

THALES

Building a future we can all trust

ETCS L1 for future functions and functionalities ŽSR – THALES

Zilina, 25.04.2023



ETCS L1 Decentralized solution / OLD Version

Decentralized ETCS L1 solution

> Advantages:

- Interlocking type independent
- Low cost

> Disadvantages:

- No diagnosis
- Tricky TSR handling
- Information only from one signal



FlexLEU / New generation 2023 for future features and functionalities

Each FlexLEU consists of
a set of slices

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

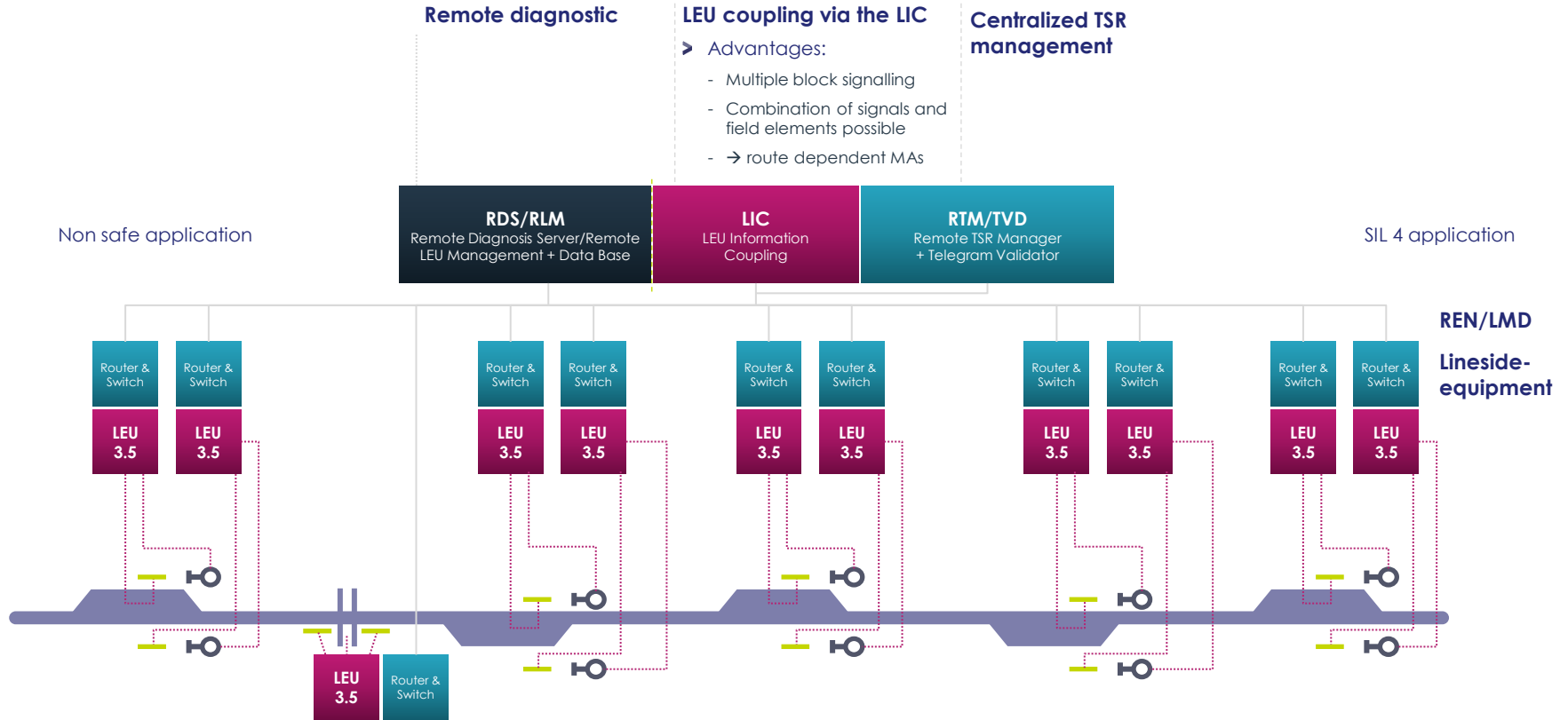
Configure the FlexLEU to exactly your needs!

Slice by Slice to the optimal solution



Steps to Centralization

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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

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

LIC
LEU Information
Coupling

RTM/TVD
Remote TSR Manager
+ Telegram Validator

SIL 4 application

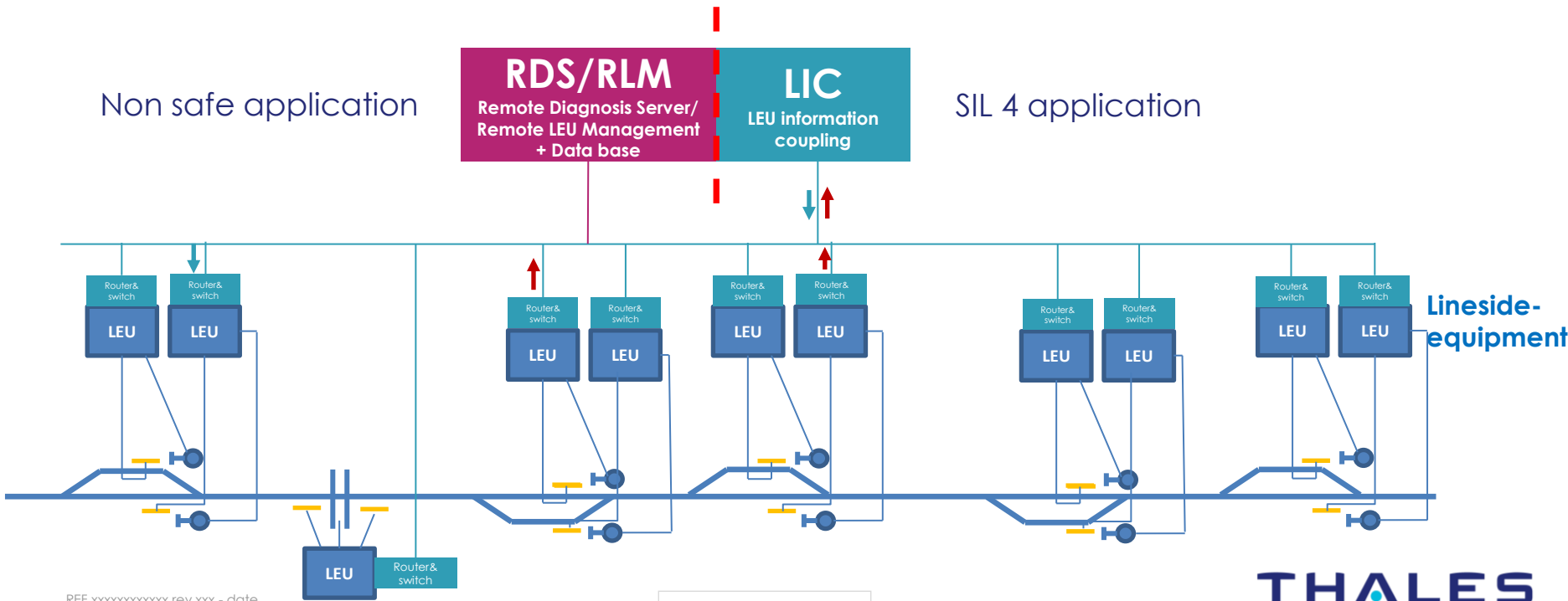
REN/LMD
Lineside-
equipment

LMD - LEU Information Coupling

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

> 3 section MA

Centralized remote diagnosis



FlexLEU - Slices

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

FS-CPU

CPU slice
based on
Thales LFC10
with optional
LTE or GSM-R
support

FS-xC

Balise/Loop
interface
slice

FS-6xCS

Current
sensing slice

FS-6VSS

Voltage
sensing slice

FS-8DI

Digital input
slice

FS-4DO

Digital output
slice

FS-PSU

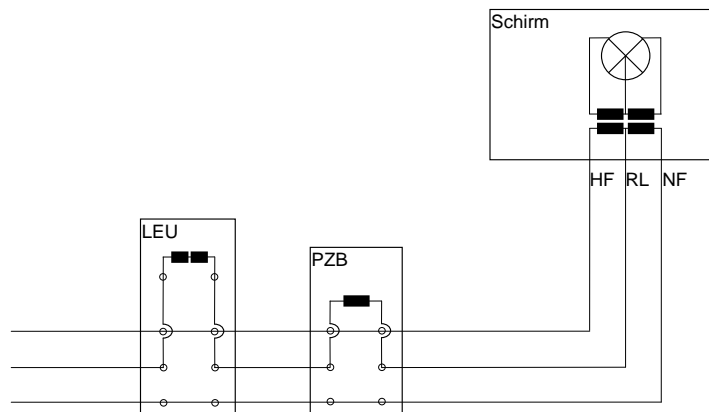
Power Supply
Unit

(110 VAC, 230
VAC, 48 VDC)

Interface to Infrastructure

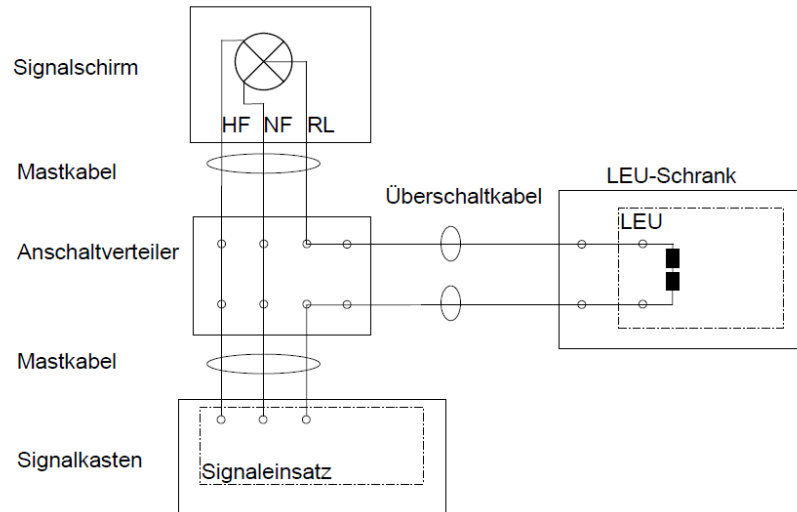
Connections to lamps in primary circuits

- The current of each lamp is lead through the LEU.
- A low impedance of 1 Ohm guarantees no influence to the interlocking.



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.



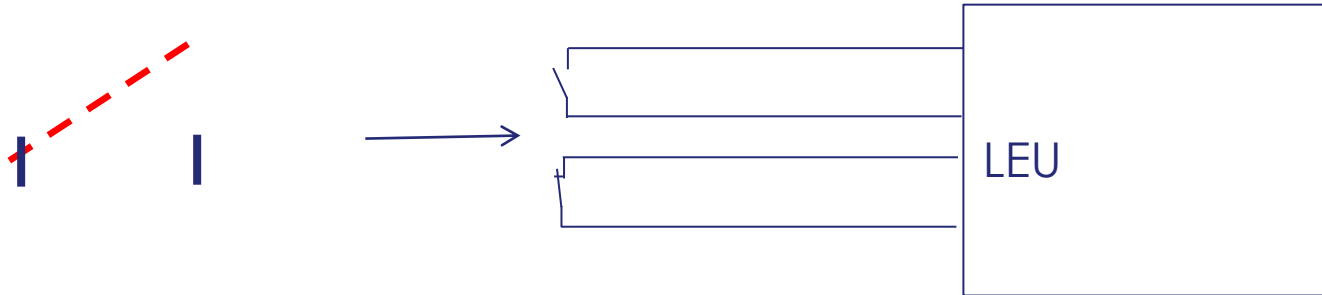
Connections to interlocking via relay contacts

- 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.



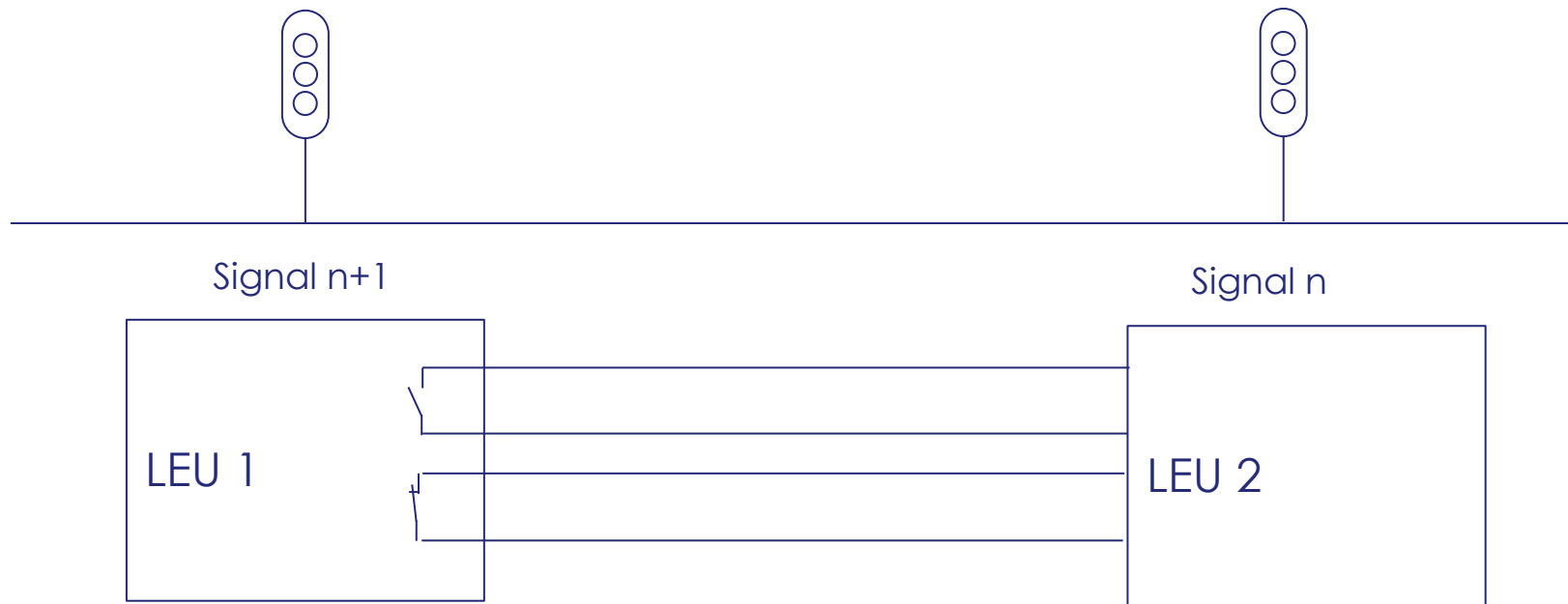
Connections to level crossings

- 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



Interface to Infrastructure

Coupling of LEUs

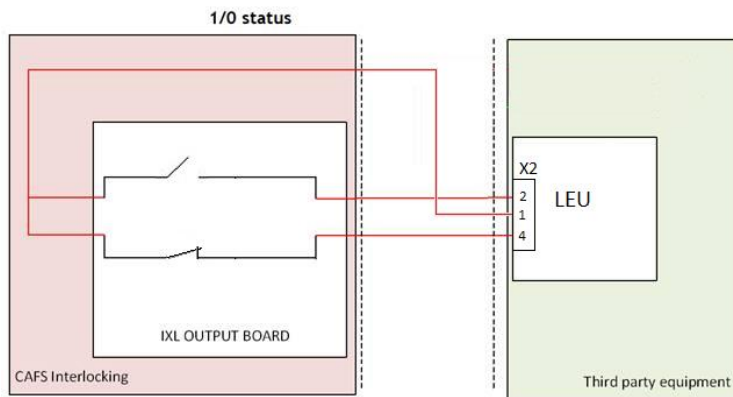


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Interface to Infrastructure

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.



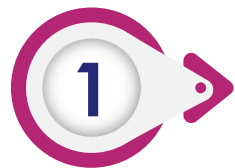
NO1	NC1	
Open	Closed	Switch locked in left position
Closed	Open	Switch locked in right position
Open	Open	Invalid
Closed	Closed	Invalid

Interface to Infrastructure

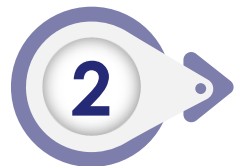
Reading semaphore signals

- 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).





Future features and functionalities in wide range



Worldwide competence in all levels of ETCS



Worldwide large reference of ETCS (since 1998)