



# VRU Victim database specifications

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## Document properties

### History

Revision: 3

- Author(s): Chris Haarmeijer
- Date: October 27th, 2010
- Changes:
  - Updated according to meeting on the 26th
  - Adapted LOD levels, model not in T-pose but arms at 45 degrees and added motion tests

Revision: 2

- Author(s): Chris Haarmeijer
- Date: October 6th, 2010
- Changes:
  - Updated according to latest meeting
  - Two skeletons (male/female) instead of one
  - Optimized structure, merged some parts

Revision: 1

- Author(s): Martijn Boosman, Chris Haarmeijer
- Date: May 20th, 2010
- Changes: Initial specification

### Acceptance

..... (signature) ..... (date) ..... (place)

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## Introduction

The specification found in this document provides the basis for all victim models that will be created for the VRU Victim database project. These specifications were drafted by the four companies participating in this project (in no particular order): E-Semble, VSTEP, ETC Simulation and re-lion.

**Note:** not included in this specification is animation and simulation. That is the responsibility of the package that will be used to display the victims (i.e. 3D engine).



# Technical Specification

## File Formats

All models must be provided in source format. This means 3DSMAX 2010 or 2011. It may be superfluous to mention, but the file extension is \*.max. All models should be exportable to the Collada format, using the NextGen Collada Exporter plugin for 3DSMAX (<http://www.opencollada.org/download.html>), and to the .X format using the PandaSoft X-exporter ([http://www.andytather.co.uk/Panda/directxmax\\_downloads.aspx](http://www.andytather.co.uk/Panda/directxmax_downloads.aspx)).

## Coordinate System and Units

All models must be set up using the standard 3DSMAX coordinate system, which is a right handed cartesian coordinate system with the Z-axis up. Units are in meters, and the model should be positioned at the origin.

## Basic Rules

Although every character is different, there are some basic rules they all must comply to:

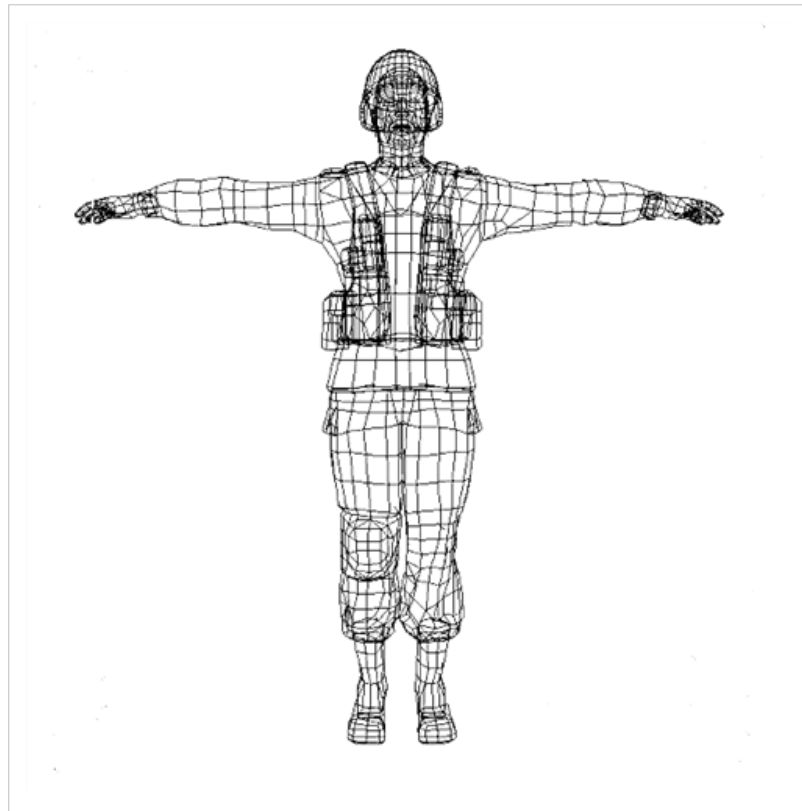
- Characters should be modeled NOT in T-pose but with arms at a 45 degree downward angle to prevent creases.
- Characters should be rigged to the skeleton that comes with this document.
- Characters should consist of only 1 surface.
- The characters pivot point must be between the feet, at [0,0,0].
- Rigging must be done using the Skin modifier. For useful results, it is not allowed to use conversion plugins that convert the physique modifier to the skin modifier.
- Bones may not be scaled or repositioned. They may be rotated however to fit the mesh better, if required. If the mesh is too big or too small, it must be scaled to fit the skeleton.
- All vertices must be welded.
- All mesh transformations must be reset, using the "Reset X-Form" command, and then collapsed to an editable poly. This must be done before the skinning/rigging process is started.

## Levels of Detail

Although every model has it's own requirements, a typical total polygon count for a character is approximately 8000 triangles at its highest level of detail. All polygon counts should be as low as possible, and well balanced with the required model detail and the texture detail.

Characters must be provided with 4 levels of detail (LOD's):

- LOD 0 will be the full detail model (approx. 6000-8000 triangles)
- LOD 1 (approx. 2000 triangles)
- LOD 2 (approx. 200-500 triangles). Also LOD level 2 is a static object not rigged to the skeleton but be set in a fixed pose (not T-pose). Furthermore all LOD levels must use the same textures.



## Mesh Geometry

Every character must be as low-poly as possible, being visually fit for use. For example, an arm may have 6 or 8 sides, instead of 32 or any other big number. Using smoothing groups and smart textures, the cylinder will appear to be round. On bending parts like elbows, knees, waists and armpits, some extra edgeloops are needed to facilitate bending without distorting the mesh in an awkward way. Polygons that cannot be seen, must be deleted, thus making the model as lean and mean as possible. This means, that a character's bodypart doesn't necessarily have to be a closed shape. It is important however to provide double sided models if needed, due to the back side culling in the game engine. Also, it is important to make sure it isn't possible to look "inside" the character when it is put in any particular pose. Typical areas that need attention are sleeves, necks and waists. Hair may be modeled using cross planes with alpha (make sure they are double sided). Hair should be as low poly as possible (again) and the mesh itself should not be modeled too much according to the "haircut". For example, tresses, pig tails or dread locks should not be modeled in full detail, but realized by the use of textures to come to proper detail. Every character must have a descriptive name.

## Character Model Parts

Basically, a character is built from a single mesh, containing all desired parts and clothing. It may be obvious that in the case of a dressed character, there are no body model parts needed that are occluded by the clothing. In the case of multiple clothing versions, the model parts that are interchangeable, should be distinguishable elements in the mesh, either by using a different texture, or by physically being another mesh element. They must all be part of the same rig however. To overall goal is to keep the element/surface count as low as possible, and to make only those extra elements, that are needed to be able to diversify the character. This is beneficial for game



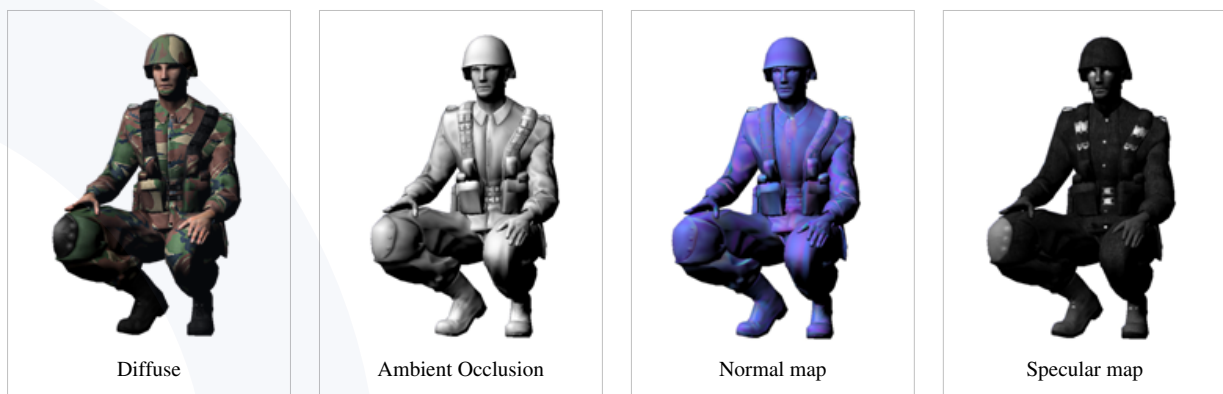
performance, and to keep the model complexity low. Since it is not likely that body parts are easily interchangeable amongst different characters, there is no need to split the model up in actual body parts like hands, elbows, heads, feet, arms, etc. An example: if a character has two versions, wearing a pair of jeans and a pair of shorts, the jeans and shoes may be equivalent to the shorts, legs and feet. Heads and eyes will belong to the same single mesh and texture.

## Texture Usage

Texture (file)names must be descriptive and easily linkable to their model. All surfaces of the character must be textured and by default use the same UV coordinates (UV0). Please note that all UV coordinates for UV0 must be unique (no mirroring). We require that the following textures be supplied in their original file format (eg. psd) as well as in DDS format with a minimum resolution of 2048x2048:

1. Diffuse color map (2048 x 2048 pixels, 32-bits RGBA)
2. Ambient occlusion map (2048 x 2048 pixels, 8-bits R)
3. Normal map (tangent-space, 2048 x 2048 pixels, 24-bits RGB)
4. Specular map (2048 x 2048 pixels, 8-bits R)
5. Reflection map (2048 x 2048 pixels, 8-bits R)

The simulation or a pre-processing tool is responsible for resizing the above textures to the appropriate dimensions for each specific case if required. In case that decals are necessary they must be provided with an alpha map (RGBA) and use of additional UV coordinates is permitted.



The combined image:



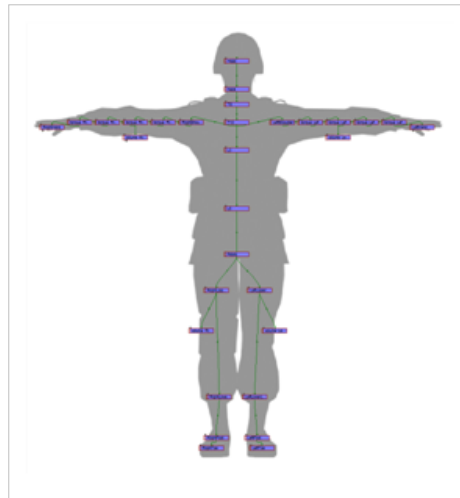
NOTE: Use of 3DSMAX texture mixing techniques such as shell materials or mix materials is not allowed, since these materials are for use in 3DSMAX only, and cannot be exported.

## Skeleton

It is very important to import the mesh into the skeleton file in order to end up with a working rigged character in the simulator. The skeleton should not be merged into the mesh file. Rigging should be done in such a way, that movements appear to be natural. This means, that bone joint mesh areas should not be too small and allow a fluent motion transition from bone to bone. A “spaghetti-figure” rig must be avoided, where the moving body parts typically are too isolated. No vertices should remain unassigned to the skeleton. The rig should be tested with various motions to check for any strange vertex-bone weights (see testing below). Hands: the skeleton has two fingers and one thumb on each hand. The thumb will be rigged to the thumb in the mesh. The index finger will be rigged to the index finger in the mesh. The last finger will be rigged to the remaining fingers in the mesh.

Two skeletons will be provided, one male and one female. The male has a standard height of 1.85m, the female has a standard height of 1.75. Both will have the setup depicted in the image below, with the addition of 3 fingers. The skeleton is made up of standard MAX bones, the difference with standard rigs is the use of twist links in the upper and fore-arms and volume bones at the elbows and knees to prevent joints collapsing in on themselves.





## Quality

Model quality must be “fit for use“. This means, that the user must easily recognize the nature of the model. When it comes to graphical style, the approach is photo realistic, rather than cartoony. Meshes must be clean, edge loops correct. All assets must thoroughly be inspected for mesh errors, unwelded vertices, double or flipped faces, double edges, unconstrained faces, cracks, UV errors, pixel stretching, exceptional off-scale pixel- and model resolution with respect to the other assets.

## Testing

All characters will be tested in 3D Studio MAX using the following motion set:

- ....
- ....
- ....