



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND – C5ISR CENTER

MORA V2.5 Specification Revision Overview Brief

RTI Directorate / CT Division / ITA Branch - MORA Architecture Working Group

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- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- MDM Type 4 and 7 Message Updates
- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
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- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
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- Clarified VRT control / context fields applicability for signal ports and switch groups
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- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
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- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability

- **MORA V2.5 Revision History**



MORA V2.5 Significant Updates



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MORA SIGNAL RESOURCE PROFILE (MSRP)



- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
 - Added MSRP Specification to MD, MSRM and MSPM CT specification tables

Table 12 MORA Device <MT92010-V2.45>

Spec Title	Spec Tag	Applicability
MORA Device Management Interface	MT92011-V2.45	Required
MORA Device Operations Interface	MT90016-V2.45	Required
Generic End Node Data Interface	VT52101-V1.9	Required
Syslog-Based Health Publishing Interface	VT50103-V1.9	Required
Syslog Protocol Data Parameters for MORA	49101-20200707, Pro	Required
MORA Signal Resource Profile	49019-202212210444, ProExp	(+) Required
Generic End Node IPv6 Data Interface	VT52103-V1.9	Optional
Auto-Discovery Interface	VT59930-V1.6	Recommended

(+) Experimental specifications are not included in compliance tests.

Table 15 MORA Signal Resource Manager <MT92013-V2.45>

Spec Title	Spec Tag	Applicability
MORA Signal Resource Management Interface	MT92014-V2.45	Required
MORA Signal Resource Manager Operations Interface	MT90017-V2.45	Required
Syslog-Based Health Publishing Interface	VT50103-V1.9	Required
Syslog Protocol Data Parameters for MORA	49101-20200707, Pro	Required
MORA Signal Resource Profile	49019-202212210444, ProExp	(+) Required
Auto-Discovery Interface	VT59930-V1.6	Recommended

(+) Experimental specifications are not included in compliance tests.

Table 18 MORA Signal Port Manager <MT92016-V2.45>

Spec Title	Spec Tag	Applicability
RF Layer Analog Data Interface	MT90011-V2.1	(1) Required
RF Layer Digital Data Interface	MT90014-V2.45	
RF Layer Command Interface	MT90012-V2.45	Required
RF Layer Context Interface	MT90013-V2.45	Required
RF Layer Operations Interface	MT90015-V2.45	Required
MORA Signal Resource Profile	49019-202212210444, ProExp	(+) Required

(+) Experimental specifications are not included in compliance tests.

(1) One or more of MT90011, MT90014 is Required



MORA SIGNAL RESOURCE PROFILE (MSRP)



- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types (con't)
 - Added MSRP Section 5.7 <49019-20221221, Pro>

5.7 MORA Signal Resource Profile <49019-20221221, Pro>

The establishment of a standardized MORA Signal Resource Profile (MSRP) enables portability for capabilities to be easily integrated across multiple systems. The MORA signal resource component type interfaces specify well defined message structures and over the wire behavior. The standardized MSRP defines a file data structure for a specific implementation's device level characteristics, signal resource attributes, and communication settings. This established file data structure allows multiple parties to view and edit profile content throughout the implementation process.

The implementation process starts with the original equipment manufacturer constructing the first MSRP file from a device perspective. This would include basic device level characteristics, detailed signal resource attributes, and some initial generic network settings for operational test purposes. Next, once the device is identified for use in a system integration, the system integrator would modify / update the MSRP from a system perspective. This would entail adding information on the device's external connections (analog signal ports) to other devices in the system as well as device level identifiers and waveforms. System specific updates would likely be made to the communication settings for both VDB and ML2B connections (static transport configurations including final URL/URI, MAC, IP, UDP Port, and MUI details). The MSRP implementation process is a key aspect that ultimately leads to program acceptance and accreditation of the system by the stakeholder.

The standardized MSRP also enables the MORA signal resource component types to support multiple profiles for selection at boot-up in devices that are approved for use in different physical locations (e.g., card slots) within a MORA system as well as across systems from different programs. Allowing devices to be preloaded with multiple approved system profiles simplifies the acquisition and provisioning for the stakeholder community while also allowing device manufacturers to maintain a lower mix of products while supporting a larger number of programs.

The standardization of the MSRP is specified through the declaration of a separate set of complex types named MORA Signal Resource Profile Complex Types. This set of complex types is organized to achieve efficient ingest at resource-side startup / boot and differs from other MORA specified sets of complex types that are organized in support of message interactions. There are some shared complex types between the complex type sets as well as some repurposed complex types. Additionally, the MSRP complex type includes configuration parameters for the resource-side that are related to component type behaviors and inter-component type interactions that are not exposed externally to clients.

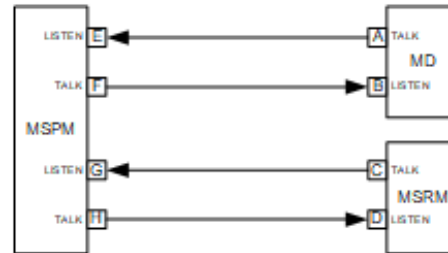
These inter-component type interactions are defined by the operation interfaces for each component type. The transport method of the operations interface MDMs can be directly addressable or can transit an intermediate appliance requiring knowledge of additional network socket parameters. [Figure 14](#) below depicts both methods and how the MSRP Configuration Parameters supports either method.



MORA SIGNAL RESOURCE PROFILE (MSRP)

MSRP Configuration Parameters Specification Support for Operations Interface Sockets

Operations Interface Directly Addressable Transport of Unidirectional Separated Lanes



A ... H are component type local "sockets" for the operations interface which include:
MAC (RC for proxy)
IP (RC for proxy)
UDP Port (R)
MUI (R)

The MUI must be minimally unique to the component type level

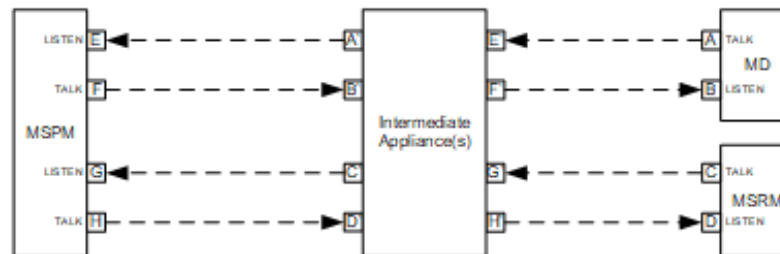
Local Sockets:

A = MD TALK TO MSPM
B = MD LISTEN TO MSPM
C = MSRM TALK TO MSPM
D = MSRM LISTEN TO MSPM
E = MSPM LISTEN TO MD
F = MSPM TALK TO MD
G = MSPM LISTEN TO MSRM
H = MSPM TALK TO MSRM

If unidirectional or separated lanes are not desired, the following maximum consolidations are allowed:

A = B
C = D
E = F = G = H
A' = B' = C' = D'
E' = F' = G' = H'

Operations Interface Intermediary Transport using Unidirectional Separated Lanes



A ... H are intermediate appliance "intermediary sockets" for the operations interface which include:
MAC (R)
IP (R)
UDP Port (R)

Local Sockets:

E = MSPM LISTEN TO MD
F = MSPM TALK TO MD
G = MSPM LISTEN TO MSRM
H = MSPM TALK TO MSRM

Intermediary Sockets:

A' = INTERMEDIARY MD TALK TO MSPM
B' = INTERMEDIARY MD LISTEN TO MSPM
C' = INTERMEDIARY MSRM TALK TO MSPM
D' = INTERMEDIARY MSRM LISTEN TO MSPM
E' = INTERMEDIARY MSPM LISTEN TO MD
F' = INTERMEDIARY MSPM TALK TO MD
G' = INTERMEDIARY MSPM LISTEN TO MSRM
H' = INTERMEDIARY MSPM TALK TO MSRM

Local Sockets:

A = MD TALK TO MSPM
B = MD LISTEN TO MSPM
C = MSRM TALK TO MSPM
D = MSRM LISTEN TO MSPM



MORA SIGNAL RESOURCE PROFILE (MSRP)



- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types (con't)
 - Added MSRP Section 5.7 (con't)

5.7.1 MORA Signal Resource Profile Implementation Rules

1. The resource-side MORA Device, MORA Signal Resource Manager, and MORA Signal Port Manager component types shall implement the standardized MORA Signal Resource Profile as defined in the section titled “[MORA Signal Resource Profile Complex Types](#).”
2. The client-side may choose to utilize the standardized MORA Signal Resource Profile for storing and sharing discovered signal resource information obtained from request/response interactions across the client-side MORA component types.
3. The resource-side MORA Device, MORA Signal Resource Manager, and MORA Signal Port Manager component types shall use an identical MSRP file for a given device in a specific implementation.
4. The MORA MSRP file shall be static within a device's operating session and shall not be dynamically modified during the system's operating session by any message interactions.
5. MORA implementations shall provide a clearly documented method for programs to update and maintain all MSRP files on a device.
6. MORA implementations may permit MSRP files to be managed via the file operations described in the section titled “[MORA Device Management Parameters](#)” for files of Type “PROFILE” corresponding to a “[MORA File](#)” complex type.
7. A MORA implementation should support the storage of multiple MSRPs for scenarios where the device may migrate in different physical locations (e.g., card slots) within a MORA system as well as across systems from different programs, selecting the appropriate file on startup/restart.
8. A program should implement a system wide MSRP file naming convention that includes methods to identify:
 - Program name
 - MORA Signal Port Manager Operations Interface MUI (e.g., 12345)
 - Physical location in the system (e.g., Slot2)
 - System specific device name in the system (e.g., Alpha_Payload_Card)
 - Device major version
 - Device minor version
 - File major version
 - File minor version
 - File extension (e.g., xyz.msrp)



MORA SIGNAL RESOURCE PROFILE (MSRP)



- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types (con't)
 - Added MSRP Section 5.7 (con't)

5.7.2 MORA Signal Resource Profile Complex Types

The following is a list of "MORA Signal Resource Profile Complex Types" used by this specification. Implementations shall be in accordance with the following sections.

Due to the data type interdependency between XML and binary based messaging, it is important that XML values which need to be translated to a binary format (e.g., on the ML2B) conforms with the precision outlined in this specification. The XML schema data formats do not provide the binary precision constraints that are specified.

The XML schema data format of "integer" shall be 32-bit signed integers, while "unsigned integer" shall be 32-bit unsigned integers. The XML schema data format of "real number" shall be 32-bit floating point numbers. There are instances where some XML schema data formats require a larger range; these formats shall be specified as "integer (64-bit)" (long) or "real number (64-bit)" (double) where necessary.

The terms "restricted string" and "restricted URI" are described in VICTORY sections titled "String Bounds" and "URI Bounds" under "VICTORY Data Types." String enumerations further restrict the String Bounds to the predefined list of values.



MORA SIGNAL RESOURCE PROFILE (MSRP)



Legend:

"Complex Type Name" or List		Inclusive list bounds <lower limit:upper limit> Where upper limit of "N" is unbounded or inherently bounded (Description/Notes)
Attribute Name	Value from Profile	Data Format (Data Range) [Units] MDM Type1 VRT Control/Context Field (Description/Notes)
Attribute Name	Implementation Specific or Value from Profile	Data Format (Data Range) [Units] MDM Type1 VRT Control/Context Field (Description/Notes)
[R] if required, [RC] if required conditionally, otherwise optional		

Data Format Note: All "Integer" values shall be 32-bit signed integers, while "unsigned integer" values shall be 32-bit unsigned integers. All "real number" values shall be 32-bit floating point numbers. There are instances where some values require a larger range; these values shall be specified as "long" for 64-bit integers or "double" for 64-bit floating point numbers where necessary.

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The purpose of this MSRP XML Structure tab is to standardize the organization and binding of profile information (resource attributes and configuration parameters) for a given MORA device (MORA Device, MORA Signal Resource Manager, and MORA Signal Port Manager component types) implementation in a given physical location in a given system (program specific). This profile is not intended to change across a production series. This profile does not include information that will change from one hardware instance to the next hardware instance such as a serial number ("Equipment ID").

MORA Signal Resource Profile <49019-20221221, Pro>
MORA Signal Resource Profile Complex Types
MoraSignalResourceProfileComplexTypes.xsd

"MORA Signal Resource Profile" [R]				
MORA Device [R]	"MORA Device"			
	ID [R]	Value from Profile	Integer (1 to 63) Stream ID	
	Type [R]	Value from Profile	Restricted String (OTH, RHD, RCD, SDR) Stream ID	
	Sub Type [R]	Value from Profile	Restricted String (RXO, TXO, TOR, TAR)	
	Service Name [R]	Value from Profile	Restricted String (Corresponds to VICTORY service name)	
	Version Info URL	Implementation Specific or Value from Profile	Restricted URI (Implementation specific for dynamic DHCP IP assignments and value from profile for static IP assignments)	
MORA Configurations [R]	List "MORA Configuration"		<1..N>	
	ID [R]	Value from Profile	Integer (>0)	
	Name [R]	Value from Profile	Restricted String	
	Configuration Files	List "File Name" corresponding to "MORA File"	<1..N> (Types "CONFIGURATION")	
		File Name [R]	Restricted String	
	Supported Signal Ports [RC]	List "ID" corresponding to "Signal Port"	<1..127> (Supported Signal Ports is required when MSRM and MSPM are present)	
		ID [R]	Value from Profile	Integer (1 to 127) Stream ID
	Supported Switch Groups [RC]	List "ID" corresponding to "Switch Group"	<1..127> (Supported Switch Groups is required when MSRM and MSPM are present with at least one Switch Group)	
		ID [R]	Value from Profile	Integer (1 to 127) Stream ID
Waveforms	List "Waveform"		<1..N>	
	ID [R]	Value from Profile	Integer (>0)	
	Description [R]	Value from Profile	Restricted String	
	RF Function [R]	Value from Profile	Restricted String (RXO, TXO, TOR, TAR)	
	Frequency Range [R]	"Frequency Range"		[RF Reference Frequency] (Operating frequency range and resolution of this waveform application)
		Start [R]	Value from Profile	Double (-2^43 to 2^43 - (1/2^20)) [Hz] (fractional resolution is 1/2^20 Hz)
		End [R]	Value from Profile	Double (-2^43 to 2^43 - (1/2^20)) [Hz] (fractional resolution is 1/2^20 Hz, End ≥ Start)
		Resolution [R]	Value from Profile	Double (0 to 2^43 - (1/2^20)) [Hz] (fractional resolution is 1/2^20 Hz)
	Associated Signal Ports [R]	List "ID" corresponding to "Signal Port"	<1..127>	
		ID [R]	Value from Profile	Integer (1 to 127) Stream ID
Waveform Operations	List "Waveform Operation"		<1..N>	
	ID [R]	Value from Profile	Integer (>0)	
	MORA Configuration IDs [R]	List "ID" corresponding to "MORA Configuration"	<1..N>	
		ID [R]	Value from Profile	Integer (>0)
	Waveform IDs [R]	List "ID" corresponding to "Waveform"	<1..N>	
		ID [R]	Value from Profile	Integer (>0)
Reference Connections	List "Reference Connection"		<1..127>	
	Reference Port ID [R]	Value from Profile	Integer (1 to 127)	
	Signal Port IDs [R]	List of Integers	<1..N>	
		Signal Port ID	Value from Profile	Integer (1 to 127)
	Association [R]	Value from Profile	Restricted String (CONDUCTED_INJECTION, RADIATED_INJECTION, SELECTABLE_INJECTION, FUNCTIONALLY_DEPENDENT)	
Static Internal Connections	List "Connection"		<1..N>	
	Port ID 1 [R]	Value from Profile	Integer (1 to 127) (Shall be less than Port ID 2)	
	Port ID 2 [R]	Value from Profile	Integer (1 to 127)	
	Gain Delta [R]	Value from Profile	Float [dB]	
	Delay Delta [R]	Value from Profile	Long [femtoseconds]	
Static External Connections	List "External Connection"		<1..N>	
	Local Signal Port ID [R]	Value from Profile	Integer (1 to 127)	
	External Signal Port ID [R]	Value from Profile	Integer (1 to 127)	
	External Device [R]	Value from Profile	Restricted String (xxxxyy) (concatenated xxx is "Type" and yy is "ID" with no zero padding that corresponds to the "MORA Device")	
	Gain Delta	Value from Profile	Float [dB]	
	Delay Delta	Value from Profile	Long [femtoseconds]	

– Signal Port (1 of 2)

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– Signal Port (1 of 2)

RF Conditioning	"Radio Frequency Conditioning"		(shall not be empty)			
	Gain Stages	List "Gain Stage"			<1-2>	
		Stage Number [R]	Value from Profile	Integer (1 to 3) [Gain]		
		Signal Direction [R]	Value from Profile	Restricted String (TX, RX)		
		Gain Type [R]	Value from Profile	Restricted String (AUTOMATIC, MANUAL, SELECTABLE) [Discrete IO 32]		
		Manual Gain [CR]	"Manual Gain"			
			Minimum Gain [R]	Value from Profile	(shall be provided as part of Gain Stage when Gain Type is MANUAL or SELECTABLE, shall not be provided as part of Gain Stage when Gain Type is AUTOMATIC)	
			Maximum Gain [R]	Value from Profile	Float (-24 to 24 - (1/2^n)) [dBm] (fractional resolution is 1/2^n dB (0.0078125 dB))	
			Resolution [R]	Value from Profile	Float (-24 to 24 - (1/2^n)) [dBm] (fractional resolution is 1/2^n dB (0.0078125 dB), Max > Min)	
			Output Level [CR]	List of Floats	Float (0 to 24 - (1/2^n)) [dBm] (fractional resolution is 1/2^n dB (0.0078125 dB))	
			Level	Value from Profile	<1-N> (shall be provided as part of Gain Stage when Gain Type is AUTOMATIC or SELECTABLE, shall not be provided as part of Gain Stage when Gain Type is MANUAL)	
				Float (-2 to 2 - (1/2^n)) [dBm] [± dB Compression Point] (fractional resolution is 1/2^n dB (0.0078125 dB))		
	Filter Banks	List "Filter Bank"				
		ID [R]	Value from Profile	Integer (1 to 3) [Discrete IO 64]		
		Filters [R]	List "Filter"		<1-32>	
ID [R]		Value from Profile	Integer (0 to 31) [Discrete IO 64] (Bypass FL0 / select FL1-FL30 / 31 is for tunable filters)			
Signal Direction [R]		Value from Profile	Restricted String (TX, RX, TOR)			
Filter Logic [R]		Value from Profile	Restricted String (FIXED, SELECTABLE, TUNABLE)			
Filter Type [R]		Value from Profile	Restricted String (BAND_PASS, BAND_REJECT, HIGH_PASS, LOW_PASS, BYPASS)			
Gain Delta [R]		Value from Profile	Float [dB]			
Delay Delta [R]		Value from Profile	Long [Tentoseconds]			
		Frequency Range [R]	"Frequency Range"			
		Start [R]	Value from Profile	(Aux Frequency) [Aux frequency at the -3 dB amplitude response points for tunable filters FL31]		
		End [R]	Value from Profile	Double (-2443 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz)		
		Resolution [R]	Value from Profile	Double (-2443 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz, End ≥ Start)		
		Bandwidth	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz)		
				Double (0) [Hz] (fractional resolution is 1/2^n*20 Hz; used with tunable filter logic)		
RF Translators	"Frequency Translation"					
	IF Center Frequencies [R]	List of Doubles			<1-N>	
		Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] [IF Reference Frequency] (fractional resolution is 1/2^n*20 Hz)			
	IF Bandwidths [R]	List of Doubles			<1-N>	
		Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] [Bandwidth] (fractional resolution is 1/2^n*20 Hz)			
	RF Range [R]	"Frequency Range"				
		Start [R]	Value from Profile	Double (-2443 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz)		
		End [R]	Value from Profile	Double (-2443 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz, End ≥ Start)		
		Resolution [R]	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz)		
	RF Bandwidths [R]	List of Doubles			<1-N>	
		Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] [Bandwidth] (fractional resolution is 1/2^n*20 Hz)			
		Bandwidth	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] [Bandwidth] (fractional resolution is 1/2^n*20 Hz)		
	Signal Domain Conversion Description	Turning Speed [R]	Value from Profile	Long (<0) [Tentoseconds]		
		"Signal Domain Conversion Description"				
		ID [R]	Value from Profile	Integer (1 to 127)		
Signal Direction [R]		Value from Profile	Restricted String (TX, RX, TOR)			
Supported Signal Data Formats [R]		"Signal Data Formats"			Must not be empty	
		Time Domain Packet Formats	List of "Time Domain Packet Format"			
		Time Domain Packet Format Description [R]	Value from Profile	Restricted String (Human Readable)		
		Time Domain Packet Format Value [R]	Value from Profile	Hexadecimal 16 Character String (Hexadecimal representation of the binary V49.2 Signal Data Payload Packet Field) [Signal Data Packet Payload Format]		
		Frequency Domain Packet Formats	List of "Frequency Domain Packet Format"			
		Frequency Domain Packet Format Description [R]	Value from Profile	Restricted String (Human Readable)		
		Frequency Domain Packet Format Value [R]	Value from Profile	Hexadecimal 104 Character String (Hexadecimal representation of the binary V49.2 Spectrum Field) [Spectrum]		
Sample Bandwidths and Sample Rates [R]		List "Sample Bandwidth and Sample Rate"				
		Sample Bandwidth [R]	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] [Bandwidth] (fractional resolution is 1/2^n*20 Hz)		
		Sample Rate [R]	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [samples per second] [Sample Rate] (fractional resolution is 1/2^n*20 samples per second)		
Sub Ports		TX Buffer Size [R]	Value from Profile	Long (16) [Bytes] (0 if Data Port)		
	RX Buffer Size [R]	Value from Profile	Long (16) [Bytes] (0 if DTX Port)			
	List "Sub Port"				<1-65,535>	
	ID [R]	Value from Profile	Integer (1 to 65,535)			
	Type [R]	Value from Profile	Restricted String (ODC, DUC, NCH)			
	Channel Coherency [R]	Value from Profile	Restricted String (PHASIS_COHERENT, LO_COHERENT)			
	Required Control Fields [R]	List of Integers			<0-63>	
		Required Control Field [R]	Value from Profile	Integer (1 to 31, 101 to 131) [1 to 31 maps to CPE bit fields, 101 to 131 maps to CFI bit fields]		
	Sub-Tuning Range	"Frequency Range"				
		Start [R]	Value from Profile	Double (-2443 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz)		
		End [R]	Value from Profile	Double (-2443 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz, End ≥ Start)		
		Resolution [R]	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] (fractional resolution is 1/2^n*20 Hz)		
	Signal Domain Conversion Description	"Signal Domain Conversion Description"				
	ID [R]	Value from Profile	Integer (1 to 65,535)			
	Signal Direction [R]	Value from Profile	Restricted String (TX, RX, TOR)			
Supported Signal Data Formats [R]	"Signal Data Formats"			Must not be empty		
	Time Domain Packet Formats	List of "Time Domain Packet Format"				
	Time Domain Packet Format Description [R]	Value from Profile	Restricted String (Human Readable)			
	Time Domain Packet Format Value [R]	Value from Profile	Hexadecimal 16 Character String (Hexadecimal representation of the binary V49.2 Signal Data Payload Packet Field) [Signal Data Packet Payload Format]			
	Frequency Domain Packet Formats	List of "Frequency Domain Packet Format"				
	Frequency Domain Packet Format Description [R]	Value from Profile	Restricted String (Human Readable)			
	Frequency Domain Packet Format Value [R]	Value from Profile	Hexadecimal 104 Character String (Hexadecimal representation of the binary V49.2 Spectrum Field) [Spectrum]			
Sample Bandwidths and Sample Rates [R]	List "Sample Bandwidth and Sample Rate"					
	Sample Bandwidth [R]	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [Hz] [Bandwidth] (fractional resolution is 1/2^n*20 Hz)			
	Sample Rate [R]	Value from Profile	Double (0 to 2443 - (1/2^n*20)) [samples per second] [Sample Rate] (fractional resolution is 1/2^n*20 samples per second)			
TX/RX Buffers	TX Buffer Size [R]	Value from Profile	Long (16) [Bytes] (0 if Data Port)			
	RX Buffer Size [R]	Value from Profile	Long (16) [Bytes] (0 if DTX Port)			



MORA SIGNAL RESOURCE PROFILE (MSRP)



– Antenna Arrays & Manifold Bands

Antenna Arrays [RC]		List "Antenna Array"	<1:32> (Required for RHD Device Type only)		
ID [R]	Value from Profile	Integer (0 to 31) [Reference Point Identifier] (ID of 0 shall be used for unlike elements not part of a true array)			
Type [R]	Value from Profile	Restricted String (CIRCULAR, DISCRETE, CONFORMAL, LINEAR_2D, LINEAR_3D, COLUMN)			
Steering Control [R]	Value from Profile	Restricted String (FIXED, MECHANICAL, BEAMFORMER)			
Array Field of View [R]	"RF Field of View"				
	Azimuth Range [R]	"Azimuth Range"			(beginning at Azimuth Start and moving clockwise to Azimuth Stop)
		Azimuth Start [R]	Value from Profile	Float (0 to <360) [Arc Degrees]	
		Azimuth Stop [R]	Value from Profile	Float (0 to <360) [Arc Degrees]	
	Elevation Range	"Elevation Range"			(beginning at Elevation Start and moving towards zenith to Elevation Stop)
		Elevation Start [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]	
		Elevation Stop [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]	
Elements [R]	List "Array Element"				
	ID [R]	Value from Profile	Integer (1 to 65,535) [Reference Point Identifier]		
	Type [R]	Value from Profile	Restricted String (MONOPOLE, DIPOLE, SPIRAL, OTHER)		
	Polarizations [R]	List "Polarization"			
		Orientation Angle [R]	Value from Profile	<1:N>	
		Ellipticity Angle [R]	Value from Profile	Float (0 to π) [Radians] (corresponding to tilt angle in VITA 49.2 polarization field)	
	Frequency Range [R]	"Frequency Range"			
		Start [R]	Value from Profile	Double (-2 ⁴³ to 2 ⁴³ - (1/2 ²⁰)) [Hz] (fractional resolution is 1/2 ²⁰ Hz)	
		End [R]	Value from Profile	Double (-2 ⁴³ to 2 ⁴³ - (1/2 ²⁰)) [Hz] (fractional resolution is 1/2 ²⁰ Hz, End $\geq$ Start)	
		Resolution [R]	Value from Profile	Double (0 to 2 ⁴³ - (1/2 ²⁰)) [Hz] (fractional resolution is 1/2 ²⁰ Hz)	
	Location [R]	"Relative Cartesian Coordinates"			(Relative to platform center)
		X [R]	Value from Profile	Double [meters] (positive x-axis shall point forward down the centerline of the platform)	
		Y [R]	Value from Profile	Double [meters] (positive y-axis shall point 90 degrees left of forward)	
		Z [R]	Value from Profile	Double [meters] (positive z-axis shall be orthogonal to the x-axis and y-axis and shall point upward from the platform)	
	Boresight Gain [R]	Value from Profile	Float [dBi]		(relative to element boresight)
	Beamwidth [R]	"RF Field of View"			
		Azimuth Range [R]	"Azimuth Range"		(beginning at Azimuth Start and moving clockwise to Azimuth Stop)
			Azimuth Start [R]	Value from Profile	Float (0 to <360) [Arc Degrees]
			Azimuth Stop [R]	Value from Profile	Float (0 to <360) [Arc Degrees]
		Elevation Range	"Elevation Range"		(beginning at Elevation Start and moving towards zenith to Elevation Stop)
			Elevation Start [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]
			Elevation Stop [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]

Manifold Bands [RC]		List "Manifold Band"	<1:2047> (Required for RHD Device Type only)		
Band ID [R]	Value from Profile	Integer (1 to 2,047) [Reference Point Identifier]			
Spatial Calibration [R]	"MORA File"				
	File Name [R]	Value from Profile	"Type"=CALIBRATION)		
	Path	Value from Profile	Restricted String		
	Size [R]	Value from Profile	Long (20) [bytes]		
	Type [R]	Value from Profile	Restricted String (CALIBRATION)		
	Date Modified	Value from Profile	Restricted String (VICTORY timestamp format)		
Frequency Range [R]	"Frequency Range"				
	Start [R]	Value from Profile	Double (-2 ⁴³ to 2 ⁴³ - (1/2 ²⁰)) [Hz] (fractional resolution is 1/2 ²⁰ Hz)		
	End [R]	Value from Profile	Double (-2 ⁴³ to 2 ⁴³ - (1/2 ²⁰)) [Hz] (fractional resolution is 1/2 ²⁰ Hz, End $\geq$ Start)		
	Resolution [R]	Value from Profile	Double (0 to 2 ⁴³ - (1/2 ²⁰)) [Hz] (fractional resolution is 1/2 ²⁰ Hz)		
Field Of View [R]	"RF Field of View"		(relative to platform forward)		
	Azimuth Range [R]	"Azimuth Range"			(beginning at Azimuth Start and moving clockwise to Azimuth Stop)
		Azimuth Start [R]	Value from Profile	Float (0 to <360) [Arc Degrees]	
		Azimuth Stop [R]	Value from Profile	Float (0 to <360) [Arc Degrees]	
	Elevation Range	"Elevation Range"			(beginning at Elevation Start and moving towards zenith to Elevation Stop)
		Elevation Start [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]	
		Elevation Stop [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]	
Manifold Band Elements [R]	List "Associated Elements"				
	Array ID [R]	Value from Profile	Integer (0 to 31) (ID of 0 shall be used for unlike elements not part of a true array)		
	Elements [R]	List of Integers	<1 to 65,535>		
		Element ID [R]	Value from Profile	Integer (1 to 65,535)	
Aperture Channels [R]	List "Aperture Channel"				
	ID [R]	Value from Profile	Integer (>0)		
	Channel Description [R]	Value from Profile	Restricted String		
	Associated Signal Port [R]	Value from Profile	Integer (1 to 127)		
	Associated Sub Port	Value from Profile	Integer (1 to 65,535)		
Beamwidths	List "RF Field of View"				
	Azimuth Range [R]	"Azimuth Range"			(beginning at Azimuth Start and moving clockwise to Azimuth Stop)
		Azimuth Start [R]	Value from Profile	Float (0 to <360) [Arc Degrees]	
		Azimuth Stop [R]	Value from Profile	Float (0 to <360) [Arc Degrees]	
	Elevation Range	"Elevation Range"			(beginning at Elevation Start and moving towards zenith to Elevation Stop)
		Elevation Start [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]	
		Elevation Stop [R]	Value from Profile	Float (-90 to +90) [Arc Degrees]	

– Configuration Parameters (1 of 2)

– Configuration Parameters (1 of 2)

Configuration Parameters [R]	"Configuration Parameters" Device [R]		Resource Side use only - not needed by clients	
B A	"MORA Device Configuration" Version Information [R]		"Version Information"	
	Interface Type [R]		Value from Profile	Restricted String (from 49102 spec tables)
	Interface SOAP Version [R]		Value from Profile	Restricted String (cmajor-minor- from 49102 spec tables) [e.g. 2.5] MORA Soap Component Types
	Interface SOAP Components [R]		List "SOAP Component"	<1..N>
	SOAP Component Type [R]		Value from Profile	Restricted String (from 49102 spec tables)
	Ports [R]		List "Port"	<1..N>
	CHOICE OF [R]		Standard Version [R]	Value from Profile Restricted String (from 49102 spec tables)
			URI	Restricted URI (for static IP configurations)
			Partial URI Info	"Partial URI Info" for dynamic IP configurations (DHCP)
			Port [R]	Value from Profile Integer (0 to 65535)
			Path	Value from Profile Restricted String (shall include a forward slash "/" as first character.)
	Zeroconf Instance Name		Value from Profile	Restricted String
	Software Version [R]		Value from Profile	Restricted String
	Device Description [R]		Value from Profile	Restricted String
	Default MORA Configuration ID		Value from Profile	Integer (<0)
	Default Device State		Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED)
	States Allowing Configuration Change [R]		List of Restricted String	<0..N>
	States Allowing Run-Built-In Test [R]		Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED)
	States Allowing Run-Built-In Test [R]		List of Restricted String	<0..N>
	Device State [R]		Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED)
	Command State Transition Map [R]		List "Command Transition"	<0..N>
	Initial State [R]		Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED)
	Allowed Transitions [R]		List "State Transition"	<1..N>
	Command [R]		Value from Profile	Restricted String (OPERATE, STANDBY, TRANSMIT, INHIBIT, POWER_ON, SHUT_DOWN, RESTART, MAINTENANCE_MODE, ZEROIZE, SANITIZE)
			Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED, OFF)
			End State [R]	<0..N>
	Organic State Transition Map [R]		List "Organic Transition"	<0..N>
	Initial State [R]		Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED)
	End State [R]		Value from Profile	Restricted String (OPERATIONAL, STANDBY, TRANSMIT, INHIBIT, FAULT, ZEROIZED, MAINTENANCE_MODE, SANITIZED)
	Device Information [R]		"Device Information"	Value from Profile
	Manufacturer [R]		Value from Profile	Restricted String
	Model [R]		Value from Profile	Restricted String
	MD Listen to MSPM [R]		"Socket"	(Required when "Signal Resource" complex type is provided as part of "Configuration Parameters" complex type.)
	MAC [R]		Value from Profile	Restricted String (Statistically assigned - locally administered. Required in a proxy implementation)
	IP [R]		Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statistically assigned. Required in a proxy implementation)
	Port [R]		Value from Profile	Integer (0 to 65535)
	Mdu [R]		Value from Profile	Integer (0 to 65535)
	MD Talk to MSPM [R]		"Socket"	(Required when "Signal Resource" complex type is provided as part of "Configuration Parameters" complex type.)
	Nack [R]		Value from Profile	Restricted String (Statistically assigned - locally administered. Required in a proxy implementation)
	IP [R]		Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statistically assigned. Required in a proxy implementation)
	Port [R]		Value from Profile	Integer (0 to 65535)
	Mdu [R]		Value from Profile	Integer (0 to 65535)
	MD to MSPM MDM Types [R]		List of Integers	<1..N> (Required when "Signal Resource" complex type is provided as part of "Configuration Parameters" complex type.)
	MDM Type [R]		Value from Profile	Integer (2, 3, 4)
	MDM Nack Timeout [R]		Value from Profile	Integer (<0) (microseconds) (Time to wait for ACK until MDM is considered a no-response, if ACK requested. Required when "Signal Resource" complex type is provided as part of "Configuration Parameters" complex type.)
	Max Number of MDM Retransmissions [R]		Value from Profile	Integer [0] (Number of times to retransmit an MDM in response to NACK or no response, if ACK requested. Required when "Signal Resource" complex type is provided as part of "Configuration Parameters" complex type.)
	MDM Time of Day Transmission Period [R]		Value from Profile	Integer [0] (Time of day transmission period. Required when "Signal Resource" complex type is provided as part of "Configuration Parameters" complex type.)



MORA SIGNAL RESOURCE PROFILE (MSRP)



– Configuration Parameters (2 of 2)

Signal Resource (RC)	"Signal Resource"	"MORA Signal Resource Manager Configuration"	(Required when the MORA Signal Resource Manager and MORA Signal Port Manager component types are present.)			
	MORA Signal Resource Manager (R)	Version Information (R)	"Version Information"			
		Interface Type (R)	Value from Profile	Restricted String (from 49102 spec tables)		
		Interface Standard Version (R)	Value from Profile	Restricted String (from 49102 spec tables)		
		Interface SOAP Components (R)	List "SOAP Component"	<1..N>		
			SOAP Component Type (R)	Value from Profile	Restricted String (from 49102 spec tables)	
		Ports (R)	List "Port"	<1..N>		
			Standard Version (R)	Value from Profile	Restricted String (from 49102 spec tables)	
			URI	Value from Profile	Restricted URI (for static IP configurations)	
			Partial URI Info	Partial URI Info	for dynamic IP configurations (DHCP)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			Path	Value from Profile	Restricted String (shall include a forward slash "/" as the first character)	
		Zeroconf Instance Name	Value from Profile	Restricted String		
		MSRM Service Unique Name (R)	Value from Profile	Restricted String		
		MSRM Listen to MSPM (R)	"Socket"			
			MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered. Required in a proxy implementation)	
			IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned. Required in a proxy implementation)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			MUI (R)	Value from Profile	Integer (0 to 65535)	
		MSRM Talk to MSPM (R)	"Socket"			
			MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered. Required in a proxy implementation)	
			IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned. Required in a proxy implementation)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			MUI (R)	Value from Profile	Integer (0 to 65535)	
		MSRM to MSPM MDM Types (R)	List of Integers	Value from Profile	<1..N>	
			MDM Type (R)	Value from Profile	Integer (2, 3, 4, 7)	
		MDM NACK Timeout (R)	Value from Profile	Integer (>0) (milliseconds) (Time to wait for ACK until MDM is considered a no-response, if ACK requested)		
		Max Number of MDM Retransmissions (R)	Value from Profile	Integer (>0) (Number of times to retransmit an MDM in response to NACK or no-response, if ACK requested)		
		MDM Time of Day Transmission Period (R)	Value from Profile	Integer (>0) (milliseconds) (0 if not periodically sent)		
	MORA Signal Port Manager (R)	"MORA Signal Port Manager Configuration"				
		MSPM Listen to MD (R)	"Socket"			
			MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered. Required in a proxy implementation)	
			IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned. Required in a proxy implementation)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			MUI (R)	Value from Profile	Integer (0 to 65535)	
		MSPM Talk to MD (R)	"Socket"			
			MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered. Required in a proxy implementation)	
			IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned. Required in a proxy implementation)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			MUI (R)	Value from Profile	Integer (0 to 65535)	
		MSPM Listen to MSRM (R)	"Socket"			
			MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered. Required in a proxy implementation)	
			IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned. Required in a proxy implementation)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			MUI (R)	Value from Profile	Integer (0 to 65535)	
		MSPM Talk to MSRM (R)	"Socket"			
			MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered. Required in a proxy implementation)	
			IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned. Required in a proxy implementation)	
			Port (R)	Value from Profile	Integer (0 to 65535)	
			MUI (R)	Value from Profile	Integer (0 to 65535)	
		MSPM to MD MDM Types (R)	List of Integers	Value from Profile	<1..N>	
			MDM Type (R)	Value from Profile	Integer (2, 5)	
		MSPM to MSRM MDM Types (R)	List of Integers	Value from Profile	<1..N>	
			MDM Type (R)	Value from Profile	Integer (2, 4, 5, 7)	
		MDM NACK Timeout (R)	Value from Profile	Integer (>0) (milliseconds) (Time to wait for ACK until MDM is considered a no-response, if ACK requested)		
		Max Number of MDM Retransmissions (R)	Value from Profile	Integer (>0) (Number of times to retransmit an MDM in response to NACK or no-response, if ACK requested)		
		MDM Health Transmission Period (R)	Value from Profile	Integer (>0) (milliseconds) (0 if not periodically sent)		
Operations Interface Intermediate Appliance (RC)	"Intermediate Appliance Configuration"					
	Intermediate MD Talk to MSPM (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MD Listen to MSPM (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MSRM Talk to MSPM (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MSRM Listen to MSPM (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MSPM Listen to MD (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MSPM Talk to MD (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MSPM Listen to MSRM (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		
	Intermediate MSPM Talk to MSRM (R)	"Intermediate Socket"				
		MAC (R)	Value from Profile	Restricted String (Statically assigned - locally administered)		
		IP (R)	Value from Profile	IP Address SimpleType (IPv4 or IPv6) (Statically assigned)		
		Port (R)	Value from Profile	Integer (0 to 65535)		



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- MDM Type 4 and 7 Message Updates
- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
- Updated MORA Implementation of VRT CAM Field Functions
- Added sequential to the uniqueness for MORA use of Message ID Field
- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



IPV4 ML2B

MULTICAST DISSEMINATION

- Updated IPv4 IGMP on ML2B (IETF RFCs)
 - ML2B - Multicast Dissemination Over the Network Specification

5.2.1.1 Multicast Dissemination Over the Network Specification <48006-2016013120211118, Exp>

The ML2B shall support [IPv4](#) Internet Group Management Protocol (IGMP), as ~~specified~~ described in the “Internet Engineering Task Force (IETF) Request for Comment (RFC) 2236: Internet Group Management Protocol (IGMP)” [6]; section of the VICTORY Standard Specifications either through the use of a compatible router or the use of a switch with IGMP snooping as described in the “IGMP Snooping in IPv4” and “IGMP Forwarding Proxy” sections of the VICTORY Standard Specifications.

The ML2B may also support IPv6 ~~referenced in Internet Engineering Task Force (IETF) Request for Comment (RFC) 4541: Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches~~ [7], as described in the “Multicast Listener Discovery (MLD)” section of the VICTORY Standard Specifications either through the use of a compatible router or the use of a switch with MLD snooping as described in the “MLD Snooping in IPv6” and “MLD Forwarding Proxy” sections of the VICTORY Standard Specifications.

10.4.7.1 Internet Group Management Protocol (IGMP) <01075-20120725, Pro>

A VDB shall maintain the capability to forward dynamically configured IPv4 multicast datagrams. In order for the VDB as a whole to support this functionality, all VICTORY-compliant routers and devices with routing capability shall conform to the Internet Group Management Protocol (IGMP) version 3 standard as described in [Table 184](#).

Table 184. IGMP (IPv4) Multicast Routing Standards

Applicability	Specification
Required	IETF RFC 3376 (Standards Track): Internet Group Management Protocol, Version 3
Informational	IETF RFC 3569 (Informational): An Overview of Source-Specific Multicast (SSM)
Required	IETF RFC 4604 (Standards Track): Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDV2) for Source-Specific Multicast

10.4.7.2 IGMP Forwarding Proxy <01087-20180215, Pro>

The VICTORY Data Bus shall support the use of IGMP forwarding proxy as defined in IETF RFC 4605: Internet Group Management Protocol (IGMP) / Multicast Listener Discovery (MLD)-Based Multicast Forwarding (“IGMP/MLD Proxying”).

10.4.8.1 IGMP Snooping in IPv4 <01024-20120725, Pro>

IGMP Snooping is a technique for extending the knowledge of end node multicast group subscriptions to layer 2 devices. A switch device ‘snoops’ by monitoring layer 3 IGMP group subscription request messages, and builds dynamic routing tables based upon them. It should be noted that not all devices that support snooping can do so at “wire speed.” Any VICTORY device that supports IGMP snooping should do so at wire speed.

It is recommended that VICTORY-compliant layer 2 network switches that comprise the VDB support IGMP snooping for IPv4 traffic as presented in [Table 186](#).

Table 186. Multicast Snooping Standards

Applicability	Comment	Specification
Informational	IPv4, Layer 2 Snooping recommended for switches at wire speed	IETF RFC 4541 (Informational): Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches

NOTE: IGMP snooping is recommended for performance considerations in a dynamically configured IPv4 multicast environment, but there are some drawbacks to the technique. See the section titled “IGMP and MLD without a Router” for an elaboration of these drawbacks and their mitigations.



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- **Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B**
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
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- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
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- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
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- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



OPTIONAL SUPPORT OF IPv6 ON VDB

- Added Optional Support of IPv6 on VDB for MD CT
 - MT-92010 table gets an added row for VT52103-V1.9 with optional applicability

Table 12 MORA Device <MT92010-V2.45>

Spec Title	Spec Tag	Applicability
MORA Device Management Interface	MT92011-V2.45	Required
MORA Device Operations Interface	MT90016-V2.45	Required
Generic End Node Data Interface	VT52101-V1.9	Required
Syslog-Based Health Publishing Interface	VT50103-V1.9	Required
Syslog Protocol Data Parameters for MORA	49101-20200707, Pro	Required
<u>MORA Signal Resource Profile</u>	<u>49019-20220414, Exp</u>	<u>Required</u>
<u>Generic End Node IPv6 Data Interface</u>	<u>VT52103-V1.9</u>	<u>Optional</u>
Auto-Discovery Interface	VT59930-V1.6	Recommended



OPTIONAL SUPPORT OF IPv6 ON ML2B

- Added Optional Support of IPv6 on ML2B
 - ML2B - Multicast Dissemination Over the Network Specification

5.2.1.1 Multicast Dissemination Over the Network Specification <48006-2016013120211118, Exp>

The ML2B shall support IPv4 Internet Group Management Protocol (IGMP), as ~~specified~~ described in the “Internet Engineering Task Force (IETF) Request for Comment (RFC) 2236: Internet Group Management Protocol (IGMP)” [6];section of the VICTORY Standard Specifications either through the use of a compatible router or the use of a switch with IGMP snooping as described in the “IGMP Snooping in IPv4” and “IGMP Forwarding Proxy” sections of the VICTORY Standard Specifications.

The ML2B may also support IPv6 referenced in Internet Engineering Task Force (IETF) Request for Comment (RFC) 4541: Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Delivery (MLD)-Snooping Switches [7], as described in the “Multicast Listener Discovery (MLD)” section of the VICTORY Standard Specifications either through the use of a compatible router or the use of a switch with MLD snooping as described in the “MLD Snooping in IPv6” and “MLD Forwarding Proxy” sections of the VICTORY Standard Specifications.

10.4.7.3 Multicast Listener Discovery (MLD) <01076–20140630, Pro>

A VDB that supports IPv6 shall maintain the capability to forward dynamically configured IPv6 multicast datagrams. In order for the VDB as a whole to support this functionality, all VICTORY-compliant routers and devices with routing capability shall conform to the Multicast Listener Discovery (MLD) Protocol version 2 standard as described in [Table 185](#).

Table 185. MLD (IPv6) Multicast Routing Standards

Applicability	Specification
Required	IETF RFC 2710 (Standards Track): Multicast Listener Discovery (MLD) for IPv6
Informational	IETF RFC 3569 (Informational): An Overview of Source-Specific Multicast (SSM)
Required	IETF RFC 3810 (Standards Track): Multicast Listener Discovery Version 2 (MLDv2) for IPv6
Required	IETF RFC 4604 (Standards Track): Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast
Recommended	IETF RFC 3590 (Standards Track): Source Address Selection for the Multicast Listener Discovery (MLD) Protocol

10.4.8.2 MLD Snooping in IPv6 <01060–20120131, Exp>

MLD Snooping is a technique for extending the knowledge of end node multicast group subscriptions to layer 2 devices which support IPv6. A switch device ‘snoops’ by monitoring layer 3 MLD group subscription request messages, and builds dynamic routing tables based upon them. It should be noted that not all devices that support snooping can do so at “wire speed.” Any VICTORY device that supports MLD snooping should do so at wire speed.

It is recommended that VICTORY-compliant layer 2 network switches that comprise the VDB support MLD snooping for IPv6 traffic as presented in [Table 186](#).

***NOTE:** MLD snooping is recommended for performance considerations in a dynamically configured IPv6 multicast environment, but there are some drawbacks to the technique. See the section titled “IGMP and MLD without a Router” for an elaboration of these drawbacks and their mitigations.*

10.4.7.4 MLD Forwarding Proxy <01092–20180215, Exp>

The VICTORY Data Bus shall support the use of MLD forwarding proxy as defined in IETF RFC 4605: Internet Group Management Protocol (IGMP) / Multicast Listener Discovery (MLD)-Based Multicast Forwarding (“IGMP/MLD Proxying”).



OPTIONAL SUPPORT OF IPv6 ON ML2B

- Added Optional Support of IPv6 on ML2B (con't)
 - Low Latency Switch Data Interface

Table 7 Low Latency Switch <MT91010-V2.45>

Spec Title	Spec Tag	Applicability
Low Latency Switch Data Interface	MT91011-V2.45	Required
Switch Management Interface	VT50902-V1.7	Required
SNMP-Based Health Publishing Interface	VT59903-V1.6	Required
MORA Low Latency Bus Performance Specification	48201-20160131, Exp	(+) Required

(+) Experimental specifications are not included in compliance tests.

5.3.1.1 Low Latency Switch Data Interface <MT91011-V2.45>

The Low Latency Switch Data Interface implementation shall be in accordance with [Table 8](#) below.

Table 8 Low Latency Switch Data Interface <MT91011-V2.45>

Spec Title	Spec Tag	Applicability
Low Latency Switch Data Interface Physical and Data-Link Layer Specifications	MT91012-V2.45	Required
Switch Data Interface Network Layer and Higher Specifications	VT50901.T4-V1.7	Required
Switch IPv6 Data Interface Network Layer and Higher Specifications	VT50901.T7-V1.7	Optional

7.3.1.4 Switch IPv6 Data Interface Network Layer and Higher Specifications <VT50901.T7-V1.7>

The table below identifies the specifications for the switch ipv6 data interface network layer and higher specifications.

Table 45. Switch IPv6 Data Interface Network Layer and Higher Specifications <VT50901.T7-V1.7>

Spec Title	Spec Tag	Applicability
Switch Data Interface IPv6-Specific Specifications	VT50901.T6-V1.6	Required
Transmission Control Protocol	01026-20120725, Pro	Required
User Datagram Protocol	01027-20120725, Pro	Required
Static Host Addressing	01061-20120725, Pro	Required
QoS Mapping to Components	01036-20120725, Pro	Recommended
Diffserv	01037-20120725, Pro	Recommended
Diffserv Code Point (DSCP) Assignments	01039-20120725, Pro	Recommended
PTP End-to-End Transparent Clock Mode for Infrastructure Components	02008-20180215, Exp	(+) Optional

(+) Experimental specifications are not included in compliance tests.



OPTIONAL SUPPORT OF IPv6 ON ML2B

- Added Optional Support of IPv6 on ML2B (con't)
 - IP/UDP specification within MDM Networking Specifications

6.2 MDM Networking Specifications <MT96002-V2.45>

The MDM message structure is used in six distinct interfaces across three different MORA component types. MDM message interactions may occur within a single MORA Device (intra-device) or occur between multiple MORA Devices. MDM message interactions between devices require the message to transit a network and therefore shall be in accordance with the following networking specifications in [Table 30](#) below.

Table 30 MDM Networking Specifications <MT96002-V2.45>

Spec Title	Spec Tag	Applicability
Low Latency Copper Data Physical and Data-Link Layer Specifications	MT91013-V2.4	(1) Required
Low Latency Fiber Data Physical and Data-Link Layer Specifications	MT91014-V2.1	
Standard for Ethernet Specification	48001-20160131, Exp	(+) Required
Virtual LANs Specification	48002-20160131, Exp	(+) Required
Standard for Internet Protocol and User Datagram Protocol Specification	48005- 2016013120211118 , Exp	(+) Required
Jumbo Frame Packet Support Specification	48007-20200707, Exp	(+) Required
MDM Traffic Marking Specification	48008-20200707, Exp	(+) Required

(+) Experimental specifications are not included in compliance tests.

(1) One or more of MT91013, MT91014 is Required

5.2.1.5 Standard for Internet Protocol and User Datagram Protocol Specification <48005- [2016013120211118](#), Exp>

~~IPv4~~ IPv4 as specified in *Internet Engineering Task Force (IETF) Request for Comment (RFC) 791: Internet Protocol* [5] shall be supported. IPv6 as specified in *Internet Engineering Task Force Request for Comment (RFC) 8200: Internet Protocol, Version 6 (IPv6) Specification* [11] may also be supported.

~~as well as~~ UDP, as specified in *Internet Engineering Task Force (IETF) Request for Comment (RFC) 768: User Datagram Protocol* [4] shall be supported.



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- MDM Type 4 and 7 Message Updates
- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
- Updated MORA Implementation of VRT CAM Field Functions
- Added sequential to the uniqueness for MORA use of Message ID Field
- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



ML2B “MORA TRANSPORT CONFIGURATION” SPLIT



- Applicability differences between resource use cases and client use cases that were not easily regulated for XML validation and not supported in binary structure of MDM Types 4 and 7
 - XML Resource Use Cases
 - getSignalPorts via MORA Common Complex Types
 - getSwitchGroups via MORA Common Complex Types
 - “MSRP Signal Resource Profile” complex types
 - XML Client Use Cases
 - reserveSignalPort via MORA Common Complex Types
 - reserveSwitchGroup via MORA Common Complex Types
 - getSignalPortReservations via MORA Common Complex Types
 - getSwitchGroupReservations via MORA Common Complex Types
 - Binary Signal Port Reservation and Release (see separate section)
 - MDM Type 4 Signal Port User ID
 - Binary Switch Group Reservation and Release (see separate section)
 - MDM Type 7 Switch Group User ID
- Underlying issue was for Context Transport Configuration, where it is required for all resources but optional for clients that are not publishing context (not a resource in the system).



ML2B “MORA TRANSPORT CONFIGURATION” SPLIT

- Resolved XML validation issue by splitting “MORA Transport Configuration” complex type into two new separate complex types.
- Existing “MORA Transport Configuration” complex type
 - Control Transport Configuration – Required
 - Signal Data Transport Configuration – Conditionally Required
 - Context Transport Configuration - **Required**

"MORA Transport Configuration"			
Component ID [R]	Value from Profile		Restricted String (xxxxyy) (concatenated xxx is "Type" and yy is "ID" with no zero padding that corresponds to the "MORA Device")
Signal Port ID	Value from Profile		Integer (1 to 127)
Priority Level	Value from Profile		Integer (>0) (1 is highest priority, higher numbers have decreasing priority, unspecified is lowest priority)
Control Transport Configuration [R]	"Data Transport Configuration"		
	Unique Name [R]	Value from Profile	Restricted String (minimally includes MAC address in first 17 characters) (Statically assigned (locally administered) e.g. 02:C0:ED:12:34:56)
	Index	Value from Profile	Integer
	URI [R]	Value from Profile	Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) [e.g. udp://192.168.0.1:50000/50100]
Signal Data Transport Configuration [R - Conditionally]	"Data Transport Configuration"		
	Unique Name [R]	Value from Profile	Restricted String (minimally includes MAC address in first 17 characters) (Statically assigned (locally administered) e.g. 03:C0:ED:12:34:56)
	Index	Value from Profile	Integer
	URI [R]	Value from Profile	Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) [e.g. multicast://224.0.0.6:50001/50100]
Context Transport Configuration [R]	"Data Transport Configuration"		
	Unique Name [R]	Value from Profile	Restricted String (minimally includes MAC address in first 17 characters) (Statically assigned (locally administered) e.g. 03:C0:ED:12:34:56)
	Index	Value from Profile	Integer
	URI [R]	Value from Profile	Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) [e.g. multicast://224.0.0.6:50002/50100]

- Note that the first three children (Component ID, Signal Port ID and Priority Level) support the client use cases and are primarily redundant / not applicable for resource use cases.



ML2B “MORA TRANSPORT CONFIGURATION” SPLIT

- New “MORA Resource Transport Configuration” complex type
 - Control Transport Configuration – Required
 - Signal Data Transport Configuration – Conditionally Required
 - Context Transport Configuration - Required
 - No longer has the first three children

"MORA Resource Transport Configuration"			
Control Transport Configuration [R]	"Data Transport Configuration"		
	Unique Name [R]	Value from Profile	Restricted String (minimally includes MAC address in first 17 characters) (Statically assigned (locally administered) e.g. 02:C0:ED:12:34:56)
	Index	Value from Profile	Integer
	URI [R]	Value from Profile	Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) (e.g. udp://192.168.0.1:50000/50100)
Signal Data Transport Configuration [R - Conditionally]	"Data Transport Configuration"		
	Unique Name [R]	Value from Profile	(Shall be provided for digital signal port "PRODUCER" or "BOTH" role use cases. Shall not be provided for all analog signal port, digital signal port "CONSUMER" role, and all switch group use cases.)
	Index	Value from Profile	Integer
	URI [R]	Value from Profile	Restricted String (minimally includes MAC address in first 17 characters) (Statically assigned (locally administered) e.g. 03:C0:ED:12:34:56)
Context Transport Configuration [R]	"Data Transport Configuration"		
	Unique Name [R]	Value from Profile	Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) (e.g. multicast://224.0.0.6:50001/50100)
	Index	Value from Profile	Integer
	URI [R]	Value from Profile	Restricted String (minimally includes MAC address in first 17 characters) (Statically assigned (locally administered) e.g. 03:C0:ED:12:34:56)

- New “MORA Client Transport Configuration” complex type
 - Control Transport Configuration – Required
 - Signal Data Transport Configuration – Conditionally Required
 - Context Transport Configuration – **Conditionally** Required

List "MORA Client Transport Configuration" [R - N number of client devices]				<1:N> {N number of client devices that are authorized to control the signal port with requesting user first}
Component ID [R]				Restricted String (xxxxyy) (concatenated xxx is "Type" and yy is "ID" with no zero padding that corresponds to the "MORA Device")
Signal Port ID				Integer (1 to 127)
Priority Level				Integer (>0) {1 is highest priority, higher numbers have decreasing priority, unspecified is lowest priority, the priority of the first TC is used for multi-client reservations}
Control Transport Configuration [R]	"Data Transport Configuration"			
	Unique Name [R]			Restricted String (minimally includes MAC address in first 17 characters) (e.g. 02:C0:ED:12:34:56)
	Index			Integer
	URI [R]			Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) (e.g. udp://192.168.0.1:50000/50100)
Signal Data Transport Configuration [RC]	"Data Transport Configuration"			{Shall be provided when digital signal data is published by this client. Shall not be provided when digital signal data is not published by this client}
	Unique Name [R]			Restricted String (minimally includes MAC address in first 17 characters) (e.g. 03:C0:ED:00:00:06)
	Index			Integer
	URI [R]			Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) (e.g. multicast://224.0.0.6:50001/50100)
Context Transport Configuration [RC]	"Data Transport Configuration"			{Shall be provided when context data is published by this client. Shall not be provided when context data is not published by this client}
	Unique Name [R]			Restricted String (minimally includes MAC address in first 17 characters) (e.g. 03:C0:ED:00:00:06)
	Index			Integer
	URI [R]			Restricted URI (RFC 3986 shall minimally include IPv4/6 address, port, and MUI in the path) (e.g. multicast://224.0.0.6:50002/50100)



- **MORA V2.5 Significant Updates**

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- **Enhanced MDM Header for Version Functionality by MDM Type**
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- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
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- Updated MORA Implementation of VRT CAM Field Functions
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- Revised applicability of Generic End Node Management Parameters
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MDM HEADER VERSION FUNCTIONALITY



- Enhanced MDM Header Version Functionality
 - Updated meaning from top level specification to specification level by MDM type in support of better granularity of compatibility understanding over time

Table 28 MDM Header Format

32-bits			
16-bits		16-bits	
8-bits	8-bits	8-bits	8-bits
MDM PREAMBLE			ACK
VERSION MAJ	VERSION MIN	MDM SEQUENCE NUMBER	
ML2B INTERFACE ID			
MDM TYPE		NUMBER OF MESSAGES	

6.1.2.1.3 **MDM Version** (16 bits)

The MDM Version fields (VERSION MAJ and VERSION MIN) shall contain the major and minor versions of the **packet by MDM Type**. The major version (VERSION MAJ) of the MDM shall be identified by an 8-bit, unsigned integer greater than or equal to 0 and less than 256. The minor version (VERSION MIN) of the MDM shall be identified by an 8-bit, unsigned integer greater than or equal to 0 and less than 256. ~~The MDM Version fields indicate the version of the MDM Header as defined by this specification. The current major version is 2 and the current minor version is 4. Current MDM versions by MDM Type shall be managed in accordance with Table 93 in Appendix “MORA DATA MESSAGE TYPE ATTRIBUTES.” to support version compatibility by message type. Implementations may support interoperability of legacy versions by MDM Type.~~



MDM HEADER VERSION FUNCTIONALITY

- Enhanced MDM Header Version Functionality (con't)
 - Added Table 93 for version callouts by MDM Type
 - Added MDM Type 2 response value for version incompatibility cases

Table 93 MDM Version by Type

MDM Packet Type	Current Version	
	2.4	2.5
VITA Radio Transport (VRT) (Type 1)		X
Acknowledgement (Type 2)		X
Time of Day (Type 3)		X
Signal Port User ID (Type 4)		X
Health Status (Type 5)		X
Command (Type 6)		X
Switch Group User ID (Type 7)		X

Table 72 MDM Acknowledgement Message Response Bit Field

8-bits							
VI	UU	US	RU	IR	IF	IM	A
R	R	R	R	R	R	R	R

New Value



- **MORA V2.5 Significant Updates**

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- Updated IPv4 ML2B Multicast Dissemination
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- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- **MDM Type 4 and 7 Message Updates**
- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
- Updated MORA Implementation of VRT CAM Field Functions
- Added sequential to the uniqueness for MORA use of Message ID Field
- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
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- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



MDM TYPE 4 MESSAGE UPDATES

- Updated MDM Type 4 Message
 - Added MUI and Field Indicator Bits Fields (i.e. IPv4 versus IPv6)

6.3.4 MDM Signal Port User ID Message (Type 4) Specification <48613-20201002202212210414307, ProExp>

Table 77 MDM Signal Port User ID Message Format

32-bits																															
16-bits																16-bits															
8-bits								8-bits								8-bits								8-bits							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MDM PREAMBLE																								SEND-ACK							
VERSION MAJ								VERSION MIN								MDM SEQUENCE NUMBER															
ML2B INTERFACE ID																															
MDM TYPE																NUMBER OF MESSAGES															
Signal Port User ID Field																															
User ML2B Command Field Indicator Bits																User Command ML2B Unique Identifier (MUI)															
User ML2B Command IP Address Field 1																															
User ML2B Command IP Address Field 2																															
User ML2B Command IP Address Field 3																															
User ML2B Command IP Address Field 4																															
User ML2B Command MAC																															
User ML2B Command UDP Port																															
User ML2B Signal Data Field Indicator Bits																User Signal Data ML2B Unique Identifier (MUI)															
User ML2B Signal Data IP Address Field 1																															
User ML2B Signal Data IP Address Field 2																															
User ML2B Signal Data IP Address Field 3																															
User ML2B Signal Data IP Address Field 4																															
User ML2B Signal Data MAC																															
User ML2B Signal Data UDP Port																															
User ML2B Context Field Indicator Bits																User Context ML2B Unique Identifier (MUI)															
User ML2B Context IP Address Field 1																															
User ML2B Context IP Address Field 2																															
User ML2B Context IP Address Field 3																															
User ML2B Context IP Address Field 4																															
User ML2B Context MAC																															
User ML2B Context UDP Port																															

The User ML2B Xxxxxxx Field Indicator Bits field shall be set to "0000000000000001" (1) when the IP Address Fields represent IPv4. The User ML2B Xxxxxxx Field Indicator Bits field shall be set to "0000000000000010" (2) when the IP Address Fields represent IPv6.



- Updated MDM Type 4 Message (con't)
 - Clarified IP and MAC Octet and Bit significance ordering
 - Updated regulations to reflect client conditional requirements

The User ML2B Context IP Address Field 2 shall be zero if using an IPv4-IPv6 address, or the 0th 4th 8th 12th 16th 20th 24th 28th 32th 36th 40th 44th 48th 52th 56th 60th 64th 68th 72th 76th 80th 84th 88th 92th 96th 100th 104th 108th 112th 116th 120th 124th 128th 132th 136th 140th 144th 148th 152th 156th 160th 164th 168th 172th 176th 180th 184th 188th 192th 196th 200th 204th 208th 212th 216th 220th 224th 228th 232th 236th 240th 244th 248th 252th 256th 260th 264th 268th 272th 276th 280th 284th 288th 292th 296th 300th 304th 308th 312th 316th 320th 324th 328th 332th 336th 340th 344th 348th 352th 356th 360th 364th 368th 372th 376th 380th 384th 388th 392th 396th 400th 404th 408th 412th 416th 420th 424th 428th 432th 436th 440th 444th 448th 452th 456th 460th 464th 468th 472th 476th 480th 484th 488th 492th 496th 500th 504th 508th 512th 516th 520th 524th 528th 532th 536th 540th 544th 548th 552th 556th 560th 564th 568th 572th 576th 580th 584th 588th 592th 596th 600th 604th 608th 612th 616th 620th 624th 628th 632th 636th 640th 644th 648th 652th 656th 660th 664th 668th 672th 676th 680th 684th 688th 692th 696th 700th 704th 708th 712th 716th 720th 724th 728th 732th 736th 740th 744th 748th 752th 756th 760th 764th 768th 772th 776th 780th 784th 788th 792th 796th 800th 804th 808th 812th 816th 820th 824th 828th 832th 836th 840th 844th 848th 852th 856th 860th 864th 868th 872th 876th 880th 884th 888th 892th 896th 900th 904th 908th 912th 916th 920th 924th 928th 932th 936th 940th 944th 948th 952th 956th 960th 964th 968th 972th 976th 980th 984th 988th 992th 996th 1000th 1004th 1008th 1012th 1016th 1020th 1024th 1028th 1032th 1036th 1040th 1044th 1048th 1052th 1056th 1060th 1064th 1068th 1072th 1076th 1080th 1084th 1088th 1092th 1096th 1100th 1104th 1108th 1112th 1116th 1120th 1124th 1128th 1132th 1136th 1140th 1144th 1148th 1152th 1156th 1160th 1164th 1168th 1172th 1176th 1180th 1184th 1188th 1192th 1196th 1200th 1204th 1208th 1212th 1216th 1220th 1224th 1228th 1232th 1236th 1240th 1244th 1248th 1252th 1256th 1260th 1264th 1268th 1272th 1276th 1280th 1284th 1288th 1292th 1296th 1300th 1304th 1308th 1312th 1316th 1320th 1324th 1328th 1332th 1336th 1340th 1344th 1348th 1352th 1356th 1360th 1364th 1368th 1372th 1376th 1380th 1384th 1388th 1392th 1396th 1400th 1404th 1408th 1412th 1416th 1420th 1424th 1428th 1432th 1436th 1440th 1444th 14



MDM TYPE 7 MESSAGE UPDATES

- Updated MDM Type 7 Message (con't)
 - Clarified IP and MAC Octet and Bit significance ordering
 - Updated regulations to reflect client conditional requirements

User ML2B Command Field Indicator Bits (16 bits)

The User ML2B Command Field Indicator Bits field shall be set to "000000000000000010" (10) when the IP Address Fields represent IPv4. The User ML2B Command Field Indicator Bits field shall be set to "0000000000000000010" (21) when the IP Address Fields represent IPv6.

User Command ML2B Unique Identifier (MUI) (16 bits)

The User Command ML2B Unique Identifier (MUI) shall be the Origination ID of the user for Commands.

User ML2B Command IP Address Field 1 (32 bits)

The ML2B Command IP Address Field 1 shall be either the most significant octet, followed by the 2nd most significant octet, followed by the 3rd most significant octet, followed by the 4th most significant octet of the IPv4-IPv4 address or the 13th-16th octet of the IPv6-IPv6 address of the user for Commands. The octet bit order shall be most significant to least significant.

User ML2B Command IP Address Field 2 (32 bits)

The ML2B Command IP Address Field 2 shall be zero if using an IPv4-IPv4 address; or the 9th-12th octet-5th most significant octet, followed by the 6th most significant octet, followed by the 7th most significant octet, followed by the 8th most significant octet of the IPv6-IPv6 address of the user for Commands. The octet bit order shall be most significant to least significant.

User ML2B Command IP Address Field 3 (32 bits)

The ML2B Command IP Address Field 3 shall be zero if using an IPv4-IPv4 address; or the 5th-8th octet-9th most significant octet, followed by the 10th most significant octet, followed by the 11th most significant octet, followed by the 12th most significant octet of the IPv6-IPv6 address of the user for Commands. The octet bit order shall be most significant to least significant.

User ML2B Command IP Address Field 4 (32 bits)

The ML2B Command IP Address Field 4 shall be zero if using an IPv4-IPv4 address; or the 1st-4th octet-13th most significant octet, followed by the 14th most significant octet, followed by the 15th most significant octet, followed by the 16th most significant octet of the IPv6-IPv6 address of the user for Commands. The octet bit order shall be most significant to least significant.

User ML2B Command MAC (32 bits)

The User ML2B Command MAC shall be the 3rd-6th octets most significant octet, followed by the 2nd most significant octet, followed by the 3rd most significant octet, followed by the 4th most significant octet of the MAC address of the user for Commands. The octet bit order shall be most significant to least significant.

User ML2B Command MAC (16 bits)

The User ML2B Command MAC shall be the 1st-and-2nd octets 5th most significant octet, followed by the 6th most significant octet of the MAC address of the user for Commands. The octet bit order shall be most significant to least significant.

User ML2B Command UDP Port (16 bits)

The User ML2B Command UDP Port shall be the UDP port of the user for Commands.

User ML2B Context Field Indicator Bits (16 bits)

The User ML2B Context Field Indicator Bits field shall be set to "000000000000000010" (10) when the IP Address Fields represent IPv4. The User ML2B Context Field Indicator Bits field shall be set to "0000000000000000010" (21) when the IP Address Fields represent IPv6. This field shall be set to "0000000000000000" (0) when context is not published by this client.

User Context ML2B Unique Identifier (MUI) (16 bits)

The User Context ML2B Unique Identifier (MUI) shall be the Origination ID of the user for Context. This field shall be set to zero when context is not published by this client.

User ML2B Context IP Address Field 1 (32 bits)

The User ML2B Context IP Address Field 1 shall be either the most significant octet, followed by the 2nd most significant octet, followed by the 3rd most significant octet, followed by the 4th most significant octet of the IPv4-IPv4 address or the 13th-16th octet of the IPv6-IPv6 address of the user for Context. The octet bit order shall be most significant to least significant. This field shall be set to zero when context is not published by this client.

User ML2B Context IP Address Field 2 (32 bits)

The User ML2B Context IP Address Field 2 shall be zero if using an IPv4-IPv4 address; or the 9th-12th octet-5th most significant octet, followed by the 6th most significant octet, followed by the 7th most significant octet, followed by the 8th most significant octet of the IPv6-IPv6 address of the user for Context. The octet bit order shall be most significant to least significant. This field shall be set to zero when context is not published by this client.

User ML2B Context IP Address Field 3 (32 bits)

The User ML2B Context IP Address Field 3 shall be zero if using an IPv4-IPv4 address; or the 5th-8th octet-9th most significant octet, followed by the 10th most significant octet, followed by the 11th most significant octet, followed by the 12th most significant octet of the IPv6-IPv6 address of the user for Context. The octet bit order shall be most significant to least significant. This field shall be set to zero when context is not published by this client.

User ML2B Context IP Address Field 4 (32 bits)

The User ML2B Context IP Address Field 4 shall be zero if using an IPv4-IPv4 address; or the 1st-4th octet-13th most significant octet, followed by the 14th most significant octet, followed by the 15th most significant octet, followed by the 16th most significant octet of the IPv6-IPv6 address of the user for Context. The octet bit order shall be most significant to least significant. This field shall be set to zero when context is not published by this client.

User ML2B Context MAC (32 bits)

The User ML2B Context MAC shall be the 3rd-6th octets most significant octet, followed by the 2nd most significant octet, followed by the 3rd most significant octet, followed by the 4th most significant octet of the MAC address of the user for Context. The octet bit order shall be most significant to least significant. This field shall be set to zero when context is not published by this client.

User ML2B Context MAC (16 bits)

The User ML2B Context MAC shall be the 1st-and-2nd octets 5th most significant octet, followed by the 6th most significant octet of the MAC address of the user for Context. The octet bit order shall be most significant to least significant. This field shall be set to zero when context is not published by this client.

User ML2B Context UDP Port (16 bits)

The User ML2B Context UDP Port shall be the UDP port of the user for Context. This field shall be set to zero when context is not published by this client.



MDM TYPE 4 AND 7 MESSAGE UPDATES



– Updated “MDM Size by Types” Table

Table 94 MDM Size by Types

<u>MDM Packet Type Description</u>	<u>MDM Packet Type Number</u>	<u>Number of Data Messages in One Packet Payload</u>	<u>Data Message Size</u>
<u>VITA Radio Transport (VRT)</u>	<u>1</u>	<u>1</u>	<u>Variable Length</u>
<u>Acknowledgement</u>	<u>2</u>	<u>0</u>	<u>NA</u>
<u>Time of Day</u>	<u>3</u>	<u>1</u>	<u>Fixed - One Word</u>
<u>Signal Port User ID</u>	<u>4</u>	<u>1</u>	<u>Fixed - Nineteen Twenty-Two Words</u>
<u>Health Status</u>	<u>5</u>	<u>1</u>	<u>Fixed - Two Words</u>
<u>Command</u>	<u>6</u>	<u>1</u>	<u>Fixed - Three Words</u>
<u>Switch Group User ID</u>	<u>7</u>	<u>1</u>	<u>Fixed - Thirteen Fifteen Words</u>



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- MDM Type 4 and 7 Message Updates
- **Updated Specific MDM Applicability Promotions**
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
- Clarified MDM Type 2 Response and added Error Order of Precedence
- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
- Updated MORA Implementation of VRT CAM Field Functions
- Added sequential to the uniqueness for MORA use of Message ID Field
- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



SPECIFIC MDM APPLICABILITY PROMOTIONS



- MORA Device Operations Interface
 - MDM Type 5 from optional to required

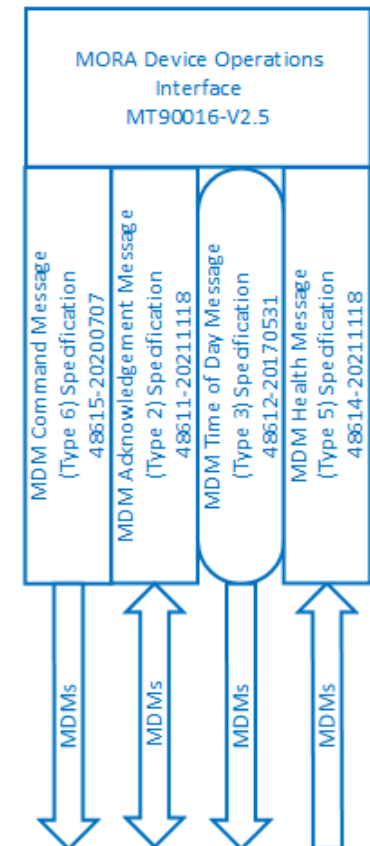
Table 14 MORA Device Operations Interface <MT90016-V2.45>

Spec Title	Spec Tag	Applicability
MDM Protocol Specifications	MT96001-V2.45	Required
MDM Command Message (Type 6) Specification	48615-20200707202212210410, ProExp	(+) Required
MDM Acknowledgement Message (Type 2) Specification	48611-20180928202212210307, ProExp	(+) Required
MDM Health Message (Type 5) Specification	48614-202212210414, ProExp	(+) Required
MDM Networking Specifications	MT96002-V2.45	Optional*
MDM Time of Day Message (Type 3) Specification	48612-20221221170531, ProExp	(+) Optional
MDM Health Message (Type 5) Specification	48614-20200707, Exp	(+) Optional

Promoted

(+) Experimental specifications are not included in compliance tests.

* Required for MDMs transiting a network





SPECIFIC MDM APPLICABILITY PROMOTIONS



- MORA Signal Resource Manager Operations Interface
 - MDM Type 7 from optional to required

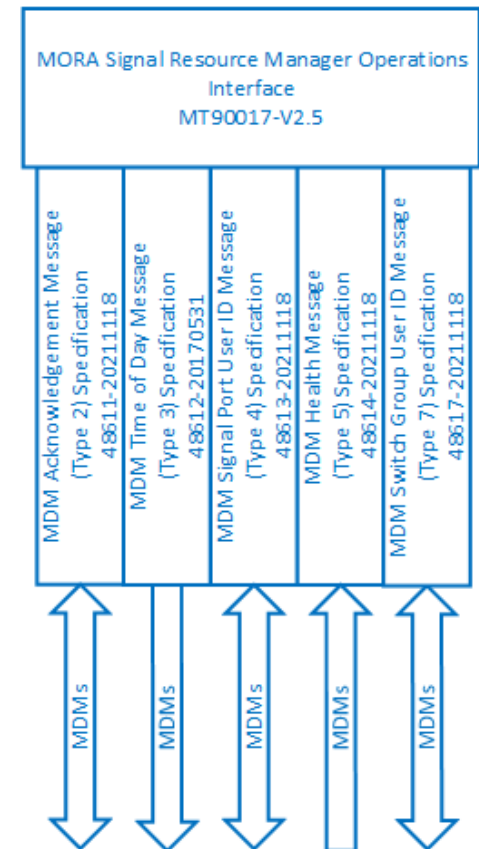
Table 17 MORA Signal Resource Manager Operations Interface <MT90017-V2.45>

Spec Title	Spec Tag	Applicability
MDM Protocol Specifications	MT96001-V2.45	Required
MDM Acknowledgement Message (Type 2) Specification	48611-20480928202212210307, ProExp	(+)-Required
MDM Time of Day Message (Type 3) Specification	48612-20221221470531, ProExp	(+)-Required
MDM Signal Port User ID Message (Type 4) Specification	48613-20204002202212210307, ProExp	(+)-Required
MDM Health Message (Type 5) Specification	48614-20200707202212210444, ProExp	(+)-Required
MDM Switch Group User ID Message (Type 7) Specification	48617-202212210307, ProExp	(+)-Required
MDM Networking Specifications	MT96002-V2.45	Optional*
MDM Switch Group User ID Message (Type 7) Specification	48617-20200707, Exp	(+)-Optional

(+) Experimental specifications are not included in compliance tests.

* Required for MDMs transiting a network

Promoted





- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
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- Updated Specific MDM Applicability Promotions
- **Updated “Required Control Fields” Definition**
- Added “Client Inactivity Timeout” & “Command Execution Time”
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- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
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- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



UPDATED REQUIRED CONTROL FIELDS DEFINITION



- Signal Port complex type update ...

- p. Required Control Fields

- i. ~~A list of integers representing t~~The minimum-comprehensive set of MDM Type 1 control fields required to be provided by a client for unambiguous operation of a-this signal port ~~to begin streaming signal data and context.~~
 - ii. Required Control Fields shall be a list of integers between 1 and 131 inclusive.
 - 1. The integer range of 1-31 shall map to the applicable CIF0 bit fields as regulated in [Table 71](#).
 - 2. The integer range of 101-131 shall map to the applicable CIF1 bit fields as regulated in [Table 71](#).
 - iii. Required Control Fields may be an empty list.
 - iv. Required Control Fields shall be provided as part of Signal Port.

NOTE: If the comprehensive set includes any fields from CIF1 (integer 101-131), then the CIF1 enable bit (integer 1) present in CIF0 would be included.



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
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CLIENT INACTIVITY TIMEOUT & COMMAND EXECUTION TIME



- Signal Port complex type additions ...

q. Client Inactivity Timeout

- Any duration of time, after the signal port reservation is confirmed, where no client communications are received at the control transport configuration of this signal port which then precipitates a timeout signal port release.
- Client Inactivity Timeout shall be an integer (64-bit), greater than or equal to 0, in nanoseconds.
 - If the signal port does not implement a timeout, then it shall be set to 0.
- Client Inactivity Timeout shall be provided as part of Signal Port.

NOTE: An MDM VRT Command Packet (Type 1) should be periodically sent to prevent an undesired timeout signal port release.

r. Command Execution Time

- The longest duration of time between the receipt of a valid command packet at this signal port and the completion of all executed controls.
- Command Execution Time shall be an integer, greater than 0, in nanoseconds.
- Command Execution Time shall be provided as part of Signal Port.

NOTE: An MDM VRT Command Packet (Type 1) utilizing the optional timestamp to schedule control execution should be received at this signal port no later than the timestamp minus the Command Execution Time.



CLIENT INACTIVITY TIMEOUT & COMMAND EXECUTION TIME

- Switch Group complex type additions

- e. Client Inactivity Timeout

- i. Any duration of time, after the switch group reservation is confirmed, where no client communications are received at the control transport configuration of this switch group which then precipitates a timeout switch group release.
 - ii. Client Inactivity Timeout shall be an integer (64-bit), greater than or equal to 0, in nanoseconds.
 - 1. If the switch group does not implement a timeout, then it shall be set to 0.
 - iii. Client Inactivity Timeout shall be provided as part of Switch Group.

NOTE: An MDM VRT Command Packet (Type 1) should be periodically sent to prevent an undesired timeout switch group release.

- f. Command Execution Time

- i. The longest duration of time between the receipt of a valid command packet at this switch group and the completion of executing the switch state control.
 - ii. Command Execution Time shall be an integer, greater than 0, in nanoseconds.
 - iii. Command Execution Time shall be provided as part of Switch Group.

NOTE: An MDM VRT Command Packet (Type 1) utilizing the optional timestamp to schedule control execution should be received at this switch group no later than the timestamp minus the Command Execution Time.



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
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- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



MDM TYPE 2 RESPONSE CLARITY

- MDM Type 2 use and functional clarifications ...

6.3.2 [MDM Acknowledgement Message (Type 2) Specification] <48611-~~20180928~~202212210307, ProExp>

This message is used for both resource inter-component type and MORA Signal Port Manager client interactions. The MDM Acknowledgement Message (Type 2) shall be used, when requested, to provide a positive acknowledgement to the sender of ~~certain valid~~ MDMs, excluding MDM Acknowledgement Message (Type 2), that a specific message (as indicated by the MDM SEQUENCE NUMBER) was received and the MDM Header was validated by the recipient. In addition to ~~delivery this initial confirmation functionality~~ scrutiny, the MDM Acknowledgement Message (Type 2) also shall provides a means by which the recipient may further delineate payload validation as well as execution success or failure in executing the delivered message for all valid MDM Types, excluding MDM VITA Radio Transport (VRT) (Type 1) and MDM Acknowledgement Message (Type 2).

MDM VITA Radio Transport (VRT) (Type 1) Command Packet Sub Type message payload validation acknowledgement shall be accomplished, when requested, using the acknowledge validation (AckV) feature of VITA 49.2. However, an AckV response shall not be issued if an MDM Acknowledgement Message (Type 2) error response occurs. Execution acknowledgement for MDM VITA Radio Transport (VRT) (Type 1) Command Packet Sub Type messages shall be accomplished by monitoring the associated multicast MDM VITA Radio Transport (VRT) (Type 1) Context Packet Sub Type messages. Therefore, MDM Acknowledgement Message (Type 2) responses to MDM VITA Radio Transport (VRT) (Type 1) Command Packet Sub Types shall not include response values of (4), (8), and (16) as depicted in Table 74 below.



MDM TYPE 2 RESPONSE CLARITY

- MDM Type 2 response clarifications ...

Table 72 MDM Acknowledgement Message Format

32-bits																															
16-bits																16-bits															
8-bits								8-bits								8-bits								8-bits							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MDM PREAMBLE																								RESPONSE							
VERSION MAJ								VERSION MIN								MDM SEQUENCE NUMBER															
ML2B INTERFACE ID																															
MDM TYPE																NUMBER OF MESSAGES															

The MDM Acknowledgement Message format shall be in accordance with [Table 72](#) above. The MDM Type 2 header fields, except for the RESPONSE field, are described in the section titled “[MDM Encapsulation Specification](#)” above. The RESPONSE field is defined below.

MDM Response (8 bits)

The [MDM](#) Response Bit Field shall be an 8-bit field with the bit field in accordance with [Table 73](#) below.

Table 73 MDM Acknowledgement Message Response Bit Field

8-bits							
7	6	5	4	3	2	1	0
FVI	UU	US	RU	IR	IF	IM	A
R	R	R	R	R	R	R	R

The definition of the encoding of the RESPONSE field shall be in accordance with [Table 74](#) below. [The response to an MDM requesting acknowledgement shall be a single MDM Acknowledgement Message \(Type 2\). The single acknowledgement shall follow the order of response precedence specified. The requester’s notional behavior based upon the response value is also described below.](#)



MDM TYPE 2 RESPONSE CLARITY

- MDM Type 2 response table updates ...

Table 74 MDM Acknowledgement Response Meaning

Response Value	Response Definition	Response Meaning	Response Precedence	Notional Behavior
No Response Received	No Response Received	Error - when no response received after a period of time	N/A	If no response is received after [NoResponseTimeInterval]** , retransmit up to [maxTimes]** and once [maxTimes]** is achieved with the same result, it becomes a hard error. Sequence numbers tracked until removed (see Response Values 1 and 32 below).
"00000001" (1)	Acknowledged (A)	Success - message shall be executed	8th	Delete the exact sequence from tracking, and if the exact sequence was a retransmission, also delete associated prior transmission sequence numbers
"00000010" (2)	Invalid Message (IM)	Error - message shall not be executed due to an unrecognized message type or message content invalid header (ACK, MDM TYPE, NUMBER OF MESSAGES fields) and/or invalid body size for fixed size MDM Types	1st	Sequence numbers tracked until removed. Retransmit up to [maxTimes]** and once [maxTimes]** achieves same result it becomes (Hard Error) and sequence number(s) is/are deleted from tracking



MDM TYPE 2 RESPONSE CLARITY

- MDM Type 2 response table updates (con't)...

"00000100" (4)*	Invalid Function (IF)	Error - message shall not be executed due to a functional discrepancy with the specified resource's profile	6th	Hard error - delete sequence number(s) from tracking
"00001000" (8)*	Invalid Range (IR)	Error - message shall not be executed due to a value that violates the range defined in the specification discrepancy with the specified resource	5th	Hard error - delete sequence number(s) from tracking
"00010000" (16)*	Resource Unavailable (RU)	Error - message shall not be executed due to the specified resource being unavailable and/or not supported in the current device configuration	4th	Sequence numbers tracked until removed. Retransmit up to [maxTimes]* and once [maxTimes]* achieves same result it becomes a hard error and is deleted from tracking
"00100000" (32)	Unexpected Sequence Number (US)	Success - message shall be executed but out of sequence noted.	7th	Delete the exact sequence from tracking, and if the exact sequence was a retransmission, also delete associated prior transmission sequence numbers.



MDM TYPE 2 RESPONSE CLARITY

- MDM Type 2 response table updates (con't)...

Response Value	Response Definition	Response Meaning	Response Precedence	Notional Behavior
"01000000" (64)	Unauthorized User (UU)	Error - message shall not be executed due to the sender identified in the ML2B Interface ID not being a current authorized user	2nd	Hard error - delete sequence number(s) from tracking
"10000000" (128)	Version Incompatibility (VI)	Error - message shall not be executed due to MDM Version incompatibility for the MDM Type	3rd	Hard error - delete sequence number(s) from tracking
All Other Values	ReservedNot Permitted	Future UseN/A	N/A	N/A

[*-Not permitted for MDM Acknowledgement responses to MDM VRT Command Packet Types.](#)

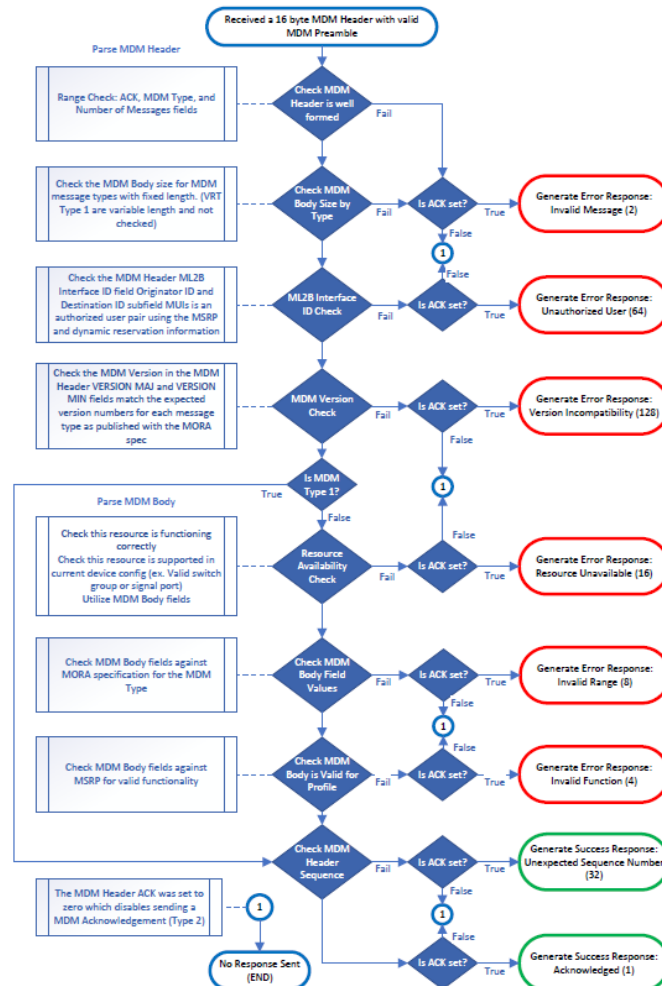
[**-Variable properties of \[maxTimes\] and \[NoResponseTimeInterval\] in the table above are implementation specific.](#)



MDM TYPE 2 RESPONSE CLARITY

- MDM Type 2 Acknowledge logical flow diagram for SW Dev Guide ...

MDM Parsing Logical Flow Diagram including Acknowledgment (Type 2) Generation





- **MORA V2.5 Significant Updates**

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- Updated IPv4 ML2B Multicast Dissemination
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- Updated “Gain Stage” complex type’s Manual Gain and Output Level
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SDPPF / SPECTRUM DECLARATIONS



• Signal Domain Conversion Description complex type updates

45-46. [Signal Domain Conversion Description]

- a. ID
 - i. The Port-port or sub port identifier relative to the Signal Domain Conversion Description.
 - ii. ID shall be an integer between:
 - 1. 1 and 127, inclusive, when representing a Port ID.
 - 2. 1 and 65,535, inclusive, when representing a Sub Port ID.
 - iii. ID shall be provided as part of Signal Domain Conversion Description.
- b. Signal Direction
 - i. The direction of the signal for the identified port or sub port.
 - ii. Signal Direction shall be a restricted string chosen from the following:
 - 1. TX
 - 2. RX
 - 3. TOR
 - iii. Signal Direction shall be provided as part of Signal Domain Conversion Description.
- c. Supported Signal Data Formats
 - i. The description and field values for the available digital signal data packet formats supported by the identified port or sub port.
 - ii. Supported Signal Data Formats shall be a "Signal Data Formats" complex type as described in "MORA Common Complex Types."
 - iii. Supported Signal Data Formats shall be provided as part of Signal Domain Conversion Description and shall not be empty.
- e. Sample Format
 - i. The data format of the sample.
 - ii. Sample Format shall be a "Signal Data Attributes" complex type as described in "MORA Common Complex Types."
 - iii. Sample Format shall be provided as part of Signal Domain Conversion Description.
- d. Sample Sizes
 - i. The sample sizes supported for the digital RF data.
 - ii. Sample Sizes shall be a list of integers with values between 1 and 64, inclusive, reflecting the bit size.

44. [Signal Data Formats]

a. Time Domain Packet Formats

- i. The description and field values for the available time domain digital signal data packet formats.
- ii. Time Domain Packet Formats shall be a list of "Time Domain Packet Format" complex types as described in "MORA Common Complex Types."
- iii. Time Domain Packet Formats shall contain at least one item in its list.
- iv. Time Domain Packet Formats may be provided as part of Signal Data Formats.

b. Frequency Domain Packet Formats

- i. The description and field values for the available frequency domain digital signal data packet formats.
- ii. Frequency Domain Packet Formats shall be a list of "Frequency Domain Packet Format" complex types as described in "MORA Common Complex Types."
- iii. Frequency Domain Packet Formats shall contain at least one item in its list.
- ~~iii-iv.~~ Frequency Domain Packet Formats may be provided as part of Signal Data Formats.



SDPPF / SPECTRUM DECLARATIONS

- Signal Domain Conversion Description complex type updates (con't)..

59. [Time Domain Packet Format]

a. Time Domain Packet Format Description

- The unique and human-readable description of the Time Domain Packet Format.
- Time Domain Packet Format Description shall be a restricted string.
- Time Domain Packet Format Description shall be provided as part of Time Domain Packet Format.

NOTE: The Time Domain Packet Format Description should include key attributes such as: packing method, data sample type, data item format, data item size, repeat count, and vector size. For example, a specific implementation could have: "Link Efficient, Complex Cartesian, Single Precision Float 64bit, No Repeat, Single Channel, No Tags".

b. Time Domain Packet Format Value

- The unique hexadecimal representation of the "Signal Data Packet Payload Format (CIF 0/Bit 15)" field value.
- Time Domain Packet Format Value shall be a hexadecimal 16-character string encoding of the binary value.
- Time Domain Packet Format Value shall be provided as part of Time Domain Packet Format.



SDPPF / SPECTRUM DECLARATIONS

- Signal Domain Conversion Description complex type updates (con't)..

17. Frequency Domain Packet Format

a. Frequency Domain Packet Format Description

- i. The unique and human-readable description of the Frequency Domain Packet Format.
- ii. Frequency Domain Packet Format Description shall be a restricted string.
- iii. Frequency Domain Packet Format Description shall be provided as part of Frequency Domain Packet Format.

NOTE: The Frequency Domain Packet Format Description should include key attributes such as: spectrum and window types, number of transform and window points, frequency span and resolution, number of averages, and any weighting. For example, a specific implementation could have: "Complex, 85 MHz Sample Rate, 1024 Samples/FFT, 83 KHz/bin, 1024 Samples/Window, No Averaging, Hanning 3.0".

b. Frequency Domain Packet Format Value

- i. The unique hexadecimal representation of the "Spectrum (CIF 1/Bit 10)" field value.
- ii. Frequency Domain Packet Format Value shall be a hexadecimal 104-character string encoding of the binary value.
- iv-iii. Frequency Domain Packet Format Value shall be provided as part of Frequency Domain Packet Format.



- **MORA V2.5 Significant Updates**

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- Updated IPv4 ML2B Multicast Dissemination
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- Updated MORA Implementation of VRT CAM Field Functions
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- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
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- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



XML TO BINARY PRECISION UPDATES



- Updated XML range and resolution cases where translation to Binary had precision issues (rounding in V49.2 observations)
- Translation Examples
 - XML Real Number (64 bit) >>> Binary Fixed Point (64 bit)
 - XML Real Number >>> Binary Fixed Point (16 bit)

5.3.5.1 MORA Common Complex Types <49016-20210301202212210414, Pro>

The following is a list of “MORA Common Complex Types” that are referenced by the MORA specifications. Implementations shall be in accordance with the following sections.

Due to the natural data type interdependency on-between XML and binary based messaging over the VDB and ML2B, it is important that XML values which may-need to be represented-intranslated to a binary format (e.g., on the ML2B) be constrained accordingly conforms with the precision outlined in this specification-. The XML schema data formats do not provide the binary precision constraints that are specified.

The XML schema data formats of All “integer” values shall be 32-bit signed integers, while “unsigned integer” values shall be 32-bit unsigned integers unless otherwise specified, and, all All The XML schema data format of “real numbers” values shall be 32-bit floating point numbers, unless specified otherwise. There are instances where some XML schema data formats values require a larger range; these values-formats shall be specified as “integer (64-bit)” integers-(long) or “real number (64-bit)” floating-point numbers-(double) where necessary.

The terms “restricted string” and “restricted URI” are described in VICTORY sections titled “String Bounds” and “URI Bounds” under “VICTORY Data Types.” String enumerations further restrict the String Bounds to the predefined list of values.



XML TO BINARY PRECISION UPDATES



- Frequency example
 - Removes precision issue created in V49.2 observations

17-31. Frequency Range

- a. Start
 - i. The lower bound of the frequency range.
 - ii. Start shall be a real number (64-bit), ~~with a range of ± 8.79 terahertz~~ greater than or equal to -2^{43} and less than or equal to $2^{43} - (1/2^{20})$, in Hz and a fractional resolution of ~~0.95 microhertz~~ $1/2^{20}$ Hz.
 - iii. Start shall be provided as part of Frequency Range.
- b. End
 - i. The upper bound of the frequency range.
 - ii. End shall be a real number (64-bit), ~~with a range of ± 8.79 terahertz~~ greater than or equal to -2^{43} and less than or equal to $2^{43} - (1/2^{20})$, in Hz and a fractional resolution of ~~0.95 microhertz~~ $1/2^{20}$ Hz.
 - ~~ii-iii. End shall be greater than Start.~~
 - ~~iii-iv. End shall be provided as part of Frequency Range.~~
- c. Resolution
 - i. ~~Resolution is the~~ The smallest unit of frequency the component can resolve.
 - ii. Resolution shall be a real number (64-bit), greater than or equal to 0 and less than or equal to ~~8.79 terahertz~~ $2^{43} - (1/2^{20})$, in Hz and a fractional resolution of ~~0.95 microhertz~~ $1/2^{20}$ Hz.
 - ~~ii-iii. If the Resolution is not applicable to the use of the Frequency Range, it shall be set to 0.~~
 - ~~iii. Resolution shall be provided as part of Frequency Range.~~
 - ~~iv. If the Resolution is not applicable to the use of the Frequency Range, it shall be set to 0.~~



XML TO BINARY PRECISION UPDATES



- **Gain example**
 - Removes precision issue created in V49.2 observations

22-23. Manual Gain

a. Minimum Gain

- i. The minimum gain setting for a manual gain functionstage within a signal port.
- ii. Minimum Gain shall be a real number, greater than ~~-256~~or equal to -2^8 and less than ~~256~~or equal to $2^8-(1/2^7)$, in dB and a resolution of ~~1/128~~ 2^{-7} dB (0.0078125 dB).
- iii. Minimum Gain shall be provided as part of Manual Gain.

b. Maximum Gain

- i. The maximum gain setting for a manual gain functionstage within a signal port.
- ii. Maximum Gain shall be a real number, greater than ~~-256~~or equal to -2^8 and less than ~~256~~or equal to $2^8-(1/2^7)$, in dB and a resolution of ~~1/128~~ 2^{-7} dB (0.0078125 dB).
- ~~ii-iii.~~ Maximum Gain shall be greater than Minimum Gain.
- ~~iii-iv.~~ Maximum Gain shall be provided as part of Manual Gain.

c. Resolution

- i. The smallest unit of ~~measure that~~gain change for a manual gain function can changestage within a signal port.
- ii. Resolution shall be a real number, greater than 0 and less than ~~256~~or equal to $2^8-(1/2^7)$, in dB and a resolution of ~~1/128~~ 2^{-7} dB (0.0078125 dB).
- iii. Resolution shall be provided as part of Manual Gain.



XML TO BINARY PRECISION UPDATES



• Power example

20.21. Injected Power Range

a. Min Injected Power

- i. The minimum power of the test source at the point of injection within a signal port.
- ii. Min Injected Power shall be a real number, greater than ~~-256~~or equal to -2⁸ and less than ~~+256~~or equal to 2⁸-(1/2⁷), in dBm and a resolution of 1/~~128~~2⁷ dB (0.0078125 dB).
- iii. Min Injected Power shall be provided as part of Injected Power Range.

NOTE: The Auxiliary Gain field in MDM Type 1 allows for the control of the injected power when a range is announced. The Auxiliary Gain field is used to obtain a specific injected power within the min/max range at the resolution specified. To achieve the Min Injected Power, the Auxiliary Gain field would be set to a negative value of ~~xx.y~~ dB, where ~~xx.y~~ = "Max Injected Power" (dBm) - "Min Injected Power" (dBm).

b. Max Injected Power

- i. The maximum power of the test source at the point of injection within a signal port.
- ii. Max Injected Power shall be a real number, greater than ~~-256~~or equal to -2⁸ and less than ~~+256~~or equal to 2⁸-(1/2⁷), in dBm and a resolution of 1/~~128~~2⁷ dB (0.0078125 dB).
- ~~iii. If the test source power is fixed, the Max Injected Power shall equal the Min Injected Power.~~
- ~~iv. If the test source power is not fixed, then Max Injected Power shall be greater than the Min Injected Power.~~
- ~~iii-v.~~ Max Injected Power shall be provided as part of Injected Power Range.

NOTE: The Auxiliary Gain field in MDM Type 1 allows for the control of the injected power when a range is announced. The Auxiliary Gain field is used to obtain a specific injected power within the min/max range at the resolution specified. To achieve the Max Injected Power, the Auxiliary Gain field would be set to 0 ~~dB~~.

c. Resolution

- i. The resolution of the test source at the point of injection within a signal port.
- ii. Resolution shall be a real number, greater than or equal to 0 and less than ~~-256~~ or equal to 2⁸-(1/2⁷), in dB and a resolution of 1/~~128~~2⁷ dB (0.0078125 dB).
- ~~iii. If the test source power is fixed, the Min Injected Power shall equal the Max Injected Power and the Resolution shall equal zero.~~
- ~~iii.~~ Resolution shall be provided as part of Injected Power Range.
- ~~iv. If the test source power is fixed, the Min Injected Power shall equal the Max Injected Power and the Resolution shall equal zero.~~



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- MDM Type 4 and 7 Message Updates
- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
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- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
- **Updated MORA Implementation of VRT CAM Field Functions**
- Added sequential to the uniqueness for MORA use of Message ID Field
- Assigned MORA Warning and Error Field bits for message level / prologue issues
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- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



VRT CAM FIELD UPDATES



- Control Packet CAM

6.3.1.6.4 MORA Control/Acknowledge Mode (CAM) Field for Control Packets

The MORA limitation of VITA 49.2 Control/Acknowledge Mode (CAM) Field for Control Packets shall be in accordance with Table 67 below. For MORA the IE, IR, Er, and ReqX bits in the Control Packet CAM shall always be set to zero "0". Additionally, the W bit in the Control Packet CAM shall always be set to "1". When the RecV bit is set to "1", then the ReqW and ReqEr bits shall also be set to "1".

Table 67 Control/Acknowledge Mode (CAM) Field for Control Packets

1 Word	32-bits																																									
	16-bits																16-bits																									
	8-bits								8-bits								8-bits								8-bits																	
	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0										
	Control												Control & Ack										Ack Only				Reserved															
	CE	IE	CR	IR	P	W	Er	A1	A0	Nack	Res	ReqV	ReqX	ReqS	ReqW	ReqEr	Res	ChnT2	ChnT1	ChnT0	0	0	0	0																		
X	0	X	0	X	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	X	0	0	0	0																		

X indicates the bit values vary depending on control and acknowledge settings



VRT CAM FIELD UPDATES



Acknowledge Packet CAM

6.3.1.6.56.3.1.6.6 MORA Control/Acknowledge Mode (CAM) Field for Acknowledge Packets

The MORA limitation of VITA 49.2 Control/Acknowledge Mode (CAM) Field for Acknowledge Packets shall be in accordance with [Table 68](#) below. For MORA the IE, IR, Er, AckX, and AckS bits in the Acknowledge Packet CAM shall always be set to “0”zero. Additionally, the W and AckV bits shall be set to “1”.

Table 68 Control/Acknowledge Mode (CAM) Field for Acknowledge Packets

32-bits																																			
16-bits																16-bits																			
8-bits								8-bits								8-bits								8-bits											
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
Control										Control & Ack							Ack Only					Reserved													
CE	IE	CR	IR	P	W	Er	A1	A0	Nack	Res	AckV	AckX	AckS	AckW	AckEr	Res	AckT2	AckT1	AckT0	AckP	SchX											Res	Res		
X	0	X	0	X	X	X	X	X	X	X	X	0	0	X	X	X	X	X	X	X	X	X	X	0	0										

X indicates the bit values vary depending on control and acknowledge settings

The VITA 49.2 table 8.4.1-1 function description for bit 16 (AckEr) for validation acknowledge packets (AckV = 1) shall be interpreted as follows: “Set To 1: Errors were generated; Set to 0: No errors were generated.”



VRT CAM FIELD UPDATES



- Control-Cancellation Packet CAM

6.3.1.6.6.3.1.6.8 MORA Control/Acknowledge Mode (CAM) Field for Control Cancellation Packets

The MORA limitation of VITA 49.2 Control/Acknowledge Mode (CAM) Field for Control Cancellation Packets shall be in accordance with [Table 70](#) below. For MORA the IE, IR, ReqX, and ReqS bits of the Control-Cancellation CAM shall always be set to zero. The ReqV bit shall be used to indicate if a Validation Acknowledge is requested and is modified from the VITA 49.2 Standard to no longer always be set to "0"zero. When the RecV bit is set to "1", then the ReqW and ReqEr bits shall also be set to "1".

Table 70 Control/Acknowledge Mode (CAM) Field for Control Cancellation Packets

32-bits																																
16-bits																16-bits																
8-bits								8-bits								8-bits								8-bits								
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Control										Control & Ack						Ack Only				Reserved												
CE	IE	CR	IR	P	W	Er	A1	A0	Nack	Res	ReqV	ReqX	ReqS	ReqW	ReqEr	Res	CntT2	CntT1	CntT0													AckP
X	0	X	0	X	0	0	1	0	X	X	0	0	0	X	X	X	X	X	X	X	0	0	0	0								

X indicates the bit values vary depending on control and acknowledge settings



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
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- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
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- Added Complete SDPPF / Spectrum Declarations
- Resolved XML to Binary Data Range and Resolution Precision Issues
- Updated MORA Implementation of VRT CAM Field Functions
- **Added sequential to the uniqueness for MORA use of Message ID Field**
- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
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MESSAGE ID FIELD UPDATE



- New section 6.3.1.6.5 added to strengthen Message ID Field use for MORA in support of sequential numbering with uniqueness for each Stream ID and Client MUI pair

6.3.1.6.5 Message ID Field for Control and Acknowledge Packets

The VITA 49.2 rules regarding the Message ID Field shall be interpreted as one 32-bit field containing a unique (for each Stream ID / Client MUI pair) sequential numeric value that allows association of the particular Control packet with any resulting Acknowledge packets.

Rule 8.2-11: The mandatory Message ID (Identifier) field **shall** be one 32 bit word field containing a numeric value that will allow association of the particular Control packet with any resulting Acknowledge packets, per Section 8.4.

Observation 8.2-3: Each new Control Packet has a unique Message ID, whereas multiple Acknowledge Packet responses to a single Control packet will have the same Message ID.

8.2.3 Message ID Field

Rule 8.2.3-1: The Message ID **shall** be a unique 32-bit identifier.

Recommendation 8.2.3-1: The V49.2 System Specification document and/or Class documentation should provide the period of uniqueness for the Message ID counter.

Rule 8.2.3-2: The Message ID field **shall** be used in Control packets to uniquely identify each sent packet to allow it to be distinguished from other Control packets with the same Stream ID.

Rule 8.2.3-3: When a device receives a Control packet with a Message ID field, it **shall** provide a Message ID field with the same value in any and all Acknowledge Packets that correspond to that specific Control packet.

Observation 8.2.3-1: The language "any and all Acknowledge Packets" provides for the case where multiple Acknowledge packets may be generated for a single Control packet. This can happen when both Validation and Acknowledge packets are requested by the Control packet.



- **MORA V2.5 Significant Updates**

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- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



WARNING AND ERROR FIELD UPDATES

- Added new section 6.3.1.6.7 to further define Acknowledge Packet's Warning and Error Fields

6.3.1.6.7 MORA Warning and Error Response Fields for Acknowledge Packets

The MORA implementation of VITA 49.2 warning and error response fields used in Acknowledge Packets shall be in accordance with Table 69 below. MORA has added further warning and error designations (bits 12 through 24) to address general prologue failures that apply to all fields in addition to the existing VITA 49.2 designations that apply to individual field failures. To further clarify the applicability of warning and error designations, MORA has added a column to the table. MORA has also renamed the VITA 49.2 column "Comment" to become "Meaning" and has clarified the meanings for some designations. On Some VITA 49.2 user defined designations (bits 3 through 1) have been reserved by MORA.

Table 69 MORA Warning and Error Response Fields for Acknowledge Packets

<u>Bit</u>	<u>Warning or Error</u>	<u>Meaning</u>	<u>Applicability</u>
<u>31</u>	<u>Field NOT executed</u>	<u>The field was NOT executed because of an Error</u>	<u>Error for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>30</u>	<u>Device failure</u>	<u>The field was NOT executed properly because of a device or signal port (such as hardware) failure</u>	<u>Error for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>29</u>	<u>Erroneous Field</u>	<u>The signal port does not support this particular control field</u>	<u>Error for a specific MORA supported field contained in the</u>



WARNING AND ERROR FIELD UPDATES



- Added new section 6.3.1.6.7 to further define Acknowledge Packet's Warning and Error Fields (con't)

			<u>control packet being acknowledged</u>
<u>28</u>	<u>Parameter out-of-range</u>	<u>The supplied field value is beyond the capability or operational range of this signal port</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>27</u>	<u>Parameter unsupported precision</u>	<u>The supplied field value specifies a level of precision beyond the capability of this signal port</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>26</u>	<u>Field Value invalid</u>	<u>This field had an invalid setting beyond those otherwise specified in this table</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>25</u>	<u>Timestamp problem</u>	<u>The <u>Controllee</u> was unable to meet the timestamp requirement specified by the [T2,T1,T0] bits for the specified field.</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>24</u>	<u>Hazardous Power Levels</u>	<u>The supplied field will cause transmission of hazardous power levels.</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>23</u>	<u>Distortion</u>	<u>The supplied field will cause components to be over driven leading to distortion. This applies to both receive and transmit.</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>



WARNING AND ERROR FIELD UPDATES



- Added new section 6.3.1.6.7 to further define Acknowledge Packet's Warning and Error Fields (con't)

<u>22</u>	<u>In-Band Power Compliance</u>	<u>The supplied field will place the in-band power levels out of compliance</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>21</u>	<u>Out-of-Band Power Compliance</u>	<u>The supplied field will place the out-of-band power levels out of compliance</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>20</u>	<u>Co-Site Interference</u>	<u>The supplied field will cause co-site interference between transmitter and receiver at same location</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>19</u>	<u>Regional Interference</u>	<u>The supplied field will cause interference between devices in the same operational region</u>	<u>Error or warning for a specific MORA supported field contained in the control packet being acknowledged</u>
<u>18-13</u>	<u>Reserved</u>	<u>Reserved</u>	<u>Reserved</u>
<u>12</u>	<u>Invalid VRT Packet Type</u>	<u>VRT Packet Type is not supported by MORA</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>
<u>1142</u>	<u>Invalid Timestamp Format</u>	<u>TSI/TSF Format Indicators in the VRT Packet Header are invalid</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>



WARNING AND ERROR FIELD UPDATES



- Added new section 6.3.1.6.7 to further define Acknowledge Packet's Warning and Error Fields (con't)

<u>1044</u>	<u>Packet Count Out of Sequence</u>	<u>Packet Count in the VRT Packet Header is out of sequence</u>	<u>Warning for all MORA supported fields contained in the control packet being acknowledged</u>
<u>10</u>	<u>Invalid Packet Structure</u>	<u>Packet Size is invalid based on VRT Packet Header and/or CIF values, if present</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>
<u>9</u>	<u>Invalid Stream Identifier</u>	<u>Prologue Stream Identifier field value is invalid</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>
<u>8</u>	<u>Invalid Class Identifier</u>	<u>Prologue Class Identifier field (optional) value is invalid</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>
<u>7</u>	<u>Unknown Message ID</u>	<u>Prologue Message Identifier field value is unknown and therefore no cancellation action can be taken</u>	<u>Error for all MORA supported fields contained in the control cancellation packet being acknowledged</u>
<u>67</u>	<u>Message ID Out of Sequence</u>	<u>Prologue Message Identifier field value is out of sequence</u>	<u>Warning for all MORA supported fields contained in the control packet being acknowledged</u>
<u>56</u>	<u>Unknown Controllee ID</u>	<u>Prologue Controllee Identifier field (optional) value is unknown</u>	<u>Error or warning for all MORA supported fields contained in the control packet being acknowledged</u>



WARNING AND ERROR FIELD UPDATES



- Added new section 6.3.1.6.7 to further define Acknowledge Packet's Warning and Error Fields (con't)

<u>45</u>	<u>Unknown Controller ID</u>	<u>Prologue Controller Identifier field (optional) value is unknown</u>	<u>Error or warning for all MORA supported fields contained in the control packet being acknowledged</u>
<u>34</u>	<u>Unsupported CIF</u>	<u>Control Indicator Field value or values are not supported by MORA</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>
<u>2</u>	<u>Invalid Packet Structure</u>	<u>Packet Size is invalid based on VRT Packet Header and/or CIF values, if present</u>	<u>Error for all MORA supported fields contained in the control packet being acknowledged</u>
<u>123-0</u>	<u>Reserved</u>	<u>Reserved</u>	<u>Reserved</u>

If the VRT control packet being acknowledged contains no control fields or cannot be successfully parsed to understand the control fields that are included, then the acknowledge response shall indicate a whole control packet warning and/or error by including the Warning Indicator Field 0 set to all zeros (when AckW = "1") and/or the Error Indicator Field 0 set to all zeros (when AckEr = "1") followed by a single Warning and Error Field with the applicable bit(s) set to one.



- **MORA V2.5 Significant Updates**

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- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
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VRT CONTEXT FIELD APPLICABILITY CLARIFICATION

- Clarified section 6.3.1.5.3 and table 65 to further specify field applicability to signal ports and switch groups

6.3.1.5.3 MORA Context Fields Matrix

The MORA limitation of VITA 49.2 Context Fields is shown below in Table 65. The matrix below depicts all context fields that are used for context packets and their associated MORA Signal Resource type. Fields indicated with "SP" shall be valid for describing signal port context. Fields indicated with "SG" shall be required for describing switch group context. Fields indicated with "SP/SG" shall be valid for describing context for signal ports and shall be required for describing context for switch groups. The CIP 1 Enable field is simply used for parsing messages and is not specifically describing context resources.

Table 65 MORA Context Fields Matrix

CIF	Bit	Field Name	Parser	Context					
				ANT	RFC	RFD	RFT	SDC	Shared
0	31	Context Field Change Indicator	SP/SG Y						
0	30	Reference Point Identifier		SPY					
0	29	Bandwidth			SPY			SPY	
0	28	IF Reference Frequency					SPY		
0	27	RF Reference Frequency					SPY		
0	26	RF Reference Frequency Offset						SPY	
0	25	IF Band Offset						SPY	
0	24	Reference Level						SPY	
0	23	Gain			SPY				
0	22	Over-Range Count						SPY	
0	21	Sample Rate						SPY	
0	20	Timestamp Adjustment						SPY	
0	19	Timestamp Calibration Time						SPY	
0	18	Temperature						SPY	
0	16	State and Event Indicators						SPY	
0	15	Signal Data Packet Payload Format						SPY	
0	8	Context Association Lists						SPY	
0	1	CIF 1 Enable	SP/SG Y						
1	30	Polarization		SPY					
1	29	3-D Pointing Vector		SPY					
1	28	3-D Pointing Vector Structure		SPY					
1	26	Spatial Reference Type		SPY					
1	25	Beamwidth		SPY					
1	18	1dB Compression Point			SPY				
1	15	Aux Frequency			SPY				SPY
1	14	Aux Gain							SPY
1	13	Aux Bandwidth			SPY				
1	10	Spectrum					SPY	SPY	
1	9	Sector Scan/Step					SPY	SPY	
1	7	Index List					SPY	SPY	
1	6	Discrete I/O 32 Bit			SPY		SPY		SPY
1	5	Discrete I/O 64 Bit			SPY	SGY			
1	1	Buffer Status						SPY	



VRT CONTROL FIELD APPLICABILITY CLARIFICATION

- Clarified section 6.3.1.6.9 and table 71 to further specify field applicability to signal ports and switch groups

6.3.1.6.76.3.1.6.9 MORA Control Fields Matrix

The MORA limitation of VITA 49.2 Command Fields shall be in accordance with Table 71 below. The matrix below depicts all control fields that are used for command packets and their associated MORA Signal Resource type. Fields indicated with "SP" shall be valid for implementing signal port control. Fields indicated with "SG" shall be required for implementing switch group control. Fields indicated with "SP/SG" shall be valid for implementing control for signal ports and shall be required for implementing control for switch groups. The two CIF 1 Enable fields are simply used for parsing messages and are not specifically implementing controlling resources.

Table 71 MORA Control Fields Matrix

CIF	Bit	Field Name	Parser	Control/Ack					Shared
				ANT	RFC	RFD	RFT	SDC	
0	31	Context Field Change Indicator	SP/SG Y						
0	30	Reference Point Identifier		SPY					
0	29	Bandwidth			SPY			SPY	
0	28	IF Reference Frequency					SPY		
0	27	RF Reference Frequency					SPY		
0	26	RF Reference Frequency Offset						SPY	
0	25	IF Band Offset						SPY	
0	24	Reference Level							
0	23	Gain			SPY				
0	22	Over-Range Count							
0	21	Sample Rate						SPY	
0	20	Timestamp Adjustment							
0	19	Timestamp Calibration Time							
0	18	Temperature							
0	16	State and Event Indicators							
0	15	Signal Data Packet Payload Format						SPY	
0	8	Context Association Lists							
0	1	CIF 1 Enable	SP/SG Y						
1	30	Polarization		SPY					
1	29	3-D Pointing Vector		SPY					
1	28	3-D Pointing Vector Structure		SPY					
1	26	Spatial Reference Type		SPY					
1	25	Beamwidth		SPY					
1	18	1dB Compression Point			SPY				
1	15	Aux Frequency			SPY				SPY
1	14	Aux Gain							SPY
1	13	Aux Bandwidth			SPY				
1	10	Spectrum					SPY	SPY	
1	9	Sector Scan/Step					SPY	SPY	
1	7	Index List					SPY	SPY	
1	6	Discrete I/O 32 Bit			SPY		SPY		SPY
1	5	Discrete I/O 64 Bit			SPY	SGY			
1	1	Buffer Status							



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
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- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
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- Added sequential to the uniqueness for MORA use of Message ID Field
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- Clarified VRT control / context fields applicability for signal ports and switch groups
- **Updated “Gain Stage” complex type’s Manual Gain and Output Level**
- Reduced content for External Device in External Connection Map
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



UPDATED GAIN STAGE COMPLEX TYPE

- Updated “Gain Stage” complex type’s Manual Gain and Output Level applicability to become conditionally required based on Type
 - Manual Gain required when Type = MANUAL and SELECTABLE
 - Output Level required when Type = AUTOMATIC and SELECTABLE
- Restructured Output Level from a range to a list in support of HPA level controls that are not using equal increments in settings e.g. 1W (+30 dBm), 2W (+33 dBm), 5W (+37dBm), 10W (+40 dBm) ...
- “Gain Stage” complex type was:

List "Gain Stage"		<1:2>
Stage Number [R]	Value from Profile	Integer (1 to 2) Gain
Signal Direction [R]	Value from Profile	Restricted String (TX, RX)
Gain Type [R]	Value from Profile	Restricted String (AUTOMATIC, MANUAL, SELECTABLE) Discrete IO 32
Manual Gain		"Manual Gain"
	Minimum Gain [R]	Value from Profile
	Maximum Gain [R]	Value from Profile
	Resolution [R]	Value from Profile
Output Level		"Output Level"
	Minimum 1 dB Compression Point [R]	Value from Profile
	Maximum 1 dB Compression Point [R]	Value from Profile
	Resolution [R]	Value from Profile

- “Gain Stage” complex type becomes :

List "Gain Stage"		<1:2>
Stage Number [R]	Value from Profile	Integer (1 to 2) Gain
Signal Direction [R]	Value from Profile	Restricted String (TX, RX)
Gain Type [R]	Value from Profile	Restricted String (AUTOMATIC, MANUAL, SELECTABLE) Discrete IO 32
Manual Gain [CR]		"Manual Gain"
	Minimum Gain [R]	Value from Profile
	Maximum Gain [R]	Value from Profile
	Resolution [R]	Value from Profile
Output Level [CR]		List of Floats
	Level	Value from Profile



RESTRUCTURED OUTPUT LEVEL



- Deletes “Output Level” complex type in MORA Common Complex Types

~~28. [Output Level]~~

~~a. Minimum 1 dB Compression Point~~

- ~~The minimum setting, stated as 1dB compression point, for an amplifier stage with a variable output level. This parameter represents bias control and is different than gain control.~~
- ~~Minimum 1 dB Compression Point shall be a real number, greater than -256 and less than 256, in dBm and a resolution of 1/128 dBm (0.0078125 dBm).~~
- ~~Minimum 1 dB Compression Point shall be provided as part of Output Level.~~

~~b. Maximum 1 dB Compression Point~~

- ~~The maximum setting, stated as 1dB compression point, for an amplifier stage with a variable output level. This parameter is bias control and is different than gain control.~~
- ~~Maximum 1 dB Compression Point shall be a real number, greater than -256 and less than 256, in dBm and a resolution of 1/128 dBm (0.0078125 dBm).~~
- ~~Maximum 1 dB Compression Point shall be provided as part of Output Level.~~

~~c. Resolution~~

- ~~The smallest unit of measure for the range of the output level.~~
- ~~Resolution shall be a real number, greater than or equal to 0 and less than 256, in dB and a resolution of 1/128 dB (0.0078125 dB).~~
- ~~Resolution shall be provided as part of Output Level.~~

- Updates “Output Level” in “Gain Stage” complex type in MORA Common Complex Types

~~e. Output Level~~

- ~~Automatic gain control description~~The 1dB compression point output power level(s) control description of this gain stage. This parameter represents an absolute value(s), such as a high power amplifier’s bias control, and is different than relative gain control values.
- ~~Output Level shall be an “Output Level” complex type as described in “MORA Common Complex Types.”~~increasing list of real numbers, greater than or equal to -2⁸ and less than or equal to 2⁸ - (1/2⁷), in dBm and a resolution of 1/2⁷ dB (0.0078125 dB).
- ~~Output Level shall~~must ~~contain at least one item in its list.~~
- ~~Output Level shall~~may ~~be provided as part of Gain Stage~~ when Gain Type is AUTOMATIC or SELECTABLE.
- ~~Output Level shall not be provided as part of Gain Stage when Gain Type is MANUAL.~~



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
- MDM Type 4 and 7 Message Updates
- Updated Specific MDM Applicability Promotions
- Updated “Required Control Fields” Definition
- Added “Client Inactivity Timeout” & “Command Execution Time”
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- Assigned MORA Warning and Error Field bits for message level / prologue issues
- Clarified VRT control / context fields applicability for signal ports and switch groups
- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- **Reduced content for External Device in External Connection Map**
- Updated MDM VLAN and Traffic Marking Specifications
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



REDUCED CONTENT FOR EXTERNAL DEVICE

- Reduced content for the “External Device” complex type in “External Connection Map” to delete the external device’s Sub Type, Service Name, and Version Information URL. This supports multiple device implementations for a given Device Type and Device ID that could have different Sub Types and Version Information URLs.
- WAS:**

List "External Connection" [R]		<0:N>
Local Signal Port ID [R]	Value from Profile	Integer (1 to 127)
External Signal Port ID [R]	Value from Profile	Integer (1 to 127)
External Device [R]	"MORA Device"	
	ID [R]	Value from Profile Integer (1 to 63) Stream ID
	Type [R]	Value from Profile Restricted String (OTH, RHD, RCD, SDR) Stream ID
	Sub Type [R]	Value from Profile Restricted String (RXO, TXO, TOR, TAR)
	Service Name [R]	Value from Profile Restricted String (Corresponds to VICTORY service name)
	Version Info URL [R]	Value from Profile Restricted URI
Gain Delta	Value from Profile	Float [dB]
Delay Delta	Value from Profile	Long [Femtoseconds]

- BECOMES:**

List "External Connection"		<1:N>		
Local Signal Port ID [R]	Value from Profile	Integer (1 to 127)		
External Signal Port ID [R]	Value from Profile	Integer (1 to 127)		
External Device [R]	Value from Profile	Restricted String (xxxxyy) {concatenated xxx is "Type" and yy is "ID" with no zero padding that corresponds to the "MORA Device"}		
Gain Delta	Value from Profile	Float [dB]		
Delay Delta	Value from Profile	Long [femtoseconds]		



REDUCED CONTENT FOR EXTERNAL DEVICE (CON'T)

- **External Device WAS:**

External Device

- i. The description of the external device.
- ii. External Device shall be a "MORA Device" complex type as described in "MORA Common Complex Types."
- iii. External Device shall be provided as part of External Connection.

- **External Device BECOMES:**

External Device

- i. The device type and identifier of the external device for this connection.
- ii. External Device shall be a restricted string composed of the concatenated "Type" and "ID" that corresponds to the "MORA Device" complex type as described in "MORA Common Complex Types." There shall not be any zero padding on the "ID" field.
- iii. External Device shall be provided as part of External Connection.



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
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- Reduced content for External Device in External Connection Map
- **Updated MDM VLAN and Traffic Marking Specifications**
- Updated MDM Type 1 Packet Generation and Execution Regulations
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



UPDATED MDM VLAN AND TRAFFIC MARKING



- Updated MDM VLAN specification for applicability to network infrastructure versus end nodes

5.2.1.4 Virtual LANs Specification <48002-~~20160131~~20220414, Exp>

The Virtual Local Area Networks (VLANs) and Priority Code Point (PCP) classes of service as specified in IEEE 802.1Q [12] are supported by the network infrastructure and VLAN tagging shall not be included contained supported in packets sourcedtransiting to and from ML2B end nodes.



UPDATED MDM VLAN AND TRAFFIC MARKING

- Added required equivalency for Traffic Marking when both DSCP and PCP are contained in a given packet

5.2.1.6 MDM Traffic Marking Specification <48008-~~20200707~~20220414, Exp>

RF Signal data is timestamped to document the time of collection or transmission. Timestamps can also be used in a transmit chain to schedule when a transmit event occurs to provide fully deterministic behavior. An acknowledgement-based approach is employed to ensure reliable delivery of critical control messages. The combination of control/context and signal data streams (information streams) on the same physical media can degrade performance of the RF capability if QoS is not enforced. MDM traffic shall be marked according to [Table 6](#) in order to maintain ultra-low latency for real-time messages. Switches shall be configured to store associated packets in a dedicated priority queue which is serviced before all other queues.

All MDM packets transiting between end nodes and network infrastructure (e.g. end node to and from switches) as well as between network infrastructure (e.g. switch trunk to another switch) shall be marked in accordance with Internet Engineering Task Force (IETF) Request for Comment (RFC) 2474: Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers [13] using the applicable DSCP DS field value from the table below. MDM packets between network infrastructure with the 802.1Q tag present shall have the 802.1Q Priority Code Point (PCP) field value marked to correspond with the DSCP DS field value within a given packet.

Table 6 MDM Traffic Marking

MDM Packet Type	DSCP		IEEE P 802.1Q p	
	Value	Service Class	Value	Service Class
MDM Type 1 VRT Command Packets and all other MDM Types	32	Inelastic/Real-Time, Short Message	3	Critical Applications
MDM Type 1 VRT Signal Data and VRT Context Packets	9	Preferred Elastic, High Throughput Data	2	Excellent Effort
All other-Other Traffic	0	Elastic, Best Effort	0	Best Effort



UPDATED MDM VLAN AND TRAFFIC MARKING



– Resulting impact to MDM Networking Specifications

6.2 MDM Networking Specifications <MT96002-V2.45>

The MDM message structure is used in six distinct interfaces across three different MORA component types. MDM message interactions may occur within a single MORA Device (intra-device) or occur between multiple MORA Devices. MDM message interactions between devices require the message to transit a network and therefore shall be in accordance with the following networking specifications in [Table 30](#) below.

Table 30 MDM Networking Specifications <MT96002-V2.45>

Spec Title	Spec Tag	Applicability
Low Latency Copper Data Physical and Data-Link Layer Specifications	MT91013-V2.4	(1) Required
Low Latency Fiber Data Physical and Data-Link Layer Specifications	MT91014-V2.1	
Standard for Ethernet Specification	48001-20221221160131, ProExp	(+) Required
Virtual LANs Specification	48002-2016013120220414, Exp	(+) Required
Standard for Internet Protocol and User Datagram Protocol Specification	48005-2016013120221221141118, ProExp	(+) Required
Jumbo Frame Packet Support Specification	48007-2022122100707, ProExp	(+) Required
MDM Traffic Marking Specification	48008-2020070720220414, Exp	(+) Required

(+) Experimental specifications are not included in compliance tests.

(1) One or more of MT91013, MT91014 is Required



- **MORA V2.5 Significant Updates**

- Added MORA Signal Resource Profile (MSRP) Regulations and Complex Types
- Updated IPv4 ML2B Multicast Dissemination
- Added Optional Support of IPv6 on VDB for MORA Device Component Type and on ML2B
- Split ML2B “MORA Transport Configuration” into resource and client structures
- Enhanced MDM Header for Version Functionality by MDM Type
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- **Updated MDM Type 1 Packet Generation and Execution Regulations**
- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



MDM TYPE 1 PACKET GENERATION AND EXECUTION

- Updated the Context Packet Generation Regulations within the MDM VRT Context Packet Type Specification to further define implications on packet generation based on Device State

6.3.1.5.4 Context Packet Generation Regulations

MORA shall use the VITA 49.2 Context Packet to describe the conditions under which signals were captured or generated. This context-to-signal-pairing applies to both analog and digital signal streams (ports) in a MORA system. With the exception of the Over-Range Count Field (CIF 0/Bit 22), all MORA context fields shall be interpreted to be persistent. That is, the metadata contained in a Context field shall be understood to be *persistent* between Context updates. Therefore, a new context packet shall be sent when fields previously reported have experienced a value change beyond the device's measurement error or repeatability tolerances. Regulations to this effect that appeared in VITA 49.0 (Rule 7.1.5-1) have been omitted in VITA 49.2 with only the spirit contained within normative text in section 7.1.4 of the VITA 49.2 document. For MORA, the VITA 49.0 rule shall apply and is shown below with strikethrough edits for VITA 49.2 consistency.

VITA 49.0 Rule 7.1.5-1: When the Context Packet Stream includes a 'Persistent' Context field, the emitter shall emit an IF Context Packet when the underlying metadata changes. The emitter may emit that Context field more often if desired.

Signal ports and subports with one or more Required Control Fields as well as all switch groups shall generate context packets in response to executed command packets while minimally in the device states of OPERATIONAL, TRANSMIT_INHIBIT, and STANDBY. Furthermore, to support non-controlling users, who may subscribe to the signal data and/or context multi-cast group(s) at any point in time, a complete context message shall be periodically published at least once a second to enable non-controlling users to have a comprehensive understanding of the contextual conditions for utilizing paired multi-cast signal data streams. Signal ports and subports with one or more Required Control Fields as well as all switch groups shall periodically generate a comprehensive context message while minimally in the device states of OPERATIONAL, TRANSMIT_INHIBIT, and STANDBY. The comprehensive context message shall include with all the "Required Control Fields" for a given signal port or subport and the "Switch State" for a given switch group. shall be periodically published at least once a second for active signal resources. Active signal resources are defined by the state field in the "Device Status" complex type as described in "MORA Common Complex Types." The periodicity of the publishing of a comprehensive context message shall be at least once a second and may be more frequent within an implementation and vary depending upon the level of dynamic resource management utilized for the expected specific use cases.



MDM TYPE 1 PACKET GENERATION AND EXECUTION

- Added Signal Data Packet Generation Regulations within the MDM VRT Signal Data Packet Type Specification to define implications on packet generation based on Device State and the Discrete IO 32-bit options field.

6.3.1.4.5 | Signal Data Packet Generation Regulations

Receive and Transmit types of digital signal ports (DRX, DTX, and DTR) shall produce and/or consume signal data packets in the device state of OPERATIONAL. Receive types of digital signal ports (DRX and DTR) shall produce and/or consume signal data packets in the device state of TRANSMIT INHIBIT. Receive and Transmit types of digital signal ports (DRX, DTX, and DTR) shall not produce and/or consume signal data packets in the device state of STANDBY. In addition to the device state implications to the flow of signal data, individual signal port and subport flows may be controlled, when in a permissible device state, using the RF Control subfield in the optional Discrete I/O 32-Bit field as described in “Discrete I/O 32-Bit (CIF 1/Bit 6).”



MDM TYPE 1 PACKET GENERATION AND EXECUTION

- Added Command Packet Execution Regulations within the MDM VRT Command Packet Type Specification to define implications on command packet execution based on Device State.

6.3.1.6.10 Command Packet Execution Regulations

Currently reserved signal ports, and any associated subports, with one or more Required Control Fields as well as all switch groups shall execute valid (e.g., authorized client, well-formed message, and MSRP consistent) command packets while minimally in the device states of OPERATIONAL, TRANSMIT_INHIBIT, and STANDBY.



- **MORA V2.5 Significant Updates**

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- Updated IPv4 ML2B Multicast Dissemination
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- Updated “Gain Stage” complex type’s Manual Gain and Output Level
- Reduced content for External Device in External Connection Map
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- Updated MDM Type 1 Packet Generation and Execution Regulations
- **Revised applicability of Generic End Node Management Parameters**
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



GENERIC END NODE MANAGEMENT PARAMETERS

- Revised applicability of Generic End Node Management Parameters in the MORA Device Management Interface from required to optional.
 - Rationale is that proxy implementations may not wish to use operations in potential conflict with the surrogate end node interfaces (e.g. host name, date time, etc.)

The Generic End Node, Waveform, Authentication Endpoints and Authorization Architecture Endpoints are optional WSDL interfaces. The Generic End Node and Waveform WSDLs shall only be available and declared in Version Information when they are included in the MORA Device Management Interface. The Authentication Endpoints WSDL shall only be available and declared in Version Information when Authentication is supported by the MORA Device Management Interface component type. The Authorization Architecture Endpoints WSDL shall only be available and declared in Version Information when both Authentication Endpoints and Authorization Architecture Endpoints are supported by the MORA Device Management Interface component type.

The MORA Device Management Interface implementation shall be in accordance with [Table 13](#) below.

Table 13 MORA Device Management Interface <MT92011-V2.45>

Spec Title	Spec Tag	Applicability
Common Management Interface Specifications	VT59902-V1.9	Required
MORA Schemas and WSDLs	49103-20201002, Pro	Required
Device Information Management Parameters	10009-20210409, Pro	Required
MORA Device Management Parameters	49011- 20240304 20220307, Pro	Required
Generic End Node Management Parameters	13003-20210409, Pro	Optional Required
Waveform Management Parameters	49012- 20201002 20220307, Pro	Optional
Data Confidentiality & Integrity for Management Interfaces	10018-20180215, Pro	Optional
Data Authentication for Management Interfaces	10019-20150331, Pro	Optional
Authentication and Authorization Security Specifications	VT50400-V1.9	Optional



GENERIC END NODE MANAGEMENT PARAMETERS

– Impacted to WSDL applicability in Appendix B Table 92

Table 91 MORA WSDLs

Specification	WSDL File Name	Applicability
MORA Device Management Parameters Specification	MoraDevice.wsdl	Required
MORA Signal Resource Management Parameters Specification	MoraSignalResource.wsdl	Optional
Radio Frequency Distribution Management Parameters Specification	RfDistributionRfDistribution .wsdl	Optional
Waveform Management Parameter Specification	Waveform.wsdl	Optional

Table 92 Inherited VICTORY WSDLs

Specification	WSDL File Name	Applicability
Authentication Service Management Specification	Authentication.wsdl	Optional
Authentication Entrypoints	AuthenticationEntrypoints.wsdl	Optional
Authorization Architecture Entrypoints	AuthorizationArchitectureEntrypoints.wsdl	Optional
Device Information Management Parameters	DeviceInformation.wsdl	Required
Generic End Node Management Parameters	GenericEndNode.wsdl	<u>Optional</u> Required
Syslog-Based Health Publishing Management Specification	HealthPublishing.wsdl	Required
Policy Enforcement Management Specification	PolicyEnforcement.wsdl	Optional
Version Information Management Parameters	VersionInformation.wsdl	Required
VICTORY Data Management Parameters	VICTORYData.wsdl	Optional



- **MORA V2.5 Significant Updates**

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- Updated IPv4 ML2B Multicast Dissemination
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- Revised applicability of Generic End Node Management Parameters
- Updated “Signal Port Description” complex type Signal Port Domain Description applicability



SIGNAL PORT DOMAIN DESCRIPTION APPLICABILITY

- Revised applicability of “Signal Port Domain Description” in “Signal Domain Conversion” complex type from required to optional.
 - Rationale is that some implementations may have performance constraints and not be able to fully produce or consume wideband signal port signal data but will instead produce or consume narrowband subport signal data.
 - Added note box for implementer to strive to produce or consume both

44.45. [Signal Domain Conversion]

- a. Signal Port Signal Domain Conversion Description
 - i. The signal domain conversion functional description ~~for of~~ the signal port.
 - ii. Signal Port Signal Domain Conversion Description shall be a “Signal Domain Conversion Description” complex type as described in “MORA Common Complex Types.”
 - iii. Signal Port Signal Domain Conversion Description ~~may shall~~ be provided as part of Signal Domain Conversion.
- b. Sub Port Signal Domain Conversion Descriptions
 - i. The signal domain conversion functional description ~~for of~~ sub ports ~~for the signal port~~.
 - ii. Sub Port Signal Domain Conversion Descriptions shall be a list of “Signal Domain Conversion Description” complex types as described in “MORA Common Complex Types.”
 - iii. Sub Port Signal Domain Conversion Descriptions shall contain at least one item in its list.
 - ~~iv.~~ Sub Port Signal Domain Conversion Descriptions may be provided as part of Signal Domain Conversion.

~~iv.~~ **NOTE:** The implementer should strive to provide both signal port and subport signal data production and/or consumption capabilities including wideband and narrowband data series where possible.



MORA V2.5 Revision Notice



MORA V2.5 REVISION NOTICE



REVISION TYPE DEFINITIONS

- **ADDITION:** The addition of normative text and/or regulations (shall, shall not, may, should, and should not), addressing new requirements or preexisting gaps.
- **CLARIFICATION:** The addition, modification, or deletion of non-normative text.
- **CORRECTION:** The modification of normative text and/or regulations (shall, shall not, may, should, and should not), addressing an error or defect.
- **DELETION:** The removal of normative text and/or regulations (shall, shall not, may, should, and should not).
- **RELOCATION:** A movement of existing content within the document. Denoted for both the “from” and the “to” location.
- **UPDATE:** The modification of normative text and/or regulations (shall, shall not, may, should, and should not), addressing formatting or changes over time.

TABLE OF REVISIONS

Section in V2.5	Rev Type	Change in V2.5
<i>throughout</i>	Clarification	Resolved typographical errors.
<i>throughout</i>	Clarification	Revised grammar for consistency.
<i>throughout</i>	Addition	Added uniqueness statements to ensure defined scope and bounds.
<i>throughout</i>	Update	Updated the formatting of management parameter sections to separately bulletize/number complex argument, return value and error condition paragraphs for ease of reading.
<i>throughout</i>	Correction	Corrected argument and error conditions in management parameters specifications that used the word “are” to use the word “shall” instead.
<i>throughout</i>	Update	Updated definition, data type/units, and applicability statements of complex type fields to have consistent verbiage and structure.
<i>throughout</i>	Update	Updated complex type field applicability statements (shall/may) to appear last in the field section.
<i>throughout</i>	Update	Updated complex type fields with Boolean logic to have data type statements of consistent structure.
<i>throughout</i>	Update	Updated internal and external document references to have consistent structure and verbiage.
<i>throughout</i>	Clarification	Revised instances of “IPV4” and “IPV6” to “IPv4” and “IPv6” respectively.

throughout	Update	Updated any MORA table/spec tags from V2.4 to V2.5 (or dates and/or maturity) if they were impacted in the 2.5 release: RF Layer Command Interface <MT90012-V2.5> RF Layer Context Interface <MT90013-V2.5> RF Layer Digital Data Interface <MT90014-V2.5> RF Layer Operations Interface <MT90015-V2.5> MORA Device Operations Interface <MT90016-V2.5> MORA Signal Resource Manager Operations Interface <MT90017-V2.5> Low Latency Switch <MT91010-V2.5> Low Latency Switch Data Interface <MT91011-V2.5> Low Latency Switch Data Interface Physical and Data-Link Layer Specifications <MT91012-V2.5> MORA Device <MT92010-V2.5> MORA Device Management Interface <MT92011-V2.5> MORA Signal Resource Manager <MT92013-V2.5> MORA Signal Resource Management Interface <MT92014-V2.5> MORA Signal Port Manager <MT92016-V2.5> MDM Protocol Specifications <MT96001-V2.5> MDM Networking Specifications <MT96002-V2.5> Standard for Ethernet Specification <48001-20221221, Pro> Virtual LANs Specification <48002-20220414, Exp> Standard for Internet Protocol and User Datagram Protocol Specification <48005-20221221, Pro> Multicast Dissemination Over the Network Specification <48006-20221221, Pro> Jumbo Frame Packet Support Specification <48007-20221221, Pro> MDM Traffic Marking Specification <48008-20220414, Exp> MDM Data Encoding Specification <48605-20221221, Pro> MDM Encapsulation Specification <48606-20221221, Pro> MDM VRT Message Structure Specification <48607-20221221, Pro> MDM VRT Signal Data Packet Type Specification <48608-20221221, Pro> MDM VRT Context Packet Type Specification <48609-20221221, Pro> MDM VRT Command Packet Type Specification <48610-20221221, Pro> MDM Acknowledgement Message (Type 2) Specification <48611-20221221, Pro> MDM Time of Day Message (Type 3) Specification <48612-20221221, Pro> MDM Signal Port User ID Message (Type 4) Specification <48613-20221221, Pro> MDM Health Message (Type 5) Specification <48614-20221221, Pro> MDM Command Message (Type 6) Specification <48615-20221221, Pro> MDM VRT Context and Command Fields Specification <48616-20221221, Pro> MDM Switch Group User ID Message (Type 7) Specification <48617-20221221, Pro> MDM Multicast Dissemination Specification <48801-20221221, Pro> Radio Frequency Distribution Management Parameters <49005-20220414, Pro> MORA Device Management Parameters <49011-20220307, Pro> Waveform Management Parameters <49012-20220307, Pro> MORA Signal Resource Management Parameters <49014-20221221, Pro> MORA Common Complex Types <49016-20221221, Pro> Radio Frequency Distribution Complex Types <49018-20220307, Pro> MORA Signal Resource Profile <49019-20221221, Pro>
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Section in V2.5	Rev Type	Change in V2.5
		Version Information Management Parameters for MORA <49102-20220307, Pro>
throughout	Update	Renamed Appendix B from “MORA WSDLs” to “MORA SCHEMAS AND WSDLs.”
throughout	Clarification	Revised the order of validation examples for value scope in the introduction second paragraph of all management parameter sections.
throughout	Addition	Added “unsigned integer” to the data type introductory paragraph within complex type sections representing a 32-bit unsigned integer for future use (no impact to current complex types).
throughout	Clarification	Resolved confusing verbiage for ID-Device Type.
throughout	Correction	Clarified the data type introductory paragraph within complex type sections to document the data type interdependency between XML and binary based messaging. Updated XML schema field specification definitions, that need a binary MDM/VRT equivalent precise translation, to use an accurate mathematical/exponent notation instead of the VITA specification’s observations which were approximate values.
throughout	Clarification	Revised table headers for binary content for consistency.
1.1	Clarification	Replaced Intelligence and Information Warfare Directorate (I2WD) references due to organizational change (integrated into the C5ISR Center).
1.7	Clarification	Clarified that compliance can be tested and documented for the MORA component types implemented.
2	Update	Updated descriptions of references [6] and [7] to “Deleted”.
2	Addition	Added Reference [11] IETF RFC 8200 IPv6 Specification. Added Reference [12] IEEE 802.1Q-2018 Specification. Added Reference [13] IETF RFC 2474 Specification.
3.1 – Table 2	Clarification	Revised “RCD”, “RHD”, and “SDR” acronym entries to include “(MORA Device Type)” to their definitions. Revised definition of “VICTORY” acronym for conciseness.
3.1 – Table 2	Clarification	Added “MD”, “MSPM”, “MSRM”, and “MSRP” acronym entries.
3.1 – Table 2	Clarification	Removed “I2WD” and “MAC” – “Message Authentication Code” acronym entries.
3.2 – Table 3	Clarification	Corrected Digital Signal Port Class definition by replacing the word “coaxial” with “copper.” Also corrected DTR from “Digital Transmit or Receive (DTR)” to “Digital Transmit and/or Receive (DTR).” Corrected Reference Signal Port Class definition by adding the word “copper.”
4.6.3.2	Clarification	Corrected definition of DTR from “Digital Transmit or Receive (DTR)” to “Digital Transmit and/or Receive (DTR).”
4.6.5 – Figure 10	Clarification	Updated image to add MDM Type 4 Signal Port User ID as additional responses to “reserve Signal Port” and “release Signal Port.”
5.1.1 – Table 4	Clarification	Corrected IEEE standard number.
5.2.1.1	Update	Replaced IPv4 specification references to IETF RFC standards [6] [7] with references to the applicable sections of the VICTORY Standard specifications.
5.2.1.1	Addition	Added optional IPv6 specifications with references to the applicable sections of the VICTORY Standard specifications.
5.2.1.3	Update	Updated the reference [10] description to remove the version year since it is already documented in the referenced documents section.
5.2.1.4	Update	Updated MDM VLAN specification for applicability to network infrastructure versus end nodes.
5.2.1.5	Addition	Added optional IPv6 specifications in addition to existing required IPv4 specifications.
5.2.1.6	Addition	Added required equivalency for Traffic Marking when both DSCP and PCP are contained in a given packet
5.2.1.6 – Table 6	Clarification	Corrected IEEE standard number.
5.3.1.1 – Table 8	Addition	Added optional Switch IPv6 Data Interface Network Layer and Higher Specifications.
5.3.2	Addition	Added statement: “The MORA Device, MORA Signal Resource Manager, and MORA Signal Port Manager component types shall all be at the same component type version (e.g., V2.5) for a given MORA Signal Resource implementation.”

Section in V2.5	Rev Type	Change in V2.5
5.3.2 – Table 12	Addition	Added required MORA Signal Resource Profile specification to the MORA Device component type. Added optional Generic End Node IPv6 Data Interface to the MORA Device component type.
5.3.2.1	Addition	Added statement about optional WSDL declarations in Version Information as well as Authentication and Authorization dependencies.
5.3.2.1 – Table 13	Update	Changed Generic End Node Management Parameters from required to optional in support of MORA proxy implementations where the surrogate host isn't managed by the proxied interfaces (e.g. set Host Name).
5.3.2.1.1 – 3.b.i.2	Correction	Corrected that list contents of the return value for the “getFileList” operation are unique.
5.3.2.1.1 – 4.b.i.2	Correction	Corrected that list contents of the return value for the “getAvailableMORAConfigurations” operation are unique.
5.3.2.1.1 – 5.b.ii.2	Correction	Corrected that list contents of the return value for the “getBuiltInTestResults” operation are unique.
5.3.2.1.1 – 6.b.i.1.a	Clarification	Added definition to OPERATE: “All RF waveform operations as well as signal resource signal data production and consumption on the device are active”
5.3.2.1.1 – 6.b.i.1.b	Clarification	Revised definition of STANDBY: “All RF waveform operations as well as signal resource signal data production and consumption on the device are halted”
5.3.2.1.1 – 6.b.i.1.c	Clarification	Revised definition of TRANSMIT_INHIBIT: “Receive RF waveform operations as well as receive signal resource signal data production and consumption on the device are active. Transmit RF waveform operations as well as transmit signal resource signal data production and consumption on the device are halted.”
5.3.2.1.2	Addition	Added statement at the beginning of the section “Waveform Management Parameters is an optional WSDL interface. It shall only be included in the MORA Device component type, and declared in the associated Version Information, when Waveforms are present in the implementation specific MORA Signal Resource Profile.”
5.3.2.1.2 – 1.a	Clarification	Updated the definition of Waveforms parameter to be analogous to a single RF application capability for a wireless protocol or modulation.
5.3.2.1.2 – 1.b.i.2	Correction	Corrected that list contents of the return value for the “getAvailableWaveforms” operation are unique.
5.3.2.1.2 – 1.b.i.2.a	Correction	Corrected statement from “If there are no available waveforms, then an empty list shall be returned.” to “The list of available waveforms shall contain at least one item.”
5.3.2.1.2 – 2.a	Relocation	Relocated a definition of Waveform Operation from section 5.3.5.2 – 2.a.iv.
5.3.2.1.2 – 2.b.i.2	Correction	Corrected that list contents of the return value for the “getAvailableWaveformOperations” operation are unique.
5.3.2.1.2 – 2.b.i.2.a	Correction	Corrected statement from “If there are no available waveform operations, then an empty list shall be returned.” to “The list of available waveform operations shall contain at least one item.”
5.3.2.2	Addition	Added that the MORA Device Operations Interface shall provide unicast transmissions.
5.3.2.2 – Table 14	Correction	Corrected the applicability of “MDM Health Message (Type 5) Specification” from optional to required for the MORA Device Operations Interface.
5.3.3	Addition	Added statement: “The MORA Device, MORA Signal Resource Manager, and MORA Signal Port Manager component types shall all be at the same component type version (e.g., V2.5) for a given MORA Signal Resource implementation.”
5.3.3 – Table 15	Addition	Added required MORA Signal Resource Profile specification to the MORA Signal Resource Manager component type.
5.3.3.1	Addition	Added statement about optional WSDL declarations in Version Information as well as Authentication and Authorization dependencies.
5.3.3.1.1 – 1.b.i.2	Correction	Corrected that list contents of the return value for the “getSignalPorts” operation are unique.
5.3.3.1.1 – 1.b.ii	Clarification	Added note “NOTE: When a client receives a reservation confirmation, unambiguous operation for a signal port and its sub ports is accomplished by ensuring that all “Required Control Fields” are set appropriately via MDM Type 1 Command Packets, or are validated via MDM Type 1 Context Packets.”
5.3.3.1.1 – 1.b.ii.1.b	Correction	Corrected that list contents of an argument for the “reserveSignalPort” operation are unique.

Section in V2.5	Rev Type	Change in V2.5
5.3.3.1.1 – 1.b.ii.1.b	Update	Changed the argument complex type from “MORA Transport Configuration” to “MORA Client Transport Configuration” Deleted operation specific regulations for “MORA Transport Configuration” optional fields.
5.3.3.1.1 – 1.b.ii.3.e	Update	Changed the complex type name from “MORA Transport Configuration” to “MORA Client Transport Configuration”.
5.3.3.1.1 -1.b.iii	Addition	Added note “NOTE: The resource’s behavior after a successful release should maintain the “Required Control Fields” settings and the persistence of analog signals or digital signal data, but is ultimately implementation specific.”
5.3.3.1.1 – 2.b.i.2	Correction	Corrected that list contents of the return value for the “getSignalPortReservations” operation are unique.
5.3.3.1.1 – 5.a	Clarification	Clarified the definition of the Static External Connection Map parameter by replacing “... connections between signal ports to other MORA Devices” with “... connections from internal signal ports to other MORA Devices”.
5.3.3.1.1 – 5.c.i.2	Correction	Corrected that list contents of the return value for the “getStaticExternalConnectionMap” operation are unique.
5.3.3.1.1 – 7.a	Clarification	Clarified the definition of the Internal Reference Connections parameter by replacing “...are available to non-reference signal ports...” with “... are connected to non-reference signal ports...”.
5.3.3.1.1 – 7.b.i.2	Correction	Corrected that list contents of the return value for the “getInternalReferenceConnections” operation are unique.
5.3.3.1.1 – 8.b.i.2	Correction	Corrected that list contents of the return value for the “getAntennaArrays” operation are unique. Corrected that return values from MORA Device Types of “SDR”, “RCD”, and “OTH” shall return an empty list.
5.3.3.1.1 – 8.b.i.2	Addition	Added that return values from MORA Device Type of “RHD” shall return at least one item in its list.
5.3.3.1.1 – 9.b.i.2	Clarification	Corrected that list contents of the return value for the “getManifoldBands” operation are unique. Corrected that return values from MORA Device Types of “SDR”, “RCD”, and “OTH” shall return an empty list.
5.3.3.1.1 – 9.b.i.2	Addition	Added that return values from MORA Device Type of “RHD” that have at least one manifold band shall return at least one item in its list. Added that return values from MORA Device Type of “RHD” that do not have a manifold band shall return an empty list.
5.3.3.1.2	Addition	Added statement at the beginning of the section “Radio Frequency Distribution Management Parameters is an optional WSDL interface. It shall only be included in the MORA Signal Resource Manager component type, and declared in the associated Version Information, when Switch Groups are present in the implementation specific MORA Signal Resource Profile.”
5.3.3.1.2 – 1.b.i.2	Correction	Corrected that list contents of the return value for the “getSwitchGroups” operation are unique.
5.3.3.1.2 – 1.b.i.2.a	Correction	Corrected statement from “If there are no switch groups, then an empty list shall be returned.” to “The list of switch groups shall contain at least one and no more than 127 items.”
5.3.3.1.2 – 1.b.ii	Clarification	Added note “NOTE: When a client receives a reservation confirmation, unambiguous operation for a switch group is accomplished by ensuring that the “Switch State” is set appropriately via MDM Type 1 Command Packets, or are validated via MDM Type 1 Context Packets.”
5.3.3.1.2 – 1.b.ii.1.b	Correction	Corrected that list contents of an argument for the “reserveSwitchGroup” operation are unique.
5.3.3.1.2 – 1.b.ii.1.b	Update	Changed the argument complex type from “MORA Transport Configuration” to “MORA Client Transport Configuration” Deleted operation specific regulations for “MORA Transport Configuration” optional fields.
5.3.3.1.2 – 1.b.ii.3.d	Update	Changed the complex type name from “MORA Transport Configuration” to “MORA Client Transport Configuration”.
5.3.3.1.2 – 1.b.iii	Addition	Added note “NOTE: The resource’s behavior after a successful release should maintain the switch state control field, and hence the persistence of analog signals, but is ultimately implementation specific.”
5.3.3.1.2 – 2.b.i.2	Correction	Corrected that list contents of the return value for the “getSwitchGroupReservations” operation are unique.
5.3.3.2	Addition	Added that the MORA Signal Resource Manager Operations Interface shall provide unicast transmissions.
5.3.3.2 – Table 17	Correction	Corrected the applicability of “MDM Switch Group User ID Message (Type 7) Specification” from optional to <u>required</u> for the MORA Signal Resource Manager Operations Interface.
5.3.4	Clarification	Added explanatory paragraphs to highlight the closely coupled relationships among component type operations and behaviors.
5.3.4	Addition	Added statement: “The MORA Device, MORA Signal Resource Manager, and MORA Signal Port Manager component types shall all be at the same component type version (e.g., V2.5) for a given MORA Signal Resource implementation.”

Section in V2.5	Rev Type	Change in V2.5
5.3.4 – Table 18	Addition	Added required MORA Signal Resource Profile specification to the MORA Signal Resource Manager component type.
5.3.4.2	Addition	Added that the RF Layer Command Interface shall provide unicast transmissions.
5.3.4.3	Clarification	Clarified that the RF Layer Context Interface shall provide multicast transmissions, which was already a requirement in the table.
5.3.4.4	Clarification	Clarified that the RF Layer Digital Data Interface shall provide multicast transmissions, which was already a requirement in the table.
5.3.4.5	Addition	Added that the RF Layer Operations Interface shall provide unicast transmissions.
5.3.5.1 – 3.b.ii	Addition	Added “SPIRAL” and “OTHER” enumerated values.
5.3.5.1 – 4.a.i	Clarification	Clarified that the “Array ID” identifier is unique.
5.3.5.1 – 4.a.ii	Addition	Added that the “Array ID” enumeration is described in the Reference Point Identifier section of the “MDM VRT Context and Command Fields Specification.”
5.3.5.1 – 8.c.i	Clarification	Clarified the definition of Compensation Criteria by replacing “maximum temperature change” with “temperature change threshold.”
5.3.5.1 – 8.d.i	Clarification	Clarified the definition of Compensation Criteria by replacing “maximum amount of elapsed time” with “elapsed time threshold.”
5.3.5.1 – 8.e.i	Clarification	Clarified the definition of Compensation Criteria by replacing “maximum frequency change” with “frequency change threshold.”
5.3.5.1 – 10	Clarification	Added missing definitions for both “Name” and “Value” fields of the Device Specific Status complex type.
5.3.5.1 – 11.a.ii.1.a	Clarification	Added definition to OPERATE: “All RF waveform operations as well as signal resource signal data production and consumption on the device are active”
5.3.5.1 – 11.a.ii.2.a	Clarification	Revised definition of STANDBY: “All RF waveform operations as well as signal resource signal data production and consumption on the device are halted”
5.3.5.1 – 11.a.ii.3.a	Clarification	Revised definition of TRANSMIT_INHIBIT: “Receive RF waveform operations as well as receive signal resource signal data production and consumption on the device are active. Transmit RF waveform operations as well as transmit signal resource signal data production and consumption on the device are halted.”
5.3.5.1 – 14.c.i	Clarification	Revised the definition of “External Device” to be the device type and identifier of the external device for this connection.
5.3.5.1 – 14.c.ii	Correction	Changed data type of “External Device” from a “MORA Device” complex type to be a restricted string composed of the concatenated “Type” and “ID” that corresponds to the “MORA Device” complex type. There shall not be any zero padding on the “ID” field.
5.3.5.1 – 15.g	Clarification	Clarified that the filter frequency range is determined at the -3 dB amplitude response points.
5.3.5.1 – 17	Addition	Added new “Frequency Domain Packet Format” complex type.
5.3.5.1 – 18.b.iii	Addition	Added “End shall be greater than or equal to Start.”
5.3.5.1 – 18.c.ii	Correction	Corrected the bounds to match the schema for the Resolution field of the Frequency Range complex type.
5.3.5.1 – 19.a.ii	Correction	Corrected the bounds to match the schema for the IF Center Frequencies field of the Frequency Translation complex type.
5.3.5.1 – 19.b.ii	Correction	Corrected the bounds to match the schema for the IF Bandwidths field of the Frequency Translation complex type.
5.3.5.1 – 19.d.ii	Correction	Corrected the bounds to match the schema for the RF Bandwidths field of the Frequency Translation complex type.
5.3.5.1 – 19.e.i	Clarification	Clarified the definition by replacing “RF Converter” with “analog frequency translation” for the Tuning Speed field of the Frequency Translation complex type.
5.3.5.1 – 20.b.i	Clarification	Revised the definition by removing “half duplex” for the Signal Direction field of the Gain Stage complex type.
5.3.5.1 – 20.d.iii/iv	Update	Changed applicability of Manual Gain from optional (may) to conditionally required (shall be provided as part of Gain Stage when Gain Type is MANUAL or SELECTABLE, shall not be provided as part of Gain Stage when Gain Type is AUTOMATIC).
5.3.5.1 – 20.e.i	Clarification	Revised the definition of Output Level to be the control description for the 1dB Compression Point output power level(s) of this gain stage.
5.3.5.1 – 20.e.ii	Correction	Changed the data type of Output Level from “Output Level complex type to be an increasing list of real numbers, greater than or equal to -2^8 and less than or equal to $2^8 - (1/2^7)$, in dBm and a resolution of $1/2^7$ dB (0.0078125 dB).”

Section in V2.5	Rev Type	Change in V2.5
5.3.5.1 – 20.e.iii	Addition	Added that “Output Level” must have at least one item in its list.
5.3.5.1 – 20.e.iv/v	Update	Changed applicability of Output Level from optional (may) to conditionally required (shall be provided as part of Gain Stage when Gain Type is AUTOMATIC or SELECTABLE, shall not be provided as part of Gain Stage when Gain Type is MANUAL).
5.3.5.1 – 21.b.iii	Addition	Added “If the test source power is fixed, the Max Injected Power shall equal the Min Injected Power.”
5.3.5.1 – 21.b.iv	Addition	Added “If the test source power is not fixed, then Max Injected Power shall be greater than the Min Injected Power.”
5.3.5.1 – 21.c.iii	Update	Updated to “If the test source power is fixed, the Resolution shall equal zero.”
5.3.5.1 – 23.b.iii	Addition	Added “Maximum Gain shall be greater than Minimum Gain.”
5.3.5.1 – 23.c.i	Clarification	Clarified the definition by replacing “measure that” with “gain change for” for the Resolution field of the Manual Gain complex type.
5.3.5.1 – 24	Addition	Added “MORA Client Transport Configuration” complex type.
5.3.5.1 – 25.d.iv	Correction	Corrected the “Supported Signal Ports” field within the “MORA Configuration” complex type where it “shall be provided as part of MORA Configuration when MORA Signal Resource Manager and MORA Signal Port Manager component types are present.”
5.3.5.1 – 25.d.v	Addition	Added the following statement to the “Supported Signal Ports” field within the “MORA Configuration” complex type: “Supported Signal Ports shall not be provided as part of MORA Configuration when MORA Signal Resource Manager and MORA Signal Port Manager component types are not present.”
5.3.5.1 – 25.e	Addition	Added the “Supported Switch Groups” field to the “MORA Configuration” complex type.
5.3.5.1 – 29	Update	Renamed “MORA Transport Configuration” complex type to “MORA Resource Transport Configuration” complex type. Deleted Component ID, Signal Port ID and Priority Level from the complex type since they do not apply to MORA Resource Transport Configuration.
5.3.5.1	Deletion	Deleted the “Output Level” complex type
5.3.5.1 – 39.b.i	Clarification	Clarified the definition by replacing “unique” with “private” since confirmation numbers could repeat during long operating cycles for the Confirmation Number field of the Reservation Confirmation complex type.
5.3.5.1 – 42.a.ii	Correction	Corrected the bounds to match the schema for the Sample Bandwidth field of the Sample Bandwidth and Sample Rate complex type.
5.3.5.1 – 42.b.ii	Correction	Corrected the bounds to match the schema for the Sample Rate field of the Sample Bandwidth and Sample Rate complex type.
5.3.5.1	Deletion	Deleted the “Signal Data Attributes” complex type.
5.3.5.1 – 44	Addition	Added new “Signal Data Format” complex type.
5.3.5.1 – 45.a.iii	Update	Changed applicability of Signal Port Signal Domain Conversion Description from required to optional for implementations that do not support signal port wide band signal data production or consumption but do support subport narrow band signal data production or consumption.
5.3.5.1 – 46	Deletion	Deleted the “Sample Format” field from the “Signal Domain Conversion Description” complex type. Deleted the “Sample Sizes” field from the “Signal Domain Conversion Description” complex type.
5.3.5.1 – 46.c	Addition	Added new field “Supported Signal Data Formats” to the “Signal Domain Conversion Description” complex type.
5.3.5.1 – 46.d	Clarification	Added note box recommending documentation as to which Supported Signal Data Formats are available for each Sample Bandwidth and Sample Rate.
5.3.5.1 – 47.m.ii	Clarification	Clarified the subfields from the field and added a hyperlink to the Reference Point Identifier (CIF0/Bit30) section.
5.3.5.1 – 47.n.ii	Update	Changed the complex type from “MORA Transport Configuration” to “MORA Resource Transport Configuration”
5.3.5.1 – 47.p	Clarification	Added a note for “If the comprehensive set includes any fields from CIF1 (integer 101-131), then the CIF1 enable bit (integer 1) present in CIF0 would be included.”
5.3.5.1 – 47.p.i	Clarification	Clarified the definition to become “The comprehensive set of MDM Type 1 control fields required to be provided by a client for unambiguous operation of this signal port.”
5.3.5.1 – 47.q	Addition	Added the new “Client Inactivity Timeout Field” to the “Signal Port” complex type.

Section in V2.5	Rev Type	Change in V2.5
5.3.5.1 – 47.r	Addition	Added the new “Command Execution Time” to the “Signal Port” complex type.
5.3.5.1 – 48.a.i	Clarification	Clarified the definition by replacing “reservation” with “description” for the Signal Port ID field of the Signal Port Description complex type.
5.3.5.1 – 48.b.iii	Addition	Added that when “RF Conditioning” is provided as part of “Signal Port Description” that “RF Conditioning” shall not be empty.
5.3.5.1 – 48.d.iii	Addition	Added that when “Signal Domain Conversion” is provided as part of “Signal Port Description” that “Signal Domain Conversion” shall not be empty.
5.3.5.1 – 50.b.ii	Update	The corresponding complex type changed from “MORA Transport Configuration” to “MORA Client Transport Configuration”.
5.3.5.1 – 53.d	Clarification	Added a note for “If the comprehensive set includes any fields from CIF1 (integer 101-131), then the CIF1 enable bit (integer 1) present in CIF0 would be included.”
5.3.5.1 – 53.d.i	Clarification	Clarified the definition to become “The comprehensive set of MDM Type 1 control fields required to be provided, in addition to the signal port control fields, by a client for unambiguous operation of this sub port.”
5.3.5.1 – 53.d.ii	Correction	Corrected the bounds to match the schema for the Required Control Fields field of the Sub Port complex type.
5.3.5.1 – 59	Addition	Added new “Time Domain Packet Format” complex type.
5.3.5.2 – 2.a	Relocation	Relocated V2.4 section 5.3.5.2 – 2.a.iv to V2.5 section 5.3.2.1.2 – 2.a.
5.3.5.3 – 1.c.iii	Addition	Added that Unique Name in the “Data Transport Configuration” shall minimally include the MAC address in the first 17 characters in the restricted string (e.g. 02:C0:ED:12:34:56) for the Control Transport Configuration field of the Switch Group complex type.
5.3.5.3 – 1.c.iv	Correction	Added that URI field in the “Data Transport Configuration” shall minimally include IPv4/6 address, UDP port and MUI information in the path (e.g. udp://192.168.0.1:50001/50100) and that the UDP port and MUI may have the same assigned value for the Control Transport Configuration field of the Switch Group complex type.
5.3.5.3 – 1.c.v	Addition	Added that the optional Network Layer field in the “Data Transport Configuration” shall not be included and that if the Network Layer field is included and well formed, it shall be ignored for the Control Transport Configuration field of the Switch Group complex type.
5.3.5.3 – 1.d.iii	Addition	Added that Unique Name in the “Data Transport Configuration” shall minimally include the MAC address in the first 17 characters in the restricted string (e.g. 02:C0:ED:12:34:56) for the Context Transport Configuration field of the Switch Group complex type.
5.3.5.3 – 1.d.iv	Correction	Added that URI field in the “Data Transport Configuration” shall minimally include IPv4/6 address, UDP port and MUI information in the path (e.g. udp://192.168.0.1:50001/50100) and that the UDP port and MUI may have the same assigned value for the Context Transport Configuration field of the Switch Group complex type.
5.3.5.3 – 1.d.v	Addition	Added that the optional Network Layer field in the “Data Transport Configuration” shall not be included and that if the Network Layer field is included and well formed, it shall be ignored for the Context Transport Configuration field of the Switch Group complex type.
5.3.5.3 – 1.e	Addition	Added the new “Client Inactivity Timeout Field” to the “Switch Group” complex type.
5.3.5.3 – 1.f	Addition	Added the new “Command Execution Time” to the “Switch Group” complex type.
5.3.5.3 – 2.b.i	Clarification	Clarified the definition with “The Client Component IDs authorized to use the identified switch group for this switch group reservation.”
5.3.5.3 – 2.b.ii	Update	The corresponding complex type changed from “MORA Transport Configuration” to “MORA Client Transport Configuration”.
5.4.2.b.i.2.a	Clarification	Added definition to OPERATE: “All RF waveform operations as well as signal resource signal data production and consumption on the device are active”
5.4.2.b.i.2.b	Clarification	Revised definition of STANDBY: “All RF waveform operations as well as signal resource signal data production and consumption on the device are halted”

Section in V2.5	Rev Type	Change in V2.5
5.4.2.b.i.2.c	Clarification	Revised definition of TRANSMIT_INHIBIT: "Receive RF waveform operations as well as receive signal resource signal data production and consumption on the device are active. Transmit RF waveform operations as well as transmit signal resource signal data production and consumption on the device are halted."
5.4 – 2.b.i.4	Update	Updated to better define the relationship between the reported SYSLOG values for a "deviceState" with the "State" in the "Device Status" complex type.
5.4 – 2.b.ii.3	Update	Updated to better define the relationship between the reported SYSLOG values for a "waveform" with the "Description" in the "Waveform" complex type.
5.4 – 2.b.iii	Clarification	Clarified that SPM_errors are related to MDM Type 2 No Responses and Response Values of 2, 4, 8, 16, 64, and 128.
5.4 – 2.b.iv	Clarification	Clarified that SPM_out_of_sequence events are related to MDM Type 2 Response Value of 32.
5.4 – 2.b.v	Clarification	Clarified that SPM_ACKs are related to MDM Type 2 Response Values of 1 and 32.
5.5 – Table 24	Update	Added a V2.5 column under the "Version Applicability" heading in the MORA Management Interface Types table.
5.5 – Table 25	Correction	Corrected by renaming heading from "Version Applicability" to "WSDL Port Version(s)" in the MORA SOAP Component Types table.
5.5 – Table 25	Update	Added a V2.5 column under the "WSDL Port Version(s)" heading in the MORA SOAP Component Types table. Changed the WSDL port versions of MORA_DEVICE, WAVEFORM, MORA_SIGNAL_RESOURCE, and RADIO_FREQUENCY_DISTRIBUTION from V2.4 to V2.5.
5.7	Addition	Added new "MORA Signal Resource Profile" section.
5.7.1	Addition	Added new "MORA Signal Resource Profile Implementation Rules" section.
5.7.2	Addition	Added new "MORA Signal Resource Profile Complex Types" section.
6.1.2.1.3	Update	Updated the meaning of the MDM header version major / minor to be specific to the MDM Type in accordance with the "MDM Version by Type" table and that implementations may support interoperability of legacy versions by MDM Type.
6.1.2.1.5	Addition	Added that the ML2B Interface ID shall be used to validate all incoming messages by verifying the originator and/or destination MUIs in MDM transmissions.
6.1.2.1.5	Update	Updated the uniqueness bounds for both the "Origination ID" and "Destination ID" are minimally unique to the component type instance within a MORA device and is also unique within a MORA system.
6.1.2.1.6	Relocation	Relocated "MDM Types" table to APPENDIX C and renamed it to "MDM Size by Types."
6.1.2.1.6	Deletion	Removed the unnecessary sentence "All messages within a particular MDM packet shall be of the same type" as regulation in the "MDM Size by Types" table naturally prevents this.
6.3.1	Clarification	Clarified that the use of MDM VRT Type 1 messages is for MORA Signal Port Manager client interactions only.
6.3.1.1	Clarification	Added summary bullets for Warning and Error Response Field. Added summary bullets for Message ID Field.
6.3.1.2.3	Update	Added synchronization of the TSI and TSF code values so that when TSI is present, TSF is also present. When TSI is not present, TSF is also not present.
6.2.1.2.3 – Table 36	Correction	Corrected erroneous callout of "T3/T2/T1" to "T2/T1/T0".
6.3.1.2.5	Update	Updated the meaning of the VERSION MAJ and VERSION MIN subfields within Information Class Code to be specific to MDM Type 1 in accordance with the "MDM Version by Type" table.
6.3.1.3.3	Clarification	Deleted two note boxes regarding the C5ISR Center reference design implementation as they are irrelevant to the specification.
6.3.1.3.3 – Table 47	Clarification	Corrected the table name from "Signal Payload Packet Data Format Field" to "Signal Data Packet Payload Format Field".
6.3.1.4.5	Addition	Added section for signal packet generation regulations.
6.3.1.5.3	Addition	Added differentiation of which MORA context fields apply to signal ports, switch groups or both.
6.3.1.5.3 – Table 65	Update	Updated table applicability indicator from "X" to now include "SP", "SG" and "SP/SG".

Section in V2.5	Rev Type	Change in V2.5
6.3.1.5.4	Update	Added rule regarding context packet generation in response to executed command packets minimally for specific Device States and stated applicability to signal ports and subports with one or more Required Control Fields as well as all switch groups. Updated existing rule regarding periodic comprehensive context packet generation minimally for specific Device States and clarified applicability to signal ports and subports with one or more Required Control Fields as well as all switch groups.
6.3.1.6.4	Addition	Added "Er" to the list of bits that shall be set to "0". Added that the "W" bit shall be set to "1". Added that when "ReqV" is set to "1", then "ReqW" and "ReqEr" shall also be set to "1".
6.3.1.6.4 – Table 67	Update	Updated "W" to "1", "Er" to "0", and all "Res" bits to "0".
6.3.1.6.5	Addition	Added new section "Message ID Field for Control and Acknowledge Packets" to further clarify VITA 49.2 rules and add sequential numbering assignment to enable detection of out of sequence control packets.
6.3.1.6.6	Addition	Added "Er" to the list of bits that shall be set to "0". Added that the "W" and "AckV" bits shall be set to "1". Add the following to clarify the VITA specification: The VITA 49.2 table 8.4.1-1 function description for bit 16 (AckEr) for validation acknowledge packets (AckV = 1) shall be interpreted as follows: "Set To 1: Errors were generated; Set to 0: No errors were generated."
6.3.1.6.6 – Table 68	Update	Updated "W" and "AckV" to "1", "Er" to "0", and all "Res" bits to "0".
6.3.1.6.7	Addition	Added new section "MORA Warning and Error Response Fields for Acknowledge Packets" to describe the MORA implementation of the VITA 49.2 Warning and Error Response Fields for Acknowledge Packets.
6.3.1.6.8	Addition	Added that when "ReqV" is set to "1", then "ReqW" and "ReqEr" shall also be set to "1".
6.3.1.6.8 – Table 70	Update	Updated all "Res" bits to "0".
6.3.1.6.9	Addition	Added differentiation of which MORA control fields apply to signal ports, switch groups or both.
6.3.1.6.10	Addition	Added section for command packet execution regulations.
6.3.1.6.9 – Table 71	Update	Updated table applicability indicator from "X" to now include "SP", "SG" and "SP/SG".
6.3.2	Clarification	Clarified that the MDM Type 2 message is used for both resource inter-component type and MORA Signal Port Manager client interactions.
6.3.2	Update	Updated first paragraph to become: "This message is used for both resource inter-component type and MORA Signal Port Manager client interactions. The MDM Acknowledgement Message (Type 2) shall be used, when requested, to provide a positive acknowledgement to the sender of valid MDMs, excluding MDM Acknowledgement Message (Type 2), that a specific message (as indicated by the MDM SEQUENCE NUMBER) was received and the MDM Header was validated by the recipient. In addition to this initial scrutiny, the MDM Acknowledgement Message (Type 2) also shall provide a means by which the recipient may further delineate payload validation as well as execution success or failure for all valid MDM Types, excluding MDM VITA Radio Transport (VRT) (Type 1) and MDM Acknowledgement Message (Type 2). Added paragraph: "MDM VITA Radio Transport (VRT) (Type 1) Command Packet Sub Type message payload validation acknowledgement shall be accomplished, when requested, using the acknowledge validation (AckV) feature of VITA 49.2. However, an AckV response shall not be issued if an MDM Acknowledgement Message (Type 2) error response occurs. Execution acknowledgement for MDM VITA Radio Transport (VRT) (Type 1) Command Packet Sub Type messages shall be accomplished by monitoring the associated multicast MDM VITA Radio Transport (VRT) (Type 1) Context Packet Sub Type messages. Therefore, MDM Acknowledgement Message (Type 2) responses to MDM VITA Radio Transport (VRT) (Type 1) Command Packet Sub Types shall not include response values of (4), (8), and (16) as depicted in Table 73 below."
6.3.2 – Table 73	Update	Replaced the "r" bit label with a "VI" bit label for "Version Incompatibility" errors.
6.3.2	Addition	Added the following sentences before Table 73: "The response to an MDM requesting acknowledgement shall be a single MDM Acknowledgement Message (Type 2). The single acknowledgement shall follow the order of response precedence specified. The requester's notional behavior based upon the response value is also described below."

Section in V2.5	Rev Type	Change in V2.5
6.3.2 – Table 74	Addition	Added a response value of 128 to the table for “Version Incompatibility (VI)” errors. Added a column specifying an order of precedence in acknowledgement evaluation. Changed existing ‘*’ callout instances to ‘***’. Added a new ‘*’ to indicate MDM Acknowledgement responses (4, 8, and 16) are not permitted for MDM VRT Command Packet Types.
6.3.2 – Table 74	Clarification	Clarified some of the entries in the “Response Meaning” column.
6.3.3 – Table 75	Clarification	Renamed “SEND-ACK” to “ACK” to be consistent with the field name defined in the MDM encapsulation section.
6.3.3	Clarification	Clarified that the MDM Type 3 message is used for resource inter-component type interactions only.
6.3.4 – Table 77	Clarification	Renamed “SEND-ACK” to “ACK” to be consistent with the field name defined in the MDM encapsulation section.
6.3.4 – Table 77	Addition	Added User ML2B Command Field Indicator Bits, User Command ML2B Unique Identifier (MUI), User ML2B Signal Data Field Indicator Bits, User Signal Data ML2B Unique Identifier (MUI), User ML2B Context Field Indicator Bits, and User Context ML2B Unique Identifier (MUI) fields to the MDM Signal Port User ID Message Format table.
6.3.4	Clarification	Clarified that the MDM Type 4 message is used for both resource inter-component type and MORA Signal Port Manager client interactions. Clarified verbiage for verifying incoming release MDMs.
6.3.4	Update	Updated the third use case description to become “To communicate to a MORA Signal Resource Manager component type and MORA Signal Port Manager Client(s) that a signal port release has occurred at its MORA Signal Port Manager component type due to a lack of communications from an authorized MORA Signal Port Manager client within a signal port specific period of time, if implemented.” Updated the octet/byte order and bit ordering verbiage for IPv4, IPv6, and MAC for Command, Signal Data, and Context.
6.3.4	Addition	Added definitions for the User ML2B Command Field Indicator Bits, User Command ML2B Unique Identifier (MUI), User ML2B Signal Data Field Indicator Bits, User Signal Data ML2B Unique Identifier (MUI), User ML2B Context Field Indicator Bits, and User Context ML2B Unique Identifier (MUI) fields. Added sentence along with updates to an existing paragraph to clarify usage of the SIGNAL PORT ID field of the SIGNAL PORT RESOURCE ID and USER ID subfields. Added sentence to User ML2B Signal Data message fields to be set to zero when the client does not publish digital signal data. Added sentence to User ML2B Context message fields to be set to zero when the client does not publish context.
6.3.5 – Table 80	Clarification	Renamed “SEND-ACK” to “ACK” to be consistent with the field name defined in the MDM encapsulation section.
6.3.5	Clarification	Clarified that the MDM Type 5 message is used for resource inter-component type interactions only.
6.3.5	Update	Updated to become “For device level operational parameters, messages shall be sent to both MORA Device and MORA Signal Resource Manager component types. For signal port level operational parameters, messages shall be sent only to the MORA Signal Resource Manager component type.”
6.3.5	Update	Updated the MDM Type 5 second method use of Operational State field’s value to not have to represent all monitored parameters in a single value.
6.3.5	Correction	Corrected that switch group resource health status is reported for each signal port(s) impacted unless all signal ports on the device are impacted, in which case it’s reported at the device level.
6.3.5 – Figure 25	Clarification	Clarified that the Operational State field is implementation specific.
6.3.6 – Table 81	Clarification	Renamed “SEND-ACK” to “ACK” to be consistent with the field name defined in the MDM encapsulation section.
6.3.6	Clarification	Clarified that the MDM Type 6 message is used for resource inter-component type interactions only.
6.3.6 – Figure 26	Correction	Corrected the upper bound of Configuration ID to be 2,147,483,647 in alignment with the XML signed integer greater than 0.
6.3.6 – Figure 27	Correction	Corrected the upper bound of Waveform Operation ID to be 2,147,483,647 in alignment with the XML signed integer greater than 0.
6.3.7 – Table 82	Clarification	Renamed “SEND-ACK” to “ACK” to be consistent with the field name defined in the MDM encapsulation section.

Section in V2.5	Rev Type	Change in V2.5
6.3.7 – Table 82	Addition	Added User ML2B Command Field Indicator Bits, User Command ML2B Unique Identifier (MUI), User ML2B Context Field Indicator Bits, and User Context ML2B Unique Identifier (MUI) fields to the MDM Switch Group User ID Message Format table.
6.3.7	Clarification	Clarified that the MDM Type 7 message is used for both resource inter-component type and MORA Signal Port Manager client interactions. Clarified verbiage for verifying incoming release MDMs.
6.3.7	Update	Updated the third use case description to become “To communicate to a MORA Signal Resource Manager component type and MORA Signal Port Manager Client(s) a switch group release has occurred at its MORA Signal Port Manager component type due to a lack of communications from an authorized MORA Signal Port Manager client within a switch group specific period of time, if implemented.” Updated the octet/byte order and bit ordering verbiage for IPv4, IPv6, and MAC for Command and Context.
6.3.7	Addition	Added definitions for the User ML2B Command Field Indicator Bits, User Command ML2B Unique Identifier (MUI), User ML2B Context Field Indicator Bits, and User Context ML2B Unique Identifier (MUI) fields. Added/updated sentence(s) to existing paragraphs to clarify usage of the SWITCH GROUP ID / SIGNAL PORT ID fields of the SWITCH GROUP RESOURCE ID / USER ID subfields respectively. Added sentence to User ML2B Context message fields to be set to zero when the client does not publish context.
7.3.1.1	Clarification	Added Avahi to the listed library examples.
7.3.2 – Figure 30	Clarification	Corrected figure to include Generic End Node content to the MORA Device response.
7.3.2	Clarification	Corrected to include Generic End Node content to the MORA Device response given by the version information web service and included references to applicable specification sections for version information and health publishing content.
7.3.5 – Figure 33	Clarification	Corrected the figure to show that the resource announces the reservation over ML2B to all clients of the reservation. Corrected the figure for the change in complex type name from “MORA Transport Configuration” to “MORA Client Transport Configuration”
7.3.5	Clarification	Corrected the explanations to show that the resource announces the reservation over ML2B to all clients of the reservation. Corrected for the change in complex type name from “MORA Transport Configuration” to “MORA Client Transport Configuration”
7.4.1	Clarification	Corrected for the change in complex type name from “MORA Transport Configuration” to “MORA Resource Transport Configuration”
7.5.2	Clarification	Clarified that the example demonstrates a multi-client reservation. Corrected for the change in complex type name from “MORA Transport Configuration” to “MORA Client Transport Configuration”
7.5.2 – Figure 39	Clarification	Corrected that the reserving client is required to be an authorized user and must be listed first in the reserve request argument’s list of MORA Transport Configuration to leverage its priority. Corrected that the MORA Signal Port Manager resource announces reservations to all authorized clients and that the reserving client does not announce reservations to non-reserving authorized clients. Corrected that the context was erroneously depicted as being sent by an RF Layer Command Interface for RHD1. Corrected the figure for the change in complex type name from “MORA Transport Configuration” to “MORA Client Transport Configuration”
7.5.2	Clarification	Corrected the explanation to align with the corrected figure.
Appendix B	Update	Updated the title of the appendix from “MORA WSDLs” to “MORA SCHEMAS AND WSDLs.”
Appendix B	Relocation	Relocated the two schema tables from the previous MORA SCHEMAS Appendix C to the existing MORA WSDLs tables in Appendix B.
Appendix B – Table 89	Addition	Added the required MORA Signal Resource Profile Complex Types schema to the “MORA Schemas” table.
Appendix B – Table 91	Correction	Corrected capitalization of “RfDistribution.wsdl” to “RFDistribution.wsdl” to match the actual filename of the wsdl.



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Section in V2.5	Rev Type	Change in V2.5
Appendix B – Table 92	Update	Changed the applicability of the GenericEndNode.wsdl from required to optional.
Appendix C	Update	Updated the title of the appendix from “MORA SCHEMAS” to “MORA DATA MESSAGE TYPE ATTRIBUTES.”
Appendix C	Relocation	Relocated the two schema tables to the new MORA SCHEMAS AND WSDLs Appendix B.
Appendix C – Table 93	Addition	Added “Current Version by MDM Type” table to Appendix C.
Appendix C	Relocation	Relocated “MDM Types” table (V2.4 table 30) from section 6.1.2.1.6 and renamed it to “MDM Size by Types” (V2.5 table 93).
Appendix C – Table 94	Update	Updated Data Message Size of MDM Type 4 from 19 to 22 words and of MDM Type 7 from 13 to 15 words.