

SAFe® for Architects

Architecting for Continuous Value Flow with
SAFe®

5.0.1

SAFe® Course: Attending this course gives students access to the SAFe® Architect exam and related preparation materials.



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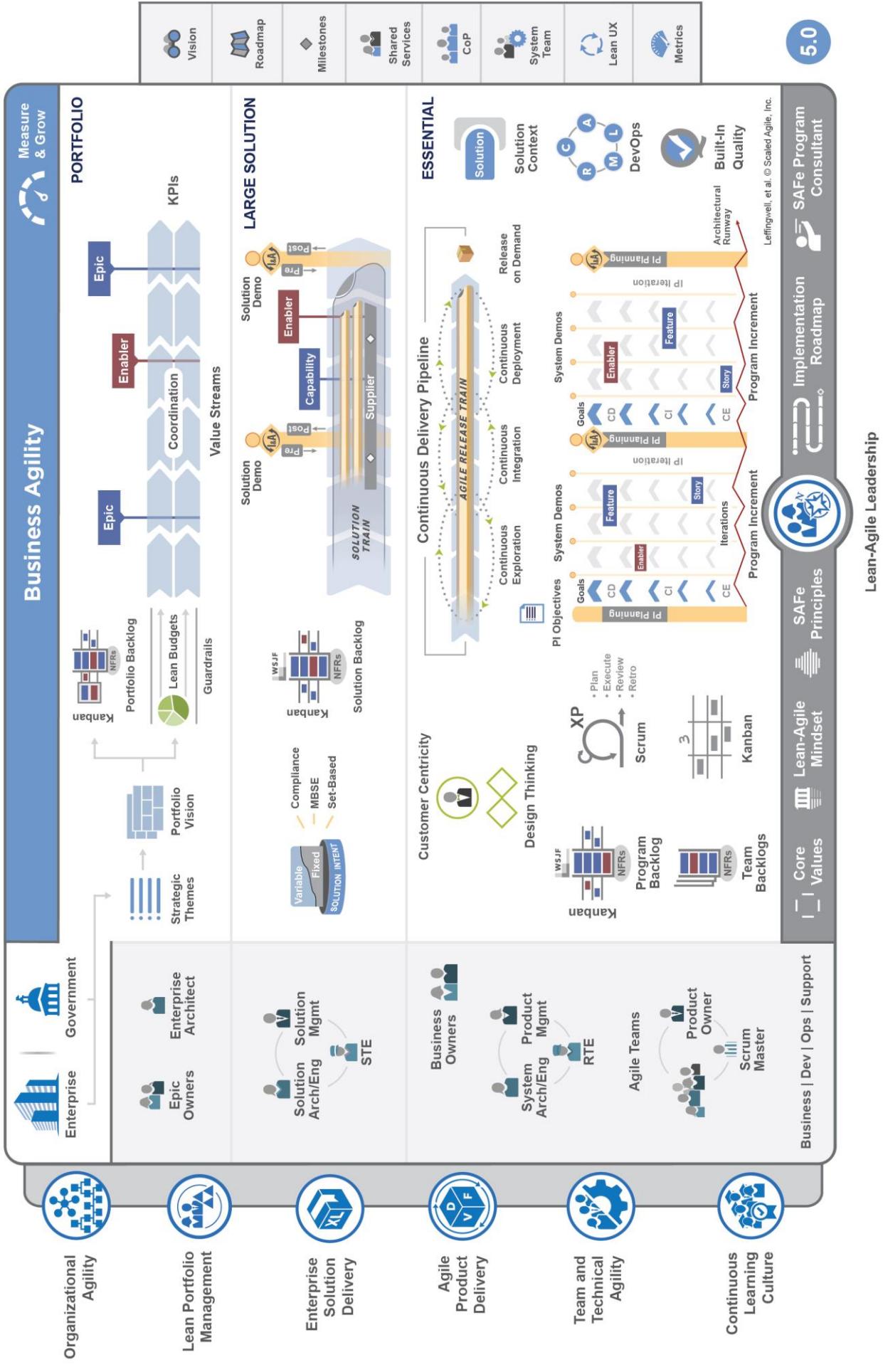
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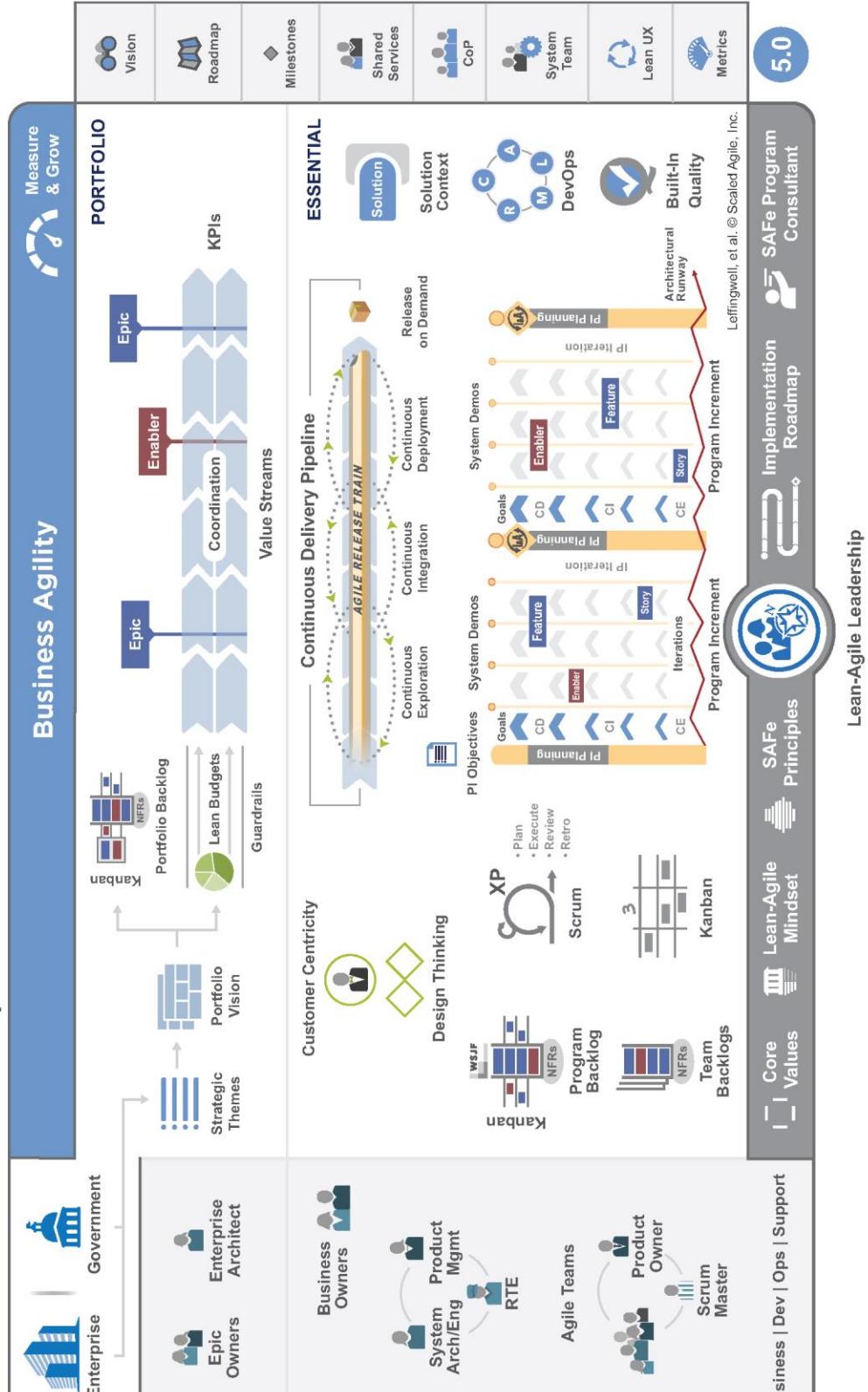
SAFe® for Lean Enterprises

Full Configuration



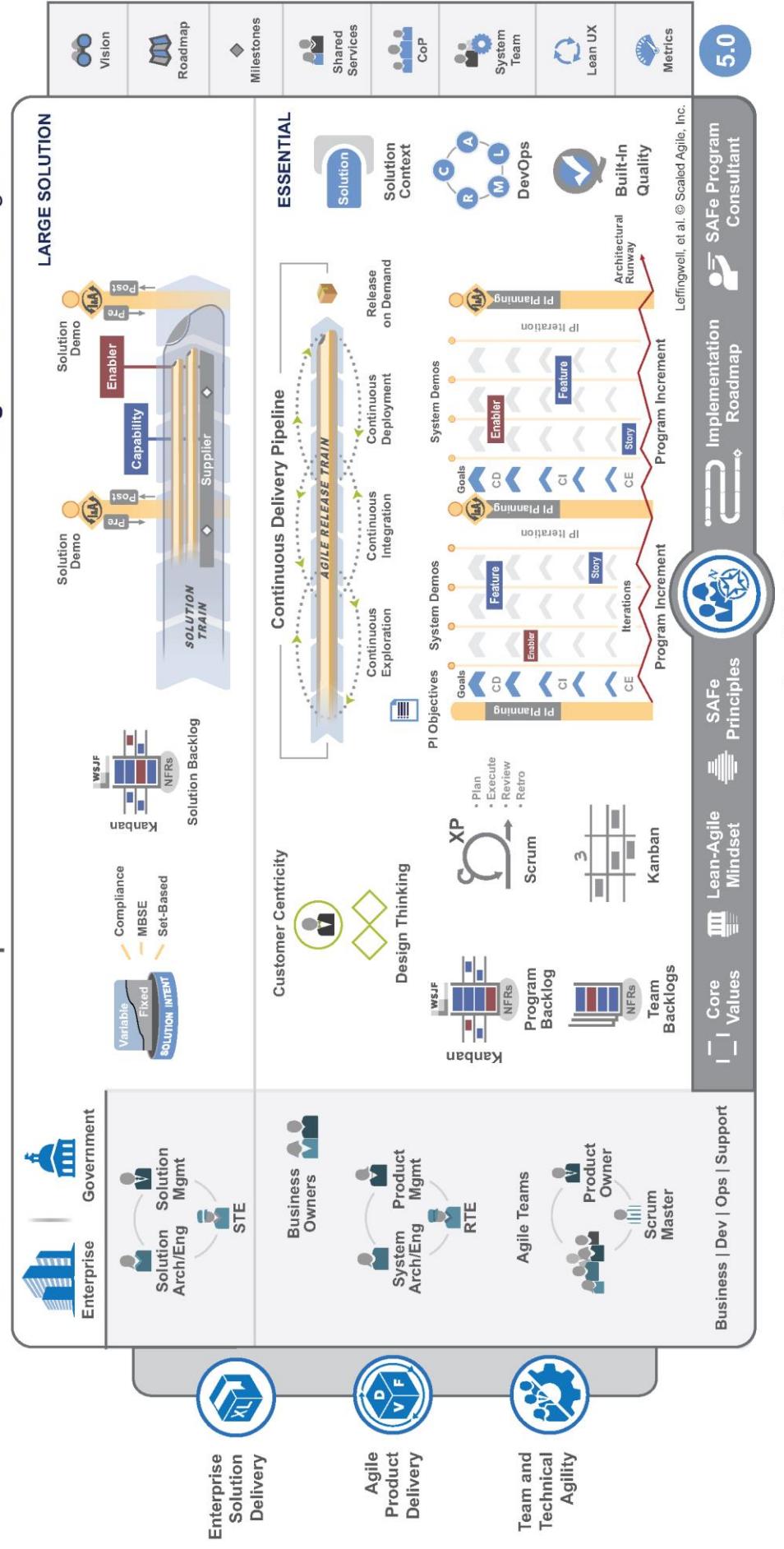
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Portfolio Configuration



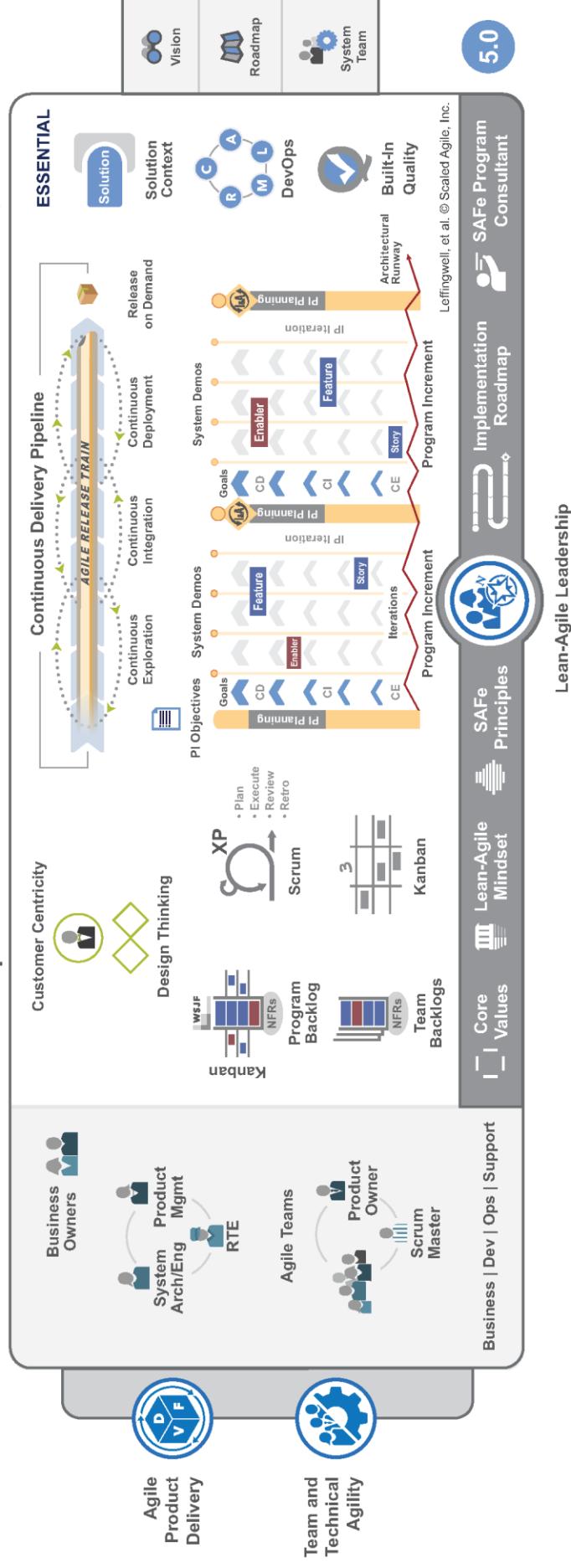
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SAFe® for Lean Enterprises



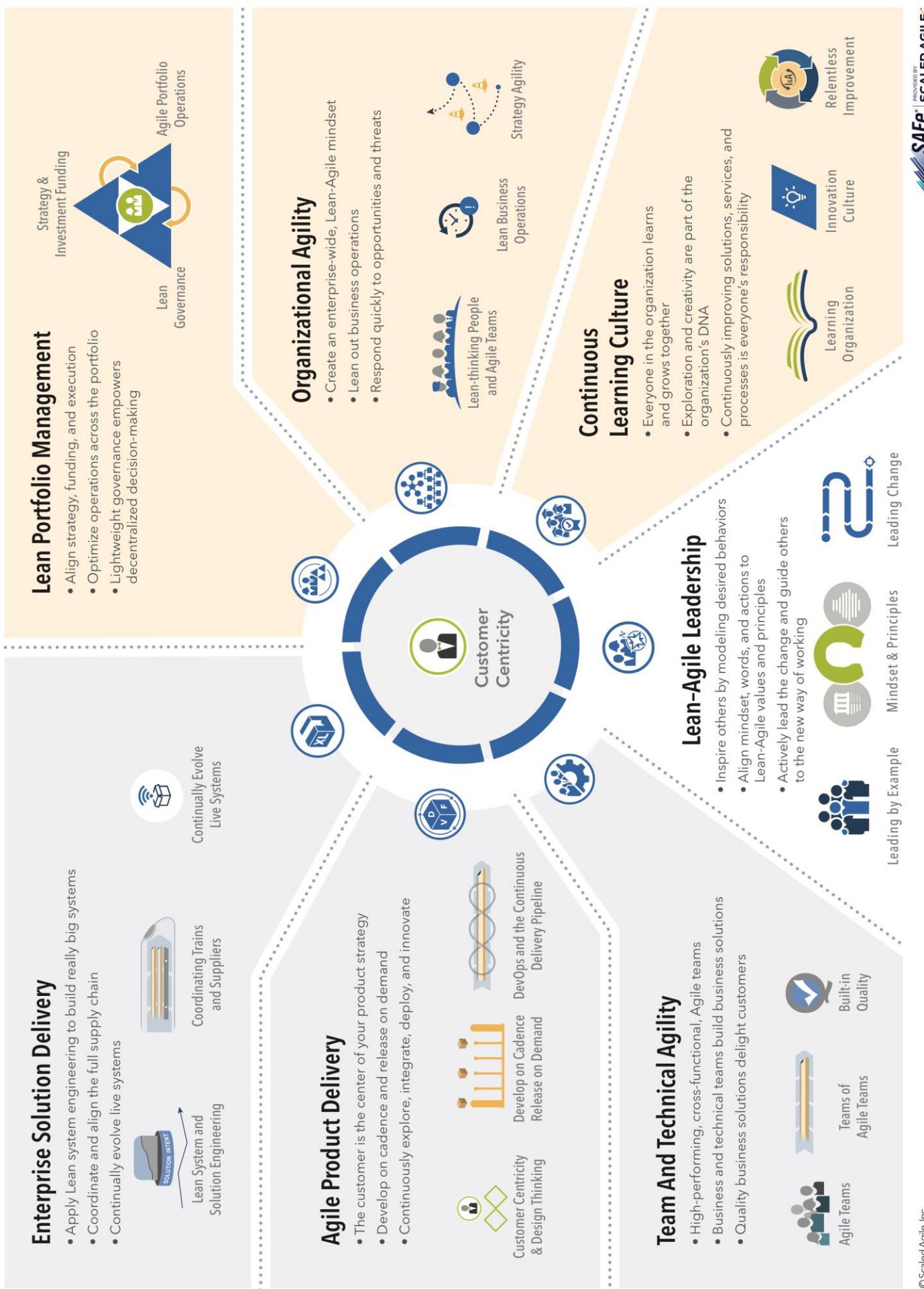
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SAFe® for Lean Enterprises



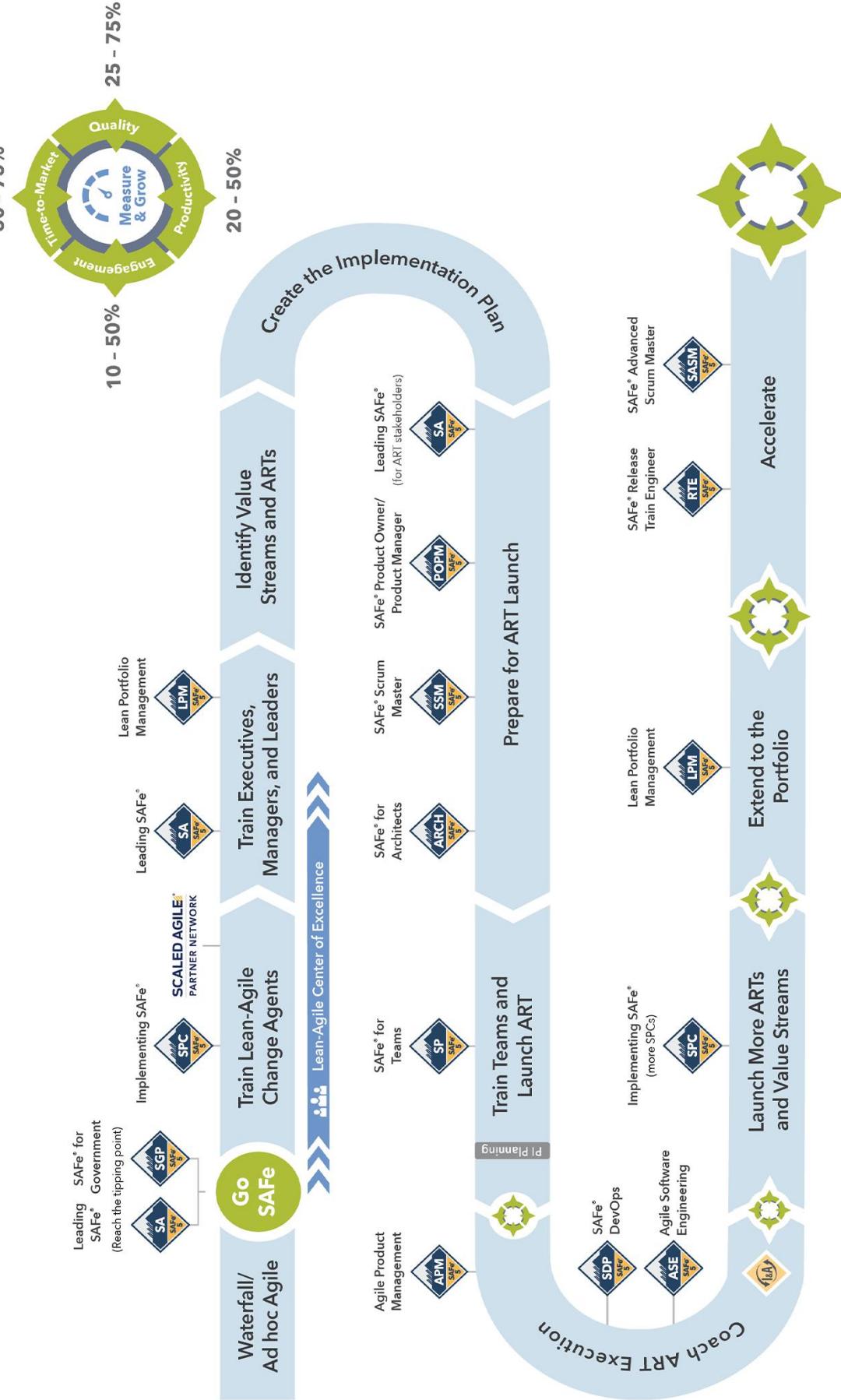
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SAFe® Implementation Roadmap

Business results



SAFe® Courses and Certifications

Course	Description	Certification
Leading SAFe®	Thriving in the Digital Age with Business Agility	 with SAFe® 5 Agilist Certification
Implementing SAFe®	Achieving Business Agility with the Scaled Agile Framework	 with SAFe® 5 Program Consultant Certification
SAFe® for Government	Applying Lean-Agile Practices in the Public Sector with SAFe®	 with SAFe® 5 Government Practitioner Certification
Lean Portfolio Management	Aligning Strategy with Execution	 with SAFe® 5 Lean Portfolio Manager Certification
SAFe® Product Owner/Product Manager	Delivering Value through Effective Program Increment Execution	 with SAFe® 5 Product Owner/Product Manager Certification
Agile Product Management	Using Design Thinking to Create Valuable Products in the Lean Enterprise	 with SAFe® 5 Agile Product Manager Certification
SAFe® Scrum Master	Applying the Scrum Master Role within a SAFe® Enterprise	 with SAFe® 5 Scrum Master Certification
SAFe® Advanced Scrum Master	Advancing Scrum Master Servant Leadership with SAFe®	 with SAFe® 5 Advanced Scrum Master Certification
SAFe® Release Train Engineer	Facilitating Lean-Agile Program Execution	 with SAFe® 5 Release Train Engineer Certification
SAFe® for Architects	Architecting for Continuous Value Flow with SAFe®	 with SAFe® 5 Architect Certification
SAFe® DevOps	Optimizing Your Value Stream	 with SAFe® 5 DevOps Practitioner Certification
SAFe® for Teams	Establishing Team Agility for Agile Release Trains	 with SAFe® 5 Practitioner Certification
Agile Software Engineering	Enabling Technical Agility for the Lean Enterprise	 with SAFe® 5 Agile Software Engineer Certification

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Digital Workbook User Guide

Frequently Asked Questions

Q: How can I take notes in my digital workbook?

A: After each lesson, there is a notes page that allows you to type notes directly into the workbook. Remember to save your workbook to your personal computer to save any content you may have added.

If you open the digital workbook with a product like Adobe Acrobat, there are functions that allow you to add your own text boxes, add bookmarks, highlight text, and add comments. Remember to save your workbook to your personal computer to save any content you may have added.

For additional assistance in annotating your digital workbook, please refer to the tutorials and support articles for the PDF reader of your choice.

Q: What other features are included in the digital workbook?

A: Action plan slides are followed by editable digital action plan worksheets. All videos have a hyperlink directly below the slide that will take you to the correct URL. If you click on assets in the front matter, you will be taken to resources on the Scaled Agile Framework website, like the Implementation Roadmap and course certification pages.

Q: How do I fill out the action plan in my digital workbook?

A: To add text to a blue text field, click within the blue box and type. Remember to save your workbook to your personal computer to save any content you may have added.

Q: Is my digital workbook saved on the community platform?

A: The original digital workbook file will always be available to you in your Learning Plan on the SAFe Community Platform. However, any text or content added to your digital workbook must be saved on your personal computer. Remember to save your workbook to your personal computer to save any content you may have added.

Q: Can I share my digital workbook with my coworkers?

A: No. You cannot share your digital workbook. It is for personal use only, so you may not reproduce or distribute it.

Q: Can I print the digital workbook?

A: Yes. You may print the digital workbook for your personal use. The file is letter sized and full color, so make sure to adjust your printing preferences accordingly.

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Logistics

- ▶ Course meeting times
- ▶ Breaks
- ▶ Eliminate distractions
- ▶ Ask questions
- ▶ Be patient
- ▶ Working agreements

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Course goals

At the end of this course you should be able to:

- ▶ Architect using SAFe principles
- ▶ Align architecture with business value
- ▶ Develop and communicate architecture Vision and intent
- ▶ Plan the Architectural Runway to enable delivery success
- ▶ Architect for continuous delivery and Release on Demand
- ▶ Lead and coach Architects and team members during PI Planning and execution
- ▶ Provide leadership during a Lean-Agile transformation

Course map

- ▶ Lesson 1: Exemplifying Agile Architecture
- ▶ Lesson 2: Architecting for DevOps and Release on Demand
- ▶ Lesson 3: Aligning Architecture with Business Value
- ▶ Lesson 4: Developing Solution Vision, Solution Intent, and Roadmaps
- ▶ Lesson 5: Preparing Architecture for Program Increment (PI) Planning
- ▶ Lesson 6: Coordinating Architecture throughout PI Planning
- ▶ Lesson 7: Supporting Continuous Delivery during PI execution
- ▶ Lesson 8: Supporting New Strategic Themes and Value Streams
- ▶ Lesson 9: Leading as an Architect during a Lean-Agile transformation
- ▶ Lesson 10: Becoming a Certified SAFe Architect

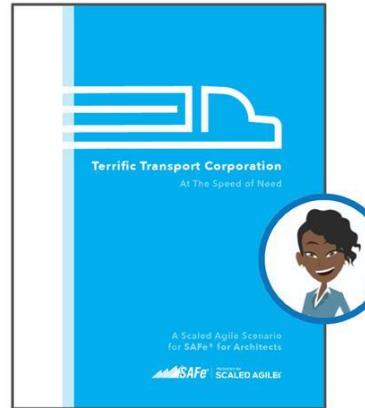
Course resources



Student Workbook



Action Plan



Scenario

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Activity: Experience and expectations



- ▶ **Step 1:** Class organizes around, "What is your experience level with SAFe?"
 - Place a dot on the graph that your instructor prepared.
- ▶ **Step 2:** Ask yourself, "What do you expect to learn from this course?"
 - Add a sticky note for each expectation you have for this course. that your instructor prepared.
 - We will revisit them at the end of the course to ensure we've met your expectations.

Lesson 1

Exemplifying Agile Architecture

Learning Objectives:

- 1.1 Describe Agile architecture
- 1.2 Describe SAFe Architect roles and collaborations
- 1.3 Architect using SAFe principles



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SAFe® for Architects

Lesson 1: Exemplifying Agile Architecture



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

At the end of this lesson you should be able to:

- ▶ 1.1 Describe Agile architecture
- ▶ 1.2 Describe SAFe Architect roles and collaborations
- ▶ 1.3 Architect using SAFe principles

1.1 Describe Agile architecture

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Discussion: What is architecture?



- ▶ **Step 1:** What are some characteristics of traditional architecture?
- ▶ **Step 2:** Write each thought on a sticky note (one word or short phrase per note) and hand them to the instructor.

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Traditional architecture definitions

ANSI/IEEE: The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution

ISO/IEC/IEEE: Fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution



Discussion: What is Agile architecture?



- ▶ **Step 1:** What are some characteristics of Agile architecture?
- ▶ **Step 2:** Write each thought on a sticky note (one word or short phrase per note) and hand them to the instructor.

Agile architecture

SAFe defines Agile architecture as a set of values and practices that support the active evolution of the design and architecture of a system while implementing new system capabilities.

Agile architecture:

- ▶ Evolves systems over time while supporting needs of current users
- ▶ Avoids overhead and delays associated with phase-gated processes
- ▶ Ensures systems always run
- ▶ Supports the continuous flow of value
- ▶ Balances intentional architecture and emergent design



Discussion: Mindset shift



- ▶ **Step 1:** As a class, discuss the issues you are facing (or anticipate facing) in shifting toward an Agile architecture mindset.
- ▶ **Step 2:** Write each issue on a sticky note and hand them to the instructor to place on the Potential Issues board.
- ▶ **Step 3:** As these issues are addressed during the course, the instructor will move them to a separate Resolved board.

1.2 Describe SAFe Architect roles and collaborations

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Activity: Architect activities



- ▶ **Step 1:** In your workbook, place a check mark for activities that you currently participate in at your organization.
- ▶ **Step 2:** As a class, discuss which activities exemplify Agile practices. Then mark the *Lean-Agile Practice* column where appropriate.

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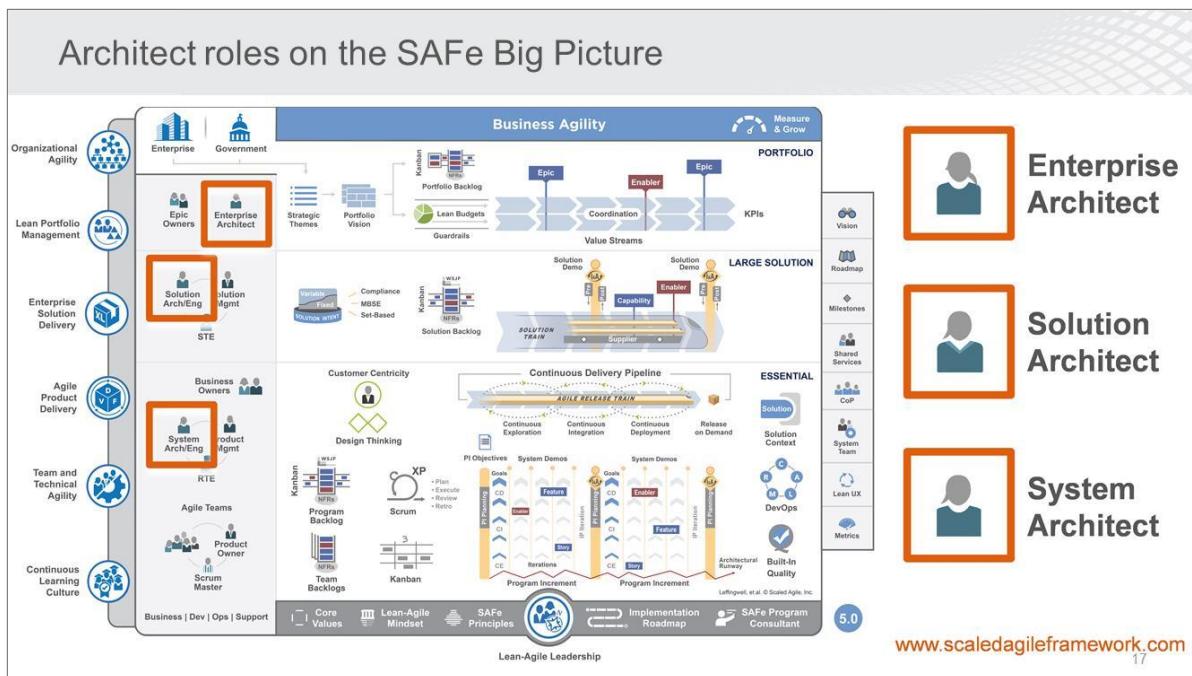
Architect Activities

✓ **Instructions:** First, place a check mark for the activities you currently participate in at your organization. Next, you will discuss as a class which activities exemplify Agile practices and mark the Lean-Agile Practice column where appropriate.

Action/Activity	Currently Do	Lean-Agile Practice
1. Verify architecture quality by examining detailed design documentation	<input type="checkbox"/>	<input type="checkbox"/>
2. Architect the whole system before any development begins	<input type="checkbox"/>	<input type="checkbox"/>
3. Maintain traceability between technology strategy and business strategy	<input type="checkbox"/>	<input type="checkbox"/>
4. Design loosely coupled systems to support continuous integration, testing and deployment	<input type="checkbox"/>	<input type="checkbox"/>
5. Participate in the prioritization of business requirements	<input type="checkbox"/>	<input type="checkbox"/>
6. Participate in architectural review boards	<input type="checkbox"/>	<input type="checkbox"/>
7. Test architectural concepts in production before enacting standards or policies	<input type="checkbox"/>	<input type="checkbox"/>
8. Write code	<input type="checkbox"/>	<input type="checkbox"/>
9. Manage vendor relationships using highly detailed, fixed-scope contracts	<input type="checkbox"/>	<input type="checkbox"/>
10. Evaluate adherence to architectural policy at release time	<input type="checkbox"/>	<input type="checkbox"/>
11. Produce the minimum amount of documentation required to enable high delivery velocity	<input type="checkbox"/>	<input type="checkbox"/>
12. Identify and document Non-Functional Requirements (NFRs)	<input type="checkbox"/>	<input type="checkbox"/>
13. Coach and mentor others in Lean practices and act as an agent for change	<input type="checkbox"/>	<input type="checkbox"/>
14. Expect development to conform to detailed technical specifications	<input type="checkbox"/>	<input type="checkbox"/>
15. Write executable tests that evaluate architectural quality	<input type="checkbox"/>	<input type="checkbox"/>
16. Regularly collaborate with development teams on architectural concepts	<input type="checkbox"/>	<input type="checkbox"/>
17. Mange all architectural work in a backlog or kanban system	<input type="checkbox"/>	<input type="checkbox"/>
18. Architect solutions based on detailed business requirements	<input type="checkbox"/>	<input type="checkbox"/>
19. Understand and communicate business drivers and strategic themes	<input type="checkbox"/>	<input type="checkbox"/>
20. Document standards that govern development tools and practices	<input type="checkbox"/>	<input type="checkbox"/>

Notes

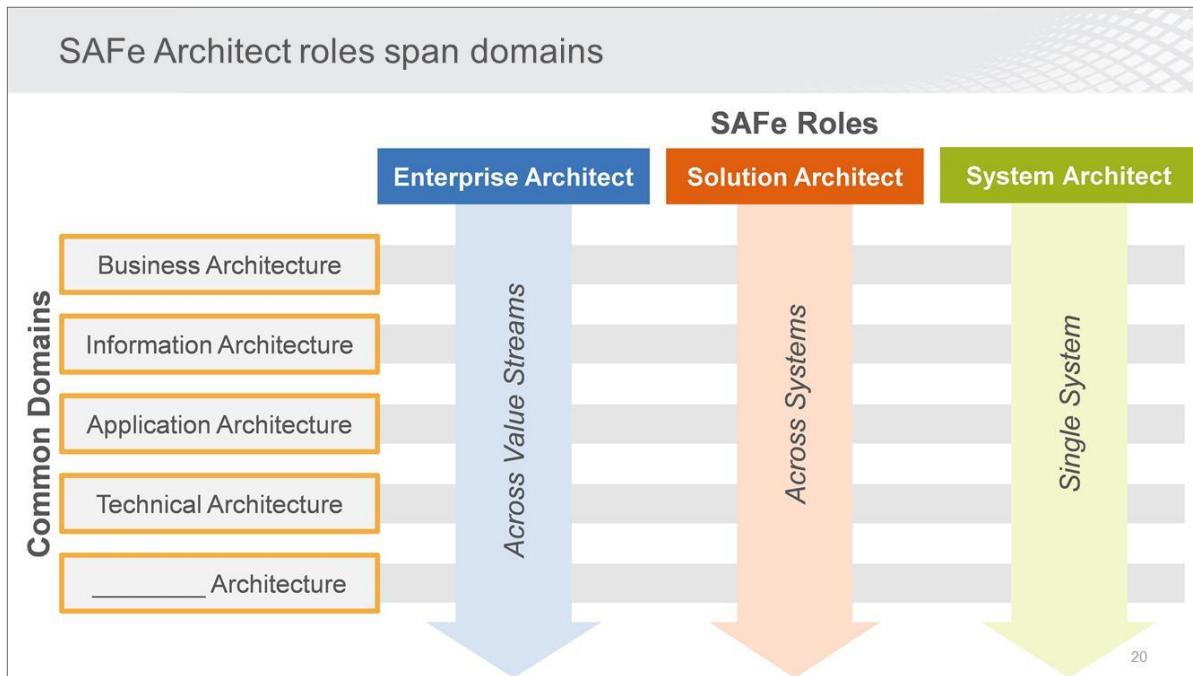
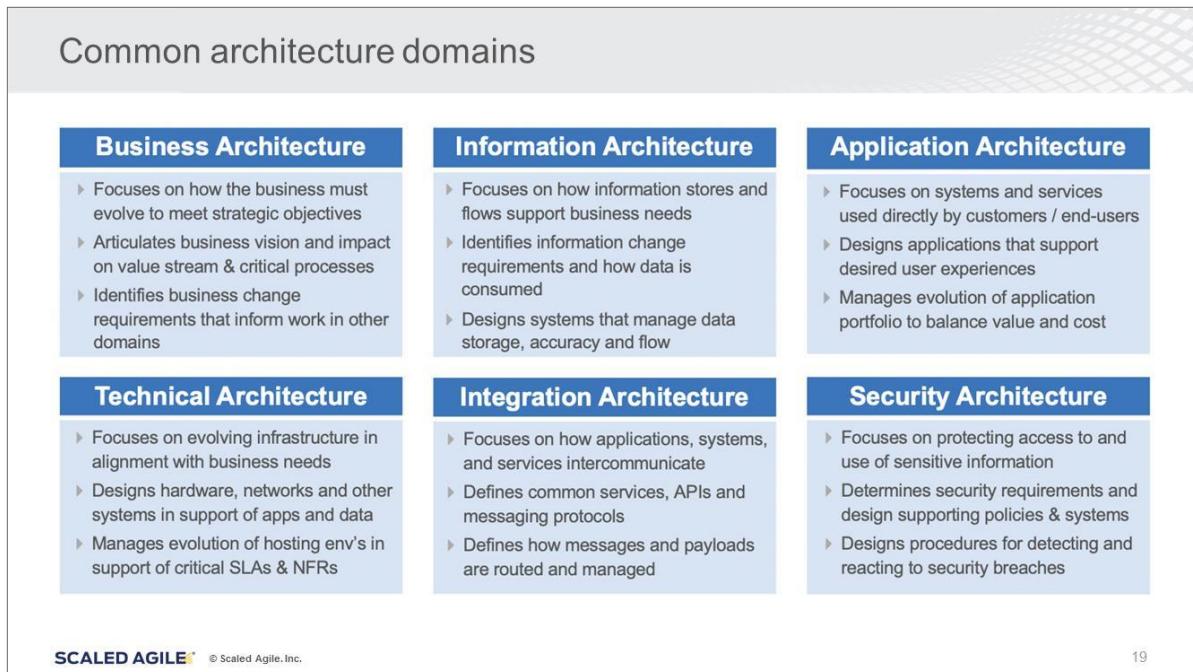
1.2 Describe SAFe Architect roles and collaborations



Architect roles and responsibilities in SAFe

Enterprise Architect Across Value Streams	Solution Architect Across Systems	System Architect Single System
<ul style="list-style-type: none"> Aligns architecture with business strategy Provides strategic technical direction across ARTs & teams Collaborates with Lean Portfolio Management Guides and supports Architectural Runway strategy Promotes modern technical and DevOps practices Synchronizes architecture functions across ARTs & teams 	<ul style="list-style-type: none"> Plans the Architectural Runway for a full Solution Actively supports design and steering of Continuous Delivery pipeline Establishes and supports definition of Non-functional Requirements Partners with System Architects to elaborate Capabilities and Features Fosters Built-in Quality for the entire Solution 	<ul style="list-style-type: none"> Plans the Architectural Runway Actively supports design and steering of CI/CD pipeline Establishes and supports definition of Non-functional Requirements Partners with Solution and Enterprise Architects to elaborate Epics, Capabilities, and Business Capabilities Fosters Built-in Quality for the ART's systems

1.2 Describe SAFe Architect roles and collaborations





Activity: Role identification and team formation

Duration
15 min

- ▶ **Step 1:** Using the chart on the next slide:
 - Circle the SAFe Architect role you most closely identify with
 - For each cell in that column, indicate whether you have relatively strong (+) or relatively weak (-) skills in that architectural domain
 - Write in any additional domains that are important in your organization
- ▶ **Step 2:** Form small groups of four to six (relocate as necessary)
 - Each group should have a mix of SAFe Architect roles
 - Try to optimize architecture domain strengths across the group

Role identification worksheet

	Enterprise Architect (across Value Streams)	Solution Architect (across systems)	System Architect (single system)
Business Architecture	+ / -	+ / -	+ / -
Information Architecture	+ / -	+ / -	+ / -
Application Architecture	+ / -	+ / -	+ / -
Technical Architecture	+ / -	+ / -	+ / -
_____ Architecture	+ / -	+ / -	+ / -
_____ Architecture	+ / -	+ / -	+ / -

1.2 Describe SAFe Architect roles and collaborations

Architect: Person or team?

Architects provide architectural guidance and technical enablement to the teams on the Agile Release Train or across a Solution Train:

- ▶ One Architect can maintain cohesion and consistency across teams in an ART.
- ▶ Disparate systems, legacy systems, numerous vendor products to integrate, etc.
- ▶ More complex Solutions with intricate technical landscapes may require a small team of Architects.

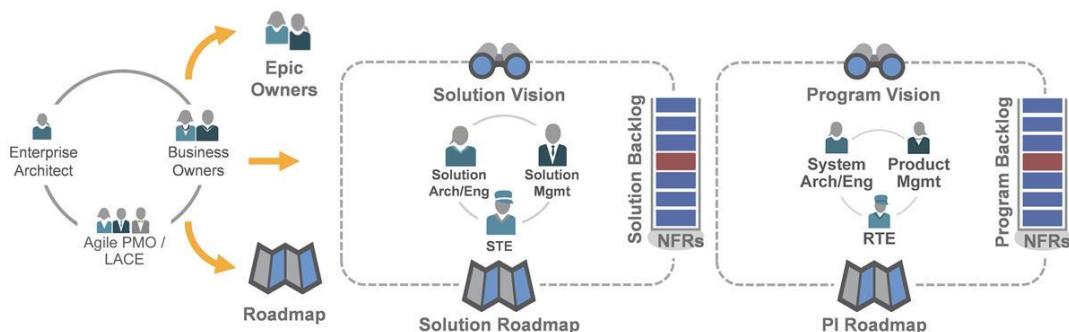


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Alignment requires collaboration

Architects collaborate with many other roles in SAFe to align Vision, Roadmaps, and backlogs.



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Activity: Shared architecture responsibility

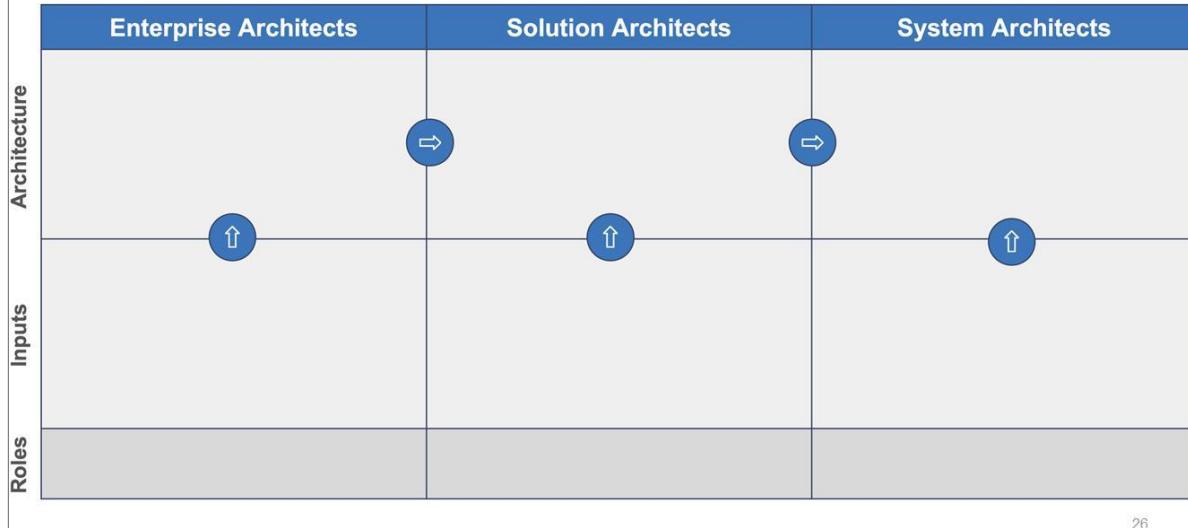
Prepare
10 min

Share
5 min

Enabling the delivery of high quality Solutions in the shortest sustainable lead time requires collaboration across many roles.

- ▶ **Step 1:** With your group, choose one of the charts on the next two slides to brainstorm
 - In the *Architecture* swim lane, insert things you believe Agile Architects must do (or produce) to enable high delivery speed or Solution quality
 - In the *Inputs* swim lane, insert things you believe Agile Architects need as input from other people (write those roles in along the bottom row)
 - Consider important inputs, outputs, and flow from role to role
- ▶ **Step 2:** Be prepared to share your insights with the class

Shared responsibility: Delivery speed worksheet



1.2 Describe SAFe Architect roles and collaborations



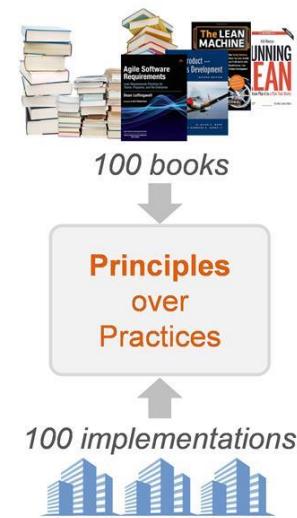
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1.3 Architect using SAFe principles

Why focus on principles?

A common disease that afflicts management the world over is the impression that, "Our problems are different." They are different to be sure, but the principles that will help to improve quality of a product and service are universal in nature. — W. Edwards Deming

- ▶ A Lean-Agile transformation will deliver substantial benefits, but it is a significant change and every implementation is different.
- ▶ Leaders should understand why the practices work; it's part of "knowing what it is they must do."
- ▶ If a practice needs to change, understanding the principles will assure the change moves the Enterprise in the right direction.
- ▶ Everyone across the organization can refer back to principles to understand how decisions were made.



SAFe Lean-Agile Principles

#1 Take an economic view

#2 Apply systems thinking

#3 Assume variability; preserve options

#4 Build incrementally with fast, integrated learning cycles

#5 Base milestones on objective evaluation of working systems

#6 Visualize and limit WIP, reduce batch sizes, and manage queue lengths

#7 Apply cadence, synchronize with cross-domain planning

#8 Unlock the intrinsic motivation of knowledge workers

#9 Decentralize decision-making

#10 Organize around value

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SAFe principles #1 – 3

#1 Take an economic view

If the Solution doesn't meet the Customer's or systems builder's economic goals, then the long-term viability of the Solution is suspect.

#2 Apply systems Thinking

Systems thinking takes a holistic approach to Solution development – one that incorporates design, development, deployment, and maintenance of the system itself.

#3 Assume variability; preserve options

Manage variability and preserve options to provide the controls and flexibility teams need to build great Solutions. Aggressively explore alternatives to arrive at the best decision.



SAFe Principle #1: SAFe highlights the important role economics plays in successful solution development. Therefore, SAFe's first Lean-Agile principle is to take an economic view. It is Principle #1 for a reason: if the solution doesn't meet the customer's or systems builder's economic goals, then the long-term viability of the solution is suspect. Solutions fail for many reasons, and failed economics is a primary culprit.

Read more at: <https://v5.scaledagileframework.com/take-an-economic-view/>



SAFe Principle #2: The three foundational bodies of knowledge of SAFe are systems thinking, Agile development, and Lean product development. Systems thinking takes a holistic approach to solution development; it incorporates all aspects of a system and its environment into the design, development, deployment, and maintenance of the system itself.

Read more at: <https://v5.scaledagileframework.com/apply-systems-thinking/>



SAFe Principle #3: Systems builders have a natural inclination to try to reduce variability. It just seems that the more you think you know and have already decided, the further along than you think you are. But this is often not the case. While it is true that variability can lead to bad outcomes, the opposite case can also be true. Variability is not inherently bad or good. Rather, it is the economics associated with the timing and type of variability that determines the outcomes.

Read more at: <https://v5.scaledagileframework.com/assume-variability-preserve-options/>

SAFe Principles #4 – 5

#4 Build incrementally with fast, integrated learning cycles

Cadence-based integration points become the primary focus of the systems builder via a Solution architecture that is designed in part of that purpose.

#5 Base milestones on objective evaluation of working systems

The system can be measured and assessed, and it can be evaluated by the relevant stakeholders frequently and throughout the Solution development life cycle.



SAFe Principle #4: In traditional, stage-gated development, investment cost begins immediately and accumulates until a solution is delivered. Often, there is little to no actual value delivered until all of the committed features are available, or the program runs out of time or money. During development, it is difficult to get any meaningful feedback because the process isn't designed for it, and the system isn't designed or implemented to permit incremental capabilities to be evaluated by the customer.

Read more at:<https://v5.scaledagileframework.com/build-incrementally-with-fast-integrated-learning-cycles/>



SAFe Principle #5: The development of today's large systems requires substantial investment, which can reach millions, tens of millions, and even hundreds of millions of US dollars. Together, systems builders and customers have a fiduciary responsibility to ensure that the investment in new solutions will deliver the necessary economic benefit. Otherwise, there is no reason to make the investment.

Read more at:<https://v5.scaledagileframework.com/base-milestones-on-objective-evaluation-of-working-systems/>

SAFe Principles #6 – 8

#6 Visualize and limit WIP, reduce batch sizes, and manage queue lengths	#7 Apply cadence, synchronize with cross-domain planning	#8 Unlock the intrinsic motivation of knowledge workers
To achieve the shortest sustainable lead time, system architectures support continuous development flow, allowing new system Capabilities to move quickly from concept to cash.	Cadence makes routine that which can be routine, so the intellectual capacity of knowledge workers can be devoted to managing the variable parameters.	Lean-Agile Leaders operate with a relatively new truth – the ‘management’ of knowledge workers is an oxymoron.

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SAFe Principle #6: Overloading teams and programs with more work than they can accomplish is a common and pernicious problem. Having too much work-in-process (WIP) in the system causes multiplexing and frequent context switching. It overloads the people doing the work, reduces focus on any task at hand, reduces productivity and throughput, and increases wait times for new functionality.

Read more at: <https://v5.scaledagileframework.com/visualize-and-limit-wip-reduce-batch-sizes-and-manage-queue-lengths/>



SAFe Principle #7: Cadence provides a rhythmic pattern, the dependable heartbeat of the process. Cadence makes routine that which can be routine, so the intellectual capacity of knowledge workers can be devoted to managing the variable parameters. Cadence transforms unpredictable events into predictable ones and has many additional benefits.

Read more at: <https://v5.scaledagileframework.com/apply-cadence-synchronize-with-cross-domain-planning/>



SAFe Principle #8: The knowledge worker is able to communicate across functional boundaries, make decisions based upon an understanding of the economics, achieve fast feedback as to the efficacy of their solution, participate in continuous, incremental learning and mastery, and more generally participate in a more productive and fulfilling solution development process. That is one of the most powerful motivations of all.

Read more at: <https://v5.scaledagileframework.com/unlock-the-intrinsic-motivation-of-knowledge-workers/>

SAFe Principle #9 – 10

#9 Decentralize decision-making

Decentralized decision-making reduces delays, improves product development flow and throughput, and enables faster feedback and more innovative solutions.

#10 Organize around value

Business agility demands that Enterprises organize around value to deliver more quickly. And when market and customer demands change, the Enterprise must quickly and seamlessly reorganize around that new value flow.



SAFe Principle #9: Delivering value in the shortest sustainable lead time requires decentralized decision-making. Any decision that must be escalated to higher levels of authority introduces a delay in delivery. In addition, escalated decisions can decrease decision fidelity due to the lack of local context plus changes to fact patterns that occur during the waiting period.

Read more at: <https://v5.scaledagileframework.com/decentralize-decision-making/>



SAFe Principle #10: Many enterprises today are organized around principles developed during the last century. In the name of intended efficiency, most are organized around functional expertise. But in the digital age, the only sustainable competitive advantage is the speed with which an organization can respond to the needs of its customers with new and innovative solutions. These solutions require cooperation amongst all the functional areas with their incumbent dependencies, handoffs, waste, and delays. Instead, Business Agility demands that enterprises organize around value to deliver more quickly. And when market and customer demands change, the enterprise must quickly and seamlessly reorganize around that new value flow.

Read more at: <https://v5.scaledagileframework.com/organize-around-value/>



Discussion: SAFe Principles at scale

Discuss
8 min

Share
5 min

- ▶ **Step 1:** Select one SAFe Principle with your group and discuss specific ways you would apply it in your organization as a:
 - Enterprise Architect
 - Solution Architect
 - System Architect
- ▶ **Step 2:** After discussing, share with the class any insights you gained during your discussion.

Lesson review

In this lesson you:

- ▶ Explored the concept of Agile architecture
- ▶ Explored SAFe roles related to architecture
- ▶ Discovered how SAFe principles impact architecture



Read more on SAFe Agile Architecture in SAFe at:
<https://v5.scaledagileframework.com/agile-architecture/>



Action Plan: Reflect on your mindset as an Agile Architect

Duration
5 min

On the Action Plan page in your workbook, answer the following questions:

- ▶ What are some potential issues you identified that might make it difficult to shift your approach, your team, and/or your organization to think and act in more Agile ways?
- ▶ As you shift to an Agile mindset in your practices and as you help others in your organization think and act in more Agile ways, what are some things you plan to do differently?
- ▶ What can you do to encourage more decentralized decision-making?
- ▶ What can you do to unlock the intrinsic motivation of knowledge workers?





Lesson 1: Exemplifying Agile Architecture



Enterprise
Architect



Solution
Architect



System
Architect

What are some potential issues you identified that might make it difficult to shift your approach, your team, and/or your organization to think and act in more Agile ways?

As you shift to an Agile mindset in your practices and as you help others in your organization think and act in more Agile ways, what are some things you plan to do differently?

What can you do to encourage more decentralized decision-making?

What can you do to unlock the intrinsic motivation of knowledge workers?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

Lesson 2

Architecting for DevOps and Release on Demand

Learning Objectives:

- 2.1 Foster a DevOps culture
- 2.2 Describe how value flows through the Continuous Delivery Pipeline
- 2.3 Architect for and facilitate Continuous Exploration
- 2.4 Architect for Continuous Integration
- 2.5 Architect for Continuous Deployment
- 2.6 Architect for Release on Demand



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

SAFe® for Architects

Lesson 2: Architecting for DevOps and Release on Demand



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

At the end of this lesson you should be able to:

- ▶ 2.1 Foster a DevOps culture
- ▶ 2.2 Describe how value flows through the Continuous Delivery Pipeline
- ▶ 2.3 Architect for and facilitate Continuous Exploration
- ▶ 2.4 Architect for Continuous Integration
- ▶ 2.5 Architect for Continuous Deployment
- ▶ 2.6 Architect for Release on Demand

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2.1 Foster a DevOps culture

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What is DevOps?

- ▶ DevOps is a combination of two words, development and operations.
- ▶ It is a mindset, a culture, and a set of technical practices.
- ▶ It provides communication, integration, automation, and close cooperation among all the people needed to plan, develop, test, deploy, release, and maintain a Solution.
- ▶ It is part of the *Agile Product Delivery* competency of the Lean Enterprise.



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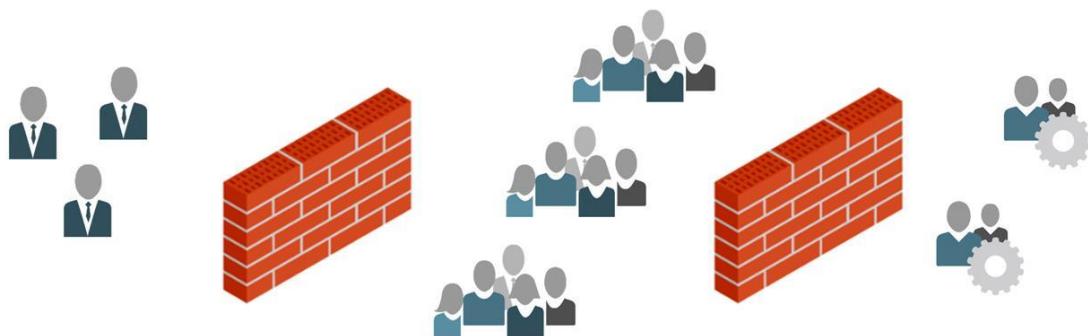
2.1 Foster a DevOps culture

Without DevOps: Walls of confusion

Business

Development

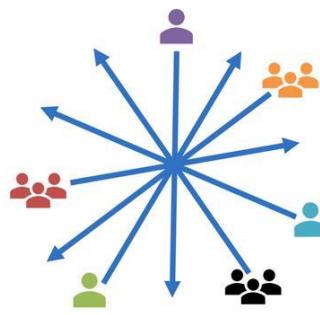
Operations



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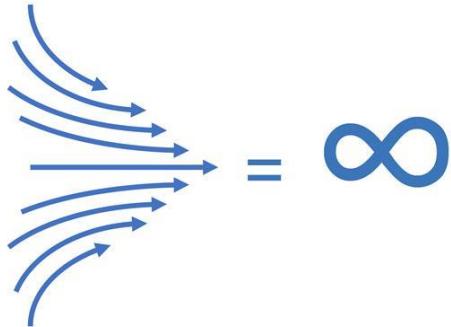
42

DevOps helps build alignment



= 0

Without DevOps
Efforts cancel each other out



With DevOps
Work is aligned to produce valuable outcomes

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A CALMR approach to DevOps

- ▶ **Culture** - Establish a culture of shared responsibility for development, deployment, and operations.
- ▶ **Automation** - Automate the Continuous Delivery Pipeline.
- ▶ **Lean flow** - Keep batch sizes small, limit WIP, and provide extreme visibility.
- ▶ **Measurement** - Measure the flow through the pipeline. Implement full-stack telemetry.
- ▶ **Recovery** - Architect and enable low-risk releases. Establish fast recovery, fast reversion, and fast fix-forward.



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Read more on SAFe CALMR at: <https://v5.scaledagileframework.com/devops/>

The Architect's role in fostering a DevOps mindset

- ▶ Architect Solutions for continuous value flow
- ▶ Participate in design and execution of the Continuous Delivery Pipeline
- ▶ Bridge communications between business, development, and operations
- ▶ Automate architectural compliance checks
- ▶ Evangelize and exemplify CALMR principles



Discussion: Does architecture support or inhibit DevOps?



- ▶ **Step 1:** Pair with someone you have not worked with yet.
- ▶ **Step 2:** Discuss the DevOps CALMR approach. Identify an example of an architectural decision you made that enabled it and an example that inhibited it.
- ▶ **Step 3:** Take turns sharing your examples with your partner.



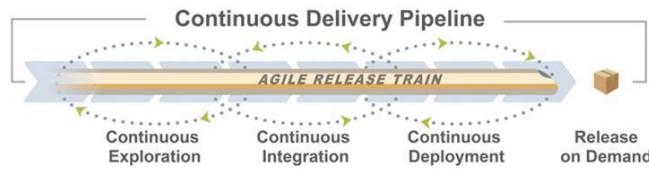
2.2 Describe how value flows through the Continuous Delivery Pipeline

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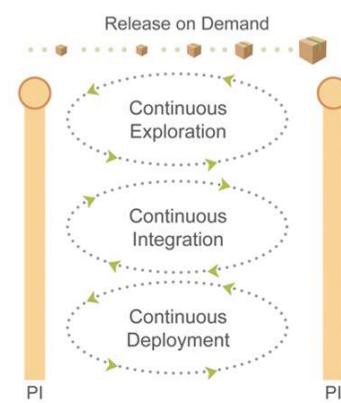
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The Continuous Delivery Pipeline (CDP)

The pipeline is in perpetual motion.



Feature View

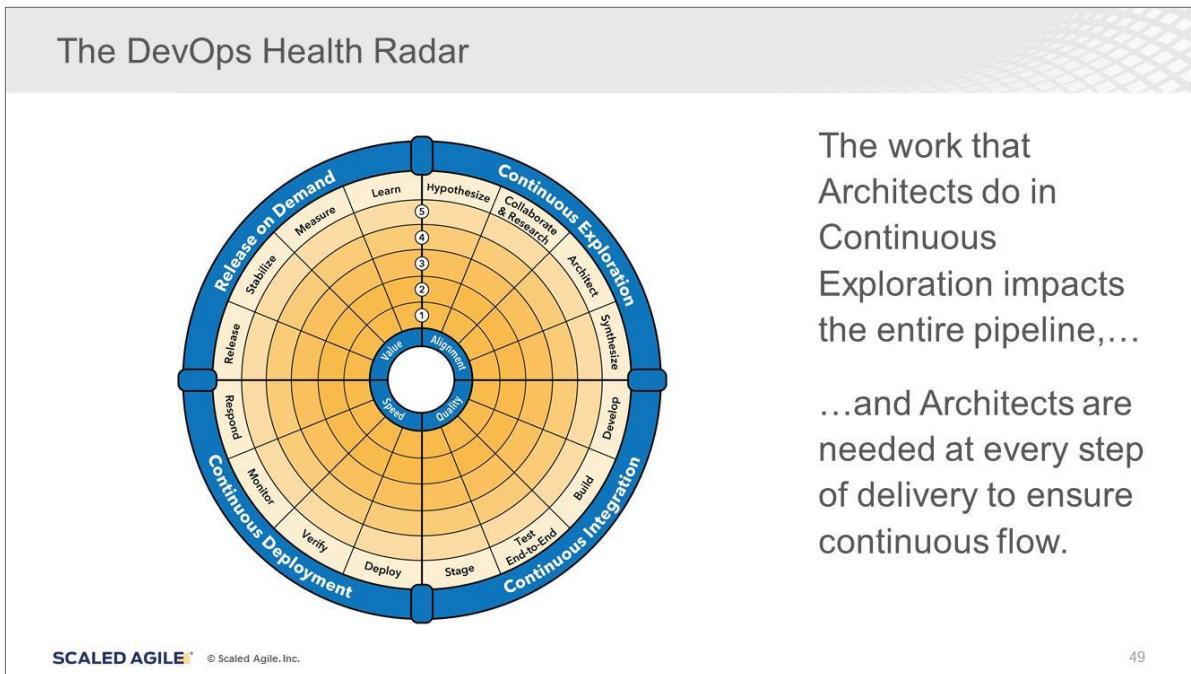


Team View

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2.2 Describe how value flows through the Continuous Delivery Pipeline



2.2 Describe how value flows through the Continuous Delivery Pipeline

Video: Formula 1 Pit Stops: 1950 and Today

Duration
2 min



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 Video link: https://youtu.be/RRy_73ivcms

2.2 Describe how value flows through the Continuous Delivery Pipeline

Analyze value flow with value stream mapping

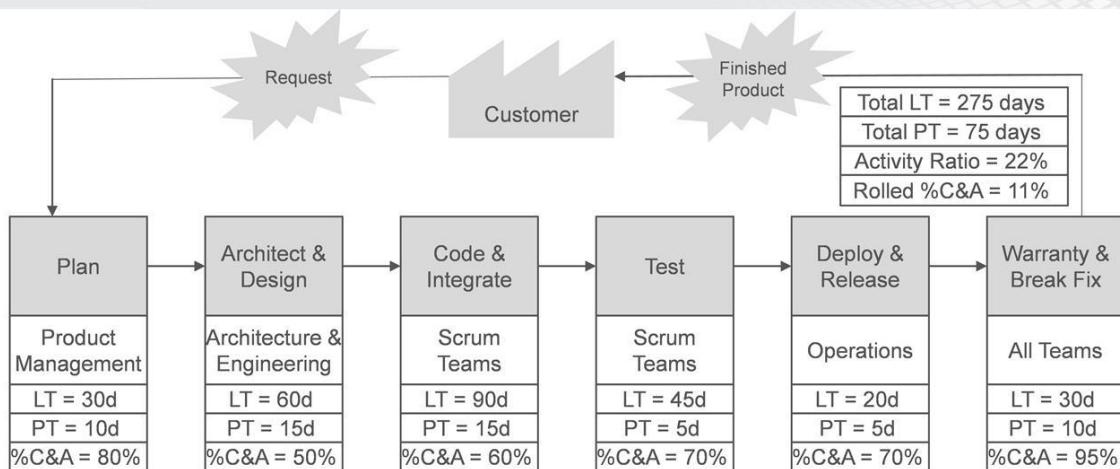


- ▶ Visualize steps in the end-to-end delivery process
- ▶ Understand how value flows through the organization
- ▶ Measure delivery efficiency and identify bottlenecks
- ▶ Locate the real root causes of delivery problems
- ▶ Define and prioritize process improvements

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Example value stream map



LT = Lead Time (completion of activity $n-1$ to completion of activity n)

PT = Process Time (start of activity n to completion of activity n)

%C&A = Percent Complete & Accurate (% of output usable as-is by owners of next activity)

Activity Ratio = Total PT / Total LT (% of total Lead Time attributable to value-add activities)

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Architecture greatly impacts value flow

Common flow impediments

- ▶ Big design up front
- ▶ Architecture review boards
- ▶ Ivory towers
- ▶ Monolithic systems
- ▶ Architecture as documentation
- ▶ Architecture silos

Common flow enablers

- ▶ Minimum viable architecture
- ▶ Automated compliance checks
- ▶ Continuous collaboration
- ▶ Loosely coupled systems
- ▶ Architecture as code
- ▶ Federated architecture

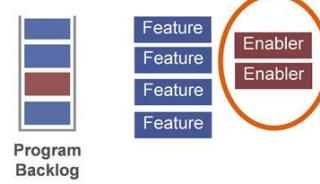
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Improve flow with Enablers

Enablers define the work required to efficiently deliver future business functionality.

- ▶ There are four types of Enablers
 - Exploration, architectural, infrastructure, and compliance
- ▶ Infrastructure enablers support DevOps and Release on Demand most directly
- ▶ Managed in backlogs, Enablers are subject to:
 - Estimation
 - Prioritization
 - Work in process (WIP) limits
 - Demos and feedback
 - Capacity allocation



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2.3 Architect for and facilitate Continuous Exploration

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Continuous Exploration

Business perspective

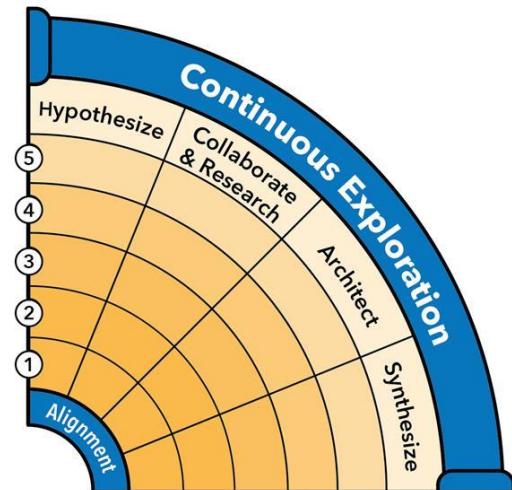
- ▶ Understand Customer needs and achieve alignment on desired business outcomes across the organization

IT perspective

- ▶ Quickly define highest value delivery path and prepare backlogs for implementation

Architecture perspective

- ▶ Align to MVPs and MMFs
- ▶ Contribute to backlogs and prioritization

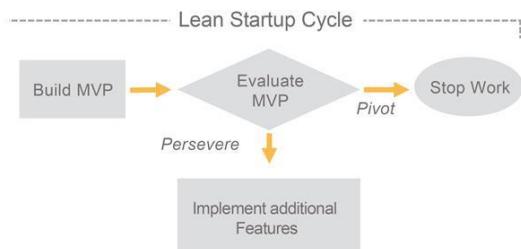


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Align to MVPs and MMFs

- ▶ A minimum viable product (MVP) is the minimum feature set required to test a business hypothesis
- ▶ Minimum marketable features (MMFs) comprise an MVP
- ▶ **Architectural considerations**
 - Architect for fast business outcomes
 - Define Architectural Runway
 - Define minimum viable architecture
 - Apply domain-driven design (DDD)
 - Define nonfunctional requirements (NFRs)



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Contribute to backlogs and prioritization

- ▶ If it's not in the backlog, it won't get done (even architecture)
- ▶ **Architectural considerations**
 - Write Enabler Epics, Capabilities, and Features
 - Add value to business Epics, Capabilities, and Features
 - Write NFRs as backlog items or acceptance criteria
 - Prioritize the backlog using WSJF
 - Write architecture requirements as executable tests

$$\text{WSJF} = \frac{\text{Cost of Delay}}{\text{Job Duration (Job size)}}$$

Given	_____
When	_____
Then	_____



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Discussion: Continuous Exploration

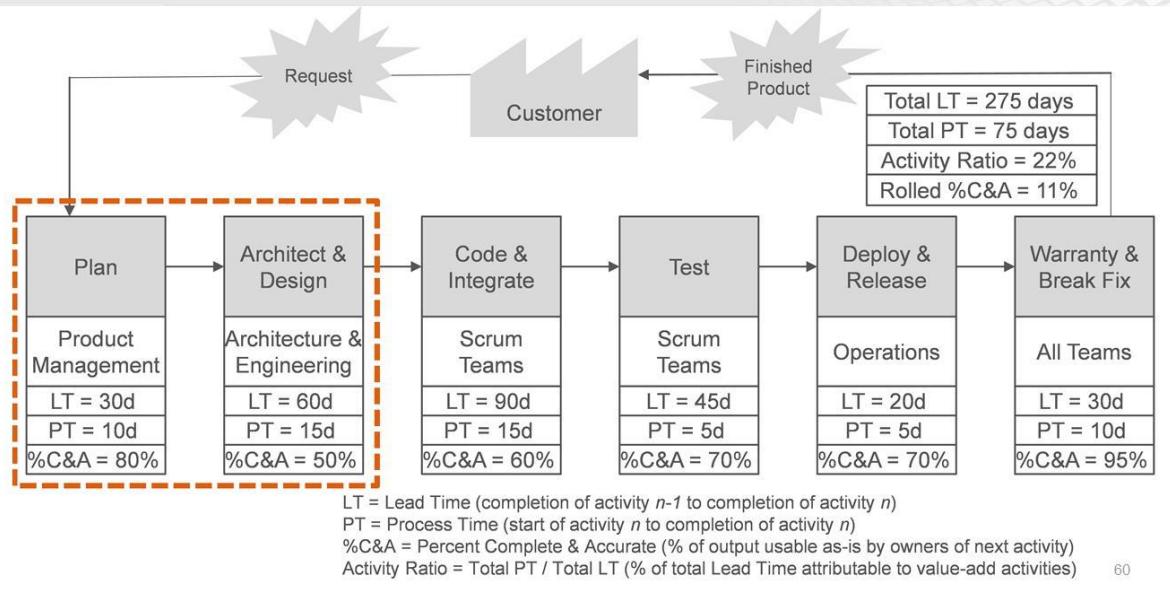


- ▶ **Step 1:** Discuss the following with your group:
 - What bottlenecks might be preventing Continuous Exploration based on the highlighted section of the value stream map on the next slide?
 - Identify three architectural considerations from previous slides that could help remove those bottlenecks and enable Continuous Exploration.
 - ▶ **Step 2:** Be prepared to discuss your thoughts.

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Baseline value stream map worksheet



2.4 Architect for Continuous Integration

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Continuous Integration

Business perspective

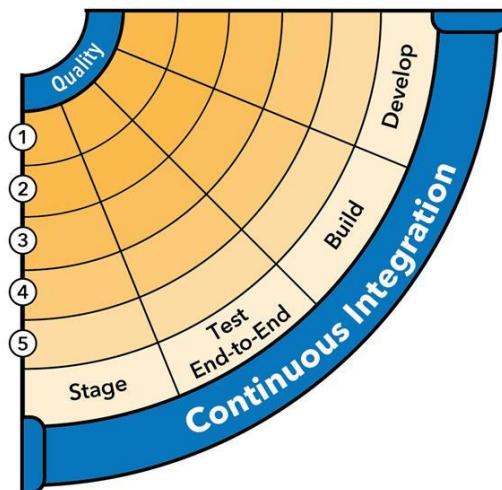
- ▶ Ensure products function properly so that value can be realized

IT perspective

- ▶ Reduce cost and risk of deferring quality issues

Architecture perspective

- ▶ Architect for Continuous Integration
- ▶ Architect for continuous testing
- ▶ Automate the deployment pipeline
- ▶ Automate compliance

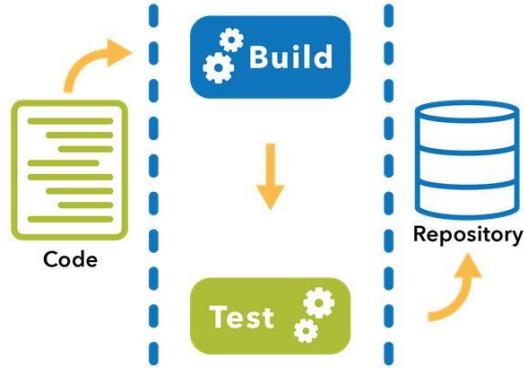


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Architect for Continuous Integration

- ▶ Enable multiple, daily clean builds per developer
- ▶ Minimize code branching and hard dependencies
- ▶ **Architectural considerations**
 - Loosely coupled systems
 - Version control
 - CI & Gated commits
 - Trunk-based development
 - Automated architecture validation



Architect for continuous testing

- ▶ In a system designed for testability, all jobs require less time
- ▶ Test continuously and demo working software at least every increment
- ▶ **Architectural considerations**
 - Loosely-coupled systems
 - Test automation
 - Test data management
 - Service virtualization
 - Stubs, mocks, and test doubles



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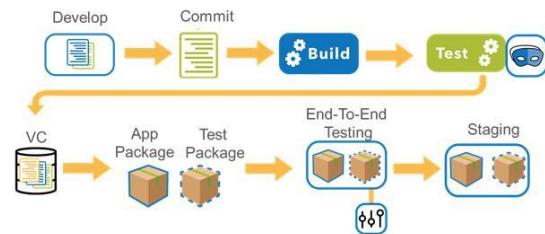


Read more on SAFe Continuous Integration at:

<https://v5.scaledagileframework.com/design-for-testability-a-vital-aspect-of-the-system-architect-role-in-safe/>

Automate the deployment pipeline

- ▶ Strive to automate all steps from commit to deploy
- ▶ This significantly accelerates and reduces the delivery process risk
- ▶ **Architectural considerations**
 - CI/CD toolchain and productivity tool integration
 - Pipeline orchestration
 - Version control
 - Build dashboards
 - ChatOps tools



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Automate compliance

- ▶ Manual compliance reviews can severely impede flow
- ▶ Automate compliance steps to speed delivery and reduce risk
- ▶ **Architectural considerations**
 - Architecture test automation
 - Automated approvals
 - Static code analysis
 - Security vulnerability scanning
 - Requirements and change traceability

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Discussion: Continuous Integration

► **Step 1:** Discuss the following with your group:

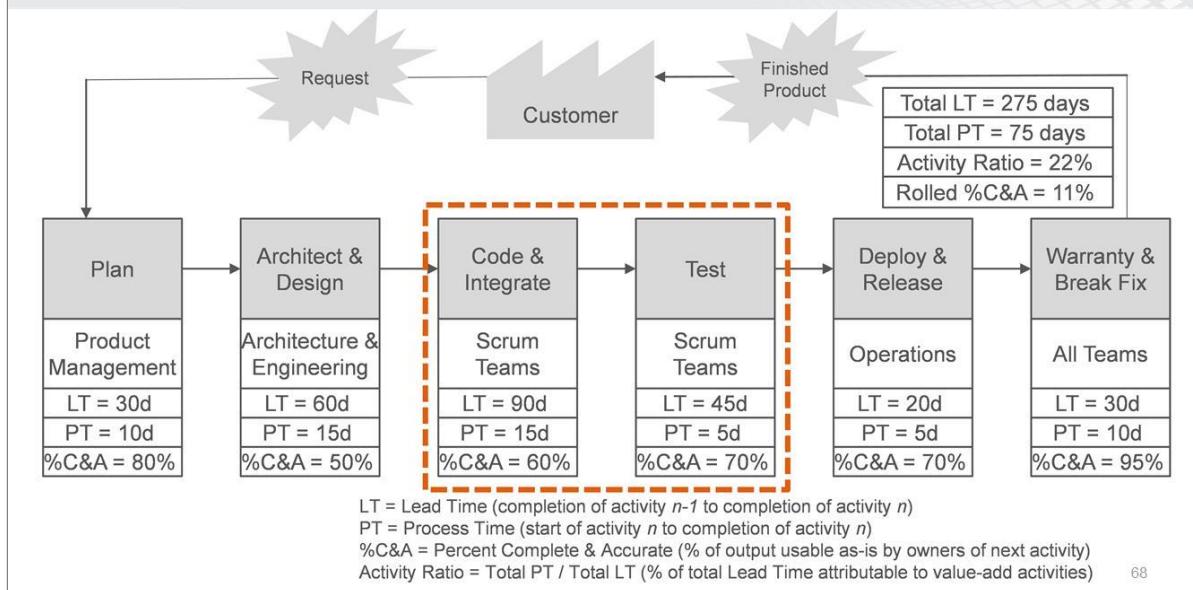
- What bottlenecks might be preventing Continuous Integration based on the highlighted section of the value stream map on the next slide?
- Identify three architectural considerations from the previous slides that could help remove those bottlenecks and enable continuous integration.

► **Step 2:** Be prepared to discuss your thoughts.

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Baseline value stream map worksheet



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2.5 Architect for Continuous Deployment

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Continuous Deployment

Business perspective

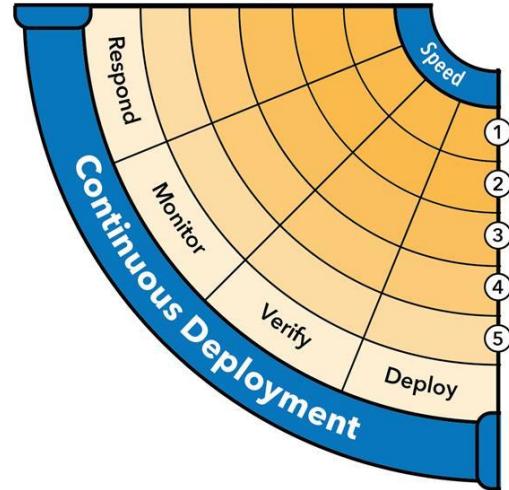
- ▶ Features are ready to be launched when market timing is optimal

IT perspective

- ▶ Features get all the way to 'done' on a continuous basis

Architecture perspective

- ▶ Continuous deployment to production
- ▶ Decouple deployment from release
- ▶ Full stack telemetry
- ▶ Rapid recovery from production issues



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Continuous Deployment

- ▶ Always be deploying to production
- ▶ The goal is a fully automated process from code commit to deploy
- ▶ **Architectural considerations**
 - Deployment automation
 - One-click deploys
 - Infrastructure as code
 - Deployment self-service
 - Ubiquitous version control



 Discussion: Decouple deploy from release 

Discuss: How can separating deploy from release help Architects experiment and validate assumptions?

- ▶ Deploy to production to end users continuously.
Release on demand.
- ▶ Ability to hide Features in production is critical
- ▶ **Architectural considerations**
 - Dark launches
 - Blue/green deployment
 - Feature toggles





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 **Read more on SAFe Release on Demand at:**
<https://v5.scaledagileframework.com/release-on-demand/>

Full-stack telemetry

To inform fact-based decision-making, we need proper data

► **Architectural considerations**

- Applications should clearly log and report meaningful activities and events
- Architect applications and infrastructure to support telemetry
- Monitor both technical and business data
- Federate/aggregate the monitoring infrastructure



Architect for recoverability

► Quickly and elegantly restore Solutions to stable states

- MTTR is a leading indicator of organizational maturity

► **Architectural considerations**

- Automated rollback
- Rapid fix-forward (never circumvent the pipeline)
- Immutable infrastructure
- Failure rehearsal and self-sabotage (e.g., Chaos Monkey)
- Containerization
- Sanctity of version control


Discussion: Continuous Deployment
 Discuss
5 min
 Share
5 min

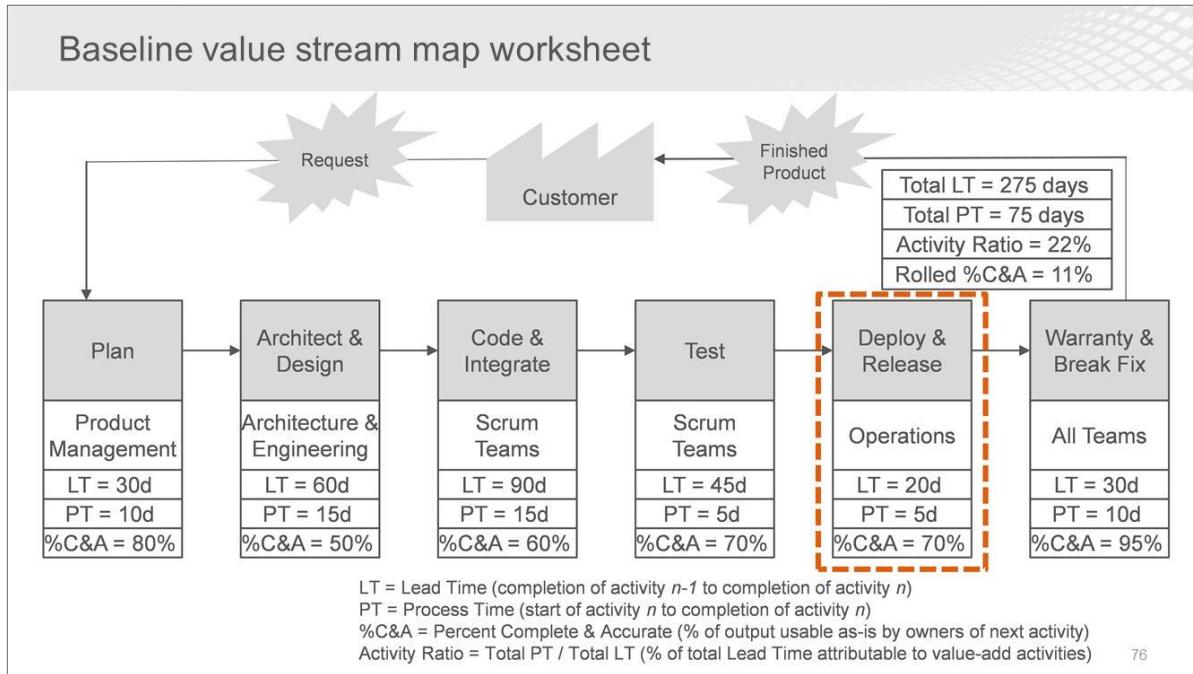
► **Step 1:** Discuss the following with your group:

- What bottlenecks might be preventing continuous deployment based on the highlighted section of the value stream map on the next slide?
- Identify three architectural considerations from the previous slides that could help remove those bottlenecks and enable continuous deployment.

► **Step 2:** Be prepared to discuss your thoughts.

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2.6 Architect for Release on Demand

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Release on Demand

Business perspective

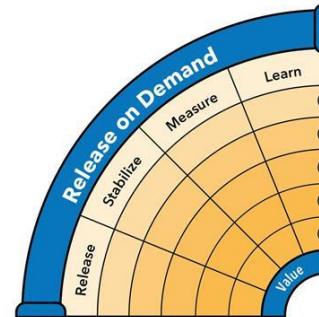
- ▶ Leverage technology to run and grow the business

IT perspective

- ▶ Provide valuable and reliable business Solutions

Architecture perspective

- ▶ Release on Demand
- ▶ Decouple release elements
- ▶ Architect for operations
- ▶ Measure business value delivered

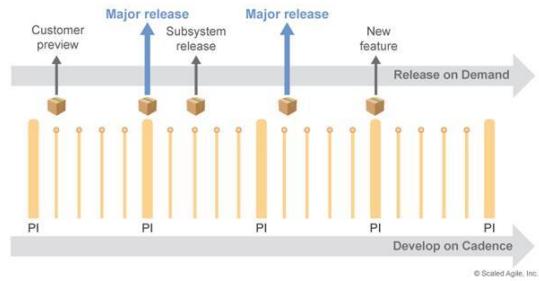


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Release on Demand

- ▶ Expose ‘dark’ features to Customers based on market readiness
- ▶ Releasing should be low risk, instantaneous, and reversible
- ▶ **Architectural considerations**
 - Blue/green infrastructure
 - Canary releases
 - Feature toggles
 - A/B testing

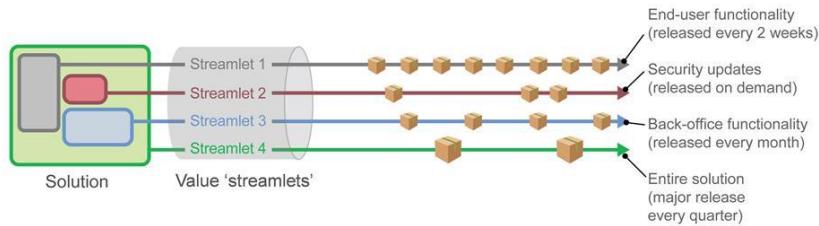


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Decouple release elements

- ▶ Different parts of the Solution may require different release strategies
- ▶ Architect the Solution to support the needs of all Customers
- ▶ Architect sub-systems for independent build, test, deploy, and release

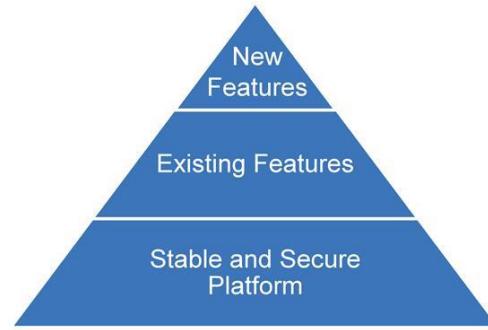


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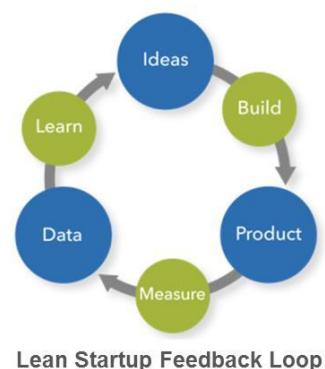
Architect for operations

- ▶ Operational integrity is the foundation of business value
 - Defined by NFRs, SLAs, BCPs, and QoS agreements
- ▶ **Architectural considerations**
 - Proactive issue detection and notification
 - Elastic infrastructure and auto-scaling
 - Failover and DR (Chaos Monkey style)
 - Intrusion detection
 - Full stack monitoring and logging



Measuring business value

- ▶ Determining value delivered is critical to evaluate hypotheses and analyze qualitative and quantitative feedback
- ▶ **Architectural considerations**
 - System performance analytics
 - User behavior/experience analytics
 - BI systems, dashboards & reports
 - Full stack telemetry
 - Retrospectives & Inspect and Adapt sessions





Discussion: Release on Demand
Discuss 
Share 

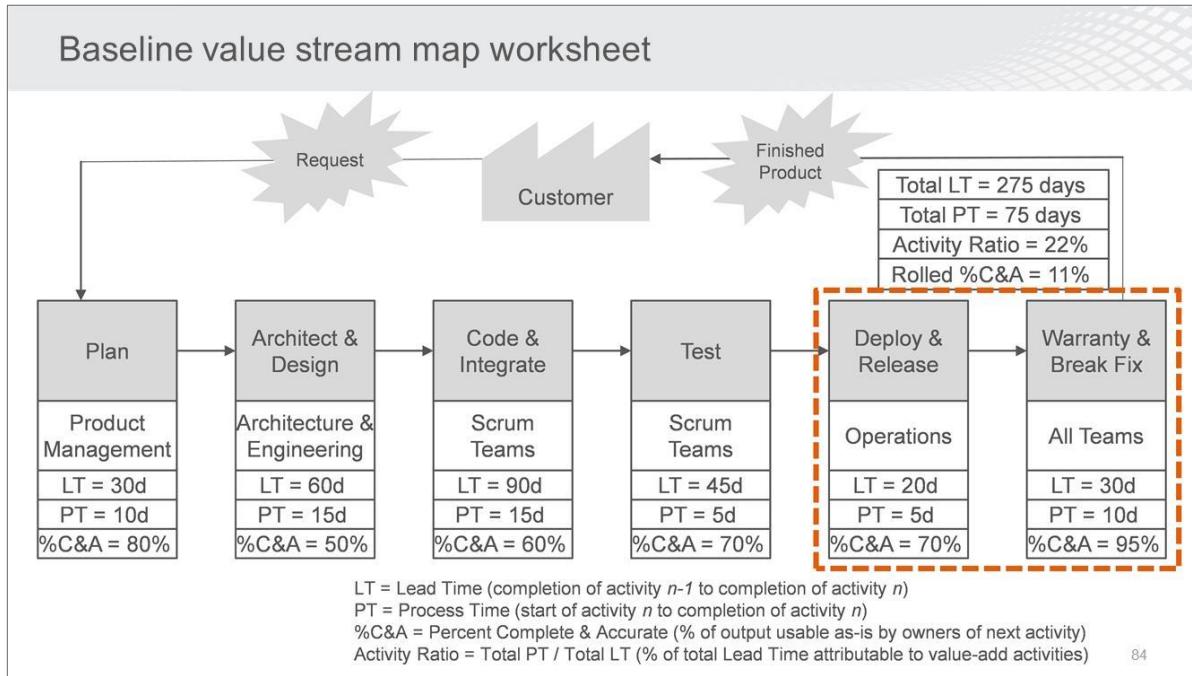
► **Step 1:** Discuss the following with your group:

- What bottlenecks might be preventing release on demand based on the highlighted section of the value stream map on the next slide?
- Identify three architectural considerations from the previous slides that could help remove those bottlenecks and enable release on demand.

► **Step 2:** Be prepared to discuss your thoughts.

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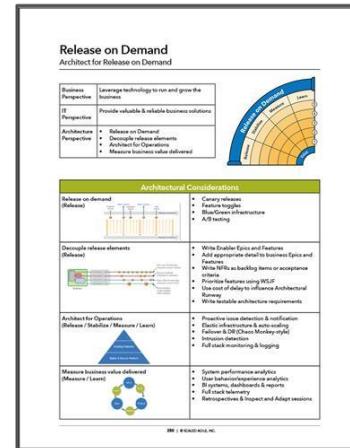
Discuss: DevOps for different environments

Duration
10 min

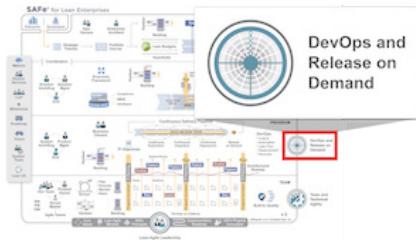
- ▶ Different environments have different challenges when enabling DevOps.
 - Some are green field environments
 - Some are brown field with monolithic systems
 - Some include third-party systems and “Shadow IT”
 - Some are a combination of these
- ▶ Discuss various challenges and Solutions in architecting for DevOps and Release on Demand in these environments.

Architecting for DevOps job aid

- ▶ You will find an *Architecture Considerations for DevOps* job aid on the next pages of your student workbook.
- ▶ This five-page job aid provides a one-stop, visible reference of all the architecture considerations presented in this lesson.



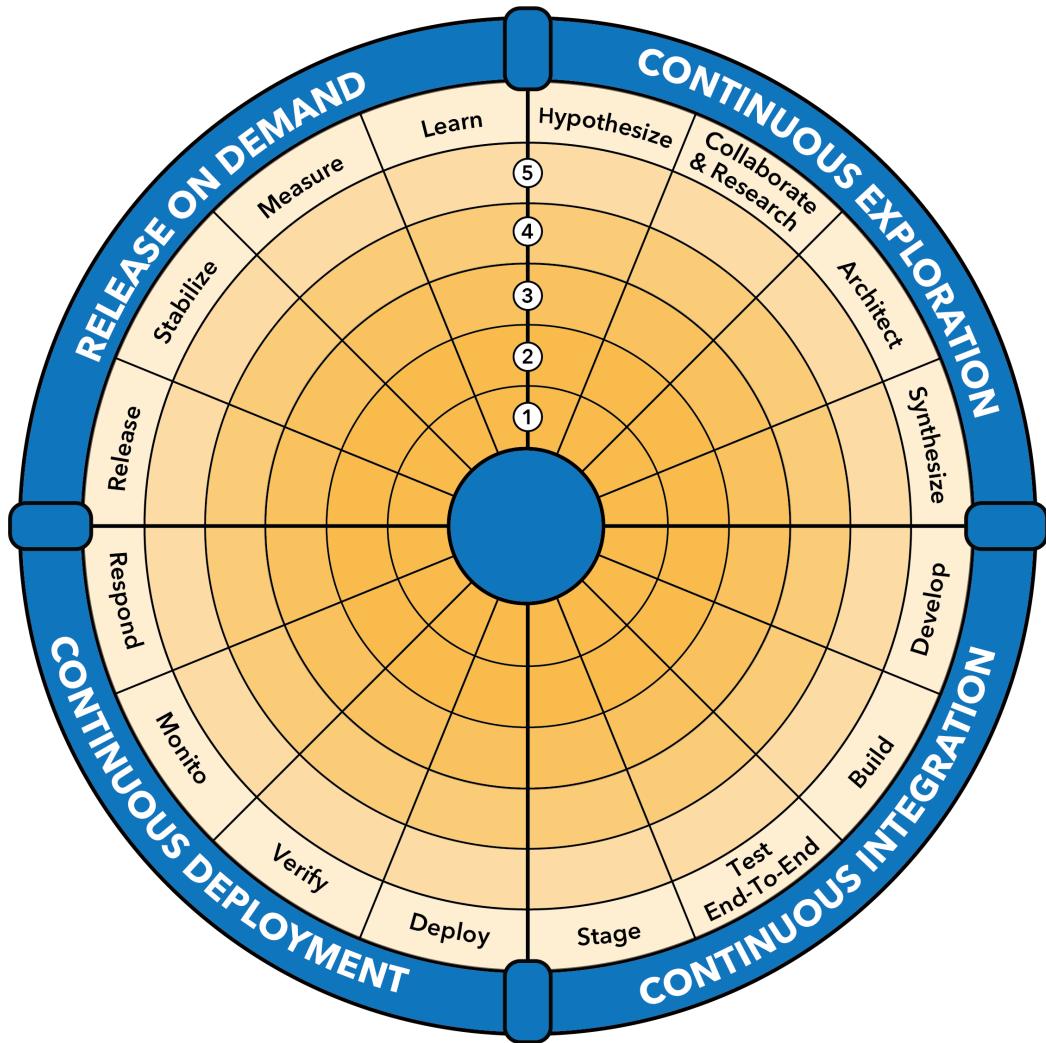
Architecture Considerations for Devops



"Work is not done when Development completes the implementation of a feature— rather, it is only done when our application is running successfully in production, delivering value to the customer."

—DevOps Handbook

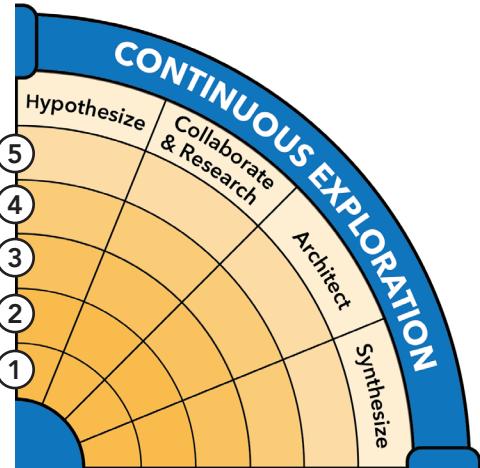
SAFe® Devops Health Radar



Continuous Exploration

Architect for and facilitate Continuous Exploration

Business Perspective	Understand customer needs and achieve alignment on desired business outcomes across the organization
IT Perspective	Quickly define highest value delivery path and prepare backlogs for implementation
Architecture Perspective	<ul style="list-style-type: none"> Align to MVPs and MMFs Contribute to backlogs and prioritization



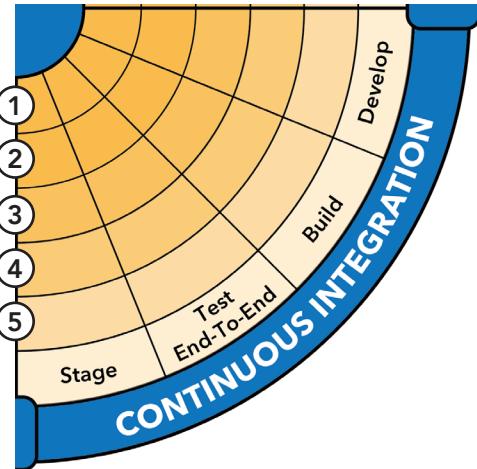
Architectural Considerations

Align to MVPs and MMFs (Collaborate and Research / Architect) <p>Lean Startup Cycle</p> <p>The Lean Startup Cycle diagram shows a sequence of steps: Build MVP → Evaluate MVP (with decision points Pivot or Persevere) → Implement additional Features.</p>	<ul style="list-style-type: none"> Architect for fast business outcomes Define Architectural Runway Define minimum viable architecture Apply domain-driven design (DDD) Define non-functional requirements (NFRs)
Contribute to Backlogs and prioritization (Synthesis) <p>WSJF = $\frac{\text{Cost of Delay}}{\text{Job Duration (Job size)}}$</p> <p>The WSJF formula is shown as $WSJF = \frac{\text{Cost of Delay}}{\text{Job Duration (Job size)}}$. Next to it is a template for writing backlog items: Given _____, When _____, Then _____, with a 'Test' button below it.</p>	<ul style="list-style-type: none"> Write Enabler Epics, Capabilities, and Features Add value to business Epics, Capabilities, and Features Write NFRs as backlog items or acceptance criteria Prioritize the backlog using WSJF Write architecture requirements as executable tests

Continuous Integration

Architect for Continuous Integration

Business Perspective	Ensure products function properly so that value can be realized
IT Perspective	Reduce cost and risk of deferring quality issues
Architecture Perspective	<ul style="list-style-type: none"> • Architect for continuous integration • Architect for continuous testing • Automate the deployment pipeline • Automate compliance

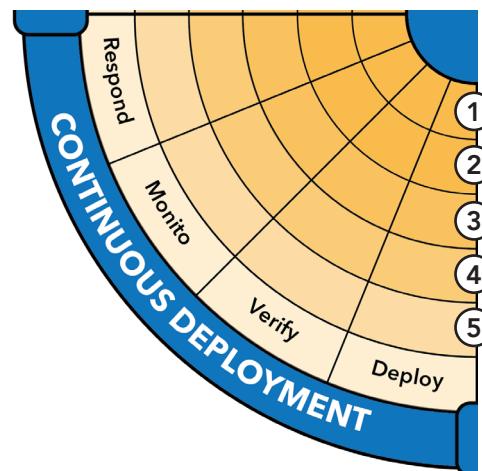


Architectural Considerations	
Architect for Continuous Integration (Build)	<ul style="list-style-type: none"> • Loosely coupled systems • Version control • CI & Gated commits • Trunk-based development • Automated architecture validation
Architect for continuous testing (Stage / Test / Build / Develop)	<ul style="list-style-type: none"> • Loosely-coupled systems • Test automation • Test data management • Service virtualization • Stubs, mocks & test doubles
Automate the deployment pipeline (Stage / Test / Build)	<ul style="list-style-type: none"> • CI/CD toolchain & productivity tool integration • Pipeline orchestration • Version control • Build dashboards • ChatOps tools
Automate compliance (Stage / Test / Build / Develop)	<ul style="list-style-type: none"> • Architecture test automation • Automated approvals • Static code analysis • Security vulnerability scanning • Requirements & change traceability

Continuous Deployment

Architect for Continuous Deployment

Business Perspective	Features are ready to be launched when market timing is optimal
IT Perspective	Features get all the way to "done" on a continuous basis
Architecture Perspective	<ul style="list-style-type: none">• Continuous deployment to production• Decouple deployment from release• Full stack telemetry• Rapid recovery from production issues



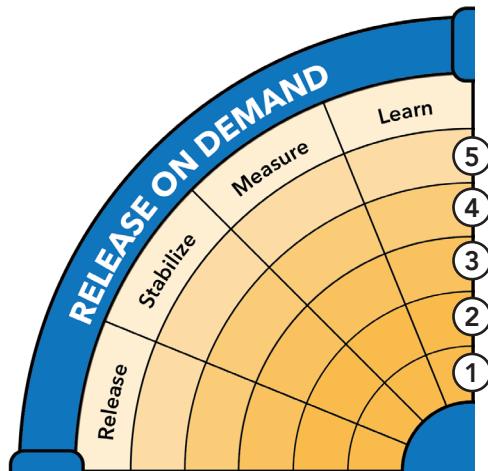
Architectural Considerations

Continuous Deployment (Deploy)	<ul style="list-style-type: none">• Deployment automation• One-click deploys• Infrastructure as Code• Deployment self-service• Ubiquitous version control
Decouple deployment from release (Deploy)	<ul style="list-style-type: none">• Dark launches• Blue/Green deployment• Feature toggles
Full stack telemetry (Monitor / Verify / Deploy)	<ul style="list-style-type: none">• Applications should clearly log and report meaningful activities and events• Architect applications and infrastructure to support telemetry• Monitor both technical and business data• Federate/aggregate the monitoring infrastructure
Rapid recovery from production issues	<ul style="list-style-type: none">• Automated rollback• Rapid fix-forward (never circumvent the pipeline)• Immutable infrastructure• Failure rehearsal & self-sabotage (e.g., Chaos Monkey)• Containerization• Sanctity of version control

Release on Demand

Architect for Release on Demand

Business Perspective	Leverage technology to run and grow the business
IT Perspective	Provide valuable & reliable business solutions
Architecture Perspective	<ul style="list-style-type: none"> • Release on Demand • Decouple release elements • Architect for Operations • Measure business value delivered



Architectural Considerations	
Release on demand (Release)	<ul style="list-style-type: none"> • Blue/Green infrastructure • Canary releases • Feature toggles • A/B testing
Decouple release elements (Release)	<ul style="list-style-type: none"> • Different parts of the Solution may require different release strategies • Architect the Solution to support the needs of all customers • Architect sub-systems for independent build, test, deploy, and release
Architect for Operations (Release / Stabilize / Measure / Learn)	<ul style="list-style-type: none"> • Proactive issue detection & notification • Elastic infrastructure & auto-scaling • Failover & DR (Chaos Monkey-style) • Intrusion detection • Full stack monitoring & logging
Measure business value delivered (Measure / Learn)	<ul style="list-style-type: none"> • System performance analytics • User behavior/experience analytics • BI systems, dashboards & reports • Full stack telemetry • Retrospectives & Inspect and Adapt sessions

Lesson review

In this lesson you:

- ▶ Explored ways Architects can foster a DevOps culture
- ▶ Explored how value flows through the Continuous Delivery Pipeline
- ▶ Explored how to architect for and facilitate Continuous Exploration
- ▶ Explored architecting for Continuous Integration
- ▶ Explored architecting for Continuous Deployment
- ▶ Explored architecting for Release on Demand



Action Plan: Architecting for DevOps



On the Action Plan page in your workbook, answer the following questions:

- ▶ What are some value pipelines in your organization that could benefit from value stream mapping to identify bottlenecks? What improvements could you implement to alleviate them?
- ▶ What are some architecture considerations that you could implement to minimize bottlenecks in your organization?
- ▶ Do you have value stream maps to visualize value flow in your organization? If not, how would you create them?





Lesson 2: Architecting for DevOps and Release on Demand



What are some value pipelines in your organization that could benefit from value stream mapping to identify bottlenecks? What improvements could you implement to alleviate them?

What are some architecture considerations that you could implement to minimize bottlenecks in your organization?

Do you have value stream maps to visualize value flow in your organization? If not, how would you create them?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

Lesson 3

Aligning Architecture with Business Value

Learning Objectives:

- 3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture
- 3.2 Explain how Value Streams support the business
- 3.3 Explain how Solution Trains and Agile Release Trains deliver value



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SAFe® for Architects

Lesson 3: Aligning Architecture with Business Value



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

At the end of this lesson you should be able to:

- ▶ 3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture
- ▶ 3.2 Explain how Value Streams support the business
- ▶ 3.3 Explain how Solution Trains and Agile Release Trains deliver value

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Video: Introduction to TTC

Duration
3 min

In this course, you will be asked to make decisions as an Architect at the Terrific Transport Corporation.

Please watch this company background video where Anthea Bowen, CEO of TTC, provides the history and future direction of the company.



Video link: <https://vimeo.com/296743657/e22b54b952>

TTC business snapshot



Design, manufacture, and sell energy-efficient, long-haul freightliners

Design, manufacture, and sell energy-efficient, local courier vans

Design, manufacture, and operate autonomous vehicles on select military bases

Design, manufacture, and operate autonomous vehicles for commercial delivery on public streets



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3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

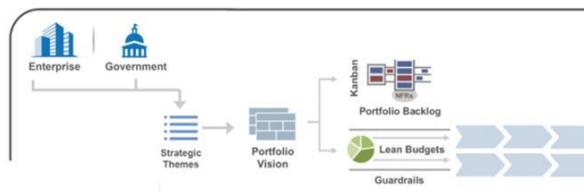
3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

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What are Strategic Themes?

- ▶ Differentiating business objectives that connect a portfolio to Enterprise strategy
- ▶ Primary purpose is to drive portfolio innovation and differentiation

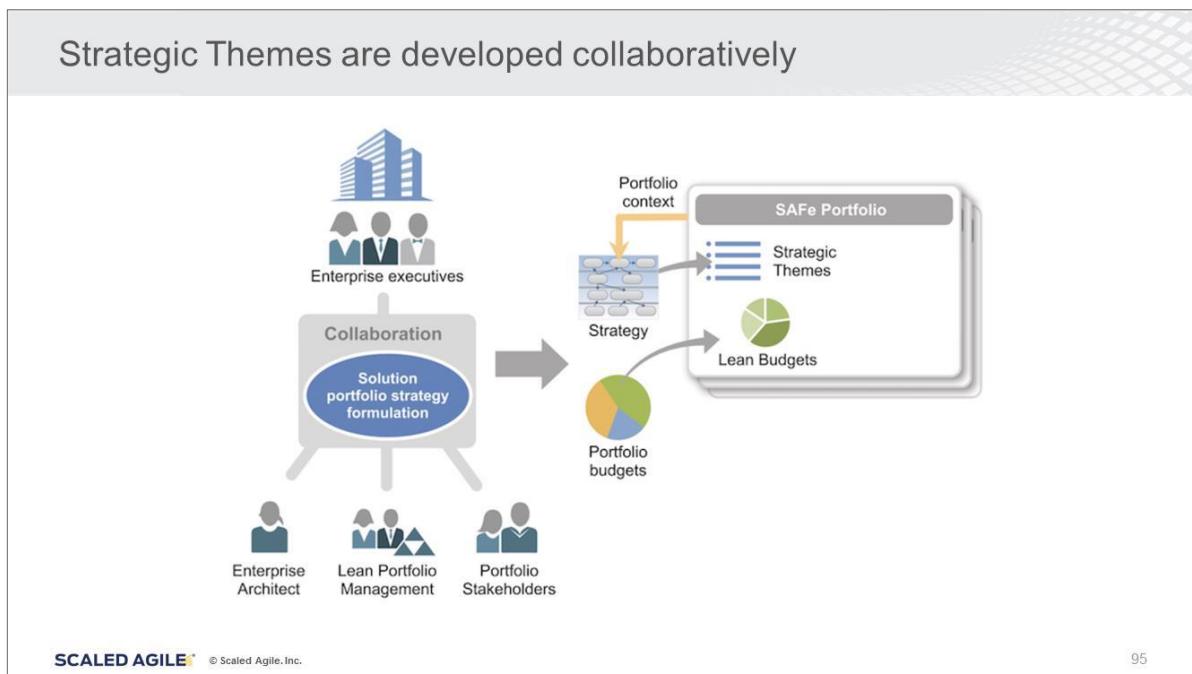


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3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture



3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

 Video: Terrific Transport Corporation all hands meeting

Duration


Anthea Bowen, CEO of the Terrific Transport Corporation, addresses the company at an all hands meeting to introduce TTC's Strategic Themes.



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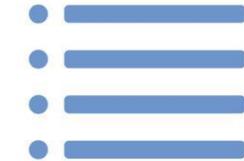


Video link: <https://vimeo.com/310890102/890a0eaa12>

3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

TTC Strategic Themes

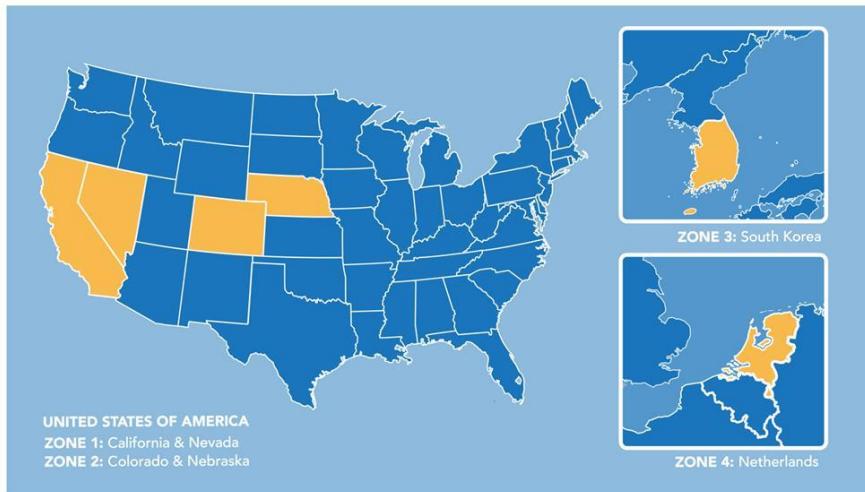
- ▶ Increase truck program sales volume by 15%
- ▶ Obtain gold safety standard status with van program
- ▶ *Triple autonomous vehicle program revenue within 18 months through commercial expansion*
- ▶ *Capture dominant autonomous delivery market share in zones 1 and 2 within 18 months*
- ▶ Expand the Giving-1 Program to all Terrific Transport locations



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TTC market zones



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3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

What is a portfolio canvas?

- ▶ The **portfolio canvas** is a business model canvas adapted to charter and describe the structure and purpose of a SAFe Portfolio.
- ▶ It describes how a portfolio of Solutions creates, delivers, and captures value for an organization.
- ▶ It helps define and align the portfolio's Value Streams and Solutions to the goals of the Enterprise.



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TTC portfolio canvas

Value Propositions						
Value Streams	Solutions	Customer Segments	Channels	Customer Relationships	Budget	KPIs / Revenue
Truck Program	Energy-efficient, long-haul freightliners	Shipping companies	Direct sales	Direct sales force	Fixed 10% of revenue (currently \$20M) \$2M operational \$13M model upgrade	Sales, margin
Van Program	Energy-efficient, local courier vans	Courier services, custom platforms	Direct sales reseller network	Direct sales force Reseller partner network	Cost + 3% \$30M investment	Sales, margin
Autonomous Vehicle Program	Autonomous vehicles for use on military installations	Government, TTC internal	Direct procurement internal relationship	Procurement officers CIO-managed	Delivery metrics Safety, availability	
Autonomous Delivery Program	Autonomous vehicles for commercial delivery on public streets	Local business delivery	Direct relationship	Direct sales force Customer portal	\$50M initial investment	Uptake On-time delivery Zone expansion

Key Partners	Key Activities	Key Resources
Viral Video - Guidance and sensor technology Federal automation initiative - government program to automate systems Lockbox Systems, Inc. – Provider of on-board lockbox hardware Various enterprise software vendors Various hardware suppliers for components (e.g. RFID systems)	Marketing new delivery capabilities Supporting autonomous delivery needs in Van/Truck programs on behalf of Autonomous Vehicle and delivery Accelerated procurement support for new capabilities Government lobbying for Zone 1 and 2 regulations	Experienced automation architects from government program Flexible St. Louis assembly plant (highly responsive to design changes) Strategic patent library for electric van systems Strong reputation for eco-operations
Cost Structure	Revenue Streams	
Total budget this year: \$117M \$95M is short-term capital investment to support autonomous push across all value streams \$22M is routine operating budget for Truck/Van programs Future operating budget depends on revenue achievement for new value streams	Current revenue is: 85% from general Truck and Van sales 8% from government program 7% from outsourced delivery contracts Goal is to achieve 40% truck/van sales, 10% government, 50% direct delivery in 24 months	100

3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

Value Propositions 🎁						
Value Streams	Solutions	Customer Segments 🧑	Channels 🚛	Customer Relationships ❤️	Budget	KPIs / Revenue
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Autonomous Vehicle Program	Autonomous vehicles for use on military installations	Government, TTC internal	Direct procurement internal relationship	Procurement officers CIO-managed	Cost + 5% \$30M investment	Delivery metrics Safety, availability
Autonomous Delivery Program	Autonomous vehicles for commercial delivery on public streets	Local business delivery	Direct relationship	Direct sales force Customer portal	\$50M initial investment	Uptake On-time delivery Zone expansion

Key Partners 🔒	Key Activities ✓	Key Resources 💼
Viral Video - Guidance and sensor technology Federal automation initiative - government program to automate systems Lockbox Systems, Inc. – Provider of on-board lockbox hardware Various enterprise software vendors Various hardware suppliers for components (e.g. RFID systems)	Marketing new delivery capabilities Supporting autonomous delivery needs in Van/Truck programs on behalf of Autonomous Vehicle and delivery Accelerated procurement support for new capabilities Government lobbying for Zone 1 and 2 regulations	Experienced automation architects from government program Flexible St. Louis assembly plant (highly responsive to design changes) Strategic patent library for electric van systems Strong reputation for eco-operations

Cost Structure 💰	Revenue Streams 💰
Total budget this year: \$117M \$95M is short-term capital investment to support autonomous push across all value streams \$22M is routine operating budget for Truck/Van programs Future operating budget depends on revenue achievement for new value streams	Current revenue is: 85% from general Truck and Van sales 8% from government program 7% from outsourced delivery contracts Goal is to achieve 40% truck/van sales, 10% government, 50% direct delivery in 24 months

What is a Vision?

- ▶ Explains why we are doing what we're doing
- ▶ Provides a unifying 'why' for major decisions
 - Sets the direction for future work
 - Ensures teams are aligned on a shared goal
 - Allows teams and individuals to make localized decisions
- ▶ Can serve as a key decision-support tool
- ▶ There are Visions at different levels (Vision is on the spanning palette)



3.1 Describe how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture

Exploring TTC's opportunities in autonomous vehicle technology, while continuing to invest in our core businesses, will allow TTC to increase global revenue and profitability, develop market-leading innovations in smart-vehicle delivery, and give more back to our communities.

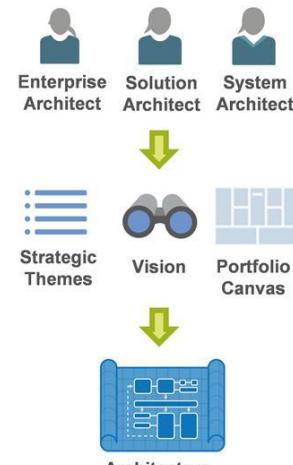
— TTC's Portfolio Vision

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 Discussion: Strategic Themes, Portfolio Canvas, Vision Duration
5 min

As a class, discuss the following:

- ▶ How can Enterprise Architects influence Strategic Themes, portfolio canvases, and Portfolio Visions?
- ▶ How do these artifacts influence architecture?
- ▶ Repeat this exercise but instead for Solution Architects and System Architects.



The diagram illustrates a vertical flow of influence. At the top, three icons represent different architect roles: Enterprise Architect (person with blue square), Solution Architect (person with blue square), and System Architect (person with blue square). Arrows point downwards from each role to their respective outputs: Strategic Themes (blue horizontal bars), Vision (binoculars icon), and Portfolio Canvas (grid icon). A final arrow points down to the Architecture icon (blue blueprint).

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3.2 Explain how Value Streams support the business

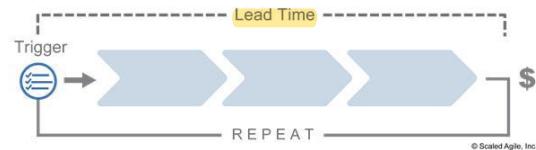
3.2 Explain how Value Streams support the business

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What is a Value Stream?

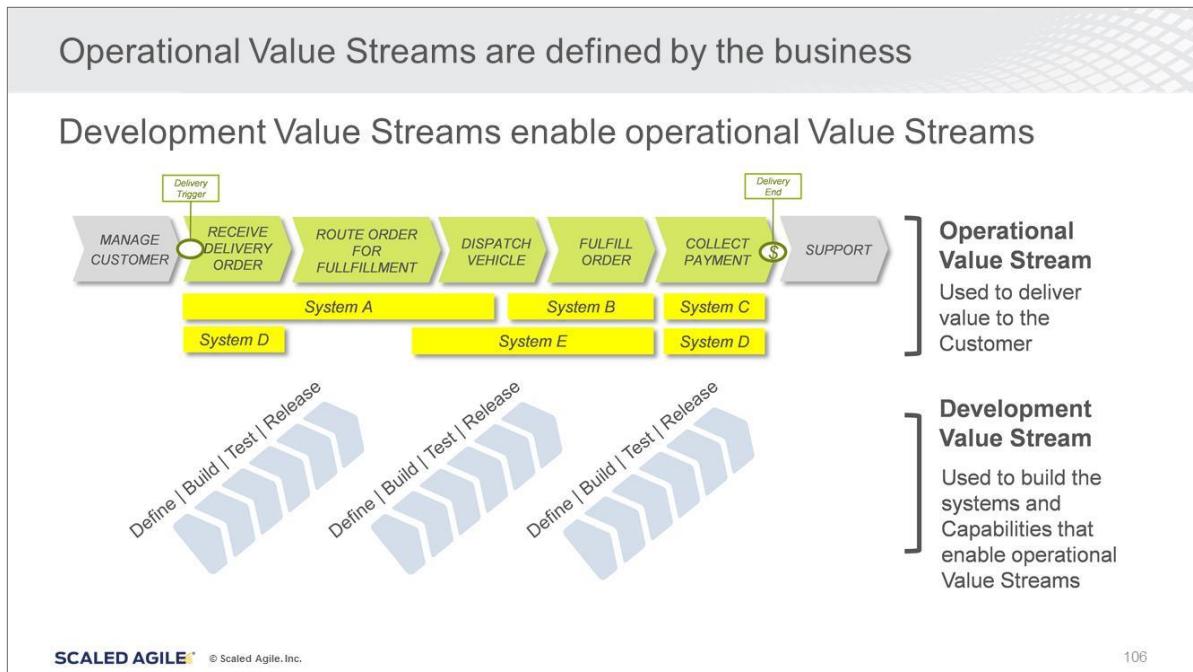
- ▶ Value Streams represent the series of steps an organization uses to build Solutions that provide a continuous flow of value to a Customer.
- ▶ Value Streams:
 - Are used to define and realize portfolio-level business objectives and organize Agile Release Trains (ARTs) to deliver value more rapidly
 - Contain the people who do the work, the systems, and the flow of information and materials



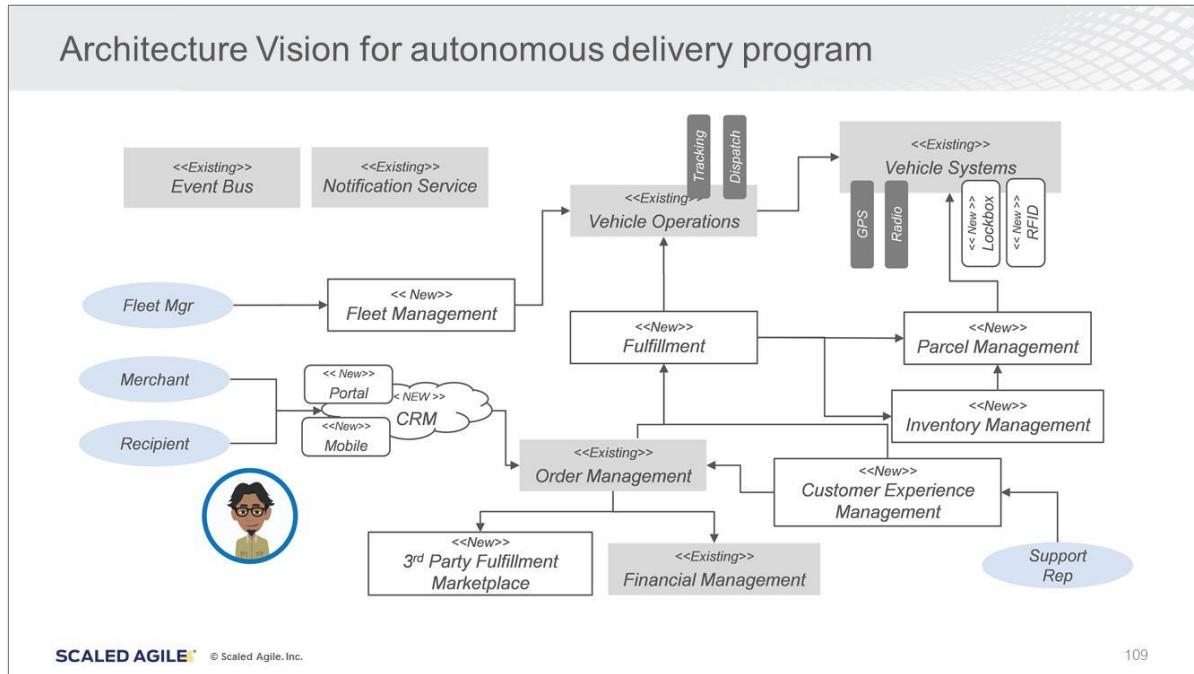
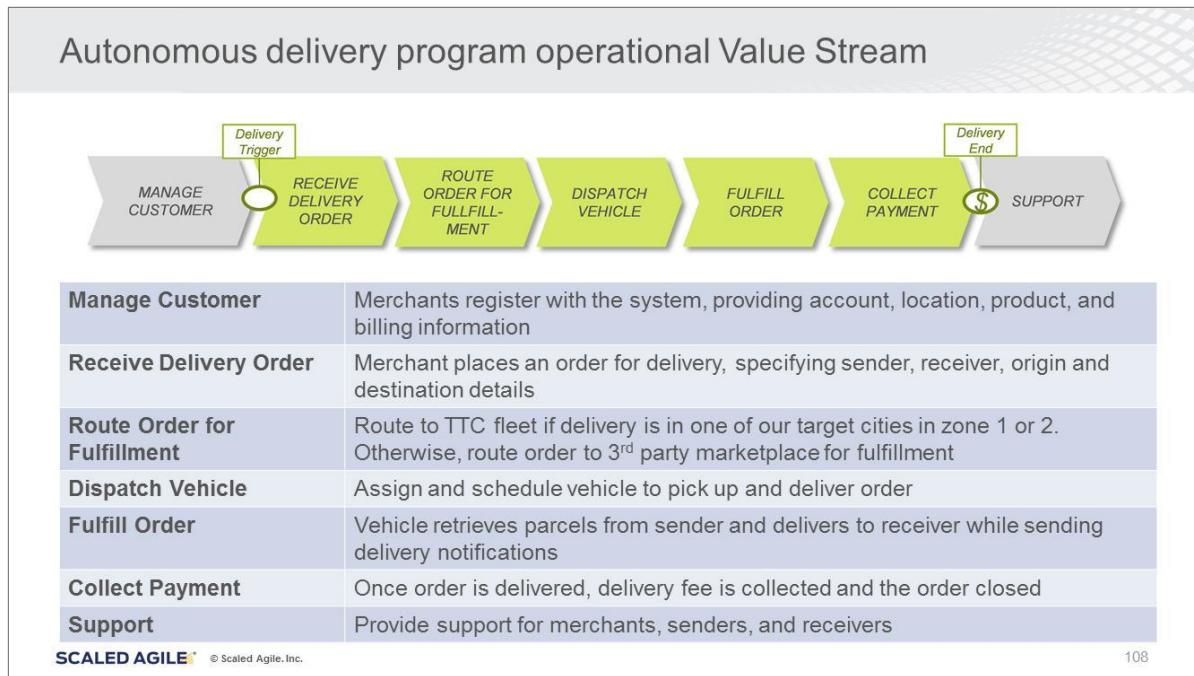
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3.2 Explain how Value Streams support the business



3.2 Explain how Value Streams support the business



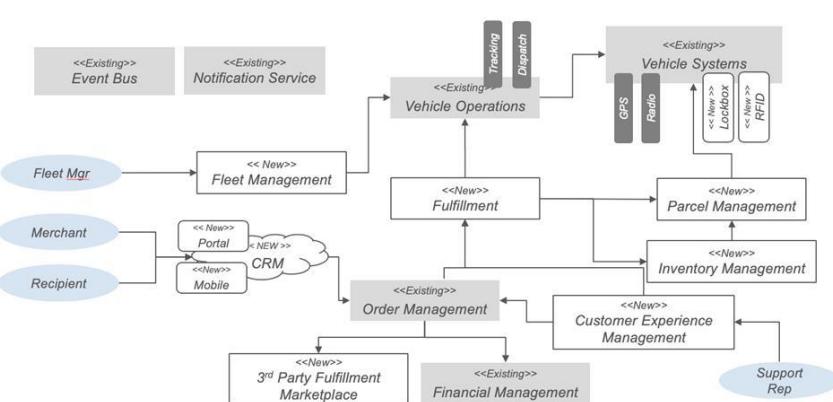
3.2 Explain how Value Streams support the business

Autonomous delivery program system descriptions

Customer Relationship Management (CRM)	Provides a robust customer relationship management capability, including prospecting, lead generation, contact database, and point of sale functionality
Order Management	Manages the full life cycle of an order, from order capture through delivery fulfillment
Fulfillment Marketplace	Third party network of delivery fulfillment providers (used for orders placed in non-supported zones)
Financial Management	Manages billings, receivables, expenses, budgeting, and reporting
Fleet Management	Manage vehicles, cross-region load balancing, maintenance, and fleet usage reporting. Provides insights into vehicle availability and expected delivery windows
Fulfillment	Orchestrates the physical delivery process from vehicle dispatch to vehicle return
Vehicle Operations	Communicates with onboard vehicle systems during delivery and tracks vehicle location
Vehicle Systems	Onboard vehicle systems that control all vehicle and lockbox functions
Parcel Management	Tracks the location and disposition of every parcel in transit
Inventory Management	Reports on product availability, storage location, size, weight, warehouse layout, and pick-up logistics
Customer Exp. Mgmt.	Provides customer service representatives visibility into delivery process and systems

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Activity: Map systems to the Operational Value Stream
Prepare 5 min Share 5 min



The diagram illustrates the operational value stream for an autonomous delivery program. It starts with external actors (Fleet Mgr, Merchant, Recipient) interacting with internal systems. The internal systems include an Event Bus, Notification Service, CRM (via Mobile and Portal), Fleet Management, Order Management, Financial Management, 3rd Party Fulfillment Marketplace, Customer Experience Management, Inventory Management, Fulfillment, Parcel Management, Vehicle Operations, Vehicle Systems, and various tracking technologies (GPS, Radio, Locbox, RFID). The flow of data is represented by arrows connecting these components in a sequential and iterative manner.

Step 1: With your group, place the systems onto the value stream map on the next slide.

The Event Bus and Notification Service have already been placed on the map as examples.

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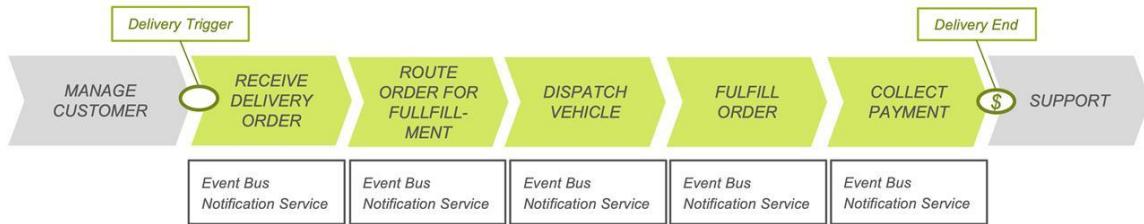
111

3.2 Explain how Value Streams support the business

Activity: Map systems to the Operational Value Stream

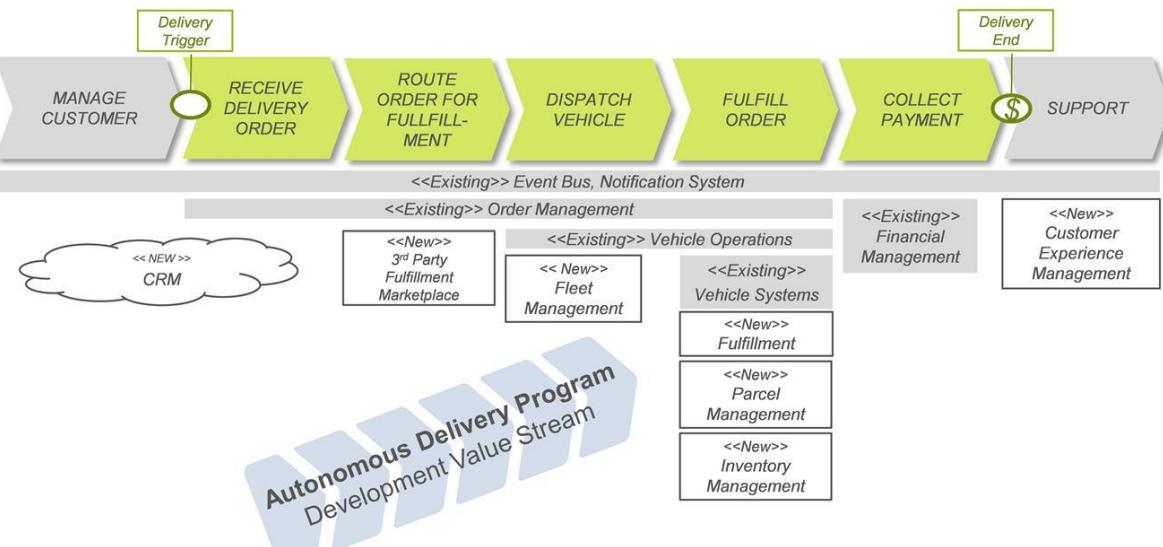
Step 1: Map these systems to the value stream segments they support:

- ▶ Fleet Management
- ▶ Vehicle Operations
- ▶ Vehicle Systems
- ▶ Fulfillment
- ▶ Parcel Management
- ▶ Inventory Management
- ▶ CRM
- ▶ Order Management
- ▶ Customer Experience
- ▶ Management
- ▶ 3rd Party Fulfillment Marketplace
- ▶ Financial Management



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Systems mapped to the Operational Value Stream



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3.3 Explain how Solution Trains and Agile Release Trains deliver value

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What is a Solution?

- ▶ Each Value Stream produces one or more Solutions, which are products, services, or systems delivered to the Customer, whether internal or external to the Enterprise.
- ▶ A Solution may be a product, a product line, a set of systems, or a service that enables an operational Value Stream.



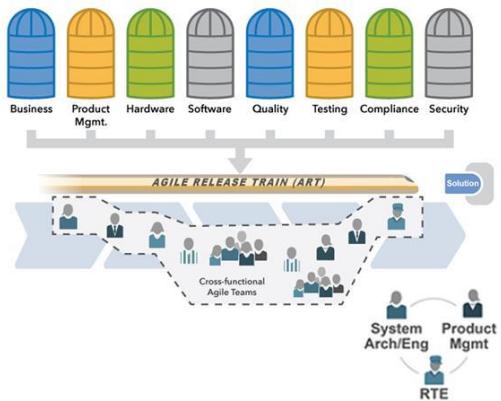
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3.3 Explain how Solution Trains and Agile Release Trains deliver value

What is an Agile Release Train (ART)?

- ▶ Virtual organization of 5 to 12 teams (50 to 125+ individuals)
- ▶ Has all the capabilities—software, hardware, firmware, and other assets—needed to define, implement, test, and deploy new system functionality
- ▶ Operates with the goal of achieving continuous flow of value
- ▶ Synchronized on common cadence (a Program Increment)
- ▶ Aligned to common mission via Program Backlog



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What is a Solution Train?

- ▶ The Solution Train is the organizational construct used to build large and complex Solutions that require the coordination of multiple Agile Release Trains (ARTs) and Suppliers.
- ▶ It aligns ARTs with a shared business and technology mission using the Solution Vision, backlog, and Roadmap, and an aligned Program Increment (PI).



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3.3 Explain how Solution Trains and Agile Release Trains deliver value

Suppliers play a key role in Large Solution development

- ▶ Provide unique value not available in Value Stream
- ▶ Can be internal (another portfolio or Value Stream within our portfolio) or external (another Enterprise)
- ▶ Lean-Agile Suppliers are treated as another ART, participating in all Solution Train events

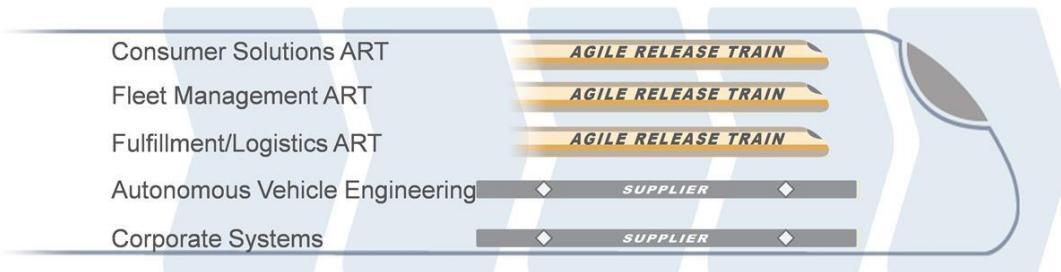


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Autonomous delivery program Solution Train

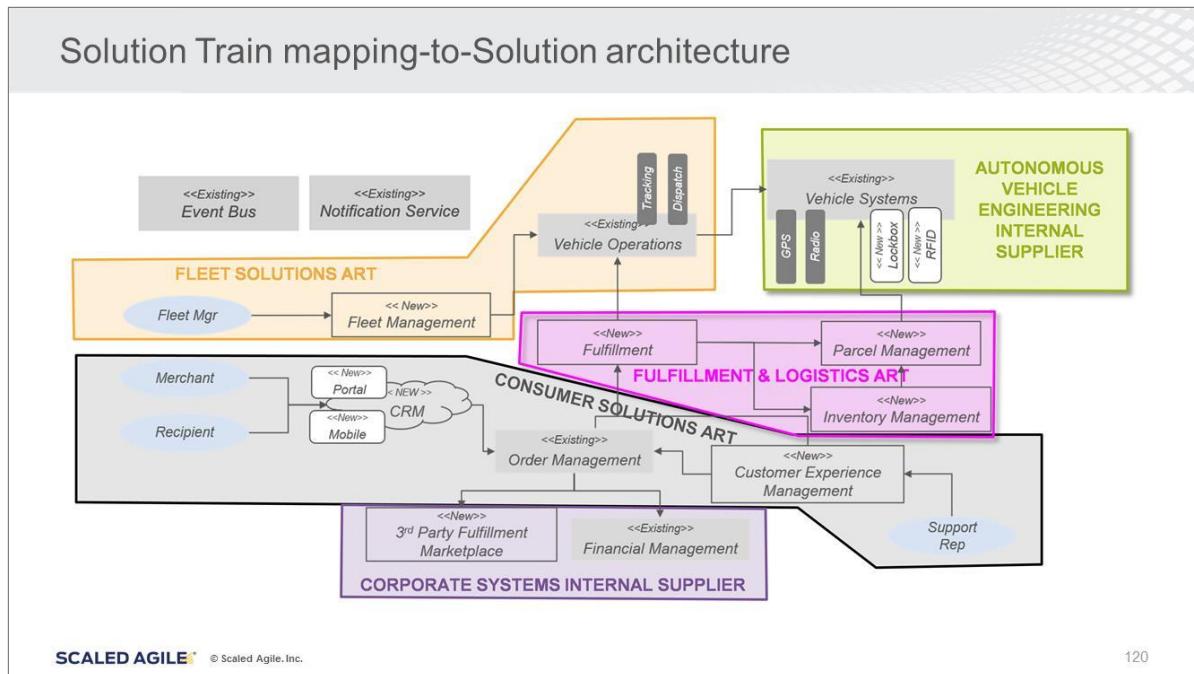
This Solution Train is organized into three ARTs and two internal Suppliers.



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3.3 Explain how Solution Trains and Agile Release Trains deliver value



Activity: Map ARTs and Suppliers to the operational Value Stream

Prepare 4 min **Share** 3 min

- ▶ **Step 1:** In your group, place two ARTs and two Suppliers in the appropriate boxes on the Value Stream provided on the next slide.
- ▶ **Step 2:** The fleet Solutions ART has already been placed on the map as an example.

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3.3 Explain how Solution Trains and Agile Release Trains deliver value

Activity: Map ARTs and Suppliers to the operational Value Stream



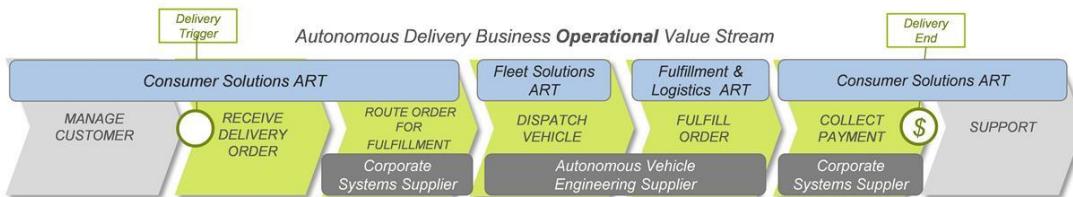
Map these ARTs and Suppliers to the operational Value Stream:

- ▶ Fleet Solutions ART (shown)
- ▶ Consumer Solutions ART
- ▶ Fulfillment and logistics ART
- ▶ Autonomous vehicle engineering Supplier
- ▶ Corporate systems Supplier

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ARTs and Suppliers mapped to the operational Value Stream



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3.3 Explain how Solution Trains and Agile Release Trains deliver value



Which ART will you be on?



Choose which ART your group would like to be on for the duration of the course and inform the instructor of your group's choice.

Oxana Schroeder is the Solution Architect for the autonomous delivery program Solution Train. You will be a **System Architect** on either the Consumer Solutions ART or the Fulfillment and Logistics ART.



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Activity: System Architect responsibilities



- ▶ **Step 1:** To contribute effectively to your ARTs as System Architects at TTC, you will need to know the following information:
 - What system am I supporting?
 - What technology is it built on?
 - What systems does it integrate with?
 - Who builds, tests, and deploys my system?
 - Who supports my system?
 - Who are my Customers?
- ▶ **Step 2:** Discuss who each of you will need to stay engaged with across the various ARTs, Suppliers, and teams.
- ▶ **Step 3:** With your team, agree on who is responsible for each of your ART's systems and answer these questions. Use the *TTC Solution Train mapping-to-Solution architecture diagram* as a resource.

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Lesson review

In this lesson you:

- ▶ Discovered how Strategic Themes, portfolio canvas, and Portfolio Vision influence architecture
- ▶ Realized how Value Streams support the business
- ▶ Explored how Solution Trains and Agile Release Trains deliver value



Action Plan: Align architecture with business value



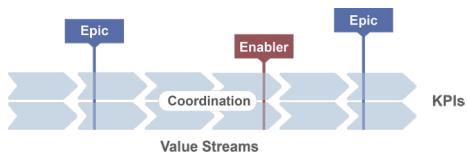
On the Action Plan page in your workbook, answer the following questions:

- ▶ What are some ways you can align architecture at your organization with Strategic Themes, the portfolio canvas, and the Portfolio Vision?
- ▶ What are the Value Streams that your architecture supports at your organization?
- ▶ How is your organization organized around Value Streams?





Lesson 3: Aligning Architecture with Business Value



What are some ways you can align architecture at your organization with Strategic Themes, the portfolio canvas, and the Portfolio Vision?

What are the Value Streams that your architecture supports at your organization?

How is your organization organized around Value Streams?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

3.3 Explain how Solution Trains and Agile Release Trains deliver value

Lesson 4

Developing Solution Vision, Solution Intent, and Roadmaps

Learning Objectives:

- 4.1 Align Solution Vision with Strategic Themes and Solution Context
- 4.2 Contribute to Solution Intent
- 4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)
- 4.4 Contribute to Roadmaps



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SAFe® for Architects

Lesson 4: Developing Solution Vision, Solution Intent, & Roadmaps



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

At the end of this lesson you should be able to:

- ▶ 4.1 Align Solution Vision with Strategic Themes and Solution Context
- ▶ 4.2 Contribute to Solution Intent
- ▶ 4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)
- ▶ 4.4 Contribute to Roadmaps

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4.1 Align Solution Vision with Strategic Themes and Solution Context

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Solution Vision

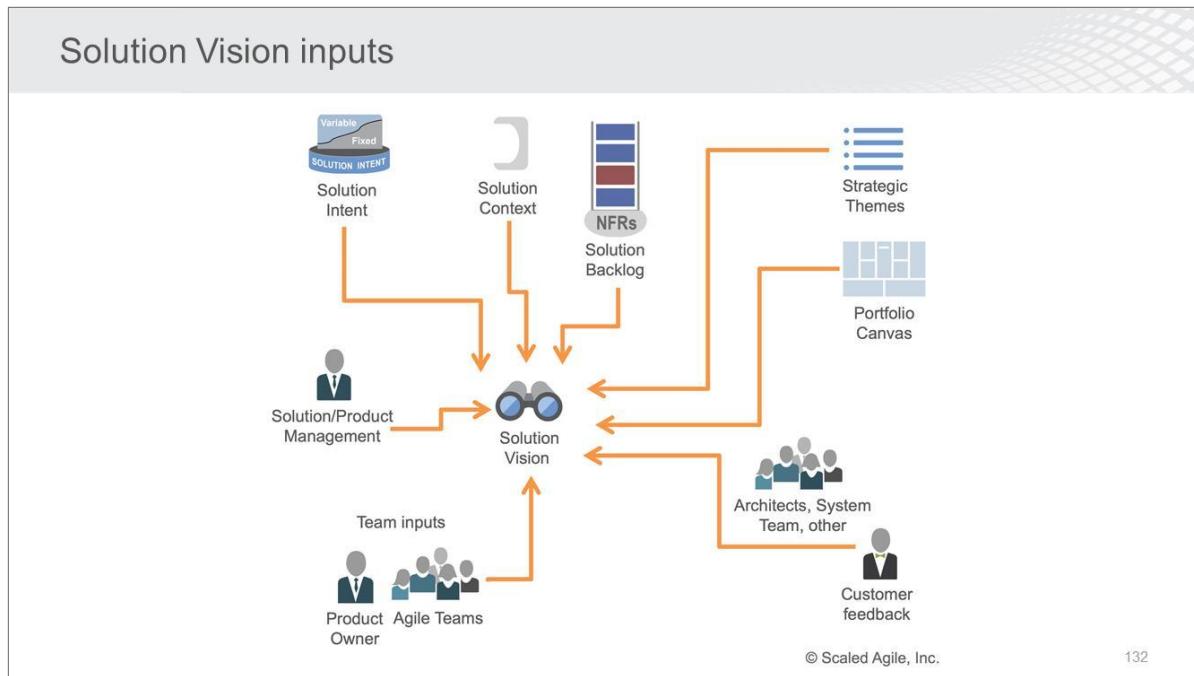
- ▶ Product and Solution Management translate the Portfolio Vision into a Solution Vision
- ▶ It defines the reason and direction behind the chosen Solution
- ▶ Solution Vision addresses questions to be asked and answered:
 - What will this new Solution do?
 - What problem will it solve?
 - What benefits will it provide?
 - For whom will it provide them?
 - What performance (nonfunctional requirements) will it deliver?



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4.1 Align Solution Vision with Strategic Themes and Solution Context



Autonomous delivery program Solution Vision

TTC's commercial autonomous delivery solution will provide:

- ▶ The most efficient and reliable parcel delivery service on the market
- ▶ Unparalleled federal, state, and local safety and compliance ratings
- ▶ Convenient, curb-side pickup and delivery anywhere within zone boundaries
- ▶ On-demand web and mobile access to delivery services
- ▶ Delivery payloads that are never lost or stolen
- ▶ An engaging, friendly merchant and endpoint customer experience

4.1 Align Solution Vision with Strategic Themes and Solution Context

Video: TTC Solution Vision video

Duration
2 min

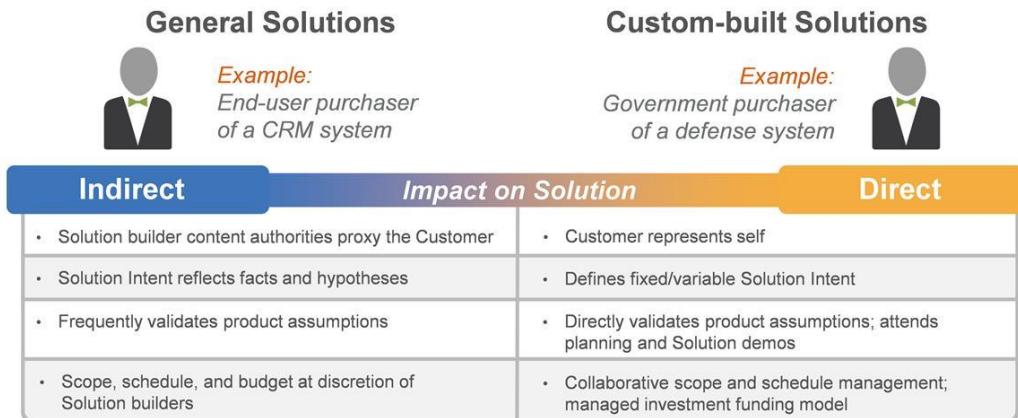
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Video link: <https://vimeo.com/scaledagile/review/317362936/00f068c0a9>

Customer engagement drives Agile success

Customers are a critical aspect of development. Engaging them in the process depends on the type of Solution and the Customer's impact.



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Solutions operate in specific contexts

- Solution Context is the environment in which the Solution operates
 - Where will the solution be deployed and used/accessed? For example:
 - Public cloud
 - On-premise data center
 - Field hardware
 - Cyber-physical system
- Influences functional and nonfunctional requirements



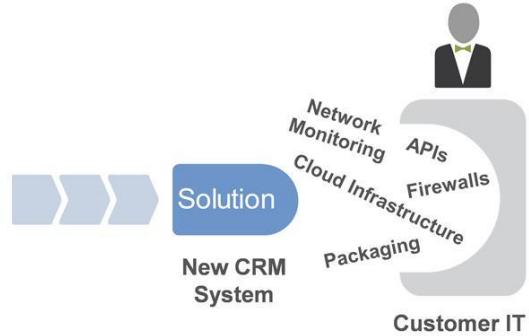
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Solution Context bounds the Solution

Solution Context strongly influences:

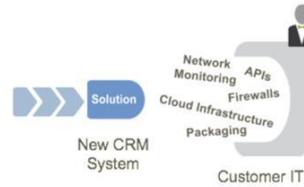
- ▶ Solution Vision
- ▶ Solution Intent
- ▶ Solution Backlog
- ▶ Nonfunctional requirements
- ▶ Continuous Delivery Pipeline flow
- ▶ Release on Demand timing



Discussion: Aligning architecture with Solution Context

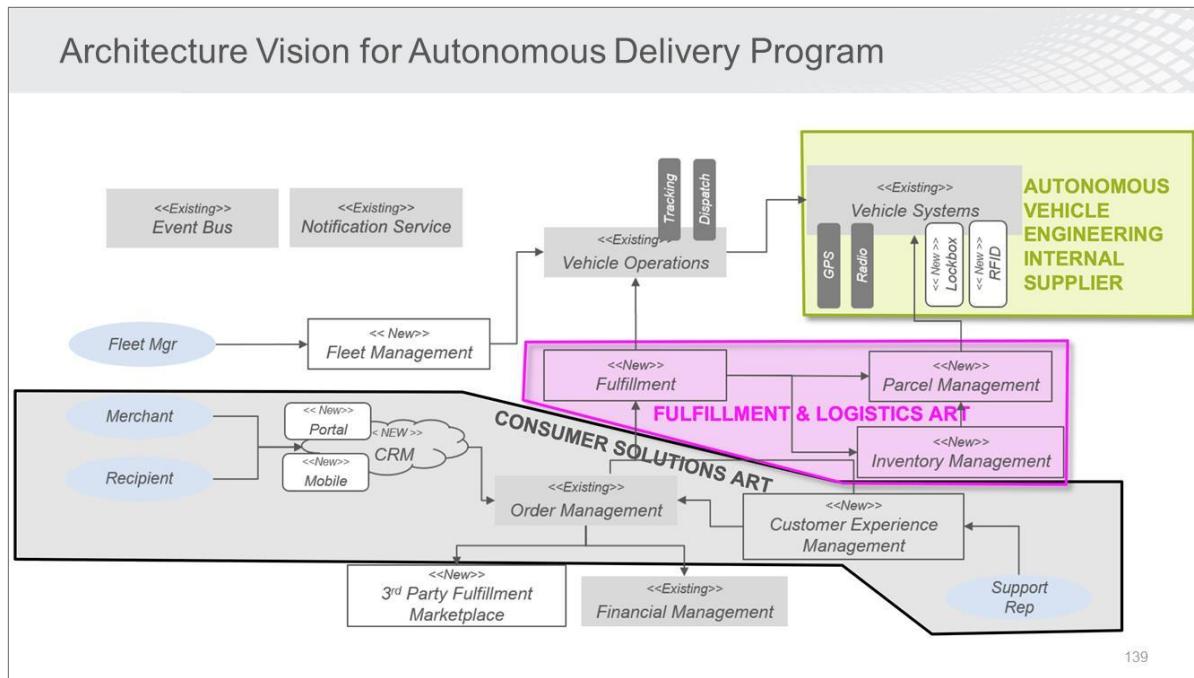
Duration
2 min

- ▶ **Step 1:** Describe the Solution Context for the Autonomous Delivery Program.
- ▶ **Step 2:** How does Solution Context influence system architecture and integration across the Autonomous Vehicle Engineering Supplier, Fulfillment & Logistics ART, and the Consumer Solutions ART?



The architecture model is provided on the next slide for your reference.

4.1 Align Solution Vision with Strategic Themes and Solution Context



Customer personas inform Solution Context

- ▶ **Merchant Persona:** My business markets and sells physical goods to retail consumers in my region. I need the ability to take orders for products I carry and deliver the orders using a reliable, secure, and cost-effective transportation service. It should pick up parcels at my business's distribution points (warehouses, stores, or curbside loading zones) and drop them off at the recipient's location.
- ▶ **Recipient Persona:** I am a retail customer placing a delivery order to a local business. I want to receive the product within two hours of ordering it. While the order is processed and the package is in transit, I would like to receive status updates through a mobile app. The package must be secured so that I am the only one authorized to take delivery of it at the drop-off location.



Activity: Communicate Architecture Vision to business stakeholders

Prepare
10 min

Share
5 min

- ▶ **Step 1:** Anthea (the CEO) sees you in the office and is interested in how the architecture is progressing. You have just a few minutes to make a great impression by communicating the following:
 - How does the Architecture Vision link to TTC's Strategic Themes through the Solution Vision, portfolio canvas, and Portfolio Vision?
 - What architectural tradeoffs have been made to ensure alignment with business goals?
- ▶ **Step 2:** Discuss with your team and be prepared to share.



Strategic Themes



Portfolio Vision



Portfolio Canvas



Solution Vision

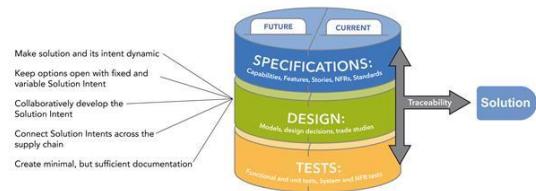
4.2 Contribute to Solution Intent

Solution Intent provides single source of truth

Solution Intent is the repository for storing, managing, and communicating the knowledge of current and intended Solution behavior.

Solution Intent:

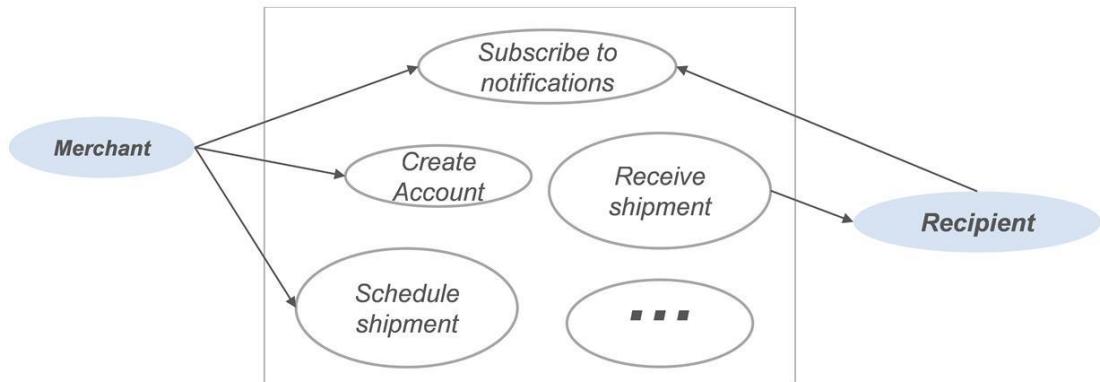
- ▶ Records and communicates requirements, design, and system architecture decisions
- ▶ Facilitates continuous exploration and analysis activities
- ▶ Aligns the customer, Development Team, and Suppliers to a common purpose
- ▶ Supports compliance, contractual agreements, traceability, high assurance



4.2 Contribute to Solution Intent

Context diagram example

The context diagram defines what is in and out of scope for system and shows communication between system and external entities.

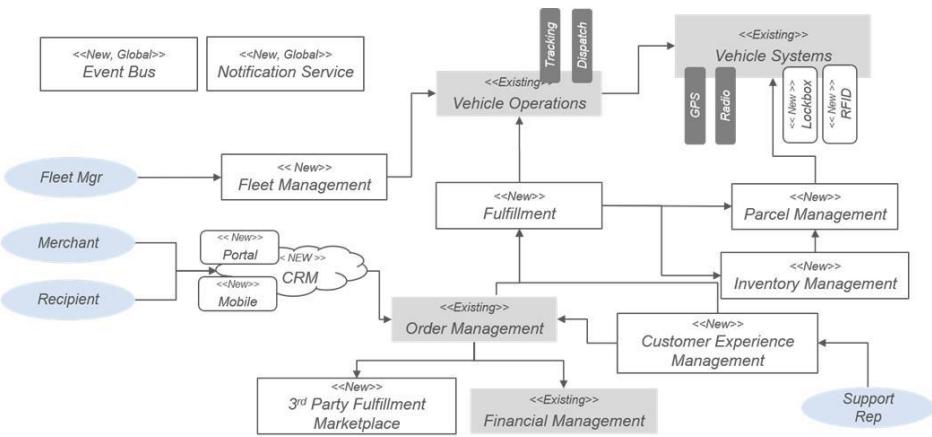


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Conceptual architecture diagram example

This shows system elements and communication paths between them.



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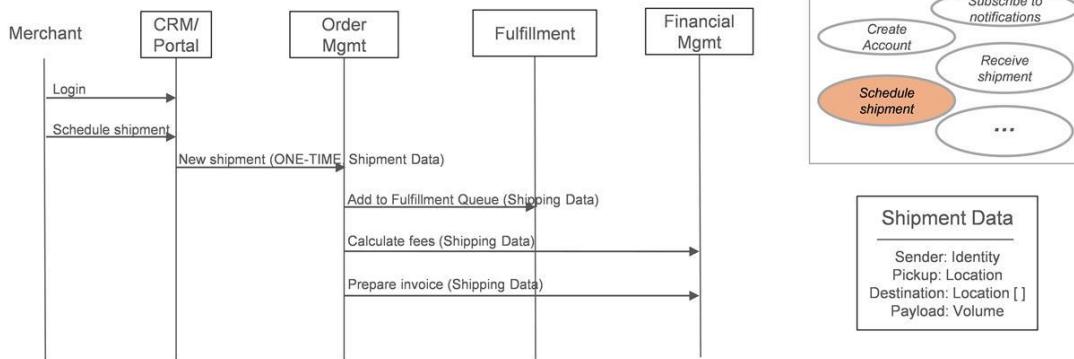
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4.2 Contribute to Solution Intent

Sequence diagram example

This models the flow of logic within the system.

Sequence diagram showing how to schedule a shipment

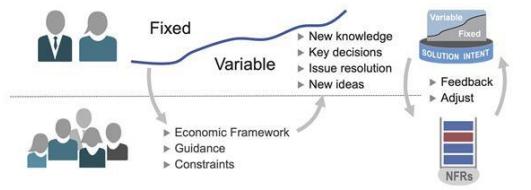


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Collaborate to create Solution Intent

- ▶ Product and Solution Management, Solution Architects, and Systems Engineering are responsible for highest-level, system-wide decisions, including:
 - System decomposition
 - Interfaces
 - Traceability
 - Structure and organization
- ▶ Teams and Suppliers add context and detail

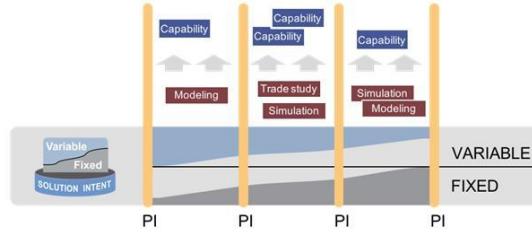


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Moving from variable to fixed Solution Intent

- ▶ Preserve flexibility to enable evolution towards optimum Solution
- ▶ Validate assumptions continuously through repetitive learning cycles (Program Increments)
- ▶ Drive exploration with Enablers
- ▶ Converge on well-defined (fixed) behaviors



Activity: Fixed versus variable architectural tradeoffs

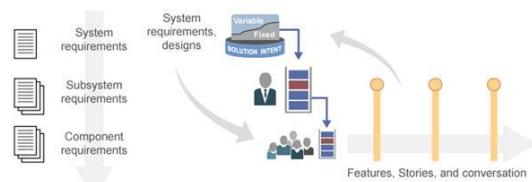


- ▶ **Step 1:** Pair with someone and explain a situation where you made an architectural decision too early that required significant rework later.
 - What caused you to make the decision early?
 - How could the rework have been avoided?
 - What made you realize you had made the decision prematurely?
- ▶ **Step 2:** After three minutes, swap and listen to your partner's story.

4.2 Contribute to Solution Intent

Architect for change

- ▶ Identify areas of external uncertainty
 - Driven by volatility in *Solution Context*
- ▶ Identify known areas for high-impact changes of approach
 - Driven by volatility in *Solution Intent*
- ▶ Invest in changeability for these areas
 - After you identify the need to change, you'll have the least time
 - Make those areas easy to change quickly

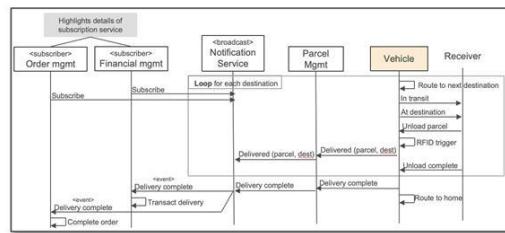
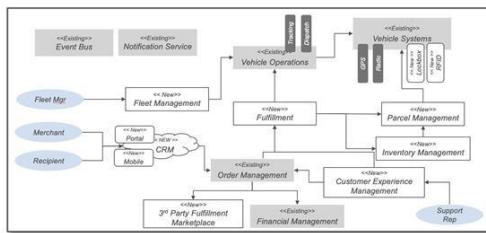


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When in doubt, model it out

- ▶ A picture is worth a thousand words
- ▶ Sketch for communication, alignment, and to create shared understanding
- ▶ Describes system context, structure, behavior, data, etc.



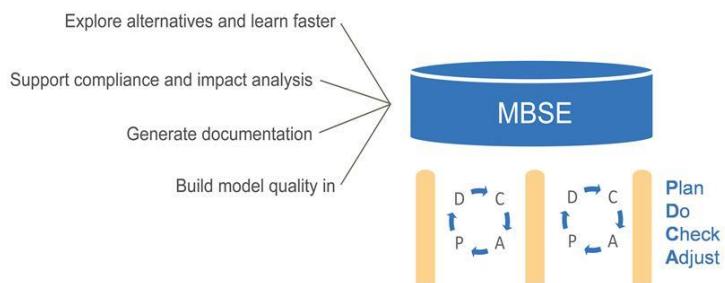
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4.2 Contribute to Solution Intent

Model-based systems engineering (MBSE)

- ▶ Using a set of related models, define, design, simulate, and document a system under development
- ▶ Accelerate learning before the cost of change gets too high



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Minimum sufficient documentation

- ▶ Favor models over documents
- ▶ Keep Solution Intent **collaborative**
- ▶ Preserve options by deferring decisions to local concerns and making decisions as late as **possible**
- ▶ Document items only in one place—a single source of truth
- ▶ Keep it high level as those details change less frequently

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Apply modern architectural and design patterns

- ▶ Eases communication by simplifying complex concepts
- ▶ Accelerates benefits by reusing proven implementation techniques



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Discussion: Contribute to Solution Intent



Step 1: Thinking about your own organizational context, discuss as a class how you currently capture and communicate Solution Intent. Consider:

- ▶ What type of information is collected?
- ▶ Where is the information stored and managed?
- ▶ Who creates the information and is it a collaborative process?
- ▶ Who has access to the information?
- ▶ How is the information kept current?

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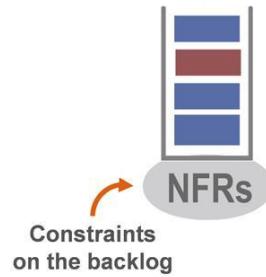
4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)

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Nonfunctional requirements constrain system designs

- ▶ NFRs ensure the system meets usability, security, and other qualities
- ▶ Persistent constraints on backlog items are typically through the item's definition of done or acceptance criteria
- ▶ Implementing an NFR requires new backlog items that evolve the system to new constraints



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4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)

NFRs are often referred to as “-ilities”

Accessibility	Efficiency	Reliability
Availability	Extensibility	Responsiveness
Compatibility	Failure Transparency	Robustness
Certification	Fault Tolerance	Safety
Compliance	Flexibility	Scalability
Configurability	Interoperability	Securability
Dependability	Maintainability	Supportability
Deployability	Operability	Testability
Documentation	Performance	Traceability
Disaster Recovery	Recoverability	Usability

Source: Wikipedia

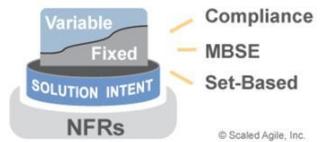
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Architecture evolves to support NFRs

By imposing constraints, NFRs often impact a wide range of system functionality. Therefore, they're an important factor to consider when:

- ▶ Analyzing business Epics, Capabilities, and Features
- ▶ Planning and building the Architectural Runway
- ▶ Refactoring to better reflect increasing Solution domain knowledge
- ▶ Imposing DevOps constraints on manufacturing, deployment, support, installation, maintainability, etc.



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4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)

			
Team Increment	System Increment	Solution Increment	Release
<ul style="list-style-type: none"> Stories satisfy acceptance criteria Acceptance tests passed (automated where practical) Unit and component tests coded, passed, and included in the BVT Cumulative unit tests passed Assets are under version control Engineering standards followed NFRs met No must-fix defects Stories accepted by Product Owner 	<ul style="list-style-type: none"> Stories completed by all teams in the ART and integrated Completed features meet acceptance criteria NFRs met No must-fix defects Verification and validation of key scenarios Included in build definition and deployment process Increment demonstrated, feedback achieved Accepted by Product Management 	<ul style="list-style-type: none"> Capabilities completed by all trains and acceptance criteria met Deployed/installed in the staging environment NFRs met System end-to-end integration, verification, and validation done No must-fix defects Included in build definition and deployment/transition process Documentation updated Solution demonstrated, feedback achieved Accepted by Solution Management 	<ul style="list-style-type: none"> All capabilities done and acceptance criteria met End-to-end integration and solution V&V done Regression testing done NFRs met No must-fix defects Release documentation complete All standards met Approved by Solution and Release Management

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Specifying NFRs

- ▶ Some NFRs must be implemented immediately (fixed).
 - All at once (e.g., change in regulatory requirement)
 - Incrementally (Story by Story):
 - As the result of selecting within variable Solution Intent
 - As part of shifting the Vision or Solution Intent
 - As part of discovering gaps in the Customer's expectations
- ▶ Trade-offs described in the economic framework impact the implementation approach. Implementation should occur in a way that will allow several learning cycles to determine the right level of NFR.

4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)

Defining NFRs

Like all requirements, NFRs must be quantified for clarity.



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NFR Example: Reliability.Delivery.Predictability

- ▶ **Name:** Reliability.Delivery.Predictability
- ▶ **Scale:** Minutes between expected vehicle arrival time and actual arrival
- ▶ **Meter:** Average observed results per delivery from monitoring



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4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)

 Activity: Define an NFR

Prepare 5 min Share 5 min

- ▶ **Step 1:** In your groups, write a nonfunctional requirement for the system you are responsible for at TTC
- ▶ **Step 2:** Be prepared to share it with the class

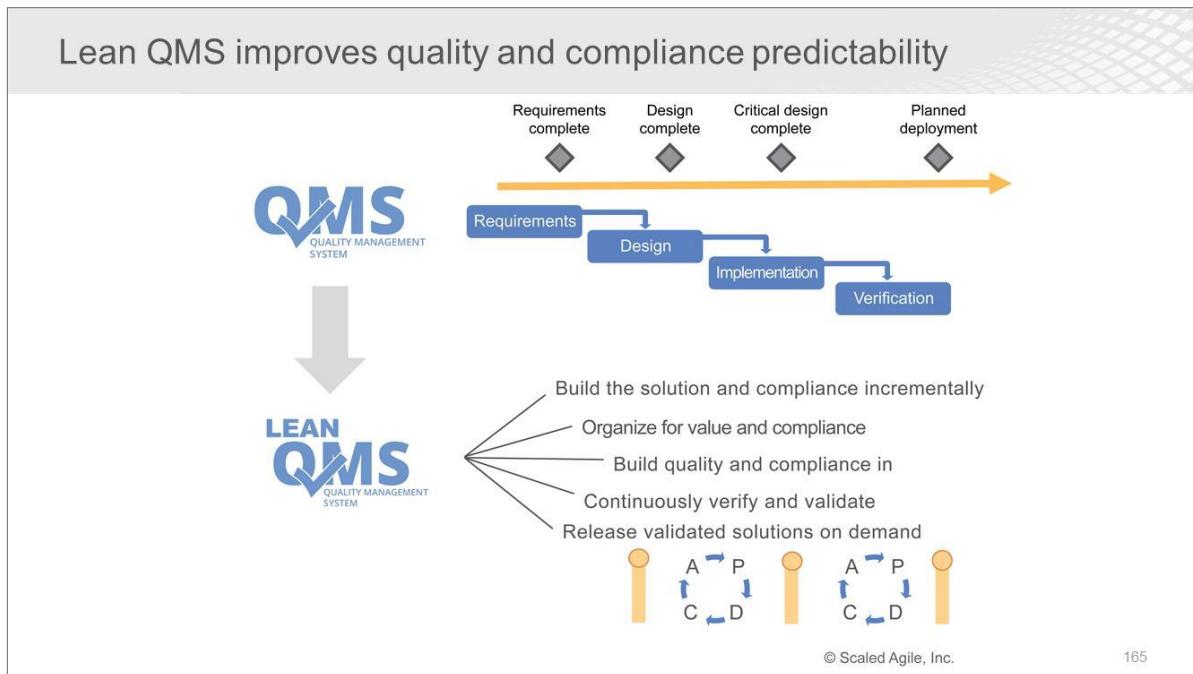
Step 1

- Name: In the form *Quality.SubQuality*
- Scale: What to measure (units)
- Meter: How to measure (method)

Step 2

- Target: Success level to achieve
- Constraint: Failure level to avoid
- Baseline: Current level

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4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)

The Lean quality management system

The Lean quality management system (QMS) is an approach or system for safeguarding high assurance in a high-risk, compliance-driven environment.

Lean QMS Practice	Brief Description
Build the Solutions and compliance incrementally	Building the Solution continuously allows compliance activities to also be performed continuously, avoiding the uncertainty and bow wave of work at the end
Organize for value and compliance	Those responsible for compliance are part of the Value Streams and ensure that the Solution Intent and backlogs adequately reflect their concerns
Build quality and compliance in	Compliance concerns are built directly into the development process through automated compliance tests and/or activities that are part of the teams' backlogs or definition of done (DoD)
Continuously verify and validate (V&V)	Make V&V part of regular flow by validating Capabilities as they are completed and regularly checking verification activities each PI
Release validated Solution on demand	Reduce the last sign-off activity from a significant, extended event to a quick, boring, non-event by building in quality and compliance

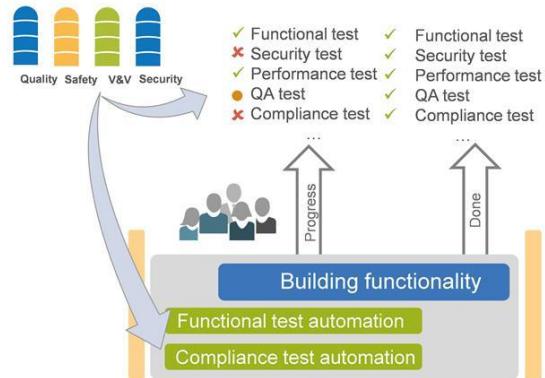
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Test automation builds quality and compliance in

Give teams automated scripts instead of checklists.

- ▶ Automate compliance and NFR tests along with functional tests
- ▶ Include tests for security, scalability, performance, compliance, etc.



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4.3 Manage quality with nonfunctional requirements (NFRs) and the Lean quality management system (QMS)



Discuss: The architect's role in the Lean QMS

Duration
 5 min

As a class, discuss:

- ▶ How does architecture help ensure compliance?
- ▶ What role do Architects play in meeting compliance goals?
- ▶ What can Architects do to accelerate delivery speed while maintaining or improving compliance?

Every requirement (including compliance) is a test, and every test should be automated.

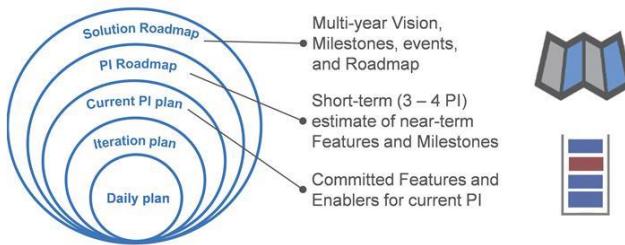
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4.4 Contribute to Roadmaps

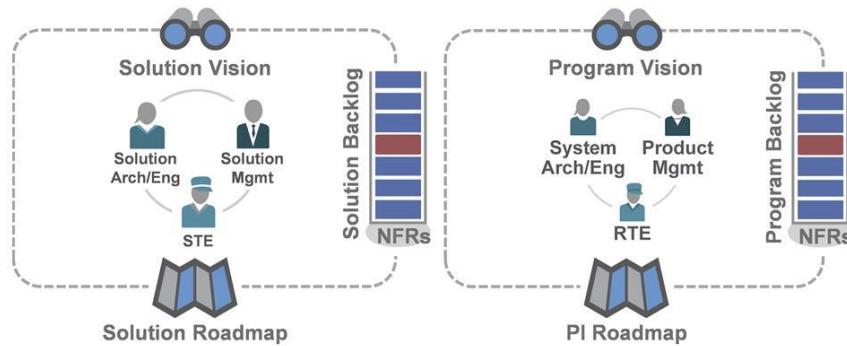
Plan at multiple levels

- ▶ Roadmaps define the path to achieve a Vision through a schedule of events and Milestones that communicate planned deliverables
- ▶ Outer levels are less defined, less committed; inner levels are more near-term, defining well-understood and committed Solution behavior



Collaborating to create Roadmaps

Tight coordination is required to keep Roadmaps aligned to business priorities, aligned to each other, and connected to the work.

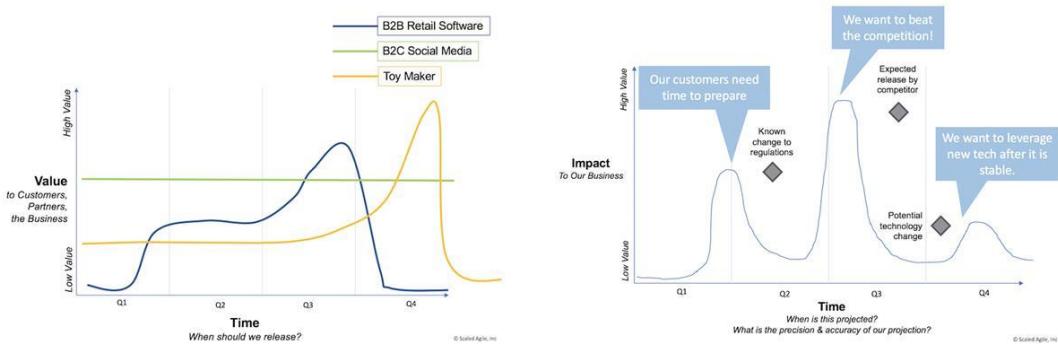


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Roadmaps are influenced by market behavior

- ▶ Market **rhythms** are cyclical and predictable
- ▶ Market **events** are ad hoc



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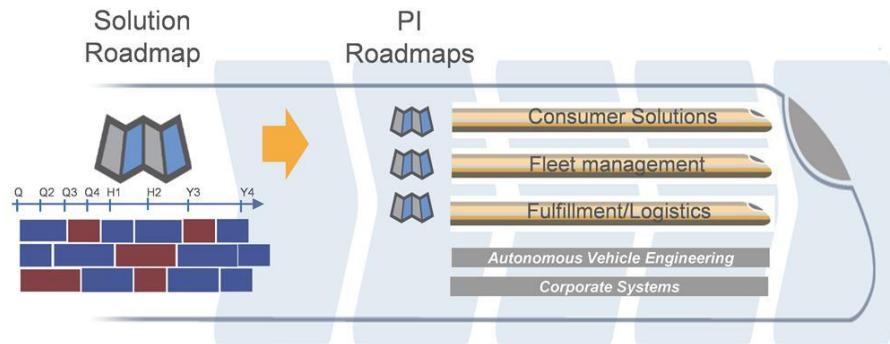
Discussion: Market rhythms and market events

Duration
3 min

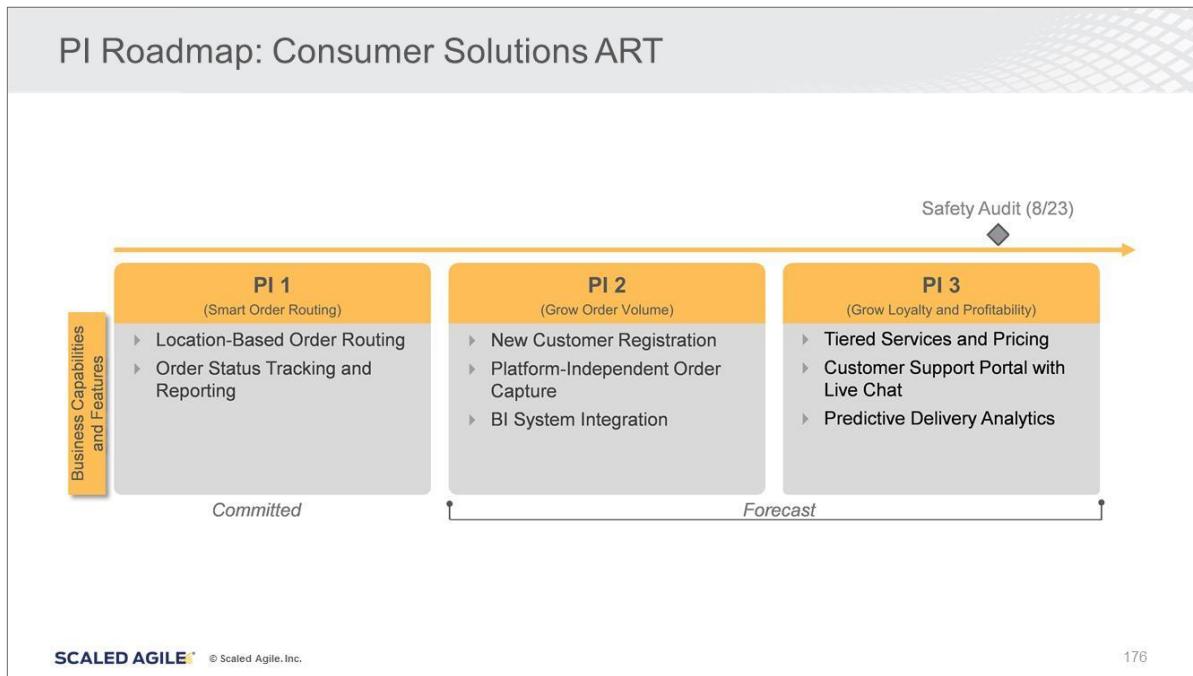
- ▶ Thinking of your own organizational context, call out some market rhythms or market events that drive your product's Roadmap.

A Solution Roadmap informs multiple PI Roadmaps

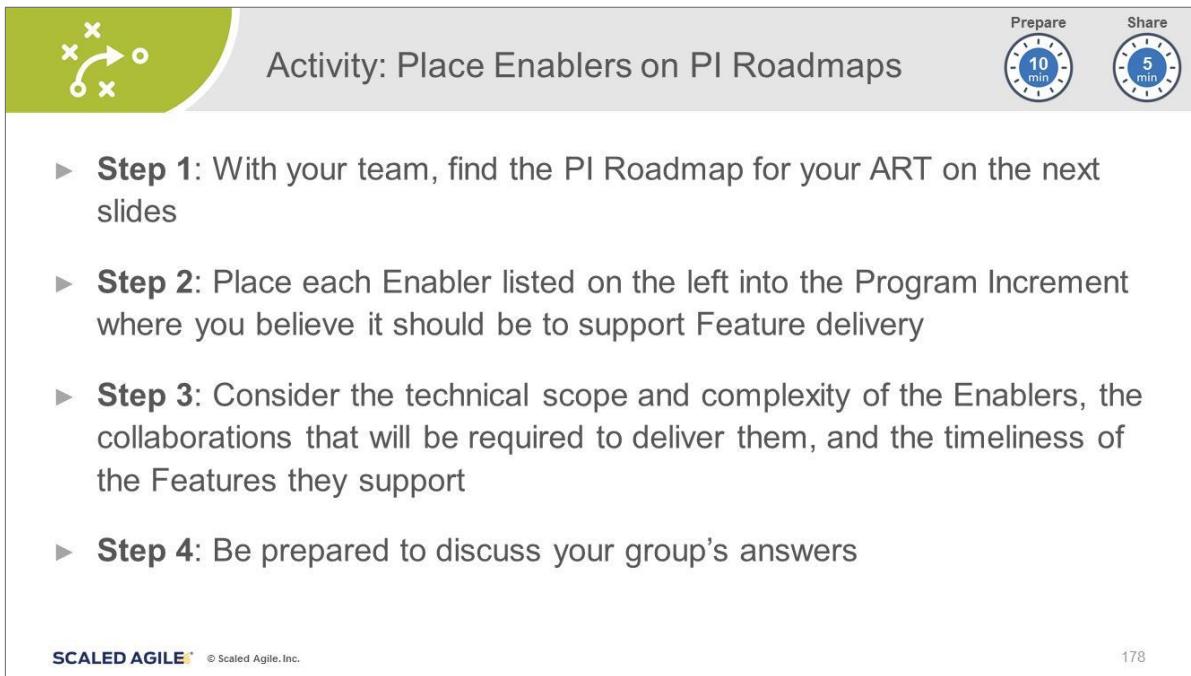
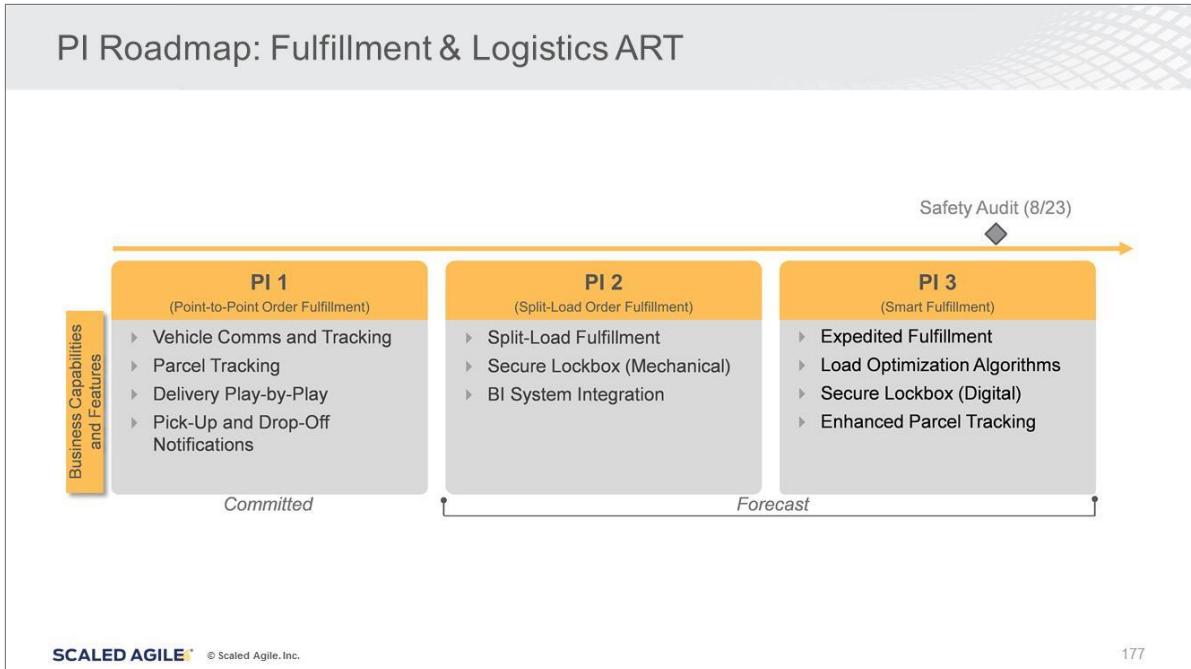
- ▶ A Solution Roadmap typically forecasts work over multiple years
- ▶ PI Roadmaps forecasts work over 3 – 4 PIs



4.4 Contribute to Roadmaps



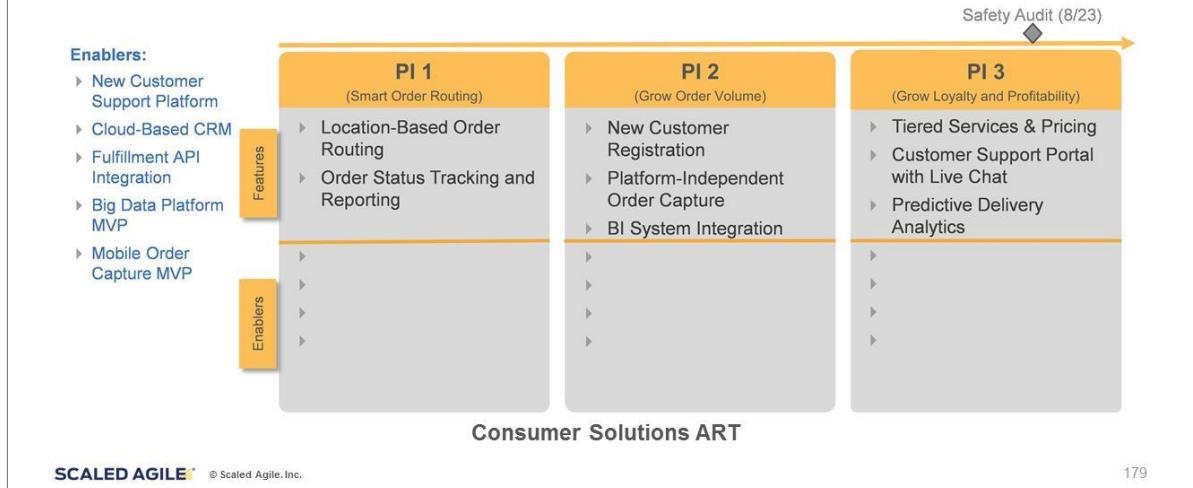
4.4 Contribute to Roadmaps



4.4 Contribute to Roadmaps

Activity: Place Enablers on PI Roadmaps

Place the Enablers in the appropriate PI to ensure timely Feature release.



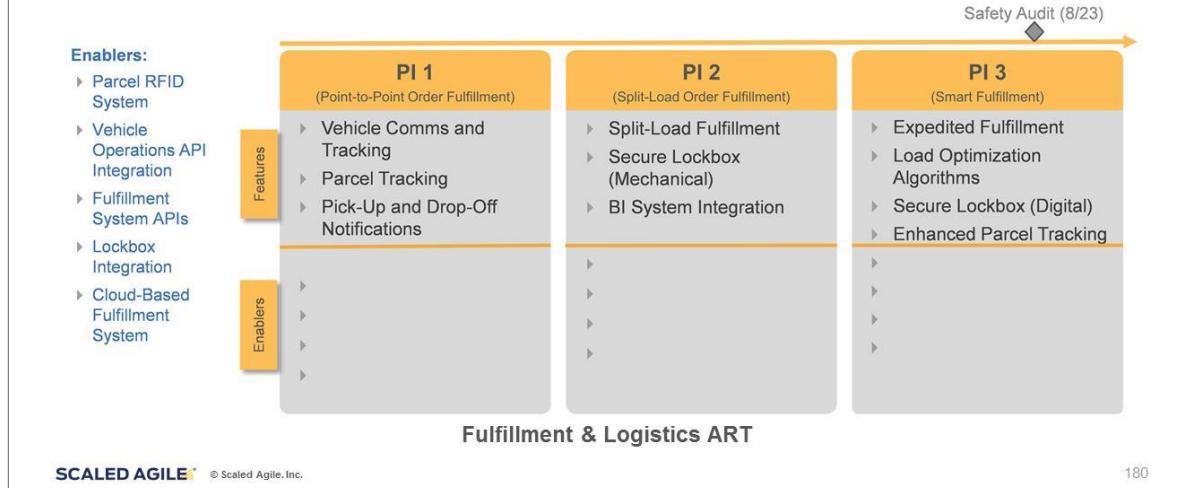
PI 1

PI 2

PI 3

Activity: Place Enablers on PI Roadmaps

Place the Enablers in the appropriate PI to ensure timely Feature release.



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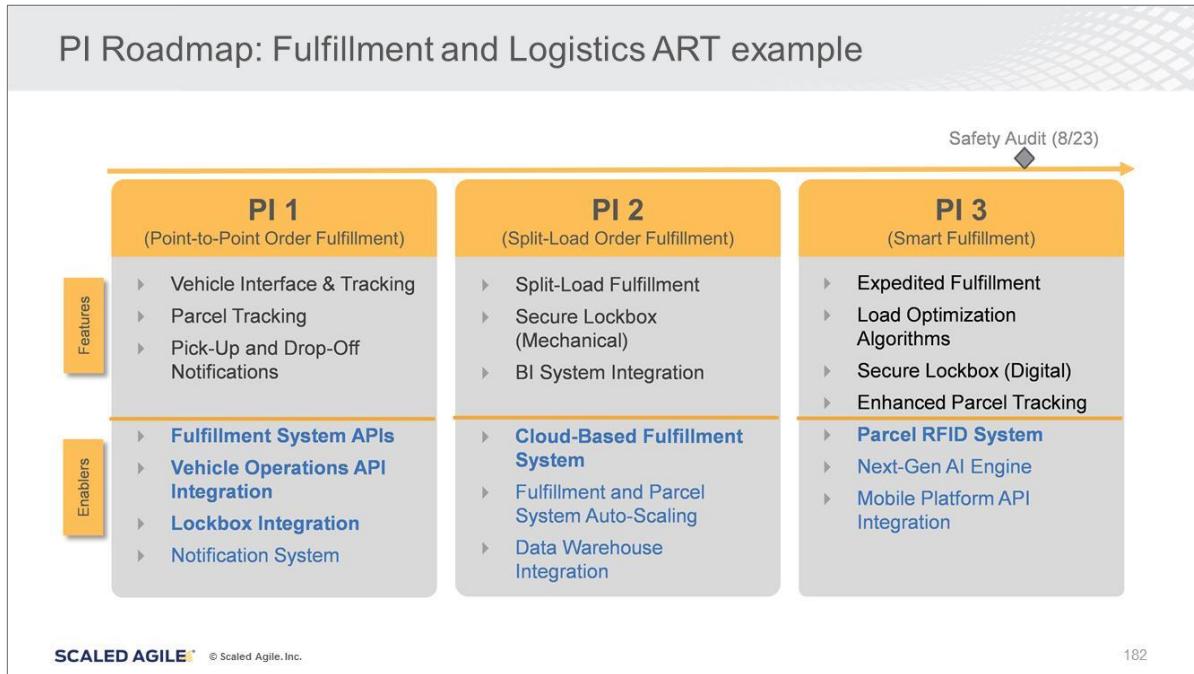
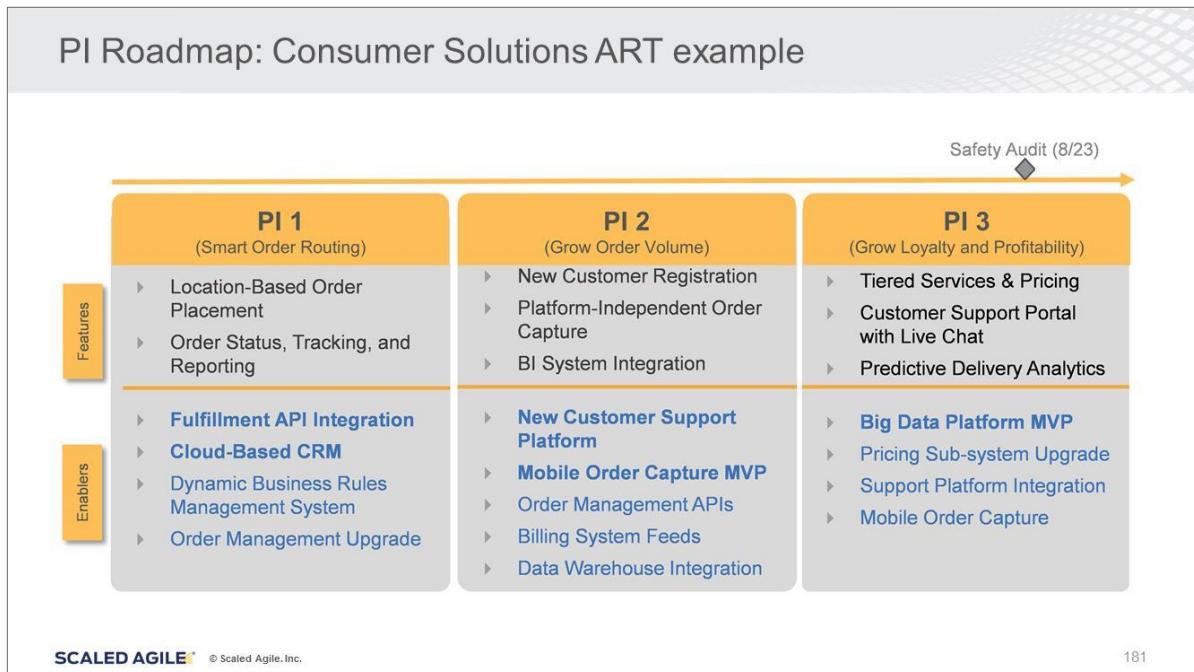
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PI 1

PI 2

PI 3

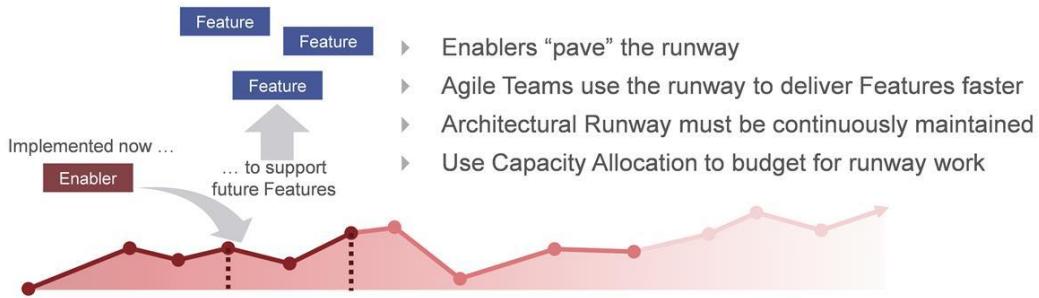
4.4 Contribute to Roadmaps



4.4 Contribute to Roadmaps

Roadmaps deliver Architectural Runway

- ▶ The Architectural Runway consists of *working components and infrastructure* that enable continuous delivery of business Features and functionality
- ▶ Example: A new API management system will enable Agile Teams to build Features with fewer code-level dependencies, less regression testing, and lower deployment risk

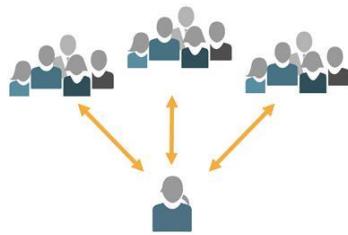


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Architectural Runway is a collaborative effort

- ▶ To keep pace with the business, substantial runway is often needed
- ▶ Decentralize the effort to ensure runway evolves as needed
- ▶ *Intentional architecture* - Specific guidelines produced by Architects that ensure the long-term performance and usability of Solutions
- ▶ *Emergent design* - Process by which Agile Teams extend and improve the architecture as needed to support Feature delivery
- ▶ A balance between intentional architecture and emergent design is required for speed of development and maintainability.



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Lesson review

In this lesson, you:

- ▶ Explored how Solution Vision, Strategic Themes, and Solution Context align
- ▶ Explored how Architects contribute to Solution Intent
- ▶ Discovered how to manage quality with NFRs and the Lean QMS
- ▶ Explored how Architects contribute to Roadmaps



Action Plan: Developing Solution Vision, Solution Intent, and Roadmaps



On the Action Plan page in your workbook, answer the following questions:

- ▶ What is the Solution Context of the Solution you are developing?
- ▶ What is your Solution Vision and how does it align to your organization's Strategic Themes and Solution Context?
- ▶ How does your organization capture Solution Intent? List any ideas as to how your Solution Intent can be improved.
- ▶ What are some ways you could automate quality and compliance in your organization?
- ▶ How do you contribute to PI and/or Solution Roadmaps?





Lesson 4: Developing Solution Vision, Solution Intent, and Roadmaps



What is the Solution Context of the Solution you are developing?

What is your Solution Vision and how does it align to your organization's Strategic Themes and Solution Context?

How does your organization capture Solution Intent? List any ideas as to how your Solution Intent can be improved.

What are some ways you could automate quality and compliance in your organization?

How do you contribute to PI and/or Solution Roadmaps?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

4.4 Contribute to Roadmaps

Lesson 5

Preparing Architecture for PI Planning

Learning Objectives:

- 5.1 Contribute to the Program Backlog
- 5.2 Sequence and prioritize work in the Program Backlog
- 5.3 Contribute to Solution pre-PI Planning



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

SAFe® for Architects

Lesson 5: Preparing Architecture for PI Planning



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Learning objectives

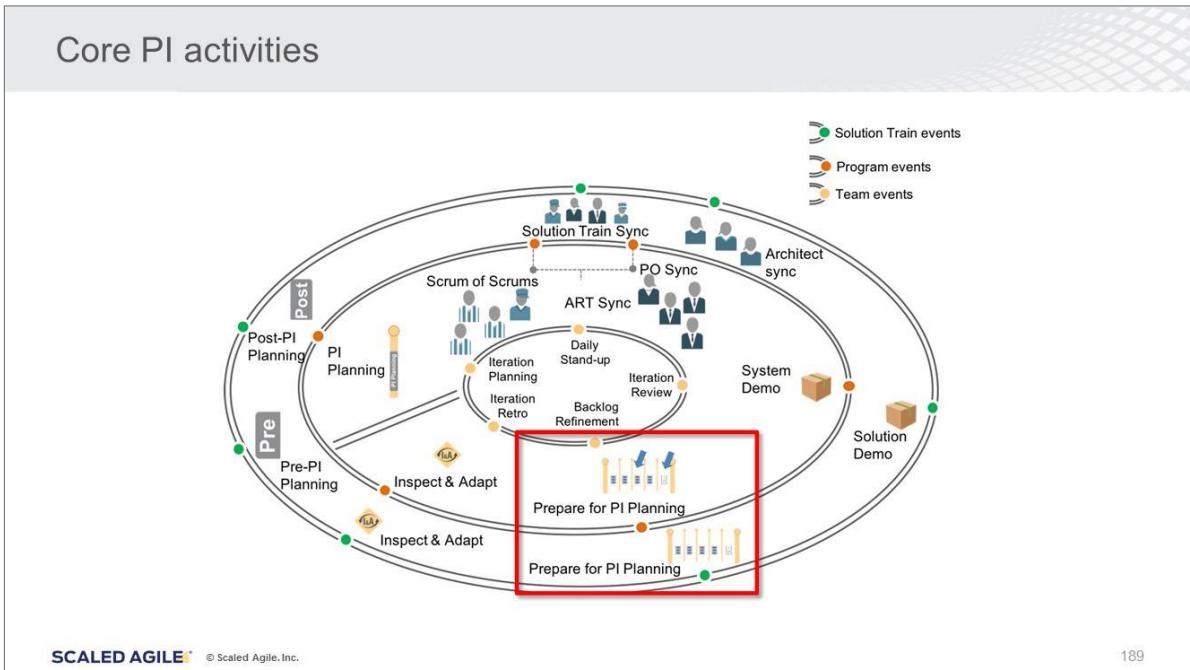
At the end of this lesson you should be able to:

- ▶ 5.1 Contribute to the Program Backlog
- ▶ 5.2 Sequence and prioritize work in the Program Backlog
- ▶ 5.3 Contribute to Solution pre-PI Planning

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Core PI activities





Video: What is Program Increment (PI) Planning?

Duration
2 min

- ▶ Cadence-based PI Planning is the heartbeat of the Lean Enterprise
- ▶ Two days every 8 – 12 weeks (10 weeks is typical)
- ▶ Everyone attends (in person if at all possible)
- ▶ Product Management owns Feature priorities
- ▶ Agile Teams own Story planning and high-level estimates
- ▶ Architect/Engineering and UX work as intermediaries for governance, interfaces, and dependencies



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Video link: <https://youtu.be/ZZAtI7nAB1M>

PI Planning readiness during Innovation and Planning Iteration

Innovation and Planning (IP) Iteration timeline



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5.1 Contribute to the Program Backlog

5.1 Contribute to the Program Backlog

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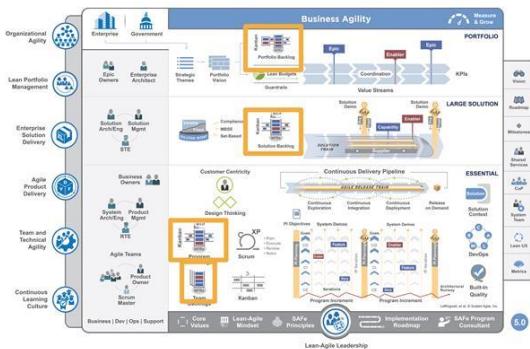
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What's in a backlog?

There is a backlog at each level of SAFe.

- ▶ Portfolio backlogs contain Epics and Enablers
- ▶ Large Solution Backlogs contain Capabilities and Enablers
- ▶ Program Backlogs contain Features and Enablers
- ▶ Team Backlogs contain Stories and Enablers

The items in these backlogs result from research activities and active collaboration with various stakeholders—Customers, Business Owners, Product Management, Product Owners, System and Solution Architects/Engineering, and more.



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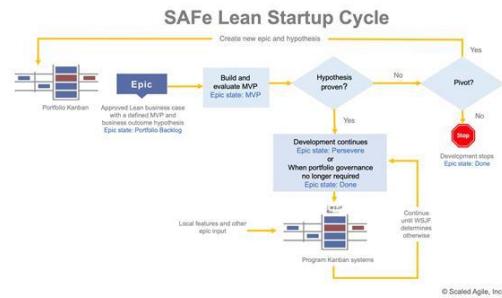
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5.1 Contribute to the Program Backlog

What are Epics?

An **Epic** is a container for a Solution development initiative large enough to require analysis, the definition of a minimum viable product (MVP), and financial approval before implementation.

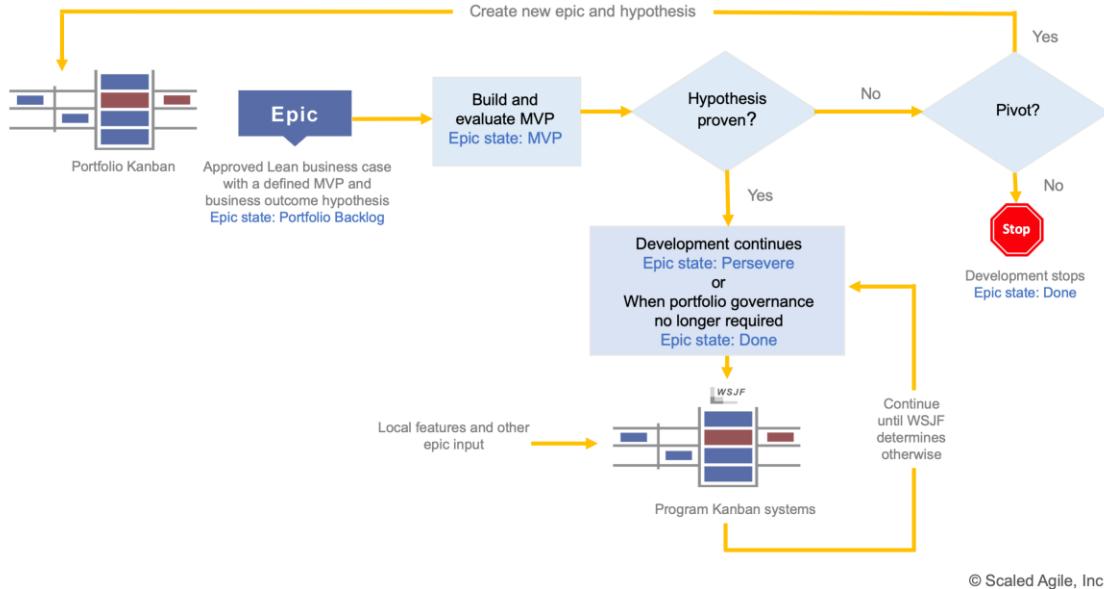
Implementation occurs over multiple Program Increments (PIs) and follows the Lean startup ‘build-measure-learn’ cycle.



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SAFe Lean Startup Cycle



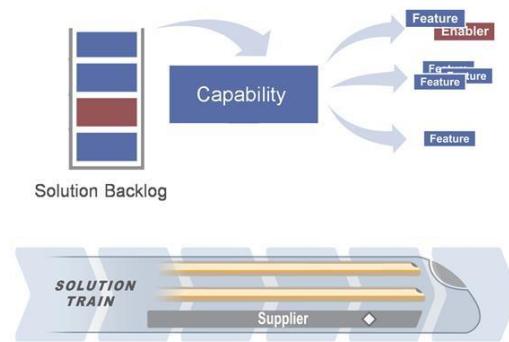
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5.1 Contribute to the Program Backlog

What are Capabilities?

A Capability is a higher-level Solution behavior that typically spans multiple ARTs.

- Maintained in the Solution Backlog, which is overseen by Solution Management
- Prioritized using weighted shortest job first (WSJF)
- Written to include a benefit hypothesis and acceptance criteria
- Structured to fit within a single PI
- Split into Features for implementation



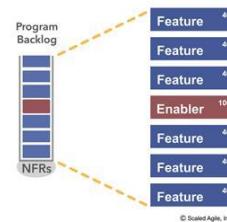
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What are Features?

A Feature is a service that fulfills a stakeholder need.

- A Feature includes a benefit hypothesis and acceptance criteria.
- Features are sized or split as necessary to be delivered by a single ART in a PI
- Product Management is responsible for business Features in the Program Backlog
- System Architects often own Enabler Features



Feature	Benefit Hypothesis
In-service software update	Significantly reduced planned downtime
Hardware VPN acceleration	High-performance encryption for secure WAN
Traffic congestion management	Improve overall quality of service across different protocols
Route optimization	Improve quality of service due to faster and more reliable connectivity

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Architects contribute to Features and Capabilities

Architects often contribute by:

- ▶ Identifying measurable benefits and Metrics
- ▶ Gauging architectural impact
- ▶ Determining acceptance criteria
- ▶ Defining non-functional requirements (NFRs)
- ▶ Participating in backlog prioritization

Feature: In-service software update

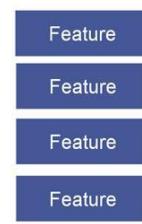
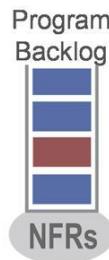
Acceptance Criteria:

- Nonstop routing availability
- Automatic and manual update support
- Rollback capability
- Support through existing admin tools
- All enabled services are running after the update

What are Enablers?

Enablers support the activities needed to extend the Architectural Runway to provide future business functionality.

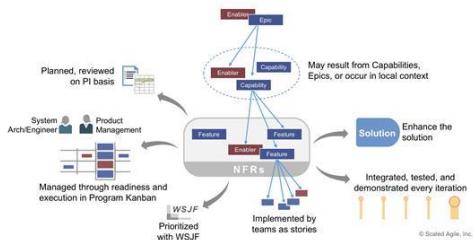
- ▶ Captured in backlogs at all levels of the Framework (as Enabler Epics, Enabler Capabilities, Enabler Features, and Enabler Stories)
- ▶ Created and managed by System Architect/Engineering
- ▶ Are managed in backlogs and are subject to:
 - Estimating
 - Visibility and tracking
 - Work in process (WIP) limits
 - Feedback
 - Presentation of results



Types of Enablers

Enablers come in different forms and exist at all levels in SAFe.

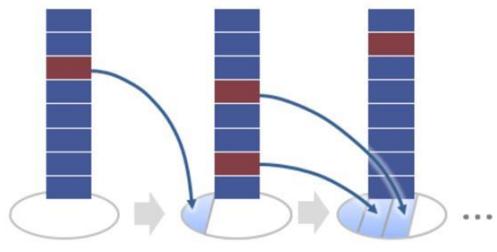
- ▶ **Infrastructure** - Build, enhance, and automate development, testing, and deployment environments
- ▶ **Exploration** - Research, prototyping, evaluating Solution alternatives
- ▶ **Architecture** - Build the Architectural Runway, proof-of-concept
- ▶ **Compliance** - Schedule and manage specific compliance events or activities



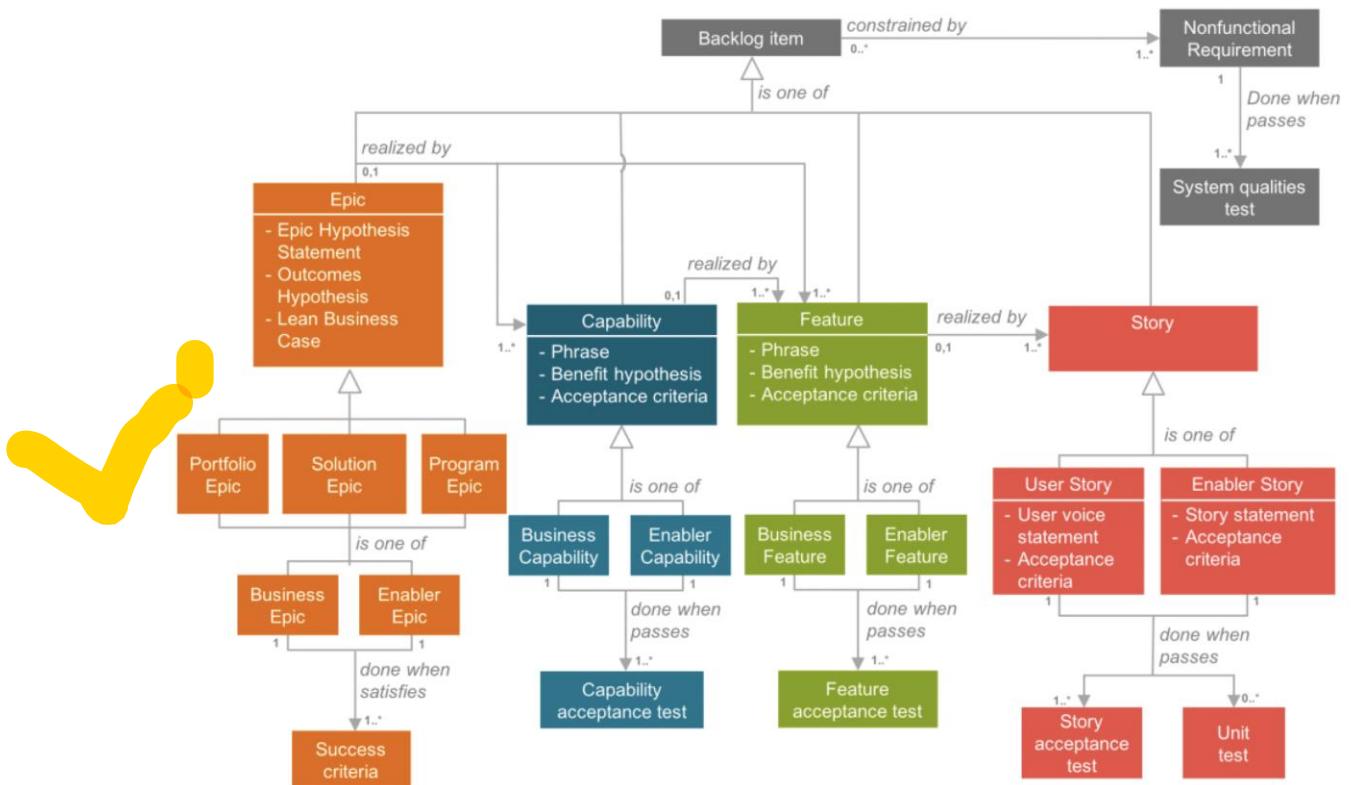
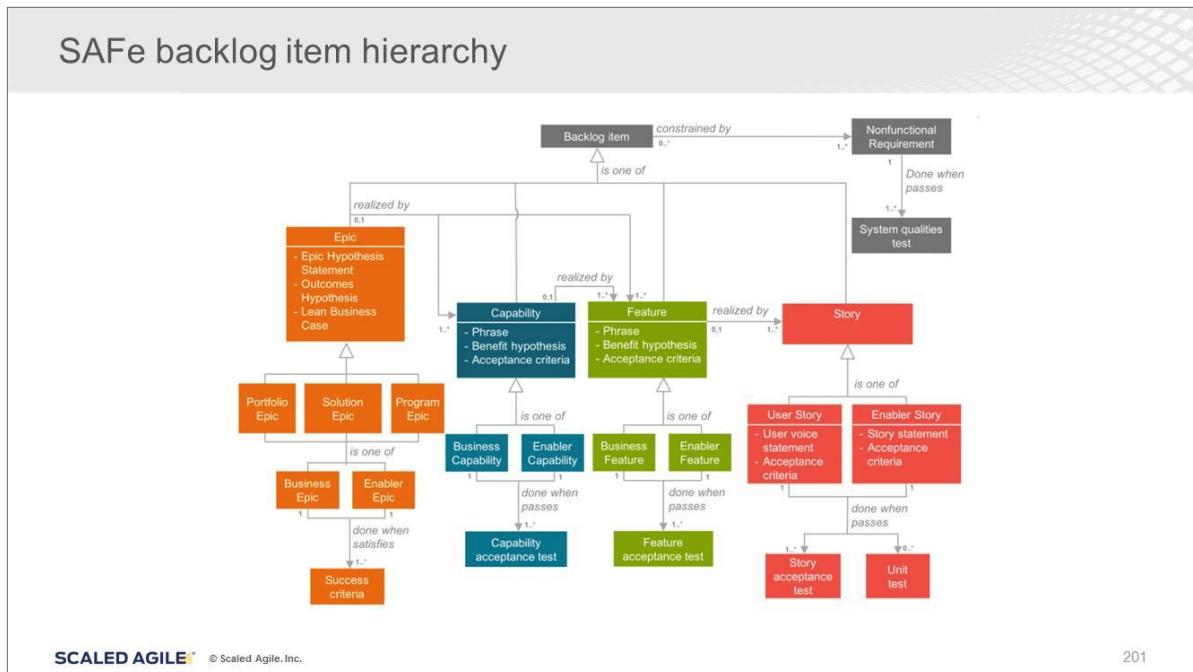
NFRs can begin as Enablers

NFRs are often initially realized by Enablers then constrain all future work in the backlog.

Many Enablers fix existing problems with the Solution (such as performance, scalability and reliability issues).



5.1 Contribute to the Program Backlog



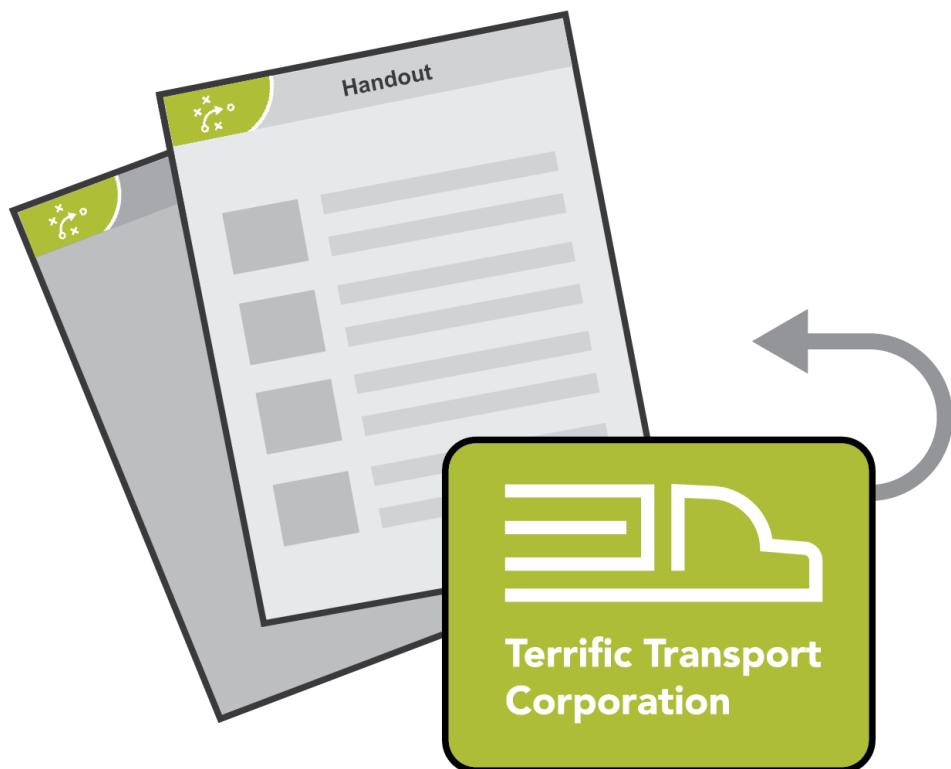


Activity: Define an Enabler Feature

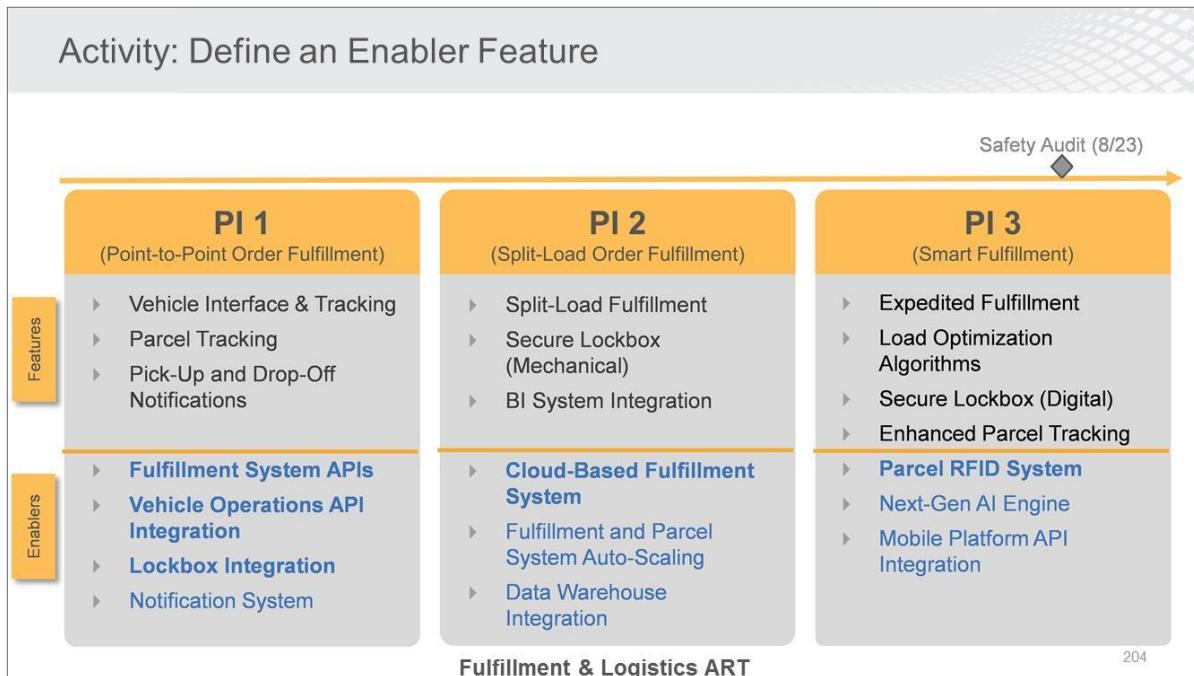
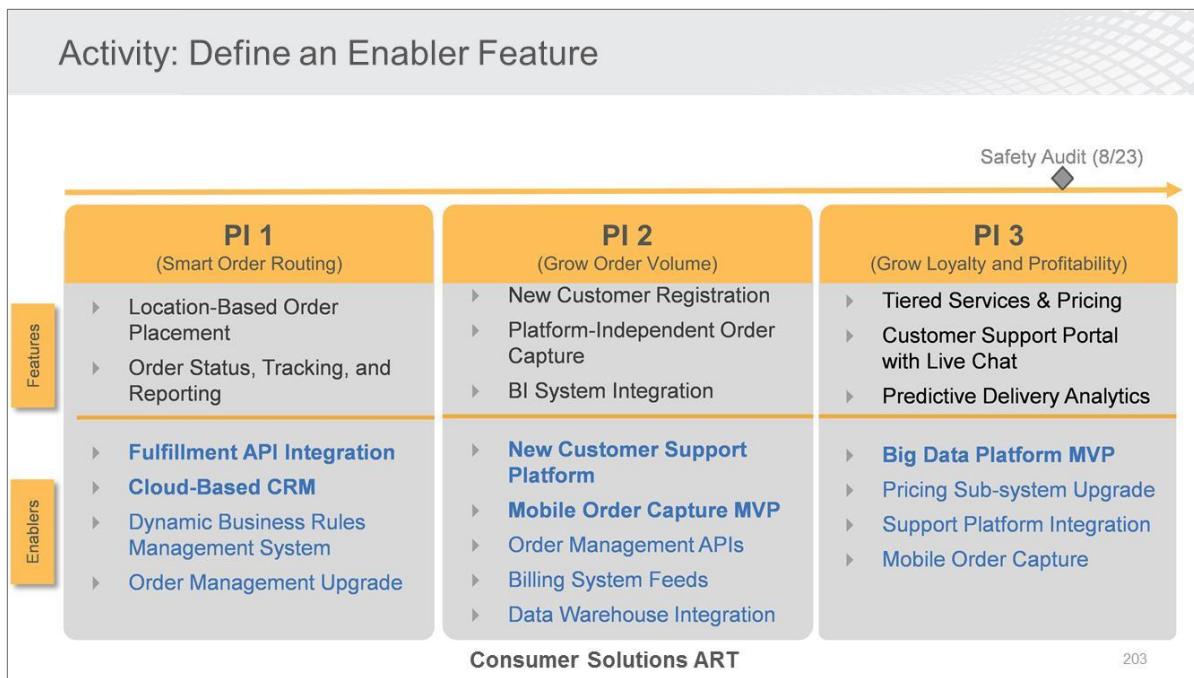
Prepare
5 min

Share
5 min

- ▶ **Step 1:** With your team, define the Enabler Feature listed below using the Enabler worksheet
 - Consumer Solutions ART: **Fulfillment API Integration**
 - Fulfillment & Logistics ART: **Vehicle Operations API Integration**
- ▶ **Step 2:** The reference Roadmaps and worksheet are provided on the next slides



5.1 Contribute to the Program Backlog



5.1 Contribute to the Program Backlog

Activity: Define an Enabler Feature

Enabler Feature name A short phrase providing name and context	
Enabler description Briefly describe the Enabler	
Benefit hypothesis Proposed measurable benefit to the end-user or business	
Acceptance criteria Determines whether the implementation is correct and delivers the proposed business benefits	

Enabler Worksheet

5.2 Sequence and prioritize work in the Program Backlog

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Sequence Features with weighted shortest job first

- ▶ Give preference to jobs with *shorter duration* and *higher cost of delay (CoD)*
- ▶ Use weighted shortest job first to prioritize and sequence Enablers
- ▶ WSJF embodies these principles:
 - Take an economic view
 - Ignore sunk costs
 - Make financial choices continuously
 - Use decision rules to decentralize decision-making and control

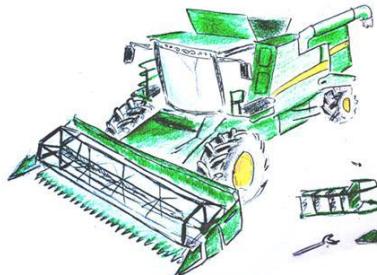
$$\text{WSJF} = \frac{\text{Cost of Delay}}{\text{Job Duration (Job size)}}$$

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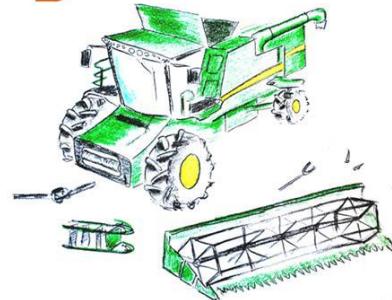
207

WSJF example with equal CoD: Which job first?

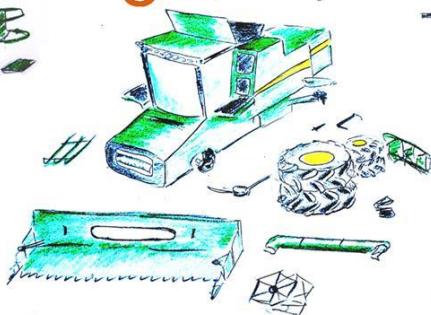
A \$\$, 1 day



B \$\$, 3 days



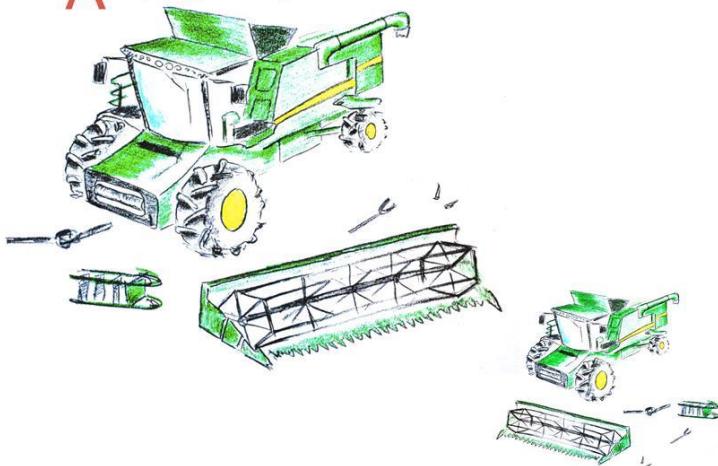
C \$\$, 10 days



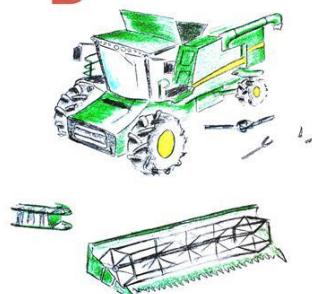
208

WSJF example with equal duration: Which job first?

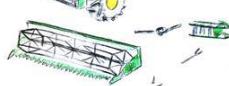
A \$\$\$, 3 days



B \$\$, 3 days



C \$, 3 days



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Calculate WSJF with relative estimating

- ▶ In order to calculate WSJF, teams need to estimate cost of delay and duration
- ▶ For duration, use job size as a quick proxy for duration
- ▶ Relative estimating is a quick technique to estimate job size and relative value
- ▶ WSJF stakeholders: Business Owners, Product Managers, Product Owners, and Architects

$$\text{WSJF} = \frac{\text{User - Business Value} + \text{Time Criticality} + \text{Risk Reduction and/or Opportunity Enablement}}{\text{Job Size}}$$

Additional cost of delay considerations

User and business value	Increased customer satisfaction Increased end-user productivity Increased revenue Reduced costs
Time criticality	Driven by market events and rhythms Driven by regulatory or other critical deadlines
Risk reduction and opportunity enablement (RR & OE)	Improved security and/or compliance New market penetration New revenue stream development Competition for contracts



Activity: Prioritize Features using WSJF



- ▶ **Step 1:** With your team, choose one business Feature and two Enabler Features from your ART's PI Roadmap (refer to slides 202 and 203)
- ▶ **Step 2:** Conduct a weighted shortest job first analysis of the three items using the matrix on the next slide

5.2 Sequence and prioritize work in the Program Backlog

WSJF prioritization worksheet

Feature	User-business value	Time criticality	RR OE value	CoD	Job size	WSJF
	+	+	=	+	=	
	+	+	=	+	=	
	+	+	=	+	=	

- ▶ Use modified Fibonacci numbers (1, 2, 3, 5, 8, 13, 20) for each component of cost of delay and job size.
- ▶ Complete one **column** at a time.
- ▶ Start by picking the smallest item and giving it a “1,” then size the others relative to that one.
- ▶ There must be at least one “1” in each column.
- ▶ Calculate WSJF for each Feature. The higher the WSJF value, the higher the priority.

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Feature	User- business value	Time criticality	RR OE value	CoD	Job size	WSJF
	+	+	=	+	=	
	+	+	=	+	=	
	+	+	=	+	=	

 Discussion: Duration vs job size 

As a class, discuss:

- ▶ Is job size always a good proxy for duration?
- ▶ When might that **not** be the case?
- ▶ How would you adjust if necessary?

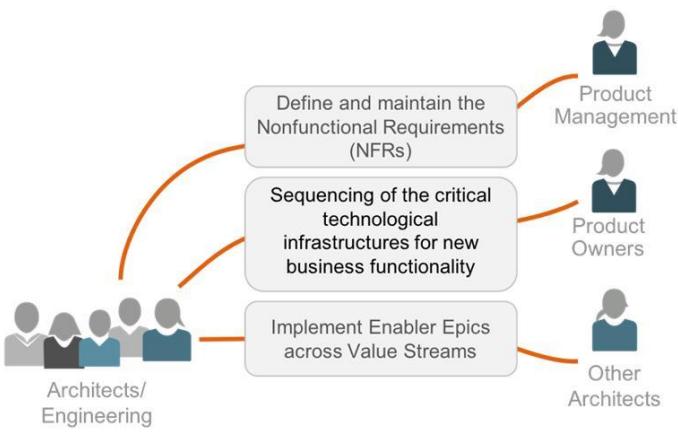
$$WSJF = \frac{CoD}{Duration} = ? \neq \frac{CoD}{Job\ size}$$

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Ensure all concerns are reflected in backlog formulation

Architects/Engineering work with Product Management, Product Owners, and other Architects.



The diagram illustrates the collaborative process for backlog formulation. On the left, a group of people labeled "Architects/Engineering" is shown. Three orange arrows point from this group to three separate boxes representing different stakeholders:

- A box labeled "Define and maintain the Nonfunctional Requirements (NFRs)" is connected to "Product Management".
- A box labeled "Sequencing of the critical technological infrastructures for new business functionality" is connected to "Product Owners".
- A box labeled "Implement Enabler Epics across Value Streams" is connected to "Other Architects".

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5.2 Sequence and prioritize work in the Program Backlog

Lack of trust can lead to poor architecture investment

The diagram shows two separate teams: Product and Solution Management and System and Solution Architect/Engineering. Product and Solution Management has a backlog of 'Feature' items. System and Solution Architect/Engineering has a backlog of 'Enabler' items. A central 'Program or Solution Backlog' contains both 'NFRs' (Non-Functional Requirements) and a mix of 'Feature' and 'Enabler' items. Question marks above each team indicate a lack of alignment or trust.

Our focus is on the capabilities and features that our customers need

Our focus is on robust technology solutions that meet near and long-term goals

?

Feature
Feature
Feature
Feature

Product and Solution Management

Program or Solution Backlog
NFRs

?

Enabler
Enabler
Enabler
Enabler

System and Solution Architect/Engineering

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Capacity allocation helps balance priorities

- ▶ Create balance between immediate and long-term value delivery
- ▶ Continuously invest in the Architectural Runway
- ▶ Provide time for exploration of requirements and design for future PIs

The diagram shows the 'Capacity Allocation for this PI'. A pie chart is divided into three segments: New Features (blue), Enablers (brown), and Tech Debt and Maintenance (purple). Arrows point from the labels 'System and Solution Architect/Engineer (Design Authority)' and 'Product and Solution Management (Content Authority)' to the 'Program Backlog' column in the center, which contains several colored boxes representing these categories.

Capacity Allocation for this PI

System and Solution Architect/Engineer (Design Authority)

Product and Solution Management (Content Authority)

Program Backlog

New Features
Enablers
Tech Debt and Maintenance

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Capacity allocation

As the System Architect for your ART, you need new infrastructure implemented this PI to support a Feature in an upcoming PI.

You also have concerns that the infrastructure, if not architected properly, will not meet the performance requirements of the Solution.

However, your ART's Product Manager has committed a significant amount of functionality to the business for this PI without considering the capacity required to deliver the infrastructure work.



Discussion: Negotiating business and technical priorities

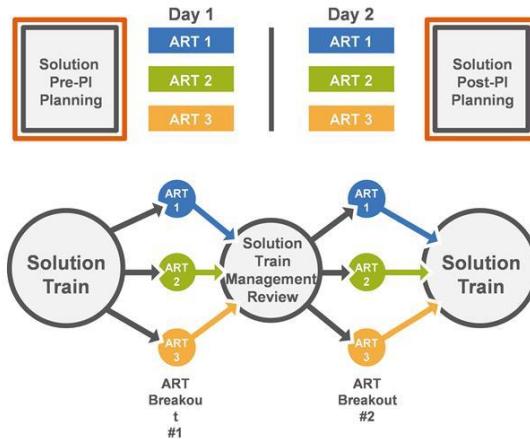


- ▶ **Step 1:** In your teams, discuss the following:
 - What conversations would you have with the Product Manager?
 - How would you leverage WSJF in this situation?
 - What else might you do to ensure the ART has balanced its commitments well across the backlog?
- ▶ **Step 2:** Be prepared to share with the class

5.3 Contribute to Solution pre-PI Planning

Prepare with Solution pre- and post-PI Planning meetings

- ▶ **Pre-meeting** helps build an aligned plan for the next PI and match Solution demand to ART capacities
- ▶ **Post-meeting** reviews, recaps, communicates, and provides feedback
- ▶ Typically attended by:
 - Customers
 - STE
 - Solution Architects/Engineers
 - Solution Train stakeholders
 - Select ART representatives
 - Solution Management
 - Supplier



5.3 Contribute to Solution pre-PI Planning

Solution Train pre-PI Planning during IP iteration

Innovation and Planning (IP) Iteration timeline



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Solution pre-PI Planning agenda

Goals:

Align Product Managers, System Architects, and other ART stakeholders to a common Vision

Prepare content for ART PI Planning

Input:

Results of the previous PI execution

Outcomes of the Solution Demo or, if delayed, ART demos

Roll-up of the program predictability measure to the Solution Train

Output:

Output:
A set of Features for every ART

Updates to the ART Visions



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Activity: Solution pre-PI Planning

Prepare
10 min

Share
15 min

- ▶ **Step 1:** With your team, pair with another team on a *different* ART and draft a Solution architecture Vision briefing for the pre-PI Planning session for PI 1. When developing the briefing, make sure to consider the following:
 - The Architectural Runway needed to realize the Solution Vision
 - The Enablers needed to deliver the necessary runway in this PI
 - The dependencies that must be managed across the ARTs and Suppliers
 - How the Solution Context and NFRs impact the architecture Vision
- ▶ **Step 2:** Deliver the briefing to the class.

5.3 Contribute to Solution pre-PI Planning

Lesson review

In this lesson, you:

- ▶ Explored contributing to the Program Backlog
- ▶ Discovered how to sequence and prioritize work in the Program Backlog
- ▶ Reviewed how Architects contribute to Solution pre-PI Planning



Action Plan: Preparing architecture for Program Increment Planning



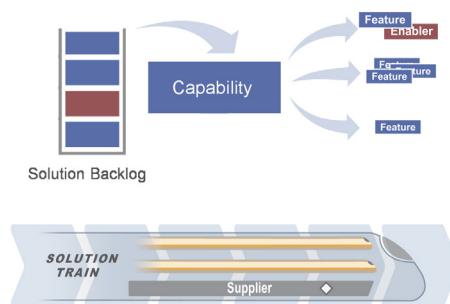
On the Action Plan page in your workbook, answer the following questions:

- ▶ Is architecture work represented in your Program (and/or Solution) Backlog?
- ▶ What steps could you take (or start taking) to ensure that architecture work gets prioritized and brought into backlogs?
- ▶ (If you have a Solution Train) How are you engaged with Architects and teams during Solution pre-PI planning?





Lesson 5: Preparing Architecture for PI Planning



Is architecture work represented in your Program (and/or Solution) Backlog?

What steps could you take (or start taking) to ensure that architecture work gets prioritized and brought into backlogs?

How does your organization capture Solution Intent? List any ideas as to how your Solution Intent can be improved.

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

Lesson 6

Coordinating Architecture throughout PI Planning

Learning Objectives:

- 6.1 Contribute to PI Planning
- 6.2 Contribute to management review and problem-solving
- 6.3 Contribute to Solution post-PI Planning



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

SAFe® for Architects

Lesson 6: Coordinating Architecture throughout PI Planning



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

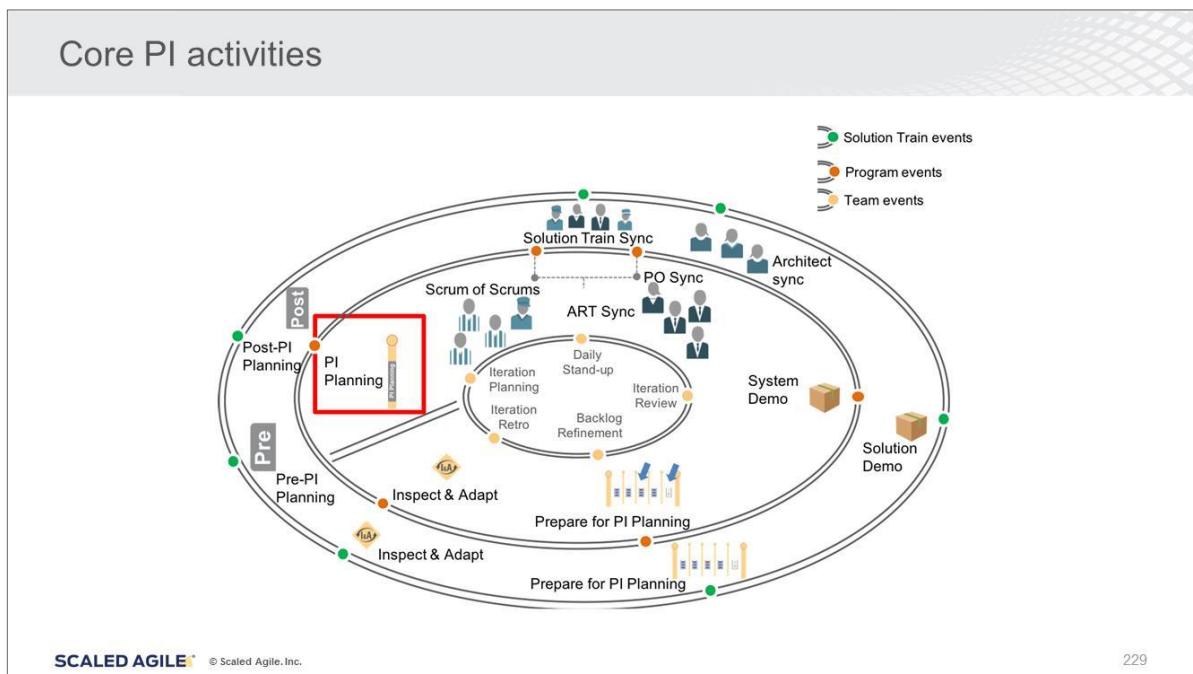
At the end of this lesson you should be able to:

- ▶ 6.1 Contribute to PI Planning
- ▶ 6.2 Contribute to management review and problem-solving
- ▶ 6.3 Contribute to Solution post-PI Planning

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Core PI activities



PI Planning timing

PI Planning typically falls within the Innovation and Planning (IP) Iteration.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
			Buffer for leftover work			
			Final verification and validation, and documentation (if releasing)			
			Innovation			
			PI planning readiness			
8	9	10	11	12	13	14
	Solution Train Pre-PI planning	Continuing education	PI planning Day 1	PI planning Day 2	Optional time for distributed planning	
	Innovation continues	Inspect and adapt workshop			Solution Train Post-PI planning	
	PI planning readiness					

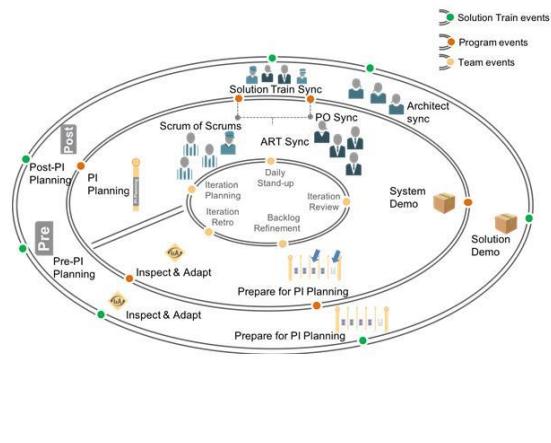
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The role of the Architect in PI Planning

During PI Planning, System Architects typically:

- ▶ Present the architecture Vision
- ▶ Elaborate on NFRs and desired implementation patterns and practices
- ▶ Ensure consistency and alignment of the implementation approach in team breakouts
- ▶ Support ROAM activity by identifying and/or owning program risks



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PI Planning agenda

PI Planning is usually a two-day event, with everyone on the ART meeting in person to plan the next Program Increment.



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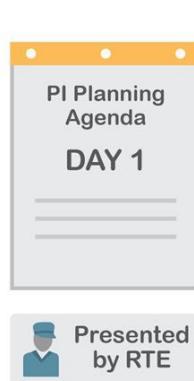
6.1 Contribute to PI Planning

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PI Planning Day 1 details

Architects play a role in all of the Day 1 events.



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6.1 Contribute to PI Planning



Activity: Prepare the architecture briefing

Prepare
15 min

Share
10 min

- ▶ **Step 1:** Work with your group to define several key points you would discuss at the architecture briefing *for your ART*. The key points may include:
 - Key architectural themes that support the PI Roadmap
 - Enablers that are in scope and their support for business Features
 - NFRs, design patterns, and/or tech standards that may be important
 - Major touch points between ARTs and Suppliers
- ▶ **Step 2:** One person from each ART should present their ART's briefing to the class. Be prepared for questions.

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Partner with Agile Teams

- ▶ During breakouts, teams are developing draft plans and identifying risks and impediments
- ▶ Architects and Product Managers should circulate among teams and collaborate to answer questions



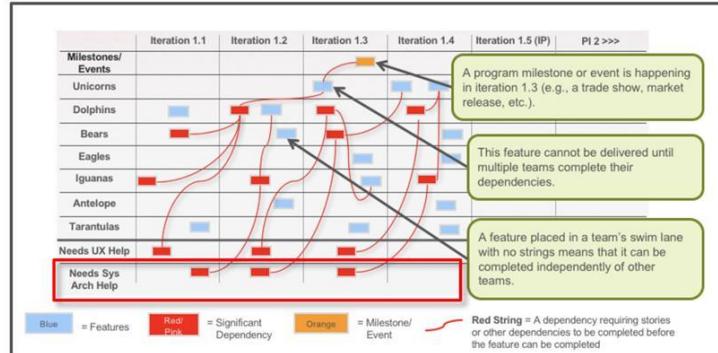
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6.1 Contribute to PI Planning

Show architecture dependencies on the program board

- ▶ Look for architectural dependencies
- ▶ Limit architecture WIP
 - Don't be a bottleneck
- ▶ Plan to collaborate during the PI
 - Defer decisions to the last responsible moment
- ▶ Partner with the System Team
 - System Team often executes a significant amount of Enabler work



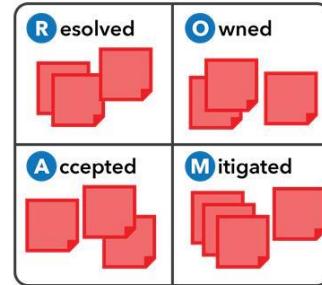
Architecture lane on program board

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Identify and resolve risks in real time

- ▶ Be on constant watch for program risks (be an exemplar)
- ▶ Anticipate dependencies across these domains:
 - Functions: dev, test, infrastructure, info-sec, compliance, etc.
 - Teams: Agile Teams, shared services, ARTs, Suppliers, etc.
- ▶ Surface risks immediately
- ▶ Assist with working them to resolution
 - Team-level risks are resolved by the owning team
 - Program-level risks are ROAMed



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A risk surfaces during team breakouts

Release Train Engineer (RTE), Ethan Pascal, requests your assistance to help resolve a program risk.

The Fulfillment team on the Fulfillment & Logistics ART has reported a critical issue. They have a task to build an “Op-Link API” to connect the Fulfillment system to Vehicle Operations. (See slide 6-15.)

However, during team breakouts, they realized that they greatly underestimated the amount of work involved, which jeopardizes the delivery of the “Vehicle Operations API Integration” enabler.

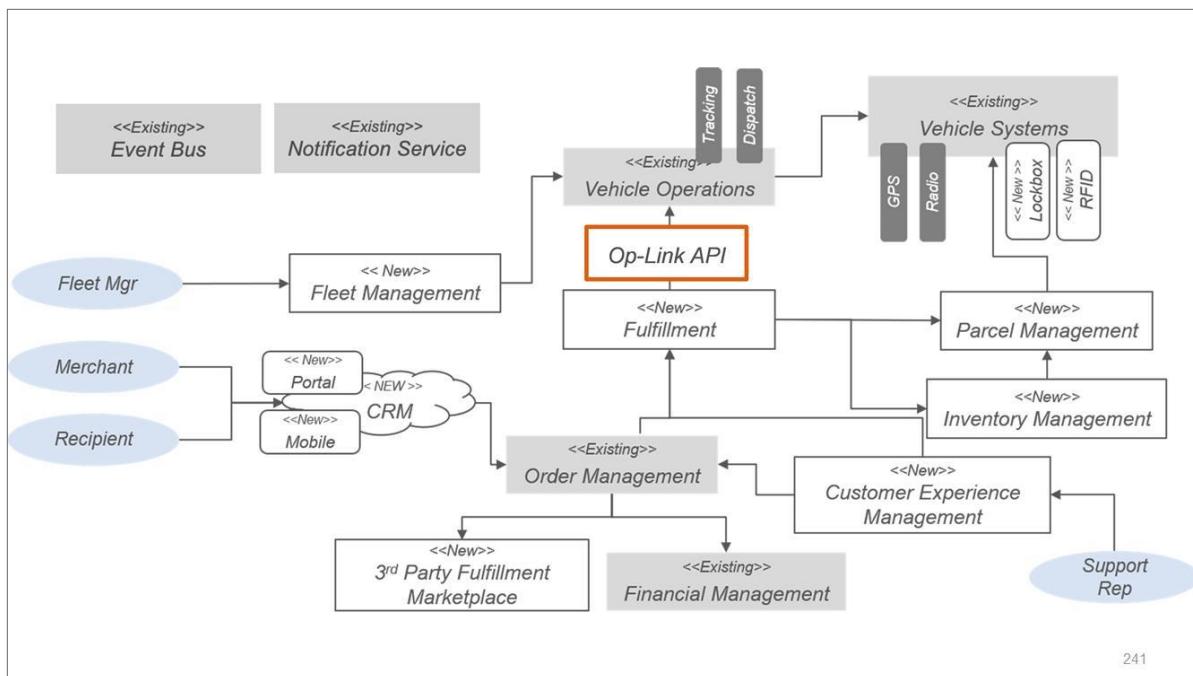


Discussion: Resolving the risk

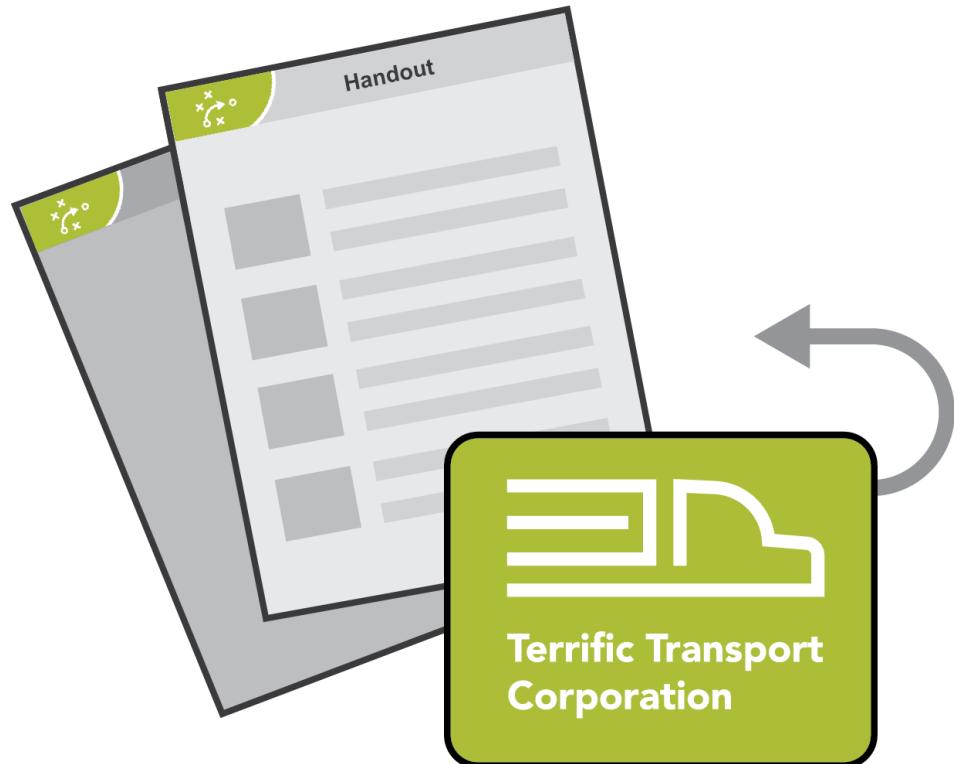


- ▶ **Step 1:** Refer to the model on the next slide showing the Op-Link API issue.
- ▶ **Step 2:** In your group, discuss potential root causes of and solutions to the issue, considering the following:
 - What may be constraining the Fulfillment team (e.g., capacity, knowledge)?
 - What is the potential business impact of this risk?
 - What tradeoffs may need to be made to resolve the risk?
- ▶ **Step 3:** Be prepared to share your ideas with the class.

6.1 Contribute to PI Planning



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6.2 Contribute to management review and problem-solving

6.2 Contribute to management review and problem-solving

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Management review and problem-solving

At the end of Day 1, Program Management meets to make adjustments to scope and objectives based on the day's planning. Common questions during management review include:

- ▶ What did we just learn?
- ▶ Do we need to adjust Vision? Scope? Staffing?
- ▶ Are there any bottlenecks?
- ▶ Will this Solution be viable over the long term?
- ▶ Does the plan balance business and IT objectives?
- ▶ What decisions must we make between now and tomorrow to close any gaps?

8:00 ▶ 9:00	Business Context
9:00 ▶ 10:30	Product/Solution Vision
10:30 ▶ 11:30	Architecture Vision and development practices
11:30 ▶ 1:00	Planning context and lunch
1:00 ▶ 4:00	Team breakouts
4:00 ▶ 5:00	Draft plan review
5:00 ▶ 6:00	Management review and problem solving

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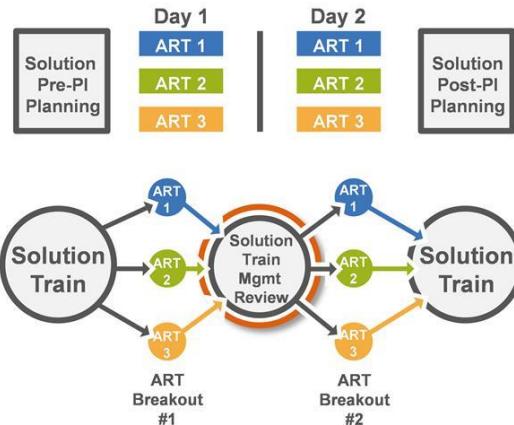
6.2 Contribute to management review and problem-solving

Solution Train management review and problem-solving

After the ARTs finish their management review and problem-solving during PI Planning, the STE facilitates a similar meeting for the Solution Train.

Common questions during Solution Train management review and problem-solving include:

- ▶ What new dependencies have we identified?
- ▶ Where do we need to adjust Vision? Scope? Staffing?
- ▶ Are there any bottlenecks?
- ▶ Do any Capabilities need to be de-scoped?
- ▶ What decisions must we make between now and tomorrow to close any gaps?

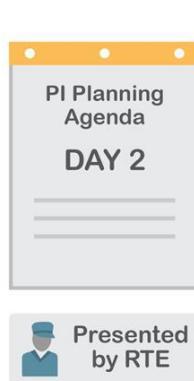


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PI Planning Day 2 details

Architects play a role in all Day 2 events.



8:00 ▶ 9:00	Planning adjustments		▶ Planning adjustments made based on previous day's management meeting
9:00 ▶ 11:00	Team breakouts		▶ Teams develop final plans and refine risks and impediments ▶ Business Owners circulate and assign business value to team objectives
11:00 ▶ 1:00	Final plan review and lunch		▶ Teams present final plans, risks, and impediments
1:00 ▶ 2:00	Program risks		▶ Remaining program-level risks are discussed and ROAMED
2:00 ▶ 2:15	PI confidence vote		▶ Team and program confidence vote
2:15 ▶ ???	Plan rework if necessary		▶ If necessary, planning continues until commitment is achieved
After commitment	Planning retrospective and moving forward		▶ Retrospective ▶ Moving Forward ▶ Final Instructions

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Planning adjustments

Oxana Schroeder, Solution Architect, reports some planning adjustments:

"At yesterday's Management Review and Problem-Solving Workshop, we realized that the Consumer Solutions ART has a team that has already built an Event Bus and Notification service, which follow a similar design pattern to the Op-Link API."

"Since the Consumer Solutions ART is a part of our Solution Train, and Fulfillment is a high priority, the Event Bus team has agreed to inherit the Op-Link API work."

"We moved the Vehicle Operations API Integration Enabler to the Consumer Solutions ART's backlog, and the Event Bus team will work with the Vehicle Operations team to complete the integration."

Addressing program risks

After all plans had been presented, remaining program risks and impediments are discussed and categorized.

ROAMing risks:

- ▶ **Resolved** - Has been addressed; no longer a concern.
- ▶ **Owned** - Someone has taken responsibility.
- ▶ **Accepted** - Nothing more can be done. If risk occurs, PI may not yield the planned results.
- ▶ **Mitigated** - Team has plan to adjust as necessary.





Discussion: Identify additional risks to ROAM

Prepare
5 min

Share
5 min

- ▶ **Step 1:** Consider the Op-Link API mitigation plan that Oxana announced during PI Planning adjustments (moving the Enabler to the Consumer Solutions ART to reduce delivery risk)
- ▶ **Step 2:** With your team, discuss what *additional* risks could possibly surface during PI Planning that could impact your ART
- ▶ **Step 3:** Be prepared to share your ideas

Final risk ROAM

Aram Sarkisian, the System Architect for the Consumer Solutions ART, has announced that the Event Bus team on his ART has the knowledge but not the capacity to implement the Op-Link API.

Someone needs to own the API development and actively manage the relationship with Vehicle Operations. Aram was the original designer of the Event Bus and is a former member of the Vehicle Operations team, so he has offered to clear his capacity and pair with the team for the implementation.

6.2 Contribute to management review and problem-solving

Final confidence vote and plan commitment

Knowing that the Consumer Solutions ART has taken ownership of the Op-Link API integration risk and both ARTs have committed to their PI objectives with high confidence, the Business Owners accept the plans.

Teams have presented their final plans, which include ROAMed risks and necessary adjustments to their Iteration plans.

6.3 Contribute to Solution post-PI Planning

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Solution Post-PI Planning agenda

Goals

- ▶ Understand the PI plan for the entire Solution Train
- ▶ Make adjustments if necessary and communicate to the ARTs

Inputs

- ▶ Program PI Objectives from all ARTs
- ▶ Solution Train board
- ▶ Solution risks

9:00 ▶ 12:00	PI planning report
12:00 ▶ 1:00	Lunch
1:00 ▶ 2:00	Plan review, risk analysis, and confidence vote
2:00 ▶ ???	Plan rework if necessary
▶ ▶ ▶	Planning retrospective and moving forward

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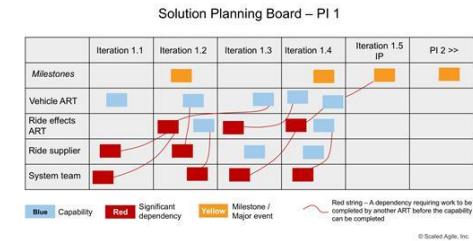
252

6.3 Contribute to Solution post-PI Planning

Solution post-PI Planning outcomes

Outcomes of post-PI Planning include:

- ▶ Set of SMART Solution PI Objectives for the Solution Train
- ▶ Updated Solution planning board
- ▶ Commitment based on a confidence vote



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Lesson review

In this lesson, you:

- ▶ Explored how Architects contribute to PI Planning, including the management review and problem-solving
- ▶ Discovered how Architects contribute to Solution post-PI Planning

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6.3 Contribute to Solution post-PI Planning



Action Plan: Coordinating architecture throughout PI Planning

Duration
5 min

On the Action Plan page in your workbook, answer the following questions:

- ▶ In what ways can you improve collaboration and risk identification during PI Planning at your organization?
- ▶ What are some ways you can improve Architects' contributions to the Program (and/or Solution) management review and problem-solving?
- ▶ How do you contribute to Solution post-PI Planning?
- ▶ How do you use the outputs of Solution post-PI Planning to inform your work?



The SAFe Program Increment Toolkit provides resources to help facilitate PI Planning.

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The SAFe Program Increment Toolkit provides resources to help facilitate PI Planning



Lesson 6: Coordinating Architecture throughout PI Planning



In what ways can you improve collaboration and risk identification during PI Planning at your organization?

What are some ways you can improve Architects' contributions to the Program (and/or Solution) management review and problem-solving?

How do you contribute to Solution post-PI Planning?

How do you use the outputs of Solution post-PI Planning to inform your work?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

6.3 Contribute to Solution post-PI Planning

Lesson 7

Supporting Continuous Delivery during PI Execution

Learning Objectives:

- 7.1 Guide architecture and Continuous Delivery throughout the PI
- 7.2 Prepare for Iteration Reviews and System and Solution Demos
- 7.3 Relentlessly improve through Inspect and Adapt (I&A)



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SAFe® for Architects

Lesson 7: Supporting Continuous Delivery during PI Execution



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Learning objectives

At the end of this lesson you should be able to:

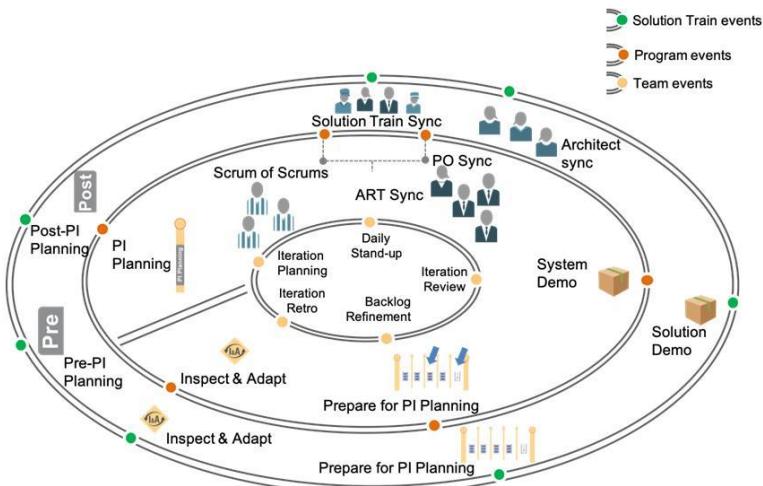
- ▶ 7.1 Guide architecture and Continuous Delivery throughout the PI
- ▶ 7.2 Prepare for Iteration Reviews and System and Solution Demos
- ▶ 7.3 Relentlessly improve through Inspect and Adapt (I&A)

7.1 Guide architecture and Continuous Delivery throughout the PI

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SAFe events for Solution Trains, ARTs, and teams



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Architects actively participate during the PI

Active participants throughout the PI, Architects are involved in:

- ▶ Working with Agile Teams
- ▶ Supporting Enabler development
- ▶ Attending Iteration Reviews
- ▶ Attending System Demos
- ▶ Continuously refining the architectural backlog
- ▶ Demonstrating continuous delivery of Architectural Runway through Iteration Reviews, System Demos, and Solution Demos
- ▶ Shepherding the architecture Vision all the way through implementation



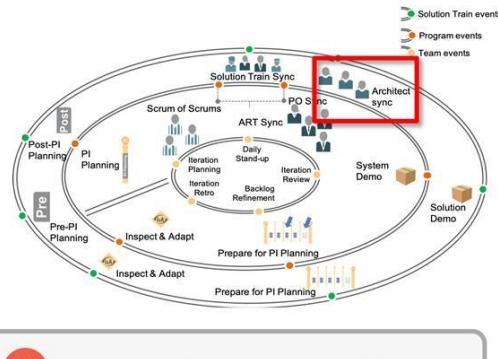
Architects support continuous improvement

- ▶ Refactoring the architecture
 - Loose coupling, cloud migration, performance tuning
- ▶ Upgrading and evolving tools, environments, and infrastructure
 - CI/CD, test automation, infrastructure-as-code, auto-scaling
- ▶ Continuous delivery of Architectural Runway
- ▶ Delivering and evaluating minimum viable architecture
- ▶ Researching trends and applying emerging technology

Architect Sync

Architects, tech leads, and key subject matter experts attend the Architect Sync to:

- ▶ Align on strategy
- ▶ Design Architectural Runway
- ▶ Resolve risks and impediments
- ▶ Share news and knowledge
- ▶ Swarm on problems and solutions



X Not a review or approval board



Activity: Architect Sync



- ▶ **Step 1:** Make a plan for implementing an Architect Sync at your organization. Who would come? How often and where would you meet? What topics would you discuss?
- ▶ **Step 2:** What value would the group be responsible for demonstrating to the organization?
- ▶ **Step 3:** How would the group avoid becoming a governance committee?
- ▶ **Step 4:** Add any insights you want to carry forward into practice in your organization to your Action Plan page for this lesson.

7.2 Prepare for Iteration Reviews and System and Solution Demos

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Value is demonstrated frequently

Iteration Review	System Demo	Solution Demo
		
<ul style="list-style-type: none">▶ WHAT: A critical method for gathering immediate, Team-level feedback▶ WHEN: Occurs every iteration▶ WHO: Presented by the teams doing the work to teammates and interested stakeholders, which may include other teams▶ SHOWS: Real measure of team value, velocity, and progress during the prior iteration	<ul style="list-style-type: none">▶ WHAT: Gathering immediate, system-level feedback of full system in representative staging environment▶ WHEN: Occurs every iteration and at end of PI (as part of Inspect and Adapt)▶ WHO: Presented by the ART Product Manager and Product owners. Attended by sponsors, stakeholders, and customers▶ SHOWS: Real measure of system value, velocity, and progress to learn and adjust	<ul style="list-style-type: none">▶ WHAT: A 'pull' event to ensure ARTs and suppliers create integrated and tested solutions demonstrated in as true a solution context as possible▶ WHEN: Occurs at least at the end of each PI, more frequently if possible▶ WHO: Presented by the ARTs. Attended by suppliers, sponsors, stakeholders, and customers▶ SHOWS: Results of the combined development efforts of multiple ARTs which determines the future course of action for investment in the Solution <small>265</small>

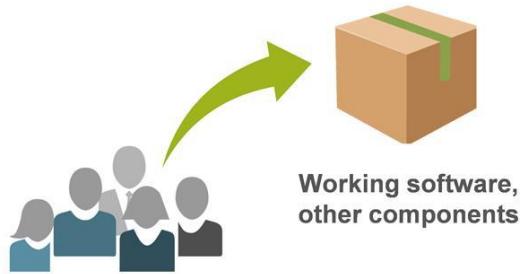
Architect's role during Iteration Review

Demonstrate intentional architecture

- ▶ Architects are team members who demo their work
- ▶ Demo spikes, story-level Enablers and NFRs
- ▶ Gather feedback from the team and stakeholders
- ▶ Gauge value of architectural decisions

Attend other Iteration Reviews

- ▶ Architects are stakeholders of Agile Teams
- ▶ Observe how design is emerging
- ▶ Gauge alignment with Solution Intent
- ▶ Provide feedback

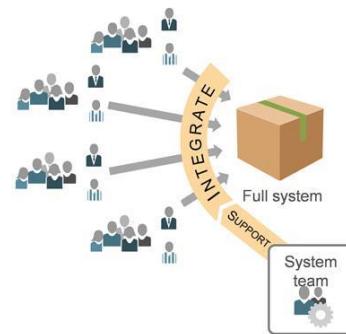


**Working software,
other components**

Architect's role during System Demo

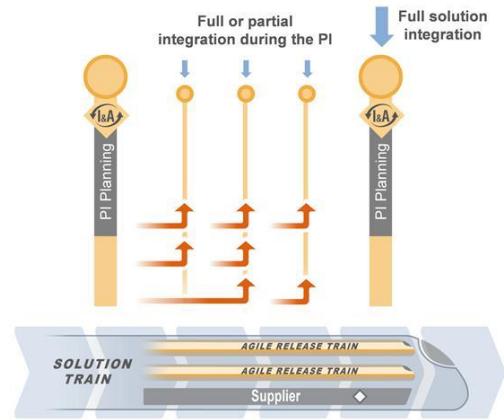
Is the architecture enabling or hindering Feature delivery?

- ▶ Help prepare features for System Demo
 - System integration, end-to-end tests, deployment
- ▶ Demonstrate Architectural Runway
 - Enabler Features, NFRs, integrated systems
 - Benefits to business and the Continuous Delivery Pipeline
 - Gather feedback to continually improve system architecture
- ▶ Provide feedback on implemented system
 - Verify alignment with Solution Intent



Architect's role during Solution Demo

- Is the architecture enabling or hindering Capability delivery?
- ▶ Help prepare capabilities for Solution Demo
 - Solution integration, end-to-end tests, deployment
 - ▶ Demonstrate Solution architecture
 - Enabler Capabilities, NFRs, benefits
 - ▶ Provide feedback on the implemented Solution
 - Verify alignment with Solution Intent



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Activity: Participating in demos



- ▶ **Step 1:** In your group, discuss which Iteration Reviews you will attend in TTC's first increment and what you are looking for in those reviews. What will *you* demo in *your* Iteration Review?
- ▶ **Step 2:** What will you be watching for in the first System Demo? What will *you* showcase in the first System Demo?
- ▶ **Step 3:** What will you be watching for in the Solution Demo at the end of the first PI? What will *you* showcase in the Solution Demo?
- ▶ **Step 4:** Write your answers on a flip chart and be prepared to discuss.

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7.3 Relentlessly improve through Inspect and Adapt

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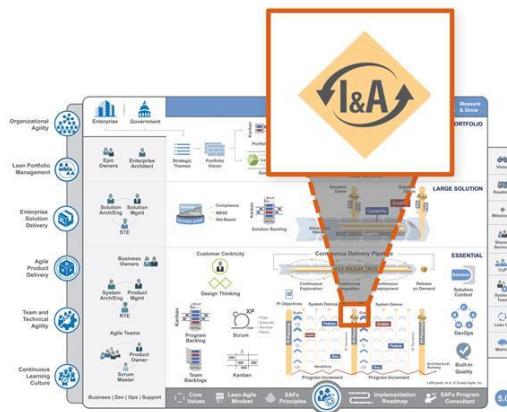
Inspect and Adapt

Three parts:

1. The PI System Demo
 2. Quantitative measurement
 3. The problem-solving workshop

Attendees: Teams and stakeholders

Timebox: 3 – 4 hours per PI



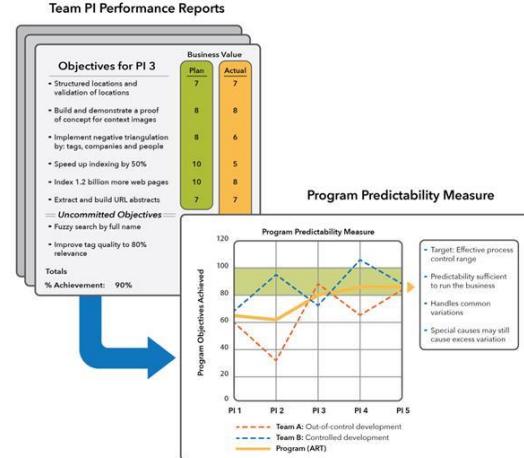
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Quantitative measurements

The program predictability measure gauges the performance of the ART.

- ▶ Each team's planned-versus-actual business value is rolled up to the program level in the program predictability measure.
- ▶ Architects are typically accountable for the business value scores of Enabler Features and Capabilities.
- ▶ Architects should also measure value delivered against architecture hypotheses.

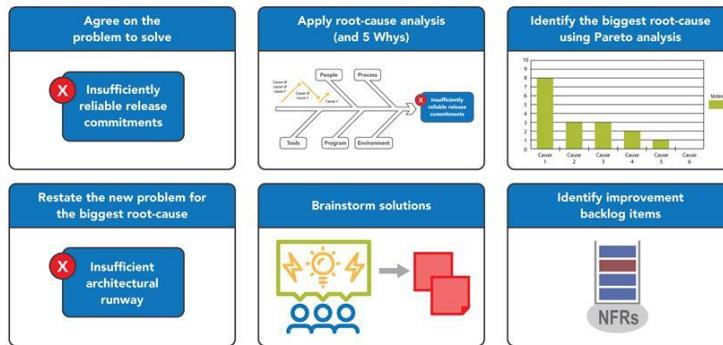


PI Retrospective

- ▶ Brief team problem-identification activity (less than 30 minutes)
- ▶ Goal is to identify systemic issues that need to be addressed
 - Typically program-level in scope
 - May be identified by multiple teams
- ▶ Teams contribute their own views of the problem
- ▶ Identified issues ‘seed’ the problem-solving workshop

The problem-solving workshop

Roles and teams on the train work together to identify systemic issues that can be brought into the Program Backlog in the upcoming PI.



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Activity: Retrospective

Prepare

Share



- ▶ **Step 1:** In your group, conduct a retrospective of this course so far
- ▶ **Step 2:** Answer these questions from your role's perspective:
 - What went well?
 - What did not go well?
 - What improvements can be made?

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Lesson review

In this lesson you:

- ▶ Explored how Architects guide architecture and Continuous Delivery throughout the PI
- ▶ Explored how Architects prepare for Iteration Reviews and System and Solution Demos
- ▶ Examined how to relentlessly improve through Inspect and Adapt



Action Plan: Supporting Continuous Delivery during PI Execution

Duration
5 min

On the Action Plan page in your workbook, answer the following questions:

- ▶ What are some ways you plan to participate differently during Program Increment execution?
- ▶ What are some ways you plan to participate differently during Iteration reviews, System Demos, and Solution Demos?
- ▶ What are some ways you plan to participate differently during the Inspect and Adapt?



The *Building Really Big Systems with SAFe Toolkit* provides guidance on applying Lean-Agile and SAFe when building large systems. 277

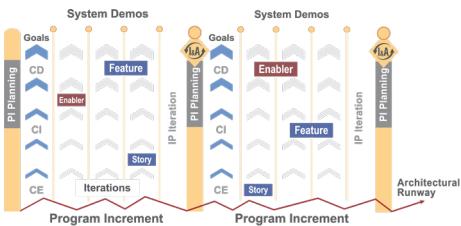
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The *Building Really Big Systems with SAFe Toolkit* provides guidance on applying Lean-Agile and SAFe when building large systems.



Lesson 7: Supporting Continuous Delivery during PI Execution



What are some ways you plan to participate differently during Program Increment execution?

What are some ways you plan to participate differently during the Inspect and Adapt?

Do you have value stream maps to visualize value flow in your organization? If not, how would you create them?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

7.3 Relentlessly improve through Inspect and Adapt (I&A)

Lesson 8

Supporting New Strategic Themes and Value Streams

Learning Objectives:

- 8.1 Align architecture to Enterprise strategy
- 8.2 Evolve the Solution Portfolio
- 8.3 Contribute Enabler Epics to the Portfolio Kanban
- 8.4 Coordinate across Value Streams



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

SAFe® for Architects

Lesson 8: Supporting New Strategic Themes and Value Streams



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

At the end of this lesson you should be able to:

- ▶ 8.1 Align architecture to Enterprise strategy
- ▶ 8.2 Evolve the Solution Portfolio
- ▶ 8.3 Contribute Enabler Epics to the Portfolio Kanban
- ▶ 8.4 Coordinate across Value Streams

New business opportunity

- ▶ Due to Terrific Transport's rapid success in autonomous delivery, Globalzon Inc., a major online retailer, wants to pilot a joint venture for autonomous package delivery from their distribution centers.
- ▶ We will be revising our business strategy, portfolio budgets, and Solution Vision to take advantage of this unique opportunity.
- ▶ TTC needs your help launching a new development Value Stream and architecting our next-generation autonomous delivery platform.



8.1 Align architecture to Enterprise strategy

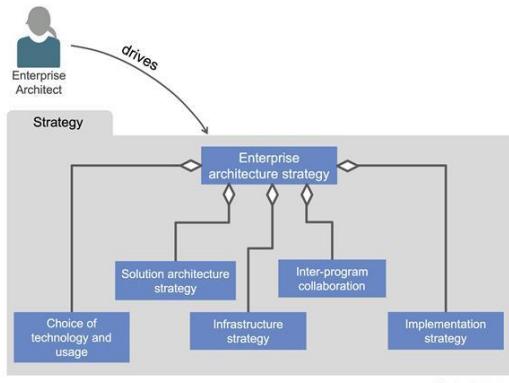
8.1 Align architecture to Enterprise strategy

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Enterprise Architects as stewards of corporate strategy

- ▶ Collaborate with Lean Portfolio Management to provide a high-level, all-inclusive Vision of Enterprise Solutions and development initiatives.
- ▶ Champion and communicate Strategic Themes and other key business drivers throughout the organization.
- ▶ Strongly influence SAFe portfolio budgets, architecture Vision and Solution Roadmaps.

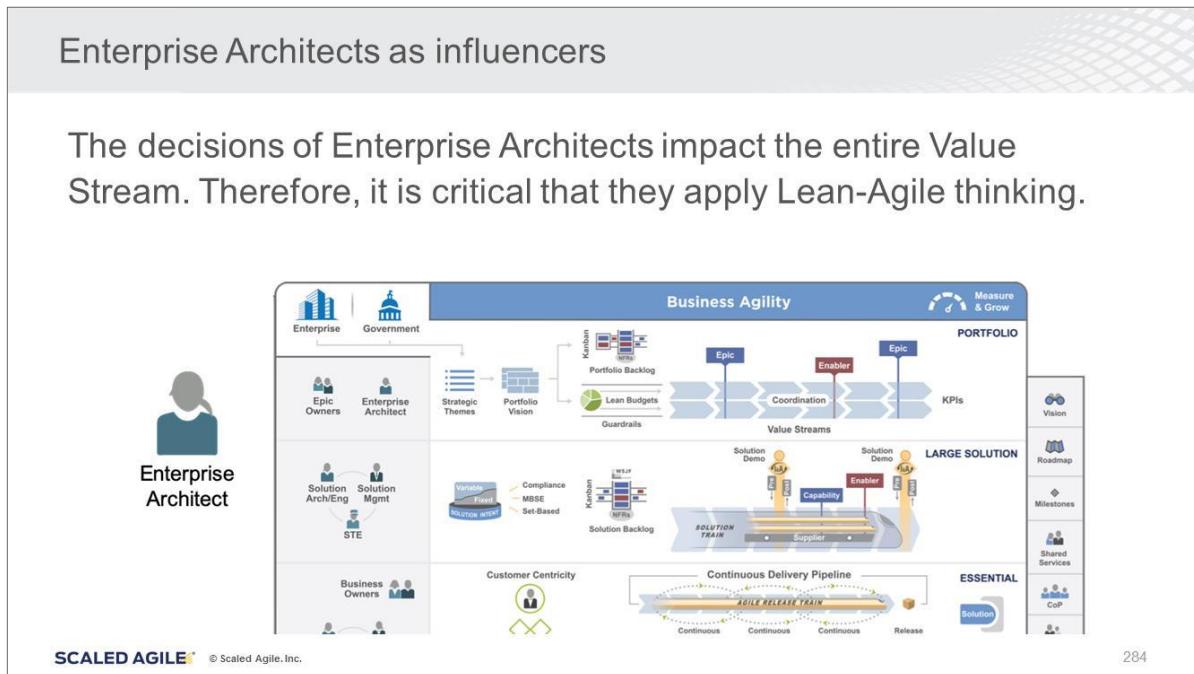
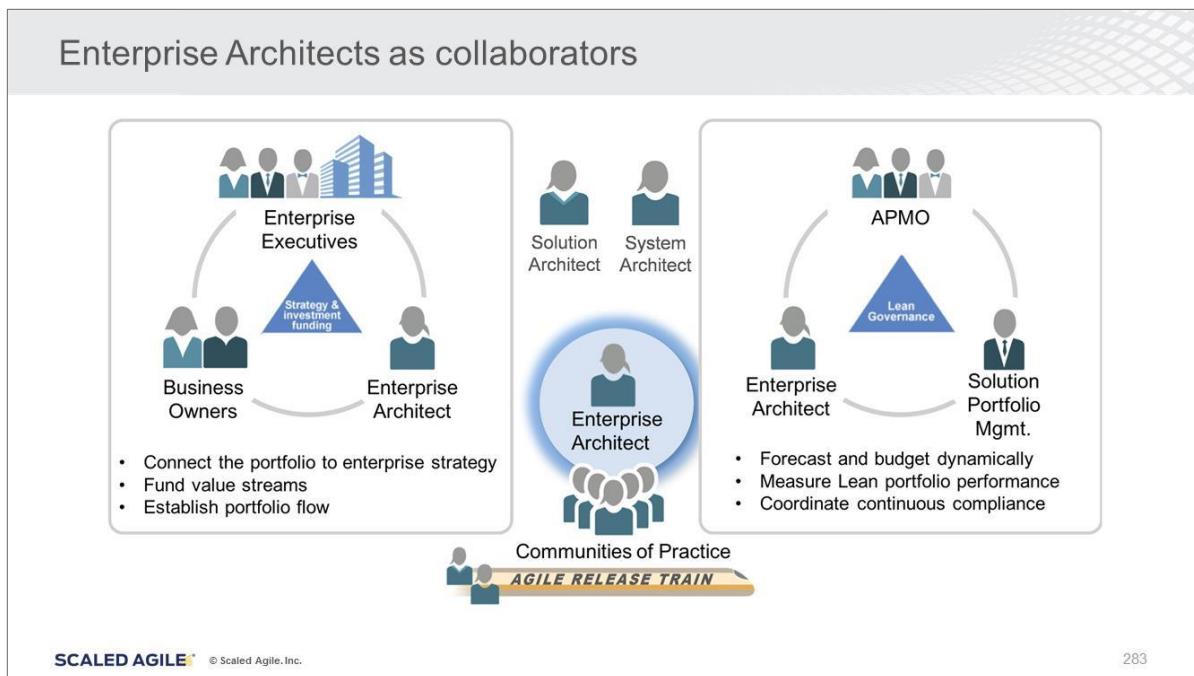


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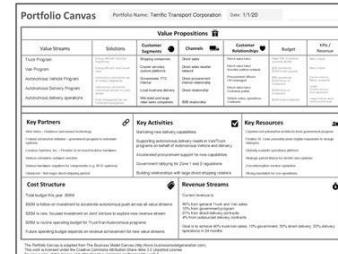
8.1 Align architecture to Enterprise strategy



8.1 Align architecture to Enterprise strategy

Enterprise Architects as strategic planners

- ▶ Strategic Themes drive the portfolio canvas, which guides decision-making throughout the Value Stream
- ▶ These decisions must reflect a balance between business strategy and technology strategy
- ▶ Enterprise Architects are specially equipped to advise on the optimal balance



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Joint venture business context

To provide some additional context on the joint venture, Globalzon will handle customer relationship management, order capture, and customer support. TTC will only be responsible for delivery fulfillment, including vehicle dispatching, parcel pick-up, parcel drop-off, in-transit notifications, and open-API integration with relevant Globalzon systems.

Globalzon will purchase an exclusive-use license of our integrated fulfillment platform (vehicles and systems) and pay TTC a shipping fee on each completed order.



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New Strategic Theme and operational Value Streams

Strategic Themes

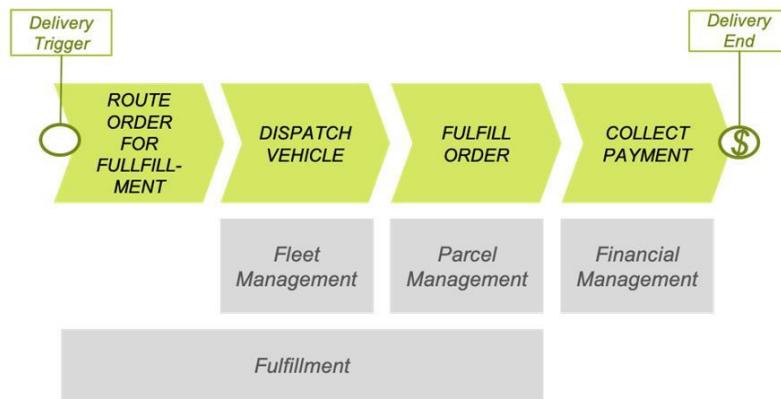
- ▶ Increase Truck Program sales volume by 15%
- ▶ Obtain gold safety standard status with Van Program
- ▶ Triple Autonomous Vehicle Program revenue within 18 months through commercial expansion
- ▶ Capture dominant autonomous delivery market share in zones 1 and 2 within 18 months
- ▶ Expand the Giving-1 Program to all Terrific Transport locations
- ▶ *Demonstrate expansion strategy through Globalzon joint venture. (New)*



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Globalzon joint venture operational Value Stream



Note: Within Globalzon, TTC would be considered a **Supplier**

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Updated Portfolio Vision

Exploring TTC's opportunities in autonomous vehicle technology, while continuing to invest in our core businesses, will allow TTC to increase global revenue and profitability, develop market-leading innovations in smart-vehicle delivery, and give more back to our communities.

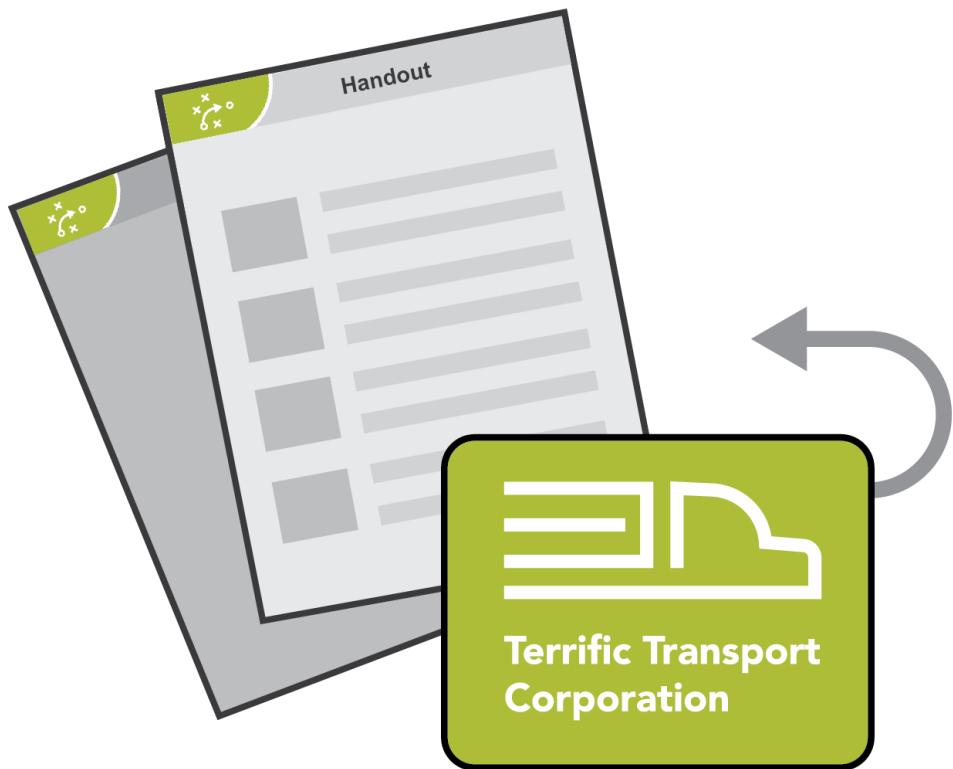
Our best-in-class autonomous delivery solution will enable TTC to experience rapid revenue growth in the commercial sector through the Globalzon partnership, as well as continued global expansion via a highly scalable, multi-tenant deployment model.



Discussion: Update NFRs in Solution Intent



- ▶ **Step 1:** Review the updated Strategic Themes, Value Stream, and Portfolio Vision on the previous slides.
- ▶ **Step 2:** What new nonfunctional requirements (NFRs) might the joint venture Solution need to adhere to?
- ▶ **Step 3:** Be prepared to share your thoughts.





Activity: Consider Enterprise Architecture Strategy

Prepare
10 minShare
5 min

► **Step 1:** Read the *Enterprise Architecture Strategy* section of the Enterprise Architect article in your workbook and review the new architecture models, Solution Train diagram, and Value Stream map.

► **Step 2:** With your team, choose one of the five elements of architecture strategy and discuss how you might address it in the new joint venture at TTC:

- Choice of technology and usage
- Solution architecture strategy
- Infrastructure strategy
- Inter-program collaboration
- Implementation strategy

► **Step 3:** Be prepared to present your thoughts to the class.

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Enterprise Architect

Article excerpt from www.scaledagileframework.com/enterprise-architect/

*"All men can see these tactics wherby I conquer,
but what none can see is the strategy out of
which victory is evolved"*

—Sun Tzu

Enterprise Architecture Strategy

The enterprise's ability to embrace organizational change is a key competitive advantage, and the enterprise architectural strategy is a vital element. Figure 1 illustrates five key aspects of such a strategy and each element is briefly described below.

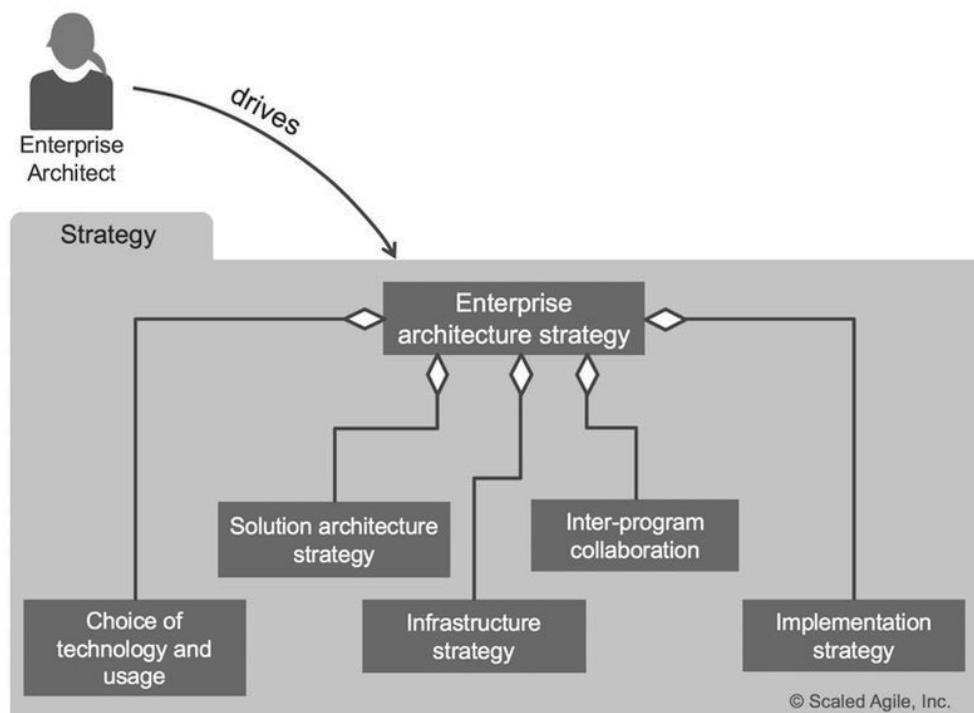


Figure 1. Five elements of enterprise architecture strategy

- **Choice of technology and usage** - Choosing appropriate technologies is a key element of strategy formulation. Supporting activities include research and prototyping, understanding applicability and scope, and assessing the maturity of innovative new technologies.
- **Solution architecture strategy** - The Enterprise Architect works closely with the Solution and System Architects to ensure that individual program and product strategies align with business and technical objectives. For example, emerging solutions to local problems should be consistent with the overall enterprise strategy. When that's not the case, decisions should be made explicit, as the inconsistent option may well influence future enterprise strategy.
- **Infrastructure strategy** - When it fulfills its function properly, development and deployment infrastructure goes unnoticed. However, the strategy for building and maintaining the infrastructure is a key challenge, overlapping with System Architect responsibilities. Some of these responsibilities include the reuse of configuration patterns, common physical infrastructure, knowledge sharing across ARTs and Solution Trains, and—especially—System Teams. In addition, some of the development and deployment infrastructure will likely intersect with internal IT systems. The Enterprise Architect can provide direction there as well.
- **Inter-program collaboration** - Various aspects of architecture work occur in different teams and programs. Which is why it's helpful to ensure that common technology, design practices, and infrastructure are used when applicable. However, it's also important that value streams and ARTs have sufficient degrees of freedom. Otherwise, innovation decreases. Thus, both common and variable architectural aspects should be actively shared among the ARTs via joint design workshops, design Communities of Practice (CoPs), etc.
- **Implementation strategy** - The importance of an effective, incremental Agile implementation strategy can hardly be overstated. Building the technical foundation for business epics into the architectural runway must be an incremental process. Continuous technical learning and fast feedback allow architecture and business functionality to grow synchronously over time. The ability of Agile Teams and programs to refactor as necessary and preserve multiple possible design options wherever practical supports this. Abstraction and generalization help avoid binding specificity too early, which preserves architectural flexibility for future business needs.

Respect for People and Relentless Improvement

The Lean-Agile Mindset creates a healthy environment in which everyone operates on facts, not assumptions. This is particularly important for Enterprise Architects, who operate one (or two!) steps removed from day-to-day development activities. This is why the Enterprise Architect is wise to maintain personal connections to each ART, Solution Train, and architect through the following activities:

- Receiving feedback on current enterprise-wide initiatives
- Participating in architecture and design CoPs
- Attending demos whenever critical redesign or foundation work is in progress

Developers and testers will better trust strategy driven by the person who knows their current challenges and context. Likewise, the Enterprise Architect will better trust teams that provide full visibility of their current context.

Learn More

- [1] Leffingwell, Dean. Agile Software Requirements: Lean Requirements Practices for Teams, Programs, and the Enterprise. Addison-Wesley, 2011.
- [2] Bloomberg, Jason. The Agile Architecture Revolution. Wiley, 2013.
- [3] Coplien, James and Gertrud Bjørnvig. Lean Architecture: for Agile Software Development. Wiley, 2010.

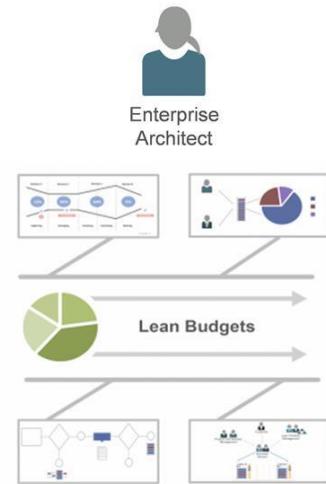
8.2 Evolve the Solution Portfolio

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Lean Budget Guardrails align investment with strategy

- ▶ Architecture influences investment decisions
- ▶ EA should participate in
 - Guiding investments by horizon
 - Optimizing value and Solution integrity with capacity allocation
 - Approving significant initiatives
 - Continuous Business Owner engagement

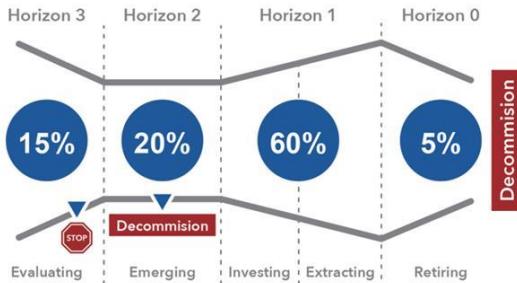


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8.2 Evolve the Solution Portfolio

Use investment horizons to manage obsolescence and technical debt



- ▶ Take an economic view
 - Which systems are assets? Which are liabilities?
 - Where is the value (present, future)?
- ▶ Maintain technical currency by:
 - Balancing legacy and emerging technology
 - Protecting and maintaining core systems
 - Leveraging new technology to innovate, commoditize, and scale
 - Retiring old systems to simplify the architecture and control costs

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Application portfolio rationalization

Continually evolve the technology ecosystem by:

- ▶ Exploring trends in emerging technology
- ▶ Investing in valuable technology experiments
- ▶ Supporting and extending core technology assets
- ▶ Minimizing technology duplication and "shadow IT"
- ▶ Retiring technology that no longer delivers appreciable value
- ▶ Minimizing technology licensing and support costs
- ▶ Managing the technology portfolio through mergers and acquisitions cycles

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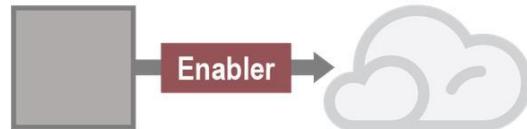
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8.3 Contribute Enabler Epics to the Portfolio Kanban

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Managing large shifts in technology



- ▶ Large shifts can include moving to the Cloud, moving off a mainframe, or moving to continuous releases
- ▶ Large shifts often start with Enabler Epics, which may require Lean business cases
- ▶ Architects typically own Enabler Epics
- ▶ Architects can advise on what patterns and techniques to use:
 - Decommission, evolve, migrate, refactor
 - Strangulation patterns, multi-tenancy, selective deployment, disaster recovery

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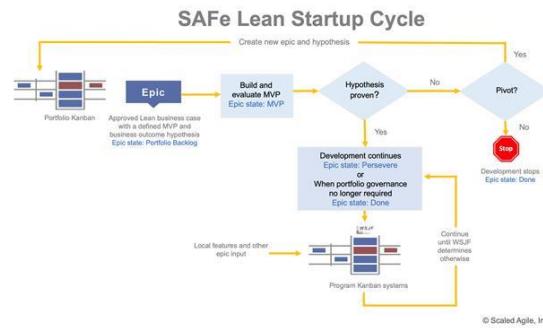
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8.3 Contribute Enabler Epics to the Portfolio Kanban

Foster innovation with the Lean Startup cycle

Each Epic:

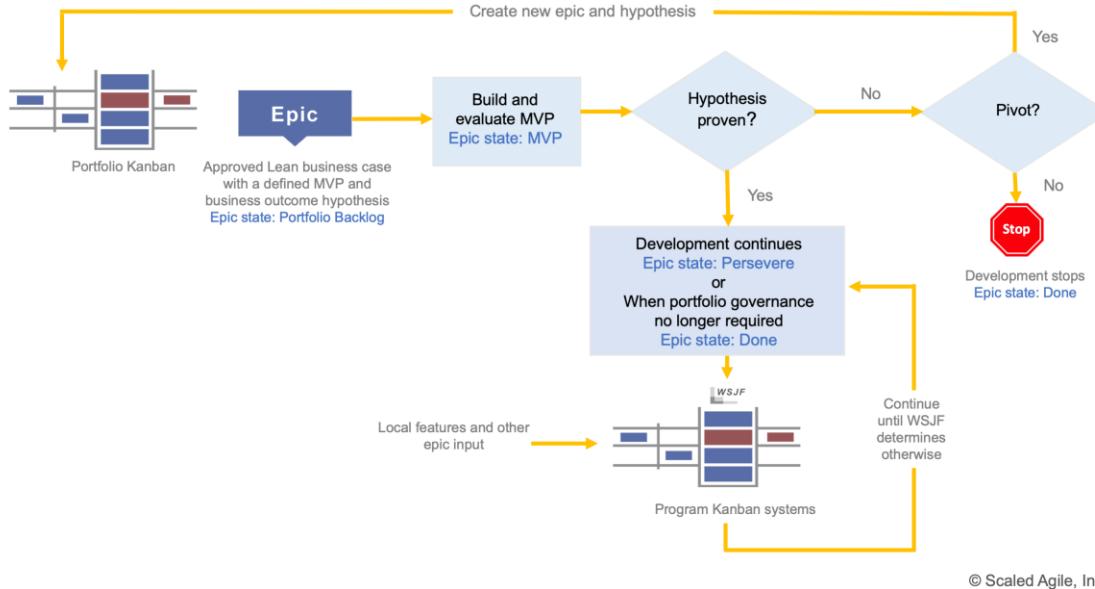
- ▶ Has an outcome hypothesis
- ▶ Defines a minimum viable product (MVP)



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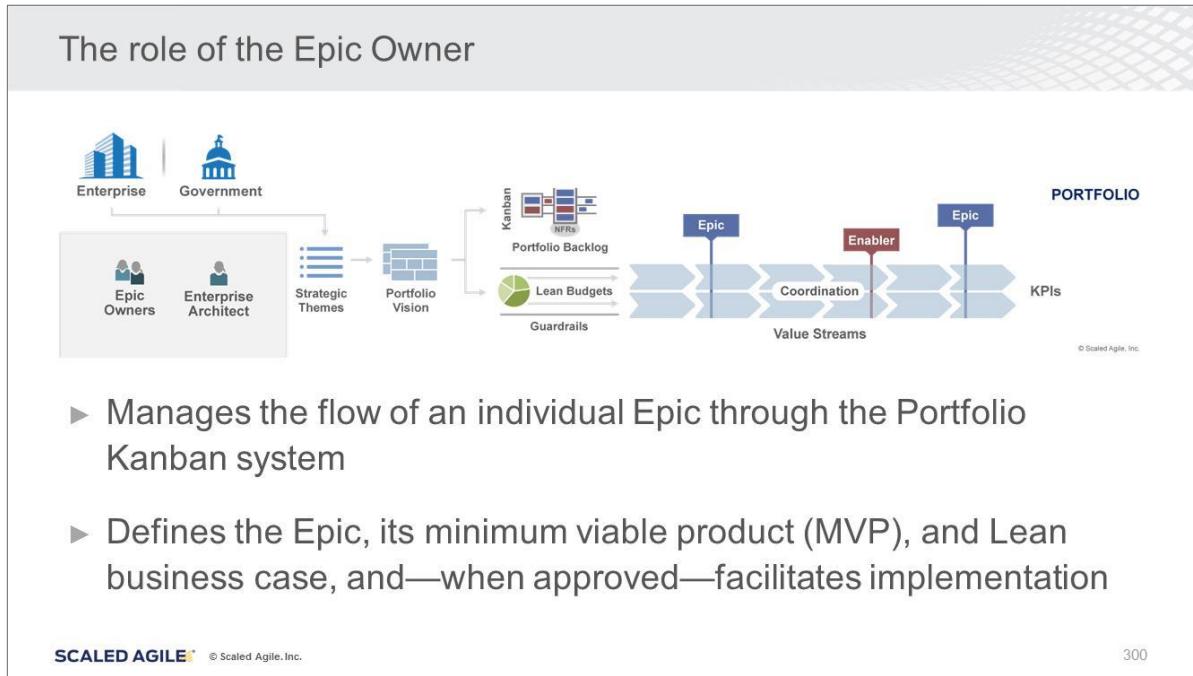
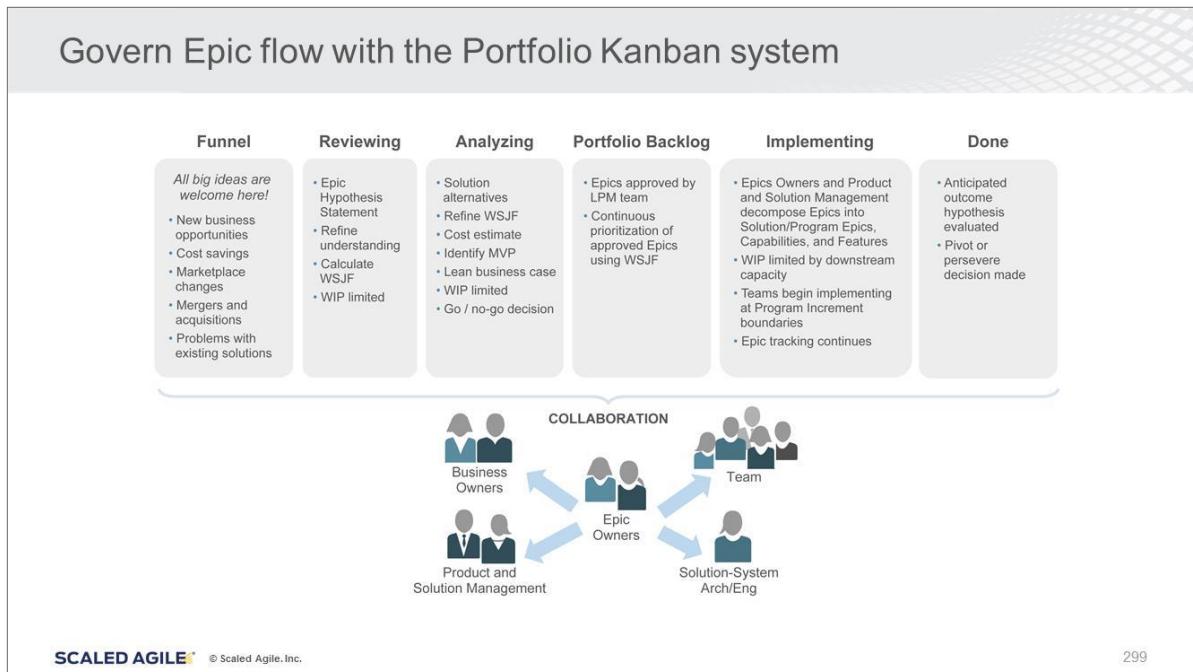
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SAFe Lean Startup Cycle



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8.3 Contribute Enabler Epics to the Portfolio Kanban



8.3 Contribute Enabler Epics to the Portfolio Kanban

Preparing an Epic

- ▶ Work with stakeholders and subject matter experts to define the Epic, its hypothesis statement, MVP, and cost of delay
- ▶ Work with development teams to size the Epic and provide input for economic prioritization
- ▶ Guide the Epics through the funnel, review, and analyzing stages of the Portfolio Kanban system
- ▶ Present the Epic and associated Lean business case to Lean Portfolio Management (LPM) for a go/no-go decision

Epic

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Enabler Epic hypothesis statement example

Epic Hypothesis Statement		Business Outcome Hypothesis	Leading Indicators	Non-Functional Requirements
For	Apple systems			
who	would like to pass information between each other			
the	Apple ID			
is a	unique user identifier			
that	is recognizable across all systems.			
Unlike	user IDs that exist in each separate system			
our solution	will provide the ability to recognize an Apple user across the entire ecosystem.	• Upsell and cross-sell due to functionality that crosses the eco-system • Lower attrition rates	• Developers internally use the feature to offer cross-system features • Features enabled by Apple ID receive high reviews	• Security and encryption considerations

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8.3 Contribute Enabler Epics to the Portfolio Kanban

Epics deserve a Lean business case

Investment in Epics is a serious matter; analysis and informed decision-making are crucial.

- ▶ ‘Just the right amount’ of analysis
- ▶ Avoid over-specificity
- ▶ Define the outcomes hypothesis
- ▶ Understand implementation impact
- ▶ Develop incremental implementation strategy
- ▶ Gain approval
- ▶ ***Not a specification!***

LEAN BUSINESS CASE		
Impact on Products, Programs and Services (Identify products, programs, services, teams, departments, etc. that will be impacted by this Epic)		
Impact on Sales, Distribution, Deployment (Describe any impact on how the product is sold, distributed, or deployed)		
Analysis Summary (Brief summary of the analysis that has been formed to create the business case)		
Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)	Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)	Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)
Type of Return: (Market share, increased revenue, improved productivity, new markets served, etc.)	Type of Return: (Market share, increased revenue, improved productivity, new markets served, etc.)	Type of Return: (Market share, increased revenue, improved productivity, new markets served, etc.)
In-Scope or Out-of-Scope Development (Describe the scope of the epic, and for what should be measured: for example, 50% increase in shoppers under 25; Availability increases from 97% to 99.7%, etc.)	In-Scope or Out-of-Scope Development (Describe the scope of the epic, and for what should be measured: for example, 50% increase in shoppers under 25; Availability increases from 97% to 99.7%, etc.)	In-Scope or Out-of-Scope Development (Describe the scope of the epic, and for what should be measured: for example, 50% increase in shoppers under 25; Availability increases from 97% to 99.7%, etc.)
Functional Implementation Metrics (List in bullet as a single value, how each metric details its potential strategy. More info for the goal)		
Sequencing and Dependencies (Describe any constraints for sequencing the epic and dependencies)		
Milestones or Checkpoints (Identify potential milestones or checkpoints for review)		
Attachments:		
Outcomes Hypothesis (Consider using the Epic Hypothesis Statement in the Epic article as a starting point for a description of the epic.)		
Leading Indicators (Establish innovative accounting metrics to provide leading indicators of the outcomes hypothesis; for example, a measurable change in purchase demographics within 30 days of feature release)		
In Scope: Out of Scope: Nonfunctional Requirements:		
• —	• —	• —
• —	• —	• —
• —	• —	• —
Minimum Viable Product (MVP) Features Additional Potential Features		
• (Feature or Capability)	• (Feature or Capability)	• (Feature or Capability)
• —	• —	• —
Sponsors: (List key business sponsors who will be supporting the initiative)		
Users and Markets Affected: (Describe the user community and any markets affected)		
Impact on Products, Programs and Services: (Identify products, programs, services, teams, departments, etc. that will be impacted by this Epic)		
Impact on Sales, Distribution, Deployment (Describe any impact on how the product is sold, distributed, or deployed)		
Analysis Summary (Brief summary of the analysis that has been formed to create the business case)		
Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)	Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)	Estimated Monetary Cost (MVP): (Example: Estimated story points * cost per story \$ for MVP features)
Go / No-Go: (Go, or No-Go recommendation)		

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Lean business case template

Minimum Viable Product Features

(Enabler Feature or Capability)

(Enabler Feature or Capability)

(Enabler Feature or Capability)

Epic Name:	Funded Entry Date:	Epic Owner:
(Short name for the Epic)	(Date the Epic entered the funnel)	(The name of the Epic Owner)
Epic Description: (Consider using the Epic Hypothesis Statement in the Epic article as a starting point for a description of the epic.)		
Impact on Products, Programs and Services: (Identify products, programs, services, teams, departments, etc. that will be impacted by this Epic)		
Impact on Sales, Distribution, Deployment (Describe any impact on how the product is sold, distributed, or deployed)		
Analysis Summary (Brief summary of the analysis that has been formed to create the business case)		
Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)	Estimated Story Points (MVP): (Estimate story points for the MVP of the epic)	Estimated Monetary Cost (MVP): (Example: Estimated story points * cost per story \$ for MVP features)
Leading Indicators: (Establish innovative accounting metrics to provide leading indicators of the outcomes hypothesis; for example, a measurable change in purchase demographics within 30 days of feature release)		
In Scope: Out of Scope: Nonfunctional Requirements:		
• —	• —	• —
• —	• —	• —
• —	• —	• —
Minimum Viable Product (MVP) Features Additional Potential Features		
• (Enabler Feature or Capability)	• (Enabler Feature or Capability)	• (Enabler Feature or Capability)
Sponsors: (List key business sponsors who will be supporting the initiative)		
Users and Markets Affected: (Describe the user community and any markets affected)		
Impact on Products, Programs and Services: (Identify products, programs, services, teams, departments, etc. that will be impacted by this Epic)		
Impact on Sales, Distribution, Deployment (Describe any impact on how the product is sold, distributed, or deployed)		
Analysis Summary (Brief summary of the analysis that has been formed to create the business case)		
Go / No-Go: (Go, or No-Go recommendation)		

View the full template in the workbook!

8.3 Contribute Enabler Epics to the Portfolio Kanban

Migrating to the Cloud

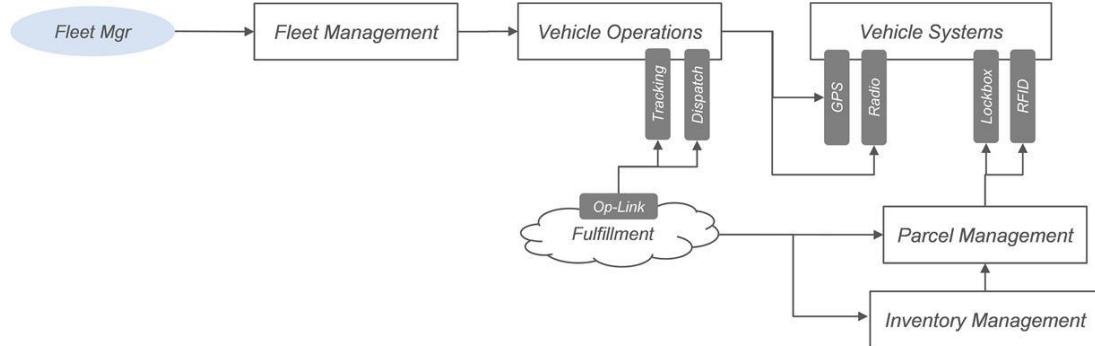
Marco Torres, Enterprise Architect, has identified a new Epic for the Globalzon joint venture:

“Our Portfolio Vision emphasizes maximum reliability, scalability, and multitenancy. Therefore, we need to start thinking about ways to port our autonomous delivery systems to the Cloud.

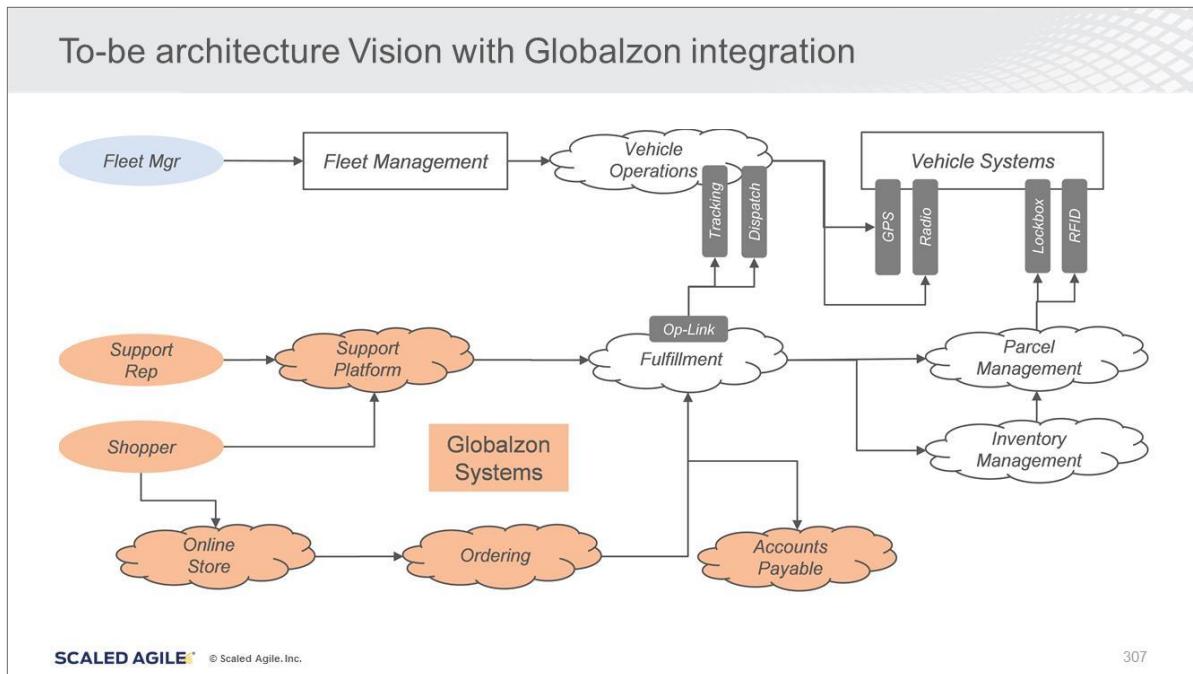
“Our Solution must also interface with Globalzon’s Cloud-based ordering, support, and accounts payable systems as shown on the next slides.”



TTC's fulfillment platform going into joint venture



8.3 Contribute Enabler Epics to the Portfolio Kanban



Activity: Write an Epic hypothesis statement

- ▶ **Step 1:** Leveraging the as-is and to-be architecture models and other assets (Strategic Themes, Value Streams, portfolio canvas, and Vision) provided earlier, develop an Epic hypothesis statement for migrating TTC's autonomous delivery fulfillment platform to the Cloud
- ▶ **Step 2:** Use the template on the next slide as a guide
- ▶ **Step 3:** Be prepared to share your answers

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8.3 Contribute Enabler Epics to the Portfolio Kanban

Epic hypothesis statement template

Epic Hypothesis Statement	
For	<customers or systems>
who	<do something>
the	<solution>
is a	<something – the “how”>
that	<provides this value>.
Unlike	<competitor, current solution, or non-existing solution>
our solution	<does something better – the “why”>.
Business Outcome Hypothesis	<ul style="list-style-type: none">••
Leading Indicators	<ul style="list-style-type: none">• <early innovation accounting measures>•
Non-Functional Requirements	<ul style="list-style-type: none">••

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Lean Business Case

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Epic Name: (Short name for the Epic)	Funnel Entry Date: (Date the Epic entered the funnel)	Epic Owner: (The name of the Epic Owner)
Epic Description: (Consider using the Epic Hypothesis Statement in the Epic article as a starting point for a description of the epic.)		
Business Outcome Hypothesis: (Describe how the success of the Epic will be measured: for example, 50% increase in shoppers under 25; Availability increases from 97% to 99.7%, etc.)		Leading Indicators: (Establish innovation accounting metrics to provide leading indicators of the outcomes hypothesis: for example, a measurable change in purchaser demographics within 30 days of feature release)
In Scope: <ul style="list-style-type: none"> • ... • ... • ... 	Out of Scope: <ul style="list-style-type: none"> • ... • ... • ... 	Nonfunctional Requirements: <ul style="list-style-type: none"> • ... • ... • ...
Minimum Viable Product (MVP) Features <ul style="list-style-type: none"> • (Feature or Capability) • ... • ... 		Additional Potential Features <ul style="list-style-type: none"> • (Feature or Capability) • ... • ...
Sponsors: (List key business sponsors who will be supporting the initiative)		
Users and Markets Affected: (Describe the user community and any markets affected)		
Impact on Products, Programs and Services: (Identify products, programs, services, teams, departments, etc. that will be impacted by this Epic)		

Lean Business Case

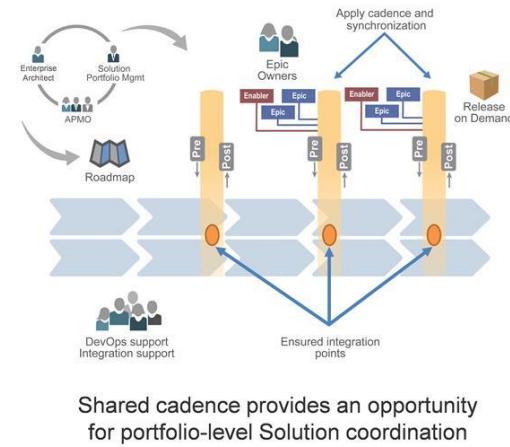
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Impact on Sales, Distribution, Deployment: (Describe any impact on how the product is sold, distributed, or deployed)		
Analysis Summary: (Brief summary of the analysis that has been formed to create the business case.)		Go / No-Go: (Go, or No-Go recommendation)
Estimated Story Points (MVP): (Estimated story points for the MVP of the epic)	Estimated Monetary Cost (MVP): (Example: Estimated story points * cost per story point for MVP features)	
Type of Return: (Market share, increased revenue, improved productivity, new markets served, etc.)	Anticipated Business Impact: (Revenue, ROI, or other applicable financial metrics)	
In-house or Outsourced Development: (Provide recommendations for where the Epic should be developed)		
Estimated Development Timeline	Start Date: (Estimated start date)	Completion date: (Estimated MVP evaluation date or estimated number of PIs)
Incremental Implementation Strategy: (Epics are defined as a single whole, but each epic undergoes incremental implementation. Click here for details on potential strategies. Many parts of this guidance can also be applied to enabler epics)		
Sequencing and Dependencies: (Describe any constraints for sequencing the epic and identify any potential dependencies with other Epics)		
Milestones or Checkpoints: (Identify potential milestones or checkpoints for reevaluation of the Epic)		
Attachments: (Other supporting documentation, links to other data, feasibility or trade studies, models, market analysis, etc., that were used in the creation of the business case)		
Other Notes and Comments: (Any additional miscellaneous information)		

8.4 Coordinate across Value Streams

Coordinate across Value Streams

- ▶ **Solution Portfolio Management -** Has the overall responsibility for guiding a portfolio to a set of integrated Solutions
- ▶ **Enterprise Architect -** Provides technical guidance for the long-term evolution of the technologies and platforms and the larger nonfunctional requirements
- ▶ **Agile Program Management Office (APMO) -** Typically responsible for supporting decentralized, but efficient, program execution (along with the STEs and RTEs)



EA role in Value Stream coordination

- ▶ Enterprise Architects (EAs) provide technical guidance for the long-term evolution of the technologies and platforms and the larger nonfunctional requirements for the portfolio Solution set (security, compliance, performance, and more)
- ▶ EAs also foster flow by identifying runway needed to minimize the impact of cross-cutting dependencies



Discussion: Coordinate across Value Streams

Duration
 5 min

As a class, discuss the coordination required across the three Value Streams below, considering the following questions:

- ▶ What systems are shared across these Value Streams?
- ▶ What systems are integrated across these Value Streams?
- ▶ How might each Value Stream evolve differently over time?
- ▶ Who should manage this coordination?

Autonomous Vehicle Program

Autonomous Delivery Program

Globalzon Joint Venture

Lesson review

In this lesson you:

- ▶ Reviewed how to align architecture to Enterprise strategy
- ▶ Examined how to evolve the Solution Portfolio
- ▶ Discovered how to contribute Enabler Epics to the Portfolio Kanban
- ▶ Examined how to coordinate across Value Streams



Action Plan: Supporting new Strategic Themes and Value Streams

Duration
5 min

On the Action Plan page in your workbook, answer the following questions:

- ▶ What can you do differently to ensure your architecture is aligned to Enterprise business strategy?
- ▶ How could you use investment horizons to manage obsolescence and technical debt?
- ▶ How can you better refine and manage Epics for architecture work?

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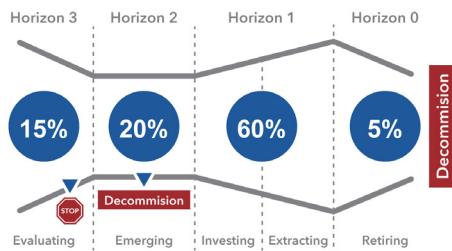
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The *Lean Portfolio Management Workshop Toolkit* provides guidance, introduces the SAFe Lean Portfolio Management Competency, and prepares learners for their role in the LPM function



Lesson 8: Supporting New Strategic Themes and Value Streams



What can you do differently to ensure your architecture is aligned to Enterprise business strategy?

How could you use investment horizons to manage obsolescence and technical debt?

How can you better refine and manage Epics for architecture work?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

Lesson 9

Leading as an Architect during a Lean-Agile Transformation

Learning Objectives:

- 9.1 Describe how Architects perform as Lean-Agile leaders
- 9.2 Describe how to lead the transition to Agile architecture during a transformation
- 9.3 Develop an action plan to support your organization's transformation



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

SAFe® for Architects

Lesson 9: Leading as an Architect during a Lean-Agile transformation



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

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Learning objectives

At the end of this lesson you should be able to:

- ▶ 9.1 Describe how Architects perform as Lean-Agile leaders
- ▶ 9.2 Describe how to lead the transition to Agile architecture during a transformation
- ▶ 9.3 Develop an action plan to support your organization's transformation

9.1 Describe how Architects perform as Lean-Agile leaders

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Activity: Motivating knowledge workers



As leaders, Architects influence the morale and productivity of knowledge workers. Thinking back to SAFe Lean-Agile Principle #8, identify some actions Architects can do to enable or inhibit knowledge workers' intrinsic drives.

Enable:

Inhibit:

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9.1 Describe how Architects perform as Lean-Agile leaders

SAFe Core Values and House of Lean

The SAFe Core Values and House of Lean guide Lean-Agile leaders.

Core Values

- Built-In Quality
- Program execution
- Alignment
- Transparency



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Lean-Agile Leadership

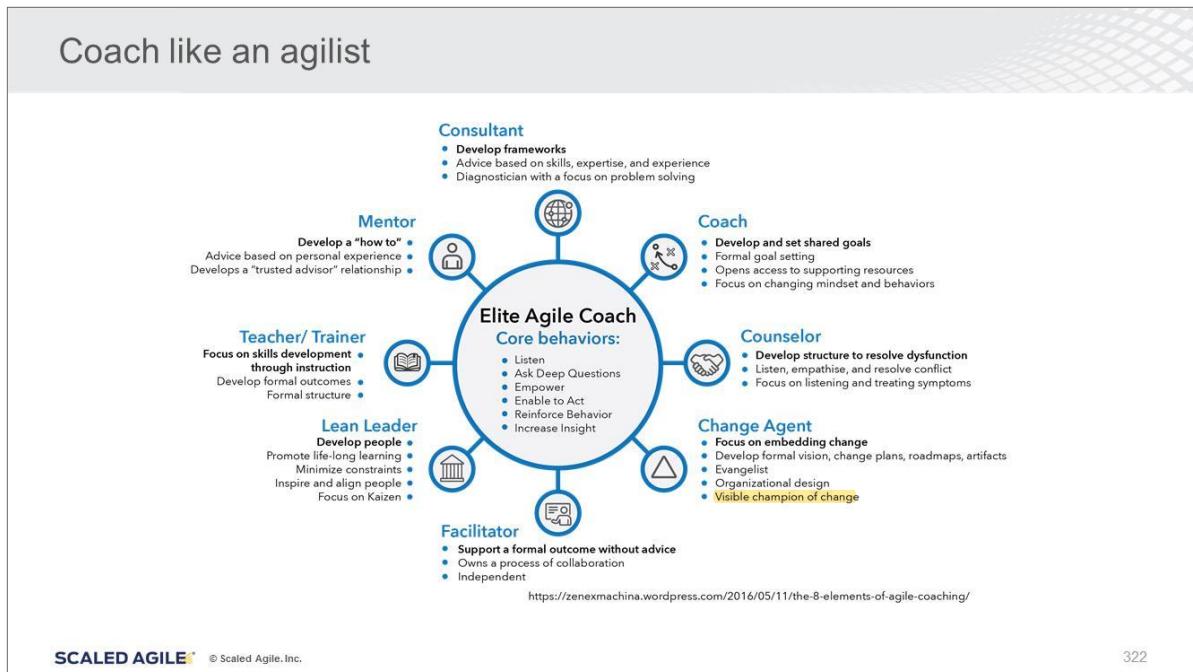
- ▶ Lean-Agile Leadership anchors the foundation of SAFe
- ▶ Lean-Agile leaders shape the culture and environment by:
 - Acting as Lean-thinking manager-teachers
 - Reinforcing SAFe Core Values and principles
 - Adopting and exhibiting a Lean-Agile Mindset



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9.1 Describe how Architects perform as Lean-Agile leaders



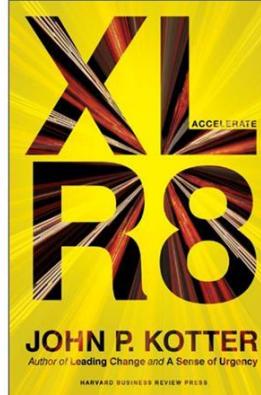
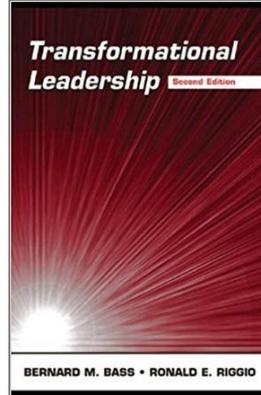
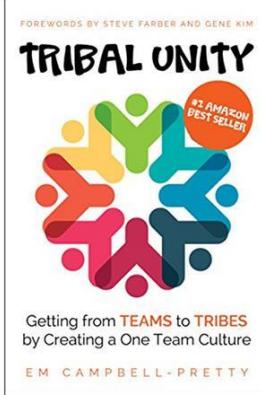
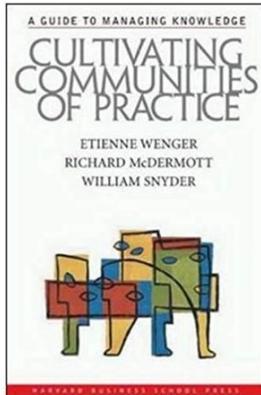
Activity: Best practices for leading and coaching

Duration: 5 min

- ▶ **Step 1:** As an Architect, how can you lead and coach others in your organization toward a Lean-Agile Mindset?
- ▶ **Step 2:** How can you lead and coach to specifically support:
 - SAFe Core Values?
 - SAFe principles?
 - The House of Lean?
 - Other values?

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Continually improve leadership and transformation skills



9.2 Describe how to lead the transition to Agile architecture during a transformation

9.2 Describe how to lead the transition to Agile architecture during a transformation

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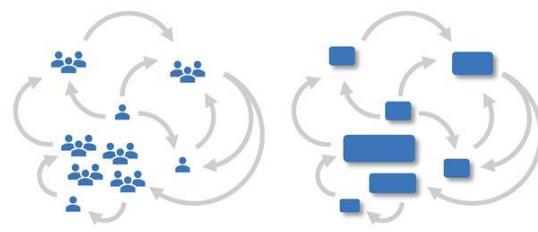
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Remember Conway's Law

Organizations which design systems...are constrained to produce designs which are copies of the communication structures of these organizations.

– Melvin Conway

- ▶ Architecture mimics team structure
- ▶ If teams are large and disorganized, the architecture will be too
- ▶ If teams are loosely coupled and Agile, the architecture will be too
- ▶ Evolve team structure and architecture together



Team Structure

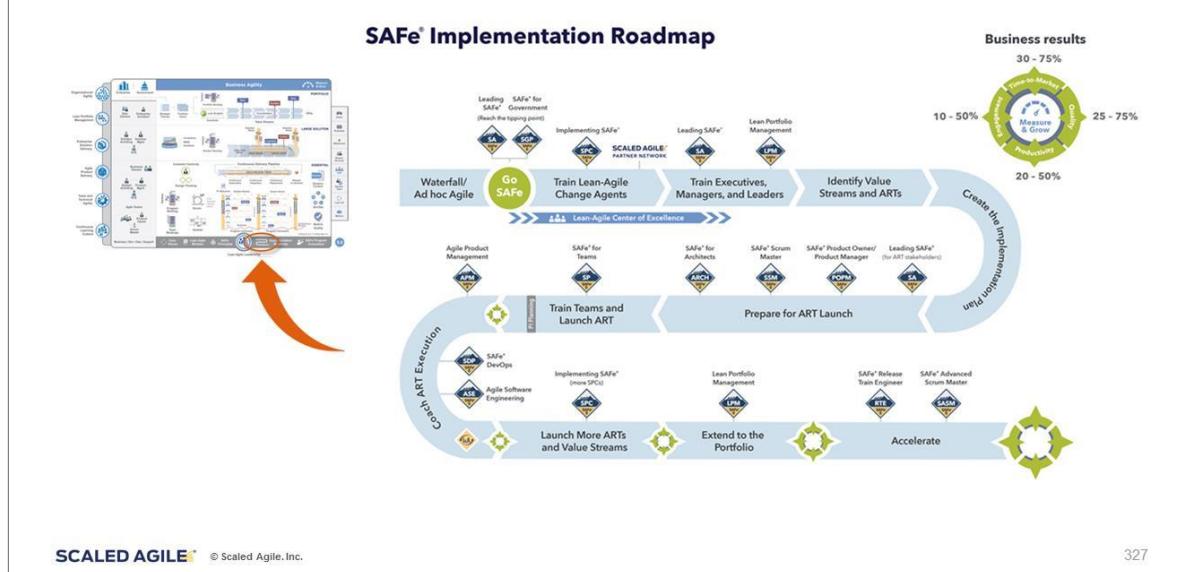
Architecture

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9.2 Describe how to lead the transition to Agile architecture during a transformation

Use the Implementation Roadmap to guide the transition

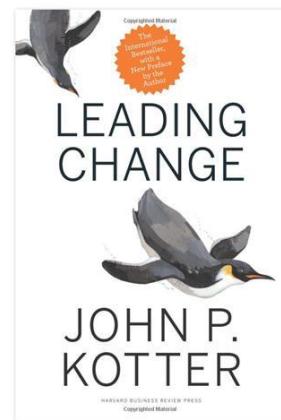


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Steps for successful change

1. Establish a sense of urgency
2. Create a powerful guiding coalition
3. Develop the vision and strategy
4. Communicate the vision
5. Empower employees for broad-based action
6. Generate short-term wins
7. Consolidate gains and produce more wins
8. Anchor new approaches in the culture



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9.2 Describe how to lead the transition to Agile architecture during a transformation

Collaborate with the Lean-Agile Center of Excellence (LACE)

- ▶ Lean-Agile transformations are typically led by a team that is committed to delivering improvements
- ▶ Transformation teams should include executive participants
- ▶ Architects should provide technical guidance to and collaborate with the LACE

A guiding coalition that operates as an effective team can process more information, more quickly. It can also speed the implementation of new approaches because powerful people are truly informed and committed to key decisions.

—John Kotter

Lean-Agile Transformation Team Mission Statement (SAMPLE)

For	EMV Productions, Inc.
who	produces automated guided vehicles and amusement park rides
the	EMV Lean-Agile Transformation Team
is a	full-time cross-functional scrum team
that	is committed to increasing quality, accelerating delivery, improving employee engagement, and increasing customer satisfaction.
Unlike	The ad-hoc transformation efforts today
we	provide the leadership for process, technology and tooling, culture, and governance using the Scaled Agile Framework

In Scope

- ▶ Leadership transformation
- ▶ ART launches
- ▶ Agile Project Management tooling
- ▶ Automated testing tools and training
- ▶ ...

Out of Scope

- ▶ Org structure changes
- ▶ Outsourcing strategy changes
- ▶ ...

Success Criteria

- ▶ 50% decrease in post-release defects
- ▶ 20% faster time to market
- ▶ 25% increase in employee satisfaction
- ▶ ...



Discussion: Architects' roles in transformation



As a class, answer the following questions:

- ▶ Discuss how Architects can participate in a Lean-Agile center of excellence (LACE). Give specific examples based on experience.
- ▶ What advice would you give Architects in organizations just beginning to implement SAFe and/or execute a Lean-Agile transformation?

9.3 Develop an action plan to support your organization's transformation

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Discussion: Overcoming barriers to Agile architecture

Duration
5 min

- ▶ **Step 1:** Review the list of challenges you are facing in transitioning to Agile architecture in your organization (created in Lesson 1).
- ▶ **Step 2:** Discuss as a class if there are any challenges on the list we have not addressed in the course.
- ▶ **Step 3:** Choose a challenge from the list that you can help lead your organization through. You will be able to record your thoughts on how you will lead your organization through this challenge during the Action Plan activity on the last slide of this course.

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Lesson review

In this lesson, you:

- ▶ Described how Architects perform as Lean-Agile leaders
- ▶ Outlined how Architects lead the transition to Agile architecture during a transformation
- ▶ Developed an action plan for supporting your Lean-Agile transformation



Action Plan: Leading as an Architect during a Lean-Agile transformation

Duration
 5 min

On the Action Plan page in your workbook, answer the following questions:

- ▶ How can you engage your organization to facilitate a Lean-Agile transformation?
- ▶ What are some of the challenges you identified on slide 18 of this lesson that might hinder the transformation and how can you help lead your organization through them?
- ▶ What are the top three things you learned in this course that you want to bring into your work immediately?



Lesson 9:

Leading as an Arch. during a Lean-Agile transformation



How can you engage your organization to facilitate a Lean-Agile transformation?

What are some of the challenges you identified on slide 18 of this lesson that might hinder the transformation and how can you help lead your organization through them?

What are the top three things you learned in this course that you want to bring into your work immediately?

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

9.3 Develop an action plan to support your organization's transformation

Lesson 10

Becoming a Certified SAFe Professional

Learning Objectives:

10.1 Becoming a Certified SAFe Professional



SAFe® Course Attending this course gives students access to the SAFe® Architect exam and related preparation materials.

SAFe® for Architects

Lesson 10: Becoming a Certified SAFe Professional



SAFe® Course Attending this course gives students access to the SAFe for Architects exam and related preparation materials.

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Manage your member profile, access videos and training resources, join Communities of Practice, and more.



Prepare Yourself

Access your learning plan featuring your digital workbook, study materials, and certification practice test



Become a Certified SAFe Professional

Get certified to validate your knowledge, expand your professional capabilities, and open the door to new career opportunities.



Access SAFe Content and Tools

Access professional development resources and your trainer enablement plan to teach SAFe instructor-led courses.



Collaborate in real time with your team and others

Choose from ready-made templates to easily set up events like PI Planning and retrospectives—all with SAFe Collaborate.



Showcase SAFe Credentials

Display your digital badge to promote your SAFe capabilities and proficiencies throughout your career.

10.1 Becoming a Certified SAFe Professional



Video: Become a Certified SAFe Professional

Duration
3 min

Continue to build on the foundation of SAFe learning you began in class by studying and taking the certification exam.

Earning this certification demonstrates and establishes your new knowledge.

Certification details at:

<https://bit.ly/2zCu2pa>



Video link: <https://vimeo.com/307578726>



About SAFe certification: <https://www.scaledagile.com/certifications/about-safe-certification/>



Video: Welcome to the SAFe Community Platform

Duration
5 min

Want to learn more about the next steps on your SAFe Journey?

Access the SAFe Community Platform and discover all the SAFe resources available for your use!



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Video link: <https://vimeo.com/286920560>

Certification Exam Sample Questions

These sample questions provide examples of the format and type of questions to expect on the exam (these are not the actual exam questions). Performance on the sample questions is NOT an indicator of the performance on the exam, and it should NOT be considered an assessment tool. A web-enabled version of the sample questions are now available in a flashcard style format (internet required). Use the link below to access the sample question bank and begin preparing for certification.

To get started:

1. Click the link below
2. A browser window will open with the sample questions site
3. Click "Start"
4. Use the left-side menu to scroll and select your course
5. Click "Start" to access the sample questions



Sample questions: <http://bit.ly/3aqpP4O>

Notes

Reminder: If using a digital workbook, save your PDF often so you don't lose any of your notes.

Appendix 1

Glossary



SAFe Glossary:

Visit the Scaled Agile Framework site
(<https://v5.scaledagileframework.com/glossary/>) to download glossaries
translated into other languages