





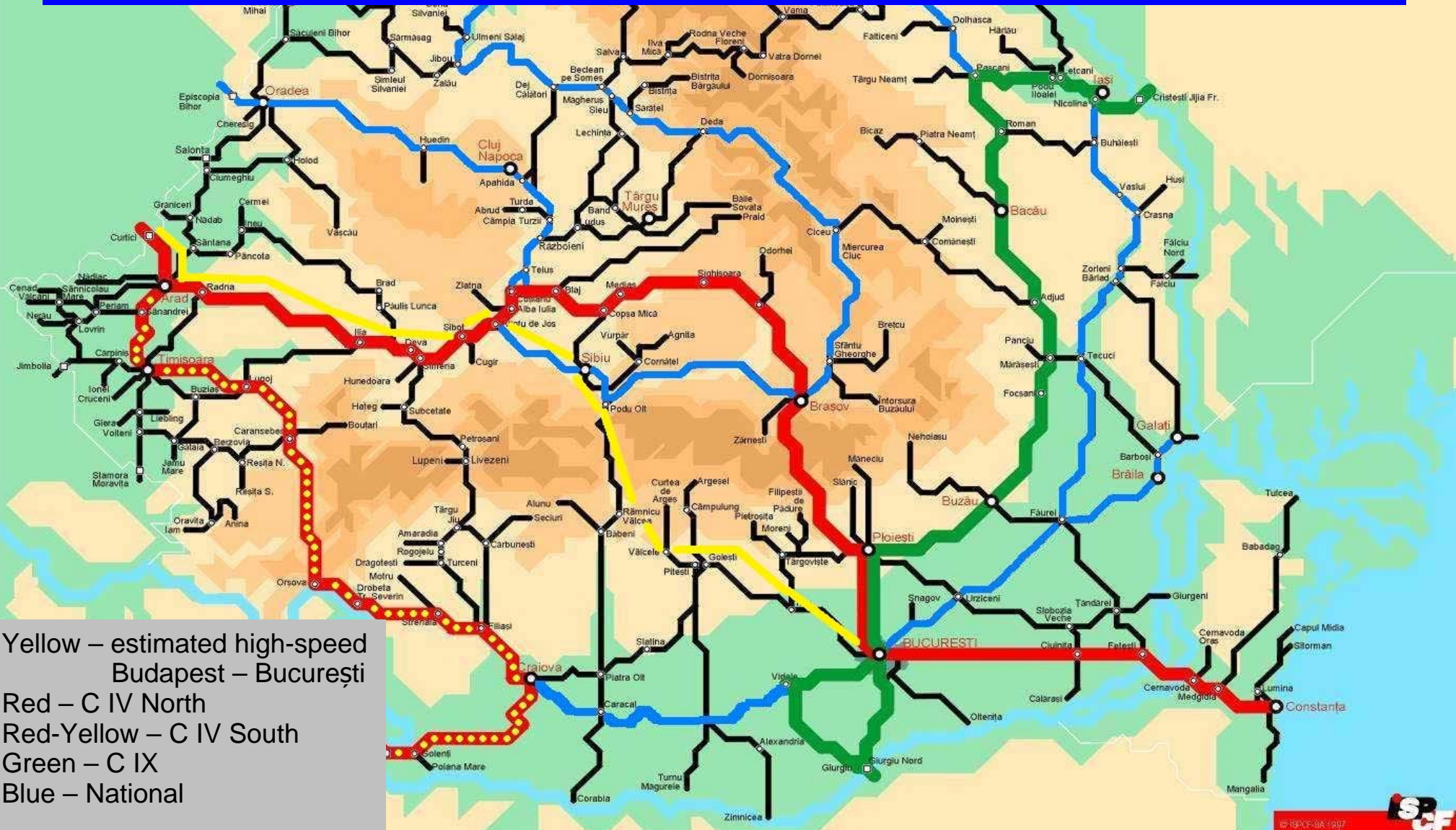
## WHY ERTMS Level 2 ?

- INDUSI is *not working properly* at 160 km/h
- alternative – other European old technologies. *Not interoperable.*
- alternative – ETCS level 1.

For reasons of *capacity, safety and functionality*, there was chosen ERTMS level 2

**ERTMS was not an “IF”, it was a “MUST”**

# CORRIDORS CROSSING ROMANIA



Yellow – estimated high-speed  
 Budapest – București  
 Red – C IV North  
 Red-Yellow – C IV South  
 Green – C IX  
 Blue – National



## ***Main directions: Rehabilitation and strategy.***

Rehabilitation preceded the strategy, that imposing the strategy to adapt to the ongoing projects.

### **Strategy objectives**

- Define the variants and implementation scenarios to be used by CFR.
- Define the philosophy concerning the implementation of ERTMS systems at CFR: principles, conditions that shall be fulfilled to ensure a successful migration to the ERTMS systems and to ensure a safe and economical efficient operation of the system.
- Identify database of the infrastructure for the implementation plan
- Define the base elements to allow the realisation of the time planning of ERTMS systems.
- Estimation of ERTMS implementation costs

### **Principles of the strategy**

- Priority for European corridor
- Considering the systems already commissioning and the ongoing contracts
- Double equipping with ETCS – CFR will not use on the same line ETCS level 1 and 2
- Shunting issue



## Implementation on „SLICES”

### Disadvantages

- Higher prices

- Risk of more suppliers, leading to more difficult and expensive maintenance

- Signalling project is part of a larger project, representing less than 10 %

- (see also other details in the GSM-R part)*

### Advantages

- Integration is outside CFR responsibility, for each project



## Implementation scenarios for level 2

- **Scenario 1** – Direct implementation

Scenariul This scenario foresees the direct implementation of level 2 on the considered lines

- **Scenario 2** – level 1 implementation, followed by migration.

CFR analyse shows that the optim path for this scenario is:

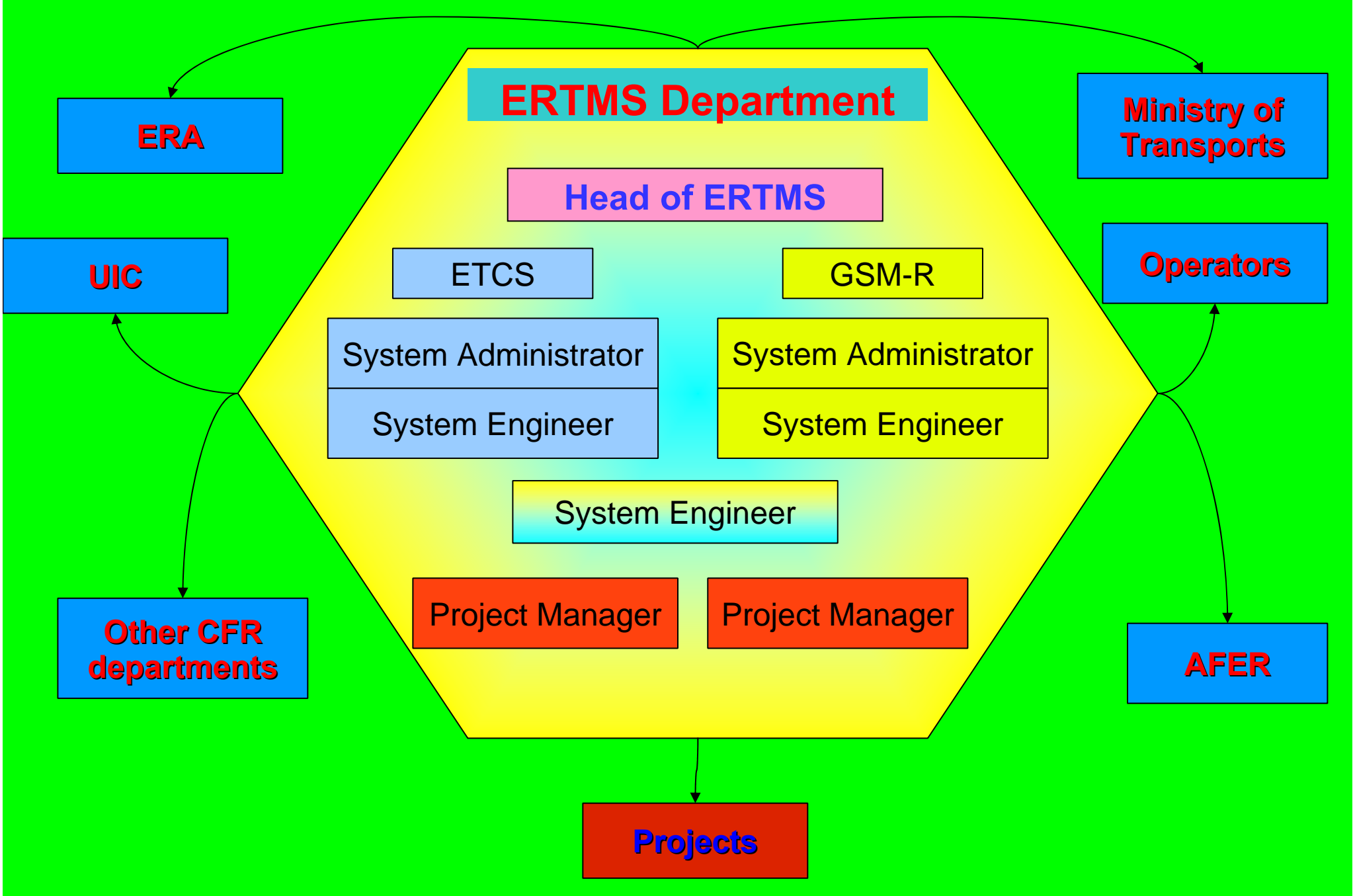
- fase 1: preliminary implementation of level 1 and GSM-R for voice communication; also implementation of electronic block and interlocking;

- fase 2: migration by replacing of ETCS level 1 with ETCS level 2 and update GSM-R for data transmissions.



## Action directions

- 1. Implementation of level 2 of the rest of the IVth Corridor**
  - Braşov – Curtici
  - Curtici – Timișoara – Craiova – Golenți
- 2. Corridor IX level 2 implementation (Giurgiu – (Videle))**
- 3. Connection between corridors (Craiova – Videle) level 2 implementation**
- 4. Migration on the ETCS level 1 Corridor IV (Braşov – Constanța), to ETCS level 2**
- 5. National principal lines ETCS level 1 implementation plus GSM-R voice. Limited Supervision is highly considered for these lines.**





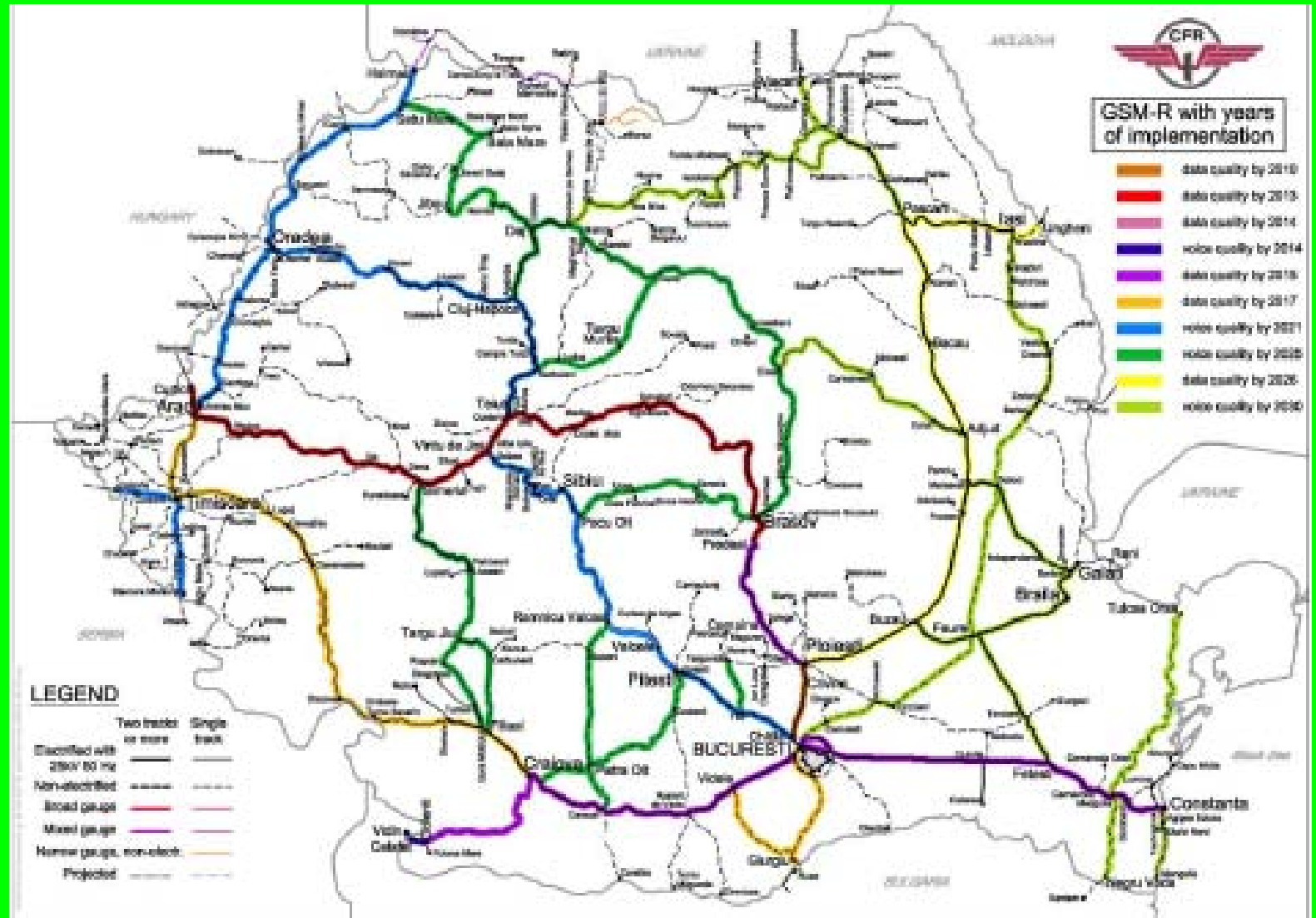


## **GSM-R system will be implemented in Romania as follows:**

- **Corridor IV, complete mainline Curtici - Simeria - Braşov – Bucureşti - Constanţa, 870 km**
- **Corridor IV, South branch Arad - Timişoara - Craiova - Golenţi, 480 km**
- **Corridor IX Ungheni - Iaşi - Paşcani - Ploieşti, Bucureşti - Videle - Giurgiu, Bucureşti - Giurgiu Nord (straight) 620 km**
- **Direct connection between corridors IV and IX Craiova - Videle, 130 km**
- **Overall length 2100 km.**



# GSM-R





## Implementation of GSM-R

The installation and commissioning of GSM-R is required for its function to provide support for railway applications such as communications or data communications traffic safety for ETCS.

This can be done in stages with the rehabilitation of a corridor segment or a single effort for the entire network.

### Mounting in stages has several disadvantages:

1. Requires keeping the old analogue voice system and use it in parallel on the train
2. Due the sequencing, several types of equipment will be installed, which will require more management systems, a bigger training of staff effort and inevitably greater incompatibility between software and equipment. Also it be required larger stocks of spare parts.
3. The transport network will be undersized and the protection will require additional cost.
4. There will be differences between the operating service sections equipped with GSM-R and those not equipped with.
5. Overall we will have additional costs because we will not negotiate directly with manufacturers. Working with complex integrated projects will invariably lead to the neglect of components that do not have high percentage value, the integrator find big interest in achieving the objectives with high percentage value.
6. Rail operators will not be interested to install new expensive equipment on-board, insisting on maintaining the old system of communications

## The advantages in creating a national network in a single effort

1. It replaces the old analog system with a modern system that offers more features and is more safe
2. We achieve interoperability with neighboring administrations
3. We can design and implement an uniform and homogenous network. All equipments will be controlled by a single management and there will be no incompatibilities between equipments or software solutions.
4. The Transport network will be appropriately sized and it will be provided protection for all routes
5. CFR will migrate to a single operating system across the country
6. The network cost can be really controlled, it will no longer be concealed in large and complex projects. Experience of other governments show that the price per km of installation is approximatively 12.000 EUR, value that includes the radio acces network, optical transport network (including fiber optic cable). We can also negotiate the prices for the making and installation of masts, when ordering in big quantities.
7. Once the national network is installed, train operators will be interested to install the equipment on-board, in order to operate the network.
8. The network will provide that certain information can be transmitted from the train to the ground surveillance systems. It can sent alarms colected from wagons (wagons status), the exact location of the train, the locomotive instant consumption, etc.

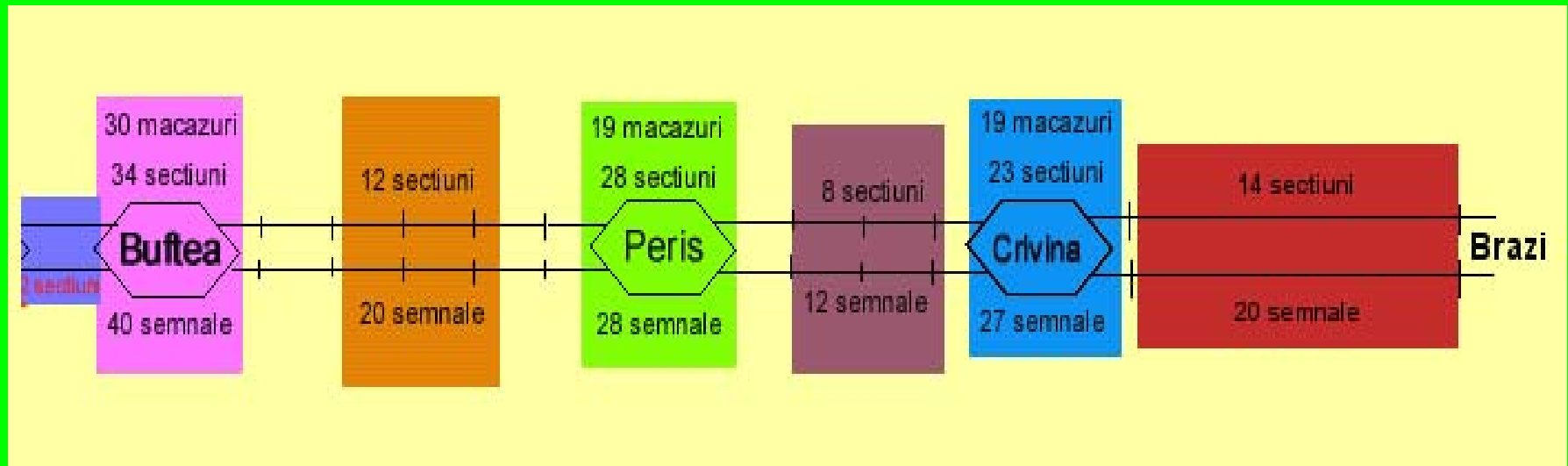


*The network can be installed in a short period of 3-5 years, because most of the equipment can be installed simultaneously with several teams.*

*The price may be decreases by using network communications by microwawe on sections with very low traffic and where is not expected a big data transmission (typically 50 Mbps can be transmitted over distances of 15 km with 25 m height masts. Beside, once the Network Pilot realised, the price will be much smaller because of the NSS (2 MSC's) will beacquired at this time*



# ***ERTMS Level 2 Pilot Project***



- Over 200 scenarios to be tested
- 37 km, 3 stations, 2 MSC, 6 OBU
- New operational rulebook to be written
- Technical requirements for ETCS (RBC), OBU, GSM-R and electronic interlocking
- Technical requirements will be the base for all ERTMS level 2 tenders to be launched



**THANK YOU !**