



VELa55Co

*Visual Analysis for **E**xtrremely **L**arge-**S**cale
Scientific **C**omputing*

Evaluation Event

USE CASE 1: FEM Use cases

Simulation Tool: iFX








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1 iFX Installation Guide

1.1 Download and installation of iFX

- Download current package from:
<https://cloud.igd.fraunhofer.de/owncloud/public.php?service=files&t=2917f738764546efd7adb29e8b1061c6>
- Unzip downloaded package.
- Directory structure should look like this :

 app	11/14/2016 6:07 PM	File folder	
 Discrete To Continuum_StepByStep.pptx	11/2/2016 3:47 PM	Microsoft PowerP...	2,957 KB
 iFX-Velassco.bat	2/3/2016 3:43 AM	Windows Batch File	1 KB
 Start_VELaSSCo_Eddie.bat	1/29/2016 4:37 PM	Shortcut	2 KB
 Tutorial-iFX-Velassco.docx	2/3/2016 5:20 AM	Microsoft Word D...	2,941 KB
 VELaSSCo-iFX-VisualizationClient-Manua...	2/3/2016 10:37 PM	Microsoft PowerP...	2,321 KB
 VisualizeParticles.pptx	11/2/2016 4:14 PM	Microsoft PowerP...	1,242 KB

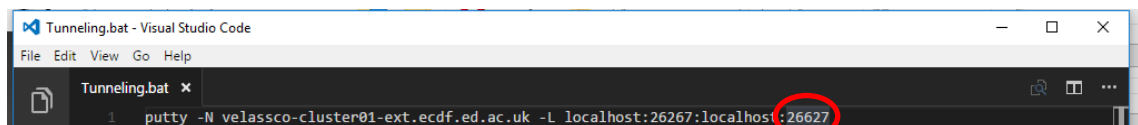
1.2 Connect to EDDIE Cluster

- The usernames created for the Evaluation Event to connect to the VPN network are **velgst2** to **velgst50** (the first 9 have only 7 characters).
- Each one has an initial/registration EASE password set to "**VELaSSCo**". This will have to be changed through the EASE webpage (<https://www.ease.ed.ac.uk/>).
- Setup VPN connection to EDDIE cluster following the instructions provided in the URL: <http://www.ed.ac.uk/information-services/computing/desktop-personal/vpn/vpn-service-using>
- Once connected to VPN, to login in into VELaSSCo will be need provided the following info into the iFX access window:

- Multi-user connection:
 - Username: velasco (default)
 - Password: --- (default)
 - VELaSSCo host: velasco-cluster01-ext.ecdf.ed.ac.uk
 - Port: **provided individually by mail. Please check the invitation mail.**
- Tunnel through:
 - Tunnel host: velasco-cluster01-ext.ecdf.ed.ac.uk
 - Local Port: same value that Port.
 - Username: **provided individually by mail. Please check the invitation mail.**
 - Password: **provided individually by mail. Please check the invitation mail.**

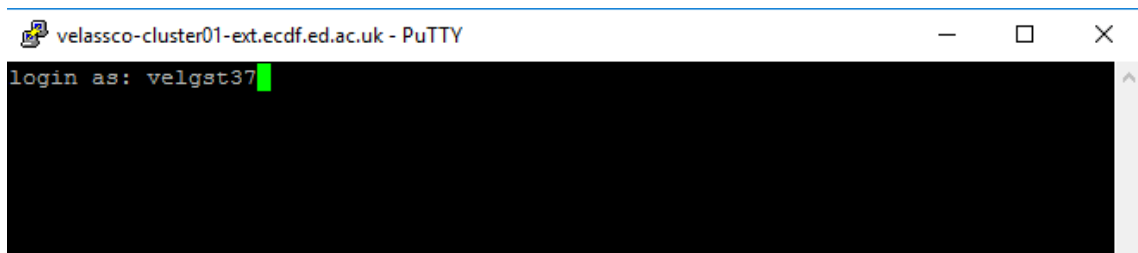
Next, the tunnel should be set up and started:

- Open the *tunneling.bat* file in iFX VELaSSCo Client's folder, and set the proper port for VELaSSCo platform:



```
putty -N velasco-cluster01-ext.ecdf.ed.ac.uk -L localhost:26267:localhost:26627
```

- Execute *tunneling.bat*. It will request for the credentials to connect to the VELaSSCo platform. Use the provided user name and password to establish the port tunneling.



```
login as: velgst37
```

2 User instructions and brief tasks description

Thank you for your participation in this study. You will carry out the tasks on your own in the presence of a facilitator. The facilitator will be giving hints, asking questions, observing your responses to the exercises and supporting you during the whole process. The study will comprise a series of tasks, to be completed one at a time; i.e. once the facilitator, who would be observing your interactions, agrees that you have concluded one task, you will be presented another one.

The study is about the use of VELaSSCo Platform by means of GiD or IFX visualizations clients to operate with a FEM or DEM simulation previously calculated and injected into the Platform. You will be asked to carry out tasks that involve simple simulations actions on the client side.

During the session you have the following tools at your disposal:

- **VELaSSCo Open Platform**
- **iFX Client V.8.4** (Visualization Tool)
- Text editor and viewer (e.g. Notepad, Word,...)
- Web browser

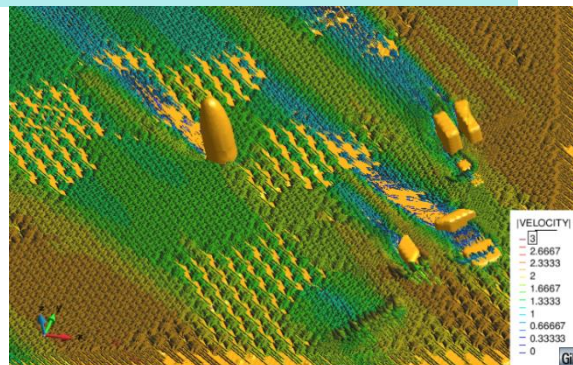
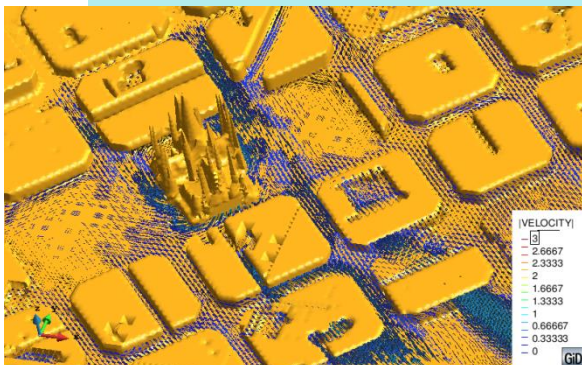
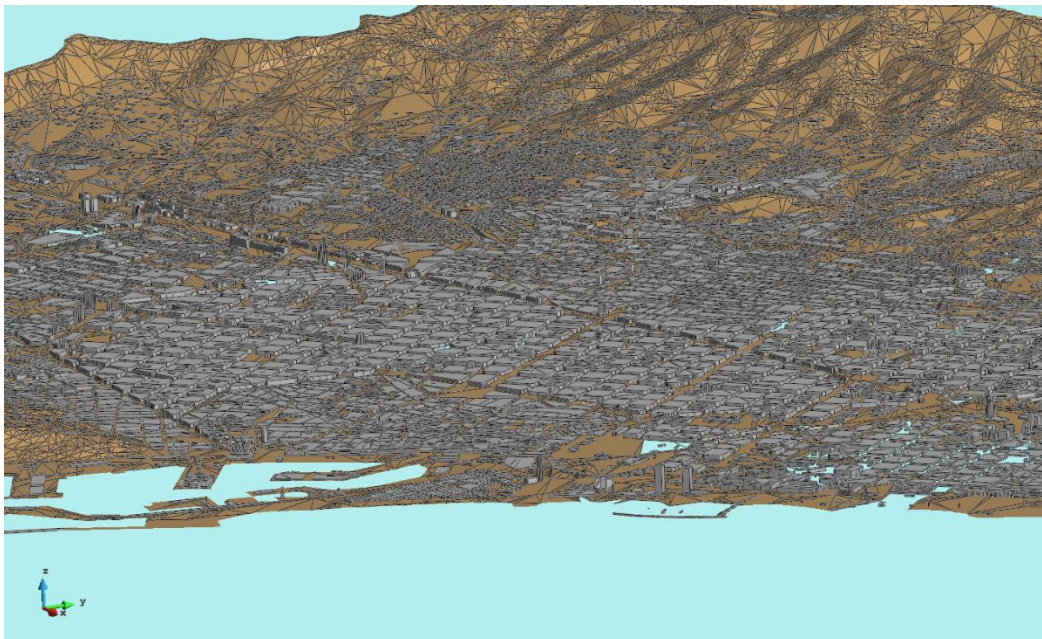
Your work may be monitored and at the end you will be asked to fill in a simple questionnaire. This will help us understand how people use VELaSSCo Platform and Visualization Clients, how efficient and effective is the VELaSSCo Platform, etc.

2.1 Barcelona Model Description

The Barcelona model selected has the following settings:

- Air flow around Barcelona city considering the Digital Model of the Terrain (DMT) and a simplified version of the buildings.
- Simulation run on 3072 cores by Kratos Multiphysics solver ()
- 3072 sub-domains (partitions):
 - Total of **60 M** nodes and **340 M** Tetrahedra
 - **240 time-steps** with:
 - Partition Index
 - Pressure
 - Velocity vector

Note: to have an order of magnitude of the size of the simulation, the results file of this simulation written by the solver occupies **2Tb** in ASCII format.



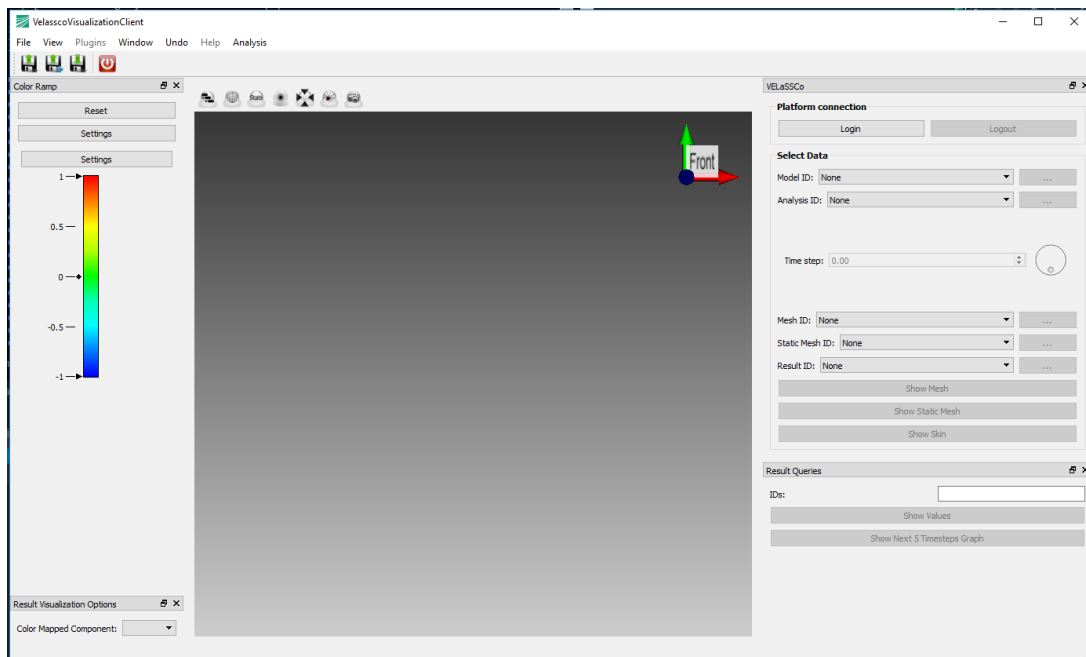
2.2 Task 1: Use case FEM.M2-01

2.2.1 Motivation

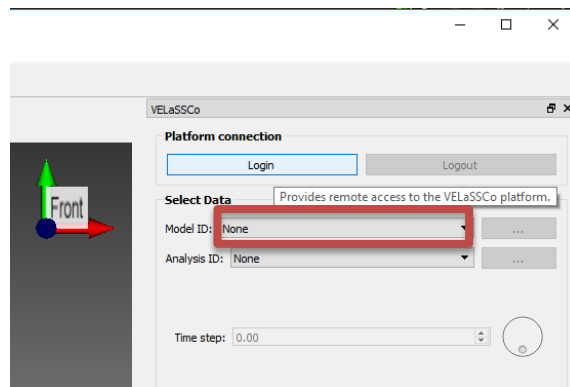
Have a look of the model, visualize the boundary mesh of the model, and see the contour-fill of a result onto that boundary, in concrete the pressure.

2.2.2 Specification

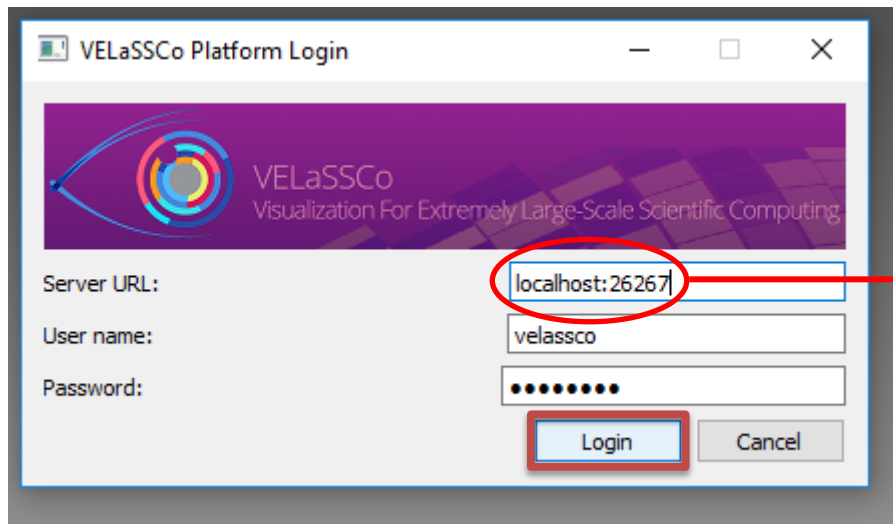
- Execute the iFX VELaSSCo client:



- Connect to VELaSSCo Server using iFX:
 - **Credentials:**
 - Tunnel one of the local ports to the query manager port of VELaSSCo platform that you have received by email.
 - Now that the port tunneling is established, click on the login button in the visualization client:

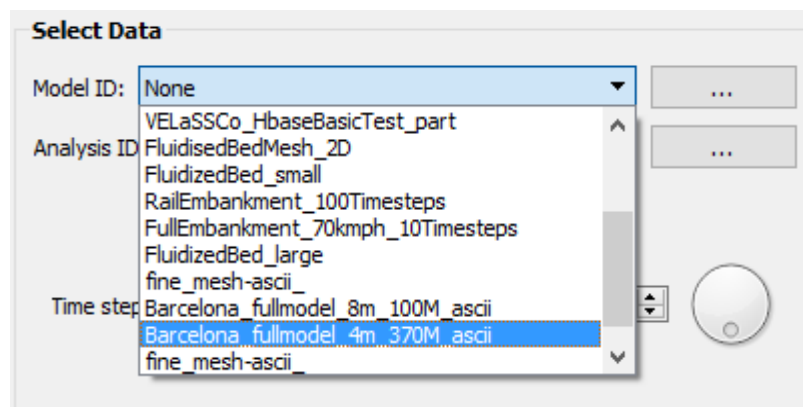


Press login again in the opened dialog to establish connection between visualization client and VELA S S C o platform:

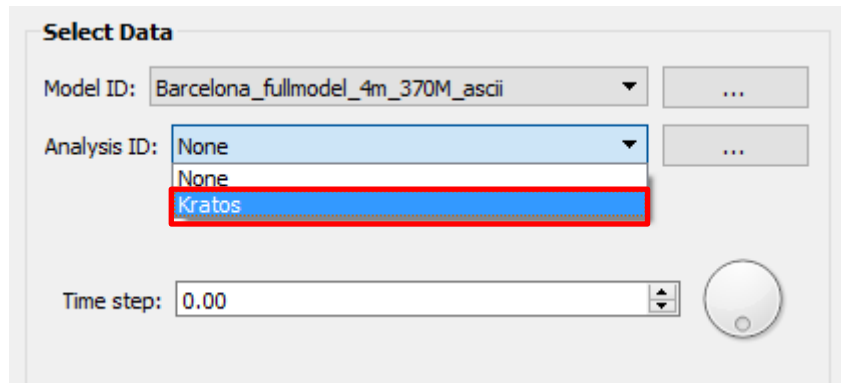


Local port tunneled to the VELA S S C o platform's port.

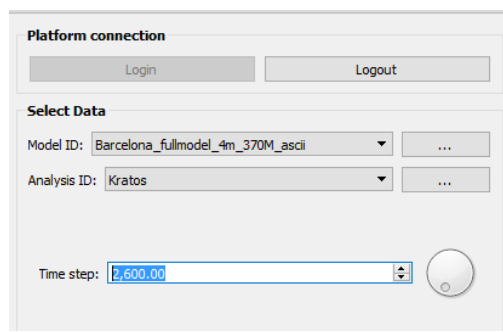
- Open a simulation model:
 - *Select the model **Barcelona_fullmodel_4m_370M_ascii** from model id list in the right pane:*



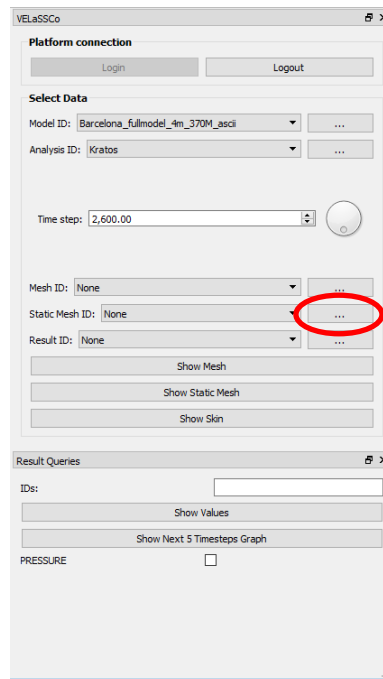
- Select the analysis ID **Kratos** from analysis ID list.



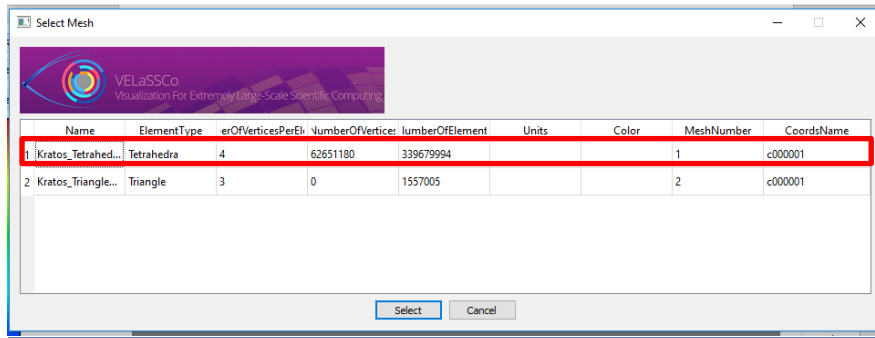
- o Set the Time step to 2,600.0.



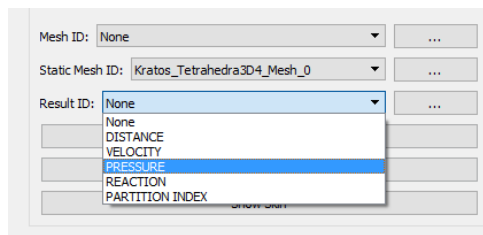
- o Click on three dots beside static meshes list to show all the available static meshes with their information.



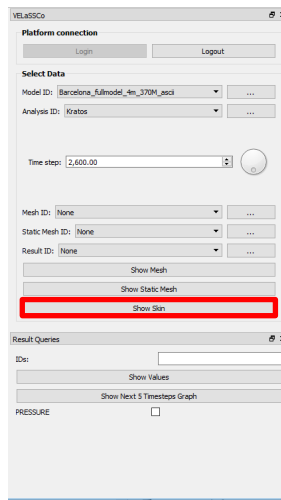
- o Choose the static mesh with tetrahedral elements (simulation mesh) and press select.



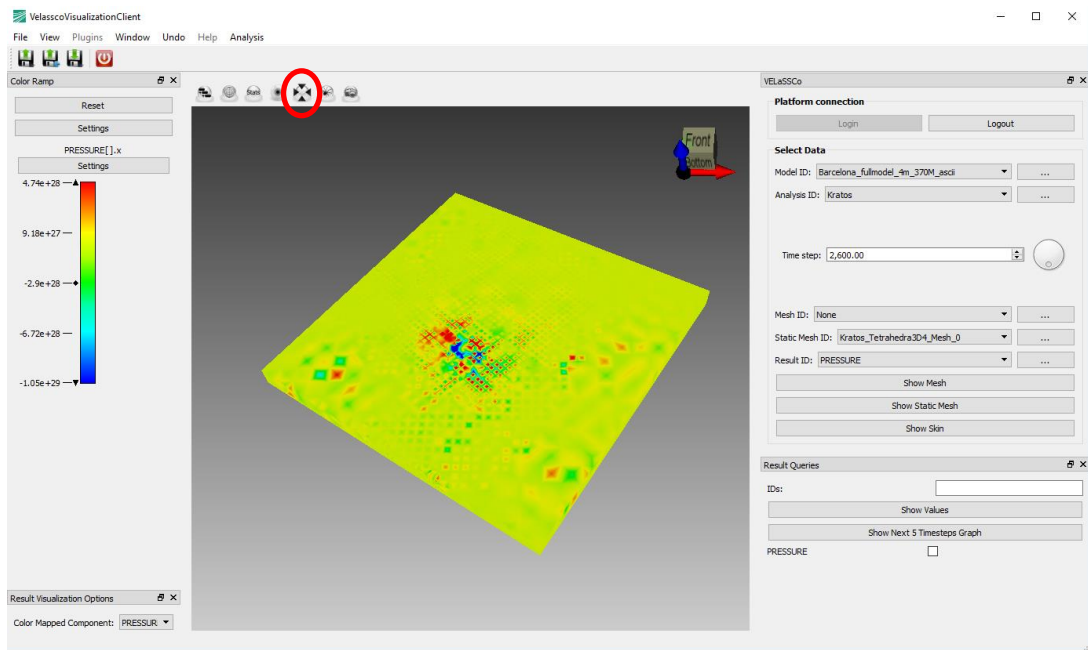
- Select **PRESSURE** result among the results list.



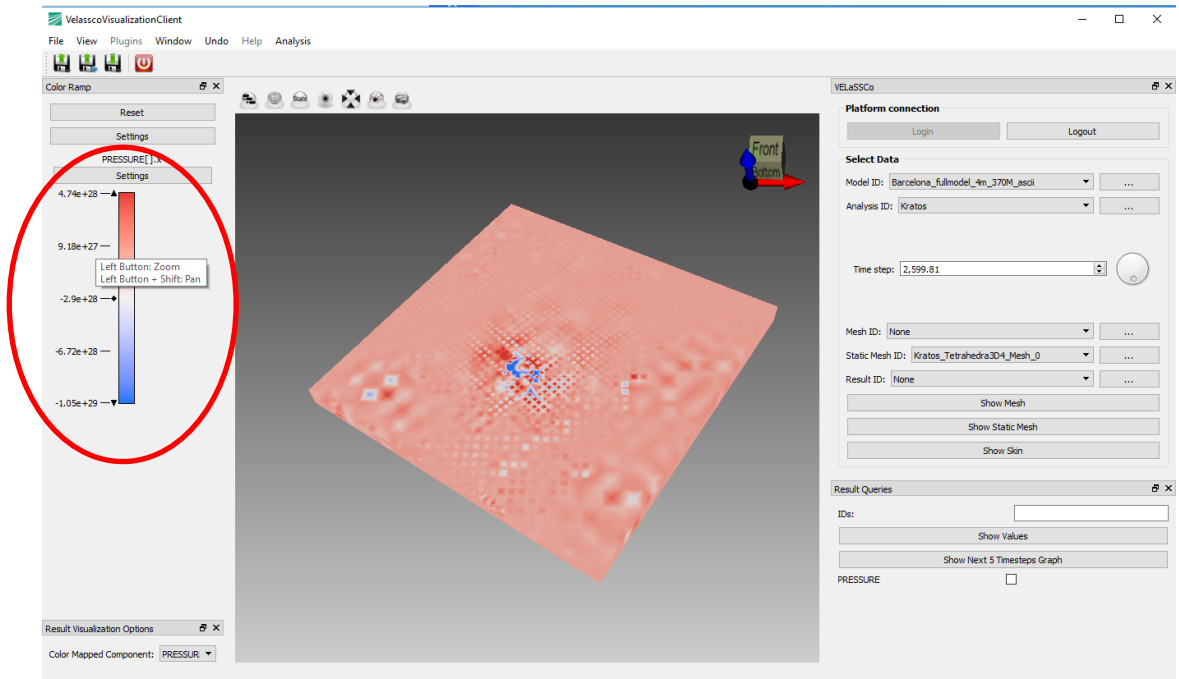
- Visualize the boundary mesh with contour fill by clicking on **show skin** button.



- When the computation was done, press reset view button which is shown in the figure. The result should appear and it should look like the following figure:



- Now, the color mapping can be modified by dragging the color mapping min, max, or center. The color mapping can also be changed by double right clicking on it.



Note: Don't logout, because the following use case is also using this model.

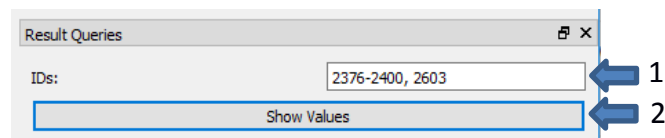
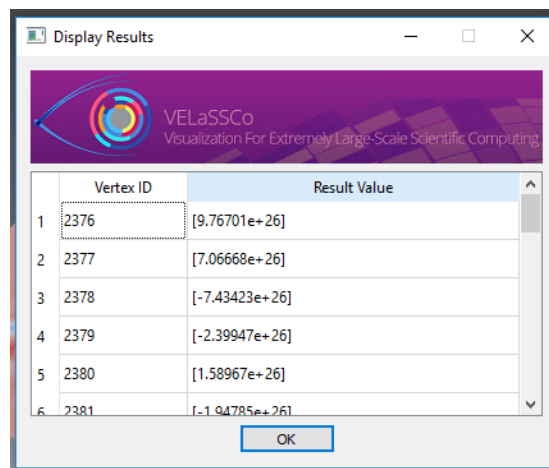
2.3 Task 2: Use case FEM.M2-02

2.3.1 Motivation

Get quantitative information about some result. Specifically, to get the result (pressure) of a specific node, and to get the evolution of the result on a node over time.

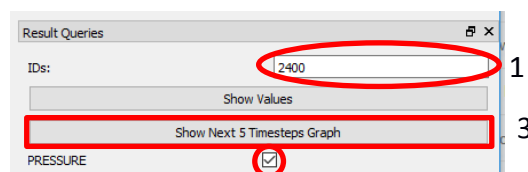
2.3.2 Specification

- Get a result on a node:
 - Get the pressure value for:
 - Analysis = **Kratos**
 - Time-steps: 2600
 - Result = **Pressure**
 - Node number **2376-2400, 2603** -> (e.g. check the value of the result for node 2376 is equal to **9.76701e+26**, and result value for node 2603 is **-3.16662e+26**).

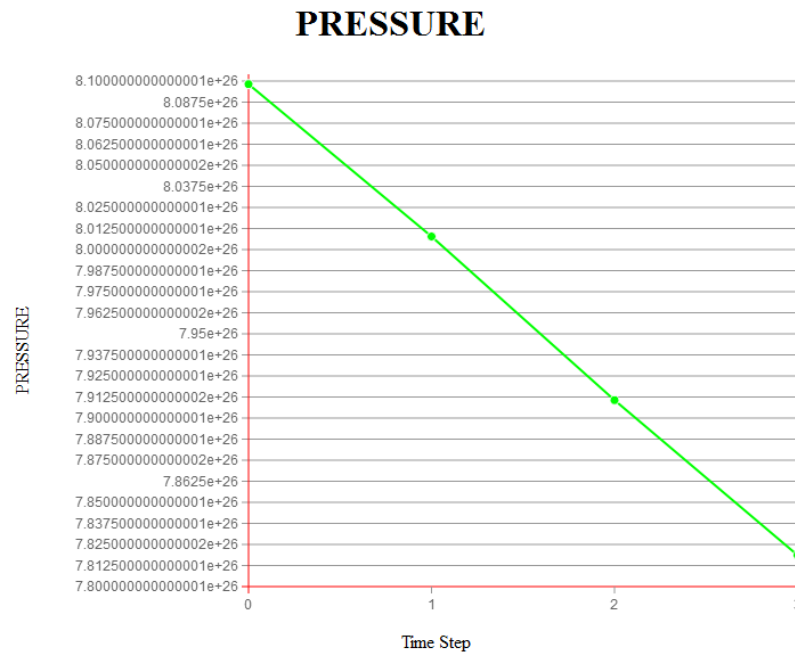



Vertex ID	Result Value
1 2376	[9.76701e+26]
2 2377	[7.06668e+26]
3 2378	[-7.43423e+26]
4 2379	[-2.39947e+26]
5 2380	[1.58967e+26]
6 2381	[-1.94785e+26]

- Get the evolution of a result on a node over time.
 - Clear the node IDs to **2400**, check **PRESSURE** and press **Show Next 5 Timesteps Graph**



- The result should look like the following figure:



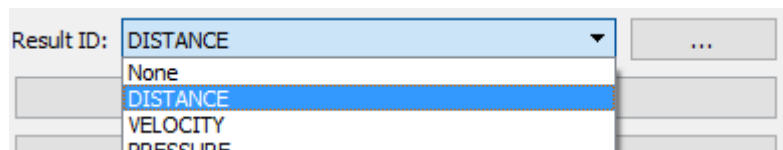
2.4 Task 3: Use case FEM.M2-03

2.4.1 Motivation

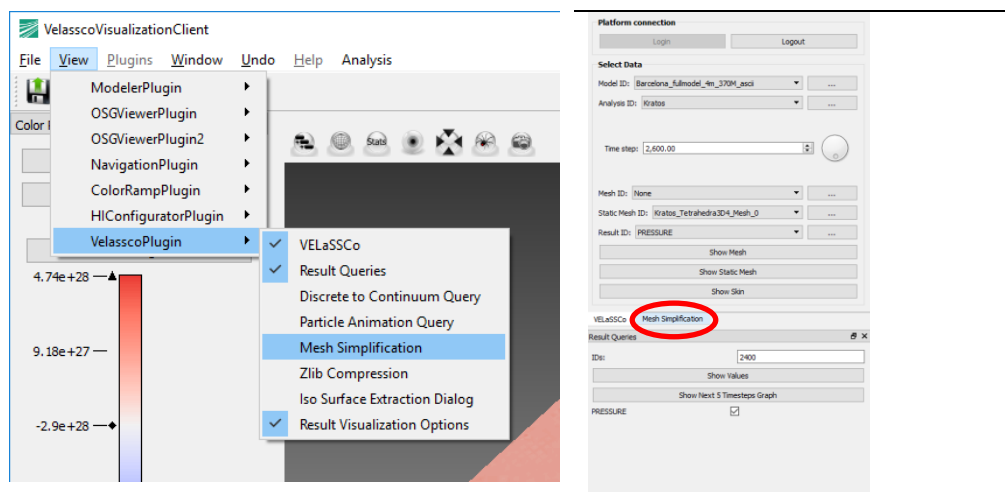
Use a simplified volume model to interact with it more efficiently.

2.4.2 Specification

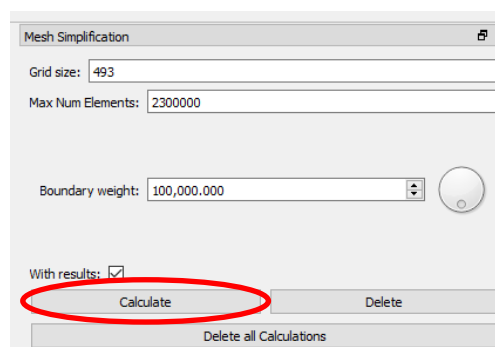
- User: Get the simplified version of the model considering the mesh and results.
 - Change the results to **Distance**



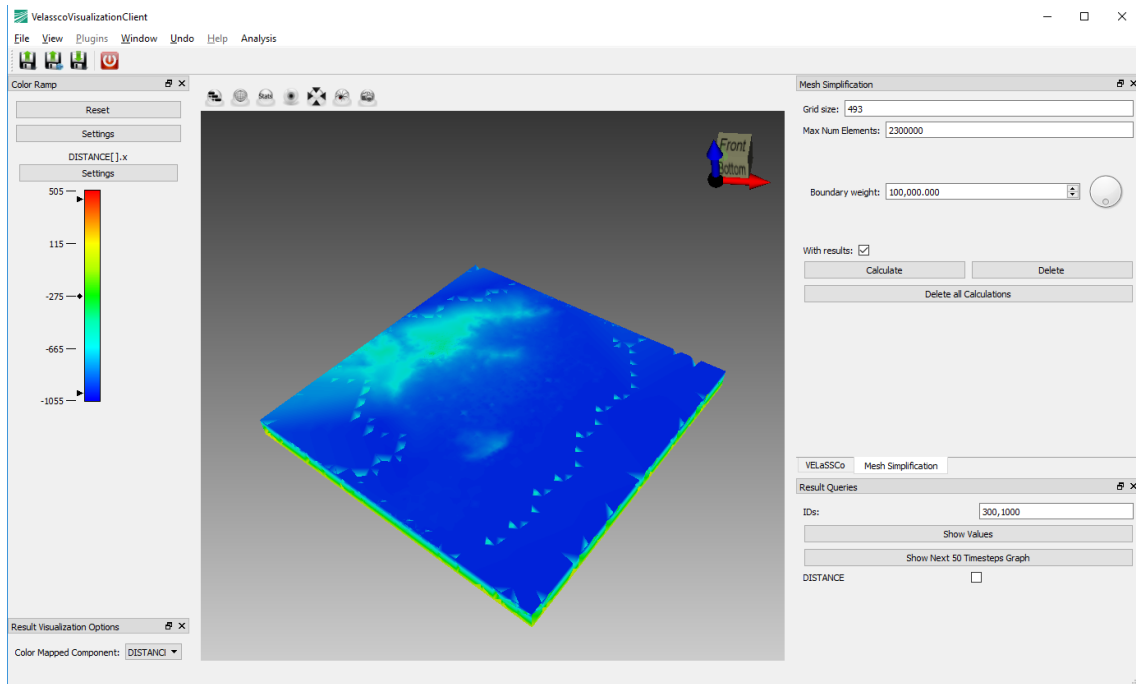
- Open the **Mesh Simplification** dialog and choose **Mesh Simplification** tab.



- Get the simplified version of the model considering the parameters. Decimation grid size=**493**, Boundary weight=**100000**, Max. Num. of elements=**2.3 million**, and with results. Make sure the parameters are set in the preference window for VELaSSCo:



- The result looks like the following image :



3 Questionnaire for participants

Measuring the quality of a service can be a very difficult exercise. Unlike product where there are specific specifications such as length, depth, width, weight, colour etc. a service can have numerous intangible or qualitative specifications. In addition there is there expectation of the customer with regards the service, which can vary considerably based on a range of factors such as prior experience, personal needs and what other people may have told them.

The questionnaire below is in three sections. On the one hand the first section asks you to rank all software tools for pre and post processing of numerical simulations in science and engineering according to your expectations i.e. what you expect all these tools to provide. On the other hand the second section asks you to rank the VELaSSCo Plugin for iFX according to your experiences and perceptions. The third section asks you about the overall satisfaction of VELaSSCo Plugin for iFX.

Expectations deals with your opinions of software tools for pre and post processing of numerical simulations. What we are interested in here is a number that best shows you expectations about software tools for pre and post processing of numerical simulations offering services.

Perceptions relate to your feelings about the iFX VELaSSCo visualization client. Please show the extent to which you believe this tool has the feature described in the statement. Here, we are interested in a number from 1 to 7 that shows your perceptions about the iFX VELaSSCo visualization client.

You should rank each statement following a seven-point Likert-style scale from 1=very unimportant to 7=very important

The questionnaire is available in the following URL to be filled:

<https://docs.google.com/forms/d/e/1FAIpQLScEQWrvk07eriIBNCb2xhjpeizZyYTtyQWEHbNE3SgbX6WgwA/viewform#responses>

In summary, our purpose is to get your valuable feedback about your experience with the VELASSCO Platform and its usability against expectations.

We would also appreciate your impressions on practical issues and any other comment or criticisms that you may find interesting.

Please send your completed questionnaires telematics using the URL indicated above.

Thanks for your time.

The VELASSCO project.