

Altium®

AltiumLive 2017: Conquering Multi-Board Design Challenges to Create Next-Generation Electronics

Rainer Asfalg
*Global Head of
Technical Sales &
Support*

Carsten Kindler
*Field Applications
Engineer*



Rainer Asfalg, Global Head of Technical Sales & Support

- 30 years experience in the EDA industry
Application Engineering, Marketing, Product development
and Sales
- 5 years of experience in System Design Software
development with focus on multi-board



Agenda

- 1 Multi-Board Challenges**
- 2 Electrical aspects
- 3 Mechanical aspects
- 4 Combined aspects
- 5 How to, with an improved EDA tool

The electronic industry creates products which consist in most cases out of multiple boards, connections and mechanical elements

- Electrical aspects must be considered
How to define and maintain correct connectivity between boards?
- Mechanical aspects must be considered
How to connect and fit all boards in the enclosure?
- Combined aspects must be considered
How to ensure that all signal path will meet the design requirements?



All aspects need to be equal considered

Multi Board considerations

- Ensure each board can have his own life cycle
- Each board is managed as a single entity
- A single board can be instantiated multiple times
I.e. Memory boards on a motherboard
- Boards can be used for multiple products
I.e. One power supply board for multiple devices



A Multi-Board system only works as good as its worst member

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Multiple methods to define system connectivity

Disconnected manual definition in xls, doc or ppt documents

How to maintain board changes?

No integration into EDA environment

How to manage signal names?

Manual approach

How to insure reliability?

Restrictive change rules

Manual time consuming verification



Manual approaches are always time consuming and error prone

Improved multi board design software enables productivity and quality

Take advantage of automation:

Does it distribute connectors, pins and signal names to the system level?

Does it allow random signal names?

Does it allow multiple signal naming schemes?

Does it provide DRC for signal path verification?

Automated = error free

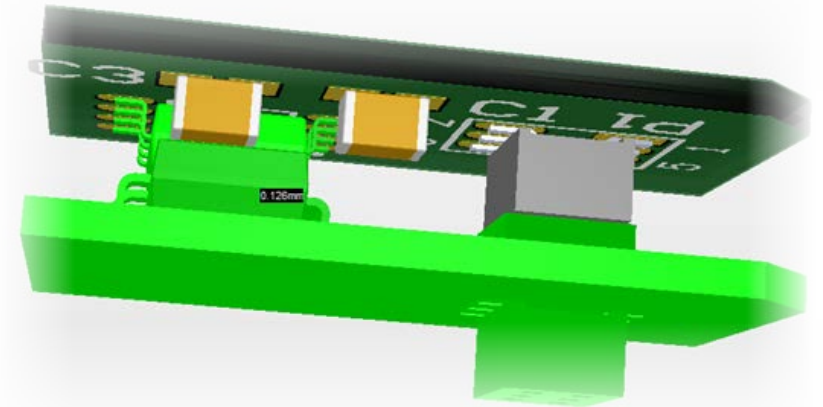
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How to position multiple boards in an enclosure? How do they fit? Is a collision with the enclosure?

- Export <-> Import of 3D Step files to place boards in a MCAD system

Requires MCAD know how or MCAD expert collaboration



Each Mechanical issue can require a new design revision and delay your project

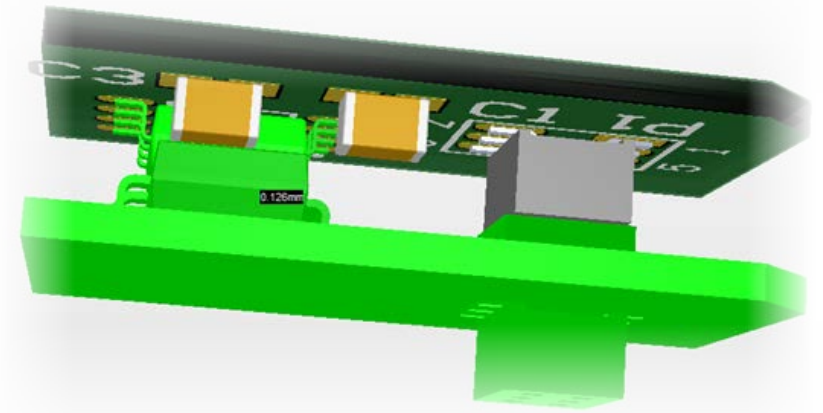
Will there be influences because of the height profile of PCB1 affecting PCB2?

- If a Component is moved on PCB1, will this affect PCB2?

Collision Check with Export <-> Import of 3D Stepfiles

- In complex projects with dense packed components, each movement of a component may require MCAD collaboration

MCAD systems do not consider electrical rules

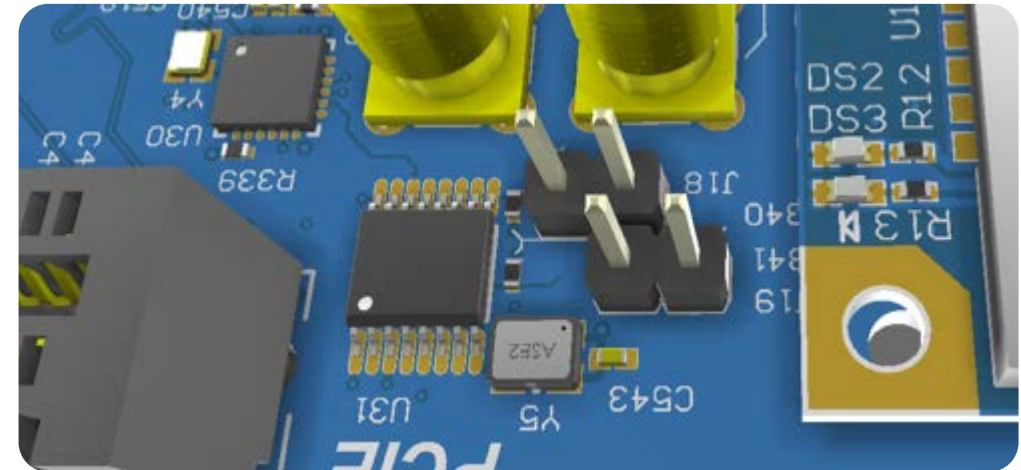


Each iteration could be very time consuming

Position boards and align connectors could be challenging

To align connectors you have to consider multiple aspects:

- Placement side
- Rotation
- Origin
- Position rotation and origin of all related boards



Applies to direct board to board connection and all cable connections

What is required for improved PCB multi board software?

- Import Step enclosure data
- Enclosure and all boards in a system assembly
- Position all boards of a system with basic mechanical functions
- Measure functionality for verification
- Ability to edit each board in a system context
- Verify system level connectivity on the logical- and physical side



A integrated multi board environment has many benefits

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Today Multiboard Projects are often managed external no real connection or interaction between the single PCB Projects.

- Position & Orientation once defined fixed in location changes prevented

- Fixed Pinning

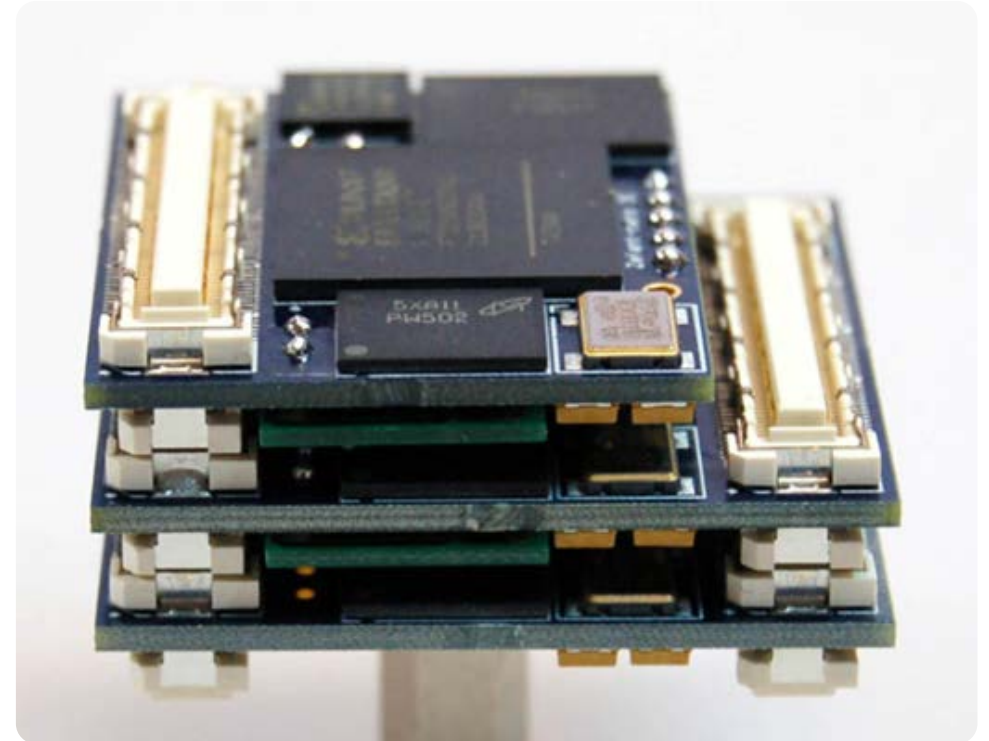
- Guide optimization not possible

Project:	Multiboard v3.2											
Project Leader:	Richard Flex											
Position & Orientation												
		Connector	Layer	Pos. X (mm)	Pos. Y (mm)	Rot		Connector	Layer	Pos. X (mm)	Pos. Y (mm)	Rot
PCB1:	Baseboard v2.5	J21	Top	10	5	90°						
PCB2:	CPU v4.1	J10	Bot	10	5	270°	J34	Top		43	25	0°
PCB3:	Optic v1.3						J2	Bot		43	25	0°
Pinning												
		Connector	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8	Pin9	
PCB1:	Baseboard v2.5	J21	VCC	USB+	USB-	EN	free	GND	/	/	/	
PCB2:	CPU v4.1	J10	VCC	USB+	USB-	EN	free	GND	/	/	/	
PCB2:	CPU v4.1	J34	AVCC	LVDS1_P	AVCC	LVDS1_P	AGND	AGND	LVDS2_P	AGND	LVDS2_N	

In an external disconnected tool Many things have to be manual verified and controlled

What will happen if there are length matching signals and because to density you are not able to tune all on PCB.

- How to control Length Matching, Signal interferences?
- In case of failure how trace a signal over multiple PCBs?



How to control signal timing from one PCB via Connector to another PCB?

To get one PCB into the chassis is sometime already difficult, to get 2, 3 or more PCBs combined in the chassis easy evolve into a highly complex task.

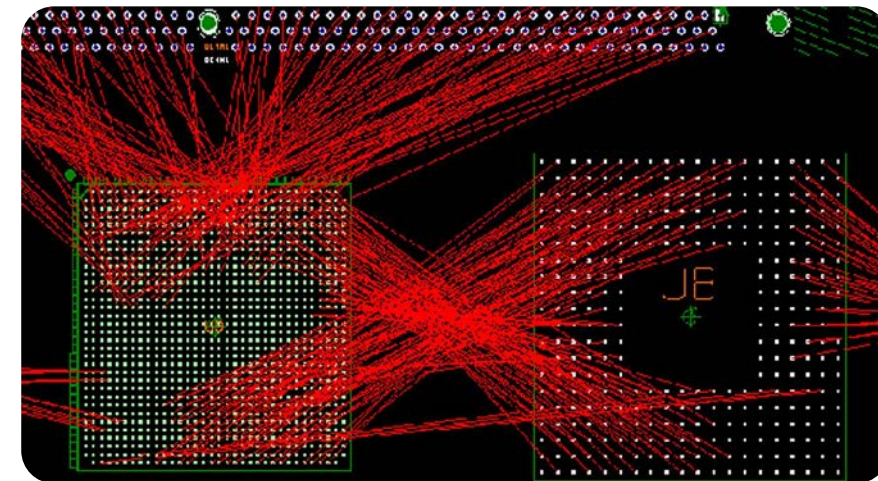
Change management

Board to board connectivity changes during design optimization

Connector connections need unraveling to meet design requirements

Many boards can be impacted
Including boards used in other designs

Connectivity verification after changes is mandatory



Change management enables system optimization and innovation

Multiple PCBs stacked other each other in compare with the chassis

- Smarthome devices bring high-tech in your Lighting Switches
- Multi board systems are even in devices which traditionally did not have electronic content



Even if the result looks simple, the requirements & thoughts might be not

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Thanks for your Attention!
Questions?