33rd Annual INCOSE international symposium

hybrid event

Honolulu, HI, USA
July 15 - 20, 2023

Agile Planning for Systems Engineering

Systems Engineering Planning in a Changing World

Acknowledgements

Sincere appreciation to:

- Northrop Grumman's Enterprise, Space Sector, and Payload & Ground Systems Division Lean-Agile Centers of Excellence
- NDIA IPMD Agile Planning for Systems Engineering Working Group

The Opportunity

The transition for traditional to agile is having to change the way we fund, contract, measure and organize; this is a complete cultural and behavioral change for all government organizations in order to increase our responsiveness to our customers.

Dr. Matt Kennedy
Defense Acquisition University (2018)

I want a plane. I want it to fly this fast. I need it to do this mission." But you don't know how to turn your desire into 100 pages of specifications that everyone needs to be checked off.

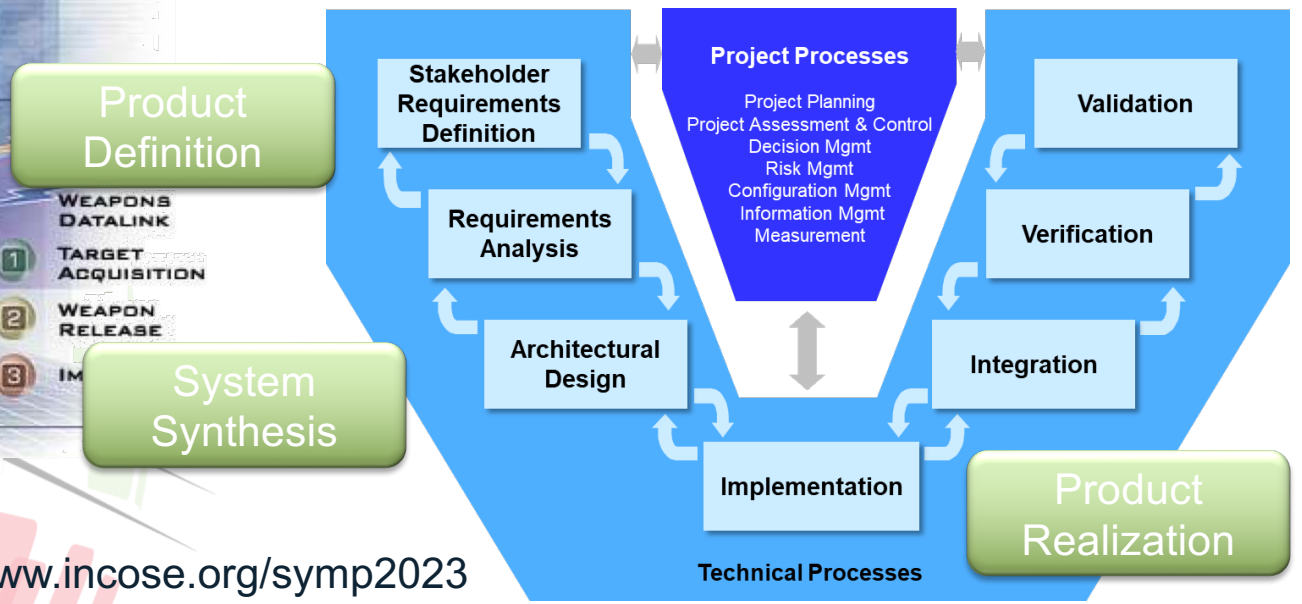
Dr. Will Roper
USAF Service Acquisition Executive (2019)

We must let go of the idea that minutely spelling out, within the four corners of the contract, exactly what "shall be delivered," is the only path to reasonably assured contracting outcomes… We need a faster way to develop and acquire leading-edge technologies.

DAU News, "Creating Incentivized Agile Contracts" (1-Jul-2021)

The Big Picture

Systems Engineers have the responsibility to tell the story of the system, ensuring that there is a common consistent understanding of the system intent, context, and implementation shared between all stakeholders at all levels of system development and operations.



Navigating Change

How much upfront planning and systems engineering is required to seed the Agile development teams without compromising the promise of Agile development methods?

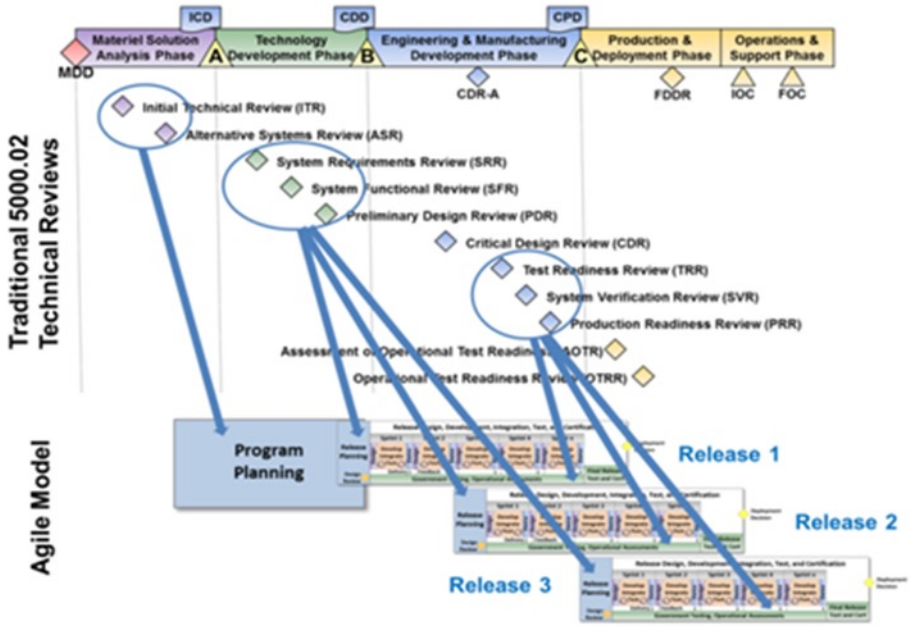
How much does the team need to perform work?

How do we balance the customer's needs for Agile capability development and traditional technical reviews as potentially competing means of reducing acquisition risk?

How does the team demonstrate sufficient technical maturity on an ongoing basis?

Scenario Overview

- Simplified example for developing initial planning, roadmap, and content for Agile reviews given an automotive system.
- Focus on two capabilities:
  - Advanced Driver Assistance System
  - In-Vehicle Infotainment

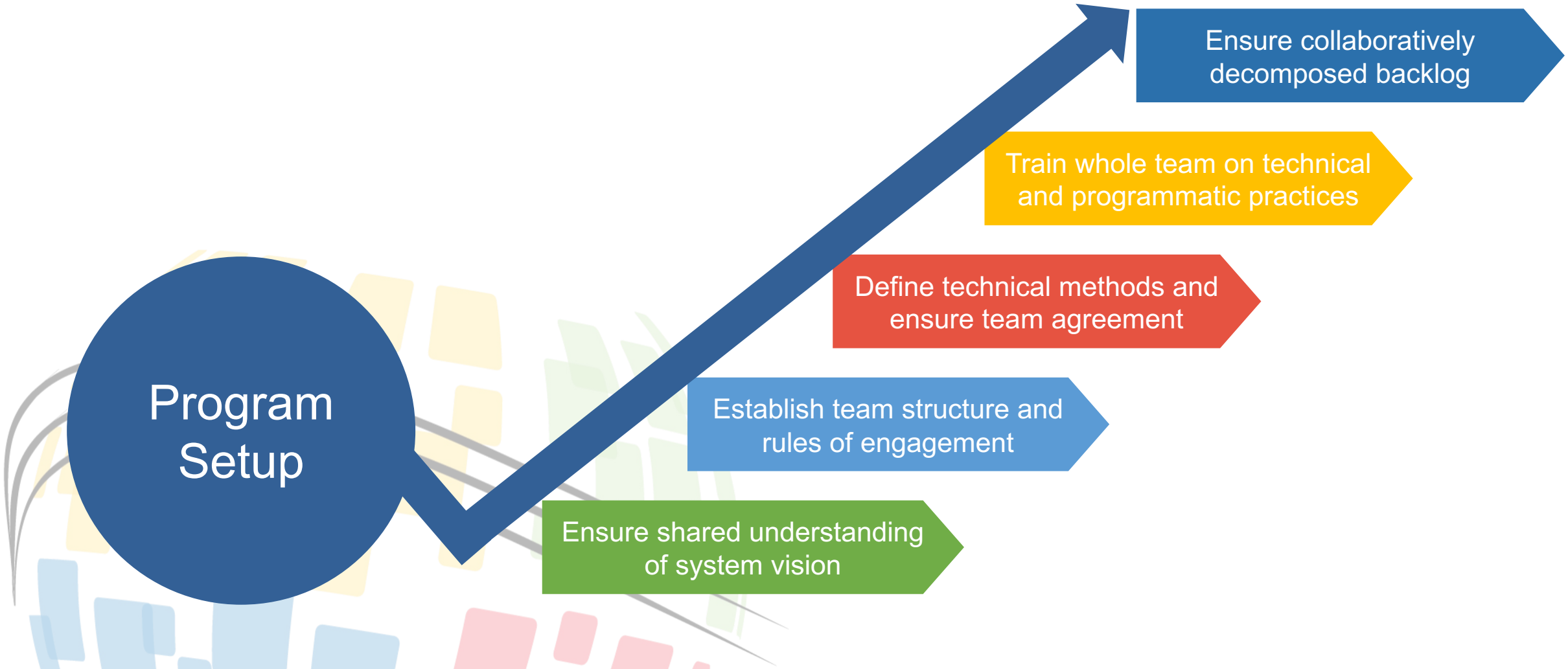


Minimum Viable Product

- Rearview backup camera
- Blindspot detection
- Rear cross-traffic alert
- Internet access
- Smartphone integration
- Mirror phone
- OTA updates
- User feedback

MVP Completion

Starting Off Right



Just Enough…

The Systems Engineering Minimum Viable Product

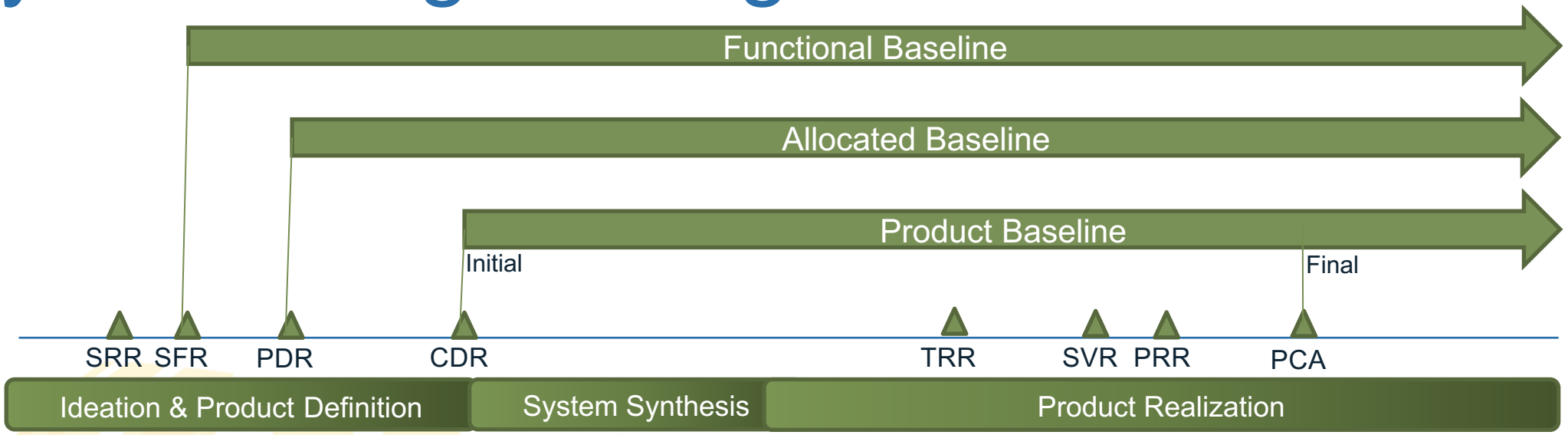
- Key system functionality/capabilities
- Product Roadmap
- (Initial) Concept of Operations
- (Initial) Technical Architectural Vision and Approach

"What does the team need to know right now?"

> *After establishing a vision, the program will typically elicit a preliminary set of very general operating requirements from all customers… Requirements are often still vague after this exercise.*
>
> GAO-20-590G

Manage the balance between
fixed and variable system definition

Systems Engineering Technical Reviews



CON OPS

Component Specs

Verification Plan

System Spec

IEEE Std 15288-2-2014
Technical Reviews and Audits

User Needs
System Concept Definition
Critical Supplier Identification

Component Analysis
Requirements Allocation

Long-lead procurement
Prototyping

Hardware and Software Integration
System Integration

Requirements Verification

Produce and Deploy
(and Sustain)

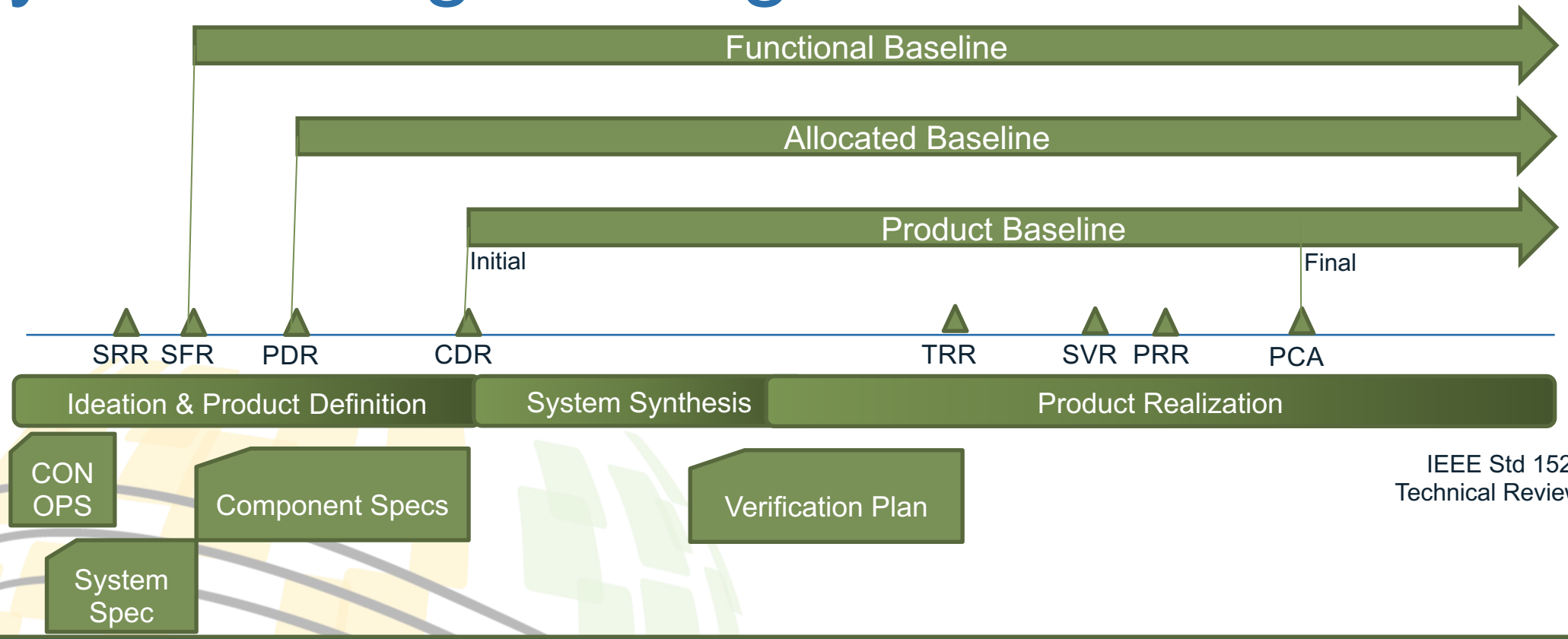
Feasibility Studies
Evaluation of alternatives

Hardware Build
Software Code/Unit Test

Functional Analysis
System Specification
Functional Specification

SRR - System Requirements Review
SFR - System Functional Review
PDR - Preliminary Design Review
CDR - Critical Design Review
TRR - Test Readiness Review
SVR - System Verification Review
PRR - Production Readiness Review
PCA - Physical Configuration Audit

Systems Engineering Technical Reviews



IEEE Std 15288-2-2014
Technical Reviews and Audits

…the traditional requirements development, preliminary design review, and critical design review events may be replaced by incremental design reviews, and, if needed, system-level reviews.
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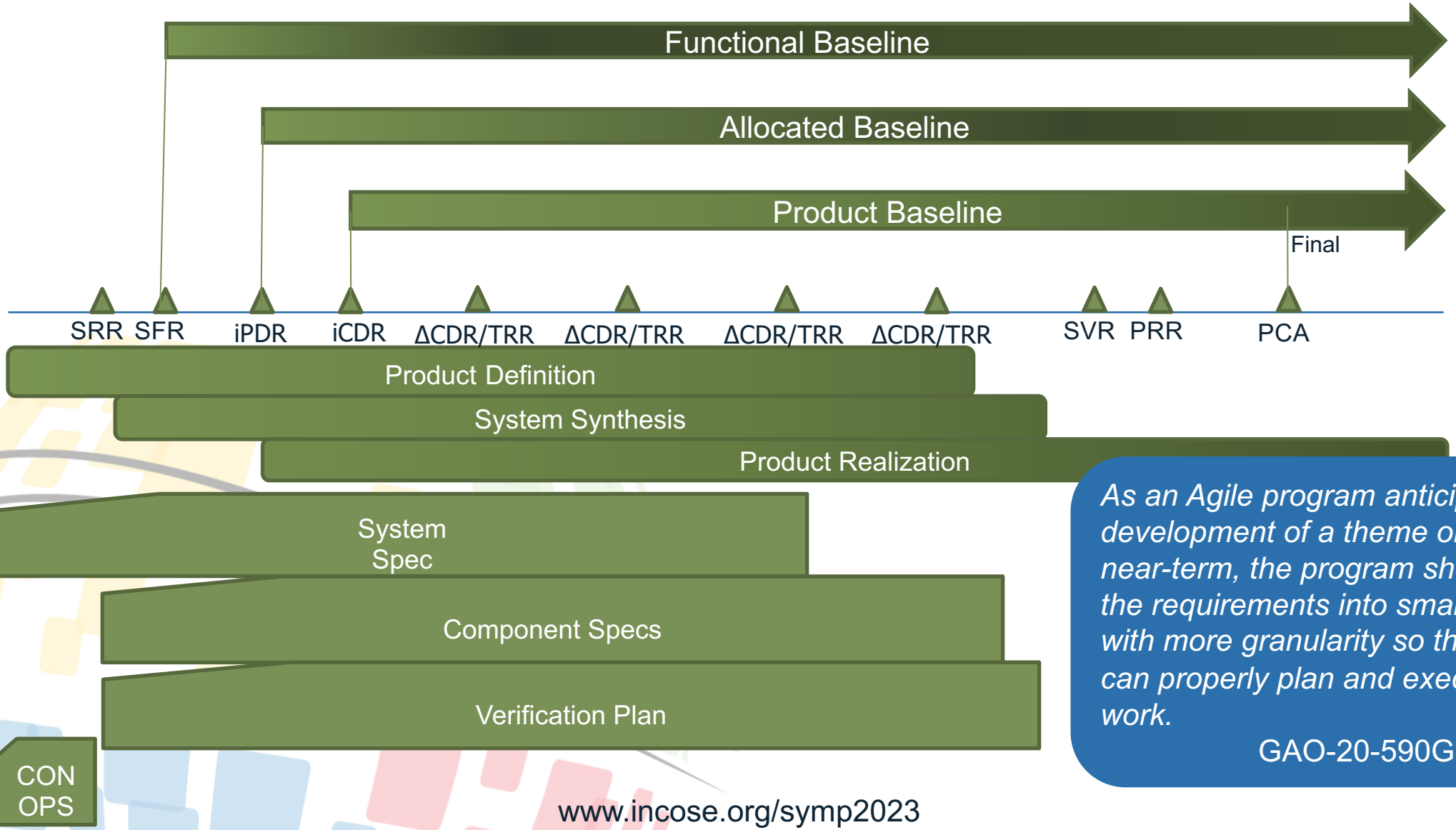
Incremental Design Review

- Confirm user needs: update specs, test approach
- Review change impacts to baselines
- Review updates to architecture and design (and design sets)
- Review Architectural Runway

Need to maintain consistent understanding of the system, incrementally refined

Incremental Systems Engineering Technical Reviews



As an Agile program anticipates the development of a theme or epic in the near-term, the program should define the requirements into smaller efforts with more granularity so that the team can properly plan and execute the work.

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Wrap Up

- Systems Engineers have an ongoing task to manage the common understanding of the system – past, present, desired.
- The need for greater responsiveness and ongoing incorporation of new information creates the need for persistent, active, and engaged Systems Engineering on both customer and contractor teams.
- This drives the need to harness the digital ecosystem to provide an efficient vehicle for this collaboration.

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