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Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center

Remote testing of ETCS Operational Scenarios

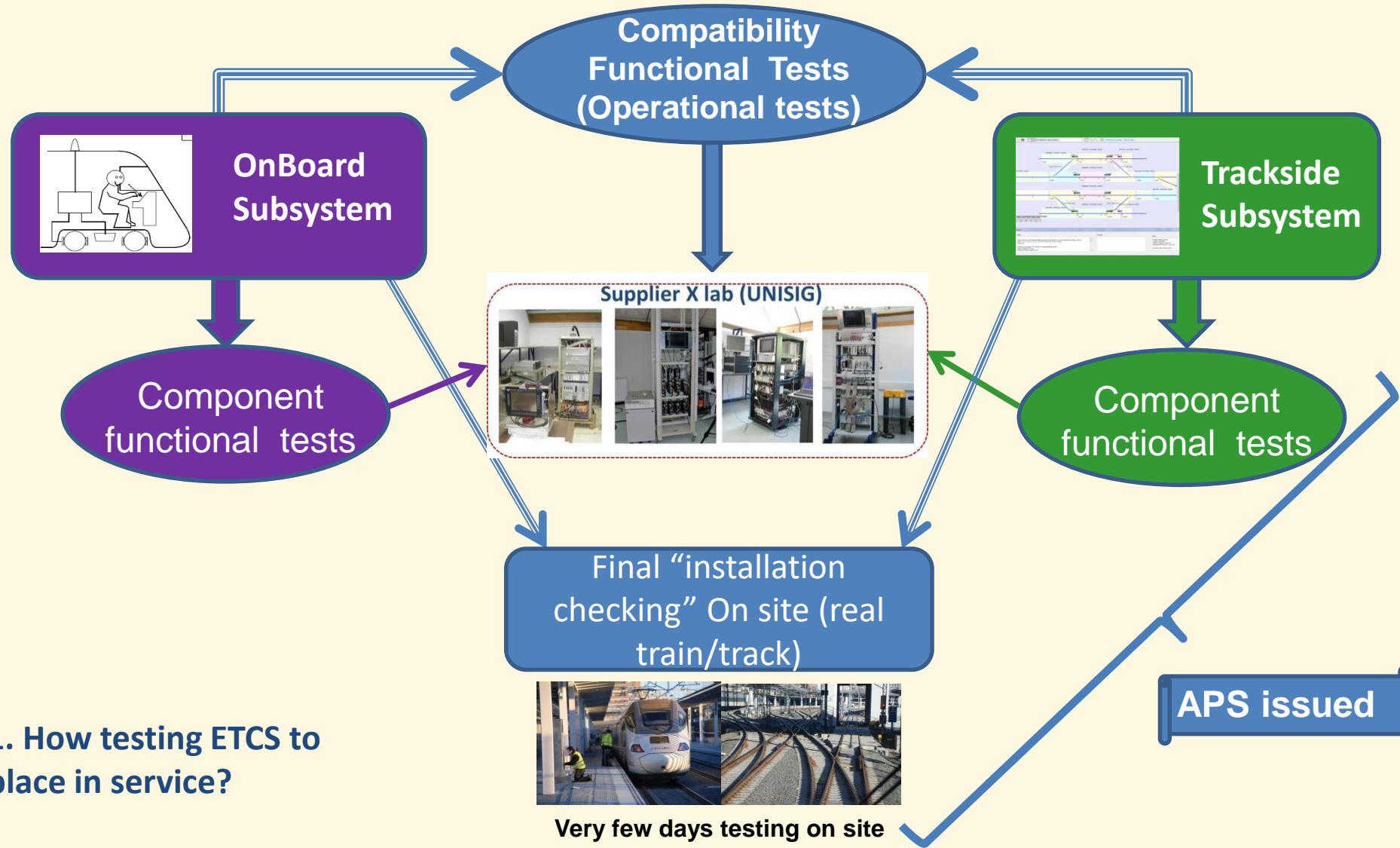
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Ignacio Jorge Iglesias Dr.- Ing. CEDEX



Summary

1. How testing ETCS to place in service?.
2. How integrating the “real world” (real EVC and RBC) at lab
3. Remote testing
4. Cost and time saved by testing at lab
5. Conclusions.

How did we test proprietary systems?

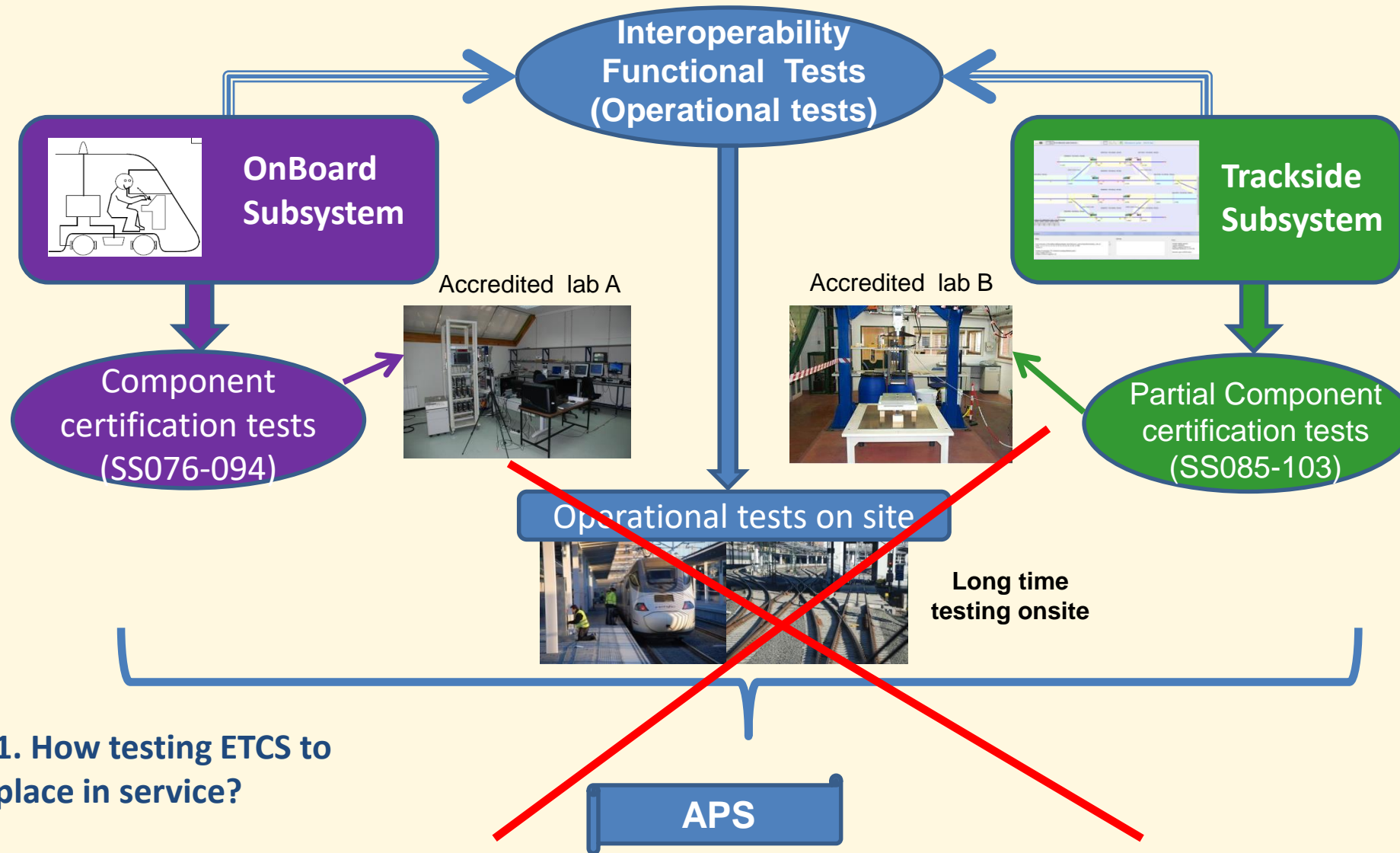


1. How testing ETCS to place in service?

Very few days testing on site



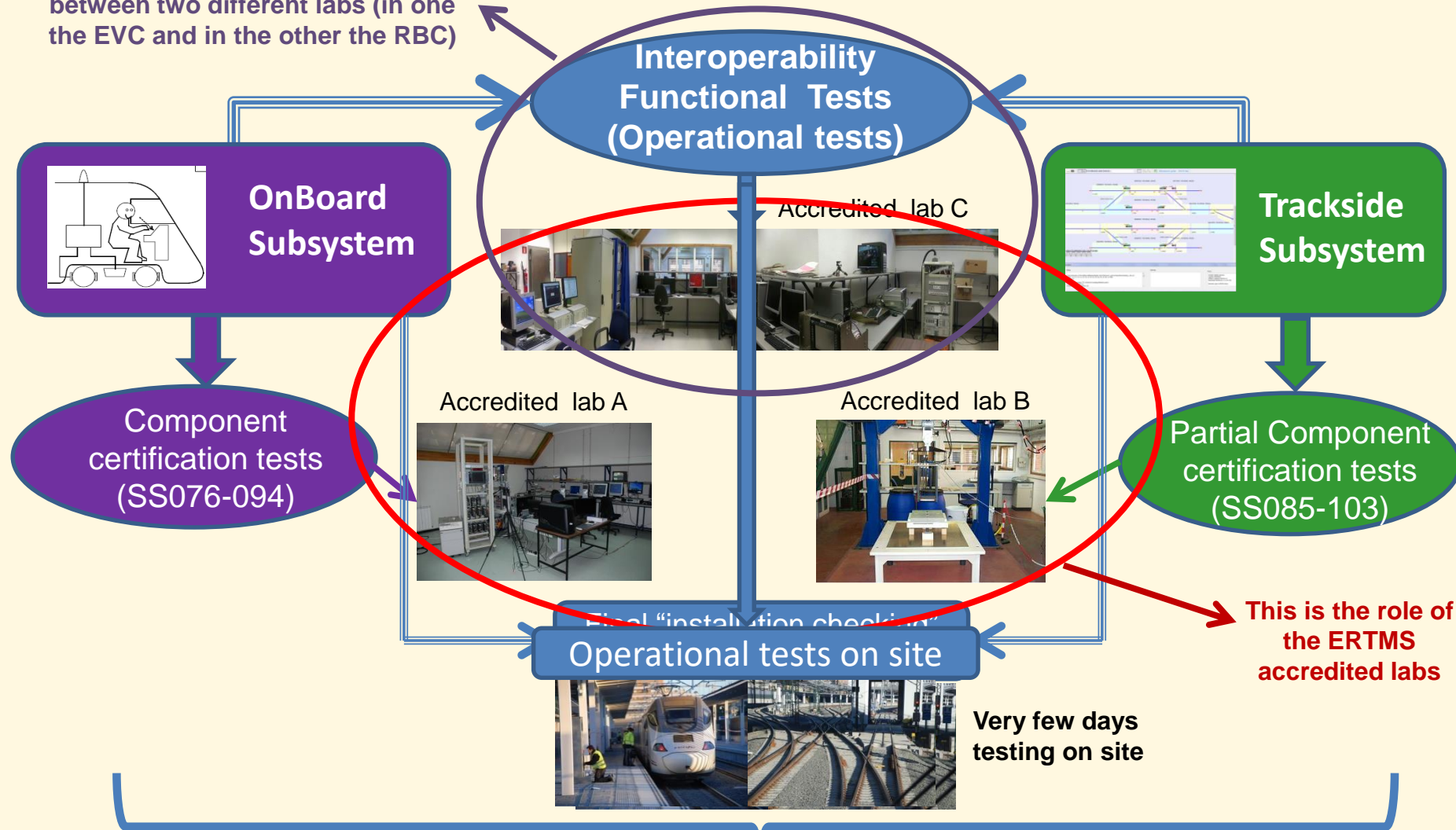
How did we test ERTMS for the first APS ?



1. How testing ETCS to place in service?

These tests can be run remotely between two different labs (in one the EVC and in the other the RBC)

How should we test ERTMS for APS ?



1. How testing ETCS to place in service?

APS



2. How integrating the “real world” (real EVC and RBC) at lab

2. How integrating the “real world” (real EVC and RBC) at lab

- Integration of both RBC and IxL (or IxL simulator) makes easier the interface between RBC (or IxL in this case) and the lab. (track circuits occupancy, aspect of the signals and status of the switches)
- In remote testing one lab integrates the trackside (RBC, IxL, LOP, trackside simulator and remote testing tool) an another lab integrates the on board (EVC, DMI, JRU, TIU , Train Motion Simulator and robot)
- HO between different RBC suppliers have been succesfully tested

Local operation posts (LOP): ...

Remote testing tool

RBCs + IxL

Trackside simulators: Track layout, switches, track circuits, signals

Train simulator + TIU

EVC+DMI +JRU

Setting routes, TSR

Track layout

CEDEX LAB

Real train antenna for balise messages

DLR LAB



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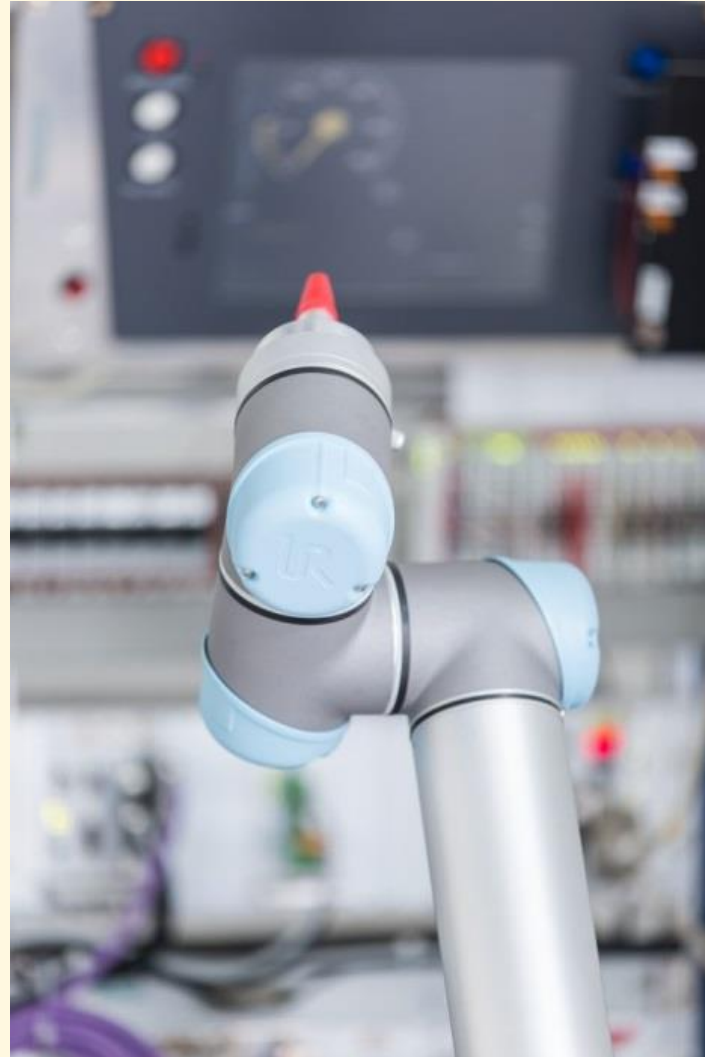


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3. Remote Testing

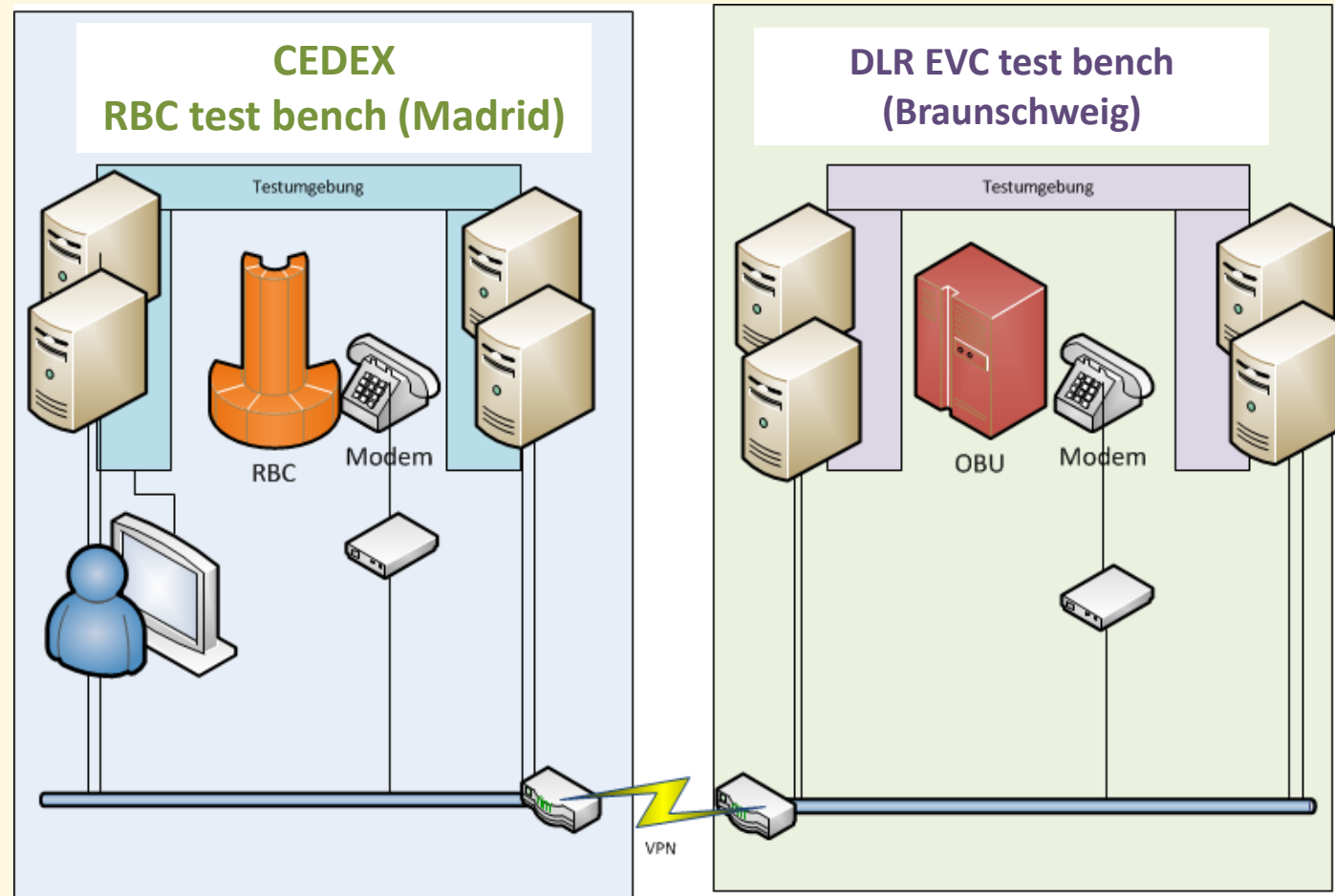


3. Remote Testing

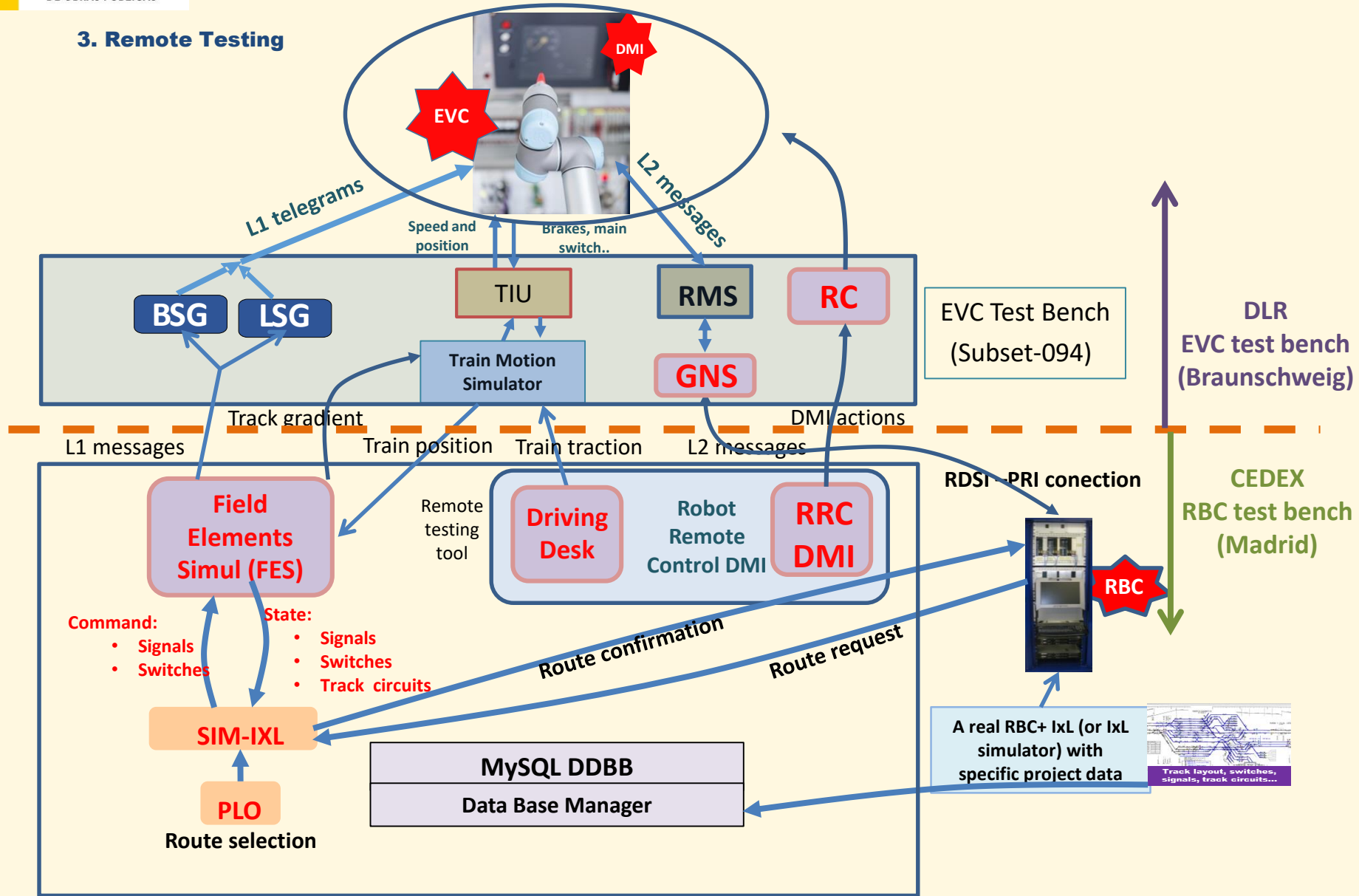


DLR DMI Robot controlled from CEDEX lab

3. Remote Testing



3. Remote Testing





3. Remote Testing

The screenshot displays a remote testing environment. On the left, a 'Radio Gateway' window shows a log of events with columns for time, symbol, and status. The log includes entries such as 'Symbol:EOA_TOGGLE:=>EMPTY 0 0' and 'Robot started 0 0 0'. In the center, a 'DMIAnalyzer' window displays a graphical interface with a speedometer and various control buttons. The speedometer shows a needle pointing to approximately 100. Below the speedometer, there are several buttons and a power icon. On the right, a 'KWrite' editor window contains the text 'DLR in Braunschweig using VNC' and 'CEDEX in Madrid using VNC+VPN'. The bottom of the screenshot shows a taskbar with several open windows and a system tray with the time '09:42 AM'.

Remote testing tool located at CEDEX lab (Driving desk)



4. Cost and duration reduction by performing Operational Tests on lab

Scenario . Test campaign with 3 OBUs	Cost (k€)	Duration (months)	Duration after construction end
1.- Test campaign only on track	1,328	10,5	10,5
2.-Test campaign only at lab	180 (13%)	3	0
3.- Test campaign first in the lab (debugging) and later on track	824 (62%)	5	2



5. Conclusions

1. Operational tests are needed to place in service a new ETCS train and/or line.
2. Performing those Operational tests at lab is the only way of saving time and approaching the process of ETCS placing in service to the process followed with old proprietary systems.
3. Remote tests allow testing together onboard and trackside subsystems located in different labs.
4. DLR and CEDEX performed these tests in 2015 with the OBU at DLR and the trackside L2 at CEDEX. Tests were totally operated from CEDEX premises in Madrid.
5. At the end of this year these remote operational tests will be used to check the backwards compatibility of EVCs BL3 running over L2 and L1 BL2 (2.3.0.d) lines.



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Thank you very
much for your
kind attention

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