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IP Migration of GSM-R

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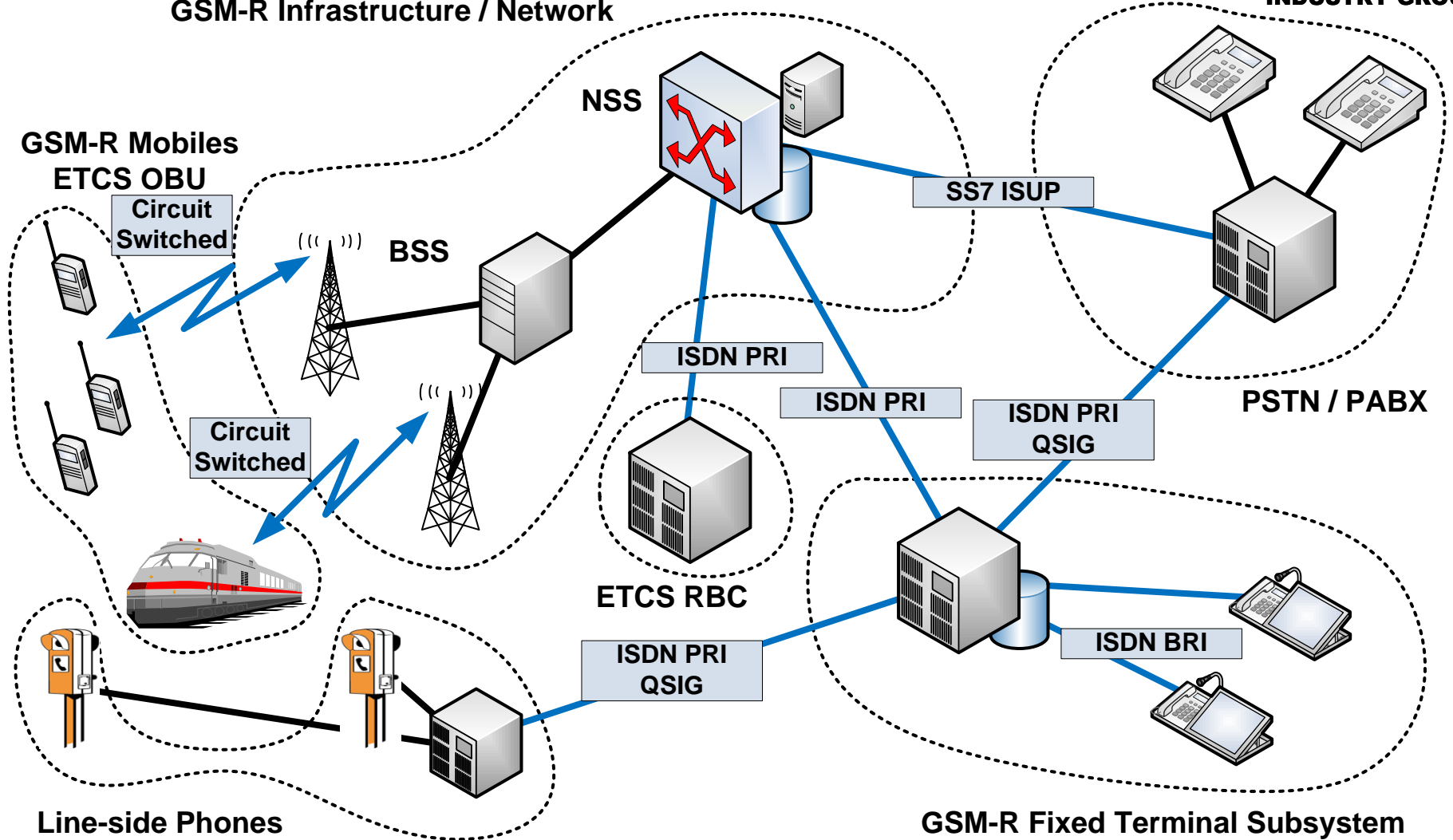
Content overview

- Evolution from a circuit-switched to a packet-switched communication system
- IP based communication systems for railway communication
- Standardisation works – present and future
- Implementation works and roll-out

Current circuit-switched GSM-R systems ...

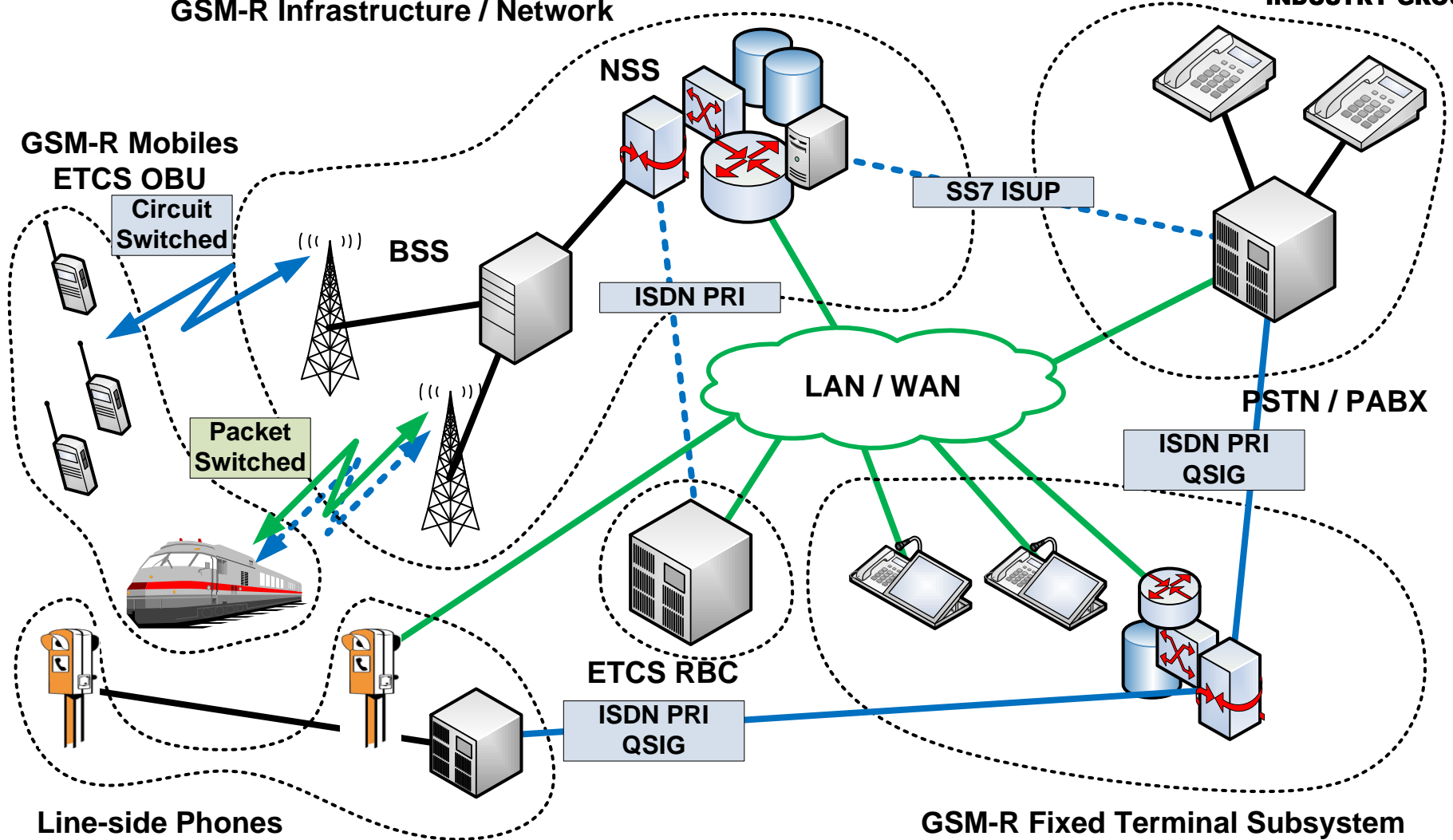


GSM-R Infrastructure / Network



... evolve to IP based ones

GSM-R Infrastructure / Network



IP based applications and sub-systems



- Applications and services evolving to IP
 - ETCS
 - Recording
 - Fixed-line voice communication
 - Sub-systems evolving to IP
 - GSM-R Infrastructure / Network
 - GSM-R Fixed Terminal Subsystem
 - GSM-R Mobiles
- “Release 4“, “GPRS/EDGE“
- “IP based“
- “GPRS/EDGE“

IP based interfaces

- Interfaces evolving to IP
 - GSM-R NSS – FTS “SIP“
 - GSM-R Network – Mobiles “GPRS/EDGE“
 - GSM-R Mobiles – ETCS on-board “IP“
 - GSM-R Network – ETCS RBC “IP“
- Legacy interfaces and sub-systems (e.g. line-side phones, PSTN) as well as voice mobiles may remain at circuit switched technology

Requirements for the Railway Communication Systems



- Railway specific services
 - Group Calls and Broadcast Calls (with & w/o talker change)
 - Priority of Calls (precedence and pre-emption)
 - Functional Addressing
 - ETCS data transport
- Quality-of-Service, guaranteed call setup times
- Well defined and guaranteed capacity on interfaces
- Simple integration of legacy systems
- Re-use of existing infrastructure (such as BTS sites and transmission)

IP Benefits



- One multi-service network for different types of applications
- Increase of reliability & availability (redundancy & resilient architecture)
- Efficient use of limited capacity at the interfaces in question
- Reduced cost for implementation and operation – use of off-the-shelf components and systems
- Re-use of existing infrastructure, add new applications
- Ease of interconnectivity of IP based networks

IP Challenges

- Quality-of-service
 - permanent resource allocation vs. dynamic one
 - determined transmission time(s) vs. efficient use of capacity
 - Critical services vs. best effort services on one single network
- Security
 - “non-disclosed“ dedicated circuits vs. “free to connect“ IP cloud
 - operate IP systems and interfaces in “trusted environment“
- Interconnection and interworking with legacy systems
- Future proof implementation vs. decreasing life-cycle of off-the-shelf components

UIC specifications are on their way ...



- UIC IP Guidelines
 - Definiton of requirements for IP based interfaces and networks
 - Consider best practices and future developments
- EIRENE FRS 7.4.0 / SRS 15.4.0
 - Change request for “Release 4 core network architecture”
 - approved
 - Change request for „core network redundancy“
 - under discussion
 - Change request SIP based interface between core network and controller equipment
 - under discussion

... projects and evaluation are ongoing



- UIC – ETCS over GPRS working group is ongoing
 - GPRS relevant technical features identified: first draft of engineering requirements has been circulated
 - Traffic model for testing is approved: test cases finished, including some EDGE specific test
 - Lab/field test (RFF-phase 1) have been successfully performed
 - Lab-Test is on-going/done in UK(NR) and in Denmark(BDK)
 - UNISIG ETCS over GPRS field testing planned for October
- ETSI – TC RT
 - consider change requests in the PS domain, which are relevant for usage of GPRS/EDGE for ETCS operation
 - consider standardisation of “A-bis over IP” interface (BTS – BSC)
 - consider standardisation of “voice recorder interface over IP”

Technical Specifications already published



- ETSI TS 103 147 – version 1.1.1
 - GSM-R Core Network Redundancy
- ETSI TS 103 166 – version 1.1.2
 - Rel-4 Core Network requirements for GSM-R
- ETSI TS 103 389 – version 1.1.1
 - Usage of Session Initiation Protocol (SIP) on the Network Switching Subsystem (NSS) to Fixed Terminal Subsystem (FTS) interface for GSM Operation on Railways

Technical Specifications upcoming



- ETSI TS 103 389 – version 1.2.1

Usage of Session Initiation Protocol (SIP) on the Network Switching Subsystem (NSS) to Fixed Terminal Subsystem (FTS) interface for GSM Operation on Railways

- Publication anticipated for Q4/2013
- Errata to version 1.1.1
 - length of User-to-User Information Element
 - applicability of User-to-User Information Element in response to SIP methods
 - Early Media Handling
- Enhancements and Amendments
 - Explicit signalling for Group Call Control (empower avoidance of DTMF)
 - Media Inactivity Detection via RTP monitoring (avoid “dead connection“)
- Issues left for future releases
 - Security
 - Supplementary Services

Implementation works and roll-out



- Evolution of GSM-R core network from “Release 99” to “Release 4”
 - Austria, Germany, Great Britain, Ireland, ...
- Roll-out of IP based controller equipment
 - Norway, Ireland, Lithuania, Tunisia, ...
- Possible implementation of SIP based interface between NSS and FTS
 - Hungary, ...
- ETCS over GPRS
 - Denmark, ...

Going beyond current IP evolution



- Current IP evolution enables future migration to an IP based railway communication system
 - core network elements are already IP capable
 - key interfaces are already based on IP
 - IP already introduced and used for ETCS message transport
- IP transport will be extended to legacy interfaces
- IP capable user-devices will be introduced
- Services, including railway specifics, will be accessible
 - via IP based networks and interfaces
 - independent of access technology and service distribution

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Thank you!