

# Working with 3D models

## 3D Assets Workflow

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### Prerequisites

- A 3D model in FBX (.fbx) file format
- Wikitude 3D Encoder for Windows or MacOS X

3D content within the Wikitude SDK can only be loaded from so-called *Wikitude 3D Format* files (.wt3). This is a compressed binary format for describing 3D content, which is optimized for fast loading and handling of 3D content on mobile devices. You still can use 3D models from your favorite 3D modeling tools (like Autodesk® Maya® or Blender), but need to convert them into wt3 file format using the Wikitude 3D Encoder (encoder for short). The Encoder loads Autodesk® FBX® files (.fbx) and exports them to .wt3 files.

This section should give an overview on how to choose the right 3D models for displaying it in Wikitude's augmented reality SDK. As Wikitude is basing 3D support on a converted file format (.wt3) it is good to follow the best practices below.

### Input format

Supported 3D model files for encoding wt3 files are:

- FBX (.fbx) - max version: 7.5 (FBX SDK 2017)

Features you can use in your 3D model source files:

- Mesh types
  - Triangle-based meshes: The 3D models usually consist on a hierarchy of scenes nodes where the leaf nodes contain parts of a 3D mesh.
  - Skin-based meshes: mesh vertices are placed relative to a list of joint nodes, so-called bones.
- Animations
  - Key-frame-based transformations/rotations/scalings applied to mesh vertices or scene nodes.
  - Bone animations for skin-based models.
- Textures
  - All textures are converted to the PNG file format during the import. The converter accepts textures of the usual picture file formats, like JPEG, GIF, TIFF, ...
- Lights
  - Diffuse (Lambert) lighting by specifying a directional light source.
  - Specular (Phong) lighting by specifying specular light source (direction and specular exponent). Several light sources can be used within a scene. However, only one light source (including diffuse+specular light) can be used for each mesh part, i.e., scene node. Thereby the light source which is closest to the scene node within the scene hierarchy (by traversing the tree upwards) is used. That is, a light source specified as a root node will be applied to all mesh parts in a scene. Other light sources will be applied to all mesh parts which are lower in the scene hierarchy.

- NURBS (will be tessellated on import)
- Transparency
  - Semi-transparent surfaces, like windows of a car, can be visualized. , but only one semi-transparent layer can be visualized accordingly. The result of rendering several semi-transparent layers upon each other is
- Model size: There is no limit on the size of the 3D models in terms of numbers of mesh vertices or textures. However, for rendering the 3D models fluently on mobile devices we recommend to keep the total file size below 5-10 MB and the number of mesh vertices below 100k.

#### Features that are not (yet) supported

- bump maps/normal maps (normals are only evaluated on mesh vertices)
- multiple light sources per node
- multi-textured surfaces (more than one texture on the same mesh)
- multiple transparent layers (transparent layers are not depth queued)
- animated textures on 3D models
- height maps

## Good practice when working with 3D models

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### Use png textures

Textures are stored in png format within wt3 files. While Wikitude 3D Encoder takes care of automatically converting textures to png, it is good practice to use png textures in the source 3D Model file.

### Use power of 2 textures

The rendering hardware on mobile devices often requires expects textures to have dimensions which are a power of 2 textures (e.g. 64x64, 128x128, ...). Other texture dimensions can lead to unexpected results. Additionally, using power-of-2 textures yields a better rendering performance.

### Validate texture paths

Textures can be stored within the FBX file or referenced by a file path. In the latter case, make sure to not use absolute paths since these often are not valid on other machines. Instead use relative paths. Texture files are also searched in the directory which contains the FBX file. We therefore recommend to provide external textures files in the same directory as the 3D model, i.e. the FBX file, itself.

### Keep texture sizes as low as possible

Keeping texture sizes as low as possible, while maintaining the required details has several benefits. The exported .wt3 file will be smaller and therefore quicker to load. And your application will require less memory.

### Use only one light

To maintain a good rendering performance each part of your model (node) is only affected by a single light source. You may use multiple lights in the source file but at render time only a single

node is selected to affect a mesh part. We make a best guess, utilizing the scene graph to assign a light to the node. If lighting is not required simply remove the lights from your source 3D model file and/or set the corresponding material properties. This helps to speed up rendering.

### Resolving problems

Different 3D modeling tools encode the 3D models differently during the FBX export which may lead to different rendering results when viewing the 3D models with other applications. We therefore recommend to verify your 3D model with the free Autodesk "FBX Reviewer".

3D Model which uses joints (bones) is distorted

Create a root joint node such that all other joint nodes share the same root node.

3D Model shows up correctly in Wikitude 3D Encoder but does not show on the device.

Check the file size of your wt3 file. Limiting the textures to the lowest size that maintains the required details. Keep the number of mesh vertices reasonable such that your targeted mobile device can cope with it.

Textures are missing

Check the error/warning dialog during the import process of the model it will give you detailed information on which textures are problematic. Make sure the texture paths are valid and accessible.