

# ISO 20210:2015-08 (E)

## Space data and information transfer systems - Mission Operations Message Abstraction Layer - JAVA API

---

<b>Contents</b>	<b>Page</b>
<b>1 INTRODUCTION.....</b>	<b>1-1</b>
1.1 PURPOSE OF THIS RECOMMENDED PRACTICE .....	1-1
1.2 SCOPE.....	1-1
1.3 APPLICABILITY.....	1-1
1.4 RATIONALE.....	1-1
1.5 DOCUMENT STRUCTURE .....	1-1
1.6 DEFINITIONS.....	1-2
1.7 CONVENTIONS.....	1-2
1.8 REFERENCES .....	1-4
<b>2 OVERVIEW .....</b>	<b>2-1</b>
2.1 GENERAL.....	2-1
2.2 MO SERVICE FRAMEWORK JAVA MAPPING .....	2-3
2.3 MAPPING FROM MAL DOCUMENT.....	2-5
<b>3 MAL API .....</b>	<b>3-1</b>
3.1 GENERAL.....	3-1
3.2 MAL PACKAGE.....	3-3
3.3 DATA STRUCTURES PACKAGE.....	3-40
3.4 CONSUMER PACKAGE .....	3-58
3.5 PROVIDER PACKAGE.....	3-94
3.6 BROKER PACKAGE .....	3-134
<b>4 SERVICE MAPPING.....</b>	<b>4-1</b>
4.1 OVERVIEW .....	4-1
4.2 DEFINITION.....	4-1
4.3 CONSUMER .....	4-8
4.4 PROVIDER .....	4-25
4.5 DATA STRUCTURES.....	4-40
4.6 ELEMENT FACTORY CLASSES .....	4-50
4.7 MULTIPLE ELEMENT BODY CLASSES.....	4-51
4.8 HELPER AND ELEMENT FACTORY CLASSES .....	4-53
<b>5 TRANSPORT API.....</b>	<b>5-1</b>
5.1 GENERAL.....	5-1
5.2 CLASSES AND INTERFACES .....	5-1

<u>Section</u>	<u>Page</u>
<b>6 ACCESS CONTROL API</b> .....	<b>6-1</b>
6.1 GENERAL.....	6-1
6.2 CLASSES AND INTERFACES .....	6-1
<b>7 ENCODING API</b> .....	<b>7-1</b>
7.1 OVERVIEW .....	7-1
7.2 CLASSES AND INTERFACES .....	7-1
<b>ANNEX A DEFINITION OF ACRONYMS (INFORMATIVE)</b> .....	<b>A-1</b>
<b>ANNEX B INFORMATIVE REFERENCES (INFORMATIVE)</b> .....	<b>B-1</b>
<b>ANNEX C SECURITY, SANA, AND PATENT CONSIDERATIONS (INFORMATIVE)</b> .....	<b>C-1</b>
<b>ANNEX D CODE EXAMPLE (INFORMATIVE)</b> .....	<b>D-1</b>

Figure

2-1 Mission Operations Services Concept Document Set .....	2-1
2-2 Relationship of MO Books .....	2-2
2-3 Overview of the Mission Operations Service Framework .....	2-3
2-4 MO Framework Java Mapping .....	2-4
3-1 Relationships between the API Main Interfaces.....	3-2
4-1 Relationships between the Stub Classes and Interfaces .....	4-8
4-2 Relationships between the Skeleton Classes and Interfaces (Delegation Pattern) .....	4-26
4-3 Relationships between the Skeleton Classes and Interfaces (Inheritance Pattern).....	4-26
4-4 Multi-Binding Service Provider .....	4-27

Table

1-1 Variable Value Case Rules .....	1-4
3-1 API Main Interfaces.....	3-1
3-2 MALContextFactory ‘registerFactoryClass’ Parameter.....	3-4
3-3 MALContextFactory ‘deregisterFactoryClass’ Parameter .....	3-4
3-4 MALContextFactory ‘createMALContext’ Parameter.....	3-6
3-5 MALContextFactory ‘registerArea’ Parameter.....	3-6
3-6 MALContextFactory ‘lookupArea’ Parameters .....	3-7
3-7 MALContextFactory ‘registerError’ Parameters.....	3-8
3-8 MALContextFactory ‘lookupError’ Parameter .....	3-8
3-9 MALContext ‘getTransport’ Parameters.....	3-11

<u>Table</u>	<u>Page</u>
3-10 MALService Attributes .....	3-12
3-11 MALService Constructor Parameters.....	3-13
3-12 MALService 'setArea' Parameter .....	3-15
3-13 MALService 'addOperation' Parameter.....	3-15
3-14 MALOperation Attributes .....	3-16
3-15 MALOperation Constructor Parameters.....	3-16
3-16 MALOperation 'getOperationStage' Parameter.....	3-18
3-17 MALOperation 'setService' Parameter .....	3-19
3-18 Interaction Stages Constants.....	3-20
3-19 Operation stages.....	3-21
3-20 MAL<<Ip>>Operation Constructor Parameters .....	3-21
3-21 MALOperationStage Attributes.....	3-23
3-22 MALOperationStage Constructor Parameters.....	3-24
3-23 MALOperation 'setOperation' Parameter .....	3-25
3-24 MALService Attributes .....	3-26
3-25 MALArea Constructor Parameters .....	3-26
3-26 MALArea 'addService' Parameter .....	3-27
3-27 MALService Constructor Parameters.....	3-28
3-28 MAException Constructor Parameters.....	3-30
3-29 MALInteractionException Constructor Parameter.....	3-31
3-30 MAElementFactoryRegistry 'registerElementFactory' Parameters .....	3-32
3-31 MAElementFactoryRegistry 'lookupElementFactory' Parameter.....	3-33
3-32 MAElementFactoryRegistry 'deregisterElementFactory' Parameter .....	3-33
3-33 MAEncoder and MALDecoder Variables.....	3-34
3-34 MAEncoder 'encode[Nullable]<<Attribute>>' Parameter .....	3-35
3-35 MALListEncoder 'createListEncoder' Parameter.....	3-36
3-36 MALListDecoder 'createListDecoder' Parameter .....	3-36
3-37 MAEncoder 'encode[Nullable]Element' Parameter .....	3-37
3-38 MALDecoder 'decode[Nullable]Element' Parameter .....	3-37
3-39 MAEncoder 'encode[Nullable]Attribute' Parameter .....	3-38
3-40 Element 'encode' Parameter .....	3-41
3-41 Element 'decode' Parameter .....	3-42
3-42 Enumeration Constructor Parameter.....	3-44
3-43 MAL::Attribute Types Mapped to a Java Type.....	3-45
3-44 Union Variables .....	3-46
3-45 Union Constructor Parameter .....	3-46
3-46 Blob Byte Array Constructor Parameter.....	3-49
3-47 Blob URL Constructor Parameter .....	3-50
3-48 MAL::Attribute Types Represented by a Specific Class.....	3-53
3-49 Initial Value Assigned by the <<Attribute>> Empty Constructor .....	3-54
3-50 MALConsumerManager 'createConsumer' Parameters .....	3-59

<u>Table</u>	<u>Page</u>
3-51 QoS Properties .....	3-60
3-52 MALConsumer ‘send’ Parameters .....	3-62
3-53 MALConsumer ‘submit’ Parameters.....	3-63
3-54 MALConsumer ‘request’ Parameters .....	3-64
3-55 MALConsumer ‘invoke’ Parameters.....	3-66
3-56 MALConsumer ‘progress’ Parameters .....	3-67
3-57 MALConsumer ‘register’ Parameters.....	3-68
3-58 MALConsumer ‘deregister’ Parameters.....	3-70
3-59 MALConsumer ‘asyncSubmit’ Parameters .....	3-71
3-60 MALConsumer ‘asyncRequest’ Parameters.....	3-72
3-61 MALConsumer ‘asyncInvoke’ Parameters .....	3-73
3-62 MALConsumer ‘asyncProgress’ Parameters.....	3-75
3-63 MALConsumer ‘asyncRegister’ Parameters .....	3-76
3-64 MALConsumer ‘asyncDeregister’ Parameters.....	3-77
3-65 MALConsumer ‘continueInteraction’ Parameters .....	3-78
3-66 MALConsumer ‘setTransmitErrorListener’ Parameter.....	3-79
3-67 MALInteractionListener ‘submitAckReceived’ Parameters .....	3-81
3-68 MALInteractionListener ‘submitErrorReceived’ Parameters .....	3-81
3-69 MALInteractionListener ‘requestResponseReceived’ Parameters.....	3-82
3-70 MALInteractionListener ‘requestErrorReceived’ Parameters.....	3-83
3-71 MALInteractionListener ‘invokeAckReceived’ Parameters .....	3-83
3-72 MALInteractionListener ‘invokeAckErrorReceived’ Parameters.....	3-84
3-73 MALInteractionListener ‘invokeResponseReceived’ Parameters .....	3-85
3-74 MALInteractionListener ‘invokeResponseErrorReceived’ Parameters .....	3-85
3-75 MALInteractionListener ‘progressAckReceived’ Parameters .....	3-86
3-76 MALInteractionListener ‘progressAckErrorReceived’ Parameters .....	3-87
3-77 MALInteractionListener ‘progressUpdateReceived’ Parameters .....	3-87
3-78 MALInteractionListener ‘progressUpdateErrorReceived’ Parameters .....	3-88
3-79 MALInteractionListener ‘progressResponseReceived’ Parameters.....	3-89
3-80 MALInteractionListener ‘progressResponseErrorReceived’ Parameters .....	3-89
3-81 MALInteractionListener ‘registerAckReceived’ Parameters .....	3-90
3-82 MALInteractionListener ‘registerErrorReceived’ Parameters .....	3-91
3-83 MALInteractionListener ‘notifyReceived’ Parameters .....	3-91
3-84 MALInteractionListener ‘notifyErrorReceived’ Parameters.....	3-92
3-85 MALInteractionListener ‘deregisterAckReceived’ Parameters .....	3-92
3-86 MALProviderManager ‘createProvider’ Parameters.....	3-95
3-87 MALProvider ‘createPublisher’ Parameters.....	3-99
3-88 MALProvider ‘setTransmitErrorListener’ Parameter .....	3-100
3-89 MALInteractionHandler ‘malInitialize’ Parameter .....	3-103
3-90 MALInteractionHandler ‘handleSend’ Parameters .....	3-103
3-91 MALInteractionHandler ‘handleSubmit’ Parameters.....	3-104

<u>Table</u>	<u>Page</u>
3-92 MALInteractionHandler ‘handleRequest’ Parameters .....	3-105
3-93 MALInteractionHandler ‘handleInvoke’ Parameters .....	3-105
3-94 MALInteractionHandler ‘handleProgress’ Parameters .....	3-106
3-95 MALInteractionHandler ‘malFinalize’ Parameter .....	3-107
3-96 MALInteractionHandler ‘get/setQoSProperty’ Parameters .....	3-108
3-97 MALSubmit ‘sendError’ Parameter .....	3-109
3-98 MALResponse ‘sendResponse’ Parameter.....	3-111
3-99 MALResponse ‘sendError’ Parameter .....	3-112
3-100 MALInvoke ‘sendAcknowledgement’ Parameters.....	3-113
3-101 MALProgress ‘sendUpdate’ Parameter .....	3-115
3-102 MALProgress ‘sendUpdateError’ Parameter.....	3-116
3-103 MALPublisher ‘publish’ Parameters .....	3-117
3-104 MALPublisher ‘register’ Parameters .....	3-118
3-105 MALPublisher ‘asyncRegister’ Parameters.....	3-120
3-106 MALPublisher ‘asyncDeregister’ Parameter.....	3-121
3-107 MALPublishInteractionListener ‘publishRegisterAckReceived’ Parameters.....	3-123
3-108 MALPublishInteractionListener ‘publishRegisterErrorReceived’ Parameters .....	3-123
3-109 MALPublishInteractionListener ‘publishErrorReceived’ Parameters .....	3-124
3-110 MALPublishInteractionListener ‘publishDeregisterAckReceived’ Parameters....	3-125
3-111 MALProviderSet Constructor Parameter.....	3-125
3-112 MALProviderSet ‘createPublisherSet’ Parameters .....	3-126
3-113 MALProviderSet ‘addProvider’ Parameter .....	3-127
3-114 MALProviderSet ‘removeProvider’ Parameter .....	3-128
3-115 MALPublisherSet Constructor Parameters.....	3-129
3-116 MALPublisherSet ‘createPublisher’ Parameter.....	3-129
3-117 MALPublisherSet ‘deletePublisher’ Parameter.....	3-130
3-118 MALPublisherSet ‘publish’ Parameters .....	3-131
3-119 MALPublisherSet ‘register’ Parameters .....	3-131
3-120 MALPublisherSet ‘asyncRegister’ Parameters .....	3-132
3-121 MALPublisherSet ‘asyncDeregister’ Parameter.....	3-133
3-122 MALBrokerManager ‘createBroker’ Parameter.....	3-135
3-123 MALBrokerBinding ‘createBrokerBinding’ Parameters.....	3-136
3-124 MALBrokerBinding ‘sendNotify’ Parameters .....	3-139
3-125 MALBrokerBinding ‘sendNotifyError’ Parameters .....	3-140
3-126 MALBrokerBinding ‘sendPublishError’ Parameters .....	3-142
3-127 MALBrokerBinding ‘setTransmitErrorListener’ Parameter .....	3-143
3-128 MALBrokerHandler ‘malInitialize’ Parameter .....	3-145
3-129 MALBrokerHandler ‘handleRegister’ Parameters .....	3-145
3-130 MALBrokerHandler ‘handlePublishRegister’ Parameters .....	3-146
3-131 MALBrokerHandler ‘handlePublish’ Parameters .....	3-147
3-132 MALBrokerHandler ‘handleDeregister’ Parameters.....	3-148

<u>Table</u>	<u>Page</u>
3-133 MALBrokerHandler 'handlePublishDeregister' Parameters.....	3-148
3-134 MALBrokerHandler 'malFinalize' Parameter.....	3-149
4-1 Service Mapping Variables.....	4-3
4-2 Area Classes.....	4-7
4-3 Service Classes .....	4-7
4-4 <<Service>>Stub Attribute.....	4-21
4-5 <<Op>> Publisher Attribute.....	4-30
4-6 <<Op>>Publisher constructor Parameter .....	4-30
4-7 <<Op>>Publisher 'publish' Parameters .....	4-31
4-8 Invoke <<Op>>Interaction Attribute .....	4-32
4-9 Progress <<Op>>Interaction Attribute.....	4-34
4-10 <<Service>>InheritanceSkeleton Attributes .....	4-36
4-11 <<Service>>DelegationSkeleton Attributes.....	4-39
5-1 MALTransportFactory Attributes.....	5-1
5-2 MALTransportFactory 'registerFactoryClass' Parameters .....	5-2
5-3 MALTransportFactory 'deregisterFactoryClass' Parameter .....	5-2
5-4 MALTransportFactory Constructor Parameter.....	5-3
5-5 MALTransportFactory 'newFactory'Parameter.....	5-4
5-6 MALTransportFactory 'createTransport' Parameter.....	5-5
5-7 MALTransport 'createEndpoint' Parameters .....	5-6
5-8 MALTransport 'getEndpoint' Parameters .....	5-7
5-9 MALTransport 'deleteEndpoint' Parameter.....	5-7
5-10 MALTransport 'isSupportedQoSLevel' Parameter.....	5-8
5-11 MALTransport 'isSupportedInteractionType' Parameter .....	5-9
5-12 MALTransport 'createBroker' Parameters.....	5-10
5-13 MALEndpoint 'createMessage' Parameters.....	5-15
5-14 MALEndpoint 'sendMessage' Parameters .....	5-16
5-15 MALEndpoint 'sendMessages' Parameters .....	5-17
5-16 MALEndpoint 'setMessageListener' Parameter .....	5-17
5-17 MALMessageBody 'getBodyElement' Parameters .....	5-20
5-18 MALMessageBody 'getEncodedBodyElement' Parameter .....	5-20
5-19 MALPublishBody 'getUpdateLists' Parameter.....	5-23
5-20 MALPublishBody 'getUpdateList' Parameter .....	5-23
5-21 MALPublishBody 'getUpdate' Parameter .....	5-24
5-22 MALPublishBody 'getEncodedUpdate' Parameter .....	5-25
5-23 MALEncodedElement Constructor Parameter .....	5-27
5-24 MALMessageListener 'onMessage' Parameters .....	5-29
5-25 MALMessageListener 'onMessages' Parameters .....	5-29
5-26 MALMessageListener 'onInternalError' Parameters.....	5-30
5-27 MALTransmitErrorException Constructor Parameters.....	5-30
5-28 MALTransmitMultipleErrorException Constructor Parameter .....	5-32

<u>Table</u>	<u>Page</u>
5-29 MALEncodedElementList Constructor Parameters .....	5-33
5-30 MALEncodedBody Constructor Parameter.....	5-33
5-31 MALTransmitErrorListener 'onTransmitError' Parameters .....	5-34
6-1 MALAccessControlFactory 'registerFactoryClass' Parameters .....	6-2
6-2 MALAccessControlFactory 'deregisterFactoryClass' Parameter .....	6-2
6-3 MALAccessControlFactory 'createAccessControl' Parameter.....	6-3
6-4 MALAccessControl 'check' Parameter.....	6-4
6-5 MALCheckErrorException Constructor Parameters .....	6-5
7-1 MALElementStreamFactory 'registerFactoryClass' Parameters .....	7-2
7-2 MALElementStreamFactory 'deregisterFactoryClass' Parameters .....	7-3
7-3 MALElementStreamFactory Creation Parameters .....	7-3
7-4 MALElementStreamFactory 'init' Parameters.....	7-5
7-5 MALElementStreamFactory 'createInputStream' Parameter .....	7-5
7-6 MALElementStreamFactory 'createOutputStream' Parameter.....	7-6
7-7 MALElementStreamFactory 'encode' Parameters.....	7-7
7-8 MALElementInputStream 'readElement' Parameters.....	7-8
7-9 MALElementOutputStream 'writeElement' Parameters.....	7-9
7-10 MALEncodingContext Attributes .....	7-11
C-1 JavaBindingNamespace Initial Values .....	C-3