

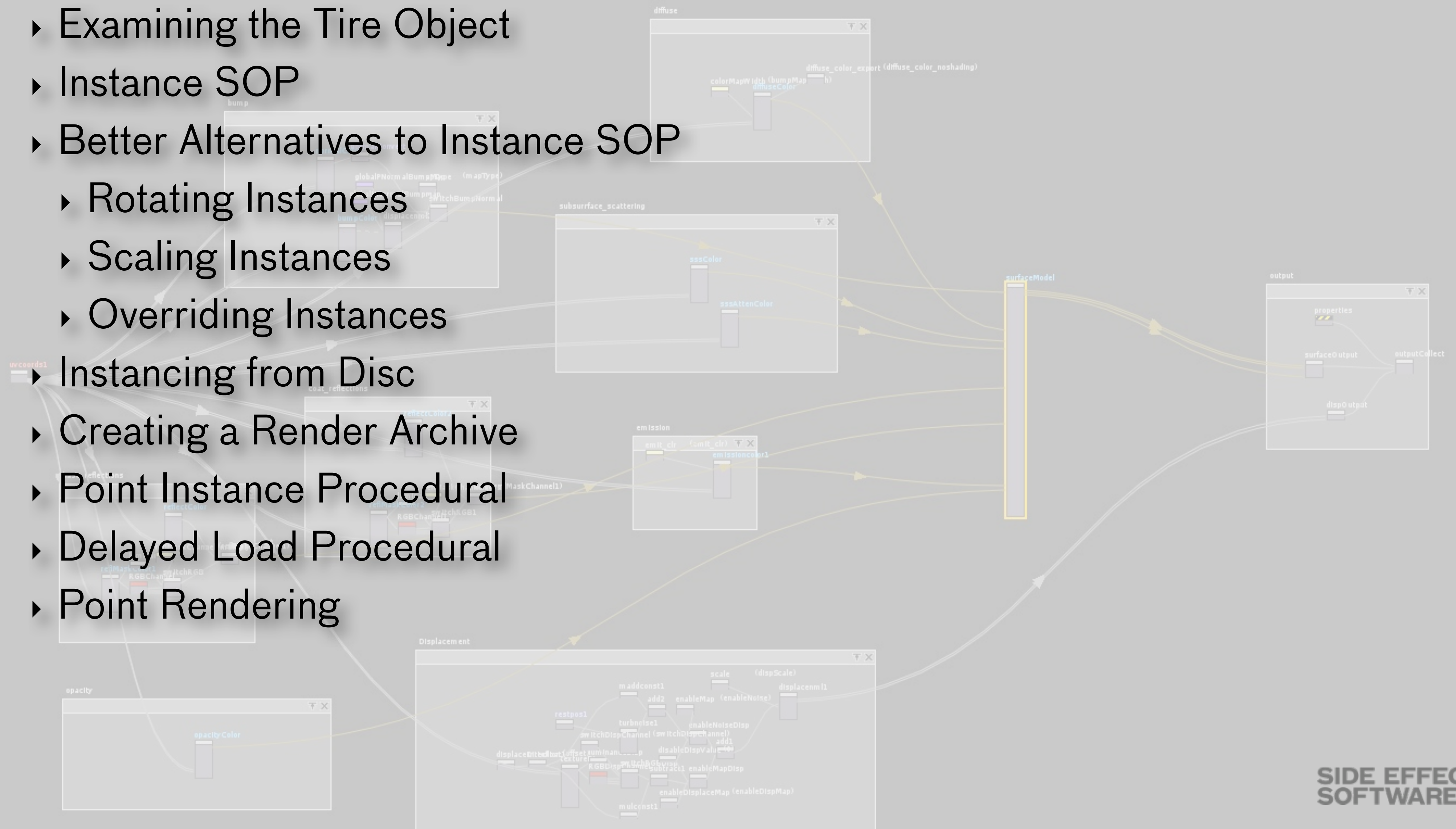
# Houdini

# Light, Shade, Render

M08:Mantra Procedurals

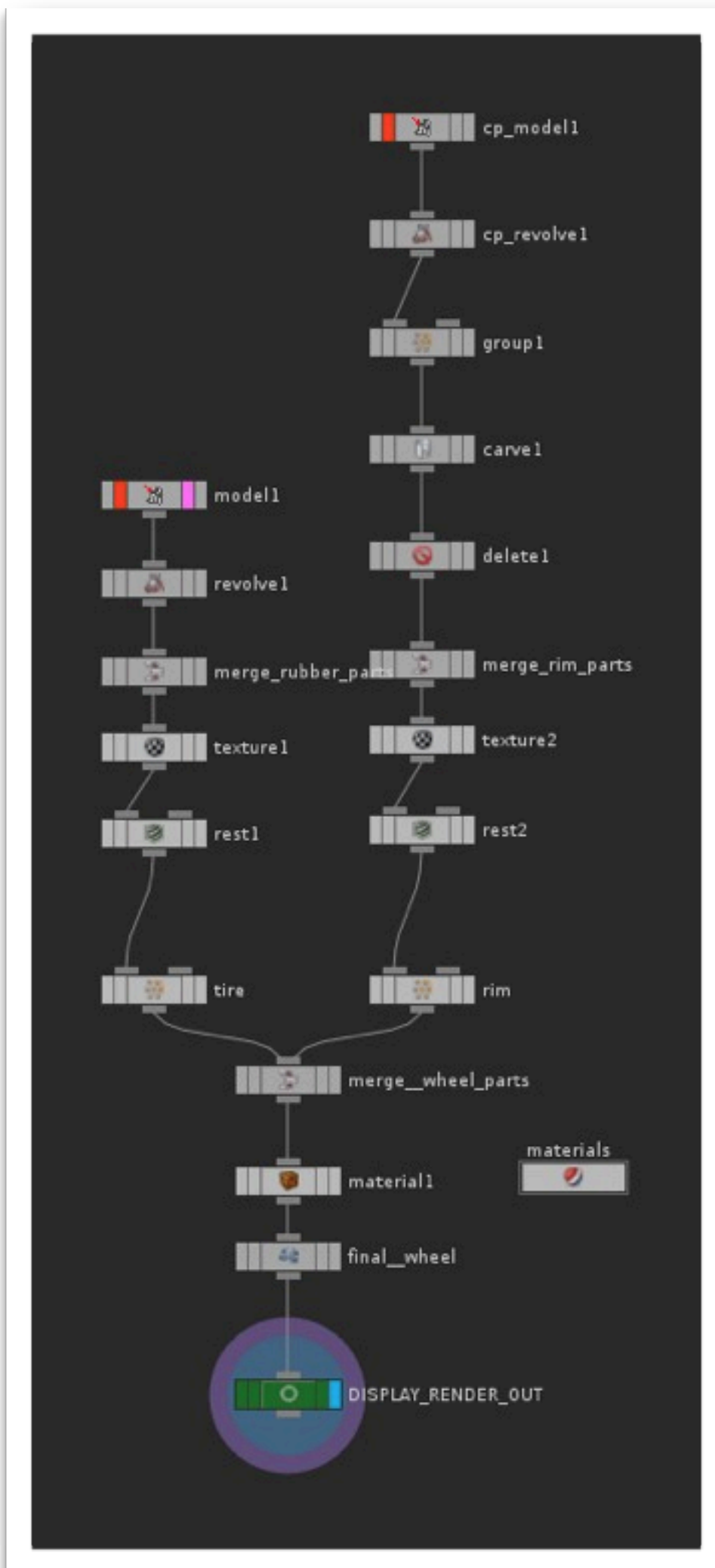
# Agenda

- ▶ Examining the Tire Object
- ▶ Instance SOP
- ▶ Better Alternatives to Instance SOP
  - ▶ Rotating Instances
  - ▶ Scaling Instances
  - ▶ Overriding Instances
- ▶ Instancing from Disc
- ▶ Creating a Render Archive
- ▶ Point Instance Procedural
- ▶ Delayed Load Procedural
- ▶ Point Rendering





# Examining the Tire Object

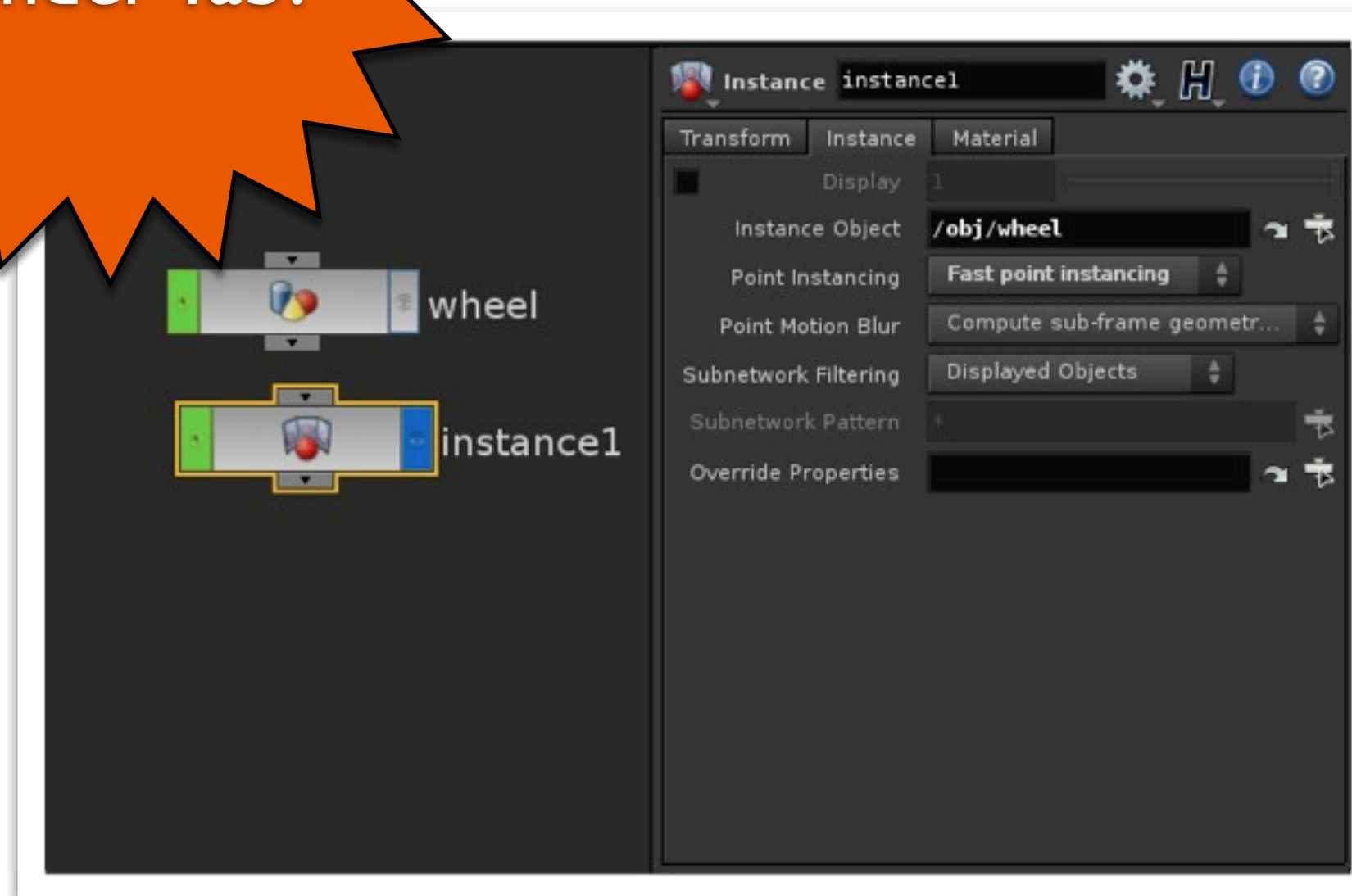


- ▶ Very old file - Notice the Model SOP (obsolete)
- ▶ Included a Rest SOP, Material SOP
  - ▶ Rest SOP placed for deformations
  - ▶ Material SOP - But you told me to assign Materials at the OBJ level
    - ▶ Looking to the future in an Alembic World
    - ▶ Notice how the Material SOP can assign Multiple Materials
    - ▶ Last Material gets Assignment Precedence

# Instance SOP

- ▶ Review of what we did in First Steps Class
  - ▶ Drop Down an Instance SOP
  - ▶ In the Instance Tab
    - ▶ Drag and Drop the Wheel Object onto the InstanceObject parameter
- ▶ Options
  - ▶ Point Instancing Off - Makes a Copy of Geometry
  - ▶ Full Point Instancing - Instances minus custom attributes
  - ▶ Fast Point Instancing - Preferred method since H12 (and will only improve)
- ▶ Notice No Render Tab <- Where would you stick a procedural shader?

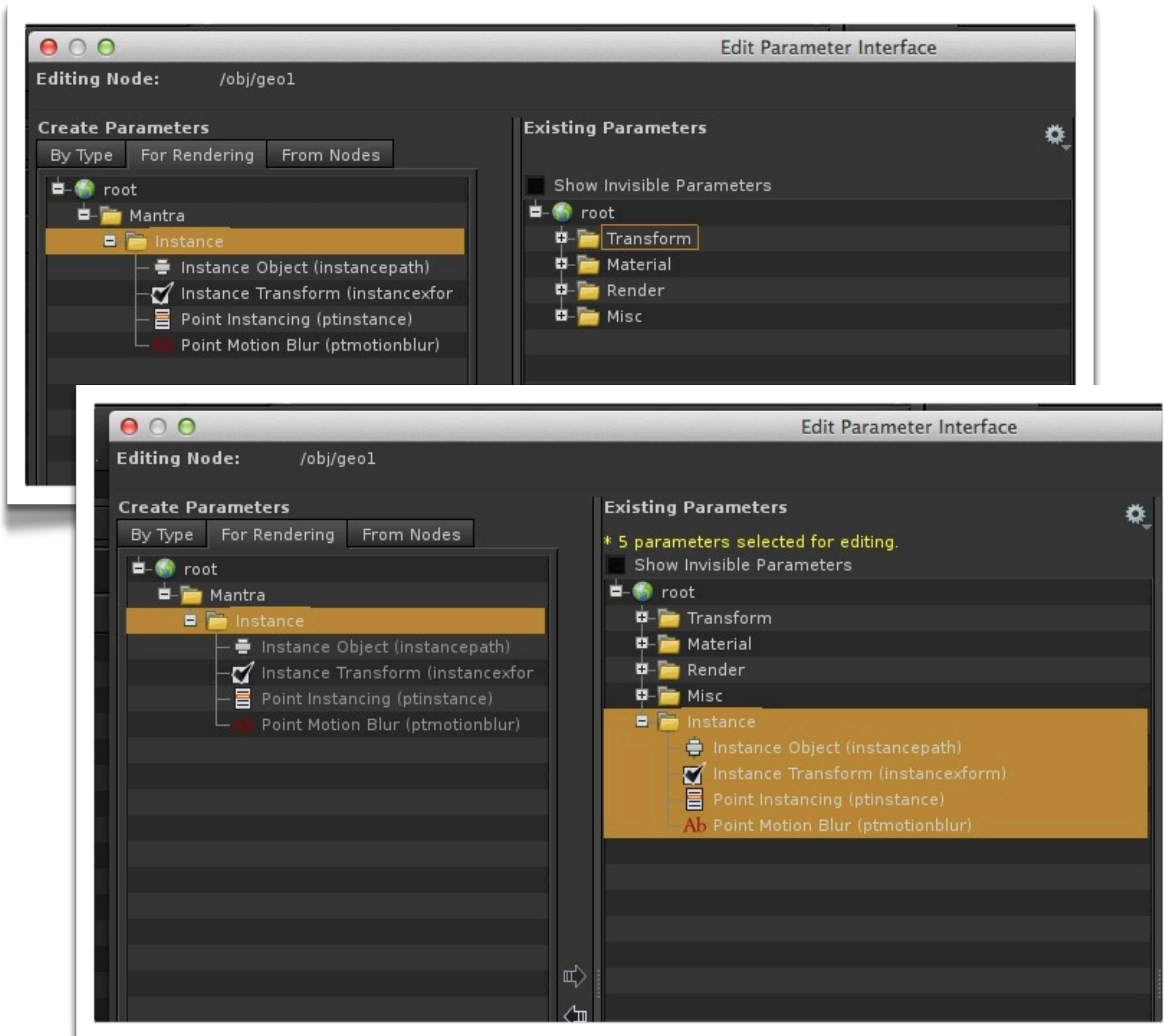
Where is the Render Tab?





# Better Approach...

## Use the Geometry Object

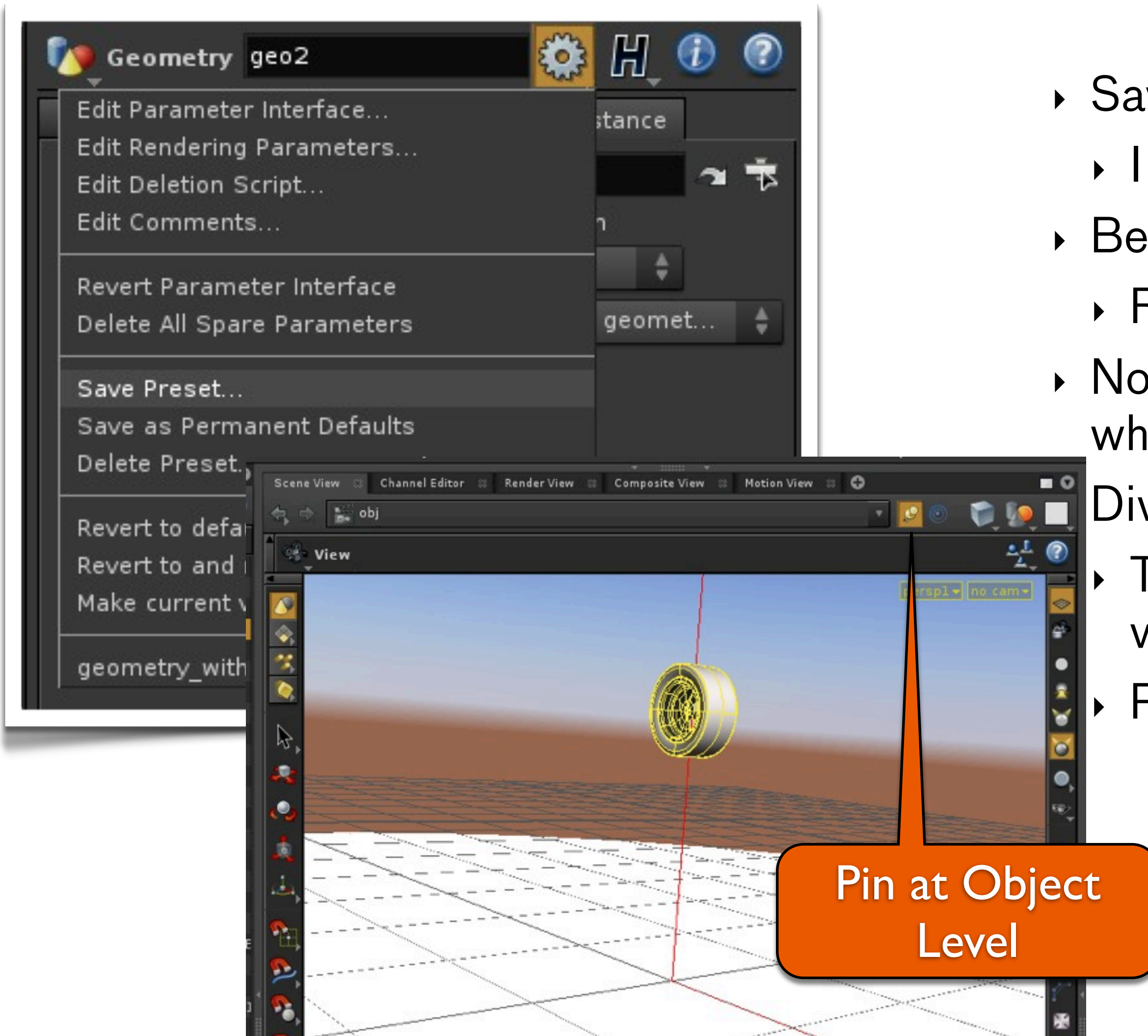


- ▶ Drop down a Geometry Object
- ▶ Open Rendering Parameters Interface
- ▶ Search for Instance
- ▶ Drag entire Instance folder to right
- ▶ Hit Apply/Accept
- ▶ Now you have “Instance” Capabilities in the Geometry Node



# Better Approach... (cont.)

## Use the Geometry Object



- ▶ Save as a preset
  - ▶ I called it geometry\_with\_instance
- ▶ Benefits
  - ▶ Render Tab
- ▶ Notice only see changes in object space when Point Instancing Off

Dive into the Geometry node

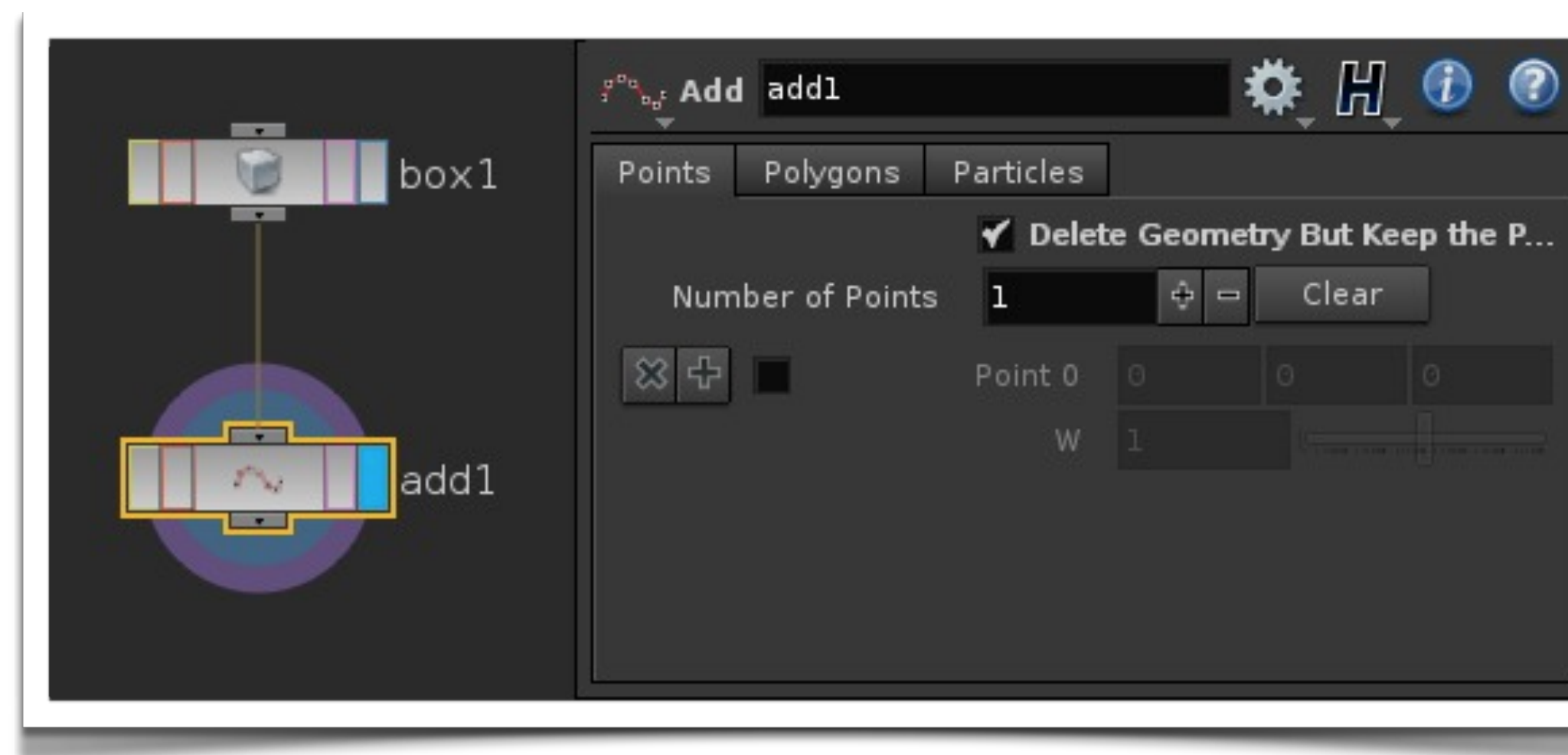
- ▶ The tires disappear - Current limit of viewport
- ▶ Fix by pinning viewport at object level



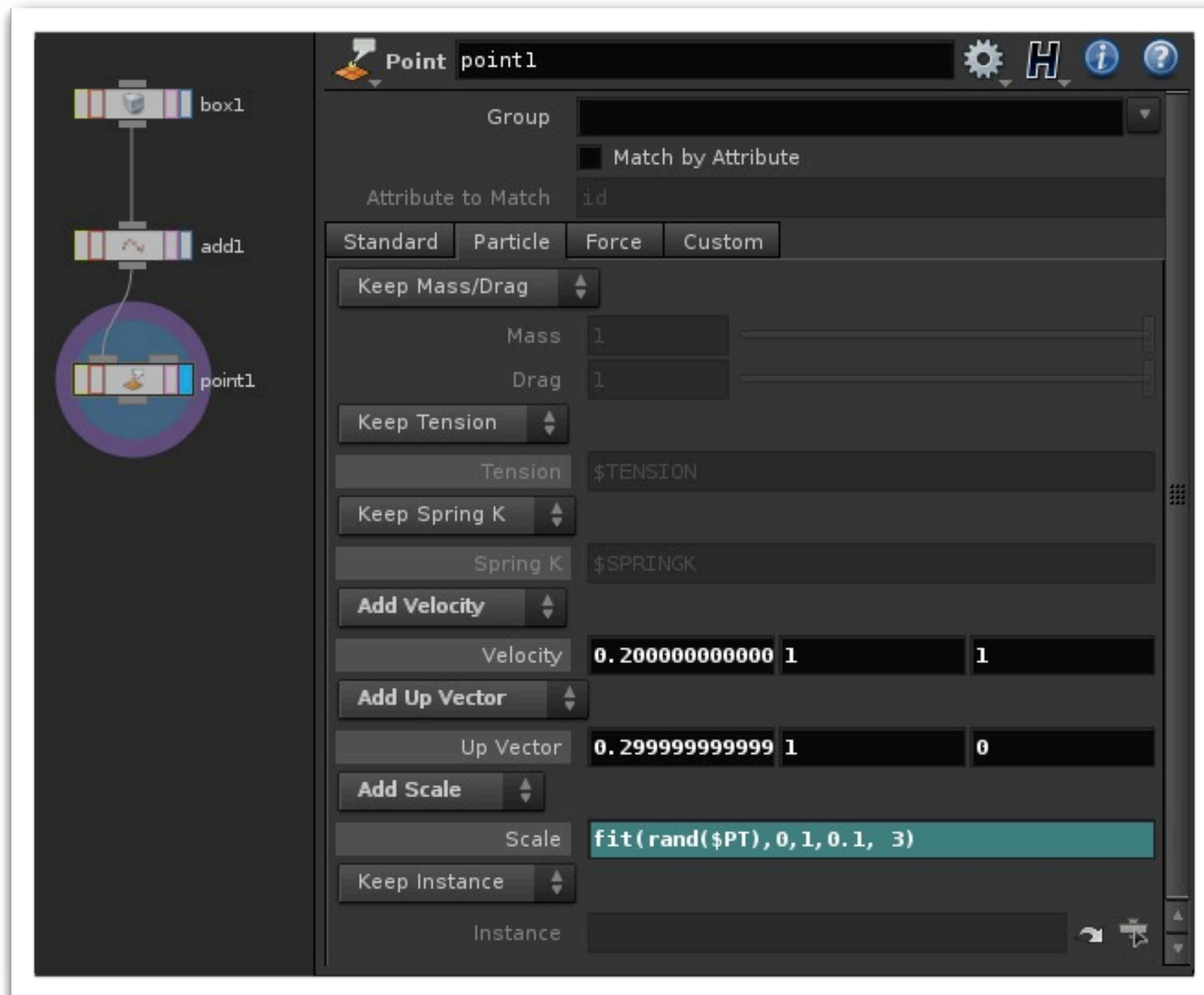
# A little more at the Geo Level..

In Houdini Points are  
the Lowest Common  
Denominator!  
Not Vertices

- Replace the Add SOP with a Box SOP
- Append a Point SOP
- Select Geometry But Keep the Points
- Middle Click on the Add SOP
  - Notice only Points are left
    - No Polys, Primitives, or Vertices



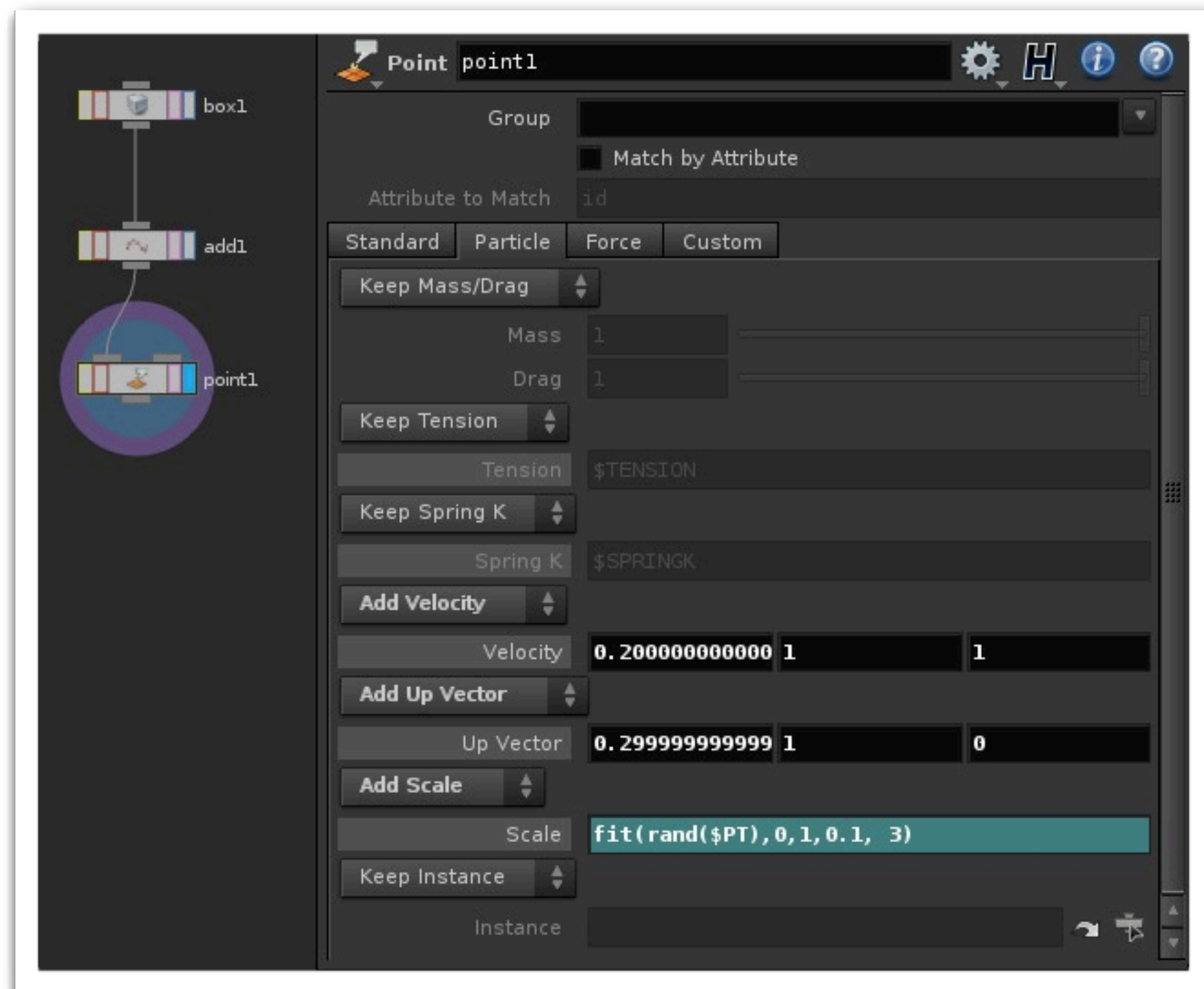
# Rotating Instances



- ▶ After the Add SOP
- ▶ Drop Down a Point SOP
  - ▶ (Can be done using VOPs too)
- ▶ Instances can be rotated using Velocities or Normals
  - ▶ Normals take precedence over Velocity
- ▶ Good practice set up rotations using Velocity
  - ▶ Allows to Override rotations down stream using normals
- ▶ To rotate either use normalized values (e.g., 1,0,1)
- ▶ Good idea to create an up vector also



# Scaling Instances

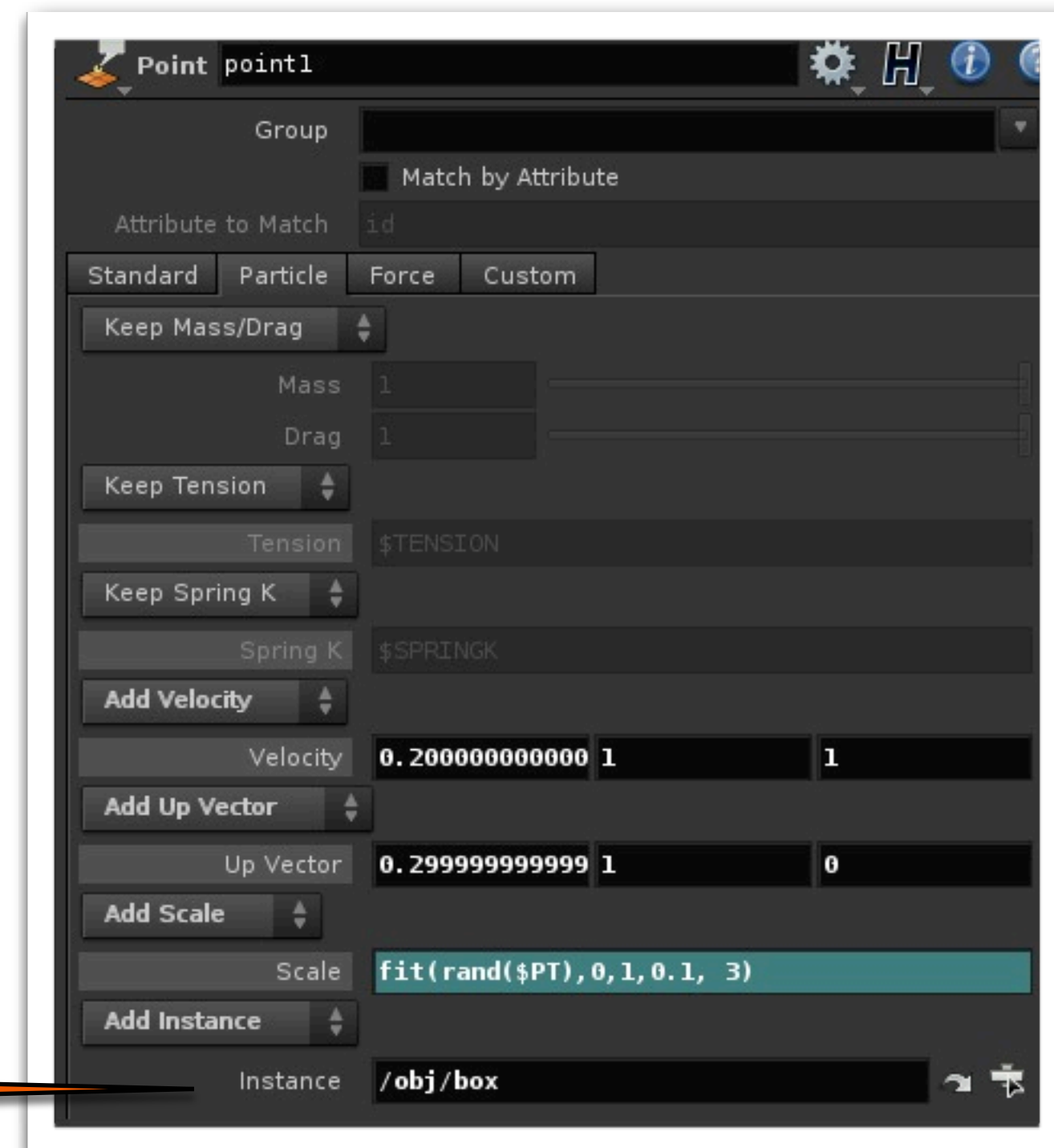


- In the Point SOP
  - Add Scale
  - Try “fit(rand(\$PT),0,1,0.1, 3)”

# Overriding Instances

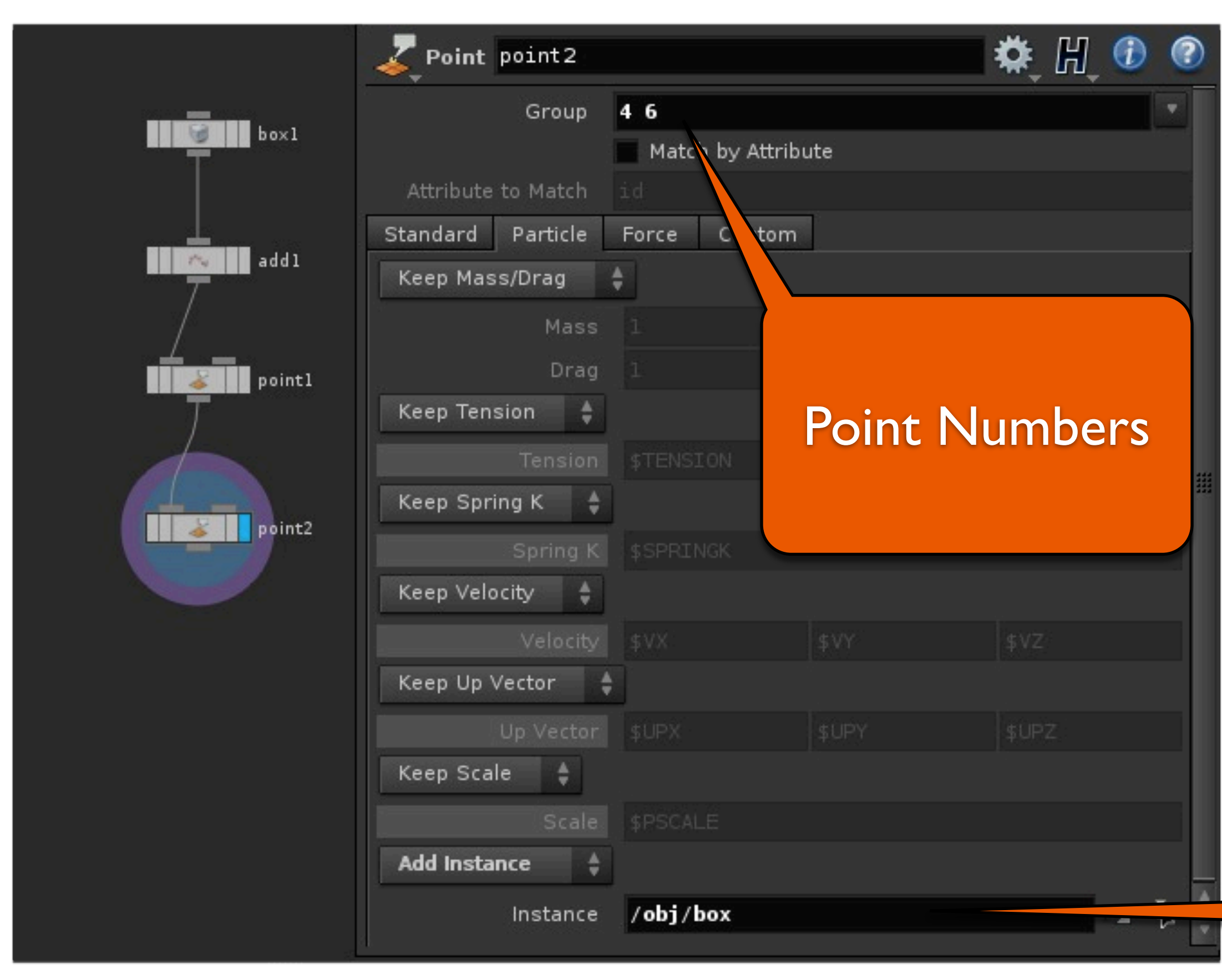
- ▶ If I want to override an Instance with another Instance
  - ▶ In the Point SOP, Particles Tab
    - ▶ “Add Instance” - Select Object for Instance
    - ▶ Make sure it is an Absolute, not relative path

Make sure it is an  
Absolute Path!





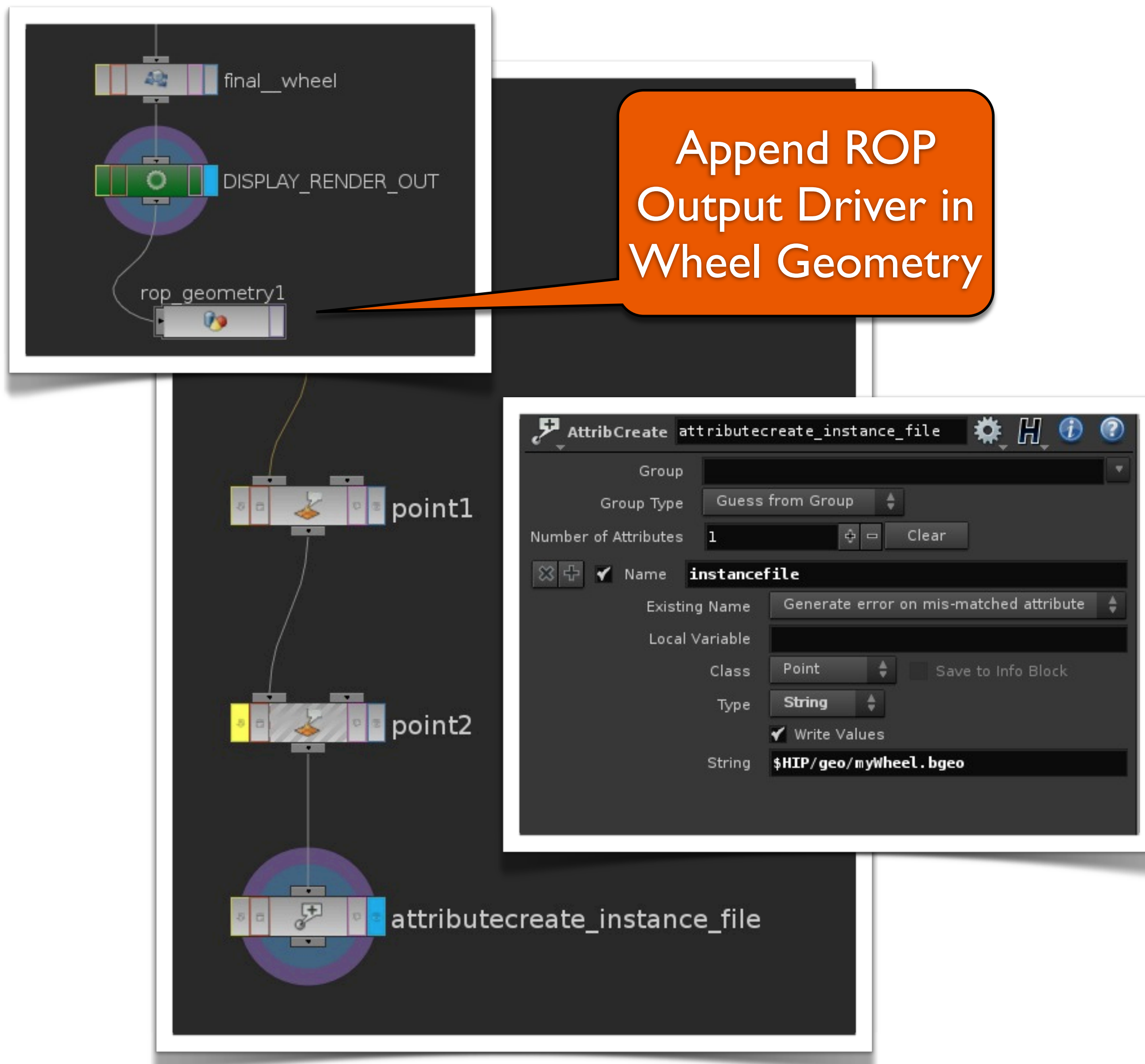
# Overriding a Unique Instance



- ▶ Return the Point SOP to Keep instance
- ▶ Append another Point SOP
  - ▶ Enter Group ID (Point Numbers)
  - ▶ Add Instance
    - ▶ Enter Object to act as Instance (absolute Path)

Absolute Path to  
Object

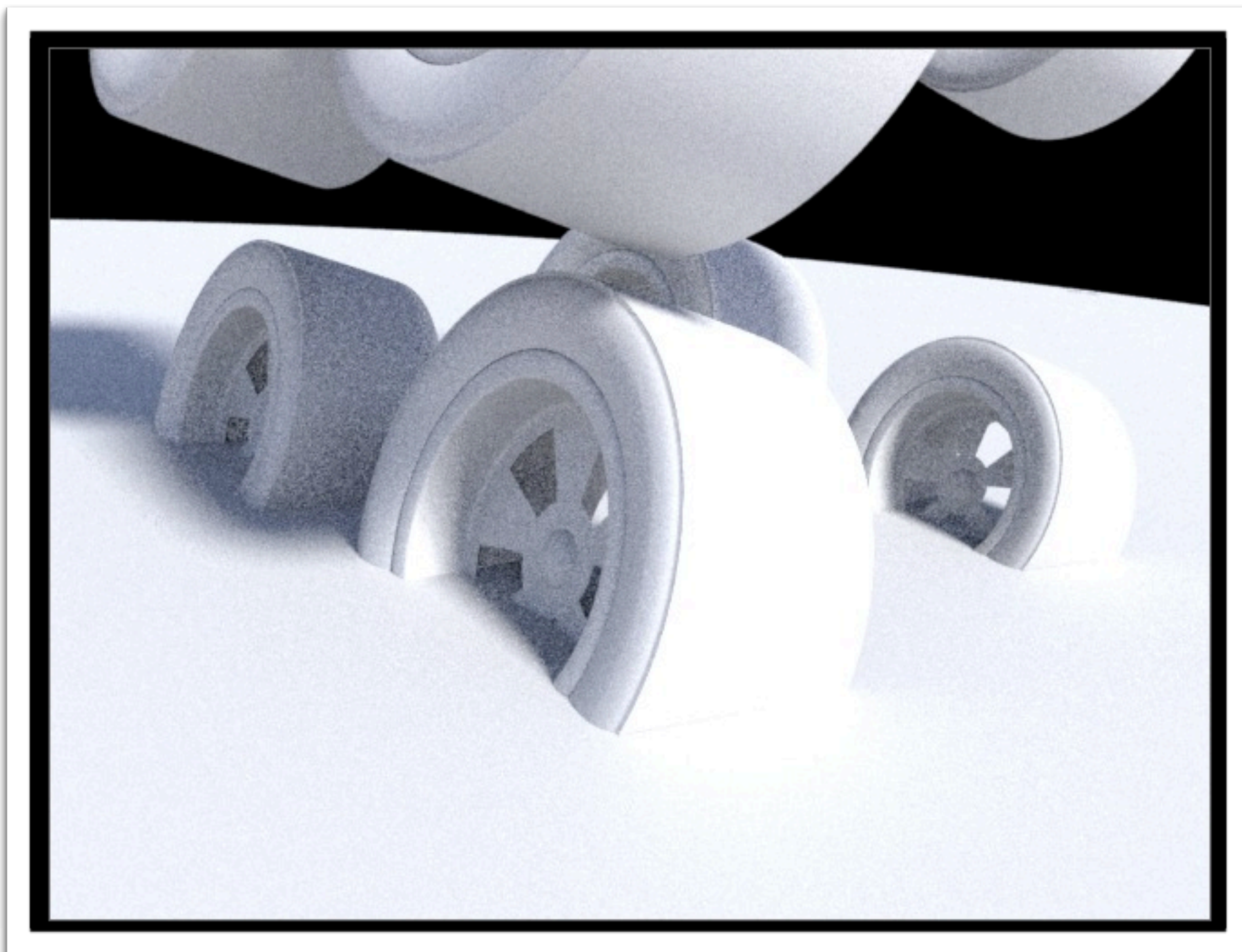
# Instancing From Disk



- ▶ Go back into the Wheel Geometry
- ▶ Add a ROP Output Driver
  - ▶ ROP Output Driver does not supply Material Archives
  - ▶ Name File - \$HIP/geo/myWheel.bgeo
  - ▶ Render file
- ▶ In Geometry Node
  - ▶ Append AttribCreate SOP
  - ▶ Name - instancefile
  - ▶ Class - Point
  - ▶ Type - String
  - ▶ String \$HIP/geo/myWheel.bgeo



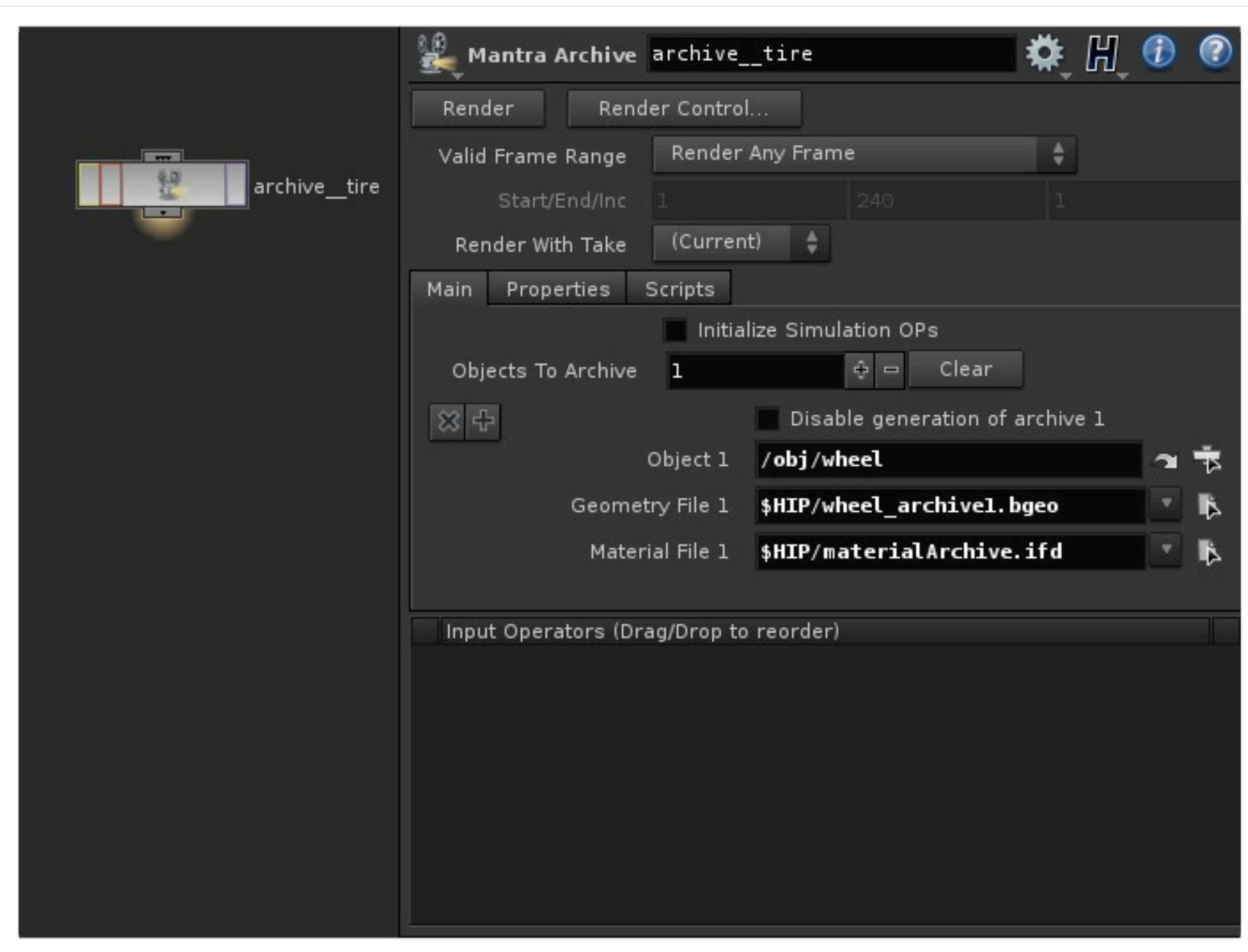
# Instancing From Disc (cont.)



- ▶ Notice no materials applied at render time.
- ▶ One way to solve issue is to turn on render flag on wheel object



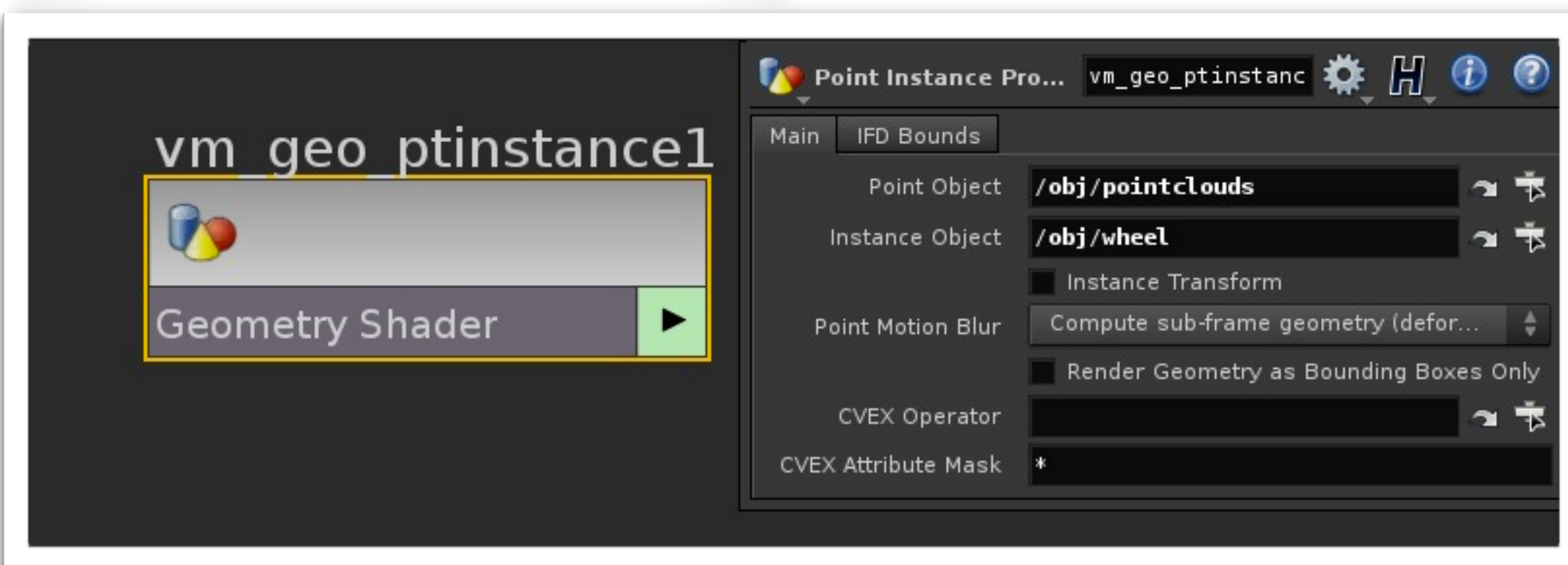
# Creating a Render Archive



- ▶ Go to the Out Context
- ▶ Drop Down a Mantra Archive
  - ▶ Object - /obj/wheel
  - ▶ Geometry File - geometry to archive
  - ▶ Material File - Material to archive
- ▶ Generates disk-based archives which can be used by mantra.
- ▶ Archives allow Houdini to be more efficient when generating scripts for renderers since:
  - a) Houdini can have different geometry displayed
  - b) Houdini doesn't have to send the geometry down to the renderer every frame.
- ▶ Mantra archives are stored as geometry files (typically .bgeo files) and material archive files.

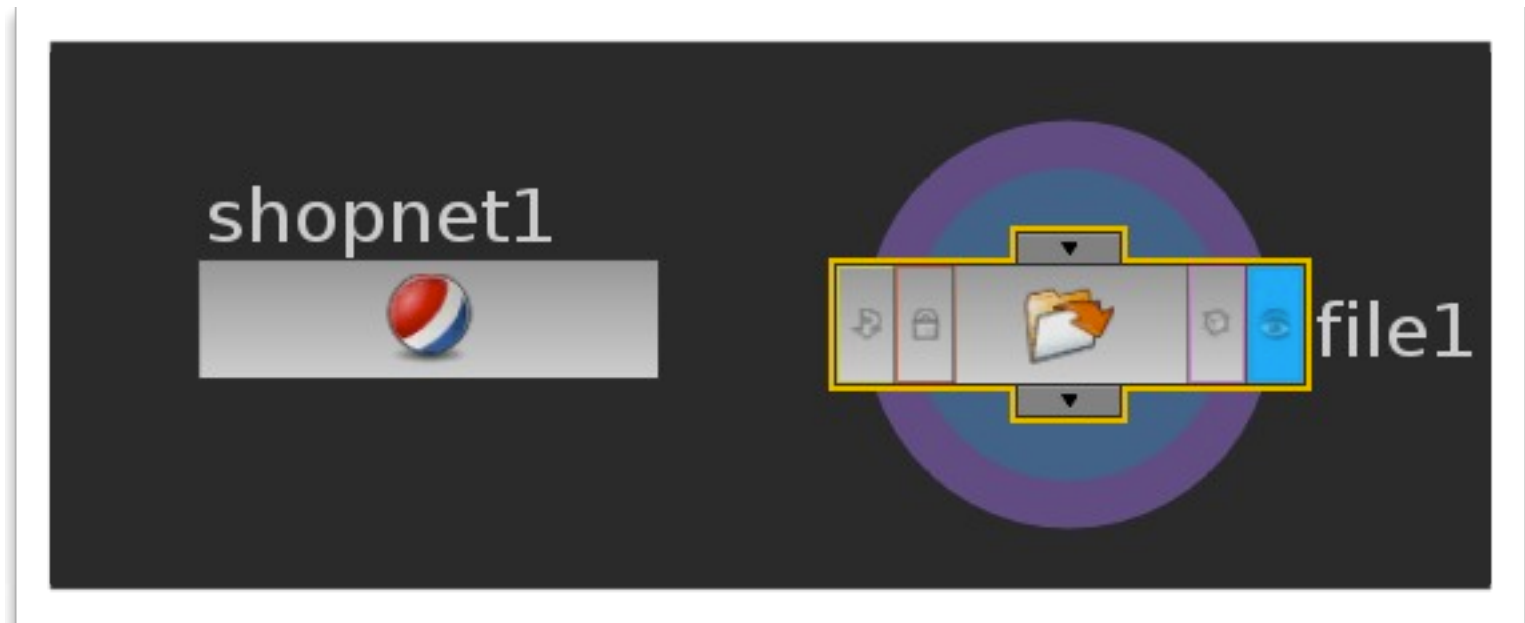


# Using a SHOPNET for Instancing

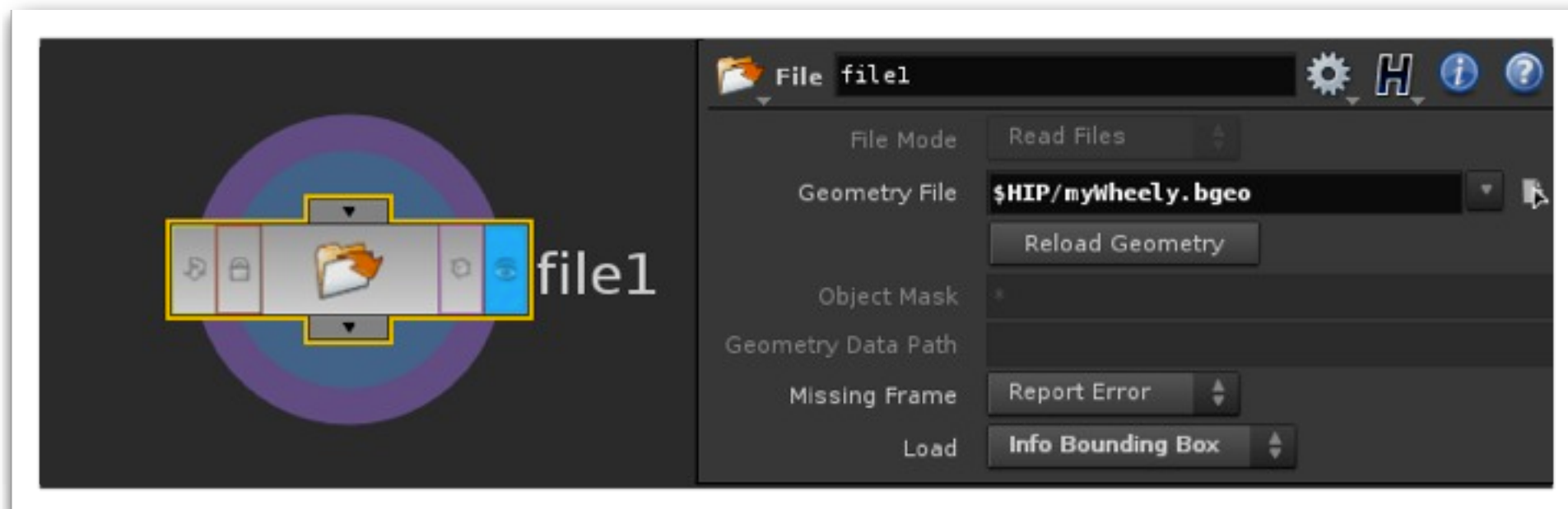


- ▶ Drop down new Geometry Node and dive inside
  - ▶ DO NOT USE THE PRESET WITH INSTANCE TAB!
- ▶ Add a SHOPNET
- ▶ Inside the SHOPNET
  - ▶ Drop Down a Point Instance Procedural
- ▶ Go back up to the Geo Node
  - ▶ In the Render Tab, Sub Tab Geometry
    - ▶ Place link to Point Instance Procedural
- ▶ Dive back to the Procedural

# Delay Load Procedural

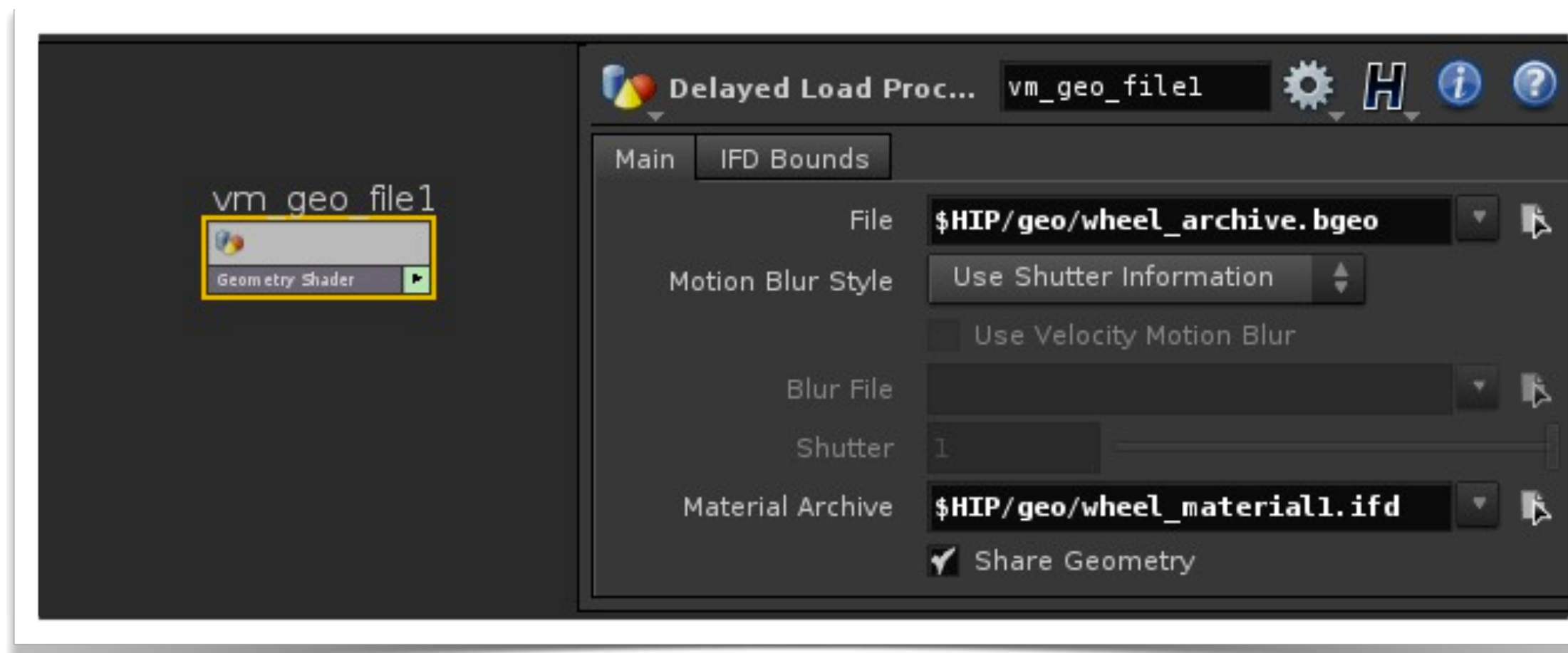


- ▶ Drop down a Geometry Object
- ▶ Dive into the Geo
  - ▶ In the File SOP load the wheel\_archive.bgeo
    - ▶ Remember we used the Mantra\_Archive Node to save the wheel\_archive.bgeo and wheel\_archive.ifd (material ) earlier
  - ▶ In the Load Parameter change to - Info Bounding Box
- ▶ At the same level as the File SOP drop down a SHOPNET





# Delayed Load Procedural (Cont.)



- ▶ Dive into the SHOPNET
  - ▶ Drop down a Delayed Load Procedural
  - ▶ For the file parameter in the Delayed Load Procedural
  - ▶ Enter the name of the archive.bgeo you created with the Mantra\_Archive
  - ▶ For the Material Archive parameter
    - ▶ Enter the name of the material\_archive.ifd you created
  - ▶ At the object level remember to go into the Geometry tab
    - ▶ Add a link to the procedural shader

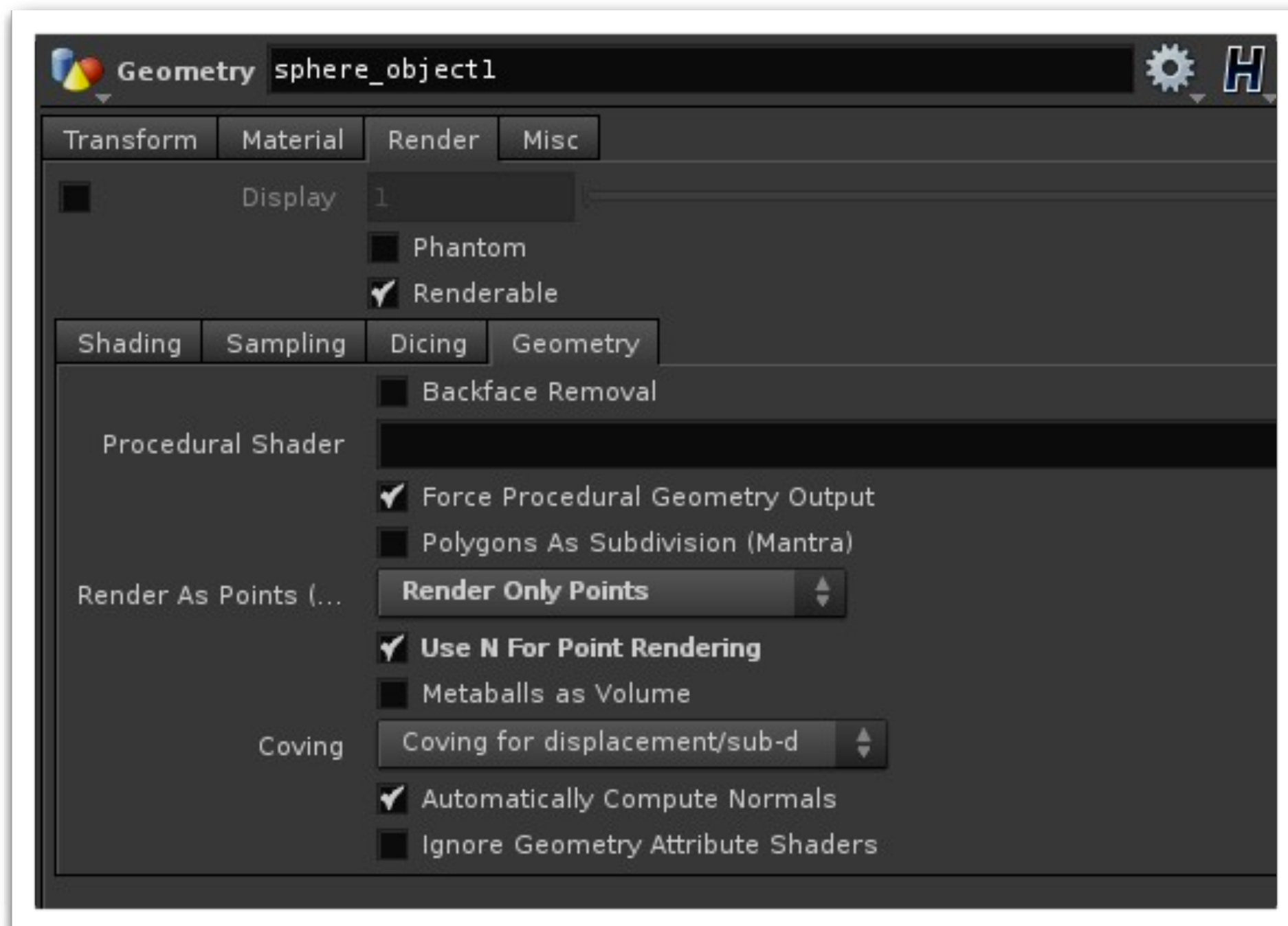
# Point Rendering



- ▶ Drop down a sphere
  - ▶ Make polygonal
- ▶ Add a Scatter SOP
- ▶ Drop down a Point SOP
- ▶ Add Normal (Standard Tab)
- ▶ Add Scale (Particle Tab)



# Point Rendering (cont.)



- ▶ The Normal will allow for correct shading of each point
  - ▶ Without normals, each disk always faces the light.
- ▶ The Add Scale will allow you to control the size of each point.
- ▶ Back at the object level of the Sphere
  - ▶ In the Render tab Geometry sub tab
    - ▶ Render as Point - Render Only Points
    - ▶ Select - Use N for Point Instancing