UIC DIGITAL DAYS | 3-4 October 2019

Using Digital twins for complex mass transit system design and integration

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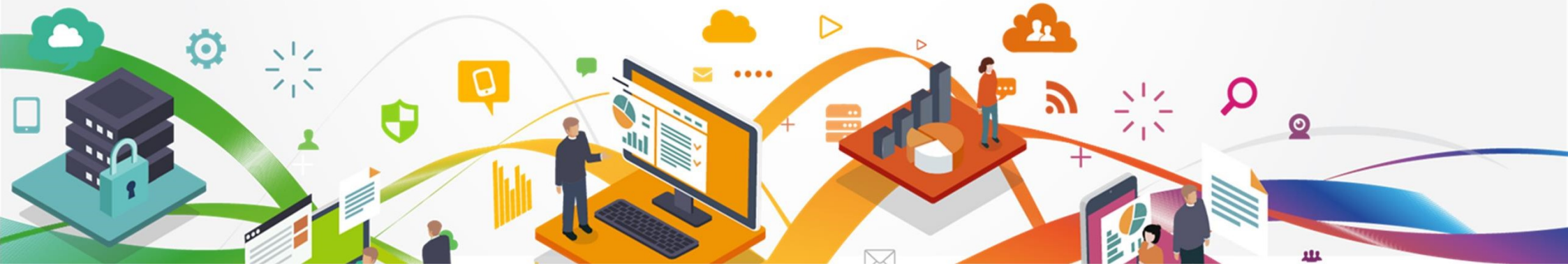
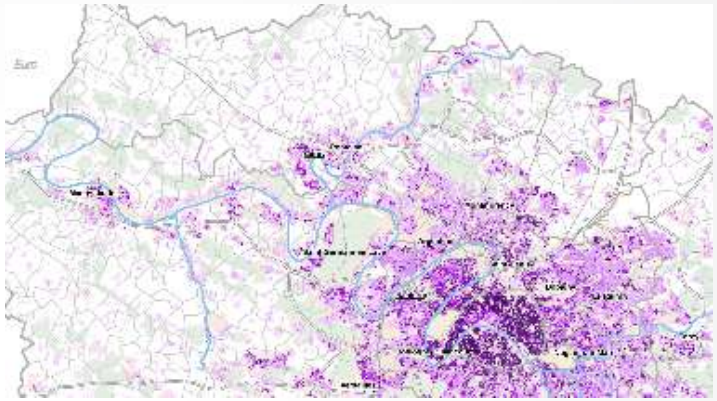
System Engineer & Project Manager SNCF RESEAU



The EOLE Line Extension Project

1900

2023



- Congestion of the “Express Lines” (RER network) in Paris Area (Ile de France) (+30% to + 40% in 10 years);
- A special need to relieve the Line A

Challenge : improve the service quality and capacity of the existing railway network
Application on Paris Line E

The EOLE Line Extension Project

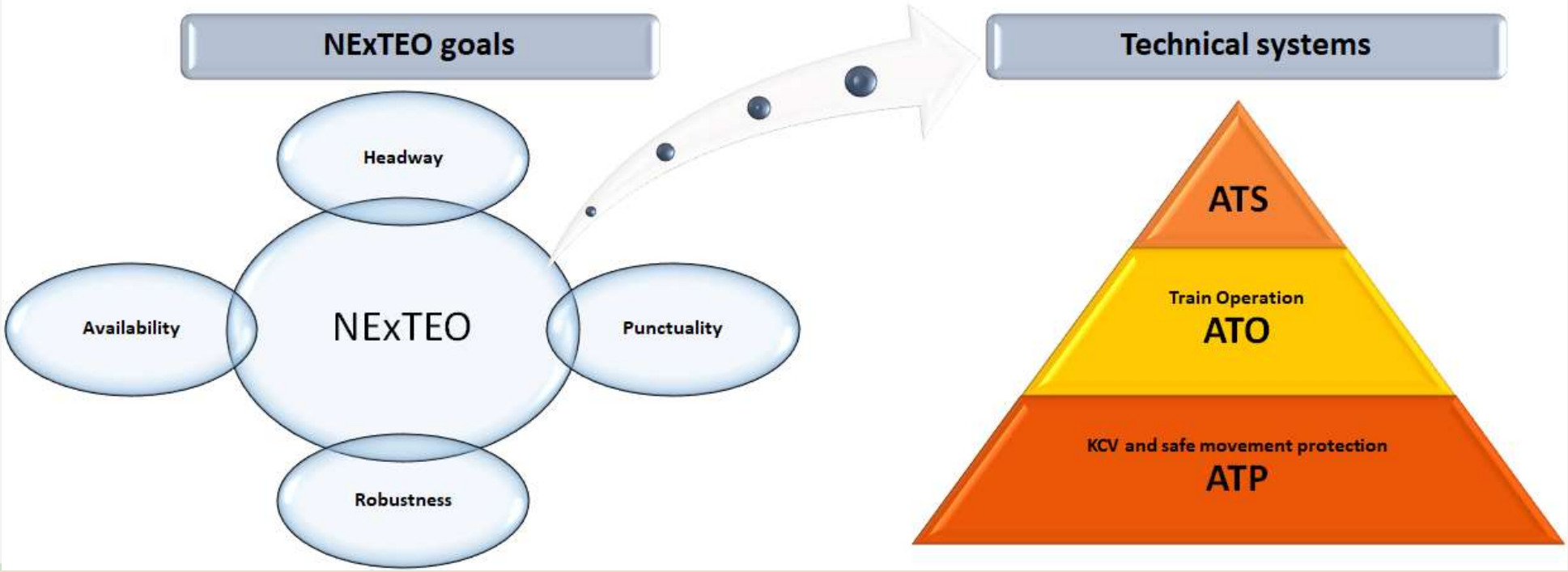
EOLE is :

- a rolling stock project

- an infrastructure project

- a new rail traffic management system : NExTEO

The EOLE Line Extension Project - CBTC



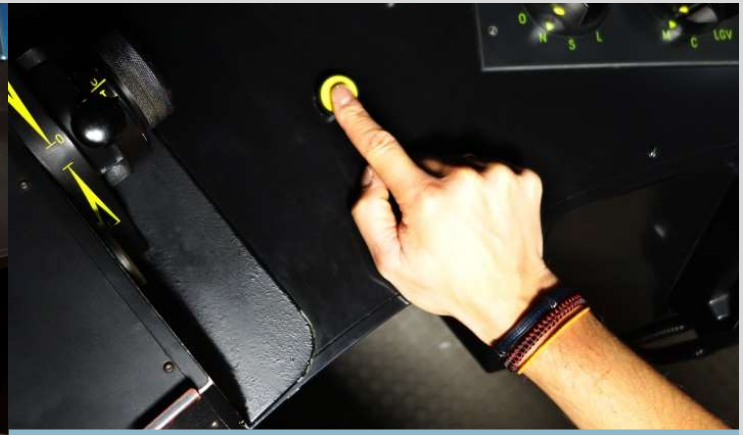
NExTEO performances are based on CBTC technology

Introducing CBTC on existing infrastructure

CBTC and ATO, ATS technologies but in an open railway environment
Handle the complexity without forgetting the final users' expectations

Automatic driving under NExTEO

1 Enter NEXTEO section



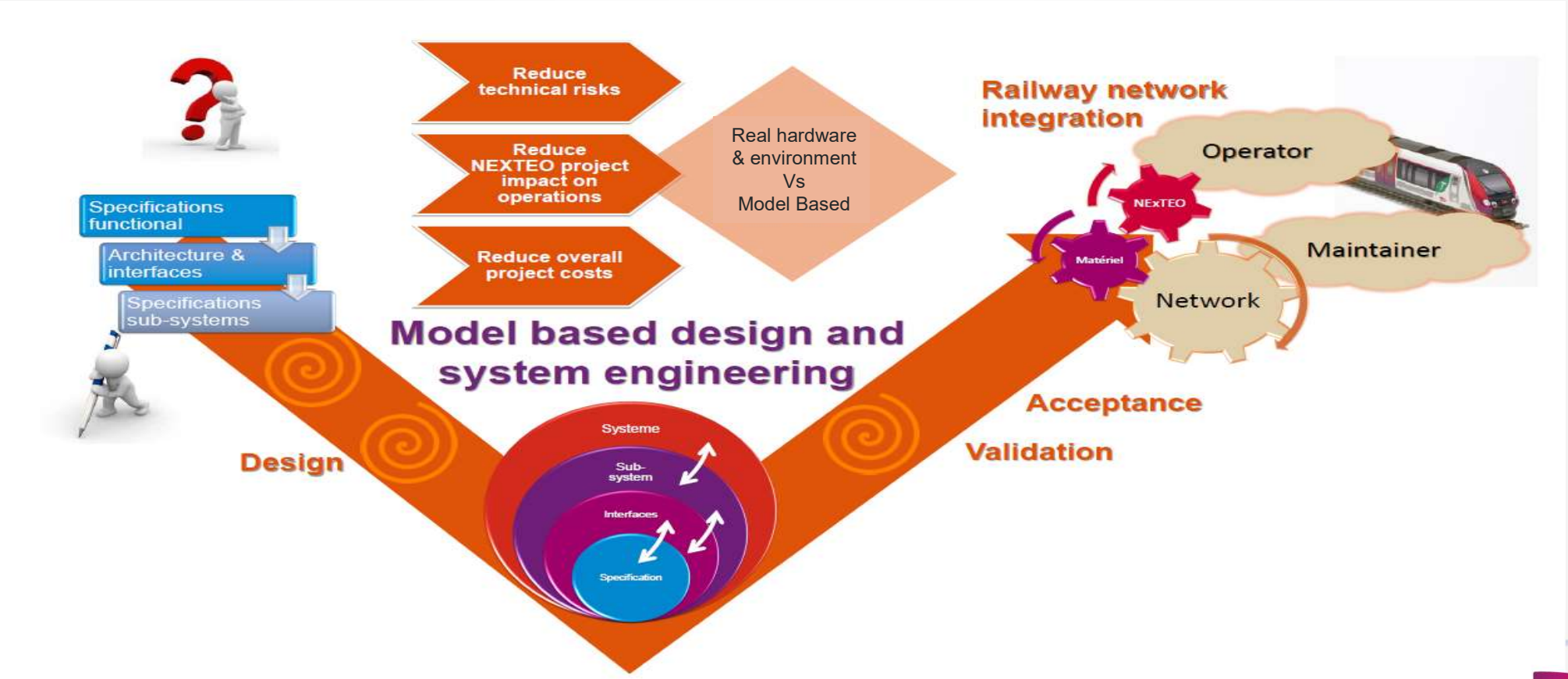
2 : Automatic driving acivation

Our expectations from Digital twin/ Model based design

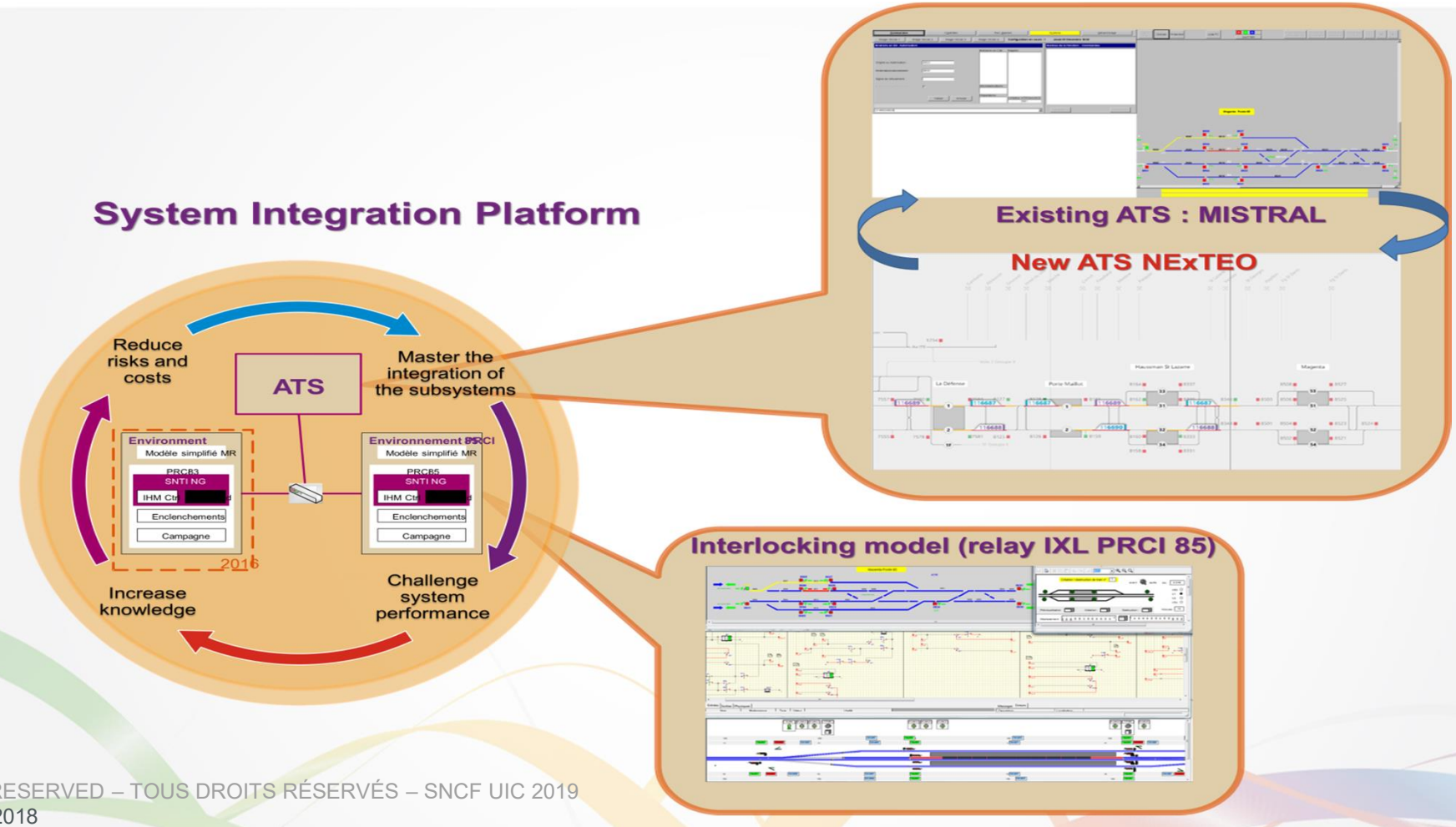
- enable a system approach clarifying functionalities, interfaces, interactions between different complex systems.
- enable Rail Operator / Final user to understand the system (evolution & changes compared to the existing one).
- allow a smooth transition from system level to the next steps of V cycle such as design, integration, validation.
- reduce on site testing (reduced amount of slots –e.g. 50 nights to save on site)
- reduce risk of disturbances on E line operations due to modifications on existing interlocking and on site testing

System engineering based on digital twin is a key to success

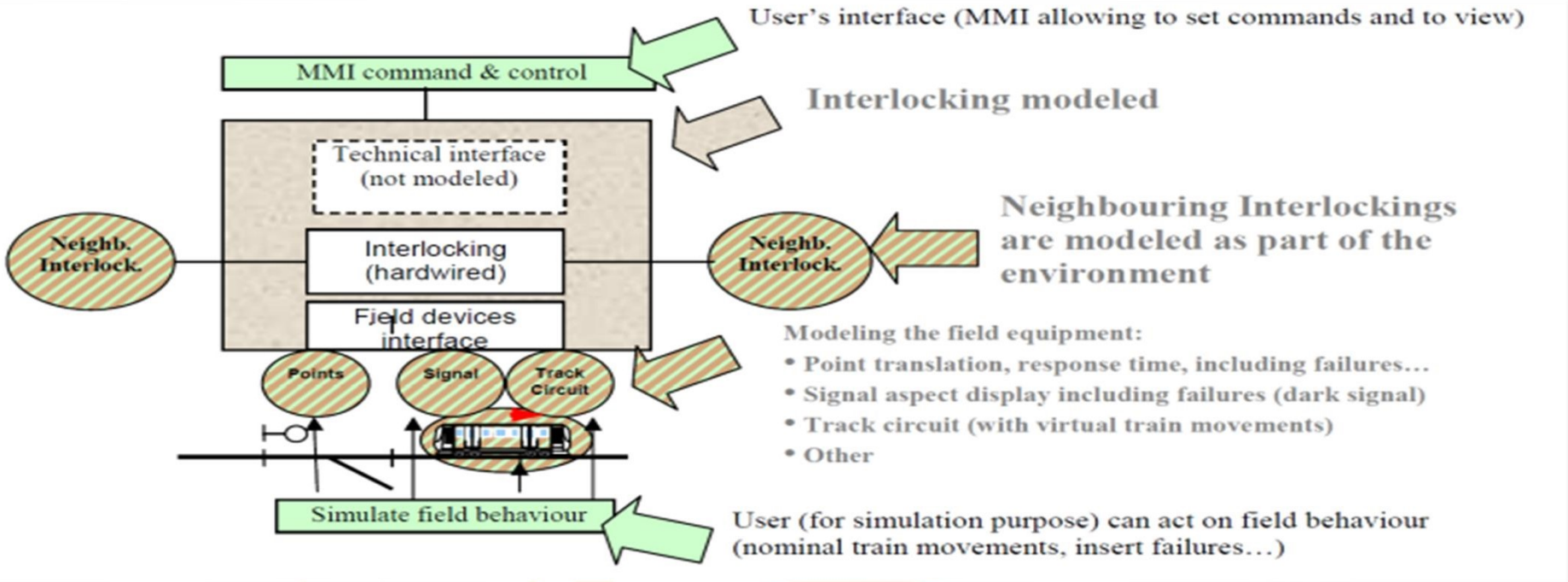
Our expectations from Digital twin/ Model based design



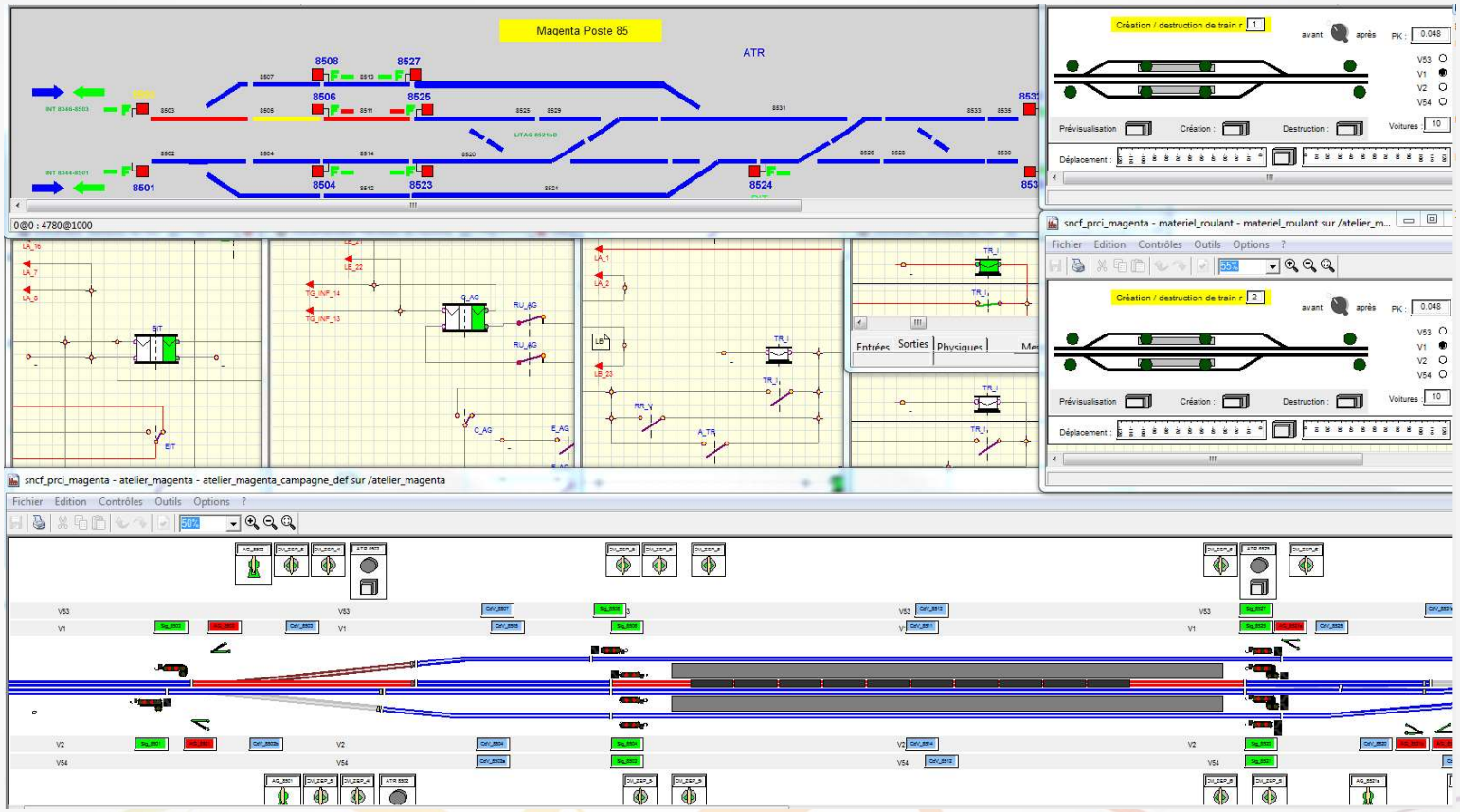
Our expectations from Digital twin/ Model based design



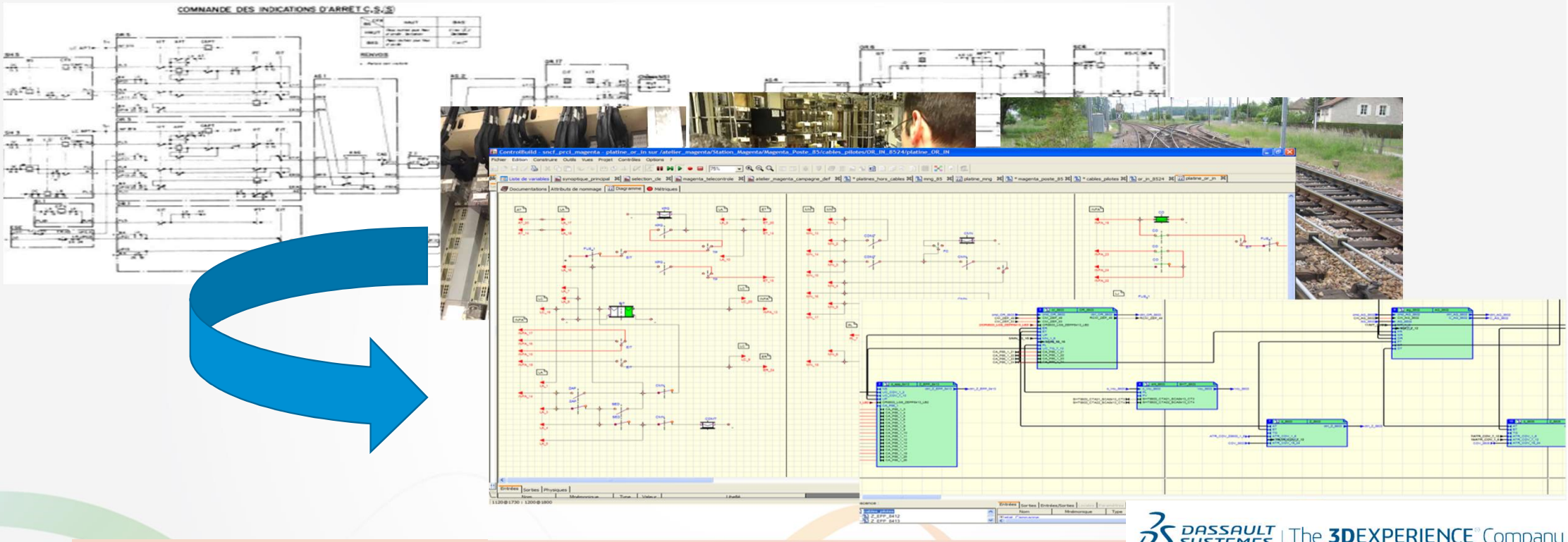
Model overview



Model overview

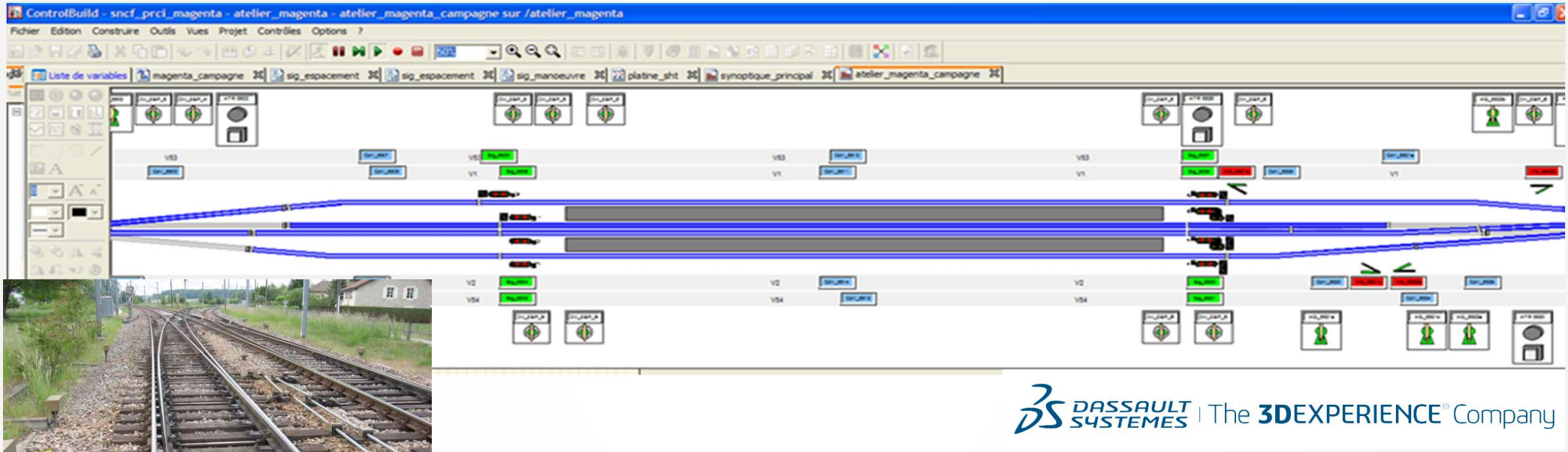


Build the models



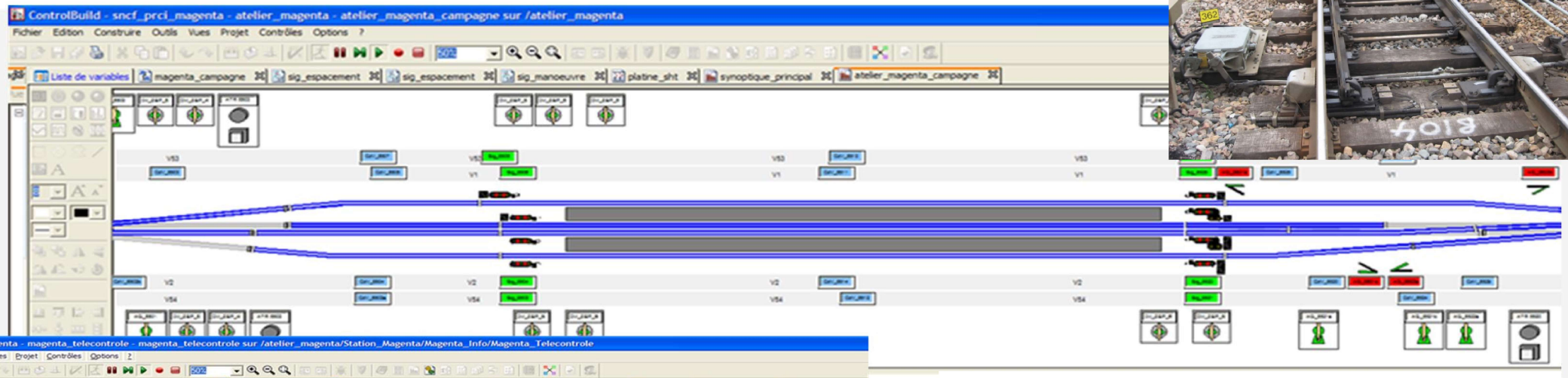
1st STEP: build the digital twin based on all drawings of the PRCI Relay IXL

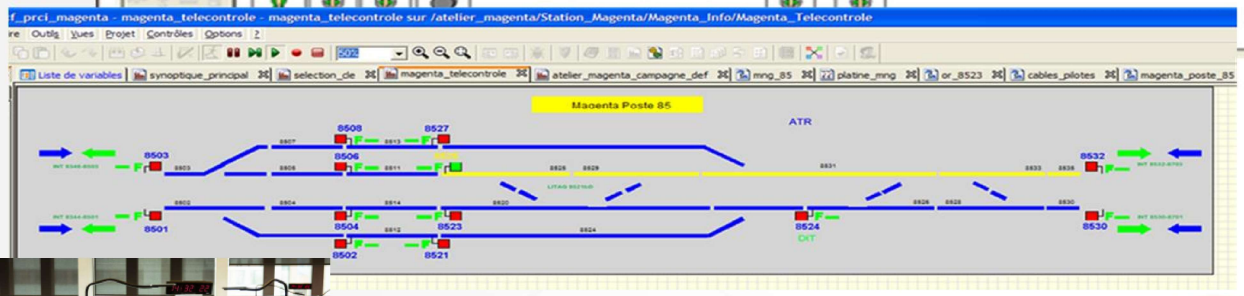
Build the models



2nd STEP : model track and devices

Simulate and validate





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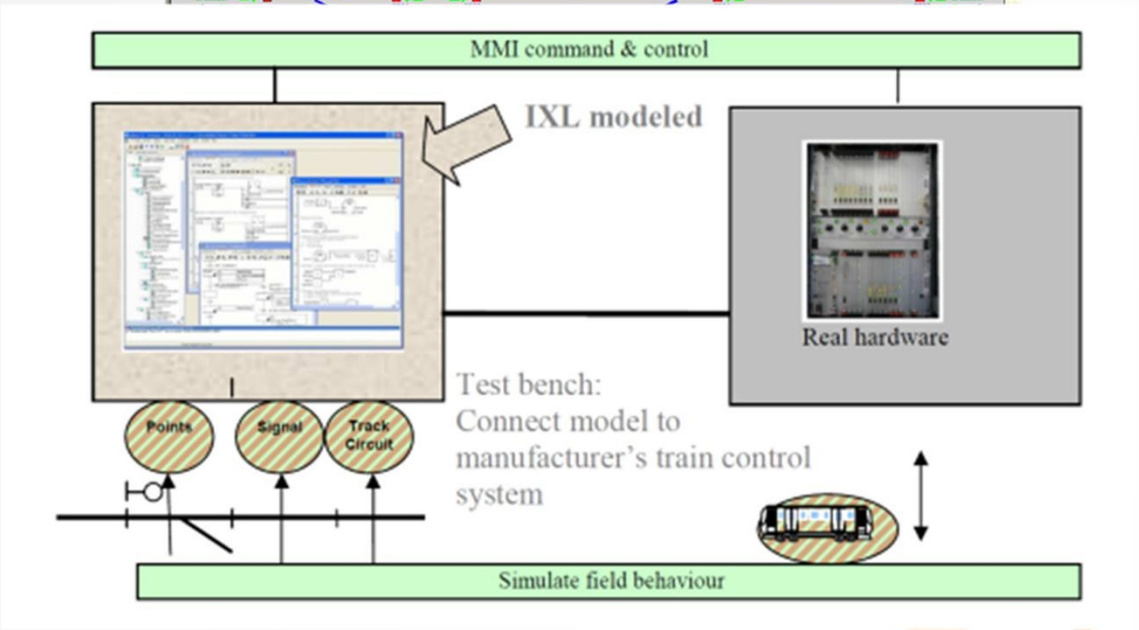
PRCI nominal.mp4

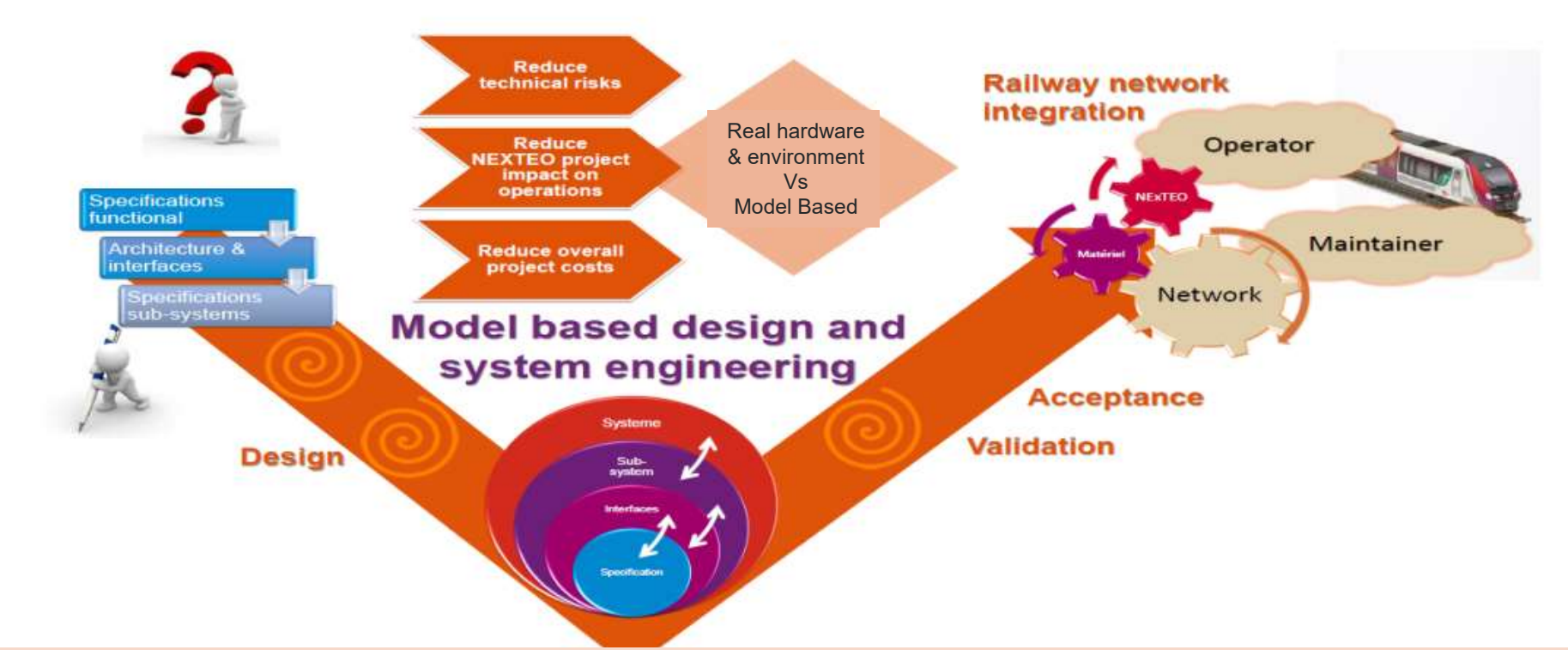
3rd STEP: simulate and validate using the models

Build the complete test bench



4th step: integrate and build the complete test bench with MIL & HIL

Perspectives & applications for the NExTEO project



Next steps: system wide test bench with MIL & HIL

Thank you!

for your kind attention