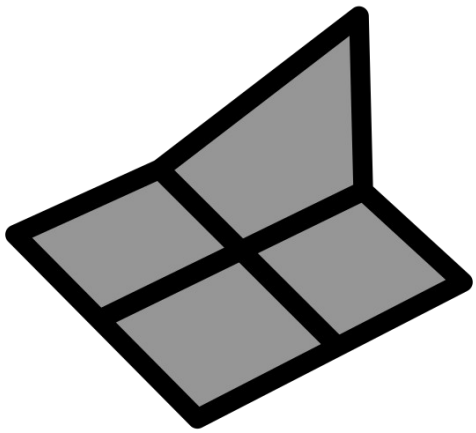


Modeler 2020.5

Installation

- Copy the **modeler** and **packages** folders from the archive to the Houdini preferences folder **houdini18.5**. If you want to place Modeler in a different location, change the file **/packages/modeler.json**
- Run Houdini.
- Add the "Modeler" shelf and assign a hotkey if you want.
- Save the Houdini desktop.

Installation notes:

- Before first installation remove any previous **DM** or **Modeler** versions.
- To update to newer versions just copy the **modeler** without **packages** folder.

Modeler Mode

To activate Modeler you can select the tool in the Modeler shelf. Modeler is a special modeling state where you can create poly models. It is strongly hotkey-based, but also contains a slightly modified native Houdini radial menu system and a special widget Launcher.

In order to make models faster Modeler temporarily changes keyboard and mouse behavior for better interaction with mesh. Unlike other modeling programs, you can associate any tool with any combination of keys or mouse actions. In a similar way, the mouse and keyboard can be configured in **Nevercenter Silo**, but unlike **Silo**, there are no restrictions here. That is, you can assign absolutely any tool to the mouse. On the other hand, mouse tools such as interactive selection or edge sliding can also be assigned to keyboard shortcuts. Also, unlike Houdini, in Modeler you can use additional two mouse buttons X1 and X2 (CTR+X1, SHIFT+CTR+X2 and so on).

The Hotkeys editor has two default mouse layouts:

Standard – for selecting with LMB and moving with MMB.

Pro – for selecting with RMB and moving with LMB. MMB used to select backface components.

In addition tools like Bevel, Extrude, Inset, Smooth, Thickness, Slide and Grab are volatile (sticky). That is, the call of a hotkey, for example, of the Extrude tool, leads to an instant change of the extrusion value before releasing the key.

Grab is an immediate moving operations. At the SOP level it uses the Edit SOP. In addition to screen space moving there are also Grab Horizontal, Grab Vertical and Grab Best Plane tools. By default SHIFT used for horizontal moving, CTRL for vertical moving, and CTRL+SHIFT for moving in the best global view plane.

By default, both **Standard** and **Pro** mouse layouts have WheelUp and WheelDown tools assigned to the mouse wheel. This allows to tweak nodes and states by increasing or decreasing their values. The tools can change:

- Soft radius int the Edit, Soft Transform and Soft Peak.
- The node divisions parameter.
- The uniform scale parameter in the transformation or primitive type of nodes.
- The number of copies in the Duplicate tool (state).
- The number of loops after in the Loop or Connect tools.
- The PolyPatch SOP divisions value.
- The PolyFill operation type.
- The Subdivide tool divisions parameter.
- QPrimitive resolution.
- The scale node parameter, if it exists.

Selection of components differs from the standard Houdini mode. The Select State tool (Escape) is very important and works as follows. When you are in any tool state Escape goes into selection mode. If faces/edges/points were highlighted before (orange color), they will fall into selection (yellow color). Pressing Escape again clears the selection. Thus, the purpose of the Escape key is to quickly enter selection mode and clear the selection. In stock Houdini mode Escape activates the view state. In Modeler the view state can be activated only by the ALT key.

Main Shortcuts

- Modeling radial menus:
  Topo: Z
  Flatten: ALT+F
  Deformation: ALT+D
  Add: ALT+A
  Boolean: ALT+B
  Pattern: ALT+R
  Network: ALT+N
  Materials: ALT+M
  KitBash: ALT+K
  Viewport Type: 9.

- Spacebar shows the Launcher widget. It contains all the modeling tools.
- The selection keys 1, 2, 3 and 4 allows to change selection mode.
- 5 activates handle for the current tool (same as Return in stock Houdini).
- CTRL+2, CTRL+3 and CTRL+4 can be used to convert selection from one type to another.
- CTRL+1 allows to convert selection to polygonal shells. Sometimes it faster then double clicking.
- 6 toggles interactive selection by shells.
- 7 activates selection by materials.
- 8 activates selection by the “name” geometry attribute.
- RETURN key works the same way as in stock Houdini.
- F1, F2, F3, F4 are used to change selection style.
- F5 toggles backface selection.
- ALT+1, ALT+2 can be used to quickly preview the subdivided variant of the geometry.
- ALT+3 key toggles view subdivision (similar to "+" and "-" hotkeys in stock Houdini).
- ALT+4 toggles view subdivision for instanced symmetry model.
- SHIFT, pressed while rotating camera, constraints the viewport to the best view plane.
- < and > are used for growing and shrinking selection respectively.
- J activates volatile sliding..
- SHIFT+F1, SHIFT+F2 and SHIFT+F3 change object display mode to the ShowAllObjects, HideOtherObjects and GhostOtherObjects modes respectively.
- CTRL+Z and CTRL+SHIFT+Z will Undo and Redo the last action respectively.
- Q key allows to tweak the geometry interactively with the Push state.
- S allows to smooth geometry with brush.
- SHIFT+Q picks the node parameters from the previously created node with same type.
- Right and Left arrows can be used to run the Wheel Up and Wheel Down tools respectively.
- Up and Down can be used to travel through nodes history.
- ALT+X deletes current node. This is done in order to quickly roll back to an earlier version of the model without multiply calls of undo action.
- A (CTRL+A, SHIFT+A, CTRL+SHIFT+A) for selecting loops interactivelly like in stock Houdini.
- ALT+V \ SHIFT+V converts selected edges to loops respectivelly.
- 0 key switches between single perspective and side by side viewport layouts
- D activates volatile handle detachment with the SetHandlePivot tool.
- “ ‘ ” is used to detach the current node handle. Standard Houdini feature.
- “ ; ” is used to orient and locate the handle. Standard Houdini feature.
- M changes handle alignment mode. Standard Houdini feature.
- If you drag something, including nodes handles, The ALT key temporarily activates snapping.
- Double clicking is a fast way to jump between different objects. The action, applied in empty viewport space, used to switch to the object mode.
- “ ` ” (tilde) key is a shortcut to Grab Moving

Usage Notes

- To start using Modeler, run Launcher with spacebar. You will see all the modeling mouse and keyboard actions.
- To change Modeler hotkeys use Hotkeys Editor in the Edit section of Launcher.
- Use the Reload shelf tool to commit changes you made in the Modeler Python code.
- To add custom shelf tools to Modeler create a shelf with name **modeler_custom**. This allows to add scripts or Houdini shelf tools to Modeler and display them in Launcher.
- To use your own or Houdini radial menus add a custom tool to the **modeler_custom** shelf and associate it with Scene Viewer hotkey. The hotkey have not intersect with the Modeler hotkeys Radial menu shelf tool example:

```
from modeler.mode import _mode
_mode.show_radial_menu("my_radial_menu")
```

Using Set Handle Pivot Tool

Some of the modeling applications have a way to quickly set location and orientation of tool handles. This what Set Handle Pivot do. The tool is volatile. So, to use it hold the hotkey, click on the geometry component and release the key. Tool features:

- If you just click the mouse button, the handle will move and rotate based on the position and normal of the target component.
- Clicking with CTRL will simply move the handle.
- Clicking with SHIFT will remain the handle in its place but will rotate depending on the target place normal.
- CTRL+SHIFT will allow you to direct the manipulator towards the selected component. The handle will remain in place.
- The tool automatically turns on snapping. Therefore, if just drag a bit (but not click) MMB, you can quickly move the handle to the snapping location. This is a fast way to quickly reposition the handle without rotating.

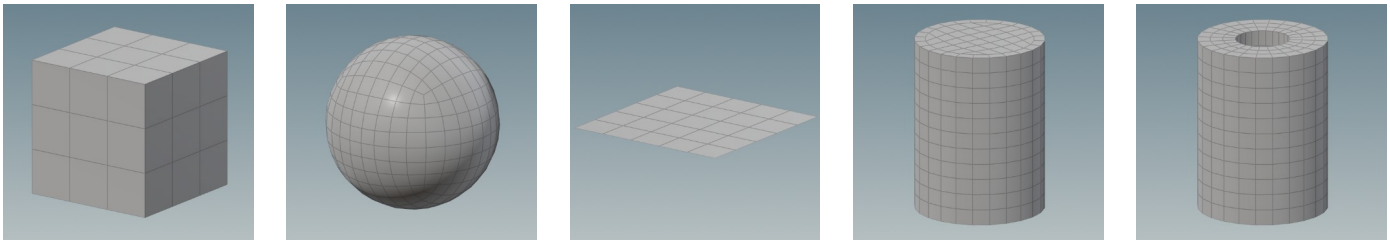
UV Editing

To edit or display UVs use the Side By Side Layout (0 key) tool.
When the mouse cursor is above UV viewport some of modeling tools work in a special way:

- Use Grab, GrabHorizontal and GrabVertical to quickly move UVs with UVEdit SOP
- Use Move, Rotate and Scale tools in UV viewport
- Push tool (Q) activated on top of UV viewport will use UV Brush state
- Relax Selection (SHIFT+R) tool can be used to smooth UVs
- Connect tool (V) can be used to sew shells by selected edges in UV viewport
- Connect tool (V) can be used to toggle seam edges in the Unwrap SOP (Setup mode)
- Use Auto Unwrap tool to create UVs automatically
- Use Unwrap tool to manually create or edit UVs
- Use Layout tool to pack maps

QPrimitive

QPrimitive is a special tool and corresponding node. With the tool you can create uniform quad primitives. This means that the transformation parameters of this tool are trying to create uniformly distributed polygons:



The node has built-in crease feature - an ability to add support loops to reach sharp corners.
- Using the Resolution and Uniform Resolution parameters, you can control divisions evenly.
- The Shell parameter works only for a primitive of the Tube type, and adds thickness.
- Parameters for full transformation in space, similar to parameters in the Transform SOP.
- The node can create accurate UV projection.

Symmetrical Modeling

One of the important Modeler features is a symmetrical modeling. When you create a symmetric model, the symmetry tools help to control the accuracy of the model without manual editing.
For simple (one-time) mirroring of the object, there is a special tool (and node) Slice. It allows you to slice the geometry, cut it into two halves and mirror in the right direction. On the other hand, to model symmetrically use the Symmetrize tool. Under the hood it creates special geometry attributes. Thanks to them transformation tools understand that geometry needs to be transformed symmetrically. Tools such as Push and Grab analyze geometry for this attributes.

Typical modeling steps:
- Create the mesh.
- To model symmetrically, run the Symmetrize tool.
- Setup axis and origin of symmetry.
- Set the Tolerance parameter, if necessary.
- Now the geometry contains symmetry attributes and ready for symmetrical modeling.

A special Instance OBJ node will be created. It mimics the opposite side of the model
To subdivide instance node in the viewport use the View Instance Subdivide tool (“Alt+4”).
To stop symmetrical modeling run the Symmetry Off tool. This action will remove the symmetry attributes and destroy corresponding instance node.
All the symmetrical, slice, clip and mirror tools can be found in the Symmetry radial menu (Alt+S).

Push Tool

For the purposes of organic modeling and rapid manipulation of local geometry places, the Push tool was created. This is a tool state and under the hood it uses the Edit SOP for transformation. The tool allows you to softly transform the geometry using a brush style manipulation. You can move, pull out a part of the model using nearest geometry normal. The tool can work in conjunction with symmetric modeling. Also, if Topo mode activated, it snaps the points to the reference geometry. Use Smooth Brush (S) to smooth the geometry.

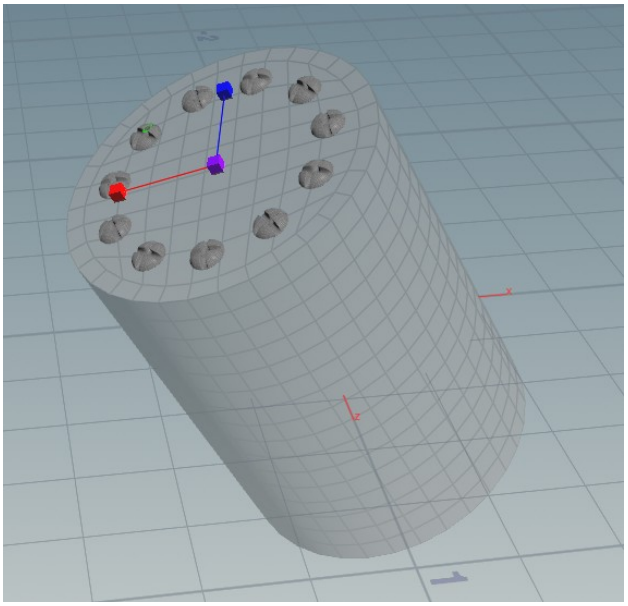
Deformation Radial Menu

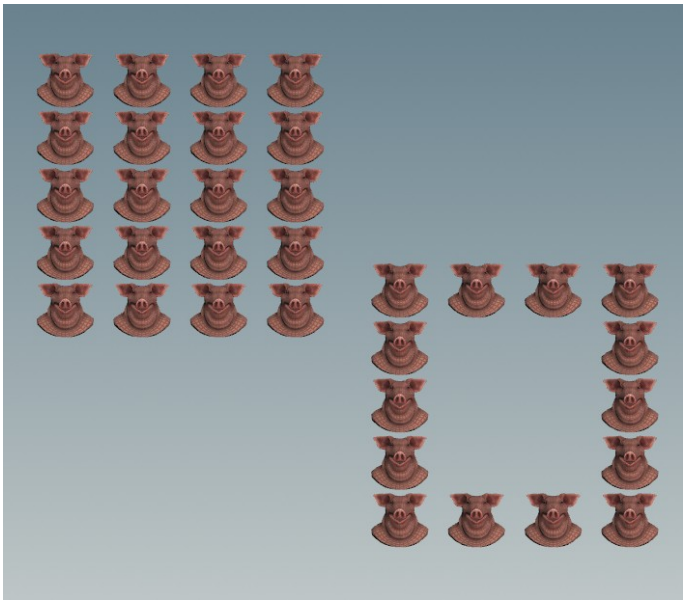
- Size Deform designed to simplify the scaling of geometry.
- View allows you to deform the geometry with the help of manipulators relative to the screen projection.
- Bend, Taper, Twist and Length Scale work similar to the standard deformation shelf tools. The only difference is that the selection of the deformation axes is more intuitive.
- Falloff Transform is a falloff type deformation. This tool is convenient to use for smooth transitions between parts of the geometry.
- Mountain allows to add noise to the surface.
- Lattice works similarly to the standard one, but without unnecessary actions. Since the lattice container is a separate object, the WireGeometry and WireShadeGeometry tools respect this.

  Lattice Usage:
  1. Select geometry.
  2. Select the tool.
  3. WheelUp and WheelDown now can be used to set the lattice resolution.
  4. Edit lattice container with any of the transformation tools.
  5. Select the tool again to finish it. You must be in the lattice container object.

Array Tool

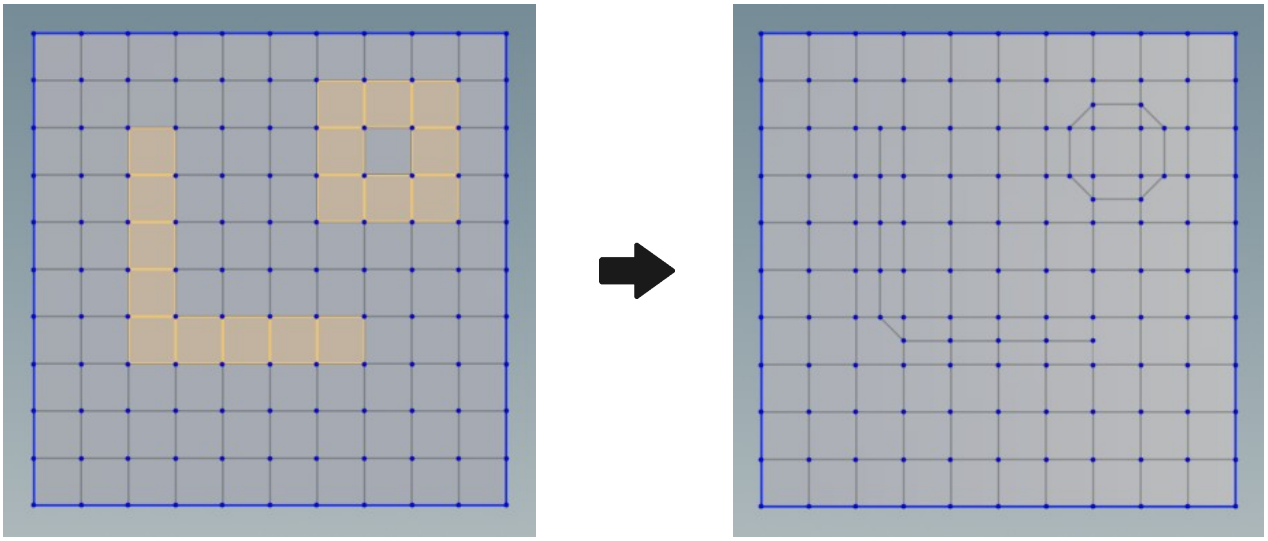
The Array tool allows you to create copies of the geometry by circle or rectangle shape. You can set a number of copies, or a number of copies separately for each axis in the rectangle mode. Also in the circle mode, there is an option Orient Copies which allows to orient the copies to follow the duplication path. In order to orient the template more accurately, you can use the Handle Orient tool (";" key) or the Construction Plane (Compass in the Modeler mode). This allows to create aligned geometry patterns on the target place.

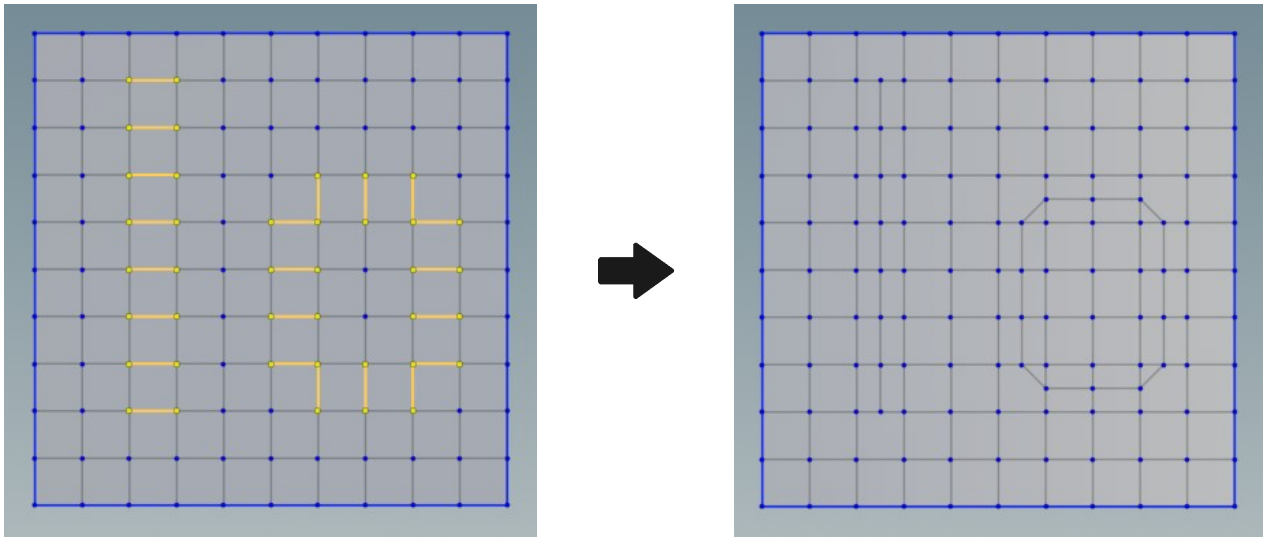


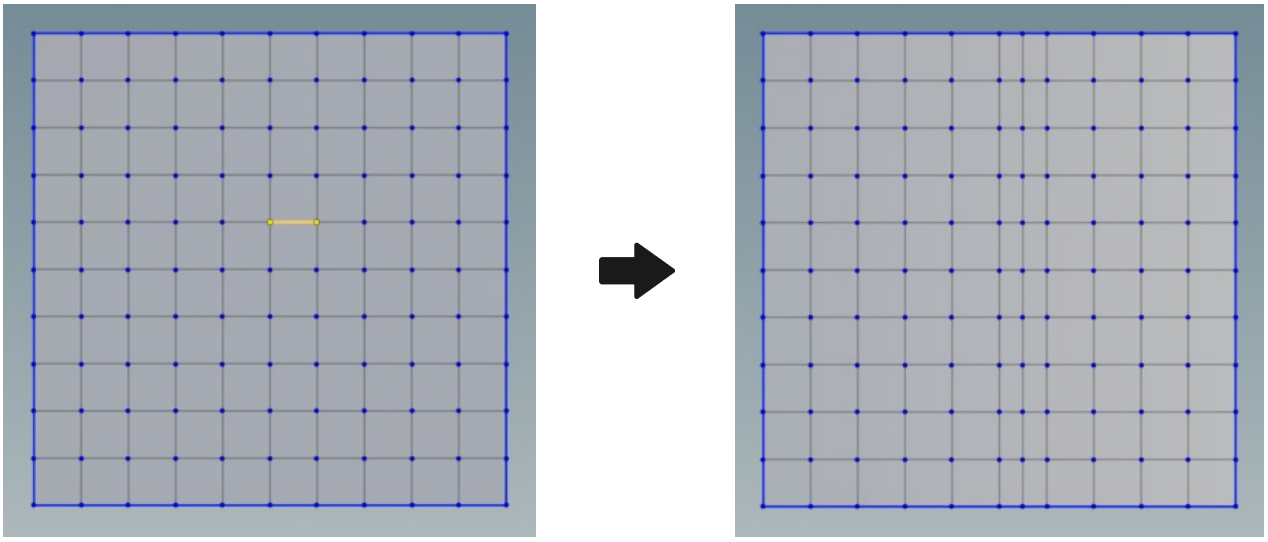


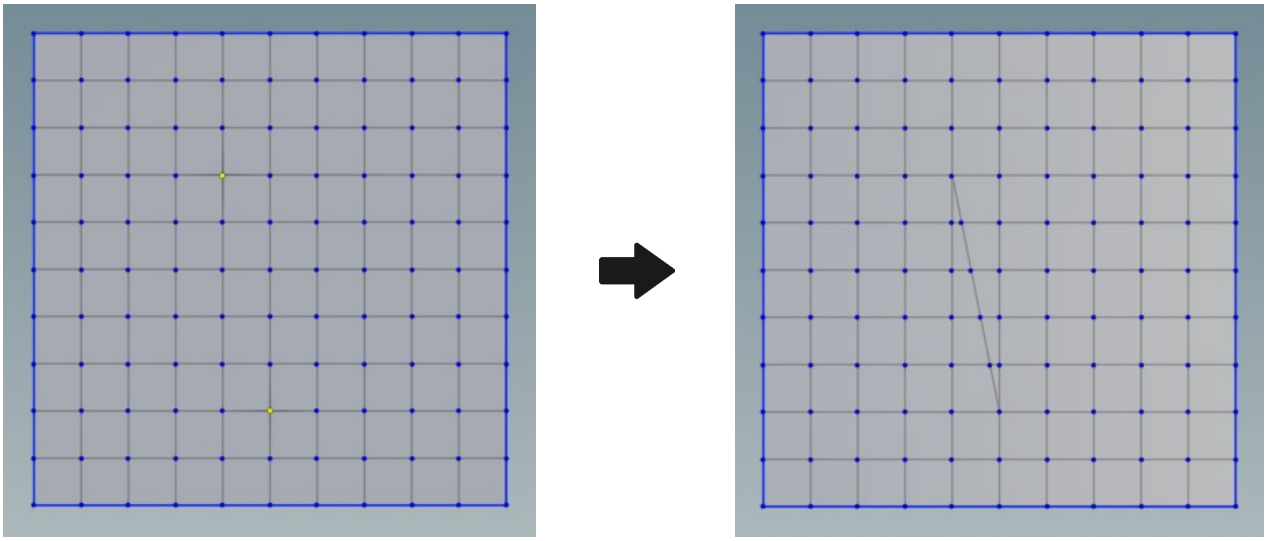
Connect Tool

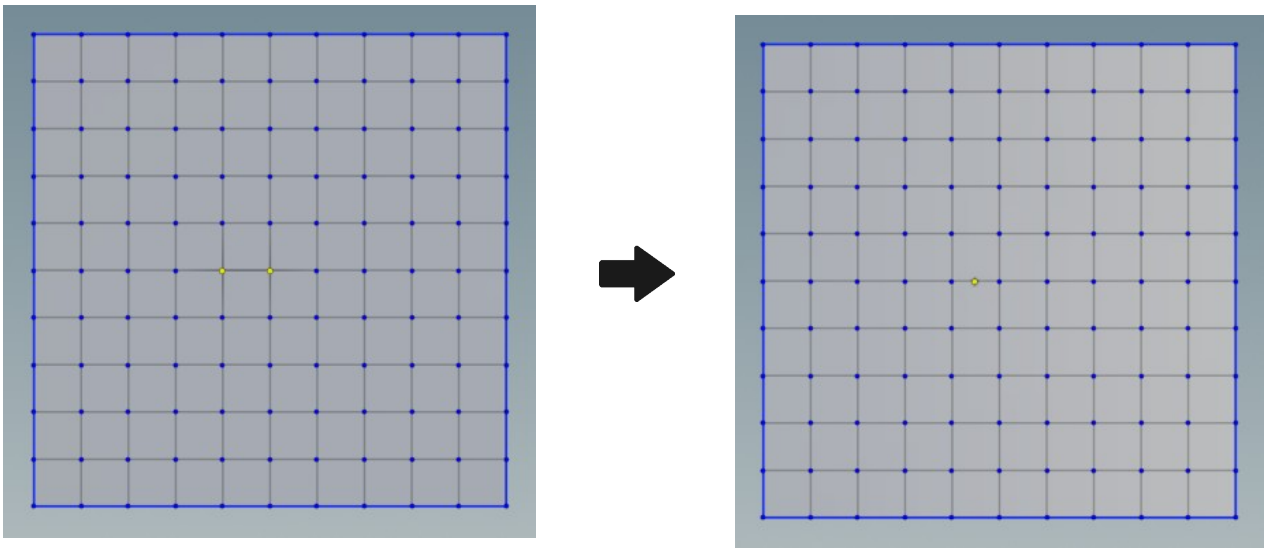
Connect allows you to cut the selected components in different ways. This is very important tool for box-style or subdivision-style modeling. It is very context-sensitive and works with points, edges and faces.





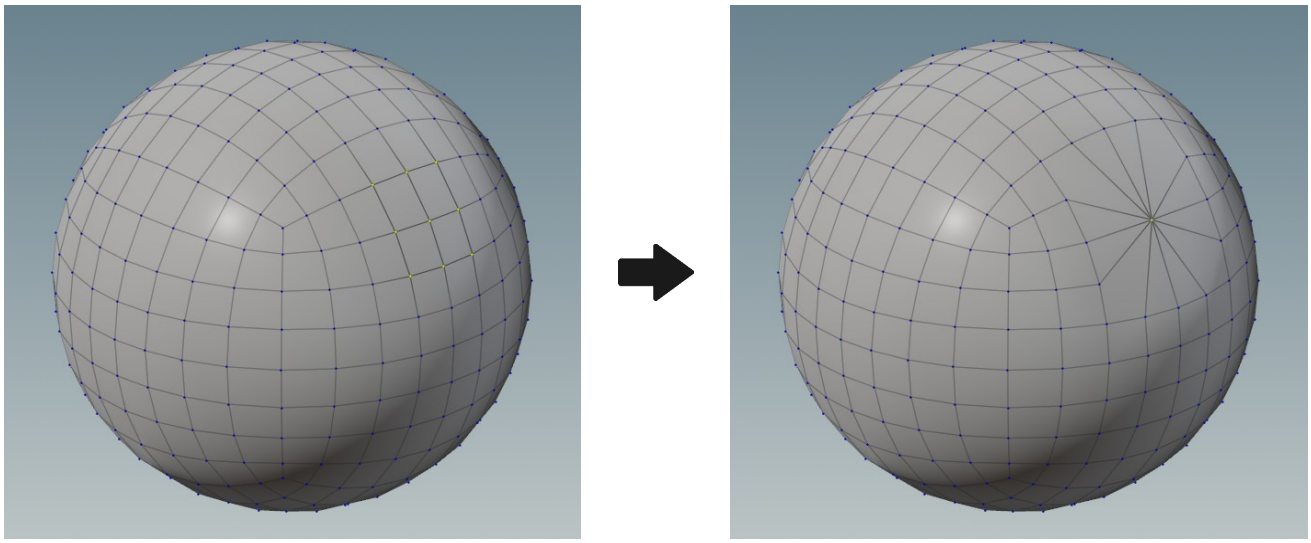


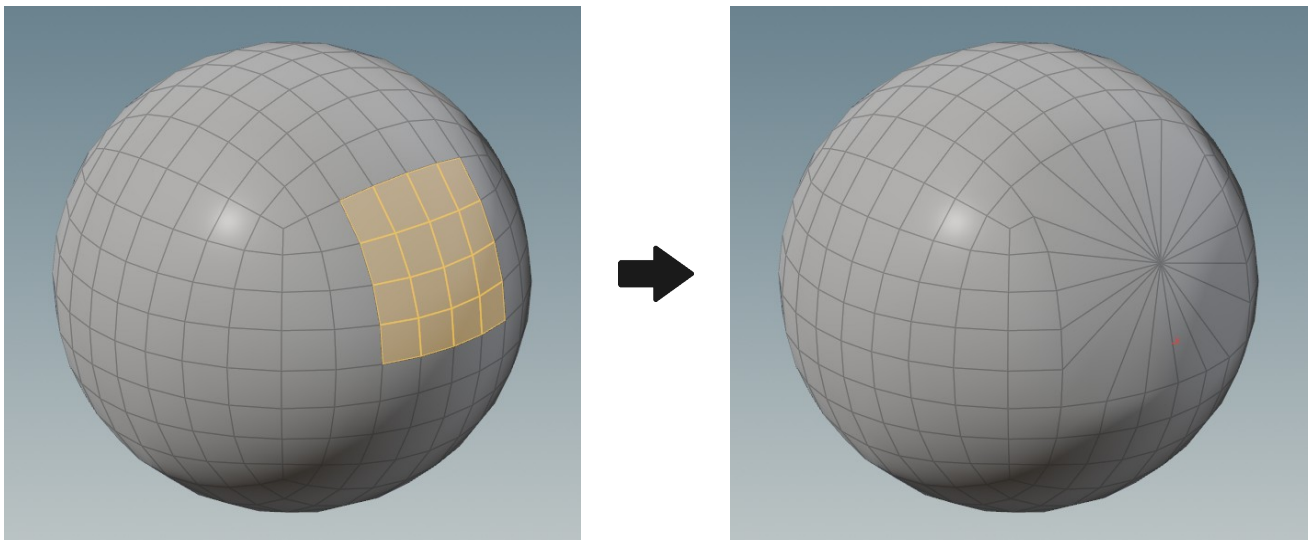


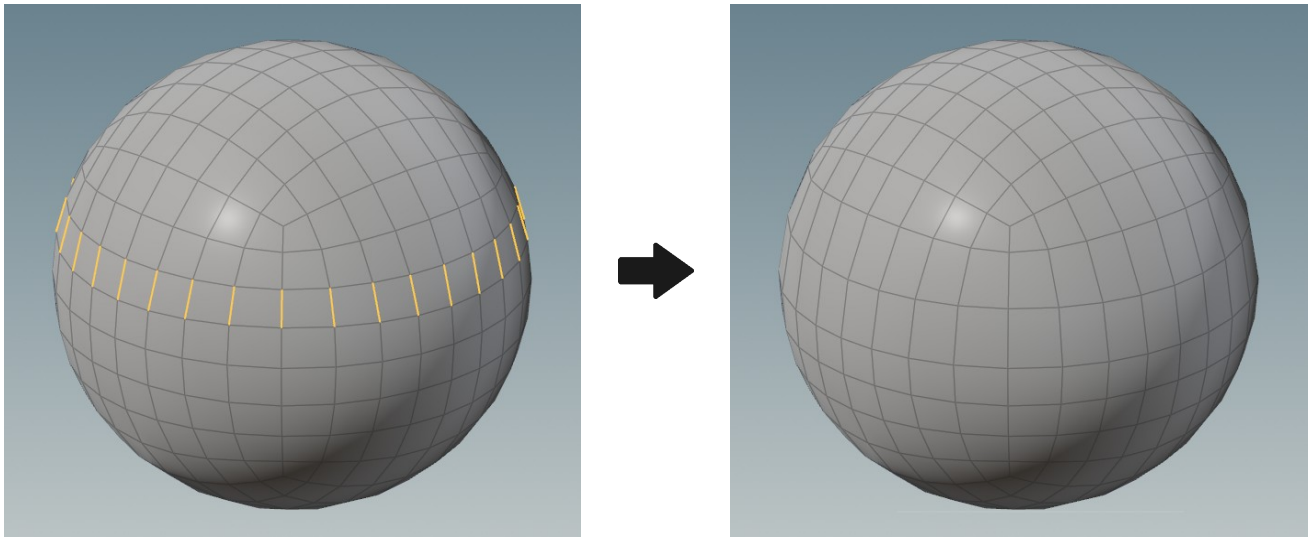


Collapse Tool

Collapse tool is also universal and can works with points, edges and faces. If nothing is currently selected, this tool fuses all the points, which is similar to Remove Doubles operation in other modeling packages.





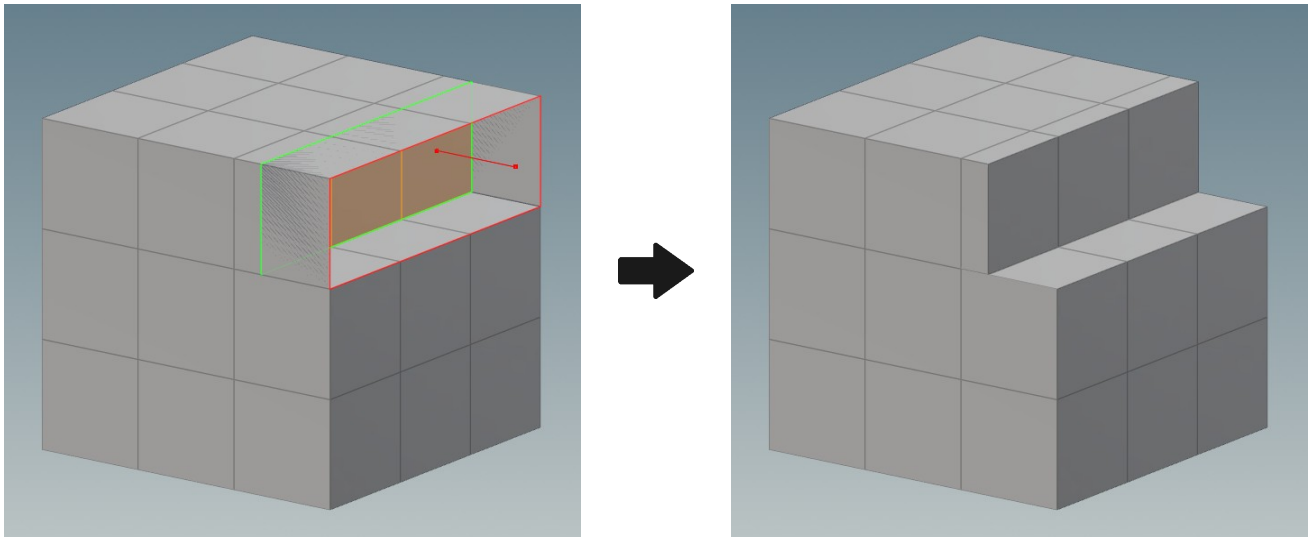


Bevel, Extrude, Bridge, Inset, Extend

- The Bevel and Extrude tools use custom Python states and custom HDAs. They have many interactive features for edit the geometry with mouse and keyboard without using Parameters pane tab.
- Extend tool can be used to extrude faces and edges and drag them by screen space.

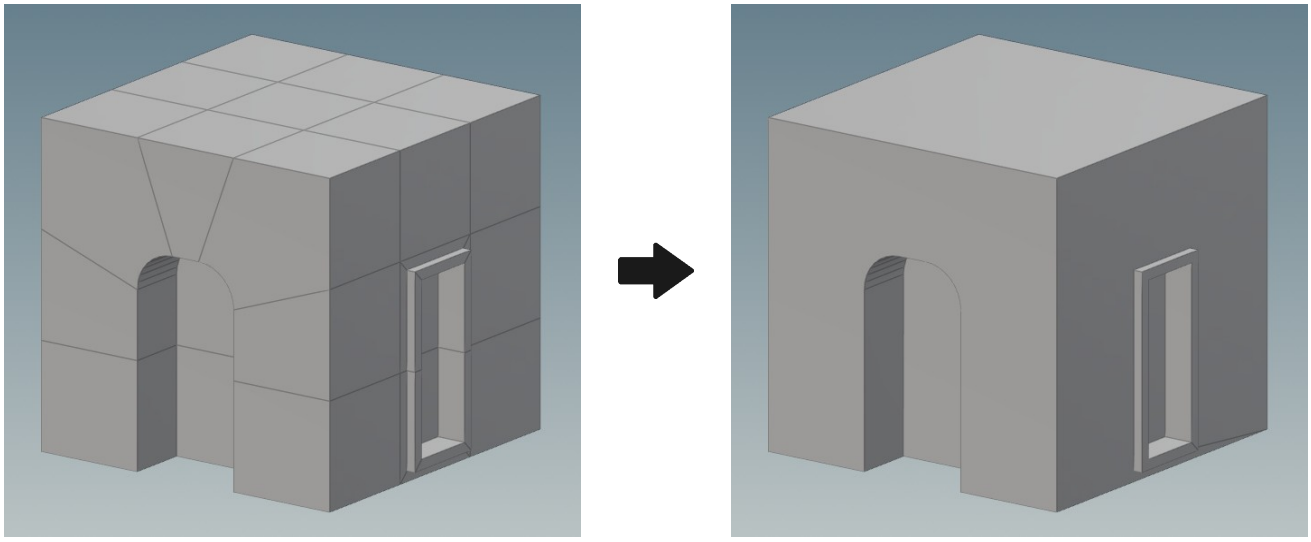
Fix Overlaps

The Fix Overlaps tool allows to clean the topology by removing overlapped polygons and unconnected edges.



Clean Edges

Clean Edges is intended for automatic removal of unnecessary edges based on their angles in faces.



Thickness and Hose

Thickness allows to add some volume to flat faces. On the other hand, the Hose tool allows to add tubes like effects to selected edges or open faces (curves).

Separate Tool

Sometimes it is better to temporarily edit a piece of geometry, especially if it has a lot of polygons. The Separate tool leave only selected faces and you can edit it without losing the performance. Later, after editing, you need to call the tool again. This will make the geometry automatically connect to the rest.

Combine and Extract tools

It is sometimes convenient to edit mesh as one piece and sometimes it is better to extract objects to separate parts:

1. The Combine tool allows to combine selected objects to a one separate geometry container to work with it as one piece. If you are in SOP context the tool will attempt to combine the current geometry with that of which it was created. For example, a geometry object from which you will create a new geometry will be saved, and can be used later with the Combine tool

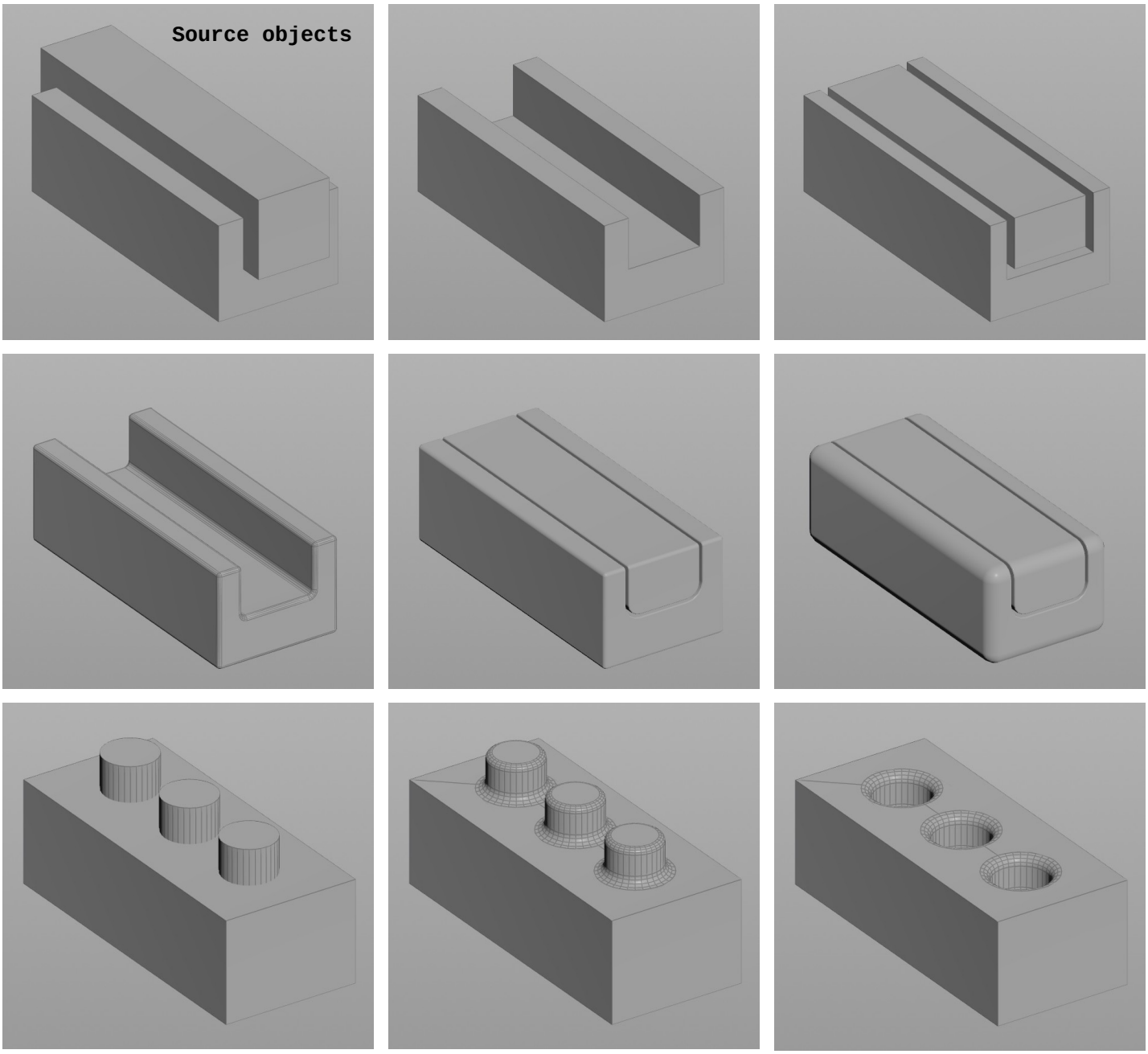
2. Extract separates selected faces to a new object. If there are no selection in the current SOP geometry or you have one selected object the tool will extract the geometry by polygonal shells to new objects.

Modeler Boolean

The boolean tools (and corresponding node) allow you to trim the geometry using boolean operations. In addition to standard features of Boolean SOP, this tool allows you to add bevels to final result. The tools located in the right side of the Boolean radial menu (ALT+B).

There are two separate bevel types:
- Cutter Bevel - a cutter object bevel.
- Bevel – an intersection bevel for the edges at the junction of both objects.

In the Shatter mode, you can adjust a thickness of the gap (border) between the objects.
In the Modeler mode there are tools: Union, Subtract, Intersect and Shatter which use the Hard Boolean node in different modes. You can select faces and cut them with the tool. You can also select two Sops in the network editor. In SOP context the tool will attempt to use current geometry as cutter with that of which it was created. More the two selected objects supported at the object level. The first one will be used as the cutter.



Soft Boolean

Boolean operations is a great choice for some types of surfaces. Polygonal geometry has its drawbacks when connecting sections of geometry. If you need to get accurate NURBS-like bevels, the standard Boolean SOP bearings are not very suitable. There is an option to use a special shader at the render stage to get small but smooth transitions. The Soft Boolean technology was created to fix conventional cutting glitches. In this node, you can fully control the transition behavior - from the size of the seam to the flatness factor. The node has a set of analysis modes and, if configured correctly, it can properly cut and stitch complicated models. The node works only with closed surfaces and tries to make the result geometry without holes.
The Soft Boolean SOP, as well as the Insert Mesh SOP, use a special Smart Normals technology to achieve the connection with highest quality. You don’t have to configure the node parameters for a long time because Smart Normals can hide a lot of problem areas.
The Boolean radial menu can be used to create soft and hard boolean effects interactivelly.
In OBJ mode, you can use menu tools for two polygonal objects. The first one is an object, the shape of which you want to cut. You can also select two nodes in the SOP container. One of the features of the Soft Boolean SOP is that you don’t need to create normals for the cutter objects. The node automatically creates normals inside.

Key node parameters:

- Relax Path Curve, Relax Path Corners and Relax Fillet Normals are designed to relax the distribution of profiles. If you have a lot of sharp corners in cutter meshes, these actions will help to quickly improve the quality of stitching.
- Remove Seam Points allows to remove extra points at the joints. Sometimes, adjusting the parameter on meshes with ornate angles, can greatly improve the result in hard corners.
- The Collapse Small Edges parameter allows to get rid of excess geometry elements in places where detail is not required.

The node has special buttons to work faster:

- + and - buttons have to be used to increase the quality of smoothing of the main geometry. These buttons simply increase or decrease the subdivision parameter of the Subdivide SOP. A node is created automatically if it has not been previously created.

- Select allows you to interactively select cutters if there are more than one in the network.

- Edit Cutter allows to quickly switch to the cutter editing mode. After completion, you need to click on the Soft Boolean node in the node editor. This will commit changes.

- Swap is a way to interactively switch between different cutters.

- Simplify All activates the Simple mode for all Soft Boolean nodes of the current branch.

- Radius allows you to add the MetaBall SOP to change the bevel radius locally.

- Finish allows you to add a special node SB Finish SOP in which you can add UV mapping, enable or disable fillet geometry, and so on.

- Soft, Simple, Radius, Seam and Curve are visualization modes designed primarily for finding difficult places. Sometimes some modes can be used for other procedural purposes.

- The Panel section allows you to add panel effects. This means that if you cut geometry, sometimes you want to get back the intersection piece. This makes hard-surface Soft Boolean modeling faster.

KitBash Geometry Library

KitBash allows you to accumulate meshes as well as other types of Houdini geometry for using them in projects. It is written with help of Qt library. KitBash supports any kind of Houdini geometry - beginning VDB and ending with NURBS surfaces. In addition to the kernel there are two simple libraries: “Quad Primitives” and “Insert Mesh”.

Four ways of using KitBash:

1. For the first method, you need to click twise on the library item. As a result, the geometry of the selected item appears in the current scene. Immediately after creation, you can use the mouse wheel to quickly scale the model. The size of the last inserted item is used in the following inserts.
2. The second method allows you to embed geometry uses Insert Mesh technology. To do this, you need to select the polygons and ALT+Double Click on the library item. After the appearance of geometry, use the mouse wheel to quickly set the size of the part.
3. SHIFT+Double Click - post changing Insert Mesh instance with new one
4. The latest method allows you to quickly replace the library item with the current scene geometry. You can immediately update the item icon with the Update Icon: Auto View and Update Icon: Current View items of the RMB menu.

There are two types of RMB menus in the KitBash UI:

- RMB menu called above the library item allows you to insert geometry into the scene, replace it, rename items, update icons, etc.
- RMB called above the library name (on the left side) allows you to add geometry from the scene to the library, create and delete libraries, make copies of them (backup). Here you can update all the icons of the current library with one click. In the menu, you can also import geometry from external files into the current library.

The Setup menu is intended for rarely used actions:

- Select “Update all icons” material - here you can specify a material that will be used when updating all library icons
- Disable “Update all Icons” material - temporarily disables the selected material
- Select Root Path - select the root folder for KitBash. Using this item, you can use previously accumulated geometry and connect folders when updating the Modeler package
- Reset Root Path - this item resets the root folder to the standard value, while the libraries from the modeler/geo_lib folder will be connected

Modeler has the KitBash radial menu (ALT+K) with most used actions:
- Replace Library Item - replaces the active item with the geometry from scene.
- Update Icon - updates the icon of the active item based on the current viewport.
- Auto Icon - updates the icon automatically.
- New Item - quickly adds geometry to the library.

Insert Mesh

The Insert Mesh technology was created to inject one mesh to another. To insert select faces and double-click on the KitBash panel item. After that, the model from the library will be inserted into the place of selected polygons using. As mentioned before, SHIFT+Double Click is intended to switch between different lubrary models on the fly. Insert Mesh has many parameters for the correct injection of polygons. In addition to simple scaling, positioning and mesh connecting, it is possible to softly repeat the target surface with Conform parameters.

Topo Mode

Houdini has a special tool for retopologizing high-poly models called TopoBuild. But it has one major problem. If the high poly model has millions of polygons, the tool works slowly. Through trial and error, it has been found that if the geometry is of the Packed type, the tools start to work quickly. Therefore, a special toolkit was created that takes this fact into account. Topo mode automatically takes care of packing and unpacking geometry for maximum performance.

Also, to quickly achieve the result, a special TopoPatch node was invented. The tools in this node allow you to draw a complex topology in a few minutes. TopoPatch can draw two types of polygonal pieces. The first type (Patch) tries to stick to existing low poly models only. It calculates the number of divisions itself based on the first stroke. The other type (Strip) draws free patches, which also snaps their ends to the points of the low poly model.

A special menu (ALT+T) contains tools for quickly activating different modes.

Usage:
1. Select the high-poly model and activate topo mode with th Topo Mode Launcher item.
   Now you will not be able to select and show it in the network editor.
2. Use the New Strip tool to create the first patch
3. Now for retopology, you can use:
   - Topo menu tools
   - The Push and Smooth Brush tools for adjustments
   - Use absolutely any polygon modeling tools
   - To project polygons after using any modeling tools, use the Project menu item
4. To complete the retopology process, select the Topo Mode tool again. The high-poly model is now selectable.

Note. Since the high-poly model can be of different sizes, you need to tweak the correct value of the Snap parameter of the TopoPatch node. If the tool is not working correctly, and glues unnecessary points, just decrease the value.