Houdini

3D Animation tools

NODES QUICK REFERENCE

Nodes Channel nodes

Channel nodes create, filter, and manipulate channel data.

Usages in other examples

Example name	Example for

Subtopics

Text Clear

Acoustic
Design audio filters and sound materials for the spatial audio system.

Area
Calculates the area under a channel's graph, which is the same as calculating the "integral" of a channel, or "integrating" the channel.

Attribute
Adds, removes or updates attributes of the input chop.

Audio In
Receives audio input from the analog audio ports or the digital port.

Band EQ
A 14-band equalizer which filters audio input channels in the same way that a conventional band equalizer uses a bank of sliders to filter fixed-frequency bands of sound.

Beat
Manually tap the beat of a piece of music, and automatically generate a repeating ramp or pulse that continues to keep time with the music after the taps stop.

Blend
Combines two or more chops in input 2, 3 and so on, by using a set of blending channels in input 1.

BlendPose
Performs multi-dimensional, example-based interpolation of channels.

Channel
Creates channels from the value of its parameters.

Layers (blends) the channels of one CHOP on the channels of another CHOP.

Constant

Create up to forty new channels.

Copy

Produces multiple copies of the second input along the timeline of the first input.

Count

Counts the number of times a channel crosses a trigger or release threshold.

Cycle

Creates cycles.

Delay

Delays the input, and can be run in normal or time-sliced mode.

Delete

Removes channels coming from its input.

Dynamics

Extracts any information from a DOP simulation that is accessible through the dopfield expression function.

Envelope

Outputs the maximum amplitude in the vicinity of each sample of the input.

Export

A convenient tool for exporting channels.

Expression

Modify input channels by using expressions.

Extend

Only sets the “extend conditions” of a chop, which determines what values you get when sampling the CHOP before or after its interval.

Fan

Used for controlling other CHOPs.

Feedback

Get the state of a chop as it was one frame or time slice ago.

Fetch

Imports channels from other OPs.

File

Reads in channel and audio files for use by chops.

Filter

Smooths or sharpens the input channels.

Function

Provides more complicated math functions than found in the Math CHOP: trigonometic functions,

Geometry

Uses a geometry object to choose a sop from which the channels will be created.

Gesture

Handle

The “engine” which drives Inverse Kinematic solutions using the Handle object.

Hold

Sample and hold the value of the first input.

Image

Converts rows and/or columns of pixels in an image to CHOP channels.

Interpolate

Treats its multiple-inputs as keyframes and interpolates between them.

Inverse Kin

Generates channels for bone objects based on a bone chain and an end affector.

Jiggle

Creates a jiggling effect in the translate channels passed in.

Keyboard

Turns key presses into channel output.

Lag

Adds lag and overshoot to channels.

Limit

Provides a variety of functions to limit and quantize the input channels.

Logic

Converts channels of all its input chops into binary channels and combines them using a…

Lookup

Uses a channel in the first input to index into a lookup table in the second input, and output values from the lookup table.

MIDI In

The MIDI In CHOP reads Note events, Controller events, Program Change events, and Timing events from both midi devices and files.

MIDI Out

The MIDI Out CHOP sends MIDI events to any available MIDI devices.

Math

Perform a variety of arithmetic operations on and between channels.

Merge

Takes multiple inputs and merges them into the output.

Mouse

Network

Similar to the Pipe In/Out CHOPs in Network mode.

Noise

Makes an irregular wave that never repeats, with values approximately in the range -1 to +1.

Null

Used a place-holder and does not have a function of its own.

Object

Compares two objects and returns information on their relative positions and orientations.

Oscillator

Generates sounds in two ways.

Parametric EQ

Filters an audio clip, and then applies other audio effects.

Particle

Produces translate and rotate channels to move Objects according to the positions of particles in a POP Network.

Pass Filter

Filters audio input using one of four different filter types.

Phoneme

Translates english text into a series of phonetic values.

Pipe In

Only works on IRIX; it is not tested under Linux or NT.

Pipe Out

Transmit data out of Houdini to other processes.

Pretransform

Takes translate, rotate, and/or scale channels and transforms them using the pretransform of the given object.

Pulse

Generates pulses at regular intervals of one channel.

Puppet

Interface to a variety of PuppetWorks devices through a serial port connection.

Record

Rename

Renames channels.

Reorder

Reorders the first input CHOP's channels by numeric or alphabetic patterns.

Resample

Sequence

Takes all its inputs and appends one chop after another.

Shift

This time-shifts a CHOP, changing the start and end of the CHOP's interval.

Shuffle

Reorganizes a list of channels.

Slope

Calculates the slope (or derivative) of the input channels.

Spatial Audio

The rendering engine for producing 3D audio.

Spectrum

Calculates the frequency spectrum of the input channels, or a portion of the channels.

Spline

Edit the channel data by using direct manipulation of cubic or Bezier handles in the graph of the CHOP.

Spring

Creates vibrations influenced by the input channels, as if a mass was attached to a spring.

Stretch

Preserves the shape of channels and the sampling rate, but resamples the channels into a new interval.

Subnetwork

Allows for the simplification of complex networks by collapsing several CHOPs into one.

Switch

Control the flow of channels through a CHOPnet.

Transform

Takes translate, rotate, and/or scale channels and transforms them.

Trigger

Adds an audio-style attack/decay/sustain/release (ADSR) envelope to all trigger points in the input channels.

Trim

Shortens or lengthens the input's channels.

VEX Waveform

This function is a sub-set of the waveform CHOP.

Voice Split

The Voice Split CHOP takes an audio track and separates "words" out into different channels.

Voice Sync

The Voice Sync CHOP detects phonemes in an audio channel given some audio phoneme samples

Warp

Time-warps the channels of the first input (the Pre-Warp Channels) using one warping channel in the second input.

Wave

Creates a waveform that is repeated.

User Contributed Notes add a note

There are no user-contributed notes for this page.

Nodes Compositing nodes

Composite nodes create, filter, and manipulate image data. You can use compositing networks to edit textures, post-process rendered frames, or perform any other image manipulation in Houdini and make the image data available to other nodes.

Compositing node flags

Display flag	Controls whether the node's image sequence appears in the viewer. You can set the display flag on multiple nodes by Shift-clicking the flag.
Render flag	Controls which node's output is the output for a compositing subnetwork or digital asset . Only one node in a network can have the render flag set.
Template flag	Specifies that the displayed image sequence should be compared to the output of this node.
Thumbnail flag	Instead of the standard node icon the node tile displays a thumbnail version of the node's output. Press  on the flag to choose which plane to use for the preview. If you choose "Follow" in the preview menu, the thumbnail uses the preview plane of its first input. This lets you change the change the preview plane of long chains of nodes by changing the preview plane of the first node in the chain. If the node has no inputs, "Follow" uses the first plane.
Bypass flag	The node passes the input through to the output unmodified (the node has no effect).

Usages in other examples

Example name	Example for

Add
Adds two images together.

Anaglyph
Creates an anaglyph from a pair of input images.

Atop
Composites the first input (Foreground) over the second (background), but only where the background alpha exists.

Average
Averages the foreground image and the background image.

Blend
Blends frames from two sequences together using a simple linear blend.

Blur
Blurs an image.

Border
Adds a border to the image.

Bright
Applies a brightness factor and bright shift to the first input.

Bump
Builds a bump map from a plane.

Channel Copy
Copy channels from any of inputs into the output image.

Chromakey
Mask or “key” an image based on its color.

Color
Creates a constant color image.

Color Correct
Applies a variety of color corrections to the image

Color Curve
Adjusts the R,G,B and/or A channels based on a user-defined curve.

Color Map
Maps a range of color to a new range.

Color Replace
Replace a color region in an image with another region.

Color Wheel

Composite
Does a composite (over, under, inside, add, etc) between two images.

Contrast
Increases or decreases the contrast of an image.

Convert
Changes the data format of a plane (i.

Convolve
Performs a generic convolve on the source image.

Corner Ramp
Generates a four corner ramp.

Crop
Crops an image and changes its resolution.

DSM Flatten
Flattens a Deep Shadow/Camera Map into a flat 2D raster.

Defocus
Defocuses an image similar to a real camera defocus.

Deform
Deforms an image by moving the underlying UV coordinates.

Degrain
Removes film grain from an image.

Deinterlace
De-interlaces a frame of video by either averaging scanlines or copying a scanline.

Delete
Removes planes or components from an input sequence.

Denoise
Removes white noise from an image.

Depth Darken
Darkens depth boundaries in an image.

Depth of Field
Creates a depth-of-field mask, which describes how out of focus parts of the image are.

Diff
Computes the difference between the foreground image and the background image.

Dilate/Erode
Expands and shrinks mattes.

Edge
Detects edges in the input image.

Blurs the edges of an image.

Emboss

Adds a lighting effect to the image by using a bump map.

Environment

Applies an environment map to an image.

Equalize

Equalizes colors by stretching or shifting the image histogram.

Expand

Expands and shrinks mattes.

Extend

Extends the length of a sequence so that it can be animated beyond its frame range.

Fetch

Fetches a sequence of images from another COP, even in another network.

Field Merge

Merges two fields into one Interlaced Frame.

Field Split

Splits an interlaced frame into two fields per frame (odd and even fields).

Field Swap

Swaps the two fields containing the even and odd scanlines of the frame.

File

Loads image files into Houdini.

Flip

Flips the image horizontally and/or vertically.

Fog

Adds a variety of atmospheric effects to an image, including fog, haze and heat waves.

Font

Renders anti-aliased text.

Front Face

Cleans up flipped normals by making them face the camera.

Function

Performs a variety of mathematical functions on the input image.

Gamma

Applies gamma correction to the image.

Geokey

Keys out parts of the image based on pixel position or normal direction.

Geometry

Gradient

Computes the gradient of an image.

Grain

Adds grain to an image.

HSV

Converts between RGB and HSV color spaces, or applies hue and saturation modifications.

Hue Curve

Adjusts the saturation or luminance of the image based on hue.

Illegal Pixel

Detects illegal pixels, like NAN and INF, in images.

Inside

Restricts the foreground color to the area of the background's alpha matte.

Invert

Applies a photographic pixel inversion to the image.

Layer

Layers a series of inputs together by compositing them one by one on the background image (input 1).

Levels

Adjusts black point, white point, and midrange to increase, balance, or decrease contrast.

Lighting

Adds a light to the image.

Limit

Limits the pixel range at the high end, low end or both.

Lookup

Applies a lookup table to the input.

Luma Matte

Sets the alpha to the luminance of the color.

Lumakey

Keys the image based on luminance (or similar function).

Mask

Masks out an area of an image.

Max

Outputs the maximum value of the foreground and background images for each pixel, which tends to lighten the image.

Median

Applies a 3 x 3 or 5 x 5 median filter to the input image.

Merges the planes of several inputs together.

Min

Outputs the minimum value of the foreground and background images for each pixel, which tends to darken the image.

Mono

Converts a color or vector into a scalar quantity, like luminance or length.

Mosaic

Takes a sequence of images and combines them into 1 image by tiling them.

Multiply

Multiplies the foreground image with the background image.

Noise

Generates continuous noise patterns.

Null

Does nothing.

Outside

Restricts the foreground color to the area outside of the background's alpha matte.

Over

Composites the first input (Foreground) over the second (background).

Pin

Fits an image into an arbitrary quadrilateral.

Pixel

Modifies an image's pixels using expressions.

Premultiply

Allows colour to be converted to or from a premultiplied form.

Pulldown

Performs a pulldown (cine-expand) on the input sequence.

Pushup

Performs a pushup (cine-expand) on the input sequence.

Quantize

Quantizes input data into discrete steps.

ROP File Output

Renders frames out to disk.

Radial Blur

Does a radial or angular blur.

Ramp

Generates a variety of linear and radial ramps, which are fully keyframable.

Copies the sequence information from its input.

Rename

Change the name a plane.

Render

Renders a mantra output driver directly into a composite network.

Reverse

Simply reverses the frames in the sequence.

Rotoshape

Draws one or more curves or shapes.

Scale

Changes the resolution of the image.

Screen

Adds two images together, saturating at white like photographic addition.

Sequence

Sequences two or more inputs end to end.

Shape

Generates simple shapes, such as circles, stars and regular N-sided polygons.

Sharpen

Sharpens an image by enhancing the contrast of edges.

Shift

Shifts an image sequence in time.

Shuffle

Shuffle frames around to do out-of-order editing.

Snip

Either removes frames from a sequence or allows you to order them in a user-defined order.

Still

Load a single image file.

Streak Blur

Streaks an image, adding a motion blur effect.

Subnetwork

Contains networks of other COPs.

Subtract

Subtracts the foreground image from the background image.

Swap

Swap any two channels.

Switch

 through, acting like an exclusive switch.

Switch Alpha

Replaces input 1's alpha with input 2's alpha.

System

Runs an external program and writes the image data to its STDIN.

Tile

Tiles the image sequence with multiple copies of the input image.

Time Filter

Blurs a pixel through several frames.

Time Machine

Uses a second input to time warp the first input on a per pixel basis.

Time Scale

Stretches or compresses a sequence in time.

Time Warp

Warps time by slowing or speeding it up throughout the sequence.

Transform

Translates, rotates and/or scales the input image without changing the image resolution.

Trim

Trims an input sequence in time by adjusting the beginning or the end of the sequence.

UV Map

Creates a UV map.

Under

Composites the first input (Foreground) under the second (background).

Unpin

Extracts an arbitrary quadrilateral area out of the input image.

VEX Filter

Runs a VEX script on its input planes.

VEX Generator

Runs a VEX script on the planes it generates.

Vector

Performs vector operations on the input.

Velocity Blur

Blurs an image by using pixel velocity to produce a motion blur effect.

Window

Cuts a small window out of a larger image.

Wipe

Does a wipe between two input sequences.

Makes two elements mutually exclusive; if their alpha mattes overlap, the overlap is removed.

Z Comp

Does a Z composite of two images.

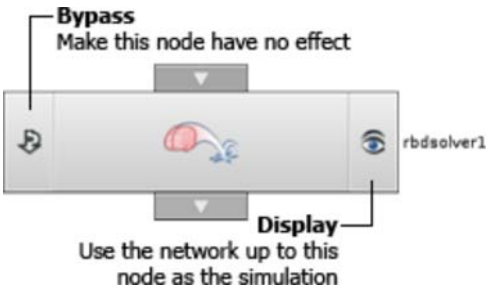
User Contributed Notes add a note

There are no user-contributed notes for this page.

Nodes Dynamics nodes

Dynamics nodes set up the conditions and rules for dynamics simulations.

Node flags



Inputs and outputs

A dynamics node may have an object input (gray), data inputs (green), or both (see objects and data). You should connect like to like (gray to gray and green to green).

A dynamics node can have an object output, or a data output. Some nodes will switch their output type based on what inputs are connected. This allows the more convenient method of connecting nodes “inline” instead of using Apply Data nodes (see objects and data).

Display flag

When Houdini runs the simulation, it cooks the network up from the node with the display flag to establish relationships between objects and data. So, nodes connected after the node with the display flag have no effect on the simulation.

Bypass flag

When the bypass flag is on, this node has no effect.

Usages in other examples

Example name	Example for

Subtopics

Active Value
Marks a simulation object as active or passive.

Affector
Creates affector relationships between groups of objects.

Anchor: Align Axis
Defines an orientation that aligns an axis in object space with a second axis defined by the relative locations of two positional anchors.

Anchor: Object Point Group Position

Anchor: Object Point Group Rotation

Anchor: Object Point Id Position

Anchor: Object Point Id Rotation

Anchor: Object Point Number Position

Anchor: Object Point Number Rotation

Anchor: Object Primitive Position

Anchor: Object Space Position

Anchor: Object Space Rotation

Anchor: World Space Position

Anchor: World Space Rotation

Apply Data
Attaches data to simulation objects or other data.

Apply Relationship
Creates relationships between simulation objects.

Blend Factor

Blend Solver

Cloth Configure Object
Attaches the appropriate data for Cloth Objects to an object.

Cloth Material
Defines the physical material for a deformable surface.

Cloth Object
Creates a Cloth Object from SOP Geometry.

Cloth Physical Parameters
Defines the physical parameters of a cloth object.

Cloth Solver

Cloth Stitch Constraint

Creates a number of constraints on a cloth object with a single node.

Cloth Visualization

Cloth/Cloth Collider

Defines a way of resolving collisions involving two pieces of cloth.

Cloth/Volume Collider

Defines a way of resolving collisions involving a cloth object and DOPs objects with volumetric representations (RBD Objects, ground planes, etc.)

Collide Relationship

Collider Label

Constraint

Constraint Relationship

Container

Copy Data

Creates multiple copies of the input data.

Copy Data Solver

Sets and configures a Copy Data Solver.

Copy Object Information

Mimics the information set by the Copy Object DOP.

Copy Objects

Delete

Deletes both objects and data according to patterns.

Drag Force

Applies force and torque to objects that resists their current direction of motion.

Empty Data

Creates an Empty Data for holding custom information.

Empty Object

Creates an Empty Object.

Empty Relationship

Fan Force

Applies forces on the objects as if a cone-shaped fan were acting on them.

Fetch Data

Fetches a piece of data from a simulation object.

Field Force

Applies forces to an object using some piece of geometry as a vector field.

Saves and loads simulation objects to external files.

File Data

Fluid Configure Object

Attaches the appropriate data for Fluid Objects to an object.

Fluid Force

Applies forces to resist the current motion of soft body objects relative to a fluid.

Fluid Object

Attaches the appropriate data for Fluid Objects to an object.

Fluid Solver

Sets and configures a Fluid solver.

Gas Adjust Coordinate System

A microsolver that adjusts an internal coordinate system attached to fluid particles in a particle fluid simulation.

Gas Adjust Elasticity

A microsolver that adjusts the strength of elastic bonds between pairs of particles in a fluid simulation.

Gas Advect

A microsolver that advects fields and geometry by a velocity field.

Gas Analysis

A microsolver that computes analytic property of fields.

Gas Blur

A microsolver that blurs fields.

Gas Build Collision Mask

A microsolver that determines the collision field between the fluid field and any affector objects.

Gas Build Relationship Mask

A microsolver that builds a mask for each voxel to show the presence or absence of relationships between objects.

Gas Buoyancy

A microsolver that calculates an adhoc buoyancy force and updates a velocity field.

Gas Burn Geometry

Sets the object to use the Gas Burn solver.

Gas Burn Geometry Object

Creates an object with appropriate data to use as a fire source.

Gas Calculate

A microsolver that performs general calculations on a pair of fields.

Gas Combustion

Gas Compute Particle Attributes

A microsolver that calculates particle fluid attribute values for each particle in a particle fluid field.

Gas Correct By Markers

A microsolver that adjusts an SDF according to surface markers.

Gas Cross

A microsolver that computes the cross product of two vector fields.

Gas DSD

A microsolver that applies one round detontation shock dyanamics.

Gas DSD Configure Object

Attaches the appropriate data for Smoke Objects to become a flame front based fire.

Gas DSD Solver

A microsolver that applies the flamefront-based fire simulation.

Gas Diffuse

A microsolver that diffuses a field or point attribute.

Gas Dissipate

A microsolver that dissipates a field.

Gas Elasticity

A microsolver that computes pairwise elastic forces between particles in a fluid simulation.

Gas Embed Fluid

A microsolver that embeds one fluid inside another.

Gas Enforce Boundary

A microsolver that enforces boundary conditions on a field.

Gas External Forces

A microsolver that evaluates the external DOPs forces for each point in a velocity field and updates the velocity field accordingly.

Gas Extrapolate

A microsolver that extrapolates a field's value along an SDF.

Gas Feather Field

A microsolver that creates a feathered mask out of a field.

Gas Feedback

A microsolver that calculates and applies feedback forces to collision geometry.

Gas Fetch Fields to Embed

A data node that fetches the fields needed to embed one fluid in another.

Gas Field Vop

Runs CVEX on a set of fields.

Gas Field to Particle

Gas Geometry To SDF

A microsolver that creates a signed distance field out of geometry.

Gas Integrator

A microsolver that applies forces to a particle fluid system.

Gas Intermittent Solve

A microsolver that solves its subsolvers at a regular interval.

Gas Lookup

A microsolver that looksup field values according to a position field.

Gas Match Field

A microsolver that rebuilds fields to match in size and resolution to a reference field.

Gas Net Fetch Data

A microsolver that arbitrary simulation data between multiple machines.

Gas Net Field Border Exchange

A microsolver that exchanges boundary data between multiple machines.

Gas Net Slice Balance

A microsolver that balances slices data between multiple machines.

Gas Net Slice Exchange

A microsolver that exchanges boundary data between multiple machines.

Gas Particle Forces

A microsolver that computes pairwise collision forces between particles that represent instanced spheres.

Gas Particle Move To Iso

A microsolver that moves particles to lie along a certain isosurface of an SDF.

Gas Particle Pressure

A microsolver that computes pairwise fluid pressure forces between particles in a fluid simulation.

Gas Particle To Field

A microsolver that copies a particle system’s point attribute into a field.

Gas Particle To SDF

A microsolver that converts a particle system into a signed distance field.

Gas Project Non Divergent

A microsolver that removes the divergent components of a velocity field.

Gas Reduce

A microsolver that reduces a field to a single constant field .

Gas Reinitialize SDF

A microsolver that reinitializes a signed distance field while preserving the zero isocontour.

Gas Resize Field

Gas Resize Fluid

A microsolver that resizes a fluid to match another object.

Gas Rest

A microsolver that initializes a rest field.

Gas SPH Density

A microsolver that calculates the density at particle positions in a particle field using techniques from Smoothed Particle Hydrodynamics.

Gas SPH Forces

A microsolver that uses techniques from Smoothed Particle Hydrodynamics to compute pressure, viscosity and surface tension forces acting between particles in a fluid simulation.

Gas Sand Forces

A microsolver that computes the forces to treat the fluid simulation as sand rather than fluid.

Gas Seed Markers

A microsolver that seeds marker particles around the boundary of a surface.

Gas Seed Particles

A microsolver that seeds particles uniformly inside a surface.

Gas Strain Forces

A microsolver that calculates the forces imparted by a strain field.

Gas Strain Integrate

A microsolver that updates the strain field according to the current velocity field.

Gas Surface Snap

A microsolver that snaps a surface onto a collision surface.

Gas Surface Tension

A microsolver that calculates a surface tension force proportional to the curvature of the surface field.

Gas Up Res

Upscales a smoke simulation to a higher resolution by adding turbulence.

Gas Upres Object

Creates an Gas Upres Object from a low resolution fluid sim.

Gas Velocity Stretch

A microsolver that reorients geometry according to motion of a velocity field.

Gas Volume Ramp

Remaps a field according to a ramp.

Gas Vortex Confinement

Applies a vortex confinement force to a velocity field.

Gas Vorticle Forces

Gas Vorticle Geometry

A DOP node that adds the appropriately formatted data to represent vorticles.

Gas Vorticle Recycle

A DOP node that recycles vorticles by moving them to the opposite side of the fluid box when they leave.

Gas Wavelets

A microsolver that performs a wavelet decomposition of a field.

Geometry Copy

Gravity Force

Applies a gravity-like force to objects.

Ground Plane

Creates a ground plane suitable for RBD or cloth simulations.

Group

Creates simulation object groups.

Group Relationship

Hard Constraint Relationship

Defines a constraint relationship that must always be satisfied.

Impulse Force

Applies an impulse to an object.

Index Field

Creates an index field.

Index Field Visualization

Visualizes an index field.

Instanced Object

Creates DOP Objects according to instance attributes

Link to Source Object

Stores the name of the scene level object source for this DOP object.

Magnet Force

Apply forces on objects using a force field defined by metaballs.

Mask Field

Matrix Field

Creates a matrix field.

Matrix Field Visualization

Visualizes a matrix field.

Merge

Merges multiple streams of objects or data into a single stream.

Modifies or creates options on arbitrary data.

Motion

Defines an object's position, orientation, linear velocity, and angular velocity.

Multiple Solver

Net Fetch Data

A DOP that transfers arbitrary simulation data between multiple machines.

No Collider

No Constraint Relationship

Noise Field

Null

Does nothing.

OBJ Position

Creates position information from an object's transform.

ODE Configure Object

Attaches the appropriate data for ODE Objects to an object.

ODE Solver

Sets and configures an ODE Dynamics solver.

POP Object

Converts a regular particle system into a dynamic object capable of interacting correctly with other objects in the DOP environment.

POP Shape Match

Defines the parameters to be used to match a particle system with a target shape.

POP Solver

Particle Fluid Configure Object

Attaches the appropriate data for Particle Fluid Objects to an object.

Particle Fluid Emitter

Emits fluid in a particle fluid simulation.

Particle Fluid Object

Creates a Particle Fluid Object from SOP Geometry.

Particle Fluid Sink

Removes fluid particles that flow inside of a specified boundary from a simulation.

Particle Fluid Solver

Evolves an object as a particle fluid object.

Partition

Creates simulation object groups based on an expression.

Defines the base physical parameters of DOP objects.

Point Collider

Point Force

Applies a force to an object from a particular location in space.

Position

Associates a position and orientation to an object.

Position From Point

Creates position information from a point on some SOP geometry.

Pump Relationship

Pyro Solver

Sets and configures a Pyro solver.

RBD Angular Constraint

Constrains an RBD object to a certain orientation.

RBD Angular Spring Constraint

Constrains an RBD object to have a certain orientation, but with a set amount of springiness.

RBD Auto Freeze

Automatically freezes RBD Objects that have come to rest

RBD Configure Object

Attaches the appropriate data for RBD Objects to an object.

RBD Fractured Object

Creates a number of RBD Objects from SOP Geometry. These individual RBD Objects are created from the geometry primitive groups.

RBD Glue Object

Creates a number of RBD Objects from SOP Geometry. These individual RBD Objects are created from the geometry primitive groups, and are glued to each other.

RBD Hinge Constraint

Constrains an object to two constraints, creating a rotation similar to a hinge or a trapeze bar.

RBD Keyframe Active

RBD Object

Creates an RBD Object from SOP Geometry.

RBD Pin Constraint

Constrains an RBD object a certain distance from the constraint.

RBD Point Object

Creates a simulation object at each point of some source geometry, similarly to how the Copy surface node copies geometry onto points.

RBD Solver

RBD Spring Constraint

Constrains an object to remain a certain distance from the constraint, with a set amount of springiness.

RBD State

Alters the state information for an RBD Object.

RBD Visualization

Reference Frame Force

Applies forces to an object according to the difference between two reference frames.

Rendering Parameters

Rendering Parameters Volatile

Rigid Body Solver

Sets and configures a Rigid Body Dynamics solver.

Ripple Configure Object

Attaches the appropriate data for Ripple Objects to an object.

Ripple Object

Creates an object from existing geometry that will be deformed with the ripple solver.

Ripple Solver

Animates wave propagation across Ripple Objects.

SOP Geometry

SOP Scalar Field

Creates a scalar field from a SOP Volume.

SOP Solver

SOP Vector Field

Creates a vector field from a SOP Volume Primitive.

Sand Configure Object

Attaches the appropriate data for Sand Objects to an object.

Sand Object

Attaches the appropriate data for Sand Objects to an object.

Sand Solver

Sets and configures a Sand solver.

Scalar Field

Creates a scalar field.

Scalar Field Visualization

Visualizes a scalar field.

Script Solver

Slice Along Line

Divides a particle system uniformly into multiple slices along a line.

Slice by Plane

Specifies a cutting plane to divide a particle system into two slices for distributed simulations.

Smoke Configure Object

Attaches the appropriate data for Smoke Objects to an object.

Smoke Object

Creates an Smoke Object from SOP Geometry.

Smoke Solver

Sets and configures a Smoke solver.

Soft Body (SBD) Pin Constraint

Constrains a point on a soft body object to a certain position.

Soft Body (SBD) Spring Constraint

Constrains a point on a soft body to a certain position, with a set amount of springiness.

Source Relationship

Sphere Edge Tree

This builds a tree of spheres producing bounding information for an edge cloud.

Sphere Point Tree

This builds a tree of spheres producing bounding information for a point cloud.

Split Object

Splits an incoming object stream into as many as four output streams.

Spring Constraint Relationship

Squishy Object

The Squishy Object DOP converts a geometry object into a dynamic object that behaves like a soft body in the DOP environment.

Static Object

Creates a Static Object from SOP Geometry.

Static Solver

Subnetwork

Switch

Passes one of the input object or data streams to the output.

Switch Solver

Switch Value

Terrain Object

Creates a Terrain Object from SOP Geometry.

Defines a way of resolving collisions between two rigid bodies.

Two State Constraint Relationship

Uniform Force

Applies a uniform force and torque to objects.

VOP Force

Applies forces on the objects according to a VOP network.

Vector Field

Creates a vector field.

Vector Field Visualization

Visualizes a vector field.

Velocity Impulse Force

Applies an impulse to an object.

Volume

Creates a volumetric representation of a piece of geometry that can be used for collision detection.

Volume/Volume Collider

Defines a way of resolving collisions involving two rigid bodies with volume.

Vortex Force

Applies a vortex-like force on objects, causing them to orbit about an axis along a circular path.

Wind Force

Applies forces to resist the current motion of objects relative to a turbulent wind.

Wire Angular Constraint

Constrains a wire point's orientation to a certain direction.

Wire Angular Spring Constraint

Constrains a wire point's orientation to a certain direction, with a set amount of springiness.

Wire Configure Object

Attaches the appropriate data for Wire Objects to an object.

Wire Elasticity

Defines the elasticity of a wire object.

Wire Glue Constraint

Constraints a wire point to a certain position and direction.

Wire Object

Creates a Wire Object from SOP Geometry.

Wire Physical Parameters

Defines the physical parameters of a wire object.

Wire Plasticity

Defines the plasticity of a wire object.

Sets and configures a Wire solver.

Wire Visualization

Wire/Volume Collider

Defines a way of resolving collisions involving a wire object and DOPs objects with volumetric representations.

Wire/Wire Collider

Defines a way of resolving collisions between two wires.

User Contributed Notes add a note

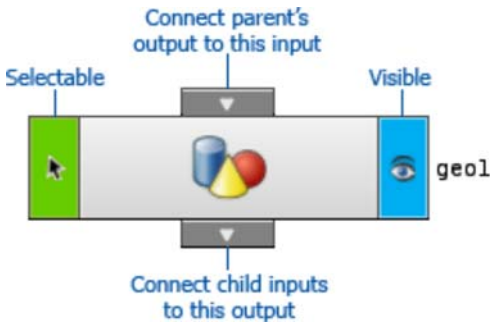
There are no user-contributed notes for this page.

Nodes Object nodes

Overview

Object nodes represent objects in the scene, such as character parts, geometry objects, lights, cameras, and so on.

Object flags



Tip

Select a node and press `1` to set its *display* flag.

Display flag	Use this to make entire objects visible or invisible.
Selectable flag	Use this to make certain objects unselectable. This lets you concentrate on other objects, and prevents you from accidentally selecting objects you don't want to touch.

Usages in other examples

Example name	Example for

Subtopics

Ambient Light

Adds a constant level of light to every surface in the scene (or in the light's mask), coming from no specific direction.

Animation Rig Biped Arm

Provides parameters to animate the arm for a biped character.

Animation Rig Biped Hand

Provides parameters to animate the hand for a biped character.

Animation Rig Biped Head and Neck

Provides parameters to animate the head and neck for a biped character.

Animation Rig Biped Leg

Provides parameters to animate the leg for a biped character.

Animation Rig Biped Spine

Provides parameters to animate the spine for a biped character.

Animation Rig Character Placer

Provides parameters to animate the character placer.

Animation Rig Quadruped Back Leg

Provides parameters to animate the back leg for a quadruped character.

Animation Rig Quadruped Front Leg

Provides parameters to animate the front leg for a quadruped character.

Animation Rig Quadruped Head and Neck

Provides parameters to animate the head and neck for a quadruped character.

Animation Rig Quadruped IK Spine

Provides parameters to animate the IK spine for a quadruped character.

Animation Rig Quadruped Tail

Provides parameters to animate the tail for a quadruped character.

Animation Rig Quadruped Toes

Provides parameters to animate the toes for a quadruped character.

Atmosphere

Creates a fog effect when rendered.

Biped Animation Rig

Provides parameters to animate the biped autorig.

Biped Deform Rig

Provides parameters to control the display of the biped autorig.

Blend

Switches or blends between the transformations of several input objects.

The Bone Object is used to create hierarchies of limb-like objects that form part of a hierarchy …

Camera

You can view your scene through a camera, and render from its point of view.

Common object parameters

Debris

Emits particles from the edges of separating fractured rigid bodies.

Dop Network

The Dop Network Object contains a dynamic simulation.

Fetch

The Fetch Object gets its transform by copying the transform of another object.

Fur

Creates fur geometry for rendering with a Mantra Fur Procedural.

Geometry container

Container for the geometry operators (SOPs) that define a modeled object.

Handle

The Handle Object is an IK tool for manipulating bones.

Instance

Instance Objects acts as proxy to other geometry objects.

Light

Light Objects cast light on other objects in a scene.

Light template

A very limited light object without any built-in render properties. Use this only if you want to build completely custom light with your choice of properties.

Microphone

The Microphone object specifies a listening point for the SpatialAudio CHOP.

Muscle

Creates a smooth muscle surface you can use to deform a character's skin in a realistic way.

Null

Serves as a place-holder in the scene, usually for parenting. this object does not render.

Path

The Path object creates an oriented curve (path)

PathCV

The PathCV object creates control vertices used by the Path object.

Quadruped Animation Rig

Provides parameters to animate the quadruped autorig.

Quadruped Deform Rig

Rivet

Creates a rivet on an objects surface, usually for parenting.

Sound

The Sound object defines a sound emission point for the Spatial Audio chop.

Stereo Camera Rig

Provides parameters to manipulate the interaxial lens distance as well as the zero parallax setting plane in the scene.

Stereo Camera Template

Serves as a basis for constructing a more functional stereo camera rig as a digital asset.

Sticky

Creates a sticky object based on the UV's of a surface, usually for parenting.

Sticky Blend

Computes its transfrom by blending between the transforms of two or more sticky objects, allowing you to blend a position across a polygonal surface.

Subnet

Container for objects.

Switcher

Acts as a camera but switches between the views from other cameras.

Whitecaps

Emits particles from the leading edges of a Particle Fluid wave, when the sharpness of the wave crest reaches a certain threshold.

Nodes Particle nodes

Particle nodes create and control particles and particle systems.

To begin working with particle nodes:

In the shelf, click **New Particle System** on the **Particles** tab.

Particle node flags

Cook	At the top-level of the POP network, controls which POP is cooked. All required ancestors of the cooked POP are also cooked. In subnets , controls which POP is the output of the subnet. Violet means on.
Template	Show guide geometry specific to the node. For example, turning on the template flag for a force node shows the direction of the force being applied to the particles. See visualize node effects with template geometry .
Bypass	Pass the input straight through to the output without modifying it. When the bypass flag is on, the node has no effect.

Usages in other examples

Example name	Example for

Subtopics

Text Clear

Acceleration
Explicitly sets a particle's acceleration.

Advect by Volumes

Age
Sets the ages and/or expected lifespan of particles.

Angular Velocity
Sets a particle's angular velocity.

Attractor
Attracts or repels particles using a referenced Force SOP or Point SOP.

Attribute
Adds custom attributes to particles.

Attribute Transfer
Transfers point or vertex attributes from reference geometry onto particles.

Code
Inserts extra code in the particle system.

Collect
Merges particle streams together so you can act on them collectively.

Collision
Sets attributes on and/or groups particles when they collide with geometry.

Color
Changes a particle's diffuse color and/or alpha.

Creep
Causes particles to stick to geometry.

Curl Noise
Applies a divergent free noise field to particles..

Drag
Applies drag to the velocity of particles.

Event
Generates events based on rules.

Fan
Applies force on particles like a cone-shaped fan.

Fetch
Imports particle streams from other networks.

Fireworks
Creates a simple fireworks system.

Follow
Makes particles follow a leader.

Force
Applies a global directional force, such as gravity.

Creates and/or combines named groups of particles.

Hit Info

Manually sets attributes associated with collisions.

Instance

Renders instanced geometry on a particle.

Interact

Make particles attract or repel other particles.

Kill

Kills particles based on expressions.

Limit

Creates collisions when particles reach a limit boundary.

Lineage

Manually sets attributes associated with the particle's family tree.

Location

Emits particles at a location in space.

Lookat

Rotates particles so they point in a certain direction.

Null

Passes inputs through unaffected.

Orbit

Makes particles orbit a center-point.

Position

Explicitly sets a particle's position.

Property

Manually set physical attributes.

Proximity

Sets attributes on and/or creates groups of particles based on which other particles are nearby.

Render

Controls how particles render.

Resistance

Calculates air or water resistance on instanced geometry.

Rotation

Rotates the particle frame of reference, allowing instanced geometry to point in a different direction from the particle motion.

SPH Density Test

Kills particles if the surrounding region exceeds a certain density.

Performs soft body deformations similar to the Spring SOP.

Soft Limit

Creates a boundary collisions like Limit, but with spongier bounces.

Source

Emits particles from geometry.

Speed Limit

Enforces minimum and maximum velocities.

Split

Splits (emits) particles from existing particles.

Sprite

Changes sprite rendering attributes like texture coordinates, SHOP, rotation, and size.

State

Sets the state information of particles.

Stream

Emit particles from areas where streams of particles mix.

Subnetwork

Encapsulates the functionality of a POP network inside a node.

Suppress Rule

Turns off default rules controlling particle behavior.

Switch

Switches between input streams.

Torque

Rotates particles around another point.

Translation

Moves the particle frame of reference, offsetting instanced geometry from the particle position.

Turn

Changes the direction of particles without affecting speed.

Up Vector

Manually sets a particle's up vector.

VEX

Executes VEX code to modify particles.

VEX Sprinkler

Simulates a sprinkler.

VOP POP

Contains a VOP network that can manipulate particle attributes.

Velocity

Velocity Stream

Emits a stream of evenly-spaced particles from geometry.

Wind

Pushes particles up to a maximum speed.

User Contributed Notes add a note

There are no user-contributed notes for this page.

Nodes Render output nodes

Render nodes are “drivers” for rendering out the scene into various formats, often using external programs. For example, the mantra node uses mantra to render the scene, while the RenderMan node uses RenderMan.

Overview

Output driver nodes translate the scene into the format expected by a renderer and run the renderer on it. Houdini includes render drivers for the built-in mantra renderer, as well as RenderMan, other RIB renderers, and mental ray.

Output driver nodes live at the Render Outputs (ROP) level. They let you set up renders for different rendering methods, programs, and/or settings, and switch between them based on your needs at any given moment.

For example, you can set up different output nodes for different render qualities (such as test render and final render) and independent render passes. Or, you can render various scenes with different renderers.

Each driver renders the view of the scene through a camera . For a driver to work correctly, the camera associated with the driver must still exist.

- Use **Render > Create Render Node** to create a new output driver.
- Use **Render > Edit Render Node** to select and edit an existing render driver.

Note

Houdini’s shaders are specific to particular renderers. Rendering with a different renderer will require you to use different shaders on your objects. However, you can switch shaders based on the renderer .

How to temporarily disable outputs

ROPs have bypass flags and lock flags, which you can use to disable ROPs without disconnecting them from the network.

Locking a ROP will stop it and all its input ROPs from rendering. This is a good way to 'lock off' a branch of renders. If some input ROP has another ROP that is dependent on it, and that ROP isn't locked, it will still render. Locking a ROP will only block the one dependency path through the locked ROP.

Bypassing or locking a subnetwork will prevent any of the ROPs inside from rendering.

> **Tip**
>
> You can still force a bypassed or locked render node to render using the "Render All Bypassed Nodes" and "Render All Locked Nodes" options in the render control window.

Usages in other examples

Example name	Example for

Subtopics

Text Clear

3D Texture Generator
This output operator is used to drive the image3d program which generates 3D texture maps.

Alfred
Alfred is a program shipped out with Pixar's distribution of RenderMan.

Archive Generator
Generates disk-based archives which can be used by either mantra or RIB renderers.

Batch
Renders the input ROP in a single batch job.

Channel
The Channel output operator generates clip files from a particular CHOP.

Composite
The Composite output operator renders the image(s) produced in the Compositing Editor.

DSM Merge
Merges two or more deep shadow/camera map files.

Dynamics
Saves the state of a DOP network simulation into files.

Filmbox FBX

Frame Depedency

Allows an output frame to depend on one or more input frames.

Geometry

Generates geometry files from a SOP or DOP network.

HQueue Render

HQueue, or Houdini Queue, is a distributed job scheduling system.

HQueue Simulation

HQueue, or Houdini Queue, is a distributed job scheduling system.

MDD Point Cache

This output operator is used to write an MDD animation file.

Mantra

Renders the scene using Houdini's standard mantra renderer and generates IFD files.

Merge

Merges several render dependencies into one.

Net Barrier

Blocks the ROP network until synhcronization occurs.

Null

Does nothing.

Object Scene

The Object Scene operator allows the creation of many different types of renderings.

RenderMan

Renders the scene using Pixar's RenderMan renderer.

Shell

Runs an external command.

Subnetwork

The SubNetwork output operator provides an easy way to manage large number of output operators.

Switch

Renders one of several inputs.

Torque

Exports the scene to the Torque DTS or DSQ format.

Wedge

Re-renders the same ROP multiple times with different settings

Wren

This output operator is used to drive the Wren rendering program.

mental ray

User Contributed Notes add a note

There are no user-contributed notes for this page.

Nodes Shader nodes

Shader nodes implement material looks that you can apply to geometry.

Usages in other examples

Example name	Example for

Subtopics

Text Clear

Material
A higher-level shader that can contain one or more sub-shaders, such as surface shaders, displacement shaders, and property shaders.

DTS Material
SHOP node allowing configuration of a DTS material.

Fur Density Map

Fur Style

GLSL Normal Map
This shader is used to render a bump mapped surface.

GLSL Tangent Space Normal Map
This shader is used to render a bump mapped surface.

Generic Displacement
Implements a generic displacement shader.

Generic Fog
Implements a generic fog shader.

Generic Interior
Implements a generic interior fog shader.

Generic Light
Implements a generic light shader.

Generic Output
Implements a generic output shader.

Implements a generic shadow shader.

Generic Surface

Implements a generic surface shader.

Mantra: Delayed Load

Replaces the object with the contents of a file at render time.

Mantra: Fur Procedural

Creates a set of hair-like curves across a surface at render time.

Mantra: HScript Procedural

Runs an HScript for each point on the object's geometry and instances the geometry output by the script at that point.

Mantra: Image3D Procedural

Generates an iso-surface from a 3D texture image (.i3d) file.

Mantra: Image3D Volume Procedural

Replaces object's geometry with a volume primitive read from a 3D texture (.i3d) file.

Mantra: Metaball Procedural

Polygonizes metaballs found in this object or another object.

Mantra: Program Procedural

Runs an external program to generate geometry at render time.

Mantra: Sprite Procedural

Renders points as sprites, small textures that are always normal to the camera.

Properties

Attach its properties to any objects that have the shader assigned.

Pyro

Flexible, production-quality fire and smoke shader.

Select

Select which shop to use for rendering based on valid render types and expressions.

Subnetwork

The Sub-net shop is essentially a way of creating a macro to represent a collection of shops as a…

Switch

Switch shops based on a single expression.

VEX 3D Texture Cloud

This surface shader uses a 3D texture image to generate clouds.

VEX 3D Texture Fog

This fog shader uses a 3D texture image to generate clouds.

VEX ASAD Light

ASAD Light - All Singing And Dancing Light Shader This shader simulates a point or cone light

VEX Ambient

Ambient Light Source.

VEX Attenuated Light

An attenuated light source.

VEX Attenuated Spotlight

An attenuated cone light source.

VEX Blur Shadow

The blurshadow shader generates soft shadows by sending out multiple shadow rays.

VEX Brushed Aluminum

This surface implements anisotropic shading based on the lighting model by Greg Ward which can be…

VEX Burlap

This displacement shader simulates rough cloth like burlap Texture coordinates (or the surface pa…

VEX Cartoon

This shader colors like a cartoon.

VEX Choppy Water

This shader gives the appearance of choppy waves.

VEX Clay

The clay shader uses the Oren-Nayar diffuse lighting model to simulate very rough surfaces.

VEX Constant

This shader will constant shade a surface.

VEX Corrugated

This displacement shader simulates corrugated material (like cardboard or metal.

VEX Decal

This surface shader generates a plastic surface which has a texture map modulating the diffuse at…

VEX Displace Map

This shader will displace the surface geometry based on the luminance of the texture map.

VEX Distant Light

Simulates a distant attenuated light source.

VEX Fluffy Cloud

This shader is used by the i3dgen program (or the 3D Texture output driver) to generate a 3D texture map.

VEX Fractal Dent

This shader generates creates a dented surface The rest position attribute is used if it exists.

VEX Gingham Checks

VEX Glass

The glass shader simulates a transparent, refractive surface.

VEX Global Illumination

This light source can be used to add some global illumination effects.

VEX Hair

This shader is based on the illumination model presented in 'Fake Fur Rendering', Siggraph Proceedings 1997.

VEX Krinkle

This shader gives the appearance of crinkled up paper which has been un-folded.

VEX Lit Fog

This fog shader computes lit fog by marching a ray from the eye to the surface being shaded.

VEX Matte

The matte shader will occlude geometry behind the surface being rendered, however, the output ima…

VEX Meta Cloud

This shader is used by the i3dgen program (or the 3D Texture output driver) to generate a 3D texture map.

VEX Metal

Simulates a reflective metallic surface.

VEX OpenGL Material

This shader is used to represent an Open GL material.

VEX Plastic

Simulates a plastic surface.

VEX Point Light

A point light source.

VEX Polka Dots

This shader generates polka dots.

VEX Riverbed

This shader gives the appearance of a dried up riverbed.

VEX Shadow

The rayshadow shader generates shadows based on one of four different techniques.

VEX Shadow Map

The shadowmatte shader generates an alpha image that stores screen-space shadow information for later compositing.

VEX Soft Toon

This non-photorealistic shader shades the surface facing away from the light, allowing detail to be seen in shadows.

Phong, Blinn or Cook shading models use all three aspects of the material: ambient, diffuse and specular color.

VEX Uniform Fog

This generates uniform fog.

VEX Volume Cloud

This volume shader will shade volume objects as if they were fog. The density value will be used as the thickness of the fog at each point.

VEX Volume Fire

This volume shader will shade volume objects as if they were flame. The density value will be used as a lookup into a color shading ramp, provided it lies within a certain range.

VEX Window

Simulates light streaming through a window.

VEX Z-Depth Fog

This fog shader computes the coverage based on an ease-in ease-out curve between the near and far clipping planes.

VEX Z-Map Fog

A fast volumetric light shader.

VOP CVEX

Container for a CVEX shader implementation.

VOP RSL Displacement

Container for an RSL displacement shader implementation.

VOP RSL Light

Container for an RSL light shader implementation.

VOP RSL Volume

Container for an RSL volume shader implementation.

VOP VEX Displacement

Container for a VEX displacement shader implementation.

VOP VEX Fog

Container for a VEX fog shader implementation.

VOP VEX Image3D

Container for a VEX image3d shader implementation.

VOP VEX Light

Container for a VEX light shader implementation.

VOP VEX Photon

Container for a VEX photon shader implementation.

VOP VEX Shadow

Container for a VEX shadow shader implementation.

There are no user-contributed notes for this page.

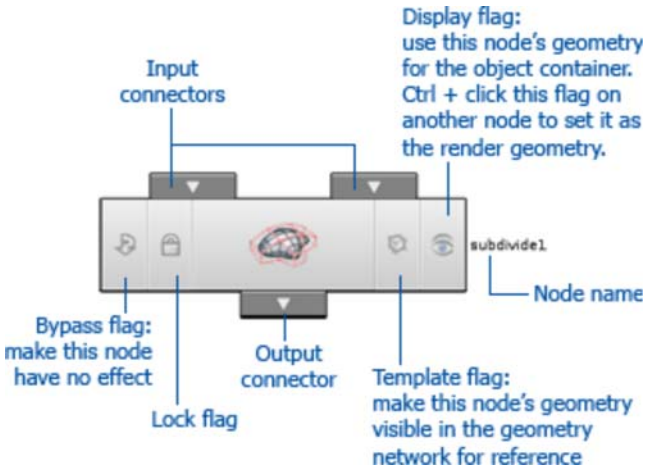
Nodes Surface nodes

Nodes that control the shape of geometry.

Overview

Surface nodes create and manipulate geometry (curves, surfaces, metaballs, and so on). Surface nodes live inside a Geometry container object.

Surface node flags



Tip

Select a node and press `1` to set its *display* flag, or `2` to set its *render* flag.

Lock	Caches the input geometry and stops cooking the inputs to improve performance.
Bypass	Makes this node have no effect: passes the geometry through from the input to the output untouched. This is useful for testing and visualizing the effect the node is having in the viewer.
Template	Makes the geometry in this node visible and snappable, but unrenderable. This is useful for "guide" geometry, where you want to edit, visually match, or snap to, existing geometry.

Templated geometry only appears at the Geometry level, for use in modeling operations. It does not appear at the Scene level (it is not part of the “final” geometry of the object).

To prevent snapping to template geometry, open the snapping options window and turn off **Apply to: Templates**.

Selectable template

Ctrl-click the template flag to make the node’s geometry templated but selectable in the 3D viewer (at the Geometry level).

Like normal templated geometry, selectable templates only appear at the Geometry level, not the Scene level. This flag is equivalent to the “footprint” flag in previous versions of Houdini.

Display

This flag indicates which node provides the geometry for the container object. Only one node at a time can have the display flag.

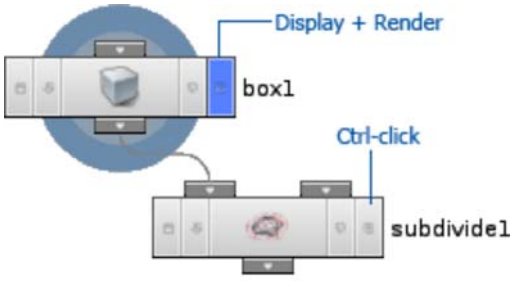
Unlike an object’s display flag, this flag does not make a node visible or invisible in the viewer.

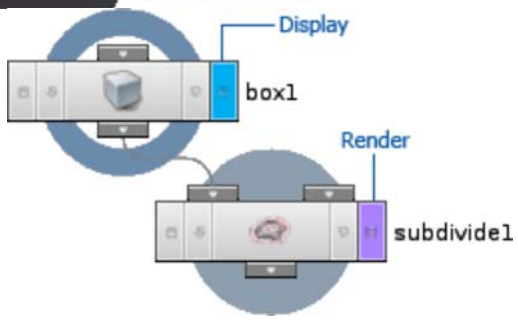
If you want geometry from more than one node in the object, use a Merge operator to merge the output of the nodes, then click the display flag on the Merge node.

A common problem when you first start working directly in the network is that you connect a node but it seems to have no effect. This is often because you haven’t clicked the display flag on the new node.

Render

The display flag normally indicates which node provides the geometry shown in the viewer and rendered by the renderer. You can set separate display and *render flags*, so one node provides the geometry for the viewer and a different node provides the geometry for the renderer. This lets you show proxy geometry in the viewer and render more detailed geometry.





Ctrl-click the display flag on another node to move the render flag there. The ring marks the display node, the circle marks the render node.

To fuse the display and render flags back together, Ctrl-click the active display flag.

Unload flag

The unload flag is available in list mode. When the unload flag is on, a surface node will *not* cache the geometry that passes through it.

This is useful for finished, static props and other non-time-dependent objects, where the geometry network cooks only once. Even if a node in a geometry is dynamic (its output changes depending on the frame number), you can turn on the unload flag of all the nodes above it to save memory.

(Unloading cached geometry will probably not decrease the total amount of memory Houdini uses, but it will free the memory for use in other parts of Houdini.)

To switch the network editor to list mode, right-click the network background and choose **View nodes as a list**, or move the mouse over the network editor and press T .

Usages in other examples

Example name	Example for

Subtopics

Text Clear

Add

Creates Points or Polygons, or adds points/polys to an input.

Aligns a group of primitives to each other or to an auxiliary input.

Assemble

Cleans up a series of break operations and creates the resulting pieces.

Attrib Composite

Composites vertex, point, primitive, and/or detail attributes between two or more selections.

Attrib Copy

Copies attributes between groups of vertices, points, or primitives.

Attrib Create

Adds or edits user defined attributes.

Attrib Mirror

Copies and flips attributes from one side of a plane to another.

Attrib Promote

Promotes or demotes attributes from one geometry level to another.

Attrib Reorient

Modifies point attributes based on differences between two models.

Attrib String Edit

Edits string attribute values.

Attrib Transfer

Transfers vertex, point, primitive, and/or detail attributes between two models.

Attribute

Renames or deletes point and primitive attributes.

Bake ODE

Converts primitives for ODE solver.

Bake VEX

Pre-shades mesh, Bezier or NURBs geometry with VEX surface and displacement VEX shaders.

Bake Volume

Computes lighting values within volume primitives

Basis

Provides operations for moving knots within the parametric space of a NURBS curve or surface.

Blast

Deletes primitives, points, edges or breakpoints.

Blend Shapes

Computes a 3D metamorphosis between shapes with the same topology.

Bone Link

Creates default geometry for Bone objects.

Bound

Box

Creates a cube or six-sided rectangular box.

Break

Breaks the input geometry using the specified cutting shape.

Bridge

Skins trimmed surfaces or holes, creates highly controllable joins between arms and body, branches, or tube intersections.

Bulge

Deforms the points in the first input using one or more magnets from the second input.

Cache

Records and caches its input geometry for faster playback.

Cap

Closes open areas with flat or rounded coverings.

Capture

Supports Capture Region and Deform by assigning capture weights to capture regions.

Capture Correct

Adjusts capture regions and capture weights.

Capture Layer Paint

Lets you paint capture attributes directly onto geometry.

Capture Metaball

Captures points on geometry to metaballs, similarly to capturing to a bone.

Capture Mirror

Copies capture attributes from one half of a symmetric model to the other.

Capture Override

Overrides the capture weights on individual points.

Capture Proximity

Supports Capture Region and Deform by assigning capture weights to points based on distance to capture regions.

Capture Region

Supports Capture and Deform operation by creating a volume within which points are captured to a bone.

Carve

Slices, cuts or extracts points or cross-sections from a primitive.

Channel

Reads sample data from a chop and converts it into point positions and point attributes.

Circle

Creates open or closed arcs, circles and ellipses.

Lets you deforms faces and surfaces by pulling points that lie directly on them.

Clean

Helps clean up dirty models.

Clip

Removes or groups geometry on one side of a plane, or creases geometry along a plane.

Cloth Create Seam

Creates point attributes that define how the ClothStitchConstraint DOP stitches together panels.

Cloth Match Panels

Ensures that all cloth seams have the same number of points on both sides.

Cloth Match Seams

Ensures that all cloth seams have the same number of points on both sides.

Cloth Refine

Refines cloth panels by triangulating them.

Color

Adds color attributes to geometry.

Comb

Adjust surface point normals by painting.

Connectivity

Creates an attribute with a unique value for each set of connected primitives or points.

Control

Creates simple geometry for use as control shapes.

Convert

Converts geometry from one geometry type to another.

Convert Meta

Polygonizes metaball geometry.

Cookie

Combines two polygonal objects with boolean operators, or computes the contour line along the intersection between two polygonal objects.

Copy

Creates multiple copies of the input geometry, or copies the geometry onto the points of the second input.

Crease

Manually adds or removes a creaseweight attribute to/from polygon edges, for use with the Subdivide SOP.

Creep

Deforms and animates a piece of geometry across a surface.

Curve

Curveclay

Deforms a spline surface by reshaping a curve on the surface.

Curvesect

Finds the intersections (or points of minimum distance) between two or more curves or faces.

Deform

Uses capture attributes created by Capture or Capture Proximity to deform outer geometry according to the movement of capture regions.

Deform Metaball

Deforms captured points according to metaball deformations.

Deform Muscle

Deforms captured points according to muscle deformations.

Delete

Deletes input geometry by entity number, bounding volume, primitive/point normals, and/or degeneracy.

Dissolve

Deletes points, primitives, and edges from the input geometry and repairs any holes left behind.

Divide

Divides, smoothes, and triangulates polygons.

Dop I/O

Imports fields from DOP simulations, saves them to disk, and loads them back again.

Dop Import

Imports and transforms geometry based on information extracted from a DOP simulation.

Dop Import Fields

Imports scalar and vector fields from a DOP simulation.

Duplicate

Copies geometry and applies transformations to the copies.

Each

Culls the input geometry in according to the specifications of the For Each SOP.

Edge Collapse

Collapses edges and faces to their centerpoints.

Edge Cusp

Sharpens edges by uniquing their points and recomputing point normals.

Edge Divide

Inserts points on the edges of polygons and optionally connects them.

Edge Flip

Flips the direction of polygon edges.

Edits points, edges, or faces interactively.

Ends

Closes, opens, or clamps end points.

Extrude

Extrudes geometry along a normal.

Extrude Volume

Extrudes surface geometry into a volume.

Facet

Controls the smoothness of faceting of a surface.

File

Reads, writes, or caches geometry on disk.

Fillet

Creates smooth bridging geometry between two curves or surfaces.

Finalize Waves

Imparts wave velocities to points in waveform geometry

Fit

Fits a spline curve to points, or a spline surface to a mesh of points.

Font

Creates 3D text from Type 1 and TrueType fonts.

ForEach

Repeatedly applies a set of SOPs to the input geometry.

Force

Uses a metaball to attract or repel particles or springs.

Fractal

Creates jagged mountain-like divisions of the input geometry.

Fur

Creates a set of hair-like curves across a surface.

Fuse

Merges or splits (uniques) points.

Geometry ROP output driver

Grid

Creates a plane.

Group

Generates groups of points or primitives according to various criteria.

Group Copy

Copies groups between two pieces of geometry, based on point/primitive numbers.

Sets group membership interactively by painting.

Group Transfer

Transfers groups between two pieces of geometry, based on proximity.

Hole

Makes holes in surfaces.

Inflate

Deforms the points in the first input to make room for the inflation tool.

Iso Offset

Builds an offset surface from geometry.

Iso Surface

Generates an isometric surface from an implicit function.

Join

The Join op connects a sequence of faces or surfaces into a single primitive that inherits their attributes.

Knife

Divides, deletes, or groups geometry based on an interactively drawn line.

L-system

Creates fractal geometry from the recursive application of simple rules.

LOD

Lets you view different levels of detail of geometry based on distance from camera.

Lattice

Deforms geometry based on how you reshape control geometry.

Layer

Lets you maintain multiple layers of attributes.

Line

Creates polygon or NURBS lines from a position, direction, and distance.

MDD

Animates points using an MDD file.

Magnet

Deforms geometry by using another piece of geometry to attract or repel points.

Match Axis

Aligns the input geometry to a specific axis.

Match Size

Resizes and recenters the geometry according to reference geometry.

Match Topology

Reorders the primitive and point numbers of the input geometry to match some reference geometry.

Assigns one or more materials to geometry.

Measure

Measures volume, area, and perimeter of polygons and puts the results in attributes.

Merge

Merges geometry from its inputs.

MetaGroups

Defines groupings of metaballs so that separate groupings are treated as separate surfaces when merged.

Metaball

Creates metaballs and meta-superquadric surfaces.

Mirror

Duplicates and mirrors geometry across a mirror plane.

Mountain

Displaces points along their normals based on fractal noise.

Muscle

Support node for the Muscle object.

Name

Creates a “naming” attribute on points or primitives allowing you to refer to them easily, similar to groups.

Network

Transmits geometry data between two instances of Houdini over a network connection.

Null

Does nothing.

Object Merge

Merges geometry from other Geometry objects into this one.

POP Merge

Loads the geometry from a pop network back into this Geometry object as points.

POP Network

Contains a Particle node network.

Paint

Lets you paint color or other attributes on geometry.

Particle

Creates simple particle simulations without requiring an entire particle network.

Particle Fluid Surface

Generates a polygonal surface around the particles from a particle fluid simulation.

Partition

Places points and primitives into groups based on a user-supplied rule.

Lets you paste local refinements on top of base NURBS geometry.

Peak

Moves primitives, points, edges or breakpoints along their normals.

Platonic Solids

Creates platonic solids of different types.

Point

Manually adds or edits point attributes.

Point Cloud Iso Surface

Constructs an iso surface from its input points.

Point Jitter

Jitters points in random directions.

Pointmap

A VEX node that generate points based on the luminance of a texture map.

Points From Volume

Creates set of regular points filling a volume.

Poly Bevel

Bevels points and edges.

Poly Cap

Fills in polygons between boundary edges.

Poly Extrude

Extrudes polygonal faces and edges.

Poly Frame

Creates coordinate frame attributes for points and vertices.

Poly Knit

Creates new polygons to joining existing polygons.

Poly Loft

Creates new polygons using existing points.

Poly Patch

Creates a smooth polygonal patch from primitives.

Poly Reduce

Reduces the number of polygons in a model while attempting to preserve its shape.

Poly Spline

The Polyspline op fits a spline curve to a polygon or hull and outputs a polygonal approximation of that spline.

Poly Split

Divides an existing polygon into multiple new polygons.

Stitches polygonal surfaces together, attempting to remove cracks.

Poly Wire

Constructs polygonal tubes around polylines, creating renderable geometry with smooth bends and intersections.

Primitive

Edits primitive, primitive attributes, and profile curves.

Primitive Split

Takes a primitive attribute and splits any points whose primitives differ by more than a specified tolerance at that attribute.

Profile

Extracts or manipulates profile curves.

Project

Creates profile curves on surfaces.

RMan Shader

Attaches RenderMan shaders to groups of faces.

Rails

Generates surfaces by stretching cross-sections between two guide rails.

Ray

Projects one surface onto another.

Refine

Increases the number of points/CVs in a curve or surface without changing its shape.

Resample

Resamples one or more curves or surfaces into even length segments.

Rest Position

Sets the alignment of solid textures to the geometry so the texture stays put on the surface as it deforms.

Reverse

Reverses or cycles the vertex order of faces.

Revolve

Revolves a curve around a center axis to sweep out a surface.

Ripple

Generates ripples by displacing points along the up direction specified.

Round

Generates round fillets of a specified radius between two surfaces.

Scatter

Scatters new points randomly across a surface.

Script

Sculpt
Lets you interactively reshape a surface by brushing.

Sequence Blend
Sequence Blend lets you do 3D Metamorphosis between shapes and Interpolate point position, colors…

Shader
Applies shaders to faces.

Shatter
Shatters the input geometry by inducing multiple fracture lines in it.

Skin
Builds a skin surface between any number of shape curves.

Slide Modifier Paint
Lets you paint the slide modifier and inflation modifier attributes onto geometry interactively.

Smooth
Smooths out (or “relaxes”) polygons, meshes and curves without increasing the number of points.

Soft Peak
Moves the selected point along its normal, with smooth rolloff to surrounding points.

Soft Transform
Moves the selected point, with smooth rolloff to surrounding points.

Sort
Reorders points and primitives in different ways.

Sphere
Creates a sphere or ovoid surface.

Spring
Simulates the behavior of points as if the edges connecting them were springs.

Standard Variables

Starburst
Insets points on polygonal faces.

Stitch
Stretches two curves or surfaces to cover a smooth area.

Subdivide
Subdivides polygons into smoother, higher-resolution polygons.

Subnetwork
The Sub-net op is essentially a way of creating a macro to represent a collection of ops as a sin…

Super Quad
Generates an isoquadric surface.

Trims or creates profile curves along the intersection lines between NURBS or bezier surfaces.

Sweep

Creates a surface by sweeping cross-sections along a backbone curve.

Switch

Switches between network branches based on an expression or keyframe animation.

TimeBlend

Blends intraframe values for geometry.

TimeShift

Cooks the input at a different time.

TimeWarp

Retimes the input to a different time range.

Torus

Creates a torus (doughnut) shaped surface.

Trace

Traces curves from an image file.

Trail

Creates trails behind points.

Transform

The Transform operation transforms the source geometry in “object space” using a transformation matrix.

Transform Axis

Transforms the input geometry relative to a specific axis.

Tri Bezier

Creates a triangular Bezier surface.

Tri Divide

Refines triangular meshes using various metrics.

Tri Strip

Converts polygons to triangle strips.

Triangulate 2D

Connects points to form well-shaped triangles.

Trim

Trims away parts of a spline surface defined by a profile curve or untrims previous trims.

Tube

Creates open or closed tubes, cones, or pyramids.

Twist

Applies deformations such as bend, linear taper, shear, squash/stretch, taper, and twist.

Adjusts texture coordinates in the UV viewport by painting.

UV Edit

Lets you interactively move UVs in the texture view.

UV Fuse

Merges UVs.

UV Pelt

Relaxes UVs by pulling them out toward the edges of the texture area.

UV Project

Assigns UVs by projecting them onto the surface from a set direction.

UV Quick Shade

Applies an image file as a textured shader to a surface.

UV Texture

Assigns texture UV coordinates to geometry for use in texture and bump mapping.

UV Transform

Transforms UV texture coordinates on the source geometry.

UV Unwrap

Separates UVs into reasonably flat, non-overlapping groups.

Unix

Processes geometry using an external program.

Unpaste

The Unpaste op removes one or more pasted surfaces from a paste hierarchy, causing the hierarchy to update.

VEX SOP

References a VEX program that can manipulate point attributes.

VOP SOP

Contains a VOP network that can manipulate point attributes.

Vertex

Manually adds or edits attributes on vertices (rather than on points).

Vertex Split

Takes a vertex attribute and splits any point whose vertices differ by more than a specified tolerance at that attribute.

Visibility

Shows/hides primitives in the 3D viewer and UV editor.

Volume

Creates a volume primitive.

Volume Break

Breaks geometry using a signed distance field volume.

Combines the scalar fields of volume primitives.

Volume Ramp

Remaps a volume according to a ramp.

Volume SDF

Builds a Signed Distance Field from an isocontour of a volume.

Volume Splice

Splices overlapping volume primitives together.

Volume Vop

Runs CVEX on a set of volume primitives.

Vortex Force Attributes

Creates the point attributes needed to create a Vortex Force DOP.

Waveform

Creates a waveform shape out of surface geometry

Wire Blend

Morphs between curve shapes while maintaining curve length.

Wire Capture

Captures surfaces to a wire, allowing you to edit the wire to deform the surface.

Wire Deform

Deforms geometry captured to a curve via the Wire Capture node.

Wire Transfer Shape

Transfers the shape of one curve to another.

Wireframe

Constructs polygonal tubes around polylines, creating renderable geometry.

Nodes Surface tools

Usages in other examples

Example name	Example for

Subtopics

Text Clear

Comb

Combing allows you to interactively orient the normals of your geometry.

Curve

The Curve operation creates polygons, NURBS and Bezier curves.

Edit

The Edit operation allows fast, interactive editing of geometry.

Paint

Interactively paint color or arbitrary attributes onto geometry.

Poly Knit

Stitches together two disjoint sets of polygons.

Poly Split

Interactive instrument for cutting polygons.

Sculpt

The Sculpt Operation allows you to interactively sculpt the shape of your geometry.

Select

The select operation lets you preselect geometry for the next operation.

UV Brush

The UVBrush operation allows you to interactively manipulate the texture coordinates of your geometry.

View

The View operation lets you change the viewing position.

add a note

There are no user-contributed notes for this page.

Nodes VEX networks

Containers for VOP networks.

These nodes are containers for VOP networks. VOPs are nodes that represent functions in the VEX language. VOP networks can perform various functions, such as computing surface shading, displacement, or defining new compositing nodes.

The type of VEX network you create controls what the VOP network inside does (for example, a surface shader) and what VOPs are available inside (for example, VOP networks for defining shaders use different VOP nodes than VOP networks for defining compositing nodes).

Right-click a network in the network editor pane and use the context menu to compile it into a new node type or (in the case of shader networks) create a one-off shader using the network.

Note

The network node's comment becomes the help page for any shader or node type created from the network. See how to write wiki-format help.

Usages in other examples

Example name	Example for

Subtopics

Text Clear

CHOPs

VEX Motion and Audio Operator

This network defines a CHOP operator type.

COMPOSITING

VEX Compositing Filter

This network defines a COP operator type that requires at least one input.

VEX Compositing Generator

Particles

VEX Particle Operator
This network defines a POP operator type.

Shading

CVEX Type
This network defines a CVEX shader (SHOP).

VEX Displacement Shader
This network defines a SHOP operator type.

VEX Fog Shader
This network defines a SHOP operator type.

VEX Image3D Shader
This network defines a SHOP operator type.

VEX Light Shader
This network defines a SHOP operator type.

VEX Photon Shader
This network defines a SHOP operator type.

VEX Shadow Shader
This network defines a SHOP operator type.

VEX Surface Shader
This network defines a SHOP operator type.

Surface

VEX Geometry Operator
This network defines a surface node (SOP).

Utility

VEX Subnetwork
This network contains other VOP networks.

Nodes VEX nodes

Usages in other examples

Example name	Example for

Subtopics

Text Clear

AXYZ: Subsurface Scattering
Generates a color using a subsurface scattering calculation ray traced from a point cloud.

Absolute
Computes the absolute value of the argument.

Add
Outputs the sum of its inputs.

Add Attribute
Adds a new point attribute (or writes to an existing attribute).

Add Constant
Adds the specified constant value to the incoming integer, float, vector or vector4 value.

Add Point To Group
Adds the point specified to the group given.

Align
Computes a matrix representing the rotation around the axes normal to two vectors by the angle which is between the two vectors.

Alpha Mix
Takes two values for alpha based on the surface orientation relative to the camera …

Ambient
Generates a color using ambient lighting model calculation.

And
Performs a logical “and” operation between its inputs and returns 1 (if all inputs …

Anti-Aliased Noise
Generates anti-aliased (fractional brownian motion) noise by using the derivative i…

Computes attenuated falloff.

Average

Outputs the average of its inputs.

Average Vector Component

Computes the average value of a vector argument.

Banana Skin

Generates a material that simulates banana skin.

Blend Regions

Takes a float input as a bias to blend between three input regions.

Bounding Box

Returns two vectors representing the minimum and maximum corners of the bounding bo…

Box Clip

Clips the line segment defined by p1 and p2 to the bounding box specified by the min and max corner points.

Boxes

Generates repeating filtered squares.

Bricker

Generates a brick pattern based on the parametric s and t coordinates.

Bricks

Simulates an anti-aliased brick wall.

Bump Map

Computes a filtered sample of the texture map specified and returns an RGB color as…

Bump Noise

Displaces surfaces along their normal using anti-aliased noise, and returns the dis…

Burlap

Generates a burlap displacement pattern useful for simulating rough cloth or weave patterns.

Burlap Pattern

Returns float between 0 and 1 which defines a burlap pattern useful for simulating rough cloth or weave patterns.

COP Input

Returns a pixel value in one of the 4 input COPs connected to the VEX COP.

Cardboard

Simulates a rough, anti-aliased cardboard surface.

Cavities

Produces a surface displacement that simulates small surface damage using anti-alia…

Ceiling

Cellular Cracks

Generates a cellular crack displacement suitable for simulating skin, leather, drie…

Cellular Noise

Computes 2D, anti-aliased cellular noise suitable for shading.

Checkered

Returns number between 0 and 1 which defines a checkered pattern useful for visualizing parametric or texture coordinates.

Chrome Environment

Simulates a chrome material defined solely by an environment map and a normal direction.

Clamp

Clamps the input data between the minimum and maximum values.

Cloud Environment

Simulates a simple cloud and sky reflection using anti-aliased noise.

Clouds

Simulates a cloudy sky using 4-dimensional anti-aliased noise, where the fourth noi…

Color Correction

Provides a means to change the hue, saturation, intensity, bias, gain and gamma of the input color.

Color Map

Looks up a single sample of RGB or RGBA color from a disk image.

Color Mix

Computes a blend (or a mix) of its two color inputs, and outputs the resulting color.

Color Vector to BSDF

This operator converts a vector to a BSDF data type for rendering with PBR.

Compare

Compares two values and returns true or false.

Complement

Computes the complement of the argument by subtracting the argument from 1.

Concrete

Produces a surface displacement that simulates small surface imperfections like tho…

Constant

Outputs a constant value of any VEX data type.

Copy

Takes a single input of any data type.

Crackle

Returns float between 0 and 1 which defines a crackle pattern useful for simulating the fine grain texture in skin or on a much larger scale dried mudflats.

Creates a new point group with the name specified.

Cross Product

Computes the cross product between two vectors, defined as the vector perpendicular to input both vectors.

Curl Noise

Creates divergence-free 3D noise using a curl function.

Degrees To Radians

Converts degrees to radians.

Depth Map

Works on an image which was rendered as a z-depth image, returning the distance fro…

Determinant

Computes the determinant of a 4×4 or 3×3 matrix.

Direction Space Change

Performs various space conversions for 3D directional data.

Displace Along Normal

Displaces the surface along the surface normal by a given amount.

Distance

Returns the distance between two 3D or 4D points.

Distance Point To Line

Returns the closest distance between a point and a segment.

Divide

Outputs the result of dividing each input value by the next.

Divide Constant

Divides the incoming integer, float, vector or vector4 value by the specified constant value.

Dot Product

Computes the dot product between two vectors.

Edge Falloff

Creates a smooth roll-off of the input color from the center of the geometry to the…

Egg Shell

Generates an anti-aliased egg-shell material with the typical egg-shell roughness and lack of specularity.

Eggshell Pattern

Returns a new surface normal (N) which has a slight fine grained bump on it.

Environment Map

Sets the environment map (on an infinite sphere) and returns its color.

Euler To Quaternion

Exponential

Computes the exponential function of the argument.

Extract Transform

Extracts the translation, rotation, or scale component of a 4×4 transform matrix.

Fast Shadow

Sends a ray from the position P along the direction specified by the direction D.

Filter Shadow

Sends a ray from the position P along the direction specified by the direction D, a…

Filter Step

Computes the anti-aliased weight of the step function.

Filter Width

This function returns the square root of the area of a 3D input or the length of the derivitive of a float input, such as s or t.

Fire

Generates 2D fire by modulating the t parametric direction using 3D anti-aliased noise.

Fit Range

Takes the value in the source range (srcmin, srcmax) and shifts it to the correspon…

Float To Integer

Converts a float value to an integer value.

Float To Matrix

Converts sixteen floating-point values to a 4×4 matrix value.

Float To Matrix3

Converts nine floating-point values to a matrix3 value.

Float To Vector

Converts three floating-point values to a vector value.

Float To Vector4

Converts four floating-point values to a vector4 value.

Float to BSDF

This operator converts a float to a BSDF data type for rendering with PBR.

Floor

Returns the largest integer less than or equal to the argument.

For Loop

Runs the VOP nodes inside its subnetwork until a given condition is true.

Fraction

Computes the fractional component of the argument.

Fresnel

normalized surface normal, and an index of refraction.

From NDC

Transforms a position from normal device coordinates to the coordinates in the appropriate space.

Front Face

Returns the front facing normal of a surface, given a surface normal (N) and an incident ray (I).

Furrows

Displaces the surface along the surface normal by an amount equal to the value of a…

Gather Loop

Sends rays into the scene and contains a subnetwork of VOPs to operate on the information gathered from the shaders of surfaces hit by the rays.

Get Matrix Component

Extracts a 4×4 matrix component.

Get Matrix3 Component

Extracts a 3×3 matrix3 component.

Get Object Transform

Gets the transform matrix (in camera space) of a named object.

Get Vector Component

Extracts a vector component.

Get Vector4 Component

Extracts a vector4 component.

Gingham Checks

Generates anti-aliased gingham checks similar to a tablecloth pattern.

Glass

Simulates a translucent material such as glass, and returns the combined color, opacity, and alpha.

Global Variables

Provides outputs that represent all the global variables for the current VOP network type.

Glow

Simulates a hot glow effect to be used in the Fog context, and outputs color and alpha.

Gradient 3D

Returns the gradient of a single channel 3D texture image at a specified position within that image.

HSV To RGB

Converts HSV color space to RGB color space.

Hair

Simulates the look of hair.

Hair Diffuse

Generates a color specifically for curves (hairs) using a lambert lighting model calculation.

Generates a normal vector which always faces the camera, parallel to the incidence vector.

Hair Specular

Generates a color specifically for curves (hairs) using a specular lighting model calculation.

Halo

Generates a soft halo effect to be used in the Fog context, and outputs color and alpha.

Has Input

Returns 1 if the specified input (0-3) is connected.

High-Low Noise

Computes a mix of high and low frequency, anti-aliased noise with a wide range of applications.

Hue Shift

Uses the shift value to shift the hue of the input color along the color wheel by the amount of the amplitude.

If

Contains other VOP operators.

If Connected

Passes through the value of the first input if the first input is ultimately connected.

Illuminance Loop

Only available in Surface VOP networks.

Import Attribute

Imports attribute data from the OP connected to the given input.

Import Displacement Variable

Imports the value of the specified variable from a displacement shader and stores it in “var”.

Import Light Variable

Imports the value of the specified variable from a light shader and stores it in “var”.

Import Surface Variable

Imports the value of the specified variable from a surface shader and stores it in “var”.

Inline Code

Write VEX code that is put directly into your shader or operator definition.

Integer To Float

Converts an integer value to a float value.

Integrate 3D

Integrates a 3D image along the line specified by two points.

Integrate 3D Clip

Integrates a 3D image along the line specified by two points.

Intersect

Computes the intersection of a ray with geometry.

Intersects a 3D image along the line specified by two points.

Invert

If given a 3×3 or 4×4 matrix, this operator computes its inverse (or just returns the input matri…

Irradiance

Computes the irradiance (the global illumination) at the point P with the normal N.

Is Connected

Outputs 1 if the input is ultimately connected, otherwise it outputs 0.

Is Fog Ray

Returns 1 if the shader is being evaluated from within a fog shader.

Is Front Face

Returns true if the normal of the surface is forward facing, and false if it isn't.

Is Shadow Ray

Returns 1 if the shader is being evaluated for shadow rays.

Lambert Diffuse

Generates a color using the Lambert diffuse lighting model calculation.

Length

Computes the length of a 3D or 4D vector.

Lighting Model

Performs a lighting model calculation that generates a color.

Look At

Computes a 3×3 rotation matrix to orient the z-axis along the vector (to - from) under the transformation.

Luminance

Compute the luminance of the RGB color specified by the input parameter.

Make Transformer

Builds a general 4×4 transform matrix given an order of transformations (trs), an o…

Mandelbrot Set

Generates a Mandelbrot pattern.

Marble

Simulates a shiny marble material.

Matrix To Float

Unpacks a 4×4 matrix into its sixteen components.

Matrix3 To Float

Unpacks a 3×3 matrix3 into its nine components.

Matrix3 To Quaternion

Converts a matrix3, representing a rotation, to a quaternion representing the same rotation.

Implements a matte shader that occludes geometry behind the surface being rendered.

Max Vector Component

Computes the maximum value of a vector argument.

Maximum

Outputs the maximum value from its inputs.

Meta-Loop Import

Takes a handle generated by the Meta-Loop Start operator and will import attributes…

Meta-Loop Next

Takes a handle generated by the Meta-Loop Start operator and will “iterate” to the …

Meta-Loop Start

Opens a geometry file (which should contain metaballs) and initializes the handle t…

Metaball Attribute

Returns the value of the given point attribute at the specified position in the metaball field.

Metaball Density

Returns the density of the metaball field at the specified position.

Metaball Space

Transforms the specified position into the local space of the metaball.

Metaball Weight

Returns the metaweight of the geometry at a given position.

Min Vector Component

Computes the minimum value of a vector argument.

Minimum

Outputs the minimum value from its inputs.

Mix

Computes a blend (or a mix) of its input values using linear interpolation.

Mix for BSDF

Computes a blend (or a mix) of its input values using linear interpolation

Modulo

Computes the modulo of two values.

Mold

Simulates anti-aliased mold.

Mosaic

Generates an anti-aliased mosaic pattern using an image file as a source for colori…

Multiply

Outputs the product of its inputs.

Multiply Add Constant

Multiply Constant

Multiplies the incoming value by a constant.

Negate

Negates the incoming integer, float, vector or vector4 value.

Neighbour

Retrieves the index of the point which is the n-th connected neighbour of point “ptnum”.

Neighbour Count

Calculates the number of points connected to the given point.

Non-deterministic Random

A non-deterministic random number generator.

Normal Falloff

Generates a falloff value based on the relationship between the normal and incident vectors.

Normalize

Normalizes a vector.

Not

Performs a logical “not” operation on an integer value, returning 1 if the input is…

Null

Passes the inputs to the output with an optional name change.

Occlusion

Computes ambient occlusion at the point P with the normal N.

Or

Performs a logical “or” operation between its inputs and returns 1 (if at least one…

Oren-Nayar Diffuse

Generates a color using the Oren-Nayar diffuse lighting model calculation.

Orient

Reorients a vector representing a direction by multiplying it by a 4×4 transform matrix.

Oscillations

Returns an anti-aliased cosine or sine wave.

Output Variables

Every VOP network requires one of these.

Parameter

Represents a user-controllable parameter.

Periodic Noise

Generates 1D and 3D Perlin noise from 1D, 3D and 4D data.

Photon Output Variables

Performs photon russian roulette.

Returns the area of the current pixel after being transformed to the new UV coordinate 'uvpos'.

Pixel Derivative

Returns U and V derivatives of the current pixel.

Plane Clip

Clips the line segment defined by p1 and p2 against the 3D plane defined by the following equation: plane.

Plane Count

Returns the number of planes in the input.

Plane Exists

Returns the name of the plane with the index 'plane_index' in input 'input_index'.

Plane Index

Returns the index of the plane with the name 'plane_name' in input 'input_index'.

Plane Name

Returns the name of the plane with the index 'plane_index' in input 'input_index'.

Plane Size

Returns the number of components in the plane with the index 'plane_index' in input 'input_index'.

Point Cloud Write

This function writes data for the current shading point out to a point cloud file.

Point Count

Returns the number of points for all primitives in the given geometry.

Point In Bounding Box

Returns the relative position of the point given with with respect to the bounding …

Point In Group

Returns 1 if the point specified by the point number is in the group specified by the string.

Point Loop

Only available in Image3D VOP networks.

Power

Raises the first argument to the power of the second argument.

Primitive Attribute

Evaluates an attribute for a given primitive at the specified uv parametric location.

Primitive Normal

Returns the normal of a primitive (defined by its number) at the given uv parametric location.

Print

Generate a formatted text string.

Pulsetrain

Filters the input

Takes an angle and an axis and constructs the quaternion representing the rotation about that axis.

Quaternion Multiply

Performs a quaternion multiplication with its two inputs.

Quaternion To Matrix3

Converts a vector4, representing a quaternion, to a matrix3 value, representing the same rotation.

RGB To HSV

Converts RGB color space to HSV color space.

Radians To Degrees

Converts radians to degrees.

Rainbow

Generates a non-repeating rainbow color ramp by modulating the hue over the range o…

Ramp Parameter

Represents a user-editable ramp parameter.

Ramps

Generates repeating filtered ramps.

Random

Generates a random number based on the position in one, three, or four dimensions.

Ray Bounce Level

Returns the current ray-bounce level.

Ray Bounce Weight

Returns the amount that the current bounce level will contribute to the final pixel color.

Ray Hit

Sends a ray from the position P along the direction specified by the direction D, a…

Ray Trace

Sends a ray starting at origin P and in the direction specified by the normalized vector D.

Reflect

Returns the vector representing the reflection of the direction against the normal vector.

Reflected Light

Computes the amount of reflected light which hits the surface.

Reflective

Simulates a material with reflective properties and returns the computed color.

Refract

Computes the refraction ray given an incoming direction, the normalized normal and an index of refraction.

Refracted Light

Sends a ray starting at origin P and in the direction specified by the normalized vector I.

Returns the pixel resolution of an input.

Rest Position

Checks if the geometry attribute “rest” is bound and, if so, uses it as the rest position for shading.

Rings

Generates repeating filtered rings.

Ripples

Generates repeating ripples.

Rotate

Applies a rotation by 'angle' radians to the given 3×3 or 4×4 matrix.

Round To Integer

Rounds the argument to the closest integer.

Rounded Hexes

Generates repeating filtered rounded hexagons.

Rounded Stars

Generates repeating filtered rounded five-pointed stars.

Rust Perforation

Simulates a rusty, possibly perforated material.

Scale

Scales a 3×3 or 4×4 matrix by 'amount' units along the x,y, and z axes.

Scales

Generates a scale-like pattern and returns the displaced position, normal, and displacement amount.

Set Matrix Component

Assigns a value to one of the matrix’s components.

Set Matrix3 Component

Assigns a value to one of the matrix3’s components.

Set Vector Component

Assigns a value to one of the vector’s components.

Set Vector4 Component

Assigns a value to one of the vector4’s components.

Shading Area

Computes the shading area of the given variable.

Shading Derivative

Computes the derivative of a given variable with respect to the s or t parametric coordinate.

Shading Layer Parameter

Creates a parameter to appear in the signature of the VEX function defined by the VOP network

Shading Normal

Computes the normal at the location specified by the P position.

Shadow

This shader calls the shadow shader inside an illuminance loop.

Shadow Map

Shadow Map treats the depth map as if the image were rendered from a light source.

Shadow Matte

Implements a shadowmatte shader that occludes geometry behind the surface being rendered.

Sheen Specular

Generates a color using a specular lighting model with a Fresnel falloff calculation.

Shiny Metal

Simulates a shiny metallic material with strong reflective properties.

Sign

Returns -1 if the input is less than 0, otherwise it returns 1.

Simple Subsurface Scattering

Generates a color with a non-raytraced subsurface scattering lighting model calculation.

Skin

Generates anti-aliased skin with optional blemish.

Smoke

Generates a material that simulates clouds, smoke, fire, and other gaseous phenomena on small spheres.

Smooth

Computes a number between zero and one.

Soft Dots

Generates repeating soft dots.

Space Change

Performs various space conversions for 3D and 4D positional data.

Space Change To Obj

Queries the scene for a geometry object, light or fog object of the given name.

Specular Functions

Generates a color using the selected specular lighting model calculation.

Spherical Linear Interp

Computes a spherical linear interpolation between its two quaternion inputs, and ou…

Splatter

Generates a splatter pattern and returns the splatter amount.

Spline

Square Root

Computes the square root of the argument.

Stone

Simulates a rough, non-descript stone material.

Stone Wall

Simulates an anti-aliased stone wall.

Stripes

Generates repeating filtered stripes.

Stucco

Simulates an anti-aliased stucco material, with its typical bumpy surface and light color.

Subnet

Contains other VOP operators.

Subnet Input

Allows the connection of operators outside a subnet to operators inside the subnet.

Subnet Output

Allows the connection of operators inside a subnet to operators outside the subnet.

Subtract

Outputs the result of subtracting all its inputs.

Surface Color

Generates a basic color with a choice of tinting with the point color and/or a color map.

Switch

Outputs the value connected to one of its inputs.

Texture

Computes a filtered sample of the texture map specified and returns an RGB or RGBA color.

Texture 3D

Returns the value of a 3D image at a specified position within that image.

Texture 3D Box

Queries the 3D texture map specified and returns the bounding box information for t…

Texture Model

Performs a lighting model calculation that generates a color.

Thin Film

Simulates the effect of light reflecting on surfaces with a thin-film coating, such…

Tiled Boxes

Generates staggered rectangular tiles.

Tiled Hexagons

Generates staggered hexagonal tiles.

Returns the frame range and rate of the given input.

To NDC

Transforms a position into normal device coordinates.

Trace

Uses the vex gather function to send a ray and return with the reflected or refracted colors.

Transform

Transforms a vector to or from an object's transform space, or one of several other spaces, such as word or camera space.

Translate

Translates a 4×4 matrix 'amount' units along the x,y,z and possibly w axes.

Translucent

Simulates a material with both reflective and refractive properties.

Trigonometric Functions

Performs a variety of trigonometric functions.

Turbulent Noise

Can compute three types of 1D and 3D noise with the ability to compute turbulence w…

Two Sided

Generates a two sided surface.

Two Tone

Performs simple, cartoon-like shading.

Two Way Switch

Takes an integer input.

UV Coords

Returns texture coordinates or geometric s and t, depending on what is defined.

UV Noise

Disturbes the incoming parametric s and t coordinates using anti aliased noise gene…

UV Project

Assigns texture coordinates based on the specified projection type.

UV Space Change

Performs various space conversions of 3D positional data for uv shading purposes.

UV Transform

Transforms texture coordinates by the inverse of the matrix consisting of the trans…

VOP Force Global Variables

Provides outputs that represent all the global variables for the Force VOP network type.

VOP Force Output

Simple output variable for VOP Force Networks.

Converts between different vector types.

Vector To Float

Unpacks a vector into its three components.

Vector To Vector4

Converts a vector to a vector4.

Vector4 To Float

Unpacks a vector4 into its four components.

Vector4 To Vector

Converts a vector4 to a vector and also returns the fourth component of the vector4.

Veins

Generates an anti-aliased vein pattern that can be used in any VEX context.

Volume Gradient

Calculates the gradient of a volume primitive.

Volume Gradient from File

Calculates the gradient of a volume primitive stored in a disk file.

Volume Index

Gets the value of a specific voxel.

Volume Index To Pos

Converts a volume index into a position.

Volume Index To Pos from File

Calculates the position of a voxel in a volume primitive stored in a disk file.

Volume Index from File

Gets the value of a voxel from a volume primitive stored in a disk file.

Volume Pos To Index

Converts a position into a volume index.

Volume Pos To Index from File

Calculates the voxel closest to a voxel of a volume primitive stored in a disk file.

Volume Resolution

Gets the resolution of a volume primitive.

Volume Resolution from File

Gets the resolution of a volume primitive stored in a disk file.

Volume Sample

Samples the value of a volume primitive.

Volume Sample from File

Samples the value of a volume primitive stored in a disk file.

Volume VOP Global Variables

Global variables for the Volume VOP network type.

Volume VOP Output

Simple output variable for Volume VOP Networks.

Voronoi Noise

Computes 1D, 3D, and 4D Voronoi noise, which is similar to Worley noise but has add…

Water Surface

Simulates marine water of variable depth and visibility.

Waves

Simulates rolling waves with choppiness of various frequencies, and outputs the pos…

While

Runs the VOP nodes inside its subnetwork as long as a given condition is true.

Wire Pattern

Returns float between 0 and 1 which defines a wire grid pattern useful for simulating screens or visualizing parametric or texture coordinates.

Wireframe

Implements a wireframe shader and outputs the final, lit color and opacity.

Wood

Simulates shiny wood grain.

Wood Plank

Simulates anti-aliased wooden planks.

Worley Noise

Computes 1D, 3D, and 4D Worley noise, which is synonymous with “cell noise”.

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