



High-reliability integrated circuits

Reliable Cable Network

CAN in Space Workshop 2019

SPACE IC GmbH

Garbsener Landstraße 10
30419 Hannover ▪ Germany
www.space-ic.com

Tel.: +49 511 99 99 33 0
Fax: +49 511 99 99 33 10
info@space-ic.com

Managing Directors:

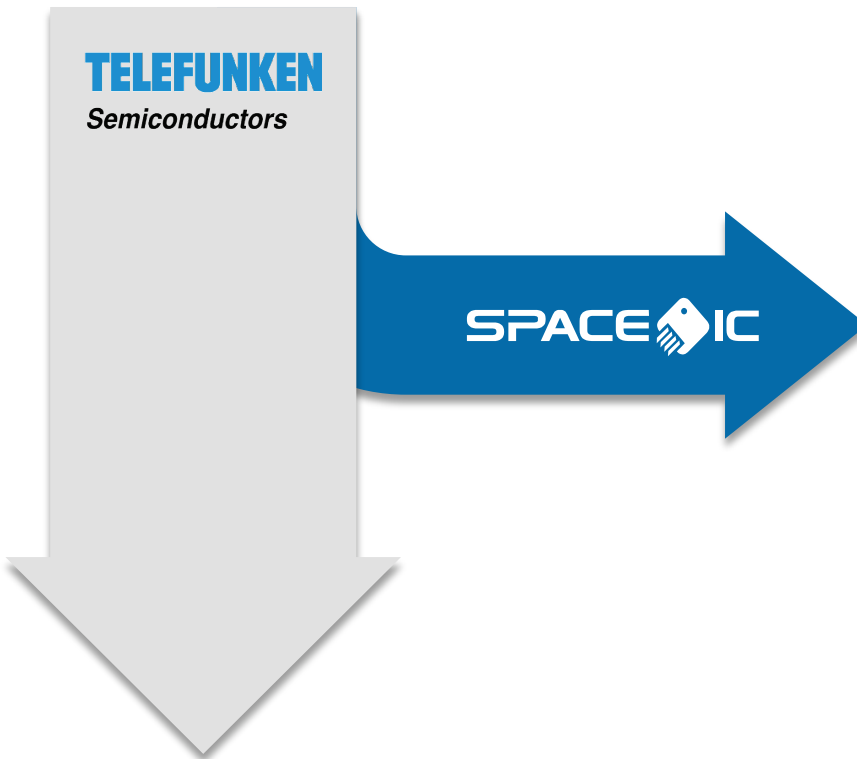
Volodymyr Burkhay ▪ Uwe Gieselmann ▪ Marko Reuter ▪ André Rocke
Register: Hannover ▪ Amtsgericht Hannover ▪ HRB 210911



Company History



- Foundation of **SPACE IC** in 2014 by experts from the TELEFUNKEN IC product development
- **SPACE IC** exclusively takes over development and manufacturing of **rad-hard IC products** from TELEFUNKEN



Founder Team & Management Board:



Headquarter:

SICAN Technology Park
in the Northwest of
Hannover, Germany





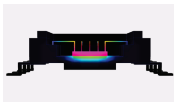
SPACE IC

high-reliability · radiation-hard · analog and mixed-signal ICs · ITAR/EAR-free
for **Power Management** and **Robust Data Interfaces**

IC Product Development

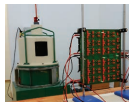
Chip Development:

- IC Spec
- IC Design
- Package Design
- Prototyping



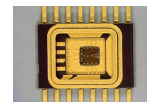
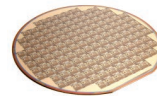
Testing:

- Screening
- Evaluation
- Qualification



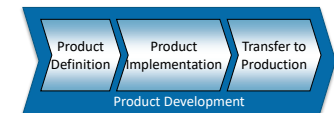
Manufacturing:

- Chip Foundry
- Wafer Test
- Dicing
- Assembly
- Screening
- Qualification Testing

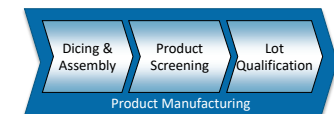


Service:

- Mixed-Signal ASIC Service

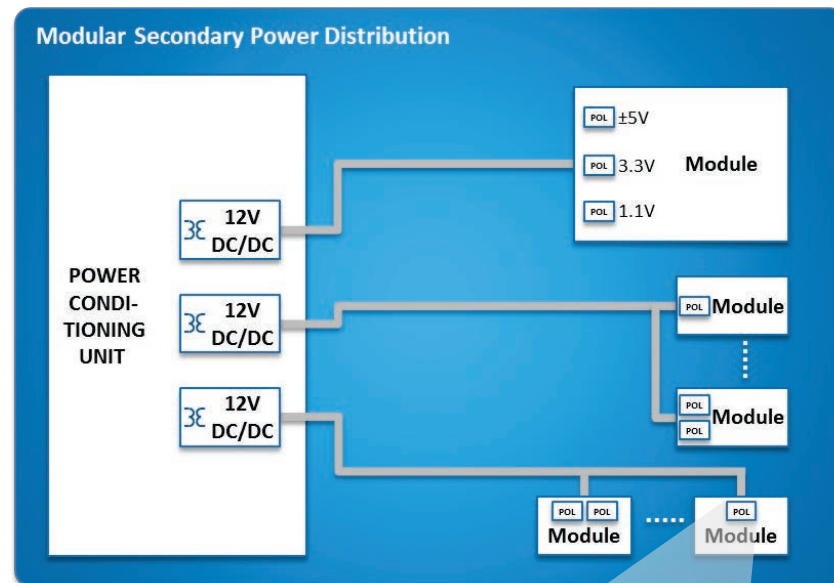
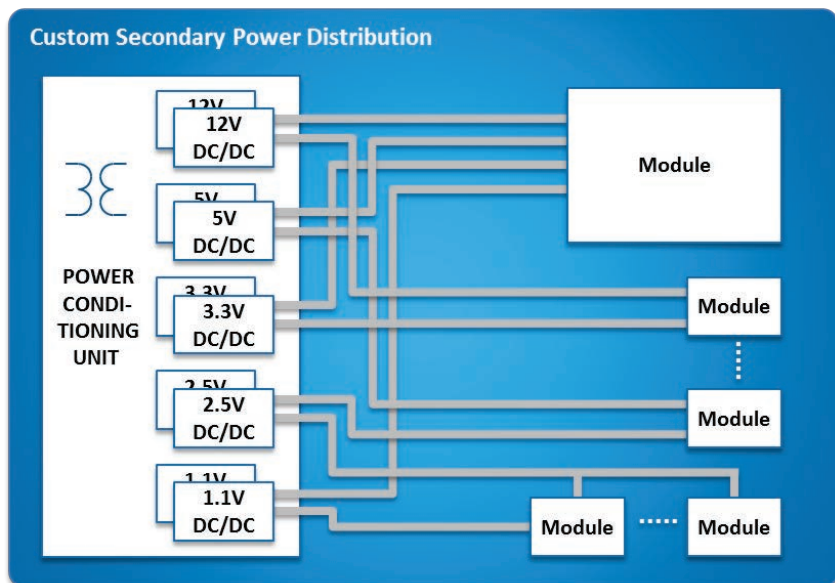


- Manufacturing Service

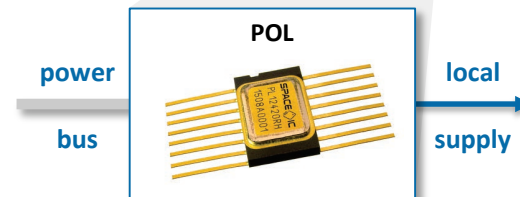


Power Management Evolution

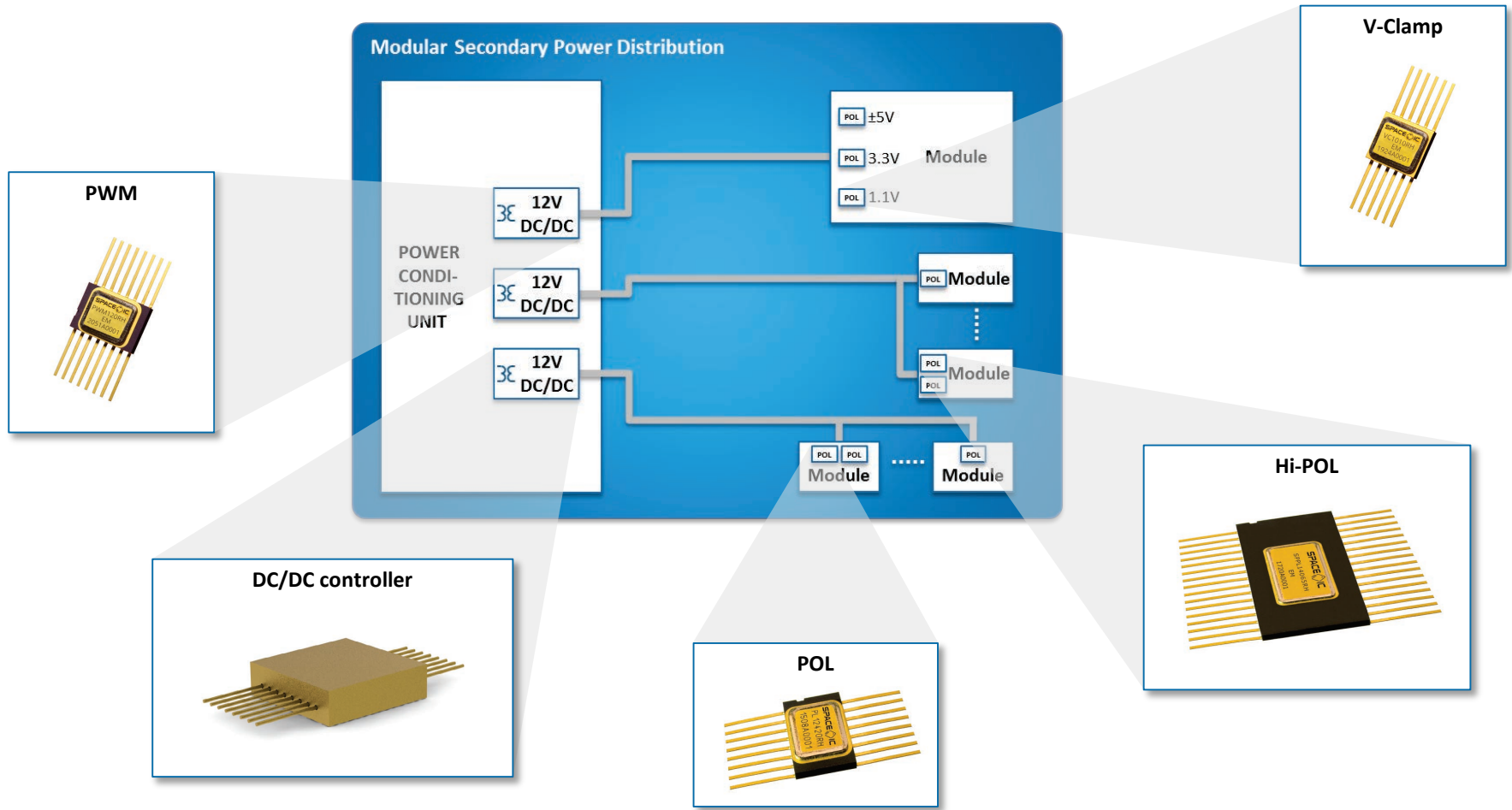
Power Distribution Evolution:



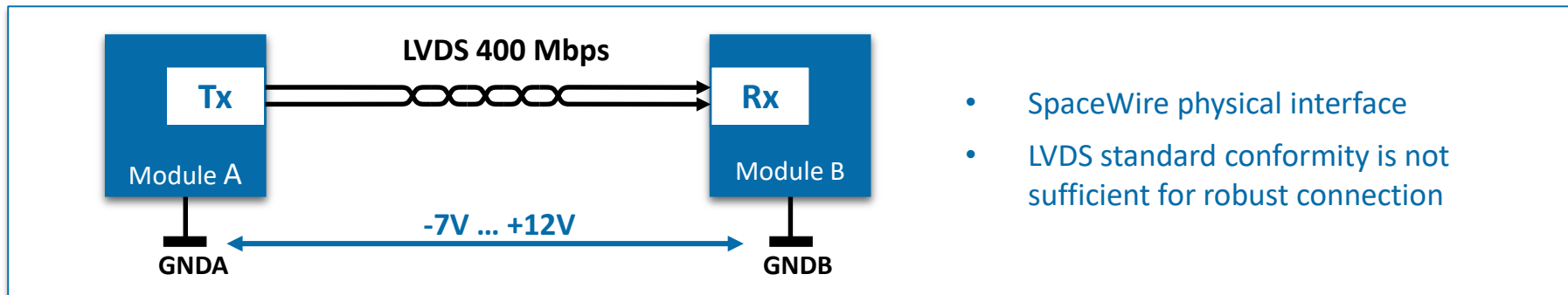
- Modular approach with standard intermediate power buses & standard power interfaces
- Highly efficient & accurate power conversion at point-of-load
- Weight & volume of few power rails; lower current



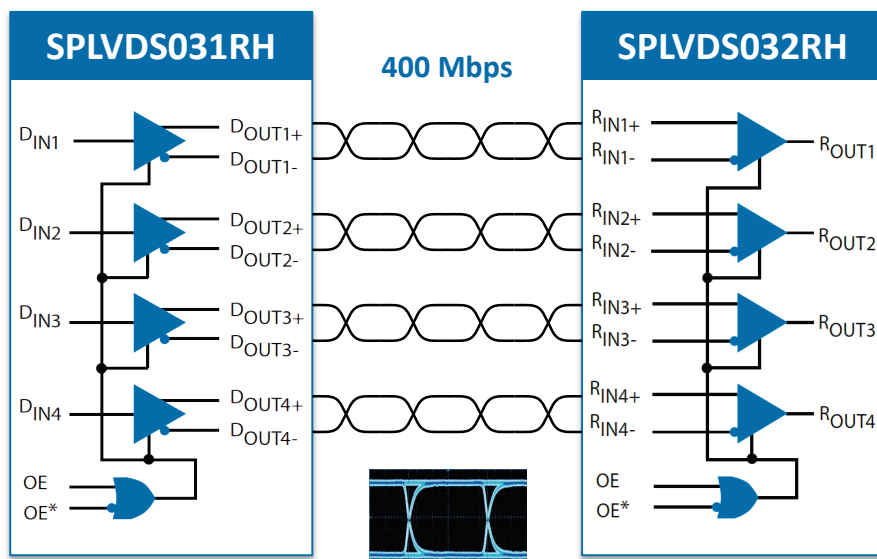
Power Management Products



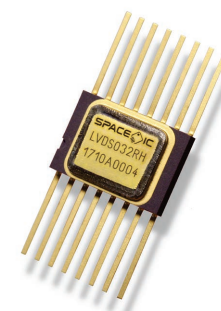
ECM LVDS Tx & Rx Products



- SpaceWire physical interface
- LVDS standard conformity is not sufficient for robust connection



- $-7V \dots +12V$ Extended Common-Mode
- excellent speed performance
- low current consumption
- latch-up free (SOI)
- ESD HBM >8kV
- $-55^{\circ}C$ to $+125^{\circ}C$



Reliable Cable Network Motivation



Network features

- High number of nodes
- High speed potential
- EMC & CM comparable to CAN
- High reliability (low failure propagation)



Bus

- Multi-node connection
- Reflections
- Limited length
- Direct communication

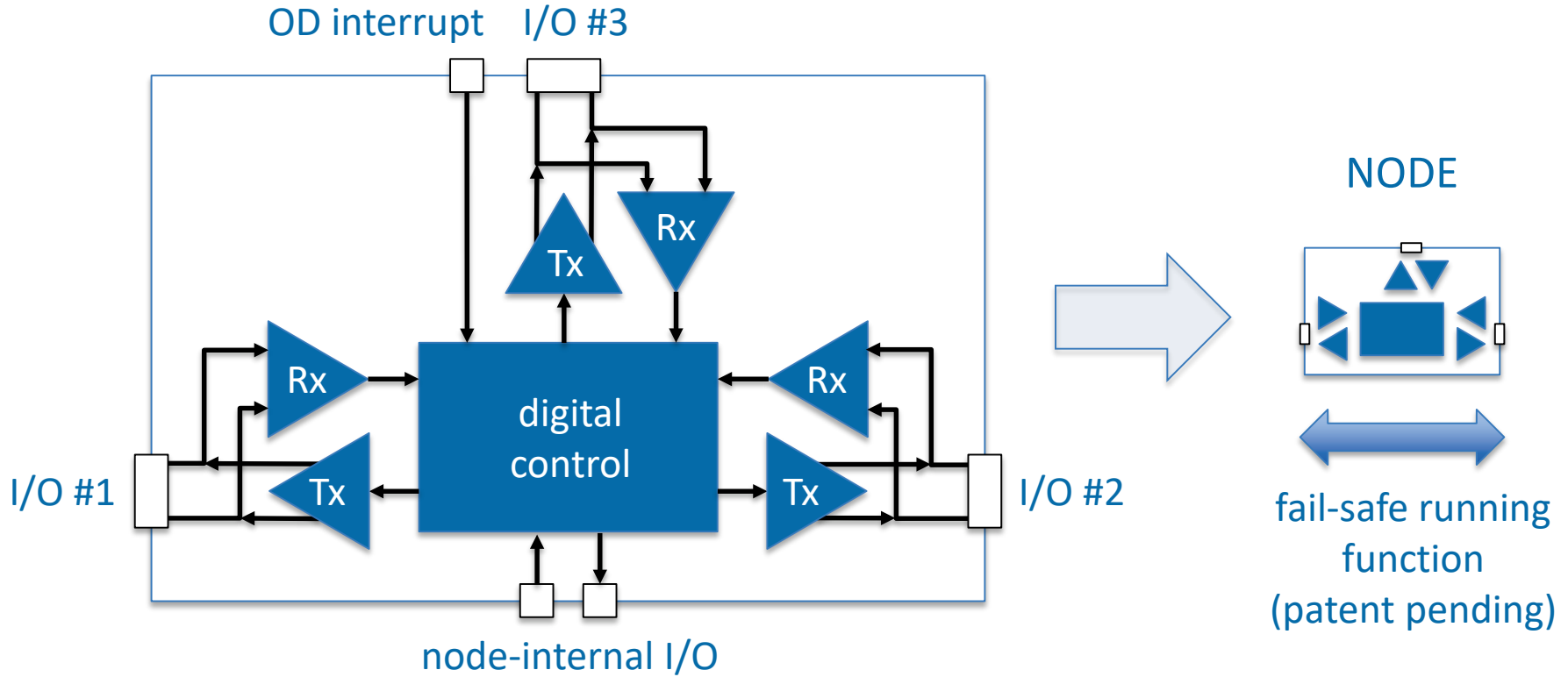
Point-to-Point

- Two-node connection
- No reflections
- Segmented
- Indirect communication
 - ↳ Fail-safe communication desired

Transceiver Specification

- Bi-directional half-duplex
- Same EMI & CM as CAN
- Master/slave configuration
- Separate interrupt input
- Fail-safe running function

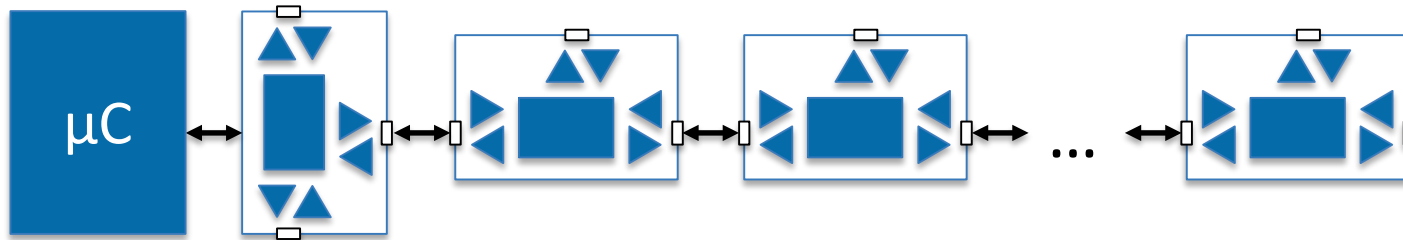
Transceiver Implementation



Physical Layer Implementation (1)

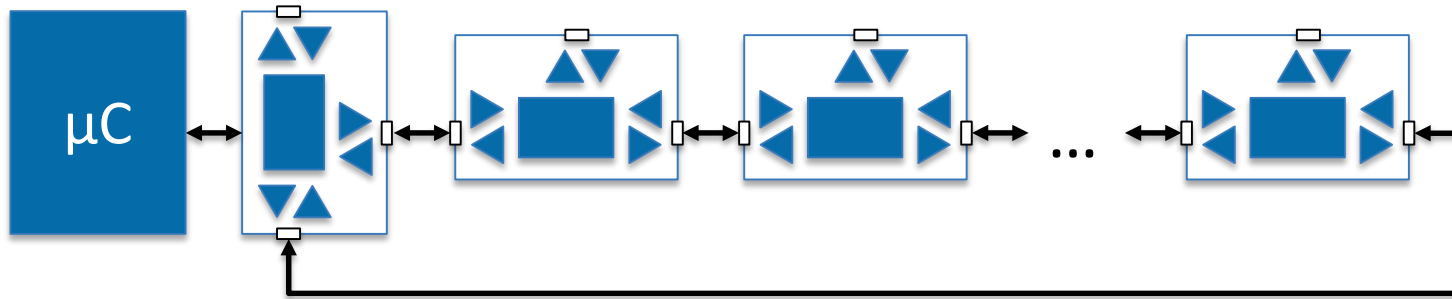
Bi-directional daisy chain

(all following variants with fail-safe communication)



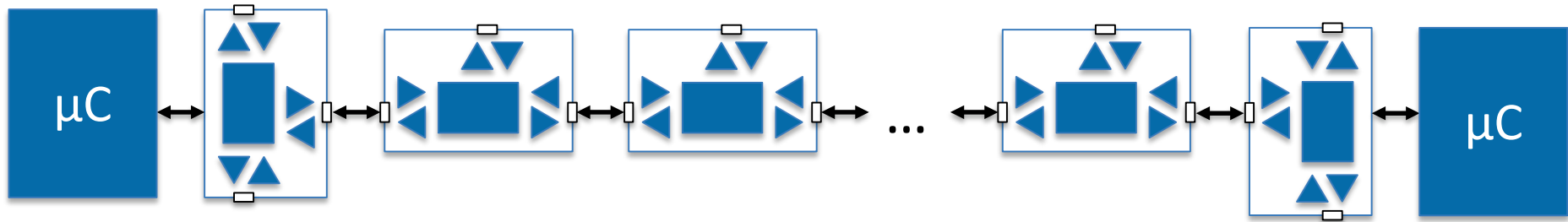
Physical Layer Implementation (2)

Bi-directional hard error safe daisy chain
(broken or shorted cable)



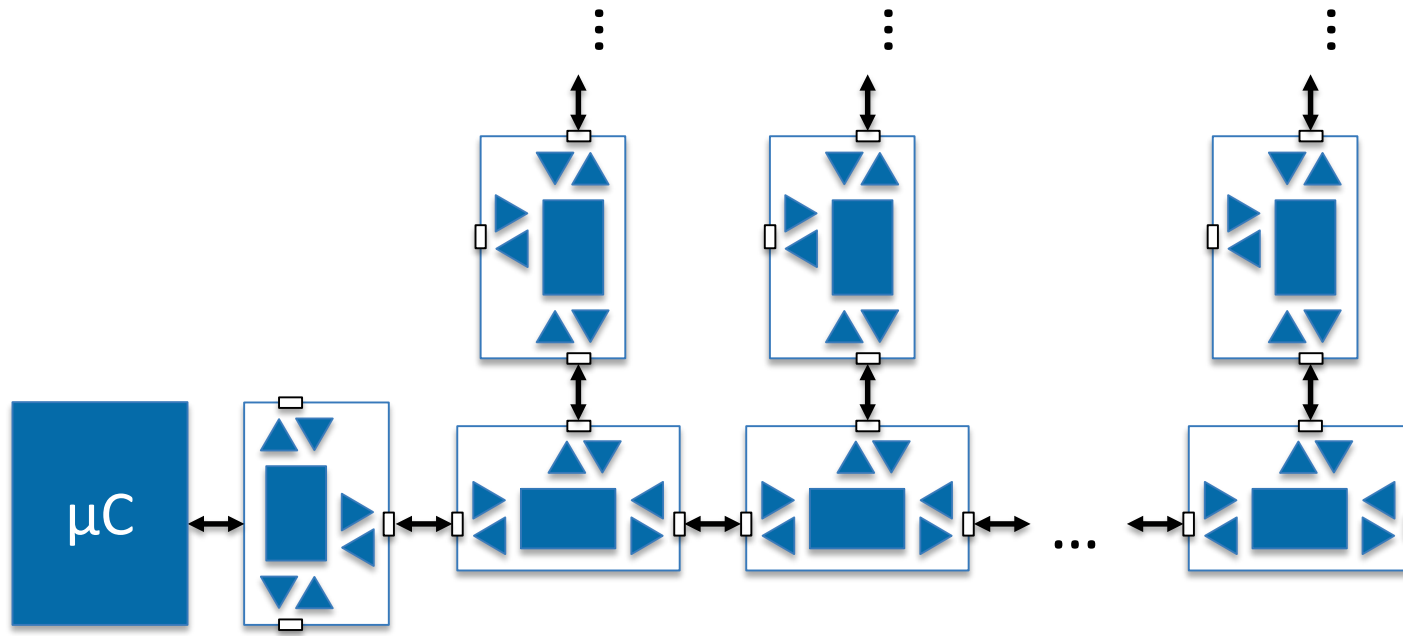
Physical Layer Implementation (3)

Bi-directional daisy chain with redundancy
(broken or shorted cable, μC fail)



Physical Layer Implementation (4)

Bi-directional segmented daisy chain





***Thank you for
your attention!***

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