

DMR

DIGITAL MOBILE RADIO ASSOCIATION

DMR Tier III A Global Standard for Critical Communications

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Honorary Director DMR Association

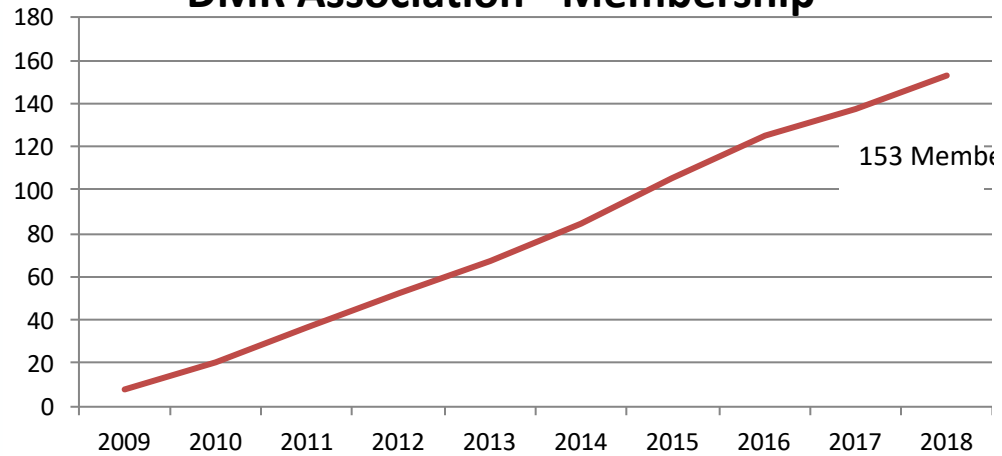
The DMR Association

- Industry body representing the DMR market.
- Established in 2005 as the DMR-MOU Association to support ETSI during the DMR standardisation process our membership is open to companies, organisations and individuals who build or use professional DMR products.
- We're in frequent and direct dialogue with regulators, trade bodies and standards organisations around the world to maintain the DMR standard for our members.

DMR Association Mission

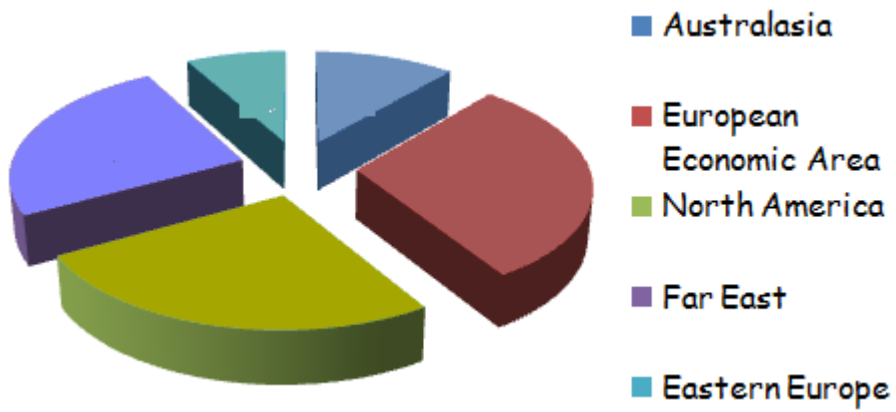
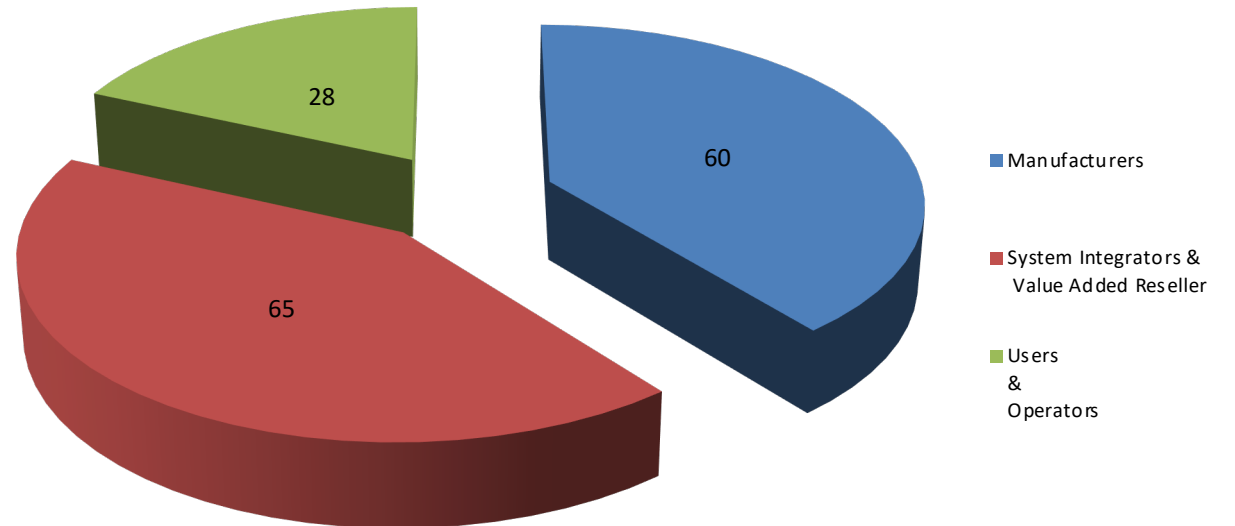
- For DMR we:
- Support the growth of the market.
- Operate an interoperability testing and certification program.
- Offer education, promotion and discussion about the standard.
- Work with regulators to provide technical support and expertise.

DMR Association - Membership

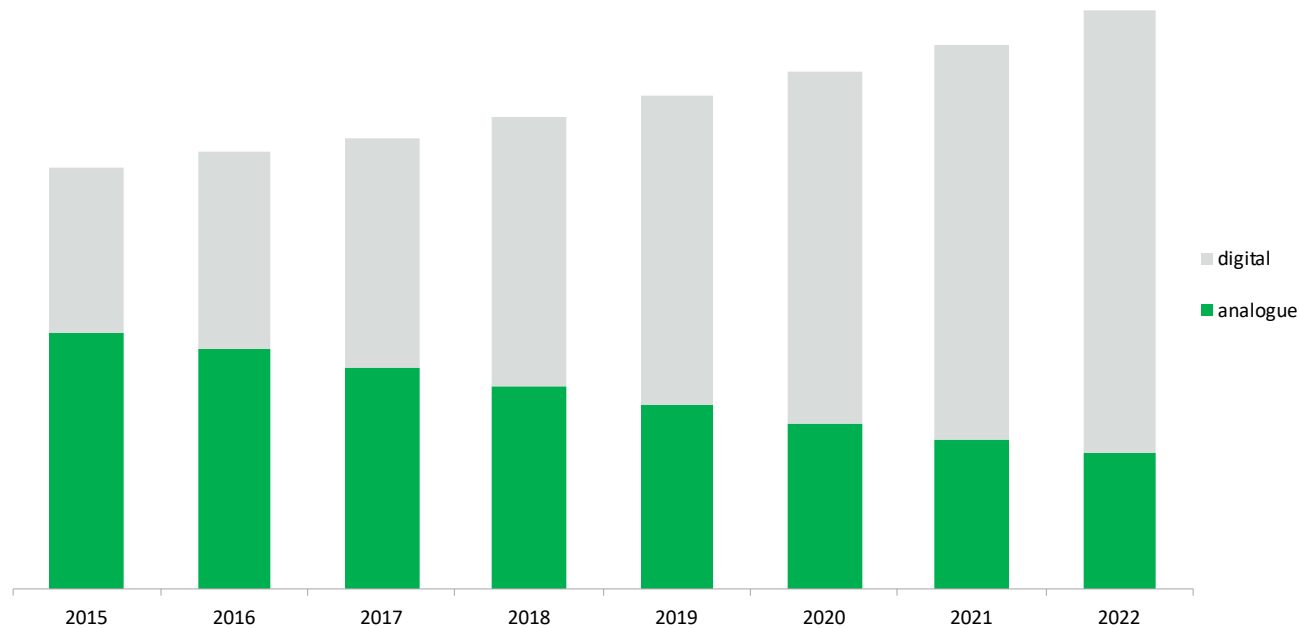


Update, 153 members as of November 2018

DMR Association - Membership



Digital migration

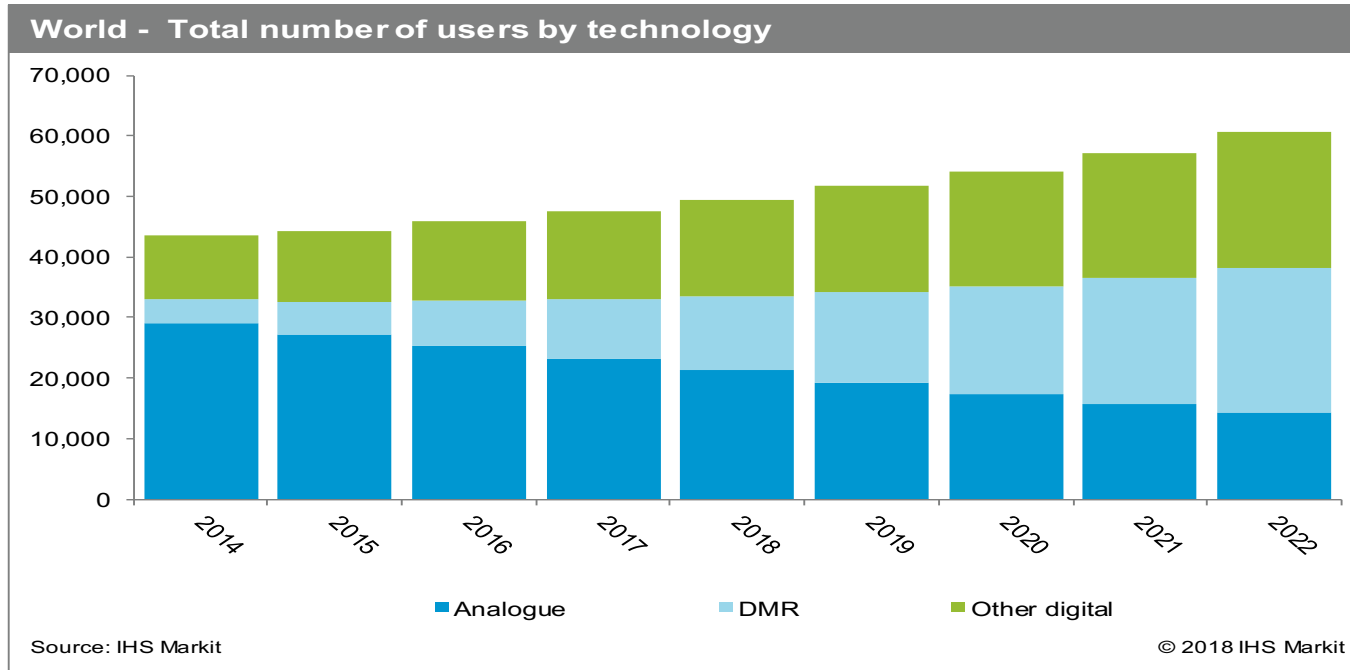


- The number of digital LMR users exceeded the number of analogue users for the first time in 2017, with over **24 million digital users**.
- The number of LMR users will increase to over **61 million by 2022**.
- Data courtesy of IHS Markit, for more info contact ryan.darrand@ihsmarkit.com

24 million digital users 2017

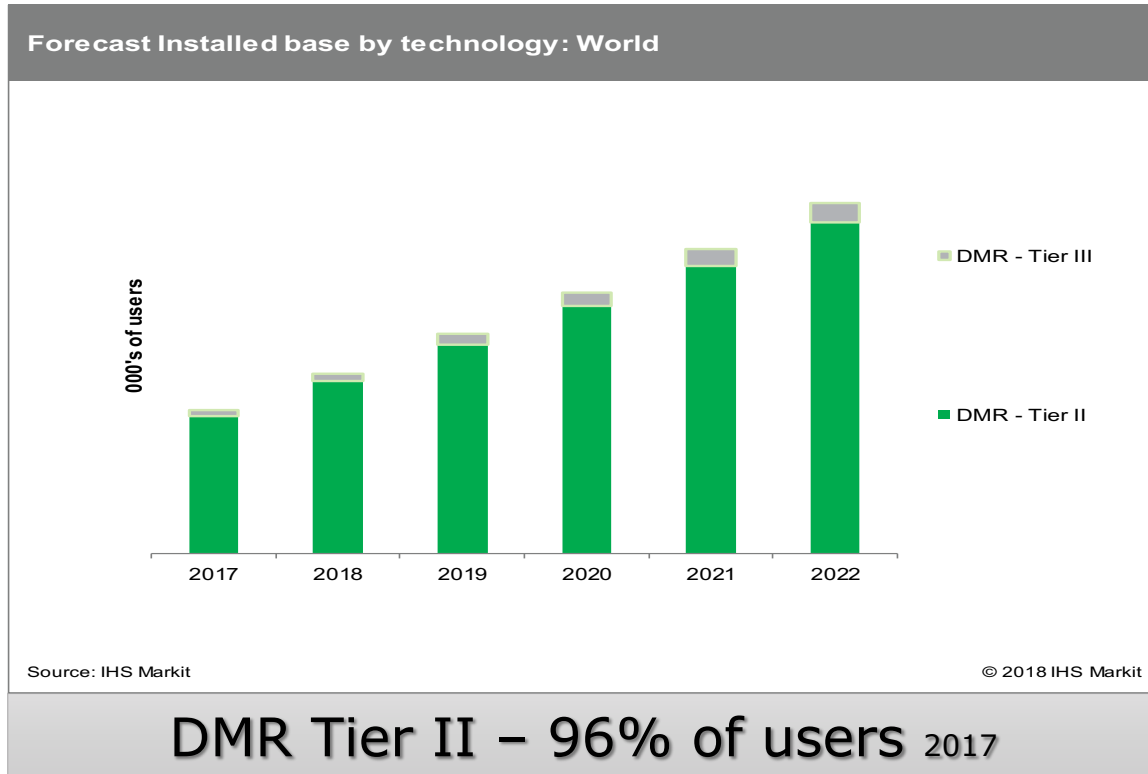
61 million users in 2022

Digital migration



- significant factor is growth in the number of **DMR** users – which will more than **double** between 2017 and 2022.
- The number of DMR users will exceed the number of all other digital LMR users by 2022.
- Data courtesy of IHS Markit, for more info contact ryan.darrand@ihsmarkit.com

Tier II vs Tier III systems



- The majority of the installed base use DMR Tier II radios.
 - 96% of the DMR installed base used DMR Tier II in 2017.
- However, the number of DMR Tier III users will grow at a faster pace between 2017 and 2022.
 - By 2022, IHS Markit estimate that 6% of the DMR installed base will use a Tier III system.
- Data courtesy of IHS Markit, for more info contact ryan.darrand@ihsmarkit.com

6% of users DMR Tier III by 2022

Key Reasons For Success of DMR Tier III

- Multivendor support for Networks, Terminals and Applications
- Support global spectrum bands in VHF, UHF & 800 MHz
- Standardised feature set backed by an IOP process and certification
- Growing set of features to suit global markets
- Scalable topology to enable small to large network deployments



Adoption of DMR technology today

Customers' operations

- DMR adoption has been extremely wide ranging and in diverse vertical markets

Education

Energy

Public Services

Healthcare

Manufacturing

Retail

Hospitality

Construction

Transportation

DMR as a more sophisticated business tool

Application development on DMR technology

- Community of 100's of application developers who are developing vertical market and customer specific applications

**Location,
Location,
Location.**

**Intelligent
Dispatch
Solutions**

**Security,
Scanning,
Alerting**

**Monitoring &
Control,
SCADA**

**People, Asset
Tracking**

Key Reasons For Success of DMR Tier III

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ETSI DMR Standard Parts

DMR Tier I: Unlicensed

- Products for license-free use in the 446 MHz band.

DMR Tier II: Conventional

- Licensed conventional radio systems operating in LMR frequency bands 30 to 1000 MHz. Targeted at users who need spectral efficiency, advanced voice features and integrated IP data services in licensed bands.

DMR Tier III: Trunked

- Trunking operation in frequency bands 30 to 1000 MHz. The ETSI Tier III standard supports Voice and Data applications.



ETSI DMR Standards

- The current version of ETSI standards as of November 2017 are:
 - ETSI TS 102 361-1 DMR Air Interface Protocol (V2.5.1)
 - ETSI TS 102 361-2 DMR Voice and Generic Services (V2.4.1)
 - ETSI TS 102 361-3 DMR Data Protocol (V1.3.1)
 - ETSI TS 102 361-4 DMR Trunking Protocol (V1.9.2)
 - ETSI TR 102 398 DMR General System Design (V1.4.1)

Standards can be downloaded from the ETSI website, www.etsi.org



DMR Tier III Features

Primary Voice Services

- Talkgroup Call
- Individual Call

Secondary Voice Services

- Late Entry
- Priority and Emergency call
- All MS Call
- Broadcast Call

Primary Data Services (Text, Location, generic IP data)

- Protected data with $\frac{1}{2}$ rate, $\frac{3}{4}$ rate and rate 1 (unprotected) FEC ack'd and unack'd
- Short Data service, via UDT
- Packet Data service (IP over DMR + UDP/IP header compression)

DMR Tier III Features

Supplementary Services

- Radio Check
- Short Data Polling
- Status Call
- MS Stun and Revive
- MS Kill
- Answer Call
- Cancel Call
- Call Diversion

Generic Features

- Encryption (DES, AES 128 and 256 bit)
- Application Interface Specification (AIS)
- Flexibility to introduce new and/or proprietary features

Supplementary Services

- Suppl. User Data Transfer
- Emergency alarm
- Emergency Pre-emption
- PTT De-key
- Transmit Interrupt
- MS Dynamic Power Control
- Group subscription/attachment
- Dynamic group number assignment
- Full duplex voice & data

DMR Tier III Features

- MS Access control and management using a control channel and a random access protocol
- MS Location within the system radio coverage by radio site identification and registration
- Control Channel hunting
- System acquisition authorization – MS and BS authentication
- A Unified Data Transport (UDT) mechanism to support the short data service, the supplementary user data service and extended addresses through gateways
- Broadcast of system parameters to MS
- Reverse Channel
- NEW: Fast data polling using alternate slot. 1000 GPS polls/minute

New Features

Recent Developments

- ETSI 102 361-4 V1.8.1 released in February 2016 introduced a powerful new set of group related features
 - Talkgroup Subscription
 - Talkgroup Attachment

Talkgroup Subscription

- Talkgroup Subscription allows an MS to inform the TSCC of a particular talkgroup of interest. The TSCC can make use of this information, when setting up a talkgroup call
- Network then only includes radio sites that contain subscribed MS units.
- This results in optimized system frequency usage and better grade of service, as the call is not set-up on radio sites that do not contain subscribed MS units.

Talkgroup Attachment

- Talkgroup attachment is a process to ensure that when an MS selects a talkgroup to use, the MS is authorized to use it and the network knows the MS individual address that is affiliated to that group.
- When the MS user selects a talkgroup to use, the talkgroup ID attachment procedure enables MS and the TSCC to exchange information about the currently attached talkgroup identities in the MS
- Until a talkgroup attach procedure has completed successfully that talkgroup group is not available to the MS.
- An MS may attach to one or more talkgroups.
- The MS may attach talkgroup identities when it initially registers with a TSCC.
- The MS may also later initiate the attachment procedure by another registration procedure (perhaps to add another talkgroup).
- (Except for the permanently held talkgroups) an MS shall only be included in a talkgroup call if the MS has previously successfully attached using the procedures in this clause.

Now Released

- Tier 3 Standard Revision (ETS 102 361-4 V1.9.2)
- 3 major function additions
 - TSCCAS (Alternate control channel)
 - Unified Single Block Data Polling Service
 - Channel authorization

TSCCAS

- **6.1.1.3 TSCCAS Structure**

- A physical channel may support both a Trunk Station Control Channel (TSCC) on one logical channel and a Trunk Station Control Channel Alternate Slot (TSCCAS) on the other logical channel. The TSCCAS provides a USBD polling and data transfer facility.
- When a physical channel supports both a TSCC and a TSCCAS, the TSCC broadcasts TSCCAS capability to MS units. When idle, MS units capable of supporting a TSCCAS monitor both the TSCC and the TSCCAS.
- Using TSCCAS a DMR Tier III network is able to support 1000 GPS polls per minute, while at the same time supporting a full set of DMR voice and data services, a very efficient use of one 12.5 KHz channel.

Unified Single Block Data Signalling

- 6.6.11 Unified Single Block Data Polling Service
- The Unified Single Block Data Polling Service enables data to be polled from an MS on either the TSCC or the TSCCAS. Up to 68 bits of data may be transported from an MS in the Poll Response PDU. The Poll Request PDU is capable of sending the polled MS up to 48 bits of data. The format of the information elements in the different USBD PDUs is implied as the Poll Request PDU is an outbound only PDU and the Poll Response PDU is an inbound only PDU.

Location Updates

- The Unified Single Block Data Signalling mechanism has an option for transferring location data in LIP (Location Information Protocol) format (see ETSI 100 392-18-1)
- Using LIP Protocol allows users to have 1000 GPS updates per site per minute!

Channel Authorization

- This feature is included in TS 102 361 Part 2 V2.5.1 published this month.
 - It is a means of ensuring multiple MS units do not transmit at the same time (typically in a group call)
 - MS sends a ChanAuth PDU prior to transmitting and only starts to send payload after receiving a matching ChanAuth PDU back from the BS or timeout.
 - Backwards compatible with earlier versions of polite channel access.
 - Applicable to Tier II and Tier III systems

Next

- Tier 3 standard ETSI 102 361-4 V1.9.2 is now published.
 - Updates to Talkgroup Attachment feature.
 - Additional clarity of standard and improved operation.
 - Scheduled Revert and Triggered Data feature
 - The use of Unified Single Block Data (USBD) to provide high efficiency data, introduced in CR097, is extended to generic Payload Channels. Scheduled Revert Data and Triggered Data features are introduced, so that terminals are instructed and then send their single block data based on time and event, respectively.
 - The last point introduces powerful new features aimed at better M2M communications.

DMR Tier III Scalable Topology

- Tier III is available from 1 to 200+ sites
- Tier III allows network owners and to scale site density to suit commercial or business critical needs.
- Tier III is available from a range of suppliers to suit different global market conditions and network sizes.

DMR Tier III In Action

- DMR Tier III is being used around the globe
- Public Transport
- Operator Networks in the UK, USA, Australia and New Zealand
- Networks in over 100 countries across North and Latin America, Europe, Asia, Australia, Africa and the Middle East



Finally ... Summary

- DMR is a mature and feature rich standard.
- DMR Tier III provides scalable networks from 1 to many sites.
- Interoperable equipment available from many manufacturers
 - DMRA Association verification of IOP via certification process
- Open Standards and Global Manufacturing support continues to promote competition, high quality and innovation.

DMR

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Thank you!

For more info: info@dmrassociation.org