The use of components for the modeling of 2D structural parts in hull construction

On the creation of a frame in the aftbody of a metal powerboat

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Introduction

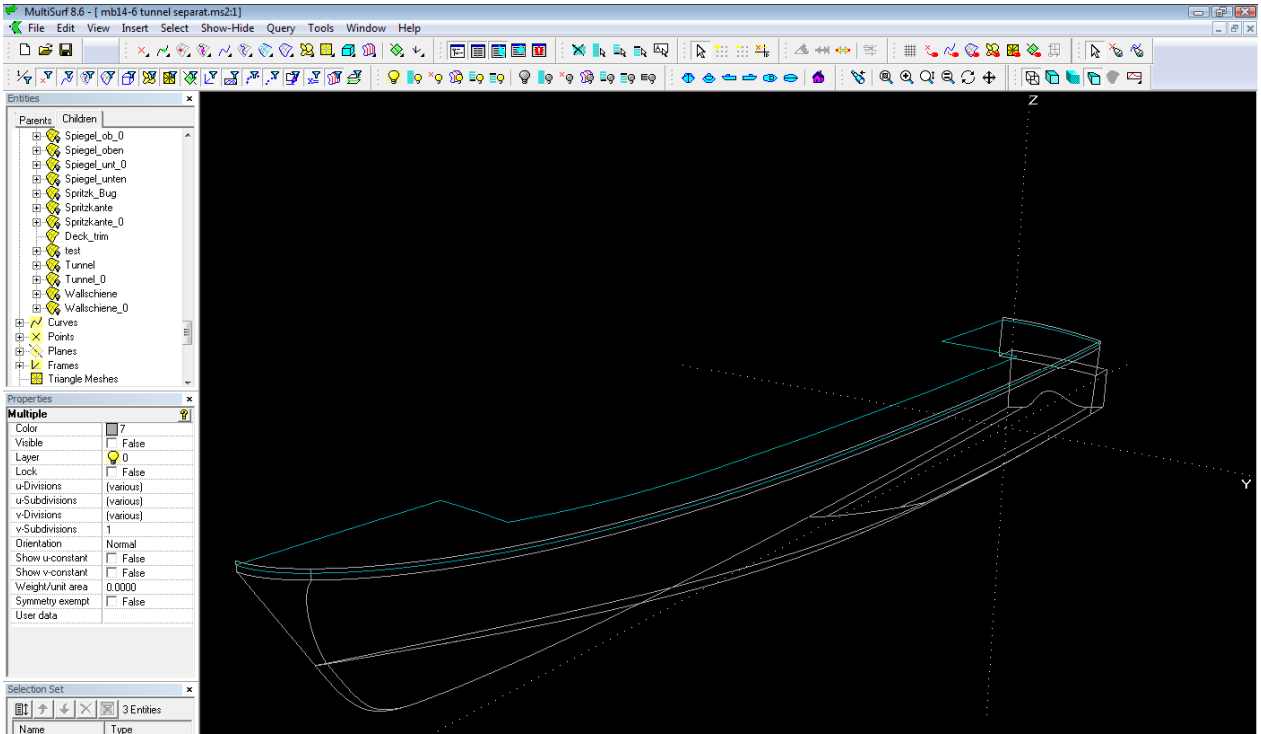
Let us assume we have made the geometry of a standard metal powerboat: surfaces for hull and deck. And we went beyond this ordinary extent and have also added a series of longitudinal frames (stiffeners) to support topside, bottom and deck. Next we would export sections and continue in a cad program in order to define all the flat structural parts required for the construction of the boat. But this means: the world of relational geometry is left. If there will be any change of the model, the cad drawings must be adapted. And certainly, there will be changes. In the following it is shown by the example of a transverse frame, that there is no need to leave MultiSurf for the creation of complex flat parts.

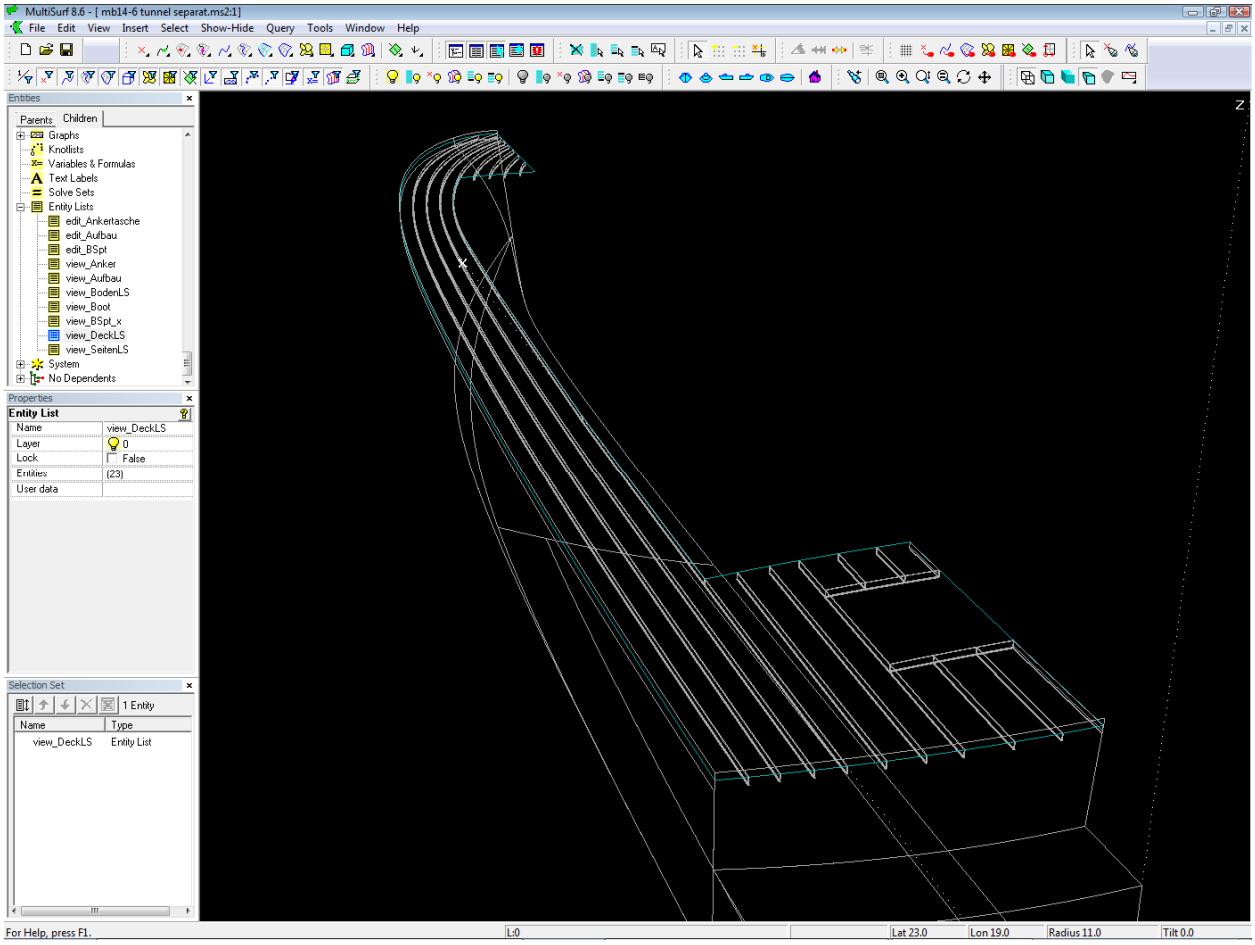
Recuring tasks

The definition of the outline of a metal boat web frame requires recuring drawing of
1. cutouts for longitudinal frames
2. cutouts for welding, limberholes
3. parallel curves
4. arc fillets between 2 curves

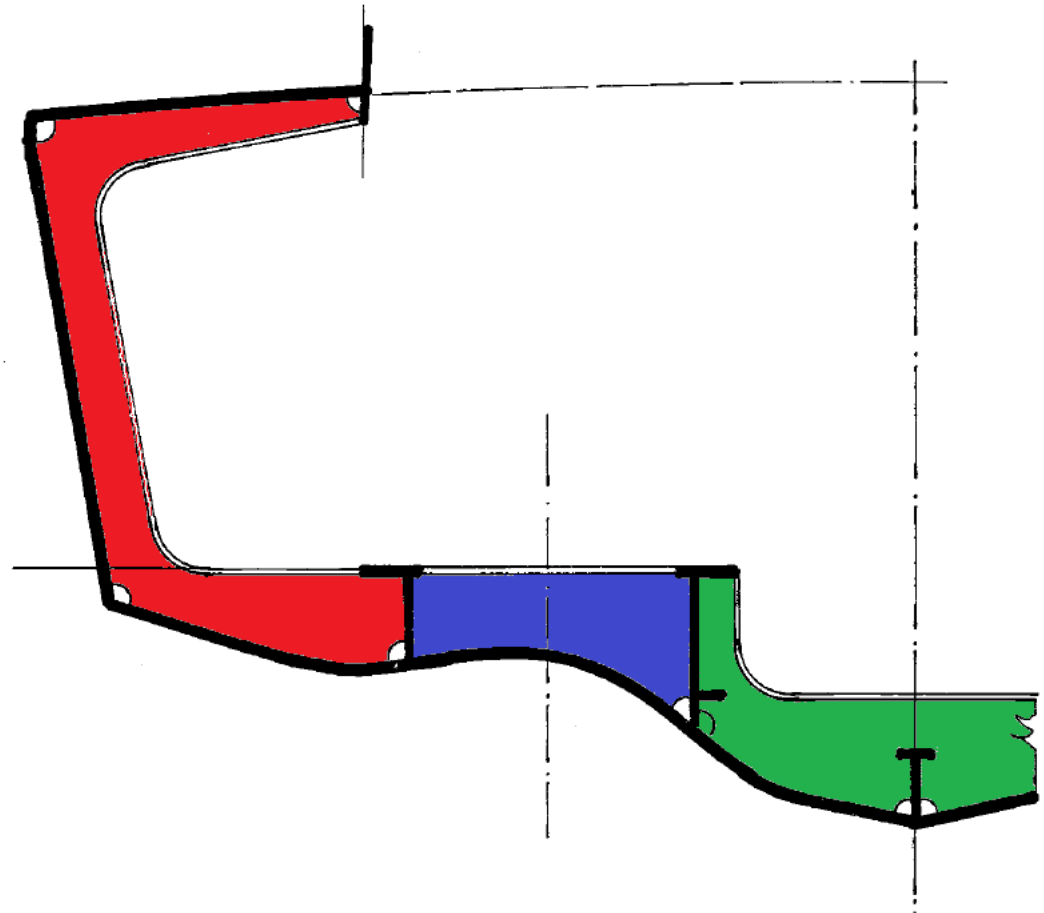
For these drawing work components are developed and repeatedly used.

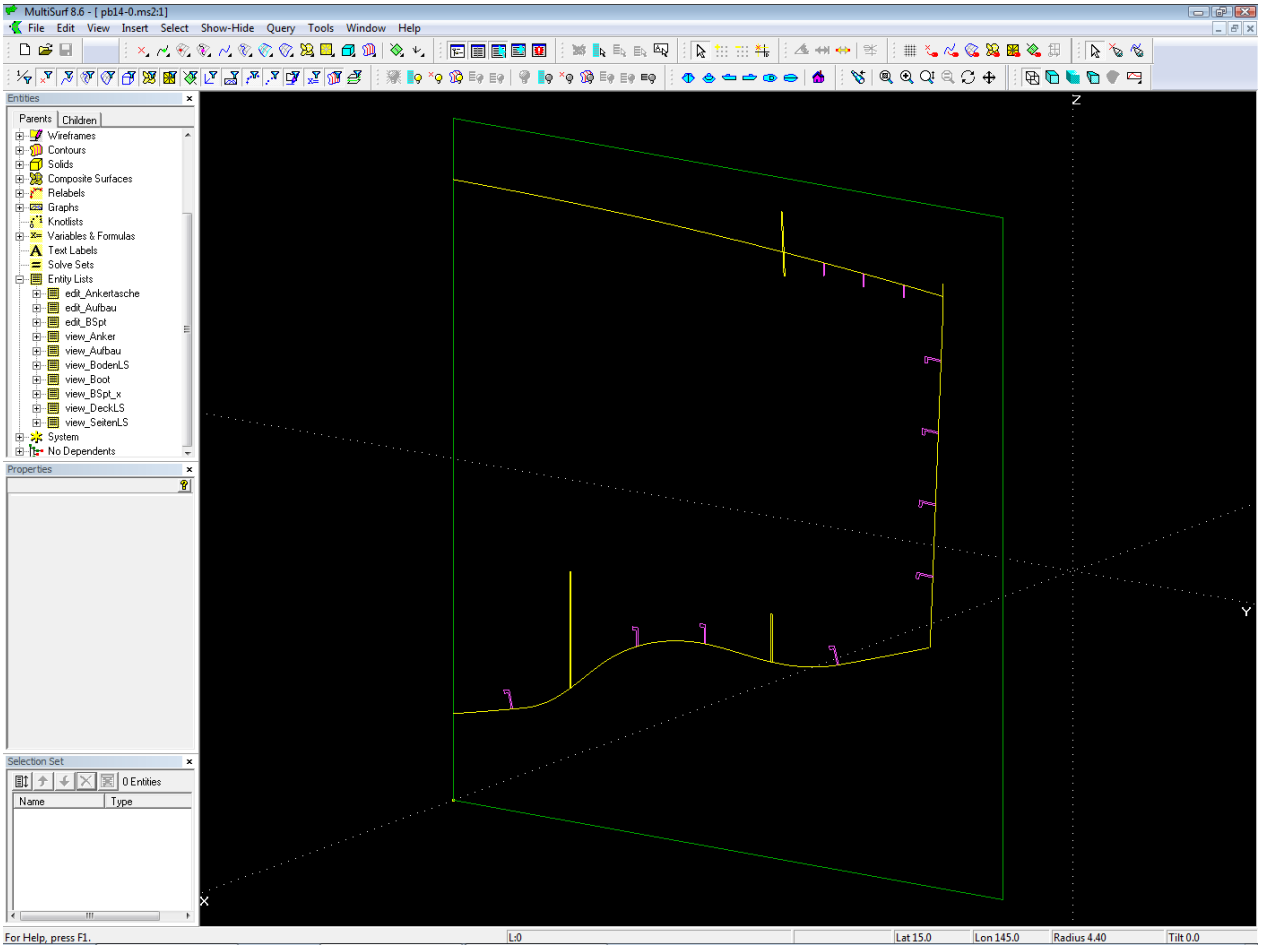
The boat





Longitudinal deck frames (Sweep Surfaces)

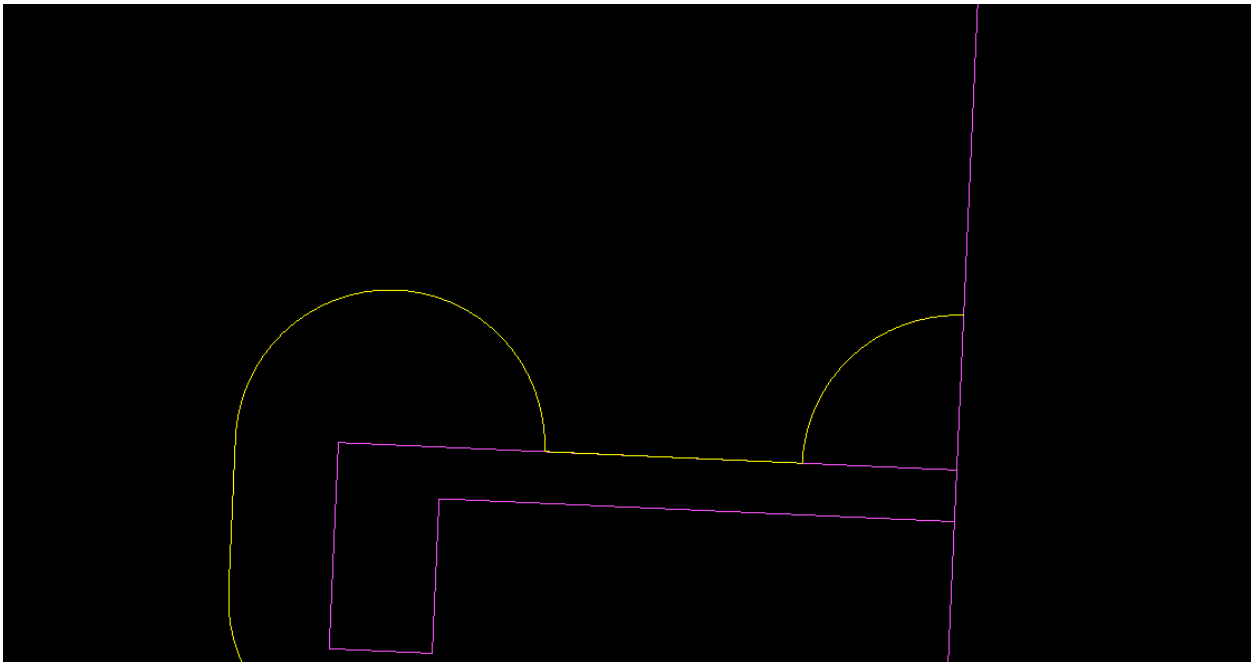


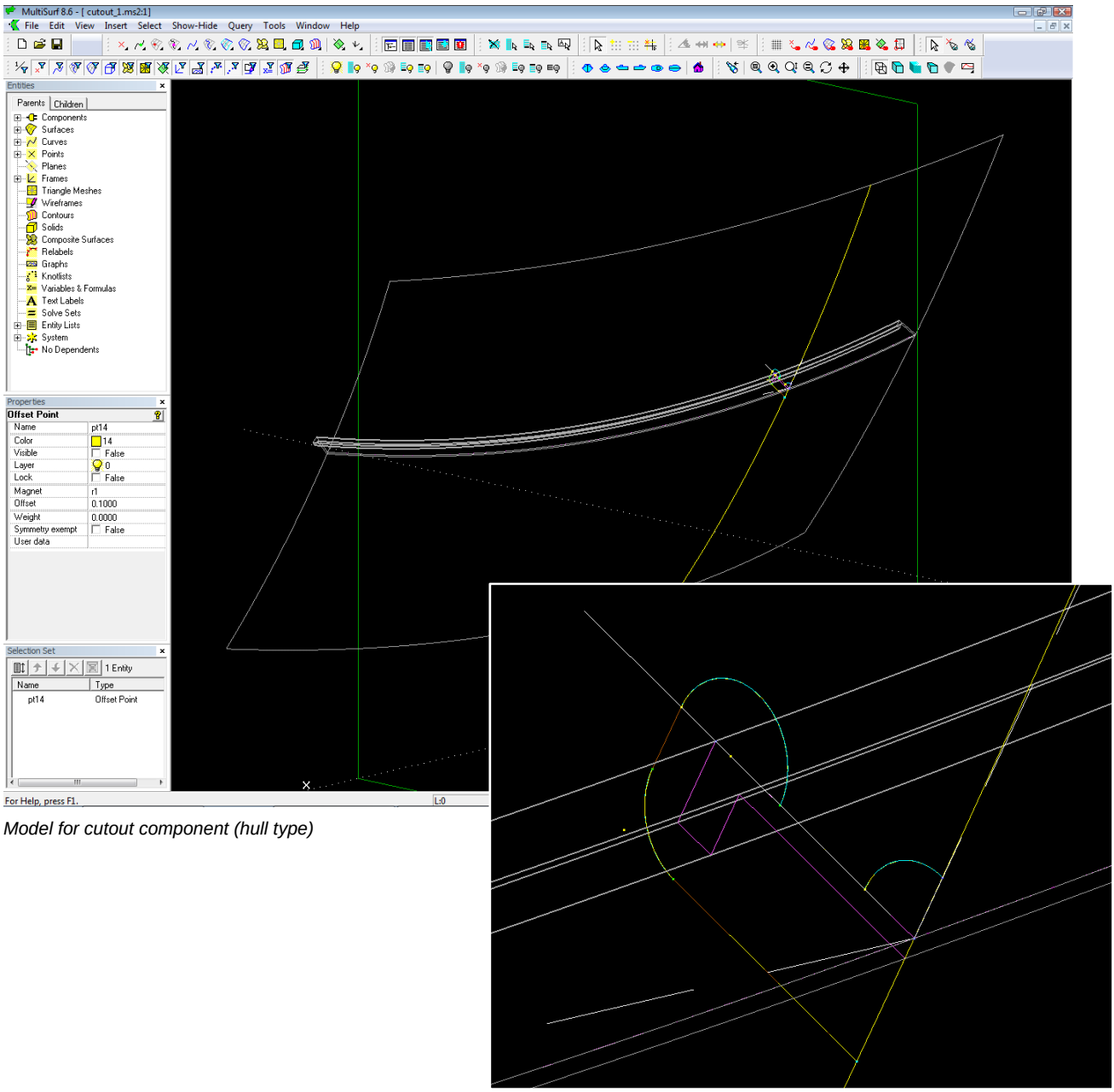


The frame basis cuts hull, deck and longitudinal stiffeners (Intersection Snakes, magenta). The intersections are projected onto the frame basis (Projected Snakes, yellow). Modell pb10-1.ms2.

Step 3 – stiffener cutout components, scallop component

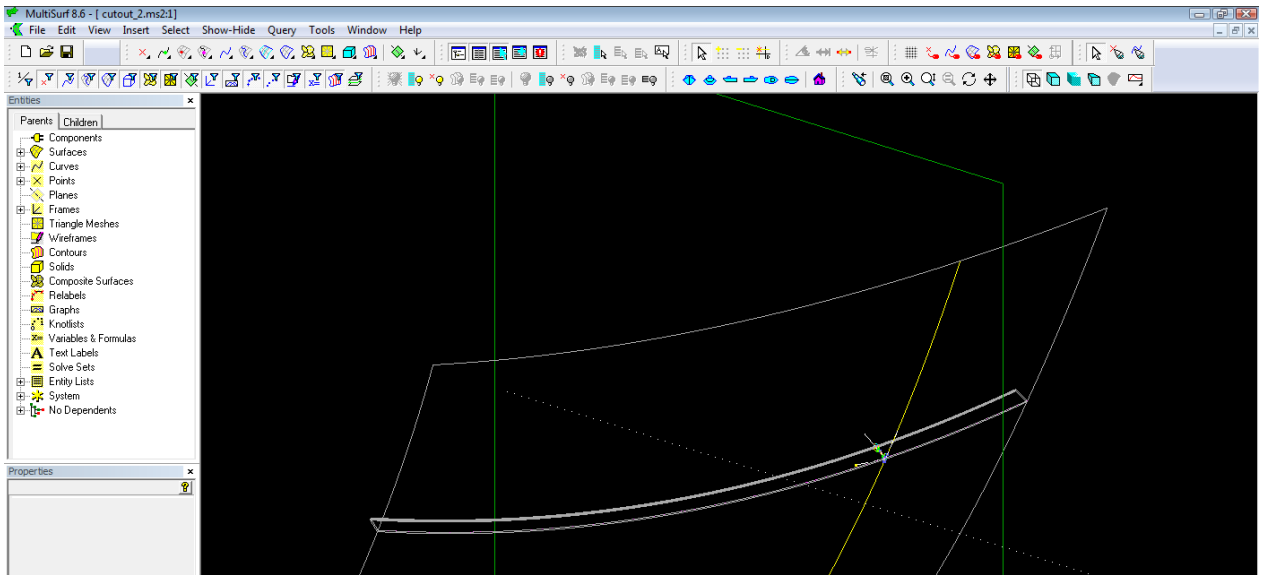
Next we create cutouts for the longitudinal stiffeners. Their shape depends on the stiffener cross section and what is considered useful, practical, suitable. Here the cutout for hull stiffeners and deck stiffeners look like this:





Model for cutout component (hull type)

This is the model for the deck stiffener cutout component:



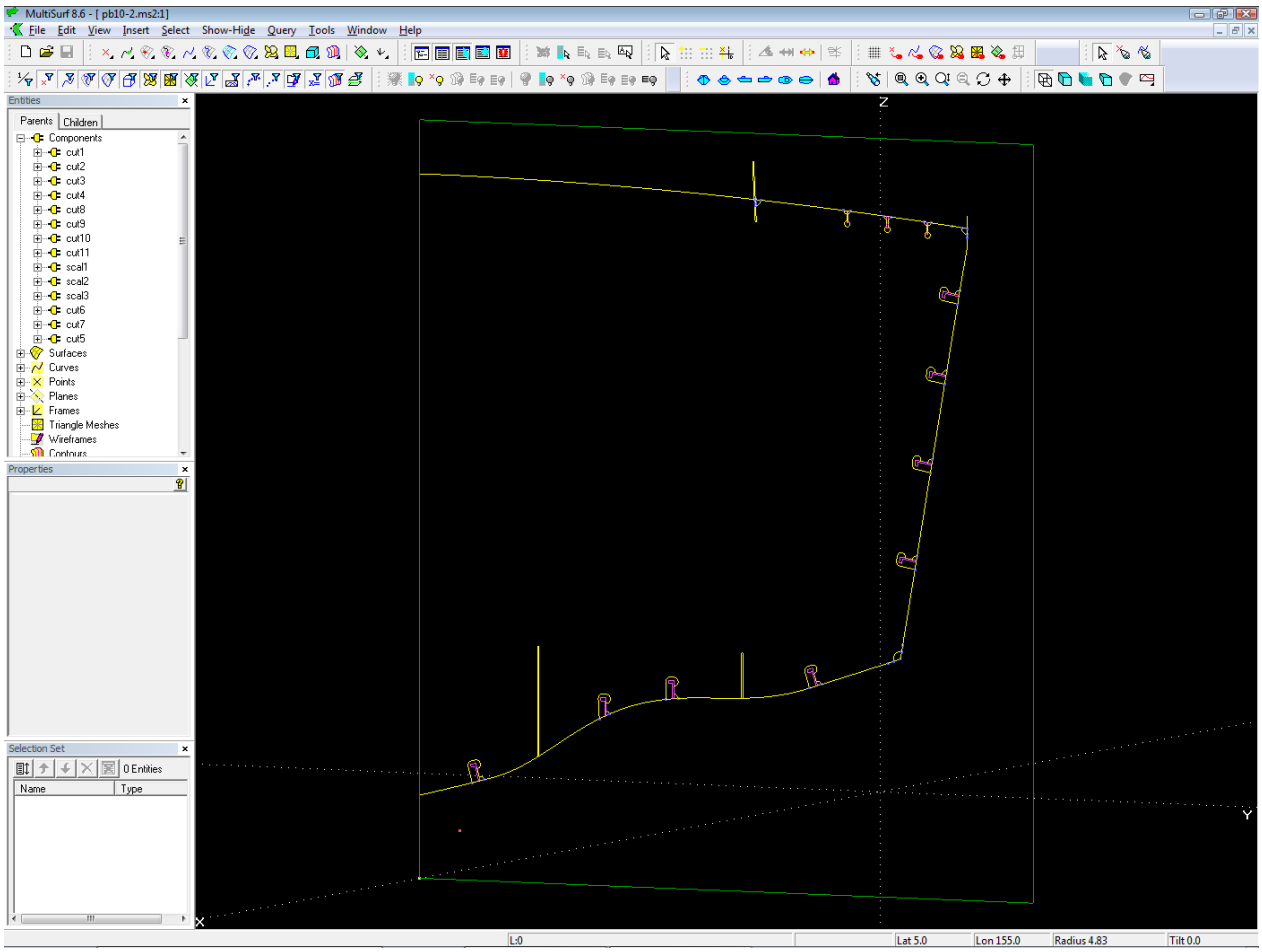
The scallop component is quite simple. The intersection point of two snakes on the frame basis is the center of an arc. Start and end of the arc are Intersection Rings, where Mirror/ Surface is that point of intersection of the two snakes, thus the cutting object is a sphere.

Parents:
- the frame basis
- a ring on each of the two snakes on the frame basis

Products:
- the scallop shape as Projected Snake on the frame basis
- rings on the snakes, where the scallop starts and ends. These rings will be used lateron for SubSnakes, when we create the frame outline boundary.

Parameters:
A variable for the scallop radius

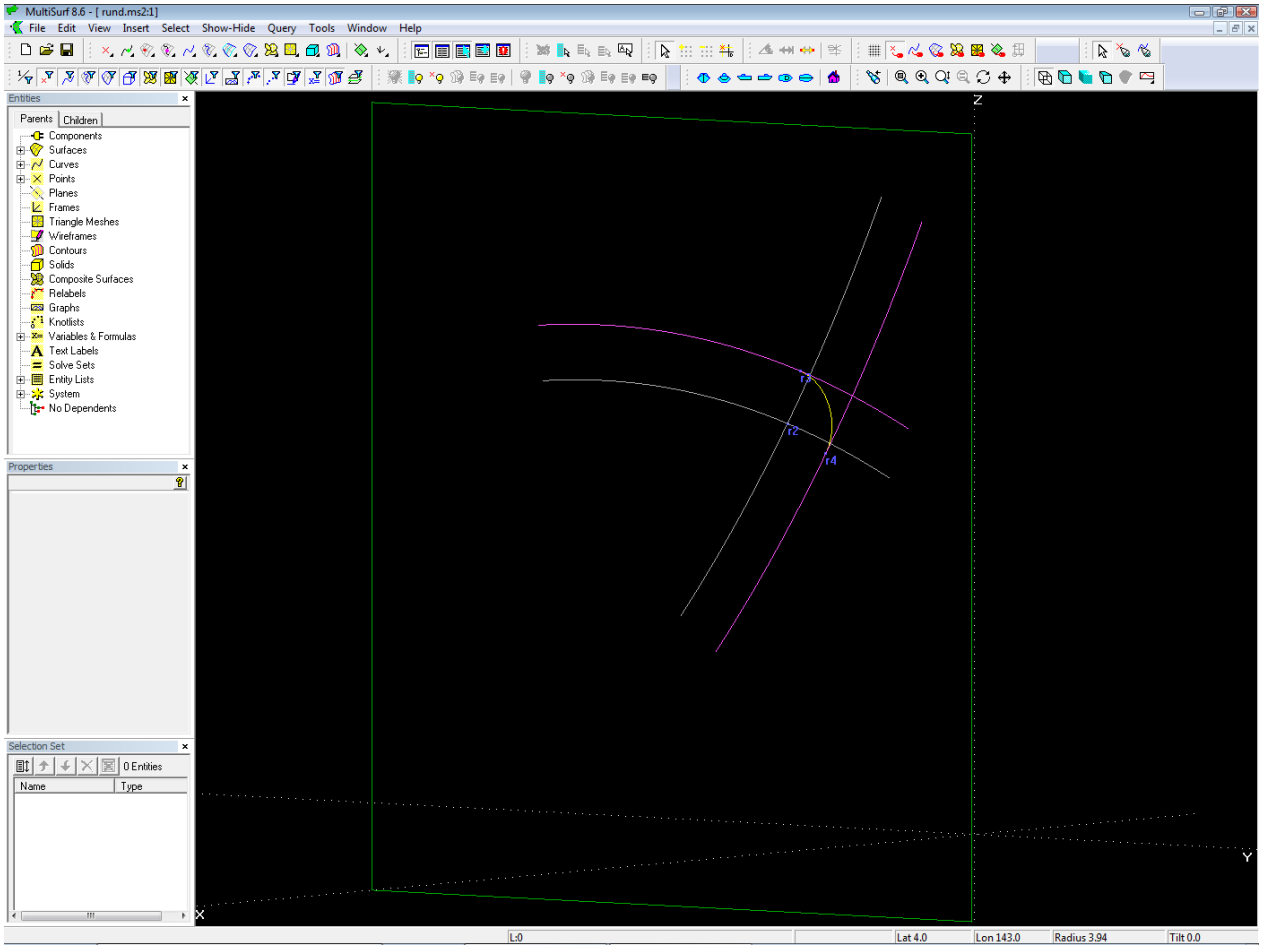
Step 4 – create cutouts and scallops by components



Cutouts by components. All relational. Move the frame basis and everything adapts. Model pb10-2.ms2.

Using the previously introduced components cutouts it is now easy to add the cutouts and scallops to the frame basisl.

Step 5 –parallel curve component and arc fillet component



Component 2D_ArcFillet.mc2: it rounds 2 snakes (magenta) by an arc (yellow)

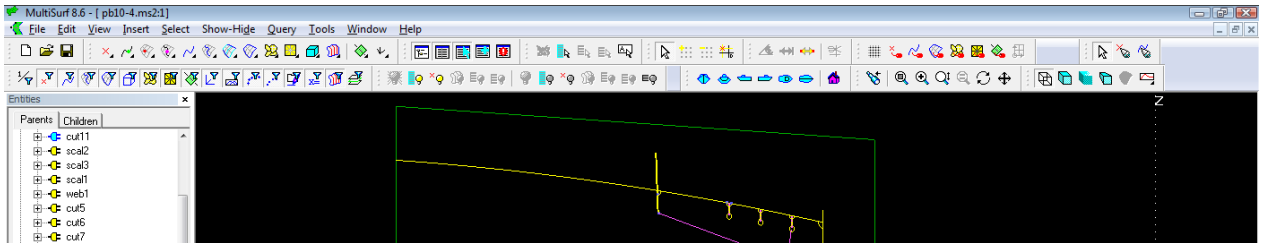
The idea is this: center of the arc is the intersection point of the 2 curves, that are parallel to the basis snakes, their distance being the arc radius. Begin and end of the arc are the points on curve 1 and 2 closest to that center point (Proximity Rings).

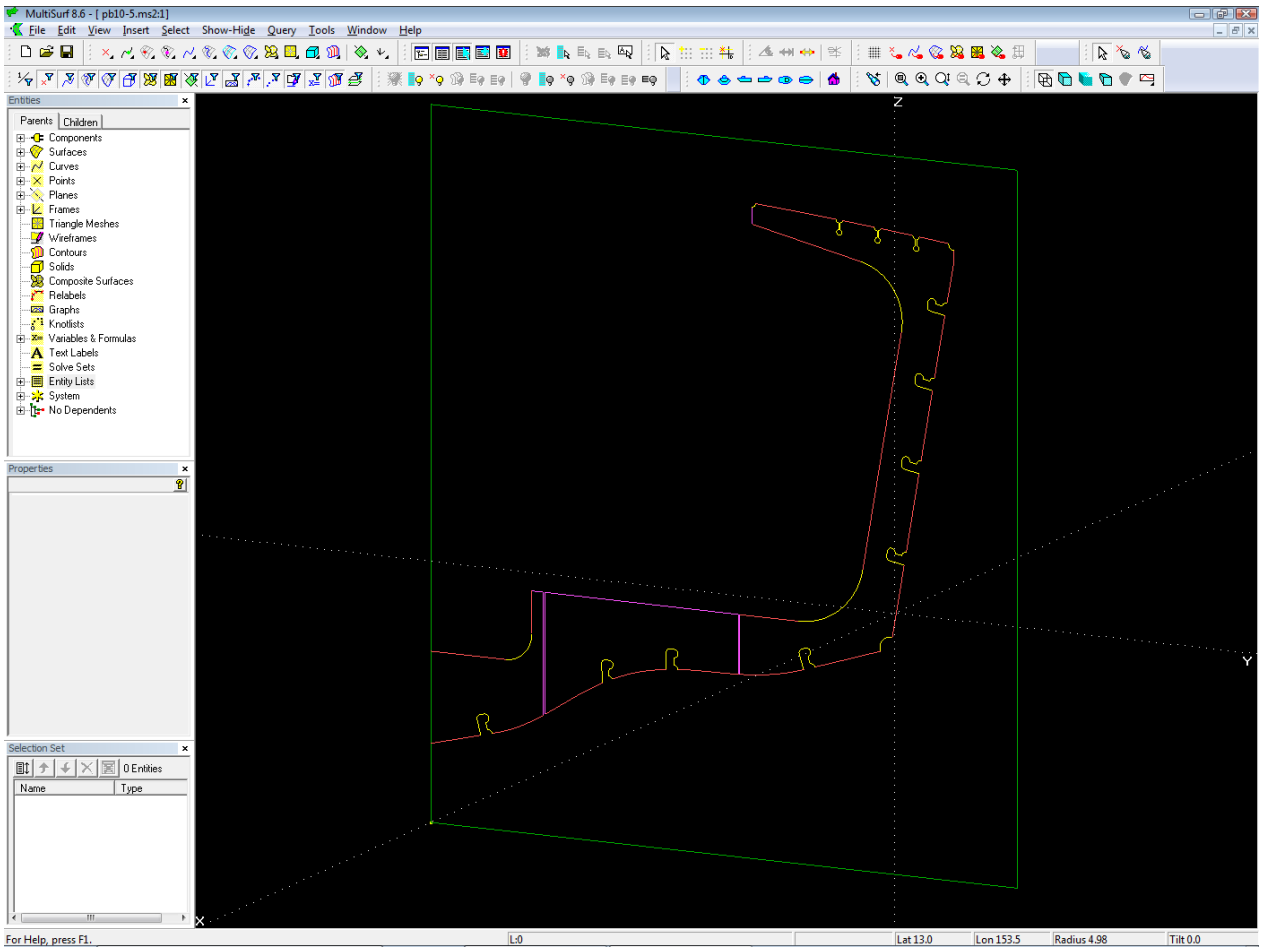
Parents of the component 2D_ArcFillet.mc2 are:
- the frame basis
- 2 snakes on the frame basis

Products of the component are:
- the arc fillet
- rings on both snakes, where the arc starts and ends (to be used for trimming SubSnakes)

Parameters:
The arc radius is set by a variable.

Step 6 – adding flesh





Frame outline. Adding SubSnakes for the boundary is easily done due to the rings on the adjacent snakes, which are created by the components for cutouts, scallops and arc fillets. Complete relational construction.If there is another frame of the same kind, the frame basis and all its children can be saved as a component and inserted again. (model pb10-5.ms2)