

Houdini First Steps

Module 03 - Procedural Modeling and HDAs

Ari Danesh
ari@sidefx.com

Side Effects
Software

Agenda

- Instance Obj
- When geometry is too great for the copy SOP
- Exporting variations of the same model for later use
- File SOP vs ROP Driver
- Creating a HDA (Houdini Digital Asset)
- Where are OTLs stored
- Making a shelf tool

Expression padzero()

- Returns a string containing <value> preceded by enough zeros to make up <size> digits.
- **EXAMPLES**
 - $\text{padzero}(5, 126) = 00126$
 - $\text{padzero}(5, 23) = 00023$
 - $\text{padzero}(1, 23) = 23$

Embedding an Expression in to a String

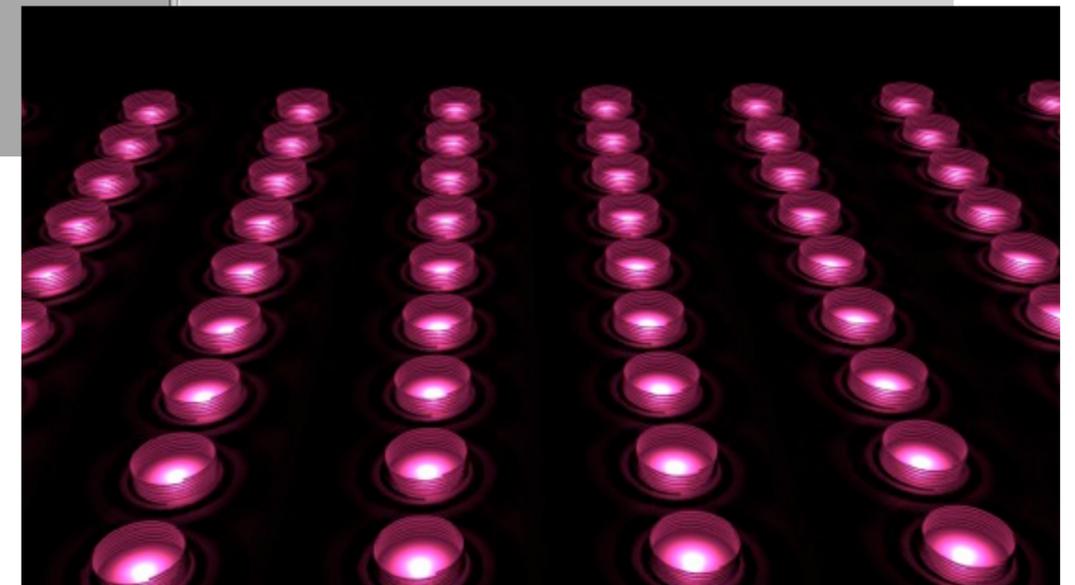
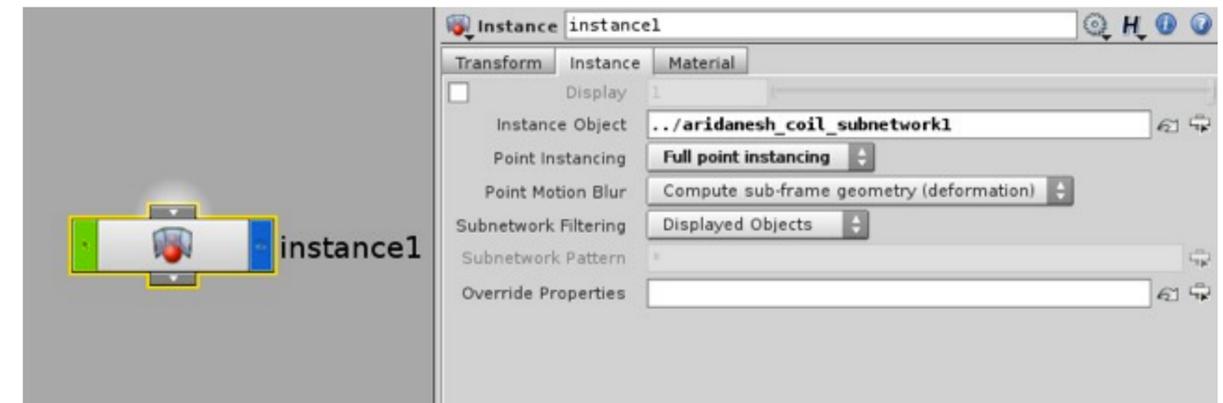
- When embedding an expression in to a string such as a file name:
 - You need to wrap the expression in back ticks
 - The ` key is found above the tab key on the American English Keyboard
 - Example:
 - `$HIP/geo/coils/coil_`padzero(3,$F)` .bgeo`

File vs ROP Driver

- **File SOP** - Reads, writes, or caches geometry on disk.
- **File SOP** has two modes of operation. If its input is connected, you can choose a File mode to control how the node reads, writes, or caches geometry on disk. If no input is connected, you can specify a geometry file to read in from disk and send through the node's output.
- Houdini's native geometry format - bgeo
- When exporting geometry most prefer to use a ROP Output Driver. It acts like a render node.
- ROP Output Driver generates geometry files from a SOP or DOP network.

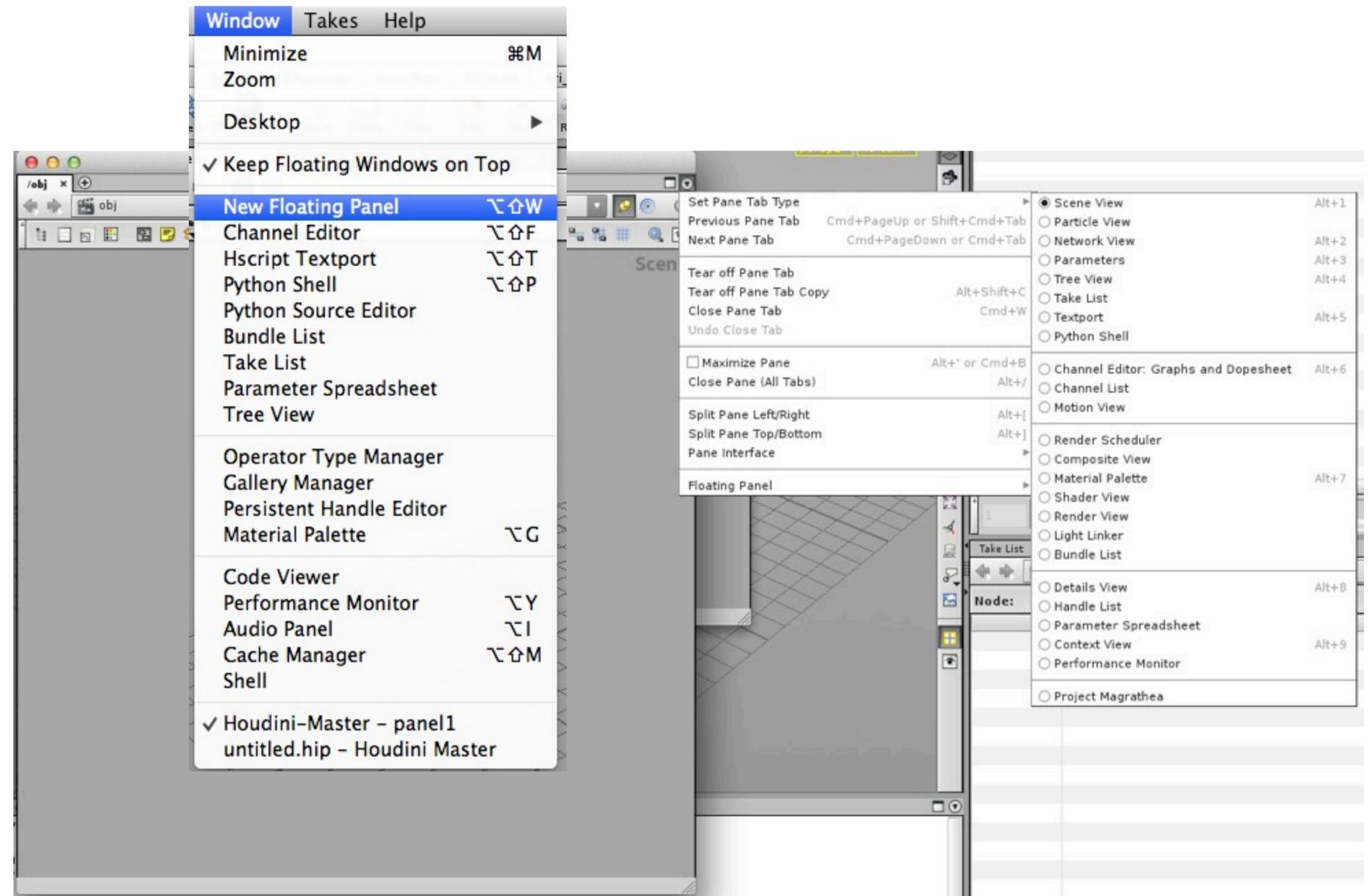
Key Components of Instancing

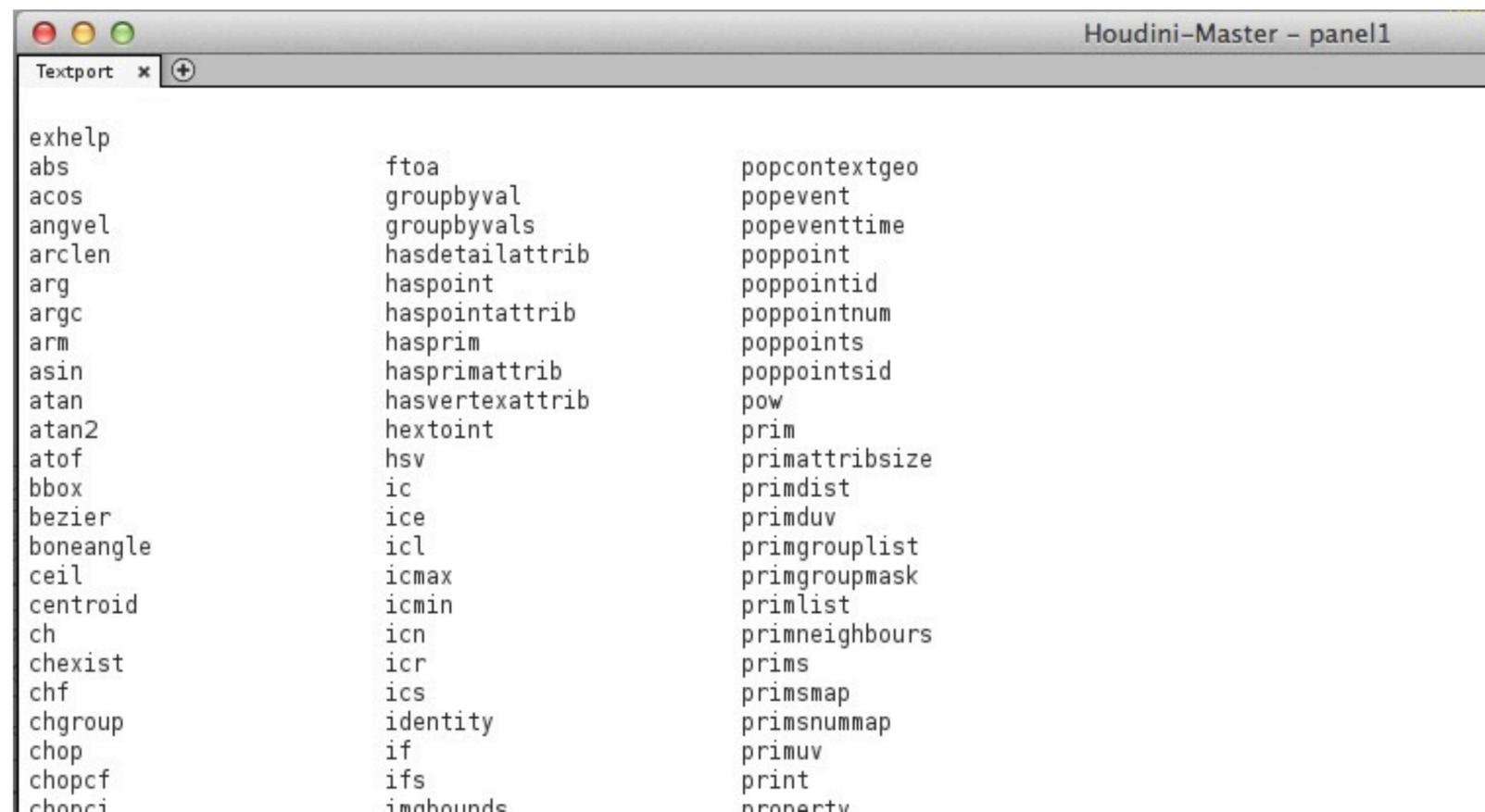
- Set point instancing to either “Full point instancing” or “Fast point instancing”
- What is the Add SOP?
- Dive into node and replace “add SOP” with geometry you want to point use as template geometry



Using exhelp in the Textport

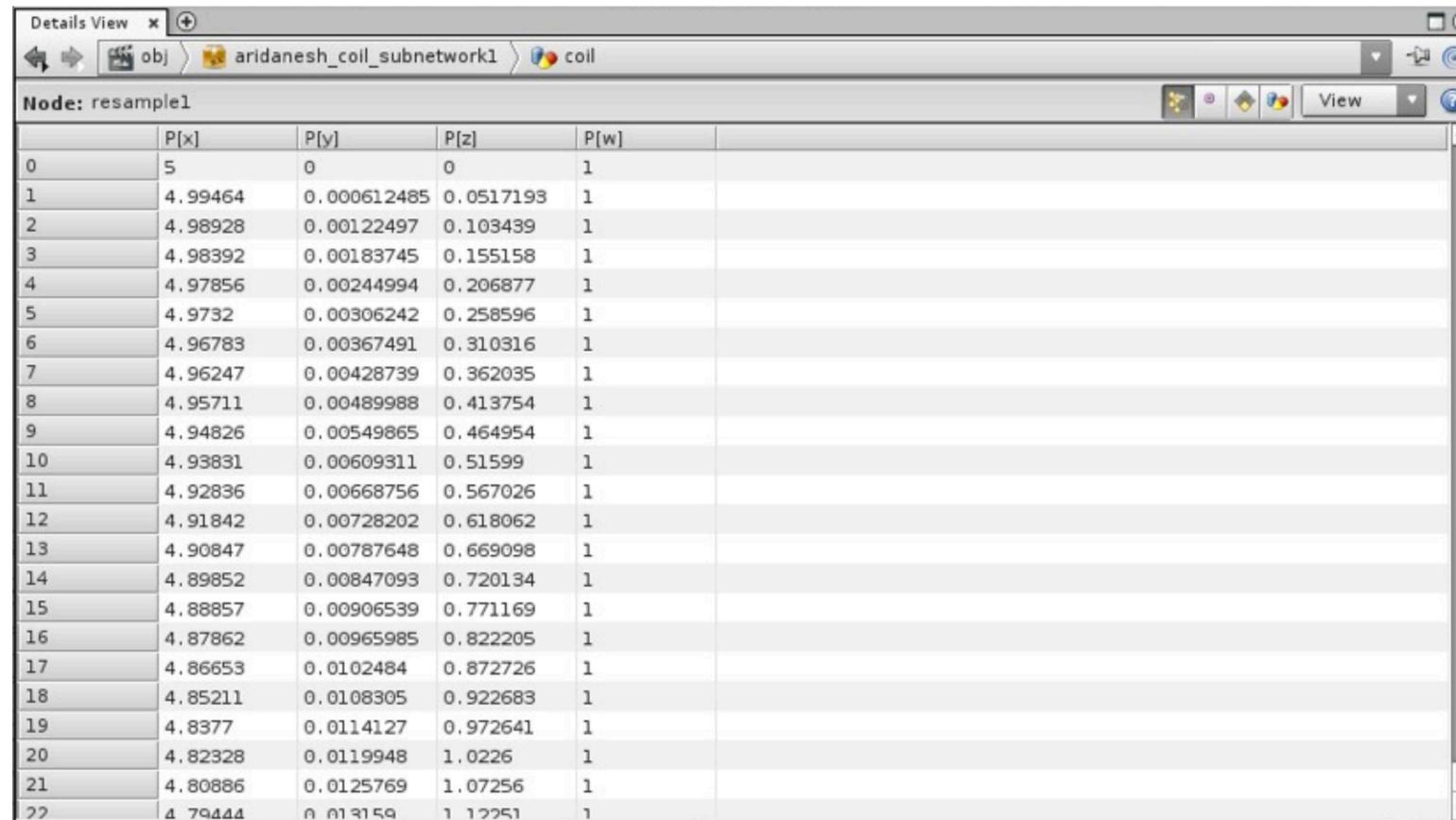
- When needing to know how to use an expression open the textport
- type exhelp expression





```
Textport x +
exhelp
abs
acos
angvel
arclen
arg
argc
arm
asin
atan
atan2
atof
bbox
bezier
boneangle
ceil
centroid
ch
chexist
chf
chgroup
chop
chopcf
chanci
ftoa
groupbyval
groupbyvals
hasdetailattrib
haspoint
haspointattrib
hasprim
hasprimattrib
hasvertexattrib
hextoint
hsv
ic
ice
icl
icmax
icmin
icn
icr
ics
identity
if
ifs
imbounds
popcontextgeo
popevent
popeventtime
poppoint
poppointid
poppointnum
poppoints
poppointsid
pow
prim
primattribsize
primdist
primduv
primgrouplist
primgroupmask
primlist
primneighbours
prims
primsmap
primsnummap
primuv
print
property
```

Exhelp Screen Shot



The screenshot shows the 'Details View' window in Houdini. The window title is 'Details View' and it contains a table of data for a node named 'resample1'. The table has five columns: 'P[x]', 'P[y]', 'P[z]', and 'P[w]'. The rows are indexed from 0 to 22. The data shows a progression of values for each parameter over time.

	P[x]	P[y]	P[z]	P[w]
0	5	0	0	1
1	4.99464	0.000612485	0.0517193	1
2	4.98928	0.00122497	0.103439	1
3	4.98392	0.00183745	0.155158	1
4	4.97856	0.00244994	0.206877	1
5	4.9732	0.00306242	0.258596	1
6	4.96783	0.00367491	0.310316	1
7	4.96247	0.00428739	0.362035	1
8	4.95711	0.00489988	0.413754	1
9	4.94826	0.00549865	0.464954	1
10	4.93831	0.00609311	0.51599	1
11	4.92836	0.00668756	0.567026	1
12	4.91842	0.00728202	0.618062	1
13	4.90847	0.00787648	0.669098	1
14	4.89852	0.00847093	0.720134	1
15	4.88857	0.00906539	0.771169	1
16	4.87862	0.00965985	0.822205	1
17	4.86653	0.0102484	0.872726	1
18	4.85211	0.0108305	0.922683	1
19	4.8377	0.0114127	0.972641	1
20	4.82328	0.0119948	1.0226	1
21	4.80886	0.0125769	1.07256	1
22	4.79444	0.013159	1.12251	1

Details View

Ari Danesh
ari@sidefx.com

Side Effects
Software

Details View

- **The Details view is one of the most useful viewports in Houdini**
- **In the Details view you can examine point, vertex, primitive, and details data of your geometry or sim data**

HDA

- **Digital assets are custom operator types built from node networks. You encapsulate the network in a digital asset, and then “promote” parameters from nodes inside the asset up as parameters or handles on the asset itself.**
- **Digital assets let you capture the functionality of any network... a character, a compositing effect, a particle system, a light... as a reusable tool with a customized interface you can put in the hands of artists.**

What is an OTL? - operator type library

- You save digital assets in operator type library files (OTLs). Depending on where you save the OTL file, you can make it available to every user, to every project, to all files in one project, or just in one scene
- Houdini searches for OTLs in the directories specified by the `$HOUDINI_OTLSCAN_PATH` environment variable

Installing OTL's

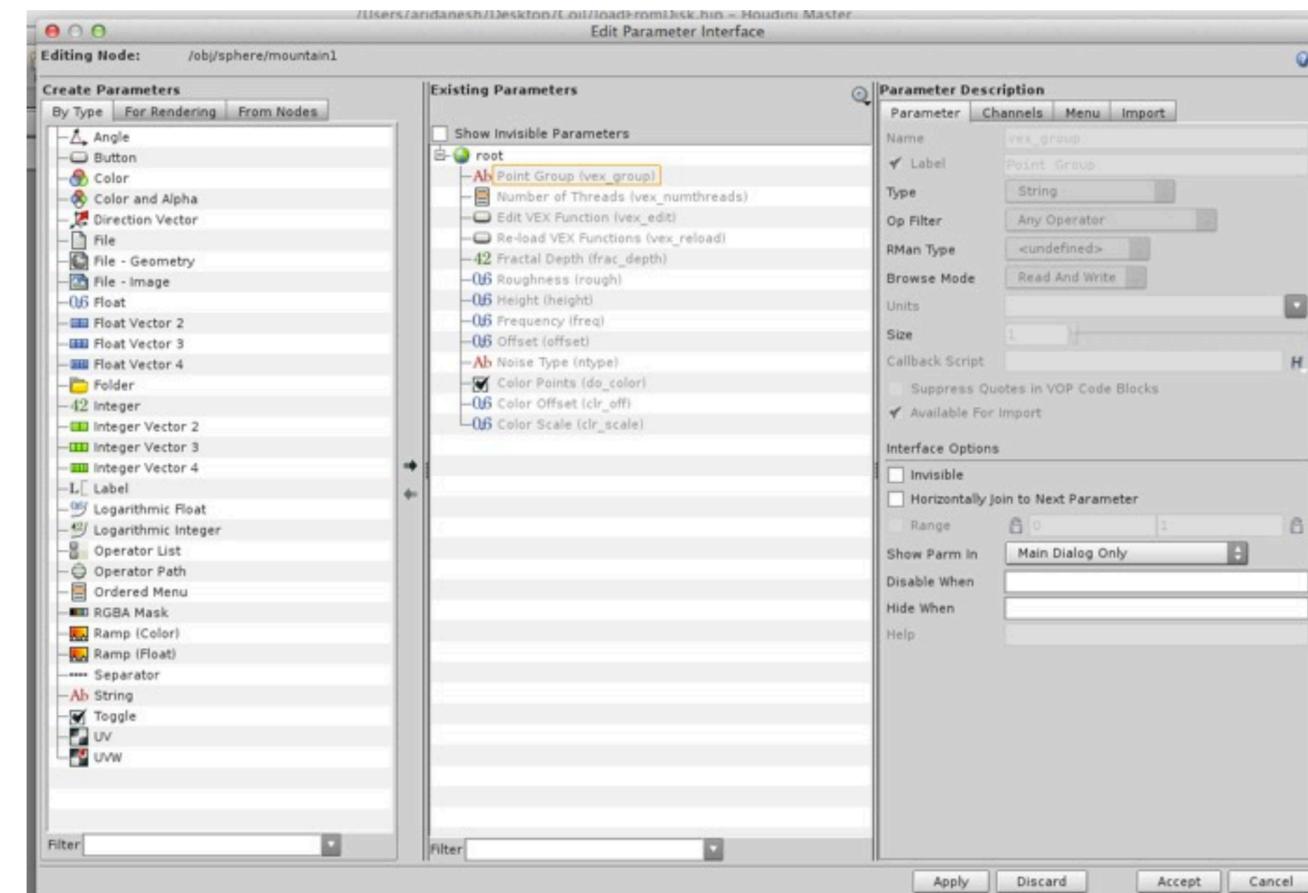
- **Choose File > Install Digital Asset Library.**
- **Select the digital asset file you want to install.**
- **Use the Install Library To option to choose where you want the type library to be available.**

Creating an HDA

- **Select all the nodes in the network you want to make into a HDA**
- **Package them into a subnetwork**
- **Promote parameters into the sub-network**
- **Right Click on the sub-network and create Digital Asset**

HDA Development is Tool Building

- On pen and paper decide what data you want to:
- Create - Is it geometry, particles, lights?
- Modify (e.g., height , radius, scale, color)
- Create a Null or Subnetwork and organize the data using the Parameter Interface Editor
- Use Copy Parameter and Paste Relative to to populate network



Data Organization

- **Folders** - Use folders to separate functionality
- **As an example** - If I have a stair way - Steps would be on one folder, hand rails on another
- **int, float** - know what type your parameter needs
- **Operator Path** - used to create a link to another object
- **Menu** - create a menu of choices
- **File** - choose an external file

Promote Parameters

- **When you create a HDA you must promote the parameters to the Obj level**

Making a Shelf Tool

- **Create a new Shelf Tab for your tools by function or author**
- **Drag the HDA you created onto the Shelf Tab**
- **Edit Shelf tool by right clicking on the icon**
- **Create tool tips**
- **Select Context**