ERTMS / ETCS in Switzerland

Stefan Sommer, Head of Business
Unit Train Control Systems
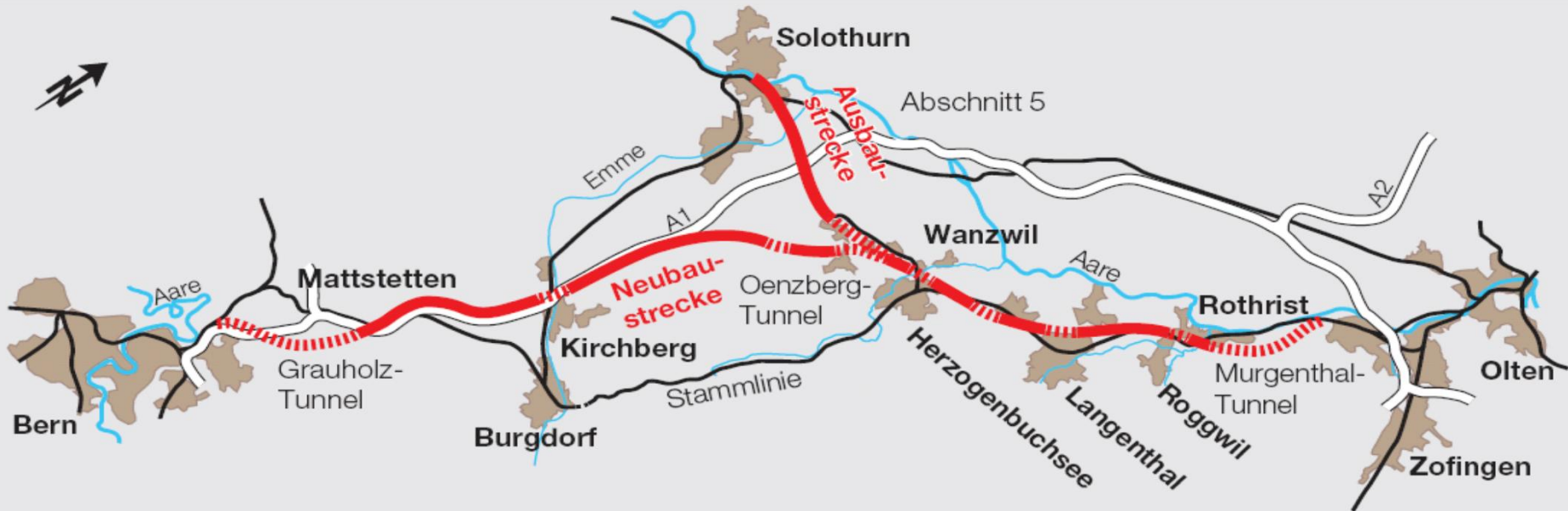01.11.2012

Agenda of the day

08.02 – 08.58 Cab drive to Bern

09.00 – 09:30 Promenade to the meeting room / coffee

09:30 – 11.00 Presentation and discussion about ERTMS / ETCS

11.00 – 		Further program

Cab drive to Bern

45 km double track

Commissioned 02.07.06

Headway 120s @ 200km/h

1 RBC (Alstom)

280 trains a day, mixed traffic

1 IXL (Thales)

Standard SRS 2.2.2+

Delay <0.5min / train / week

Agenda of the presentation

1. Some facts and figures about SBB
2. SBB Infrastructure
3. Todays train control systems
4. ETCS Strategy in Switzerland
   - Drivers to introduce ETCS in Switzerland
   - ETCS L1LS and ETCS L2
   - The strategy on one page
   - Impact of the strategy on vehicles and network access
   - Step 1: Migration to ETCS L1LS
   - Step 2: Network-wide introduction of ETCS L2
   - The Gotthard base tunnel
5. Todays experience
6. Our challenges
7. Geographical deployment of ETCS
8. Conclusions

SBB is Switzerland's biggest transport company.

Passenger Division
977,000 passengers per day
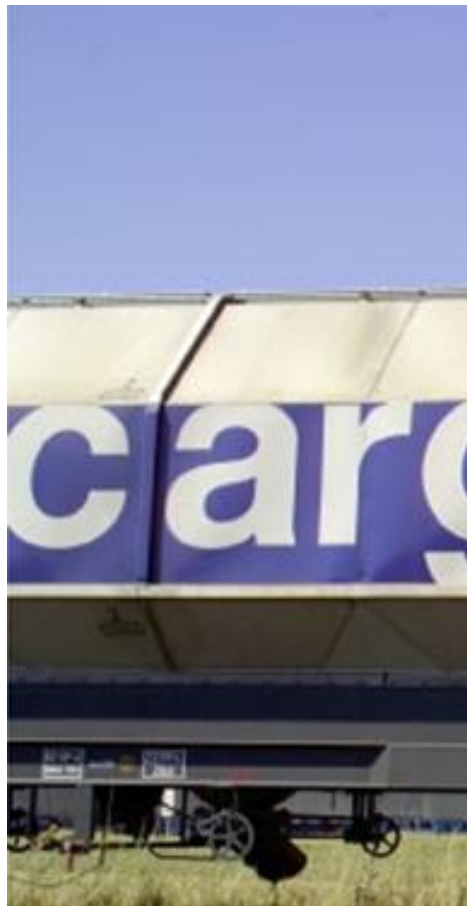
SBB Cargo
195,000 tonnes of freight per day

Infrastructure
3,100 km network

Real estate
3,500 buildings

Management Board SBB

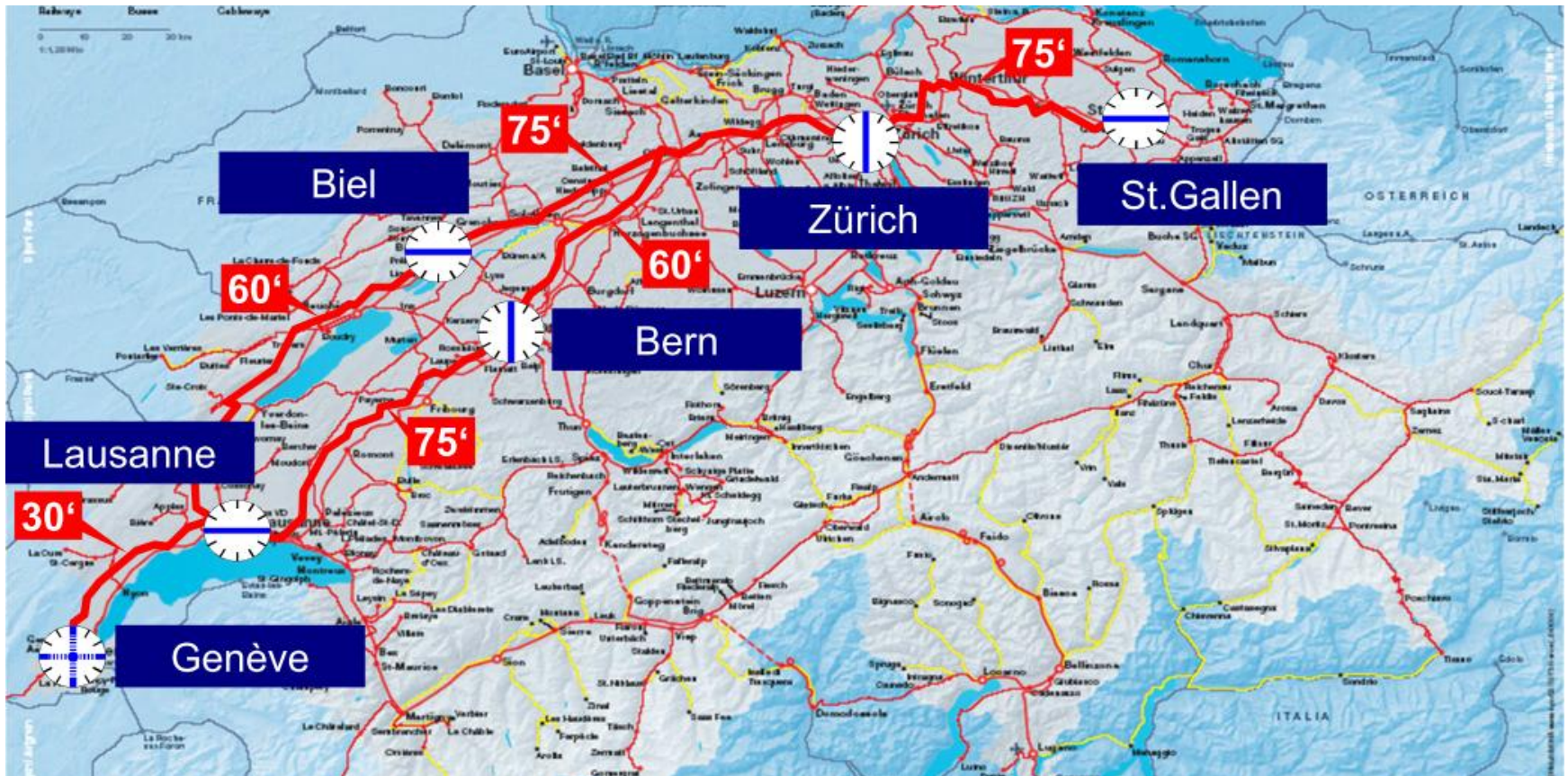| From left to right	Nicolas Perrin	Head of Freight
	Georg Radon	CFO
	Jürg Stöckli	Head of Real Estate
	Markus Jordi	Head of Human Resources
	Jeannine Pilloud	Head of Passenger Division
	Andreas Meyer	CEO
	Philippe Gauderon	Head of Infrastructure

One important success factor.

→ The commuter railway Switzerland – you have always a connection

The SBB infrastructure – a complex system

→ 9,300 employees

→ 3 138 km of track

→ 6054 bridges

→ 303 tunnels

→ 30 265 signals

→ 14 254 sets of points

→ 6 hydroelectric power stations

→ 6 frequency converters

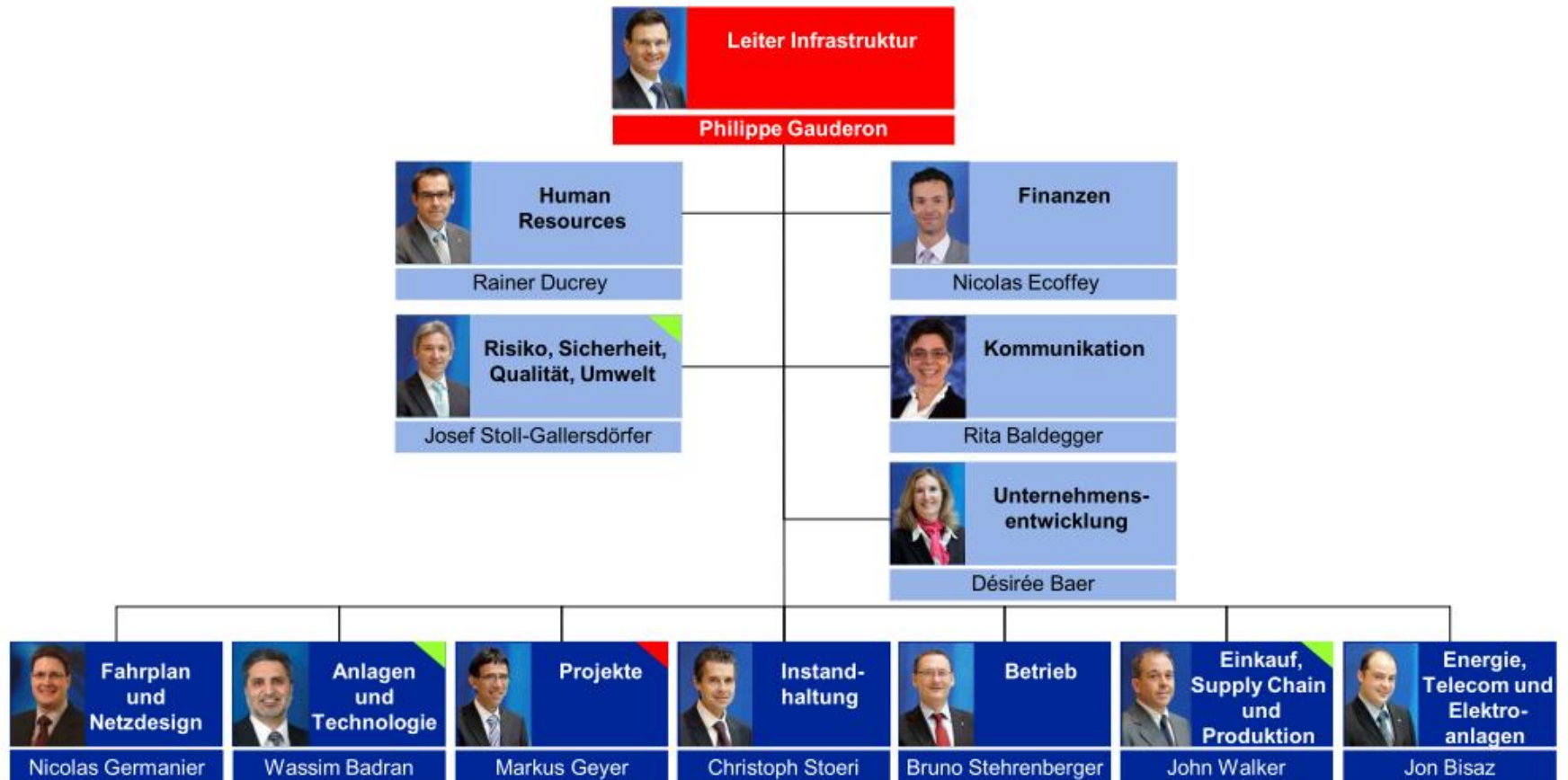→ 1,800km 132kV of cable

→ 2 GSM-R ops centres

Rail network

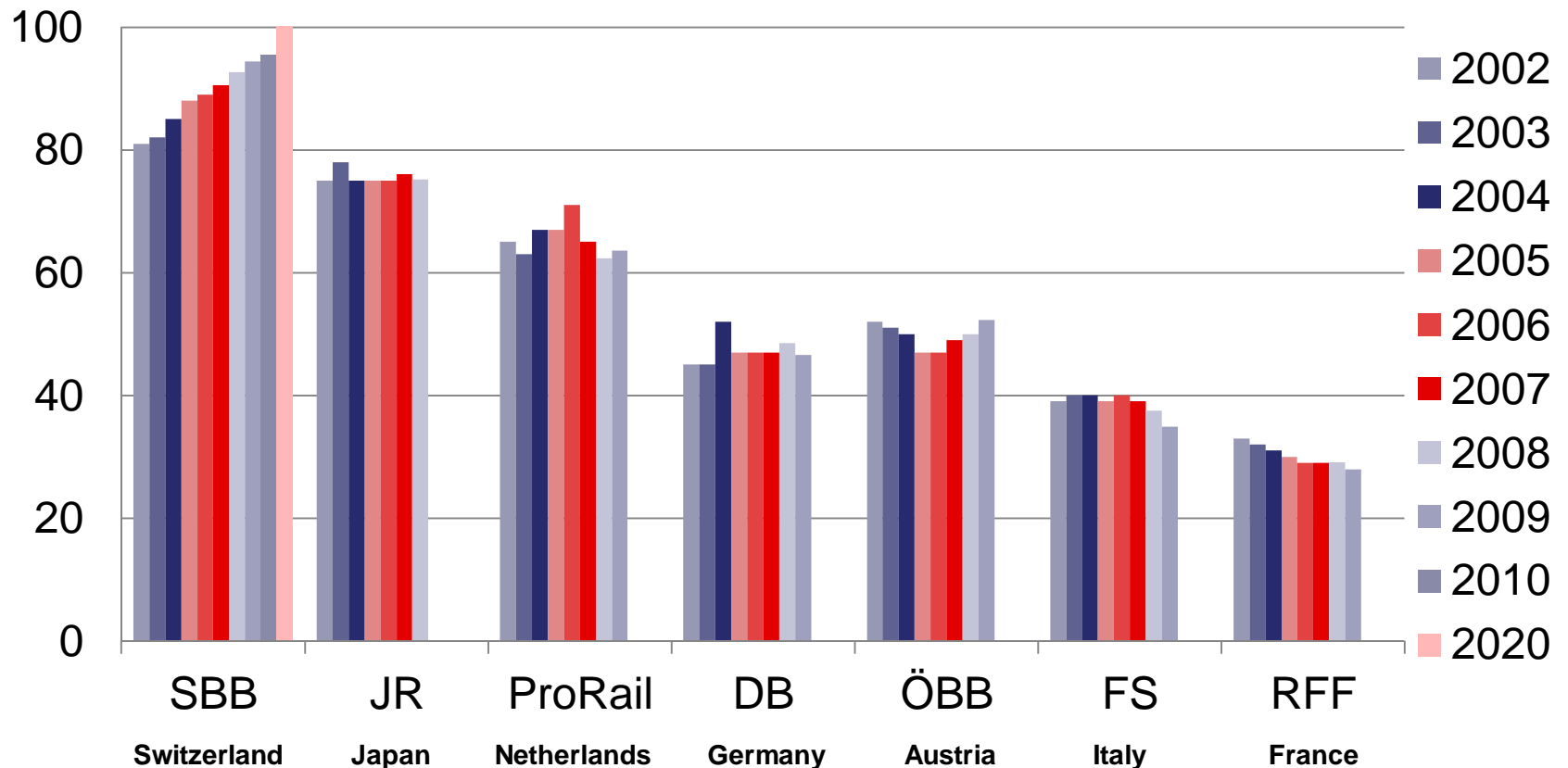**Power network**

Telecommunications network

Management Board Infrastructure

SBB has the densest rail network in the world.

Efficiency of network usage: trains per main track and day

Situation and history
Todays train control systems

Actual situation:

➔ Integra-Signum (punctual supervision with warning / trip behavior, 1930's)

- Application: 11'000 signals are equipped with this protection functionality.

➔ ZUB (semi continous speed supervision, 1990's)

- Application: ~3'000 Main signals with higher risk evaluation are equipped with this protection functionality.

➔ ETCS Level 2 (continous speed supervision)

- Application: two lines in operation: Berne – Olten 45km double track, Lötschbergtunnel 35 km single
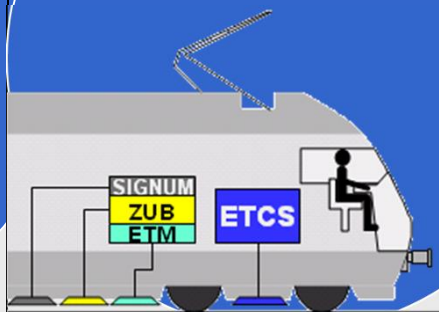
Strategy and way forward

Drivers to introduce ETCS in Switzerland

| Renewal / Safety	Network access	Interoperability	Travelling time Network capacity
Old national systems get obsolete or are not fail safe. Therefore they don't fulfill the requirements anymore and have to be replaced.	Multiple equiped vehicles are lacking flexibility and are cost intensive. Therefore they are less competitive.	Interoperability directives pave the way towards homogenous networks. → The cornerstone for efficient operation.	Improved rail services • shorter travelling time • more often / density • mixed traffic networks

ETCS
The future in Switzerland
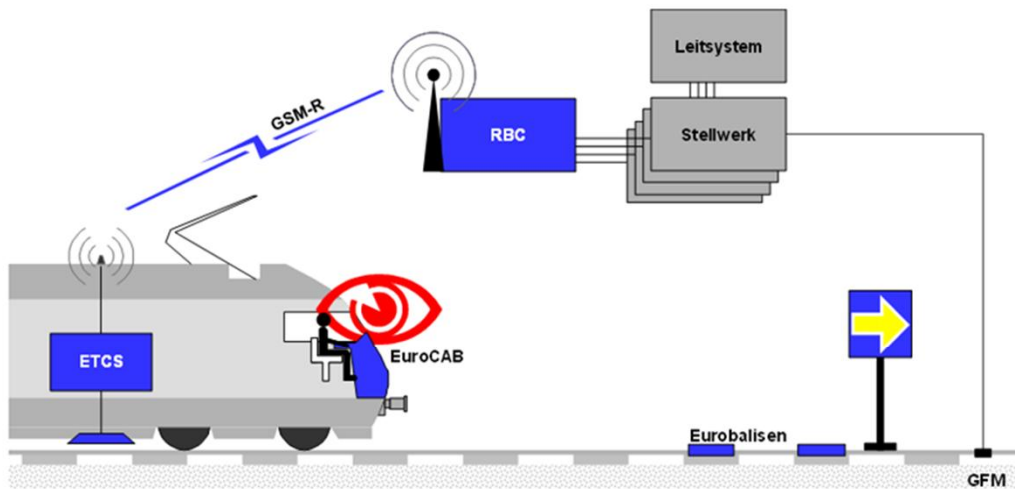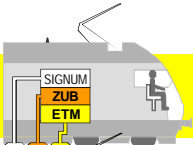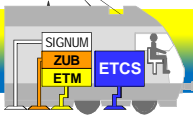

ETCS Level 2

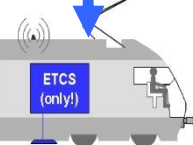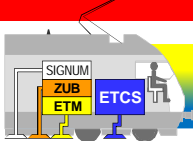ETCS Level 1 Limited Supervision (L1 LS)
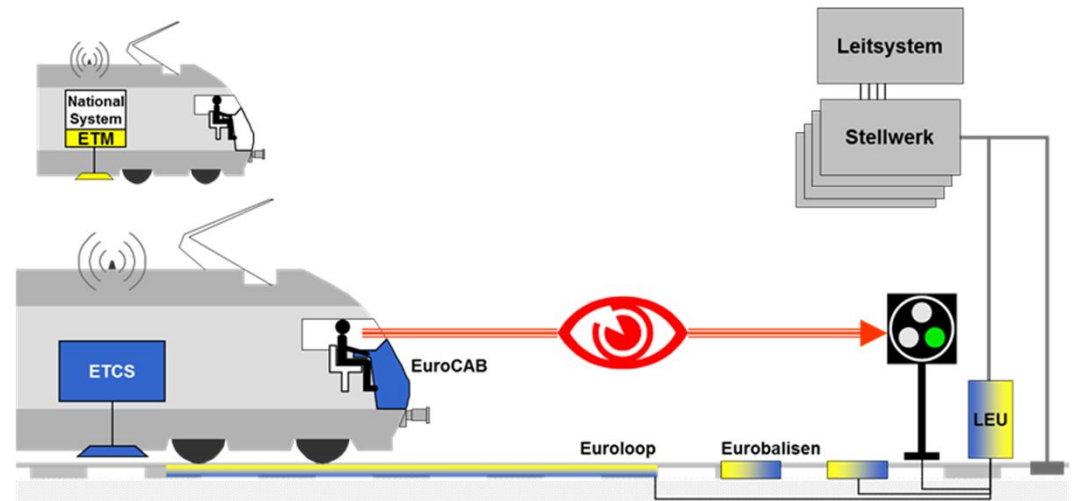
Overview of the strategy
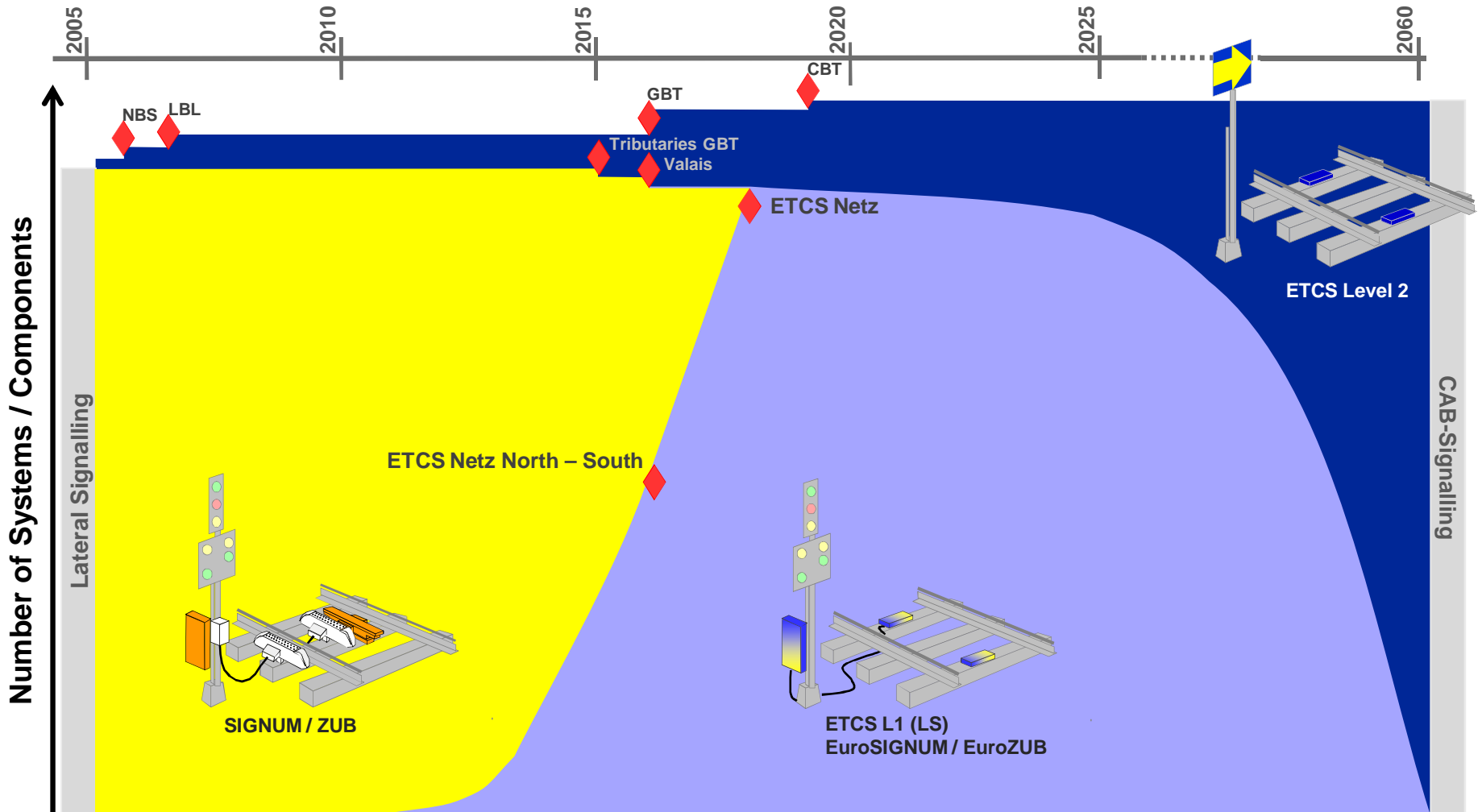
Impact on vehicles and network access
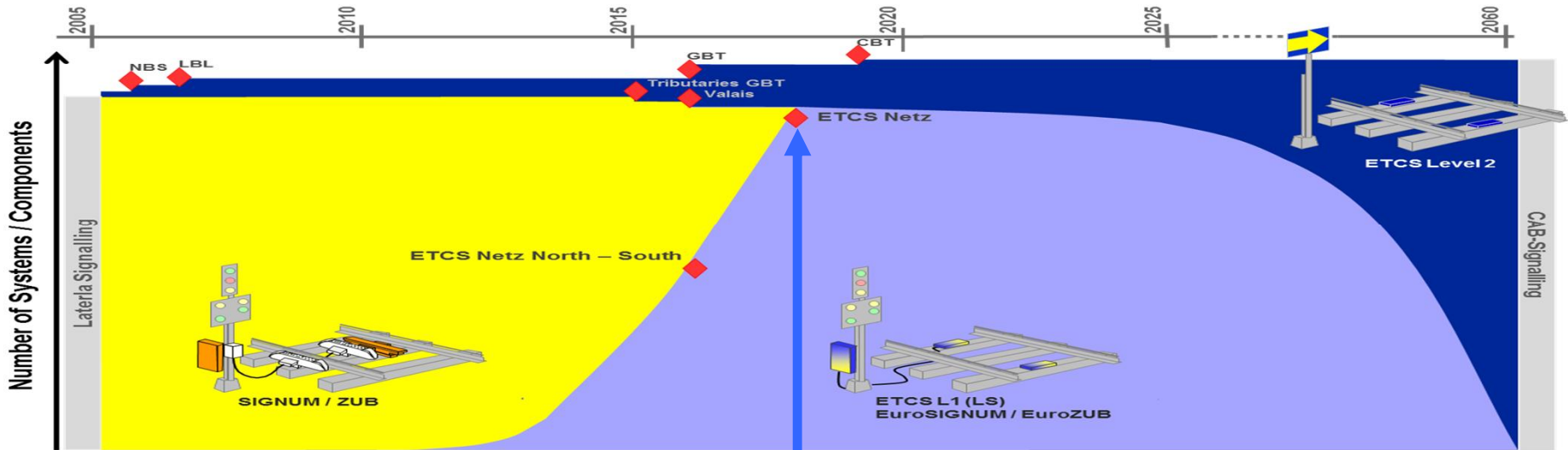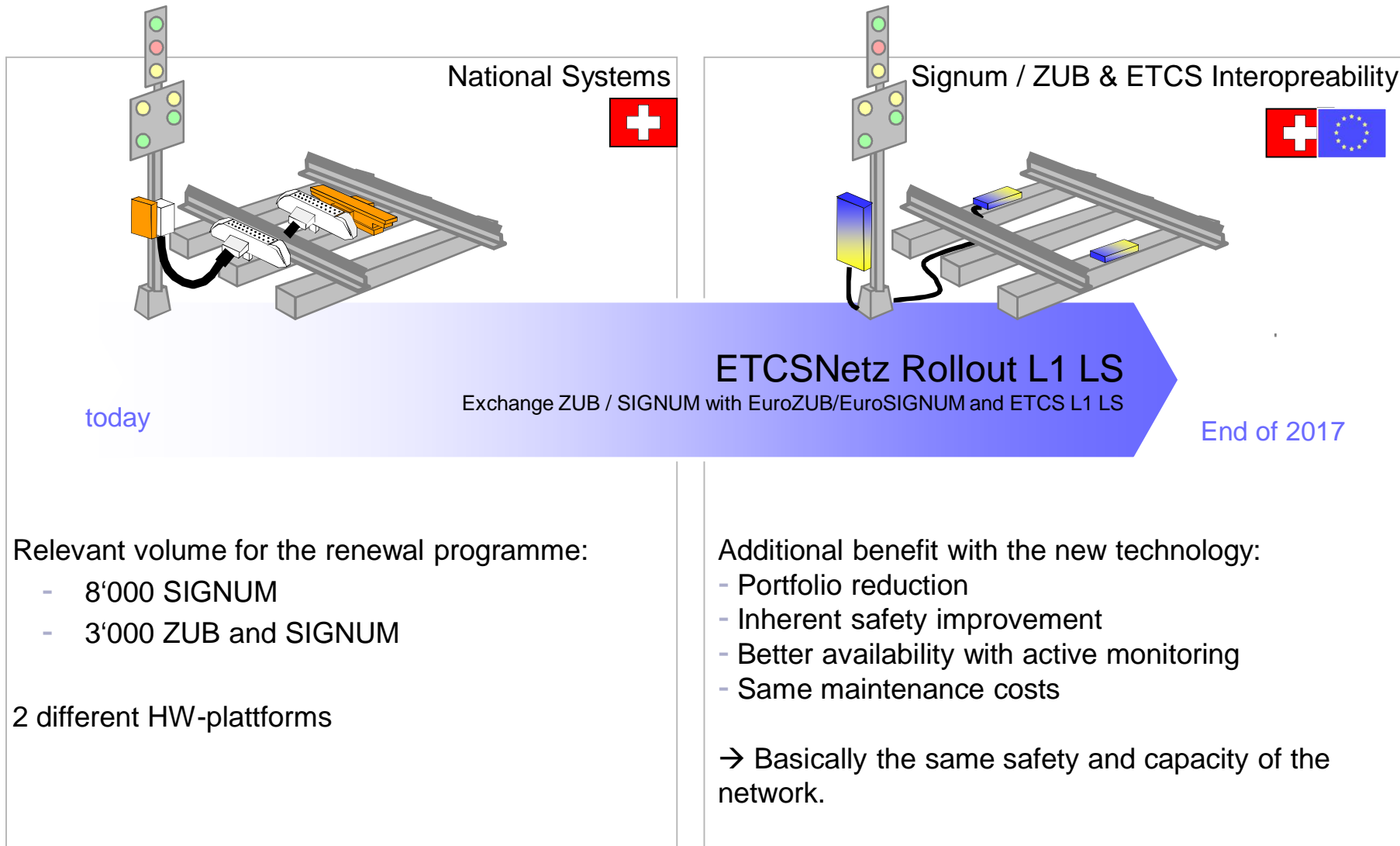

Conventional network access without ETCS L2 lines

2006 Conventional network access AND ETCS L2 lines

December 2017 "ETCS only" possible

July 2014 ETCS on-board required for network access

15

Step 1: Migration to ETCS L1LS

National Systems

Signum / ZUB & ETCS Interopreability

ETCSNetz Rollout L1 LS
Exchange ZUB / SIGNUM with EuroZUB/EuroSIGNUM and ETCS L1 LS

today

End of 2017

Relevant volume for the renewal programme:

- 8'000 SIGNUM
- 3'000 ZUB and SIGNUM

2 different HW-plattforms

Additional benefit with the new technology:
- Portfolio reduction
- Inherent safety improvement
- Better availability with active monitoring
- Same maintenance costs

→ Basically the same safety and capacity of the network.

SBB CFF FFS

The use of an Eurobalise

ETCS L1 mode LS
ETCS telegram

ETCS

SIGNUM
ETM-S

SIGNUM
ZUB
ETM

P44
National application

P12| P21| P27| P80|... (ETCS SRS)   ...| Packet 44 (national use)

ETCS telegram

Euroloop

Eurobalise
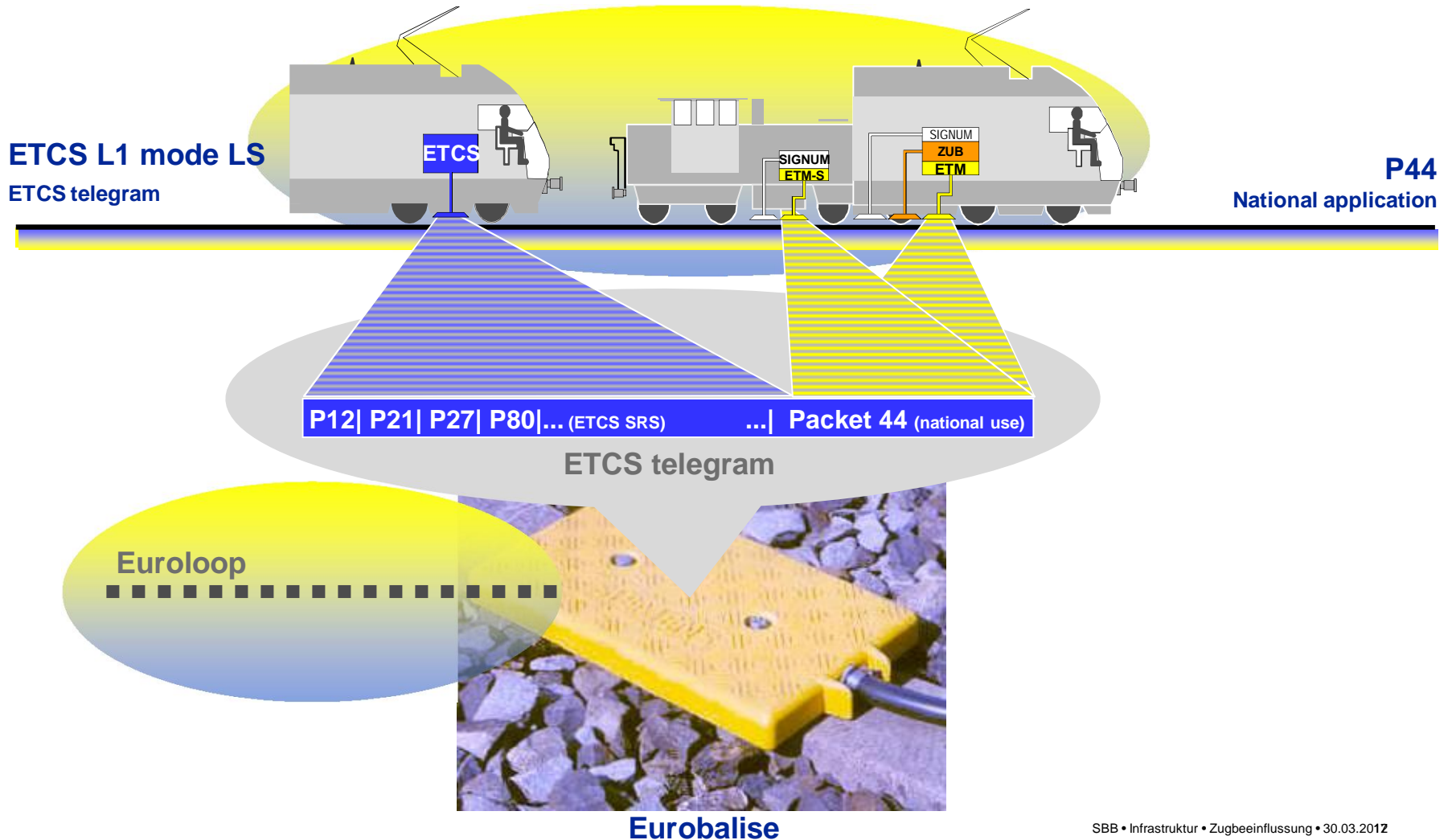
Step 2: network-wide introduction of ETCS Level 2

Gotthard Base Line

Altdorf/Rynächt

Gotthard-Basetunnel

Biasca

- ● International passenger train
- ● National passenger train
- ● Passenger train Gotthard-Mountainline
- ● Freight train Luino
- ● Freight train Chiasso

Minuten

| X | X | : | 8 | 8 |
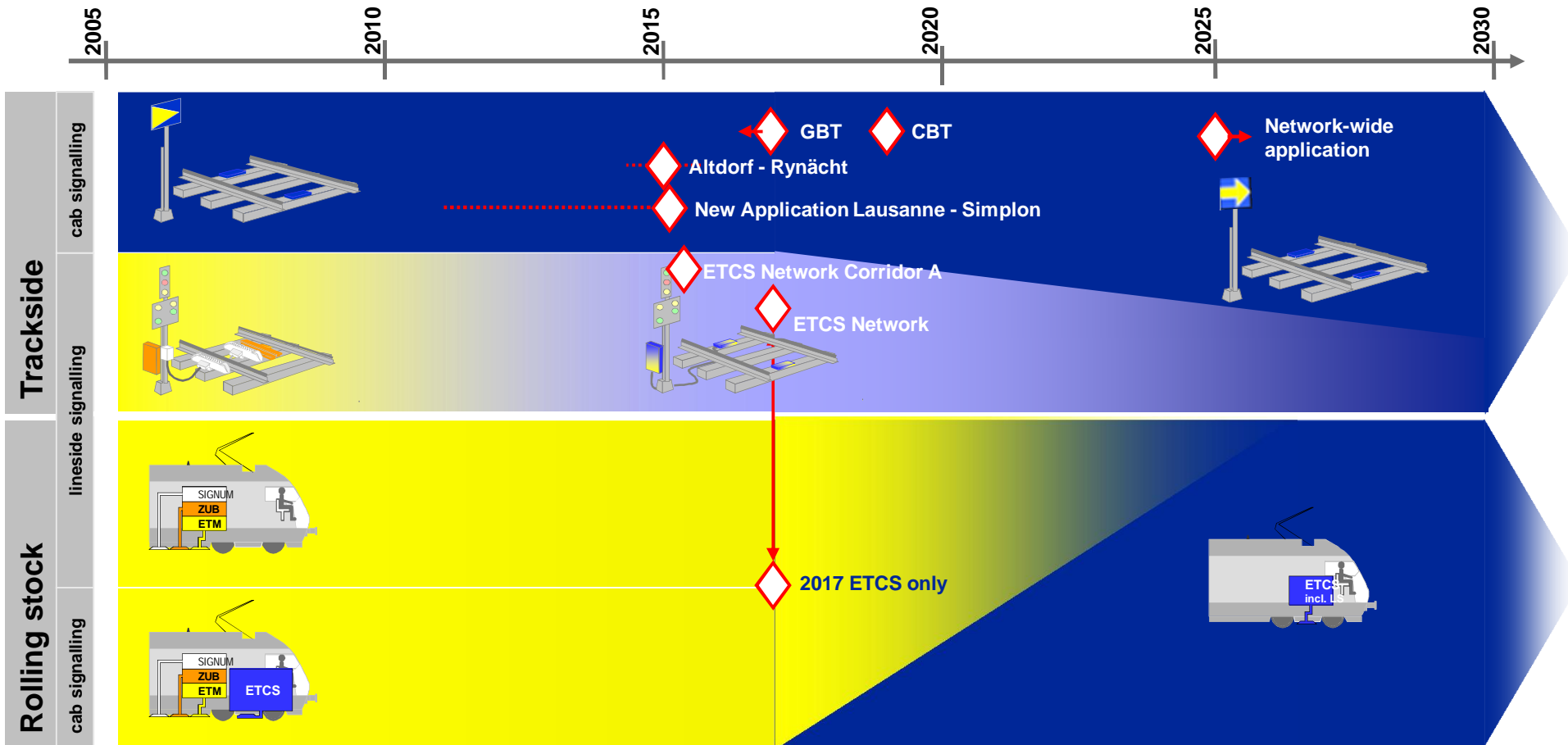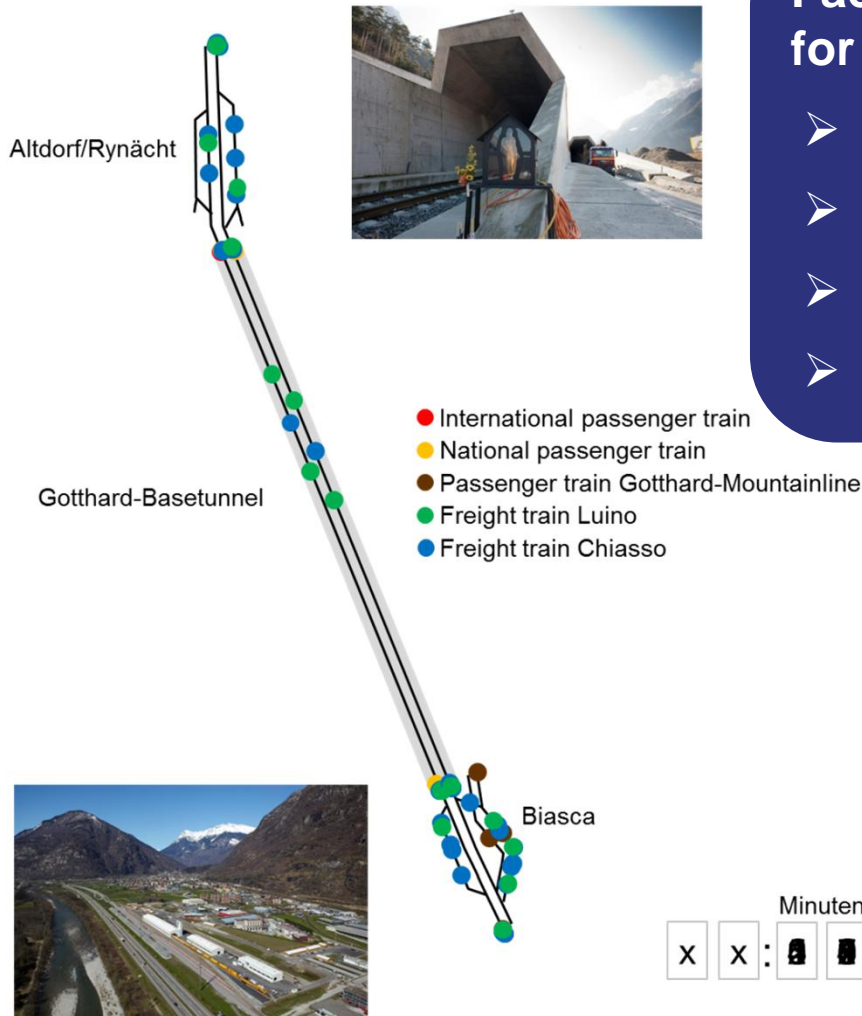
Facts and figures to fullfill the needs for the timetable:

➢ 57km double track in single tube

➢ 300 trains a day (¼ P, ¾ F)

➢ Headway 180 sec. with mixed traffic

➢ Maximum speed of 250 km/h

Todays experience

➔ The high requirements on safety, reliability and availability are fully fulfilled

➔ Only about 5 of more than 8'500 vehicles have a failure (per month)

➔ Most of the failures are related to the rolling stock (GSM-R and odometry)

➔ It's important to develop the new processes for authorisation in advance

➔ It's important to have a detailled concept for commissioning
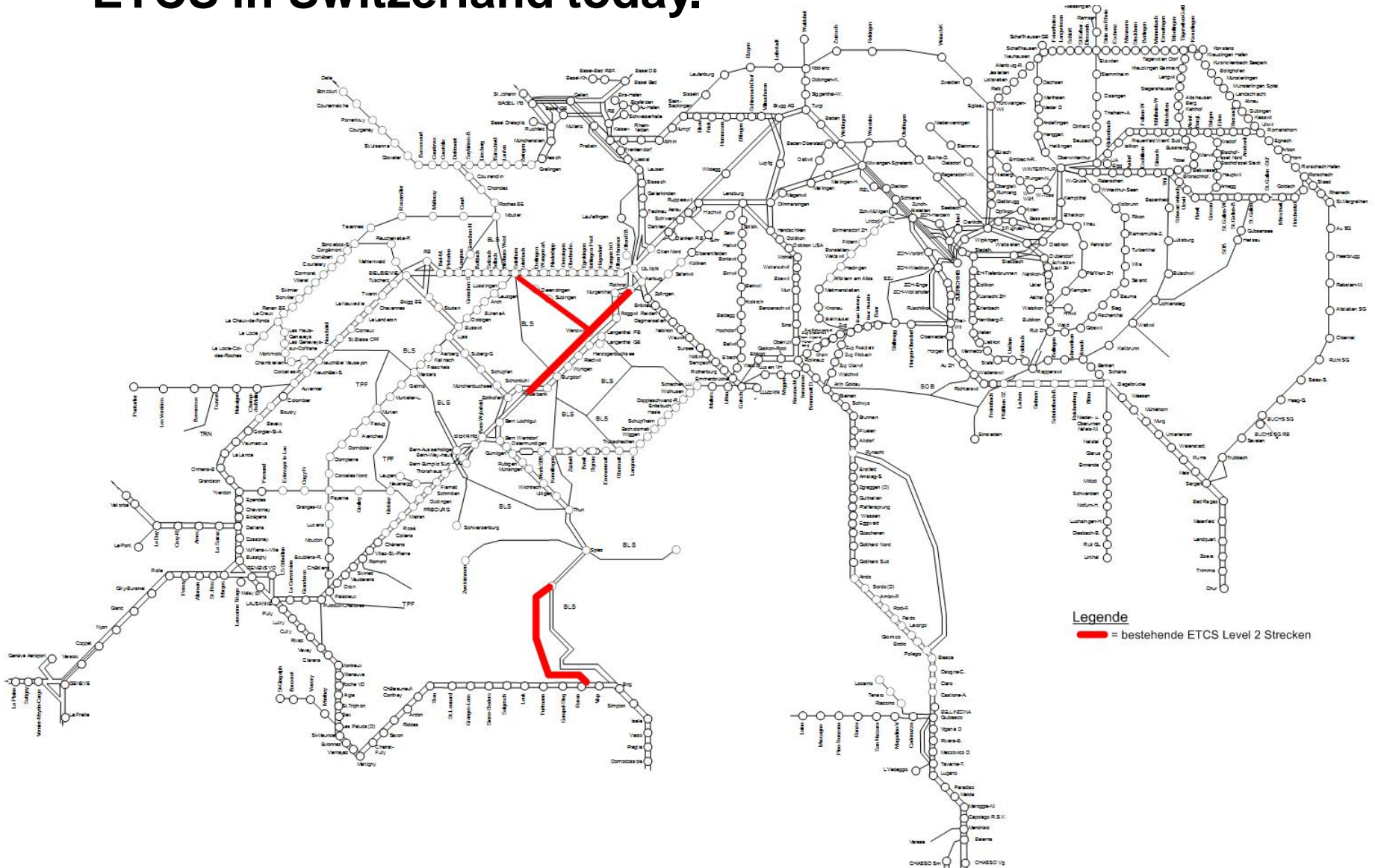
Our challenges
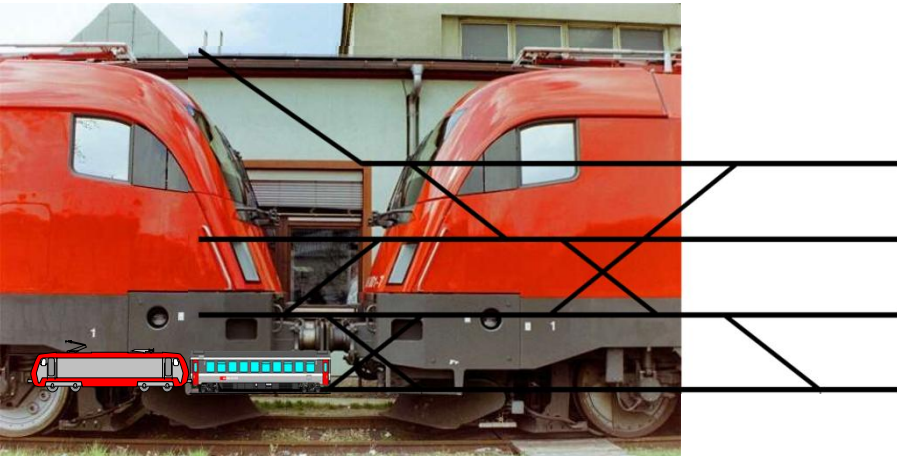
→ Operational:

- Shunting (passenger trains)

- Start of mission, change of direction

- Joining and splitting

- Stopping point at stations

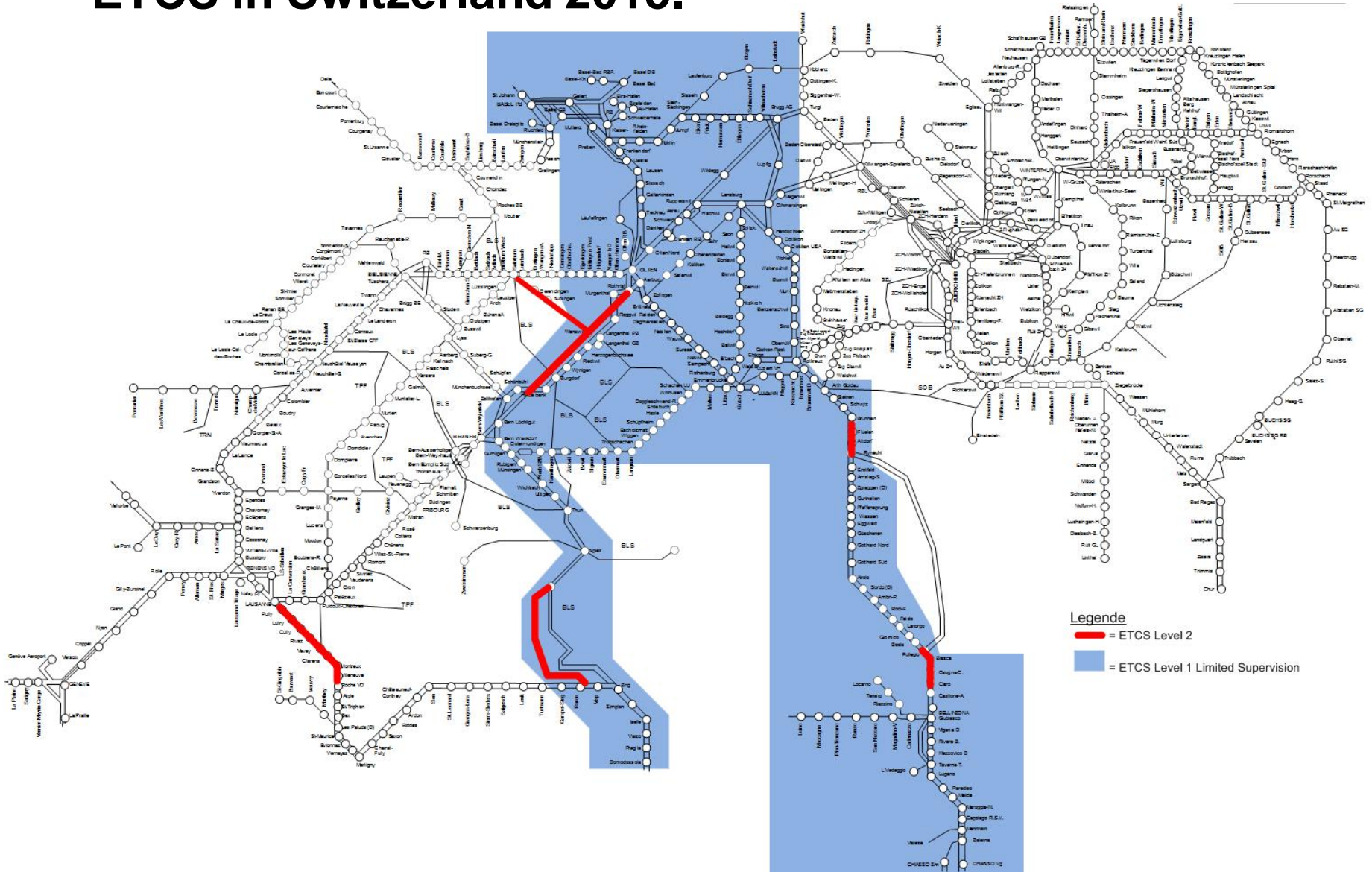- Performance requirements regarding

- timing

→ Technical:

- RBC – RBC border and handover

- Radio capacity
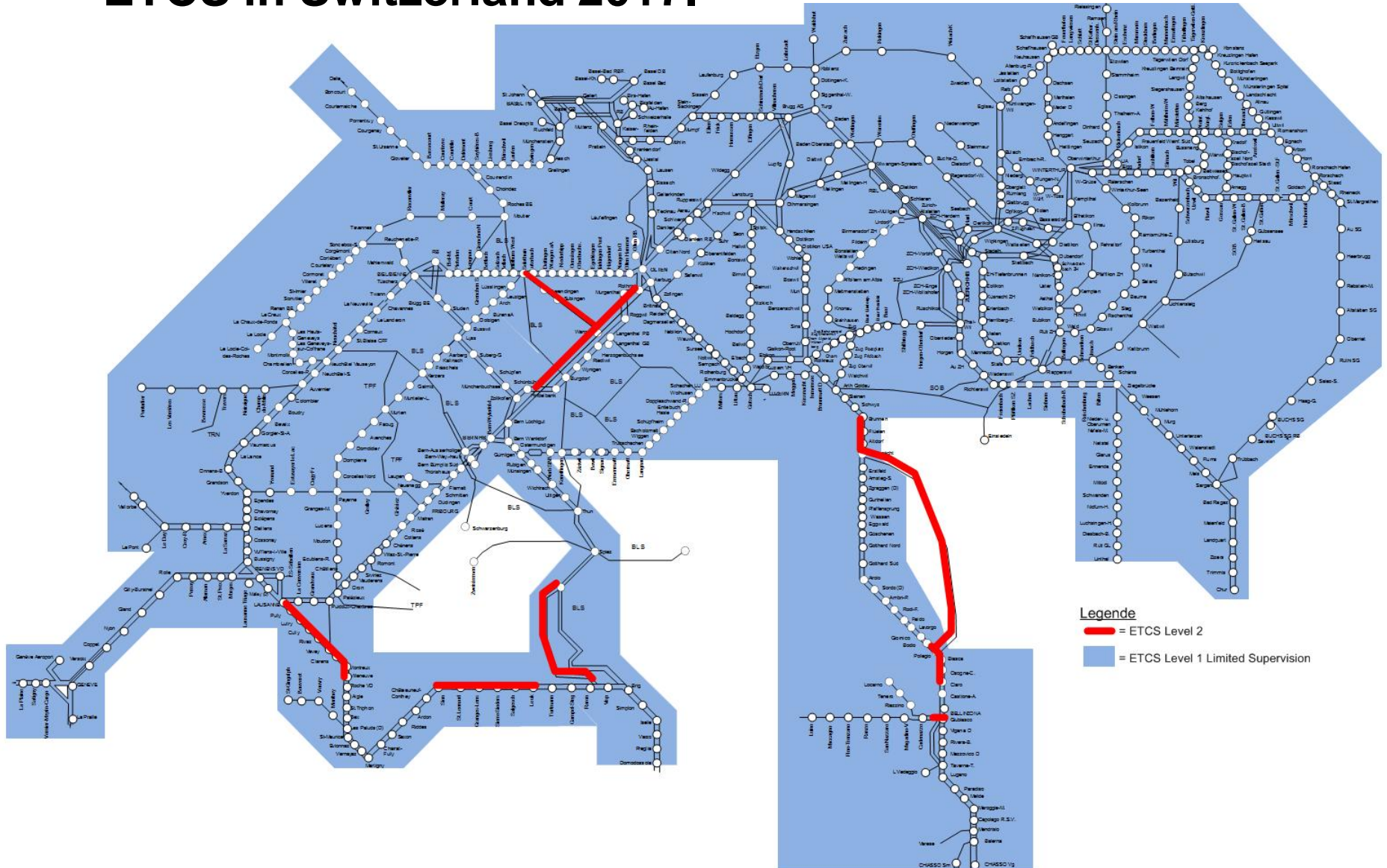
- Train data exchange with ETCS

ETCS in Switzerland today.

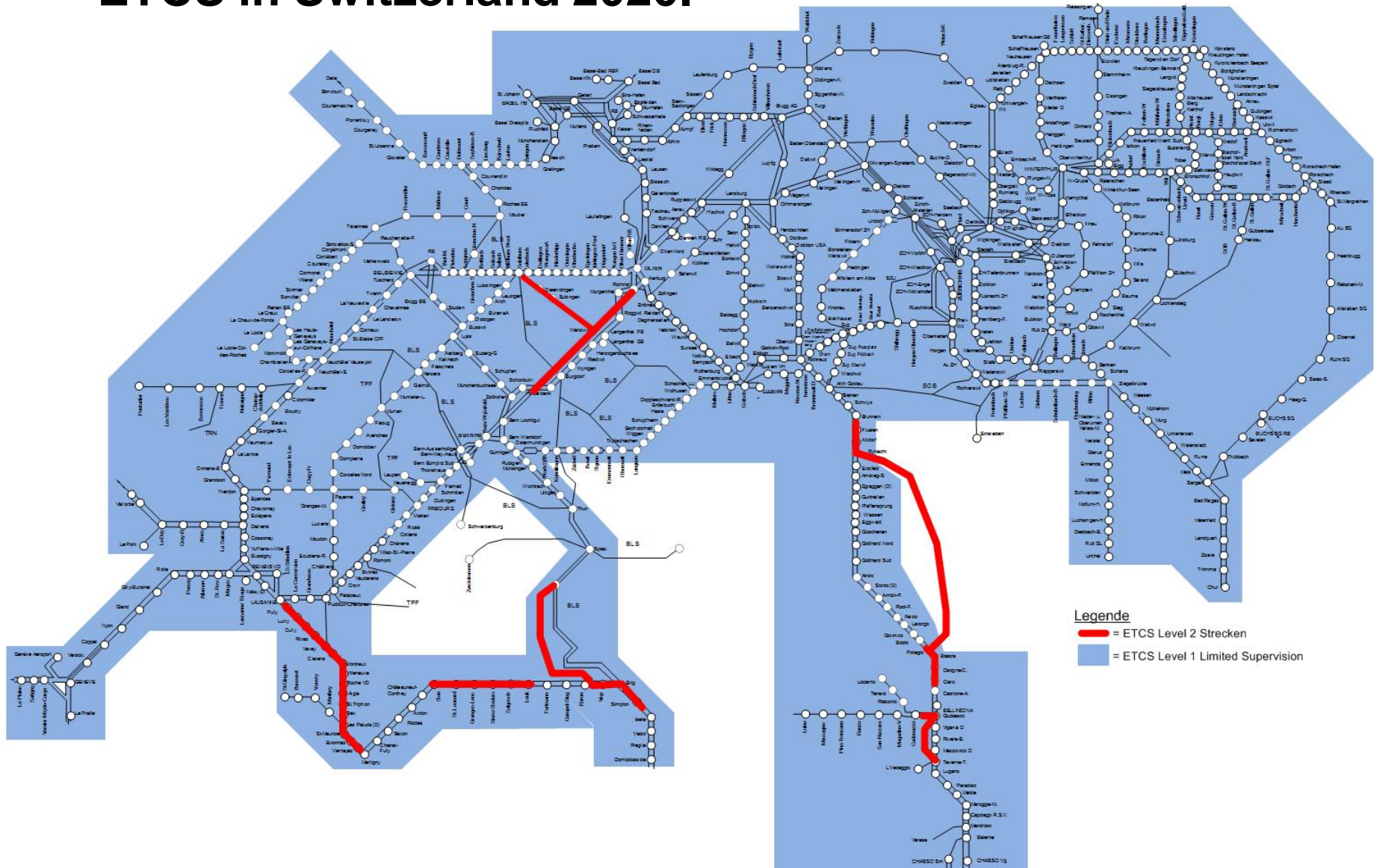Legende

━━ = bestehende ETCS Level 2 Strecken

ETCS in Switzerland 2015.

Legende

━━ = ETCS Level 2

▇ = ETCS Level 1 Limited Supervision

ETCS in Switzerland 2017.

SBB CFF FFS

Legende
= ETCS Level 2
= ETCS Level 1 Limited Supervision

ETCS in Switzerland 2020.

Legende
= ETCS Level 2 Strecken
= ETCS Level 1 Limited Supervision

Conclusion

→ As a consequence, the committed ETCS strategy back from the year 2000, is gradually implemented in Switzerland.

→ ETCS L2 operational experience is highly satisfactory.

→ Step 1, the migration towards a pure ETCS network, is successfully under continuous implementation (ETCS Netz / L1 LS).

→ Step 2, the planning for the future deployment of ETCS L2 in Switzerland is intensively under way.

→ Setting up a „ ETCS System Authority", in charge for the harmonized and similar application in the whole country, was a very important step towards a successful introduction of ERTMS in Switzerland.

Thank you very much for your attention