



PERMAS for Education

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INTES GmbH



1. Introduction

- What is PERMAS for Education?
- Content of EDU Edition
- Limits, Rules, Basics

2. How to get the EDU Edition?

- Registration, Download, Installation, Manuals, Forum, First Usage

3. Demonstration

- PERMASCC, PERMAS, VisPER, Wizards
 - PERMAS4EDU Tutorial with Meshing (Movie)
 - Topology Optimization
 - Contact Analysis



Introduction

- What is PERMAS for Education?
 - Essentially the same functionality as PERMAS, but some limitations to prevent commercial use.
 - VisPER → GUI to PERMAS, Pre- and Postprocessor
- Benefits
 - Available on Windows and Linux
 - Based on Version 18
 - Almost all modules are available
 - Ideal for self-study and further training
 - Access to Reference Manuals
 - Access to a multitude of application examples
 - Trying out new modules, e.g. TOPOlogy optimization and Shape OPTimization
 - Interfaces to Abaqus and NASTRAN for a seamless transition to PERMAS
 - Enhanced Python Interpreter → pyINTES
 - User Forums hosted at INTES and Researchgate for the exchange with other users

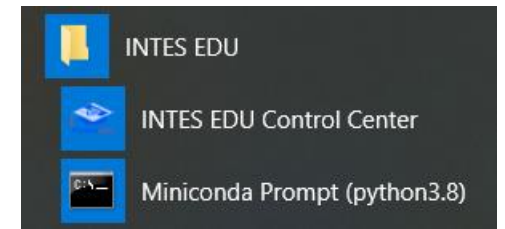
Limitations

- Max. Number of Nodes: ~16K
- Max. Number of DOFs: ~65K
- Max. Number of Elements: ~32K
- Max. Number of point/line elements (e.g. BECOS, SPRING, MASS): 100

- Max. Number of Excitation Frequencies: 500
- Max. Number of Time Steps: 1000
- Max. Number of Load Cases: 1000
- Max. Number of Nonlinear Results Steps: 100

- Python has become the programming language of choice for certain research and industry projects
- We are aware of this development and offer an own Python environment
- UCI USER section
 - CALL TOOL6 P1 = 'pyINTES <myscript.py> ...'
- Examples
 - EMA1 – Experimental Modal Analysis MAC matrix visualization, Excel export
 - MNL17 – Fiber Reinforced Wheel

- numpy
- scipy
- sympy
- Matplotlib
- scikit-image
- mplcursors
- meshio
- numpy-stl
- python-pptx
- python-docx
- Xlsxwriter
- ... many more



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Registration Process

www.intes.de/EDU

- Activate the checkbox, i.e. accept the conditions for PERMAS4EDU
- EULA is available in pdf format
- Activate the checkbox *I'm not a robot*
- Push the **Send Request** button
- Instructions by E-Mail how to proceed
- A link to the user forum

PERMAS for Education

Please register for your personal copy of INTES Software (PERMAS, VisPER and Tools) for educational purposes* **free of charge.** PERMAS4EDU is the ideal tool to become acquainted with the software or to be used in academic coursework on the Finite Element method.



Your personal data

Salutation:

First Name:

Last Name:

E-Mail Address:


Additional Information:

Organisation Name:

Address:

Country:

I accept the [conditions for PERMAS for Education.](#)

I'm not a robot 

You will receive PERMAS and VISPER with a comprehensive scope of functionality which is limited with respect to model size (e.g. 16.000 nodes).

* PERMAS4EDU is valid for education and research. Commercial, professional or any other for-profit purposes are excluded from this license. Please see the license agreement or terms of service for all specific terms, conditions and definitions.

Mandatory

- First Name
- Last Name
- Valid E-Mail address

Optional

- Organization
- Address
- Country

Requirements on Windows

- Target CPU: INTEL EM64t/I64 or AMD Opteron / Athlon 64
- 64-bit
- Build OS: Windows 10
- Target OS: Windows 10
- Memory Limit: 8000 MB
- Required Windows packages:
 - pdf viewer e.g. foxit, sumatra, acrobat reader DC
- Optional : INTEL Fortran Compiler

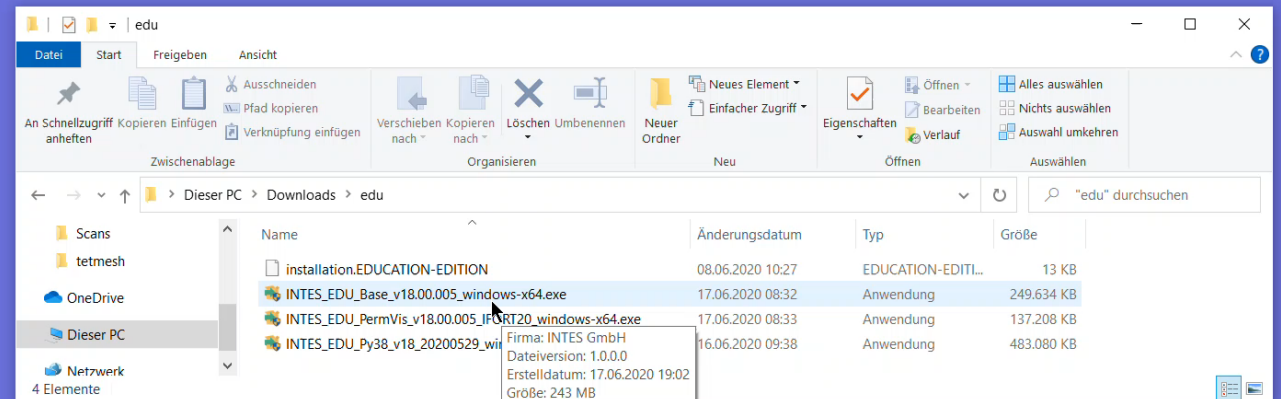
Download & Installation on Windows

- According to the received E-mail download the 3 Windows installers, i.e.
 - INTES_EDU_Base_v18.00.NNN_windows-x64.exe (244 MB)
 - INTES_EDU_Py38_v18_YYYYMMDD_windows-x64.exe (472MB)
 - INTES_EDU_PermVis_v18.00.NNN_IFORT20_windows-x64.exe (134MB)
- Copy the received license file to the directory containing the downloaded installers.
- Now run the Base installer and follow the instructions, i.e.
 - INTES_EDU_Base_v18.00.NNN_windows-x64.exe
- Launch intesedu
 - Click on the PERMAS4EDU icon



Entire Installation Process on Windows

- Real time installation process
- Base Installer
- License agreement (00:13)
- Installation directory
- Scratch directory for database (quick access time, i.e. SSD)
- License agreement Miniconda (01:48)
- Installing PERMAS/VisPER EDU binaries (6:40)
- Installation finished (7:20)



Requirements on Linux

- Target CPU: INTEL EM64t/I64 or AMD Opteron / Athlon 64
- 64-bit
- Build OS: CentOS 7
- Target OS: **64-bit** Linux with GNU 8 compiler suite
 - glibc 2.18 and gfortran/gcc/g++ 8 based
- Memory Limit: 8000 MB
- Required Linux packages: zlib-devel, gfortran, g++, gcc, pdf viewer, e.g.okular, qpdfview, envince, xpdf

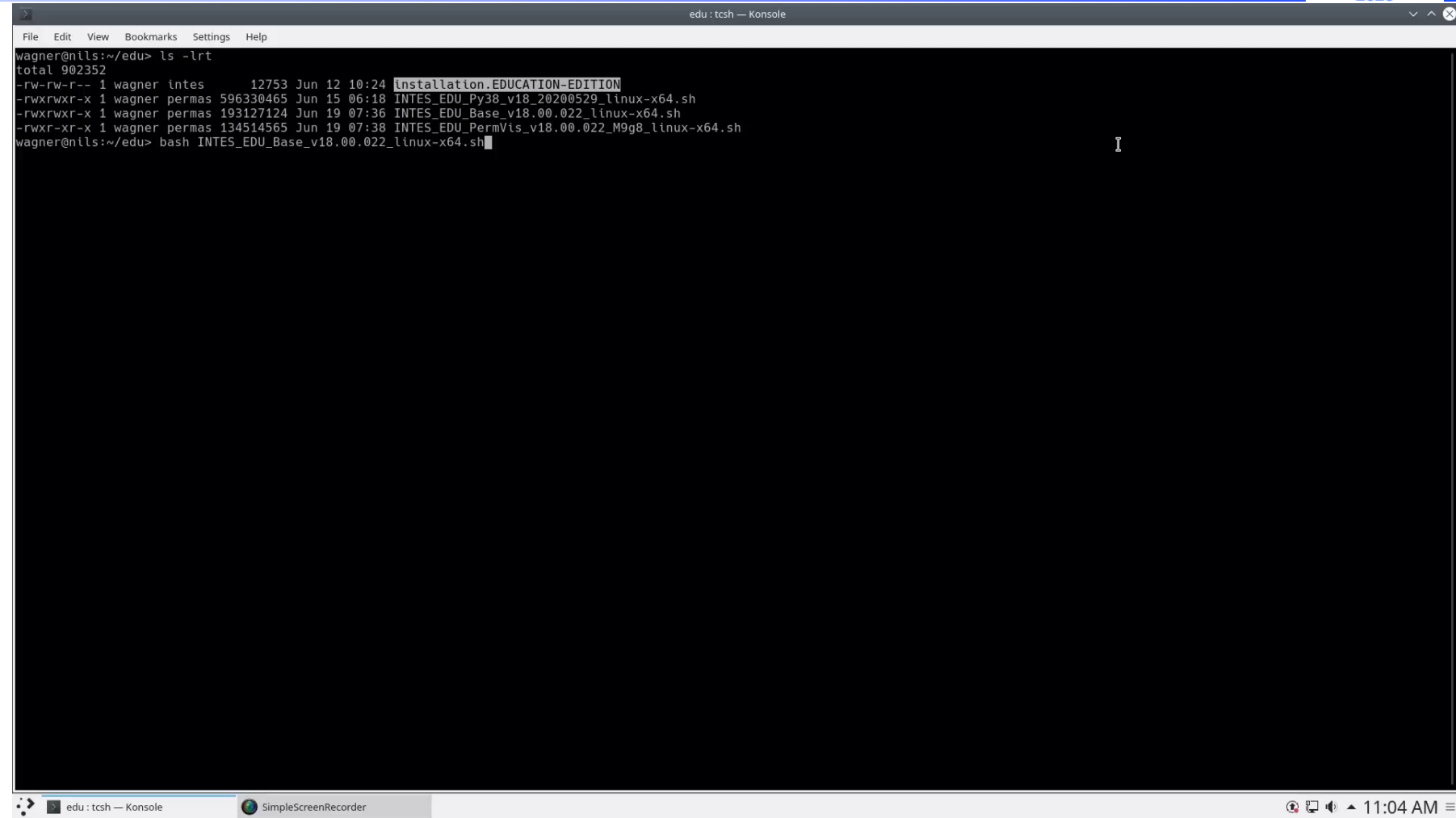
Download & Installation on Linux

- According to the received E-mail download the 3 Linux installers, i.e.
 - INTES_EDU_Base_v18.00.NNN_linux-x64.sh (185MB)
 - INTES_EDU_Py38_v18_YYYYMMDD_linux-x64.sh (569 MB)
 - INTES_EDU_PermVis_v18.00.NNN_M9g8_linux-x64.sh (129 MB)
- Copy the received license file to the directory containing the downloaded installers.
- Now run all 3 installers, beginning with the Base installer and follow the instructions, i.e.
 - `bash INTES_EDU_Base_v18.00.NNN_linux-x64.sh`
 - `bash INTES_EDU_Py38_v18_YYYYMMDD_linux-x64.sh`
 - `bash INTES_EDU_PermVis_v18.00.NNN_M9g8_linux-x64.sh`

Entire Installation Process on Linux

Installation Directory

- Absolute path is needed, e.g. /home/edu/intesEDU
- Absolute path is needed for the license file



```
edu : tcsh — Konsole
File Edit View Bookmarks Settings Help
wagner@nils:~/edu> ls -lrt
total 902352
-rw-rw-r-- 1 wagner intes      12753 Jun 12 10:24 installation.EDUCATION-EDITION
-rwxrwxr-x 1 wagner permas 596330465 Jun 15 06:18 INTES_EDU_Py38_v18_20200529_linux-x64.sh
-rwxrwxr-x 1 wagner permas 193127124 Jun 19 07:36 INTES_EDU_Base_v18.00.022_linux-x64.sh
-rwxr-xr-x 1 wagner permas 134514565 Jun 19 07:38 INTES_EDU_PermVis_v18.00.022_M9g8_linux-x64.sh
wagner@nils:~/edu> bash INTES_EDU_Base_v18.00.022_linux-x64.sh
```

Manuals

PERMAS Online Manuals (EDU)
(PERMAS 18.00.036)


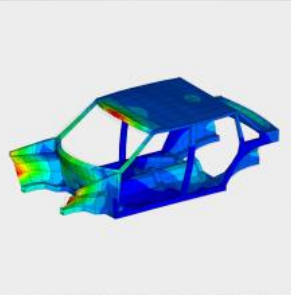
Introduction:
[um705_edu_v18](#) *PERMAS for Education (EDU)*

PERMAS:
[um450_edu_v18](#) *PERMAS User's Reference Manual (EDU)*
[um550_edu_v18](#) *PERMAS Examples Manual (EDU)*

VisPER:
[um470_edu_v18](#) *VisPER User's Manual (EDU)*

Tools:
[um491_edu_v18](#) *PERMAS Tools User's Manual (EDU)*

Installation:
[unix_install_edu_v18](#) *PERMAS on UNIX: Installation Manual (EDU)*
[winx_install_edu_v18](#) *PERMAS on Windows: Installation Manual (EDU)*



- PERMAS for Education UM705_EDU_V18
- PERMAS User's Reference Manual UM450_EDU_V18
- PERMAS Example's Manual UM550_EDU_V18
- VisPER User's Manual UM470_EDU_V18
- PERMAS Tools User's Manual UM491_EDU_V18
- PERMAS on Unix: Installation Manual
- PERMAS on Windows: Installation Manual

Forum

- Exchange with other users
- <https://www.intes.de/forum>
- <https://www.researchgate.net/topic/PERMAS>
- Hotline support is not available for EDU users


Home My page Projects Administration Help Logged in as **INTESmoderator** My account Sign out


PERMAS4EDU Search: PERMAS4EDU


+ Overview Activity **Forums** Files Settings


Forums Settings

Forum	Topics	Messages	Last message
Rules Forum Rules	4	4	Added by Moderator INTES GmbH about 1 month ago How to request help
PERMAS PERMAS related topics	0	0	
Help Request Help	0	0	
Tips and Tricks Share interesting applications/informations	0	0	
VisPER VisPER related topics	0	0	
Help Request Help	0	0	
Tips and Tricks Share interesting applications/informations	1	1	Added by Moderator INTES GmbH about 1 month ago Start VisPER
General Discussion General Discussions, not related to specific topics	1	1	Added by Moderator INTES GmbH about 1 month ago Forum at researchgate
Tools auxiliary tools like permasgraph, permasCC, pyINTES	0	0	
Examples Provide interesting examples with data and description	1	1	Added by Moderator INTES GmbH about 1 month ago Standard Examples

Also available in: 

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 **INTES Support** ✕

 **Contact: INTES GmbH**
Breitwiesenstrasse 28
70565 Stuttgart
Germany

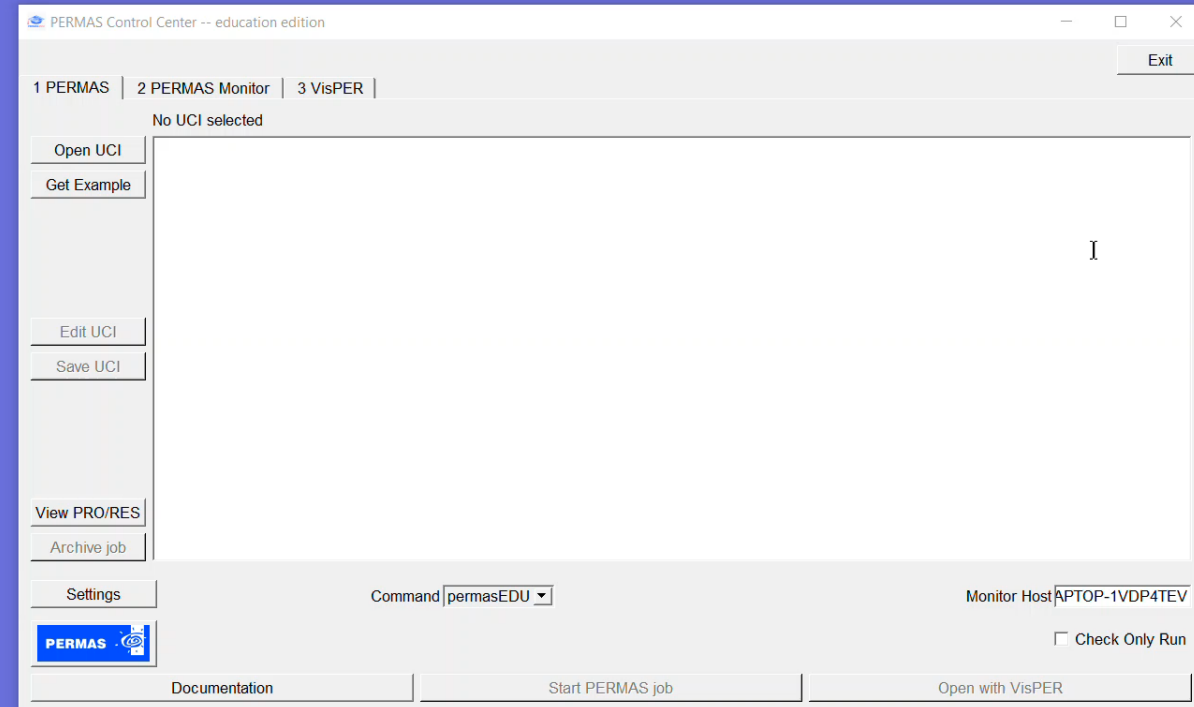
Tools: Version 18.00.104 education edition
 Python 3.8.3, QT 5.14.2, PySide2 5.14.2

Forum: <https://www.intes.de/forum>

Visit <https://www.intes.de/> for more information.

First Usage

- PERMAS Control Center
- Settings
- Emacs Gold for *.dat
VisPER Tab PERMASCC(Edit)
- **Code handling:** automatic
Highlighting using the
Pygments highlighter
- Direct access to manuals
- Get Example
 - Linear Statics LS1
 - Edit UCI (F1 button)
 - Start PERMAS Job
 - Open with VisPER



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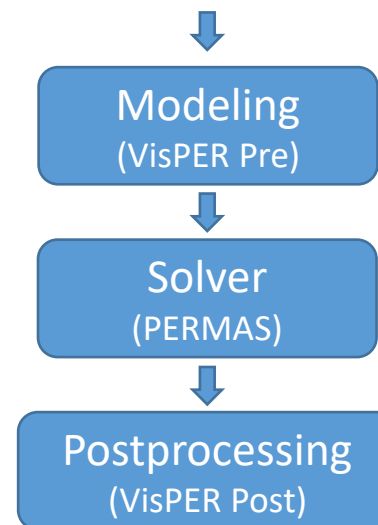
- PERMASCC, PERMAS, VisPER, Wizards
 - PERMAS4EDU Tutorial with Meshing (Movie)
 - Topology Optimization
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Handling of STL Files in VisPER

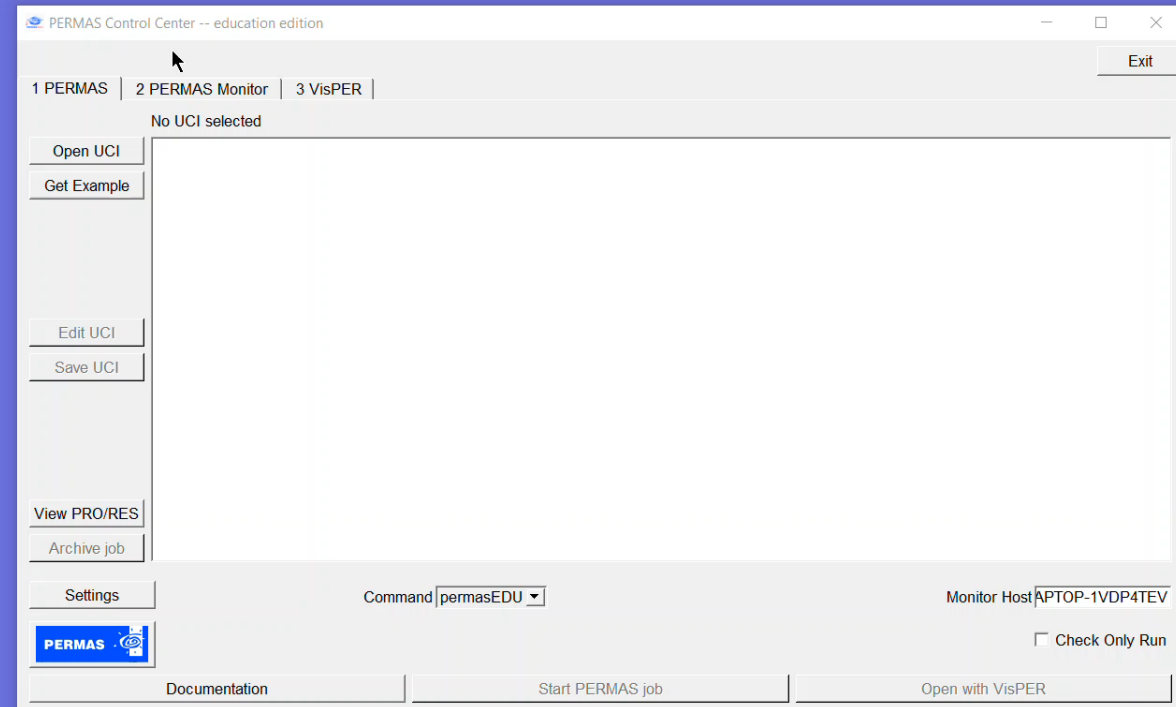
- Raw, unstructured triangulated surface
- Support of ASCII format
- Binary format can be converted to ASCII format by using numpy-stl (Part of pyINTES)
- Direct import in VisPER
- Alternatively, READ STL FILE = geom1.stl within INPUT section of *.uci
- Remeshing is usually necessary due to poor element quality
- Volume meshing is supported in VisPER by an interface to netgen

Mesh *.dat ; STL;
other FEM Formats, e.g. *.inp, *.bdf, *.unv



Patch Meshing & Design Wizard

- VisPER tutorial: edu1
- Element quality PLOTA3
- PatchMeshing Tool
- Average Edge length: 5mm
- Edges are retained during remeshing
- Check element quality again
- Design Wizard
- Create Tet Mesh
- Check element quality TET4
- Export New Items



Objective function

- WEIGHT

$$m = \int \rho dV = \sum_{i=1}^n \rho_i V_i \quad (1)$$

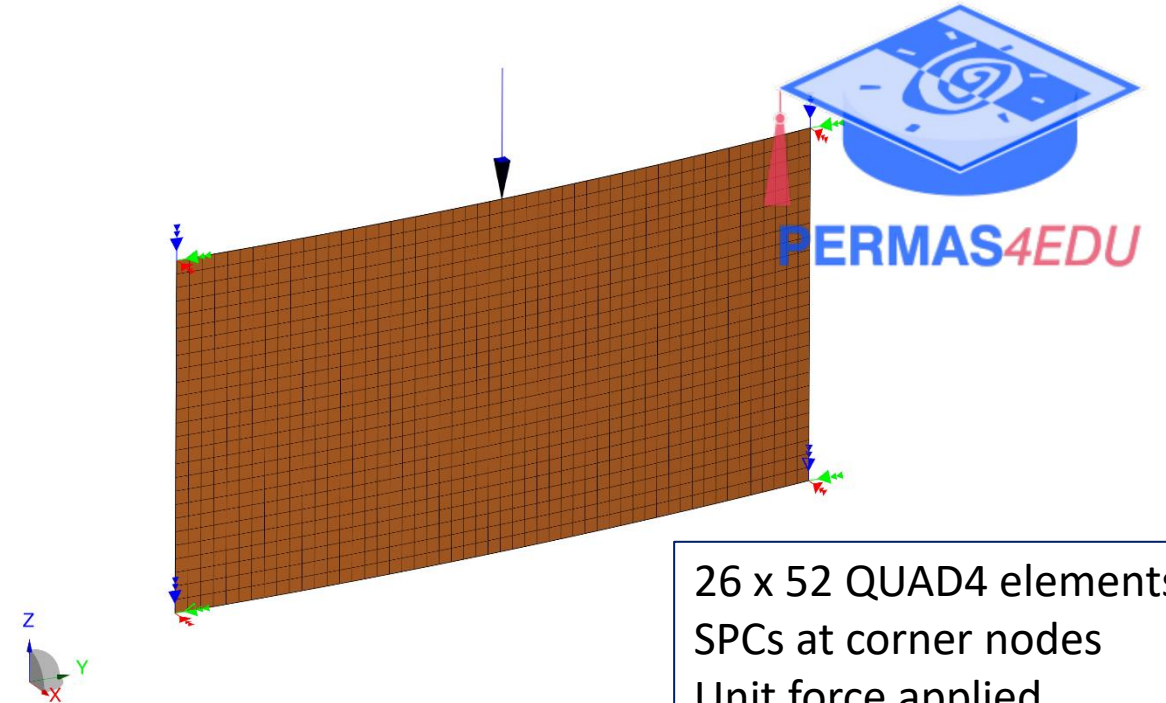
Two Constraints

- STATIC

$$\mathbf{K} \mathbf{u} = \mathbf{f}, \quad \mathbf{c}^T \mathbf{u} \geq \underline{u}_j \quad (2)$$

- BUCKLING ANALYSIS MODES = 1 SIGN = POSITIVE

$$\mathbf{K}_g(\boldsymbol{\sigma}) \mathbf{x} = \lambda \mathbf{K} \mathbf{x}, \quad s = -\frac{1}{\lambda}, \quad s \geq \underline{s} \quad (3)$$



26 x 52 QUAD4 elements
 SPCs at corner nodes
 Unit force applied
 Material: Aluminum
 R = 3000 mm
 h = 260 mm
 s = 520 mm
 t = 2 mm

<https://iopscience.iop.org/article/10.1088/1757-899X/531/1/012082>

Topology Optimization

PERMAS is controlled by a stream of commands submitted by the User Control Interface (UCI)

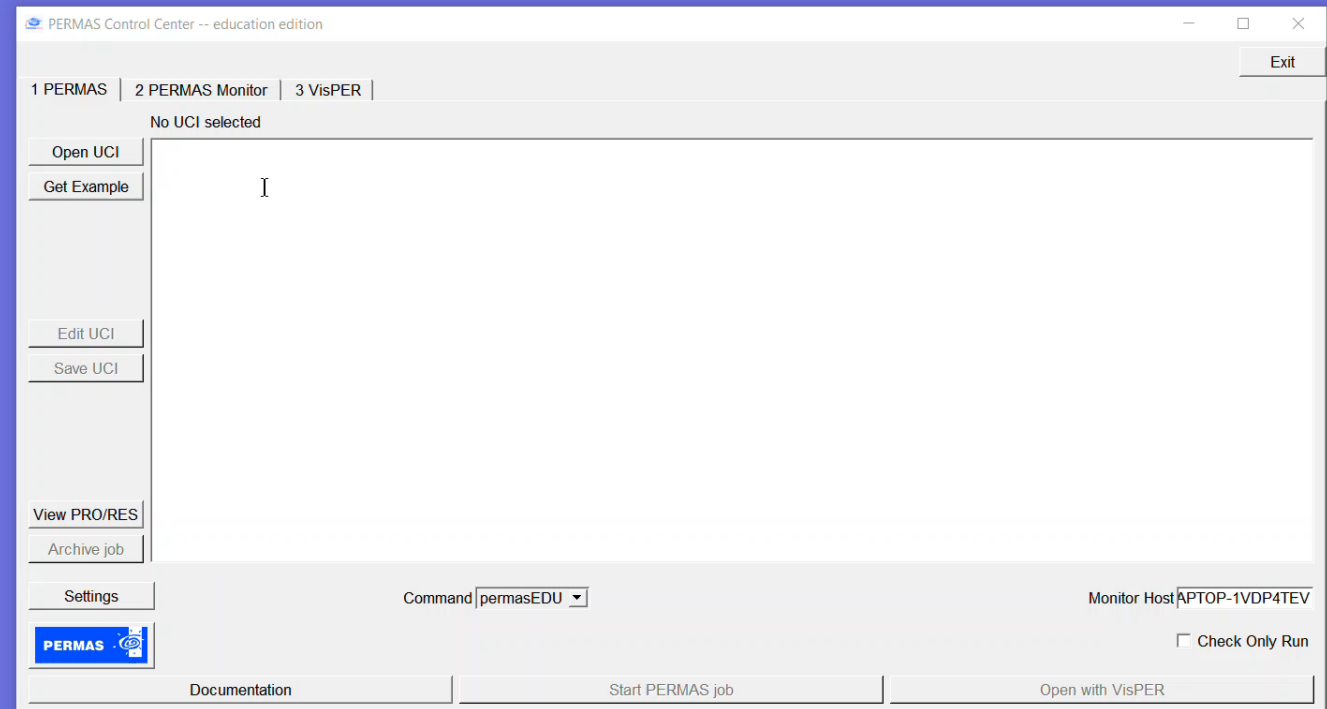
```
! See PERMAS Examples manual "um550.pdf" for more informations.
!
! REQUEST.MODULES = BA; LS; MQA; TOPO
!
NEW
INPUT
  READ PERMAS FILE = topo13_model.dat
  READ PERMAS FILE = topo13_topo.dat
RETURN
TASK LOOPS = 80
EXEC
  ACT SIT = STATIC
  STATIC
  ACT SIT = BUCKLING
  BUCKLING ANALYSIS MODES = 1 SIGN = POSITIVE
  ACT SIT = TOPO
  TOPO METHOD = ACP
EXPORT
  ITEM CLEAR
  ITEM EFRATIO
  GO PERMAS BINARY FILE = topo13_efratio
TASK END
EXPORT
  ITEM CLEAR
  ITEM EFRATIO
  GO PERMAS BINARY FILE = topo13_efratio
EXPORT
  ITEM CLEAR
  ITEM XYDATA TYPE = SRHIS
  GO PERMAS ASCII FILE = topo13_tracking
  ITEM CLEAR
  ITEM XYDATA TYPE = OHIS
  ITEM XYDATA TYPE = CHIS
  ITEM XYDATA TYPE = RHIS
  GO PERMAS ASCII FILE = topo13_histories
  ACT SIT = BUCKLING
  GO PERMAS FILE = topo13_modes
STOP
```

- Subsequent Steps in 3 Videos
 - PERMAS Control Center
 - How to get examples
 - Model completion
 - Export New Items
 - Launch modified TOPO13
 - Postprocessing of TOPO results
 - xy-data by PERMASGraph
 - Objective Function History
 - Relative Constraint History (Possible violations?)
 - Evolution of Element Filling RATIOS by VisPER
 - Derive Data → Data Combination → ITEM EFRATIO

Model Completion by Wizards

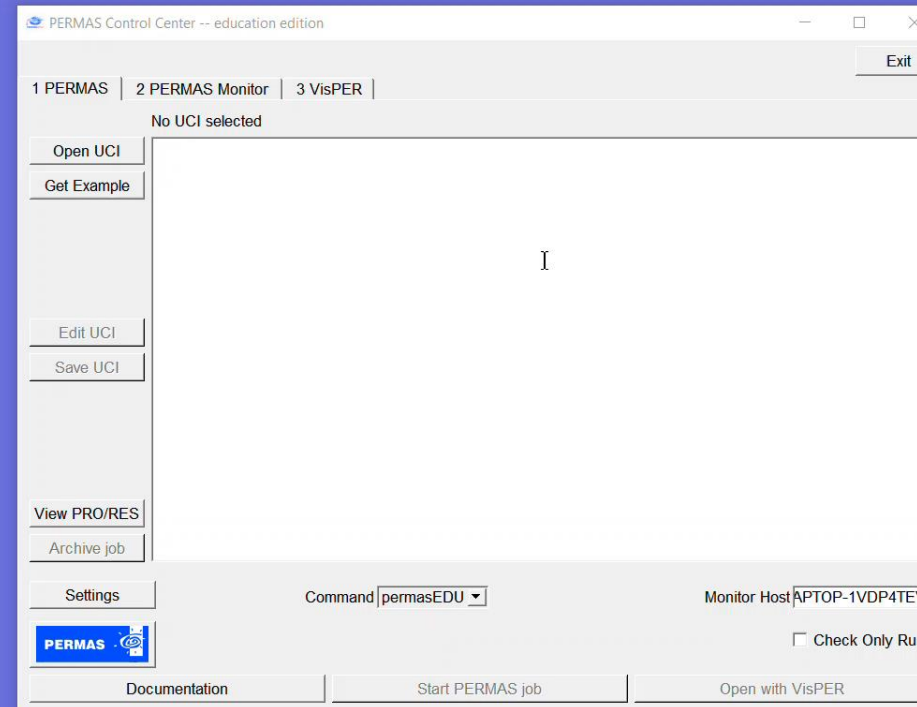
- Wizard concept in VisPER
- User-friendly, guided way to create additional data
- Machine generated data
- Less error prone

- TOPO Situation
- Design element
- Initial filling ratio
- Lower and Upper Bounds
- Exponent for SIMP method
- Manufacturing Conditions
- Design variable filter
- Constraints
- Optimization Target
- Export New Items



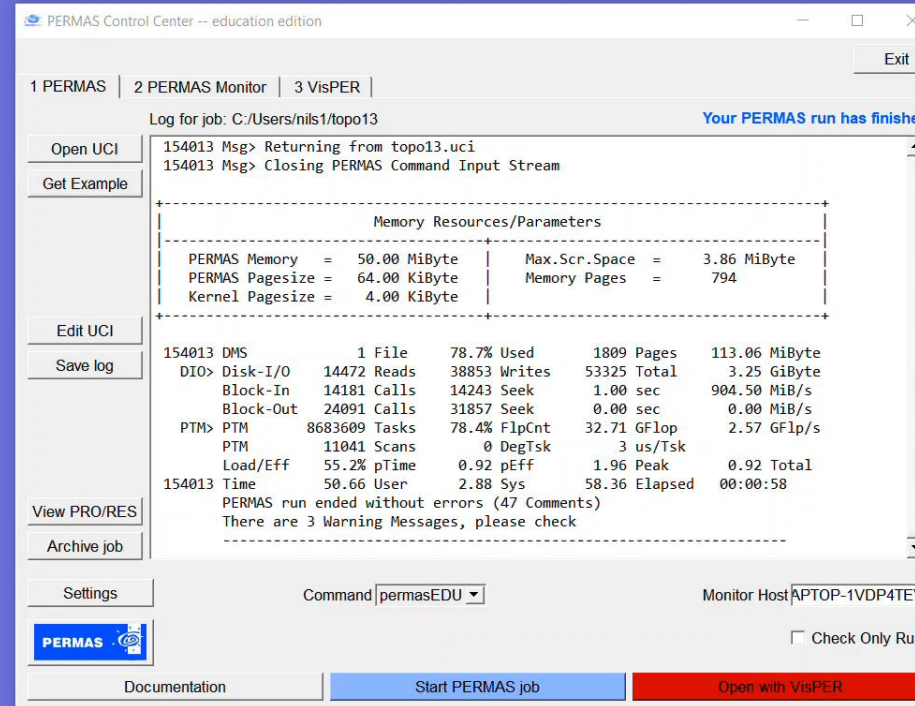
SIMP : Solid Isotropic Material with Penalisation

- PERMAS CC
- Get Example TOPO13
- Edit UCI
- New Export section within TASK LOOP for intermediate results
- Run TOPO13
- Logfile output



Post-Processing of TOPO Results

- Postprocessing
- Import of selected results
- Permasgraph for xy-data
- Interpreting results
- VisPER
- Derive data
- Data combination
- Animation



PERMAS Control Center -- education edition

1 PERMAS | 2 PERMAS Monitor | 3 VisPER

Log for job: C:/Users/nils/topo13 Your PERMAS run has finished

154013 Msg> Returning from topo13.uci
154013 Msg> Closing PERMAS Command Input Stream

Memory Resources/Parameters			
PERMAS Memory	= 50.00 MiByte	Max.Scr.Space	= 3.86 MiByte
PERMAS Pagesize	= 64.00 KiByte	Memory Pages	= 794
Kernel Pagesize	= 4.00 KiByte		

154013 DMS 1 File 78.7% Used 1809 Pages 113.06 MiByte

DIO> Disk-I/O 14472 Reads 38853 Writes 53325 Total 3.25 GiByte

Block-In 14181 Calls 14243 Seek 1.00 sec 904.50 MiB/s

Block-Out 24091 Calls 31857 Seek 0.00 sec 0.00 MiB/s

PTM> PTM 8683609 Tasks 78.4% FlpCnt 32.71 GFlop 2.57 GFlop/s

PTM 11041 Scans 0 DegTsk 3 us/Tsk

Load/Eff 55.2% pTime 0.92 pEff 1.96 Peak 0.92 Total

154013 Time 50.66 User 2.88 Sys 58.36 Elapsed 00:00:58

PERMAS run ended without errors (47 Comments)
There are 3 Warning Messages, please check

Settings Command: permasEDU Monitor Host: APTOP-1VDP4TEV

Check Only Run

Documentation Start PERMAS job Open with VisPER

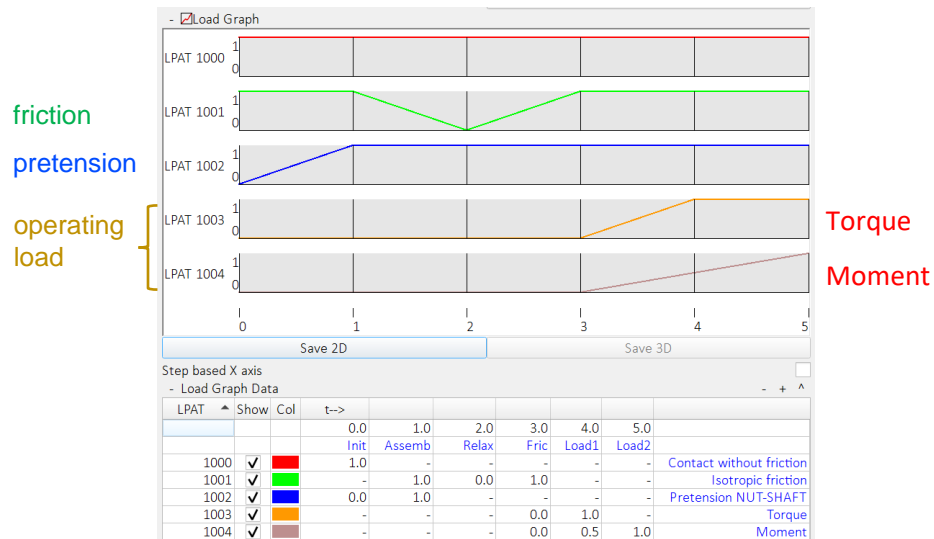
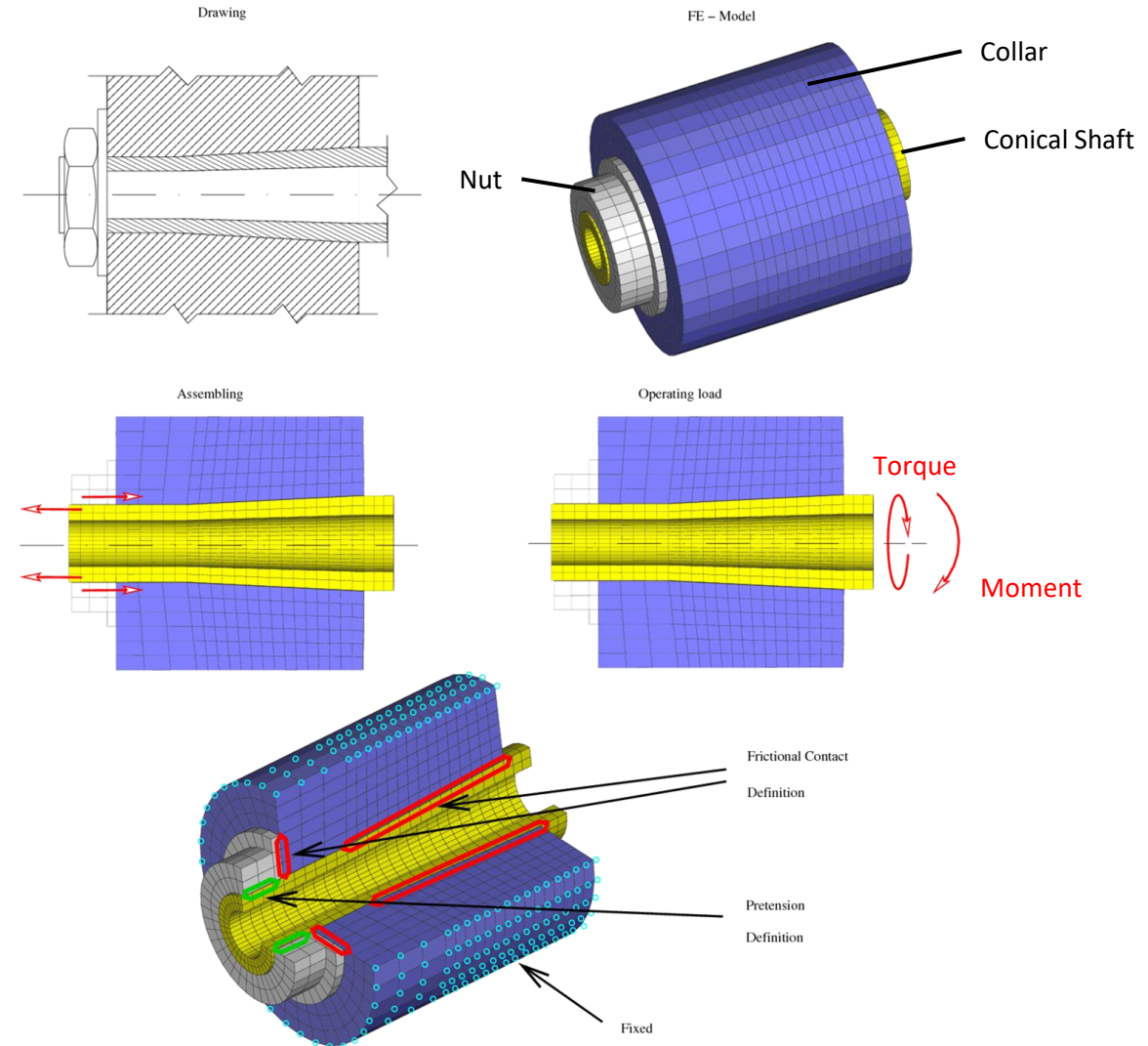
- Many thanks to my colleagues from the development department. Without them PERMAS4EDU wouldn't exist.
- Feedback is welcome!
- Are you curious to use PERMAS4EDU?
- Don't hesitate to contact us at any time → info@intes.de
- Follow our [YouTube Channel](#)
- Follow us on [LinkedIn](#)



Demo: Contact Analysis

- Based on example CA6

- Pretension Wizard
- CA-Wizard: CA-Check
- Load History-Assistant: Editing
- Postprocessing: Displacement, CA-Results



PERMAS4EDU

- Essentially the same functionality as PERMAS/VisPER
- Ideal for self-study and further training
- User Forums available
- Complete solution from mesh to postprocessing

- Free for noncommercial use
- Registration necessary: www.intes.de/EDU

- Available July 02, 2020 (tomorrow)

Thank You!



- Feel free to ask!
- Do you need more information about PERMAS: info@intes.de

