | $0.0 |
| 0003 (Optional) | Agile Team (7-members) | n | EA | $0.0 |
| 0004 (Optional) | Agile Team (9-members) | n | EA | $0.0 |

# Is this performance-based contracting?

- Modification from the traditional performance based contracting model
- Give the vendors freedom to propose solutions within certain guideposts
- Could you make this approach truly performance based?

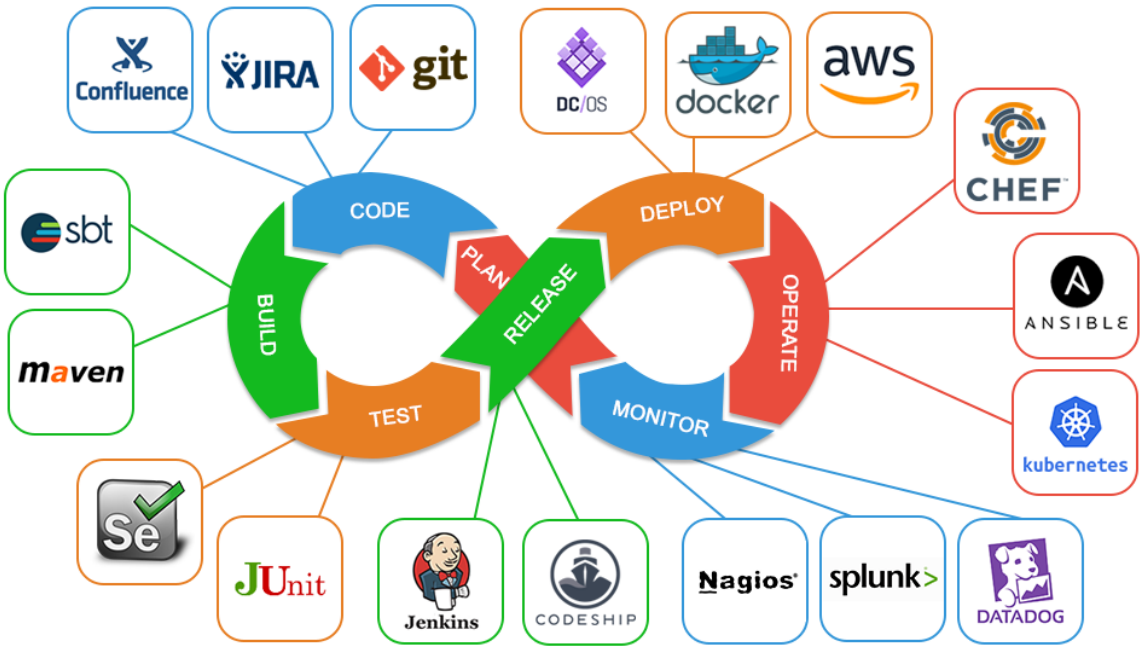




# Conclusion

# Future Applications of Agile Teams

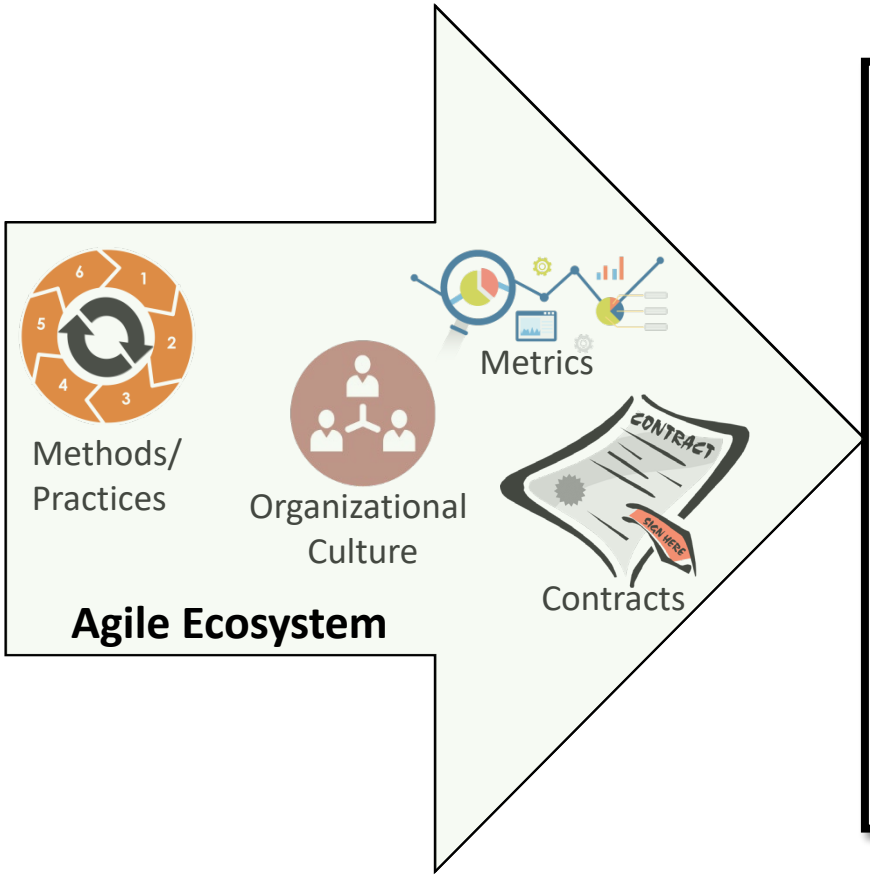
- Anywhere you require teams that:
  - Are Multidisciplinary
  - Have a fixed capacity
  - Have requirements that continually change
  - Have a continual backlog of requirements

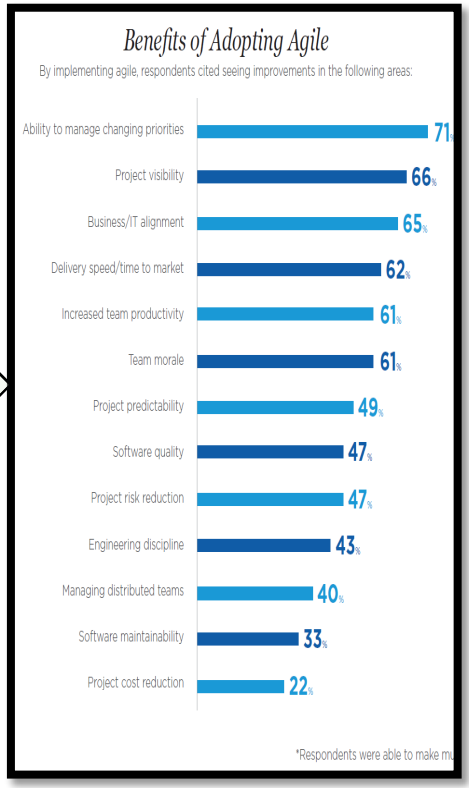



DevOps

# The Path to Agility





# Makoto P. Braxton

- Makoto P. Braxton is the Director of the Contracts and Grants Division within the Office of Resource Management at the Assistant Secretary for Preparedness and Response (ASPR). ASPR is a Staff Division within the Department of Health and Human Services. The Contracts and Grants Division provides acquisition and assistance support across the entire ASPR organization. The Division supports major Program Offices within the Division of the Strategic National Stockpile, the Office of Emergency Management and Medical Operations, as well as the Office of the Biomedical Advanced Research and Development Authority.
- Makoto has been working in the contracting field since 2005. He started with the Federal Government in 2008. Previously, Makoto has worked for the Department of the Air Force, the Department of the Army, and the Office of the Comptroller of the Currency (within the Department of the Treasury). Makoto holds a Bachelor of Science in Business Administration from the University of Arizona and is Level III Certified in Contracting in accordance with the Defense Acquisition Workforce Improvement Act, as well as Federal Acquisition Certification in Contracting Level III Certified.



# Matthew R. Kennedy, PhD

- Matthew R. Kennedy is a Senior IT Program Manager and Contracting Officer Representative (COR) at the Office of the Comptroller of the Currency (OCC). Formerly, Matt was a Program Manager at the Army's Program Executive Office - Enterprise Information Systems (PEO-EIS) and was a Professor of Software Engineering at Defense Acquisition University (DAU) where he specialized in agile acquisition. Matt served as the Associate Director of Engineering at the National Cancer Institute's Center for Biomedical Informatics and Information Technology and served in the U.S. Air Force as a network intelligence analyst. He has worked both inside and outside of the government on various IT projects over the last 18 years.
- Matthew holds a Bachelors in Computer Science, and a masters and PhD in Computer Science and Software Engineering from Auburn University. He is Defense Acquisition Workforce Improvement Act (DAWIA) Level III certified in Program Management, Systems Engineering, and Information Technology (IT).



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# Discoveries from the Agile Hardware Research Project

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The leader in training and consulting for Agile product development

## Kevin Thompson, Ph.D.



### Chief Scientist

- Trains, coaches teams and companies in Agile development
- Creator, Cprime Agile training content
- Author, *Solutions for Agile Governance in the Enterprise (Sage)*
- Education and certifications
  - **Certified Scrum Master and Scrum Professional**
  - **PMI Project Management Professional**
  - **PMI Agile Certified Practitioner**
  - **Scaled Agile Framework Program Consultant**
  - **Certified Yellow Belt Collaboration Architect**
  - **Doctorate in Physics, Princeton University**

# Research Partners



## John Carter

- Principal TCGen Inc.
- Cirrus Logic Board Member
- Former Chief Engineer (Bose)
- MS EE, MIT, BS Harvey Mudd



## Scott Elliott

- Principal Techzecs
- R&D Director, HP
- Founder, Process Consulting HP
- BS,MS and PhD, UC Berkeley and Santa Barbara

# The Research Project: 2013—2015

- Motivations and Key Questions
- What are effective techniques for
  - Agile development of hardware?
  - Concurrent Agile development of hardware and software?
- What are specific “recipes” for the above, using Cprime’s principles for Agile governance
  - Scrum, Kanban, something else…
- Capture what “best practices” exist and what gaps exist
- How organizations have effectively implemented such development

# Companies and Methodology

- Nearly Twenty Companies – Responses from
- Amazon
- Applied Materials
- AT&T
- Beats
- Cisco
- Hitachi
- HP
- KLA Tencor
- Tandem
- Teradata

## Methods

- Developed hypothesis on what could lead to agility in HW/Large programs
- Developed interview guide and construct data collection approach
- Constructed interview guide with key questions
- Gathered information via interviews, probing on emerging best practices
- Analyzed data, extracted common characteristics & outstanding practices
- Consolidated findings to create novel process model and recommend agile development organization



# Research Findings

- Hardware companies used different Agile techniques
- None had a full Agile process
- Still emerging, and still experimenting, but some successes

- Several best practices emerged
- Not slave to identical Sprints, but adhere to identical durations
- Overlapping prototyping of circuit boards – not strictly serial
- Planning with ‘sticky notes on a wall’
- Hardware Sprints of longer than SW (typically 2x duration)
- Creative use of Burn down charts – repurposed for Hardware
- Burn down metrics change by Sprint
- Ranking of features by value

# Key Differences
# Hardware Versus Software

- Flexibility is inherently less
  - Can’t do an update over the web for physical product
- Cost of change is higher for hardware
- Architectural work is more front-loaded for hardware
- Availability of standard components constrains hardware design more than software design
- In software development, variation in type of work done over time is small
  - In hardware development, because of the realization of a physical product, the type of work done changes substantially over time
- Hardware development cost rises towards end of work, while software costs are flat over time
  - Hardware Sprints towards end have significant test costs

# Key Similarities between Hardware and Software Development

- The total work of product development can be divided into a large number of small and testable deliverables
  - True in Software and Hardware
- Work can be partitioned over Sprints (short development cycles). Sprint scope can be estimated, progress can be measured, and learning can be integrated
  - Planning poker, Burn down charts, and Retrospectives common to both
- Self-contained, self-organized work teams can be created for even the largest projects
  - Creation of small, self sufficient, cross functional teams with Scrum Masters common to both
- Important distinction:
  - Software: Aggregation of deliverables yields usable features over time
  - Hardware: Aggregation of deliverables yields usable product at the end of development

# Recommended: Scrum Process for Hardware Development

1. Story Types: “User” vs “Technical”
2. Sprint Length
3. Work estimation is Time-Based
4. Release Planning is Needed
5. Variation in Sprint Focus during Release Cycle

# Story Types

- User Story: Short narrative description of a user experience. Usually written by Product Owners.
- Technical Story: Short description of deliverable that is not user-facing. Usually written by Team Members

- Both types occur in both software and hardware development
- Expect higher ratio of Technical Stories to User Stories in hardware than in software

# Sprint Length for Hardware

- Usual Scrum advice is 2—4 weeks for Sprint length in software
- I advocate 2—3 weeks for hardware and software development
- Most hardware clients choose 2 weeks
- Lengthen if necessary to discover optimum length
- Use the same length for all Sprints across all collaborating teams

# Work Estimates are Based on Time

- Use of relative sizing with Story Points is common in software. This requires Team be able to develop consensus norm of sizing that is not based on time.

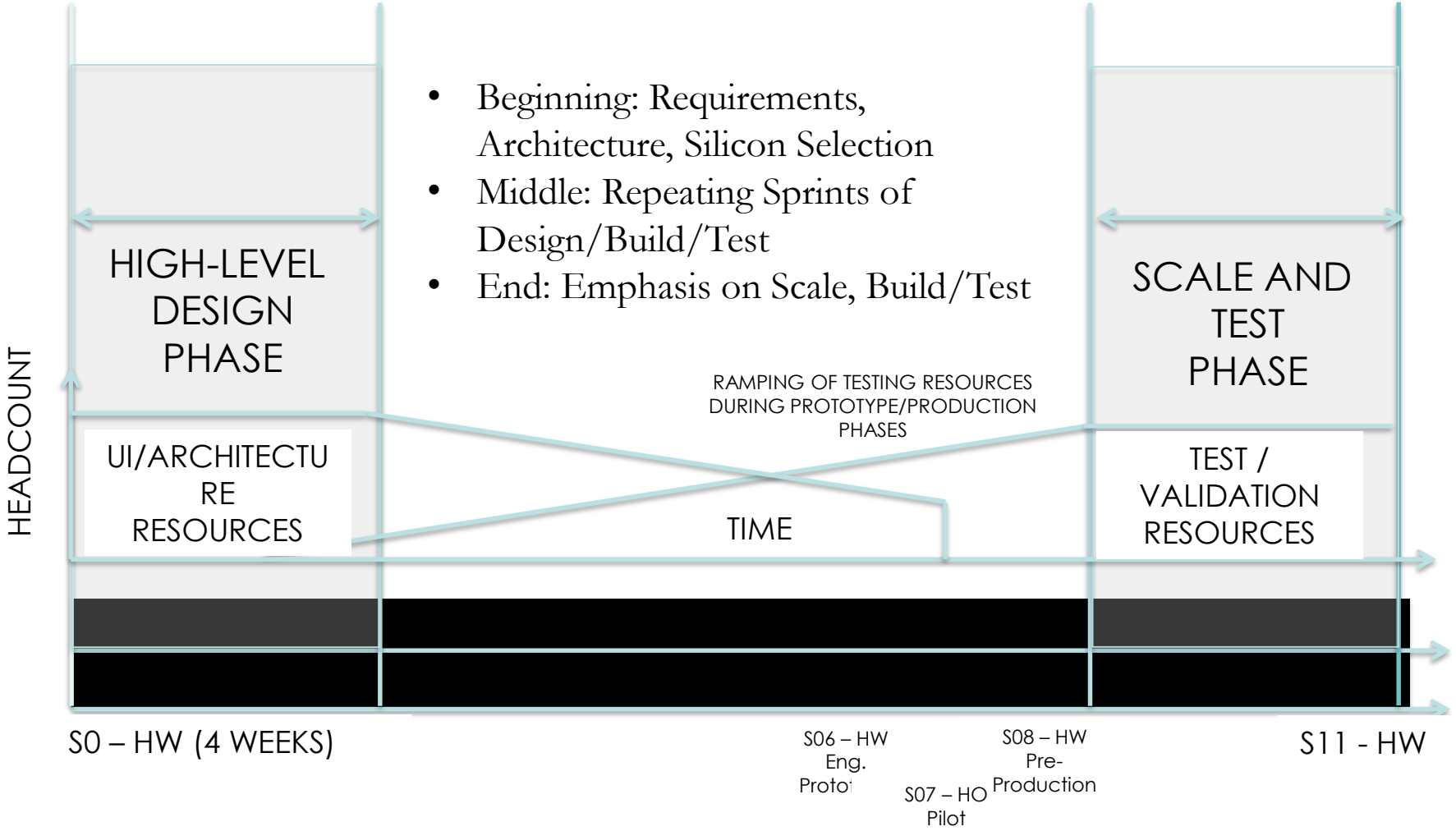
- High degree of specialization of hardware Team skills (ME, EE, etc.) means consensus norm not based on time is not possible, because most Stories cannot be sufficiently understood by all Team members
- Time-based estimation (Person-Days, Man-Days, etc.) is understood by all Team members, and tends to be familiar to them already
- Task estimates are in hours (common in software, too)

# Release Planning

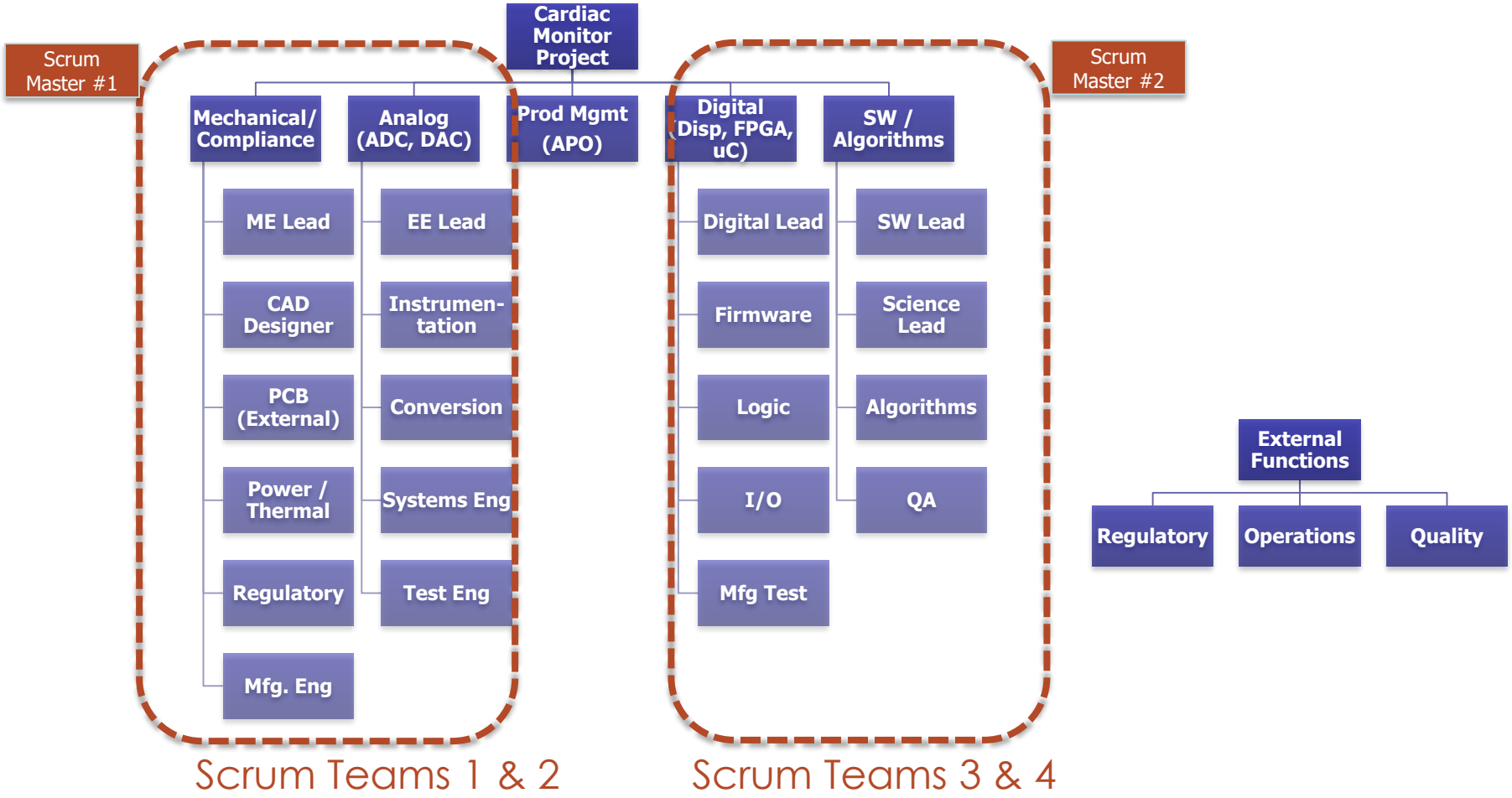
- Release Planning (planning for longer than one Sprint) is often useful in software development, but is optional

- Release Planning is essential for hardware development
  - Higher cost of change implies need to plan complete product development to some degree (more than a Sprint)
  - Variation in type of work over time must be considered in the longer-term plans

# Variation in Skills Over Release Cycle



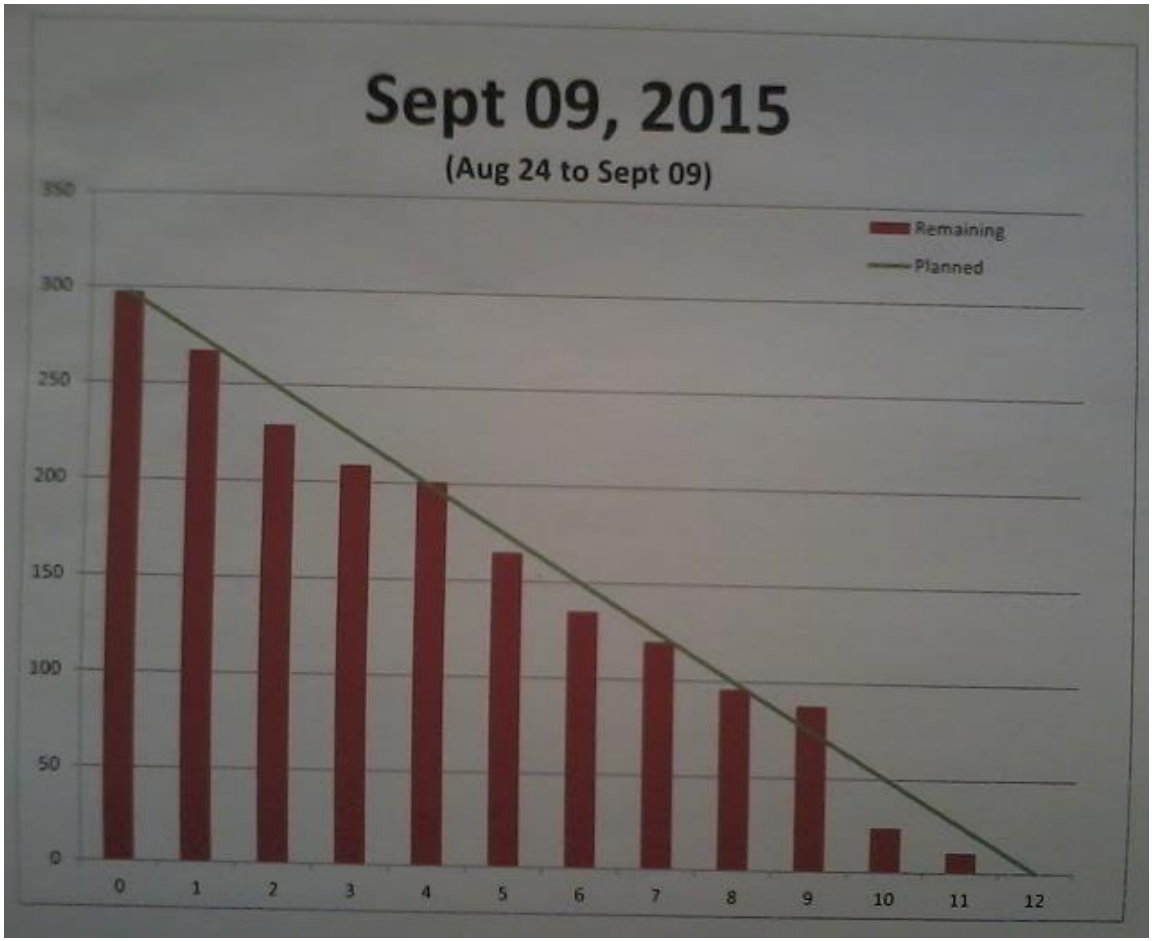
# Example Scrum Organization for Hardware Development



# Client Results

Product: Device for analyzing chemical samples

Image is Burndown chart for first Sprint



# Conclusions

1. Hardware development can be done in an Agile way
2. Scrum is well-suited for hardware development
3. Hardware requires time-based estimation, Release Planning, and a shift in types of Stories relative to software

Visit www.cprime.com for white papers and links to Dr. Thompson's book, *Solutions for Agile Governance in the Enterprise (Sage): Agile Project, Program, and Portfolio Management for Development of Hardware and Software Products*

# Where It's Happening*

ThermoFisher SCIENTIFIC

Chromatography and Mass Spectrometry devices for laboratory and medical use

PICARRO

Isotope and Trace-Gas Analyzers for field use

Culligan Water

Water-treatment equipment for home and industrial use

INSITU
A Boeing Company

Unmanned aircraft, ground stations, and related equipment

Bird

High precision, high reliability radio communication and test equipment

plantronics

Audio and communications products

* Cprime clients

**Questions & Comments**



# Agile approach to assuring the safety-critical embedded software for NASA's Orion spacecraft


**Justin Smith**

Independent Verification & Validation

**John Bradbury**

SAIC

**Will Hayes**

Software Engineering Institute
Carnegie Mellon University

**Wes Deadrick**

Independent Verification & Validation



# NASA's IV&V Program

IV&V Program

- NASA's Independent Verification & Validation (IV&V) Program reports to the Office of Safety and Mission Assurance (OSMA)
  - Technically, Managerially, and Financially Independent
- Located in Fairmont, West Virginia
- IV&V perspectives structured around the following:
  - Does the software do what it is supposed to do
  - Does the software not do what it is not supposed to do
  - Does the software respond appropriately under adverse conditions
- IV&V's goal across all projects is to add assurance and mitigate risk
- Orion IV&V goal: Add evidence-based assurance that minimizes the overall risk of Orion software



# Orion
# Multi-Purpose Crew Vehicle

IV&V Program





# Traditional Approach

IV&V Program

- Traditionally, IV&V analyzes artifacts when they are received from the developer and delivers findings when the next group of artifacts are received or at major milestone events
- IV&V has historically been more suited to a waterfall development lifecycle although it has always adapted as necessary
- Orion IV&V utilized a plan based off of a flight software risk assessment and planned twice a year for what assurance would be added
- Using this plan as a guide, Orion IV&V analyzed entities in their entirety, with some entities not considered risky enough to analyze at all



# Challenges

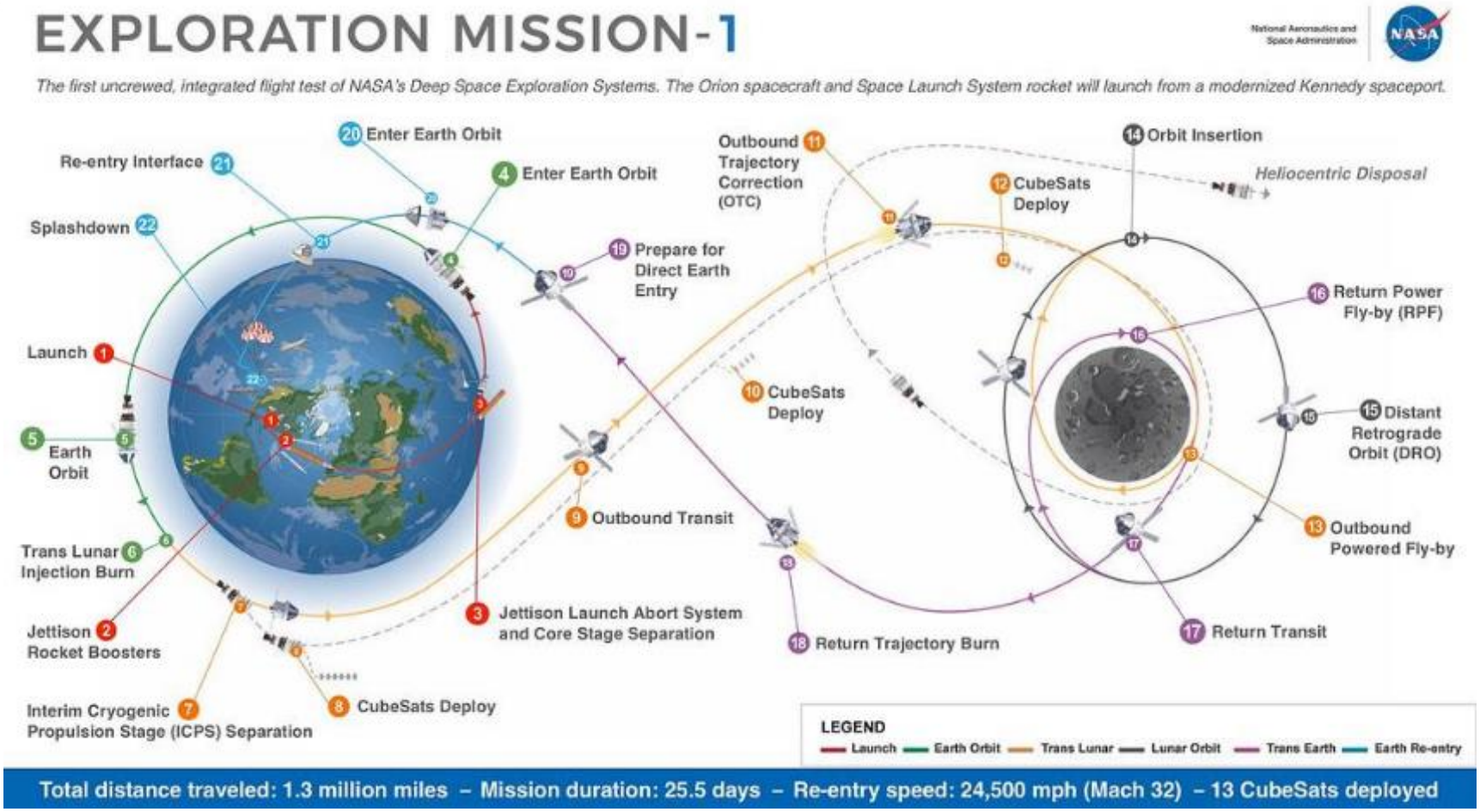
IV&V Program

- Orion development environment is very dynamic
- Orion flight software for EM-1 is developed using an Agile development model which was very different for IV&V
- Team members could not perform the previous analysis without frustration
- In many cases IV&V provided inputs months out of phase with the developer
- Approach required IV&V to adapt much more than usual to perform effective analysis



# Orion EM-1 Mission Overview

IV&V Program





# Switch to Capabilities

IV&V Program

- Orion IV&V was uncomfortable with the residual risk that would have resulted from the previous approach
- IV&V decided to make sure to analyze the highest risk mission capabilities regardless of their association to the entities
- IV&V now adds targeted assurance for specific capabilities and no longer focuses on everything within specific entities

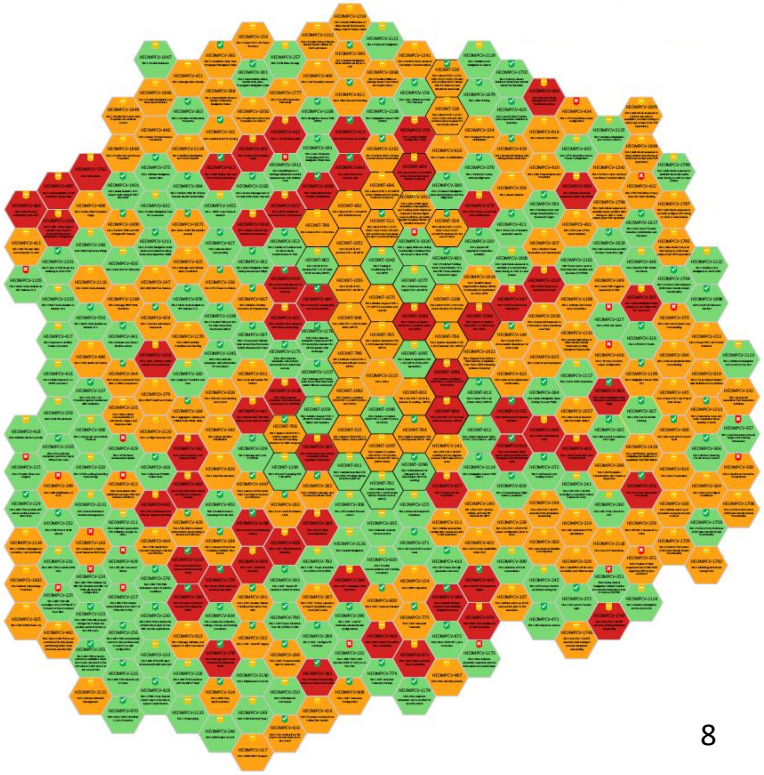




# Following the Risk

IV&V Program

- IV&V wanted to evaluate risk more dynamically, doing so much more frequently to match the changing risk landscape of the Orion Program
- Following the risk focuses the Orion IV&V team's effort on areas of highest concern – knowing their work will have an impact





# Agile IV&V

IV&V Program

- To develop understanding of the Agile approach used by the Orion flight software developer, IV&V approached the Software Engineering Institute at Carnegie Mellon University
- IV&V learned Agile and Lean concepts that integrated logically with the Capability Based Assurance approach
- Agile IV&V is the application of those relevant Agile and Lean principles in the planning, management and performance of IV&V – not an orchestrated adoption of some branded framework or tool



# Agile Principles

IV&V Program

- Retrospectives
- Small batch sizes of assurance work
- Fast integrated learning cycles
- Small self-organizing teams
- Frequent delivery
- Scrum / Scrumban
- Backlogs
- Daily stand-ups



# Results

IV&V Program

- Communication improved in many areas
- The team embraced the continuous improvement mindset
- Orion IV&V changed delivery cadence from months to weeks
- Stakeholders were happy with the changes:
  - “IV&V's capability based approach and "follow the risk" strategy allows them to have relevant opinions on the most difficult issues the program is facing. Their recommendations and conclusions are well researched and obviously vetted internally. They consistently bring coherent communication and clarity to discussion and I highly value their opinion.”



# Aspirations for Long Term

IV&V Program

- Build stronger team focus and increase collaboration among IV&V staff
- Improve the efficiency of IV&V analysis and delivery cycle
- Move toward greater synchronization with the development team
- Get comfortable with feeling uncomfortable
- Continue to add assurance and mitigate risk for Exploration Mission 1 and subsequent missions



# Questions?

IV&V Program

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MAY 8, 2019

Maj Matthew Getts, USAF

Mr. Bart Hackemack, SEI

#AgileInGov19

#AgileAF

#SpaceStartsHere



# THE AGILE PROGRAM OFFICE:

## APPLYING AGILE PRINCIPLES AND PRACTICES IN A HIGH STAKES ACQUISITION ENVIRONMENT



The Challenge



Our Goals



New Approach



The Results

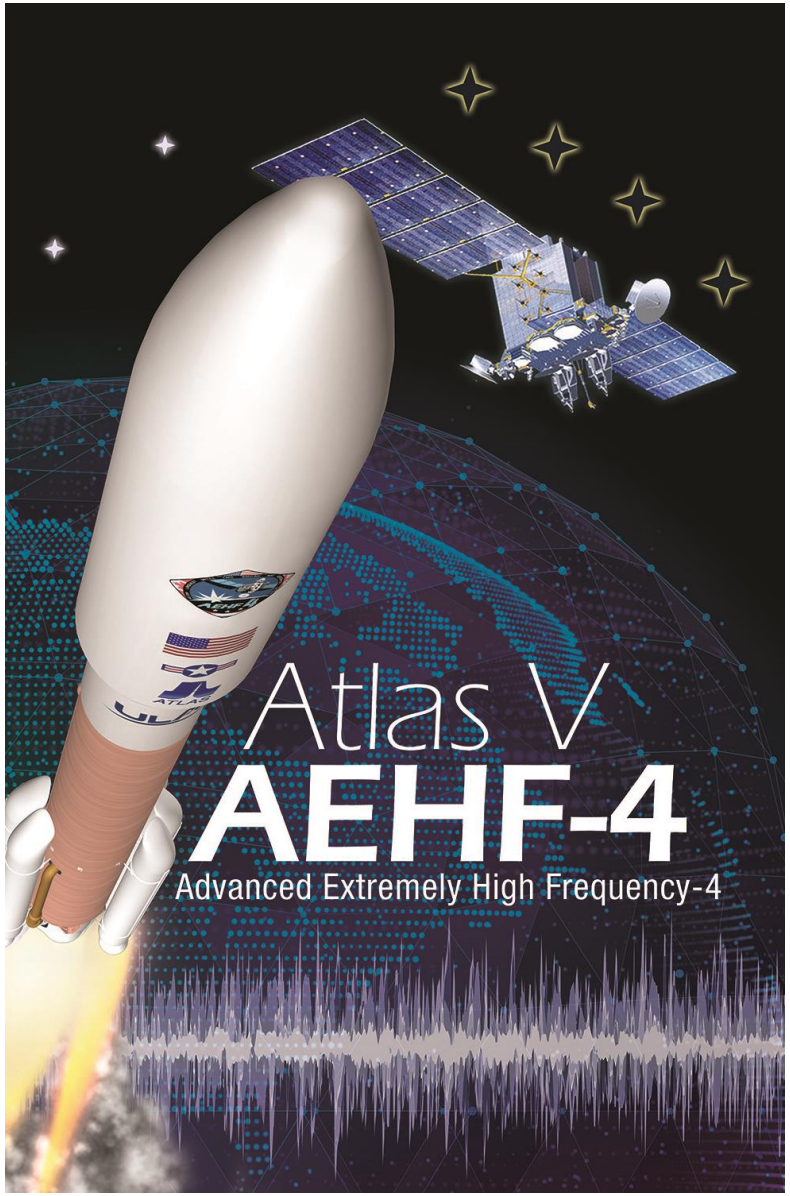


Getting Started



What's Next

# OVERVIEW

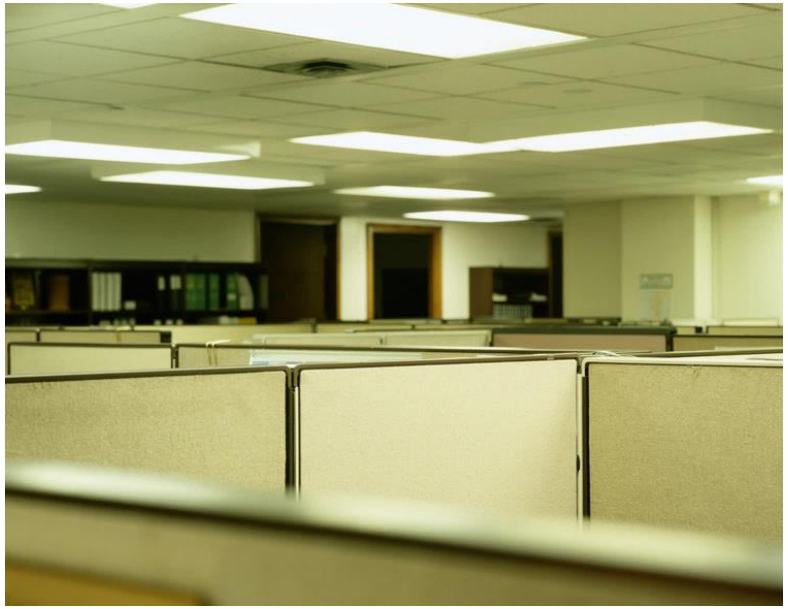



# THE HIGH STAKES CONTEXT

## BUILDING & LAUNCHING SATELLITES FOR STRATEGIC SATELLITE COMMUNICATION

# THE CHALLENGE:







# THE CHALLENGE:

## THE WAY WE STORE DATA



# THE CHALLENGE:

# THE WAY WE COMMUNICATE



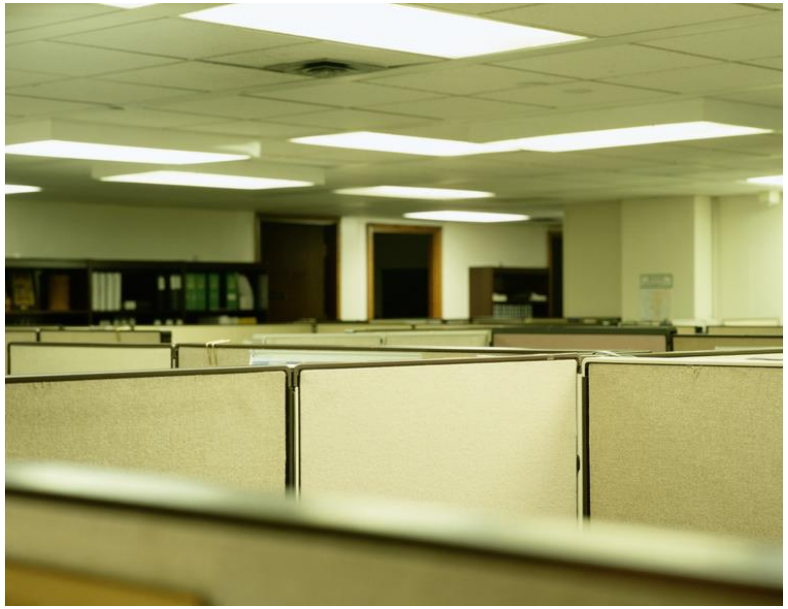




# THE CHALLENGE:

## THE WAY WE ARE ORGANIZED





# GOALS



Connect People in Meaningful Ways



Put Data at their Fingertips



Establish Enduring Collaboration Platform

# A NEW APPROACH



KANBAN

# THE KANBAN PRIMER



Start with What You Do Now



Improve Through Evolutionary Change



Encourage Acts of Leadership at Every Level



Understand & Focus on Customer Needs



Manage the Work and Let People Self-Organize Around It



Evolve Policies to Improve Outcomes

# THE KANBAN PRIMER

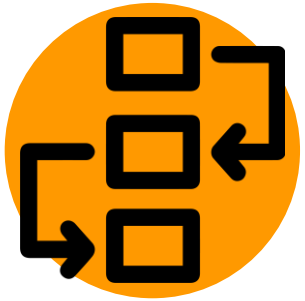
## PRINCIPLES



Visualize the Work



Limit Work in Progress (WIP)



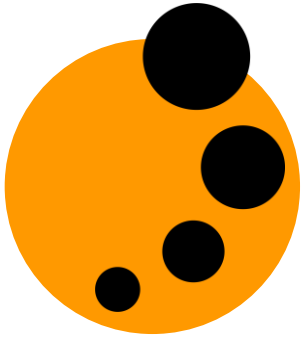
Manage Flow



Make Policies Explicit



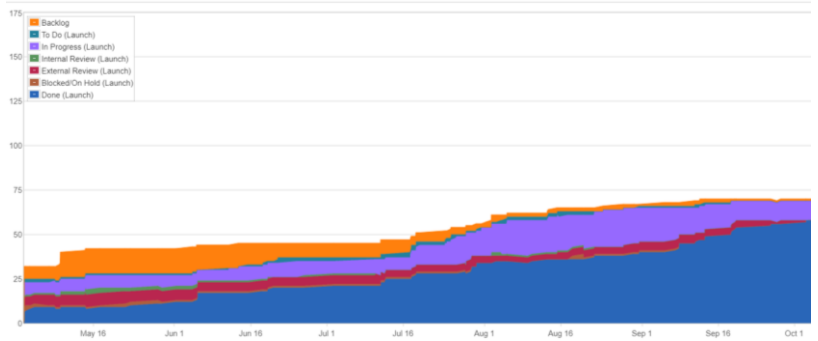
Feedback Loops



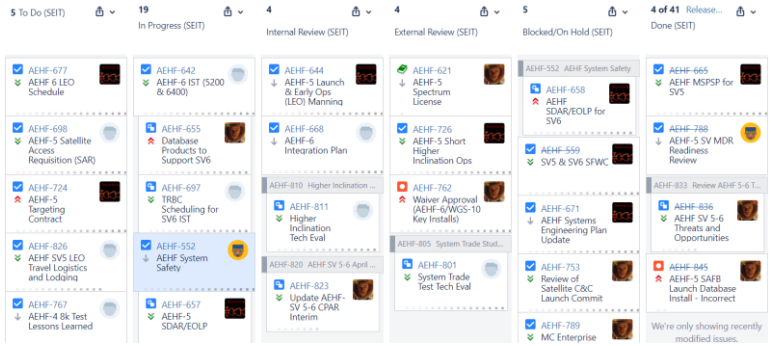
Improve and Evolve

# THE KANBAN PRIMER

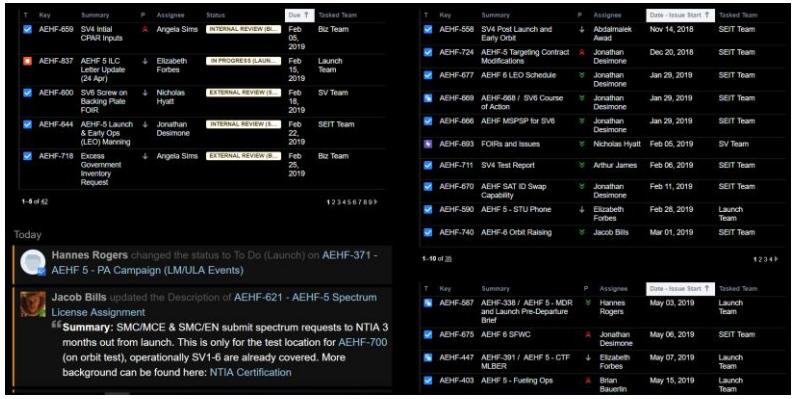
## PRACTICES



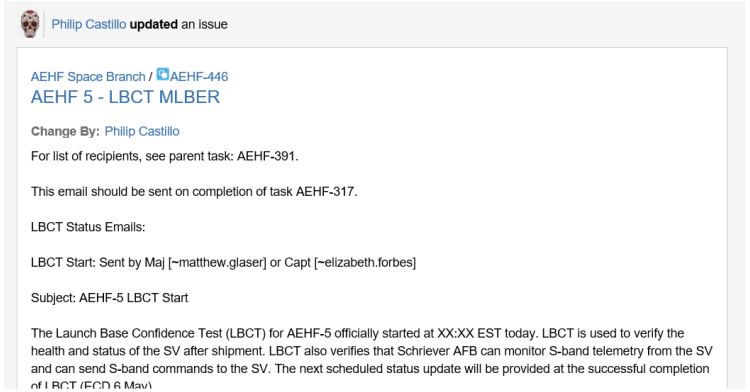

Cumulative Flow Diagrams




Kanban Boards




Dashboards




Automated Messages

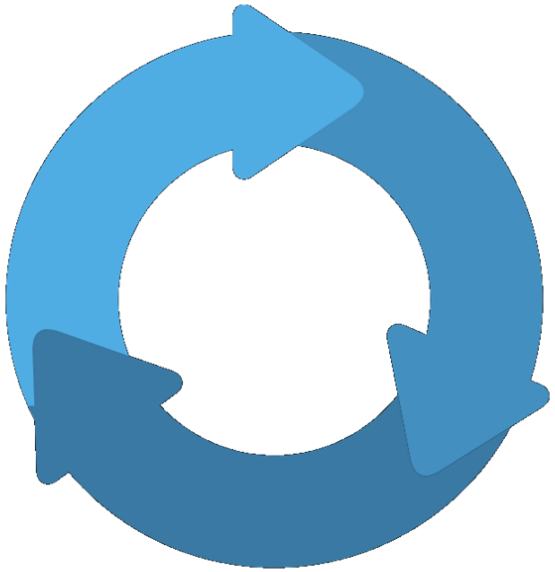
# THE KANBAN PRIMER

## VISUALIZATION TECHNIQUES

# THE AGILE PROGRAM OFFICE

## THE RESULTS





Before
- 35 days

After
- 10 days

# THE AGILE PROGRAM OFFICE

AVG CYCLE TIME

35d → 10d



# THE AGILE PROGRAM OFFICE

## 17d TECHNICAL EVALUATION



# THE AGILE PROGRAM OFFICE

## INCREASED RESILIENCY



TRAINING

# THE AGILE PROGRAM OFFICE: WHERE TO START

## 1. TRAINING

# THE AGILE PROGRAM OFFICE: WHERE TO START




The Backwards Brain Bicycle - Smarter Every Day 133 - YouTube

YouTube · SmarterEveryDay



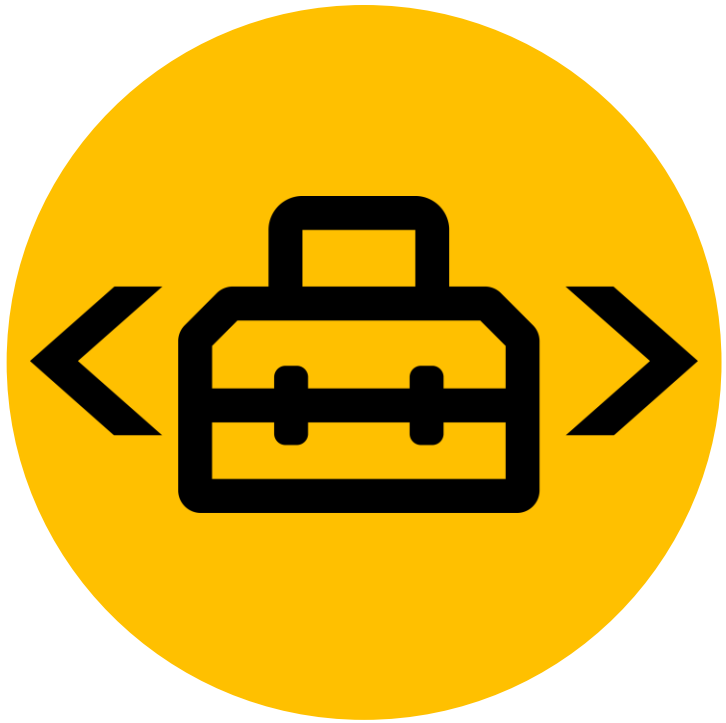
KNOWLEDGE ≠ UNDERSTANDING



# COACHING

THE AGILE PROGRAM OFFICE: WHERE TO START

1. **TRAINING**
2. **COACHING**



# TOOLING

THE AGILE PROGRAM OFFICE: WHERE TO START

1. **TRAINING**
2. **COACHING**
3. **TOOLING**



SPONSORSHIP



CULTURE

# THE AGILE PROGRAM OFFICE: WHERE TO START

ENABLERS


ATLAS
GATEWAY TO INNOVATION
#atlasx #innovation #development #agile #analytics

# NEXT STEPS

# STATE OF AGILE

ATLASX

AGILE READINESS CENTER



## AGILE IS EXPANDING WITHIN THE DOD ENTERPRISE

There is a national imperative to leverage agile practices in defense acquisition settings. This will be the first survey of its kind implemented within a large DoD organization



## SMC MUST BE OPERATIONALLY RESPONSIVE

The threat in the space domain is moving fast, and SMC must move faster. The survey will help identify the critical factors in adopting and scaling agile at SMC.



## BENEFITS OF AGILE ADOPTION BEING REALIZED

The survey will report the impacts as a result of adopting agile practices at SMC.



## WHAT DOES AGILE MEAN TO TEAMS?

The survey will report the top reasons for adopting agile techniques at SMC.

# THANK YOU

AEHF Launch Highlights

## THE AGILE PROGRAM OFFICE

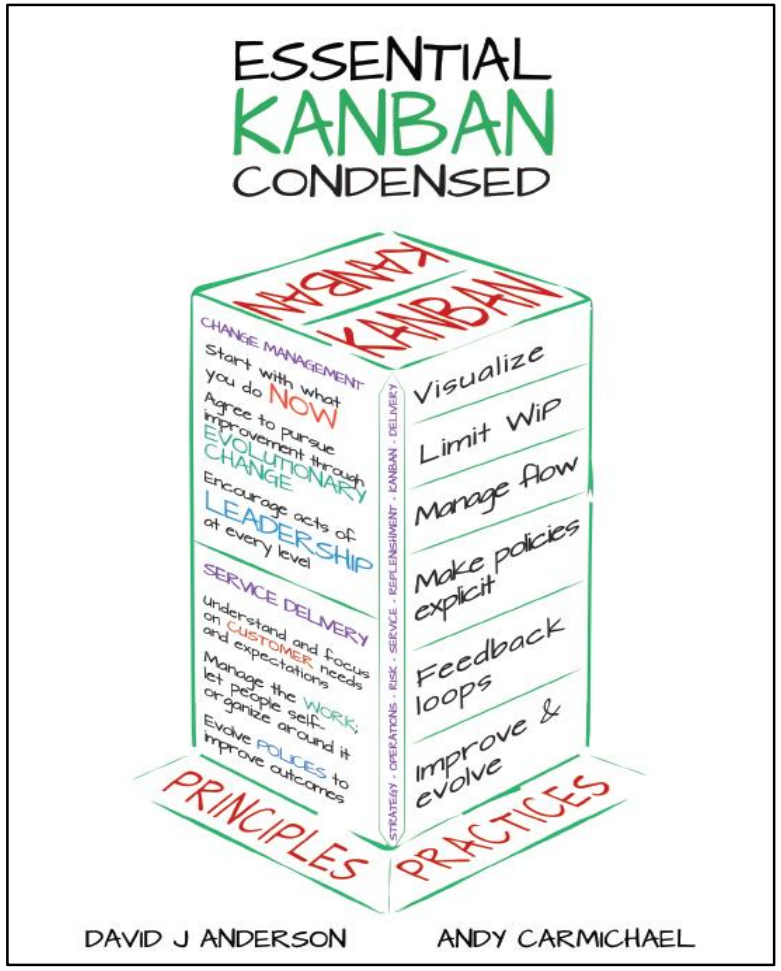
Maj Matthew Getts, USAF
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310-725-9052

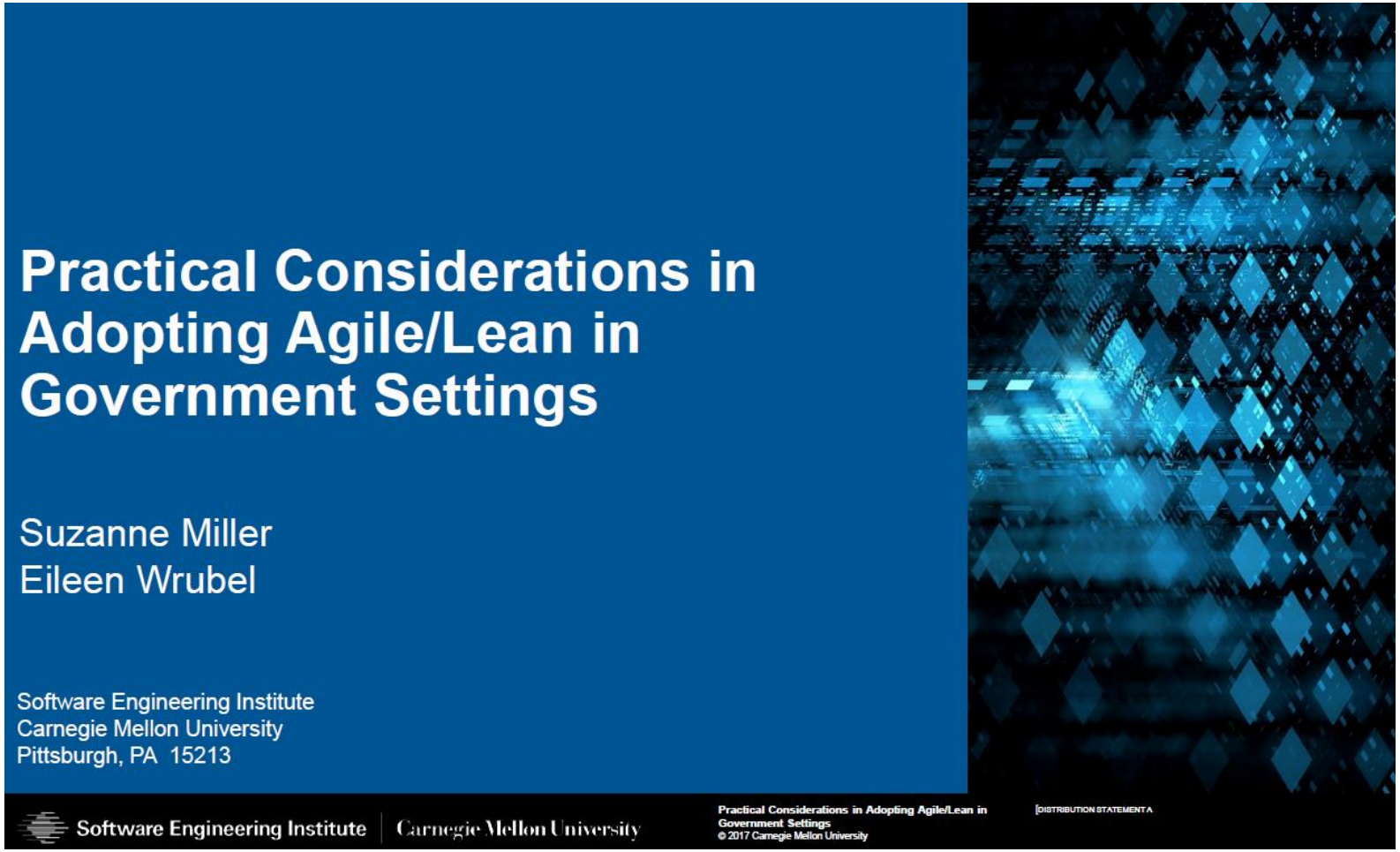
#AgileinGov19

#AgileAF

#SpaceStartsHere

# RESOURCES


ESSENTIAL
KANBAN
CONDENSED
KANBAN
KANBAN
CHANGE MANAGEMENT
Start with what you do NOW
Agree to pursue improvement through EVOLUTIONARY CHANGE
Encourage acts of LEADERSHIP at every level
SERVICE DELIVERY
understand and focus on CUSTOMER needs and expectations
Manage the WORK; let people self-organize around it
Evolve POLICIES to improve outcomes
STRATEGY - OPERATIONS - RISK - SERVICE - REPLENISHMENT - KANBAN - DELIVERY
Visualize
Limit WiP
Manage flow
Make policies explicit
Feedback loops
Improve & evolve
PRINCIPLES
PRACTICES
DAVID J ANDERSON
ANDY CARMICHAEL


Practical Considerations in Adopting Agile/Lean in Government Settings
Suzanne Miller
Eileen Wrubel
Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213
Software Engineering Institute | Carnegie Mellon University
Practical Considerations in Adopting Agile/Lean in Government Settings
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# Continuous Modernization

## Maintaining Long-Lived Federal Systems

Excella | Dane Weber

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# Long-Lived Federal IT Systems

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Federal IT systems include critical enterprise functions:

- System of record
- Implementation of mandate
- Accomplishing the mission

# Long-Lived Federal IT Systems

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- System of record
- Implementation of mandate
- Accomplishing the mission

These frequently evolve over time, but rarely go away.

# Long-Lived Federal IT Systems



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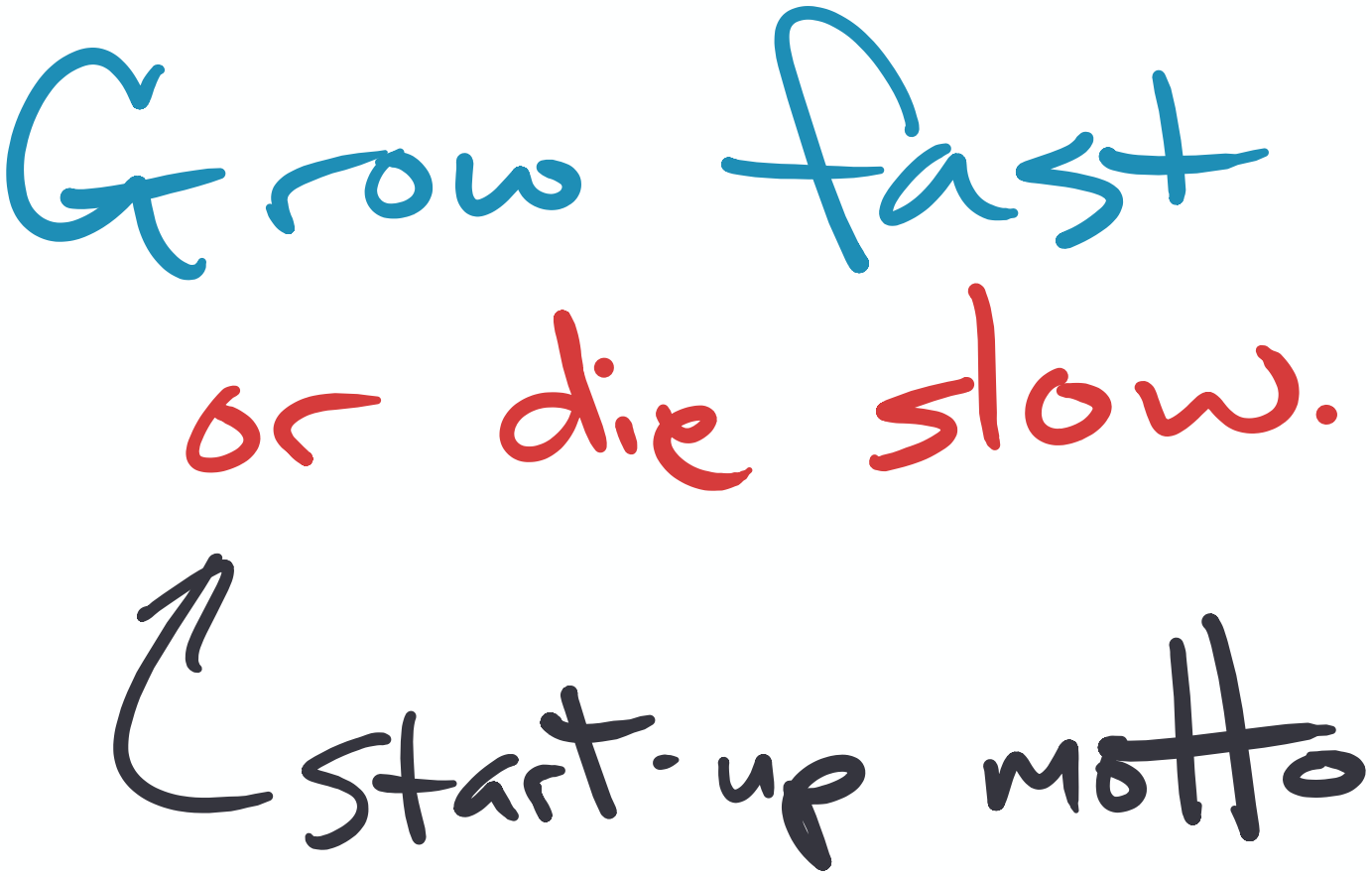
Federal systems serve uniquely long-lived missions.

# Long-Lived Federal IT Systems

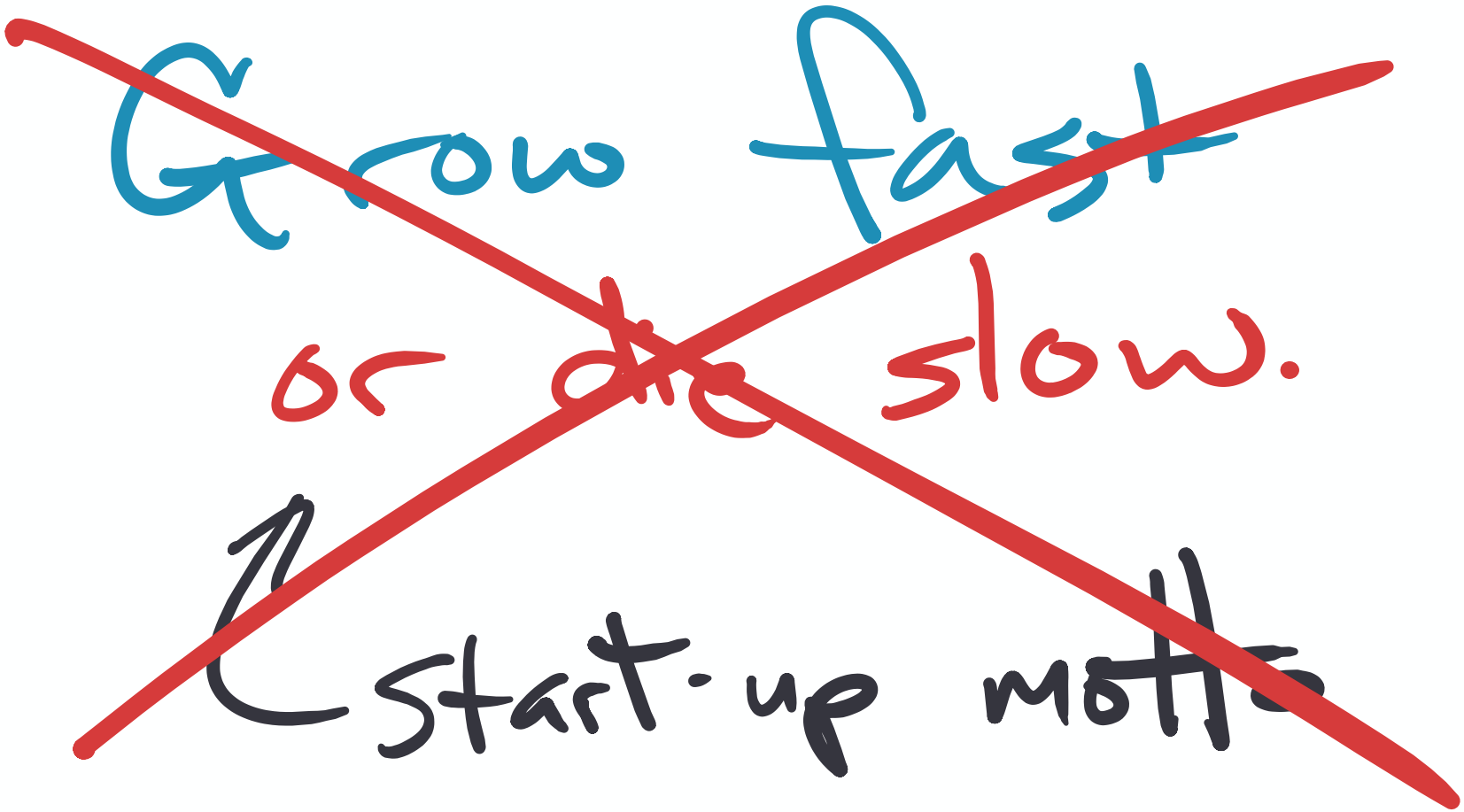
Federal systems serve uniquely long-lived missions.

Short-term thinking often leads to **risks** and **waste** that have long-term consequences.

# Long-Lived Federal IT Systems



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# Long-Lived Federal IT Systems

Goals for critical enterprise functions:

# Long-Lived Federal IT Systems

Goals for critical enterprise functions:

- Cost-effective

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Reality

~~Goals~~ for critical enterprise functions:

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- Dependable
- Extensible

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Reality

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- Dependable
- Extensible

# Long-Lived Federal IT Systems

Reality

~~Goals~~ for critical enterprise functions:

- ~~Cost-effective~~ Expensive
- ~~Dependable~~ Unreliable
- Extensible

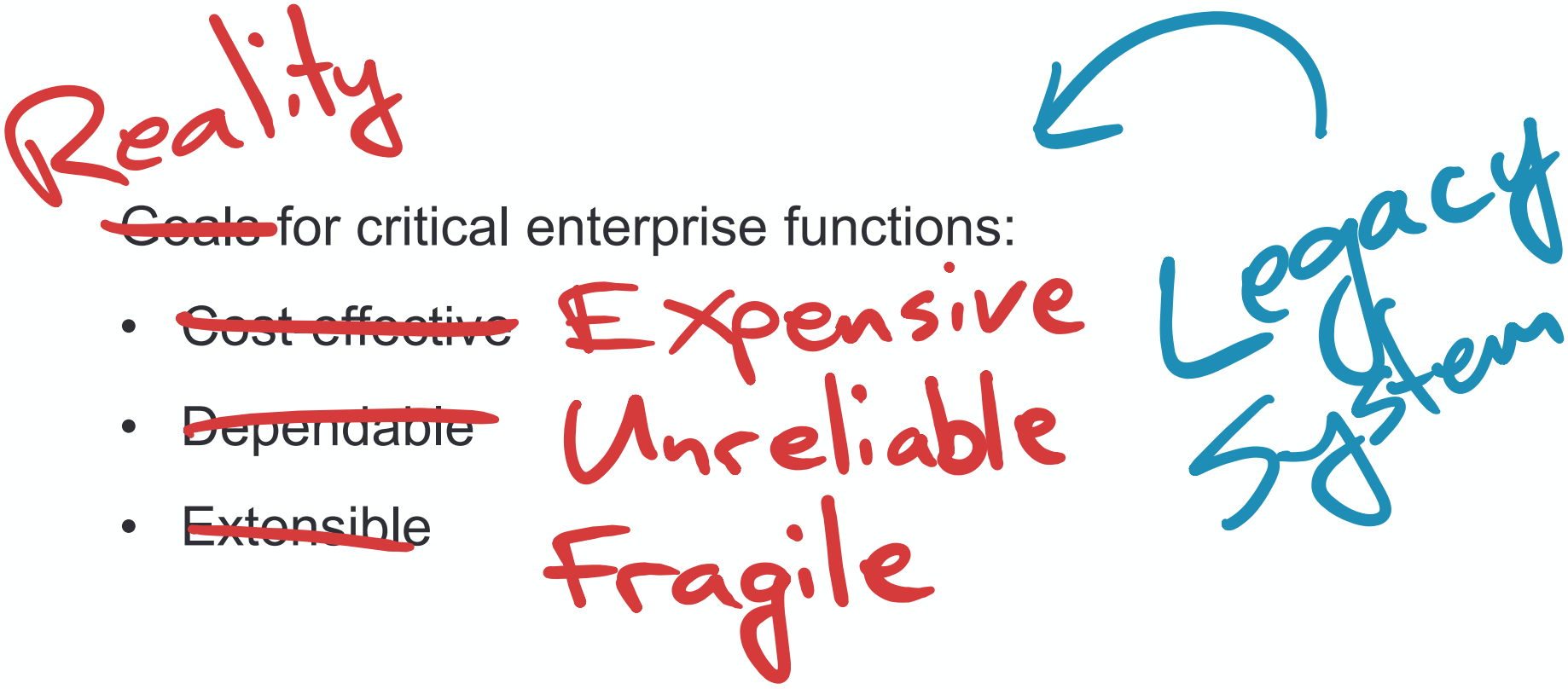
# Long-Lived Federal IT Systems

Reality

~~Goals~~ for critical enterprise functions:

- ~~Cost-effective~~ Expensive
- ~~Dependable~~ Unreliable
- ~~Extensible~~ Fragile

# Long-Lived Federal IT Systems



# Long-Lived Federal IT Systems

What makes legacy systems so expensive, unreliable, and fragile?

# Long-Lived Federal IT Systems

What makes legacy systems so expensive, unreliable, and fragile?

**Technical Debt**

# Technical Debt

# Technical Debt

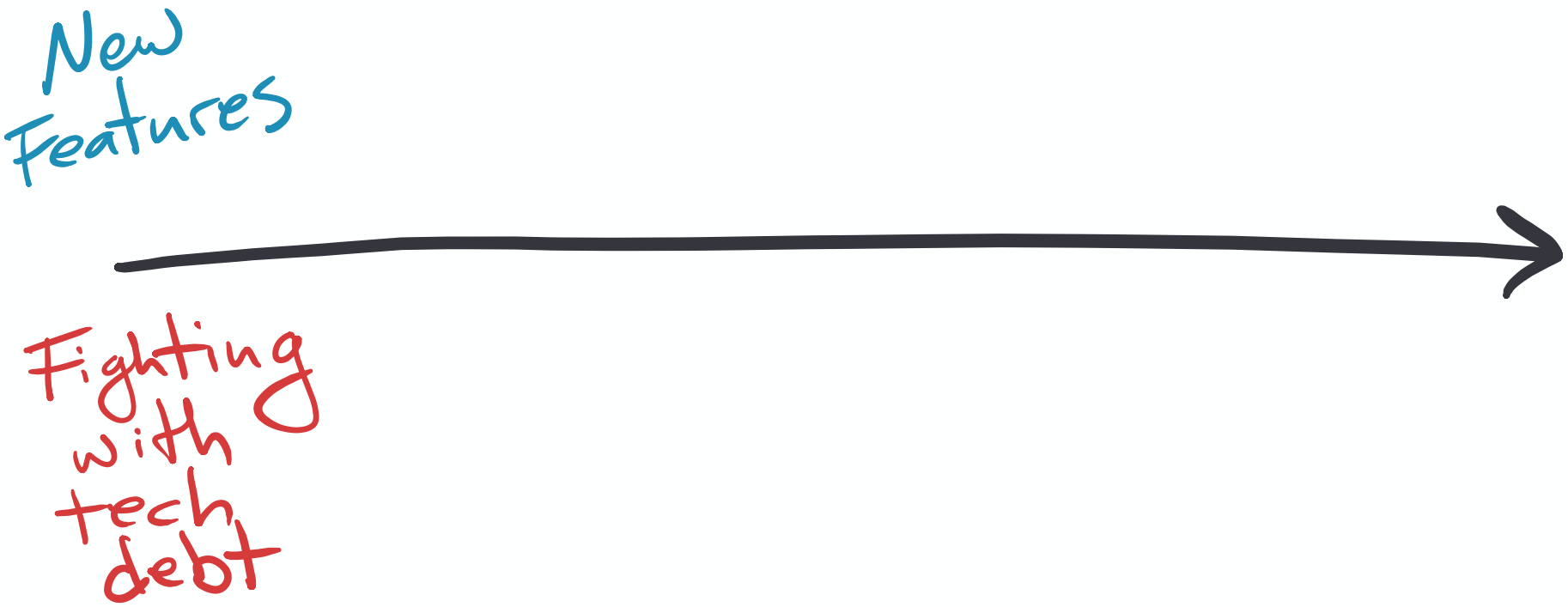
*Technical debt* is a metaphor for the shortcuts, onerous designs, and outdated technology that make modifying the system difficult and risky.

# Technical Debt

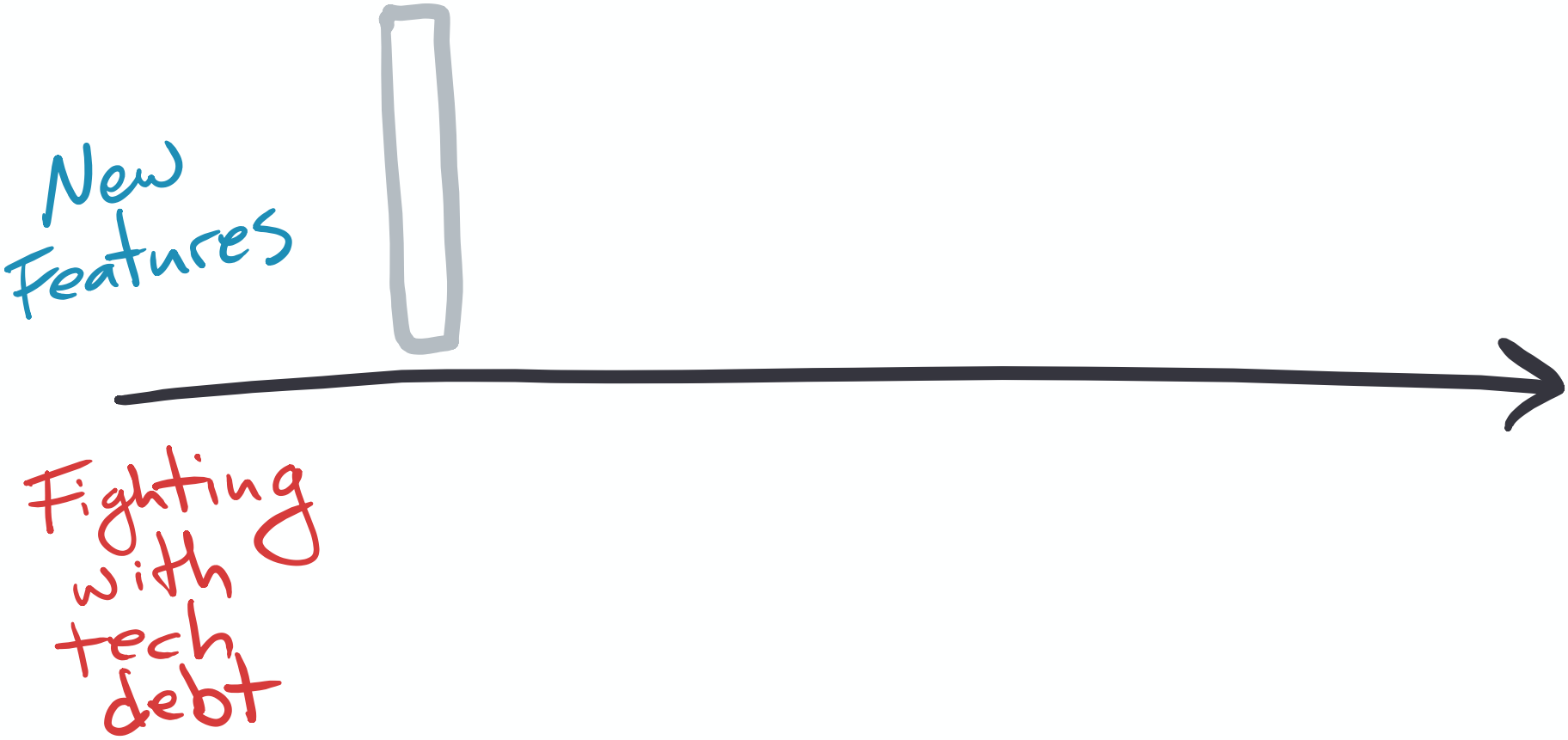
*Technical debt* is a metaphor for the shortcuts, onerous designs, and outdated technology that make modifying the system difficult and risky.

Like *financial debt* it compounds and accumulates over time and has ongoing costs until it is paid off.

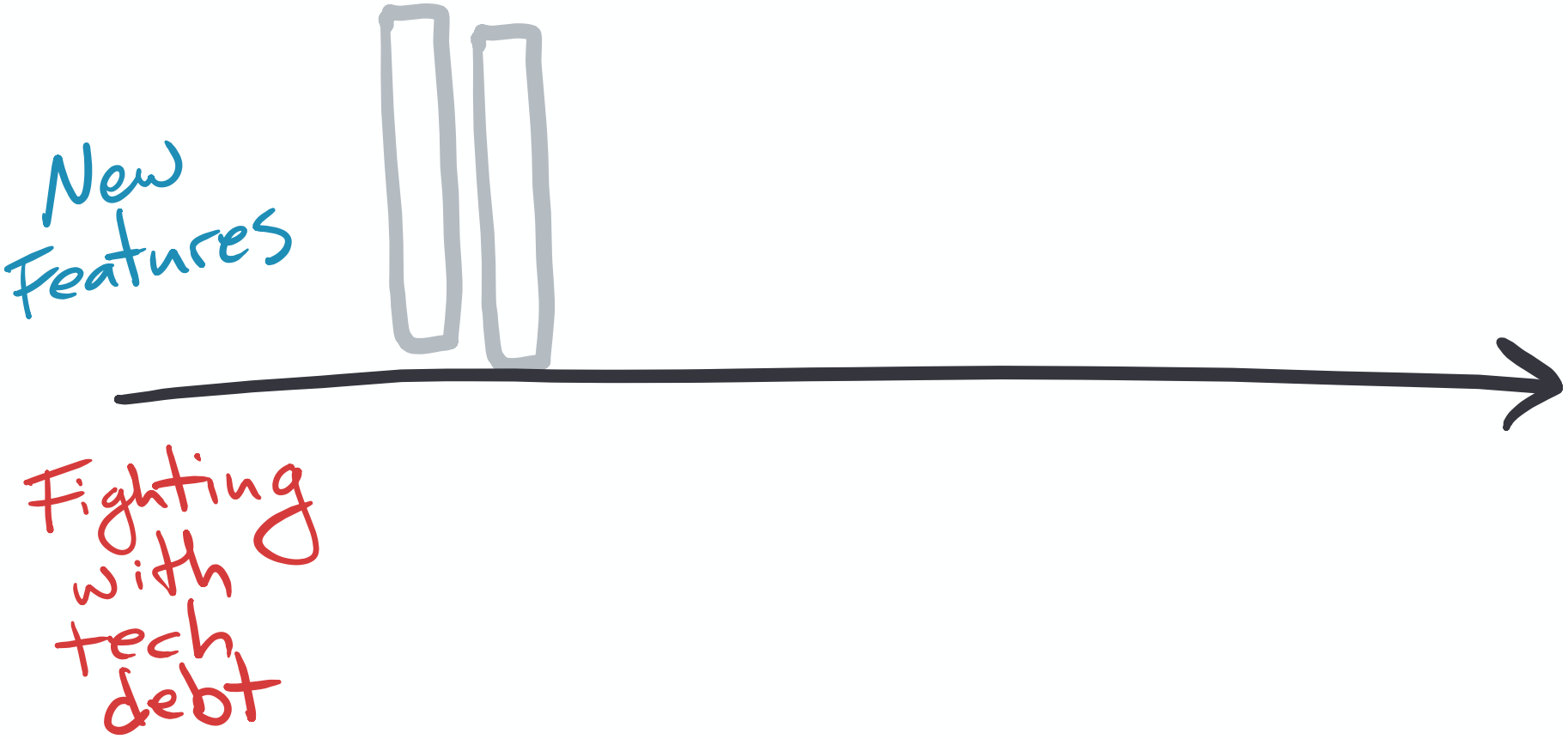
# Technical Debt



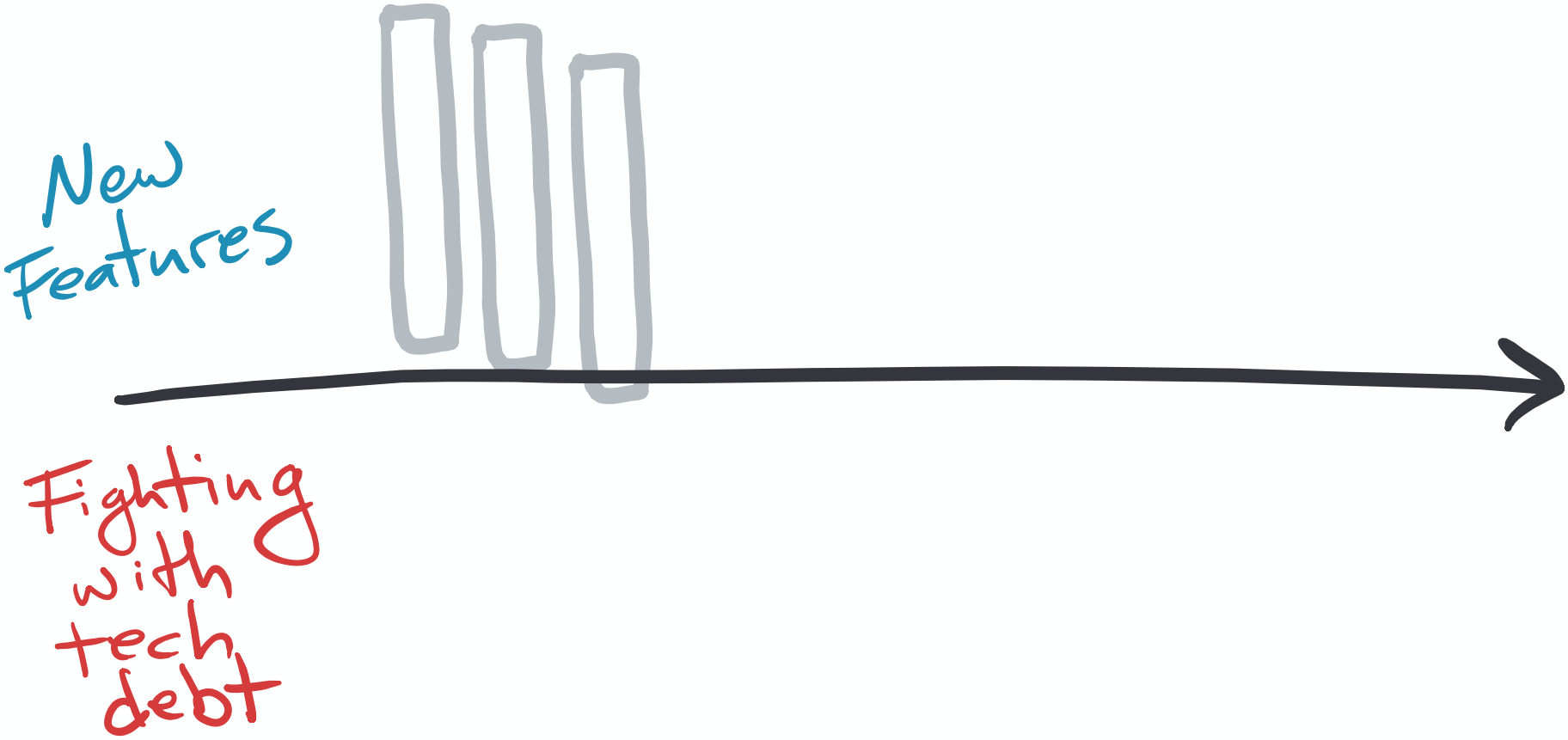
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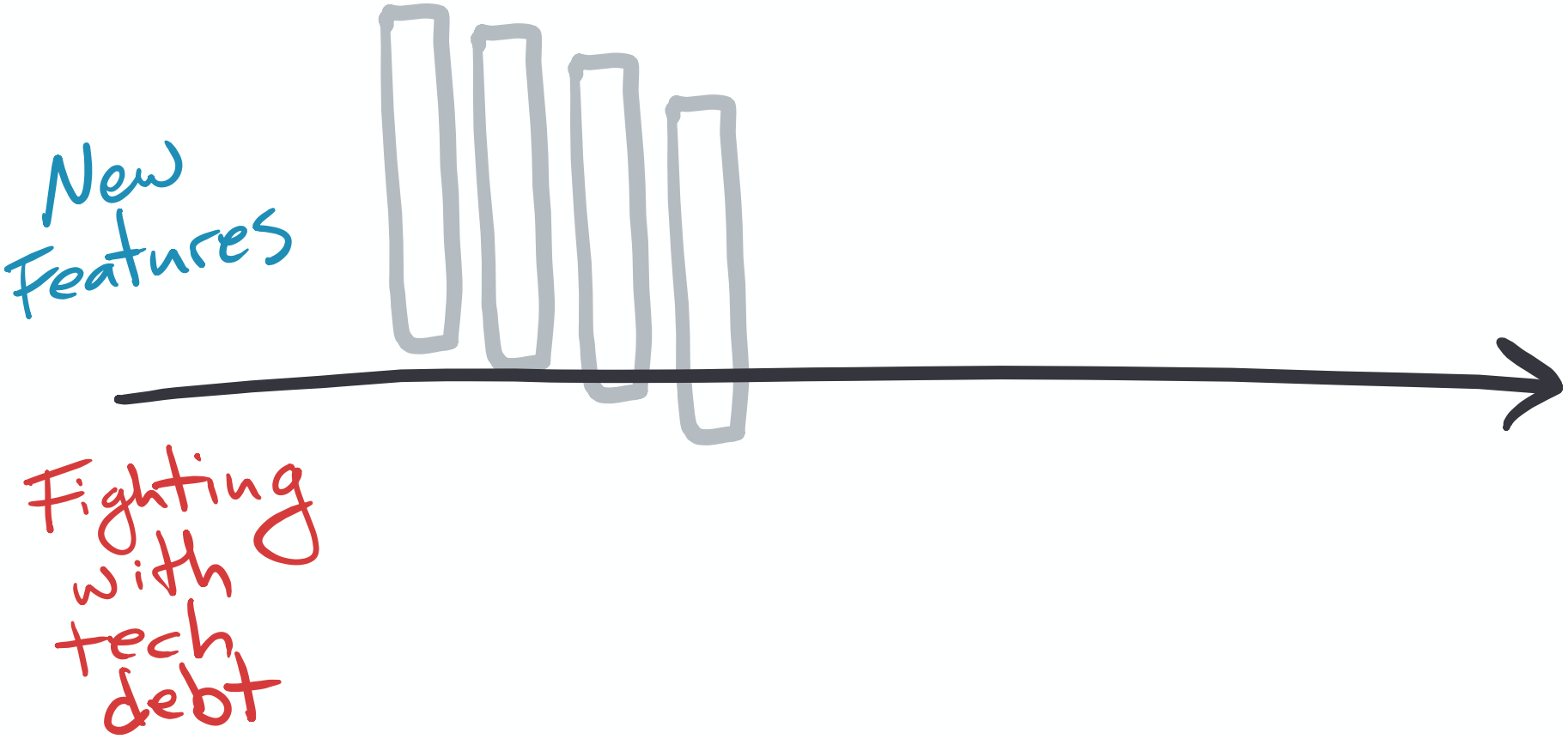
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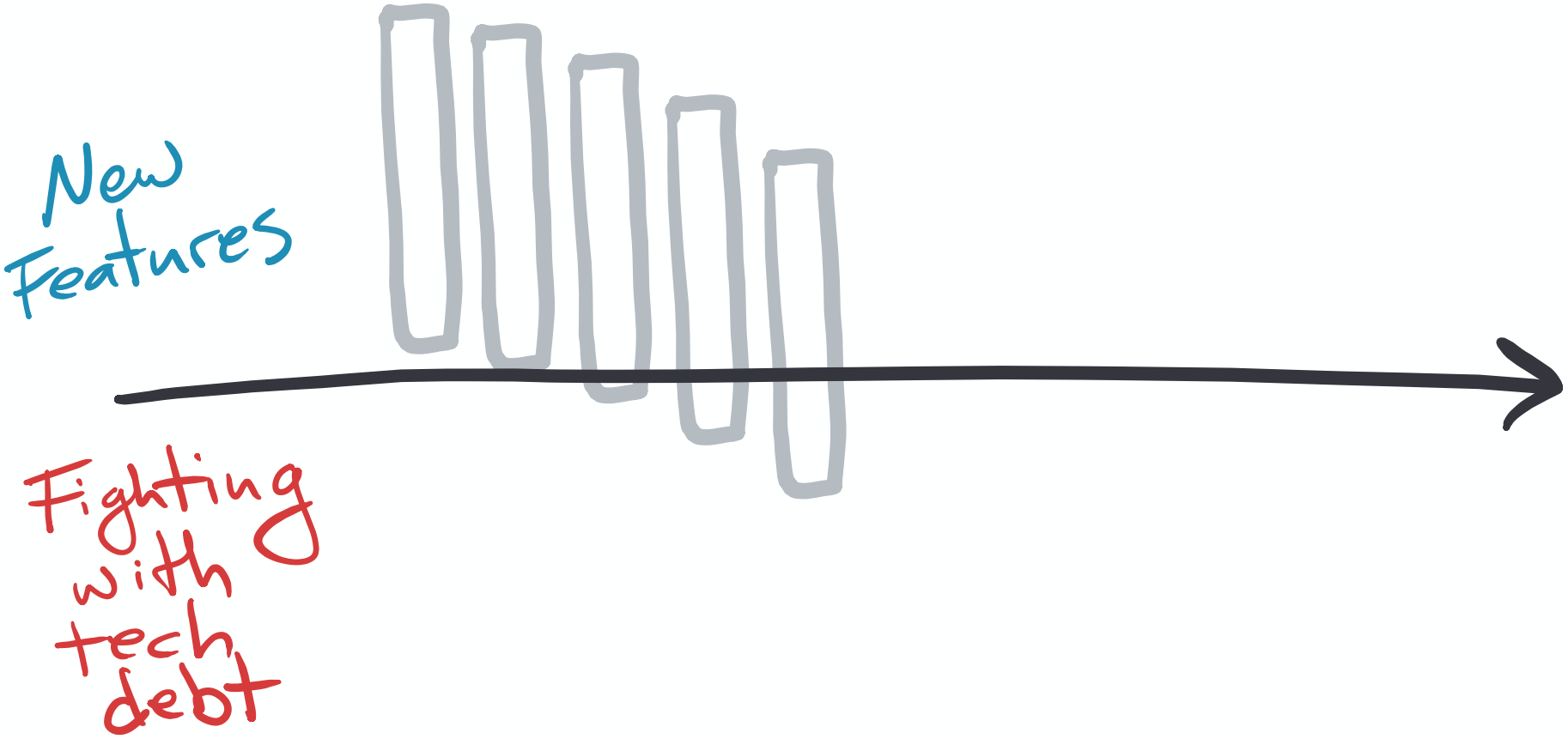
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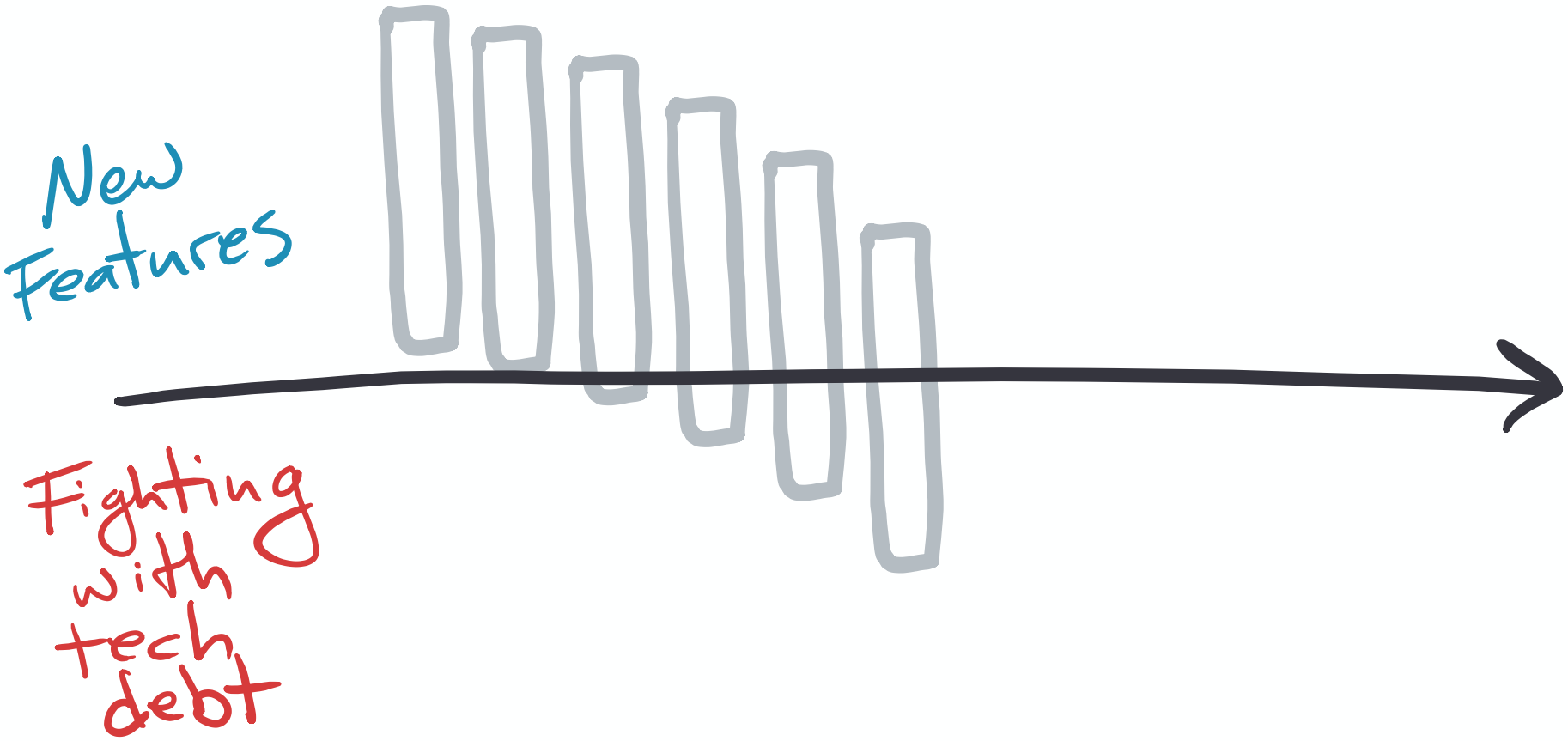
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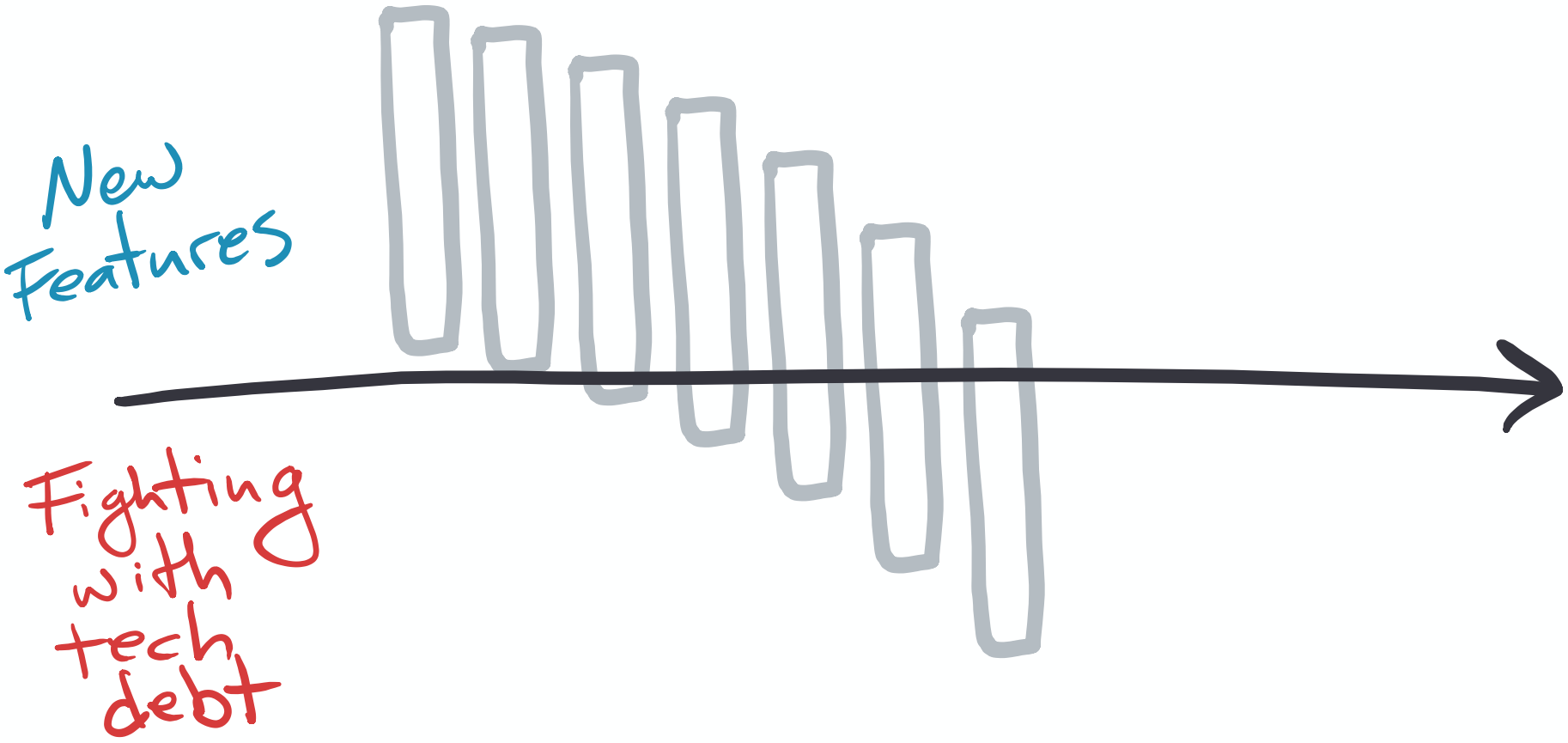
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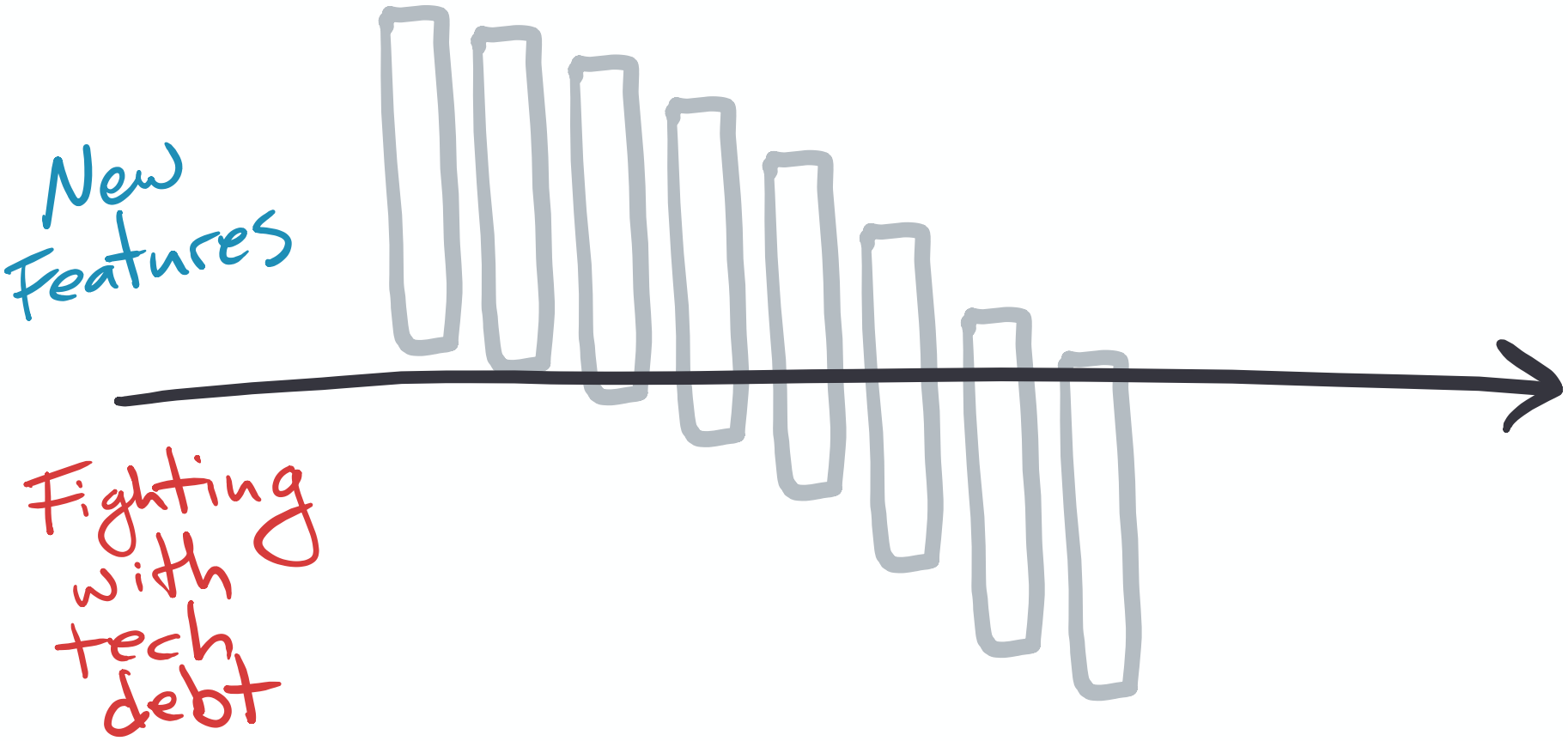
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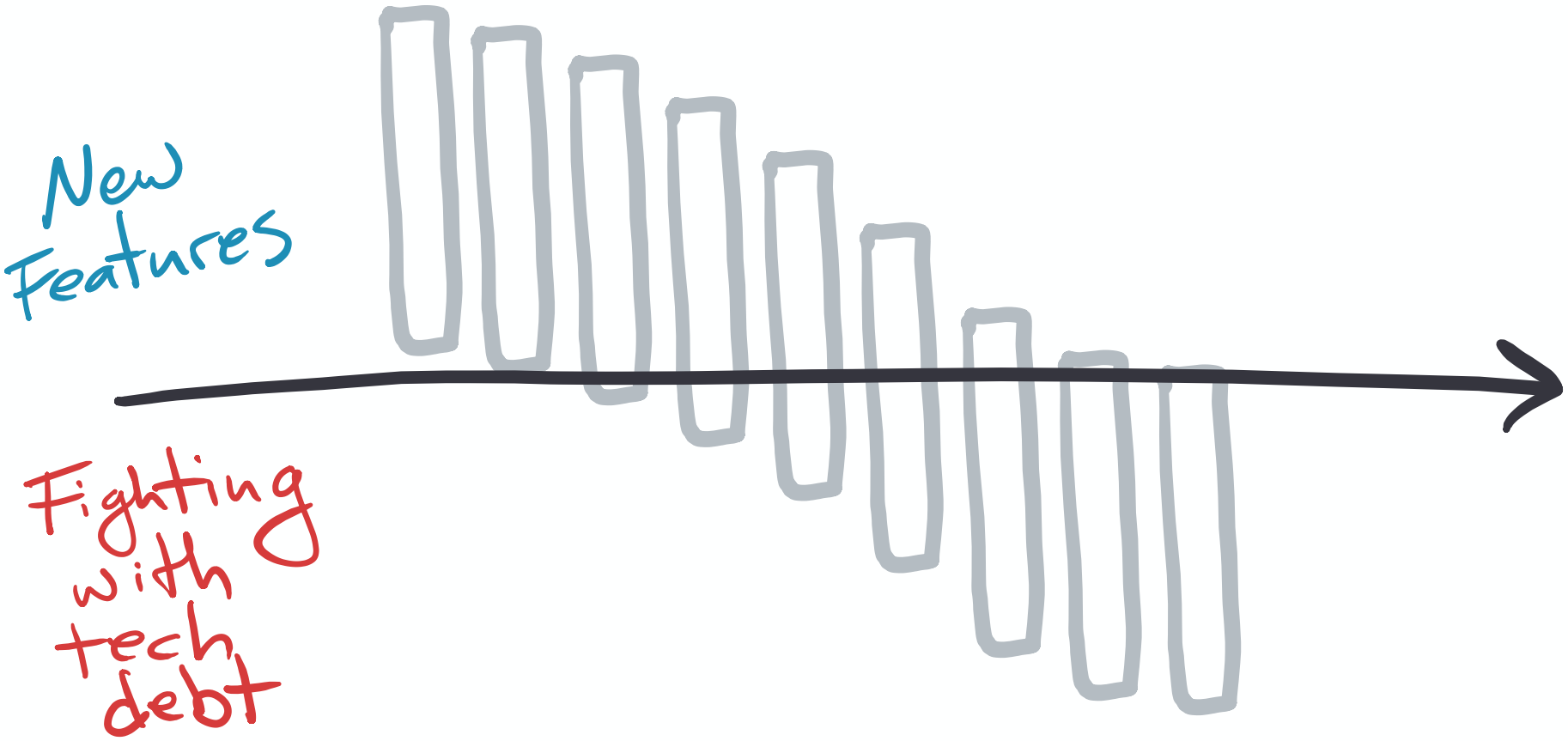
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It is *compounding risk*.

# Legacy Modernization

**Legacy System** → **Modernization** → **Modern System**

# Legacy Modernization



## Legacy System

The bad old system full of technical debt.

## Modernization

## Modern System

# Legacy Modernization



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## Modernization



## Modern System

The replacement that will make all of our dreams come true.

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## Modernization




## Modern System

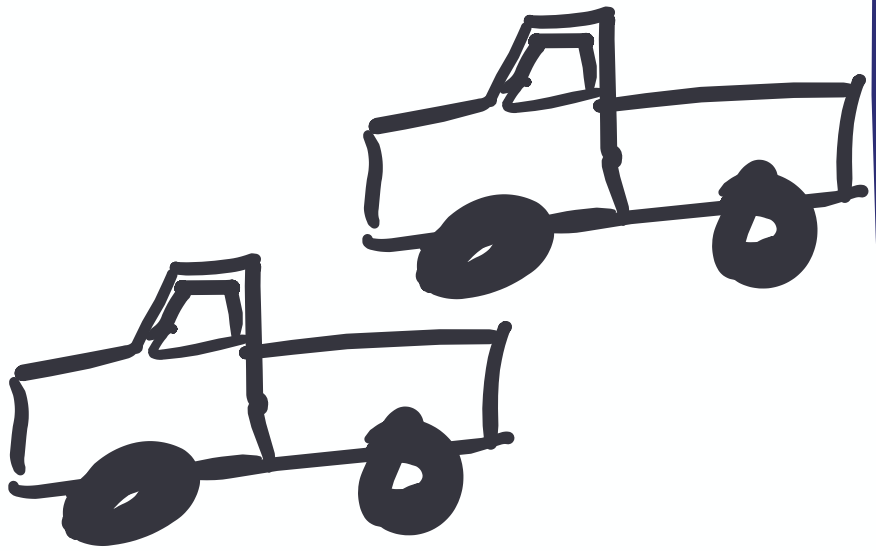
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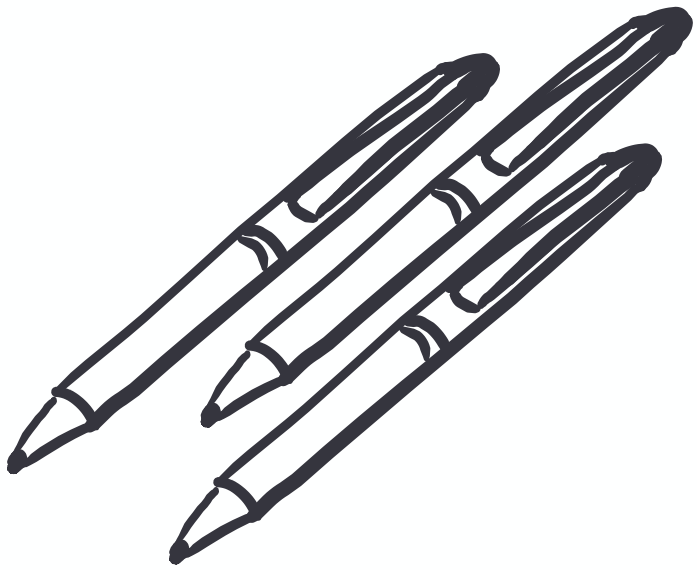
# Legacy Modernization



# “Product” is a problematic metaphor

Trucks, pens, laptops, and code?



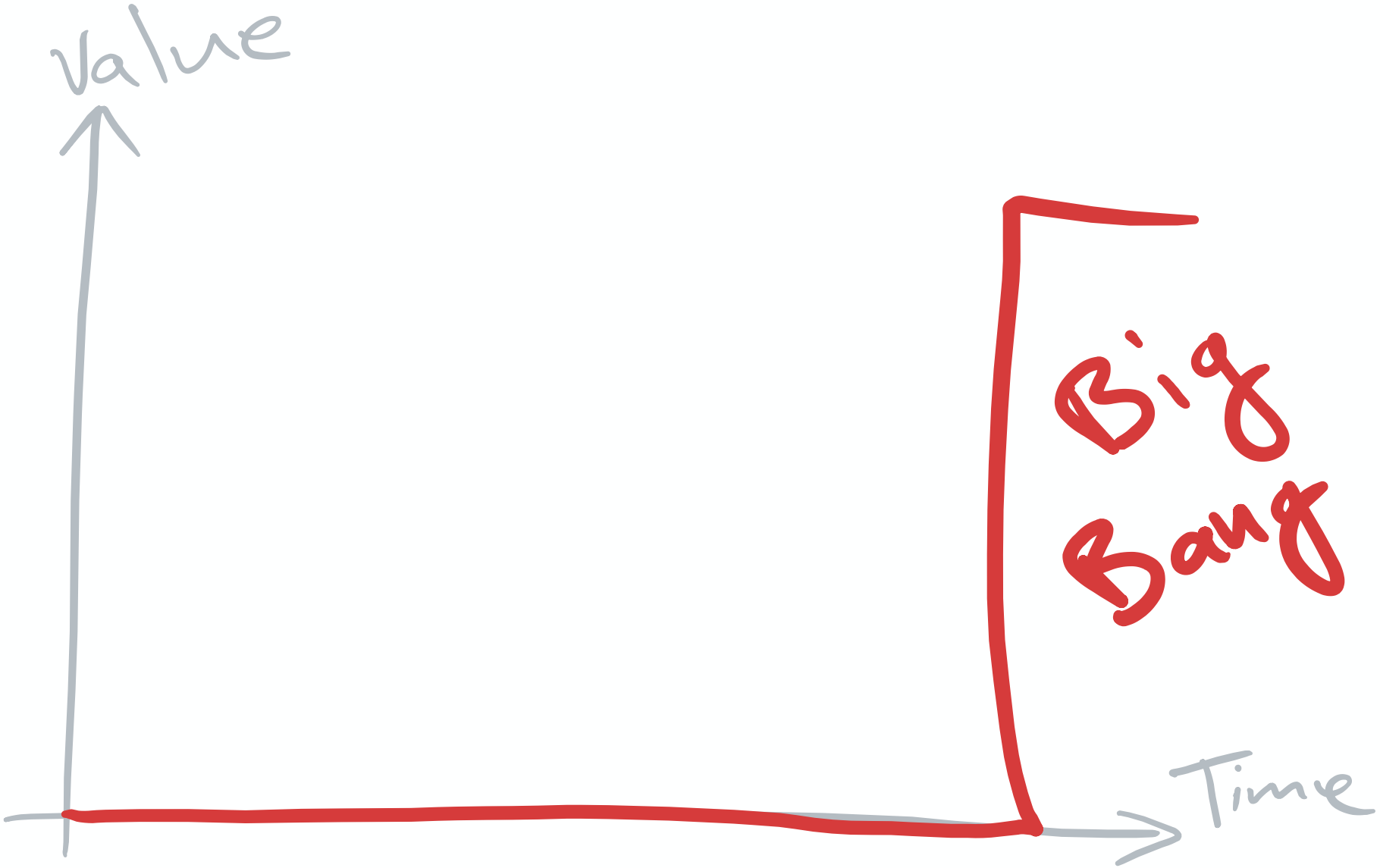


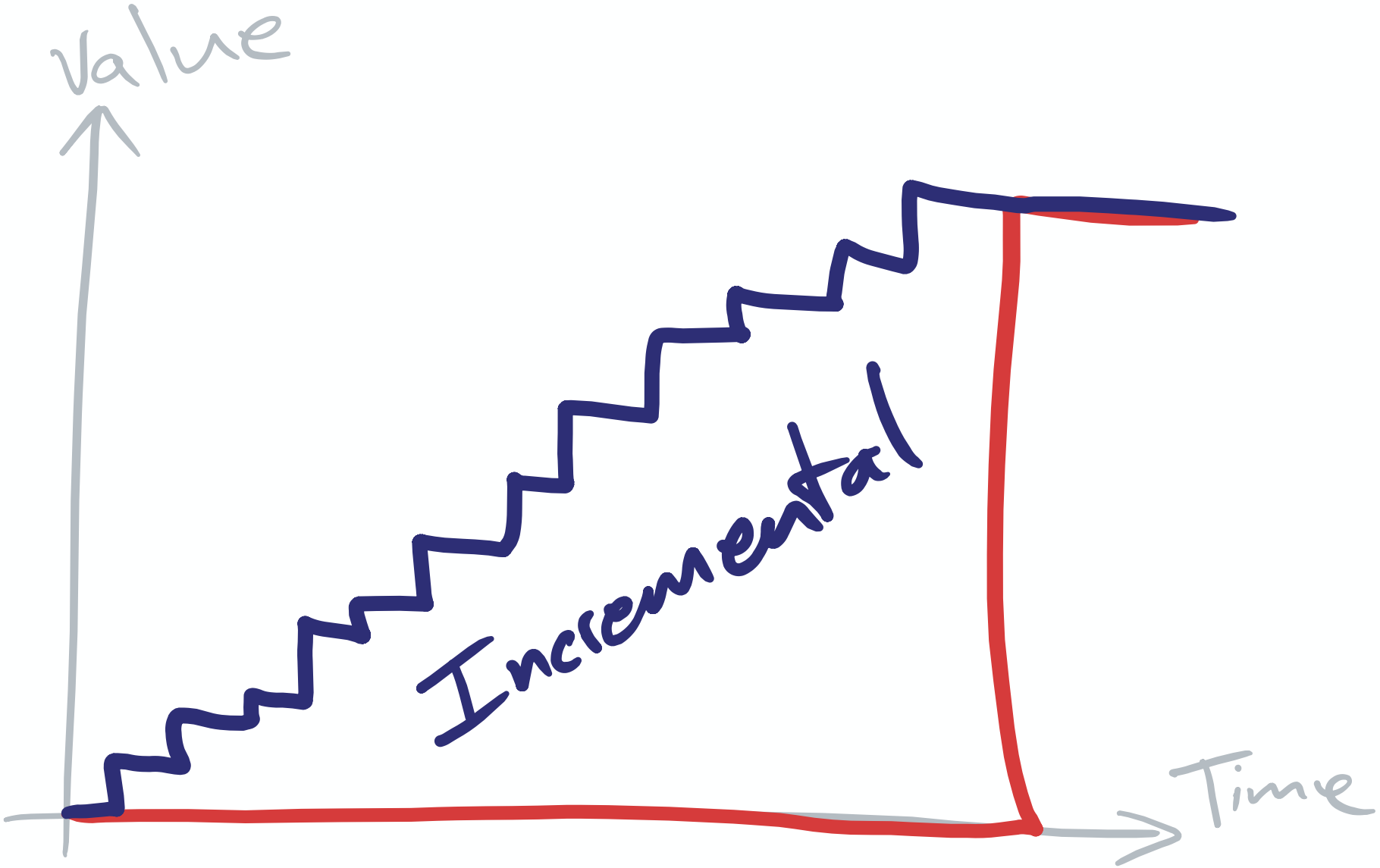


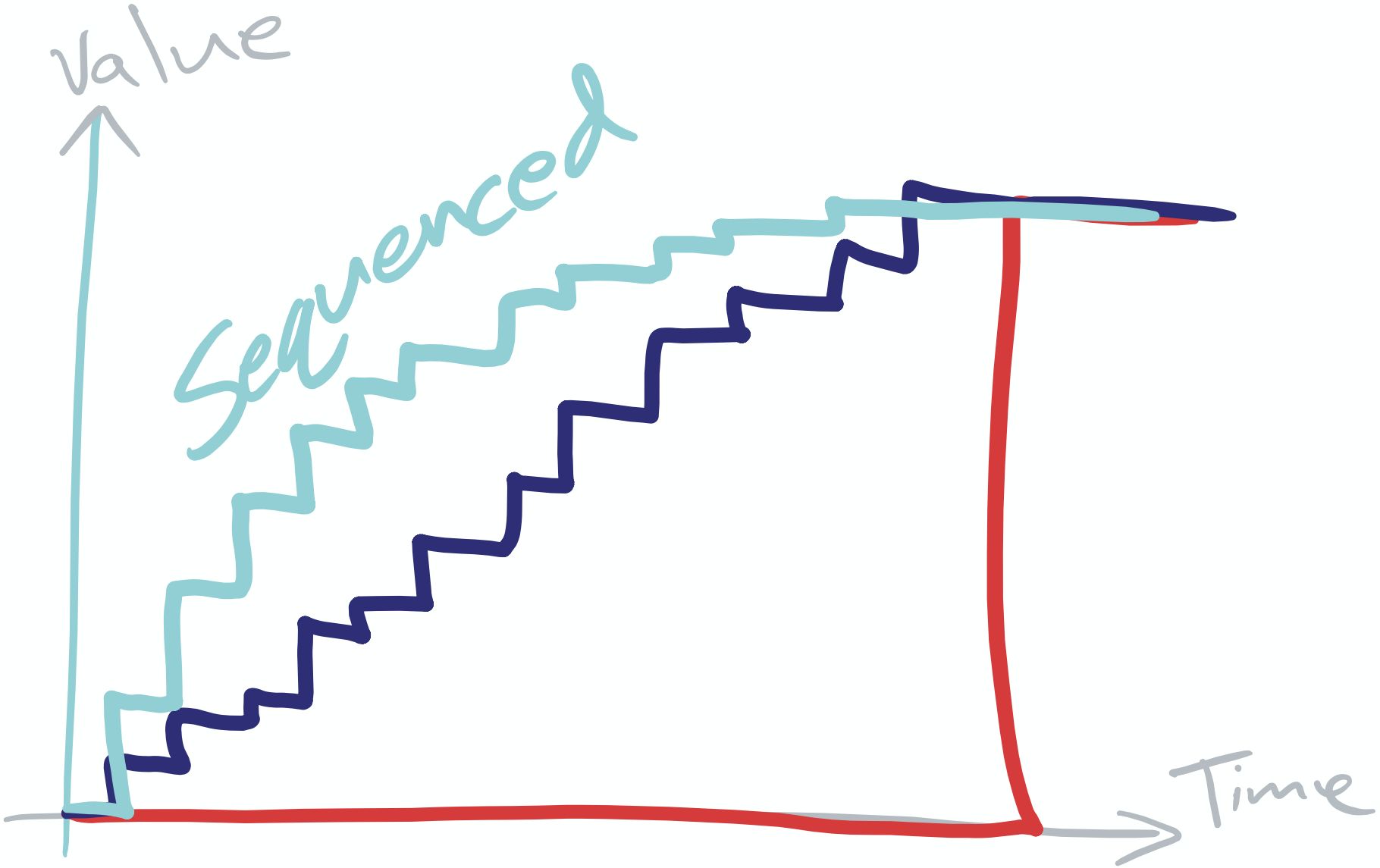
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```

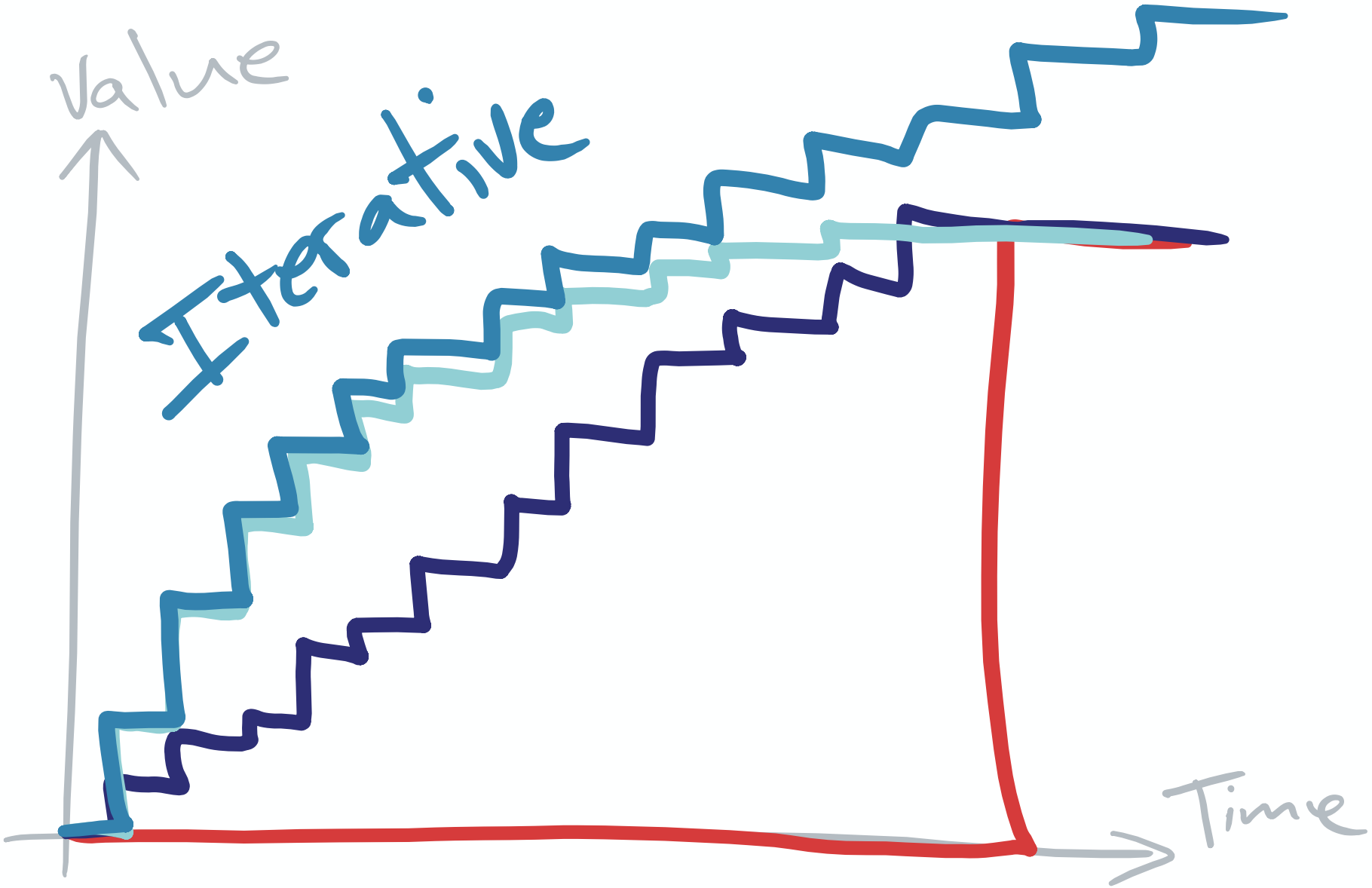
# The Promise of Agile Delivery


Value
Time


Value
Big Bang
Time

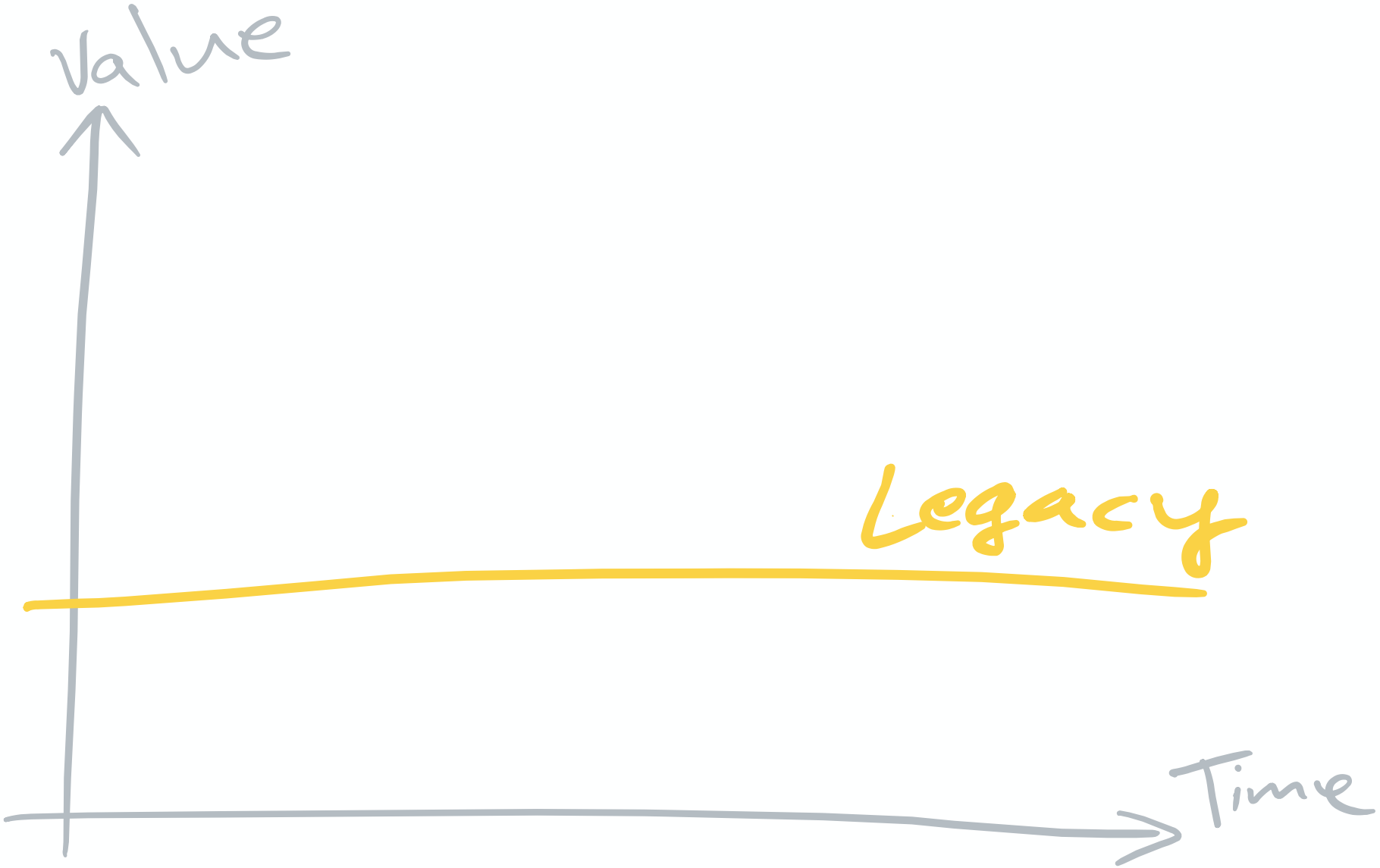

Value
Incremental
Time

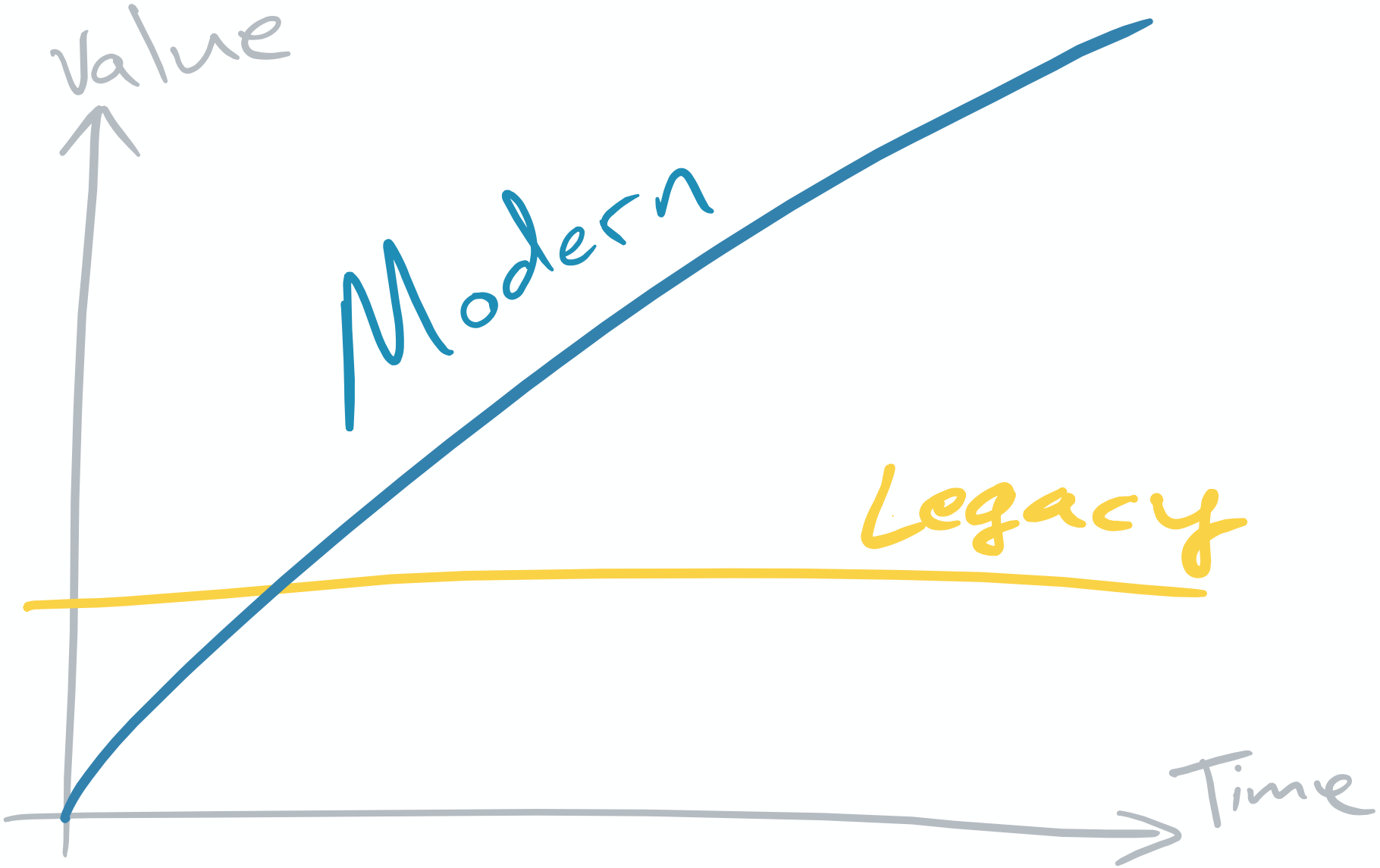

Value
Sequenced
Time

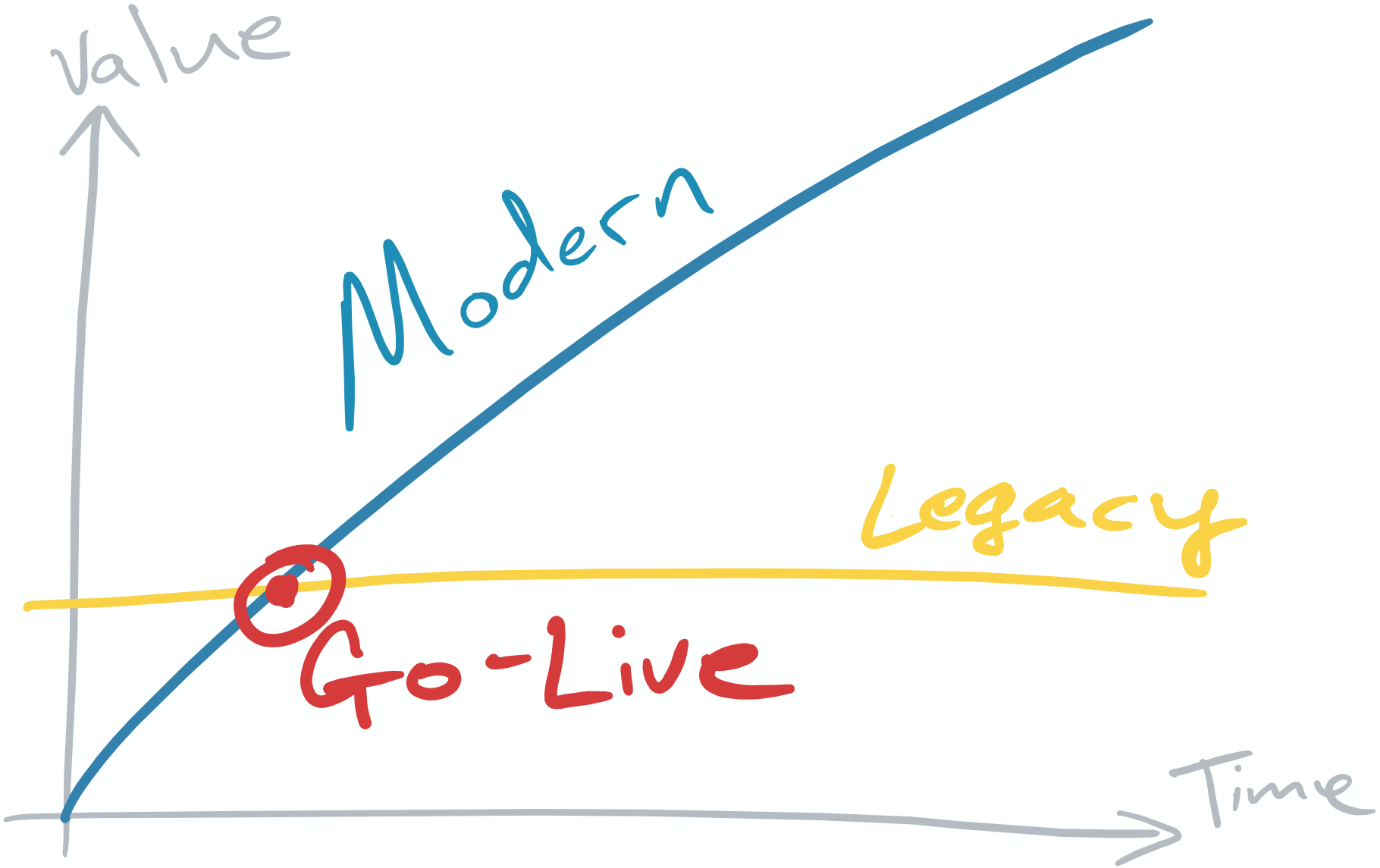

Value
Iterative
Time

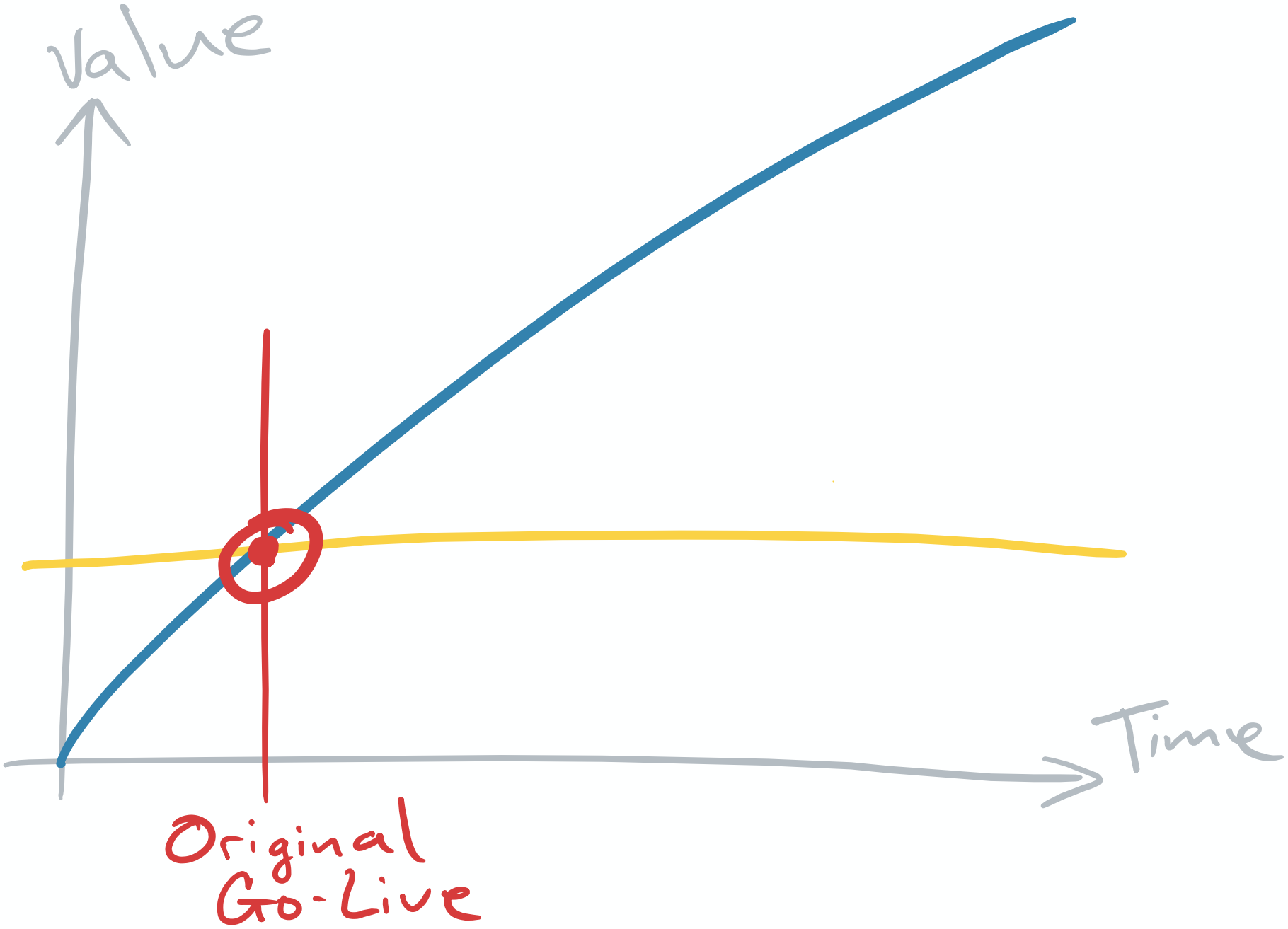
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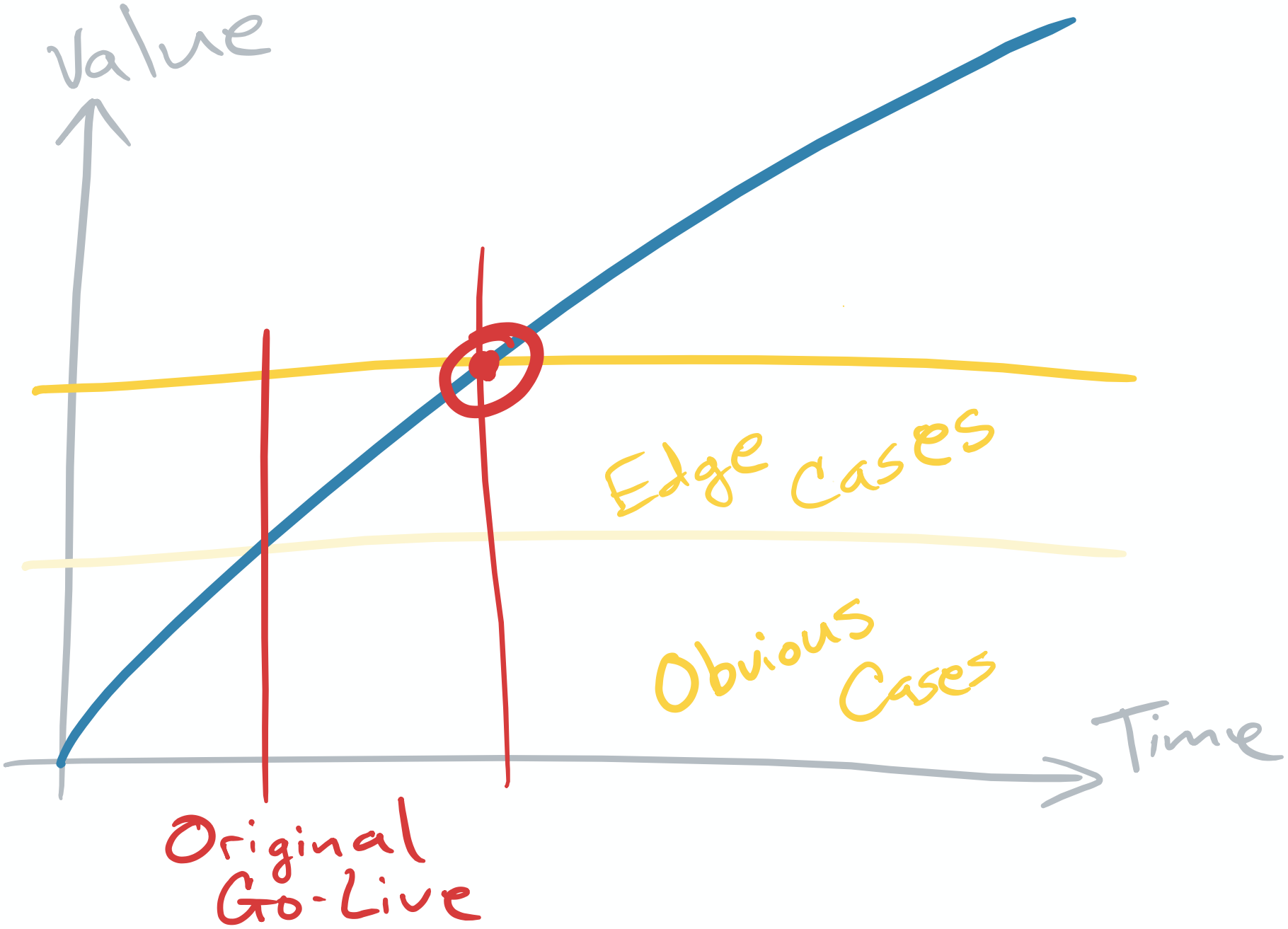

Value
Time

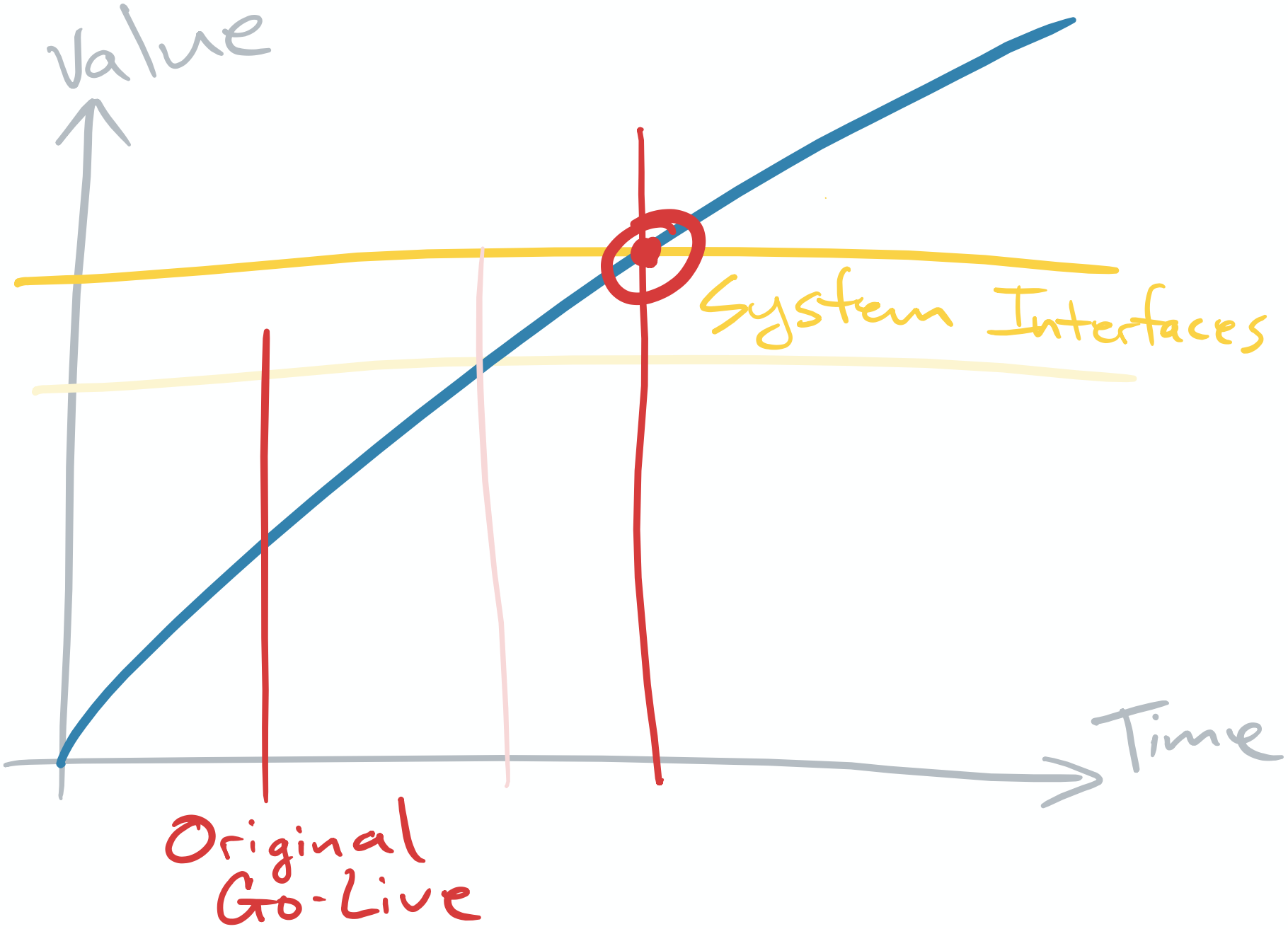

Value
Legacy
Time

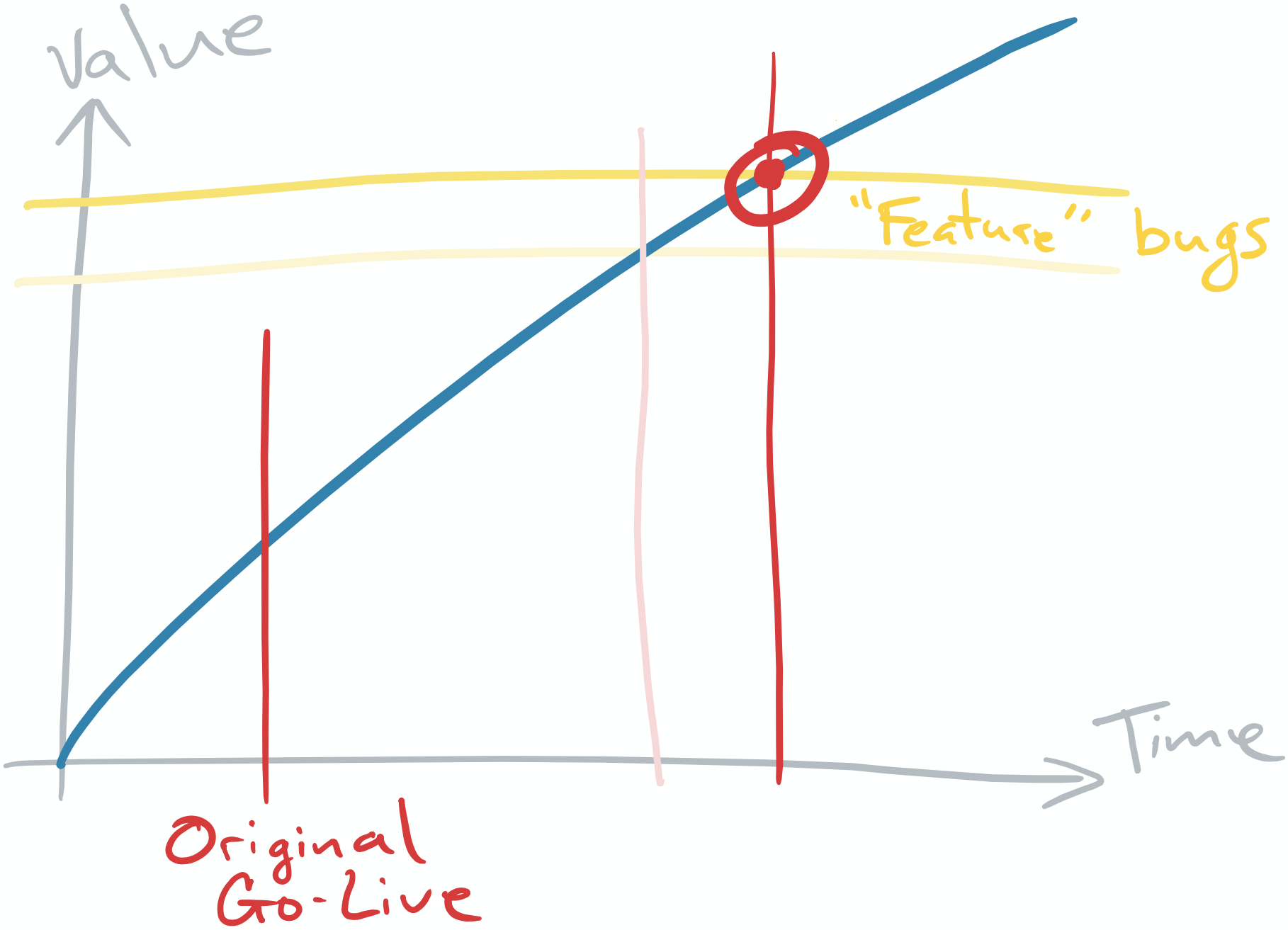

Value
Modern
Legacy
Time

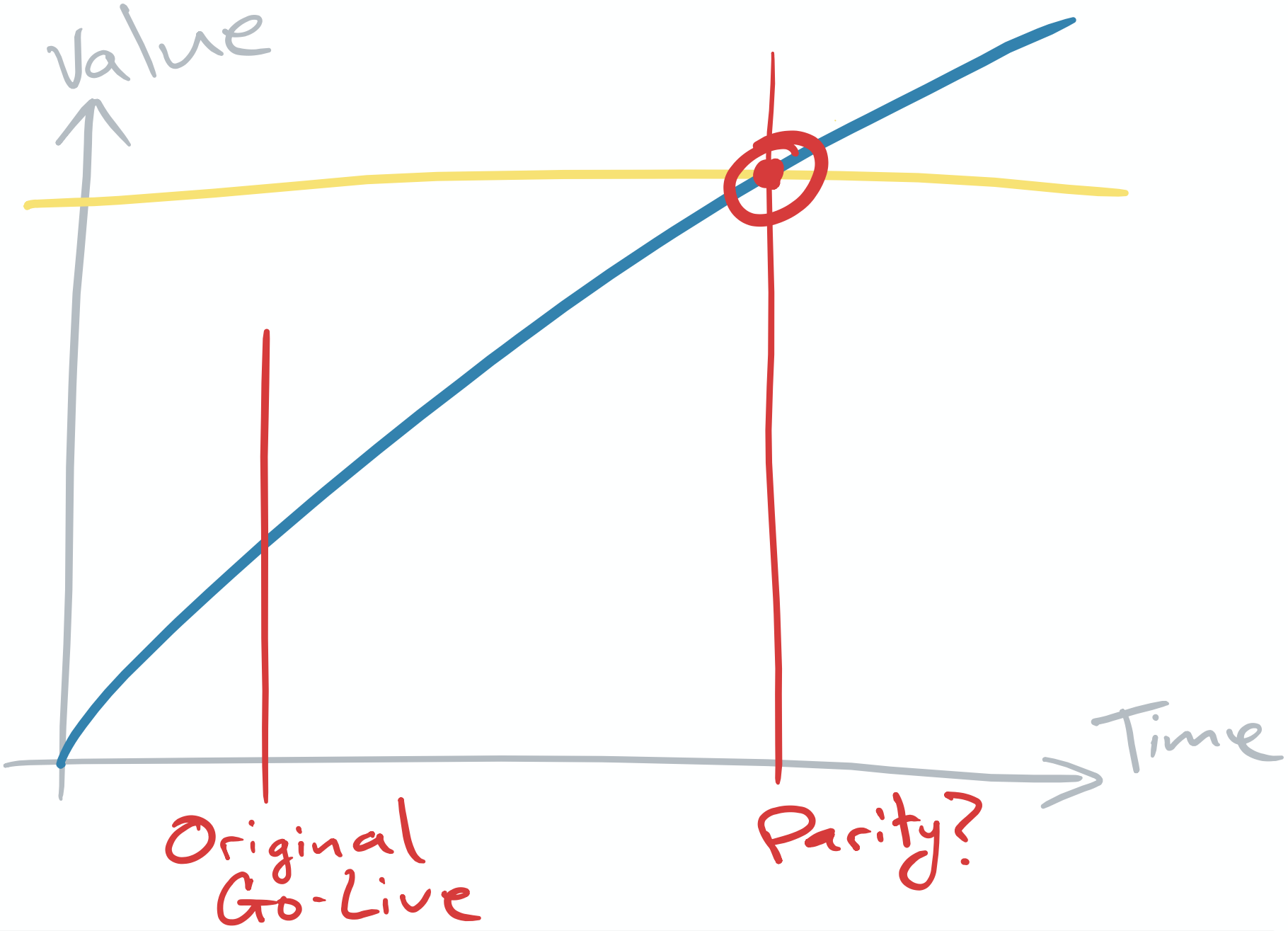

Value
Modern
Legacy
Go-Live
Time

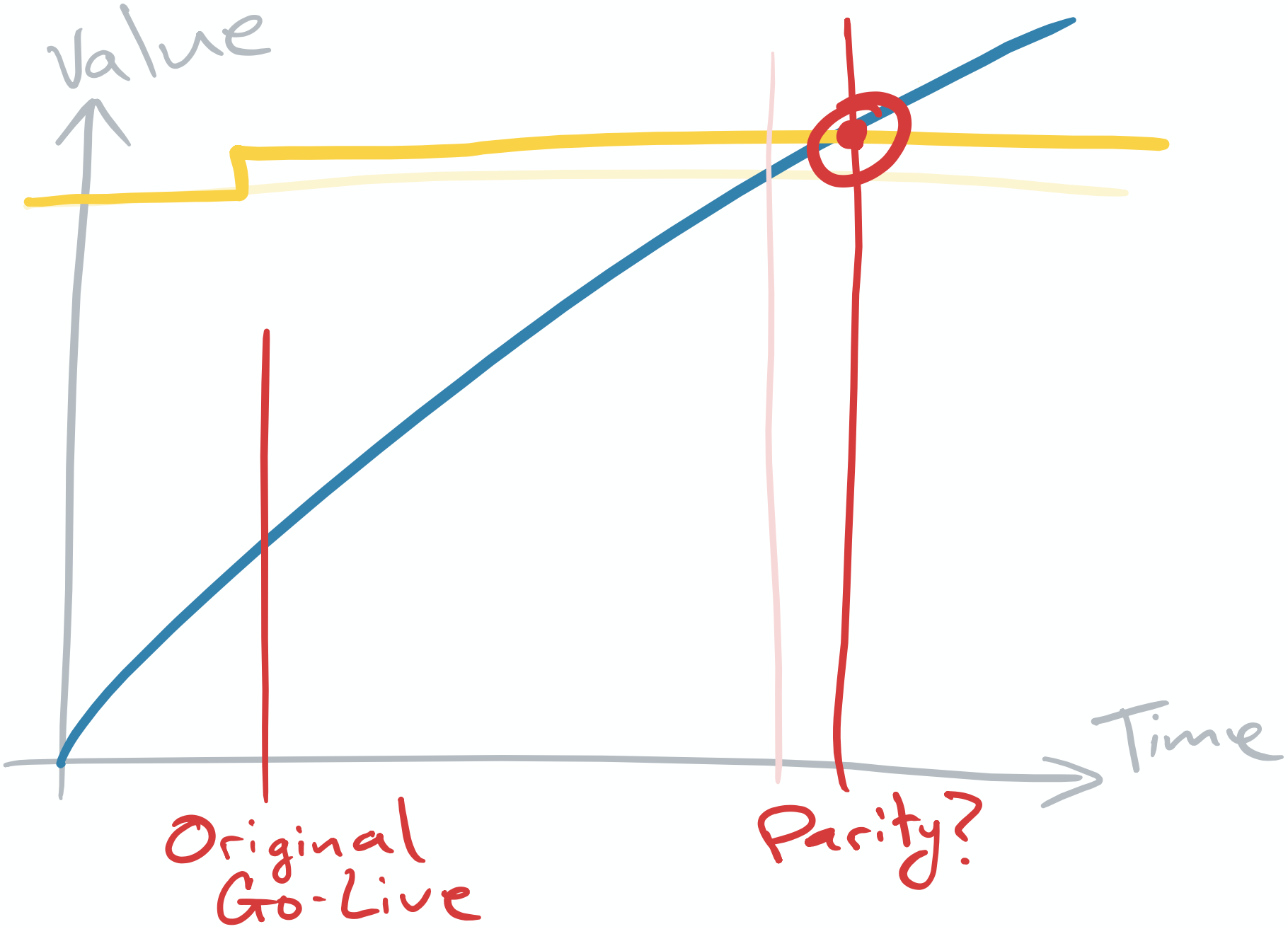

Value
Time
Original
Go-Live

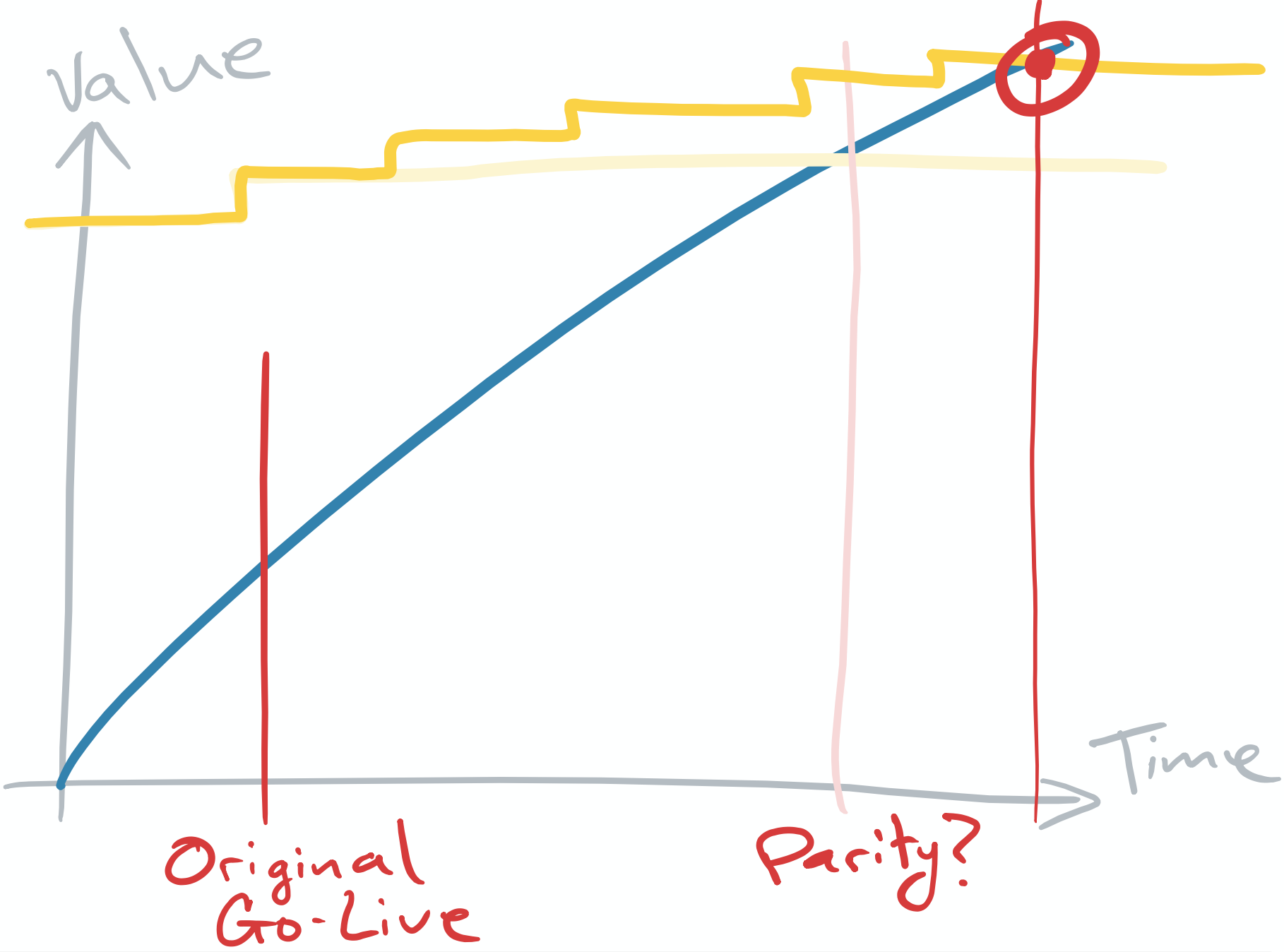

Value
Edge cases
Obvious Cases
Time
Original Go-Live

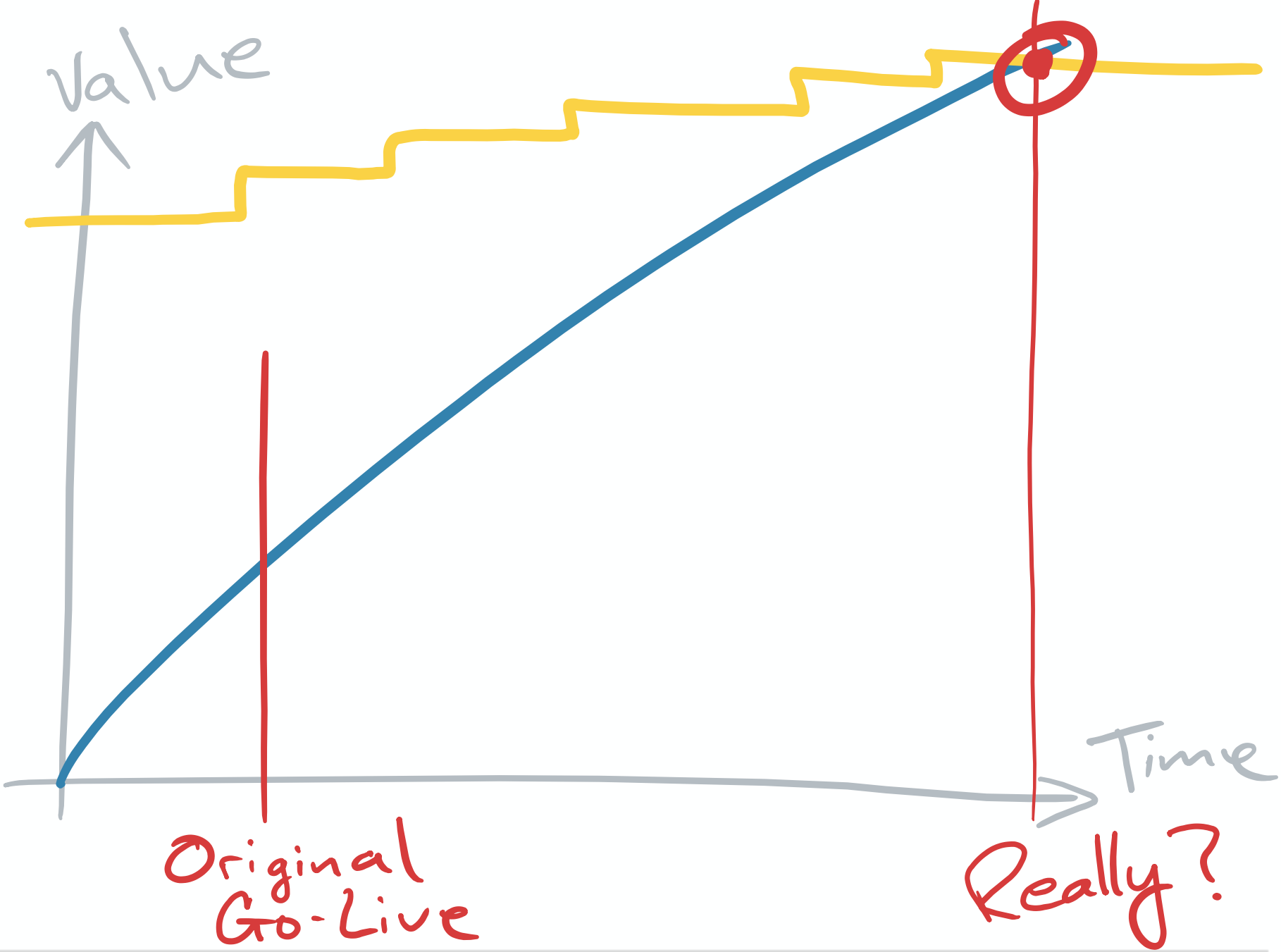

Value
System Interfaces
Time
Original
Go-Live

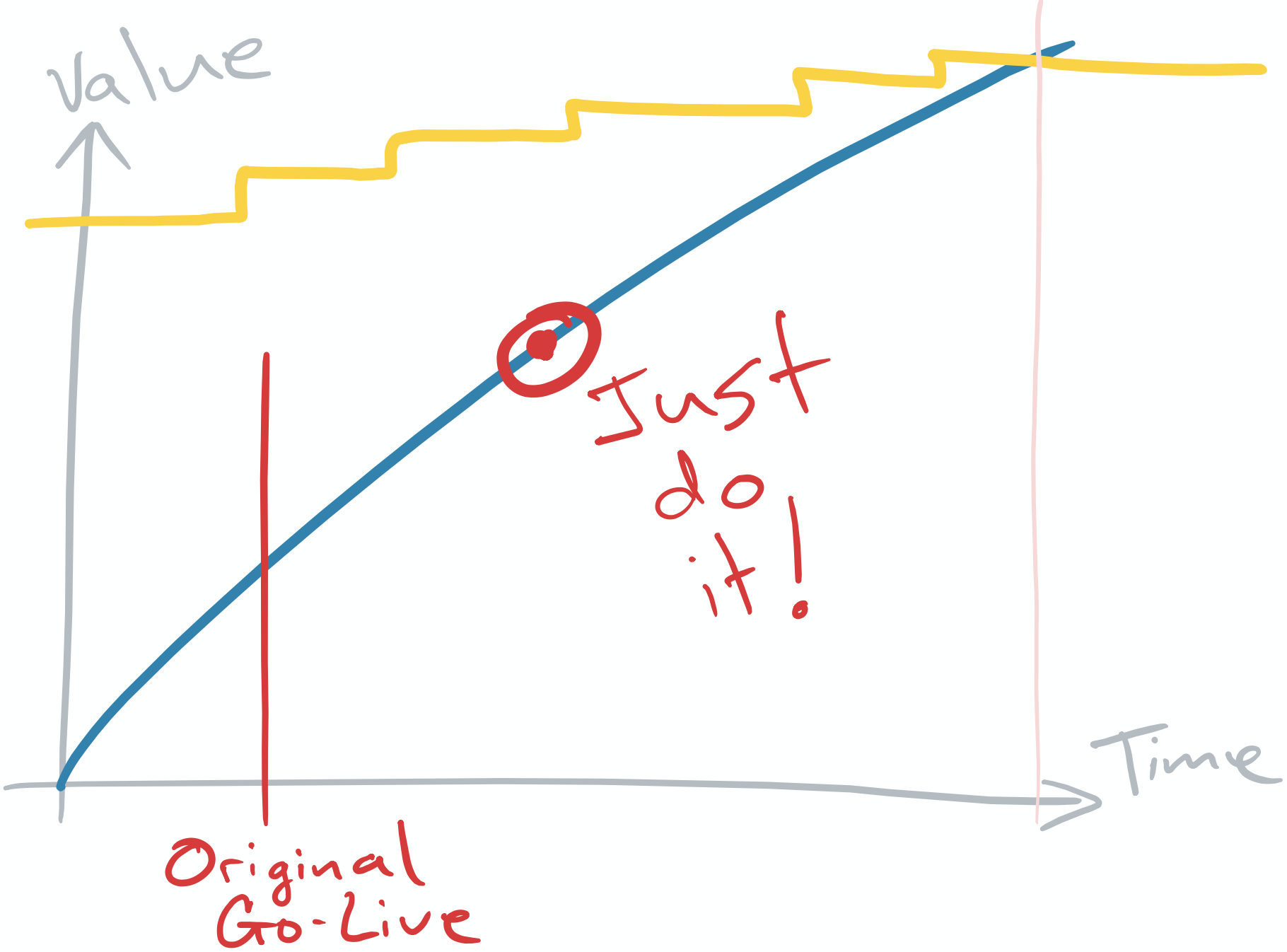

Value
"Feature" bugs
Time
Original
Go-Live

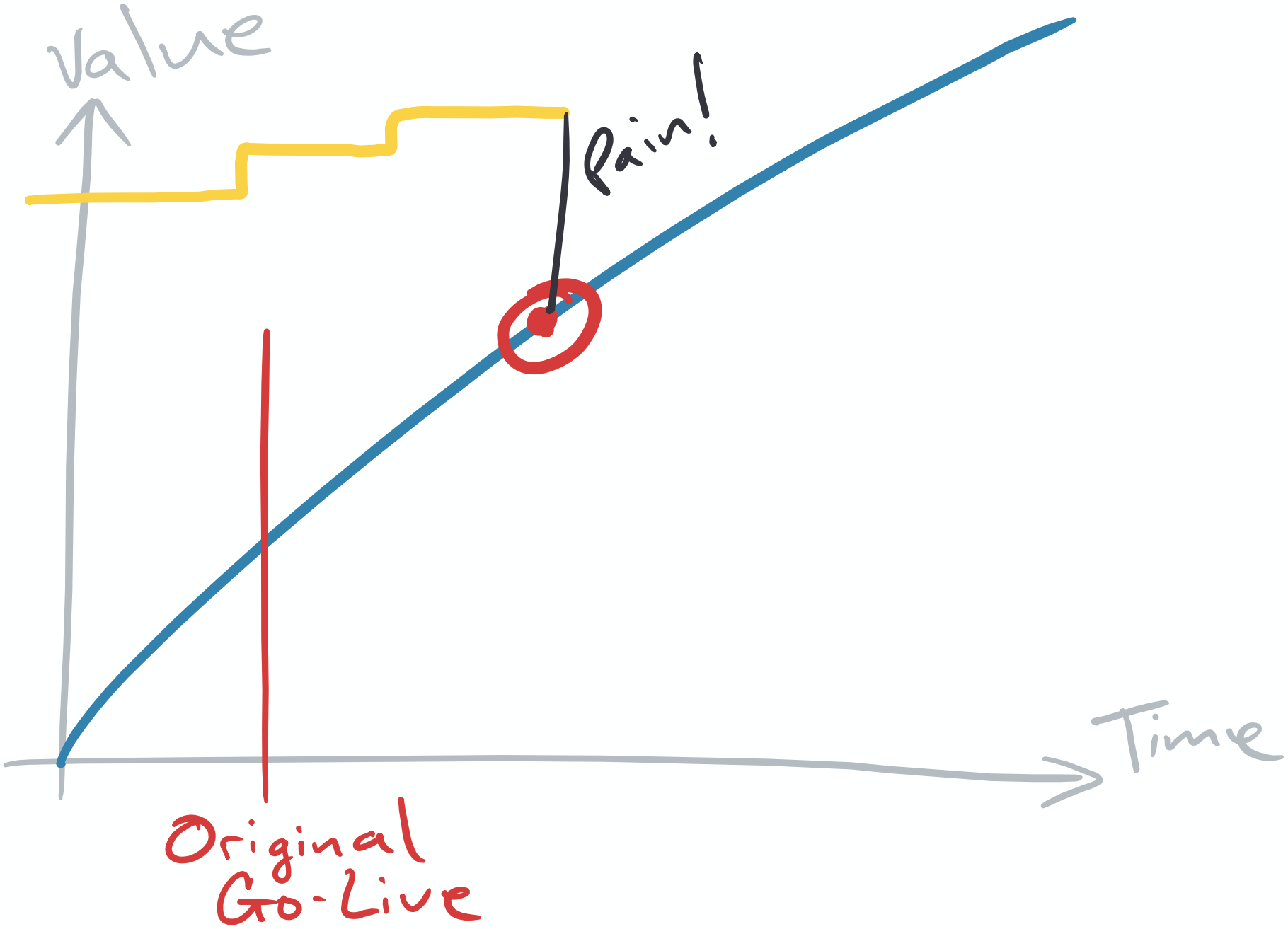

Value
Time
Original Go-Live
Parity?

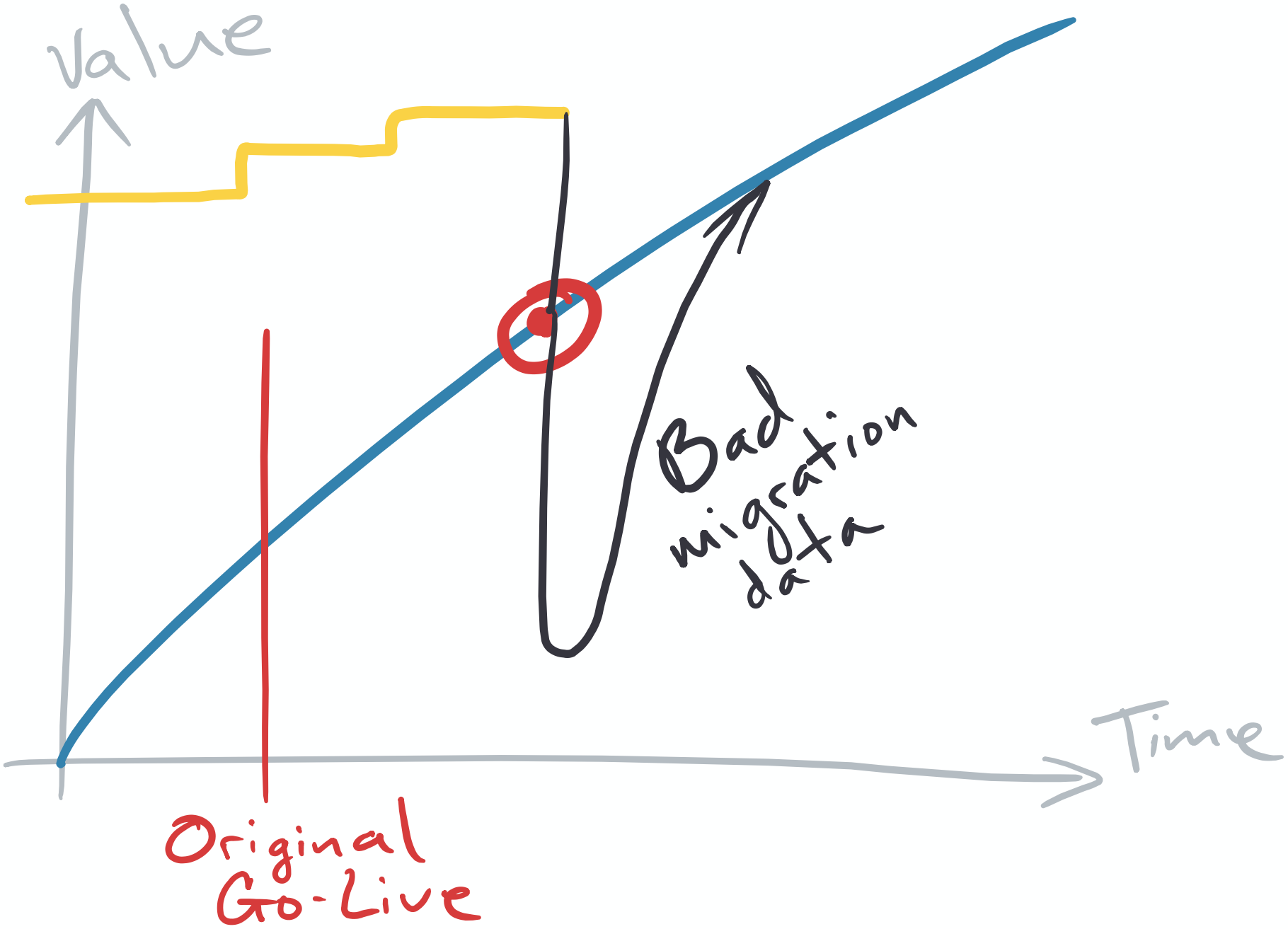

Value
Time
Original Go-Live
Parity?


Value
Time
Original Go-Live
Parity?

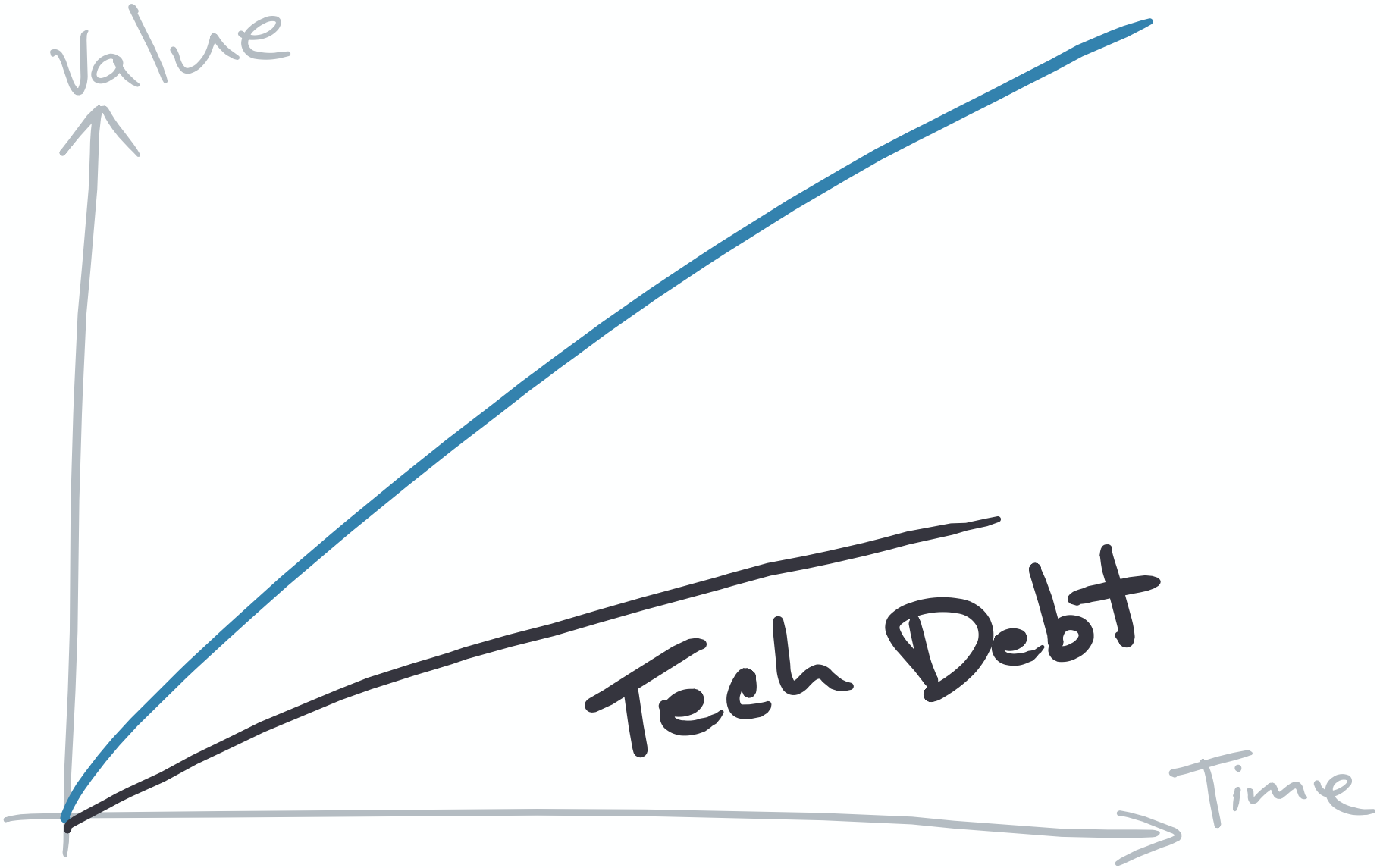

Value
Time
Original Go-Live
Really?

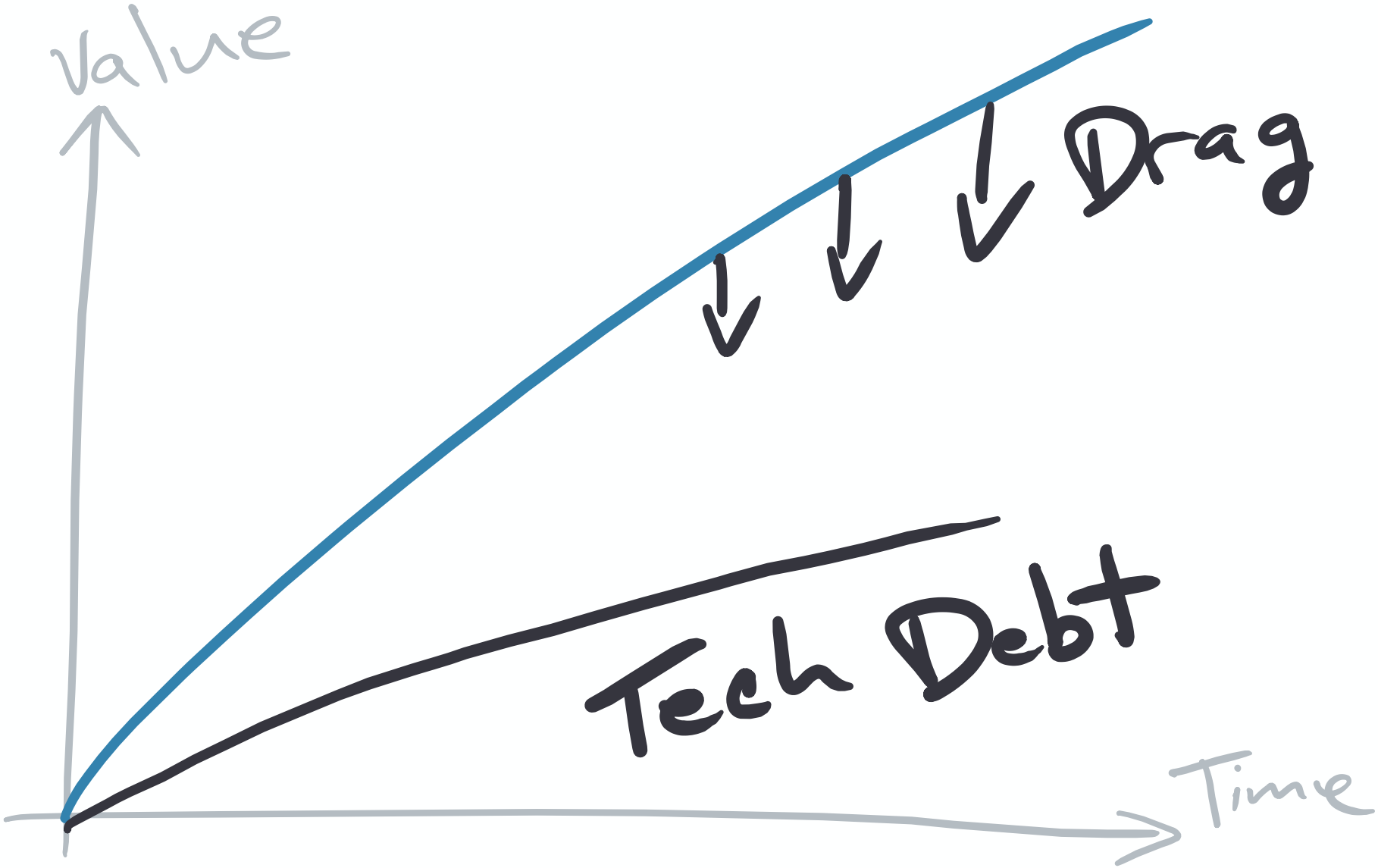

Value
Just do it!
Time
Original Go-Live

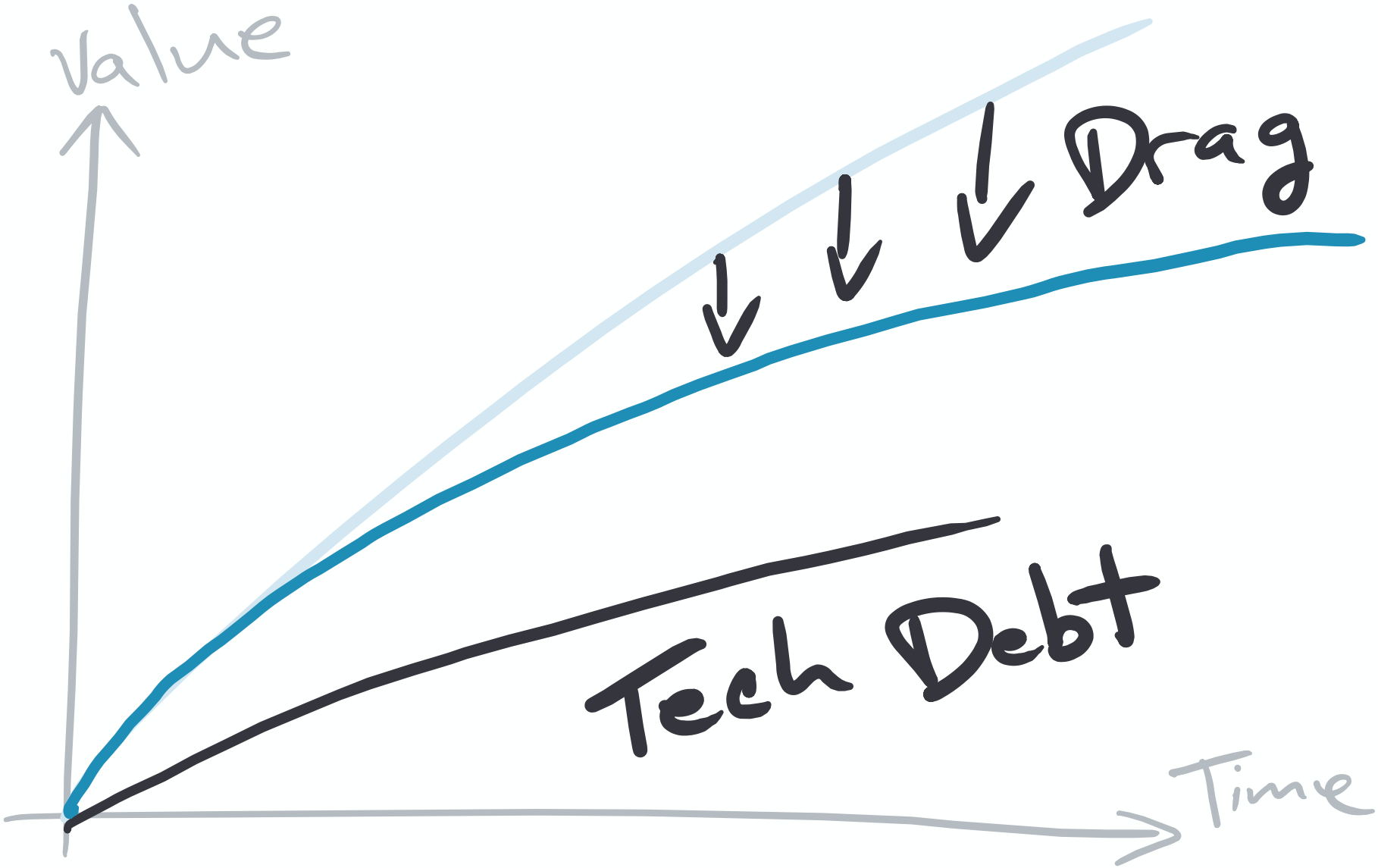

Value
Pain!
Time
Original
Go-Live

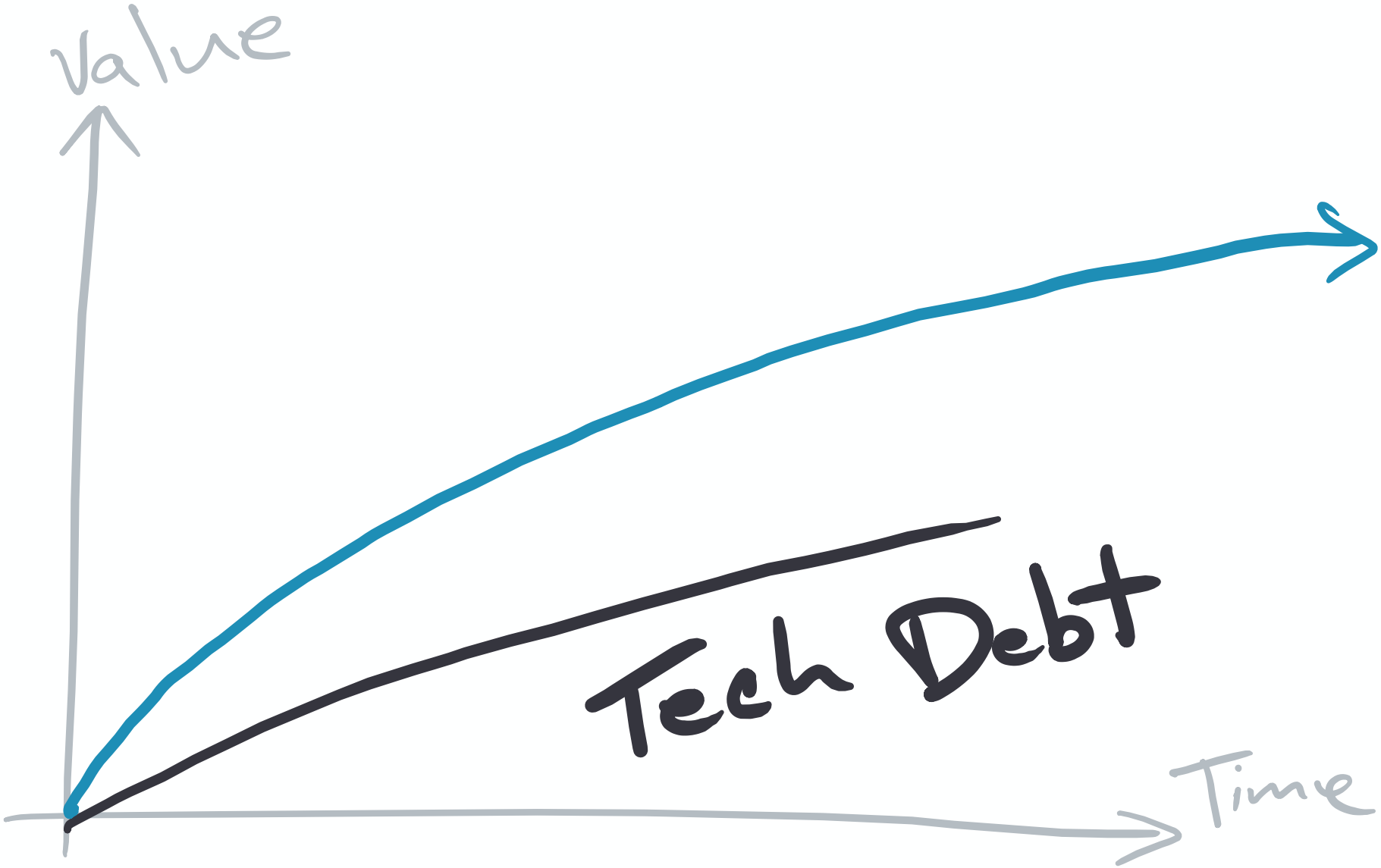

Value
Bad migration data
Time
Original Go-Live

# Dirty Secret: The modernization was “rushed”


Value
Tech Debt
Time


Value
Drag
Tech Debt
Time


Value
Drag
Tech Debt
Time

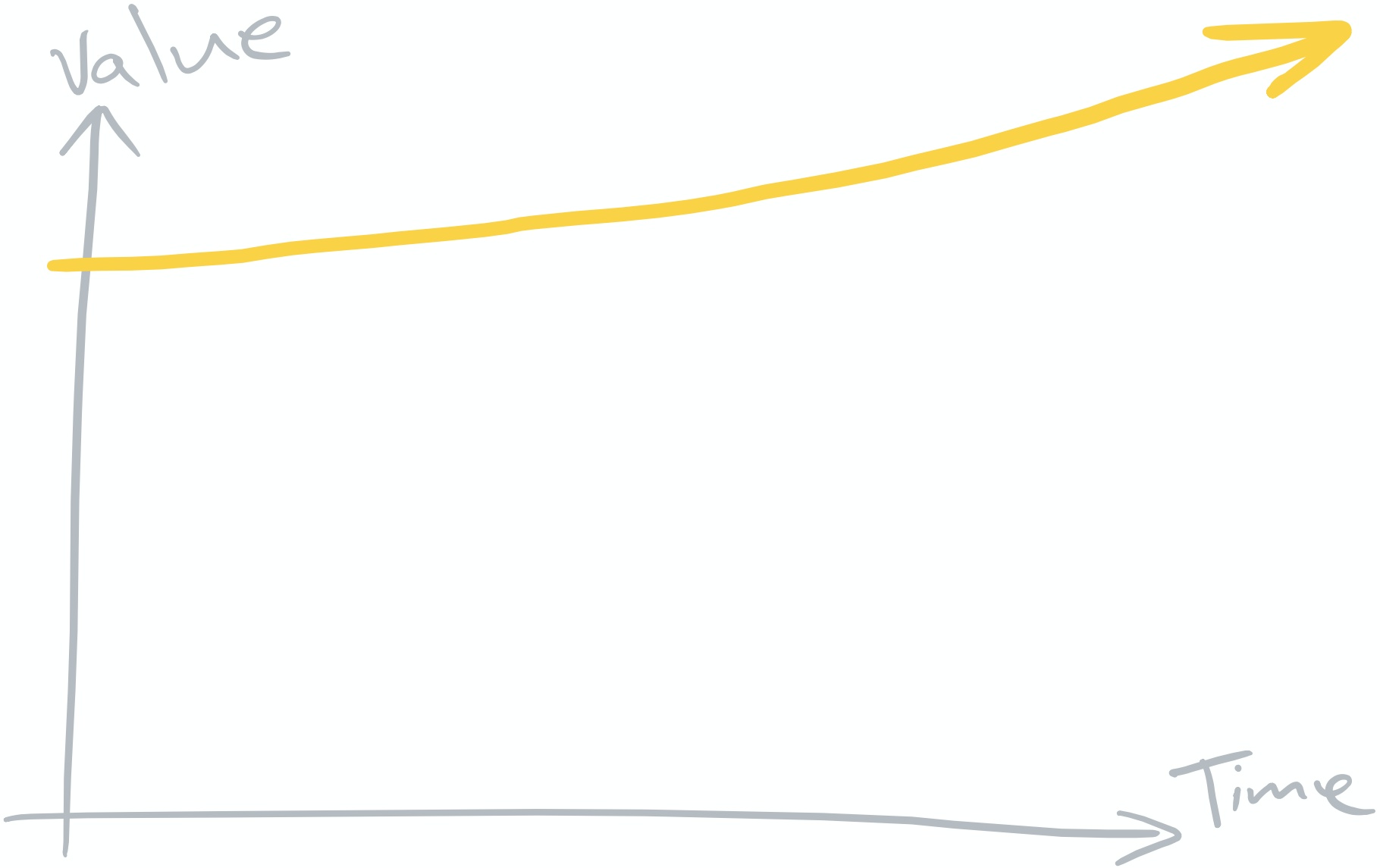

Value
Tech Debt
Time

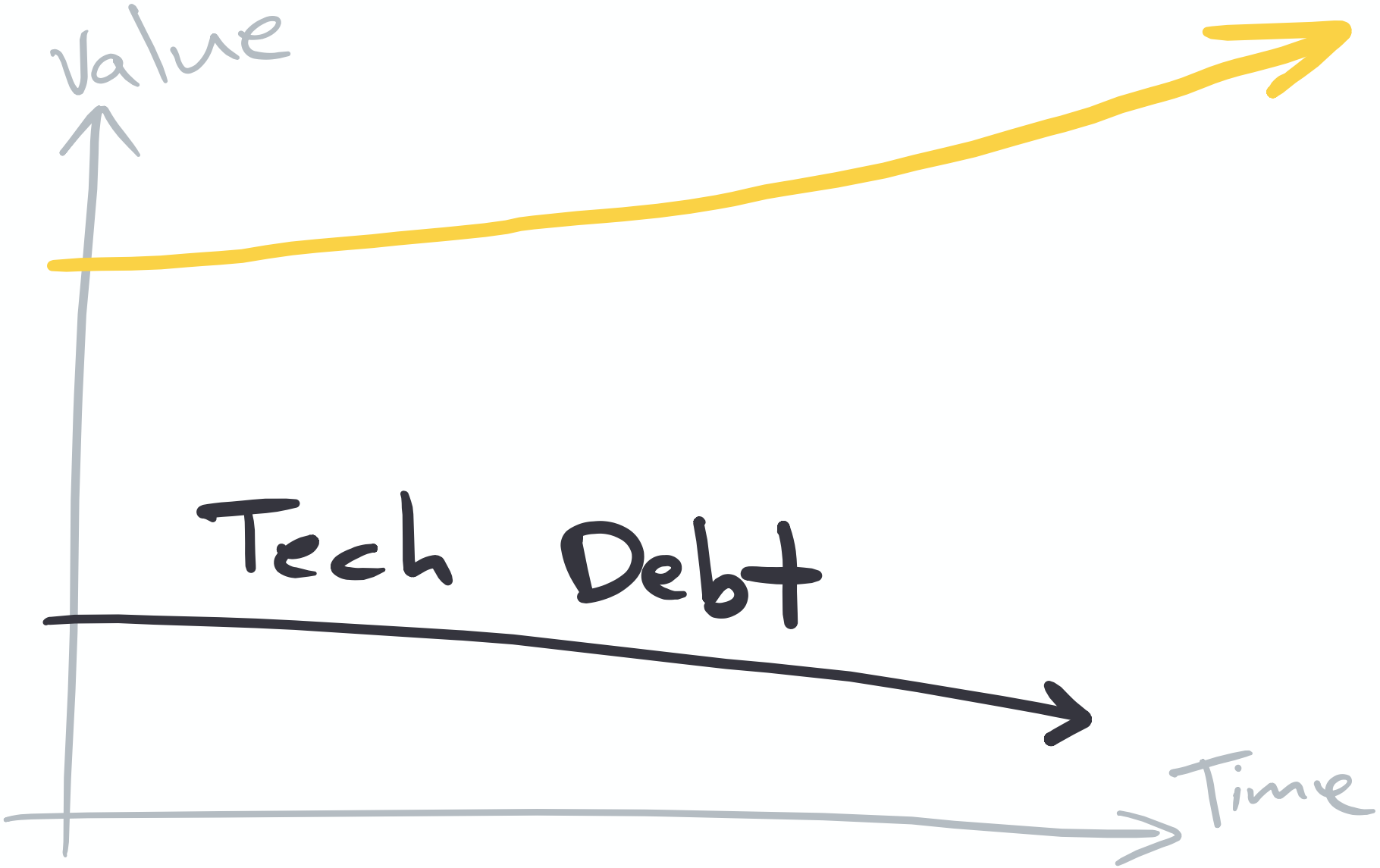
# Every Legacy System was once “Modern”

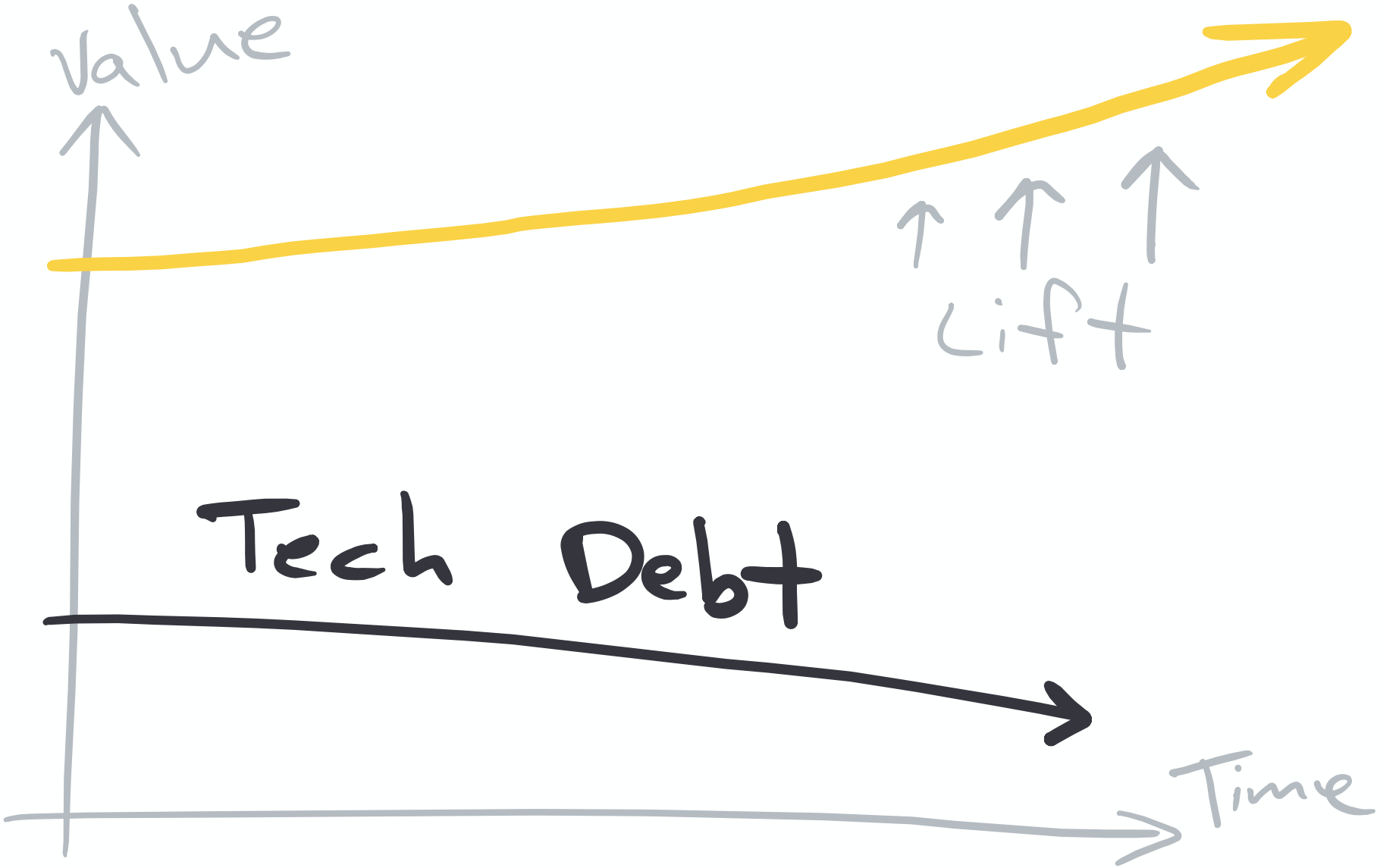
Congratulations!

We just built another legacy system.

# Instead: Maintain and Renovate


Value
Time

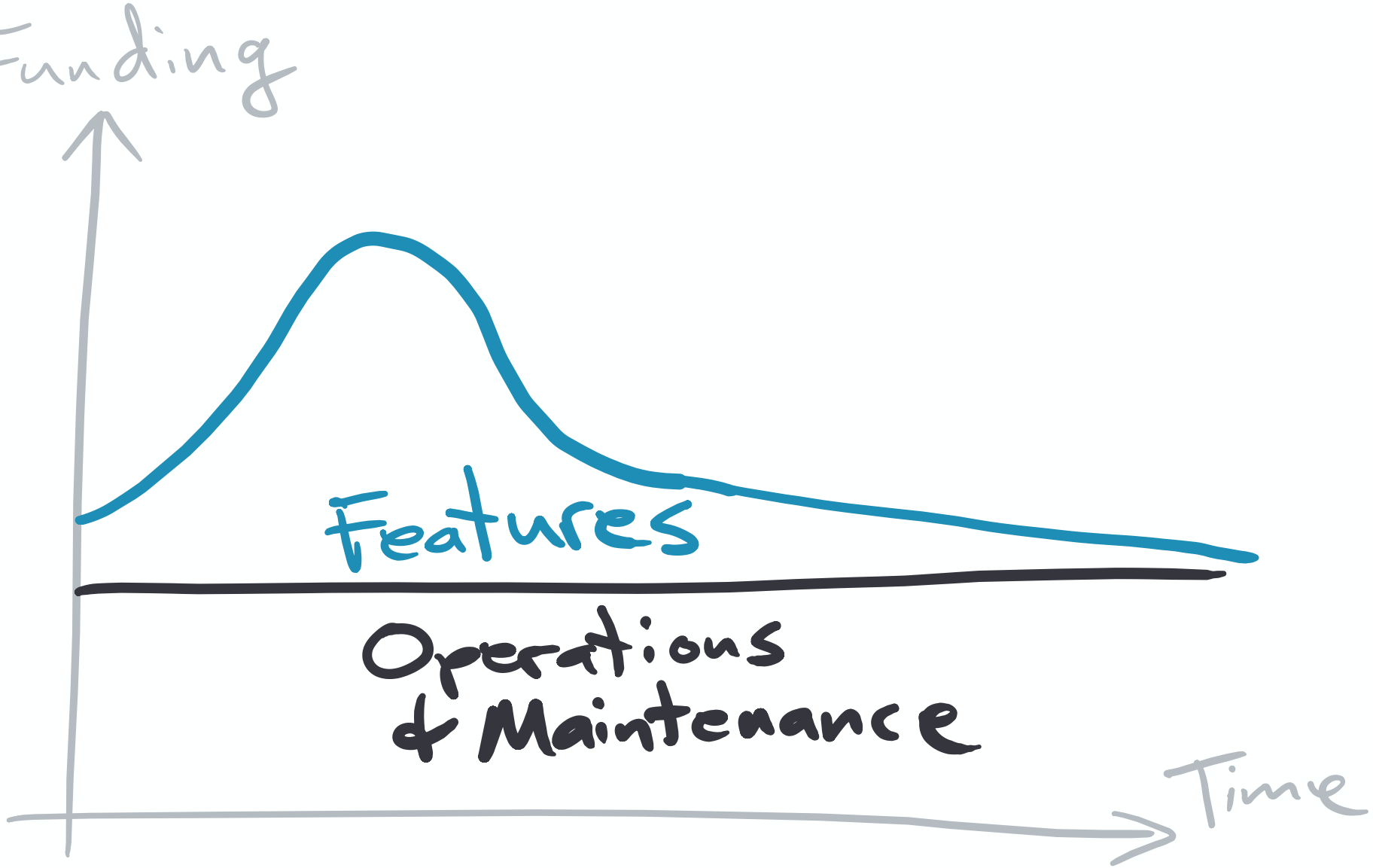

Value
Tech Debt
Time

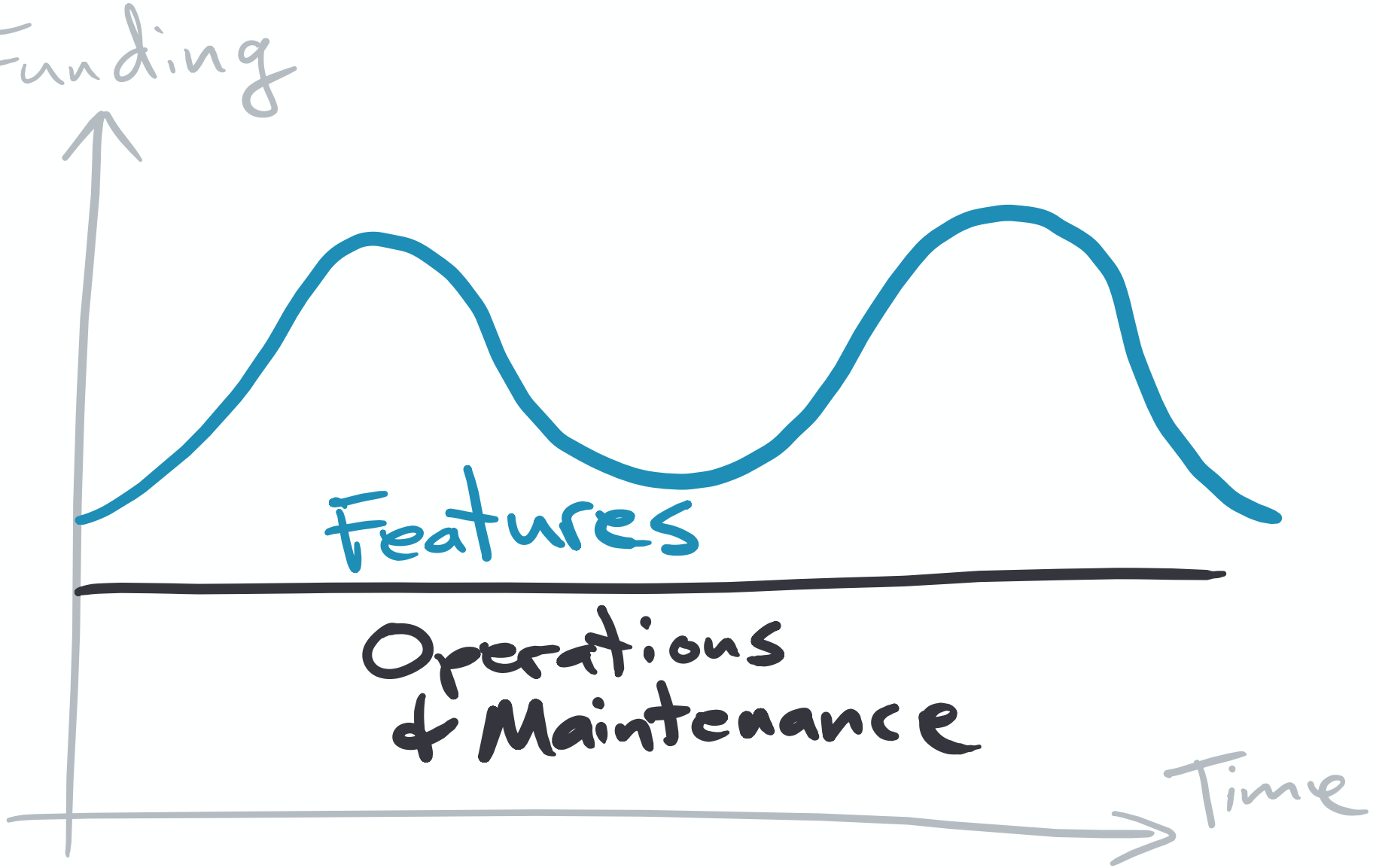

Value
Lift
Tech Debt
Time


Funding
Time

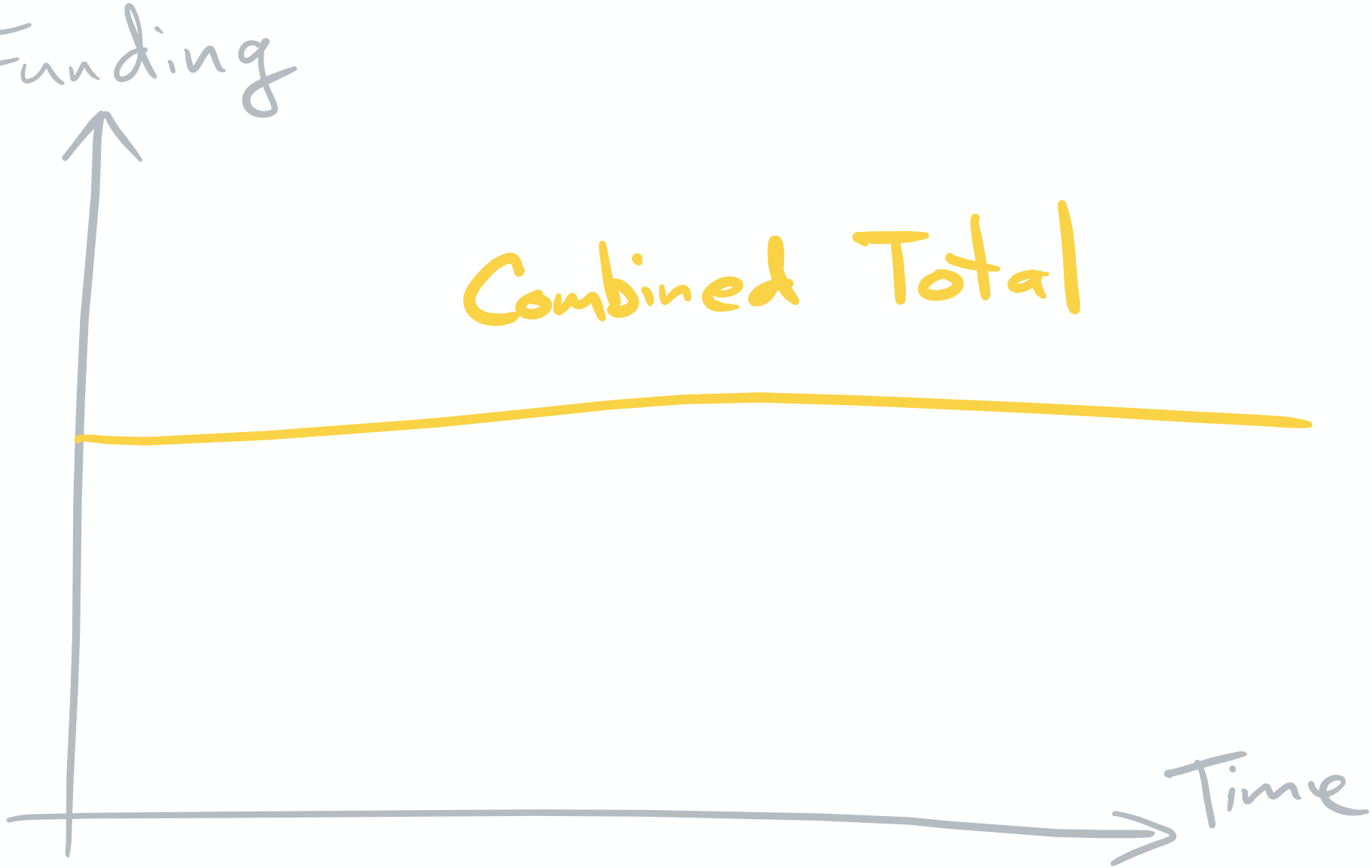

Funding
Time

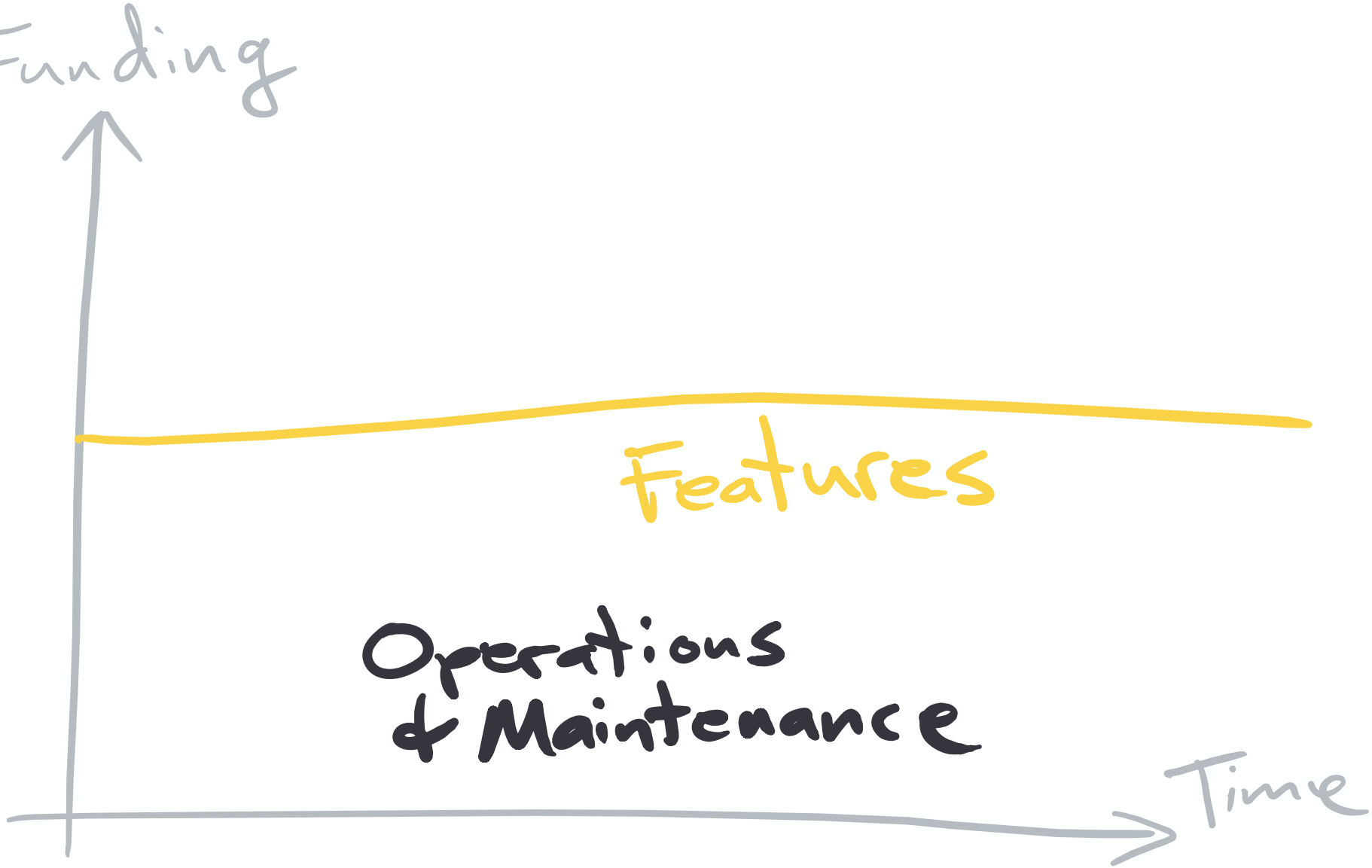

Funding
Operations
& Maintenance
Time

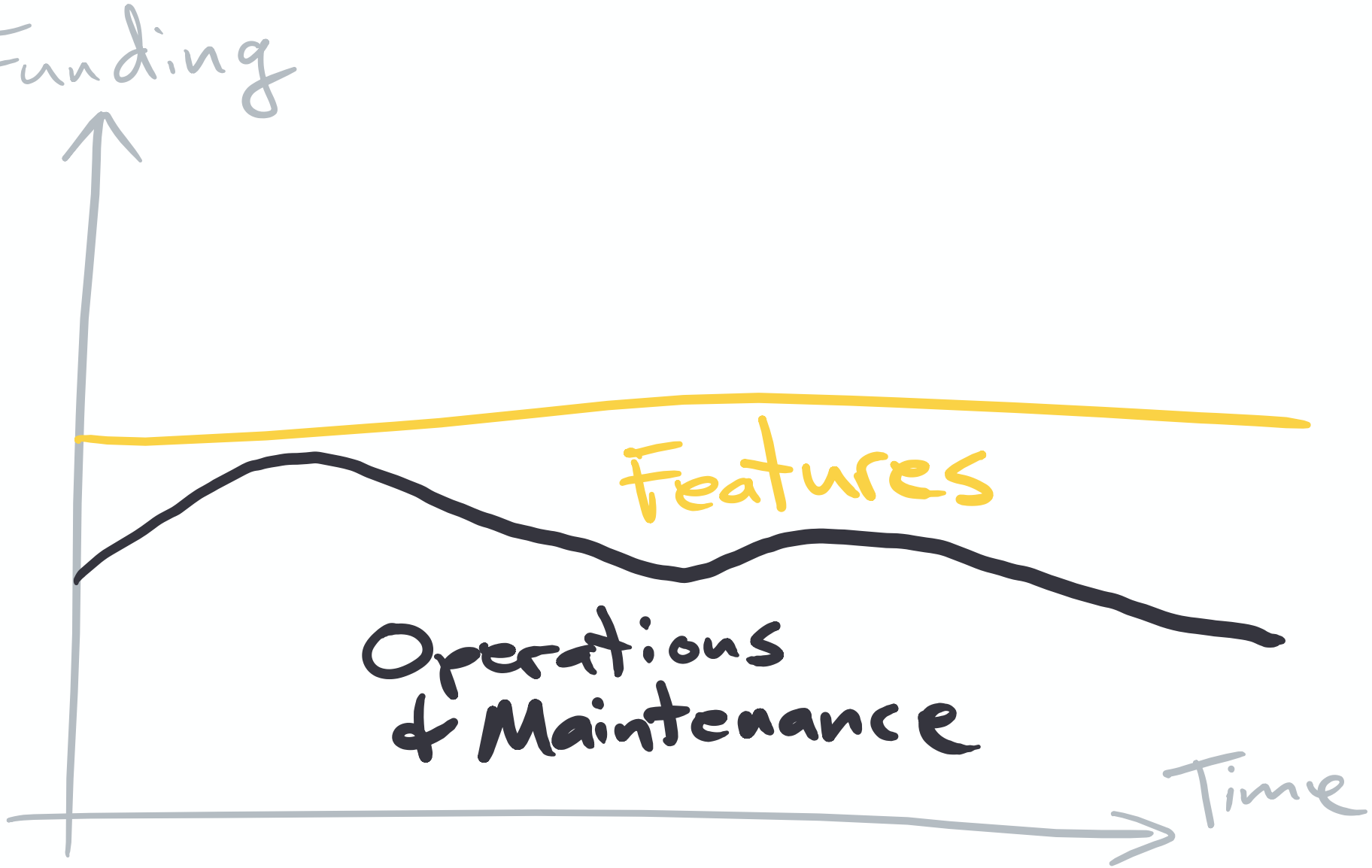

Funding
Features
Operations
& Maintenance
Time


Funding
Features
Operations
& Maintenance
Time


Funding
Time


Funding
Combined Total
Time


Funding
Features
Operations
& Maintenance
Time


Funding
Features
Operations
& Maintenance
Time

# Another Metaphor: Your Home

Does it really need to be demolished?

# The “Home” Metaphor



# The “Home” Metaphor



- Long-term investment
- In daily use
- Needs maintenance
- Renovate as needed
- Make it safe to renovate with girders, braces, shoring, & jacks

# The “Home” Metaphor

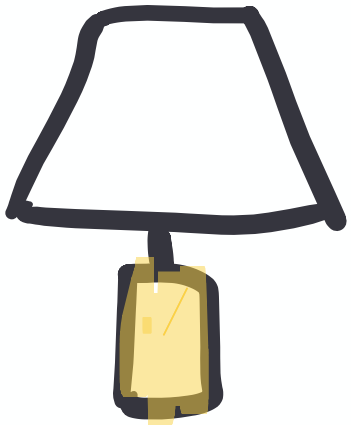
It is one thing to build a new house, but to build a new house in the same exact spot?

# The “Home” Metaphor

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## Live On-Site

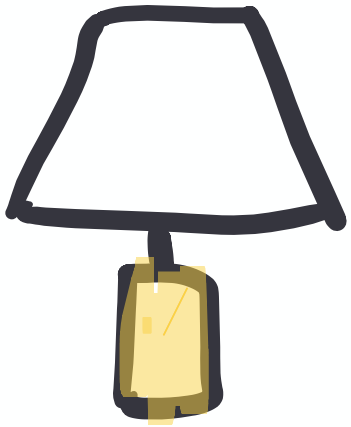
This is critical to the enterprise. Moving out for a year is a costly and risky option.



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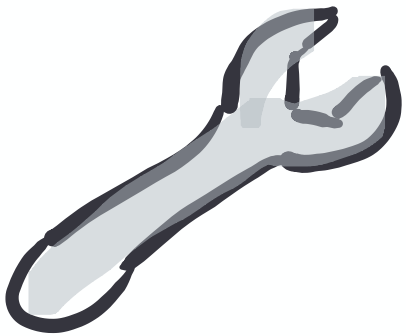
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## Maintain

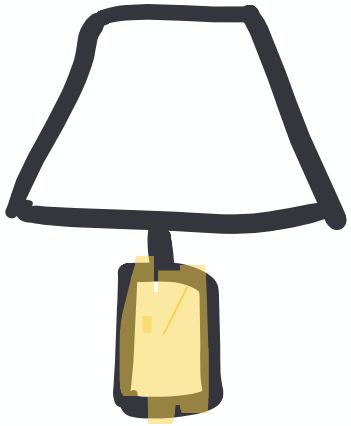
Prevention over cure. Don’t save money now at the risk of catastrophe later.



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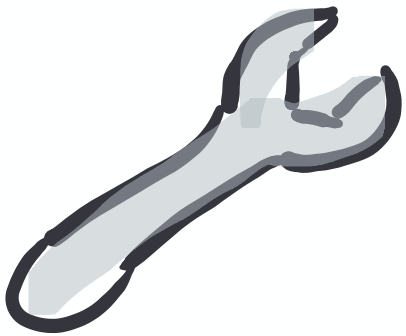
## Live On-Site

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## Maintain

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## Renovate

Drastic changes may include remodeling, additions, and major retrofitting.

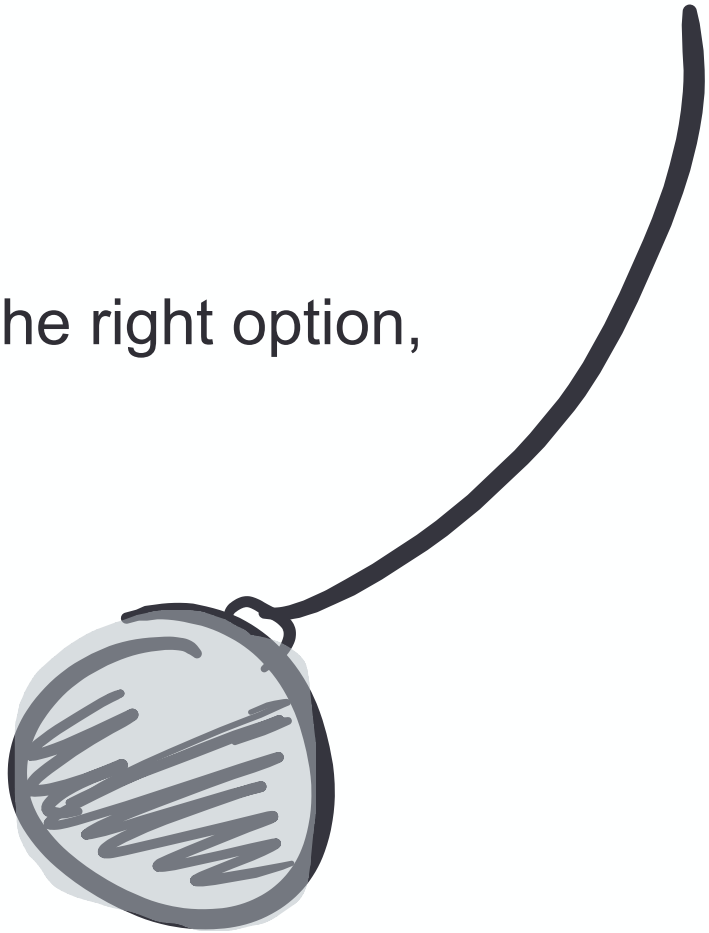


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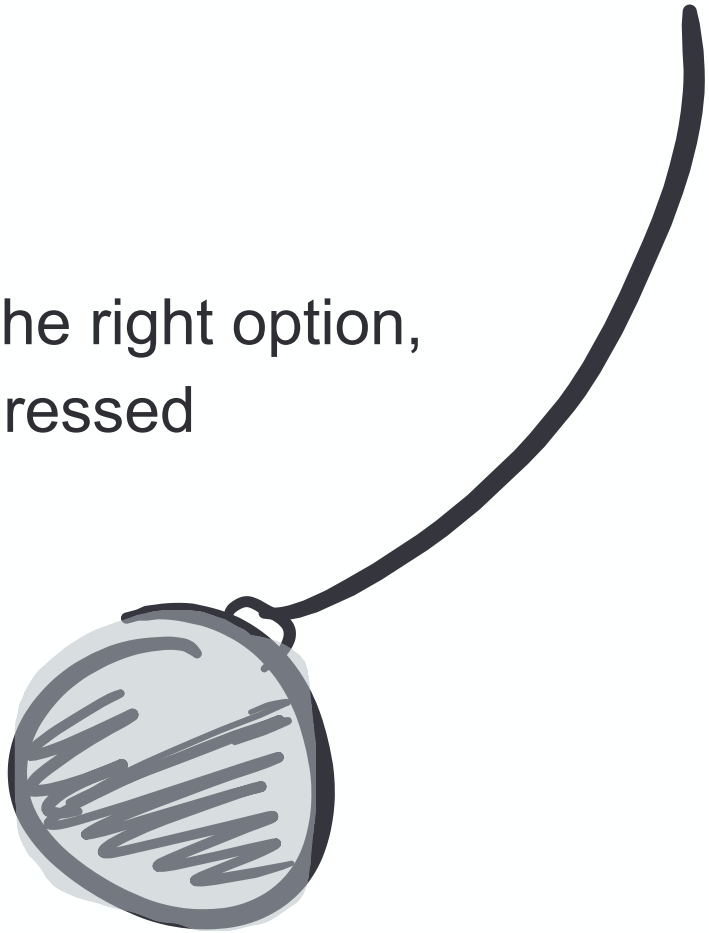
# The “Home” Metaphor

Demolition and rebuilding may be the right option,



# The “Home” Metaphor

Demolition and rebuilding may be the right option, although usually because of unaddressed deterioration.



# How to maintain and renovate

# Maintain & Renovate

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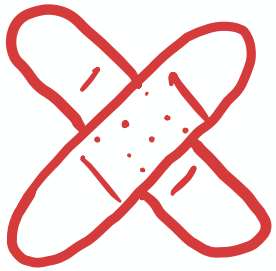
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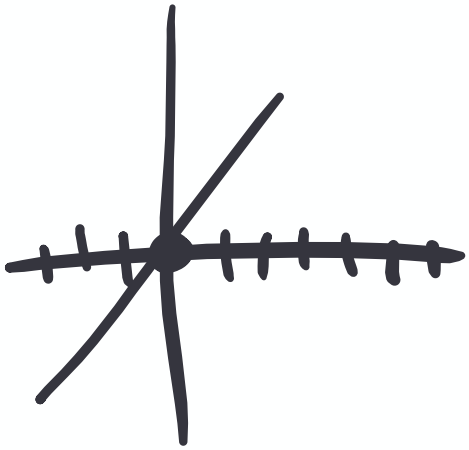

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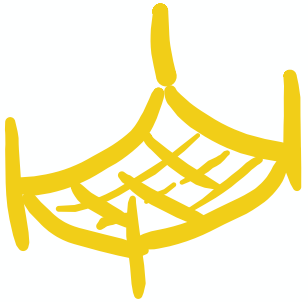
# Reduce Technical Debt



**Stop the bleeding**

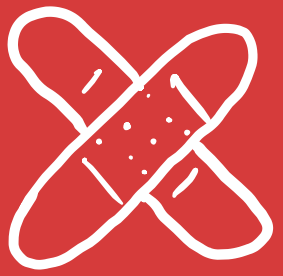


**Create time and space**

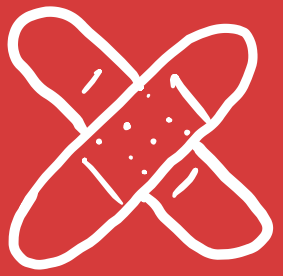


**Ensure safety**

# Stop the Bleeding

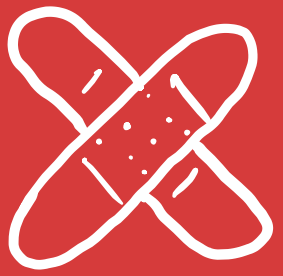


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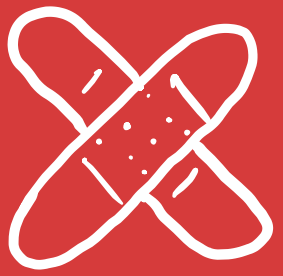
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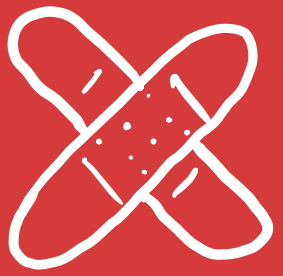
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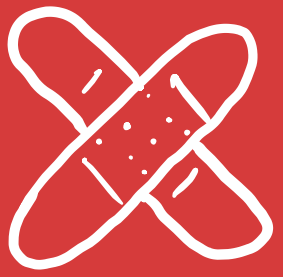
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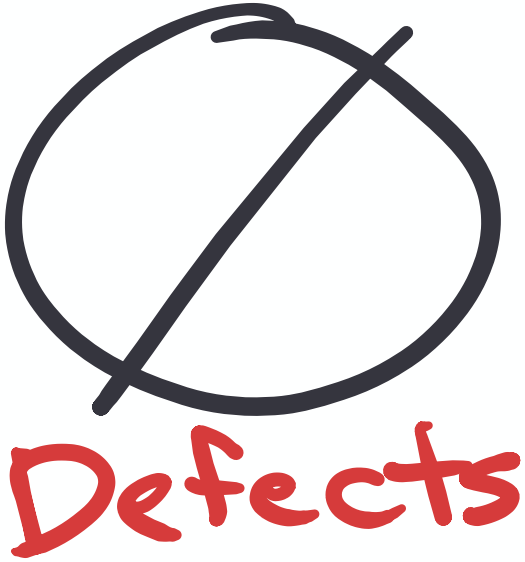


- Every piece of work should result in equal or reduced technical debt.
- Boy Scout Rule: leave it better than you found it.
- Refactor as you go.
- Fix defects ASAP.

# Stop the Bleeding



Zero Defects:
fix all known defects before adding functionality.



# Create Time and Space



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- Educate stakeholders about the effort: these systems are long-term investments.

# Create Time and Space



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- Adding test coverage, applying updates, and rewriting portions of the code should be celebrated as much as adding new functionality.

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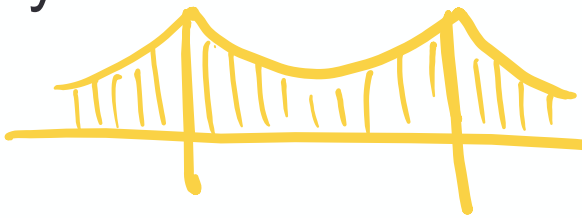


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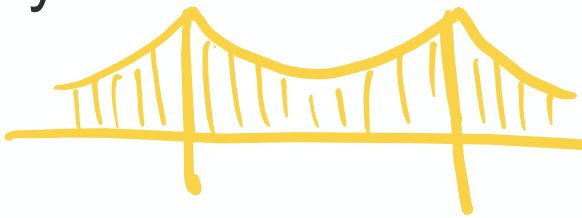
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- Imagine if bridge infrastructure was only measured by number of miles added!
- If you target a metric, you will likely improve it, although at some cost elsewhere.
- I want to drive on bridges where the key metric is on-time inspection and maintenance.

# Create Time and Space

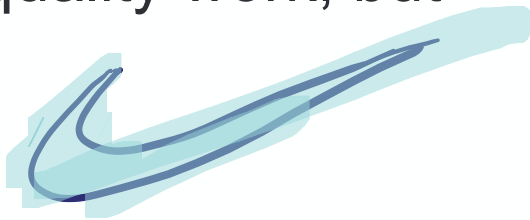


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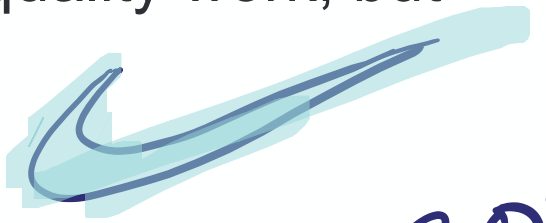
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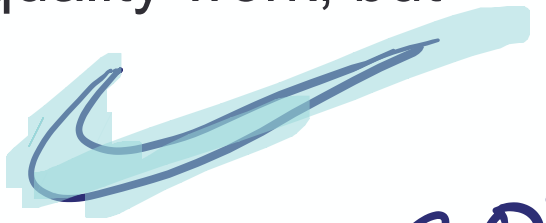
- Just do it.
- Set aside time & capacity for maintenance.

20%

# Create Time and Space



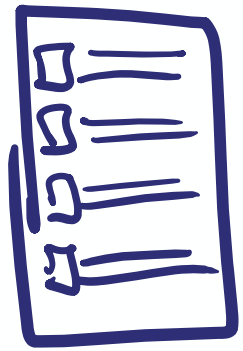
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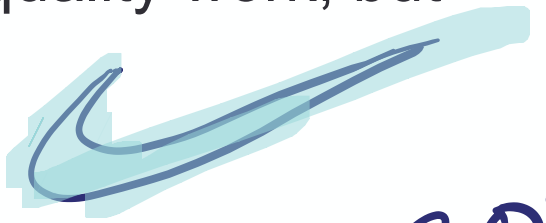

- Track maintenance and refactors the same as PBIs/User Stories/etc.



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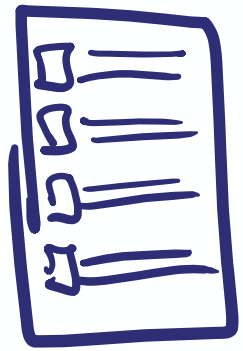
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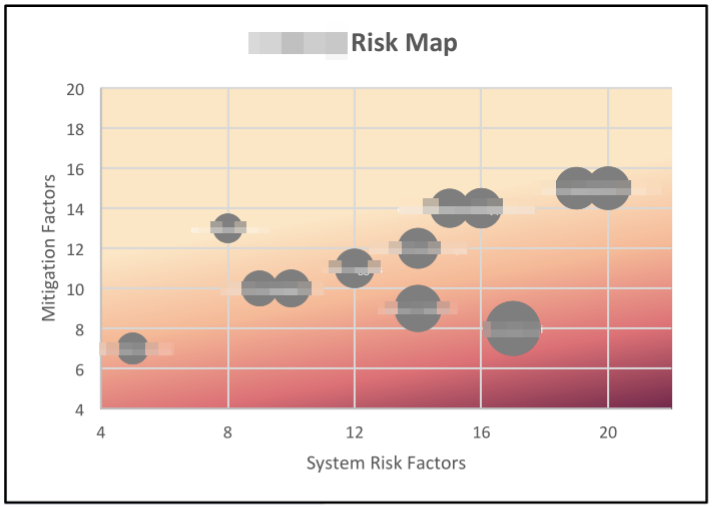
- Just do it.
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- Track maintenance and refactors the same as PBIs/User Stories/etc.
- Inspect the code and create metrics around maintenance to be done.



# Create Time and Space




| Maximum Risk Score: | |
|---|---|
| 10.6 | |
| 1 week ago | 10.6 |
| 5 weeks ago | 10.6 |
| Report Date: | 10/14/18 |

| Microservice | Risk Score | Mitigation | Testing | Monitoring | Logging | Alerting |
|---|---|---|---|---|---|---|
| | 10.6 | 25% | 2 | 2 | 1 | 3 |
| | 7.8 | 31% | 3 | 3 | 2 | 1 |
| | 6.7 | 69% | 4 | 4 | 4 | 3 |
| | 6.3 | 69% | 4 | 4 | 4 | 3 |
| | 5.8 | 50% | 3 | 3 | 3 | 3 |
| | 5.7 | 63% | 4 | 3 | 4 | 3 |
| | 5.5 | 44% | 3 | 3 | 2 | 3 |
| | 5.4 | 63% | 4 | 3 | 4 | 3 |
| | 5.0 | 38% | 2 | 3 | 2 | 3 |
| | 4.5 | 38% | 1 | 3 | 3 | 3 |
| | 3.6 | 19% | 2 | 2 | 2 | 1 |
| | 3.1 | 56% | 4 | 3 | 3 | 3 |

# Ensure Safety



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- Testing, especially automated testing, is huge.
- Blue/green deployments & shadowing (running new code in parallel with the old) can be even more effective.

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Automated tests pay off over time and make future changes safer.

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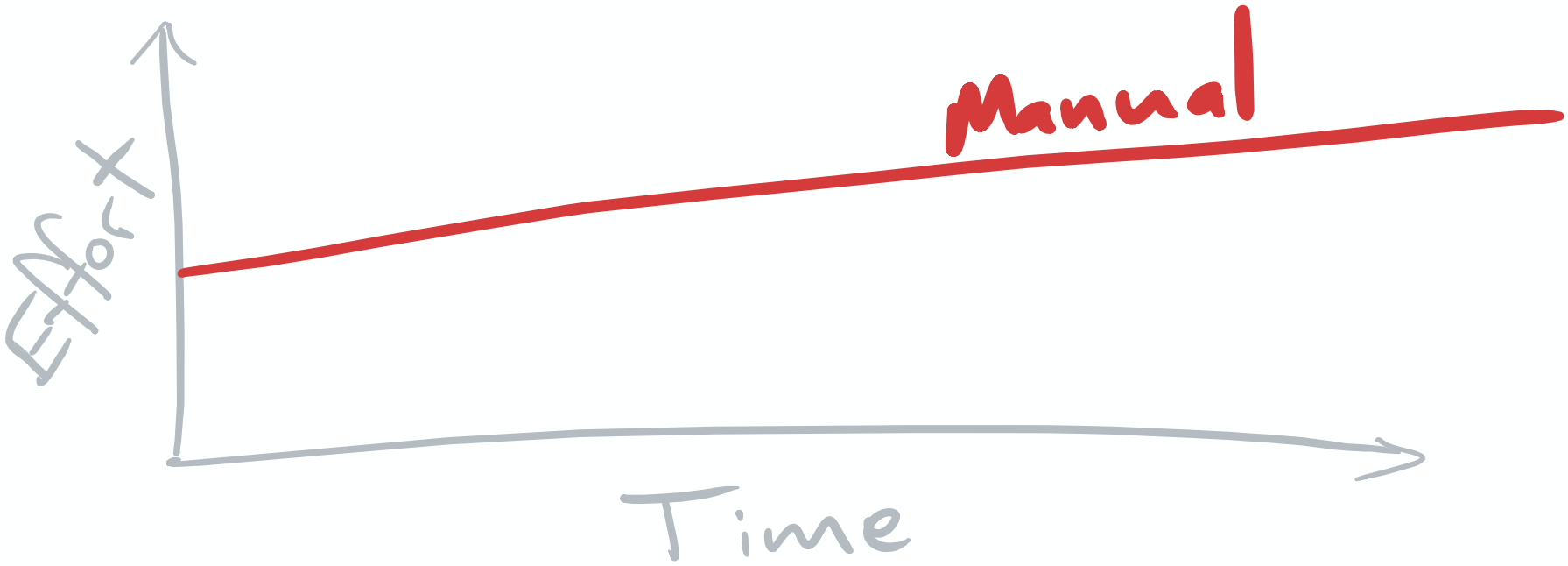


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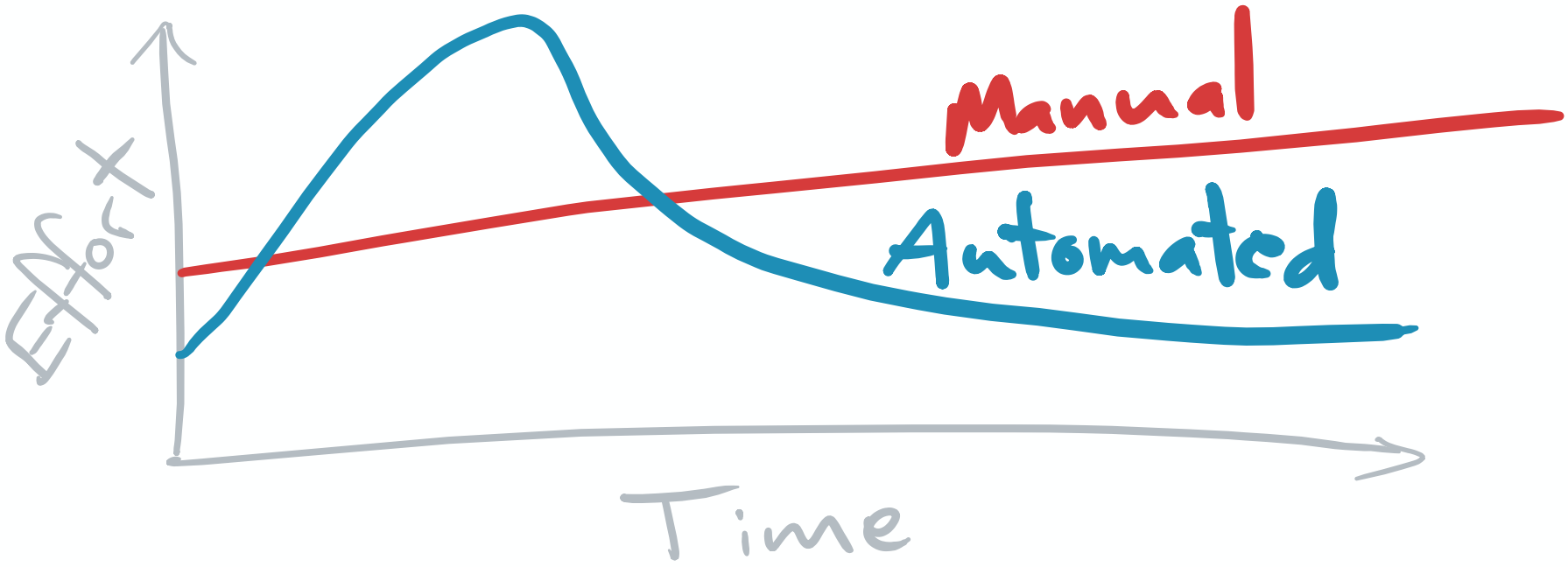


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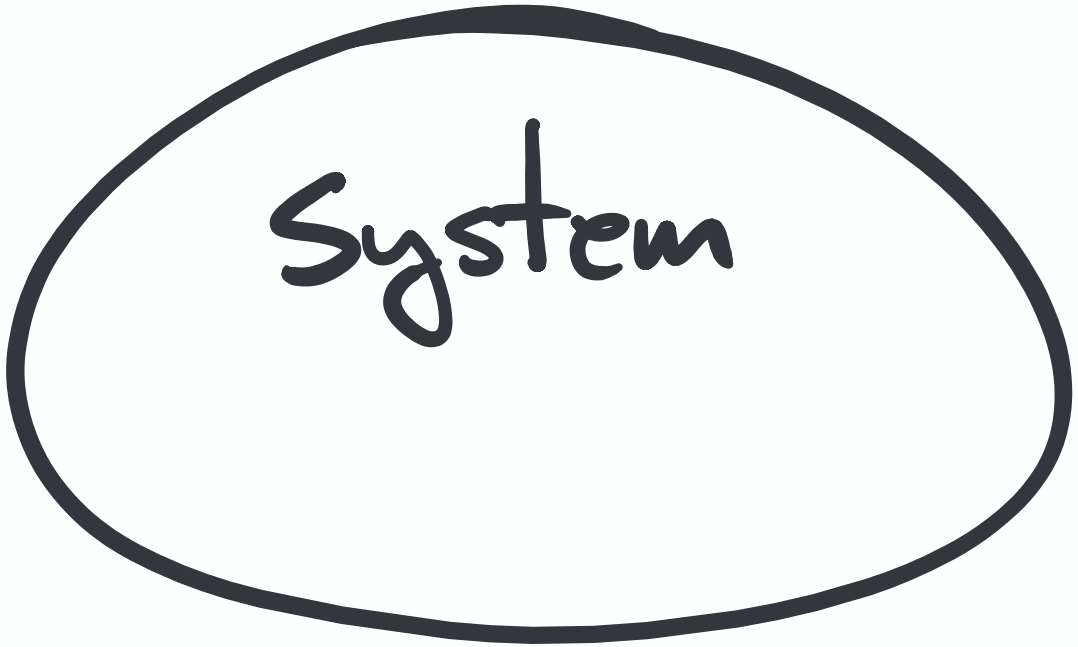
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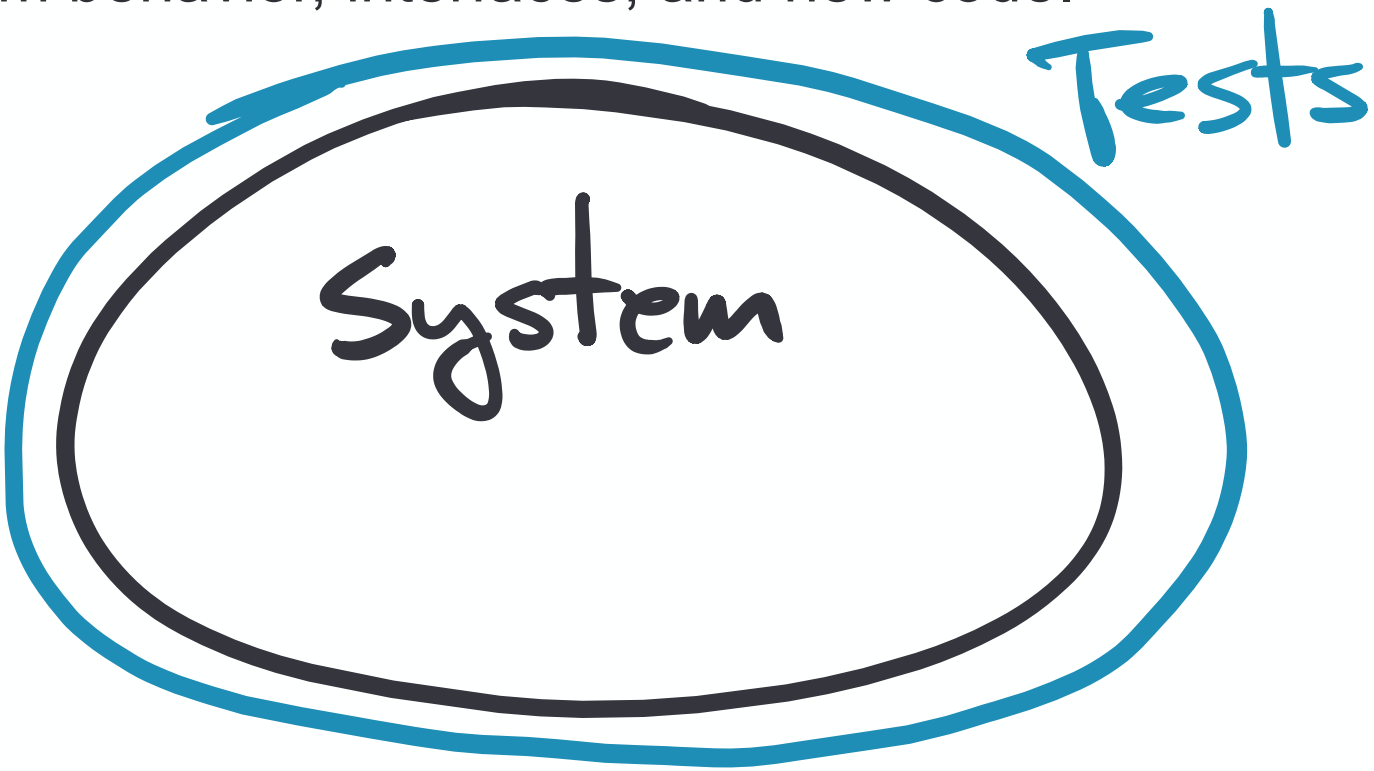


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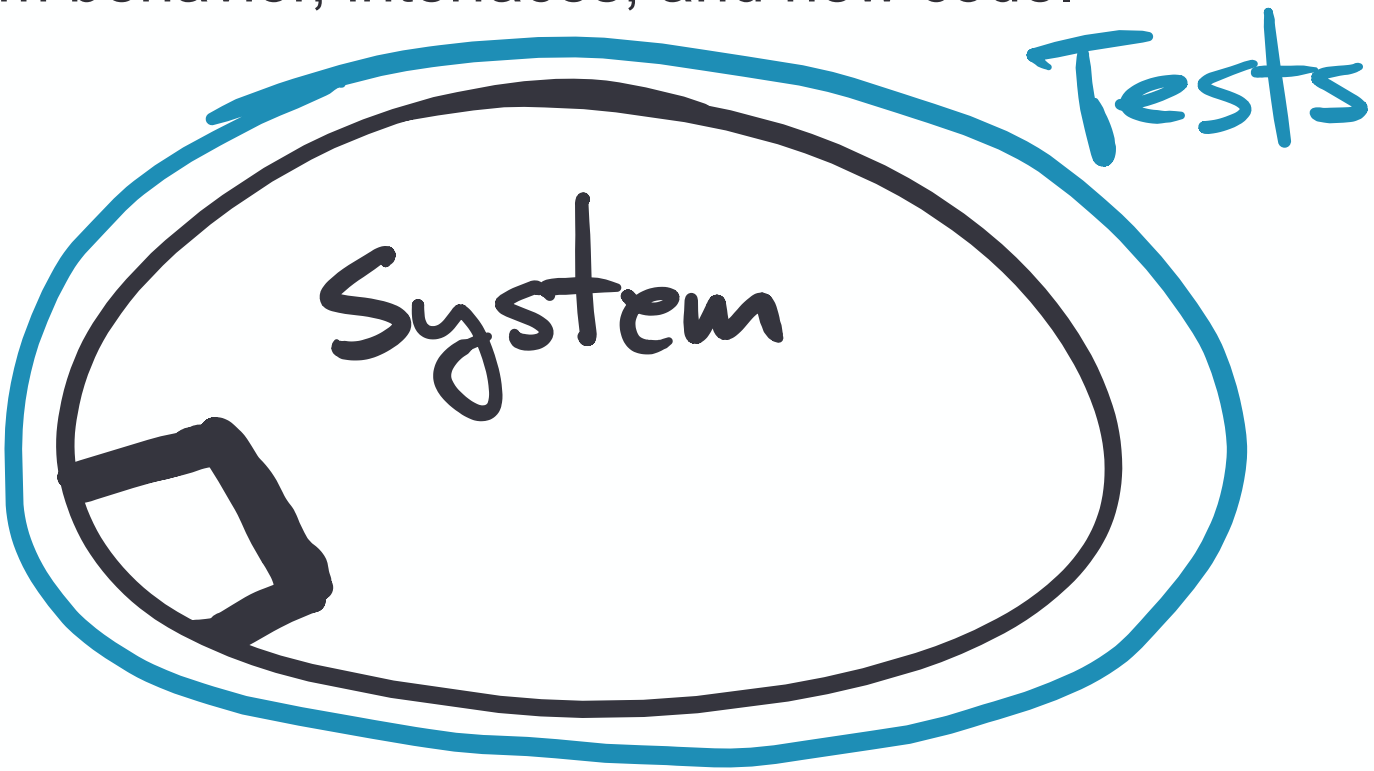


# Ensure Safety



**Automated Tests!**

Test system behavior, interfaces, and new code.

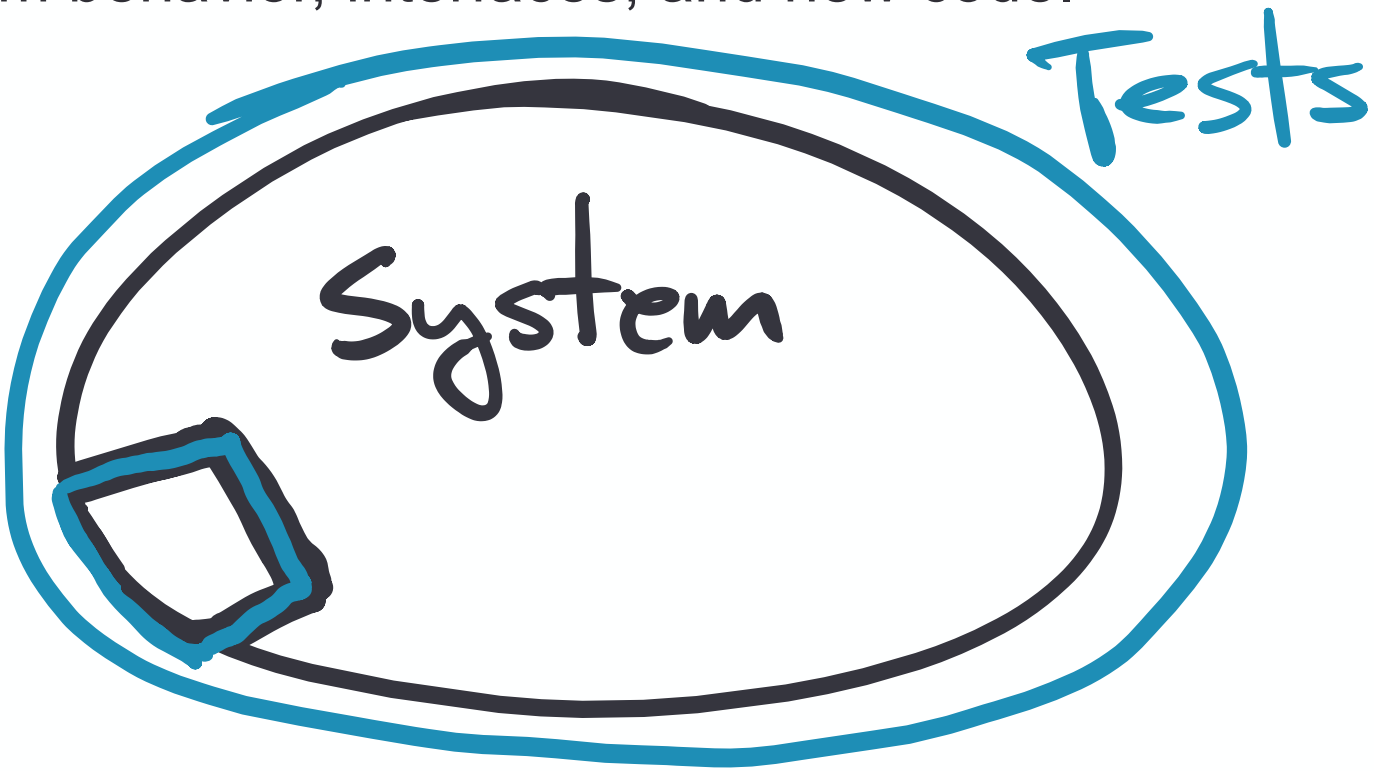


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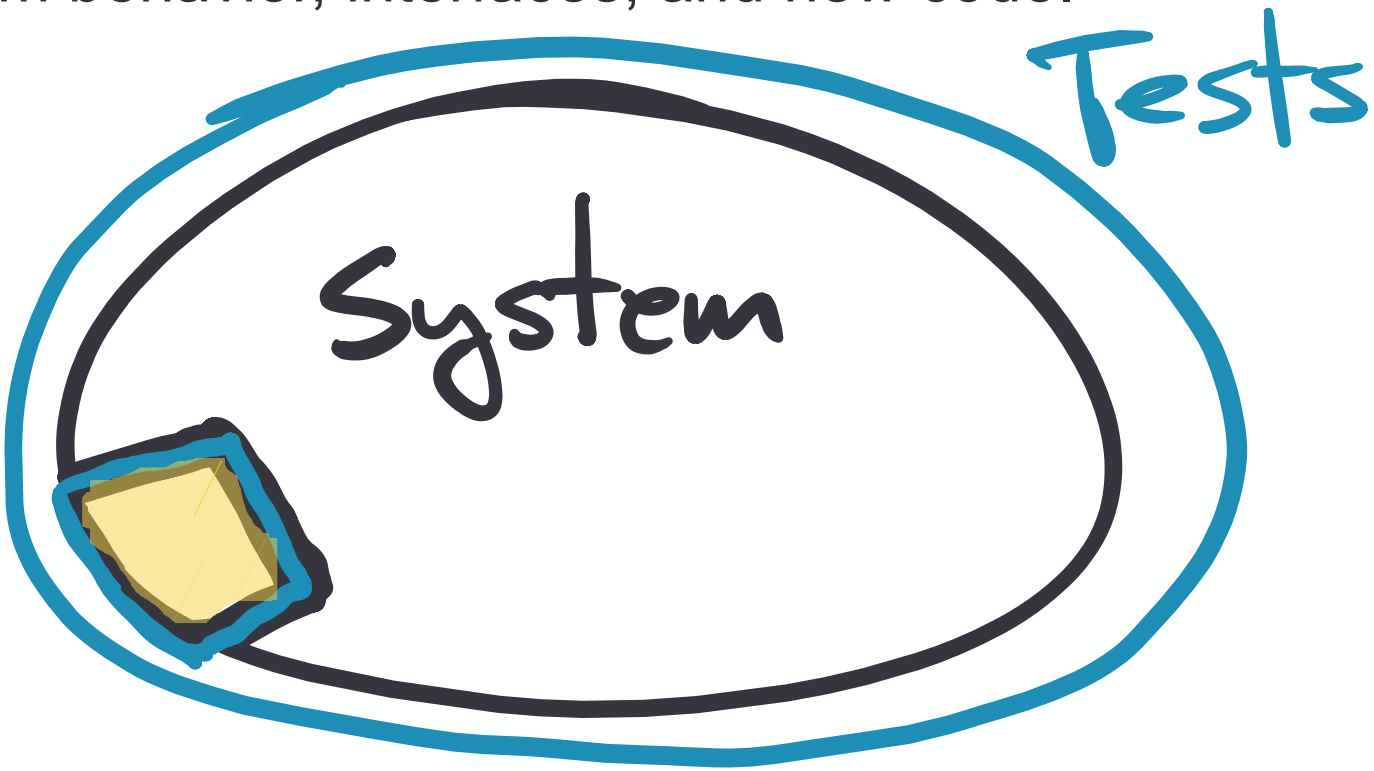


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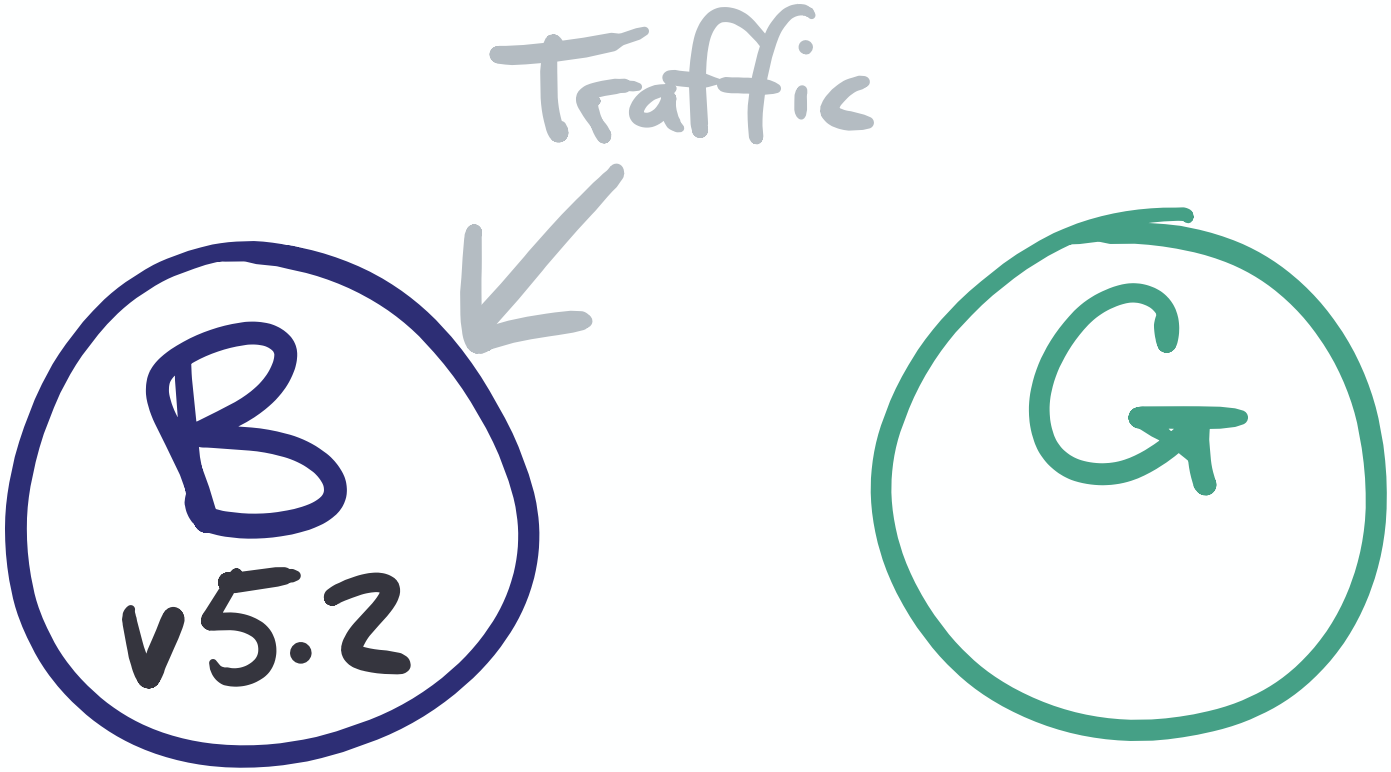


## Blue/green deployments

# Ensure Safety



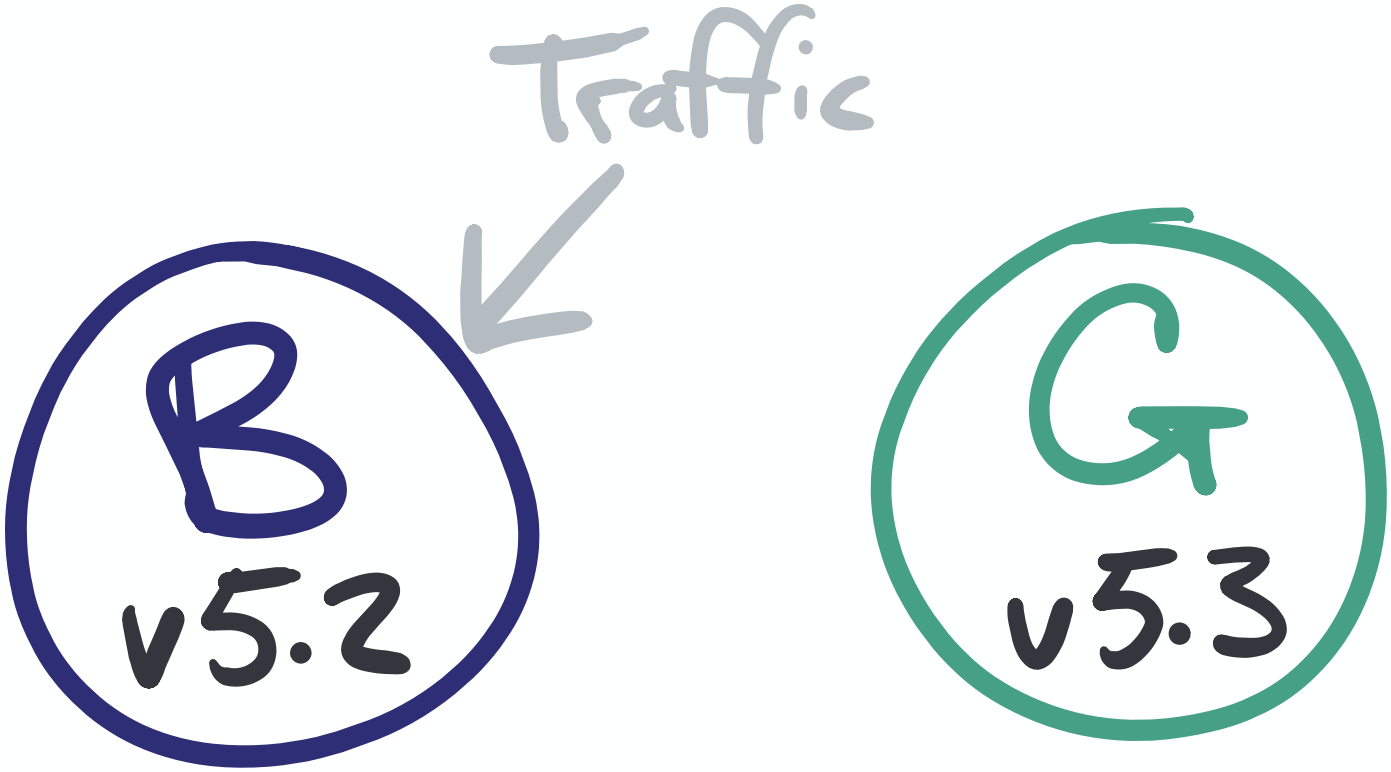
## Blue/green deployments



# Ensure Safety



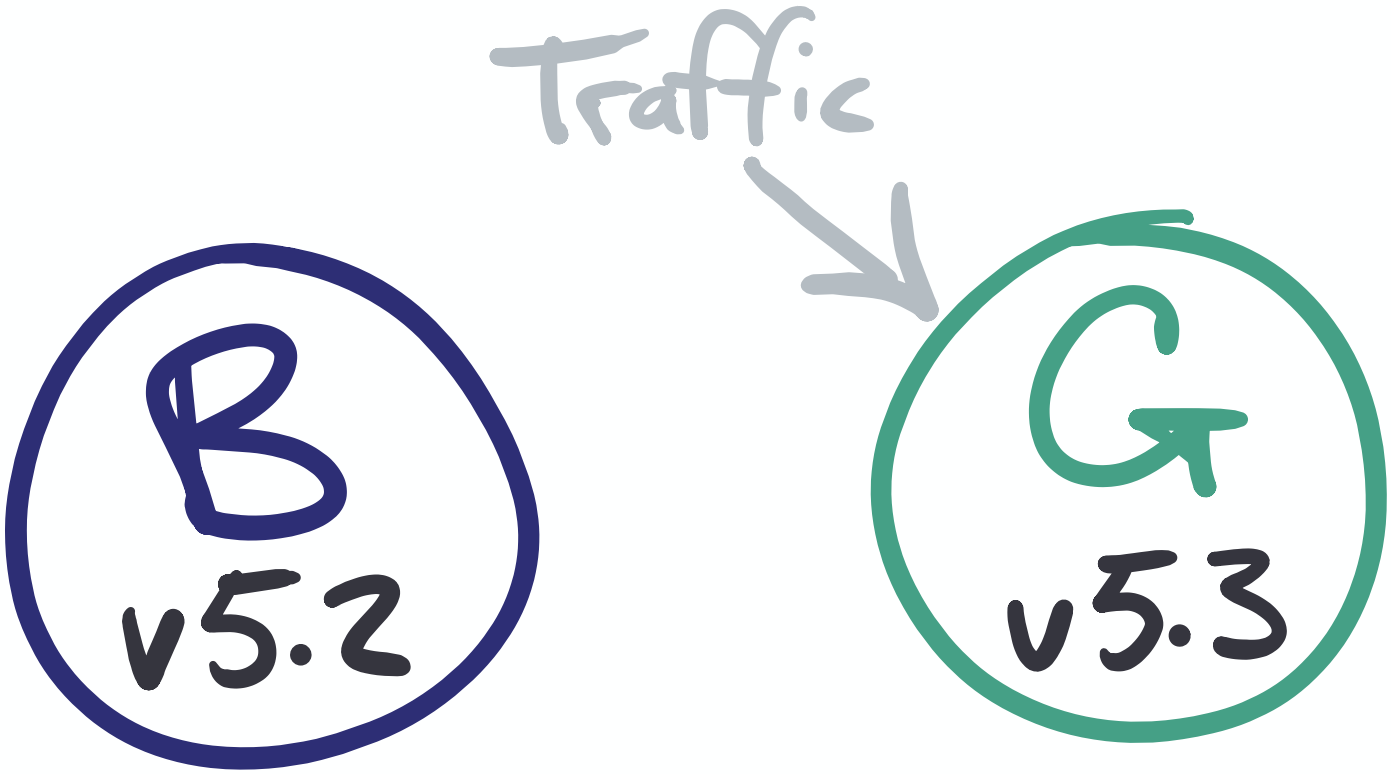
## Blue/green deployments



# Ensure Safety



## Blue/green deployments



# Ensure Safety

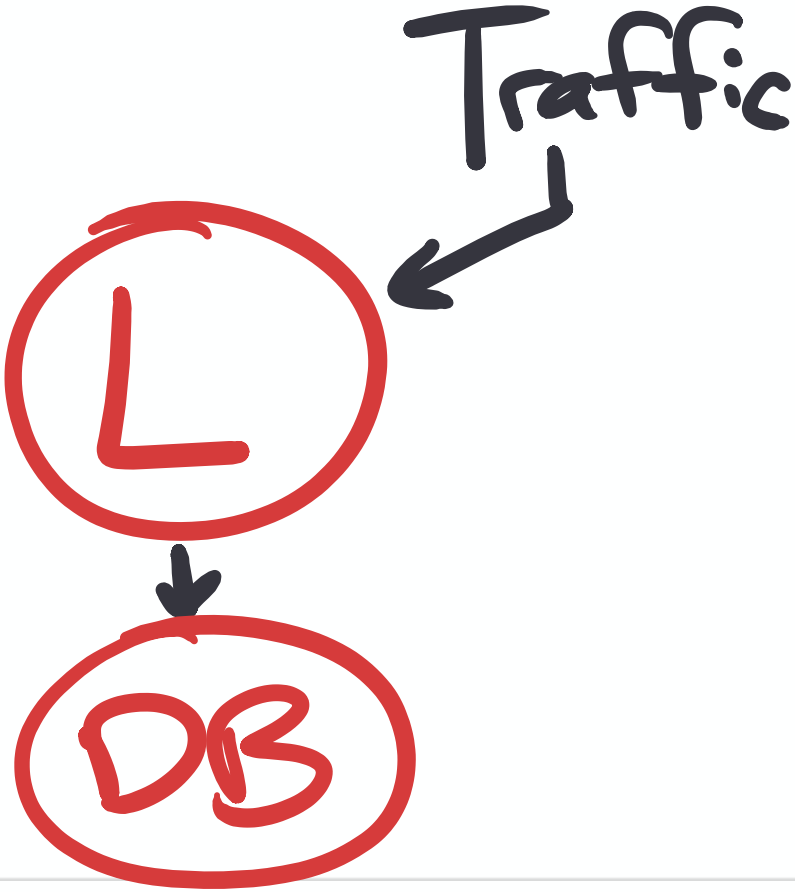


## Shadowing (Transform & Eliminate)

# Ensure Safety



## Shadowing (Transform & Eliminate)



# Ensure Safety



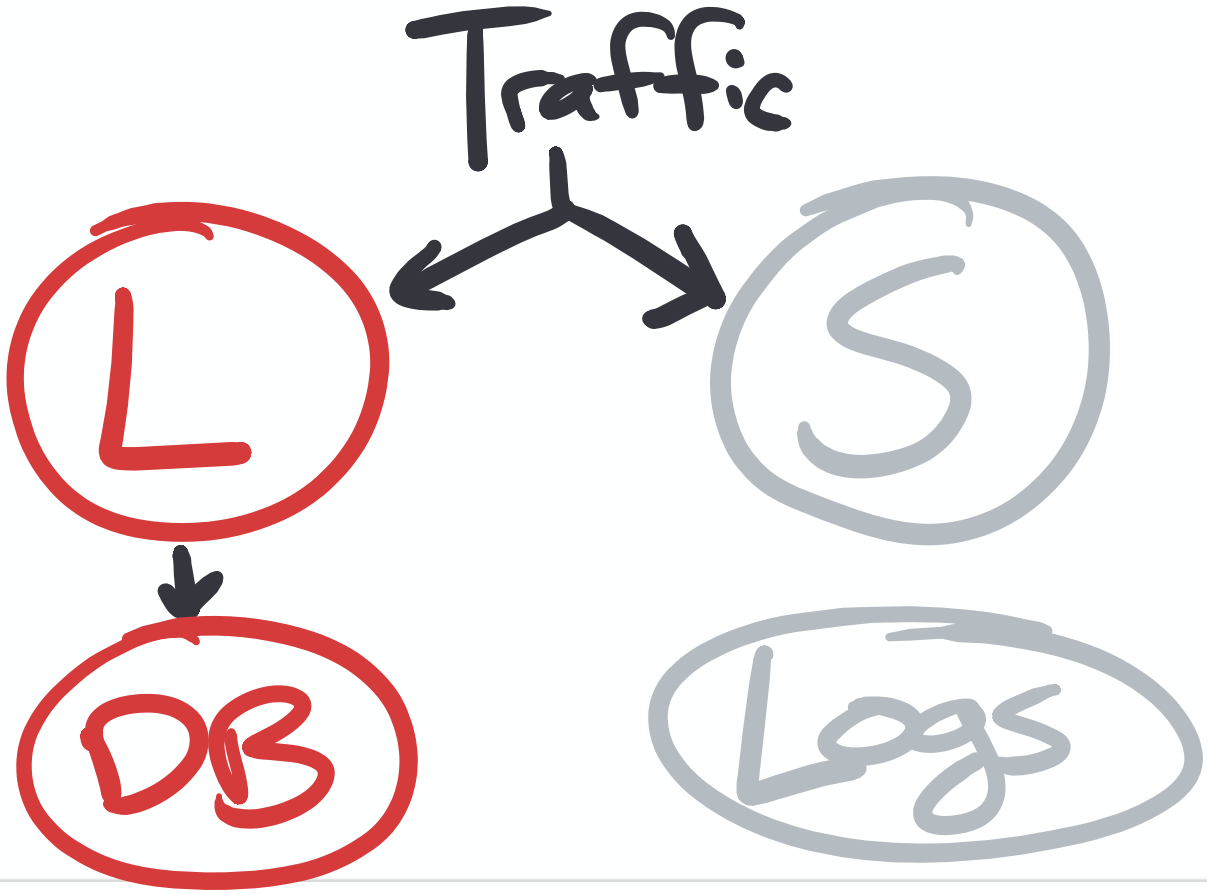
## Shadowing (Transform & Eliminate)



# Ensure Safety



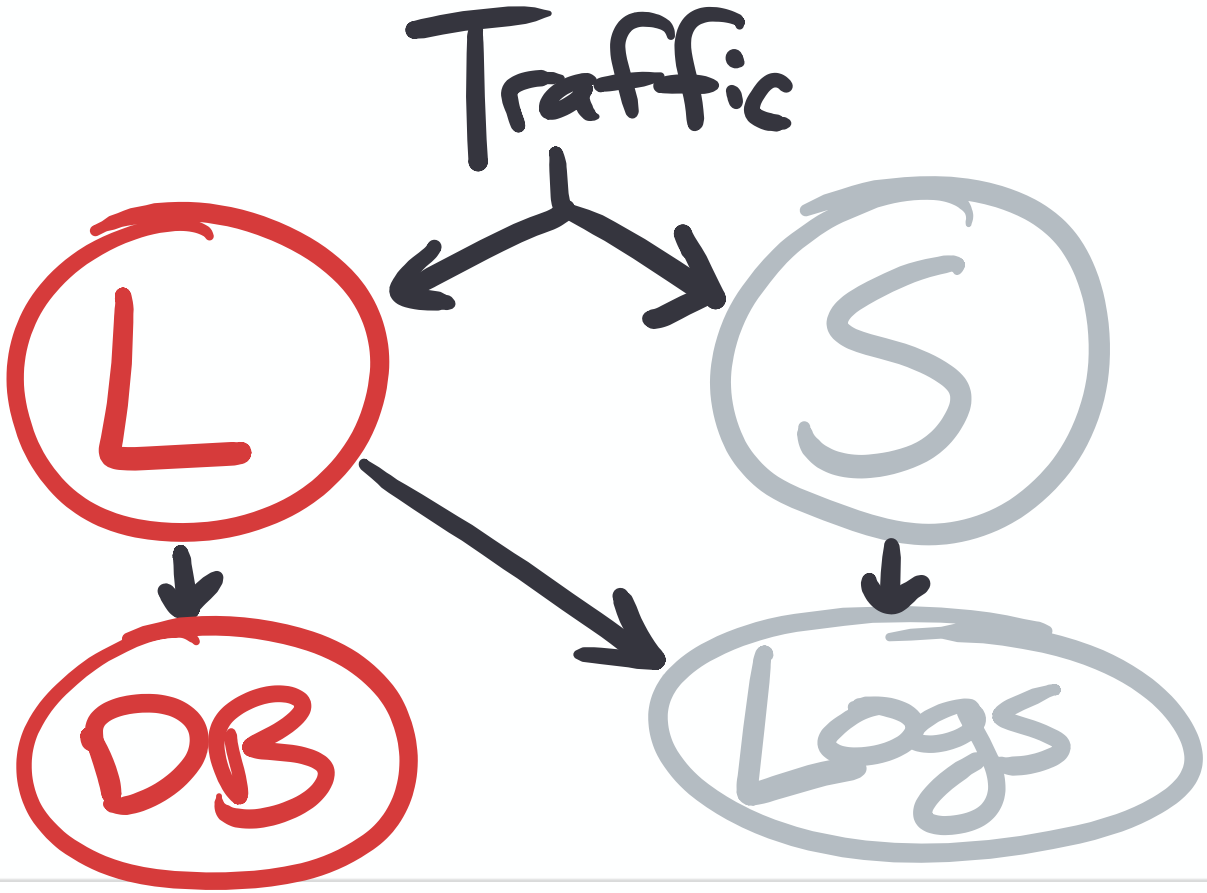
## Shadowing (Transform & Eliminate)



# Ensure Safety



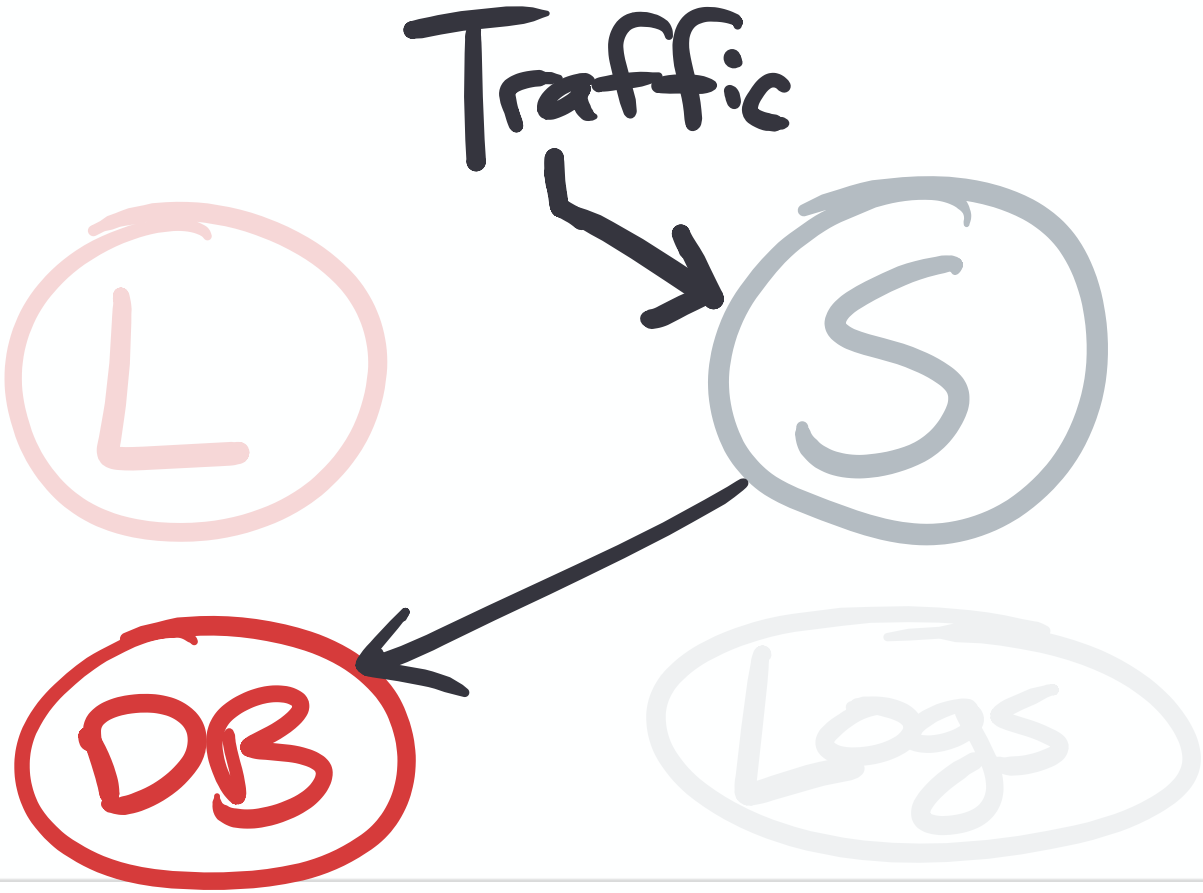
## Shadowing (Transform & Eliminate)



# Ensure Safety



## Shadowing (Transform & Eliminate)



# Ensure Safety



## Further reading:

# Ensure Safety



## Further reading:

- The “strangler vine” pattern

# Ensure Safety



## Further reading:

- The “strangler vine” pattern
- Agile engineering

# Ensure Safety



## Further reading:

- The “strangler vine” pattern
- Agile engineering
- The world of DevOps

# Continuous Modernization

# Continuous Modernization



# Continuous Modernization

**Treat long-lived Federal IT systems like homes.**

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**Avoid demolition and rebuilding.**

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**Treat long-lived Federal IT systems like homes.**

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**Pay down technical debt.**

# Continuous Modernization

**Treat long-lived Federal IT systems like homes.**

**Avoid demolition and rebuilding.**

**Pay down technical debt.**

**Steadily invest in modernizing the system.**

# Never Stop Modernizing!

DO IT CONTINUOUSLY




excella.com | @excellaco

# Collaboration Over Competition

## Open Source Agile Development for ISR

Chris Froude
VP of Programs
chris.froude@connexta.com
(781) 371-4901
May 8th, 2019

connexta

# Connexta

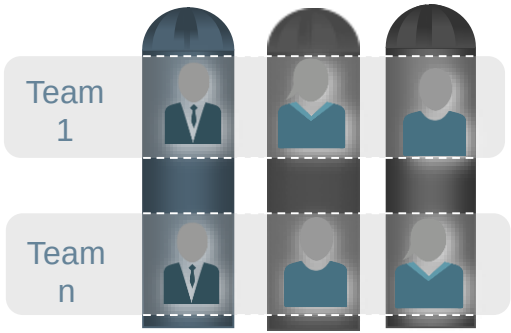
- Agile Software Development
  - Offices in Phoenix (HQ), Denver, Boston, DC
- History of performance in government space
  - TS/SCI Cleared, full-stack software developers
- Committed to Open Source and Open Development
  - Delivers the Distributed Data Framework ecosystem



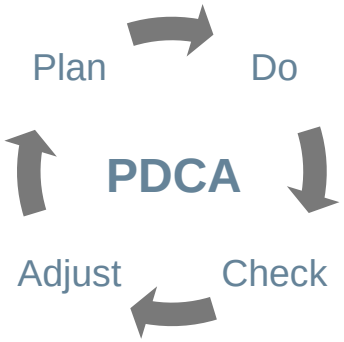

ddf
distributed data framework

# Nothing beats an Agile Team

- Cross-functional, self-organizing entities that can define, build and test a thing of value
- Applies basic scientific practice: Plan—Do—Check—Adjust
- Delivers value frequently





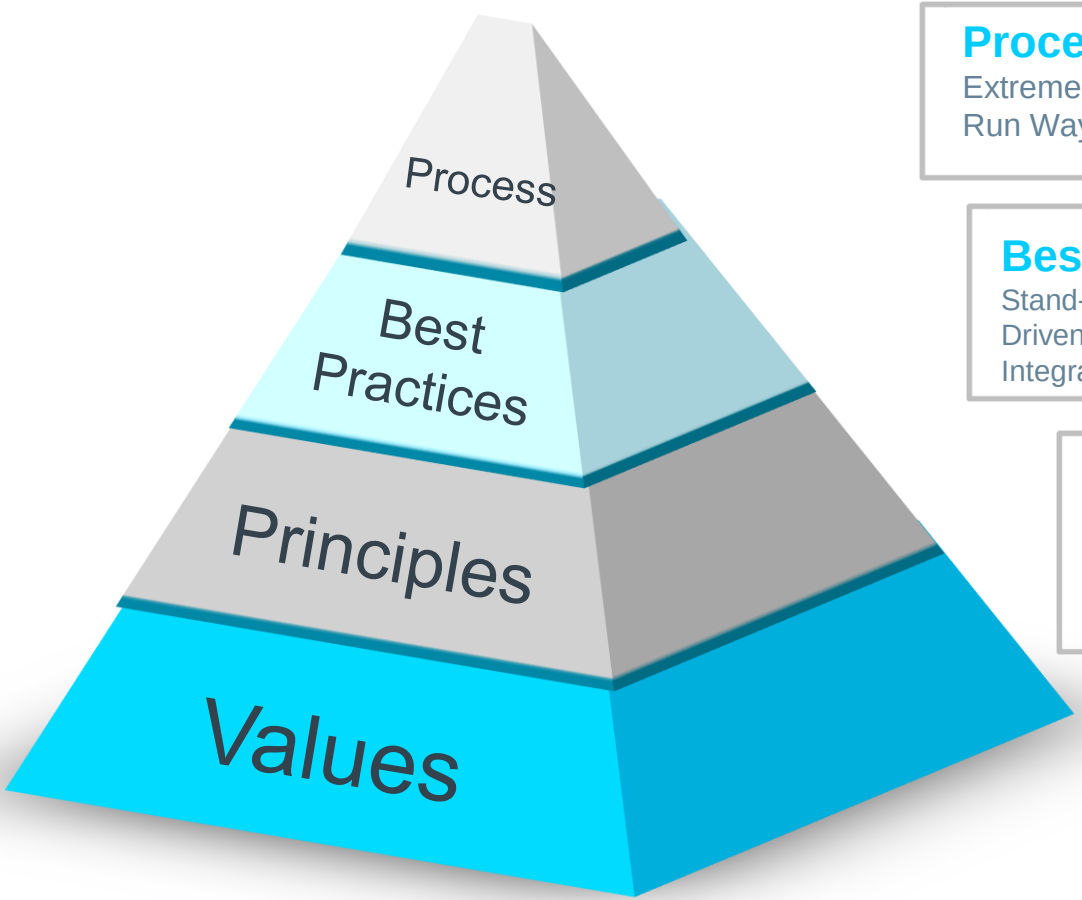



# Business results




See ScaledAgileFramework.com/**case-studies**

# Connexta Agile Development




**Process**
Extreme Programming, Scrum, SAFe, Kanban, Kessel Run Way

**Best Practices**
Stand-ups, Retrospective, Pair Programming, Test Driven Development, Automated testing, Continuous Integration, Refactoring, Loose Coupling, Security

**Principles**
Lean, Teamwork, Collaboration, Flexibility, User-focus, Small teams, Business Value Driven, Simplicity, Feedback, Effective Communication

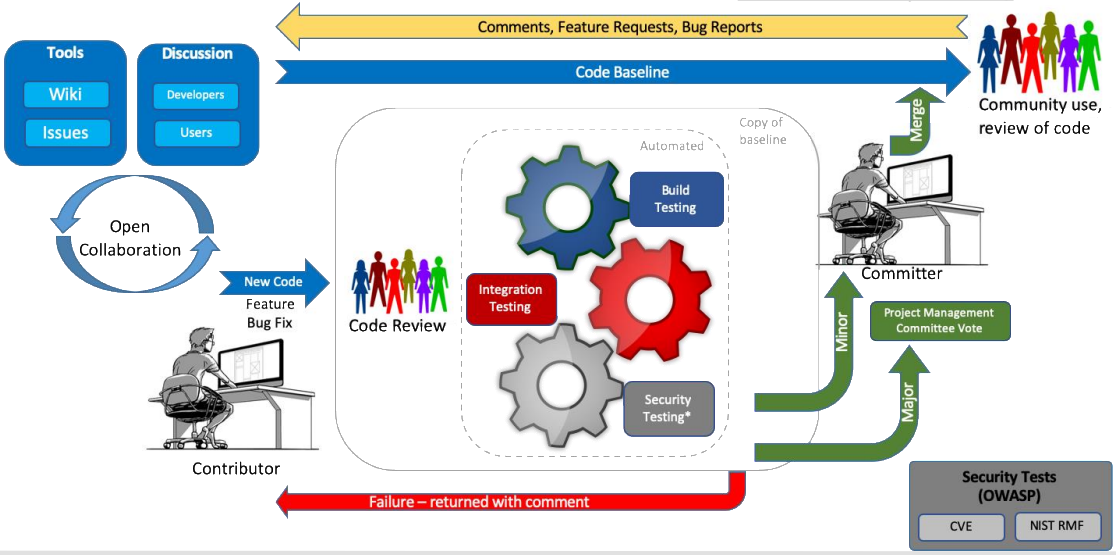
**Values**
Trust, Innovative, Courage, Honesty, Accountability, Empowerment, Self-Organization

# Open Source for Collaboration

- Who Uses Open Source?
- Benefits of Open source for Government use
  - Flexibility, Adoption, Support Innovation, Reuse, Quality
- Challenges
  - Sponsorship and maturity
  - Security




https://wso2.com/whitepapers/the-business-value-of-open-source/



# Open Source Development with Government Leadership

## Government Role

- Provide prioritization
  - Sponsored development
  - User centric design coordination
- Establish program vision
- Stakeholder communication
- Resourcing

## Developers Role

- Provide input for Government vision
- Architectural design
- Evaluation of technical solution
- Provide agile development best practice guidance
- Develop software

# Capabilities Flow Downstream

Free and
Open Source

DDF
Distributed Data Framework

Free and
Open Source

ALLIANCE

*ISR-focused*

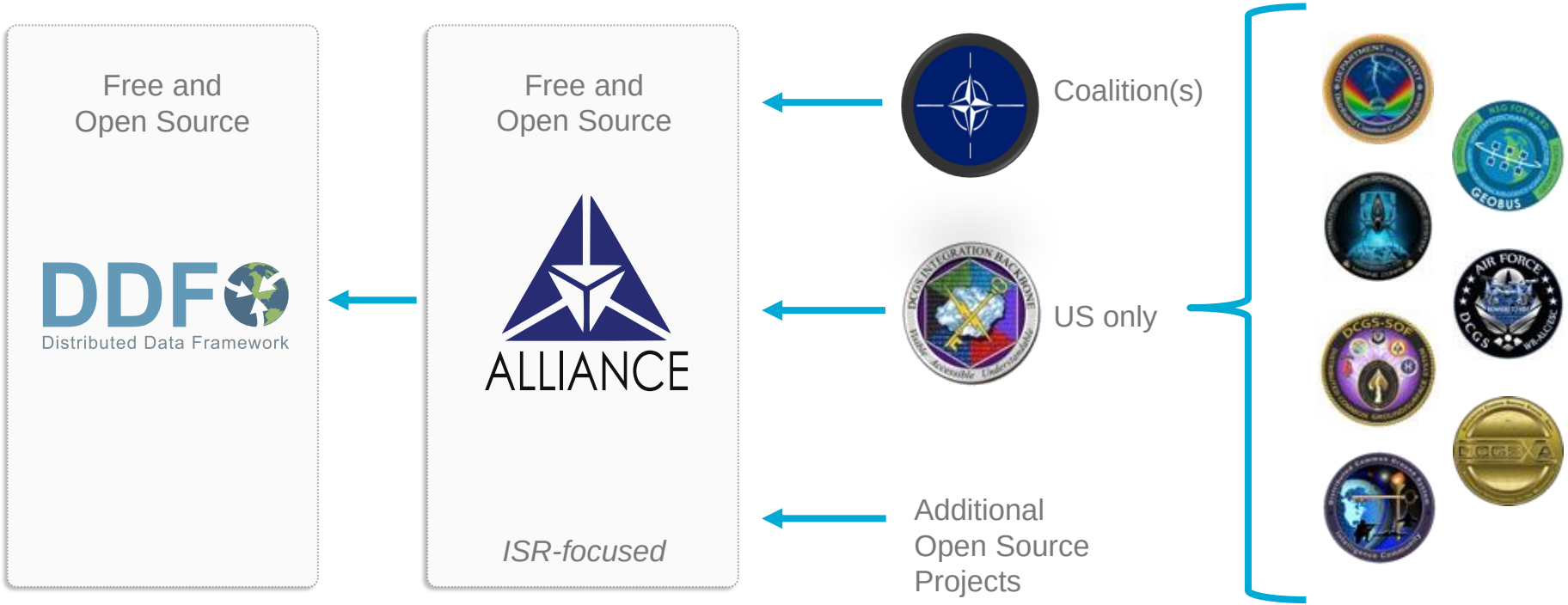
Coalition(s)

US only

Additional
Open Source
Projects



# Contributions Flow Upstream When Possible



# Meeting the Challenges with Open Source and Open Development

## Government

- Government Unlimited Rights
- Establish modular, agile processes, open architecture, and standards
- Promote collaboration & contribution
  - Projects
  - Bug reports
  - Documentation
  - Feature requests
  - Sponsored development of new capabilities

## Contractors & Developers

- Understand and promote Open Source & Open Development
- Build and demonstrate merit
- Offer and leverage Unlimited Rights

# Benefits

- **Open Source Software** is a successful model, *even in ISR*
- **Agile methods promote** transparency and collaboration
- **Collaboration** over competition leads to collective success



# Thank You.

Chris Froude
VP, Programs
chris.froude@connexta.com
(781) 371-4901

connexta

# A Real-World Roadmap for Organizational Change

w/ Pete Oliver-Krueger

LitheSpeed

# Pete OK (Oliver-Krueger)

**Agile -> Lean -> Teal Managing Consultant**
peter.ok@lithespeed.com

- B.S. in Electrical & Computer Engineering from Carnegie Mellon
- Co-designed the first online university
- Entrepreneur & DC Lean Startup Circle
- USA Today, Motley Fool, IRS, TD Ameritrade, InterAct Story Theatre



# The Problem

- **Three-in-one**
  - Profit-Based Business
  - Regulatory Agency
  - Not-for-profit advocacy group
- **Global Organization**
- **Large External Competitors,** including *Google*
- **Disrupted by Startups**

# Case Study

# Problems

## Sound Familiar?

- Different Flavors of Agile, including “Agile doesn’t work here”
- Losing Customers
- Talking about layoffs
- Being disrupted - Startups (plus Google) moving in
- Most releases 6 months or more
- Re-architecting - Going on 2 years
- Little/No metrics
- 2 product lines; 1 API; 7 teams

# Challenges ~~Problems~~

Sound Familiar?

- Different Flavors of Agile, including “Agile doesn’t work here”
- Losing Customers
- Talking about layoffs
- Being disrupted - Startups (plus Google) moving in
- Most releases 6 months or more
- Re-architecting - Going on 2 years
- Little/No metrics
- ~~2 product lines; 1 API; 7 teams~~
- 7 product lines; 18+ teams

# The Plan

# The Plan

- 1st Month - Product Line #1
  - Training
  - Coaching
- 2nd Month - Product Line #2
  - Training
  - Coaching Product #1 & Product #2
- 3rd Month - API Team
  - Training
  - Coaching Product #1, Product #2, & Product #3
- 4th Month - Onboard next product lines
  - etc…

“How are we doing?” - Executives

# How are we being measured?

## ScrumMasters & Delivery Team

- Story *Count* **Velocity**
- **Predictability** (Actual Velocity vs Planned Velocity)
- Time to Close **Impediments** (lower)
- **Automated Code Coverage** (measured against Acceptance Criteria, not lines of code)

## Product/Strategy Team

- Definition of Ready, approved by delivery team (Y/N)
- 2 sprints worth of stories that meet the Definition of Ready
- >= 3 months Roadmap of new features

# Agile Metrics

*But really…*

# “How are we doing?” – Executives

*”How do we know we’re getting our money’s worth?”*

# Teal to the Rescue

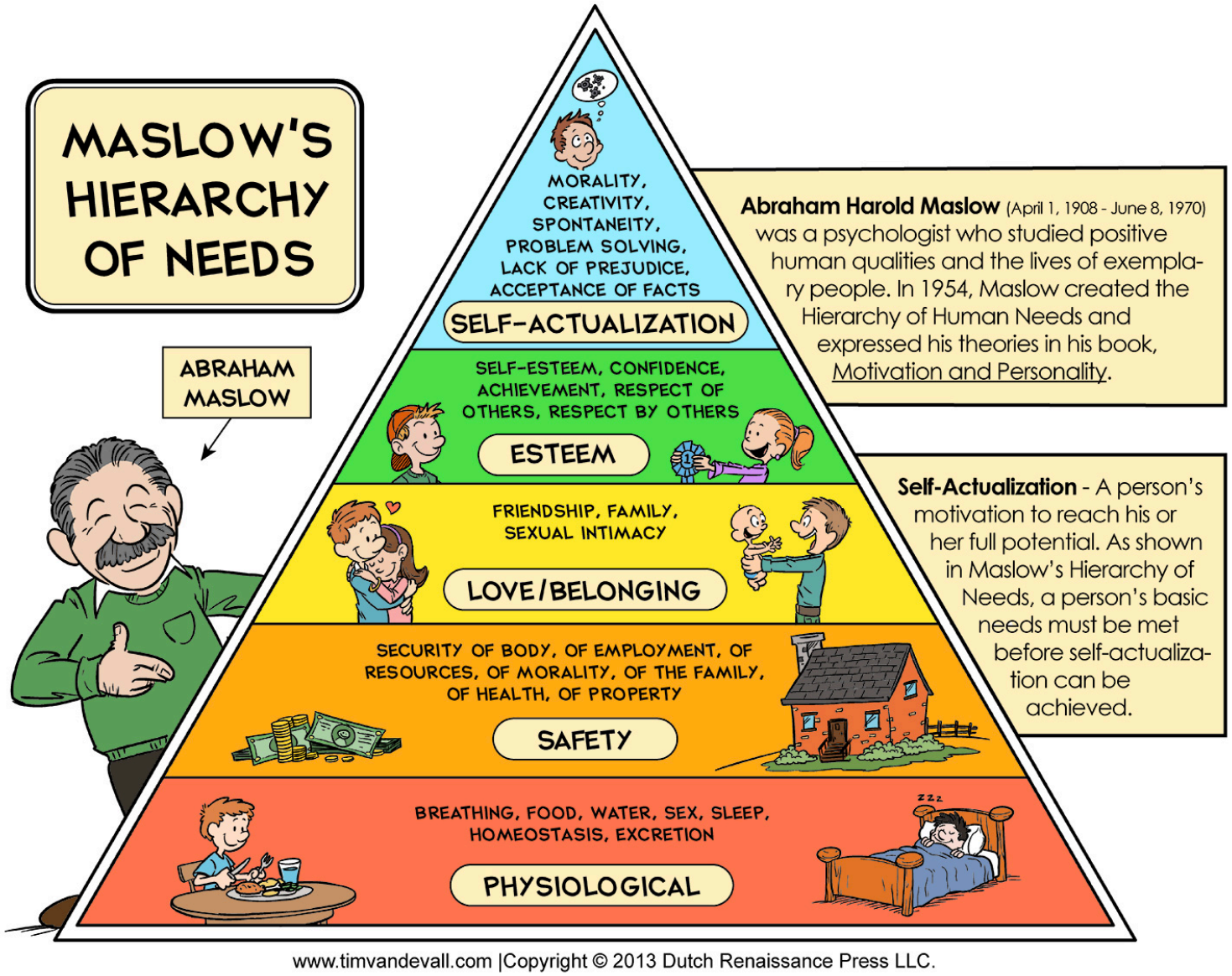
*What is Teal?*

# Maslow's Hierarchy of Business Needs

- **Physiological** = Resources (e.g. Computers, tools, website, employees)
- **Safety** = Sales (e.g. consistent sales pipeline that you can rely on)
- **Belonging** = Culture (i.e. psychology)
- **Esteem** = Recognition
- **Self-Actualization** = Self-Management

**You must satisfy lower needs before you can satisfy higher needs.**

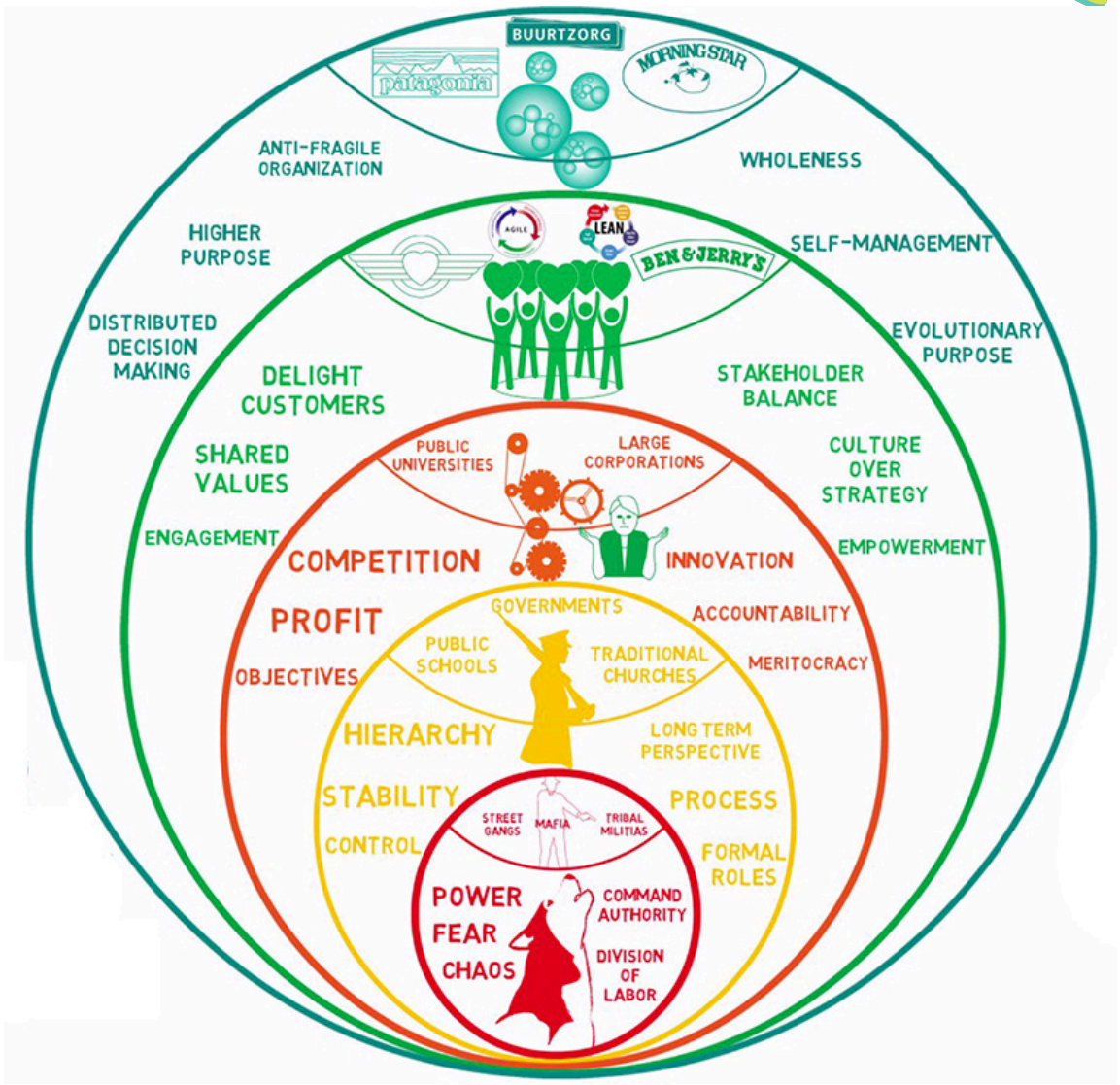
Example: Companies need a consistent pipeline of sales (Safety) before they can embrace culture consulting (Belonging)





# Frederick Laloux
# Reinventing Organizations

*Illustration by Rod Collins, Director of Innovation at Optimity Advisor and published in the Huffington Post*



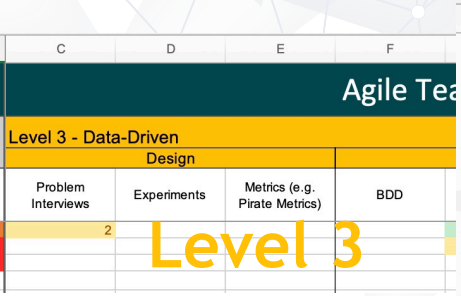

http://www.reinventingorganizations.com/

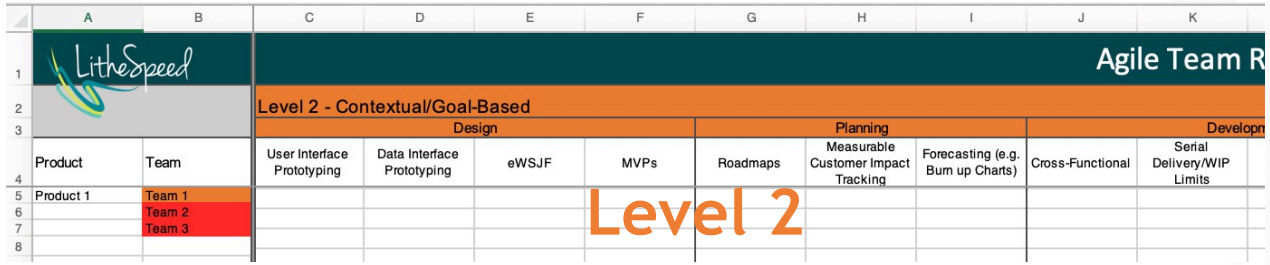
# Exercise: Which Level Is Your Organization?

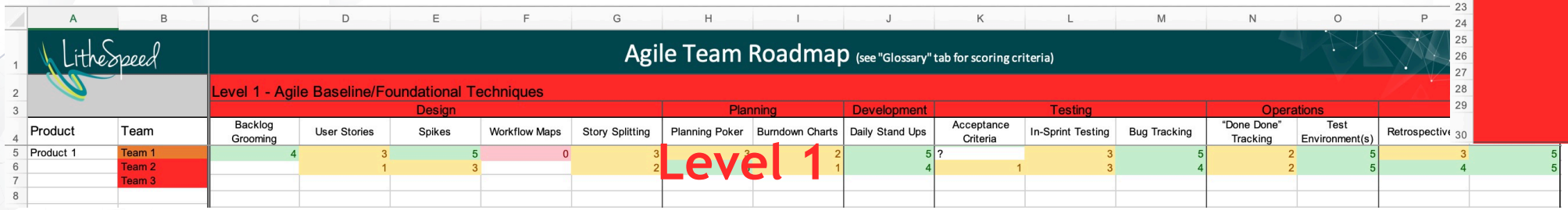
| Level | Management | Affecting Change | You might hear | Examples |
|---|---|---|---|---|
| Teal | Spiral Dynamics | Change appropriate for each individual | “The world is great!" “We embrace our differences!” | Star Trek, Morningstar, Buurtzorg |
| Green | Conscious Capitalism | Metrics to measure mission impact | “We're great!” “Does that fit our mission?” | Virgin, Southwest, Patagonia, Zappos |
| Orange | Entrepreneurial | Follow the Money | “I'm great!” “I deserve this.” | Pixar, Intuit, Tesla, Proctor & Gamble |
| Amber | Corporate Hierarchy | Highest-Paid Person’s Opinion (HIPPO) | “My life sucks!” “That's not how we do things.” | Government, Churches, Star Wars |
| Red | Family Business | The boss said so | “Life sucks!” “Every man for himself.” | Trump Enterprises, Game of Thrones |
| Purple | Small town family store | Why change? | “Life is a mystery!” “We don't take kindly to strangers.” | |

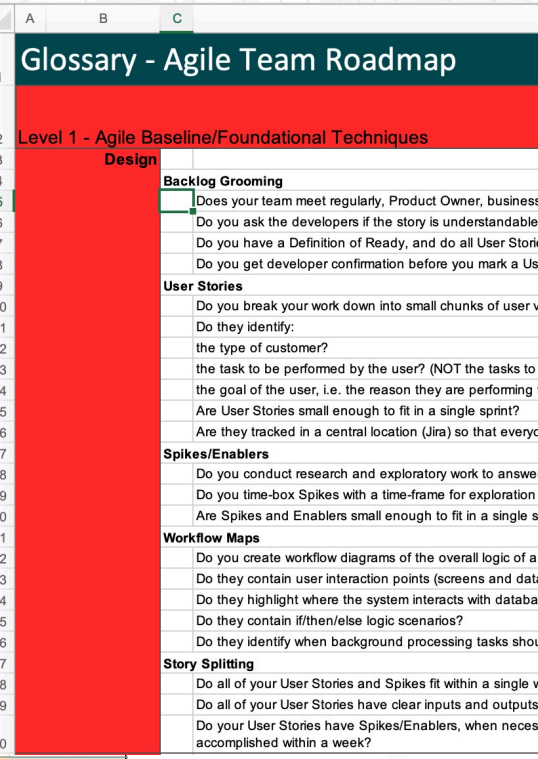
# The Agile Maturity Model

| Level | Design | Planning | Development | Testing | Operations | People |
|---|---|---|---|---|---|---|
| Green | World Impact Planning, Teal | American Metrics | Reusable Code, Open Source Library Development/Support | World Impact Metrics | Continuous Deployment | Positive Psychology, American Performance System, 20% Time |
| Orange | Problem Interviews, Wizard of Oz, Frankenstein, Concierge | Pirate Metrics, Theory of Constraints | BDD, APIs, Architectural Stories, Pi Programming Technical Health | Gherkin Syntax, Automated Testing Diamond, DevOps | Automated Deployment | OKRs, American Performance Reviews, Losada Ratio |
| Amber | Product Managers, Start w/Why, MVPs, eWSJF, Prototypes, Wireframes | PI Planning, Roadmaps, Impact Maps, Burnup Charts | Cross-functional, Pull Model, ATDD, WIP Limits, Repository Branching, Tech Debt | Validation Criteria, Stories Verified In-Sprint, Integration/ Regression Testing | Automated setup/builds, Build reports, Rollback | Double Aces, Decision Tree, Awesome Island, 360-Degree Quarterly Reviews |
| Red | Product Owners, Story Splitting, Backlog Grooming, Spikes, User Stories | ScrumMasters, Burndown Charts, Planning Poker | Daily Standups, Impediment Tracking, Serial Delivery, Repositories | Acceptance Criteria, In-Sprint Manual Testing, Bug tracking | Manual setup & Deployments | Retrospectives, Yearly Performance Reviews |



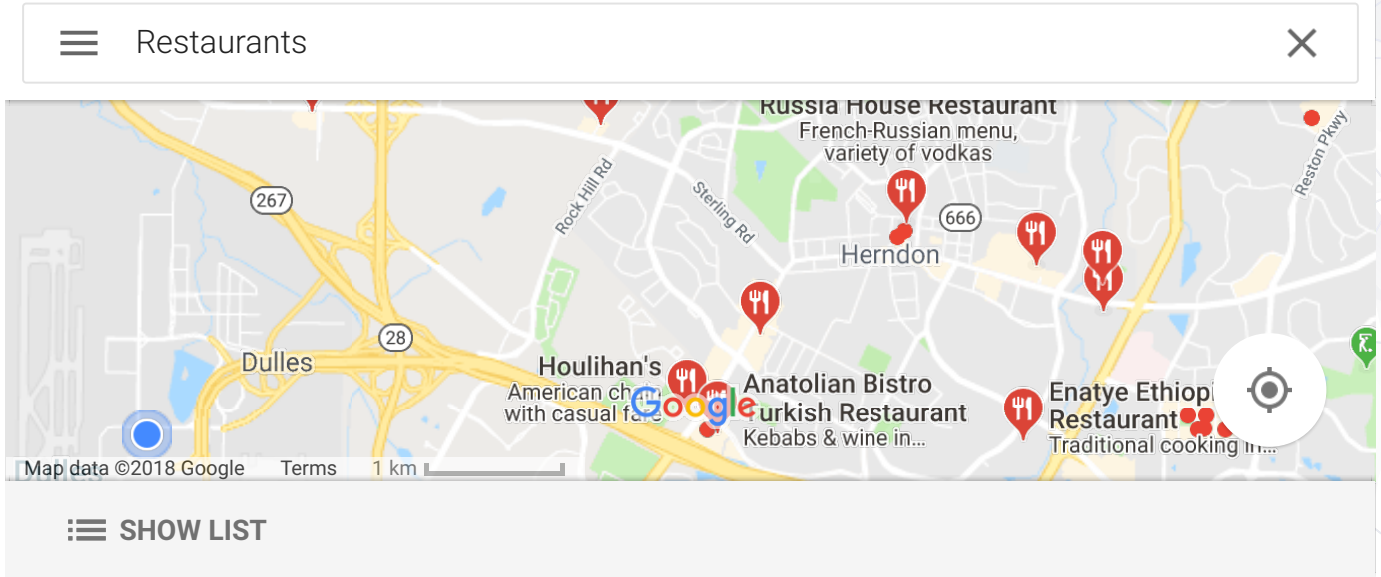




https://lithespeed.com/agile-team-roadmap/

# Agile Team Roadmap

# Welcome! Would you like to join us for lunch?

1. Take them out to eat
2. Show them a map of the area
3. They explore and find new restaurants




# Example: A New Team Member

# Agile Baseline

| Level 1 - Agile Baseline/Foundational Techniques | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Design | | | | | Planning | | Development | Testing | | |
| Backlog Grooming | User Stories | Spikes | Workflow Maps | Story Splitting | Planning Poker | Burndown Charts | Daily Stand Ups | Acceptance Criteria | In-Sprint Testing | Bug Tra |
| 4 | 3 | 5 | 0 | 3 | 3 | 2 | 5 | ? | 3 | |
| | 1 | 3 | | 2 | 5 | 1 | 4 | 1 | 3 | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**Features**

- Quick Wins
- Large productivity boosts
- Anyone can do them, whether they want to or not
- After you do it, the lightbulb goes on and they understand why.

**How to Measure**

- Are they doing it? How often?
- Story Count Velocity
- Predictability (Actual vs Committed)
- Time to Close Impediments

"Just do it!"

# Organizational Alignment

| Level 2 - Contextual/Goal-Based | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Design | | | | Planning | | | Development | | | |
| User Interface Prototyping | Data Interface Prototyping | eWSJF | MVPs | Roadmaps | Measurable Customer Impact Tracking | Forecasting (e.g. Burn up Charts) | Cross-Functional | Serial Delivery/WIP Limits | ATDD | Tech De |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

## Features

- Promotes teamwork and Collaboration
- Goal-Oriented instead of Task-Oriented
- Takes a Long View
- Promotes Efficiency

## How to Measure

- Give teams a goal and metrics
- KPIs - Key Performance Indicators
- Don't focus on how.
- If not working, adjust the metrics

# Data-Driven Decision Making

| Level 3 - Data-Driven | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Design | | | Development | | | | Testing | | Operations | |
| Problem Interviews | Experiments | Metrics (e.g. Pirate Metrics) | BDD | API-Based Architecture | Technical Health (vs Tech Debt) | PI Programming | Cross-functional Test Syntax (e.g. Gherkin) | Automated Testing Diamond | DevOps | Automa Deploym |
| 2 | | | | 4 | 1 | | 3 | 2 | 4 | |
| | | | | 1 | | | | | 2 | |
| | | | | | | | | | | |
| | | | | | | | | | | |

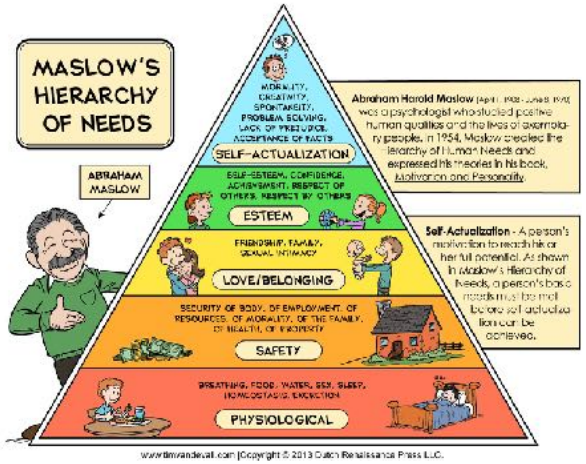
## Features

- Promotes direct customer engagement and collaboration
- Leverages the Scientific Method
- Leverages A.I. and automation
- Promotes self-organized teams and mutual respect

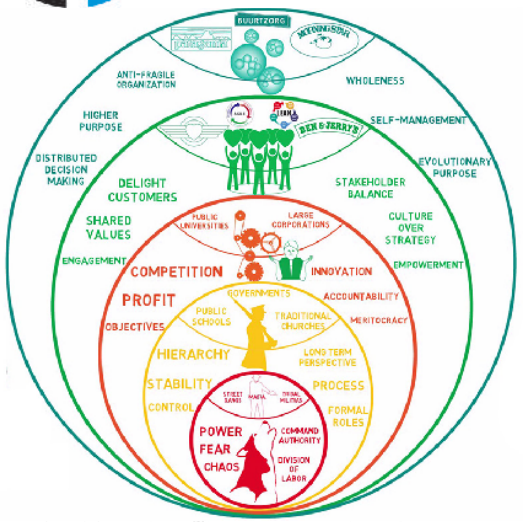
## How to Measure

- Teams at this level know how to participate in strategy
- Have teams propose goals and metrics for approval
- Use dashboards to track real-time performance

“In times of change learners inherit the earth; while the learned find themselves beautifully equipped to deal with a world that no longer exists.”




LEAN STARTUP CIRCLE




AGILE DC EXECUTIVE SUMMIT

AGILE LEADERSHIP ACADEMY

Scrum Alliance CAL CREDENTIAL 1

LitheSpeed




## Pete Oliver-Krueger:

peter.ok@lithespeed.com


We can help you with:

- Agile HR "How you introduce something has more impact than what you introduce."
- Are your Agile & DevOps "Done Done"? Wondering what's next? Welcome to the Green, and Teal Organizational Levels
- Agile Teams, but Middle Managers or Executives don't "get it"? Ask us about the Agile Leadership Academy

# The End

ÁBACO STRATEGY.

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Leesburg, VA 20148
703.785.5215
www.AbacoStrategy.com

**D-U-N-S No:** 079410349
**CAGE No:** 767H4
**NAICS:** 541511, 541512, 541519
541611, 541618, 561110
561410, 611519

EDWOSB Certified Economically Disadvantaged Women-Owned Small Business

HUBZone Historically Underutilized Business Zone CERTIFIED

CERTIFIED SWaM Small, Women and Minority-Owned
Supplier Diversity Strengthens the Commonwealth
by the Virginia Department of Minority Business Enterprise

ISO 9001:2008 CERTIFIED

# EVM Metrics in Federal Government Agile Contracts: Filling the Project Monitoring Gap in Agile Projects

Presented by

Dr. Dan Navarro
Dr. Mahdieh Gholampoor

May 8, 2019

You can count on us!

# Agenda

- Background and Objectives
- Earned Value Management
- Agile Scrum for Application Development
- Agile on EVM
- Why Agile projects fail?
- Using EVM KPIs to improve Agile performance
- Q & A



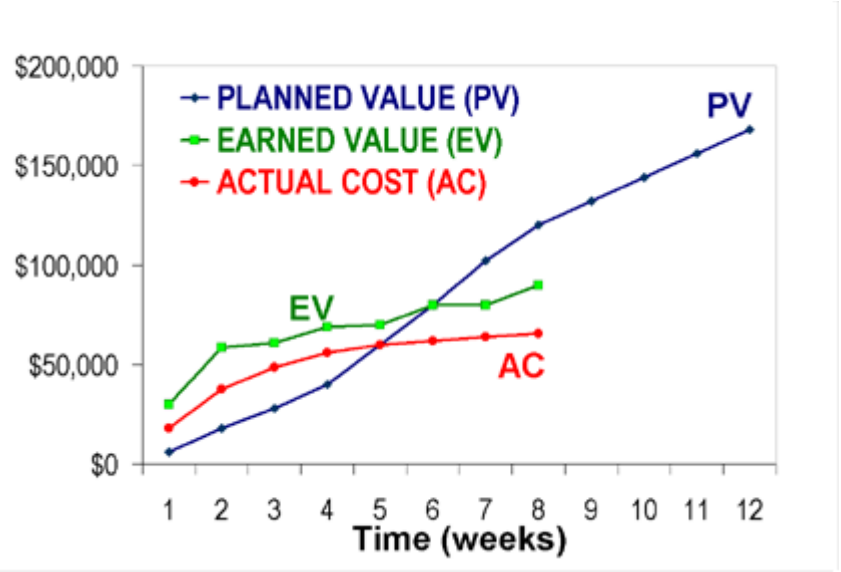
# Background & Objectives

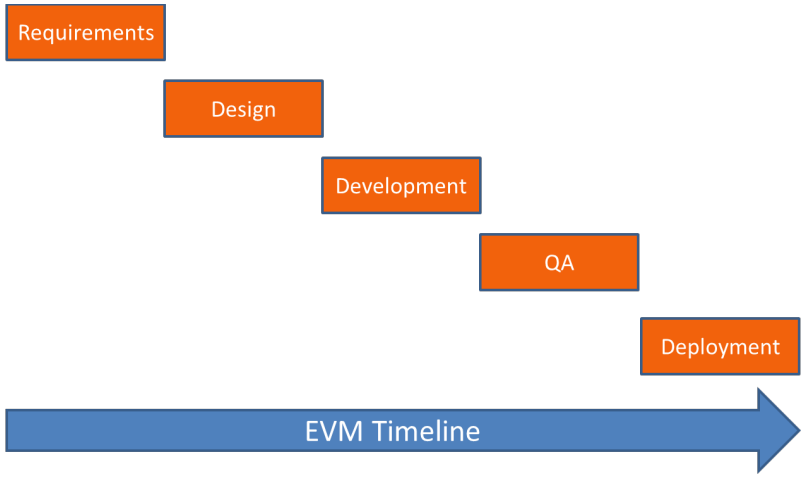
- Background:
  - In recent years, Governments have been adopting Agile practices for software development projects, which provide a lean flow of value
  - EVM, as a method of project control, has been successfully practiced in traditional engineering projects and for software products
  - OMB Circular A-11, Page 843: The acquisition strategy should make sure any contracts resulting from the acquisition that meet the Major Acquisition Threshold contain requirements for the use of EVM.
  - OMB Circular A-11, Page 850: If the scope of work requires development type work, EVM must be the major management system used.
  - ANSI 748 standard recommends the use of EVM as a good project management practice when applicable for development efforts or multiple projects in a program
- Objective
  - In this presentation authors discuss the implementation of EVM in Agile projects, and review how to use EVM metrics to monitor and improve performance in Agile projects. Real life scenarios focus on how Contract Officers and Project Managers can use EVM metrics to identify early signs of potential performance problems in projects.



# Earned Value Management (EVM)

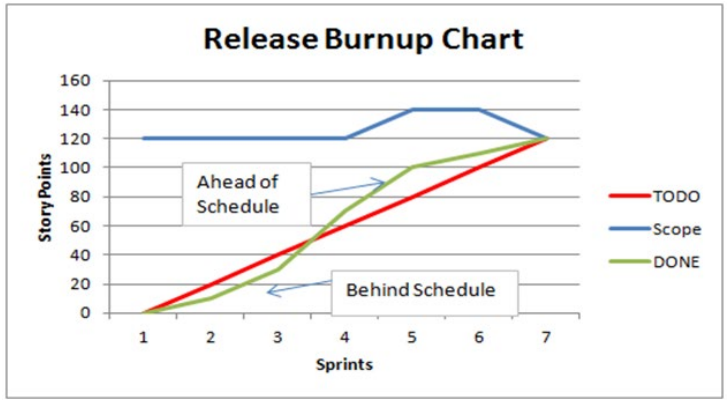
- A project management technique for measuring project performance and progress.
- EVM has the ability to combine measurements of the project management triple constraint: scope, time, and costs.
- Application of EVM principles provides positive predictors of project success. Provides accurate forecasts of project performance problems.
- EVM for Software Development typically used in waterfall model (relatively linear sequential design and development approach).

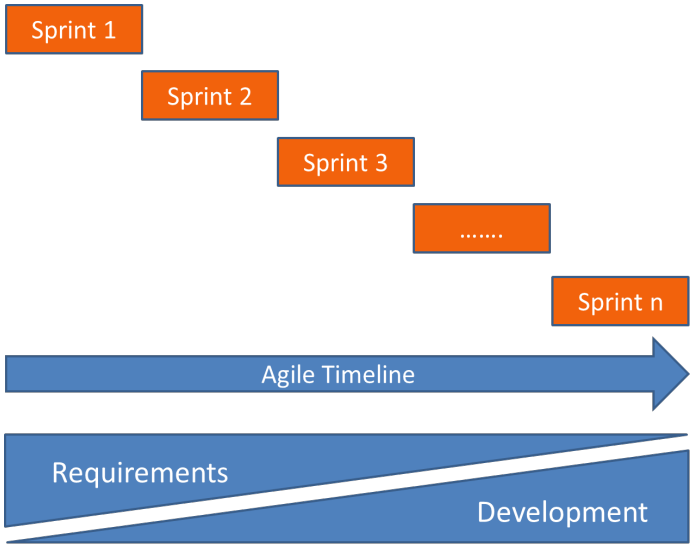


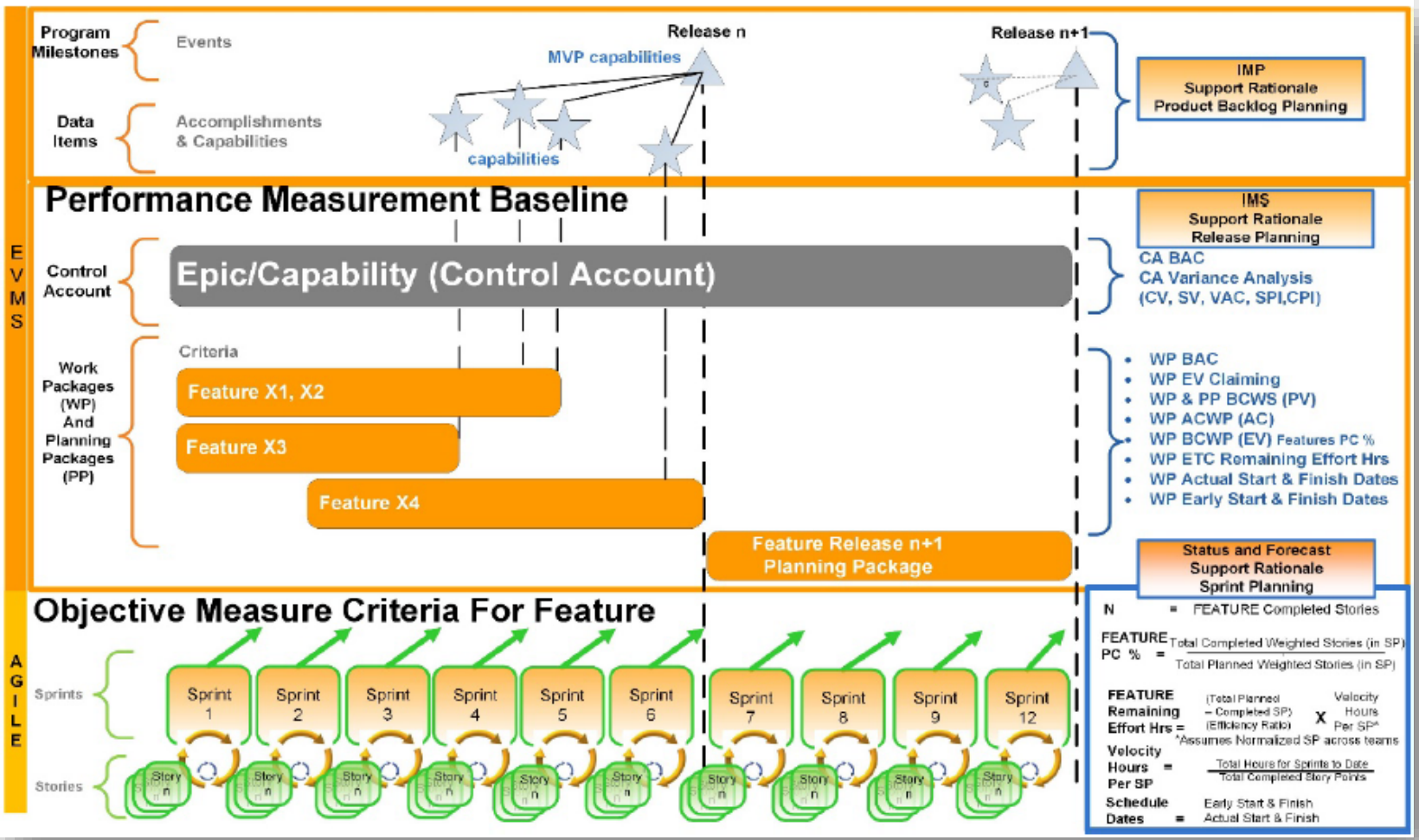
# Agile Scrum Framework



# Agile on EVM

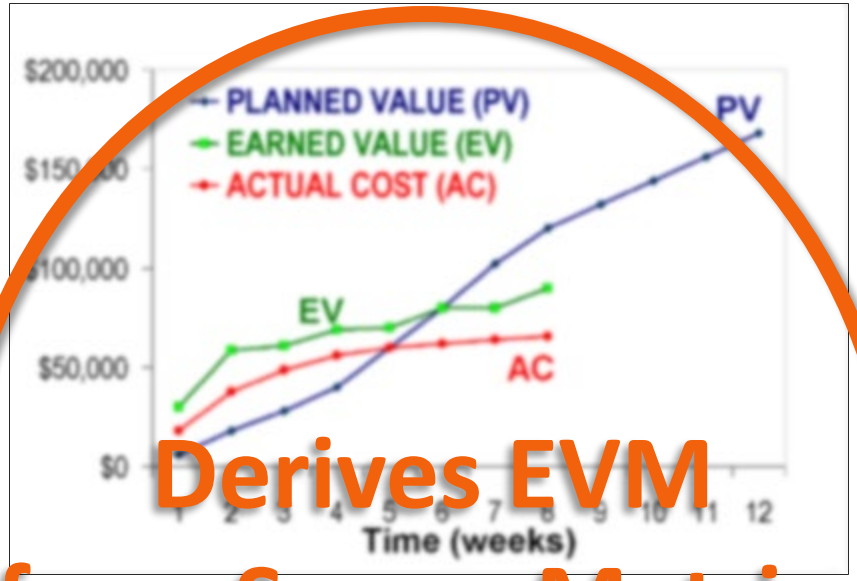



NDIA's Agile Product and Time Hierarchies

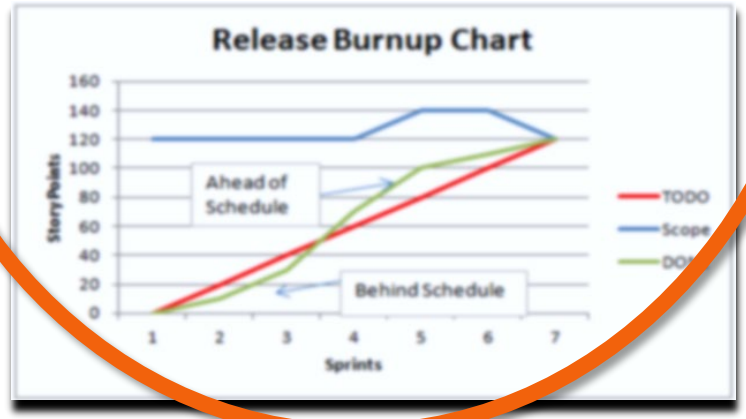
https://www.humphreys-assoc.com/evms/evms-documents/ndia/NDIA_IPMD_EVM_Agile_Guide_Rev_Mar112016.pdf

# Agile Scrum EVM framework

- It is an adapted implementation of EVM that uses Agile Scrum framework inputs to calculate traditional EVM metrics.
- Agile Scrum EVM framework is based on the notion that total scope is known. The framework is not well-suited for large-scale agile programs.
- Requires a minimal set of input parameters:
  - Planned and actual cost of a project
  - Estimated product backlog
  - Release plan (Product roadmap and number of iterations)
  - Assumed velocity (story points as a measure of story complexity and velocity)
- Agile Scrum EVM combines burn-up charts (as used in Scrum) with project cost information.




**Derives EVM from Scrum Metrics**



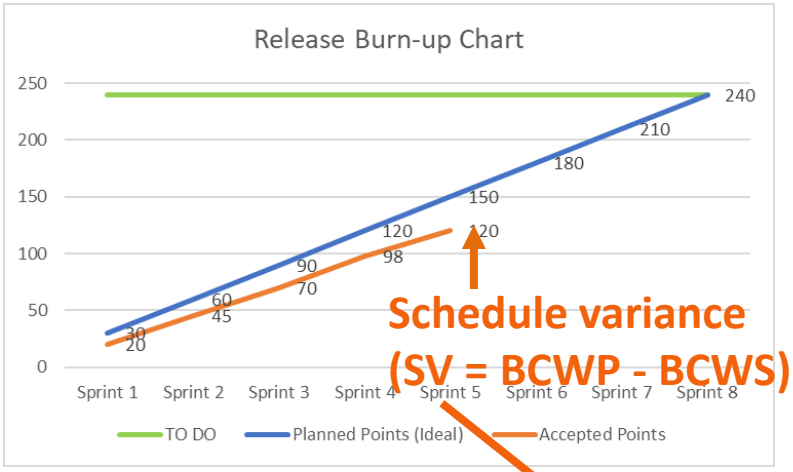
# Agile Metrics to Track EVM KPIs

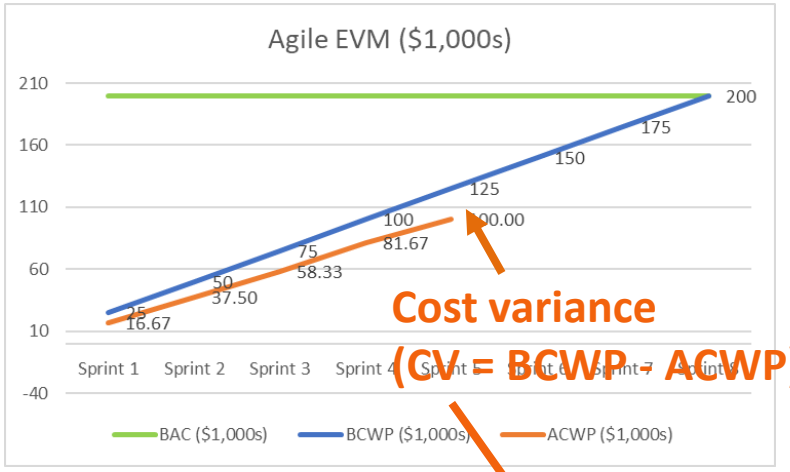
- Agile EVM – Glossary & KPIs
  - ***Actual Cost (AC) a.k.a., Actual Cost of Work Performed (ACWP)*** *– The AC represents the total costs incurred in accomplishing the work completed (usually cumulative to date, or any selected time period).*
  - ***Budget at Completion (BAC)*** *– The total value of budget (distributed) within the Performance Measurement Baseline (PMB).*
  - ***Earned Value (EV) a.k.a., Budgeted Cost of Work Performed (BCWP)*** *– The EV is the cumulative value of the work performed (usually cumulative to date, or any selected time period). EV is calculated at feature level, project level and program level in dollars and story points.*
  - ***Planned Value (PV) a.k.a., Budgeted Cost of Work Scheduled (BCWS)*** *– The sum of the authorized budgets for work planned to be completed plus the level of effort scheduled to be accomplished (usually cumulative to date, or any selected time period). EV is calculated at feature level, project level and program level in dollars and story points.*
  - ***Cost Performance Index (CPI)*** *– The CPI is the performance ratio comparing BCWP (EV) and ACWP (AC), for any given period of time. (EV/AC). CPI gives a measure of efficiency. A CPI of 1 indicates the project is spending the at the planned rate of expenditures. A CPI less than 1 means the project is over budget. A CPI greater than 1 means project is under budget.*
  - ***Cost Variance (CV)*** *– The difference between EV and AC for any given period of time. (BCWP-ACWP)*
  - ***Estimated Cost at Completion (EAC)*** *– Statistical estimate of all costs at complete based upon current performance, calculated by taking actual direct costs allocated to the contract plus a forecast for costs of authorized work remaining based on cumulative performance to date.*
  - ***Schedule Performance Index (SPI)*** *– The schedule performance index is the performance ratio comparing EV and PV for any given time period. (BCWP/BCWS). A CPI of 1 indicates the project is spending the at the planned rate of expenditures. An SPI less than 1 means the project is behind schedule. An SPI greater than 1 means project is ahead of schedule.*



# Agile EVM Metrics

## (FFP capacity model)



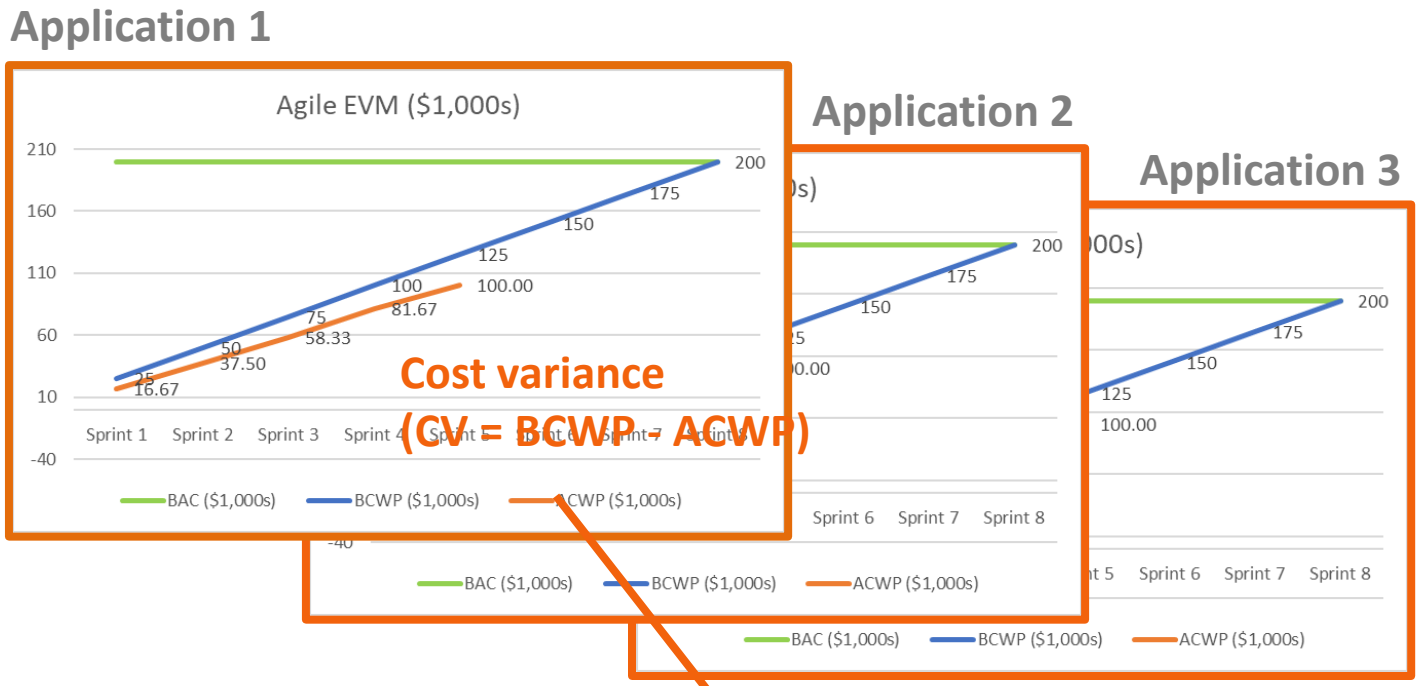

**Schedule variance (SV = BCWP - BCWS)**

**Cost variance (CV = BCWP - ACWP)**

| Sprint | Planned Velocity per Sprint | Accepted Points per Sprint | Project Budget per Sprint (FFP - $1,000s) | Actual Spent per Sprint (FFP - $1,000s) | Planned Points (BCWP in Points) | Accepted Points (BCWS in Points) | Schedule Variance in Points (SV = BCWP - BCWS) | Planned Value in Dollars (PV or BCWS in $1,000s) | Earned Value in Dollars (EV or BCWP in $1,000s) | Actual Cost in Dollars (AC or ACWP in $1,000s) | Cost Variance in Dollars (CV = EV - AC) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sprint 1 | 30 | 20 | $ 25.00 | $ 25.00 | 30 | 20 | -10 | $ 25.00 | $ 16.67 | $ 25.00 | $ (8.33) |
| Sprint 2 | 30 | 25 | $ 25.00 | $ 25.00 | 60 | 45 | -15 | $ 50.00 | $ 37.50 | $ 50.00 | $ (12.50) |
| Sprint 3 | 30 | 25 | $ 25.00 | $ 25.00 | 90 | 70 | -20 | $ 75.00 | $ 58.33 | $ 75.00 | $ (16.67) |
| Sprint 4 | 30 | 28 | $ 25.00 | $ 25.00 | 120 | 98 | -22 | $ 100.00 | $ 81.67 | $ 100.00 | $ (18.33) |
| Sprint 5 | 30 | 22 | $ 25.00 | $ 25.00 | 150 | 120 | -30 | $ 125.00 | $ 100.00 | $ 125.00 | $ (25.00) |
| Sprint 6 | 30 | | $ 25.00 | | 180 | | | $ 150.00 | | | |
| Sprint 7 | 30 | | $ 25.00 | | 210 | | | $ 175.00 | | | |
| Sprint 8 | 30 | | $ 25.00 | | 240 | | | $ 200.00 | | | |
| | 240 | 120 | $ 200.00 | $ 125.00 | | | | | | | |

# Agile EVM Roll-up – Portfolio Metrics

## (FFP capacity model)




**Cost variance (CV = BCWP - ACWP)**

| Application / Project | Total Budget (BAC) | Planned Value to Date (PV) | Earned Value to Date (EV) | Actual Cost to Date (AC) | Cost Variance (CV) | Cost Performance Index (CPI = EV/AC) | Schedule Performance Index (SPI = EV / PV) | Estimate at Completion (EAC = BAC / CPI) |
|---|---|---|---|---|---|---|---|---|
| Application 1 | $ 200.00 | $ 125.00 | $ 100.00 | $ 125.00 | $ (25.00) | 0.80 | 0.80 | $ 250.00 |
| Application 2 | $ 300.00 | $ 150.00 | $ 150.00 | $ 150.00 | $ - | 1.00 | 1.00 | $ 300.00 |
| Application 3 | $ 800.00 | $ 175.00 | $ 200.00 | $ 180.00 | $ 20.00 | 1.11 | 1.14 | $ 720.00 |
| Program Totals | $ 1,300.00 | $ 450.00 | $ 450.00 | $ 455.00 | $ (5.00) | 0.99 | 1.00 | $ 1,314.44 |

**Portfolio EAC = BAC / CPI ($1,314 = $1,300 / 0.99 )**

# Why Agile projects fail?

- Based on a literature review, there are about 50 reasons listed on why agile projects fail, and they can be categorized as:
  - Lack of experience/training with the methodology
  - Culture
    - Organization's values not aligned with Agile core values
    - Not open to change
    - Other non-agile teams of the organization not being open about agile
  - Lack of buy-in from executive level

**Source:**

- Agile problems, challenges, & failures , Miller, https://www.pmi.org/learning/library/agile-problems-challenges-failures-5869
- 8 Reasons Why Agile Projects Fail, Cunningham, https://www.agilealliance.org/8-reasons-why-agile-projects-fail/
- Agile Failure Patterns in Organizations 2.0, https://age-of-product.com/agile-failure-patterns-in-organizations/
- The impact of Organizational Culture on Agile Method Use, Strosede, Huff & Tretiakov, https://www.researchgate.net/publication/221183602_The_Impact_of_Organizational_Culture_on_Agile_Method_Use

# Impact of Organizational Culture in Agile Method Use

Organizational Culture Factors that correlate significantly with Agile methods performance. The organization:

- Values feedback and learning. Social interaction is trustful, collaborative and competent. The project manager acts as a facilitator.
- Values teamwork, is flexible and participative.
- Enables empowerment of people.
- Is results oriented.
- Leadership is entrepreneurial, innovative and risk taking.
- Is based on loyalty and mutual trust and commitment.

- The impact of Organizational Culture on Agile Method Use, Strosede, Huff & Tretiakov, https://www.researchgate.net/publication/221183602_The_Impact_of_Organizational_Culture_on_Agile_Method_Use

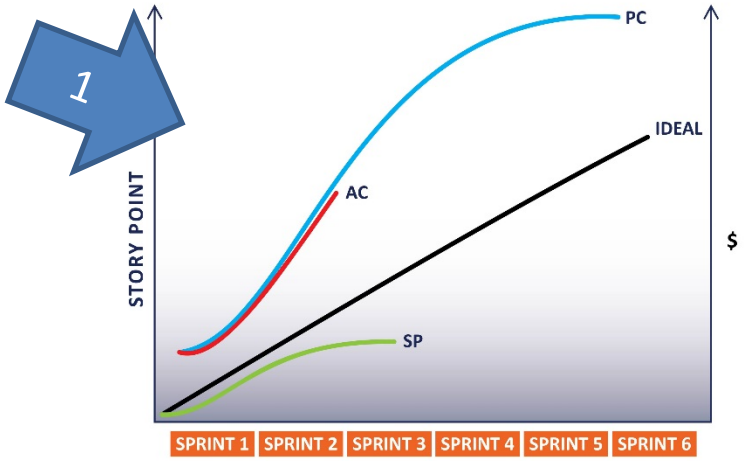


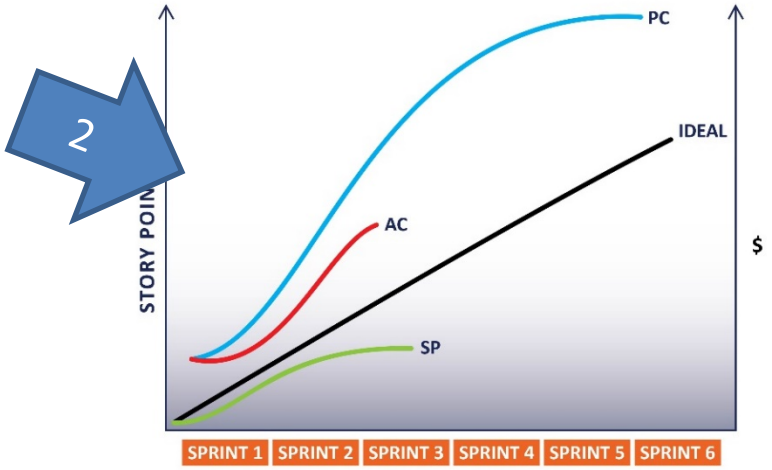
# EVM Baseline Maintenance in Agile environments

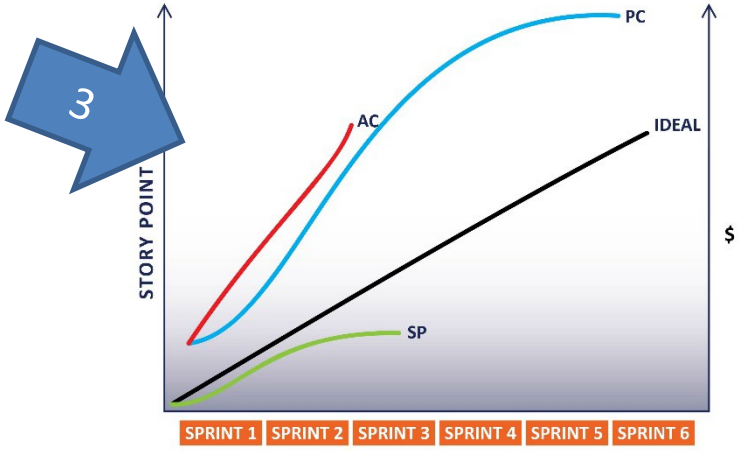
- Requires active engagement of the government.
- Requires frequent backlog grooming sessions to decide how to deal with changes in scope (this is the nature of agile). For Example:
  - Taking features out of releases using controlled change process
  - Removing stories if they are not necessary for the release baseline, causing a positive schedule variance
  - Adding unplanned stories needed to accomplish the desired feature, causing a negative schedule variance
  - Adding features that were not in the original contract, causing a contractual direction and modification
  - Improving team velocity, allowing the team to complete additional work from the backlog. This could require a baseline change and/or cause positive schedule variance



# Negative Burnup Variance

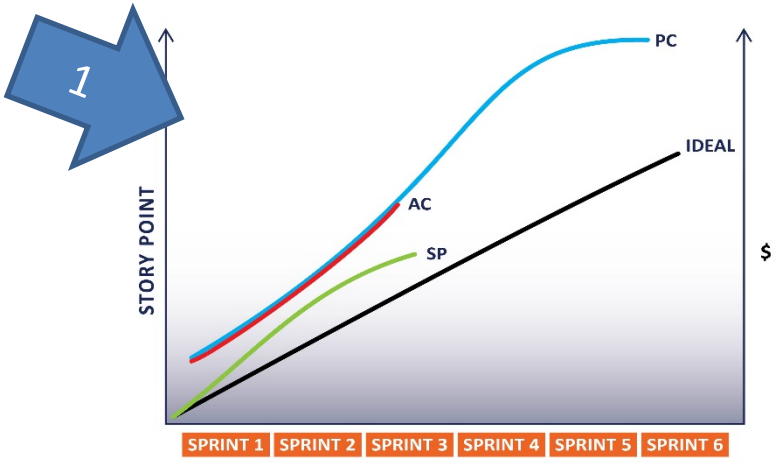


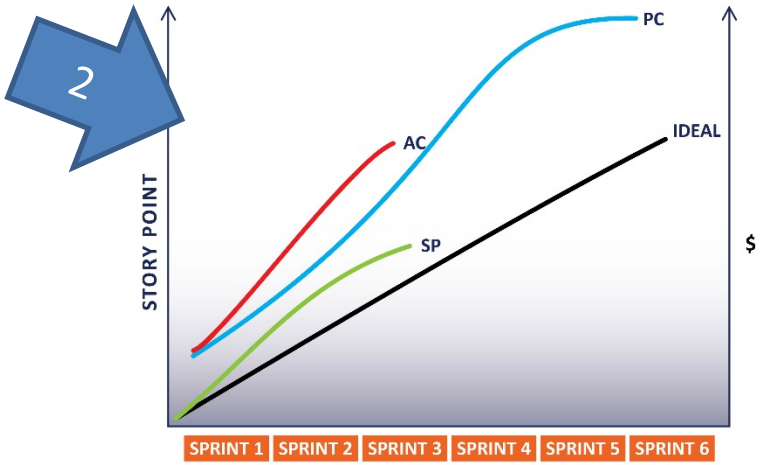



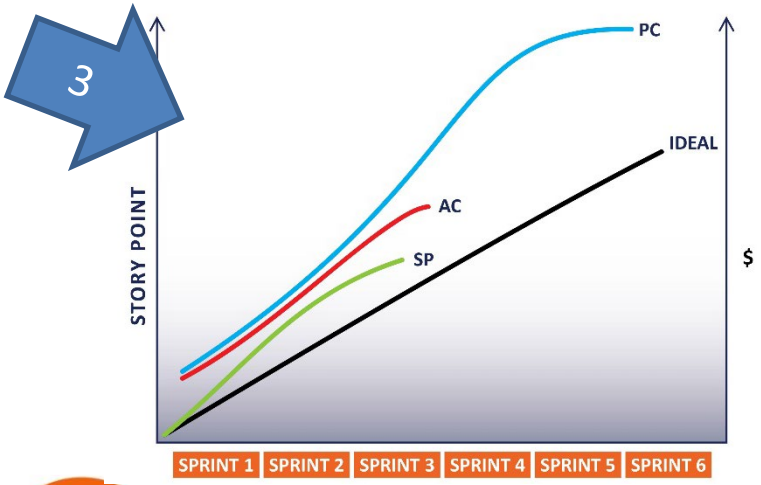




| # | Most Possible Scenario | Who should get engaged? |
|---|---|---|
| 1 | Under performing scrum team | PM/Scrum Master |
| 2 | Wrong estimation of velocity | PM/Scrum Master |
| 3 | Wrong estimation on story points | Scrum Master/Tech Lead/PO |

# Positive Burnup Variance

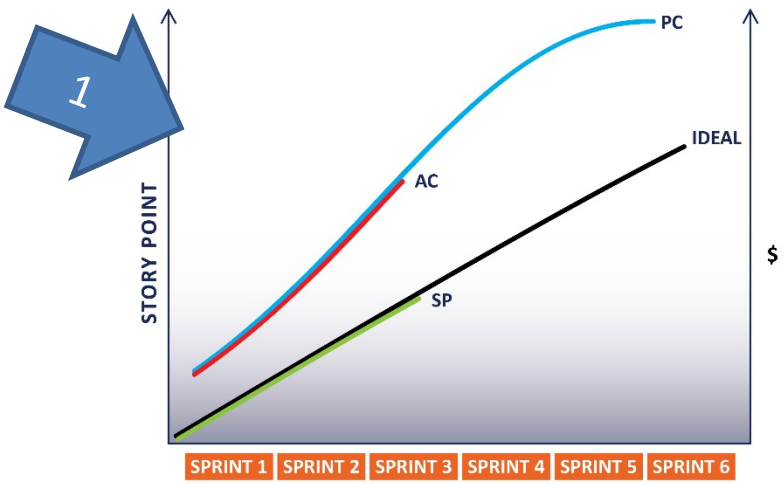


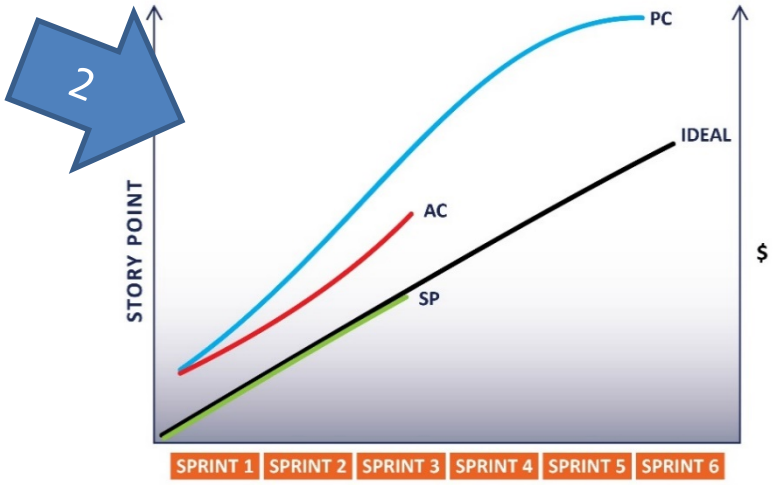



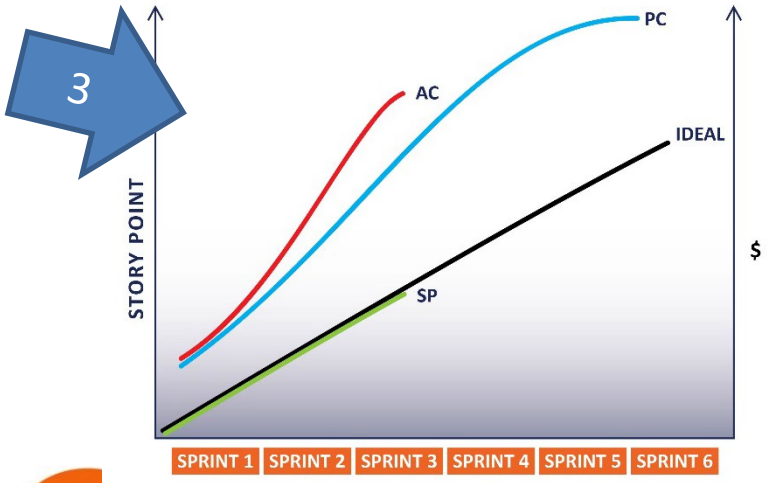




| # | Most Possible Scenario | Who should get engaged? |
|---|---|---|
| 1 | Velocity improvement | Scrum Master |
| 2 | Wrong estimation of velocity | PM/PO |
| 3.1<br>3.2 | Velocity improvement<br>Wrong story point estimation | Scrum Master<br>Technical Lead/PO |

# Burnup on Track




| # | Most Possible Scenario | Who should get engaged? |
|---|---|---|
| 1 | Mature Scrum Team | Scrum Master/PO |
| 2 | Over Performing scrum team (improved velocity) | Scrum Master/PO/PM |
| 3.1<br><br>3.2 | Wrong estimation on story points<br>Under performing scrum team | Technical Lead/PO PM/Scrum Master |


Q
A


THANK
YOU

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2019

# AGILE IN GOVERNMENT SUMMIT

THE VALUE OF PERFORMANCE.

NORTHROP GRUMMAN

# Managing Agile Teams

## A Servant-Leader Based Approach

NDIA Agile in Government Summit May 8-9

Scott Grimes

Software Engineer/Product Owner

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# GAP CIE Global Adaptive Planning Collaborative Information Environment



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# What is GAP CIE

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- Web-Based Collaborative Planning Portal
- Joint Operation Planning
- Program of record for Joint Course of Action (COA) development
- Situation awareness for Joint operations
- Senior Leaders
- Awarded to Northrop Grumman in 2014
- Technical Debt
- Fragile and unstable system






Transformation through Agile

# Purpose

## Mission Statement

"Foster an organizational culture that empowers cross-functional teams working across the value stream to deliver the highest quality products while acting with intention and adhering to the Agile Principles."

*aka "Do good things!*

## Core Books






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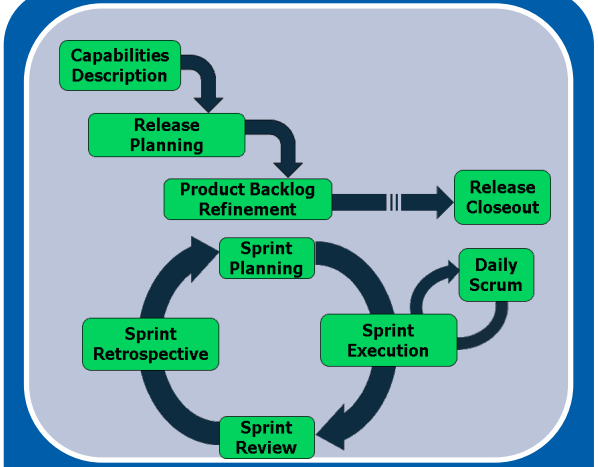
# GAP CIE Vision Statement

- “Serve as a catalyst for Agile and DevOps practices within the Defense Community while remaining true to our culture of team empowerment.”



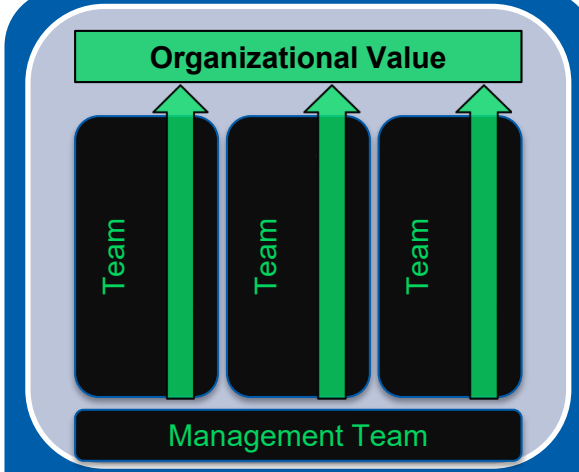
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# GAP CIE Approach



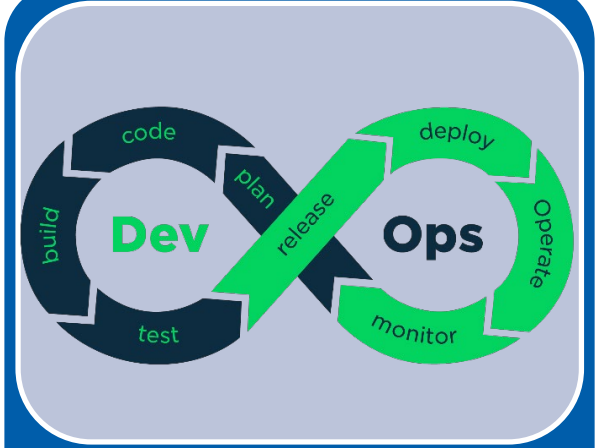

## Agile

- Frequent deliveries
- Continuous feedback
- Transparency




## Lean

- Common goal/vision
- Efficiency



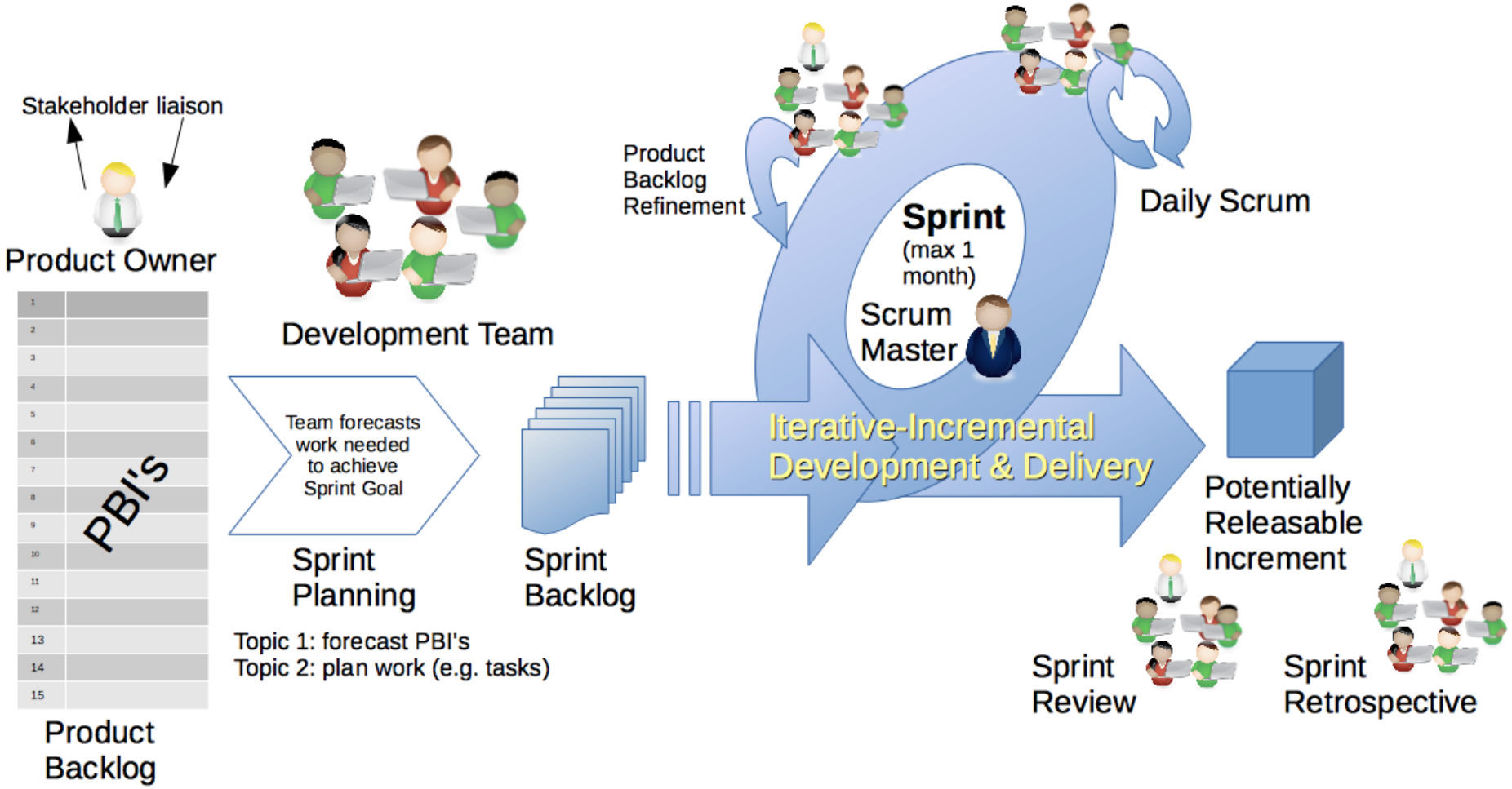

## DevOps

- Automation
- Speed

**Reduced Risk and High Quality**



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# Definitions

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# Power vs Authority

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- Power
  - Do this or you're fired
- Authority
  - Explain why it is being done, ask for input, build consensus
- Who in your life has power?  Who has authority.



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# Manager vs Leader

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- Manager – someone in a formal supervisory role.
  - Could be People Manager or Project Manager
  - Conducts performance reviews
  - Financial planning
  - Wields Power
- Leader – someone who says “Let’s go”
  - Takes the lead in an activity
  - Mentors others
  - Wields Authority



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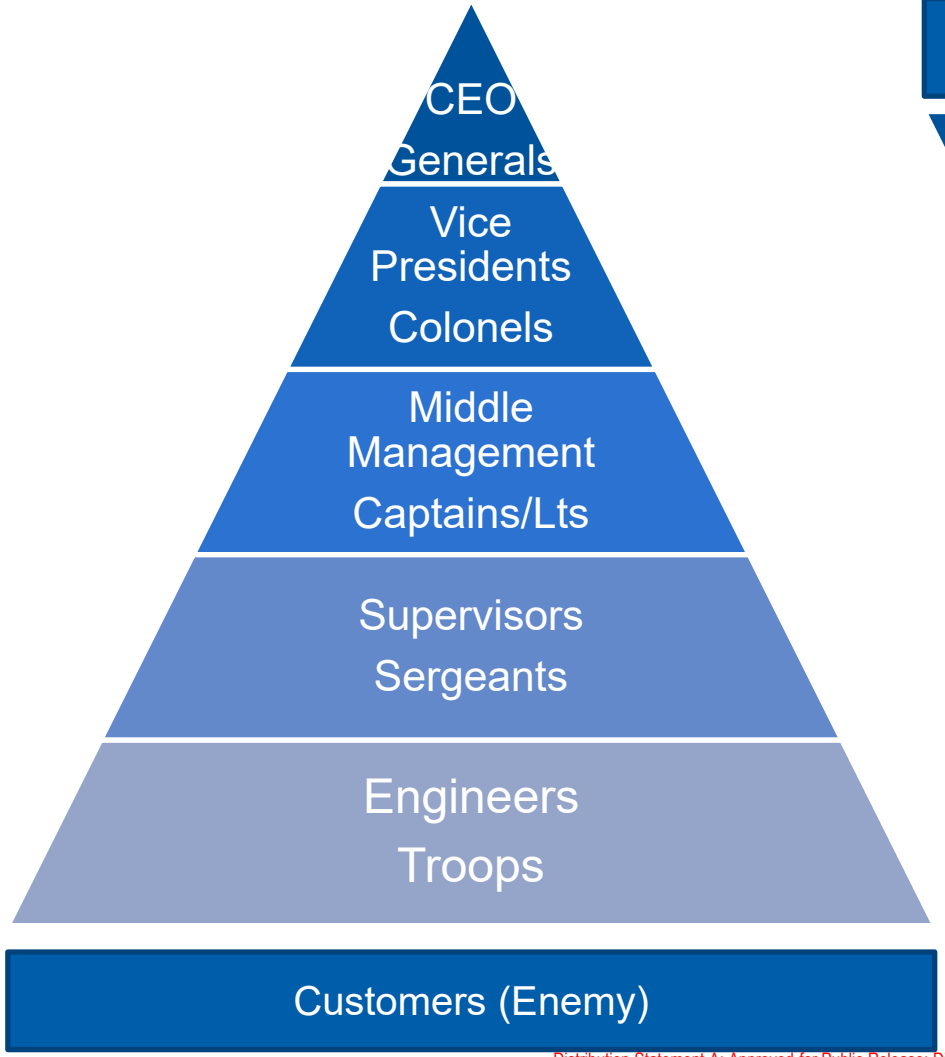
# Servant Leadership

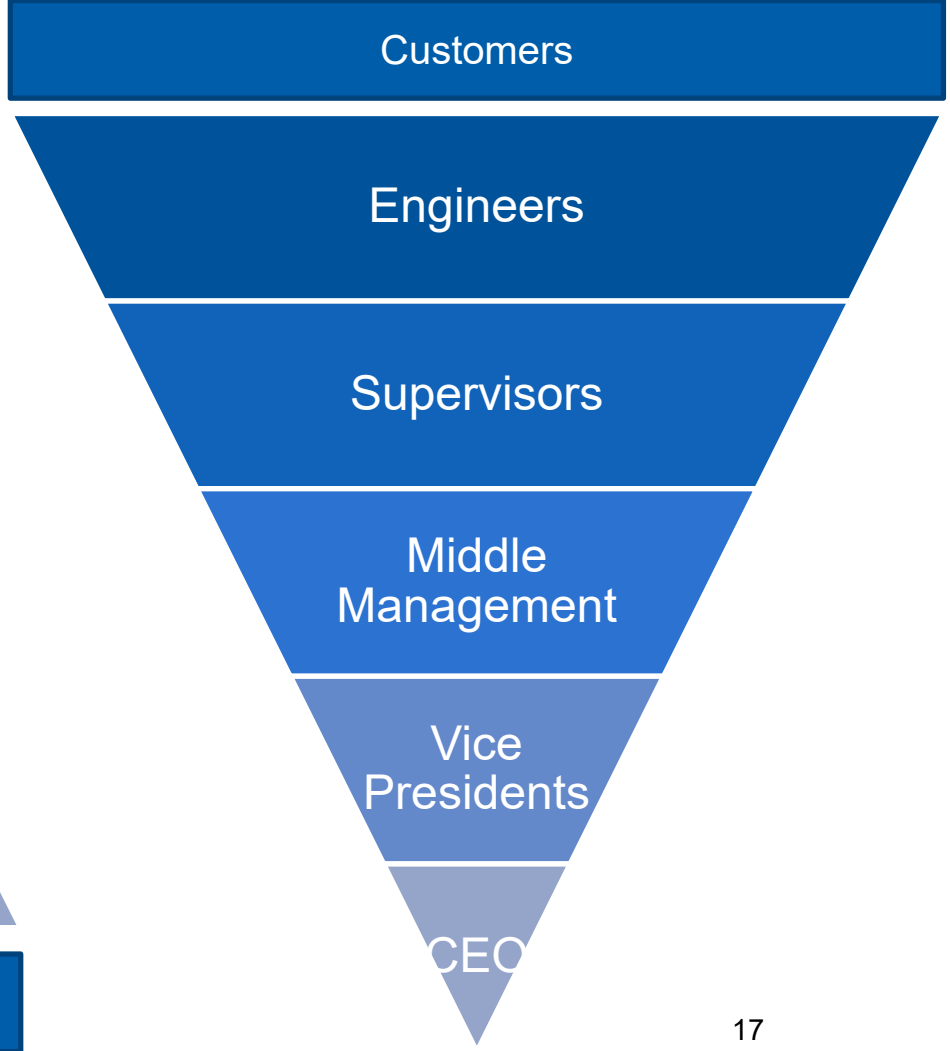
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- “A servant-leader focuses primarily on the growth and well-being of people and the communities to which they belong. While traditional leadership generally involves the accumulation and exercise of power by one at the “top of the pyramid,” servant leadership is different. The servant-leader shares power, puts the needs of others first and helps people develop and perform as highly as possible.”
  - Greenleaf center for Servant Leadership



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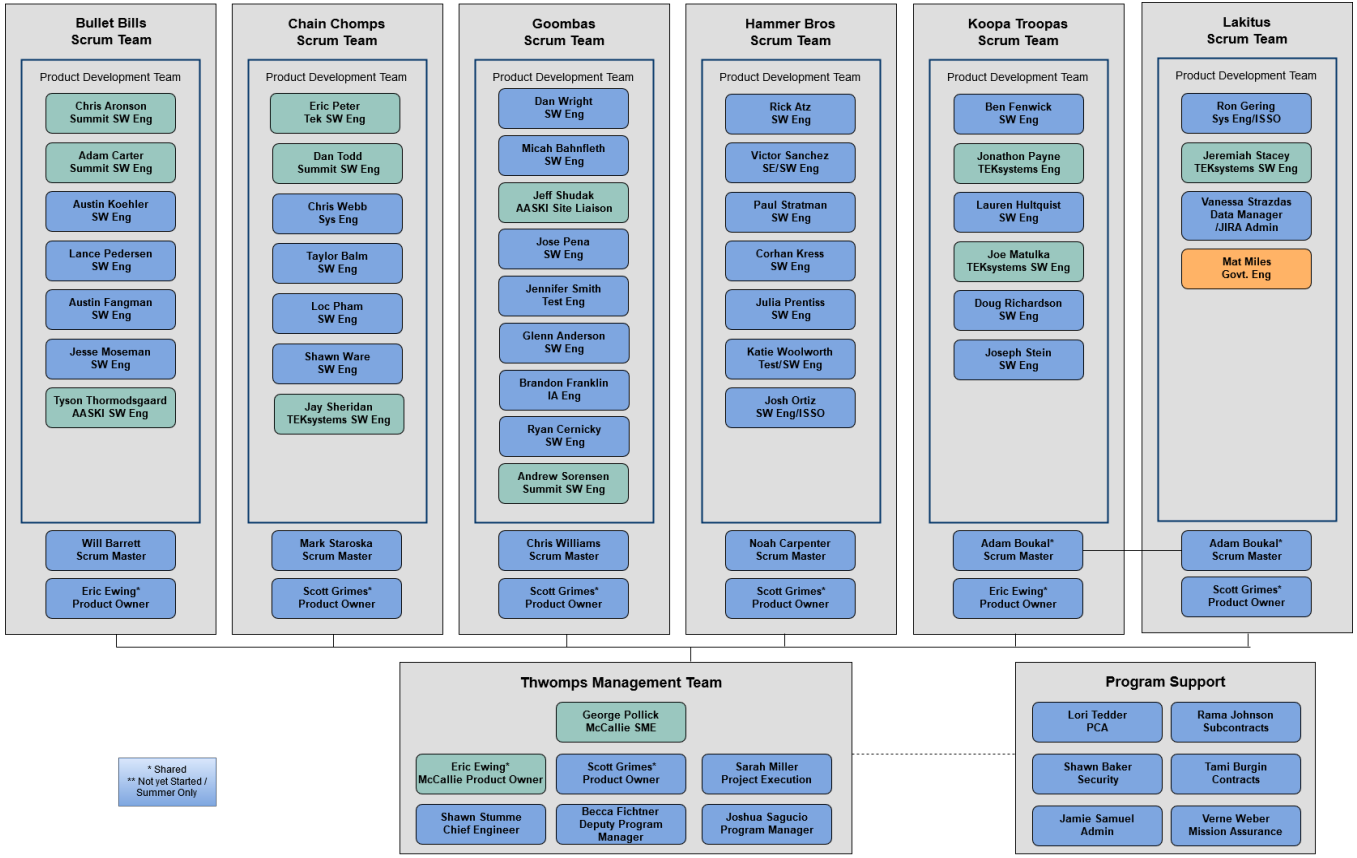





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# Inverted Org Chart






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# Characteristics of Admired Leaders

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- Honest – 85%
- Forward-Looking – 70%
- Inspiring – 69%
- Competent – 64%
- Intelligent – 42%
- Broad-Minded – 40%
- Dependable – 37%
- Supportive – 36%
- Fair-Minded – 35%
- Straightforward – 31%
- Determined – 28%
- Cooperative – 26%



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# Being a Leader

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- Not just strategic thinking
- Embrace the future as a technical leader
  - Agile
  - Devops
  - New Technologies
  - Keep yourself up-to-date on developments in technology
  - Continuous Learning

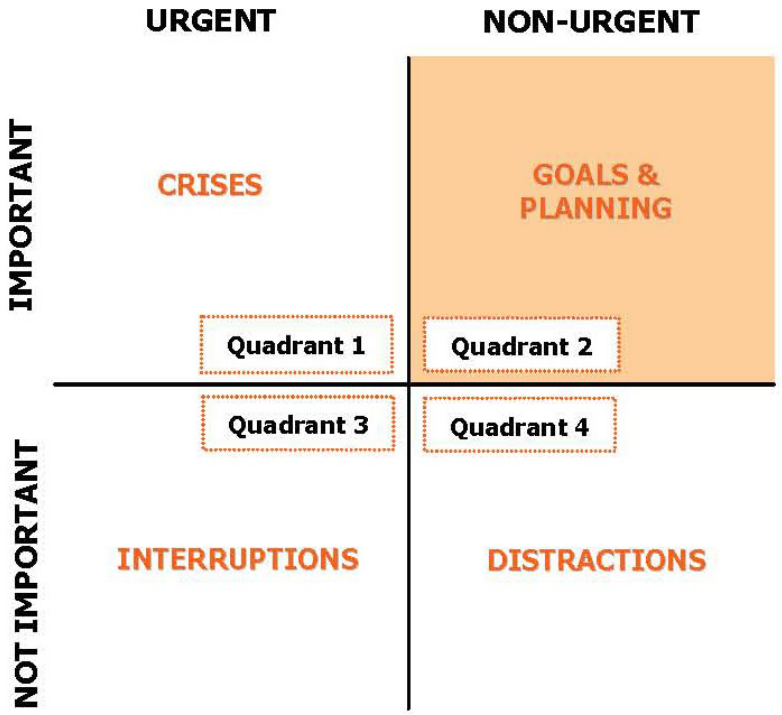


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# Future Planning

- Eisenhower Matrix
- Invest In Quadrant 2
- Set Limits for Quadrant 3
  - Check Email at set Intervals
  - Pomodoro Technique

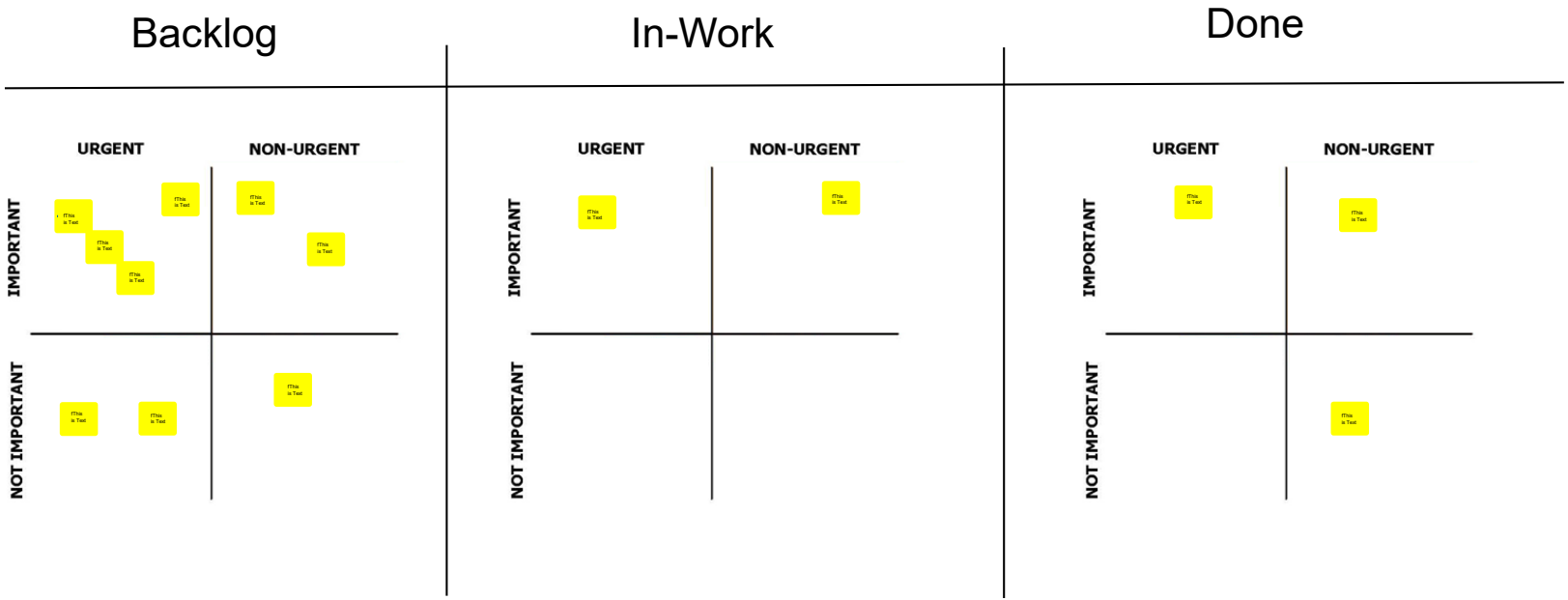





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# Scrum Board With Matrix






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# Managing

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# Think about those you admire

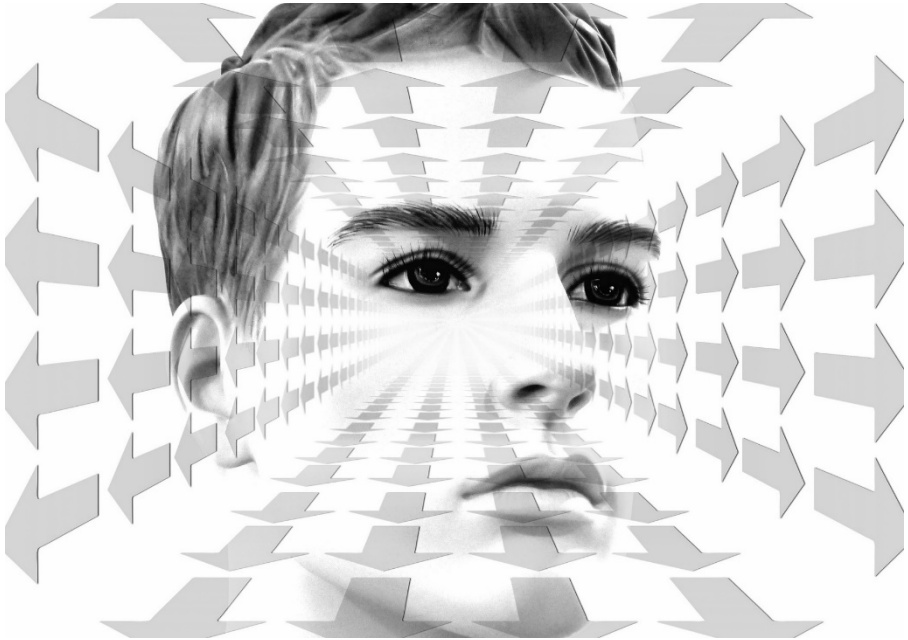
- The People in your life you most like
- Your Best Boss
- The person who Inspires you to do your best
- The acquaintance you most respect



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# Be Outward Focused

- Inward Focus
- “Good” Inward Focus
- Outward Focus
- See Others motivations





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# Empower Others

- *Empowerment: authority or power given to someone to do something.*

- *Who can Empower others?*









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# Create Rules





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# Stress the Rules

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- Create a mission statement
- Refine the mission statement
- Stress the mission statement



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# Examples

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- CVS: “Helping people on their path to better health.”
- Disney: “Creating happiness through magical experiences.”
- “To be a company that inspires and fulfills your curiosity.” – Sony
- “Shape the future of the Internet by creating unprecedented value and opportunity for our customers, employees, investors, and ecosystem partners.” – Cisco



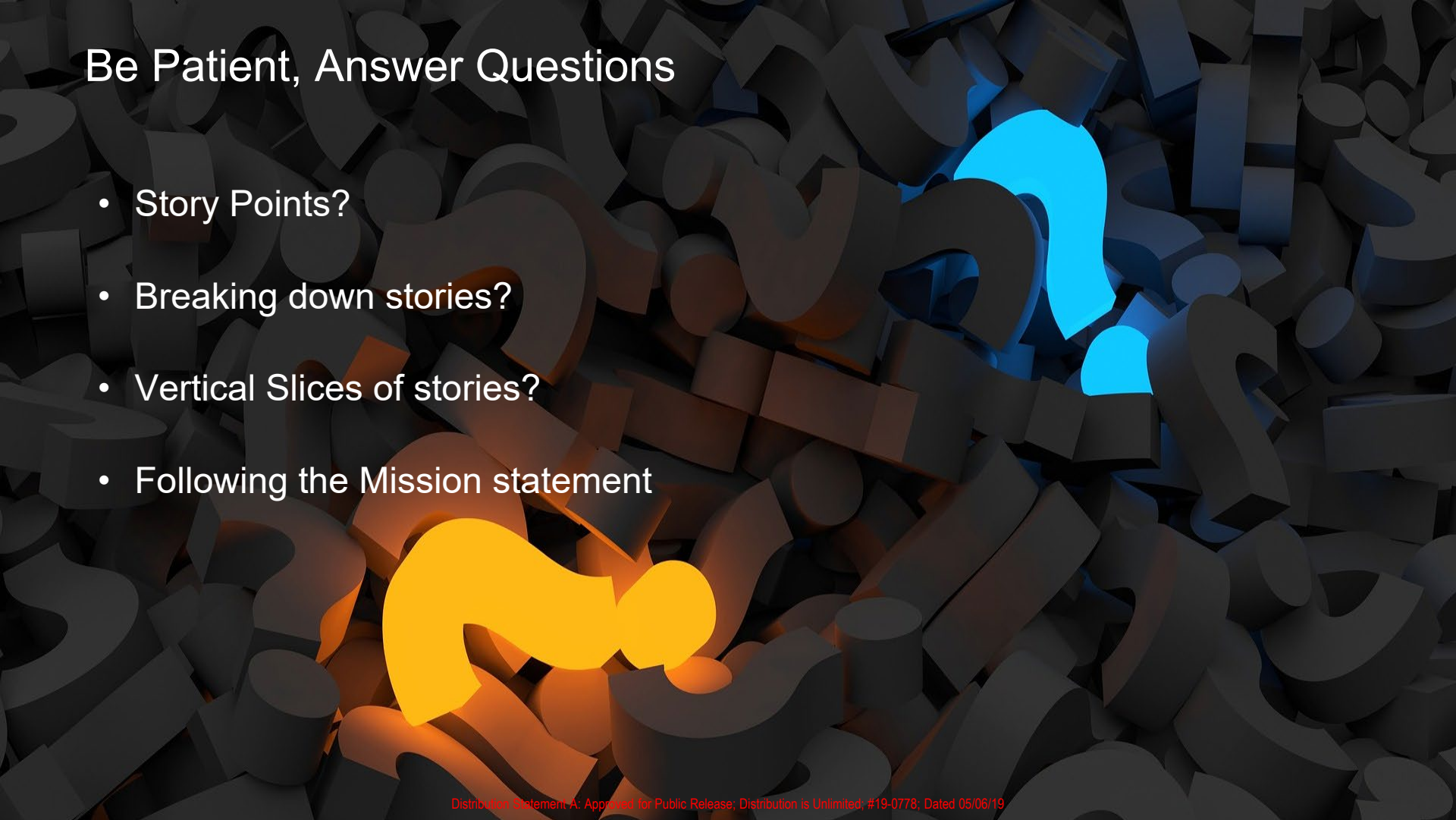
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# Look for Bright Spots



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# Be Patient, Answer Questions



- Story Points?
- Breaking down stories?
- Vertical Slices of stories?
- Following the Mission statement

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# Getting Started

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- Partner with those who have done it before
- Non-traditional contractors
- Small business
- Seed teams with experienced Team Members who “get it”



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# Best Managers are the Best Learners

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- Leadership can be learned
- Learning is critical
  - Professional Development Challenge
  - Community Groups
    - Agile for Defense
    - DevOps for Defense



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# Who are you… Who am I?

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- Identifying your team members
  - Early adopters and self motivators
  - The “2 things I hate” crowd
  - Late and reluctant adopters



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# Are you Learning

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- If you can look at something you've done a year ago, and not be embarrassed to be associated with it, you are not learning.
  - Code
  - Presentations
  - Emails
  - Test Plans
  - Documentation
  - Etc.
- Talent is not the key that unlocks excellence



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# Growth Mindset vs. Fixed Mindset

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- Researcher Carol Dweck: The Effect of Praise on Mindset
- Group A success is praised “you must be smart”
- Group B success is praised “you must have worked hard”
- Group A will want to work on simple problems, and regard failure to mean they are not smart –Fixed Mindset
- Group B will want to work on hard problems, and regard failure to mean they need to work, learn, practice to succeed. – Growth Mindset



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# Questions?

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- Foster an organizational culture that empowers cross-functional teams working across the value stream to deliver the highest quality products while acting with intention and adhering to the Agile Principles.

- *AKA - "Do Good Things!"*



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# Payoff

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## 2018 Program Excellence Awards

**WINNER**

**Supplier Sustainment**

2nd Lt. Catharine Wagner, **U.S. Air Force**
Joshua Sagucio, **Northrop Grumman**
**GAP-CIE**



- Product Owner, Team Member, Scrum Master, Facilitator, Coach, Manager? The Work done by managers of agile teams can decide the success or failure of any agile initiative. The benefits of Agile adoption have become apparent even one of the biggest waterfall advocates, the Department of Defense is now requiring the adoption of Agile Development Methods. The day-to-day implementation of these initiatives requires the coordination between program management and the teams actually doing the work. The Management team must learn to co-create value for the customer in order to succeed and thrive in today's Agile world. How can management and technical leaders contribute to the success of an agile project at all phases of Agile adoption? How can years of experience, research, and knowledge of management principles be leveraged to meet the Agile goal of providing more value quickly. This presentation will provide a fact-based presentation on leadership, interpreting the results of multiple leadership surveys over the past 30+ years in a way that promotes Agility and empowers teams. This presentation will also provide examples from the Global Adaptive Planning Collaborative Information Environment (GAP CIE), a project which recently won the Aviation Week Program Excellence Award under the supplier aftermarket category for their Agile, Lean, and DevOps adoption on the project designed to support the U.S. Air Force’s contingency and crisis action planning operations.



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# Contact Information


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- 402-319-0134
- Northrop Grumman
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D I G I T A L  D I R E C T O R A T E

# Agile in the Air Force— The Future of Software Development




Agile in Government Summit

Kellogg Conference Center

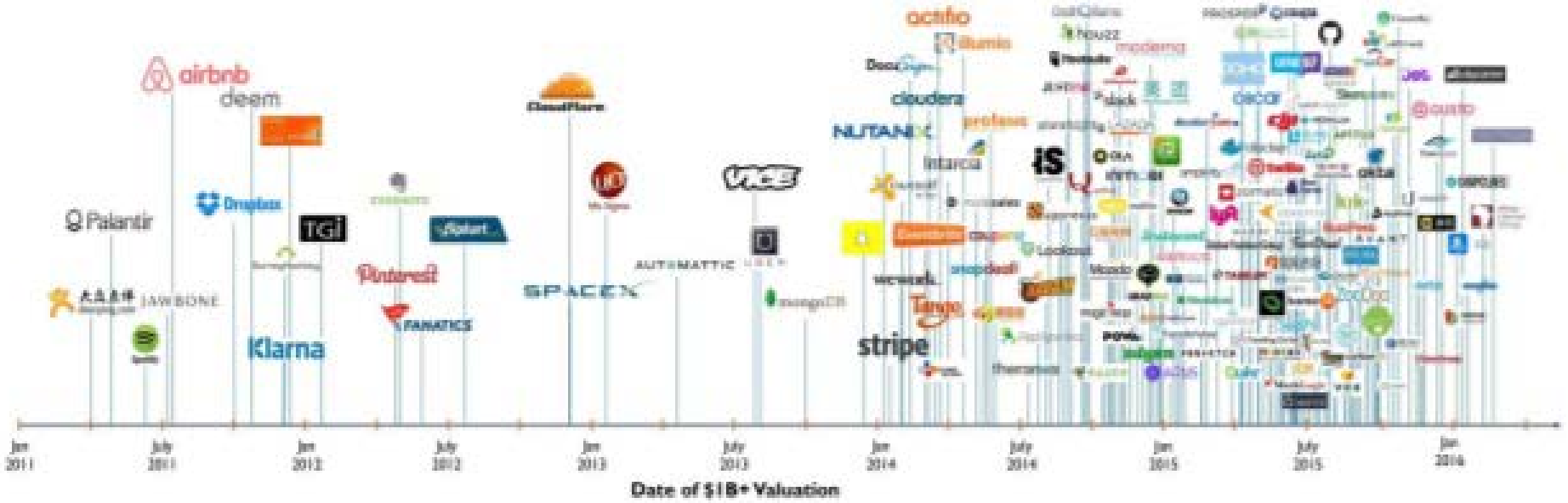
9 May 2019

Steven D. Wert, SES

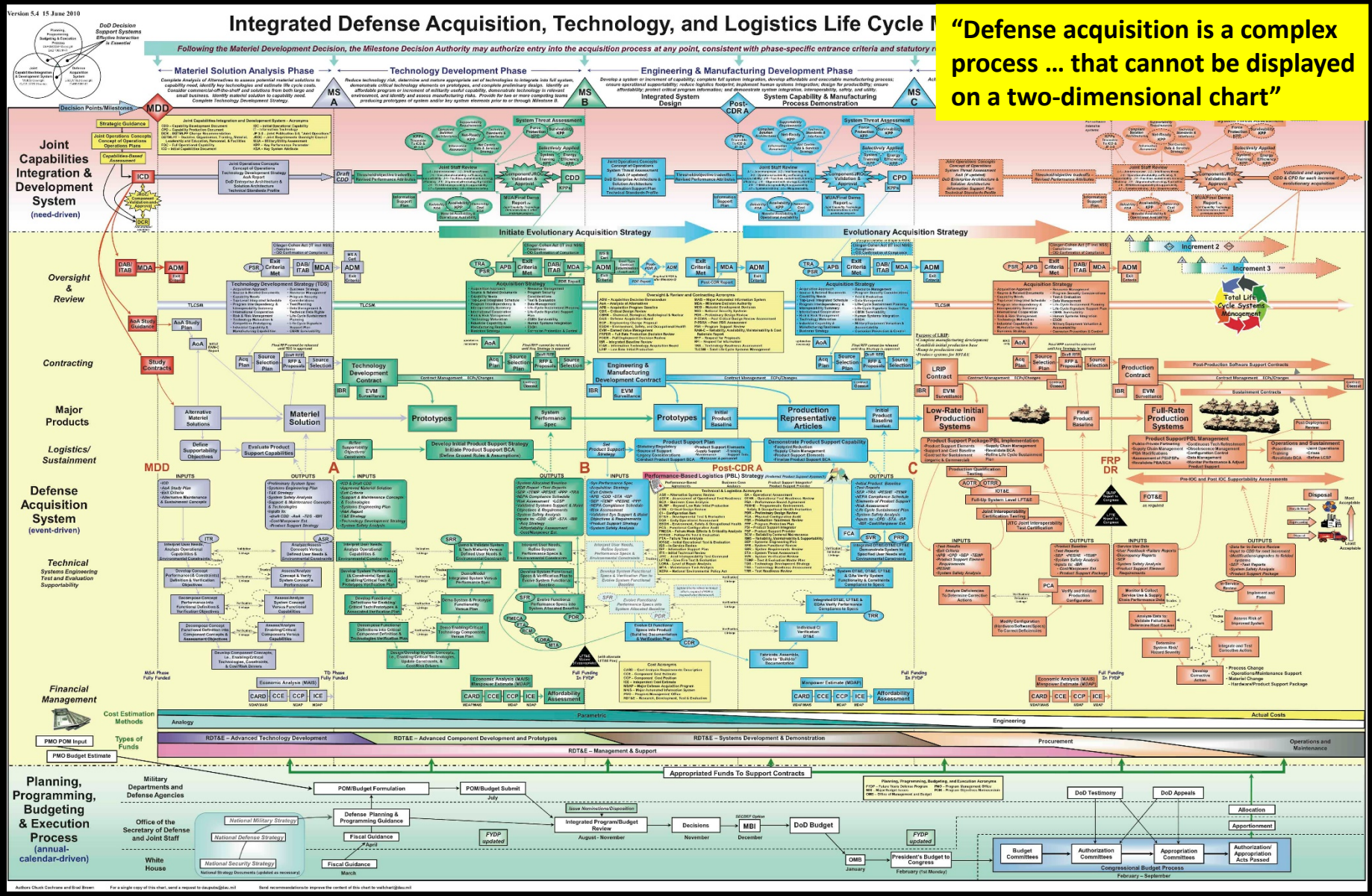
PEO Digital, AFLCMC/HB

**66ABG/PA Clearance Number: 66 ABG-2019-0025**
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# The explosive pace of technological change means we all need to be empowered to embrace new approaches



# Acquisition Has Been Isolated from Technology Rates of Change by Bureaucracy




**"Defense acquisition is a complex process … that cannot be displayed on a two-dimensional chart"**

"The United States must bolster its competitive military advantage—which the NDS sees as having eroded in recent decades—relative to the threats posed by China and Russia."

Summary of the National Defense Strategy

"The traditional requirements-driven process that the DoD has to deal with for acquisition has become more than inefficient … it's become dangerous."

Milo Medin, Alphabet Inc.
Defense Innovation Board
At AFA National 2017

# Digital Directorate
## Scope and Mission Areas



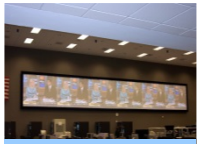

**Mission** **Expedite delivery, and effectively support, warfighting battle management systems in partnership with users and industry**

**Vision:** **Our people make the Digital Directorate the most proactive and effective DoD life cycle management organization**

**Goal 1:** **Plan and execute extremely well** achieve 85% on-time or early for planned critical events in FY19 to build the trust and confidence of our stakeholders

**Goal 2:** **Speed and innovation,** a majority of our programs in FY19 include innovative approaches to speed capability to the warfighter

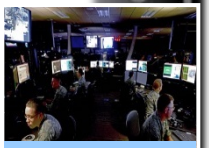

Aerospace Mgnt Systems

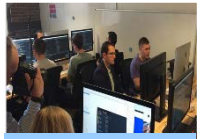

Ops Command & Control



COCOM Comm & Control


Theater Battle Control

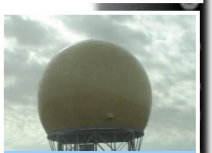

C2ISR


Air Force Software Factory


International Airborne BMC2


E-4B SAOC Recapitalization


Airspace Mission Plan Sys

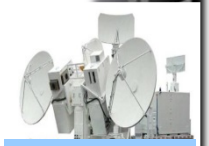

Foreign Military Sales

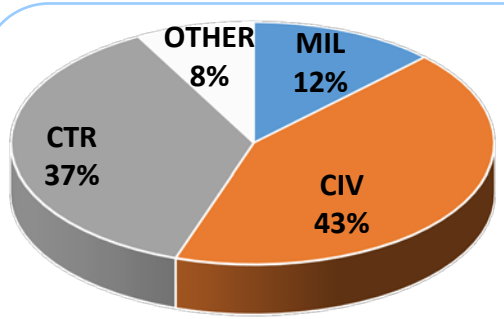

Strategic Warn & Surv Systems


AWACS


Force Protection


Qatar IAMD


Aerospace Dominance Enabler

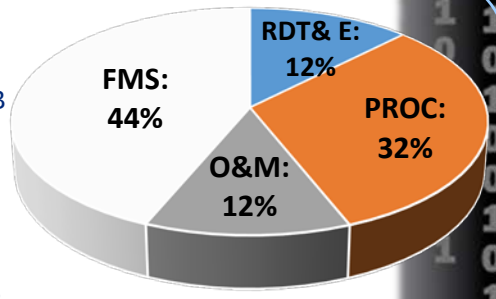



MIL: 445
CIV: 1528
CTR: 1319
OTHER: 282

**3574 Total Manpower**

| | |
|---|---|
| ACAT I | 8 |
| (5 ACAT 1C, 3 ACAT 1AC) | |
| ACAT II | 1 |
| ACAT III | 74 |
| FMS | 131 |
| AML EXEMPT | 28 |
| SUSTAINMENT (O&M/O&S/Supt) | 28 |

RDT&E: $1.5B
PROC: $3.8B
O&M: $1.5B
FMS: $5.624B




**$12B Total AY & FMS**

**"An organization's ability to learn, and translate that learning into action rapidly, is the ultimate competitive advantage."** **Jack Welch**

# Factors Enabling Innovation

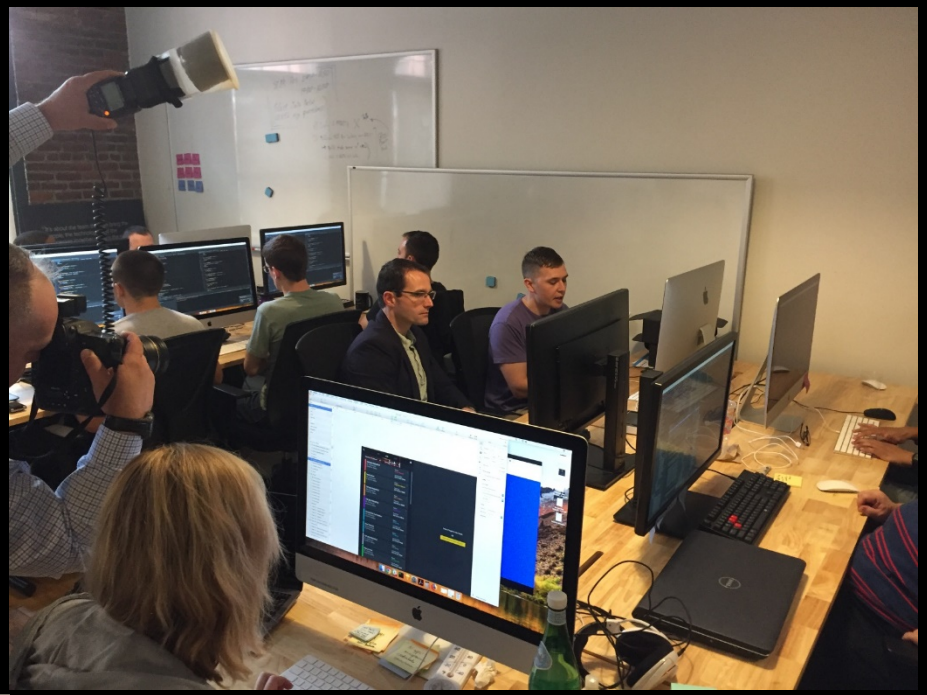
- Outside influencers—DIB, DDS, DIU, AFWERX, AFSBs, and others
- Unprecedented delegation of authority
- Changing strategies—agile devops, rapid prototyping, and MVP
- Working with accelerators and start-ups
- Technology—commercial tools, ML/AI
- New partnerships
- AF leadership—SECAF, CSAF, USECAF, and VCSAF

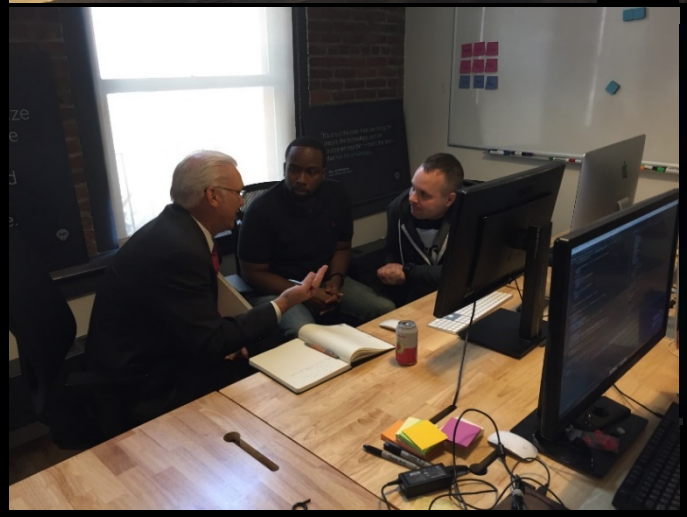
**VCSAF: "Status quo is not acceptable"**

**Dr. Roper: "Be radical! Make me nervous!"**

# Kessel Run


THE VISION
Revolutionize the way the Air Force builds and delivers software.






KESSEL RUN BOSTON
HIRING EVENT
January 23-24
Registration required.
Register at
afciviliancareers.com/kesselrun

Personnel Recovery C2
ISPAN Msn Planning and Analysis System
ISPAN Nuclear Planning and Execution System
ISPAN GAP CIE
NCR-IADS
Mission Planning CSAR Pedro King
C-sUAS Medusa C2
C2AOS/C2IS
Targeting and GEOINT
UC2
AF-DCGS Phoenix
OA-DCGS
DMO DIB
Weather Data Analysis
Cheyenne Mountain CIC2S
Legacy SPADOC SPEARR
Cobra Dane ADPE Re-host
Integrated Broadcast Service
F-35 ALIS

## Growing revolution

- Bespin, PEO/BES, Montgomery
- Level Up, PEO/C3I&N, San Antonio
- Kobyashi Maru, SMC West Coast
- Rogue Blue, PEO/Digital, Offutt
- RPF Proposal, PEO/Digital & SMC/SY, Colorado Springs
- Software Engrg Groups, Hill, Robins, and Tinker

## We have successfully implemented agile devops with:

- Organically-led PMO coding teams
- Government as integrator—industry coding teams
- Traditional contract relationships with industry
- Organic SEGs at Robins, Hill, & Tinker

**Not every program can migrate to the cloud and create a continuous delivery pipeline**

**But every software program can:**

- **achieve a release cadence of weeks**
- **use automated testing for quality and cyber-security**
- **and work directly with end-users**

# NDAA Section 804—Enabling Agile DevOps

| Program | Benefit | Current Schedule Savings Estimate | Initiation Plan |
|---|---|---|---|
| Air Operations Center Pathfinder (AOC) | Integrated product teams, software developers, platform teams, and platform operators together in the entire development process, creating a true user-centered design that supports continuous delivery | 16 months (to IOC) | YES (30 Jul18) |
| Command and Control Air Operations Suite Command and control Information Services (C2AOS-C2IS) | Utilizing Rapid Prototyping authority to develop Minimally Viable Products (MVPs) in support of deprecating TBMCS FL and other mission critical fielded applications to meet current warfighter needs | -3.0 Years (TBMCS deprecation) | YES (6 Oct18) |
| Integrated Strategic Planning and Analysis Network Increment 5 | Frequent software deliveries that are more responsive and aligned with customer needs | -2.5Years (to IOC) | YES (8 Aug18) |
| Nuclear Planning and Execution System Recapitalization (NPES Recap) | Delivers initial Minimum Viable Product (MVP) approximately 2 years prior and Minimum Operational Product (MOP) approximately 9-12 months prior to warfighter's original requested IOC | 9 mon (to IOC) | YES (14 Sep 18) |
| AWACS Communications Network Upgrade (CNU) | Enables CNU to modify multiple aircraft before the crypto mandate. A traditional acquisition approach would yield zero aircraft by the mandated date. The prototype will be based on the earliest available AWACS software baseline and integrated at the first opportunity. This prototype will then be incorporated within the next AWACS baseline software. | -1 Year (to IOC) | YES (10 Oct18) |
| AWACS Mode 5 Acceleration | Mode 5 804 enables Mode 5 capability to be delivered separate from ADS-B out. Purchasing and quickly installing this GOTS solution enables AWACS to utilize a more resilient IFF capability in contested air space multiple years prior to the DRAGON update. Reduces the gap of not meeting the JROC Mode 5 mandate by five years (from DRAGON's planned FY27 FOC date to FY22) | -5 Years (to FOC) | YES (18 Nov 18) |
| AWACS Electronic Protection | AWACS EP 804 enables the program to compete the AWACS EP system and to recover from the schedule delays from the previous sole-source effort. This competition will save cost and provide a better solution to the warfighter | 6 months (to IOC) | |
| MAF Modernization AGM | MAF Modernization 804 will enable the program to get on contract 1 year earlier than previously planned under 5000.2. In addition with by moving to Agile DevOps releases will be delivered to the field in a 3-month cadence enabling rapid user feedback | 1 Year (to IOC) | YES (8 Nov 18) |

15 years of potential savings already identified

# AF Pitch Day NYC, 6-7 March



# PEO DIGITAL

VIAFORENSICS

PFP CYBERSECURITY

FASTPORT

Arganteal

ATC-NY
ARCHITECTURE TECHNOLOGY CORPORATION

INTENTIONET

SEGUE TECHNOLOGIES




navsys CORPORATION

PRAESES Business Technologies
Process Re-engineering and Software Development

Metis

onsul Systems

DARK WOLF SOLUTIONS

emagine it | consider it solved.

BEACON INTERACTIVE SYSTEMS

FIBERQA
Robotic Fiber Optic Inspection + Cleaning

Architecture Technology Corporation
Specialists in Computer Architecture

# PEO Digital as a Venture Capitalist

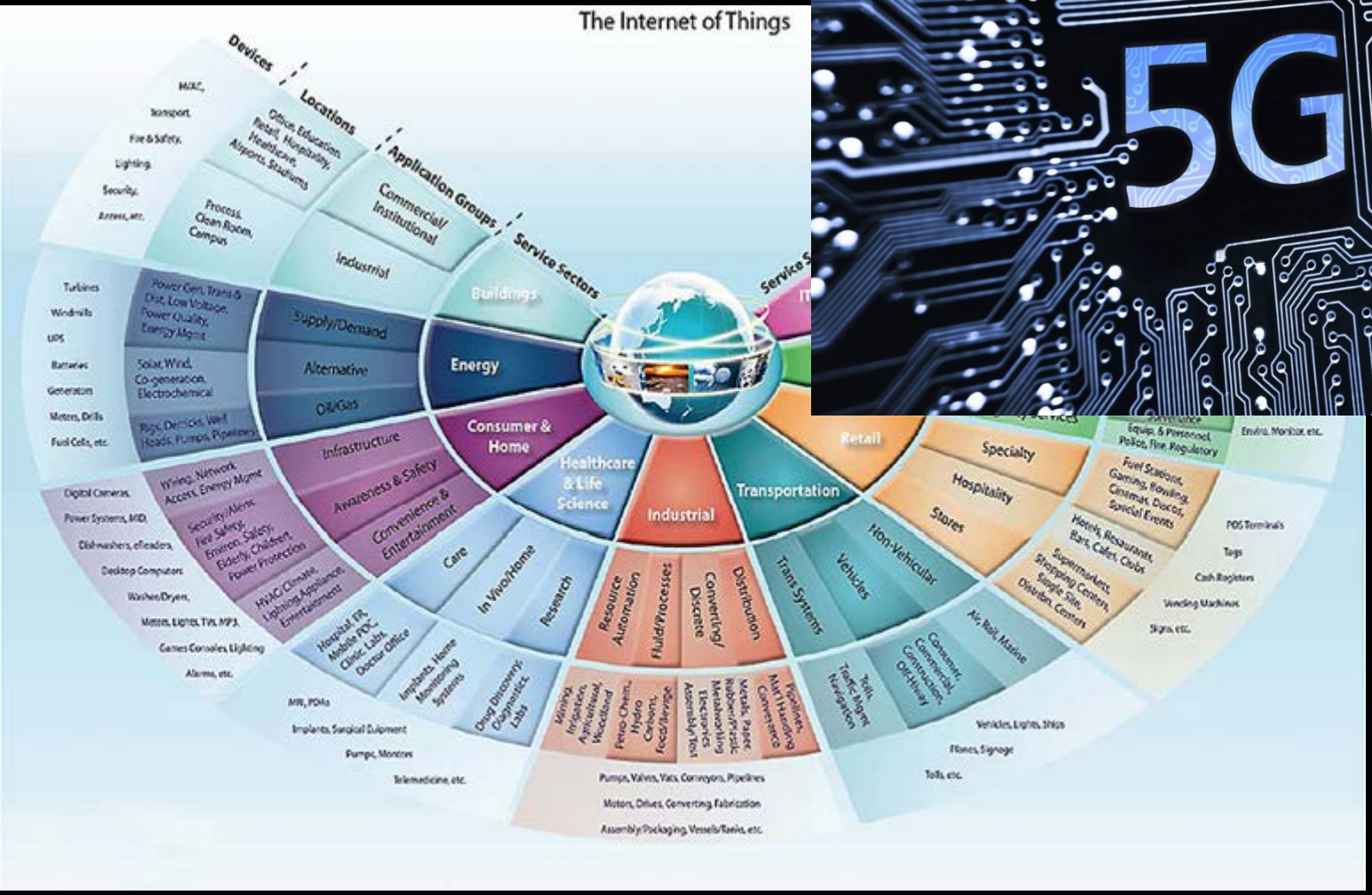
| | |
|---|---|
| **MD5 Starts** | Showcase Event, 22 May 19, Los Angeles<br>MDO/MDC2 Data Virtualization / Human Machine Learning |
| **MassChallenge** | Safety & Security Accelerator, Jun-Oct 19<br>MD5 Sponsored Problems: Secure ops in Cloud / AI/ML techniques<br>Accelerating high-potential start-ups with high success rate |
| **AF Pitch Day Kessel Run** | July 2019 at Kessel Run<br>Identify product teams/tools/processes for Kessel Run<br>Focus on security and low-bandwidth networks |
| **AF Pitch Day UAS Event** | Northeastern Kostas Research Institute, 17 July 19<br>UAS payloads, signature identification, software trust/verification<br>Set the stage for a CSAF Challenge Event at USAFA in Jan 2020 |
| **AF Pitch Day Space/SW** | SMC Pitch Day, Sep 19 in San Francisco<br>PEO Digital topics on software |

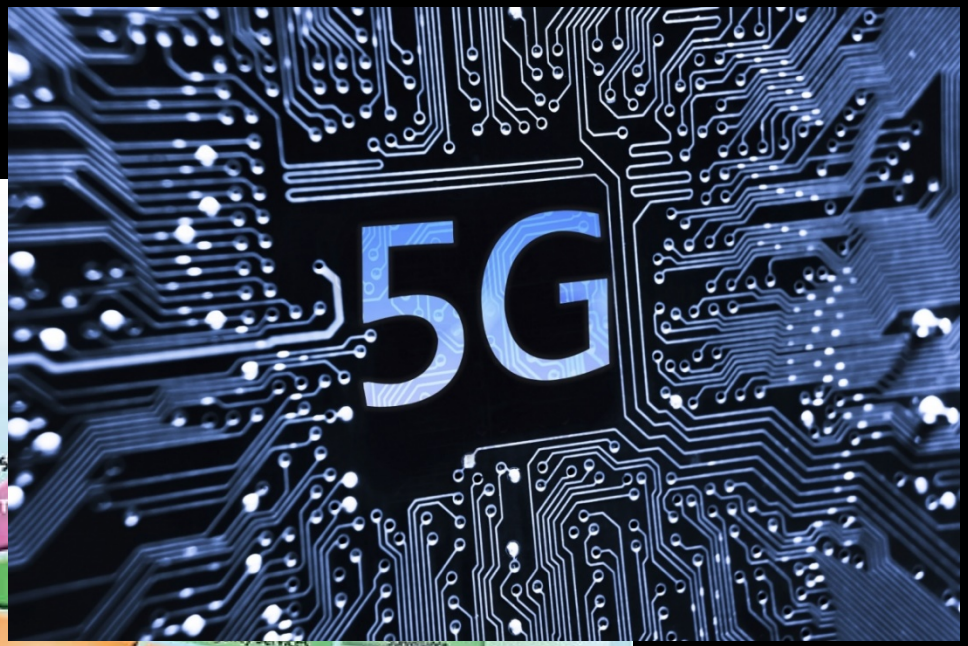
# Data Analytics



- Attacking underutilized data and lack of simple analytics

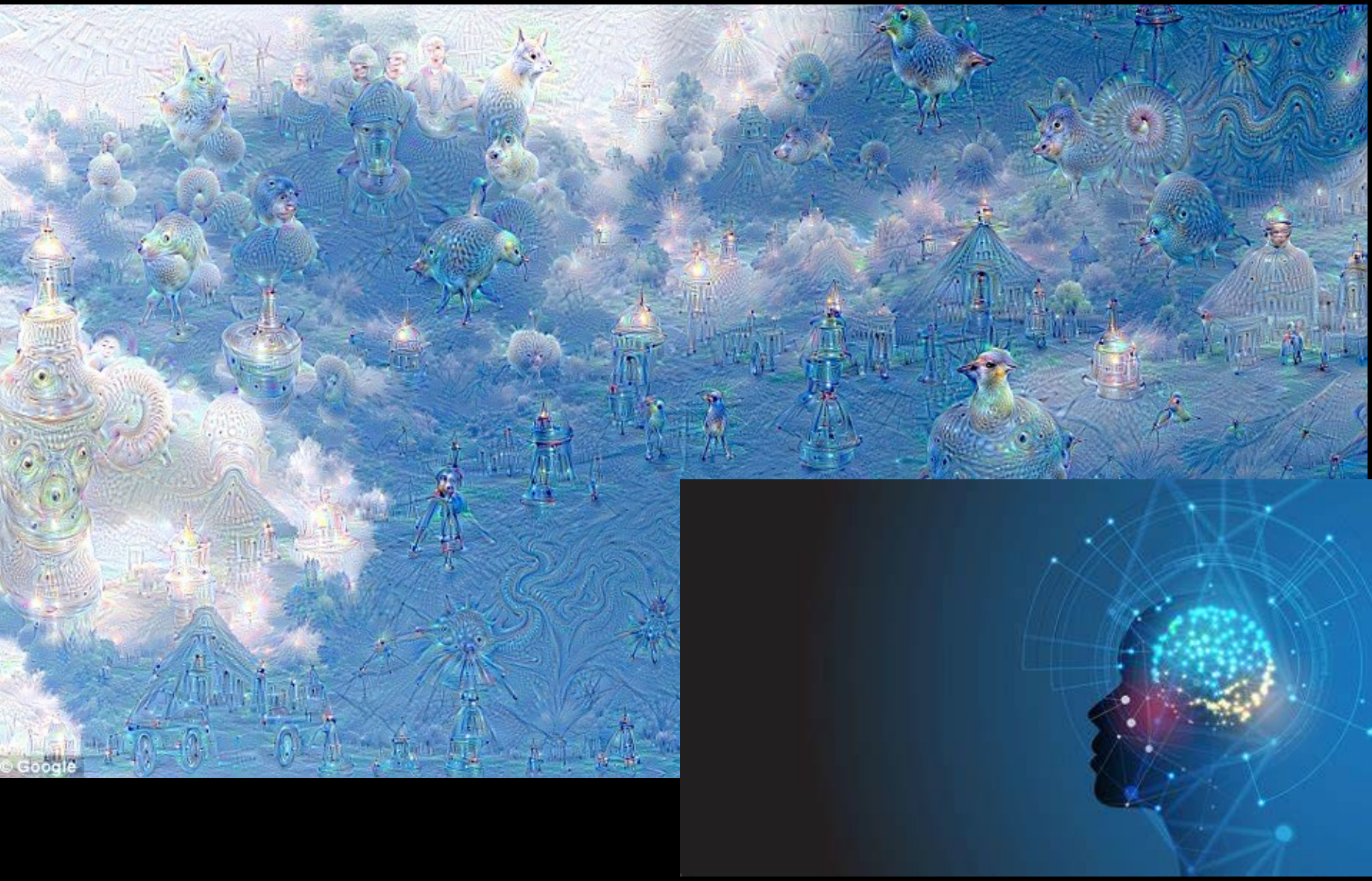
# Internet of Things



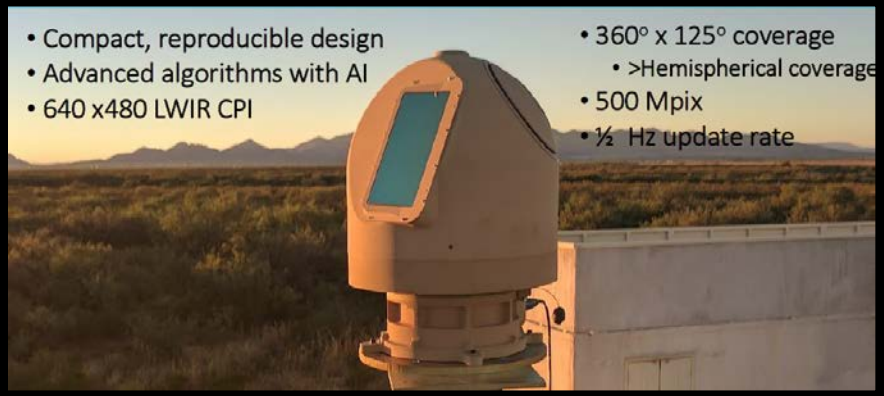

**Advanced Battle Management System (ABMS) and Multi-Domain C2 (MDC2) are the Air Force's IoT challenges**

# Machine Learning / Artificial Intelligence

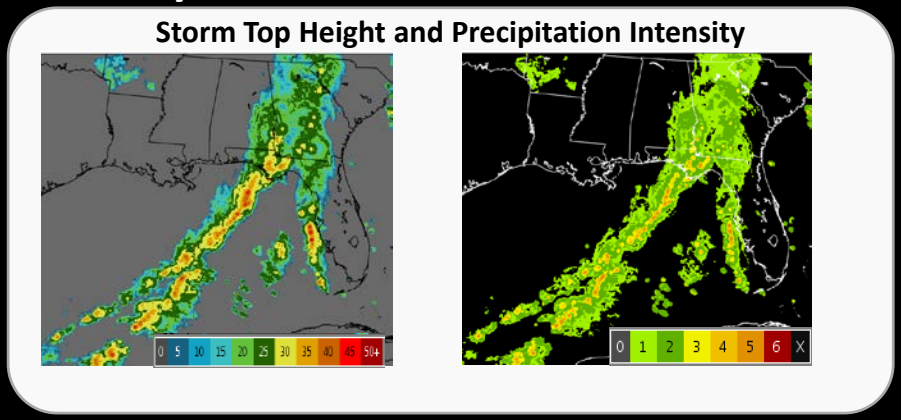


# Machine Learning and AI

## Infrared Persistent Surveillance




## Global Synthetic Weather Radar




## Machine Learning Cloud Detection



## RTES



# Implications for the Institution

**Right skills versus traditional functions**

- **Kessel Run leader is a 17D Cyber Officer running a platform in operations and leading a team updating applications daily**
- **SrA are leading product teams**

**Hiring new skill sets for which there is no AFSC/job-series**

- **Coders, designers, platform operations, and data scientists**
- **Creating software SML/MLs**

**Demand for training programs**

- **Individual programs are self-funding**
- **Need for familiarization to reach other PEOs/teams**

**Traditional APDP certifications viewed as suspect—and traditional acquisition courses viewed as negative training**

# Agile is a Team Sport

We will not be agile by capturing hundreds of requirements up front and then not fielding unless all requirements are satisfied—this is basically how we've traditionally operated

Beginning to change the tide working with AF MAJCOMs

- Rapid prototyping to discover high level requirements?
- Is it better than what we are currently operating?
- Is it more secure than what we are currently operating?
- How much faster can we iterate and improve it in a production environment working with operators?
- Can we address minor issues in parallel instead of stopping?

"It's not that acquisition has decided to go fast … the Air Force has decided to go fast!"
Dr. Will Roper


PEO DIGITAL
AFLCMC/HB
INNOVATE...DEPLOY...WIN

THE VALUE OF PERFORMANCE.

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# Applying an Agile Approach with MBSE

## 2019 Agile in Government Summit

May 8-9, 2019


Madeline Pantano
Systems Engineer




Flavius Galiber III
Cyber Architect






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# Abstract

The combination of Model-Based Systems Engineering (MBSE) and the Agile process aids in the execution of programs that are constantly changing, are highly complex, and contain uncertainties throughout system development. Establishing an Agile MBSE approach allows teams to manage change and uncertainties, manage the complexity of a system, foster multidisciplinary collaboration between cross-functional teams, and provide a central repository model as the source of truth for system information.

Implementing an Agile MBSE approach provides teams the opportunity to easily manage changing system requirements and focus on Lean Modeling to deliver capabilities aligning to team-defined iteration goals. By breaking down model development into time-boxed iterations, the overall quality is increased allowing teams to focus on specific iteration goals to develop and collaborate upon. At the completion of each iteration, teams receive feedback to ensure customer alignment, overall focusing the team's efforts on Lean Modeling by avoiding Big Modeling Up Front (BMUF). This iterative process supports model development by adapting to change, ensuring transparency, delivering models frequently, and ensuring a short period of time where teams fail-fast to learn what specific approaches work. By defining the approach for combining Agile and MBSE best practices, the groundwork is laid for successful collaboration and generation of meaningful architectural solutions.



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# Table of Contents

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- Why Model-Based Systems Engineering (MBSE)?
- How do you apply MBSE in Agile Development?
- What are the challenges associated with Agile MBSE?
- Summary
- References




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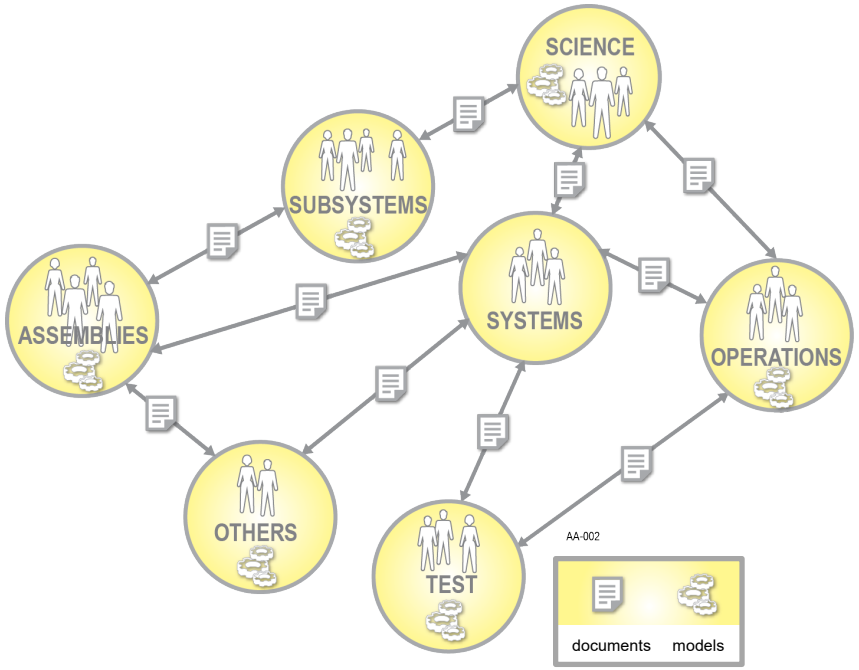
# Why Model-Based Systems Engineering (MBSE)?

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# Key Systems Engineering (SE) Challenges

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- Customers do not have detailed/justified definitions of their problems
- The **complexity** of future **problems** and **solutions** (e.g., hardware, software, systems, systems-of-systems) is **growing exponentially** and will (or have) reach a point where we can no longer afford to solve them
- Using documentation to **manually** manage SE data, information and knowledge is exceptionally labor-intensive and error-prone for complex systems (of systems)
- Producing and using voluminous documentation to share and transfer SE knowledge is ineffective
- Assessing the impact of changes is exceptionally difficult in complex solutions




**Government programs involving complex solutions must address some enduring SE challenges**

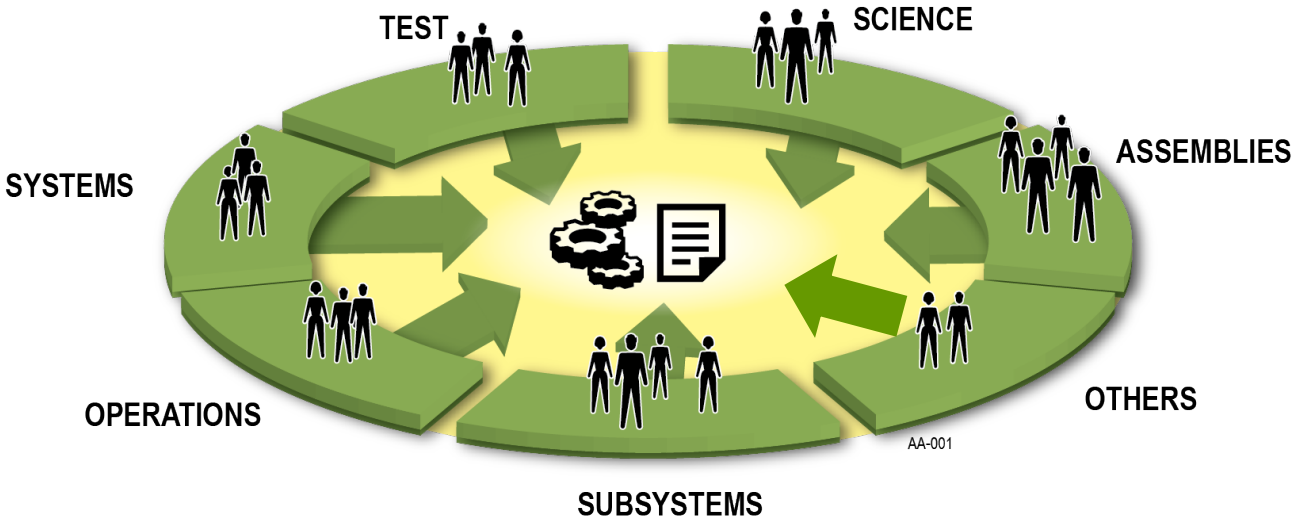


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# Model-Based Systems Engineering (MBSE)

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- MBSE is a standardized environment/methodology that provides linkage, rules, metrics and views of engineering artifacts created to define, solve, and manage **problems and solutions of high complexity**
- MBSE models are the central repository of all engineering/management artifacts—**single source of truth**
- MBSE modeling tools are used to build and evolve models, described using modeling languages




**Government programs increasingly employ MBSE throughout the solution lifecycle**



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# Models

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- **What is a Model?**
  - A simplified—physical, mathematical and/or logical—representation of a mission/solution at some particular point in time or space intended to promote understanding of the real mission/solution
  - Provides insight about one or more of the mission/solution's aspects, such as its function, structure, properties, performance, behavior, or cost
  - Leveraged by most engineering disciplines (e.g., electrical, mechanical, software)

- **Types of Models**
  - Descriptive
  - Analytical
  - Hybrid (Descriptive + Analytical)
  - Domain-Specific
  - Mission/Solution/System
  - Integrated/Executable

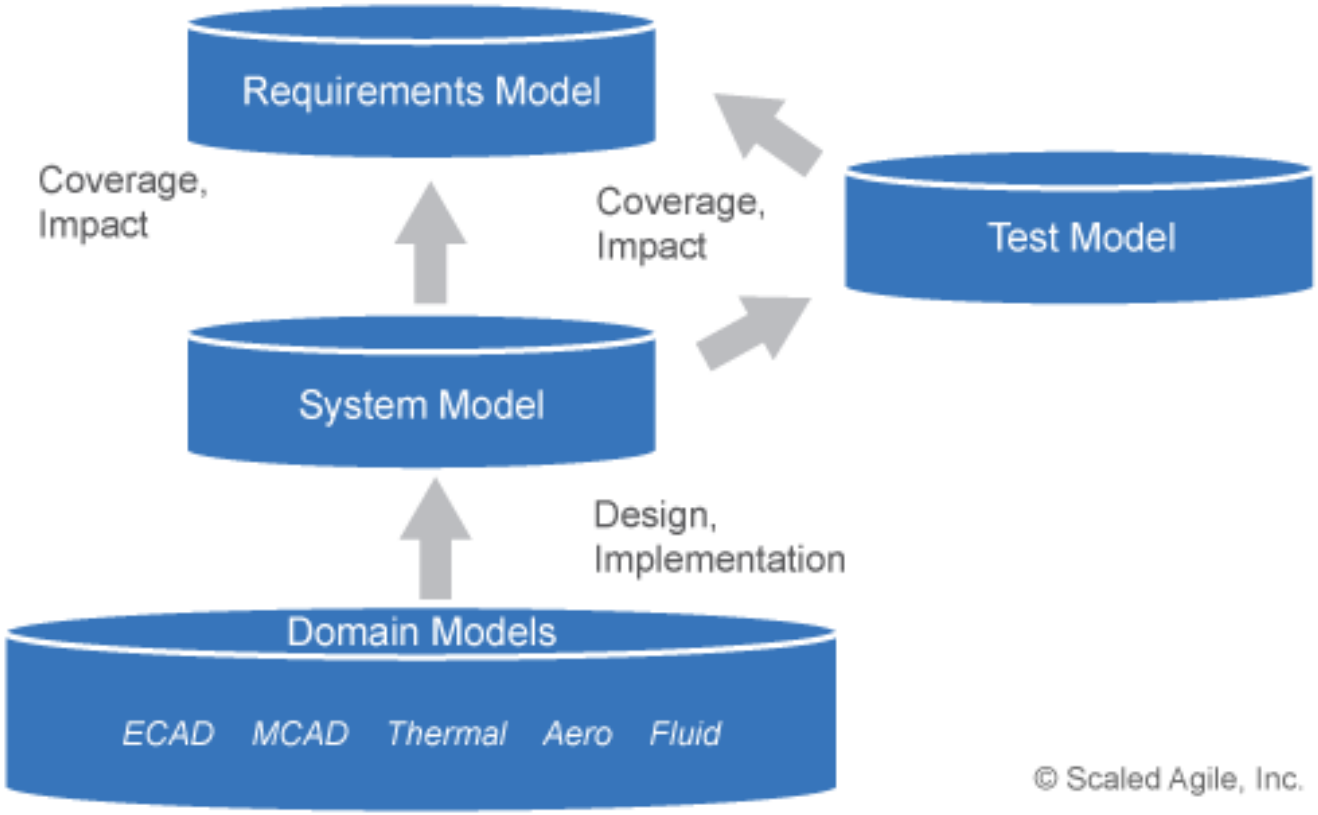
- **Simulations**
  - Implement models over time
  - Used to analyze the complex dynamic behavior of missions, solutions and their respective operational environments
  - May be live, virtual or constructive

**"All models are wrong, but some are useful."—George E. P. Box**



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# Examples of Models




**Government programs will develop numerous models during the period of performance**



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# Uses of Models

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- Characterizing an existing mission/solution
- Mission/solution concept formulation, exploration and evaluation
- Solution design synthesis and requirements flow-down
- Support for solution integration and verification
- Support for training solution operators, maintainers and other stakeholders
- Capture and sharing of solution knowledge
- Support change impact analysis, as part of on-going solution design evolution
- Estimate mission/solution costs
- Evaluate mission/solution alternatives
- Efficiently produce contract- or compliance-required documentation

**Government programs use models to help answer critical SE questions**



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# Benefits of MBSE

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- Single source of engineering truth
- Increase ability to manage complexity
- Improve communications among stakeholders
- Rapidly analyze the impact of changes
- Improve system architecture, design and quality
- Minimize staff attrition impact
- Enable fast-feedback on requirements and design decisions
- Lower maintenance costs to modify solution design
- Validate problem and solution hypotheses at lower cost
- Identify risks earlier
- Improve productivity through automation and reusability

**Government programs employing MBSE realize numerous benefits—at a cost**



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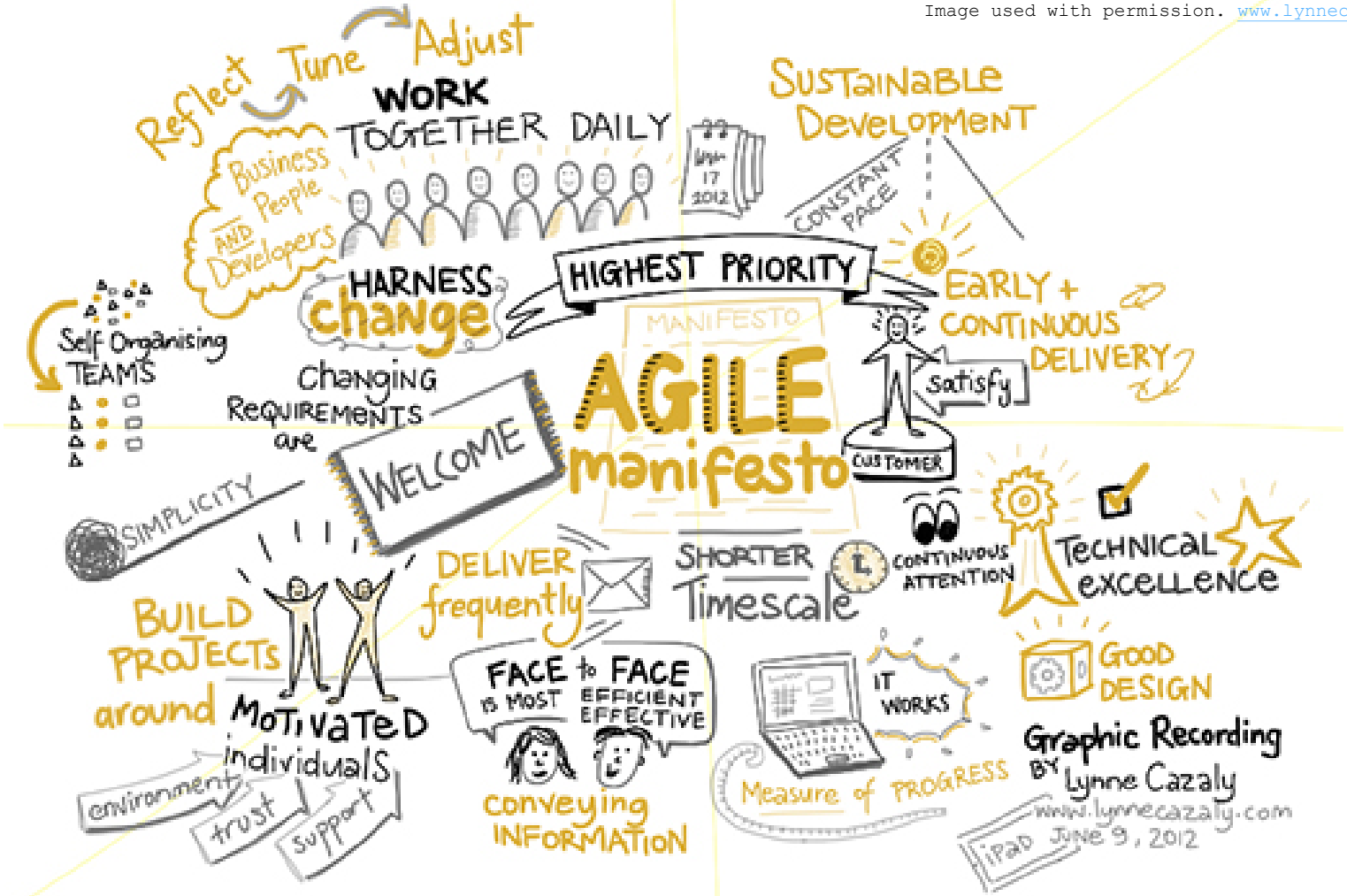
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# How do you apply MBSE in Agile Development?

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# Agile Development

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**Agile values, principles and methods continue to be embraced by industries worldwide**

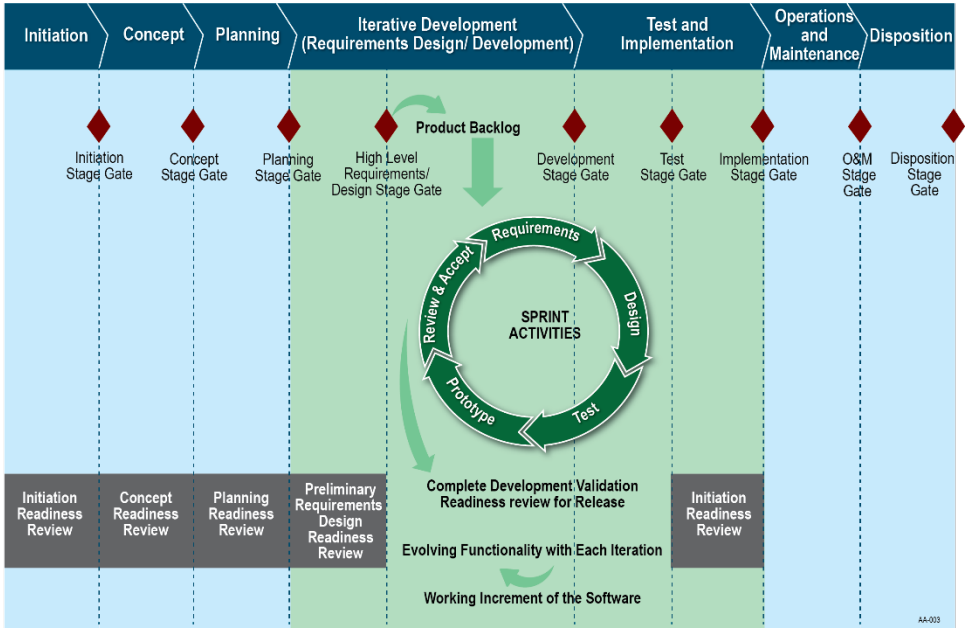


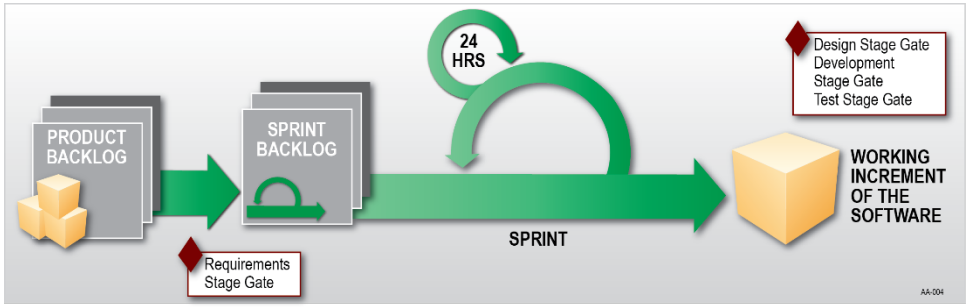
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# Agile Development

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- Traditional Agile development frameworks and best practices (e.g., Scrum, XP) don't explicitly provide guidance on how to:
  - Integrate **MBSE** and other SE disciplines
  - Scale to large, distributed project teams (potentially with many suppliers) developing **complex solutions**
  - Manage projects in heavily regulated domains such as health, financial, **government**, etc.
  - Operate, maintain and evolve systems in production




*"We embrace modeling, but not in order to file some diagram in a dusty corporate repository."*—Jim Highsmith, History: The Agile Manifesto

**Defense Innovation Board Issues Guide to 'Detecting Agile BS'**

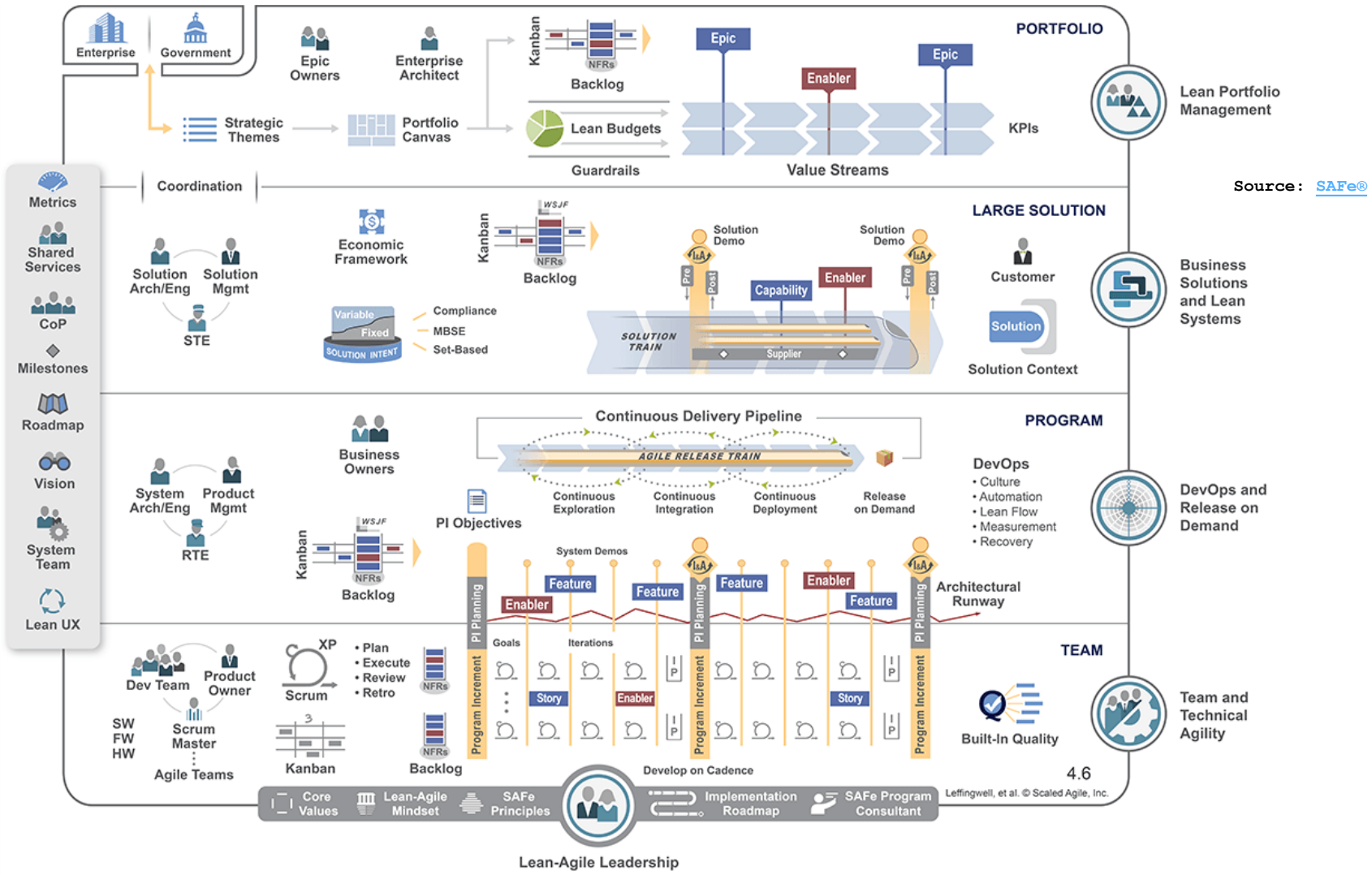
**Most government programs that develop any software are expected to employ Agile**



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# Agile Development at Scale

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**Government agencies are starting to embrace the Scaled Agile Framework (SAFe®), which incorporates MBSE**

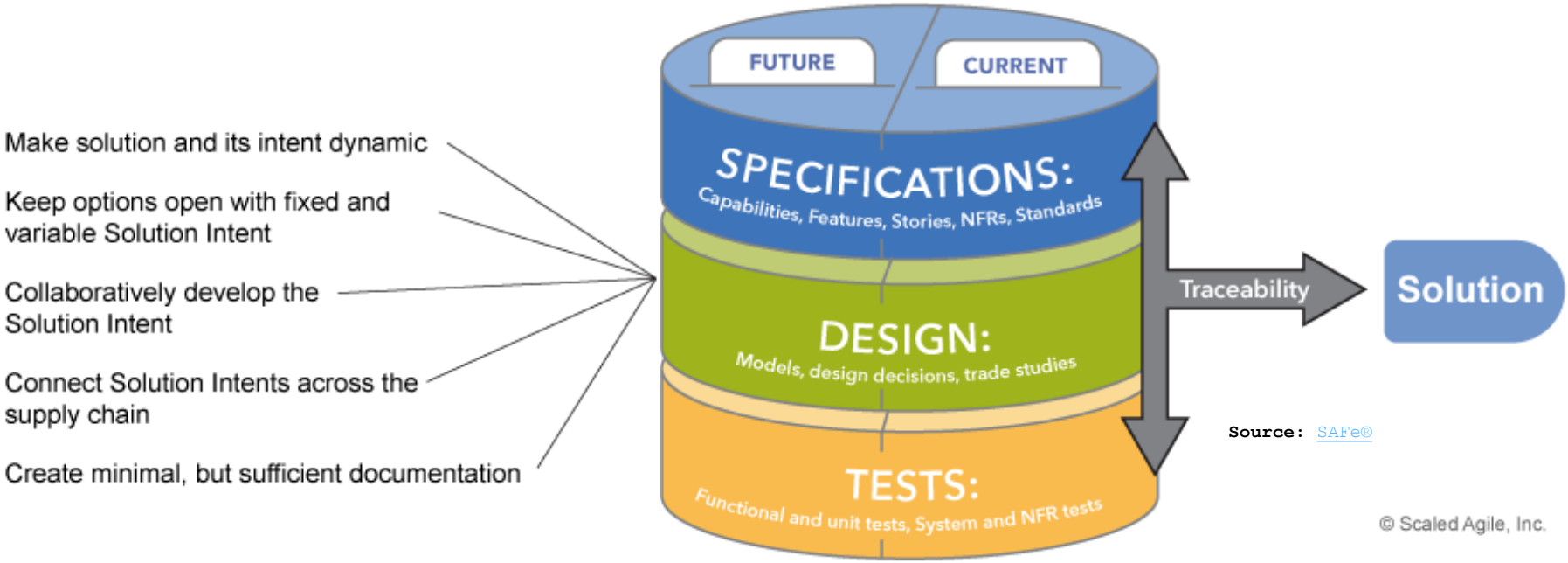


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# Agile MBSE (AMBSE) Best Practices

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- Incrementally build "just barely good enough" models of the Solution Intent ("as-built" and "to-be") with each Iteration
  - Avoid Big Modeling Up Front (BMUF)




**Apply AMBSE when there is significant complexity, uncertainty and/or ambiguity during solution development**

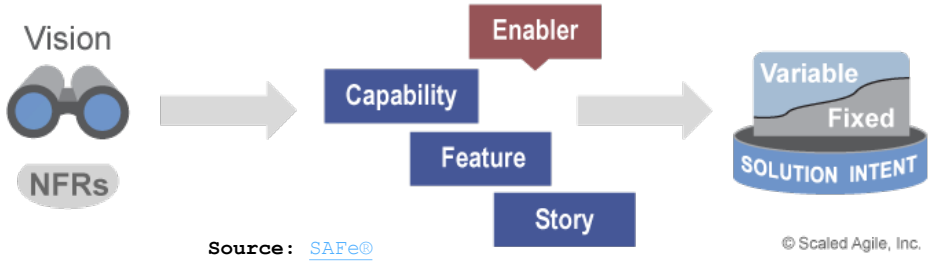


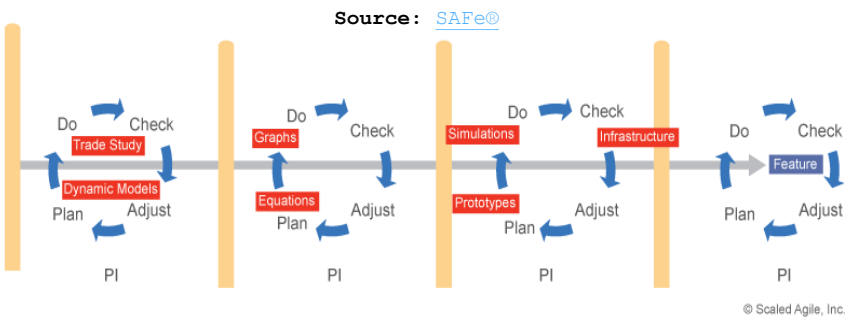
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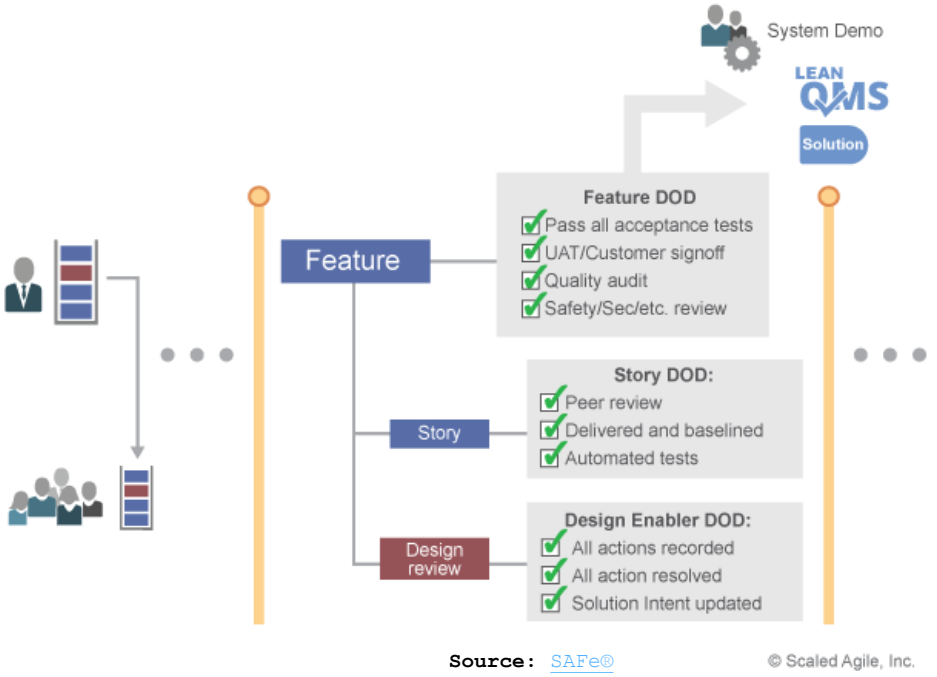
# Agile MBSE (AMBSE) Best Practices

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- Describe modeling-related Acceptance Criteria and/or Definition of Done on the Solution's Capabilities and Features
- Describe explicit modeling work as Enablers associated with the Solution's Capabilities, Features and/or Non-Functional Requirements




**Apply AMBSE when there is significant complexity, uncertainty and/or ambiguity during solution development**



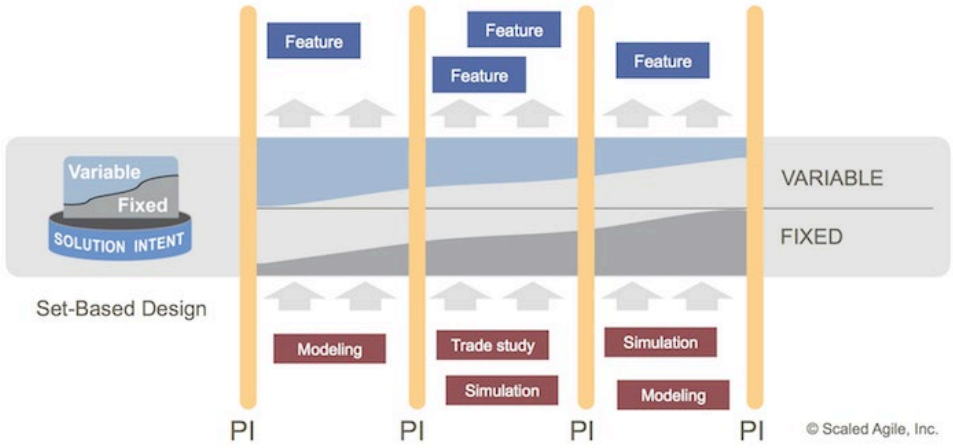
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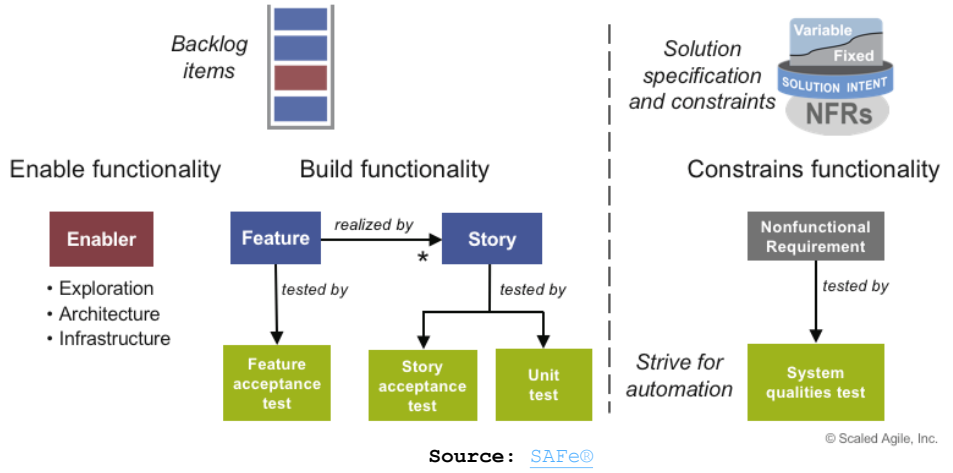
# Agile MBSE (AMBSE) Best Practices

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- Utilize models to support Set-Based Design and Compliance (e.g., V&V, RMF) activities
- Ensure models are configuration controlled
- Employ role-based access control to models
- Create testable and executable models (when feasible)
  - Utilize Behavior-Driven Development (BDD)
  - Utilize/develop model verification scripts

Source: SAFe®




Source: SAFe®

**Apply AMBSE when there is significant complexity, uncertainty and/or ambiguity during solution development**



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# Agile MBSE (AMBSE) Best Practices

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- Maximize stakeholder participation in identifying, building and validating models
- Create and capture informal models developed as part of refining the Solution Backlogs, Program Backlogs and Team Backlogs (i.e., "model storming")
- Minimize duplication of model elements
- Model at the lowest security classification possible
- Establish modeling standards (e.g., processes, style guide) across all projects in the Portfolio
- Leverage Iteration Retrospectives and Inspect & Adapt workshops to improve modeling standards

**Apply AMBSE when there is significant complexity, uncertainty and/or ambiguity during solution development**



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# Agile MBSE (AMBSE) Best Practices

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- Create models working in pairs
- Conduct a modeling “jam session” after Iteration Planning with modelers across the Agile Release Train
  - Review models created in the previous Iteration
  - Share lessons learned & best practices
  - Collaborate on the most difficult modeling problems in the current Iteration





**Apply AMBSE when there is significant complexity, uncertainty and/or ambiguity during solution development**



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# What are the challenges associated with Agile MBSE?

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# Agile MBSE (AMBSE) Challenges

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- Culture change
- Leadership buy-in
- Building and retaining modeling talent
- Access to and availability of stakeholders to support iterative model validation
- Adopting emerging modeling standards (e.g., UAF 1.0, SysML 1.5)
- Lack of training in modeling methodologies, languages, frameworks and tools
- Vendor lock-in with modeling tools
- Communicating models with stakeholders with no experience with modeling languages and notation

**Government programs that embrace AMBSE will still face a number of challenges**



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# Agile MBSE (AMBSE) Challenges

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- Integration of multiple modeling tools and associated data, as well as simulators, within and across security classifications
- Integration of modeling tools with agile project management and software development tools
- Tools, modeling notations, and processes used by one discipline (e.g., Systems, Hardware, or Software) do not mesh well with other disciplines
- Semantic gaps between business/mission and engineering domain & disciplines
- Creating executable models
- Automated document production snafus
- Use of models in DevSecOps (at scale) and Software Factories

**Government programs that embrace AMBSE will still face a number of challenges**



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# Summary

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# Summary

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- Government development programs are increasingly employing MBSE in order to cost-effectively explore and document solution characteristics
- Government organizations are beginning to adopt the Scaled Agile Framework (SAFe®) in order to improve solution development and mission outcomes across their entire enterprise
  - Provides guidance on adopting MBSE on large-scale Agile Development programs
- Government programs operating within SAFe can leverage proven Agile MBSE (AMBSE) best practices to incrementally plan, develop and validate models
  - Efficiently and effectively manage complexity, uncertainty and/or ambiguity throughout the solution lifecycle
  - Additional challenges will still need to be addressed



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# References


- Scaled Agile Framework (SAFe®) 4.6
- Agile Modeling – Scott Ambler
- Agile Systems Engineering – Bruce Powel Douglass, Ph.D.
- A Practical Guide to SysML: The Systems Modeling Language, Third Edition – Sanford Friedenthal, Alan Moore, Rick Steiner
- Unified Architecture Framework Specification Version 1.0 – Object Management Group
- SEBoK: Guide to the Systems Engineering Body of Knowledge – INCOSE, IEEE Computer Society, Systems Engineering Research Center




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# The Lean Agile Architecture

Ms. Lisa Ann Henke
Chief Architect Global Support Programs

Mr. Matthew Reider, SAFe SPC
DevSecOps Engineer

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# Introduction

- Focus on WHY
- Words of Betty Sapp, Lower the ratio between what she calls the "doers" and the "reviewers”
- Role of Architecture and Systems Engineering in an agile construct (not 25 DoDAF artifacts for delivery and review)
- Acknowledgement that not all projects and programs require the same level of rigor.  Important to evaluate what level of rigor is necessary

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# Focus on Why

- Maximize the amount of work not done
- System Engineering/Architecture artifacts and documentation should have a known audience and purpose for the communication
  - Ask:
    - Who is it for?
    - What is its purpose?
    - When is it needed?
    - Why am I generating it?
    - How can I automate it?
- Balance top down systems engineering with emergent design through the use of the agile cadence

"We have some of that same urgency in terms of where adversaries are going both in their own space-based capabilities and in their counter-space," she explained. "But we don't quite have that same level of risk tolerance or the processes that support a lot of going fast."

She cited the need to lower the ratio between what she calls the "doers" and the "reviewers," the ballooning set of overseers in the Pentagon and on Capitol Hill that have slowed the acquisition process.

"How this all comes out, I don't know," she said of the reform push. "To just reorganize the doers, I think, we will have fallen short. A lot of what's in the way of the doers is the processes above them."

**~ Politico Article 'We are getting left behind'**
**The nation's spy satellite chief calls for empowering the 'doers' by reducing the 'reviewers.'**
**By BRYAN BENDER 08/17/2018 06:49 AM EDT**

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# Lean Agile Architecture

- Lean Six Sigma and Agile development overlap
  - Both focus on removing waste and eliminating/reducing defects
  - SAFe, LeSS, and DAD have "Systems Engineers/Architects," "Architecture and Design," and "Architecture Owners" described but how and what they do is left somewhat undefined.
    - The Scaled Agile Framework for the enterprise (SAFe),
    - Large Scale Scrum (LeSS)
    - Disciplined Agile Delivery (DAD) SAFe

**Major Agile methodologies recognize the role of Architecture and SE**

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# Agile with Lean Systems Engineering

- Scaled Agile Framework for the Enterprise
  - "The Systems Engineering and Architect are responsible for defining and communicating a shared technical and architectural vision."
    - Evolves over time while supporting needs of current users
  - Avoids overhead and delays associated with phase-gate and BUFD- methods
    - Ensures the ‘system always runs’
    - **Balances emergent design and intentionality**
    - Takes a systems view across the full value stream




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# Agile with Lean Systems Engineering




- Large Scale Scrum (LeSS)
  - "The only software documentation that actually seems to satisfy the criteria of an engineering design is the source code" (Jack Reeves, "What is Software Design")
  - First observation –The sum of all the source code is the true design blueprint or software architecture.
  - Second observation –The real software architecture evolves (better or worse) every day of the product, as people do programming .
  - Third observation –The real living architecture needs to be grown every day through acts of programming by master programmers .
  - Fourth observation –A software architect who is not in touch with the evolving source code of the product is out of touch with reality ("Powerpoint Engineer.")
  - Fifth observation –Every programmer is some kind of architect–whether wanted or not. Every act of programming is some kind of architectural act–good or bad, small or large, intended or not .

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# Agile with Lean Systems Engineering

- Disciplined Agile Delivery
  - The "Identify Architecture Strategy" process occurs early in program kickoff and then prove that architecture early in development
    - It enables effective **evolutionary architecture.**
    - We want to identify, and hopefully eliminate architectural key risks early.
    - Avoid technical debt.
    - Improved DevOps integration.
    - Enables us to **answer key stakeholder questions.**
    - Enhance initial scoping and planning efforts.



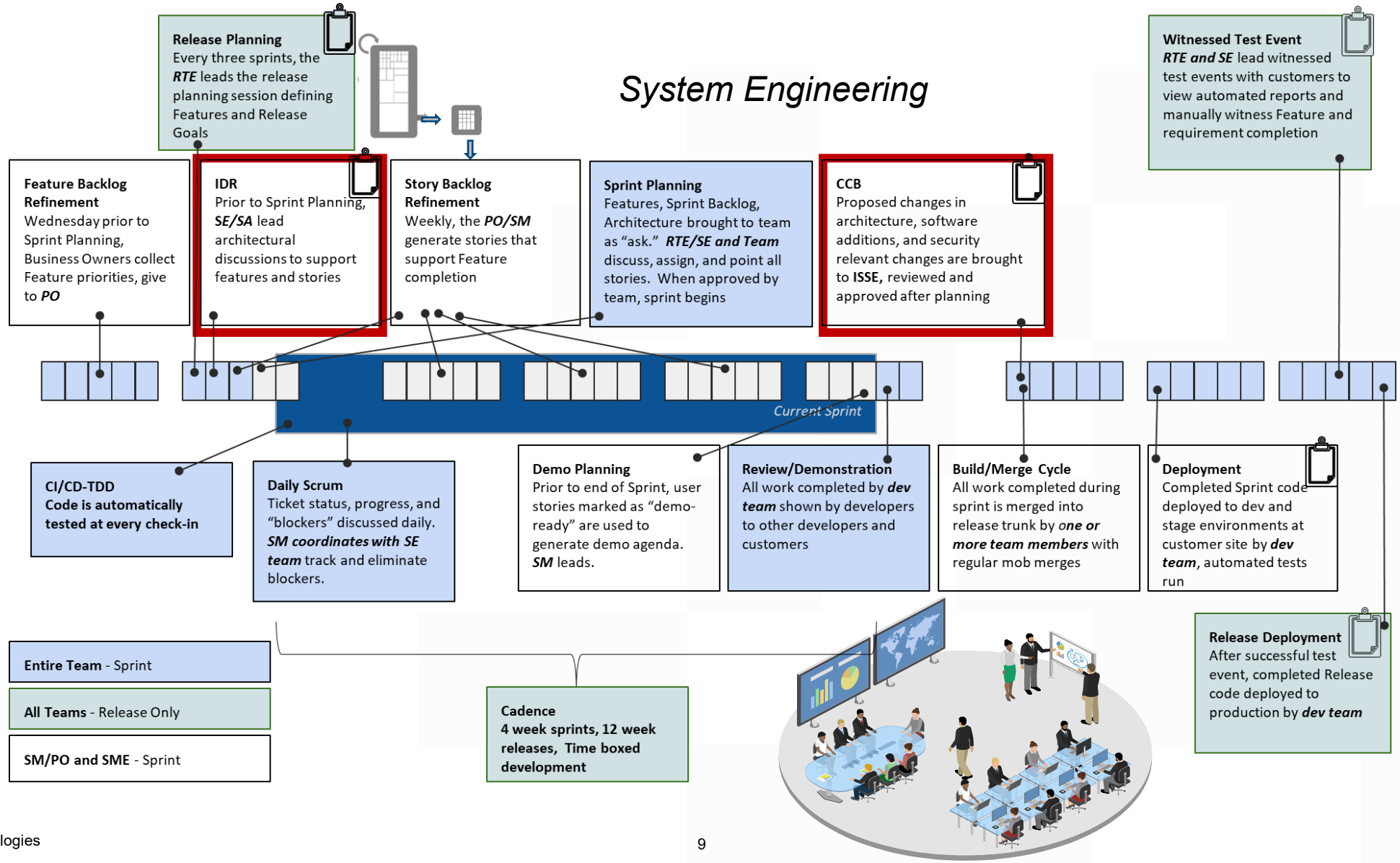

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# REALM (Rapid Enterprise Agile Lean Methodology)

- "Intentionality"
  - We incorporate a time-boxed up-front design session to establish an architectural vision delivered with the program vision
  - We maintain (preferably automated) lean architectural views of the system at the level necessary for the system in development
- "Emerging"
  - We incorporate an iterative design review at the beginning of each Program Increment or Sprint planning to discuss, decide, and update the architecture with the entire team, in a room full of whiteboards
  - We automate documentation *from the codebase*, we do not "powerpoint engineer" a set of documents that are given to the developers

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# Logical Backlog Decomposition – Concept to Deployment in Every Sprint & Release




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# Agile and Lean Systems Engineering Methodology

## Requirements
Align requirements at spin planning – ID reqs under test and full or partial sell off

## Architecture
Iterative Design Review (IDR) held with Sprint Ceremonies, used as a readiness evaluation for features, & builds the Body of Evidence

## Design
Reviewed at IDR
Intent is to maximize sell off
Updated during Backlog Grooming & Sprint Planning

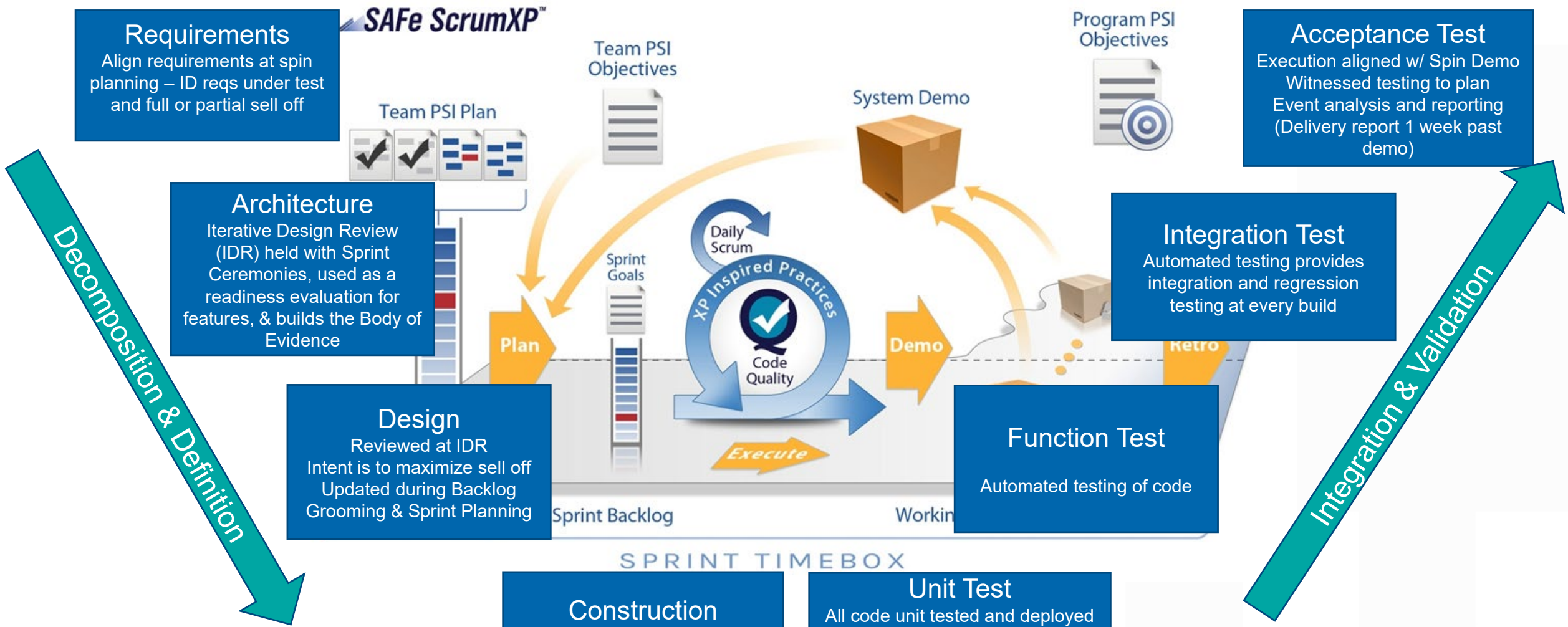
## Construction
Every Sprint is sacred.
Artifacts updated to document implementations.

## Unit Test
All code unit tested and deployed nightly
Code automatically built, deployed as containers on a PaaS

## Function Test
Automated testing of code

## Integration Test
Automated testing provides integration and regression testing at every build

## Acceptance Test
Execution aligned w/ Spin Demo
Witnessed testing to plan
Event analysis and reporting (Delivery report 1 week past demo)

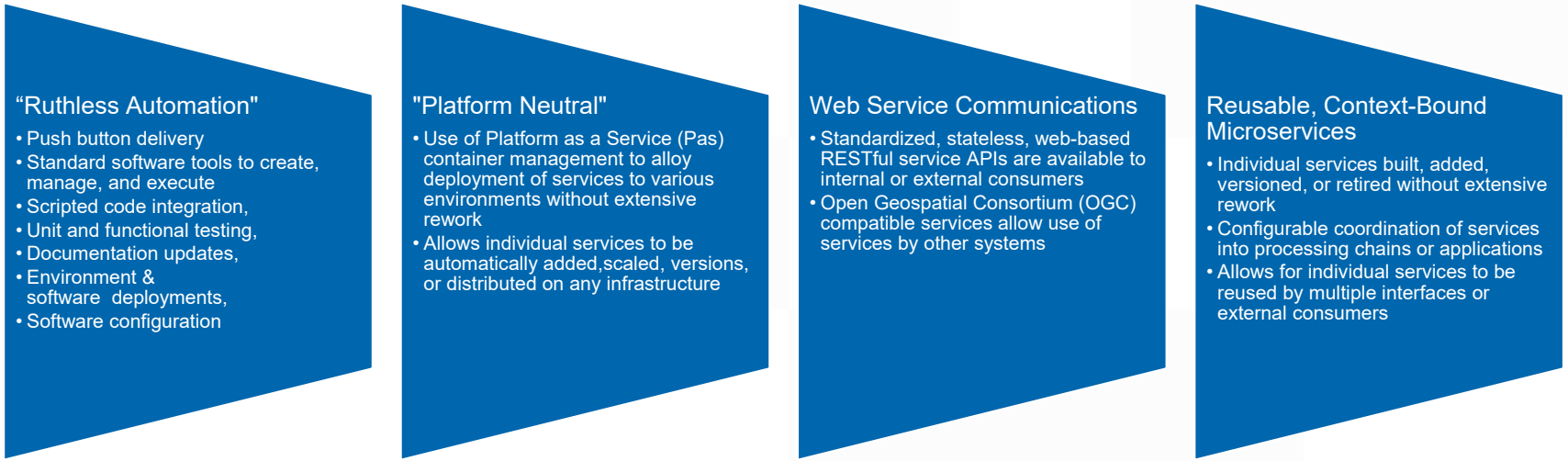



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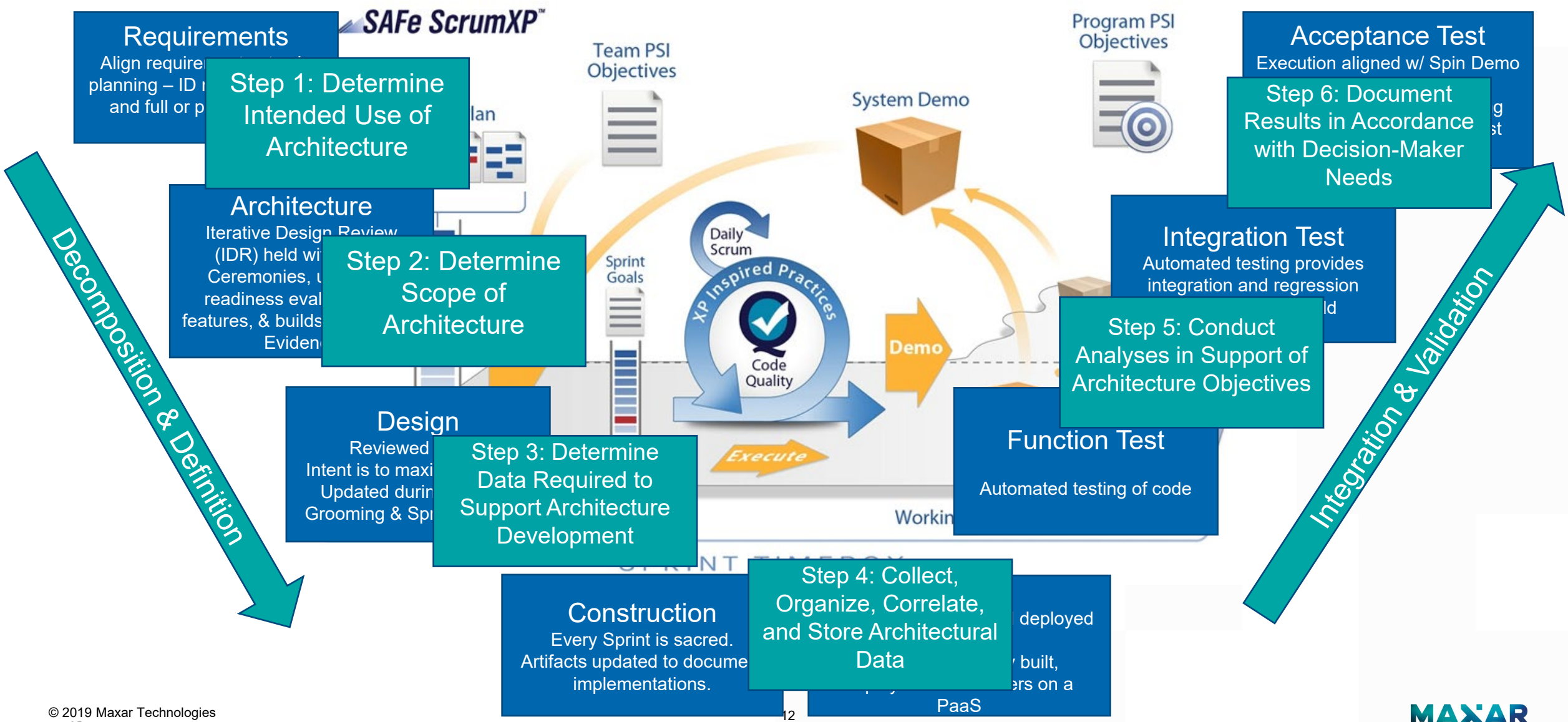
# Architectural Vision (a.k.a Design Guardrails)

- Agile defines a "Program Vision" that discusses what the software will do for what users.
- REALM includes an "Architectural Vision," described by the Open Group Architecture Framework, (TOGAF) as "essentially the architect's "elevator pitch" - the key opportunity to sell the benefits of the proposed development to the decision-makers within the enterprise"
- Intentional, high level architectural goals that emerging architectural decisions will align to and be challenged against




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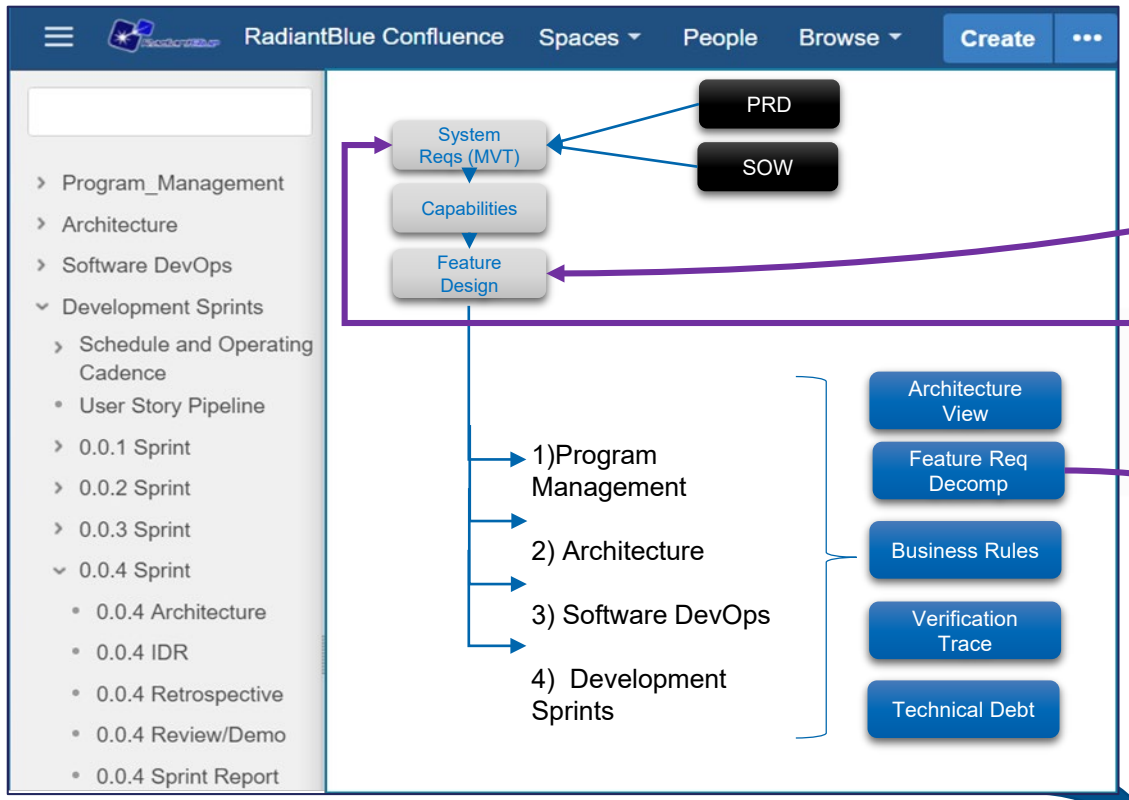
# Emerging Architecture Methodology

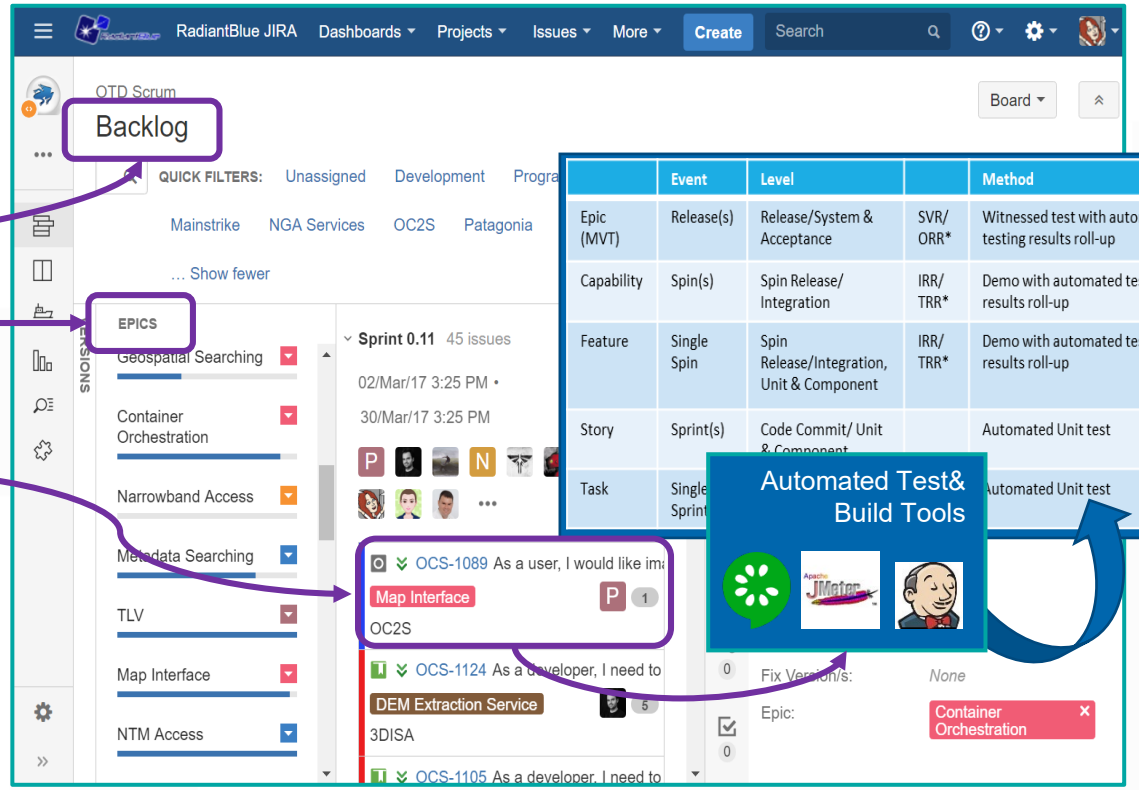



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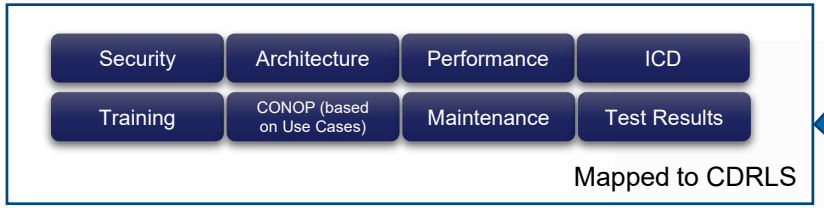
# Ruthless Automation –Automate Documentation




| | Event | Level | | Method | Perf & Sec |
|---|---|---|---|---|---|
| Epic (MVT) | Release(s) | Release/System & Acceptance | SVR/ ORR* | Witnessed test with automated testing results roll-up | ✓ |
| Capability | Spin(s) | Spin Release/ Integration | IRR/ TRR* | Demo with automated testing results roll-up | ✓ |
| Feature | Single Spin | Spin Release/Integration, Unit & Component | IRR/ TRR* | Demo with automated testing results roll-up | ✓ |
| Story | Sprint(s) | Code Commit/ Unit & Component | | Automated Unit test | ✓ |
| Task | Single Sprint | | | Automated Unit test | ✓ |




Snap @ Release

Tools reflect the true state of the "as-is" development and not someone's interpretation of development status.

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# Lessons Learned

- You have to know the WHY to communicate the WHY
- Acknowledgement that not all projects and programs require the same level of rigor.  First important step is to evaluate what level of rigor is necessary
- Ruthlessly automate – make the tools work for you

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# Questions?

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# AGILE: BEYOND SOFTWARE

*Making your delivery as agile as your development*

PREPARED BY CLAIRE ATWELL FOR NDIA AGILE IN GOVERNMENT CONFERENCE 2019

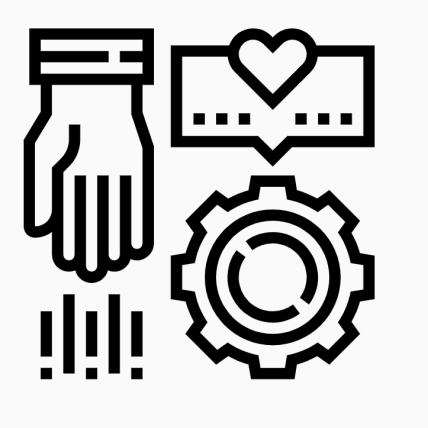
# LET'S TAKE A POLL

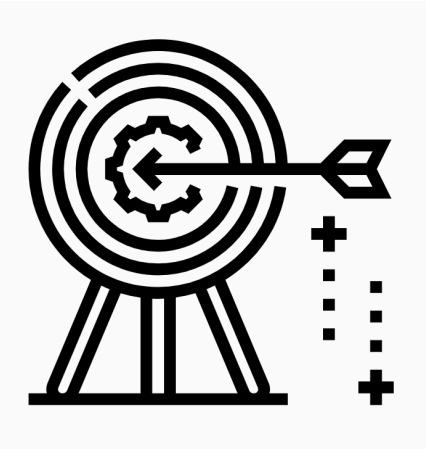
**CURIOUS ABOUT AGILE AND HERE TO LEARN MORE**

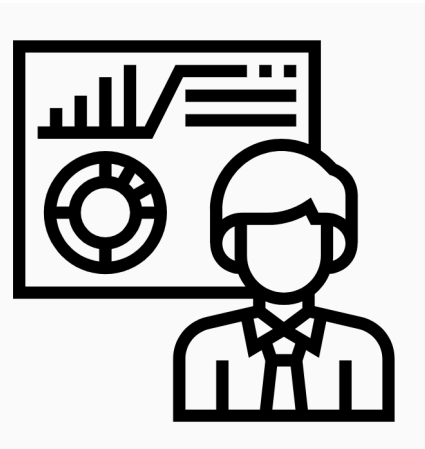
**ABOUT TO START A TRANSFORMATION**

**IN THE MIDDLE OF A TRANSFORMATION**

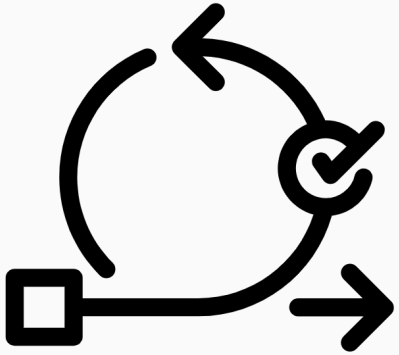
**HAVING A GREAT TIME WITH AGILE!**

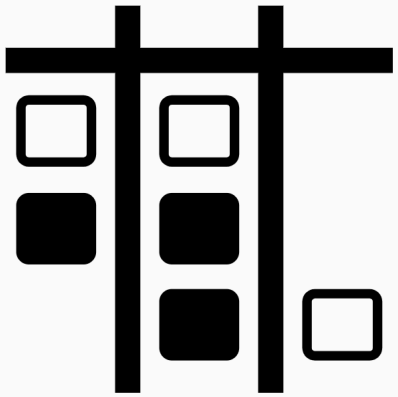


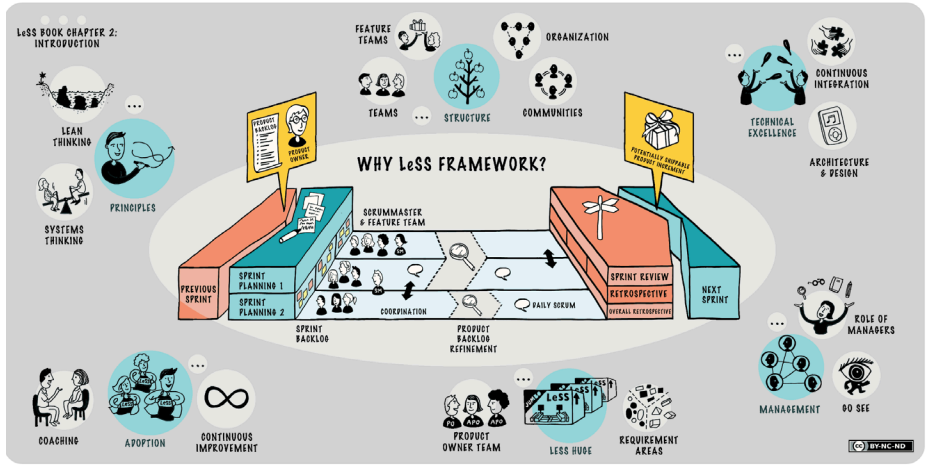


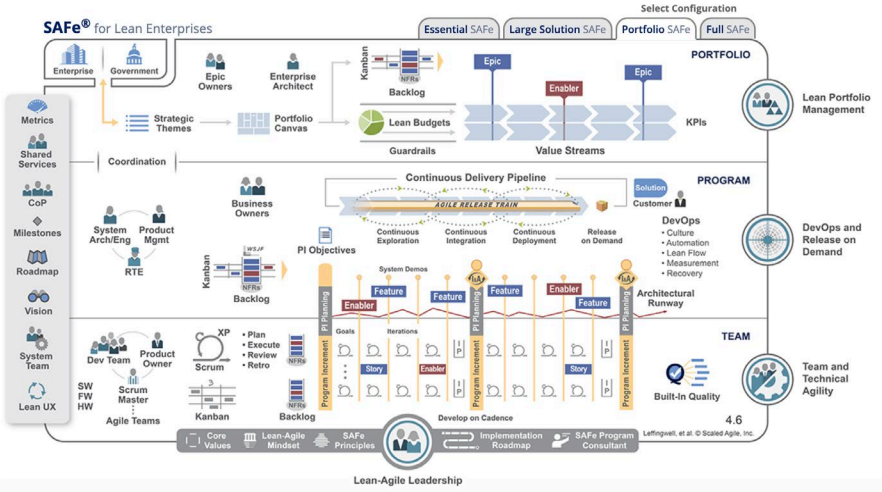


# WE KNOW THESE









# THE EMERGING NEED

AGILE ”TRANSFORMATIONS” ARE ONLY FOR DEVELOPMENT

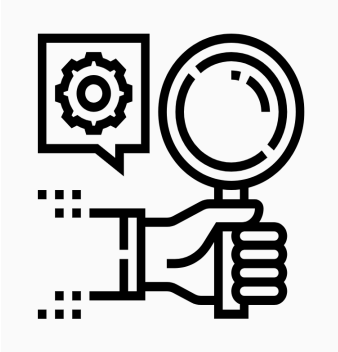
NOT IMPROVING DELIVERY, JUST DEVELOPMENT

CREATING A BIGGER STOVEPIPE

REST OF THE ORGANIZATION PLAYING CATCH-UP

MANDATED AGILE IMPLEMENTATIONS WITHOUT CHANGING PROJECT MANAGEMENT AND MEASURES

WHAT ELSE?







# WHAT ABOUT...

**TRAINING**

**HELPDESK**

**OPERATIONS**

**HUMAN RESOURCES**

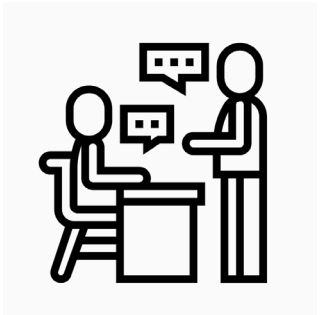
**PROJECT/PROGRAM MANAGEMENT SUPPORT**

**COMMUNICATIONS AND MARKETING**

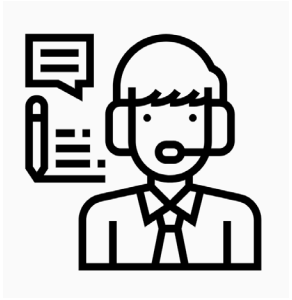
**LONG TERM STRATEGY**

**CONTRACTS**

**WHO ELSE?**

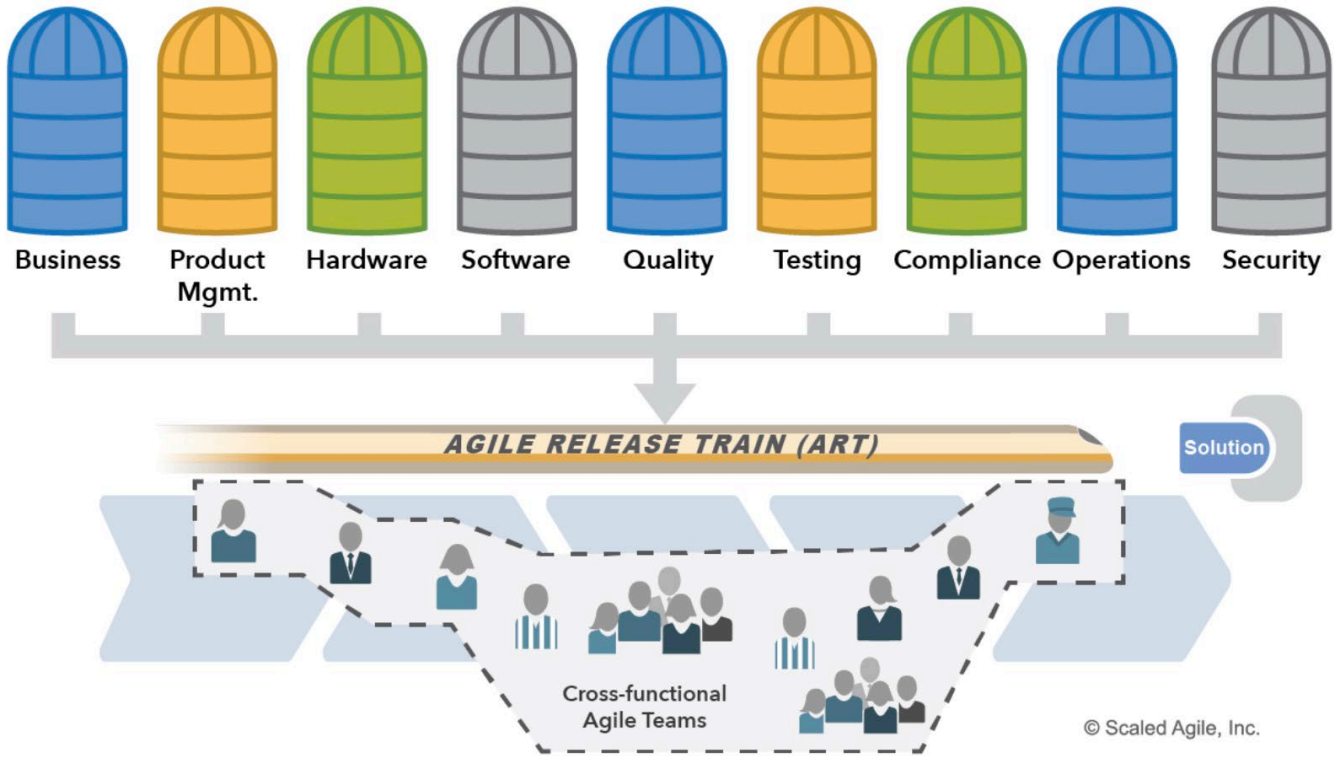






# THIS IS AS CLOSE AS WE GET

*The Agile Release Train concept from Scaled Agile Framework (SAFe) is as close as we get, but we still need to fill in the gaps*





# START WITH THE AGILE MANIFESTO

WE ARE UNCOVERING BETTER WAYS OF DEVELOPING SOFTWARE BY DOING IT AND HELPING OTHERS DO IT. THROUGH THIS WORK WE HAVE COME TO VALUE:

**INDIVIDUALS AND INTERACTIONS** *OVER PROCESSES AND TOOLS*

**WORKING SOFTWARE** *OVER COMPREHENSIVE DOCUMENTATION*

**CUSTOMER COLLABORATION** *OVER CONTRACT NEGOTIATION*

**RESPONDING TO CHANGE** *OVER FOLLOWING A PLAN*

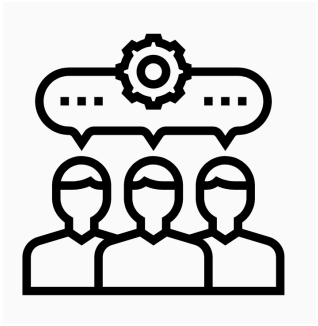
THAT IS, WHILE THERE IS VALUE IN THE ITEMS ON THE RIGHT, WE VALUE THE ITEMS ON THE LEFT MORE.*

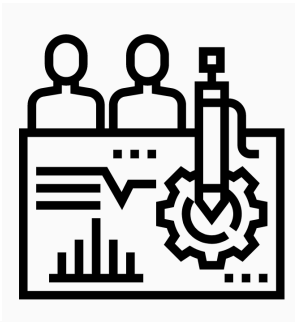
*Source: http://agilemanifesto.org/

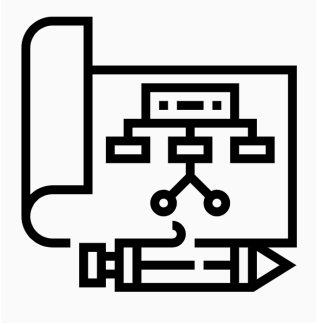
# PART ART – PART SCIENCE



# FINDING THE BALANCE







| Art | Science |
|---|---|
| True collaboration | Understanding Roles |
| Breaking down silos | Creating cross functional teams, including non-technical roles |
| Safe environment for innovation | Management practices to encourage intellectual risk taking |
| Team Engagement | Opportunities for mastery, self directed work |
| Stakeholder partnerships | Stakeholder Analysis/Management |
| Understanding Definition of Done and Intent of control gates | Value Steam Mapping/Eliminating Waste |
| Emergent Practices rather than Best Practices | Process Improvement through retrospectives and/or root cause analysis |



# QUICK TAKE-AWAYS

1. Every person in the organization should feel involved
2. Think about the end to end system of delivery
3. Find the balance between Art and Science for your organization
4. Review how you work together, it’s worth the time
5. When in doubt, go back to the Agile Manifesto
6. Create your future together

# THANK YOU!

Claire Atwell

Enterprise Agile Coach

571-295-1155

Claire.d.atwell@gmail.com

For further coaching contact agile@bah.com

Free to download, Booz Allen Resources:

Booz Allen Agile Playbook - https://www.boozallen.com/s/insight/publication/agile-playbook.html

Booz Allen Enterprise DevOps Playbook - https://www.boozallen.com/s/insight/publication/enterprise-devops.html

# Adopting AGILE and the Scaled Agile Framework (SAFe) for the Federal Government: A case study application for a satellite ground system acquisition program

Dr. Roderick Capili

US Government

National Defense Industrial Association (NDIA)

9 May 2019

# Presentation Topics

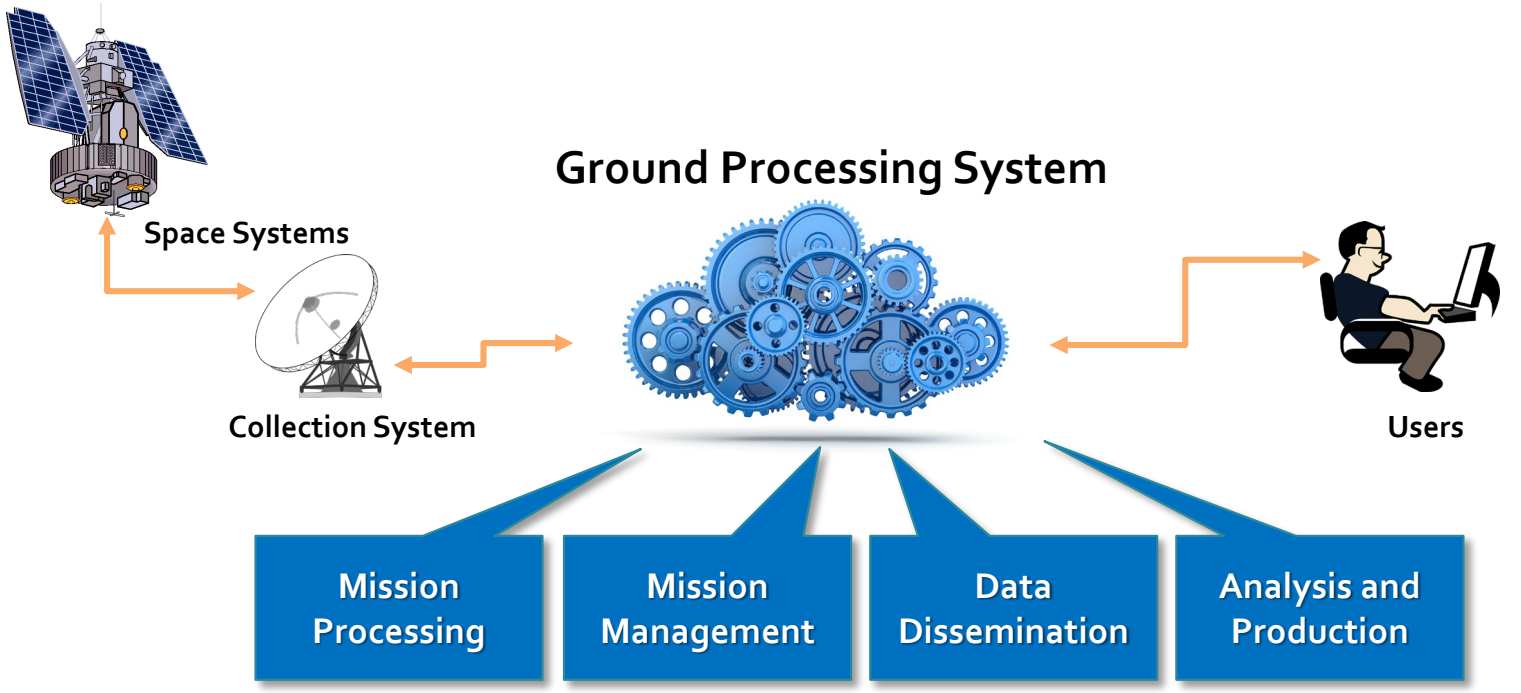
- A case for adopting AGILE and SAFe – The Systems Program Office
- Defining the challenge
- Adopting Agile and the Scaled Agile Framework (SAFe)
- Lessons Learned and observations – How Federal "constraints" impacted the ability to be "Agile"
- Onward and beyond for the program office

**Intent is to provide individuals and organizations key lessons learned for implementing the Agile and Scaled Agile approach within the constraints of the federal government**

* Assumption – familiarity with Agile, Scaled Agile Framework (SAFe), and Continuous Integration concepts

# A case for adopting AGILE and SAFe

# The Systems Program Office




- Systems Program Office (SPO) - joint program office between multiple federal agencies and strategic organizations
- System-of-Systems (SoS) construct to provide ground station functionalities for space systems.
  - Remove stovepipe dependencies for various space system capabilities

# A case for adopting AGILE and SAFe

# The Systems Program Office

- Major Systems Acquisition (ACAT- I equivalent) program office responsible for the acquisition of a ground processing system
- "Government-As-The-Integrator" (GATI) – serve as the primary integrator for legacy and emerging ground station capabilities in support of NTM
- Software intensive development effort – multiple vendors, multiple sub-systems
- Primarily software development effort provided by >20 vendors with multiple contract lines and types.
- Program Office composed of Military, Government, Contractor-support
- Future Year Defense Program (FYDP) budget – FY 19-25 > $1.0B

# Defining the Challenge

- Implement Agile methodology to software development in order to enable rapid software delivery (capability) to the users
- Scale the Agile process to enable enterprise integration activities
- Adopt cloud  environments where applicable
- Enable organizational processes to allow iterative activities
- Align resource skillsets to enable Agile processes and integration capabilities

- Federal Agency Organizational focus – Acquisition-centric approach
  - DoDI 5000.02 – Operation of the Defense Acquisition System
  - Traditional Waterfall approach
  - Significant top-down System Engineering mindset
  - Systematic oversight from Congress and other federal organizations

# Program Office

# Drive to adopt Agile and SAFe

- Decision to implement Agile and Scaled Agile (2015/16)
- Focused and deliberate activity
  - Allow/direct component development to utilize Agile development approach – Scrum
  - Adopt Scaled Agile Framework (SAFe) – early iteration of SAFe, tailored approach
  - Re-organize according to SAFe approach
  - Adoption of Agile and SAFe lexicon
- Initial emphasis on component developers to adopt Agile approach – tempo, delivery cycle, and scale where appropriate, within the component efforts
- Develop and migrate into the cloud environment as appropriate
- Establish a cyclic planning cycle – Increment planning
  - Organizational focused with stakeholder expansion

# Program Office

# Case Study Results

## Successes

- Adoption of Scrum as the preferred Agile approach for developers
  - Cycle of activities around the iterative approach
- Established quarterly incremental planning cycle
- Established a dynamic, iterative approach that went beyond software development and deliveries – redefined organizational activities
- Provided a means for cross-component collaboration and interaction
- Led agency approach to address iterative (Agile) activities and overall adoption
- Pathfinder for additional framework activities
- **Effective component deliveries that addressed mission or user demands to the stakeholders**

# Program Office

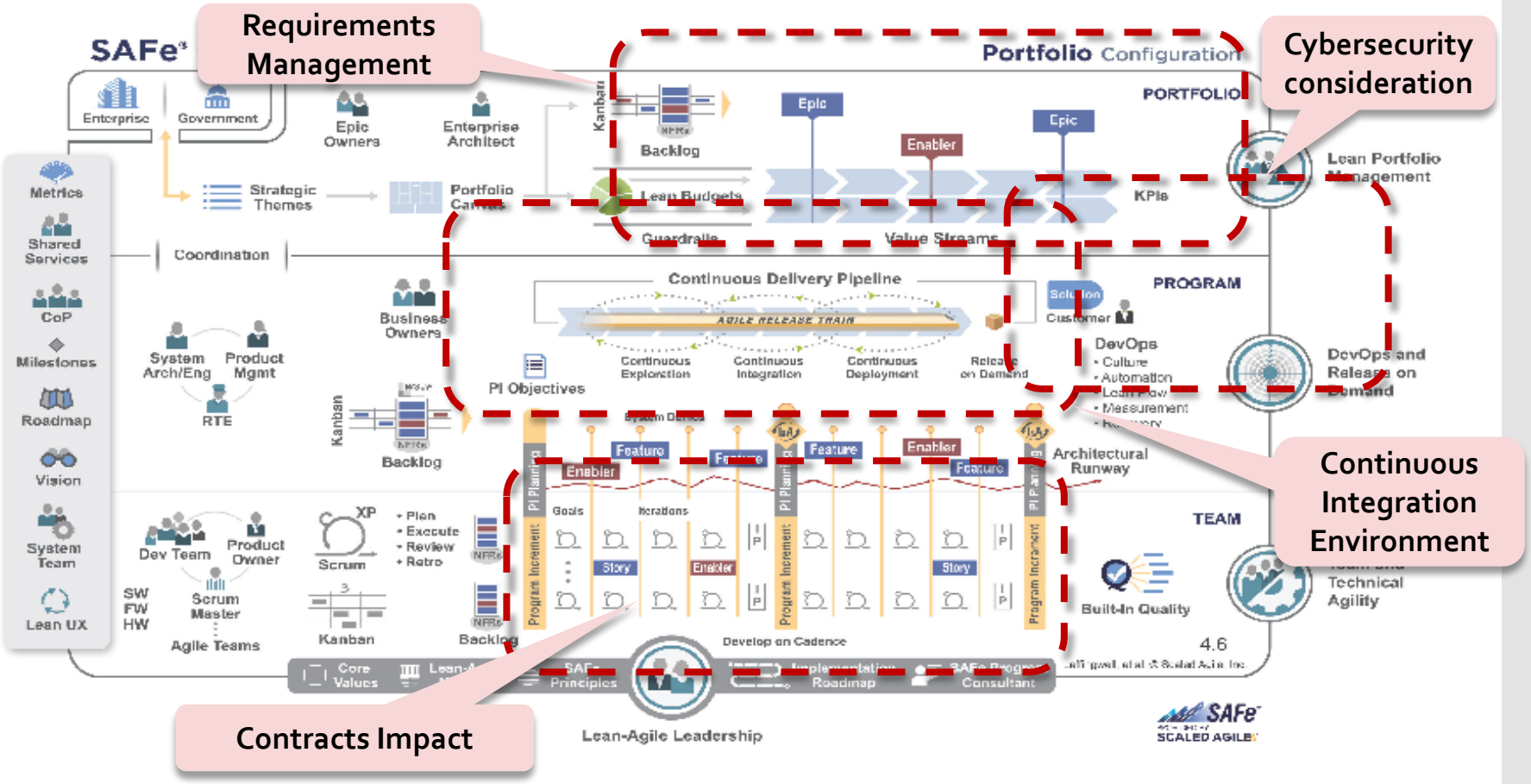
# Case Study Results

## Challenges

- Scaling of activities remains a challenge
  - Initial concept to adopt Minimum Value Threads was not successful
- Relegated systems engineering activities to supporting events
  - Program Office is responsible for translating Agile and SAFe "speak" to oversight and higher agency reporting
- Additional resources did not alleviate the challenges
  - Financial and human resources did not resolve difficulties
- Processes did not translate to effective tools and environment
  - Agile and SAFe came first; supporting structure was not ready
- Critical lessons learned obtained in four areas:
  - Requirements management
  - Contracts management
  - Continuous Integration Environment
  - Cybersecurity considerations

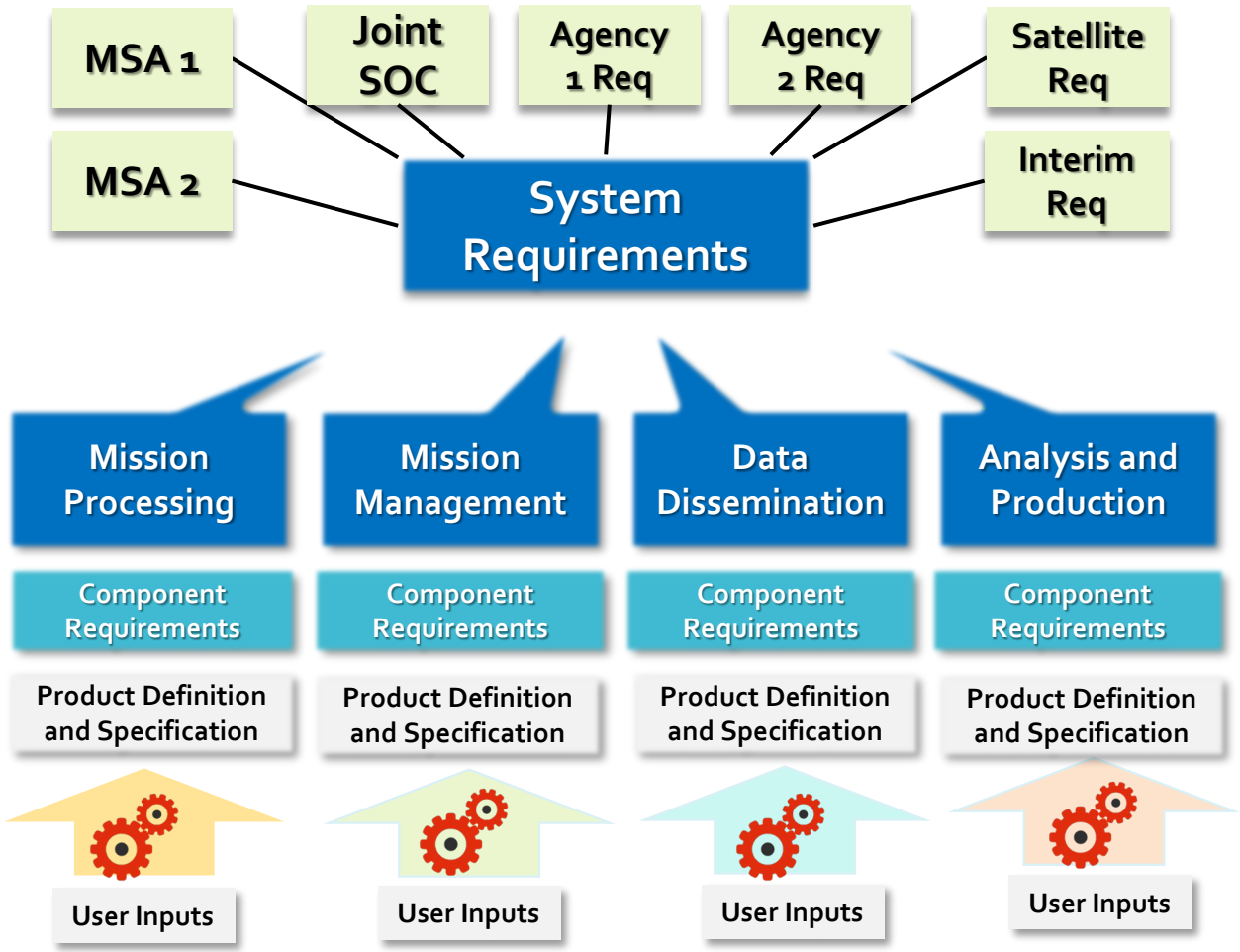
# Scaled Agile Framework

# Scaling Agile activities to support integration




- Fundamentally, the decision to the adopt the Agile approach is to also implement the Scaled Agile Framework (SAFe)
- Mindset to go “faster in delivering capabilities” and “scaling faster delivery”

# Requirements Management



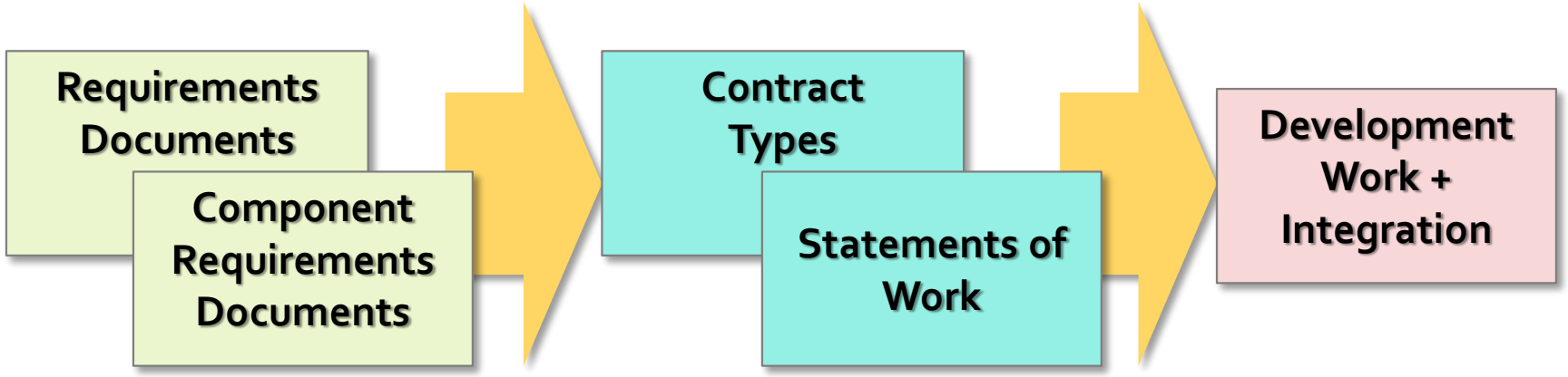

Long-lead Information for high-level requirements

Define Mission Areas to accommodate difference between Requirements and System Deliveries (System Validation Testing)

Utilized contractor-defined software specifications after development (inclusive of user inputs) (Component Verification Testing)

**Continuing challenge to maintain strategic obligations while executing dynamic development**

# Contract Impacts and Consideration



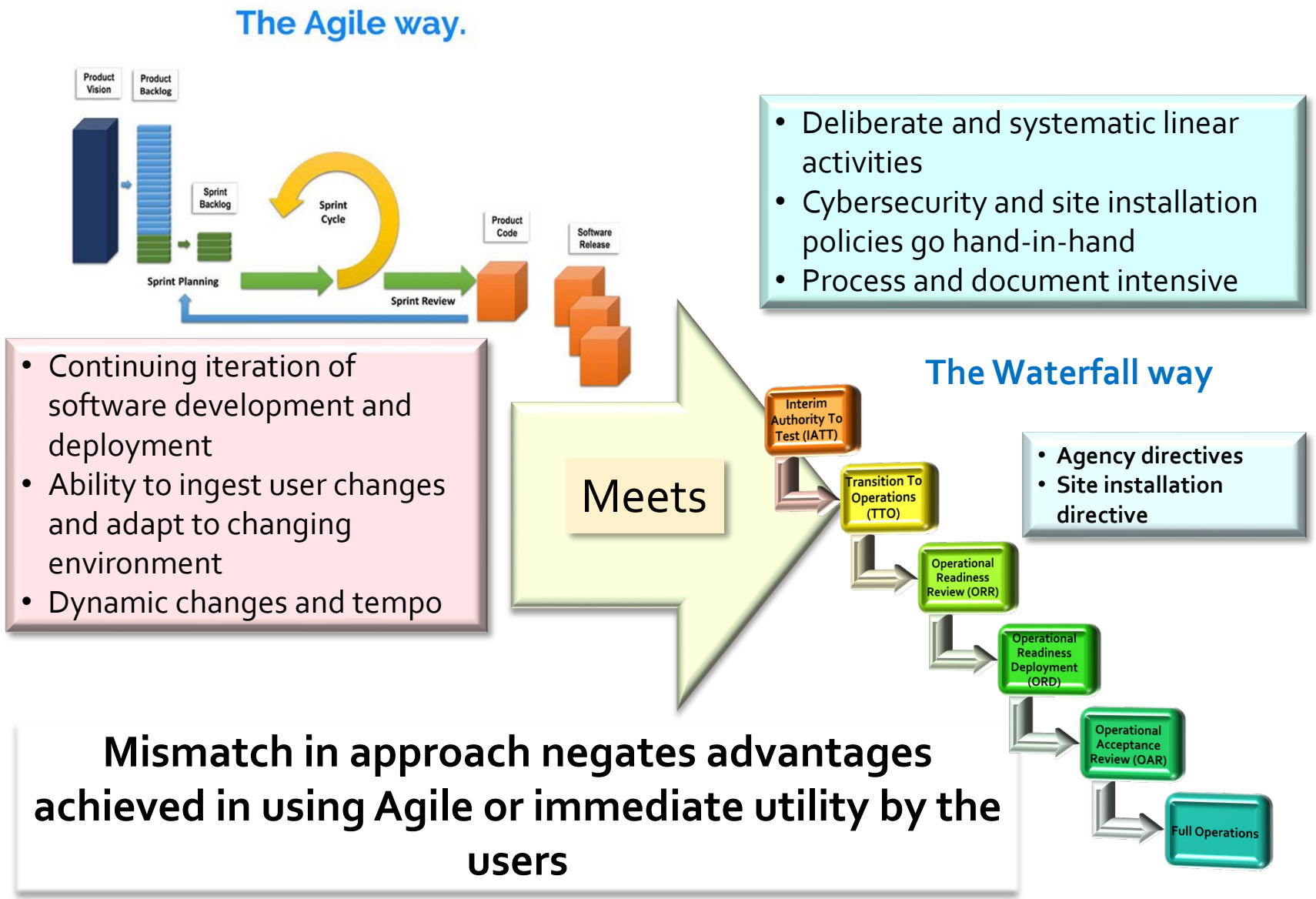

- Can be viewed as the PMO's "span of control" – defines type of work that developers and contractors can legally execute
- Done incorrectly, this will disable ability to become Agile or integrate effectively
  - Ensure contract language exists for scaling and integration activities
  - Ensure contract language exists for product delivery
- Contract types will be a factor in determining flexibility – for the Program Office, Cost-plus award and incentive fee were particularly successful
- **Contract definition (i.e. Statements of Work, contract deliverables, etc.) will be critical in defining work and ability to accommodate changes per the Agile doctrine**

# Continuous Integration Environment

- Key enabler for utilizing scaling and integration activities – tied to strategic vision of overall effort
- DEVOPS pipeline – strategic design – How can the user utilize the system?
- Provide the necessary environment for deployment for user access to software
- Align use of software development toolkits
- Lack of common environment will negate key advantages of what Agile and SAFE can offer (i.e. automated testing, etc.)
- **Significant driver for cost increase and cyber security activities; schedules and performance very close second**



# Cybersecurity Considerations



# Key Lessons Learned / Observations

1) "Digital Engineering" is an agency approach; Agile and Scaled Agile will influence a significant portion of how the organization conducts business
2) Agile and SAFe does NOT replace good Systems Engineering processes
   - They are process tools to implement Systems Engineering
   - Adopt and tailor Agile and SAFE processes to maximize efforts
3) Federal ecosystem will continue to have challenges ahead
   - Most agency activities are still simply too entrenched in the traditional mindset of "waterfall"
4) Challenge in understanding the "Tools of Agile" – consistency and control of these tools are essential
5) The "Cloud" environment will exacerbate challenges of Agile
   - Highly recommend to understand the environment first, develop it, and prepare the environment, to fully maximize agility and integration

# Key Lessons Learned / Observations

6) Mapping of lexicon and terminology is essential to organization success
   - Recommend that organizations implement a top-down approach for consistency
7) Establish the strategic implementation plan at the agency level – don't forget data design and considerations
8) Highly recommend a common "digital environment" at the highest level possible (i.e. common environments, common platforms, common toolsets) – minimize duplicity in approach and redundancy in activity
9) Cybersecurity will be an exponential factor as you scale integration activities
10) Basics of Systems Engineering cannot be over-emphasized

# Onward and beyond for the Program Office

- All component development activities are utilizing the Agile methodology
- Adopted SAFe construct for cross-component coordination
  - Increment Planning construct (quarterly coordination)
- Entering next phase of system-of-system integration
  - Multi-environment integration and testing (Distributed Test approach)
  - Common testing toolset
  - Rolling integration and test windows – adopted Agile process to system-of-system integration
  - Continuing requirements management process (component verification testing)
  - Aligning integration testing to Mission Areas per user inputs (system test validation)
- Re-defining agency Systems Engineering process to adapt to Agile and Scaled Agile approach
- Preparing for higher Enterprise integration activities

# Questions

# 76TH SOFTWARE ENGINEERING GROUP

## Challenges of Employing Agile DevOps Practices for Embedded Operational Flight Software

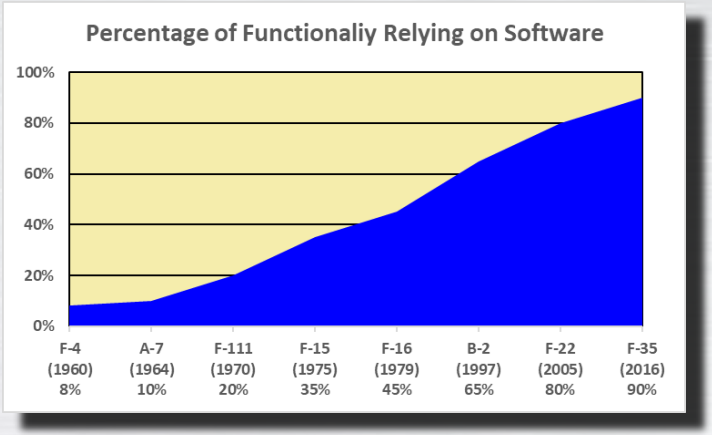



**Shawn Taylor**
**Technical Director**
**76th Software Engineering Group**
**Tinker AFB, OK**
**shawn.taylor@us.af.mil**
**405-736-5834**


**DELIVERING COMBAT POWER FOR AMERICA!**

# Embedded Operational Flight Software Growth

**Weapon Systems**
**Increasingly Software Intensive**




SLOC = Source of Lines Of Code

F-16
~ 200K SLOC

B-2
~ 1.5M SLOC

F-22
~ 2M SLOC

F-35
~ 9M SLOC

KC-46
~ 15M SLOC

Heads Up Displays

Controls & Displays

Digital Flight Controls

Predictive Maintenance

Situational Awareness

Multi-Mission Platforms

GPS/Navigation

Smart Weapons

Sensor Fusion

Electrical-Optical

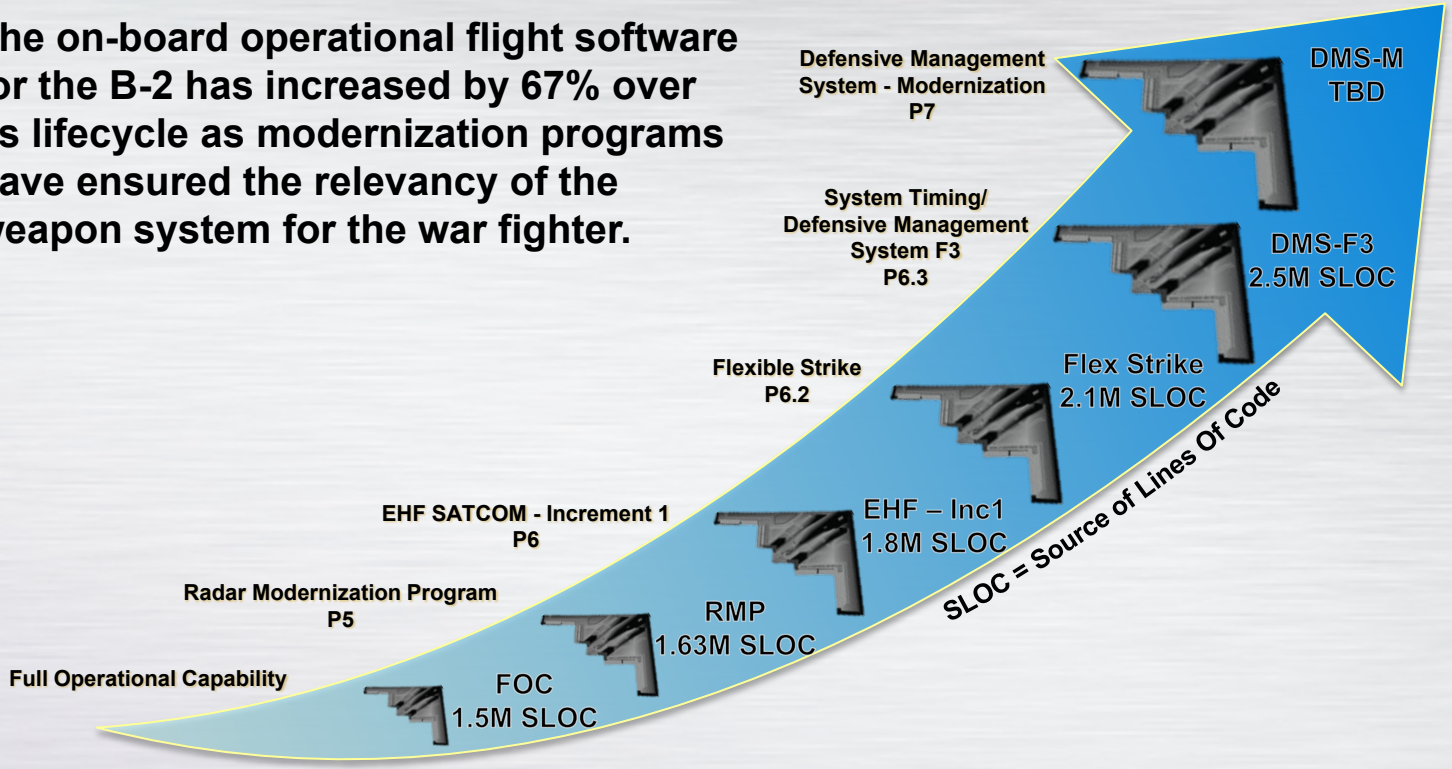
Improved Sensors

SLOC estimates at initial production

**Software is Today's Catalyst in enabling Weapon System Capability**

# Growth within Weapon Systems

**The on-board operational flight software for the B-2 has increased by 67% over its lifecycle as modernization programs have ensured the relevancy of the weapon system for the war fighter.**




**Software Size Continuously Increases During System Lifecycle**

# Need for Speed

- Near peer adversaries are closing the gap
- Speed with discipline enhances security
- Delivery of outdated requirements reduces value
- Fail fast, learn fast
- National security concerns compel us to take action
  - Shorten software release cycles to operate within our adversaries' observe-orient-decide-act (OODA) loop
  - Identify and attack impediments prohibiting deployment at the speed required to ensure relevance
  - Leverage Agile DevSecOps practices to put operational flight software in the hands of the war fighter sooner







**We Must Change the Delivery Cadence of Operational Flight Software**

# Barriers to Agile DevSecOps Implementation



- Limited Stakeholder Involvement/Experience
- Operator Training Cadence
- OSS&E/Airworthiness/Nuclear Certification
- Developmental/Operational/Flight Test
- Joint Interoperability Test Certification
- Authority to Operate (ATO)
- Collaboration Tools – Network Limitations/Classified Environments
- Tightly-coupled Architecture
- Scarce Tool Chain Support for Legacy Languages
- Overreliance on System Integration Labs vs. Emulation
- Complex Algorithm Development

**Operational Flight Software Faces Unique ADSO Implementation Challenges**

# Stakeholder Involvement

- **Agile DevSecOps requires dedicated stakeholder involvement**
  - **Program Office/Owning Command**
  - **Cyber Security Authorities**
  - **Developmental/Operational Test Community**
  - **End Users (Pilots and Maintainers)**
- **Clarification and maturation of requirements**
  - **Essential for meaningful prioritization**
  - **Ensures continuous evaluation of relevance**
  - **Completes the feedback loop**
- **Stakeholders must be knowledgeable of ADSO methodologies**
  - **Training**
  - **Hands-on Experience**



**Culture Change Across the Entire Spectrum of Stakeholders**

# Operator Training Cadence

- Pilot training cadence affected by Agile DevSecOps pace
  - Status quo geared toward large block changes
  - Iterative and incremental builds create fewer training requirements per release
  - Minimum acceptable cadence much longer than sprint cycle
- Not all software updates require training changes
  - Identification of Pilot Vehicle Interface (PVI) changes
    - Track PVI changes to understand impacts
    - Potentially bypass training for releases without PVI changes
  - Training system synchronization must be considered
- User representative must be integral to development team
  - Current or former pilot input extremely valuable
  - Most software developers aren't pilots and vice versa



**Operational Flight Software Demands Rigorous Training**

# Regulation, Policy and Guidance

- Operational Safety Suitability and Effectiveness (OSS&E)
  - JSSG-2008, MIL-STD-882D, RTCA DO-178B, AC 20-115B
  - Airworthiness and nuclear certification
- Developmental/Operational Test
  - No substitute for flight test in certain cases
  - Bring DT/OT requirements into development teams – shift left
- Joint Interoperability Test Certification
  - Weapon systems must communicate with one another
  - Net Ready Key Performance Parameter (NR-KPP)
- Look for ways to streamline compliance




**Regulations Inevitable for Systems that Fly and Deliver Weapons**

# Toolchain Procurement and Authorization

- **Authority to Operate (ATO)**
  - Move to Continuous ATO
  - Authorize the pipeline, not the product
  - Security baked in not bolted on
- **Procurement of Software Tools**
  - Typical timeline of 6-18 months from need to usability
  - Approval for use process too slow
- **There is no one-size-fits-all solution, but…**
  - Cloud architectures enable buying power
  - DoD Enterprise DevSecOps Initiative
    - Hardened Software Factory
    - Avoids vendor lock




**These Processes Must be Vastly Improved to Enable Successful Implementation**

# Legacy System Sustainment

- Many Tightly Coupled Legacy Architectures
- Limited Support for Languages and Hardware
  - Ada, Jovial, ANSI C, assembly codebases
  - MIL-STD-1750A spec processors
- Overreliance on hardware-in-the-loop System Integration Labs
  - Virtual labs leveraging robust emulation enable faster development
  - Development environments must be kept modernized
- Complex Algorithm Development
  - Certain “science project” solutions not easily decomposable
  - Exasperated by lack of modularity in architecture







**Modernizing the Way Legacy Systems are Sustained**

# Takeaways

- Growth of operational flight software in quantity and complexity
- Adoption of iterative and incremental build cycles is vital
- Operational flight software presents unique challenges
- Stakeholders must commit resources to enable success
- Users of these systems require rigorous training
- Regulatory requirements must be considered
- DevSecOps infrastructure requires deliberate investment
- Retooling of legacy system development environments
- Degree of implementation will vary by platform



**Implementation of DevSecOps Imperative to National Security**

# Q&A



# Sparking Mission Agility with End to End **Value Stream Teams**

LitheSpeed

## About Me – Bob Payne



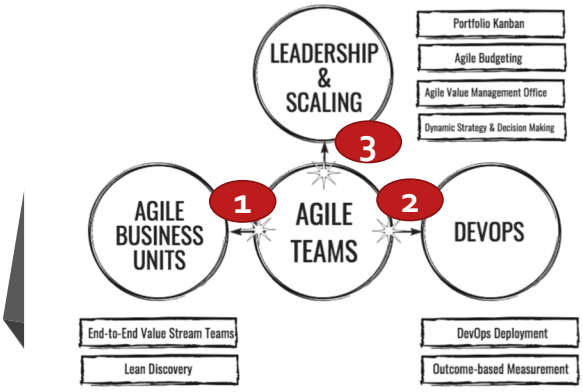

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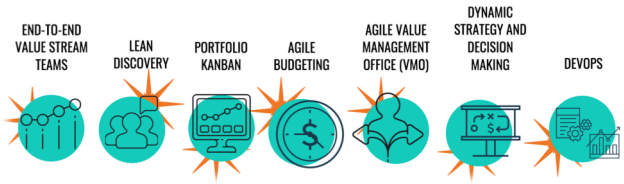


- Change Agent
- Experience: 25 years industry, 20 years of Agile/Lean
- Specialties: Agile, Lean, Innovation
- Practitioner, consultant, trainer, author, speaker and community organizer
- Host AgileToolkit Podcast
- @AgileToolkit Twitter
- Chair, AgileDC Conference


- Bob.Payne@Lithespeed.com
- 202-903-6854

# Three Essential Shifts – Left, Right and Up

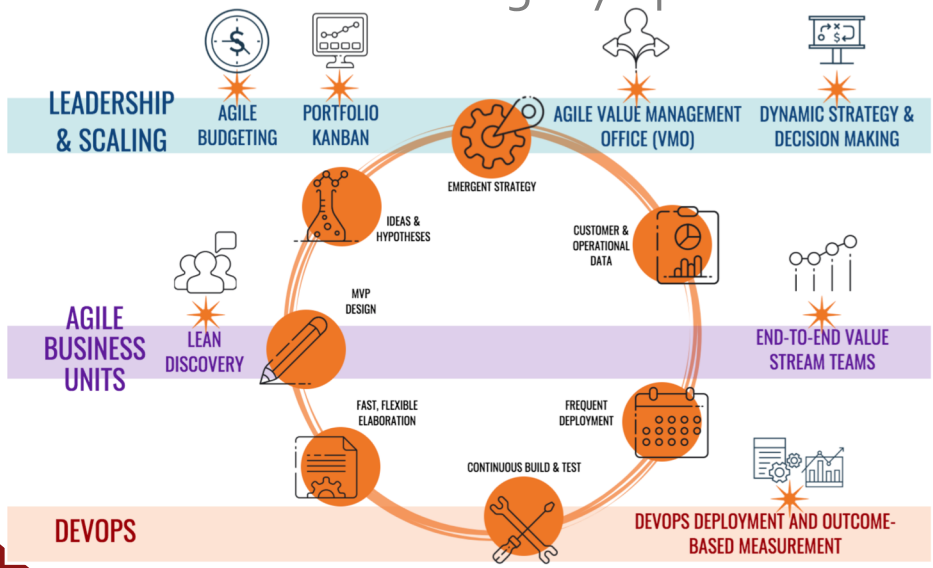


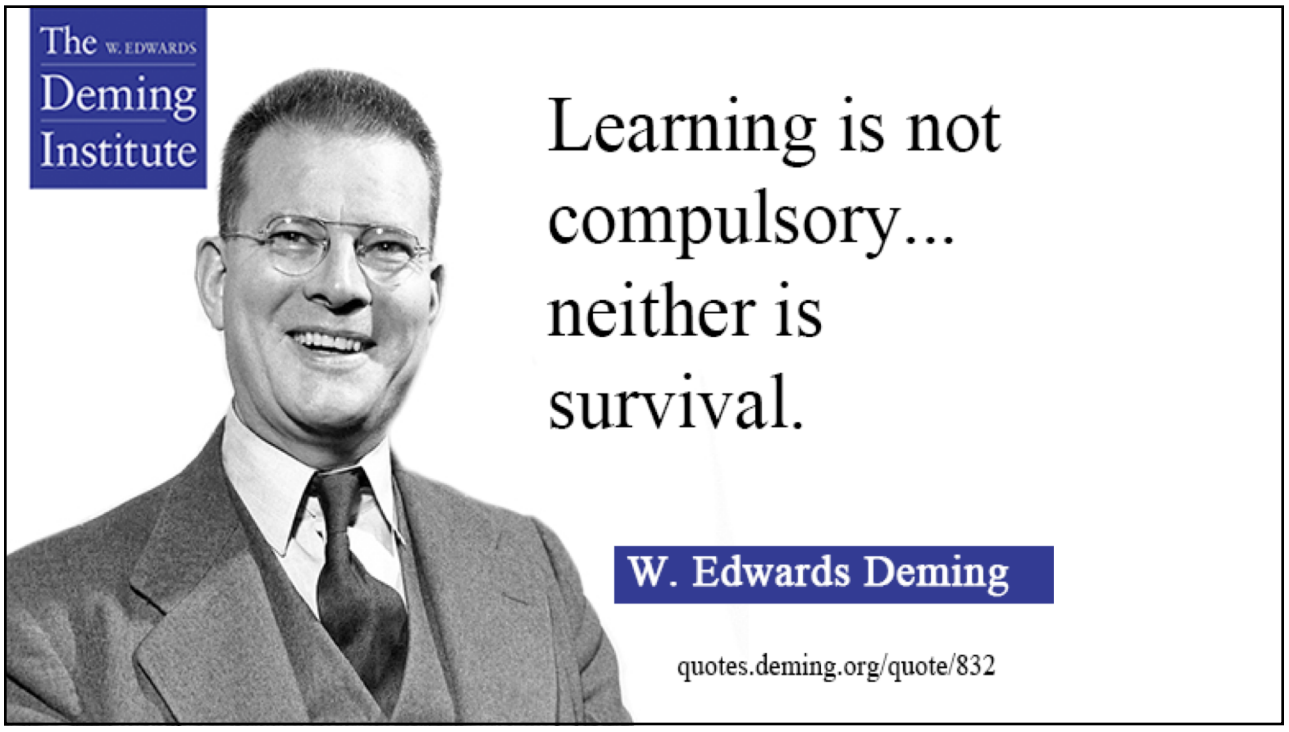

To truly enable **end-to-end agility,** **adopt the sparks and incrementally shift your organization to Agile**.

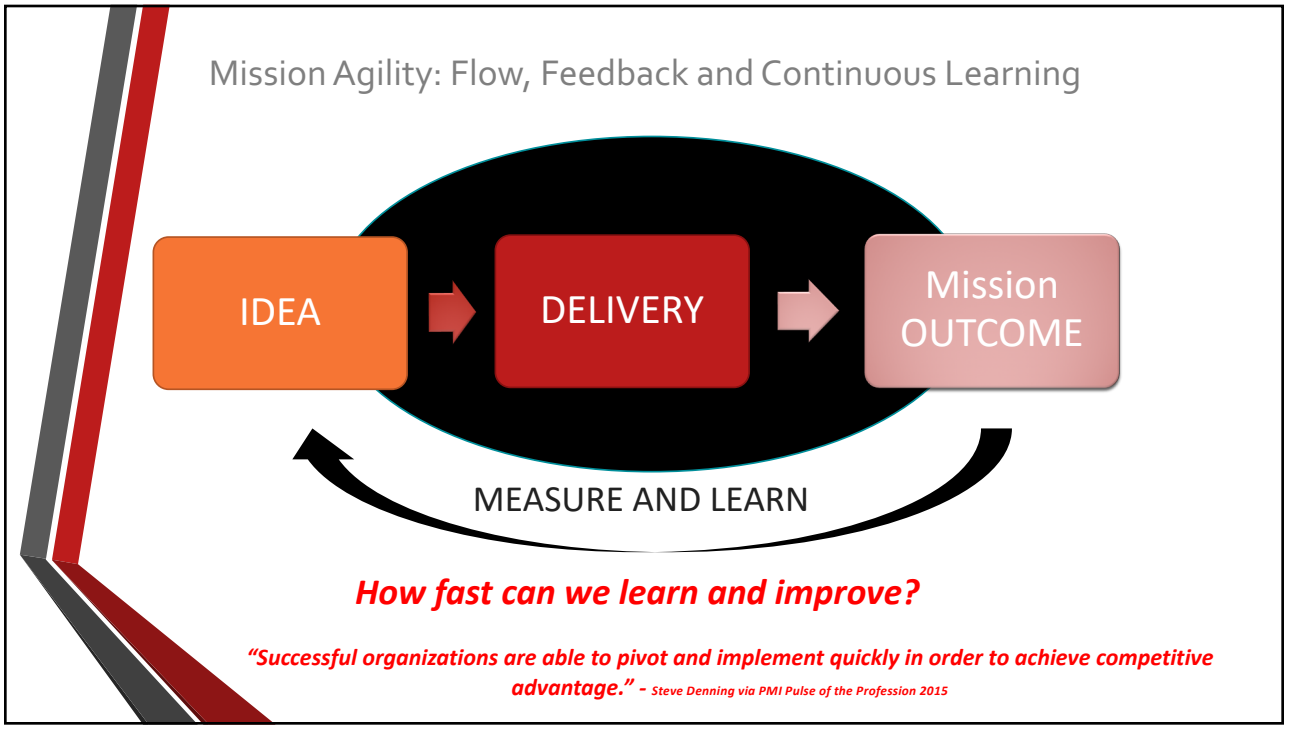
1. Shift left with Agile Business Units
2. Shift right with DevOps
3. Shift up with Leadership and Scaling

# The Essential Business Agility Sparks

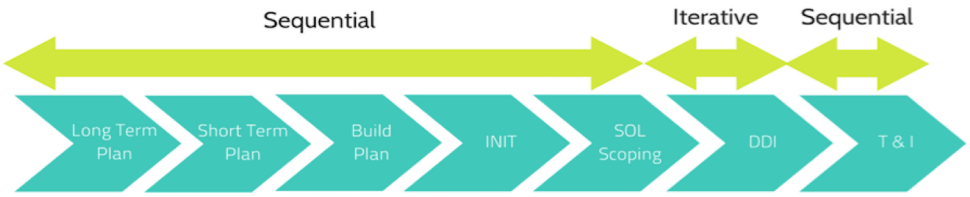



*Business Agility Sparks™, Agile Value Management Office™ and AVMO™ are trademarks of LitheSpeed LLC*


The W. EDWARDS Deming Institute
Learning is not compulsory... neither is survival.
W. Edwards Deming
quotes.deming.org/quote/832


Mission Agility: Flow, Feedback and Continuous Learning
IDEA
DELIVERY
Mission OUTCOME
MEASURE AND LEARN
How fast can we learn and improve?
"Successful organizations are able to pivot and implement quickly in order to achieve competitive advantage." - Steve Denning via PMI Pulse of the Profession 2015

# Problem: Current organization and process not responsive enough




- Long, linear process
- Unidirectional information flow
- Large, infrequent deliveries
- Silo-ed interactions, many handoffs, lack of integration
- Unclear product ownership
- Planning is inflexible and is tied to a rigid annual funding cycle

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# ...Extended to Value Stream Teams



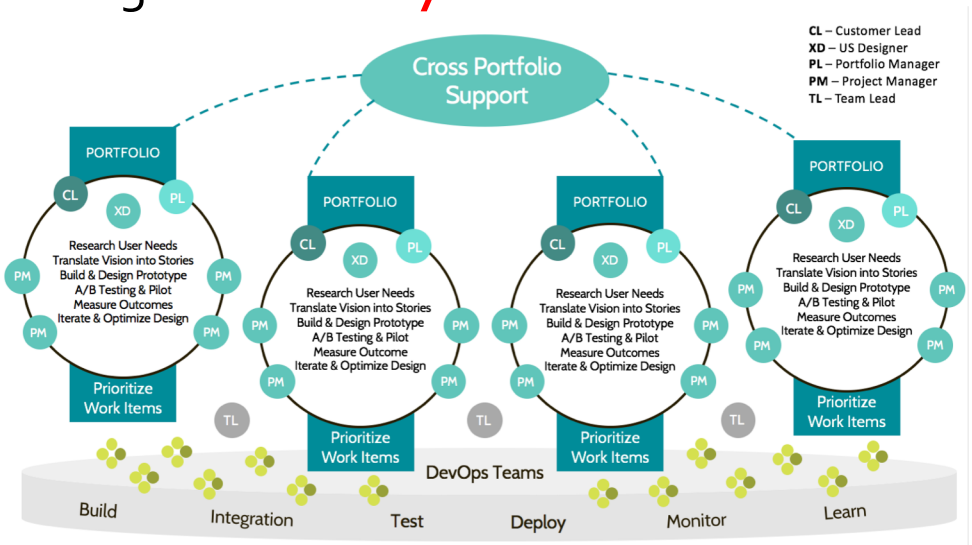

- Set up end-to-end team focused on **value streams**
- Each value stream has **all/most of the functions necessary** to deliver value to end users

Each **value stream** has:
- Product Management/Owners
- User Experience
- Discovery/Refinement/Delivery
- Run Support
- Prototyping R&D
- Digital Measurement support

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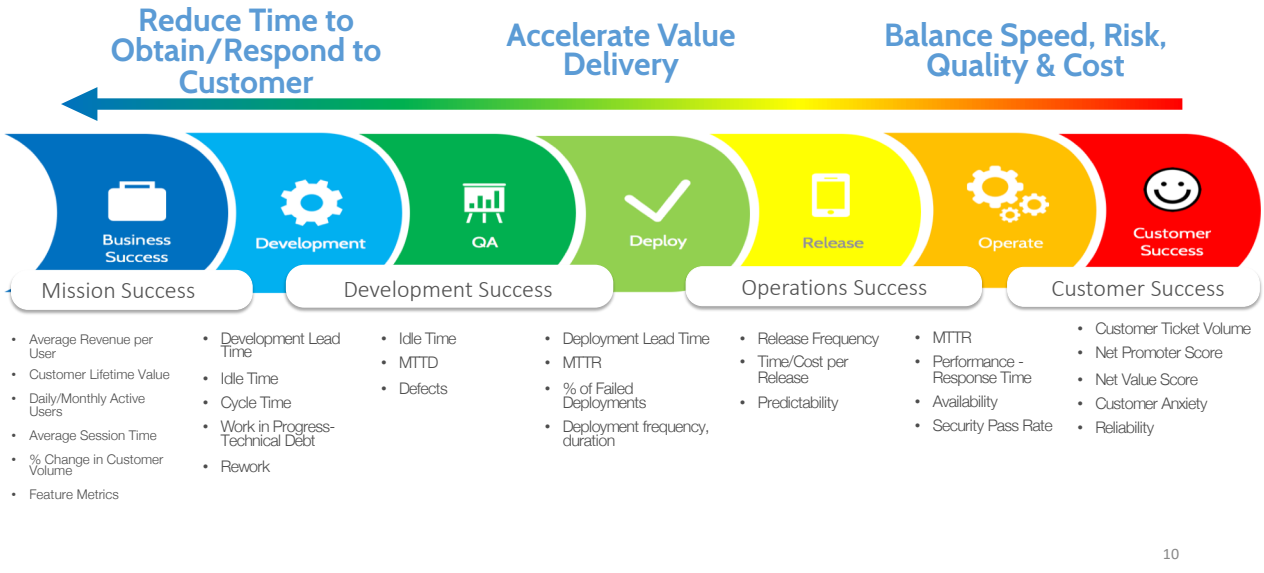
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# Standing Teams **Ecosystem**



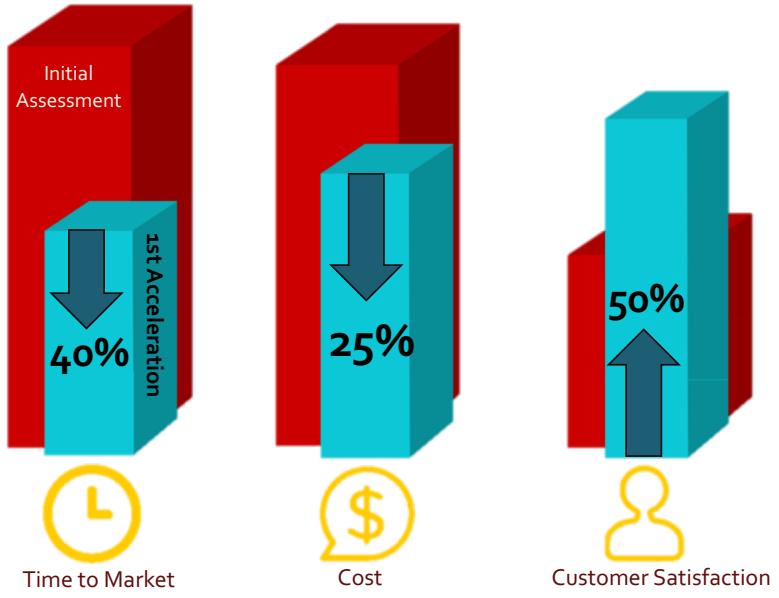

Credit: David Blair, USCIS

# **Closing the Loop**: Customer to Mission Success




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## Acceleration Results




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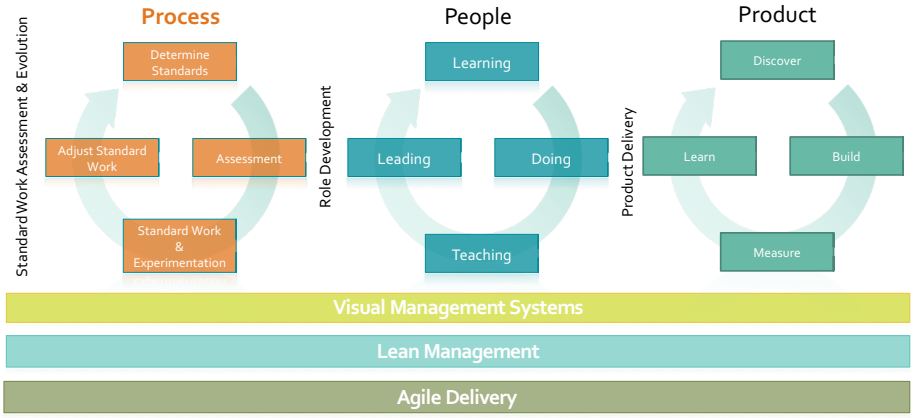
# Agile Approaches to Change

The Human Dimension

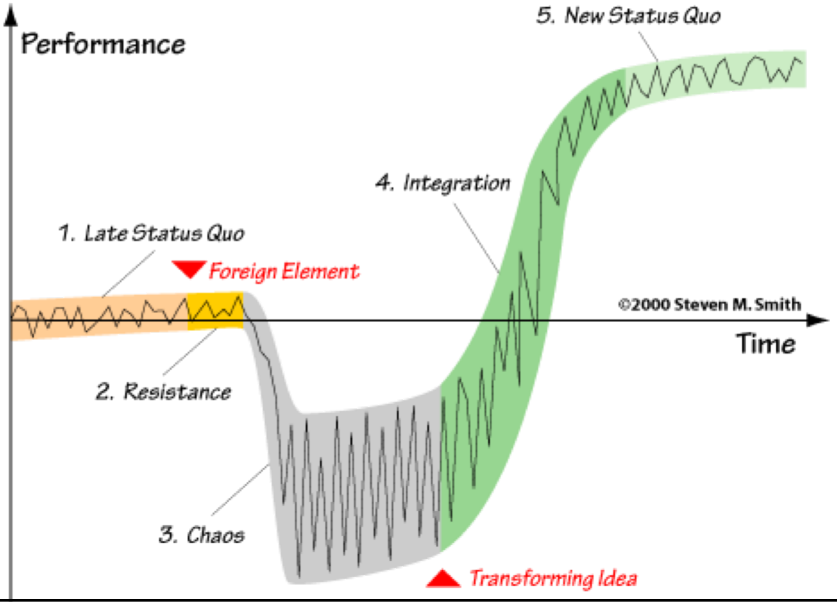
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# Agile **PDCA Processes**

- **Process** – Assessing current practices, comparing to Standard Work, and team experimentation to continuously improve practices and processes.
- **People** – Role development and equipping teams with the skills to successfully implement Agile practices.
- **Product** – Product discovery, execution, measurement and learning.




# The **Satir Change Curve**




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## Agile Champion Role

- **Central point person** for the overall Agile adoption effort
- **Own a centralized budget** for the implementation of Agile. Treat the centralized Agile budget as a project portfolio to maximize returns: customer satisfaction, financial performance, and associate satisfaction
- **Oversee business satisfaction, progress, associate satisfaction, and budget performance** reporting across all Agile projects
- **Act as the "program glue"** that will bring the various silos together to address issues in the Agile program
- **Grow Agile capability internally** to operate with minimal external support

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## Agile Center of Excellence (COE)

Provide **overall leadership and direction** for the Transformation

Monitor the ***value stream*** (all pilot project/product related activities across organizational stovepipes) to ensure delivery of business value to Business customers

Assist in the **identification and selection of pilot projects**

Perform **prioritization of projects** by business value

**Communicate ongoing status** of the Agile pilot program

**Highlight successes** on the Transformation to generate buy-in and enthusiasm

**Manage expectations** of the Transformation to avoid confusion and misunderstanding

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# Agile and the USMC – MCRISS II Program

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# Program Background

- The Marine Corps Recruiting Information Support System II (MCRISS II) is Marine Corps Recruiting Command's (MCRC) enterprise software system for tracking all Officer, Enlisted and Prior Service recruiting activities.

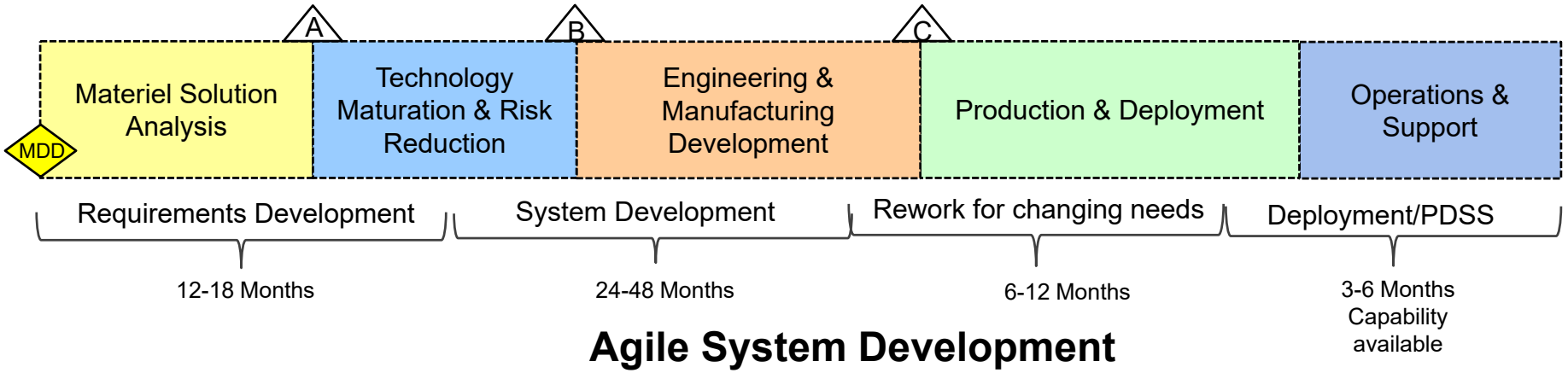
- MCRISS II enables the command and control of systematic recruiting operation across all distributed locations around the globe. Additionally, through the collection of data, it enables demographic and market analysis to optimize the performance of the recruiting force.

- MCRISS II is the USMCs first cloud based and mobile capable enterprise business system

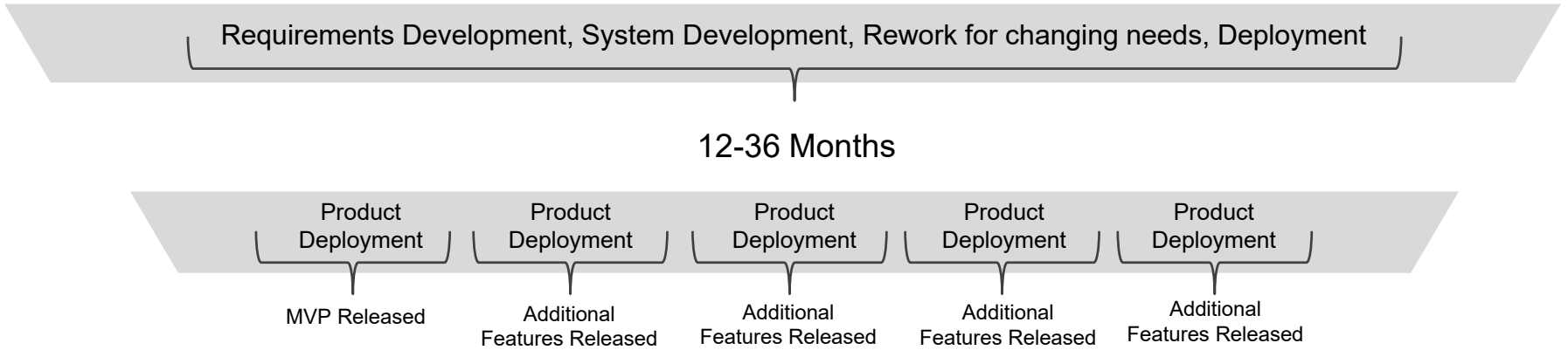
- It is also the first major system to use Government and Contractor fully integrated agile development processes.

# What does Agile look like?

## Traditional System Development




## Agile System Development



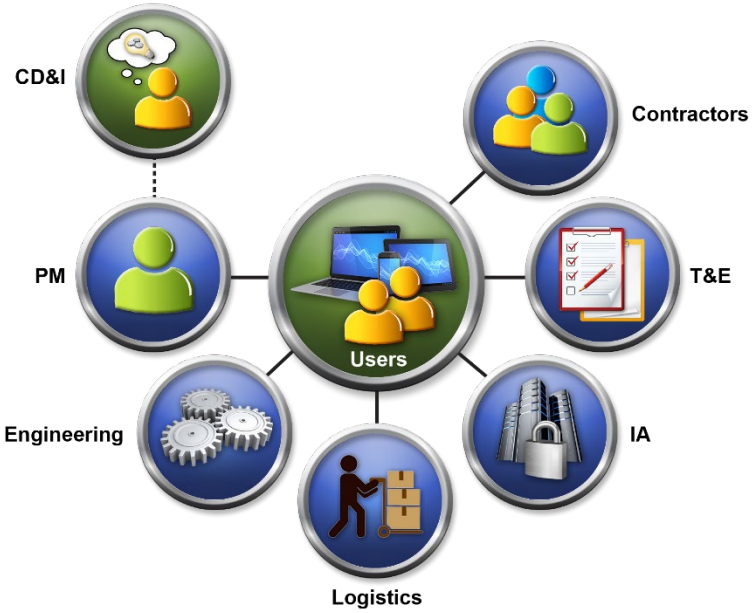

| Agile Myths | | Agile Reality |
|---|---|---|
| Faster | | Predictable |
| Cheaper | Vs. | Focused |
| Easier | | Disciplined |
| | | Manpower Intensive |

# New Strategies Emerged

- MCRISS II Concept – Sep 2016
- Contract Awarded – Mar 2017
- BCA Completed – Aug 2017
- Statement of Need – Sep 2017
- Agile Options Presented – Nov 2017
- ~~CDD Completed~~
- ~~Requirements Development – Oct 2017 – Oct 2018~~
- ~~SSS, SRR, Design Reviews/Approval~~




- Primary Focus is the User
- Agile Contract that meets FAR Guidelines
- MVP Delivery = Capability Sooner




- Dev Environment Standup – Jan 2018
- Development Begins – Apr 2018
- Build 1 Completed – July 2018
- Build 2 Completed – Oct 2018
- Build 3 Completed – Jan 2019
- Build 4 Completed – Apr 2019

# What does Agile Require?

- Areas that need to adapt for Agile to be successful
  - Cultural Transformation
  - Mission Owner Commitment
  - Acquisition Commitment
  - Infrastructure
  - Transforming accreditation and testing
  - Results

# Cultural Transformation

- The need for a team cultural that fits an agile project cannot be overstated.

- Agile is a mindset:
  - Organizations have to be open for change
  - Ready for continuous delivery and continuous improvement Ready to learn through failures

- For an agile team to be effective, every team member is informed on the progress of the project and is empowered to make decisions on his/her own.

# Mission Owner Commitment

- Agile Best Practice
  - Overall Vision of the need (Need Statement, Problem Statement, UNS, etc.)
  - Providing SME support for the development effort
  - Supporting change as it is realized to allow adoption at the speed of development
  - The mission owner must be an equal part of the daily evolutions

- Agile as Implemented for MCRISS II
  - Provided 6 experienced Marine Corps Recruiters full time to the program
  - Provided G6 and Operations resources as part of the program
  - Marines are co-located with Developers
  - Marine Corps Recruiting Command  is an equal member of the team and part of all decisions

# Acquisition Commitment

- Agile Best Practice
  - Strategic Contracts to allow for fast entry into development timeline
  - Dedicated Teams to facilitate efforts
  - Agile expertise to guide mission owners through the process
  - Committed leadership
  - Streamlined Technical Reviews
  - Agile approach to statutory requirements (BCAC, 5000.75, NDAA 874)

- Agile as Implemented for MCRISS II
  - Strategic Contract developed to shorten task order awards from 3 months to 3 weeks
  - Allows for modernization of all Manpower Systems in Agile manner
  - Provided Dedicated Team consisting of Government and contractors
  - Provided Agile experienced PM and Agile training and coaches
  - Leadership is committed to reducing bureaucracy and focusing on providing working software to the customer
  - Technical reviews are held on each item as Marines review and approve designed items and then tested before considered done

- Agile Best Practice
  - Integrated with the development team
  - Adapts to changes in demands during development
  - Testing is done as an integrated part of each sprint and build
  - Accreditation and Authorization must keep pace with development

- Agile as Implemented for MCRISS II
  - Using tools to automate test documentation
  - Building automated regression tests
  - Technical reviews are held on each item as Marines review and approve designed items and then tested before considered done
  - Develop IPT with MCOG, C4, MCSC and MCRISS II Team
  - Engage RMF team on procurement and project planning
  - Education sessions with ISSMs (about the cloud) and with developers (about RMF) to create understanding and advocates
  - Work CAP, SCCA and Cloud Environment in Parallel

# Transforming accreditation and testing

- Agile Best Practice
  - Integrated with the development team
  - Adapts to changes in demands during development
  - Testing is done as an integrated part of each sprint and build
  - Accreditation and Authorization must keep pace with development
- Agile as Implemented for MCRISS II
  - Using tools to automate test documentation
  - Building automated regression tests
  - Developed IPT with Cyber Operations Teams, Cyber Policy Teams, Expert Users and MCRISS II Team
  - Work CAP, SCCA and Cloud Environment in Parallel

# Results

- Agile Best Practice
  - Agile focus on products vs projects
  - Agile focuses on working software over documentation
  - Agile focuses on solving the problem the customer has presented
  - Agile allows for creative evolutions as requirements are realized or changed from higher policy

- Agile as Implemented for MCRISS II
  - Improved timeline from conception to development and customer impact (MVP)
  - Providing useful deliveries to close gaps not addressed by legacy system
  - BETA testers are helping to drive change
  - BETA testers are becoming early adopters of new technology
  - Giving customer exactly what they want and need
  - Causing business process re-engineering to occur

## Positive Lessons Learned

- ❑ MCRISS User Involvement
  - ❑ User Stories
    - ❑ Enables better system development
    - ❑ Allows for instant feedback
    - ❑ Allows for requirements to be written as users and developers understand them
    - ❑ RFIs allow for further feedback instantly
  - ❑ BETA Testers
    - ❑ Allows feedback of additional 750 users
    - ❑ Build completion videos delivered to all 6k MCRISS users for feedback
  - ❑ User Feedback
    - ❑ Sprint demos every 2 weeks
    - ❑ Feedback every day during Marine Review stages of sprint
    - ❑ Design review and feedback as each item is built
- ❑ What does this mean to the user?
  - ❑ The system is built for what the user actually needs
  - ❑ Entire System vision is kept as the goal
  - ❑ Multiple chances to get it right

### Before

**Requirement:** Developed by engineers

The System shall be capable of adding a new lead

### After

**User Story:** Developed by recruiters

As a recruiter I need to be able to add a new lead while conducting AC activities
- I need this ability to be mobile native
- I need to be able to take credit for AC contact as it happens
- I need to be able to check the global list to ensure the contact does not already exist

## Other Lessons Learned

- Mission Owner Commitment
  - Previous MCRC MCRISS Team was comprised of 3 Marines – Now 6
  - User involvement is full time
  - Not all users agree all the time
    - This is positive
    - Disagreement leads to exposing subculture but drives standardization for user community
  - SMEs have the connections to experts in all areas that influence the design
- Release planning and timeline needs to be established upfront to prioritize incremental capabilities
- SMEs will drive doctrinal changes that need to be adopted
- Missed opportunities to align new agile processes with Higher Headquarters for policy and implementation roadmaps
  - Course correction driving to implementation
- Where is the line for scope creep and delivering the capability needed

**Trusted & Empowered Users/Team drive system and cultural change**

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