EXPO FERROVIARIA 2012 - Turin, 27-29 March 2012
"THE INTERNATIONAL ITALIAN ENGINEERING AD DESIGN IN RAILWAY TRANSPORT" SESSION

Conference

in collaboration with

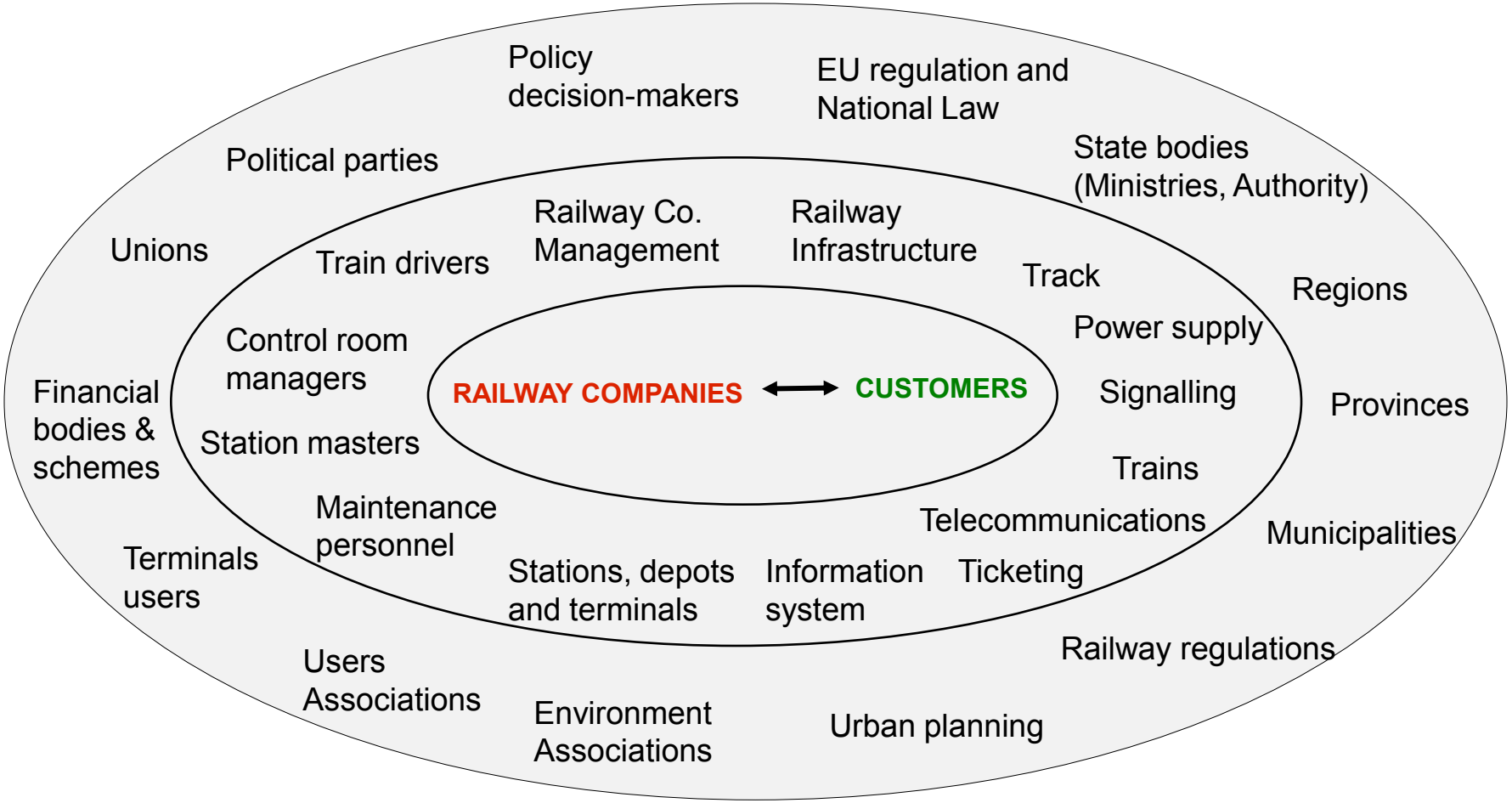
"ADVANCED SOFTWARE AND SIMULATORS PLATFORM AS A TOOL TO IMPROVE THE EFFECTIVENESS, EFFICIENCY, SAFETY, PERFORMANCE AND QUALITY LEVELS IN RAILWAY SYSTEMS AND TRANSPORT SERVICES"

Claudio Masi, Eros Pettinelli – SHRAIL S.r.l.

TARGETS TO BE ACHIEVED BY RAILWAY SYSTEMS AND TRANSPORT SERVICES

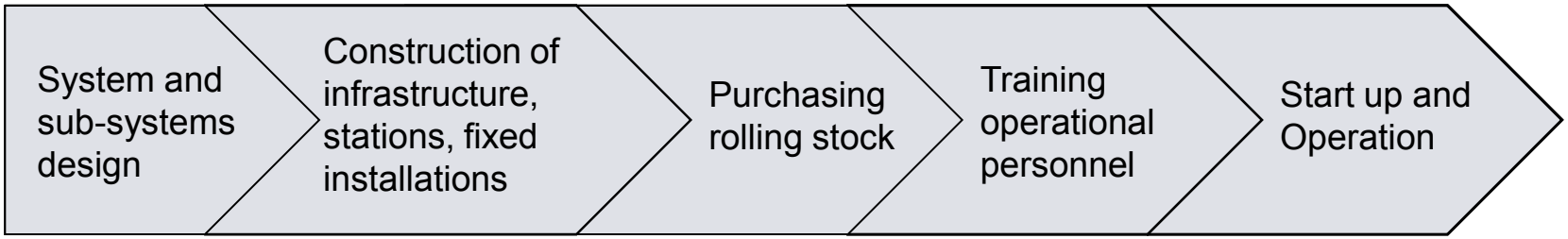
- ❑ PERFORMANCE
- ❑ SAFETY AND SECURITY
- ❑ EFFICIENCY AND EFFECTIVENESS
- ❑ QUALITY
- ❑ SOCIAL ASPECTS
  - ✓ Decent work
  - ✓ Customer care
  - ✓ Environment protection
  - ✓ Energy saving
  - ✓ Employees motivation

THE RAILWAY ECOSYSTEM



HOW THE RAILWAY PROJECT TARGETS CAN BE SUPPORTED BY THE PROPOSED SOFTWARE AND SIMULATORS ADVANCED PLATFORM

Railway project phases

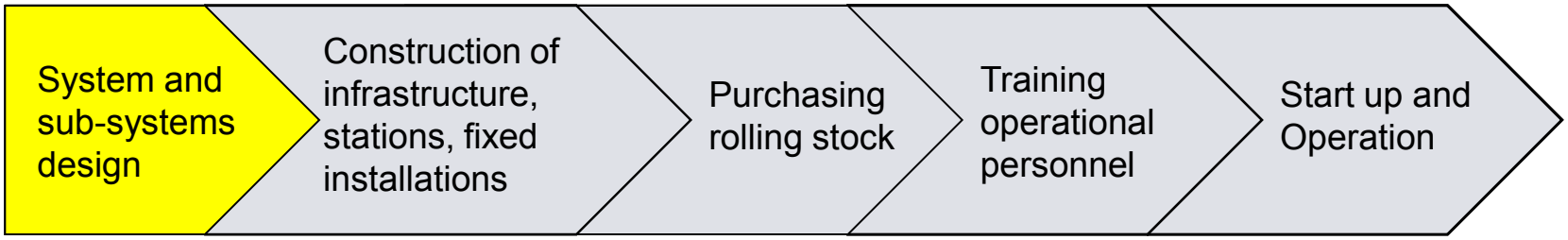


SHRAIL simulation tools involved

TRAFERR	TRAFERR	TRAFERR	TRAFERR	TRAFERR
SIMACEI	SIMACEI	SIMURAIL	SIMACEI	SIMACEI
ICS	ICS		ICS	ICS
SIMUGENS	SIMUGENS		SIMUGENS	SIMUGENS
SIMURAIL	SIMURAIL		SIMURAIL	SIMURAIL

HOW THE RAILWAY PROJECT TARGETS CAN BE SUPPORTED BY THE PROPOSED SOFTWARE AND SIMULATORS ADVANCED PLATFORM

Railway project phases



SHRAIL simulation tools involved

TRAFERR	TRAFERR	TRAFERR	TRAFERR	TRAFERR
SIMACEI	SIMACEI	SIMURAIL	SIMACEI	SIMACEI
ICS	ICS		ICS	ICS
SIMUGENS	SIMUGENS		SIMUGENS	SIMUGENS
SIMURAIL	SIMURAIL		SIMURAIL	SIMURAIL

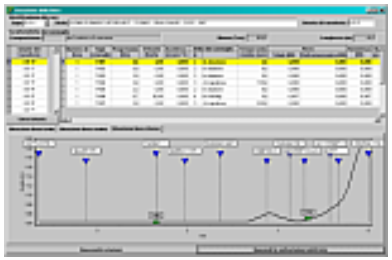
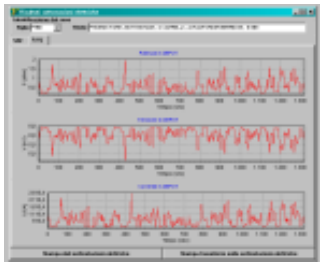
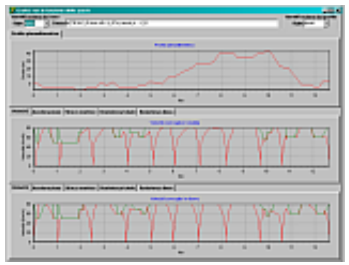
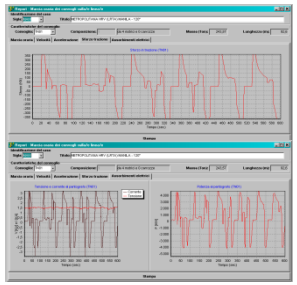
DESIGN PHASE

TRAFERR for designing "0peration" and the Power Supply sub-system

The TRAFERR software takes into account various components of the railway system, such as the planaltimetric profile, the fixed installations (power supply and signalling) and the trains with their characteristics.

It gives evidence of the relations among the different components and the output is represented by data and graphics (see some examples herebelow) showing the train running time, speed, energy consumption and location along the line as well as the electric parameters (voltage, current, energy absorption) of both catenary and electric substations (where existing).

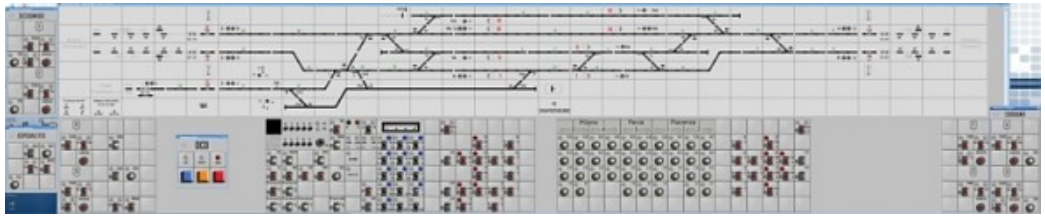
That allows to simulate different configurations and characteristics of basic components of the railway system to evaluate the transport services offered and analyse possible dowgrades in the operation.

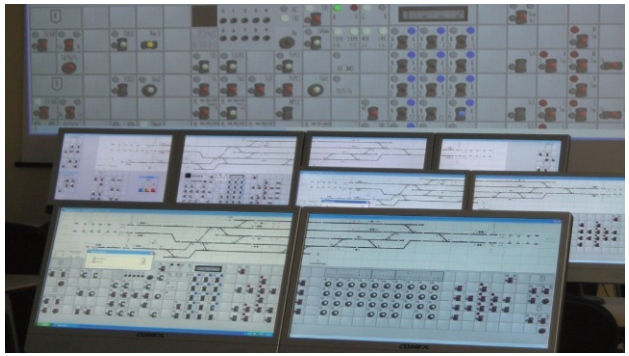





DESIGN PHASE

SIMACEI & ICS for designing signalling & testing operation robustness (1)

SIMACEI simulates a traditional A.C.E.I. (interlocking) with a high level of realism and all its electromechanic circuits. It meets the railway regulations. In case of modifications of an existing A.C.E.I. it allows to test them in advance. In case of a new advanced control and supervision signalling system, it can help to interfacing the Supervision and Control Centre with traditional interlocking systems as well as for diagnostic and related interventions.



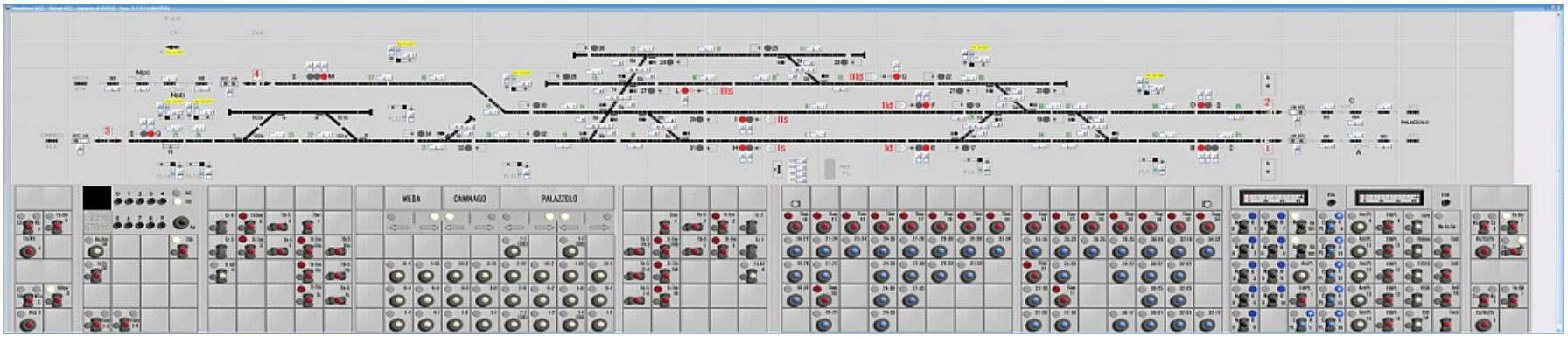


SIMACEI *simulator for Casalpusterlengo station (RFI- since 2007)*

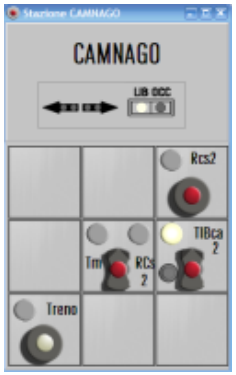
DESIGN PHASE

SIMACEI and ICS for designing signalling & testing operation robustness (2)

The virtual simulation of the interlocking system in a significant railway station with SIMACEI software tool allows to analyse how a Control Centre Manager or a Station Master can reduce the impact of perturbances of the train circulation in order to mantain the defined time-schedule.



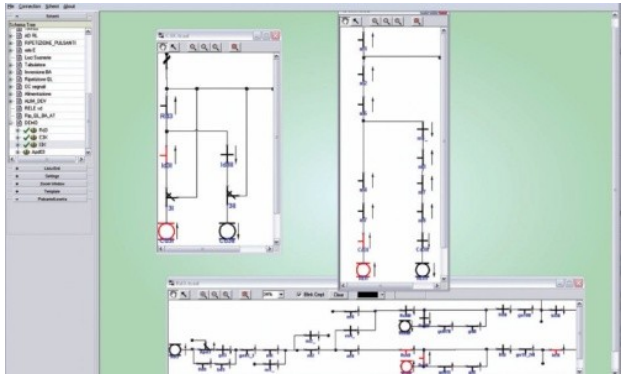
SIMACEI *simulator for Seveso- Meda (FERROVIENORD- since 2001)*

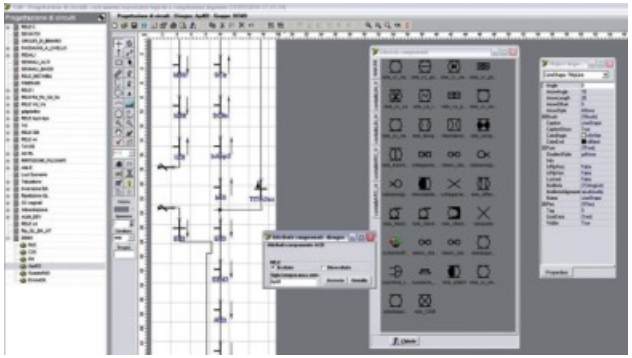


DESIGN PHASE

SIMACEI and ICS for designing signalling & testing operation robustness (3)

ICS has been designed to provide A.C.E.I. maintenance personnel with a tool to visualise the dynamic functioning of the “relays’ room” circuits. The software allows not only to see the consequences of possible faults but also to test in advance in detail the results of any modification applied to the A.C.E.I.



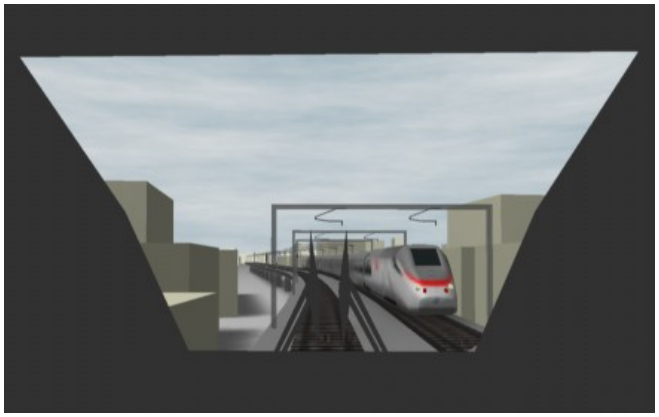


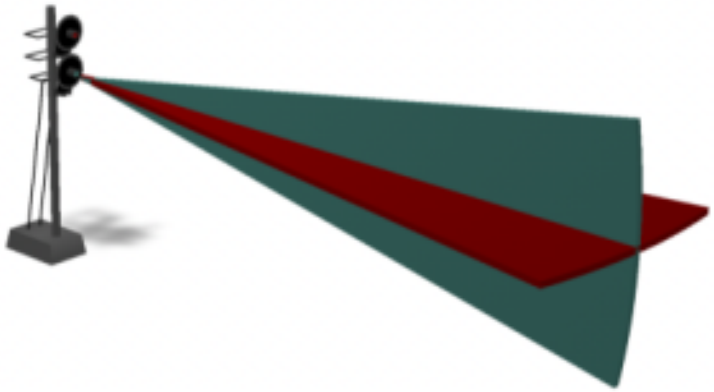
Interlocking Circuitry Simulator

DESIGN PHASE

SIMURAIL support to positioning the signals along the railway line

SIMURAIL allow to analyse the visibility of the signals simulating the train drivers' visual perspective in any meteo condition.





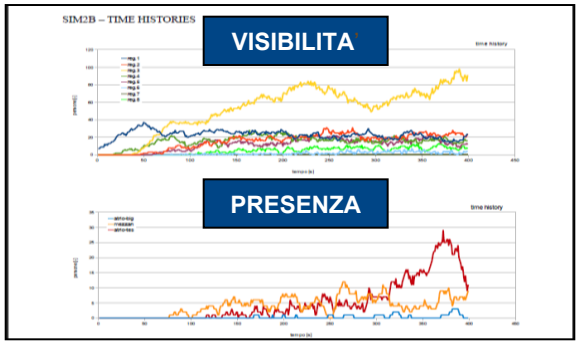
DESIGN PHASE

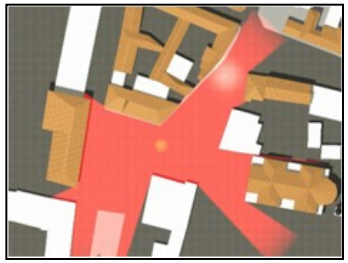
SIMURAIL & SIMUGENS for designig railway stations and terminals

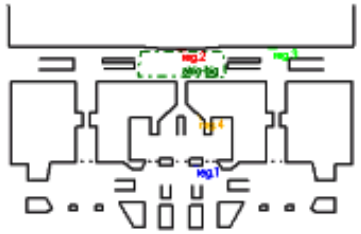
Together with SIMACEI, the SIMURAIL and SIMUGENS software tools allow to represent (with a 3D virtual simulation) a railway station complete with building, trains circulating on the tracks, overhead contact line, signalling and passengers moving inside the interchange facility, on platforms and stepping in/out in/from trains. That helps to designing the station and the mobility of people and vehicles approaching it. Same approach can regard tunnels infrastructure.

SIMUGENS software (a program to simulate the dynamics of crowds' behaviour) helps in particular, with a view to passengers' safety and security, to:

- dimension the station spaces, corridors, stairs, safety exits etc;
- design an effective information system for passengers (panels and voice messages), based on real passengers' needs and location inside the building.





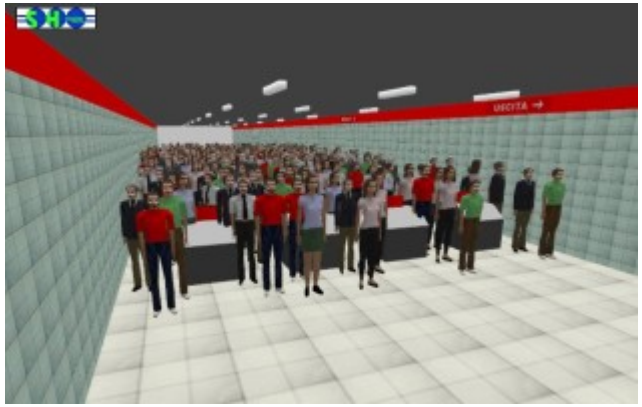


STARTING AT THE END OF THE DESIGN PHASE:

COMMUNICATING THE RAILWAY PROJECT

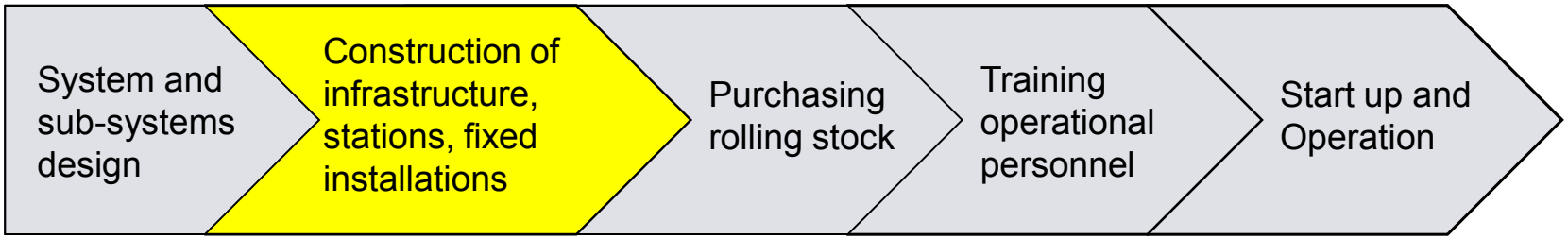
A railway line or section of it with several stations can be represented in a 3D virtual very realistic way with the SIMACEI, SIMURAIL and SIMUGENS simulators.

It is therefore possible to use the "live representation" also for communicating to all possible stakeholders (public bodies, citizens etc.) the project targets and how it will works when in operation.



HOW THE RAILWAY PROJECT TARGETS CAN BE SUPPORTED BY THE PROPOSED SOFTWARE AND SIMULATORS ADVANCED PLATFORM

Railway project phases

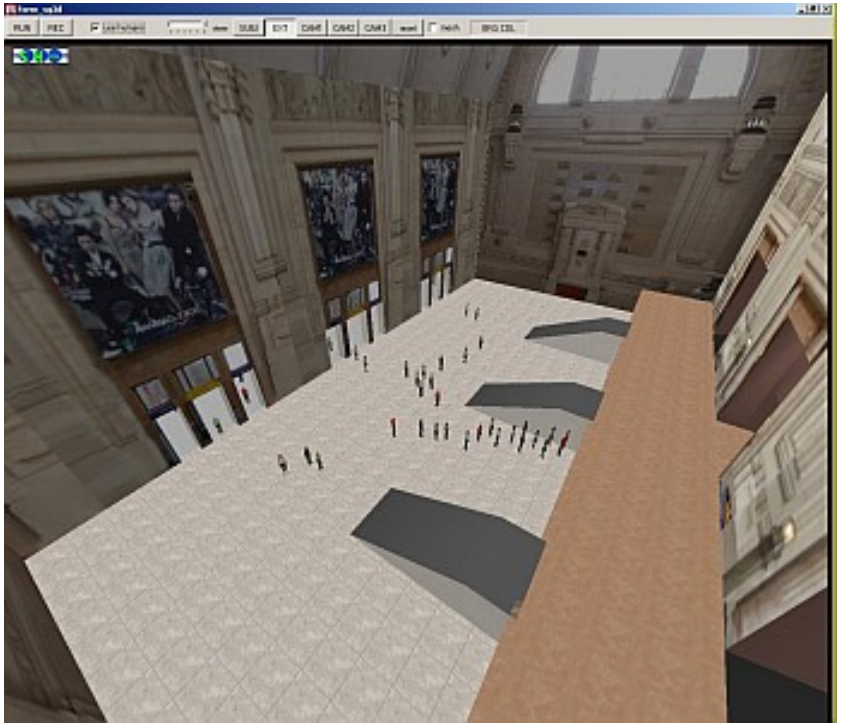


SHRAIL simulation tools involved

TRAFERR	TRAFERR	TRAFERR	TRAFERR	TRAFERR
SIMACEI	SIMACEI	SIMURAIL	SIMACEI	SIMACEI
ICS	ICS		ICS	ICS
SIMUGENS	SIMUGENS		SIMUGENS	SIMUGENS
SIMURAIL	SIMURAIL		SIMURAIL	SIMURAIL

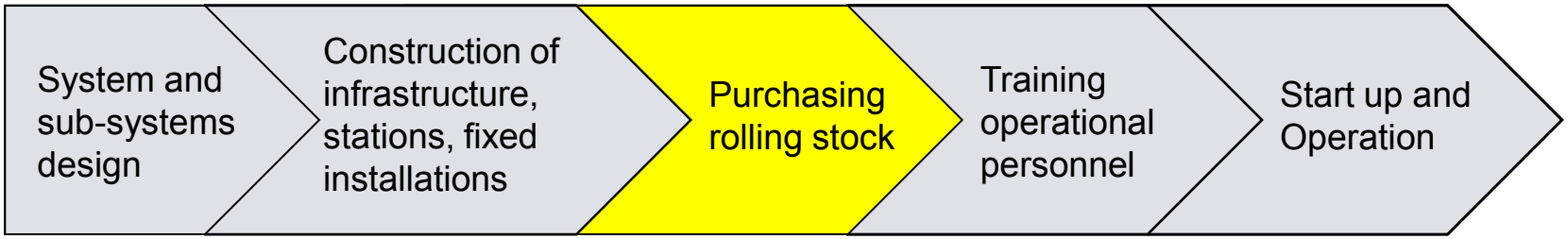
CONSTRUCTION OF INFRASTRUCTURE, STATIONS & FIXED INSTALLATIONS

SIMACEI, ICS, SIMURAIL , TRAFERR and SIMUGENS simulators can support in the construction phase when project variants have to be considered



HOW THE RAILWAY PROJECT TARGETS CAN BE SUPPORTED BY THE PROPOSED SOFTWARE AND SIMULATORS ADVANCED PLATFORM

Railway project phases



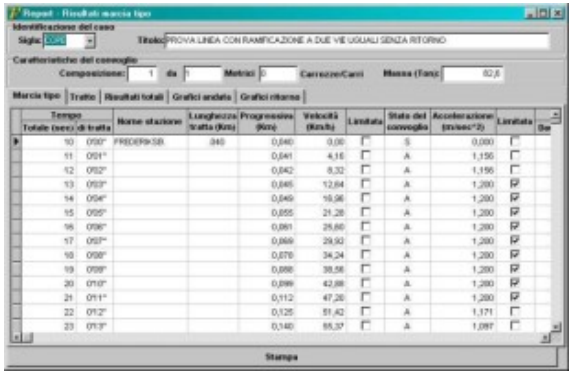
SHRAIL simulation tools involved

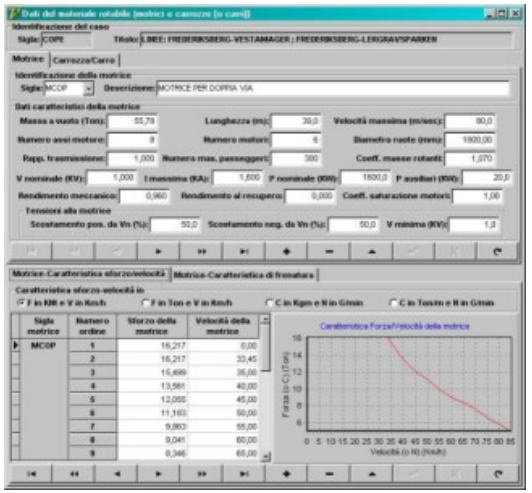
TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL

TECHNICAL SUPPORT DURING TENDERS TO PURCHASING ROLLING STOCK

SIMURAIL , integrated with TRAFERR and SIMACEI, can be a tool for the “purchasing body” to verify the performances of the offered rolling stock on the railway line of reference.

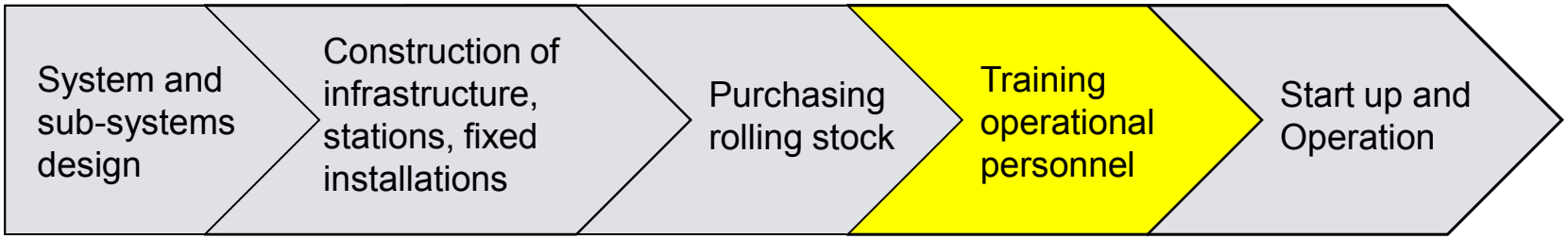
A train driver can also test the rolling stock on the 3D virtual line.





HOW THE RAILWAY PROJECT TARGETS CAN BE SUPPORTED BY THE PROPOSED SOFTWARE AND SIMULATORS ADVANCED PLATFORM

Railway project phases



SHRAIL simulation tools involved

TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL

TRAINING OPERATIONAL PERSONNEL

- SIMURAIL , SIMACEI , ICS, TRAFERR, SIMUGENS: each of them has been designed to simulate specific aspects making part of the railway system and operation, but all of them have been developed to be in a condition to work together in an integrated way to simulate the system and operation complexity.

- The training demand for each professional job can be answered (as shown in the following slide) by different combination of the above “bricks”, making possible at same time to create joint training sessions involving different professional people of Railway Companies (Rail Network Co. and Transport Services Co).

TRAINING SOLUTIONS

SHRAIL sofware

	DM	DCO	MAINT	TD	CD
SIMUGENS	●	●			
SIMURAIL	●	●		●	●
ICS	●		●		
SIMACEI	●	●	●	●	●
TRAFERR				●	

DM= Station master
DCO= Control Centre Manager
MAINT=ACEI maintenance personnel
TD=TRAIN DRIVER
CD= TRAIN CONDUCTOR

TRAINING OF RAIL NETWORK COMPANY PERSONNEL

SOLUTION FOR TRAINING STATION MASTERS

It simulates an A.C.E.I., exactly riproducing how the A.C.E.I. works both in normal and anomalous conditions, generating the flow of trains on arrival and leaving the station.

It allows to generating faults in the interlocking system.

It helps to improving the effectiveness and speed of the Station Master to solve anomalous situations.

Training to draw up prescriptions for train drivers

SOLUTION FOR TRAINING CONTROL CENTRE MANAGERS

It simulates the equipment and the conditions which the Control Centre Manager is used to work with, representing a railway line with stations equipped with A.C.E.I.

It is integrated with the simulator for Station Masters.

It helps to improving the effectiveness and speed of Control Centre Managers to solve anomalous situations.

SOLUTION FOR A.C.E.I MAINTENANCE PERSONNEL

It allows to show the operation of the circuits in the „relays‘ room“.

Useful as a tool to show how the A.C.E.I. and more generally the interlocking circuits work (to support basic didactics activities).

It allows to study the consequences of faults of the equipmente in order to speed up the diagnostics and the solution of abnormal operation.

It allows to study the effects and consequencies of modifications occasioned to the A.C.E.I.

TRAINING OF RAIL NETWORK COMPANY PERSONNEL

SOLUTION FOR EACH SPECIFIC FUNCTION (DM, DCO AND ACEI MAINTENANCE PERSONNEL)	SOLUTION FOR „SERVICE PRODUCTION“	SYSTEM INTEGRATION
SOLUTION FOR DM **SOLUTION FOR DCO** **SOLUTION FOR ACEI MAINTENANCE**	Integration of the funcionalities of the DM, DCO and ACEI Mantenance personnel simulators, to work as an integrated system describing one or more railway sections.	Training of DM e DCO to draw up the prescriptions for train drivers in specific operation conditions. Possibility of joint training sessions with DM, DCO, train drivers and conductors (real and/or virtual) Joint training/practical exercises to face anomalous, extraordinary and also emergency situations.

SIMACEI for FERROVIENORD

INTEGRATION SIMACEI-SIMURAIL

TRAINING OF RAIL TRANSPORT COMPANY PERSONNEL

Driving the train

Familiarize with:

- the driving cabin equipment and with the safety/diagnostic systems
- line signals and devices (i.e. switch points, indicators etc.)
- the functioning of the main rolling stock subsstems (i.e.on board electric and pneumatic equipment).

Training to:

- Drive the trains in different meteorological, visibility and adherence conditions
- Face any possible anomaly pointed out by the diagnostic subsystem as well as possible emergency situations

Service mission

Train preparation

Training to the line service observing the railway regulations, in normal or degraded or emergency situations

The dialogue with DM and DCO via prescriptions

Driving style oriented to passengers' confort

Energy saving and eco-driving

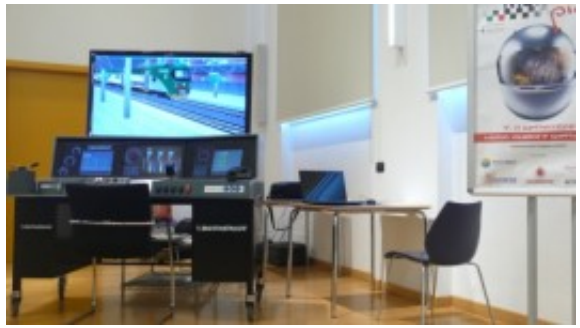
Training to the best use of the rolling stock

System integration

Practice with more trains and more drivers (real and/or virtual)

Joint training sessions with the contemporary presence of train drivers, conductors, DM and DCO (real and/or virtual)

Sessions dedicated to how to face anomalous, extraordinary or emergency situations

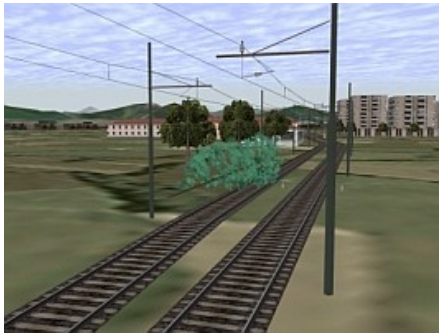


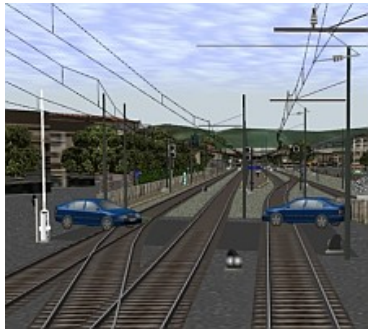
TSR simulator-TRENORD 2011

Possible layout for a Train Driver-Training Solution

TRAIN DRIVERS-TRAINING SOLUTIONS
Some basic activities

- Learning about main rolling stock subsystems
- Train preparation
- “Interactive study” of railway regulations and prescriptions
- Driving and performing the line service in accordance to railway regulations, in presence of normal or degradated or emergency situations
- Learn how to manage the anomalies pointed out by the on board-diagnostic equipment
- Correct use of SCMT
- Energy-saving driving
- Further possibilities to integrate and improve the effectiveness of “theory courses”





SIMURAIL system architecture

Peculiar characteristics(1)

- Possibility to activate more driving cabins contemporary
- Possibility to make circulating also “virtual driven trains”
- *Everybody* sees *everything*
- Possible look-out from any observation post

- The trains:
  - ✓ move on the basis of the signalling provided by SIMACEI
  - ✓ occupy the circuit-blocks of SIMACEI
  - ✓ can circulate on a line belonging to more Rail Network Co.
- Dialogue with the Training Centre management system

SIMURAIL system architecture

Peculiar characteristics(2)

- Every station with its own virtual interlocking
- The remote control of the stations is also possible
- It is also possible to import the track geometry from CAD (inRAIL or DXF)
- Possible interaction among different professional people of the Railway Companies (Rail Network Co. and Transport Services Co)

SIMURAIL system architecture

Peculiar characteristics(3)

- Dedicated posts for the instructors.
- The software allows the instructors to create exercises.
- It is possible to record the entire sequence of the manoeuvres on simulators for subsequent play-back.
- It is possible to trace the entire training process and results and interface with the Training Centre management system.

MANAGING THE TRAINING PROCESS

TRAINING CENTRE MANAGEMENT SYSTEM (TCMS) PROGRAM (1)

The Program allow to trace the entire training process with the following targets:

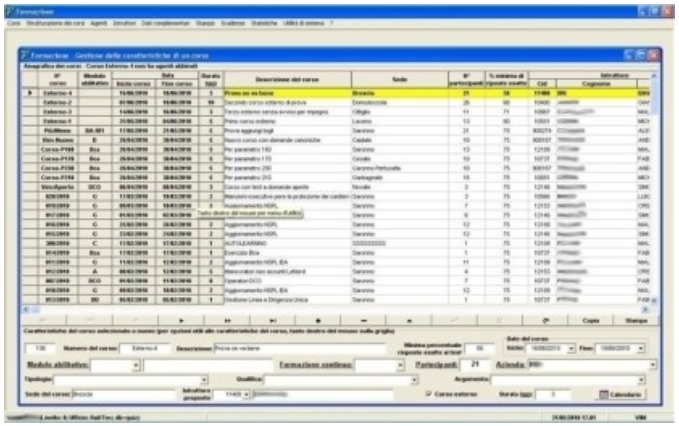
- Record the training activities of teachers and students .
- Keep control of the status of the learning of each student.
- Keep control about the resources used in the teaching activities.
- Best preparation of the exams questionnaires.
- Allow possible future e-learning activities.

Note: a TCMS program is installed with Ferrovienord S.p.A. since 2007

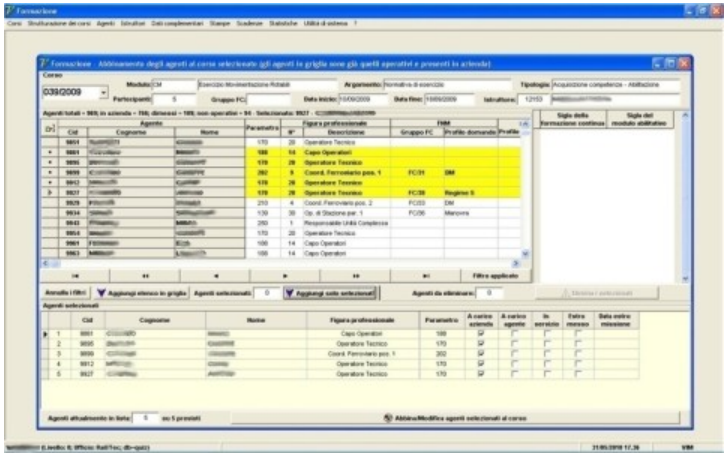
MANAGING THE TRAINING PROCESS

TRAINING CENTRE MANAGEMENT SYSTEM (TCMS) PROGRAM (2)

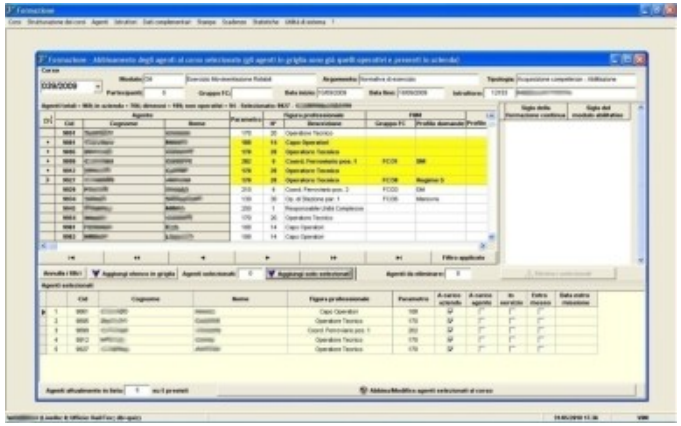
Examples of the program output



Preparation of the course

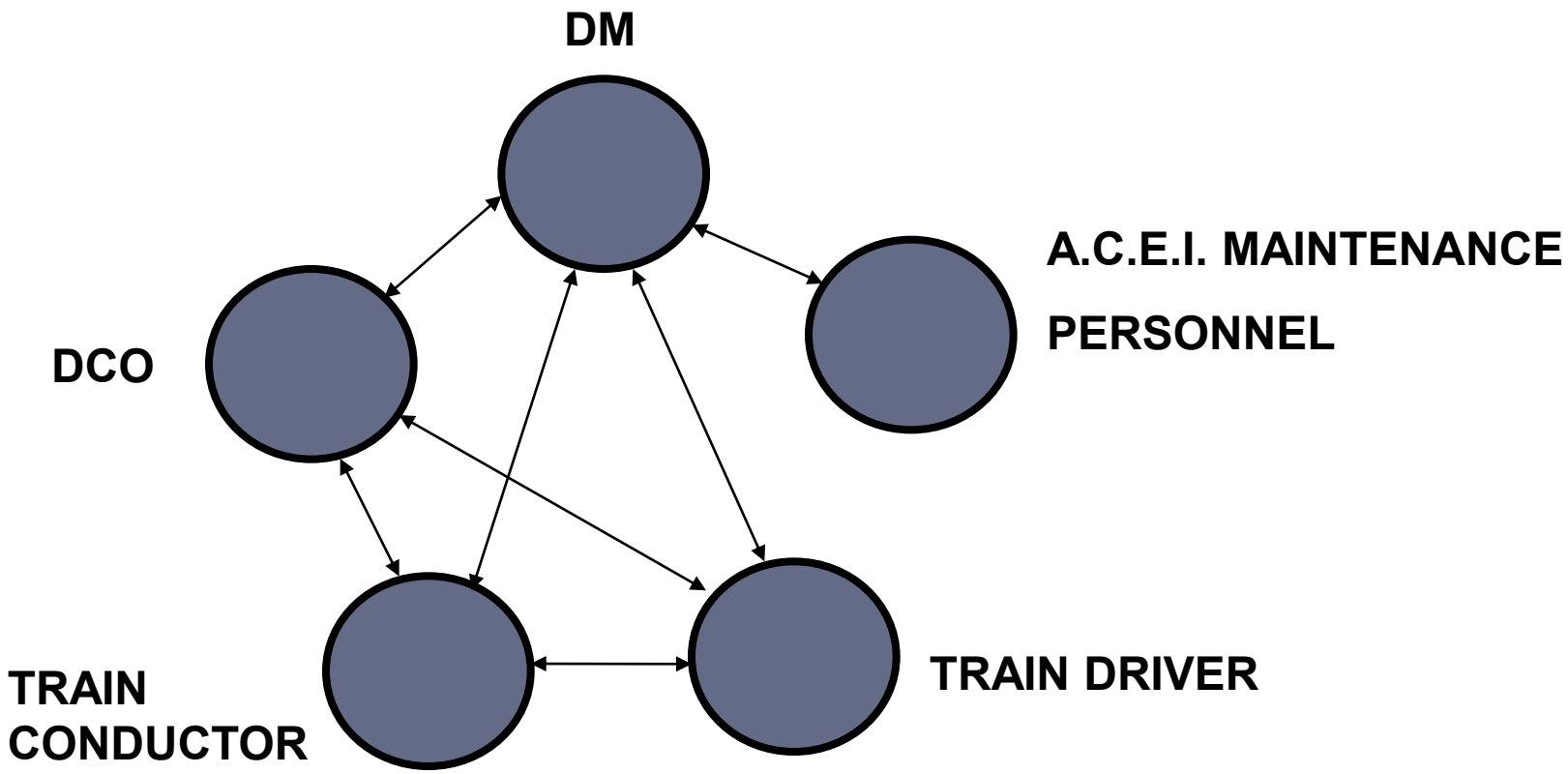


Managing the course and the students



Statistics

THE COHERENCE WITH THE GUIDELINES OF ANSF FOR THE TRAINING CENTRES (1)



ANSF=National Agency for Railway Safety

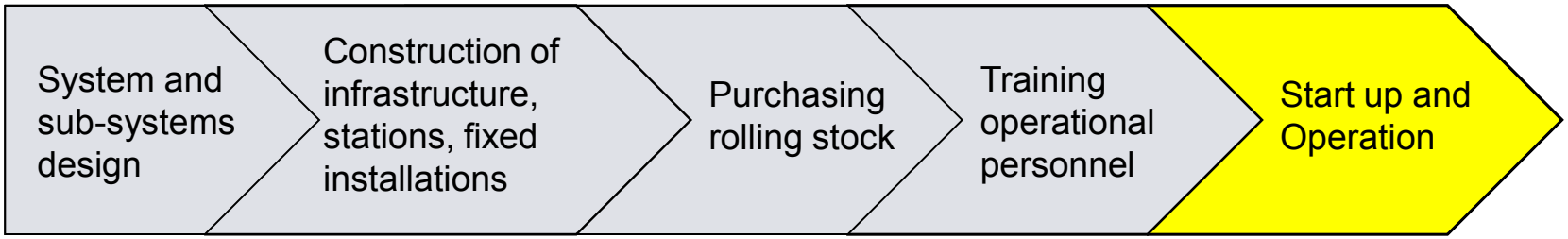
THE COHERENCE WITH THE GUIDELINES OF ANSF FOR THE TRAINING CENTRES (2)

Desired features

- ❑ Interoperability
- ❑ Simulators are welcome
- ❑ Well traced training process
- ❑ Development of the teachers' competences
- ❑ Objectivity and impartiality of judgment

HOW THE RAILWAY PROJECT TARGETS CAN BE SUPPORTED BY THE PROPOSED SOFTWARE AND SIMULATORS ADVANCED PLATFORM

Railway project phases



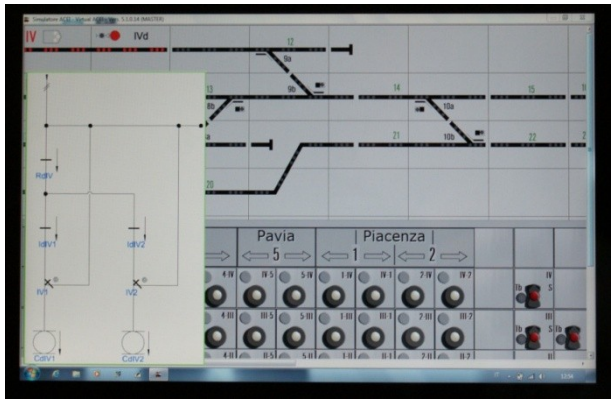
SHRAIL simulation tools involved

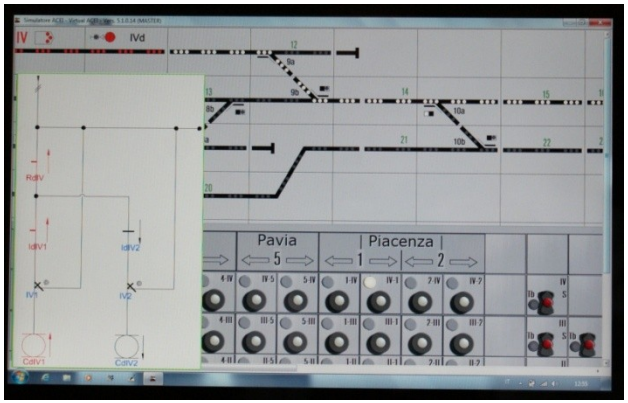
TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL	TRAFERR SIMACEI ICS SIMUGENS SIMURAIL

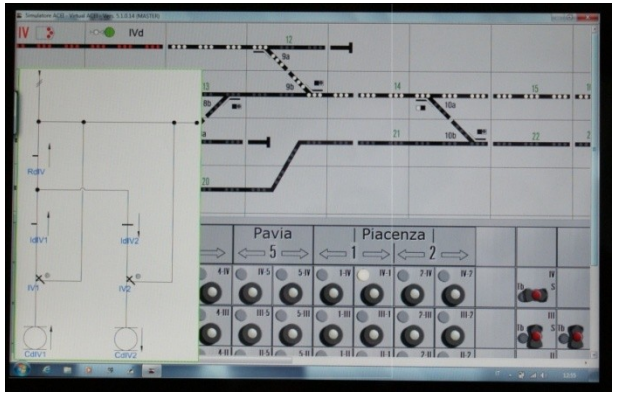
START UP AND OPERATION

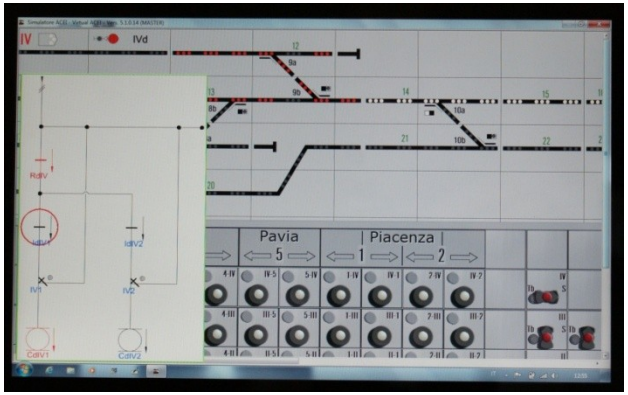
Example: SIMACEI and ICS jointly used for field maintenance activities

This application can support the interlocking system's maintenance people in their field interventions. It can run on a WiFi tablet. The pictures show the tablet screen with a living portion of the interlocking simulator together with the changes in the relevant electric diagrams.









START UP AND OPERATION

SHRAIL SOFTWARE & SIMULATORS CAN PROVIDE ADDED VALUE ALL ALONG THE DEVELOPMENT OF A RAILWAY PROJECT SINCE THE VERY EARLY PHASE OF DESIGN UP TO OPERATION, WHEN THEY CAN SERVE AS TOOLS TO HELP OPERATION PERSONNEL IN TAKING DECISIONS.

THEIR OPEN ARCHITECTURE/STRUCTURE MAKE POSSIBLE FURTHER DEVELOPMENTS AND EXTENDED USE SUCH AS:

- TO BE USED TO SUPPORTING THE TRAINING OF ROLLING STOCK MAINTENANCE PERSONNEL AND THEIR INTERACTIONS WITH TRAIN DRIVERS AND OPERATION MANAGERS.
- TO BECOME A REAL LABORATORY FOR THE RAILWAY COMPANY WHERE NEW OPERATION METODOLOGIES AND PROCEDURES CAN BE DEVELOPED AND TESTED BEFORE IMPLEMENTING THEM IN TRUE OPERATION.
- TO BE A TOOL AT DISPOSAL OF THE RAILWAY COMPANIES MANAGEMENT TO ADOPT THE BEST STRATEGIES TO REDUCE THE TECHNICAL RISKS AND OPTIMISE THE TRANSPORT SERVICES.

SIMURAIL FOR PUBLIC TRANSPORT

Trolleybus simulator- in cooperation with VOSSLOH KIEPE- 2010

TSR Simulator for TRENORD 2011

SHRAIL SOFTWARE APPLICATIONS

- SHRAIL software & simulators applications up to now in the domestic market (RFI, FERROVIENORD, TRENORD, ENTE AUTONOMO VOLTURNO).

- For the export market:

  - ✓ TRAFERR, SIMUGENS and SIMURAIL (for urban transport) are already available;
  - ✓ SIMURAIL, SIMACEI and ICS need adaptation to specific local railway regulations;

- Technology and Know-how are 100% Italian

THANKS FOR YOUR ATTENTION

For any further information:

www.shrail.it