Cenelec TC 9X

Electrical and electronic applications for railways

Survey group 34

Digitalization for railways

2022-02-26

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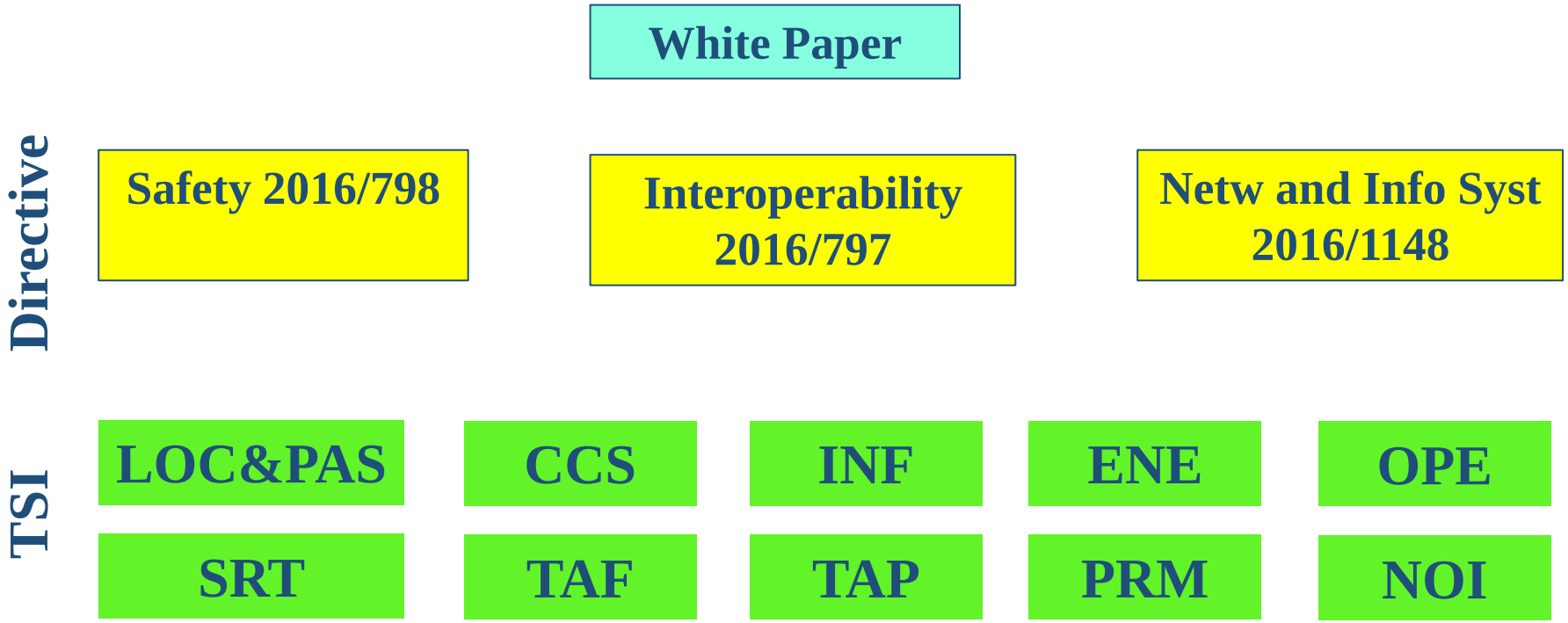
Creation

- 1988 : preliminary survey about the creation of two railway specific standardization bodies (CEN and CENELEC)
- 1989 : setup of TC9X “ Electric and electronic applications for Railways”
- May 1990 : 1st meeting
- Promoted by the European commission
- Initial objectives :
  - prepare standards supporting Directive 93/38 for the European market in the excluded sectors (railways, water, ...) in order to achieve the free market for goods and services inside Europe
  - Enlarge scope of IEC TC 9 (not only to rolling stocks) and speed-up work (two plenary meetings / year)

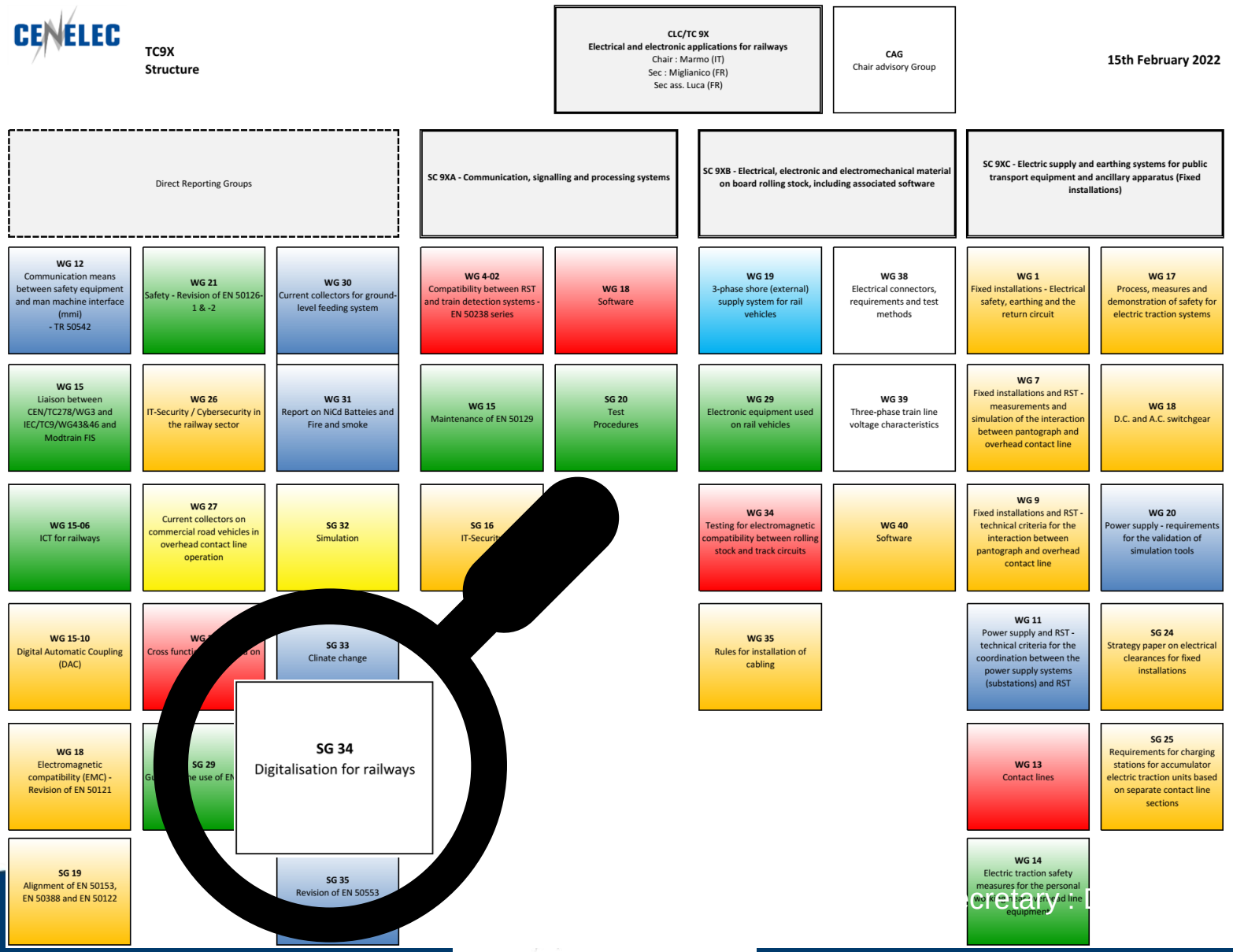
Additional Mandates

- To support TSI interoperability specification
  - Directive 1996/48 : Interoperability of the trans-European high-speed rail system
  - Directive 2016/797 : Interoperability of the rail system within the European Union
- To support Safety directive
  - Directive 2016/798 : railway safety
- To support Network and Information Directive (NIS)
  - Directive 2016/1148 : security of network and information systems across the Union

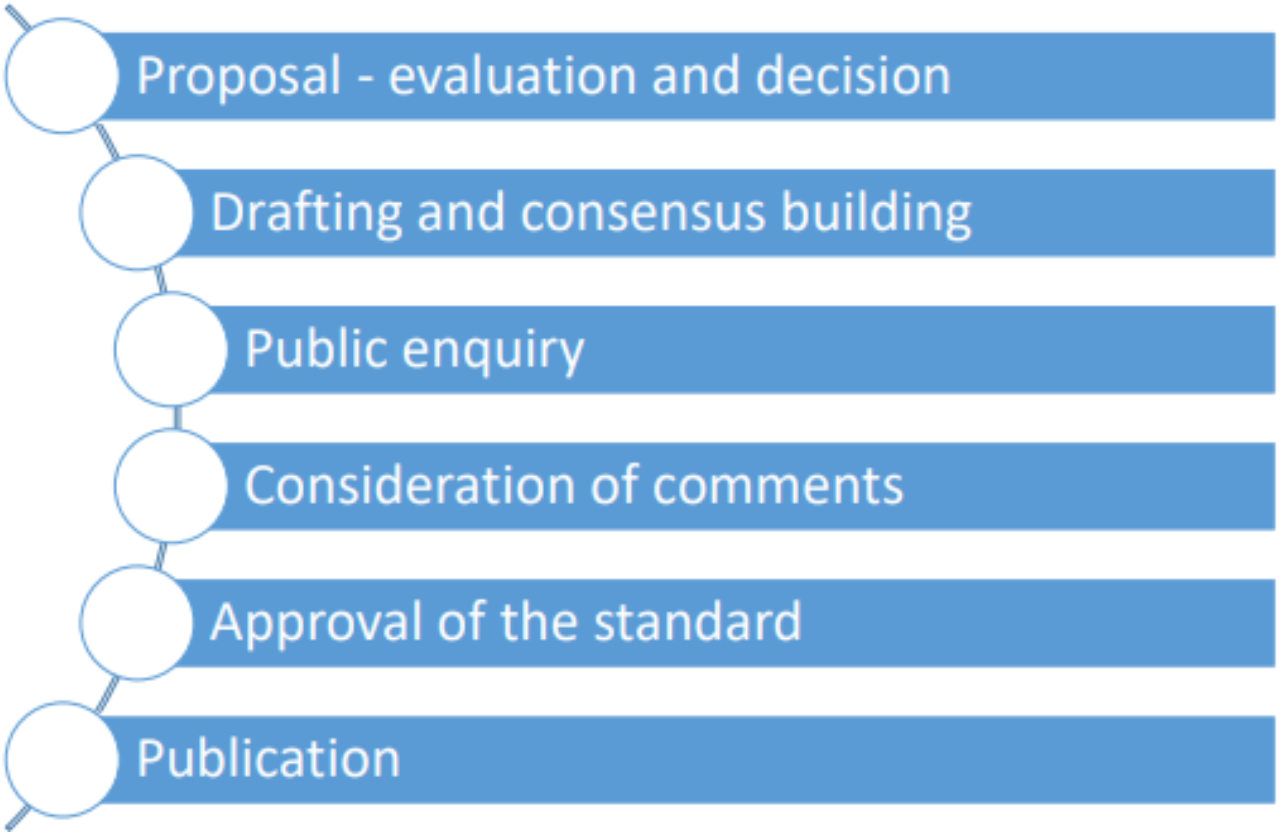
Regulation context



CLC TC 9X Projects – General view



Process to elaborate a standard



Between 2 and 3 years

Current AI and Digital twins standardisation activities

- ISO/IEC JTC 1/SC 41/WG 6 : **Digital twin**
- ISO/IEC JTC 1/SC 41/WG 7 : **Maritime, underwater IoT and digital twin applications**
- ISO/IEC JTC 1 SC 42 : **Artificial Intelligence**
- IEC SEG 10 : **Ethics in Autonomous and Artificial Intelligence Applications**
- ISO/IEEE 11073 : **Standardized Digital Twin Framework for Health and Well-Being in Smart Cities**
- CEN-CENELEC JTC 21 : **Artificial Intelligence**

Digital twins in Railways

- At diferent stages:
  - Requirements and concept
  - Product development
  - Test and commissionning
  - Operation and services
- With different systems:
  - Moving system (Train, Metro, Tram, People mover)
  - Infrastructure
  - Signalling systems
  - Process (manufacturing)

Challenges

- Exchange data, object …
- With the same structure, format, unit, time stamping, accuracy, …
- With the same meaning …
- Even if one side if changing process or upgrade software

- Interoperable twins

- Define :
  - Who owns the data, its definition ?
  - Who is responsible of the data ?

113-01-06	process	[113 - Physics for electrotechnology]
113-04-08	quasi-static process	[113 - Physics for electrotechnology]
113-04-10	process quantity	[113 - Physics for electrotechnology]
192-01-08	process, <in dependability>	[192 - Dependability]
351-42-33	process, <in control technology>	[351 - Control technology]
351-42-34	technical process	[351 - Control technology]
351-47-60	process-oriented sequential control	[351 - Control technology]
351-54-01	process computer system	[351 - Control technology]
351-54-02	compact process computer system	[351 - Control technology]
351-54-03	distributed process computer system	[351 - Control technology]
351-54-04	redundant process computer system	[351 - Control technology]
351-54-05	process interface	[351 - Control technology]
351-54-10	process monitoring system	[351 - Control technology]
351-54-11	process peripherals	[351 - Control technology]
351-55-16	process control function	[351 - Control technology]
395-08-07	centrifugal process	[395 - Nuclear instrumentation]
395-08-08	gaseous diffusion process	[395 - Nuclear instrumentation]
395-08-38	Purex process	[395 - Nuclear instrumentation]
485-22-03	process and control test	[485 - Fuel cell technologies]
523-05-06	LIGA process	[523 - 523]
541-04-02	subtractive process	[541 - Printed circuits]
541-04-03	additive process	[541 - Printed circuits]
541-04-04	semi-additive process	[541 - Printed circuits]
561-07-23	polarization process	[561 - Piezoelectric devices for frequency control and selection]
561-07-26	reduction process, <material for SAW devices>	[561 - Piezoelectric devices for frequency control and selection]
692-01-15	restoration process, <in an electric power system>	[692 - Generation, transmission and distribution of electrical energy – Dependability and q
811-37-05	application process	[811 - Electric traction]
811-37-85	process data	[811 - Electric traction]
811-37-86	process variable	[811 - Electric traction]
815-14-09	surface diffusion process	[815 - Superconductivity]
815-14-10	composite fabrication process	[815 - Superconductivity]
815-14-11	bronze process	[815 - Superconductivity]
815-14-12	chemical vapour deposition process	[815 - Superconductivity]
815-14-13	physical vapour deposition process	[815 - Superconductivity]
815-14-14	in-situ process	[815 - Superconductivity]
815-14-15	ex-situ process	[815 - Superconductivity]
815-14-16	powder metallurgy process	[815 - Superconductivity]
815-14-17	external diffusion process	[815 - Superconductivity]
815-14-18	tube process	[815 - Superconductivity]
815-14-19	internal tin process	[815 - Superconductivity]
815-14-20	infiltration process	[815 - Superconductivity]
815-14-21	jelly roll process	[815 - Superconductivity]
815-14-22	melt-textured growth process	[815 - Superconductivity]
815-14-24	melt process	[815 - Superconductivity]
815-14-28	sol-gel process	[815 - Superconductivity]
815-14-29	coprecipitation process	[815 - Superconductivity]
815-14-30	spray drying process	[815 - Superconductivity]
815-14-31	spray pyrolysis process	[815 - Superconductivity]
815-14-32	freeze-drying process	[815 - Superconductivity]
815-14-33	plasma spray process	[815 - Superconductivity]
821-12-58	safety process	[821 - Signalling and security apparatus for railways]
841-21-18	thermal process	[841 - Industrial electroheat]
841-22-08	physical vapour deposition process	[841 - Industrial electroheat]
845-24-043	spectral quantum efficiency of a fluorescent process	[845 - Lighting]
901-02-18	process standard	[901 - Standardization]
904-01-05	process, <in environmental standardization>	[904 - Environmental standardization for electrical and electronic products and systems]

Why standards are required ?

- Railways is a specific sector
  - Reliability, punctiality
  - Safety
  - Security
  - Constraints
    - **Regulation**
    - **EMC**
    - **Legacy systems**

- To allow interoperability and interchangeability

Standards for what ?

- Need to clearly separate twins technologies for which generic standards will be developped (for example a language for describing and defining digital twins that allows tools to manipulate them)

and

- Application to the railways domain
  - Definition (ontology-ies)
  - Granularity, level of detail, acccuracy,
  - Adapted to the use (safety and security)

Digital twins standard characteristics

- They should help :
  - To ensure clear, unambiguous definition of data
  - To allow privacy of data
  - To ensure exchange of data between the physical object and the digital object in both direction
  - To evaluate and validate any update of the real system before entry into service

AI standard characteristics

- They should help :
  - To respect fundamental values and human rights
  - To ensure appropriate governance of AI throughout the system lifecycle compliant with the safety process defined in EN 50126 series
  - To ensure trustworthy (availability, robustness, reliable, safe, secure, resilient, maintainability) AI
  - To strengthen European competitiveness

Conclusions

- Results from R&D activities should feed the standardisation activities
- Standardisation ensures a broad use of S2R results
- Participations to Technical committee (in particular TC 9X / SG 34) are welcome !

Thank you for your attention