

Welcome to the World of Standards



TECHNOLOGY OPTIONS FOR BROADBAND

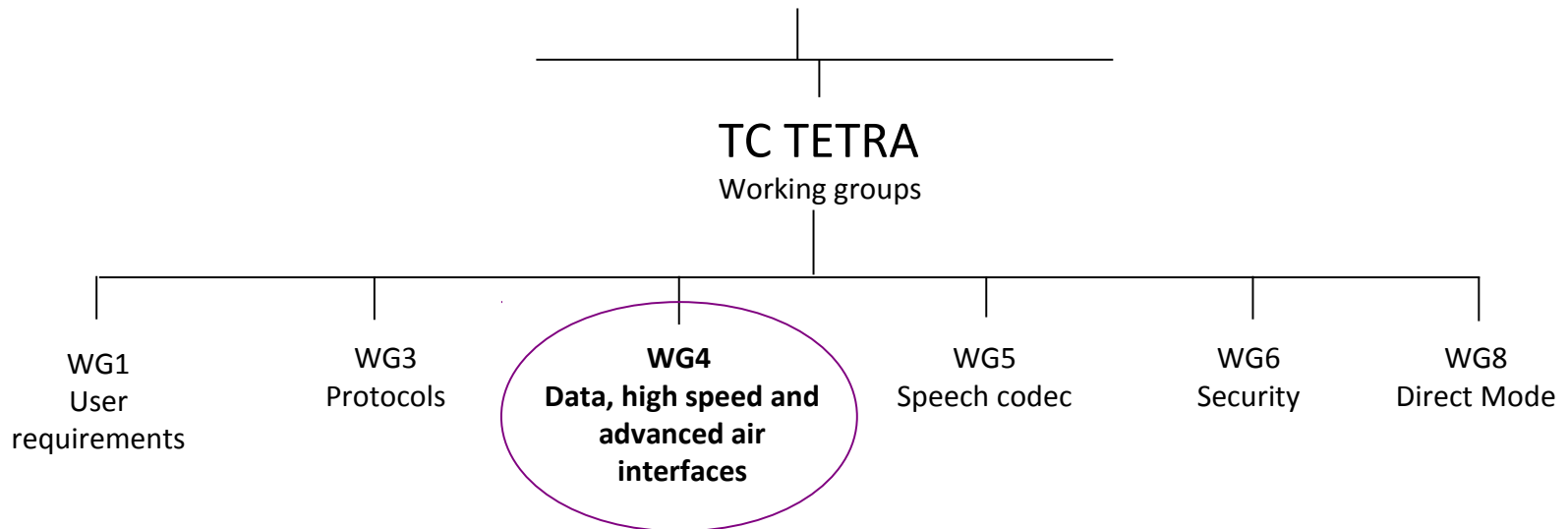
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Chairman, TC TETRA WG4
Vice Chairman, TC TETRA WG6

Broadband Critical Communications
Conference
14-15 February 2012

Who are we?



European Telecommunications
Standards Institute
Technical committees

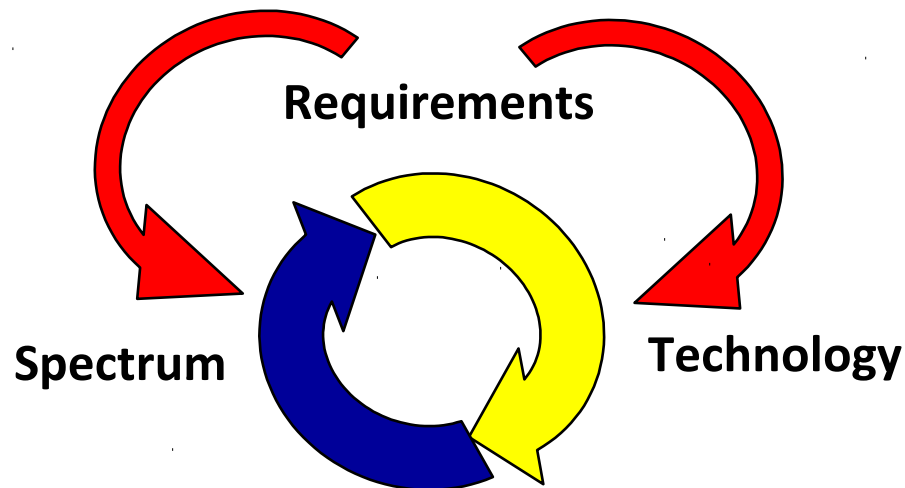


Technology is determined by:

- Requirements – what do we have to do?
- Spectrum – where can we put the technology?

It's a circular discussion:

- What is a technology capable of?
- Is it compatible with other technologies, in the same spectrum?
- The technology and requirements dictate the spectrum requirements



Any technology adopted for professional communications must be standards based

- The professional mobile communications industry is too small to support several technologies
- We need the total market size to support competition for pricing and functionality
- We need the total market size to support the niche market products – ruggedised terminals, covert installations, ATEX products etc.

Design a technology standard ourselves, or pick up an existing standard?

- The greatest investments in wireless technology development come from the Cellular operator and Internet industries
 - Driven by growth in data communications, and need to drive down the cost of data service
- Our industry cannot match the level of investment, if we want an equivalent broadband standard



- Develop and standardise a fresh technology within our own industry
- Take an existing standard from elsewhere and use 'as is'
- Take an existing standard, and modify for suitability

- Areas where an existing Public Mobile standard may need development:
 - Group communications – voice and data
 - Prioritisation amongst users and groups
 - Security
 - Interworking with existing narrowband standards (TETRA etc)

- Issue: we are a small voice compared to the size of the commercial cellular market

*Approx 3 million terminals sold vs
5 billion active subscriptions....*



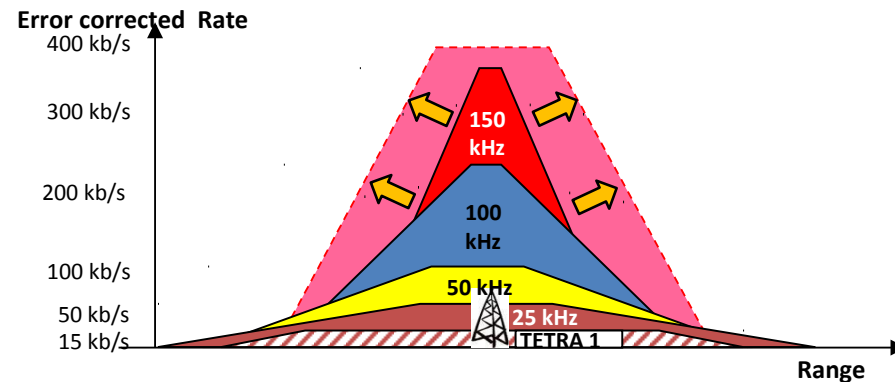
🌐 Narrowband – wideband technologies – TEDS

- Designed to fit into existing spectrum without interference to adjacent users
- Tradeoff range vs capacity; can match or exceed range of TETRA 1 cell
- Easy to adapt to group communications
- Capable of hundreds of kbps

🌐 Techniques from other industries can be used to increase throughput/range

➤ TEDS enhancements are possible

➤ WG4 are working on improvements to TEDS already



All require separate spectrum from narrowband because of interference issues

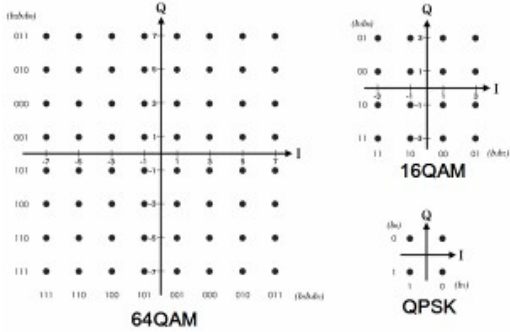
- Guard bands needed at band edges for protection
- Transmitter and receiver issue

Broadband technology in use today

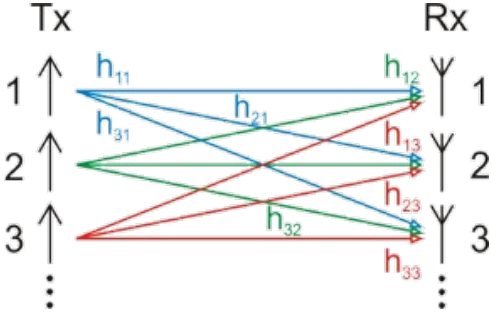
- CDMA (Code Division Multiple Access)
 - CDMA 1x EV-DO
 - Wideband CDMA – UMTS (HSPA etc)
- OFDMA (Orthogonal Frequency Division Multiple Access)
 - LTE
 - WiMax

OFDMA technologies are replacing CDMA technologies in the Cellular world

- Better data throughputs with better spectral efficiency

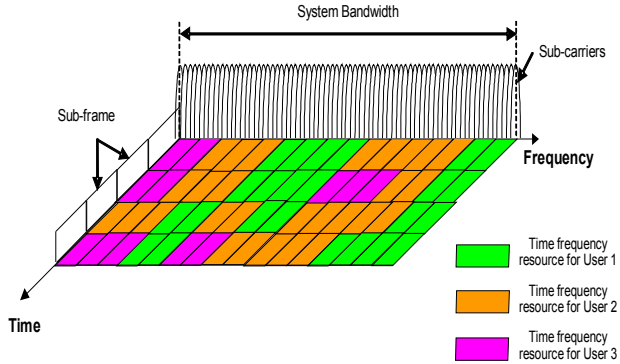


Adaptive Modulation and Coding up to 64QAM

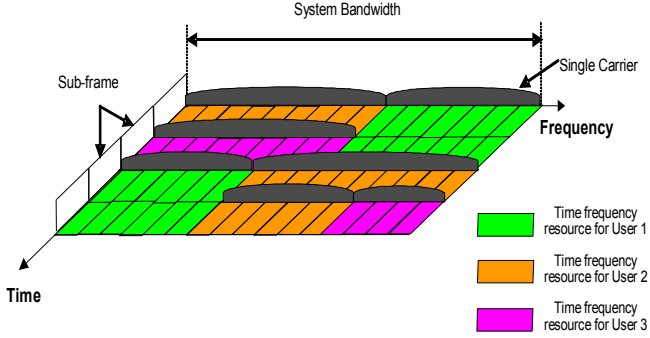


Multiple-Input Multiple-Output

Orthogonal Frequency Division Multiple Access



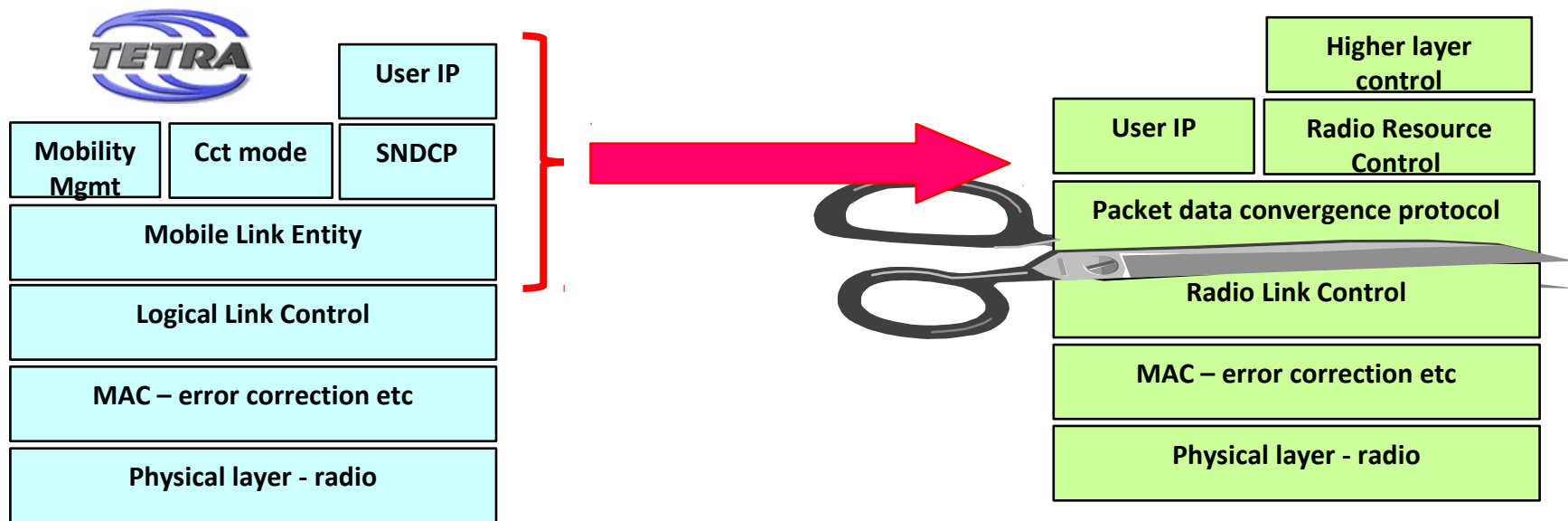
Single-Carrier Frequency Division Multiple Access



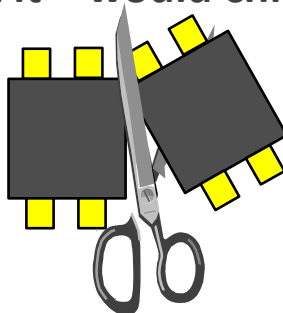
Can we mix and match from other standards?



- Can we build TETRA services by using some of the layers existing broadband standard such as LTE?

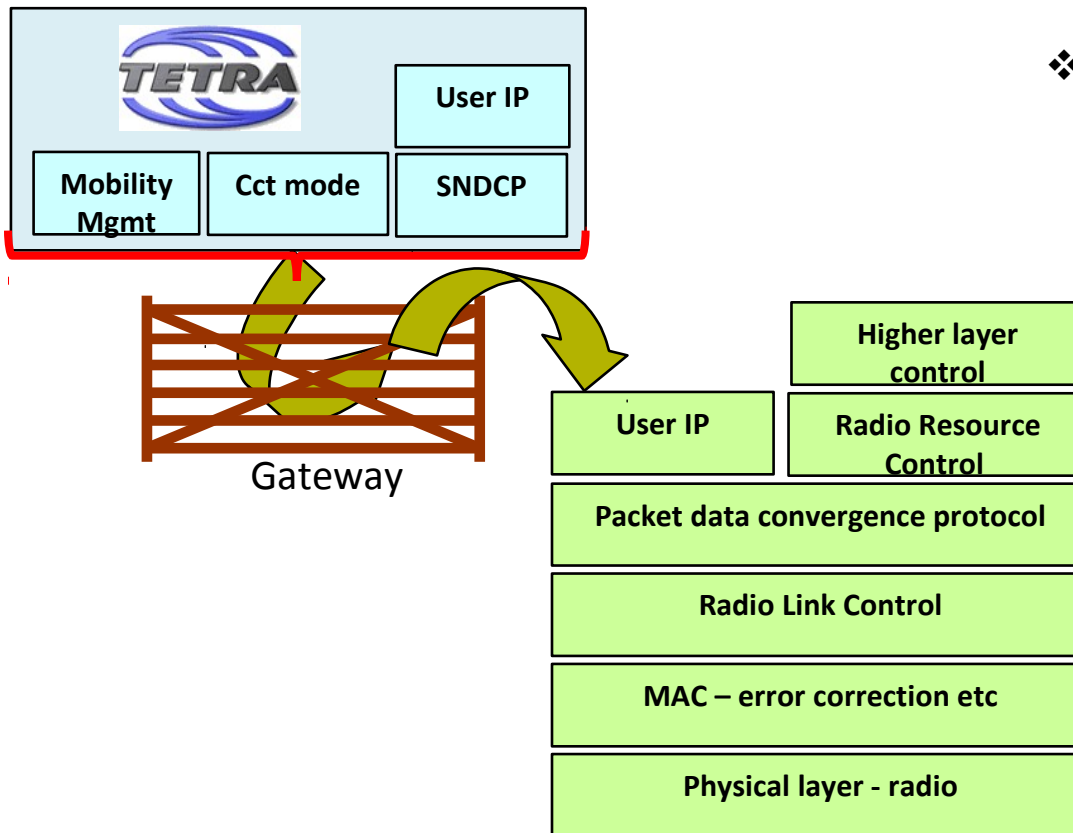


- But if we did, could we implement it – would chips be available?



Alternative 'application' approach

- Can we standardise TETRA services as 'applications' operating over another standard using IP?



- ❖ Several approaches could be followed:
 - ❖ 'Package' TETRA services and use the IP service of the broadband standard
 - ❖ Use an available service (e.g. based on IMS, SIP, PoC, or....) and standardise a gateway interface
 - ❖ Add End to end security
 - ❖ **NB: underlying protocols must support all the required services!**

Can LTE be used in the professional communications market?



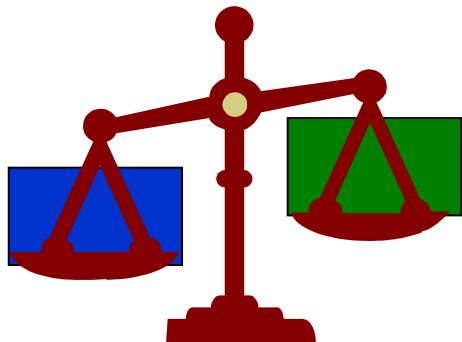
- **Already adopted in the USA for data, operating together with APCO Project 25 voice and narrowband data equipment**
- **Good spectrum efficiency**
 - Reuse same frequencies on every site
- **High capacity**
- **Spectrum – needs separation from existing narrowband equipment**
 - 1 MHz guardbands chosen in the US
- **Should we adopt it as a ‘standard’ for the professional mobile radio market as is?**
 - Data only for sure – depends on developments for voice

Tradeoffs when using commercial cellular technology



Positives:

- Access to technology developed from high levels of investment
- Rapid technology development
- Fundamental chipsets available
- Reuse of commercial applications



Areas for caution:

- ❑ **Fast development roadmap vs a conservative industry – danger of obsolescence**
 - GSM-R serves as an illustration
- ❑ **Reuse of technology doesn't mean use of commercial terminals**
 - Consumer terminal suppliers will not load the cost of additional bands into mass market terminals
- ❑ **Performance can be frequency band dependent – may not realise all of the benefits**
 - Coverage and capacity need careful attention
- ❑ **May be difficult to influence changes in a standard, even if requirements are presented:**
 - E.g. need a common interest to provide group call service
 - DMO?

Where do we go from here?



1. Complete the development of the requirements

- Work out which applications can be carried with existing narrowband and wideband systems, and which need broadband
- Use the numbers derived to reinforce the case for spectrum

1. Continue TEDS development

- Range/throughput improvements, such as Alamouti coding
 - (Use of two transmit antennas at base station)
- Efficiency improvements at the protocol level
- Consider whether any further TEDS channels are needed
 - >150kHz? Multiple channels simultaneously?

1. Continue the development of broadband

- Current work item running to 2015
- Actively looking at LTE as the base technology
- Will need to decide how it can be used

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THANK YOU.

QUESTIONS?

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