Real-Time Platform
Reference FOM
Product Development Group

26-27 January 2000
ITT Systems
Huntsville, AL

Meeting Minutes

Introduction

Presiding Officers:
Richard Schaffer, Chair

Drafting Groups:
Graham Shanks and Mike O'Conner, RPR FOM
Sean Reilly and Keith Briggs, GRIM

Minutes Prepared by:
Douglas Wood (Secretary)

On Site Attendees:
Fischer, Jeff; McLaughlin, Eugene; Monson, Steve; O'Conner, Michael; Schaffer, Richard; Shanks, Graham; Wood, Douglas

Teleconference Attendees:
Granowetter, Len; Normoyle, Aline; Reilly, Sean; Rieger, Larry; Rivera, Bill, Katz, Dan (IFF discussion)

Next Meeting:
The next meeting is tentatively scheduled for 29 March 1999 from 6:30 to 9:00 PM EDT at the 2000 Spring SIW in Orlando, Florida.

Action Items:

Reference #	Responsibility	Action
A2000-1-01	Schaffer	Prepare a presentation for this SAC SIW overview session.
A2000-1-02	O'Conner	Present RPR FOM meeting proposal to SAC.
A2000-1-03	Shanks	Provide the specification for the SIMAN-R interactions in the FOM and rationale in the GRIM.
A2000-1-04	Shanks	Add a MeasuredSpeed attribute to the PhyiscalEntity class.
A2000-1-05	Rieger	Write up the Live Entity mapping rationale for the GRIM.
A2000-1-06	Shanks	Specify additional attributes in RPR FOM and rationale in GRIM.
A2000-1-07	Wood	Investigate the impact of using these PDUs in this manner can have on the HLA Gateway application.
A2000-1-08	Rieger	Write up rational on Is-Group-Of for the GRIM.
A2000-1-09	Monson	Write up rationale on mapping the Transfer-Control PDU into HLA ownership transfer and SIMAN interactions.
A2000-1-10	Shanks	Add these new SIMAN PDUs will be added as new SIMAN interactions and write up rationale for GRIM.
A2000-1-11	Shanks	Add additional attributes to IFF leaf classes and rationale for GRIM.
A2000-1-12	Wood	Consider impact of scaled real-time in Gateway dead reckoning.
A2000-1-13	O'Conner	Write up rationale on how Non-Real-Time is supported by HLA time management.
A2000-1-14	Shanks	Provide O'Conner with input on scaled real-time.
A2000-1-15	Schaffer	Investigate the Taz. Devil FOM.
A2000-1-16	Rieger	Doing work with the Air Force and will investigate also. He should contact Captain Jacques Barber.
A2000-1-17	Wood	Collect HLA Gateway user list.
A2000-1-18	Granowetter	Collect VR-Link user list.
A2000-1-19	Schaffer	Initiate discussion on reflector.
A2000-1-20	Schaffer	Promote RPR FOM community.
A2000-1-21	Shanks	Remove the NumberOfEntities attribute.
A2000-1-22	Shanks	Write up rational for GRIM on why "use alt mode 4" bits in change/option is redundant and not needed in FOM.

Reference #	Responsibility	Action
A2000-1-23	Shanks	Change units of altitude from 1 to 100 with accuracy of 1.
A2000-1-24	Shanks	Look at UseAltMode5 attribute and change sense of name so that it can be assumed false and it is only sent with the alt mode 5 value is to be used.
A2000-1-25	Shanks and Reilly	Write up rational for GRIM on how and when acoustic transients should be sent as objects or interactions.
A2000-1-26	Shanks	Combine PropulsionNoise's CurrentShaftRate, OrderedShaftRate, and ShaftChangeRate attributes into single complex type and replace them with a single attribute ShaftData as an array of this data type.
A2000-1-27	Shanks	Move ActiveSonarBeam to base class level with additional attributes that were inherited from EmitterBeam.
A2000-1-28	Shanks	Add octet padding before DataVariant.
A2000-1-29	Shanks	Add padding to appropriate DataVariant types.
A2000-1-30	Shanks	Add padding after NumberOfRecords.
A2000-1-31	Shanks	Change GridID to GridIdentifier.
A2000-1-32	Shanks	Remove FieldNumber, RecordNumber, and RecordTotal.
A2000-1-33	Shanks	Alphabetize GriddedData in OMD.
A2000-1-34	Wood	Investigate remove SequenceNumber from Minefield to be consistent.
A2000-1-35	Shanks	Change name of NumberOfValues to NumberOfBytes in GridValueType0.
A2000-1-36	Shanks	Implement scale and offset.
A2000-1-37	Shanks	Add padding before values and change cardinality of padding from 2 to 0+ in GridValueType2Struct.
A2000-1-38	Shanks	Name byte alignment in variable padding fields (e.g., PaddingTo64 or PaddingTo32) and add notes that indicate padding alignment.
A2000-1-39	Reilly	Incorporate padding naming convention into GRIM.
A2000-1-40	Reilly	Fix lexicon for underwater acoustics, contacting Roy Scrudder for input.
A2000-1-41	Shanks	Remove "Representation" from attribute names. Must check OMDD names.
A2000-1-42	Shanks	Specify intercom command interaction with command attributes from intercom control (ControlType, Command, IntercomParameters, and IntercomParametersLength).
A2000-1-43	Monson	Write up Intercom rational for GRIM.
A2000-1-44	Shanks	Change MasterChannelIndex to MasterChannelIdentifier.
A2000-1-45	Monson	Check intercom parameters to see if some types belong with intercom object versus command interaction.
A2000-1-46	Shanks	Move IntercomSignal parameters down to duplicate them in each subclass (similar to RadioSignal).
A2000-1-47	Wood	Remove RequestorID and ReceivingID from object classes.
A2000-1-48	Wood	Define new interaction classes with the same contents of the object classes to be used for communication between SE creator and Master.
A2000-1-50	Wood	Work on lexicon.
A2000-1-51	Shanks	Add note to FOM Actions and rational to GRIM to indicate that how pending HLA IF Specification can handle bit encoding.
A2000-1-52	When	Balloting is finalized and tools are available, this bit encoding should be included in FOM.
A2000-1-53	Shanks	Publish RPR FOM v2d4 on RPR FOM reflector (02/04/00).
A2000-1-54	Schaffer	Contact RPR FOM 1.0 assigned reviewers.
A2000-1-55	Schaffer	Contact Bob Lutz (OMDT for 1516).
A2000-1-56	1516 BM	Review 1516 changes for impact on RPR FOM.
A2000-1-57	Shanks	Publish RPR FOM v2d5 on RPR FOM reflector (03/20/00).
A2000-1-58	Reilly	Publish GRIM v2d5 on reflector (03/20/00).
A2000-1-59	Schaffer	Contact OMDD folks for review of RPR FOM.
A2000-1-59	Wood	Remove UpdateNumber from object classes.

Agenda:

Wednesday, January 26

08:30 - Welcome, Introductions, Status

08:50 - Review of RPR FOM 2.0 Draft 2
- · Aggregate PDUs
- · IFF PDUs

10:30 - Break

10:45 - Review of RPR FOM 2.0 Draft 2
- · Underwater Acoustics PDUs

12:00 - Lunch

13:00 - Review of RPR FOM 2.0 Draft 2
- · Environmental Process PDUs
- · Gridded Data PDUs

15:15 - Break

15:30 - Synthetic Environment PDUs:
- · Point, Linear, and Areal Object State

16:45 - Volunteers and proposed schedule

17:00 - Adjourn

Thursday, January, 27

08:30 - Entity information/interaction PDUs:
- · Collision-Elastic

09:15 - Radio Communications
- · Intercom Signal
- · Intercom Control

10:30 - Break

10:45 - Minefield

12:00 - Lunch

13:00 - Miscellaneous Rationale
- · Live Entity
- · Non-Real Time
- · Simulation Management with Reliability
- · Supplemental Emission/Entity State

15:00 - Break

15:15 - Guidance Document - Rationale, mapping & assignments

17:00 - Adjourn

Wednesday Morning

Approval of Minutes of Previous Meeting:

Minutes from the previous meeting were read. The 99F-SIW meeting minutes were approved.

RPR FOM 1.0 Status

Graham Shanks

Draft three of FOM is in document library. The following actions are needed to complete it as a SISO product:

- Add "Master" and "Product distribution" language to GRIM
- Remove individual names from front sheet
- Define front page for SAC to include SISO copyright and product number
- Place SISO product number in FOM Identification version field.
- Master format for GRIM is PDF
- Master format for FOM is OMT (OMT takes precedence when there are any differences between other formats and OMT).
- Download of FOM should be a zip file that includes the master (OMT) as well as other formats (OMD, FED, and PDF).

Motion to accept items above was moved by Wood and seconded by O'Conner. Motion passed unanimously.

The FOM and GRIM need to be placed in a higher visibility web site. It is suggested that a Products document library section be created where all SISO products can be found.

There is serious concern about distribution rights of the RPR FOM product. SISO is instituting a membership requirement for downloading SISO products. There should be no restrictions on SISO members to redistribute the RPR FOM product other than retaining the SISO copyright in the distributions.

RPR FOM SIW Meetings

O'Conner brought up a SAC business issue dealing with RPR FOM requirements at the Spring SIW. The SAC will have an activity output session on Monday from 08:30am to 12:00. This session will include 1/2-hour time slots for Study Group and Product Development Group updates.

In addition to the usually Wednesday evening session (4 hours 1800-2200), the RPR FOM group would like to have a 4 hour session on Tuesday afternoon (1300 - 1700). The Tuesday session would be similar to a User Forum and it would be used to for status review and general issue discussion (basically what previous SIW evening sessions covered). The Wednesday session would then be available for development (similar to interim meeting sessions).

Motion to propose Tuesday afternoon and Wednesday evening session moved by Schaffer and seconded by Monson. Motion passes unanimously with Shanks abstention.

Actions: Schaffer will prepare a presentation for this session. O'Conner will present RPR FOM meeting proposal to SAC.

RPR FOM draft 2 version 3 Review

Graham Shanks

RPR FOM d2v3 is a working draft for this meeting only. It includes Aggregate, IFF (layer 1), Underwater Acoustics, Environmental Process, Gridded Data, Collision-Elastic, Intercom, and Supplemental Entity State.

Minefield and Synthetic Environment Point-Linear-Areal are proposals that will also be reviewed, but they are not in the d2v3 draft.

The new specifications are complete except for some missing enumerations and many definitions are simply TDB.

The following are not defined in either the d2v3 draft or existing proposals: SIMAN w / Reliability, Live Entity, Is-Part-Of, Is-Group-Of, Transfer-Control, and IFF layer 2.

SIMAN with Reliability

First, existing SIMAN interactions are useful for large exercises using unreliable transport. Even though HLA supports a reliable transport class, it does not guarantee an interaction will be delivered. Reliable, in HLA, means it will get there, unless something seriously wrong occurs (similar to TCP); however, HLA does not have an error out mechanism and it will not inform a federate if an error occurs due to transmission. Also, there is no acknowledgment mechanism. Shanks proposes deriving SIMAN-Reliable interactions from existing SIMAN interactions. Each reliable interaction would include an acknowledgment protocol indicator. This indicator would take on one of three values: Unacknowledge, Standard (1278.1-1995; must ack), or Reliable (acknowledge but keep track of transaction to allow retransmission). The existing SIMAN interactions would assume (as they do now) the Standard acknowledgement protocol mechanism (i.e., must ack).

Actions: Shanks will provide the specification for the SIMAN-R interactions in the FOM and rationale in the GRIM.

Live Entity

Rieger stated that the Live Forum determined that no additional classes in RPR FOM were needed to support the Live Entity PDUs. The inherent capabilities of HLA (i.e., only sending changed data) were sufficient for performing the bandwidth reduction techniques provided by these PDUs. Monson noted that the TSPI PDU contains a measured speed field that is not in the RPR FOM entity specification. There is also system specific data that is not defined in the enumeration document. It was agreed that this system specific information will not be defined in the RPR FOM, but instead SOM/FOM derivations will define this system specification data according to the needs of the Federate/Federation.

Actions: Shanks will add a MeasuredSpeed attribute to the PhyiscalEntity class. Rieger will write up the Live Entity mapping rationale for the GRIM.

Secretary's note: The discussion of Live Entity at the meeting appeared to reference the 2.1.4 Entity State Update 1-2-3 PDUs and the Profile PDU. These PDU were interim versions of what is now the Entity State Update PDU and they are not the Live Entity PDUs (what in 2.1.4 was referred to as Instrumented Entity PDUs). While the rationale for not including Live Entity object classes or interactions is still valid, the Live Entity PDUs contain additional pieces of information that are not in the RPR FOM. Specifically, the TSPI PDU contained fields for transmitting position and orientation error information and the Appearance PDU contained fields for visual, IR, EM, and audio appearance. These PDU data specifications should be re-examined for inclusion in the RPR FOM.

Is-Part-Of and Is-Group-Of

Is-Part-Of has nothing specified. Is-Part-Of came from Danna Patterson. Is-Part-Of could be used to put entities in a fixed location wrt other entities (e.g., plane landing on carrier). Enumerations for Is-Part-Of were only specified for aircraft and warships. Since an entity can only be designated as being part of only one other entity, this functionality can be specified with additional attributes to PhysicalEntity (e.g., AttachedToEntityIdentifier, RelativeAttachmentLocation).

Actions: Shanks will specify additional attributes in RPR FOM and rationale in GRIM.

Rieger wrote up Is-Group-Of. Is-Group-Of is an update of TSPI data for a group of entities and it is primarily a bandwidth reduction technique. There is no reason to specify Is-Group-Of data within context of HLA and RPR FOM for that purpose. However, it is possible that Is-Group-Of was used in conjunction with Aggregate State to specify location of aggregated entities.

Actions: Wood will investigate the impact of using these PDUs in this manner can have on the HLA Gateway application. Rieger will write up rational on Is-Group-Of for the GRIM.

Transfer-Control

The Transfer-Control PDU allowed ownership transfer with the transmission of internal state data. While the HLA 1.3 specification has ownership management services, it does not allow the transfer of internal state data unless it is specifically called out in the FOM. In addition, the transfer of attributes and the transmission of the transfer values are not performed atomically. The proposed method in HLA with the RPR FOM is to use ownership transfer in conjunction with SIMAN interactions to transfer internal state data.

Actions: Monson will write up rationale on mapping the Transfer-Control PDU into HLA ownership transfer and SIMAN interactions.

SIMAN Record PDUs

Actions: Shanks will add these new SIMAN PDUs will be added as new SIMAN interactions and write up rationale for GRIM.

IFF Layer 2

Actions: Shanks will add additional attributes to IFF leaf classes and rationale for GRIM.

Non-Real-Time

There is no need for additional FOM specification. Non-Real-Time is a way of doing HLA like time management in DIS. The GRIM will require a significant rationale for how this DIS functionality is performed in HLA.

Actions: Wood will have to consider impact of scaled real-time in Gateway dead reckoning. O'Conner will write up rationale on how Non-Real-Time is supported by HLA time management. Shanks will provide O'Conner with input on scaled real-time.

RPR FOM Divergence

Monson brought up the issue of RPR FOM divergence by the simulation community. He cited the AFRL at Taz. Devil in Mesa. The Taz. Devil FOM is a large effort that used the FEDEP process. Aspects of the RPR FOM did not meet their requirements. Other divergent FOM development related to the RPR FOM is the specification of radio communication by ASTI. It is important for the RPR FOM group to get feedback from those efforts that are diverging from the RPR FOM standard. There are two aspects to the RPR FOM. One aspect is as a reference FOM that is a starting point for FOM development (reduces the work in defining common functionality found in most real-time platform level simulations). The other aspect is the fact that it can provide apriori interoperability between federates. The issue of divergence goes back to SAC and promoting discussion and interchange of issues. This issue also brings to light the issue of whether to allow changes to RPR FOM 1.0 specification during the RPR FOM 2.0 development. Unless the existing specification is broken or an alternative is greatly improved, changes will be discouraged. An alternative is to start the 3.0 effort in parallel.

Initial RPR FOM User List: Taz Devil (diverged), I/ITSEC Desert RATs (STRICOM), HLA Gateway, ASTI, MaK, Motorolla, F-16 DMT (Boeing teamed w/LM), FOAS SE TDP (Future Offense Air Systems SE Tech Demo P), FCTT (Future Command Team Trainer, Royal Navy), CIS (UK)

Actions: Schaffer will investigate the Taz Devil FOM. Rieger is doing work with the Air Force and will investigate also. He should contact Captain Jacques Barber. Wood will collect HLA Gateway user list. Granowetter will collect VR-Link user list. Schaffer will initiate discussion on reflector. Schaffer will promote RPR FOM community.

Wednesday Afternoon

RPR FOM draft 2 version 3 Review Continued

Graham Shanks

See Graham Shanks presentation for additional details.

Aggregate State

Aggregate PDU History

- Introduced: Pre-history (i.e. Pre v0.1.3)
- Removed: v0.8 (assigned reviewers ballot)
- Maps to object (AggregateEntity)

Aggregate Class Mapping

BaseEntity (S)	AggregateEntity (PS)
	EnvironmentalEntity (PS)
	PhysicalEntity (PS)

Aggregate PDU Field	RPR FOM Class::Attribute
Aggregate ID	BaseEntity::EntityIdentifier
Force ID	AggregateEntity::ForceIdentifier *
Aggregate State	AggregateEntity::AggregateState
Aggregate Type	BaseEntity::EntityType
Formation	AggregateEntity::Formation
Aggregate Marking	AggregateEntity::AggregateMarking **
Dimensions	AggregateEntity::Dimensions
Orientation	BaseEntity::Orientation
Center of Mass	BaseEntity::WorldLocation
Velocity	BaseEntity::VelocityVector
No DIS Aggregates	Length field of AggregateEntity::SubAggregateIdentifiers
No DIS Entities	Length of AggregateEntity::EntityIdentifiers
No silent aggregate types	Derived from AggregateEntity::SilentAggregates
No silent entity types	AggregateEntity::NumberOfSilentEntities ***
Aggregate ID List	AggregateEntity::SubAggregateIdentifiers
Entity ID List	AggregateEntity::EntityIdentifiers
Padding	N/A
Silent aggregate system list	BaseEntity::SilentAggregates
Silent entity system list	AggregateEntity::SilentEntities
No variable datum records	AggregateEntity::NumberOfVariableDatums
Variable datum	AggregateEntity::VariableDatums

* Changed from ForceID
** Marking is 31 characters instead of entity marking that is 11
*** Not needed since number can be determined directly from silent entity list

Draft 3 Aggregate Changes
- All "ID" names changed to "Identifier"
- Aggregate Marking Struct added
  - Entity Marking - 11 characters
  - Aggregate Marking - 31 characters
- Silent Entity Struct modified
  - Draft 2 missing appearance records
  - Silent Entity Struct is now variable size so must add number of silent entities attribute
  - Note AppearanceRecord is currently a packed 32-bit record of enumerations

The depiction of appearance fields and size calculation of silent entity list is ambiguous in IEEE 1278.1a document. GRIM should provide explanation that appearance attribute is a variable list from 0 to number of entities of each specific entity type. The fact that each record contains a variable size appearance array requires the count of items in appearance array to e added to the complex data type. Accessing the i^{th} element requires parsing through the (I-1) elements. Number of entities is not needed because this information can be derived from the length field of the EntityIdentifiers.

Actions: Shanks will remove the NumberOfEntities attribute.

IFF Layer 1

IFF History
- Based on proposal by Doug Wood
- Object classes introduced v2.0 D2 (attributes missing - editor's oversight)
- Current proposal does not adequately distinguish between IFF types:
  - e.g. NATO, Soviet and RRB

Discussion: Proposal does not distinguish IFF types, e.g.: NATO vs. Soviet vs. RRB. RRB is British system that was just added in latest enumerations. Soviet IFF is lacking any details in enumeration document. RRB is totally different than NATO. Considering differences among system types, it makes better sense to separate their definition into separate object classes. Two options are shown below.

Object Classes
Option 1

IFF	IFFtransponder	NATOtransponder
		SovietTransponder
		RRBtransponder
	IFFinterrogator	NATOinterrogator
		SovietInterrogator

Option 2

IFF	NATO_IFF	Transponder
		Interrogator
	Soviet_IFF	Transponder
		Interrogator
	RRB	

The second option with the organizational grouping is implemented in d2v3.

IFF PDU Field	RPR FOM Class::Attribute
Emitter Entity ID	EmitterSystem::EntityIdentifier & EmitterSystem::HostObjectIdentifier
Event ID	IFF::EventIdentifier *
Location	EmitterSystem::RelativePosition
SystemID	
System Type	IFF::SystemType
System Name	IFF::SystemName
System Mode	IFF::SystemMode
Change/Options	<TBD>
AlternateParameter4	NATOtransponder::AlternateParameter4
System Status	IFF::SystemIsOperational IFF::SystemIsOn
	NATO::Mode1Enabled NATO::Mode2Enabled etc.
	Soviet::P1Enabled Soviet::P2Enabled etc.

* Changed from EventID

IFF v2.0 Draft 3 Changes

- Attribute name changes
  - Mode 3 renamed Mode 3A
  - Mode 5 renamed Mode C
  - Mode 6 renamed Mode S
- Add EventIdentifier attribute to IFF object
- Combine code digits into single code value
- Mode C Altitude units are flight levels (100 feet)

Discussion: A lot of discussion focused on definition of modes and codes. NATO is mode based with modes 1 & 2 military, 3/A civil, 4 uses cyrpto-based challenge response. Mode 5 is not in NATO (Katz indicated that it is proposed) and is really only C. Mode C includes altitude report. RRB has only 1 mode. Change/Options in PDU indicated PDU contains changed data. This mechanism is redundant in HLA since only changes are sent. The exception being provideAttributeValueUpdate, but those should be infrequent enough to tolerate the additional processing.

Actions: Shanks will write up rational for GRIM on why "use alt mode 4" bits in change/option is redundant and not needed in FOM. Shanks will change units of altitude from 1 to 100 with accuracy of 1. Shanks will look at UseAltMode5 attribute and change sense of name so that it can be assumed false and it is only sent when the alt mode 5 value is to be used.

Underwater Acoustics

Underwater Acoustics History

- Introduced: V2.0 Draft 2
- Based on a proposal from Sean Reilly

Underwater Acoustic PDU Field	RPR FOM Class::Attribute
Emitter Entity ID	EmitterSystem::EntityIdentifier & EmitterSystem::HostObjectIdentifier
Event ID	UnderwaterAcousticsEmission::EventIdentifier * EmitterBeam::EventIdentifier
State/Change Update	Not required
PassiveParameterIndex	PropulsionNoise::PassiveParameterIndex
Propulsion Plant Configuration	PropulsionNoise::PropulsionPlantConfiguration
Number of shafts	*
Shaft Data Current RPM Ordered RPM RPM rate of change	*
Number of Additional Passive Parameters	N/A
Acoustics Name	ActiveSonar::SystemName
Function	ActiveSonar::FunctionCode
Acoustics ID	ActiveSonar::AcousticsIdentifier
Beam Data Length	N/A
Beam ID	ActiveSonarBeam::AcousticsBeamIdentifier
Active Emission Parameter Index	EmitterBeam::BeamParameterIndex
Scan pattern	ActiveSonarBeam::ScanPattern
Beam center azimuth	EmitterBeam::BeamAzimuthCenter
Azimuth beamwidth	*
Beam center D/E	EmitterBeam::BeamElevationCenter
D/E Beamwidth	*

Underwater Acoustics Changes

- Added event identifier attribute to Underwater Acoustics Emission class
- Moved Database Identifier attribute from Underwater Acoustics Emission class to Propulsion Noise class
  - Renamed PassiveParameterIndex

Underwater Acoustics Problems

- Only one shaft supported
- Usage of Acoustics Transient interaction
- Addition of azimuth & D/E beamwidths

Discussion: Three things represented in underwater acoustics: propulsion noise, additional passive activities (transients), and active sonar. Use of both interactions and objects for transients is problematic but it was determined that both were necessary. Having acoustic beams under emitter beam causes a problem for declaration management and there are many attributes of emitter beam that do not apply to acoustic. In order to avoid changes to 1.0 and since there is no real purpose in common subscription, the acoustic beams will be moved up to a base class. Original proposal was changed to allow multiple shafts as can be represented in PDU.

Actions: Shanks and Reilly will write up rational for GRIM on how and when acoustic transients should be sent as objects or interactions. Shanks will combine PropulsionNoise's CurrentShaftRate, OrderedShaftRate, and ShaftChangeRate attributes into single complex type and replace them with a single attribute ShaftData as an array of this data type. Shanks will move ActiveSonarBeam to base class level with additional attributes that were inherited from EmitterBeam.

Thursday Morning

Review of AggregateEntity for Rieger brings up issue that entities would have to be deaggregated in order to determine their individual positions.

Minefield

Doug Wood

Minefield Object Class Mapping

DIS PDU	RPR FOM Object Class
Minefield State	MinefieldData

Minefield Interaction Class Mapping

DIS PDU	RPR FOM Interaction Class
Minefield Data	MinefieldData
Minefield Query	MinefieldQuery
Minefield Response NACK	MinefieldResponseNACK

Minefield State PDU Fields	Minefield Object Class Attributes
Minefield ID	MinefieldID
Minefield Sequence Number	MinefieldSequenceNumber
Force ID	ForceID
Minefield Type	MineTypes
Number of Mine Types	N/A
Minefield Location	MinefieldLocation
Minefield Orientation	MinefieldOrientation
Appearance	MinefieldAppearanceType
Protocol Mode	ProtocolMode
Perimeter Point Coordinates	PerimeterPointCoordinates
Mine Type	MineTypes

Minefield Response NACK PDU Fields	MinefieldResponseNACK Interaction Class Parameters
Minefield ID	MinefieldID
Requesting Entity ID	RequestingEntityID
Request ID	RequestID
Number of Missing PDU(s)	
Missing PDU Sequence Number(s)	MissingRecordNumbers

Minefield Data PDU Fields	**MinefieldData Interaction Class Parameters**
Minefield ID	MinefieldID
Requesting Entity ID	RequestingEntityID
Minefield Sequence Number	MinefieldSequenceNumber
Request ID	RequestID
PDU Sequence Number	RecordSequenceNumber
Number of PDUs	NumberOfRecords
Number of Mines in this PDU (n)	N/A
Number of Sensor Types (m)	N/A
Data Filter	N/A
Mine Type	MineType
Sensor Types	SensorTypes
Mine Location	MineLocation
Ground Burial Depth Offset	GroundBurialDepthOffset
Water Burial Depth Offset	WaterBurialDepthOffset
Snow Burial Depth Offset	SnowBurialDepthOffset
Mine Orientation	MineOrientation
Thermal Contrast	ThermalContrast
Reflectance	Reflectance
Mine Emplacement Time	MineEmplacementTime
Mine Entity ID	MineEntityID
Fusing	Fusing
Scalar Detection Coefficient	ScalarDetectionCoefficient
Paint Scheme	PaintScheme
Number of Trip/Detonation Wires	NumberTripDetonationWires
Number of Vertices	NumberWireVertices
Vertex	WireVertices

Minefield Query PDU Fields	**MinefieldQuery Interaction Class Parameters**
Minefield ID	MinefieldID
Requesting Entity ID	RequestingEntityID
Request ID	RequestID
Number of Perimeter Points	N/A
Number of Sensors Types	N/A
Data Filter	QueryGroundBurialDepthOffset
	QueryWaterBurialDepthOffset
	QuerySnowBurialDepthOffset
	QueryMineOrientation
	QueryThermalContrast
	QueryReflectance
	QueryMineEmplacementAge
	QueryTripDetonationWire
	QueryFusing
	QueryScalarDetectionCoefficient
	QueryPaintScheme
Requested Mine Type	RequestedMineType
Requested Perimeter Point Coordinates	PerimeterPoints
Sensor Types	SensorTypes

Keith Briggs has an alternate proposal that relies on adding a request-able object service to HLA Interface Specification. It is unclear whether the changes to the HLA Interface Specification will be made.

SequenceNumber attribute is used indicate a change in the minefield data. In DIS, it is used to filter processing of minefield data that has been previously received. In HLA, only changed data is transmitted for normal updates. Updates resulting from request/provide could be discarded using a SequenceNumber. Consensus is that additional processing as a result of request/provide is nominal overhead. SequenceNumber should be removed. Wood will investigate any other uses for sequence number.

Minefield has two protocol modes, a heartbeat mode and a query response mode (QRP). In heartbeat mode the minefield state and minefield data are issued on a periodic basis. In QRP mode, only minefield state data is transmitted. The minefield query and knack are used to provide a query mechanism for minefield data. It was suggested that it should be possible to move the MinefieldData parameters into the Minefield as attributes. The HLA request/provide mechanism could be used to perform the query response protocol. However, the MinefieldData describes data for a particular mine type within a minefield. The separate MinefieldQuery, MinefieldData, and MinefieldNack interactions are needed to provide the exchange of information based on mine type as supported in DIS. An alternative implementation could implement minefields as individual objects (too many for land mines) or mine types.

Environment Process

Graham Shanks

Environmental Process PDU

- Introduced: pre-history
- Removed v0.3 (interim meeting)
- Included in v2.0 Drafts

Environmental Process PDU Fields	RPR FOM Class::Attribute
Env Process ID	EnvironmentProcess::ProcessIdentifier
Environment Type	EnvironmentProcess::Type
Model Type	EnvironmentProcess::ModelType
Env Status	EnvironmentProcess::EnvironmentProcessActive
Number env records	Encoded in EnvironmentProcess::EnvironmentRecordList (CHECK)
Sequence number	EnvironmentProcess::SequenceNumber
Env record	EnvironmentProcess::EnvironmentRecordData

Aline's Points on Environment Process

- Padding should go before data variant, not after, in EnvironmentRecStruct
- 4 bytes of padding needed after numberOfRecords in EnvironmentRecordList to ensure that it's on a 64 bytes boundary
- Just as a note, the EnvironmentRecVariant's size needs to be a multiple of 64 bits, meaning that all the GeometryData's need to be padded to a valid size.

Actions: Shanks will add octet padding before DataVariant. Shanks will add padding to appropriate DataVariant types. Shanks will add padding after NumberOfRecords.

GriddedData

Graham Shanks

Gridded Data PDU Fields	RPR FOM Class::Attribute
Application ID	GriddedData::GridID *
Field Number	Griddeddata::FieldNumber
PDU Number	N/A
PDU Total	N/A
Coordinate System	GriddedData::CoordinateSystem
Number grid axes	GriddedData::NumberOfGridAxes
Constant grid	GriddedData::ConstantGrid
Env Type	GriddedData::EnvironmentType
Orientation	GriddedData::Orientation
Sample Time	GriddedData::SampleTime
Total Values	GriddedData::TotalValues
Vector Dimensions	GriddedData::VectorDimensions
Grid Axis Description	GriddedData::GridAxisInfo
Grid Data	GriddedData::GridDataInfo

Points raised by Aline Normoyle

- GridValueType0Struct should contain NumberOfBytes as an attribute, not NumberOfValues.
  - *Agreed*
- Scale and Offset in GridValueType1Struct should be Float32's -- as in the GriddedDataPdu
  - *Agreed*
- The byte of padding should go before the values in GridValueType2Struct
  - *Its actually 2 bytes (octets)*
  - *Need 2 bytes before values*
  - *Need 0+ bytes after values*
- Padding for grid value type structs are of limited size
  - *Should we use cardinality 0-2 (for instance)? Rather than 0+*
- The following perhaps should be added to the notes section:
  - The padding in IrregularGridAxisStruct should pad up to an 8 byte boundary
  - The padding in GridValueType0Struct should pad up to a 4 byte boundary
  - The padding in GridValueType1Struct should pad up to a 4 byte boundary

Actions: Shanks will change GridID to GridIdentifier. Shanks will remove FieldNumber, RecordNumber, and RecordTotal. Shanks will alphabetize GriddedData in OMD. Wood will investigate remove SequenceNumber from Minefield to be consistent. Shanks will change name of NumberOfValues to NumberOfBytes in GridValueType0. Shanks will implement scale and offset. Shanks will add padding before values and change cardinality of padding from 2 to 0+ in GridValueType2Struct. Shanks will name byte alignment in variable padding fields (e.g., PaddingTo64 or PaddingTo32) and add notes that indicate padding alignment. Reilly will incorporate padding naming convention into GRIM.

Review of Underwater Acoustics with Reilly

Reilly concurs on the changes to his proposal except he prefers acoustics beams to be subclasses of emitter beams. There are many applications looking at both EM and acoustic data. However, emitter beam would have to change that would result in changes to 1.0. Approach will put acoustic beams in separate base class, but a unified approach should be investigated in the 3.0 effort.

Actions: Reilly will fix lexicon for underwater acoustics, contacting Roy Scrudder for input.

Collision-Elastic

Graham Shanks

Collision-Elastic Attribute Mapping

Collision-Elastic PDU Fields	RPR FOM Class::Attribute
Issuing Entity ID	Collision::IssuingObjectIdentifier
Colliding Entity ID	Collision::CollidingObjectIdentifier
Collision Event ID	Collision::EventIdentifier
Contact Velocity	Collision::IssuingObjectVelocityVector
Mass	Collision::ObjectMass
Location of Impact	Collision::CollisionLocation
Intermediate Result - XX, etc.	CollisionElastic::IntermediateResultXX etc.
Unit Surface Normal	CollisionElastic::UnitSurfaceNormal
Coefficient of Restitution	CollisionElastic::CoefficientOfRestitution

Collision-Elastic Inheritance

- Collision PDU has 8 bit collision type enumeration
- Collision-Elastic PDU does not
- CollisionElastic interaction inherits CollisionType parameter from Collision interaction

The Collision PDU and the RPR FOM Collision interaction define a collision type as elastic or inelastic. With the introduction of Collision-Elastic, the collision with collision type elastic seems redundant (i.e., if it is elastic use the collision-elastic PDU). However, there may be some applications that use the original Collision and not the new Collision-Elastic even for elastic collisions (i.e., still using a simple model). For now, keep collision type parameter and allow collision elastic with basic collision interaction.

Supplemental Emission/Entity State (SEEs)

Graham Shanks

SEES Attribute Mapping

SEES PDU Fields	RPR FOM Class::Attribute
Originating entity ID	BaseEntity::EntityIdentifier
Infrared signature index	PhysicalEntity::InfraredSignatureRepresentationIndex
Acoustics signature index	PhysicalEntity::AcousticSignatureRepresentationIndex
Radar cross-section signature index	PhysicalEntity::RadarCrossSectionSignatureRepresentationIndex
Number propulsion systems	Derived from PhysicalEntity::PropulsionSystemsData array
Number Vectoring nozzle systems	Derived from PhysicalEntity::VectoringNozzleSystemData array
Propulsion system data	PhysicalEntity::PropulsionSystemsData *
Vectoring nozzle system data	PhysicalEntity::VectoringNozzleSystemData *

Actions: Shanks will remove "Representation" from attribute names. Must check OMDD names.

Intercom

Graham Shanks

Basic Intercom approach

- Two intercom PDUs
  - Intercom Control
  - Intercom Signal
- Intercom Control maps to the Intercom object
- Intercom Signal maps to the IntercomSignal family of interactions
- Intercom PDUs derived from Radio PDUs
  - RPR FOM implementation similarly derived
- Intercom attributes not typed in draft 3

Intercom Control PDU Fields	RPR FOM Class::Attribute
Control type	Intercom::ControlType
Communications channel type	Intercom:: CommunicationsChannelType
Source entity ID	EmbeddedSystem::EntityIdentifier & EmbeddedSystem::HostObjectIdentifier
Source comms device ID	Missing? Intercom::Intercom::IntercomIndex
Source line ID	Intercom::SourceLineIndex
Transmit priority	Intercom::TransmitPriority
Transmit line state	intercom::TransmitLineState
Command	Intercom::Command
Master entity ID	Intercom::MasterEntity
Master comms device ID	Missing? Intercom::MasterIntercomIndex?
Master Channel ID	Intercom::MasterChannelIndex
Intercom parameter length	Intercom:: IntercomParametersLength ????
Intercom parameters	Intercom:: IntercomParameters

Intercom Signal Mapping

IntercomSignal	ApplicationSpecificIntercomSignal
	DatabaseIndexIntercomSignal
	EncodedAudioIntercomSignal
	RawBinaryIntercomSignal

Intercom Signal Parameter Mapping

Intercom Signal PDU Fields	RPR FOM Class::Attribute
Entity ID	IntercomSignal::OriginatingEntity
Comms device ID	IntercomSignal::HostIntercomIndex
Encoding scheme	Maps to individual interaction type
TDL Type	Signal Type dependent
Sample type	Signal Type dependent
Data length	Signal Type dependent
Samples	Signal Type dependent
Data	Signal Type dependent

Intercom could support LAN lines and exchange of raw binary data. While enumeration document does not specify LAN lines, intercom specification was general enough to allow it.

Intercom control has both state and commands. The commands should be separated into an intercom command interaction. The master attributes (MasterEntity, MasterIntercomIndex, and MasterChannelIndex) establish a unique channel identification and they belong as state data.

DIS defines similar but separate PDUs for Intercom and Radio. RPR FOM will likewise have similar but separate specification for Intercom. Putting Intercom together with Radio would alter RPR FOM 1.0 Radio specification. Intercom and Radio do have differences. Intercom and Radio signals should be separate to support declaration management filtering. There would be no guarantee that radio and intercom signals could be distinguish. Even transmitter identifier could be overloaded (i.e., a single entity could have a radio 1 and an intercom 1).

Actions: Shanks will specify intercom command interaction with command attributes from intercom control (ControlType, Command, IntercomParameters, and IntercomParametersLength). Monson will write up Intercom rational for GRIM. Shanks will change MasterChannelIndex to MasterChannelIdentifier. Monson will check intercom parameters to see if some types belong with intercom object versus command interaction. Shanks will move IntercomSignal parameters down to duplicate them in each subclass (similar to RadioSignal).

Synthetic Environment Point-Linear-Areal

Doug Wood

SE Point-Linear-Areal Object Classes

EnvironmentObject (S)	PointObject (S)	StructureObject (PS)
		BreachablePointObject (PS)
		BurstPointObject (PS)
		CraterObject (PS)
		OtherPointObject (PS)
		RibbonBridgeObject (PS)
	LinearObject (S)	BreachableLinearObject (PS)
		ExhaustSmokeObject (PS)
		MinefieldLaneMarkerObject (PS)
		BreachObject (PS)
		OtherLinearObject (PS
	ArealObject (S)	OtherArealObject (PS)
		MinefieldObject (PS)

Point Object State	Attribute	Object Class
Object ID	ObjectID	EnvironmentObject
Referenced Object id	ReferencedObjectID	EnvironmentObject
Update Number	UpdateNumber	EnvironmentObject
Force ID	ForceID	EnvironmentObject
Modifications	Modification	PointObject
Object Type	ObjectType	EnvironmentObject
Object Location	Location	PointObject
Object Orientation	Orientation	PointObject
Object Appearance	PercentComplete	PointObject
Object Appearance	DamageAppearance	PointObject
Object Appearance	ObjectPreDistributed	PointObject
Object Appearance	Deactivated	PointObject
Object Appearance	Smoking	PointObject
Object Appearance	BreachedAppearance	BreachablePointObject
Object Appearance	PercentOpacity	BurstPointObject
Object Appearance	CylinderSize	BurstPointObject
Object Appearance	CylinderHeight	BurstPointObject
Object Appearance	NumberOfBursts	BurstPointObject
Object Appearance	ChemicalContent	BurstPointObject
Object Appearance	CraterSize	CraterObject
Object Appearance	NumberOfSegments	RibbonBridgeObject
Requestor ID	RequestorID	EnvironmentObject
Receiving ID	ReceivingID	EnvironmentObject

Linear Object State	Attribute	Object Class
Object ID	ObjectID	EnvironmentObject
Referenced Object id	ReferencedObjectID	EnvironmentObject
Update Number	UpdateNumber	EnvironmentObject
Force ID	ForceID	EnvironmentObject
Number of Segments	N/A	N/A
Requestor ID	RequestorID	EnvironmentObject
Receiving ID	ReceivingID	EnvironmentObject
Object Type	ObjectType	EnvironmentObject
Linear Segment Parameters	SegmentRecords	LinearObject

Areal Object State	Attribute	Object Class
Object ID	ObjectID	EnvironmentObject
Referenced Object id	ReferencedObjectID	EnvironmentObject
Update Number	UpdateNumber	EnvironmentObject
Force ID	ForceID	EnvironmentObject
Modifications	Modification	ArealObject
Object Type	ObjectType	EnvironmentObject
Object Appearance	PercentComplete	ArealObject
Object Appearance	DamageAppearance	ArealObject
Object Appearance	ObjectPreDistributed	ArealObject
Object Appearance	Deactivated	ArealObject
Object Appearance	Smoking	ArealObject
Object Appearance	Flaming	ArealObject
Number of Points	N/A	N/A
Requestor ID	RequestorID	EnvironmentObject
Receiving ID	ReceivingID	EnvironmentObject
Object Location	PointsData	ArealObject

Modification attribute is redundant in context of HLA. Sending an attribute (or not) is sufficient notice of its modification.

Requestor and Receiving ID are used for SE server type architecture. They do not apply to object state. The server architecture could be implemented in HLA using Ownership Management. However there are latency, implementation, and reliability issues with ownership management. An alternative is too define interactions that perform the DIS query mechanism.

UpdateNumber is not necessary. It is similar to other attributes discussed above that are used to indicate the PDU being sent contains changed data. In HLA, only changes should be sent; no heartbeats. Overhead of processing infrequent cases of provide/request should be negligible.

Actions: Wood will remove RequestorID and ReceivingID from object classes. Wood will define new interaction classes with the same contents of the object classes to be used for communication between SE creator and Master. Wood will remove UpdateNumber from object classes. Wood will work on lexicon.

POC for CCTT (in priority order recommended by Larry Rieger):

POCs (in priority order, recommended by Larry Rieger):
Pat Spangler - Deputy Program Manager
384-3602

Bob White - Consultant to CCTT
384-3627

Jeff Clarke - Engineering Assistant
384-3646

Aggregate State Appearance Records and Silent Entities

The Entity State Appearance field is the a bit packed filed. The appearance has been broken down into individual attributes for entity state specification. The same approach would be awkward for aggregate entities. Approach is to include appearance records and reference DIS approach.

Actions: Shanks will add note to FOM Actions and rational to GRIM to indicate that how pending HLA IF Specification can handle bit encoding. When balloting is finalized and tools are available, this bit encoding should be included in FOM.

RPR FOM 2.0 Schedule

The product development cycle will allow the RPR FOM 2.0 specification to an addendum to the RPR FOM 1.0 product or it can be specified as a completely new product (i.e., all of 1.0 and additional 2.0). As an addendum, the 2.0 specification would be a separate set of documents (GRIM and FOM). There are issues of how well OMT tools merge FOMS and the confusion of having two separate sources for product (look at IEEE 1278.1 and 1278.1a). Consensus at the meeting was to create a new RPR FOM 2.0 product that supercedes RPR FOM 1.0. The RPR FOM 2.0 product will essentially be the RPR FOM 1.0 with the added 1278.1a specification.

The group needs to reestablish the assigned reviewers. The existing reviewers can continue to review the RPR FOM 2.0.

The RPR FOM 2.0 intended to use the HLA 1516 standard, but the 1516 standard is unlikely to be completed before RPR FOM 2.0 could ready for assigned review. Current RPR FOM 2.0 specification relies on HLA 1.3 because of tool support (OMDT and RTI). It is unknown when tools for 1516 will be available. Changes to specification that effect the RPR FOM mainly occur in the OMT and not the Interface Specification (i.e. the data is specified in a new format but it is essentially the same structure being sent over the RTI). The complex data type table has the most change (multiple tables instead of 1). The RPR FOM could drop the convention of putting the size in enumerated types since the new tables will support size specification. The passing through of the timestamp parameter for non time-managed federations will change the RPR FOM convention of passing a character hex representation in the tag parameter. Members of 1516 ballot group need to review changes to standard for impact on RRR FOM. Mixed opinion by group at meeting as to whether to proceed without 1516 or wait for 1516 standard and tool support. For now, assume schedule based on RPR FOM development.

Enough useful specification to put out RPR FOM Version 2 Draft 4 (v2d4) one week following this meeting. This draft will include everything in RPR FOM v2d3 with corrections made at this meeting and the addition of SE Point-Linear-Areal classes. Complete specification of 1278.1a should be doable for RPR FOM v2d5 for review at SIW. Rough draft for GRIM v2d5 should also be doable for SIW review. Some sections may only be placeholders.

At some point, the RPR FOM 2.0 draft needs to be reviewed against OMDD.

Schaffer offers to host Interim meeting in June at LIMS in Boston.

Actions: Shanks publish RPR FOM v2d4 on RPR FOM reflector (02/04/00). Schaffer contact RPR FOM 1.0 assigned reviewers. Schaffer contact Bob Lutz (OMDT for 1516). 1516 ballot members review 1516 changes for impact on RPR FOM. Shanks publish RPR FOM v2d5 on RPR FOM reflector (03/20/00).Actions: Reilly publish GRIM v2d5 on reflector (03/20/00). Schaffer will contact OMDD folks for review of RPR FOM.

RPR FOM 2.0 Development Schedule:

02/04/00	RPR FOM v2d4 - Update of v2d3 based on decisions of this meeting
03/10/00	GRIM input due to Reilly
03/20/00	RPR FOM v2d5 - Complete draft specification of 12781.a
03/20/00	GRIM v2d5 - Draft rationale or placeholders for complete 12781.a
03/29/00	Review RPR FOM and GRIM v2d5 at SIW
06/xx/00	RPR FOM Interim Meeting
06/30/00	Submit RPR FOM v2dx to assigned reviewers