PLM Convergence: A Data Driven Approach to Determine which PLM Systems to Sunset

David Pessin
Consulting Engineer
Northrop Grumman

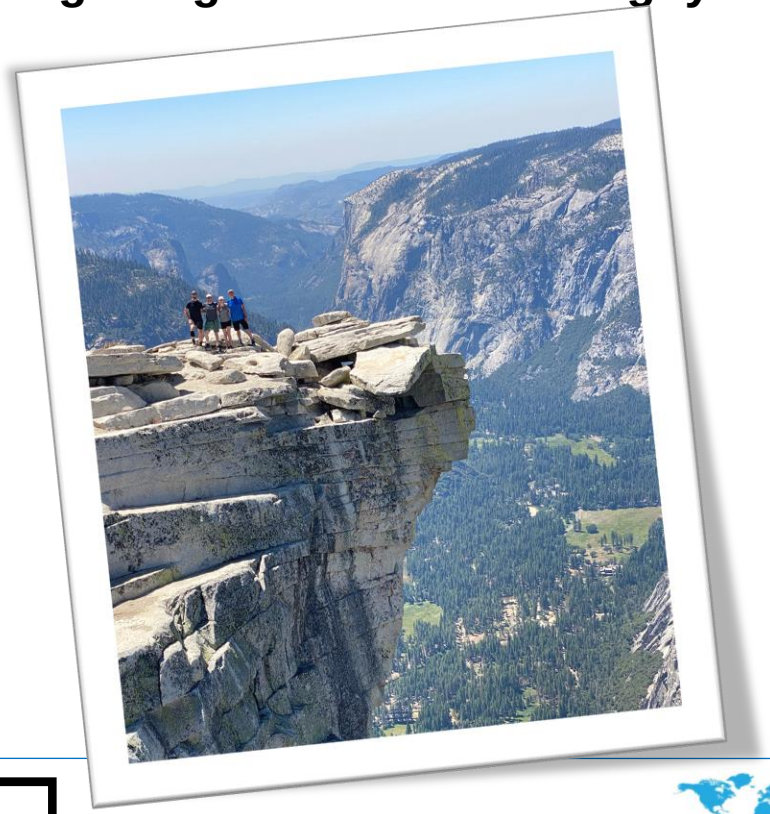
GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2024

BOEING ELYSIUM NORTHROP GRUMMAN Parker PDES, Inc.® Connecting the Digital Enterprise

NORTHROP GRUMMAN

Presenter's Bio – David Pessin

- **Consulting Engineer with 20+ years at Northrop Grumman (NGC)**
- **Works in the Aeronautics Systems sector (NGAS)**
- **Former Design Engineer turned PLM guy**



- **Married to wife Karen for 31 years**
- **Twin 23-year-old Daughters – Maya and Alissa**
- **Hobbies**
  - **Hiking**
  - **Brewing Beer and Cider**
  - **Exercising with my Weimaraner**

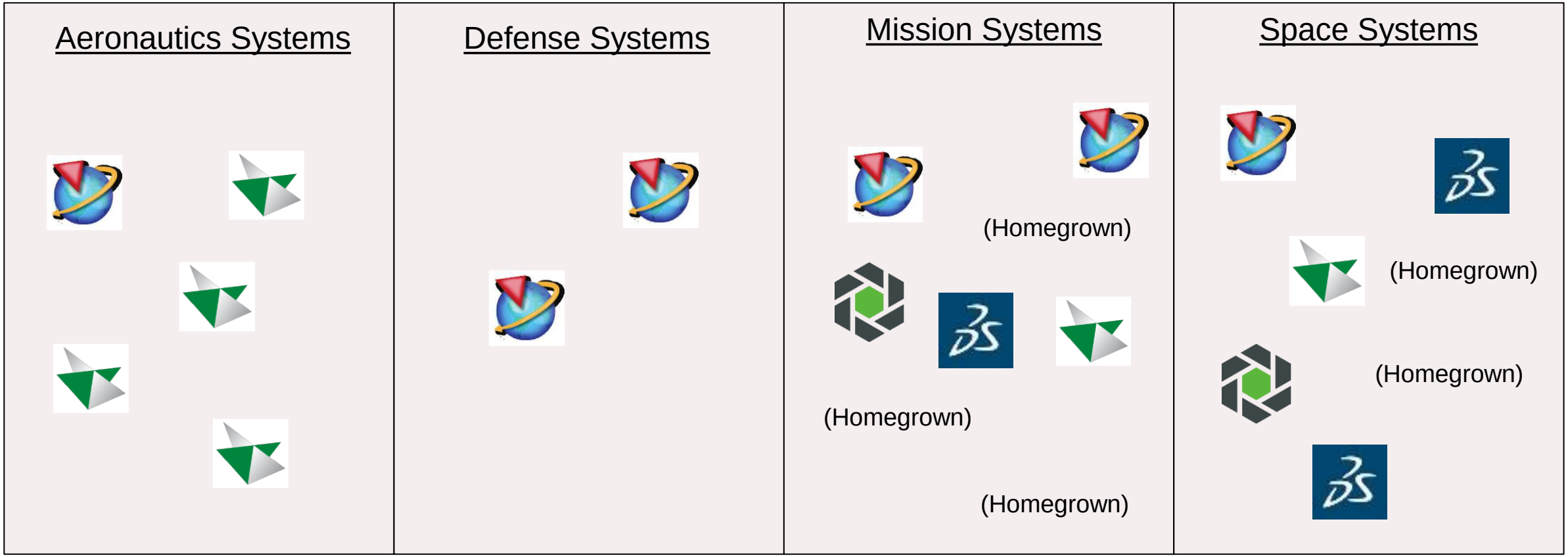
PLM Convergence: PLM Convergence: A Data Driven Approach to Determine which PLM Systems to Sunset

- **The Situation – Too many PLM systems**
- **The Task – Make a Convergence Recommendation**
- **The Approach – A Capability Assessment... and other Assessments**
- **Where we are at / What is next**

The Situation – Too Many PLM Systems

PLM Landscape at NGC

PLM System Usage*

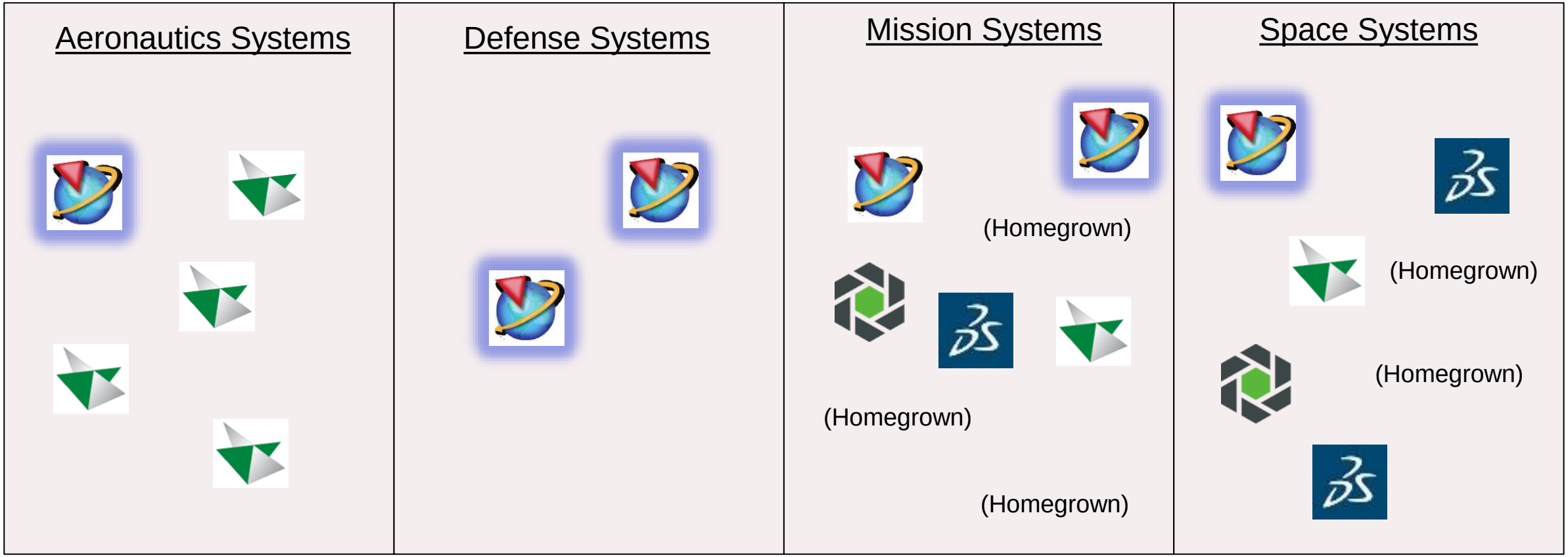


1 Company / 24 PLM Systems / 50,000+ User Accounts

* Excludes Usage under 200

PLM Landscape at NGC

PLM System Usage*



1 Company / 24 PLM Systems / 50,000+ User Accounts

* Excludes Usage under 200

PLM Landscape at NGC

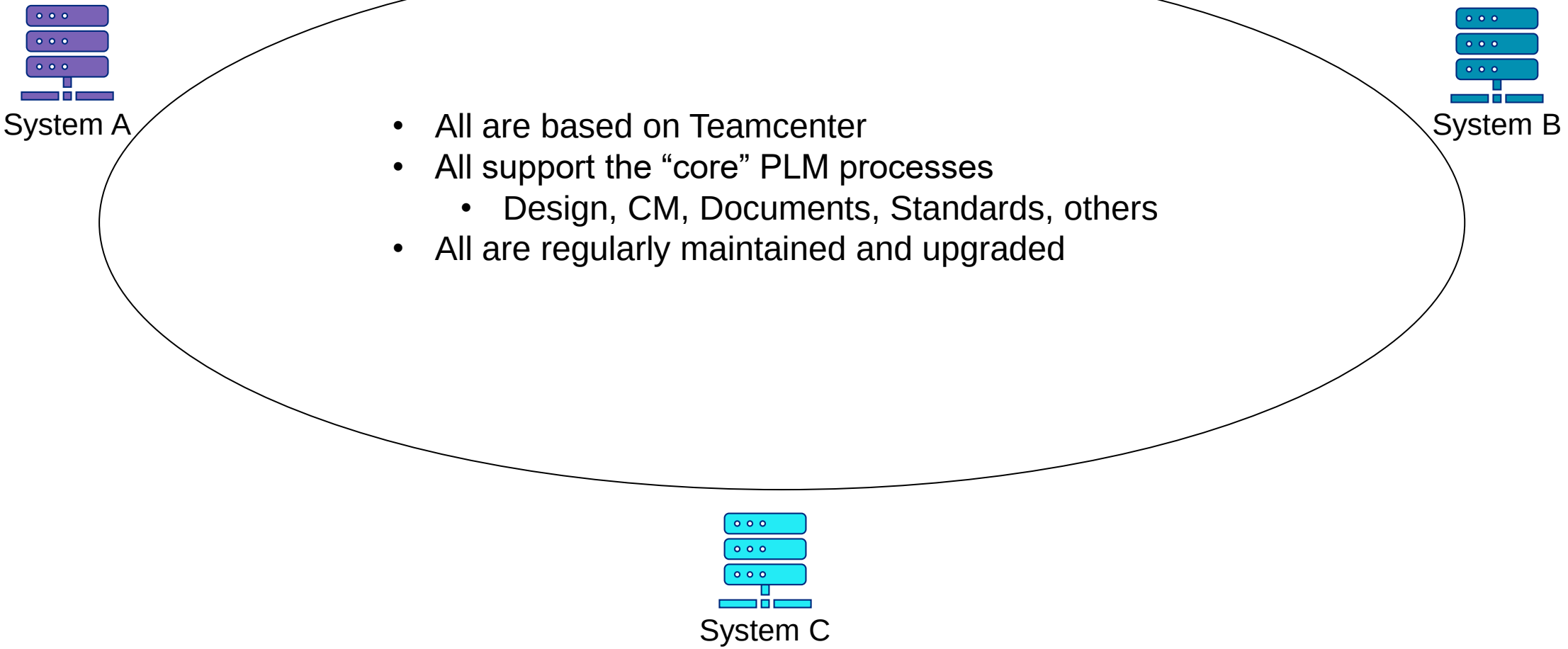
PLM System Usage*

Aeronautics Systems	Defense Systems	Mission Systems	Space Systems
System A	System A	System C	System B
TcEnterprise	System B	Teamcenter	(Homegrown)
TcEnterprise		Enovia	Enovia
TcEnterprise		(Homegrown)	TcEnterprise
TcEnterprise		Windchill	(Homegrown)
		(Homegrown)	Smarteam
		(Homegrown)	Windchill
		TcEnterprise	

Currently 3 “Primary” PLM Systems

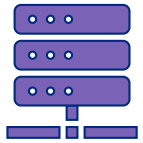
* Excludes Usage under 200

Similarities



- All are based on Teamcenter
- All support the “core” PLM processes
  - Design, CM, Documents, Standards, others
- All are regularly maintained and upgraded

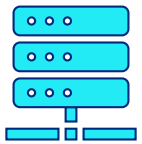
Differences



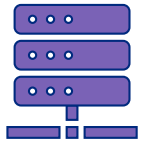
System A

System B

- Clientele: Few Large Programs vs. Many Small Programs
- Process and Configuration Governance: Centralized vs. Local
- Amount of Configuration and Customization
- Data Model Differences
  - Part-CAD Relationship: Integrated vs. Distinct
  - Design Package Release: Part-Centric vs. Document Centric
- Support for Authoring tools (MCAD, ECAD)



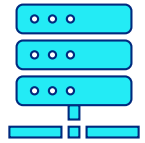
System C



System A

System B

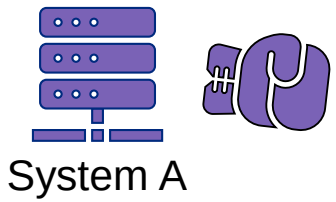
The Task –
Make a Convergence Recommendation

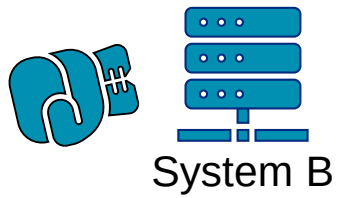


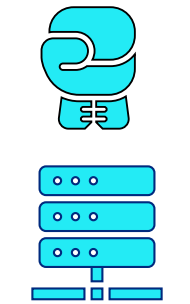
System C

Convergence Recommendation

Should NGC reduce the number of “Primary” PLM systems?
If so… down to 2 or 1?
And if so……Which one(s) is to be sunsetted?







Goal:
Provide Data-Driven Answers
- Minimize Bias
- Minimize Subjectivity
- Maximize Transparency

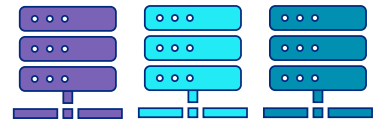
What Benefits might come out of this?

If we decide to converge

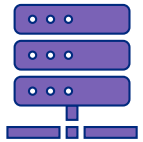
- Focus resources on remaining target(s)
  - $$$
  - People
- Migrate existing programs into target systems… *when prudent*
- Point all new Programs to remaining Target systems

If we decide NOT to converge

- Use Assessments to help new programs decide which system to use



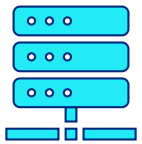
Outline



System A

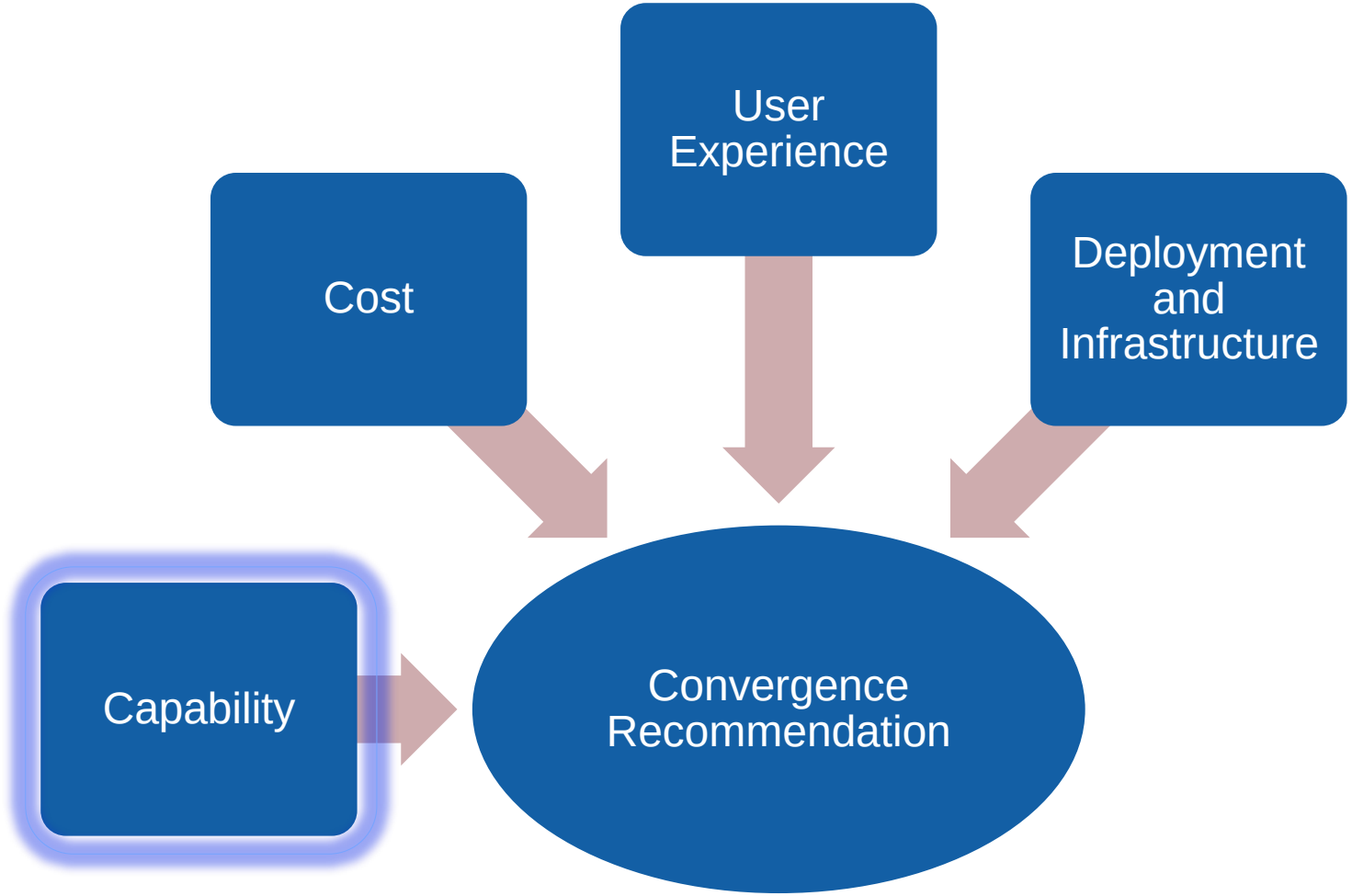
System B

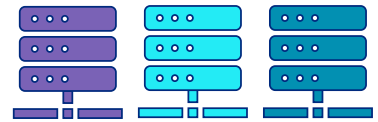
The Approach –
A Capability Assessment... and other Assessments



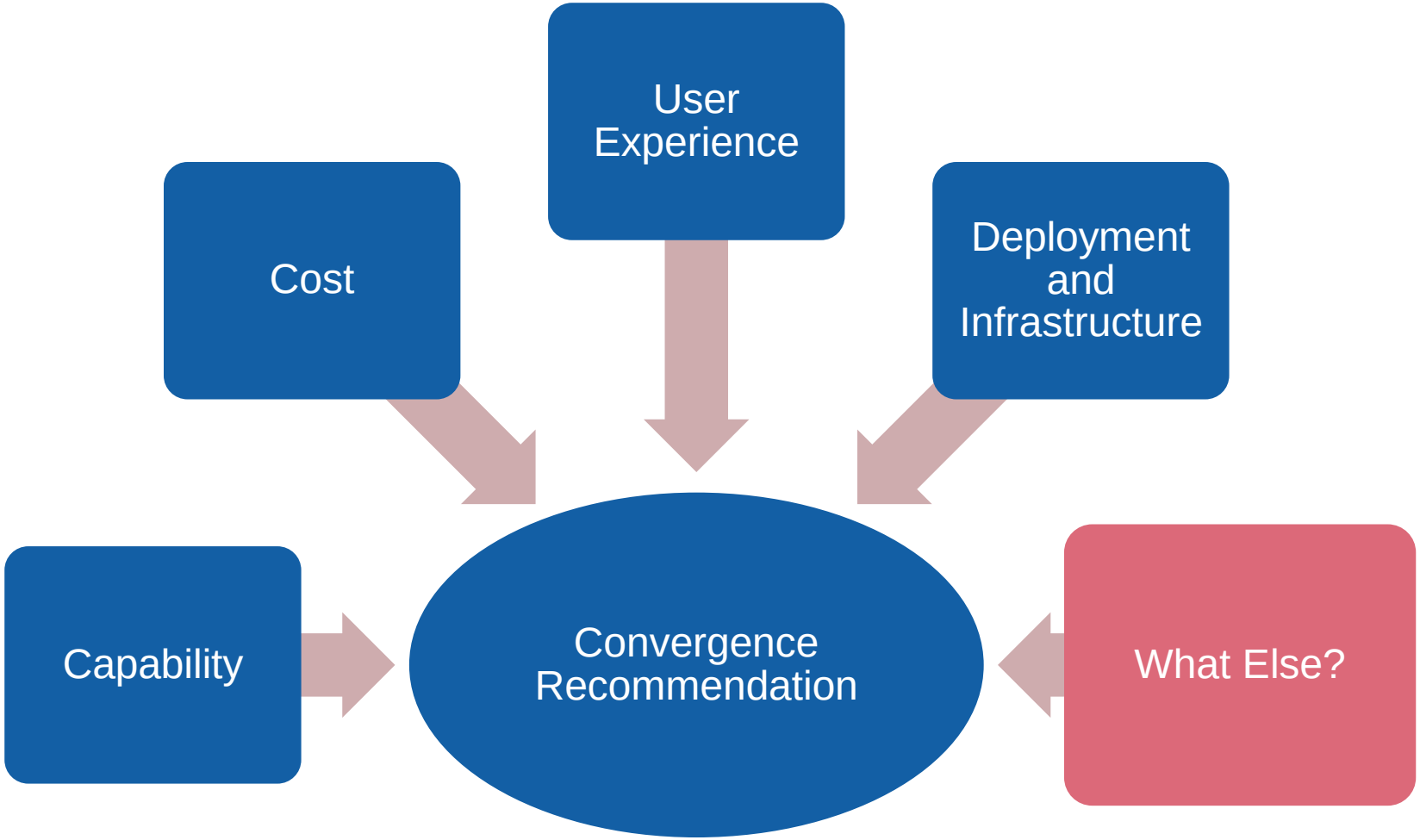
System C

Assessments that make a thorough Convergence Recommendation





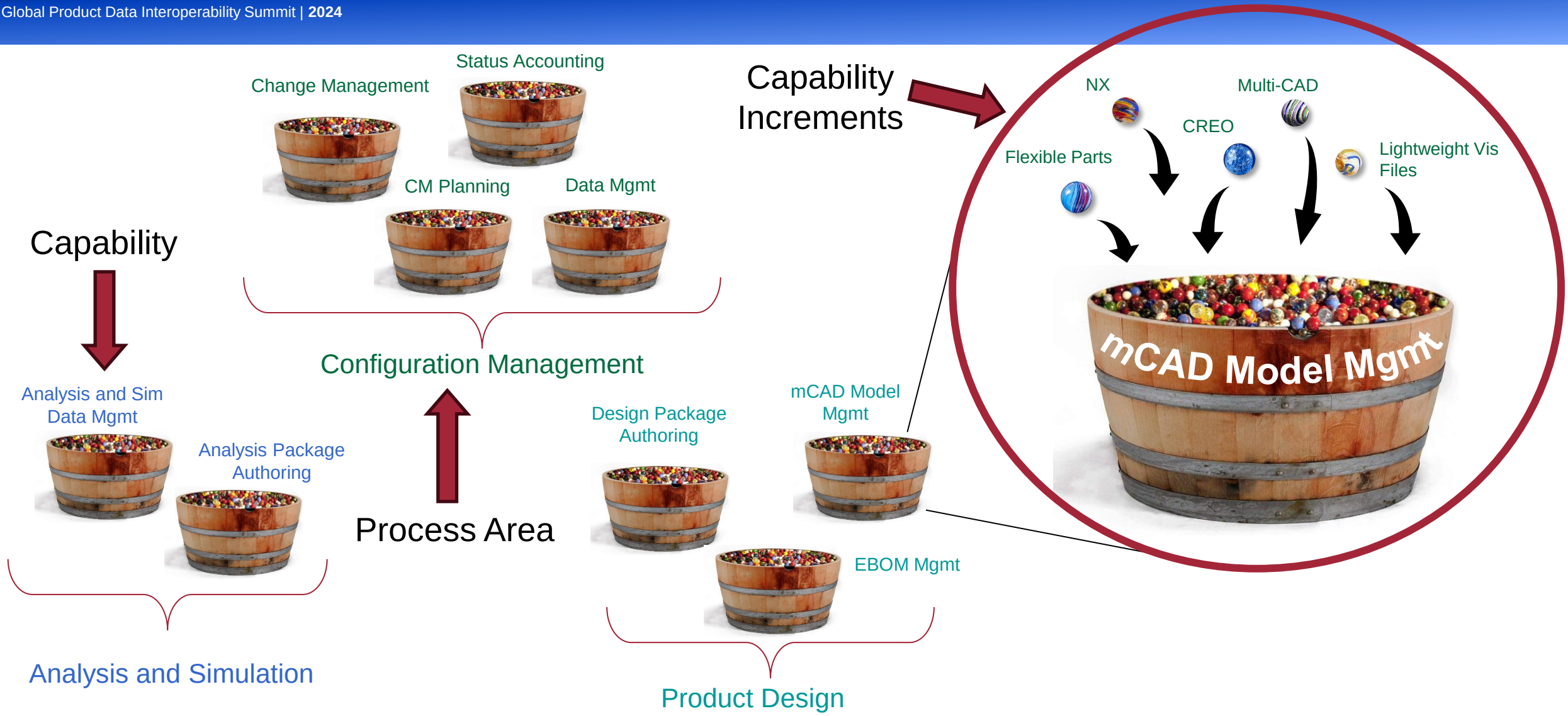
Elements of a good Convergence Recommendation



NGC PLM Capability Tree

All the Process Areas, Capabilities, and Capability Increments that make up an ideal, mature PLM system for NGC

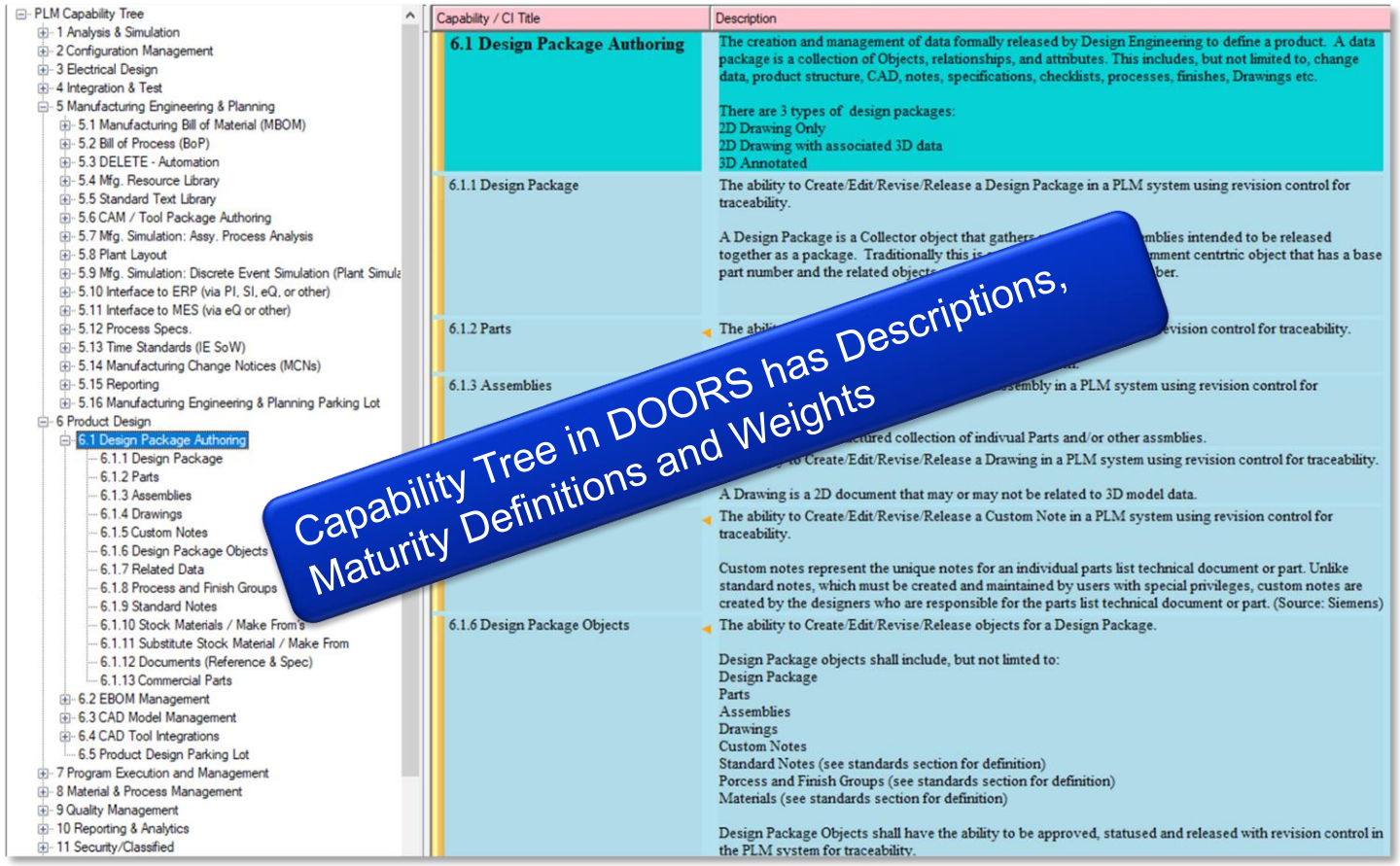
PLM is bunch of Capabilities, organized by Process Area, made up of Capability Increments



Capability Tree Authored in Doors

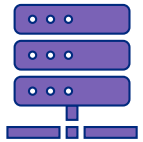
Item Type	Count
Process Areas	16
Capabilities	90
CI's	418
Grand Total	**524**

Process Areas	Count of Capabilities	Count of CI's
Analysis & Simulation	3	57
Configuration Management	5	32
Electrical Design	9	47
Integration & Test	3	6
Manufacturing Engineering & Planning	14	77
Material & Process Management	6	22
Product Design	4	34
Program Execution and Management	5	13
Quality Management	10	32
Reporting & Analytics	2	12
Security/Classified	4	7
Software Development	1	19
Standards Management	7	28
Supplier Collaboration	5	2
Sustainment	9	19
Systems Engineering	3	11
Grand Total	**90**	**418**



Capability Tree in DOORS has Descriptions, Maturity Definitions and Weights

All the Process Areas, Capabilities, and Capability Increments that make up an ideal, mature PLM system for NGC

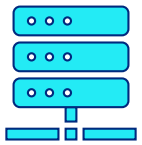


System A

System B

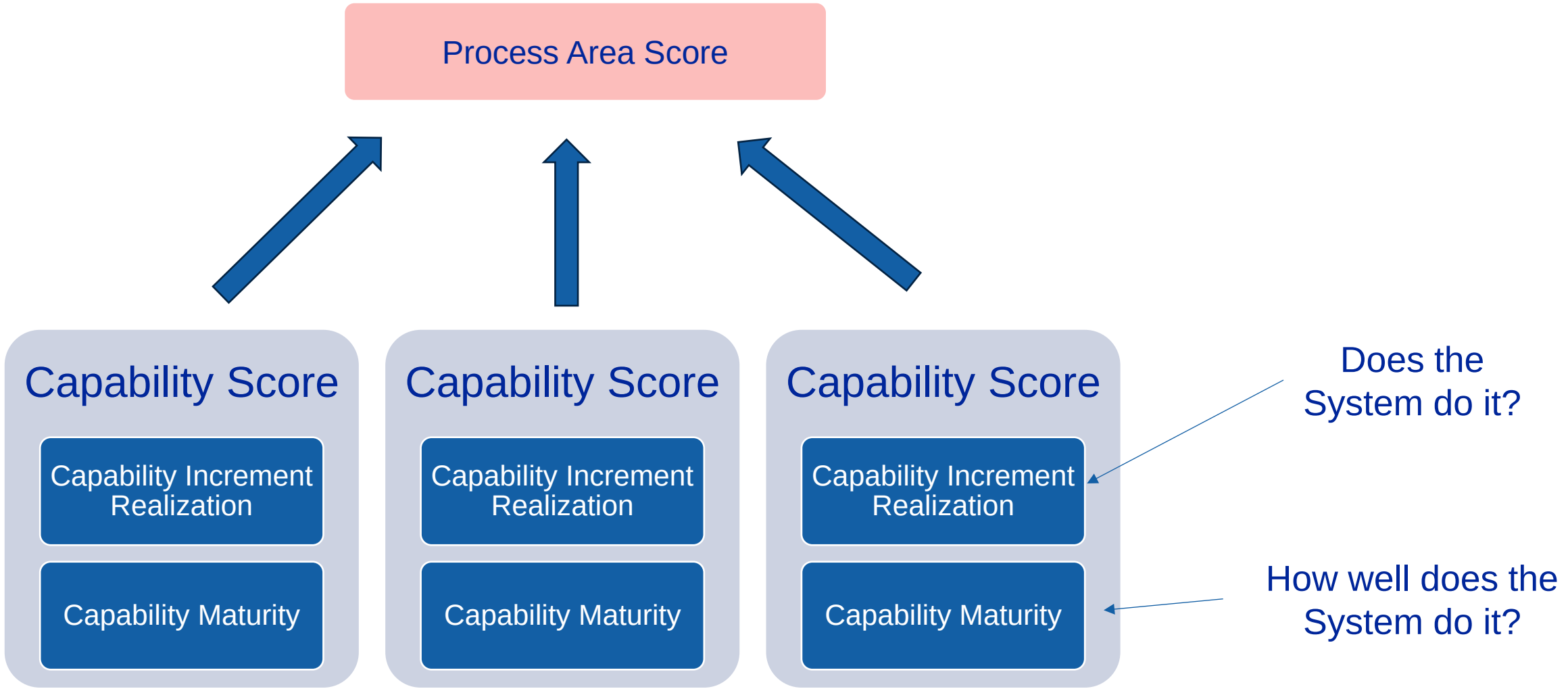
The Capability Assessment Process

- Capability Scoring
- Scoring Review Process
- Capability Assessment Board (“CAB”)



System C

Capability Assessment: What goes into a Score?



Capability Assessment Example

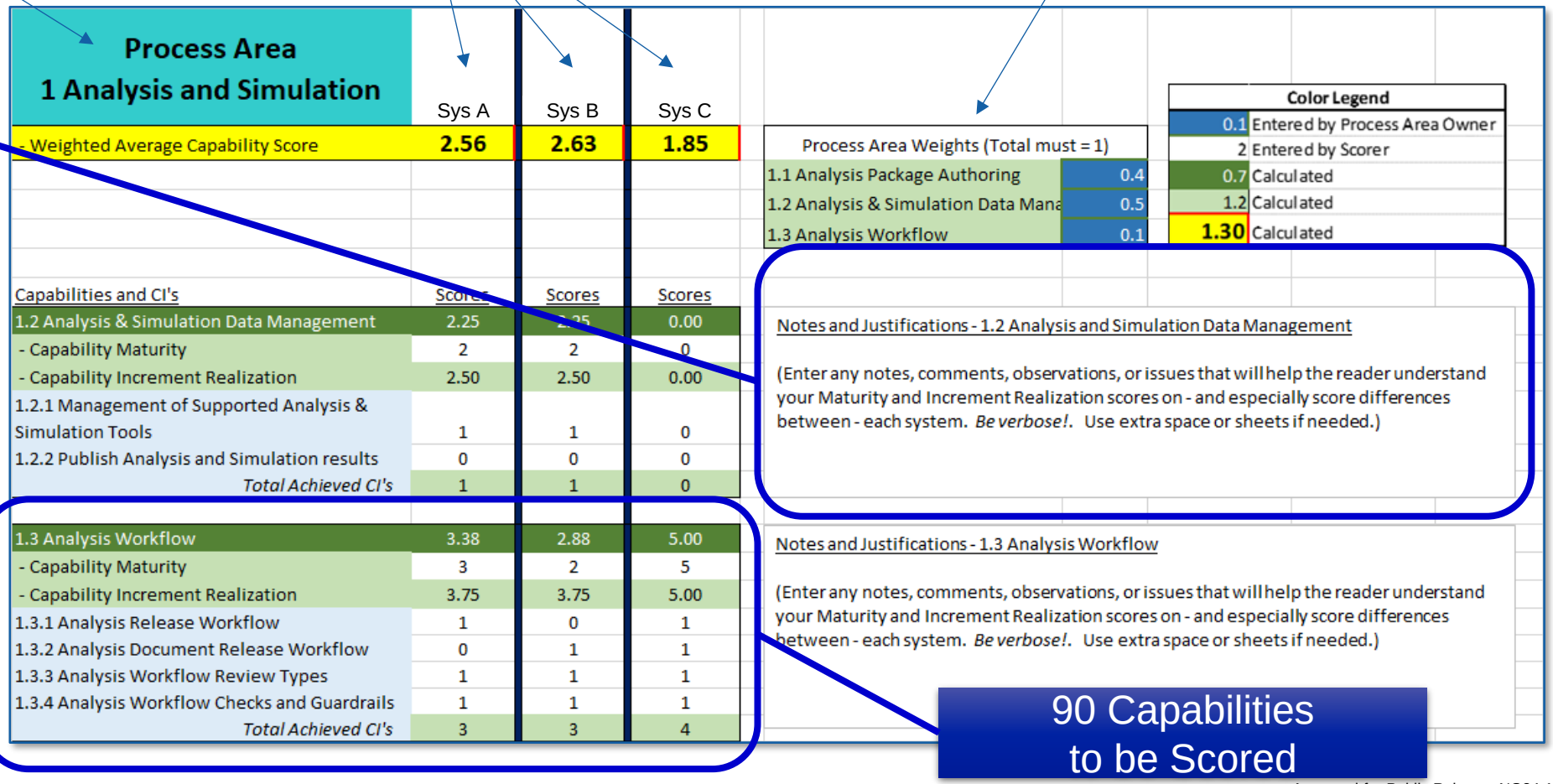
1. One Scoresheet per Process Area

2. Each Solution (System A, System B, System C) gets an overall score by Process Area.

3. Process Area Score is a weighted average of each Capability within the Process Area

Notes and Justifications are Required with each score

4. Capability Score is an Average of:
   - Capability Maturity
   - Capability Increment Realization



Process Area 1 Analysis and Simulation	Sys A	Sys B	Sys C
- Weighted Average Capability Score	2.56	2.63	1.85

Process Area Weights (Total must = 1)	
1.1 Analysis Package Authoring	0.4
1.2 Analysis & Simulation Data Mana	0.5
1.3 Analysis Workflow	0.1

Color Legend	
0.1	Entered by Process Area Owner
2	Entered by Scorer
0.7	Calculated
1.2	Calculated
1.30	Calculated

Capabilities and CI's	Scores	Scores	Scores
1.2 Analysis & Simulation Data Management	2.25	2.25	0.00
- Capability Maturity	2	2	0
- Capability Increment Realization	2.50	2.50	0.00
1.2.1 Management of Supported Analysis & Simulation Tools	1	1	0
1.2.2 Publish Analysis and Simulation results	0	0	0
Total Achieved CI's	1	1	0
1.3 Analysis Workflow	3.38	2.88	5.00
- Capability Maturity	3	2	5
- Capability Increment Realization	3.75	3.75	5.00
1.3.1 Analysis Release Workflow	1	0	1
1.3.2 Analysis Document Release Workflow	0	1	1
1.3.3 Analysis Workflow Review Types	1	1	1
1.3.4 Analysis Workflow Checks and Guardrails	1	1	1
Total Achieved CI's	3	3	4

Notes and Justifications - 1.2 Analysis and Simulation Data Management

(Enter any notes, comments, observations, or issues that will help the reader understand your Maturity and Increment Realization scores on - and especially score differences between - each system. *Be verbose!*. Use extra space or sheets if needed.)

Notes and Justifications - 1.3 Analysis Workflow

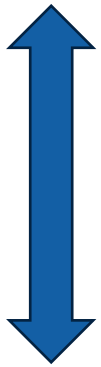
(Enter any notes, comments, observations, or issues that will help the reader understand your Maturity and Increment Realization scores on - and especially score differences between - each system. *Be verbose!*. Use extra space or sheets if needed.)

90 Capabilities to be Scored

Maturity Level Definition
Product Design: CAD Model Management

NORTHROP GRUMMAN

Score = 5
System executes capability following MBD/MBE processes with full PMI and integrated workflows. All derivative files are automatically generated. CAD and derivative files able to be used by downstream capabilities and systems. CAD interface is fully integrated and intuitive.



Score = 1
System executes capability in a very manual fashion. PMI is not usable. Derivate files are not generated. Interface to CAD tool is cumbersome.

Maturity

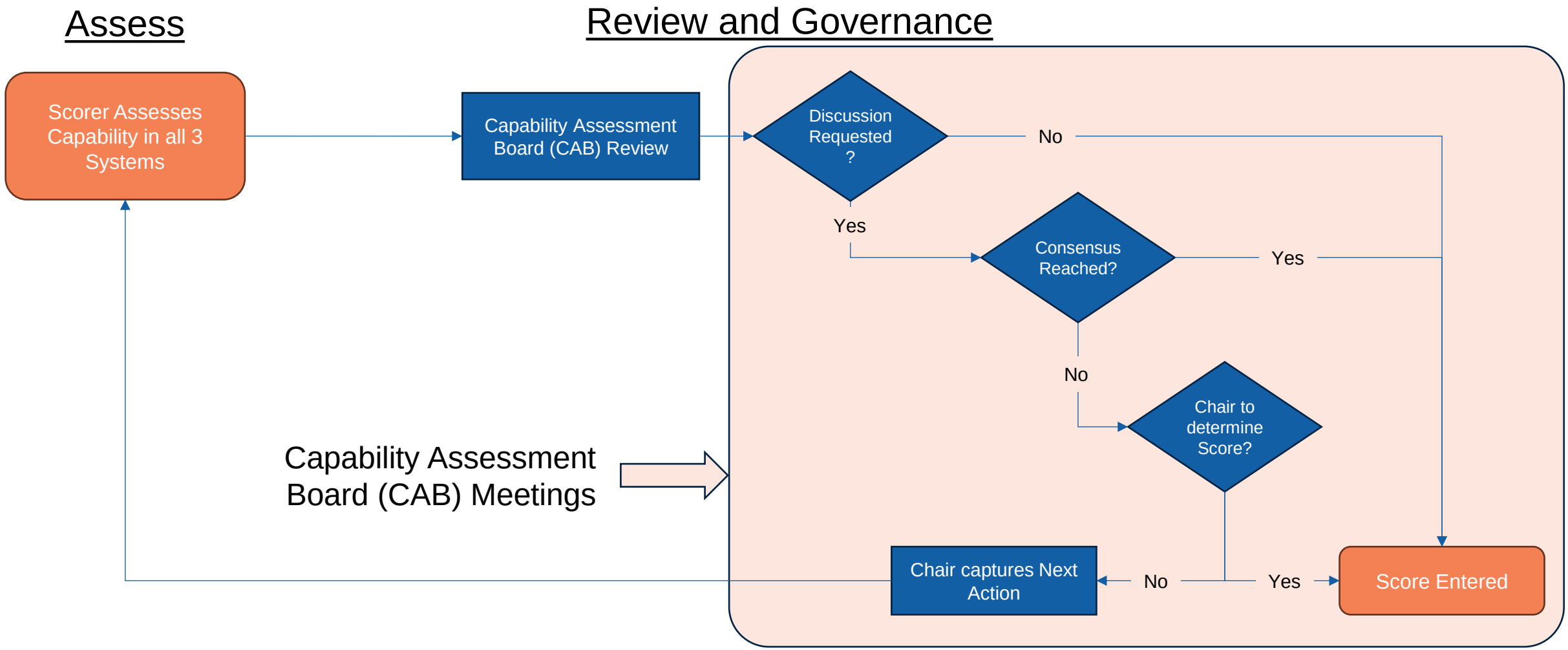
Automation	Usability	Digital Thread Connectivity	Usage
Full	Intuitive, Modern	Complete	Widely used throughout System
			
All Manual	Frustrating, Antiquated	None	Available, but not used

* If Capability does not exist, then Maturity is 0

Capability Assessment Process

Followed for each Capability for each PLM Solution

NORTHROP GRUMMAN



Platform for discussion and debate. Path for decisions to be made.

Capability Assessment Board Representation

Independent Perspective

- Siemens Rep
- CIMdata Rep

User Representation

- Aeronautics Systems
- Defense Systems
- Mission Systems
- Space Systems

Tool Representation

- System A
- System B
- System C

PLM Convergence

- Process Owner / Chair
- PLM Architect / Facilitator
- PLM Convergence Chief Engineer
- Process Area Owner ** (Varies)
- Scorer (Varies)

Back to Process

Full Representation on CAB – No Surprises when Recommendation is Made

Where we are at / What is next

Where we are at / What is next

Where we are at

- Capability Tree Defined
  - Descriptions
  - Maturity Level Definitions
  - Process Area Weights
- Assessments are started
  - 4 of 16 Process Areas
    - Product Design
    - Manufacturing
    - Standards
    - Supplier Collaboration
- Capability Assessment Board “Kicked-off”

What is next

- Make Assessments
- Review and Approve Scores
- Define and Plan “Other” Assessments
- Interim Assessment Presentation – December 2024

Final Assessment Presentation and Convergence Recommendation – March 2025

Questions??

GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2024

BOEING ELYSIUM NORTHROP GRUMMAN Parker PDES, Inc.® Connecting the Digital Enterprise

NORTHROP GRUMMAN