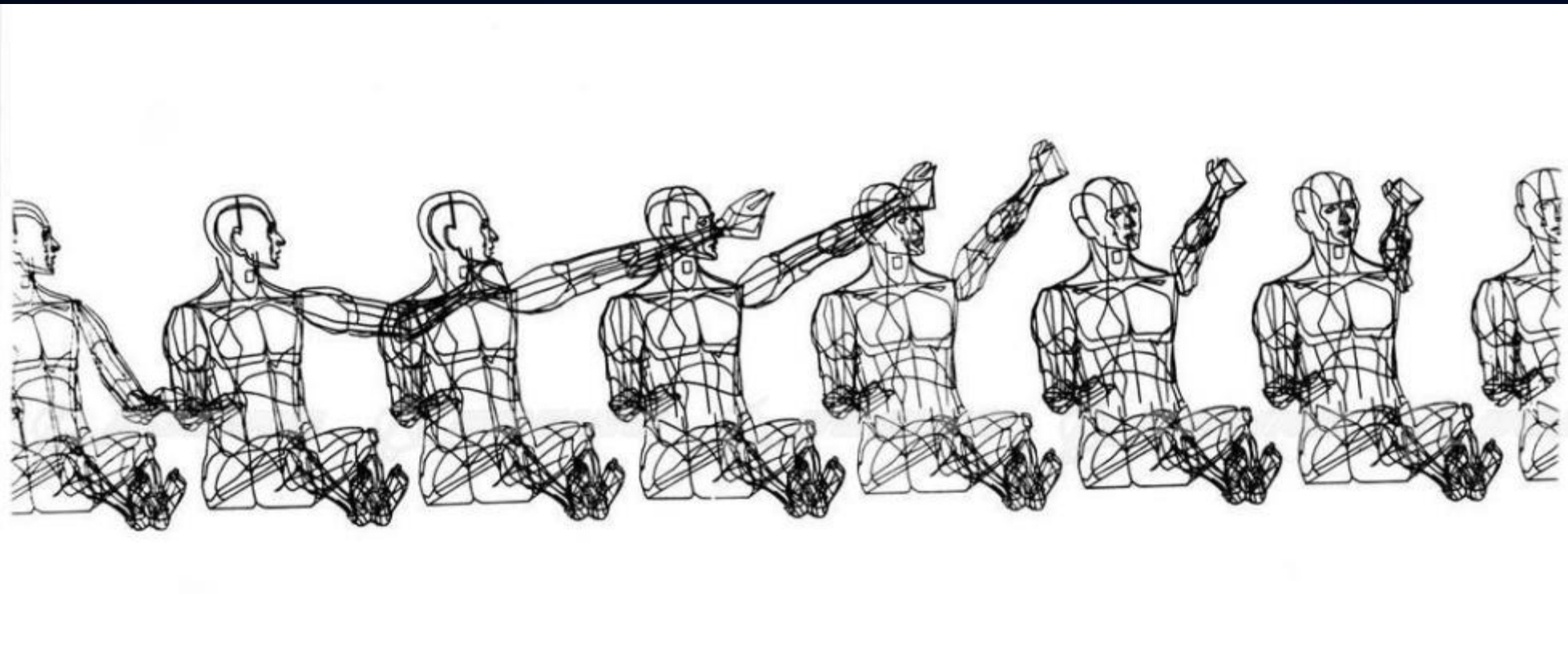# Digital Reality Check

Breaking the time cycle of digital technology in aerospace

Adam Marshall | Sr. Director & Chief Engineer

Commercial Airplanes Digital Transformation | September 19, 2023

Commands: Workpad Range Copy Move Data File Print Environment System Quit
Workpad: Global Insert Delete Mark Width Erase Titles Status

R	A	B	C	D	E	F	G	H	I
1	987	654	432						
2	234	456	685						
3	853	554	432						
4	433	333	233						
5	544	564	432						
6	55	53	645						
7	400	466	707						
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

VIRTUAL FIXTURES
(A.R. system - 1992)
Wright Patterson AFB

VIRTUAL OVERLAY
CONCEPTUAL

1 2 3 4   5 6 7 8

WORK SPACE

Image Source: https://www.g2.com/articles/history-of-augmented-reality

Image Source: Google / Sidewalk Labs

" The problem … is that the aerospace supplier industry, though it provides parts for awesome and innovative products, **is not attractive** to young people because … it is **technologically backward.**

… young people coming into the industry are appalled to find they must fill out paper records instead of having everything digitized... "

The Seattle Times 9/17/2023
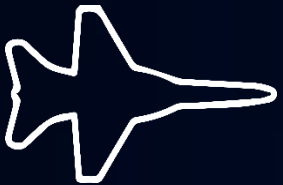
Why Digital Transformation

FOR…

…the Boeing team	Access to authoritative data for faster, better decisions; attract, recruit, retain the next generation workforce	
…our Customers	Operational efficiency enabled by digital twins	
…Product Development	Engineering quality driving schedule assurance and certification confidence	
…the Production System	Flatten the disruption curve	

Full Digital Engineering Lifecycle

Digital Thread – Single Source of Truth Data

Digital Requirements	Digital System Model	Digital Manufacturing	Digital Test	Digital Twin
"As Specified"	"As Designed"	"As Built"	"As Verified"	"As Maintained"

Model-Based Systems Engineering
Concept / Requirements

Model-Based Design
Design / Analysis

Model-Based Production System
Production System Design

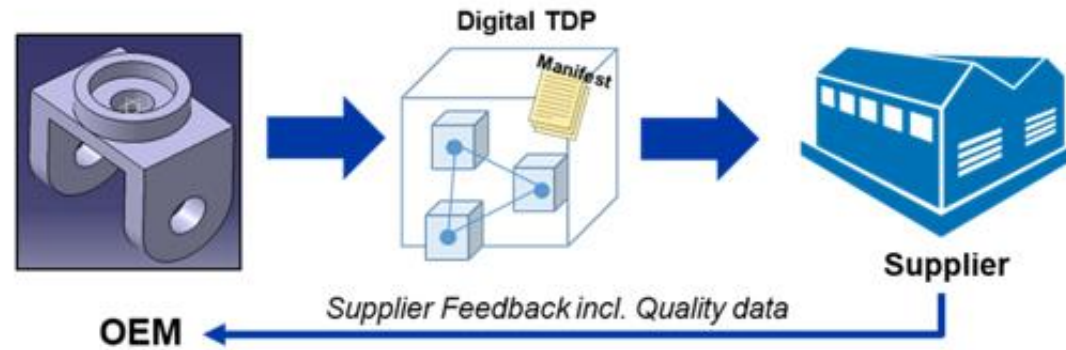**Model-Based Verification**
Certification / Test

Model-Based Support & Services
Maintain & Enhance

LEVEL 1
EXCHANGE

Unidirectional Exchange of TDP – *build to model*
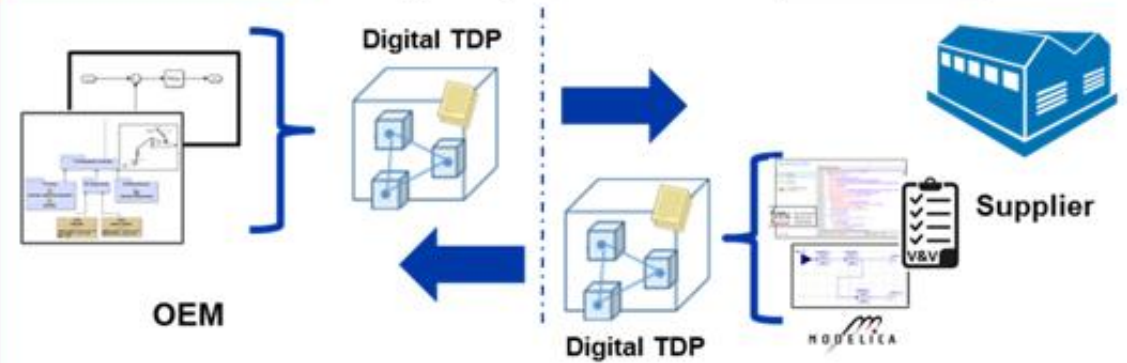Unidirectional exchange of Technical Data Packages (TDP) from OEM to Supplier. Supplier feedback will be requested and may contain model artifacts.

Digital TDP
Manifest

Supplier

OEM

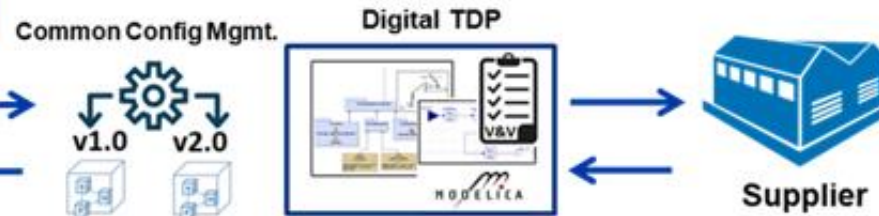Supplier Feedback incl. Quality data

LEVEL 2
INTEROPERABILITY

Bidirectional Exchange of TDP – *build to requirements*
Bi-directional exchange of TDP. OEM provides specification models. OEM and supplier import, review and return *different versions* of the TDP.
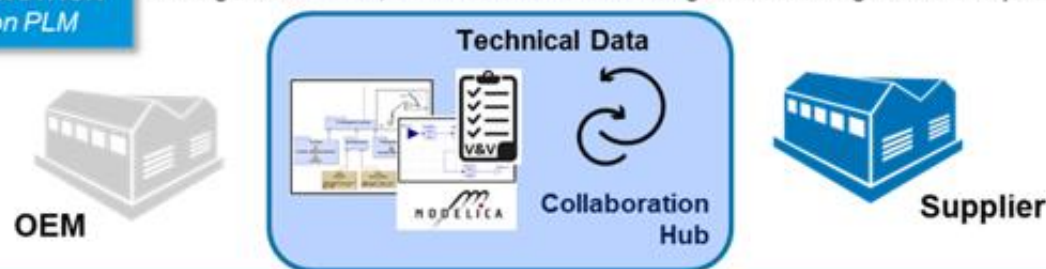
Digital TDP

Supplier

OEM

Digital TDP

MODELICA

V&V

LEVEL 3A
COLLABORATION based on TDP

Co-development where OEM and supplier import, review and return a *shared version* of the TDP, under common Configuration Management (CM).

Common Config Mgmt.

Digital TDP

v1.0   v2.0

V&V

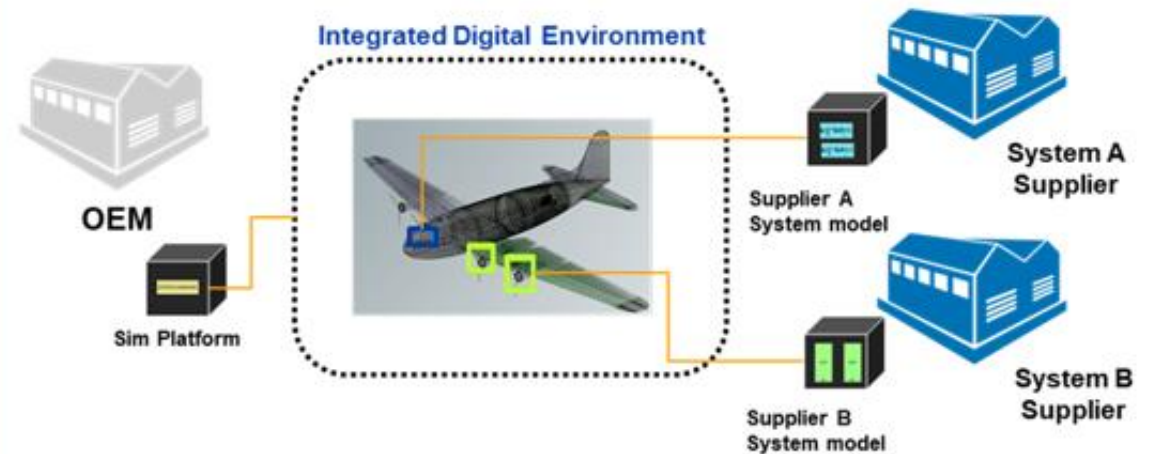MODELICA

Supplier

LEVEL 3B
COLLABORATION based on PLM

Co-development in a *shared "collaboration vault"* where TDP content is managed. Common, PLM-enforced data Configuration Management is required.

Technical Data

V&V

MODELICA

Collaboration Hub

OEM

Supplier

LEVEL 4
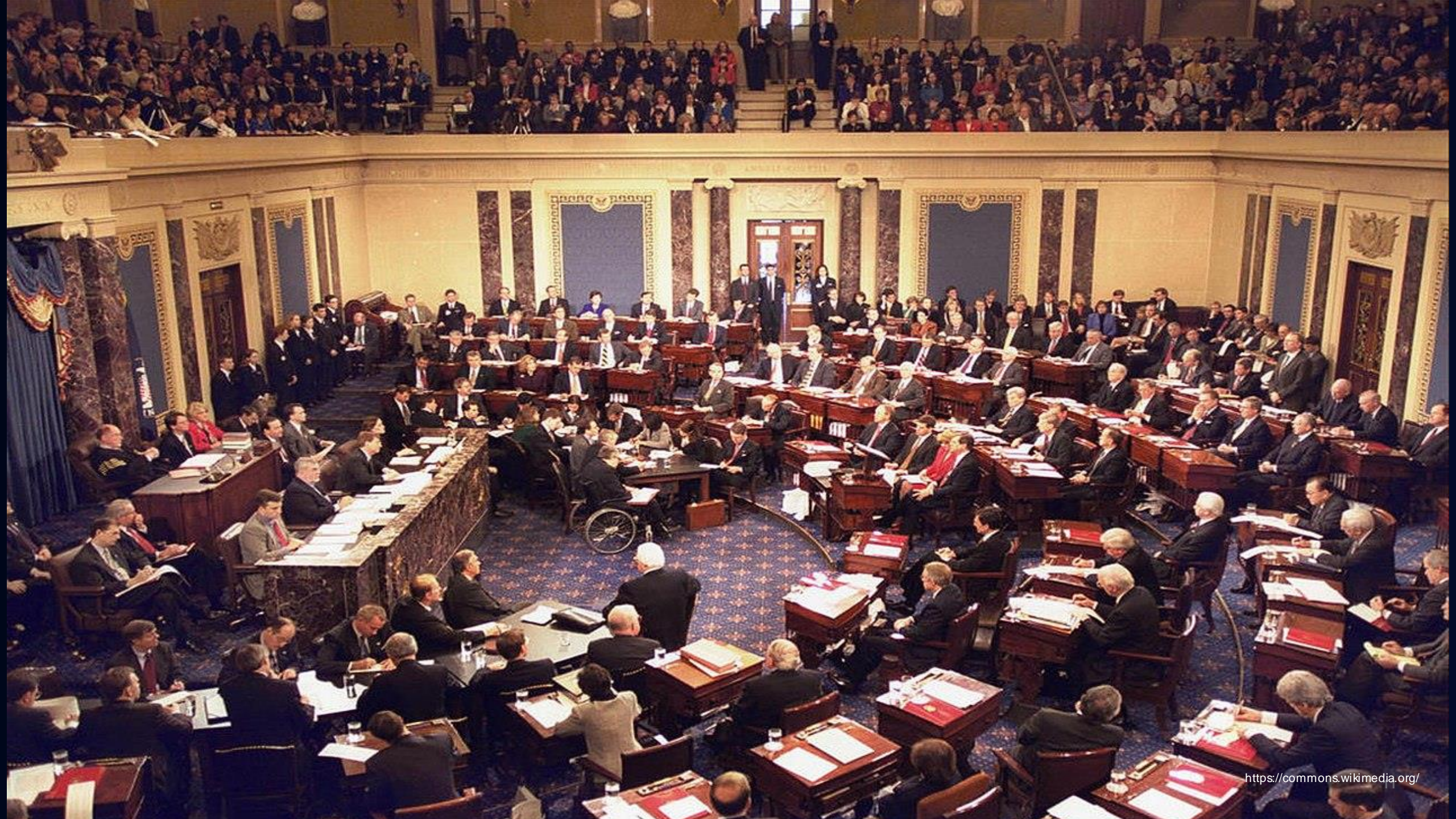**DIGITAL INTEGRATION**

Platform level co-simulation
Joint simulation of behavior (executable) models to perform system or platform level integration tests. Used in combination with other Engagement Levels. Multiple variants: real time, distributed, cloud based...

Integrated Digital Environment

OEM

Sim Platform

System A Supplier

Supplier A System model

Supplier B System model

System B Supplier

GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2023

The model based supply chain; what is reality?

https://commons.wikimedia.org/

The Online Handbook

File Edit View Go Bookmarks Options Directory   Help

Back Forward Home   Reload Images   Open Find   Stop

Location: http://wp.netscape.com/home/online-manual.html

Guided Tour What's New Questions Net Search Net Directory Newsgroups

NETSCAPE HANDBOOK

Tutorial

Essentials
Want the Netscape Navigator essentials for a quick start.

Heartwarming introduction
Hardly know a darn thing and wish to read a heartwarming introduction.

Learn Netscape
Am ready to learn Netscape to bring the Internet to my curious eyes.
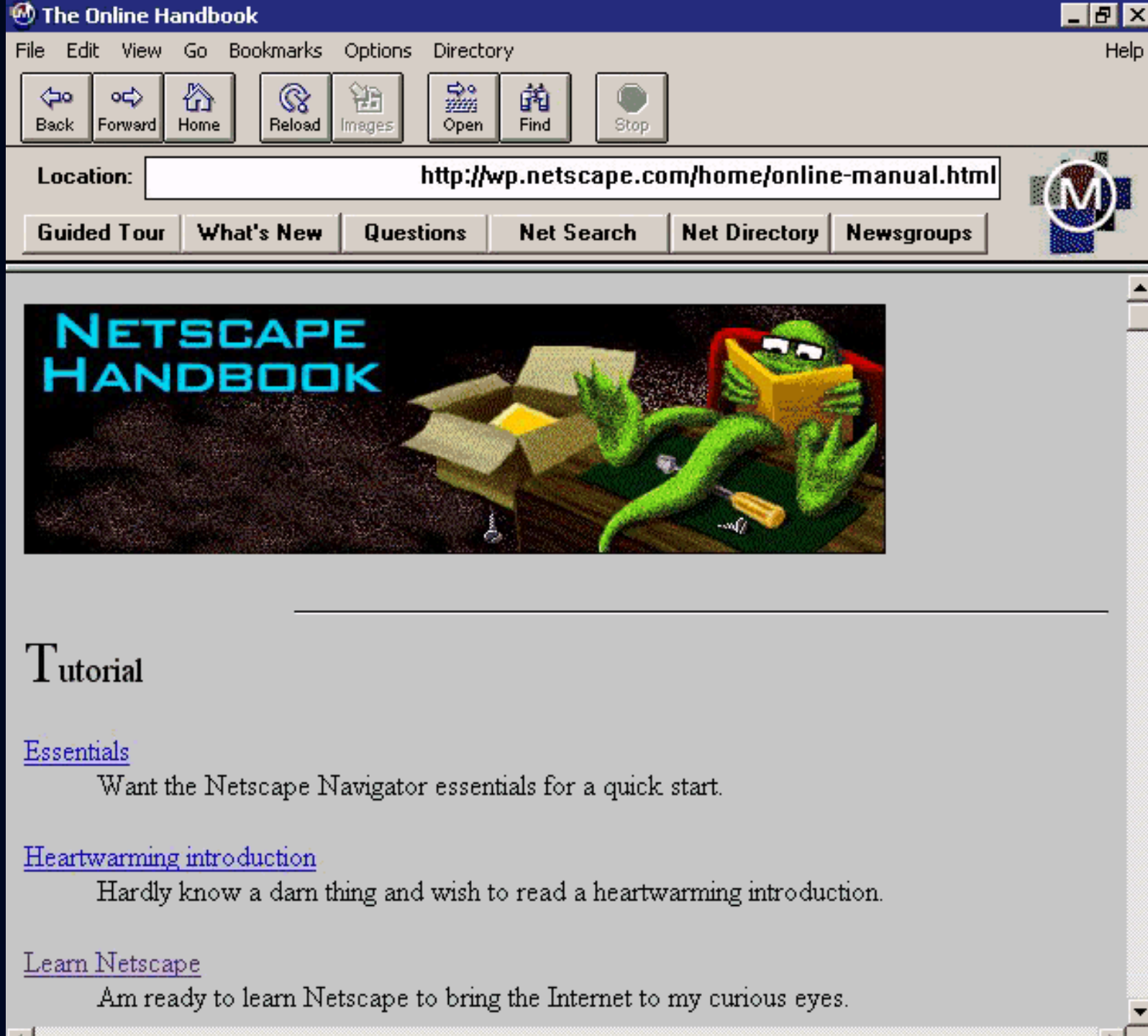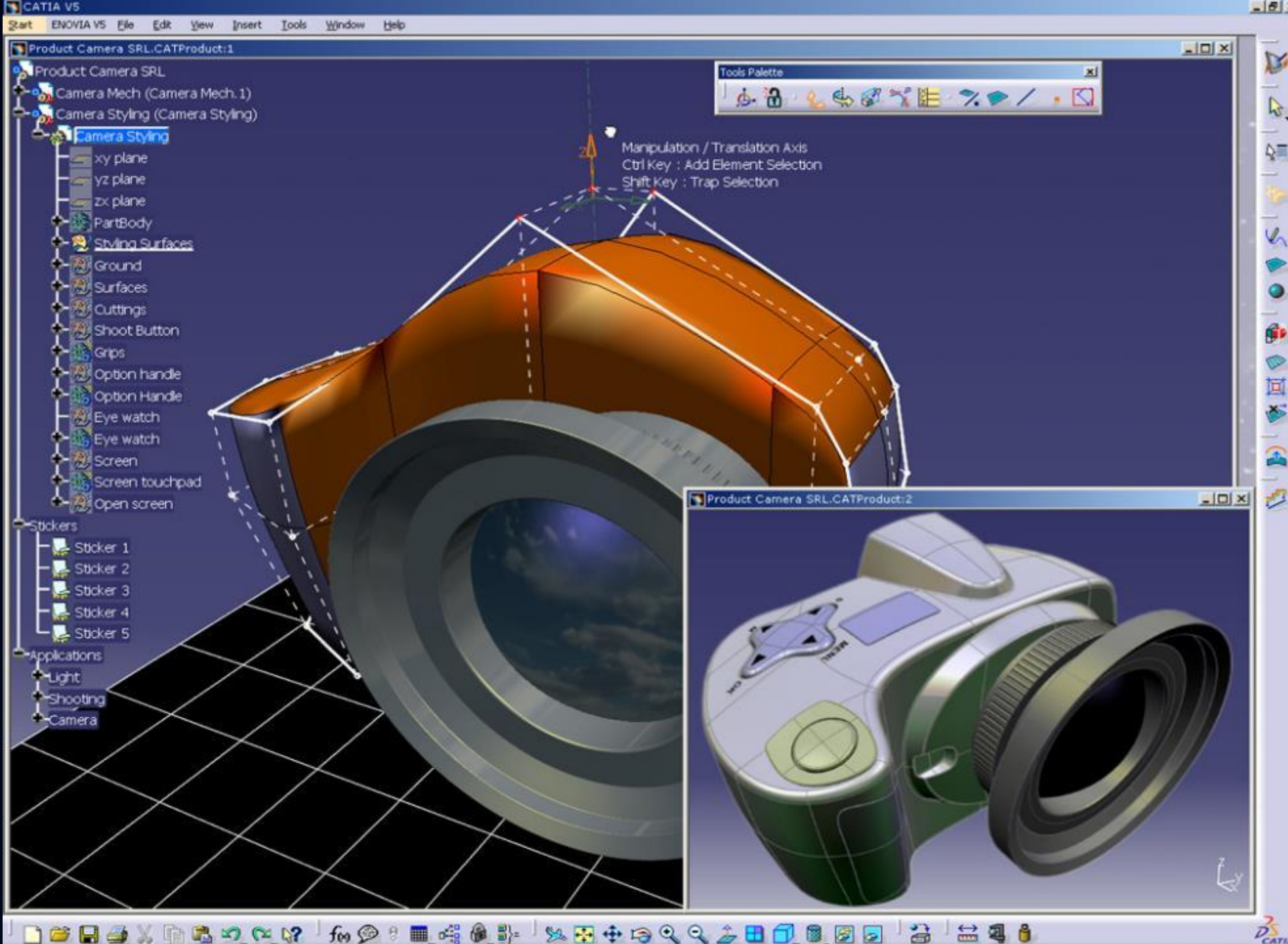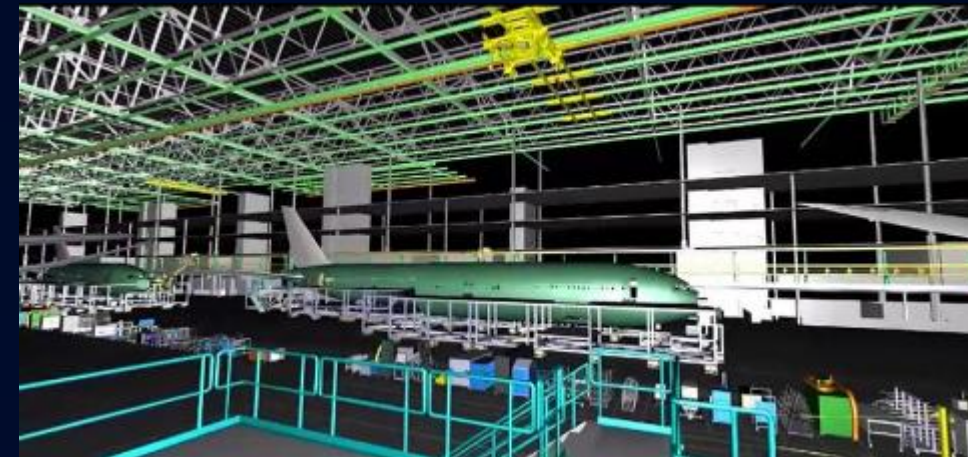
14

18

What is the reality of transformation?

- Clock speed of digital change has become generational; Pace of digital technology outpaces the ability to leverage and integrate

- Focus often is on standards and new products versus legacy data

- Cultural barriers are real; progress is being made but slowly

Shifting from generational to rapid change

Focus on People	This is being done for our teams… not to them. Build Belief.
Innovate with Legacy Data	Provide value sooner and leverage existing products
Collaborate	Across the complete supply chain
Mature Standards	And adopt them into digital platforms at a faster pace

Questions?