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TETRA to 2035 and beyond – an overview of the continuing enhancement of the TETRA standard 24 June 2020

View the webinar recording here

This document sets out the questions and answers given after the webinar

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Q. Are TETRA standards (i.e. ETSI EN 300 392-1,2,7,10,13) applicable in all countries around the globe or is there any country which has its own standards?

A. Our standards are global, not just in TETRA but other technologies that ETSI has been involved in and is now involved in through partnership agreements such as with 3GPP. There are other standards, but we believe this is the dominant one.

Q. For TETRA as a critical communication network, typically what length of back-up power time is needed and what kind of power sources are currently being used? Are there plans for renewable energy sources?

A. Renewable energy sources are being used, initially just UPS were used on base stations but on critical base stations back up of 48 hours is in place. Different countries have different strategies - in certain areas of Scandinavia for instance a week of battery back-up is required.

(Participant comment: You need a backup not only for base stations but also for GBN and Core (typically done with generators)).
(Participant comment: There are some hydrogen sites for backup out there).
(Participant comment: We use generators and UPS for our critical sites. For renewables, wind is not very common, but solar power is used for some remote sites).

Q. How many real-world instances are there of ISI implementation?

A. ISI is in operation between Norway and Sweden, Norway and Finland and Finland and Sweden.

Q. What would be the effective throughput of Group Addressed packet data?

A. A TETRA 1 base station using the multi slot packet data service typically gives about 10-12 kbit/s throughput. The throughput would reduce if significant amounts of error correction were added – so 50% redundancy might reduce the throughput to about 8 kbit/s or so. It is not an LTE-type of bandwidth, but it is still something useful for the more textual and low-resolution picture applications.

NOTE: This is the throughput to the group of MSs in a cell. If you consider that this is to every MS, you could multiply this by the number of MSs to reach the equivalent bandwidth in a unicast situation, so for example with 10 MSs this would be equivalent to 80 kbit/s or so.

Q. What key length is to be expected for encryption - 256 or higher? Or enciphering twice or more with different keys?

A. The sort of calculations that we have seen today indicate that something around 192 bits would be enough to resist any foreseeable technological attack from the sort of threat we are looking at – to well beyond 2045. Air interface encryption is one encryption process, one algorithm, one set of keys, and works in conjunction with end-to-end encryption, which adds a second encryption process, a second algorithm and a second set of keys, so that will result in double enciphering.

Q. The enhancements with error correction look very much like the methods used in DAB+, also an ETSI standard. Is the group looking also into this knowledge base?

A. DAB forward error correction process relies on its type of modulation and bandwidth, and error correction is applied across frequencies, different sub-carriers and also over time. We don't have the air interface adaptability to do some of the frequency diversity aspects of error correction, so we are looking at something that operates more linearly using a very well tried and tested solution – just simply extending the amount of redundancy. The effect of that transmits more data, hence takes a little more time.

Q. What support will there be for sharing terminal/UE location information between a 3GPP system and a TETRA system?

A. If the TETRA LIP protocol over short data is used it can be transmitted from a TETRA user to something on the 3GPP side, or vice versa – so that certainly is going to be supported. However it seems more likely that each system will provide its own location feed to a central location system. , The resolution that is possible will be different between the two systems, because TETRA does have limited bandwidth so the number of updates you could provide from a terminal over a period of time is less than is possible on the MC side. It seems more likely that each system's mobile users will be sweeping up their location into a central server, and then the central servers will share that information so that the appropriate picture is available to any user that needs it.

Q. Is the primary aim of IWF/ISI to prolong the 'life' of TETRA to the horizon of 2035 mentioned?

A. No - that may be a consequence but the primary requirement is the number of different countries and users that are looking at 3GPP mission critical applications – either to work side by side with TETRA or to eventually replace it. We need a means of communicating between the two.

Q. Do you know if P25 as a standard is working on a similar IWF model, and if so, would there be a pathway that TETRA could "speak" to a P25 system using the same IWF standard?

A. P25 are going down their own route but essentially they have the same problem to solve which is the translation from the protocols and speech format from a P25 system to those of an MC system. However, any means of connecting a TETRA system to a P25 system via an intermediate MC system is really outside the scope of the standards work that we are developing.

Q. Do you think P25 will stay the test of time like TETRA will?

A. As this webinar concerns TETRA only this is not a question that we are qualified to answer.

Q. Are there are some plans to make interoperability with PoC (Push to talk over Cellular)?

A. No, there are no user requirements being brought forward for that. The only user requirements that we are responding to are those that adapt to 3GPP mission critical systems.

Q. Do you believe the NATO band 380-410MHz to be reserved until end of life for TETRA in Europe?

A. The sharing of the spectrum is an agreement with NATO – it is up to each country to negotiate with the NATO authorities regarding keeping the spectrum. As long as there is a network in operation for public safety there should not be any issues but going forward the spectrum will return to NATO if and when the network ceases to be operational.

Q. Is there any relation between TCCA and the interoperability work with the GSM-R efforts to become part of 3GPP standard?

A. In 3GPP the Future Railways Mobile Communication System FRMCS is a feature that is being worked on in the current release of standards. That work has all been predicated on the work that TCCA members and other interested parties did on mission critical features in 3GPP, so there is definitely a link. From the 3GPP side, the study that is going to take place in expanding railway technology in Release 17 is going to look at interworking with GSM-R as one of its requirements.

(Participant comment: It is also anticipated that the GSM-R interworking architecture will be similar to 3GPP architecture for LMR interworking unless good reasons otherwise)

Q. Will there be a limitation on the number of groups that can be "interconnected" between TETRA and MC 3GPP? Will this be vendor related?

A. The standard will have no limitations, it will be simply down to the practical side that the vendor is able to support and what is needed in the circumstances of the network itself.

Q. Does TETRA have a future in the UK once ESN is implemented?

A. It depends on the rate of progress of ESN and other markets – there are other organisations using TETRA in the UK but ESN is clearly designed to replace TETRA services.

Q. Is there a plan of standardisation about the dispatcher interfaces, not to use separate dispatcher solutions for TETRA users and for 4G/5G users?

A. There is a plan and TCCA will be taking this up following the workshop in Berlin earlier in 2020.

Q. Have you considered transcoding the media on the interworking gateway instead of having a TETRA codec on the MCPTT handset?

A. Yes – absolutely – we think for the majority of users that is exactly what the solution is going to be. The gateway will take the 3GPP encoded speech and will transcode it to TETRA ACELP in one direction and do the opposite in the reverse direction. That means TETRA terminals do not need to know anything about MC systems, and MC systems do not need to know anything about TETRA. A TETRA codec will only be needed on the MCPTT handset if fully end to end encryption is required.

Q. Are the TETRA associated equipment vendors also planning hybrid endpoints 5G-TETRA?

A. That would be up to individual manufacturers. With the interworking interface the standard will give you the means to let information be transferred between the two; how you realise that in product is really up to the vendors.

Q. With MCPTT solutions already in deployment around the world, some with pre-standards TETRA interworking, are the standards taking into consideration these technologies to avoid significant change to these pre-standard integrations?

A. That would be very difficult as if they are pre-standard, we do not know what they are. Pre-standard solutions need to be considered case by case and business by business in terms of what they need to achieve and whether they have any need to change.

Q. How would it be possible to extend the base station range from 58km with the current delay time limitation?

A. The original range was set to 58km and that was determined by the TDMA slot timing. The TETRA mobile is allowed to ramp up over a few bits at the start of its timeslot, then it transmits its burst, then it ramps down over a few bits at the end. If the bits during ramp down at the end of transmission start to overlap into the following timeslot and cause interference, then there is a clash. The range limitation sets the boundary where this overlap would start. When we increased the range to 83 km for TETRA 1 it was done by shortening the ramp time of the TETRA mobile, so it waits a little bit longer then ramps up more quickly, and when it has finished transmitting it ramps down more quickly. That lets the mobile in timeslot 1 be a bit later before it ramps down before the mobile in timeslot 2 needs to start transmitting, and therefore before the overlap occurs. Allowing the transmission to be received that little bit later at the base station gives you that extra range. That was all part of the TETRA 2 development and increased the range to 83km. The TEDS Enhanced Data Service has a slightly different ramp timing and gives a range of around 90km.

Q. If TETRA is going to be around to beyond 2035, why is there not a TETRA-R standard to replace GSM-R?

A. TETRA did not need an R standard, it was suitable for rail use as it was, it was GSM that had to be modified.

Q. Is there a plan for a standard logging interface in MC which can also be applicable for TETRA IWF?

A. Within SA6 in 3GPP, there was a study into logging and discreet listening, looking at what is needed to be done within the 3GPP standards. It is still just a study, but we hope at some point 3GPP will follow that up with normative work. If the 3GPP logging solution becomes a normative solution, then it will inherently cover interworking as all users and group communications can be logged.

Q. You mentioned that there are planned changes in Key Management, can you say something more about these changes? Are these changes specific to AIE keys?

A. The key management protocols and mechanisms will remain the same. However because the keys for the new algorithms will be longer, the encrypted keys will be longer and new key management messages will be needed to carry these keys.