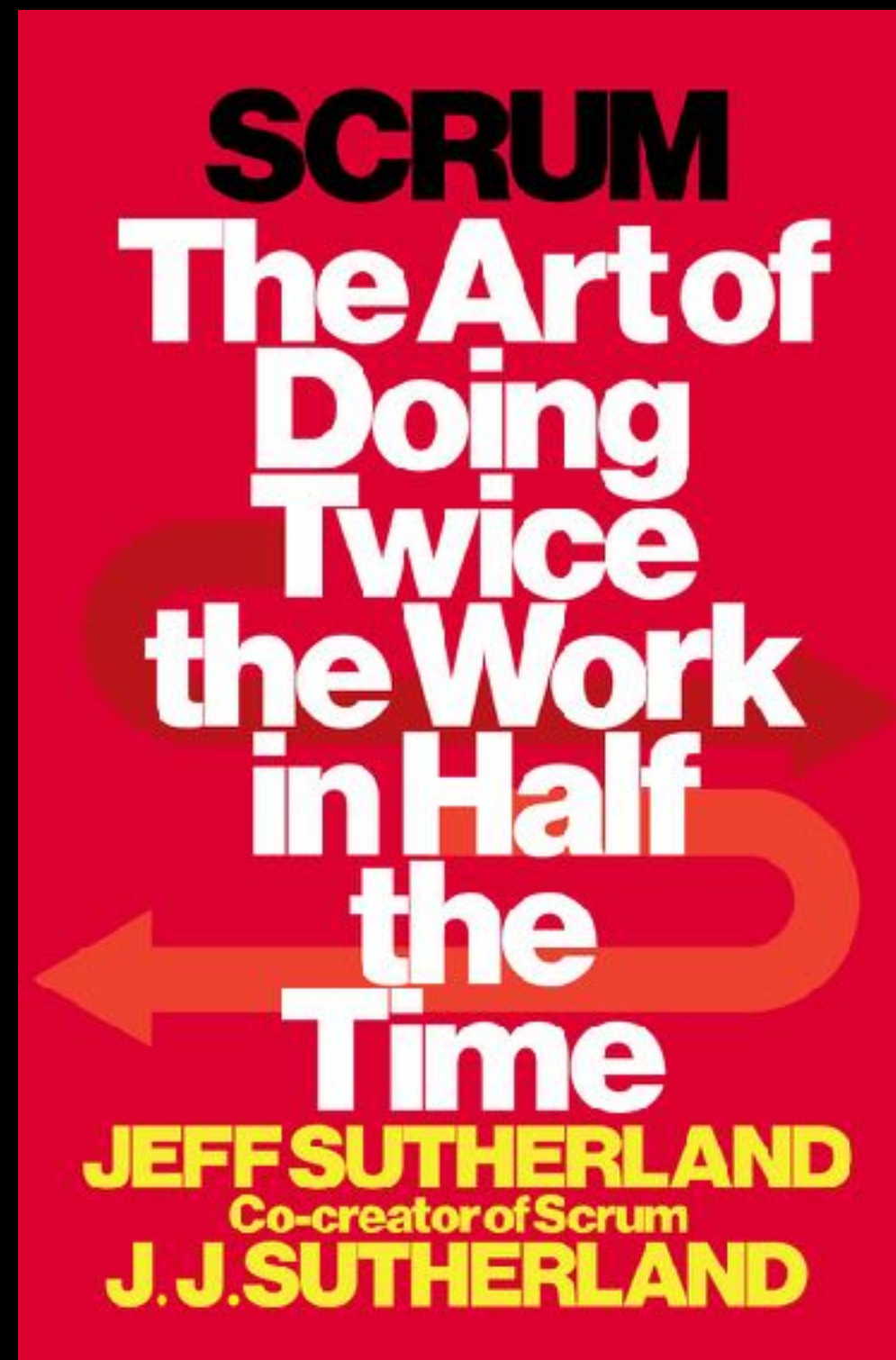


scruminc.

# Scrum@Scale Hardware



Agile is all about innovation!



# Joe Justice

“WE HAVE FOUND TEAM MORALE TO BE A MULTIPLIER FOR VELOCITY.”

- Leader of large groups to deliver quickly
- President of Scrum@Hardware practice at Scrum Inc.
- CEO WikiSpeed Inc., Manufacturing Company operating in 23 countries
- Creator of eXtreme Manufacturing Methods



[Joe.Justice@ScrumInc.com](mailto:Joe.Justice@ScrumInc.com)



Forbes



TEDx

x = independently organized TED event

Discovery CHANNEL

scruminc.  
the way teams work

EXTREME  
MANUFACTURING



CNNMoney.com  
FORTUNE

scruminc.

[Joe@ScrumInc.com](mailto:Joe@ScrumInc.com) @WikiSpeed



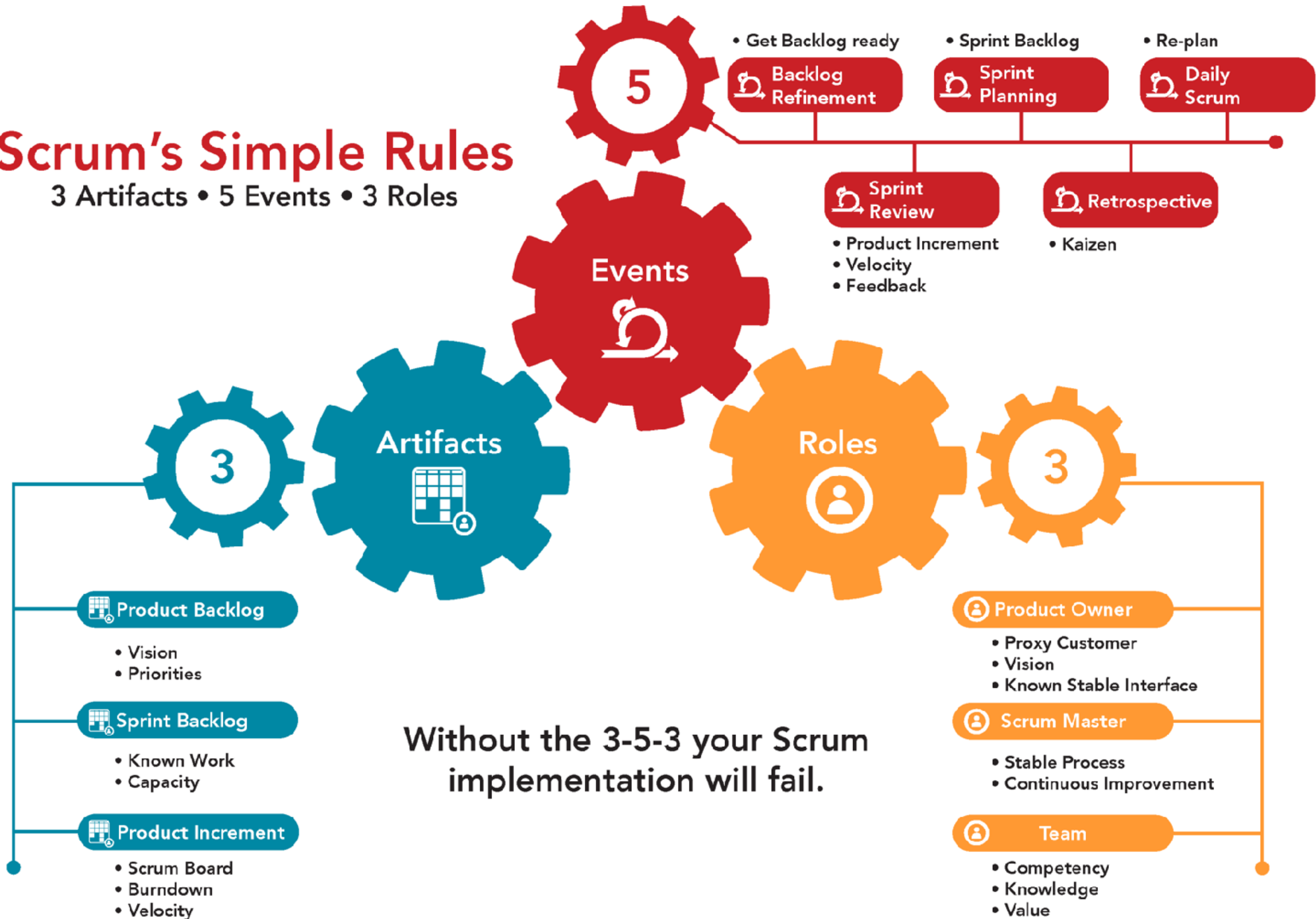
# Scrum@Scale

Coordinating Across Teams, Modules, Missions



# Scrum's Simple Rules

3 Artifacts • 5 Events • 3 Roles



Without the 3-5-3 your Scrum implementation will fail.



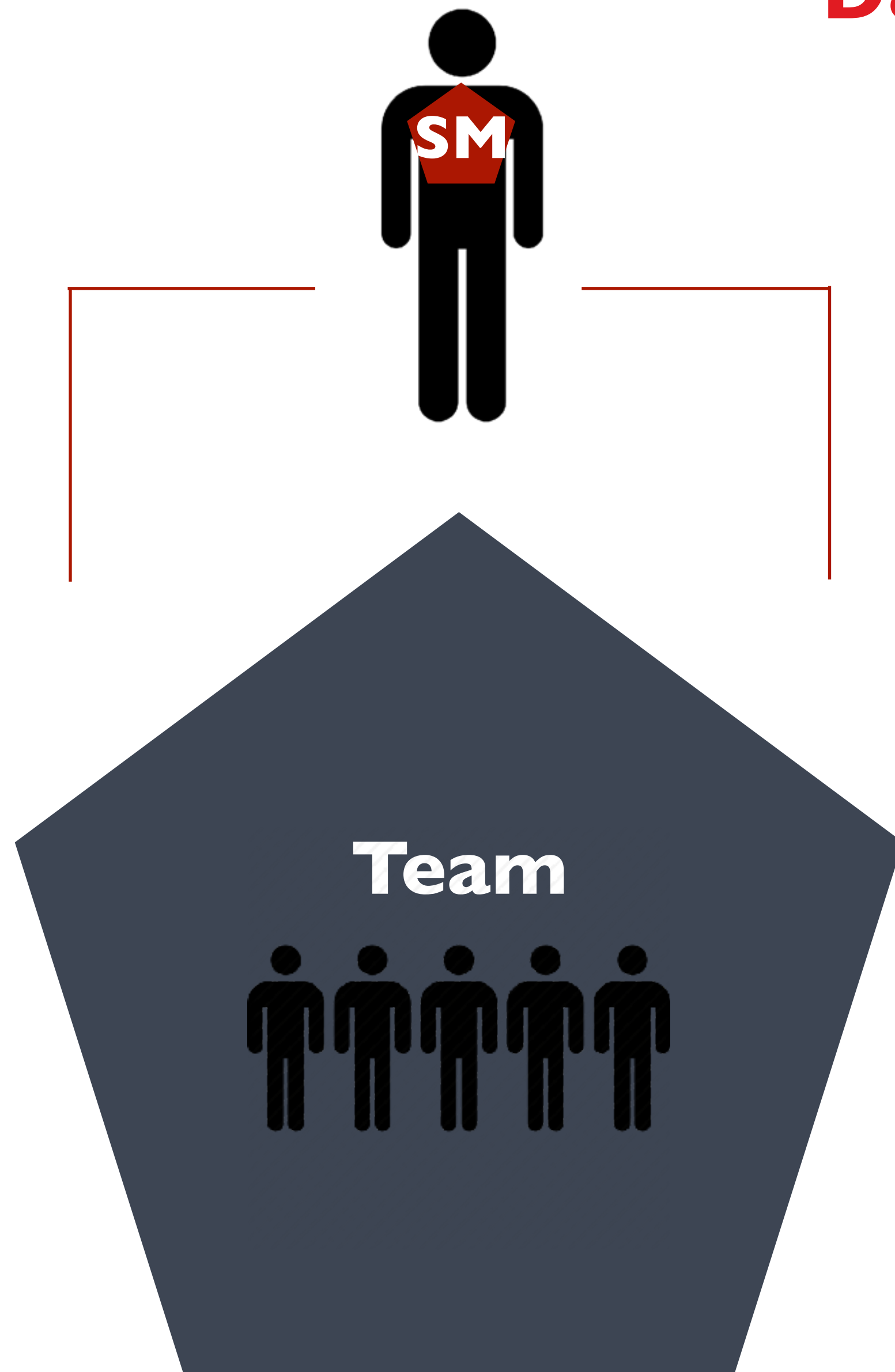
## Scaling the SM





# Single Team Scrum

## Daily Scrum

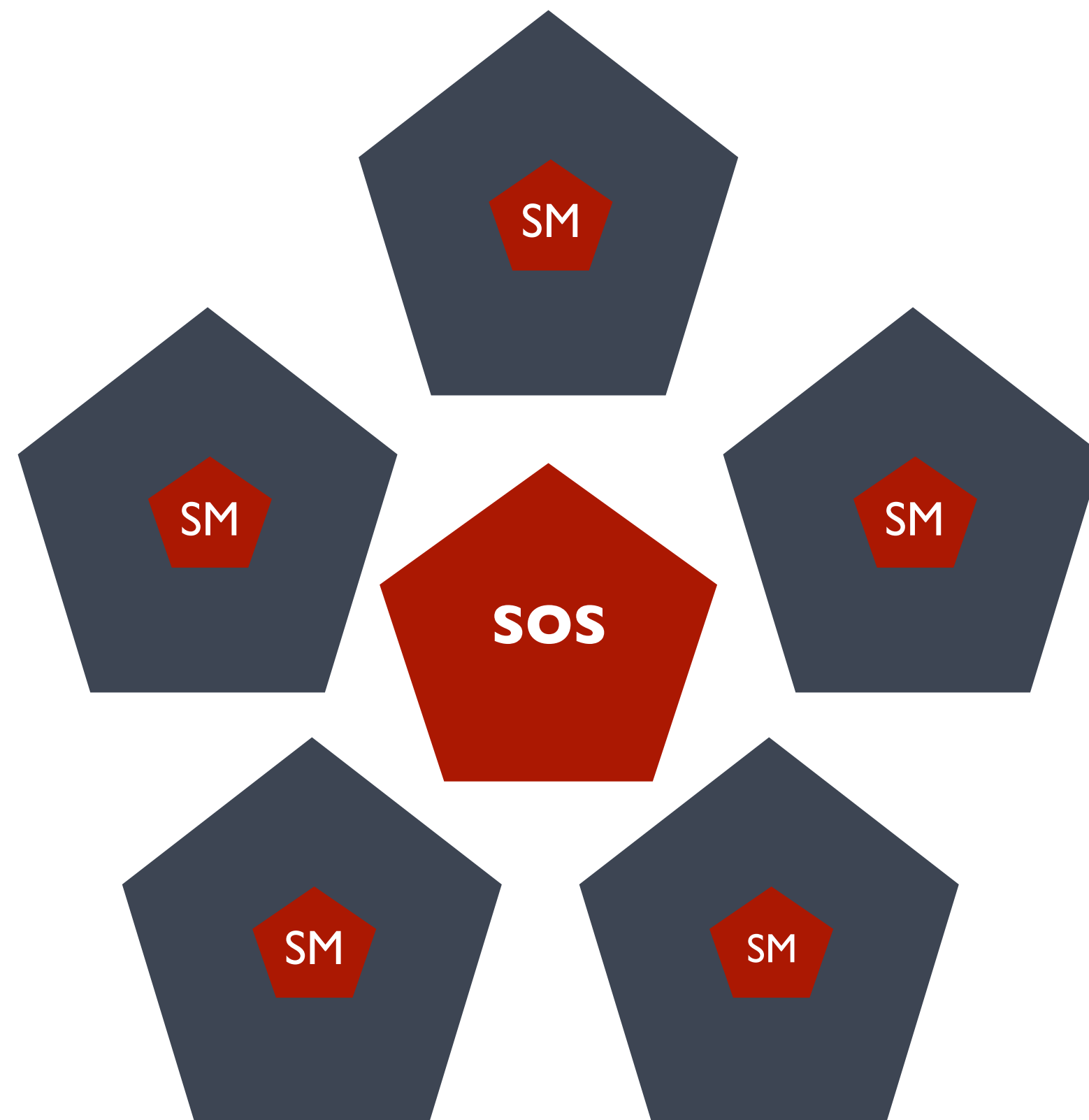


- **SM - Protects The Team**
- Visualizes progress, impediments, burn down
- Servant leader.
- Complete Responsibility Through Trust
- Coaches the Team & Product Owner in Scrum.
- Implements the values of the Agile Manifesto.
- Facilitates Scrum events.
- Ensures work & impediments are made visible.
- Maintains external radiators of team progress.
- Encourages openness & transparency.
- Identifies and ensures impediments are resolved.
- Promotes Kaizen thinking and waste reduction.



# Scaled Scrum Level 1 - 5 Teams of 5

## Scrum-of-Scrums

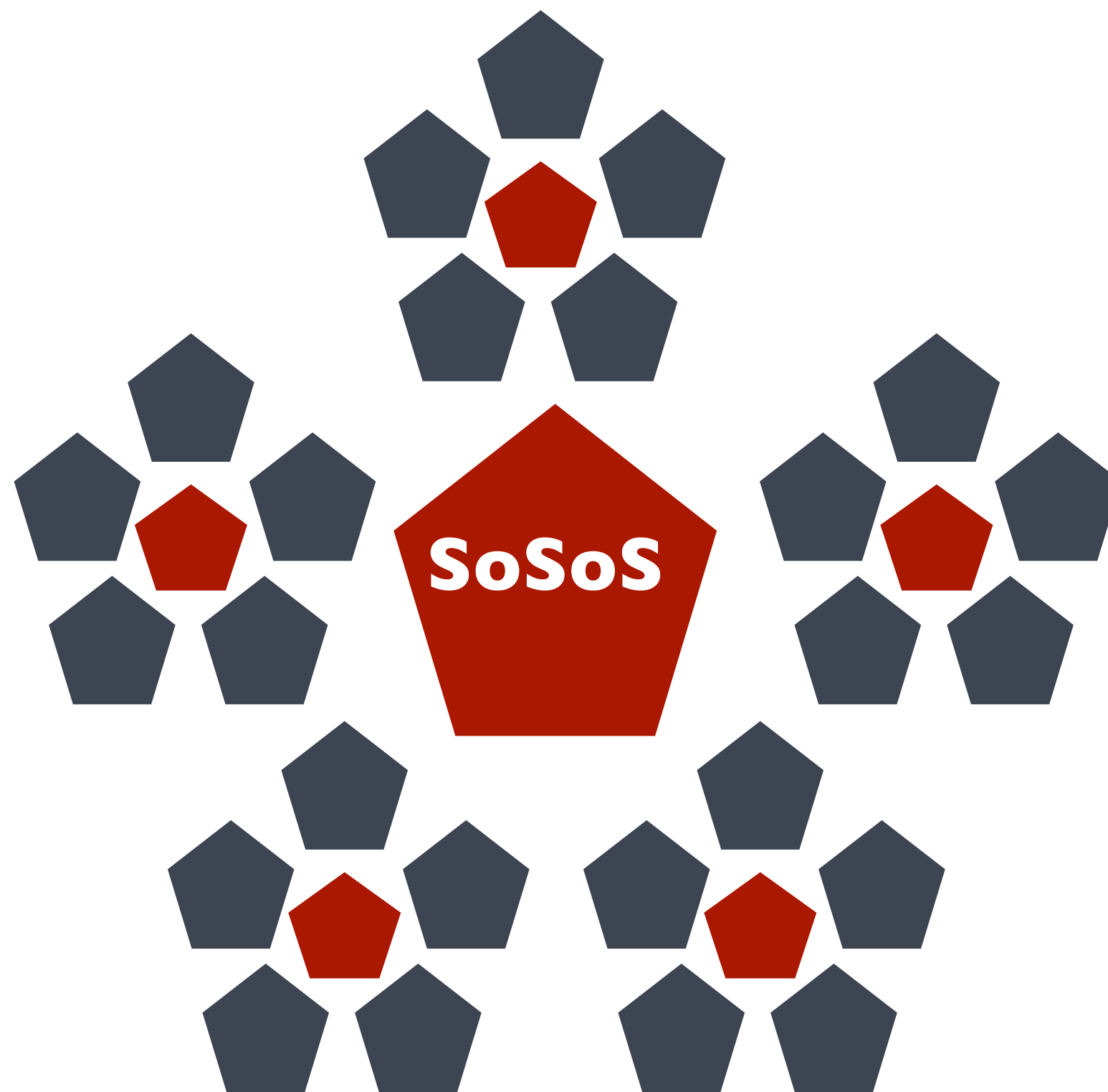


- **Scrum of Scrums Scales the SM**
- Surfaces & Removes Impediments
- Mirrors Daily Scrum
- Limits Communication Pathways
- Achieves Communication Saturation
- Cross-Team Coordination



# Scaled Scrum Level 2 - 25 Teams of 5

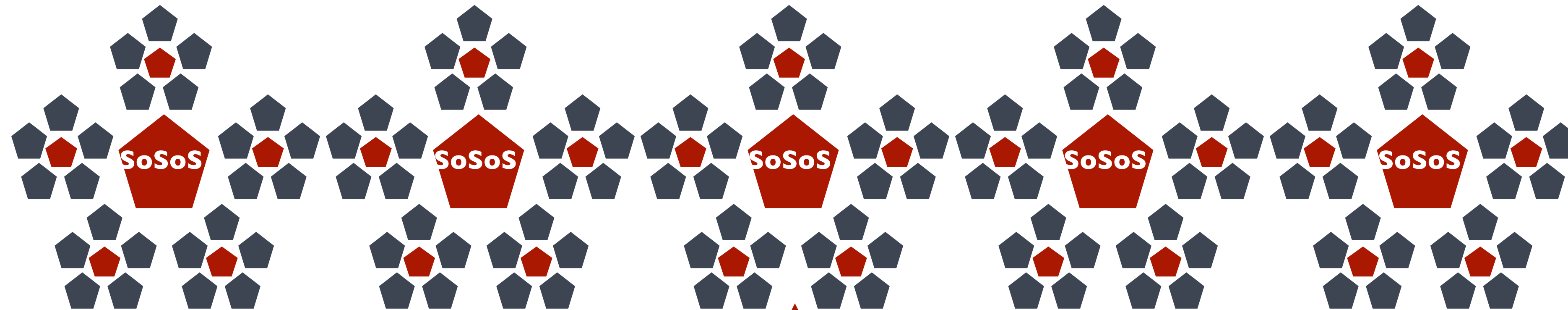
## Scrum-of-Scrums-of Scrums



- **Scrum of Scrums of Scrums**
- Surfaces & Removes Impediments
- Mirrors Daily Scrum
- Limits Communication Pathways
- Increases Communication Saturation
- Cross-Team Coordination
- Surfaces Impediments

# Scaled Scrum Level 3 - 125 Teams of 5

## Executive Action Team



- EAT - Eats Impediments
- Surfaces & Removes Impediments
- Mirrors Daily Scrum
- Limits Communication Pathways
  - (300 vs. 195,000)



- Increases Communication Saturation
- Cross-Team Coordination
- 125 People Coordinate in 60 min.

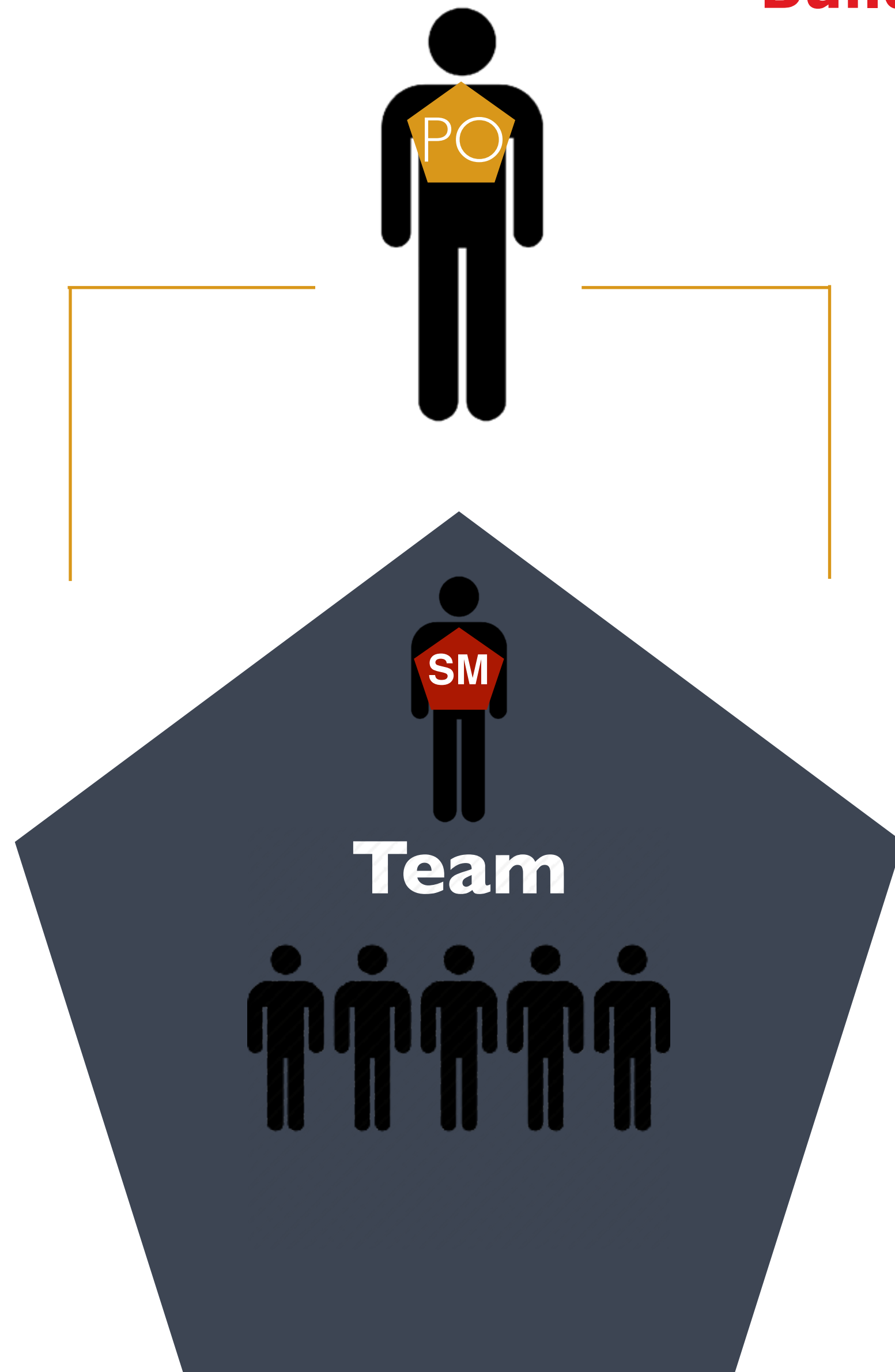


## Scaling the PO



# The Team PO

## Builds, Refines, Plans



- PO - **Sets Team Priorities**
- Servant Leader
- 50% w/ Customer, 50% w/ Team
- Single Backlog
  - **Stories**
  - **Epics**
- What not How
- Systems Thinking - Oversees the Whole
- Sometimes referred to as Line PO
- Complete Responsibility Through Trust
- Known-Stable-Interface to the Enterprise



# Meta Scrum at 1 Level

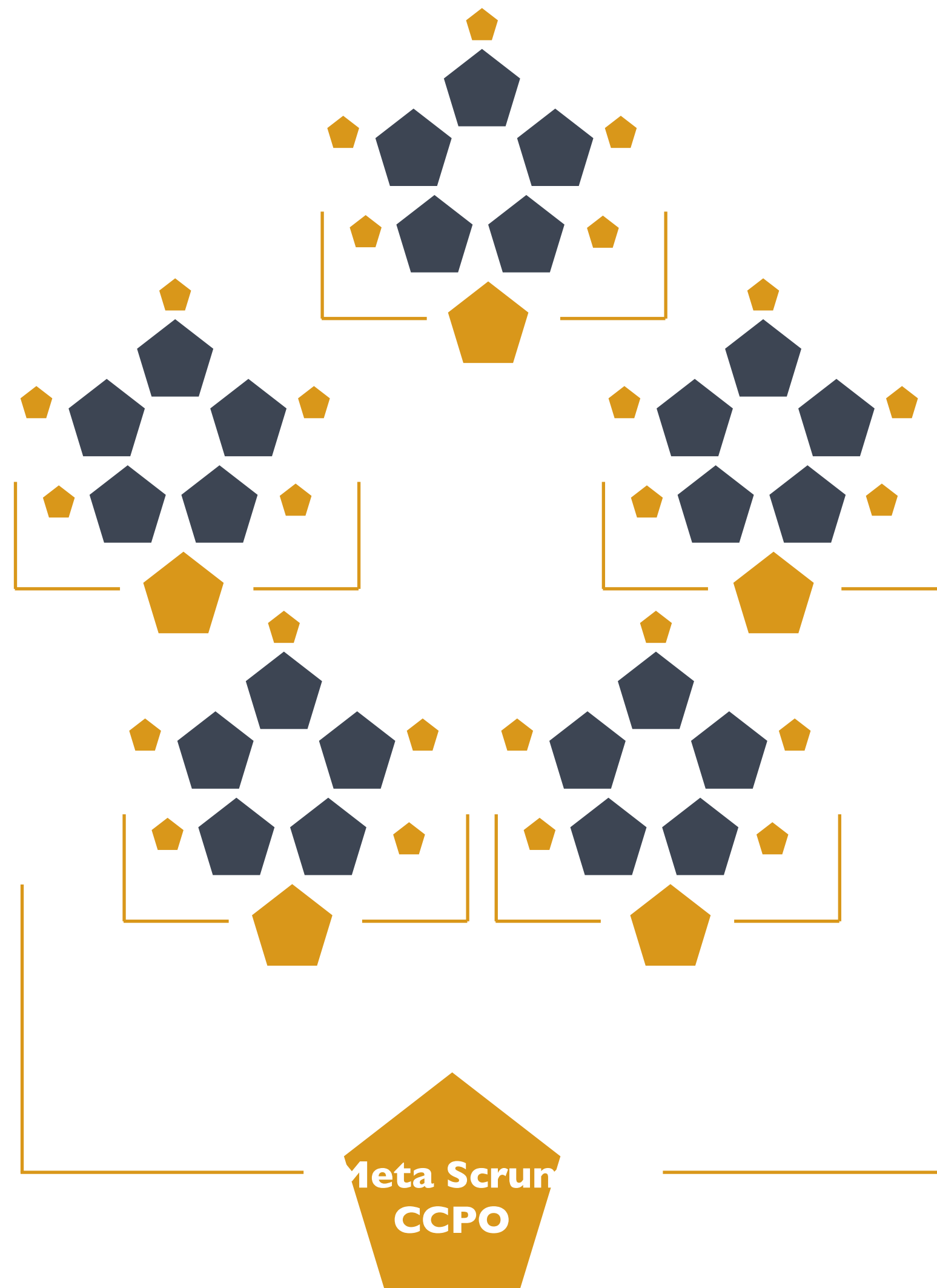
Aligns, Refines, Plans



- **Sets Priorities for Multiple Team**
- Mirrors Refinement and Planning
- Single Backlog Pulled by Line POs
  - **Epics**
  - **Features**
- Cross-Team Coordination & Alignment
- Systems Thinking - Oversees the Whole
- Level 3 PO - Servant Leader

# Meta Scrum at Level 2

Aligns, Decomposes, Refines

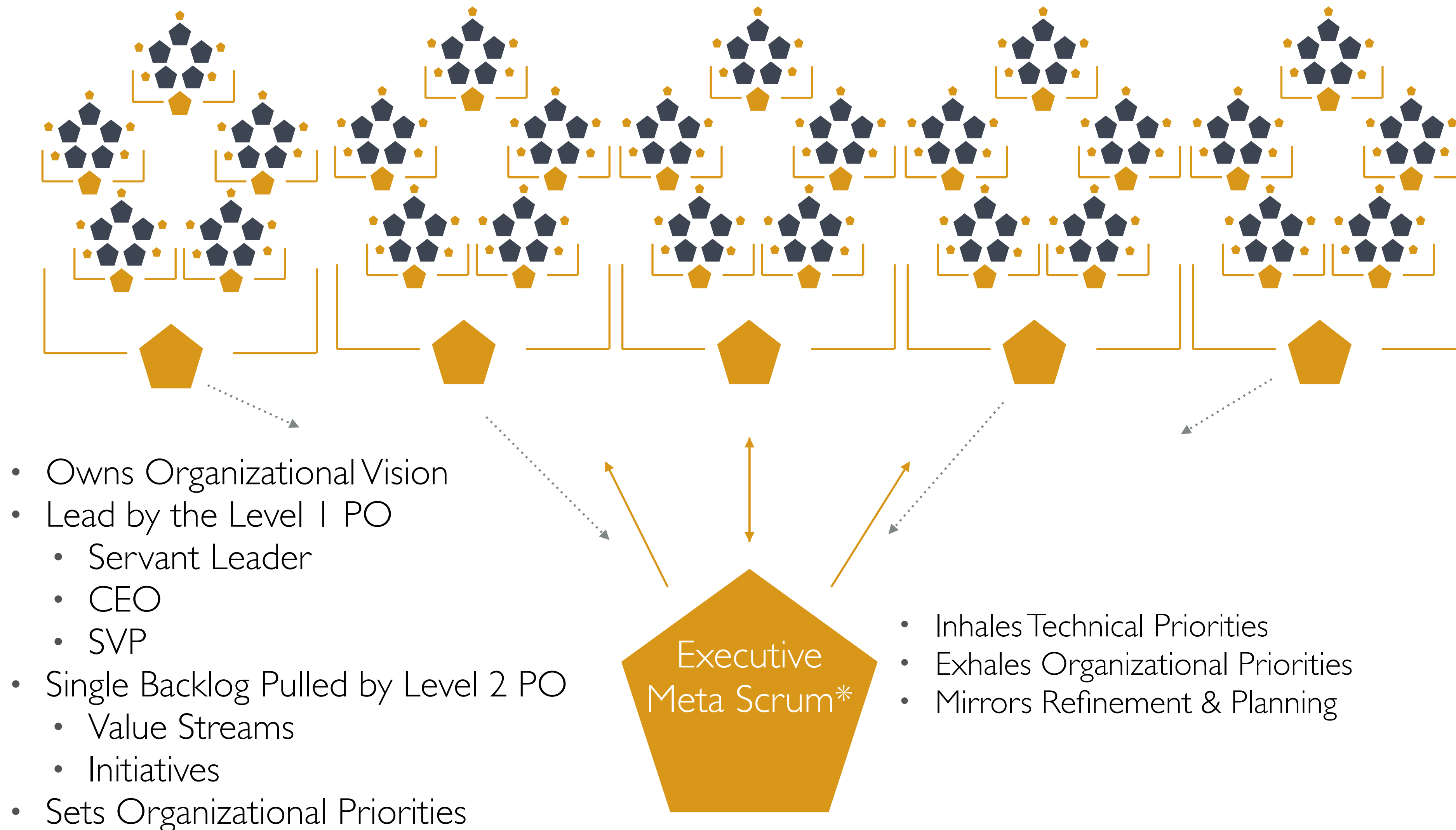


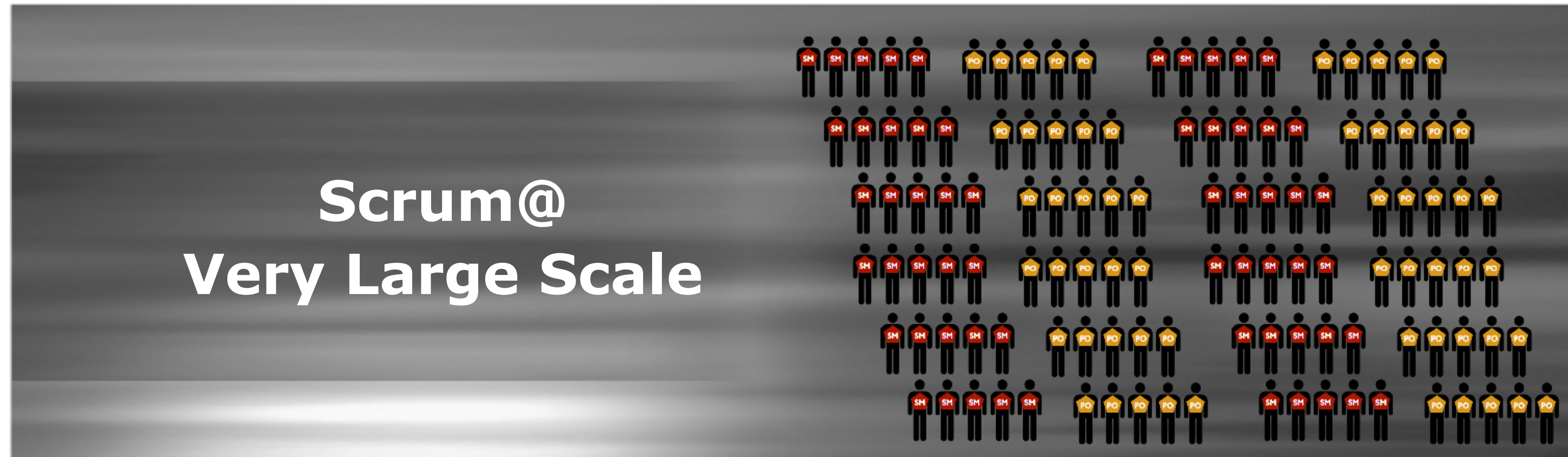
- **Sets Priorities for Multiple Team**
- Mirrors Refinement and Planning
- Single Backlog Pulled by Level 3 POs
- **Features**
- **Value Streams**
- Cross-Team Coordination & Alignment
- Systems Thinking - Oversees the Whole
- Level 2PO - Servant Leader



# Executive Meta Scrum

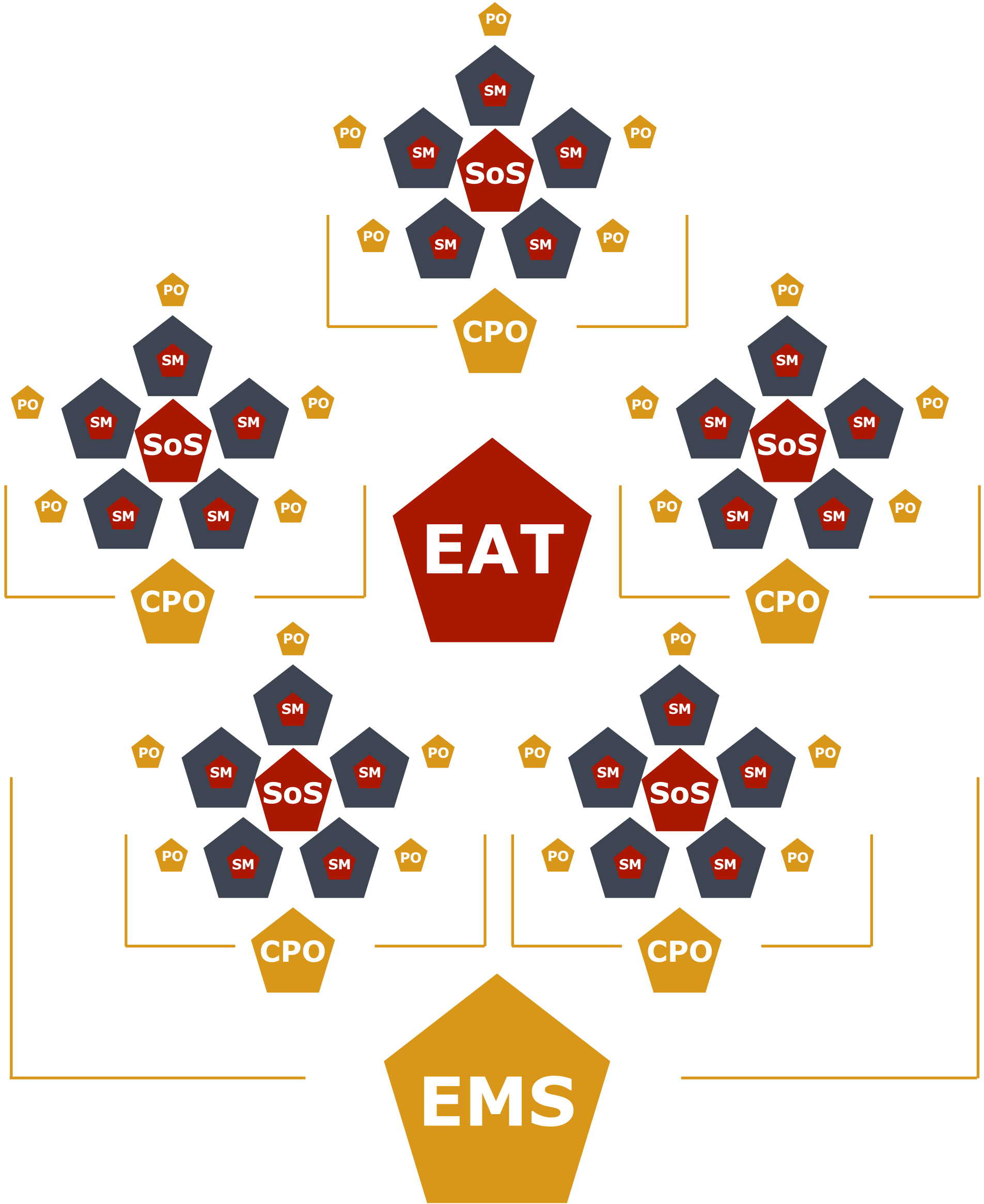
Aligns and Sets Strategic Priorities for the Organization



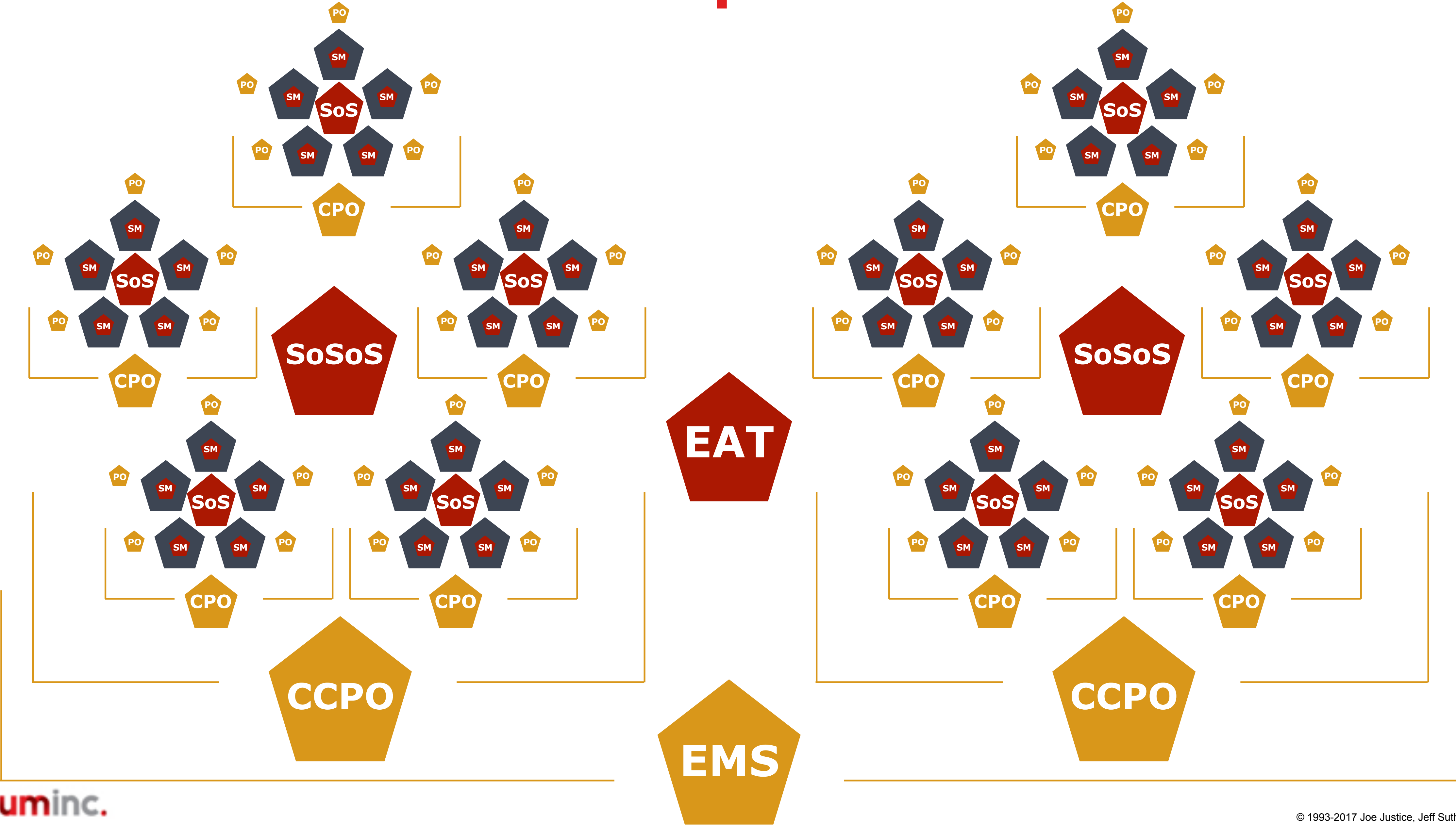




# 125 People Scaled



# 250 People Scaled

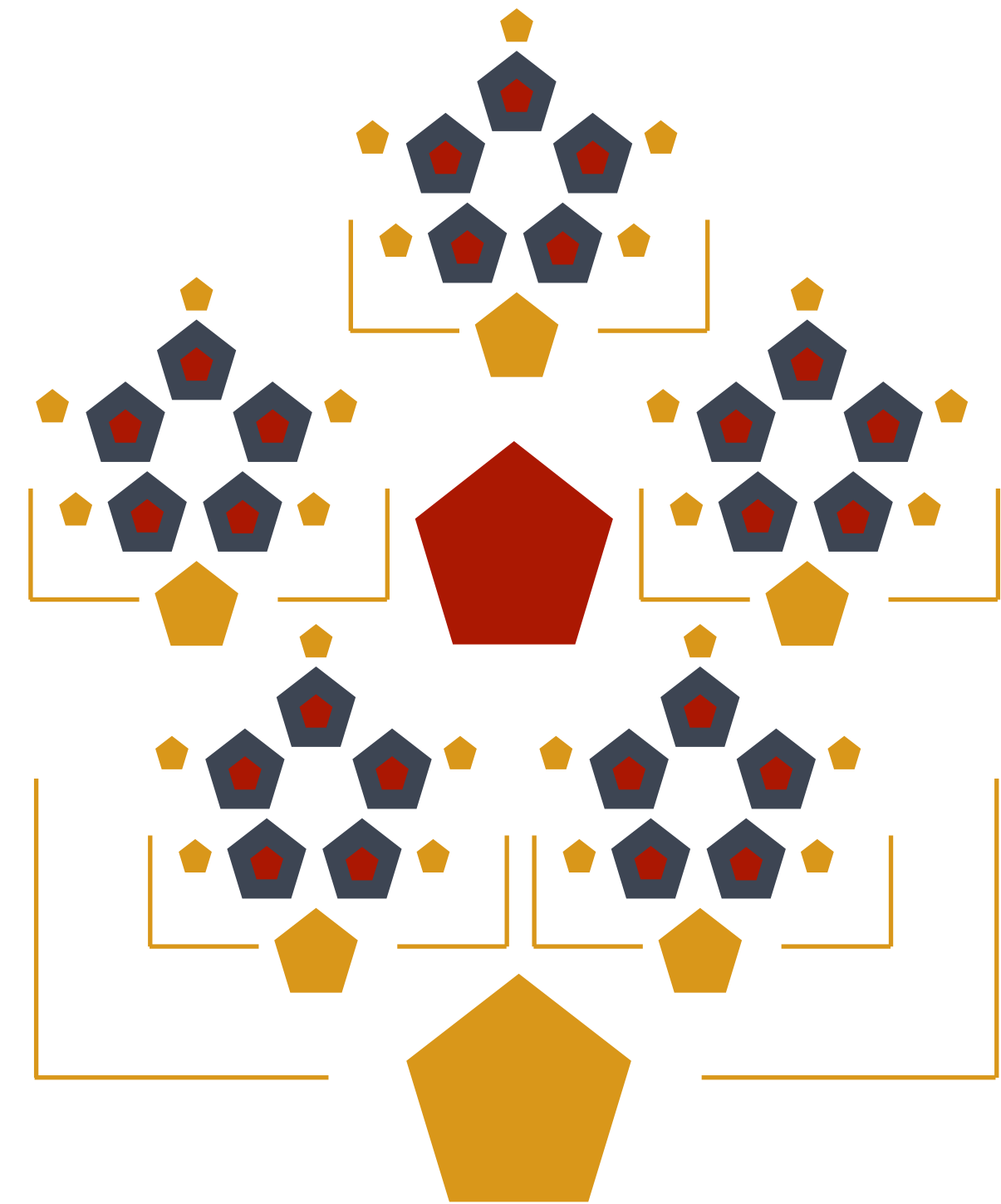
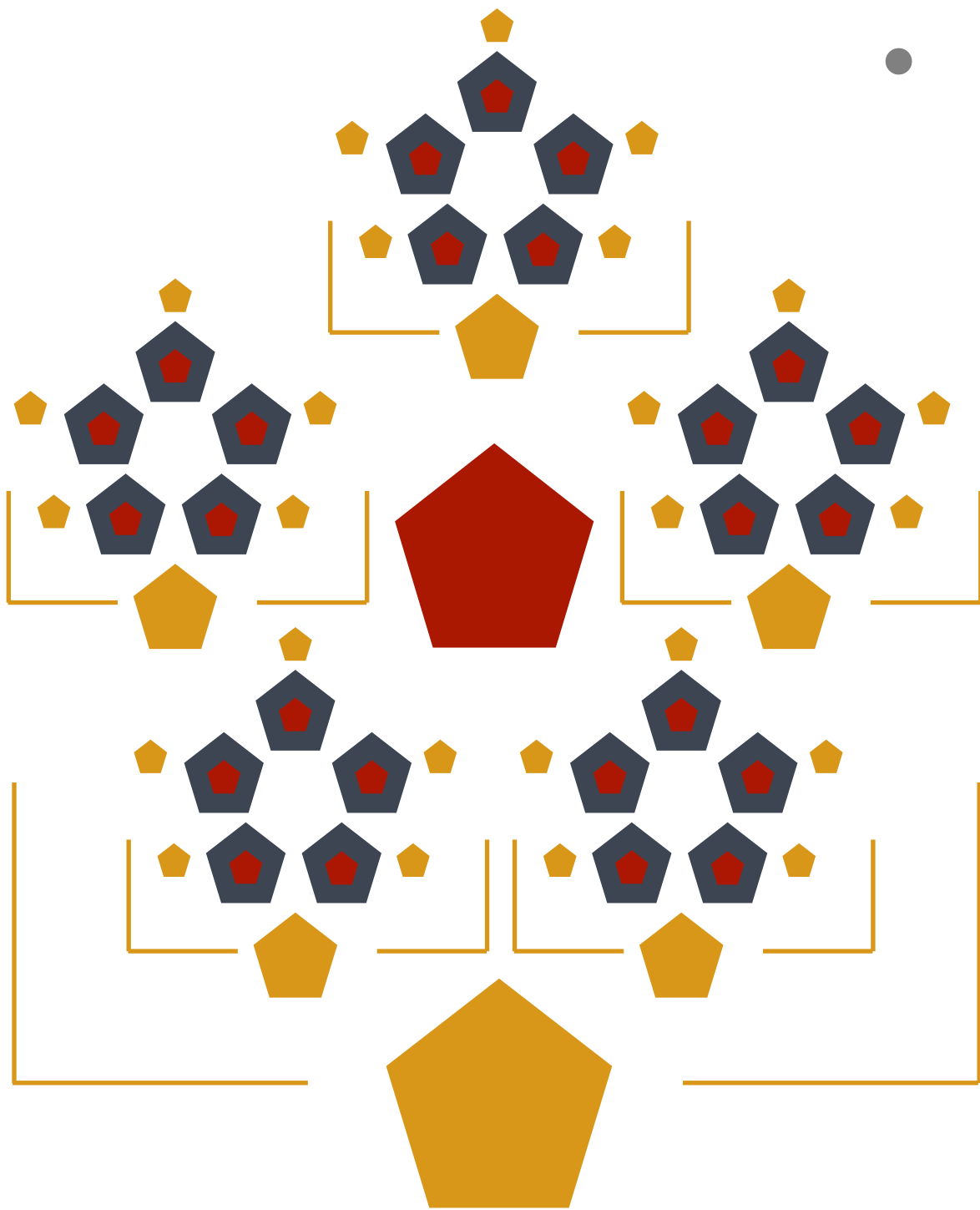




# SAAB Defense

## 4096 People in 1 Hour!

- 8:30 Executive Action Team
- 8:15 Scrum of Scrum of Scrum of Scrums
- 8:00 Scrum of Scrum of Scrums
- 7:45 Scrum of Scrums
- 7:30 Daily Scrum



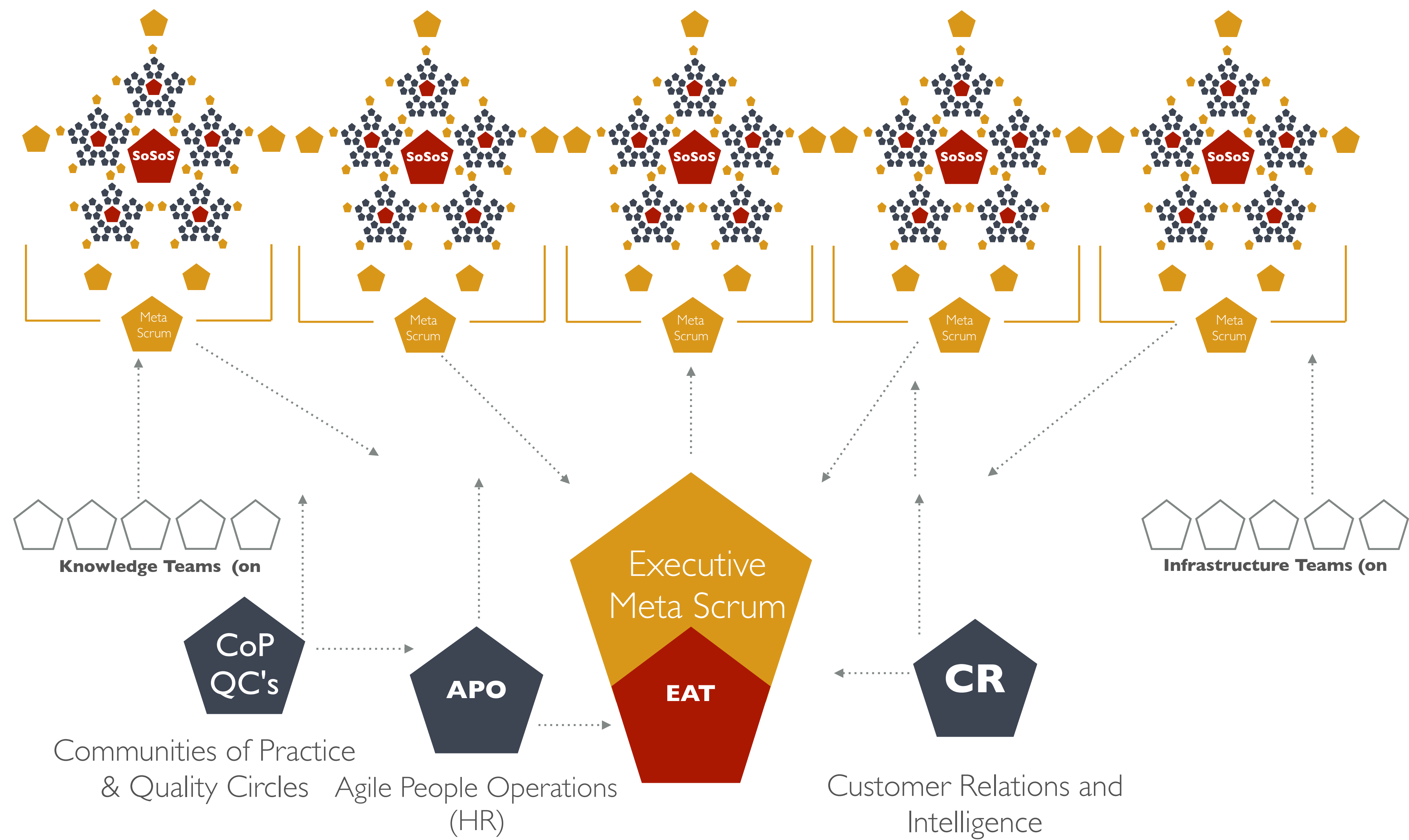


# Scrum Room





# Case Study: 3M-HIS



# 3M and Telsa Global Unveil in 5 Weeks



# Brief Effective Demo





# 3M and Tesla



**5 weeks.**

**3 real houses with new solar roof tiles created and installed.**

**7 patents filed.**



# Scrum Center of Excellence

A team has started Scrum when they report 3 roles, 5 meetings, and 3 outputs

3-5-3	Team Names											
Product Owner												
Scrum Master												
Development Team												
Sprint Planning												
Daily Standup												
Product Backlog												
Sprint Review												
Sprint Retrospective												
Product Backlog												
Sprint Backlog												
Make Work Visible												

Then, the Fastest teams then execute the Scrum Pattern Language of Performance

Swarming												
Interrupt												
Daily Clean Produce												
Emergency Procedure												
Scrumming the Scrum												
Happiness Metric												

## Riccardo's Restaurant London





# Riccardo's Restaurant





# PHONE INTERVIEWS

	<b>REJECT</b> 
TOTAL 19	

# ONSITE INTERVIEWS

	<b>REJECT</b> 
	DECLINE
TOTAL 10	

# OFFERS

	<b>DECLINE</b> 
--	--------------------

# FUTURE

--

# LIMBO

--

# FUTURE ONSITES

--

# HIRES ☺☺

QA UNIT 
-------------



TO Phone	Coming for Interview	Coming for trial shift	NEW STARTERS.
<div>Rejected</div> <div> Emily 09950 821861 </div> <div> Natalie williams natalie.williams @yahoo.co.uk </div> <div> Ana 07402 85897 </div>	<div>Rejected</div> <div> Mihaila mihaila.ariu@ yahoo.com 0759069 5990 </div> <div> Eryka 07769 49 445 </div>	<div>Rejected</div> <div> Monika VRS monika.vrs@ gmail.com </div>	<div> JORDAN BURKE </div>
<div>Declined</div> <div> Louise 07821 808145 </div>	<div>Declined</div>	<div>Declined</div>	



# Swarming





# All Blacks Haka





**Grand Prix : Europe**  
**Team : Williams**  
**Driver : Felipe Massa**  
**World Record**

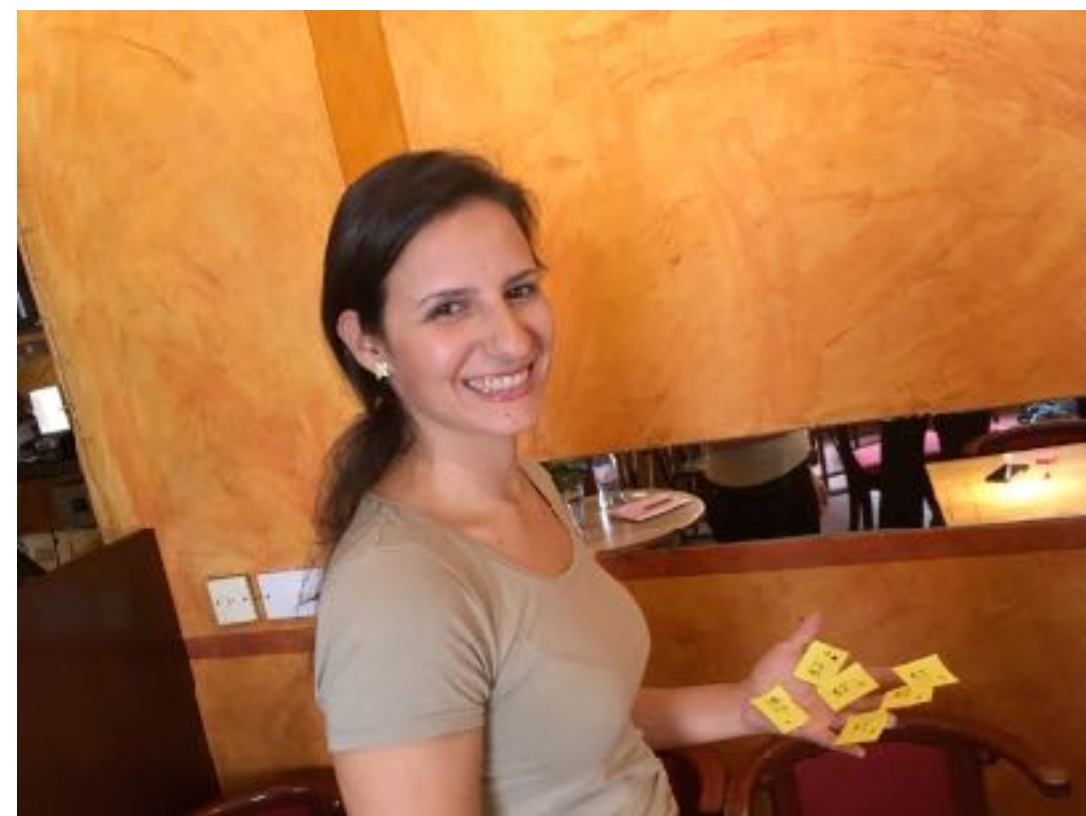
**1**

**CRASHYARD**











# **JOIN OUR AMAZING TEAM! START TODAY**

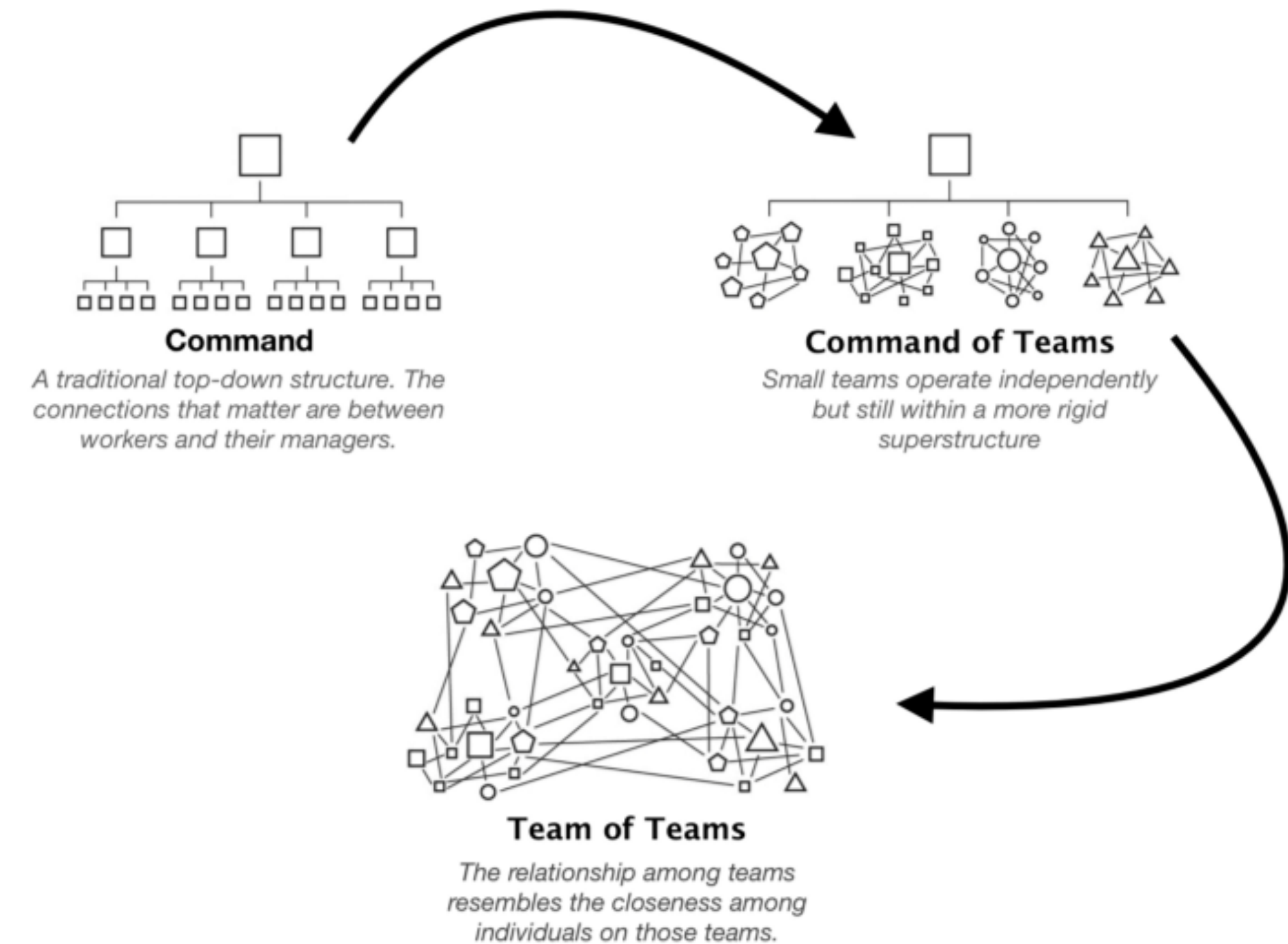
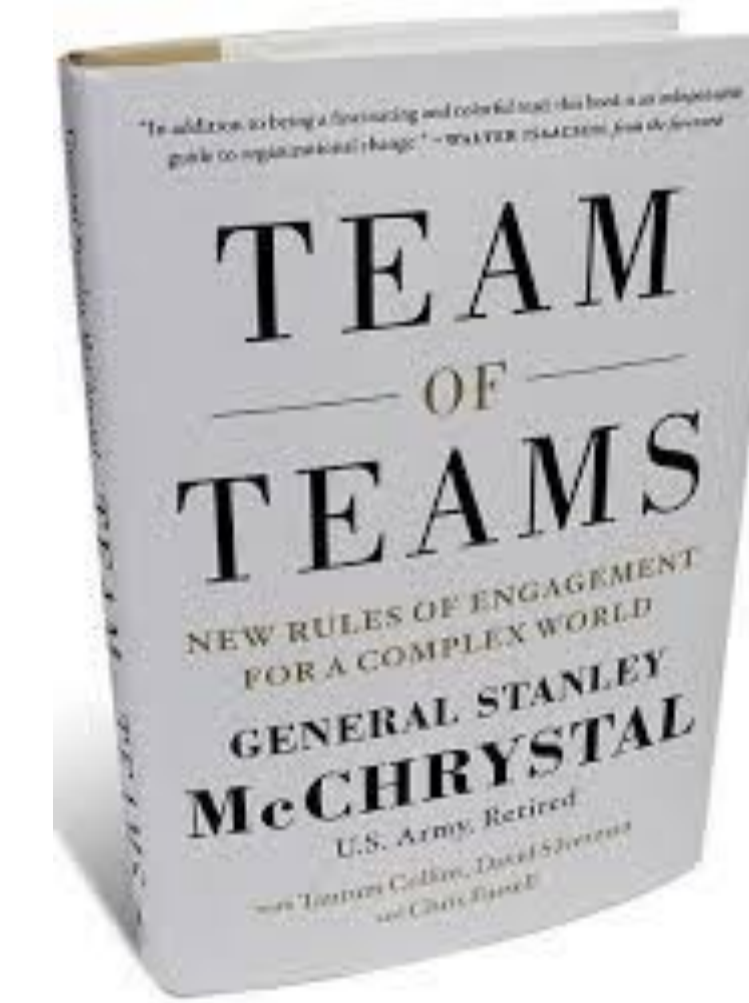
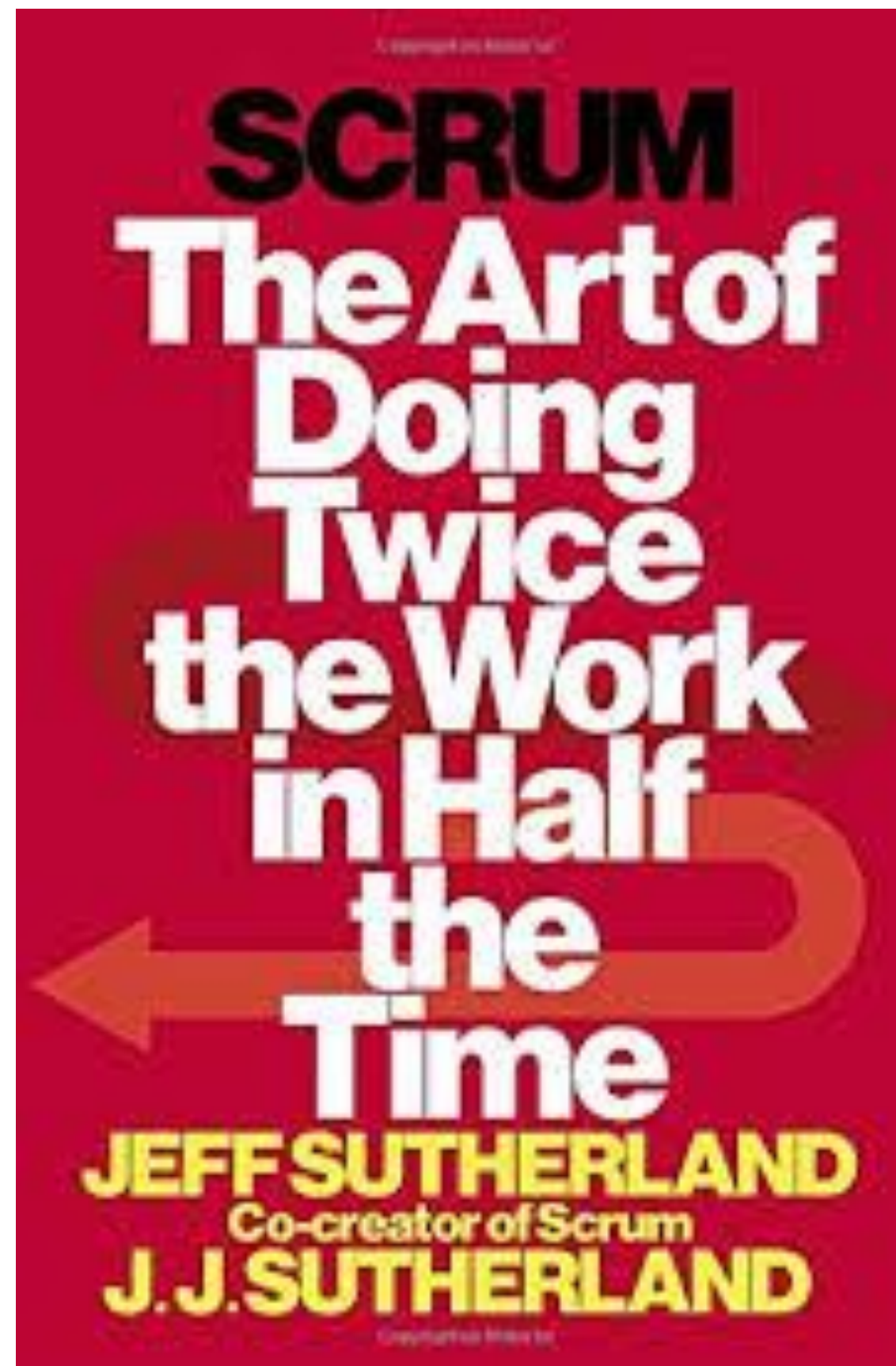


**WAITRESSES NEEDED FOR OUR ITALIAN RESTAURANT IN CHELSEA**  
**[work@riccardos.it](mailto:work@riccardos.it)**

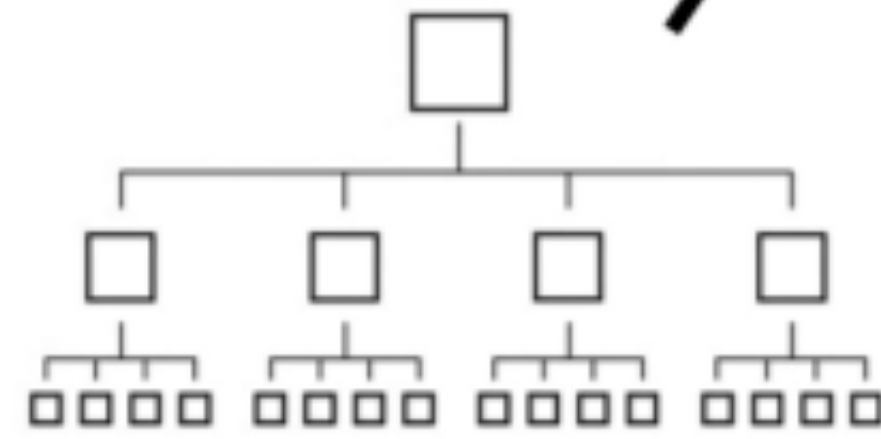


- Here's my email address.
- [riccardo@riccardos.it](mailto:riccardo@riccardos.it)
- I'd love to hear from you if you have any questions or ideas for me.
- Or, if you come to London, please come and have lunch and I'll introduce you to my team and we can talk Scrum!
- Thank you!!

# Original Influences

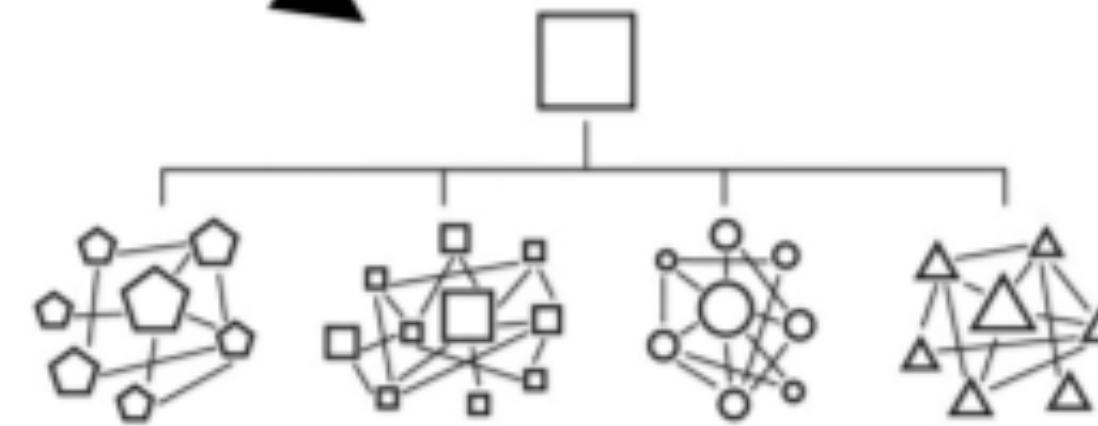






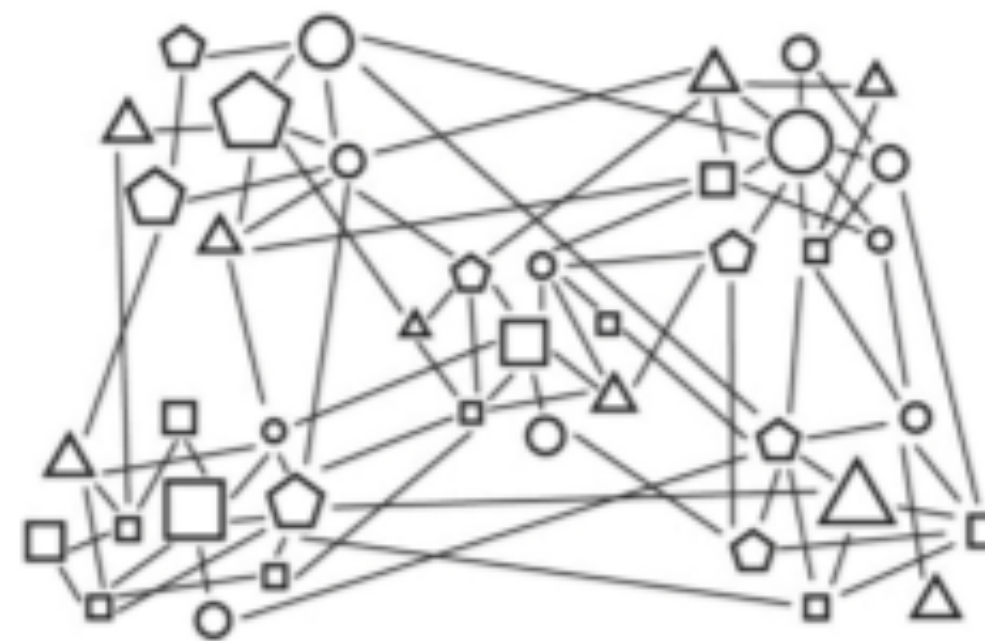
### **Command**

*A traditional top-down structure. The connections that matter are between workers and their managers.*



### **Command of Teams**

*Small teams operate independently but still within a more rigid superstructure*



### **Team of Teams**

*The relationship among teams resembles the closeness among individuals on those teams.*

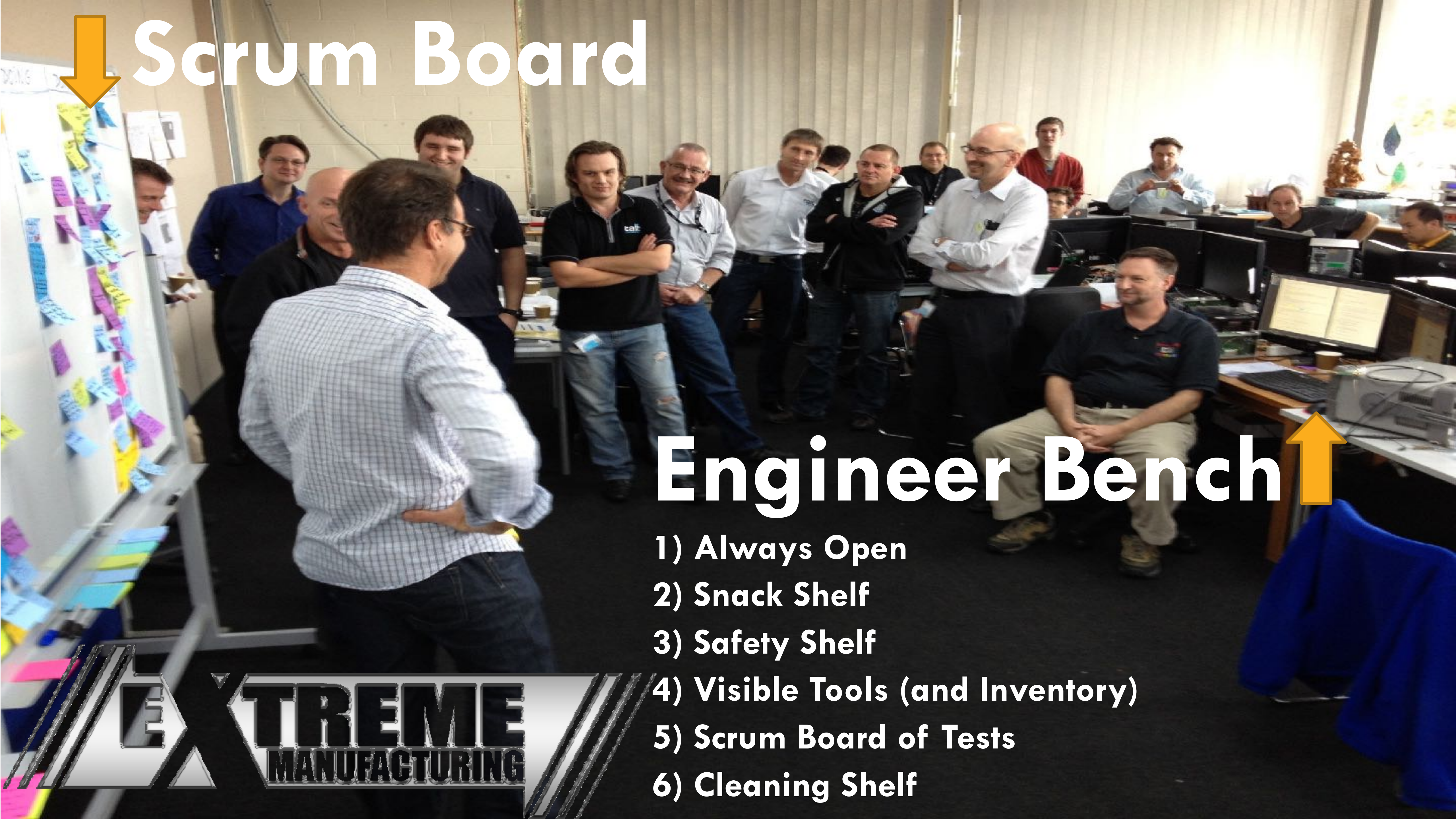


# Is it Hardware or Software

## Coding Hardware







# ↓ Scrum Board

# Engineer Bench↑

- 1) Always Open
- 2) Snack Shelf
- 3) Safety Shelf
- 4) Visible Tools (and Inventory)
- 5) Scrum Board of Tests
- 6) Cleaning Shelf



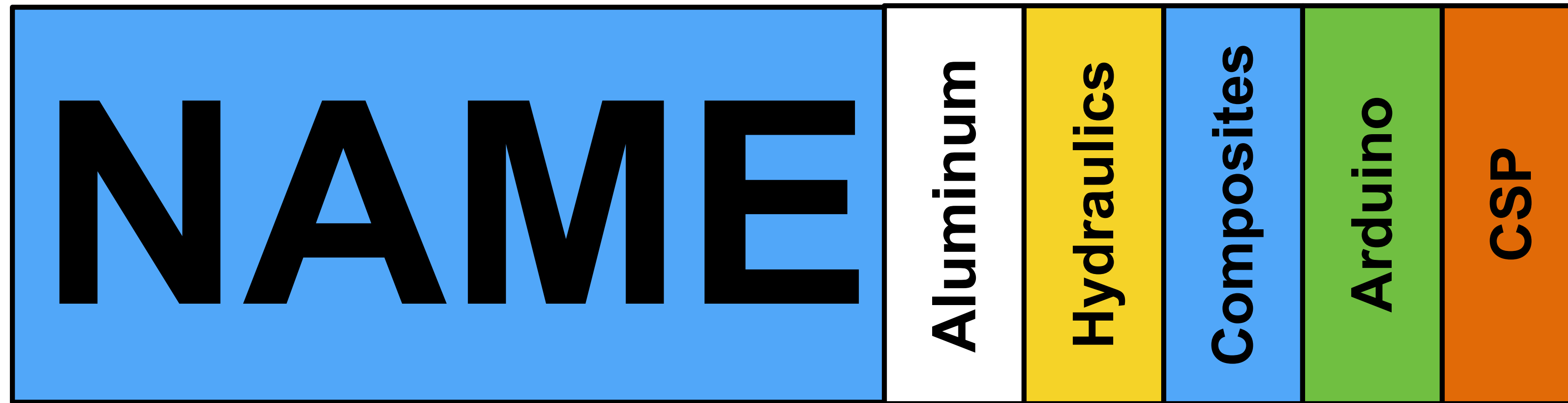


# Get Started by Just Getting Started





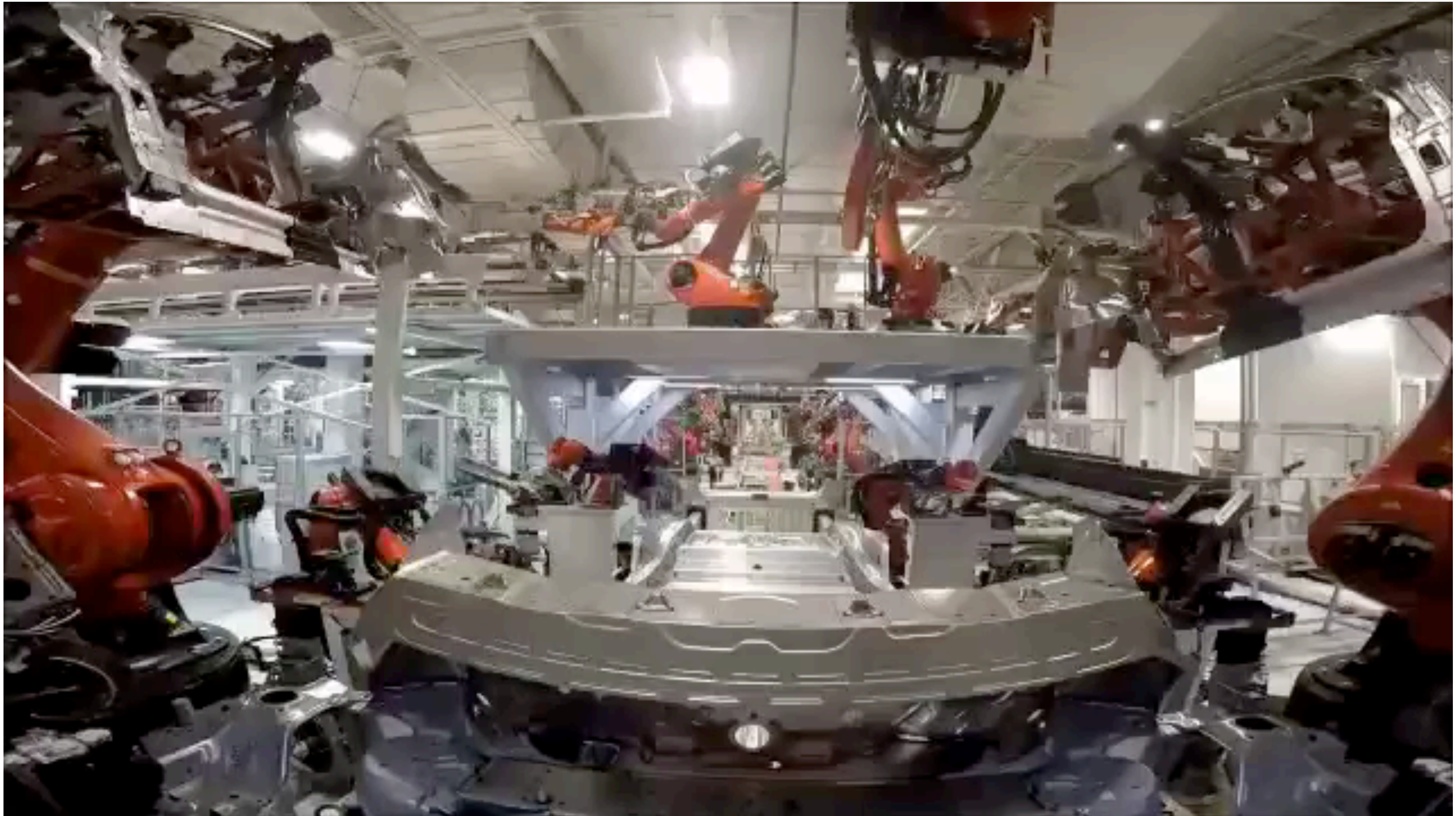
# Everyone on a Scrum Team? How Do I Deal With Specialists?



- **WIKISPEED Inc. awards colored stripes to team members who pass a test that they can design, analyze, build, test, and deploy to production a part made from a given material. The goal is for an employee to obtain ALL stripes. These people are called Black Belts in their organization.**
- **We group our wost into these 4 categories:**
  - **Aluminum (design, fabrication, testing, installing)**
  - **Hydraulics (pipes, tubes, gaskets, and fluids)**
  - **Composites (design, mold making, part making)**
  - **Arduino (electronics, wiring, plugs, programming)**
- **Note, we do have a 5th category for those who can deploy teams: CSP (Scrum expertise to launch, network, and accelerate teams)**



# Scrum Hardware Compiler: 11 Robot Swarm



Tesla published video showing the most work dense piece of the Model X production and assembly line, 5 simultaneous robotic welders. USA, 2016



# XM Technical Practices





# Rapid Evolution of the Wikispeed Car

2009



Only 3-months after team is formed, early version of Wikispeed car places 10<sup>th</sup> in mainstream class at Automotive X-Prize

2010

2011



Enhanced version of Wikispeed car shown at Detroit Auto Show and featured on Discovery Channel

2012

Production version of Wikispeed car commercially available for purchase





# eXtreme Manufacturing: 10 principles

- 1 Optimize for change
- 2 Object-Oriented, Modular Architecture
- 3 Test Driven Development
- 4 Contract-First Design
- 5 Iterate the Design
- 6 Agile Hardware Design Patterns
- 7 Continuous Integration Development
- 8 Continuously Deployed Development
- 9 Scaling Patterns
- 10 Partner Patterns

Published by Peter Stevens, June 2013

<http://www.scrum-breakfast.com/2013/06/extreme-manufacturing-explained.html>

Available also in Italian and English on:

<http://www.scrum-hardware.com>

**scrum**inc.







We embrace agile methods as the engine driving innovative solutions and collaboration to amplify economic, ecologic and social benefits across our planet.

Through this work we have come to value:

**Cross functional team collaboration** over specialization, process and tools

**Modularity** over tightly-coupled solutions

**Continuous customer collaboration** over inflexible contracts

**Useful continuous delivery** over a single comprehensive delivery

**Extending development through manufacturing** over fixing problems in the field

**Useful continuous documentation** over comprehensive documentation

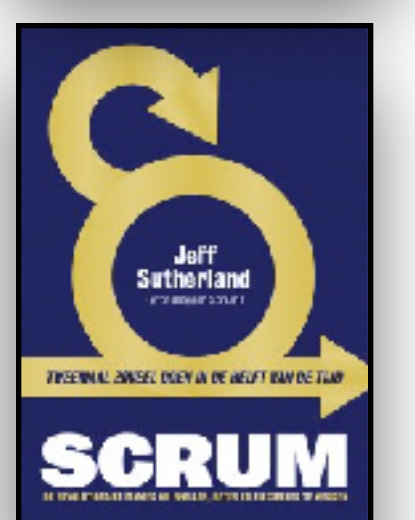
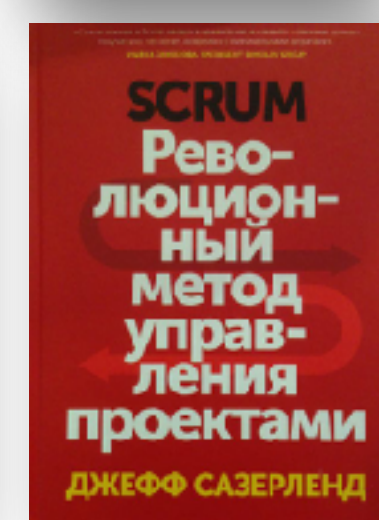
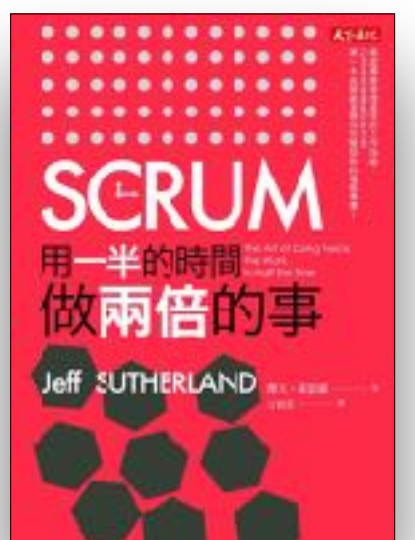
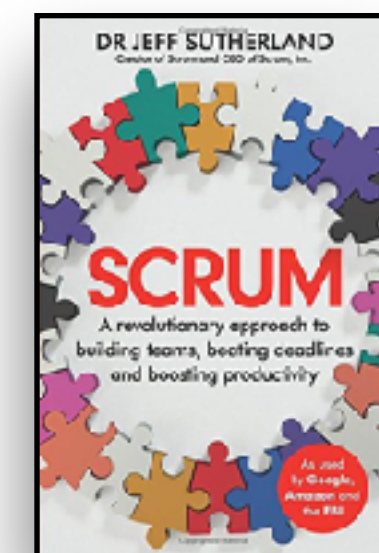
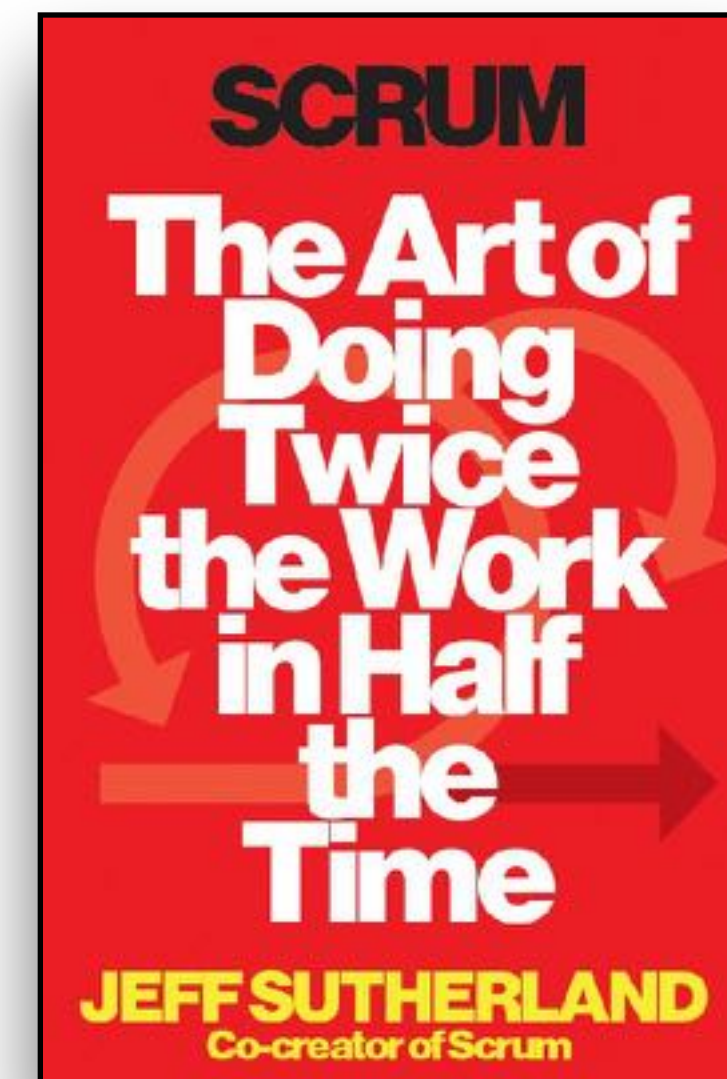
That is, while there is value in the items on the right,  
we value the items on the left more.



**Thank You Very Much!!**

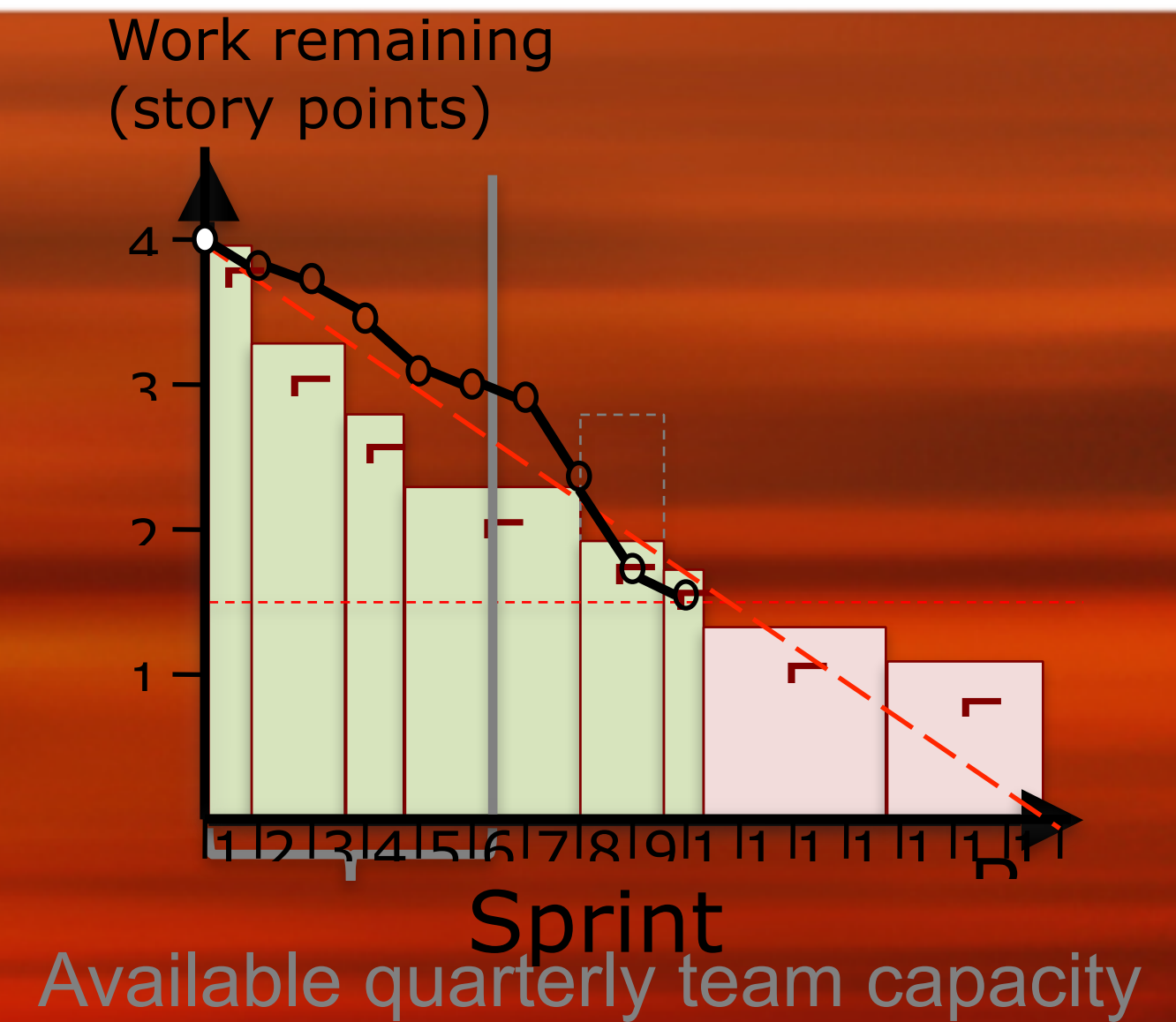
**scruminc.com**

- You can learn more about Scrum@Scale at [www.ScrumInc.com](http://www.ScrumInc.com)
- You can download a free copy of the book, Scrum hardware, with this URL coupon code: <https://leanpub.com/Scrum-for-Hardware/c/justice01>
- You can read case studies from global companies in the book "Scrum, the Art of Doing Twice the Work in Half the Time."



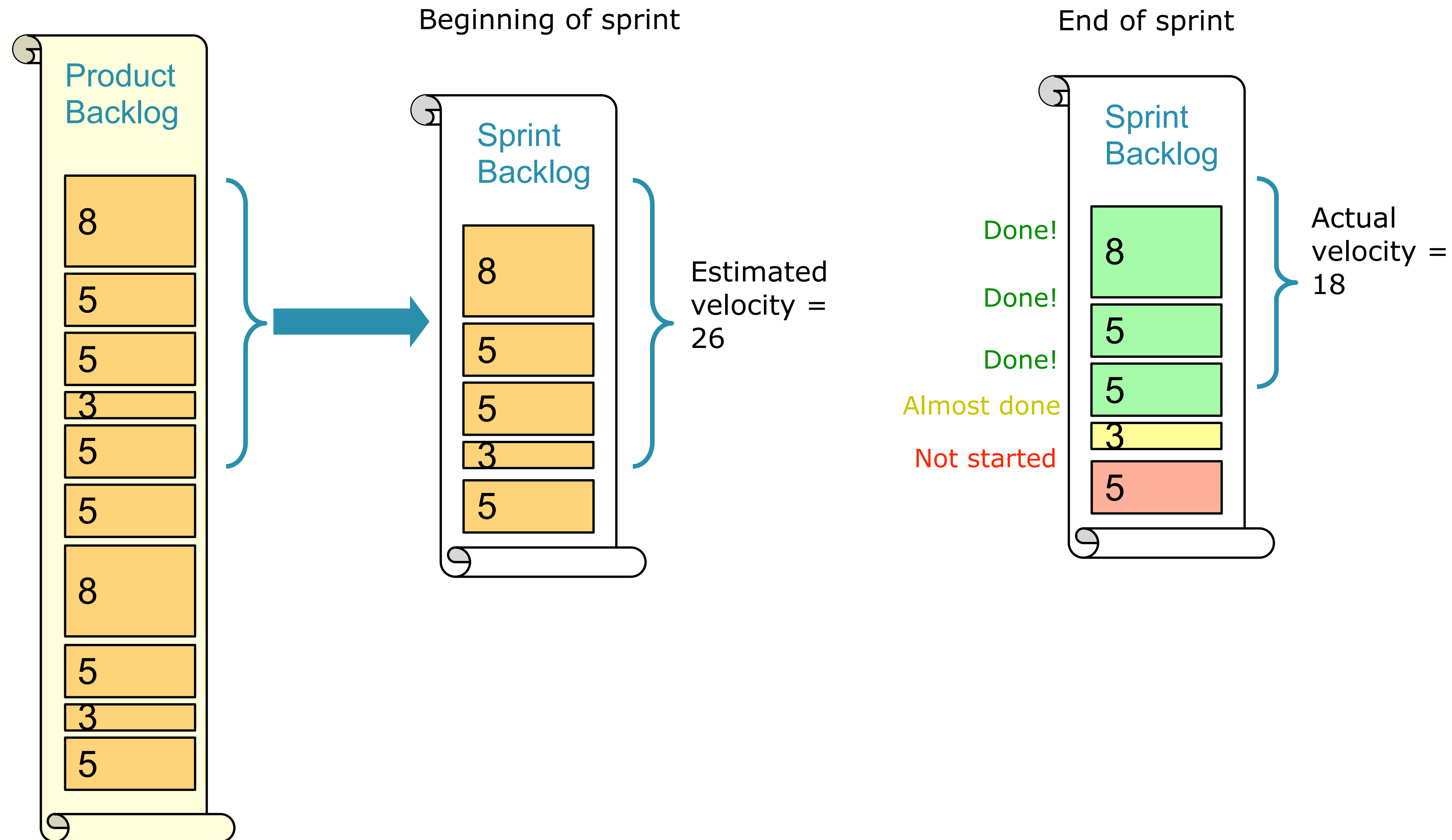


# A Scrum Master Needs to Help With Portfolio Planning to Deliver Multiple Products to End Users





# Measuring Velocity

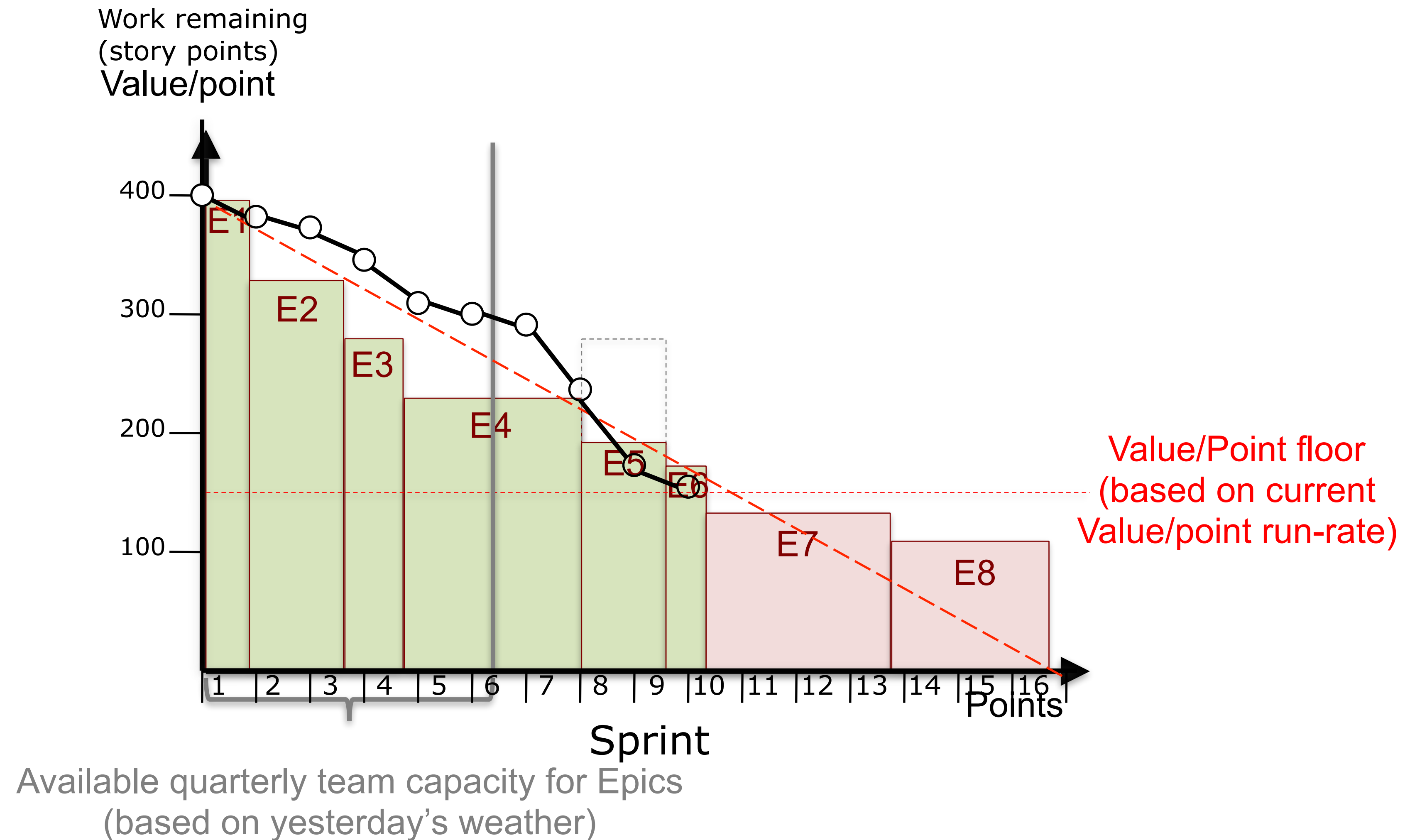






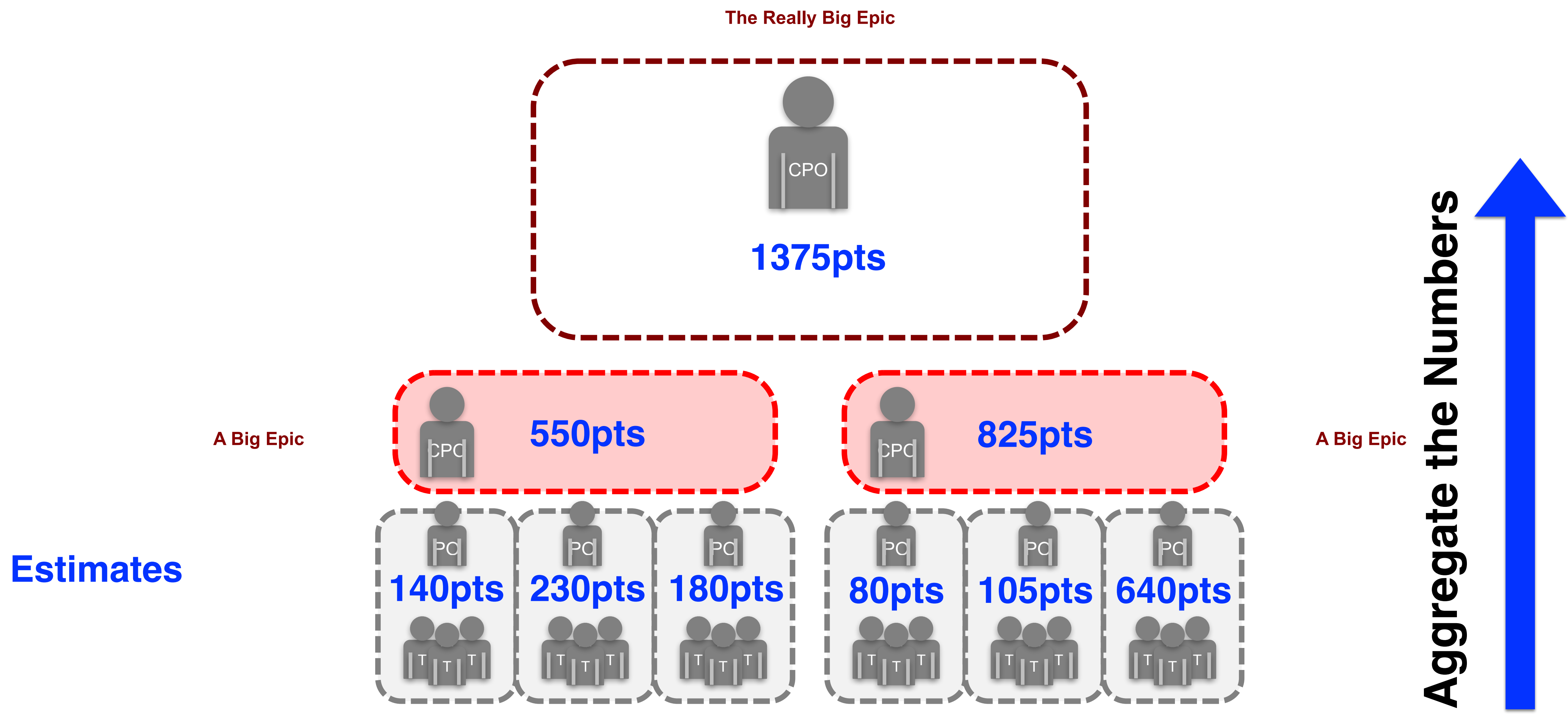
# Prioritize Possible Epics by Value/Point

Minimum Level Set by Current Value/Point Run Rate



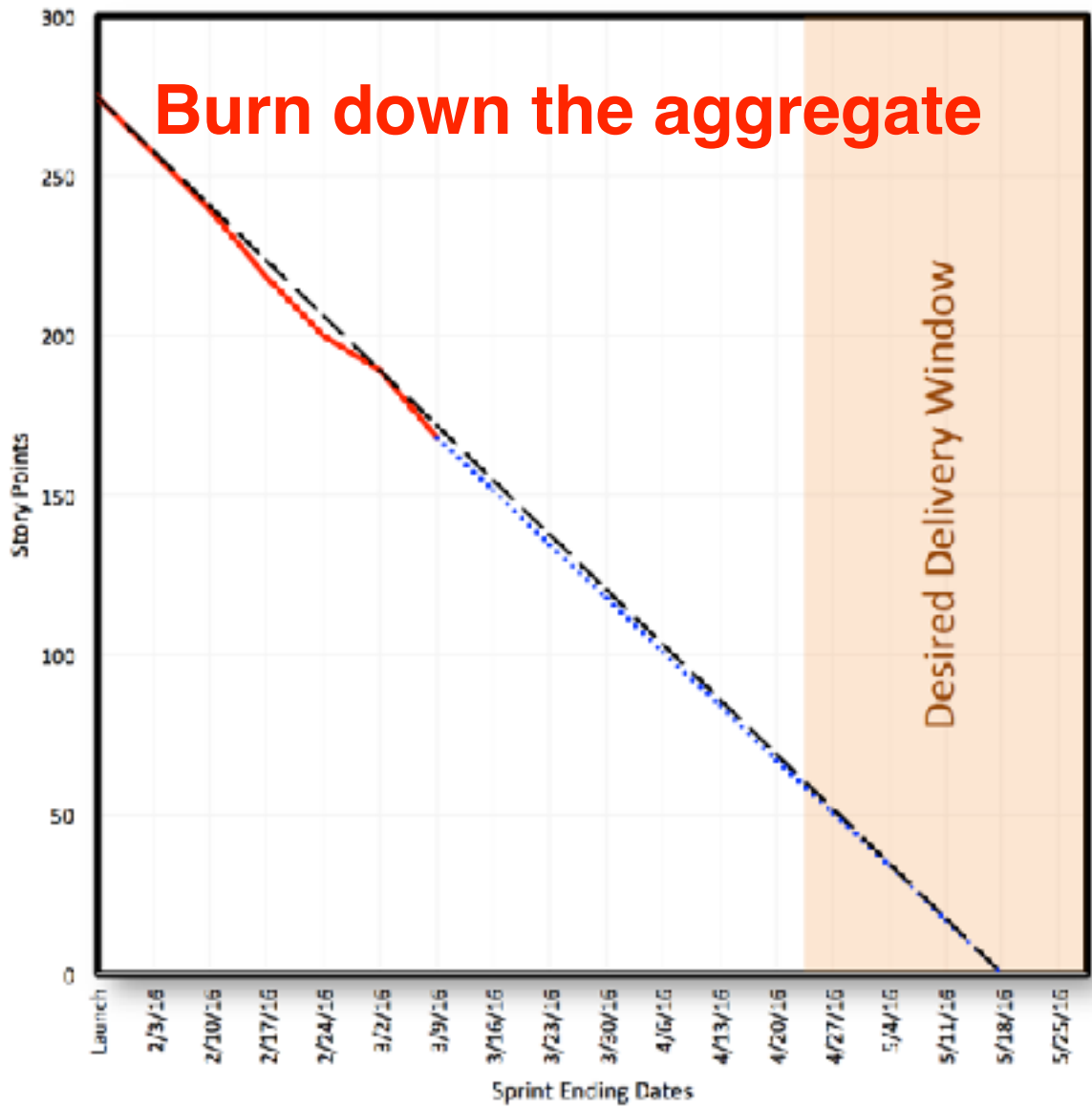


# Scaling Estimates Across Teams





# Scaling Velocity Across Teams



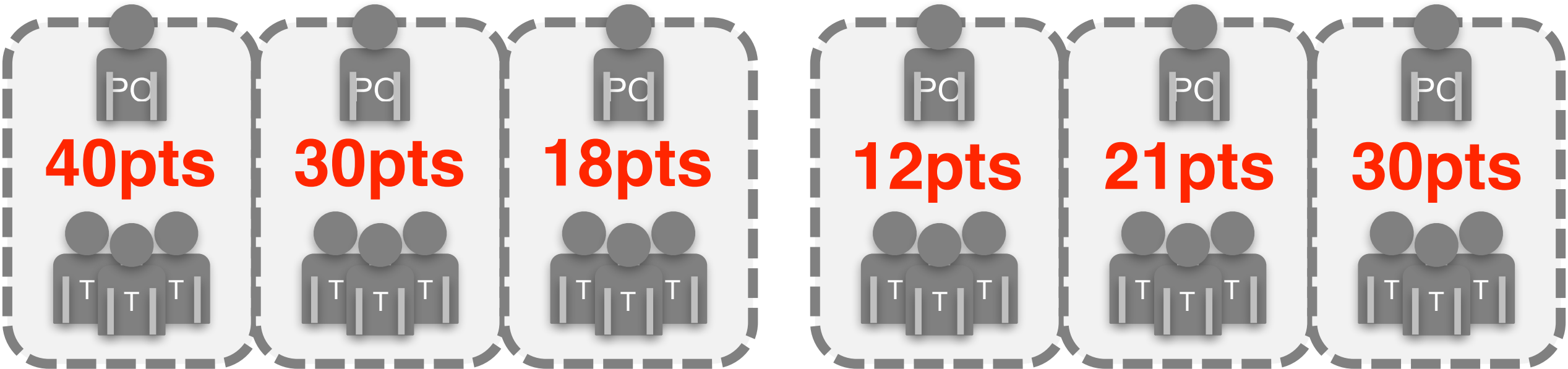
The Really Big Epic



A Big Epic

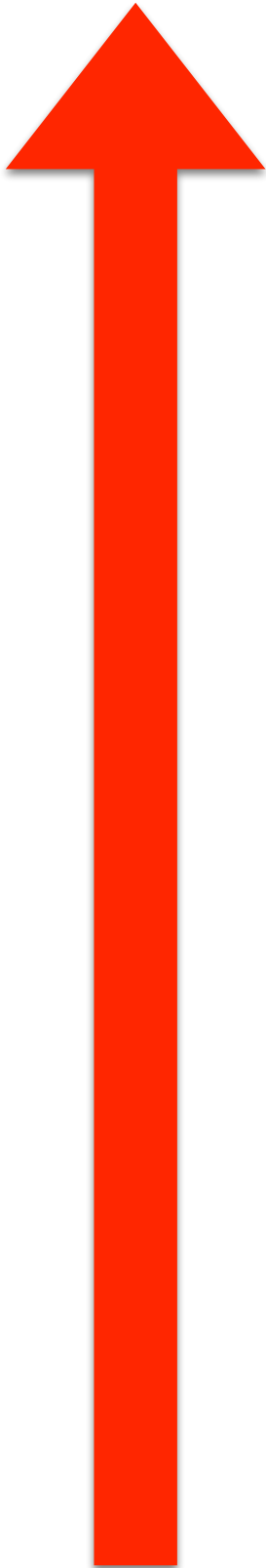


A Big Epic



Velocity

Aggregate the Numbers



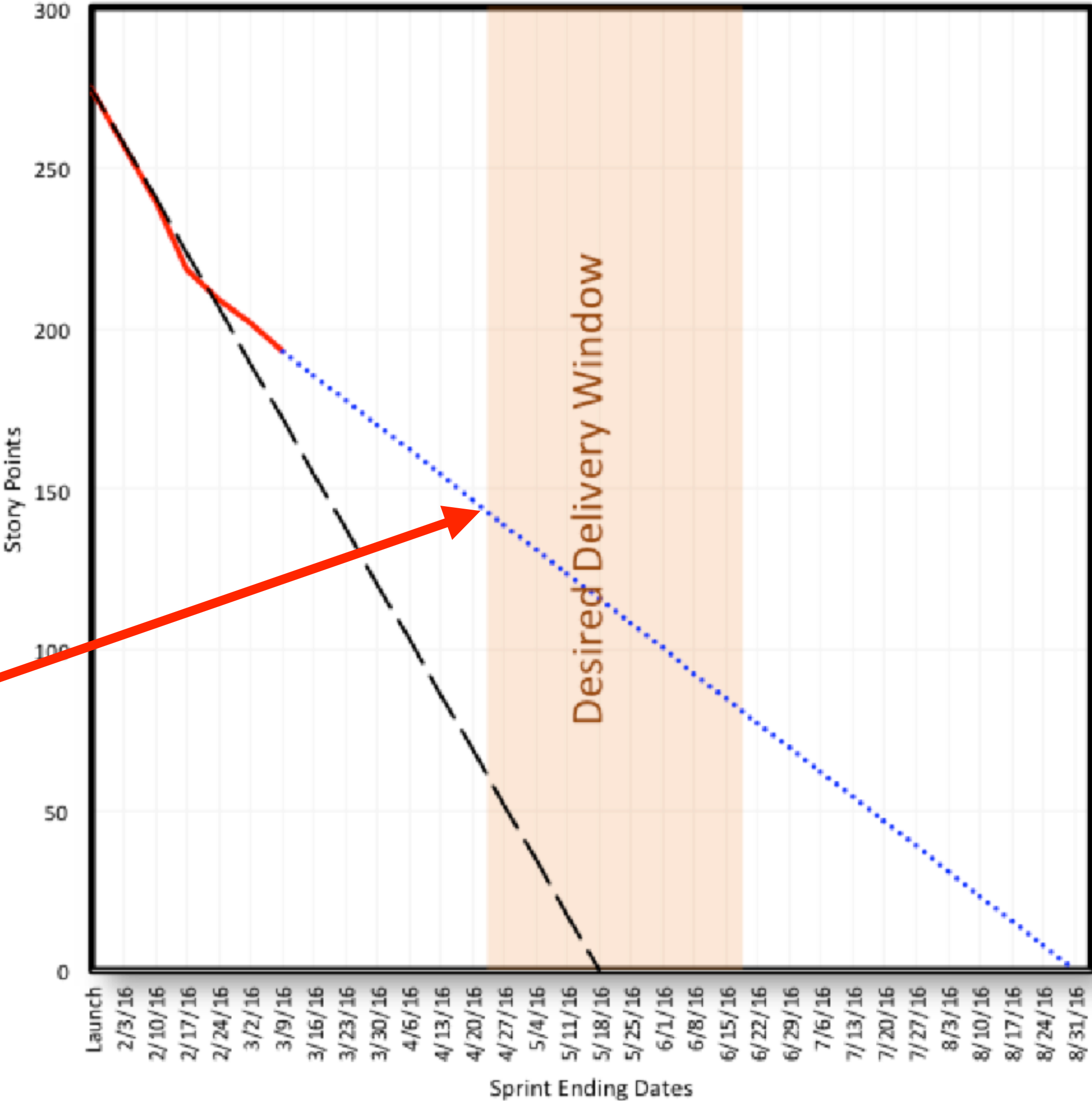


# Team Losing Focus

Big Epic
2/3/16
275
5/25/16

Sprint	Per-Sprint Contribution to Big Epic:
2/3/16	18
2/10/16	18
2/17/16	21
2/24/16	9
3/2/16	7
3/9/16	9
3/16/16	

Big Epic Initiative Burndown Chart with Optional Projected Dates



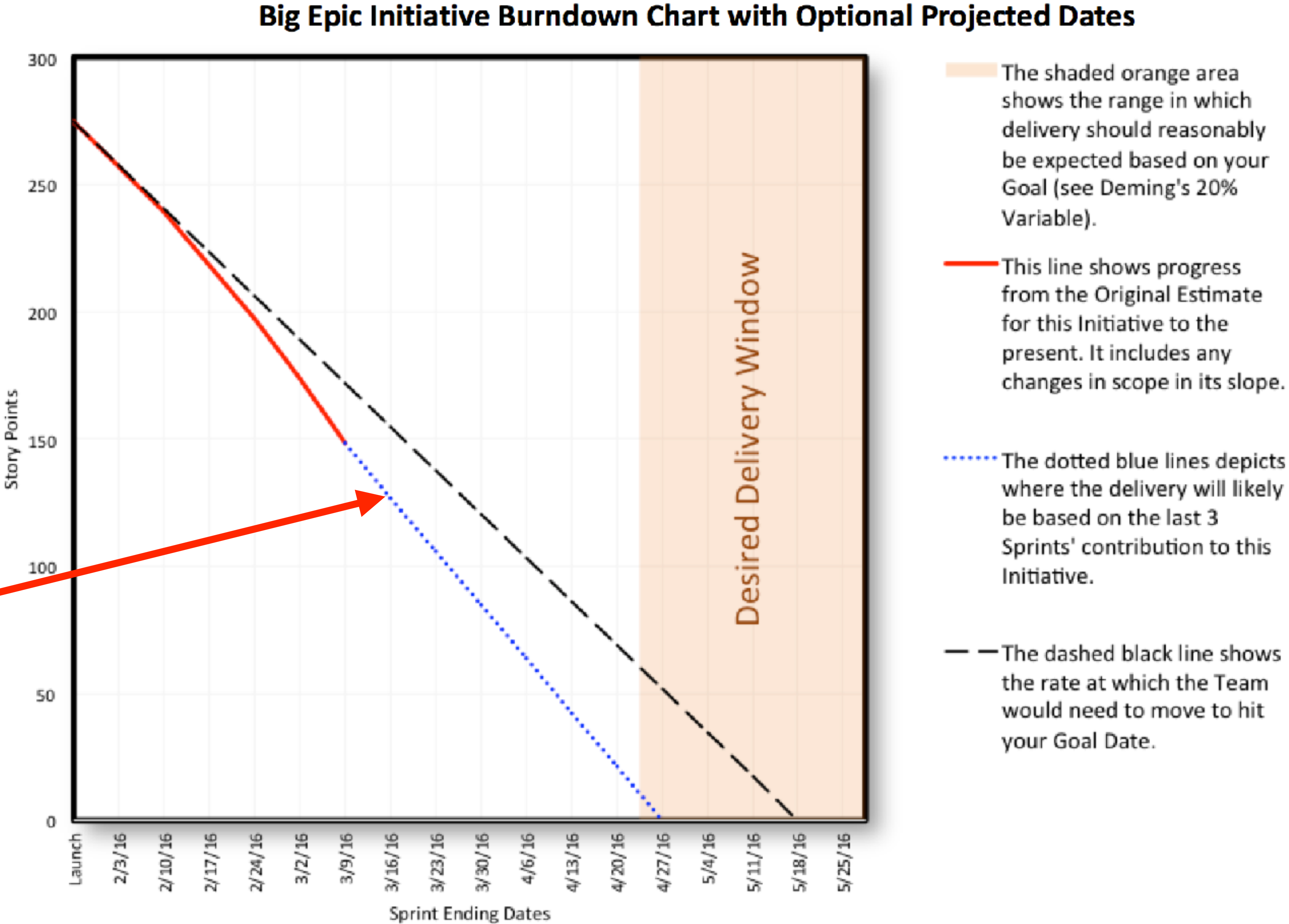
- The shaded orange area shows the range in which delivery should reasonably be expected based on your Goal (see Deming's 20% Variable).
- This line shows progress from the Original Estimate for this Initiative to the present. It includes any changes in scope in its slope.
- The dotted blue lines depicts where the delivery will likely be based on the last 3 Sprints' contribution to this Initiative.
- The dashed black line shows the rate at which the Team would need to move to hit your Goal Date.



# Team Accelerating

Big Epic
2/3/16
275
5/25/16

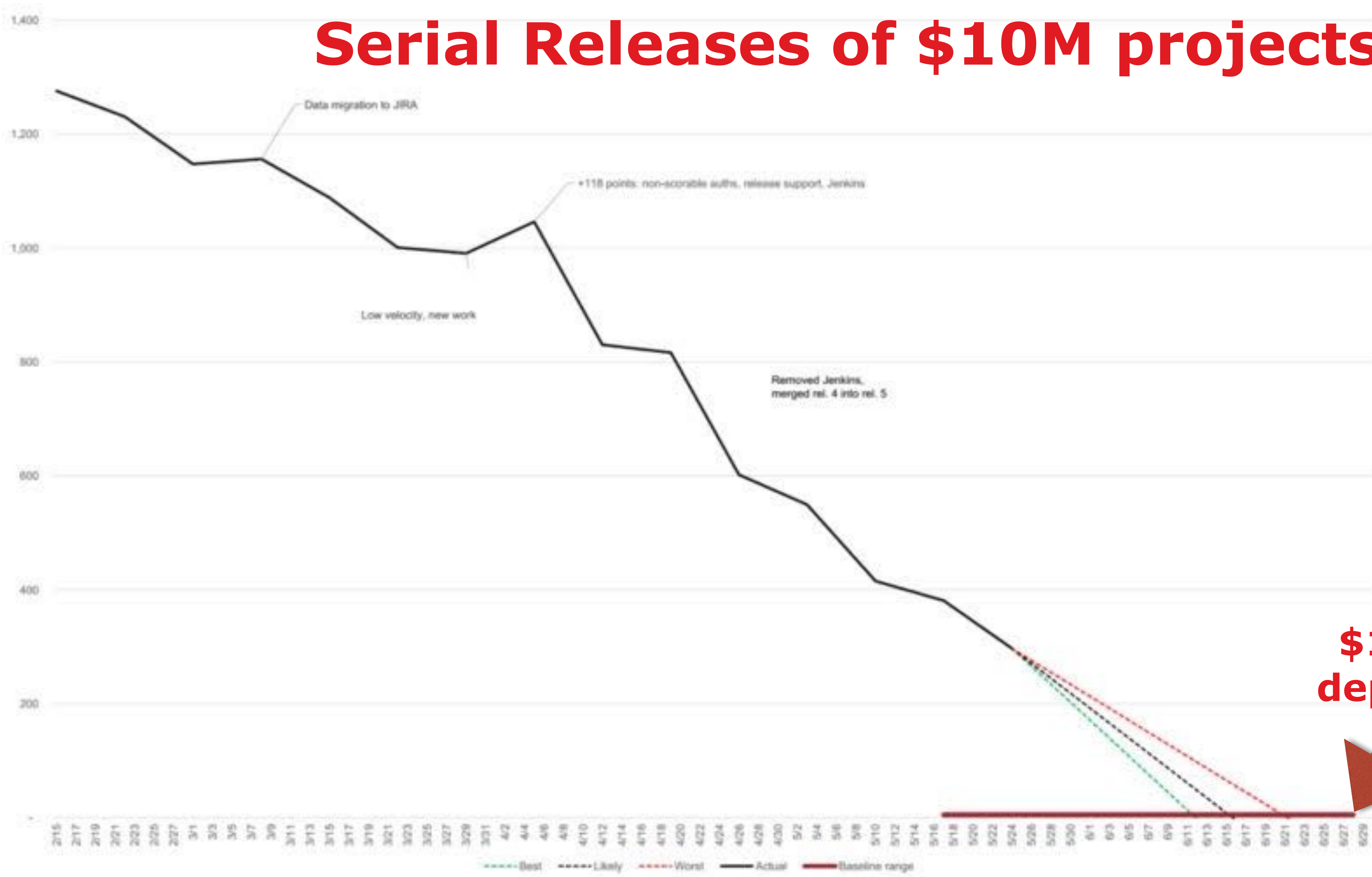
Sprint	Per-Sprint Contribution to Big Epic:
2/3/16	18
2/10/16	18
2/17/16	21
2/24/16	21
3/2/16	23
3/9/16	26
3/16/16	





# Scrum at the Bank

## Serial Releases of \$10M projects



Sprint ending 5/24

- CD1 3 week average velocity went down due to Release 5 work
- Tracking with 60% buffer assumption
- Target is still June 13<sup>th</sup> and within initial estimates

**\$100M penalty if deployed after this window**





# Critical Numbers for Release Date

- **Product Backlog Estimates** (based on Definition of Done)
- **Undone Work** (anything beyond DoD needed to deploy)
- **Emerging Requirements** (historical data)
- **Customer Issues post release** (historical data)
- Example Healthcare company in Houston:
  - For every 100 points estimated
    - 20 points of undone work (User Acceptance Testing)
    - 40 points of emerging requirements
    - 60 points of customer feedback when new features go live
  - Plan must include  $100+20+40+60 = 220$  points for every 100 points of initial estimate
- **Release plan must be updated based on real data after every sprint**

