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Standard For Distributed Interactive Simulation Fidelity Description Requirements : Draft

University of Central Florida Institute for Simulation and Training

INSTITUTE FOR SIMULATION AND TRAINING

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STANDARD FOR DISTRIBUTED INTERACTIVE SIMULATION FIDELITY DESCRIPTION REQUIREMENTS

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Standard for Distributed Interactive Simulation-- Fidelity Description Requirements

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Fidelity Description Requirements
For
Distributed Interactive Simulations

1. Scope

This standard defines a method to describe the fidelity of DIS-compliant simulators, simulations, and models (SS&M) for potential DIS Users. Using this method, SS&M can be interconnected to provide real-time simulation applications with the level of fidelity appropriate for supporting the specific application objective. This standard does not prescribe any minimum level of fidelity for SS&M to participate in DIS applications; the User must make this decision based upon the specific application. To support this decision process, this standard provides a *fidelity characteristics taxonomy* which permits a User to assess which SS&M are appropriate candidates for a given application. An example of this decision process is shown in Figure 1

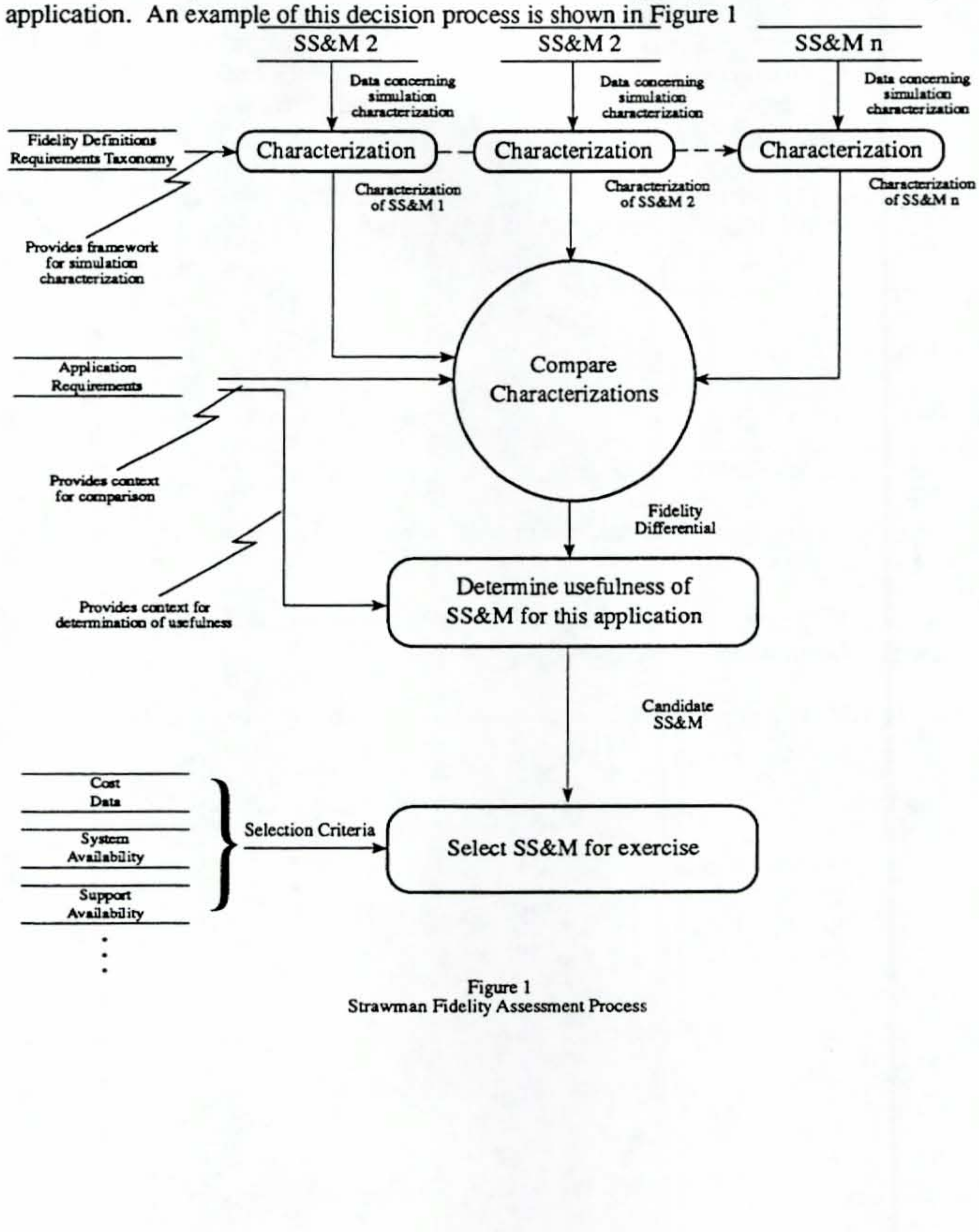

Figure 1
Strawman Fidelity Assessment Process

2. Definitions

2.1 Fidelity-The similarity, both physical and functional, between the simulation and that which it simulates.[1]

2.2 Fidelity Characteristic -The attributes that describe the capabilities and limitations of SS&M.

2.3 Accuracy -[2] The quality of freedom from mistake or error, that is of conformity to truth or a rule.

2.4 Precision-The quality of being exactly or sharply defined or stated. A measure of the precision of a representation is the number of distinguishable alternatives from which it was selected. In a narrow sense, precision is indicated by the number of significant digits, while in a broader sense, it can be indicated by the number of real world features included in a given model or simulation.

2.5 Resolution - [2] The degree to which nearly equal values of a quantity can be discriminated, e.g.. for displays, it is measure of ability to delineate picture detail.

2.6 Entity- (be consistent with DIS lexicon)

2.7 Measurement - (use IEEE definition)

2.8 Site - To be Supplied

2.9 Host - (be consistent with DIS lexicon)

2.10 Entity Domain -A group of capabilities of the simulation entity that may affect the fidelity of a DIS exercise.

2.11 Environment Domain- A group of capabilities of the synthetic environment which may affect the fidelity of a DIS exercise

2.12 Site Domain -A group of capabilities of the site which may affect the fidelity of a DIS exercise

2.13 Host Domain - A group of capabilities of the host which may affect the fidelity of a DIS exercise

2.14 Taxonomy -To be supplied

2.15 PDU - (use DIS lexicon)

3. Taxonomy

The Fidelity characteristics taxonomy shall comply with all requirements of Section 4. The taxonomy is organized in the following hierarchy.

a. DIS Resource: A combination of hardware and software components that can be connected to and interoperate within a DIS application.

a.b Fidelity Domain: A group of related capabilities of a DIS resource that may affect the fidelity of a DIS application.

a.b.c. Capability: A property that describes a type of action that a DIS resource can perform or represent.

a.b.c.d. Implementation: The means by which a capability is realized.

a.b.c.d.e. Characteristic: A distinctive quality of an implementation or characteristic.

a.b.c.d.e.f. Descriptor: A measurable feature of one or more characteristics, including units and definition of measurement.

The taxonomy is developed according to a set of criteria. This criteria serves to arbitrate whether or not a particular element belongs in the taxonomy and to help bound the problem. Specifically, the objectives of a rule set are as follows:

- Rules must define what is included (and excluded) from the taxonomy,
- Rules must be applicable at all levels of the taxonomy,
- The rules must provide a context for the taxonomy (note that sections 1 through 3 provide some context for the taxonomy),
- Rules must define exit criteria for developing taxonomy, and
- Rules must define bounding criteria for taxonomy.

To these ends, the following rules were established.

Rule 1- Each element of the taxonomy must address an aspect of SS&M fidelity which may affect entity interactions in a DIS network. Interactions are described as the ability to shoot, move, communicate, and sense.

Rule 2 - Descriptors must be measurable in objective terms.

Rule 3- The elements of the taxonomy must be decomposed until rule 1 no longer applies, i.e. until the characteristic or descriptor no longer has a meaningful effect on DIS entity interaction.

Rule 4 - The taxonomy is bounded by DIS representations described in the PDU standard, (version 2.0.4), the CADIS standard (version 2.0), the ECFR standard (version 1.0) , and a TDB version of the Draft VV&A standard.

4. Resource Description

Each DIS resource shall be described in terms of the following taxonomy. Section 4 is broken into four sections one, for each of the fidelity domains defined in figure 2.

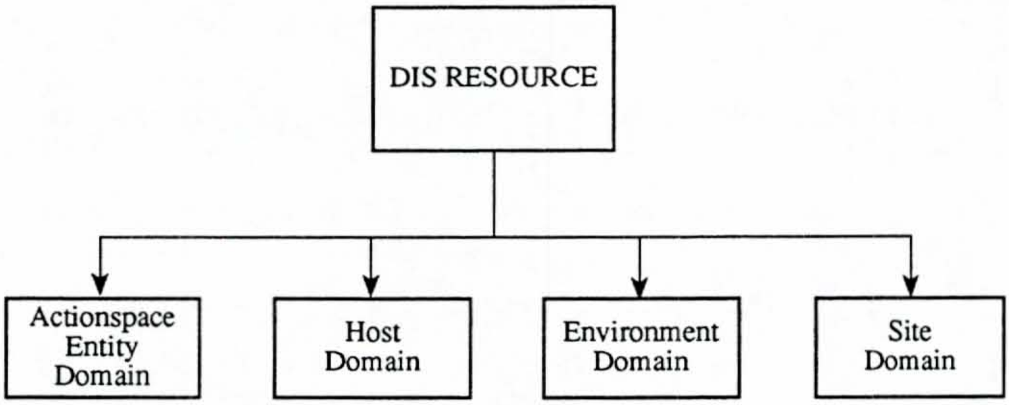

Figure 2
Top and Second Level of Taxonomy

4.1 Action Space Entity

This fidelity domain describes the degree to which a particular DIS resource represents an actual real world system. The action space entity shall be described in terms of the following capabilities.

First level: DIS Resource -
This part of the taxonomy defines each of the entities an asset can represent on a DIS network via PDUs.

Second level: Fidelity domain - 4.X
(actionspace entities)
-Entity type

Third Level: Capability - 4.X.X
Capabilities which may be apart of a given entity. For example, communication is a characteristic of an action space entity.

Fourth Level: Implementation - 4.X.X.X
The means by which a capability is accomplished by the entity. For example, communication may be implemented with a UHF radio and with an LF radio.

Fifth Level: Characteristic - 4.X.X.X.X
A particular attribute of an implementation which may affect interaction between DIS entities. For example, Frequency is an important characteristic of UHF radios. Although two radios may both be UHF, they can only interoperate if they both broadcast and receive the same frequencies.

Sixth Level: Descriptor - 4.X.X.X.X.X
the basic yardstick for measuring fidelity
- Definition
- Source
- Rational

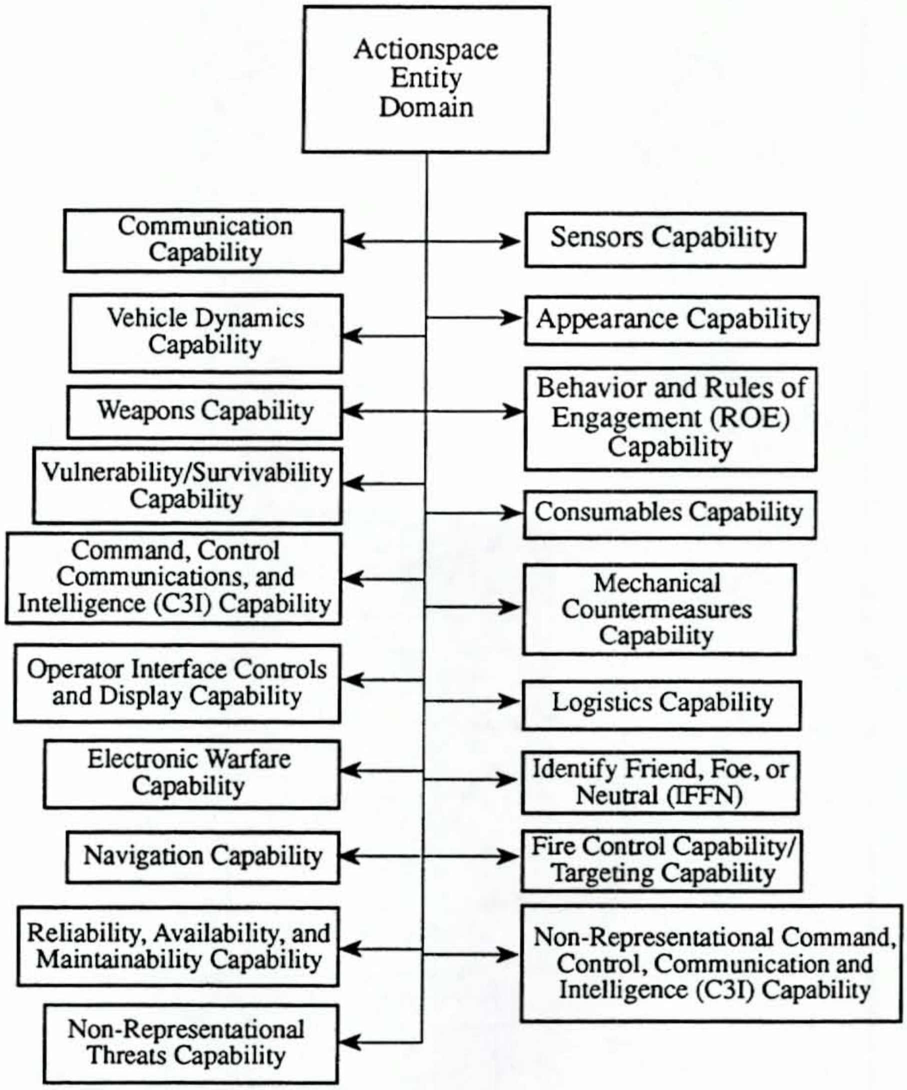

Figure 3
Action Space Entity Capability

Actionspace Entity Fidelity Domain

Definition: The Actionspace participant specific set of unique system and subsystem capabilities, e.g. an F-16C which is comprised of numerous subsystems.

Source: FDR Subgroup

Rational: Each Actionspace entity in a DIS synthetic environment replicates some identifiable real world system. The top level of the Actionspace entity fidelity domain is organized by these participants, in that the goal of the selecting DIS capable assets is to place these entities in a synthetic environment.

Entities are the basic components of a DIS exercise and are represented by a unique stream of Entity State PDUs. Figure 3 contains the potential capabilities of each actionspace entity.

4.1.1 Communications

Communications implementation characteristics are shown in Figure 4.

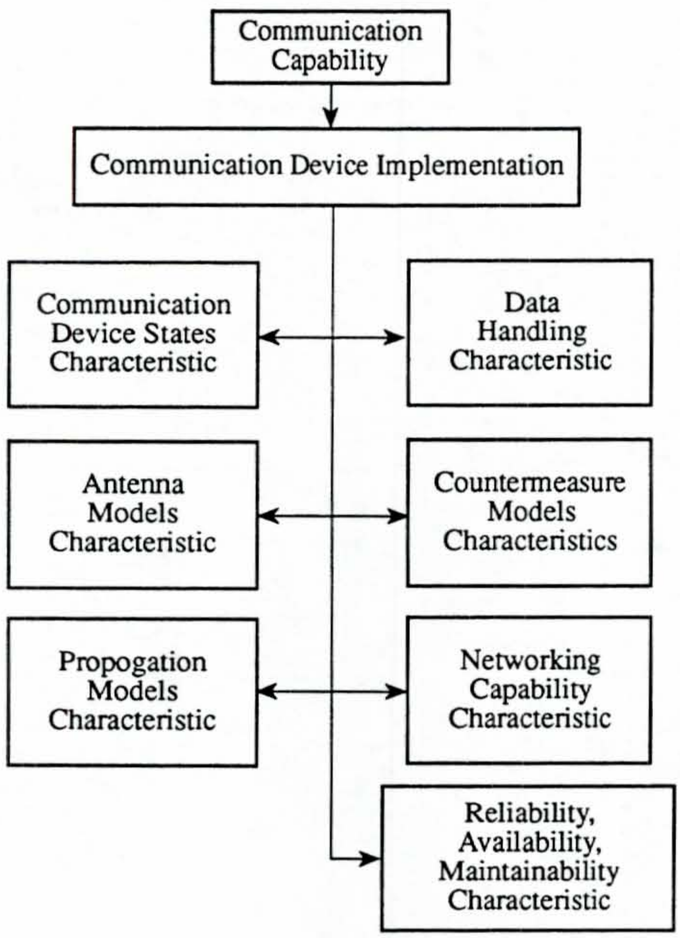

Figure 4
Communication Characteristics

4.1.1.1 Communication Implementations

Device type

Definition: Communication device(s) incorporated in the entity. Each device must have the rest of this section filled out individually. Device name and model are specific or generic type, such as radio, fax, landline, acoustic.

Rational: People putting together a DIS exercise may be looking for a specific device type to support their needs.

4.1.1.1.1 Device State

Definition: Different operational states modeled for the device, such as on. off, standby, modes of operation. The device state descriptors are shown in Figure 5.

Rational: Different modes of operation may be important for the device to play realistically in the synthetic environment.

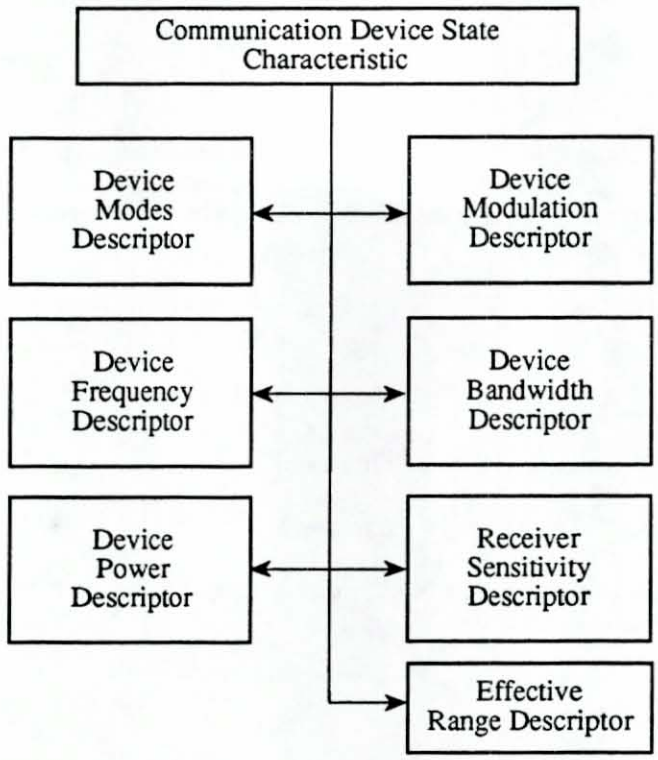

Figure 5
Device State Descriptors

4.1.1.1.1.1 Device Modes

Definition: This descriptor is a list of distinct operating modes available in the device simulation or model. Since modes are either included or not, issues such as precision and accuracy are not applicable

Source: Model/Simulation creator

Rational: Available modes of operation may be important

4.1.1.1.1.2 Device Modulation

Definition: If the device uses electromagnetic or acoustic waves to propagate emissions, which modulation types are modeled. This may be a function of device mode. If so, separate Device Modulation descriptors are required for each mode.

Source: 2.0.4 PDU Standard

Rational: The correct modulation model may be critical to other entities ability to interact with the device.

4.1.1.1.1.3 Device Frequency

Source: DIS 2.0.4 Standard

Definition: If the device uses electromagnetic or acoustic waves to propagate emissions, what frequency (or frequencies) are modeled. This may be a function of device mode. If so, separate Device Frequency descriptors are required in the case that multiple frequencies are used, such as spread spectrum techniques.

Rational: Frequencies are of particular interest to communications simulation

4.1.1.1.1.4 Device bandwidth

Definition: What is the bandwidth associated with each frequency in Hertz.

Source: 2.0.4 PDU Standard. A zero implies a fixed frequency.

Rational: The correct spread of frequencies may be critical to other entities ability to interact with the device.

4.1.1.1.1.5 Device Power

Definition: What transmit power is modeled by the device. This may be a function of device mode. If so, separate Device Power descriptors are required for each mode. Power is measure as Effective Radiated Power (ERP) as defined in section 5.3.22(3) of the PDU standard

Source: 2.0.4 PDU Standard

Rational: DIS expects each participant to model the effects of radiated energy from other participants. An ERP is important to support this function.

4.1.1.1.1.6 Receiver Sensitivity

Definition: How is the minimum discernible signal determined. There are several different approaches to this from a modeling standpoint. There can be a minimum power associated with the device, minimum signal to noise, minimum signal to jam, or other methods. List the factors which impact the entity's sensitivity model. Note that propagation and antenna models are addressed below.

Source: Device Model Developer

Rational: Necessary to determine boundaries of system performance

4.1.1.1.2 Antenna models

Description: Is the device's antenna or antennae modeled. Figure 6 contains the Antenna model descriptors.

Rational: A physical model of the antenna's location relative to the entity and it's beam pattern may well be crucial to exercise fidelity.

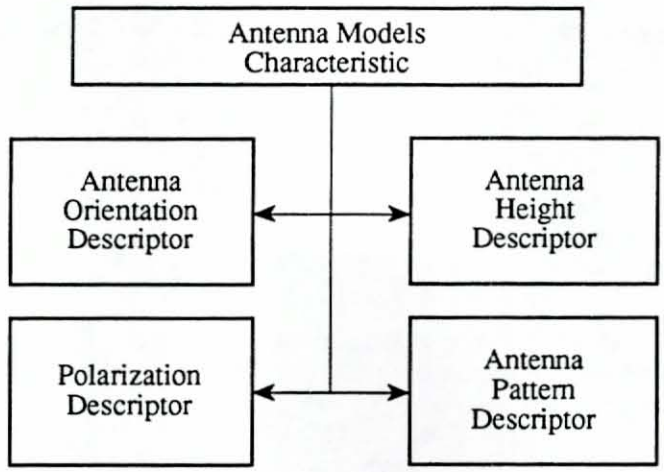

Figure 6
Antennal Model Descriptors

4.1.1.1.2.1 Antenna Orientation

Definition: Many antennae are trainable in space. Does the model include antenna orientation. Omni-directional antenna have no particular orientation.

Source: FDR Subgroup

Rational: Antenna orientation is crucial to modeling some antenna.

4.1.1.1.2.2 Antenna location

Definition: The displacement of the antenna from the location of the associated entity. A zero indicates the antenna and entity are co-located.

Source: FDR Subgroup

Rational: Radar Horizon is significantly affected by antenna height.

4.1.1.1.2.3 Polarization

Definition:

Source: FDR Subgroup

Rational:

4.1.1.1.2.4 Antenna Pattern model

Definition: What antenna pattern model is used. This descriptor can only be represented by a description of the antenna model. The description must address main antenna beam gain, and how antenna gain in varied throughout the antenna pattern. In this sense, this is a qualitative descriptor, and the judgment of adequacy is on the shoulders of the potential users.

Source: Device Model Developers

Rational: How antenna performance is modeled throughout the antenna pattern is elemental to fully modeling the antenna.

4.1.1.1.3 Propagation Model

Definition: Are the factors which affect signal propagation included in this device model, or does an interface to incorporate external propagation data exist. The descriptors for propagation models are contained in figure 7.

Rational: The inclusion of propagation effects in whatever medium is employed by the communications device has significant impact on communication device performance.

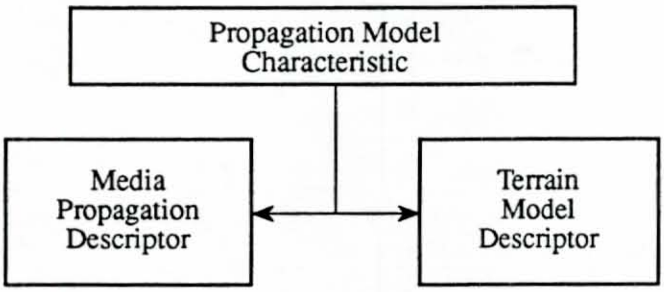

Figure 7
Propogation Model Descriptors

4.1.1.1.3.1 Media Propagation

Definition: What is the propagation model used, ranging from a simple range squared model to a full weather model for all frequency bands of interest with upper atmosphere properties included. Localized effects such as ducting should also be listed and described. Note that references to portion of the taxonomy which describes environmental modeling is allowable, providing there is a consistent description of all those models which are included in the simulation of this particular device.

Source: Device Model Developer

Rational: The real world is loaded with environmental phenomena which effect communication device performance.

4.1.1.1.3.2 Terrain model

Definition: What is the terrain model used, ranging from a simple flat earth with computed radar horizon model to a full terrain model including occulting, clutter, back scattering, diffraction, and multipath. Note that references to the portion of the taxonomy which describes environmental modeling is allowable, providing there is a consistent description of all those models which are included in the simulation of this particular device.

Source: Device Model Developer

Rational: The real world is loaded with terrain phenomena which effect communication device performance.

4.1.1.1.4 Data Handling modeled

Definition: Are communication data processing and handling included Figure 8 contains the data handling characteristic descriptors.

Rational: Data manipulation may be part of communication devices. Whether or not models of this in included may be important.

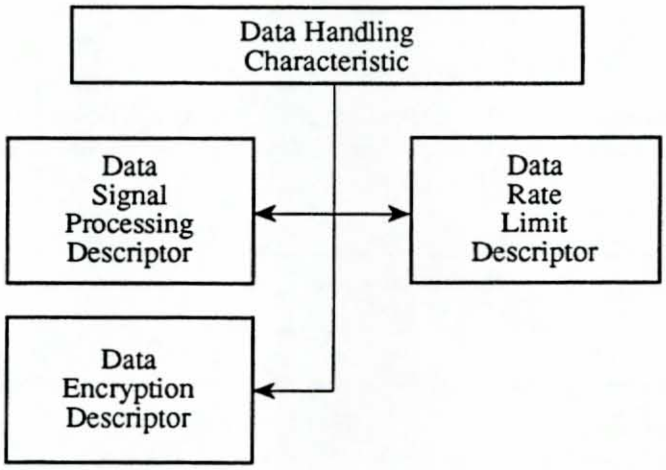

Figure 8
Data Handling Descriptors

4.1.1.1.4.1 Data Signal Processing

Definition: Is data signal processing modeled, and if so, provide a brief description for each type of processing. Examples include such user controllable features as a squelch knob to data compression to data multiplexing in a network environment. This descriptor is quantitative in nature.

Source: Device Model Developers

Rational: DSP can significantly alter range capabilities, and even if there is no explicit ECCM modes on the communication device, some types of DSP are inherently more resistant to ECM. These features may be important.

4.1.1.1.4.2 Data Rate Limit

Definition: What is the maximum rate at which data are handled by the simulation or model.

Source: FDR Subgroup

Rational: Imposing realistic limits on how fast data can be moved may be important.

4.1.1.1.4.3 Data encryption modeled

Definition: Does the model include data encryption/decryption, and if so, what methods are used.

Source: FDR Subgroup

Rational: Coded message handling is part of the real world

4.1.1.1.5 Countermeasures

Definition: Are external countermeasures (CM) modeled and are internal counter-countermeasures (CCM) models available to reduce susceptibility. Figure 9 contains the CM/CCM descriptors

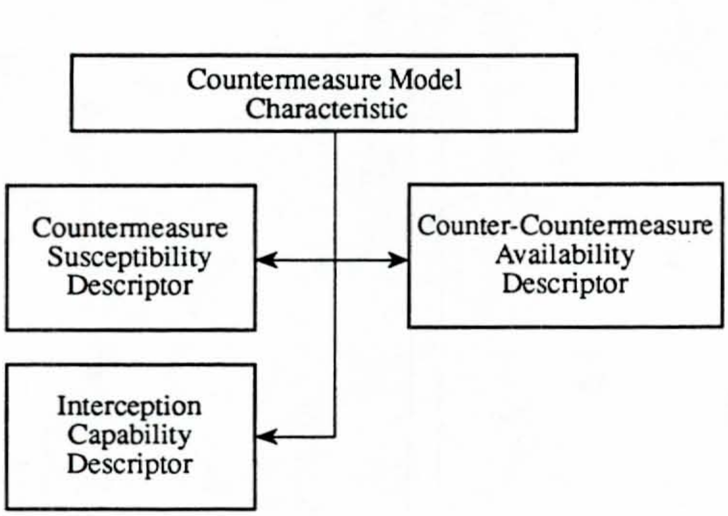

Figure 9
Countermeasure Descriptors

4.1.1.1.5.1 Countermeasure susceptibility

Definition: What type of countermeasures is this device model susceptible to. The descriptor is a list of countermeasures and how the susceptibility to them is modeled.

Source: Device Model Developers

Rational: The real world is rarely a clean electromagnetic environment and attacking communication resources is an essential tactic used to disrupt opposing forces.

4.1.1.1.5.2 Counter-countermeasures available

Definition: What types of CCM is modeled for this device. The descriptor is a list of CCM techniques modeled and a brief description of how they are modeled.

Source: Device Model Developer

Rational: There are probably as many CCM techniques as there are communication devices and any may be important to exercise fidelity.

4.1.1.1.5.3 Interception capability

Definition: Does the device model allow for interception of their message traffic or is it capable of intercepting other systems message traffic

Source: Device Model Developers

Rational: Real world scenarios may well depend on interception of radio traffic.

4.1.1.1.6 Networking capability

Definition: Does the model have a means of being incorporated into a network of other communication devices. Figure 10 contains the networking characteristic descriptors.

Rational: Many communication devices are part of a bigger network which supports an overall C3I structure. How the network is put together and is managed impacts how information is propagated throughout an exercise, and thus may have a bearing on exercise outcome.

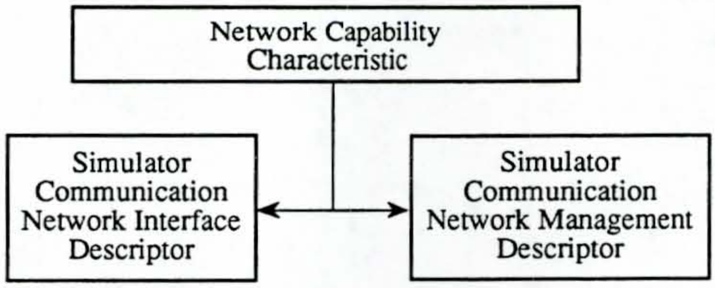

Figure 10
Network Capability Descriptors

4.1.1.1.6.1 Simulator Communication Network Interface

Definition: What network interface is supported by the model of the device. Can it be supported by the DIS PDU concept?

Source: Device Model Developer

4.1.1.1.6.2 Simulator Communication Network Management

Definition: Does the model of the device in the context of its networking capabilities support network management. If so, a list of management functions supported is required.

Source: Device Model Developer

Rational: If there is a capability to build a network of comm devices to support a DIS exercise, than the network will require management functions to be performed in real time.

4.1.1.1.7 Reliability, Maintainability, Survivability

Definition: Are the various -ilities modeled. Figure 11 contains the descriptors.

Rational: Devices break, need maintenance, and are damaged in the real world. Events relating to this may well affect exercise outcomes.

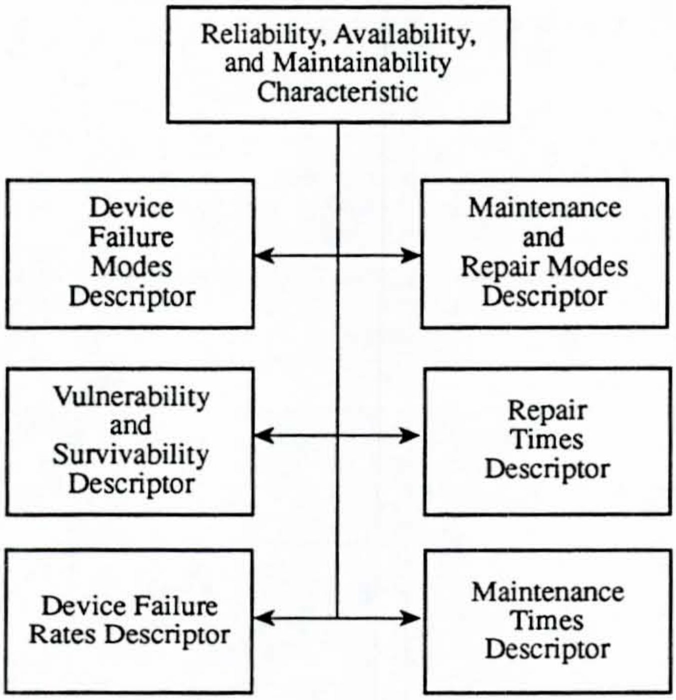

Figure 11
Reliability, Availability, Maintainability Descriptors

4.1.1.1.7.1 Device failure modes

Definition: There are numerous ways in which a communications device fails. What types of failures are modeled and what is the effect of the failure on device performance.

Source: Device model developer

Rational: What type of failures are modeled may affect exercise.

4.1.1.1.7.2 Device Maintenance and repair modes

Definition: Given a device can be modeled to fail, can it also be fixed, and is maintenance part of the equation.

Source: Device model developer

Rational: How M and R are modeled may affect exercise validity, particularly if the device is allowed to fail.

4.1.1.1.7.3 Device vulnerability and survivability models.

Definition: Does the device sustain battle damage and to what extent is performance degraded.

Source: Device model developer

Rational: How V and S are modeled may affect exercise validity, particularly if the device is allowed to fail during the exercise.

4.1.1.1.7.4 Device Failure Rates

Definition Mean time between failure (MTBF) for each failure mode, or a discussion of what triggers failures.

Source: FDR Subgroup

Rational: Failure rates and the degree to which they can be controlled may be important.

4.1.1.1.7.5 Repair Times

Definition: Simulation time required to effect repair of device, or a discussion of what triggers repair.

Source: FDR Subgroup

Rational: When things get fixed has a bearing of entity actions.

4.1.1.1.7.6 Maintenance Times

Definition: Simulation time required to perform maintenance, or a discussion of how maintenance is performed.

Source: FDR Subgroup

Rational: Effect entity behavior.

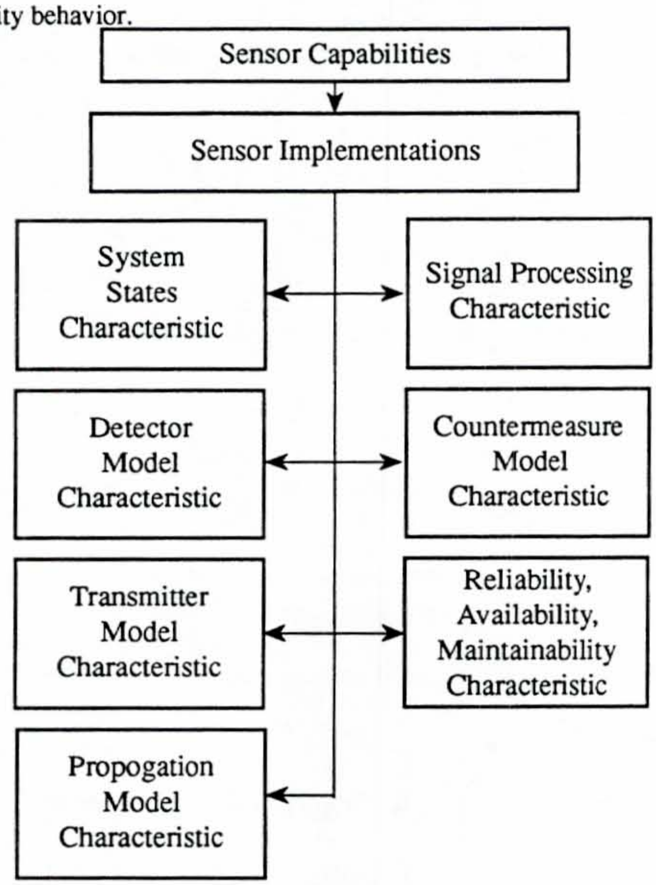

Figure 12
Sensor Characteristics

4.1.2 Sensors

4.1.2.1 Sensor Implementations

Each sensor type modeled as part of an actionspace entity is defined as described below. Figure 12 contains the implementation characteristics for sensor models.

System type

Definition: What sensor system(s) are incorporated in the entity. Each system must have the rest of this section filled out individually

Rational: People putting together a DIS exercise may be looking for a specific system type to support their needs.

4.1.2.1.1 System state modeled

Definition: Different operational states modeled for the system, such as on. off, standby, other .modes of operation

Rational: Different modes of operation may be important for the system to play realistically in the synthetic environment. Figure 13 contains the system state descriptors.

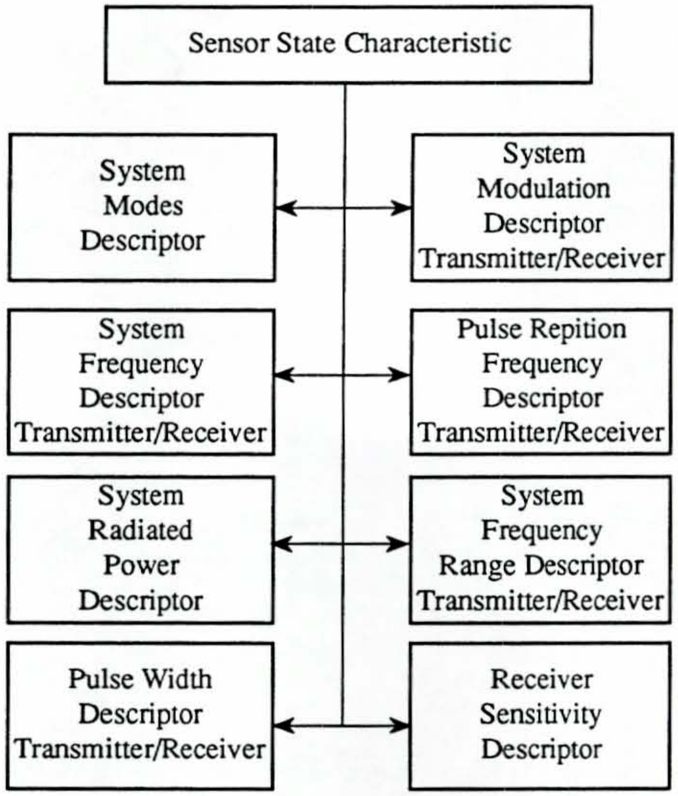

Figure 13
Sensor State Descriptors

4.1.2.1.1.1 System Modes

Definition: This descriptor is a list of distinct operating modes available in the system simulation or model. Since modes are either included or not, issues such as precision and accuracy are not applicable.

Source: Model/Simulation creator

Rational: Available modes of operation may be important

4.1.2.1.1.2 System Modulation - Transmitter

Definition: If the transmitter uses electromagnetic or acoustic wave propagation, which modulation models are used. This may be a function of system mode. If so, separate system Modulation descriptors are required for each mode.

Source: 2.0.4 PDU Standard

Rational: The correct modulation model may be critical to other entities ability to interact with the system.

4.1.2.1.1.3 System Modulation - Detector

Definition: If the detector uses electromagnetic or acoustic wave propagation, which modulation models are used. This may be a function of system mode. If so, separate system Modulation descriptors are required for each mode.

Source: 2.0.4 PDU Standard

Rational: The correct modulation model may be critical to other entities ability to interact with the system.

4.1.2.1.1.4 System Frequency-transmitter

Definition: If the transmitter uses electromagnetic or acoustic waves to propagate emissions, what frequency band(s) are used. This may be a function of system mode. If so, separate transmitter Frequency descriptors are required for each mode. In the case that multiple frequencies are used, such as spread spectrum techniques, a brief description of how frequencies are modeled is required.

Source: 2.0.4 PDU Standard

Rational: The correct frequencies may be critical to other entities ability to interact with the system.

4.1.2.1.1.5 System Frequency - Detector

Definition: If the detector useselectromagnetic or acoustic waves to propagate emissions, what frequency band(s) are used. This may be a function of system mode. If so, separate detector Frequency descriptors are required for each mode. In the case that multiple frequencies are used, such as spread spectrum techniques, a brief description of how frequencies are modeled is required.

Source: 2.0.4 PDU Standard

Rational: The correct frequencies may be critical to other entities ability to interact with the system.

4.1.2.1.1.6 System Frequency Range - Transmitter

Definition: What is the bandwidth associated with each transmitter frequency.

Source: 2.0.4 PDU Standard. A zero implies a fixed frequency.

Rational: The correct spread of frequencies may be critical to other entities ability to interact with the system.

4.1.2.1.1.7 System Frequency Range - Detector

Definition: What is the bandwidth associated with each detector frequency.

Source: 2.0.4 PDU Standard. A zero implies a fixed frequency.

Rational: The correct spread of frequencies may be critical to other entities ability to interact with the system.

4.1.2.1.1.8 System Radiated Power - Transmitter

Definition: What transmit power is modeled by the system. This may be a function of system mode. If so, separate system Power descriptors are required for each mode. Power is measure as Effective Radiated Power (ERP) as defined in section 5.3.22(3) of the PDU standard.

Source: 2.0.4 PDU Standard

Rational: DIS expects each participant to model the effects of radiated energy from other participants. An ERP is important to support this function.

4.1.2.1.1.9 Receiver Sensitivity - Detector

Definition: How is the minimum discernible signal determined. There are several different approaches to this from a modeling standpoint. There can be a minimum power associated with the system, minimum signal to noise, minimum signal to jam, or other methods. List the factors which impact the entity's sensitivity model. Note that propagation and antenna models are addressed below. Also note that minimum discernible signal may well be a function of mode, for example, a s/n ratio is required to track is generally different than to acquire.

Source: System Model Developer

Rational: Necessary to determine boundaries of system performance in some applications.

4.1.2.1.1.10 Pulse Repetition Frequency - Transmitter

Definition: PRF modeled for transmitter as a function of system mode.

Source: 2.0.4 PDU Standard

Rational: PRF required by Emission PDU and may be important in modeling transmitter effect on other entities

4.1.2.1.1.11 Pulse Repetition Frequency - Detector

Definition: PRF modeled by receiver as a function of system mode.

Source: 2.0.4 PDU Standard

Rational: PRF provided by Emission PDU and may be important in modeling signal processing by entity.

4.1.2.1.1.12 Pulse Width - Transmitter

Definition Pulse width modeled for transmitter as a function of system mode.

Source: 2.0.4 PDU Standard

Rational: Pulse width required by Emission PDU and may be important for modeling transmitter effect on other entities.

4.1.2.1.1.13 Pulse Width - Detector

Definition: Pulse width modeled by receiver as a function of system mode.

Source: 2.0.4 PDU Standard

Rational: Pulse width proided by Emission PDU and may be important in modeling signal processing by entity.

4.1.2.1.2 Detector models

Description: Is the system's antenna or antennae modeled. Figure 14 contains the antenna model descriptors.

Rational: A physical model of the antenna's location relative to the entity and it beam pattern may well be crucial to exercise fidelity.

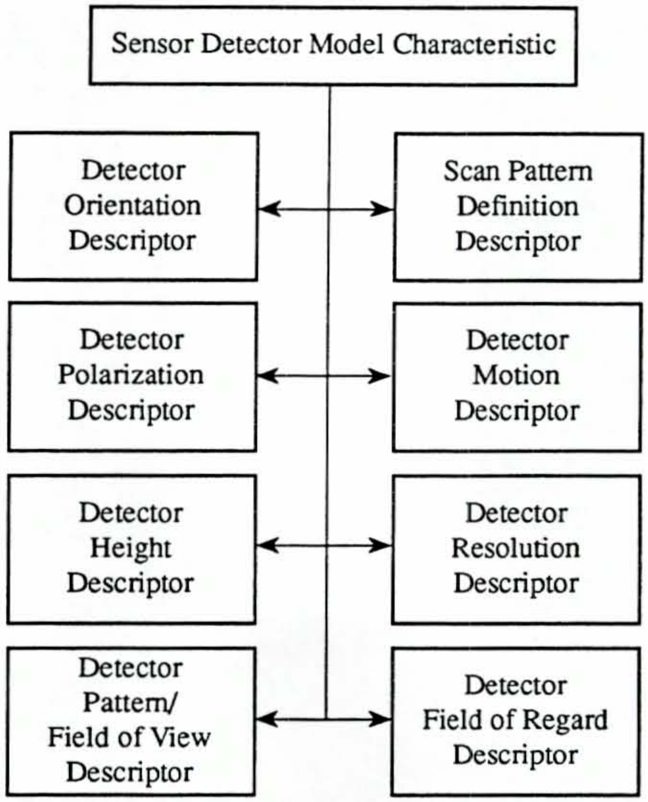

Figure 14
Sensor Antenna Descriptors

4.1.2.1.2.1 Detector Orientation

Definition: Many antennae are trainable in space. Does the model include antenna orientation. Omni-directional antenna have no particular orientation.

Source: FDR Subgroup

Rational: Antenna orientation is crucial to modeling some antenna

4.1.2.1.2.2 Detector Height

Definition: The vertical displacement of the antenna from the location of the associated entity. A zero indicates the antenna and entity are co-located.

Source: FDR Subgroup

Rational: Radar Horizon is significantly affected by antenna height.

4.1.2.1.2.3 Detector Resolution

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.2.4 Detector Field of Regard

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.2.5 Detector Polarization

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.2.6 Detector Pattern model/Field of view

Definition: What antenna pattern model is used. The description must address main antenna beam gain, and how antenna gain in varied throughout the antenna pattern. In this sense, this is a qualitative descriptor, and the judgment of adequacy is on the shoulders of the potential users.

Source: System Model Developers

Rational: How antenna performance is modeled throughout the antenna pattern is elemental to fully modeling the antenna.

4.1.2.1.2.7 Detector Motion Model

Definition: Is the scan patterned model supported by a model of antenna motion. In particular, are the antenna motion fields of the version 2.0.4 Emission PDU supported.

Source: Version 2.0.4 PDU Standard

Rational: Antenna motion are a part of antenna behavior in the real world.

4.1.2.1.2.8 Scan pattern definition

Definition: What patterns are available. Some sensors have only one pattern, such as a rotating dish, while others, particularly Airborne Intercept radars, have sets of pre-defined patterns which the operator orients in space.

Source: System Model developer

Rational: Selecting the appropriate pattern for a sensor may have significant impact on human interaction in a DIS exercise.

4.1.2.1.3 Transmitter models

Description: Is the system's antenna or antennae modeled. Figure 14 contains the antenna model descriptors.

Rational: A physical model of the antenna's location relative to the entity and it beam pattern may well be crucial to exercise fidelity.

4.1.2.1.3.1 Transmitter Orientation

Definition: Many antennae are trainable in space. Does the model include antenna orientation. Omni-directional antenna have no particular orientation.

Source: FDR Subgroup

Rational: ntenna orientation is crucial to modeling some antenna

4.1.2.1.3.2 Transmitter Height

Definition: The vertical displacement of the antenna from the location of the associated entity. A zero indicates the antenna and entity are co-located.

Source: FDR Subgroup

Rational: Radar Horizon is significantly affected by antenna height.

4.1.2.1.3.3 Transmitter Resolution

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.3.4 Transmitter Field of Regard

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.3.5 Transmitter Polarization

Definition:

Source: FDR Subgroup

Rational: .

4.1.2.1.3.6 Transmitter Pattern model/Field of view

Definition: What antenna pattern model is used. The description must address main antenna beam gain, and how antenna gain in varied throughout the antenna pattern. In this sense, this is a qualitative descriptor, and the judgment of adequacy is on the shoulders of the potential users.

Source: System Model Developers

Rational: How antenna performance is modeled throughout the antenna pattern is elemental to fully modeling the antenna.

4.1.2.1.3.7 Transmitter Motion Model

Definition: Is the scan patterned model supported by a model of transmitter motion. In particular, are the antenna motion fields of the version 2.0.4 Emission PDU supported.

Source: Version 2.0.4 PDU Standard

Rational: Antenna motion are a part of antenna behavior in the real world.

4.1.2.1.3.8 Scan pattern definition

Definition: What patterns are available. Some sensors have only one pattern, such as a rotating dish, while others, particularly Airborne Intercept radars, have sets of pre-defined patterns which the operator orients in space.

Source: System Model developer

Rational: Selecting the appropriate pattern for a sensor may have significant impact on human interaction in a DIS exercise.

4.1.2.1.4 Propagation Model

Definition: Are the factors which affect signal propagation included in this system model, or does an interface to incorporate external propagation data exist. Figure 15 contains the propagation model descriptors

Rational: The inclusion of propagation effects in whatever medium is employed by the sensor system has significant impact on system performance.

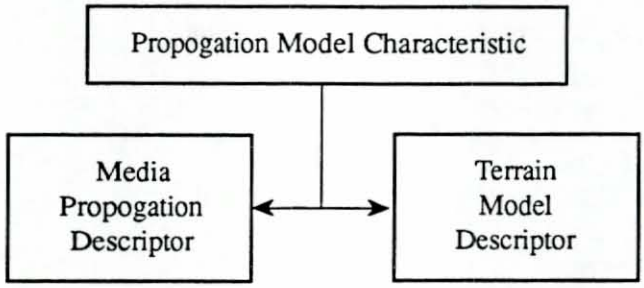

Figure 15
Propogation Model Descriptors

4.1.2.1.4.1 Media Propagation model

Definition: What is the propagation model used, ranging from a simple range squared model to a full weather model for all frequency bands of interest with upper atmosphere properties included. Localized effects such as ducting should also be listed and described. Note that references to the portion of the taxonomy which describes environmental modeling is allowable, providing there is a consistent description of all those models which are included in the simulation of this particular system.

Source: Sytem Model Developer

Rational: The real world is loaded with environmental phenomena which effect communication system performance.

4.1.2.1.4.2 Terrain model

Definition: What is the terrain model used, ranging from a simple flat earth with computed radar horizon model to a full terrain model including occulting, clutter, back scattering, diffraction, and multipath. Note that references to the portion of the taxonomy which describes environmental modeling is allowable, providing there is a consistent description of all those models which are included in the simulation of this particular system.

Source: System Model Developer

Rational: The real world is loaded with terrain phenomena which effect communication system performance.

4.1.2.1.5 Data Handling modeled

Definition: Is sensor data processing and handling included in the sensor modeled. Figure 16 contains the Data Handling descriptors.

Rational: Data manipulation may be part of sensor system design. Whether or not models of this in included may be important.

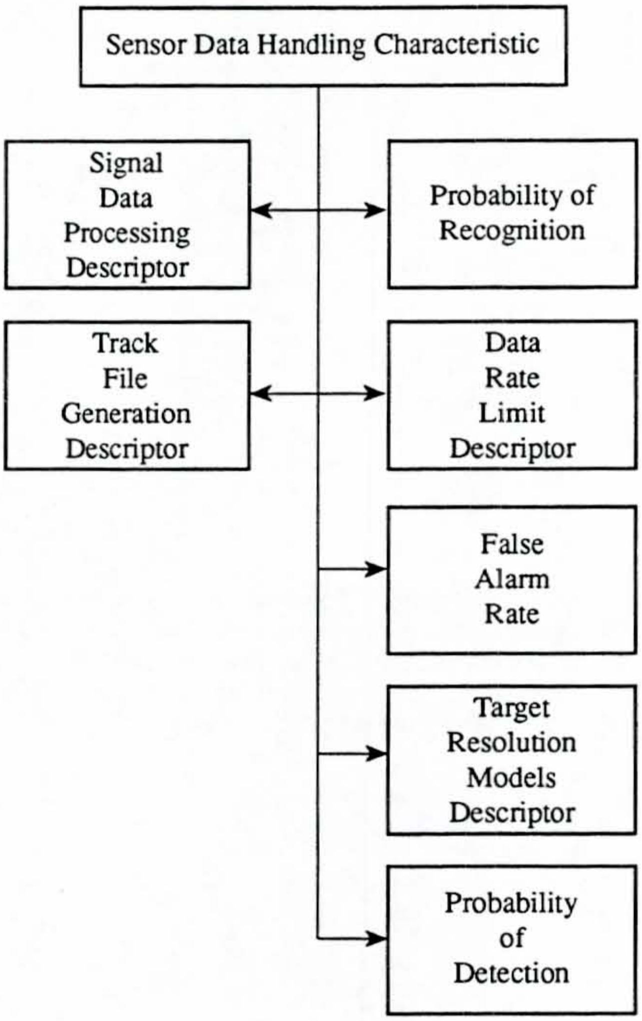

Figure 16
Data Handling Descriptors

4.1.2.1.5.1 Signal Data Processing

Definition: Is signal data processing modeled, and if so, provide a brief description for each type of processing.

Source: System Model Developers

Rational: DSP can significantly alter system performance, and even if there is no explicit ECCM modes on the sensor system, some types of DSP are inherently more resistant to ECM. These features may be important.

4.1.2.1.5.2 Track File Generation

Definition: Are track files generated and made available to the rest of the entity model, or the world at large. If so, what format to they have, what filtering is performed on them, and how often are they updated.

Source: System Model Developers

Rational: May be important in modeling entity situation awareness.

4.1.2.1.5.3 Target Resolution Modeled

Definition: Is there a target resolution model. That is, are all targets detected and reported individually or are there minimum thresholds which must be exceeded in order to resolve individual targets.

Source: FDR Subgroup

Rational: Target resolution has an impact on situation awareness.

4.1.2.1.5.4 Data Rate Limit

Definition: What is the maximum rate at which data are handled by the simulation or model.

Source: FDR Subgroup

Rational: Imposing realistic limits on how fast data can be moved may be important.

4.1.2.1.5.5 False Alarm Rate

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.5.6 Probability of Recognition

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.5.7 Probability of Detection

Definition:

Source: FDR Subgroup

Rational:

4.1.2.1.6 Countermeasures Modeled

Definition: Are external countermeasures (CM) modeled and are internal counter-countermeasures (CCM) models available to reduce susceptibility. Figure 17 contains the Countermeasure descriptors.

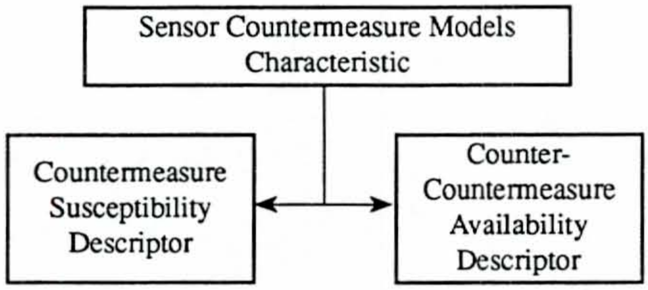

Figure 17
Countermeasure Descriptors

4.1.2.1.6.1 Countermeasure susceptibility

Definition: What type of countermeasures is this device model susceptible to. The descriptor is a list of countermeasures and how the susceptibility to them is modeled.

Source: Device Model Developers

Rational: The real world is rarely a clean electromagnetic environment and attacking situation awareness resources is an essential tactic used to disrupt opposing forces.

4.1.2.1.6.2 Counter-countermeasures available

Definition: What types of CCM is modeled for this device. The descriptor is a list of CCM techniques modeled and a brief description of how they are modeled.

Source: Device Model Developer

Rational: There are probably as many CCM techniques as there are countermeasures. How the game between them is played may be important to exercise fidelity.

4.1.2.1.7 Reliability, Maintainability, Survivability

Definition: Are the various -ilities modeled. The descriptors for RAM are contained in figure 18.

Rational: Sensors break, need maintenance, and are damaged in the real world. Events relating to this may well affect exercise outcomes.

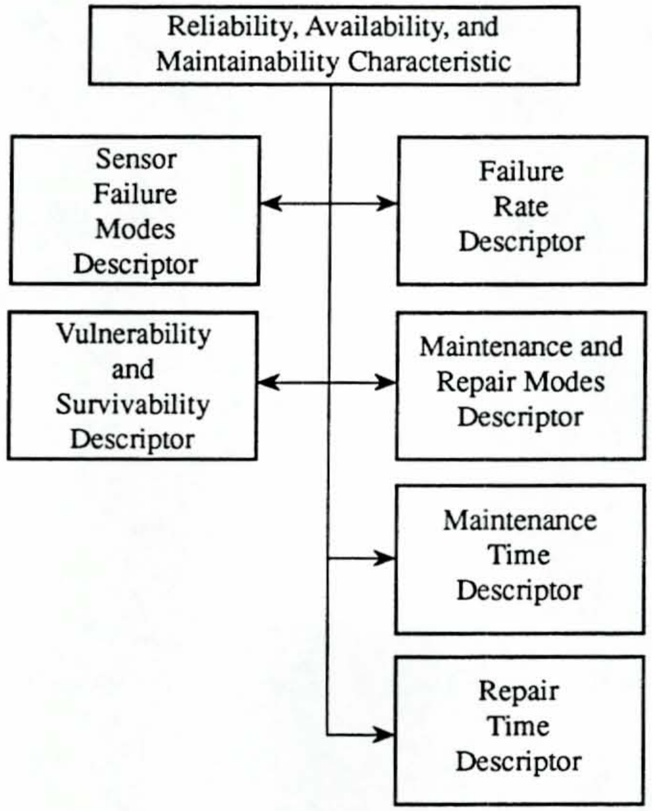

Figure 18
Reliability, Availability and Maintainability
Descriptors

4.1.2.1.7.1 Sensor failure modes

Definition: There are numerous ways in which a sensor system fails. What types of failures are modeled and what is the effect of system performance.

Source: Device model developer

Rational: What type of failures are modeled may affect exercise validity.

4.1.2.1.7.2 System Maintenance and repair modes

Definition: Given a sensor can be modeled to fail, can it also be fixed, and is maintenance part of the equation.

Source: System model developer

Rational: How M and R are modeled may affect exercise validity, particularly if the sensor is allowed to fail during the exercise.

4.1.2.1.7.3 Sensor vulnerability and survivability models.

Definition: Does the sensor sustain battle damage and to what extent is performance degraded.

Source: Sensor model developer

Rational: How V and S are modeled may affect exercise validity, particularly if the device is allowed to fail during the exercise.

4.1.2.1.7.4 Failure Rate

Definition Mean time between failure (MTBF) for each failure mode, or a discussion of what triggers failures.

Source: FDR Subgroup

Rational: Failure rates and the degree to which they can be controlled may be important.

4.1.2.1.7.5 Maintenance Time

Definition: Simulation time required to effect repair of device, or a discussion of what triggers repair.

Source: FDR Subgroup

Rational: When things get fixed has a bearing of entity actions.

4.1.2.1.7.6 Repair Time

Definition: Simulation time required to perform maintenance, or a discussion of how maintenance is performed.

Source: FDR Subgroup

Rational: Effect entity behavior.

4.1.3 Vehicle Dynamics

4.1.3.1 Vehicle Dynamics Implementations

Definition: What movement system(s) are incorporated in the entity, such as point-mass constant movement between scripted waypoints. If a generic type is selected, a brief description of the model must be included. Vehicle Dynamics Characteristics are contained in figure 19

Rational: People putting together a DIS exercise may be looking for a specific system movement model to support their needs.

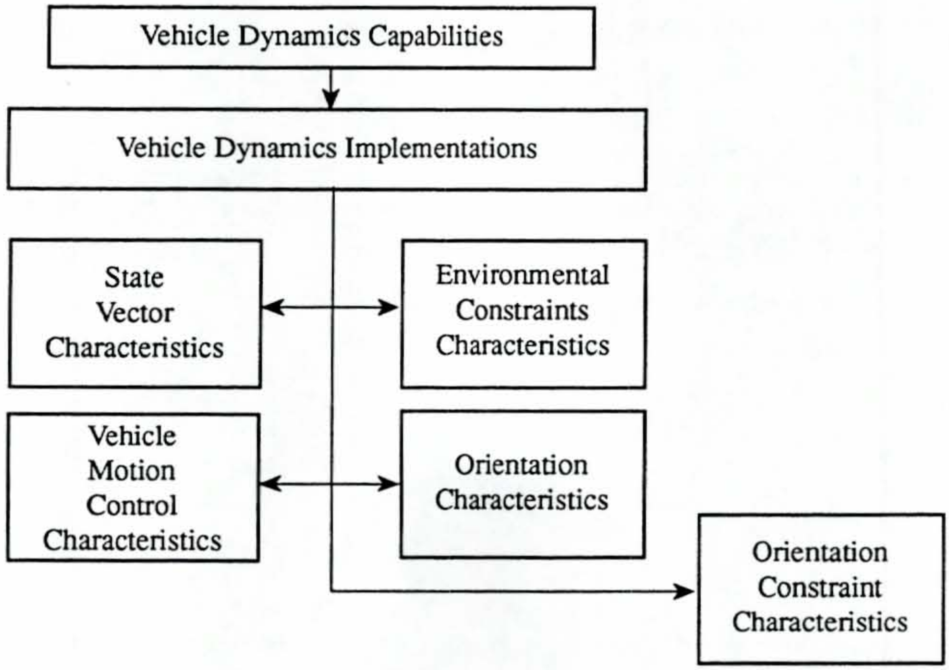

Figure 19
Vehicle Dynamics Characteristics

4.1.3.1.1 State Vector Characteristics

Definition: What state vectors are modeled to support entity Motion models, e.g. position, velocity, acceleration. With each vector modeled, provide a brief description of model type, e.g. degrees of freedom, open or closed loop model, factors considered. State Vector descriptors are contained in Figure 20.

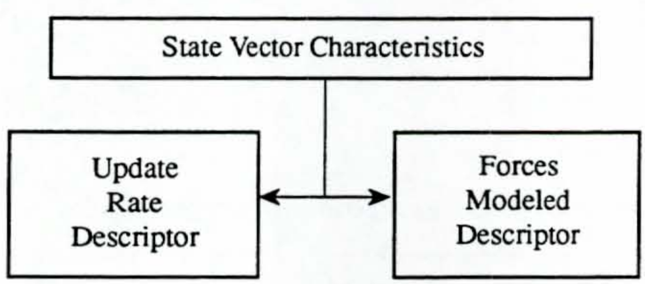

Figure 20
State Vector Descriptors

4.1.3.1.1.1 Update rate

Definition: How frequently are new values for state vectors computed. Each state vector identified in 4.1.3.1.1 is required to have an update rate associated with it.

Source: FDR Subgroup

Rational: This describes the granularity of entity motion dynamics.

4.1.3.1.1.2 Forces modeled

Definition: What forces are modeled to act on the entity. Forces are the elemental factors in creating entity motion (forces includes torques) and a list of what forces are modeled and a brief description of each should be provided.

Rational: This provides insight to how accurately entity motion is modeled.

4.1.3.1.1.3 Position

4.1.3.1.1.4 Orientation

4.1.3.1.1.5 State Vectors Modeled

4.1.3.1.1.6 Orientation of Entity modeled

Definition: Is the angular orientation of the entity and its articulated parts modeled. Orientation descriptors are contained in Figure 21.

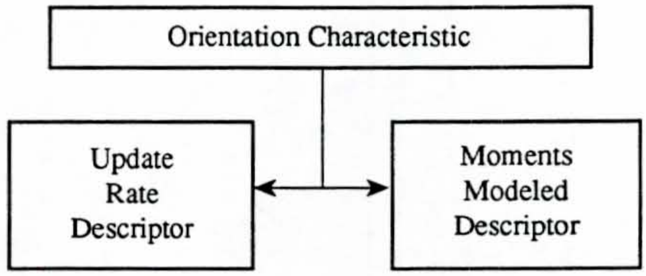

Figure 21
Orientation Descriptors

4.1.3.1.2 Environmental Constraints

Definition: Are environmental constraints to entity motion modeled. Figure 22 contains environmental descriptors

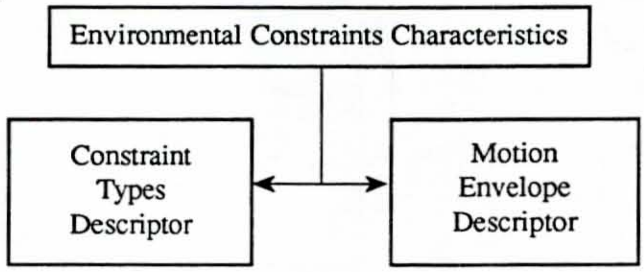

Figure 22
Environmental Constraint Descriptors

4.1.3.1.2.1 Vehicle Constraint Types

Definition: List of constraints and a brief description of how they affect entity motion. Specific constraints of interest are: Collisions with other entities and/or terrain features, types of weather, currents, sea state, terrain tractability, terrain traversal.

Source: FDR Subgroup

Rational: The environment around an entity affects its ability to move.

4.1.3.1.2.2 Motion Envelope

Definition: What is the envelope of values for each of the state vectors identified in 4.1.3.1.1. list upper and lower limits, along with units of measure for each.

Source: Entity Model Developer

Rational: Likely to limit where an entity can turn up within a synthetic environment.

4.1.3.1.2.3 Maximum Altitude

41.3.1.2.4 Minimum Altitude

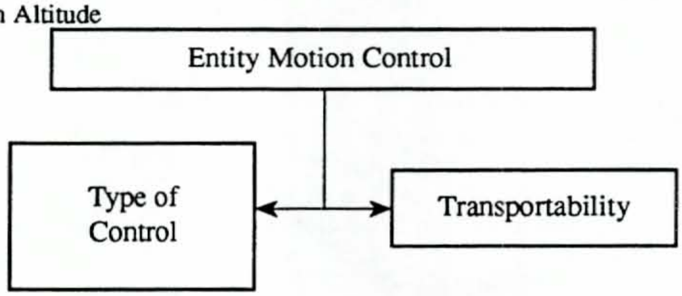

Figure 23
Motion Control Descriptors

4.1.3.1.2.5 Orientation Characteristics

Definition: What angle and angular rates are modeled to support entity orientation models, e.g. heading, heading rate, heading acceleration. With each set of angular data modeled, provide a brief description of model type, e.g. rotational or trim (steady state) dynamics.

4.1.3.1.2.6 Update rate

Definition: How frequently are new values for angles and rates computed. Each set of data identified in 4.1.3.1.2.5 is required to have an update rate associated with it.

Source: FDR Subgroup

Rational: This describes the granularity of entity orientation dynamics.

4.1.3.1.2.7 Moments modeled

Definition: What moments are modeled to act on the entity. Moments are the elemental factors in creating entity angular dynamics and a list of what is included in moment calculations and a brief description of each should be provided.

Rational: This provides insight to how accurately entity orientation is modeled.

4.1.3.1.2.8 Orientation Constraints Modeled

Definition: Are environmental or physical constraints to entity orientation modeled. Figure 24 contains the constraint descriptors.

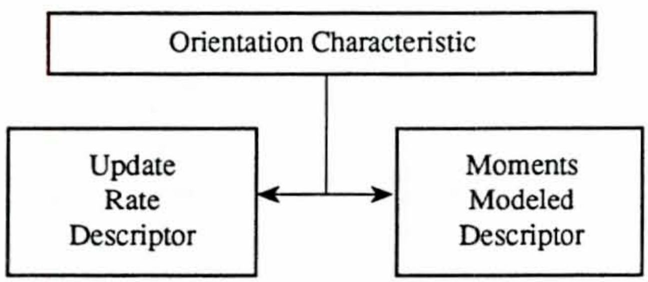

Figure 24
Orientation Descriptors

4.1.3.1.3 Type of Motion Control

Definition: Entity Motion may be implemented numerous ways. Is motion scripted, with a capability to edit scripts in real time. Is there a set of controls which duplicate motion controls on the entity itself, such as stick, throttle, rudders. List the motion controls and briefly describe which state vector they affect and how.

Source: Entity model developer

Rational: May be important to how entity operates in the synthetic environment.

4.1.3.1.3.1 Transportability

Definition: The ability of an entity to be transported by another entity, or to transport another entity (e.g. sling load)

Source: FDR Subgroup

Rational: Not sure about this one. Maybe there are models which can both move and be transported. If that's the case, this is not the best descriptor.

4.1.3.1.3.2 Constraints Types

Definition: List of constraints and a brief description of how they affect entity orientation. Specific constraints of interest are system limits and model limits.

Source: FDR Subgroup

Rational: Orientation limits may be important.

4.1.3.1.3.3 Angle and Angular Rate Envelope

Definition: What is the envelope of values for each of the angles and rates identified in 4.1.4.1.1.1. List upper and lower limits, along with units of measure for each.

Source: Entity Model Developer

Rational: Likely to limit how an entity can appear within a synthetic environment.

4.1.4 Appearance

4.1.4.1 Appearance Implementations

Figure 25 contains the characteristics of appearance implementations.

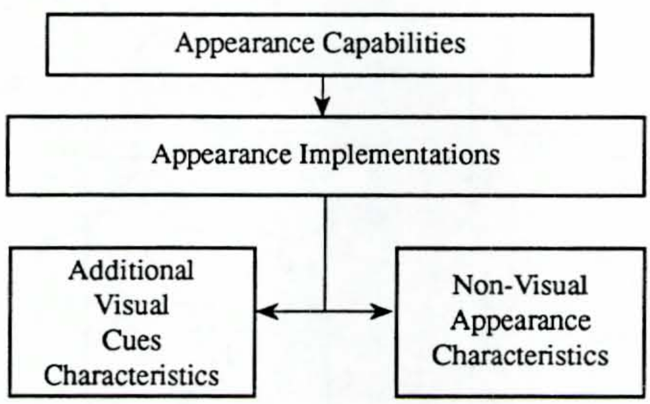

Figure 25
Appearance Characteristics

4.1.4.2 Non-visual appearance

Definition: Are non-visual appearance characteristics modeled and made available, e.g. IR signature, RF cross section. Descriptors for Non-visual appearance are contained in Figure 25.

4.1.5 Weapons Systems

4.1.5.1 Weapon System Implementations

Weapon systems are a primary agent of interaction for most actionspace entities. In a military application, the outcome of battles and campaigns ultimately boil down to the employment of individual weapon systems; indeed, it might be said that one of the principal advantages of DIS based synthetic environments is

to support the complexity of evaluating individual weapon employment outcomes. Thus, the fidelity of an actionspace entity's weapon simulations has, for many DIS exercises, a significant influence on exercise fidelity. Weapons are unique in the respect that they, along with mechanically dispensed countermeasures, are the only parts of an entity model which are represented by their own set of entity state PDUs, hence the emphasis on trajectory generation. Only the weapon itself is considered here, as fire control and other supporting subsystems are considered elsewhere. Since entities carry all manner of weapon systems, and each must be characterized individually, this part of the taxonomy should be filled out for each weapon system. Needless to say, each characteristic will not apply to every weapon, those portions are not applicable to the specific system under consideration. Figure 26 contains the fidelity characteristics associated with weapon system model implementations.

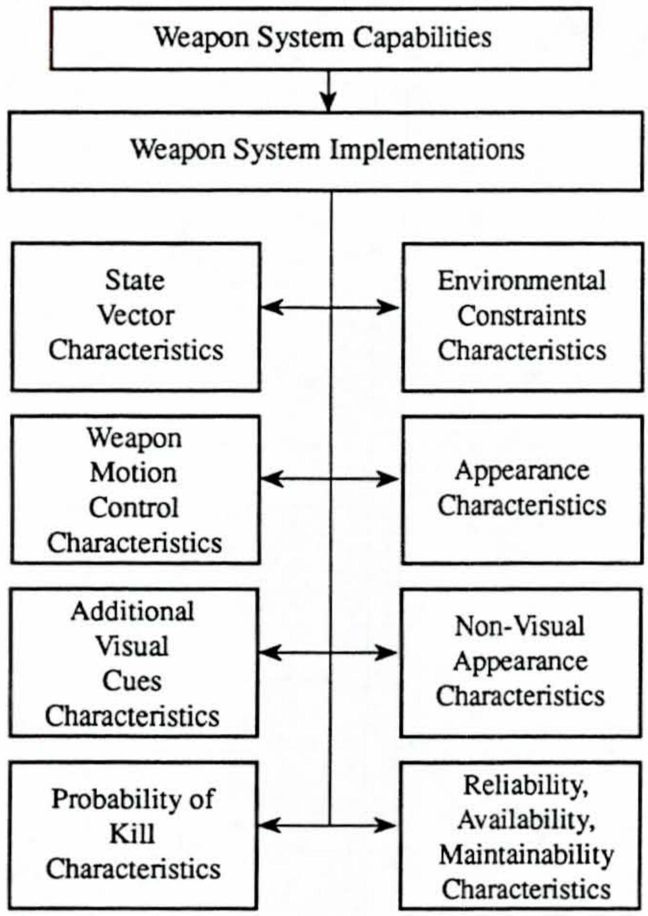

Figure 26
Weapon System Characteristics

4.1.5.2 System type

Weapon system(s) incorporated in the entity simulation. Each system shall have the rest of this section filled out individually People putting together a DIS exercise may be looking for a specific weapon system type to support their needs. Also, the remainder of the section is to be filled out for each type identified.

4.1.5.2.1 State Vector Characteristics

Definition: State vectors modeled to support weapon trajectory models, e.g. position, velocity, acceleration. With each vector modeled, provide a brief description of model type, e.g. degrees of freedom, open or closed loop model, factors considered. Figure 27 contains the state vector descriptors.

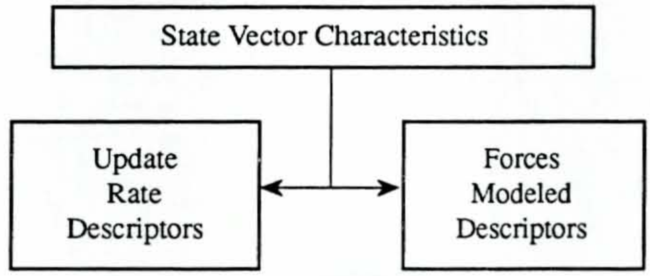

Figure 27
State Vector Descriptors

4.1.5.2.1.1 Update rate

Definition: How frequently are new values for state vectors computed. Each state vector identified in 4.1.5.1.1 is required to have an update rate associated with it.

Source: FDR Subgroup

Rational: This describes the granularity of weapon motion dynamics.

4.1.5.2.1.2 Forces modeled

Definition: What forces are modeled to act on the weapon. Forces are the elemental factors in creating weapon motion (forces includes torques if a rotational dynamics model is specified) and a list of what forces are modeled and a brief description of each should be provided.

Rational: This provides insight to how accurately weapon motion is modeled.

4.1.5.1.3 Environmental Constraints

Definition: Are environmental constraints to weapon motion modeled. Descriptors for environmental constraints are contained in Figure28.

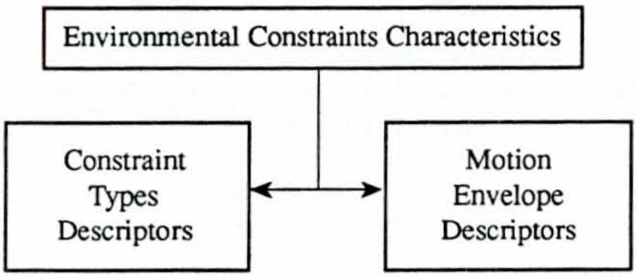

Figure 28
Environmental Constraint Descriptors

4.1.5.1.3.1 Constraints Types

Definition: List of constraints and a brief description of how they affect weapon motion. Specific constraints of interest include: Collisions with other (non-targeted) entities and/or terrain features, types of weather, currents, and undersea conditions.

Source: FDR Subgroup

Rational: The environment around an weapon affects its ability to move.

4.1.5.1.3.2 Motion Envelope

Definition: What is the envelope of values for each of the state vectors identified in 4.1.5.1.1. list upper and lower limits, along with units of measure for each.

Source: Weapon Model Developer

Rational: Likely to limit where an weapon can turn up within a synthetic environment.

4.1.5.1.4 Weapon Motion Control

Definition: Is weapon motion guided or unguided. Figure 29 contains the descriptors for motion control.

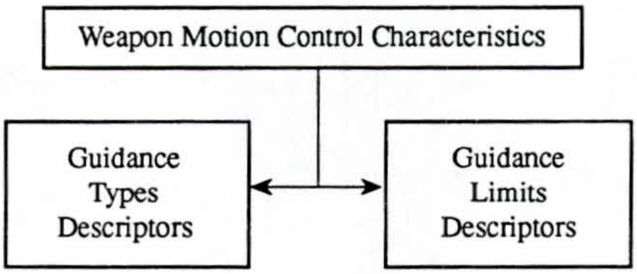

Figure 29
Weapon Motion Control Descriptors

4.1.5.1.4.1 Type of Weapon Guidance

Definition: Weapon motion may be implemented numerous ways. Is motion scripted, with a capability to edit scripts in real time. Is there a set of controls which duplicate guidance controls on the weapon itself. List the motion controls and briefly describe which state vector they affect and how.

Source: weapon model developer

Rational: May be important to how weapon operates in the synthetic environment.

4.1.5.1.4.2 Guidance limits

Definition: What limits are place on the ability of the weapon to guide to the target.

Source: Weapon model Developer

Rational: All guided systems have inherent limits, all of which affect performance to one extent or another.

4.1.5.1.5 Appearance

Does the Actionspace weapon have the capability to represent appearances to the rest of the DIS world. Appearance descriptors are contained in Figure 30.

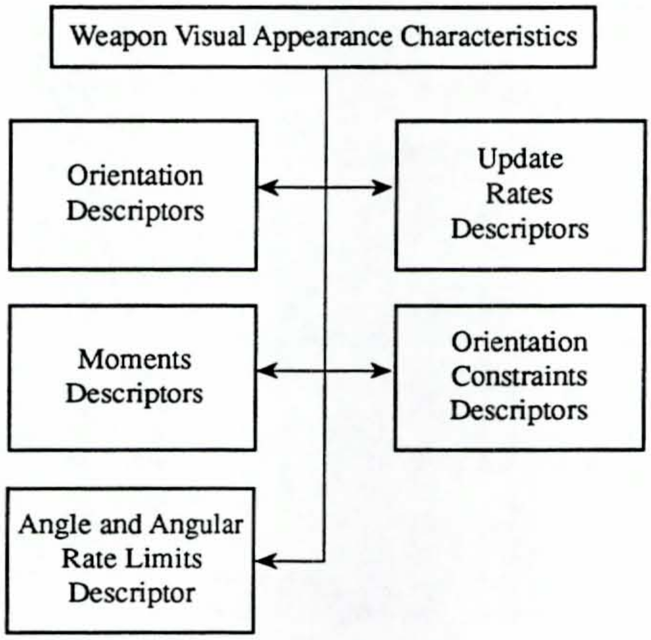

Figure 30
Weapon Visual Descriptors

4.1.5.1.5.1 Orientation of weapon

Definition: What angle and angular rates are modeled to support weapon orientation models, e.g. heading, heading rate, heading acceleration. With each set of angular data modeled, provide a brief description of model type, e.g. rotational or trim (steady state) dynamics.

4.1.5.1.5.2 Update rate

Definition: How frequently are new values for angles and rates computed. Each set of data identified in 4.1.5.1.1.1 is required to have an update rate associated with it.

Source: FDR Subgroup

Rational: This describes the granularity of weapon orientation dynamics.

4.1.5.1.5.3 Moments

Definition: What moments are modeled to act on the weapon. Moments are the elemental factors in creating weapon angular dynamics and a list of what is included in moment calculations and a brief description of each should be provided.

Rational: This provides insight to how accurately weapon orientation is modeled.

4.1.5.1.5.4 Orientation Constraints

Definition: List of constraints and a brief description of how they affect weapon orientation. Specific constraints of interest are system limits and model limits.

Source: FDR Subgroup

Rational: Orientation and its limits may be important.

4.1.5.1.5.5 Angle and Angular Rate Envelope

Definition: What is the envelope of values for each of the angles and rates identified in 4.1.5.1.1.1. List upper and lower limits, along with units of measure for each.

Source: Weapon Model Developer

Rational: Likely to limit how an weapon can appear within a synthetic environment.

4.1.5.1.6 Non-visual appearance

Definition: Are non-visual appearance characteristics modeled and made available, e.g. IR signature, RF cross section. Figure 31 contains the descriptors for non visual appearance.

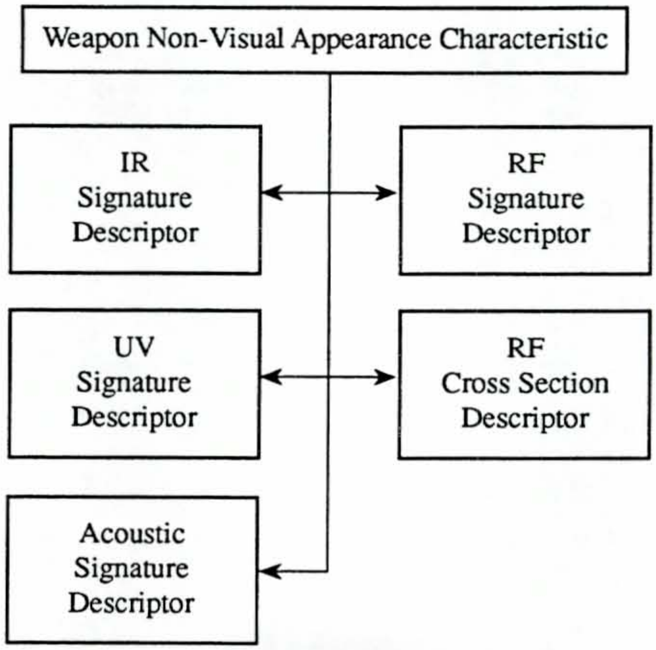

Figure 31
Weapon Non-Visual Descriptors

4.1.5.1.6.1 IR signature

Definition: Is the weapon's IR signature model and if so, describe the model briefly.

Source: Weapon Model Developer

Rational: The IR signature of the weapon may be crucial to exercise fidelity.

4.1.5.1.6.2 RF signature

Definition: Is the weapon's RF signature model and if so, describe the model briefly.

Source: Weapon Model Developer

Rational: The RF signature of the weapon may be crucial to exercise fidelity.

4.1.5.1.6.3 RF Cross Section

Definition: Are radar cross sections modeled and for what distributions of viewing angles

Source: Weapon Model Developer

Rational: Probability of detection models have cross section area as a primary input, and their inclusion or exclusion can affect fidelity.

4.1.5.1.6.4 UV signature

Definition: Is the weapon's UV signature model and if so, describe the model briefly.

Source: Weapon Model Developer

Rational: The UV signature of the weapon may be crucial to exercise fidelity.

4.1.5.1.6.5 Acoustic signature

Definition: Is the weapon's acoustic signature model and if so, describe the model briefly.

Source: Weapon Model Developer

Rational: The acoustic signature of the weapon may be crucial to exercise fidelity.

4.1.5.1.7 Additional visual cues

Definition: Does the weapon provide additional visual cues relating to its appearance. Figure 32 contains the descriptors for additional visual cues.

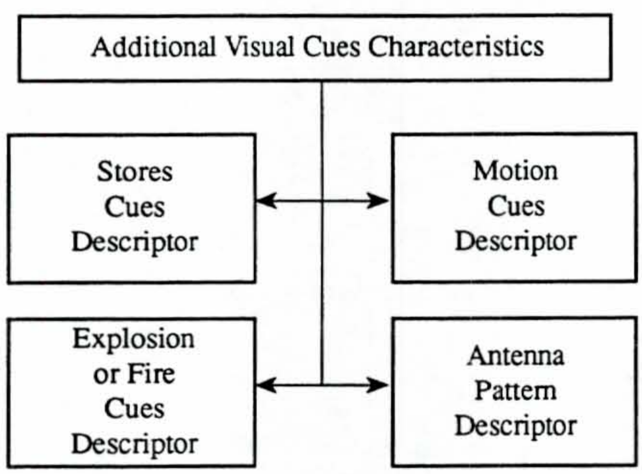

Figure 32
Visual Cue Descriptors

4.1.5.1.7.1 Stores cues

Definition: What visual cues are available concerning the presence of external stores, including their deployment and type.

Source: FDR Subgroup

Rational: May be required for realistic visual portrayal of weapon.

4.1.5.1.7.2 Motion cues

Definition: What motion cues are available concerning the presence or nature of weapon motion, such a dust trails, contrails wakes, or the like.

Source: FDR Subgroup

Rational: May be required for realistic visual portrayal of weapon.

4.1.5.1.7.3 Explosion or Fire cues

Definition: What visual cues are available concerning the presence of Explosions, Fire, or Smoke.

Source: FDR Subgroup

Rational: May be required for realistic visual portrayal of weapon.

4.1.5.1.7.4 Visual Damage cues

Definition: What visual cues are available concerning the presence of weapon damage, including location with respect to weapon and severity.

Source: FDR Subgroup

Rational: May be required for realistic visual portrayal of weapon.

4.1.5.1.8 Probability of Kill

4.1.5.1.9 Reliability, Maintainability, Survivability modeled

Definition: Are the various -ilities modeled. The descriptors for RAM are contained in Figure 33.

Rational: Sensors break, need maintenance, and are damaged in the real world. Events relating to this may well affect exercise outcomes.

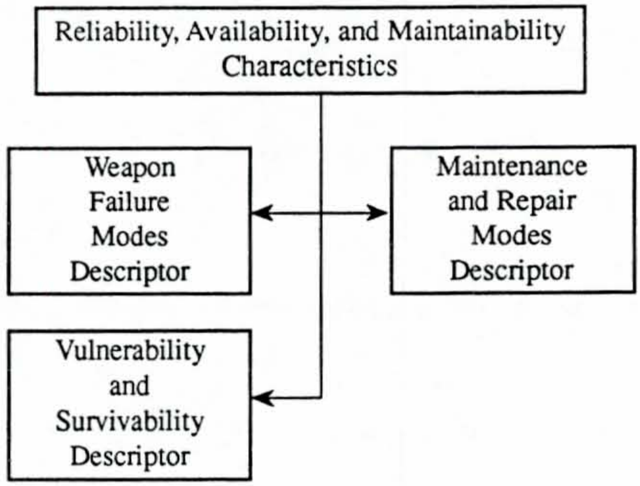

Figure 33
Weapon Reliability, Availability, and Maintainability Descriptors

4.1.5.1.9.1 Weapon System failure modes

Definition: There are numerous ways in which a weapon system fails. What types of failures are modeled and what is the effect of system performance.

Source: Weapon model developer

Rational: What type of failures are modeled may affect exercise validity.

4.1.5.1.9.2 Weapon Maintenance and repair modes

Definition: Given a weapon can be modeled to fail, can it also be fixed, and is maintenance part of the equation.

Source: Weapon model developer

Rational: How M and R are modeled may affect exercise validity, particularly if the weapon is allowed to fail during the exercise.

4.1.5.1.9.3 Weapon vulnerability and survivability models.

Definition: Does the weapon sustain battle damage and to what extent is performance degraded.

Source: Weapon model developer

Rational: How V and S are modeled may affect exercise validity, particularly if the weapon is allowed to fail during the exercise.

4.1.6 Vulnerability

Vulnerability and survivability of an actionspace entity is an inherent property of interoperating within a ynthetic environment. Being vulnerable and/or surviving interactions with other entities or the environment is, in many cases, a critical outcome of a DIS exercise. Therefore, this section contains descriptors for vulnerability and survivability (V&S) models. Figure 34 contains the implementation and characteristics of this portion of the taxonomy.

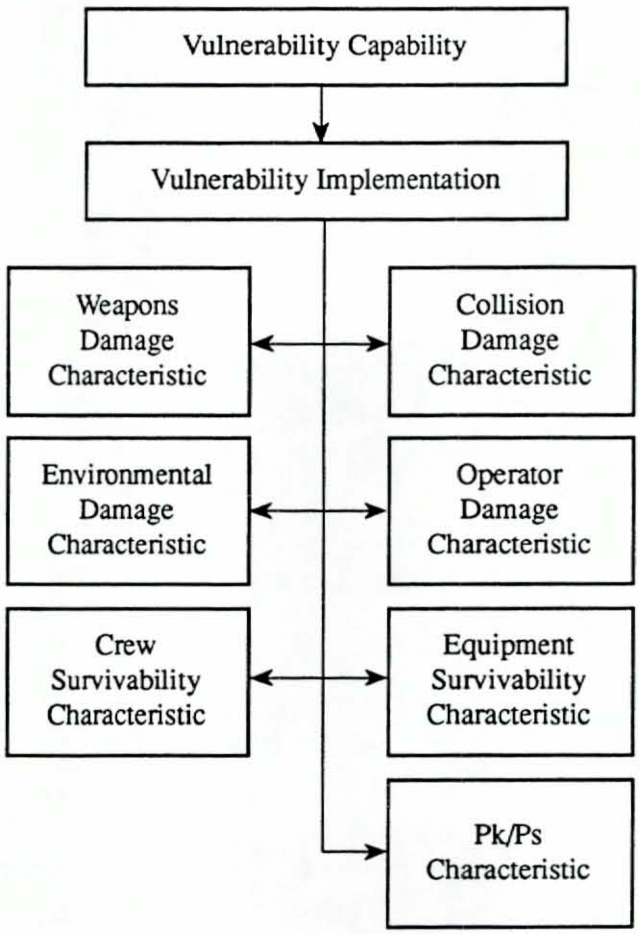

Figure 34
Vulnerability Implementation & Characteristics

4.1.6.1 Vulnerability Implementation

The typical approach to V&S calculation is to use table look-ups as a function of weapon type, target type, and geometric relationships. This approach may not be satisfactory from a fidelity standpoint for some applications. There should be identification of model type at this level, i.e. tabular statistical or dynamic.

4.1.6.1.1 Weapon Damage

Definition: Vulnerability of the entity and/or it's subsystems to weapons employed against it.

Rational: Weapons have an effect on entities and this is a primary outcome of DIS exercises. As stated in the PDU standard, entities are responsible for assessing and telling the world about damage sustained to it. How well and what aspects of weapon vulnerability is modeled is therefore significant. Figure 35 contains the descriptors for Weapon Damage.

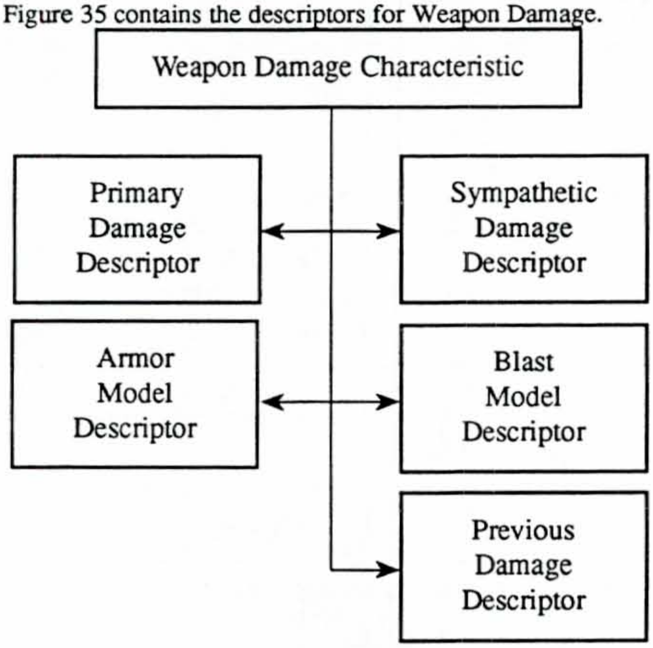

Figure 35
Weapon Damage Descriptors

4.1.6.1.1.1 Primary Damage

Definition: The damage to an entity caused by direct interaction with the munition, either by impact or warhead detonation.

Source: FDR Subgroup

Rational: Vulnerability assessment is driven by the weapon's direct effect on the entity and it's subsystems.

4.1.6.1.1.2 Sympathetic Damage

Definition: The damage to an entity caused by secondary interaction with the munition, or by interaction with entity subsystems suffering primary damage.

Source: FDR Subgroup

Rational: Vulnerability assessment is affected by secondary effects on the entity and it's subsystems.

4.1.6.1.1.3 Armor Model

Definition: The three dimensional effect of armor on resisting damage from weapon interaction.

Source: FDR Subgroup

Rational: Modeling of armor is essential in some vulnerability assessment applications.

4.1.6.1.1.4 Blast Model

Definition: The three dimensional effect of warhead blast and fragment dispersion on causing damage to the entity or it's subsystems.

Source: FDR Subgroup

Rational: Blast and fragment modeling is essential in some vulnerability assessment applications.

4.1.6.1.1.5 Previous Damage

Definition: The effect of previous damage condition of the entity on assessing the current weapon damage.

Source: FDR Subgroup

Rational: The cumulative effect of previous weapon interactions can significantly change the effect of a current weapon interaction.

4.1.6.1.2 Collisions

Definition: Vulnerability of an entity or it's subsystems to collisions with other entities or terrain feature as modeled by the DIS resource. Figure 36 contains the descriptors for Collision Vulnerability.

Rational: When entities are involved in collisions, they may be vulnerable to damage which affects their ability to interoperate.

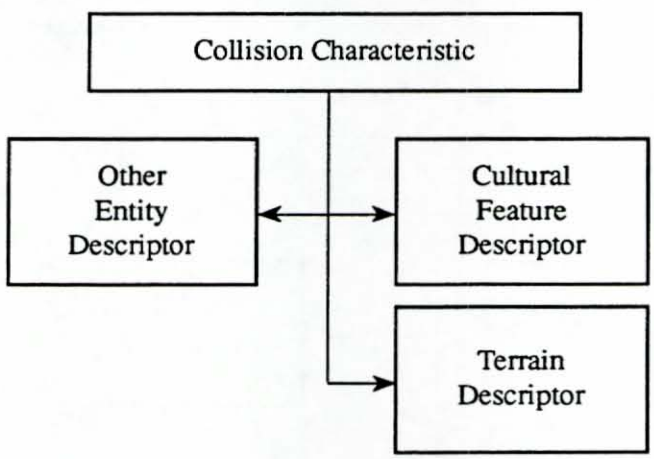

Figure 36
Collision Damage Descriptors

4.1.6.1.2.1 Other Entities

Definition: Damage caused to the entity or it's subsystems by collisions with other entities.

Source: FDR Subgroup

Rational: When entities are involved in collisions, they may be vulnerable to damage which affects their ability to interoperate.

4.1.6.1.2.2 Cultural Features

Definition: Damage caused to the entity or it's subsystems by collisions with cultural features, e.g. buildings, bridges, wires, or trees.

Source: FDR Subgroup

Rational: When entities are involved in collisions, they may be vulnerable to damage which affects their ability to interoperate.

4.1.6.1.2.3 Terrain

Definition: Damage caused to the entity or it's subsystems by collisions with the terrain, such as the ground or hills.

Source: FDR Subgroup

Rational: When entities are involved in collisions, they may be vulnerable to damage which affects their ability to interoperate.

4.1.6.1.3 Environmental Damage

Definition: The vulnerability of an entity or it's subsystems to elements of the environment, such as heat, rain, and/or wind. Figure 37 contains the descriptors for environmental damage vulnerability.

Rational: Some entity's performance is degraded by undue exposure to the elements.

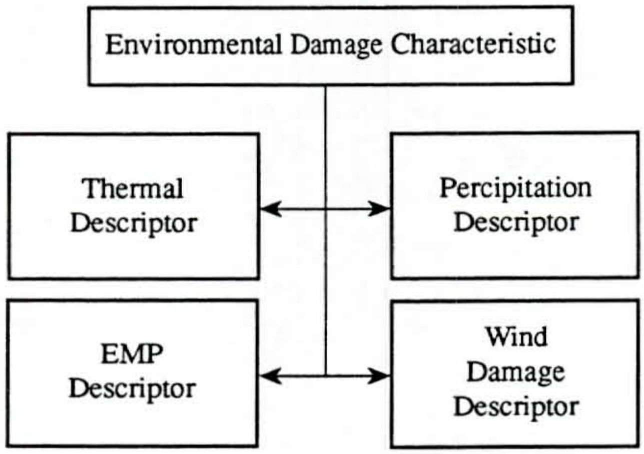

Figure 37
Environmental Damage Descriptors

4.1.6.1.3.1 Thermal Damage

Definition: The vulnerability of an entity or it's subsystems as a result of exposure to excessive heat or cold. In this context, vulnerability may well be a degradation of one or more aspects of performance.

Source: FDR Subgroup

Rational: Loss or degradation of performance affects interoperability.

4.1.6.1.3.2 Precipitation Damage

Definition: The vulnerability of an entity or it's subsystems as a result of exposure to excessive precipitation, including ice storms, lightning, heavy rain, or snow. In this context, vulnerability may well be a degradation of one or more aspects of performance.

Source: FDR Subgroup

Rational: Loss or degradation of performance affects interoperability.

4.1.6.1.3.3 Wind Damage

Definition: The vulnerability of an entity or it's subsystems as a result of exposure to high winds, including sand storms, dust storms, tornados, and/or hurricanes. In this context, vulnerability may well be a degradation of one or more aspects of performance.

Source: FDR Subgroup

Rational: Loss or degradation of performance affects interoperability.

4.1.6.1.3.4 EMP Damage

Definition: The vulnerability of an entity or it's subsystems as a result of exposure to powerful electromagnetic pulses. In this context, vulnerability may well be a degradation of one or more aspects of performance.

Source: FDR Subgroup

Rational: Loss or degradation of performance affects interoperability.

4.1.6.1.4 Operator Damage

Definition: The susceptibility of an entity or it's subsystems to being damaged or otherwise degraded by improper operator inputs. This fidelity characteristics is not related to simulator operation, such as erasing a simulation database during a DIS exercise, but rather those operator errors which might damage the entity in the real world, like jamming a car in reverse while driving down the expressway. Figure 38 contains the descriptors for operator damage

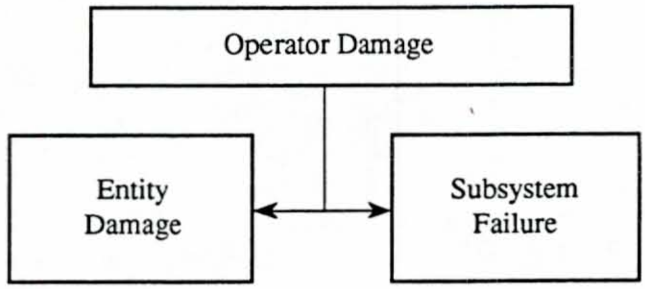

Figure 38
Operator Damage Descriptors

4.1.6.1.4.1 Entity Damage

Definition: Damage or vulnerability of the entire entity to operator error.

Source: FDR Subgroup

Rational: Maybe the simulation of throwing a lit cigarette in the gas tank or some equally boneheaded move is important for exercise fidelity.

4.1.6.1.4.2 Subsystem Damage

Definition: Damage or vulnerability of individual entity subsystems to operator error.

Source: FDR Subgroup

Rational: Maybe the simulation of using the radar to microwave popcorn or some equally boneheaded move is important for exercise fidelity.

4.1.6.1.5 Crew Vulnerability

Definition: The ability of human crew members to survive (or be killed) as a result of entity vulnerability. Crew Vulnerability descriptors are contained in Figure 39.

Rational: may be an important MOP/MOE in a DIS exercise.

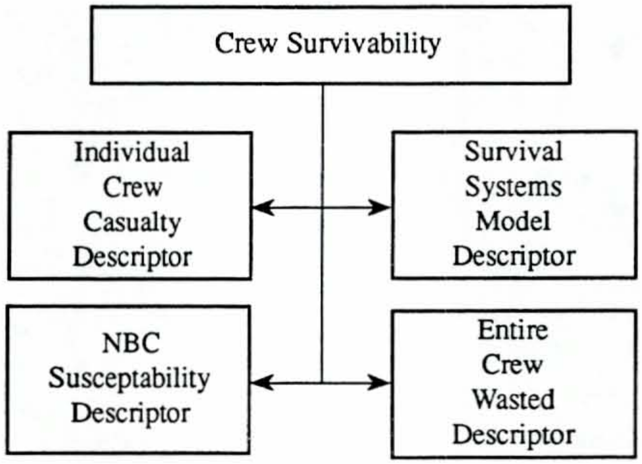

Figure 39
Crew Survivability Descriptors

4.1.6.1.5.1 Individual Crew Vulnerability

Definition: The ability to model differential Vulnerability among crew members of an entity.

Source: FDR Subgroup

Rational: Which crew members get killed may have significant affect on an entity's post-damage interoperability.

4.1.6.1.5.2 Entire Crew Vulnerability

Definition: The ability to model entire vulnerability among crew members of an entity.

Source: FDR Subgroup

Rational: Maybe the entire crew gets the bomb dropped on them.

4.1.6.1.5.3 NBC Susceptability

Definition: The ability to model NBC vulnerability among crew members of an entity.

Source: FDR Subgroup

Rational: Or maybe it get dropped nearby.

4.1.6.1.5.4 Survival System Model

Definition: Models of those specific systems which aid crew survival.

Source: FDR Subgroup

Rational: May well effect entity interoperability with other DIS players.

4.1.6.1.6 Equipment Damage

Definition: Equipment or subsystem loss or degradation of performance as a result of damage. Figure 40 contains the equipment damage descriptors.

Rational: Entities are comprised of many interoperating systems, damage one and the rest may well be affected.

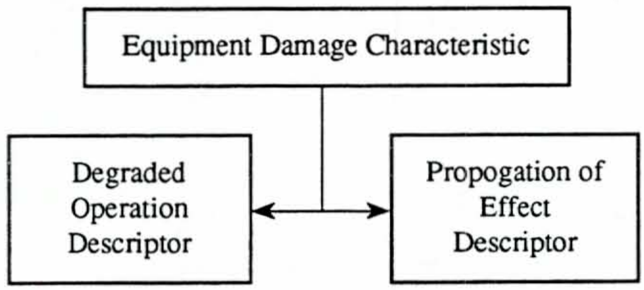

Figure 40
Equipment Damage Descriptors

4.1.6.1.6.1 Degraded Performance

Definition: The partial loss of equipment function as a result of damage.

Source: FDR Subgroup

Rational: May well effect entity interoperability with other DIS players.

4.1.6.1.6.2 Propagation of effect

Definition: The partial loss of undamaged equipment function as a result of damage to an entity subsystem.

4.1.6.1.7 Pk/Ps characteristic

Definition: The most commonly used MOP/MOE regarding entity vulnerability, Pk/Ps reflects the likelihood of an entity's continuing presence in a DIS exercise. Figure 41 contains Pk/Ps descriptors.

Rational: The various factors which contribute to computation of Pk/Ps, and thus the continuing participation in an exercise, significantly affects exercise outcomes.

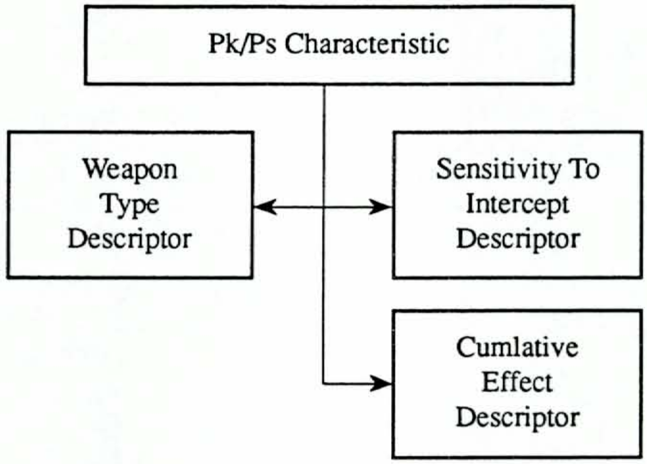

Figure 41
Pk/Ps Descriptors

4.1.6.1.7.1 Weapon Type

Definition: The sensitivity of Pk calculations as a function of the type of weapon employed against the entity.

Source: FDR Subgroup

Rational: May have a significant bearing on entity vulnerability.

4.1.6.1.7.2 Terminal Geometry Sensitivity

Definition: The sensitivity of Pk calculations as a function of the geometry of intercept conditions, including velocity, relative position, and relative orientation. See section on blast damage in 4.1.6.1.1.

Source: FDR Subgroup

Rational: May have a significant bearing on entity vulnerability.

4.1.6.1.7.3 Cumulative Ps

Definition: The sensitivity of Ps calculations as a function of previous engagements within the exercise.

Source: FDR Subgroup

Rational: May have a significant bearing on entity vulnerability.

4.1.7 Consumables

It is the nature of entities to consume resources, be it JP-4 for an aircraft, rations for a platoon, or medical supplies for a hospital. Consumables impose limits on entity actions and these limits have an impact of an entity's interoperability in some DIS exercises. The capacity to model consumables is characterized in the following paragraphs.

4.1.7.1 Consumables Implementations

Definition: The implementation of a consumable resource, such as weapons, batteries, ammunition, POL, rations, medical supplies, mechanical countermeasures, or any item which affects an entity's interactions in a DIS environment. In the absence of a consumable implementation, it shall be assumed that the consumable is available, in a modeling sense, in unlimited supply. Figure 42 contains the fidelity characteristics of consumables models.

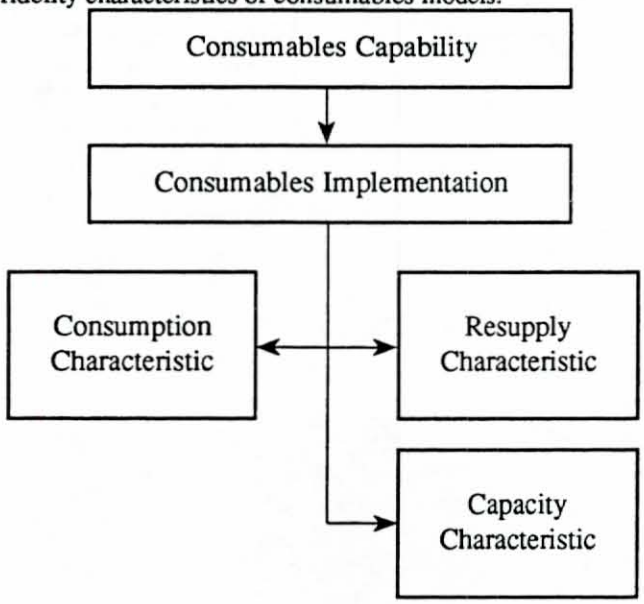

Figure 42
Consumables Implementation and Characteristics

4.1.7.1.1 Consumption

Definition: The means by which a consumable is depleted or expended Figure 43 contains consumption descriptors.

Rational: How a consumable is modeled affects when it is used up and thus the entity's interoperability on a DIS network.

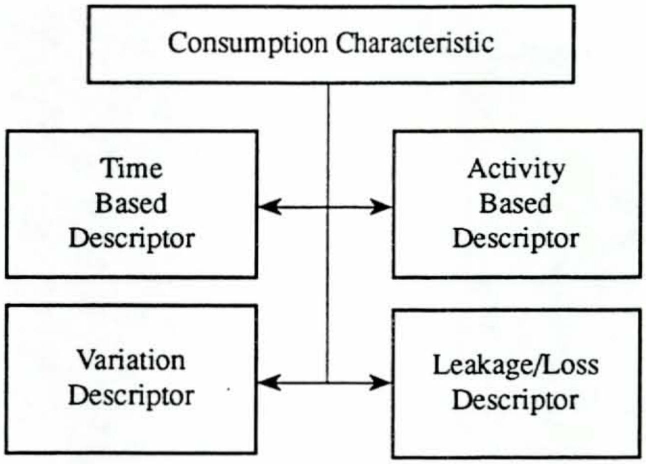

Figure 43
Consumption Descriptors

4.1.7.1.1.1 Time Based

Definition: The time dependency of the consumption model, i.e. is a consumable depleted as a function of time.

Source: FDR Subgroup

Rational: May impact the fidelity of a DIS exercise.

4.1.7.1.1.2 Activity Based

Definition: The dependency of the consumption model on specific entity activities, e.g. are weapon stores depleted as a function of weapon launch.

Source: FDR Subgroup

Rational: May impact the fidelity of a DIS exercise.

4.1.7.1.1.3 Variation

Definition: The variation of consumption rate as a function of both time and activities, for example, the fuel used in an aircraft as a function of time and throttle position.

Source: FDR Subgroup

Rational: May impact the fidelity of a DIS exercise.

4.1.7.1.1.4 Leakage/Loss

Definition: The sensitivity of a consumption model to leaks or other kinds of abnormal losses.

Source: FDR Subgroup

Rational: These things happen in the real world.

4.1.7.1.2 Resupply

Definition: Just as comsumables can be used up, they can be replenished. Resupply of an entity which has used up some of its consumables affects its DIS interoperability. Figure 44 contains resupply descriptors.

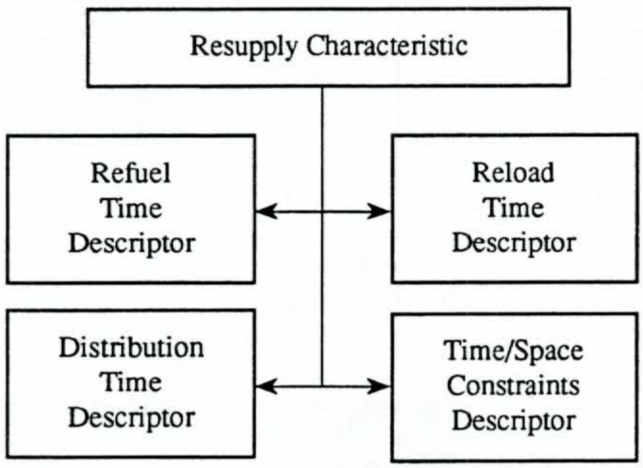

Figure 44
Resupply Descriptors

Rational: May be crucial to large scale DIS exercise outcomes.

4.1.7.1.2.1 Refuel Time

Definition: The simulated refueling time model.

Source: FDR Subgroup

Rational: Affects when an entity can interoperate within a DIS exercise.

4.1.7.1.2.2 Reload Time

Definition: The simulated weapon or ammunition reload time model.

Source: FDR Subgroup

Rational: Affects when an entity can interoperate within a DIS exercise.

4.1.7.1.2.3 Distribution Time

Definition: The simulated time model of distribution of consumables supplies within an entity.

Source: FDR Subgroup

Rational: Affects when an entity can interoperate within a DIS exercise.

4.1.7.1.2.4 Time/Space Constraints

Definition: The simulated time/space constraints in order to facilitate resupply, e.g. rendezvous with a supply ship or moving an entity to a supply depot.

Source: FDR Subgroup

Rational: Affects when an entity can be resupplied within a DIS exercise.

4.1.7.1.3 Capacity

Definition: The amount and location of consumables within an entity. Figure 45 contains capacity descriptors.

Source: FDR Subgroup

Rational: Weight/balance and available payload weight/volume may be important to entity interaction. Also, location of some types of consumables would be important in a detailed vulnerability model.

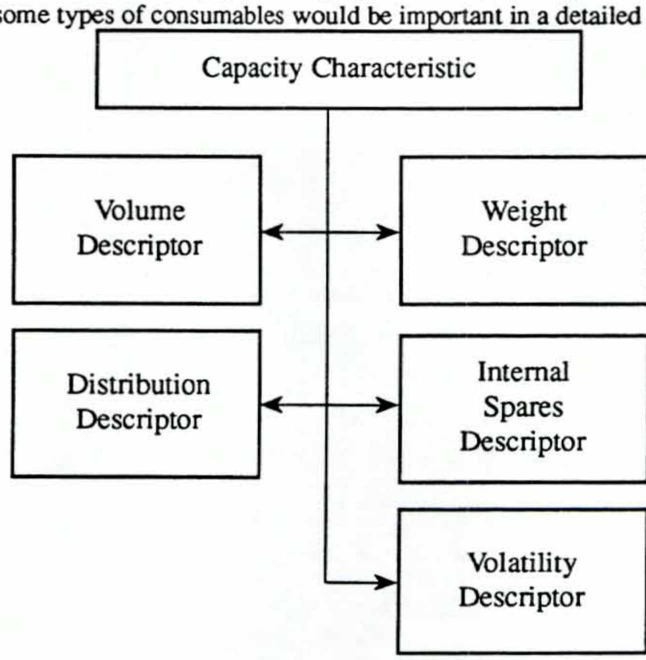

Figure 45
Capacity Descriptors

4.1.7.1.3.1 Volume

Definition: The volume occupied by a consumable and its behavior as the consumable is depleted.

Source: FDR Subgroup

Rational: May be important in modeling entity capability within a DIS exercise.

4.1.7.1.3.2 Weight

Definition: The weight of a consumable and its behavior as the consumable is depleted.

Source: FDR Subgroup

Rational: May be important in modeling entity capability within a DIS exercise.

4.1.7.1.3.3 Distribution

Definition: The location of a consumable relative to the entity and its behavior as the consumable is depleted.

Source: FDR Subgroup

Rational: May be important in modeling entity capability within a DIS exercise.

4.1.7.1.3.4 Internal Spares

Definition: On-board consumables not currently available to an entity, e.g. spare batteries.

Source: FDR Subgroup

Rational: Affects time/space requirements for resupply of that consumable, i.e. there are none.

4.1.7.1.3.5 Volatility

Definition: A time based dependency of the consumable's usability, e.g. does it spoil or otherwise go bad.

Source: FDR Subgroup

Rational: May be important in modeling entity capability within a DIS exercise.

4.1.8 Behavior/ROE

Behavior and applying Rule of Engagement (ROE) are elemental to entity interaction on a DIS network. Indeed, it might be said that the principal reason for creating DIS networks and exercised is to introduce the very human element of behavior into simulated environments. From a fidelity standpoint, behavior of a man in the loop is not part of this taxonomy per se, although required skill levels are a consideration in assembling an exercise and the fidelity of how human behavior can be facilitated is significantly dependent on the fidelity of non-human aspects of entity simulation, e.g. sophisticated human decision making in the employment of a sensor, and thus what the rest of the synthetic environment sees, can not be realized if he/she has a simplistic sensor model in the entity. These aspects of fidelity are addressed in other parts of the taxonomy.

How behavior at the entity level is implemented, human or otherwise, is addressed as an implementation. If the implementation is a human, the lower levels of the taxonomy are of interest only for those aspects of entity behavior which are non-human in the real system, such as automated target prioritization or automated ECM/ECCM systems. In the sense that these automated functions have a bearing on how the rest of the

synthetic environment 'sees' the entity, how they are modeled or simulated will have an impact on fidelity. Figure 46 contains the fidelity characteristics associated with behavior/ROE.

4.1.8.1 Implementation

Definition The means by which entity behavior is realized by the model or simulation. Implementations include human-in-the-loop (HIL), Scripted, Algorithmic, Adaptable/AI based, Semi-automated.

Rational: How entity behavior is generated is certainly a factor in exercise fidelity.

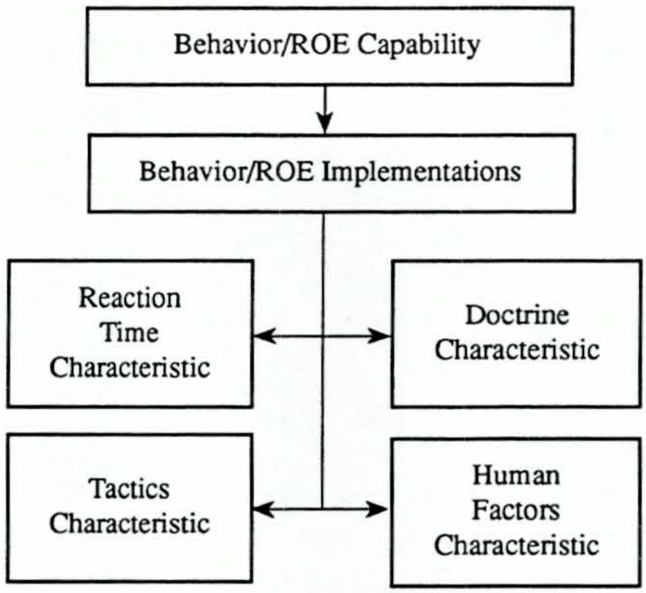

Figure 46
Behavior/ROE Implementation and Characteristics

4.1.8.1.1 Reaction Time

Definition: The elapsed time between external stimulus and an entity's or entity subsystem's behavioral reaction to it. Figure 47 contains the reaction time descriptors.

Rational: Timing is crucial in replicating real world events.

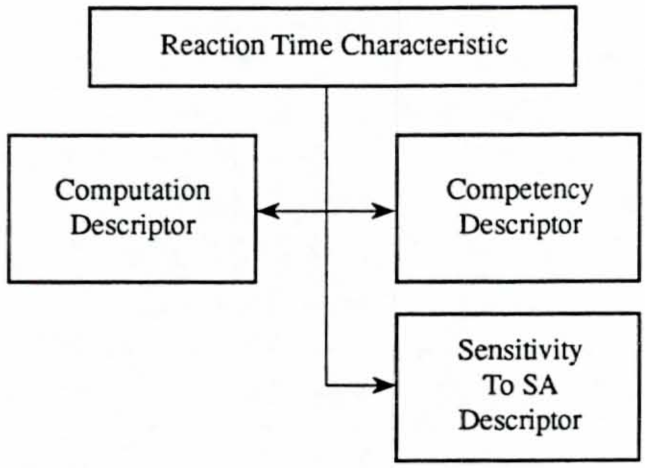

Figure 47
Reaction Time Descriptors

4.1.8.1.1.1 Computation

Definition: The means by which reaction time is established, either as a fixed number (including no reaction delay) or by algorithmic methods.

Source: FDR Subgroup

Rational: The fidelity of how reaction times are computed may be important to a DIS exercise.

4.1.8.1.1.2 Competency

Definition: The skill level, and its variability, of entity behavior as a function of the simulated competency of human operators.

Source: FDR Subgroup

Rational: The modeling of variable competency may be important to a DIS exercise.

4.1.8.1.1.3 Sensitivity to Situational Awareness

Definition: The correlation of entity behavior to what it knows about the rest of the synthetic environment.

Source: FDR Subgroup

Rational: The level of Situational Awareness has significant impact on entity behavior and may be important to a DIS exercise.

4.1.8.1.2 Doctrine

Definition: The correlation of entity behavior to a set of rules, i.e. doctrine, as trained by the service which it is simulating in a DIS exercise. Figure 48 contains doctrine descriptors.

Rational: Behavior is significantly affected by doctrine.

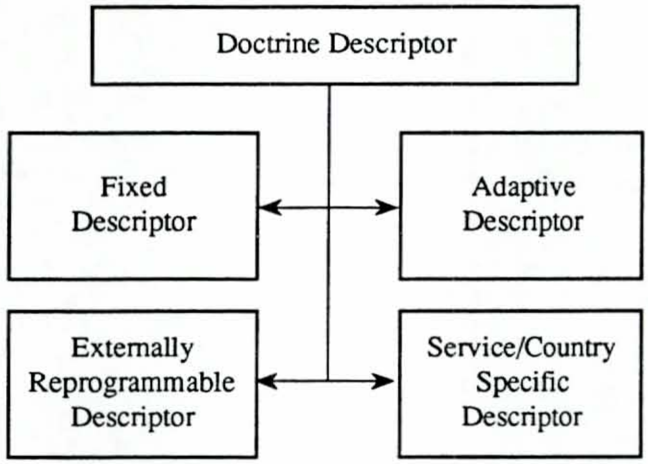

Figure 48
Doctrine Descriptor

4.1.8.1.2.1 Fixed

Definition: Behavioral Doctrine which is invariant with time or situation.

Source: FDR Subgroup

Rational: May be important to DIS exercise fidelity.

4.1.8.1.2.2 Adaptive

Definition: Behavioral Doctrine which is adaptive in time or in reaction to past situations.

Source: FDR Subgroup

Rational: May be important to DIS exercise fidelity.

4.1.8.1.2.3 Externally Reprogrammable

Definition: Behavioral Doctrine which can be modified, either in prepreration for a DIS exercise, or during the conduct of the exercise itself.

Source: FDR Subgroup

Rational: May be important to DIS exercise fidelity.

4.1.8.1.2.4 Service/Country Specific

Definition: The extent to which behavior reflects a specific doctrine as prescribed by a service or country.

Source: FDR Subgroup

Rational: May be important in replicating the real world within a synthetic environment.

4.1.8.1.3 Tactics

Definition: The means by which doctrine is executed as realized in a set of specifics actions simulated by an entity towards the accomplishment of a specific goal or set of goals. Figure 49 contains tactics descriptors.

Rational: Tactics drive entity behavior as perceived by the rest of the synthetic environment, and thus, have a significant impact of DIS exercise fidelity.

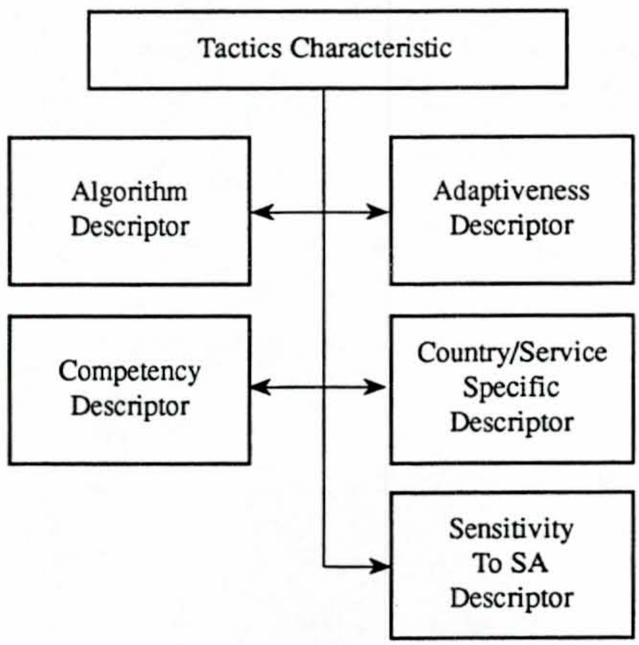

Figure 49
Tactics Descriptor

4.1.8.1.3.1 Algorithm

Definition: The means by which tactic and the set of specific entity actions to be undertaken are established, either as a fixed response or reactive algorithm.

Source: FDR Subgroup

Rational: The fidelity of how tactics are decided on and implemented may be important to a DIS exercise.

4.1.8.1.3.2 Adaptiveness

Definition: Tactical behavior which is adaptive in time or in reaction to past situations.

Source: FDR Subgroup

Rational: May be important to DIS exercise fidelity.

4.1.8.1.3.3 Competency

Definition: The skill level, and its variability, of entity tactics as a function of the simulated competency of human operators.

Source: FDR Subgroup

Rational: The modeling of variable competency may be important to a DIS exercise.

4.1.8.1.3.4 Sensitivity to Situational Awareness

Definition: The correlation of entity tactical selection and implementation to what it knows about the rest of the synthetic environment.

Source: FDR Subgroup

Rational: The level of Situational Awareness has significant impact on entity behavior and may be important to a DIS exercise.

4.1.8.1.3.5 Service/Country Specific

Definition: The extent to which tactics reflect a specific doctrine as prescribed by a service or country.

Source: FDR Subgroup

Rational: May be important in replicating the real world within a synthetic environment.

4.1.8.1.4 Human Factors

Definition: The simulated elements of entity behavior attributed to human responses in a wartime or other DIS synthetic environment.

Rational: These elements of human behavior, although not specifically established or trained as are tactics and doctrine, are influential in defining entity behavior.

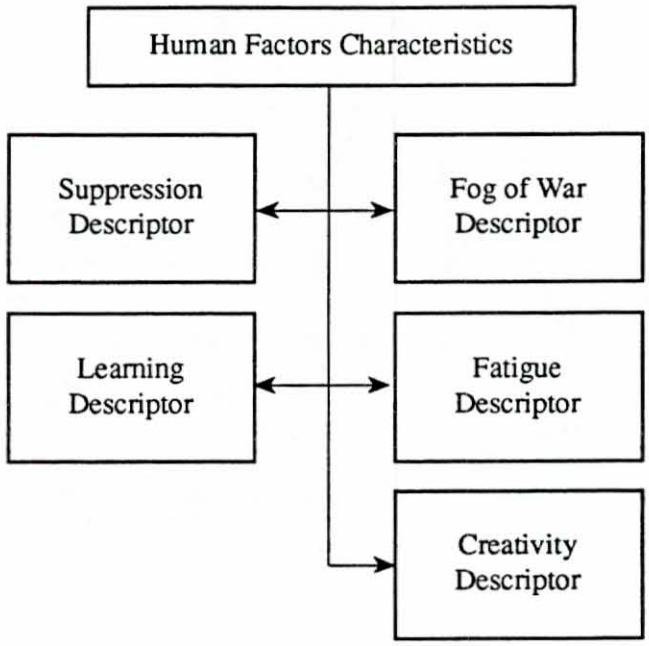

Figure 50
Human Factors Descriptors

4.1.8.1.4.1 Suppression

Definition: The failure to react in accordance to tactics or doctrine due to operator task overloading.

Source: FDR Subgroup

Rational: This happens, particularly in dense environments and with increasingly complex systems to operate. May be a significant fidelity consideration within the context of a DIS exercise.

4.1.8.1.4.2 Fog of War

Definition: Unpredictable behaviors exhibited by simulated human operators as a result of the ambiguity, fear, and tension of the battlefield environment.

Source: FDR Subgroup

Rational: May be a significant fidelity consideration within the context of a DIS exercise.

4.1.8.1.4.3 Learning

Definition: The ability to modify behaviors as a direct result of previous related experience.

Source: FDR Subgroup

Rational: This is a natural human activity with potentially significant impact on DIS fidelity.

4.1.8.1.4.4 Creativity

Definition: The ability to modify behaviors as a result of previous related and unrelated experience.

Source: FDR Subgroup

Rational: This is a natural human activity with potentially significant impact on DIS fidelity.

4.1.8.1.4.5 Fatigue

Definition: The condition of diminished decision making capacity as a result of time on station.

Source: FDR Subgroup

Rational: This is a natural human activity with potentially significant impact on DIS fidelity.

4.1.9 Command, Control, Communications, and Intelligence (C3I)

C3I is the capability to interoperate in a command structure and for a given battlespace entity can range from the ability to receive and act on commands or contribute information such as track files or threat ID to a C3I structure to acting as command center for air defense, collecting reports from other DIS entities and assigning threats for observation or prosecution to lower level commands. In this sense, almost every entity has some C3I responsibilities in the real world. This section characterizes C3I capabilities as distinct from the more generalized Communication capability described in section 4.1.1. As with other sections of this standard, not every characteristics is applicable to each entity. The characteristics are oriented to those entities which operate primarily as C3I entities, e.g. command posts or filter centers.

4.1.9.1 C3I Implementation.

Definition: Identification of device, devices, and/or human systems which are simulated in the DIS resource. If multiple devices or systems are modeled independently within the resource, each shall be identified and characterized separately. Figure 51 contains C3I implementations and characteristics.

Source: FDR Subgroup

Rational: A specific device or system may be of particular importance in a DIS exercise.

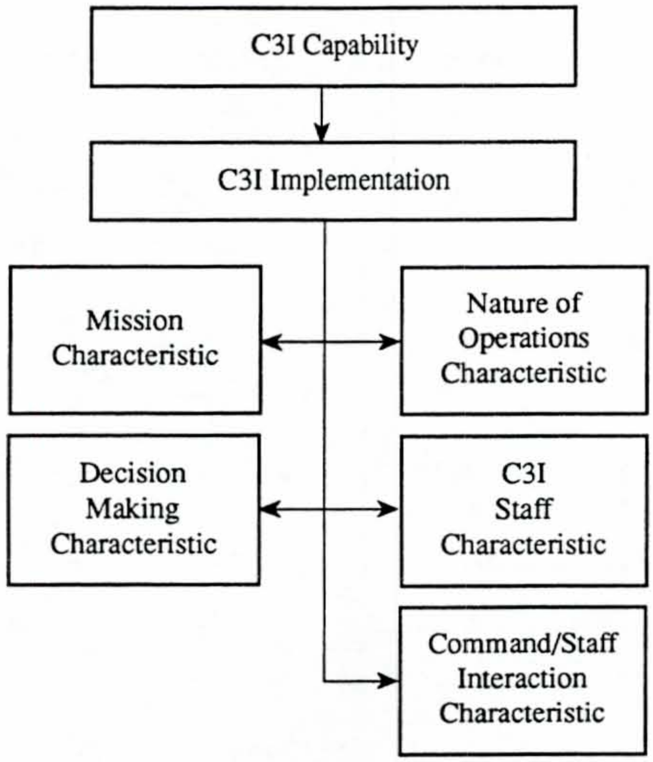

Figure 51
C3I Implementation and Characteristics

4.1.9.1.1 Mission Characteristics

Definition: The missions for which this C3I entity was designed and its associated features. Figure 52 contains Mission descriptors

Source: FDR Subgroup

Rational: It may be important to keep compatible with the mission assigned to it in a synthetic environment.

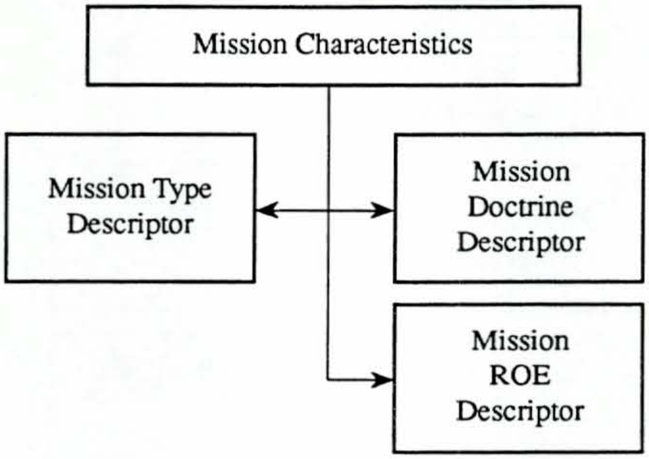

Figure 52
Mission Descriptors

4.1.9.1.1.1 Mission type

Definition: Generic mission type, e.g. Combat, Rescue, Peacekeeping

Source: FDR Subgroup

Rational: It may be important to keep compatible with the mission assigned to it in a synthetic environment.

4.1.9.1.1.2 Mission Doctrine

Definition: C3I Doctrine, if any, employed by the system.

Source: FDR Subgroup

Rational: May be important in the simulation of C3I behavior.

4.1.9.1.1.3 Mission ROE

Definition: C3I ROE, if any, employed by the system.

Source: FDR Subgroup

Rational: May be important in the simulation of C3I behavior.

4.1.9.1.2 Nature of Operations

Definition: Help me here, Dave. Figure 53 contains Nature of Operations descriptors.

Source: FDR Subgroup

Rational: May be important in selection of the simulation for a particular DIS exercise.

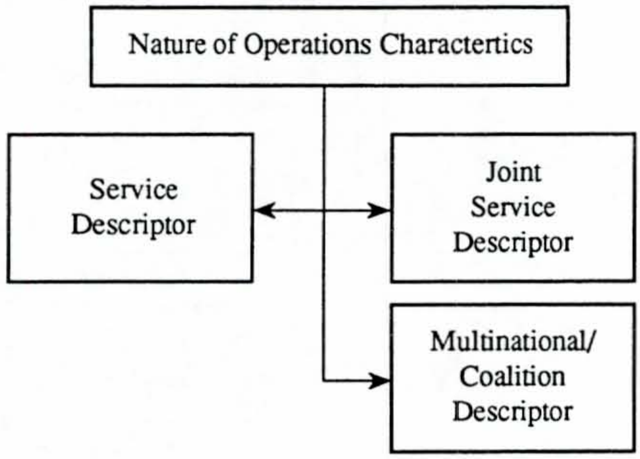

Figure 53
Nature of Operation Descriptors

4.1.9.1.2.1 Service

Definition: Branch of the service for which device is intended.

Source: FDR Subgroup

Rational: May be important in selection of the simulation for a particular DIS exercise.

4.1.9.1.2.2 Joint Service

Definition: Services which can interoperate with the simulated device or system.

Source: FDR Subgroup

Rational: May be important in selection of the simulation for a particular DIS exercise.

4.1.9.1.2.3 Multinational/Coalition

Definition: Non-U.S. services which can interoperate with the simulated device or system.

Source: FDR Subgroup

Rational: May be important in selection of the simulation for a particular DIS exercise.

4.1.9.1.3 Decision Making

Definition: The ability of the simulated device/system to make C3I decisions. Figure 54 contains Decision Making descriptors.

Source: FDR Subgroup

Rational: May be important in selection of the simulation for a particular DIS exercise. Certainly will impact behavior of not only this system, but other entities in a DIS environment.

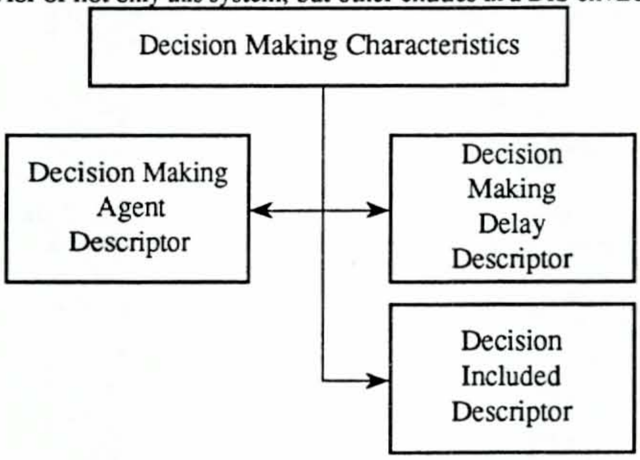

Figure 54
Decision Making Descriptor

4.1.9.1.3.1 Decision Making Agent

Definition: The means by which C3I decisions are simulated, for example man-in-the-loop, expert system, deterministic algorithm, or none.

Source: FDR Subgroup

Rational: Definitely affects behavior and actions of other entities.

4.1.9.1.3.2 Decision Making Delay

Definition: The elapsed time involved in making a decision

Source: FDR Subgroup

Rational: May be important in selection of the simulation for a particular DIS exercise. Affects the timing of events in a DIS exercise.

4.1.9.1.3.3 Decisions included

Definition: What kinds of decisions are made by this device.

Source: FDR Subgroup

Rational: Are decisions consistent with simulated decision maker, and are they compatible with other DIS entities waiting for them.

4.1.9.1.4 C3I Staff

Definition: Help me here, David. How does this differ from decision making?

Source: FDR Subgroup

Rational: See Definition

4.1.9.1.5 Command/Staff Interaction

Definition: Help me here, David. How does this differ from decision making? Is it entity to entity communication? Figure 55 contains Command/Staff interaction descriptors.

Source: FDR Subgroup

Rational: See Definition

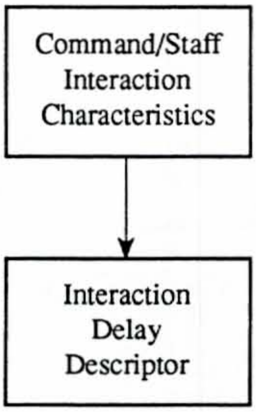

Figure 55
Command/Staff Interaction Descriptors

4.1.9.1.5.1 Interaction Delay

Definition: The elapsed time associated with the physical connection between interacting individuals, e.g. faxes, walking to the next trailer, firing up the radio.

Source: FDR Subgroup

Rational: As important as decision making delay, but may be independent model.

4.1.10 Mechanical Countermeasures

4.1.11 Entity Operator Interface - Controls and Displays

4.1.12 Logistics and Maintenance Interface

4.1.13 Electronic Warfare

Note: Performance of EW models can only be assessed in conjunction with the other entities in the exercise, see Sensors, Communications, and C3I functions for them

4.1.14 Combat ID/IFFN

4.1.15 Navigation

4.1.16 Fire Control and Targeting

4.1.17 Reliability and Availability

* Note: See Logistics and Maintenance Interface and Consumable, along with the individual subsystem's RAM data

4.1.18	**Non-representational C3I**
4.1.18.1	TBD
4.1.18.1.1	TBD
4.1.18.1.1.1	DIS Source
4.1.18.1.1.2	Types
4.1.18.1.1.2.1	Information type
4.1.18.1.1.2.2	Command type
4.1.18.1.1.3	Recipients
4.1.18.1.1.3.1	Intended recipients
4.1.18.1.1.3.2	Multi-cast, Broadcast, Single Address capability
4.1.18.1.1.3.3	Originating Entity
4.1.18.1.1.3.4	Initial condition/Dynamically soured
4.1.18.1.1.3.5	DIS Information
4.1.19	**Non-representational Threats**
4.1.19.1	TBD
4.1.19.1.1	TBD
4.1.19.1.1.1	DIS source for threat
4.1.19.1.1.2	Type of threat
4.1.19.1.1.2.1	Specific threat type
4.1.19.1.1.2.2	Desired impact on exercise
4.1.19.1.1.2.3	Side effects
4.1.19.1.1.3	Other requirements
4.1.19.1.1.3.1	Intended Recipients
4.1.19.1.1.3.2	Multi-cast, Broadcast, Single address capability
4.1.19.1.1.3.3	Entity from which threat could emanate
4.1.19.1.1.3.4	Initial condition/Dynamically injected
4.1.19.1.1.3.5	DIS Information

4.2 Environment

This fidelity domain describes the degree to which the environment associated with a particular DIS resource represents an actual real world system. The environment shall be described in terms of the following capabilities. Figure 56 contains the environmental capabilities.

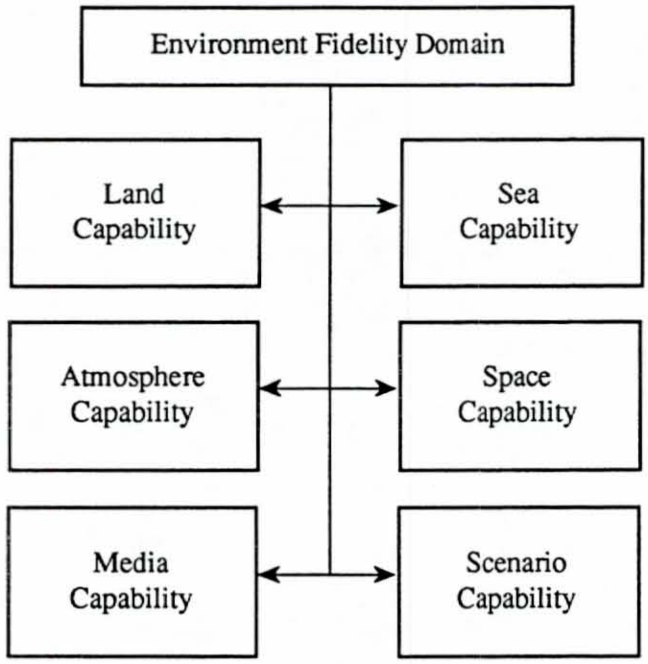

Figure 56
Environment Capabilities

4.2.1 Land:

This capability describes the properties of the earth surface and man-made and natural objects on the earth's surface. Much of the information used to generate is available in standard DMA products such as DFAD, DTED,.... Satellite imagery may also be used. Figure 57 contains land implementations.

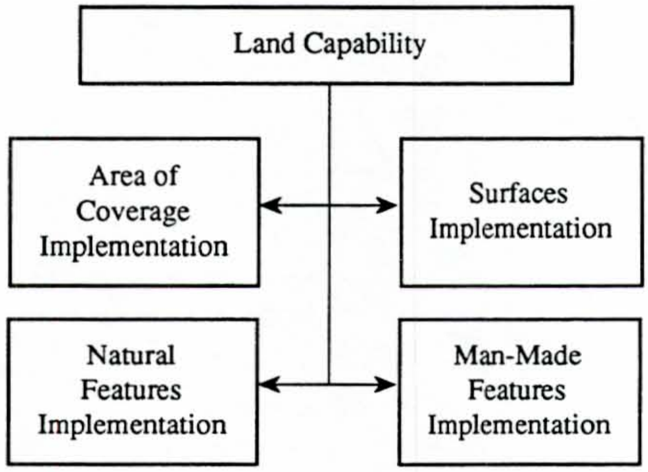

Figure 57
Land Implementations

4.2.1.1 Areas of coverage

The portion of the earth's land surface contained within the synthetic environment. Figure 58 contains Area of Coverage characteristics and descriptors.

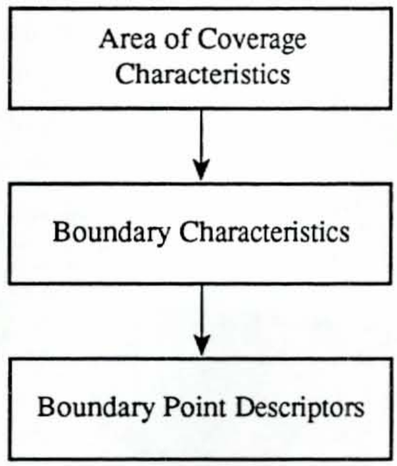

Figure 58
A.O.C. Characteristics and Descriptors

NOTE: It is not a given at least in terms of training simulation that similar areas will be available for use in all simulations.

4.2.1.1.1 Boundary (characteristic)- Describe the boundary of each area terrain covered in terms of points enclosing it in a clockwise circle.

4.2.1.1.1.1 Boundary Points (descriptor) measured in latitude and longitude using the WGS- 84 datum. The boundary between two successive points is a great circle arc.

4.2.1.2 Surface (implementation) A grid is assumed to overlay the surface. The grid is uniformly spaced in degrees, minutes, or seconds of latitude and degrees, minutes, or seconds of latitude. Characteristics of the surface will be determined at each point of the grid. If most simulators, simulations or models represent terrain as a series of posts the most consistent set of posts should be chosen. If there is little or no consistency an arbitrary set should be selected and tested. The smaller the spacing the more accurately it will be possible to compare the simulated surfaces. Figure 59 contains Surface characteristics and descriptors.

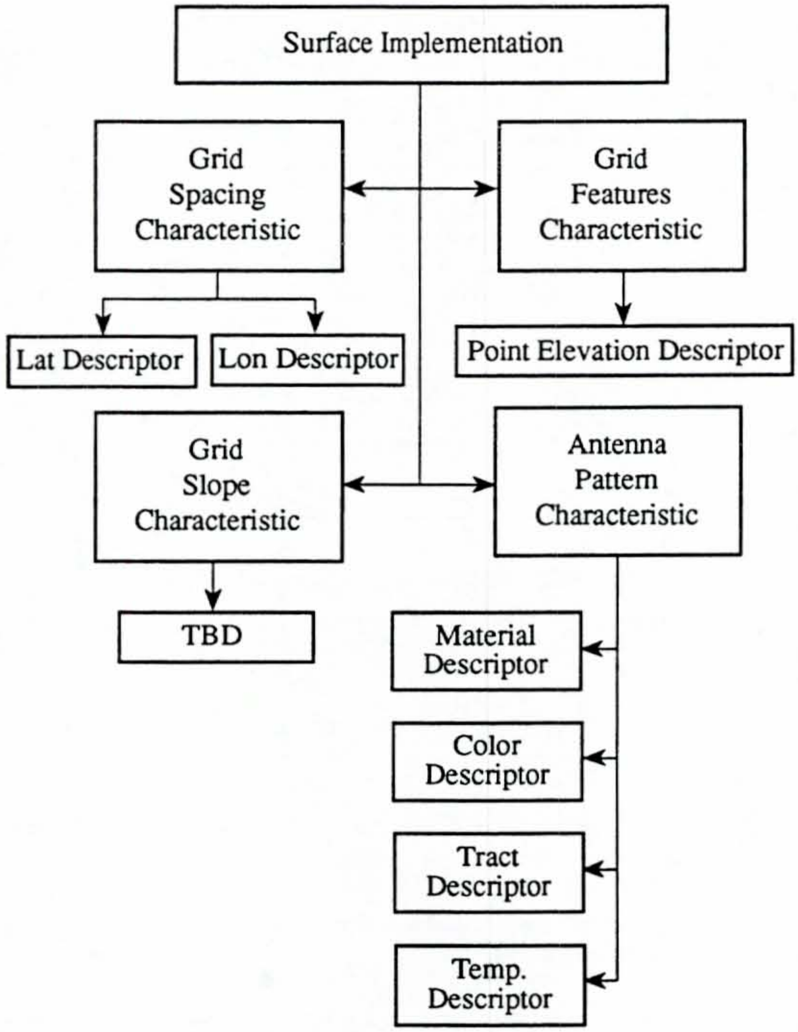

Figure 59
Surface Characteristics and Descriptors

4.2.1.2.1 Grid spacing (characteristic) defines the spacing of the grid in increments of latitude and longitude

4.2.1.2.1.1 Latitude grid spacing (descriptor) arc seconds

4.2.1.2.1.2 Longitude grid spacing (descriptor) arc seconds

4.2.1.2.2 Grid elevation (Characteristic) defines the elevation of each of the grid point.

4.2.1.2.2.1 Point elevation (descriptor) feet above MSL

4.2.1.2.3 Grid slope (Characteristic) defines the slope of the terrain at each grid point. Calculation must be consistent with the method used by the terrain modeler.

4.2.1.2.3.x Descriptors TBD slopes in several directions

4.2.1.2.4 Surface characteristics - Other properties of the surface that may affect the simulation.

4.2.1.2.4.1 Material (TBD)(descriptor)

4.2.1.2.4.2 Tractability(descriptor) - or whatever the ground people need

4.2.1.2.4.3 Color (descriptor)

4.2.1.2.4.4 Temperature(descriptor)

4.2.1.3 Natural Features (implementation) These would include lakes, rivers, fields, forests etc. Figure 60 contains the characteristics and descriptors for natural features.

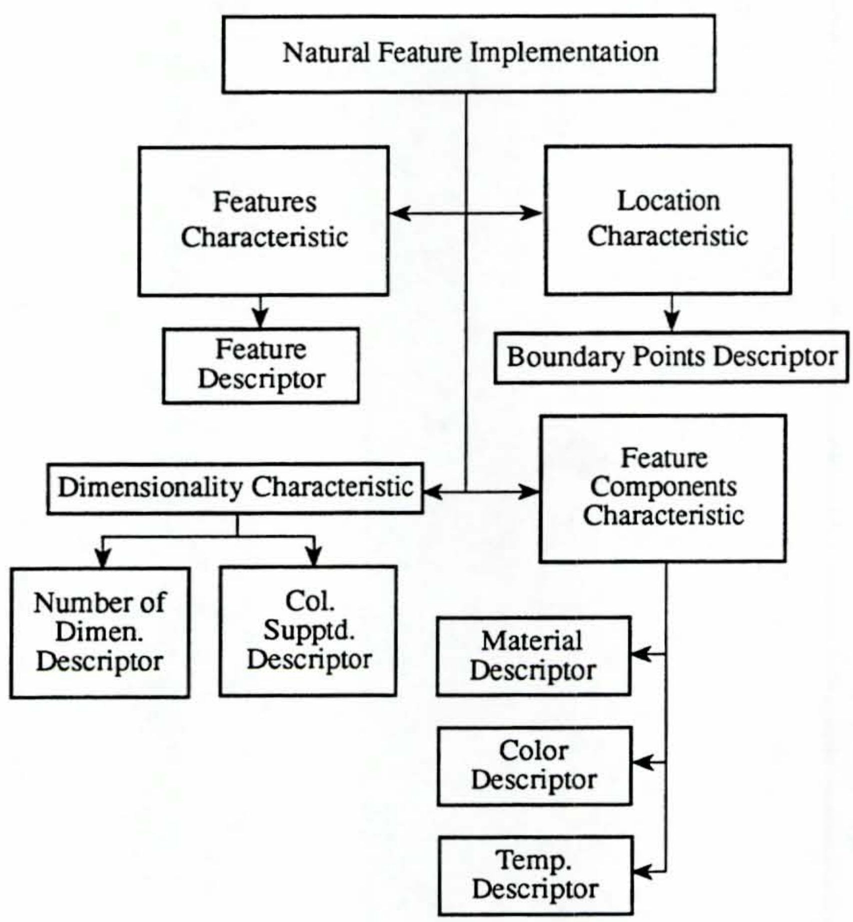

Figure 60
Natural Feature Characteristics
and Descriptors

4.2.1.3.1 Feature Presence (characteristic) Is each required feature modeled.

4.2.1.3.1.1 Describe a feature in text; is that feature present

4.2.1.3.2 Location (characteristic) Describe the boundary of each feature in the terrain area in terms of points enclosing it in a clockwise circle.

4.2.1.3.2.1 Boundary Points (descriptor) measured in latitude and longitude using the WGS- 84 datum. The boundary between two successive points is a great circle arc.

4.2.1.3.3 Dimensionally of feature (characteristic)

4.2.1.3.3.1 Number of dimensions (1, 2, or 3)

4.2.1.3.4 Feature Composition(characteristics)

4.2.1.3.4.x Descriptor (TBD) to include material, temperature, tractability, etc.

4.2.1.4 Man made Features (implementation) These would include buildings, airfields, roads etc. Figure 61 contains Man-Made feature characteristics and descriptors.

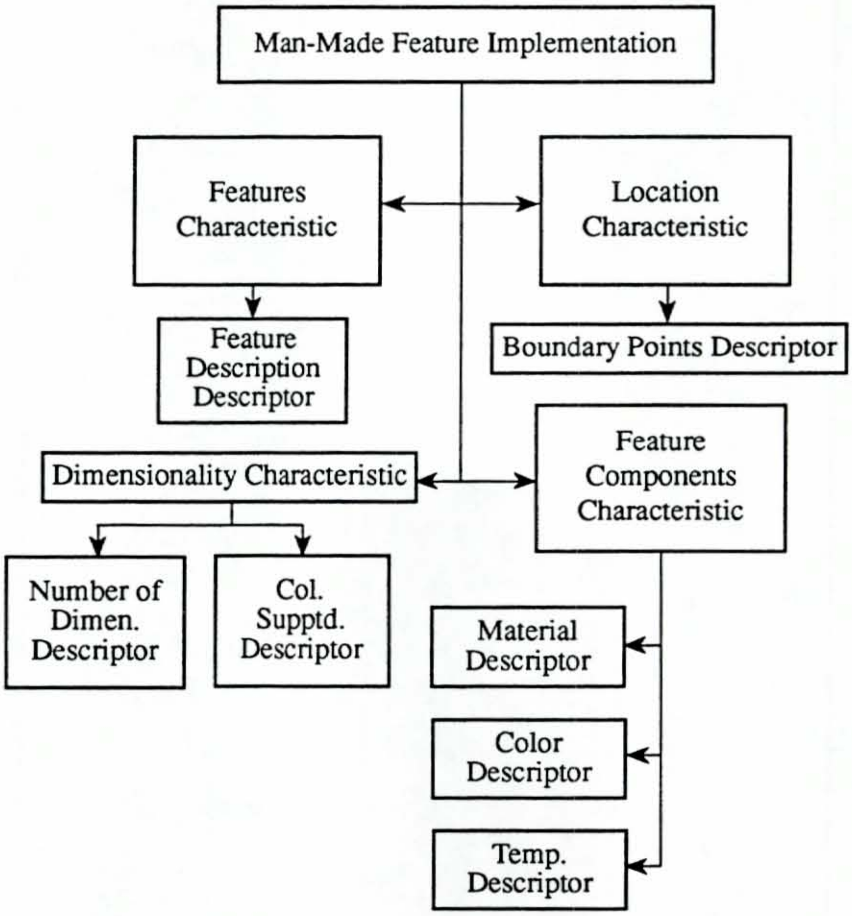

Figure 61
Man-made Feature Characteristics
and Descriptors

4.2.1.4.1 Feature Presence (characteristic) Is each required feature modeled.

4.2.1.4.1.1 Describe a feature in text; is that feature present

4.2.1.4.2 Location (characteristic) Describe the boundary of each feature in the terrain area in terms of points enclosing it in a clockwise circle.

4.2.1.4.2.1 Boundary Points (descriptor) measured in latitude and longitude using the WGS- 84 datum. The boundary between two successive points is a great circle arc.

4.2.1.4.3 Dimensionally of feature (characteristic)

4.2.1.4.3.1 Number of dimensions (1, 2, or 3)

4.2.1.4.4 Feature Composition(characteristics)

4.2.1.4.4.x Descriptor (TBD) to include material, temperature, is it hollow ,etc.

4.2.2 Sea
4.2.2.1 Sea State
4.2.2.2 Currents
4.2.2.3 Tides
4.2.2.4 Opacity
4.2.2.5 Turgidity
4.2.2.6 Salinity
4.2.2.7 Bioluminescence
4.2.2.8 Man-made Objects
4.2.2.9 Water Temperature
4.2.2.10 Seabed Characteristics
4.2.2.11 Seabed Contours and Elevation
4.2.2.12 Ice Models
4.2.2.13 Wind
4.2.3 Atmosphere
4.2.3.1 Weather
4.2.3.1.1 Precipitation
4.2.3.1.2 Haze/Dust/Obscurants
4.2.3.1.3 Humidity
4.2.3.1.4 Wind
4.2.3.1.5 Temperature
4.2.3.1.6 Clouds
4.2.3.1.7 Barometric Pressure
4.2.4 Space
4.2.4.1 Sun
4.2.4.2 Moon
4.2.4.3 Stars
4.2.4.4 Non-Entity Satellites
4.2.5 Ephemeral
4.2.5.1 Time of Day
4.2.5.2 Time of Year
4.2.6 Media
4.2.6.1 Visible spectrum
4.2.6.1.1 Luminance
4.2.6.1.2 Chromaticity
4.2.6.1.3 Texture
4.2.6.2 Non-visual Electromagnetic
4.2.6.2.1 IR
4.2.6.2.2 Radiation
4.2.6.2.3 RF Propagation
4.2.6.2.4 Background Noise
4.2.6.2.5 Ultraviolet
4.2.6.3 Acoustic
4.2.6.3.1 Ambient Noise
4.2.6.3.2 Seismic
4.2.6.4 Gravity
4.2.6.5 Earth Magnetic Field
Note To do this approach on a large scale will require automated correlation checking tools.
4.2.7 Scenario
4.2.7.1 Doctrine
4.2.7.1.1 TBD
4.2.7.1.1.1 TBD
4.2.7.1.1.1.1 Doctrinal Attributes

4.2.7.1.1.1.2 Doctrinal Influences
4.2.7.2 Geopolitics
4.2.7.2.1 TBD
4.2.7.2.1.1.
4.2.7.2.1.1.1 Limitations based on geography/politics
4.2.7.2.1.1.2 Effects on simulator as deviation from real-world behavior (EX: motion model fails to function at attitudes above 85 degrees)

4.3 Host

This fidelity domain describes the system on which a particular DIS resource operates. The host shall be described in terms of the following capabilities.

4.3.1 Non-traditional Controls and Displays
4.3.1.1 Instructor Operator Station
4.3.1.2 Student Program Int'l Station
4.3.1.3 Motion Systems
4.3.1.4 Damage Control
4.3.2 Embedded Features
4.3.2.1 Embedded Training
4.3.2.2 Shared memory capability
4.3.2.3 Embedded Computer Generated Forces
4.3.3 Support Personnel
4.3.3.1 Operations (cold start, etc.)
4.3.3.2 HW/SW Maintenance
4.3.3.3 Instructors
4.3.3.4 Data (entry, updates, etc.)
4.3.4 Data Logging
4.3.4.1 Storage capability
4.3.4.2 Data Access
4.3.5 Computational Capacity
4.3.5.1 Architecture
4.3.5.1.1 CPU
4.3.5.1.2 Parallel Processing
4.3.6 Image Generation and Display
4.3.6.1 System Performance Implementation

4.3.6.1.1 Update (Frame) Rate:

Definition: The rate at which the image is computed for an updated eye point position

Source: Image Generator Survey2

Rationale: Update rate is one criterion which affects the smoothness of an image. In numerous studies, the smoothness of the displayed image has been shown to affect a crew's ability to perform tasks without degradation of performance from the real world.

4.3.6.1.2 Transport Delay

Definition: The time required to compute a new eye point position measured from the receipt of a new eye point position by the IG to the completion of generating an updated field.

(Alternate): The time required to propagate data from the initiation of a visual system cycle, with time-corrected (extrapolated) control input from the simulator computer, to the last picture element

of the most recently updated field. Transport delay does not include the time associated with the asynchronous simulator/visual computer interface, or with simulator delay contribution.

Source: Image Generator Survey[RM1]2

Rationale: Image generator transport delay is part of the overall network latency measurement. Network latency is a factor in the ability to perform certain tasks in a network environment (such as aerial refueling and formation flight).

4.3.6.1.3 Field of View (IG)

Definition: The maximum angular extent, measured horizontally and vertically, for which an image generator can instantaneously produce imagery in a given simulation. Note: For many applications, there are multiple fields of view. In these cases, each field of view must be listed.

Source: None.

Rationale: Field of View must be representative of the real-world for certain testing and training applications. Studies4 have shown that failure to properly match the real-world field-of-view can lead to negative training and erroneous results in research applications

4.3.6.1.4 Field of View (Display)

Definition: The extent or coverage of a visual system over which images will be displayed and outside of which darkness is generally evident. Images may have been produced by one or more image generators. There are three fundamental characteristics of FOV: shape, size, and orientation. The boundaries of the FOV are limited to the physic geometry of the trainer out of which the observer looks. The shape is defined by mapping the points on its boundary in terms of the two plane angles with origin at the observer's eye, and reference (look) direction parallel to air craft body x-axis, and order of rotation (look direction rotated into right wing tip about an axis normal to reference direction and then rotated toward the aircraft zenith until it intersects a point on the boundary). Source: AGARD Advisory Report Number 164, Characteristics of Flight Simulator Visual Systems.

Rationale: The FOV is the pilot's window to the world. Because certain parts of the outside world scene are important to the accomplishment of the flight tasks, the shape, orientation, and size of the FOV influences the way the pilot flies the simulated aircraft. If any of the visual scene features important to the task are outside the simulated field boundary, the pilot's performance and behavior will likely be different from what it would be in the real world.

4.3.6.2 Image Characteristics

4.3.6.2.1 Polygonal Throughput

Definition: The total number of polygons which can be drawn by an image generator within a fixed amount of time

Source: Image Generator Survey[RM2]2

Rationale: The polygonal throughput of an image generator is one measure of the maximum scene complexity which can be displayed. The choice of triangles/second as the unit of measure

allows standardization of terminology across multiple vendors, since the terms "polygon" and "triangle" are synonymous for some image generators. For those vendors that can render non-triangular polygons, this measurement becomes the equivalent number of triangles/second which can be rendered by the system.

4.3.6.2.2 Scene Resolution

Definition: The minimum angular distance, measured both horizontally and vertically, which may be portrayed in the computed image.

Source: None.

Rationale: Scene resolution limits the types of operations which may be performed in a particular simulation. For example, range may disappear in the simulation at a smaller distance than they would in the real-world because their computed size is smaller than the scene resolution.

4.3.6.2.3 Position Accuracy

Definition: The maximum difference between the computed position of an object in the image generator and its corresponding position in a reference data base.

Source: None.

Rationale: Allows an exercise planner to determine whether there is sufficient similarity between two simulations to perform a given mission. A question still remains as to how such accuracy can be tested.

4.3.6.2.4 Attitude Accuracy

Definition: The maximum difference between the computed attitude of an object in the image generator and its corresponding attitude in a reference data base.

Source: None.

Rationale: Allows an exercise planner to determine whether there is sufficient similarity between two simulations to perform a given mission. A question still remains as to how such accuracy can be tested.

4.3.6.2.5 Number of Dynamic Models

Definition: The number of dynamic models supported by the image generator, and the number of degrees of freedom supported by each model.

Source: Image Generator Survey2

Rationale: The number of moving models supported by an image generator determines the amount of filtering required by the network node. Certain tasks may be unrealistic unless all models in the network environment are represented, although some filtering will probably be acceptable for most applications. The inclusion of the degrees of freedom/model allows comparison of image generators using an unbiased measurement, since vendors describe the number of moving models in a variety of ways.

4.3.6.2.6 Dynamic Model Update Rate

Definition: The rate at which the transformation between the data base reference coordinate frame and the dynamic coordinate frame is computed.

Source: None.

Rationale: The smoothness of moving model motion has been shown to affect a crew's ability to perform tasks without degradation of performance from the real world.

4.3.6.2.7 Displayed Polygons

Definition: The total number of polygons which can be simultaneously displayed by an image generator.

Source: None.

Rationale: Displayed polygons is one measure of the maximum scene complexity which can be displayed. Even if an image generator can process a very high data base density, it can still display a limited number of polygons. therefore, as data bases increase in size, the achievable data base density of the system is reduced.

4.3.6.2.8 Time of Day Representation

Definition: The number of unique times of day supported by simulation. During daytime, the time of day is defined by a unique sun angle. At night, time of day is defined by unique lighting conditions (moon phases, stars, constellations, etc.).

Source: None.

Rationale: Time of day is an important factor in most mission operations. An unfair advantage may be given to a simulation which models time of day less rigorously than another simulation.

4.3.6.2.9 Sun Angle

Definition:
Source:
Rationale:

4.3.6.2.10 Moon Phase

Definition:
Source:
Rationale:

4.3.6.2.11 Time of Year Representation

Definition: The number of unique times of year supported by simulation. Unique times of year are characterized by variations of leaf thickness and color in foliage, variations in reflectance and IR returns from certain materials, water levels, sun angle relative to time of day, and similar seasonal factors.

Source: None.

Rationale: Time of year is an important factor in many mission operations. An unfair advantage may be given to a simulation which models time of year less rigorously than another simulation.

4.3.6.2..12 Colors Supported

Definition: The total number of colors supported and the device independent value of each supported color.

Source: None.

Rationale: Allows a device independent measurement and specification of color values which is also independent of the application and the data base used (unlike target/background contrast).

4.3.6.2.13 Texture

Definition: A process of adding 2-Dimensional modulated video patterns (texel maps) to the traditional flat, smooth, or fixed-shaded polygons. By varying the scales and positions of the maps, a great variety of patterns can be achieved with only a few maps. Source: IMAGE IV Conference, June 1987

Rationale: Texture multiplies scene content (scale, shape, and proportion) and yields significant operational and functional benefits to the visual system by supporting increased emergence of optical flow in relation to the pilot's heading; extended dynamic range of operational altitudes; improvement in scene density and peripheral cueing; improvement of sensor imagery; increased aesthetic realism of displayed scene; enhanced proximity judgment of objects; and releases polygons to enable resources to be applied to more specific scenery.

4.3.6.2.14 Texture Memory

Definition: The number of different texture maps available.

Source: Image Generator Survey2

Rationale: Texture Memory is one measure of the maximum scene complexity which can be displayed. Even if an image generator can process relatively few polygons , it may still display a sufficient image for a particular application if the texture memory (and map size) are large enough.

4.3.6.2.14.1 Texture Map Size

Definition: The number of texels within an individual map, and the number of map sizes available.

Source: Image Generator Survey2

Rationale: Texture Map Size is one measure of the maximum scene complexity which can be displayed. Even if an image generator can process relatively few polygons , it may still display a sufficient image for a particular application if the texture map size (and texture memory are large enough.

4.3.6.2.15 Level Of Detail (LOD) Blending

Definition: A process (employing LOD transitions based on viewing range) by which contiguous levels-of-detail can be matched at their boundaries such that the visible effects of the scene content changes are indistinguishable. Process optimizes blending in both the spatial domain and in the frequency domain.

Source: None.

Rationale: Eliminates objectionable boundary discontinuities between LOD scenes and consequently reduces stress induced by visual anomalies.

4.3.6.2.16 Antialiasing

Definition: A method by which the visual anomalies associated with quantizing and sampling at various stages of the generation, processing, and display of raster-type images are either eliminated, or reduced to acceptable levels.

Source: None.

Rationale: Minimizes the basic disparity between how CIG scenes are modeled and how they are displayed. The CIG models embody very high implied spatial bandwidths as represented by sharp edge boundaries, fine detail, and point sources (lights).

4.3.6.2.17 Transparency/Translucency

Definition: Transparency is the ability to view through a polygon to an underlying polygon. Translucency is the ability to partially view through a polygon, as is the case in smoke clouds, or when looking down at a shallow river.

Source: None.

Rationale: TBD

4.3.6.2.18 Luminous Polygons

Definition: Polygons which are displayed at their full intensity (i.e. day mode) intensity when the system is in dusk or night mode.

Source: Image Generator Survey2

Rationale: TBD

4.3.6.2.19 IR Encoding

Definition: Process includes IR emissivity, atmospheric and sensor system effects, divided into three distinct stages: 1) Off-line data base processing, 2) Real-time CIG processing, 3) Post-processing.. Off-line process includes determining data base geometry, taking the appearance of IR imagery into account. Real-time IR processing is performed by the CIG and provides the atmospheric attenuation effects of slant range, wavelength, clouds, humidity, rainfall, etc.

Post-processing provides effects not attainable within the CIG system, i.e. optical transfer function, receiver bandwidth, scan format, noise, scan conversion, gain control, and system anomalies.

Source: None.

Rationale: Correlated out-the-window and sensor visual data bases are key elements in meeting tactical operations requirements. Devices with IR have the capability to detect, recognize, and engage targets at extended standoff ranges. This gives a tactical advantage over those devices without IR.

4.3.6.2.20 Light Sources (Visual and IR)

Definition: Ownship search and landing lights, reflections from land and water, sun, moon, stars, horizon glow, flares, detonations, and navigation/landing devices.

Source: None.

Rationale: Necessary to create realistic visual environment for day, dusk, and night operations training.

4.3.6.2.21 Cloud/Haze/Fog

Definition: Visual simulation of atmospheric and meteorological effects representing light attenuation as a composite effect of each visibility layer. Visibility is a function of distance along the line-of-sight through each visibility region (cloud, haze, fog). A cloud model can be a textured cloud (white with varying transparency pattern), or a continuous cloud (solid layer with controllable top and bottom height). Fog is that region extending from the ground to a delectable altitude with a density determined by visibility and runway visual range (RVR) control setting. Haze is the attenuation of light by the atmosphere in regions not occupied by the cloud or ground fog.

Source: None.

Rationale: Necessary to provide realistic atmospheric conditions.

4.3.6.2.22 Weather/Thunderstorm

Definition: Atmospheric phenomenon displayed as a thunderhead above the cloud layer and as an area of heavy rain below the cloud layer, with random flashes of lightning (in cloud, cloud to cloud, and cloud to ground).

Source:

Rationale: Required for training in adverse training conditions.

4.3.6.2.23 Special Effects

Definition: TBD
Source: TBD
Rationale: TBD

4.3.6.3 Data Base Characteristics

4.3.6.3.1 Data Base Size

Definition: The maximum area which can be stored by an image generator

Source: None.

Rationale: Interoperable simulations require that the gaming areas be identical in size and general content for the area of interest. The choice of square kilometers for units (as opposed to geo-cells or square nautical-miles) supports a more universal application of the measurements (for example, geo-cells vary in size depending on the latitude at which they are measured.

4.3.6.3.1.1 Active Data Base Size

Definition: The maximum area which can be instantaneously accessed by an image generator

Source: None.

Rationale: Interoperable simulations require that the active, displayed gaming areas be of sufficient similarity in size and content to allow interactions to occur in a manner similar to the real world. The choice of square kilometers for units (as opposed to geo-cells or square nautical-miles) supports a more universal application of the measurements (for example, geo-cells vary in size depending on the latitude at which they are measured.

4.3.6.3.2 Data Base Coordinate:

Definition: The minimum distance represented within the data base.

Source: None.

Rationale: Affects position accuracy.

4.3.6.3.3 Dynamic Model

Definition: Any data base object in which any degree of freedom is not fixed to the data base reference coordinate system.

Source: Image Generator Survey2

Rationale: Necessary to accurately measure the number of dynamic models.

4.3.6.3.4 Data Base Density

Definition: The average number of polygons which can be computed for a given area.

Source: None:

Rationale: The data base density of an image generator is one measure of the maximum scene complexity which can be displayed. The choice of triangles/square kilometer as the unit of measure allows standardization of terminology across multiple vendors, since the terms "polygon" and "triangle" are synonymous for some image generators, and since the measurement of data base size is inconsistent from vendor to vendor. For those vendors that can render non-triangular polygons, this measurement becomes the equivalent number of triangles/square kilometer which can be rendered by the system.

4.3.6.3.5 Data Base Source

Definition: The data source(s) which can be used to generate a data base.

Source: None.

Rationale: Until such time as the DIS specifies a standard data base format, it will be necessary for exercise planners to know whether a source data base can be used by a particular simulation.

4.3.6.3.6 Data Base Generation Time

Definition: The time required to generate a visual data base of given size, measured from the time that the source data is received to the time that the visual data base is ready for use.

Source: None.

Rationale: For mission rehearsal applications, data base generation speed will be a factor in choosing simulations for a networked exercise.

4.3.6.3.7 Texture

Definition: The process of mapping a photograph or computer generated synthetic texture image onto a polygon.

Source: Wyckoff5

Rationale: Necessary to define texture memory, map size, maps/polygon.

4.3.6.4 Environmental Feedback

4.3.6.4.1 Test Frequency

Definition: The maximum rate at which environmental feedback tests may be performed, where a test is defined as the process of retrieving all requested information between two points in the data base.

Source: Matusof6

Rationale: For many applications, the interactions between the crew and the simulated environment is important for the outcome of the exercise. Exercise planners will need to know if a simulation provides appropriate environmental feedback.

4.3.6.4.2 Test Latency

Definition: The maximum time for the image generator to return the results from an environmental feedback test, measured from the time that the request is issued to the time that a response is received.

Source: Matusof6

Rationale: For certain tasks (such as aerial refueling), the latency of the environmental feedback could adversely affect the outcome of the exercise.

4.3.6.4.3 Test Accuracy

Definition: The maximum difference between the result of the calculated environmental feedback test and corresponding physical reality of a reference data base..

Source: Matusof6

Rationale: For most tasks, the accuracy of the environmental feedback test could adversely affect the outcome of the exercise, especially those tasks which require interoperation between players (handover tasks) .

4.3.6.4.4 Test Types

Definition: The environmental feedback information required from the image generator.

Source: Matusof6

Rationale: Handover tasks may require that environmental feedback is provided in a consistent manner in all simulations.

4.3.6.4.5 Terrain Clamping

Definition: TBD
Source: TBD
Rationale: TBD

4.3.7 VV&A Activities
4.3.7.1 History
4.3.7.2 DIS VV&A Process
4.3.8 Simulation Class
4.3.8.1 Virtual
4.3.8.2 Live
4.3.8.3 Constructive
4.3.8.4 Mixture
4.3.9 Security
4.3.9.1 Encryption Device
4.3.9.2 Tempest
4.3.10 Configuration Management

4.3.10.1 Tracking System

4.3.11 DIS Compliance & Compatibility

4.3.11.1 DIS Version

4.3.11.1.1 PDU's supported

4.3.11.2 Interface Software (i.e.: NIU, CAU, CIU, DIU)

4.3.11.2.1 Dead Reckoning

4.3.11.2.1.1 Algorithm

4.3.11.2.2 Coordinate System

4.3.11.2.2.1 Precision

4.3.11.2.3 Filtering

4.3.11.2.3.1 Distance

4.3.11.2.3.2 PDU type

4.3.11.2.3.3 Exercise Number

4.3.11.2.4 Version Translation

4.3.11.2.4.1 DIS 1.0

4.3.11.2.4.2 SIMNET 6.6.1

4.3.11.2.5 Capacity

4.3.11.2.5.1 PDU's per ?

4.3.11.2.6 Aggregation/Deaggregation

4.4 Site

The site shall be described in terms of the following capabilities.

Site Domain-

The group of capabilities associated with one or more hosts and their supporting environment. An example of a site would be the complex of SIMNET trainers at Ft. Knox, consisting of networked simulators (via SIMNET) and with a DIS interface unit acting as a gateway to a larger DIS network.

On this Site domain-

Note we started with a definition of the domain, and then list capabilities (third level) and provide implementations examples for the fourth level. You are welcome to have at this, but please consider our need to elaborate as we go along. As you recall, we have deleted units of measure for all but the descriptor level, and are focusing on definitions, sources of definitions, and brief rationale for each of the nodes in the taxonomy. If you can provide these, we will be further along.

4.4.1 Clocks

4.4.1.1 Time Code Generation and Reconciliation

4.4.1.2 Network time stamping

4.4.1.3 GPS

4.4.1.4 WWV

4.4.2 Data Logging

4.4.2.1 Network logging

4.4.2.1.1 host instrumentation

4.4.2.1.2 simulation application instrumentation

4.4.3 Security

4.4.3.1 Network Security

4.4.3.3 Tempest

4.4.4 Supporting Hosts

4.4.4.1 LAN
4.4.4.2 Channel to Channel
4.4.4.3 Non-DIS WAN
4.4.4.4 remote analog

4.4.5 Data Exchange
4.4.5.1 Physical Connection

4.4.6 Networks
4.4.6.1 DSI Capable
4.4.6. 2 ADWS
4.4.6.3 TERIS (Test and Evaluation Range Interneting System)
4.4.6.4 Stellite

4.4.7 Past VV&A activities
4.4.7.? TBS by VV&A subgroup

4.4.8 Past DIS VV&A Activities
4.4.8.? TBS by VV&A Subgroup

4.4.9 Past DIS Activities

4.4.10 Support Facility
4.4.10.1 Computer System Administration
4.4.10.2 Personnel Logistics and Administration
4.4.10.3 Uninterrupted Power
4.4.10.4 Data Reduction and Analysis Tools
4.4.10.5 Video Teleconferencing
4.4.10.6 Presentation Facilities

4.4.11 Simulation Management

5. Processes

5.1 Characterization

DIS Owners shall provide all information required by Section 4 for their simulator, simulation, or model as part of DIS qualification. DIS Owners shall update the information whenever it changes. For DOD applications a Verification, Validation and Accreditation process will be performed on the simulator, simulation, or model in accordance with applicable service/component regulations.

5.2 Selection

DIS Users shall use a logical process to define the simulators, simulations, and models to be used in a DIS application. The process shall be based on:

a. Objectives of the application

b. Fidelity characteristics as defined by Section 4.

c. Company or agency policy or regulations.

d. Costs and availability of particular simulators, simulations, and models.

For DOD activities and when otherwise required by company or agency policy or regulation, a Verification, Validation and Accreditation process must be performed to assure the simulation application will achieve the required result. It is imperative that all DIS users document the selection process to assist future users in their selection activities.