Using MBPLE to manage specification complexity

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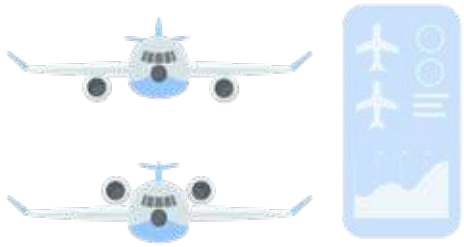
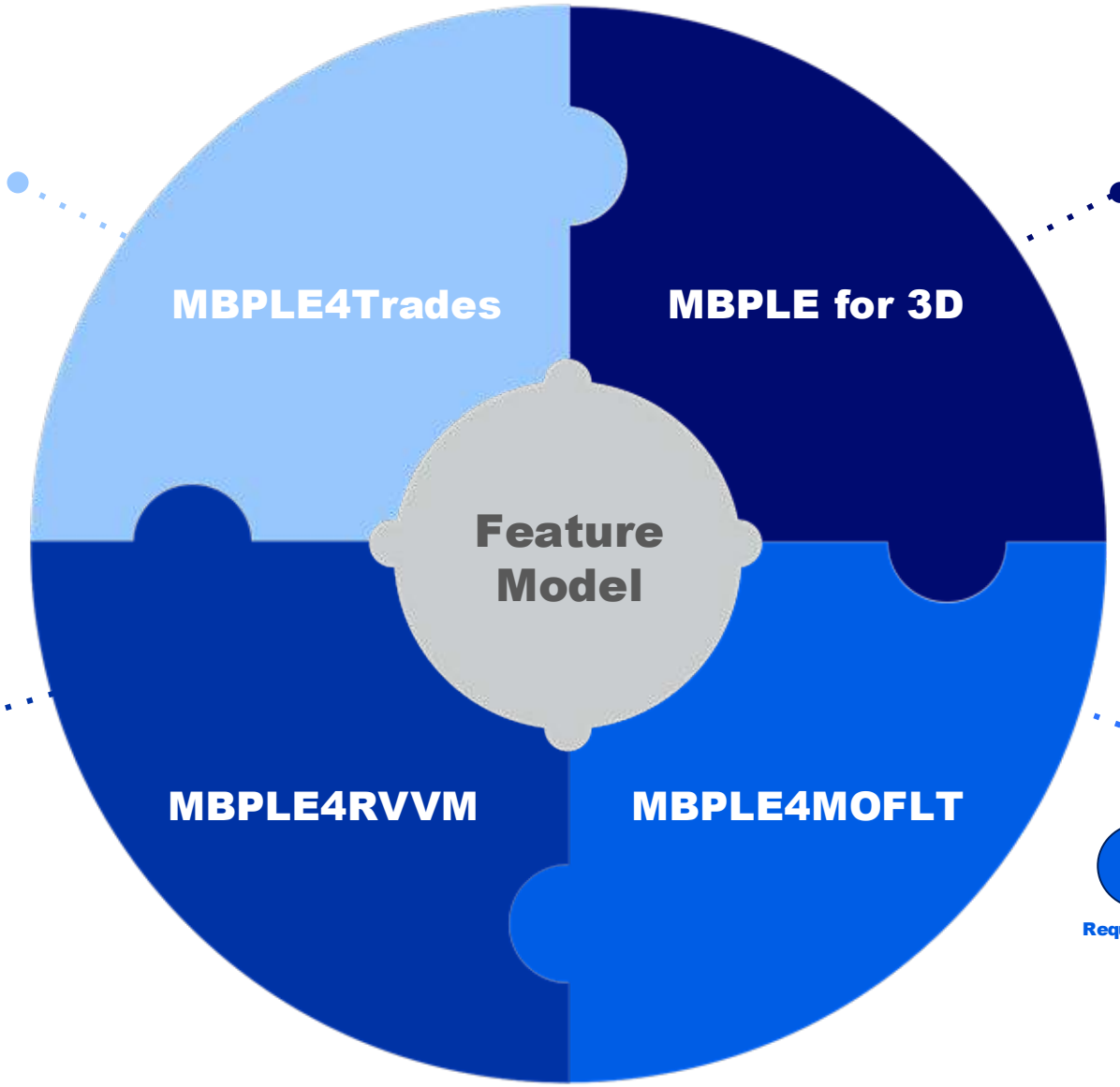
ptc

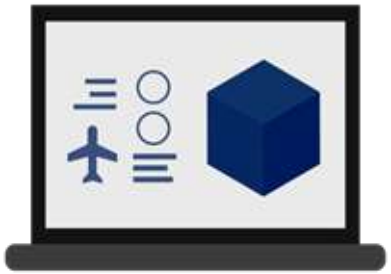
Product Line Engineering in Action

AIRBUS

Holistic MBPLE Framework Methods







Approach A
Approach B

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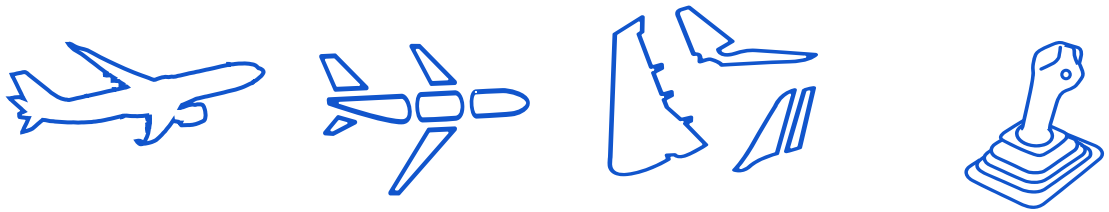
Deployment at Airbus

Beyond the "Traditional" System Development

Successfully Deployed at the Three Axis of Co-Development

Proven to Support Diverse Types of Systems and Hierarchical Levels

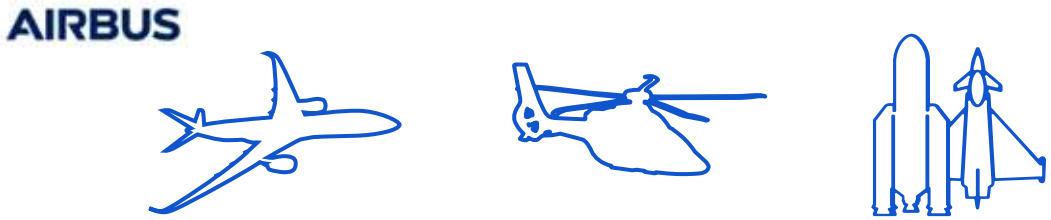


Method proven applicable to different domains

Method already delivering value to real-life projects for 1.5+years

From Proof of Concept to Real-Life Deployment

Method developed accounting to the need of the whole Airbus Group



Covering the Needs of Airbus "Big Family"

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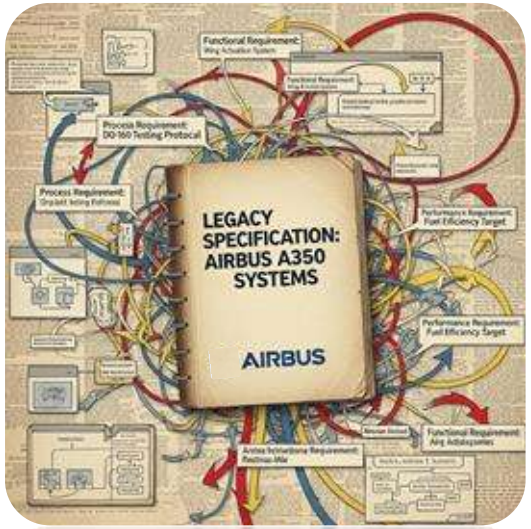
Introduction and Challenges

Context

- Seat vendor designs seats (owns the design)
- Airbus oversees and integrates the Seats inside the aircraft
- Airbus requirements shared with the seat vendor as PDF Documents
- Shared V&V Activities

Challenge from Legacy Specification

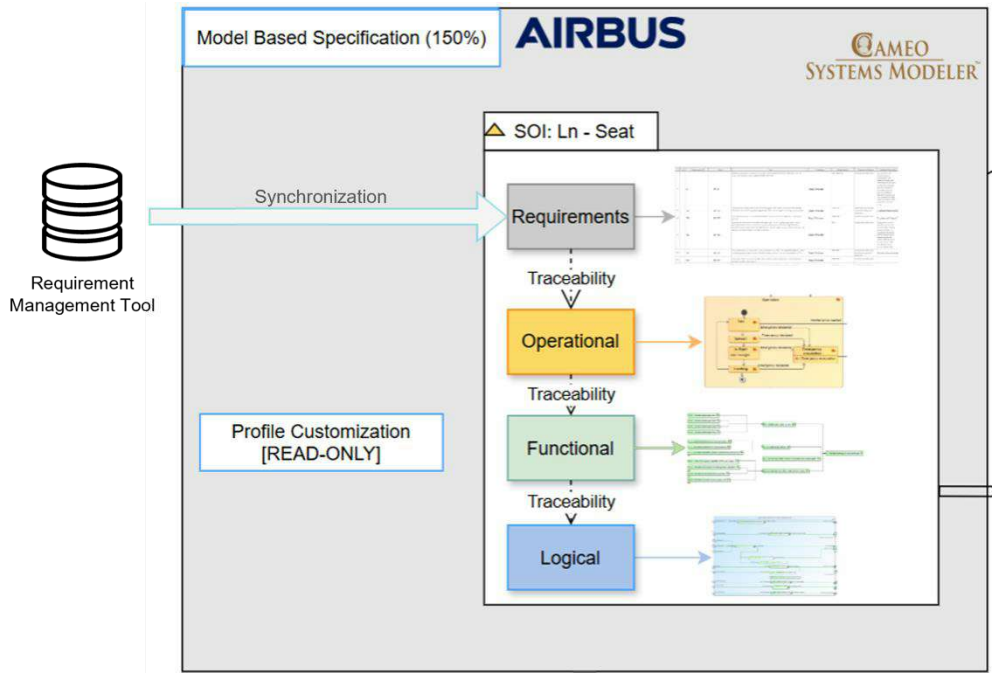


- Specification comes as a 1000+ page document
- Cross-Program requirements, difficult to determine their applicability
- Gathers different types of requirements: Process, Functional, Performance…

Overall MBSE and MBPLE Approach

- Airbus MBSE/MBPLE Framework R-MOFLT (Mission, Operational, Functional, Logical, Technical)
- Seat as System of Interest
- Development of the 150% Seat specification
  - Feature Model in Pure Variants
  - **Requirements** synchronized from database
  - **Use Cases**, Seat **Life Cycle**
  - High-Level **Functional architecture**
  - Primary **Logical Architecture** of the Seat's main components
  - No Technical Layer developed within the specification to preserve seat vendor's innovation

 100% Model-Based Specification (MBS) is sent to seat vendors alongside the traditional 150% PDF documents



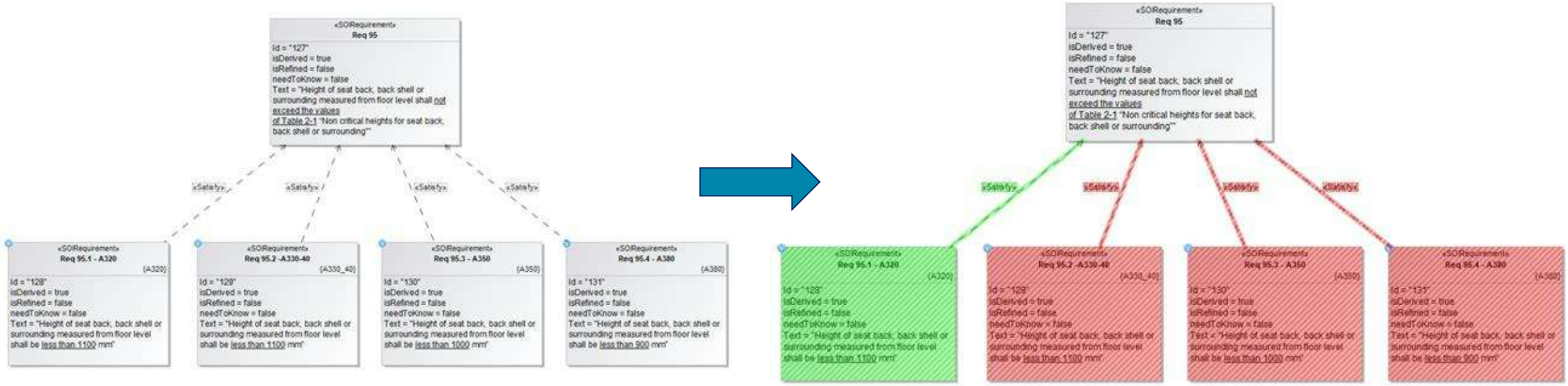
Cross Program Requirements

- Development of a feature model in Pure Variants
- Variation Points set up on the system model elements
- Different approaches identified and tested for this project to manage the requirement set once in the modeling tool

Cross Program Requirements

Option 1: Variation points on Requirements

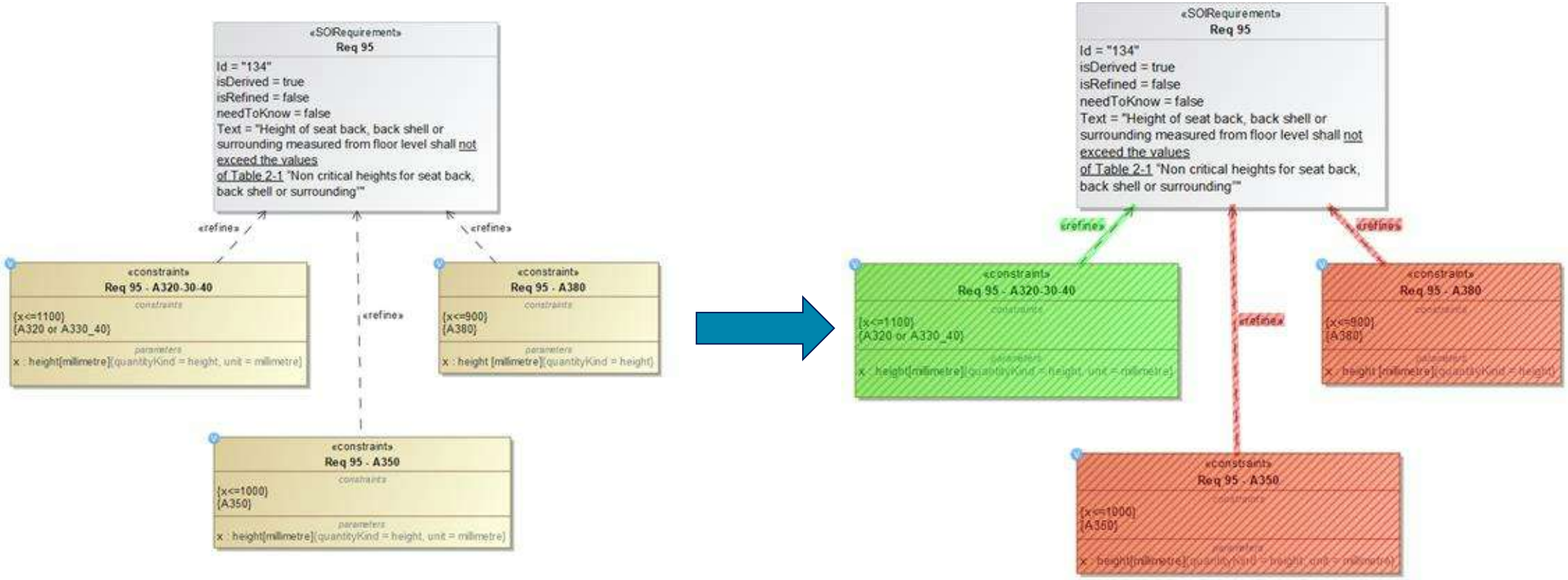
One cross-program requirement split into individual requirements



Cross Program Requirements

Option 2: Variation points on Constraint Blocks

One cross-program requirement refined by individual constraintBlocks



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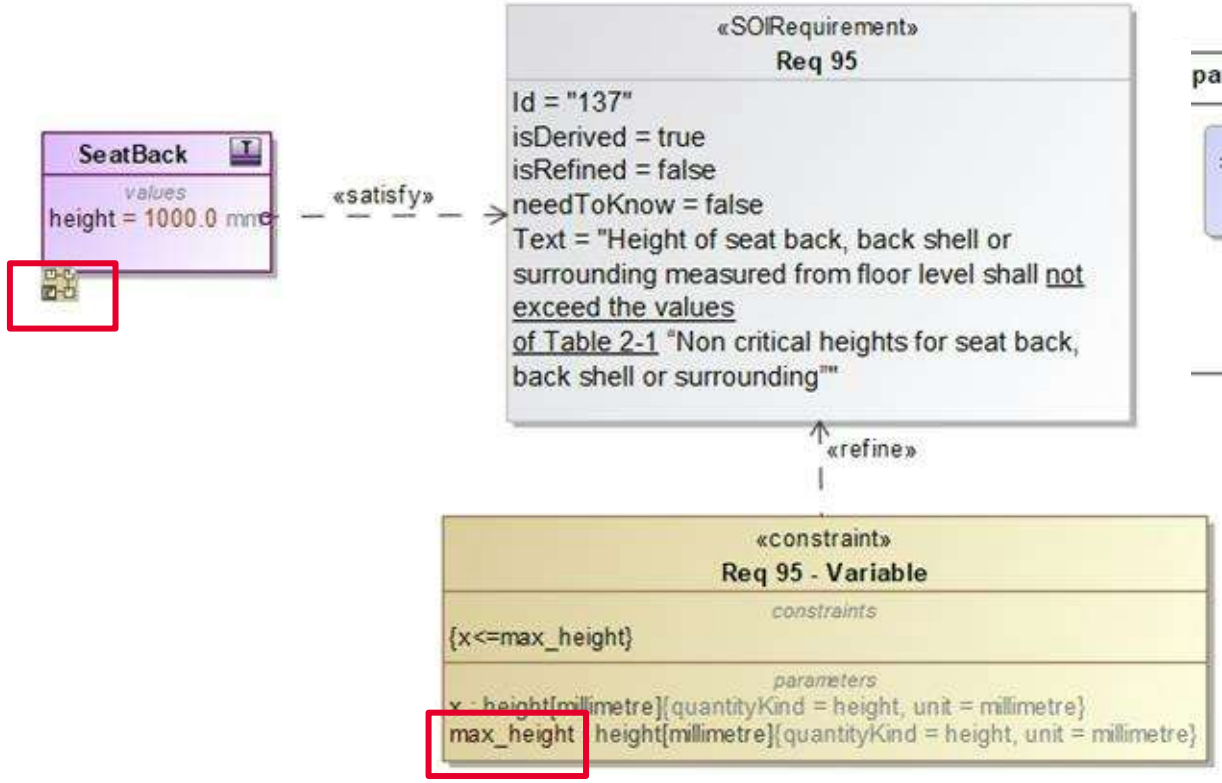
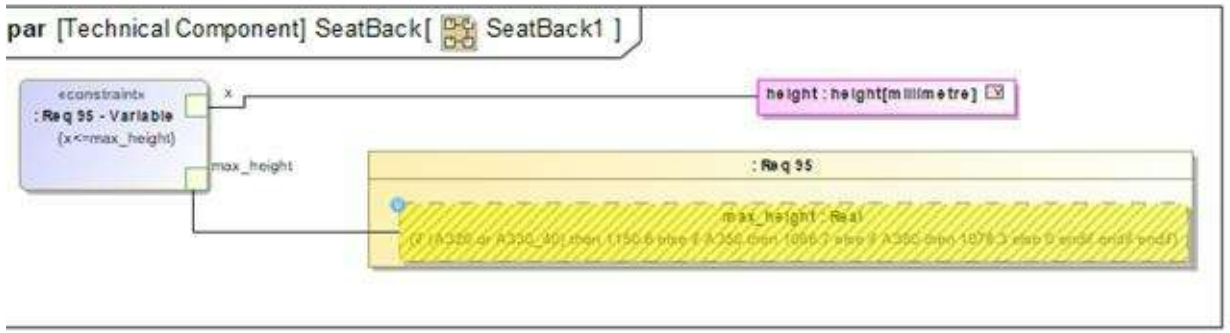
Cross Program Requirements

Option 3: Variation points on objective value/constraint

One cross-program requirement refined by a unique constraintBlock, for which the mathematical constraints varies





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Cross Program Requirements

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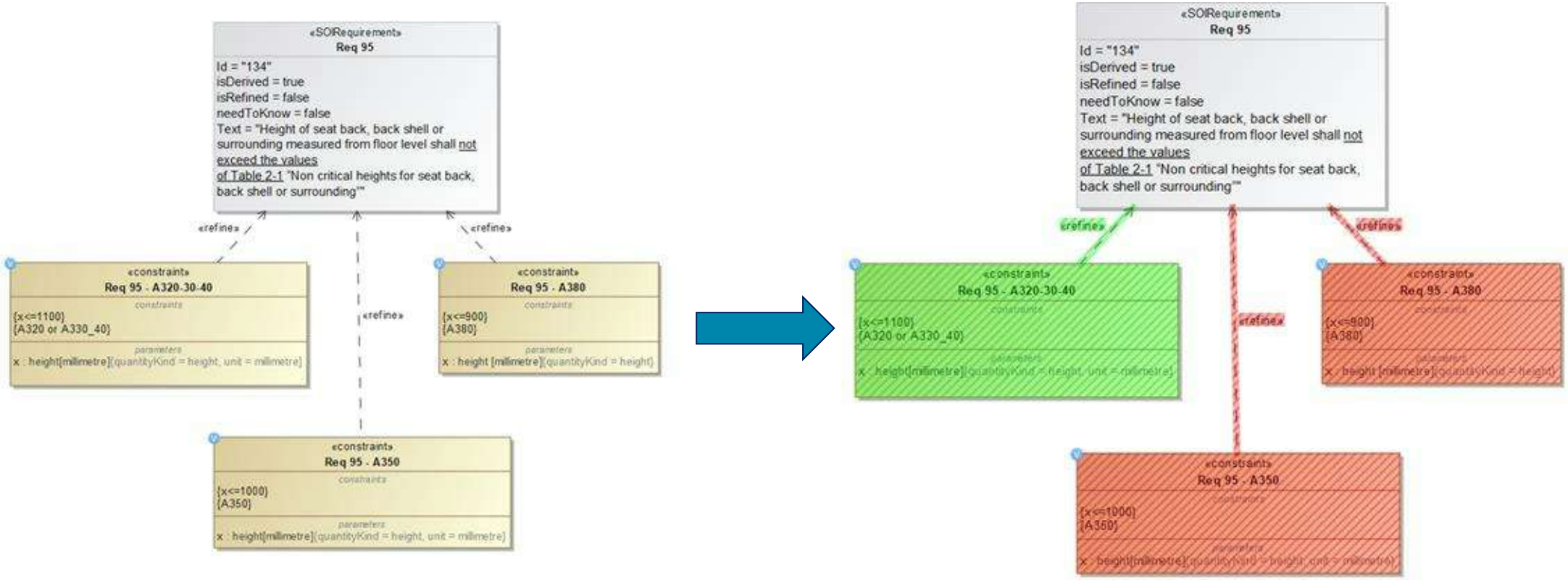

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Highlights of the Approach - Requirements

- Variation Points on requirements and potential constraintBlocks

- From a cross-program to version-specific tailored specification

#	Id	Name	PV Feature
2	X_2521_Frame-18	SR General	
14	X_2521_Frame-67	SR Certification Tests	
111	X_2521_Frame-74	SR Process (non technical) Requiremen	
269	X_2521_Frame-23	SR Product Requirements	
270	X_2521_Frame-24	SR Product Description	
384	X_2521_Frame-31	SR Module	
385	X_2521_Frame-101	SR	Seat
386	X_2521_Frame-311	SR	
387	X_2521_Frame-32	SR Weight	
388	X_2521_Frame-34	SR Weight Report	
389	X_2521_Frame-111	SR	
390	X_2521_Frame-126	SR	Seat_Furniture OR Seat
391	X_2521_Frame-128	SR	
392	X_2521_Frame-112	SR	
393	X_2521_Frame-4863	SR	
394	X_2521_Frame-4864	SR	
395	X_2521_Frame-4865	SR	
396	X_2521_Frame-5251	SR	
397	X_2521_Frame-35	SR Weighing and Weighing Re	
398	X_2521_Frame-117	SR	
399	X_2521_Frame-120	SR	
400	X_2521_Frame-121	SR	
401	X_2521_Frame-122	SR	
402	X_2521_Frame-5245	SR	Seat_Furniture OR Seat
403	X_2521_Frame-123	SR	
404	X_2521_Frame-127	SR	
405	X_2521_Frame-2719	SR	
406	X_2521_Frame-41	SR Materials	
419	X_2521_Frame-42	SR TToL	
431	X_2521_Frame-44	SR Rapid Decompression	
449	X_2521_Frame-45	SR Ventilation	
460	X_2521_Frame-46	SR Appearance	
474	X_2521_Frame-47	SR Identification & Placards	
531	X_2521_Frame-1383	SR Special Seats	
[illegible]	X_2521_Frame-5316	SR Full Height Seat Furniture (FH	Full_Height_Seat_Furniture
587	X_2521_Frame-48	SR Components	
748	X_2521_Frame-28	SR Aircraft Interfaces	
822	X_2521_Frame-49	SR Safety, Installation & Maintenance	
942		HLPTS-V-25-20 Seat Interface Specificat	
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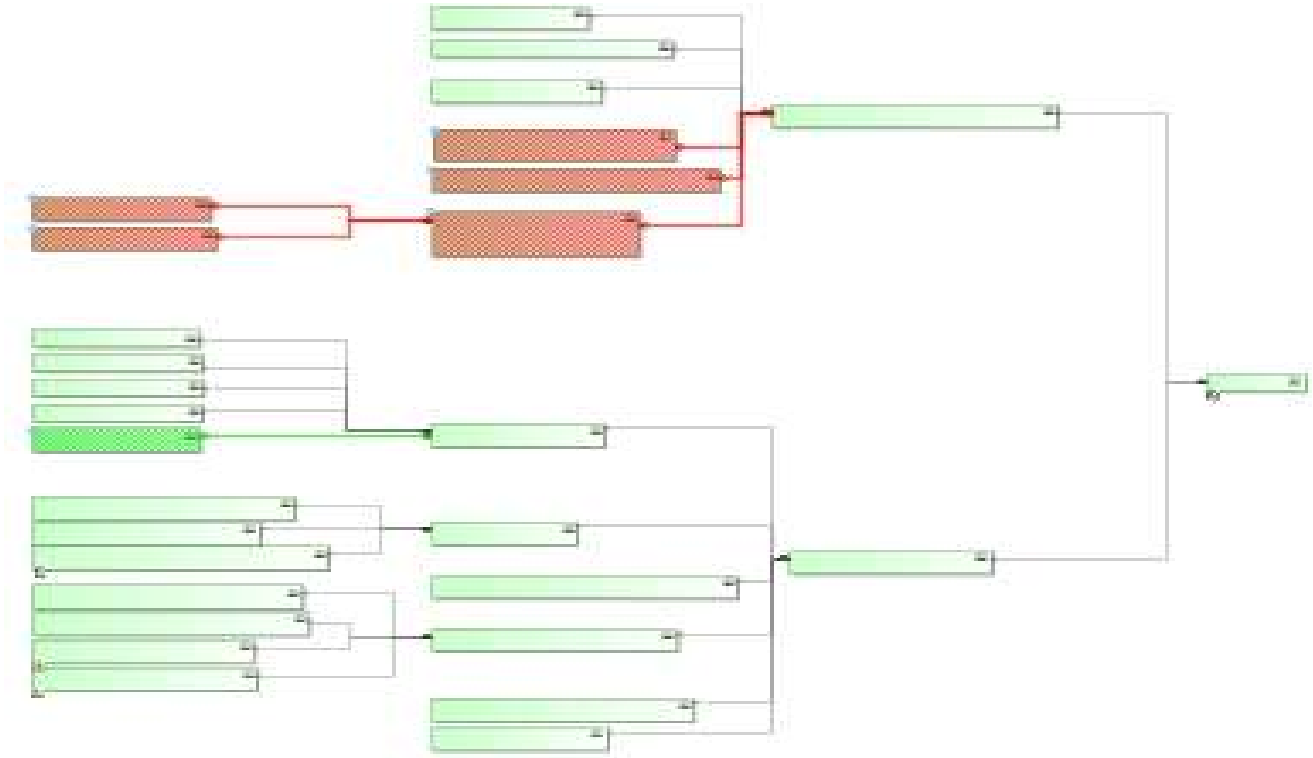
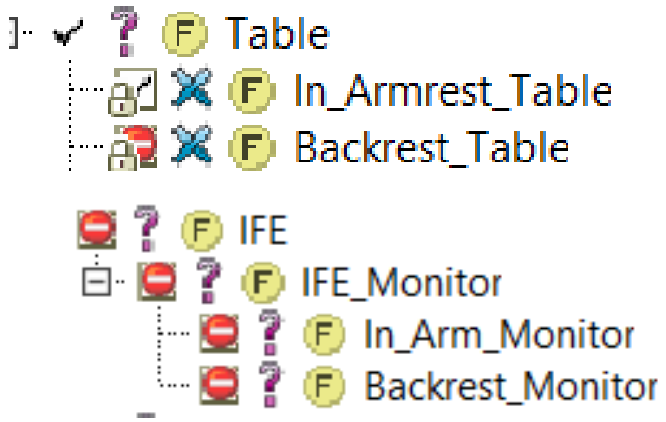
Highlights of the Approach - Functional

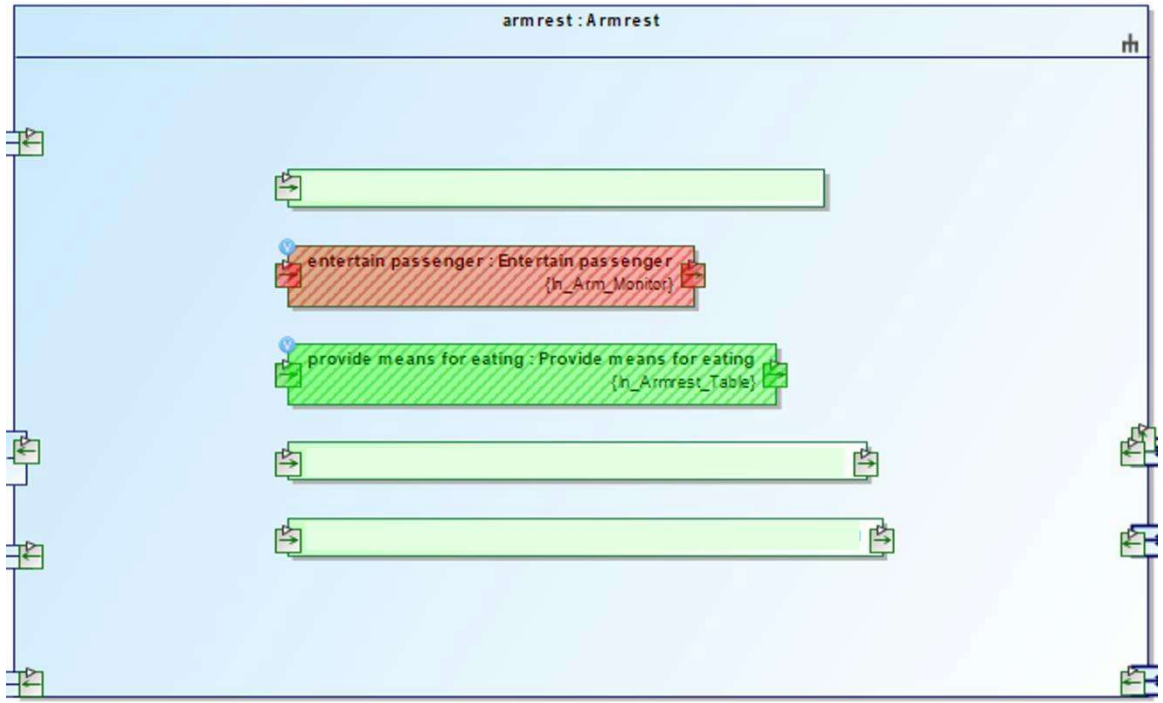
- Variation Points on High Level Seats Functions
- Architecture cleaned up for each version



Highlights of the Approach - Logical

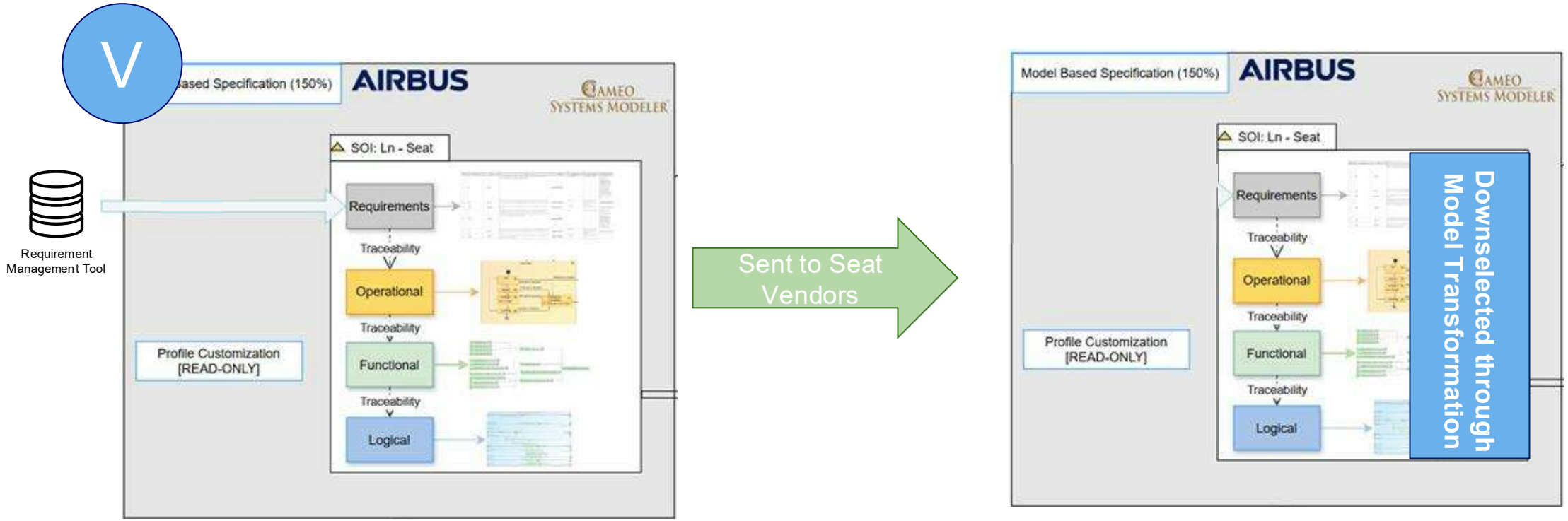
- Variation Points within Logical Components
- Expected functions the sub-systems realize are version-dependent





Highlights of the Approach - Model-Based Specification

- Specification applicable for specific seat development



MBPLE for Specification - Overview

150%

- Model contains the entire specification, **all possible Seats features**

120%

- Represents a platform seat and contains a reduced specification, with vendor's offered features

100%

- Represents a platform seat to be integrated in an aircraft and contains and even more reduced specification with the specific **features selected by the airline**

Benefits

- **Improved specification** quality
- Pure variants provides **easy selection** of features and connects to all R-MOFLT assets
- Provides a visualization of the Feature Model to present to SMEs
- Automated generation of applicable **requirements**
- **Functional and Logical breakdown** structure adapted to each Aircraft
- **High reusability** of models thanks to 150%/120%/100% configurations

Thank you

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Thank you