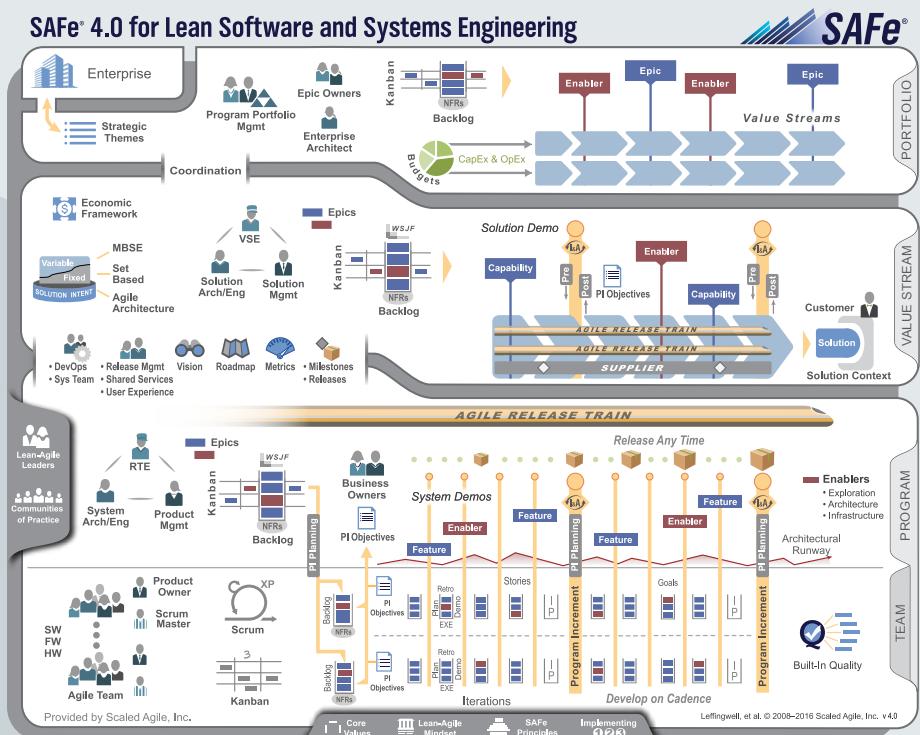


SAFe® 4.0 Introduction

Overview of the Scaled Agile Framework® for Lean Software and Systems Engineering

A Scaled Agile, Inc. White Paper
July 2016



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Foreword

To understand why there is a need for the Scaled Agile Framework® (also known as SAFe®), I'm reminded of Jack Welch's words: "If the rate of change on the outside exceeds the rate of change on the inside, the end is near."

Digital disruption is now causing the rate of change to accelerate in ways that are leaving some of the world's largest brands eating the dust of their newer competitors. It's no longer happening to just a few organizations in select industries. It's a reality for every enterprise and government, regardless of size, geography, or industry. It's easy to see that market leaders have turned that disruption into opportunity, finding ways to quickly adapt to the change, and leverage the disruption to their advantage.

This is the new norm. To succeed in this digital adapt-or-die environment, enterprises must be able to rapidly change the way they create and deliver value to their customers. Their ability to do that is highly dependent on their dexterity in developing software and systems—the underpinnings of nearly every function in every industry across the globe. As those software and cyber-physical systems become increasingly complex, the methods used to develop those systems must allow the work culture to embrace collaboration, innovation, and speed.

The assumptive, one pass, stage-gated, waterfall methods of the past have not scaled to the new challenge. A more responsive development method is needed to take on the demands of the modern technological and cultural landscape. Agile is a major step in that direction, but Agile was developed for small teams, and by itself, does not scale to the needs of the larger enterprises and the systems they create. That's where SAFe comes into the picture. It applies the power of Agile, but takes it to the next level by leveraging the more extensive knowledge pools of systems thinking and Lean product development.

SAFe provides comprehensive guidance for achieving the benefits of Lean-Agile development at enterprise scale. It is designed to help enterprises deliver value continuously and more efficiently on a regular and predictable schedule, making them more Agile in the marketplace and more competitive in their industry. Many of the largest organizations in the world have adopted SAFe, and the adoption rate is accelerating.

As you introduce yourself to the Framework, it is important to understand the reasons *why* these approaches work, not just what they are. That's why SAFe is based on Lean-Agile principles. If you understand why things work, you can more easily apply them to your unique context. Also, know that SAFe, like the marketplace it serves, is an evolving work of innovation and ideas by people committed to the same mission that you are. It may look a little different from version to version, but its core purpose remains steady, which is to help enterprises build better systems, achieve better business outcomes, and provide better daily lives for the people who build the world's most important new systems.

—**Dean Leffingwell**

Creator of SAFe, and Chief Methodologist, Scaled Agile, Inc.

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Introduction

The Scaled Agile Framework® (SAFe®) is a freely revealed knowledge base of proven, integrated patterns for enterprise-scale Lean-Agile development. It is scalable and modular, allowing each organization to apply it in a way that provides better business outcomes and happier, more engaged employees.

SAFe synchronizes alignment, collaboration, and delivery for large numbers of Agile teams. It supports both software and systems development, from the modest scale of well under 100 practitioners to the largest software solutions and complex cyber-physical systems, systems that require thousands of people to create and maintain. SAFe was developed in the field, based on helping customers solve their most challenging scaling problems. It leverages three primary bodies of knowledge: Agile development, Lean product development, and systems thinking.

The SAFe website—scaledagileframework.com—provides comprehensive guidance for scaling development work across all levels of an enterprise. SAFe's interactive “Big Picture” (Figure 1) provides a visual overview of the Framework. Each icon on the website is selectable, allowing the user to navigate to an article which provides extensive guidance on the topic area, along with links to related articles and further information.

The Big Picture has two views. The default “3-level view” (Figure 1, left) is well suited for solutions that require a modest number of Agile teams, as well as smaller systems, products and services that are largely independent of each other. The “4-level view” (Figure 1, right) supports those building large, integrated solutions that typically require hundreds or more practitioners to build and maintain.

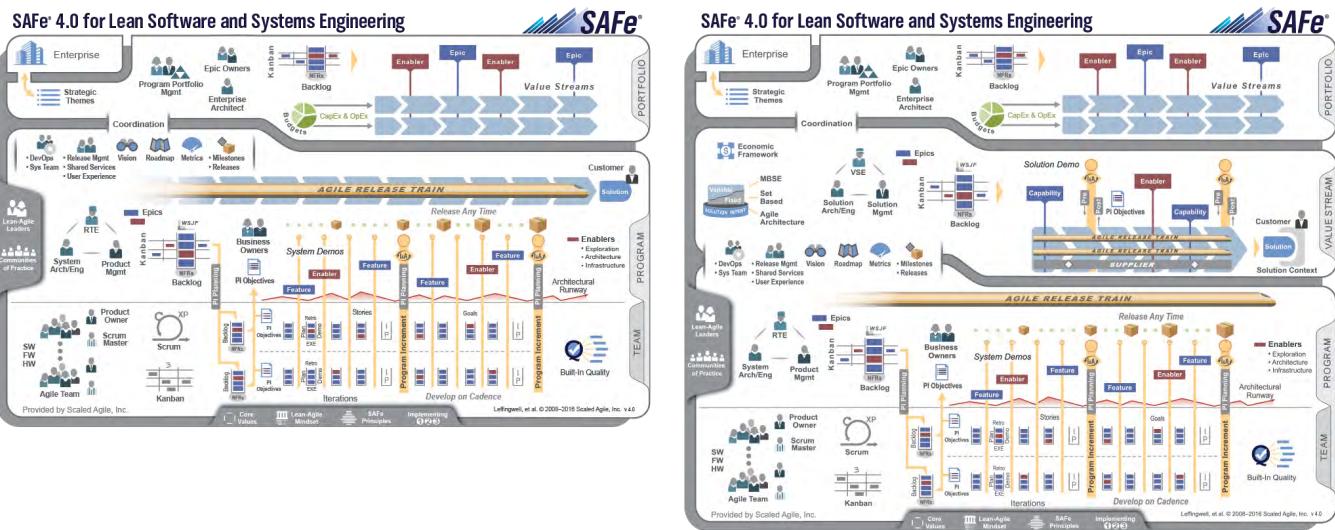


Figure 1. Big Picture: 3-level and 4-level SAFe

SAFe can be configured with the three or four organizational levels described above, plus a Foundation layer, as described below:

- **Team level** – SAFe is based fundamentally on Agile teams. Each team is responsible for defining, building, and testing stories (small pieces of new functionality) from their backlog. Teams deliver value in a series of fixed-length iterations (also called sprints). Teams use a common iteration cadence to synchronize work with other teams; this allows the entire system to iterate simultaneously. Teams employ Scrum (primarily) or Kanban methods. Each of these methods is augmented by built-in quality practices. Many software quality practices are derived from eXtreme Programming, while hardware and system quality practices are derived from contemporary Lean product development practices.
- **Program level** – SAFe teams are organized into a virtual program structure called the “Agile Release Train” (ART). Each ART is a long-lived, self-organizing team of Agile teams (typically 5 to 12), along with other stakeholders, that plan, commit, execute, inspect, and adapt together. ARTs are organized around the enterprise’s significant value streams. They align teams to a common mission, provide architectural and user experience guidance, facilitate flow, and provide continuous objective evidence of progress.
- **Value Stream level** – The optional Value Stream level supports the development of large and complex solutions. These solutions require multiple, synchronized ARTs, as well as stronger focus on solution intent and solution context. Suppliers and additional stakeholders contribute to this level as well. Pre-and Post Program Increment (PI) planning inform the ARTs (and vice versa) of the Value Stream mission and objectives.
- **Portfolio level** – The Portfolio level organizes and funds a set of value streams. The value streams realize a set of solutions, which help the enterprise achieve its strategic mission, as defined in part, by a set of strategic themes. The Portfolio level provides solution development funding via Lean-Agile budgeting, any necessary governance, and coordination of larger development initiatives that affect multiple value streams.
- **Foundation layer** – The Foundation layer holds various additional elements that support development. Elements of the Foundation layer include: Lean-Agile Leaders, Communities of Practice, Core Values, Lean-Agile Mindset, and Principles.

SAFe is improving business outcomes for government agencies and companies of all sizes across the globe, resulting in dramatic increases in employee engagement, improved economics, and workplaces that are more productive, engaging, and fun. Benefits from documented case studies include:

- 20-50% increase in productivity
- 30-75% faster time to market
- 50%+ defect reduction
- Happier, more motivated employees

View SAFe case studies from a wide range of industries at scaledagileframework.com/case-studies.

SAFe Core Values

"Find people who share your values, and you'll conquer the world together."

—John Ratzenberger

The SAFe Core Values are the guiding principles that dictate behavior and action. These values can help people know what is right from wrong, where to put their focus, and how to help companies to determine if they are on the right path to fulfill their business goals.

1. **Alignment** – Global alignment delivers more value than local optimization [1]. Thereby, individuals on Agile teams value the team's iteration goals above their personal responsibilities and tasks. Teams on Agile Release Trains value the achievement of the vision and program objectives over their team objectives. ARTs value the achievement of Value Stream objectives over ART objectives. Value streams most highly value their ability to contribute to portfolio business outcomes. Management is largely responsible for establishing the mission, but does so with the minimum possible constraints.
2. **Built-in quality** – Large systems have more economic sensitivity to quality than do the features and subsystems that define them. SAFe's built-in quality practices help every team understand and ensure that each solution element, at every increment, achieves appropriate quality standards throughout development. The result is fast, continuous flow with a minimum of delays due to rework, high value delivery velocity, and the highest levels of customer satisfaction.
3. **Transparency** – Large-scale solution development is difficult; things do not always work out as planned. Transparency—sharing progress and facts openly across all levels—is a key enabler of trust. Trust, in turn, enables fast, decentralized decision-making and higher levels of employee empowerment and engagement. Lean-Agile leaders foster trust and transparency by creating an environment of openness, one where "the facts are always friendly."
4. **Program execution** – The ability of each Agile Release Train to routinely and predictably deliver value is a hallmark of a successful SAFe implementation. To this end, SAFe's Program level provides extensive guidance to the roles and responsibilities—and the most significant activities—that help ARTs accomplish this key objective.

The Lean-Agile Mindset

"It is not enough that management commit themselves to quality and productivity, they must know what it is they must do. Such a responsibility cannot be delegated."

"People are already doing their best. The problem is with the system. Only management can change the system."

—W. Edwards Deming

Deming's quotes inspire and inform a fundamental premise of SAFe: the ultimate responsibility for the success of the enterprise, and thereby any significant change to the way of working, lies with management. To this end, SAFe describes a new style of leadership, one that is exhibited by SAFe's Lean-Agile leaders.

SAFe Lean-Agile leaders are lifelong learners and teachers who understand and embrace a Lean-Agile Mindset, its principles, and practices, and teach it to others. To achieve that effectively, leaders must first be trained in, and then become trainers of, these leaner ways of thinking and operating. This mindset is exhibited in SAFe, in part by the House of Lean and the Agile Manifesto, as illustrated in Figure 2.

House of Lean



Value in the sustainably shortest lead time

Agile Manifesto

- Individuals and interactions** over processes and tools
- Working software** over comprehensive documentation
- Customer collaboration** over contract negotiation
- Responding to change** over following a plan

Figure 2. Aspects of a Lean-Agile Mindset

The SAFe “House of Lean” metaphor is used to describe a number of fundamental lean concepts:

Value. The goal is the delivery of maximum value and quality to the customer in the shortest sustainable lead time. High employee morale, physical, intellectual and emotional safety, and customer delight are further tangible targets and benefits. Value is supported via the four “pillars” of the house:

1. **Respect for people and culture** – Management challenges people to change and may recommend what to improve, but the teams learn reflection and problem-solving skills and make the appropriate improvements. Leaders understand the role that culture plays, and work to move the culture forward in alignment with the new value system and principles.
2. **Flow** – Establishing a continuous flow of work is critical to fast value delivery. Emphasis is on avoiding the start-stop-start delay of project-based work, and a high value is placed on work visibility, long-lived teams, continuous knowledge acquisition and sharing, and decentralized decision-making.
3. **Innovation** – Flow builds a solid foundation for the delivery of value. But without innovation, both product and process will stagnate. Innovation doesn’t simply “happen”—the right environment, including dedicated time for innovation must be allocated. One element of this is SAFe’s Innovation and Planning iteration, a free-form iteration that provides the time and intellectual freedom needed for innovation.
4. **Relentless improvement** – An enterprise improves through continuous reflection and relentless improvement. A constant sense of competitive danger drives the learning organization to aggressively pursue opportunities to improve, and to respond quickly to challenges and opportunities.

Leadership. The foundation of the House of Lean is leadership. Leaders are trained in these new and innovative ways of thinking, and personally exhibit these values, principles, and behaviors. The other element of Lean-Agile leadership is defined in large part by the Agile Manifesto. Along with various Agile practices, the Manifesto for Agile Software Development provides the foundation for effective, empowered, cross-functional, self-organizing, and self-managing Agile teams. It provides both a value system (Figure 2, right) and a set of twelve principles [3] that provide the basic philosophy of the Agile approach. SAFe’s Lean-Agile leaders support the Manifesto, and SAFe is fully dependent on Agile teams.

SAFe Lean-Agile Principles

"The impression that 'our problems are different' is a common disease that afflicts management the world over. They are different, to be sure, but the principles that will help to improve the quality of product and service are universal in nature."

—W. Edwards Deming

SAFe's practices are grounded on nine fundamental principles that have evolved from Agile principles and methods, Lean product development, systems thinking, and observation of successful enterprises. There is a specific article for each principle on the SAFe website, and the embodiment of the principles appears throughout the Framework. Each of the principles is briefly described below.

#1 - Take an economic view

Delivering the best value and quality to people and society in the sustainably shortest lead time requires a fundamental understanding of the economics of the system builder's mission. Lean systems builders endeavor to make sure that everyday decisions are made in a proper economic context. The primary aspects include developing and communicating the strategy for incremental value delivery, and the creation of the Value Stream economic framework, which defines the trade-offs between risk, cost of delay, operational and development costs, and supports decentralized decision-making.

#2- Apply systems thinking

Deming, one of the world's foremost systems thinkers, constantly focused on the larger view of problems and challenges faced by people building and deploying systems of all types—manufacturing systems, social systems, management systems, even government systems. One central conclusion was the understanding that the problems faced in the workplace were a result of a series of complex interactions that occurred within the systems the workers used to do their work. In SAFe, systems thinking is applied to the organization that builds the system, as well as the system under development, and further, how that system operates in its end user environment.

#3 - Assume variability; preserve options

Traditional design and life cycle practices drive picking a single requirements and design option early in the development process (early in the "cone of uncertainty"). However, if the starting point is wrong, then future adjustments take too long and can lead to a suboptimal long-term design. Alternatively, Lean systems developers maintain multiple requirements and design options for a longer period in the development cycle. Empirical data is then used to narrow focus, resulting in a design that creates better economic outcomes.

#4 - Build incrementally with fast, integrated learning cycles

Lean systems builders develop solutions incrementally in a series of short iterations. Each iteration results in an integrated increment of a working system. Subsequent iterations build upon the previous ones. Increments provide the opportunity for fast customer feedback and risk mitigation, and also serve as minimum viable solutions or prototypes for market testing and validation. In addition these early, fast feedback points allow the systems builder to "pivot" where necessary to an alternate course of action.

#5 - Base milestones on objective evaluation of working systems

Systems builders and customers have a shared responsibility to assure that investment in new solutions will deliver economic benefit. The sequential, phase-gate development model was designed to meet this challenge, but experience has shown that it does not mitigate risk as intended. In Lean-Agile development, each integration point provides an objective milestone to evaluate the solution, frequently and throughout the development life cycle. This objective evaluation provides the financial, technical and fitness-for-purpose governance needed to assure that a continuing investment will produce a commensurate return.

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

Lean systems builders strive to achieve a state of continuous flow, whereby new system capabilities move quickly and visibly from concept to cash. Three primary keys to implementing flow are to: 1) Visualize and limit the amount of work-in-process so as to limit demand to actual capacity, 2) Reduce the batch sizes of work items to facilitate reliable flow through the system, and 3) Manage queue lengths so as to reduce the wait times for new capabilities.

#7 – Apply cadence, synchronize with cross-domain planning

Cadence transforms unpredictable events into predictable ones, and provides a rhythm for development. Synchronization causes multiple perspectives to be understood, resolved and integrated at the same time. Applying development cadence and synchronization, coupled with periodic cross-domain planning, provides Lean systems builders with the tools they need to operate effectively in the presence of product development uncertainty.

#8 - Unlock the intrinsic motivation of knowledge workers

Lean-Agile leaders understand that ideation, innovation, and engagement of knowledge workers can't generally be motivated by incentive compensation, as individual MBOs (Management by Objectives) cause internal competition and destruction of the cooperation necessary to achieve the larger system aim. Providing autonomy, mission and purpose, and minimizing constraints, leads to higher levels of employee engagement, and results in better outcomes for customers and the enterprise.

#9 – Decentralize decision-making

Achieving fast value delivery requires fast, decentralized decision-making, as any decision escalated introduces delay. In addition, escalation can lead to lower fidelity decisions, due to the lack of local context, plus changes in fact patterns that occur during the wait time. Decentralized decision-making reduces delays, improves product development flow and enables faster feedback and more innovative solutions. However, some decisions are strategic, global in nature, and have economies of scale sufficient enough to warrant centralized decision-making. Since both types of decisions occur, the creation of an established decision-making framework is a critical step in ensuring fast flow of value.

Program and Team Level

The values and principles of SAFe provide the foundation for the Framework. However, as valuable as they are, values and principles alone don't provide much guidance on what one must do to achieve the benefits implied. For that, more specific guidance is needed: practices that identify roles and responsibilities, activities and events, and the various artifacts Lean systems builder use to manage the work of system building. Indeed, in an organizational change of any kind, people need to know what to do, and what is expected of them. That's only fair. To that end, the remainder of this document describes the specific practice guidance in SAFe, organized primarily by the four levels introduced earlier.

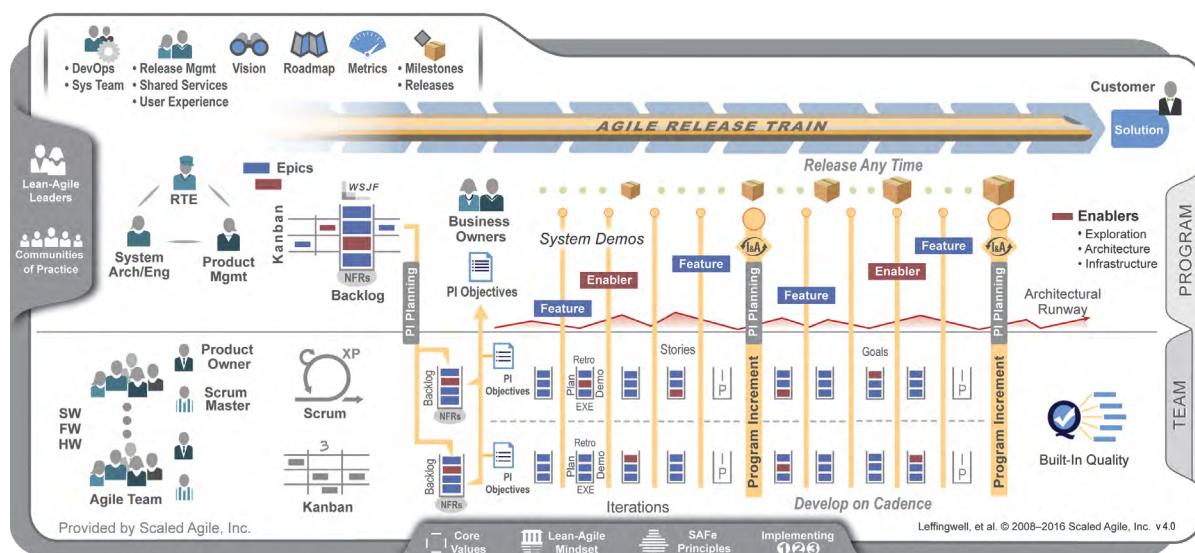


Figure 3 - Program level

Each ART is a long-lived, self-organizing team-of-Agile-teams: a virtual organization of about 50-125 people who plan, commit, and execute together. The ART is comprised of cross-functional teams, and includes all the roles that are necessary to move ideas from concept through deployment, as illustrated in Figure 4.

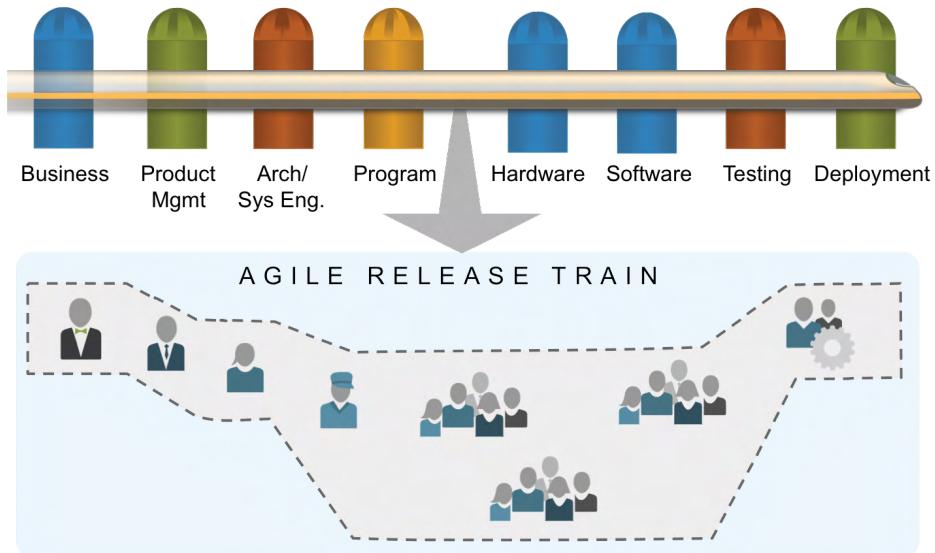


Figure 4. Cross-functional teams and trains

Each Agile Release Train:

- Aligns teams to a common mission and vision via a single program backlog
- Produces valuable and evaluable system-level solutions every two weeks
- Synchronizes team iterations
- Accumulates team iterations into a Program increment (PI), a fixed timebox for planning and execution
- Operates under the guidance of architects and user experience designers

The Spanning Palette

The Spanning palette (Figure 5) serves as a floating surface for roles and artifacts that can apply to multiple levels of SAFe. Most often, the items on the palette apply to the Program or Value Stream level. Some items can apply to the Portfolio or Team levels (e.g. Metrics, Vision, Roadmap, etc.). The Spanning palette is an essential part of the configurability and modularity of the Framework.



Figure 5. The Spanning palette

Agile Teams Power the Train

ARTs include the teams that define, build, and test features and components. SAFe teams have a choice of Agile practices, based primarily on Scrum, XP, and Kanban. Software quality practices include continuous integration, test-first, re-factoring, pair work, collective ownership, and more. Hardware quality is supported by exploratory early iterations, frequent system-level integration, design verification, modeling, and set-based design. Agile architecture supports software and hardware quality.

Each Agile team has five to nine dedicated individual contributors, covering all the roles necessary to build a quality increment of value for an iteration. Teams can deliver software, hardware, and any combination. Team roles include:

- **Scrum Master** – The Scrum Master facilitates team meetings, drives Agile behavior, removes impediments, helps maintain the team's focus by managing input demand, attends Scrum of Scrum meetings, and helps build a high-performing and self-managing team
- **Product Owner** – The Product Owner owns the team backlog, acts as the customer for developer questions, prioritizes the work, and works with Product Management to plan PIs and to deliver the larger scope of value
- **Development Team** – Developers, testers, and various specialists create and refine user stories and acceptance criteria; they define, build, test, and deliver stories

Agile Teams are supported on the ART mission by other stakeholders, including:

- **The Release Train Engineer (RTE)**, who acts as the chief Scrum Master for the train
- **Product Management** owns, defines, and prioritizes the program backlog
- **System Architect-Engineering** provides architectural and technical guidance
- **Business Owners** and the **Customer** are the key stakeholders on the Agile Release Train
- The **System Team** helps with infrastructure, assists with integration, performs ART-level testing, is capable of evaluating conformance to nonfunctional requirements, and assists with the system demo
- **DevOps** builds the deployment pipeline and facilitates automation and cooperation between Agile Teams and Operations
- **Shared Services** assists the train with specialty functions that cannot be dedicated to the train (database administrators, business analysts, etc.)

The supporting roles ensure that teams are capable of defining, developing, testing, and delivering working solutions at least every iteration.

Planning a Program Increment

"The most efficient and effective method of conveying information to and within a development team is face-to-face conversation." [4] SAFe takes face-to-face conversation to the next level via Program Increment (PI) planning. PI planning is a routine event that occurs on whatever PI cadence (usually 8-12 weeks) the train selects. A typical agenda is shown in Figure 6.



Figure 6. PI Planning agenda

The result of the planning event is a commitment to an agreed set of objectives for the next PI. The meeting is largely face-to-face. However, in geographically distributed ARTs, the event may occur at multiple locations simultaneously, with real-time communication between the locations.

PI planning requires preparation, coordination, and communication. Prior to the planning session, Product Management collaborates with Agile teams, stakeholders, and customers to develop the roadmap, program vision, top features, and milestones. System Architect/Engineering prepares technical briefings and guidance to support planning.

The Product/Solution vision and roadmap guides the delivery of features. The roadmap communicates the ART deliverables over a near-term time line—typically six months, or about three PIs. The roadmap provides visibility into the committed deliverables of the upcoming PI, and it shows forecasts, with medium confidence, for the following PI or two. Product Management develops and updates the roadmap, as the vision and delivery strategy evolve.

The program backlog stores all the upcoming work, and is developed, maintained and prioritized by Product Management. The backlog holds the features that have gone through the program Kanban and are ready for implementation in the upcoming or future PIs.

ARTs work in a continuous flow model that helps eliminate delays and keeps the system lean. Product Management applies weighted-shortest-job-first (WSJF) sequencing to prioritize work. WSJF gives precedence to jobs that have the highest cost of delay and the shortest duration.

Executing a Program Increment

After planning, various program events are used to create a closed-loop system that “keeps the train on the tracks,” as shown in Figure 7.

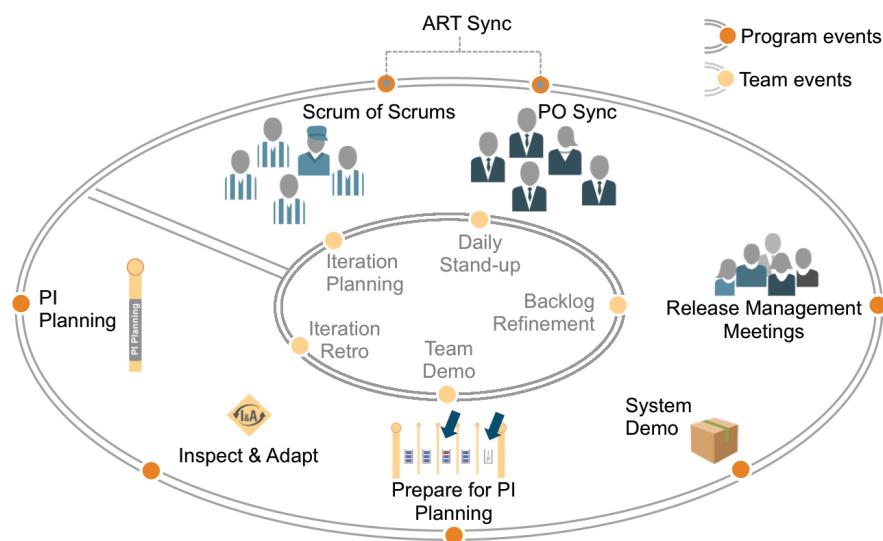


Figure 7. Program execution events

The RTE facilitates a weekly (or more frequent) Scrum of Scrums meeting to coordinate dependencies and gain visibility into progress and impediments. Product Managers (PMs) and Product Owners (POs) meet in the “PO Sync” to get visibility into how well the ART is progressing toward meeting the program PI objectives. Some ARTs combine the Scrum of Scrums and PO sync into one “ART Sync” meeting. Release Management meetings provide governance for upcoming releases. The System Demo occurs at the end of every iteration and provides an integrated, aggregate view of the new features that have been delivered by all the teams on the train. Finally, an Inspect and Adapt workshop is held to capture opportunities for improvement to be incorporated into the next PI planning session.

Team events form the inner loop and are repeated once per iteration. Individual team ceremonies include: Iteration Planning, Daily Stand-up, Team Demo, and local team Retrospective. During the iteration, teams use built-in quality practices and improve flow with Kanban. Teams also build up the Architectural Runway using emergent design in collaboration with intentional architecture.

Inspect and Adapt

In order to reflect on the execution and results of the previous PI, and build improvement backlog items for the next PI, the Inspect & Adapt (I&A) workshop is held at the end of each Program Increment.

The I&A events have three parts:

- PI System Demo – is a demo of all features completed by the ART during the past PI
- Quantitative measurement – teams review any quantitative metrics they have agreed to collect and discuss the data and trends
- Problem-solving workshop – teams conduct a short retrospective, and then systematically address the larger impediments that are limiting velocity.

Participants in the program I&A workshop include all the people involved in building the system, including the teams, RTE, System and Solution Architect/Engineering, Product Management, and Business Owners. Value Stream stakeholders may also attend this workshop, where applicable.

Develop on Cadence, Release Any Time

SAFe provides development teams with the cadence and synchronization tools needed to manage complexity, uncertainty, and rapid change. Releases, however, are a different matter. Releases may occur at any time, as the market demands. For example: at the end of a PI, during any iteration, or even continuously. Separating development concerns from release concerns allows Agile Release Trains to run on a routine, predictable schedule, without constraints on when releases can occur.

Portfolio Level

Each SAFe portfolio has the value streams, people, and processes necessary to provide funding and governance for the products, services, and solutions required to fulfill the overall business strategy. In small to mid-size companies, one SAFe portfolio may be all that's necessary. In the largest enterprises, multiple SAFe portfolios—one for each line of business—may be required, as shown in Figure 8.

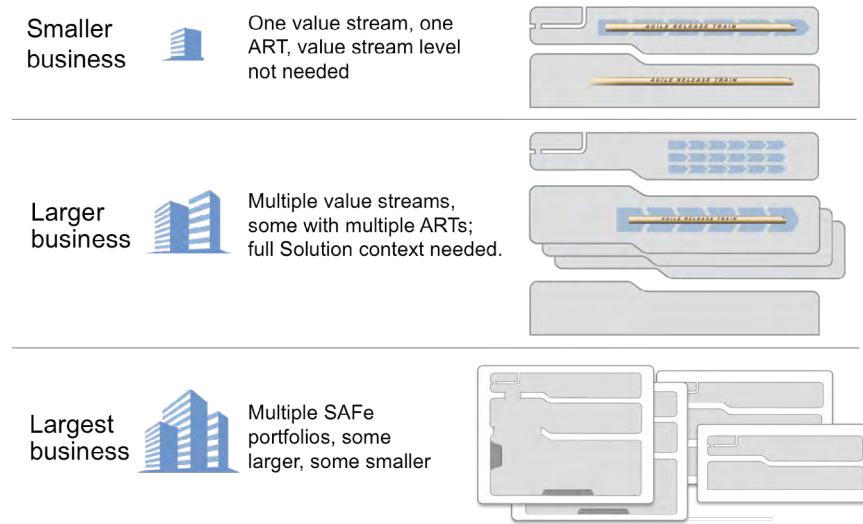


Figure 8. Portfolio structure by size of business

The constructs of the portfolio are illustrated in Figure 9 below.

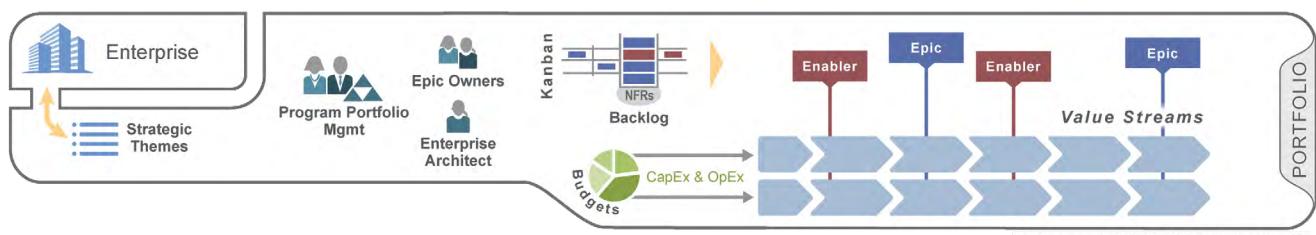


Figure 9. SAFe Portfolio level

Elements of the Portfolio include:

- Strategic Themes connect the portfolio to the Enterprise business strategy
- Program Portfolio Management consists of the stakeholders who have the highest level of fiduciary responsibility to deliver the business results
- Value streams are responsible for delivering the solutions, products and services required to help the enterprise achieve its mission

- The Enterprise Architect works with business stakeholders and Solution and System Architects to guide technology initiatives (enabler epics) and drive enterprise standards (NFRS and other) across value streams
- Portfolio Kanban provides visibility, analysis, and governance to initiatives that cut across value streams
- Lean-Agile budgeting and governance funds value streams (instead of projects) and applies objective metrics and milestones. This empowers value streams with their own dedicated budget for rapid decision-making and flexible value delivery, while Program Portfolio Management (PPM) retains control of total spending, which is adjusted over time.
- Portfolio Epics (large initiatives) are stewarded by Epic Owners from identification through the analysis and approval process of the Portfolio Kanban system

Portfolio epics are particularly important to an understanding of how the flow of value is managed in SAFe. Portfolio epics are large-enterprise initiatives requiring analysis of cost, impact, and opportunity in a lightweight business case, as well as approval, before implementation.

The Portfolio Kanban system manages the flow of epics. It brings structure to analysis and provides a transparent and quantitative basis for economic decision-making. It uses WIP limits to prevent overburdening teams with more epics than the teams can responsibly analyze or deliver, prevents unrealistic expectations, and drives collaboration among the key stakeholders.

Portfolio Value Streams

Lean and systems thinking drives the enterprise to organize development activities around the long-lived flows of value that deliver its products and services. In larger enterprises however, it is readily recognized that the flow of value does not respect organizational nor geographic boundaries, as Figure 10 illustrates.

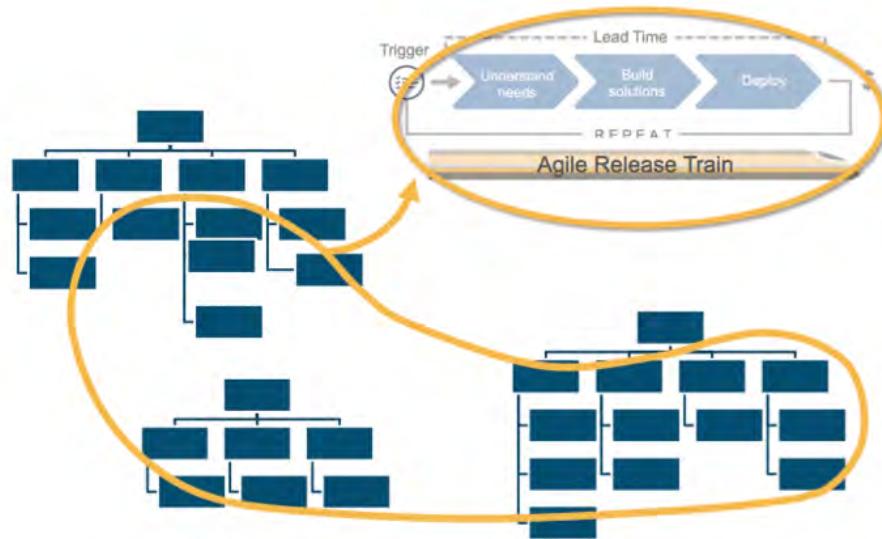


Figure 10. Value streams often cut across organizational and geographic boundaries

Value streams provide the mechanism for identifying and improving product development flow, but by themselves, they do not create systems. For that we need Agile Release Trains—the individuals and teams that build the value. The typically distributed nature of value creation is one of the reasons that ARTs are often virtual, rather than physical organizational units. For more information, please refer to the section entitled "Realizing Value Streams with ARTs."

Lean-Agile Budgeting

The traditional project-based work and funding model inhibits agility, flow, and knowledge acquisition. In its place, SAFe provides guidance for implementing a Lean-Agile budgeting model that includes:

- Funding value streams, not projects
- Approving epic-level initiatives vs. funding projects
- Empowering Value Stream content authority
- Providing objective evidence of fitness for purpose
- Exercising fiscal governance with dynamic budgeting

This approach reduces much of the friction and overhead associated with traditional project cost accounting, while still providing the appropriate fiduciary controls over what gets built and how that work is funded.

Forecasting

Given history and the work physics of Agile development, Program Portfolio Management and other planners can estimate how long a new portfolio epic might take under various scenarios. This provides a reasonable model for longer term planning and forecasting, as Figure 11 illustrates.

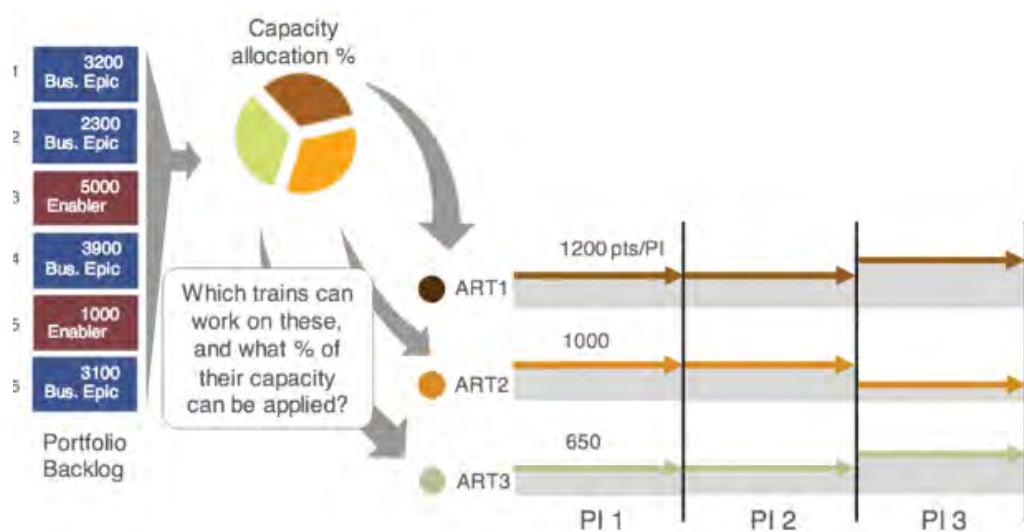


Figure 11. Portfolio forecasting with epic size estimates, capacity allocation, and program velocities

The capacity allocation for epics vs. existing work is negotiated between Program Portfolio Management and ART business owners. After performing various what-if calculations, the enterprise can reasonably predict how long it will take to deliver new initiatives, and provide a six-month to one-year roadmap with reasonable fidelity.

Value Stream Level

The Value Stream level is optional in SAFe. Enterprises that build systems that are largely independent, or that can be built with a few hundred practitioners, may not need these constructs. In that case, the portfolio can operate with the 3-level view. Even then, however, those are far from trivial systems, and the constructs at the Value Stream level can be used in 3-level SAFe as needed.

The Value Stream level helps enterprises that face the largest systems challenges, building large-scale, multidisciplinary software and cyber-physical, as well as high-assurance, systems. Building such solutions in a Lean-Agile manner requires additional constructs, artifacts, and coordination. The constructs of the Value Stream level are illustrated in Figure 12.

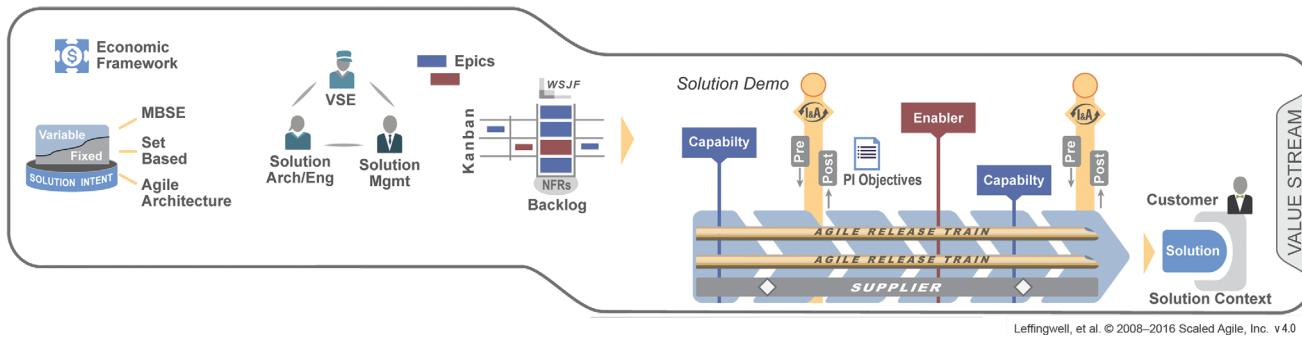


Figure 12 - Value Stream level

Highlights include:

- The Economic Framework which provides the financial boundaries for Value Stream decision-making
- Solution Intent that communicates the current and intended future state of the system
- Solution Context which provides how the solution fits in the deployment environment
- Capabilities which are used to describe the larger behaviors of the solution
- Capabilities that are developed and managed through the Value Stream Kanban (see below)
- Suppliers who add value and therefore are integral to the Value Stream

The Value Stream cadence is organized around ART PIs, which are used to synchronize all the ARTs in the Value Stream. Value streams enable cadence and synchronization of multiple ARTs and Suppliers via Pre and Post-PI planning meetings, Solution Demos, and Inspect and Adapt workshops. The Value Stream level also typically requires additional roles, specifically Solution Management, Solution Architect/Engineering, and the Value Stream Engineer.

Value Stream Flow

The Value Stream Kanban increases the visibility and flow of work and establishes a connection between portfolio-level and program-level Kanban systems. The Value Stream Kanban has two sections:

1. **Value Stream section** – is used to analyze and approve Value Stream epics and split them into capabilities that will be further explored and implemented in the “downstream” capabilities section.
2. **Capabilities section** – supports readiness, prioritization, and implementation of capabilities. Capabilities may originate locally or come from the upstream portfolio Kanban.

Realizing Value Streams with ARTs

Once the flow of value—and the location of the people and systems that deliver that value—is understood, the enterprise can start to consider how to organize Agile Release Trains to build the solution. ARTs are organized for the explicit purpose of working across boundaries to accelerate delivery. Effective ARTs typically consist of 50–125 people. The upper limit is based on Dunbar's number [2], which suggests a limit on the number of people with whom one can form effective, stable social relationships.

Given the size constraints, there are three possible value-stream-to-ART organizational outcomes, as illustrated in Figure 13.

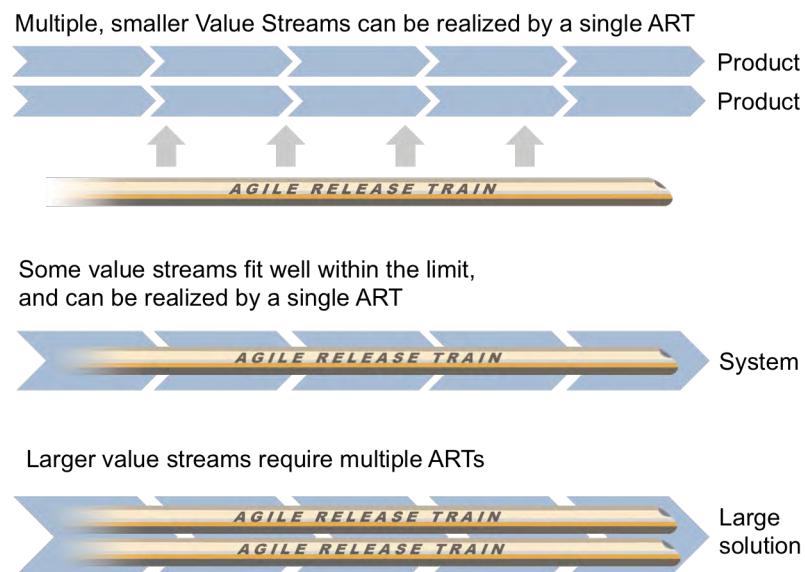


Figure 13. Organizing ARTs depending upon Value Stream size

Splitting large value streams into ARTs requires significant consideration. Some common patterns for how to accomplish this include dividing them by:

- Solution capabilities or feature areas (see below)
- Subsystems (applications, components, platforms, etc. - see below)
- Customer or market segment
- Subsets of value: enabling flows or Value Stream segments

Other considerations may play a role:

- Trains should be focused on a single, primary product or solution objective
- Teams with features and components that have a high degree of interdependencies should plan and work together

Train design requires careful consideration of the trade-offs and often involves a combination of the various patterns described above. The most common approach for ART design organizes around capabilities or subsystems.

- Capability ARTs are generally preferred and are optimized for value flow and delivery speed. However, they require additional technical governance to keep architecture from decaying and, ultimately, decreasing velocity.
- Subsystem ARTs are optimized for architectural robustness, critical components, or components that are used by many other elements. However, they may require significant content coordination to manage dependencies, as well as prioritization of different trains to maintain a reasonable velocity.

Leading the Lean-Agile Enterprise

The enterprise's executives, leaders, and managers are responsible for Lean-Agile adoption and success. Managers must become leaders who are trained in, and become trainers in, these leaner ways of thinking and operating. These behaviors are briefly described below.

#1 - Lead the change

Steering an organization toward Lean and Agile behaviors, habits, and results cannot be delegated. Leaders must exhibit and communicate the urgency for change, collaboratively build a plan, understand and manage the change process, and quickly solve problems. Leaders must have knowledge of organizational change management and take a systems view for implementing the transformation.

#2 - Know the way; emphasize lifelong learning

Create an environment that promotes continuous learning, and fosters formal and informal groups for learning and improvement. Encourage team members to build relationships with customers and suppliers and expose them to other world views. Strive to learn and understand new developments in Lean, Agile, and contemporary management practices.

#3 - Develop people

Focus on developing people's knowledge and skills rather than on being the go-to expert or coordinator of tasks. Create a team that is jointly responsible for success. Learn how to solve problems together in a way that develops people's capabilities and increases their engagement and commitment. Respect people and culture.

#4 - Inspire and align with mission

Minimize constraints. Provide an inspirational mission and vision and eliminate demotivating rules, policies, and procedures. Build Agile teams and trains organized around value. Understand the power of self-organizing, self-managing teams. Create a safe, failure-tolerant environment for learning, growth, and mutual influence. Build an economic framework for each Value Stream and teach it to everyone.

#5 - Decentralize decision-making

Establish a decision-making framework. Empower others by setting the mission, developing people, and teaching them to problem-solve. Take responsibility for making and communicating strategic decisions—those that are infrequent, long lasting, and have significant economies of scale. Decentralize all other decisions.

#6 - Unlock the intrinsic motivation of knowledge workers

According to Peter Drucker, "knowledge workers are individuals who know more about the work that they perform than their bosses." Given that context, managers need to change the system. For example: Understand the role that compensation plays in motivating knowledge work and change from individual rewards to team rewards. Create an environment of mutual influence. Eliminate any and all management processes that cause internal competition. Revamp personnel evaluations to support Lean-Agile principles and values. Provide purpose and autonomy; help workers achieve mastery of new and increasing skills.

Implementing SAFe

Implementing any change, including one as significant as moving to a Lean-Agile way of working, is a significant effort in any enterprise. Based on the learnings from hundreds of SAFe implementations, a basic "Implementing SAFe 1-2-3" pattern for adopting SAFe has emerged, as illustrated in Figure 14. Each of the elements in this strategy is described in the paragraphs below:

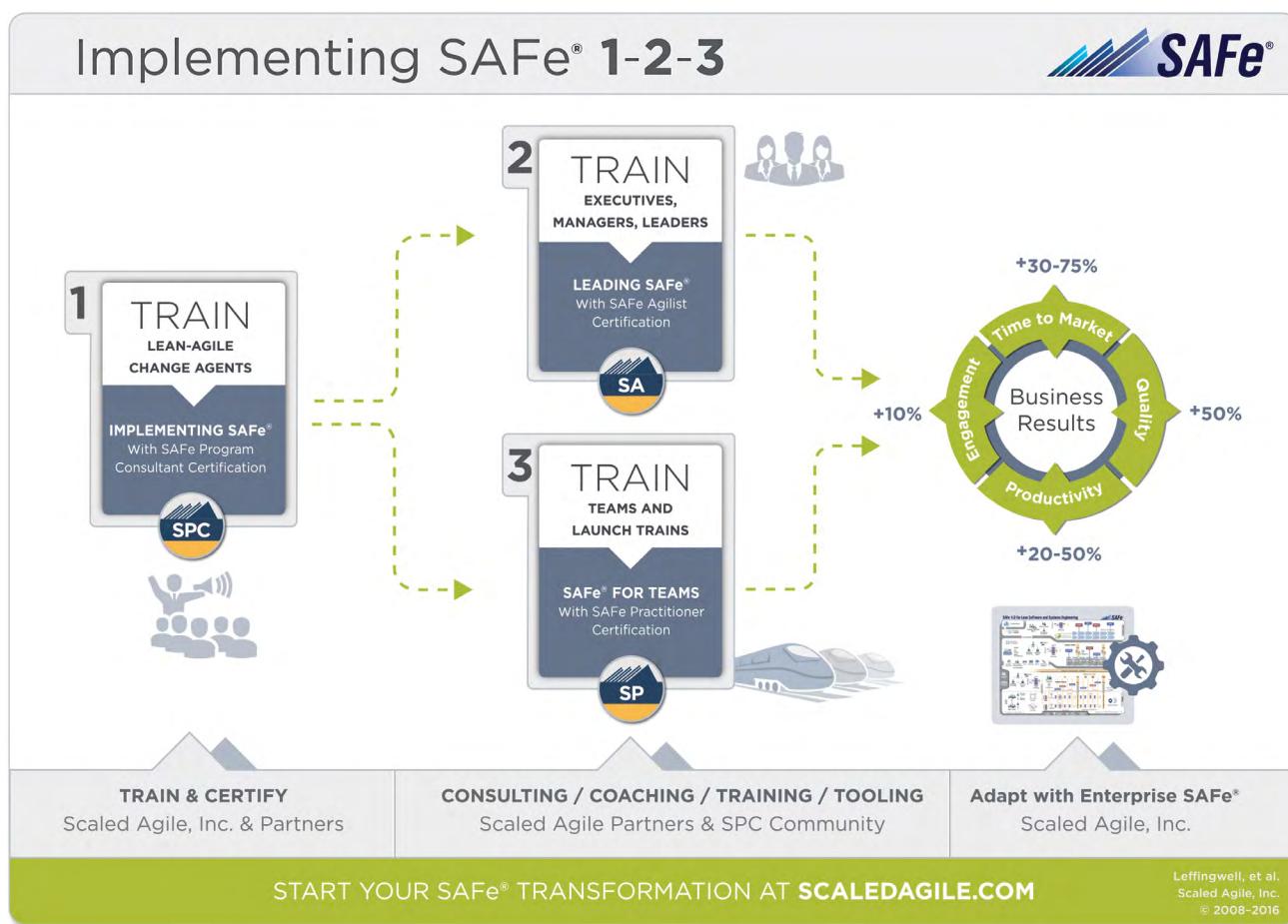


Figure 14. Implementing SAFe 1-2-3 strategy

- 1. Train implementers and Lean-Agile change agents.** The successful adoption of SAFe requires that most enterprises use a combination of internal and external change agents, leaders, mentors, and coaches. These people need to be skilled in teaching and delivering SAFe. To achieve this, Scaled Agile, Inc. (SAI) provides a course, Implementing SAFe 4.0 with SPC4 Certification. The audience for this course is internal change agents, external consultants, and those managers and leaders responsible for the implementation.
- 2. Train all executives, managers, and leaders.** It is important that leaders are trained, so they can understand how and why things work in SAFe and help their teams succeed by exhibiting the new values and behaviors. SAI provides a Leading SAFe with SA Certification course to provide leadership with the knowledge and skills they need to start the transformation.
- 3. Train teams and launch Agile Release Trains.** The primary value delivery mechanism in the enterprise is the Agile Release Train, but starting these trains is not a trivial task. One proven starting mechanism is an Agile Release Train Quickstart. Suitable after some significant up-front preparation, the Quickstart is a one-week training and immersion program that:
 - Organizes 50–125 team members into Agile teams, training them simultaneously in the principles of Lean, Agile, and SAFe.
 - Aligns the teams on the train to a common mission and spends two days face-to-face planning the next Program Increment.
 - Introduces prospective Product Owners and Scrum Masters to the skills and activities unique to their roles in the new Agile enterprise.
 - Builds context and a cadence-based, rolling-wave planning and delivery model that continuously incorporate business objective setting and program commitments, effective and reliable program execution, and adaptive feedback.

SPCs are trained and tooled with a role-based curriculum and courseware in order to provide the above services. Their role is to effectively prepare the organization, programs, teams, and individuals for success and continuous improvement, so that the enterprise, and its people, can achieve the larger business benefits of a Lean-Agile way of working at enterprise scale.

Summary

This white paper introduces the Scaled Agile Framework (SAFe), including its core values, principles, and practices, along with a strategy for implementation.

SAFe provides guidance and training for scaling agile development across the Portfolio, Value Stream, Program, and Team levels. The Framework is scalable and modular, allowing each organization to adapt it to its own business model. The Framework can be configured with three or four levels. The "3-level" view works best for smaller systems and a modest number of Agile teams. The "4-level view" supports building large, integrated solutions that typically require hundreds or more practitioners to build and maintain.

The Framework has four core values that help make SAFe effective: Alignment, Built-in Quality, Transparency and Program Execution. SAFe's practices are grounded on nine fundamental principles that have evolved from Agile principles and methods, Lean product development, systems thinking, and observation of successful enterprises. The "House of Lean" metaphor is used to describe a number of fundamental lean concepts used in SAFe. The goal of lean is the delivery of maximum value and quality to the customer in the shortest sustainable lead time.

The heart of SAFe is the Program level, which revolves around an organization called the Agile Release Train (ART). The ART includes all the roles that are necessary to move ideas from concept through deployment. Each ART aligns teams to a common mission and vision via a single program backlog and produces valuable and evaluable system-level solutions every two weeks. ARTs use a Program increment (PI), a fixed timebox for planning and execution and operate under the guidance of architects and user experience designers. The Agile teams in an ART have of choice of methods: Scrum, Kanban, and XP. They also use built-in quality practices.

Each SAFe portfolio has the value streams, people, and processes necessary to provide Lean-Agile funding and governance for the products, services, and solutions required to fulfill its business strategy. Based on the learning from hundreds of SAFe implementations, a basic "Implementing SAFe 1-2-3" pattern for adopting SAFe has emerged.

The Value Stream level helps enterprises that face the largest systems challenges, building large-scale, software and systems. Building such solutions in a Lean-Agile manner requires additional constructs, artifacts, and coordination. Value streams are realized through the implementation of one or more ARTS. ARTs are organized for the explicit purpose of working across silos to accelerate delivery. Given the size constraints (50-125+ people), there are three possible value-stream-to-ART organizational structures.

Lean-Agile leaders are key to the success and adoption of SAFe. Such leaders are lifelong learners and teachers who help teams build better systems through understanding and embracing the SAFe Lean-Agile mindset, principles, practices, and systems thinking.

SAFe recommends coupling the Implement 1-2-3 strategy to the enterprises' organizational change management process, for successfully adopting SAFe.

Learn More

If you would like to learn more about SAFe, visit these websites:

- Learn about real world implementations at scaledagileframework.com/case-studies
- Browse the Framework at scaledagileframework.com
- Find role-based SAFe training and certification at scaledagile.com
- View SAFe presentations and videos at scaledagileframework.com/videos-and-presentations
- Read Agile Software Requirements: Lean Requirements Practices for Teams, Programs, and the Enterprise – bit.ly/AgileSWReq

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- [4] Manifesto for Agile Software Development. Manifesto for Agile Software Development Accessed May 31, 2016. <http://www.agilemanifesto.org/>



About Scaled Agile, Inc.

Based in Boulder, Colorado, Scaled Agile's mission is to help system and software-dependent enterprises achieve better outcomes, increase employee engagement, and improve business economics through adoption of Lean-Agile principles and practices based on the Scaled Agile Framework® (SAFe®). Scaled Agile supports tens of thousands of practitioners of the Framework through training, certification, consulting services, and a global partner network that reaches over 35 countries and 350 cities.

Contact

Scaled Agile, Inc.

5480 Valmont Rd, Suite 100

Boulder CO 80301 USA

+1.303.554.4367

support@scaledagile.com

scaledagile.com

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with SAFe Program Consultant 4.0 Certification (SPC4)

The SAFe Program Consultant 4.0 (SPC4) certification is for those who will be directly involved in a SAFe adoption. This includes practitioners, change agents, and consultants responsible for implementing Agile programs and portfolios as a part of a Lean-Agile change initiative. SPC4s train SAFe Agilists (SA), SAFe Practitioners (SP), and Product Managers/Product Owners (PM/PO).



Leading SAFe® 4.0

with SAFe Agilist Certification (SA)

The SAFe Agilist (SA) certification program teaches enterprise leadership Lean-Agile principles, how to execute and release value through Agile Release Trains (ARTs), how to build an Agile portfolio, and how to lead a Lean-Agile transformation at enterprise scale. It is designed for executives, managers, consultants, and Agile change agents responsible for leading or supporting a Lean-Agile change initiative in a large software of systems-dependent enterprise.



SAFe® 4.0 for Teams

with SAFe Practitioner Certification (SP)

The SAFe Practitioner (SP) certification program teaches teams how to work in an Agile environment using Scrum, Kanban, and XP. Using real-world activities, the teams learn how to become Agile teams, build their backlog, and plan and execute iterations. Agile teams learn about their ART and their role in planning, executing, and improving with other teams. This course prepares teams to execute the iterations in a Program Increment (PI), including all meetings at the Team and Program level.



SAFe® 4.0 Advanced Scrum Master

with SAFe Advanced Scrum Master Certification (SASM)

This course prepares current Scrum Masters for their leadership role at the Team and Program level in a SAFe enterprise. The course covers facilitation of cross-team interactions in support of the program execution and relentless improvement. It enhances the Scrum paradigm with an introduction to scalable engineering and DevOps practices; the application of Kanban to facilitate the flow of value; and supporting iterations with architects, product management, and other critical stakeholders in the larger program and enterprise contexts.



SAFe® 4.0 Product Manager/Product Owner

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This course teaches how the roles of Product Manager, Product Owner, Solution Manager, and Epic Owner drive the delivery of value in the SAFe enterprise. You'll get an overview of the Scaled Agile Framework® (SAFe®), the Lean-Agile mindset, and an understanding of how the Product Manager and Product Owner roles operate in the enterprise to drive the delivery of value. Finally, you will get an in-depth understanding of the specific activities, tools, and mechanics used to effectively deliver value to the enterprise.



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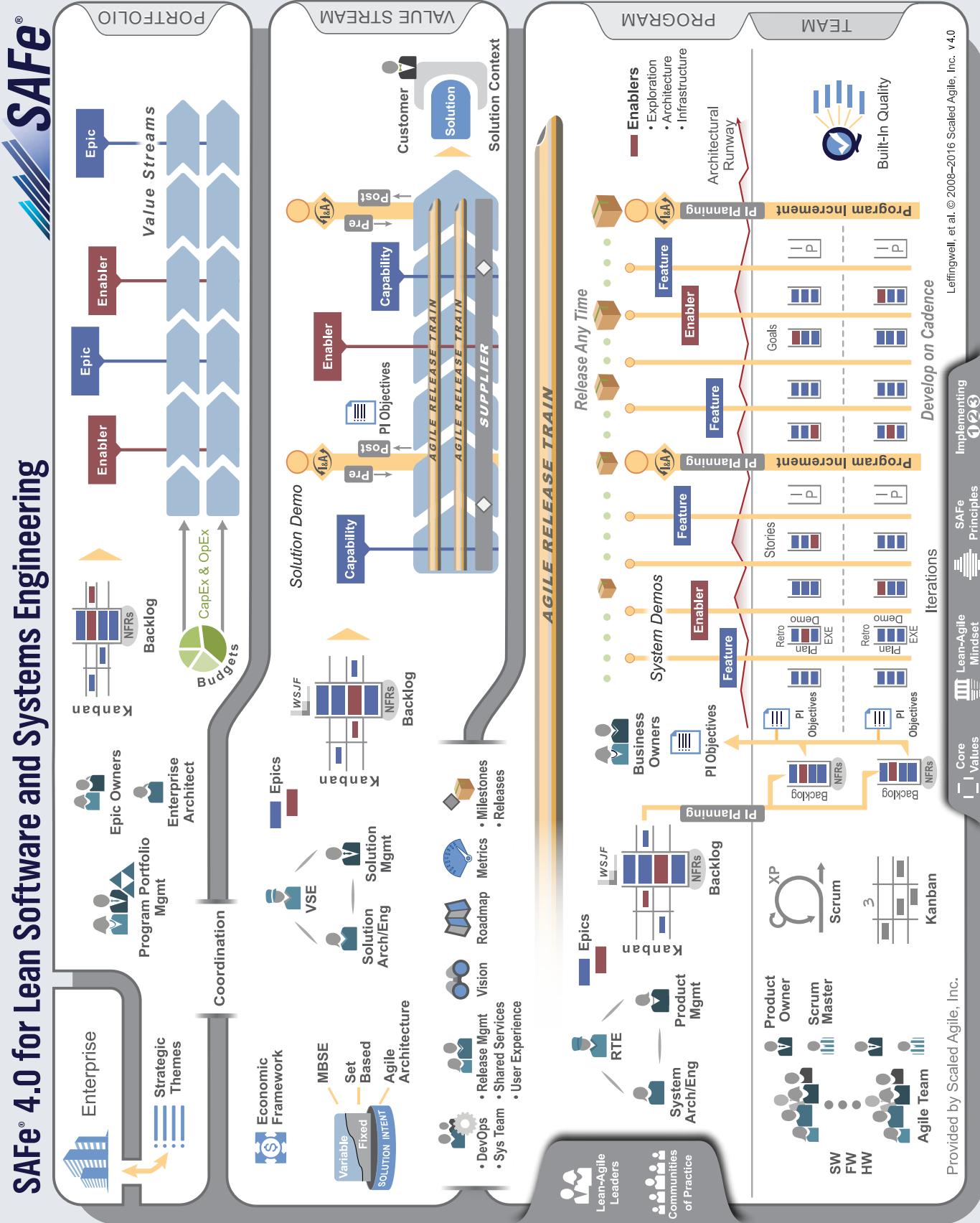
Training is at the core of customer success

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SAFe® 4.0 for Lean Software and Systems Engineering



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