Houdini
Light, Shade, Render

M10: Non GUI Rendering

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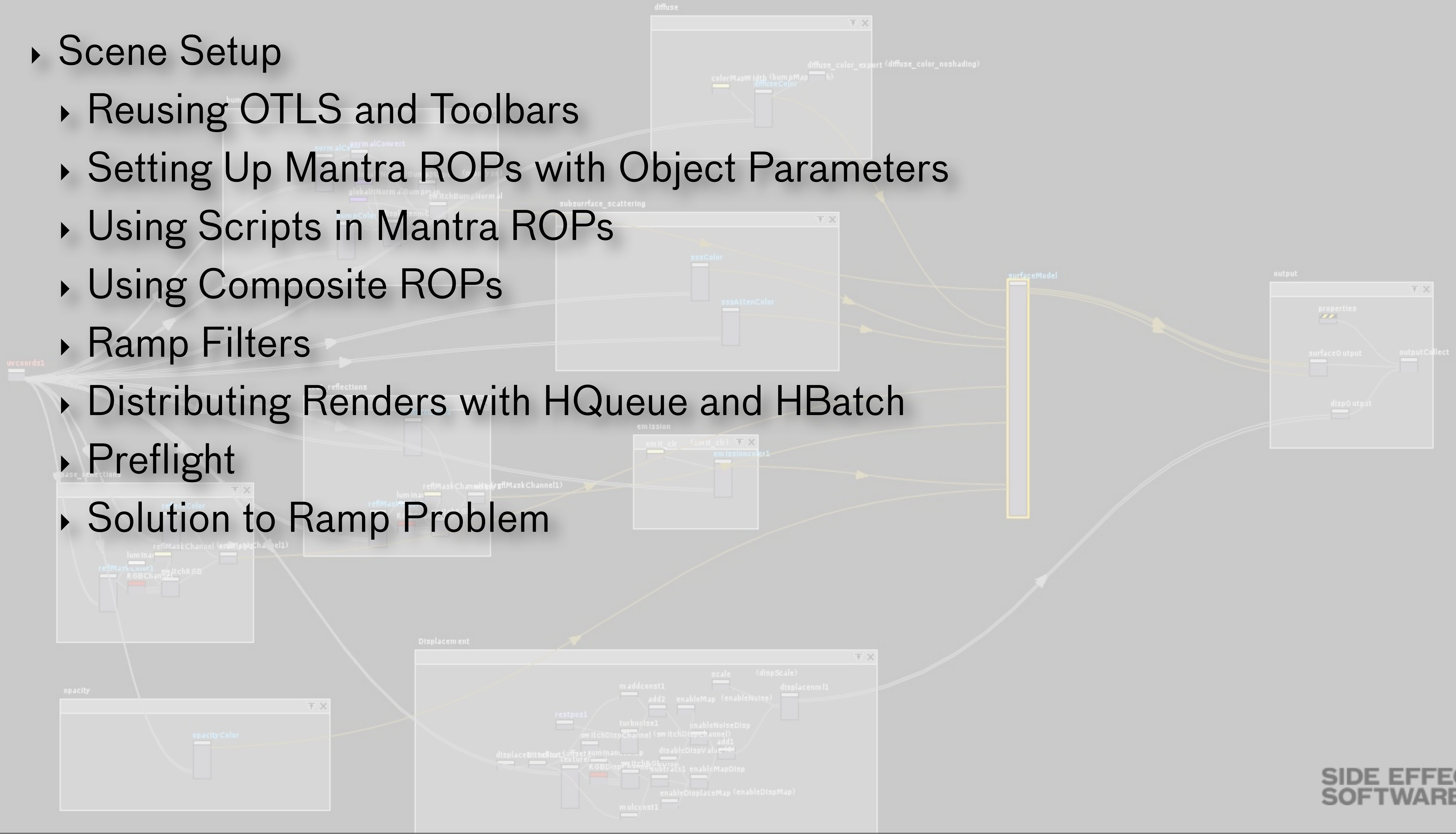
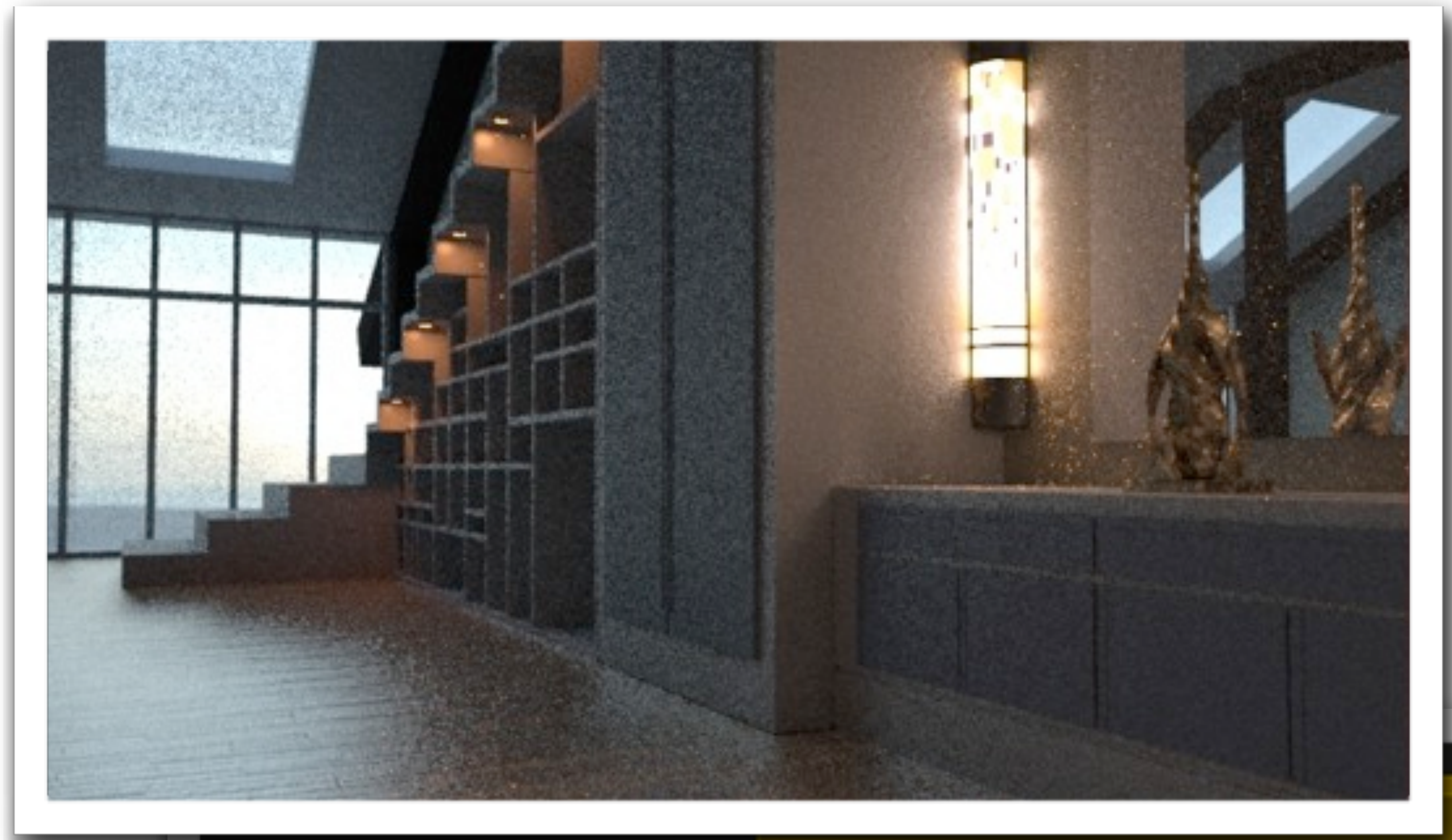
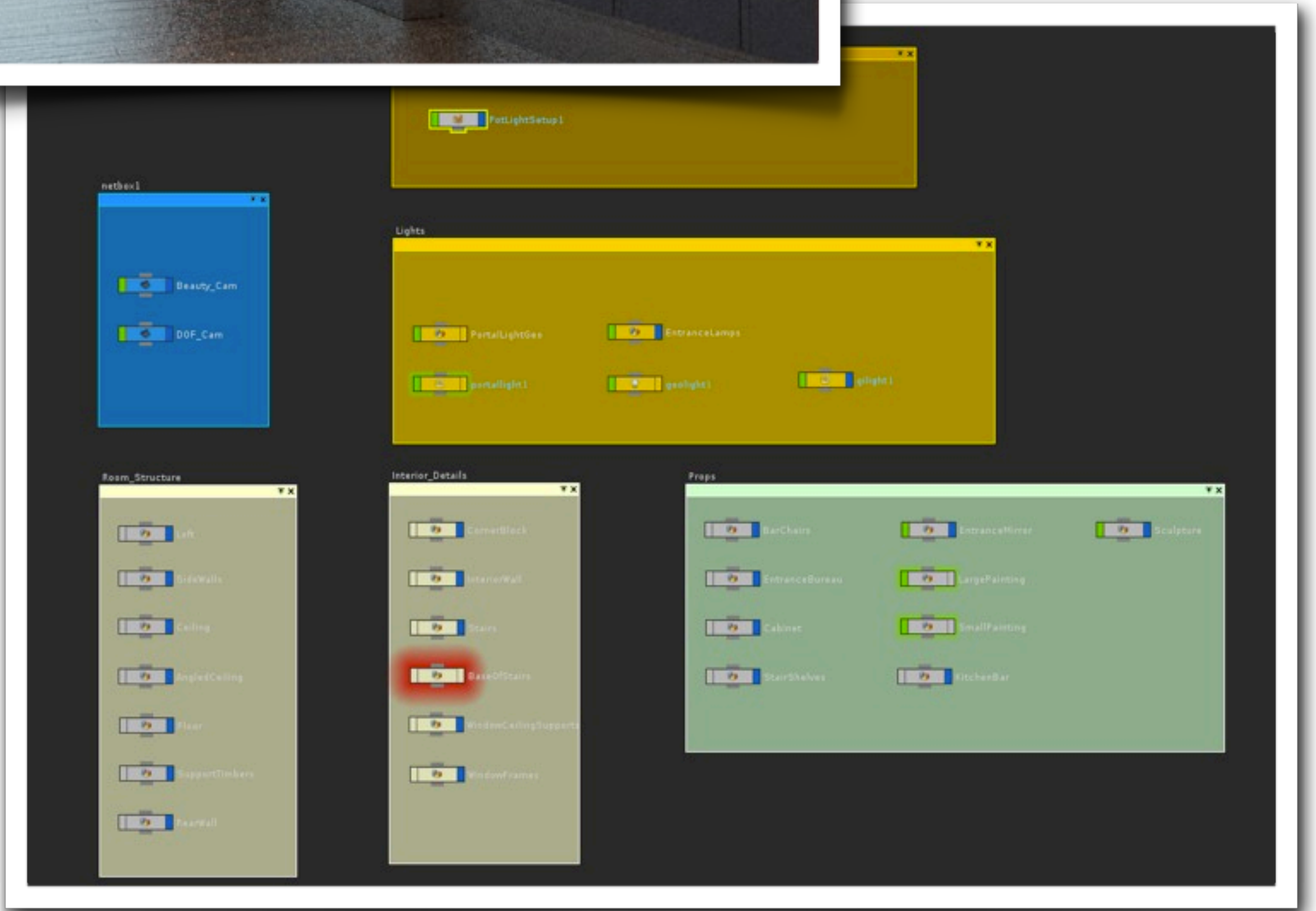
Agenda



- Scene Setup
  - Reusing OTLS and Toolbars
  - Setting Up Mantra ROPs with Object Parameters
  - Using Scripts in Mantra ROPs
  - Using Composite ROPs
  - Ramp Filters
  - Distributing Renders with HQueue and HBatch
  - Preflight
  - Solution to Ramp Problem

Tour the Scene





Things to notice...

- Check out how the object is laid out
- What shaders are used

- Go into the Project Folder
  - What otls are used?
- What Textures are used?
- What geometry is used?

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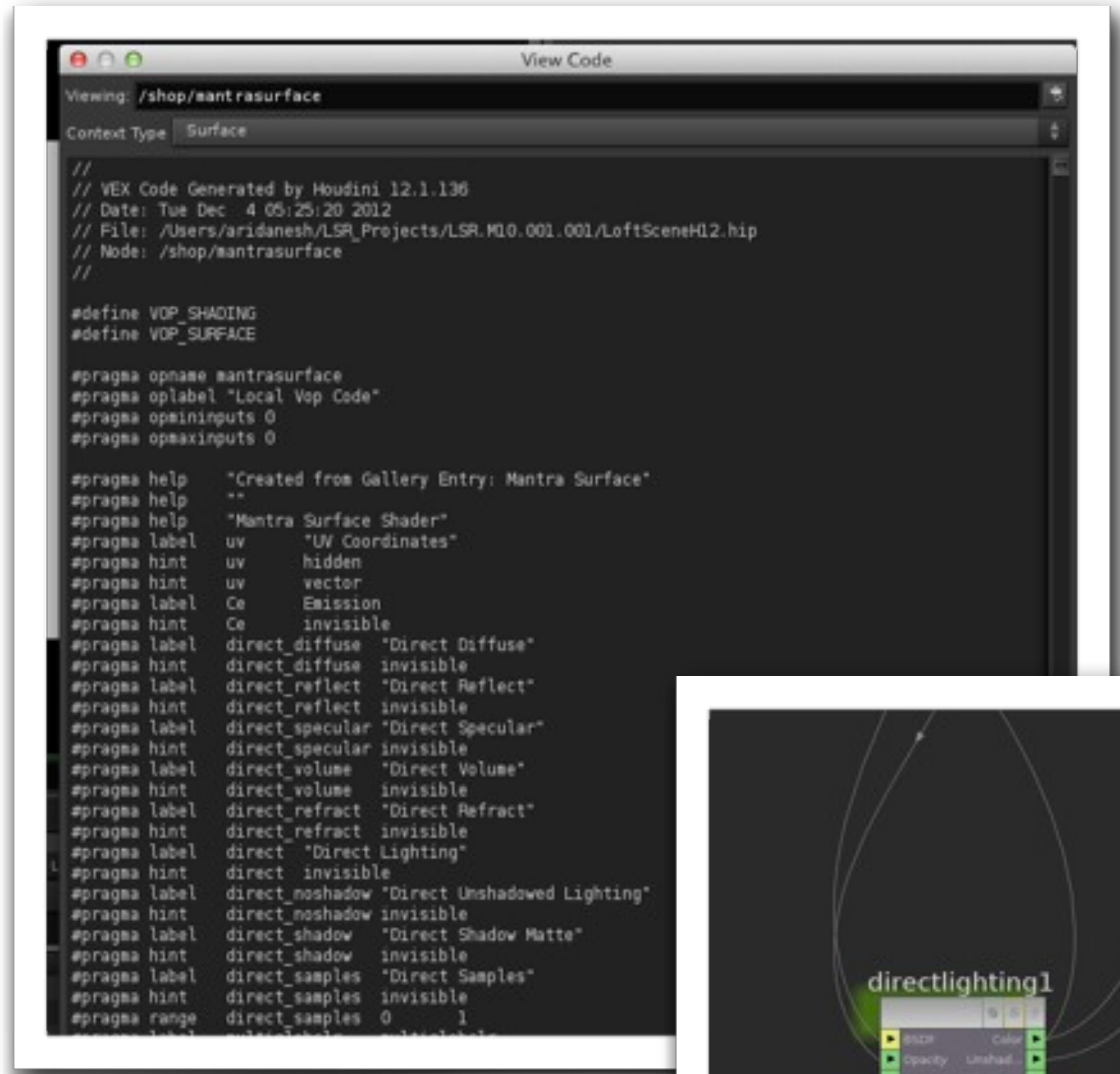
Which Render Passes Can I use?

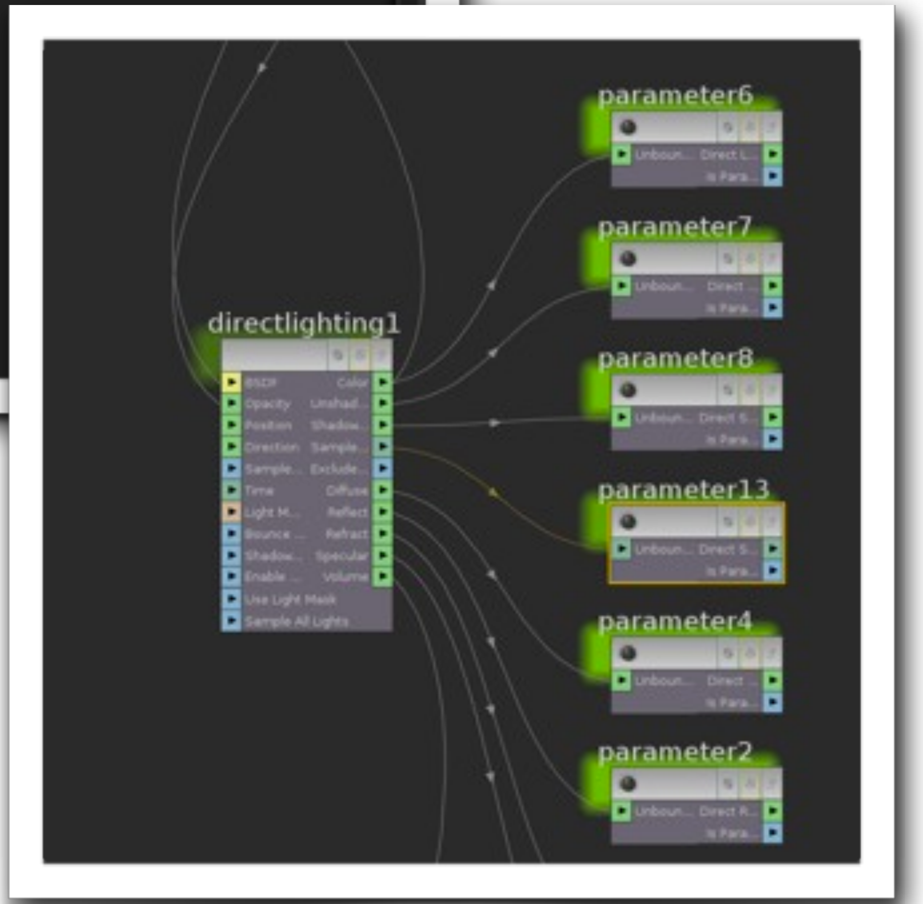


```
//
// VEX Code Generated by Houdini 12.1.136
// Date: Tue Dec  4 05:25:20 2012
// File: /Users/aridanesh/LSR_Projects/LSR.M10.001.001/LoftSceneH12.hip
// Node: /shop/mantrasurface
//

#define VOP_SHADING
#define VOP_SURFACE

#pragma opname mantrasurface
#pragma oplabel "Local Vop Code"
#pragma opmininputs 0
#pragma opmaxinputs 0

#pragma help    "Created from Gallery Entry: Mantra Surface"
#pragma help    ""
#pragma help    "Mantra Surface Shader"
#pragma label   uv      "UV Coordinates"
#pragma hint    uv      hidden
#pragma hint    uv      vector
#pragma label   Ce      Emission
#pragma hint    Ce      invisible
#pragma label   direct_diffuse  "Direct Diffuse"
#pragma hint    direct_diffuse  invisible
#pragma label   direct_reflect  "Direct Reflect"
#pragma hint    direct_reflect  invisible
#pragma label   direct_specular "Direct Specular"
#pragma hint    direct_specular invisible
#pragma label   direct_volume   "Direct Volume"
#pragma hint    direct_volume   invisible
#pragma label   direct_refract  "Direct Refract"
#pragma hint    direct_refract  invisible
#pragma label   direct  "Direct Lighting"
#pragma hint    direct  invisible
#pragma label   direct_noshadow "Direct Unshadowed Lighting"
#pragma hint    direct_noshadow invisible
#pragma label   direct_shadow   "Direct Shadow Matte"
#pragma hint    direct_shadow   invisible
#pragma label   direct_samples  "Direct Samples"
#pragma hint    direct_samples  invisible
#pragma range   direct_samples  0       1
```



- If you use the Materials built into Houdini the render passes are created for you
  - You can see them either in the VEX Code, or...
  - if you dive into the Surface Model Node
- If you build your material from scratch then you can set up properties to export your own passes.

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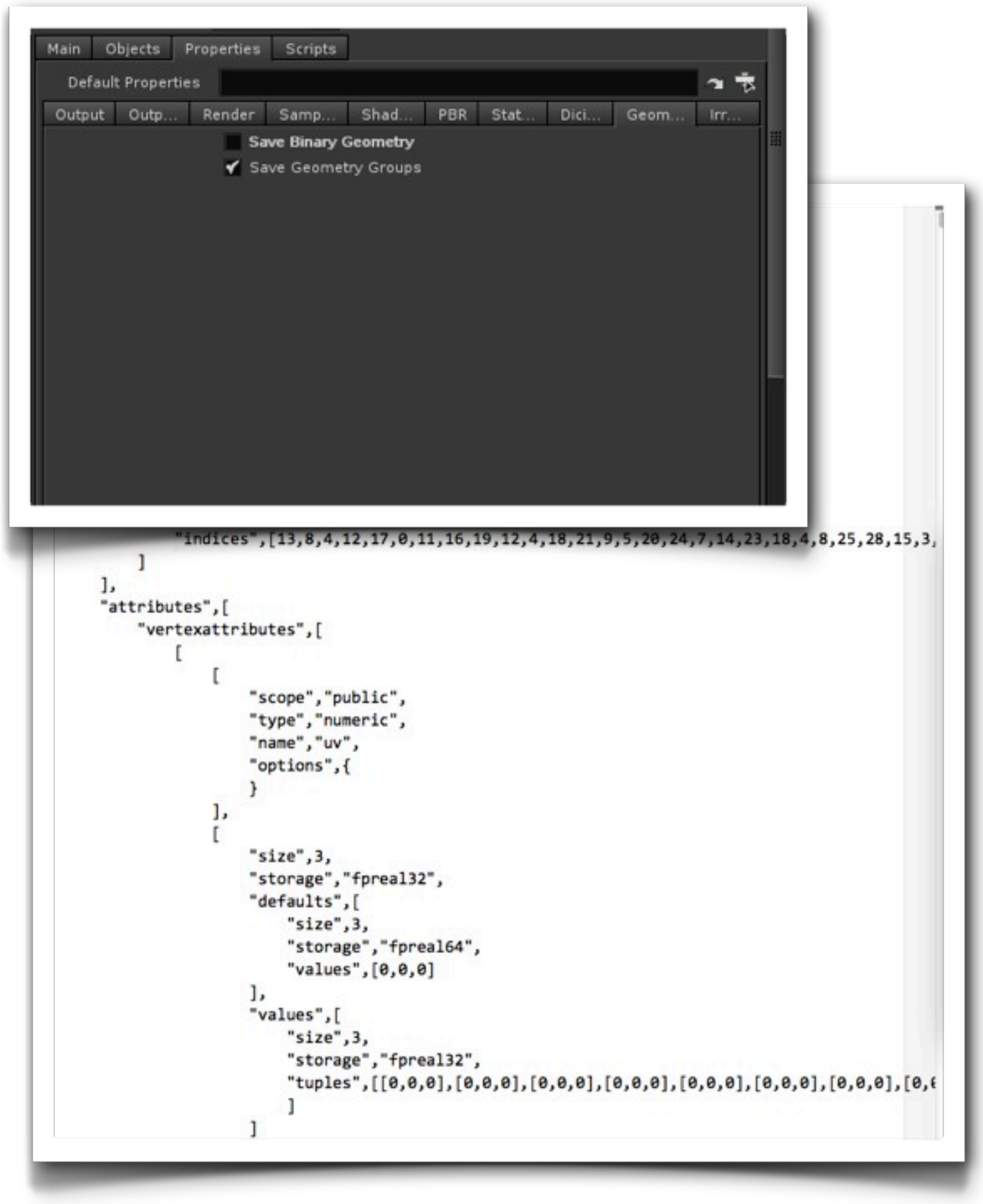
Main Purpose of Today

- Rendering from the back end
  - Using scripts to optimize renders
- Understanding the different ROPs

Setting up Mantra PBR



- [ ] Save Binary Geometry
- [x] Save Geometry Groups

```
            "indices",[13,8,4,12,17,0,11,16,19,12,4,18,21,9,5,20,24,7,14,23,18,4,8,25,28,15,3,
        ]
    ],
    "attributes",[
        "vertexattributes",[
            [
                [
                    "scope","public",
                    "type","numeric",
                    "name","uv",
                    "options",{
                    }
                ],
                [
                    "size",3,
                    "storage","fpreal32",
                    "defaults",[
                        "size",3,
                        "storage","fpreal64",
                        "values",[0,0,0]
                    ],
                    "values",[
                        "size",3,
                        "storage","fpreal32",
                        "tuples",[[0,0,0],[0,0,0],[0,0,0],[0,0,0],[0,0,0],[0,0,0],[0,0,0],[0,
                        ]
                    ]
```

- Drop down a Mantra node
  - Set render to PBR
  - Look at the command parm in Properties/Render
- Go to Main tab
  - Look at Command parm - mantra
    - mantra is a shell command.
- Debugging your scene
  - You can save your ifd as an ascii file
    - Go to properties/Geometry tab
      - Disable “Save Binary Geometry”

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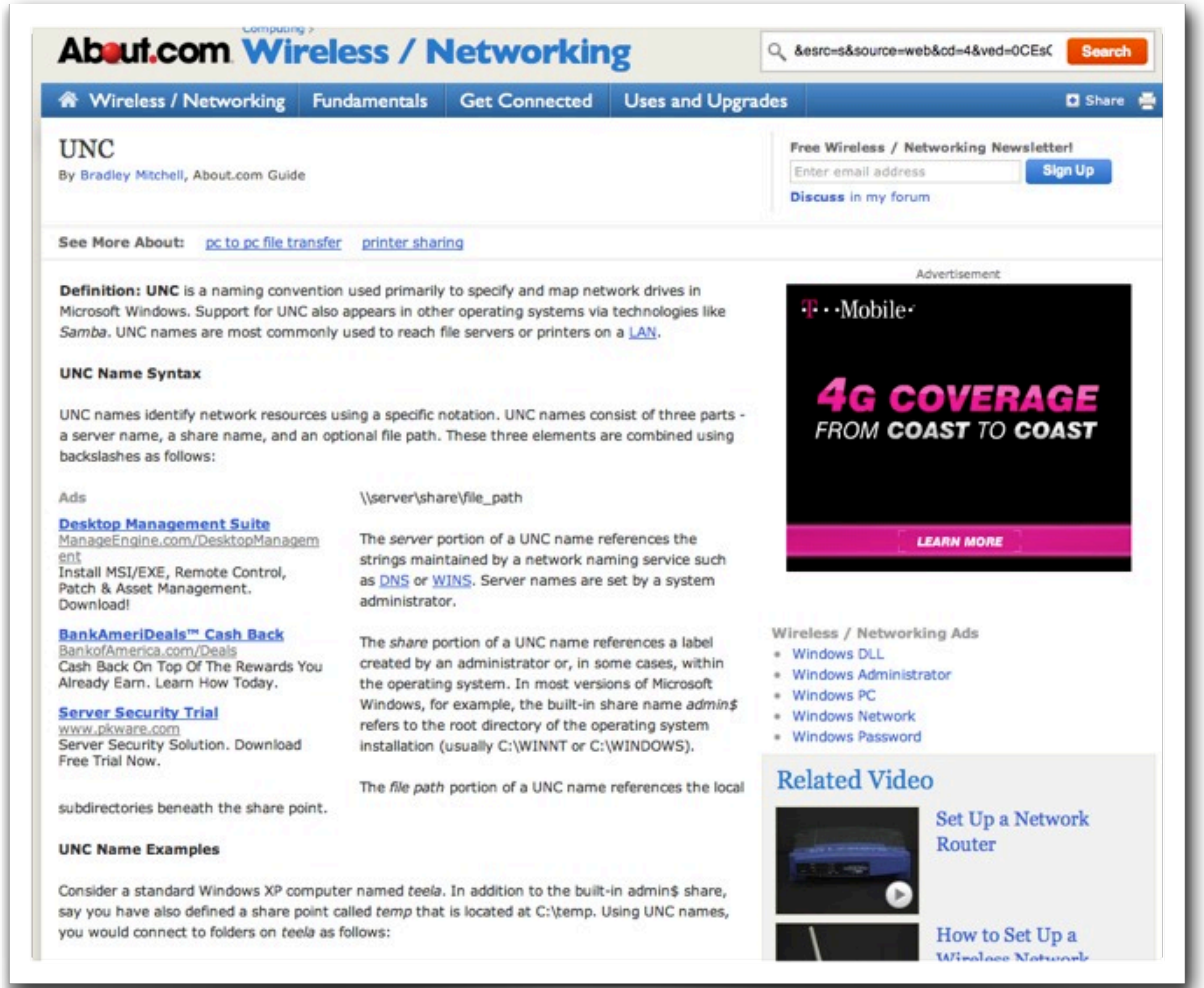
Windows Users - You must use UNC Paths

http://compnetworking.about.com/od/windowsnetworking/g/unc-name.htm



UNC

By Bradley Mitchell, About.com Guide

See More About: pc to pc file transfer printer sharing

Definition: UNC is a naming convention used primarily to specify and map network drives in Microsoft Windows. Support for UNC also appears in other operating systems via technologies like *Samba*. UNC names are most commonly used to reach file servers or printers on a LAN.

UNC Name Syntax

UNC names identify network resources using a specific notation. UNC names consist of three parts - a server name, a share name, and an optional file path. These three elements are combined using backslashes as follows:

Ads

Desktop Management Suite
ManageEngine.com/DesktopManagement
Install MSI/EXE, Remote Control, Patch & Asset Management. Download!

BankAmeriDeals™ Cash Back
BankofAmerica.com/Deals
Cash Back On Top Of The Rewards You Already Earn. Learn How Today.

Server Security Trial
www.pkware.com
Server Security Solution. Download Free Trial Now.

\\server\share\file_path

The *server* portion of a UNC name references the strings maintained by a network naming service such as DNS or WINS. Server names are set by a system administrator.

The *share* portion of a UNC name references a label created by an administrator or, in some cases, within the operating system. In most versions of Microsoft Windows, for example, the built-in share name *admin$* refers to the root directory of the operating system installation (usually C:\WINNT or C:\WINDOWS).

The *file path* portion of a UNC name references the local subdirectories beneath the share point.

UNC Name Examples

Consider a standard Windows XP computer named *teela*. In addition to the built-in admin$ share, say you have also defined a share point called *temp* that is located at C:\temp. Using UNC names, you would connect to folders on *teela* as follows:

- If you plan to render on a network and are using Windows machines you must use UNC paths
- z:\\myServer\MyComputer will not Work
- Instead use UNC paths
- Learn how to use them at...
  - //serverName/foldername/fileName

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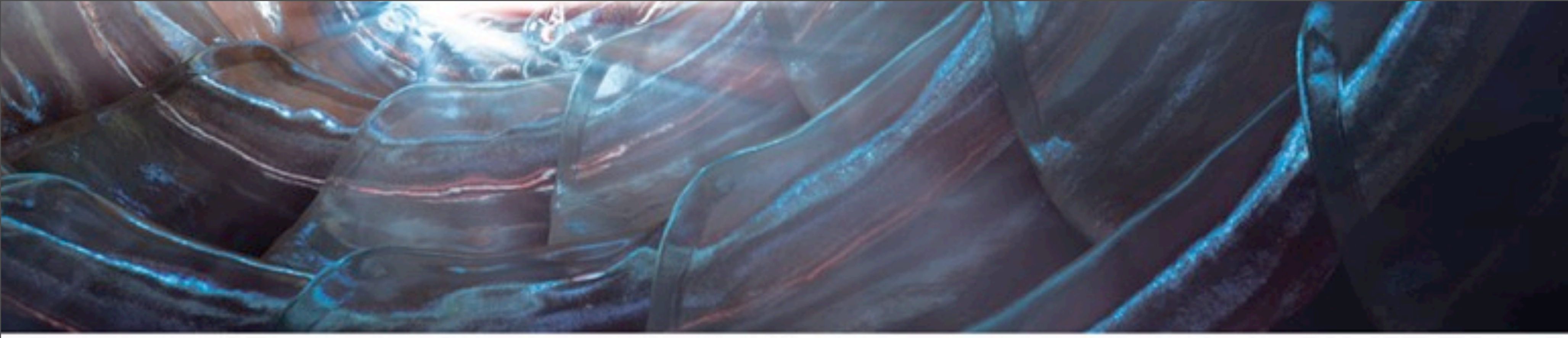

Candidate vs Forced Objects

Forced Objects and Lights Good Way to Organize Scene...

- Candidate Object - The geometry objects in this parameter will be included in the IFD if their display flags are turned on and their display channel is enabled
- Forced Object - Objects in this parameter are added to the IFD regardless of the state of their display. Objects can only be added to the IFD once.
- Forced Matte - Objects forced to be output as matte objects.
- Forced Phantom - Objects forced to be output at phantom objects

- Before Rendering you should set up your render to use forced objects and lights
- Do not use candidate objects
  - The lighter might have tweaked render at obj level
  - You will be rendering in passes so render everything you want out

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Object and Light Hierarchy

- Exclude
  - Forced
    - Candidate

When Creating Extra Image Planes Use Per Light Option and Let Compositor have Options

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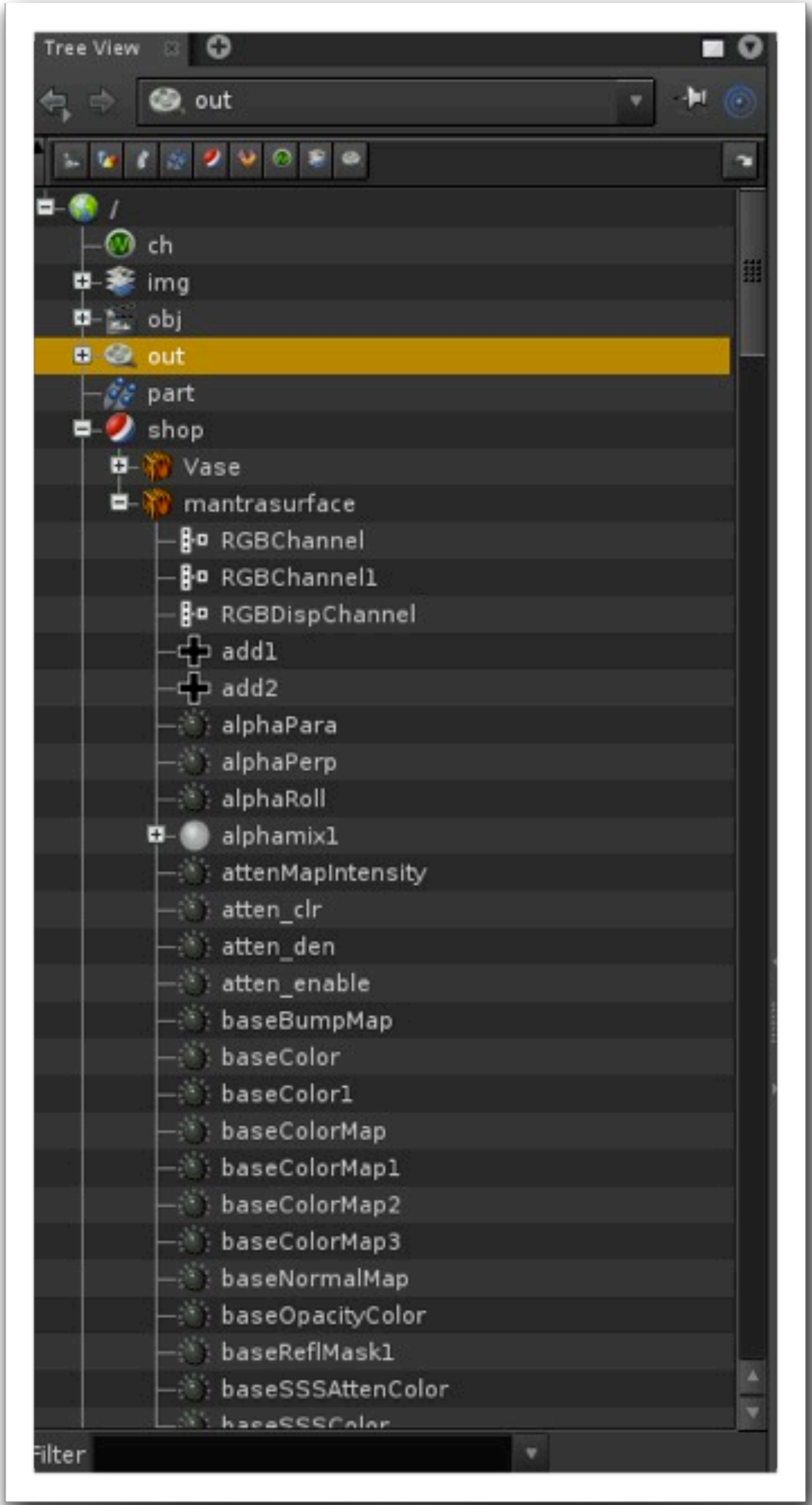
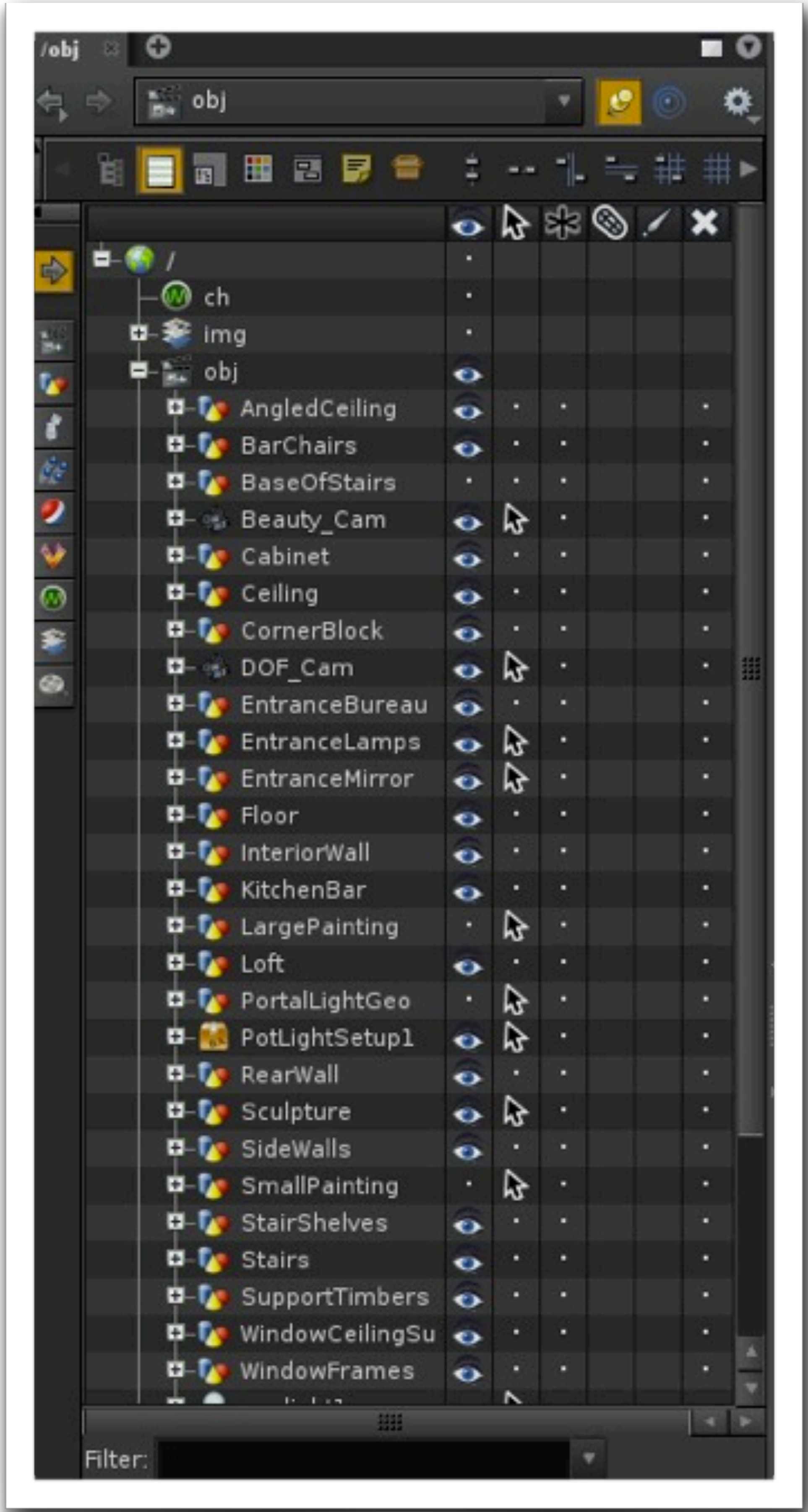
Diversion - Making the Tree View More Useful



Before



After

- Right Click on your Tree View
  - Make it into a Network View
  - Go back to /OBJ level
  - Toggle Show/Hide List View
- Right Click on Tree “Top Bar” and select “List Order-->Tree View”
- Pin Panel

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Candidate and Forced Lights

- Candidate Light - Each light in this parameter is added to the IFD if the dimmer channel of the light is not 0. The standard light sets the dimmer channel to 0 when the light is not enabled.
- Forced Light - The lights in this parameter are added to the IFD regardless of the value in their dimmer channels.
- Visible Fog - The fog/atmosphere objects in this parameter are included in the IFD if their display flags are turned on and their display channel is enabled.
  - Not really used anymore
  - Has Nothing to do with Volumes

Solo Lights are for Debugging

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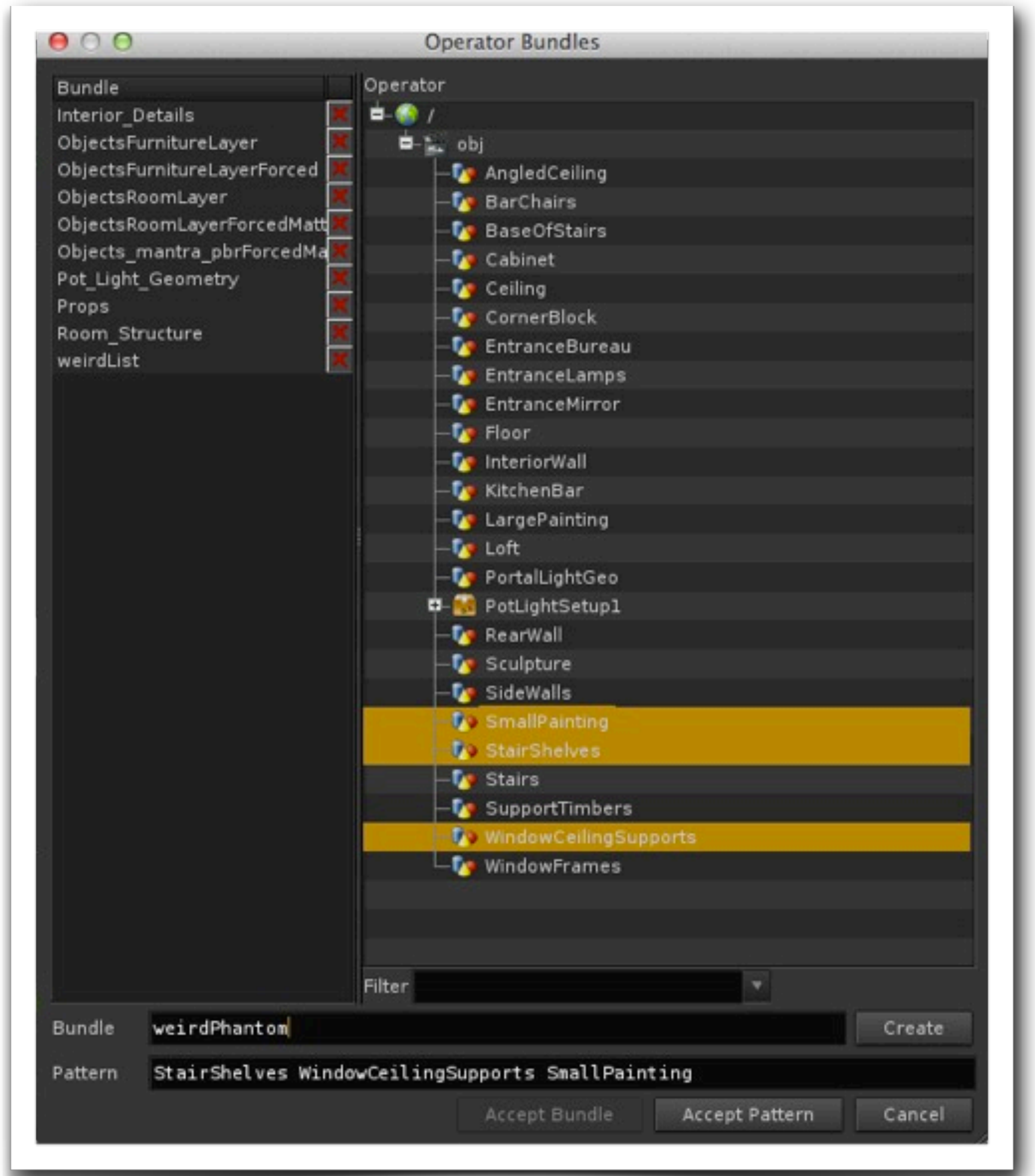
Make Bundle from obj or Light Parm



```
Interior_Details
ObjectsFurnitureLayer
ObjectsFurnitureLayerForced
ObjectsRoomLayer
ObjectsRoomLayerForcedMatt
Objects_mantra_pbrForcedMa
Pot_Light_Geometry
Props
Room_Structure
weirdList
```

```
/
  obj
    AngledCeiling
    BarChairs
    BaseOfStairs
    Cabinet
    Ceiling
    CornerBlock
    EntranceBureau
    EntranceLamps
    EntranceMirror
    Floor
    InteriorWall
    KitchenBar
    LargePainting
    Loft
    PortalLightGeo
    PotLightSetup1
    RearWall
    Sculpture
    SideWalls
    SmallPainting
    StairShelves
    Stairs
    SupportTimbers
    WindowCeilingSupports
    WindowFrames
```

Bundle: weirdPhantom

Pattern: StairShelves WindowCeilingSupports SmallPainting

- In the parm
  - click on object chooser
  - pick a few objects
  - at the bottom save as bundle

- Exporting bundles
  - In the Textport
    - help opbls
    - opbls -g weirdBundle
  - To save to project folder
    - opbls -g > $HIP/scripts/weirdBundle.cmd
  - To import back into another scene
    - source $HIP/scripts/weirdBundle.cmd

Saving Out Contexts

- opscript -h
- Let’s dump out the entie /out context
- opscript -r -b /out > $HIP/scripts/out/roomRender.cmd
  - -r = recursive
  - -b = brief
- Why do this?
  - Share render configs with team mates

Can use this for all Contexts
/SHOP
/OUT
/OBJ

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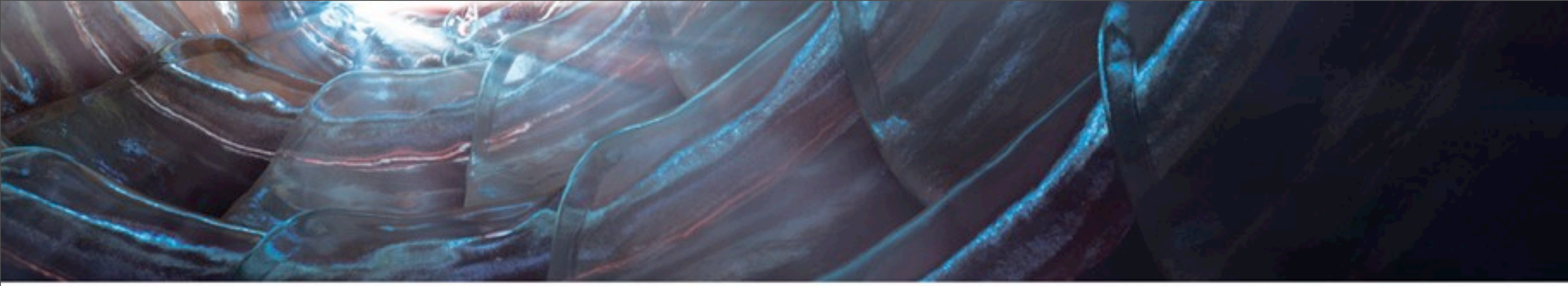

Why HScript?

- I like Python!
  - Yes but Houdini Scene files are natively stored in HScript.
  - So... When dealing with Houdini internals it is better to use HScript
- Use Python when communicating with outside world.

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Houdini Supports Dangling References

Very different from other 3D Packages...

- Try this
  - Go to /obj level
  - opscript -r -b /obj > $HIP/scripts/obj/myRoom.cmd
  - opscript -r -b /shop > $HIP/scripts/shop/myRoomShaders.cmd
- Now create new scene
  - source $HIP/scripts/obj/myRoom.cmd
- All objects, lights, cameras come into scene
- No shaders
  - All the shaders are referenced, but none exist
- Now bring in the shaders
  - source $HIP/scripts/shop/myRoomShaders.cmd

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Extra Image Planes

Color Channels
Quantize at 16 bit float
Other channels at 32 bit float

- Ray Trace and Micropolygon - No overhead and Not hit in Render Times
- PBR - One time hit of 10 percent for setup

- Direct Diffuse
  - Quantize = 16 bit float
  - Sample Filter = Opacity Filter
  - Pixel Filter = Gaussian 2x2
  - Light Export = Export Light for Each Light
- Direct Reflection
  - Quantize = 32 bit float
  - Sample Filter = Opacity Filter
  - Pixel Filter = Gaussian 2x2
  - Light Export = Export Light for Each Light
- Direct Refract
  - Quantize = 32 bit float
  - Sample Filter = Opacity Filter
  - Pixel Filter = Gaussian 2x2
  - Light Export = Export Light for Each Light

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Extra Image Planes (cont.)

Do not use "Export for Each Light" on P or N Channels - Makes no sense

- For P channel
  - Make sure quantize is set to 32 bit
  - Need extra resolution for small areas to give accurate results
  - Sample Filter = closest surface or min max
  - Pixel Filter = Closest Sample Filter
- For N Channel
  - Same as P Channel
  - Sample Filter should be same a P

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Sample Filter and Pixel Filter

Sample Filter

- Mantra Renders everything internally as a 32 bit float
- Filters are used when exporting image/ image planes to disk
- Sample Filter is used when downsizing to 16 bit float. How should Mantra smoothly compress to 16 bit.
  - Opacity Filter takes opacity into account of the smoothing algorithm
  - Full Opacity is used for Clouds or Sprites which are highly transparent
  - Closest Surface - No transparency figured in

Pixel Filter

- Once Sample Filter is determined what convolution filter will we use on neighboring pixels
- Closest, Farthest, and Disable Edge Antialiasing will do no anti-aliasing

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Combined Channels

- Ignores “Export for Each Light”

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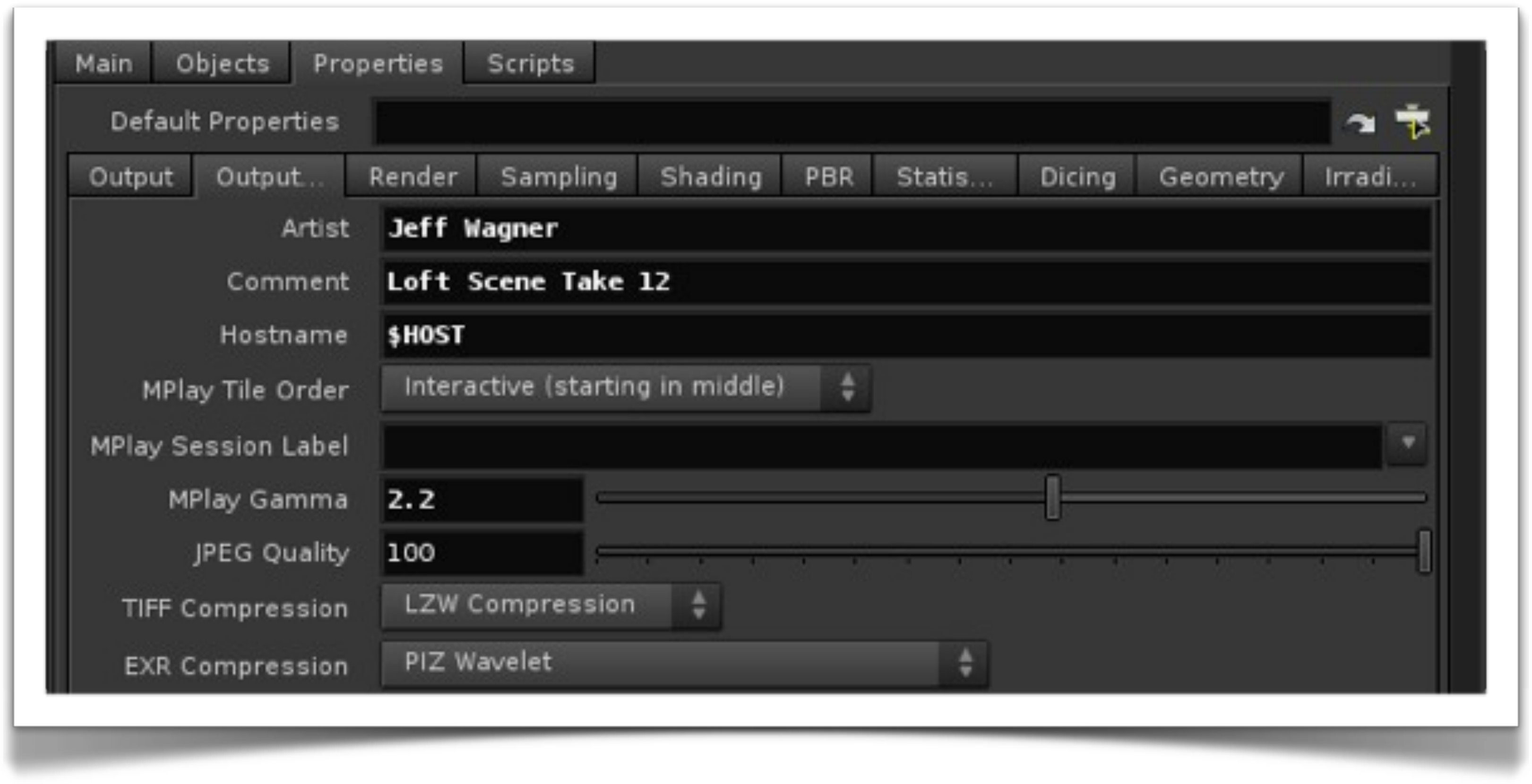
Output Options



Default Properties

Artist: Jeff Wagner

Comment: Loft Scene Take 12

Hostname: $HOST

MPlay Tile Order: Interactive (starting in middle)

MPlay Session Label:

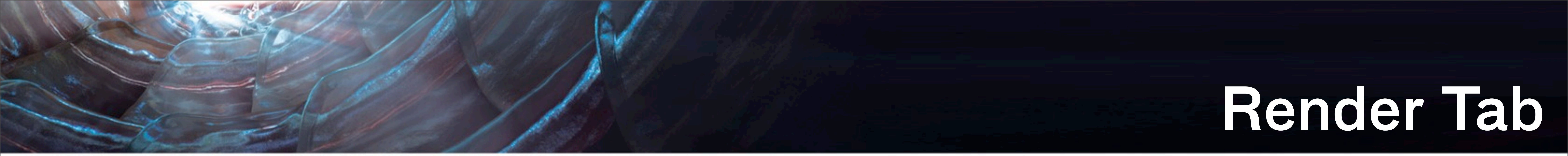
MPlay Gamma: 2.2

JPEG Quality: 100

TIFF Compression: LZW Compression

EXR Compression: PIZ Wavelet

- MPlay Tile Order
  - This can be important
  - Sometimes a frame will render fine interactively, but crash when rendering to disk
  - The problem could be with tile rendering order
  - Interactively it renders from center spiraling outward
  - To disk it renders bottom to top
  - Fix can be as easy as changing tile order



Render Tab

- Tile Size
  - For Production render to disk min. size = 64

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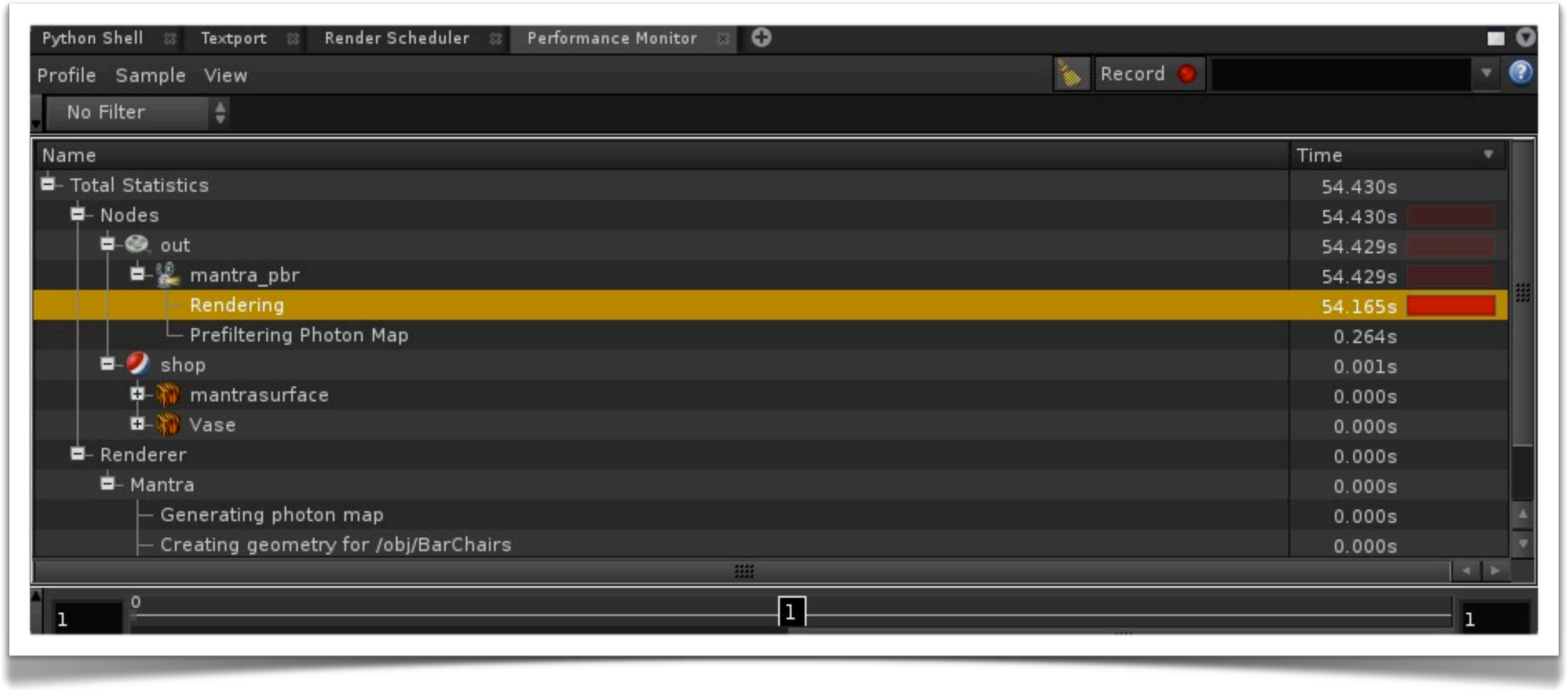
Statistics Tab

- Set verbose to 5
- Turn on Performance Monitor



Name	Time
Total Statistics	54.430s
Nodes	54.430s
out	54.429s
mantra_pbr	54.429s
Rendering	54.165s
Prefiltering Photon Map	0.264s
shop	0.001s
mantrasurface	0.000s
Vase	0.000s
Renderer	0.000s
Mantra	0.000s
Generating photon map	0.000s
Creating geometry for /obj/BarChairs	0.000s

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Output Picture

- ip - interactive preview
- md - non interactive preview (used for mplay diagnostics)
  - Forces tile order to same tile order as rendering to disc
- md is good to use to test hypothesis tile order is causing crash

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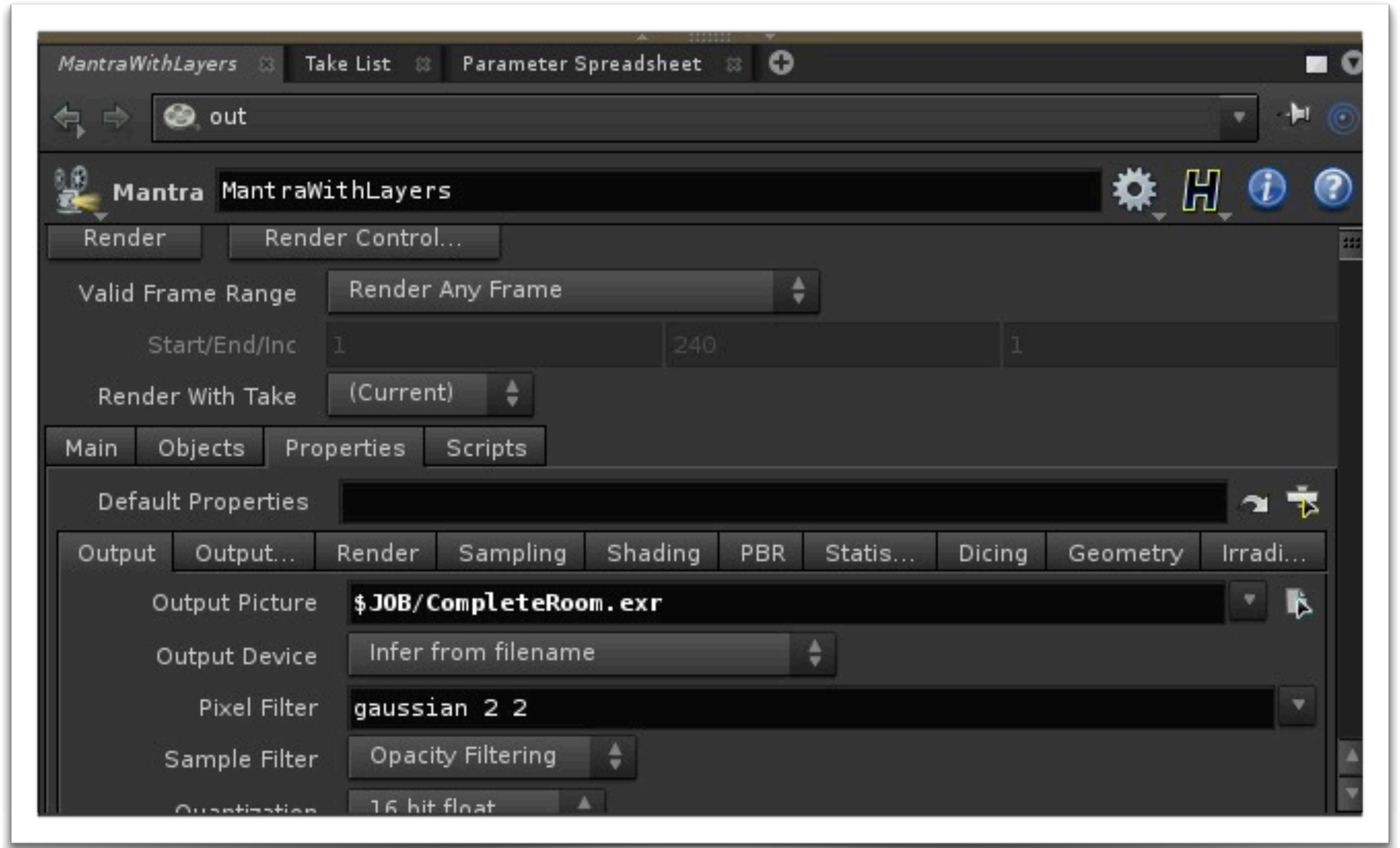
$JOB

- setenv JOB = /Users/aridanesh/LSR_Projects/LSR.M10.001.001/FinalCopLayers
- Dump render files here
- Notice my output picture setup. No longer long path names. Independent of $HIP



Mantra MantraWithLayers

Valid Frame Range: Render Any Frame

Start/End/Inc: 1 240 1

Render With Take: (Current)

Output Picture: $JOB/CompleteRoom.exr

Output Device: Infer from filename

Pixel Filter: gaussian 2 2

Sample Filter: Opacity Filtering

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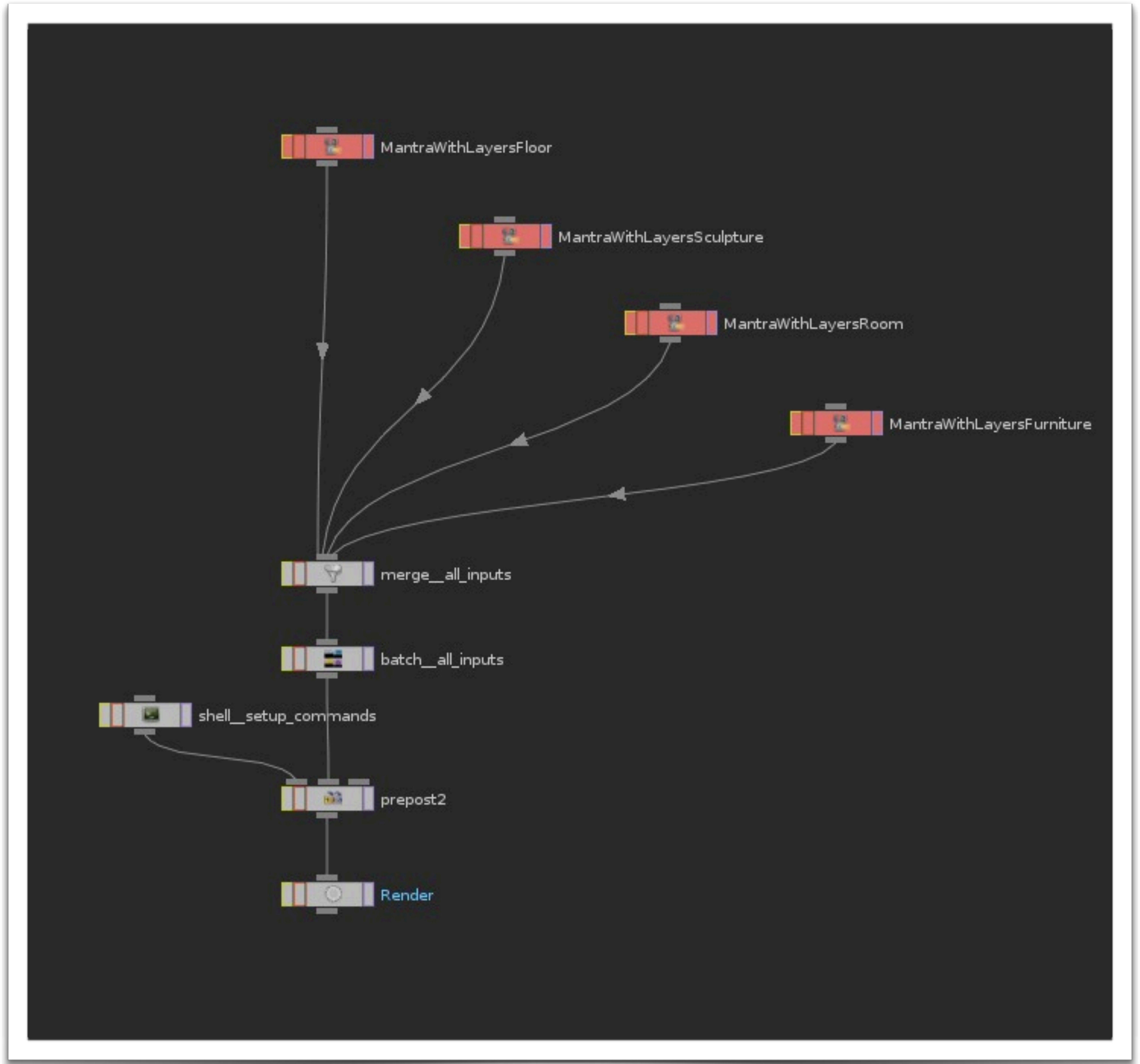
Putting it All Together



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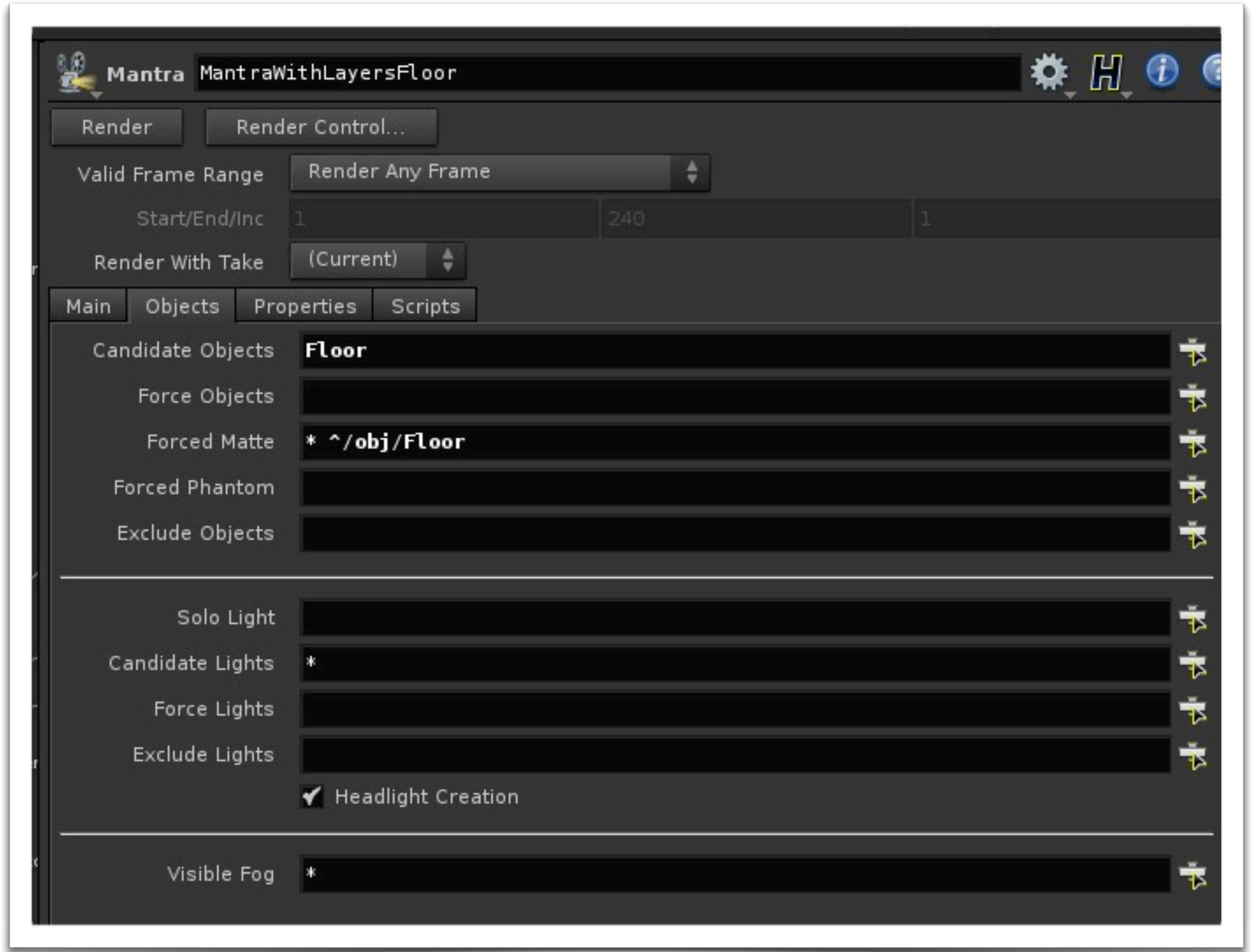
Mantra with layers floor



Mantra MantraWithLayersFloor

Render | Render Control...

Valid Frame Range: Render Any Frame

Start/End/Inc: 1 240 1

Render With Take: (Current)

Main | Objects | Properties | Scripts

```
Candidate Objects   Floor
Force Objects
Forced Matte        * ^/obj/Floor
Forced Phantom
Exclude Objects

Solo Light
Candidate Lights    *
Force Lights
Exclude Lights
                    ✓ Headlight Creation

Visible Fog         *
```

- **^** - not including

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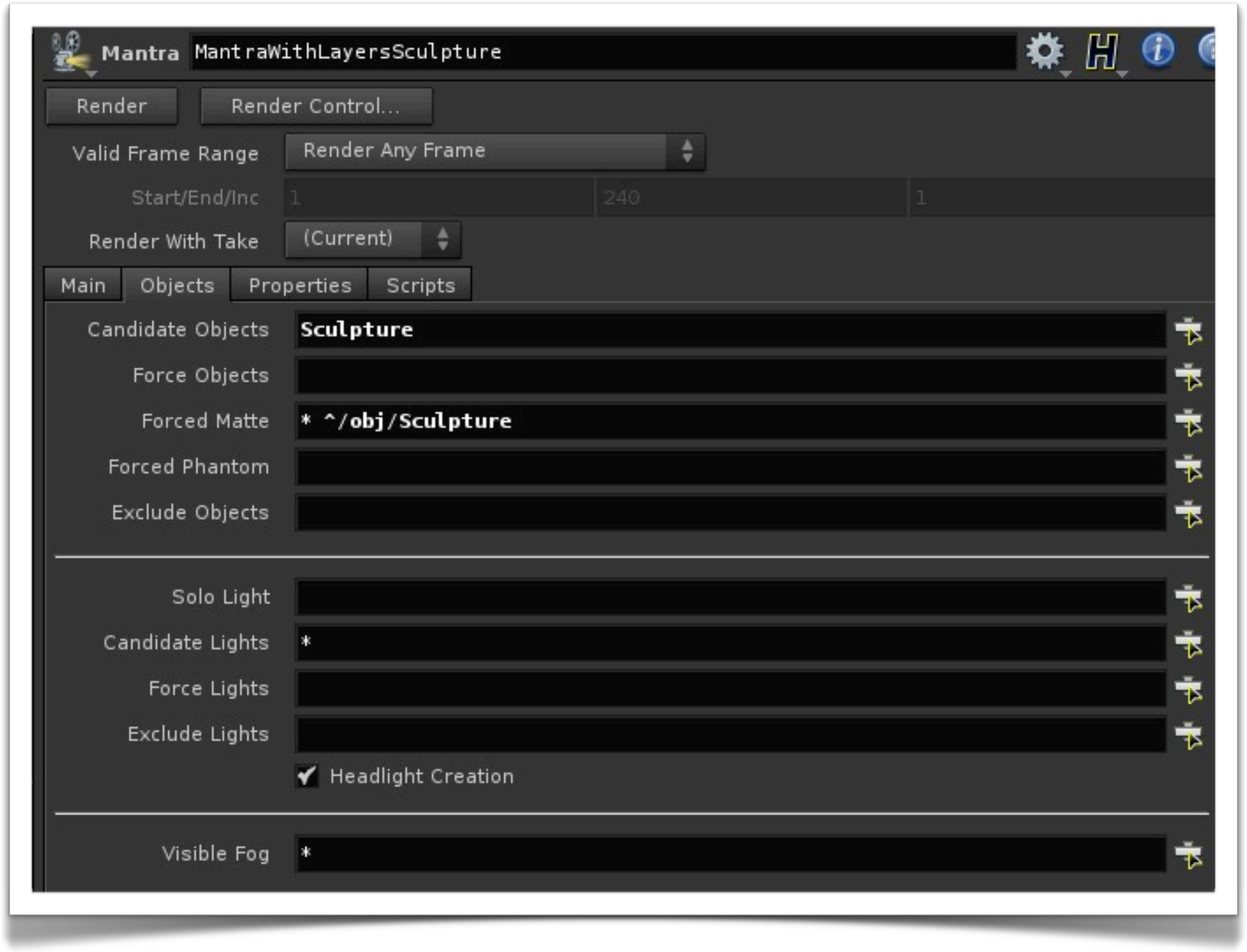
Mantra with layers sculpture



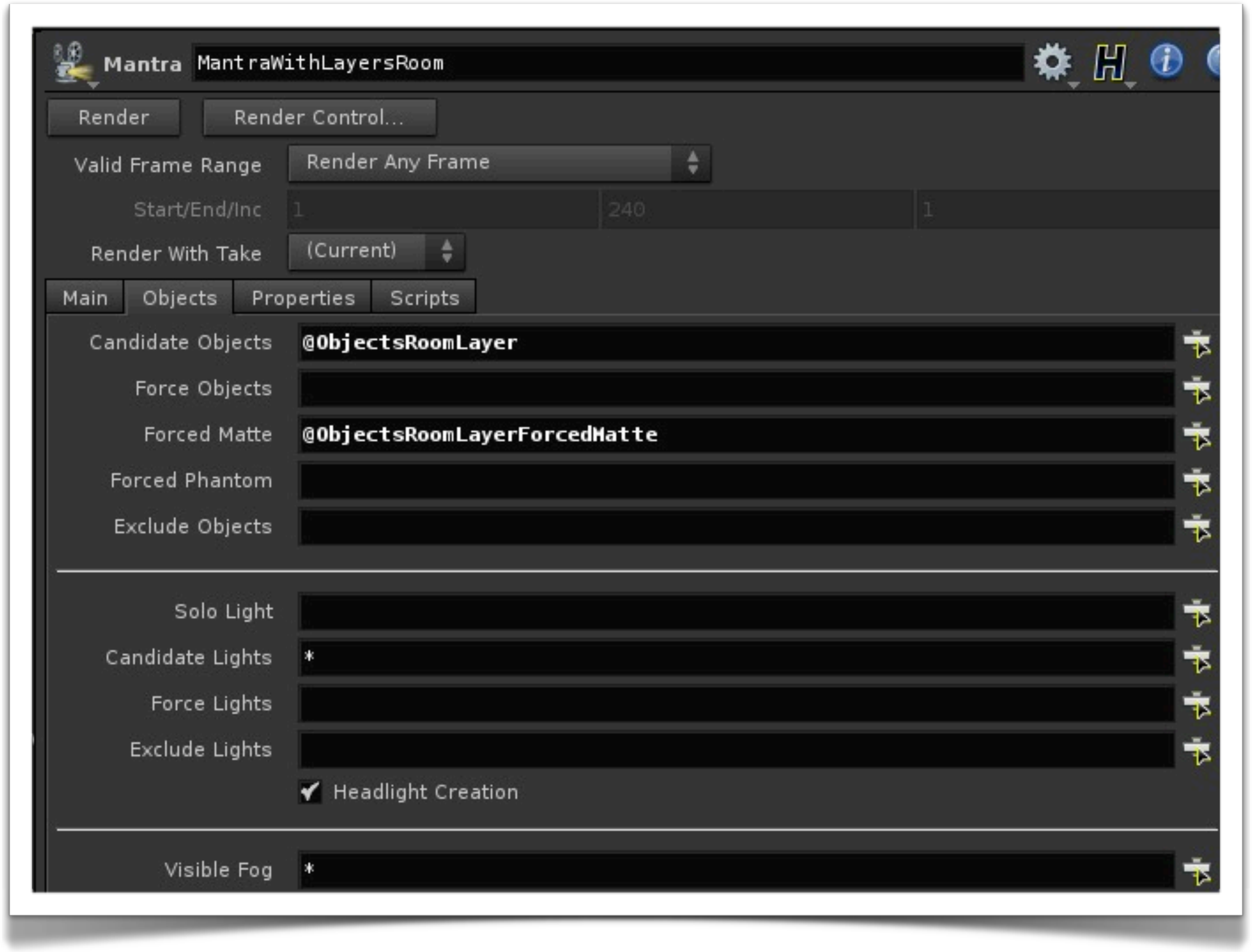
Mantra MantraWithLayersSculpture

Valid Frame Range	Render Any Frame
Start/End/Inc	1 240 1
Render With Take	(Current)

Candidate Objects	Sculpture
Force Objects	
Forced Matte	* ^/obj/Sculpture
Forced Phantom	
Exclude Objects	
Solo Light	
Candidate Lights	*
Force Lights	
Exclude Lights	
✓ Headlight Creation	
Visible Fog	*

- ^ - not including

Mantra with layers room



Mantra MantraWithLayersRoom

Render | Render Control...

Valid Frame Range: Render Any Frame

Start/End/Inc: 1 240 1

Render With Take: (Current)

Main | Objects | Properties | Scripts

Candidate Objects: @ObjectsRoomLayer

Force Objects:

Forced Matte: @ObjectsRoomLayerForcedMatte

Forced Phantom:

Exclude Objects:

Solo Light:

Candidate Lights: *

Force Lights:

Exclude Lights:

✓ Headlight Creation

Visible Fog: *

- **Notice use of bundles**

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Prepost

- Renders ROPs before and after a main job.
- The Pre Post ROP allows you to wire in three render nodes and then renders a Pre render ROP before any of the main input's frames render, and a Post render ROP after all of the main input's frames have completed. This is especially important for render jobs that use frame interleaved rendering, as a simple Pre render → Main job → Post render chain would execute the pre and post ROP for every frame.
- The Pre Post ROP looks at the entire render job and places the Pre render ROP before any of the main job's frames, and the post ROP after the last of the main job's frames. This is similar to the way the pre and post render scripts work.
- The Pre Post ROP will render: pre1, pre2, pre3, mantra1, mantra2, mantra3, post1, post2, post3

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