



# RAPID REMODELING IN ANSA/META FOR ADDITIVE MANUFACTURING DESIGN OPTIMIZATION

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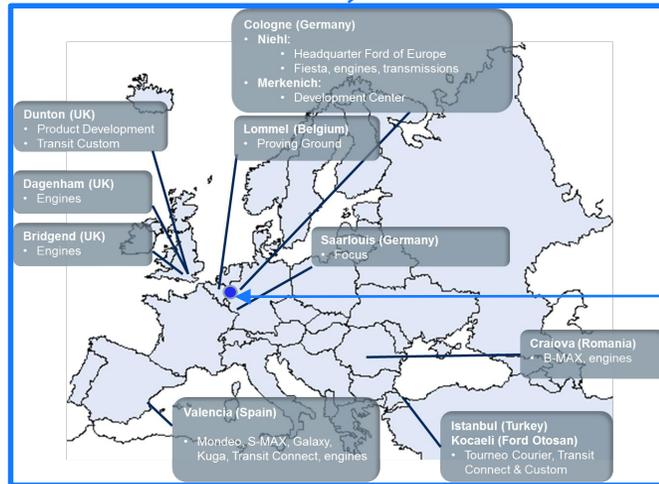
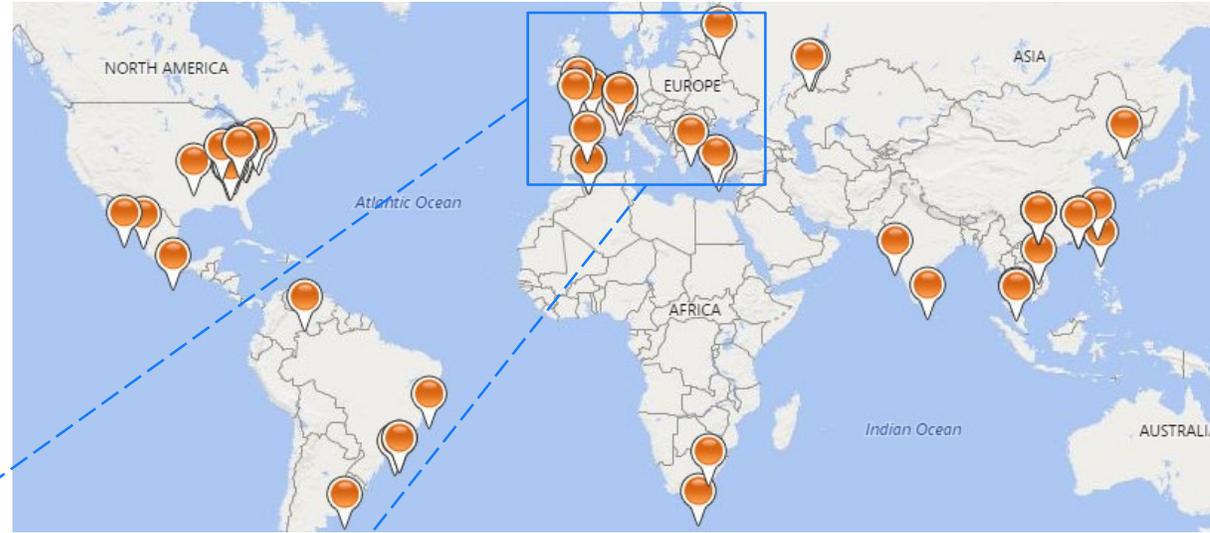
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# FORD MOTOR COMPANY – FORD OF EUROPE – FORD RESEARCH & INNOVATION CENTER AACHEN

- 62 plants worldwide
- 200 markets
- 203,000 employees, 53,000 in Europe
- \$141,5 billion revenues, \$28,5 billion in Europe
- 6.6 million vehicle units, 1.5 million in Europe
- \$ 7.3 billion expenses for engineering, research and development



FORD RESEARCH & INNOVATION CENTER AACHEN

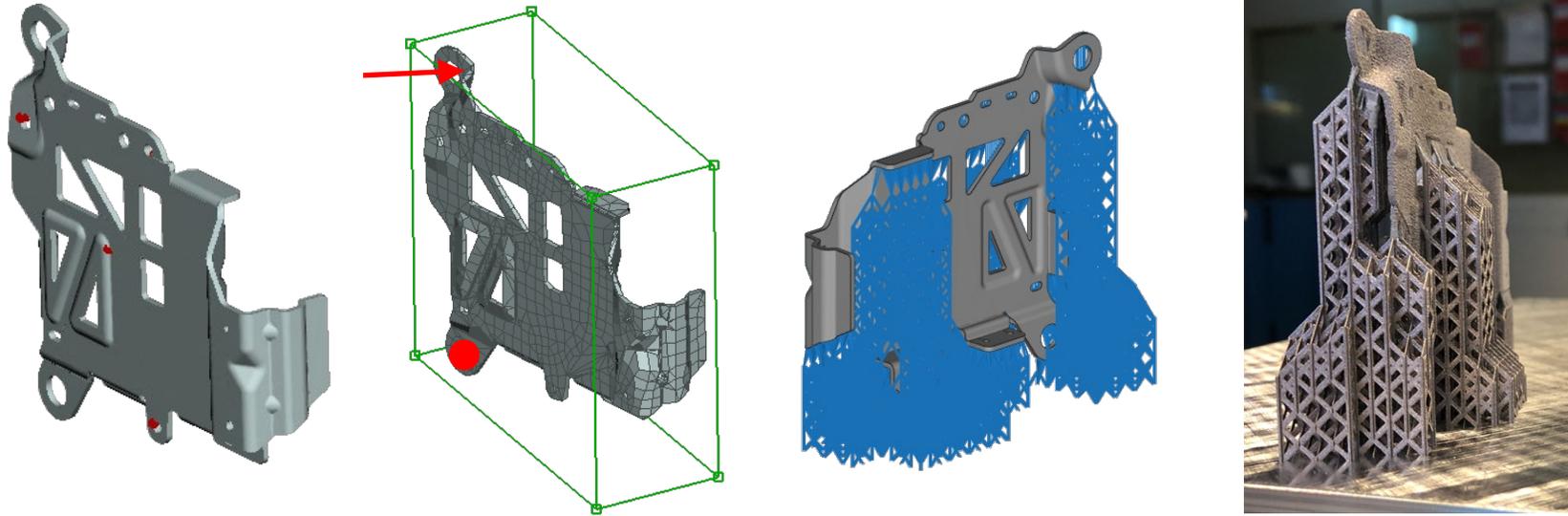


# ADDTIVE MANUFACTURING @ FORD MOTOR COMPANY

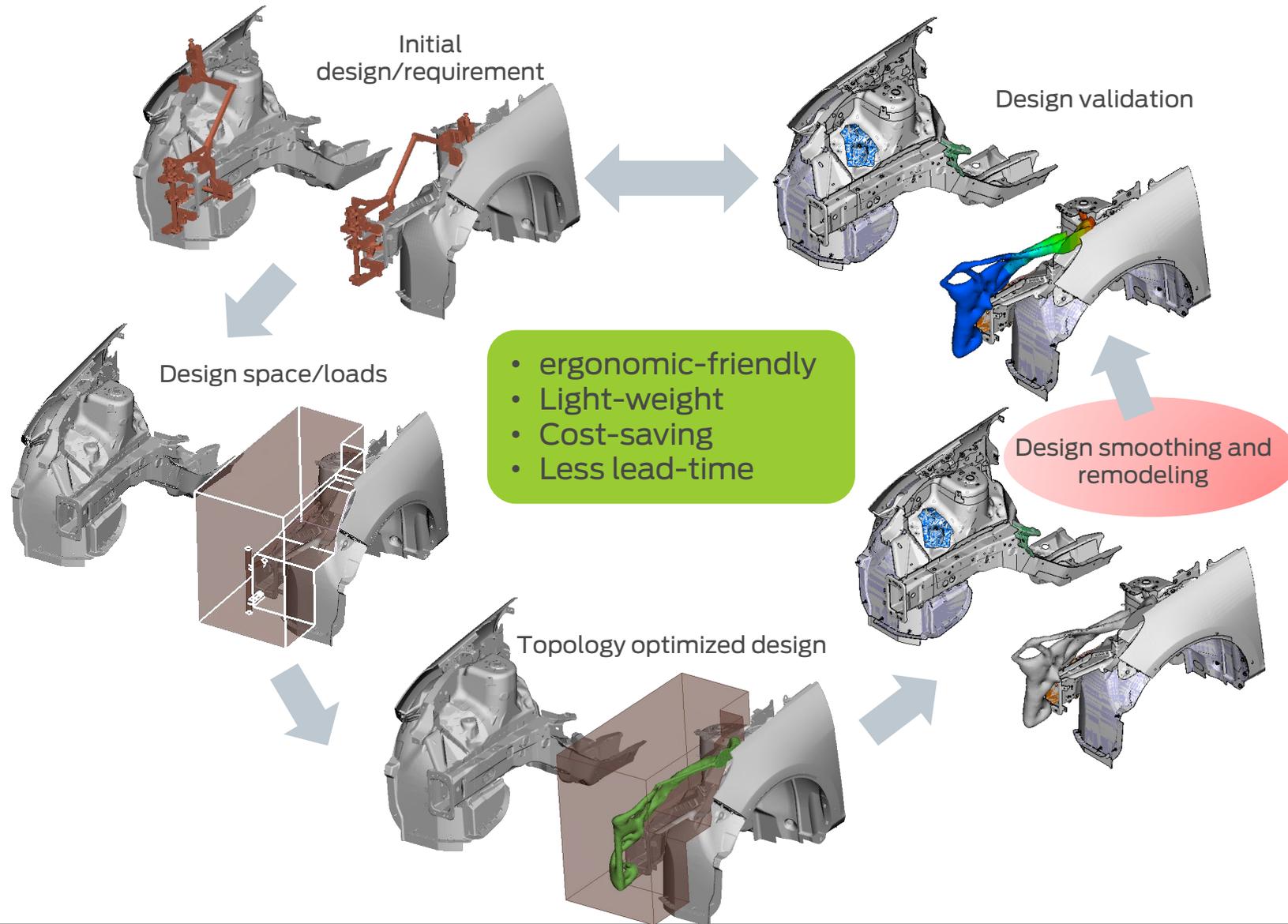
Video here: <https://www.youtube.com/watch?v=6GsuRCGEZno>



# ADDDITIVE MANUFACTURING CAE

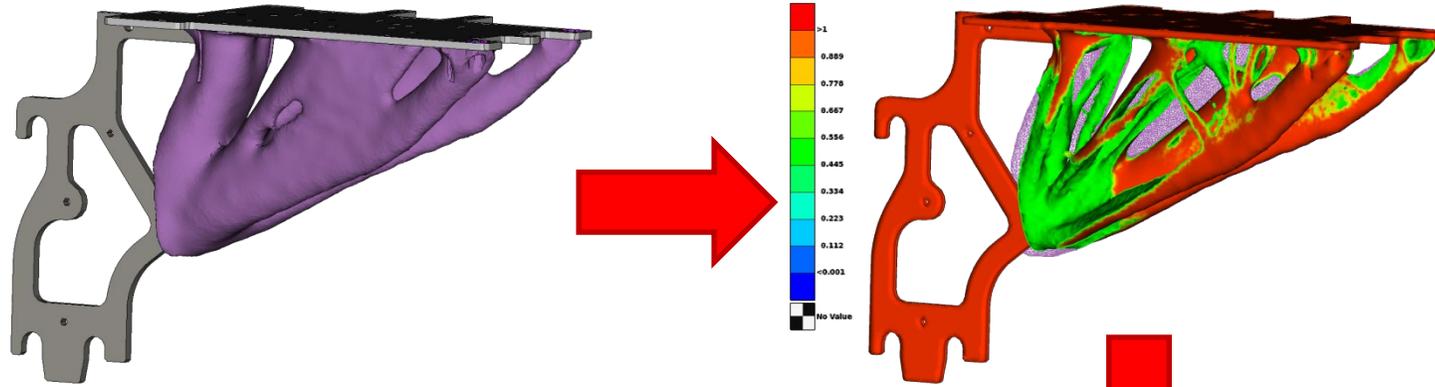


# CAE OPTIMIZATION FOR ADDITIVE MANUFACTURING



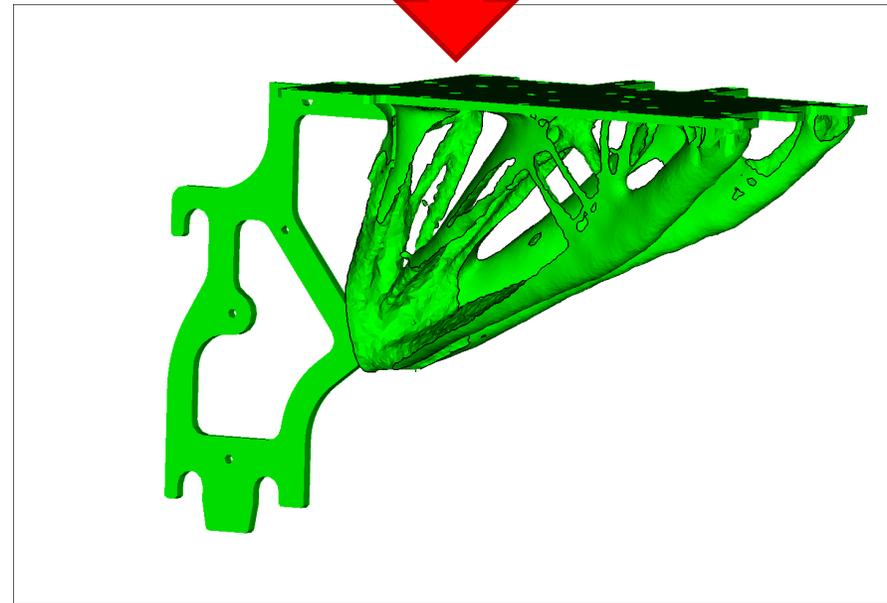
# RAPID REMODELING IN ANSA/META

## 1. ISO-SURFACE FROM THE TOPOLOGY OPTIMIZATION RESULT



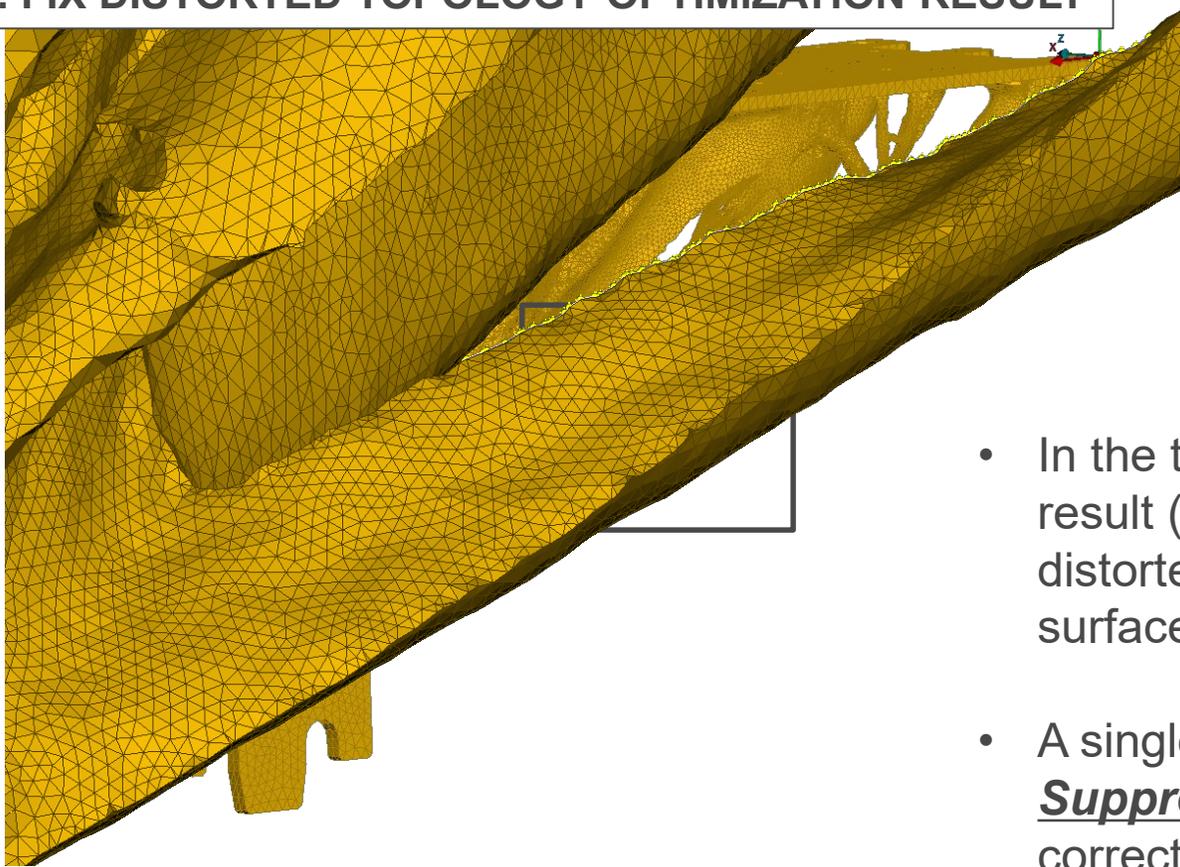
Visualize the topology results in META  
“Topology Optimization” toolbar

- View the suggested ISO-surface
- Manipulate the outcome through the topology toolbar
- Select areas from optimization iterations
- Output ISO-surface



# RAPID REMODELING IN ANSA/META – CONT'D

## 2. FIX DISTORTED TOPOLOGY OPTIMIZATION RESULT

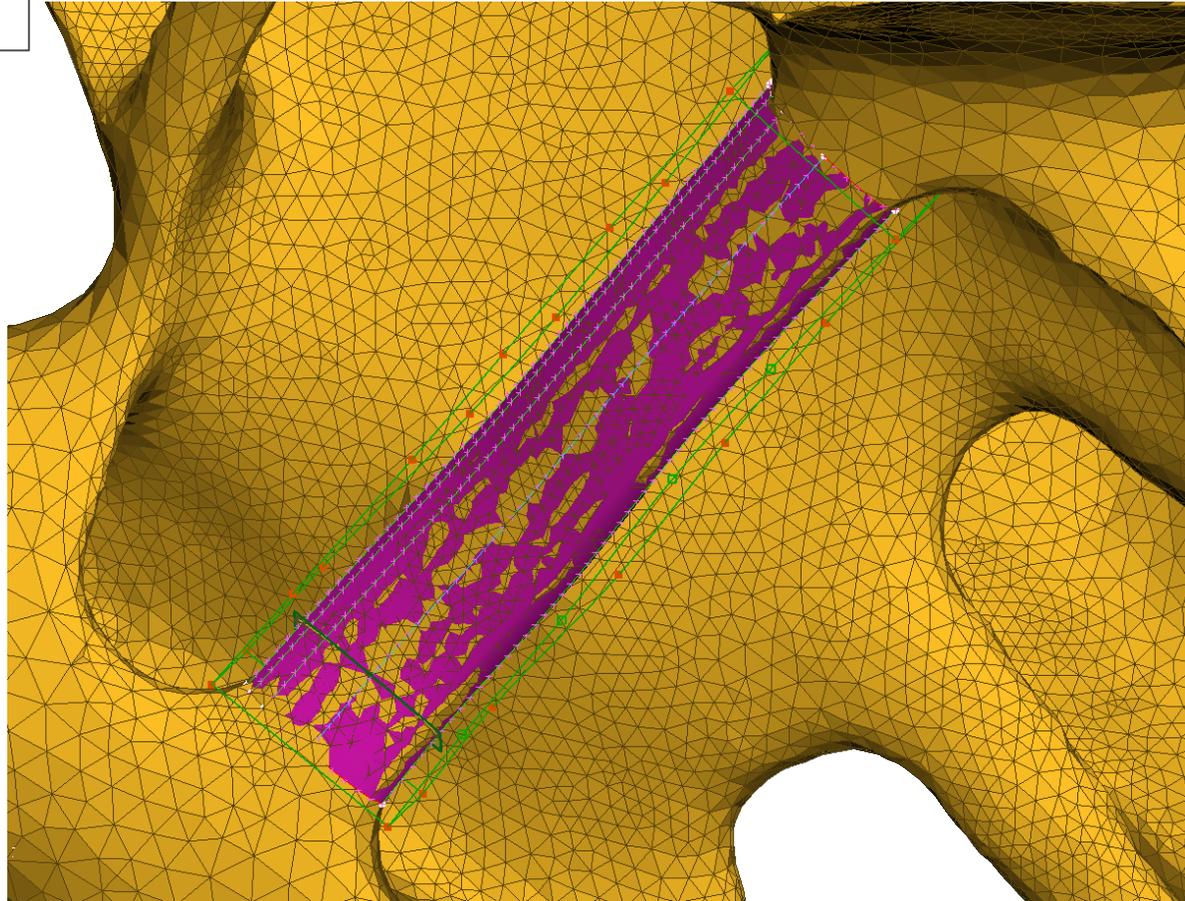


- In the topology optimization result (\*.stl), there are often distorted elements on the surface.
- A single ANSA function: **Suppress>Noise** can correct these distorted elements easily

## RAPID REMODELING IN ANSA/META – CONT'D

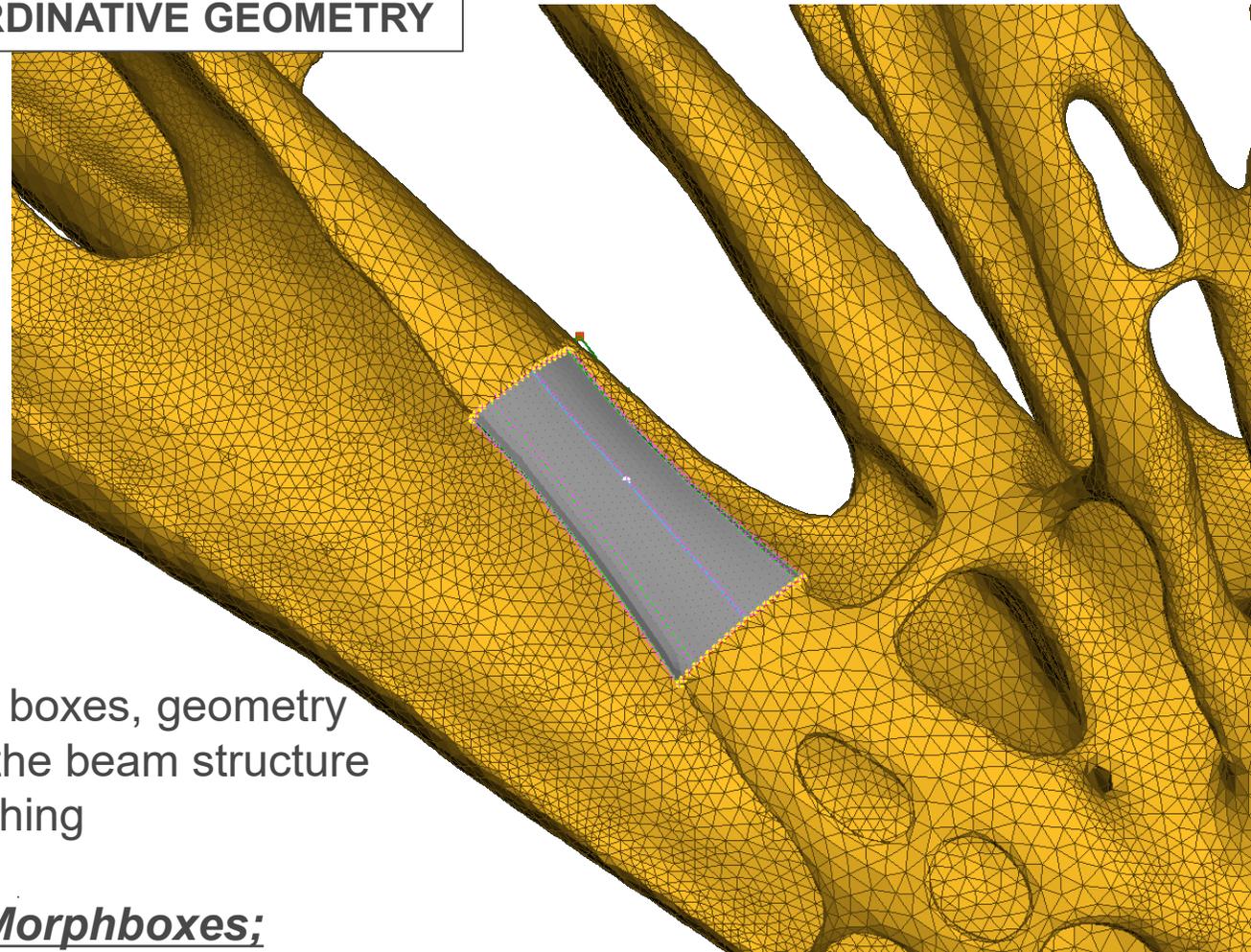
### 3. GEOMETRY ALIGNMENT

- Geometry can be created on a beam-like structure with the use of morphing boxes
- Apply user-defined cross sections to get desired shape
- Morph elements of the beam structure to adjust newly created geometry
- ANSA Functions:  
*Morph boxes; Cross-section; A\_ Extrude; DFM>Align*



## RAPID REMODELING IN ANSA/META – CONT'D

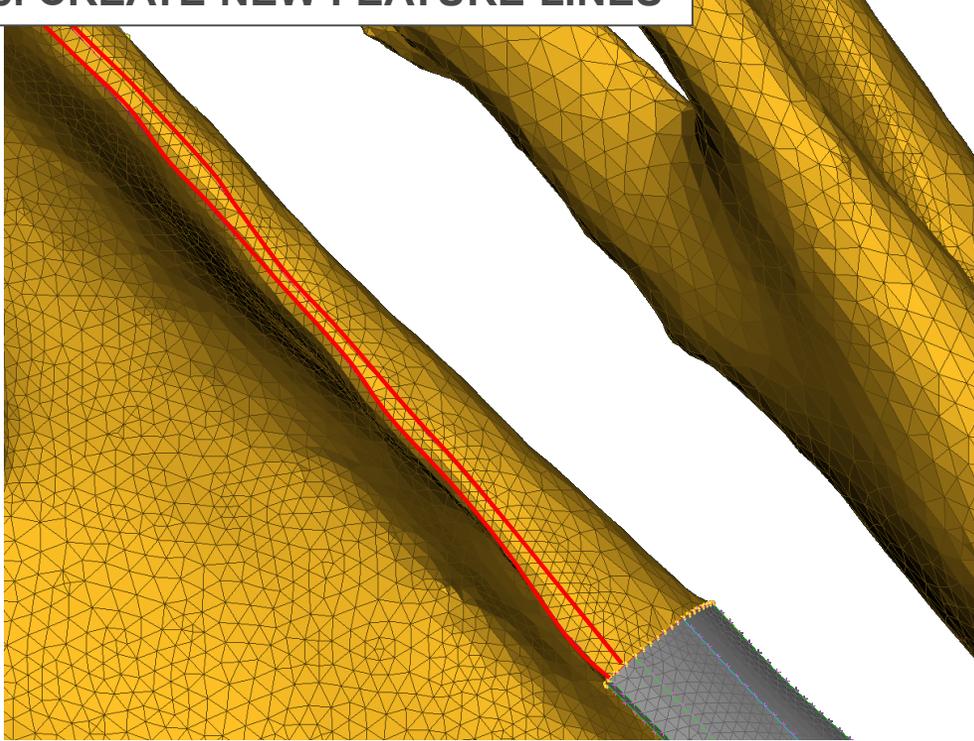
### 4. CREATE SUBORDINATIVE GEOMETRY



- By using morphing boxes, geometry faces can replace the beam structure meshes for re-meshing
- ANSA Functions: **Morphboxes;**  
**Cross-section; A\_**  
**Extrude;**  
**Fill>Manual**

## RAPID REMODELING IN ANSA/META – CONT'D

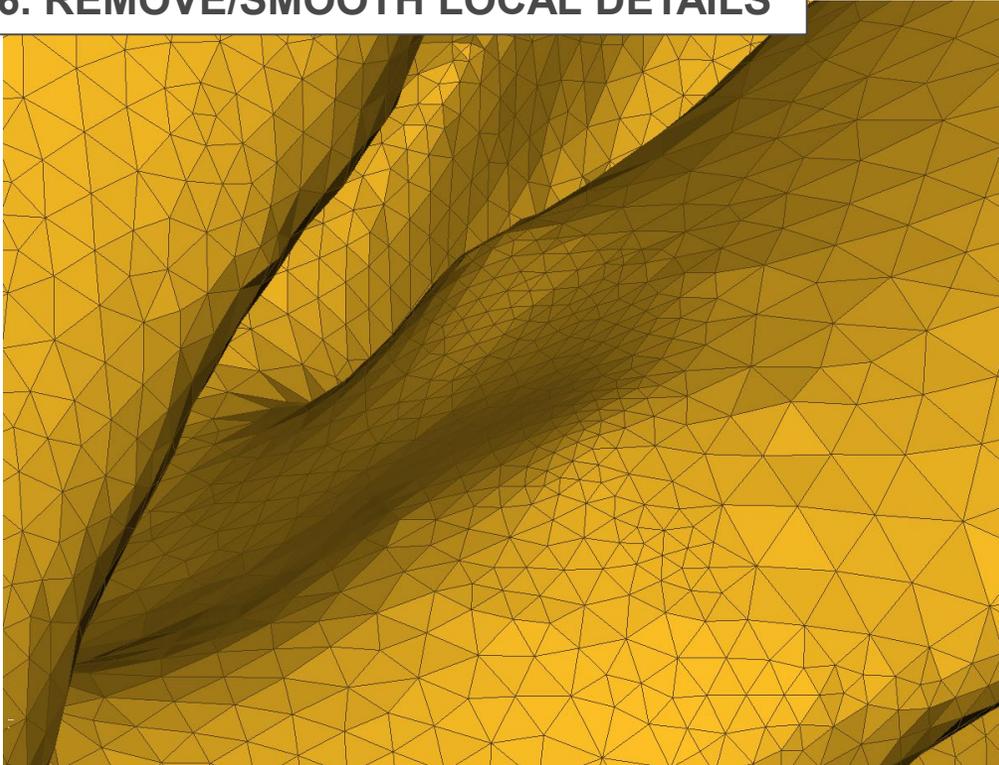
### 5. CREATE NEW FEATURE LINES



- Smoothing and recreation of feature lines based on a topology optimized mesh is often a difficult task
- Projection of curves onto the FE elements can be very helpful in creating new feature lines
- ANSA Functions:  
**Project>Curves**

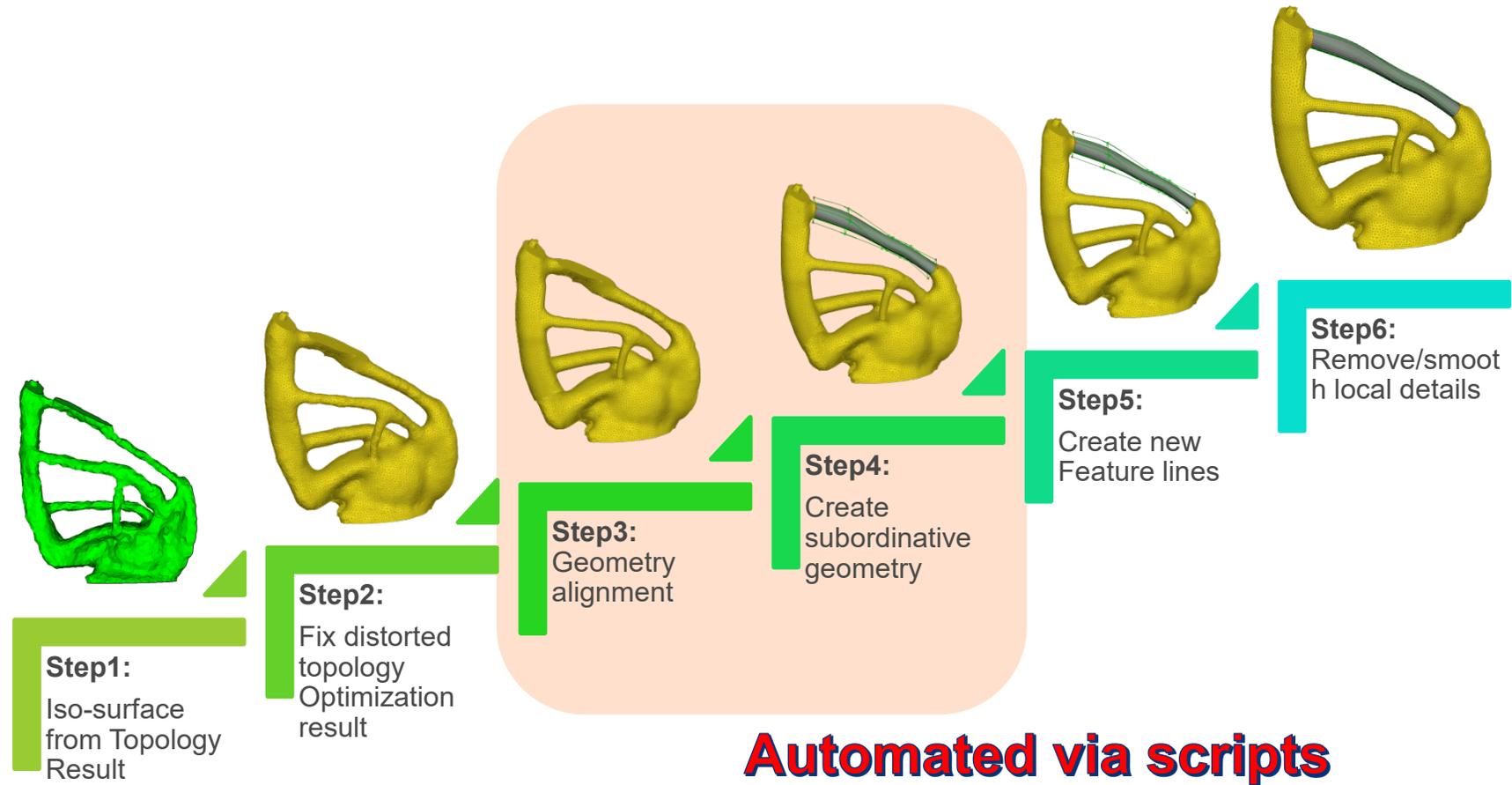
## RAPID REMODELING IN ANSA/META – CONT'D

### 6. REMOVE/SMOOTH LOCAL DETAILS

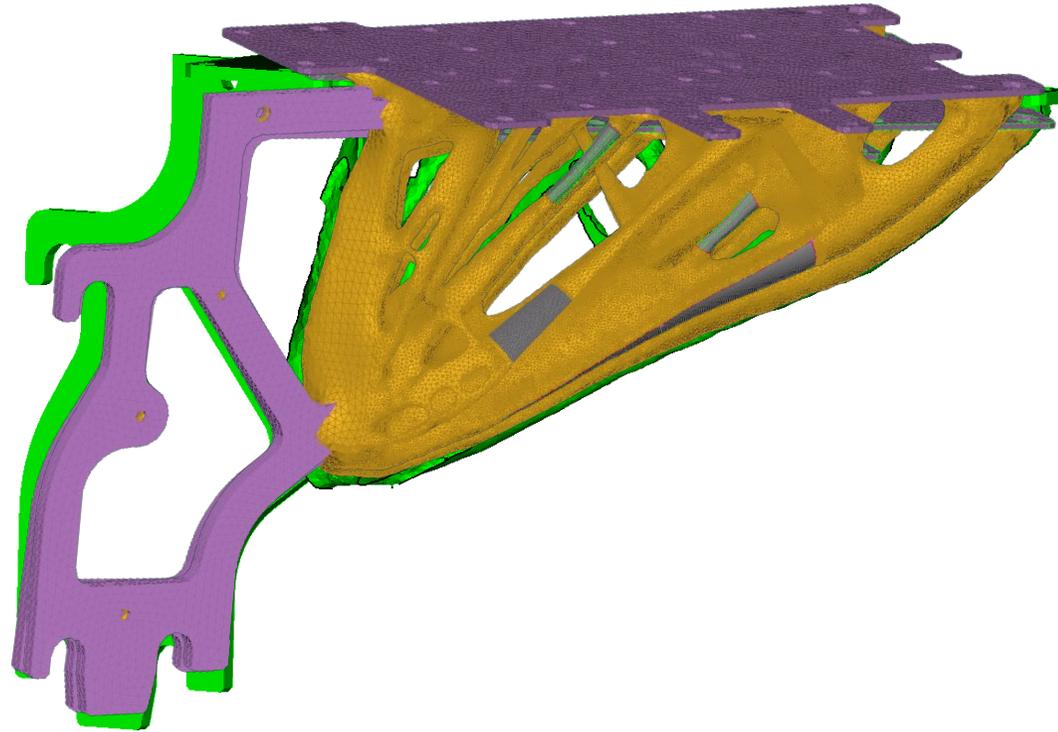


- Undesired localized mesh perturbation often exists in topology optimization results
- Quick and easy suppression of these areas can be done with a single ANSA function:  
**Suppress>Noise**

# ANSA/META PROCESS FOR AM DESIGN



## SUMMARY



- Additive Manufacturing (AM) technologies are one of the key technologies in the future.
- It is challenging to find the optimal design solution for AM product in CAE design and optimization process efficiently.
- Advanced pre/post processing functionalities in ANSA and META, enables smoothing, remodeling and validating topology optimized designs efficiently.



Thank You

