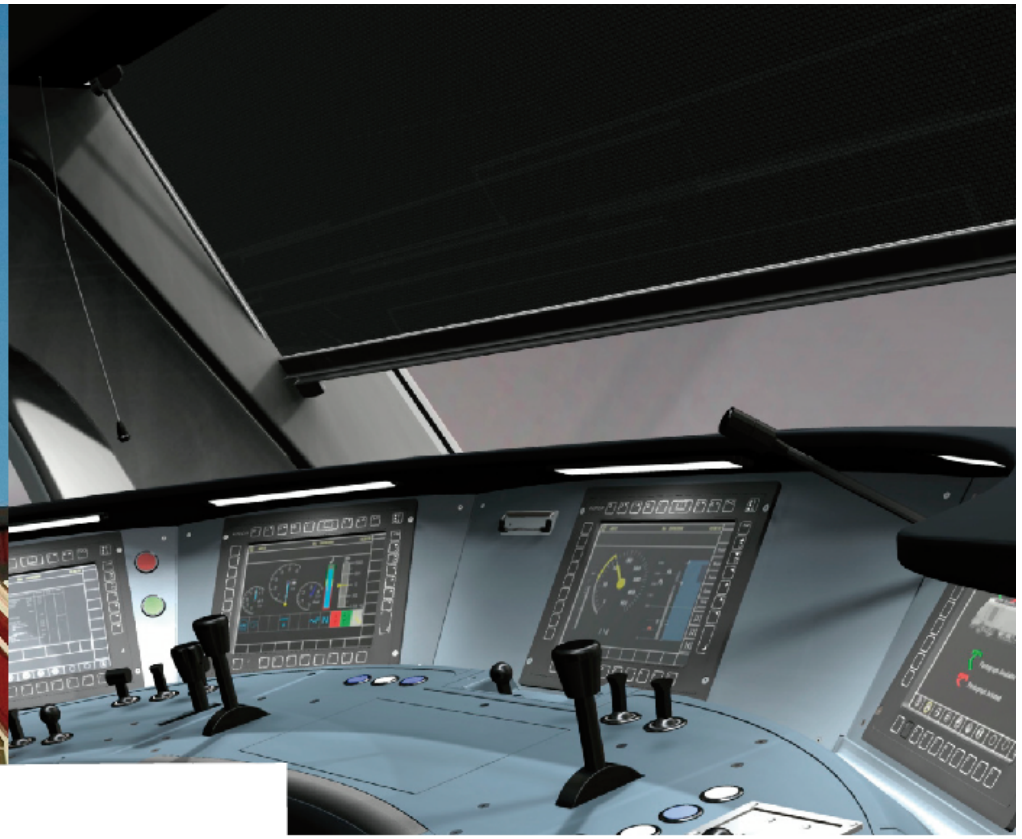

Fjernbane East, Denmark
IRSE

Paul Visser, Project Manager
19th of May, 2016

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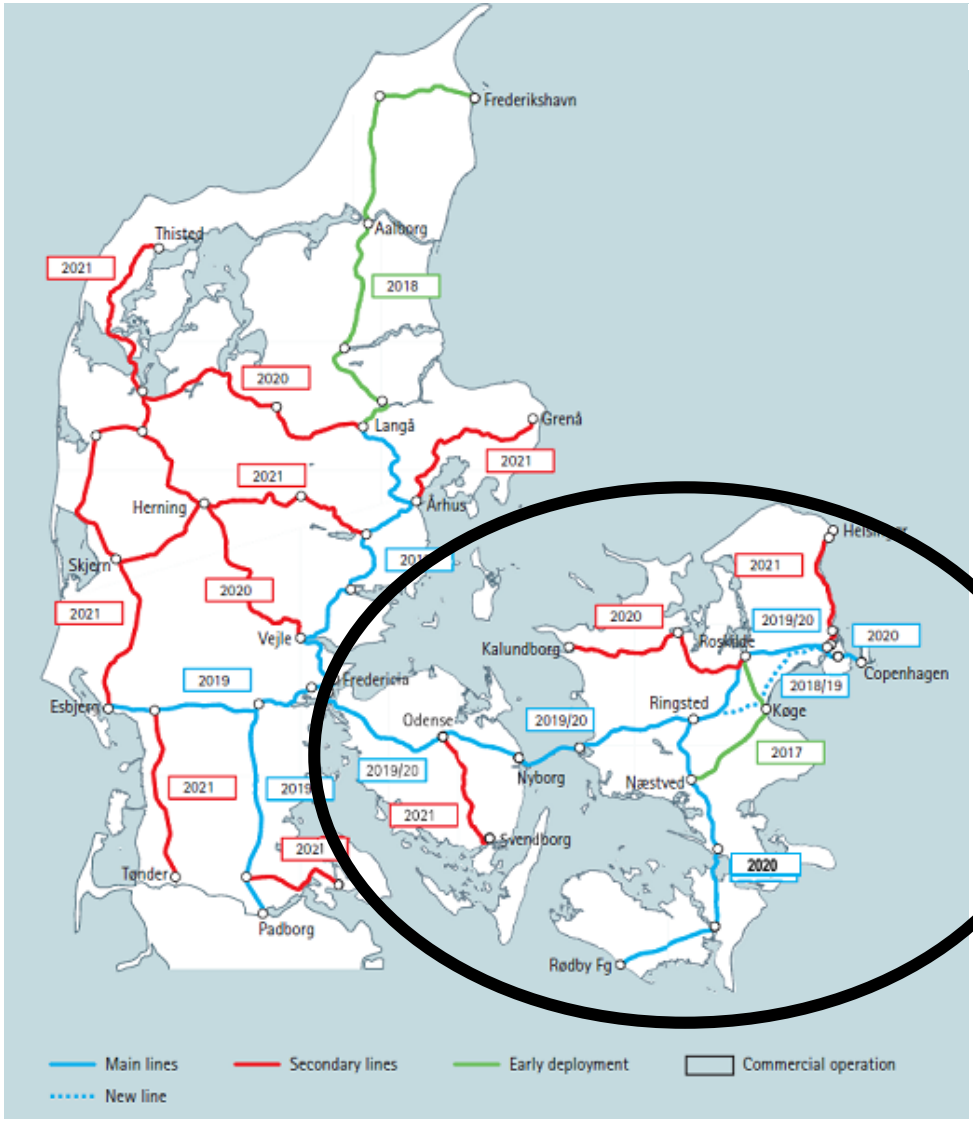
Roll-out plan & Scope for Fjernbane East

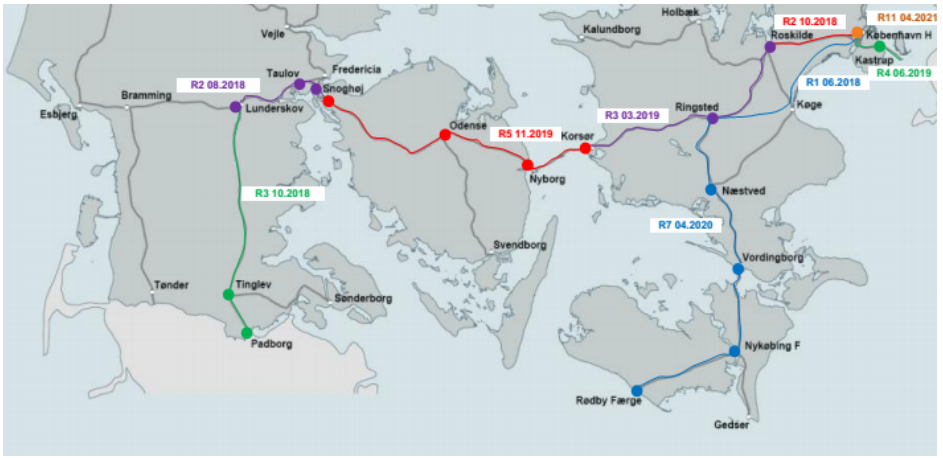


12 lines, 87 stations, 800 km

Replacement of point machine and Level crossing

Renewal of train detection, interlocking, and traffic management system

New F.O.network and ERTMS Level 2



Part of European Corridor B

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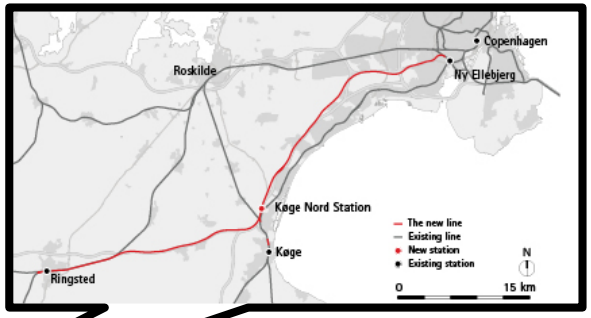
New infrastructure projects

- Copenhagen Ringsted
- Ringsted Fehmarn



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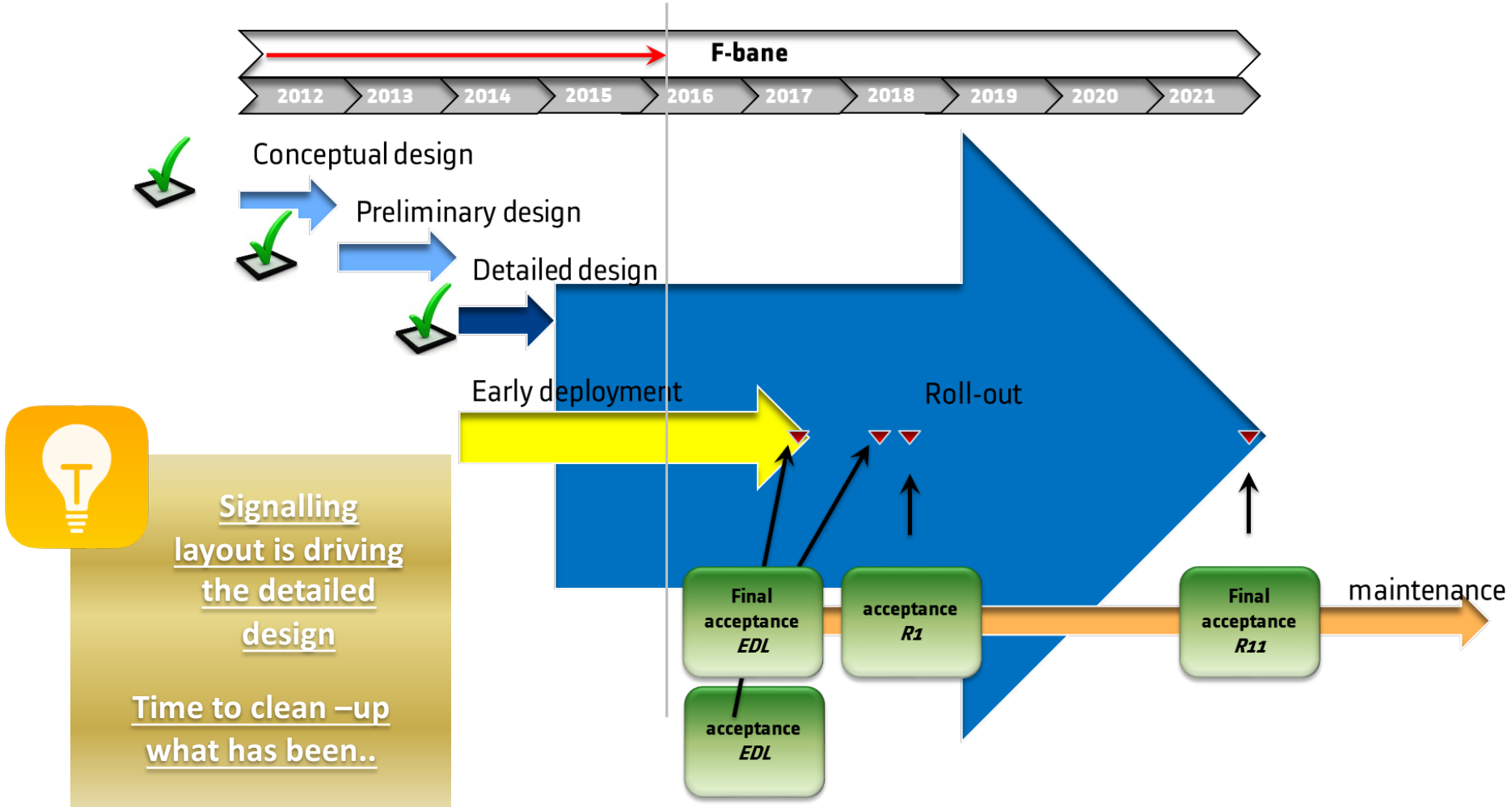
Planning overview Fjernbane East



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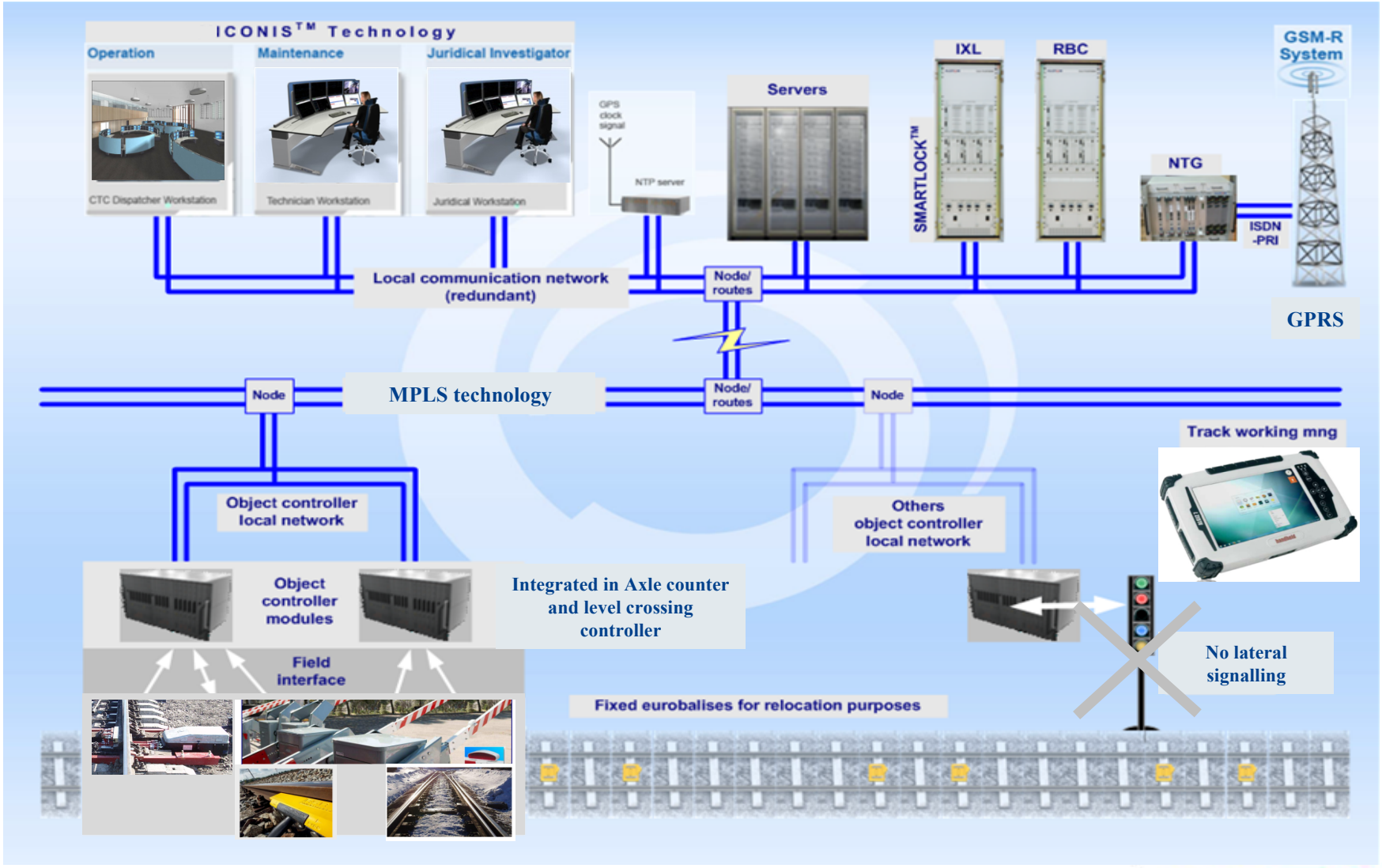
ATLAS 200 : Generic Architecture



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Integration with External Systems

Interfaces are not only for new systems

Non-migrated lines have also interfaces

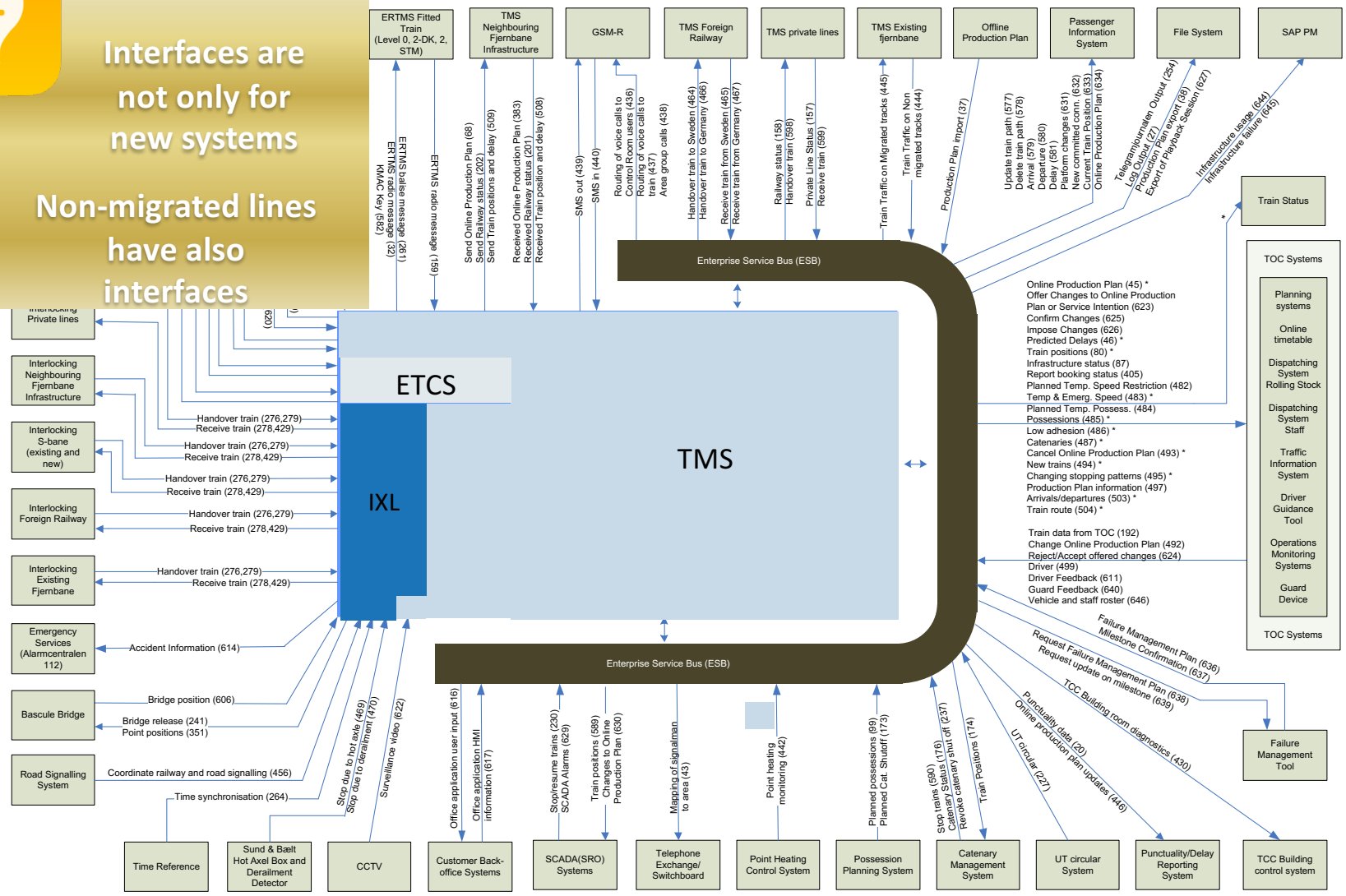

Figure 4. The System's Interface Overview Diagram

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SMARTLOCK – The Interlocking Solution

- SMARTLOCK 400 GP (2003) + Smart IO
- Main Technical object building (5 in total)
- In stations and along the line Satellite Technical Object Buildings
- Fiber optic network
- Point machine: P80 and MET
- Train detection: axle counters
- Level crossings cabinets

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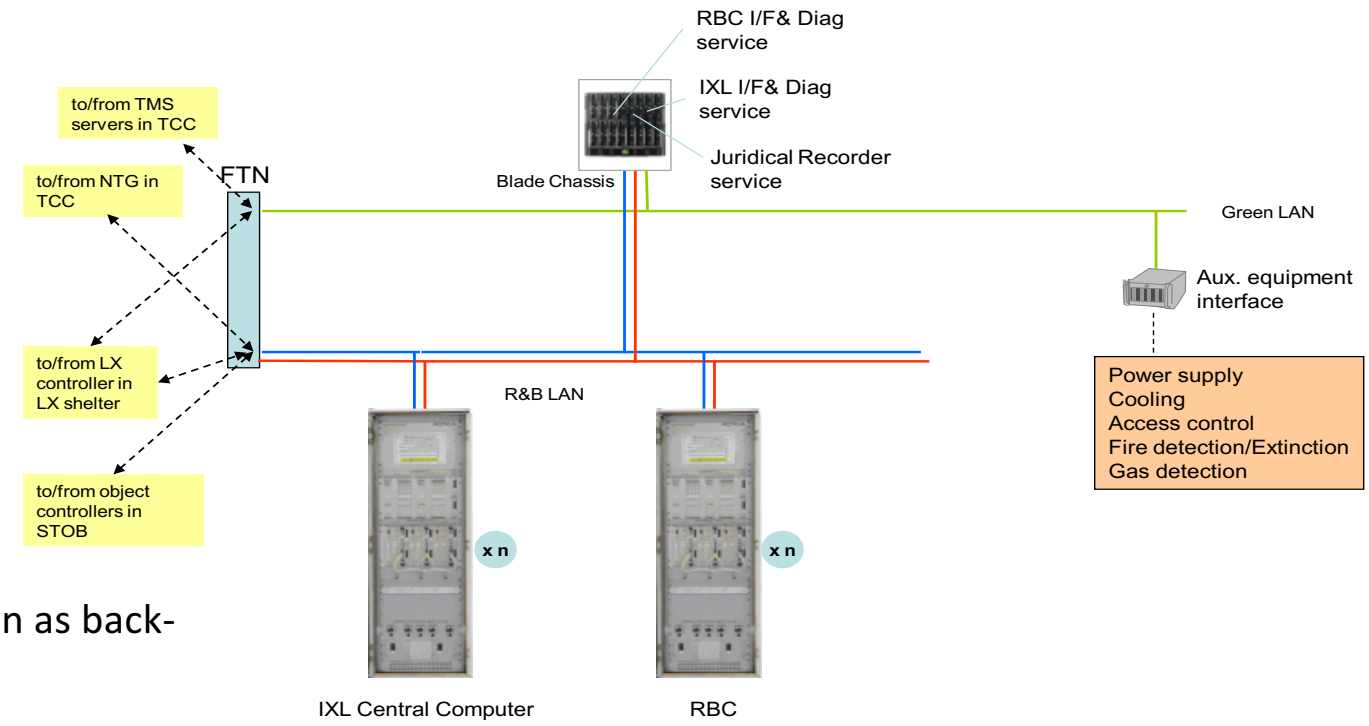
SMARTLOCK – The Interlocking Solution

One MTOB contains the equipment needed to manage one or more roll out lines

1. **Interlocking**
2. **RBC**
3. **TMS Front End**
4. **FTN and ODF**
5. **Aux systems**



A so-called “MAXI Main TOB” is foreseen as back-up in case of fault of another MTOB

This MAXI Main TOB is dimensioned as the most complete of the other TOBs

Power supply system is located into a specific TOB (PTOB)

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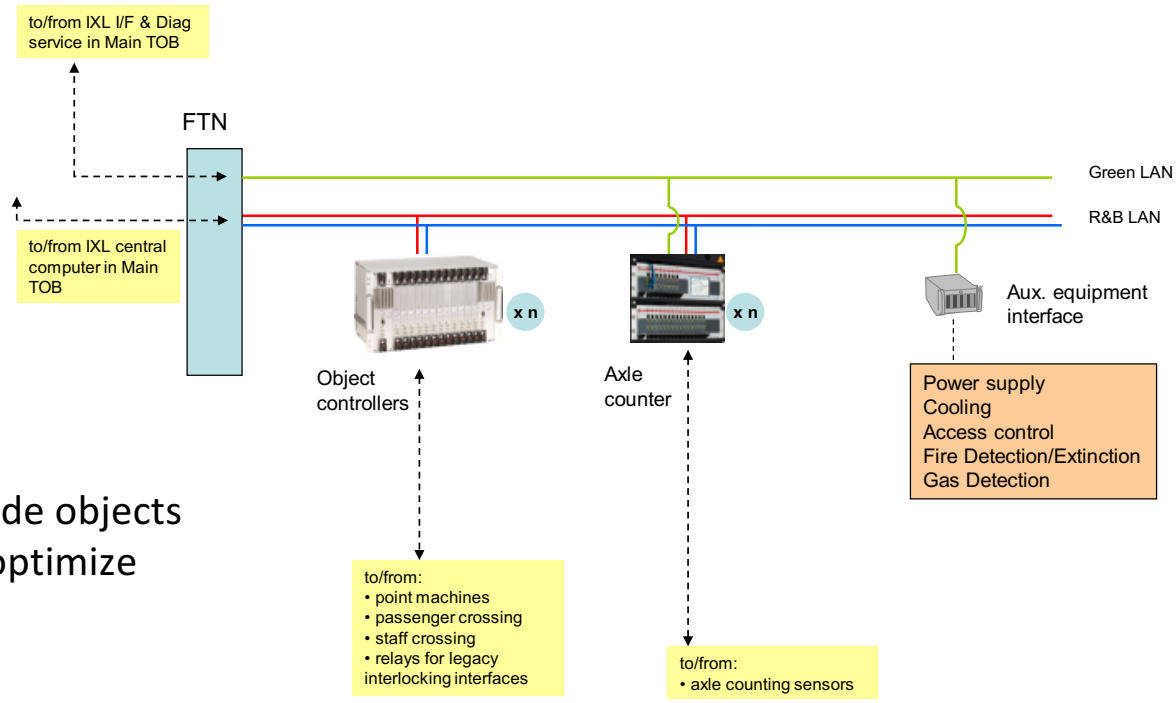
SMARTLOCK – The Interlocking Solution

One STOB for each station

1. **Power supply**
2. **Alstom Object Controllers**
3. **Axle counter**
4. **Relays**
5. **FTN and ODF**
6. **Aux systems**

In case of complex stations, with many trackside objects to be managed, two STOB can be installed to optimize cables layout



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SMARTLOCK – The Interlocking Solution

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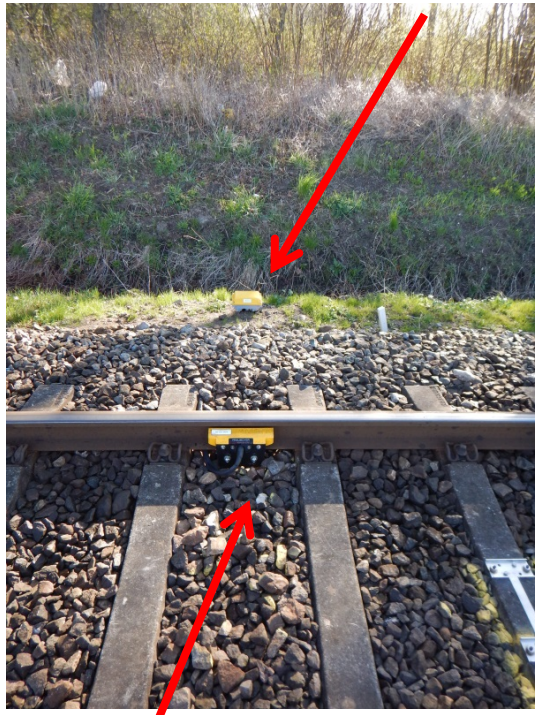
SMARTLOCK – The Interlocking Solution

Cable connection box



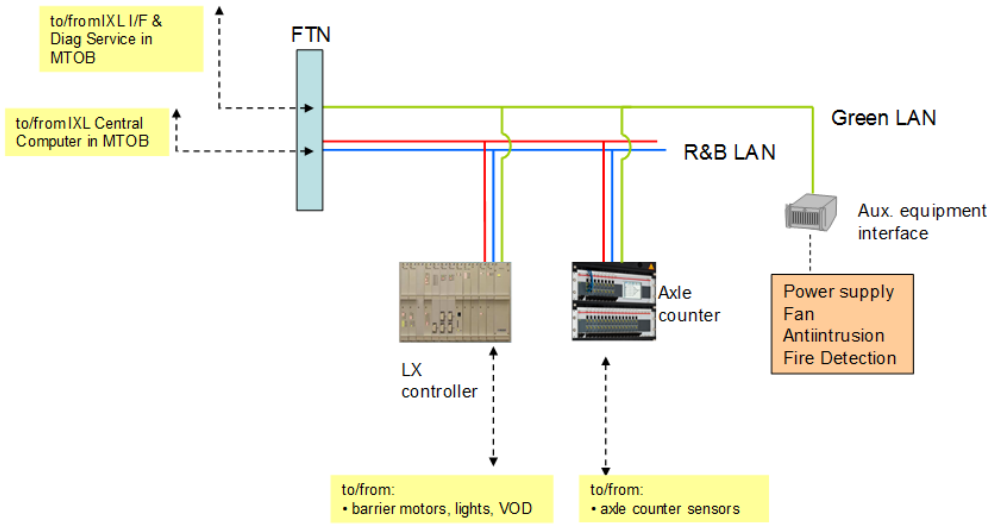
Axle counter head

Cable duct in slope (PCP + foundation)

SMARTLOCK – The Interlocking Solution

One level crossing cabinet for each Level Crossing

1) **Power supply**
2) **Level crossing controller**
3) **Axle counter**
4) **FTN and ODF**
5) **Aux systems**

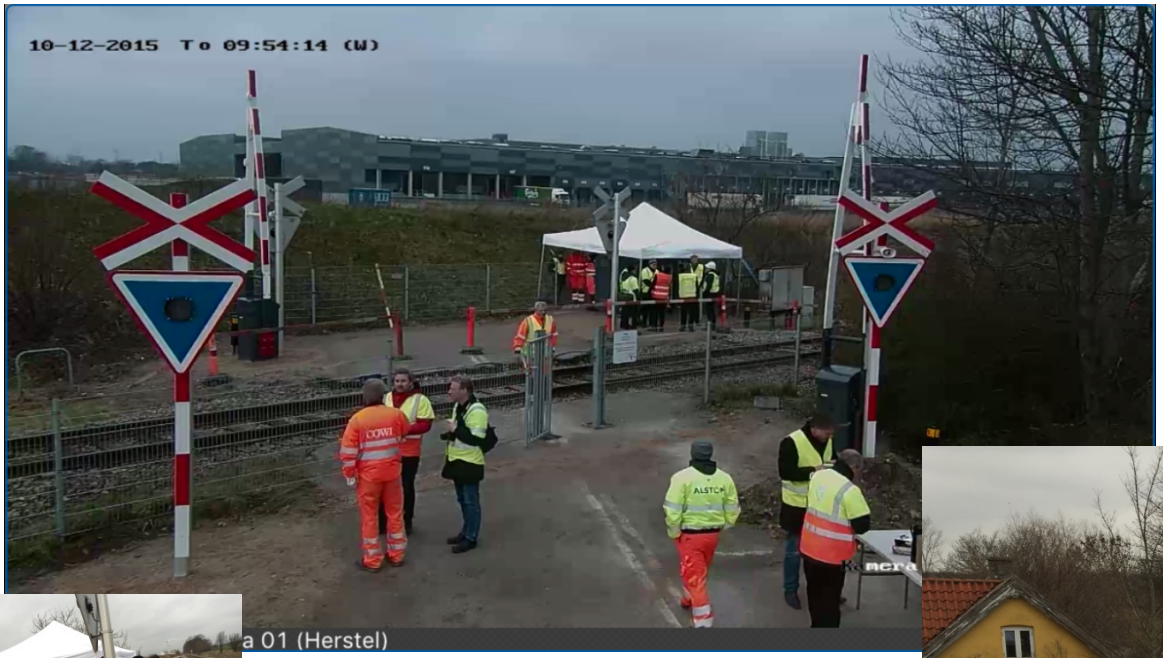


An Axle Counter rack is foreseen because:

Using a Axle Counter permits to lay down cables from the cabinet, so reducing the cables length (i.e. the amount of copper) for AC between the two stations where the level crossing is located

An Axle counter section is read by the level crossing (by a parallel connection), so enabling to deactivate the LX also in cases where the level crossing is fully disconnected by the interlocking

Level Crossing Test Site



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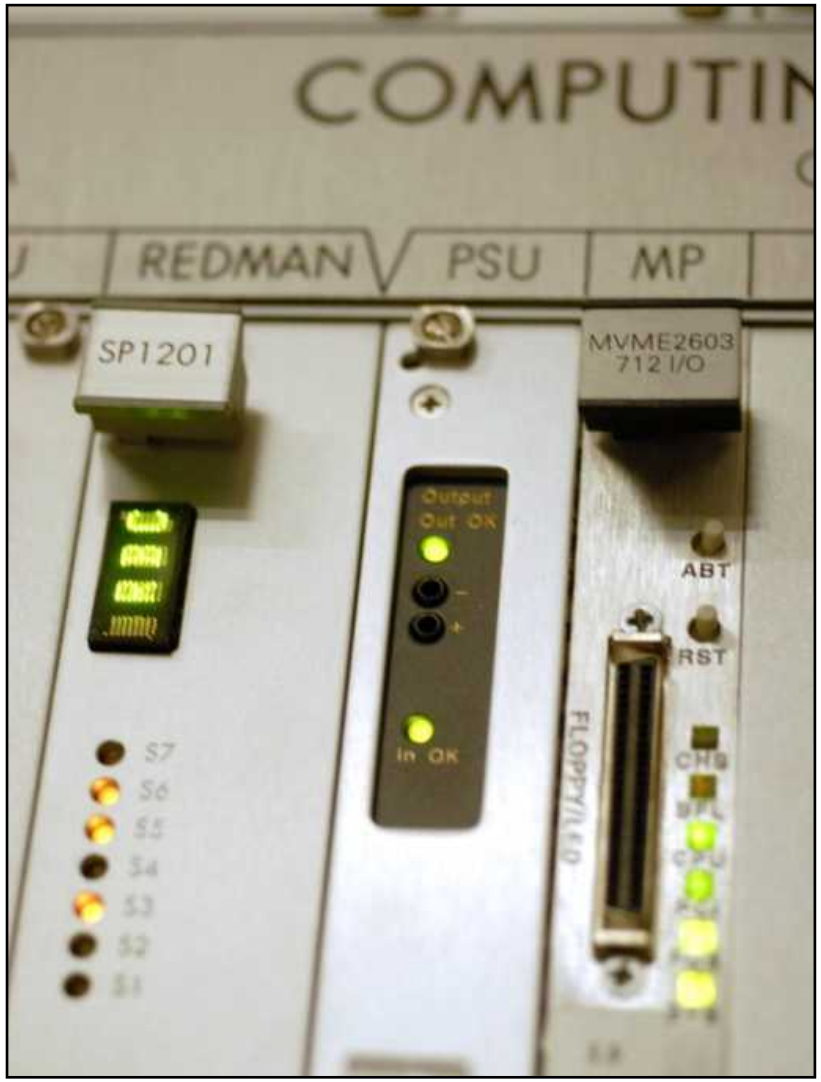
ETCS – The Automatic Train Control Solution

- RBC (2oo3) same hardware as for the interlocking
- ETCS level 2 on conventional and new lines (max line speed 250 kph)
- Compliancy to UNISIG Baseline 3 with Subset 26 Baseline 3.3.0 based on TSI 2012
- Trackside-Train communication based on GPRS technology
- Online Key Management System for secure on-line access control (country wide)



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ETCS – The Automatic Train Control Solution

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ETCS – The Automatic Train Control Solution

- MR test train in the workshop at Fredericia
- APIS (STM operation) based on EGO tests

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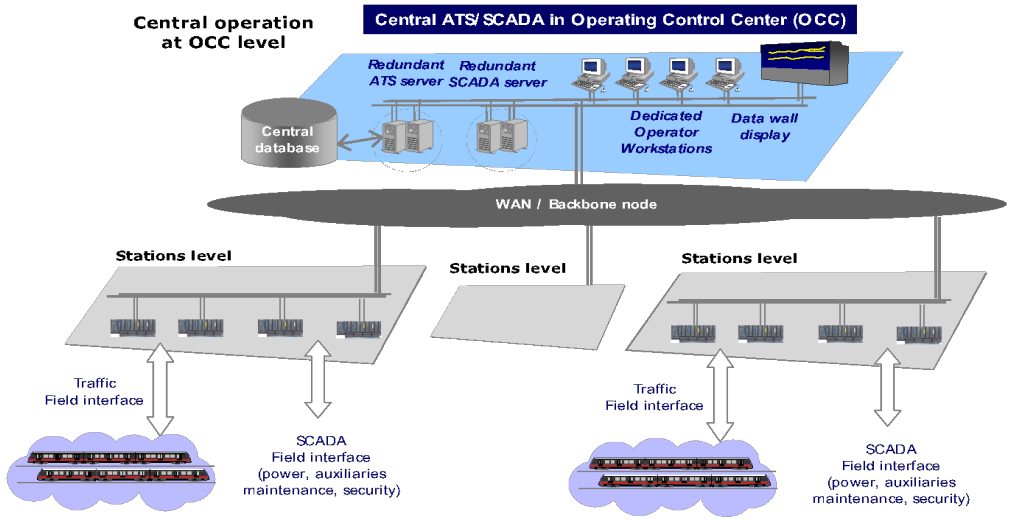
ICONIS – The Traffic Management Solution

- Integrated TMS Solution (modular approach for scalable performances)
- Centralization of traffic management in Denmark will be based on two Traffic Control Centers, one in Copenhagen (East lot) and one in Fredericia (West lot).
- Deliver of advanced functions (Decision Support System, DSS) country wide implementation
  - Late booking or changes to booking
  - Conflict detection and resolution
  - Service intentions
- Delivery offline scheduler (country wide implementation)
- Human factor studies performed by the supplier
- Hand held terminal to support maintenance operation



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TMS Subsystem – Design Guidelines

Level 1 functions - basics:

1. Interface
   Centre (
2. Controls
3. Train trac
4. Automat
5. Alarm an
6. Logging
7. Playback
8. CTC HMI

Level 2 functions - regulation:

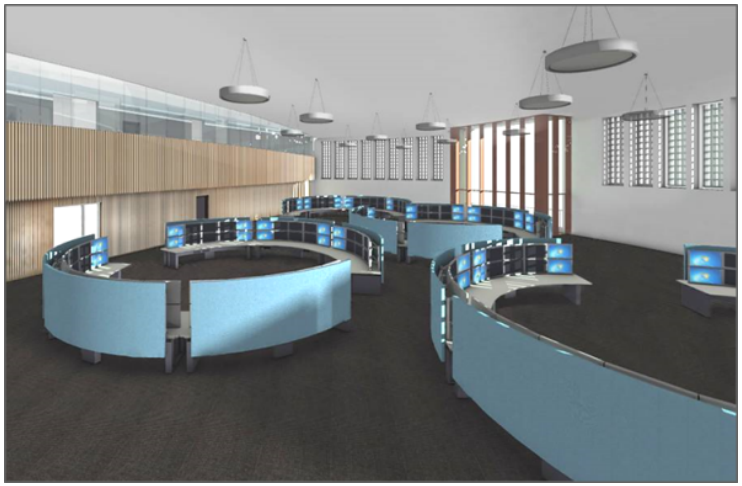
- Territor
- Posses
- Shuntir
- Speed
- Level C
- UT/UN
- Time D
- Platfor

Level 3 functions – supervision and optimization:

- Task Management
- Remedy plan
- Service Intentions
- Route Selection Interface
- Conflict Detection and Solution

Local approach
&
Global approach

TMS Subsystem – Design Guidelines



Human factor analysis:

- Lightings, acoustics, ergonomics aspects
- operation
- Joint analysis

TCC

- 3D Workplace and Layout Design CAD Specifications (input to workplace prototype)
- Workload Analysis of O&M Coordinator (using RAMs data & TMS HMI timings)
- Low Fidelity Mock-up
- High Fidelity mockup

Field

- Usability testing of TMS and HHT HMIs
- HMI design assisted by HF support

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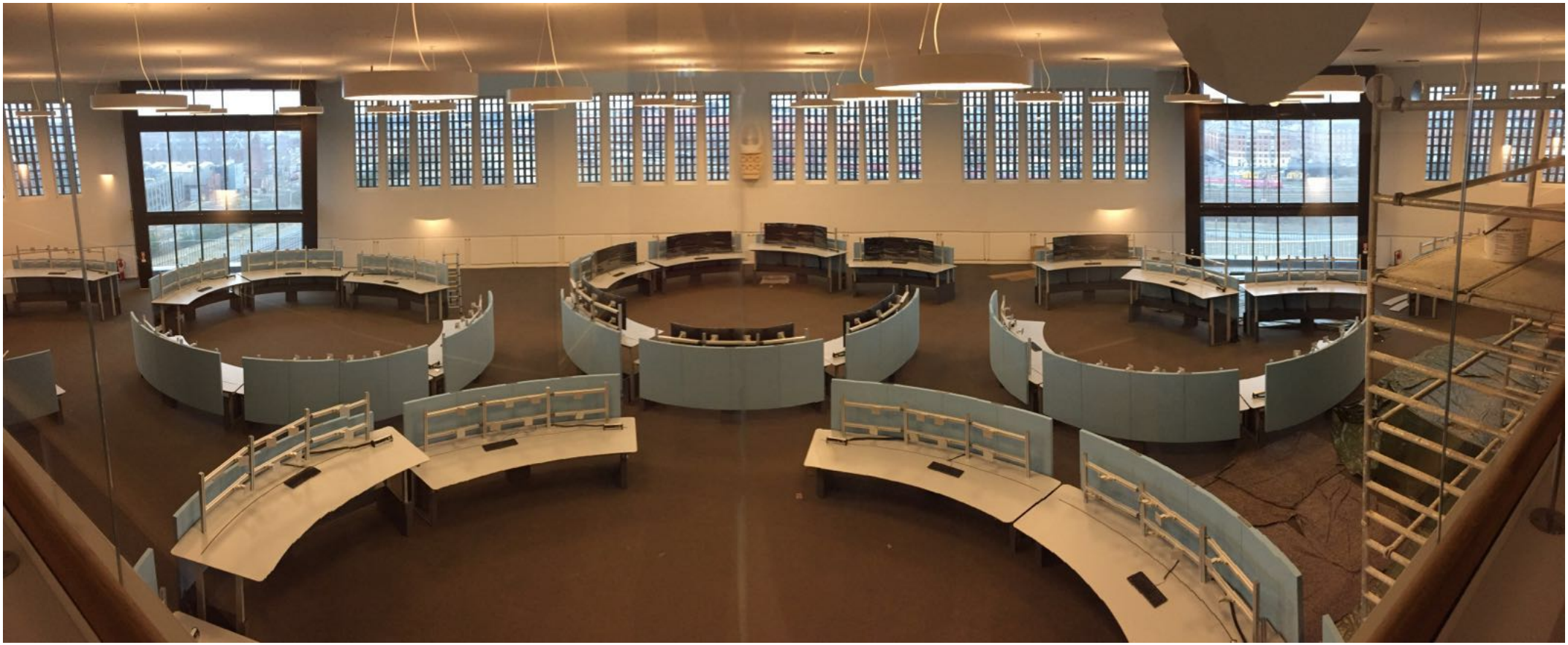
TMS Subsystem – Design Guidelines



ETCS: new technologies

- Baseline 3
  - Internet over GPRS, online key management: we have developed the functions but it is not frozen in ETCS standard therefore it will be a Danish standard (valid until ERTMS standards will be available) - User Group and ERA are analyzing the Danish solution
  - RBC handover is now implemented as a Danish standard
  - Maintenance release strategy for Denmark is now being defined
  - Onboard specific modification for DMI, STM interface, braking curves, version management, remote maintenance
- GPRS:
  - Internet over GPRS, no more limitations in number of connections
  - Larger bandwidth, number of trains connected increased
  - GPRS for all Danish network (roadmap) aligned with planning of the signalling also for EDL. Currently under test in the JTL

ETCS: new technologies for trackside

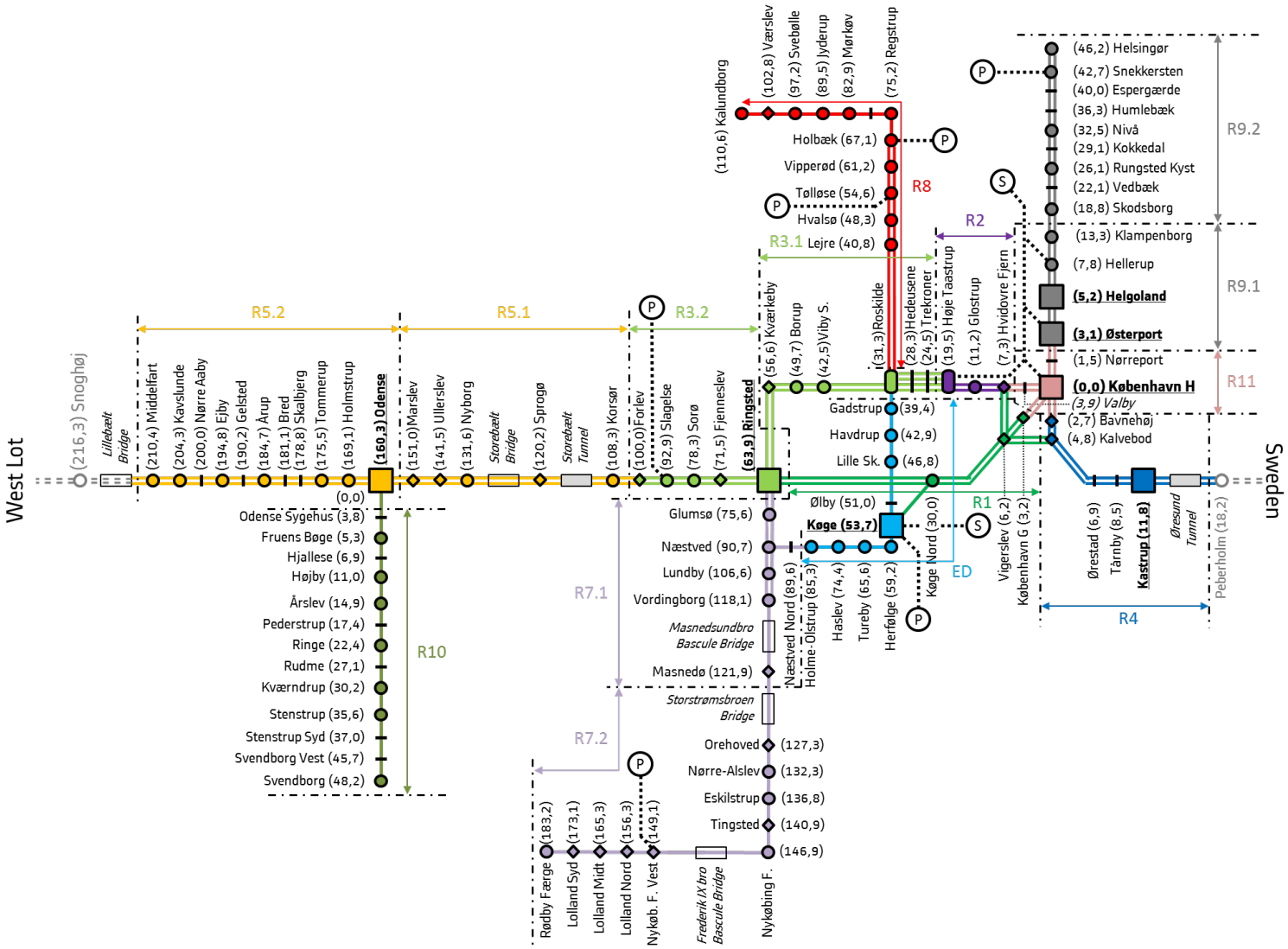
- Level crossing, opening and closing of barriers (traffic management system in combination with RBC and interlocking and EVC)
- Passenger warning and staff crossing announcement from RBC
- Emergency stop (traffic management system in combination with RBC and interlocking)
  - Area
  - In vicinity of another train
- Online key management (dynamic replacement of keys)
  - Management of Transport key (KTRANS) is a specific Danish function and it can also be changed dynamically

Migration strategy : Changeover schematic overview

It is not technology !

It’s the procedure to switch between day and night mode which is key

Migration strategy: Roll-out concept (transitions)



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Thank you for your attention

paul.visser@alstom.com

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