



Il sistema integrato dei trasporti nell'area del mediterraneo

**Le nuove frontiere dei sistemi di segnalamento:
ACC-M e Telecontrollo**

Bari, 23 Giugno 2011



IP-based Interlocking solutions

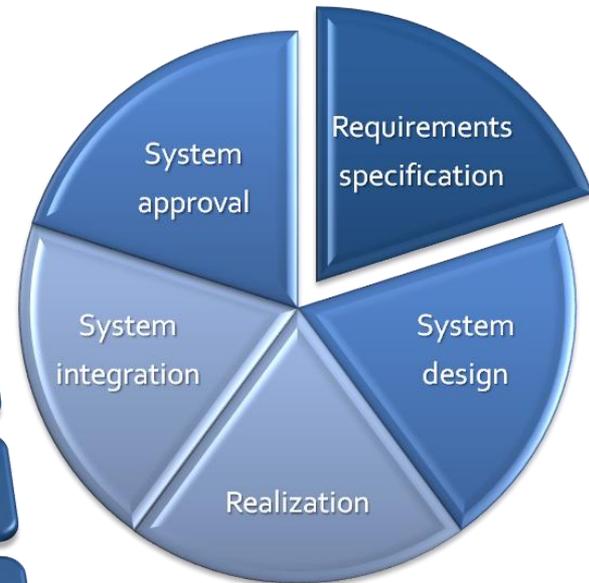
compliance with European Norms

MEETS CUSTOMER NEEDS

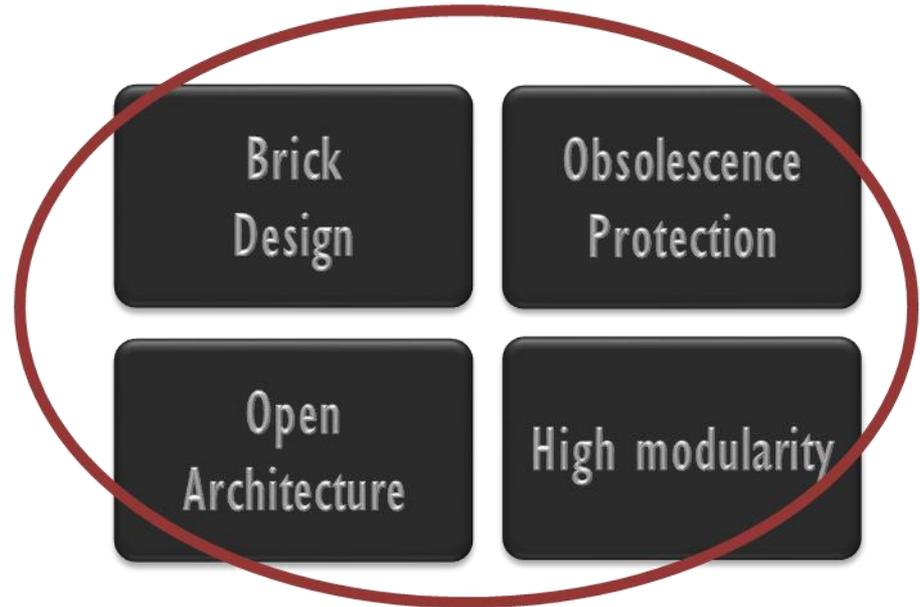
SUPPORTED BY A COMPLETE SET OF DESIGN TOOLS

SUPPORTED BY A SET OF VERIFICATION & TESTING TOOLS

INCLUDES V&V ACTIVITIES



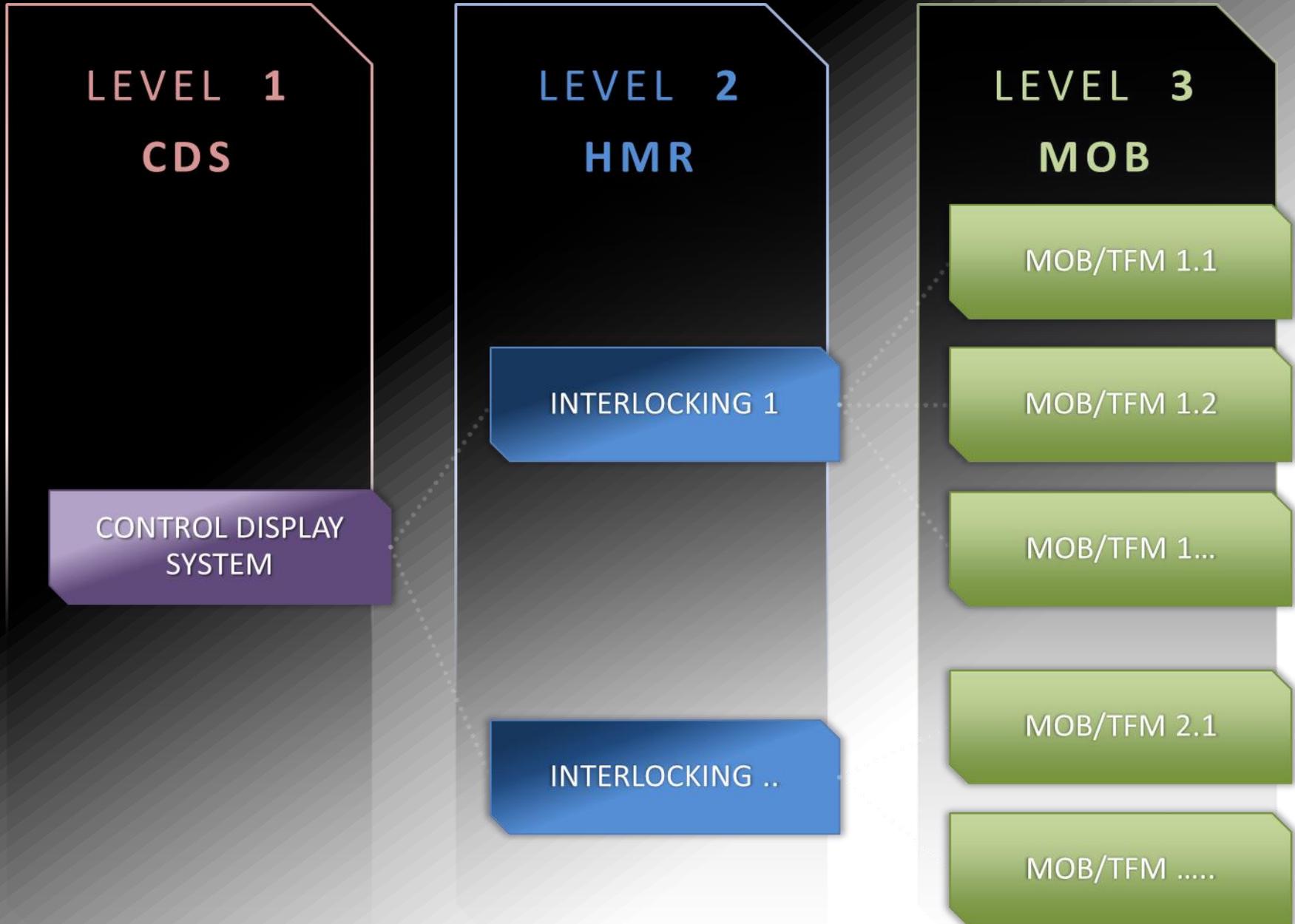
Industry standard platform



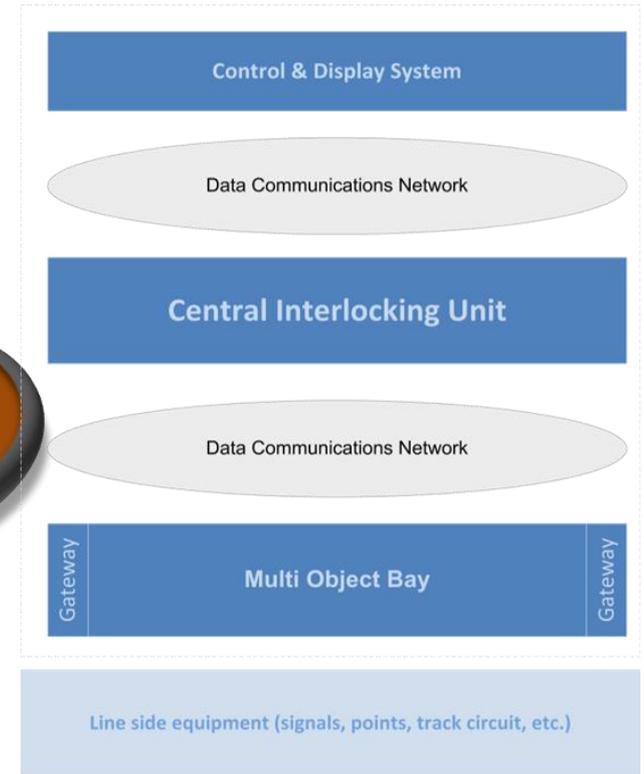
All ECM signalling solutions are based on industry standard platforms having a history of long-term reliability.

HMR9® interlocking system is safe, reliable, versatile and easy to use

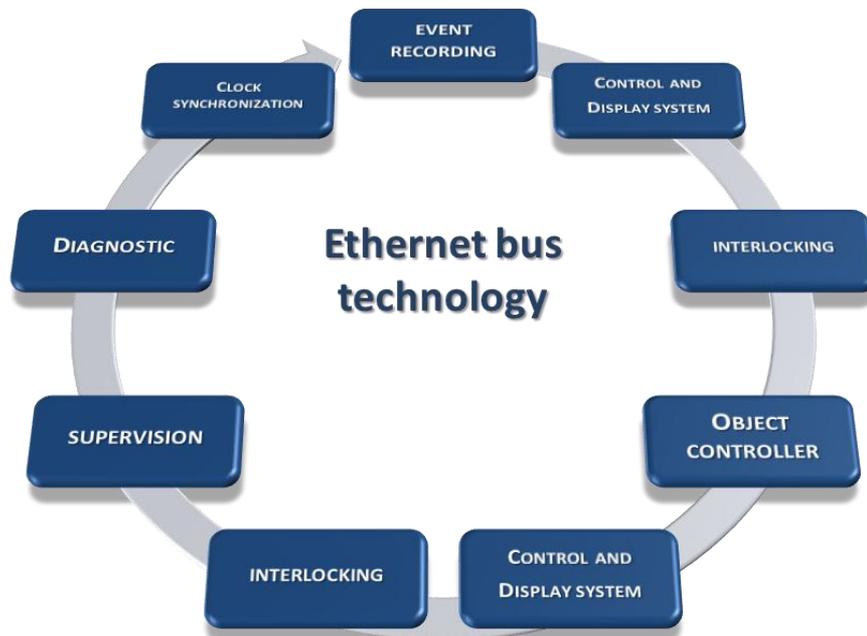
Architecture: 3 levels



modular architecture



open Architecture



Interlocking unit

- "2oo2" Redundant safety architecture
- HW/SW diversity on demand
- Additional stand-by system

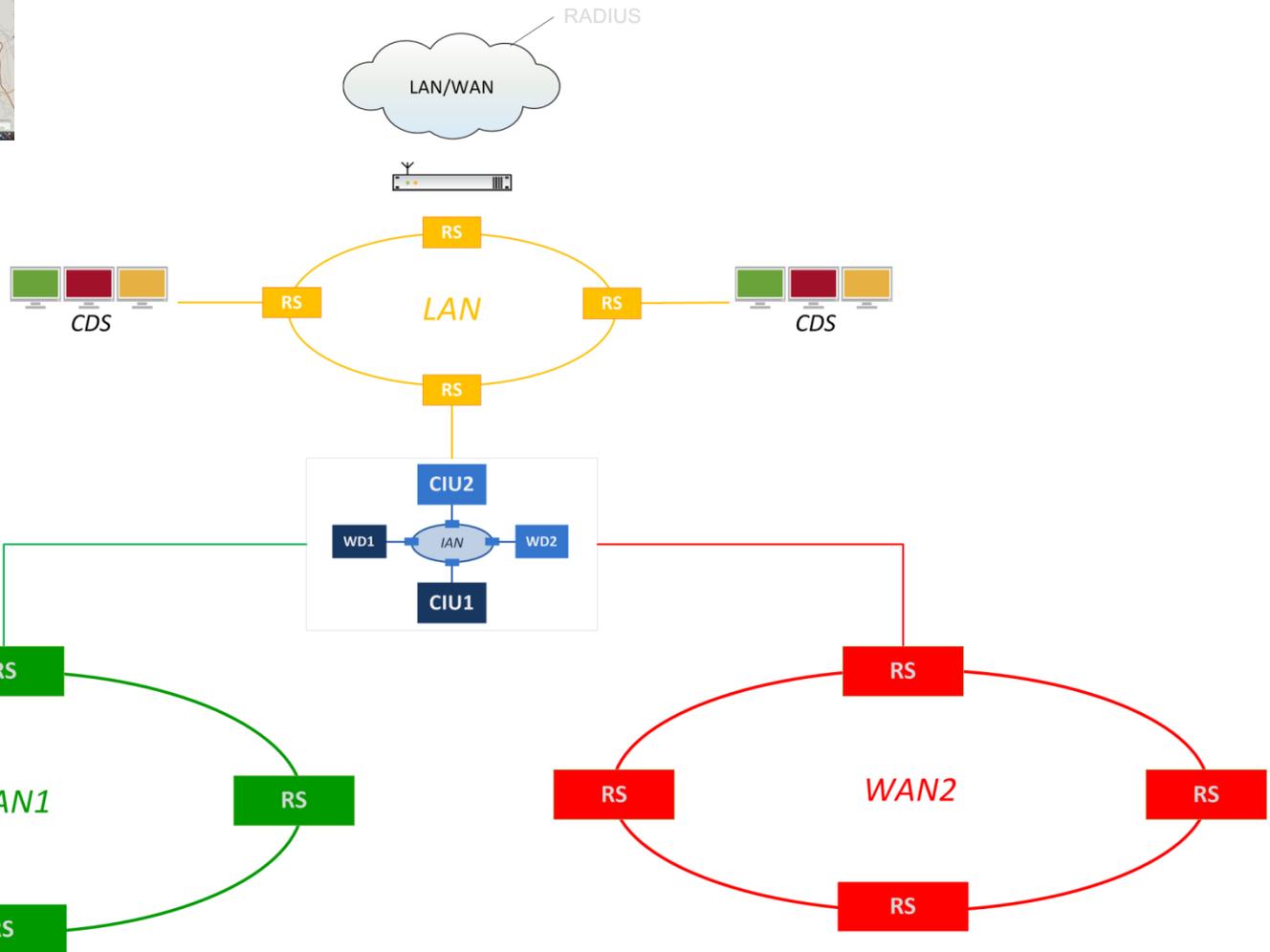
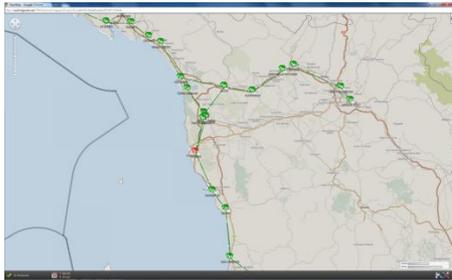
Control and display system

- SIL4 Display unit on demand
- LCD/TFT display unit technology

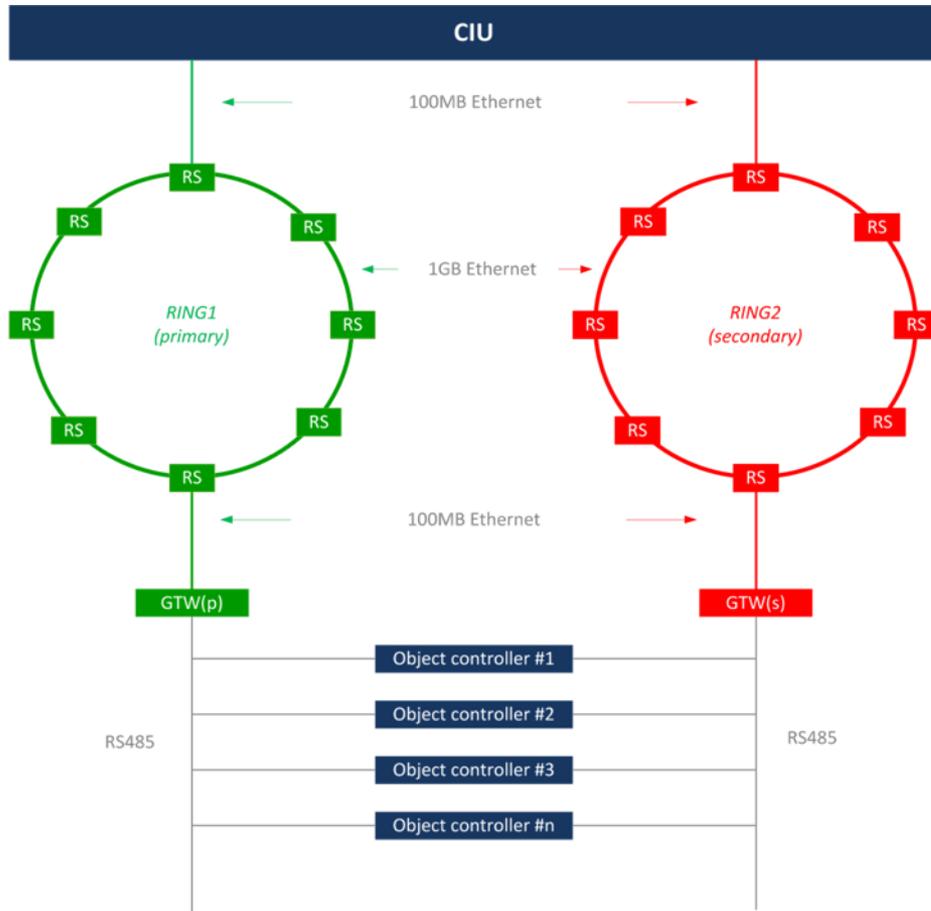
Object Controller

- SIL4 PLC (Customer programmable)
- Signal led and halogen lamps
- Track circuit
- Axle counter
- Eurobalise
- Transponder
- Point machine
- Level crossing

high modular redundant architecture: top view



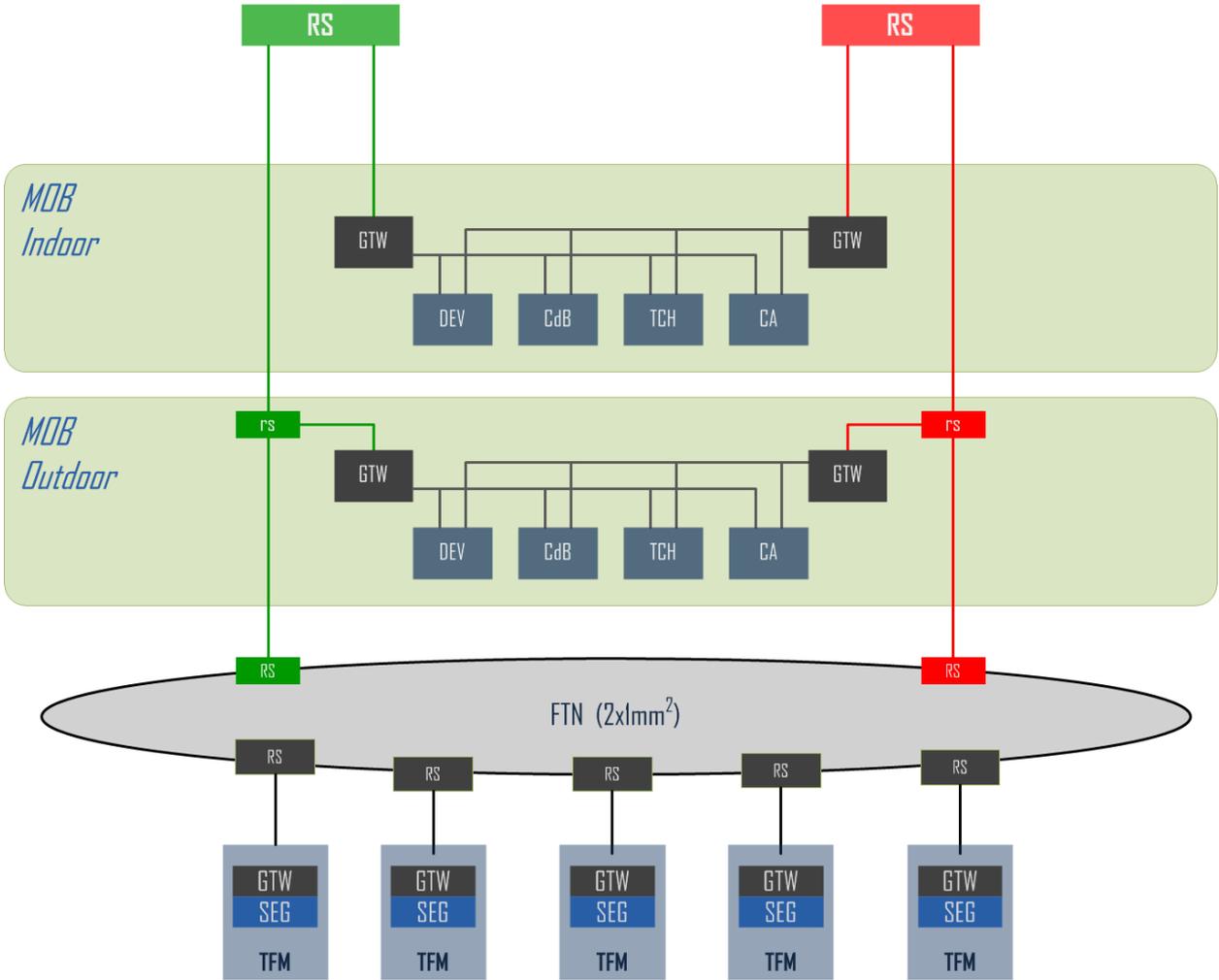
high modular redundant architecture: central view



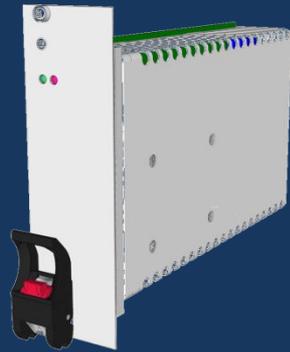
THE PERIPHERAL LOCATIONS ARE CONNECTED TO THE CENTRAL POST USING A DUPLICATED HIGH SPEED VITAL BACKBONE: FIBRE OPTIC, COPPER, OR ALLOCATED IN THE EXISTING SDH NETWORK.

THIS BACKBONE WILL ALLOW THE EXCHANGE OF VITAL TELEGRAMS CONTAINING CONTROLS TO AND FROM THE LINESIDE OBJECTS.

high modular redundant architecture: bottom view



Computer Based Interlocking



Power supply



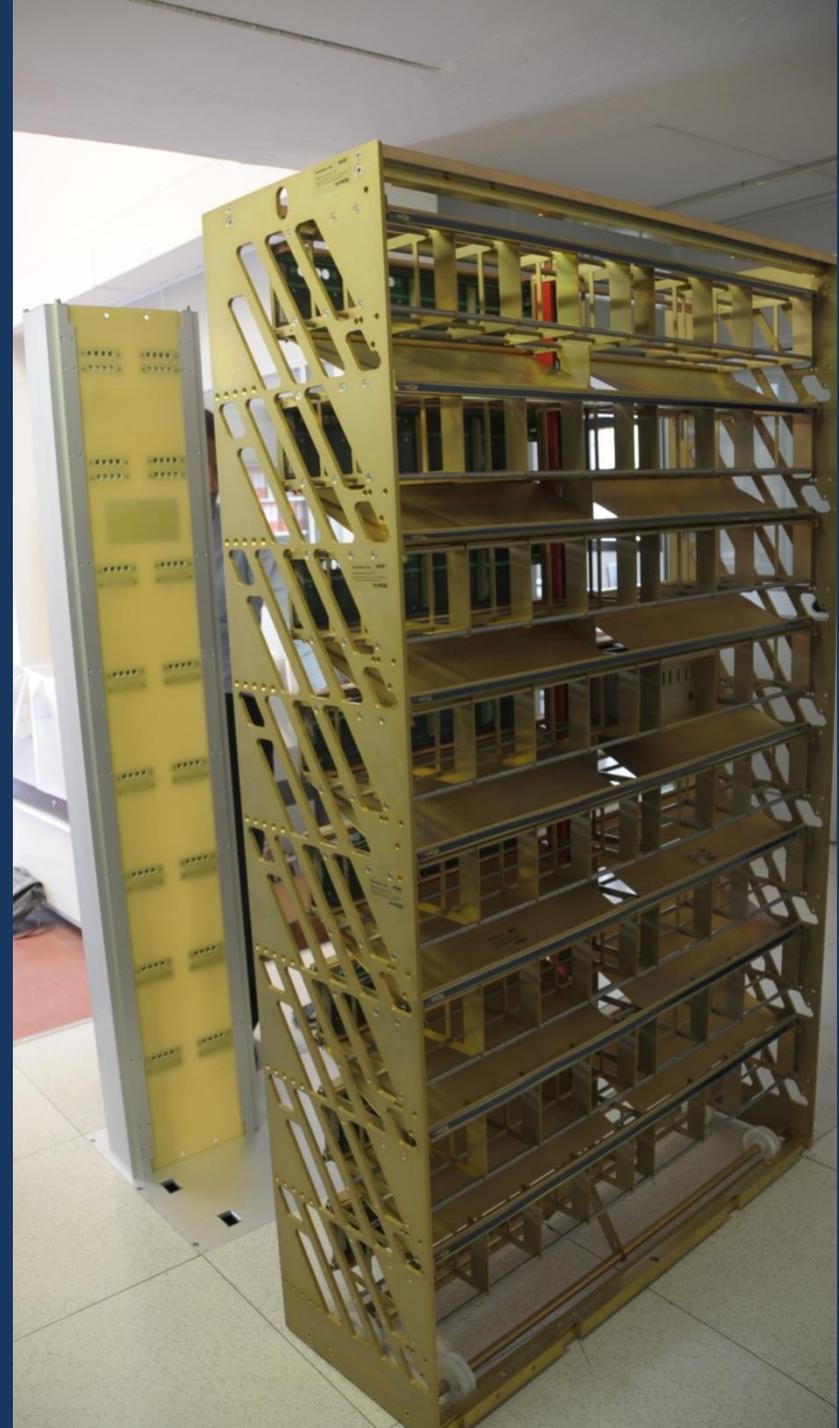
CPU DualCore



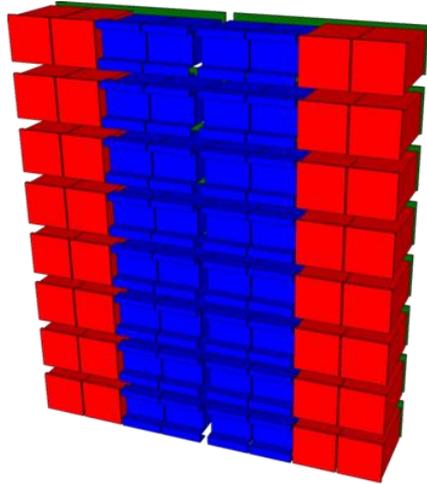
Ethernet Interface



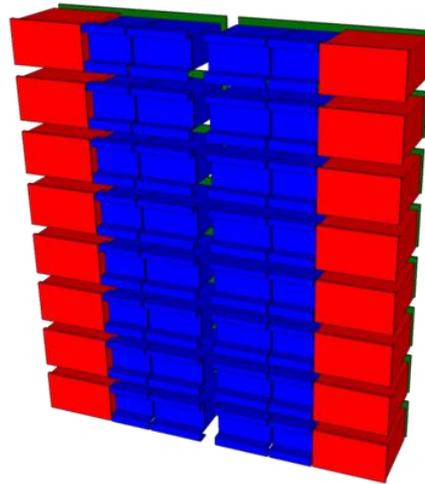
Bespoke mechanical housing



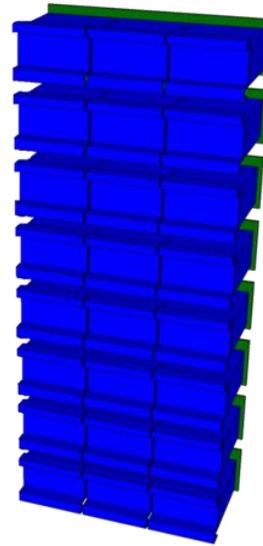
multi object bay capability



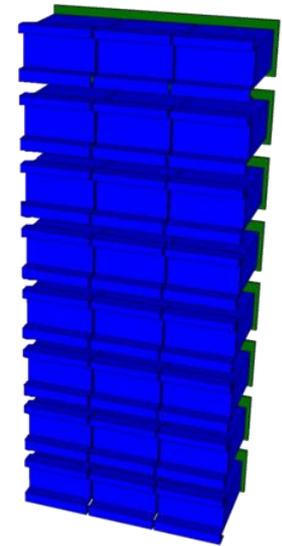
32 Track circuit



16 Point machine

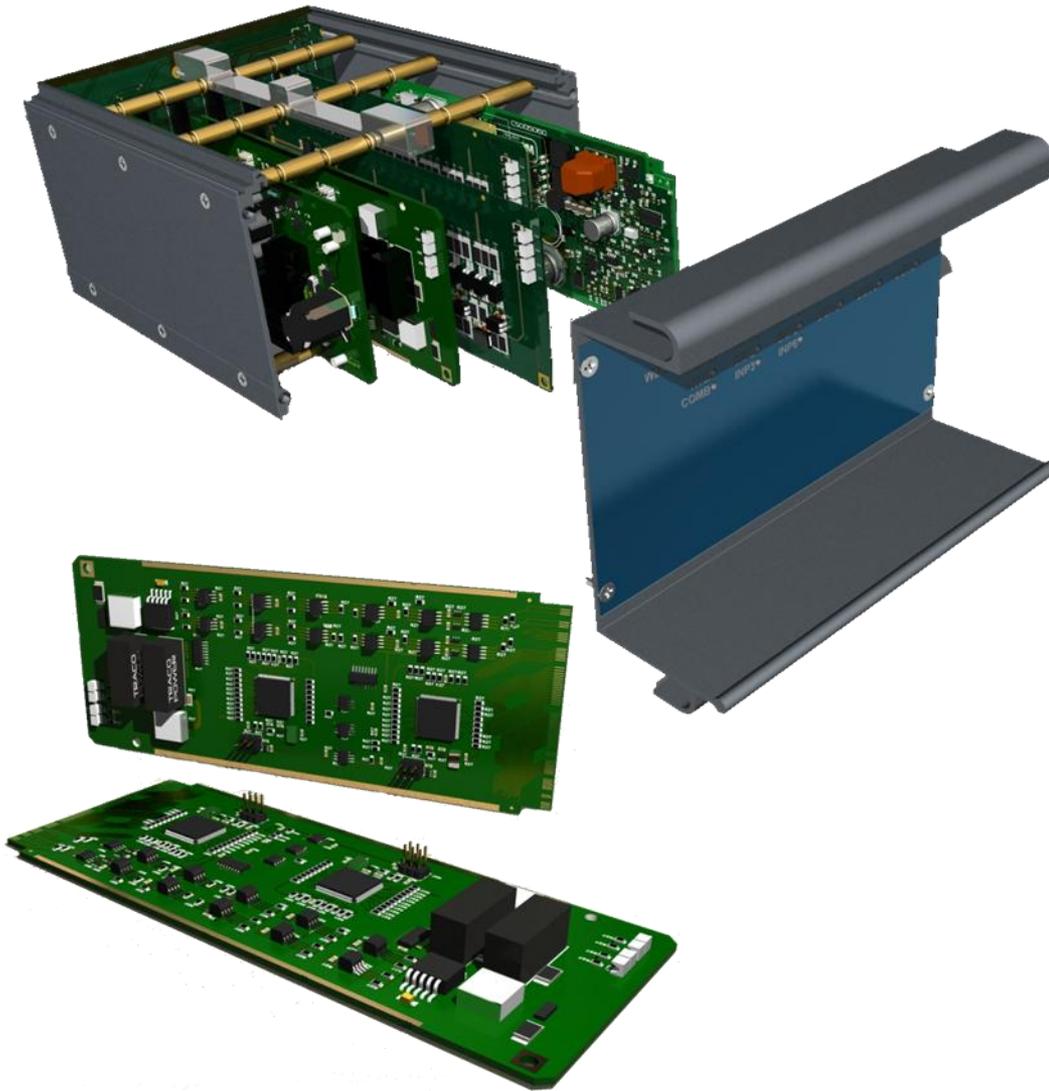


192 Vital input/output



96 eurobalise

object controller pick'n'mix



Reduced dimensions & lightweight

MTBF $300k h_{rs}$ mil-hdbk-217f @25°C

Operating temperature -40÷85°C

"2002" SIL4 safety architecture

Rated voltage 19÷60V_{dc}

Robust construction

Fanless technology

Ethernet interface

High modularity

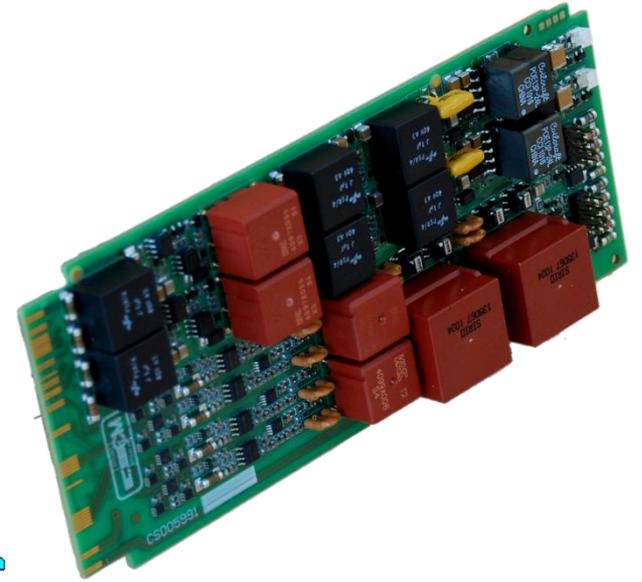
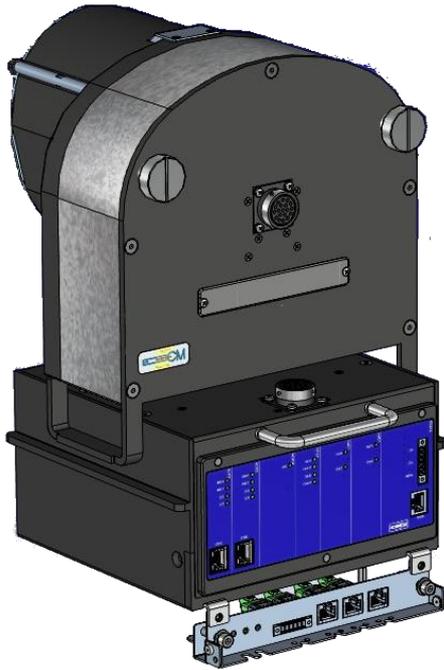
Easy to maintain

RS-485 interface

μTCA card size

Line replaceable unit

trackside functional module TFM®



ethernet gateway



POWER

Voltage	24 ÷ 72Vdc (polarity protected)
Current	120mA@48Vdc
Connection	RJ11

ENVIROMENTAL

Enclosure	IP40/IP67
Temperature (storage)	-40 to +85 °C
Temperature (operating)	-40 to +85 °C
Altitude	2000m
EMC	EN 61000-6 industrial immunity EN 50081-2 industrial emission
CE Mark	Industrial European Conformity
Railroad	Approval for track side use (RFI IS402)
Vibration	IEC 255-21-1 Class 1 IEC 255-21-2 Class 1

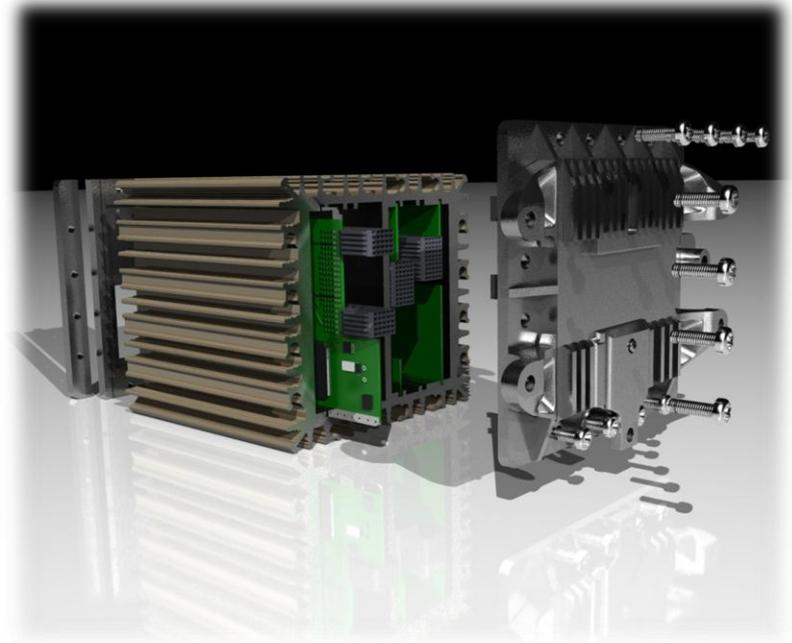
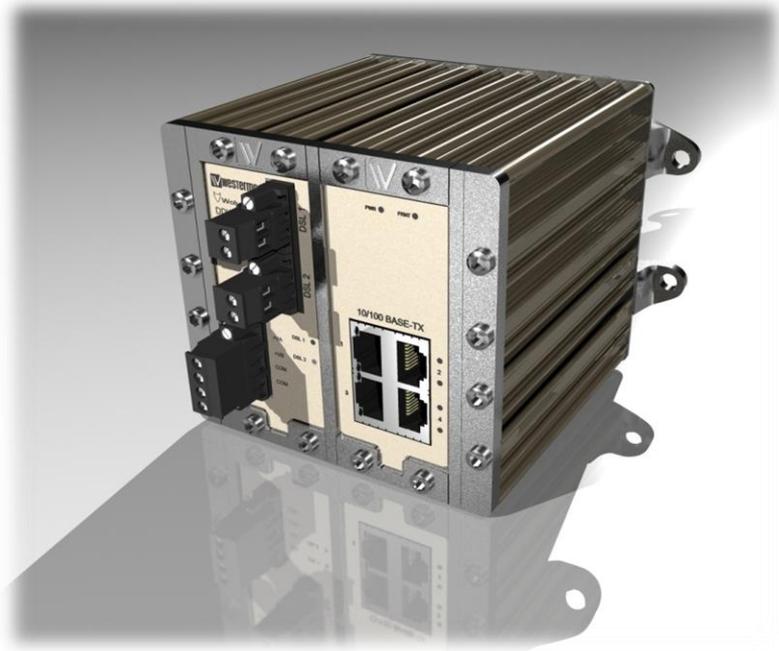
PHYSICAL DIMENSIONS

Dimensions (W x H x D)	120 x 101 x 22 mm
Weight	0,2Kg

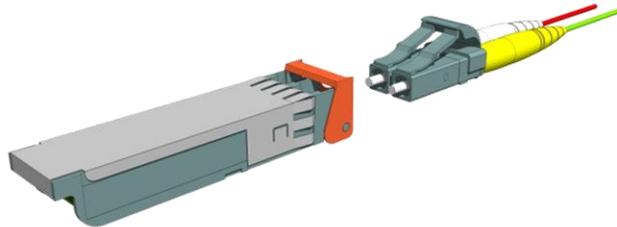
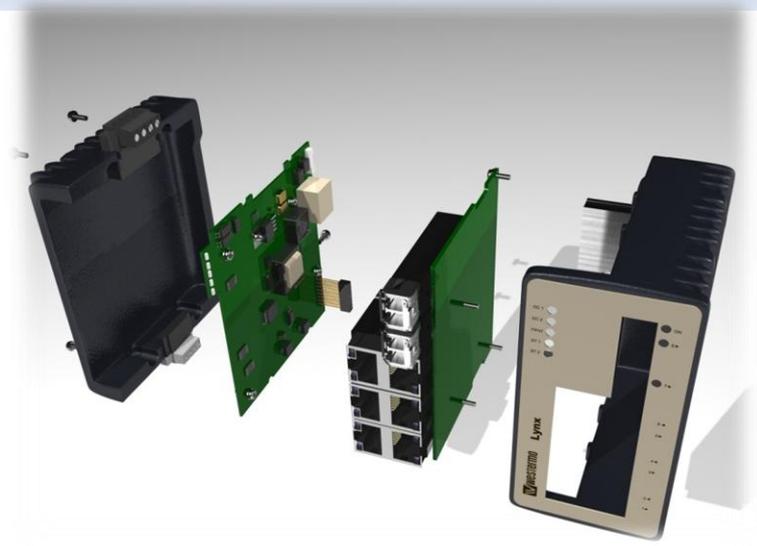
TECHNICAL CHARACTERISTICS

Microcontroller	AT MEGA
Memory	2560Flash SPI 2/4 Mb
Ethernet protocol	SNMP, FTP, HTTP
Ethernet port	1 x 100Mb/s (RJ45)
Serial port	2 x RS485 500Kb/s (RJ45)
LED Indications	Ethernet/RS485 activity
Modem radio	Zigbee
Real Time Clock	Battery supplied
MTBF	400.000 h

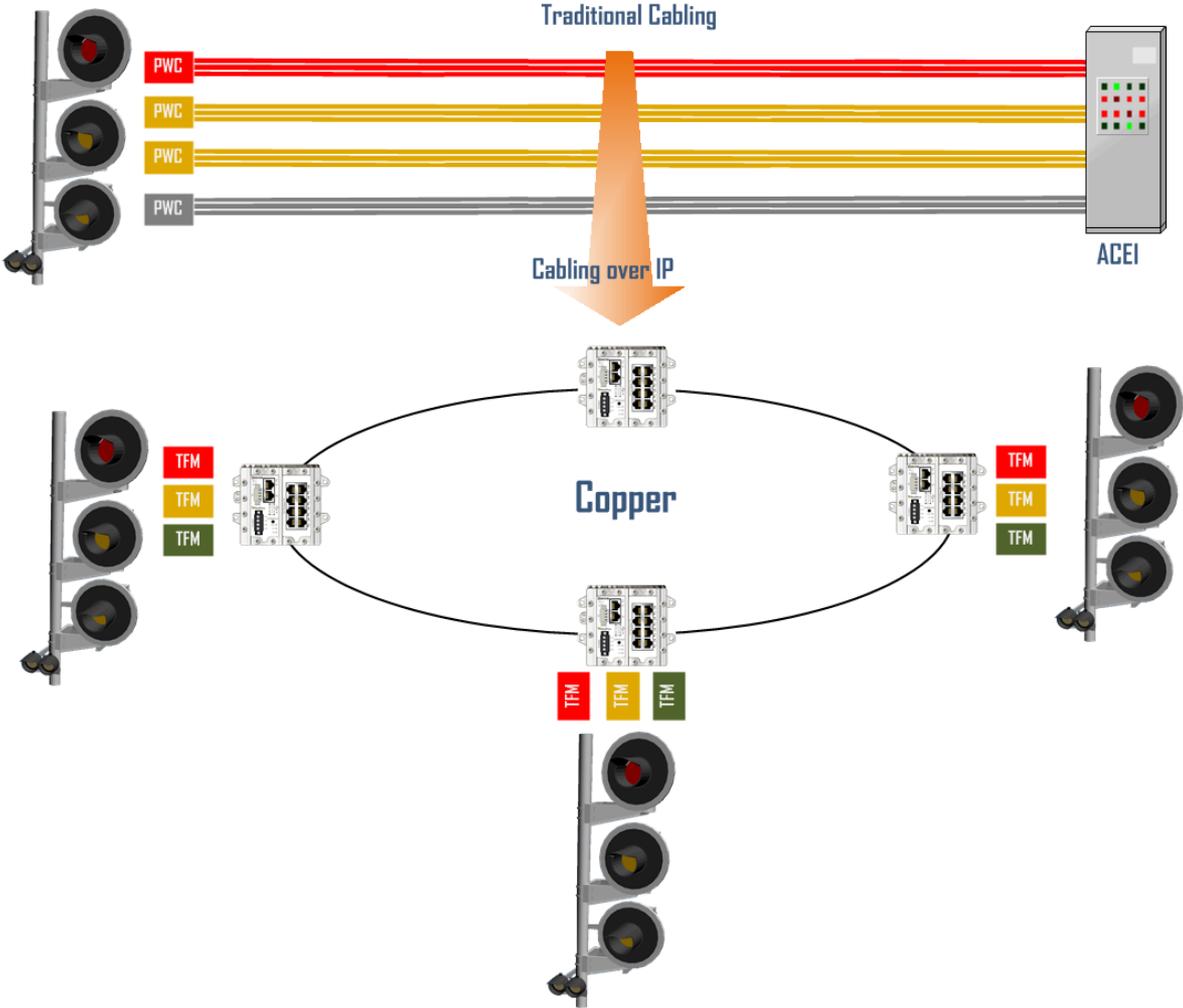
standard field ethernet switch using copper cables



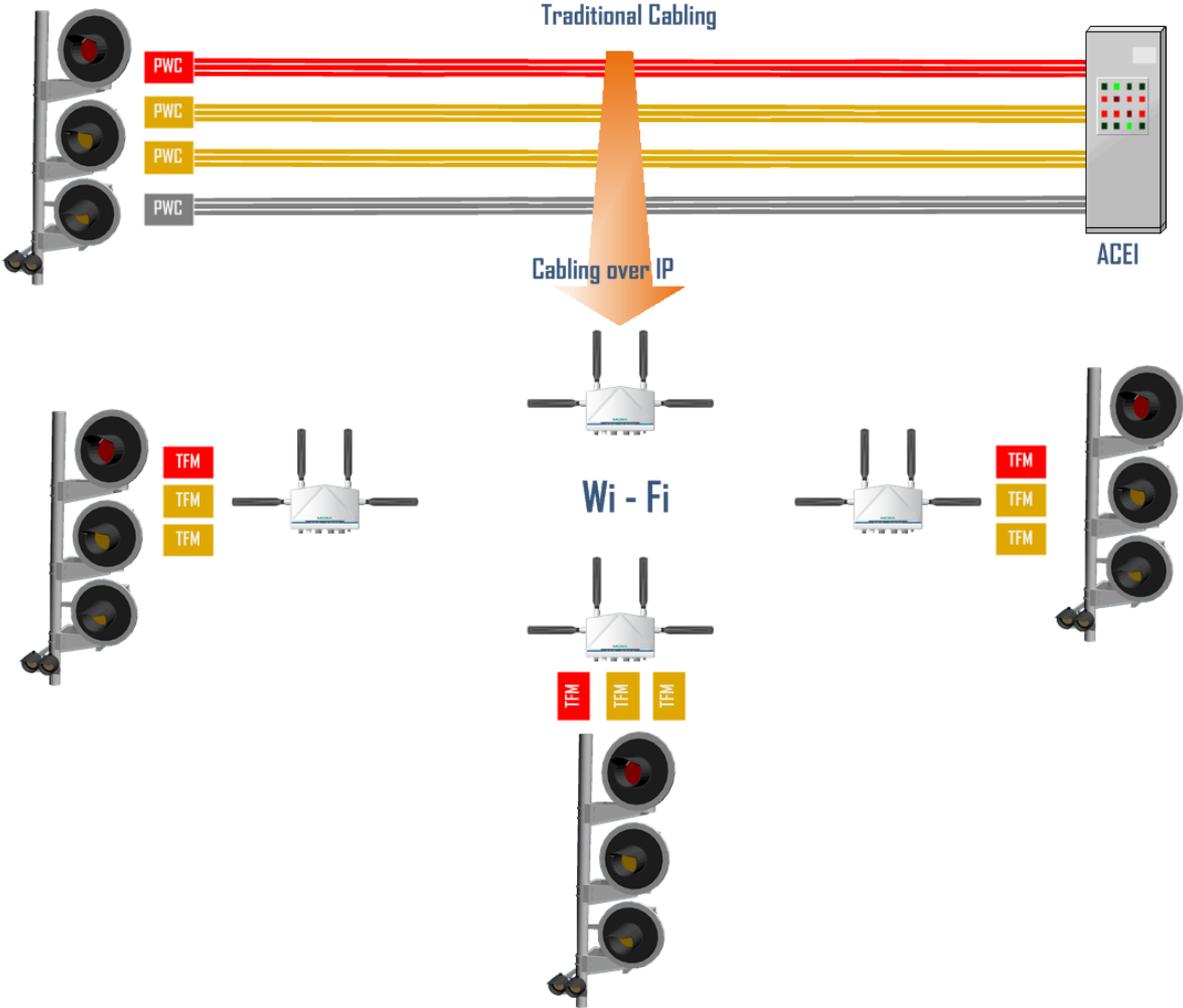
standard ethernet switch



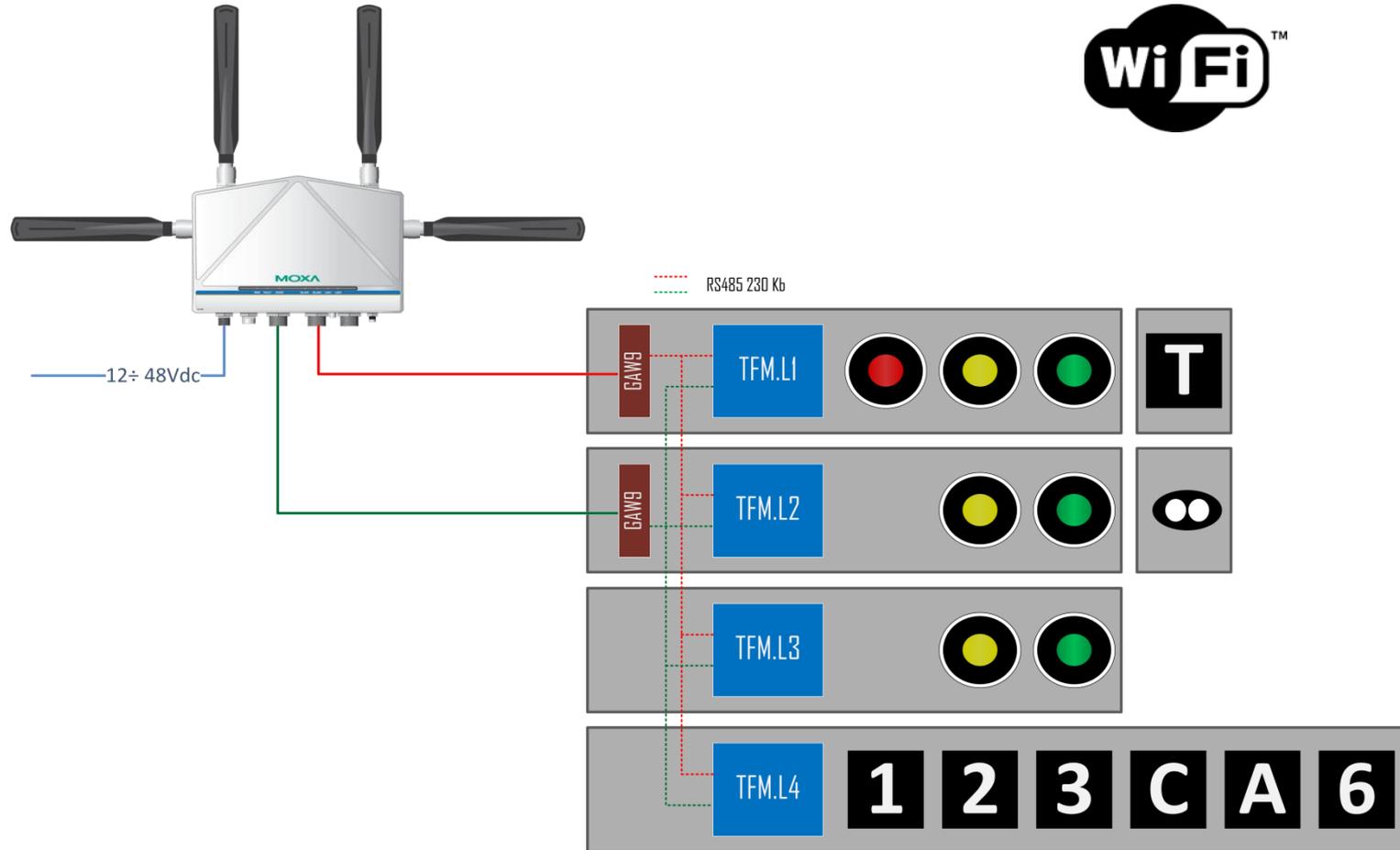
cabling over IP



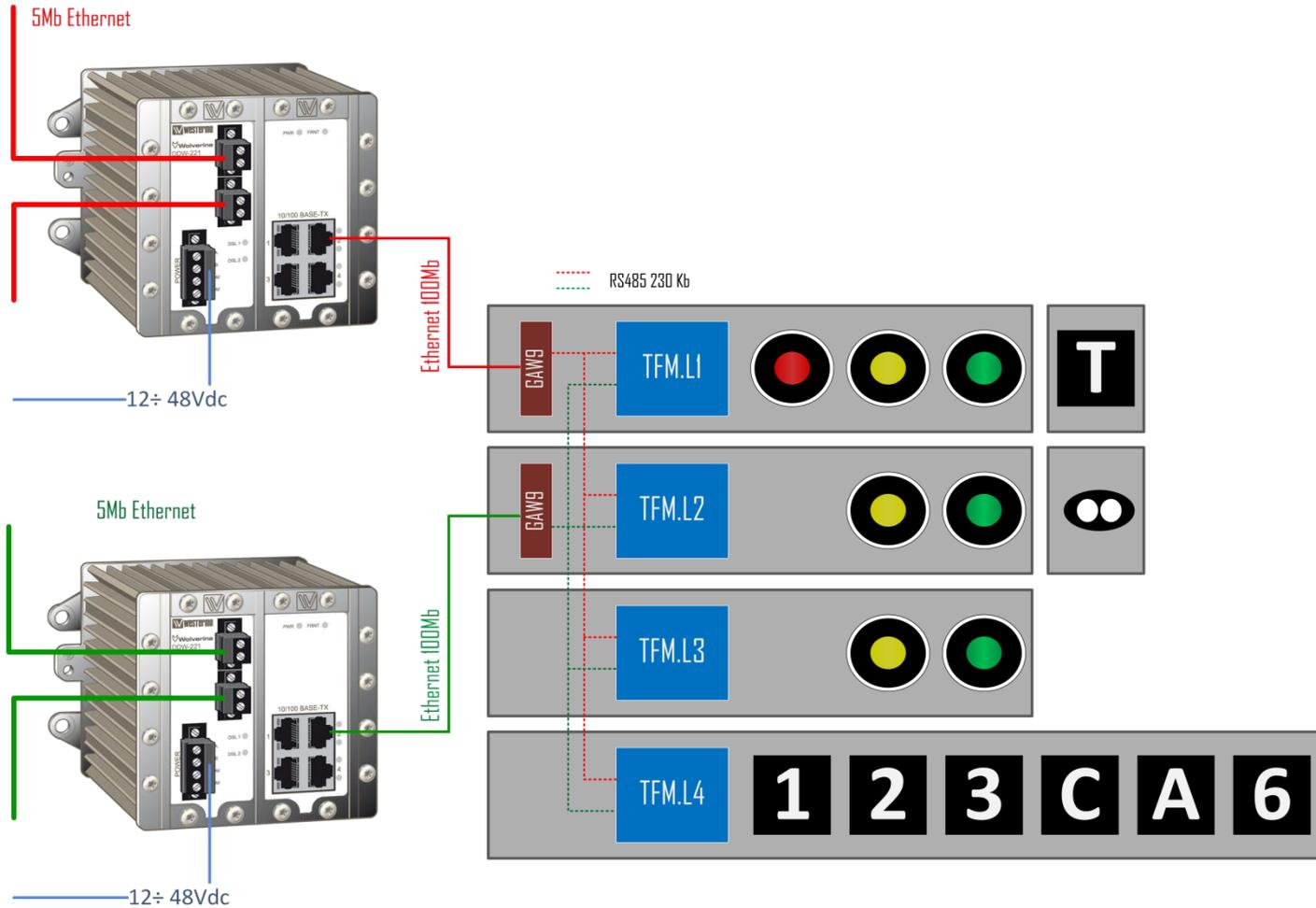
cabling over IP



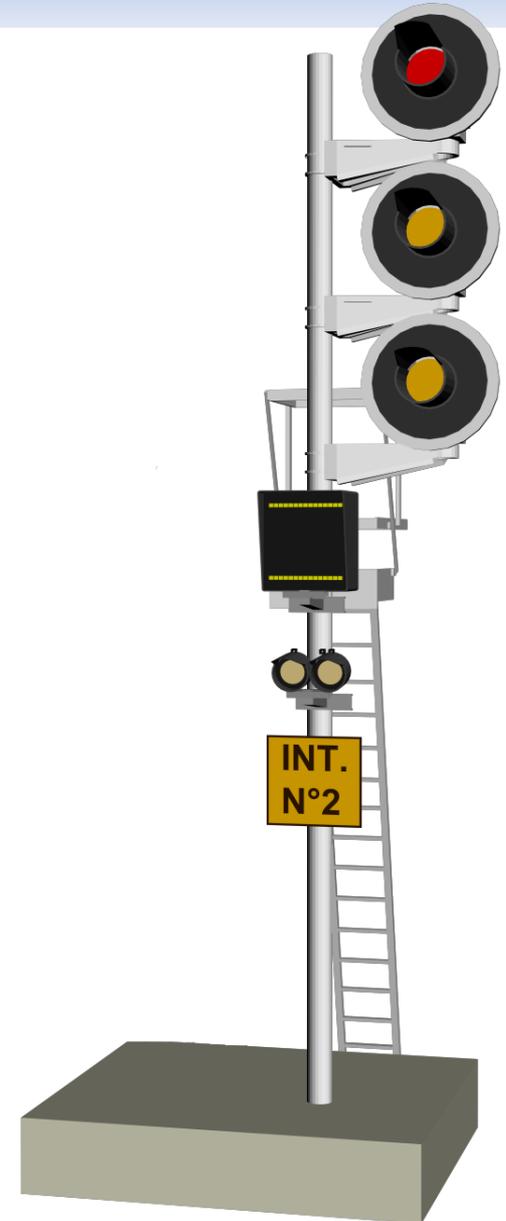
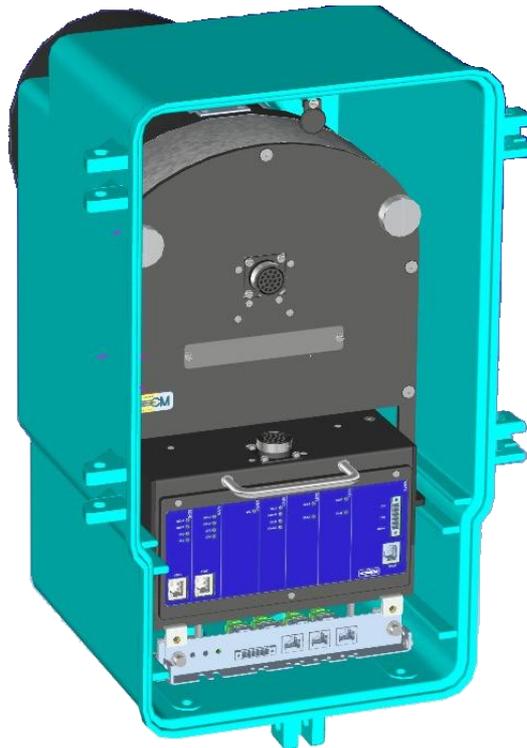
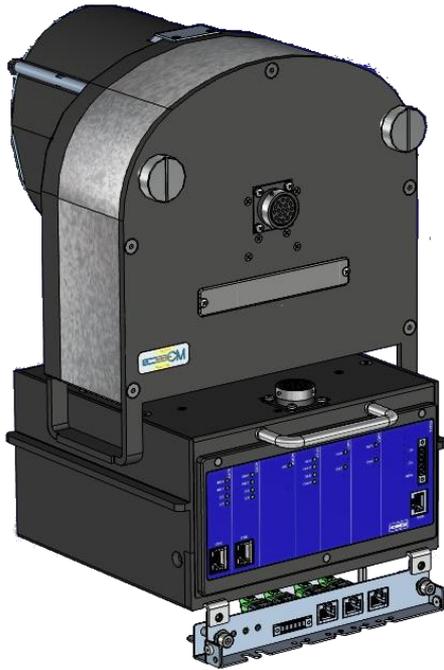
telecommunications go wireless

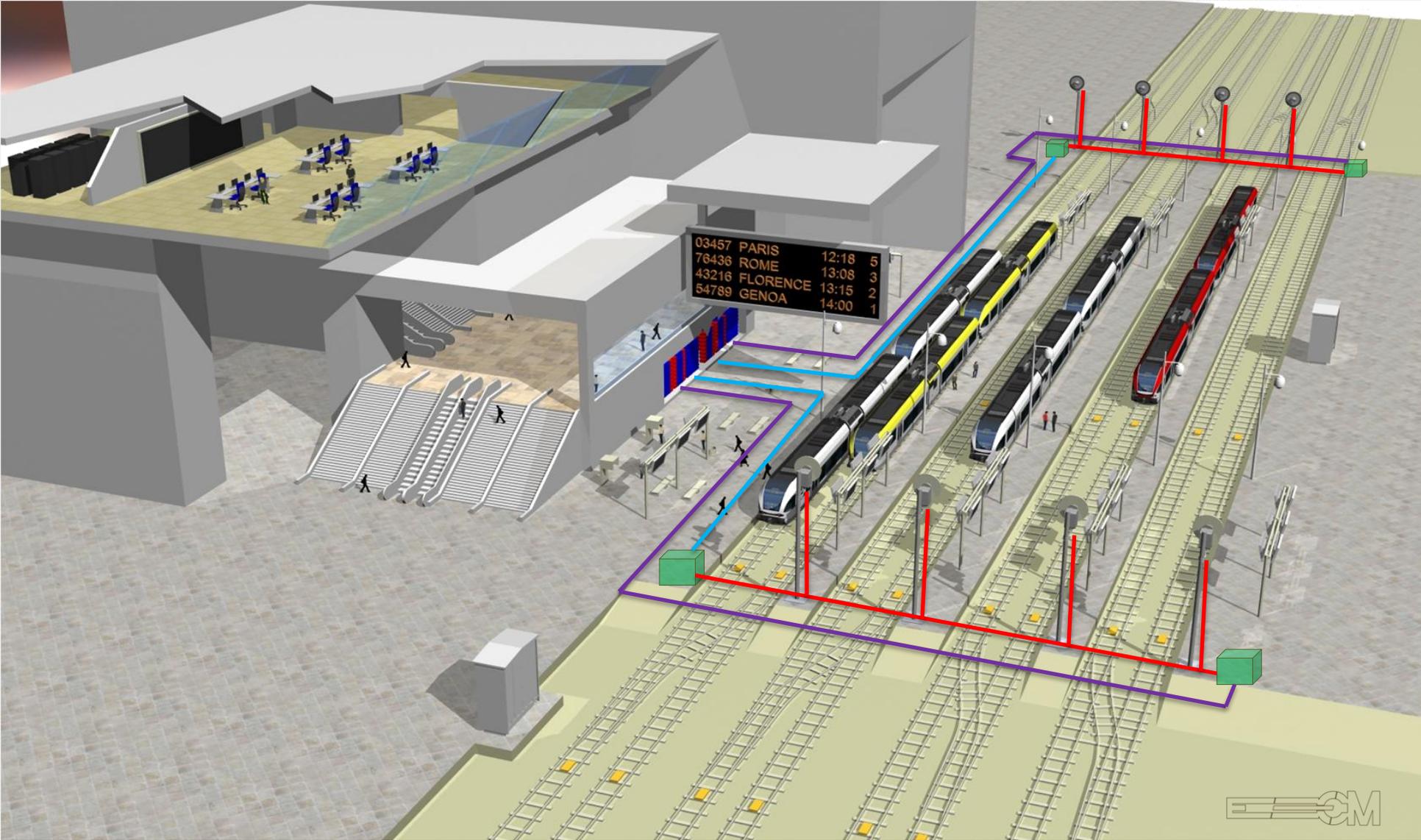


telecommunications go copper Ethernet



trackside functional module TFM®





- AC/DC Converter and Ethernet switch
- Main power supply and Ethernet link
- Reserve power supply and Ethernet link
- DC Supply voltage / Ethernet link



control and display system



web technology
web technology



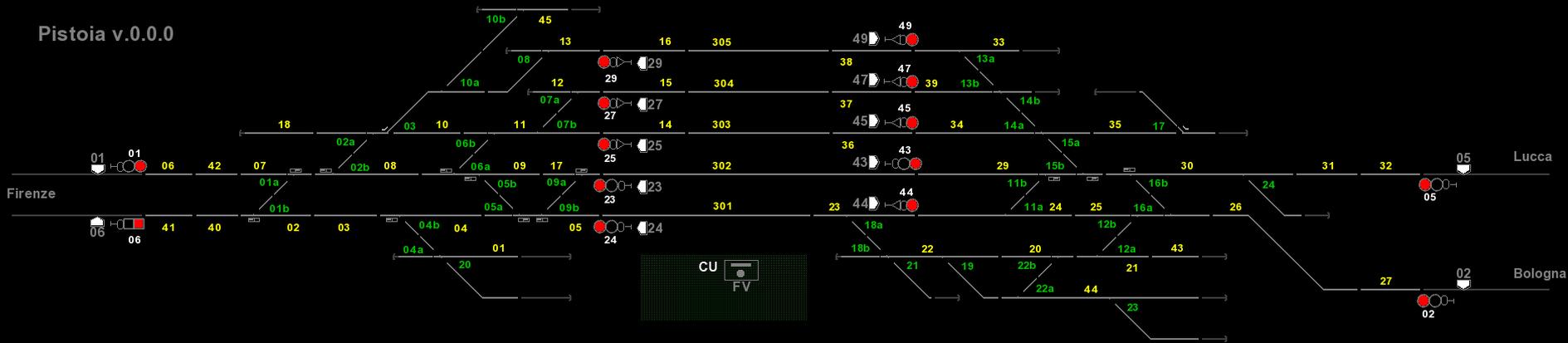
OpenGL



Clutter-free desk
Clutter-free desk

control and display system

Pistoia v.0.0.0



Stazione




Stazione

PISTOIA

CU 

Tutti Leggeri

Abilita

Disabilita

Ripristino deviatori

Invio comando...

Notifiche

Notifiche Preserratura

Notifiche da CIU

Stazione

Stazione	ADM	PDM	NTF
Pistoia	■	■	■
Montecatini	■	■	■
Serravalle	■	■	■

Comandi CIU

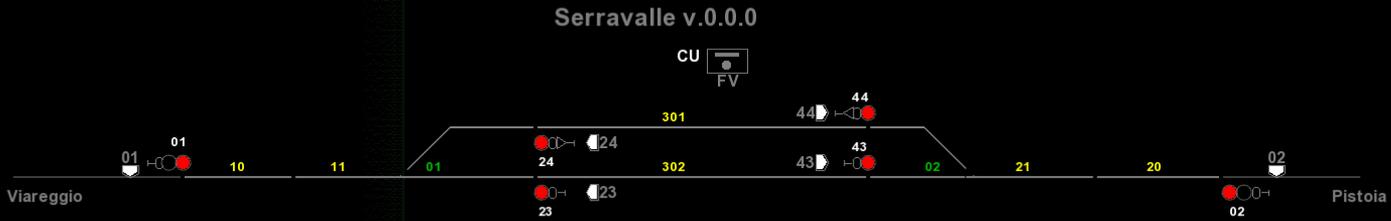
Stazione	Data e Ora	Esito	Notifiche	Classe	Istanza	Comando
Pistoia	2011/04/05 14:53:13	✓	<input type="checkbox"/>	CSt	PISTOIA	RipristinoDeviatoi
Pistoia	2011/04/05 14:53:07	✓	<input type="checkbox"/>	CSt	PISTOIA	sysAbilitaLeggeri
Pistoia	2011/03/14 14:59:12	✓	<input type="checkbox"/>	Citi	01-43	Formazione
Montecatini	2011/03/14 12:14:54	✓	<input type="checkbox"/>	CSt	MONTECATINI	RipristinoDeviatoi
Serravalle	2011/03/14 12:14:38	✓	<input type="checkbox"/>	CSt	SERRAVALLE	RipristinoDeviatoi
Serravalle	2011/03/14 12:14:23	✓	<input type="checkbox"/>	CSt	SERRAVALLE	sysAbilitaLeggeri
Pistoia	2011/03/14 11:21:52	✓	<input type="checkbox"/>	CSt	PISTOIA	RipristinoDeviatoi
Pistoia	2011/03/14 11:21:48	✓	<input type="checkbox"/>	CSt	PISTOIA	sysAbilitaLeggeri

Notifiche Comando

Altri Banchi

Telecomando

control and display system



Stazione

IT

IST

DV

Itinerario

PO	PF	Alt.
01	43	
02	44	
23		
24		
43		
44		

01



01



44



Attivazione

Distruzione

Notifiche TdC

Notifiche Preserratura

Notifiche da CIU

Stazione	ADM	PDM	NTF	Allarmi	Promemoria	Comandi CIU
Pistoia						
Montecatini						
Serravalle						
tazione	Data e Ora	Esito	Notifiche	Classe	Istanza	Comando
Serravalle	2011/03/23 18:06:03	✔		CSt	SERRAVALLE	RipristinoDeviatoi
Serravalle	2011/03/23 18:05:59	✔		CSt	SERRAVALLE	sysAbilitaLeggeri
Pistoia	2011/03/23 18:05:47	✔		CSt	PISTOIA	RipristinoDeviatoi
Pistoia	2011/03/23 18:05:43	✔		CSt	PISTOIA	sysAbilitaLeggeri
Pistoia	2011/03/18 14:59:18	✘	1	Citi	06-44	Formazione
Pistoia	2011/03/18 14:58:50	✔		Citi	01-44	Formazione
Serravalle	2011/03/18 14:57:43	✔		CSt	SERRAVALLE	RipristinoDeviatoi
Montecatini	2011/03/18 14:57:35	✔		CSt	MONTECATINI	RipristinoDeviatoi
Pistoia	2011/03/18 14:57:23	✔		CSt	PISTOIA	RipristinoDeviatoi
Pistoia	2011/03/18 14:57:20	✔		CSt	PISTOIA	sysAbilitaLeggeri
Pistoia	2011/03/11 12:19:44	✘	1	CDv	06	ManovraDv n nessuno

Altri Banchi

Telecomando

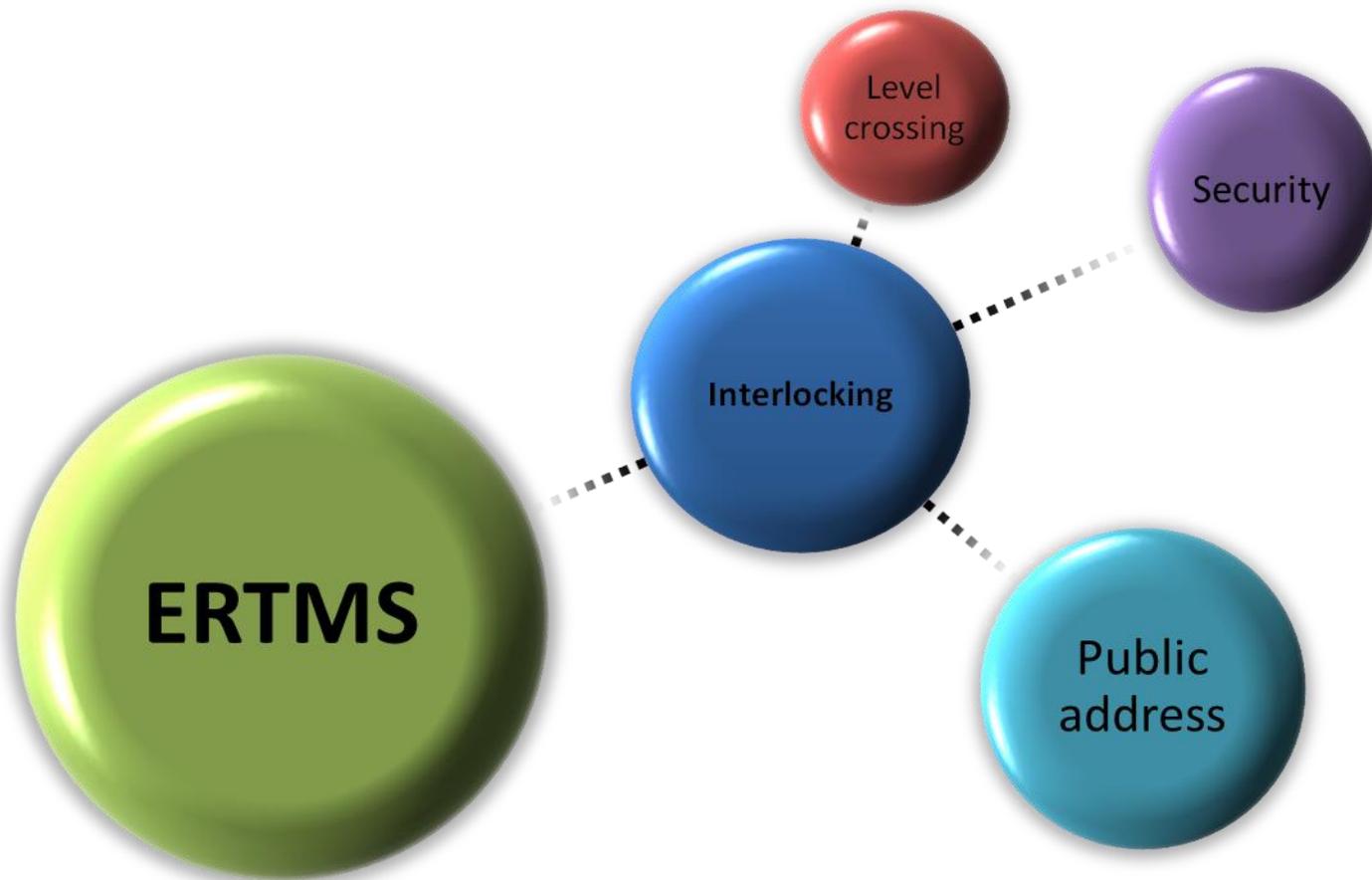
multi-station key features

THE MULTI-STATION IS A COMPUTER BASED INTERLOCKING SYSTEM CAPABLE OF CONTROLLING A RAILWAY SIGNALING SYSTEM FOR LARGE AND COMPLEX AREAS AND LONG AND THIN LINES.

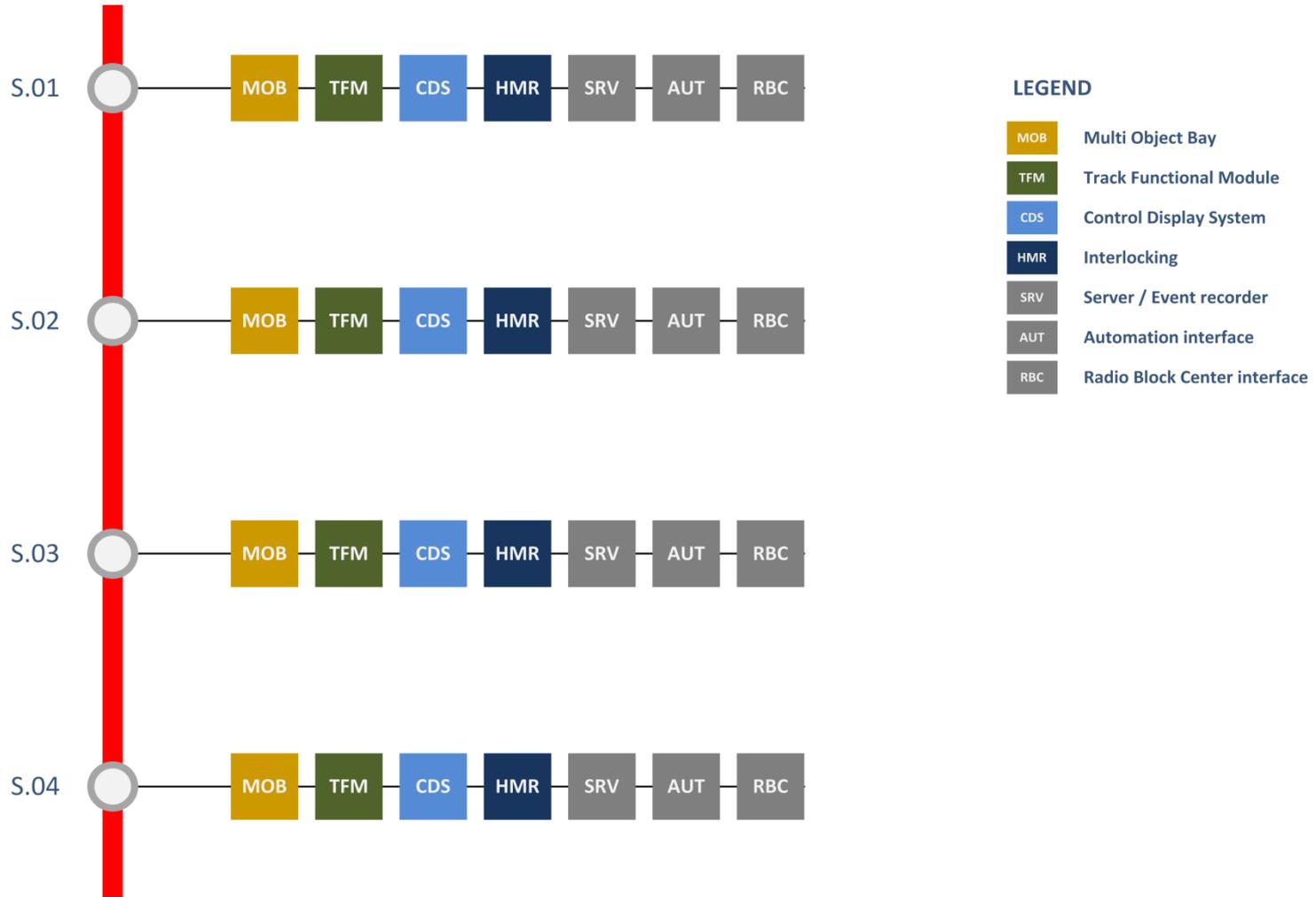
IT CAN BE COMMISSIONED AS A "ONE-OFF", OR CAN BE COMMISSIONED IN STAGES WITHOUT HAVING TO REPEAT PREVIOUS VERIFICATION AND TESTING ACTIVITIES.

THE SYSTEM IS COMPLETE WITH CONTROL AND DISPLAY SYSTEM FOR SIGNALER AND MAINTAINER,
INTERFACE WITH PERIPHERAL TRACKSIDE EQUIPMENT AND EXTERNAL SYSTEMS

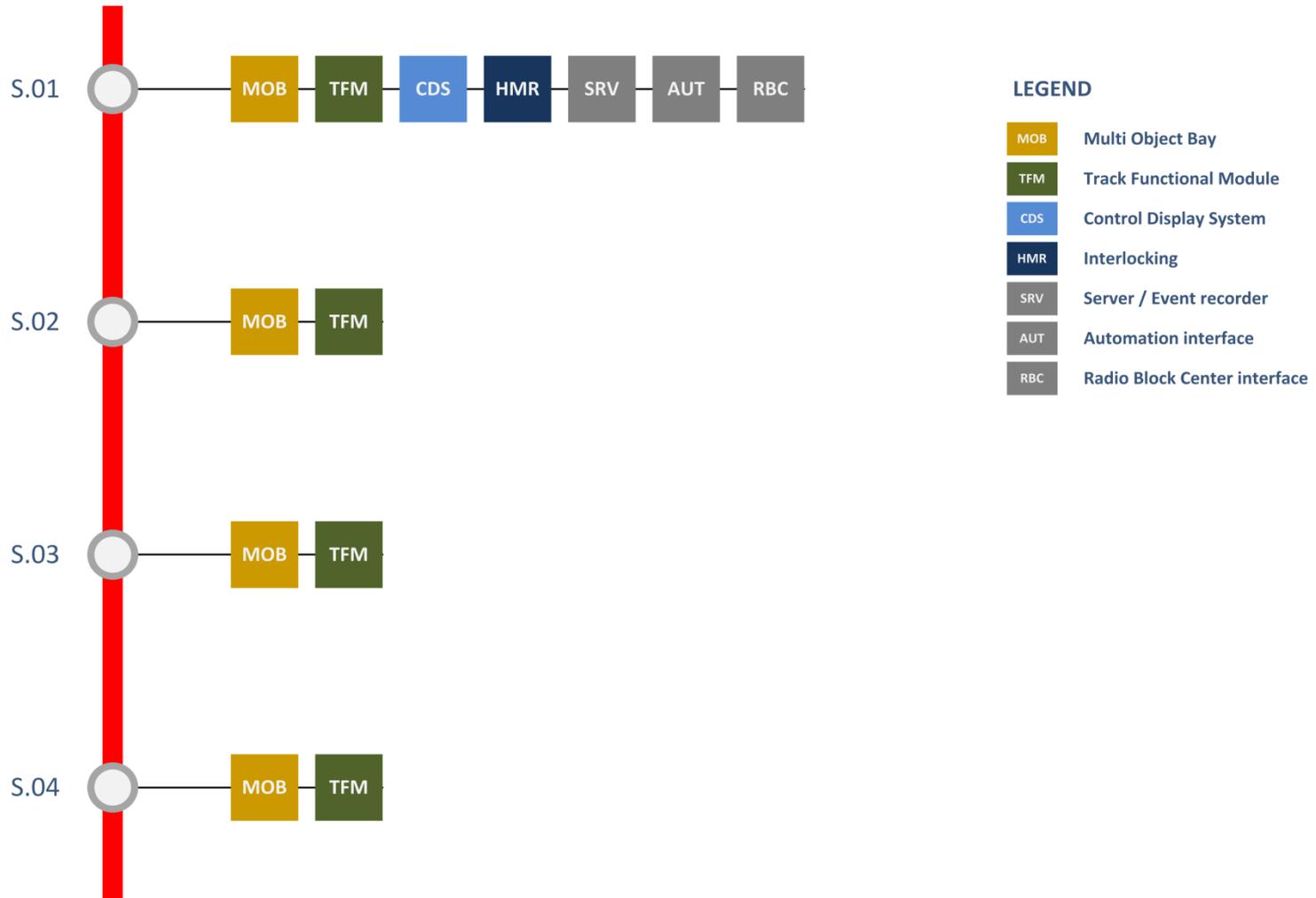
typical embedded system



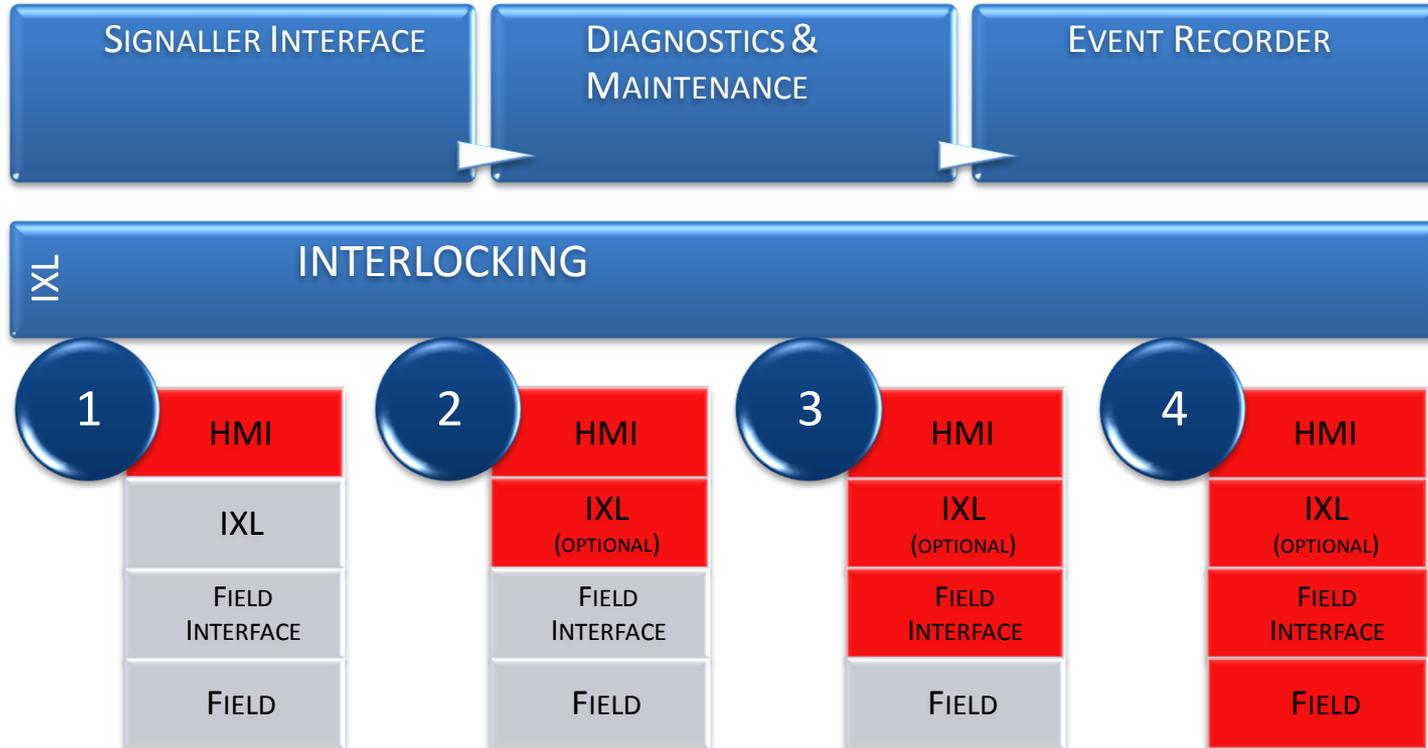
Single Station



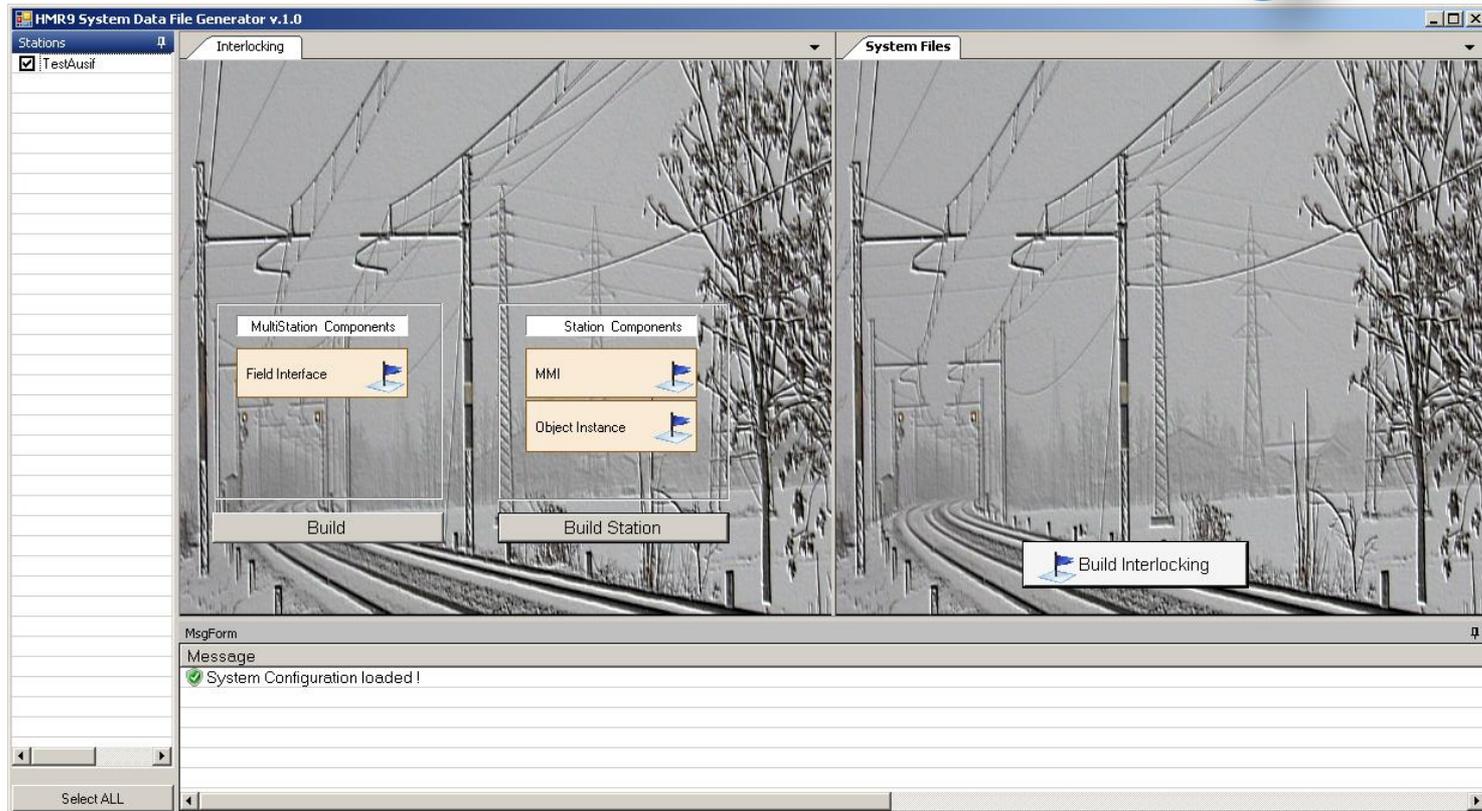
Multi Station



multi-station scalable approach



design tools



scheme plan editor

objrails

AutoCAD 2010 testausif3.dwg

Digitare parola chiave o frase

File Disegna Visualizza Finestra DataBase

Tavolozze degli st...

Picchetti Limite

Deviatori

- Destro Superiore
- Destro Inferiore
- Sinistro Superiore
- Sinistro Inferiore

Gunti

Casse

Fermadevi...

- Traversa Limite
- Traversa Limite

Binari

Disegna

Edita

Circuit Bin

25

23

302

ip23

24

RSE

DESCRIZIONE	VALORE	DETTAGLIO
Nome Ripetizione	ip23	
Presenza Segnale di Avvio	NO	
Presenza Segnale Avanzamento	NO	
Presenza Segnale Lambda	NO	
Presenza Indicatore di Partenza	SI	Modifica
Cdb di appartenenza	302	
Kilometrica Linea	0	
Kilometrica Linea	0	
Kilometrica Linea	0	

IP

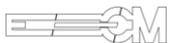
DESCRIZIONE	VALORE
Nome del Segnale (SE o SE+ r se rpet...	ip23
Nome del segnale Alto	23
Posizione	R
Nome Schema Elettrico	IP01

Modello Layout1 Layout2

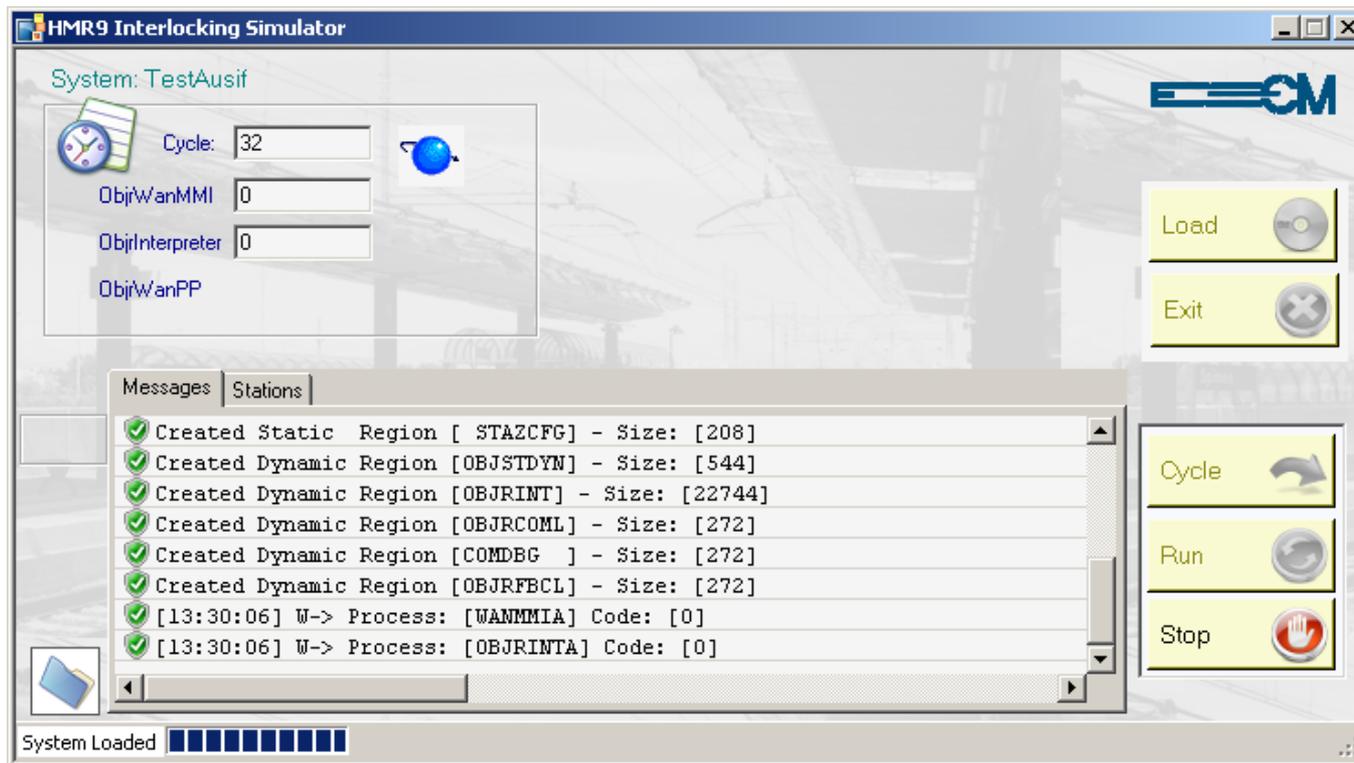
OBJRAILFS - Select entity:
Comando: MASKMOD
OBJRAILFS - Select entity:
Comando: MASKMOD
OBJRAILFS - Select entity: mas*Annulla*
Comando: maskmod
OBJRAILFS - Select entity:

979.0000, 314.0000, 0.0000

1:1 EditorePS



interlocking simulator



objrail debugger

objrails

The screenshot displays the objrails debugger interface with several windows:

- TestAusif CDv.01**: Shows the source code for the `ManovraDv` class. The code includes local variables, constants, and a `Begin` block.
- TestAusif Ccb.110**: Shows the source code for the `ItiSet` method, which checks for resource availability and sets the status.
- TestAusif classes**: A tree view of the loaded classes, including `Objr Classes Tree`, `Objr Classes`, and `Objr Instances`.
- Context Class**: A table showing the current context class and its variables.
- Variable**: A table showing the current variable being inspected.
- Parameters**: A window showing the parameters of the current method call.

Variable	Type	Value
posiz	tDv_m	
socc	tDv_socc	
degr2l	CD2	
dcoref	CDco	

Context Class	Type	Value
OnStartUp	System	
OnStartCyc	System	
OnEndCyc	System	
SetState()	Native	
ItiSet()	System	
isFattibile	Event	
ItiCancel()	System	
is_Bloccab	Private	
cb_liberi()	Private	
is_E()	Private	
testIncom	Private	
status	cstatus	idle
po_releas	bool	false
IPO	CPU	Filled
IPF	CPU	Filled
ICbP	CCb	Filled
ICbL	CCb	Emp
ICbU	CCb	Emp
IdvPnor	CDv	Filled
IdvProv	CDv	Emp

```
bool CDv::ManovraDv(tDv_m posiz,tDv_socc socc)
LocalVars
CD2 degr2l;
CDco dcoref;
csystem sys;
CIterator <CCb> itcb;
Begin
```

```
bool Citi::ItiSet()
LocalVars
csystem sys;
Begin
if ( not isFattibile() ) then
return(false);
endif
if ((ICbP.forall(lis.RequestLocking(this)) and ICbOccup.fo
if (IdvPnor.forall(lis.Comando(tDv_m::n)) and IdvProv.fo
status.set(registrazione);
else
return(false);
endif
else
return(false);
endif
return(true);
End Citi 01-43 ItiSet
```

station simulator

objrails

Simulatore di Stazione 2010

File Opzioni Stazioni Finestra

Toolbar della stazione

TestAusif

Deviatori Circuiti di binario

Segnali alti Segnali avvio

Segnali avanzamento Indicatori luminosi

AVW02 - TestAusif - Segnali alti

Elenco delle istanze

Nome	Sta...	A...
SE 06	Off	
SE AWW02	Off	
SE AWW01	Off	
SE 43	Off	
SE 46	Off	
SE AWW05	Off	
SE 44	Off	
SE 02	Off	
SE AWW06	Off	
SE 05	Off	
SE 25	Off	
SE 26	Off	
SE 45	Off	

Controlli logici

Controllo	Descrizione	Stato
Prima luce	Stato della prima luce	S
Seconda l...	Stato della seconda luce	S

Anormalità

Anormalità	Descrizione	Stato
aSR1L	Anormalità sulla lam...	Off
aSG1L	Anormalità sulla lam...	Off
aSV1L	Anormalità sulla lam...	Off
aSG2L	Anormalità sulla lam...	Off
aSV2L	Anormalità sulla lam...	Off

Comandi

Relazioni

Comando Relazione |scipizi| Direzione | Status | Feedback

Simulatore di Periferia 2010

File Visualizza Finestra

Selezione ante

VisualizzatoreStruttura

Numero di gateway = 3 Numero di attuatori = 79 Numero di interfacce = 86

- Label: S.23 Tipo: S
- Label: S.24 Tipo: S
- Label: S.25 Tipo: S
- Label: S.26 Tipo: S
- Label: S.43 Tipo: S
- Label: S.44 Tipo: S
- Label: S.45 Tipo: S
- Label: S.46 Tipo: S
- Label: S.AVV01 Tipo: S
- Label: S.AVV02 Tipo: S
- Label: S.AVV05 Tipo: S
- Label: S.AVV06 Tipo: S
- Label: Avz.01 Tipo: S
- Label: Avz.02 Tipo: S

- Attuatore: S.26
- Attuatore: S.43
- Attuatore: S.44
- Attuatore: S.45
- Attuatore: S.46
- Attuatore: S.AVV01
- Attuatore: S.AVV02
- Interfaccia CSeAWV1
- Attuatore: S.AVV05
- Attuatore: S.AVV06
- Attuatore: Avz.01
- Attuatore: Avz.02
- Attuatore: Avz.05
- Attuatore: Avz.06

- Interfaccia: CSe23
- Interfaccia: CSe24
- Interfaccia: CSe25
- Interfaccia: CSe26
- Interfaccia: CSe43
- Interfaccia: CSe44
- Interfaccia: CSe45
- Interfaccia: CSe46
- Interfaccia: CSeAWV01
- Interfaccia: CSeAWV02
- Label: S.AVV02 Tipo: S
- Interfaccia: CSeAWV05
- Interfaccia: CSeAWV06
- Interfaccia: CSilum01

VisualizzatorePiazzali

- Header - n.ro stazioni = 1
 - TestAusif - n.ro tipi = 7
 - Cdb - n.ro istanze = 31
 - Deviatioio - n.ro istanze = 7
 - SegnaleAlto - n.ro istanze = 16
 - SegnaleAvvio - n.ro istanze = 8
 - SegnaleAvanzamento - n.ro istanze = 4
 - IndicatoreLuminoso - n.ro istanze = 13
 - FrecciaEvidenziatrice - n.ro istanze = 2

RegistroMessaggi

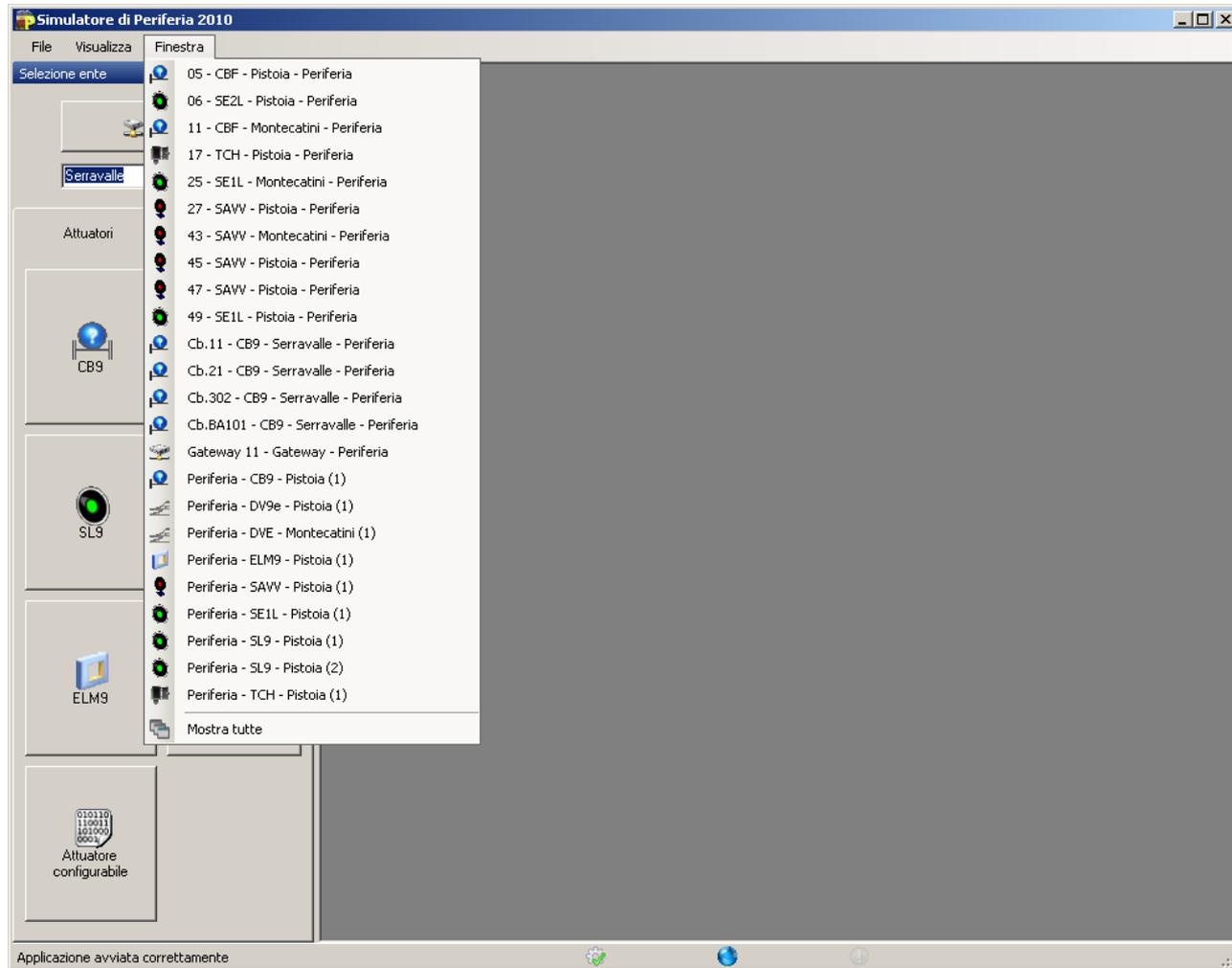
N°	Messaggio	Mittente	Destinatario
----	-----------	----------	--------------

OK

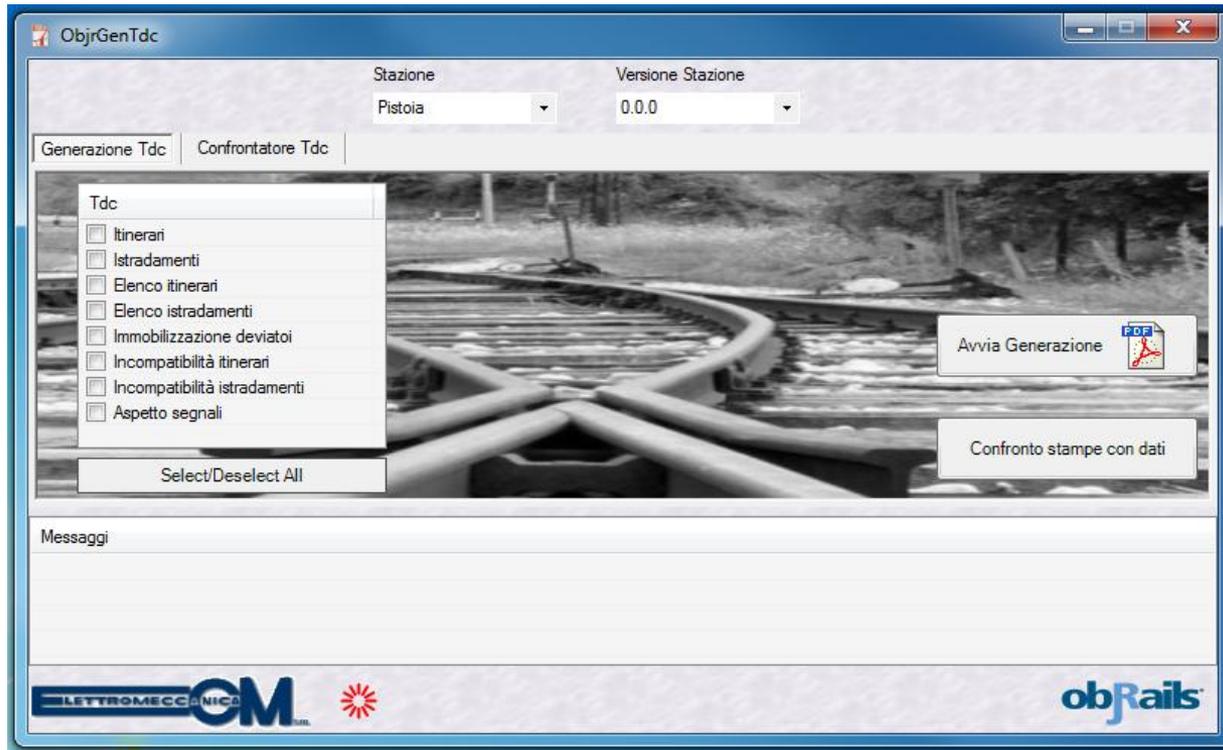
Applicazione avviata correttamente

peripheral simulator

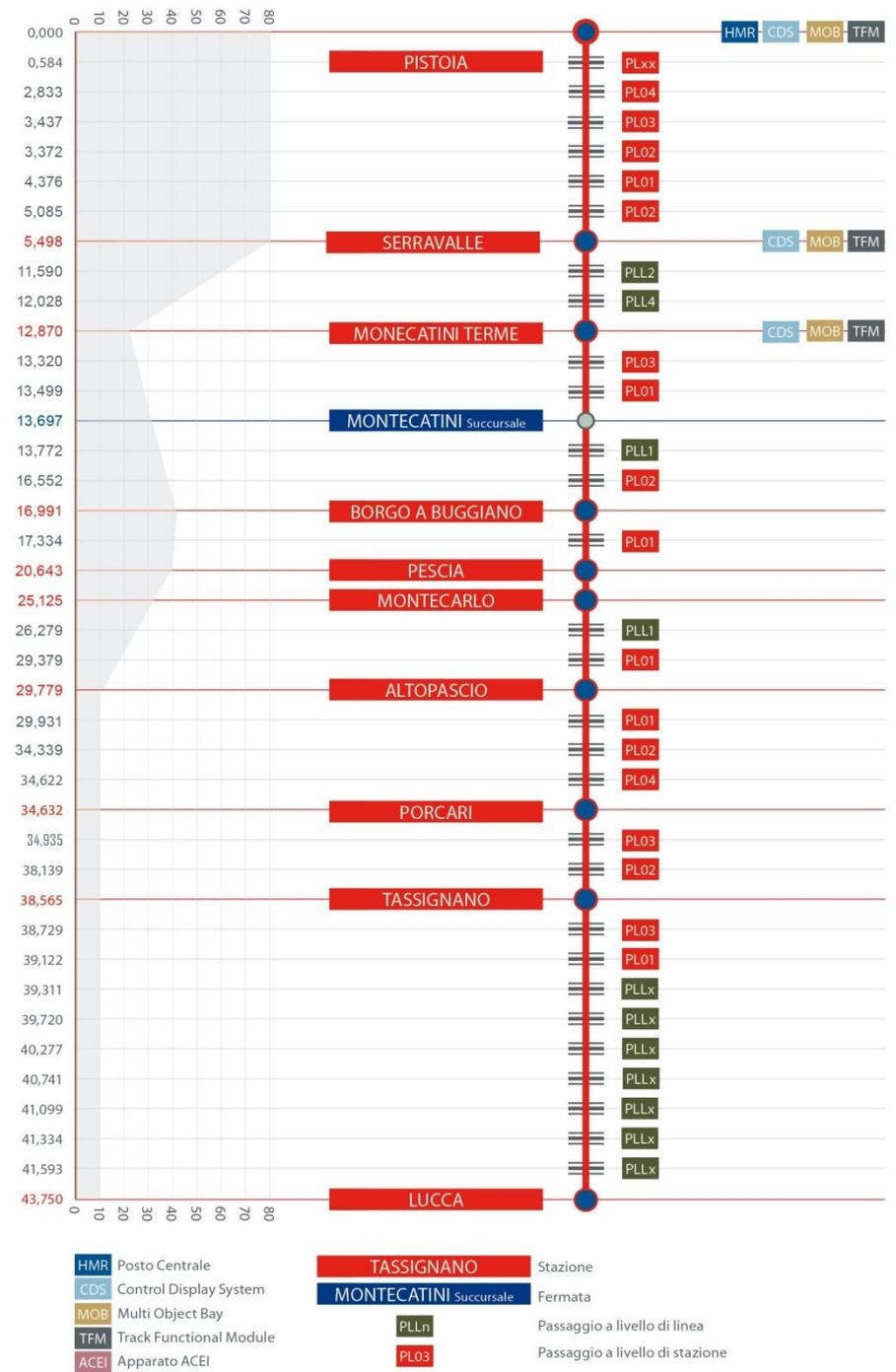
objtools



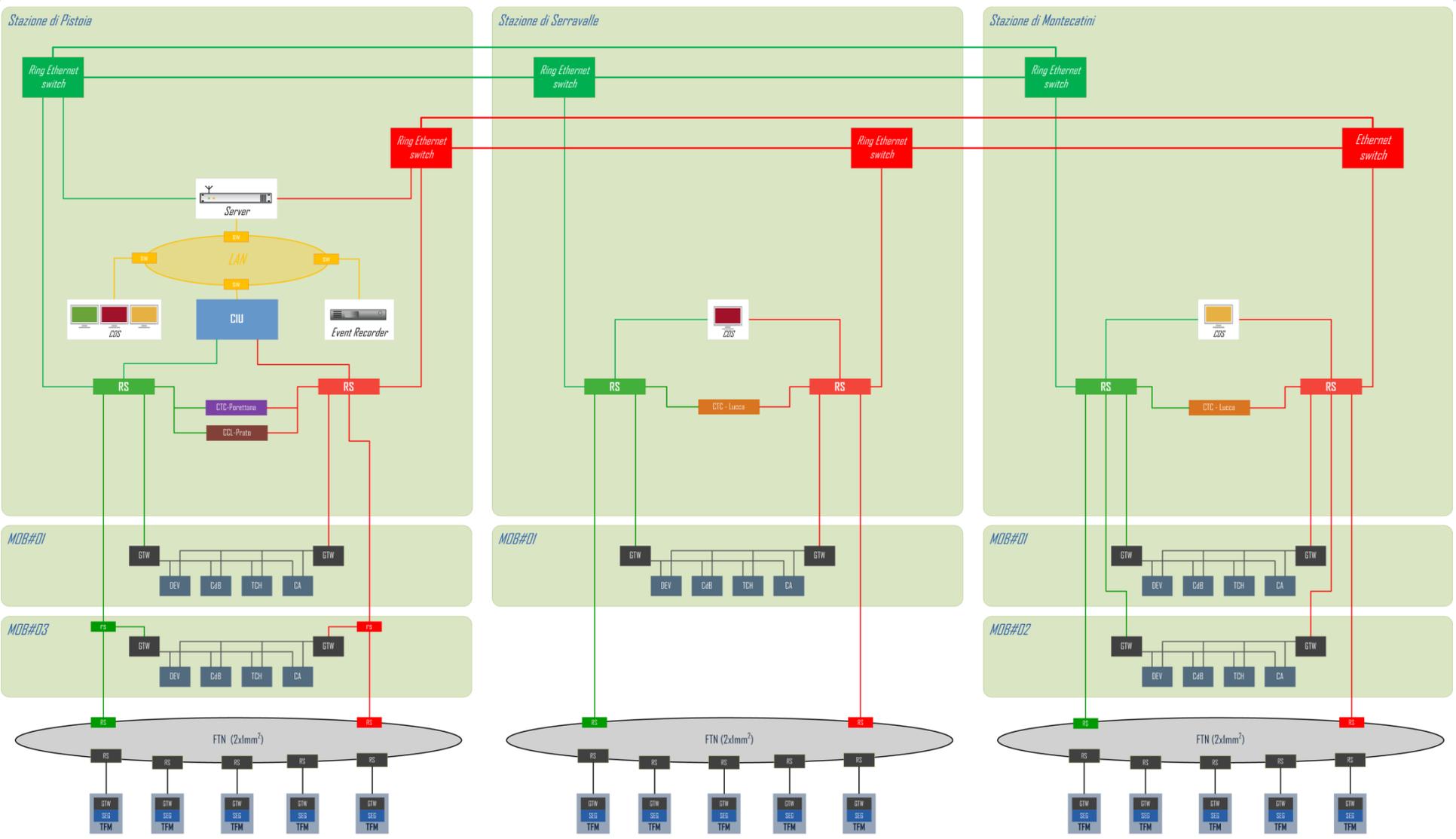
verification & testing tools



First application



- HMR Posto Centrale
- CDS Control Display System
- MOB Multi Object Bay
- TFM Track Functional Module
- ACEI Apparat ACEI
- TASSIGNANO Stazione
- MONTECATINI Succursale Fermata
- PLLn Passaggio a livello di linea
- PL03 Passaggio a livello di stazione



DMS	CIU	CDS	MOB	GTW	TFM	FTN	LAN	WAN#01	WAN#02
Diagnostic Management System	Central Interlocking Unit	Control & Display System	MultiObject Bay	Communication Gateway	Trackside Functional Module	Fixed Telecommunication Network			



The very best in
remote
control for railway
systems



What is special about AUSIF?

- **Centralised** information
- **Remote control** of geographically distributed equipment
- **Clear and precise presentation** of data (states and variations)

Performance data

10.000.000

number of database records managed

400.000

number of status variations per day

Performance data

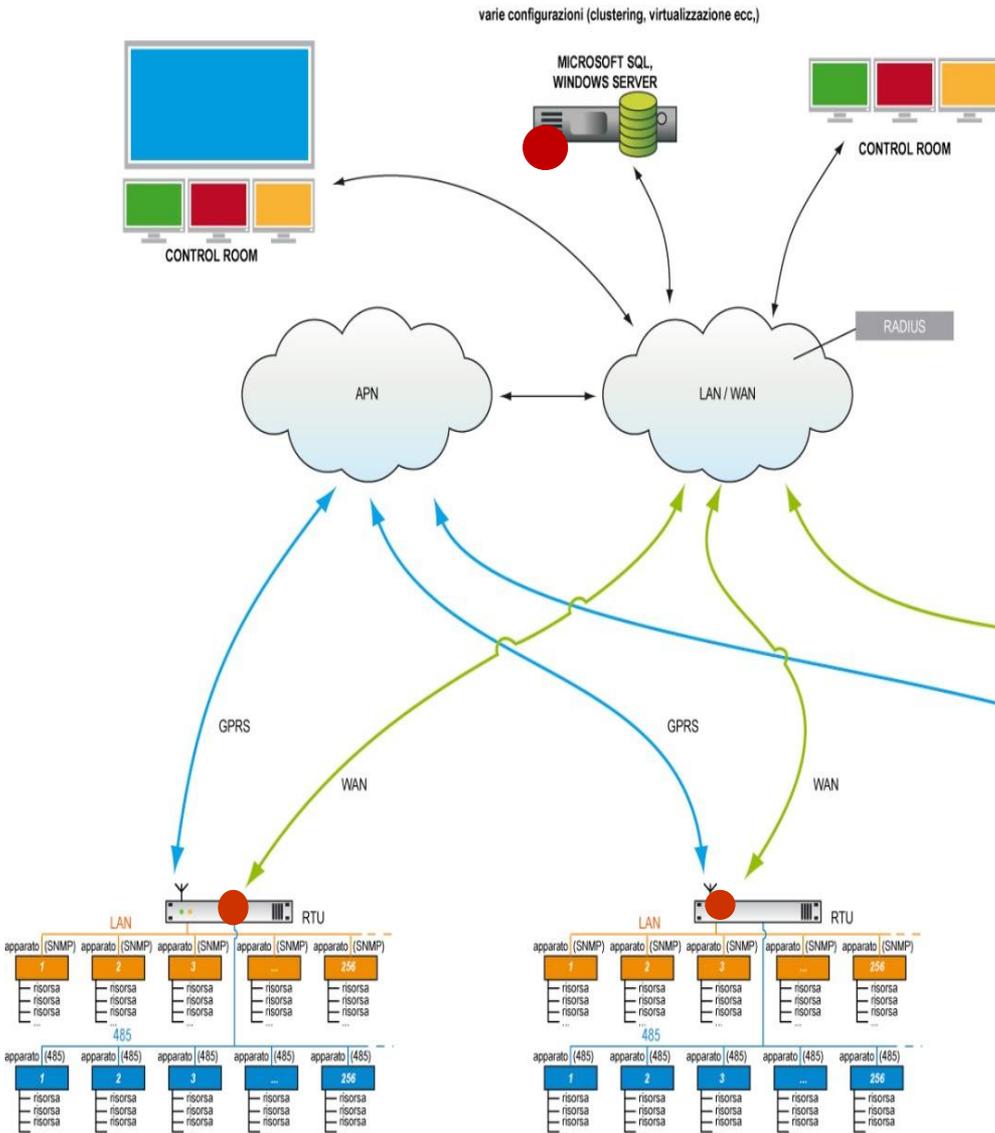
40.000

number of status variations per hour

3

seconds max. data acquisition time

AUSIF: System components



Web server (Windows Server + Microsoft SQL)

LAN / WAN

Access Point Name (GPRS,

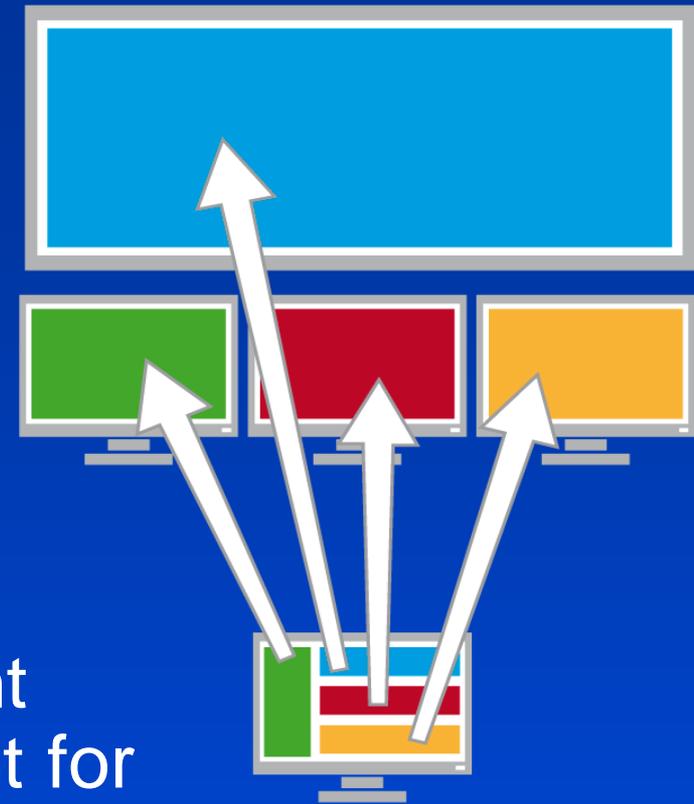
Remote Terminal Unit (RTU).
 Devices that are connected via an RS485 data link using a specific protocol and/or LAN connection implementing Simple

Key features

WEB technology

- Use of **multi-monitors**
- **Secure** transmission and data correctness
- **Strong point:** informs the user about device states and VARIATIONS providing a true and undisputable picture of the information displayed

Multi-monitors



It is possible to send the information frames to different monitors (typical arrangement for a control room)

The screenshot displays the AUSIF web application interface. On the left, a tree-based structure lists various locations, with 'TRAZZONARA' selected. The main area shows a table of 'Nuovi allarmi importanti' (New important alarms) with columns for date, time, and location. Below this, an overview screen for 'PUGLIA - TRAZZONARA' displays a status bar with indicators for 'ANALOGICO', 'RETI DIGITALI', 'Sistema', and 'WEB CONFIG'. At the bottom, a table shows details for these control points.

Icona	Data Visualizzazione	Ultimo Aggiornamento	Località
[Icona]	26/01/2010 14:36:39	[Icona]	[VENETO \ ROVIGO]
[Icona]	26/01/2010 14:36:11	[Icona]	[LIGURIA \ CARCARE]
[Icona]	26/01/2010 14:37:12	[Icona]	[TOSCANA-UMBRIA \ FIRENZE STUDI]
[Icona]	26/01/2010 14:37:05	[Icona]	[TOSCANA-UMBRIA \ M.TE PEGLIA]
[Icona]	26/01/2010 14:30:53	[Icona]	[EMILIA ROMAGNA \ BUONACOMPRA]
[Icona]	26/01/2010 14:30:53	[Icona]	[SICUREZZA \ EMILIA ROMAGNA \ BUONACOMPRA]
[Icona]	26/01/2010	[Icona]	[SICUREZZA \ PUGLIA \ TRAZZONARA]

Icona	Data Visualizzazione	Ultimo Aggiornamento	Località
[Icona]	26/01/2010 14:16:18	[Icona]	[ANALOGICO]
[Icona]	26/01/2010 12:39:47	[Icona]	[RETI DIGITALI]
[Icona]	22/01/2010 21:18:40	[Icona]	[Sistema]
[Icona]	01/01/1970 00:00:00	[Icona]	[WEB CONFIG]

NEW ALARM FRAMES

TREE BASED STRUCTURE

OVERVIEW SCREENS

CONTROL POINTS

Counter dashboard

Alternative to the tree structure approach, offering a numerical summary of the entire situation

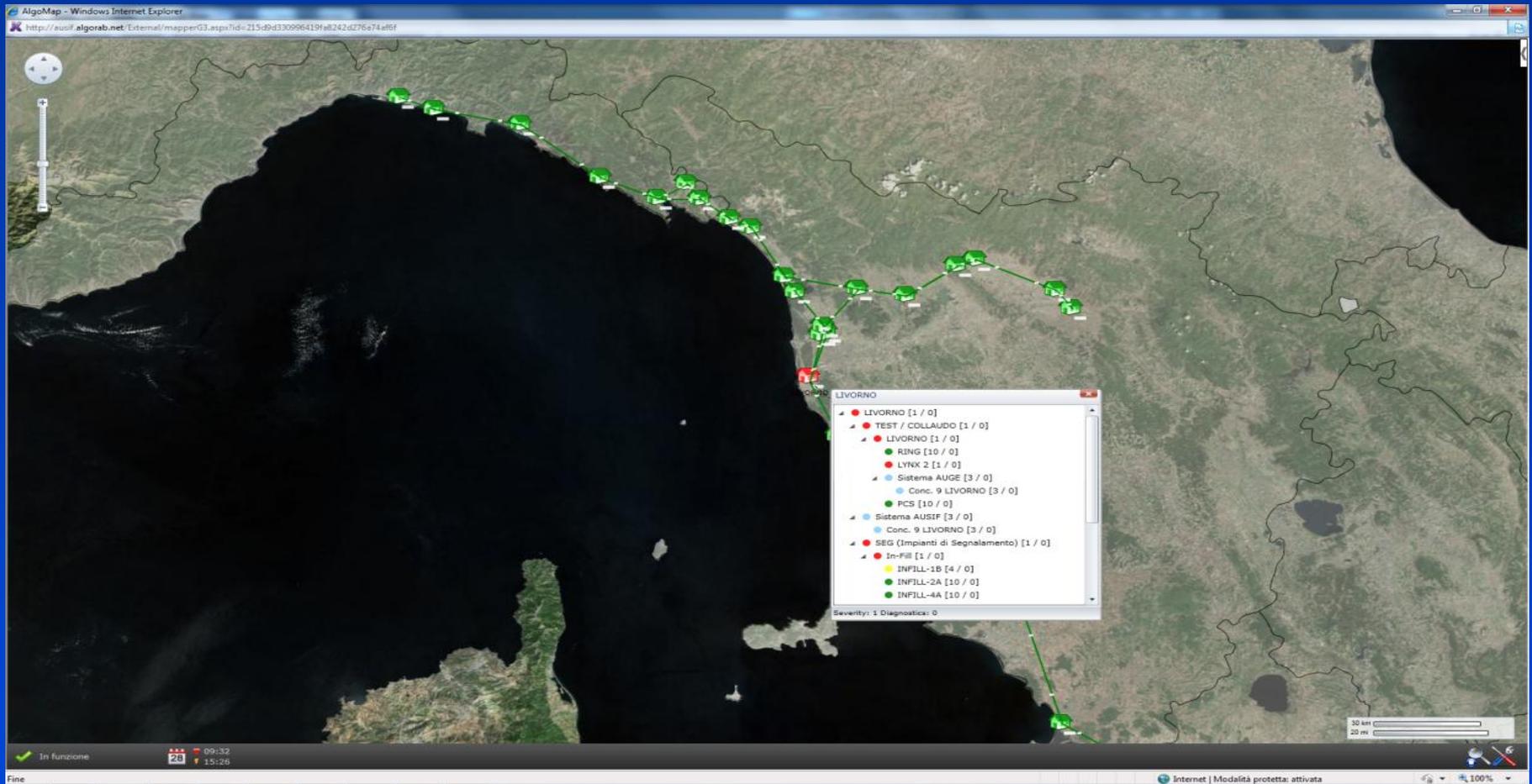
The screenshot displays the AUSIF Counter dashboard. The interface is divided into several sections:

- Header:** Includes the AUSIF logo, user information (UTENTE IN LINEA, DATA VISUALIZZAZIONE, ULTIMO ACCIORNAMENTO), and a navigation menu with items like Albero, Risorse nuove, Risorse allocate, Gruppi, Utenti, Nomi, Black-Box GPRS, Cerca, and Var.
- Left Panel:**
 - Ticket:** A vertical stack of four digital displays showing counts: 9 (red), 25 (red), 19 (green), and 1 (green).
 - Ack:** A vertical stack of six digital displays showing counts: 49 (red), 165 (red), 291 (orange), 1443 (orange), 2490 (green), and 88 (green).
- Right Panel:**
 - Nuovi allarmi importanti:** A list of recent alerts with columns for date/time and status.
 - Regional Summary:** A table listing regions with their respective counts and status indicators.

Icona	Data	Tempo	Status
[Icona]	29/01/2010	11:43:39	[Icona]
[Icona]	29/01/2010	11:43:39	[Icona]
[Icona]	29/01/2010	11:43:25	[Icona]
[Icona]	29/01/2010	11:43:25	[Icona]
[Icona]	29/01/2010	11:43:18	[Icona]
[Icona]	29/01/2010	11:43:18	[Icona]
[Icona]	29/01/2010	11:43:18	[Icona]
[Icona]	29/01/2010	11:38:56	[Icona]
[Icona]	29/01/2010	11:38:47	[Icona]
[Icona]	29/01/2010	11:38:47	[Icona]

Regione	Contatore	Status
ALGORAB	3	[Icona]
EMILIA ROMAGNA	3	[Icona]
MARCHE	0	[Icona]
PUGLIA	3	[Icona]
SICUREZZA	3	[Icona]
VALLE D'AOSTA	3	[Icona]

Geo module: AUSIFmap





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