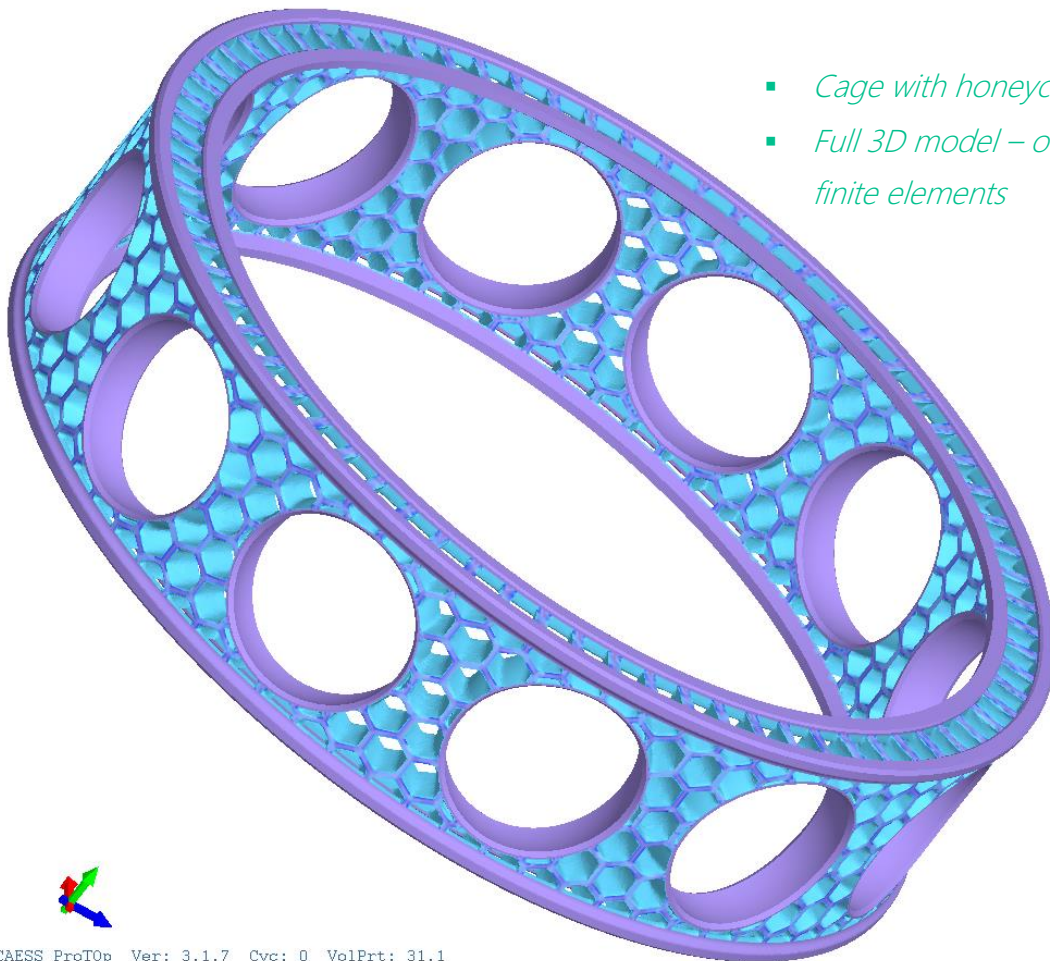


# CAESS ProTOp / ProTOpCI

## Lattice and Shell Tools

*Smart tools for creation and optimization of advanced structures ...*



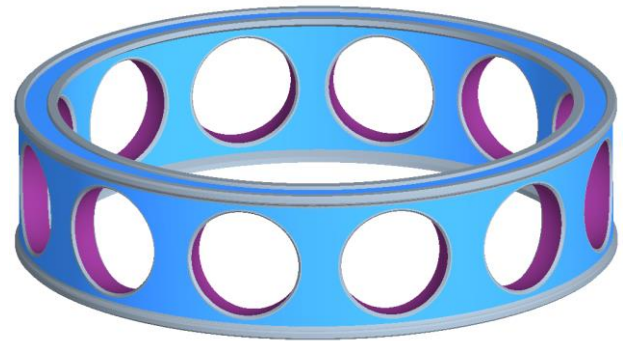
- *Cage with honeycomb lattice*
- *Full 3D model – only solid finite elements*



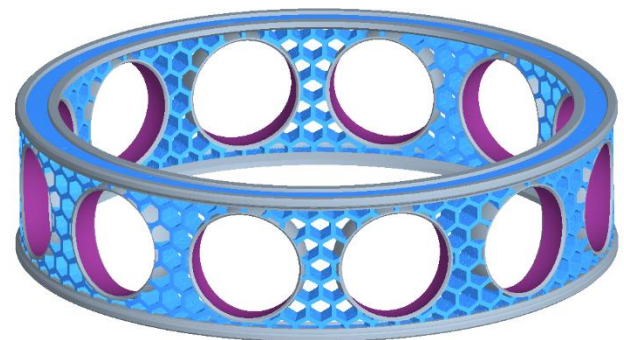
CAESS ProTOp Ver: 3.1.7 Cyc: 0 VolPrt: 31.1  
Date: 03/11/2015 Inp: CAESS\_Cage-XXL.ptop Own: CAESS d.o.o.

# Lattice and shell tools in ProTop/CI. Overview ...

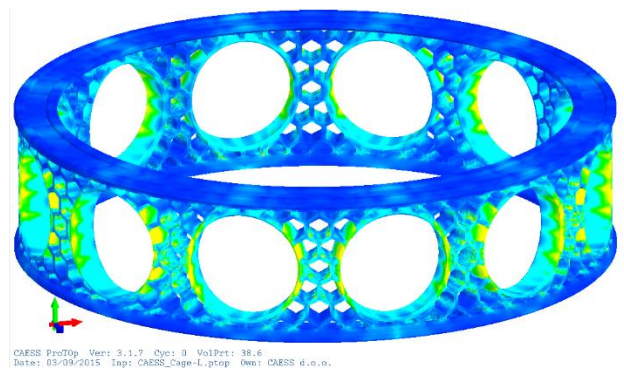
- Prepare the CAD model of your solid part in your favorite modeler
- Apply BCs as usually to define and complete your FEA model
- No need to bother with CAD modeling of a shell or lattice structure



- Import your FEA model into ProTop/CI and select the desired lattice pattern
- Adjust your lattice configuration as desired
- Create any number of additional (different) lattice configurations if needed

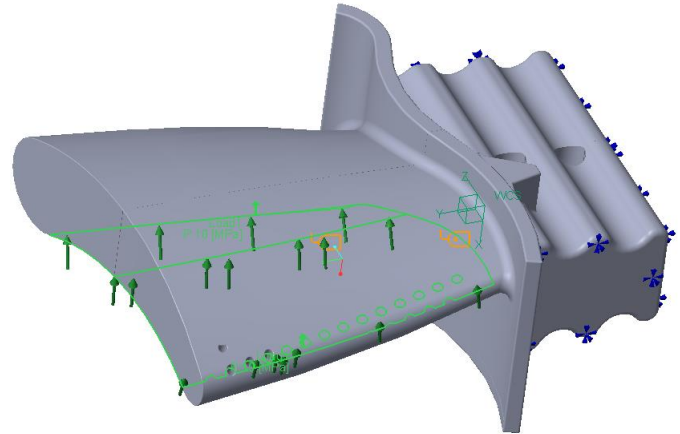


- Check quickly your design by running ProTop/CI initialization FEA
- Simply proceed with optimization cycles to improve the design and remove stress concentrations
- Engage ProTop/CI export tools to smooth and export your design



# Lattice and shell creation from solid models ...

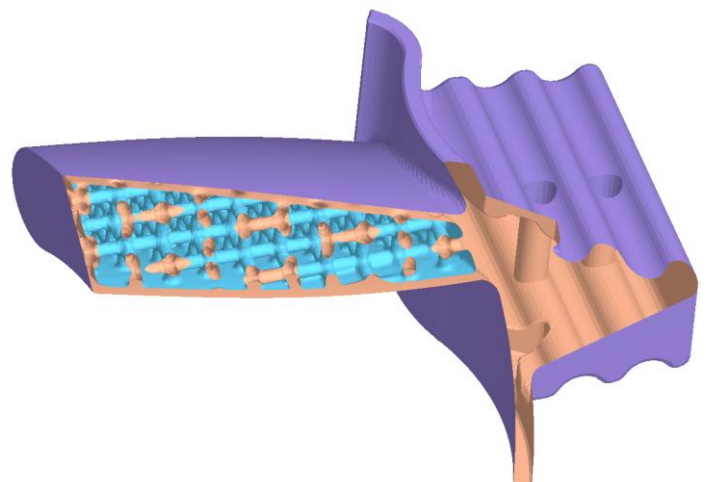
- Use your favorite modeler to create the CAD model of your solid part
- Add and apply various supports and loads to create various analyses – these will define optimization load cases
- Create the FEM model (meshing, export to a FEM model file)



- In ProTOp/CI import the FEM model
- Create numerically various configurations: solid, lattice, shell/lattice
- Any number of configurations can be defined without any CAD modeling
- Individual lattice patterns can be arbitrarily combined by superposition to form more sophisticated patterns

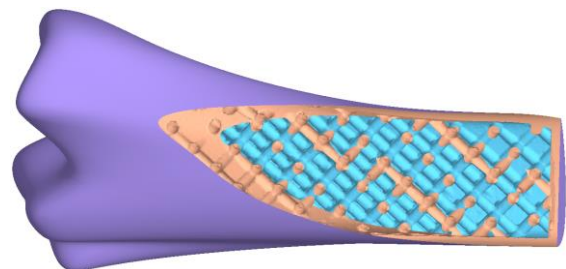
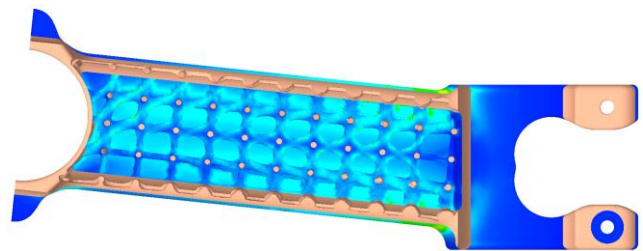
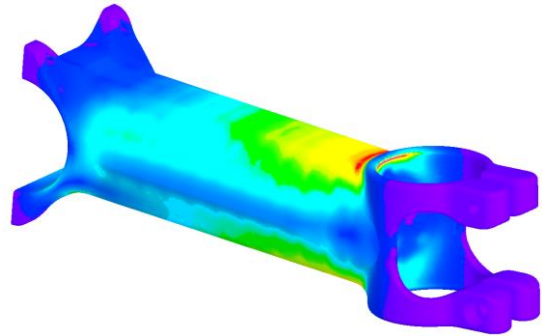
CNFRegions   Add new   Add copy			
	Configuration	Active	Name
	SolidNormal	<input type="checkbox"/>	
▶	Lattice	<input checked="" type="checkbox"/>	Cross
	Lattice	<input type="checkbox"/>	Diag
	Shell	<input checked="" type="checkbox"/>	
	Lattice	<input type="checkbox"/>	H Comb Wall

- Check visually your design (cross-sections) to finalize your configuration data
- Adjust and fine tune the parameters (min/max thicknesses, ...)
- The full 3D (solid finite elements) structure is immediately ready for optimization



# Optimize a full 3D model to make your part durable and failure resistant ...

- Stress concentrations initiate fatigue cracks which lead to structural failure
  - Thus, stress concentrations have to be removed by all means
  - This can only be done by optimizing a full 3D model containing solid finite elements
- 
- ProTop/CI tools create full 3D lattice and shell models
  - Optimization reshapes lattices and shells (continuously varying thickness) to lower the stresses and remove stress concentrations
  - This makes the optimized part resistant to fatigue cracks and failure
- 
- Ideally for development of lightweight and durable load-carrying structures
  - Applicable in a wide range from machinery parts to medical implants
  - Perfectly suited for new additive manufacturing technologies



# Contact us at...

info@caess.eu

*We will be glad to discuss your needs and we will do our best to fulfill your expectations.*

Our location within Slovenia



and Europe



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