34th Annual INCOSE international symposium

hybrid event

Dublin, Ireland
July 2 - 6, 2024

Through the Theoretical Framework of Stafford Beer's Viable System Model (VSM)

Examination of the SAFe® (Scaled Agile Framework®)

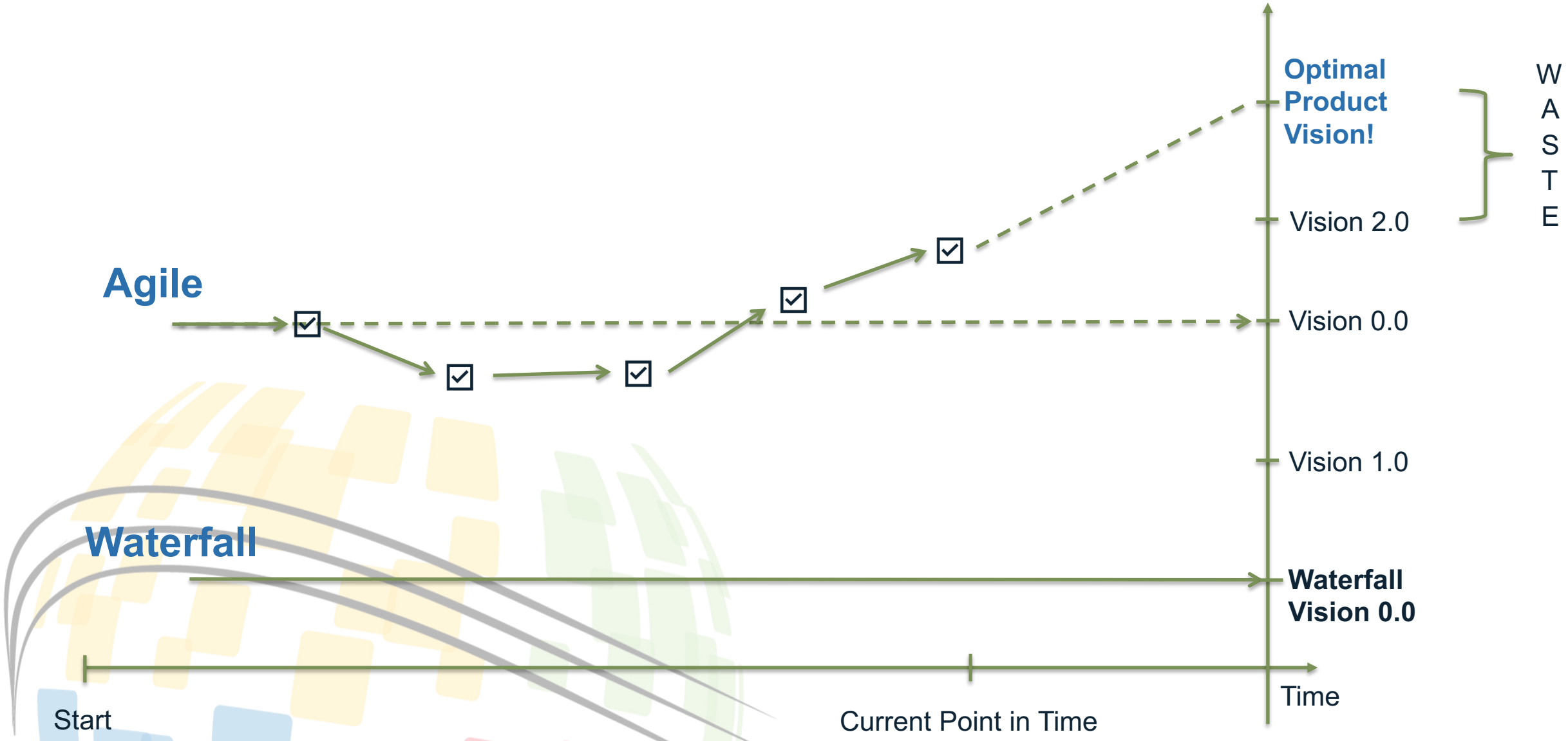
About Us

C. Robert Kenley

Dr. Kenley is a Professor of Engineering Practice in Purdue's School of Industrial Engineering, where has been developing courses and curricula to support the educational objectives of the Purdue Systems Collaboratory. He has over 30 years' experience in industry, academia, and government as a practitioner, consultant, and researcher in systems engineering. He has published papers on systems requirements, technology readiness assessment and forecasting, Bayes nets, applied meteorology, the impacts of nuclear power plants on employment, model-based systems engineering, and agent-based modeling for systems of systems. He is an expert system engineering professional (ESEP), and a Fellow of INCOSE.

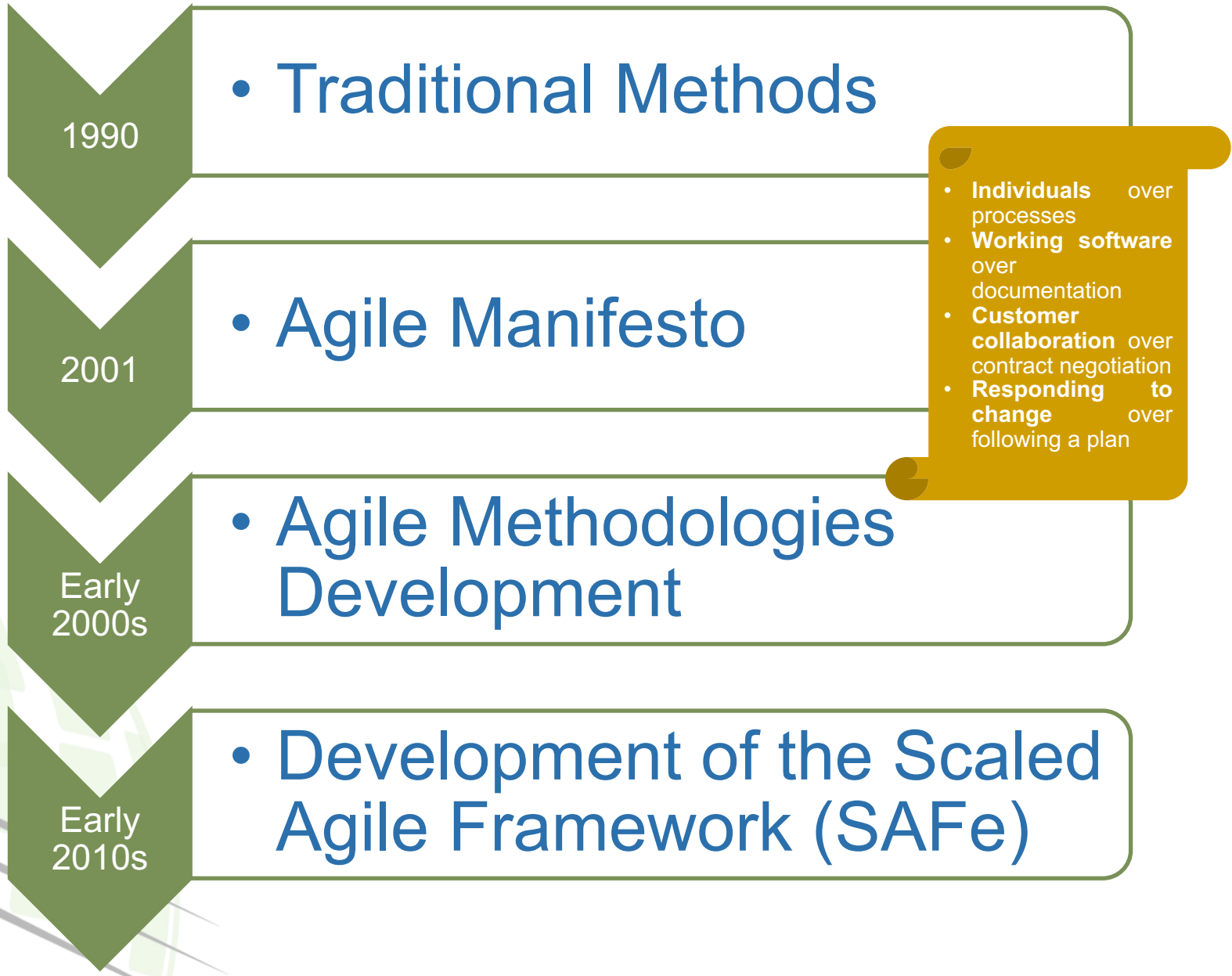
Juan M. Cadena

Juan M. Cadena is a graduate student at Purdue University, completing an M.S. in Engineering Management with a focus on Systems Engineering, and at Georgia Tech, where he is pursuing an M.S. in Computer Science with a specialization in Computing Systems. He earned his B.S. in Engineering from Universidad San Francisco de Quito, Ecuador. Prior to his academic endeavors, Juan worked as a Digital Product Manager in a German HealthTech company, where he enriched his international perspective and expertise in technology management.


Optimal
Product
Vision!
WASTE
Vision 2.0
Agile
Vision 0.0
Vision 1.0
Waterfall
Waterfall
Vision 0.0
Time
Start
Current Point in Time

The Agile Movement: From Concepts to SAFe

- Originated in the 1990s as a response to traditional, rigid software development processes, a.k.a. Waterfall.
- Agile Manifesto in 2001 emphasized individuals, interactions, and responding to change.
- Agile methodologies include Scrum, XP (Extreme Programming), and Kanban.
- Evolved into SAFe to address scaling challenges in larger organizations.



Roles

Scrum Master	Product Owner	Development Team
• Facilitates Scrum practices, ensures the team works harmoniously and removes obstacles.	• Defines the product vision, prioritizes the backlog to ensure work focuses on maximizing value.	• Cross-functional members who do the work of delivering the product increment

Artifacts

Product Backlog

Sprint Backlog

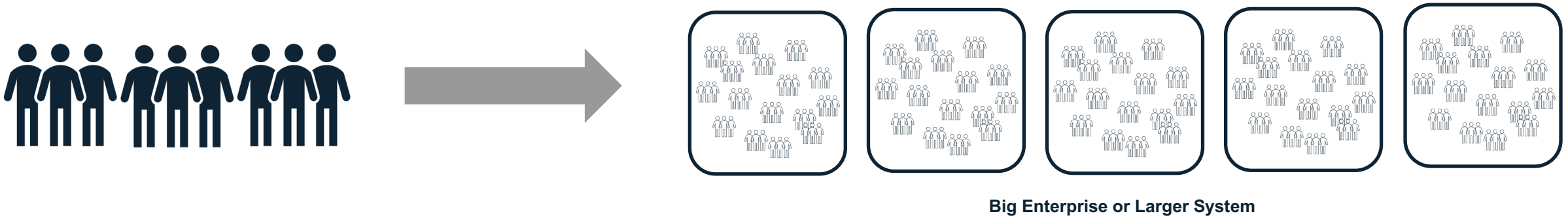
Sprint Increment

The Scrum Framework

- **Empowers Collaboration:** Emphasizes teamwork, communication, and fast feedback among self-organizing teams
- **Iterative Process:** Consists of fixed-length sprints (usually 2-4 weeks), enabling frequent delivery of product increments.
- **Continuous Improvement:** Through regular retrospectives, teams refine their process to increase efficiency and quality.

Scrum

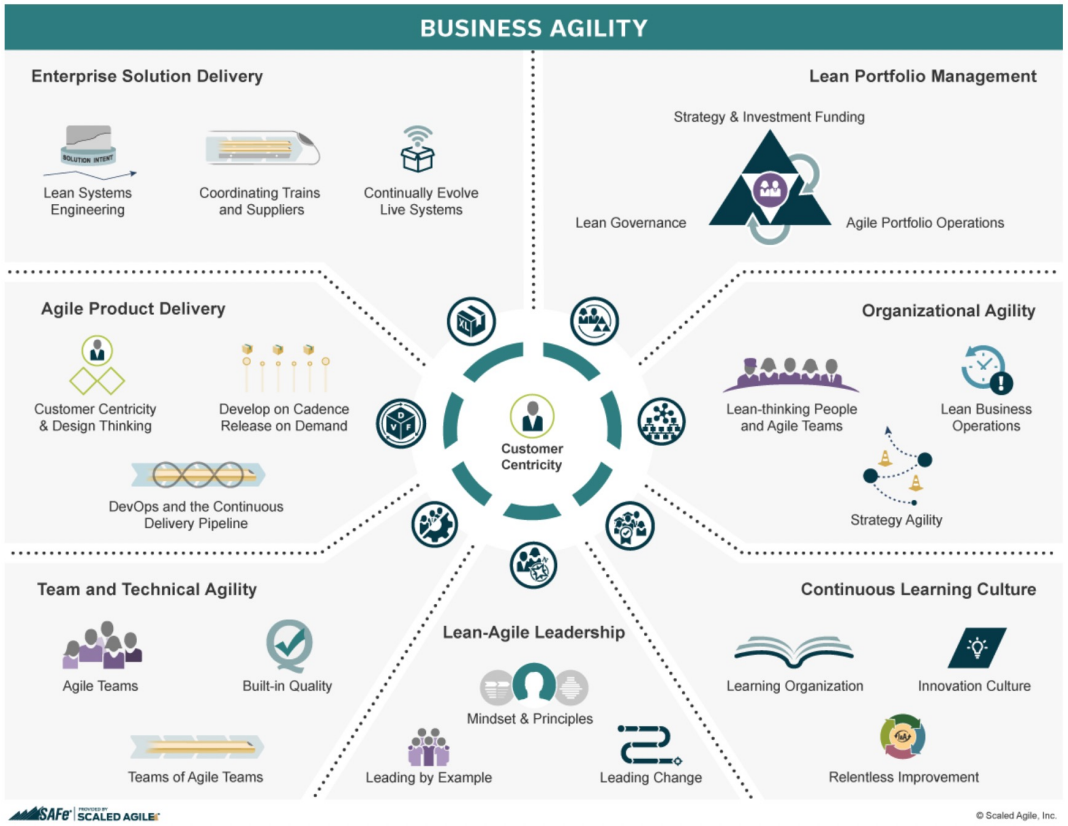
Scaled Agile Framework (SAFe)



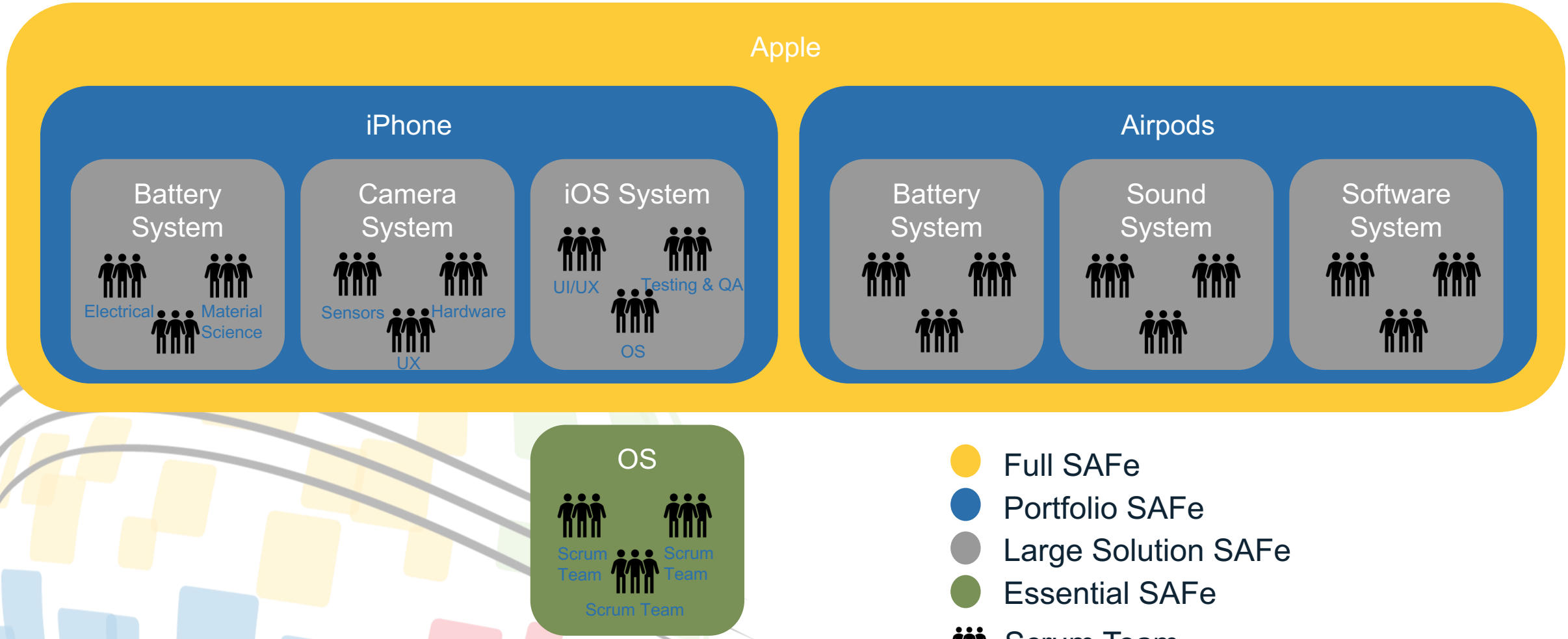
- Scrum is optimal for small, usually up to 9 members, facilitating close collaboration and decision-making.
- Challenges arise when scaling up, as complexity and coordination needs increase, potentially impacting agility and efficiency.
- **Scaled Agile frameworks like SAFe** were developed to address these challenges, enabling Agile practices to be effectively applied in larger organizations and multi-team projects.

Introduction to the Scaled Agile Framework (SAFe)

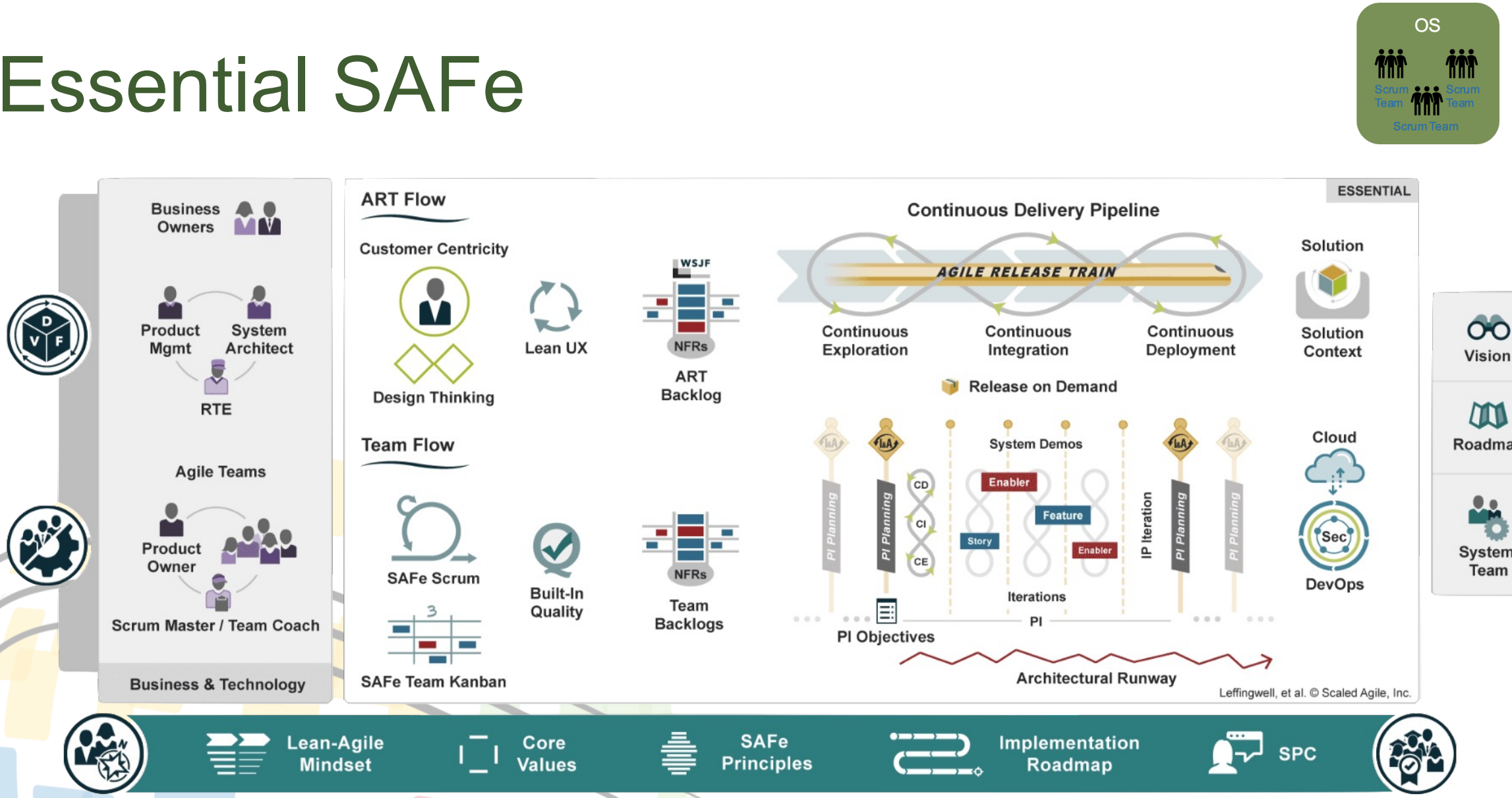
- **Definition:** SAFe (Scaled Agile Framework) is a set of organization and workflow patterns intended to guide enterprises in scaling lean and agile practices.
- **Values:**
  - Alignment
  - Built-in Quality
  - Transparency
  - Program Execution
- **Levels of SAFe**:
  - Essential SAFe
  - Large Solution SAFe
  - Portfolio SAFe
  - Full SAFe
- **Benefits:**
  - Improved Quality
  - Faster Time-to-Market
  - Increased Productivity
  - Enhanced Employee Engagement



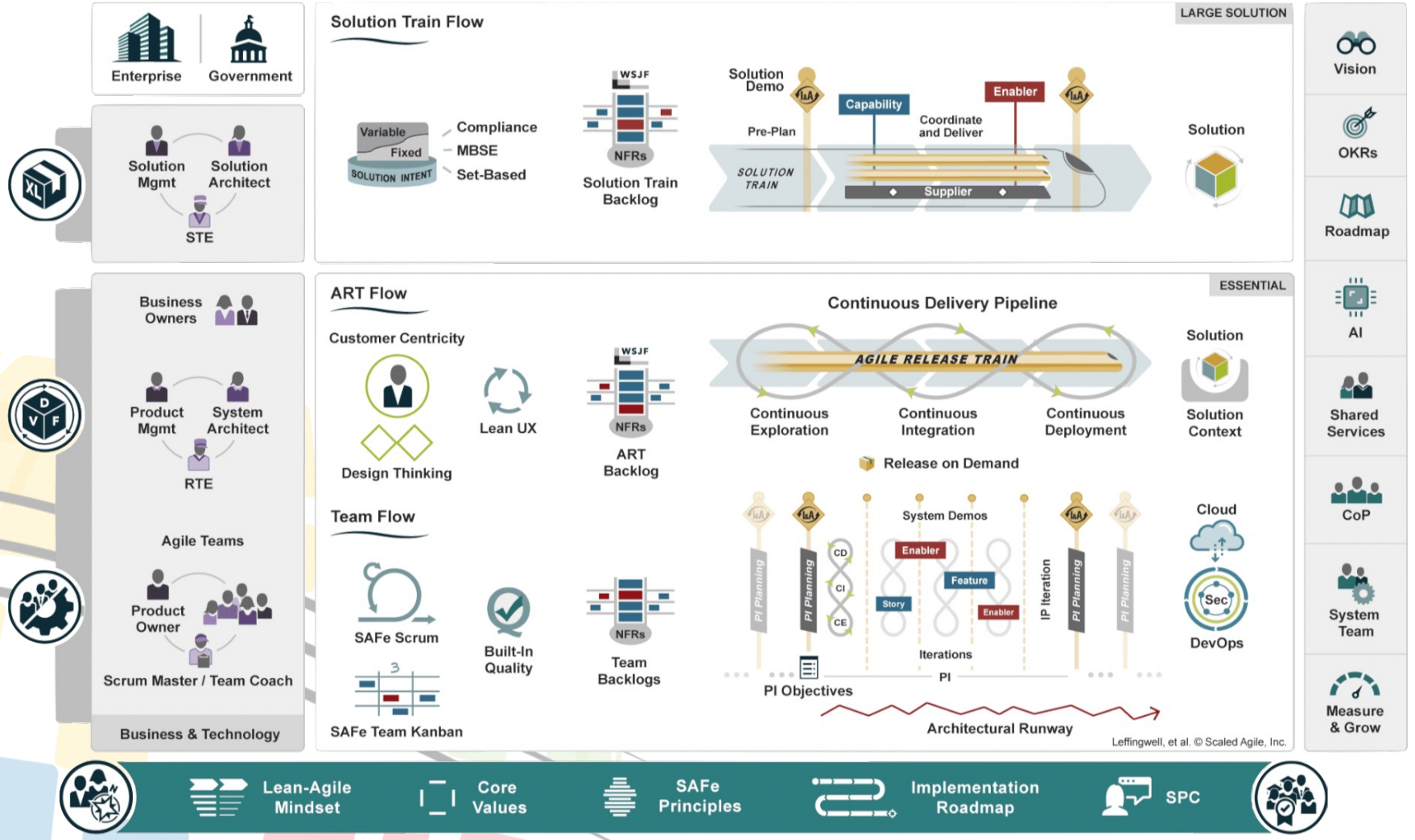
4 SAFe Configuration Overview Example



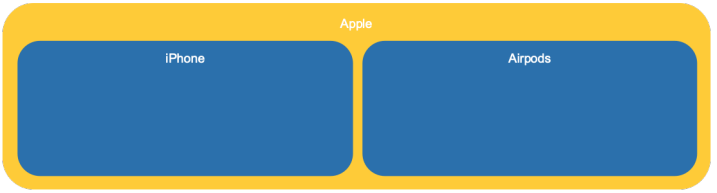
Essential SAFe

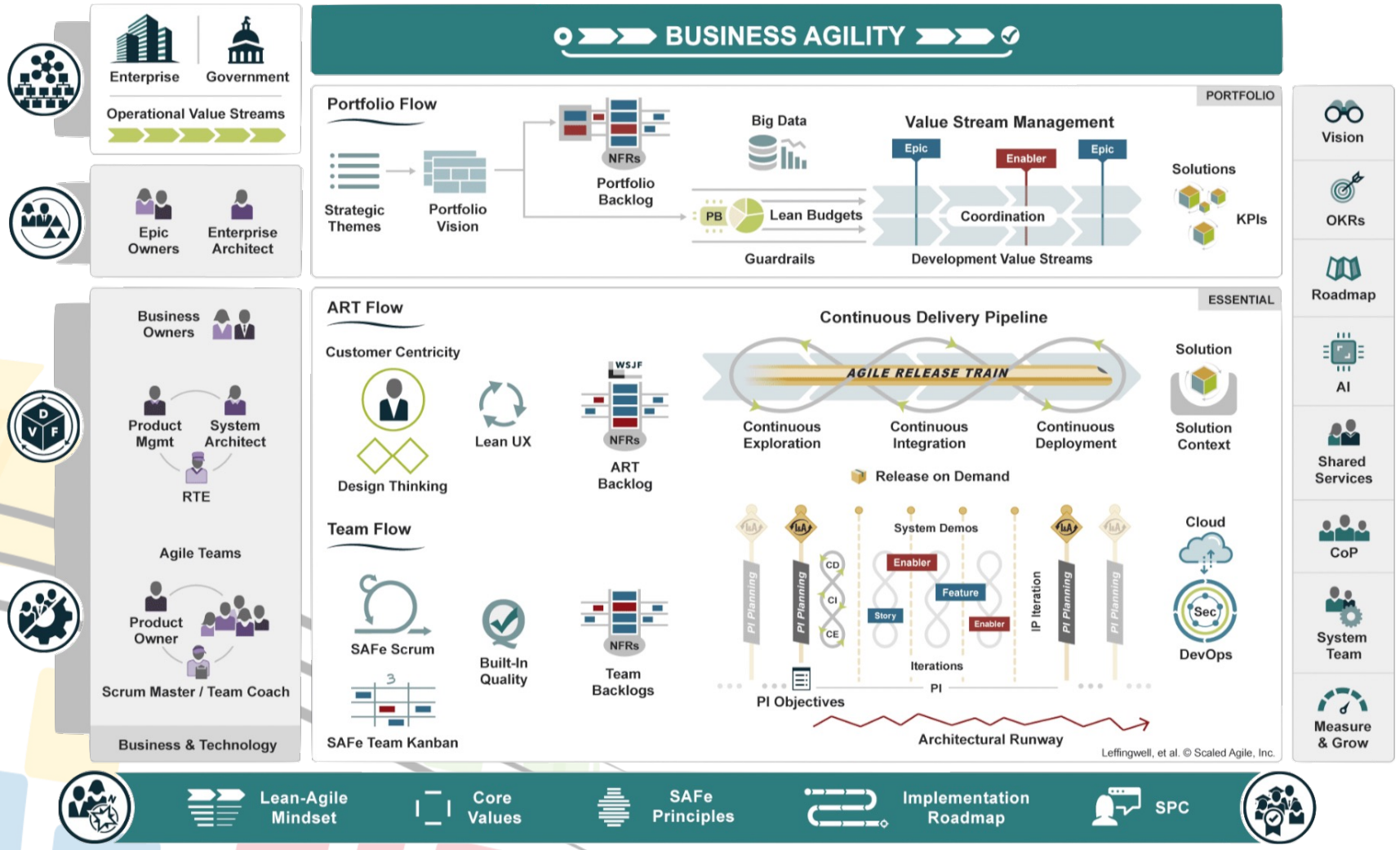


Large Solution SAFe

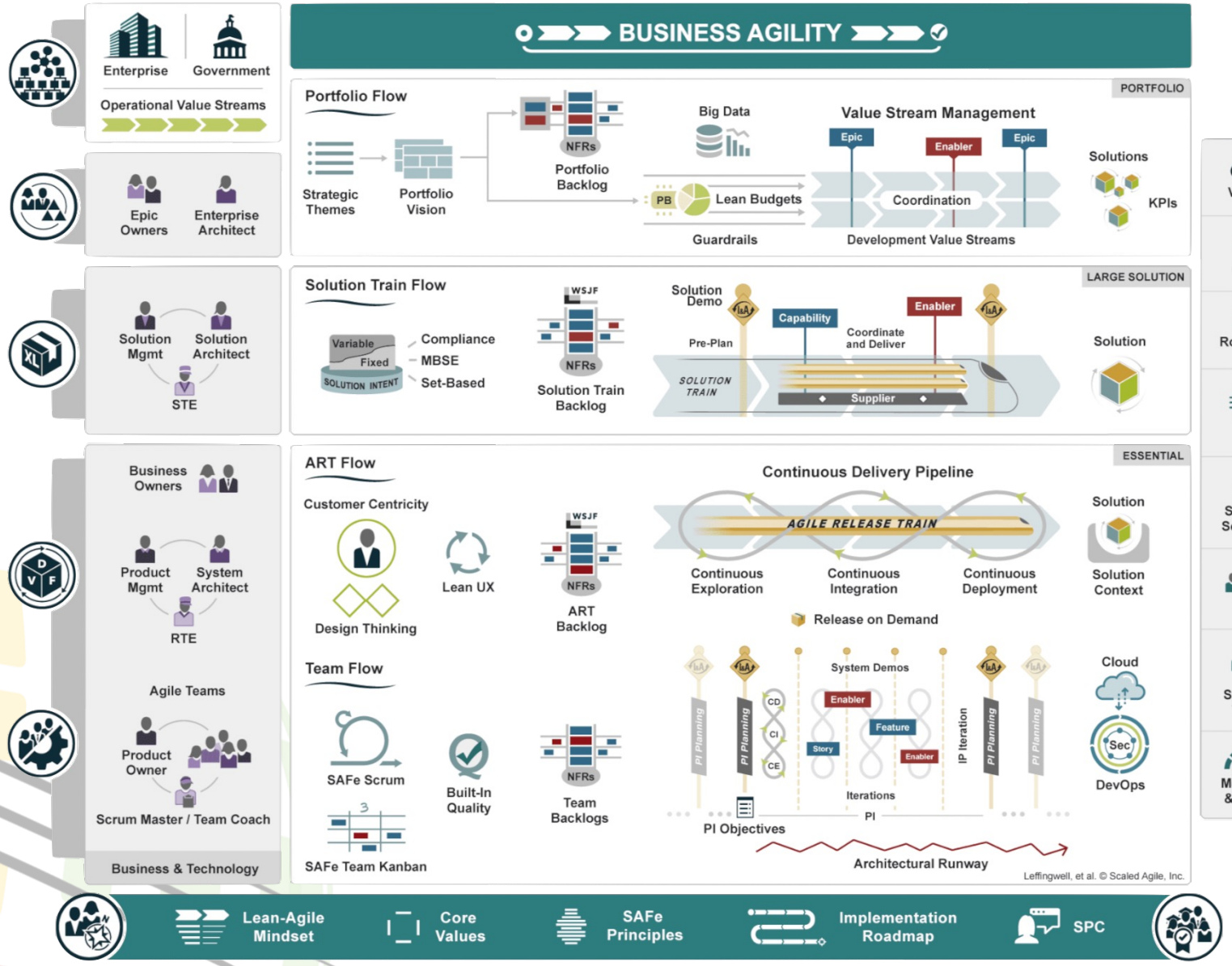


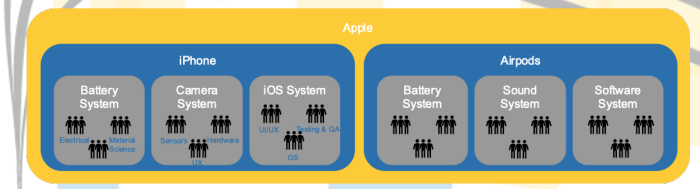
Portfolio SAFe





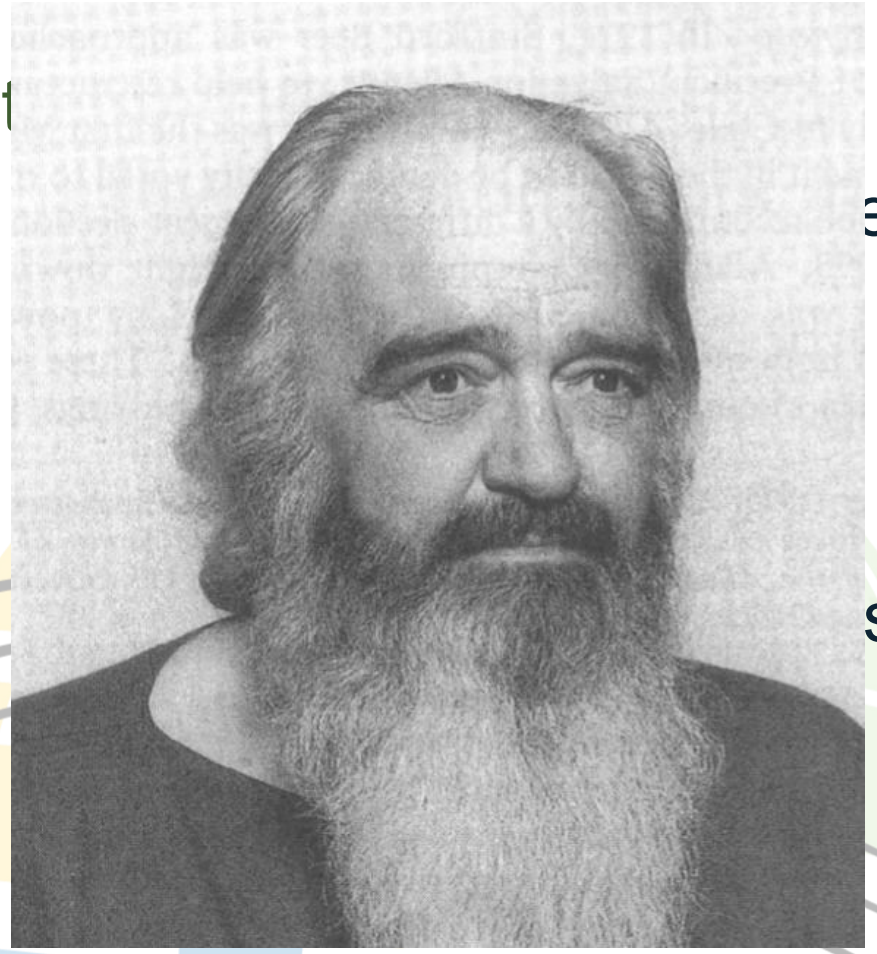
Full SAFe


BUSINESS AGILITY
Enterprise
Government
Operational Value Streams
Epic Owners
Enterprise Architect
Solution Mgmt
Solution Architect
STE
Business Owners
Product Mgmt
System Architect
RTE
Agile Teams
Product Owner
Scrum Master / Team Coach
Business & Technology
PORTFOLIO
Portfolio Flow
Strategic Themes
Portfolio Vision
NFRs
Portfolio Backlog
Big Data
PB
Lean Budgets
Guardrails
Value Stream Management
Epic
Enabler
Epic
Coordination
Development Value Streams
Solutions
KPIs
LARGE SOLUTION
Solution Train Flow
Variable
Fixed
SOLUTION INTENT
Compliance
MBSE
Set-Based
WSJF
NFRs
Solution Train Backlog
Solution Demo
Pre-Plan
Capability
Enabler
Coordinate and Deliver
SOLUTION TRAIN
Supplier
Solution
ESSENTIAL
ART Flow
Customer Centricity
Design Thinking
Lean UX
WSJF
NFRs
ART Backlog
Continuous Delivery Pipeline
AGILE RELEASE TRAIN
Continuous Exploration
Continuous Integration
Continuous Deployment
Release on Demand
Solution
Solution Context
Team Flow
SAFe Scrum
SAFe Team Kanban
Built-In Quality
NFRs
Team Backlogs
System Demos
Enabler
Feature
Story
Enabler
PI Planning
CD
CI
CE
IP Iteration
Iterations
PI
PI Objectives
Architectural Runway
Cloud
Sec
DevOps
Vision
OKRs
Roadmap
AI
Shared Services
CoP
System Team
Measure & Grow
Lean-Agile Mindset
Core Values
SAFe Principles
Implementation Roadmap
SPC
Leffingwell, et al. © Scaled Agile, Inc.


Apple
iPhone
Battery System
Camera System
iOS System
Airpods
Battery System
Sound System
Software System

Understanding the Viable System Model (VSM)

Int



- er in
- s

Core

- T
  o
  id
- C
  u
  m
  w
  g
- V

nges.

mous

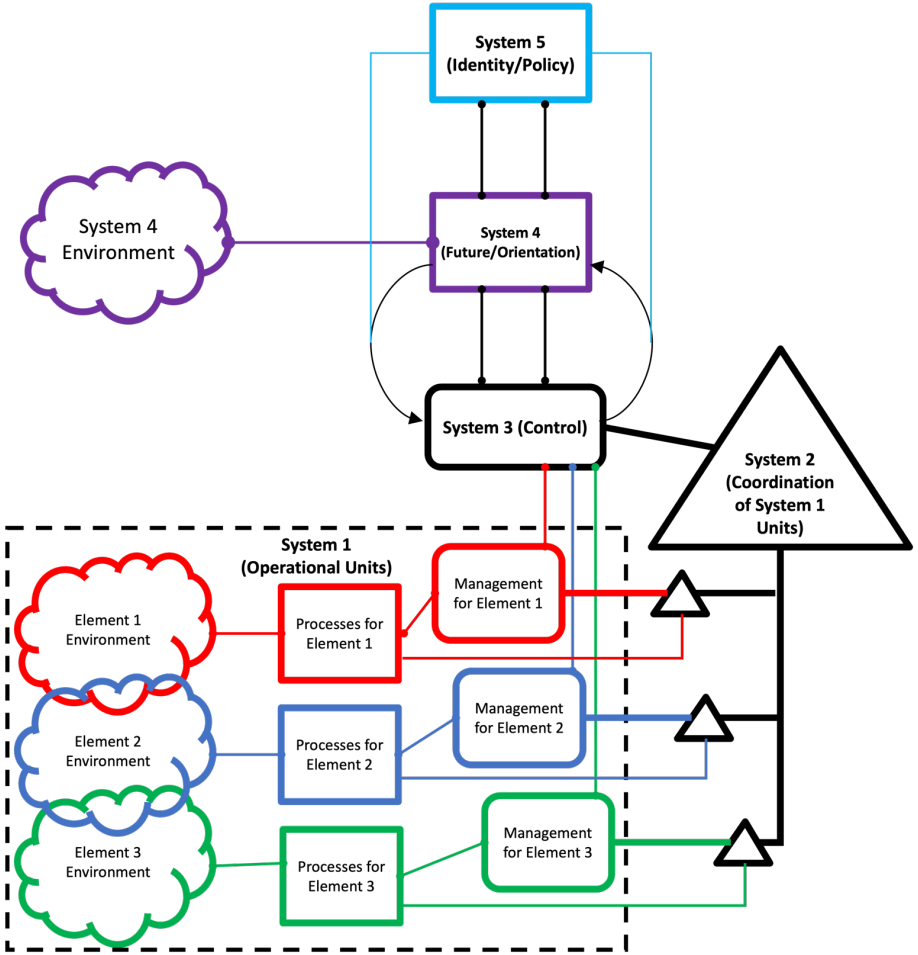
gned

tional

re.

Viable Systems Model Systems

- **System 1:** Operational units executing primary activities.
- **System 2:** Coordinates System 1 units to ensure smooth operations.
- **System 3:** Controls resources and performance monitoring.
- **System 4:** Focuses on future challenges and external interactions.
- **System 5:** Governs organizational identity and policy making.



Review so far…

- Agile Frameworks:
  - Agile methodologies have reshaped software/product development with flexibility and customer focus.
- Scaling Agile:
  - Scaling agile practices in large systems introduces complexity and challenges.
  - Enter SAFe
- VSM:
  - VSM, known for its systemic insights into organizational dynamics, offers a promising lens to analyze and enhance systems.

Research Questions

- How the principles of the VSM can be applied to the SAFe to enhance its functional dynamics across various configurations?
- Uncover synergies between VSM and SAFe, aiming to offer insights for organizations to optimize their agile practices in complex settings.
- Diagnose SAFe with a systemic approach.

Methodology Overview

4 SAFe Configurations

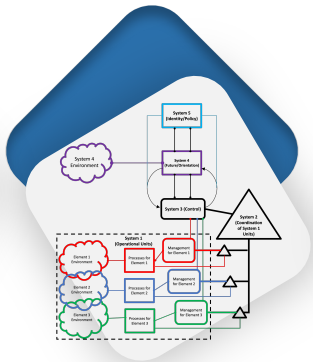
Essential, Large
Solution, Portfolio, Full

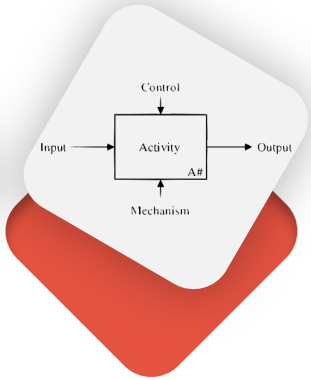
Official SAFe Website

SAFE Framework 6.0
scaledagileframework.com

Viable System Model

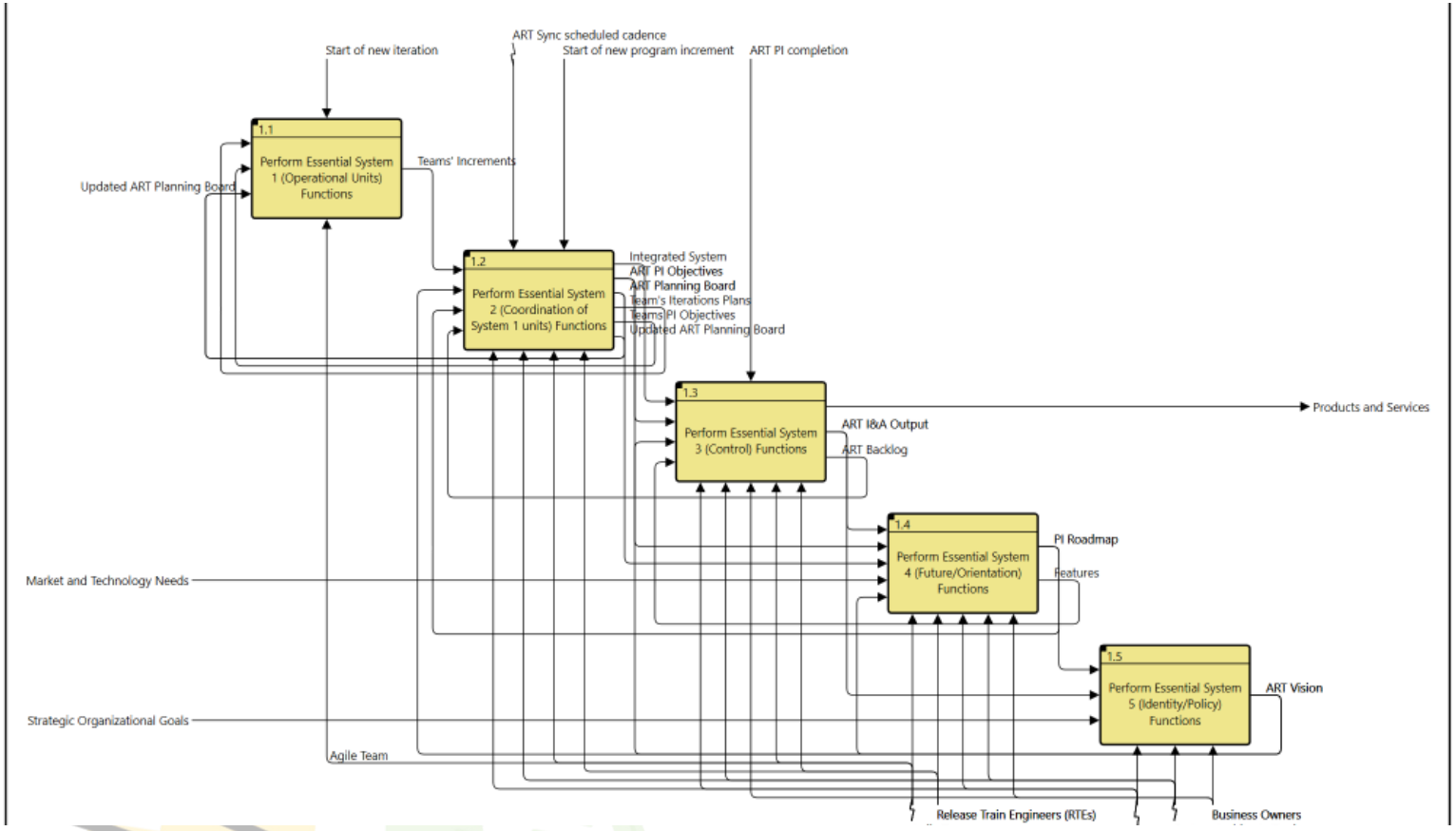
Organizational Concept
5 Systems





IDEF0

Functional Modeling
with IDEF0

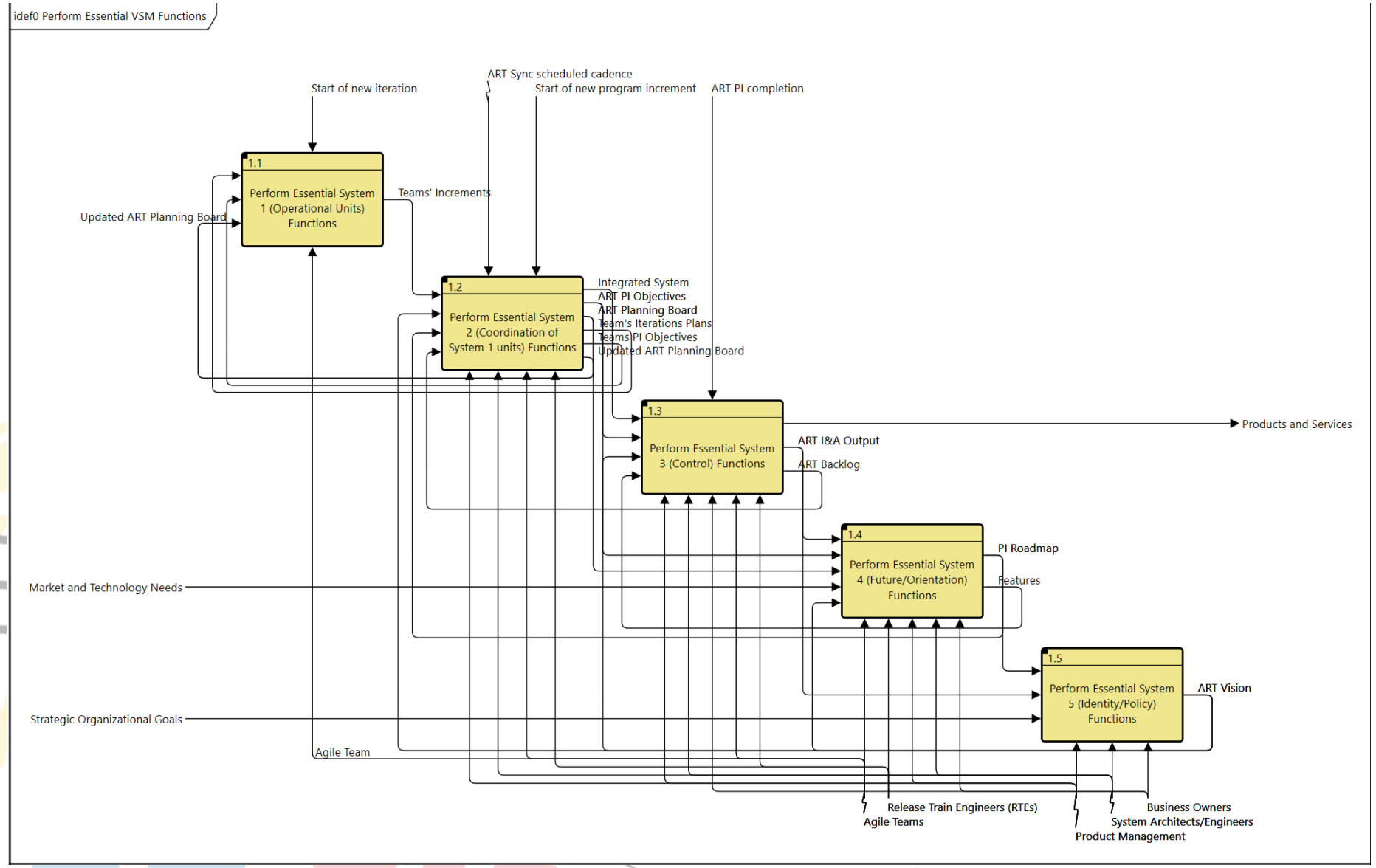


4. Mapping VSM to SAFe Configurations

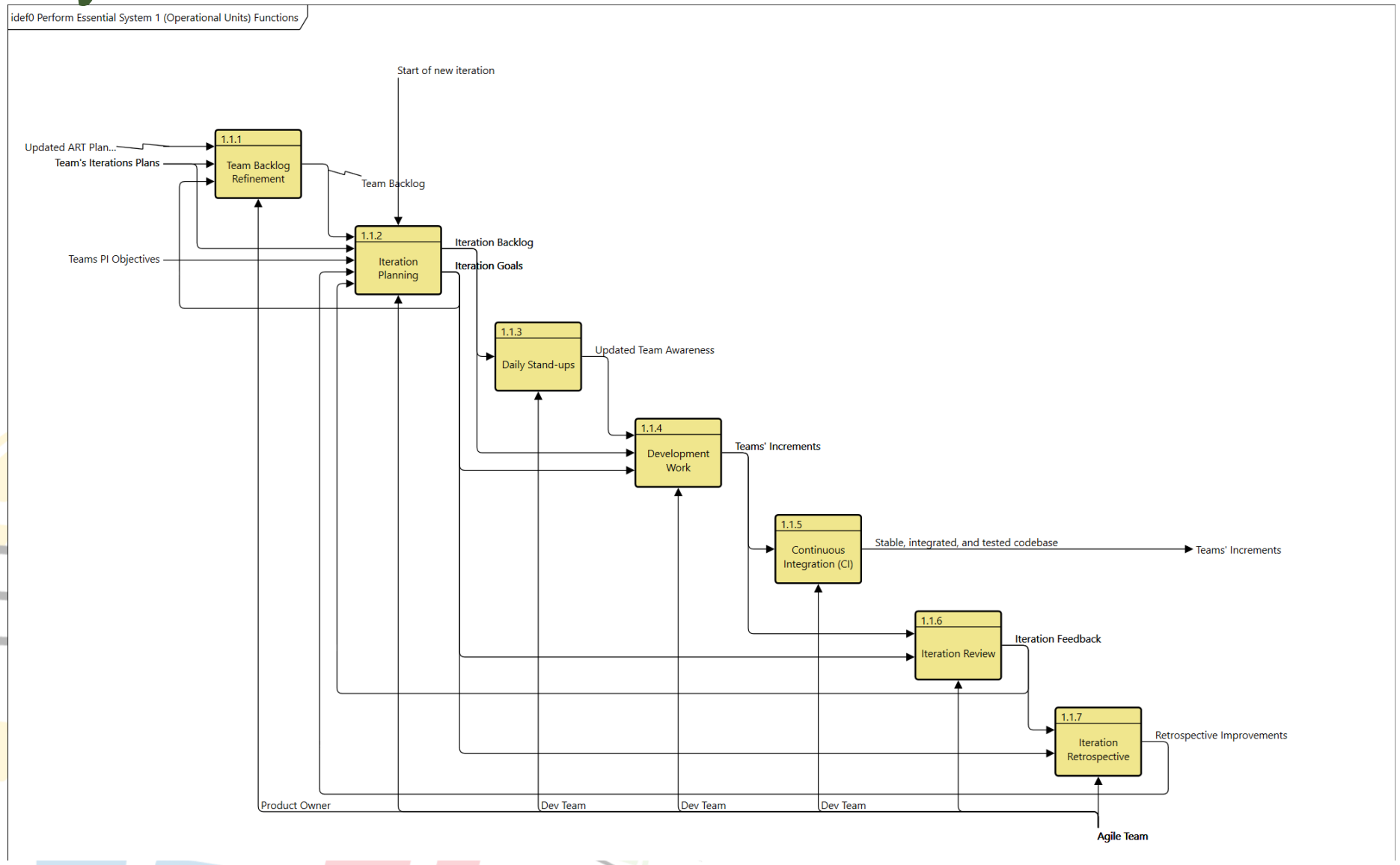
Essential SAFe Configuration: Discussion on the mapping of VSM to the Essential SAFe configuration, focusing on the operational units (System 1) and their coordination (System 2).

Large Solution Configuration: Exploration of the Large Solution configuration through the lens of VSM, emphasizing control (System 3), future orientation (System 4), and identity/policy (System 5).

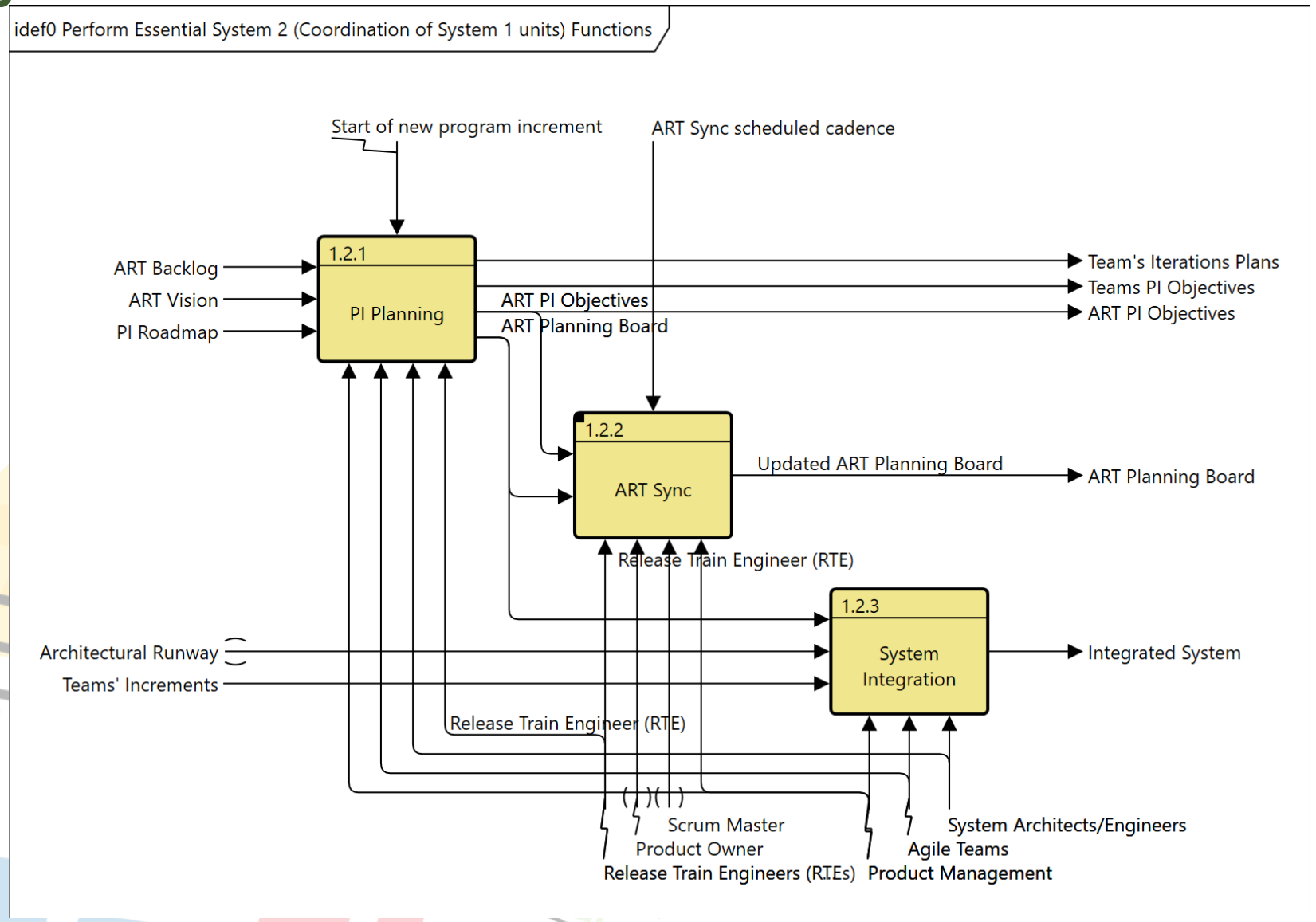
Essential SAFe - VSM



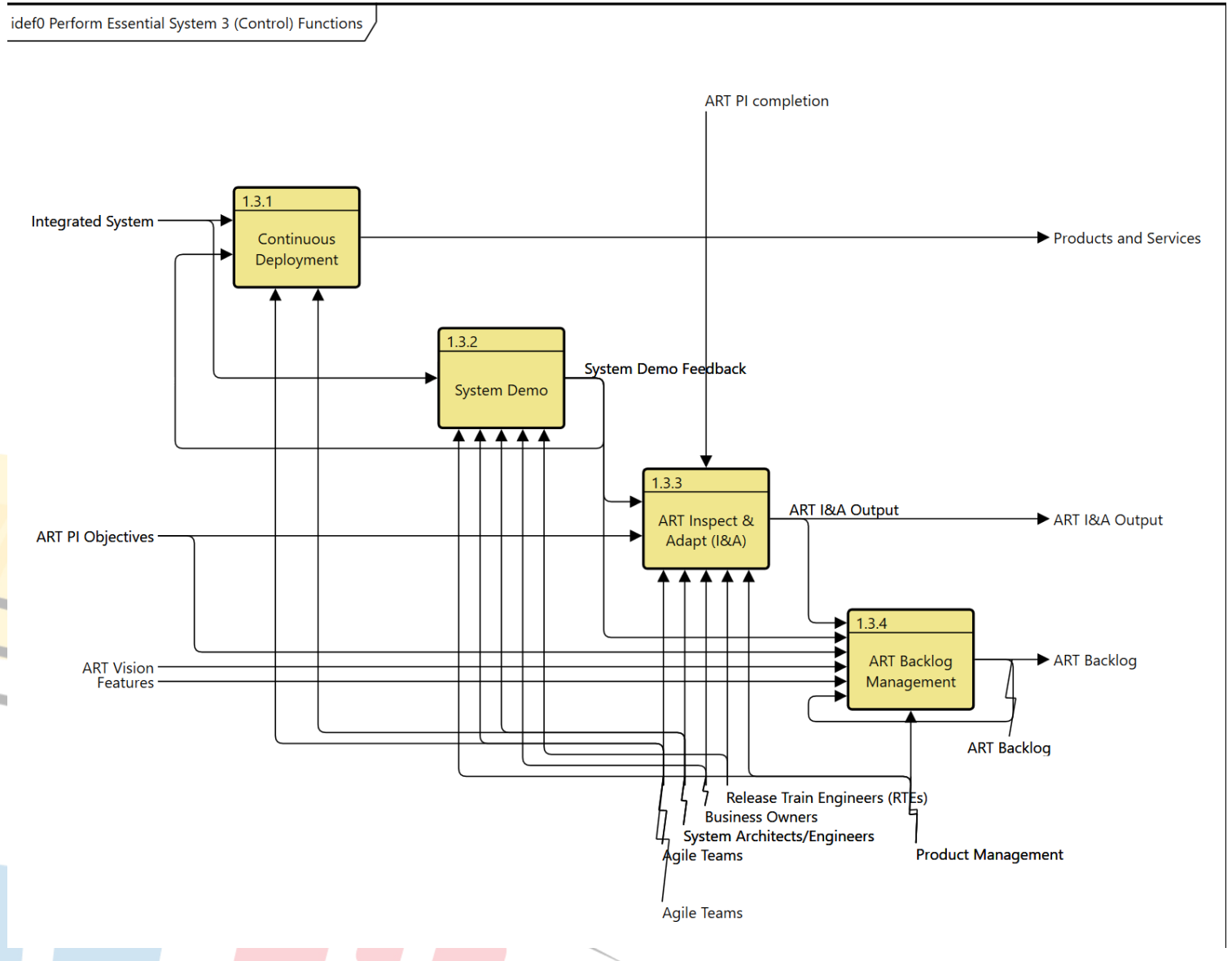
System 1 – Essential SAFe



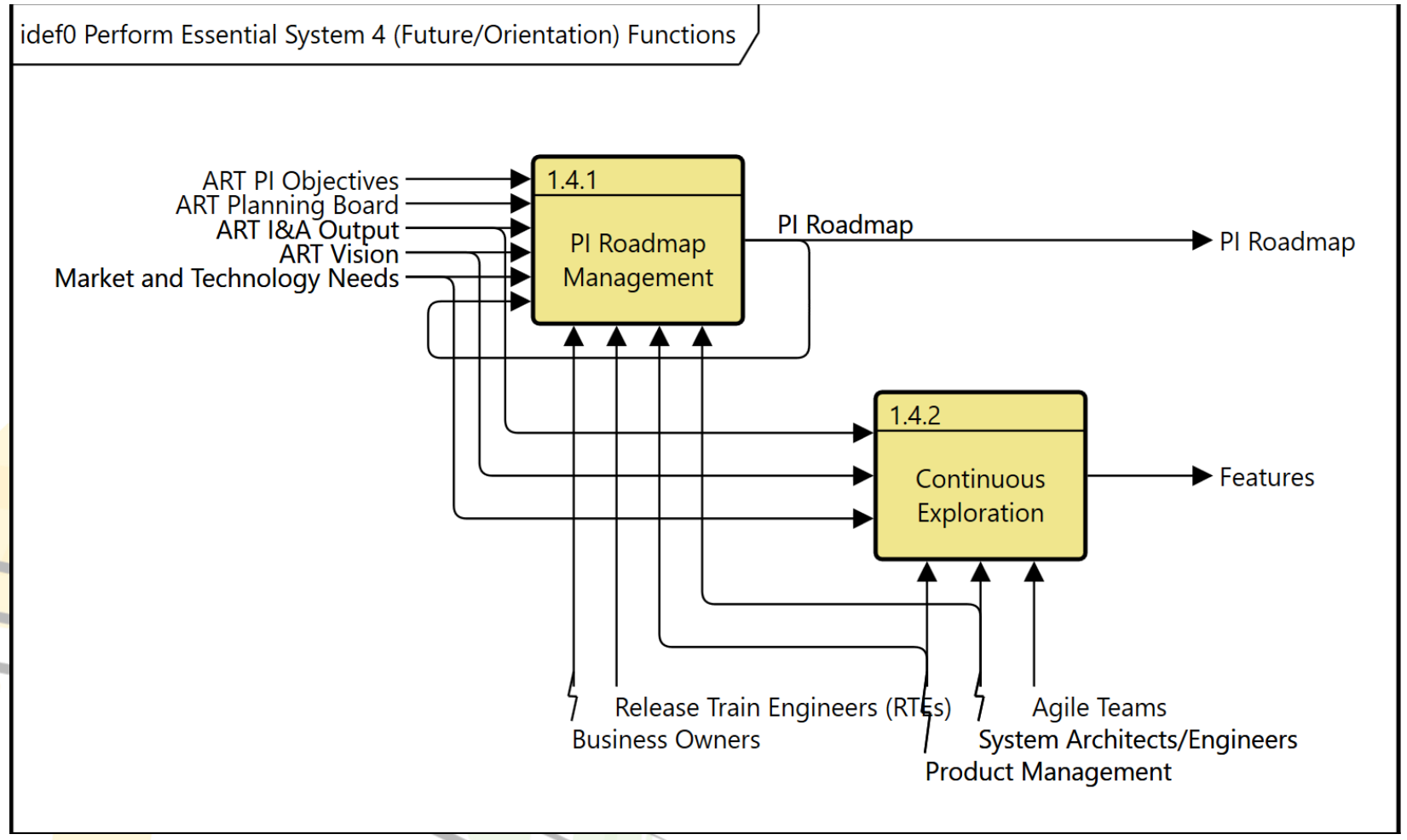
System 2 – Essential SAFe



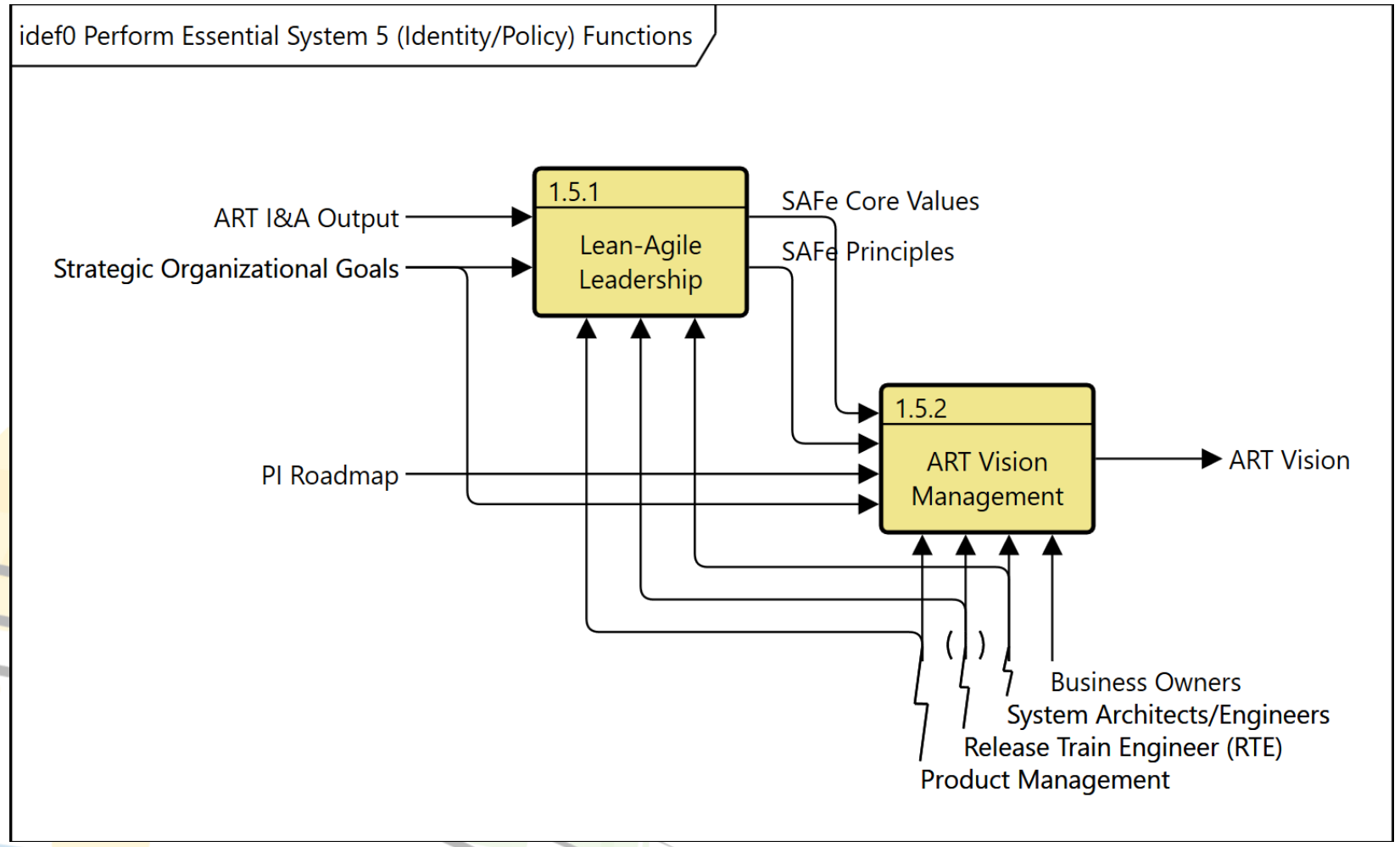
System 3 – Essential SAFe



System 4 – Essential SAFe



System 5 – Essential SAFe



System 1 Diagnosis of Essential SAFe using VSM

Strengths

- Agile teams are autonomous.
- Iterative processes and continuous integration.

Weakness

- Potential for misalignment
- Requires disciplined backlog refinement

System 2 Diagnosis of Essential SAFe using VSM

Strengths

- Regular PI Planning and ART Sync events foster alignment.
- System Integration activities ensure cohesive delivery.

Weakness

- High dependency on effective communication and collaboration.
- Potential for delays.

System 3 Diagnosis of Essential SAFe using VSM

Strengths

- Frequent validation of increments.
- Continuous improvement and responsiveness to change.

Weakness

- Complex performance monitoring.
- Risk of bureaucratic overhead.

System 4 Diagnosis of Essential SAFe using VSM

Strengths

- Alignment of future goals with current capabilities.
- New opportunities and challenges.

Weakness

- Potential for misalignment.

System 5 Diagnosis of Essential SAFe using VSM

Strengths

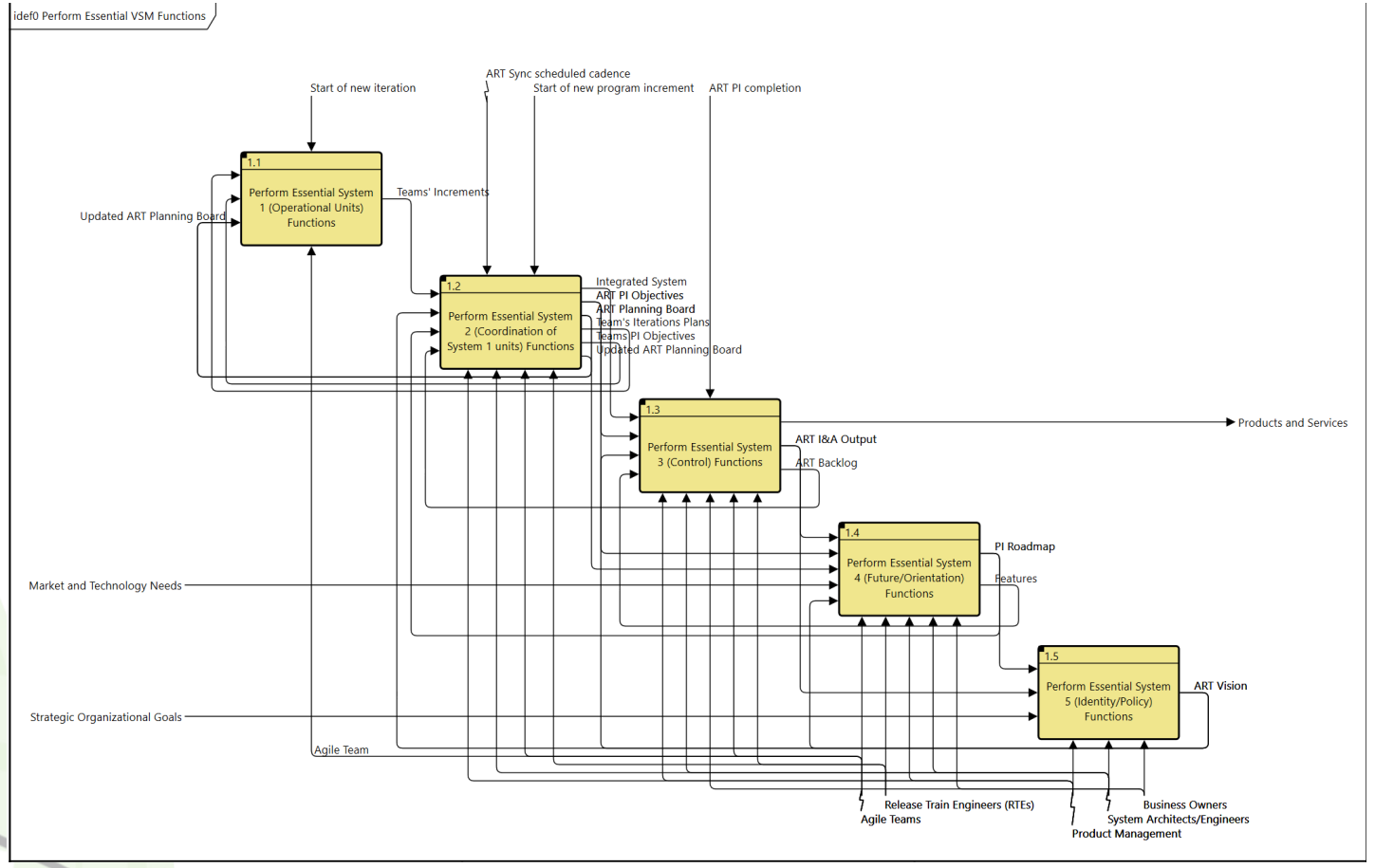
- Guide the organization's agile transformation.
- Ensure alignment with the organization's mission and values.

Weakness

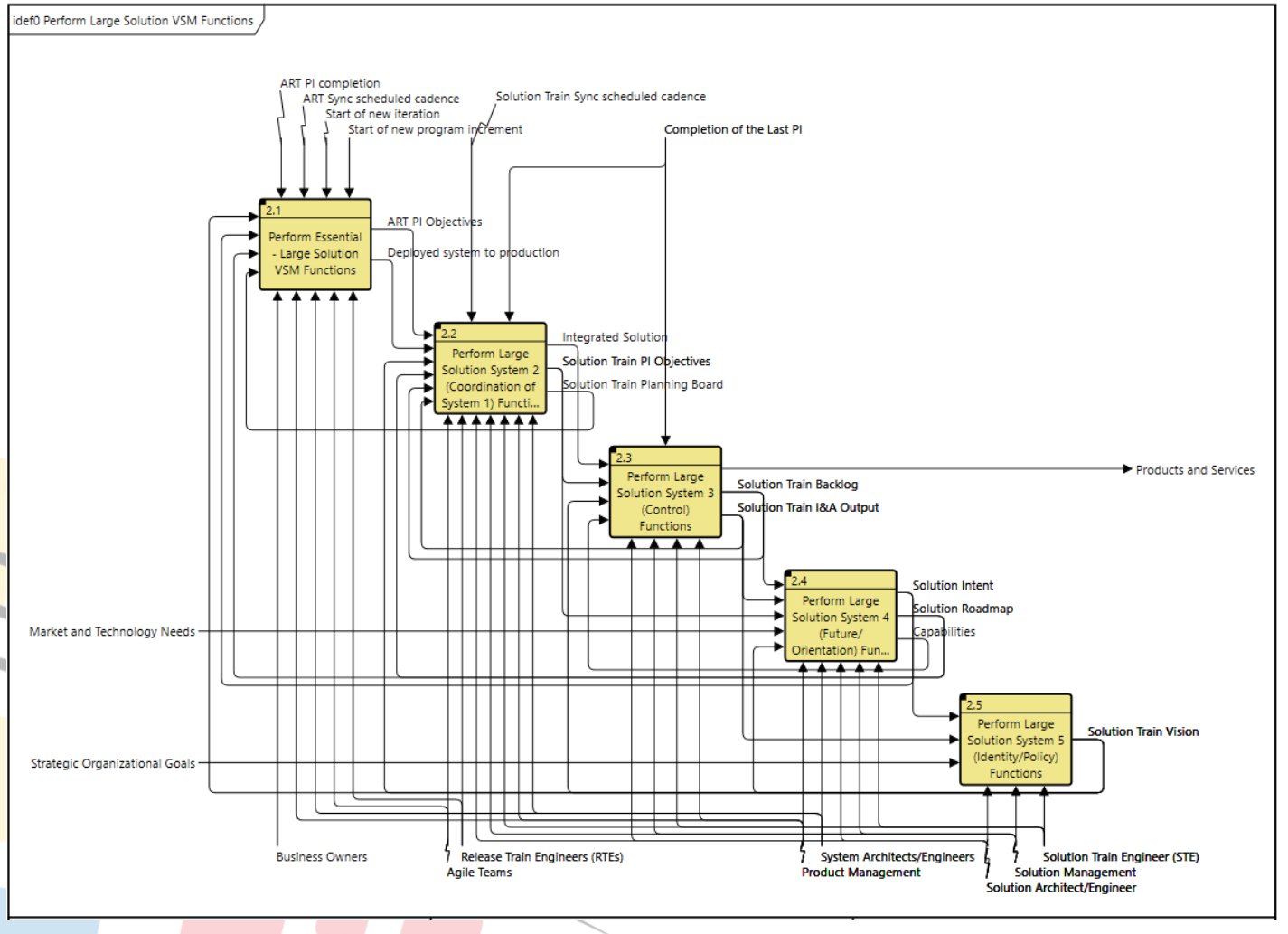
- Risk of disconnect between strategy and operation.
- Requires ongoing commitment to uphold agile principles.

Essential SAFe Overall Diagnosis

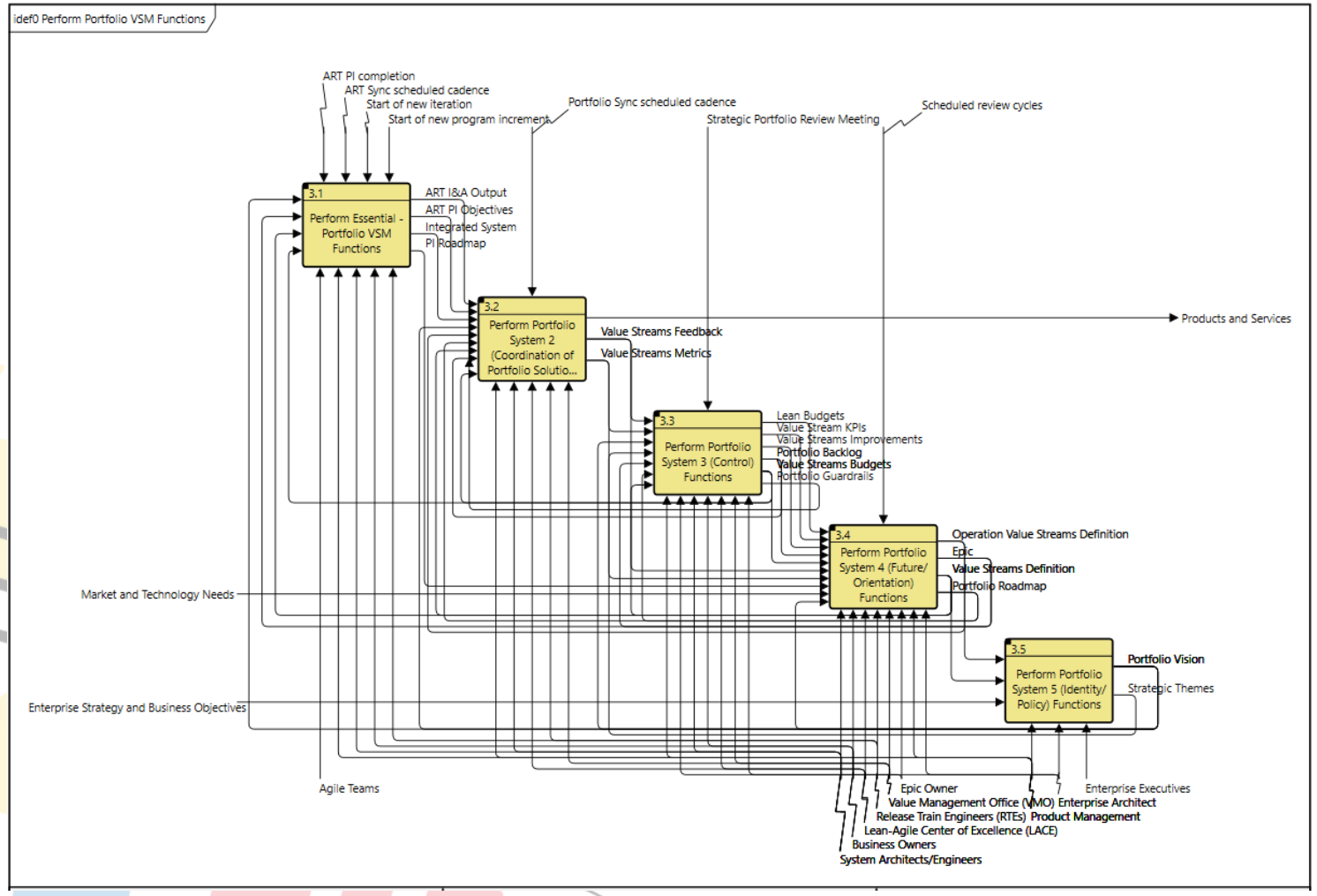
- Strengths
  - Autonomy, coordination, and continuous improvement
- Weakness
  - Alignment, resource management, and future planning



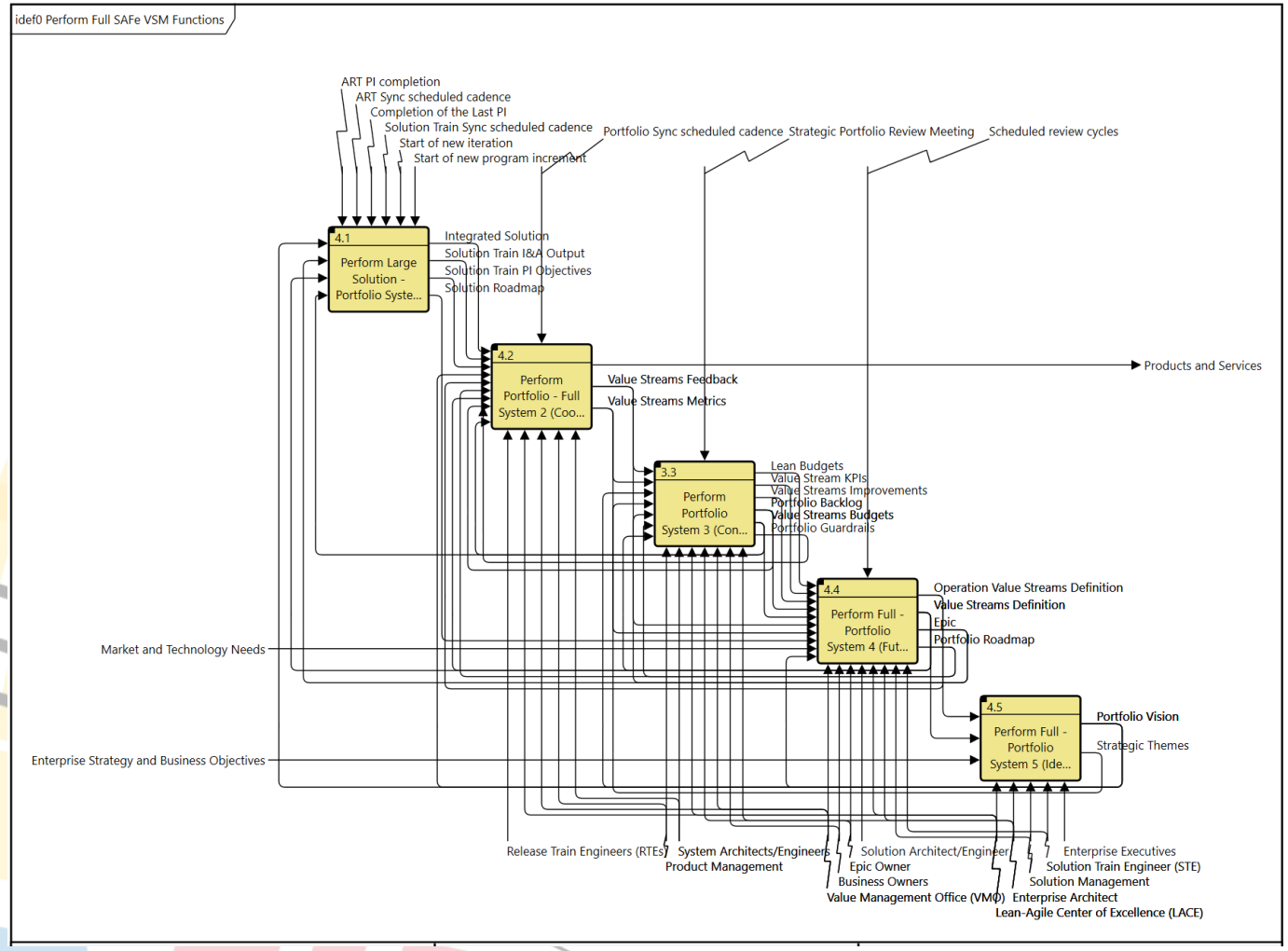
Large Solution SAFe Configuration



Portfolio SAFe Configuration



Full SAFe Configuration



Conclusions

- SAFe provides a robust framework for scaling agile.
- VSM offers a powerful tool for understanding organizational viability.
- IDEF0 modeling enhances clarity and systemic diagnosis.
- Combining SAFe, VSM, and IDEF0 leads to improved organizational efficiency and adaptability.
- Addressing identified weaknesses can optimize agile implementations.

Thank you!

Q&A

34th Annual INCOSE international symposium

hybrid event

Dublin, Ireland
July 2 - 6, 2024

www.incose.org/symp2024

#INCOSEIS