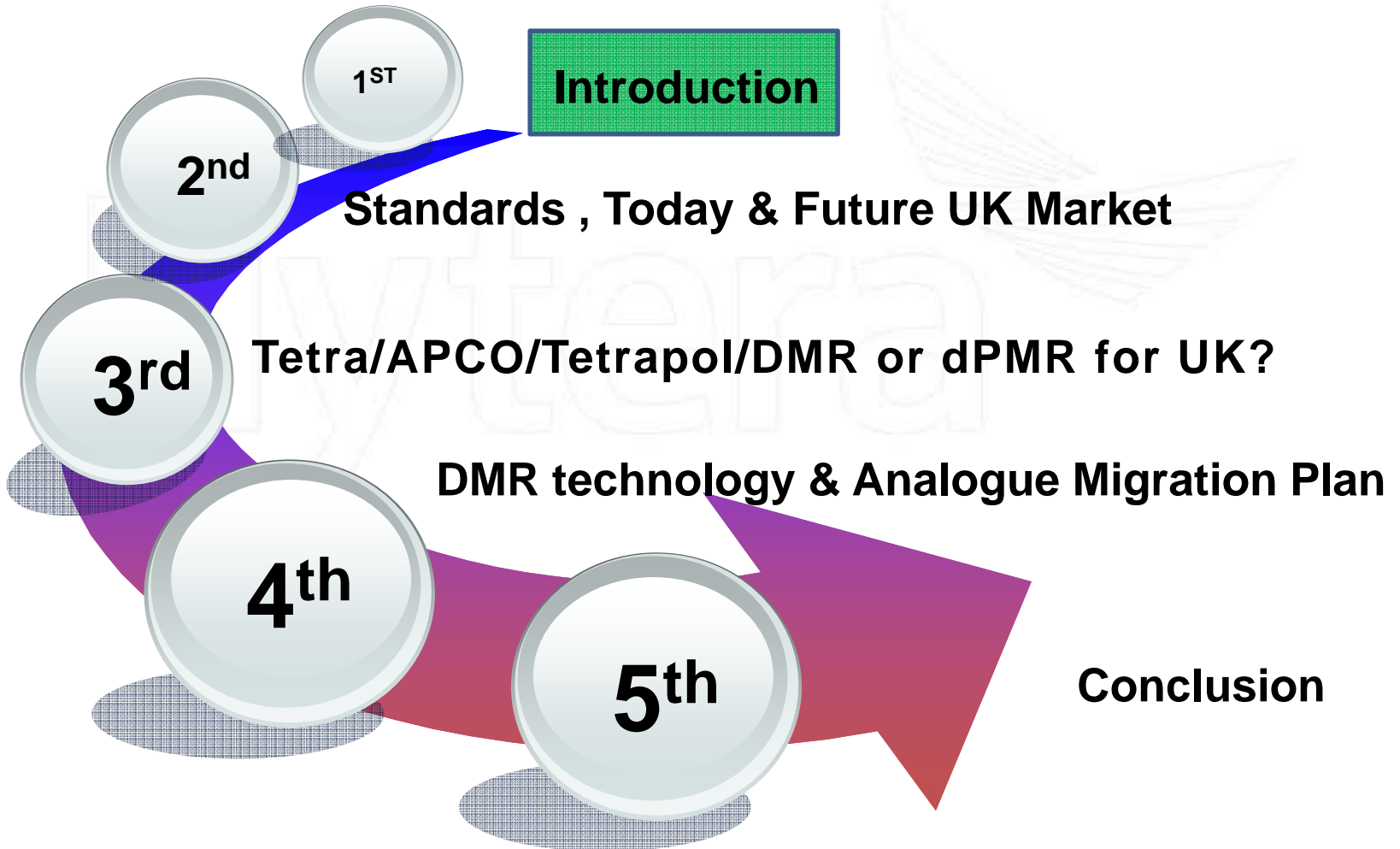




Business Radio 10



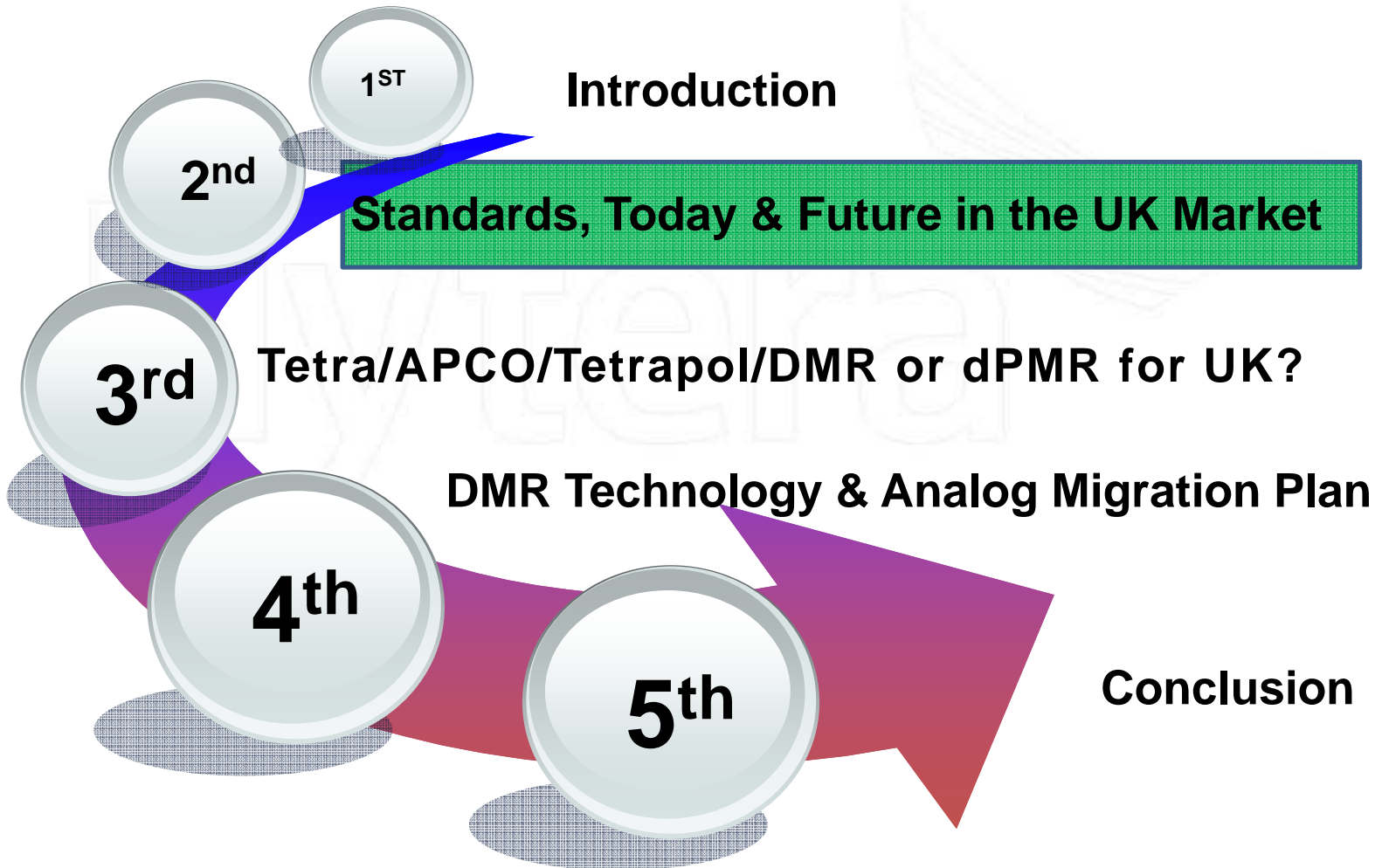
Digital Technologies For The UK Market





Introduction

Analogue to digital migrations had been a trend in the communication industry for quite sometime. It started in the 1980s' with the Cellular market migrating towards a GSM TDMA digital solution. Professional Mobile Radio; PMR, markets had traditionally favored analogue design. But with increasing demand for higher security, audio quality, longer battery life and channel capacities, analogue equipments are undergoing a change to move towards a digital solution.





Available Technologies

	Conventional	Trunked
Analogue	Analogue Conventional	MPT1327 APCO-P16 LTR PASSPORT EDACS
Digital	TETRA Tetrapol APCO P25 DMR dPMR EDACS OpenSky	TETRA Tetrapol APCO-P25 DMR dPMR EDACS OpenSky



FCS Business Radio 10



Today UK Market

Public Safety & Security, Professional & Commercial business uses analogue technologies for their communication needs because of its flexibility and ability to be customized to provide unique solutions for nearly every requirements. PMR digital migration started in 1994 with Tetra, Tetrapol and APCO. This was followed by DMR products which began shipping to Europe in 2008 and dPMR products shipment to Europe started in 2009 after ETSI released the dPMR standard.

Analogue conventional radios in general uses FM modulation and 5-tone signaling, operating in the 25kHz or 12.5kHz channel spacing and MPT1327 trunking had been the preferred trunking solution for UK.

In general UK and Eire PMR is still predominately an analogue market and according to latest IMS report which projects 21,843 units of low cost digital terminals sales in 2010 and 119,885 analogue terminals shipped in the same period.



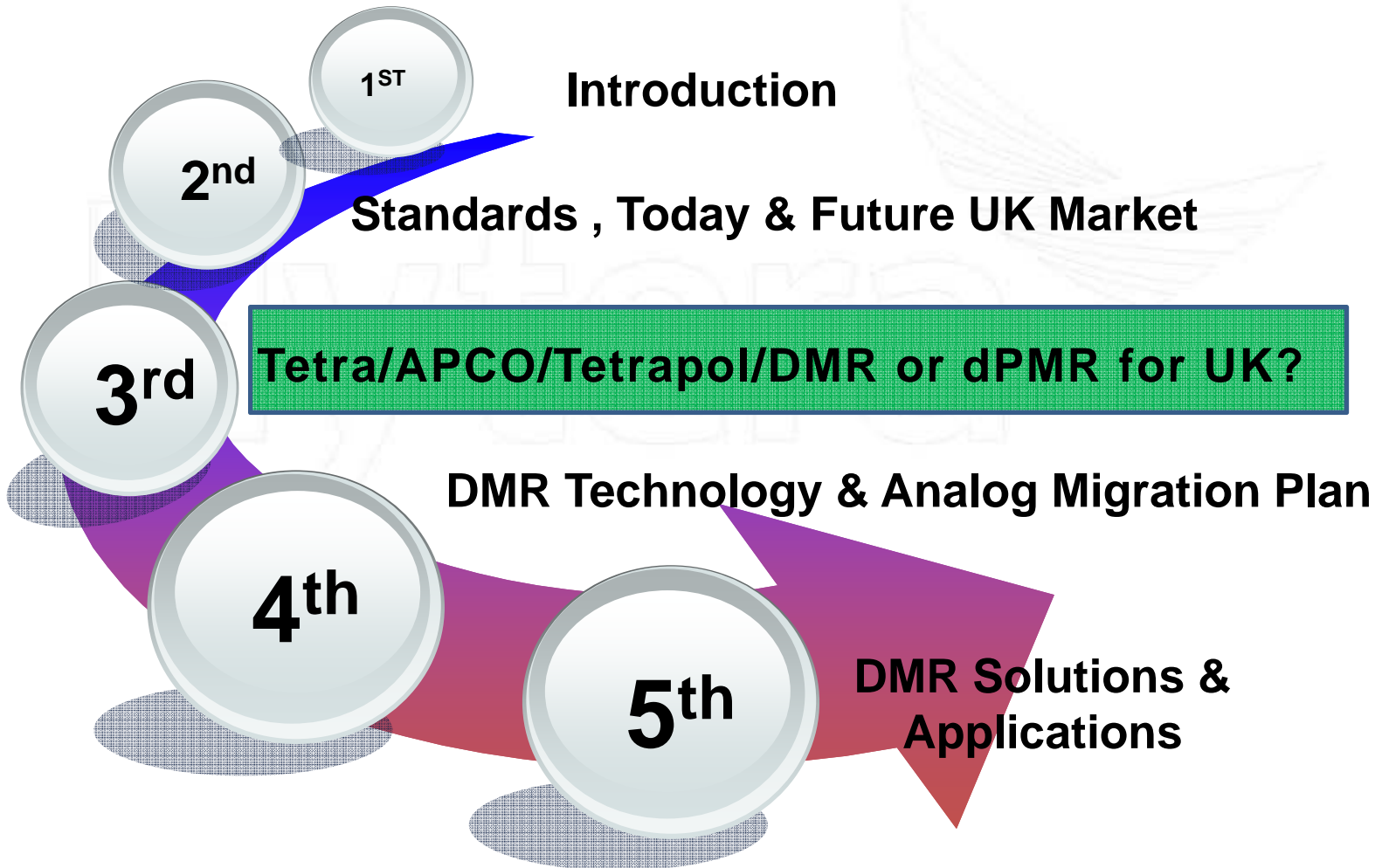
UK Market Future Trend

Table 3.50
UK & Eire Radio Terminals Shipped by Technology
Units Shipped

Technology		2008	2009	2010	2011	2012	2013	CAGR 08 - 13
Analogue	New Units	2,901	874	0	0	31	3	-59.6%
	Replacement Units	138,367	118,473	119,885	115,832	109,580	98,711	-6.5%
	Total Units	141,268	119,347	119,885	115,832	109,612	98,744	-6.9%
TETRA	New Units	11,840	19,858	19,552	25,000	36,124	3,248	-22.8%
	Replacement Units	45,134	45,239	49,334	53,645	59,950	60,226	5.9%
	Total Units	56,974	65,097	68,886	78,645	96,074	63,474	2.2%
TETRAPOL	New Units	140	0	0	0	0	0	-100.0%
	Replacement Units	555	569	569	569	569	569	0.5%
	Total Units	695	569	569	569	569	569	-3.9%
P25	New Units	0	0	0	0	0	0	-
	Replacement Units	90	106	106	106	106	106	3.3%
	Total Units	90	106	106	106	106	106	3.3%
Low Cost Digital	New Units	3,070	13,797	21,674	32,196	56,866	74,189	89.1%
	Replacement Units	0	0	169	771	2,829	7,655	-
	Total Units	3,070	13,797	21,843	32,967	59,695	81,844	92.8%
EDACS	New Units	0	0	0	0	0	0	-
	Replacement Units	0	0	0	0	0	0	-
	Total Units	0	0	0	0	0	0	-
Other Digital	New Units	0	0	0	0	0	0	-
	Replacement Units	0	0	0	0	0	0	-
	Total Units	0	0	0	0	0	0	-
Total Units	New	17,951	34,529	41,226	57,196	93,021	77,467	34.0%
	Replacement	184,147	164,388	170,063	170,923	173,035	167,270	-1.9%
	TOTAL	202,098	198,916	211,289	228,119	266,056	244,738	3.9%

Source: IMS Research

Feb-10





Which Technologies For UK?

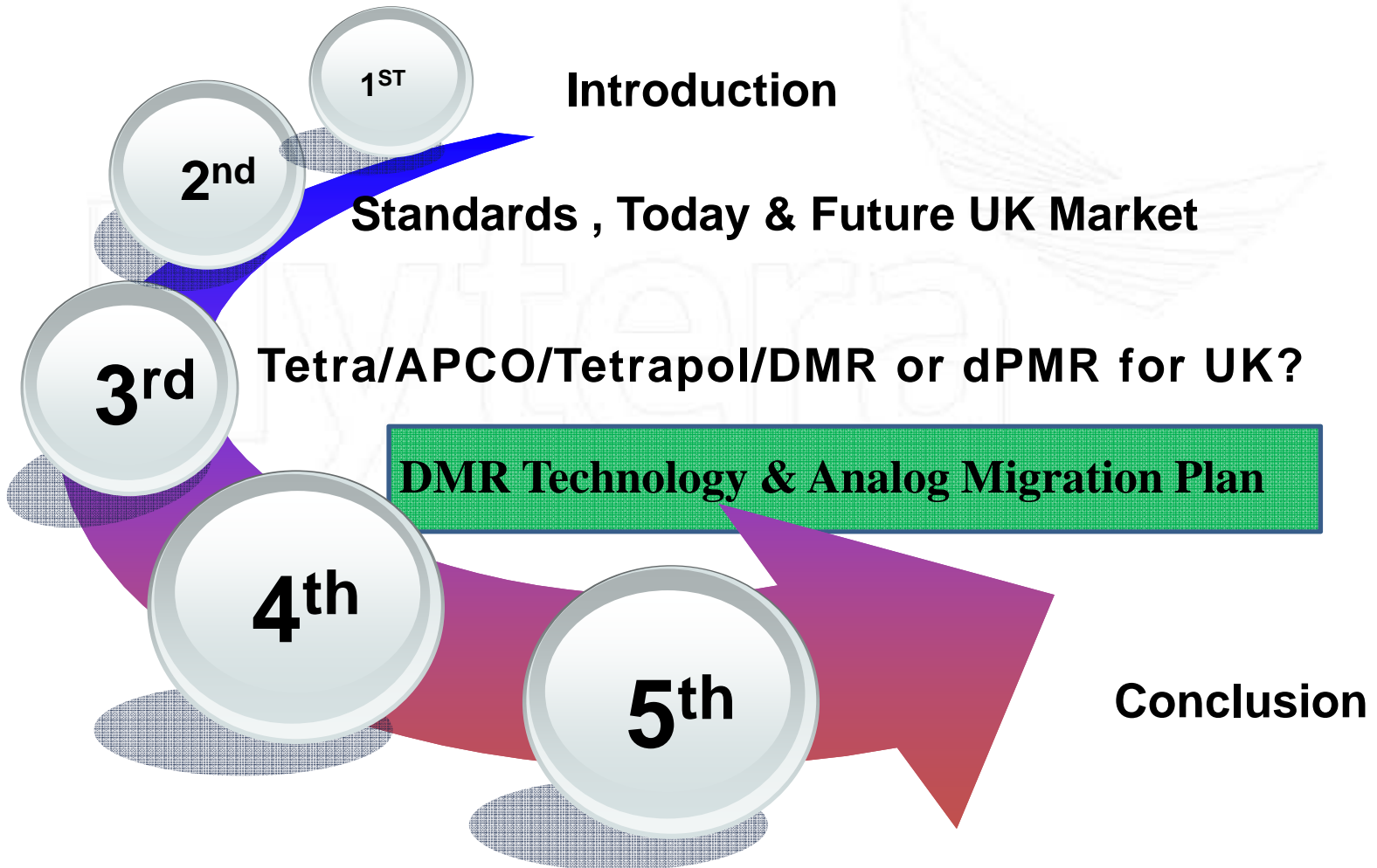
The fundamental needs in UK is to replace aging analog equipments with new digital ones which offers:

- i) double channel capacity (more efficient channel spectrum utilizations)
- ii) longer battery life with the same battery capacity
- iii) better audio quality
- iv) higher security
- v) support data & text messaging without additional cost
- vi) better call controls & features
- vii) same or better range and coverage
- viii) easier network integration; IP ready
- ix) better or same data rates
- x) support easy migrations
- xi) Plug & Play into existing frequency license without needing to modification



Tetra, DMR & dPMR Compared

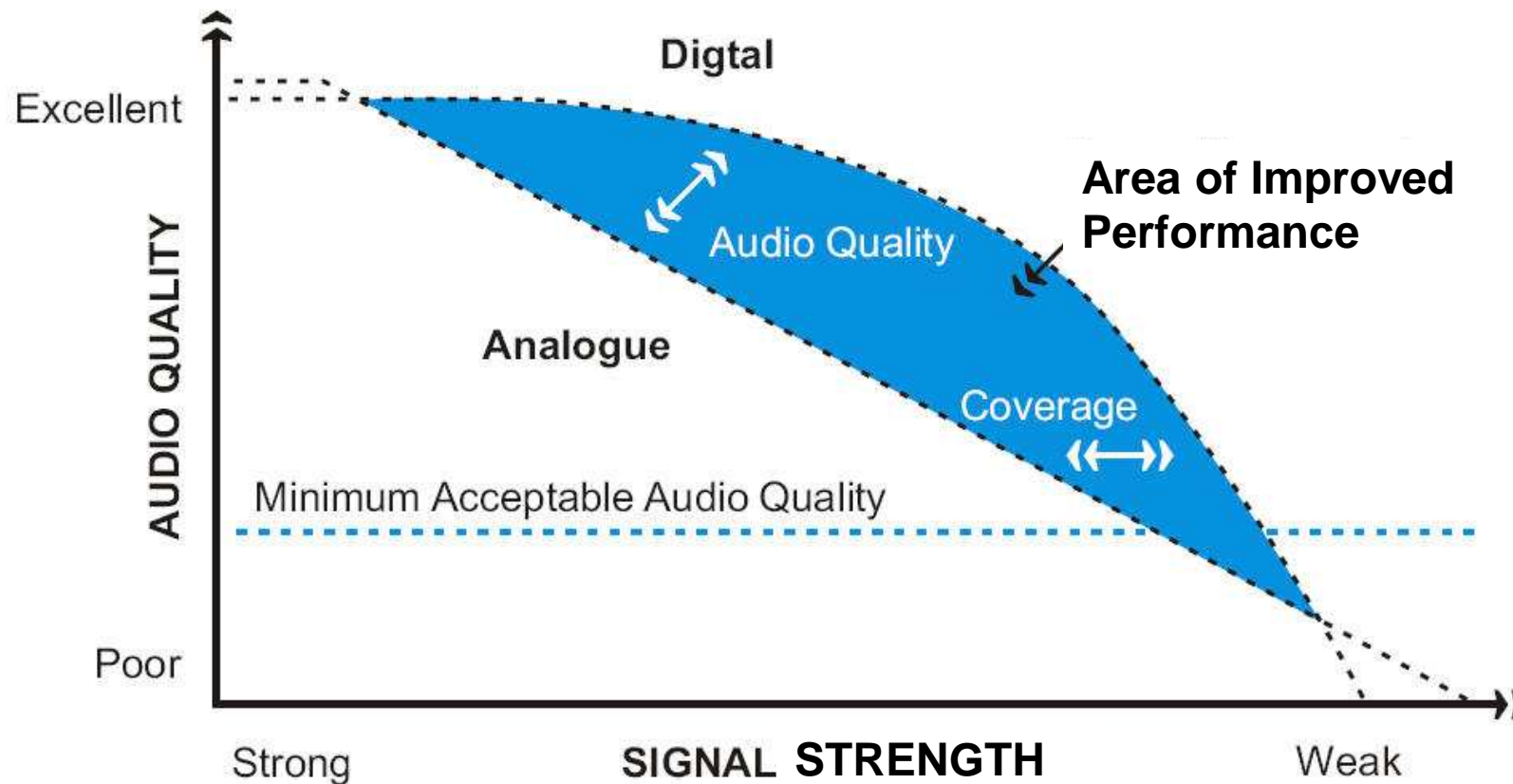
No	ADVANTAGES & DISADVANTAGES	TETRA	DMR	dPMR	comments
1	Technology Used?	√	√	√	
	FDMA (4FSK)	X	X	√	
	2 slot TDMA (4FSK)	X	√	X	
	4 slot TDMA ($\frac{1}{4}\pi$ DQPSK)	√	X	X	
2	Spectrum efficiency ?	√	√	√	
	25kHz?	√	√	√	
	12.5 kHz	X	√	√	
	6.25 kHz	X	X	√	
	6.25e kHz	√	√	X	
3	All band uses same bandwidth?	√	√	√	
	700/800/900	X	√	√	
	Uhf	√	√	√	
	Vhf	X	√	√	
4	6.25kHz / 6.25e kHz Direct Mode Operation?	√	X	√	Hytera True-2 Slot & Psuedo Trunking in DMO
5	Low subscriber unit cost	X	√	√	
6	Low Infrastructure Cost for 2 repeater channels?	X	√	√	
7	Interoperability between analogue & digital fleet?	X	√	√	
8	Interoperability with other dPMR, DMR or Tetra system?	X	X	X	Need multi-protocol repeater or system
9	Good Audio quality	√	√	√	DMR & dPMR use AMBE++ LR DVSI Vocoder
10	Good Range Performance	X	√	√	Tetra 1W RF limits coverage (maximum tunable is 1.8W)
11	Better Battery Life	√	√	X	Tetra 1W reduces current drain (most manufacturer can go up to 1.8W Hytera Tetra $\geq 3W$)
12	Data rate ≥ 9600 bps @ 12.5kHz and 4800bps @ 6.25e kHz	√	√	X	Tetra is able to substain up to 36kbps while dPMR=4.8kbps
12	Backward compatible with analogue 25KHz /12.5KHz	X	√	√	
13	Trunking system available?	√	√	√	DMR Tier III/NXDN/iDAS
14	Platform for future integration of IT/IP/VOIP etc.	√	√	√	





Improved D & A Audio Quality & Range

- Clearer voice over a greater range
- Expanded range
- Static and noise rejection

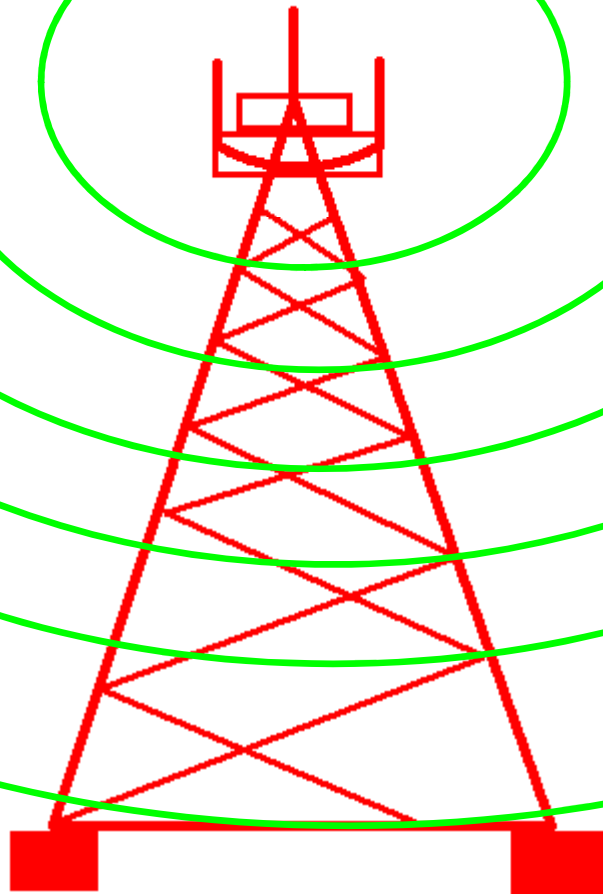




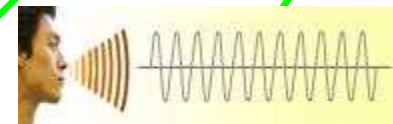
Audio Quality At Fringe Range

Signal Strength / Coverage

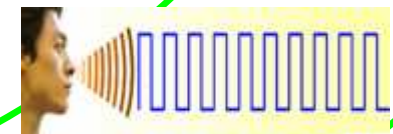
Edge Of Coverage



analog



digital





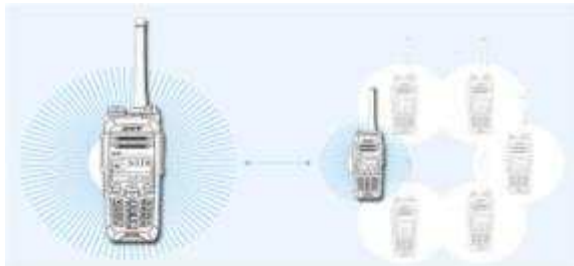
DMR advanced digital voice features

features	benefits
All call	Ensure Entire radio fleet is instantly provided with critical information
Group call	Helps ensure critical work group are fully informed
Private call	Allows call to be directed at individuals
Channel Scan	Supporting mix mode scanning (analogue & digital channel) . Helps ensure all relevant calls are heard
PTT ID & Aliasing	Allows the receiving party to instantly identify the caller and respond accordingly
Talk around	Enable the radio to communicate directly with one another
Emergency	An emergency call can be confirmed to maximize the employee's safety and accelerate incident response



TDMA Advantage : Enhanced Calling

- *Enhanced Selective Calling*
- *Improve the call and channel management, and adding more features*



One-to-One



One-to-Many



One-to-All

Easier & faster communications less missed calls

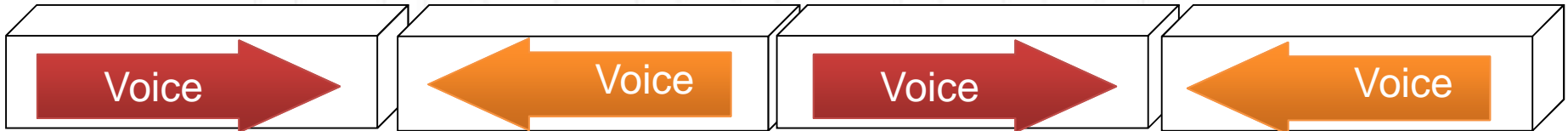
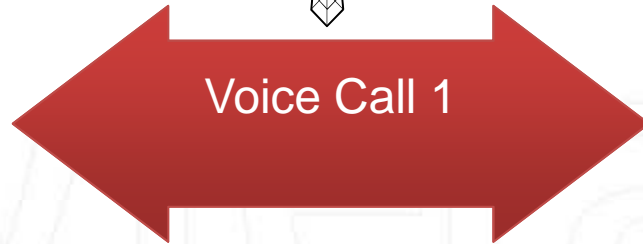
- Many more addresses
- Simple, transparent call set-up
- Late call-entry



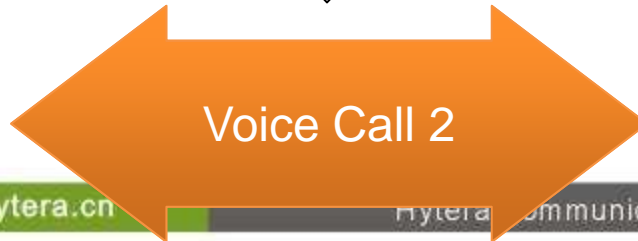
TDMA Advantage: Double Voice Capacity



Through the repeater

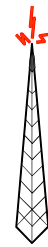


Through the repeater

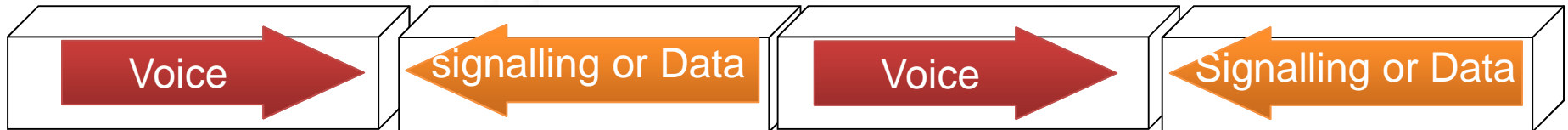




TDMA Advantage: Double Capacity



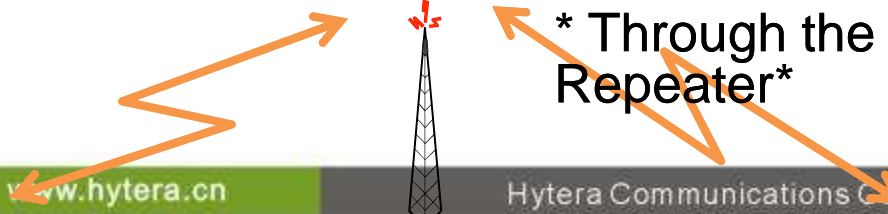
* Through the Repeater*



- *Priority call control*
- *Data control*



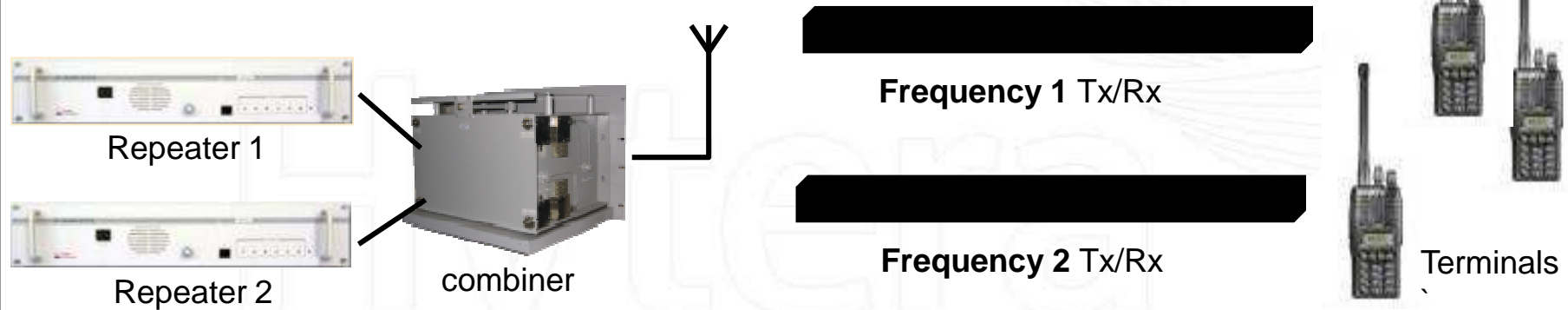
* Through the Repeater*





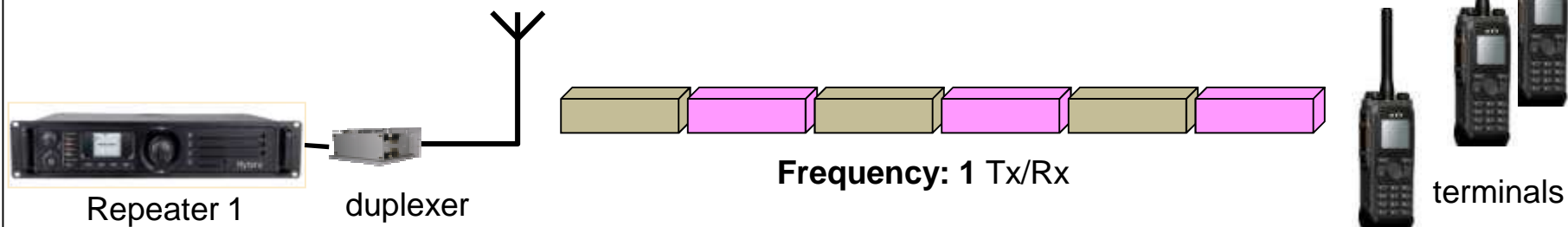
Entry Level : Reduce infrastructure cost

2-channel Analog or Digital FDMA System



2-channel Digital TDMA System

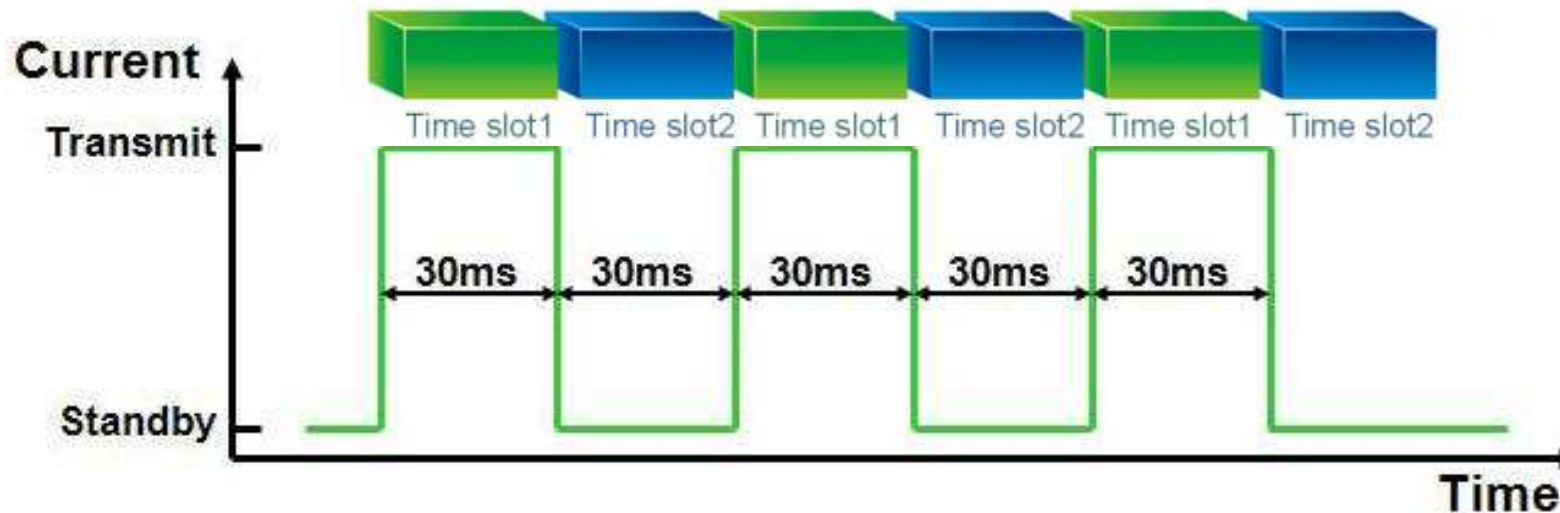
- Reduced equipment costs
- Lower licence costs





Longer battery life

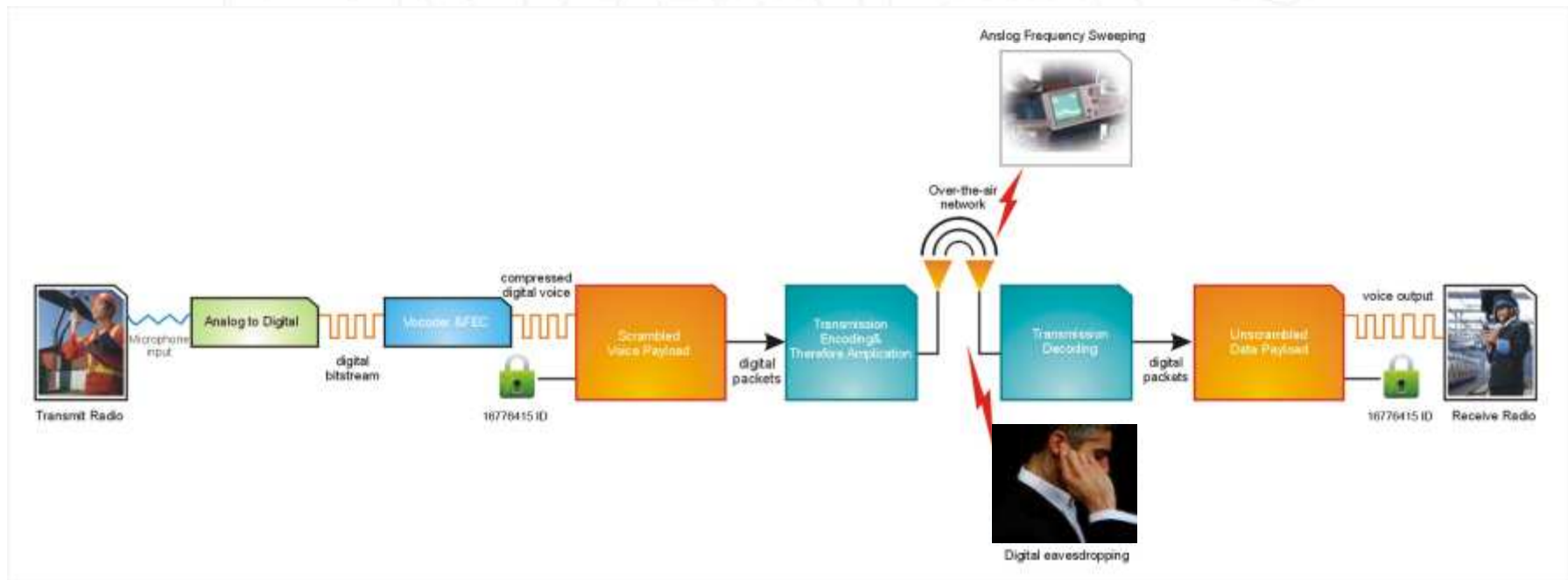
- 80% of battery is consumed during transmission;
- Two-slot TDMA, however, offers a good way forward. Since an individual call uses only one of the two timeslots, it requires only half of the transmitter's capacity.
- 40% Battery Life Improvement with TDMA





Enhanced privacy with digital technology

- On analogue channel , the audio signal can still be monitored even it is not easy to identify.
- Digital offers inherent protection against casual eavesdropping using scanner etc. On a digital channel , the audio signal cannot be heard if the signaling or ID doesn't match. (16776415 ID)





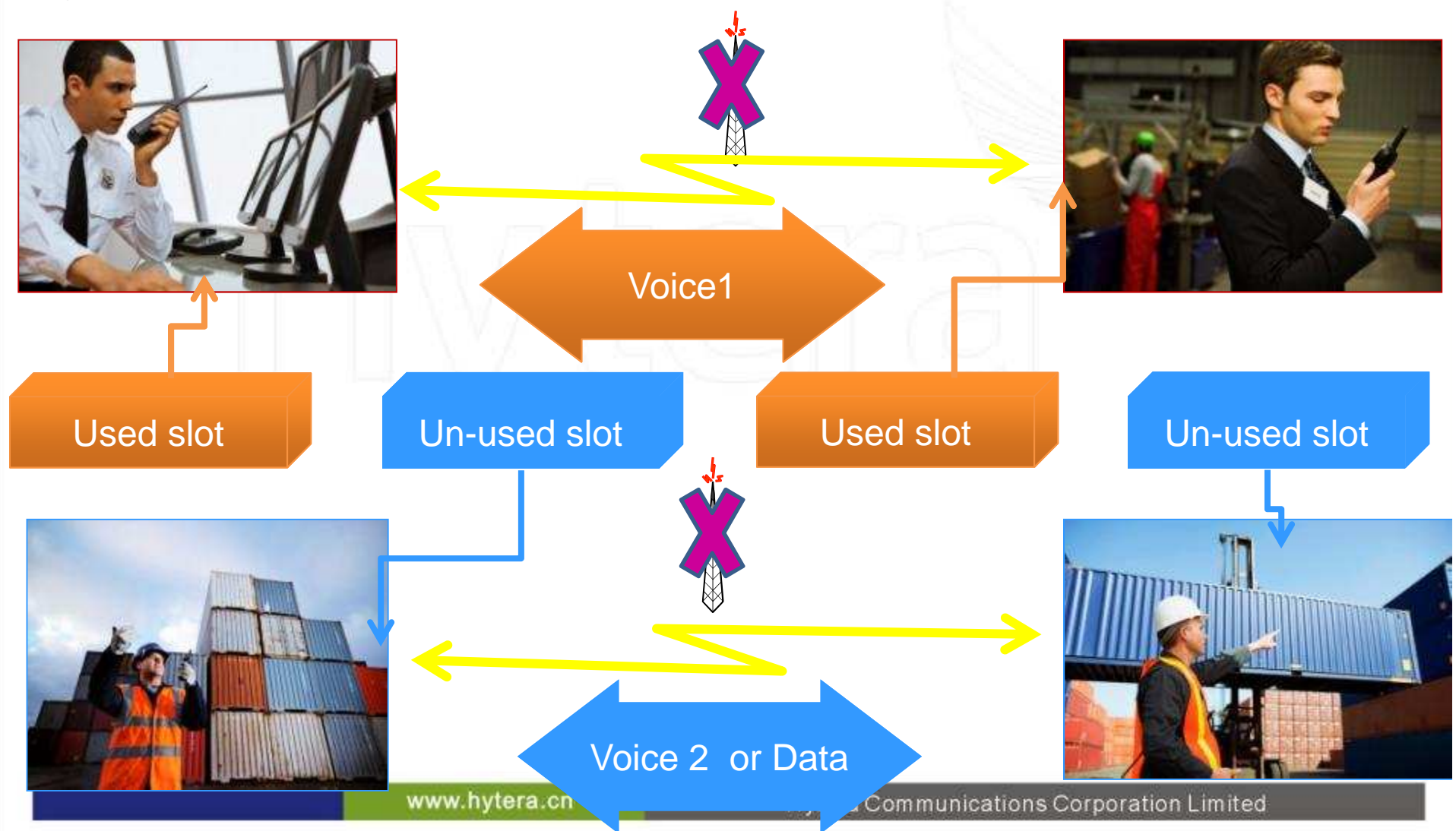
Co-exist with analogue system

- 12.5kHz channel spacing in digital mode and 12.5/20/25kHz channel spacing selectable
- Mixed mode scanning (scans both analogue channel and digital channel);



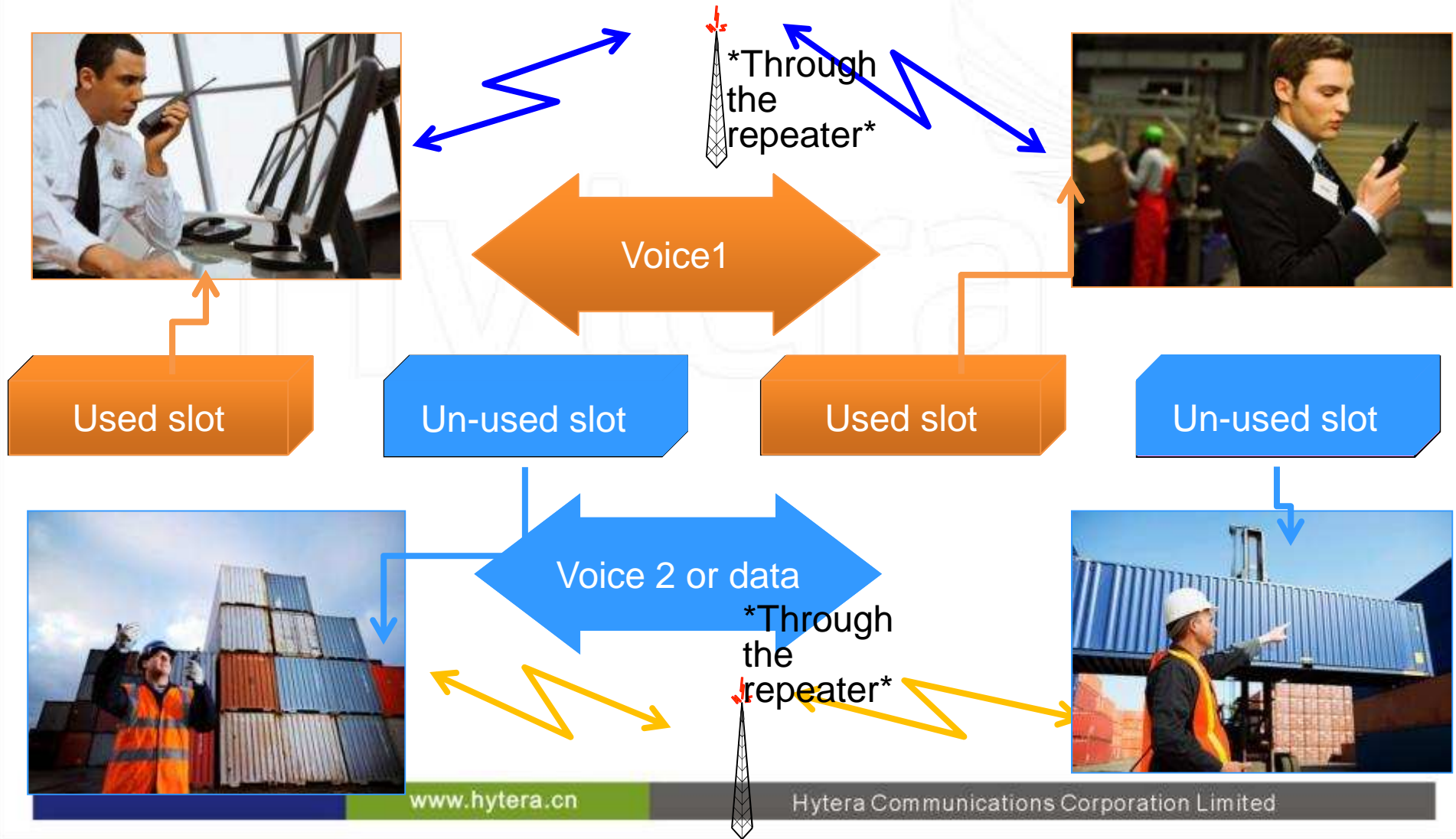


Hytera: DMO Pseudo Trunk





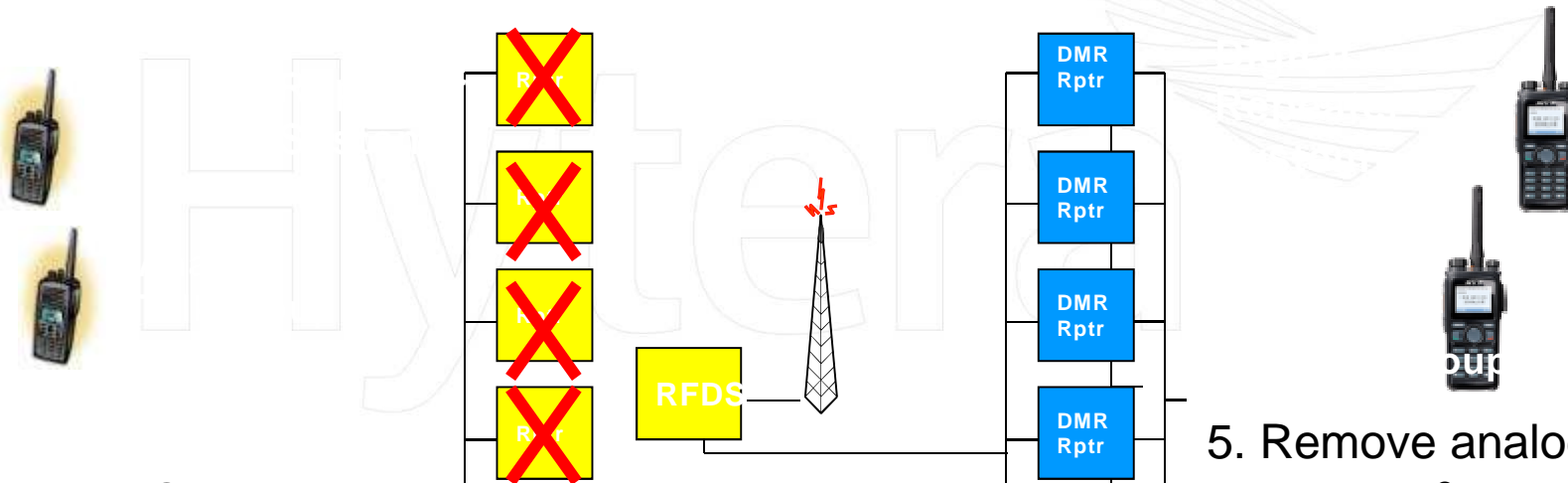
Hytera: RMO Pseudo Trunk





Analogue to Digital Repeater Migration

Hytera DMR Smooth Migration: Multi-channel system



1. Add Digital Site,
Remove some
analog repeaters

2. Start migration of
talk groups

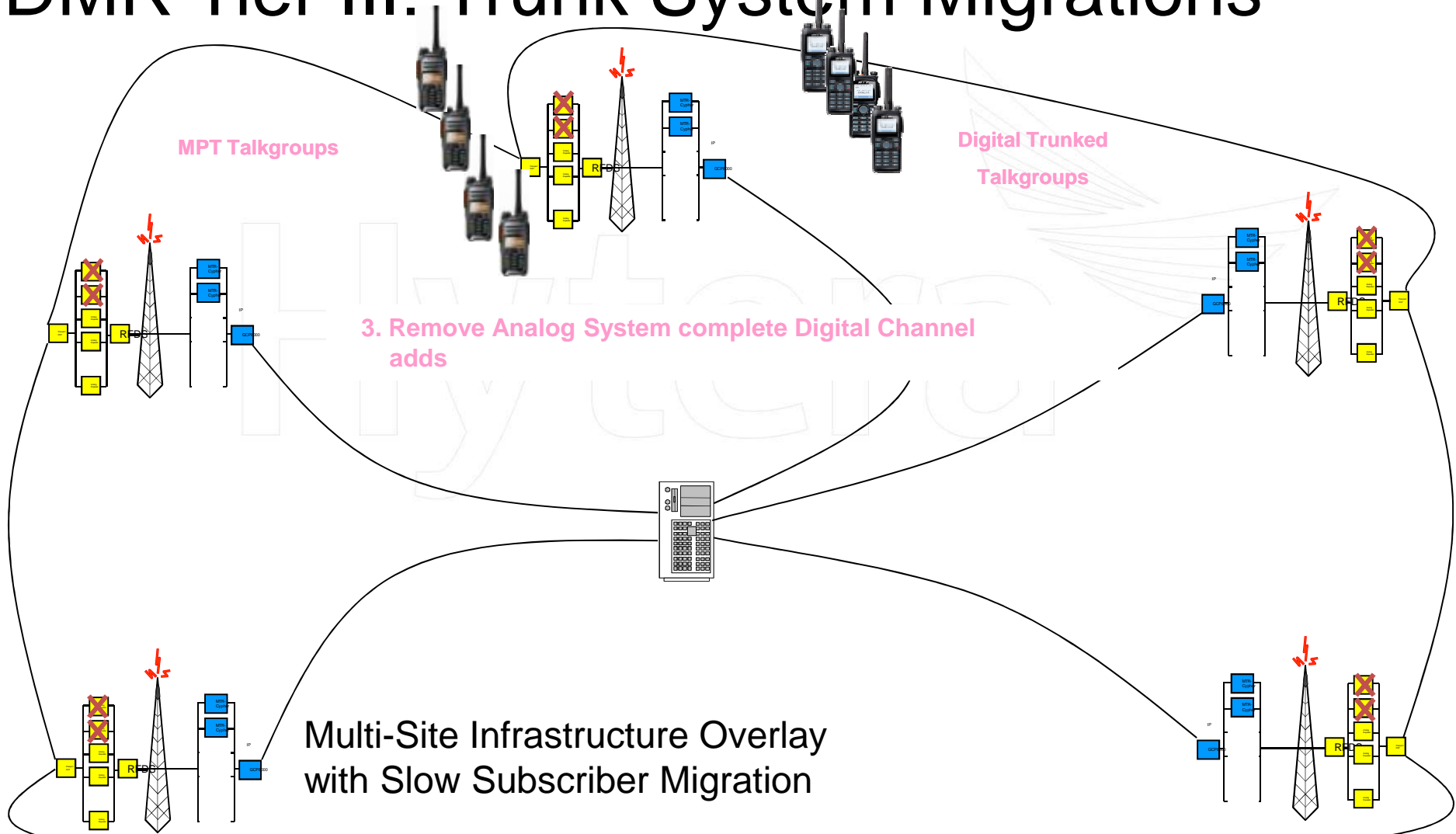
3. Move more
channels to digital

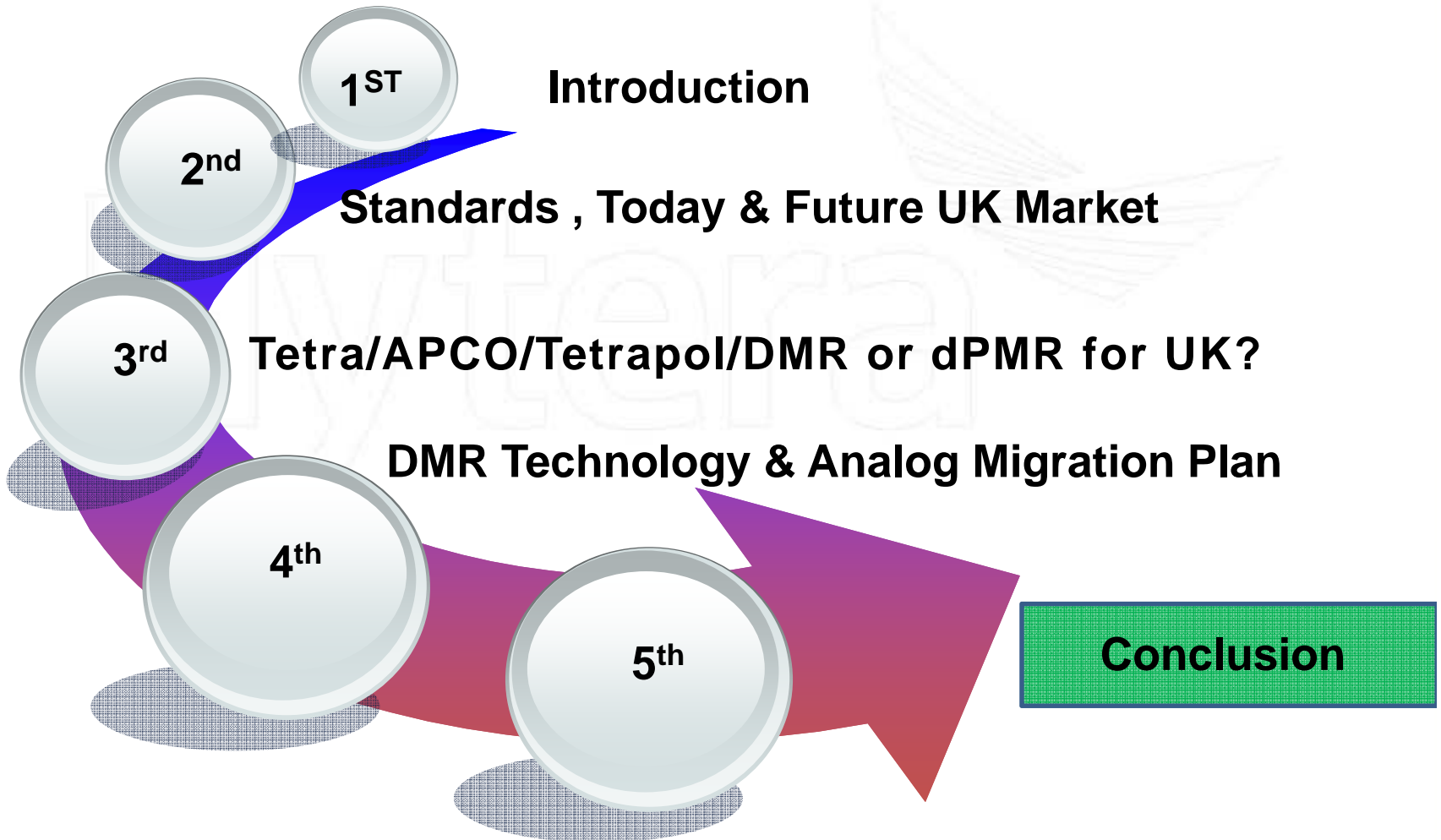
4. Complete talk
group migration

5. Remove analog
system & complete
digital channel
adds



DMR Tier III: Trunk System Migrations





Conclusion

Analogue migration to digital is inevitable. DMR and dPMR protocols are attractive technologies that offers to solve the high terminals and infrastructure cost with an added bonus as it is easier to achieve backward compatible to the old analogue systems. With limited frequencies spectrum availability it's very little OfCom can do as it has no spectrum to allocate for 6.25kHz utilization. The other alternative would be to re-farm the existing 12.5kHz frequencies, which of course will exclude DMR technology and also will be too costly to endure. There is a high desire for the new product to be able to be Plug and Play as it offers the least pain to migrate to digital!. These two protocols can be considered pretty future proof as long as the basic requirements to maintain narrow band (6.25kHz, 6.25e), good range and low cost private systems are the main objectives. So until there's a big change to these basic needs, the DMR and dPMR protocols are here to stay.

ACKNOWLEDGEMENTS

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Hytera

Thanks You!!!