

**Metro 911 of Kanawha County**

**Request for Proposals for**

**METRO EMERGENCY OPERATIONS CENTER MICROWAVE RADIO  
COMMUNICATION  
SYSTEM DESIGN-BUILD SERVICES**

**RFP #2017-05**



**KANAWHA COUNTY**  
POLICE | FIRE | EMS

Date issued:

July 28, 2017

Proposal due:

August 15, 2017, 2 p.m.

**Radio Group RFP #2017-05**

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

## Table of Contents

1. Introduction and Schedule .....	4
i. Introduction.....	4
ii. Schedule.....	4
2. Overview and Background .....	4
i. Initial Feasibility Path Studies .....	6
ii. Path Design & Performance, Verification & Acceptance Testing .....	6
3. Project Scope .....	6
4. Contact Information .....	7
5. Walk Through.....	7
6. Proposer Minimum Qualifications.....	7
Proposer Qualification Validity .....	9
7. New System Requirements.....	9
8. Required Inclusion for Available Options at Metro’s Discretion.....	10
i. Structural Analysis and Inspection Quote.....	10
ii. Performance Bond Quote.....	11
9. System Mandatory Completion Date and Bid Requirement.....	11
10. Change Procedure .....	12
11. Codes and Standards .....	12
12. Microwave Radio Equipment .....	13
i. Microwave Radio System Type.....	13
ii. Technical Requirements.....	13
iii. General Requirements/Equipment Supported.....	13
iv. Frequency Band Coverage.....	14
v. Modulation.....	15
vi. Adaptive Modulation .....	15
vii. Radio Performance.....	15
viii. Protection.....	20
ix. Network Protection .....	20
x. Hardware Requirements.....	20
xi. Antennas .....	21

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

xii. Baseband Unit (BBU) .....	21
xiii. Power Supply and Power Consumption.....	21
xiv. Environmental .....	21
xv. Standards Compliance.....	22
13. Interfaces.....	22
i. User Interfaces .....	22
ii. Ethernet Interfaces .....	22
iii. DSI Interfaces .....	23
14. Platform Operation and Management.....	23
15. Platform Security .....	24
i. Secure Management.....	24
ii. Secure Versions of Management Protocols .....	25
iii. RADIUS Client.....	25
iv. Payload Encryption.....	25
16. Platform Software Maintenance .....	25
17. Element and Network Management.....	25
18. Product Warranty and Support.....	26
i. Supply and Support.....	26
ii. Warranty .....	27
iii. Post Warranty Support and Change of Status Notification .....	27
iv. Optional Extended Warranty .....	27
19. Technical Training/Maintenance and Service Training.....	27
20. Spare .....	27
21. Documentation.....	28
22. Terms and Conditions for Receipt of Proposals .....	28
23. Objections to RFP Terms.....	28
24. Financial Responsibility.....	29
25. Reservations of Rights by Metro .....	29
26. Additional Requirements and Information .....	30
27. Appendix A: Map of the Proposed Paths.....	34

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

**1. INTRODUCTION AND SCHEDULE**

i. Introduction

Metro 911 of Kanawha County (hereinafter referred to as Metro), is issuing this RFP to obtain a microwave backbone network that in aggregate, will comprise of an interoperable, secure, reliable and cost effective microwave platform that interconnects a minimum of three locations to the West Virginia Interoperable Radio Network (SIRN) system.

The contract shall have an original term of four (4) months.

ii. Schedule

The anticipated schedule for selecting a consultant is:

<i>Proposal Phase</i>	<i>Date</i>
RFP is issued by Metro	July 28, 2017
Proposals Due	August 15, 2017 at 1400

**2. OVERVIEW AND BACKGROUND**

Metro Communications Division Radio Group is soliciting proposals from firms to build and deploy a microwave network connecting to the West Virginia Interoperable Radio Network (SIRN) system. It is expected that the microwave communication will provide the resilience and redundancy to public safety communications and be a turnkey solution for comprehensive additions of their public safety communication.

The services include planning, design, engineering and technical support to maintain the system. This Request for Proposals (RFP) outlines the Radio Group's Public Safety Operation's requirements and specifications for a carrier grade combination network.

Metro seeks to procure a microwave backbone network that will comprise an interoperable, secure, reliable and cost effective Ethernet and TDM (natively) platform supporting interconnects at three locations: Metro Communication Center, National Weather Service (Doppler Radar Tower), and the Garfield SIRN site.

The Metro Communication Center is located at 200 Peyton Way in Charleston, West Virginia (38.313650, -81.723016 / 38°18'49.1"N 81°43'22.9"W (180ft tower), – National Weather Service 38.311128, -81.722920 / 38°18'40.1"N 81°43'22.5"W (120ft Doppler Radar tower) - WV SIRN System at Garfield Ave 38.375842, -81.657105 / 38°22'33.0"N 81°39'25.6"W (330ft tower). The Metro Communication Center will provide operational resiliency, enabling Metro to provide day to day first responder operations and Kanawha County Emergency Management to promptly and properly coordinate public safety services in the event of a major natural disaster.

Prospective bidders (hereinafter referred to as proposer(s)) are required to propose a complete

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

system(s) and equipment to achieve the desired Microwave Communication Network configuration. Some requirements in this RFP refer to ‘proposer’ and proposer requirements are those that are not necessary in the proposal, but they become an obligation of the proposer as a result of the proposal, compliance with Microwave Communication Network, and contract negotiations. The requirements utilized in this RFP are not intended to be proprietary or restrictive to a single manufacturer. The sole intent of these requirements is to establish a benchmark of the equipment quality desired as an outcome to this RFP. Alternatives to the requirements listed in this RFP shall be considered and evaluated. It is the responsibility of each proposer to identify in writing any requirements they believe are restrictive. Failure to do so will automatically nullify any post-conference concerns in this regard.

Proposers are responsible for designing and proposing a system that meets the requirements set forth by the Radio Group. It is important that the proposed design have the flexibility to accommodate additional uses who may enter the system in the future.

Proposals shall be fully responsive to the documentation, descriptions, and specifications contained in this RFP, and its attachments. Metro reserves the right to reject any or all proposals or portions of any proposals, waive any informality or irregularity in any proposal received, and to award the contract for reasons other than the lowest price.

The successful proposer will be singularly responsible for the proposed microwave system. This installation is to include, but not be limited to, all system design(s), complete site development, site preparation on proposed sites, microwave radios, hardware, antenna support structures, software, engineering, installation of materials, all labor for design, engineering, program management, configuration, optimization, testing, and warranty maintenance. The proposal must also include all network connectivity to all existing sites and any proposed new microwave site that may be required. Proposals for proposed sites must include any additional costs that may be required for power, emergency back-up power, antenna support structures, FCC licensing and a reasonable level of assurance the site will be available to achieve the coverage delineated in this RFP. In the event that the proposer’s microwave backhaul technologies improve before satisfactorily completing final acceptance testing, the proposer will be responsible for conversion or addition of the needed changes or upgrades.

Some sites may require power, new antenna supports, and equipment enclosure and microwave radio equipment. The new system must be in conformance with applicable standards, which have been approved at the time of the first equipment order. The proposer is responsible for providing a system with identical hardware, wherever possible, in terms of hardware model number, software versions and firmware versions.

The selected proposer will be responsible for licensing and permitting, including any FAA, zoning, FCC and NOAA/NWS requirements.

Proposals must be designed around the assumption that the system will operate with new frequencies. Microwave channels will need to be licensed to Metro, the proposer will obtain frequencies that can be incorporated in the new system.

It is the intent of this RFP that the new microwave system will include all necessary

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

hardware/software to provide interconnection to the SIRN network.

The system must be developed, installed and tested in a manner that provides continued, uninterrupted communications.

The proposer must provide a detailed plan with their proposal as to how they will accomplish their implementation plan and what, if any, problems or issues they anticipate as the system is implemented.

Proposals will be fully responsive to the documentation, descriptions, and specifications contained in this RFP, and its attachments. Metro reserves the right to reject any or all proposals or portions of any proposals, waive any informality or irregularity in any proposal received, and to award the contract for reasons other than the lowest price. Metro also reserves the right to alter this RFP or the terms and conditions and attachments at any time prior to the execution of a contract by Metro and the selected proposer.

i. Initial Feasibility Path Studies

Metro hasn't performed initial path studies, no calculations were prepared using preliminary and or unverified information. A line of sight path helped form the baseline for equipment and radio frequency system design for budgetary estimates. The proposer must perform the final and formal path studies and analysis for the design and build of this project. A path map of the network is shown on Appendix A.

ii. Path Design & Performance, Verification & Acceptance Testing

- a. Site locations will remain unchanged, the proposer will determine all other pertinent data necessary for successful path design and capacity requirements for each path.
- b. Radio Site & Path Specific Requirements. It is Metro's intent to retain the existing communications equipment, structures, and support facilities including buildings, shelters, towers, raceway, waveguides and antennas, power supplies, HVAC, etc. in order to minimize the need for civil, mechanical, and electrical construction efforts.
- c. Proposers shall perform their own calculations and studies, including field verification as required to achieve path reliability and system performance objectives. Proposers shall show calculation methods and assumptions.

**3. PROJECT SCOPE**

Metro Communications Division is soliciting bids to enter into a contract with a qualified proposer to build-out, configure, install and provide technical support to a new Metro microwave backbone network. This RFP will target a configuration that will establish a microwave network to the respective Metro service areas. This microwave network configuration will provide an interoperable communications foundation for public safety and must be designed to support current radio, data, voice, and video system applications with a

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

single platform supporting Ethernet and TDM (natively).

This section defines the specific services to be performed by the successful proposers in the management of the project, the interfaces between the successful proposers and the Metro technical program management service facilitator, and the Metro Communications Division. The successful proposer will ensure that the personnel, material, equipment, services and facilities required to satisfy the requirements of this project are made available in a timely manner. In addition, the successful proposers will have a project evaluation and control system that provides all information needed to manage the project satisfactorily, including as a minimum the milestone status, schedule, planning, and technical data.

The scope of this RFP is to analyze the appropriate microwave transport technology providing the transmission network with the ability to:

- Efficiently aggregate and transport existing services
- Be able to fully integrate into the existing SIRN Microwave Ethernet and TDM services

**4. CONTACT INFORMATION**

All questions relating to this RFP must be presented by 2 p.m., August 10, 2017 in email to:

Attention: Communications Division Radio Group, Email: [rfp@metro911.org](mailto:rfp@metro911.org).

All questions and correspondence must be submitted in writing. All non-written communication will be considered non-binding.

**5. WALK THROUGH**

Proposers will be permitted to schedule an on-site visit with Metro. Such visits must be scheduled through [rfp@metro911.org](mailto:rfp@metro911.org).

**6. PROPOSER MINIMUM QUALIFICATIONS**

Candidates qualified under this RFP will be eligible to propose the Metro Communication Center Microwave Radio Communication System Design-Build Services. To be qualified to perform the microwave build-out project, proposers must meet the following minimum qualifications:

Candidate must be experienced and established in managed consulting and professional services portfolio to build (plan, design, planning, engineering, installation, integration, optimization, test and network turn-up) microwave communication network.

Candidate must be in possession of all applicable and current licenses, certifications, etc.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

Proposers must complete all of the questions in this section. All questions in this section are pass/fail with criteria for passing listed for each question. Proposers must pass all questions in this section in order to be qualified to submit a proposal for the Project.

Question 1:

Has your company successfully completed any digital microwave communication system construction projects with a minimum of five (5) hops?

\*Note: Qualifying digital microwave radio communication system projects shall include installation of digital microwave radio equipment, configuration of a Ethernet and TDM microwave system, communication tower preparation/ installing antenna mounting structures, communication cabling, site power connectivity, and other supporting equipment.

Yes

No

If 'no', your firm is not qualified to submit a proposal for this project.

Question 2:

Have your superintendents completed no less than 75% of at least three (3) digital microwave radio communication system construction projects?

\*Note: Qualifying digital microwave radio communication system projects shall include installation of digital microwave radio equipment, configuration of a Ethernet and TDM microwave system, communication tower preparation /installing antenna mounting structures, communication cabling, site power connectivity, and other supporting equipment.

Yes

No

If 'no', your firm is not qualified to submit a proposal for this project.

Question 3:

Does your proposed Project Manager for this Project have at least one (1) year of experience on digital microwave system projects of similar size and complexity as the Microwave Radio Communication System Design-Build Services as described on RFP?

Yes

No

If 'no', your firm is not qualified to submit a proposal for this project, otherwise list the qualifying projects by submitting Project Data Sheets.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

Proposer Qualification Validity

Qualification approval will be valid for one (1) calendar year from the date of notice of qualification or until the forthcoming Design-Build contract is awarded. Metro reserves the right during the one calendar year to limit, suspend or rescind the prequalification status based on subsequently learned information and after giving notice of the proposed action to the proposer and an opportunity for a hearing consistent with the hearing procedures described below for appealing a pre-qualification determination.

**7. NEW SYSTEM REQUIREMENTS**

The successful proposer will supply all goods and services described herein as a ‘turnkey’ project and will assume complete responsibility for all engineering, FCC licensing, design, integration, installation, testing, commissioning, and delivery of a completely operational microwave system and associated applications as specified by this RFP and any resulting contract or agreement. The successful proposer will be responsible for system performance, including a guarantee of microwave connectivity, installation of all equipment at sites (with the exception of those items specifically stated), optimization of the microwave backbone, and the training of system users and maintenance personnel where required.

This specification covers the design, fabrication, and testing of microwave radios for Metro’s proposed communications systems infrastructure.

It is not Metro's intent to specify all technical requirements or to set forth those requirements adequately covered by applicable codes and standards. The proposer product shall meet the requirements of this specification and the applicable industry codes and standards.

Proposer shall provide technical documentation of enhancing / features capabilities, if any.

This RFP is not frequency specific and therefore the Metro requests that this document be completed per platform and not per product range (if differences exist). All supported frequency bands should be specified.

Upon acceptance of a purchase order based on this specification, the proposer accepts full responsibility for engineering, design, material, and workmanship of the product and warrants that the product will satisfy the performance requirements of this specification. The work includes all items necessary for the safe, efficient and continuous operation of the equipment within the scope of this specification.

a) Turnkey

The proposer will furnish all materials, equipment, tools, engineering, and labor necessary to fully complete, in a professional and timely manner, the requirements of this request for proposals. Turnkey installation will include path calculation, frequency search, frequency coordination, FCC licensing, insure frequencies will be on a non-interference basis with the National Weather Service Doppler Radar system (RLX)

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

installation, optimizations and testing. A map of the proposed paths are shown on section Appendix A. Installation will follow Motorola R56 guidelines.

b) Design

The proposer will be responsible for the design and construction of the digital microwave system. In submitting a proposal for consideration the proposer acknowledges a full understanding of the scope of work and the system requirements. The proposer guarantees that the microwave system will be furnished, designed, installed, and tested by the proposer to meet or exceed Metro's current and projected requirements as described in this request for proposals.

The proposer will provide any changes to the microwave system that are required to meet the performance criteria. Any changes in system components, not included in the proposer's response to this request for proposals, required to correct deficiencies because the proposer has failed to satisfy the performance requirements stated in this RFP, will be provided at the proposer's expense.

c) Integration

The proposer will be responsible for the proper installation and interfacing of all of the equipment provided, pursuant to this request for proposals. In circumstances where Metro's existing equipment is being utilized in the overall network architecture, the proposer will warrant that the microwave system will be compatible with the existing networking and communications infrastructure. The proposer will provide network routers and or switches at each site that are required to facilitate these communications.

To maximize the use of public safety licensed spectrum, demark of the microwave needs to provide QoS and flexibility to prioritize the public safety communication and data needs.

**8. REQUIRED INCLUSION FOR AVAILABLE OPTIONS AT METRO'S DISCRETION**

i. Structural Analysis and Inspection Quote

Microwave Dish Installation Guidelines for Towers and Masts

To ensure the safety and sound engineering practices, before installing any mast or support structure, tower inspections and structure analysis may need to be carried out by the proposer. Proposer's engineer may be required to perform the structural analysis after the award of the project with SIRN (SWIC) and or NWS. Prior to the installation of the mast and antenna support structure on any tower, building or roof, the structure may be required to be inspected by a structural engineer and certify that the structure will support and not be adversely affected by the proposed mast, tower, antenna and associated equipment and will not exceed its designed capacity.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

ii. Performance Bond Quote

Proposer must provide quote for performance bond guaranteeing satisfactory completed work no later than December 1, 2017.

**9. SYSTEM MANDATORY COMPLETION DATE AND BID REQUIREMENTS**

- a) The microwave network shall be provided as a complete turnkey system. Turnkey installation shall include path calculation, frequency search, coordination, FCC licensing, installation, testing and optimization. Installation shall follow industry standards, guidelines, and practices. Unless mutually agreed upon, the microwave radio network shall be provided and fully invoiced no later than:

*December 1, 2017*

- b) The microwave equipment is intended for public safety data, voice, and video networks with an Ethernet and TDM platform which is 100% compatible and consistent with the WV SIRN System. This system is intended to support Metro's mission utilizing not less than 16 Console Direct Connections into a Motorola 450MHz APCO Project 25 Trunked Radio system, legacy VHF/UHF links, etc. and a T-1 or greater for the NWS. Equipment must meet or exceed all telecommunication transport requirements, such as latency, propagation delay, and jitter. Any bid proposing alternate equipment that requires alteration, modification, upgrade, rewiring, reformatting, or any change, no matter how minor, to any Metro's radio system installation is unacceptable.
- c) Proposer who submits alternate microwave radio equipment is responsible for proving performance and technical equality to the equipment specified on the bid. Proposer who submits alternate microwave radio equipment must clearly identify manufacturer, model, and part number including any and all options that are deleted or part of the bid. Proposer must include manufacturer documentation that details the performance and technical specification of the alternate equipment. Proposed alternate microwave radio equipment that is not accompanied by manufacturer documentation as specified here will be automatically rejected.
- d) Our goal is to provide Metro's public safety community with a common and inter-operable communications platform.
- e) The locations of the network sites are listed below with a diagram shown in Appendix A. A clear line of sight for each link has been verified. All the listed sites are County, State, Federal owned or leased facilities with towers, antenna mounting capabilities, equipment shelter, and utility power. It is the intent of this RFP to utilize as much of the existing resources at each of the facility as much as possible without disturbance to current services.
- The Metro Communication Center at 200 Peyton Way, Charleston, WV
  - National Weather Service RLX Doppler Radar Tower, Charleston, WV
  - WV SIRN System at Garfield Ave., Charleston, WV

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- f) The microwave network is intended to operate on the 11-13 GHz band on paths less than 6 miles. Exceptions may be considered if proposer can show reasonable justification, and the proposer needs to select an optimum frequency for the high capacity carrier grade operation.

**10. CHANGE PROCEDURE**

Either party may request changes within the general scope of this agreement. If the requested change causes an increase or decrease in the cost of or time required for the performance of this agreement, the proposer and Metro will agree to an equitable adjustment in the agreement price, performance schedule or both. If the parties are unable to agree to the change, the change request will not become effective.

**11. CODES AND STANDARDS**

- a) The equipment and accessories shall be designed, manufactured, and tested in accordance with the applicable standards from the following organizations, including all amendments which are in effect at the time of purchase order placement.
- b) These codes and standards set forth minimum requirements necessary to assure satisfactory performance of the proposer's equipment. Other internationally recognized codes and standards will be acceptable provided they meet or exceed the requirements of the listed codes and standards.
- c) If different from the project list, the proposer shall submit for Metro's approval, details of the codes and standards that are being proposed for use. The proposer shall demonstrate to the satisfaction of Metro that these codes and standards meet or exceed the requirements of the codes and standards listed.
- d) In the event of any conflict between codes, standards, and this specification; the proposer shall refer the conflict to Metro for written resolution before start of design.
- e) The proposer shall provide a list of codes and standards used in the manufacturing of proposer's product in effect at the time of the purchase order.
- f) All materials and equipment supplied under this specification shall comply with all applicable regulations and standard listed below, and all Federal, State and Local Statutes. All electrical material and equipment shall be listed and/or labeled by OSHA through a National Recognized Testing Laboratory (NRTL) and approved by the authority having jurisdiction.
- ANSI – American National Standards Institute
  - EIA – Electronic Industries Alliance
  - FCC - Federal Communications Commission
    - 1) FCC Rules Part 101
    - 2) FCC Rules Part 15
  - IEEE – Institute of Electrical and Electronics Engineers
  - ITU – International Telecommunication Union

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- g) Codes and Standards of good practice issued by, but limited to the following:
- National Electric Manufacturers Association (NEMA)
  - National Fire Protection Association (NFPA)
  - Occupational Safety Health Administration (OSHA)
  - Underwriters Laboratories (UL)
  - Motorola R56 guidelines and practices.
- h) The proposer will conform to any standard SOP/SOG Policy and Procedure as required by NWS, SIRN/SIEC and Metro.

**12. MICROWAVE RADIO EQUIPMENT**

In all respects, equipment shall incorporate the highest quality of modern engineering, design, and workmanship. It is not the intent to specify all details of design and construction; therefore, equipment shall be fabricated and equipped with accessories in accordance with proposer's standard practices when such practices do not conflict with this specification.

i. Microwave Radio System Type

Metro requires that the selected proposer provide digital Microwave Packet Radio equipment that operates in the FCC Part 101 licensed bands or the frequency proposed by proposer which is 100% compatible with the WV SIRN System.

ii. Technical Requirements

- a. The radio shall be all-Indoor of no more than 5 Rack Units (5RU) for the RF and Baseband/Mux stages, for a single protected terminal.
- b. The radio shall have an RF transmitter switch.
- c. The radio shall have a transmit monitor port for in-service maintenance.
- d. The radio must have expansion ports for all configurations.
- e. There shall be a downloadable log file for each radio transceiver. The radio will be capable of synchronizing the log file to an NTP server.
- f. The radio shall be capable of synchronous Ethernet transport with a clock quality meeting G.8262 limits.
- g. The radio shall be capable of distributing timing to and from the Ethernet modules via a multicast DS1 signal throughout the network.
- h. The radio shall have ability to operate in native IP or native TDM.
- i. The radio shall be NEBS Level 3 compliant.
- j. The radio shall have comprehensive secure management options.
- k. The radio shall provide comprehensive payload encryption options.
- l. The radio shall be FIPS 140-2 Level 2 validated.
- m. The radio shall have an Integrated RADIUS option.
- n. The radio shall have a minimum 20 year field-proved MTBF.
- o. The radio platform shall be capable of transmitting 37 dBm (guaranteed, top of rack) in the L6 band.

iii. General Requirements/Equipment Supported

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- a. All-indoor node-based operation whereby multiple links and required user interfaces are supported on one common and compact platform comprising a baseband unit (BBU) with one or more radio frequency units (RFU).
- b. The platform shall provide a complete solution for all traffic, transport, and protection types.
- c. The platform BBU shall be a single unit - not a stacking of multiple units.
- d. Hot-swappable plug-in cards on the BBU shall provide required RFU and user interfaces.
- e. 1+1 optimized RFUs. Two RF transceivers with antenna coupling unit (ACU) in one chassis shall enable:
  - 1+1 hot standby (HSB), space diversity (SD), or frequency diversity (FD).
  - 1+0 repeater (2x 1+0).
  - 2+0 co-path (2x 1+0).
- f. Links individually configurable for frequency, capacity, traffic type, and protection type.
- g. Operation on L6/U6/UU6 and 11 GHz licensed bands.
- h. Channel bandwidths (on relevant bands) of 3.75, 5, 10, 20, 30, 40, 60 MHz.
- i. Adaptive modulation QPSK to 256 QAM.
- j. Co-channel dual polarized (CDDP) link operation with co-channel interference cancellation (XPIC).
- k. Ethernet switch with advanced QoS, VLAN, LAG, EOAM, and ring/mesh protection capabilities.
- l. Synchronous Ethernet synchronization with ESMC.
- m. Software configurable TDM traffic add/drop and pass-through.
- n. Integrated DS1 route/loop switch for DS1 tribs.
- o. NEBS level 3 compliance options.
- p. IPv4 and IPv6 NMS addressing.
- q. FIPS 140-2 Level 2 NIST validation (secure network management access.)
- r. FIPS 197 validation (up to 128/256-bit encryption for data payload).
- s. RADIUS client capabilities.
- t. 19" rack mounting.
- u. Operation from -48 Vdc or optional +24 Vdc power supply systems.
- v. Preference will be given to equipment that supports risk-free, cost-efficient, and non-disruptive migration from TDM, to TDM+Ethernet, to all-Ethernet network connections.
- w. Network transport of Ethernet and/or TDM shall be optimized (native) for each. There shall be no transport of Ethernet over TDM, or TDM over Ethernet.

iv. Frequency Band Coverage

- a. The all-indoor radio equipment shall be available for the following frequency bands:

Band (GHz)	Range (GHz)	Standard T/R Spacing's (MHz)
L 6/U6	5.925 - 7.125	160, 170, 252.04, 340
11	10.7 - 11.7	490, 500

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- b. Operation on the licensed 6 and 11 GHz bands shall be compliant with relevant FCC CFR's.
- c. Support shall be provided for unpaired frequencies using a T/R spacing of 88.9 MHz or higher at 6 GHz.

v. Modulation

- a. The equipment shall offer a selection of user-configurable modulation schemes for each capacity within the allowable practical and regulatory limits. Modulation options shall encompass QPSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM and 256 QAM, to allow systems to be maximized for system gain and performance, or spectrum efficiency, as required.
- b. The channel bandwidths supported shall include (on relevant bands) 3.75, 5, 10, 20, 30, 40 MHz.

vi. Adaptive Modulation

- a. Adaptive modulation shall be supported over a minimum of four modulation rates comprising QPSK, 16 QAM, 64 QAM, 256 QAM.
  - Intermediate modulation steps shall be available as additional modulation rates or as coding options on each of the specified QPSK to 256 QAM rates.
  - Where provided by coding options, these should be enabled for maximum throughput or maximum gain for each modulation rate to provide a total of eight modulation states.
  - Switching between modulation rates (including coding options) shall be error-free for all traffic (Ethernet and TDM).
- b. Supporting information shall include:
  - The criteria used to switch to a lower modulation rate and back.
  - Ethernet throughput and TDM maximums supported at each modulation step.
  - The QoS awareness and prioritization options supported for Ethernet and/or TDM traffic for a change in modulation rate.

vii. Radio Performance

- a. The Supplier shall provide guaranteed radio performance data for each frequency band, for each channel bandwidth and modulation required with their design. The data supplied shall include:
  - TX output power at the antenna port by frequency band and modulation
  - Rx  $10^{-6}$  threshold values by frequency band, channel bandwidth, and modulation.
  - Maximum Rx input level (error free).
  - Manual Tx power control range.
  - Co and Adjacent Channel Interference Sensitivity

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- b. TX power shall be adjustable by 0.1dB steps
- c. Automatic Transmitter Power Control (ATPC) shall be provided with a control range matching the Tx power manual control range, and with a change-rate capability of 6 dB per second.
- d. The tables below show the guaranteed Tx power output maximums and Rx threshold (BER 10<sup>-6</sup>) values at room temperature (68 to 86°F) that shall be met for the required frequency bands, channel bandwidths, and modulations. The Supplier shall provide equivalent tables for direct comparison with these values.
- e. The references to ACM and Fixed have the following meaning:
  - ACM/Fixed: the modulation can be selected for operation within an adaptive coding and modulation (ACM) series, or selected for fixed - modulation operation.
  - Fixed: the modulation is for fixed-modulation operation.
- f. The references to Max TP and Max SG modulation have the following meaning:
  - Max TP: maximum throughput. Maximum throughput coding on ACM delivers maximum data throughput - at the expense of some system gain.
  - Max SG: maximum system gain. Maximum system gain coding on ACM delivers a higher system gain - at the expense of some throughput.
- g. The TX and Rx performance values shall be referenced to the ACU antenna flange for a 1+0 system, and include ACU losses.
- h. The specified radio performance shall be achieved with an RFU that occupies not more than 2RU of a 19" rack.

**Table 1. Transmitter Power Output L6/U6 GHz for Channel BWs to 30 MHz**

Frequency Band L6/U6 GHz	
Modulation	TX Power dBm
QPSK	37.0
16 QAM	37.0
32 QAM	37.0
64 QAM	37.0
128 QAM	37.0
256 QAM	37.0

**Table 2. 10<sup>-6</sup> Receiver Threshold L6/U6 GHz for Channel BWs to 30 MHz**

Frequency Band L6/U6 GHz			
Channel/Modulation			dBm
3.75 MHz Channel	Fixed - Max TP	32 QAM	-82.50
5 MHz Channel	ACM/Fixed - Max SG	QPSK	-95.25
5 MHz Channel	ACM/Fixed - Max SG	16 QAM	-88.25
5 MHz Channel	ACM/Fixed - Max SG	64 QAM	-81.75
5 MHz Channel	ACM/Fixed - Max SG	256 QAM	-75.25

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

5 MHz Channel	Fixed - Max TP	128 QAM	-77.50
10 MHz Channel	ACM/Fixed - Max SG	QPSK	-92.00
10 MHz Channel	ACM/Fixed - Max SG	16 QAM	-85.00
10 MHz Channel	ACM/Fixed - Max SG	64 QAM	-78.75
10 MHz Channel	ACM/Fixed - Max SG	256 QAM	-73.25
10 MHz Channel	ACM/Fixed - Max TP	QPSK	-89.00
10 MHz Channel	ACM/Fixed - Max TP	16 QAM	-81.75
10 MHz Channel	ACM/Fixed - Max TP	64 QAM	-78.00
10 MHz Channel	ACM/Fixed - Max TP	256 QAM	-71.75
10 MHz Channel	Fixed - Max TP	64 QAM	-78.50
10 MHz Channel	Fixed - Max TP	128 QAM	-76.75
10 MHz Channel	Fixed - Max SG	256 QAM	-74.25
20 MHz Channel	ACM/Fixed - Max SG	QPSK	-89.25
20 MHz Channel	ACM/Fixed - Max SG	16 QAM	-82.50
20 MHz Channel	ACM/Fixed - Max SG	64 QAM	-76.25
20 MHz Channel	ACM/Fixed - Max SG	256 QAM	-70.50
20 MHz Channel	ACM/Fixed - Max TP	QPSK	-86.25
20 MHz Channel	ACM/Fixed - Max TP	16 QAM	-78.75
20 MHz Channel	ACM/Fixed - Max TP	64 QAM	-74.75
20 MHz Channel	ACM/Fixed - Max TP	256 QAM	-69.00
30 MHz Channel	ACM/Fixed - Max SG	QPSK	-87.25
30 MHz Channel	ACM/Fixed - Max SG	16 QAM	-80.25
30 MHz Channel	ACM/Fixed - Max SG	64 QAM	-73.25
30 MHz Channel	ACM/Fixed - Max SG	256 QAM	-68.50
30 MHz Channel	ACM/Fixed - Max TP	QPSK	-86.50
30 MHz Channel	ACM/Fixed - Max TP	16 QAM	-79.25
30 MHz Channel	ACM/Fixed - Max TP	64 QAM	-73.00
30 MHz Channel	ACM/Fixed - Max TP	256 QAM	-66.50
30 MHz Channel	Fixed - Max SG	64 QAM	-75.25
30 MHz Channel	Fixed - Max SG	128 QAM	-72.50
30 MHz Channel	Fixed - Max SG	128 QAM	-72.50
30 MHz Channel	Fixed - Max SG	256 QAM	-69.00

**Table 3.** Transmitter Power Output 11 GHz

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

Frequency Band 11 GHz	
Modulation	TX Power dBm
QPSK	32.5
16 QAM	32.5
32 QAM	32.5
64 QAM	32.5
128 QAM	32.5
256 QAM	32.5

**Table 4. 10<sup>-6</sup> Receiver Threshold 11 GHz**

Frequency Band 11 GHz			
Channel/Modulation			dBm
3.75 MHz Channel	Fixed - Max TP	32 QAM	-80.75
5 MHz Channel	ACM/Fixed - Max SG	QPSK	-93.50
5 MHz Channel	ACM/Fixed - Max SG	16 QAM	-86.75
5 MHz Channel	ACM/Fixed - Max SG	64 QAM	-80.00
5 MHz Channel	ACM/Fixed - Max SG	256 QAM	-73.50
5 MHz Channel	Fixed - Max TP	128 QAM	-75.75
10 MHz Channel	ACM/Fixed - Max SG	QPSK	-90.25
10 MHz Channel	ACM/Fixed - Max SG	16 QAM	-83.25
10 MHz Channel	ACM/Fixed - Max SG	64 QAM	-77.25
10 MHz Channel	ACM/Fixed - Max SG	256 QAM	-71.50
10 MHz Channel	ACM/Fixed - Max TP	QPSK	-87.25
10 MHz Channel	ACM/Fixed - Max TP	16 QAM	-80.00
10 MHz Channel	ACM/Fixed - Max TP	64 QAM	-76.50
10 MHz Channel	ACM/Fixed - Max TP	256 QAM	-70.25
10 MHz Channel	Fixed - Max TP	64 QAM	-76.75
10 MHz Channel	Fixed - Max TP	128 QAM	-75.25
10 MHz Channel	Fixed - Max SG	256 QAM	-72.50
20 MHz Channel	ACM/Fixed - Max SG	QPSK	-87.50
20 MHz Channel	ACM/Fixed - Max SG	16 QAM	-80.75
20 MHz Channel	ACM/Fixed - Max SG	64 QAM	-74.50
20 MHz Channel	ACM/Fixed - Max SG	256 QAM	-69.00
20 MHz Channel	ACM/Fixed - Max TP	QPSK	-84.50
20 MHz Channel	ACM/Fixed - Max TP	16 QAM	-77.25
20 MHz Channel	ACM/Fixed - Max TP	64 QAM	-73.00

**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

20 MHz Channel	ACM/Fixed - Max TP	256 QAM	-67.25
30 MHz Channel	ACM/Fixed - Max SG	QPSK	-85.75
30 MHz Channel	ACM/Fixed - Max SG	16 QAM	-78.50
30 MHz Channel	ACM/Fixed - Max SG	64 QAM	-71.75
30 MHz Channel	ACM/Fixed - Max SG	256 QAM	-67.00
30 MHz Channel	ACM/Fixed - Max TP	QPSK	-84.75
30 MHz Channel	ACM/Fixed - Max TP	16 QAM	-77.75
30 MHz Channel	ACM/Fixed - Max TP	64 QAM	-71.25
30 MHz Channel	ACM/Fixed - Max TP	256 QAM	-65.00
30 MHz Channel	Fixed - Max SG	64 QAM	-73.75
30 MHz Channel	Fixed - Max SG	128 QAM	-71.00
30 MHz Channel	Fixed - Max SG	128 QAM	-71.00
30 MHz Channel	Fixed - Max SG	256 QAM	-67.25
40 MHz Channel	ACM/Fixed - Max SG	QPSK	-85.00
40 MHz Channel	ACM/Fixed - Max SG	16 QAM	-78.25
40 MHz Channel	ACM/Fixed - Max SG	64 QAM	-72.00
40 MHz Channel	ACM/Fixed - Max SG	256 QAM	-65.75
40 MHz Channel	ACM/Fixed - Max TP	QPSK	-84.00
40 MHz Channel	ACM/Fixed - Max TP	16 QAM	-76.75
40 MHz Channel	ACM/Fixed - Max TP	64 QAM	-70.75
40 MHz Channel	ACM/Fixed - Max TP	256 QAM	-63.75
40 MHz Channel	Fixed - Max SG	32 QAM	-74.75
40 MHz Channel	Fixed - Max SG	64 QAM	-73.25
40 MHz Channel	Fixed - Max SG	64 QAM	-72.75
40 MHz Channel	Fixed - Max TP	64 QAM	-71.50

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- viii. Protection
- a. Link Protection
    - The equipment shall be capable of supporting hot standby (HSB), space diversity (SD), combined HSB/SD, and frequency diversity (FD) link configurations.
  - b. Receiver path switching (voting) shall be errorless.
  - c. Average transmitter switching times for HSB and SD shall be not more than 50 ms.
  - d. HSB and SD shall support main and standby TX active (standby into a resistive load), plus an option for main TX active, and TX mute on standby (for lower power consumption).
    - The standby TX shall be monitored as if active online.
    - For the TX mute option there shall be provision to periodically activate (momentarily) the standby TX into a resistive load to verify its operational status.
  - e. Transmitter switching for HSB and SD shall use a TX coaxial switch and embedded Rx coupler.
  - f. Equal or unequal loss Rx couplers shall be available.
  - g. Proposer to state A-side and B-side losses by band.
  - h. For SD there shall be support for:
    - Primary TX and secondary TX on a common antenna.
    - Primary TX and secondary TX on separate antennas.
  - i. A silent TX protection feature shall be used to guard against non-detected TX failures on HSB and SD systems. Proposer shall specify the action and state the recovery time.
  - j. Protection switching shall automatically revert when required to preserve the integrity of the protected equipment/system.
  - k. Measured system losses relative to a 1+0 configuration shall be displayed on each RFU.
- ix. Network Protection
- a. Ethernet ring/mesh protection complying with the following standards shall be provided.
    - IEEE 802.1w RSTP.
    - ITU-T G.8032v2 ERPS.
  - b. An Integrated TDM loop/route protection function shall be provided for NxDS1 ring networks.
- x. Hardware Requirements
- a. Radio Units
  - b. The indoor Radio Frequency Unit (RFU) shall be 19" rack-mountable for co-location with its indoor baseband unit (BBU).
  - c. The RFU shall:
    - Support frequency bands L6/U6, 11 GHz licensed, and 5.8 GHz unlicensed.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- Support two transceiver units and a common filter-based ACU.
- Support 1+1 protected, 1+0 repeater, and 2+0 co-path link configurations.
- Support back-to-back 1+1 repeater configurations in conjunction with a second co-located RFU.
- Support paired and non-paired frequency assignments.
- Provide built-in waveguide expansion ports to allow multiple RF signals to operate on a common waveguide/antenna.
- Have industry-standard waveguide ports.
- Include a calibrated TX monitor port on the ACU for power and spectrum measurement purposes. A label on the unit shall show the measured ex-factory insertion loss of the port.
- Include front-panel test points for RSSI measurement.
- Occupy not more than 2 RMS for frequency bands 5.8, L6/u6/UU6,11 GHz.

xi. Antennas

- a. Antennas shall be high performance shielded and meet all relevant FCC regulatory requirements for the 6 and 11 GHz licensed bands, and 5.8 GHz unlicensed band.
- b. Antennas shall meet all relevant EIA195 and EIA222 standards for electrical, mechanical and structural performance and construction.

xii. Baseband Unit (BBU)

- a. The BBU shall provide required traffic interfaces, service interfaces, IF interfaces to the RFU, and network management interfaces.
- b. The BBU shall have:
  - Slot-based installation of plug-in cards for required radio link and user interfaces.
  - Plug-in cards that are hot-swappable for service and upgrade purposes.
  - Redundancy options for plug-in cards, power supply, and BBU management.
  - An ability to support up to six 1+0 links or three 1+1 links.
  - A rack space occupancy of not more than 2RU.

xiii. Power Supply and Power Consumption

- a. The equipment shall operate from a -48 Vdc (+ve ground) batter-backed power supply system. Proposer shall provide details of the voltage ranges supported.
- b. The equipment shall be protected against reverse voltage.

xiv. Environmental

- a. The platform (BBU + RFU) shall operate to specification under ambient temperatures of 23°F to 131°F, and 0% to 93% humidity (non-condensing).
- b. Proposer shall state the impact on operation when temperatures are outside those specified.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- c. The platform shall operate to specification to altitudes of 15,000 ft.

xv. Standards Compliance

- a. The equipment shall comply with all relevant standards for EMC, radio frequency, link operation, safety, security, and transportation. Specific standards include:
- FCC part 15 for a Class A digital device for (EMC).
  - UL 60950-1 for safety.
  - CFR 47, Part 101 for radio frequency, 6 and 11 GHz bands.
  - FCC CFR47, Part 15.247, and Industry Canada RSS-210 Annex 8 for radio frequency, 5.8 GHz unlicensed band.
  - GR-63-CORE, GR-1089-CORE, Level 3, for NEBS compliance.
  - Figures shall include data for 1+0 and 1+1 operation.
- b. The equipment shall be NEBS compliant to NEBS GR-63-CORE, GR-1089-CORE, Level 3.

### 13. INTERFACES

i. User Interfaces

Preference will be given to equipment that uses hot-swappable plug-in cards to provide required user interfaces.

ii. Ethernet Interfaces

- a. An Ethernet plug-in card shall provide advanced Layer 2 (L2) switch functions for 10/100/1000 Mbit/s interfaces. Interfaces shall be IEEE 802.3 compliant.
- b. The equipment shall provide:
- A plug-in card with a minimum 3x RJ-45 ports for 10/100/1000Base-T, and 2x GigE optical ports.
  - Optical ports shall be provisioned using SFP transceiver options for 850nm multi-mode, or 1310nm single-mode.
  - Programmable mapping of Ethernet traffic to radio or fiber links.
  - Eight transmission queues (eight queue classes).
  - Ingress traffic classification based on MPLS EXP bits, DSCP/ToS, VLAN 802.1p, or ports.
  - Storm protection capabilities to contain broadcast and multicast traffic storms.
  - 802.1Q VLAN tagging, filtering, and VID translation.
  - G.8262 compliant Synchronous Ethernet, with clock sourcing, prioritization, and protection (fail-over) options.
  - G.8262 compliance shall be maintained over radio and fiber links.
  - Clock quality shall be advised via SSM.
  - An integrated Stratum 3 clock shall be included for hold-over purposes.
  - 802.1w compliant RSTP.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- G.8032v2 compliant ERPS.
  - 802.1AX compliant LAG and LACP options with hash selections for layers 2, 3, 4.
  - Layer 1 (physical layer) link aggregation to aggregate the capacity of multiple co-path radio links.
  - Operation shall be hitless/errorless on capacity change under adaptive modulation.
  - Throughput acceleration with inter-frame gap (IFG) and preamble stripping and re-insertion.
  - Flow control through 802.3x pause-frame option.
  - Jumbo frames to 9600 bytes.
  - 802.1ag / Y.1731 compliant OAM.
  - A MAC address table able to support 16,000 address entries.
- c. Protection shall be available for the switch function and user ports.
- Protection options shall support single and dual feed user connections.
  - When deployed with protected links (hot-standby or diversity), there shall be full end-end redundancy available on the radio link and Ethernet switch functions.
  - Average protection switching times shall be less than 100 ms.
  - Link aggregation options shall support redundant Ethernet switch card configurations.

iii. DS1 Interfaces

- a. The equipment shall provide:
- A plug-in DS1 card with not less than 16xDS1 ports per card.
  - 120 ohm balanced ports with individual selection of AMI or B8ZS.
  - Ethernet over NxDS1 mode to support transport of Ethernet data over legacy DS1 radios or leased-lines.
  - Protection options for port and card redundancy.
  - Protection switching times shall be less than 200ms.
  - Compact interface connectors and cable sets, as options, for connection to punch-blocks, wire-wrap, or BNC terminations.
  - A facility to set a looped or both-way BER test on a selected trib.
  - AIS on tributary-out ports during link failure or BER test.
  - An AIS detect/alarm capability per trib for an incoming AIS.
- b. 3 DS1 interfaces shall be G.703/G.824 compliant.

**14. PLATFORM OPERATION AND MANAGEMENT**

General Platform Operation

- a. Through appropriate selection of plug-in cards, the platform shall enable practical and cost efficient solutions for:
- Simple links
  - Nodal, multiple links

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- Provisioning TDM links
  - Provisioning TDM+Ethernet links
  - Provisioning all-Ethernet links
- b. One common platform shall provide a complete solution for all traffic and transport types.
  - c. The platform shall support a minimum of four radio links, with radio and interfaces customized by software configurable plug-in cards.
  - d. Plug-in cards shall be hot-swappable.
  - e. Replacement plug-in cards shall automatically assume the software configuration of the replaced card.
  - f. The software configuration of the platform and its services shall not be affected by power-off situations.
  - g. The software configuration of the platform and its services shall be portable to other platforms.
  - h. The platform shall be supported on a Layer 3 element management system (EMS). Each platform shall incorporate a router function and have a unique IP address.
  - i. The platform shall deliver native Ethernet and/or native TDM traffic over the radio links. Transport of Ethernet over TDM or TDM over Ethernet is not acceptable.
  - j. The platform shall have a date/time configuration capability with synchronization to the craft tool PC, to network time, or to an external time server using SNTP or NTP.
  - k. There shall be redundancy for essential platform power supply and management functions, and for any forced-air (fan) cooling.
  - l. The platform and its plug-in cards shall provide visible front-panel indications of operational status.

**15. PLATFORM SECURITY**

The platform shall support basic, strong, and FIPS 140-2 security options.

- i. Secure Management
  - a. Strong security shall provide multiple levels of authorization for user access. These shall be made available as individual levels or in any combination.
  - b. FIPS 140-2 Level 2 validated security shall be available to provide compliance with the Federal Information Processing Standard (FIPS) Publication 140-2.
    - FIPS compliance shall be certified by an accredited laboratory under the Cryptographic Algorithm Validation Program (CAVP).
    - FIPS 140-2 validation shall be at Level 2 or higher.
    - Proposers shall supply NIST's FIPS140-2 certificate numbers.
  - c. Under Strong or FIPS security, unauthorized local or remote access to platform management and configuration shall be prevented. This shall include prevention from mechanized attacks.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- ii. Only secure versions of the management protocols shall be allowed to access the NMS port. This shall apply to physical connections and to software downloads.
  - a. Physical connections shall be held secure using selectable encryption cipher suites. Under FIPS security only FIPS approved cryptographic algorithms shall be made available.
  - b. SNMPv3 shall be used to secure remote network management communications. HTTPS (or similar) shall be used to secure software downloads.
  - c. All password storage, configuration data, event logs and performance data files on the radio shall be encrypted.
  - d. There shall be complex password requirements.
- iii. RADIUS Client
  - a. A RADIUS client function shall be available to support RADIUS centralized management of user names, passwords, and access permissions.
  - b. The proposer shall make available files required to support installation of RADIUS client account permissions on the RADIUS server.
- iv. Payload Encryption
  - a. Payload encryption shall be available on radio links to prevent eavesdropping. Both the payload and the radio overheads, including any NMS channel, shall be encrypted.
  - b. Operation shall be FIPS-197 compliant, and allow for independent enabling/disabling per wireless link.
  - c. The cipher suite shall include AES counter mode data encryption and CBC-MAC data integrity validation.
  - d. 128, 192 and 256-bit symmetric keys shall be supported.

**16. PLATFORM SOFTWARE MAINTENANCE**

- i. The platform shall support software version management for software upgrades.
- ii. The platform craft tool shall provide a means to source and save software upgrades and to download the software to the platform.
- iii. The NMS shall support individual and bulk upgrades to platforms within the network.
- iv. Options shall be provided to:
  - Transfer and activate the new software
  - Transfer only
  - Activate transferred software at a set time of day
- v. During download and activation the status of the process shall be indicated through to completion and confirmation.
- vi. A facility shall be available to roll back to the prior build of software.

**17. ELEMENT AND NETWORK MANAGEMENT**

- i. Local Management - Craft Tool

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

A PC based craft tool shall provide local and remote platform monitoring, configuration, and diagnostic services. There shall be no front-panel controls or externally-connected keypads to provide required capabilities.

- ii. It shall be possible to select, view, configure and set diagnostics on any platform within the network when connected from any one platform within the network.
- iii. The PC shall operate as a host device on a LAN supported from the platform.
- iv. The PC shall use Ethernet 10/100Base-T Ethernet as its primary connection to the platform, whereby the PC and the platform operate on a common LAN.
- v. The craft tool software shall always match the version of system software in use on the platform.
- vi. To avoid the potential for software miss-alignment between the craft tool and the platform system software, auto-versioning of craft tool software is required.
- vii. When initially connected to a platform, the craft tool software shall detect the version of system software in use, and auto-align to that version.
- viii. A mechanism shall be provided to ensure craft tool connectivity is always possible in the absence of a known IP address for the platform it is connected to.
- ix. The craft tool software shall be designed to maintain currency with all recent and future Windows operating systems.
- x. The craft tool shall use a graphics-rich user interface to provide operator-friendly screens for its various configuration and diagnostics functions.
- xi. The craft tool shall be supported by context-sensitive help.
- xii. Preference will be given to context-sensitive help systems that use an online version of the platform user manual.
- xiii. Preference will be given to systems that ensure the version of online help always matches the version of platform system software (and craft tool SW).
- xiv. The craft tool diagnostic capabilities shall include:
  - An event log
  - Alarms status
  - History options to review operation over one month, or over 7 days using a higher resolution
  - A real-time performance summary for radio link and e) Ethernet network connections
  - RMON performance on Ethernet traffic ports
  - System controls for setting loopbacks, AIS, protection locks, TX mute, and BER testing
- xv. The craft tool shall include capabilities to view and set network management variables for the platforms.
- xvi. The craft tool shall support upgrade of platform system software.

**18. PRODUCT WARRANTY AND SUPPORT**

- i. Supply and Support
  - Preference will be given to suppliers with best-practice supply and support capabilities. Proposer shall state their commitments to logistical support, design and configuration support, delivery times, and after-sales support.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- Equipment for return to proposer under warranty or otherwise shall be to a USA address with cost to and from destination covered by proposer.
- Proposer to state guaranteed turn-around times for items returned for repair or replacement.
- Cost of said support shall be clearly broken out in the proposal.

ii. Warranty

All equipment shall be warranted against defects in material and workmanship for a minimum of 24 months for parts and labor. Detailed terms and conditions of warranty as well of cost of said warranty clearly broken out shall be provided by the proposer.

iii. Post Warranty Support and Change of Status Notification

The proposer shall provide support in the form of repair/return services for a period of up to 10 years from the date of the last sale. Notification shall be given not less than 1 year ahead of any change of status from regular production to maintenance-only (MO).

iv. Optional Extended Warranty

If available, the proposer will include an option to extend system maintenance on an annual basis for a period of five (5) years following expiration of the 24 month system warranty period. Maintenance terms and conditions will be the same as those described for the first 24 months of warranty coverage.

**19. TECHNICAL TRAINING/MAINTENANCE AND SERVICE TRAINING**

The proposer shall provide a comprehensive technical training program.

Classes shall be available with substantial hands-on involvement, and course content for

- Principles of digital transmission
- Product/system description
- Installation procedures
- Configuration procedures
- Turn-on, alignment and testing procedures
- Diagnostic procedures
- Unit replacement procedures
- Operating, safety, and traffic continuity procedures

**20. SPARE**

Proposer will provide a list of recommended spare equipment for each unique type of equipment in the system.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

**21. DOCUMENTATION**

The successful proposer will provide 2 sets of complete print documentation including ‘as built’ to the Metro’s public safety operations. The documentation shall include technical service manuals for each unique type of equipment provided in the system. In addition to print documentation, 6 soft copies on USB Memory Devices of the ‘as built’ documentation shall be provided to each participating trainee.

**22. TERMS AND CONDITIONS FOR RECEIPT OF PROPOSALS**

Errors and Omissions in RFP

- i. Proposers are responsible for reviewing all portions of this RFP.
- ii. Proposers are to promptly notify the Radio Group, if the proposer discovers any ambiguity, discrepancy, omission, or other error in the RFP. Any such notification should be directed to the Radio Group promptly after discovery, but in no event later than five working days prior to the date for receipt of proposals. Modifications and clarifications will be made by addenda as provided below.
- iii. Failure by Metro to object to an error, omission, or deviation in the proposal will in no way modify the RFP or excuse the proposer from full compliance with the specifications of the RFP or any contract awarded pursuant to the RFP.
- iv. Inquiries Regarding RFP  
Inquiries regarding the RFP and all notifications of an intent to request written modification or clarification of the RFP must be submitted by August 8, 2017 to [rfp@metro911.org](mailto:rfp@metro911.org).

**23. OBJECTIONS TO RFP TERMS**

- i. Should a proposer object on any ground to any provision or legal requirement set forth in this RFP, the proposer must, not more than ten calendar days after the RFP is issued, provide written notice to Metro setting forth with specificity the grounds for the objection. The failure of a proposer to object in the manner set forth in this paragraph shall constitute a complete and irrevocable waiver of any such objection.
- ii. Term of Proposal  
Submission of a proposal signifies that the proposed services and prices are valid for 120 calendar days from the proposal due date and that the quoted prices are genuine and not the result of collusion or any other anti-competitive activity.
- iii. Revision of Proposal
  - A proposer may revise a proposal on the proposer’s own initiative at any time before the deadline for submission of proposals. The proposer must submit the

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

revised proposal in the same manner as the original. A revised proposal must be received on or before the proposal due date.

- In no case will a statement of intent to submit a revised proposal, or commencement of a revision process, extend the proposal due date for any proposer.
- At any time during the proposal evaluation process, the Department may require a proposer to provide oral or written clarification of its proposal. Metro reserves the right to make an award without further clarifications of proposals received.

**24. FINANCIAL RESPONSIBILITY**

Metro accepts no financial responsibility for any costs incurred by a firm in responding to this RFP. Submissions of the RFP will become the property of Metro and may be used by Metro in any way deemed appropriate.

**25. RESERVATIONS OF RIGHTS BY METRO**

- i. The issuance of this RFP does not constitute an agreement by Metro that any contract will actually be entered into by Metro. Metro expressly reserves the right at any time to:
  - Waive or correct any defect or informality in any response, proposal, or proposal procedure;
  - Reject any or all proposals;
  - Reissue a Request for Proposals;
  - Prior to submission deadline for proposals, modify all or any portion of the selection procedures, including deadlines for accepting responses, the specifications or requirements for any materials, equipment or services to be provided under this RFP, or the requirements for contents or format of the proposals;
  - Procure any materials, equipment or services specified in this RFP by any other means; or
  - Determine that no project will be pursued.
- ii. No Waiver  
No waiver by Metro of any provision of this RFP shall be implied from any failure by Metro to recognize or take action on account of any failure by a proposer to observe any provision of this RFP.
- iii. All warranties will commence on the date that Metro signs the final acceptance agreement. A completed and signed copy of each type of warranty specified herein this document will be provided to the Radio Group's, public safety operations at the time of delivery of the completed system.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

**26. ADDITIONAL REQUIREMENTS AND INFORMATION**

- i. Bids must be received in a sealed envelope with the name and address of the proposer. The envelope must also show “Communication Center Microwave Communication System” with the date and time that bids are due on the outside of the envelope. Faxed bids or electronically-submitted bids will not be accepted.
- ii. Bids must include original and three copies.
- iii. Bids must be F.O.B. Delivery Point, unless otherwise indicated.
- iv. Bids must be signed in ink, showing all facts and the total amount.
- v. Metro will not be responsible for any expenses incurred in the preparation and/or presentation of bid or for the disclosure of any information or material received in connection with the solicitation, whether by negligence or otherwise.
- vi. Proposals may be withdrawn prior to the scheduled date and time, or postponement thereof, of the opening of proposals. Proposals will not be accepted after the scheduled date and time. No proposer may withdraw a proposal after bid opening. Once proposals are unsealed, all proposal documents become public record. Metro reserves the right to reject any and/or all proposals, with or without cause, and to waive any informality in bidding. Metro further reserves the right to resolicit proposals.
- vii. Payment will be released within 30 days of completion of work that is satisfactory to Metro. At its sole discretion, Metro will consider the proposer’s request for reasonable intermittent payment as acceptable progress is made.
- viii. Proposer is to provide liability insurance coverage for all vehicles and equipment of Proposer. Proof of a current minimum one million dollar per occurrence general liability insurance policy with Metro named as additional insured is to be submitted by successful proposer prior to commencement of work.
- ix. Proof of a current workers’ compensation policy is to be submitted by the proposer prior to commencement of work as well as a copy of the proposer’s current WV Contractor’s License.
- x. Proposer will completely indemnify and hold harmless Metro from any damages whatsoever caused by the proposer and/or its employees.

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

- x. The proposer is responsible for all required notification and permitting requirements. Copies of all documents are to be forwarded to Metro.
- xii. The Proposer shall be responsible for all damages to the persons or property that may occur as a result of the proposer's fault or negligence until the completion of the project.
- xiii. The Proposer hereby indemnifies, holds and saves harmless Metro, the State of West Virginia, and the Federal Government free from any and all claims for damages sustained by the proposer during the performance of this contract, and hereby indemnifies Metro, the State of West Virginia, and the Federal Government against any claims arising from such work.
- xiv. In the event Metro should be cited for a violation of any applicable State, Federal, or local law, rule, or regulation as a result of success proposer's actions associated with the activities described herein, proposer shall reimburse Metro for all attorney's fees associated with the defense of same and also reimburse Metro for any fines, penalties, and other costs paid as a result of proposer's actions.
- xv. Inspection of Work and Correction of Defects – All work under this contract shall be subject to inspection, surveillance, and testing by Metro at all reasonable times. All such inspection(s) shall be performed in a manner as will not unduly delay the work.
- xvi. Proposer warrants that the services and work are to be rendered and completed in a manner acceptable to Metro and within the stated time.
- xvii. At any time during the performance of the work described or contemplated herein, Metro may require the successful proposer to remedy, by whatever means necessary, and at no additional costs to Metro, any failure by the proposer to comply with the proposer's obligations to Metro and to those State, Federal, and Local Regulatory agencies having jurisdiction over the activities associated with the Scope of Work defined herein or as may be amended and mutually agreed upon by both parties in the future.
- xviii. Disputes and Arbitration – If, at any time, a difference of opinion or dispute shall arise between the parties to the agreement with respect to any right or obligation arising under the agreement, the question in dispute, if it cannot be settled between the parties themselves, may be referred to arbitrators consisting of three competent and disinterested persons, one of which persons shall be selected by the Owner, one by the proposer, and the third by the two arbitrators thus chosen by the Owner and proposer. The party desiring that any matter be submitted to arbitration shall give written notice thereof to the other party, stating therein the specific point or points in dispute and naming the person selected by said party as an arbitrator, and it shall be the duty of the other party, within fifteen days after receiving such notice, to agree in writing to submit the dispute to arbitration and to

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

name an arbitrator. If the party upon whom such notice is served fails to respond thereto with such fifteen-day period, then such failure shall be deemed a refusal by such party to agree to submit the dispute to arbitration and civil action may be filed in the Circuit Court of Kanawha County, West Virginia, for the purpose of resolving the dispute. In the event such other party does agree in writing to submit to arbitration but fails to name an arbitrator, the party desiring arbitration may apply to the Judge of the Circuit Court of Kanawha County, West Virginia, to appoint such arbitrator. Likewise, in the event of the failure of the arbitrators thus named to agree upon the third arbitrator within twenty days after notification of their appointment, then the third arbitrator may be named by such judge upon application of either party hereto, and such judge is empowered to name such arbitrator. The arbitrators thus chosen shall give to the parties to any dispute written notice of time and place of hearing and at the time and place appointed shall proceed with the hearing, unless, for some good cause of which the arbitrators, or a majority of them, shall be the sole judge, it shall be postponed until some later date within a reasonable time. The discussion of the board of arbitrators thus constituted, or a majority of the persons composing the same, shall be made in writing and a copy thereof delivered to each of the said parties. Payment of the expenses of such arbitration, including the fees of the arbitrators, shall be as directed by the board of arbitration, or a majority thereof.

If the parties hereto expressly agree to submit any dispute to arbitration as herein provided then, and in such event, the decision rendered by the arbitrators shall be binding upon the parties and shall be specifically enforceable. If the parties do not agree, in writing, to submit such dispute to arbitration, the party requesting such arbitration may file a civil action in the Circuit Court of Kanawha County for the purpose of resolving such dispute; however, a request for arbitration shall not be a prerequisite to filing a civil action to settle any such dispute.

Where the parties have submitted any question to arbitration as herein provided, the award of arbitrators shall be final and conclusive upon said parties with reference to the question so submitted on any judgment may be entered upon it in accordance with the provisions of Article 10, Chapter 55 of the Code of West Virginia, 1931, as amended.

- xix. Termination of Contract and Liquidated Damages – If the proposer refuses or fails to perform this work with such diligence as will insure its completion within the time specified, including extensions, if any are granted, then Metro, by written notice to the proposer, may terminate the proposer’s right to proceed with the work and this contract shall be terminated for any and all future work. On such termination, Metro may take over the work and prosecute the same to completion, by contract or otherwise, and the proposer shall be liable to Metro for any additional costs incurred by Metro in the completion of the work. In addition, the proposer shall also be liable for liquidated damages in the amount of \$4,300 per day for any delay in the completion of the work.
- xx. Compliance with Laws – The proposer shall complete such action as is required to become fully informed of all State and Federal laws and local ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work,

**REQUEST FOR PROPOSALS**  
**METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

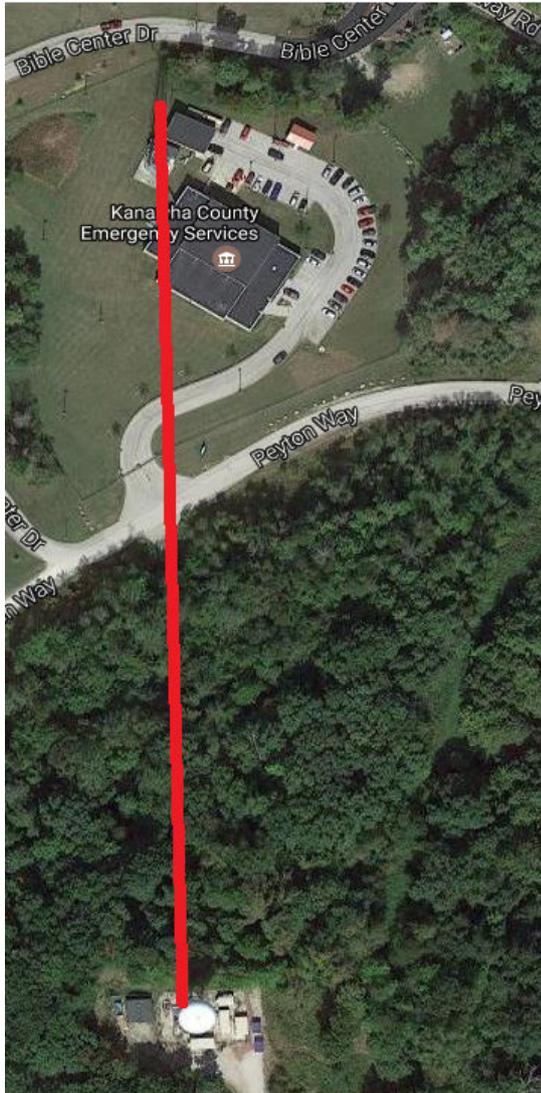
or in any way affecting the conduct of the work. The proposer shall, at all times, observe and comply with and shall cause all the proposer's agents and employees to observe and comply with all such existing and future laws, ordinances, regulations order s and decrees. The proposer shall further protect and indemnify Metro from any claim or liability arising or based on the violation of any such law, ordinance, regulation, order or decree, whether by the proposer or the proposer's employees.

- xxi. Standards of Quality and Codes – All work must conform to all rules and regulations of all governmental authorities having jurisdiction over the project including, but not limited to:
- Federal Occupational Safety & Health Administration Regulations (OSHA)
  - WV Department of Environmental Protection
  - WV Bureau of Public Health
  - WV State Fire Marshall
  - WV Department of Natural Resources
  - WV Department of Labor
- xxii. For the Metro's record, submit copies of permits, licenses, certifications, inspection records, releases, notices, receipts for fee payments, correspondence and records, established in conjunction with compliance with standards and regulations bearing upon performance of work.
- xxiii. Real Estate and Personal Property Taxes – No bid contract will be awarded to a proposer who is listed on the last published list of delinquent real or personal property taxes in Kanawha County; however, Metro will accept bids from proposers who provide satisfactory proof of payment of current taxes or a certification from the Sheriff that no taxes are due prior to award of said contract.
- xxiv. Required Forms – Proposer shall complete and submit, or have on file with Metro, a Vendor Registration and Disclosure Statement Form and a State of West Virginia No Debt Affidavit, both of which can be found on Metro's website at metro911.org, as well as a completed IRS Form W9.
- xxv. Conflicts of Interest – Proposer must affirm in writing that proposer and all individuals who will be assigned to this transaction are free from all obligations and interest which conflict with the interest of Metro.

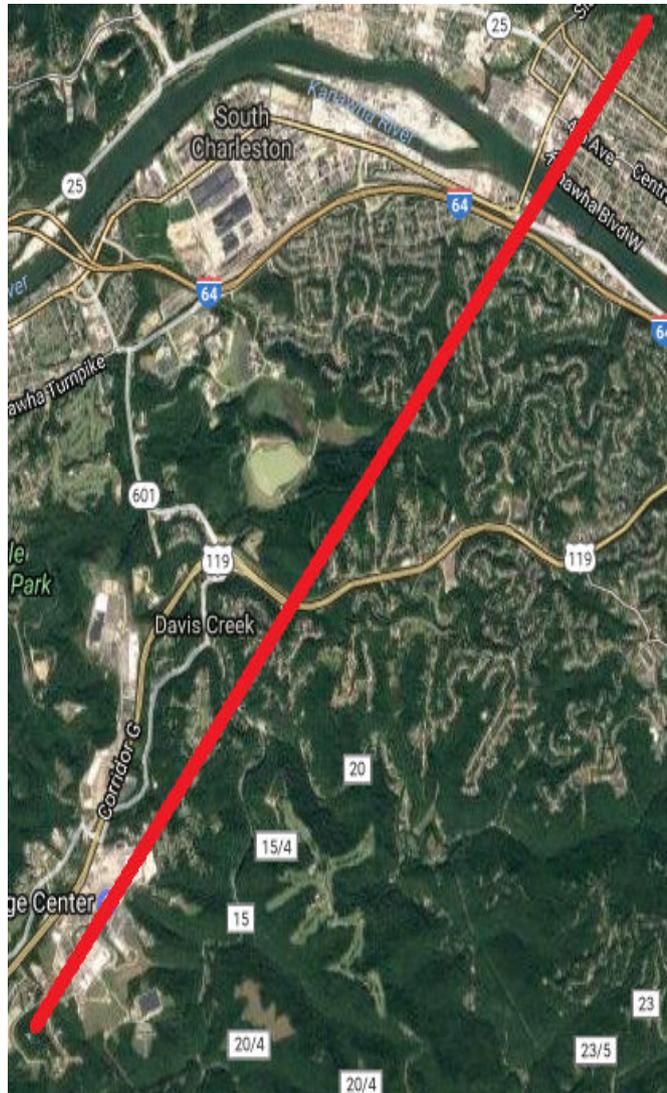
**REQUEST FOR PROPOSALS  
METRO EMERGENCY OPERATIONS CENTER MICROWAVE COMMUNICATON SYSTEM**

**27. APPENDIX A – PROPOSED MICROWAVE PATHS**

1-Metro/NWS



2-NWS-SIRN/Garfield Site



The topology shown here is considered to be the typical path model.