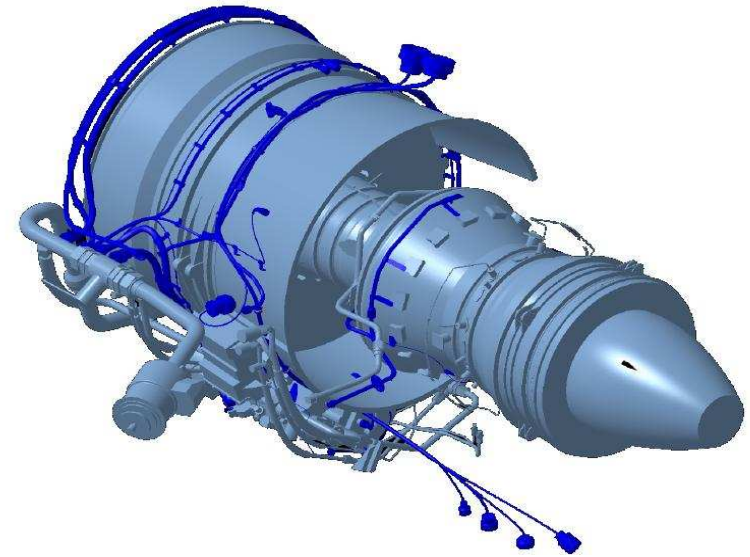


CATIA Electrical Process

Electrical System: from Design to Manufacturing

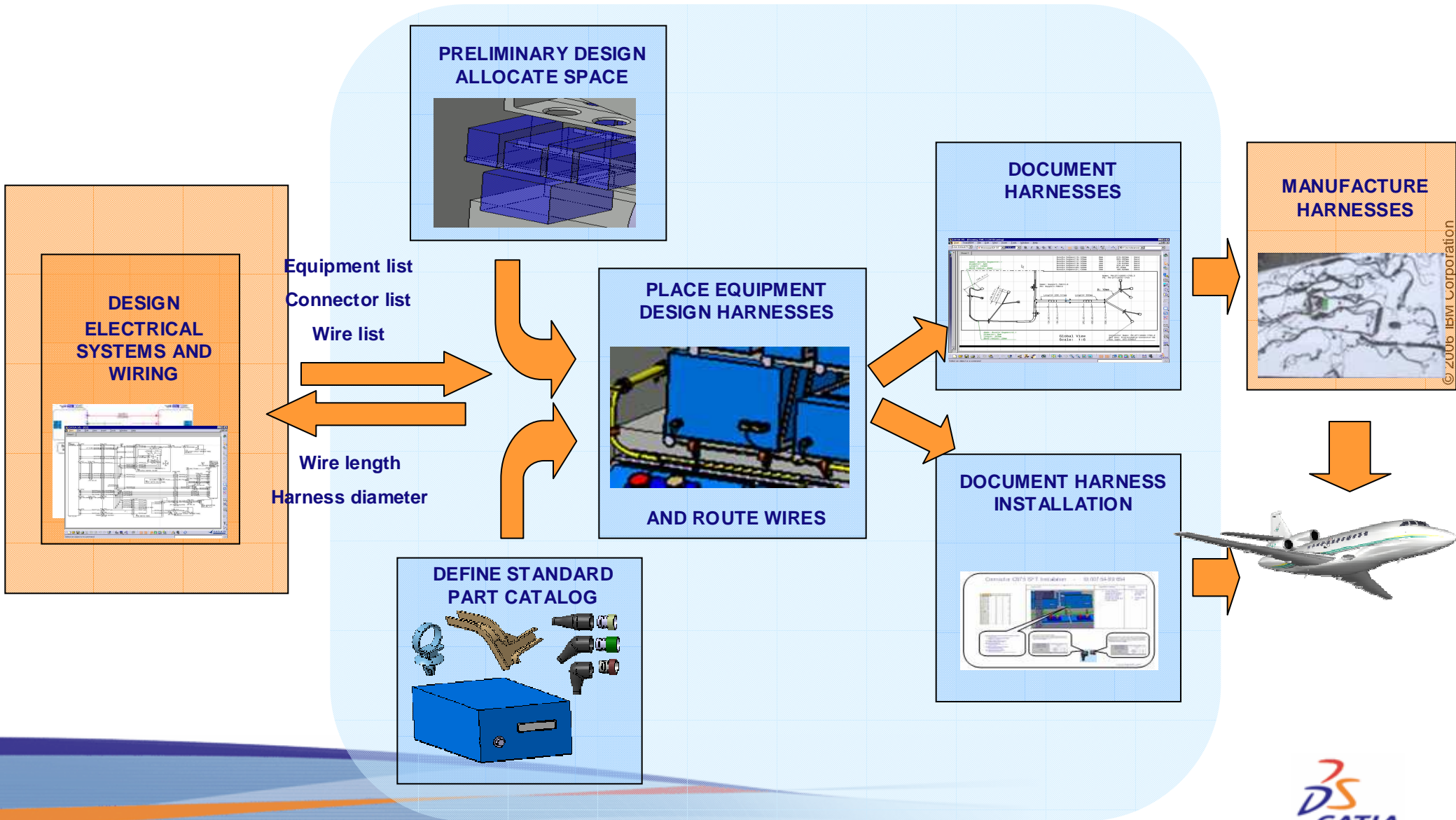
Technical Overview
Tim Greenwood



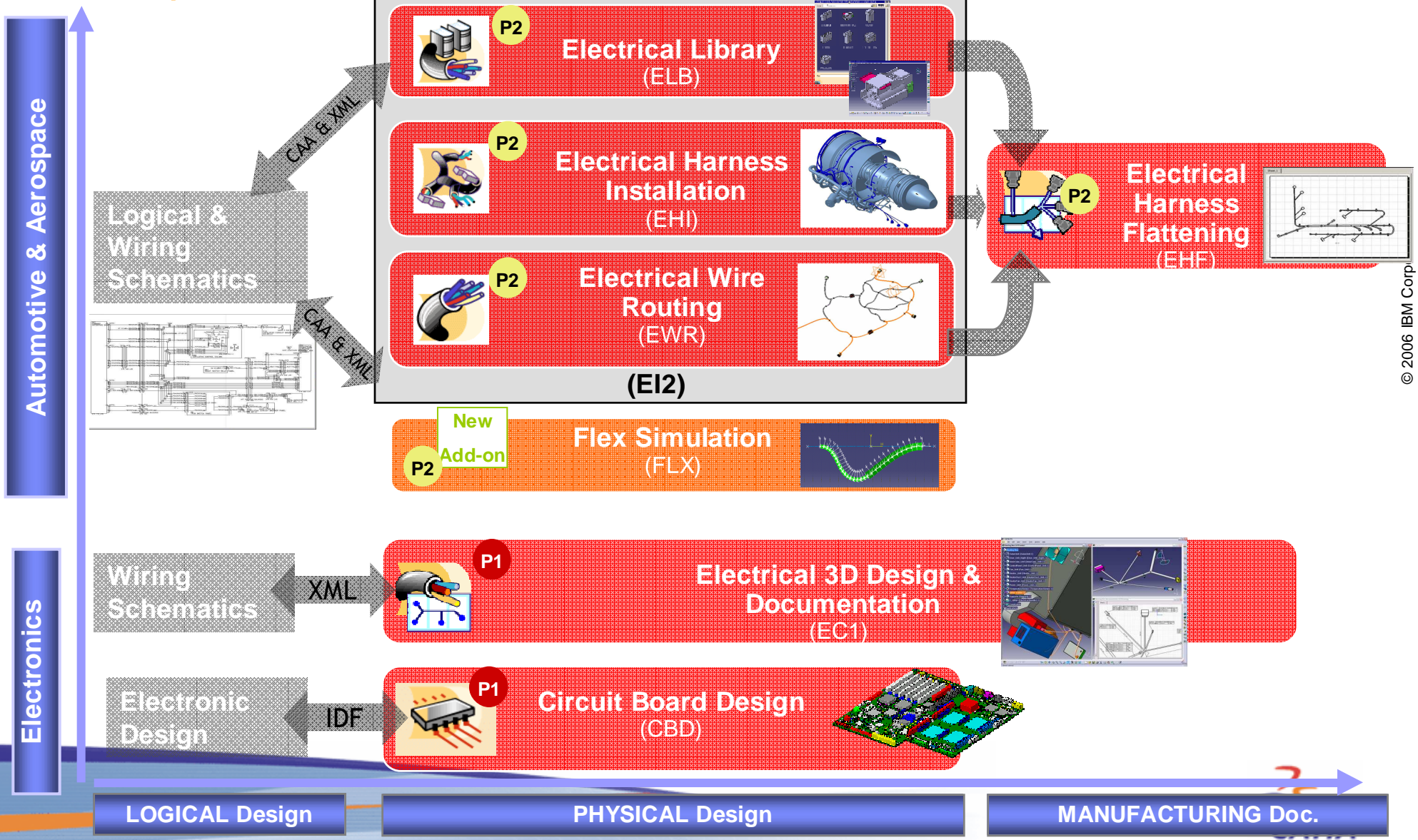
Industry Challenges | Fully Integrated Electrical Design

- Electrical systems more and more complex in a tighter environment
 - Design in context
 - Manage link with electrical schematic definition
 - Manage space integration to avoid clashes
 - Facilitate design changes
- Avoid design changes late in the process
 - Integrate electrical design process
- Eliminate physical MOCK-UP
 - Accurate and complete Digital Mock-Up
 - Realistic modeling
- Complete and accurate electrical information
 - Wire length/harness diameter
 - Harness weight/center of gravity
- Up to date manufacturing information
 - Wire/harness information
 - Identify changes and update manufacturing documentation

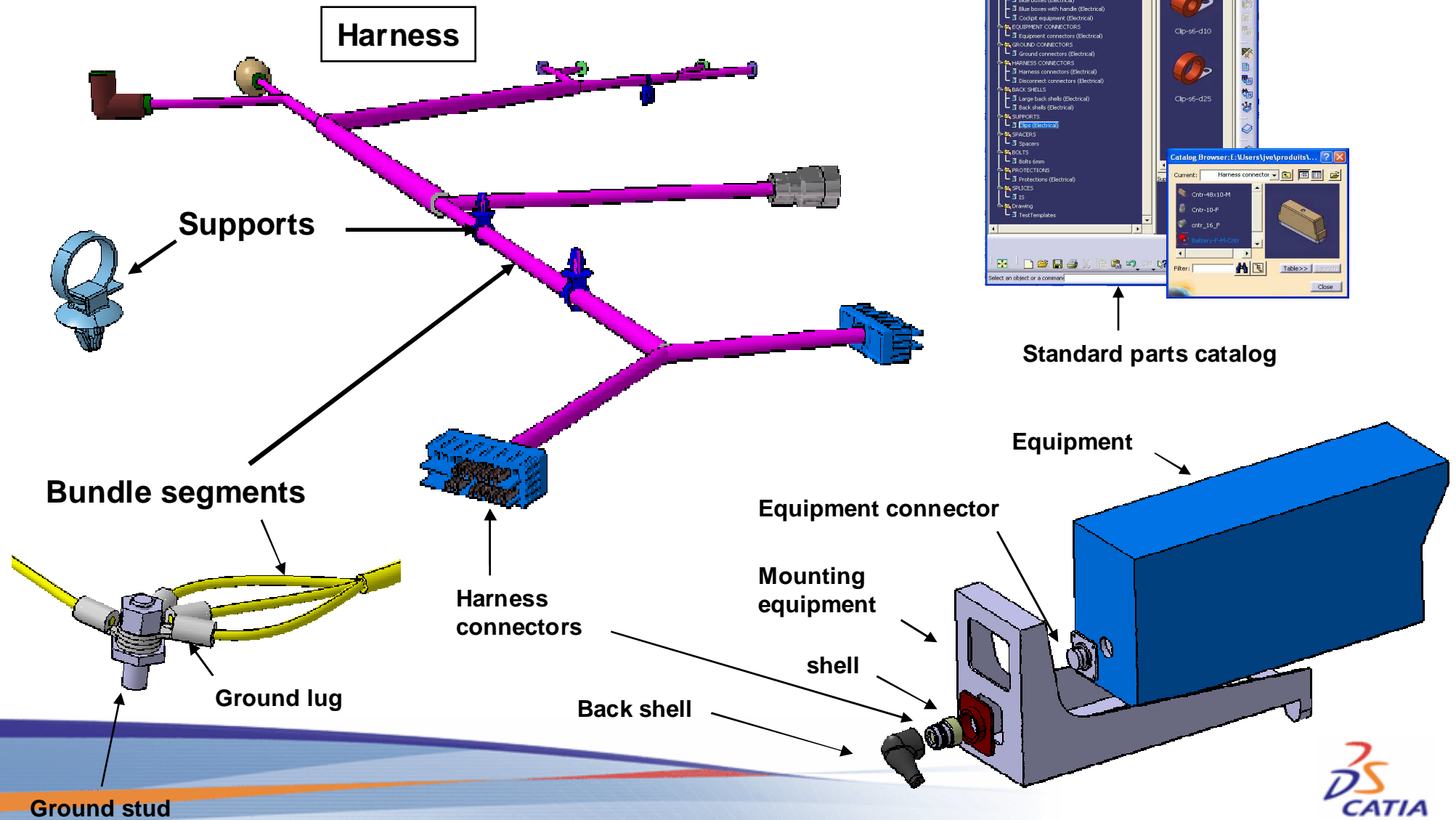
Electrical Process Overview



CATIA / Electrical & Electronics portfolio

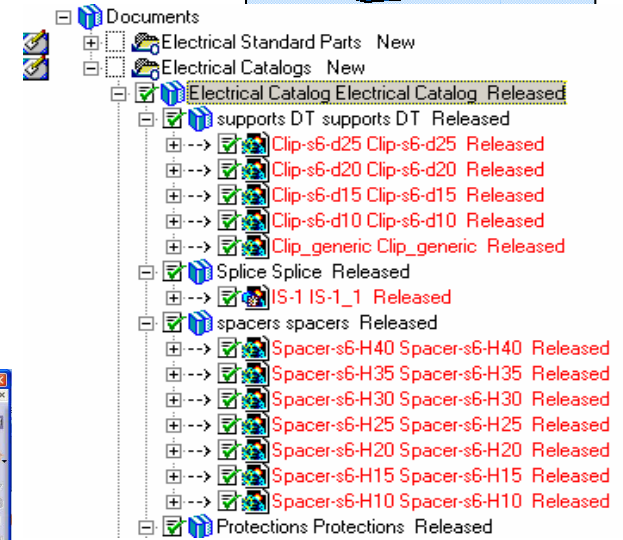
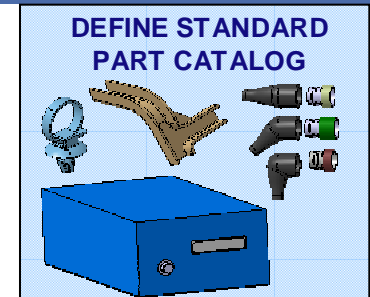


Technology / Electrical terminology

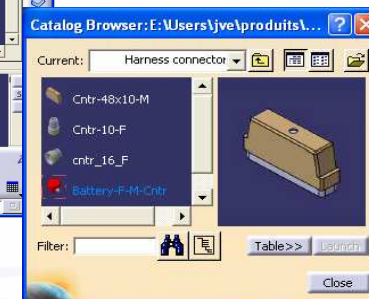
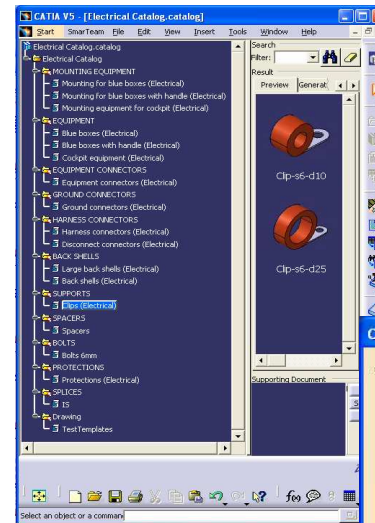
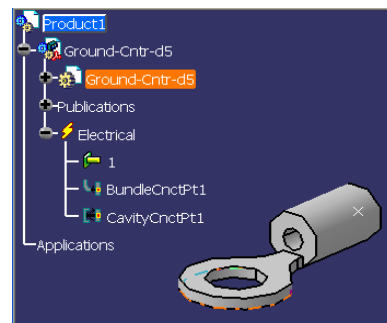
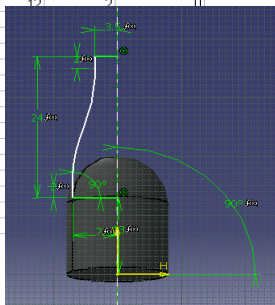


Technology / Standard parts management

- **ELB creates and manages catalogs containing electrical components**
 - Design table to facilitate part family creation
 - Definition of parts with associated electrical behavior
 - Part storage and classification in catalog



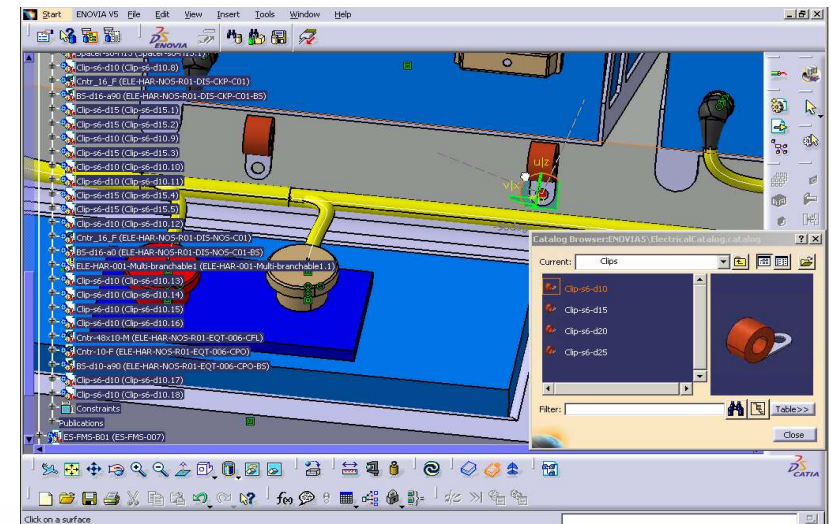
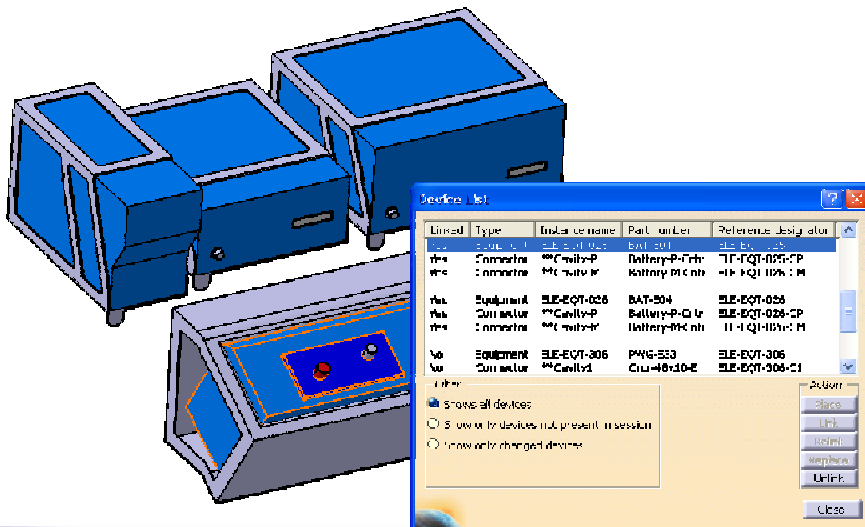
	1	2	3	4
1	PartNumber	Diam (mm)	Thick (mm)	BSAngle (deg)
2	BS-d10-a0	10	2	0
3	BS-d10-a30	10	2	30
4	BS-d10-a45	10	2	45
5	BS-d10-a60	10	2	60
6	BS-d10-a90	10	2	90
7	BS-d12-a0	12	2	0
8	BS-d12-a30			
9	BS-d12-a45			
10	BS-d12-a60			
11	BS-d12-a90			
12	BS-d16-a0			
13	BS-d16-a30			
14	BS-d16-a45			
15	BS-d16-a60			
16	BS-d16-a90			
17	BS-d20-a0			
18	BS-d20-a30			
19	BS-d20-a45			
20	BS-d20-a60			
21	BS-d20-a90			



Technology / Harness Design



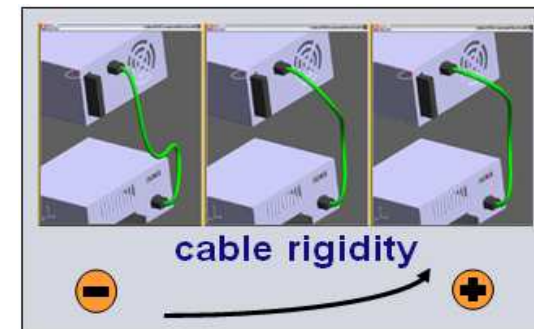
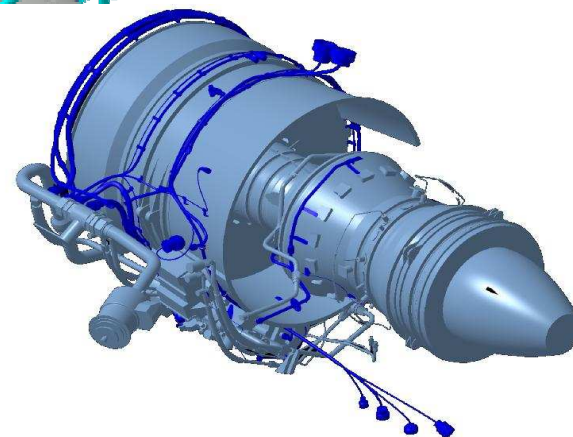
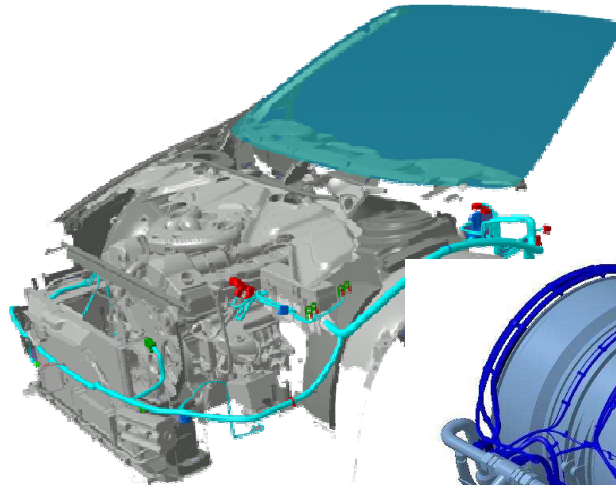
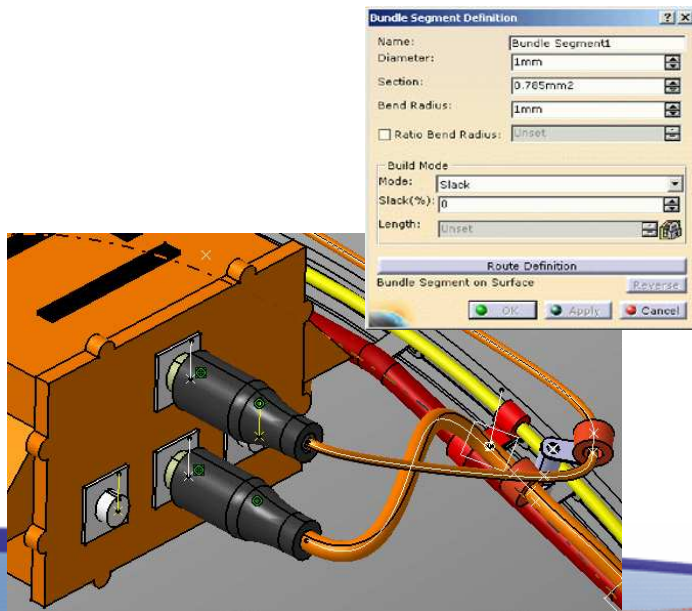
- ELB and EHI provides powerful tools to place, replace or move easily components needed for electrical installation
 - High productive part placement during design
 - 👉 Automatic placement from device list
 - 👉 Drag and drop or smart placement from catalog
 - 👉 Compass and smartmove for easy objects manipulation



Technology / Harness Design



- EHI provides powerful tools to route physical harnesses in 3D DMU context
 - Easy harness routing in 3D DMU context with realistic bundle shape
 - Mechanical and electrical links between objects providing easy and fast modification capability
 - Harness weight/center of gravity computation



Technology / Wire Routing



- EWR generates and manages the electrical wires within the DMU according to the functional or wiring specifications
 - Routing wires in harness based on « from-to » information
 - Automatic bundle segments diameter update according to wire content
 - Wire length calculation
 - Output of the wire length for use in manufacturing and schematic back annotation
- Ability to store, load and manage revision on Logical Definition XML files

Wire and Wire group Routing

Type	Identifier	External dia...	Routed	Extremities
Wire	W17ID	0,002	No	Found
Wire	W11ID	0,001	No	Found
Wire	W8ID	0,001	No	Found
Wire	W2ID	0,001	No	Found
Wire	W16ID	0,001	No	Found
Wire	W24ID	0,003	No	Found
Wire	W7ID	0,001	No	Found
Wire	W1ID	0,001	No	Found
Wire	W15ID	0,001	No	Found
Wire	W23ID	0,003	No	Found
Wire	W6ID	0,002	No	Found
Wire	W14ID	0,001	No	Found

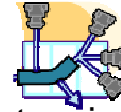
Automatic Wire Routing Report

Name	Reference Designator	Status	Origin
W24ID	W24ID	Successfully routed	New
W7ID	W7ID	Successfully routed	New
W1ID	W1ID	Successfully routed	New
W15ID	W15ID	Successfully routed	New
W23ID	W23ID	Successfully routed	New
W6ID	W6ID	Successfully routed	New
W14ID	W14ID	Successfully routed	New
W22ID	W22ID	Successfully routed	New
W5ID	W5ID	Successfully routed	New
W13ID	W13ID	Successfully routed	New

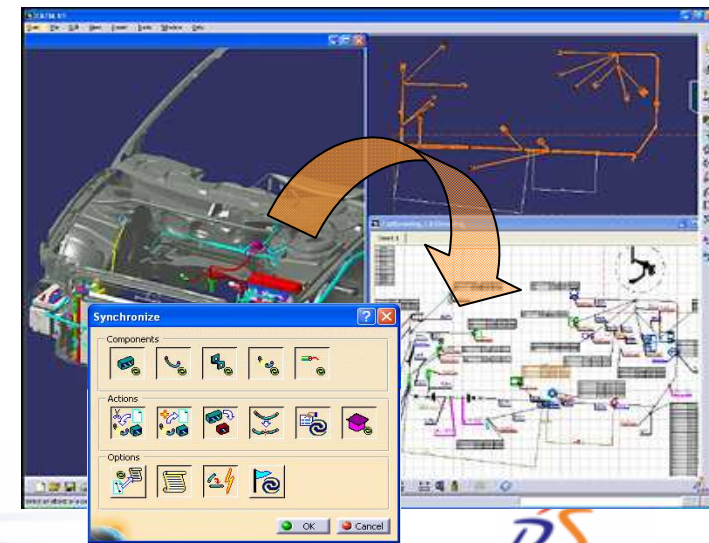
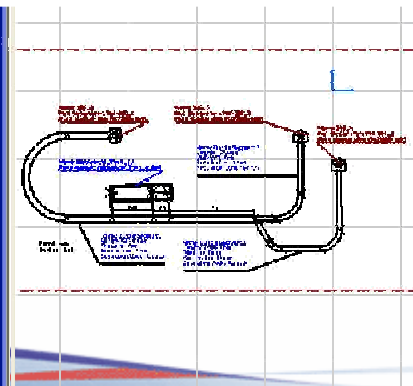
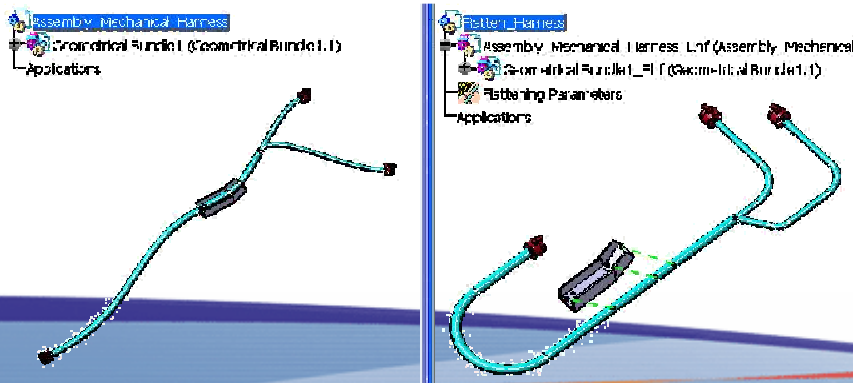
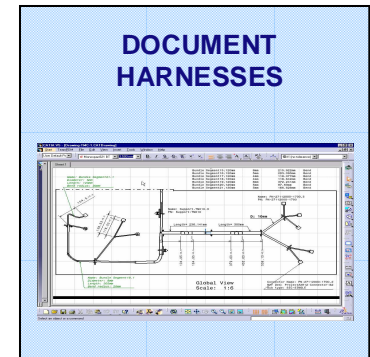
Wires And WireGroups List

Name	Type	Part Number	Signal	Separation Code	Length	Diameter	Color	Pin (From)	Contact Part Number (From)	Connector/Device (From)	Pin (To)	Contact Part Number (To)	Connector/Device (To)
W17ID	Wire	W17ID			1271,336mm	2mm	Blue	2	ELE-PBC-H001-1	6		ELE-EQT-011-C1-H	
W11ID	Wire	W11ID			1271,336mm	1mm	White	1	ELE-PBC-H001-1	1		ELE-EQT-011-C1-H	
W8ID	Wire	W8ID			178mm	1mm	White	2	ELE-PBC-H001-2			IS2	
W2ID	Wire	W2ID			198,25mm	1mm	White		IS2		1	ELE-EQT-013-C2-H	
W16ID	Wire	W16ID			623,664mm		White	6	ELE-PBC-H001-1	2		ELE-EQT-013-C2-H	
W24ID	Wire	W24ID			815,585mm		White	1	ELE-GC-H001-005	1		ELE-EQT-026-CP-H	
W7ID	Wire	W7ID			4829mm		White		ELE-PBC-H001-2			IS1	
W1ID	Wire	W1ID			137mm		White	1	ELE-PBC-H001-2	1		ELE-EQT-011-C1-H	
W15ID	Wire	W15ID			1225,664mm	1mm	White	3	ELE-PBC-H001-1	1		ELE-EQT-013-C2-H	
W23ID	Wire	W23ID			745,806mm	3mm	Red	8	ELE-PBC-H001-2	1		ELE-EQT-026-CM-H	
W6ID	Wire	W6ID			178,098mm	2mm	Blue	6	ELE-PBC-H001-2	6		ELE-EQT-011-C1-H	
W14ID	Wire	W14ID			842mm	1mm	White	4	ELE-PBC-H001-1	2		ELE-EQT-012-C2-H	
W22ID	Wire	W22ID			16,877mm	3mm	Red	1	ELE-GC-H001-004	1		ELE-EQT-025-CP-H	
W5ID	Wire	W5ID			182,537mm	1mm	White		IS1		2	ELE-EQT-013-C2-H	

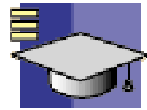
Technology | Generative Harness Documentation



- EHF achieves flattening of Electrical Harnesses for extensive drafting production (i.e. manufacturing documentation)
 - Full or partial flattening of a 3D electrical cable harness according to user specifications with:
 - Manipulators to modify harness layout
 - Dress-up capabilities for manufacturing information (connector reports, wire length...)
 - Propagate modifications from the 3D harness design to the flattened harness including update of drafting documentation



Technology | Knowledge expert

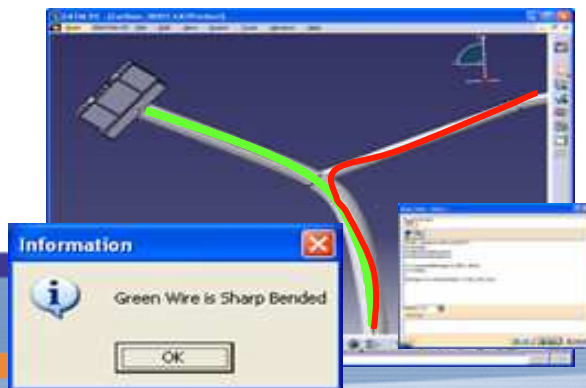
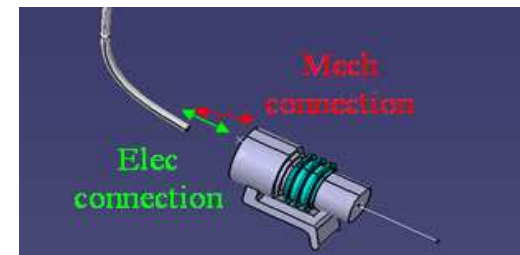
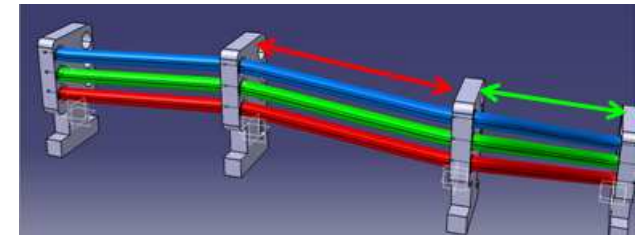


CATIA - Knowledge Expert
& Engineering Optimization
(KOE)

: Add an extension to allow automatic design checks

- With KWE check harness design is consistent with your specific rules in order to improve harness design quality and to facilitate manufacturing preparation, for example :

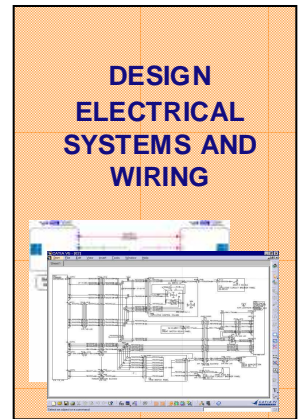
- The minimum distance (curvilinear) between 2 supports on a same branch must be 50cm
- Electrical and mechanical connections of bundle segment should be same
- No more than four branches at a branch point



Technology | Partnerships

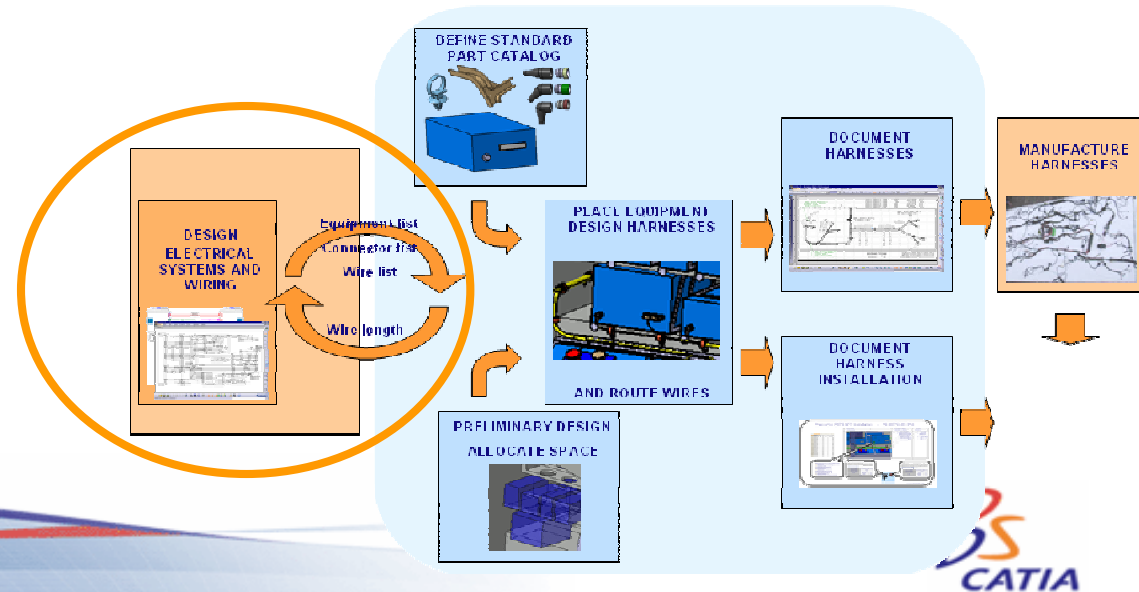
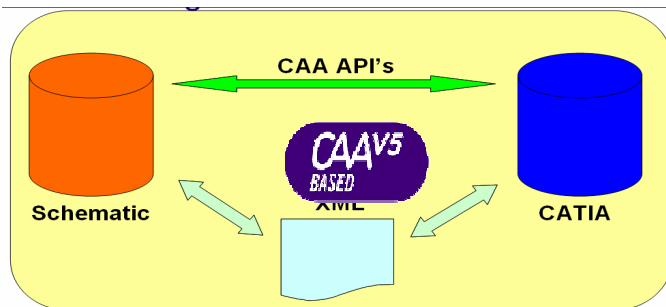
CAAV5 BASED ■ Integrated Solution strategy (Gold Partners)

- Single user interface
- Enable 2D Logical and 3D Physical integrated design environment
- Gold Partners:



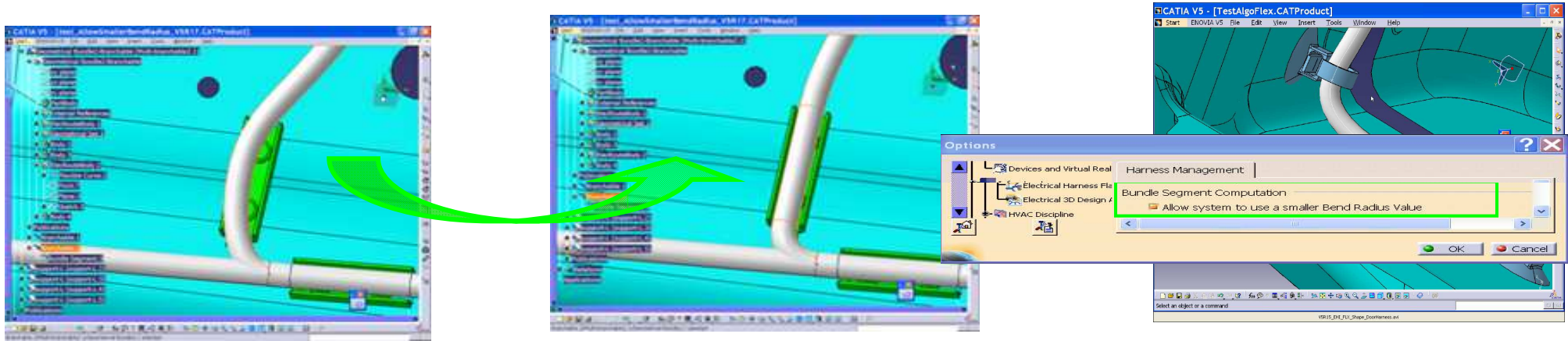
■ Interface Solution

- Exchange data between application (based on CAA & XML)



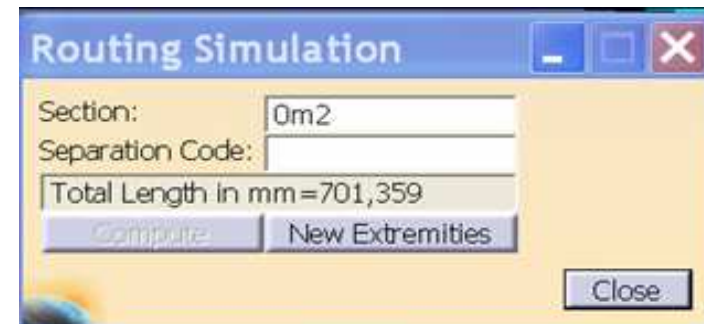
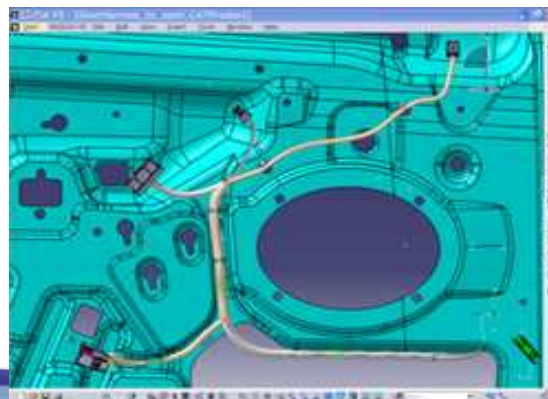
More tolerant Bend Radius + FLEX algorithm

Improve quality of harness geometry (no more “exotic shape”), less integration problems in physical mockup

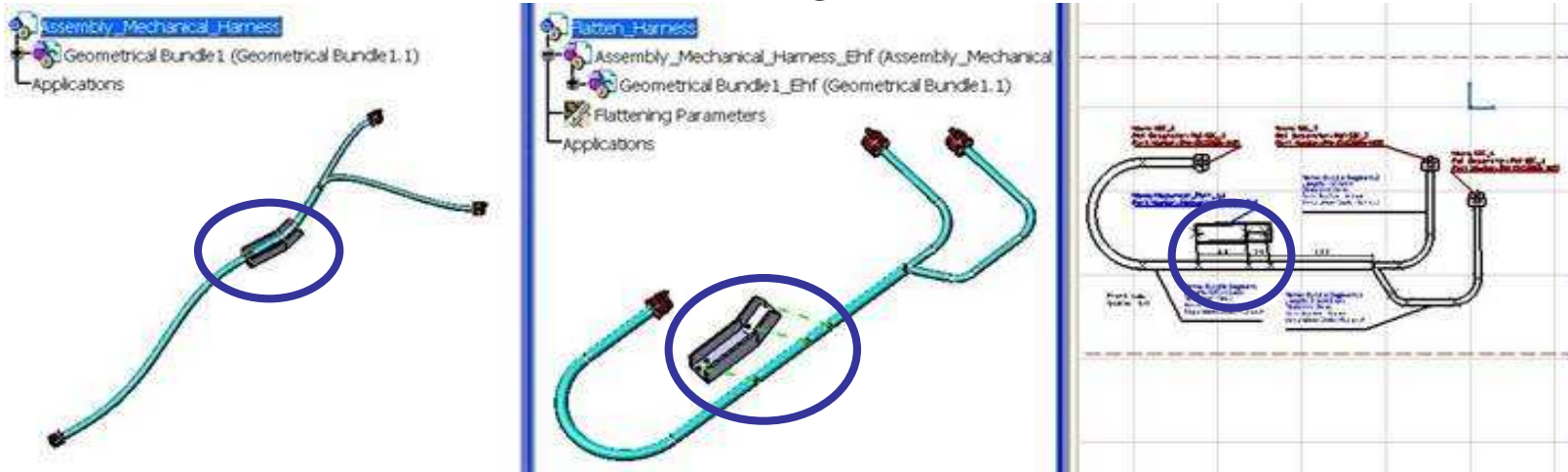


Measure shortest distance between connectors (EWR)

Routing Simulation command now displays the length of paths between selected connectors

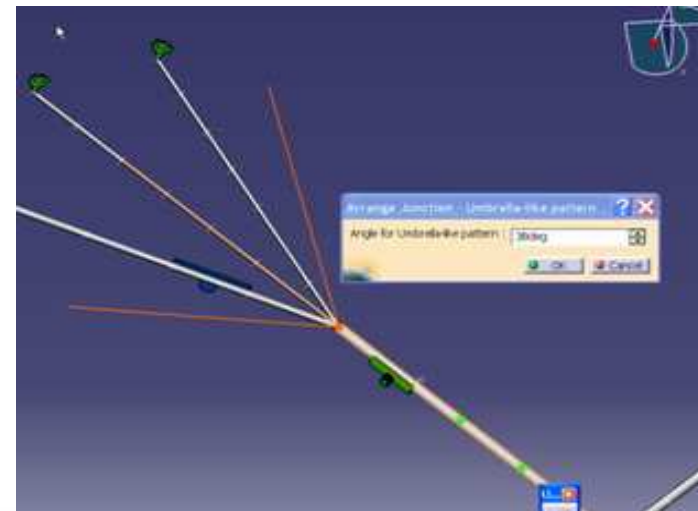


Harness mechanical part integration (EHF)



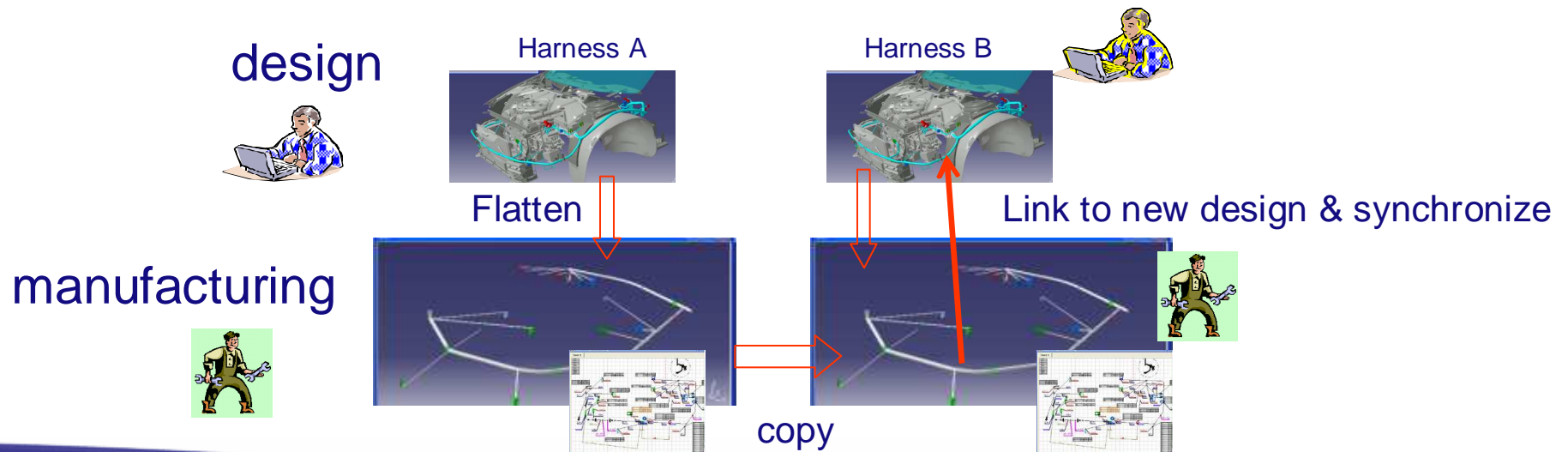
Productivity enhancements for faster layout edition (EHF)

- Quick Roll in one selection
- “Umbrella” Junction Layout arrangement
- Rotate on Branch point with automatic split on branch point



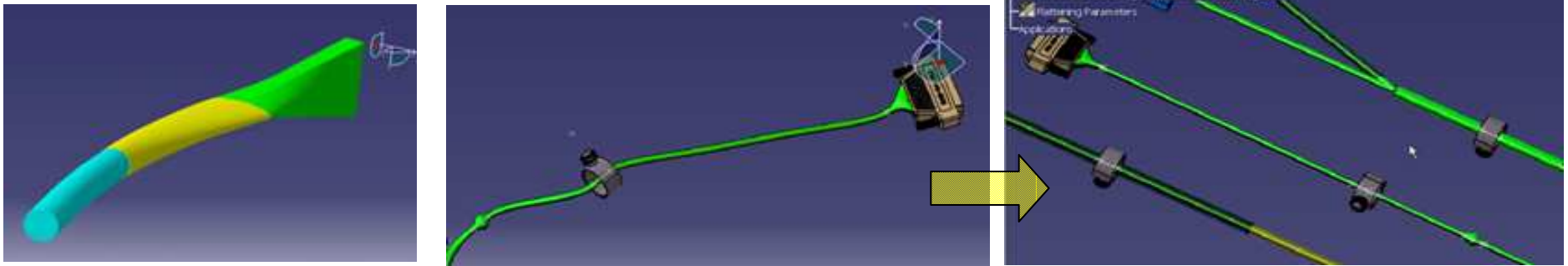
Optimize manufacturing with reuse of flatten harness

- Objective
 - Optimize harness manufacturing with reuse of an existing flatten harness or formboard for similar harness designs
- Solution
 - New commands to link an existing flatten harness to other harness design
 - Automatic or semi automatic link process based on object name or harness network topology
- Benefits
 - Reduce time for generating harness documentation thanks to reuse
 - Introduce more flexibility for collaboration between design & documentation teams



Other EHF improvements

- Enhancement of synchronization capability for multi-profile bundle segments
 - Allow flattening & synchronization of geometric harness with non circular section



- Harness 2D drawing enhancement
 - Update all text template to synchronize electrical attributes
 - Leader on protection extremity to better visualize to what protection a generated 2D information is attached
- New CAA API exposition for:
 - Extract and flatten of harness
 - Flattening parameters access

Conclusion

- Electrical Systems play a key role in the product development process
- Complete electrical process
 - Integrated Process (from schematic to manufacturing)
 - Specification driven design
 - Modification propagation through the complete process
 - Associative with the mechanical environment
 - Dedicated toolsets for electrical systems
 - Easy/fast modifications
 - Productive toolset
 - Realistic modeling
 - Complete Digital Mock Up avoiding late changes in the design
 - Design quality
 - Right information (e.g. length, BOM)
 - Optimized definition of your systems
 - Company/regulation rules compliancy

