



Healthcare
Working Group
5th Annual Systems
Engineering in Healthcare
Conference

May 1-2, 2019
Minneapolis, MN

Using System Engineering Methods in an Agile Development Framework

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Agile Quality Systems, LLC

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How Systems Engineering Can Reduce Cost & Improve Quality

1-2 May, 2019 Twin Cities, Minnesota



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Using System Engineering Methods in an Agile Development Framework

- Topics
 - The Systems Engineering Engine
 - Agile Basics
 - What do Systems Engineers DO in an Agile model?



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What Systems Engineers Do

- Activities of Systems Engineering

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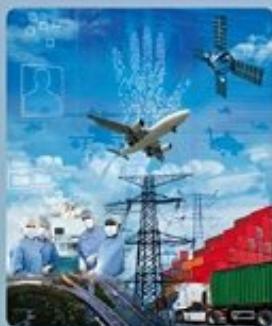


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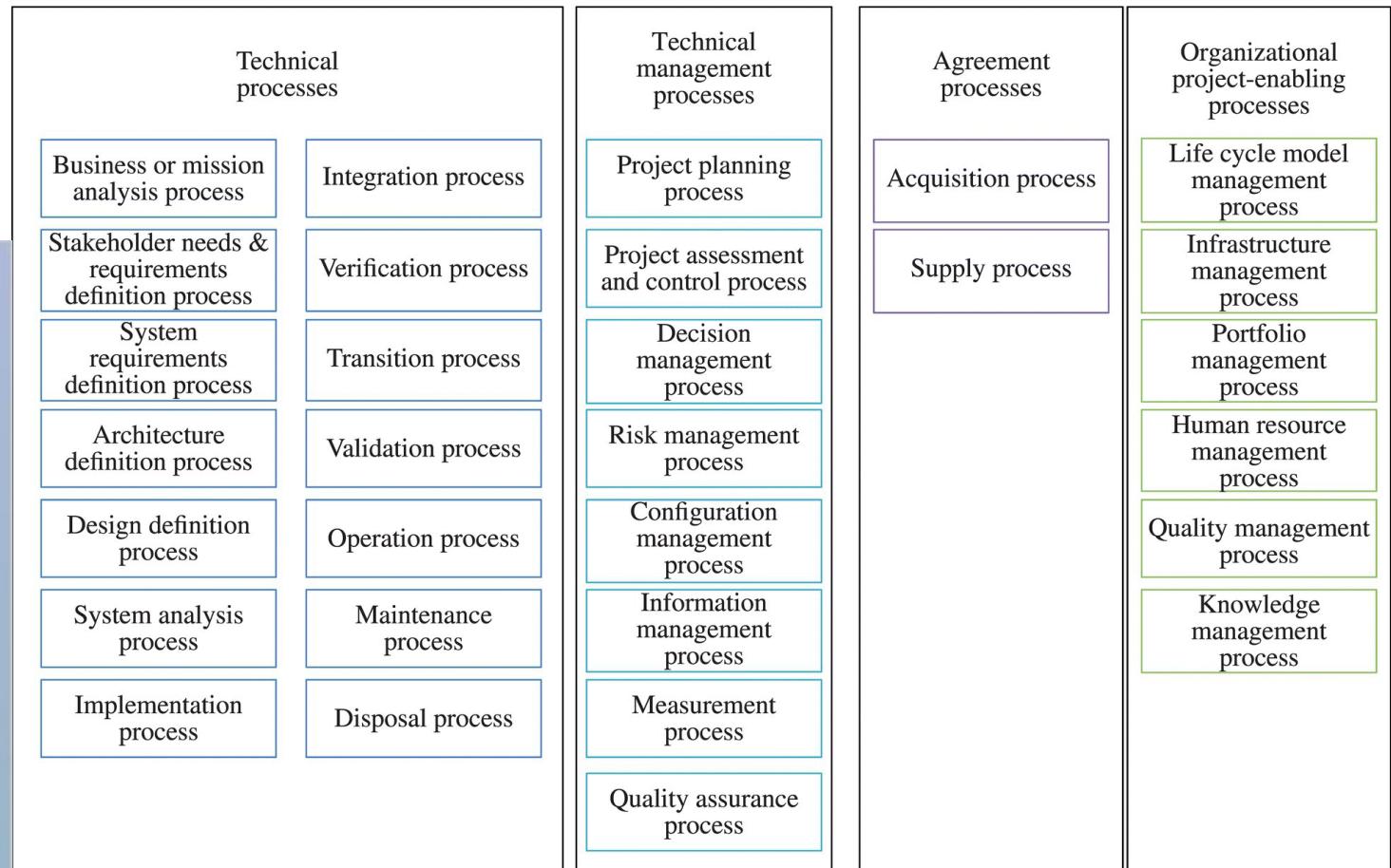


SYSTEMS ENGINEERING HANDBOOK
A GUIDE FOR SYSTEM LIFE CYCLE PROCESSES AND ACTIVITIES



FOURTH EDITION

WILEY



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NASA/SP-2007-6105
Rev1

NASA Systems Engineering Handbook

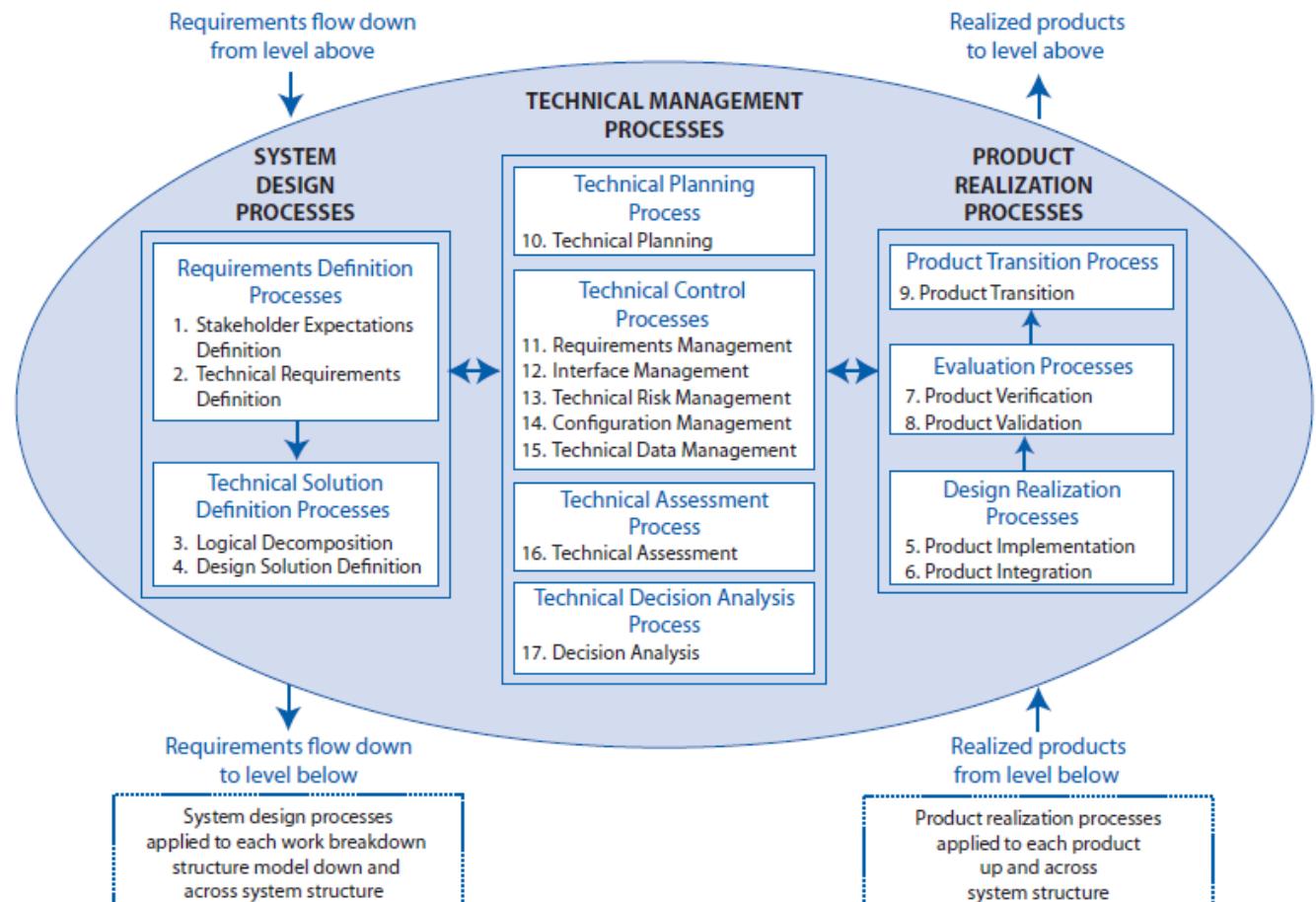


Figure 2.1-1 The systems engineering engine

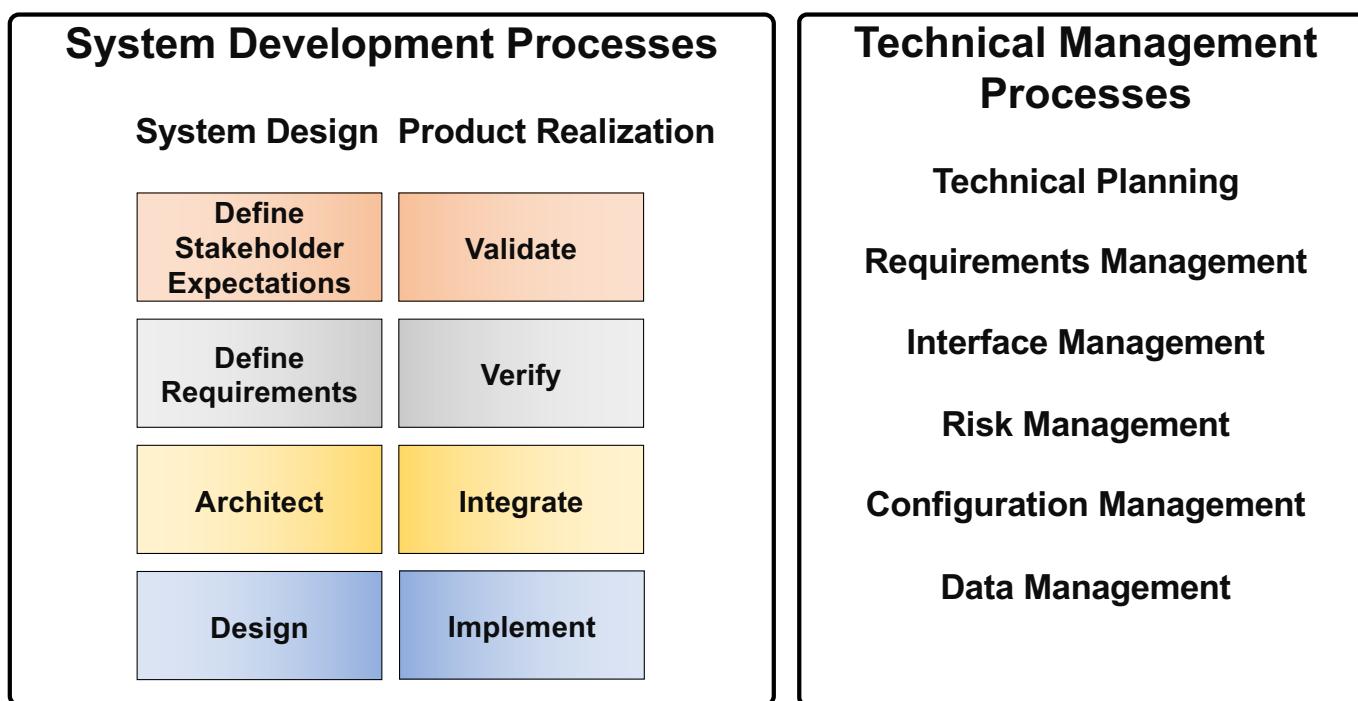
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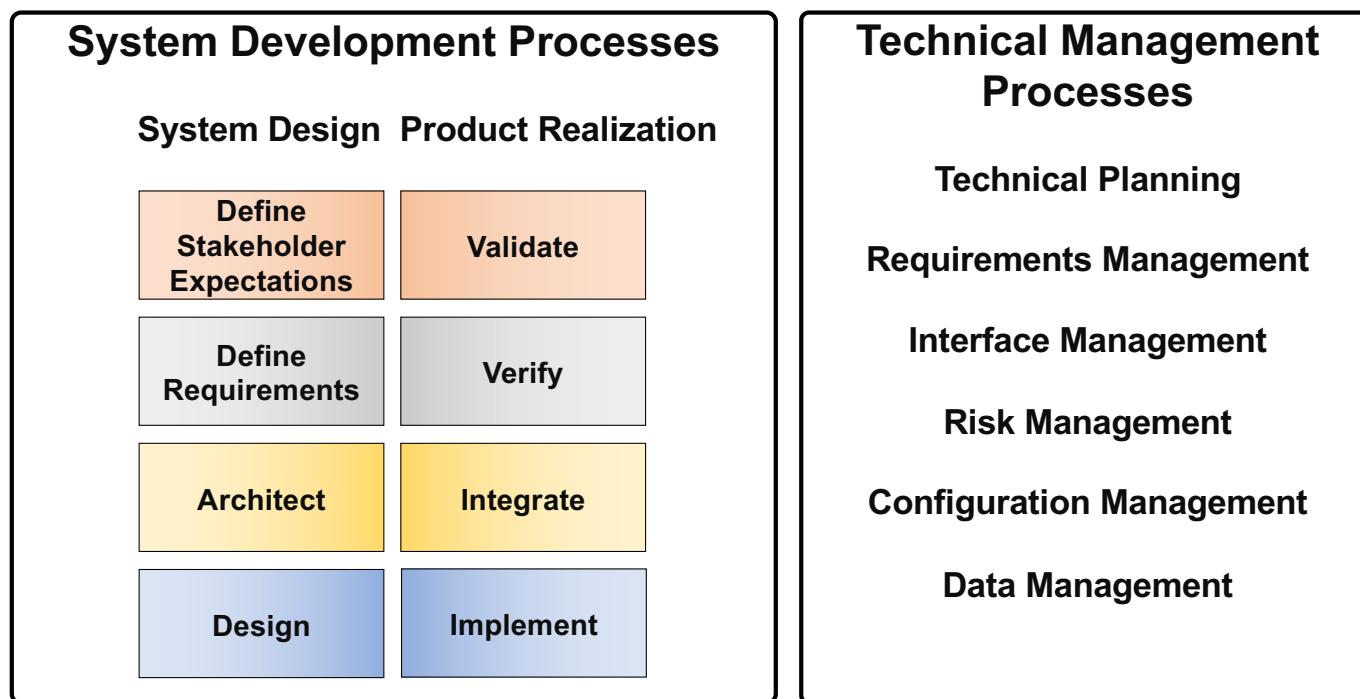
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The Systems Engineering Engine



Poll: Which activities do Systems Engineers do in your organization?



What is Your System?

System of Systems

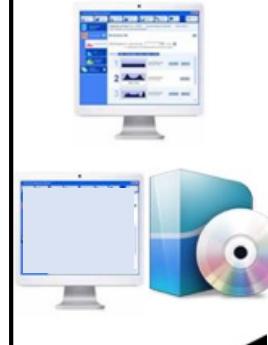
Electrical Mechanical System



Electrical Mechanical Firmware System



Web / Stand-alone Software System

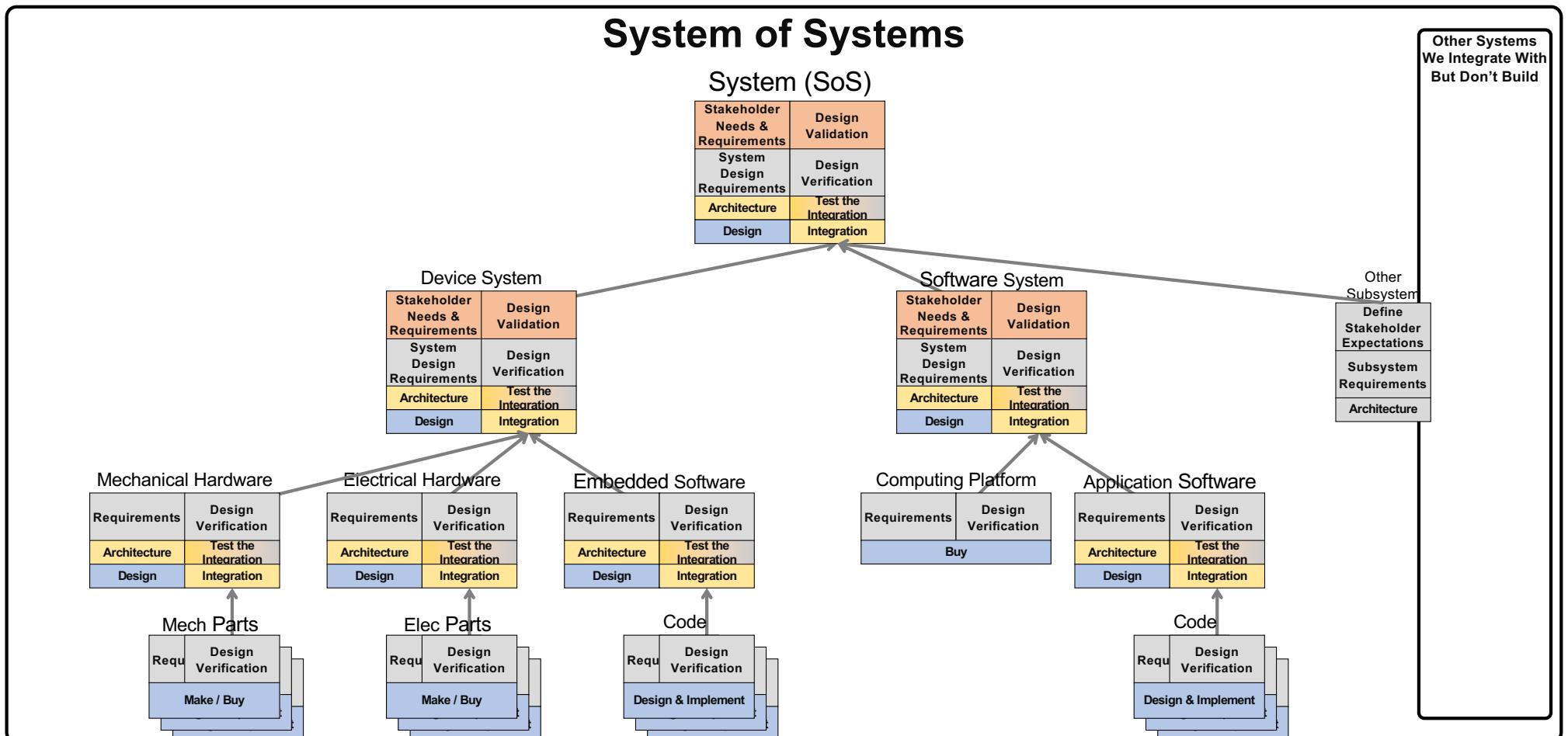


Mobile App System



Other Systems
We Integrate With
But Don't Build

What is the System? And What are the Activities & Deliverables?





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Agile Basics

- A foundation for discussions to come

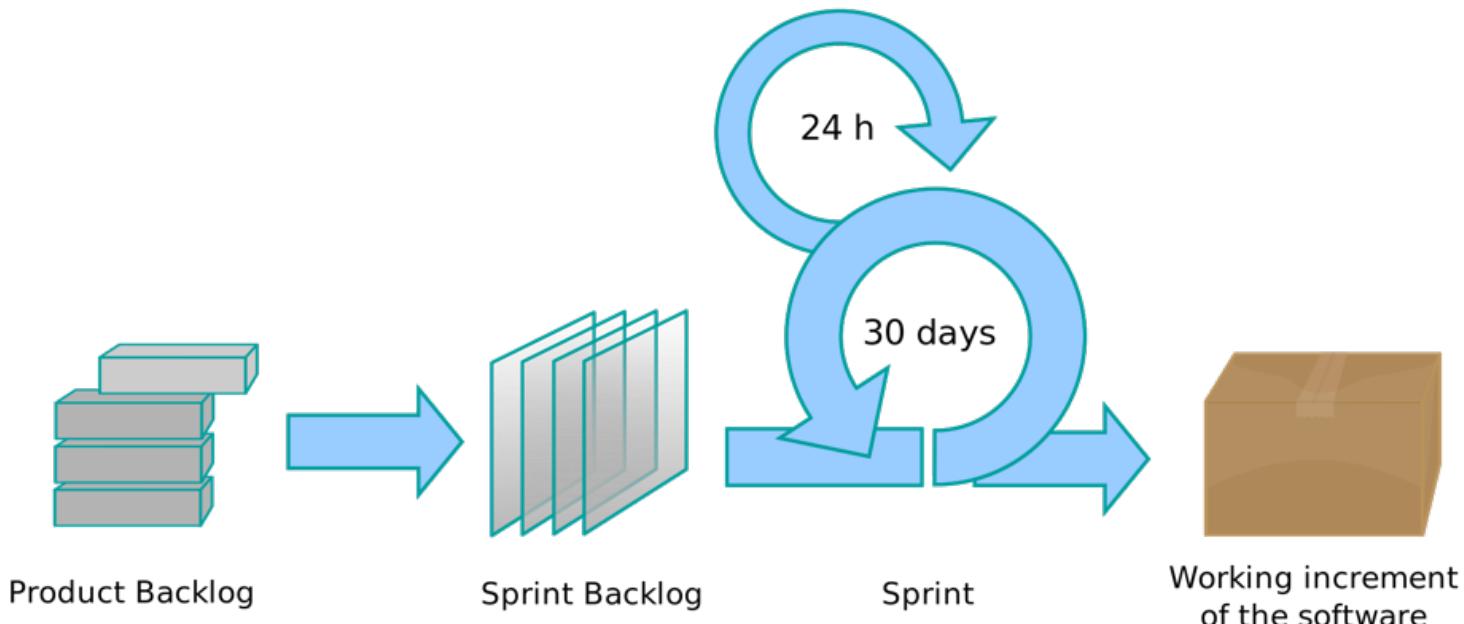
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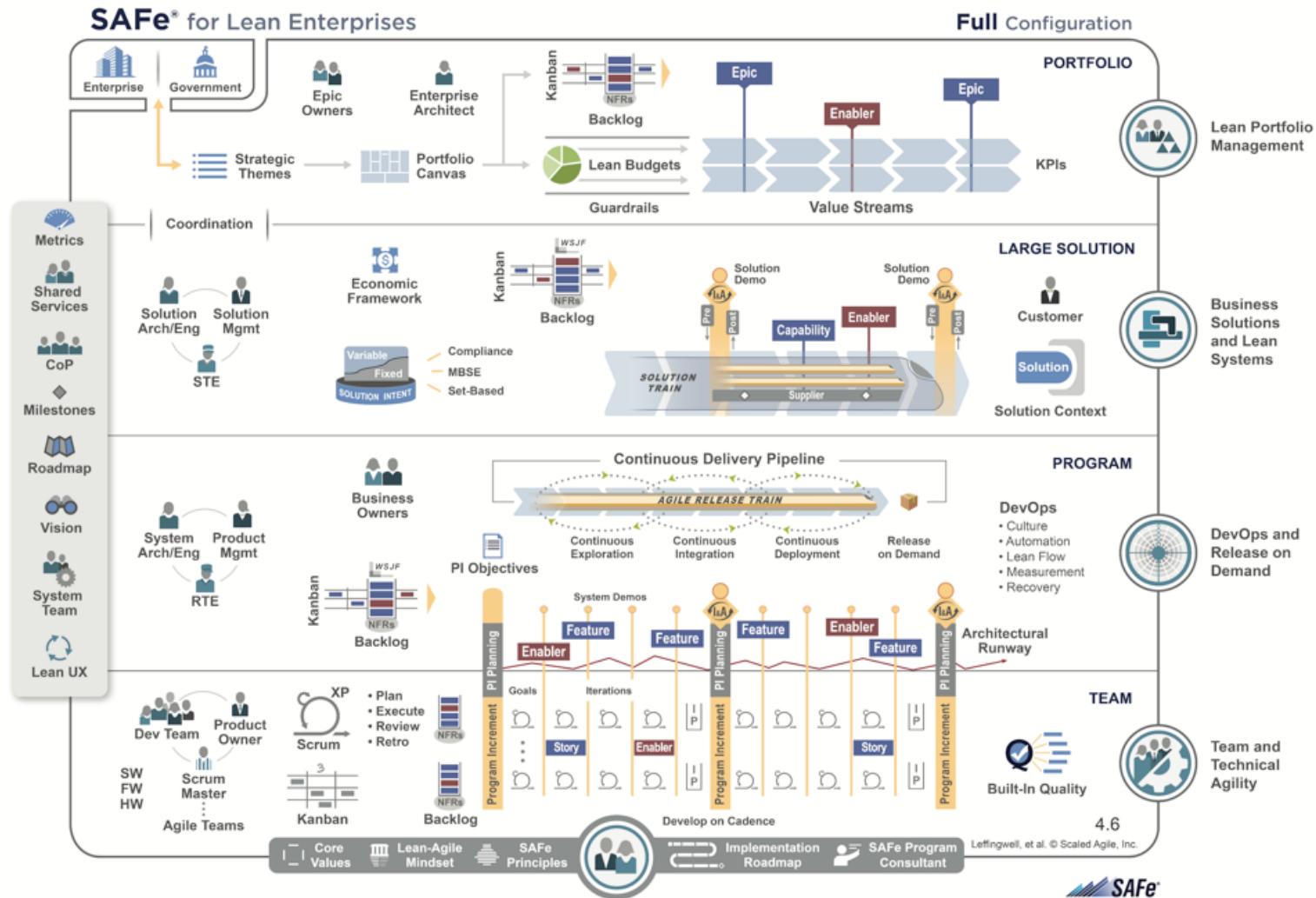
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The Scrum Model

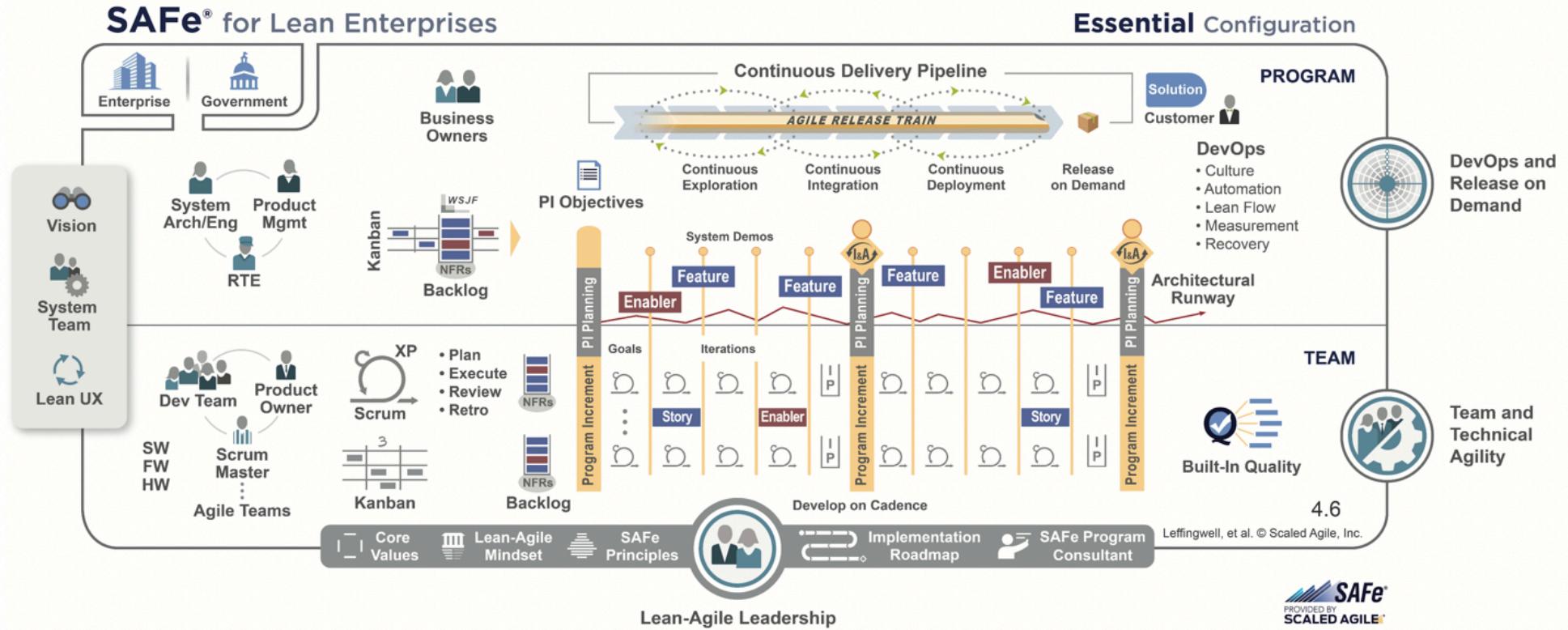
(scrumalliance.org)





(<http://www.scaledagileframework.com>)

SAFe® for Lean Enterprises



(<http://www.scaledagileframework.com>)

For Each Product

- Some activities span the entire life cycle of the product, from initial concept, to the creation of the first version, to ongoing improvements and maintenance.

For Each Product

For Each Release

- Some activities are performed when a version of the product is released, whether that be an external release to the market, a limited release for a field evaluation, or an internal release for internal evaluation.
 - A product could have one or many releases, including large releases of new functionality or small releases for minor enhancements

More releases...

For Each Product

For Each Release

For Each Increment

- Some activities are performed when a meaningful set of features and functionality are complete enough for an internal evaluation, or as needed for synchronization and alignment of activities and deliverables across the software product and/or the complete system.

More increments...

- There could be one or many increments in a release, depending on the complexity of the product and the appropriate frequency of synchronization for aligning development activities.

More releases...

For Each Product

For Each Release

For Each Increment

For Each Small Change

- Most activity happens a change at a time, using the mechanism of Sprints and small Backlog Items.

More Backlog Items...

- There are many Backlog Items in an Agile project
 - Hundreds, even thousands, are possible.

More increments...

More releases...

Agile (over) Simplified:

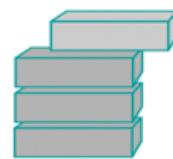
- We plan, managing Backlogs
- We deliver, one Backlog Item at a time

For Each Product



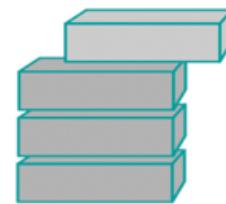
Product Backlog

For Each Release



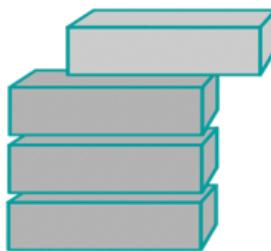
Product Backlog

For Each Increment



Product Backlog

For Each Small Change



Product Backlog

More Backlog Items...

More increments...

More releases...

For Each Product

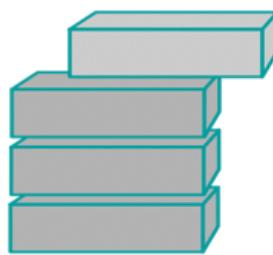


Product Backlog

For Each Release

For Each Increment

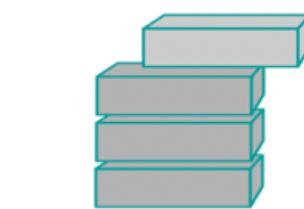
For Each Small Change



Product Backlog

More Backlog items...

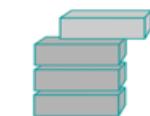
Product Backlog



More increments...

Product Backlog

More releases...



Product Backlog

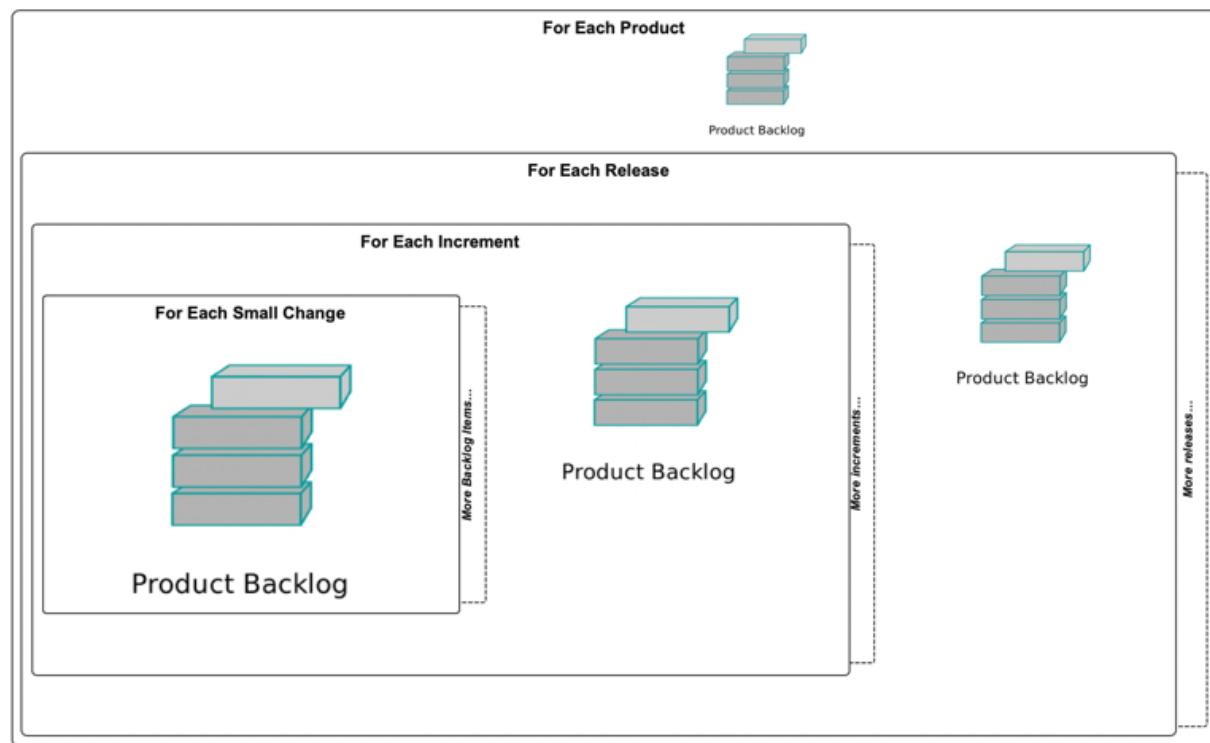
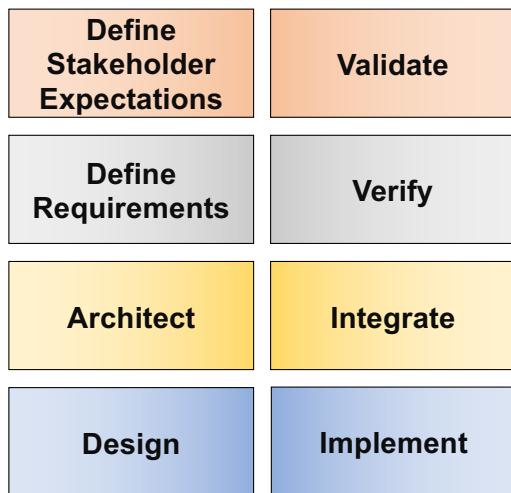


More releases...



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What Do Systems Engineers Do in an Agile Development Model?



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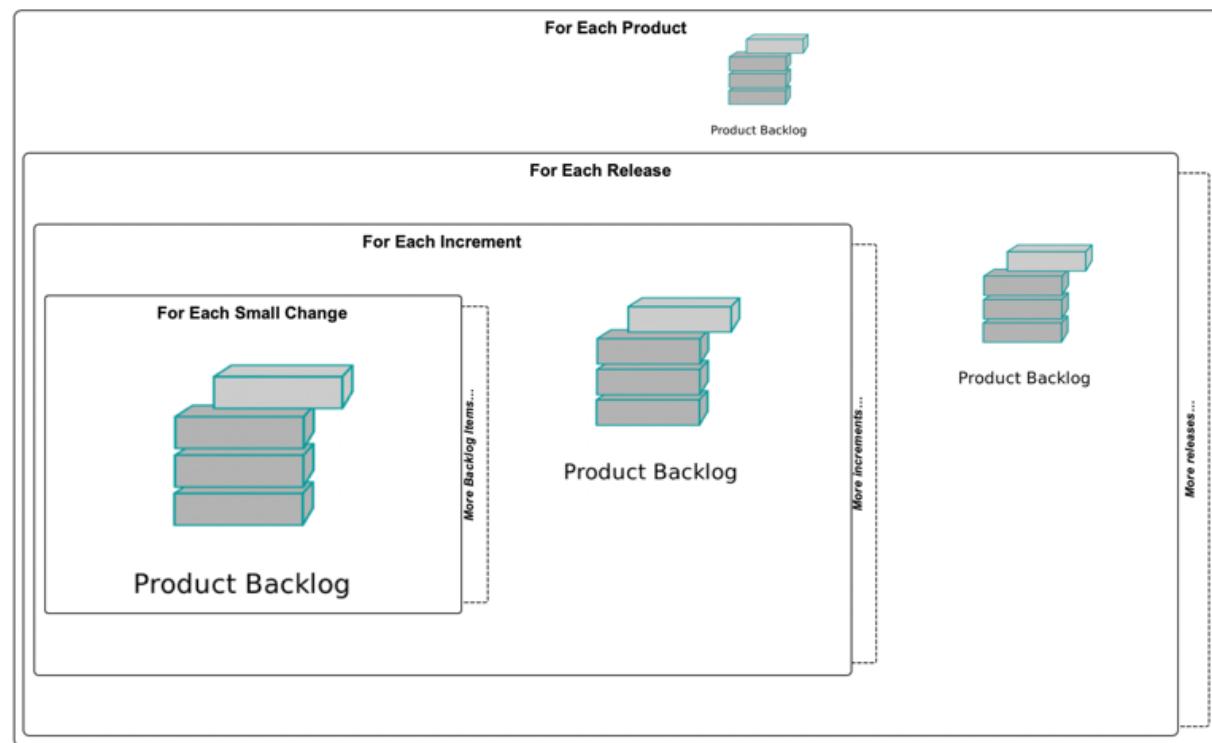
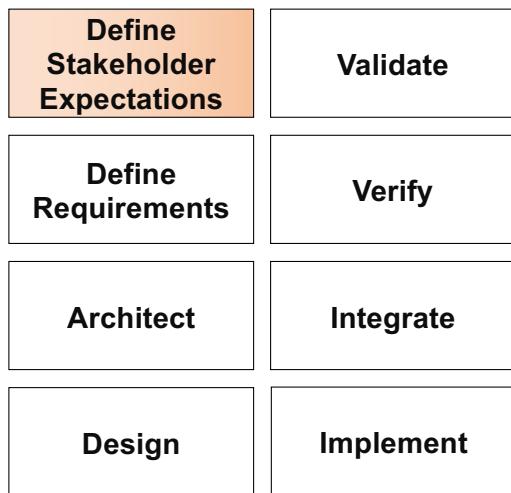


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Defining Stakeholder Expectations



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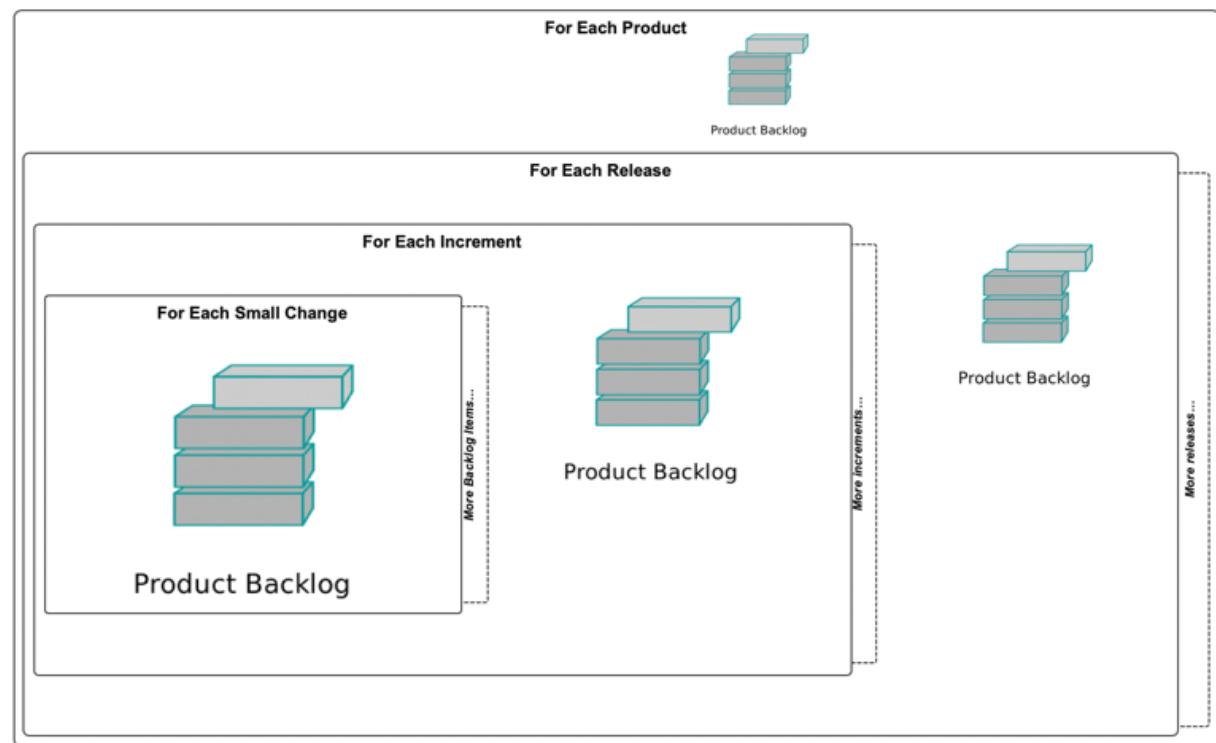
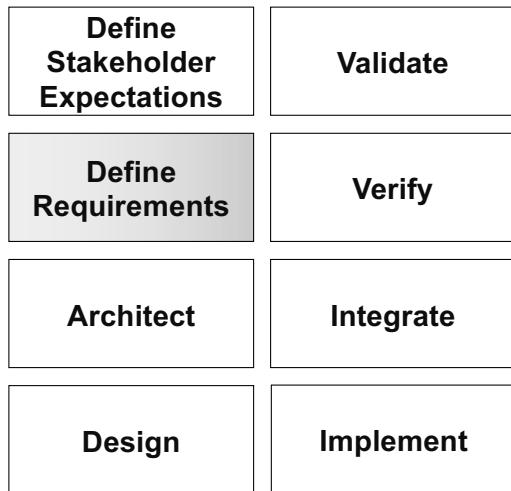


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Defining Requirements



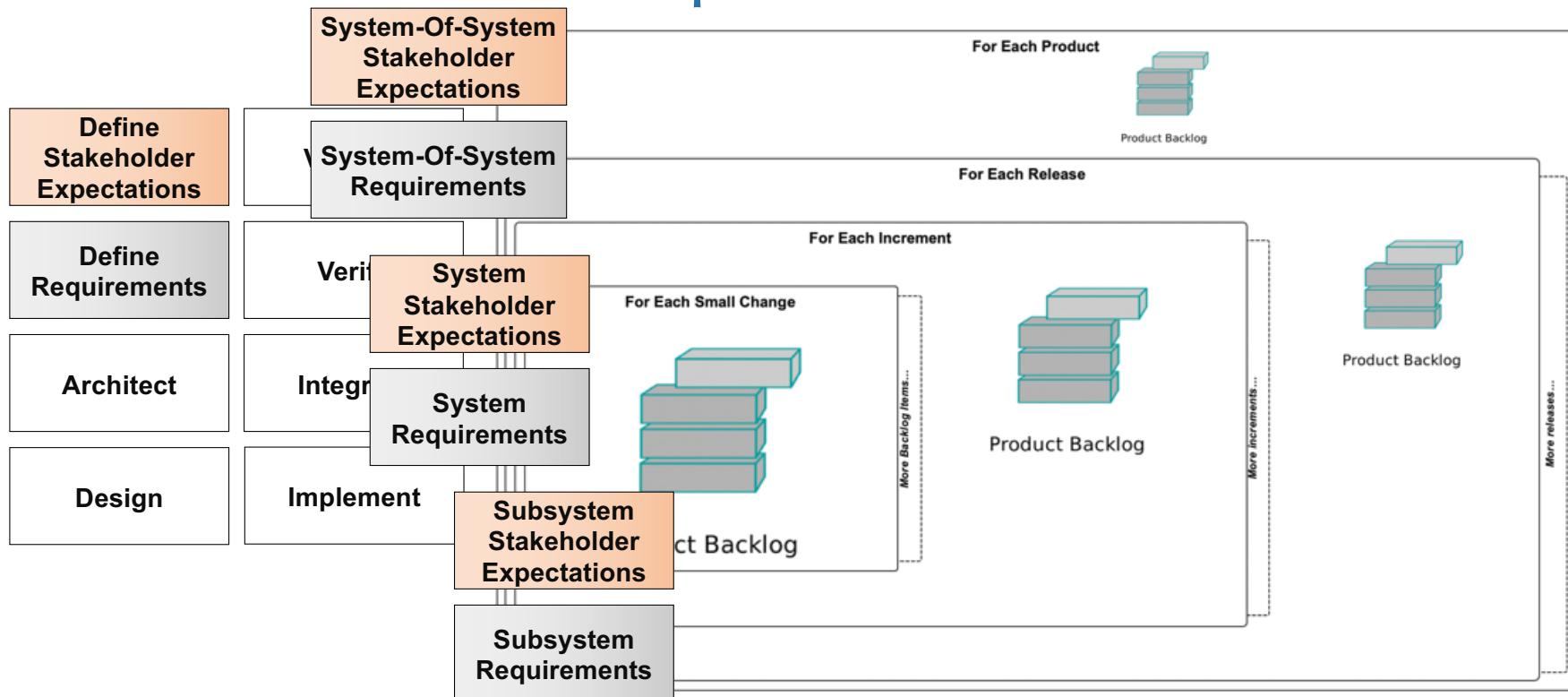
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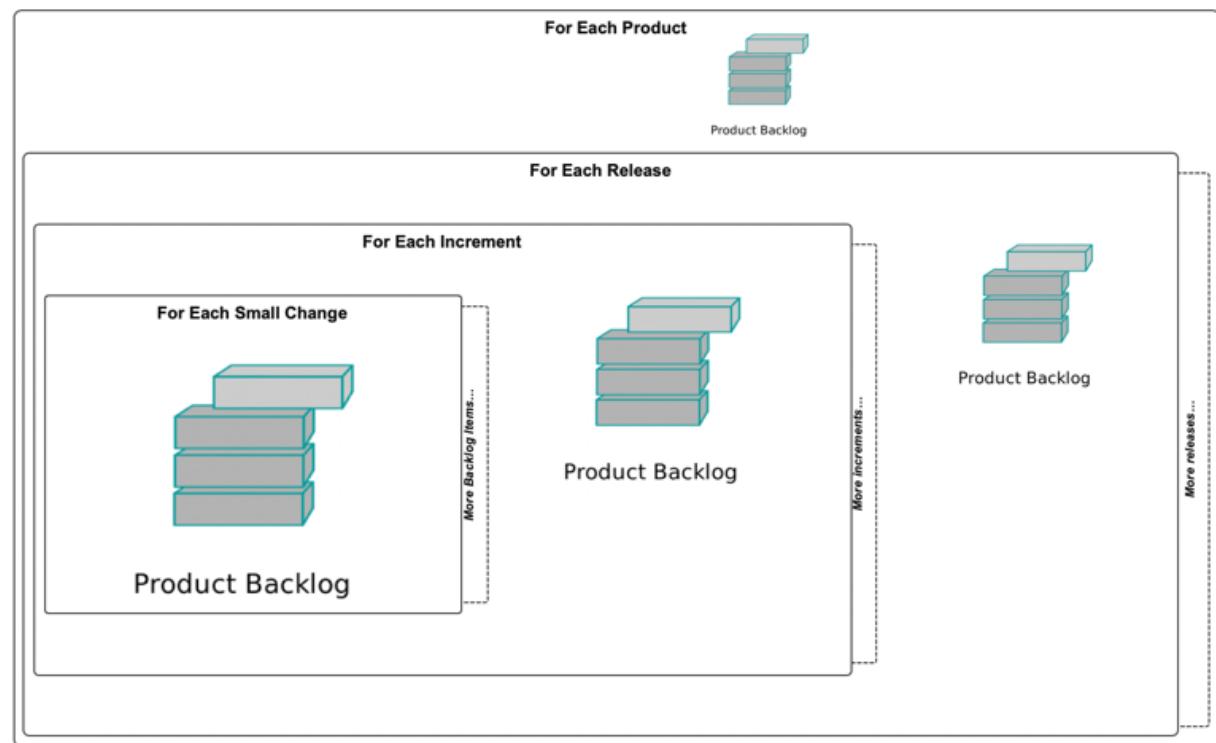
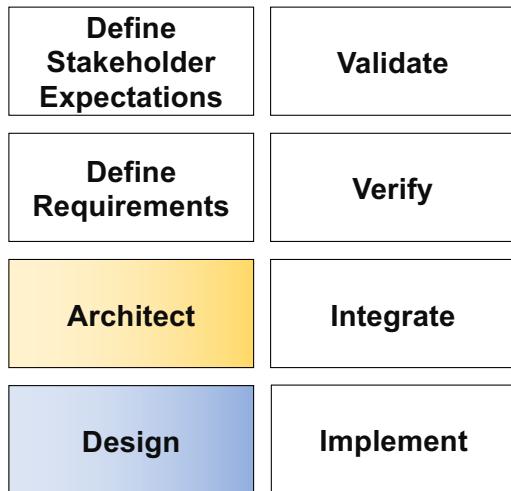
Layers of Stakeholder Expectations and Requirements





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Architecture & Design



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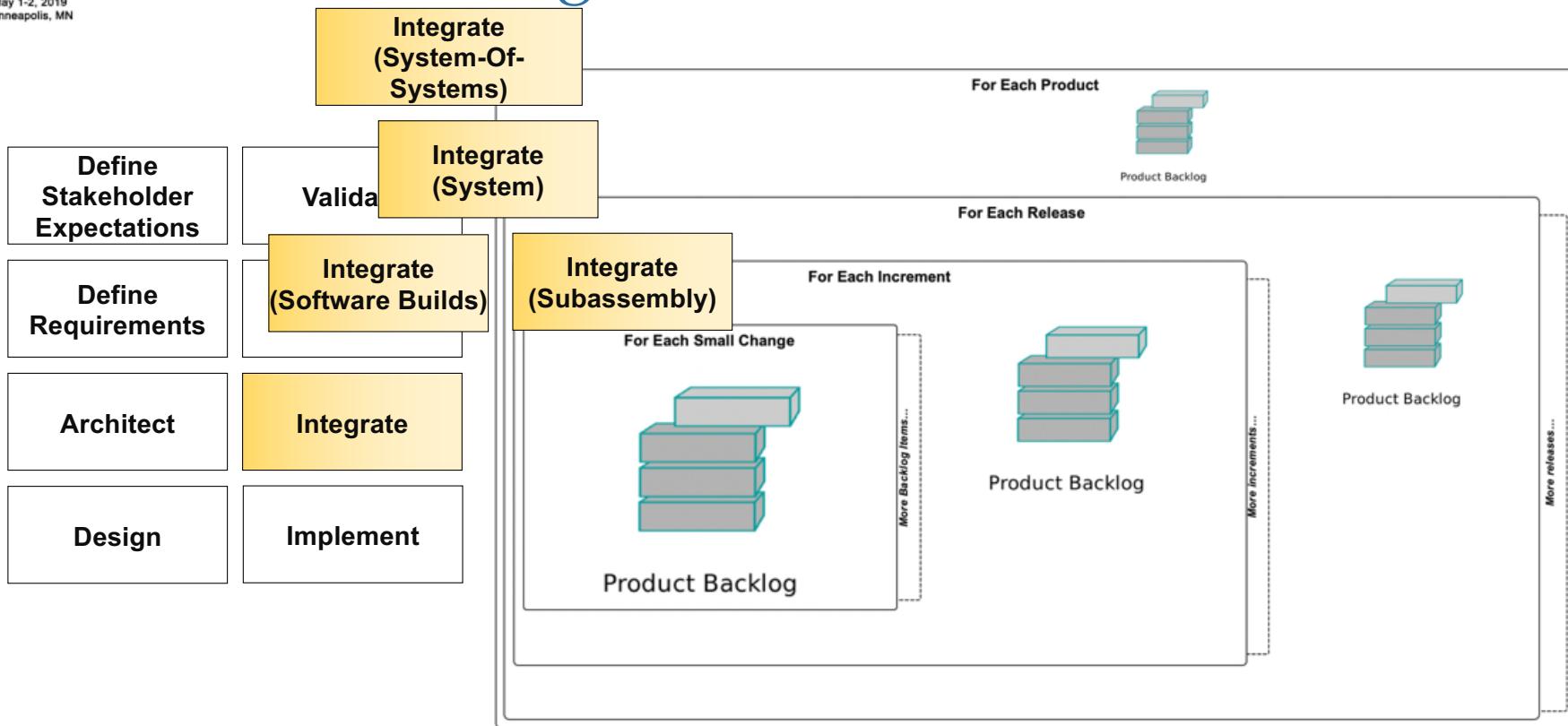


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Integration



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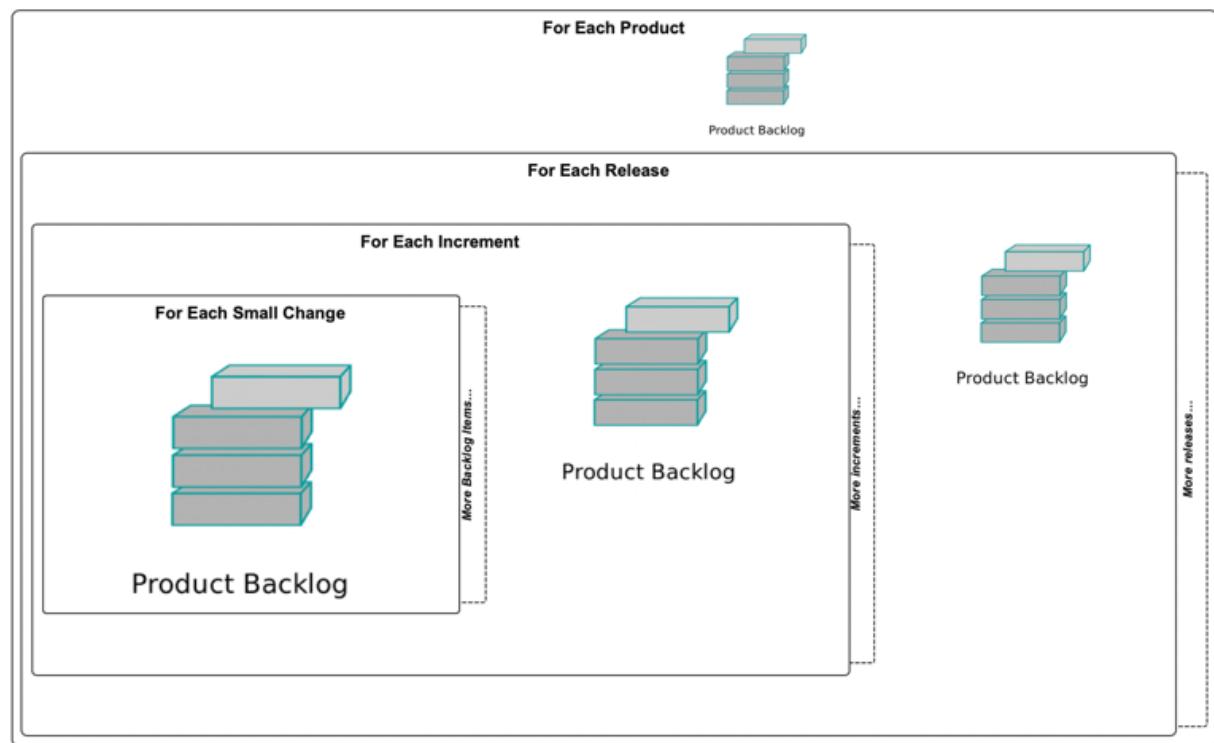
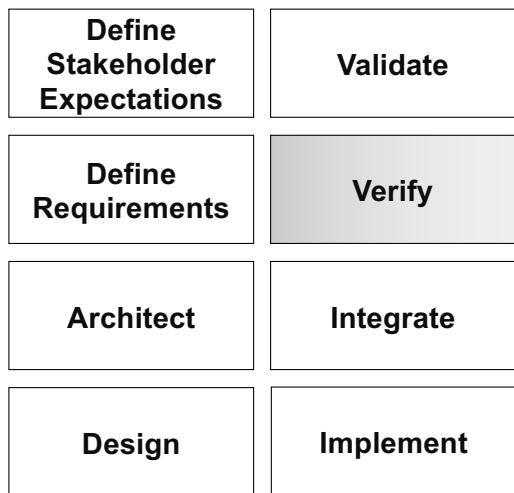


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Verification



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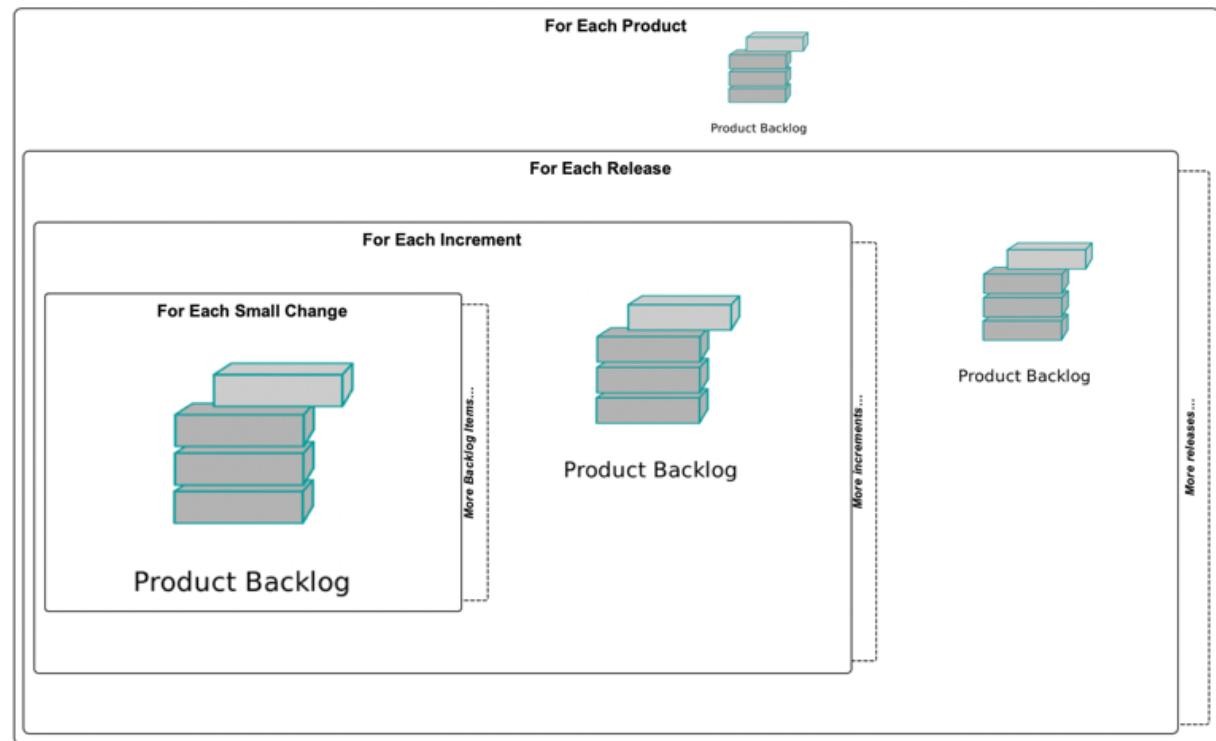
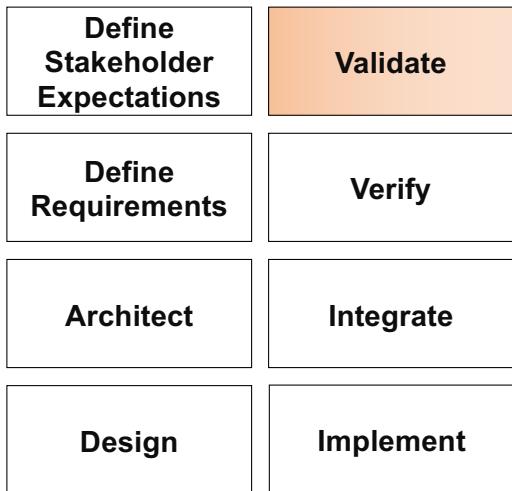


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Validation



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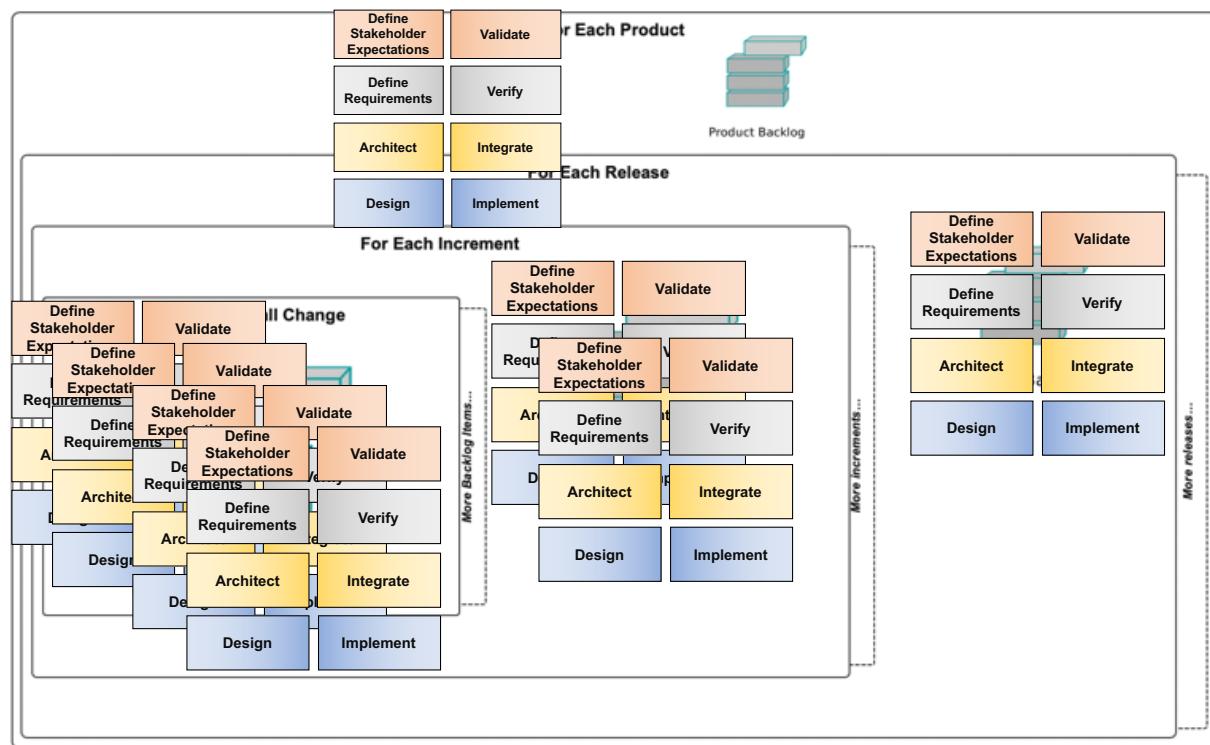
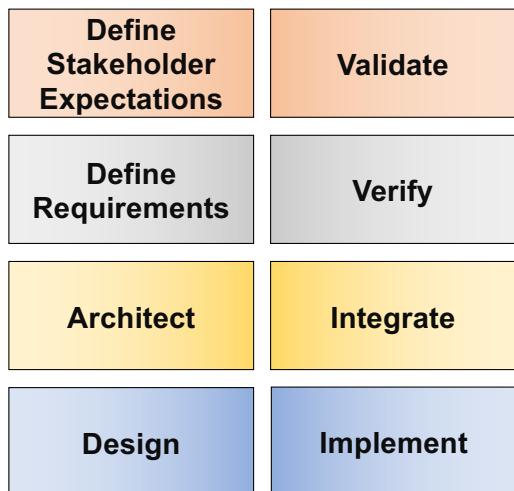
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What Do Systems Engineers Do in an Agile Development Model?



Want More?

- INCOSE Chicagoland Fall Tutorial, Tentative 28 Sept 2019
 - More on this topic, SE & Agile
- AAMI Course: The Application of Agile to the Development of Medical Device Systems
 - Kelly Weyrauch (Agile Quality Systems) and Chris Unger (GE Healthcare)
- Agile Training?
 - Certified Agile Regulatory Specialist™ (CARS™) (Flyer in the program)
 - Talk to me after this session about other Agile training

Contact Information

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- www.AgileQualitySystems.com
- Connect with me on LinkedIn

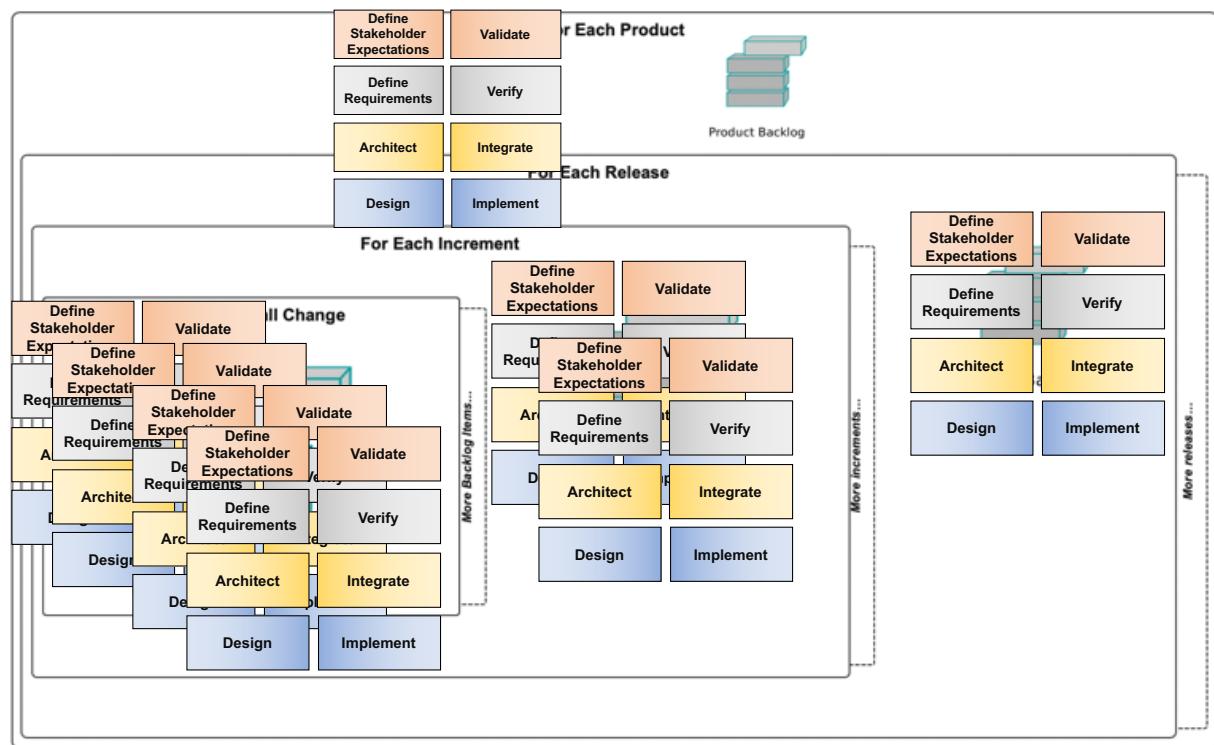
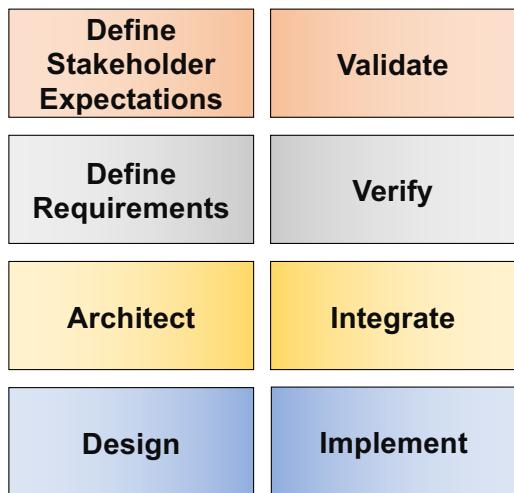


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Questions? Comments?



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**Thank you for attending!
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