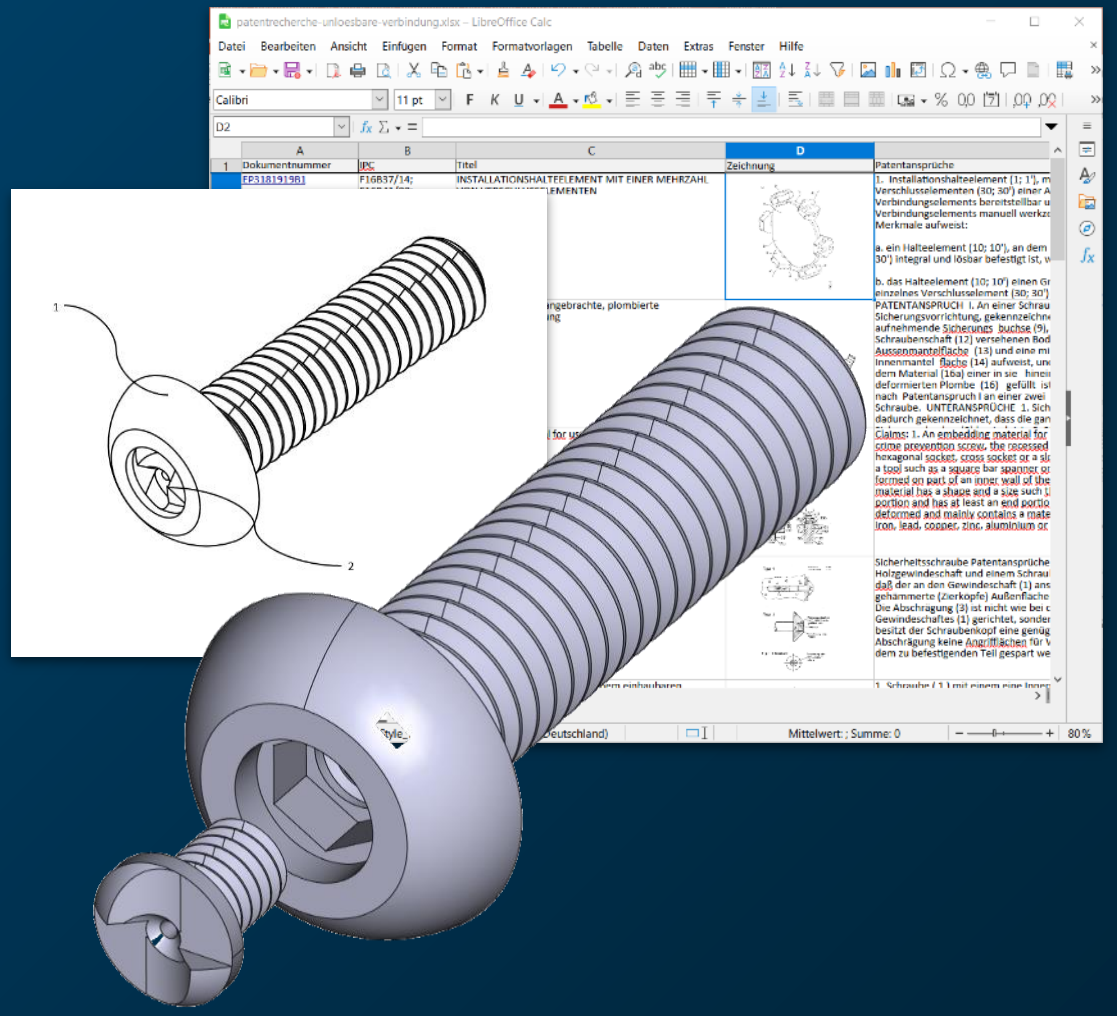
ALSADO

Keynote

Product development with FreeCAD

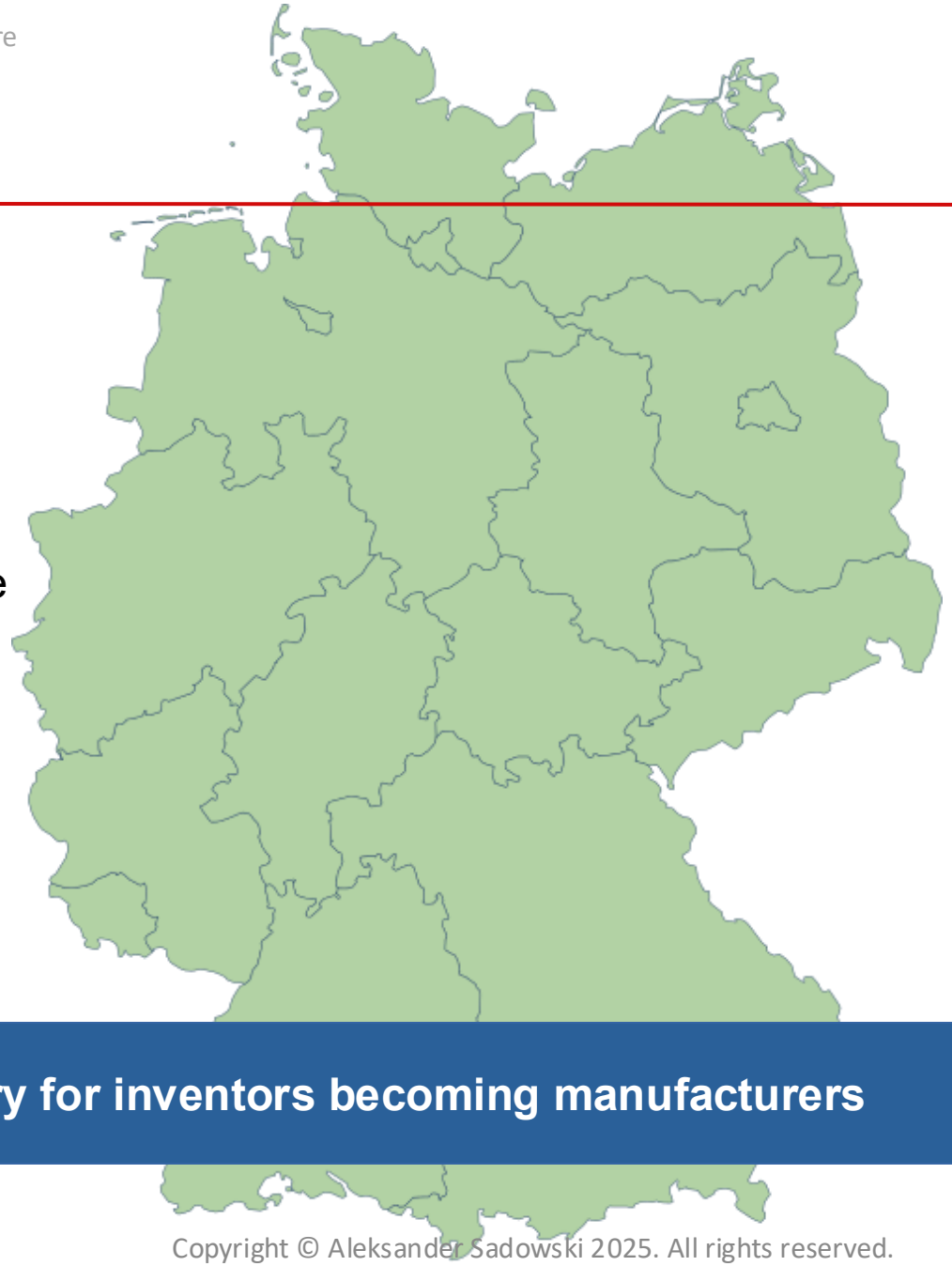
Guide to the product development process using open-source software



Aleksander Sadowski

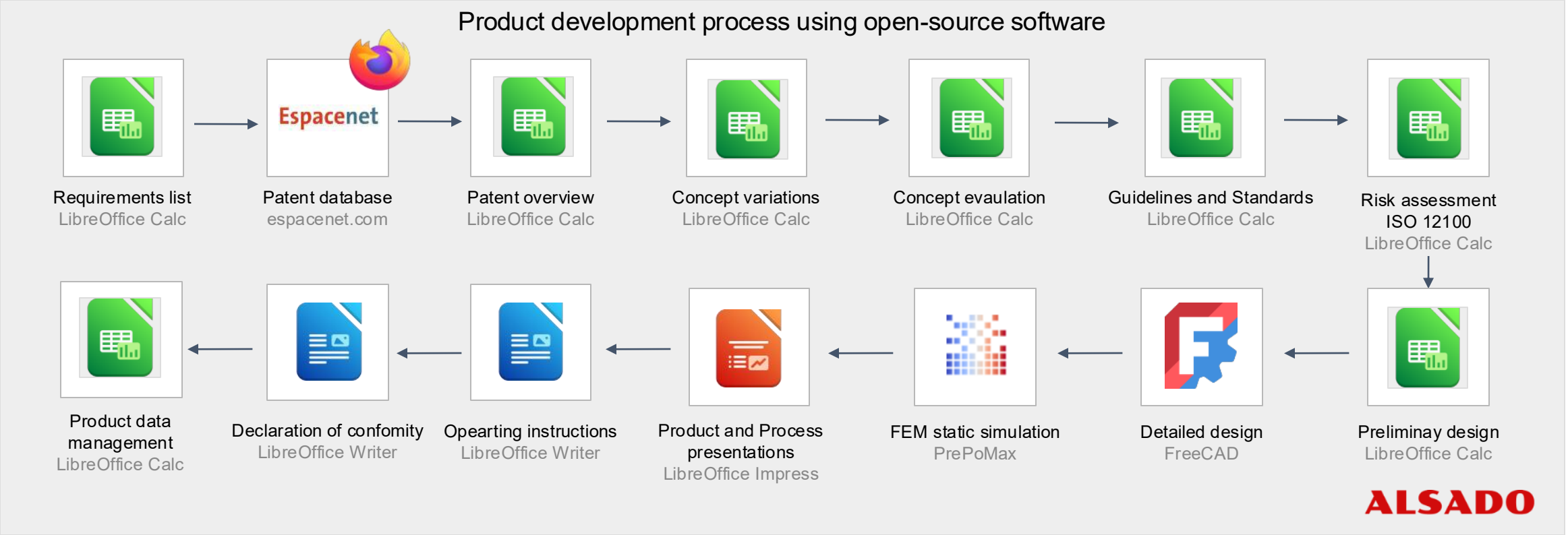
Manufacturing in Germany

- Industry on downwards trends
- Affecting overall prosperity across entire nation
- China is taking over High-tech
- Boost inventions and their implementation
- Entrepreneurs need lower barrier to entry and more stability



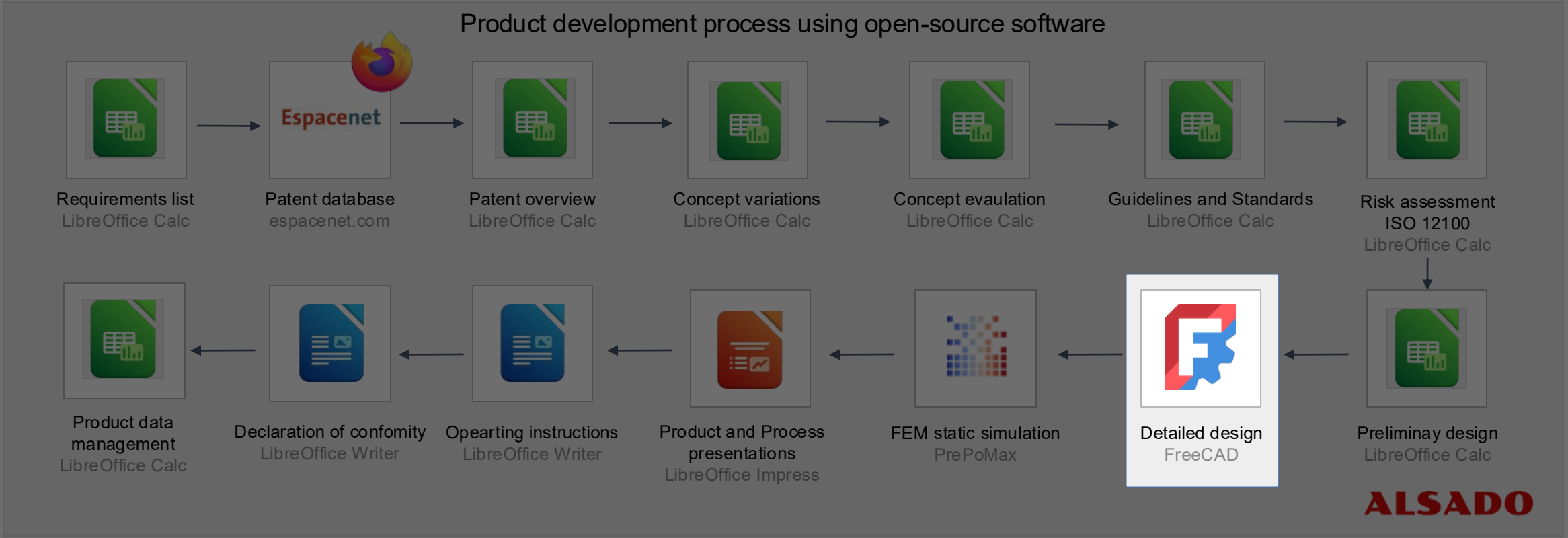
=> Open-source software lowers the barrier to entry for inventors becoming manufacturers

Overview of the Product development process using open-source software

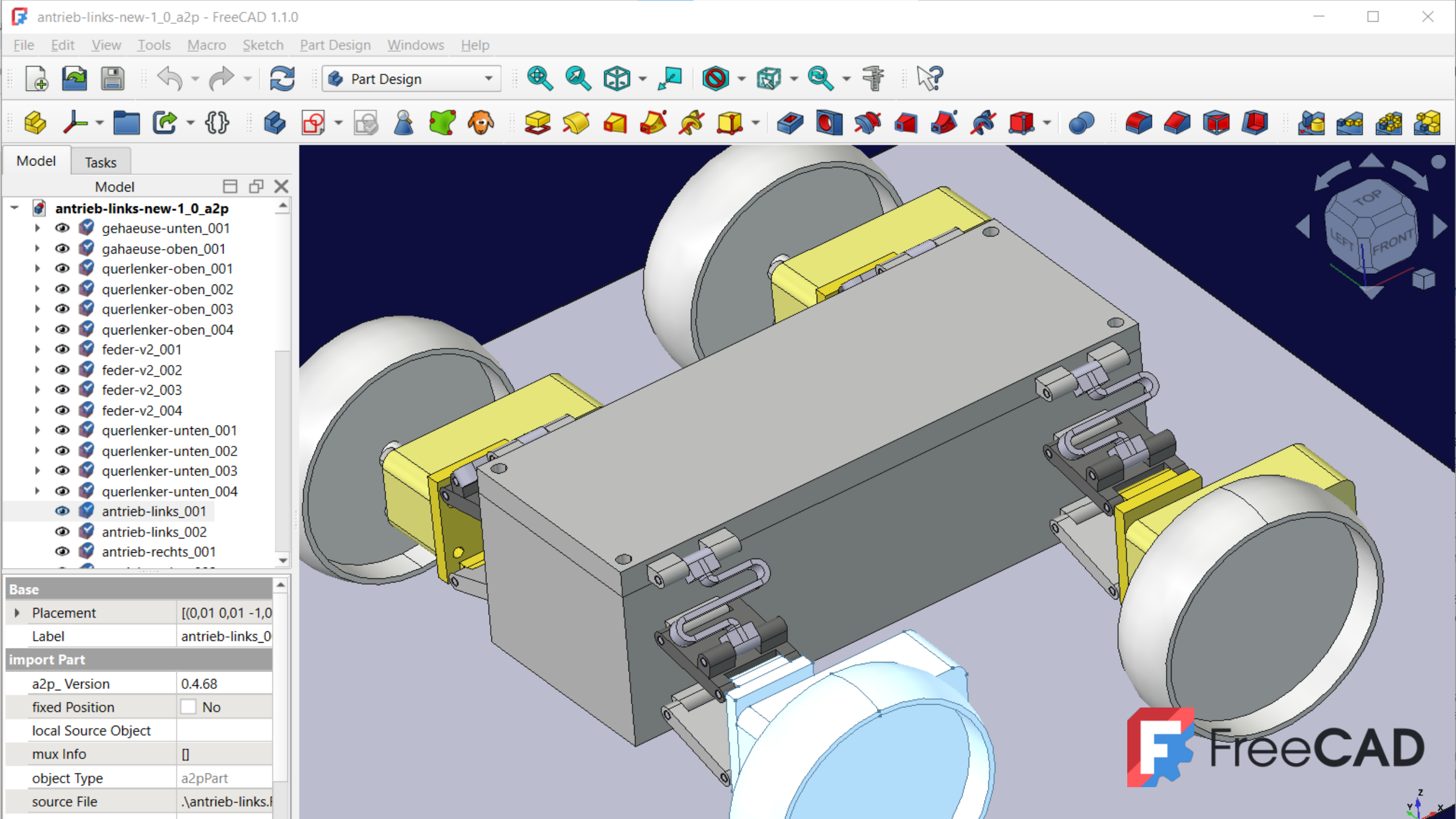


=> Product development can be fully implemented using open-source software

Overview of the Product development process using open-source software

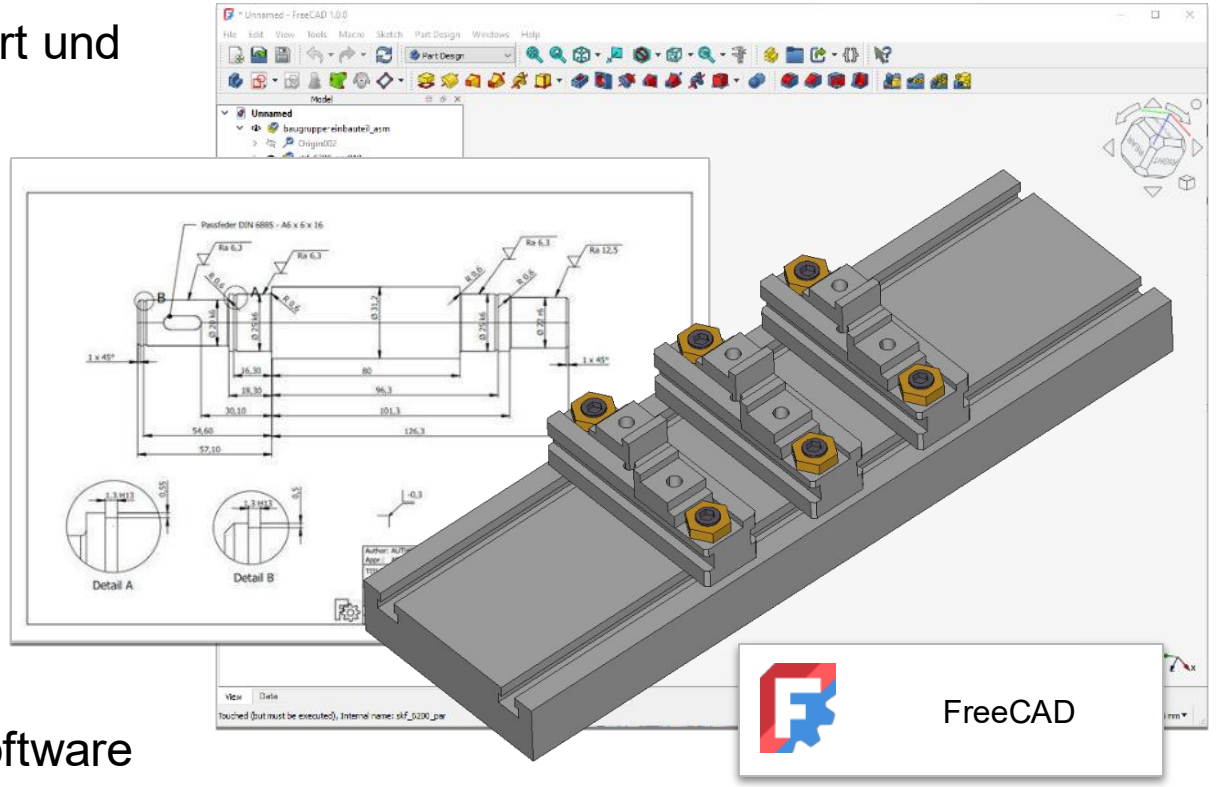


=> Product development can be fully implemented using open-source software


antrieb-links-new-1_0_a2p - FreeCAD 1.1.0
File Edit View Tools Macro Sketch Part Design Windows Help
Part Design
Model Tasks
Model
antrieb-links-new-1_0_a2p
gehaeuse-unten_001
gahaeuse-oben_001
querlenker-oben_001
querlenker-oben_002
querlenker-oben_003
querlenker-oben_004
feder-v2_001
feder-v2_002
feder-v2_003
feder-v2_004
querlenker-unten_001
querlenker-unten_002
querlenker-unten_003
querlenker-unten_004
antrieb-links_001
antrieb-links_002
antrieb-rechts_001
Base
Placement [(0,01 0,01 -1,0
Label antrieb-links_0
import Part
a2p_ Version 0.4.68
fixed Position No
local Source Object
mux Info []
object Type a2pPart
source File .\antrieb-links.
TOP
LEFT
FRONT
FreeCAD

Detailed design in FreeCAD

- 3D-CAD-software with universal Interface: Import und Export STEP, DXF, PDF
- Modular framework:
  - Part Design (parts)
  - A2Plus (assemblies)
  - TechDraw (technical drawings)
- Python-API: Intuitively understand scripting and automate tasks
- Community: Wiki, Forum and social media
- Over 20 million downloads as a Desktop GUI software



=> FreeCAD is a complete 3D CAD software

Part Design: Creating individual parts

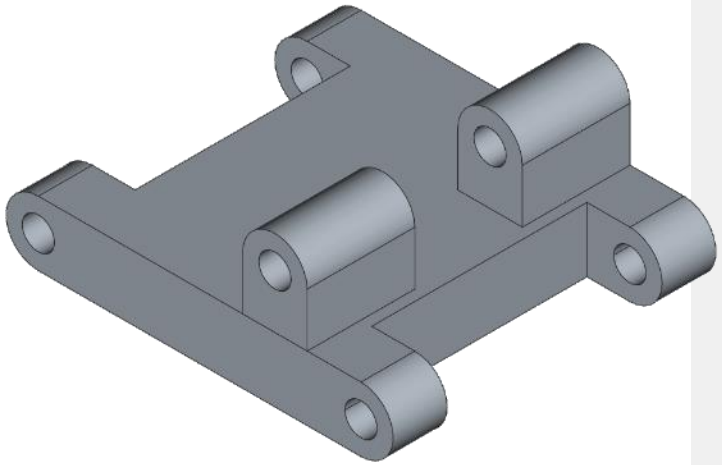
ALSADO

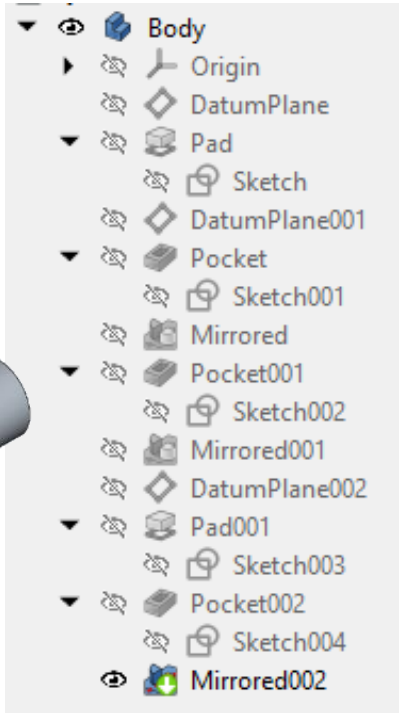
- Each document represents one part (*.FCStd)
- One body within document (except parts that require booleans)
- Body includes Origin (planes and axes)

Part Design Workflow:

1. Select plane or create a new datum plane
2. Create sketch on that plane
3. Create 3D feature from sketch (sketch gets consumed by feature)

- First additive then subtractive features
- Topology dependent features at the end





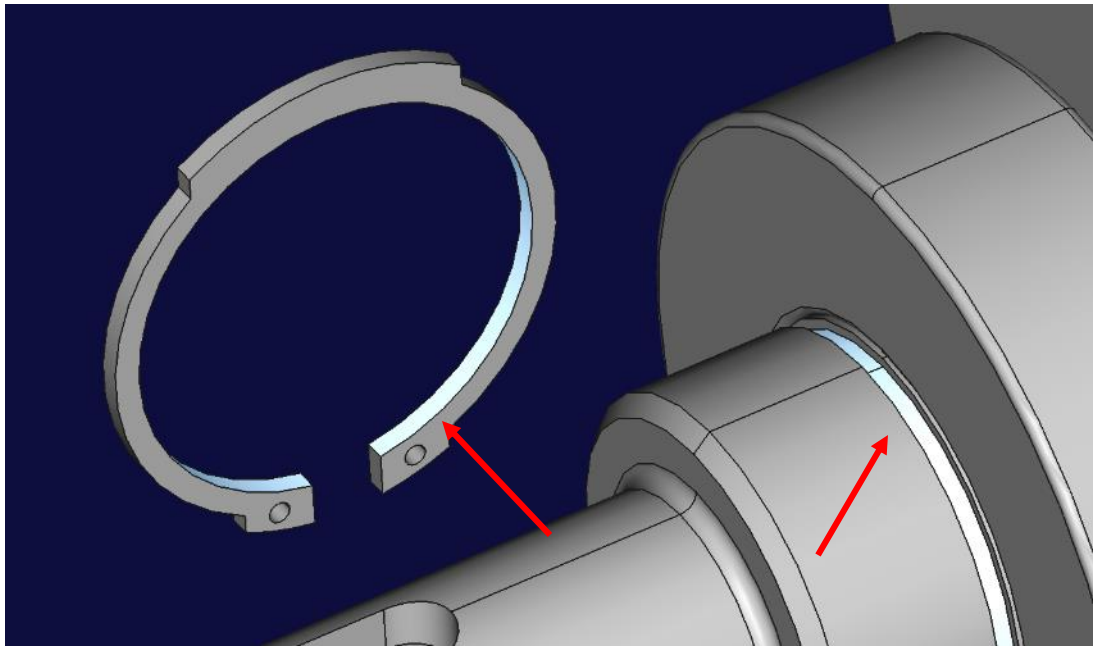
Body object of upper wishbone part in the document tree

=> Creating parts in FreeCAD is similar to most CAD software

A2plus: Creating assemblies using contraints

ALSADO

- Create each assembly as separate FreeCAD document (*.FCStd)
- Import instances of parts from external FreeCAD document (*.FCStd)
- Constrain faces and axes of parts (e.g. Plane coincident or Axis coincident)
- Temporarily move parts, to get access to selected topology elements
- Create a multi-level assembly hierarchy with subassemblies



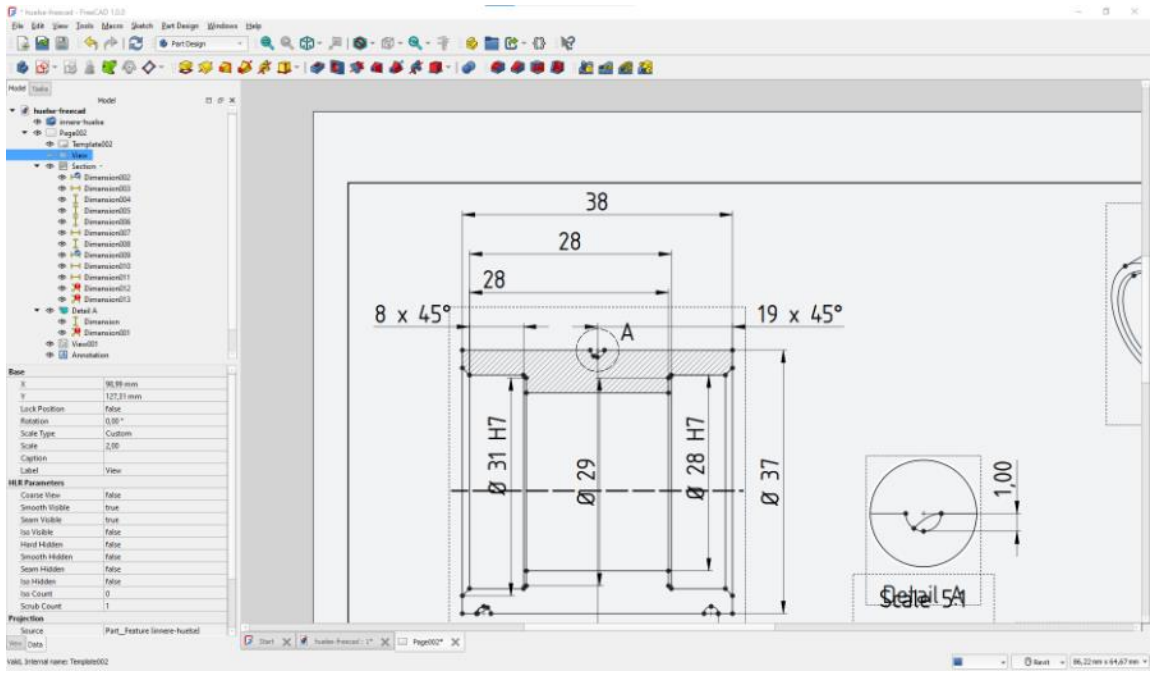
Selecting two cylindrical faces of the snap ring and groove to define a Axis conincident constraint

=> Creating assmblies in FreeCAD is similar to most CAD software

TechDraw: Creating technical drawings for manufacturing

ALSADO

- Create drawing page with integrated and editable page template (*.SVG)
- Rotate part body to its main view in 3D view, select it and create a projection group on the page
- Add dimensions (e.g. distance, diameter or radius) and tolerances (e.g. +/- per dimension or as page annotation)
- Add edge and surface annotations (e.g. roughness or edge break)
- Define material, treatment and more
- Export as PDF document for manufacturing



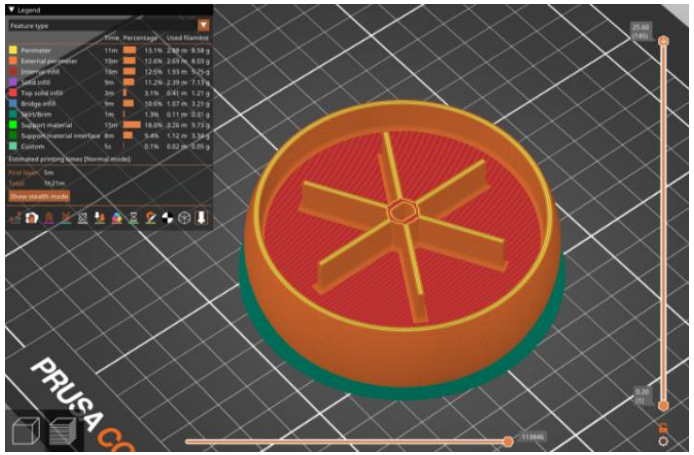
=> Derive technical drawings from 3D CAD models and get your design manufactured

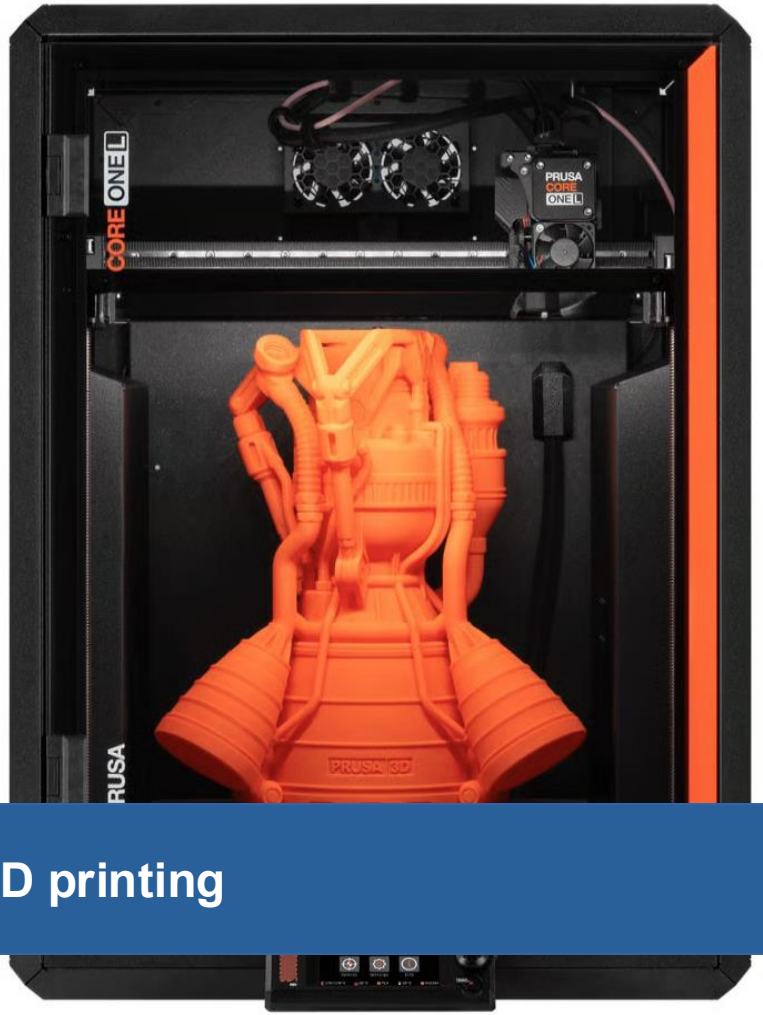
PrusaSlicer: Prepare your parts for 3D printing

ALSADO

- Export part bodies from FreeCAD as 3MF
- Import parts into PrusaSlicer and arrange on build plate
- Set printing settings and click on slice
- Save the gcode and transfer it to your 3D printer

PRUSA RESEARCH by JOSEF PRUSA





=> Quickly manufacture the first prototype of your design with 3D printing

FreeCAD supports for industry standard SpaceMouse

ALSADO

3Dconnexion

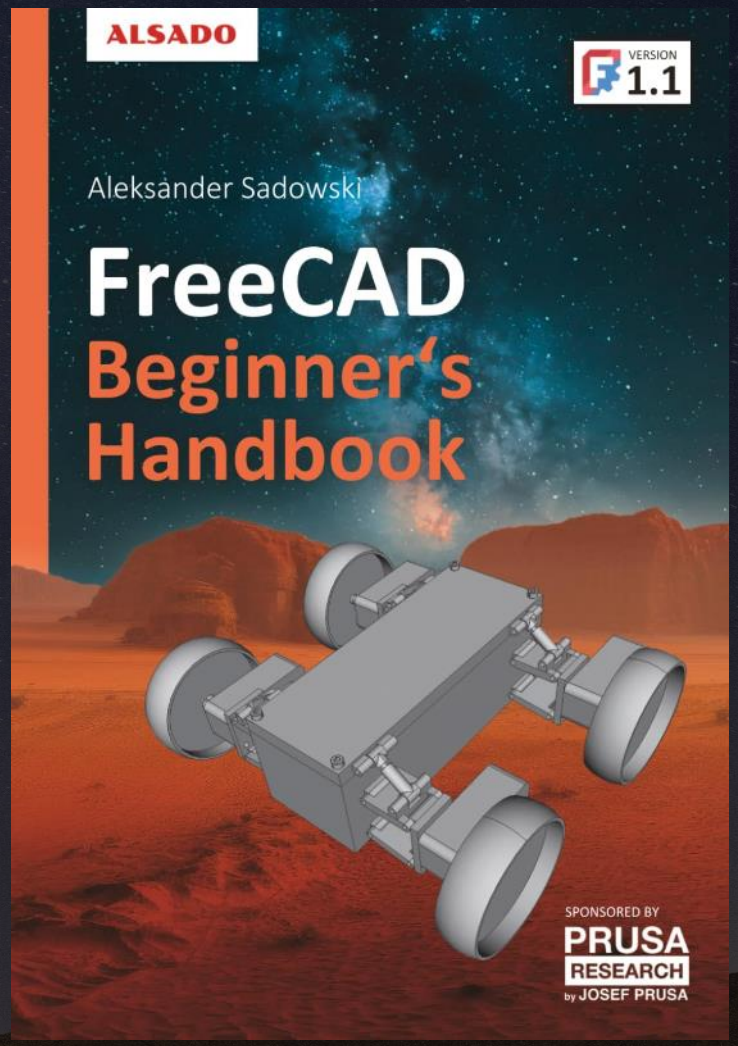
FreeCAD

=> FreeCAD is ready for professional environments

FreeCAD Beginner's Handbook

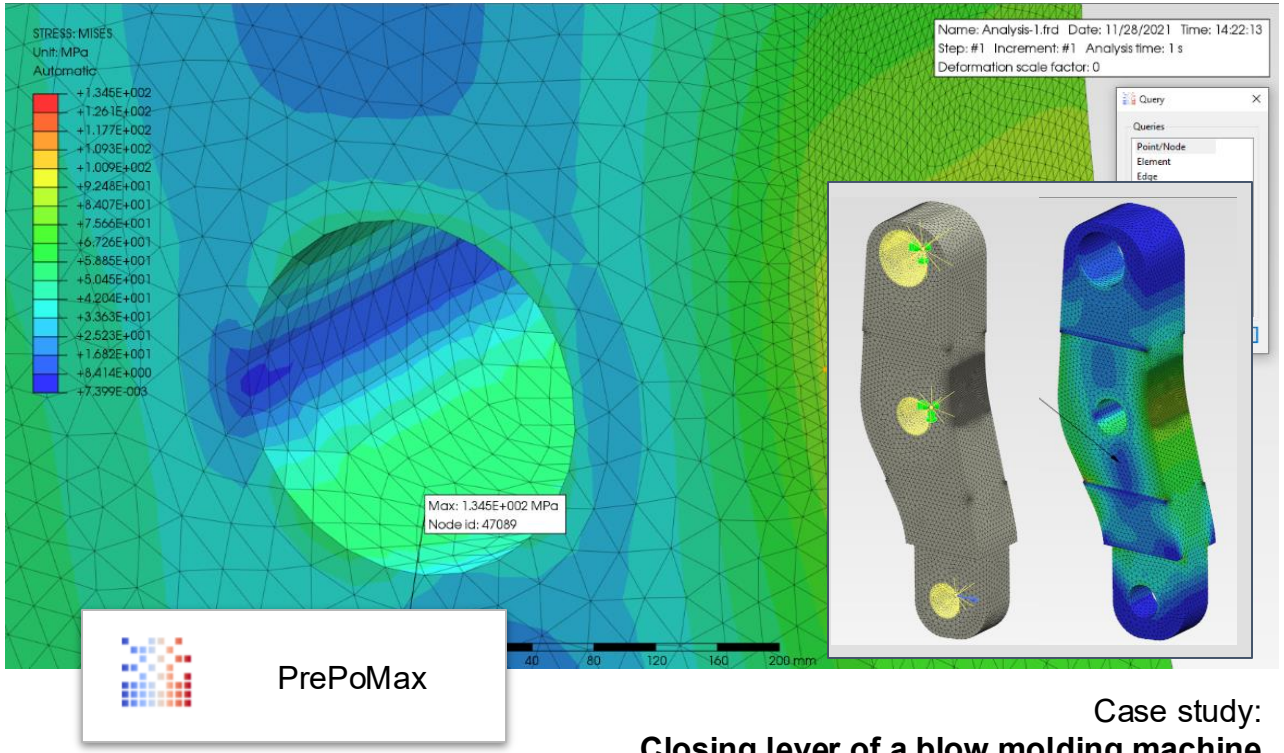
Turn your idea from sketch to 3D-printable prototype

Aleksander Sadowski
Liebfrauenstraße 31
53757 Sankt Augustin
Mobil +49 (0) 1578 965 67 67
E-Mail aleksander.sadowski@alsado.de
Web www.alsado.de



Simulation with Finite-Element-Method

- PrePoMax GUI and workflow similar to Abaqus
- PrePoMax with Calculix solver for static analysis
- PrePoMax with OpenRadioss solver for dynamic analysis

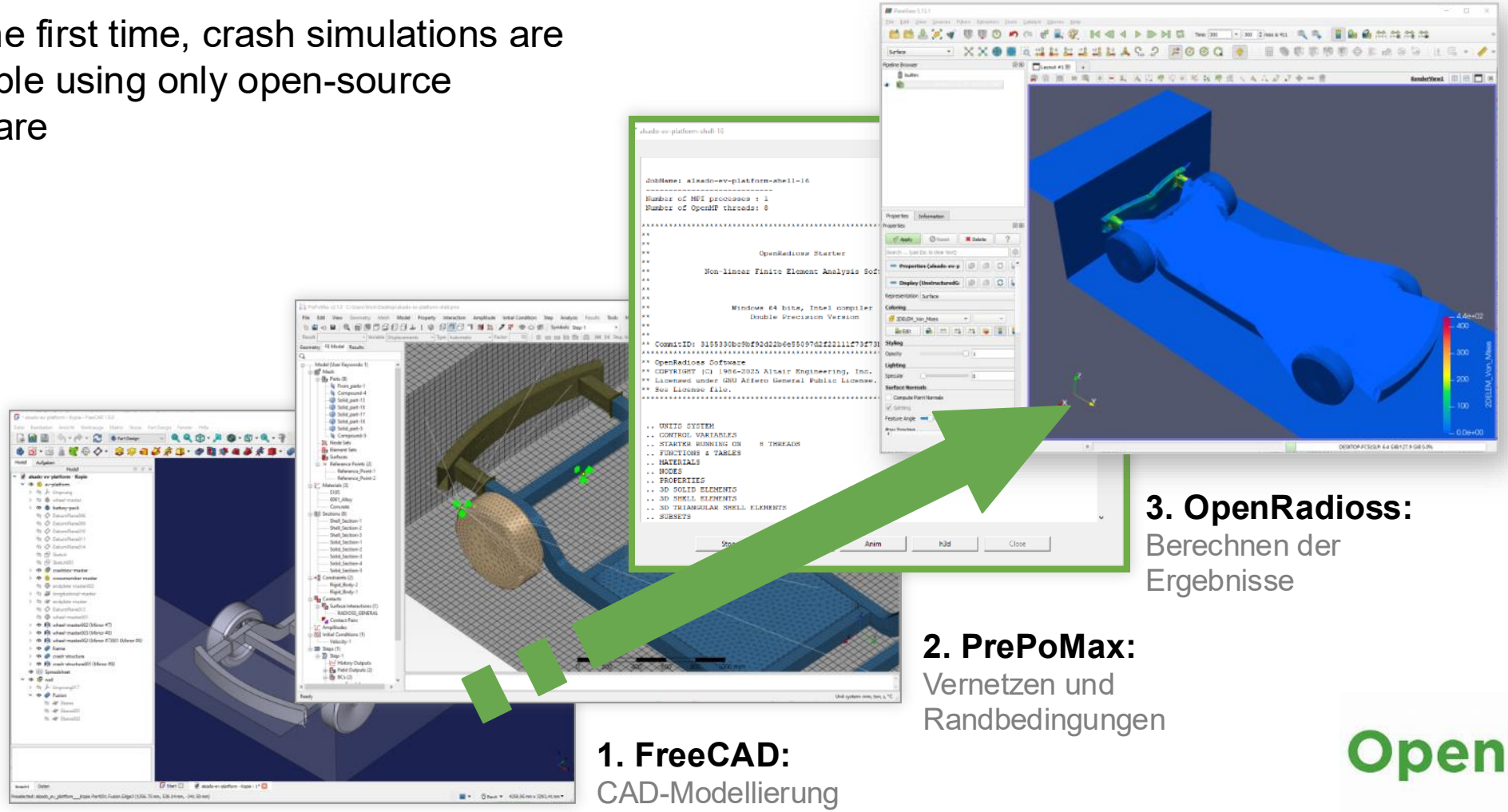


Case study:
Closing lever of a blow molding machine

=> PrePoMax is similar to Abaqus and can be used as a pre-prcessor for OpenRadioss

Dynamic simulations with open-source software

For the first time, crash simulations are possible using only open-source software



1. FreeCAD:
CAD-Modellierung

2. PrePoMax:
Vernetzen und Randbedingungen

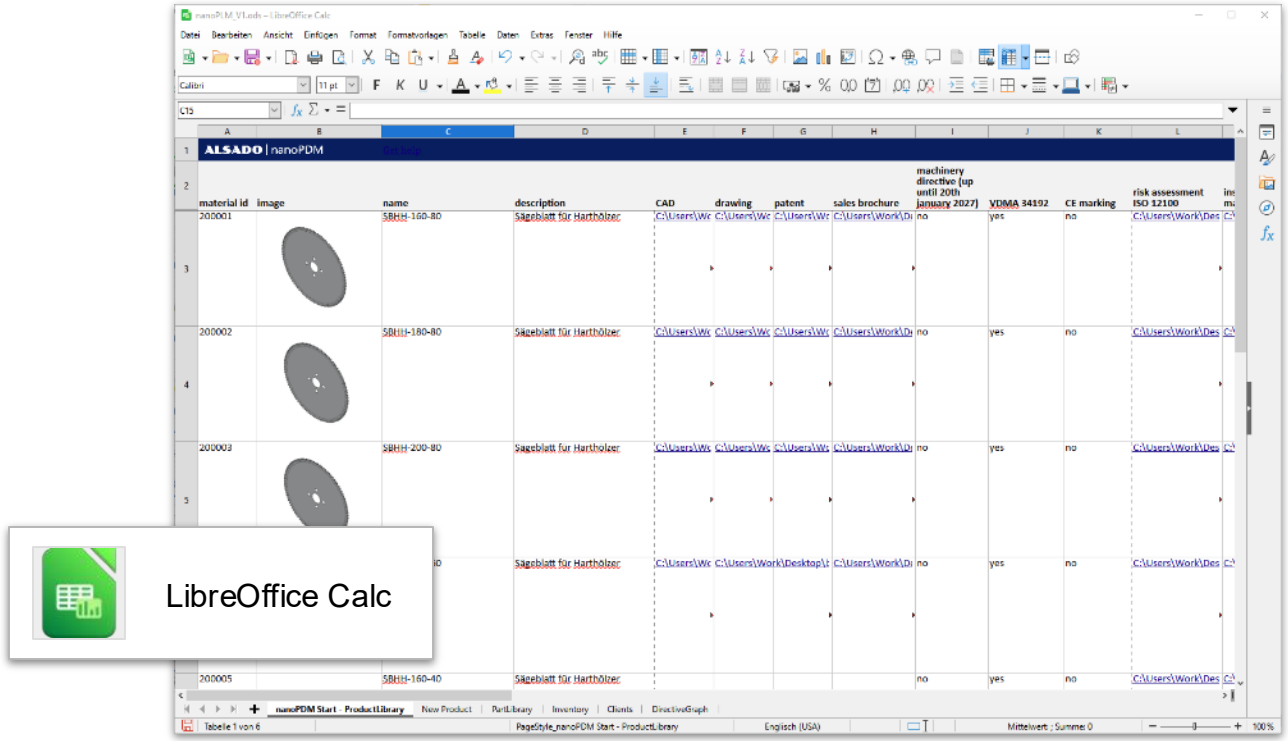
3. OpenRadioss:
Berechnen der Ergebnisse

4. ParaView:
Visualisierung der Ergebnisse

OpenRadioss™

Product data management using simple tools

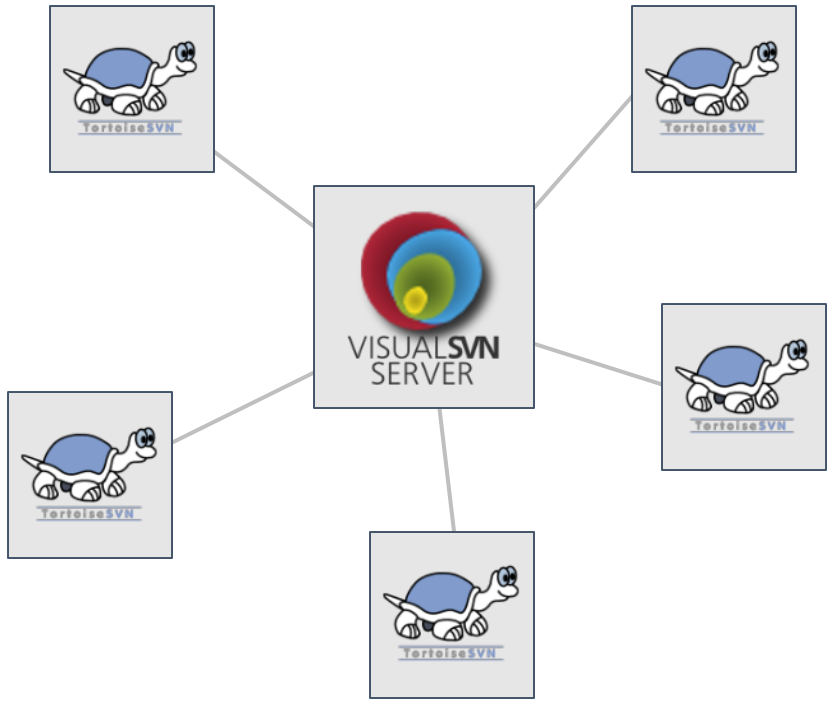
- Manage all your parts and assemblies in a centralized spreadsheet with all associated files (drawings, legal documents, patents)
- Easily accessible for non-engineers
- Assign clients to serial numbers



=> Getting an overview of all your parts, products and associated files

Create an infrastructure for your team

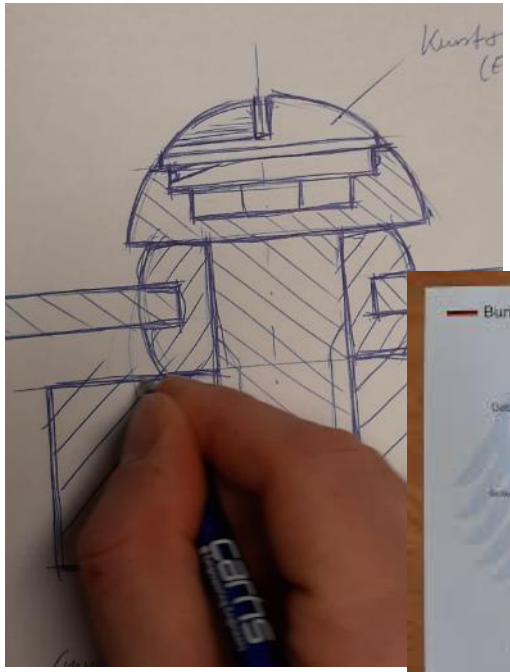
- Setup versioning system for product data without programming skills (VisualSVN + TortoiseSVN)
- Let your team collaborate and manage their roles
- Prevent file duplicates
- Centralized server in your organsation with redundancy and a battery backup
- Back up data in regular time intervals and store it in a different location

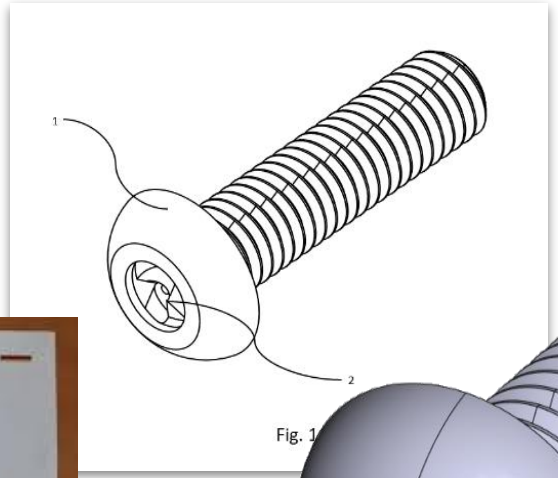


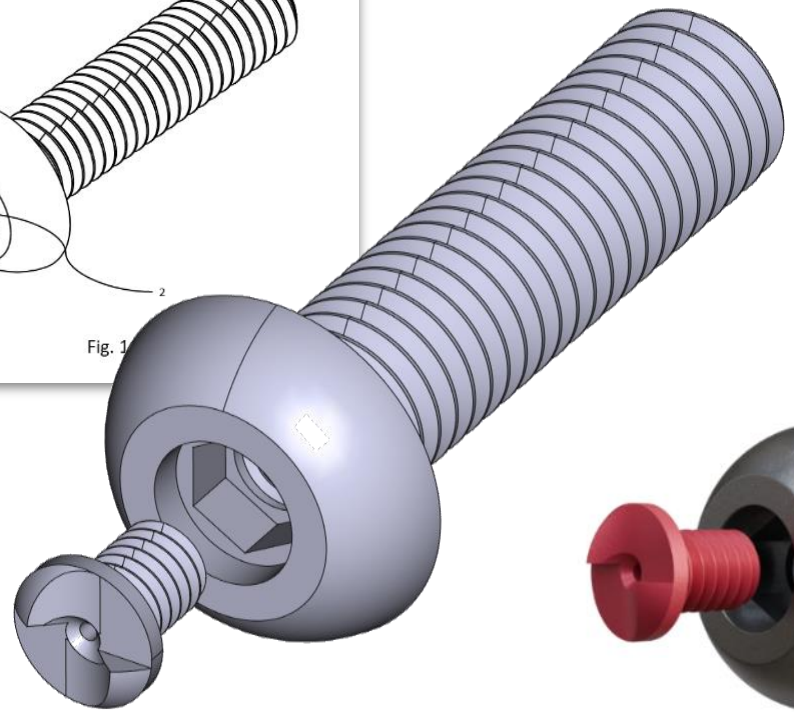
=> Secure your product data and enable collaboratin in a team

Invention: Security (tamper-resistant) screw

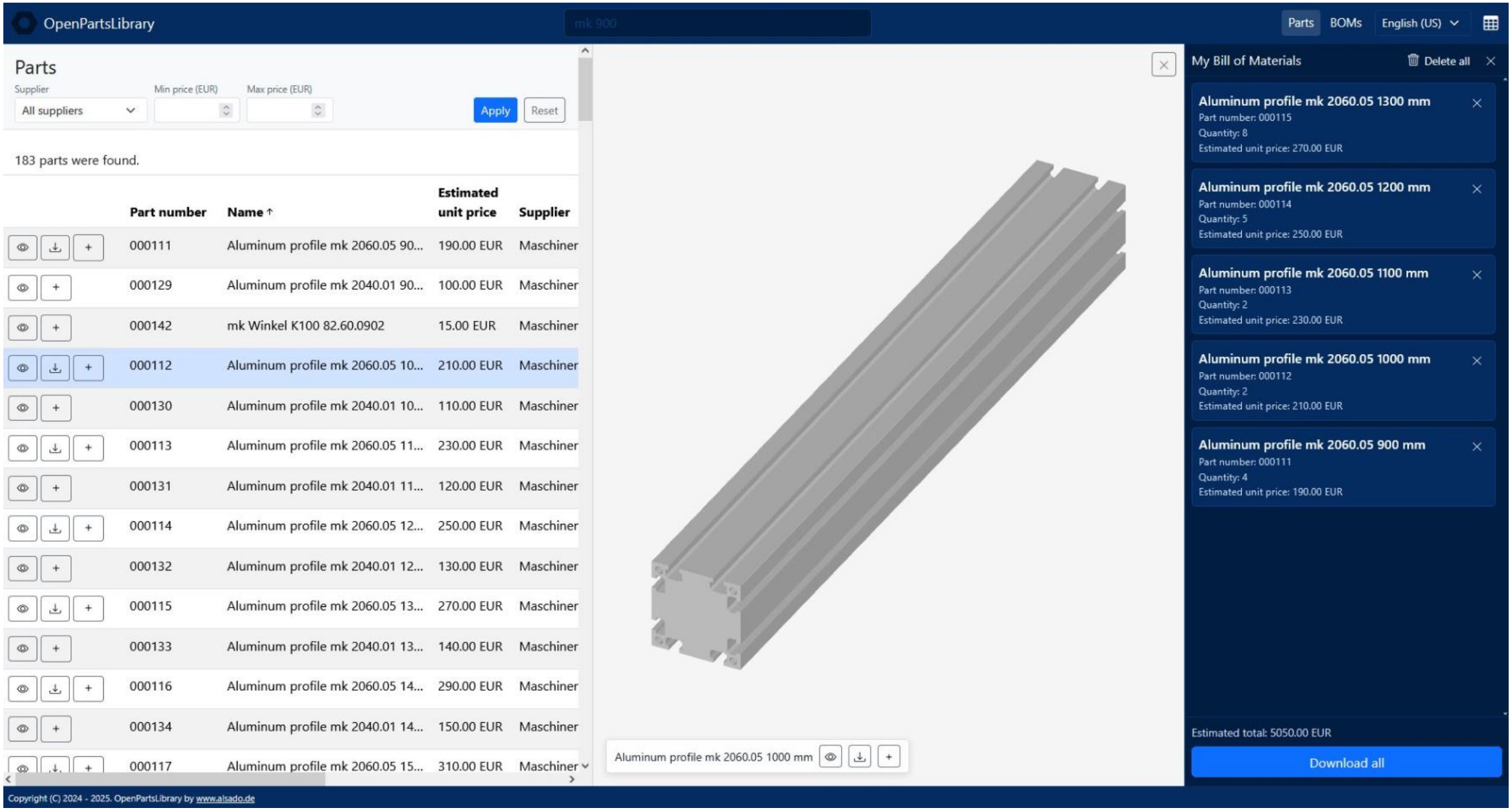
ALSADO

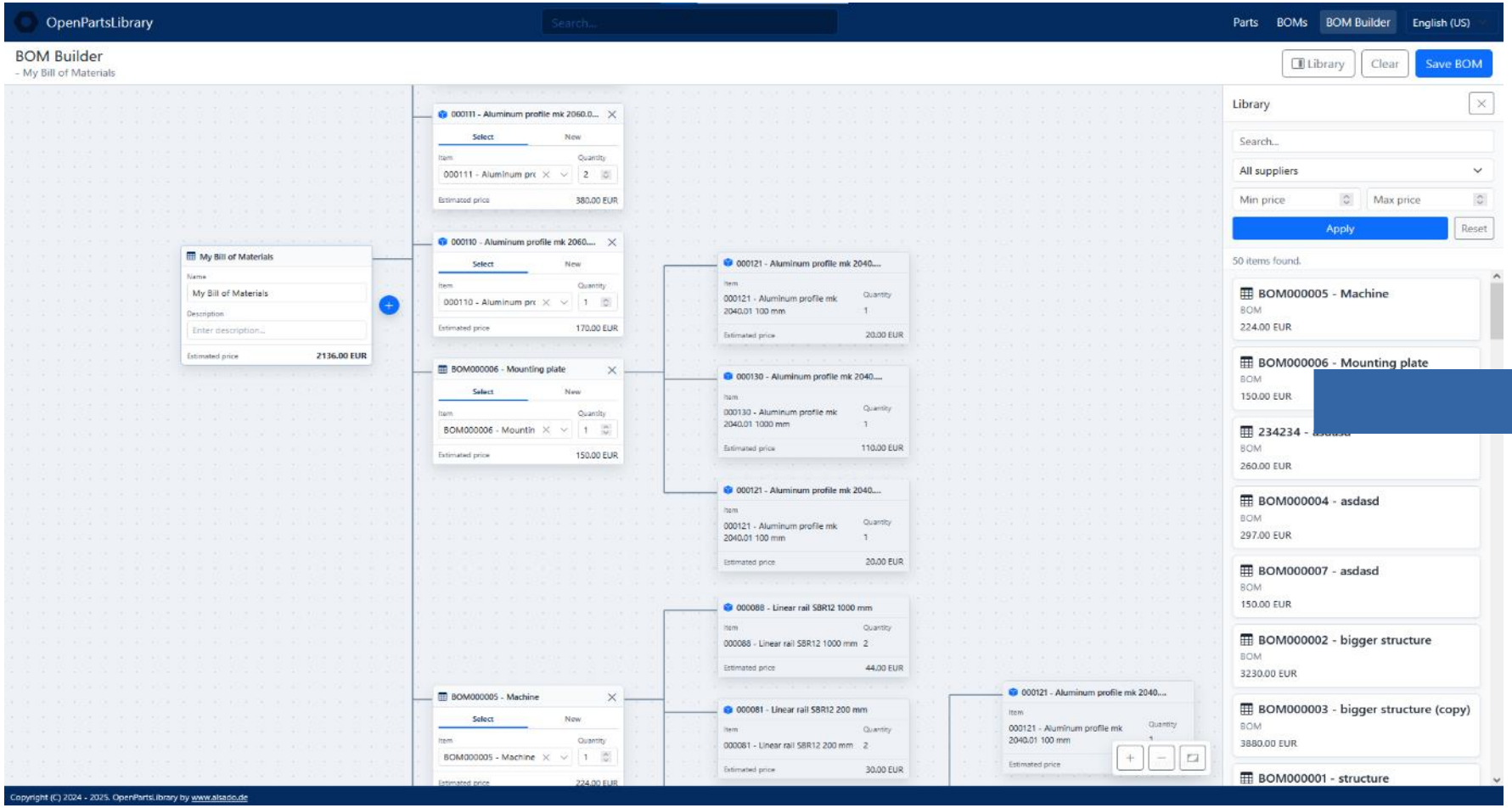




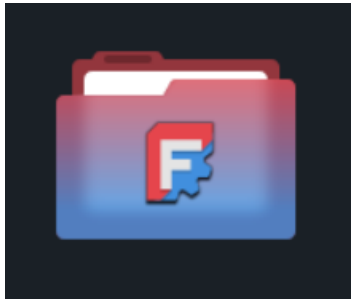


=> Validating the open-source workflow for product development





FreeCAD Package (assembly)



ALSADO

Open-Source PLM

Kontakt

ALSADO

Aleksander Sadowski
Inhaber

ALSADO
Liebfrauenstraße 31
53757 Sankt Augustin
Mobil +49 (0) 1578 965 67 67
E-Mail aleksander.sadowski@alsado.de
Web www.alsado.de

Mission: Deutschen Maschinenbau mittels Open-Source-Software wieder auf Vordermann bringen!