



Asset ***JUGGLER***

Combination Generator for Cinema 4D

Manual

Contents

- Introduction.....3
- Thanks!3
- Features.....4
- Requirements.....4
- Installation.....5
- Demo Mode5
- Licensing6
- General Workflow7
- Asset Groups8
- Generation10
- Baking11
 - Baking Modes Overview12
- Menu Row Buttons.....13
- Settings: Main14
- Settings: Preview.....15
- Settings: Asset Groups16
 - Asset Group17
 - Asset Group Configuration.....18
 - Advanced Settings20
- Settings: Rules21
 - Rule.....21
 - Rule Types22
 - Rule Configuration22
- Statistics and Reports23
- Trick: Dummy Groups25
- Limitations28

Introduction

Welcome to Asset Juggler for Cinema 4D.

At first, we would like to thank you very much for the purchase of Asset Juggler. We appreciate the trust you put in our product, and we will do our best to really deserve this trust.

Asset Juggler will assist you with the creation of series of unique combinations of assets. Be it in game development, in order to quickly show different options and variations of a project to a customer or for NFT series, which became so popular in the recent past.

We put quite a bit of effort into the design of Asset Juggler and its workflow, to provide as much flexibility as possible, while at the same time keeping the time to final result as short as possible. Most important, Asset Juggler is supposed to be fun to use.

Regardless of your setup, Asset Juggler will make sure, the created versions are indeed unique, and you receive as much information about the resulting series as possible.

If you run into issues with Asset Juggler, which we do not hope, please do not hesitate to contact us (either via mail info@3dtoall.com or our website <https://www.3dtoall.com/contact/>). We will always try to fix any bugs as quickly as possible. Feature requests (e.g., maybe additional report formats) are welcome as well. Unless no major architectural changes get implemented (which we would indicate via an increased in major version), updates will be free and are covered by your current license. Assuming you already bought a license, that is. If not, then feel free to enjoy the demo mode and hopefully you will consider the purchase of a license later.

Thanks!

We are especially grateful to Tural/2ragon for providing ideas and beta testing.

Features

- 5 types of Asset Groups
- Support for animated assets
- Up to 1000 Asset Groups per project
- Up to 1000 Assets per Asset Group
- 6 different types of Rules
- Up to 1000 Rules per project
- 5 different modes to Bake the final series
- Live-Preview
- Statistics and bar chart
- Different report formats, for example one prepared for Openseas
- and more...

Requirements

- Cinema 4D R23+ on Windows or Mac
NOTE: Asset Juggler has been designed for Cinema 4D R25+, but has been tested to work down to R23. Due to Maxon's UI changes in R25, icons will look a bit strange and will not match this documentation in versions below.
- One Asset Juggler license per machine. Without valid license Asset Juggler will work in demo mode and allow very limited baking, only.

Installation

- 1) Unzip the downloaded Asset Juggler archive into Cinema 4D's plugins folder.
- 2) (Re-)start Cinema 4D.
- 3) Asset Juggler can now be found in Cinema 4D's Extensions menu.



Nowadays Cinema 4D supports multiple places/folders to install plugins into. The easiest way to find the default location is to open Cinema 4D, open Preferences and press "Open Preferences Folder..." in the bottom left corner of the Preferences dialog. Within there you should see the "plugins" folder.

Demo Mode

After installation Asset Juggler will be in *Demo Mode*. With the sole exception of baking the generated series, all features work and can be explored in depth. In *Demo Mode* baking of series is restricted to five combinations maximum and upon pressing the *Bake* button, Asset Juggler will ask to activate the plugin with a valid license.

Differences in *Demo Mode*:

- Baking restricted to a maximum of five combinations
- *Bake* button opens Activation dialog, Asset Juggler will still bake up to five combinations if the dialog gets canceled.
- Additional "Activate Asset Juggler" button at the top of the main dialog
- About dialog has an additional "Activate..." button

Licensing

A valid license is needed to use Asset Juggler (instead of just playing around in *Demo Mode*). An Asset Juggler license is locked to a single computer and cannot be transferred to another machine (nor would it be allowed). If for some reason, you need to move the license to another machine, please contact us (info@3dtoall.com or <https://www.3dtoall.com/contact/>).



- 1) Copy your personal activation code to the clipboard (e.g., by pressing "Copy").
- 2) Clicking "Get Activation Serial" takes you to 3DtoAll's activation page.
- 3) Paste your personal activation code there.
- 4) **Important:** Use the **same** e-mail address, which was used to purchase Asset Juggler.
- 5) You'll receive your personal Activation Serial via e-mail.
- 6) Paste your personal Activation Serial into the respective field in the Activation dialog and press "ACTIVATE".

NOTE: Between steps 4 and 5 the Activation dialog may be closed. It can be opened later again, after you have received your personal activation serial.

General Workflow

Asset Juggler works best, if used after a collection of assets has been assembled.

To create a series of unique combinations of such prepared assets, you will more or less quickly go through the following steps:

- 1) Create one or multiple Asset Groups.
One or two clicks per group, a matter of seconds.
See chapters Asset Groups and Settings: Asset Groups.
- 2) Assign assets to these Asset Groups.
Few seconds, depends on how fast you can drag stuff from the Object Manager.
- 3) Optionally create one or more Rules to further influence the generation of the series.
Just a few clicks per Rule, again a matter of seconds.
See chapter Settings: Rules.
- 4) Tweak probabilities and Rules assisted by Live-Preview.
Well, this one is on you. If you are more the perfectionist type, do not blame us, if you get stuck here forever...
See chapter Asset Group Configuration.
- 5) Generate the final series.
A single button click, usually just a matter of a second or two for series of 10000 combinations.
See chapter Generation.
- 6) Check statistics of the generated series to make sure, it looks as expected.
See chapter Statistics and Reports.
- 7) Bake the generated series into one or multiple Cinema 4D project(s).
Depending on the mode used for baking, this can indeed take a while. If you chose a slow mode, just get yourself a coffee and enjoy the feeling, that Cinema 4D and Asset Juggler are working for you, doing all the stuff you did manually before purchasing Asset Juggler.
See chapter Baking.

In summary, excluding the time for tweaking (which is on you) and baking (which is on your computer), the entire setup of a series is a matter of seconds or very few minutes.

Asset Groups

Asset Groups are different, well..., groups of assets (or components, traits, different object belonging to a kind of flavor or family, ...). The main difference between the five types of Asset Groups is the source, where the assets are coming from.

Up to 1000 Asset Groups can be created per project and each Asset Group can refer to up to 1000 assets.

We recommend assembling all assets before starting a series in Asset Juggler and assigning them to Asset Groups.

Asset Juggler will always refer to assets via their respective index within (or relative to) their "asset source". Keep this in mind, when changing the actual assets of already assigned Asset Groups! Also see Note on Updating Asset Groups in chapter Settings: Asset Groups.

For details on setup and configuration of Asset Groups see chapter Settings: Asset Groups.

Asset Group "Object" (●)

Defined by an arbitrary parent object.

All first level child objects of the parent will be regarded as separate assets.

Objects get indexed in their order in Object Manager (top to bottom).

Asset Group "Material" (○)

Defined by a base object and a layer.

All materials assigned to the layer are considered assets and will be assigned to the linked base object. In other words: A Material Group always leads to the same object, only with different materials.

Materials get indexed in their order in Material Manager (left to right, top to bottom).

Asset Group "Project" (📁)

Defined by selecting an arbitrary Cinema 4D project file (or an Alembic or FBX file for that matter) from disc. All root level objects inside this project will be regarded as separate assets. Objects get indexed in their order in Object Manager (top to bottom).

Asset Group "Folder" (📁)

Defined by selecting an arbitrary folder on disc. All scene files (C4D, ABC or FBX) found in this folder will be regarded as separate assets.

Projects get indexed in alphabetical order of their filenames inside the folder.

Asset Group "Material Override" (🌀)

Defined by an Asset Group and a layer.

All materials assigned to the layer are considered assets and will be assigned to the object chosen by the connected Asset Group in any given combination.

In other words: This Asset Group does not create or add any object, but it changes the texture of another Asset Group.

Only preceding Asset Groups can be selected. Therefore, we recommend adding any Material Override Groups last.

Material or Material Override Groups can not be selected for obvious reasons.

Materials get indexed in their order in Material Manager (left to right, top to bottom).

NOTE: It is not recommended to use the same asset(s) in multiple Asset Groups!



Simplified (ignoring different Baking Modes) Material Groups and Material Override Groups can be imagined as adding a Texture tag to an asset's parent object. This means Cinema 4D's texture inheritance rules fully apply. Therefore, these Asset Groups can not only be used to completely texture assets. In fact they really only texture untextured parts of assets. Imagine an asset consisting of a hierarchy of objects, with only parts of the hierarchy pre-textured.

NOTE: This also means, these Asset Groups have a potential to cause visually duplicate combinations, if the asset is already fully textured. Despite Asset Juggler choosing two different materials, such an asset will look visually identical!

Generation

While generating a series of combinations, Asset Juggler basically throws dice. Afterall it is supposed to create random combinations of assets. But this also means, there may be situations, where Asset Juggler is not able to find enough unique combinations. In this case the Statistics button will be colored red, green otherwise.

Influences on Asset Juggler's ability to find combinations:

- Very low chances
- Rules

Asset Juggler estimates a maximum number of combinations, which in best case may be possible to generate from the given assets. This number is shown directly below the Count slider on Main tab. Best case means, equal chances and only certain rules. Assets with zero chance or rules which force pairs or equal index are taken into account, but as rule setups can get arbitrarily complex (e.g., rules may depend upon another, ...), that's really all and it should only be considered an optimistic guess of an upper bound.

Asset Juggler really works best, if provided with enough assets to easily reach the desired number of combinations. It will do a terrible job, if you want to generate all possible combinations from a given set of assets. Such a mode could be implemented, if requested by enough users.

This is also the reason, why the Count slider's maximum is capped at half of the calculated maximum of combinations. One can override the maximum via the edit field left of the slider, though.

Baking

Baking will turn a formerly generated series (basically a list of asset indices) into an actual project file (or multiple thereof).

NOTE: Unfortunately Asset Juggler can not show any progress information (believe us, we tried hard). Cinema 4D will appear locked during baking. Baking is finished, when Picture Viewer shows the resulting bar chart and the target folder gets opened in Explorer/Finder.

When baking a generated series, Asset Juggler executes the following steps:

- 1) A target folder is created within the current project's folder. Its name consists of the name of the series plus a date/time code. Asset Juggler writes only into this folder.
- 2) Assets from Project Groups get imported under a separate Null object.
NOTE: Texture paths (rather any path to external assets) get converted into absolute paths.
- 3) Depending on baking option "Xref" assets from Folder Groups get either imported under separate Null objects or one Xref object per asset gets created.
- 4) Active camera and render settings get cloned into the resulting project(s).
NOTE: Active camera gets cloned including all its parent objects (if any). This is done in case the camera is animated by any such parents.
- 5) Visibility of original assets gets initialized as needed (usually: Parent object gets hidden; assets get default visibility).
- 6) Depending on Baking Mode:
 - a) Keyframes / Visibility**
 1. No further referencing takes place, instead Asset Juggler directly creates keyframes switching the visibility of assets on and off (plus turning invisible generators off).
 2. Maximum project time gets set to the number of baked combinations.
 3. The result is a project file with one combination per keyframe.
 - b) Keyframes / Instances**
 1. Asset Juggler creates one Instance object per Asset group. It is the Reference Object parameter of these Instance objects, which get keyframed in this mode.
 2. Maximum project time gets set to the number of baked combinations.
 3. The result is a project file with one combination per keyframe.

c) Takes / Visibility

1. Similar to mode "Keyframes / Visibility", but instead of keyframes, a Take is created per combination.
2. The output filename in render settings (Save tab) is set to use the Take name.
3. The result is a project file with one Take per combination.

d) Takes / Instances

1. Similar to mode "Keyframes / Instances", but instead of keyframes, a Take is created per combination.
2. The output filename in render settings (Save tab) is set to use the Take name.
3. The result is a project file with one Take per combination.

e) Project Files

- a. No keyframes or Takes get created in this mode. Instead, only the assets visible in a combination get extracted into a separate project.
 - b. The output filename in render settings (Save tab) of each project file is set to the series name plus a four-digit index of the combination ("My Series_0000", "My Series_0001", ...).
- 7) Finally, statistics and reports will be generated and written into the target folder.
 - 8) By opening the target folder in Explorer/Finder and presenting a bar chart of the baked series in Picture Viewer, Asset Juggler signals baking is finished. For all modes but "Project Files" the resulting project file will also be opened in C4D in background.

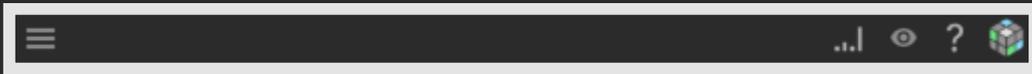
NOTE: The two Keyframes Baking Modes are not suitable for animated assets.

Baking Modes Overview

Baking Mode	Speed	Animated Assets	Result
Keyframes/Instances	Fastest	✗	1 Project File
Keyframes/Visibility	Fast	✗	1 Project File
Takes/Instances	Slow	✓	1 Project File
Takes/Visibility	Slow	✓	1 Project File
Project Files	Depends*	✓	n Project Files

* Highly depends on size and complexity of involved assets

Menu Row Buttons



Statistics ( /  / ): Opens the *Statistics and Reports* window.

Grey: No series generated, yet. Statistics get shown for Live-Preview.

Green: Generation succeeded to create the requested number of combinations.

Red: Generation failed to create the requested number of combinations.

[Shift+Click]: Renders a bar chart of the statistics. See chapter *Statistics and Reports*.

Preview Enable ()

Toggle Live-Preview on and off. See *Settings: Preview*.

Help ()

Opens the documentation you are currently reading.

About ()

Opens the About dialog.

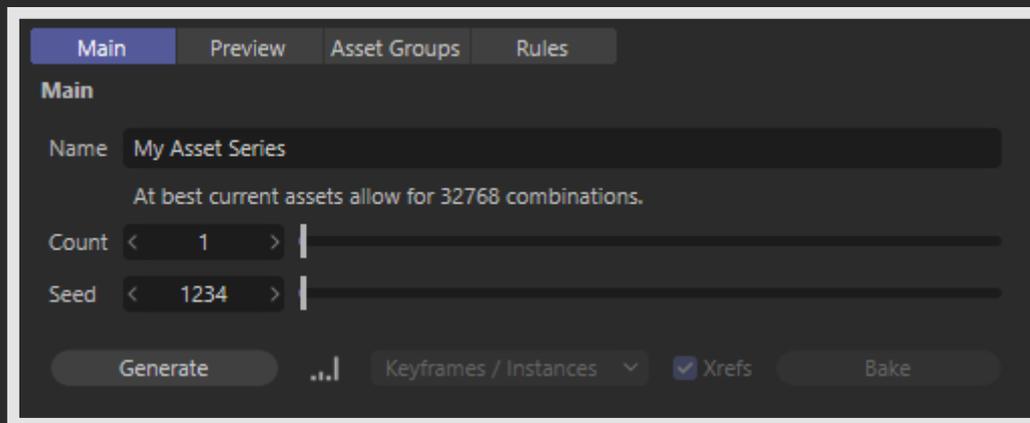
Hint: One can easily open included example projects from here.



Using the Hamburger icon in top left corner the Asset Juggler dialog can be docked like all other dialogs in Cinema 4D. To have Asset Juggler behave like e.g., the new foldable Asset Browser or Material Manager dialogs in Cinema 4D R25, do the following:

- 1) Use “Customize Palettes...” to add the Asset Juggler command to an arbitrary palette.
- 2) Open the Asset Juggler dialog and dock it in its desired position and size.
- 3) Click the Asset Juggler button created in step 1) to fold Asset Juggler.
- 4) Save the layout as needed.

Settings: Main



Name

Name of the series. This name will be used for target folder and resulting project file(s). It is preset with the project name.

Count

Number of combinations to create in a series.

Seed

Start seed for the random generator used to create the series.

Generate

Start the generation of the entire series of combinations. When done, the Statistic button will light up in green or red to reflect the result of the generation.

Statistic (/ /)

Identical to same button in Menu Row Buttons.

Baking Mode

Select mode for baking, see chapter *Baking* for details.

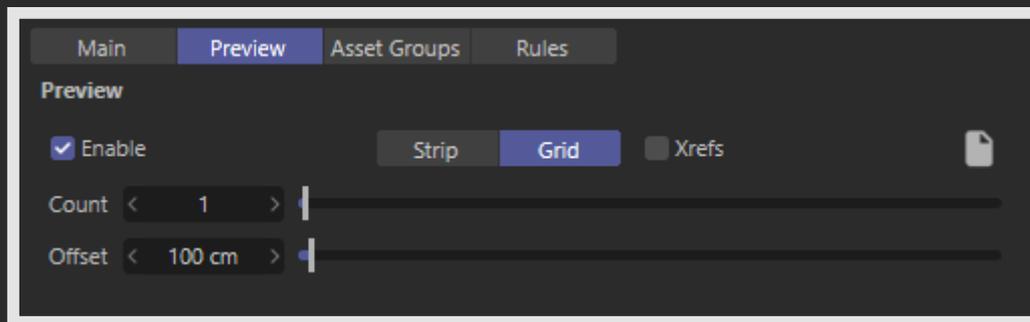
Xrefs

If disabled, no Xrefs will be created during baking, instead assets from Folder Groups will be imported.

Bake

Only available after a series has been generated. Click to start baking the series into a project, see chapter *Baking* for details.

Settings: Preview



Enable

Check to enable Live-Preview (same as button in menu row).

Strip / Grid

Live-Preview gets shown either as a strip of combinations offset in Z direction or as a grid with combinations offset in X/Y direction. Regardless of mode the Live Preview is offset by one offset unit in Z direction, in order to somewhat hover in the background of the original assets.

Xrefs

This checkbox is different to the Xrefs option on Main tab. Depending on this checkbox, Live-Preview either uses Xrefs to show the assets of Folder Groups (which can slow down Live-Preview considerably) or only shows the filename of the chosen asset.

Copy Preview into separate project ()

The currently shown Live-Preview will be copied into a separate scene file.

Count

Number of combinations to show in Live-Preview.

Offset

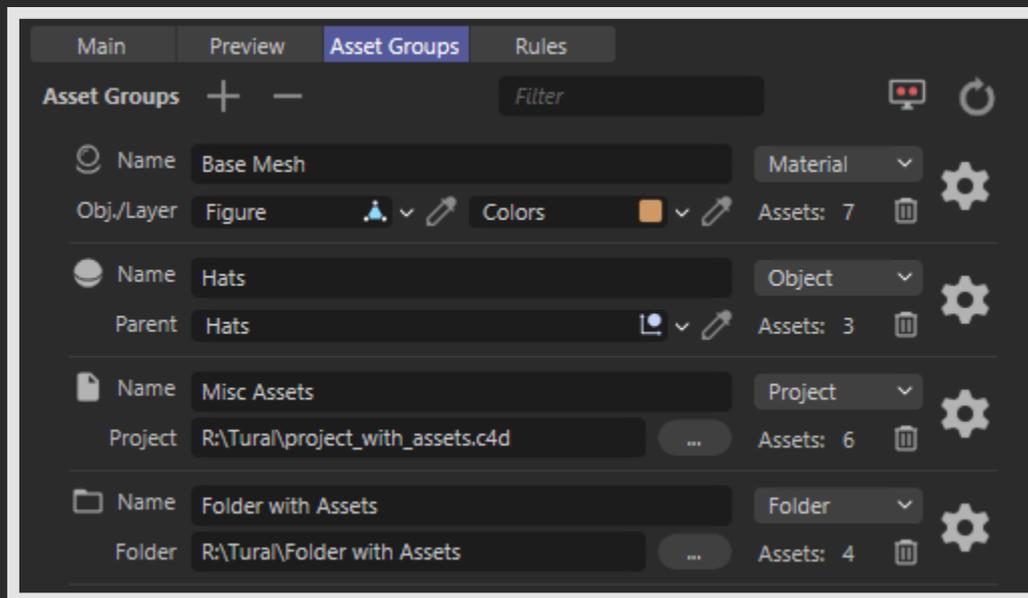
Offset between two versions.

NOTE: The Live-Preview is actually part of the current project. For example, it will be saved with the project. While this is no problem for Asset Juggler, you may want to avoid this, by either temporarily disabling the Live-Preview or by closing or folding the Asset Juggler dialog.

NOTE 2: If a Folder Group is involved and Xrefs are enabled, certain operations (basically everything, which forces Asset Juggler to rebuild the assets of the Folder Group) will change the Undo Stack of the current project.

Unfortunately, there's currently no way around this. Sorry!

Settings: Asset Groups



Add Asset Group (+)

Creates a new Asset Group.

Delete Last Asset Group (—)

Deletes the last Asset Group.

Filter

Only Assets Groups containing the text entered here show up in the table below.

Hide Source Assets (📺)

Hides the source assets.

[Shift+Click]: Sets the visibility to default for all Asset Groups.

Update All Asset Groups (🔄)

Check all Asset Groups for changed (new, deleted, renamed, reordered) assets and update the groups accordingly. All locked chances will be unlocked during this process!

It is also possible to just update a single Asset Group. See chapter Asset Group Configuration.

NOTE: No effort is taken to associate formerly set chances with the updated assets. This is especially apparent, when deleting or reordering assets.

Appending new assets at the end or renaming assets is no problem. To preserve already configured chances, new assets will get zero percent chance initially.

Deleting the last asset is also fine, all remaining chances will be rebased (sum of chances is always 100%).

All other changes will lead to wrongly associated chances and/or rule references and will need your attention. At least check the configuration of such Asset Groups.

NOTE 2: While Asset Juggler does not forbid to reference one asset in multiple Asset Groups, this is usually a bad idea. Without further care one will end up with two more or less identical assets in the same location. The only Baking Modes this can work at all (even though most likely not as intended) are Project Files and the Instance modes, regardless of Keyframes or Takes. The modes changing visibility only, obviously can not duplicate a source asset.

Asset Group

Asset Group Icon (/ / / /)

Click to go to the respective assets, actual action depends on type of the Asset Group. Objects are made visible and selected, projects opened in Cinema 4D and folders shown in Explorer/Finder.

[Shift+Click]: Only for Groups with parent or base object, visibility will be reset.

Name

If it's left empty, the name will be automatically preset when assets get assigned to the group. The name is used in reports and can be changed arbitrarily as needed.

Asset Group Type

See chapter *Asset Groups*.

Asset Source

Options depend on Asset Group type.

Object Group: Link field to drop the parent object of an Asset Group.

Material Group: Two link fields, one for the base object and one for a layer with materials.

Project Group: Path to a Cinema 4D, Alembic or FBX project file.

Folder Group: Path to a folder containing project files (C4D, ABC or FBX).

Material Override Group: An Asset Group and a link field for a layer with materials.

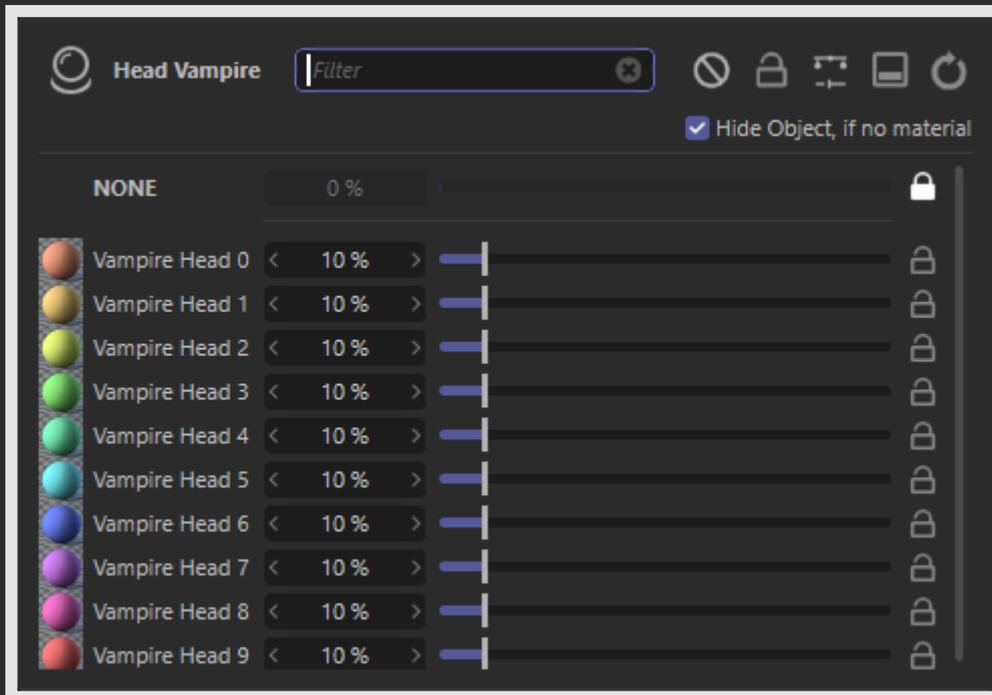
Delete Asset Group ()

Deletes this Asset Group.

Configuration ()

Opens the Asset Group Configuration.

Asset Group Configuration



Asset Group Icon (🌐 / 🌑 / 📁 / 📂 / 🗑️)

Click to go to the respective assets, same as Asset Group Icon in main dialog (see Asset Group).

Filter

Only assets containing the entered text show up in the list of chance sliders below.

Lock None at Zero Chance (🔒)

Chance for having none of the assigned assets gets locked at zero percent.

Unlock All Chances (🔓)

All chance sliders get unlocked.

[Shift+Click]: Toggle all locks.

[Ctrl+Click]: Toggle all locks, except the first one (chance for no asset).

Equalize All Unlocked Chances (🔧)

All chances, which are not locked, get set an equal chance.

[Shift+Click]: Randomize all unlocked chances instead.

Show Advanced Settings (📄)

Unfolds the Advanced Settings.

Update Asset Group (🔄)

Updates the Asset Group to reflect potential changes to its assets. All notes mentioned in chapter Settings: Asset Groups on updating all groups apply here as well.

Hide object, if no material

Only for Material and Material Override Groups: In combinations, where no material got chosen, the object will be hidden.

Asset Icons (Icon depends on asset type)

Click to go to the respective asset. Not available for Project Groups.

[Shift+Click]: Only for Object Groups: Set object default visibility.

Chance Sliders

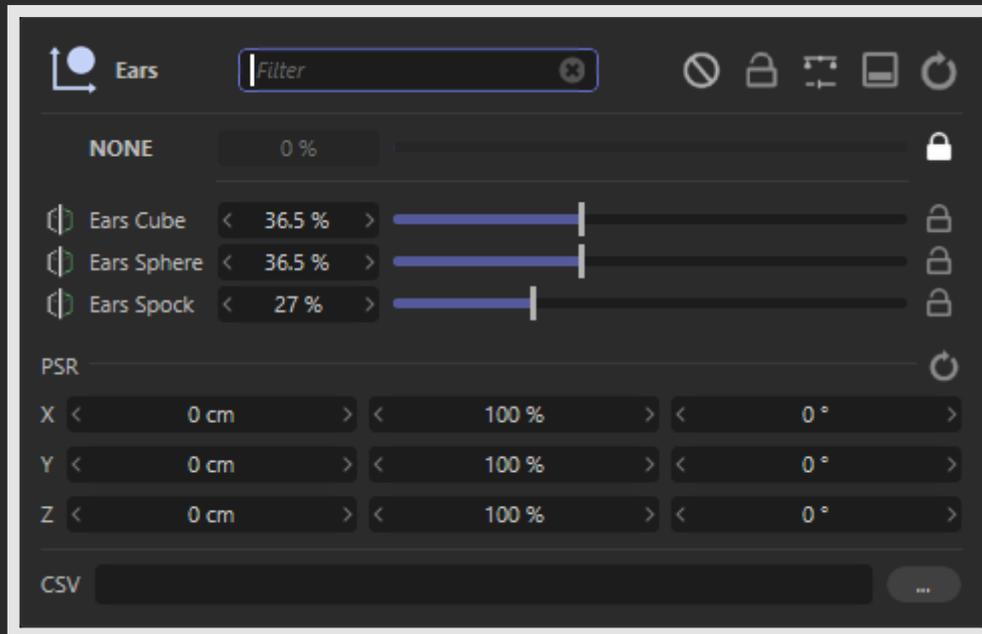
Defines the chance of an asset appearing in a series.

Locks ( / )

Locks the value of a chance slider. Very helpful, if one wants to set multiple assets to precisely defined chances (set first chance, lock it, set second chance, lock it, ...). Or simply to protect values once dialed in.

Locking chances has no effect on Generation or Baking. Locks' sole purpose is to provide more control, when dialing in values.

Advanced Settings



PSR

Assume a ready made collection of Asset Groups and asset types and while creating the series, one realizes one Asset Group is erroneously offset. Now, one could go into all of the assets of concern and fix them manually. Or one simply unfolds Assets Juggler's advanced Asset Group settings and tweaks position, scale and rotation as needed directly for the entire Asset Group at once.

For Material Override Groups this option is not available. Use PSR controls in connected Asset Group instead.

NOTE: Especially with animated assets, one may need to take special care when creating the assets for this to work. Usually it is enough to parent assets under an additional Null object.

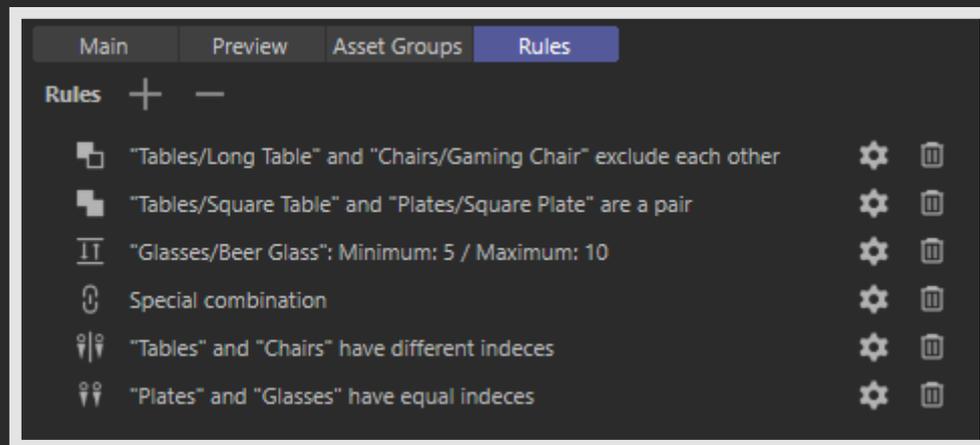
Reset PSR (↻)

Reset position, scale and rotation to default values.

CSV

Here one can specify a CSV file containing comma separated asset indices (Index 0 is "none", 1 the first asset, ...). These indices will be used instead of probabilities (chance sliders get disabled) to define which asset gets shown in which combination. If more combinations are requested, than the CSV file contains indices, Asset Juggler will wrap around, so the CSV sequence gets repeated.

Settings: Rules



Add Rule (+)

Create a new Rule.

Delete Last Rule (—)

Deletes the last Rule.

NOTE: Up to 1000 Rules can be created per project. Yet, please keep in mind, that rules reduce the number of combinations, that can be generated from a given set of assets. See also chapter Generation.

NOTE 2: Rules may depend upon one another.

Rule

Configuration (⚙)

Opens the Rule Configuration.

Delete Rule (🗑)

Deletes this Rule.

Rule Types

Special Combination (🍷)

Define a special combination of assets to appear in a series.

Min/Max (📊)

The asset will appear at least in “minimum” number of combinations, but not more than “maximum”.

Force Pair (📌)

Two assets will always appear as a pair. Obviously works only if assets from different Asset Groups are chosen.

Option One Way:

Asset 1 forces Asset 2 to appear, but Asset 2 may still appear without enforcing Asset 1.

Exclusion (🚫)

Two assets exclude each other. So, if one of the chosen assets appears in a combination, it is guaranteed the other will not. Obviously works only if assets from different Asset Groups are chosen.

Equal Index (📊)

Two Asset Groups will always show assets with the same index. If the third asset from Asset Group 1 is chosen, then Asset Group 2 will also show its third asset. Works best, if both Asset Groups have an equal number of assets. If an index is chosen, which is not available in the other Asset Group, then no asset will be shown for the second group.

Different Index (📊)

Two Asset groups will never show assets with an identical index. If the second asset is chosen from Asset Group 1, it will be guaranteed Asset Group 2 will not show its second asset.

Rule Configuration

Configuration of Rules is so simple, we didn't even bother to take a screenshot. Simply choose a Rule Type together with Asset group(s) and potentially assets. Done.

Statistics and Reports

...
Statistic
↓

Generated Versions: 503 / 503

General

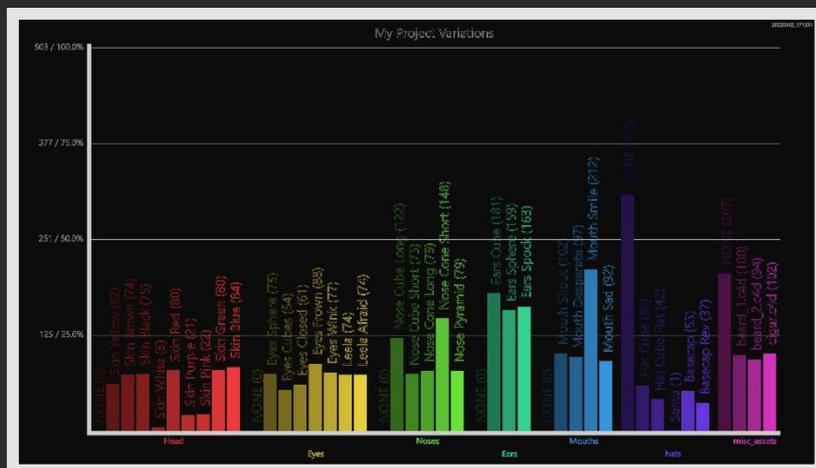
Series Name: My Project Variations
 Project: R:\Asset Juggler Demo\asset_juggler_demo_test_2.c4d
 Seed: 1234
 Number of Versions: 503
 Time of Creation: 2022-03-02 16:23:19.683836

Asset Groups (7)

Group:	Head	
NONE:	0 (0.00% / 0.00%)	Rule Influence
Skin Yellow:	62 (12.33% / 14.70%)	Large Difference Actual vs. Chance
Skin Brown:	74 (14.71% / 14.70%)	

Render Statistic (...)

Renders a bar chart of the statistics, like the following:



Write Reports (...)

Write all report files to a folder. Name of the folder is the series name (without date code). These are the same report files, one would get, if the current series was baked. If one wants to check a generated series before it gets baked, then this is the button.

Statistics

Statistics are divided in three main groups:

- General information about the series.
- Information about all Asset Groups.
- List of Rules which were applied during Generation.

Reports

- Text report, filename `series name_report.txt`
Basically the content of Statistics window in plain text.
- CSV, filename `series name.csv`
A plain, comma separated table of all combinations of a series.
- Custom JSON, filename `series name.json`
All statistic information in simple JSON format.
- Custom XML, filename `series name.xml`
All statistic information in simple XML format.
- Two JSON files prepared for Openseas,
filenames `series name_openseas.json` and `series name_openseas_2.json`
Highly depends on personal preference and pipeline considerations, which format suits a given workflow better.
- Bar chart, filename `series name_barchart.png`
Provides a quick overview of asset occurrences in a series.
- Bar chart project file, filename `series name_barchart.c4d`
Maybe one wants to use the bar chart in some other context and thus modify it to some specific needs, here's the project file to start with.
- HTML bar chart, filename `series name_barchart.html`
As a pixel image is not always the best representation of a bar chart, here is one in HTML to open in a browser.



While we tried to offer multiple report formats to suit as many needs or workflows as possible, we openly confess, your special case is probably still not covered. If so, please do not hesitate to contact us (info@3dtoall.com or <https://www.3dtoall.com/contact/>). Such an update would be free and delivered rather sooner than later.

Trick: Dummy Groups

Lets assume, we have two different characters, a vampire and a zombie. Each consisting of a body and a head mesh. Further we have multiple materials per head and per body (of course different ones for zombies and vampires).

For the series, we demand the following:

- There's always exactly one character visible, either vampire or zombie.
- Vampires and zombies are supposed to be textured randomly.

Problems:

- A Material Group allows to re-texture only one single asset.
- A single asset should not be used in multiple asset groups.

How do we get around this limitation?

The answer is a "Dummy Group".

Basically this is an Asset Group, which refers only to Null object assets and itself does not have any visible influence on the end result.

Here's how to set up above series (project file with this setup is delivered with the plugin):

- Scene preparation
 1. Have all materials assigned to one of four different Layers (Head/body of vampires/zombies).
 2. Separate the heads into their own hierarchy. If the characters are animated, possibly constraining the heads to the position of a Null object in their previous position and hierarchy.
 3. Set up the "Dummy Group", have one Null object representing a vampire and one Null object representing a zombie grouped under a third Null object.
- Asset Group setup
 1. First we need four Material groups, each gets assigned a head/body of a vampire/zombie plus the respective material layer.
Result: Arbitrarily textured vampire bodys and heads, glitching into arbitrarily textured zombie heads and bodys in the same location. Some even without any texture!
 2. In anticipation of what's to come, we enable "Hide object, if no material" and also lock the chance of no material to 0%.
Result: Some changes in generated combinations, as now all meshes are textured, but still far from what we want to achieve.

3. Add another Asset Group in Object mode and assign the parent of the “Dummy Group” created before. We always want to have either a vampire or a zombie, so we also lock the chance for None to 0%.

Result: Again the chosen combinations change (there’s another level of freedom, now), but we didn’t seem to get closer to the desired result. Actually it seems, we are even further away, because now there’s a certain chance, we end up with pairs identically looking combinations in a series! The “Dummy Group’s” choice makes a combination unique, but it doesn’t add visual difference...

- Rules setup

With four quick to setup Rules, we will now fix the setup and achieve exactly what we wanted.

1. Add two Force Pair Rules:
 - a. Force Pair “Dummy Group / Vampire” and “Zombie Body / None”
 - b. Force Pair “Dummy Group / Zombie” and “Vampire Body / None”
2. These two Rules force the material chosen for the respective body to “no material” and in combination with the “Hide object, if no material” option we activated earlier in the Material Groups, the respective body will be hidden completely in this case.

Result: For the bodies it looks ok now, but the heads do still not behave.

3. Add two more Rules, this time we use Equal Index:
 - a. “Vampire Body” and “Vampire Head” use equal indices
 - b. “Zombie Body” and “Zombie Head” use equal indices
4. These two Rules now force the head material to be chosen according to the chosen body material,

Result: We are done!

NOTE: This is a pretty extreme example of how Rules and Chance settings severely reduce the number of combinations, which can be generated. Let’s assume we have ten materials in each of the four groups (with None included this makes eleven possible choices per group), plus the “Dummy Group” (which doesn’t even add uniqueness, rather the opposite!).

- In best case we could get:
 $11 * 11 * 11 * 11 * 3 = 43935$ unique combinations
- We locked None to 0% in all groups, which leaves us with:
 $10 * 10 * 10 * 10 * 2 = 20000$ unique combinations
- Via the Equal Index Rules we actually locked two groups to be the same as their counter parts. Now, it’s only:
 $10 * 10 * 2 = 200$ unique combinations
- Finally the Force Pair Rules say, it’s only either a zombie or a vampire. So we end with:
 $10 * 2 = 20$ unique combinations

20 unique combinations of vampires or zombies, that's all there is left.
This is not a limitation of Asset Juggler, but cruel reality of mathematics.

If more than these 20 combinations are requested for the series in this setup, Live-Preview will start to feel sluggish and Generation will take significantly longer, as Asset Juggler fights a lost battle, looking for unique combinations, where there are no more.

Lastly this "Dummy Group" is also a nice example, why Asset Juggler can not easily provide an exact maximum number of unique combinations possible, but instead only provides a rough guess of an upper limit.

And here are our vampires and zombies:



Pretty sure, everybody immediately recognizes the vampires and zombies...
Yet, we hope, we are better developers than artists.

Limitations

- Cinema 4D is blocked during Generation (usually a short moment) and Baking (as this takes time, it's more obvious here). Unfortunately Cinema 4D's current API allows to show progress in a reliable way, only under certain conditions.
This can be solved, but the technical implications are not negligible. Fixing this would need some reasonable amount of sold licenses to be feasible for us.
- Xrefs can be a pain, for users as well as developers. When baking into separate project files, any created Xref end up in a rather strange "zombie" state. We believe this is a bug on Maxon's side and we currently do not see, how this could be fixed on our side. The fun part about this bug, it leads to the exact behavior we want to get. The Xref'ed projects appear and work in the final series, without Xrefs causing any additional harm due to being "too alive". Workaround: Disable Xrefs when baking.
- Asset Juggler does not track changes to assets in Asset Groups. There is a manual update command, but we do not consider this a good solution.
We recommend assembling all assets before starting in Asset Juggler.
- When projects from Folder or Project Groups get imported (opposing to be Xref'ed) all texture paths (actually all paths to external assets) get converted into absolute file paths.
- Using Alembic or FBX files in a Folder Group will cause Xrefs (if enabled) to open an import dialog, whenever these get created. Unfortunately there is no way to avoid this behavior. Workaround: Disable Xrefs.
- Live-Preview will change the undo stack if Folder Groups are involved and Xrefs are enabled. This is just another shortcoming of Xrefs and we have no means to avoid this. Workaround: Disable Xrefs for Live-Preview.