Toon Boom Animation Inc.

White Paper:
2D-3D Integration Pipeline

This paper presents the information required to integrate 2D/3D in Toon Boom Storyboard Pro 3D.

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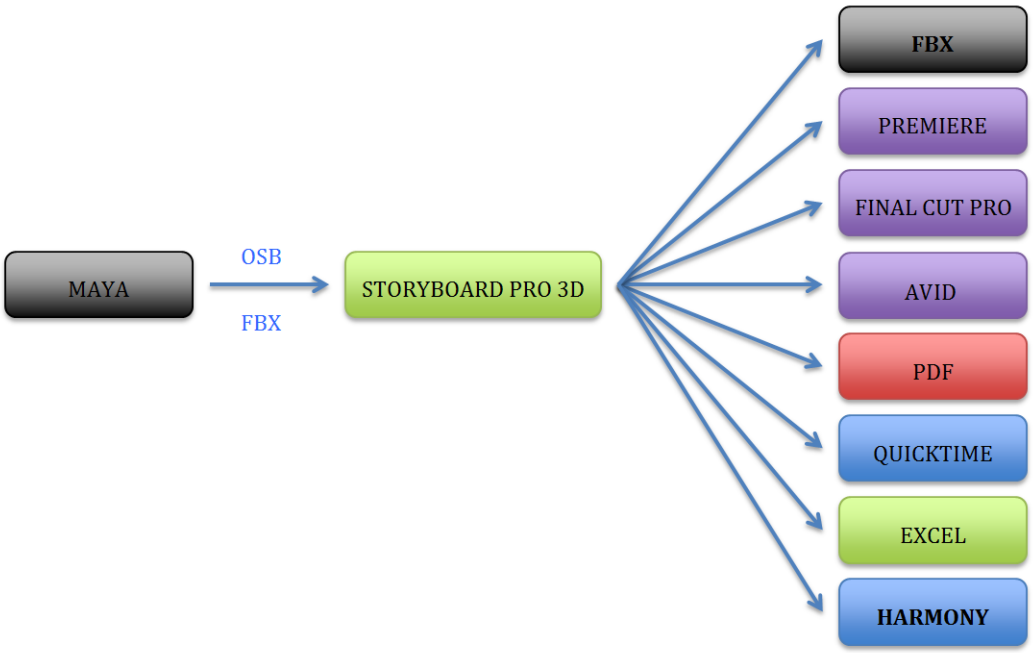
Introduction

In this document we will present the different production pipelines possible for integrating 2D and 3D content together, in both pre-production and production. We will discuss the software that can be integrated with Toon Boom products and recommend the preparatory steps necessary to further investigate using those pipelines.

2D-3D Integration Pipelines

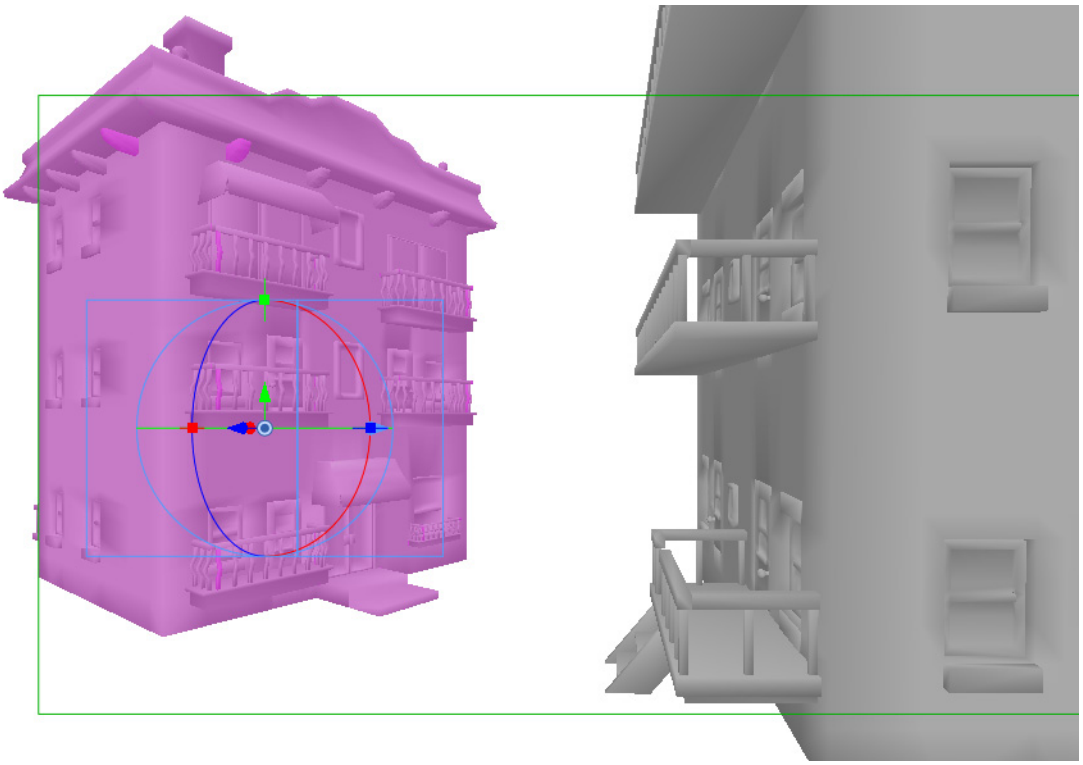
Pre-Production Phase



For the pre-production phase, 2D-3D integration can take place between any 3D software that can export to the FBX format and Storyboard Pro 3D. Examples of software that can export to FBX are: Autodesk® Maya®, 3D Studio Max, Luxology Modo, Blender, Google Sketch-Up to name a few.

In the case of using Autodesk® Maya®, you can export to the OSB format using a plug-in that Toon Boom Animation has developed. Exporting to the OSB format instead of the FBX format will allow you to continue working in a 2D-3D integrated pipeline with Toon Boom Harmony.

Storyboard Pro 3D also supports a limited import of legacy 3D files like 3ds and Obj.



Preparation of your 3D files

When you prepare your 3D file, there are some things to be aware of:

- **Texturing**: When exporting to FBX or OSB, your texture files are automatically packaged. What this means is that if you choose to texture your 3D file before sending it to Storyboard Pro 3D, then you will be able to view those textures in Storyboard Pro 3D.
- **Pivot Points**: When exporting to the FBX format, it will take into account any pivot points that you have set up in your 3D file. Even when you have a hierarchy of different elements, those pivot points of those elements will be preserved. So it's a good idea to set up your pivot points in your 3D file.
- **Quality of the 3D file**: Storyboard Pro 3D uses the low-quality OpenGL preview of the 3D file, it does not do a full render. So it is not necessary to make a perfect model of your object. Think of your 3D model as a placeholder, as a guide, and as a time-saver, around which you can still storyboard in a traditional way.

Keeping those ideas in mind, it becomes easy to work with 3D files in Storyboard Pro 3D. Refer to the Storyboard Pro 3D User Guide to find out how to import 3D files into the library, how to add them to the scene, and how to manipulate their position, rotation, and scale.

Exporting to 3D

When exporting back out to 3D, we do a comprehensive export through the FBX format. That export will break up your Storyboard file into individual FBX files for each scene in your Storyboard Pro 3Dproject. It also names those files according to the scene names in your Storyboard Pro 3D project, so this saves you having to take the time to exhaustively create scene files of the correct name and scene length.

You can also export information about your project to Excel through the CSV format, to help with production tracking, for information like scene length, panel length, content of captions, and what drawings or objects you'll find in each panel.

Exporting to Harmony

In order to export to a Harmony pipeline, please contact your sales rep, **sales@toonboom.com**, or **support@toonboom.com** to make sure that you have the Consulting version of Storyboard Pro 3D to unlock this feature.

The Harmony 2D-3D pipeline is more complex than the Storyboard Pro 3D pipeline, due to the consideration of how best to achieve the final render. For this reason, we can only support a Maya-based pipeline with Harmony.

Refer to the following section on Production, to find out more about the recommended Harmony 2D-3D pipeline.

When thinking ahead of using a Harmony pipeline, however, there are a few things that you might want to keep in mind in the pre-production phase.

- The Harmony export, for the moment, only supports export of OSB files, not FBX. So make sure that you contact **support@toonboom.com** to obtain the appropriate plug-in to be able to export OSB from Maya 2011 or 2012 for your operating system.
- The Harmony pipeline does not yet support what we call "sub-node transformations" – i.e., the ability to transform (move, rotate, or scale) sub-meshes inside your 3D object. So if you're planning on continuing along the Harmony pipeline, then you should export each 3D object individually.

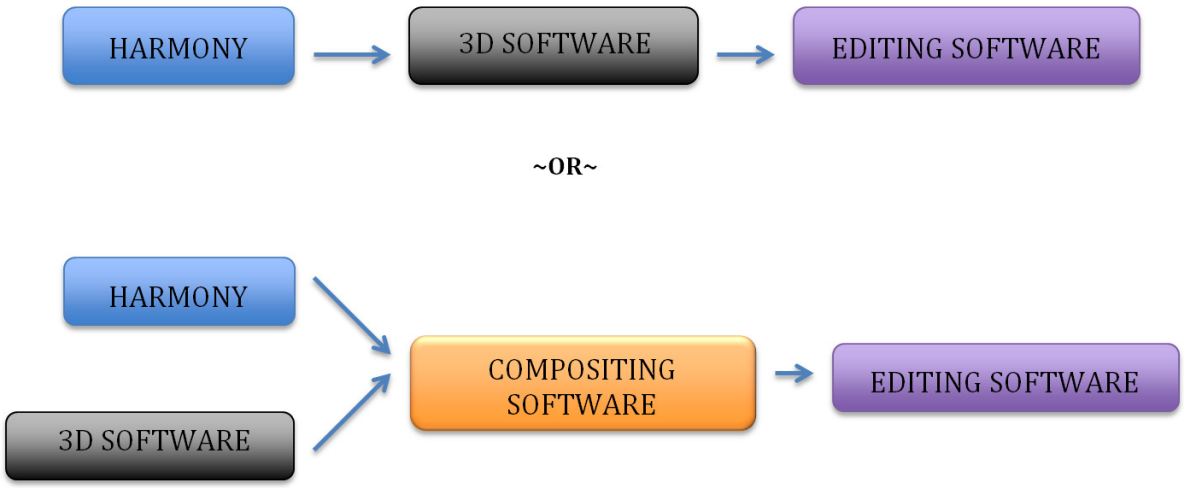
Production

There are several different 2D-3D pipelines that are possible to achieve through Harmony.

1. Exporting an Image Sequence to 3D
2. Importing an Image Sequence from 3D
3. Importing 3D then Rotoscoping
4. Full 2D-3D Integration with Render

Both **Exporting an Image Sequence to 3D** and **Importing an Image Sequence from 3D** can be achieved with the Animate product line as well as Harmony. While **Importing 3D then Rotoscoping** and **Full 2D-3D Integration with Render** are particular to Toon Boom Harmony.

Exporting an Image Sequence to 3D



The simplest 2D-3D pipeline is simply to export an image sequence from your 2D animation software to your 3D animation software. When doing this, it's important to export individual elements to give you the flexibility of placement in your 3D software. For example, each character should have its own image sequence.

When using a software like Animate, this can be challenging to achieve, because you need to turn off individual elements in order to render them on their own. With Animate Pro or Harmony, you can use the Network View to configure multiple Write nodes to make it easy to export multiple image sequences simultaneously.

Advantages

The advantage of this pipeline is that you can work with any 3D software or compositing software to achieve this task.

Limitations

The limitation of this pipeline is that there is no way for your 2D animator to interact with the 3D scene. They have no reference of the 3D scene, which can make it difficult for the animator to work effectively.

Importing an Image Sequence from 3D

It is equally possible to export an image sequence from your 3D software, or to export a movie file, and to import this image sequence or movie file into Animate, Animate Pro, or Harmony.

Advantages

The advantage of this pipeline is that you can see your 3D sequence as you're animating your 2D sequence, which helps the animator a lot to be able to achieve a natural look and feel. You can also use any 3D software.

Limitations

The limitations of working with this pipeline are that it is very difficult to make changes to the 3D scene, because if you need to make a change, you have to go back into your 3D software, make the change, render the sequence, and then re-import it.

Importing 3D then Rotoscoping

This is a pipeline that is sometimes forgotten in the world of 2D-3D integration, but can still prove extremely fruitful and interesting. One of the major challenges with the pipeline is the aspect of rendering, and the Rotoscoping pipeline avoids that entirely.

With rotoscoping, you need only import a proxy model from your 3D software, to help the animator to achieve the correct angles, and to help them to re-draw things like complicated props. However the nice thing about this pipeline is that you don't need to spend the extra effort on the 3D side to achieve a 3D render.

Rendering your 3D sequence can be time-consuming to set up, because you need to texture your 3D model, then you need to set up the shaders, add some lighting into your scene, and finally you then need to perform the final render. Depending on the complexity of the scene, and the lighting, and the effects, 3D render times can be quite long, and this means that you need to spend more to set up a more advanced render farm. You also have to budget to finish your production earlier in order to give yourself enough time to render your 3D scene.

By rotoscoping, you're not actually rendering any 3D. You're just importing your object, then drawing on top of it. This may actually be the cheapest 2D-3D integration solution, depending on the project.

Advantages

Advantages are that you can use any 3D software. The animator can have the freedom to push the animation beyond the limits of 3D. Render times are extremely low.

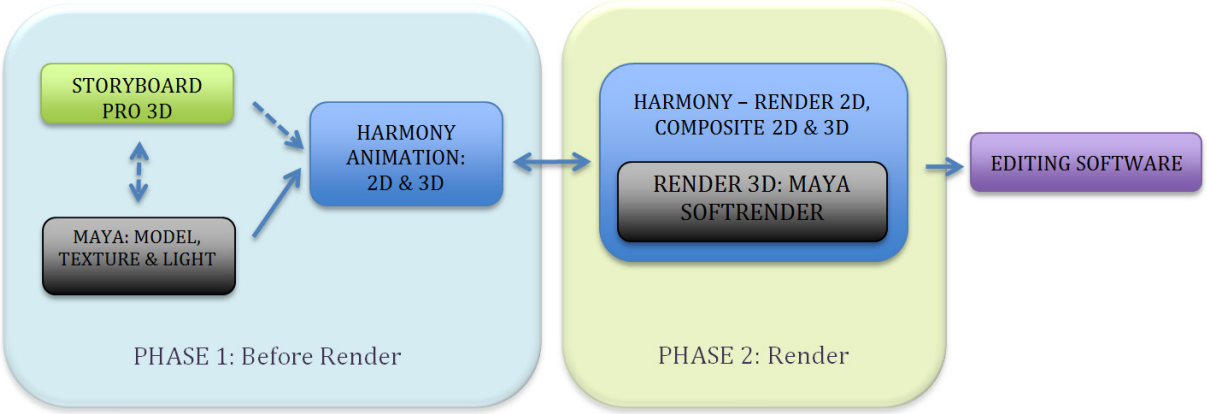
Limitations

Disadvantages are that there is more drawing involved. However with some of the improvements in the Harmony paperless workflow, such as the new True Pencil, the Deform, and improvements to the XSheet and the Shift and Trace, drawing itself has become faster and easier to achieve digitally.

Full 2D-3D Integration with Render

This is the most complex pipeline to set up for 2D-3D integration, however, the benefits of being able to set this pipeline up far outweigh the others. With the full pipeline, you can take advantage of creating props, vehicles, and backgrounds in 3D, then you can animate your characters in 2D. You can even do the compositing and effects directly in Harmony.

If you take advantage of Storyboard Pro 3D to do your pre-production, then you can also export directly to Harmony. This will save you time in setting up your scenes, and it will even automatically import any OSB files that you were working with in Storyboard Pro 3D.



So how does it work? There are a two different aspects of this pipeline to be aware of; Phase 1, which takes place before any rendering, and Phase 2, which is where the rendering occurs.

The real complication in this pipeline takes place during Phase 2. In order to preserve the quality of the render that was achieved through the 3D software, we decided to simply use the 3D software. The way that this works inside the software is that there is a scripting interface that allows Harmony to communicate with Maya through MEL script. Being able to communicate with Maya means that we can open up a session of Maya Batch and render through Maya Batch, this allows the user to preserve the lighting, the textures, and the shading that was created in the original 3D file.

Each 3D software handles rendering, shaders, and scripting differently. For this reason we have had to focus on fine-tuning the Maya pipeline. If you are using other software, however, and would like us to consider your pipeline, write in to **support@toonboom.com** to let us know. Toon Boom also prides itself in being able to provide custom development, but we do plan on continuing our development of this pipeline to suit our customer's needs.

So what do you need to know about this pipeline to make it work for you? Let us know and we will work to make it so!

Preparing your Models

In Maya, you should create a separate scene file for each object that you would like to animate in Harmony. When you import the object into Harmony, you will be able to move, rotate, and scale the object, and even animate these transformations over time. Each object must be its own Maya file, however you can take advantage of Harmony's hierarchy and peg tools to create rigs of Maya files to move them in unison.

Before you import into Harmony, you should also complete the lighting, texturing, and shading of your models. If you want to create generic lighting for a Toon-Shader look, then you can create some ambient lighting, and then parent the lights to your model so that they move along with your model.

You then need to obtain the appropriate plug-in for your version of Maya, so that you can export an OSB file format from Maya to import into Harmony. Refer to the Harmony User Guide for more information on how to export your model.

You need to also save your original .mb file, since this is the file the Maya will use to render the object during the render phase.

Also refer to the Harmony User Guide for instructions on how to manipulate the 3D model once you've imported it into Harmony.

Setting up the Render Pipeline

The render side of things requires some setup in order to get it fine-tuned.

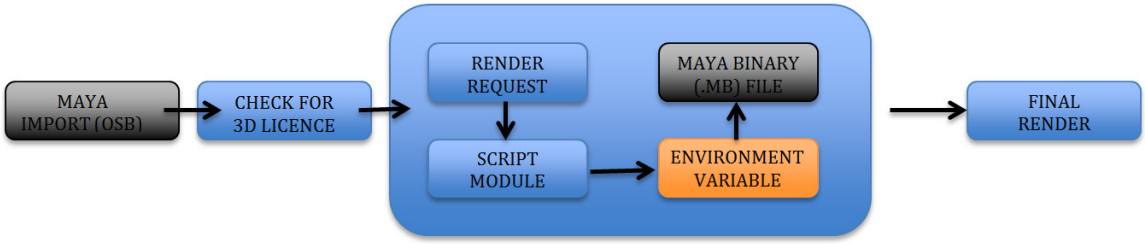
- First, you should have both Harmony and Maya Batch installed on the machine on which you wish to perform the render.
  NOTE: You only need a full version of Maya installed if you want to open up your original Maya file and adjust the model, the lighting, or the shaders.
- Next, in addition to having both software available on the machine, you also need to make sure that you have obtained a 3D licence from Toon Boom.
  Contact your sales rep, **sales@toonboom.com**, or **support@toonboom.com**, to obtain this license.

- Then you need to set up an environment variable in order to open up a communication port between Harmony and Maya.
  For instructions on how to set this up, refer to the Harmony User Guide.

For any objects that you have imported into your Harmony file, you also need to copy the original .mb file into the same location, so that Harmony can find the file it needs to complete the render. You should also copy the texture files into this location as well. Follow the instructions provided in the Harmony User Guide to copy these files correctly.

Now that the software is installed, the correct licenses have been obtained and you have established communication between the software, you're ready to open up Harmony. Open up a scene file that you've imported some 3D models into. The next step is to import, into Harmony, the script module that will tell Maya to render each 3D object. For more information on how to import the script module, refer to the Harmony User Guide.

With the setup complete, you can test the render by clicking on the Render View button to render the current frame. If all is successful, you will see the 2D and 3D objects rendered and composited together automatically.



If your 3D object does not render, it could be one of a couple things:

- First, if your 3D object does not show up at all, you may not have your 3D licence installed.
- Second, if the 3D object shows up, but does not render, then likely there is a problem with the handshake between Harmony and Maya. Verify that you have both software on the machine, and that the environment variable is set up, and that you have imported the **`RenderMayaBatch`** script into your Network View according to the instructions in the Harmony User Guide. If all else fails, contact **support@toonboom.com** for further assistance.

Be aware that when you're working with a pipeline that combines 2D and 3D rendering, your system requirements will be higher than they would be if you were just doing 2D alone. Make sure that you fulfill the system requirements for both Harmony AND Maya to optimize your setup. It's also recommended that you test the pipeline on one system **before** deploying on a render network.

Setting up a Render Network

You can set up your project to render over the Render Network in the same way as you do when you are working with Harmony in 2D. There's no additional setup necessary in terms of what you need to do in Control Centre, but you just need to be aware that you need to perform the setup to confirm the handshake between Harmony and Maya on each individual machine first, to verify that it works. When the pipeline works in Standalone mode, or at least in the Render View of each machine, then go ahead and try to render over the Render Network.

Working with Other Pipelines

We do also have the ability to render through Pixie or 3delight to use renderman .rib files. So if you can export from your 3D software to RIB, then we can investigate that pipeline with you. However it is highly recommended to work with the Maya pipeline, since this pipeline has been thoroughly investigated and tested.