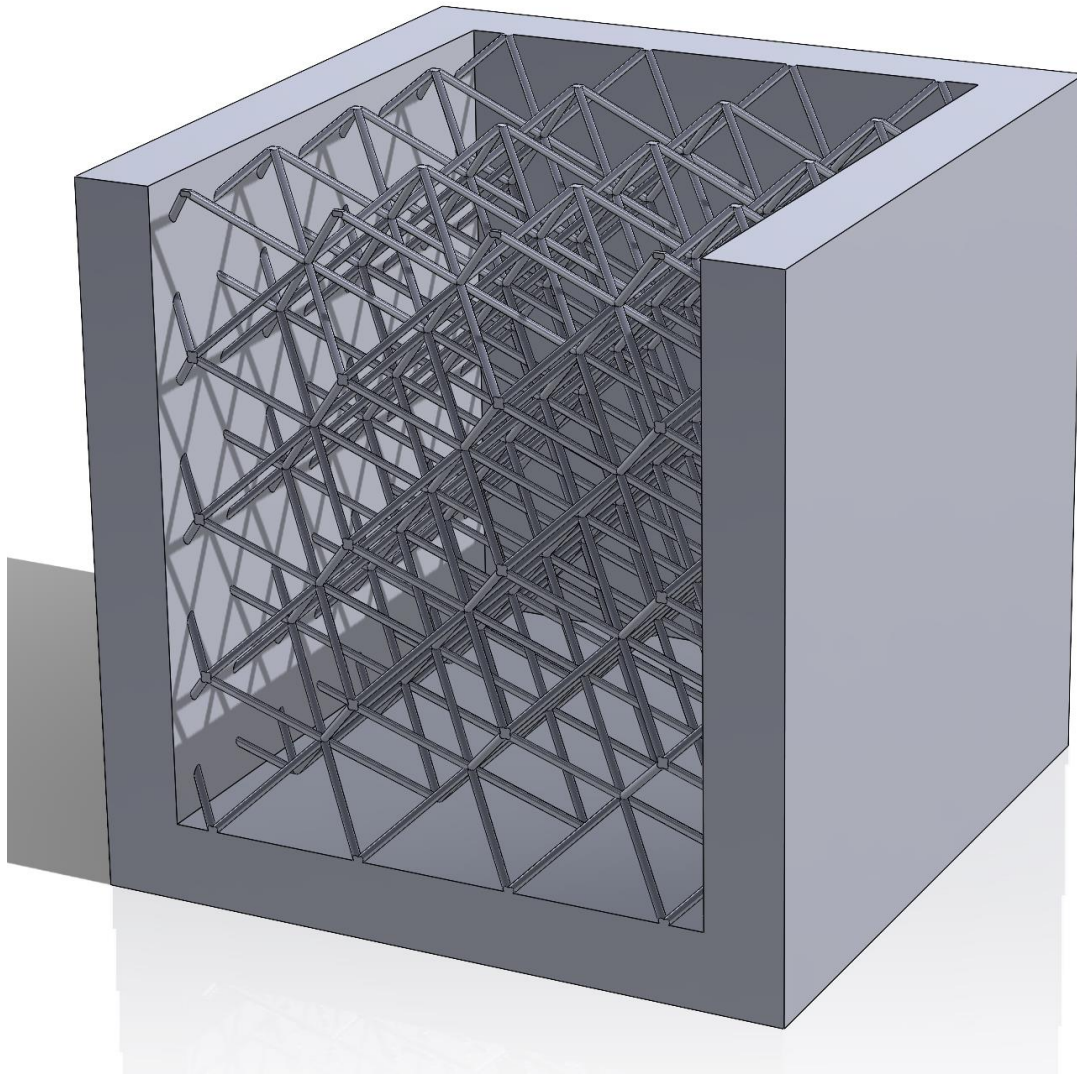# Lattice Structure Workflow in SolidWorks

Working with lattice structures is troublesome depending on the number of Cells patterned.
In this tutorial I will show you an easy way to handle it and discuss others relevant topics.
Hope you enjoy it,
Lucas Bastos

Preparing the Lattice Body

Chek my other tutorial, Lattice Design for Additive Manufacture, to create the lattice body used in this tutorial. Change both Linear Patterns instances numbers to 5, to generate a 5x5x5 structure, and save it. (Don't forget to edit the Combine features after changing the Linear Patterns). Tip: Use the Rollback Bar before editing.
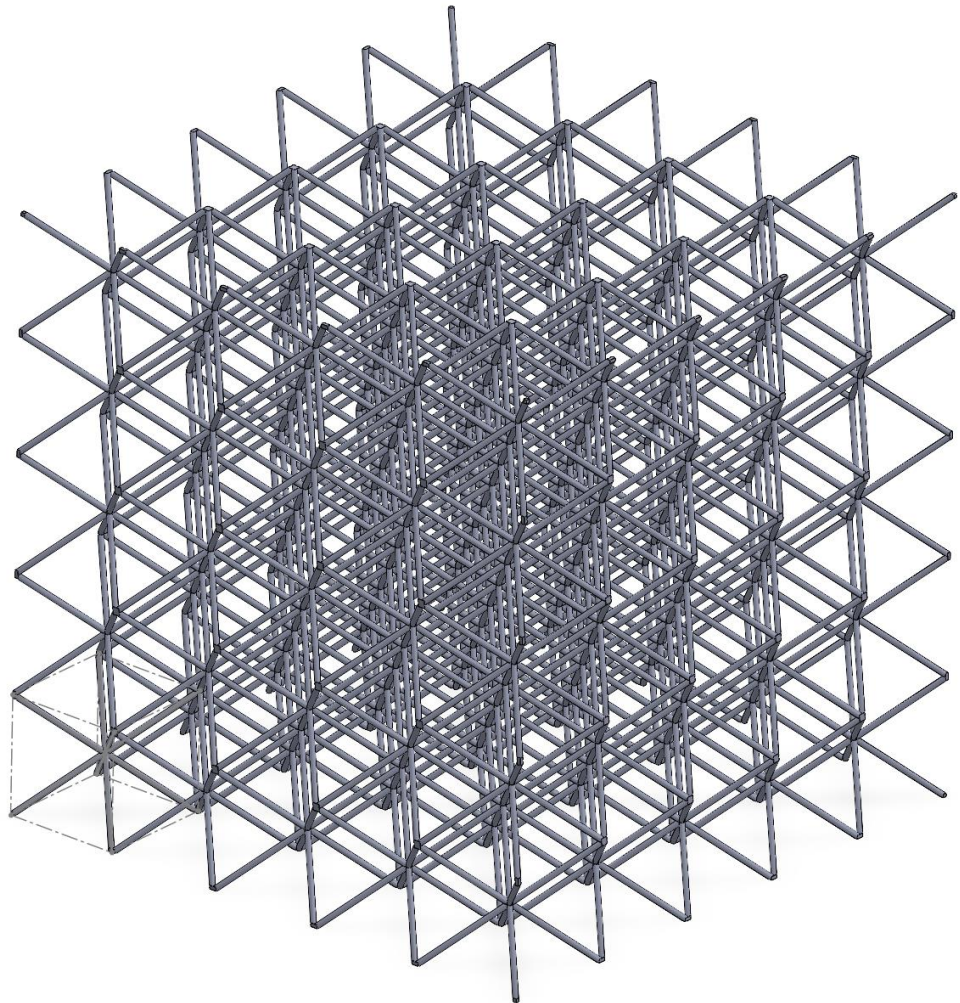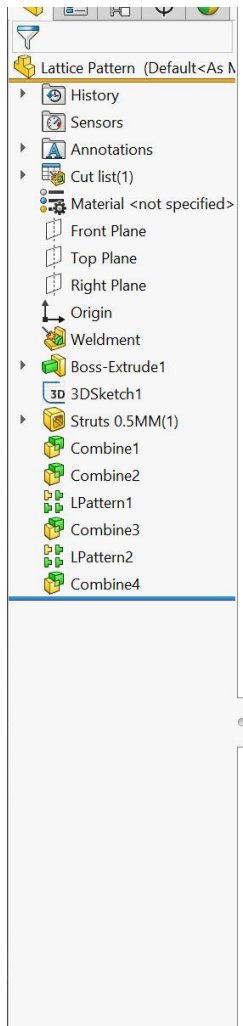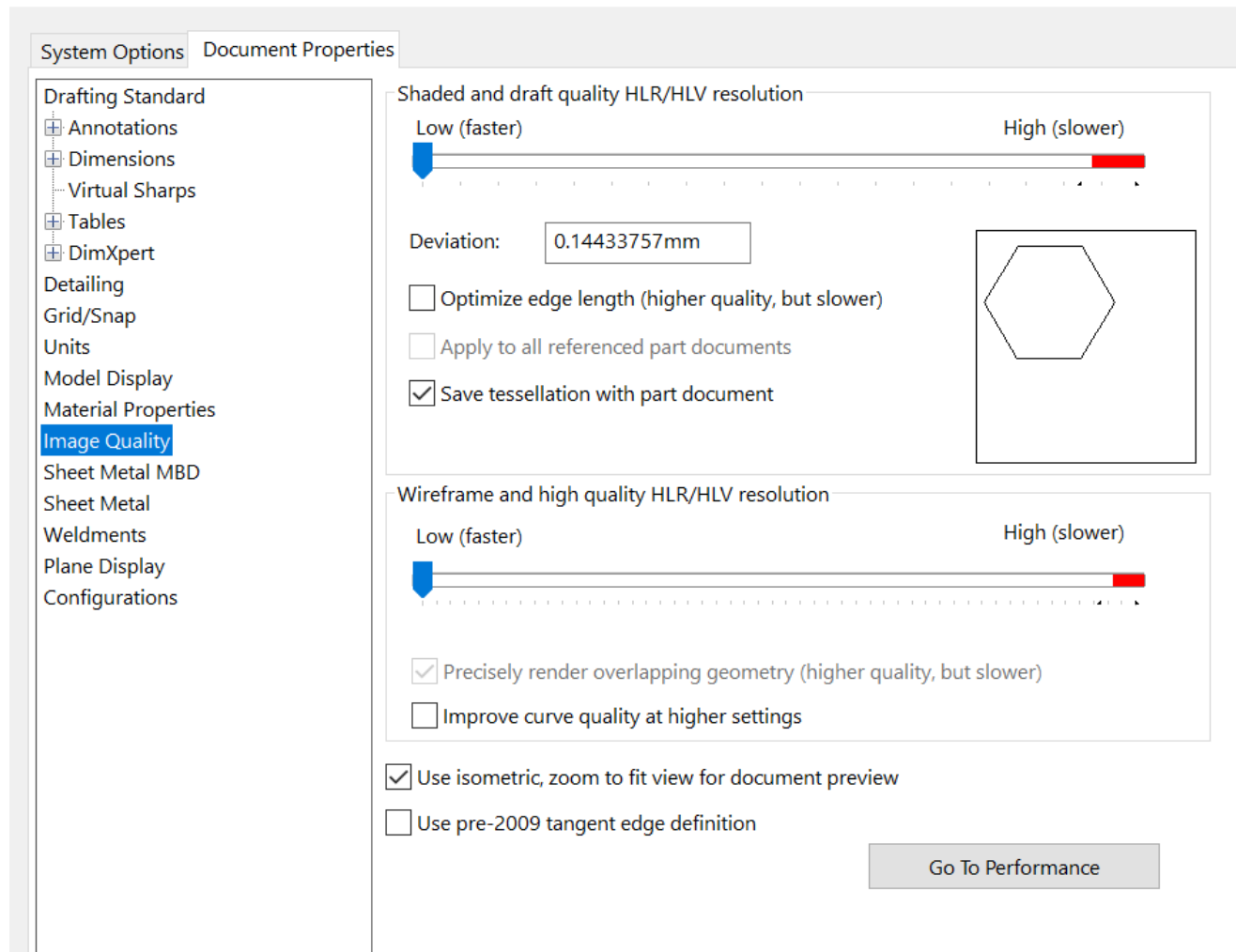
Now, open a New Part document and create the following part. It is a Cube 45x45x45mm with a Shell of 5mm on both the Top and Front faces. This will be the base structure to merge the lattice with.
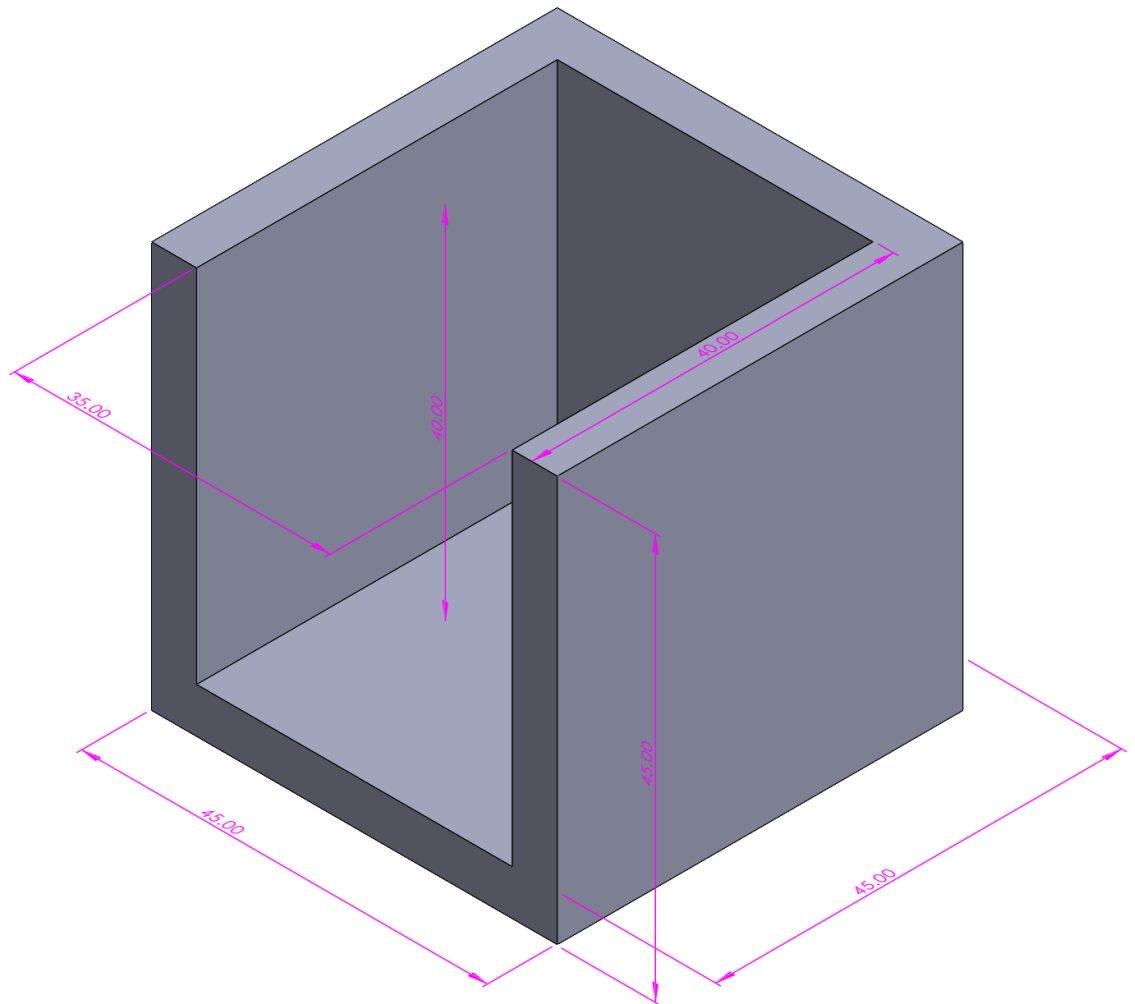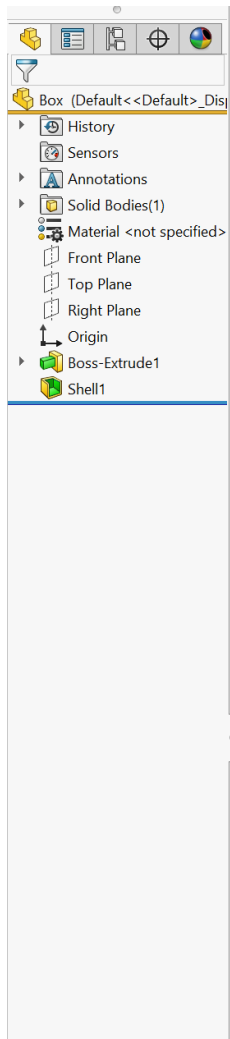
Save it. Open a New Assembly document. Insert Component and select the cube file (Browser, if you closed it). Click on OK to mate all the three planes from the Assembly with the Part.

Before continuing, set the quality of the document as low as possible as shown in Tools: Options, this will help to work with heavy files:

Document Properties - Image Quality

System Options	Document Properties

Drafting Standard
⊞ Annotations
⊞ Dimensions
— Virtual Sharps
⊞ Tables
⊞ DimXpert
Detailing
Grid/Snap
Units
Model Display
Material Properties
Image Quality
Sheet Metal MBD
Sheet Metal
Weldments
Plane Display
Configurations

Shaded and draft quality HLR/HLV resolution

Low (faster)   High (slower)

Deviation: 0.14433757mm

☐ Optimize edge length (higher quality, but slower)

☐ Apply to all referenced part documents

☑ Save tessellation with part document

Wireframe and high quality HLR/HLV resolution

Low (faster)   High (slower)

☑ Precisely render overlapping geometry (higher quality, but slower)

☐ Improve curve quality at higher settings

☑ Use isometric, zoom to fit view for document preview

☐ Use pre-2009 tangent edge definition

Go To Performance

In the Assembly tab, select Insert Components and pick up the lattice part.

Tip: this file is not heavy, since it is a 5x5x5 lattice structure, but on larger files I would recommend setting the lattice as Lightweight.
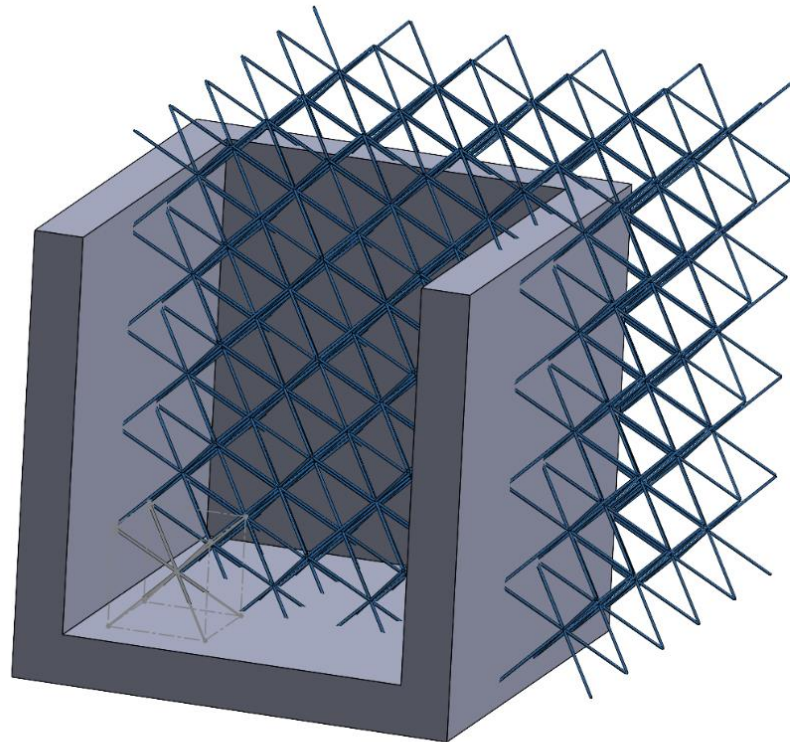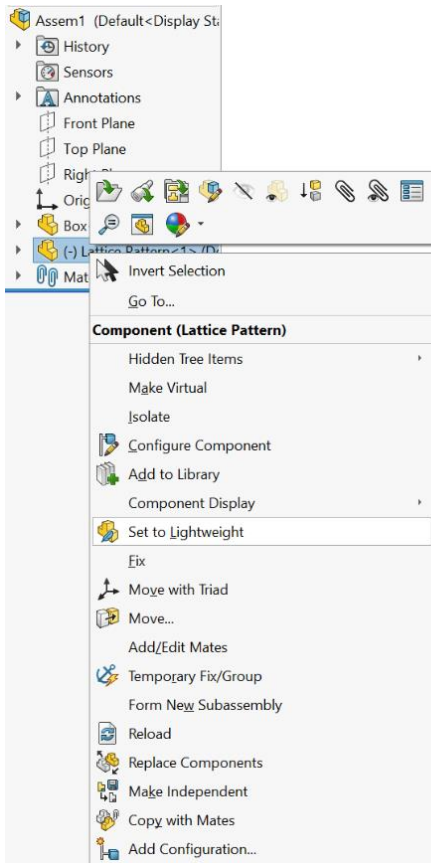
Mate the Up and Front faces from the lattice and the box Coincident and mate the sides Width (using the planar faces from the lattice).

Tip: You may want to create extra planes on the lattice file before starting the assembly on large files. 😉
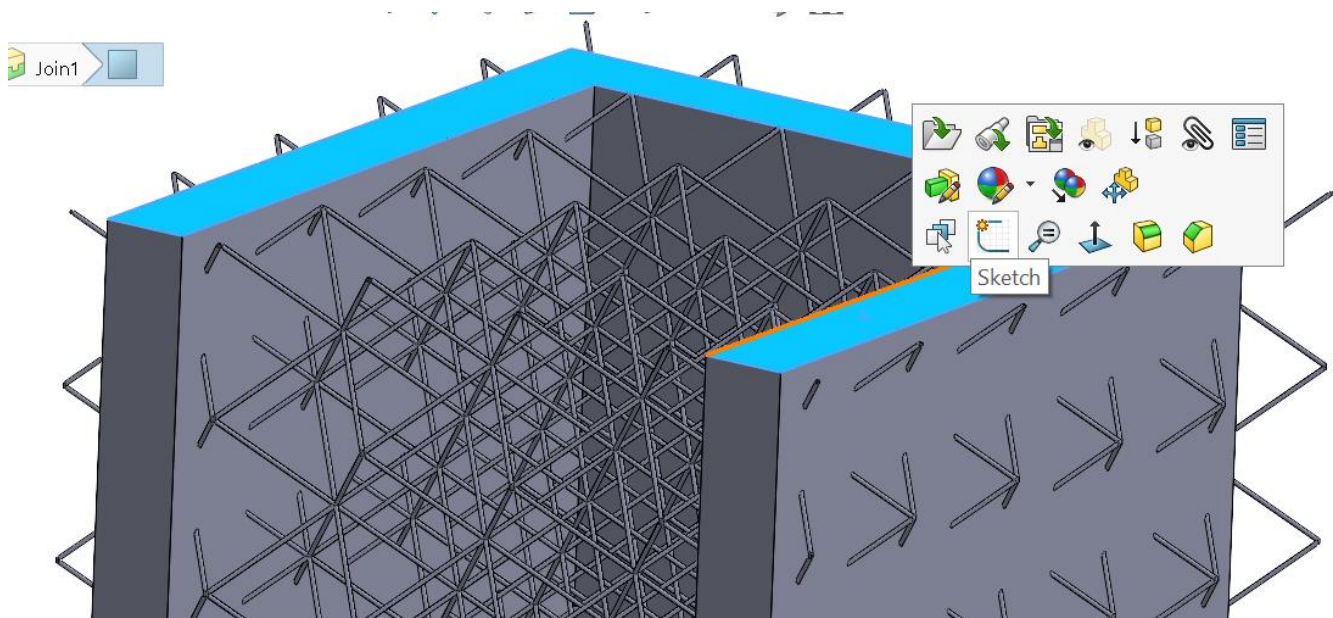
With everything positioned, create a New Part, and select a plane or click on a surface.
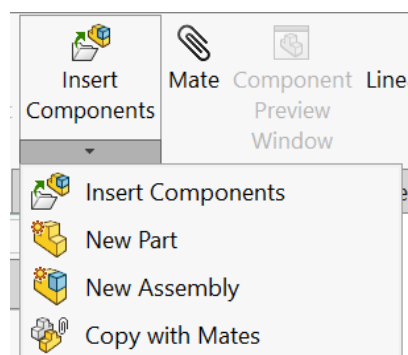

A new part will appear on the Feature Tree and you will enter on Sketch Mode, exit the Sketch Mode and search the Join feature or Insert -> Features -> Join. Select both parts and click OK. Rename the new part on the Feature Tree.
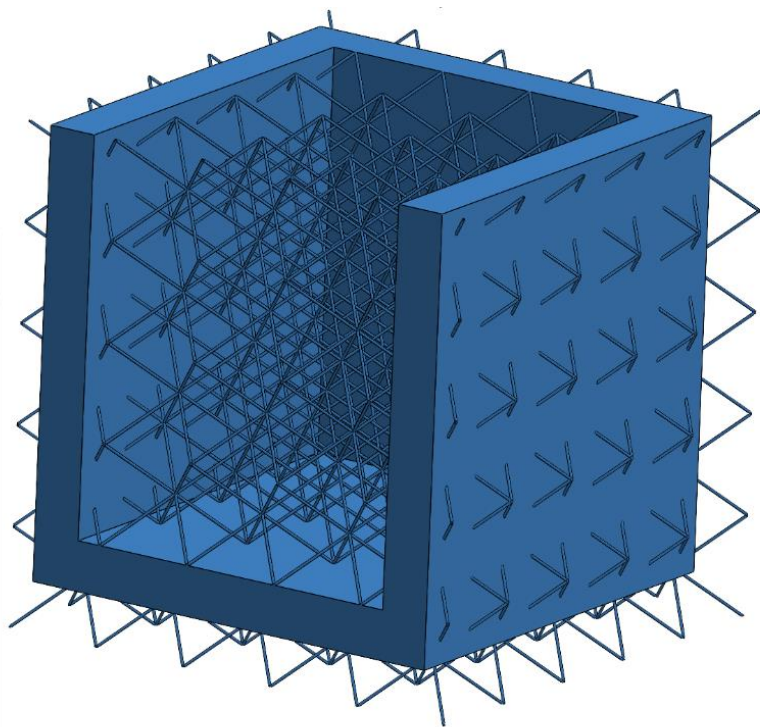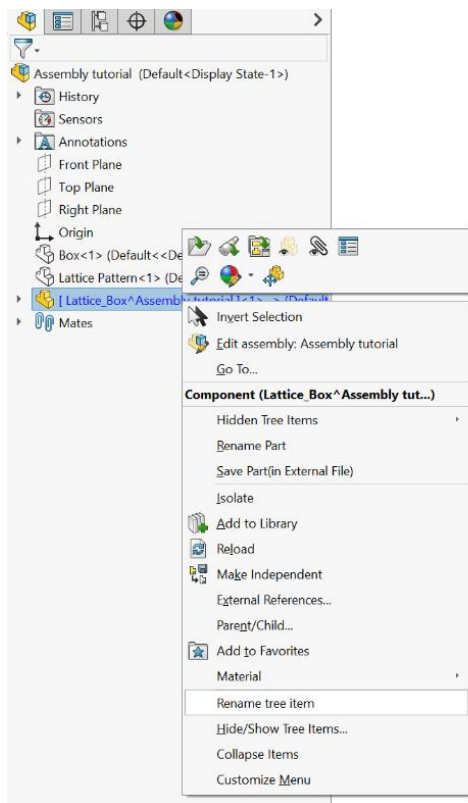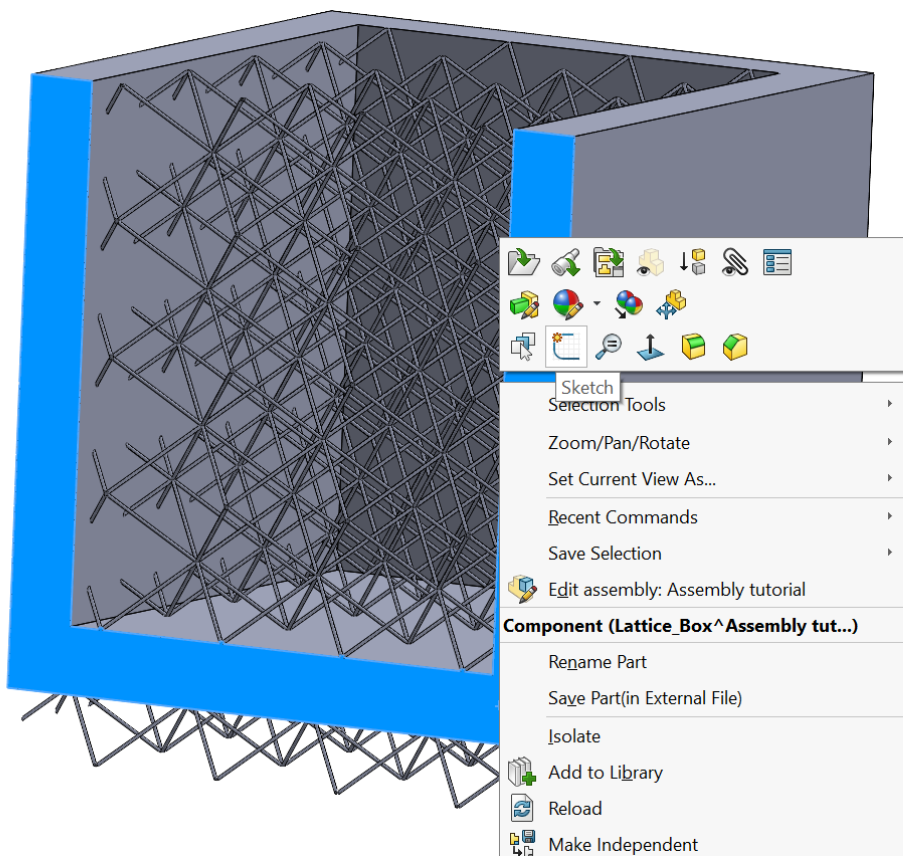
Now comes the trimming. Open a Sketch on the upper surface:
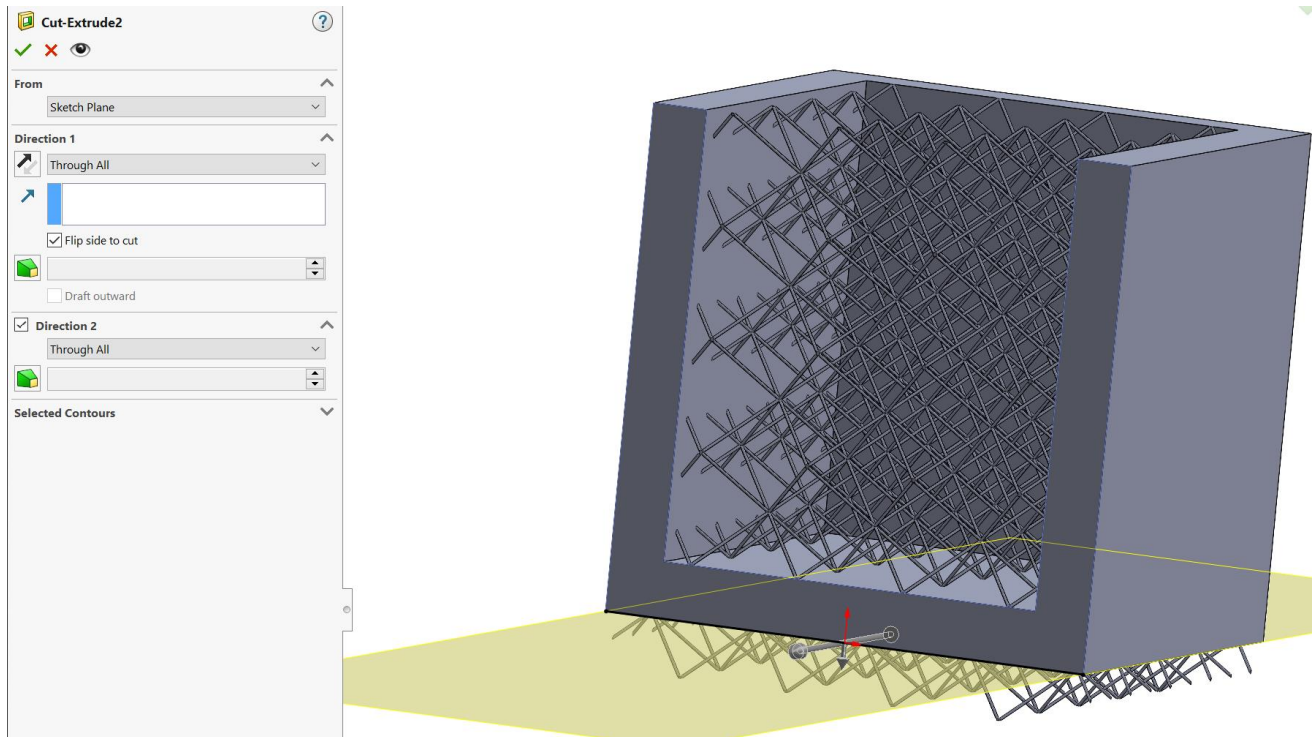

Use Convert Entities on the outer edges of the Box and do a Extrude Cut. Set the Trought All Direction and Flip side, if necessary.
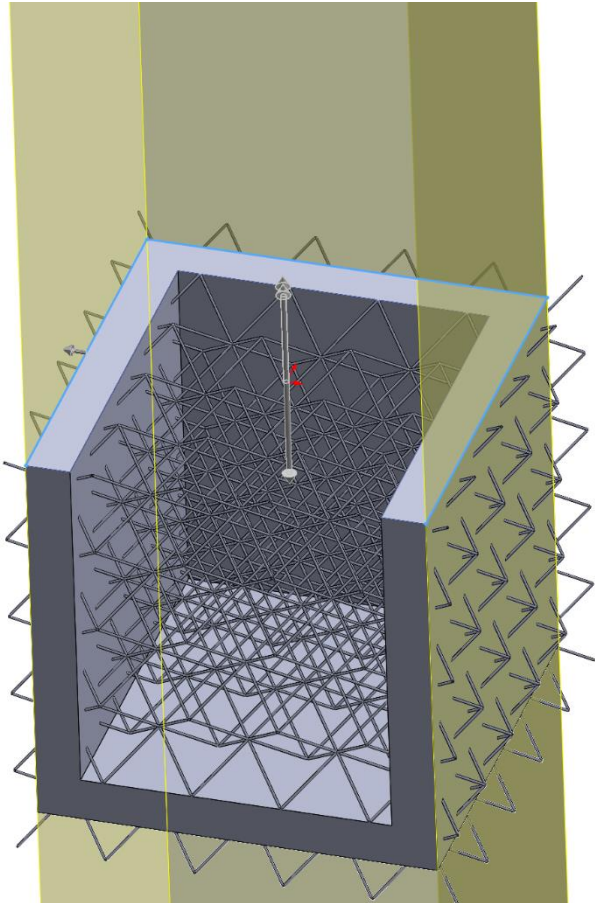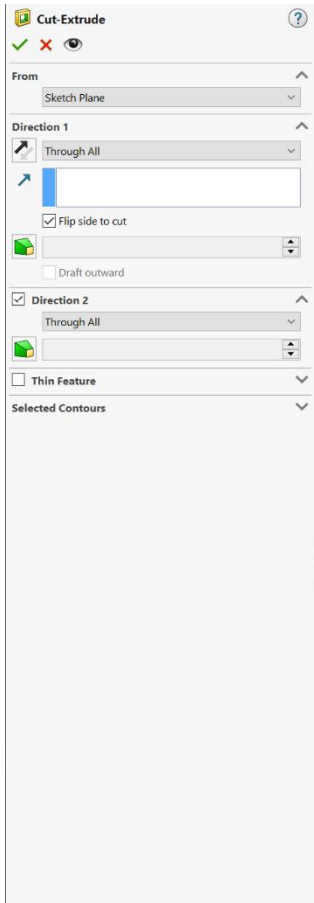
We just trimmed the excess of lattice from the sides. Now for the bottom part, open a new sketch on the Front face.

Convert Entities from the outer edge and make another Extrude Cut with Through All Direction as before.

Leave the Edit Part and save it. I recommend saving it internally because it is less messy, when you decide to print it you can just open the virtual part and save the STL file from it.
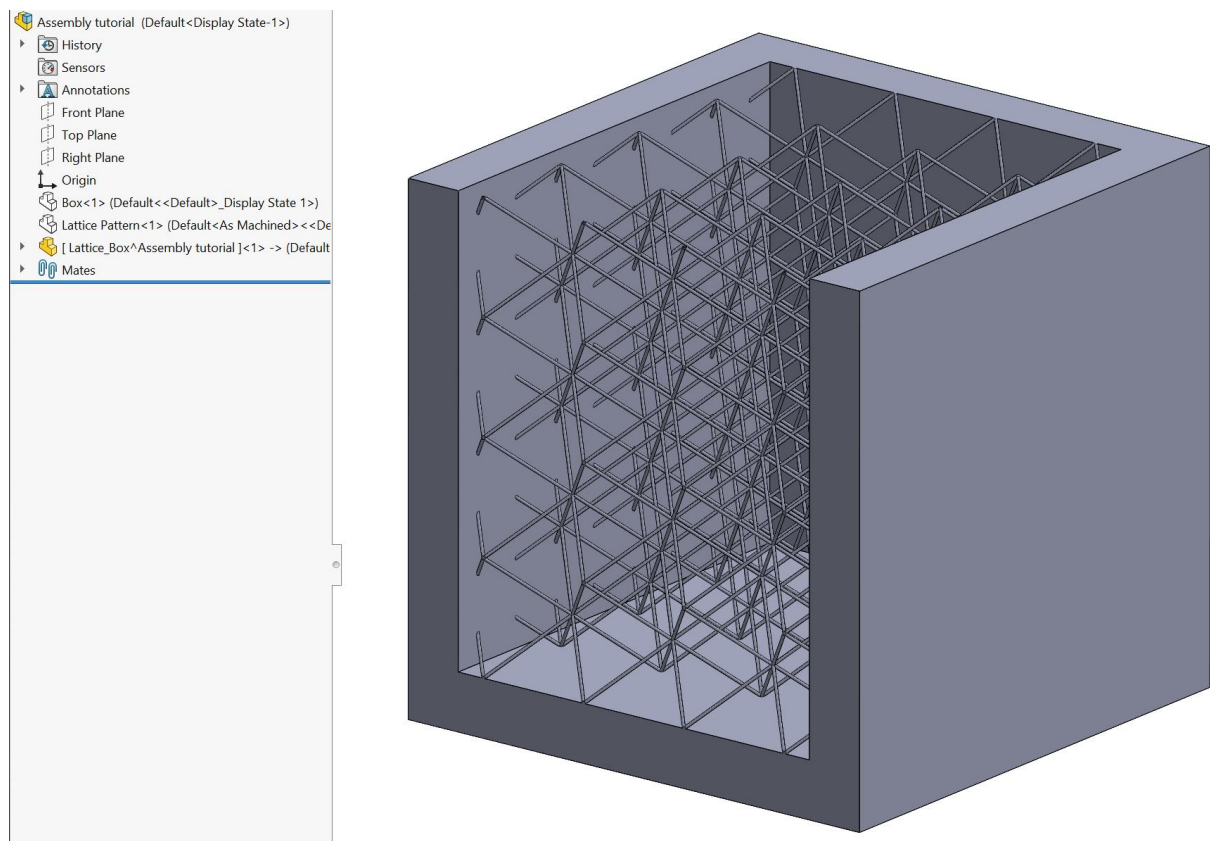
Discussion

-   It is also possible to do this with Multibody and I advise you to give it a try. But the workflow using Assembly document is much easier when dealing with large files, you can set it Lightweight and the Mates from assembly are much more user friendly than Move/Copy Bodies in a Multibody file.

-   Saving the part internally is less messy and more convenient when you want to update the structure. For example: changing the diameter of the Struts or the Cell size.

-   When inserting lattice on complex structures, take some time getting the measurements and generate a Lattice with a proper Cell size and pattern instances. Don't pattern much more than necessary, the file will become too heavy.

-   Depending on the complexity of the part a Extrude Cut is not the best approach. There are many ways to trim a lattice, like Cut with Surface and the Split feature.

-   In-Context techniques are also possible. Instead of creating a virtual part.

Advanced techniques
Creating extra planes to help positioning the part while assembling it.

Handling large lattice files: Create a New Configuration (in the lattice part) and do some cuts with the Extruded Cut feature removing most inner cells; or generate a solid with the same volume merging the structure. Then after the assembly, change the configuration back to default.

Trimming complex boundary (works in Multibody and Assembly):
Split feature: After merging the parts use Split and select the faces as Trim Tools and the lattice bodies to split, then delete them with Delete Body.
Surface Offset and Cut with Surface: For Assembly: Create a New Part, use Join on the base part only, create the surfaces offsets with zero distance from it, after that Join the lattice part. Then use Cut with Surface to trim the lattice and delete the surfaces with Delete Body.
For Multibody: make the Surface Offset before merging the lattice on the base part.

Best regards,
Lucas Bastos