ATO

Next Step in the Automation (Rail Industrialisation)

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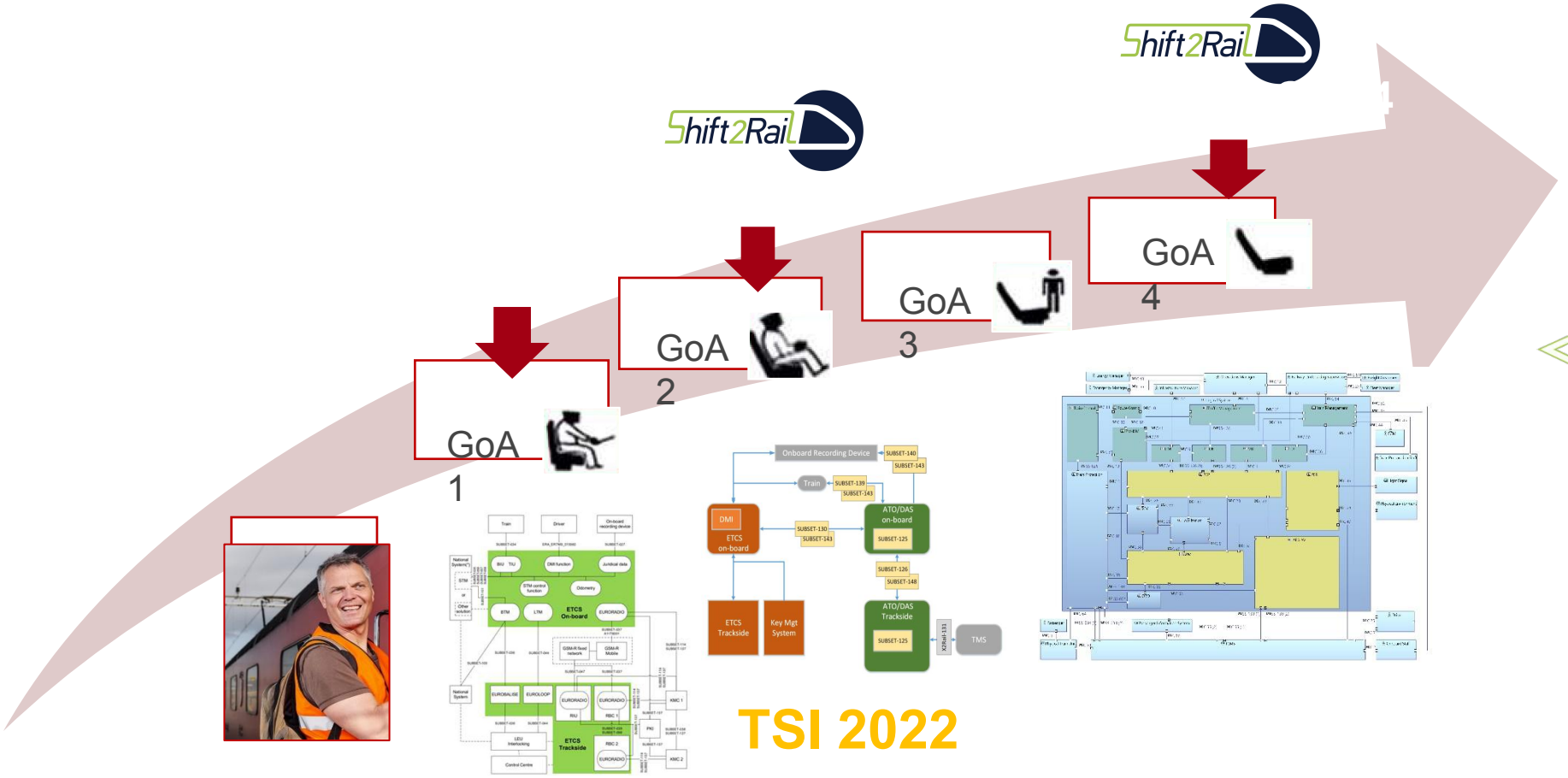
Agenda

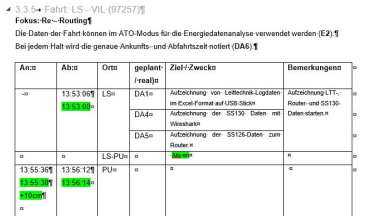
1. ATO Standardisation (GoA2) for TSI 2022 and following
2. SBB Activities for Verification (GoA2) of TSI 2022 Specifications
3. Concerns about GoA2
4. Challenges of “Up to GoA4”
5. ATO Relations
6. Conclusion

Roadmap of ATO Specifications – Standardisation Activitas



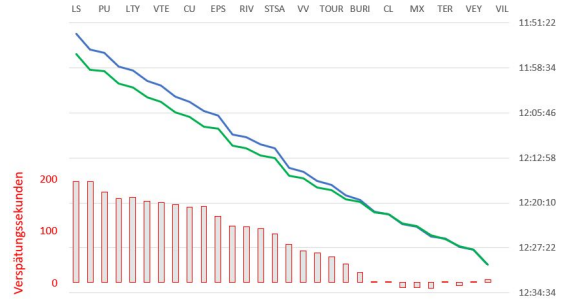
SBB Activities «TSI-2022 ATO GoA2 Specification verification»
ATO GoA2 – Main Driving Factors for Benefits

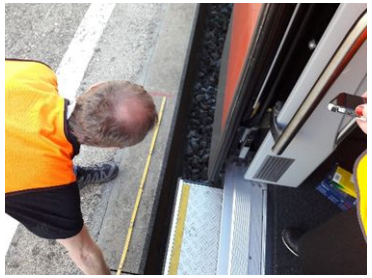
Switzerland has an extremely busy mixed rail network with train headways in nodes of up to 70-90 sec.
The change of trains is constantly optimized to get every second or a fraction of a second out of it.



Punctuality:

Deviation to scheduled arrival of the ATO-OBU **within seconds**:
ATO drives closely to the speed curves,
and this considerably reduces delays
□ Figures shows delay reduction

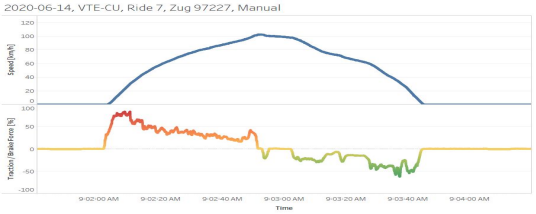


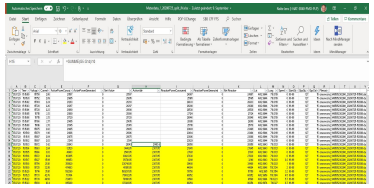


Stopping position:

SR40 requirement of **+/- 1.5m** kept **in >97%**
of all qualifying measurements with the functional sample.

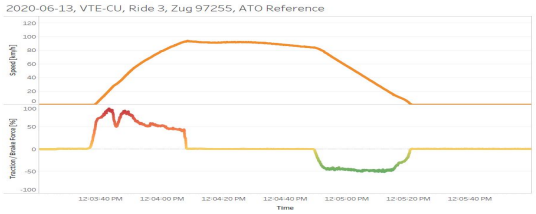
(Recommended balise positions required)





Energy savings:

Plausibility of 42% energy savings value
from industry sources was tendentiously
confirmed by a single measurement (up to 37%)



ATO GoA2 shows enormous potential for punctuality, capacity, etc.

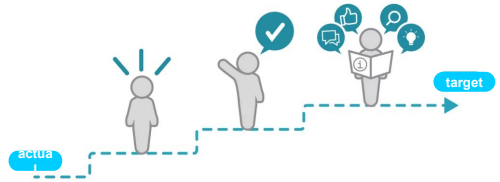
Concerns of ATO GoA2

General:

Human transformation (planning, operation and operation centres, ..)

Reliability, stability and performance of related System (Traffic Management System….)

sensitise > enable > accompany



GoA2 Human concerns:

Automatic Train Operation (ATO) can run with reduced headway
Present levels of technology, ATO (GoA2) is not a ‘full automation’: “It is expected that the driver monitors and takes over the control in case of restrictions or emergencies!”

However, humans are badly suited to carrying out such monitoring tasks!

ATO GoA2 can be used in sensitive, demanding and time-critical small areas such as nodes
(as implemented in Thameslink and Hamburg)
However, it is not possible to use the system at full network because the skills of the drivers have become obsolete.

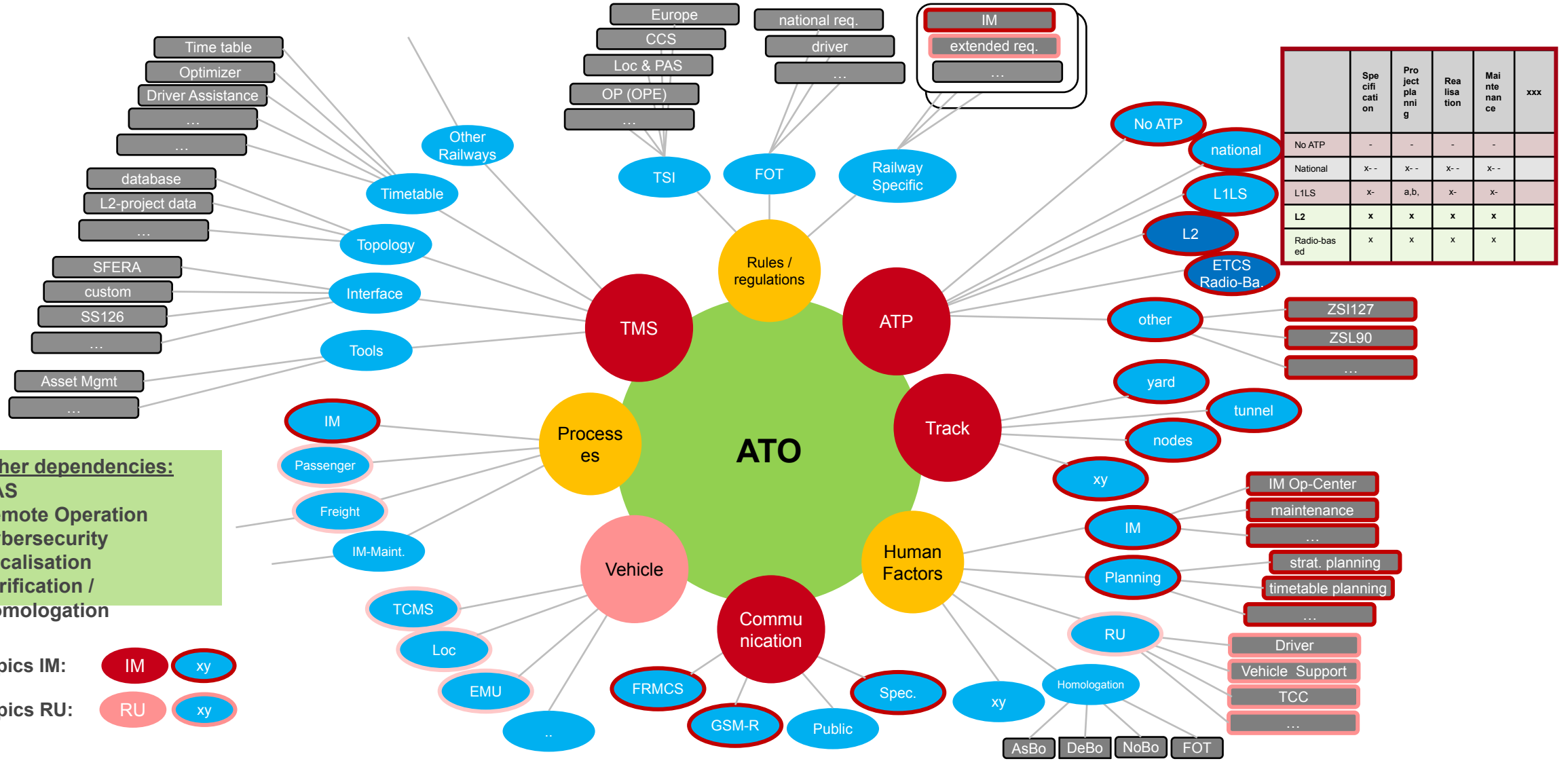
Challenges of “Up to GoA4”

Challenges @ ATO Up to GoA4:

- Political and social acceptance
- Legal and ethics
- Harmonised Operational Processes
- Human Factors: Transferring functions in case of malfunctions to remote operator etc.
- Necessary types of vehicles with corresponding functions, high reliability and availability
- Availability Perception System with required safety and quality levels
- Required peripheral systems with corresponding data (resolution and quality)

ATO operations acceptance requires a gradual introduction of operations in line with the required system performance, reliability and stability

ATO relations (non conclusive)



	Specification	Project planning	Realisation	Maintenance	xxx
No ATP	-	-	-	-	
National	x- -	x- -	x- -	x- -	
L1LS	x-	a,b,	x-	x-	
L2	**x**	**x**	**x**	**x**	
Radio-based	x	x	x	x	

Conclusion

- ATO is not a product, it’s a complex system and **next step in the automation** (rail industrialization)

- ATO needs a coordinated roadmap with migration plan of <u>all stakeholders</u> (human, infrastructure, railway undertaken, systems, FOT, legislators, ...)
  and the industry

Don’t forget our customers !

A lot of work needs cooperation between **railways (IM and RU) & industry,** also across EU borders.

SBB CFF FFS
Thank you.