System Version (SV) Management
and
Backward Compatibility Analysis (BCA)

The presentation represents a compilation taken from documents prepared by the ERTMS Users Group and ERA

Baseline

A **baseline**…

…is defined by a <u>stable kernel</u> in terms of system <u>functionality</u>, performance and other non-functional characteristics.
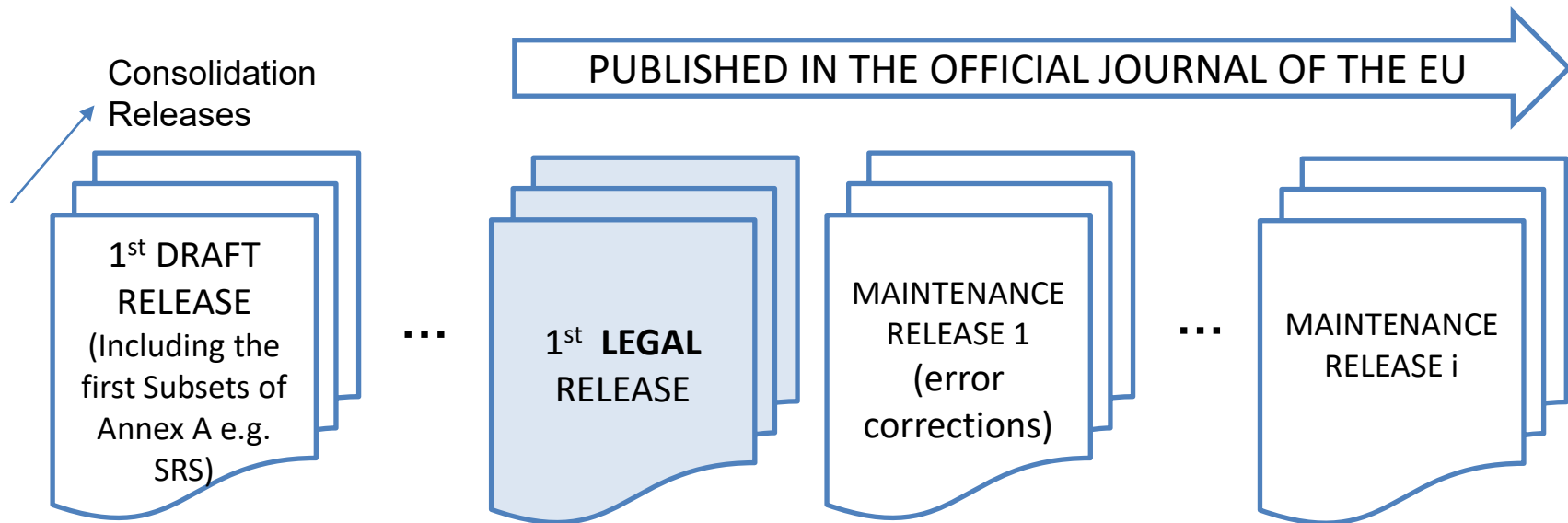
New baseline implies significant changes to the kernel by:
- adding new functionalities
- changing substantially existing ones

Baseline release

A **baseline release…**

…is defined by a specific version of the relevant documents that are listed in the TSI CCS* annex A or included in the TSI OPE* annex A.

see ERA_ERTMS_0001: ERTMS Change Control Management

Consolidation Releases

PUBLISHED IN THE OFFICIAL JOURNAL OF THE EU

1st DRAFT RELEASE (Including the first Subsets of Annex A e.g. SRS)

...

1st **LEGAL** RELEASE

MAINTENANCE RELEASE 1 (error corrections)
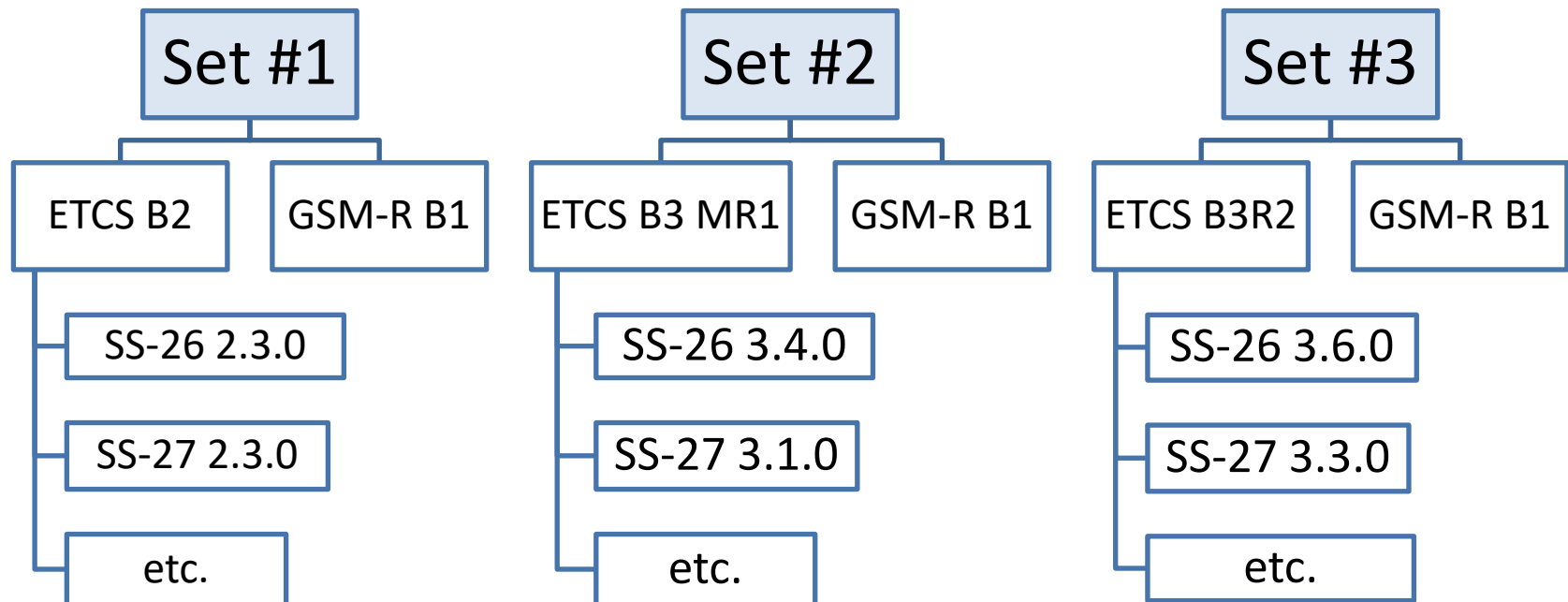
...

MAINTENANCE RELEASE i

(*) Abbreviations   TSI: Technical Specification for interoperability
- CCS: Control Command Signalling
- OPE: Operation and traffic management

Set of specifications

A **set of specifications** …

… lists all mandatory specification documents with their version.

The TSI contains now 3 sets of which one has to be applied.

Set #1	Set #2	Set #3
ETCS B2 — GSM-R B1	ETCS B3 MR1 — GSM-R B1	ETCS B3R2 — GSM-R B1
SS-26 2.3.0	SS-26 3.4.0	SS-26 3.6.0
SS-27 2.3.0	SS-27 3.1.0	SS-27 3.3.0
etc.	etc.	etc.

System Version

A **System version (SV)…**

… defines unambiguously the ETCS mandatory functions
that ensure technical interoperability
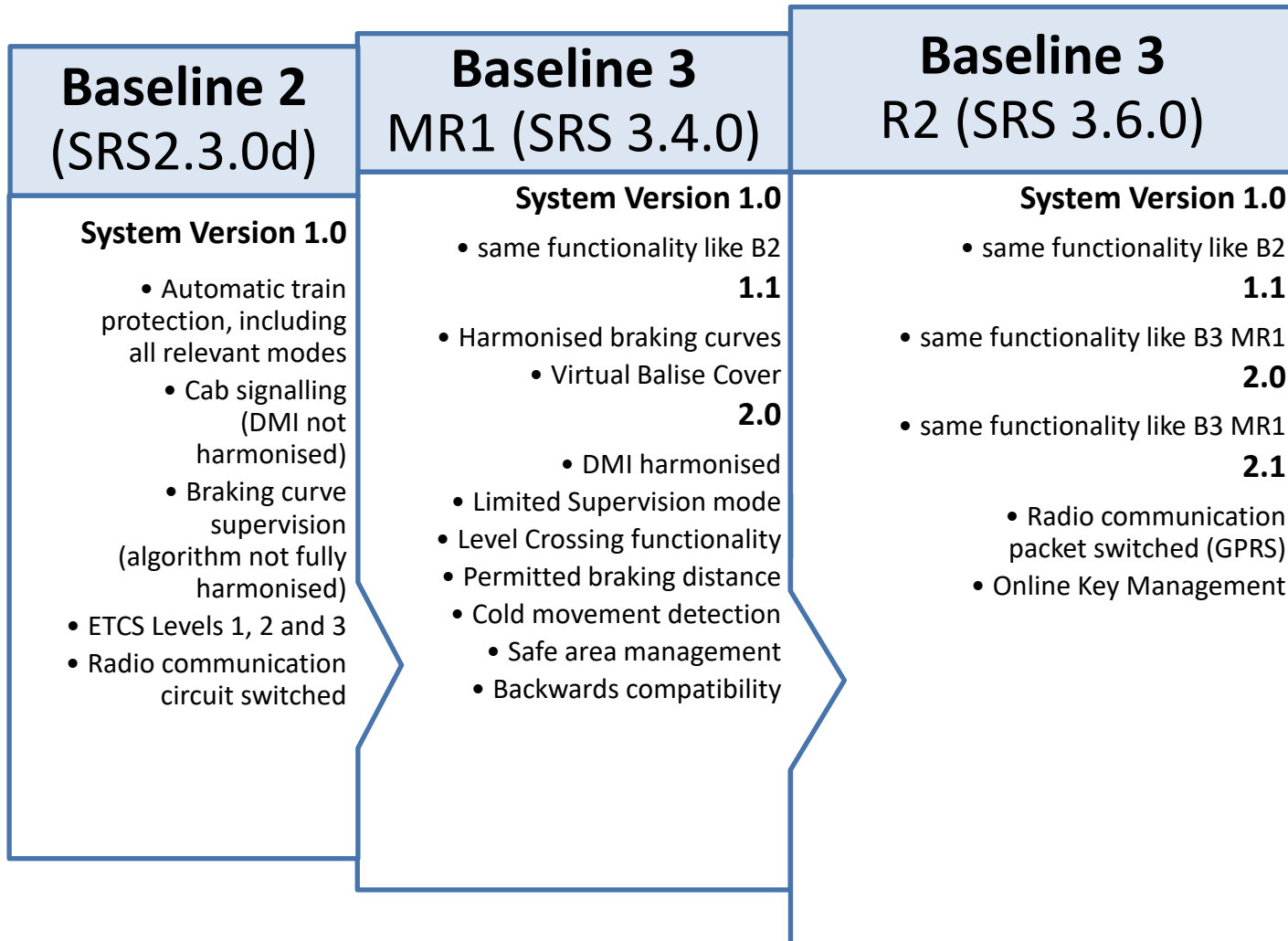between ERTMS/ETCS on-board and trackside subsystems

Why do we need a System version (SV)?
- To to prevent situations leading to an unacceptable reduction of safety or performance, due to changes in the ERTMS/ETCS specifications (and hence behaviour)
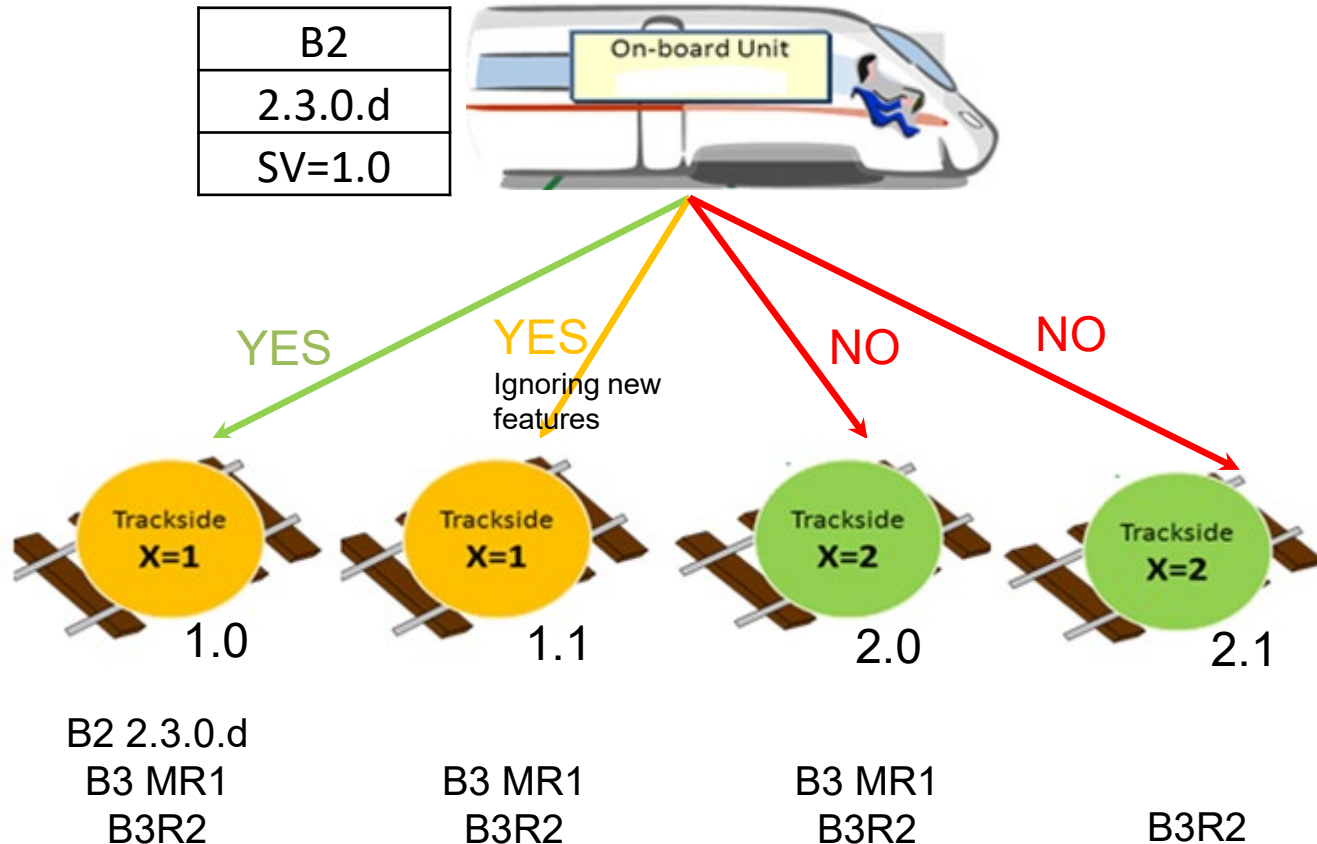
A System version (SV) **is NOT**:
- To be assimilated to a certain Baseline or Baseline Release
- Defined by a single document (f.e. SRS)
- A version of the ETCS language
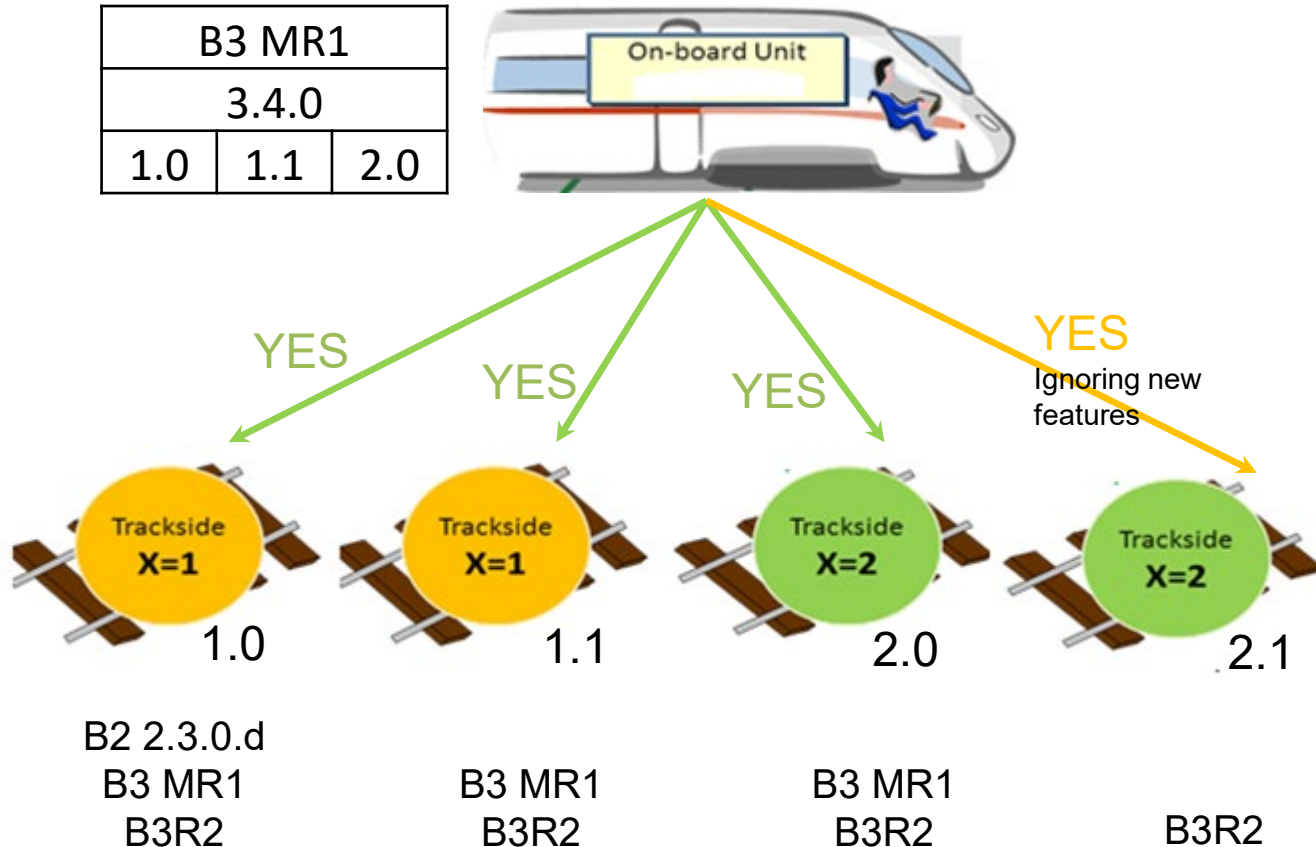- A suppliers' product version !

Baselines and System Versions

Baseline 2 (SRS2.3.0d)	Baseline 3 MR1 (SRS 3.4.0)	Baseline 3 R2 (SRS 3.6.0)
System Version 1.0 • Automatic train protection, including all relevant modes • Cab signalling (DMI not harmonised) • Braking curve supervision (algorithm not fully harmonised) • ETCS Levels 1, 2 and 3 • Radio communication circuit switched	**System Version 1.0** • same functionality like B2 **1.1** • Harmonised braking curves • Virtual Balise Cover **2.0** • DMI harmonised • Limited Supervision mode • Level Crossing functionality • Permitted braking distance • Cold movement detection • Safe area management • Backwards compatibility	**System Version 1.0** • same functionality like B2 **1.1** • same functionality like B3 MR1 **2.0** • same functionality like B3 MR1 **2.1** • Radio communication packet switched (GPRS) • Online Key Management

The B2 on-boards

| B2 |
| 2.3.0.d |
| SV=1.0 |

YES

YES
Ignoring new features

NO

NO

Trackside X=1
1.0

Trackside X=1
1.1

Trackside X=2
2.0

Trackside X=2
2.1

B2 2.3.0.d
B3 MR1
B3R2

B3 MR1
B3R2

B3 MR1
B3R2

B3R2

The B3 MR1 on-boards

B3 MR1		
3.4.0		
1.0	1.1	2.0

YES

YES

YES

YES
Ignoring new features

1.0

1.1

2.0

2.1

B2 2.3.0.d
B3 MR1
B3R2

B3 MR1
B3R2

B3 MR1
B3R2

B3R2

The B3R2 on-boards

B3R2			
3.6.0			
1.0	1.1	2.0	2.1

On-board Unit

YES   YES   YES   YES

Trackside **X=1**   Trackside **X=1**   Trackside **X=2**   Trackside **X=2**

1.0   1.1   2.0   2.1

B2 2.3.0.d
B3 MR1
B3R2

B3 MR1
B3R2

B3 MR1
B3R2

B3R2

Summary Compatibility (1)

Quality, Functionality "Evolution" ↑

Quality, Functionality "Evolution" ←

B3R2 OBU

B3MR1 OBU

B2 OBU

System Version		**Highest** SV supported by on-board			
		1.0	1.1	2.0	2.1
B2	One Installed SV trackside — 1.0	Yes	Yes	Yes	Yes
	1.1	Yes*	Yes	Yes	Yes
B3MR1	2.0	No	No	Yes	Yes
B3R2	2.1	No	No	Yes*	Yes

* without X.1 functionality

Summary Compatibility (2)

On-board Unit **Baseline 2**

On-board Unit **Baseline 3 MR1**

On-board Unit **Baseline 3 R2**

↓	OK	
↓ (dashed)	OK, but new X.1 functions not used	
↓ (red)	Not OK	

Trackside **1.0**

Trackside **1.1**

Trackside **2.0**

Trackside **2.1**

B2
B3MR1
B3R2

B3MR1
B3R2

B3MR1
B3R2

B3R2
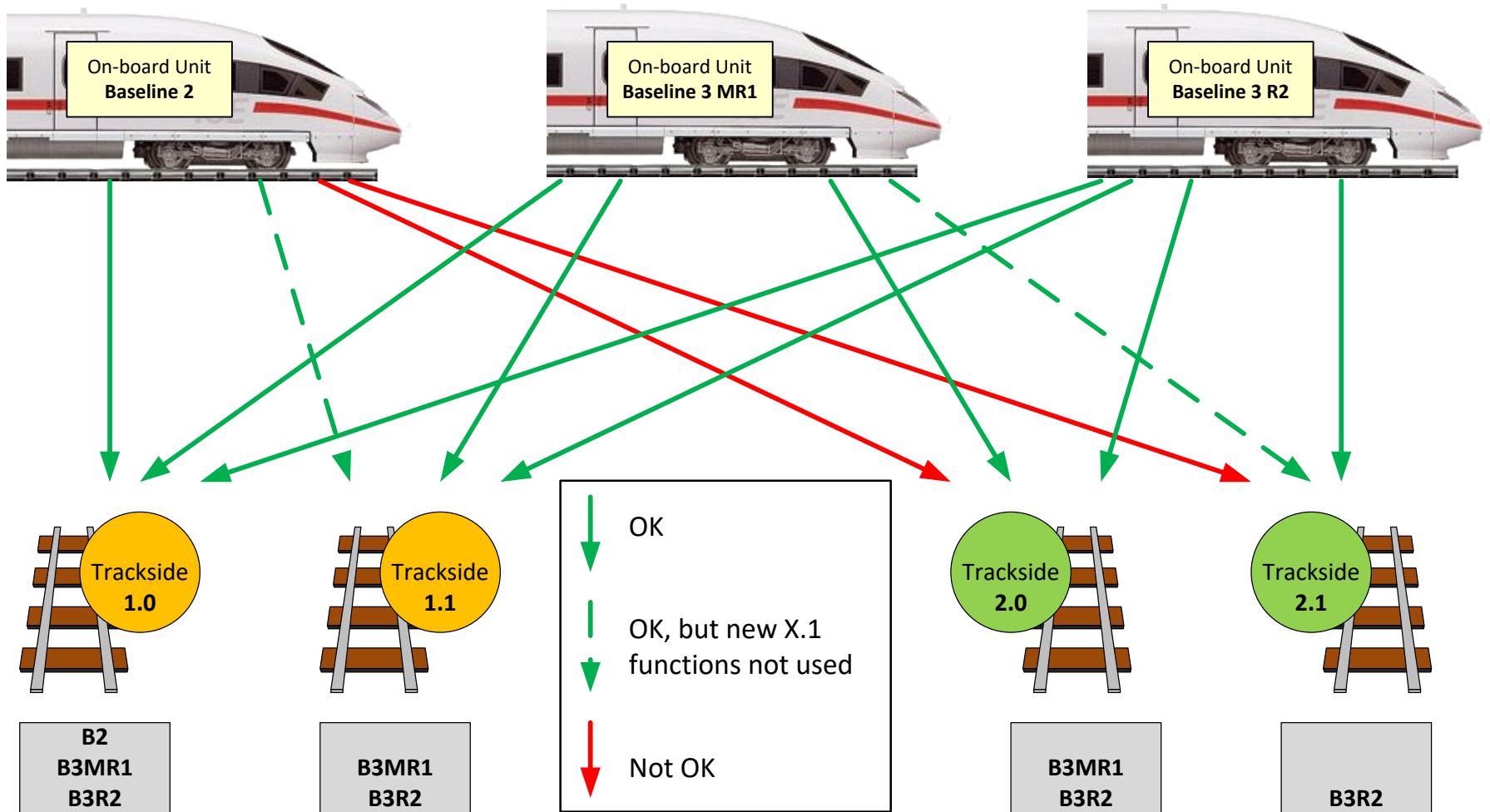
Summary

- A baseline can contain several system versions, a baseline release defines which SVs are available.

- Technical compatibility is checked between (implemented) trackside and (available) on-board system versions, NOT between baselines or SRS versions

- Trains can be backwards and forwards compatible to a trackside (however, some BCA mitigation measures should be obeyed).

Excursion on
Baseline Compatibility Assessment

Baseline Compatibility Assessment

- What is a BCA ?

- BCA = **Baseline Compatibility Assessment**

- Check of compatibility between specific specification versions of ERTMS Baseline trackside and the Baseline of the on-board installed in train

- Performed on paper by specification experts

BCA history

CCS TSI 2016/919
ART 10 ERROR Corrections

2016

| 1st BCA 2014 | 2nd BCA 2016 | 3rd BCA T.O. 2017 | 4rd BCA T.O. 2020 * |

SET #1

SET #2

SET #3

1st BCA: 436 CRs

2nd BCA: 55 CRs

3rd BCA : 22 CRs

4th BCA : 42 CRs
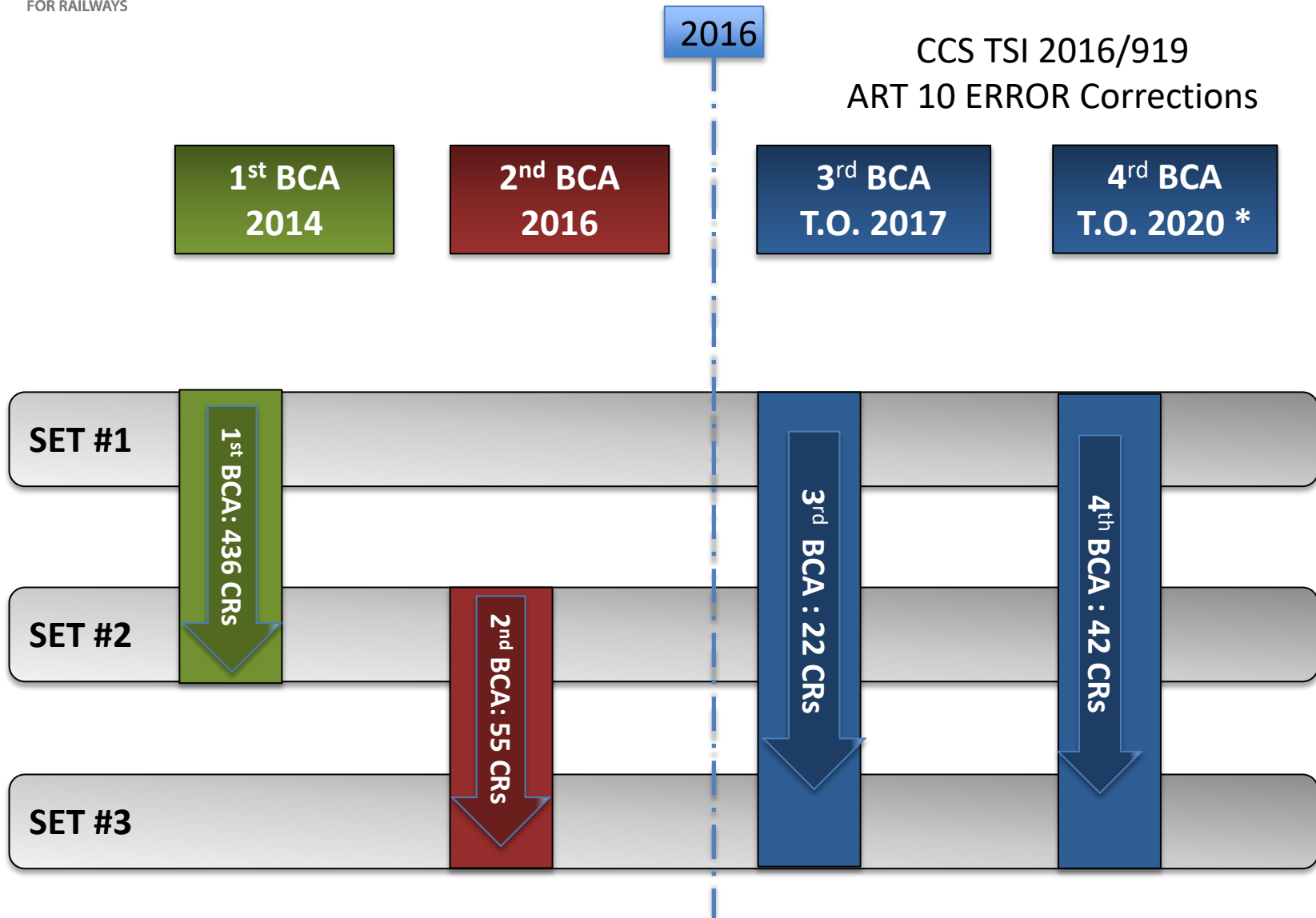
An assessment of the compatibility between baselines (BCA) has been carried out by EUG, UNISIG

How? Evaluating all changes between Baseline 2 (2.3.0d) and Baseline 3 MR1 (2014)

Why? 1. To verify the backwards compatibility between B3 and B2

2. To detect potential compatibility issues within B2, due to unsolved errors in the specs.

Results:

1. CRs fixing problems introduced by the B3

2. Recommendation on how to deal with errors already existing in B2 specifications.

B3 MR1

U·N·I·S·I·G   ERTMS

ERTMS/ETCS

**Baseline Compatibility Assessment
Final Report**

- A <u>second baseline compatibility assessment</u> has checked that:

  - ETCS baseline 3 R2 is fully backward/forward compatible with ETCS baseline 3 MR1

- Was part of the Change Control Management organised by ERA

- Checking of compatibility between B3 and B2 and within B3

- For all **55 CRs** of B3 R2

- Defining mitigation measures for detected problems

- The Agency, in collaboration with the experts of the Sector organizations, is carrying out the analysis and assessment of the CR in the database that can be considered as errors in the system specifications, with a view to identify those errors which could prevent the system to provide normal service according to Article 10 of the Commission Regulation (EU) No 2016/919.

- The results of this work is presented in this Opinion ERA/OPI/2020-2.

- Performed for all **new validated** error CRs
- **Mitigation** to be published regularly (Art. 10)
- **Changes** to specifications to be included in next TSI

- BCA provides help to analyse compatibility

- Art. 10 provides officially published – between legal TSI's – mitigation measures.

- Further reading :

  - ERA_ERTMS_0001 ERTMS Change Control Management

  - BCA reports