

Systemhaus für Kommunikationstechnik



GSM-R

Basics

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European Standards for Interoperability

❑ Memorandum of Understanding

21 European railways decided at June, 19th 1997 to introduce GSM-R according EIRENE specifications as interoperable railway radio system

❑ EIRENE-Documents

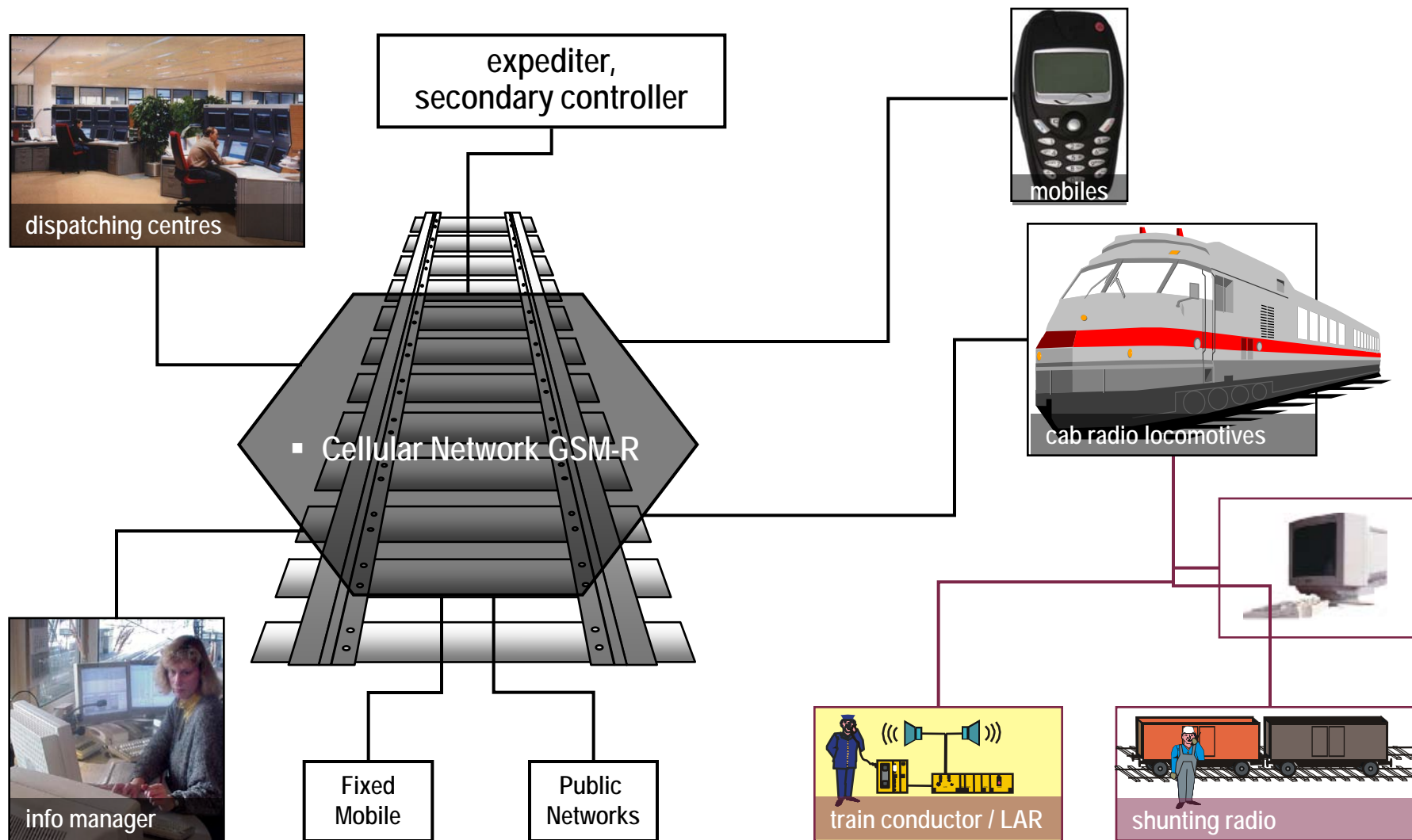
- SRS (System Requirements Specification) and
- FRS (Functional Requirements Specification)
- Valid versions SRS 7 / FRS 15

describing the functional and technical requirements to cab radio's

❑ MORANE-Documents

- FFFIS (Form Fit Functional Interface Specification)
- FIS (Functional Interface Specification)

describing the technical realisations resulting from SRS and FRS



- At 900 MHz range there are 3 GSM ranges

	Downlink(BTS zu MS)	Uplink(MS zu BTS)
public (P) Band	890 – 915 MHz	935 – 960 MHz
extended (E) Band	880 – 915 MHz	925 – 960 MHz
railway (R) Band	876 – 915 MHz	921 – 960 MHz

- For GSM-R only the range from 876 – 880 MHz and 921 – 925 MHz is usable
- Max. 19 channels with 8 timeslots are available

GSM	<i>gsm-R</i>
Complete areas should be covered	Only on-track areas should be covered
Antenna angle of beam spread: 65° to 360°	Antenna angle of beam spread: 20° to 65°
max. velocity 250 km/h	max. velocity 500 km/h
58 frequencies	19 frequencies

❑ Traffic model

- Short calls but high availability

❑ Geographical issues

- Always at least 2 cells required, in best case at 2 BSC's

❑ Power

- Cab radios has to have 8W output power, therefore the density can be adapted

Common functionality GSM

- ❑ Point to points calls (PtP)
- ❑ Hold and swap of PtP calls
- ❑ Call forwarding
- ❑ Conference calls with max 6 participants
- ❑ CS data calls up to 9.6 kBit/s, PS data calls (GPRS) $4 \times 13,4 \text{ kBit/s} = 53,6 \text{ kBit/s}$
- ❑ SMS

Functionalities exceeding GSM

- ❑ Functional addressing via functional codes
- ❑ Registration / Deregistration / Forces Deregistration
- ❑ Location depending addressing (LDA)
- ❑ Group Calls (VGC)
- ❑ Broadcasting Calls (VBC)
- ❑ Priorities (0-4)
- ❑ Precedence and Preemption
- ❑ Call acknowledgement

❑ Registration

- Allocation of a functional number to a MSISDN

❑ Deregistration

- Deleting of an allocation of a functional number to a MSISDN

❑ Forced Deregistration

- Deleting of an already existing allocation of a functional number to an other MSISDN followed by an allocation of a functional number to a MSISDN

❑ Functional Addressing

- Each subscriber can register one or more functional numbers according EIRENE numbering plan and can be reached via this functional numbers independent of its own MSISDN

❑ Functional Addressing: numbering plan

- The first digit defines the type of number:
 - 1 = short code,
 - 2 = train running number,
 - 3 = engine number,
 - 4 = coach number,
 - 6 = shunting teams,
 - 7 = controller,
 - 8 = subscriber number

❑ Location Depending Addressing

- Due to the actual location of a subscriber the same number (short code) will lead to different b-parties. Therefore EIRENE defines a number of short codes.

❑ Group Calls (VGC)

- Connecting all subscribers in the defined group call area which have activated the appropriate group on SIM
- A special group call is the Emergency Call
- All subscriber can listen but only one subscriber can speak The uplink (for speaking) has to be requested by the speak button

❑ Broadcast Calls (VBC)

- Connecting all subscribers in the defined group call area which have activated the appropriate group on SIM
- All subscriber can listen but only A-subscriber can speak

❑ Call Acknowledgement

- Railway Emergency Calls will be acknowledged from all mobile stations which have this feature activated on SIM

❑ Priority

- All calls have a priority
- priorities are from:
 - 0 for emergency calls up to
 - 4 for common PTP calls
- The priorities are the basis for the precedence of calls

❑ Precedence and Preemption

- The calls will be handled by the mobile stations according there priority, High Priority calls supersede Low Priority calls.
- The network suppresses calls only if all traffic channels are busy

- ❑ Cab Radio / MTRS / MESA
 - Mobile Train Radio Station
- ❑ MMI
 - Man Machine Interface
- ❑ GPH
 - General purpose handheld
- ❑ OPH
 - Operational purpose handheld
- ❑ OPS
 - Operational purpose handheld shunting