Running OpenFOAM Simulation in UberCloud Container

Prepared by UberCloud

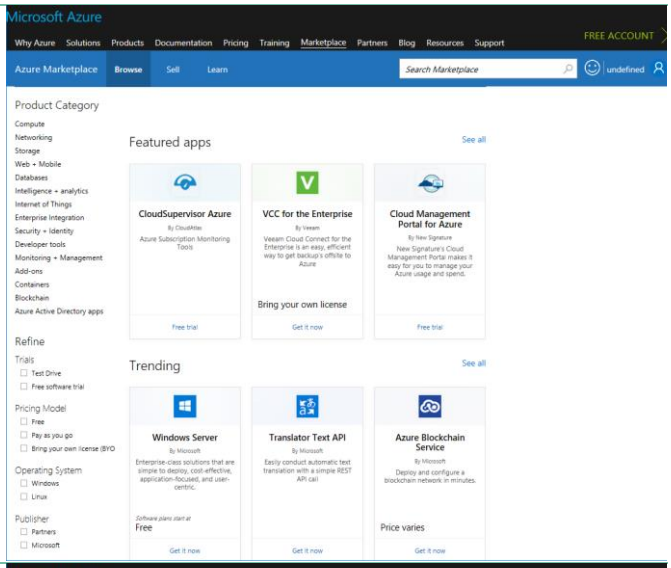
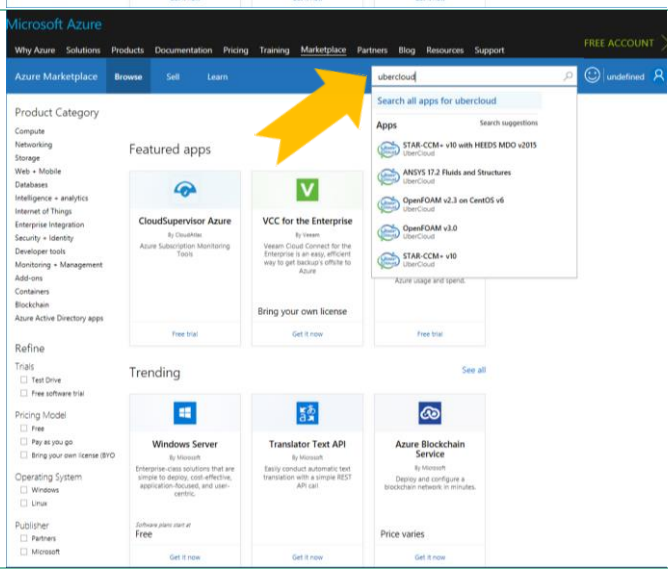
March 13, 2018
Version 1.2

Index

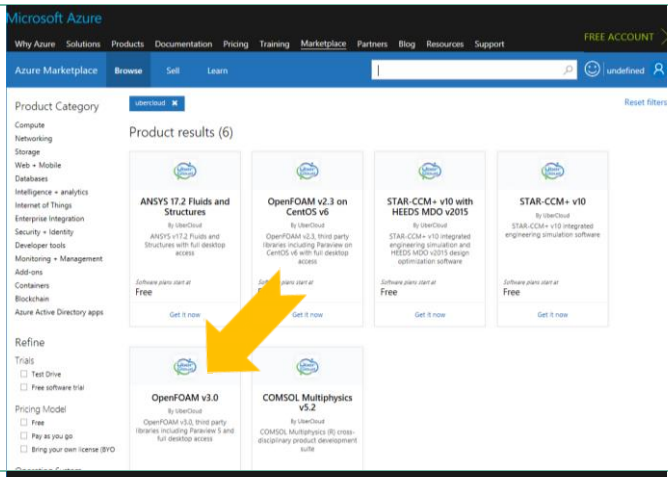
Introduction

This document serves as a guideline to select an UberCloud application service and an Azure cloud instance and run it on Azure. OpenFOAM v3.0 is used as an example in this tutorial. There are over 40 CAE applications available in UberCloud.

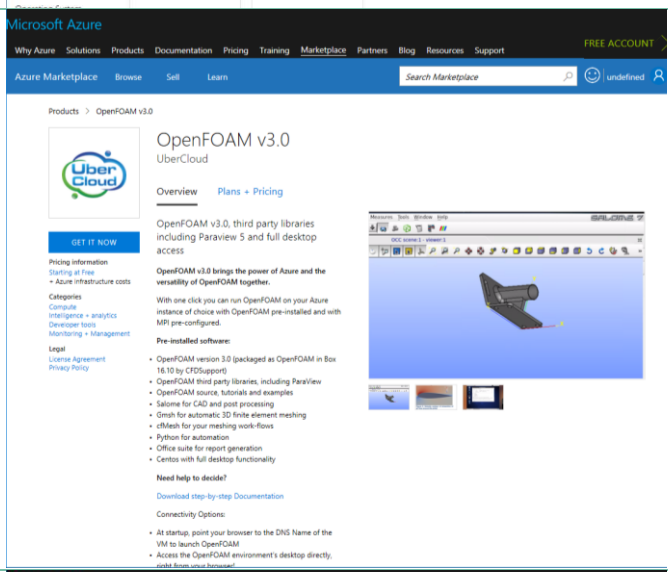
1. Purchase UberCloud OpenFOAM Service through the Azure Marketplace

a.	In your browser go to: https://azure.microsoft.com/en-us/marketplace/	
b.	In the "Search Marketplace" area Search for UberCloud	

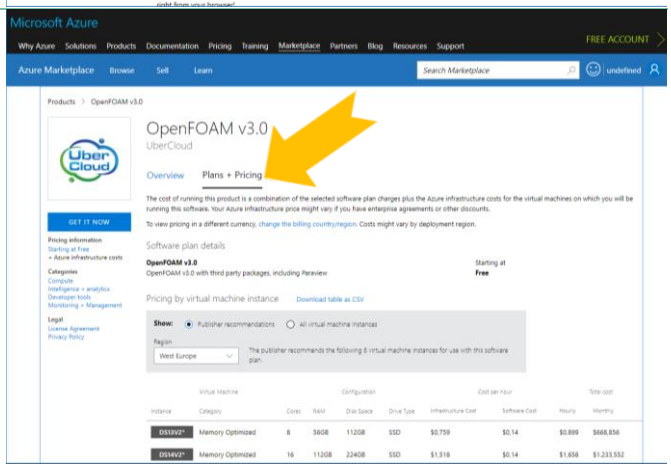
c. Click on the UberCloud service you'd like to purchase (***OpenFOAM v3.0 in this example***).
If you need a different software release not (yet) available on this marketplace please contact www.TheUberCloud.com/Help/



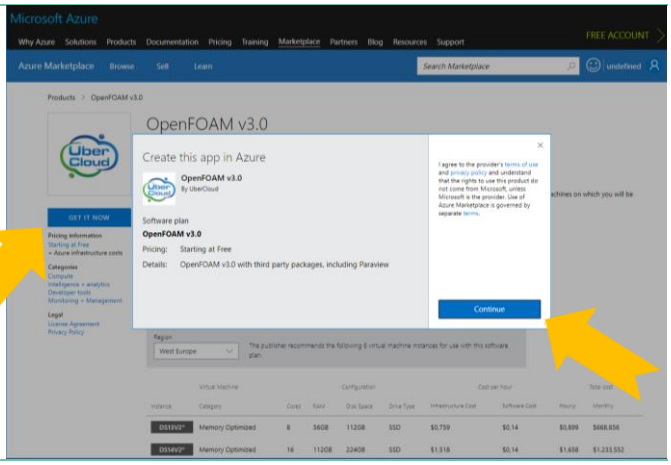
d. Review the service details.



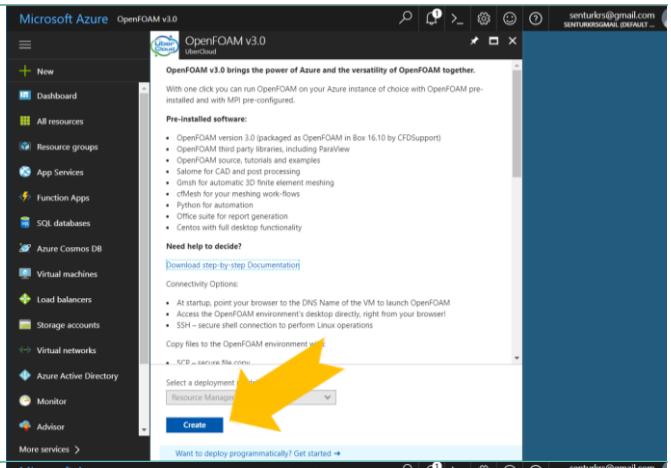
e. Click on "Plans and Pricing". This page presents all the instance types available per region along with pricing. Select and note down the region that's closest to you to achieve best performance. Note down the instance type you'd like to work on. Note: not all instance types are available at each Azure region. To start with we recommend 4 or 8 cores so you can compare the results with the one on your workstation.



f. Click on the "GET IT NOW" button under the UberCloud logo on the left and click "Continue".



g. You will land on the Azure Portal Page. Scroll to the top of the page and click on the "Create" button at the bottom of OpenFOAM information window.

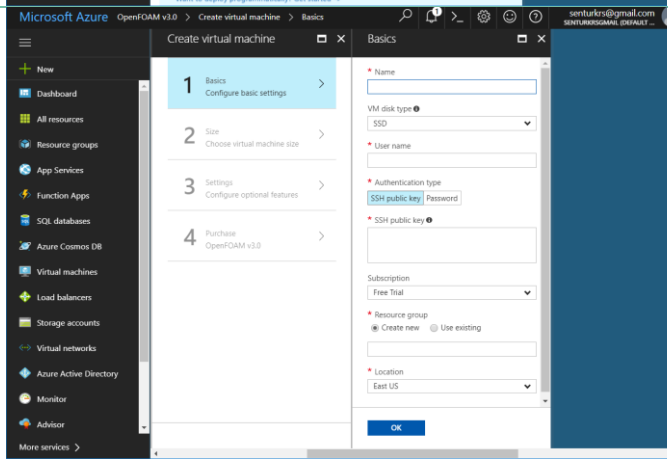


h. On the "Create virtual machine" Basics page enter the following information:

i. Name: A name for your VM. This name can't contain any special characters or spaces.

ii. VM Disk Type: For performance reasons we highly recommend the Premium (SSD) option.

iii. User name: Pick a username, which will be used as the administrator username of your new VM. The username can't contain any spaces or special characters. For example you may enter "vmadmin".



iv. Authentication type: Choose the connection security option from "SSH public key" or "Password". Password is usually sufficient for most needs however you may select SSH if you have highly sensitive data. Select "Password" option and enter a password for your administrator username. You are required to select a sufficiently complex password, so please use a mix of upper and lower case letters, numbers and special characters.

v. You can leave the defaults for other options.

vi. Enter a name for the resource group you want to create; this can be any name. We usually use the same name as the VM and add –rg to the end.

vii. Location: This is where you enter the region you decided to select in Step 2.e above.

viii Click "OK" to save and go to the next step.

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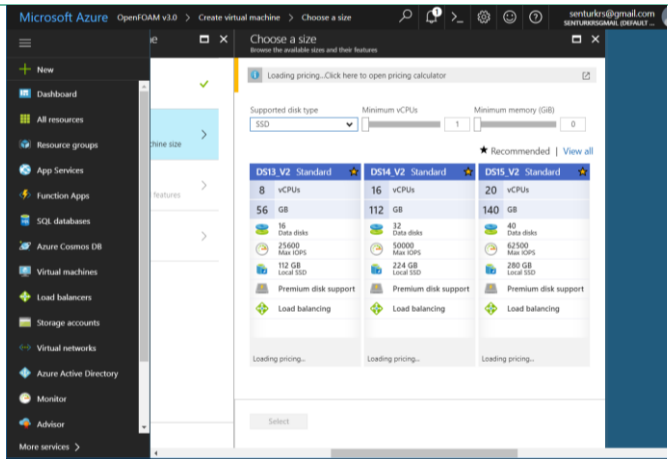
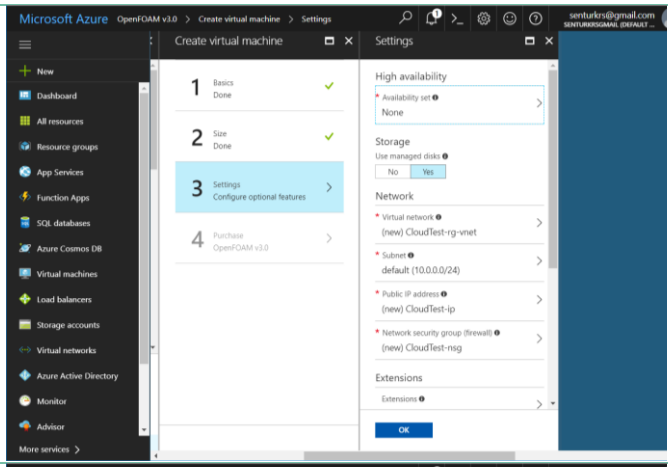
i. Now you will select the size of your environment. At this step you may notice "*Loading Pricing*" status and it may take several minutes to load pricing data. Select the Pricing Tier you decided on in Step 2.e. You may need to click on the "View All" link which appears above the pricing tier if the pricing tier you'd like to pick isn't displayed as a "Recommended" option. Click on the "Select" button at the bottom of the page once you have selected your

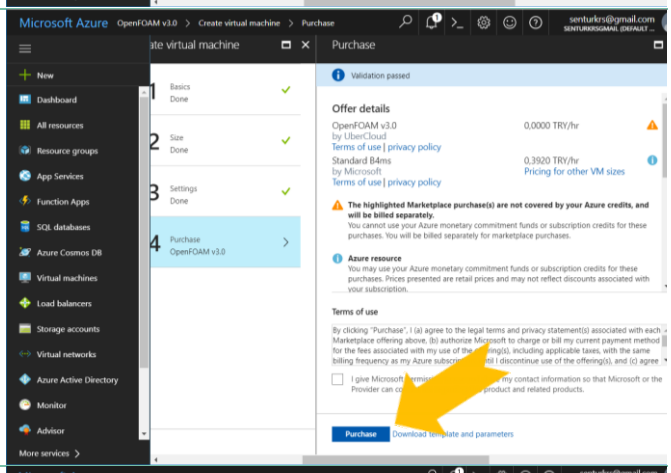


Pricing Tier. Click "OK" to save and go to the next step

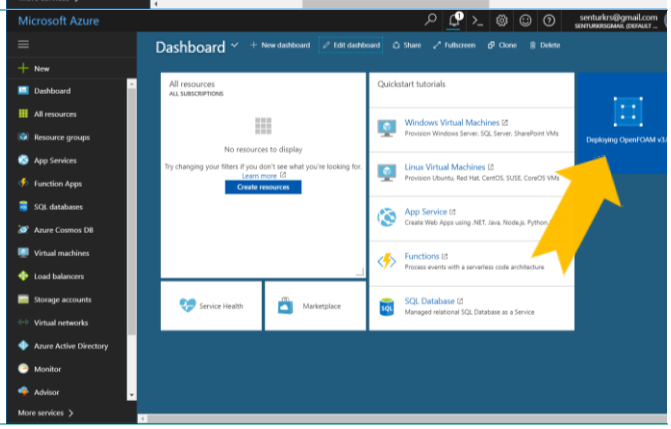
j. Now you will be deciding on settings for your environment. You can leave the defaults for these options. Click "OK" to save and go to the next step.



k. Please verify your service details and review settings. Click on the "Purchase" button at the bottom of the page.

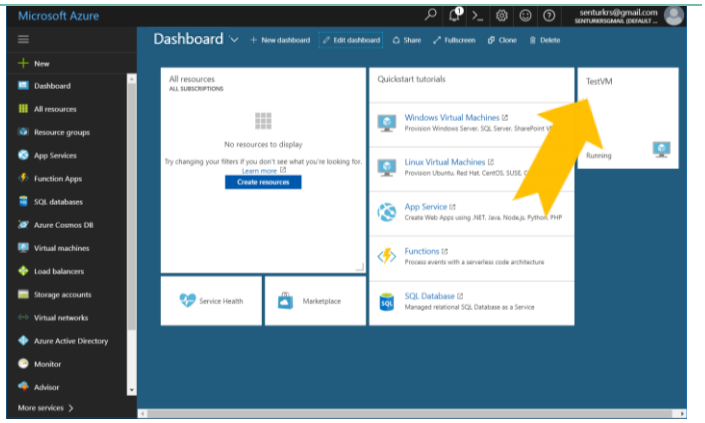


l. You will land on the "Dashboard" and you will see the new VM set up process to the right of the page. The set up process can take several minutes. The status can be obtained by clicking on the "Notifications" button on the left panel.

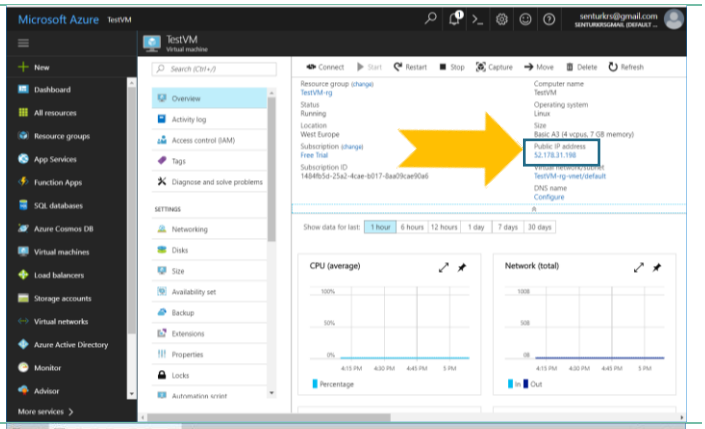


2. Running CAE Applications on Azure using UberCloud

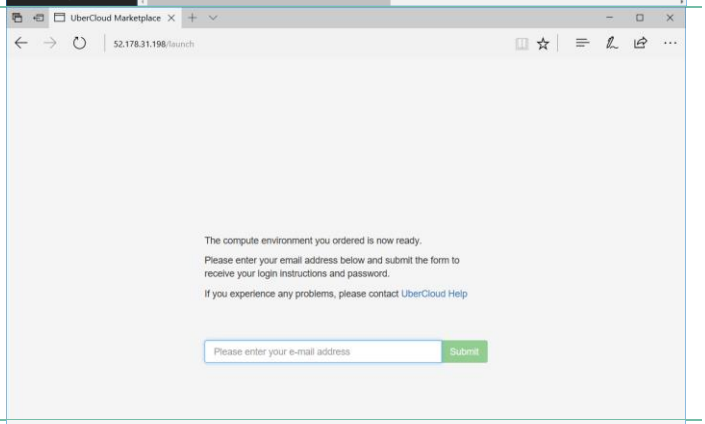
a. Once your new VM with the UberCloud service starts, you will be notified on the "Azure Dashboard" page, which can be reached at https://portal.azure.com/ You can see the status either on the far right of the page where you will see the name of your VM, or by clicking on the "Virtual machines" link on the far left of the page.



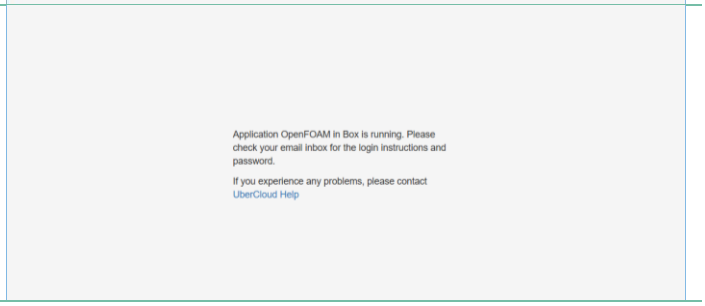
b. When you click on your new VM's name you will land on the "Running Virtual Machine" page, where you can see statistics and management options for your VM. To access the UberCloud service, find the "Public IP Address" of the VM on the "Running Virtual Machine" page.



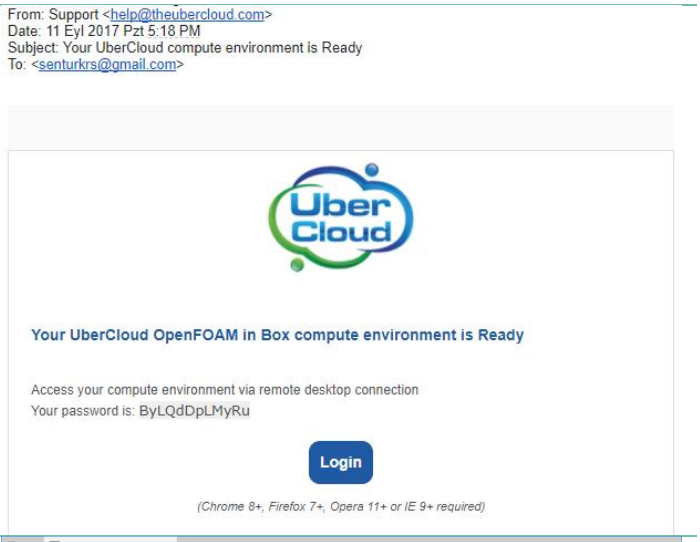
c. Copy this IP Address in full and paste the IP Address into your browser in a new tab and go to this IP Address. You will land on the management page for the UberCloud service. Enter your email address and click on the "Submit" button to receive instructions on how to access the UberCloud service through your browser.



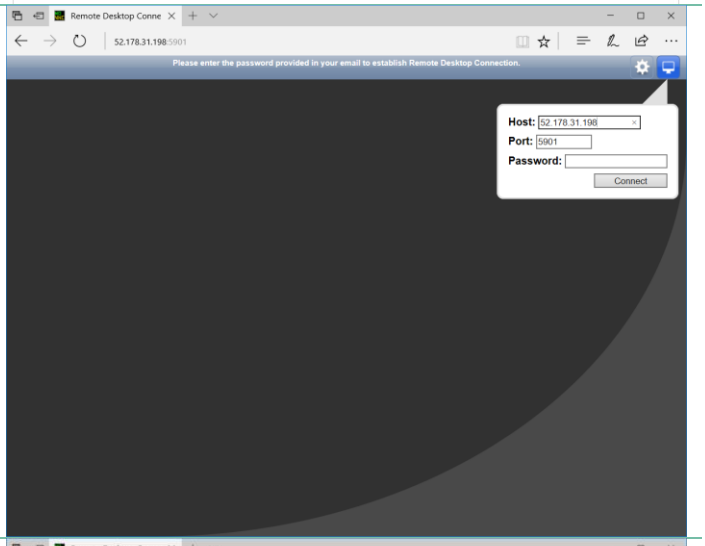
d. This process may take several minutes. You will see a message stating "Application is running..." when the process is complete.



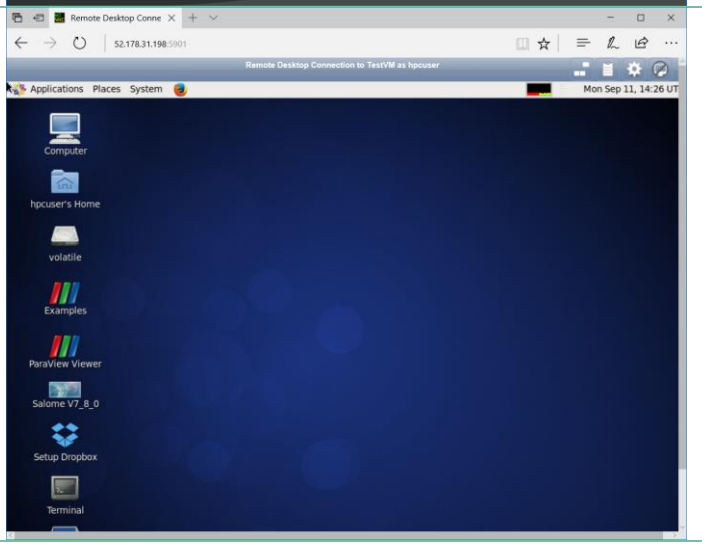
e. Check your email inbox for instructions on how to use the UberCloud service. Keep this email for future reference and do not share it with others for the privacy of your data. Look for the password and copy it. Right below the password is the "Login" button, which will enable you to connect to the UberCloud service running in your new VM.



f. When you click on the Login button you will land on the login page of the remote desktop connection to the UberCloud service. Look for the password box and paste the password you've received with the instructions email.

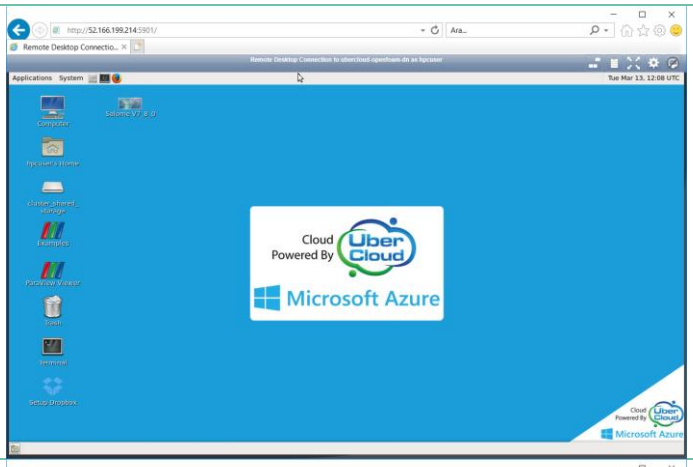


g. You will see the desktop of the UberCloud service using a remote desktop connection through your browser.



3. Using OpenFOAM Tutorials to get familiar with the UberCloud Service

a. UberCloud services contain an "Examples" desktop shortcut. Tutorials provide a great opportunity to discover how the UberCloud service works.



b. Double click on the "Examples" shortcut to access sample data files and instructions on how to run them.

c. As you work on the tutorials, you will download sample data files from the Internet to your new VM. It is worth mentioning that you can use the following methods to transfer data files:

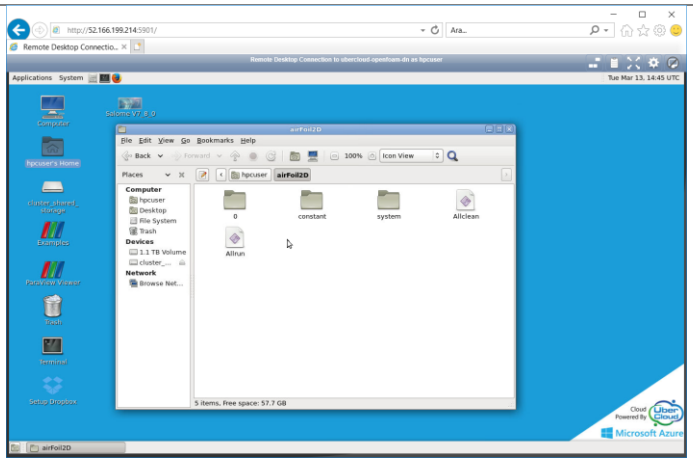
i. ***From the Internet, using the browser:*** With this method, you can access public data sources on the Internet. You can also log in to private data sources such as your email account, your Cloud file sharing account (such as Google Drive) or your company's Internet site.

ii. ***From your Cloud storage account, using Dropbox:*** If you are a user of Dropbox, you can use the "Dropbox" shortcut on the desktop and synchronize your files to your new VM automatically. Similarly, you can review other Cloud storage account options in the "Applications/File Transfer" menu, which appears in the top left corner of the UberCloud service.

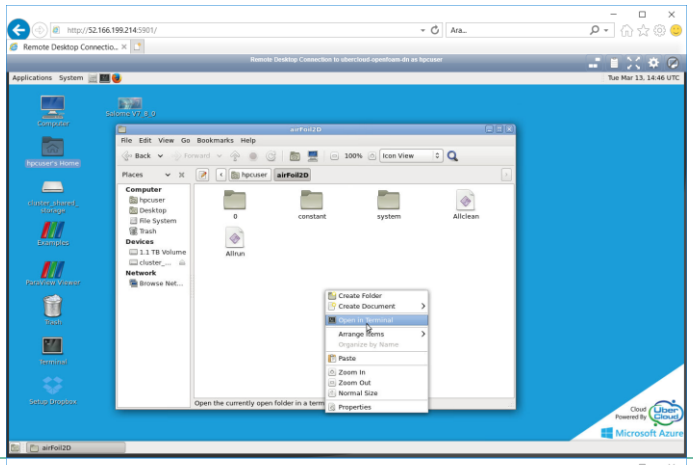
iii. ***From your desktop, using SCP:*** You can use secure file copy (SCP) to upload files from your desktop directly to your new VM. The instructions email, which you have received in Step 3e describes how to use SCP.

3.1. Airfoil Tutorial

a. Tutorial has been already loaded to the VM. Double click on the "hpcuser's Home" icon to open the home folder and do into "airFoil2D" folder to access sample data.

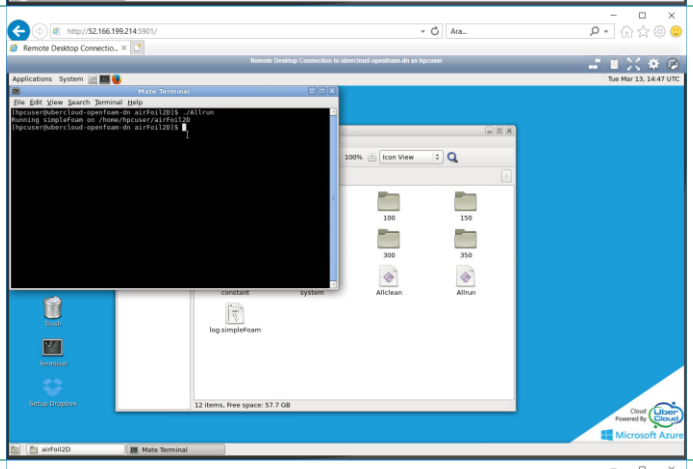


b. Right-clink in the folder and select "Open in Terminal" to open Terminal window.



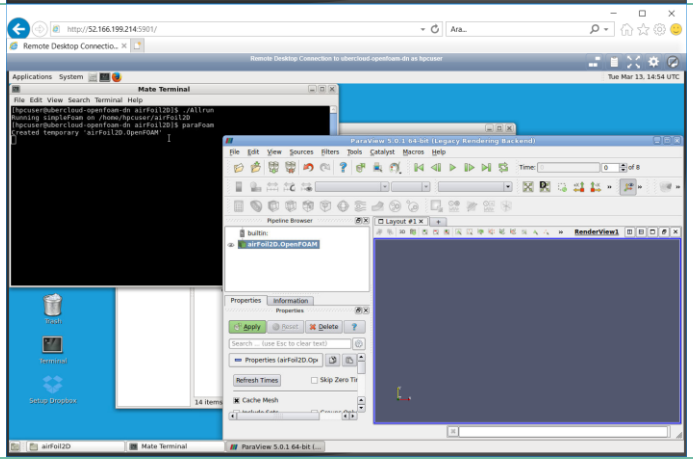
c. Airfoil tutorial comes preconfigured with all necessary parameters and a script to run mesh and solver in one command. You can start the simulation by entering this command in the terminal:

```
./Allrun
```

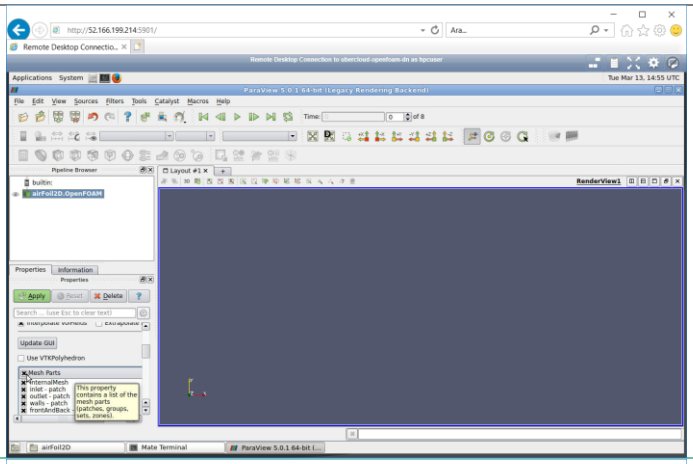


d. Once the simulation is completed, you can visualize the results by entering this command in the terminal:

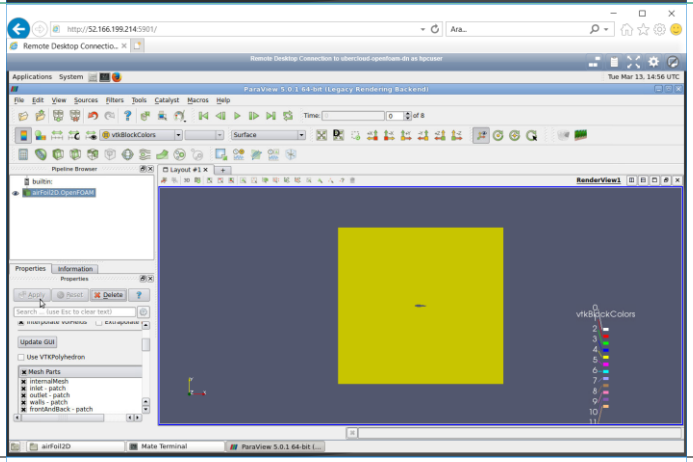
```
paraFoam
```



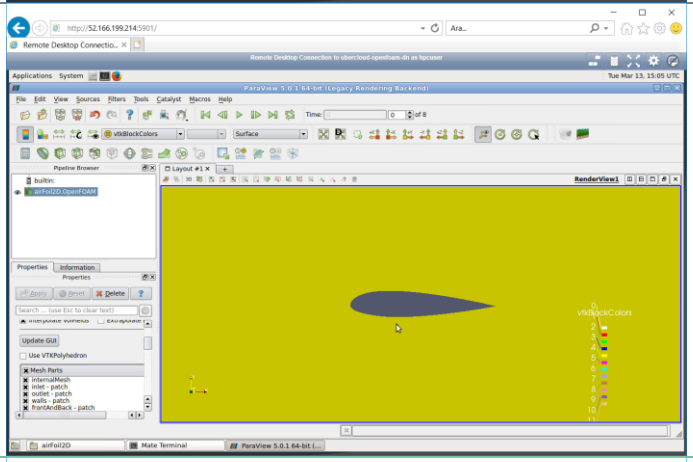
e. Maximize the ParaView window, go to Properties section at the bottom-right corner and click on the "Mesh Parts" checkbox to select all parts.



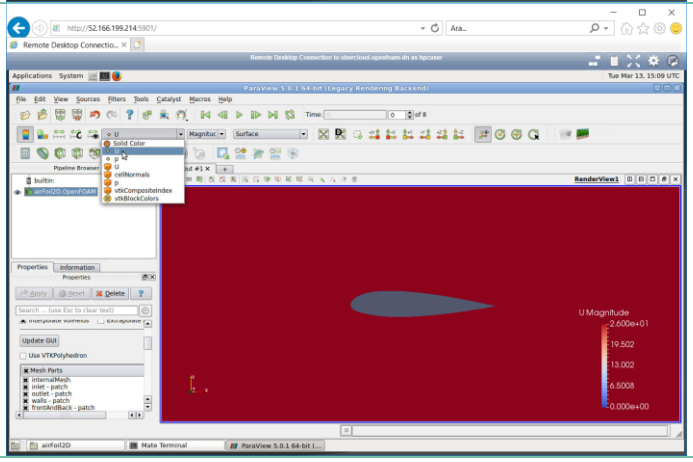
f. Click on the "Apply" button to load mesh data.



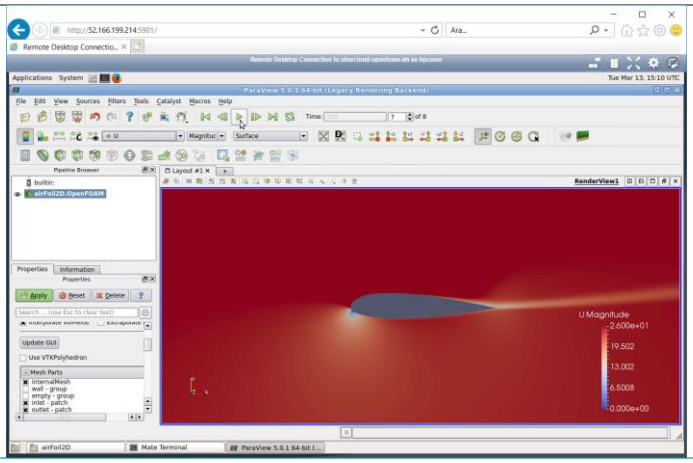
g. Zoom in to the wing cross section using the mouse or clicking on the "Zoom to Box" icon in the toolbar and drawing a box around the wing cross section to select the area to zoom.



h. Choose wind velocity by selecting "♦U" in the toolbar to visualize.

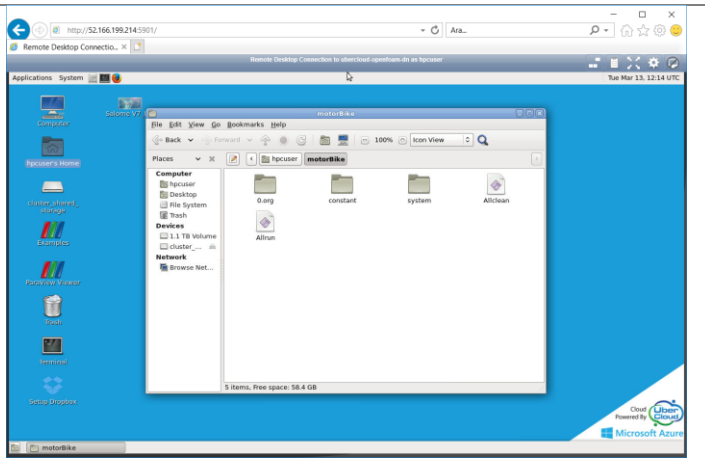


i. To see the wind velocity effects click on the "▶" in the toolbar to visualize.

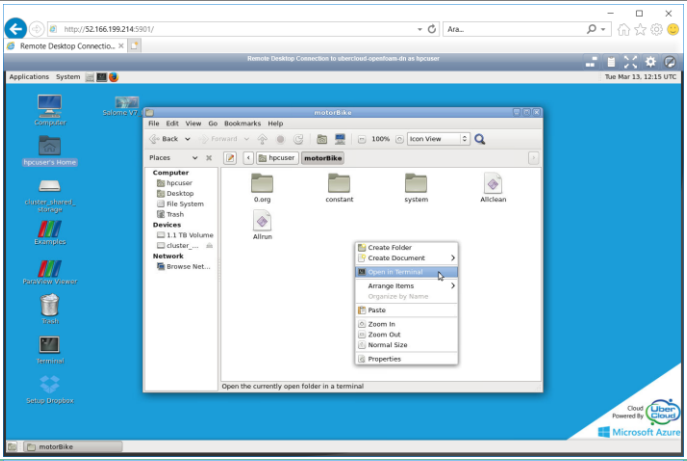


3.2. Motorbike Tutorial

a. Tutorial has been already loaded to the VM. Double click on the "hpcuser's Home" icon to open the home folder and do into "motorBike" folder to access sample data.

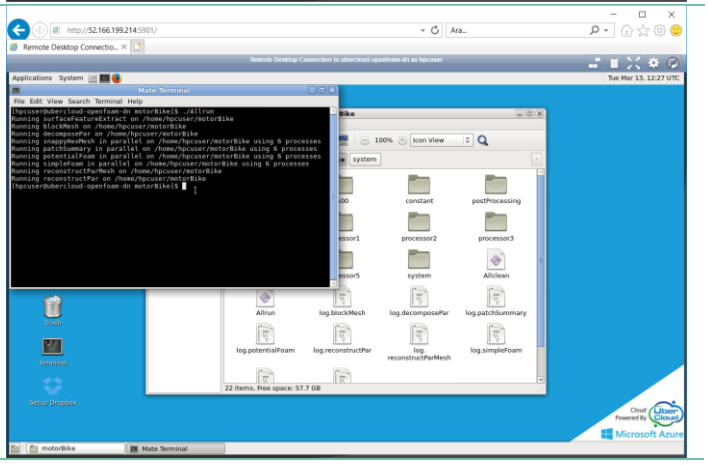


b. Right-clink in the folder and select "Open in Terminal" to open Terminal window.



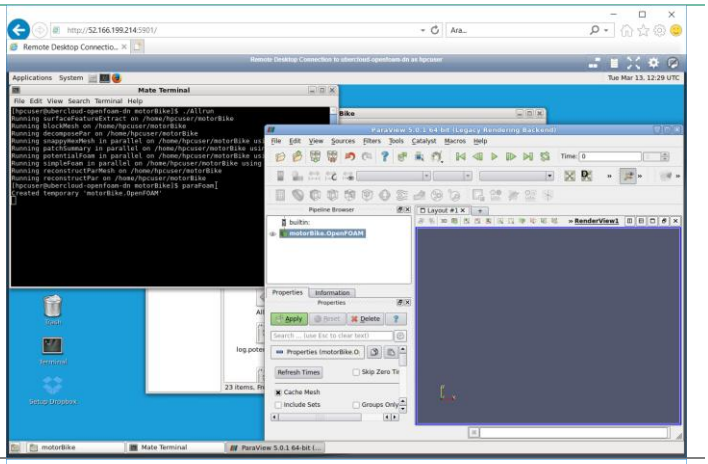
c. Motorbike tutorial comes preconfigured with all necessary parameters and a script to run mesh and solver in one command. You can start the simulation by entering this command in the terminal:

```
./Allrun
```

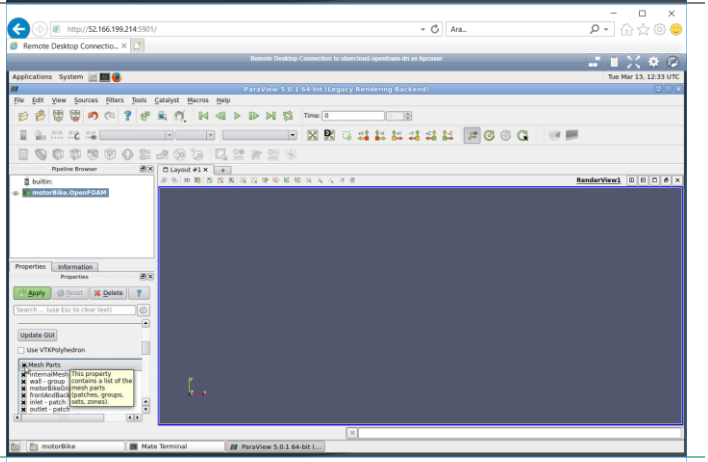


d. Once the simulation is completed, you can visualize the results by entering this command in the terminal:

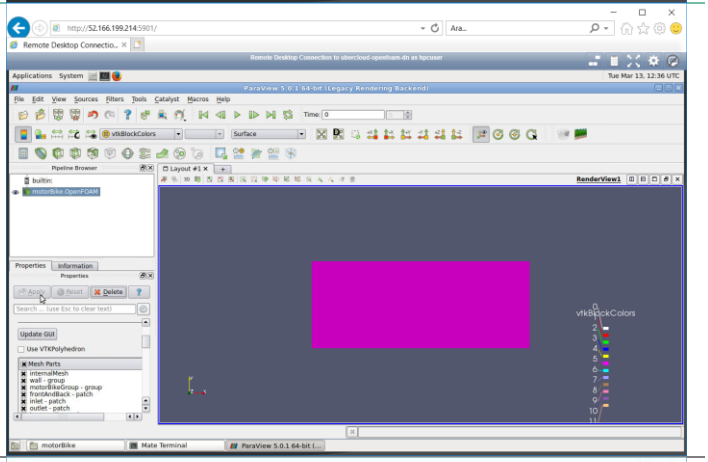
```
paraFoam
```



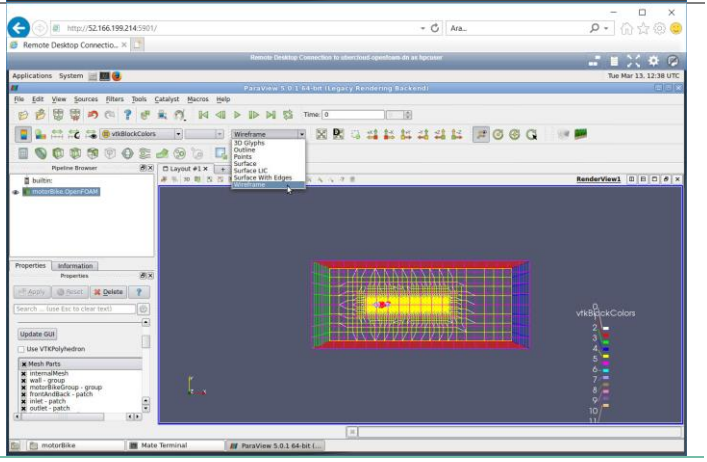
e. Maximize the ParaView window, go to Properties section at the bottom-right corner and click on the "Mesh Parts" checkbox to select all parts.



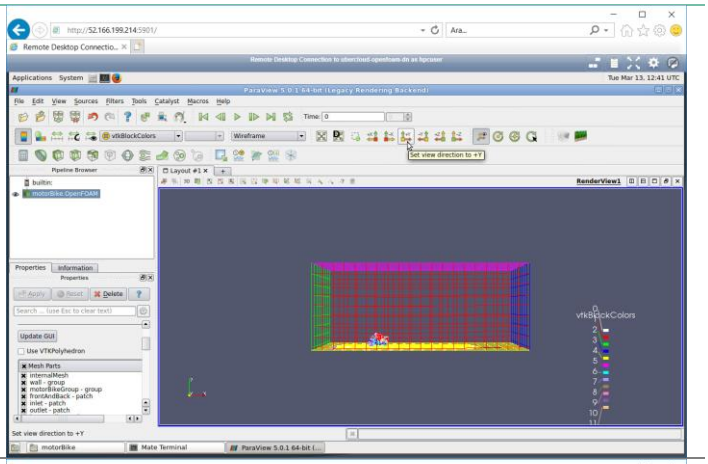
f. Click on the "Apply" button to load mesh data.



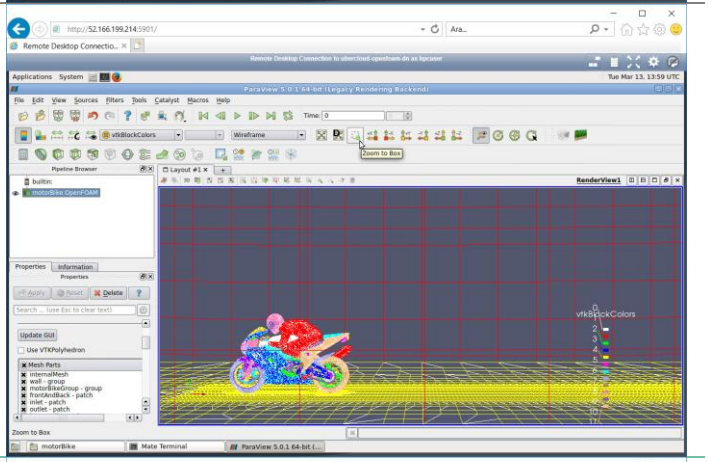
g. Select "Wireframe" in the toolbar to visualize.



h. Click on the "+Y" icon in the toolbar to rotate to Y-axis.

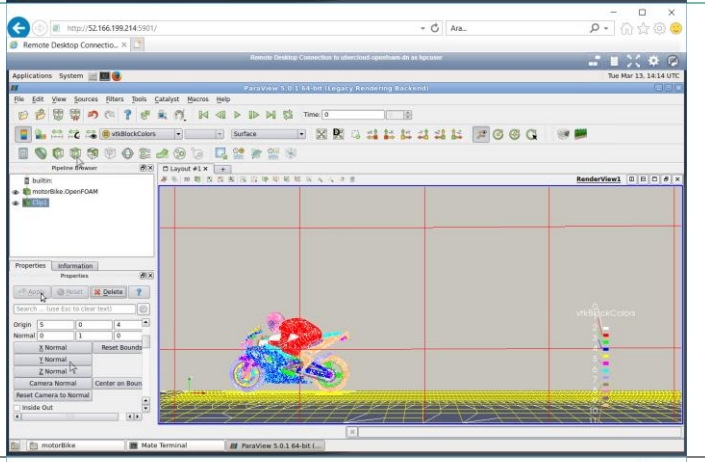


i. Click on the "Zoom to Box" icon in the toolbar and draw a box around the motorbike to select the area to zoom.

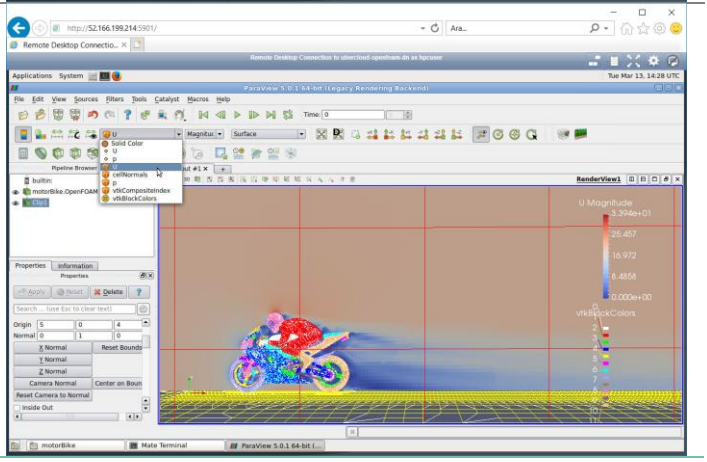


j. To apply a slice on Y-axis:

- Click on the "Slice" icon in the toolbar,
- Click on the "Y Normal" button in the Properties box,
- Click on the "Apply" button.



k. To see the wind velocity distribution select "U" in the toolbar to visualize.



5. Shutting down the VM with the UberCloud Service

a. You may want to shut down the UberCloud service for 3 reasons:

i. You have a long running computation. Follow Step 5.b to let the VM run in the background.

ii. You don't have any computations to run now, but would like to return back to run computations soon. Follow Step 5.c to stop the VM.

iii. Your computations are complete and you are not planning to return back to run computations soon. Follow Step 5.d to delete the VM.

b. You have a long running computation: If you have a long running computation and you wish to let it continue running without your supervision, you can simply close the browser window, which you've started in Step 3.e.

c. You don't have any computations to run now, but would like to return back to run computations soon: If you'd like to preserve your VM and run computations on it soon, then follow Step 3.a to access the "Running Virtual Machine" page for your VM. Then click on Stop. Stopped VM's preserve the files which have been saved and incur storage charges, however, you will not be charged for compute usage. You can return back to restart the VM at a later time and log in to your UberCloud service following Step 3.e. **Please note that if you stop and start your server, the IP address may change.**

d. Your computations are complete and you are not planning to return back to run computations soon: If you'd like to terminate the VM and the UberCloud service, please make sure you copy all your data files by following Step 4.c. Then follow Step 3.a to access the "Running Virtual Machine" page for your VM and click the "Delete" button. Please remember that this step cannot be reversed and all the data you have in the VM and the UberCloud service will be deleted. You need to follow this method to stop any charges against your account for compute, storage, and software charges.