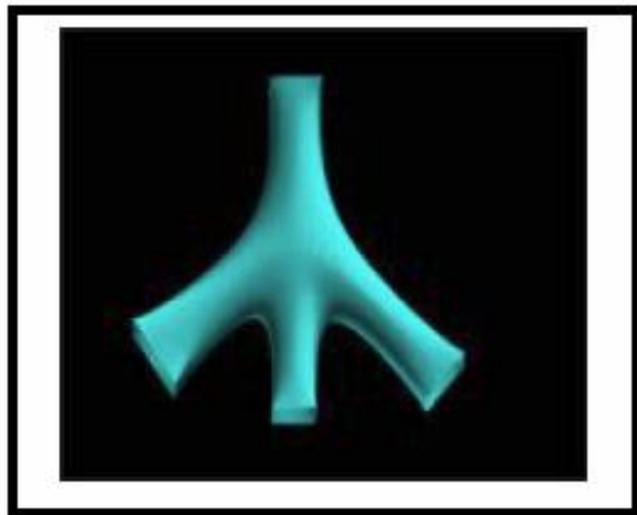


# DFCONTROL NET SURFACE TUTORIAL

**Control Net Surfaces** are smooth surfaces created from an input topology control net. The control net is defined using topology corners and the correspondent links.

Control net surfaces are a powerful way of creating arbitrary shaped surfaces. They are very useful for creating smooth internal surfaces. For example, one can control the wake grid coming off a curved turbo blade by creating a control net surface wake sheet. They can also be used to approximate or replace missing or complicated geometry. Control net surfaces are easy to create and have an intuitive feel to them so they can be controlled easily. This tutorial walks you through some basic steps in creating a control net surface.

**What  
You  
Will  
Create**

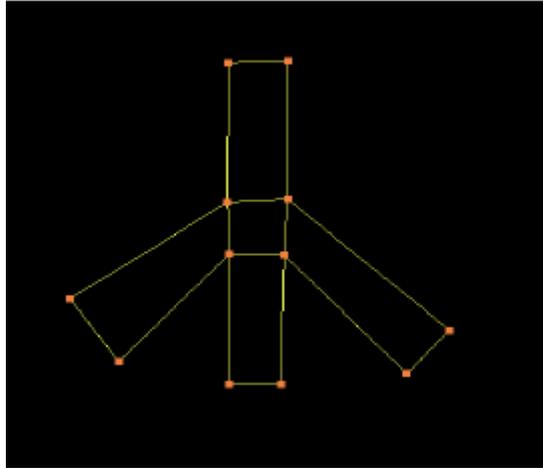


**What  
You  
Will  
Learn**

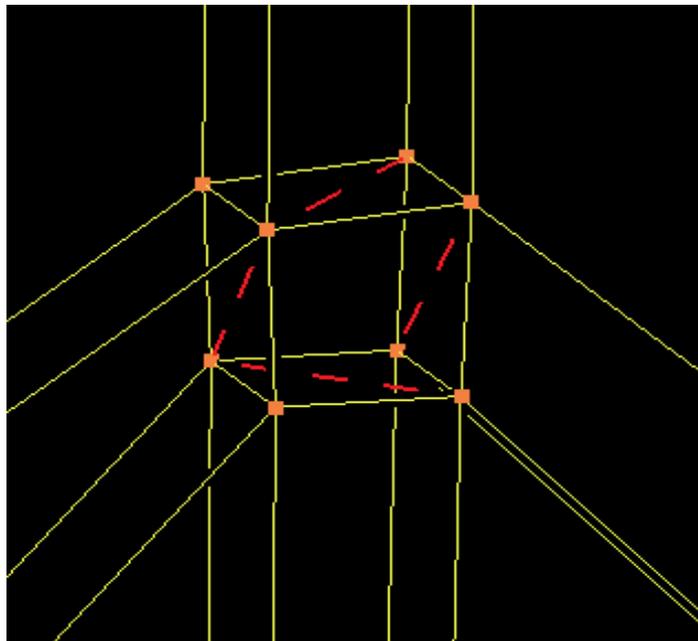
- **Using the Control Net Surface dialog box.**
- **Setting regions as Feature Corners.**
- **Add Edge Sheets to control surfaces.**

## Step 1: Creating the Surface

Load-up the **initial.fra** file. Zoom-in to get a better view, and turn off the axis and cut plane.



This topology has the four center faces excluded by default in order to resolve ambiguity. Zoom-in and rotate to see the exclusion of the four faces.

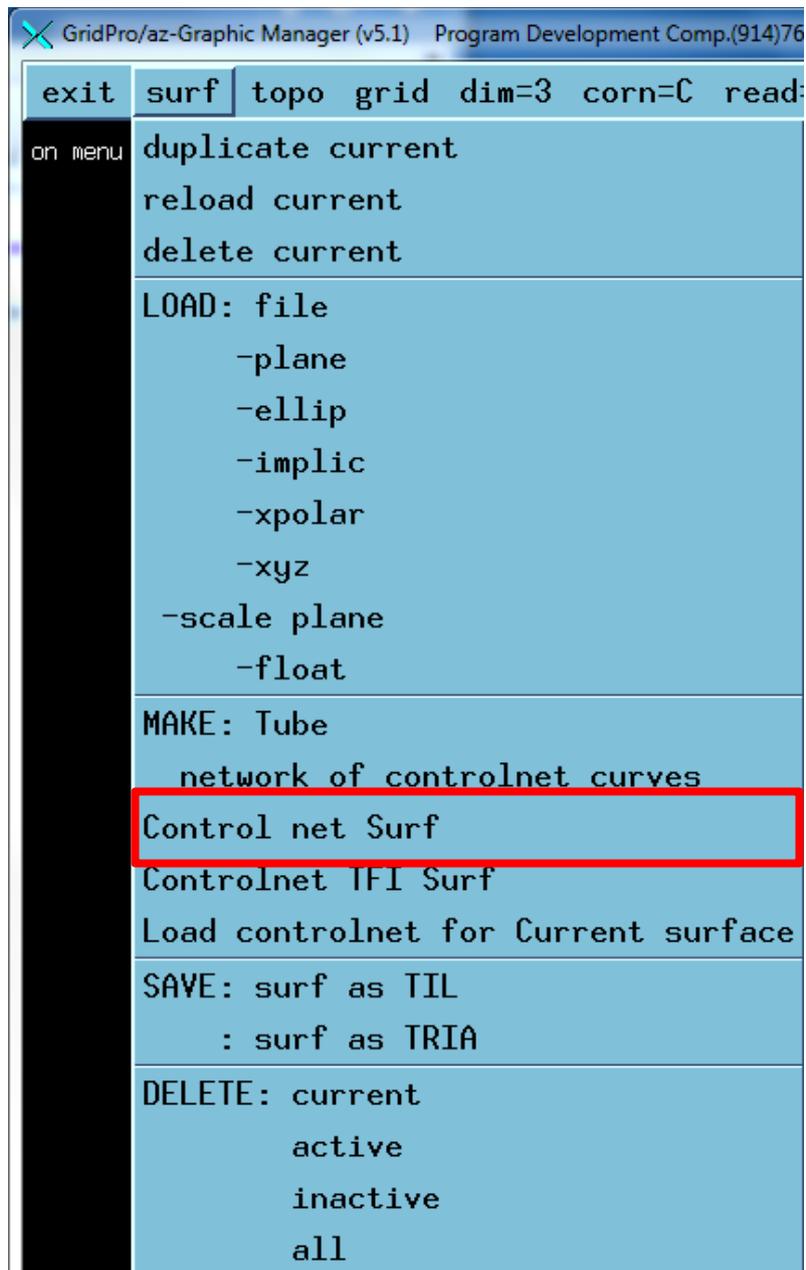




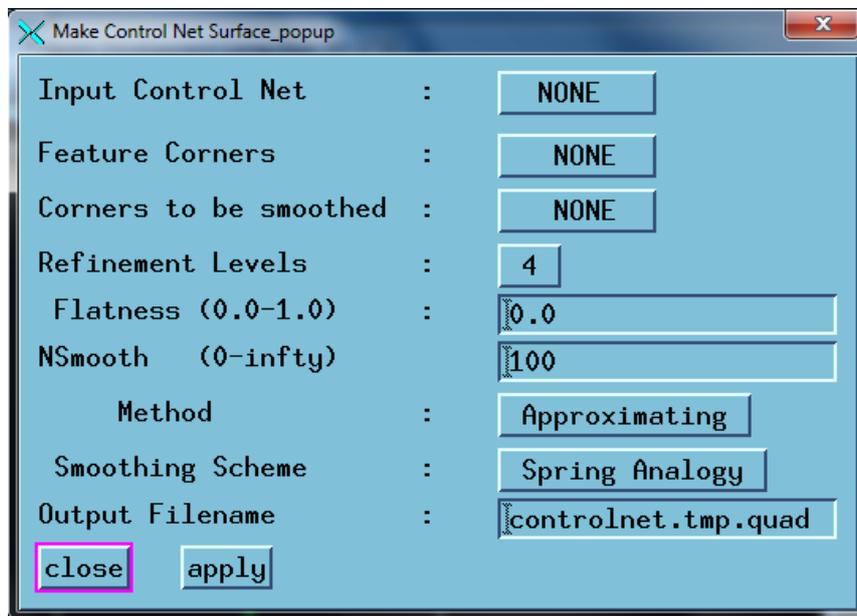
### Face Exclusion:

When you are excluding a face, you are basically saying that the face is non-existing (or hollow). Later, you will use face exclusions to create open control net surface from this topology.

Add the topology to **Group 1**. Go to `surf` on the top bar menu and click on *Control net Surf*.

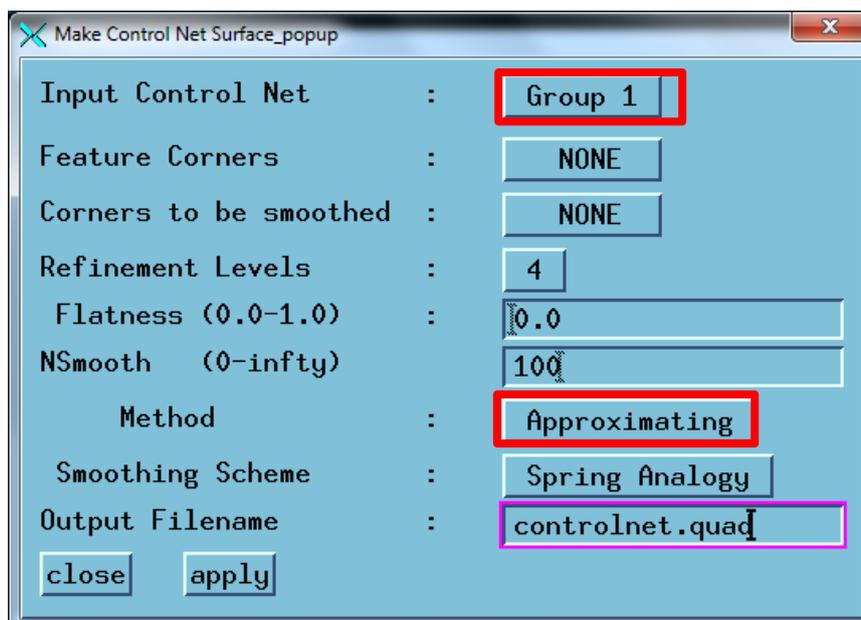


The *Control net Surface* pop-up window is used to apply certain properties to the topology and create the Control Net Surface.

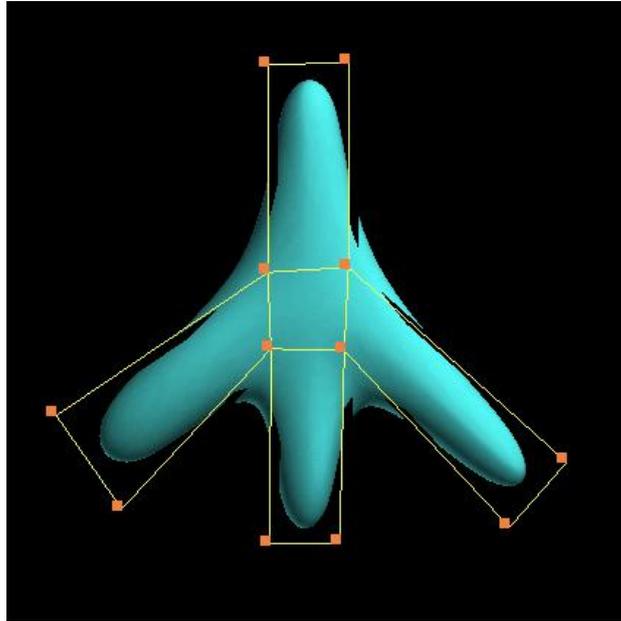


Select **Group 1** on the *Input Control Net* option and leave everything else to its default value.

Since we are working with the *Control net Surface* pop-up window, let's save the file as **controlnet.quad** on the *Output Filename* option just to recognize the application we are working with; any file name can be used.



Click on **apply** and a surface will be created as in the picture below.

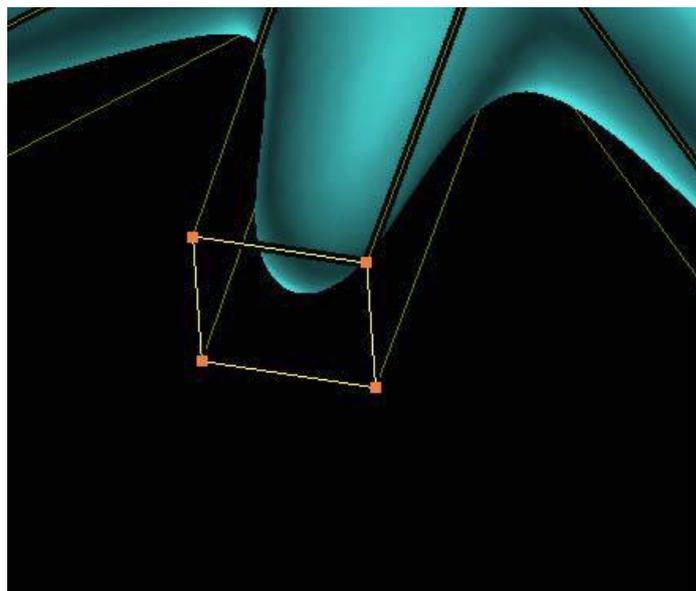


The surface has a shape given by the topology. If we apply other options on the *Control net Surface* window, the surface will acquire new shapes.

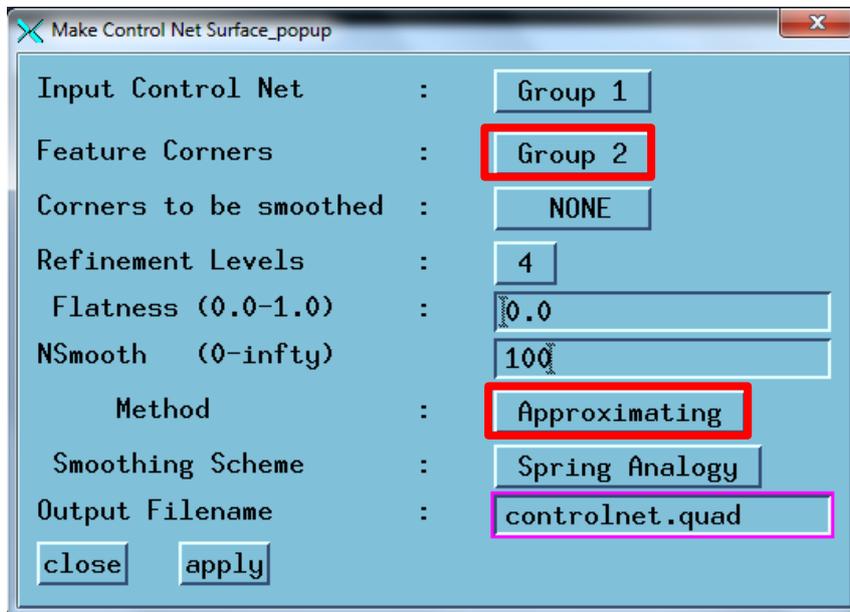
## Step 2: Working with Feature Corners

Control Net Surfaces can be made to respect features in the corresponding control net. In this case, the four outer corners are going to be modified with the *Feature Corners* option on the *Control net Surface* window.

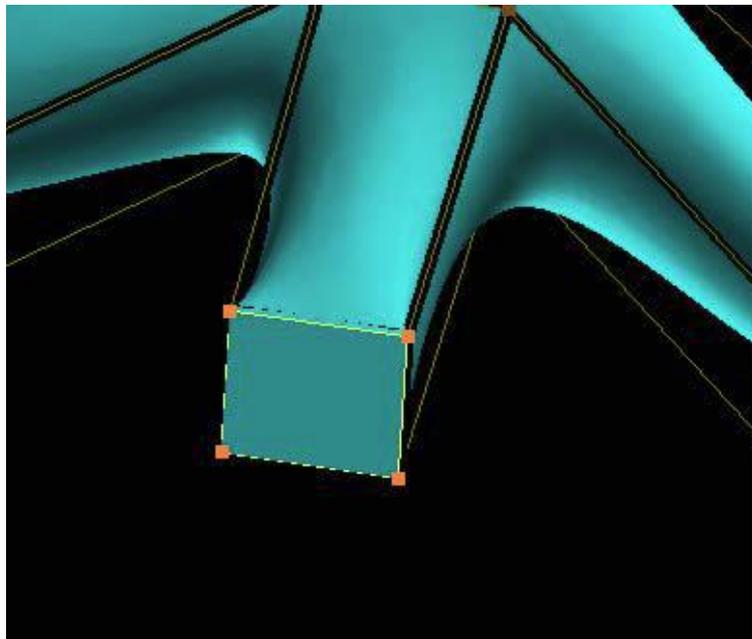
Assign one of the outer corners to **Group 2**.



Go to the *Control net Surface* window and on the *Feature Corners* option select **Group 2**. Make sure *Method* still has the **Approximating** option selected. Save as a different file or select **overwrite** after clicking **apply**.



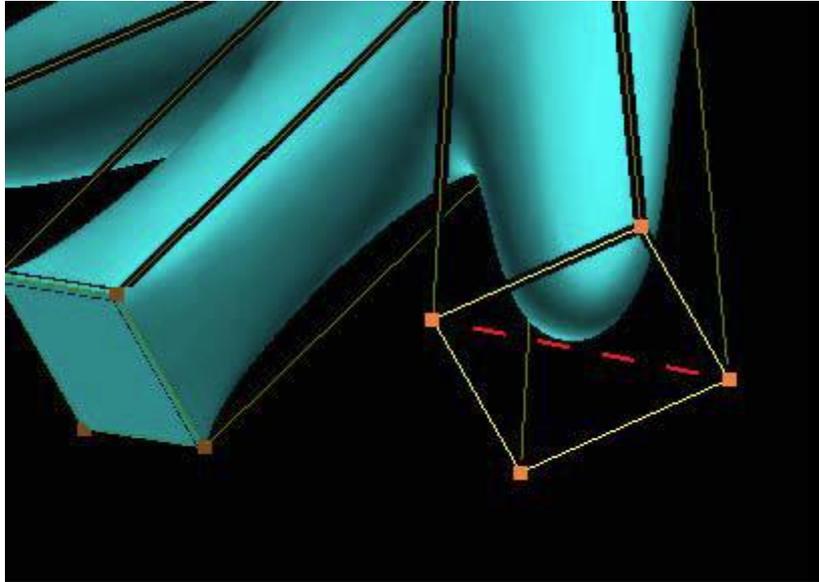
The assigned corners now have a different shape as in the picture below.



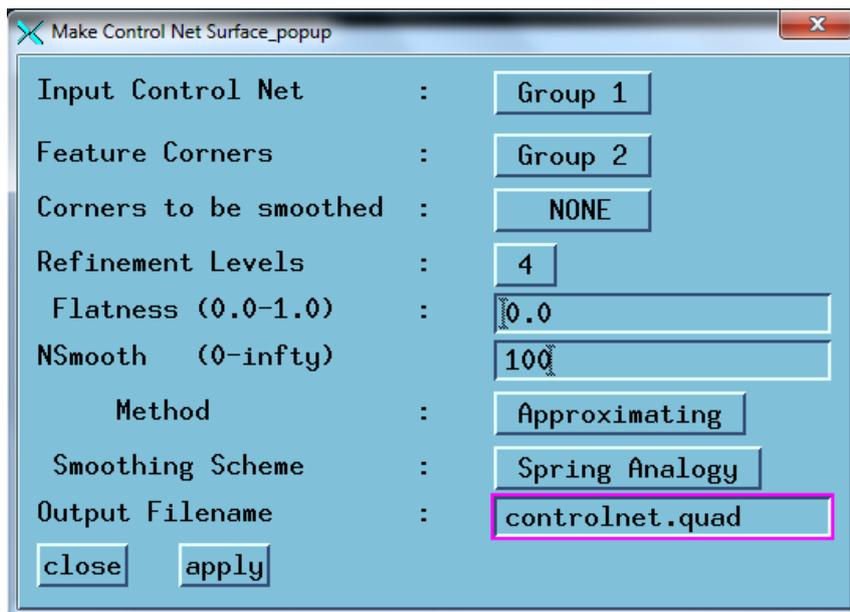
Selecting a subset of the corners as feature corners forces the resulting surface to pass through all the edges interlinking them.

Control net Surface can also have open boundaries.

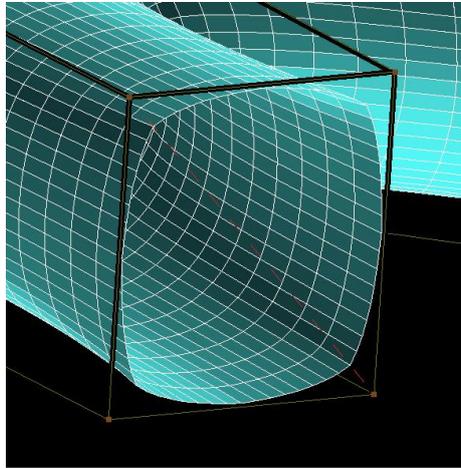
Exclude any or all the outer faces using the F button on the keyboard.



Go to the *Control net Surface* window, and on the *Feature Corners* option select **Group 2** and click **apply**.



The new surface will have a different feature corner as shown in the picture below. Change the **shade with HLR** and rotate the topology to see the difference in the surface.

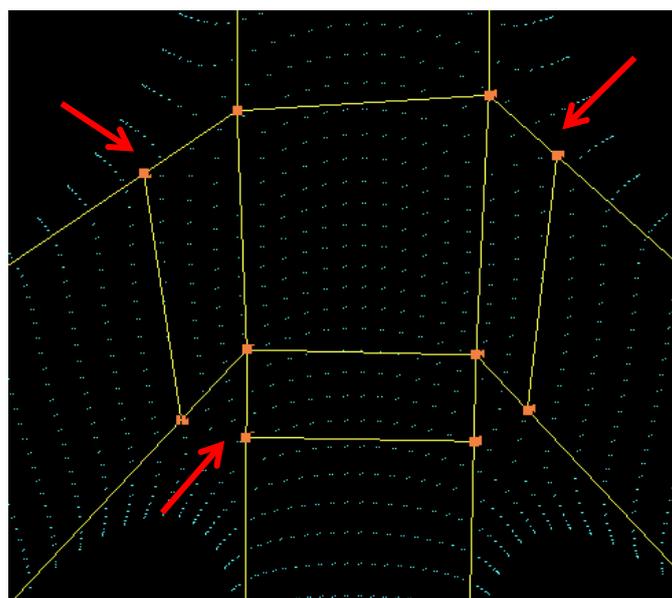


As seen on the picture above, the surface now has an open duct. Excluding faces allows one to create open Control net Surfaces. .

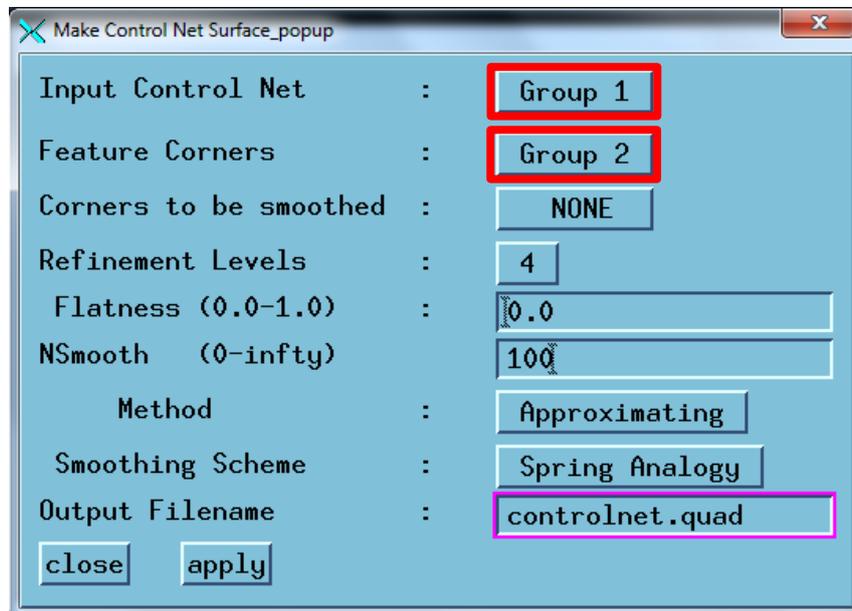
### Step 3: Adding Edge Sheets

While feature corners are a hard way of controlling the surface, Edge Sheets are a soft way to control the surface. In this example, one can add edge sheets near the intersection to make the turning of the surface tighter.

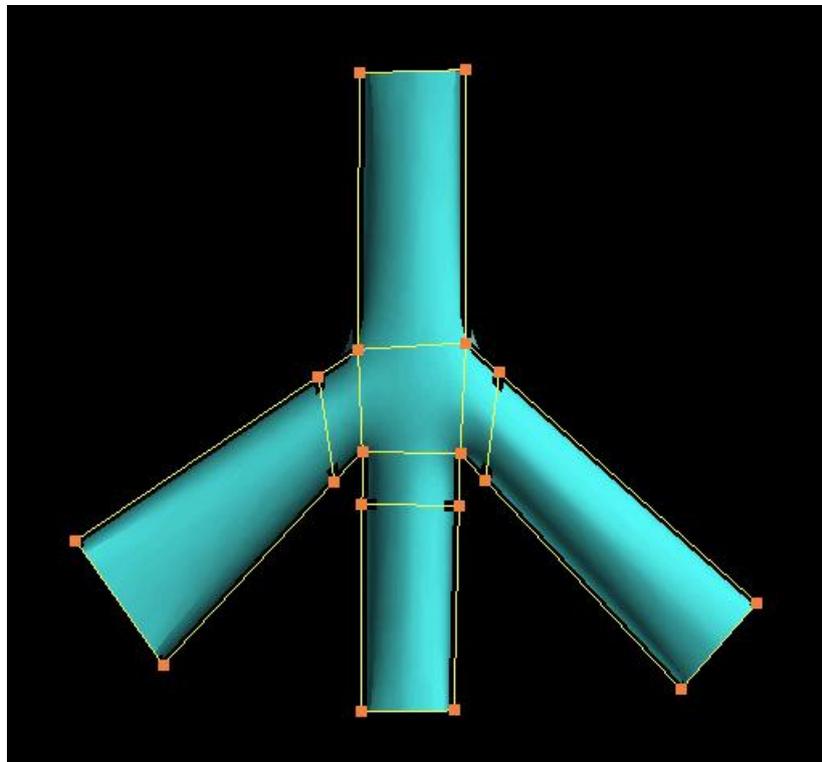
Change the style of the surface to **point** on the Style submenu to get a better view of the surface, and insert **Edge Sheets** on the upper part of the lower branches of the topology using the I button on the keyboard and clicking on the edge links.



Go to the *Control net Surface* window. Select Group 1 on the *Input Control Net* option and Group 2 on the *Feature Corner* option. Click **apply**.



A new surface is obtained as shown in the picture below.



Looking carefully where the Edge Sheets have been placed, the surface is now tighter and closer to the original Control Net.

