U.S. SOLDIER

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

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1   MODEL OVERVIEW

1.1   DESCRIPTION

This document details the 3-Dimensional (3D) model of a U.S. Soldier character.   The U.S. Soldier 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. Soldier 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. Soldier 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. Soldier model provided by SE Core and the VBS3 U.S. Soldier model provided by LVC-IA. To meet the LVC-IA AAR performance requirement, a medium fidelity model was developed.

The U.S. Soldier character model components include:
- Scorpion OCP (Operation Camouflage Pattern 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. Soldier Character Model

1.3   MODEL VERSION

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_Soldier_skelmesh.fbx	10/03/14

1.4   MODEL SUMMARY

Table 2 Model Summary

Model Name	US_Soldier_skelmesh.fbx
SE Core MEL Version L ID	849
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: Negative Z Up: Positive Y

Figure 2 U.S. Soldier 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. Soldier (unarmed) character model has a single LOD which is labeled LOD0.

Table 3 Polygon Allocation

Model	# of Triangles	# of Vertices
US Soldier (unarmed)	3300	1753

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

Figure 3 U.S. Soldier Texture Map

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

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:

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

2.6.2   ATTACH POINTS AND ATTACHED 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.

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 (foregrip)	All stowed animations
LeftHandWeaponAttach	M4 (foregrip)	All WeaponAtReady and WeaponFiring animations
RightHandWeaponAttach	M4 (pistolgrip)	Incapacitated and Killed animations
RightUpLeg	M9 Pistol (pistolgrip)	All stowed animations
RightHandWeaponAttach	M9 Pistol (pistolgrip)	All WeaponAtReady and WeaponFiring animations
RightHandWeaponAttach	M9 Pistol (pistolgrip)	Incapacitated and Killed animations
stowedWeaponAttach	M249 (foregrip)	All stowed animations
LeftHandWeaponAttach	M249 (foregrip)	All WeaponAtReady and WeaponFiring animations
RightHandWeaponAttach	M249 (pistolgrip)	Incapacitated and Killed animations
stowedWeaponAttach	M240 (foregrip)	All stowed animations

LeftHandWeaponAttach	M240 (foregrip)	All WeaponAtReady and WeaponFiring animations
RightHandWeaponAttach	M240 (pistolgrip)	Incapacitated and Killed animations
stowedWeaponAttach	Javelin (foregrip)	All stowed animations
RightHandWeaponAttach	Javelin (pistolgrip)	All WeaponFiring animations
RightHandWeaponAttach	Javelin (pistolgrip)	Incapacitated and Killed animations
stowedWeaponAttach	AT4 (foregrip)	All stowed animations
RightHandWeaponAttach	AT4 (pistolgrip)	All WeaponFiring animations
RightHandWeaponAttach	AT4 (pistolgrip)	Incapacitated and Killed animations
stowedWeaponAttach	Stinger FIM 92 (foregrip)	All stowed animations
RightHandWeaponAttach	Stinger FIM 92 (pistolgrip)	All WeaponFiring animations
RightHandWeaponAttach	Stinger FIM 92 (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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