



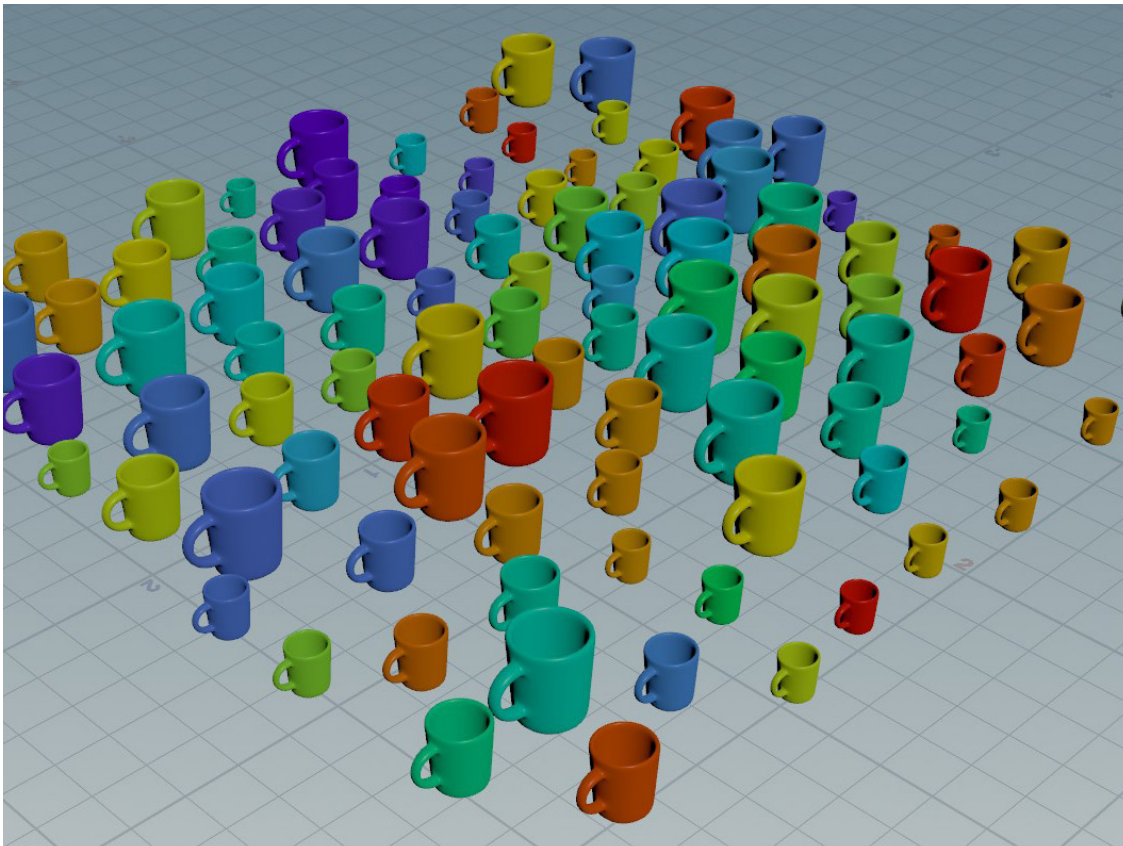
Curriculum-in-a-Box | Lesson 3 | Guided Work

RANDOM ATTRIBUTES WITH SCATTERING

Students are now asked to follow-along with the teacher as they build something in Houdini. For this lesson, students will learn how to work with attributes and how to use those attributes to manipulate copies of geometry. In this example, students will take a coffee cup and scatter it onto a grid. In order to achieve this, students will learn how to set random attributes on the source points to alter the geometry's color and scale. Copying geometry to points is a fundamental concept for working with geometry in Houdini and after this lesson, students will have a much deeper understanding of this concept.

WHAT STUDENTS WILL LEARN

- How to scatter points onto geometry
- How the *Cd* and *pscale* attributes are used
- How to apply random attributes to points
- How to use the Copy to Points SOP to copy geometry



PART ONE

Grid and Scatter Setup

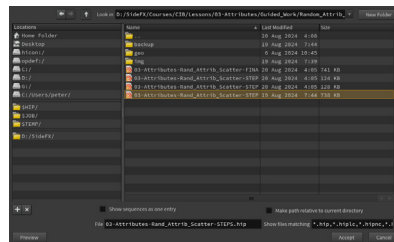
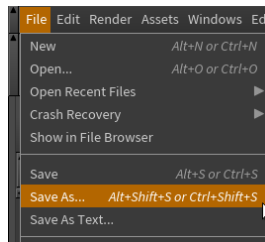
In the first part of this lesson, students will set up their projects, add a grid to the scene and scatter points onto the grid. These points will be the location onto which you copy your geometry later in the lesson.

1. Set up your Project Directory

- Download the *CIB_Lesson03.zip* file. Unzip the file then place it in the *documents>HoudiniProjects* directory.
- Open Houdini and from the **File** menu, choose **Set Project**.
- Navigate to the *CIB_Lesson03* directory and press **Accept**.

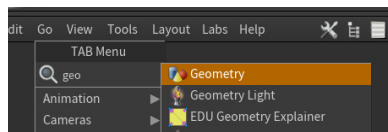
2. Save your Scene File

- From the File menu, choose **Save As**.
- Make sure you are in the *CIB_Lesson03* directory, give the **File** a name and press **Accept**.

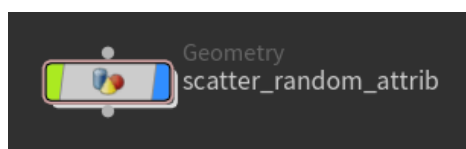


3. Set up the Geometry Network

- Press Tab in the Network View, start typing *geo*, then select **Geometry**.



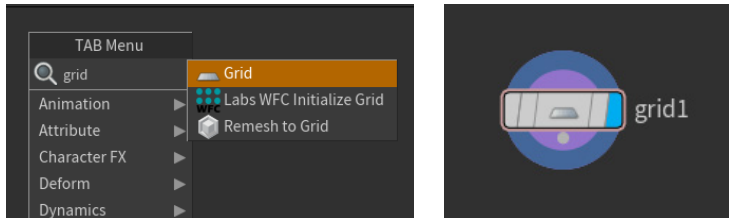
- Click in the Network View to place the node.
- Double-click the *geo1* name and change it to something like *scatter_random_attrib*.
 - This will be a container for the geometry you create.



- Double-click the *scatter_random_attrib* node to dive inside.

4. Add a grid to the scene

- Press **Tab** in the Network View, type *grid*, and press **Enter**.
- **Left-click** to place the node.

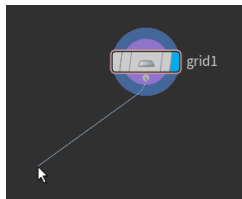


- In the Parameter Pane, change the **Size** to 4 and 4.

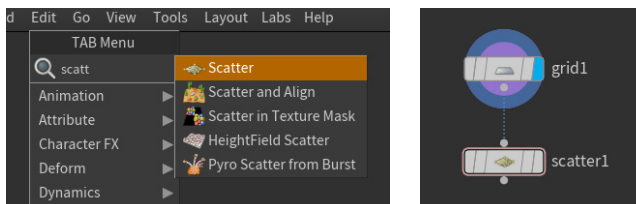


5. Scatter points onto the grid

- **Left-click** on the *Grid* node's output dot.
 - You will now have a wire that follows your cursor and is connected to the output dot.



- Press **Tab** in the Network View, type *scatt*, and press **Enter**.

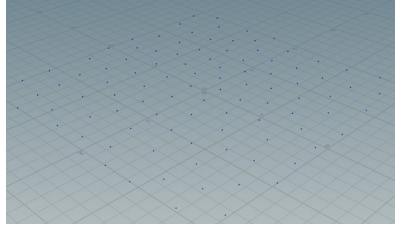
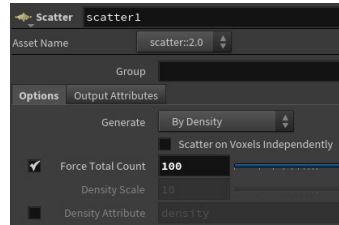


- A new *Scatter* node will be placed in your Network View and will be connected to the *Blast* node.
- You can move the new node in order to keep your network organized. You should see the node snap into alignment with the positions of the other nodes that are already in the network.
- **Click** the right-most section of the *Scatter* node to move the blue Display Flag.
 - This allows us to visualize what the *Scatter* node is doing. The Display Flag is a cornerstone of using Houdini because it lets you visualize the result of all nodes that were placed before the one with the Display Flag.

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- If your *Scatter* node isn't highlighted in yellow, click on the center of it in the Network View.

6. Change the number of scattered points

- In the Parameter Pane, change the **Force Total Count** to **100**.
- You should see the number of points scattered on the grid change to 100.



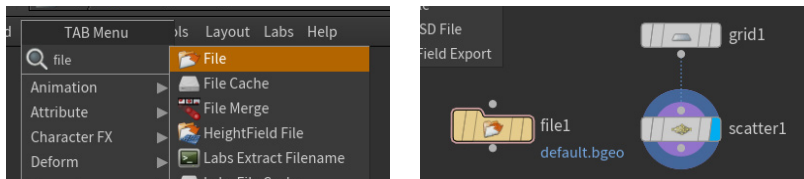
PART TWO

Import Geometry and Copy to Points

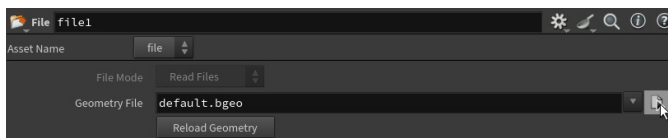
In the next step of this lesson, students will import a supplied coffee cup model, and copy it to the scattered points. This part of the exercise will introduce students to the Copy to Points node, which has two inputs. Students will learn the beginning stages of how more complex scenes are created.

1. Import the provided coffee cup geometry

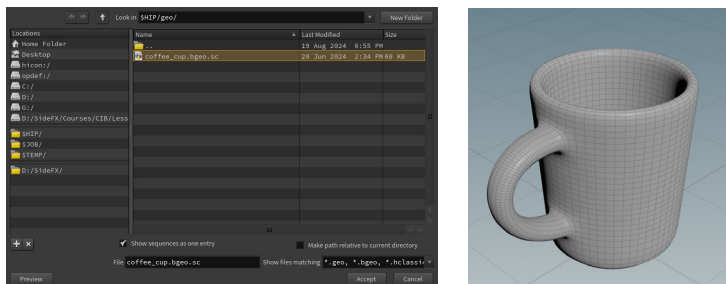
- Press **Tab** in the Network View, type *file*, and press **Enter**.
- **Left-click** to place the node.



- In the Parameter Pane, use the displayed icon next to the **Geometry File** parameter.

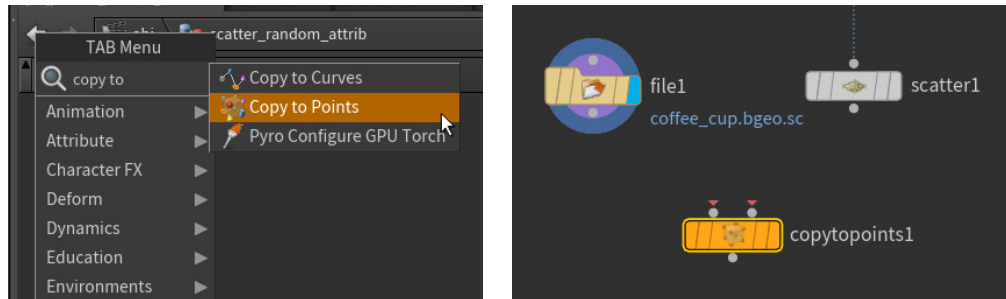


- Navigate to the supplied coffee cup geometry, select it, and press **Accept**.
 - If you move the blue Display Flag to the *File* node, you should see the cup geometry in the Scene View.

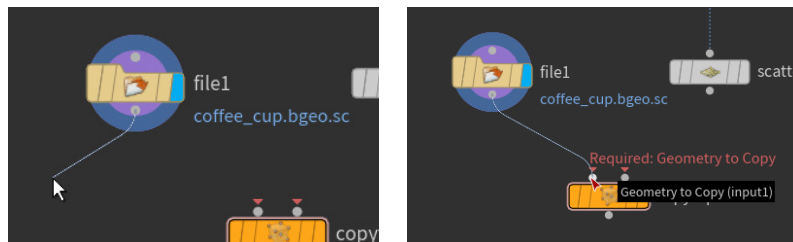


2. Copy the cup to the points

- Press **Tab** in the Network View, type *copy to*, and select **Copy to Points**.



- Take care to select *Copy to Points*, and not *Copy to Curves*. The latter node comes first in the list so it might be easy to select incorrectly.
- Left-click** to place the node.
- Left-click** on the Output dot from the *file1* node, and then **Left-click** to attach the wire to the first input of the *copytopoints1* node.



- You can see that inputs are named in the screenshot. This is especially helpful for multi-input nodes like *Copy to Points*. Here you can see that input 1 is named **Geometry to Copy**.
- Repeat the last step between the *scatter1* node and the *copytopoints1* node's second input.



- If you move the blue Display Flag to the *Copy to Points* node, you should see the copied cups in the Scene View.

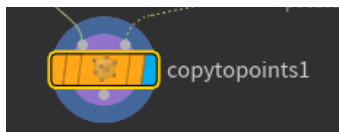
PART THREE

Add Attributes to Modify Copies

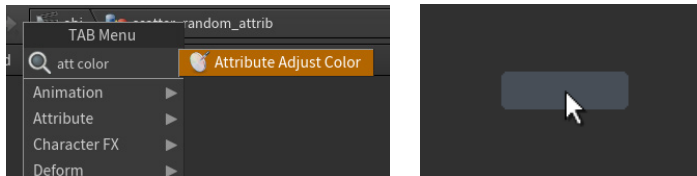
In the final part of this lesson, students will be guided through adding attributes to the points that we created in the first part of this lesson. You will look at two standard Houdini attributes: *pscale* and *Cd*. *Pscale* uniformly scales Copy to Points' input. *Cd* is transferred from the source points onto the newly copied geometry, and Houdini displays this value as a color.

1. Adjust the color attribute (*Cd*) of the points

- During the following steps make sure that the blue Display Flag is on *copytopoints1*.



- Press **Tab** in the Network View, type *att color*, and press **Enter**.
 - You should now have a ghosted node attached to your mouse pointer.



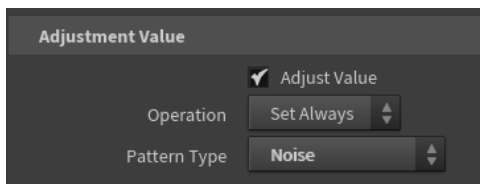
- Hover the ghosted node over the dotted line between *scatter1* and *copytopoints1*, and Left-click.



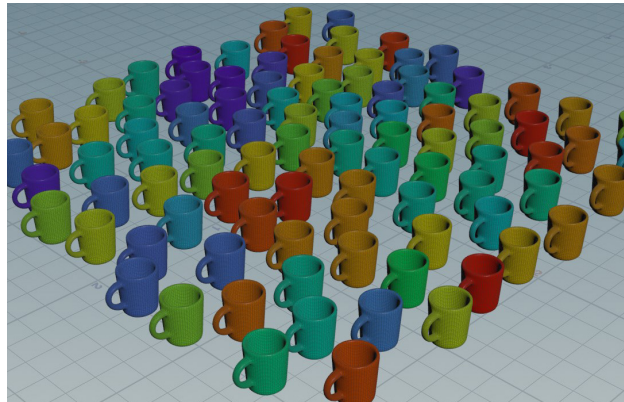
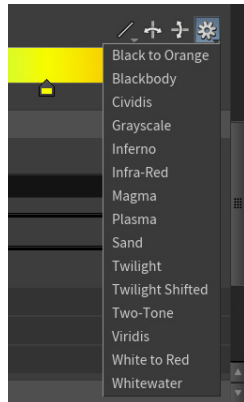
- Feel free to rearrange the nodes as desired, or hover your mouse over the Network View, and press **L** to auto-align the nodes.

2. Randomize the cup's colors

- In the Parameter Pane, change the **Pattern Type** to **Noise**.

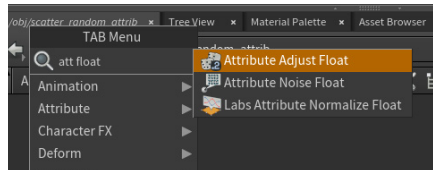


- Scroll down in the Parameter Pane, and change the **Color Ramp** to colors that you like. A list can be found beneath the gear icon, or you could create your own.
 - In this document you'll see the default color ramp being used.

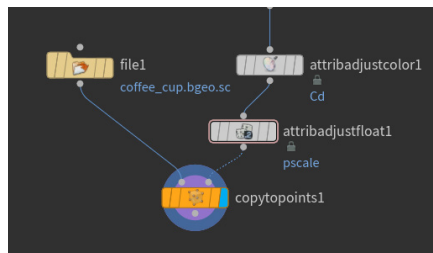
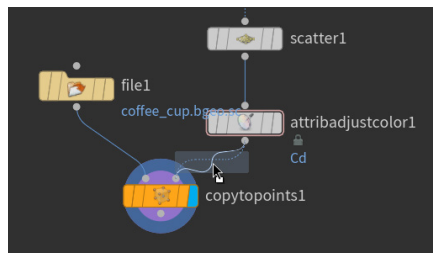


3. Adjust the *pscale* of the points

- Press **Tab** in the Network View, type *att float*, and press **Enter**.
 - You should now have a ghosted node attached to your mouse pointer.

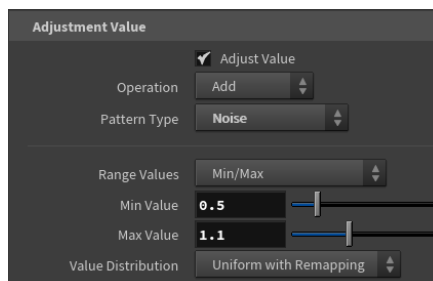


- Hover the ghosted node over the dotted line between *scatter1* and *copytopoints1*, and **Left-click**.

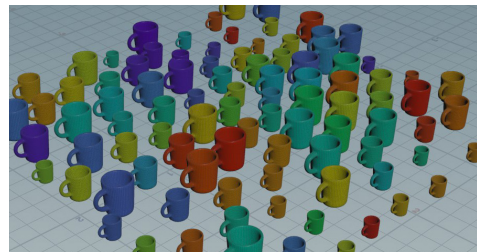
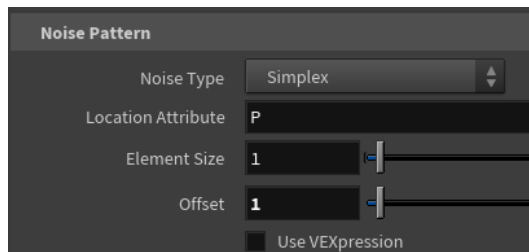


4. Randomize the scales of the copied cups

- In the Parameter Pane, change the **Pattern Type** to **Noise**.
- Change the **Min Value** to **0.5**, and the **Max Value** to **1.1**.

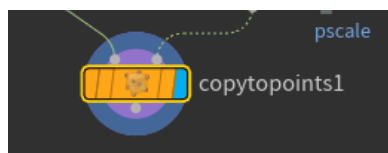


- Scroll down to the **Noise Pattern** section, and change the **Offset** to 1.

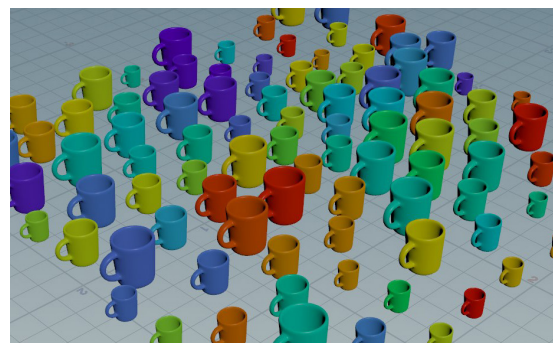
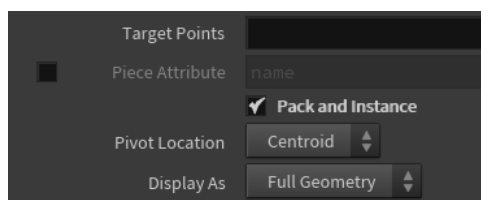


5. Optimize the copies

- Select the *copytopoints1* node in the Network View.



- In the Parameter Pane, check the box next to **Pack and Instance**.
 - This should slightly change the geometry's look in the Scene View, but could improve the Scene View performance depending on the number of copies.



CONGRATULATIONS

You have now completed your random scattering exercise. This has taken you through a project that began with points on a grid, copied a coffee cup onto the points, and added the *pscale* and *Cd* attributes to the points to control the copies.