

MILTON





OPPORTUNITY • ACHIEVEMENT
COMMUNITY

REQUESTS FOR PROPOSALS
REQUIREMENTS TO THE
VHF/UHF RADIO COMMUNICATION SYSTEM
(DMR Tier 2 System) For The School District of Milton

Legend of the text markings:

 yellow markings show optional requirements, please see explaining text when this option is recommended or applicable

 lilac markings show mandatory requirements where project-specific or customer-specific definitions must be made e.g. frequency bands or power supply options (AC vs. DC)

 green markings show Unique Selling Points which are highly recommended to include but can be both mandatory or optional (example for optional = features of the dispatcher)

Blue italic text shows hints and explanations to help with the decision to use certain optional requirements and to guide the reader/user.

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1 INTRODUCTION

The mobile communication system based on the high-performance DMR Tier 2 technology is intended to be used for mission critical voice and data communication by the <please add customer / user organization name here>. Any other proprietary standard or system shall not be adopted for the project.

<Please add additional information on the customer / user / tenderer and it's operational communications scenario as detailed as possible>

2 GENERAL REQUIREMENTS ON THE VHF/UHF RADIO SYSTEM

The land mobile radio system shall support voice and data services.

An open radio infrastructure application interface shall be provided to access the land mobile radio system's services and features and thus provide enhanced functionality (value add) by the connected applications, e.g. dispatcher, PSTN gateway, voice recording.

The land mobile radio network shall easily be expandable in terms of coverage (increasing the number of repeaters, dispatchers), and gateway interfaces.

Expansions of the land mobile radio network shall be possible without removal of existing repeaters or network management facilities.

A long lasting, cost-efficient maintenance of the network and of its components as well as the supply with spare parts must be ensured.

3 FEATURE REQUIREMENT

3.1 Portable radio features

To ensure mission-critical yet user-friendly operation, the voice group call set-up time shall be less than 500 milliseconds within the operational area of repeaters.

3.1.1 General requirements

Radios should support both analogue mode and digital mode.

Terminals should support scrambling/comparator/squelch in analogue mode.

Support Channel notification customization.

Support power on animation customization (only for radio with screen).

Support switching knob and buttons Lock.

Support Rental feature, the rental time can be configured by the actual using time(days, hours, minutes) or by GPS time range(start date, end date).

Power on ID input should be supported, which enable different users to use their own ID to power on the radio(the subscriber will not power on until the user enters the valid radio ID)(only for full keypad and screen radio).

User could configure parameters through radio menu, including Frequency, Slot, Color Code, CTCSS/CDCSS, Tx contact name Rx Group List, Radio Alias, Radio ID(only for full keypad and screen radio).

Terminals support roaming between different repeaters.

Users can configure the frequently used contacts that are correlated to the Contact List into the Favorite Contact List for the user(only for full keypad and screen radio).

Different alert tone can be defined for different services such as group call tone, power on tone, etc.

Radio Alias Displaying During Power-on Progress(only for radio with screen).

3.1.2 Voice features

Terminals should support all call, individual call, group call.

Terminals should support Transmitter Time Out Timer (TOT).

Terminals could automatically choose an idle timeslot or channel from the system for communication.

Terminals should be capable to scan analogue channels and digital channels at any physical channel.

Terminals should support low and high power transmission switching.

Support One touch call

Support wireless earpiece accessory.

Radio battery could charge wireless earpiece with adaptor.

Support making phone calls via DTMF signalling(only for full keypad and screen radio).

The radios can display the contact's ID and alias alternatively during a call(only for radio with screen).

Support at least 64 receiving groups configuration in one receiving group list.

3.1.3 Data features

Terminals should support supplementary service including alert call, remote monitor, radio enable/disable, radio check(only for radio with screen).

Radio Disable, Radio Enable, Remote Monitor shall be authentication controlled.

Support text message up to 256 characters(only for radio with screen).

Support built-in GPS, GPS message(GPS message only for radio with screen).

Support One touch message.

Terminal with display and GPS can poll direction and distance of another terminal with GPS(only for full keypad and screen radio).

Data service including short message(only for radio with screen), GPS, encryption should be supported.

3.1.4 Encryption requirements

Terminals should support encryption.

40bit, 128bits, 256 bits basic and advanced encryption in Digital Mode should be supported.

3.1.5 Safety requirements

Terminals should support both Digital and Analogue Emergency, including emergency type: Siren Only, Regular, Silent, Silent with Voice.

Support built-in Man-down, Lone worker.

3.2 Mobile radio features

To ensure mission-critical yet user-friendly operation, the voice group call set-up time shall be less than 500 milliseconds within the operational area of repeaters.

3.2.1 General requirements

Radios should support both analogue mode and digital mode.

Support upgrading to MPT/DMR Tier 3 trunking mode through software.

Terminals should support scrambling/comparator/squelch in analogue mode.

Support channel voice notification customization.

Support power on animation customization.

Support Rental feature, the rental time can be configured by the actual using time(days, hours, minutes) or by GPS time range(start date, end date).

Power on ID input should be supported, which enable different users to use their own ID to power on the radio(the subscriber will not power on until the user enters the valid radio ID).

User could configure parameters through radio menu, including Frequency, Slot, Color Code, CTCSS/CDCSS, Tx contact name Rx Group List, Radio Alias, Radio ID.

Terminals support roaming between different repeaters.

Users can configure the frequently used contacts that are correlated to the Contact List into the Favorite Contact List for the user.

Different alert tone can be defined for different services such as group call tone, power on tone, etc.

Radio Alias Displaying During Power-on Progress.

3.2.2 Voice features

Terminals should support all call, individual call, group call.

Terminals should support Transmitter Time Out Timer (TOT).

Terminals could automatically choose an idle timeslot or channel from the system for communication.

Terminals should be capable to scan analogue channels and digital channels at any physical channel.

Terminals should support low and high power transmission switching.

Support One touch call

Support making phone calls via DTMF signalling.

The radios can display the contact's ID and alias alternatively during a call.

Support at least 64 receiving groups configuration in one receiving group list.

3.2.3 Data features

Terminals should support supplementary service including alert call, remote monitor, radio enable/disable, radio check.

Radio Disable, Radio Enable, Remote Monitor shall be authentication controlled.

Support text message up to 256 characters.

Support built-in GPS, GPS message.

Support One touch message.

Terminal with display and GPS can poll direction and distance of another terminal with GPS.

Data service including short message, GPS, encryption should be supported.

3.2.4 Encryption requirements

40bit, 128bits, 256 bits basic and advanced encryption in Digital Mode should be supported.

3.2.5 Safety requirements

Terminals should support both Digital and Analogue Emergency, including emergency type: Siren Only, Regular, Silent, Silent with Voice.

Support Lone worker.

3.3 Networking requirements

3.3.1 General requirements

There should be one or more repeaters in the system to support more channel capacity.

System should have voice channels and data revert channels, the voice channel capacity should be at least 16 and data channel capacity should be at least 16.

System should support TDMA technology to get better channel efficiency.

System could not use continues transmission channel. So the system can not use one or more time slot working as a control channel.

System should broadcast BEACON signal in all available channels.

The system support load balance by broadcast beacon information in free channel, certain transceiver fail will not affect the system reliability.

System must have authentication mechanism to limit the channel usage of terminal user without right password.

System should have interference detection mechanism to guarantee the channel reliability.

System should have Time out Timer (TOT) function to limit the talking time of each conversation.

System transceiver should support software upgrade to MPT/DMR trunking transceiver.

System transceiver should support software upgrade to simulcast transceiver.

There should be a colourful display console in the transceiver for configuration and working status monitor.

System transceiver should support power on animation customization.

There should be no less than 4 programmable keys in the transceiver.

System transceiver should support internal duplexer installation and external duplexer installation.

Transceiver should be installed in standard 19 inch rack with no more than 2U height.

System must have access management functions to control the group ID which can access to the network.

Base station should support IP connection between each other to enlarge the coverage.

3.3.2 Roaming

The mobile station updates its location information when it moves from one base station to another.

3.3.3 Telephone System Integration

System should support SIP protocol to connect with IP-PBX.

The system should support communications between radios and PSTN phone.

The system should support communications between radios and digital phone.

3.3.4 Management and maintenance

There should be a software which can provide network management function through the IP network.

The network management software should provide at least below functions:

- View the network topology and display transceiver type and working status.
- Monitor channel status of each repeater and site.
- Provide diagnostic and alarm function for system administrator to maintain the repeaters.
- Check the basic serial number and software version of each repeater.
- Monitor and modify the parameters of each transceiver.
- Support activity query, include service query, call query, text query, alarm query, repeater log, running log.
- Support system activity statistic function, include site statistics, repeater statistics, private call statistics, group call statistics.
- Database backup and recovery.
- Configuration ability for analog channel, digital channel and mixed channel;

The network device should support SNMP standard to report device status information.

Transceiver in the network should support remote software upgrade.

3.3.5 Encryption

40bit, 128bits, 256 bits basic and advanced encryption in Digital Mode should be supported.

System should support MultiKey Encrypt.

3.4 Dispatching system requirements

The system should be able to provide the below functions:

3.4.1 General requirements

The dispatching system should support multi-screen display.

The dispatching system supports to work with the external PTT such as the desktop PTT.

The dispatching system should support connecting mobile radio or transceiver as dispatch station.

The dispatching system should support database backup and recovery.

3.4.2 Voice Dispatch

The dispatching system should support private call, group call and all call.

The dispatching system could record all voice calls. Users can query the call history through call time, caller ID or callee ID and retrieve recorded voice and play back.

The dispatcher could link different channels together for a temporary intercommunication purpose.

The dispatcher could add a temporary group to link groups from different system. Group users could call other members from a different system.

The dispatcher could delete the temporary group.

3.4.3 GPS tracking management

The dispatching system could track the radios' location based on any time interval or a distance moved.

The dispatching system should support history location checking. Users are allowed to query history location information of a radio as well as playing back the location route.

The dispatch system supports GPS tracking history export.

The dispatching system should support google online map, and google offline map, MapInfo map.

User could add the Point of Interest (POI) on the map.

The dispatcher could make visible dispatching on the map.

The dispatching system should support terminal online/offline status.

3.4.4 Text message

The dispatch system can send message to an individual radio or a group of radios.

The dispatch system should support sending message to offline terminals.

The dispatching system should support alert indication when receiving a message.

The dispatching system should support send timed message to radios automatically by day, week or month.

3.4.5 Supplementary services

The dispatching system should support call alert, disable/enable, remote monitor the radio.

The dispatching system should support disabling offline radios.

The dispatching system should support disabling the unregistered radio according to radio ID.

The dispatching system should support remotely monitor the status of the external device connected to the radio, as well as controlling it.

3.4.6 Alarm management

Dispatchers can define the boundary around a location on the map for a subscriber. Once he/she enters or exits this region, the dispatcher will send the alert message to him/her.

The dispatching system can show emergency alarm activated by a radio and center that radio subscriber on the map.

The dispatching system could show the over speed alarm.

3.4.7 Statistic report

The dispatcher supports generation of various reports regarding call, message, online/offline status, various alarms.

These reports can be enquired through keyword such as time period and ID, or be exported in Excel format.

3.4.8 Dispatch privilege management

The dispatching system should support defining administrators and dispatchers with different dispatching privileges. Selected dispatching functions and areas could be assigned to each dispatchers based on their demands.

3.4.9 SIP phone interconnection

The dispatching system should support SIP phone intercommunication.

4 SPECIFICATION

4.1 Portable radio specification

General	
Frequency Range	350~400MHz 400~470MHz 450~527MHz 806~941MHz 136~174MHz
Channel Capacity	1024(with display series)/1024(with no display series)
Channel spacing	12.5KHz/20KHz/25KHz
Zone Capacity	64(with display series)/3(with no display series)
Operating Voltage	7.4V(rated)
Battery Life(5/5/90 Duty Cycle, High TX Power)	Analog: about 13 Hours Digital: about 15 Hours
Weight (with antenna & standard battery)	≤335g (no display) ≤355g (with display) (with standard battery)
Size (H×W×L) (with standard battery, without antenna)	Length≤ 125 mm Width≤ 55mm Thickness≤ 35mm(no display) Length≤ 125 mm Width≤ 55mm Thickness≤ 37mm(with display)
Frequency Stability	≤±1.5 ppm
LCD Display	High brightness color LCD at least 1.8"; Sunlight readable; ≥4 rows
Antenna Impedance	50Ω

Transmitter	
RF Power Output	High Power: 4W(UHF)/5W(VHF) Low Power :1W UHF5* High Power: 3W (806-870MHz), 2.5W (896-941MHz); U5* Low Power: 1W VHF High Power: 5W; VHF Low Power: 1W
FM Modulation	11K0F3E @ 12.5KHz; 14K0F3E @ 20KHz 16K0F3E @ 25KHz

4FSK Digital Modulation	12.5KHz Data Only: 7K60FXD 12.5KHz Data & Voice: 7K60FXW
Conducted/Radiated Emission	-36dBm <1GHz -30dBm >1GHz
Modulation Limiting	±2.5KHz @ 12.5KHz ±4.0KHz @ 20KHz ±5.0KHz @ 25KHz
FM Hum & Noise	40dB @ 12.5KHz 43dB @ 20KHz 45dB @ 25KHz
Adjacent Channel Power	60dB @ 12.5KHz 70dB @ 20/25KHz
Audio Response	+1 ~ -3dB
Audio Distortion	≤3%
Digital Protocol	ETSI-TS102 361-1,-2,-3

Receiver	
Sensitivity (Analog)	0.3μV (12dB SINAD); 0.22μV (Typical) (12dB SINAD) 0.4μV (20dB SINAD)
Sensitivity (Digital)	0.3μV /BER5%
Adjacent Selectivity TIA-603 ETSI	60dB @ 12.5KHz/70dB @ 20&25KHz 60dB @ 12.5KHz/70dB @ 20&25KHz
Spurious Response Rejection TIA-603 ETSI	70dB @ 12.5/20/25KHz 70dB @ 12.5/20/25KHz
Inter-modulation TIA-603 ETSI	70dB @ 12.5/20/25KHz 65dB @ 12.5/20/25KHz
Hum and Noise	40dB @ 12.5KHz 43dB @ 20KHz 45dB @ 25KHz
Blocking TIA-603 ETSI	80dB 84dB
Rated Audio Power Output	0.5W
Rated Audio Distortion	≤3%
Audio Response	+1 ~ -3dB

Conducted Spurious Emission	<-57dBm
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Environmental	
Operating Temperature	-30°C ~ +55°C
Storage Temperature	-40°C ~ +85°C
ESD	IEC 61000-4-2(level 4) ±8kV(contact) ±15kV(air)
Dustproof & Waterproof	IP67 Standard
Humidity	Per MIL-STD-810 C/D/E/F/G Standard
Shock & Vibration	Per MIL-STD-810 C/D/E/F/G Standard

4.2 Mobile radio specification

General	
Frequency Range	400~470MHz 450~520MHz 350~400MHz 136~174MHz 806~941MHz
Channel Capacity	1024 (64 Zone,each with a maximum of 16 channels)
Channel spacing	Analog:25/20/12.5kHz Digital:12.5kHz
Zone Capacity	64
Operating Voltage	13.6 V ±15%
Current Drain: Standby	< 0.6A
Current Drain: Receive	<2.0 A
Current Drain: Transmit	<12A (45/50W); <8A(25W); <5A (5W)
Weight	≤1.7Kg
Size	Length≤200 mm Width≤174 mm Thickness≤60 mm
Frequency Stability	≤±1.5 ppm

LCD Display	High brightness TFT color LCD at least 2.0" (220 176 pixels, 262000 colors) ; sunlight readable; ≥ 4 rows
Antenna Impedance	50 Ω

Transmitter	
RF Power Output	Low Power: UHF1/UHF2/UHF3 VHF: 5-25W : 5-25W High Power: UHF1/UHF2/UHF3: 5-45W; ; VHF: 5-50W UHF5* 5-35W
FM Modulation	11K0F3E @ 12.5KHz 14K0F3E @ 20KHz 16K0F3E @ 25KHz
4FSK Digital Modulation	12.5KHz Data Only: 7K60FXD 12.5kHz Data & Voice: 7K60FXW
Conducted/Radiated Emission	-36dBm<1GHz -30dBm>1GHz
Modulation Limiting	± 2.5 KHz @ 12.5KHz ± 4.0 KHz @ 20KHz ± 5.0 KHz @ 25KHz
FM Hum & Noise	40dB @ 12.5KHz 43dB @ 20KHz 45dB @ 25KHz
Adjacent Channel Power	60dB @ 12.5KHz 70dB @ 20/25KHz
Audio Response	+1 ~ -3dB
Audio Distortion	$\leq 3\%$
Digital Protocol	ETSI-TS102 361-1,-2,-3

Receiver	
Sensitivity (Analog)	0.3 μ V(12dB SIN AD) 0.22 μ V(Typical)(12dB SIN AD) 0.4 μ V(20dB SIN AD)
Sensitivity (Digital)	0.3 μ V/BER 5%
Adjacent Selectivity TIA-603 ETSI	65dB @ 12.5KHz /75dB @ 20&25KHz 60dB@12.5KHz/70dB@25KHz&20KHz

Spurious Response Rejection TIA-603 ETSI	75dB @ 12.5/20/25KHz 70dB @ 12.5/20/25KHz
Inter-modulation TIA-603 ETSI	75dB @ 12.5/20/25KHz 70dB @ 12.5/20/25KHz
Hum and Noise	40dB @ 12.5KHz 43dB @ 20KHz 45dB @ 25KHz
Blocking TIA-603 ETSI	90dB 84dB
Max Audio Power Output	Internal 8W(@20 ohm load) External 20W(@8 ohm load)
Rated Audio Power Output	Internal 3W(@20 ohm load) External 7.5W(@8 ohm load)
Rated Audio Distortion	≤3%
Audio Response	+1 ~ -3dB
Conducted Spurious Emission	<-57dBm

Environmental	
Operating Temperature	-30°C ~ +60°C
Storage Temperature	-40°C ~ +85°C
ESD	IEC 61000-4-2 (level 4) ±8kV (contact) ±15kV (air)
American Military Standard	MIL-STD-810 C/D/E/F/G
Dustproof & Waterproof	IP54 Standard
Humidity	Per MIL-STD-810 C/D/E/F/G Standard
Shock & Vibration	Per MIL-STD-810 C/D/E/F/G Standard

4.3 Repeater specification

General	
Frequency Range	400~470MHz 450~520MHz 350~400MHz 136~174MHz 806~941MHz
Channel Capacity	16

Channel spacing	12.5kHz/20kHz/25kHz
Operating Voltage	13.6 V \pm 15%
Current Drain: Standby	< 0.8A
Current Drain: Transmit	<11A
Weight	\leq 8.5 kg
Size	Width \leq 500mm,depth \leq 400, height \leq 100mm;
Power supplier	External Power Supplies
Frequency Stability	\leq \pm 0.5 ppm
LCD Display	\geq 2.0 inch; \geq 4 rows
Available Installation Type	Rackmount, Desktop, Wallmount,
Duty Cycle	100%
Antenna Impedance	50 Ω

Transistor

RF Power Output	5~50W
FM Modulation	11K0F3E@12.5kHz 14K0F3E@20kHz 16K0F3E@25kHz
4FSK Digital Modulation	12.5kHz Data Only: 7K60FXD 12.5kHz Data & Voice: 7K60FXW
Conducted/Radiated Emission	-36dBm <1GHz-30dBm >1GHz
Modulation Limiting	\pm 2.5 kHz @ 12.5 kHz \pm 4.0 kHz @ 20 kHz \pm 5.0 kHz @ 25 kHz
FM Hum & Noise	40dB @ 12.5 kHz 43dB @ 20 kHz 45dB @ 25 kHz
Adjacent Channel Power	60dB@12.5kHz 70dB@20 /25kHz
Audio Response	+1 ~ -3dB
Audio Distortion	\leq 3%
Digital Protocol	ETSI-TS102 361-1,-2,-3

Receiver

Sensitivity (Analog)	0.3 μ V(12dB SIN AD) 0.22 μ V(Typical)(12dB SIN AD) 0.4 μ V(20dB SIN AD)
Sensitivity (Digital)	0.3 μ V/BER 5%
Rated Audio Power Output	0.5W

Adjacent Selectivity TIA-603 ETSI	65dB @ 12.5 kHz ; 70dB @ 20/25 kHz 65dB @ 12.5 kHz ; 70dB @ 20/25 kHz
Spurious Response Rejection TIA-603 ETSI	80dB @ 12.5/20/25KHz 80dB @ 12.5/20/25KHz
Inter-modulation TIA-603 ETSI	75dB @ 12.5/20/25KHz 70dB @ 12.5/20/25KHz
Hum and Noise	40dB@12.5kHz 43dB@20kHz 45dB@25kHz
Rated Audio Distortion	≤3%
Audio Response	+1 ~ -3dB
Conducted Spurious Emission	<-57dBm

Environmental	
Operating Temperature	-30°C ~ +60°C
Storage Temperature	-40°C ~ +85°C

4.4 PORTABLE RADIO NEEDS FOR QUOTE REQUESTED

For the purposes of a response to this request for proposals, the School District of Milton seeks a quote on portable radios with an anticipated purchase of between 75-112 portable radios

5. TRANSMISSION NETWORK

The connections between repeaters, network management PC, dispatching system shall all be realized by IP network.

The link budgets according international standard must be provided for reference.

The proposed equipment must be able to work over IPv4 Ethernet connections.

6. TRAINING AND SUPPORT

The accepted firm shall provide initial on-site training in all of the district's school buildings (8) to ensure proper operation and maintenance of the purchased equipment. The firm will also coordinate annual system quality checks to ensure system accuracy and assess system current and potential future needs.

The accepted firm shall further provide technical support to the School District of Milton when questions about purchased equipment arise and/or warranty issues are noted so that equipment purchased may be repaired and/or replaced within the equipment's warranty schedule if necessary.

7. GENERAL TERMS AND CONDITIONS:

The School District of Milton’s Board of Education reserves the right to reject any or all proposals, to waive formalities, to negotiate separately in any manner necessary, and to accept the proposal which appears to be in the best interest of the School District of Milton. All proposals must arrive by the due date in order to be considered.

8. SUBMITTAL DEADLINE

All proposals and information requested must be received by the School District of Milton no later than Tuesday, July 25th, 2017 at 4:00 p.m. Each firm submitting a proposal must submit one original and five copies or may provide a PDF version via email. Proposals should clearly be marked “Proposal For Radio Communications” and shall clearly identify the submitting firm on the proposal.

Please address proposals to the following

School District of Milton
Attention: Jerry Schuetz, Communications Supervisor
448 E. High Street, Milton WI 53563

or: schuetzj@milton.k12.wi.us

9. QUESTIONS CONCERNING THIS REQUEST FOR PROPOSALS:

All questions concerning this RFP should be directed to Jerry Schuetz, Communications Supervisor for the School District of Milton at 608-868-9222 or via email at schuetzj@milton.k12.wi.us