IPC-2581 CONSORTIUM

For an open neutral global standard for efficient PCB design data transfer

Design Data Transfer using IPC-2581

Hemant Shah, Chair IPC-2581 Consortium
Ed Acheson, Technical Committee Chair IPC-2581 Consortium
PCB West 2016, Santa Clara Convention Centre
14 Sept 2016

IPC-2581 CONSORTIUM

Topics

1. IPC-2581 - a brief introduction

2. Adoption update

3. Standard Update
    1. Rev B1
    2. What's cooking (revC)

4. Data Augmentation

IPC-2581 Journey

2004	IPC 2581 Born	
2007	IPC 2581 Rev 1.0 (Amendment)	
2011	Consortium formed	12 members
2012	First PCB using IPC 2581	30% fabrication time saved
2012	Rev A	36 Corporate members
2013	Rev B Approval / Publication	
2015	79 Corporate Members	45 Associate Members
2016	88 Corporate members	50+ Associate members

Founding Members

ADIVA
cadence
DownStream Technologies
FUJITSU
HARRIS
NVIDIA
SANMINA
ScanCAD INTERNATIONAL
Making Complex Technology Simple
Ucamco
UP Media Group
WISE SOFTWARE
ZUKEN

IPC-2581 CONSORTIUM

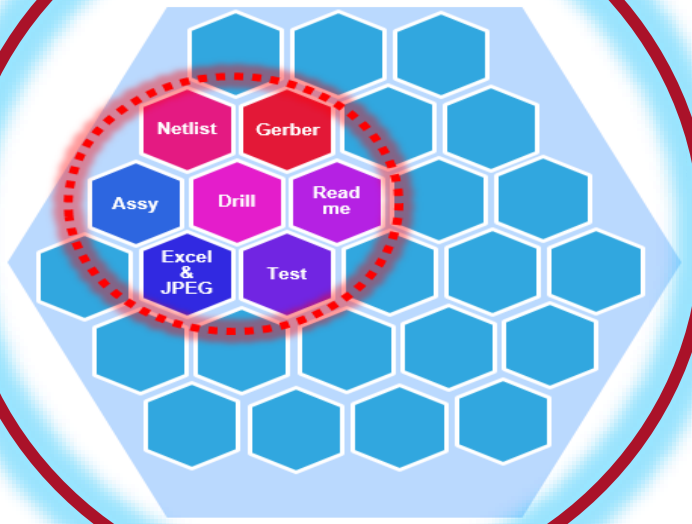
Complicated “Design to Manufacture” Today

Systems Company

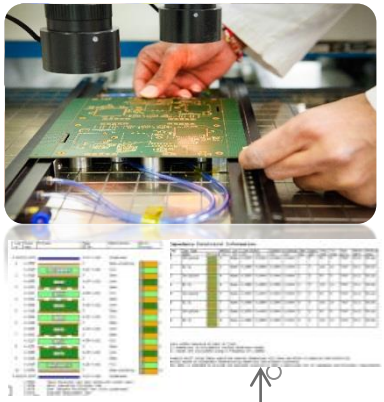
Intelligent, Single file OPEN Standard

Where’s the BOM?

“IPC-2581”
A Single XML File



Manufacturing Partner



Did you read my instructions?

Impedances?

BOM

IPC-2581 CONSORTIUM

IPC-2581 CONSORTIUM

- A group of PCB design and supply chain companies whose goal is to enable, facilitate and drive the use of IPC-2581

- Join the consortium today! Make IPC-2581 part of your company's Roadmap. Ask your suppliers to support IPC-2581

Join Us

For more details on how to join the consortium, please visit http://www.ipc-2581.com/

IPC-2581 Consortium – www.ipc2581.com
Drive innovation through collaboration

IPC-2581 Consortium Website

- List of members
- Standard support information
- Free Viewers
- IPC-2581 Specification documents

A

Join the Consortium

- Its Free, Join as corporate member
- 1 Click Joining Process, visit www.ipc2581.com

B

IPC-2581 Industry Adoption

Manufacturer Support Status

Company Name	Software Used	IPC-2581 Amend 1	IPC-2581A	IPC-2581B	Stack-up Exchange
Accurate Circuit Engineering	Genesis, InSight, InPlan		•		
Axiom	VisualCAM	•	•	•	•
	CircuitCAM		•	Q4 2014	
CC Electronics	VisualCAM	•	•	•	•
Electrostein	CAM350	•	•	•	
Sanmina	Genesis, InSight, InCAM		•		Q4 2014
Sierra Circuits	Genesis		•		
Viasystems	Genesis		•		

Software Vendor Support Status

Company Name	Software Name	IPC-2581 Amend1	IPC-2581A	IPC-2581B	Stack-up Exchange
AEGIS	Factory Logix	•	•		
ADIVA	ADIVAnet	•	•	•	
	ADIVADRC	•	•	•	
	ADIVAview	•	•	•	
Altium	Altium Designer			Q2 2016	
Cadence	Allegro PCB Designer	•	•	•	•
	OrCAD PCB Designer	•	•	•	
Downstream Technologies	CAM350		•	Q3 2015	
	Blueprint PCB		•	•	
	DFMStream		•	Q3 2015	
EasyLogix	PCB-Investigator	•	•		
Frontline	InCAM			Q3 2015	
	Insight PCB			Q3 2015	
	InStack				
In-Circuit Design	ICD Stackup Planner		•	•	•
Numerical Innovations	FAB 3000 Version		•		
	ACE 3000 Version		•		
	PreflightPCB Version		•		
Polar Instruments	Speedstack			•	•
PTC	PTC Creo View ECAD		•	Q3 2015	
Siemens	Test Expert		•	•	
	UniCam FX		•	•	
	UniDoc FX		•	•	
Vayo	VayoPro-DFM Expert		•		
	VayoPro-SMT Expert		•		
	VayoPro-Test Expert		•		
	VayoPro-Document Expert		•		
	VayoPro-View Expert		•		
WISE	VisualCAM	•	•	•	•
	GerbTool	•	•	•	
	WISE2581Viewer	•	•	•	•
Zuken	CR-5000	•			
	CR-8000	•		•	

Support matrix on ipc2581.com

7

IPC-2581 CONSORTIUM

IPC-2581 Consortium members

PCB Design and Supply chain companies (88)

ALL

- OEMs
  - Cisco, EMC, Ericsson, MSFT, Fujitsu Huawei, Network Communications, Harris, LMCO, QCOM, Qlogic, NVIDIA, Orbital, ZTE
- ECAD
  - Altium, Cadence, Zuken
- DFM/CAM companies
  - Frontline, Downstream, ADIVA, ….
- EMS/FAB companies
  - Sanmina, Viasystems, Sierra Circuits, …
- IPC

IPC-2581 CONSORTIUM

IPC-2581 Consortium members

PCB Design and Supply chain companies (88)

ALL

Software vendors

- OEMs
  - Cisco, EMC, Ericsson, MSFT, Fujitsu Huawei, Network Communications, Harris, LMCO, QCOM, Qlogic, NVIDIA, Orbital, ZTE
- ECAD
  - Altium, Cadence, Zuken, SiSoft, Mentor Graphics
- DFM/CAM companies
  - Frontline, Downstream, ADIVA, ….
- EMS/FAB companies
  - Sanmina, Viasystems, Sierra Circuits, …
- IPC

IPC-2581 CONSORTIUM

IPC-2581 Consortium members

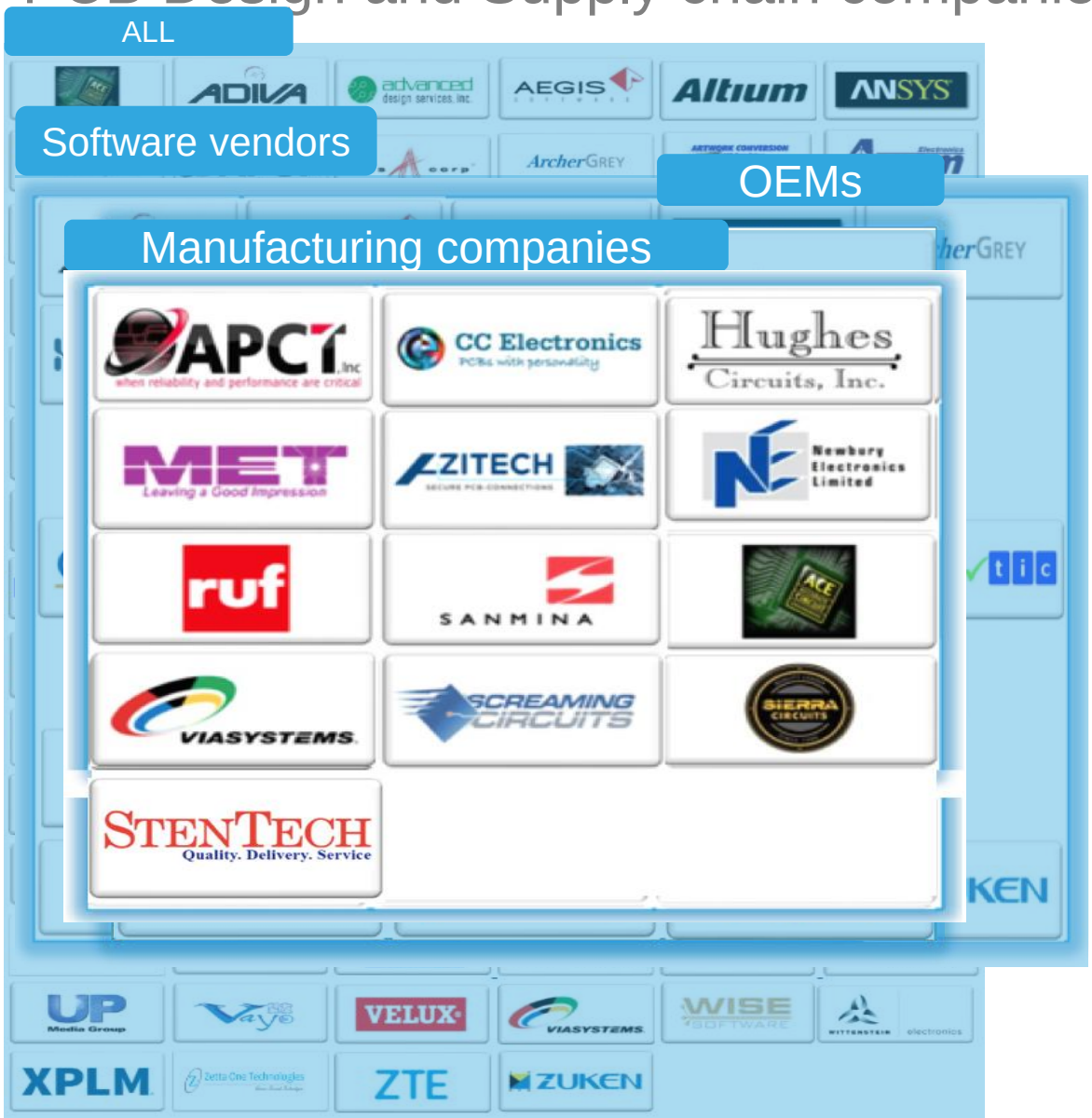
PCB Design and Supply chain companies (88)

- OEMs
  - Cisco, EMC, Ericsson, MSFT, Fujitsu Huawei, Network Communications, Harris, LMCO, QCOM, Qlogic, NVIDIA, Orbital, ZTE
- ECAD
  - Altium, Cadence, Zuken, SiSoft, Mentor Graphics
- DFM/CAM companies
  - Frontline, Downstream, ADIVA, ….
- EMS/FAB companies
  - Sanmina, Viasystems, Sierra Circuits, …
- IPC

IPC-2581 CONSORTIUM

IPC-2581 Consortium members

PCB Design and Supply chain companies (88)



- OEMs
  - Cisco, EMC, Ericsson, MSFT, Fujitsu Huawei, Network Communications, Harris, LMCO, QCOM, Qlogic, NVIDIA, Orbital, ZTE
- ECAD
  - Altium, Cadence, Zuken, SiSoft, Mentor Graphics
- DFM/CAM companies
  - Frontline, Downstream, ADIVA, ….
- EMS/FAB companies
  - Sanmina, Viasystems, Sierra Circuits, …
- IPC

IPC-2581 CONSORTIUM

IPC-2581 CONSORTIUM

For an open neutral global standard for efficient PCB design data transfer

Recent Adoption Updates

Adoption Update

- A large networking equipment provider in Europe reported in a July 2016 consortium meeting that they have standardized on IPC-2581 since Jan 1, 2016
- The only format they provide is IPC-2581
- Successfully produced 50+ boards
- Boards are fabricated in factories located in Europe, US and China

Adoption Update

Axiom Electronics
www.axiomsmt.com

DFX DESIGN

TELEDYNE LECROY
Everywhereyoulook™

NORTHROP GRUMMAN

Teledyne LeCroy has produced over 400 designs using IPC-2581 and expects to reach over a 1000 designs this year

10 additional companies providing data to DFX Design in IPC-2581 format

Axiom Electronics
Contract Manufacturer

- Many of our customers are providing only IPC-2581 format to fabricate, assemble, and test their PCBs.
- Twelve of Axiom's customers have been providing IPC-2581 since 2014
- DFX Design, a subsidiary of Axiom, plans to completely automate their design handoffs to Axiom.
  - Driven by Axiom customers to provide a smoother and better transition process of their project data for full turnkey engineering projects
- PCB data in IPC-2581 format generated from Altium, Cadence, Zuken, and Mentor design tools has reduced time and streamlined customer design data hand-off to Axiom

IPC-2581 CONSORTIUM

For an open neutral global standard for efficient PCB design data transfer

Standards update

IPC-2581 CONSORTIUM

Standards Update

Revision B

- September 2013
- Fastest revision in IPC history
- Unanimous approval

Revision B1

- August 2016
- Unanimous approval

Revision C

- Discussions on topics started in August 2016

CONCLUSIONS

Collaboration between Consortium members and IPC-2581/IPC

Innovation through OPEN collaboration

IPC-2581 Rev B Amendment1

- Added Appendix D Summary of Changes
  - Will be included with each rev of Spec.
  - Faster review of what's changed/added
- Document Clarifications
  - Reduces multiple interpretations
  - Correct missed schema detail in document
  - Address Naming types
    - Qualified NameType
    - shortName
- Element and attribute type adjustments
  - Object naming, such as spokeWidth vs gap
- New Function Mode Table
  - More function types
  - Reduces excessive data within specific functions
  - Function/mode identifiers
- Altered data needs requirements
  - Some element change from Required to Optional
  - Removed default value assumptions. Must be explicit.
- More Reference types
  - Added dielectric type (enumeration)

Areas of improvements to be considered for revC

- Validate Schema structure
  - Schema structure, consistency with embedded data,. More info on Rigid-flex designs
  - BOM table enhancement with part description
- Rigid/Flex Support
  - Stackup structures
  - Stackup zones
  - Component placement (zone based and embedded)
- New hole / pad types
  - Counter sink, counter bores
- Packaging
  - Bond pads, wire bonds, …
- Enhance Varient BOM
- DFx – Markup, bi-directional
- External references to specs

IPC-2581 CONSORTIUM

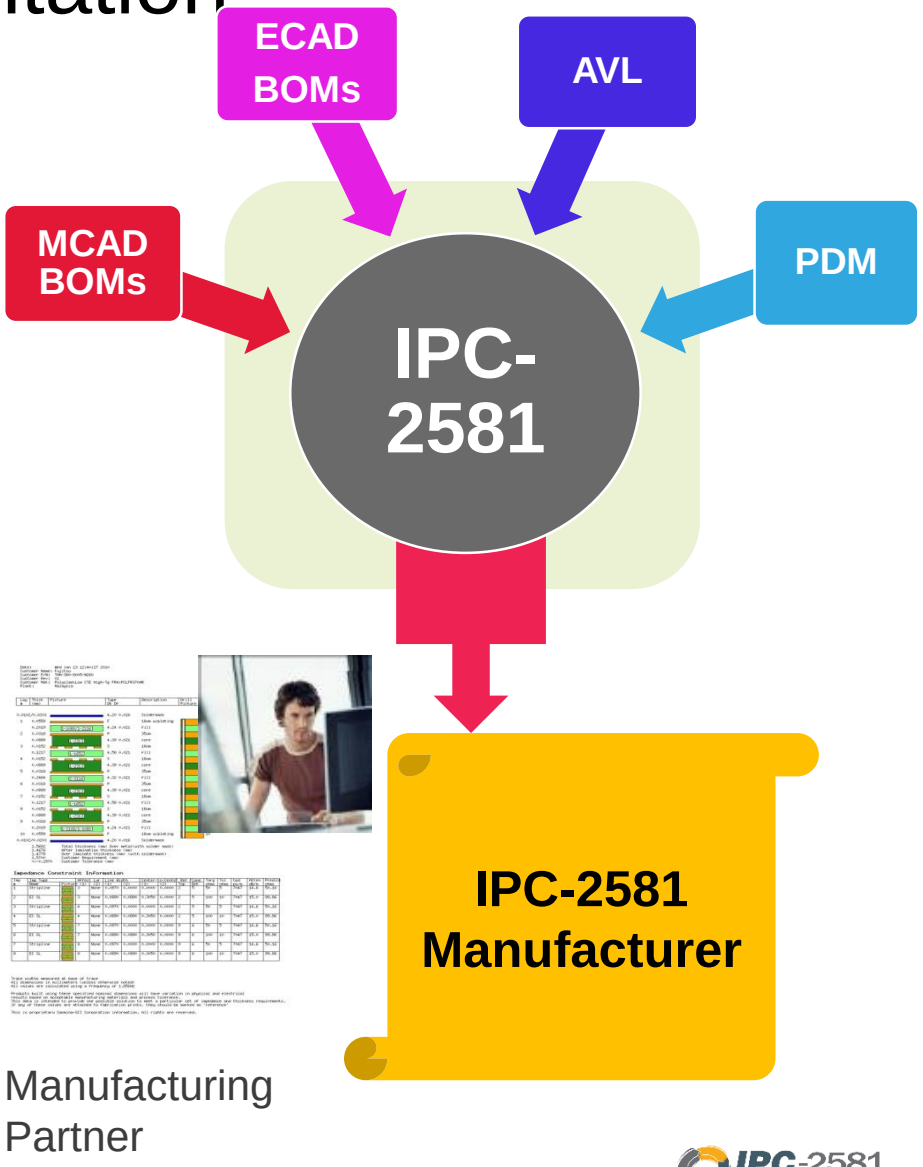
For an open neutral global standard for efficient PCB design data transfer

Data Augmentation

IPC-2581 CONSORTIUM

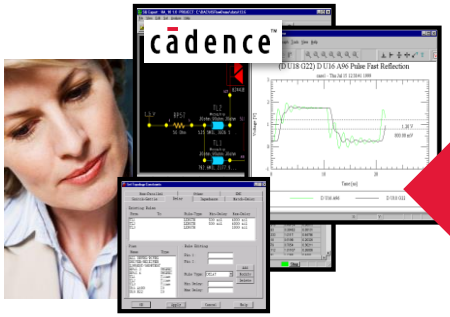
Future direction
IPC-2581 Data Augmentation

- ECAD Provides only E-BOM
- MFG needs more inputs
  - Mechanical
  - Corporate data
  - Logistic data
  - What not!
- IPC-2581 enables data augmentation very easily
- Companies can manage the IPC-2581 content as per their need
- Open Future
  - Such as “Planning Analysis”



IPC-2581 Integration with PLM

Data Augmentation made easy



IPC-2581

Changes

Add

Modify

Change

PLM

Systems Company

ECAD BOMs

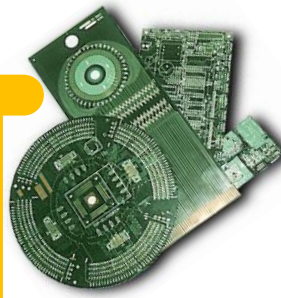
AVL

MCAD BOMs

Other

IPC-2581

IPC-2581 Manufacturer

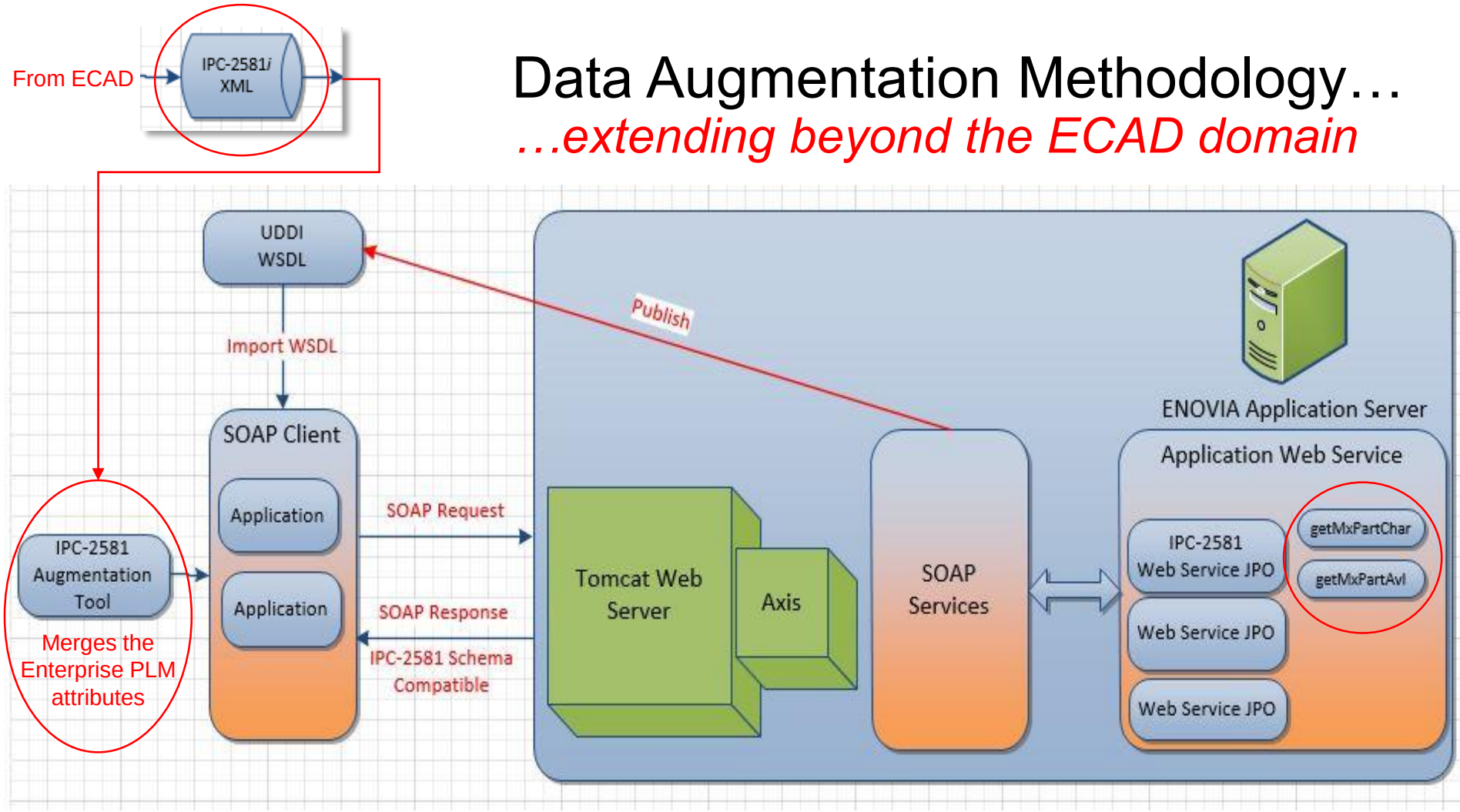


Fab House

IPC-2581 CONSORTIUM

Data Augmentation Methodology…

…extending beyond the ECAD domain

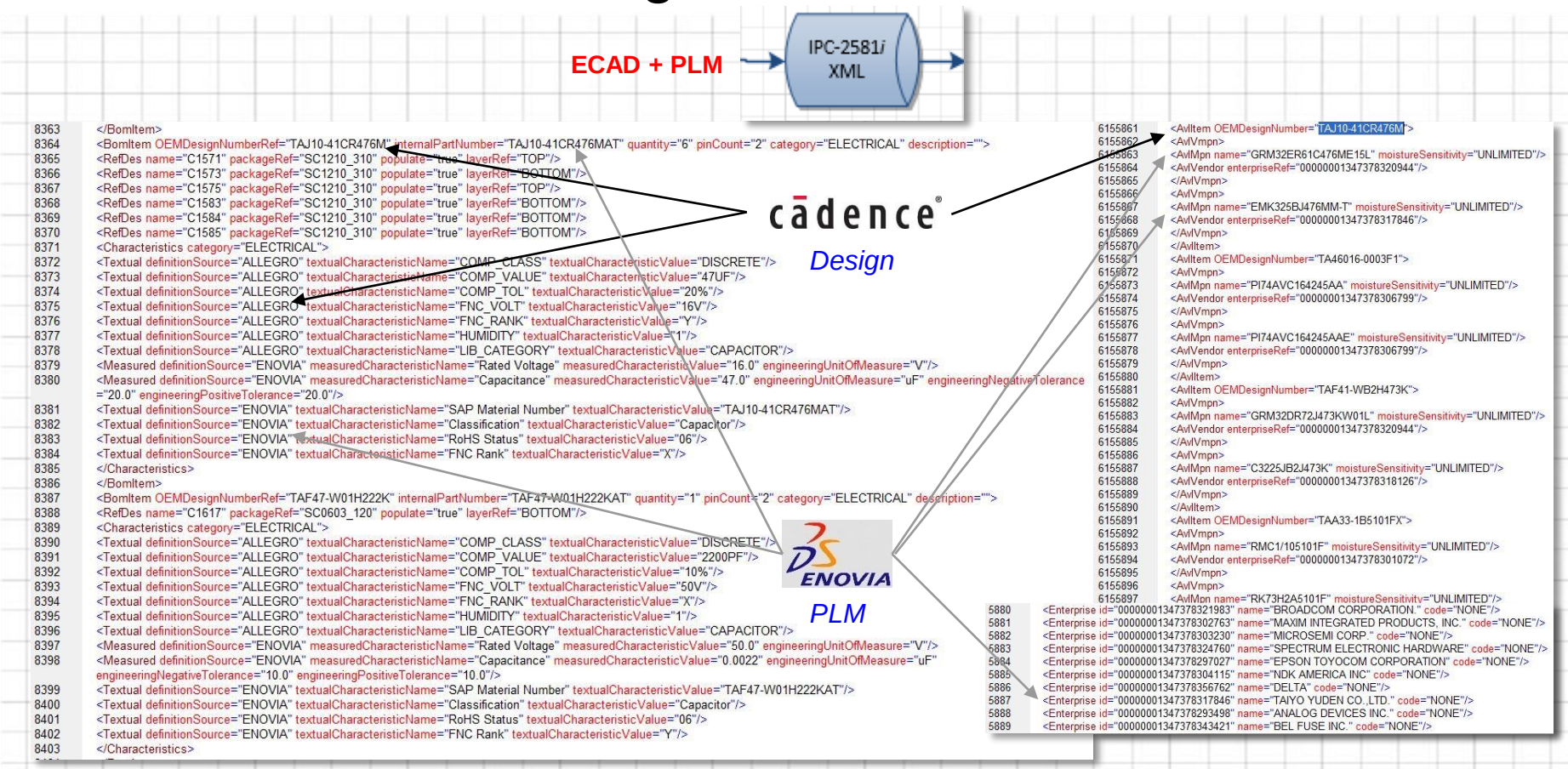


Supports the concept of the "Digital Thread"

Enterprise business systems can import, augment, and export IPC-2581 content in order to complete the "configuration".

IPC-2581 CONSORTIUM

Data Augmentation Results



IPC-2581 file now includes Part characteristics and AVL attributes merged from an Enterprise PLM system

IPC-2581 CONSORTIUM

Summary

- IPC-2581 is good for PCB Design and supply companies
  Reduced cost and iterations, Improved Quality
- Support a Global, Open, Neutral standard for collaboration between PCB design and manufacturing companies
- Join the consortium today!
  Make IPC-2581 part of your company's roadmap
  Ask your suppliers to support IPC-2581

- Visit www.ipc2581.com to join

IPC-2581 CONSORTIUM

- A group of PCB design and supply chain companies whose goal is to enable, facilitate and drive the use of IPC-2581

- Join the consortium today! Make IPC-2581 part of your company's Roadmap. Ask your suppliers to support IPC-2581

Join Us

For more details on how to join the consortium, please visit http://www.ipc-2581.com/