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ELECTRONIC SYSTEMS

Way Forward

GSM-R Conference
UIC 10-11 Sept 2013

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NSN

Agenda

Why GSM-R?

Why consider a Next Generation System?

Fundamental Assumptions!

Safeguarding GSM-R Investments!

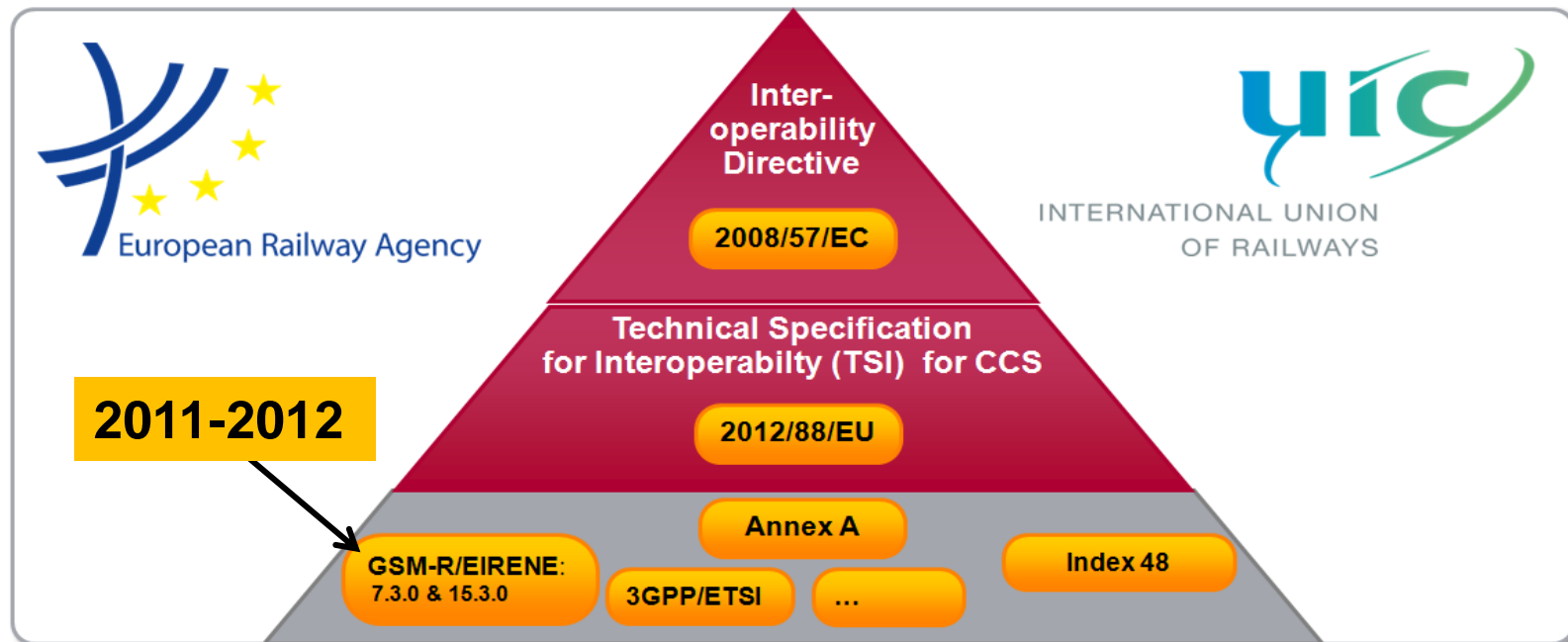
What's going on in 3GPP?

What's going on in EU (METIS, 5G or beyond 2020) ?

Today's activities towards Future System !

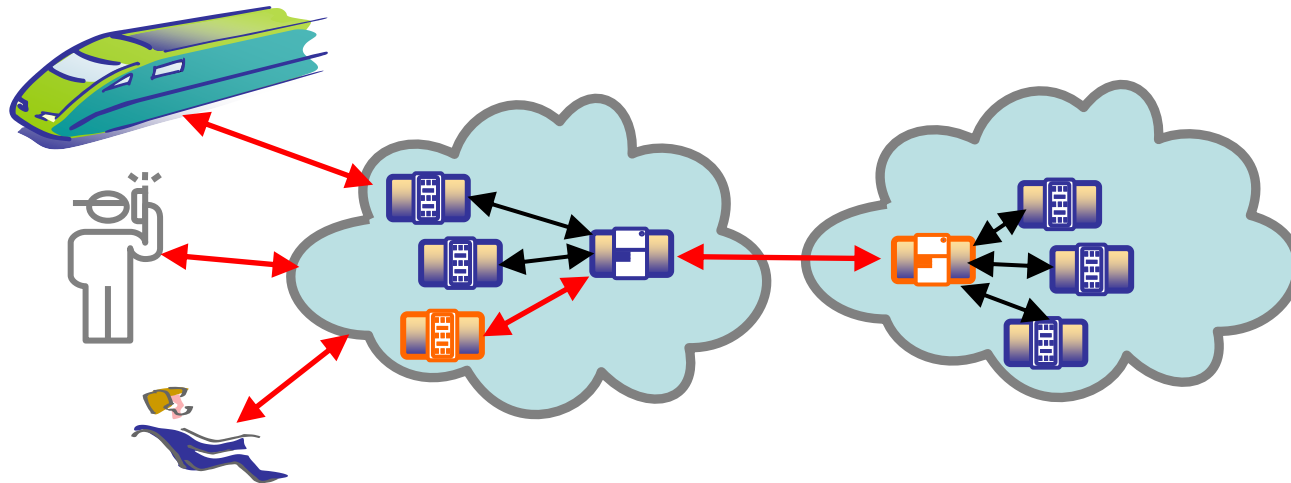
Why GSM-R?

- Radio communications for train operation since the 50's – many well functioning but incompatible and old fashioned systems
- Under UIC leadership a modern and compatible system was specified during the 90's – GSM-R...
- ...and has been refined over the years since then



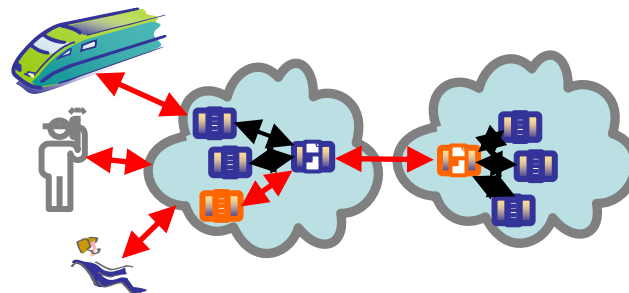
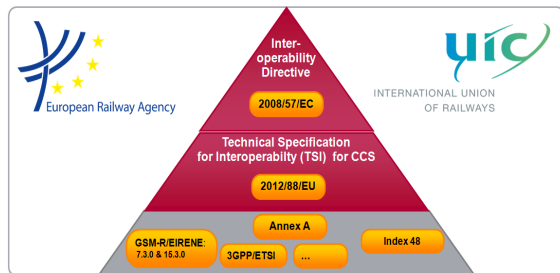
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- GSM-R is Multivendor



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- GSM-R has proven to be “almost” optimal and utmost reliable for both Railway Voice Communications and ETCS data transfer
- GSM-R is Multivendor
- GSM-R has a very large footprint – in Europe and internationally
- GSM-R is a true success story!



Why consider a Next Generation System?



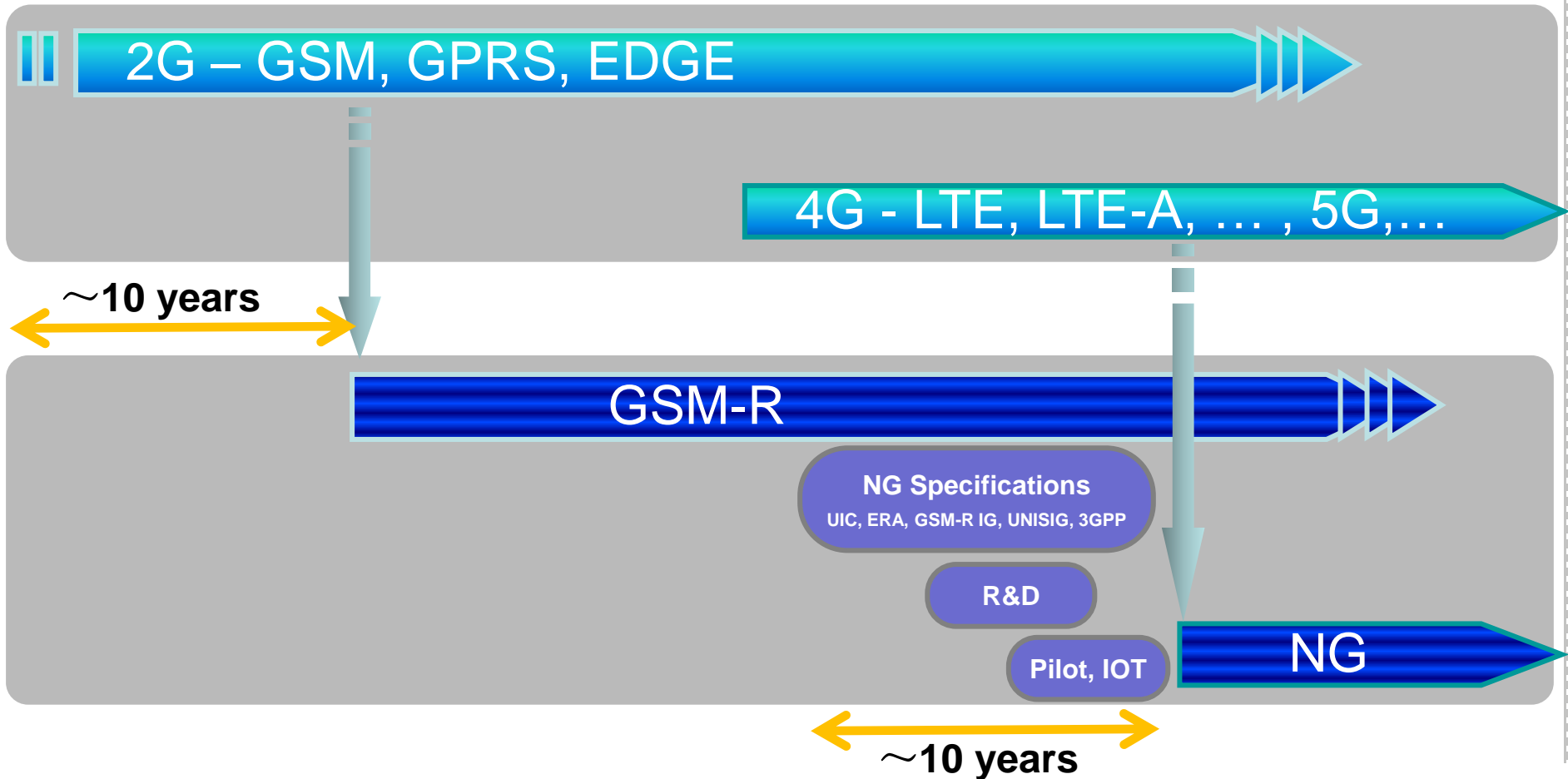
- GSM was specified in the 80's ...
- ...so soon reaching the mature age of 25 very well established...
- ...but not delivering the data capacity required for public users today...
- ...and not using spectrum efficiently!

- Therefore GSM will inevitably be phased out...and GSM-R will follow...later!

- To be prepared for the future it is anyway a well invested effort to seriously assess the different alternatives for a “Next Generation System”

- If we move at the GSM-R speed it will take some 10 years from now for studies, specifications, prototyping and testing

Why consider a Next Generation System?



Fundamental Assumptions (1)

- Today's GSM-R functionality as specified in EIRENE...
 - Functional Addressing
 - Location Dependent Addressing
 - Group Calls (Railway Emergency Call, All Drivers in the Area, ...)
 - Carrying Safety Critical data of ETCS levels 2 and 3
 - ...
- ...must be supported one-to-one by the NG system, since
 - during a migration period lasting several years...
 - ...both systems will be in simultaneous service!
 - a train driver moving from a GSM-R area to a NG area or vice versa shall not have to behave differently depending on location...
 - ...but (at most) benefit from additional supporting services in NG areas!

Fundamental Assumptions (2)

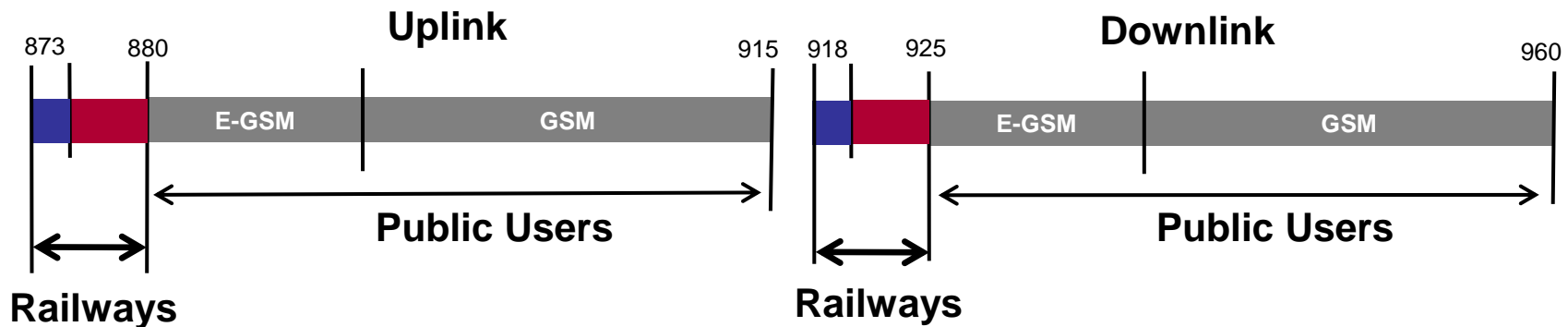
- Additional new data services utilising the capacity of modern technology will however be part of NG, e.g.
 - to transfer any relevant train data for maintenance and other purposes to ground
 - to support energy efficient (green) train driving
 - to transfer recordings of on board supervision cameras to ground
 - to transfer detailed travel information to passengers
 - to support conductors with info and ticket sales
 - to transfer safety supporting images to train drivers (level crossings...)
 - ...
- Surplus capacity could possibly even be leased by Public Mobile Operators to provide “regular”, high quality Mobile Services to Passengers – hereby improving their Travel Experience

Fundamental Assumptions (3)

- NG will be a Cellular Mobile Network (just like GSM-R)
 - with radio base stations (cells) along the railway lines, in stations, shunting yards
 - possibly supported by satellite based services for special needs
- NG will be an “application” on top of a regular Mobile Service (even more than GSM-R)
 - based on 3GPP services tailored for a much larger user community than only Railways
 - a variant of Mobile Professional Radio used by (in particular) Public Safety (police, fire brigades, ...) and others (private and public users)

Fundamental Assumptions (4)

- NG will be owned and operated by Railways
 - public networks will presumably not guarantee the required 7d/24h availability
 - public networks are subject to continuous change (feature content, radio design, capacity enhancements,...) which harmonises poorly with NSA's authorisation to operate
- NG will possibly reuse existing ER-GSM frequencies (4+3 MHz)
 - sharing spectrum with GSM-R during migration
 - however subject to technical clarification – and there are other possibilities



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 - however subject to technical clarification – and there are other possibilities
- **Whatever the frequency allocation may be, imperative that focused efforts are invested in concerned international and European bodies to ensure that sufficient spectrum is granted**

Safeguarding GSM-R Investments! (1)



- Onboard Cab radio will be maintained, only upgraded
 - Driver's Interface will remain unchanged
 - Additional radio module supporting the new technology
 - Possibly also new roof top antenna and cabling
 - ...
- Major parts of track side GSM-R network will be maintained
 - Base Station civil works, towers
 - Base Station transmission infrastructure
 - Core system civil works, sites
 - Most of Network Management , e.g. KPI supervision
 - ...
- Fixed Dispatcher Network will be maintained, only upgraded
 - Human Machine Interface will remain unchanged in general...
 - ...slight additions in the menu navigation supporting the new radio technology
 - Very limited effort for training of operator staff

Safeguarding GSM-R Investments! (2)



- Railway staff already very experienced operating a Mobile Network
- **In total a very substantial part of the GSM-R investment will be reused!**

What's going on in 3GPP? (1)



Group Call functionality of today's GSM-R

- ...was specified as a “railway add on” by ETSI/3GPP in the 90’s
- It is an additional functionality requiring a major R&D effort in the basic equipment design...
- ...and it is a rather costly task to implement in infrastructure and radio terminals (Cab etc)

- There are comparatively few users – only railways...
- ...since “all” other users of professional mobile radio have opted for TETRA or APCO 25 or some further similar systems

What's going on in 3GPP? (2)

Group Call functionality of tomorrow's NG

- Group call functionality currently at 3GPP work is...
- ... Group Call System Enablers GCSE
- This standardisation is driven by users and suppliers of Public and Professional Mobile Radio aiming at one common efficient and truly user friendly solution...
- ...so will have many users - over time entire public safety sector ?
- ...a much larger market and much improved economy of scale for group calls
- Planned for inclusion in 3GPP Release 12

GCSE is an interesting candidate for NG

What's going on in EU (METIS, 5G or beyond 2020)?

- Aiming at an ultra high capacity mobile radio system “beyond 2020” ...
- ...the **European Commission** is spending 50 M€ on the project METIS!
- Among 5 Mobile Operators, 5 Mobile Vendors, 13 Academic Organisations...
- ...there is (only) one Consortium member representing the interests of Transport, namely BMW...



- METIS stands for “Mobile and wireless communications Enablers for the Twenty-twenty Information Society”

Today's activities towards Future System

- GSM-R Core architecture Rel 4 is introduced
- Stepwise introduction of IP ...
- ...now available on several interfaces interconnecting GSM-R subsystems, e.g. Train Controller system
- ETCS over GPRS (that is over Packet Switching PS) is a stepping stone for...
- ...much better utilisation of radio resources
- ...making ETCS bearer independent
- ER-GSM, enhancement of the European UIC Frequency Band for GSM-R by 3MHz, i.e. 75%



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Thank you!