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ETCS L1
for future functions and functionalities
ŽSR– THALES

Zilina, 25.04.2023

OPEN

Decentralized ETCS L1 solution

> Advantages:
- Interlocking type independent
- Low cost

> Disadvantages:
- No diagnosis
- Tricky TSR handling
- Information only from one signal

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Each FlexLEU consists of a set of slices

► Each slice has one basic function
► Slices can be combined in various ways

Configure the FlexLEU to exactly your needs!
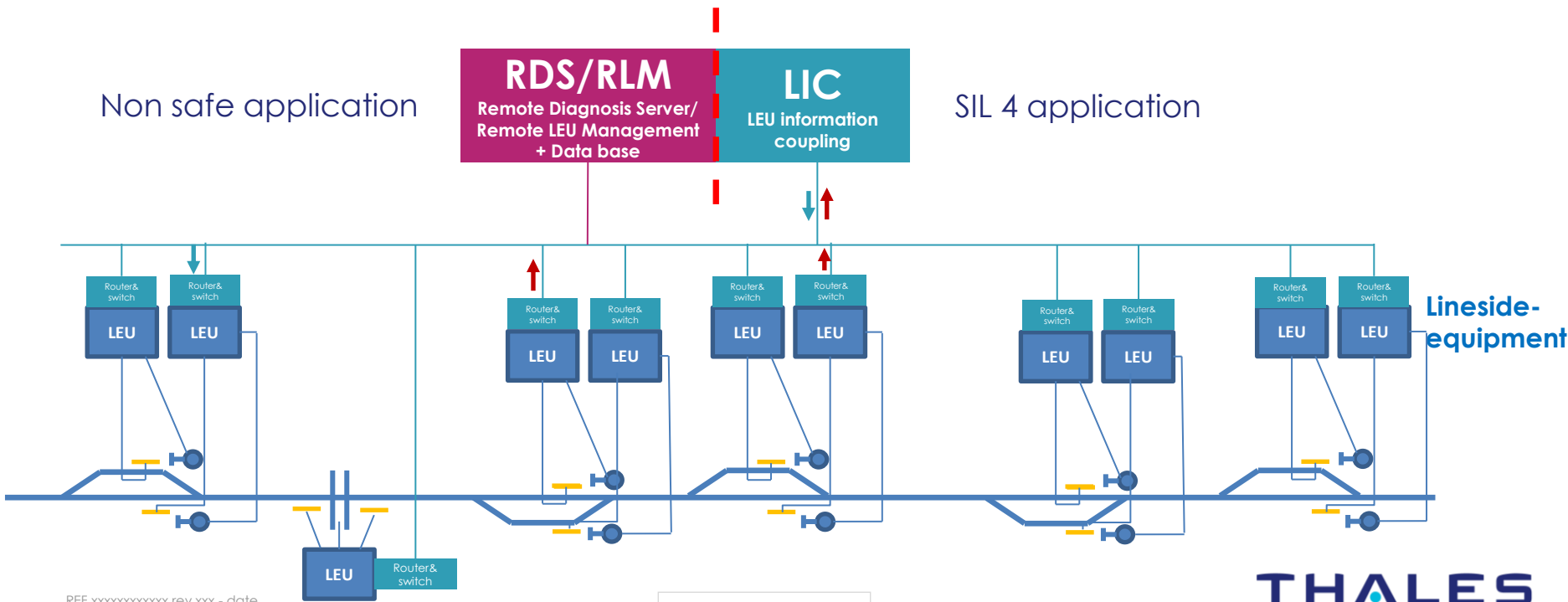
Slice by Slice to the optimal solution

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Steps to Centralization

Remote diagnostic

LEU coupling via the LIC

> Advantages:

- Multiple block signalling
- Combination of signals and field elements possible
- → route dependent MAs

Centralized TSR management

Non safe application

SIL 4 application

RDS/RLM	LIC	RTM/TVD
Remote Diagnosis Server/Remote LEU Management + Data Base	LEU Information Coupling	Remote TSR Manager + Telegram Validator

REN/LMD

Lineside-equipment

Router & Switch ×10 (with LEU 3.5 units below)

LEU 3.5 / Router & Switch

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LMD - LEU Information Coupling

Flexible coupling of LEUs and signal data exchange between LEUs via router and LIC

> **3 section MA**

Centralized remote diagnosis

Non safe application

RDS/RLM
Remote Diagnosis Server/
Remote LEU Management
+ Data base

LIC
LEU information
coupling

SIL 4 application

Router& switch — LEU

Lineside-equipment

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FlexLEU - Slices

Each function is available as one slice (DIN rail case)
which can be combined via the DIN rail bus

FS-CPU	**FS-xC**	**FS-6xCS**	**FS-6VSS**	**FS-8DI**	**FS-4DO**	**FS-PSU**
CPU slice based on Thales LFC10 with optional LTE or GSM-R support	**Balise/Loop** interface slice	**Current** sensing slice	**Voltage** sensing slice	**Digital input** slice	**Digital output** slice	**Power Supply** Unit (110 VAC, 230 VAC, 48 VDC)

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Connections to lamps in primary circuits

> The current of each lamp is lead through the LEU.

> A low impedance of 1 Ohm guarantees no influence to the interlocking.

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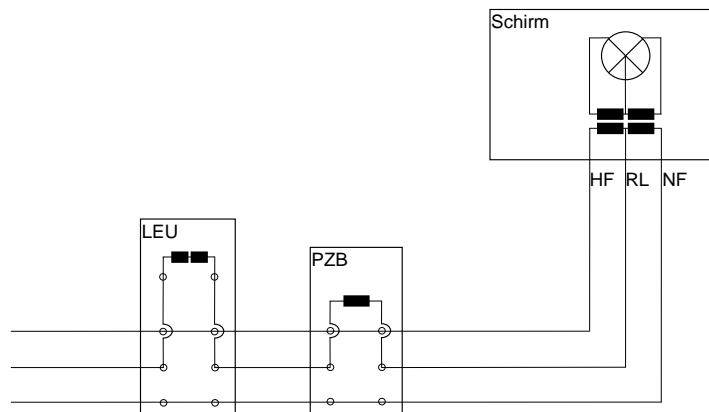
Connections to lamps in secondary circuits

> The current of each lamp is lead through the LEU.

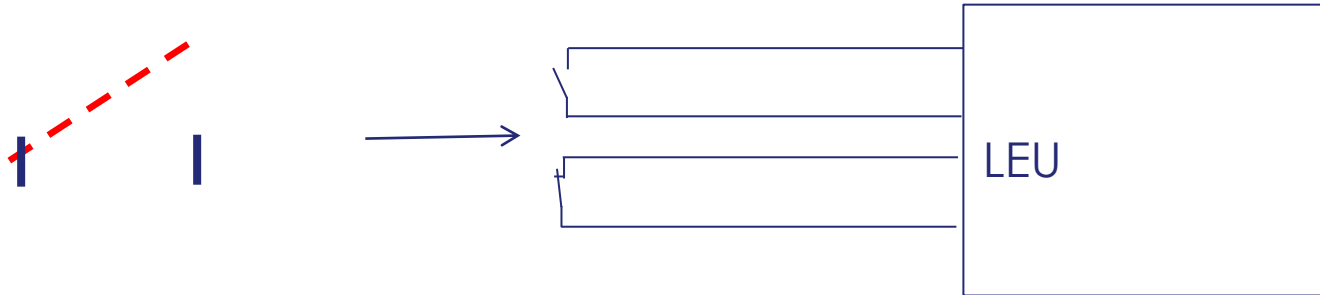> A low impedance of 160 mOhm guarantees no influence to the interlocking.

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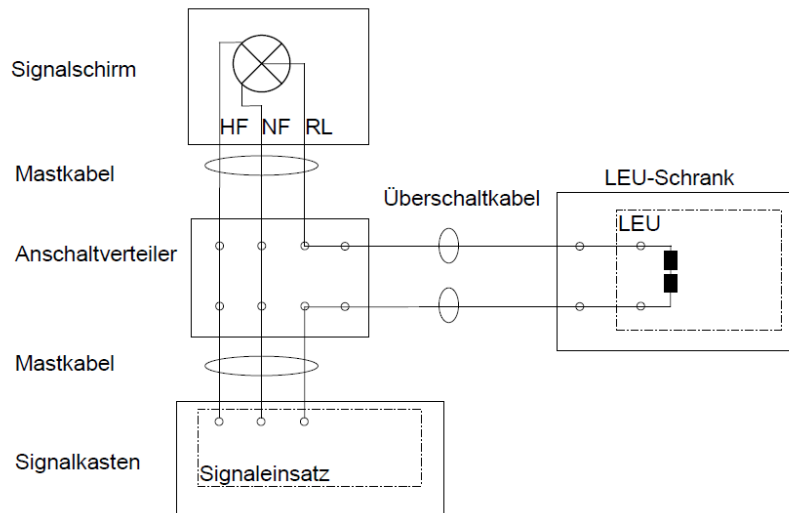
Connections to interlocking via relay contacts

> If it is not allowed to connect to the lamp circuits, it is also possible to get the information via relay contacts as it was done on the Redline in Thailand.

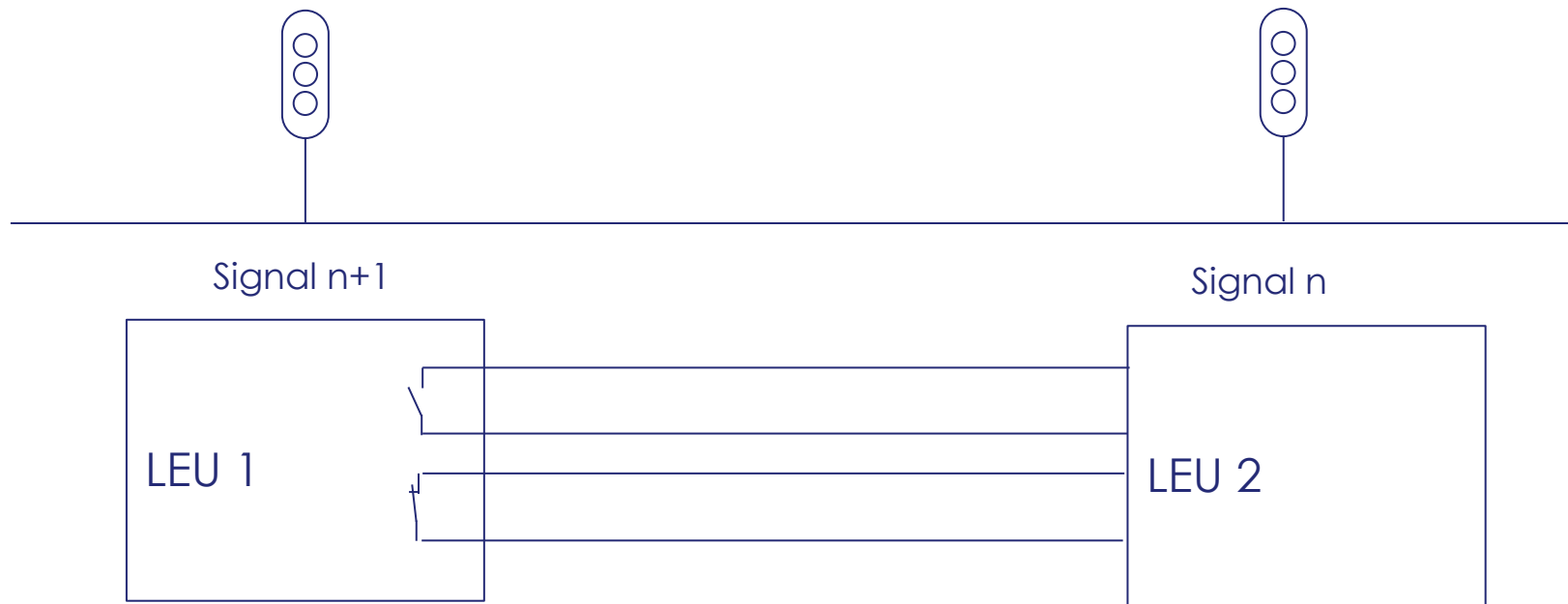> If necessary input can also be read as safe couple.

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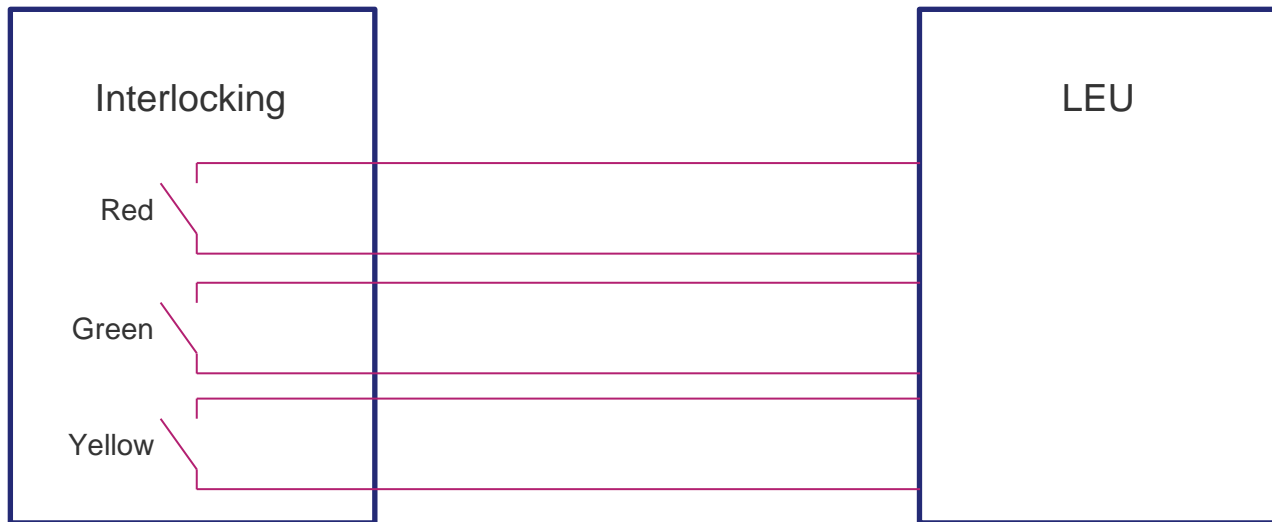
Connections to level crossings

> Status of LC is detected via antivalent pair of relay contacts.

> Open/closed -> Stop in front of LC
> Closed/Open-> LC ok
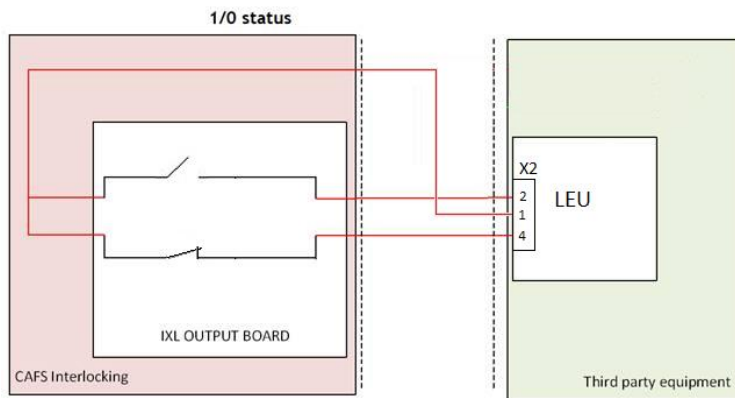> Open/Open, Closed/Closed -> Malfunction

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Interface to Infrastructure

Coupling of LEUs

Signal n+1

Signal n

LEU 1

LEU 2

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Reading switch information

> Reading switch information can be helpful, if the route is not clear from the signal aspect.

> Reading of switch inputs is done in a safe way by antivalent relay contacts.
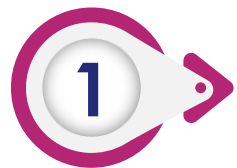

NO1	NC1	
Open	Closed	Switch locked in left position
Closed	Open	Switch locked in right position
Open	Open	Invalid
Closed	Closed	Invalid

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Interface to Infrastructure

Reading semaphore signals

> Due to the flexibility of the LEU even semaphore signals can be connected to the LEU which was done on a project in Singen (Germany).

1. Main signal

2. Distant signal

LEU

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Conclusio

1 | **Future features and functionalities in wide range**

2 | **Worldwide competence in all levels of ETCS**

3 | **Worldwide large reference of ETCS (since 1998)**

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