Annex 1: Presentations

1. General Introduction
2. Procurement Strategy and System Integration
3. Transport System
4. Rolling Stock
5. Infrastructure

1.

Market Consultation ERTMS

General Introduction

July 9th, 2015

Wim Fabries
Programme Director ERTMS Netherlands

-Confidential-

Programme today

14.15 - 14.45	• Current status of the ERTMS programme • Procedure market consultation
14.45 - 15.00	Questions
15.00 - 17.00	• Briefing Procurement strategy and system integration • Briefing Transport system • Briefing Rolling stock • Briefing Infrastructure
16.45 - 18.00	Drinks

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Current status of the ERTMS programme

ERTMS rollout

Preference decision (April 2014):

- € 2.57 billion until 2028
- Start with refurbishment of rolling stock (ready 2022)
- Rollout of infrastructure: ERTMS Level 2 only (proven technology)

ERTMS routes:

- EU mandatory 2020 (Amsterdam-Betuweroute and Kijfhoek-Belgium)
- OV SAAL-corridor 2023
- EU mandatory 2030 (TEN-T)
- As many High Frequency Rail Transport Programme (PHS) lines as possible
- Connecting existing ERTMS lines
- Optimalisation of current replacement strategy

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Challenges (with relevance for today)

- Brownfield project in signalling is new:
  - Consequences during first days of operation
- Interoperability: different levels in different countries:
  - Consequences for cross-border operators
- System integration (technical and operational)
- STM and level-playing field
- Procurement and contracting strategy: how to challenge the market
- New technologies versus stable scope
- Level 2 and GSM-R at large stations/nodes
- Interfaces with old system (ATB) and ERTMS
- Knowledge and availability of personnel

Update: what are we working on? (1)

General

- Procurement strategy and project decisions
- Market consultations
- Stakeholder management
- Foreign contacts
- Website (ready): www.ertms-nl.nl

Transport system

- Operational framework for ERTMS
- System requirements i.e. capacity, safety, RAMS
- Managing all requirements in a database
- Further detailing of Rollout strategy
- Monitoring tool; measuring to what extent we achieve our targets
- Specifying first rollout

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Update: what are we working on? (2)

Infrastructure

- Elaborating frameworks for system architecture, maintenance, management and monitoring
- Elaborating specifications including user-processes
- Elaborating the Design Process and Data management
- First sessions in preparation for the realisation of Kijfhoek – Belgian border.

Rolling stock

- Setting up requirements for OBU/STM etc and refurbishment process
- Preparation of transport and maintenance organisation, including elaboration of user-processes
- Studying what requirements to set for system and processes, which are realistic for the market

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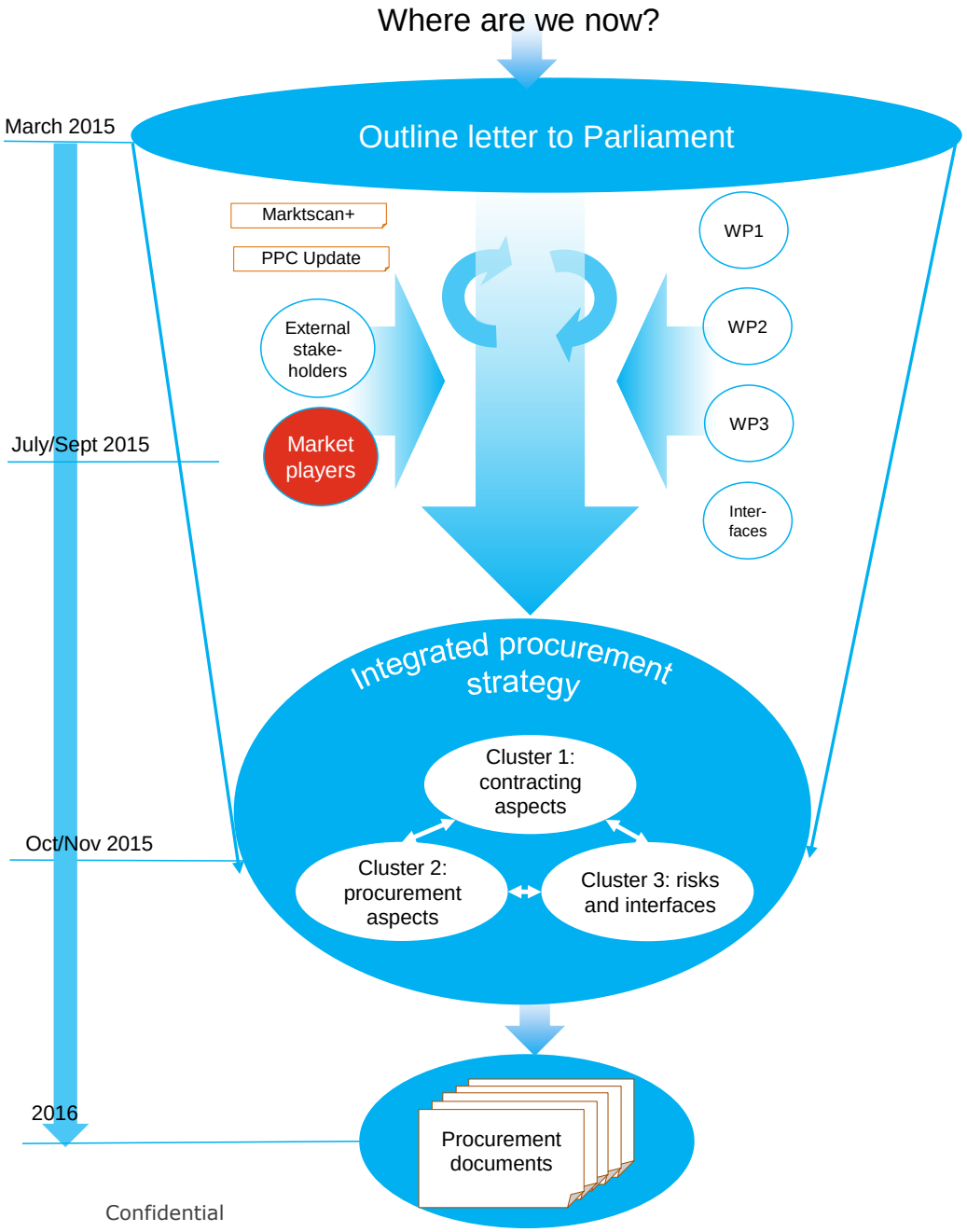

Procurement strategy

- March 2015:
  outline strategy
- July-September 2015:
  market consultation
- End 2015:
  integrated procurement strategy (go/no-go)
- 2016:
  programme decisions (go/no-go) + start tenders
- 2017 onwards:
  implementation phase

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Market consultation today

ERTMS market consultation

- Market consultation is key moment for the programme
- Objective is twofold:
  1. to inform the market about where the programme stands
  2. to validate assumptions and provide deeper insights on certain aspects
- Programme has developed a market consultation document with questions on key themes
- Programme will select organisations to invite for 1-to-1 sessions
- 1-to-1 sessions to discuss your answers and broaden insights
- Input from market consultation will be used to further develop our strategy and implementation plans

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Structure of the consultation

Five key themes:

- Procurement strategy
- System Integration
- Transport system
- Rolling stock
- Infrastructure

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Market consultation planning

Date	Activity
July 9th	• Kick off meeting • Distribution market consultation document (*Dutch*)
August 17th	Deadline for responses to questions Procurement strategy, System Integration and Rolling stock
August 24th	Invitations for 1-to-1 sessions
August 31th	Deadline for responses to questions Transport system and Infrastructure
September 14th	Invitations for 1-to-1 sessions
October 9th	Final 1-to-1 sessions

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Room allocation

Presentation	Location
Procurement strategy and system integration	Auditorium
Rolling stock	Skytheater
Transport system	Break-out room 2
Infrastructure	Break-out room 3

Thank you for your attention

marktconsultaties@ERTMS-nl.nl

2.

Market Consultation ERTMS

Briefing: Procurement Strategy and System Integration

July 9th, 2015

-confidential-

Eric Mink
Programme office

Xaf Utberg
System Integrator

Agenda

1. Introduction
2. Procurement strategy
3. System Integration

1. Introduction

Eric Mink
Programme office

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2. Procurement Strategy

State of play according to last market consultation meeting 9th April

- Procurement objectives
- Procurement scope
- Towards three scenarios
- Challenges for procurement

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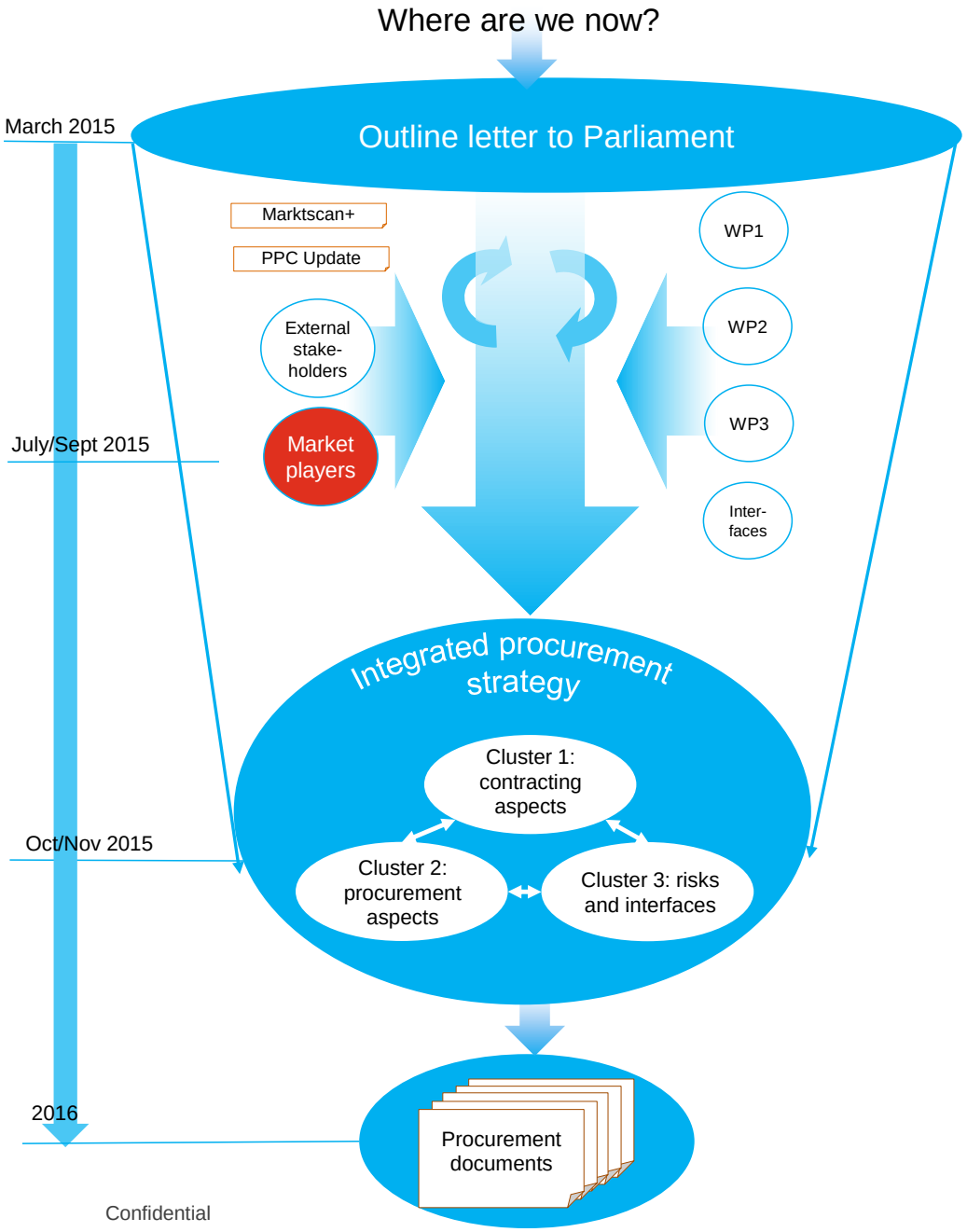
Documents on Procurement Strategy

1. Internal, confidential Strategy Document for ERTMS Programme, with all research/assessments (MarketscanPlus, PPC update, legal assessments, market consultation, etc)
2. Public document outlining all research (and options/scenarios) for the Tendering Strategy, “Railway Map 4.0”
3. Government Decision via letter to Parliament explaining (choices made for the) strategy



Procurement strategy

- March 2015: outline strategy
- July-September 2015: market consultation
- End 2015: integrated procurement strategy (go/no-go)
- 2016: programme decisions (go/no-go) + start tenders
- 2017 onwards: implementation phase

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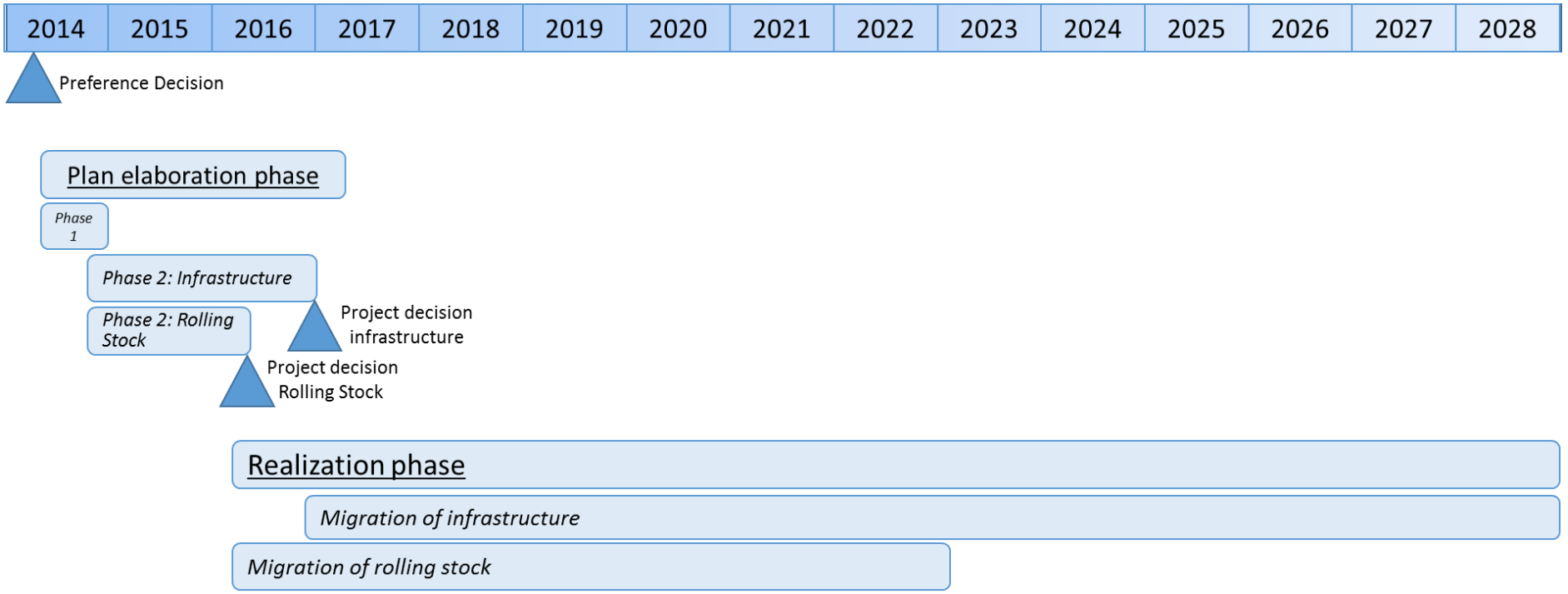
Procurement scope in time



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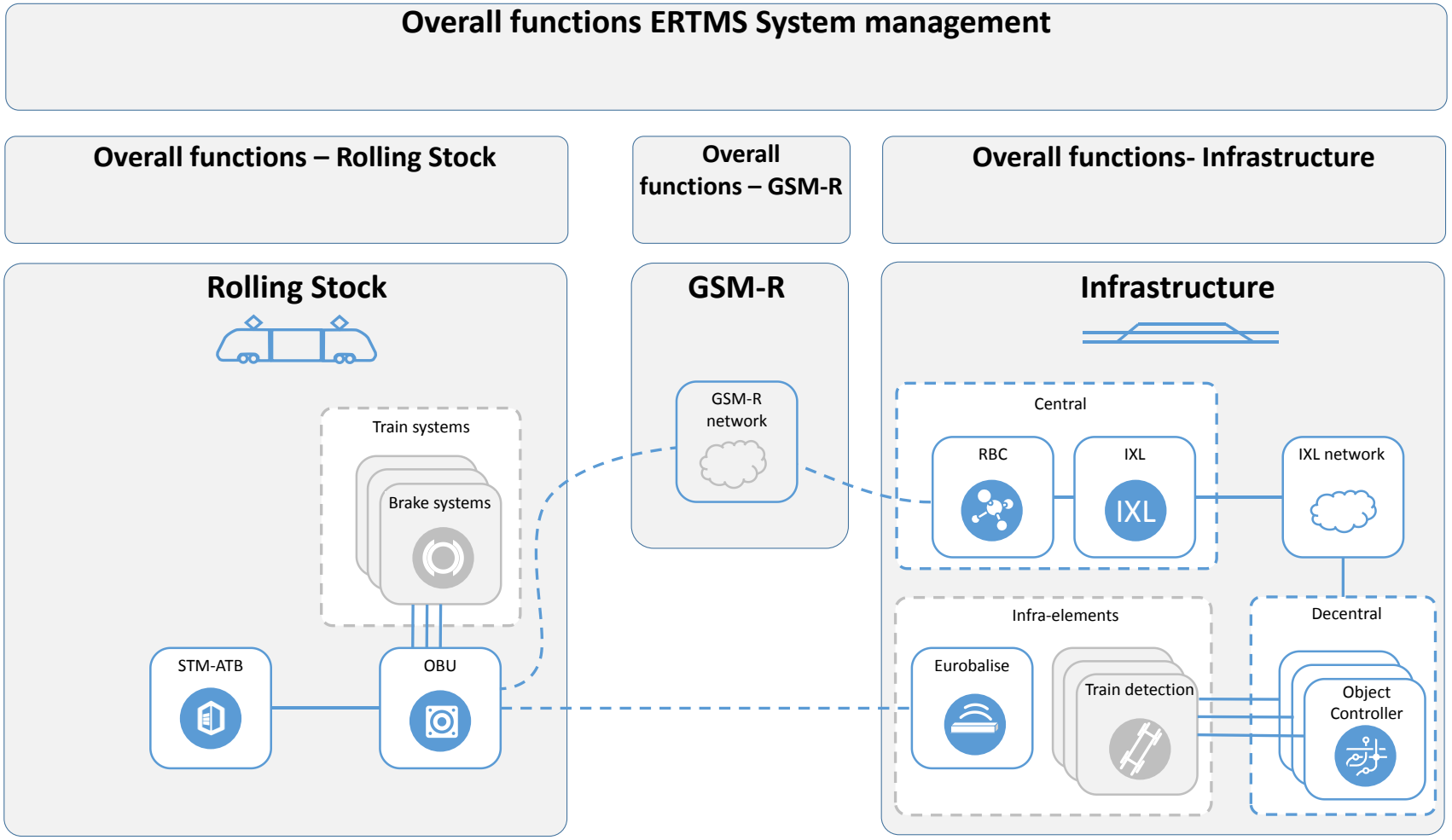
Procurement scope in functionality



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Procurement objectives

- Value-for-money
- Continuity
- System integration, manageability and reliability
- Sustainable market

(detailed description in consultation document)

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MarketscanPlus

- Two objectives:
  1. Data analysis of the signalling market;
  2. Analysis and interpretation of the market data for advice on potential procurement strategy
- Currently finalisation report
- Synthesis of the results to be presented with the Procurement Strategy
- The programme has used these results, together with other considerations, to develop three scenarios, each with 5 contracting options

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Three procurement scenarios

- The programme has defined three outline scenarios for discussion
  - Scenario A (D+B+M)
  - Scenario B (DBM)
  - Scenario C (DBM + joint cooperation agreement)

- All scenarios have separate functional scope, operational rules, infrastructure and rolling stock
- GSM-R is out of scope
- Limited or no private funding (F)
- Incentives
- Several contracting sub-options for each scenario

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Scenario A

- Objective is to make optimal use of experience with D+B+M contracts in sector
- Separate tendering procedures and contracts for:
  - Design (D)
  - Build (B)
  - Maintenance (M)
- Each contract to have incentives for optimal performance
- Integration between contracts to be secured through framework of cooperation

Scenario B

- Objective is to minimize number of interfaces between principal and contractor(s)
- Maximum competitiveness up front; design freedom for contractors
- Integral DBM (design, build, maintenance) contracted to a single contractor/consortium
- To include incentives on integral performance of subsystem
- Integration between contracts to be secured through framework of cooperation

Scenario C

- Objective is to focus on integral working system through partnership and cooperation
- (Cross)-connecting partners in the sector and partners in the market
- Integral DBM contracts with incentive on cooperation, integral working system and performing subsystems
- Integration between contracts through framework of cooperation
- Includes cooperation incentives in a joint cooperation agreement

Contracting models for each scenario

1. **All in 1:** Functional scope infrastructure/rolling stock as a whole in a single contract
2. **Lead-challenger:** Two contracts. Contracting based on ranking of bidders; bidder with highest score gets largest contract; smaller contract for runner up with option to step in
3. **Equal volume:** Two/three contracts of equal volume to two or three contractors
4. **Base contract with option to expand**: Two tranches. First tranche consists of two contracts, granted to two bidders. Best performing contractor gets the last tranche (single contract)
5. **Framework agreement** granted to several bidders via tendering procedure. (Substantial) contracts for train types/infra corridors granted via mini-tenders within framework agreement

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Procurement themes 1-on-1 sessions

- Advantages/disadvantages of each scenario
- Methods for sustainable competition, cooperation and integration
- Your opinion on the different contracting models
- Optimum contract size
- Optimum contract duration
- Risk allocation (principal-contractor)
- Incentives

Challenges for procurement

How to deal with...

- Accommodation of technological advancements during programme: maturity level 2 vs. developments level 3
- Market lock-in effects
- Determination of optimum contract size
- Managing a large, complex and long-running programme?
- System integration in brown field context
- System integration across track and train

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Next steps for procurement

- Third progress report (September 2015)
- Results ERTMS pilot Amsterdam-Utrecht (summer 2015)
- Market consultation (July/ October 2015)
- Integrated procurement strategy (December 2015)
- Programme decisions + start tenders (2016)
- Implementation phase (2017 onwards)

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Questionnaire Procurement Strategy

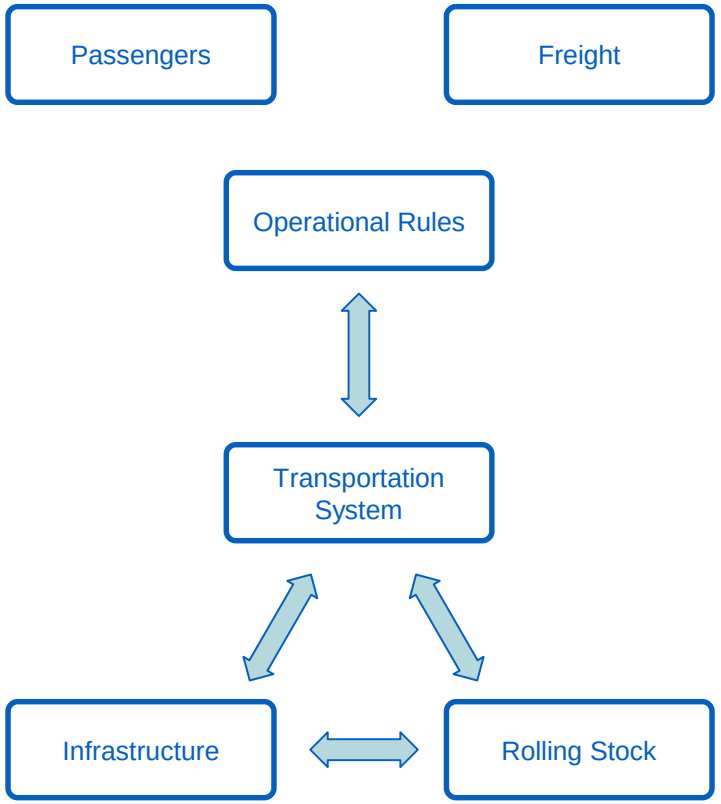
- Our questions can be found at the end of this presentation

3. System Integration

Xaf Utberg
System Integrator

System Integration to ensure services for our customers

Iceberg



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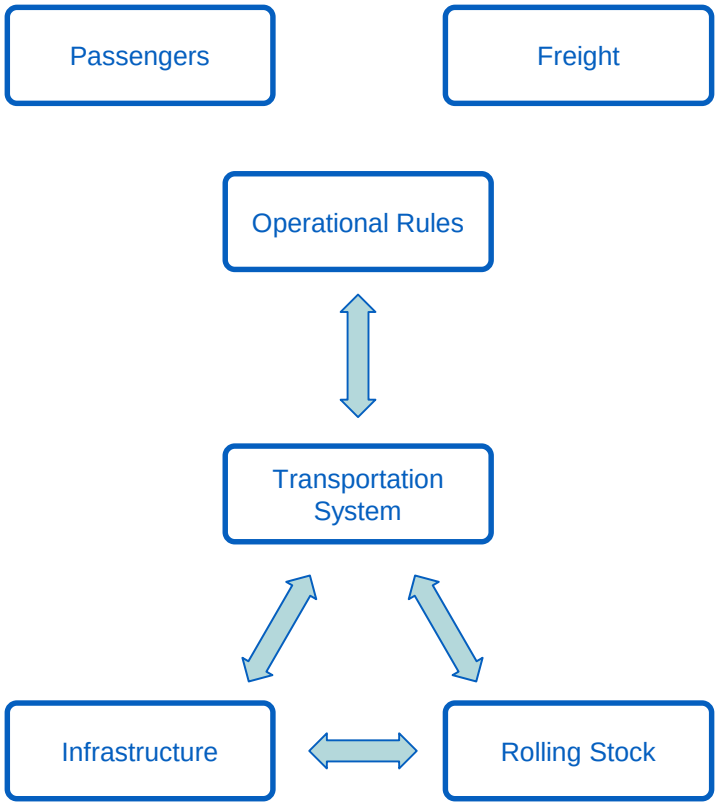
System Integration is about cooperation and mutual respect



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System Integration

- National and international experience shows system integration is key for a succesful implementation
- Unsuccessful integration emerge as technical and operational misfits but are born from poor organisational, cultural and communication aspects
- New systems in brownfield environment, interfacing with legacy systems
- Train-track integration is important but also seamless integration in trains and track-side infrastructure
- Traffic control procedures working seamlessly, without inconvenience for passengers and freight operator
- Not just during implementation, also during operation, e.g. failure monitoring, significant upgrades of system

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Independent Design Authority

- The programme has appointed an independent Design Authority
- Objective is not to take over the integration responsibility but to facilitate and monitor all necessary system integration activities
- Integration and tests will be the responsibily of all the parties involved
- Independent design authority will ensure proper attention is paid to:
  - Uniform architecture
  - Interfaces
  - Uniform and transparant processes for Verification and Validation
  - Open accces to data
  - Adequate mutual participation by all parties to achieve to best service to the end customers

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5. Next steps

DATE	ACTIVITY
JULY 9	• Kick off meeting • Distribution of market consultation document
AUGUST 17	• Deadline for responses to questions
AUGUST 24	• Invitations for 1-on-1 sessions
OCTOBER 9	• Final 1-on-1 sessions

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Thank you for your attention

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Questionnaire

Questionnaire Procurement Strategy (1)

Procurement scenarios

1.1	What do you believe to be the most important advantages and disadvantages of the three scenarios outlined in chapter 5?
1.2	Are you able to identify any other promising alternative scenario(s)? If so, please elaborate and specify the associated contracting model.
1.3	Which of the scenarios do you prefer and why? Could you elaborate on the details of your preferred scenario?

Questionnaire Procurement Strategy (2)

Cooperation and contract options

2.1	Which forms of cooperation between suppliers, engineering firms and contractors are required with a view to achieving the Programme objective of delivering a complete transport system, for your preferred scenario (A, B or C)?
2.2	Which performance incentive do you prefer (e.g. bonus, penalty, bonus-penalty, pain-share/gain-share, pre-financing, etc.) within the various scenarios?
2.3	Do you prefer a single integrated contract for rolling stock and infrastructure, or multiple separate contracts?
2.4	Do you prefer functionally or geographically separated contracts for the infrastructure?
2.5	Regarding rolling stock fitment contracts, do you prefer division of the contracts based on train type (passenger/freight/historic, etc.), rolling stock owner or other criteria?

Questionnaire Procurement Strategy (3)

Scope of contracts to be tendered

3.1	For you, as an engineering firm, supplier or contractor, what is the minimum and maximum financial scope of engagements to make the tendering process worthwhile?
3.2	What do you believe to be the minimum financial scope of the lots to be put out to tender within scenarios A, B and C?
3.3	What is the required minimum and maximum technical scope that should be included in the lots to be put out to tender for an integral ERTMS contract?

Questionnaire Procurement Strategy (4)

Contract models for rolling stock

4.1 What do you believe to be the most important advantages and disadvantages of the five contracting models for rolling stock fitment as described in chapter 5?

4.2 Do you propose any other suitable contracting models for rolling stock fitment ? If so, please elaborate.

4.3 Which contracting model for rolling stock fitment do you prefer and why? Could you give a more detailed description of your preferred model?

Questionnaire Procurement Strategy (5)

Contract models for infrastructure

5.1 What do you believe to be the most important advantages and disadvantages of the five contracting models for the infrastructure as described in chapter 5?

5.2 Do you propose any other suitable contracting models for infrastructure? If so, please elaborate.

5.3 Which of the contracting models for infrastructure do you prefer and why? Could you give a more detailed description of this model?

Questionnaire Procurement Strategy (6)

Dialogue

6.1	What do you believe to be the optimal structure and approach for dialogue during the tender procedure for each of the three possible scenarios?

Questionnaire System Integration

Independent Design Authority

1.1	What opportunities and threats do you identify with regard to the introduction of an independent design authority?
1.2	Which of the three scenarios described in chapter 5 offers the best scope for effective fulfilment of the independent design authority's tasks, and why?
1.3	What should be the role of such a design authority?
1.4	What minimum mandate should an independent design authority have?
1.5	What requirements should be made of the independent design authority? a. what is its dimension (in FTEs)? b. what knowledge and experience should it be able to offer?
1.6	What are your experiences with independent design authorities? What do you know about them? Do you have any general advice?

3.

Market Consultation ERTMS

Briefing: Transport System

July 9th, 2015

Reinoud Liefting (Programme Manager Transport system)

Wim Jägers (Technical Project Leader)

-confidential-

Agenda

1. Introduction
2. Purpose of the afternoon
3. Explanation of the questions
4. Next steps

1. Introduction

- Rules in brief
- Functional scope and system subjects

Rules in brief

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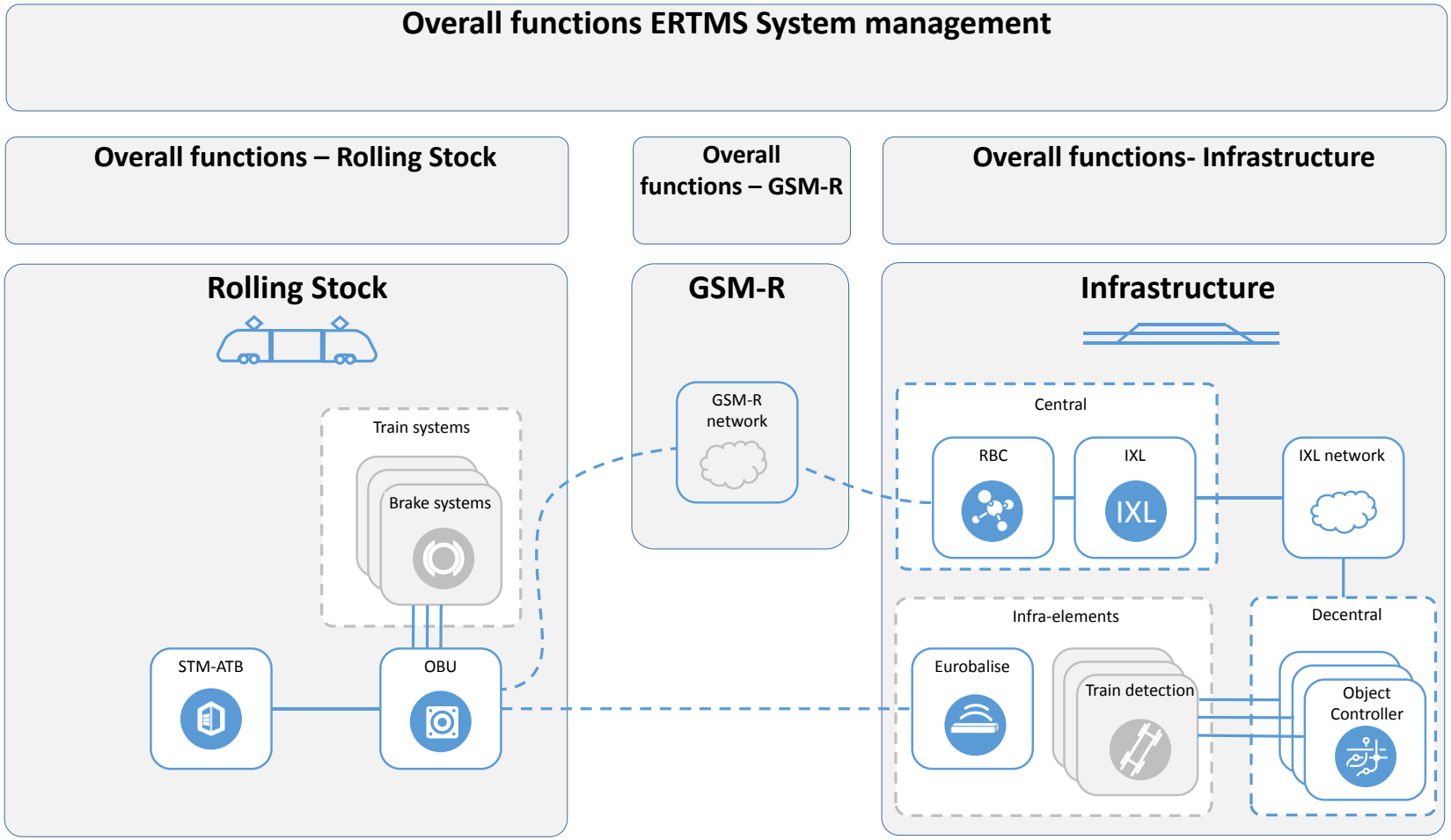
Context of transport system questions



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2. Purpose of this afternoon

State of play

- Detailing of comprehensive transportation system

What else do we need?

- Specification
- Chain functionality
- Implementation
- Learning experience
- Maintenance

What's next?

- To achieve a whole which is greater than the sum of the parts

3. Explanation of the questions

Specification

In the tender, the ERTMS Programme has **formulated requirements** for the various systems, subsystems, components, interfaces and user processes. Such requirements can be formulated **in various ways and at various levels of abstraction**. The requirements must not form a constraint for **future development, innovations and/or creative solutions** from the market.

1. How would you formulate these requirements in such a manner that they allow opportunities for future development of ERTMS?
2. Where do you identify risks of over-specification? How can a certain level of abstraction of the specifications be retained?
3. To what degree should a PoR provide specifications for the chain, rolling stock or infrastructure in order to give market parties sufficient input during the tender process and the realisation phase (best value for money)?

3. Explanation of the questions

ERTMS chain functionality

The Programme would like to know more about **optimisation of the ERTMS chain** in order to achieve the required **total availability for passengers and transporters**. In order to realise this, the Programme intends to formulate quantitative RAMS performance requirements for the subsystems. The ERTMS chain comprises the interfaces between the various systems, subsystems and components. An example of division of the ERTMS chain into system components is VPT, IXL, RBC, Infra connection, GSM-R infrastructure, Air interface GSM-R, train (incl. GSM-R modem).

1. How can the chains be specified at the transport system level in such a manner that quantitative RAMS performance requirements can be formulated for the subsystems?

3. Explanation of the questions

ERTMS chain functionality

2. What advice can you give the Programme regarding realisation of the system components referred to above, in order to achieve the RAM requirements?
3. What relevant developments do you expect will influence the performance of the system components referred to above?
4. What level of availability of the transport system as a whole do you believe is feasible (versus current availability), and could you specify the availability of the various system components?
5. GSM-R is the standard (TCI CCS paragraph 4.1) compulsory technology for data transfer. Which fall-back scenarios (alternative technology?) do you propose in order to keep trains running when the GSM-R network is unavailable, also when ERTMS is implemented at large stations/nodes such as Amsterdam and Utrecht?
6. How can we achieve the most accurate location of the vehicle through cooperation between the various train and track systems?

3. Explanation of the questions

ERTMS chain functionality

One of the potential benefits of ERTMS is the possibility of making supplementary **information available to the traffic controllers**. We wish to make train information from the ETCS available to the traffic controllers.

7. What are the technical possibilities to make train information from ETCS available online to the infrastructure manager's traffic controllers?

3. Explanation of the questions

Implementation

The **integration of systems in the train and on the track is crucial** in the implementation of ERTMS. For this purpose, careful thought must be given beforehand to the **various phases** (Design, Build, Maintain) during the implementation of ERTMS. The Programme is therefore interested in the possibilities in order to optimise implementation of the ERTMS chain.

1. What is your optimal implementation process within the three possible scenarios, taking into account the various subsystems? What are your views regarding the steps in the implementation process needed to integrate the various subsystems (possibly from multiple suppliers) into an operational transport system?

3. Explanation of the questions

Implementation

2. What is the significance of these steps within your optimal implementation process for the roll-out strategy (unit size, sequence, etc.)? What market considerations are there with regard to the roll-out strategy (unit size, roll-out sequence)?

3. Under what conditions would you be willing to share information on the performance of the ERTMS system with principals and competitors in order to identify the causes of operational problems?

4. What strategy do you envisage for migrating the existing ERTMS implementations in the Netherlands (Betuweroute, HSL, Amsterdam-Utrecht, etc.) to the new user standard? How do you believe the standard implemented in the Netherlands can be effectively aligned with the standards used in neighbouring countries?

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3. Explanation of the questions

Implementation

The infrastructure will be refurbished at a later date than the rolling stock, which will result in the rolling stock already having been refurbished while the track still makes use of the ATB train protection system. For the Programme, proven technology is a precondition.

5. What is your opinion regarding the risks of ERTMS Level 2 only in an ATB environment?
   How can the Programme apply baseline 3, if we first refurbish the rolling stock, and the track at a later date? What is the best method to demonstrate the effective operation of refurbished rolling stock while the infrastructure used by the train is not yet available with ERTMS?

3. Explanation of the questions

Learning experience

The Programme is thinking about the opportunity to gain learning experience with the entire transport system on a pilot track.

1. What else can the Programme and the market parties do in order to learn from the ERTMS implementation in the first section to be rolled out (for example in terms of monitoring, testing with a test driver, specific items in a contract)?

3. Explanation of the questions

Management

Also important is that the management process is comprehensive and effective. Centralised access to all available data from the train and track offers new opportunities in terms of maintenance.

1. What is your opinion on chain monitoring and the monitoring systems in the key objects of the ERTMS chain (train and track) in order to continuously monitor the effectiveness of the comprehensive chain?

2. What current developments in terms of monitoring, diagnosis etc. could be applicable?

3. Explanation of the questions

Maintenance

3. How often will the systems relevant to you solution require updating and/or modernisation? What will this mean for operations? What is the expected working life? What maintenance requirements apply?

4. Can you explain the change management process for your own products (the train operators and freight transporters will purchase such products and wish to stay informed of upgrades, system bugs, etc.)

5. What opportunities do you have to minimise inconvenience caused by system updates?

4. Next steps

Date	Activity
July 9th	• Kick off meeting • Distribution market consultation document
August 31th	Deadline for responses to questions on the Transport system
September 14th	Invitations to 1-on-1 sessions
October 9th	Closure 1-on-1 sessions

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Thank you for your attention

Marktconsultaties@ERTMS-nl.nl

4.

Market consultation ERTMS

Briefing: Rolling Stock

July 9th, 2015

Boukhiar Hamdani
Project Team Rolling Stock

-Confidential-

Agenda

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2. Purpose of this afternoon
3. Explanation of the questions
4. Next steps

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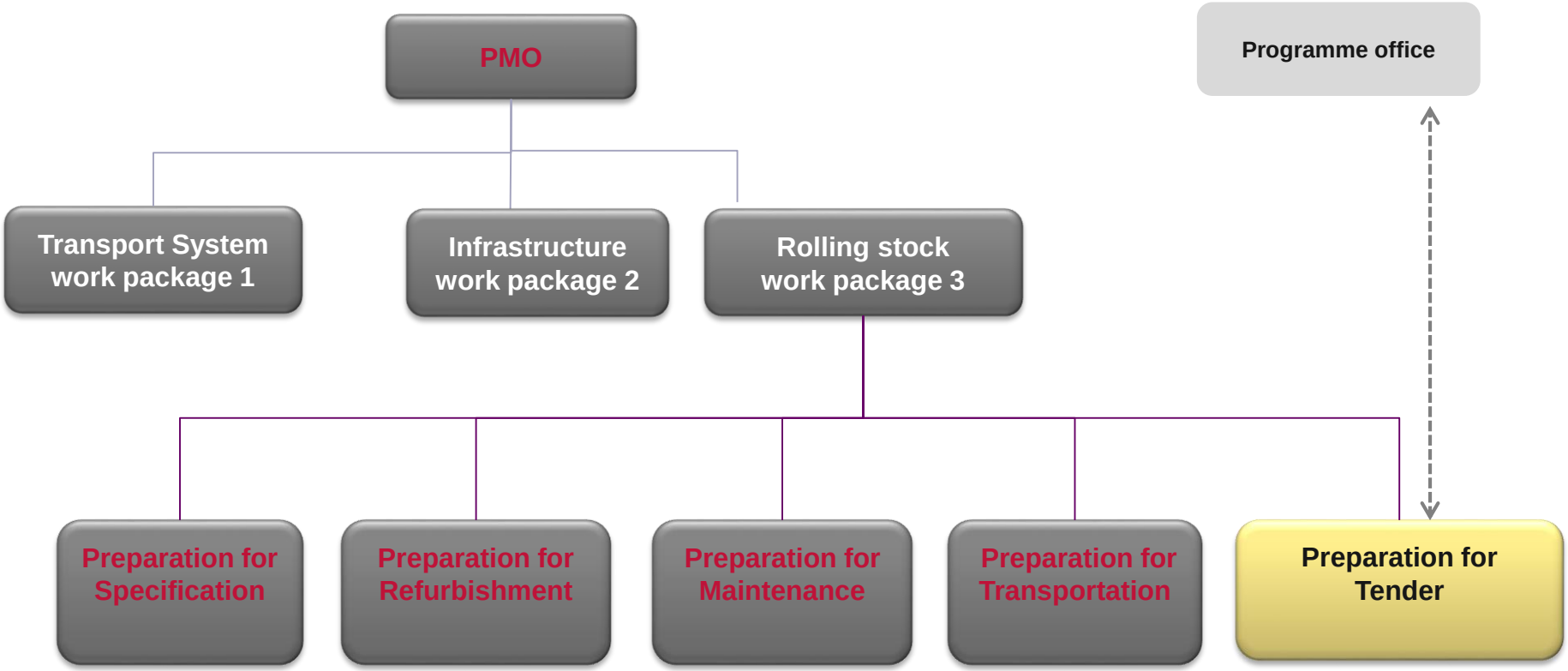
1. Introduction



2. Purpose of this afternoon

State of play

•Scope definition (products and services – ETCS/Refurbishment/Maintenance)
•Make or buy decision
•Contract options
•Scenario choices based up on leading Rolling stock characteristics
•Plot (parcel) choices (Time, Rolling Stocks types, (Clusters/NS-Other), Scale and to take into account the refurbishment plan)

What else do we need?

•Info to further design the tender strategy

What's next?

•Further design of strategy
•Following market consultation in which we focus on specific Rolling Stock subjects and ETCS products.

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3. Explanation of the questions

System integration within the rolling stock domain

- Besides system integration in the transportation system, there is system integration in the train

1. What are the conditions and challenges for effective on-board integration of ETCS? Describe how the three possible scenarios may or may not influence this.

3. Explanation of the questions

Cooperation between train manufacturers and ETCS suppliers

•In order to be able to integrate ETCS in the rolling stock, cooperation between train manufacturers and the ETCS supplier is essential. The market player facilitating the incorporation therefore requires access to information and knowledge regarding the system, which is already present in the train.

1. If you were responsible for the on-board integration of ERTMS, how would you acquire the necessary knowledge of the various trains and types of trains? What is essential for this purpose and what do you expect from the ERTMS Programme?

2. How do you believe the cooperation between the ERTMS supplier and the train manufacturer (of the train type in which it is to be incorporated) should be designed in order to successfully integrate ERTMS in the train, and what risks do you identify?

3. Explanation of the questions

Capacity issues (workshop capacity and resources)

- The workshop capacity and resources (knowledge) for incorporation of ETCS in the trains is scarce. This may influence the manner and time path for incorporation of ETCS.

1. How can sufficient workshop capacity and resources (knowledge) be guaranteed in order to ensure the successful integration of ETCS in the rolling stock?

3. Explanation of the questions

Incorporation and maintenance

•The Dutch railway network comprises a diversity of trains and train types, from various suppliers. This requires specific attention for the incorporation and maintenance of the ETCS system.

1. What do you believe to be the main challenges of the maintenance programme for on-board ETCS? Describe how the three possible scenarios may or may not influence this.

2. What expertise with regard to types of rolling stock is required in order to incorporate and maintain ERTMS? Please specify the fields of expertise concerned.

4. Next steps

Date	Activity
July 9th	• Kick off meeting • Distribution market consultation document
August 17th	Deadline for responses to questions Rolling stock marktconsultaties@ertms-nl.nl
August 24th	Invitations for 1-to-1 sessions
October 9th	Closure of 1-to-1 sessions

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Thank you for your attention

marktconsultaties@ERTMS-nl.nl

5.

Market consultation ERTMS

Briefing: Infrastructure

July 9th, 2015

Saskia Groot
Programme Manager Infrastructure

-Confidential-

Agenda

1. Introduction
2. Presentation of subjects and questions
   a. Use of commercial off-the-shelf PLCs as object controllers, Hans van Zandvoort
   b. RBC hand-overs and RBC areas, Maarten Bartholomeus
   c. Centralisation of RBC and IXL systems and network architecture, Kees Goossen
   d. Exchange of information using an ERTMS data model, Fokke Bronsema
3. Next steps

1. Introduction

Rules in brief

Primary language and communication:

- The primary language of the market consultation is English; if necessary, the primary language may be changed to Dutch
- All communication and submission of reply forms via marktconsultaties@ertms-nl.nl

Status market consultation:

- Participation in the market consultation will take place on a voluntary basis
- No payment will be made for participation
- Participation will not lead to preferential status or exclusion from future tenders for the ERTMS Programme

Information to be made public:

- All information submitted and the participating companies
- The report of the plenary meeting
- The overall report (main points) from the individual meetings (anonymous and without any commercially sensitive details)

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Our main ERTMS system goals

- Uniformity in operational use, systems, ICT infrastructure and maintenance
- Stimulate use of open systems: easy to manage, maintain and configure by local service providers
- Information for managing the ERTMS assets easy and remote accessible
- Efficient and automated infra data exchange between parties involved in system's lifecycle (ProRail, IB' s, suppliers, PCA's)
- Real time monitoring of assets and traffic
- Migration of a major part of the Dutch rail infrastructure from ATB to ERTMS with minimal operational disturbance in about 10 years time
- ERTMS must become 'business as usual' as soon as possible

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How to achieve our main ERTMS system goals

- National systems architecture and maintenance philosophy
- National operational rules and regulations
- Standardized engineering processes and rules
- Standard process and rules how to deal with ERTMS data throughout the lifecycle
- Good cooperation with the market

Your answers will help us in making the right choices in the system architecture.

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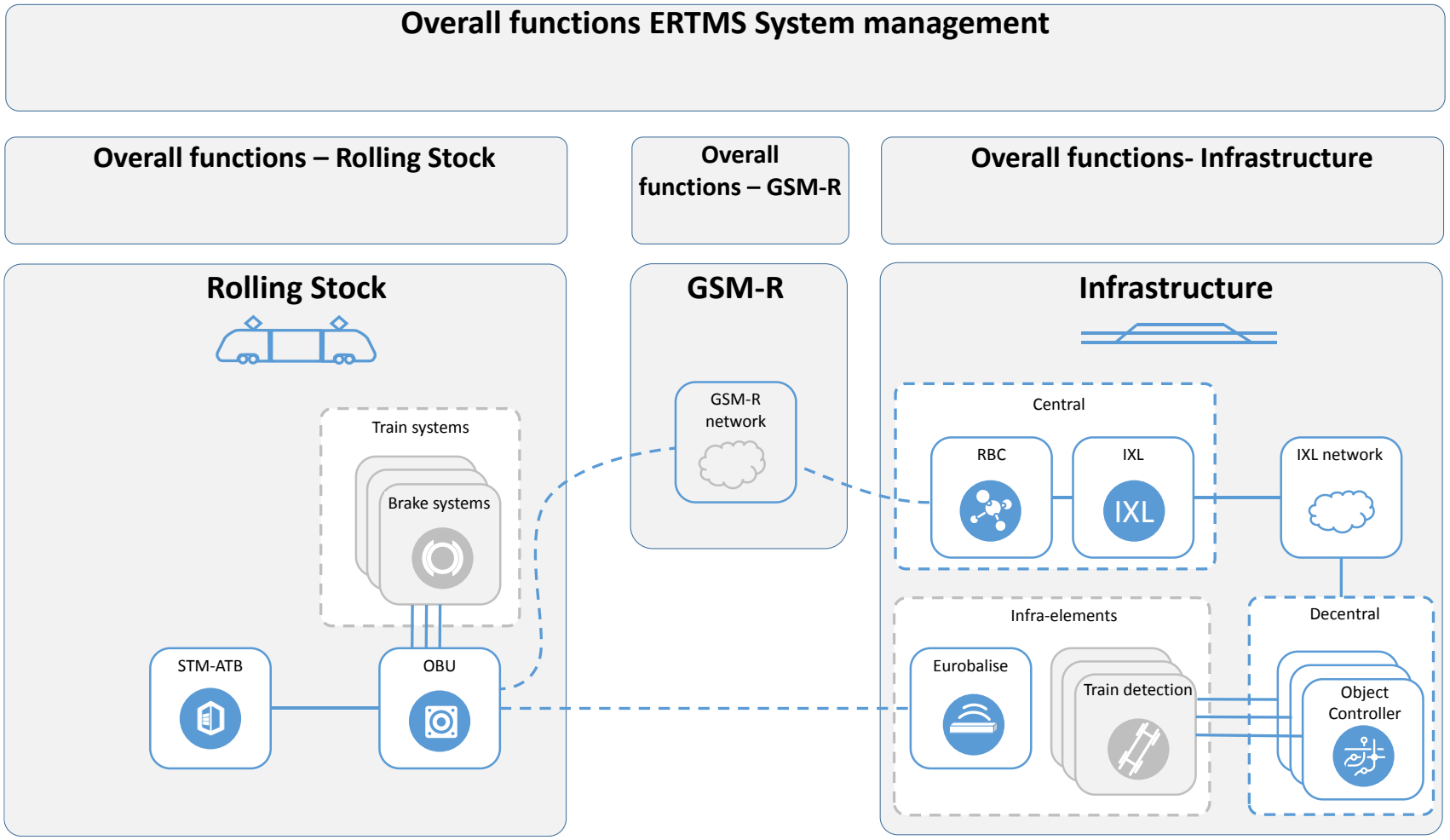
2. Presentation of subjects and questions

a. Use of commercial off-the-shelf PLCs as object controllers

Hans van Zandvoort

Context of infrastructure questions



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Why use off the shelf object controllers

- Safety system specific (currently in use):
  - Small series: long lead time
  - Limited scalability (smallest configuration already quite large)
  - Redesign by supplier needed for adaptation to new trackside objects
  - Specific maintenance needs
  - High cost

- Industrial PLC:
  - Large series, used in different industries, good logistics
  - Scalable (cost effective small configurations possible)
  - Small packaging
  - Easy maintenance
  - Low cost

Requirements for ERTMS rollout

- Interface towards trackside elements:
  - Many sites, often only few inputs/outputs per site
  - Different types and configurations of points
  - Different types of signaling
  - Different “grendel” configurations
  - Housing: trackside cabinets without air conditioning, limited space
- Interface to central interlocking equipment:
  - Interlocking to be housed georedundant necessitates use of “standardised” IP network
- Maintenance:
  - Like all other trackside equipment to be done by PCA

Some figures

Based on: Roosendaal-Dordrecht-Kijfhoek (all figures approximate)

- 170 points
- 600 track sections
- 35 level crossings
- 40 “departure lights” on platforms
- 30 WUBO warning equipment for trackside workers

- About 1000 inputs, 450 outputs
- About 12 relais houses with larger configurations
- About 80 cubical-sites

Current considerations

- Use universal object controllers, same unit to be used for every type of trackside object
  Rationale: Simplify logistics and maintenance, enable introduction of new types of trackside object without changing controller

- No object specific functionality in object controller
  Rationale: Simplify software design, eliminate need to distribute software thus simplifying maintenance

- Network equipment (switch, fiber optics) separate from object controller
  Rationale: Enables application of COTS ICT – equipment

- Interface object controller to trackside element through relais
  Rationale: robust, galvanic uncoupled, eliminating need for overvoltage protection, simplify maintenance

Considerations for network characteristics

- Ethernet/IP based
- Standardised COTS switching/routing equipment
- Predictable behaviour through well designed segmentation
- Very high availability

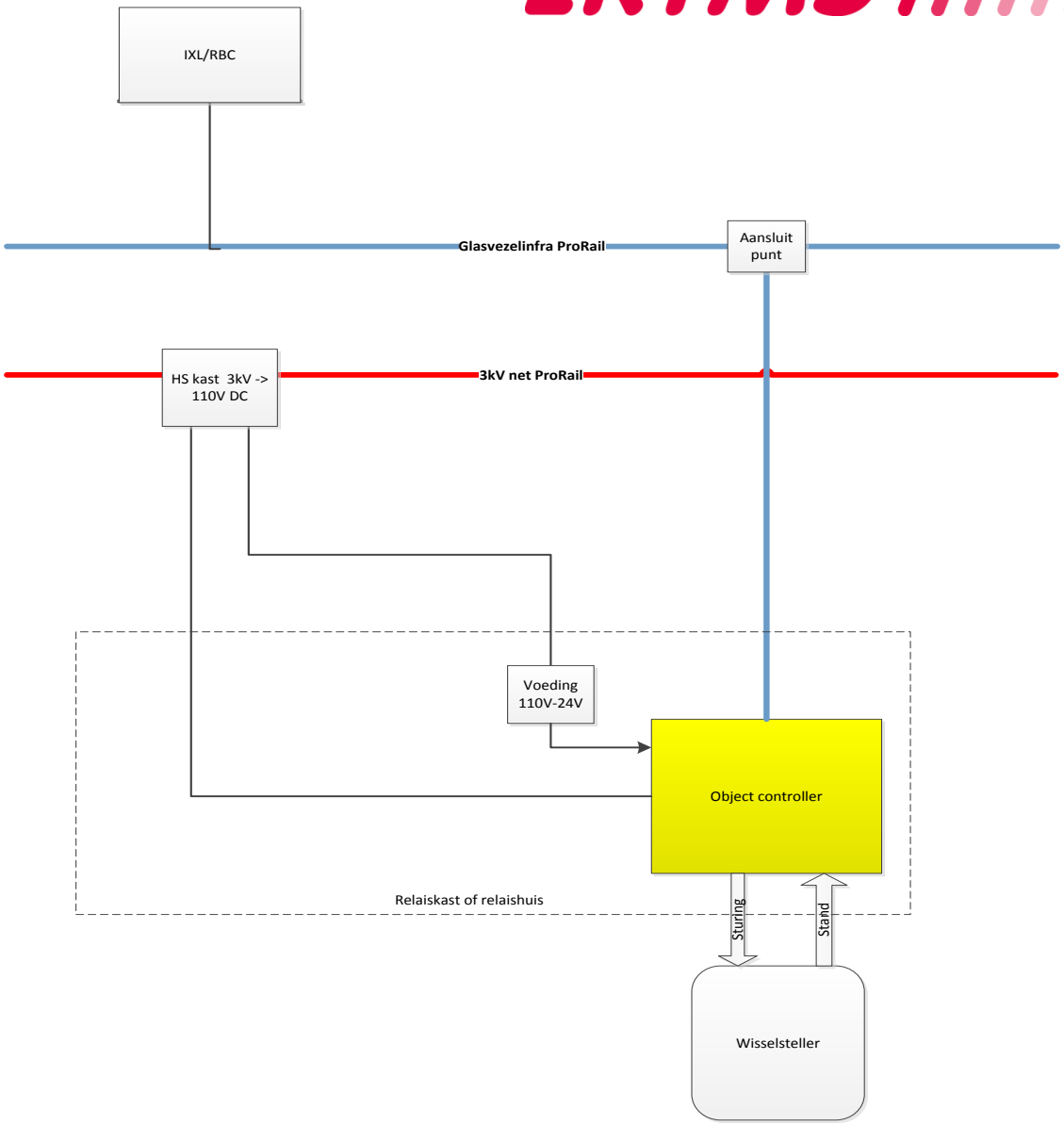
Rationale: Robustness, same operational and maintenance needs as for existing ProRail ICT networks, cost savings through co-use of transmission cabling. Integrated approach to providing sufficient security

Considerations of monitoring trackside element

Monitoring (example: point motor current) though dedicated equipment, separate from vital IXL IO

Rationale: Flexibility, cost saving through use of standardised COTS equipment, enable connection to existing SCADA infrastructure, eliminate need to modify IXL when monitoring requirements change

Current situation



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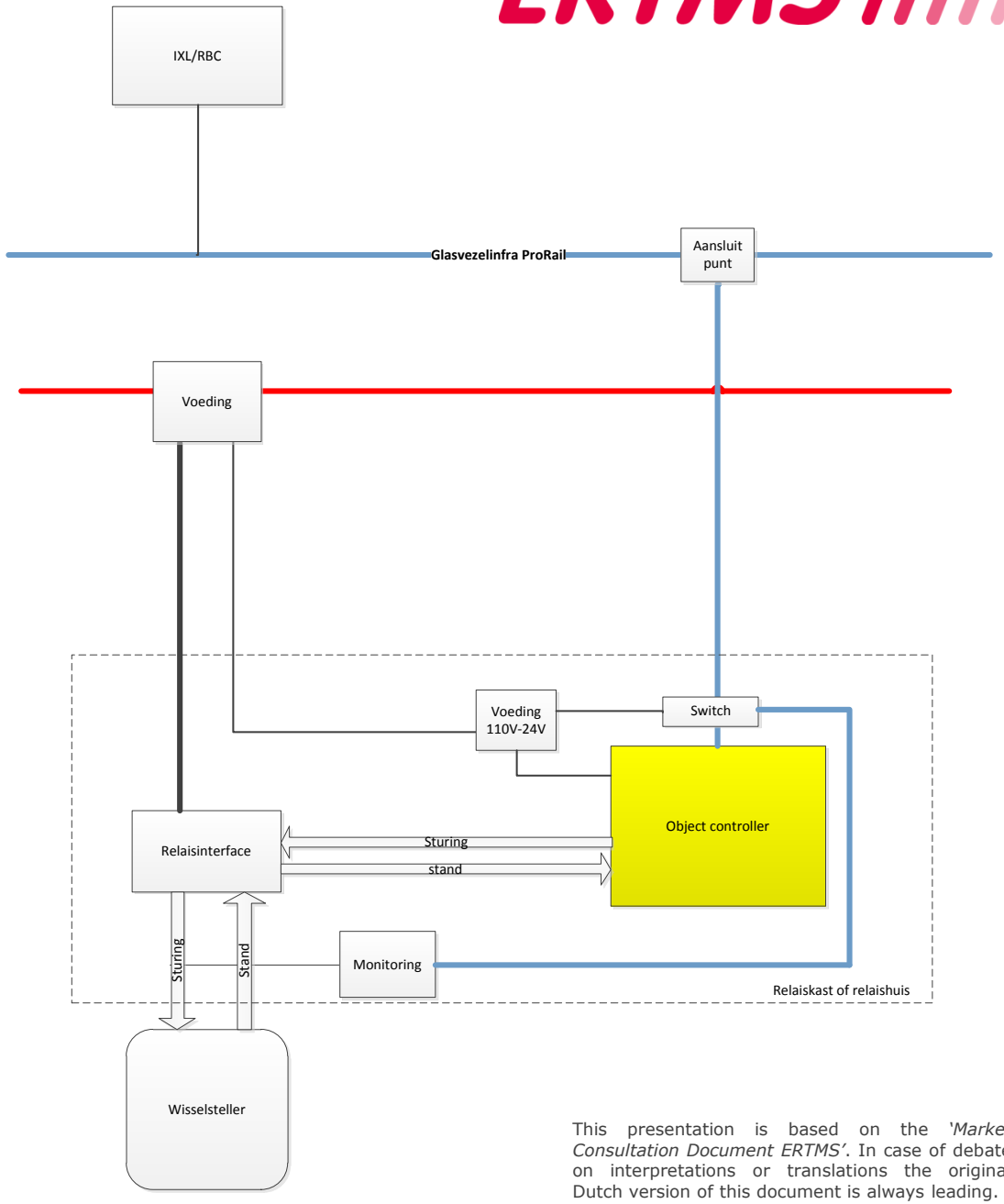
Possible future situation



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Questions

1. What is the optimal method of combining this technology (the use of compact, industrial PLC equipment) with existing, centralised ERTMS-L2 technology?
2. What alternatives for setting up / controlling the outside elements are you capable of offering a this moment, and how do these alternatives compare with industrial PLC equipment for the aforementioned aspects?
3. Please also explain what specific requirements those alternatives make of the datacom network between the location of the elements and the centralised ERTMS equipment.

What developments are you working on in this area and when do you expect to be able to present results?

2. Presentation of subjects and questions

b. RBC hand-overs and RBC areas

Maarten Bartholomeus

RBC-RBC Handover

Agenda

- Short introduction RBC/RBC HO
- RBC-RBC known issue's/aspects
- Proposed RBC-RBC HO location
- Proposed RBC area/topology
- Questions

RBC HO / ERTMS topology

Starting points:

- RBC area is limited -> RBC-RBC interface required in subset-039
- RBC-RBC Hand Over interface is specified in the TSI

Attention points:

- No RBC-RBC HO experience between suppliers with subset-039
- Limited experience with RBC-RBC HO's
- Outstanding CR's on RBC-RBC HO interface

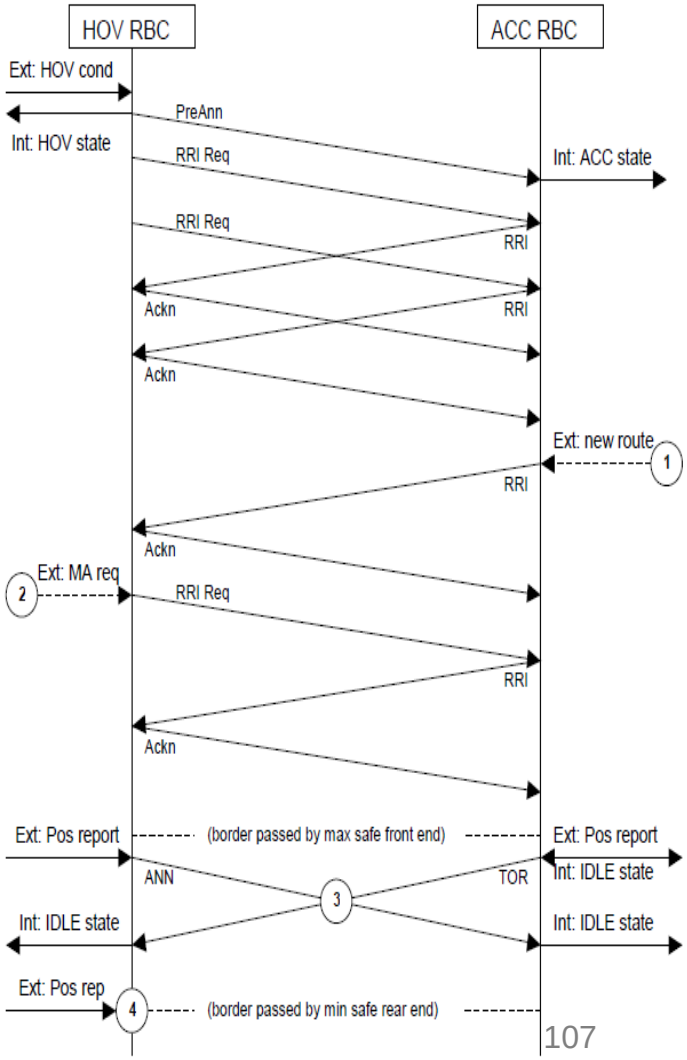
RBC-RBC HO experiences and analysis

- Experience with 3 RBC-RBC HO's in The Netherlands
  - Two RBC HO's from one supplier
  - One RBC HO between RBC's from two suppliers on a country border
  - Located on 'open track', i.e. no nominal start/stop or change direction
- Nominal operation OK
  - Some connection issue's second modem (0,5%)
- In 'degraded' situations issues found
- New subset-039 available
- Remaining questions on:
  - Open issue's RBC-RBC HO interface (Open CR's, known issues)
  - Impact of the RBC-RBC interface on RBC area configuration

ERTMS RBC – RBC HO

SUBSET-039:

- Covers:
  - Safe communication
  - MA exchange
  - (SSP, Gradients, mode profile, National values, Track Cond., Transition Orders, ..)
  - MA revocation
- Not (yet):
  - (Conditional) EM stop (CR1193)
  - Detailed implementation (CR1182)
  - RBC transition problem (CR1228)
  - Engineering rules (PVE, OVS)
  - Not yet used between different suppliers
  - No transitions between baseline versions



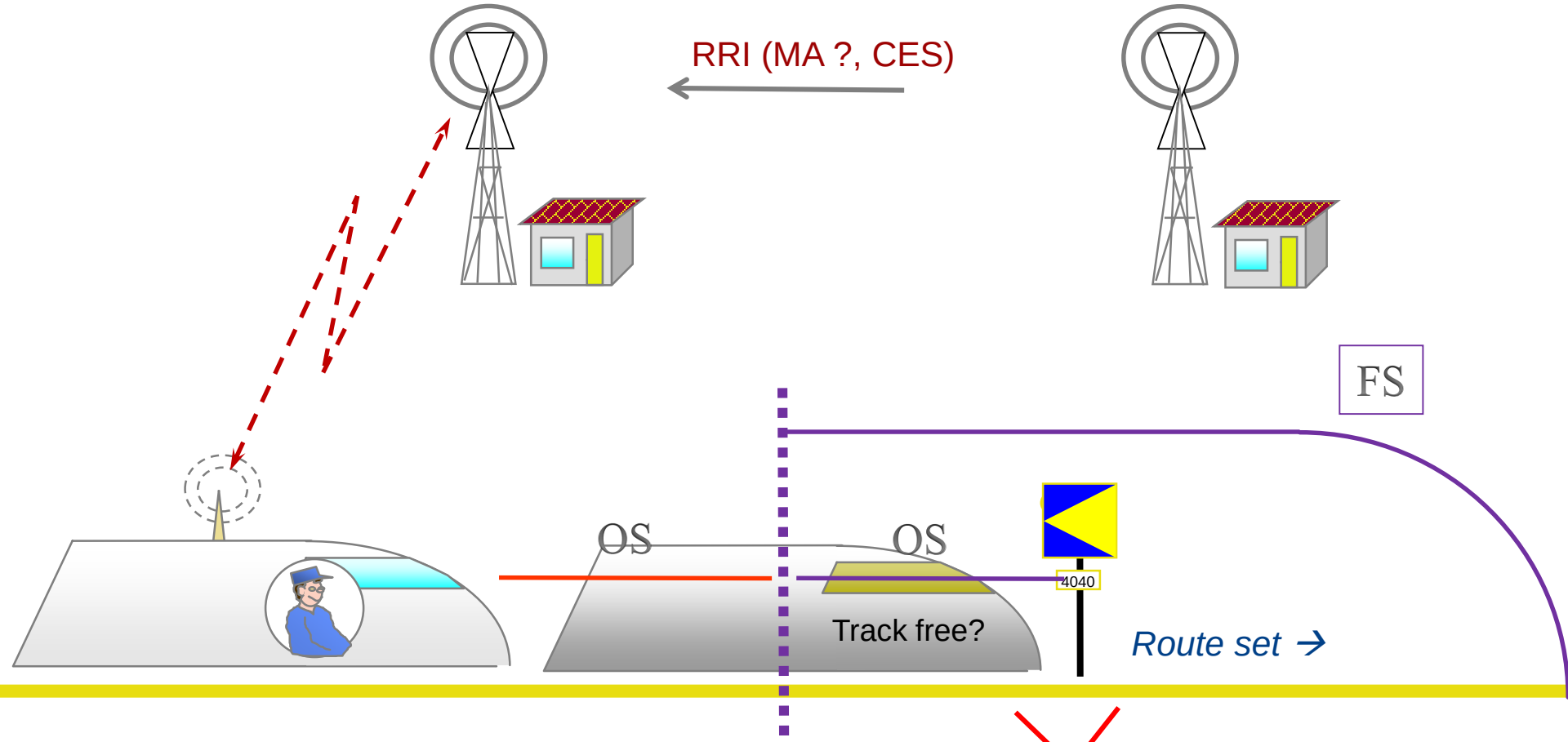
RBC – RBC Open CR's

Open CR's B3:

A. CR1193 Emergency Stops on RBC interface
B. CR1228 RBC transition problem
C. CR1182 Detailed RBC/RBC Handover procedures

Issue A

CR1193 (No CES) Start of Mission (ATAF)

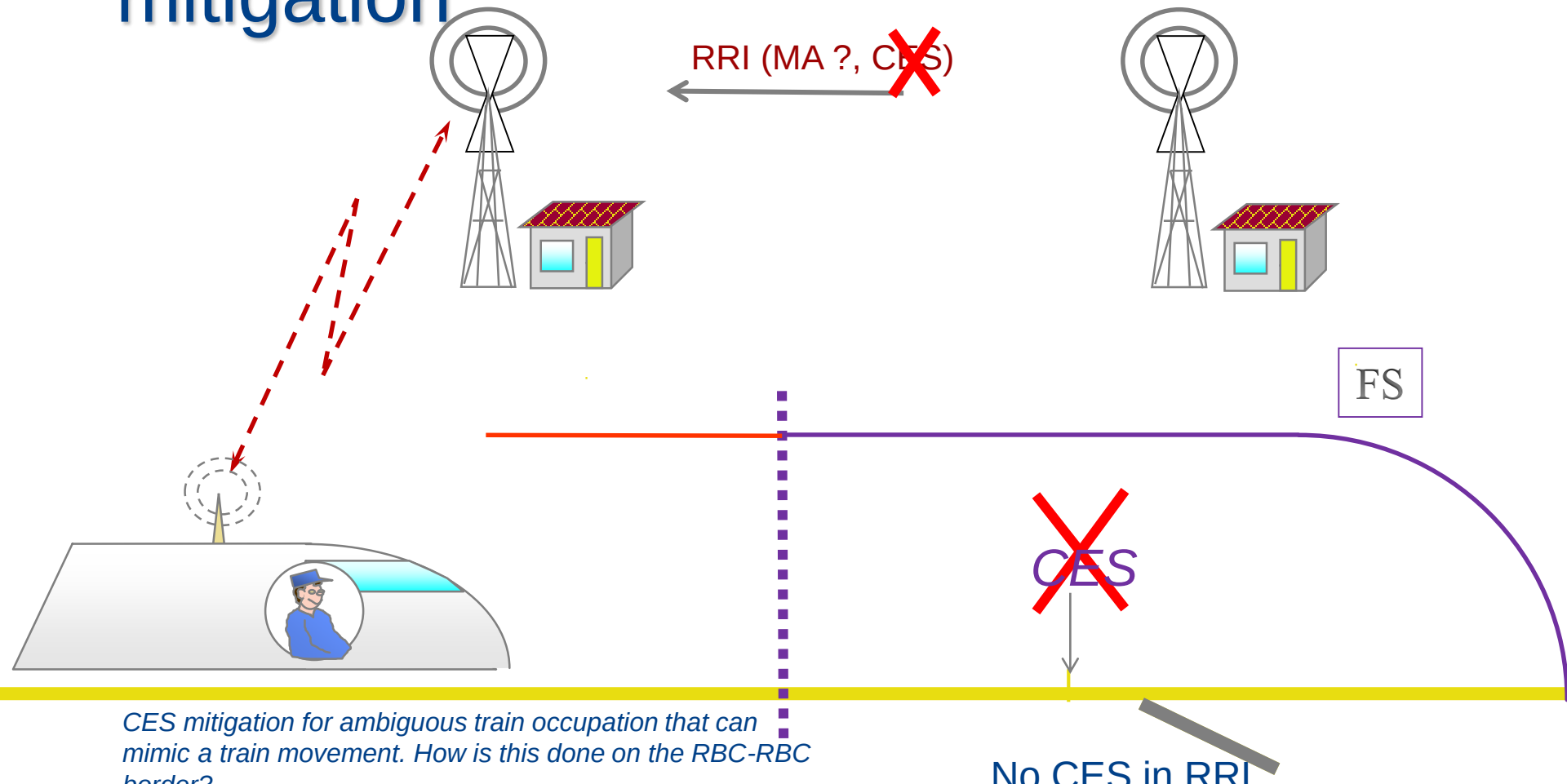


OS route up to border
Not only SoM, all OS->FS transitions
CR1193: CES not supported over RBC-RBC interface

~~*CES (ATAF)*~~
~~*not suported*~~

Issue B

CR1193 (No CES) Ambiguous occupied mitigation



CES mitigation for ambiguous train occupation that can mimic a train movement. How is this done on the RBC-RBC border?

CR1193: CES not supported over RBC-RBC interface

No CES in RRI

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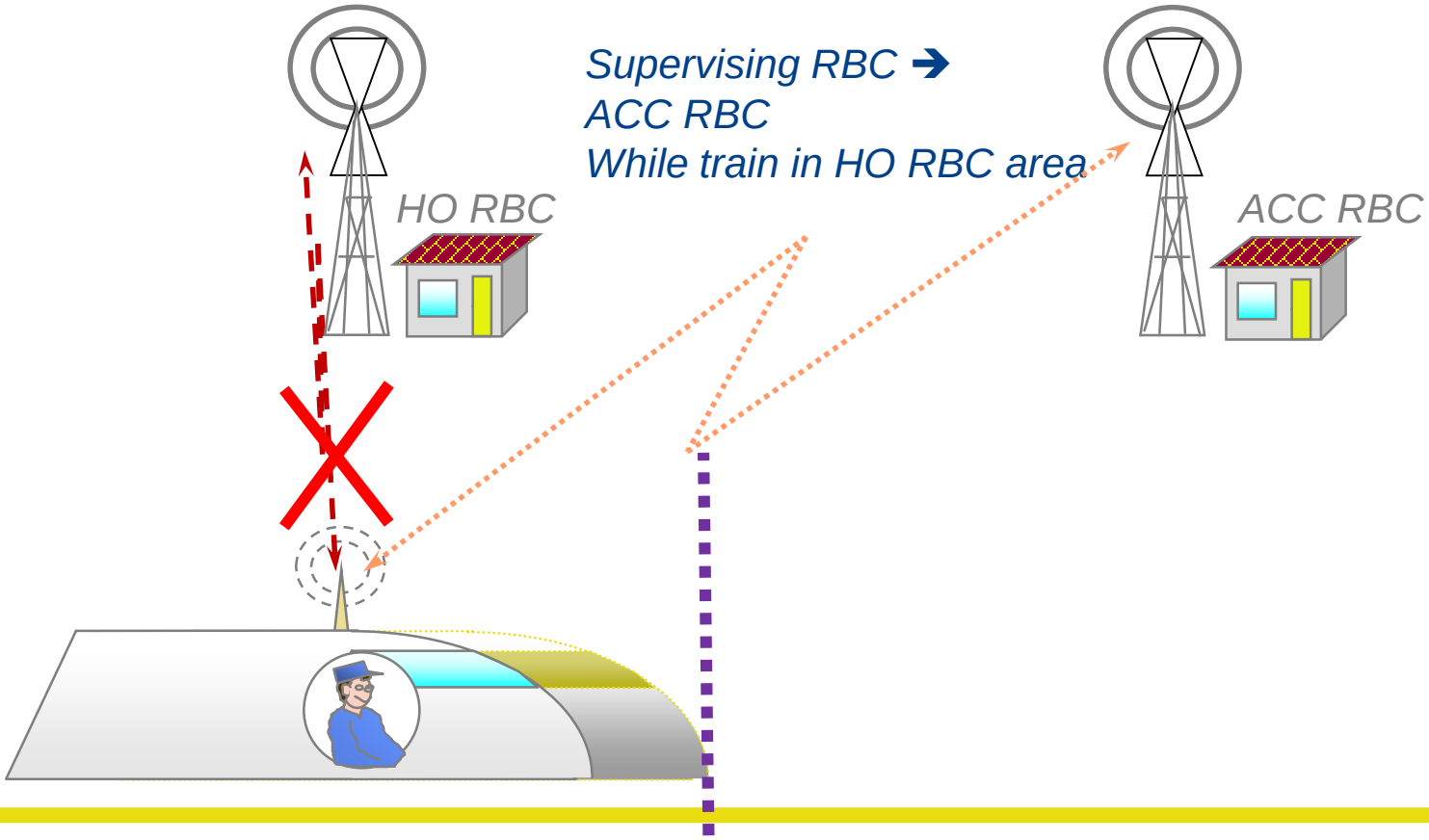
Issue C

CR1228 (RBC HO on Max Front End)



Balise or communication error; CR1228: SB stop in HO RBC area. EoA at front of the train. Max-safe in ACC RBC area. ACC RBC supervising.
ACC RBC can not give MA track description for HO RBC area.
How is the MA extension possible? How to continue?

CR1182 Detailed RBC procedures

Issues:

D.1st MA across border

E.SoM SR BG list

F.SoM MA and no following route set

G.Changing direction wrong RBC

H.Data entry RBC data

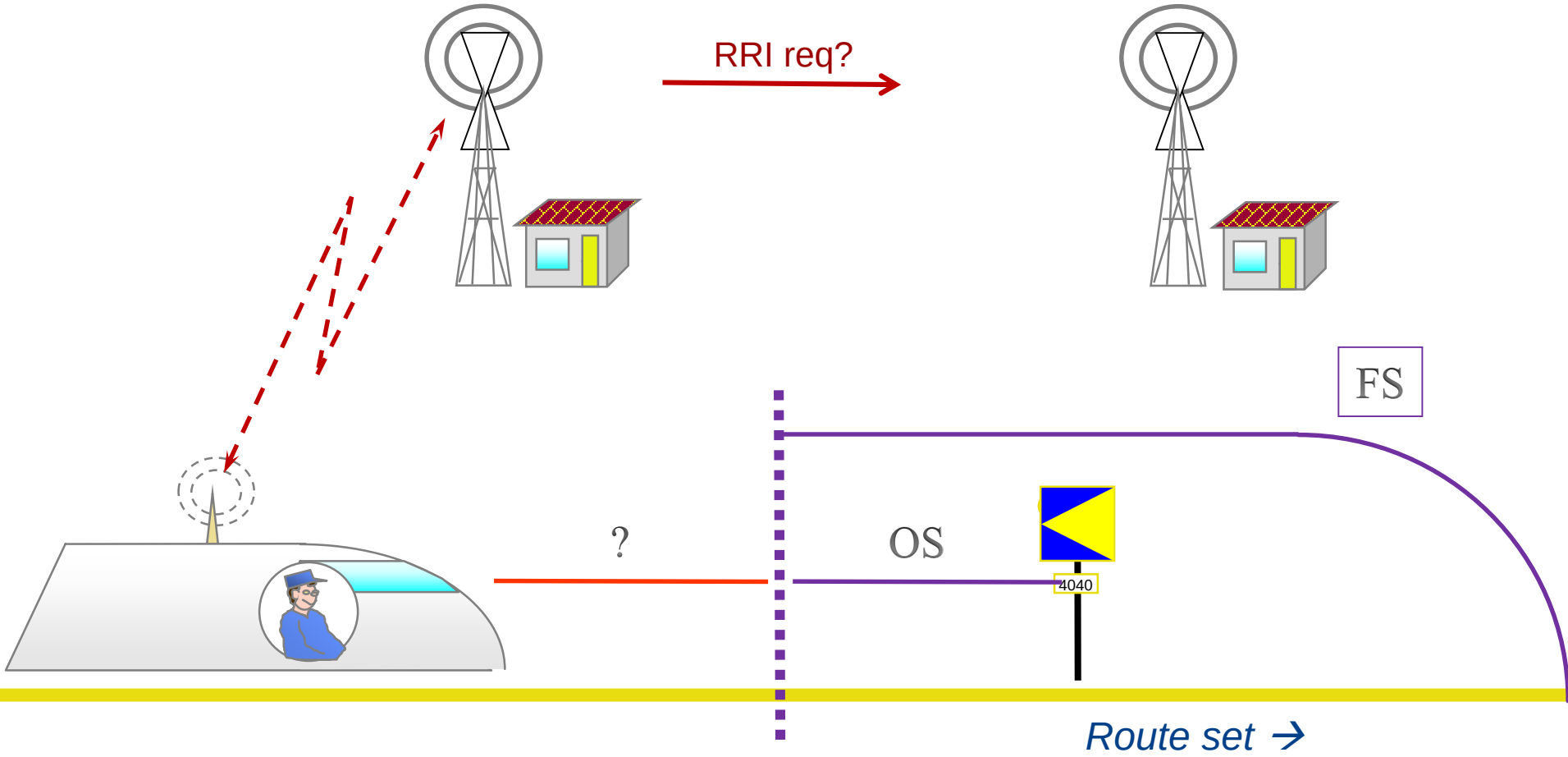
I.Subsequent RBC HO's

J.RSM SMA

K.One modem performance

Issue D

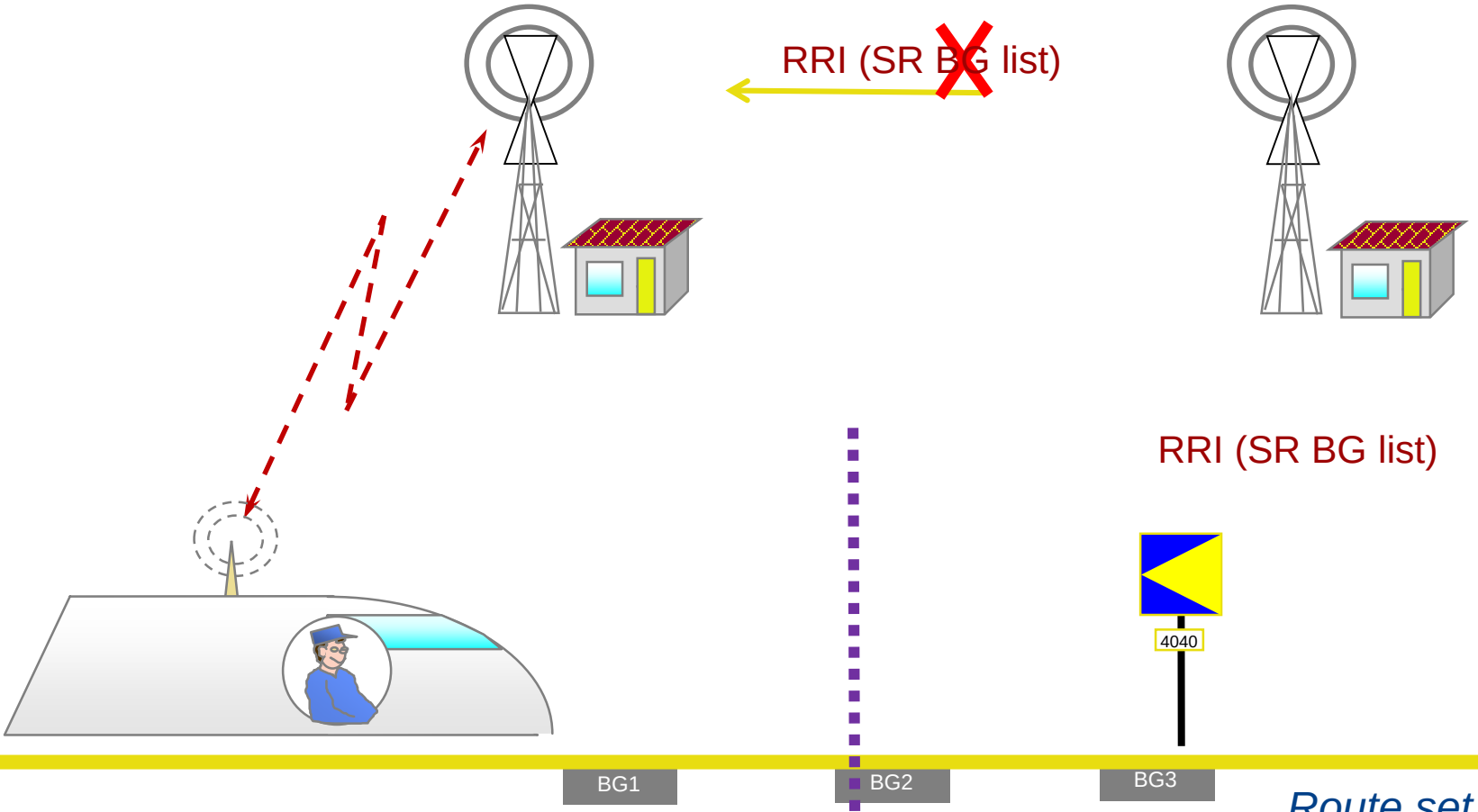
Aspects of Start of Mission (CR1182)



Driver selects <start>, known position. Start with OS MA possible?
What does the HO RBC sent for RRI req? No MA available up to the border until known the route is set in the ACC RBC area.
Note: mode Standy By not support in RRI.

Issue E

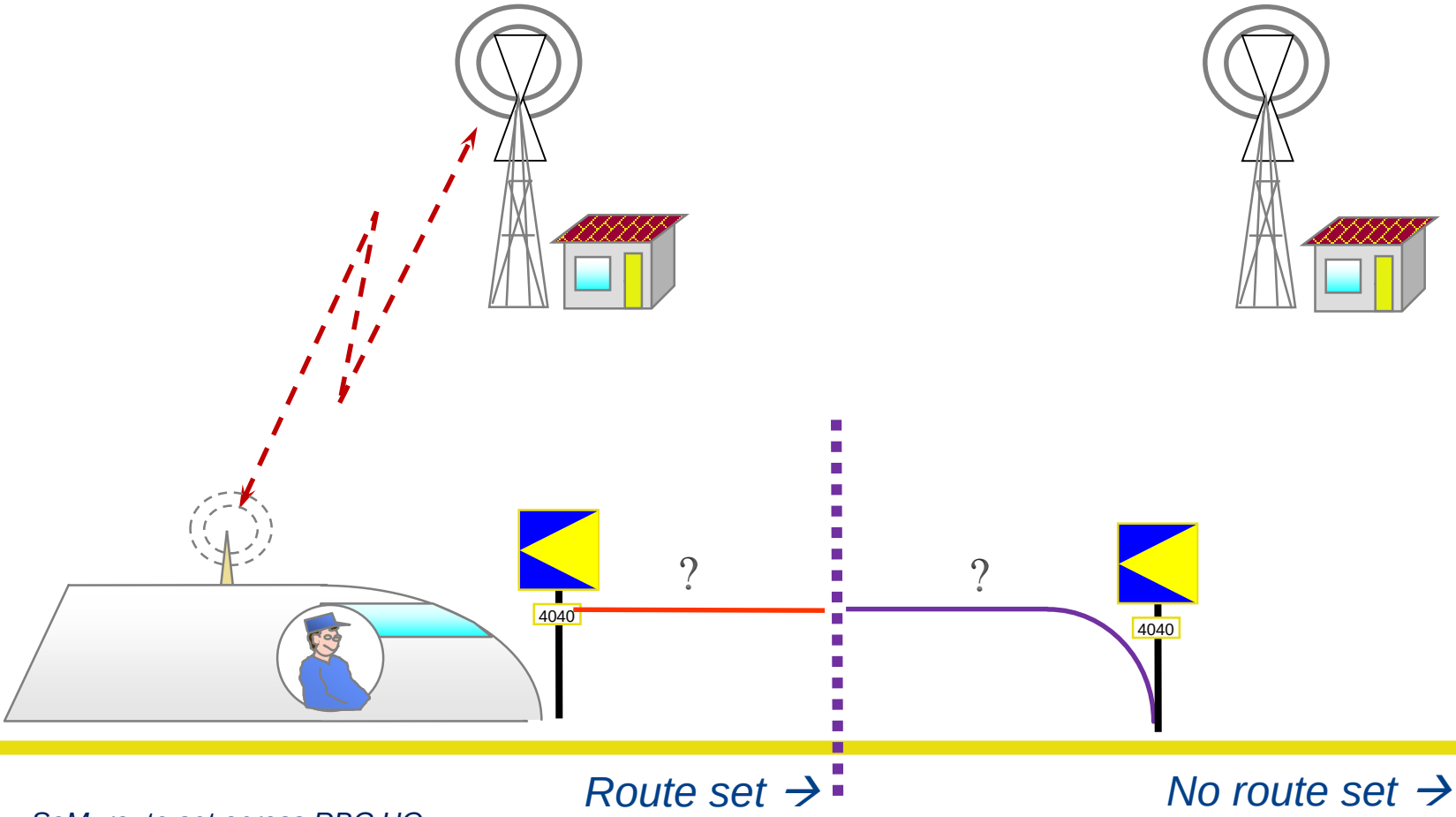
Aspects of Start of Mission (CR1182)



"Start" selected, unkown position
Only start in SR possible. With start in SR a SR BG list is to be used.
But SR BG list not supported (CR494) in RBC/RBC HOV.

Issue F

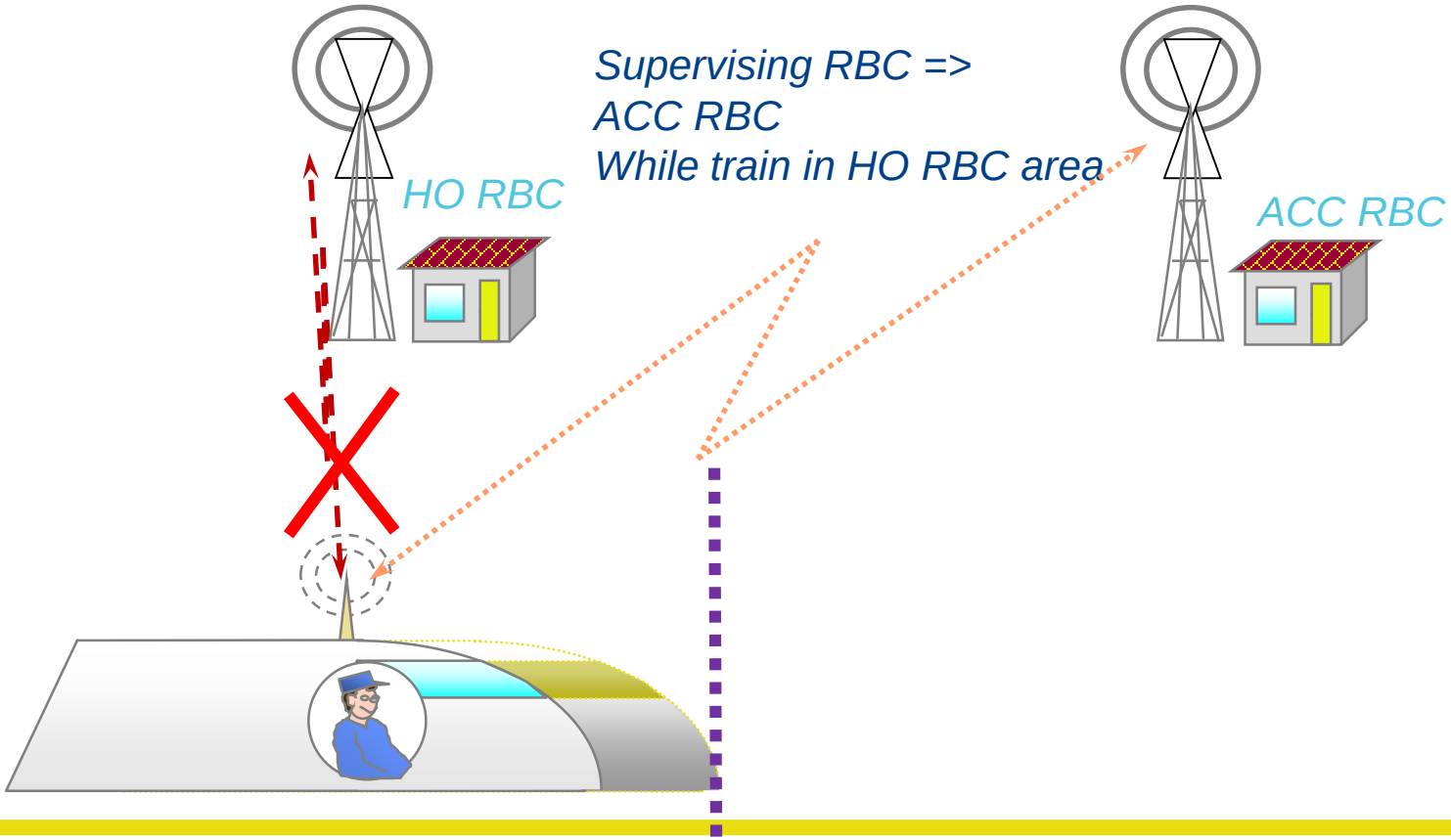
Aspects of Start of Mission (CR1182)



SoM, route set across RBC HO
No route set in Acc RBC area.
What does Acc RBC do? Accept or reject RRI?
(Did not work on HSL-South RBC-RBC HO)

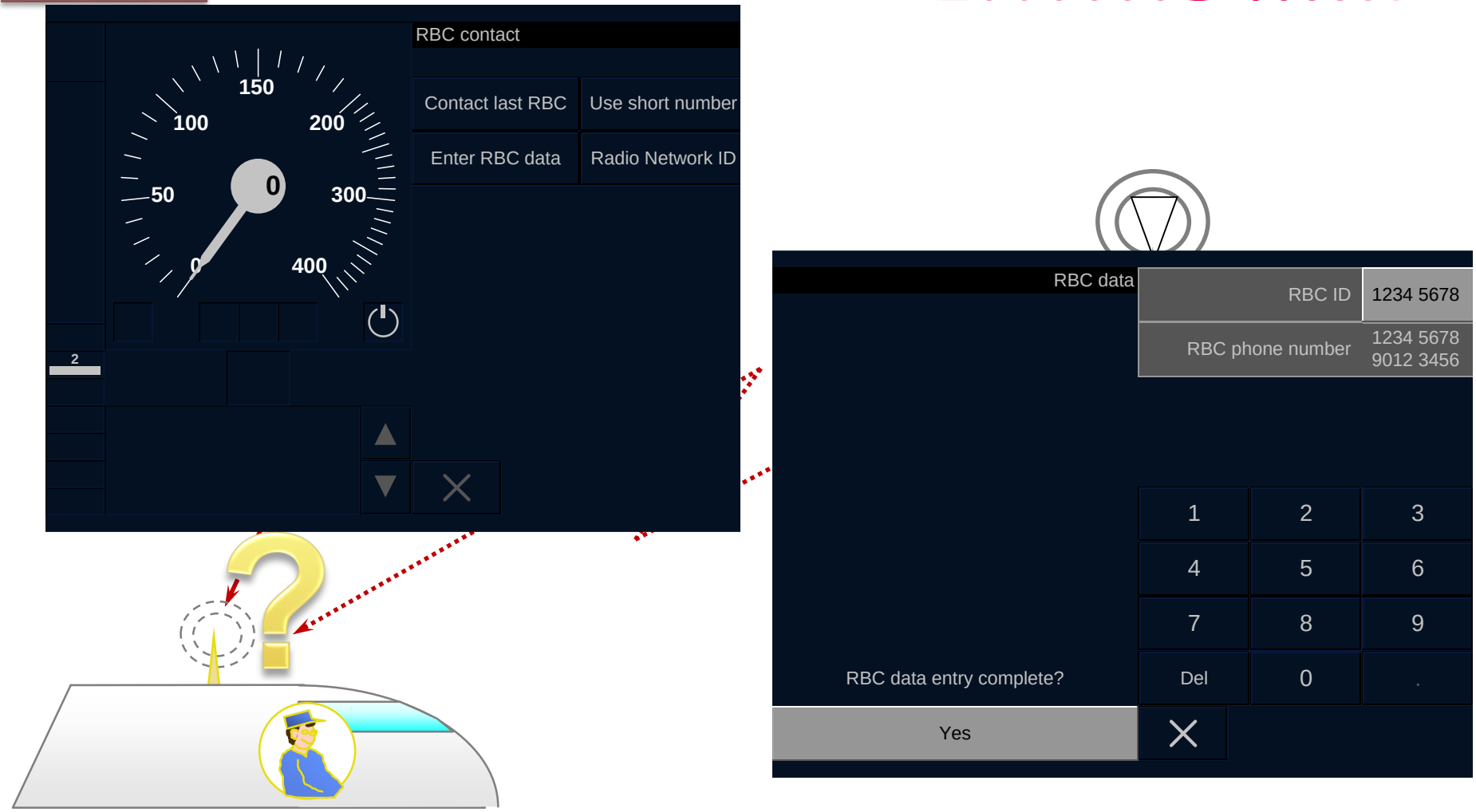
Issue G

Changing direction



Stop in HO RBC area, max –safe – frontend in ACC RBC area. ACC RBC supervising.
Change cab/direction and Start of Mission.
Train still connected to ACC RBC. ACC RBC can not give MA in HO area.
Should the driver change RBC data (how does he know this)?
This also applies if the train changes direction while not completely in ACC RBC area.

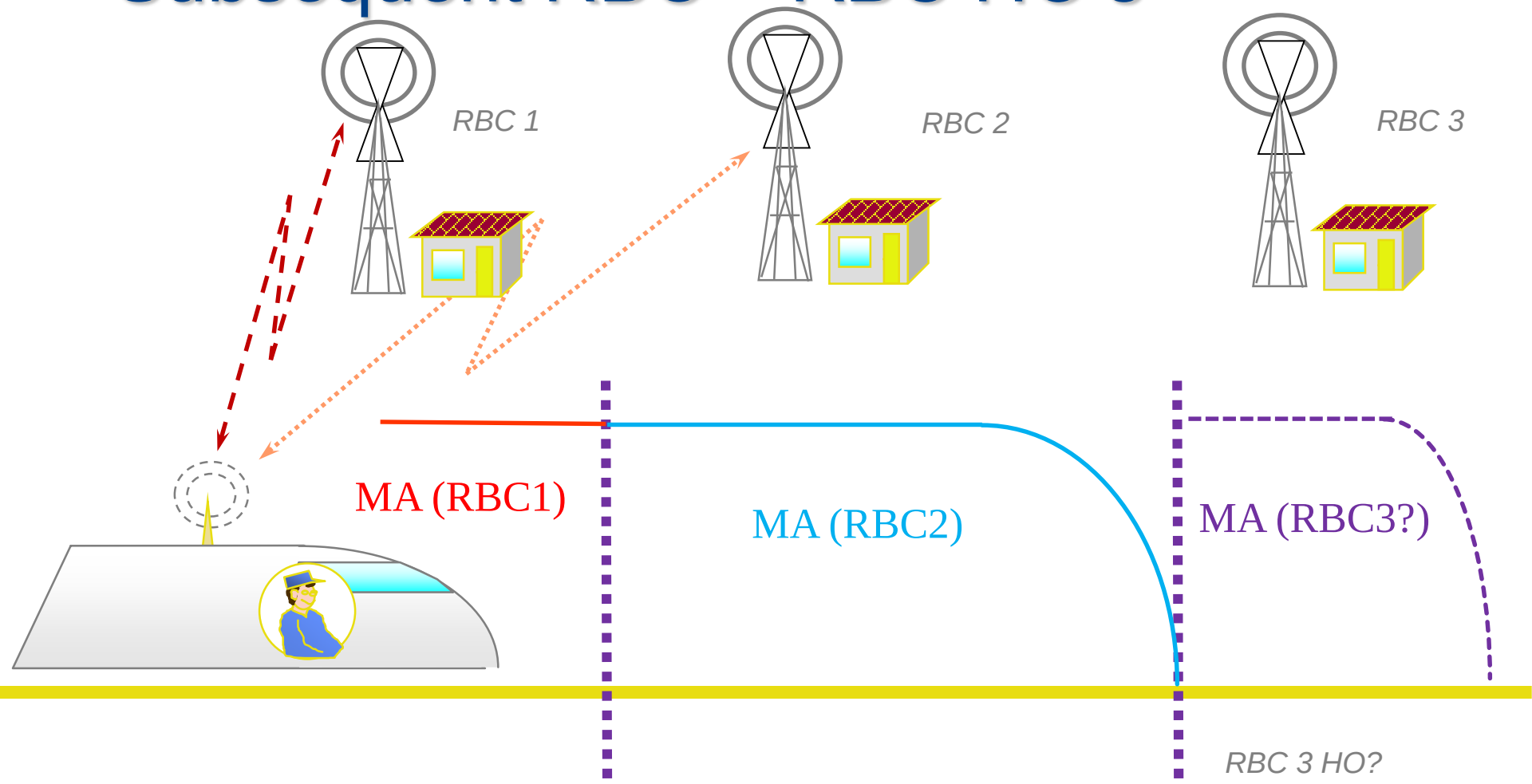
Issue H



SoM with an invalid position: driver has to validate/enter the RBC train data.
How does the driver know which RBC data is required?
Especially near a RBC-RBC HO location.
Note: RBC data errors take (from experience) a long time to (detect and) resolve.

Issue I

Subsequent RBC – RBC HO's



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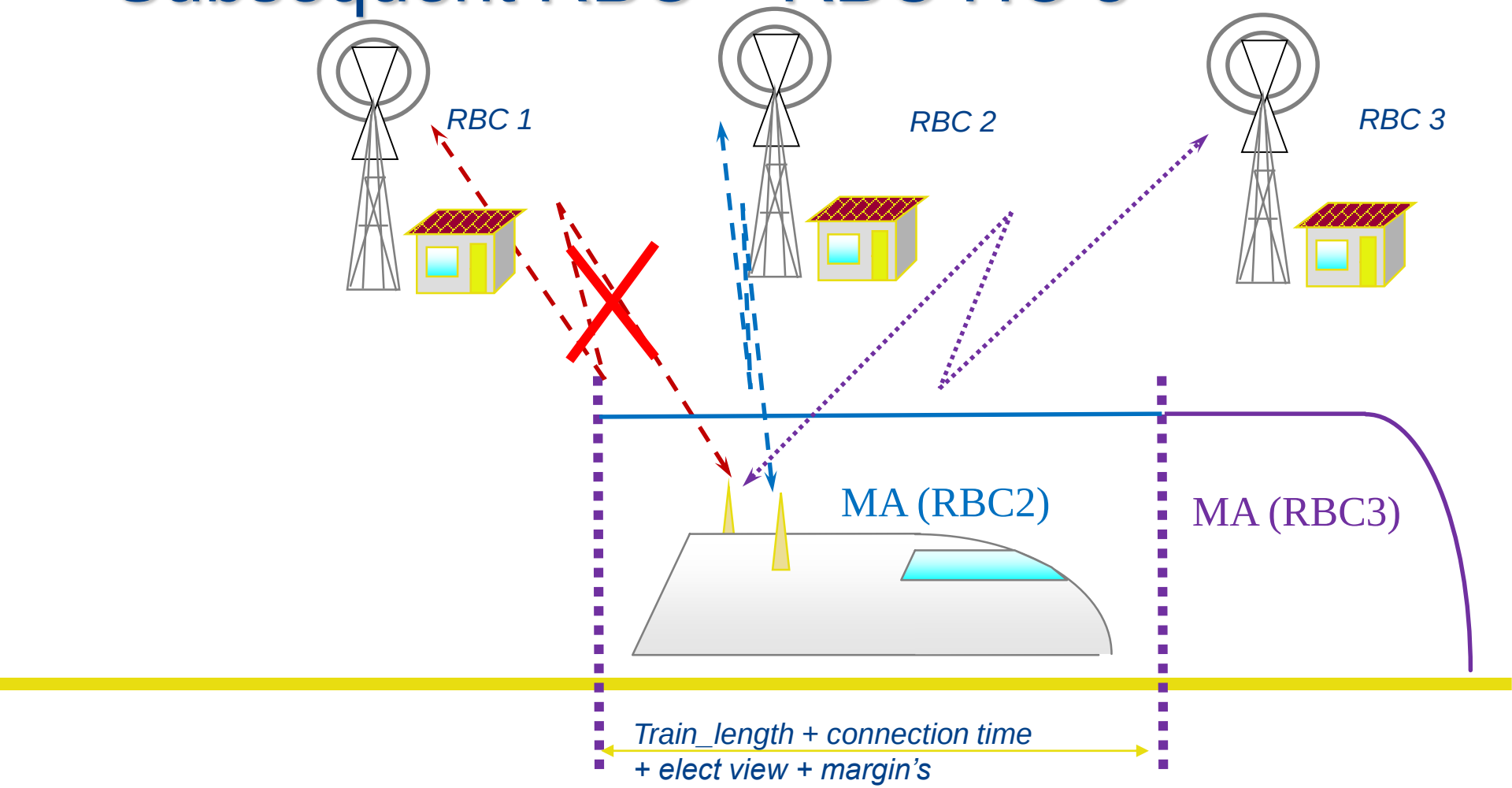
Issue I

Subsequent RBC – RBC HO's



What is the minimal distance between subsequent RBC HO's?

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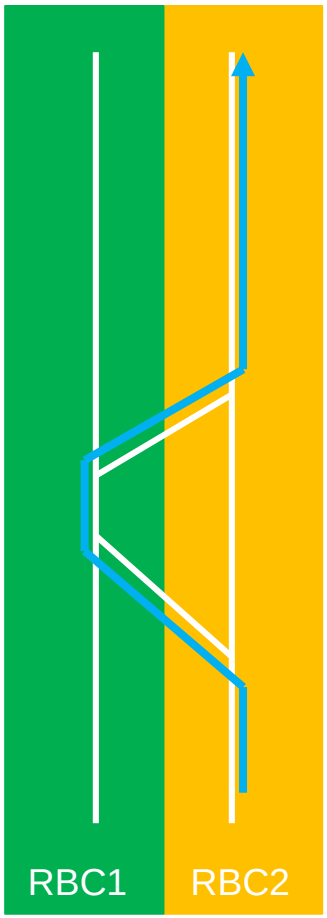
Issue I

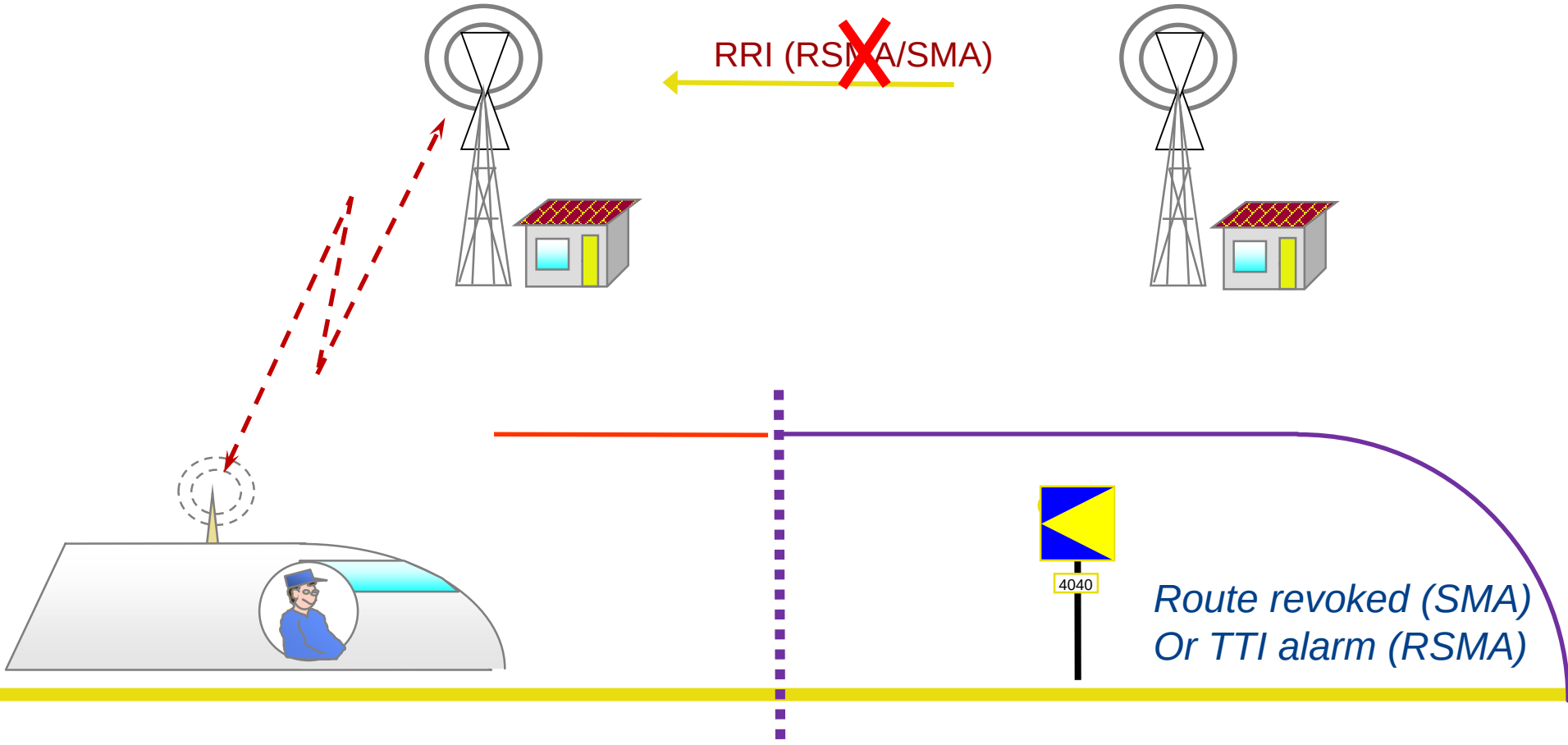
Subsequent RBC HO's



- Two RBC area's
- HO1 RBC2 ➔ RBC1
- HO2 RBC1 ➔ RBC2
- Possible?
  - P131 for second RBC HO can only be issued when in RBC 1 area
  - RBC 2 and RBC 1 are accepting and handing-over RBC for the same train

Issue J

Shorten MA on RRI: RBC RSMA or SMA?



ACC RBC shortens MA on RRI does HO RBC use a RSMA or SMA (SS039 4.5.1.2)

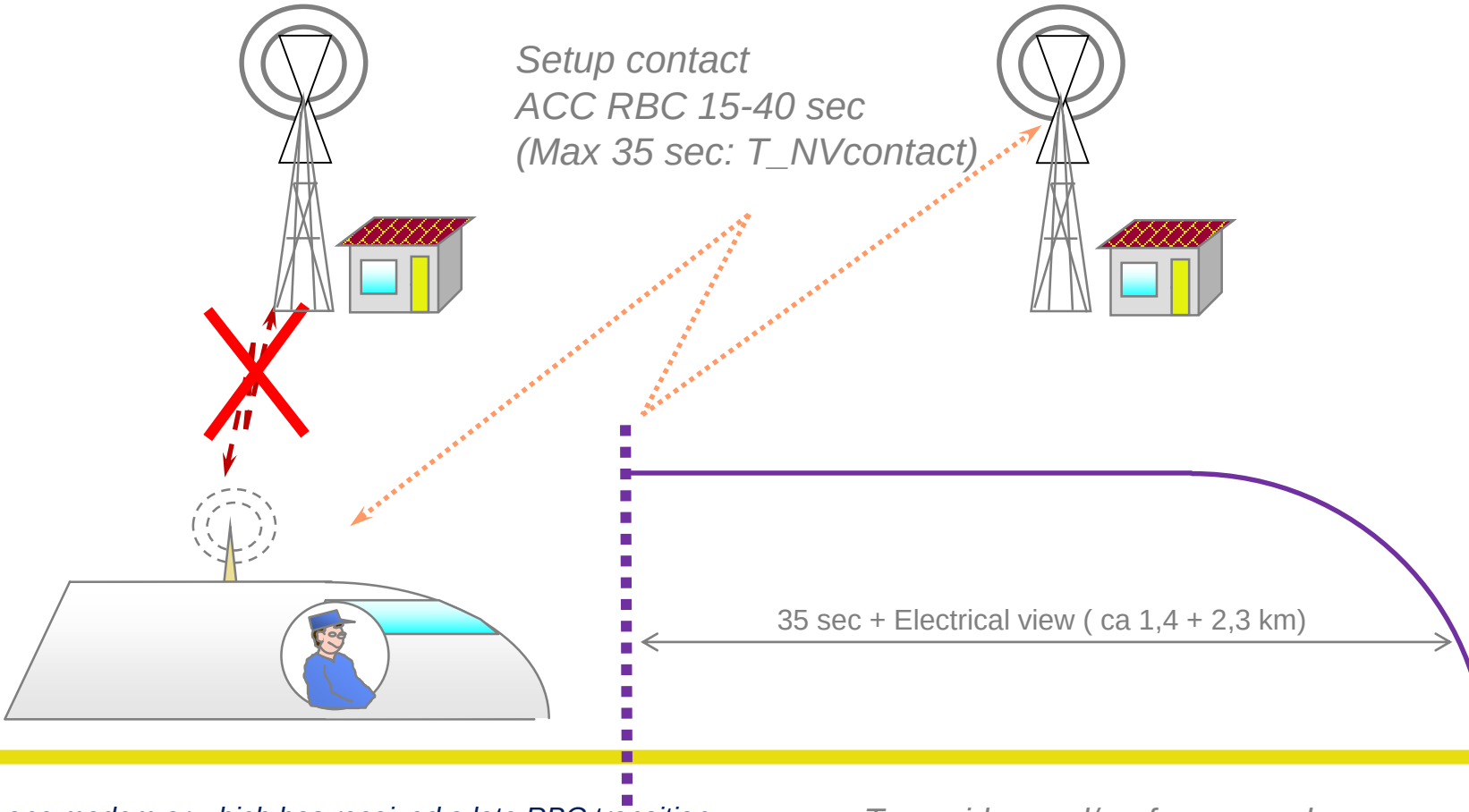
For a revoked signal the MA is always shortened (SMA). The cooperative revocation is used to release the route.

For a TTI alarm only a cooperative revocation (RSMA) is used to allow the train to continue if it can not stop in time.

How can the difference be made across the RBC-RBC interface?

Issue K

One modem or ‘late” RBC order



For a train with one modem or which has received a late RBC transition order the connection to the ACC RBC is established after the RBC-RBC transition. This takes nominally up to 40 sec. During this time no MA extensions are received. This has an performance impact and not also no CES or SMA can be received.

To avoid speed/performance decrease due to late MA update

RBC – RBC Hand Over analysis

Advise

- RBC-RBC HO location on the open line
  - Limits complexity (no danger points, SoM)
  - RBC area's have to include yards/"knopen"
- Limit the number of RBC's
  - Less RBC-RBC interfaces
  - Less RBC data entry complexity

Onboard

- Minimally two modems (preventing performance loss)
- Cold movement detector (prevent loss of RBC train data)

The downside of large RBC area's

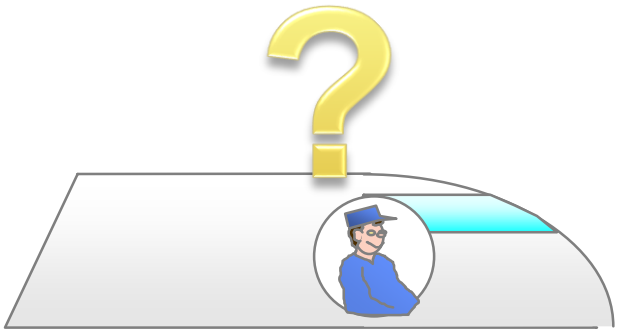
RBC availability

- High availability required → achievable?
- Fast restart/recovery needed → achievable?

RBC changeability

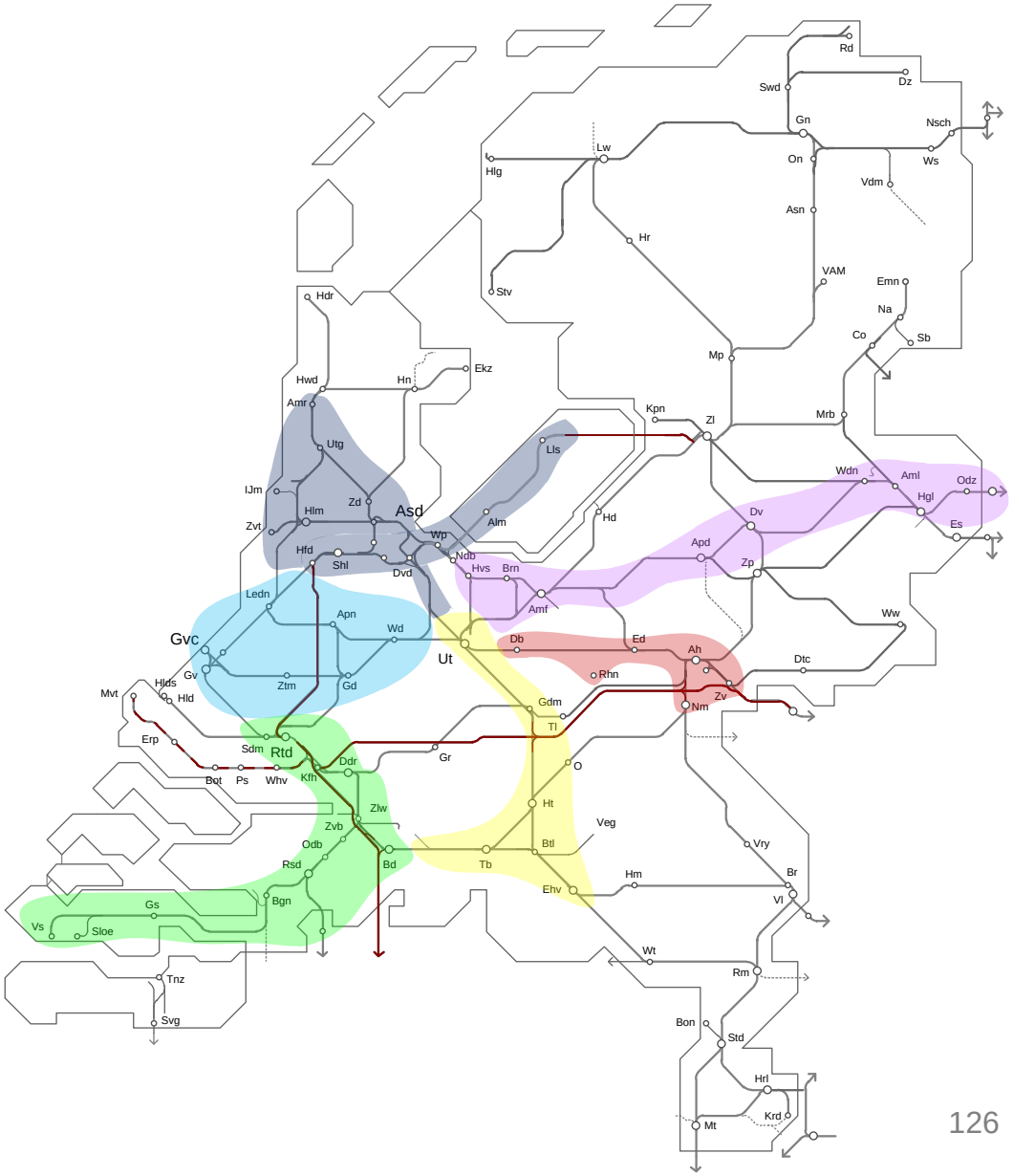
- Impact (time, area impacted) for change of application version
- Impact (time, area impacted) for change of infra (data)
- Efficient procedure needed for test/ startup after change

Example: Small RBC's



For illustration purposes only

Example: Large RBC's



For illustration purposes only

Question 1:

Do you have experience with RBC-RBC interfaces in operation?

If so, please specify:

- The location of RBC HO / RBCs involved
- Number of years RBC HO in operation
- Supported subset-39 version (if applicable)
- Infrastructure details (e.g. number of tracks, open line, yard, SoM area, distance points,...)
- Traffic details: (e.g. Cargo, HighSpeed, conventional Passengers, trains/hour,...)
- Known challenges

Question 2:

What is the known or expected behaviour of your product for the issues described (in the previous slides)?

- Please specify for each issue:
- The behaviour of your product
- The operational scenario and constraints
- The engineering requirements and constraints

What would the behaviour be in the case of an RBC-RBC HO between various suppliers (i.e. is the behaviour exactly as specified in TSI CCS subset-026/039/098)?

Question 3:

Do you agree with the conclusion of the analysis that RBC-RBC HO locations should be limited on the open line, so as to minimise operational issue's?

- Please specify:
  - Arguments why the conclusion is correct/incorrect
  - Alternative solutions
  - Engineering constraints of the RBC-RBC HO locations
  - Operation constraints of the RBC-RBC HO

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Question 4:

What is the size limitation of a RBC area that can be supported by your RBC product?

- Please specify the limitations:
  - Maximum number of elements (routes/points/sections,...)
  - Maximum number of connected and supervised trains
  - Maximum connected interlocking's
  - Maximum connected RBC's
  - Other constraints of the RBC area's

Question 5:

Would your product support the proposed RBC area definition (refer to slide 'Example: Large RBC's' in this presentation)?

- If not please specify:
  - Reasons why not
  - An advised alternative RBC area configuration for the roll-out of ERTMS

Question 6:

Please specify the following availability details of your RBC product

- Please specify :
  - Calculated availability
  - Number of installed RBC's, incl. years in service
  - Realised availability for RBC's in operation
    - Number of down times (planned and unplanned)
    - MTBF
    - MTTR
  - Constraints on environment(e.g. UPS, network demands, maximum distance interlocking, ...)

Question 7:

What is the impact of an RBC configuration change for an infrastructural alteration, such as moving a market sign or a change in the SSW area for your RBC product, on the supervised trains outside the impacted area?

- Please specify:
  - Size of impacted area
  - Required time window
  - On-site testing needed

Question 8:

What is the impact of a RBC software change on the supervised trains outside the RBC are in question?

- Please specify:
  - Size of impacted area (whole or part of RBC area)
  - Required time window
  - What kind of on site testing is needed

2. Presentation of subjects and questions

c. Centralisation of RBC and IXL systems and network architecture

Kees Goossen

ERTMS Infrastructure – What are the starting points?

- New framework for a Rail safety systems infrastructure
- Potential for national coverage
- Concentration of complex RBC/IXL functionality in a limited number of data centres
- Full remote control & monitoring of all assets and functions
- A underlying IP/MPLS network infrastructure
- Simple local infrastructure along the tracks (easy to maintain by local rail infra service providers)
- Configuration management by one flexible service provision partner
- In line with existing and evolving ICT infrastructure for traffic management

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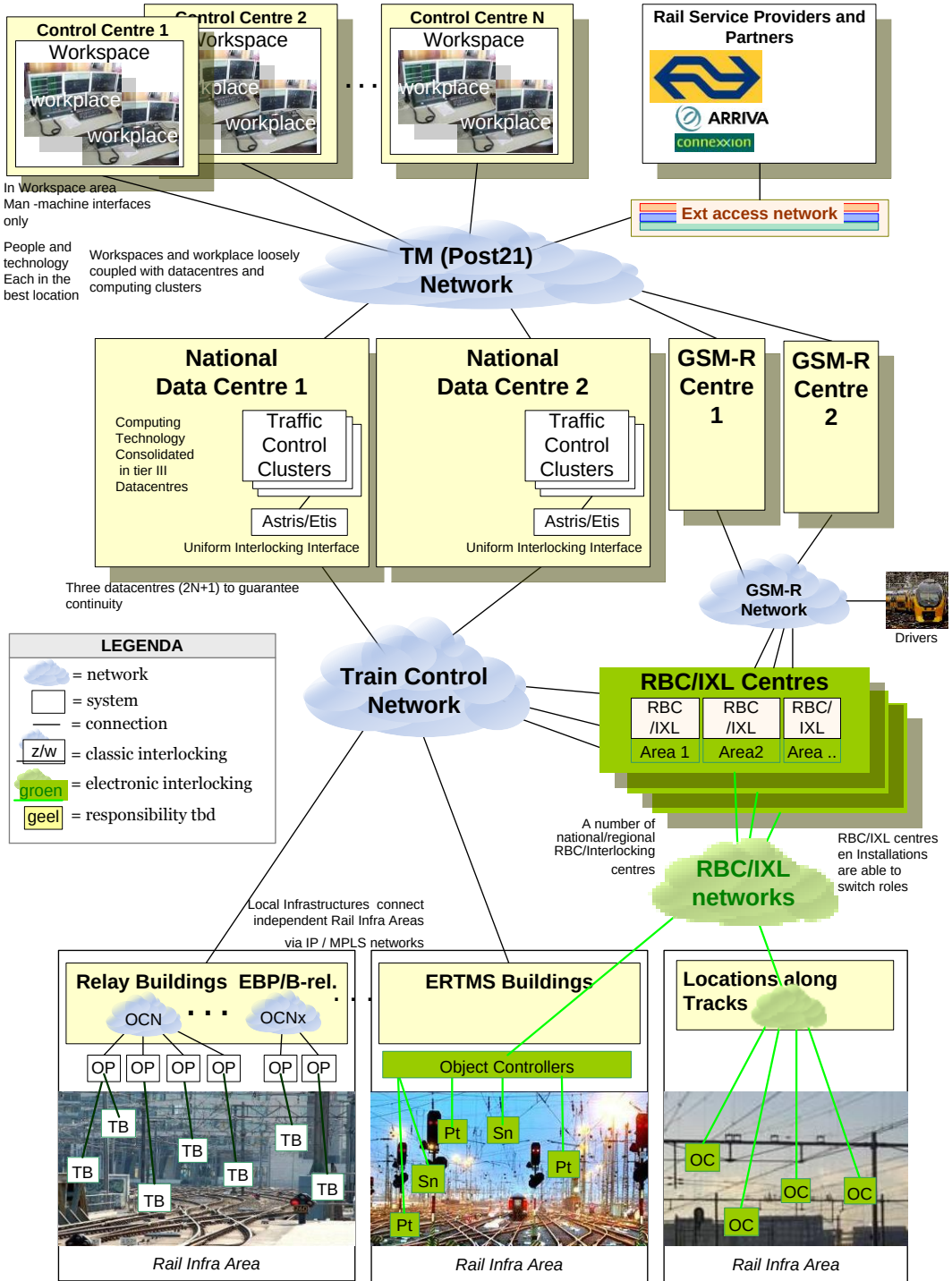

Traffic Management and Interlocking Systems

For illustration purposes only

Question 1: Disaster tolerance RBC/IXL

How can we prevent the long-term loss of RBC/IXL functionality in the event of a calamity?

What are the potential options to minimise the impact?

- Geographic redundancy
- Recovery Time Objective (RTO): how fast can we recover?
- Recovery Point Objective (RPO): How much data loss can we accept?

Which strategies can be applied?

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Question 2: Network strategies

Which strategies could be followed to build the network infrastructure ?

E.g:

- Independent network segments and layers as indicated in the previous slides;
- Routing techniques versus switching techniques
- Which measures will minimize impact on traffic in case of changes and failures?
- Backup networks?
- Geographic separation of routes?

Question 3: Data centre services

- ERTMS systems are in fact ICT systems; the question we wish to address here is whether the systems can be hosted by a third party (a data centre service provider).
- For the Programme it is essential that these systems are fully manageable via remote management tools (Lights out Data Centre).
- **What issues and challenges can be expected in this context?**

Question 4: Growth model

The idea is that in a period of ten years the main corridors of the Dutch Rail Infrastructure will be migrated to ERTMS in a growth model by adding geographical areas and implement new ERTMS functions (e.g. introduction level 3)

- **How can we support such a growth model and on the same time guarantee uniform behavior of ERTMS systems for the main users (drivers and traffic managers)?**
- **How can we prepare?**
- **What is the vision of suppliers to this subject?**

2. Presentation of subjects and questions

d. Exchange of information using an ERTMS data model

Fokke Bronsema

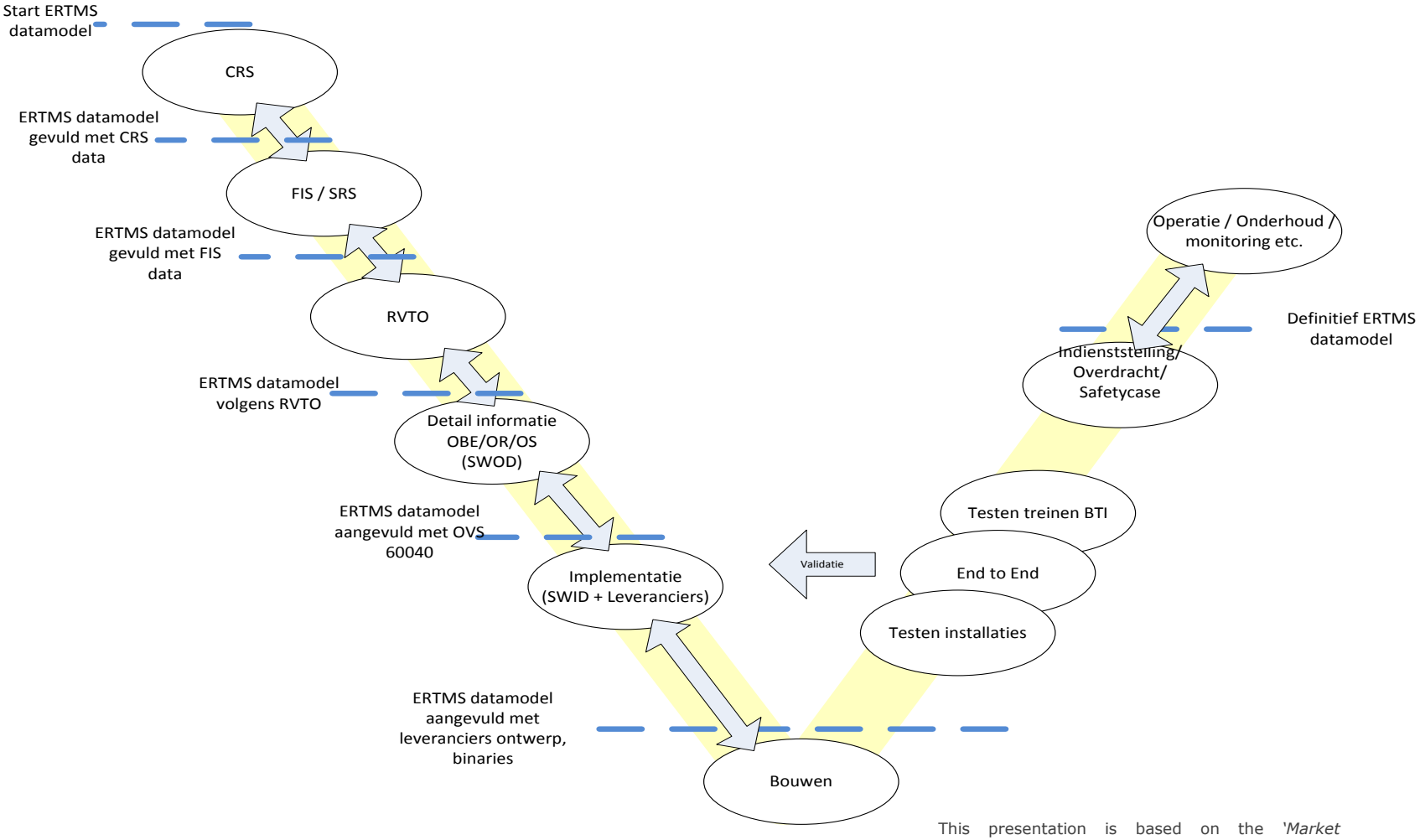
Contents

- Current problems with data exchange
- Proposed solution: IM Spoor
- What is IM Spoor?
- Example
- Future plans
- Our questions

Current problems with data exchange

- Format of existing ERTMS designs determined per project. This has lead to an inefficient way of data management
- Not all ERTMS data types can be described in conventional drawings (OBE/OR). For example: Static Speed Profile, Gradients
- The resolution of conventional drawings is not detailed enough (resolution in meters instead of centimeters)
- Inefficiency during handovers of design data between parties involved in design process (see next sheet)

V-model of design process



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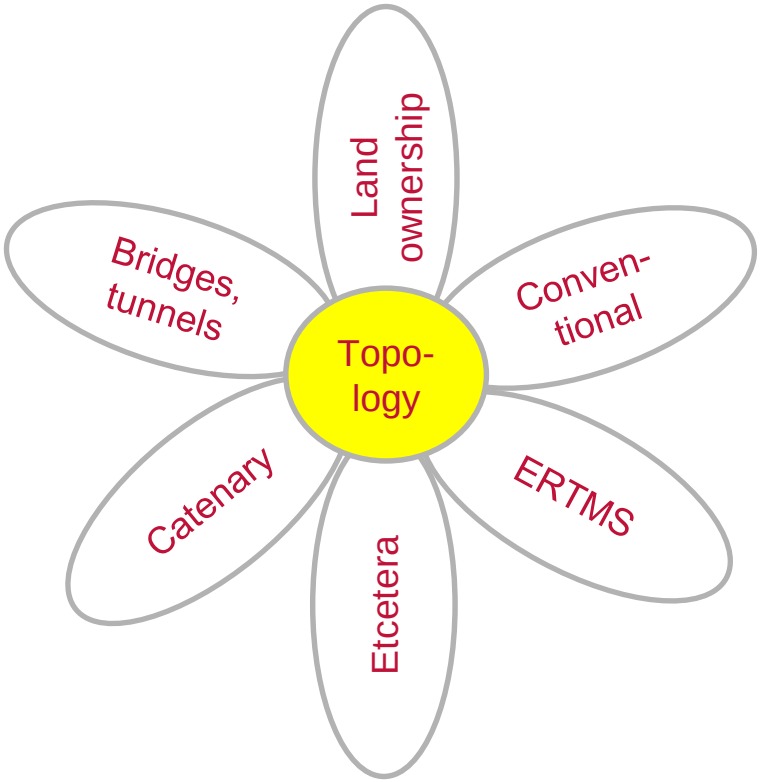
Proposed solution: “Infra Model Spoor”

IM Spoor:

- Is one common language to describe ERTMS data types to all stakeholders (amongst others: engineering companies, manufacturers, contractors, other ProRail departments)
- Reduces overhead during data transfers as there is less interpretation needed
- Complies to the XML-standard
- Ready for international standard RailML

IM Spoor flower



- The flowerbud contains the topology, the common core of all information types
- The petal “ERTMS” contains the SSP, gradients, balise contents, etc.
- The petal “Conventional” contains interlocking data, such as demand points, work zones, etc.

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IM Spoor example

This example describes a fictional part of a track (only topology) in a structured way. ERTMS data in IM Spoor are not yet available.

```
<?xml version="1.0" encoding="UTF-8"?>
<IMSpoor xmlns="http://www.prorail.nl/IMSpoor" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gml="http://www.opengis.net/gml" xsi:schemaLocation="http://www.prorail.nl/IMSpoor IMSpoor-0.420.xsd">
    <RailInfrastructure>
        <RailTopology>
            <RailTopologyFragment>
                <Nodes>
                    <Node puic="n01">
                        <Passages>
                            <Passage fromIndex="0" toIndex="1"/>
                            <Passage fromIndex="0" toIndex="2" twoway="false"/>
                        </Passages>
                        <PointGeography>
                            <gml:Point srsName="EPSG:28992">
                                <gml:posList srsDimension="2">140000 497500</gml:posList>
                            </gml:Point>
                        </PointGeography>
                    </Node>
                    <Node puic="n02">
                        <Passages>
                            <Passage fromIndex="0" toIndex="1"/>
                            <Passage fromIndex="0" toIndex="2"/>
                        </Passages>
                        <PointGeography>
                            <gml:Point srsName="EPSG:28992">
                                <gml:posList srsDimension="2">141000 497500</gml:posList>
                            </gml:Point>
                        </PointGeography>
                    </Node>
                    <Node puic="n03">
                        <PointGeography>
                            <gml:Point srsName="EPSG:28992">
                                <gml:posList srsDimension="2">141500 497000</gml:posList>
                            </gml:Point>
                        </PointGeography>
                    </Node>
                    <Node puic="n04">
                        <Passages>
```

IM Spoor, future plans

Now:

- Topology, geography and ERTMS-relevant objects can be modelled in IM Spoor (XSD available)
- Conventional data available in conventional formats (OBE/OR)

Future:

- All interlocking and RBC design data available in IM Spoor
- Schematic overviews (like OBE) will be generated
- Incorporation with RailML (current model is compatible with RailML v3)

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Questions

1. Dataprep

a) Is this format in keeping with your existing data prep processes?

b) If not, can you adjust your existing data prep processes to make them suitable?

c) What do you believe to be the pros and cons of this format?

2. Data exchange

a) Are you able to use this format for the exchange of design data with ProRail? E.g. to build / as built designs, intermediate communication.

b) What do you consider alternatives to this format?

3. Next steps

Date	Activity
July 9th	• Kick off meeting • Distribution market consultation document
August 31th	Deadline for responses to questions Infrastructure
September 14th	Invitations for 1-to-1 sessions
October 9th	Final 1-to-1 sessions

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Thank you for your attention

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