

# **5th Fenix Research Infrastructure Webinar: How to use ICEI's Virtual Machines for deploying platform services**

Tuesday 23 June 2020, 15:00 CET

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# Overview of webinar

- Cloud Computing
- ICEI VM Service
- Creating and Launching VMs using Pollux
- Q & A

# Cloud Computing

- **Cloud computing** offers on-demand, self-managed infrastructure, as a service
- It is comprised of **three layers**:

## Software-as-a-Service (SaaS)

Software delivered via the internet, usually accessible via browser or downloadable client, examples include Google Play Store, Dropbox & Spotify

## Platform-as-a-Service (PaaS)

Platform for deploying and building software, examples include operating systems, web servers & databases

## Infrastructure-as-a-Service (IaaS)

Computing infrastructure including virtual machines, storage and network, examples include AWS, Azure and Google Cloud Platform

# ICEI Virtual Machine Service

- ICEI offers **IaaS** for deploying virtual machines (VMs) in a **stable and controlled environment**
- This is currently offered through the **OpenStack Pollux** system operated by **CSCS**
- OpenStack is a **free** and **open-source** software platform for cloud computing
- In addition to Pollux, over the next months **other Fenix/ICEI sites** will also offer **VM services**
  - <https://fenix-ri.eu/infrastructure/resources/planned-resources>

# Pollux – OpenStack@CSCS

- Pollux is **CSCS**'s general purpose OpenStack system
- Offers a **stable** and **reliable** environment for defining, building and deploying VMs
- VM uptime in 2018:
  - **99.93%** unplanned
  - **99.76%** unplanned and planned
- VM uptime in 2019:
  - **100%** unplanned
  - **99.93%** unplanned and planned

# HBP Platform Services using Pollux

- Number of HBP Platforms are using VMs deployed on Pollux to offer services including:
  - **Collaboratory**
    - Collab 2.0 – solution to facilitate collaboration in neuroscience
  - **Neuromorphic Computing Front-end**
    - Job Queue, Resource Manager and Benchmarking REST APIs
    - Collaboratory apps including Job Manager and PyNN Network Builder
  - **Neurorobotics Platform**
    - Enable embodiment experiments by connecting spiking neural networks to robots
    - Online platform deployed on Pollux allowing use of NRP without installation
  - **The Virtual Brain (TVB)**
    - Framework for the simulation of the dynamics of large-scale brain networks
    - TVB web app deployed on Pollux (using OpenShift Container Platform)

# Virtual Machines

- A **virtual machine (VM)** is a software implementation of a machine (i.e. a computer) that executes programs like a physical machine
- An **image** of a VM is (put simply) a copy of the VM, which may contain an OS, data files, and applications
- **ICEI VM services** provides means to deploy **platform services** by configuring, building and launching VMs in a stable and reliable environment

# Virtual Machines Deployment

- In order to create and deploy a Virtual Machine, essentially four things are required:
  - An **image** from which the VM should be created
  - A **flavour** defining the size of the VM
  - A **keypair** to define the authentication for logging in as admin
  - An **IP address** so that it is accessible from the internet
- It is also possible to create custom security groups to restrict VM access based on e.g. IP range etc.



# Virtual Machines Suitability

- Whilst the VM service is extremely flexible and suited to a wide number of uses, it is not suitable for:
  - Workflows that require the use of specific hardware such as **GPUs** that are not available in Pollux
  - Highly **scalable workflows** better suited to **scalable compute resources** such as Piz Daint
- As can be seen, important to identify the **appropriate ICEI service for your use-case**

# Creating and Deploying VMs

- Different **flavours** of VM are available on Pollux depending on intended use
- Examples of pre-defined flavours:

Flavour	VCPUs	RAM
m1.tiny	1	2GB
m1.small2	2	4GB
m1.small	2	8GB
m1.medium	4	16GB
m1.large	8	32GB
m1.x-large	16	64GB

- Range of flavours offers high level of flexibility and suitability for wide range of VM uses

# Creating and Deploying VMs

- VMs and other actions can be executed using the OpenStack **Horizon graphical interface**
  - Accessed via <https://pollux.cscs.ch>
- In addition, the **command line** can also be used
- A number of operations can be performed using Horizon, however command line is more complete

# Command Line Operation

- OpenStack can be **fully operated** from command line
- **Configure environment** for CSCS access:  
<https://user.cscs.ch/tools/openstack/>
- Simplified example of how to create a VM:

```
$ source pollux.env  
    (then choose the project you want to run in)  
$ openstack server create --flavor m1.small \  
    --image CentOS7 \  
    --security-group default \  
    --key-name my_key \  
    my_test_instance
```

- <https://docs.openstack.org/python-openstackclient/queens/cli/command-list.html>

# Horizon Web GUI – Live Demo

The screenshot shows the Horizon Web GUI interface for the OpenStack Platform. The top navigation bar includes tabs for Project, Compute, Volumes, Network, Orchestration, Data Processing, and Object Store. The main content area is titled 'Overview' and displays a 'Limit Summary' section with six circular progress indicators showing resource usage:

- Instances:** Used 3 of 20
- VCPUs:** Used 3 of 120
- RAM:** Used 6GB of 100GB
- Floating IPs:** Allocated 3 of 50
- Security Groups:** Used 2 of 10
- Volumes:** Used 3 of 40

Below the Limit Summary is a 'Volume Storage' section showing 'Used 120GB of 1000GB'.

The 'Usage Summary' section allows users to select a period of time to query its usage. The date range is set from 2020-06-10 to 2020-06-11. The summary shows:

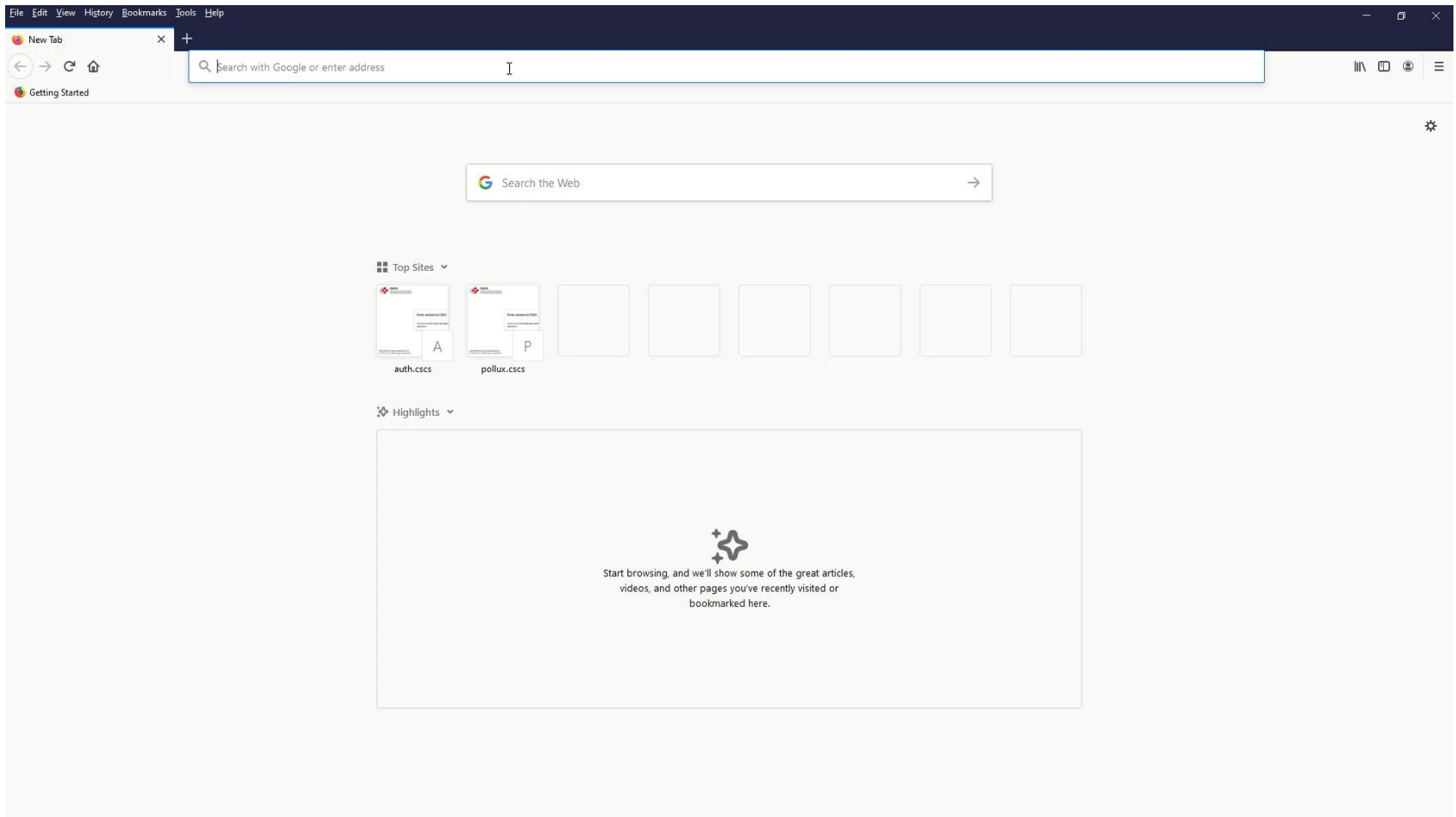
- Active Instances: 3
- Active RAM: 6GB
- This Period's VCPU-Hours: 110.71
- This Period's GB-Hours: 4428.30
- This Period's RAM-Hours: 226728.99

A 'Download CSV Summary' button is available. At the bottom, a table titled 'Usage' displays 3 items, with columns for Instance Name, VCPUs, Disk, RAM, and Time since created.

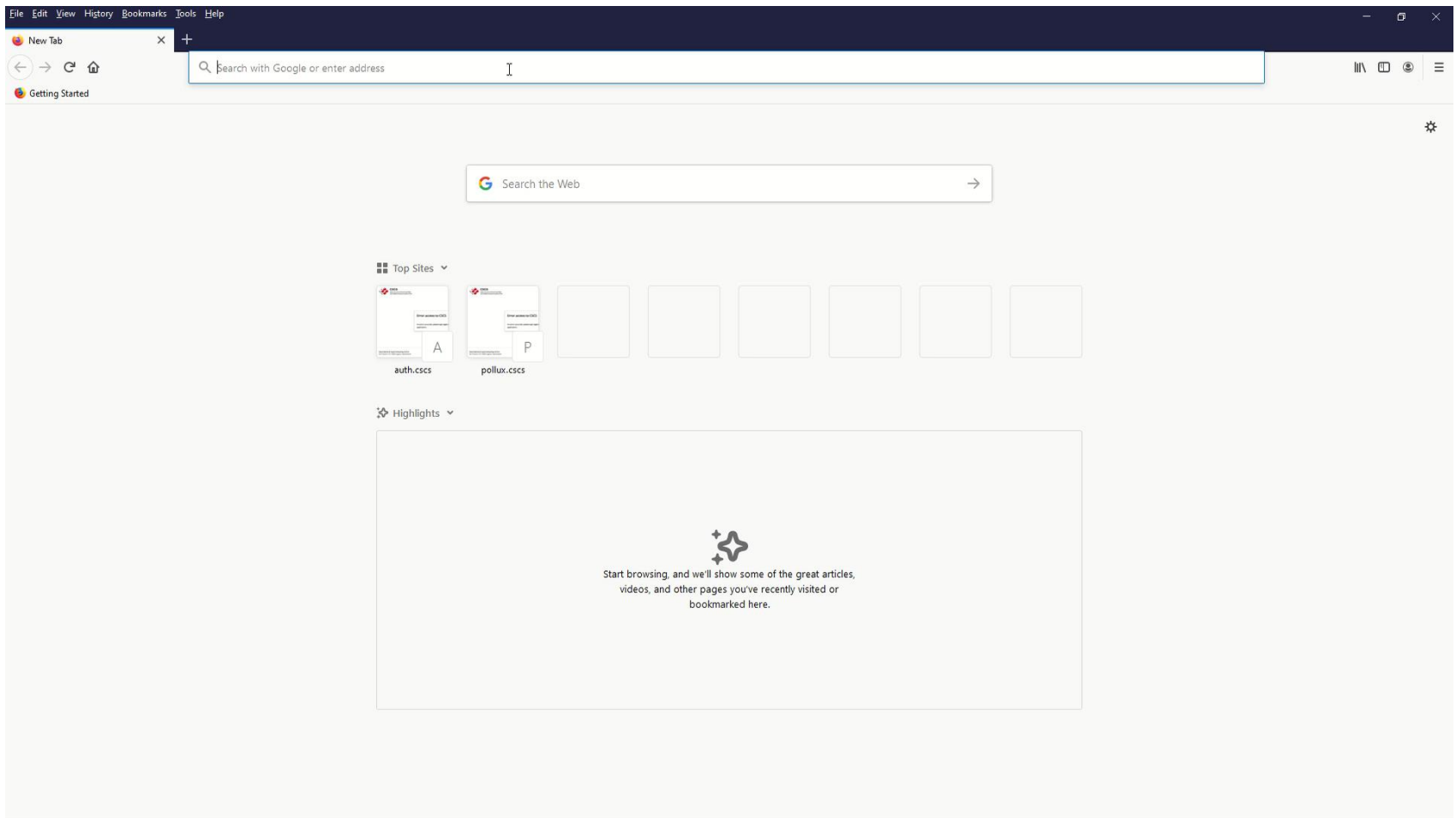
# Backup demo

- Pre-recorded demo of Horizon Web GUI in case of technical issues – one I made earlier...

# Complete Video



# Resources Overview





# Creating Keypair

Instances - OpenStack Dashboard

https://pollux.cscs.ch/dashboard/project/instances/

RED HAT OPENSTACK PLATFORM

Project Identity

Project Compute Volumes Network Orchestration Data Processing Object Store

Overview Instances Images Key Pairs

Project / Compute / Instances

## Instances

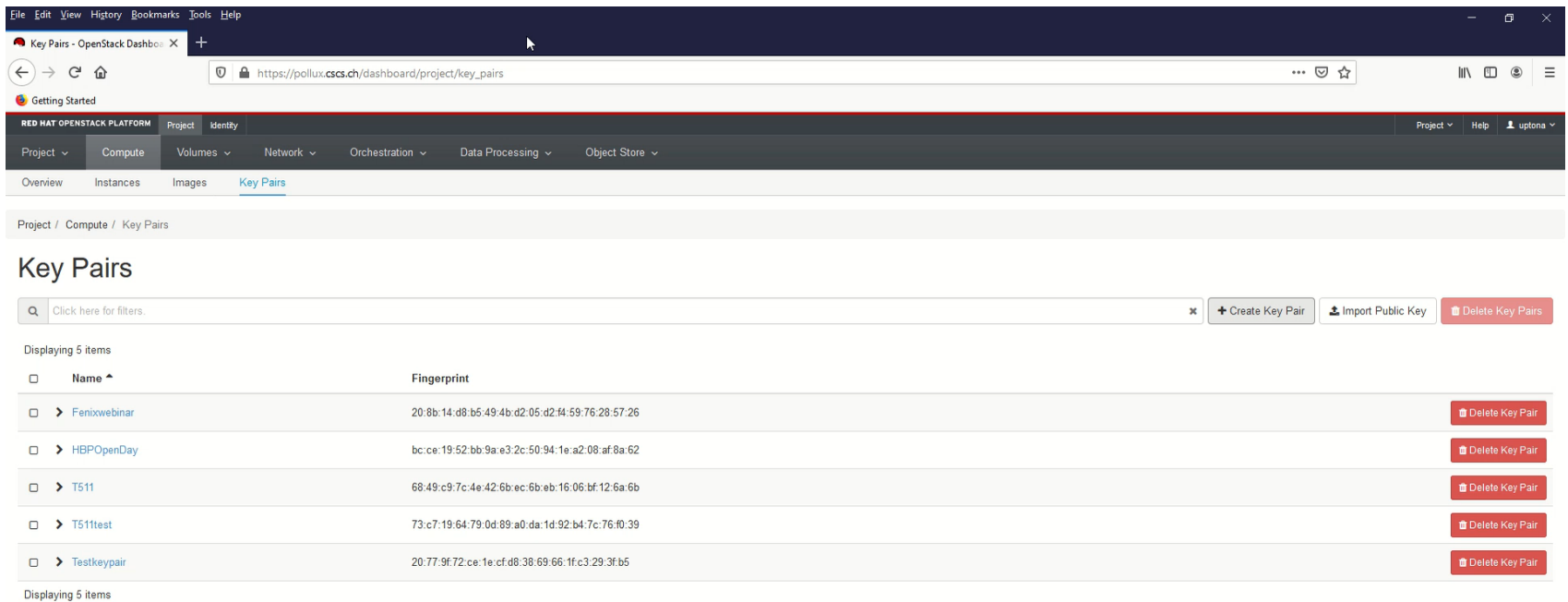
Instance ID = Filter Launch Instance Delete Instances More Actions

Displaying 3 items

Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
T511	-	10.0.0.17 Floating IPs: 148.187.98.51	m1.tiny	T511	Active	nova	None	Running	2 weeks, 3 days	Create Snapshot
T511test	-	10.0.0.21 Floating IPs: 148.187.98.50	m1.tiny	T511test	Active	nova	None	Running	3 weeks, 2 days	Create Snapshot
HBPOpenDay	-	10.0.0.9 Floating IPs: 148.187.98.75	m1.tiny	HBPOpenDay	Active	nova	None	Running	4 months, 2 weeks	Create Snapshot

Displaying 3 items

# Network and Router



Key Pairs - OpenStack Dashboard

Getting Started

RED HAT OPENSTACK PLATFORM

Project Identity

Project Compute Volumes Network Orchestration Data Processing Object Store

Overview Instances Images Key Pairs

Project / Compute / Key Pairs

## Key Pairs

Click here for filters. + Create Key Pair Import Public Key Delete Key Pairs

Displaying 5 items

Name	Fingerprint	
Fenixwebinar	20:8b:14:d8:b5:49:4b:d2:05:d2:44:59:76:28:57:26	Delete Key Pair
HBPOpenDay	bc:ce:19:52:bb:9a:e3:2c:50:94:1e:a2:08:af:8a:62	Delete Key Pair
T511	68:49:c9:7c:4e:42:6b:ec:6b:eb:16:06:bf:12:6a:6b	Delete Key Pair
T511test	73:c7:19:64:79:0d:89:a0:da:1d:92:b4:7c:76:f0:39	Delete Key Pair
Testkeypair	20:77:9f:72:ce:1e:cf:d8:38:69:66:1f:c3:29:3f:b5	Delete Key Pair

Displaying 5 items

# Configuring and Deploying VM

The screenshot shows the OpenStack Network Topology dashboard in a web browser. The browser's address bar displays the URL `https://pollux.cscs.ch/dashboard/project/network_topology/`. The dashboard header includes the 'RED HAT OPENSTACK PLATFORM' logo and navigation tabs for 'Project' and 'Identity'. Below the header, a menu bar lists various network components: 'Network Topology' (selected), 'Networks', 'Routers', 'Security Groups', 'Load Balancers', 'Floating IPs', and 'Trunks'. The main content area is titled 'Network Topology' and features a 'Topology' tab (selected) and a 'Graph' tab. Below the tabs, there are 'Small' and 'Normal' view options. The network diagram shows a blue vertical bar representing the 'OSX host' with IP addresses `148.187.96.0/24`, `148.187.97.0/24`, `148.187.98.0/24`, and `148.187.99.0/24`. This host is connected to an orange vertical bar representing the 'HPAC network' with IP address `100.0.0.0/8`. The connection is shown as a double line with a small icon. To the right of the diagram, there are three buttons: 'Launch Instance', 'Create Network', and 'Create Router'.

# Connecting to the VM

The screenshot displays the OpenStack dashboard interface. The top navigation bar includes the 'RED HAT OPENSTACK PLATFORM' logo and various menu items like 'Project', 'Identity', 'Compute', 'Volumes', 'Network', 'Orchestration', 'Data Processing', and 'Object Store'. The 'Compute' menu is expanded, showing 'Instances', 'Images', and 'Command Prompt'. The 'Instances' page is active, displaying a list of instances: 'Fenixwebinar', 'T511', 'T511test', and 'HBPOpenDay'. A 'Command Prompt' window is overlaid on the dashboard, showing the Windows command line interface. The text in the command prompt reads: 'Microsoft Windows [Version 10.0.18363.900] (c) 2019 Microsoft Corporation. All rights reserved. C:\Users\uptona>'. The background of the command prompt is black, and the text is white.

# Stay tuned!

Sign up for the **Fenix User Forum**:

<https://fenix-ri.eu/infrastructure/fenix-user-forum>

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