

ETCS System Compatibility Testing (ESC)

Optimisation of campaigns and reduction of needed tests

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Agenda

1. ETCS System Compatibility (ESC) - Background & definition
2. ESC return of experience – Sector feedback from ERTMS Users Group (EUG)
3. ESC Experience and viewpoint from a vehicle supplier
4. Experience and viewpoint from an ETCS on-board supplier
5. Conclusions and proposed next steps

Introduction to ETCS System Compatibility

<https://www.era.europa.eu/content/etcs-and-radio-system-compatibility-escrsc>

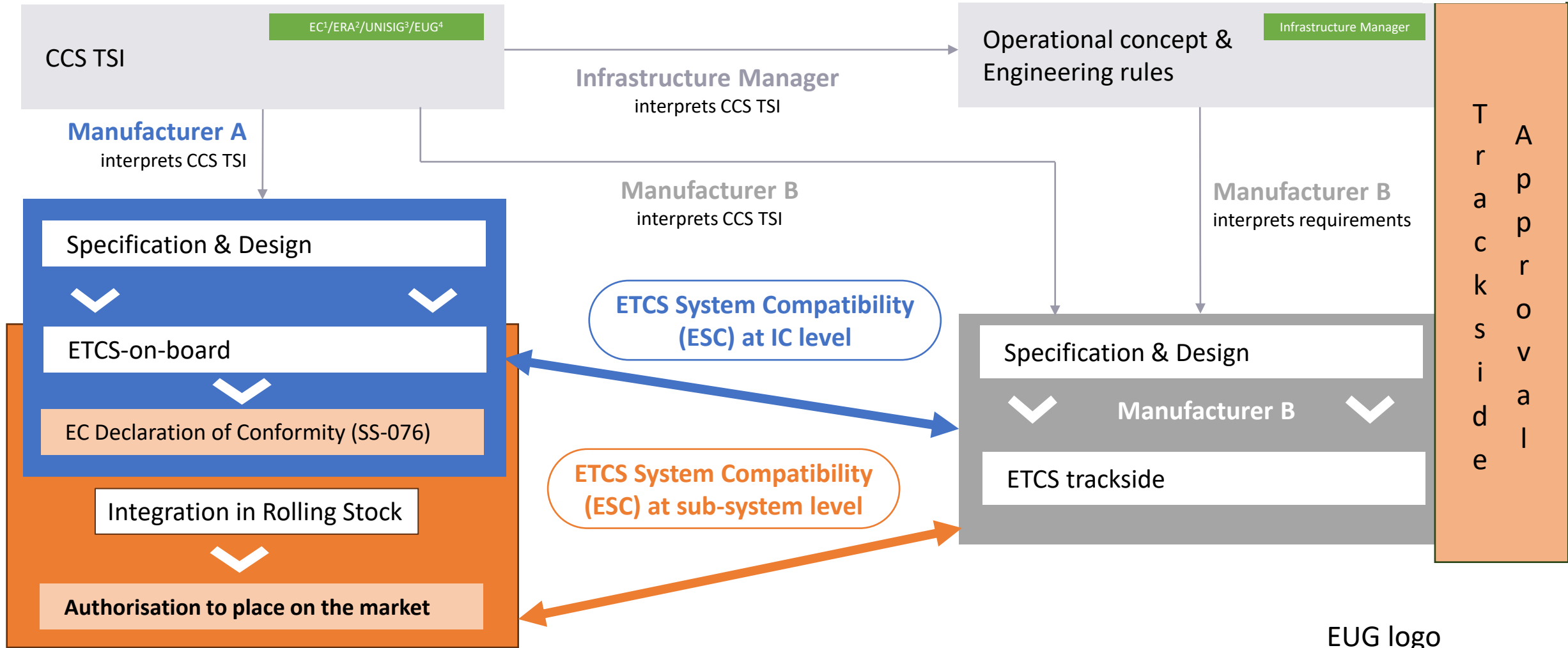
Even a successful certification process cannot always exclude that, when an on-board CCS subsystem interacts with a trackside CCS subsystem, one of the subsystems repeatedly fails to function or perform as intended under certain conditions. This may be due to ***variance*** in national control-command and signalling equipment (e.g. interlockings), ***engineering and operational rules***, deficiencies in the specifications, different interpretations, ***design errors*** or equipment being installed incorrectly.

Therefore, ***checks*** might need to be carried out to ***demonstrate the technical compatibility*** of the control-command and signalling subsystems ***in the area of use*** for a vehicle. The necessity of these checks should be considered as a ***temporary measure*** to increase the confidence on the technical compatibility between the subsystems. The possibility of executing those ***checks in a laboratory*** representing the trackside configuration to be made available by the Infrastructure Manager should be ***prioritized***.

Reminder : [ERA report V1.1 March 2021 : On the implementation of ETCS system compatibility \(ESC\) and radio system compatibility \(RSC\)](#)

The background of ETCS system compatibility (ESC)

Harmonization of compatibility test processes for ETCS track and train integration



EUG logo

1 European Commission | 2 European Agency for Railways | 3 Consortium of the European Signalling Industry to produce & maintain the ETCS specification | 4 ERTMS Users Group

Highlights from the ESC return of experience

(Performed by EUG – feedback from IMs, RUs, UNISIG)

1. Positive elements

- Process up and running – more than 100 ESC campaigns performed
- Checks available from all IMs
- Very few errors detected demonstrating maturity of Baseline 3 products
- Anticipation of issues affecting operation due to testing with real trackside engineering

2. Reported issues

- Administrative burden leading to high costs
- ESC should be decoupled from authorisation process
- Poor availability of labs and/or limited access
- Very few ESC performed at IC level
- Change management very complex
- In practice, implementation of ESC is different (from very simple to very complex) from one country to the other



Question : considering this feedback, how to improve ESC ?

EUG logo

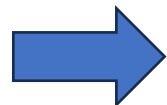
Conclusions from the EUG survey

The necessary conditions for a seamless integration are not fulfilled, e.g.:

- No harmonised trackside engineering rules
- No harmonised operation rules
- No standard products
- ESC process not harmoniously implemented over Europe
- Products based on new baseline with functional updates under development

Therefore, ESC remains necessary but shall be simplified :

- As a target, track-train integration should be tested once at IC-level for each major functional version



Next step : Sector and ERA representatives to rework the ESC process

ESC

Process & checks

Dirk Feigenspan, Hartwig Schuster

ERTMS Conference

ESC/RSC process

VECTRON – One locomotive platform for Europe – Scope of ESCs

What did we expect?

Harmonization

- Standardized test procedure

Reduced efforts

- Simple procedures
- Generic product approach

Reduced complexity

- Involved parties
- Fast processing

Cooperation Track/Train

- Clear Transition period
- Coordinated Timeline

ESC is not yet the European standard.

What have we recognized?

Country	Nr.	Remark (based on ESC/RSC Technical Document V28)
AT	1	Full ETCS network coverage
BE	4	Differentiation by Level and Line classification
BG	0	Not published yet
CH	3	Differentiation by Baseline -> Full network coverage
CZ	2	Differentiation by Baseline
DE	2	Differentiation by Baseline and Level /Line-specific?
DK	2	Differentiation by Region East and West
FR	37	Differentiation by Network/Level/Transition/Border station
HR	0	Not published yet
HU	0	Not published yet
IT	22	Differentiation by Line/Border station
LU	2	Full network coverage
NL	23	Differentiation by Level/Transition/Class B section/Border station
PL	6	Differentiation by Sections of lines
RO	1	Not applicable yet
RS	0	Not published yet
NO	2	Differentiation by Baseline and Project stage
SK	2	Differentiation by Baseline and Line-specific?
SE	5	Differentiation by Trackside versions
SI	0	Not published yet
Total	114	High efforts caused by inhomogeneous procedures

ESC/RSC process

VECTRON – One locomotive platform for Europe – Vehicles in operation

What did we experience?

ESC for existing lines

- TTI further valid?
- New defined ESCs obligatory?
- Updates within same ESC / Line

Long lasting procedure

- First procedures up to 24 months
- In average > 6 months

Identical ETCS track equipment

- Generic ESCs work well
- Identical tracks directly usable

for “vehicles in operation”

Resources for procedure

- TM / IM / NoBo available?
- Lab / Track / Vehicle available? TM / IM / NoBo available?

Deadlines

- Disadvantage for vehicles with ETCS OBU
- Deadlines do not reflect time required

Forced Upgrades

- Certification not for all SW versions feasible
- ESCs can demand HW/SW upgrade for a fleet

ESC causes additional costs in order to keep vehicles running.

ESC/RSC process

VECTRON – One locomotive platform for Europe – New Authorization

What did we experience?

Efforts for ESC procedures

- Tests in Lab / Track / Linespecific
- Test campaign > 50% only for ESC

ESC versus Class B

- Simple procedure for most Class B systems
- Netwide access with Class B
- ESC multiple more complex, trend rising

ESC in Type Authorization

- Clear visibility
- Extensions by New versions possible (but new APM required)

ESC puts additional efforts on vehicles with Class B and ETCS.

for “New Authorization” of existing vehicle type

Cross border with ESC

- Up to 20 ESCs per country
- Pure Class B transition as ESC
- Blocked crossing for BL3 vehicles

Specific ESCs

- Engineering rules / Level/ suppliers
- Numerous Linespecific ESCs

ESC Coverage

- ESC types not released
- No test tracks available

ESC checks – experience from the ETCS on-board perspective

Trainguard 100/200/300 OBU – A mature, maintenance free ETCS on-board – ESC test methods

Field testing

Experience:

- **High effort for organization; requires often “non-harmonized” test authorization;**
- Limited time for testing (e.g. only weekends at night);
- Amount of tests very different, but transparent; sometimes faster than lab;
- Lab testing sometimes a precondition.

Room for improvement:

- Shall be reduced to the absolute minimum;
- Authorization procedures should be aligned on a pan-European basis.

Lab testing – RBC supplier lab

Experience:

- **Complexity for integration of test environments not to be underestimated** (e.g. for remote: tunnel infrastructure, agreements for IP addresses, customs);
- **High costs;**
- Untransparent testing (without ETCS on-board supplier).

Room for improvement:

- stronger harmonization of interfaces for test environments;
- Testing shall be more transparent with involvement of all parties;
- Costs need to be optimized.

Lab testing – IM lab

Experience:

- **Costs differ (from free of charge to very high), but usually transparent;**
- Transparent testing (IM, trackside and on-board supplier);
- Preconditions very different (from “IC certificates only” to “specific hazard analysis”).

Room for improvement:

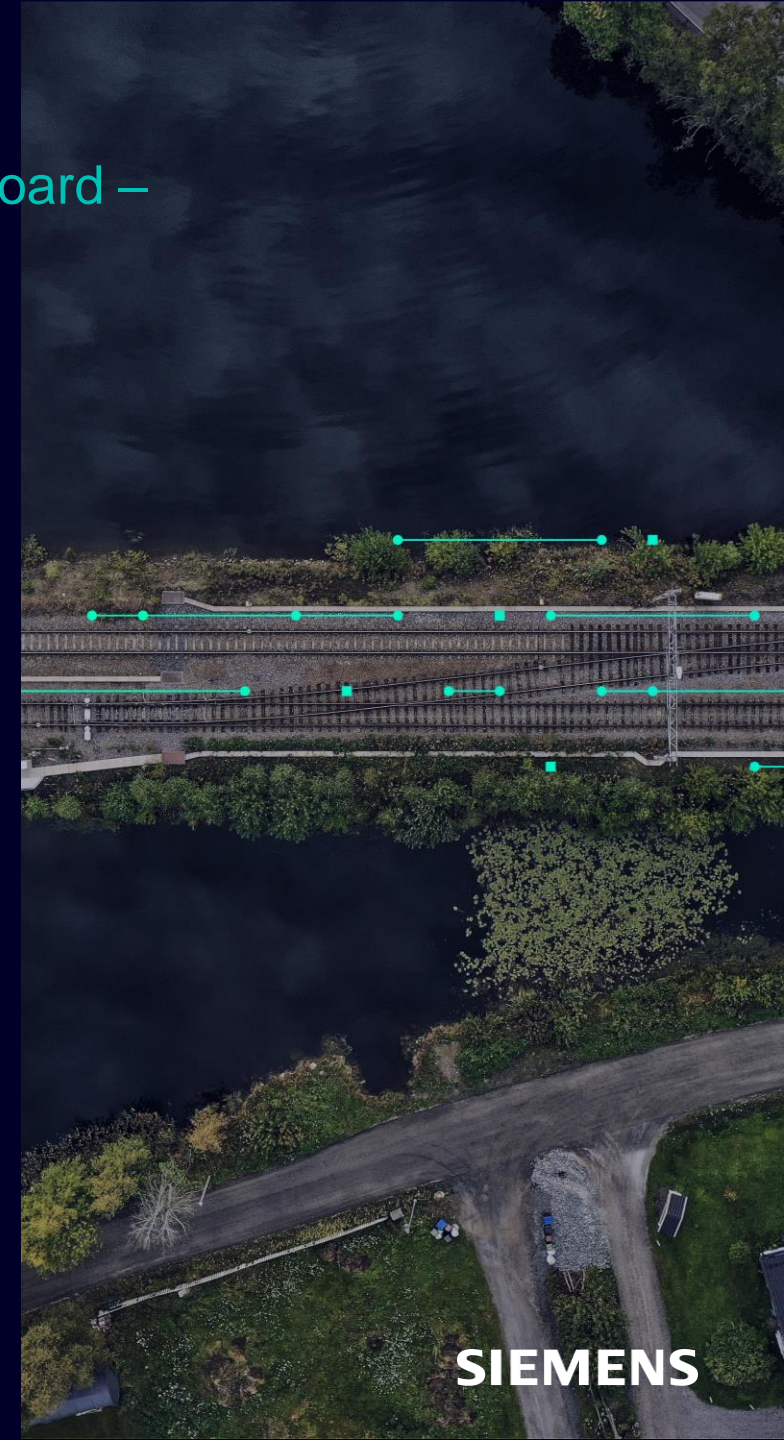
- Labs shall align on best practice approach;
- Harmonization of preconditions necessary (IC certificates shall be sufficient).

ESC checks – experience from the ETCS on-board perspective

Trainguard 100/200/300 OBU – A mature, maintenance free ETCS on-board – ESC check findings

- We performed **ESC checks in 12 countries** with **hundreds of test cases**;
- Findings are very small in number and not in acceptable proportion to effort and cost;
- Findings are...
 - ...related to **ETCS trackside engineering** or **ETCS trackside product errors**;
 - ...related to the **ETCS on-board**. These are **very limited** (five on-board related findings in total, traced back to different interpretation of the specification);
 - Some IMs accept ESC IC statements, for others it is not an option at all.

All ETCS on-board findings have **been related to the interoperability constituent level** and could be solved by **small SW updates**; none of the findings have been vehicle type specific; none of the updates introduced additional problems.



ESC checks – experience from the ETCS on-board perspective.

Trainguard 100/200/300 OBU – A mature, maintenance free ETCS on-board –
Conclusion

Suggestions by an ETCS on-board supplier for improvement of ESC

- Stronger focus of ESC checks on analysis and restriction to the most efficient method;
- Assign ESC checks per default to the interoperability constituent / product level;
- Stop functional enhancements and maintain ETCS system version 2.1 for a reasonable time; focus on improvement of ETCS quality and performance;
- Harmonize operational procedures and trackside engineering rules;
- **Trust the competence of infrastructure managers, railway undertakings and suppliers; disconnect ESC from conformity assessment and authorization.**



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