

# Textures

- [Maketx](#)
- [Tokens](#)

When using Arnold it is best to use a tiled mipmapped texture format such as .exr or .tx that has been created using maketx.

.tx textures are:

1. Tiled (usually the tiles are 64x64 pixels).
2. Mip-mapped.

If you already have tiled and mipmapped EXR's that have been created by another renderer, you won't need to convert those files to .tx

Due to (1), Arnold's texture system can load one tile at a time, as needed, rather than having to wastefully load the entire texture map in memory. This can result in faster texture load times, as texels that will never be seen in the rendered image will not even be loaded. In addition to the speed improvement, only the most recently used tiles are kept in memory, in a texture cache of default size 512 MB (can be tuned via `options.texture_max_memory_MB`). Tiles that have not been used for a long time are simply discarded from memory, to make space for new tiles. Arnold will never use more than 512 MB, even if you use hundreds or thousands of 4k and 8k images. But then, if you only use a handful of 1k textures, this will not matter.

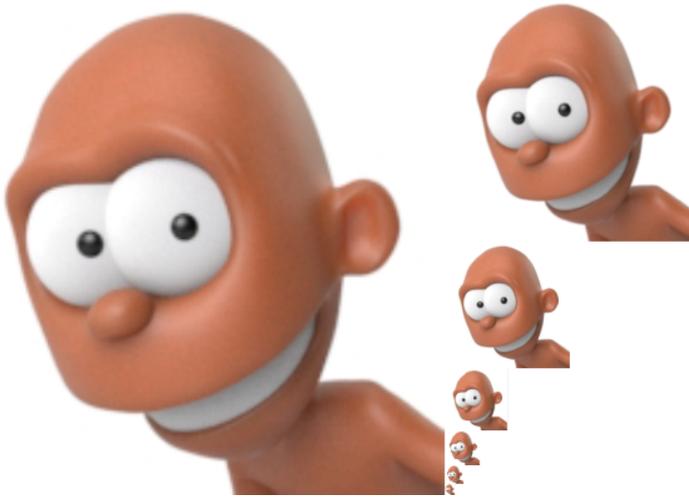
Due to (2), the textures are anti-aliased, even at low AA sample settings. Neither of these is possible with JPEG or other untiled/unmipped formats (unless you tell Arnold to auto-tilde and auto-mip the textures for you, but this is very inefficient because it has to be done per rendered frame, rather than a one-time pre-process with maketx).

It should be worth pointing out that .tx files are basically .exr or .tif files that have been renamed to .tx. This means .tx files can be read by image editors, although you may need to rename the file to .exr or .tif so that the image editor will load it. However, .tx files have a few extra custom attributes set that are not normally included in .exr/.tif files which can make rendering even faster. For instance, they will include a hash so that if you try to load two different files that contain the same data, Arnold only needs to load this data once.

## Benefits of Using .TX

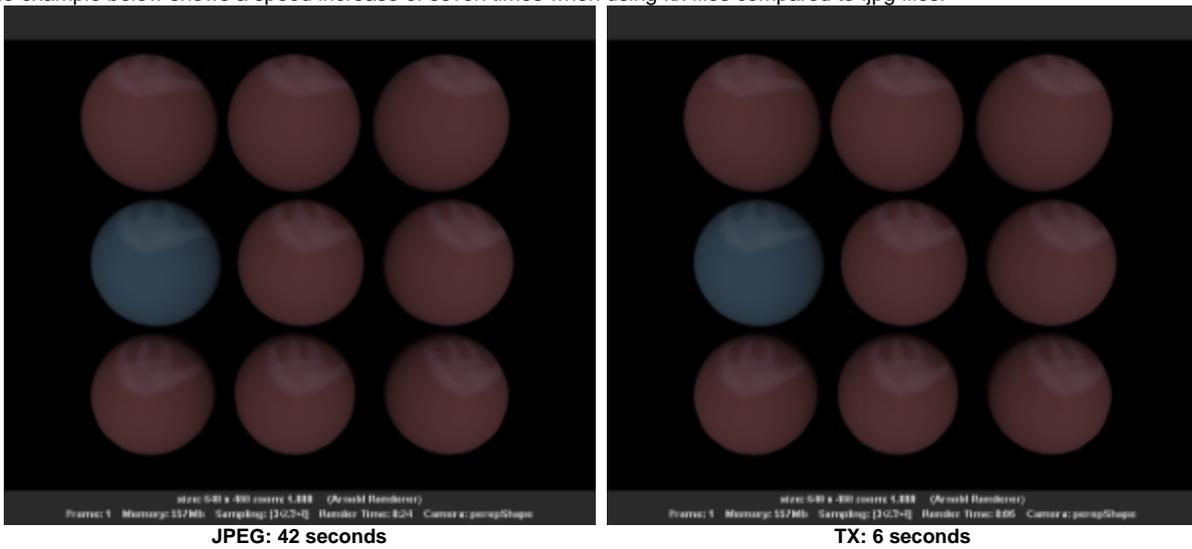
The first benefit is that you are assured of having mipmaps and tiles. These will dramatically improve time to the first pixel, overall render time, and allow using a smaller texture cache. This should be considered mandatory, with the possible exception being don't use .tx for the few images you are actively modifying if you don't want to wait for them to be constantly converted to .tx every time you make a change.

The previous level you could get from non-tx files that you saved with tiles and mipmapping. The second level of benefit is only with .tx files and that involves maketx adding metadata that lets Arnold make more optimizations, such as being able to detect duplicate textures and only loading a single copy into memory or detecting constant color images, such as an all-black **UDIM**, and instead of storing all those black pixels in memory Arnold can special case that.



An example of mipmap image storage. The first image on the left is shown with filtered copies reduced in size.

The example below shows a speed increase of seven times when using .tx files compared to .jpg files:



## Manually Generate TX Textures

The process is quite simple. You will need the maketx.exe utility, the texture that needs to be converted, and a dos shell. Below is an example of how you would convert a .tif file to a .tx file.

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Documents\projects\MakeTx\sourceimages>maketx --oio C:\Users\MakeTx\sourceimages\texture.tif
  
```

Folder which contains the texture that needs to be converted.      Maketx command with the optimize '--oio flag' and the pathname of the .tif file that needs to be converted.