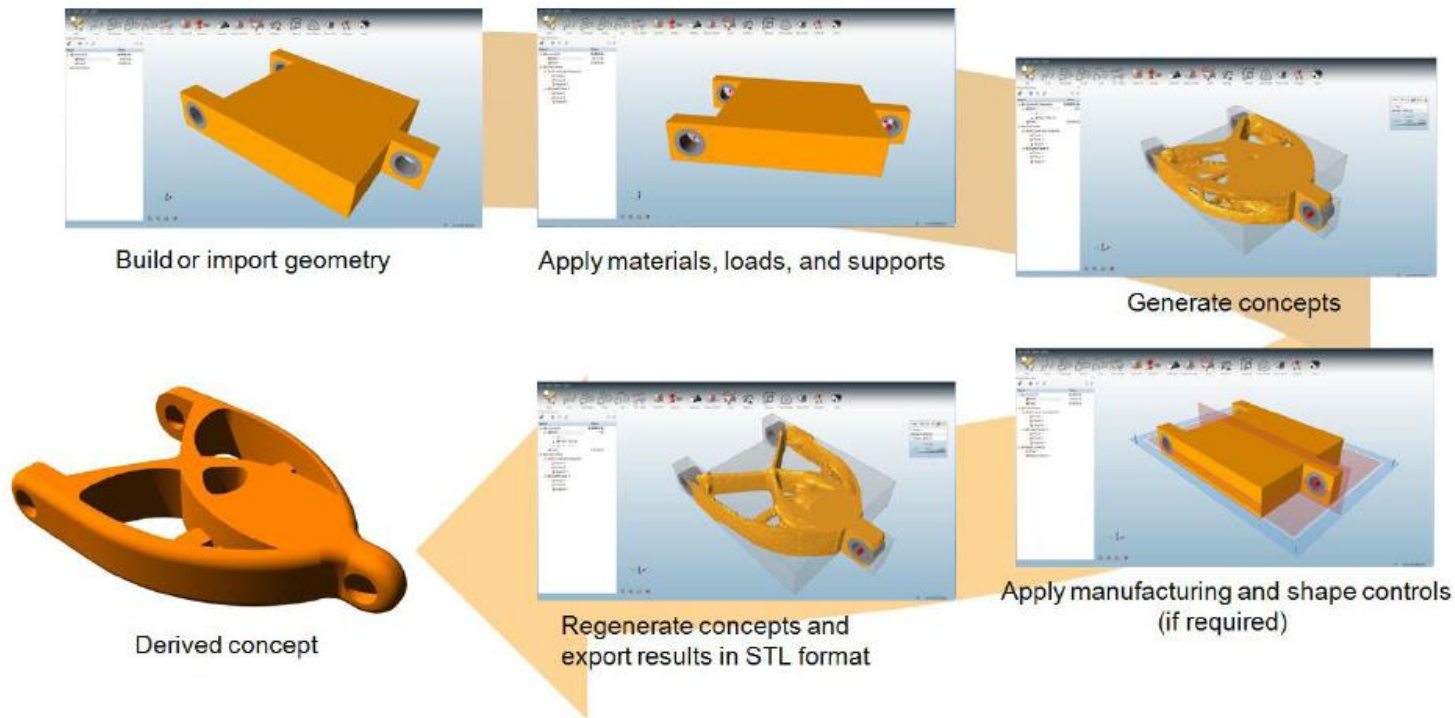


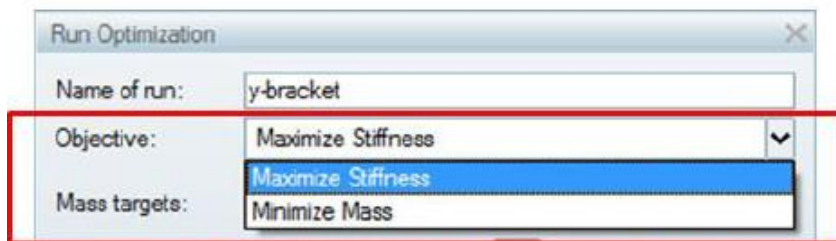
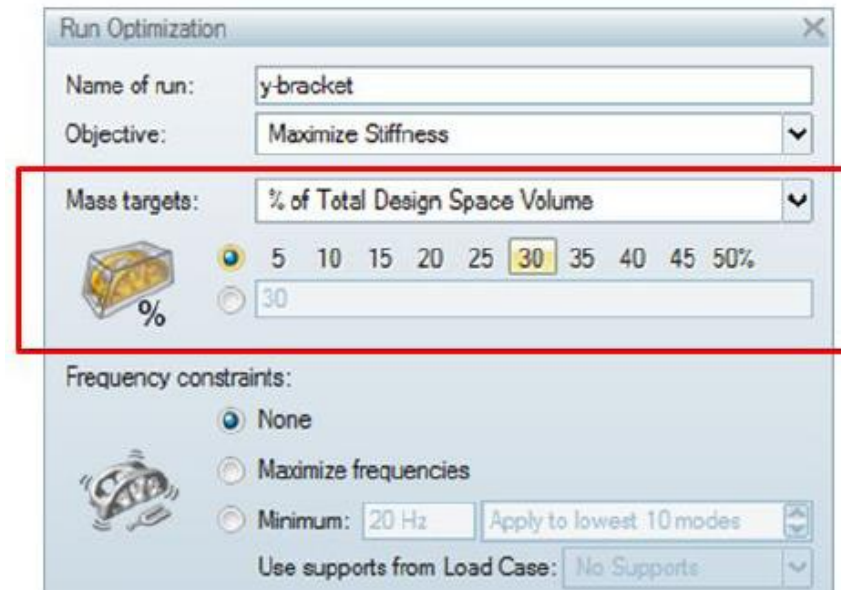
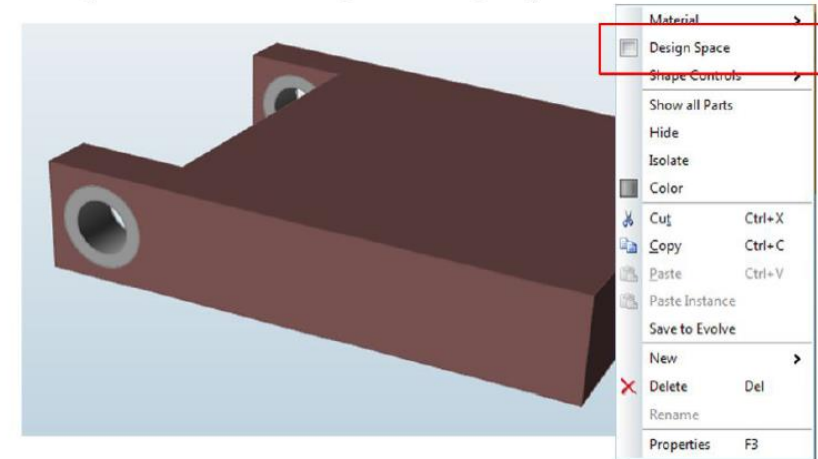
Topology Optimisation

- Used in early conceptual design phase to define major loadpaths



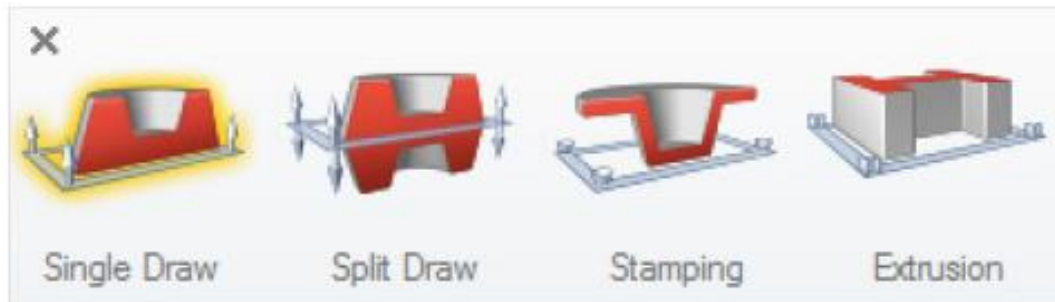
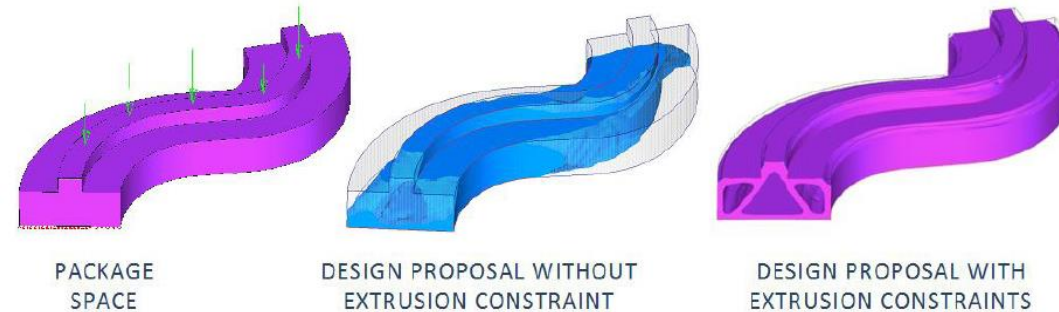
Topology Optimisation - Inputs

- Package space
 - Designable regions
 - Non-designable regions
- Boundary conditions
- Loadcases
- Variable
- Objective
- constraints
- If material is linear, material choice is irrelevant



Topology Optimisation - Variables

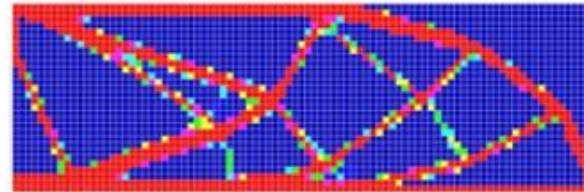
- Material usage
- Min member
- Spread fraction
- Manufacturing constraints
- Symmetry constraints



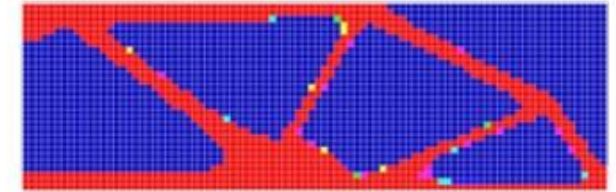
- Single draw: parting plane outside of the design space
- Split draw: parting plane inside design space
- Stamping: uniform thickness
- Extrusion: uniform profile

- Symmetric
- Cyclic
- Cyclic symmetric

Topology Optimisation - Variables



Without Minimum Member Size



Minimum D=60

- Material usage
 - Tip: Try 0.3 to start
- Min member size
- Controls the smallest dimension to be retained
- Minimising “checkerboarding” by forcing 0/1 answers
- Tip: Try three times your element size to start

Topology Optimisation - Variables



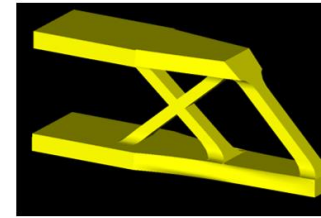
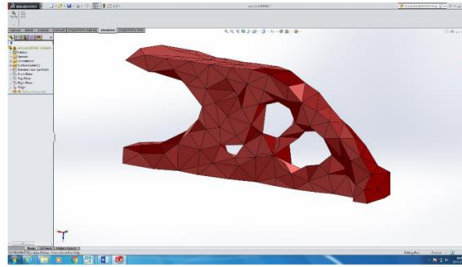
Without Maximum Member Size



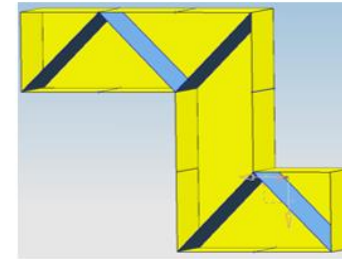
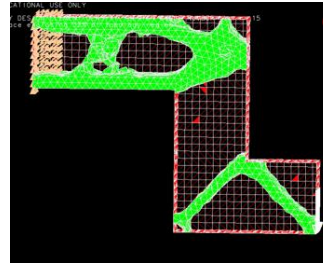
With Maximum Member Size

- Max member size
- Controls the largest dimension to be retained
- Fine mesh!
 - Twice your min member size to start
 - If min member was 3 times your element size – this needs to be 6 times your element size
 - Half the width of your thinnest part of your design
- Use with caution

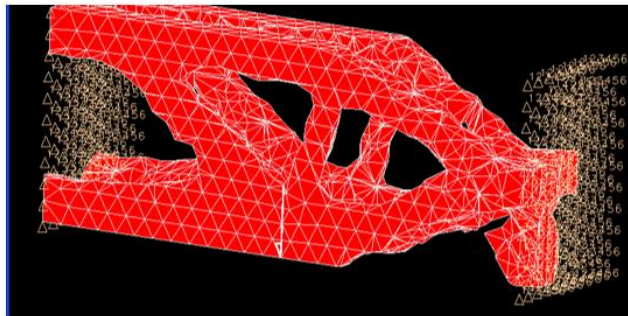
Topology Optimisation Examples



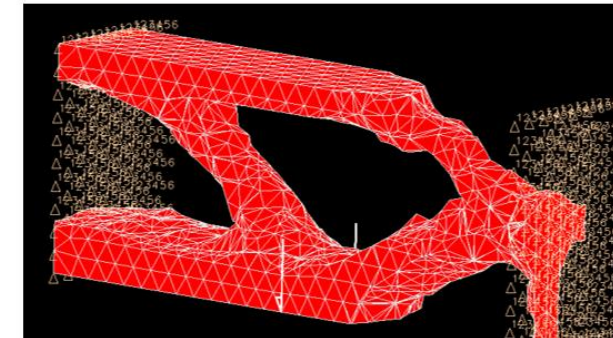
One loadcase



Ribbings in castings



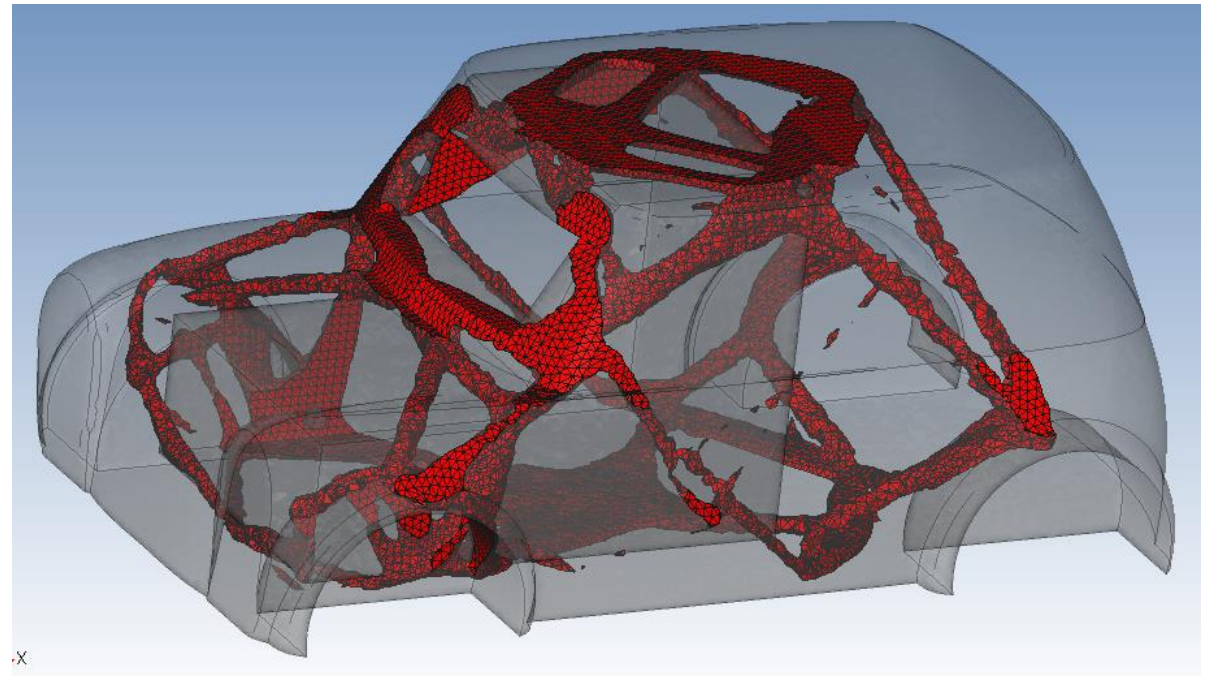
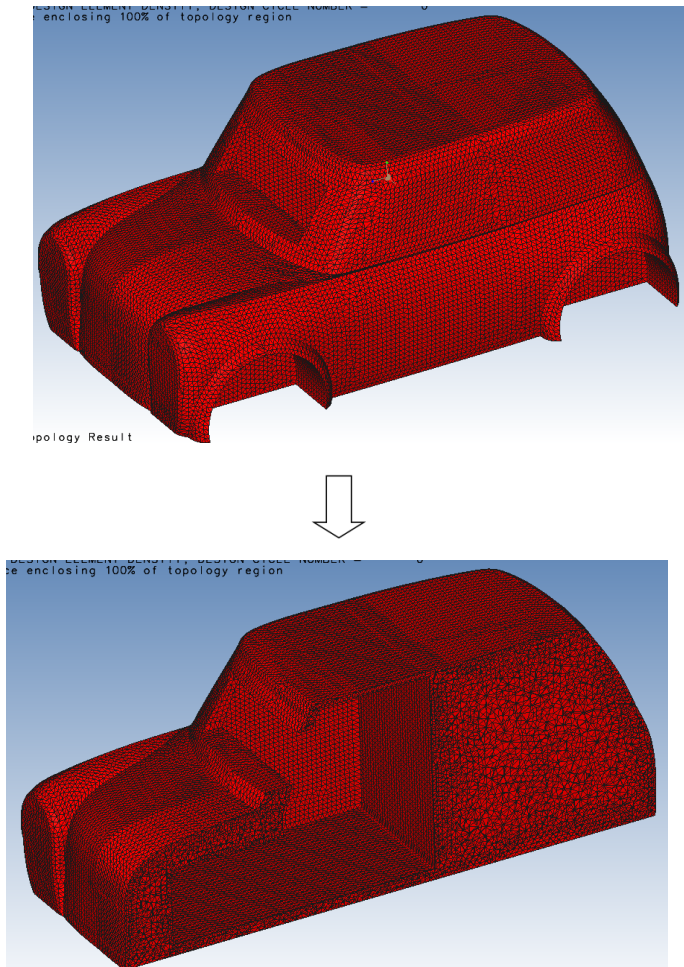
Multiple loadcases



Multiple loadcases with casting constraints

Topology Optimisation Examples

- Design must be interpreted
- Use your engineering judgement!



Notes adapted from/Further reading

- Practical Aspects of Structural Optimisation, Altair University, 2014