

U.S. MARINE

MODEL DESCRIPTION DOCUMENT (MDD)

Version 1.0



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DOCUMENT REVISION HISTORY

Version	Description	Date
0.1	Draft	01/07/15
1.0	Initial Release	09/11/15

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY i

TABLE OF FIGURES iii

TABLE OF TABLES iii

1 MODEL OVERVIEW 1

 1.1 DESCRIPTION 1

 1.2 REFERENCES 1

 1.3 MODEL VERSION and History 2

 1.4 MODEL SUMMARY 2

 1.5 LICENSING/RIGHTS 3

2 MODEL ATTRIBUTES 4

 2.1 POLYGON ALLOCATION 4

 2.2 LEVEL OF DETAIL (LODS) 4

 2.3 TEXTURE MAPS 4

 2.4 SENSOR VIEWS 5

 2.5 HEALTH STATES 5

 2.6 SKELETAL STRUCTURE 5

 2.6.1 JOINTS IN THE RIG 5

 2.6.2 ATTACH POINTS AND ATTACH MODELS 6

3 ANIMATIONS 7

4 VERIFICATION APPROACH 7

 4.1 RUNTIME SYSTEMS 7

5 LIMITATIONS 7

6 CONTACT INFORMATION 7

TABLE OF FIGURES

Figure 1 U.S. Marine Character Model 2

Figure 2 U.S. Marine Origin on Cartesian X, Y, Z Coordinate System 3

Figure 3 U.S. Marine Texture Map 4

Figure 4 U.S. Marine Normal Map..... 5

TABLE OF TABLES

Table 1 Character Revision History 2

Table 2 Model Summary..... 3

Table 4 Polygon Allocation..... 4

Table 5 Naming Convention for Joints..... 6

Table 5 Attached Models..... 6

1 MODEL OVERVIEW

1.1 DESCRIPTION

This document details the 3-Dimensional (3D) model of a U.S. Marine character. The U.S. Marine character model can be used with and without weapons and with a set of animations (see the specific weapons and animations Model Description Documents for more information). Weapons are attached and detached from the U.S. Marine character model at specific attach points. During runtime weapons are attached and detached to the model by the visualization system that controls the 3D model. This model can be used with any visualization system that can import FBX or COLLADA formats.

The U.S. Marine character model was developed by Dignitas Technologies for the SE Core DT Phase III Small Business Innovative Research (SBIR) project. The model is part of a larger set of character and weapon models, and animations, developed to support the LVC-IA AAR 3D Viewer. The model design was based on screen captures of the CCTT DI Guy U.S. Marine model provided by SE Core and the VBS3 U.S. Marine model provided by LVC-IA. To meet the LVC-IA AAR performance requirement, a medium fidelity model was developed.

The U.S. Marine character model components include:

- Desert ACU (Army Combat Uniform) Fatigues
- ACH (Advanced Combat Helmet)
- IBA (Interceptor Body Armor)
- Knee Pads
- Elbow Pads
- Combat Gloves
- Combat Boots
- Ballistic Glasses

1.2 REFERENCES

- 3D_Model_Development_Process.docx
 - The 3D model development process details Dignitas Technologies' procedure for building 3D characters and animations.
- Character_Model_Specification.docx
 - The character model specification provides the requirements for developing 3D character models and attachments.



Figure 1 U.S. Marine Character Model

1.3 MODEL VERSION AND HISTORY

Information about the model version can be found in the “Model_Version.txt” file located in the model’s directory (same directory the model’s .fbx file is located).

Table 1 Character Revision History

Version	Description	Date
1.0	Initial release of the US_Marine_skelmesh.fbx	05/22/15

1.4 MODEL SUMMARY

Table 2 Model Summary

Model Name	US_Marine_skelmesh.fbx
SE Core MEL Version L ID	903
Model Units	Meters
Model Height	2 Meters (units) or 200 Centimeters
Coordinate System	Cartesian X, Y, Z (see Figure 2 below)
Model Origin	Origin is located on the ground between the character's feet. (0, 0, 0) (See figure 2 below)
Model Orientation Runtime	Forward: Positive Y Up: Positive Z
Model Orientation Maya	Forward: Positive Z Up: Positive Y



Figure 2 U.S. Marine Origin on Cartesian X, Y, Z Coordinate System

1.5 LICENSING/RIGHTS

Models built by Dignitas Technologies along with all files and documentation, have full Government Purpose Rights.

2 MODEL ATTRIBUTES

2.1 POLYGON ALLOCATION

Polygon allocation is the number of triangles and vertices for a given state and Level of Detail (LODs) in the model. The method for calculating the number of polygons is to gather each model state then count the polygons present in each representation. Animations are not included in the polygon allocation. The U.S. Marine (unarmed) character model has a single LOD which is labeled LOD0.

Table 3 Polygon Allocation

Model	# of Triangles	# of Vertices
US Marine (unarmed)	3270	1711

2.2 LEVEL OF DETAIL (LODS)

Dignitas supports only one LOD (LOD0) and no switch distances at this time.

2.3 TEXTURE MAPS

Textures:

- US_Marine_COL.dds (Diffuse) 2048 x 2048 pixels
- Texture Version: 1.0



Figure 3 U.S. Marine Texture Map

- US_Marine_NRML.dds (Normal map) 2048 x 2048 pixels
- Texture Version: 1.0

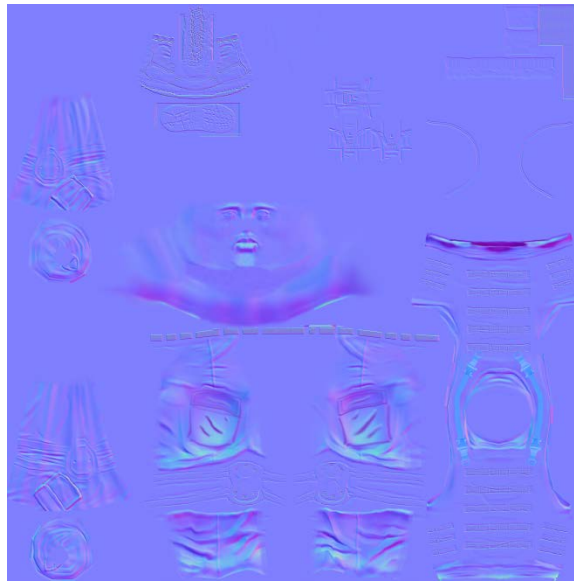


Figure 4 U.S. Marine Normal Map

2.4 SENSOR VIEWS

Not applicable at this time.

2.5 HEALTH STATES

For more information on the Incapacitated and Killed States refer to their respective MDDs.

Healthy State

Incapacitated State

Killed State

2.6 SKELETAL STRUCTURE

2.6.1 JOINTS IN THE RIG

A **rig** is a skeleton that attaches to the 3D model to allow for animations to be added. The **joints** in the rig hold the translation and rotational data from the animations.

Naming convention for joints:

Table 4 Naming Convention for Joints

Hips	RightForeArm
Spine	RightHand
Spine1	RightThumbBase
Neck	RightThumbTip
Head	RightHandTip
HeadEnd	LeftUpLeg
LeftShoulder	LeftLeg
LeftArm	LeftFoot
LeftForeArm	LeftToeBase
LeftHand	LeftToe
LeftThumbBase	RightUpLeg
LeftThumbTip	RightLeg
LeftHandTip	RightFoot
RightShoulder	RightToeBase
RightArm	RightToe

2.6.2 ATTACH POINTS AND ATTACH MODELS

The model rig and the **Attach Model** (e.g. weapons, cell phones, etc) both have **Attach Points** where they can be connected (“attached”) during runtime. **Attach Points** are unweighted joints on the model rig that represent locations where **Attach Models** can be connected. Attachments occur during runtime based on the animation applied to the model rig. Table 5 lists all Attach Points, associated Attach Models, and corresponding animations for this character model.

Table 5 Attached Models

Attach Point (on Rig)	Attach Model	Animations
stowedWeaponAttach	M16A2 (foregrip)	All stowed animations
LeftHandWeaponAttach	M16A2 (foregrip)	All WeaponAtReady and WeaponFiring animations
RightHandWeaponAttach	M16A2 (pistolgrip)	Incapacitated and Killed animations
stowedWeaponAttach	M4 with RCO (foregrip)	All stowed animations
LeftHandWeaponAttach	M4 with RCO (foregrip)	All WeaponAtReady and WeaponFiring animations
RightHandWeaponAttach	M4 with RCO (pistolgrip)	Incapacitated and Killed animations

3 ANIMATIONS

The animations associated with this character are shown below. For additional animations compatible with this character, or more information on those listed above, please refer to the Animation MDDs.

- Walking
- Running
- Crawling
- Standing
- Kneeling
- Prone
- Incapacitated
- Crouching
- Killed

4 VERIFICATION APPROACH

4.1 RUNTIME SYSTEMS

This 3D model, associated accessories and weapons, and animations were tested using the following:

- Veritas 3D Viewer v1.13
- Veritas Model Viewer v1.4
- FBX Viewer 2013.3
- OneSAF v8.0

5 LIMITATIONS

Killed state is not implemented yet, however, it is under development.

6 CONTACT INFORMATION

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