WATT System Documentation

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Getting Started

1. Request an account from <u>SBEUC-Access@netl.doe.gov</u>. You will receive a username and temporary password, as well as a physical USB security key called a Yubikey.



- 2. Download the ML client software from https://ml.netl.doe.gov .
- 3. Run the client. You will need to insert your Yubikey before you are able to enter your username and temporary password. The client will attempt to guess the correct config in the drop-down box. You will be asked to change your temporary password on first login.

Machine Learning Client 20.10.30	? ×
Instance(s)	
Project ML_Demo_sub	- C
Instance	State
testshare	SHUTOFF
Connect	
Tools	
Web Interface Text Login	File transfer
Connection Established (SSH Port: 22,	K Web Port: 10080)

- Selecting a project from the drop-down box will list all instances (VMs) in that project
- Clicking on an instance name and the connect button will connect you to that instance
- Clicking Web Interface will open your browser to the web GUI where you can create and delete instances, volumes, networks, shares, and access other management tools.
- Clicking File Transfer will open the file transfer utility, where you can transfer data between your local computer and your home folder on Watt

Overview (Usage statistics and summaries)



The overview is where you will see usage statistics and resource quotas for your project. Resource quotas are set by an administrator on a per-project basis.

Images (Operating Systems)

openstack.	■ ML_0	Demo 🔻							🛔 openstackdemo 👻
Project	~	Project / Compute / Images							
API A Compute	v v	Images							
Ov	erview	Q Click here for filters.						* Create Image	🛱 Delete Images
Inst	tances mages	Displaying 7 items							
Key	/ Pairs	Name	Туре	Status	Visibility	Protected	Disk Format	Size	
Volumes	>	CentOS7.TF.DOCK.SING	Image	Active	Public	No	QCOW2	7.81 GB	Launch -
Container Infra	>	CentOS_7_1804_GUI	Image	Active	Public	No	QCOW2	1.69 GB	Launch -
Network	>	CirrOS	Image	Active	Public	No	QCOW2	12.13 MB	Launch -
Orchestration	>	manila-service-image	Image	Active	Public	No	QCOW2	220.67 KB	Launch -
Share	>	test-new-glance-storage	Image	Active	Public	No	QCOW2	7.65 GB	Launch -
Identity	>	Win10 Enterprise-cloud	Image	Active	Public	No	QCOW2	9.89 GB	Launch -
		Windows 10 Enterprise	Image	Active	Public	No	QCOW2	10.06 GB	Launch -
		Displaying 7 items							

Images are stored, base VM templates. A few basic cloud-aware Linux and Windows images have been pre-built and provided by an administrator for public use.

Cloud-aware images have the commands cloud-init and growpart installed. When they startup they will be able to retrieve metadata from ML servers, set hostnames based on instance name, inject and run custom user code, set passwords and key pairs, and expand the base image partition into the instance's volume.

Users can create and upload their own images. Images can be created in various formats, ranging from raw to vdi. Be aware that if cloud-init has not been installed and configured prior to saving and uploading the image, the instance launched using that image will not be cloud aware and additional manual setup must be done on the instance after it is launched.

Instances (Virtual Machines)

openstack	(, 🔳 ML_	Demo 🕶										🛔 openstackdemo 👻
Project	~	Project / Compute / Insta	unc es									
Compute	V Access	Instances										
	Overview Instances								Instance ID = 🕶		Fil	er Launch Instance
	Images	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since crea	ed Actions
	Key Pairs						No items to d	lisplay.				
Volumes	>											
Container Infra	>											
Network	>											
Orchestration	>											
Object Store	>											
Share	>											
Identity	>											

The instances tab shows a list of running instances in the project. From here users can:

- Launch new instances
- Delete existing instances
- Access the instances console
- Add or remove volumes
- Add or remove network interfaces
- Shutdown, restart, pause an instance
- Create instance snapshots

Launching a new instance

•	Click '	'Launch]	Instance"	from	the	instances	screen
---	---------	-----------	-----------	------	-----	-----------	--------

Launch Instance		
Details * Access & Security Networking *	Network Ports Post-Cr	eation Advanced Options
Availability Zone	Specify the details for la	unching an instance
nova 👻	The chart below shows t	he resources used by this project
Instance Name *	in relation to the project's	s quotas.
my-new-vm	Namo	ml anu 4
Flavor * 😧	VCPUs	16
ml.gpu.4		10
Some flavors not meeting minimum boot source	Root Disk	50 GB
Num hen oftenstangesen disabled.	Ephemeral Disk	0 GB
1	Total Disk	50 GB
Instance Boot Source * 🕑	RAM	22 768 MR
Boot from image 🗸		52,700 MD
Image Name	Project Limits	
ContOS 7.6 (5.7 GP)	Number of Instances	2 of 100 Used
	Number of VCPUs	8 of 400 Used
	Total RAM	16,384 of 2,000,000 MB Used
	Number of Volumes	8 of 100 Used
	Total Volume Storage	475 of 10,000 GiB Used
		Launch
		Contraction of the second

- In the details tab set an instance name.
- Select a flavor. Flavors are preset templates for hardware configurations. These templates are created by an administrator. If there is a configuration that you would like that is not listed, you can ask the support staff to create a new flavor for you. You can also ask the support staff for more detailed flavor information.
- You can increase the count to launch multiple instances, such as if you are creating a cluster.
- Select a source. Use 'Image' for an uploaded image. Use 'Snapshot' to boot a snapshot of an already running instance.
- Select the name of the image or snapshot you wish to boot.
- Click the 'Access and Security' tab

Launch Instance				
Details * Access & Security Key Pair @	Networking *	Network Ports	Post-Creation	Advanced Options
No key pairs available	- +	Control access groups, and of	s to your instance v her mechanisms.	ia key pairs, security
Admin Password				
******	۲			
Confirm Admin Password				
******	۲			
Security Groups ଡ • □ default				
				Launch

- Set an instance password in the 'Admin password' section. This is used to access the remote console of the instance, not to log into the operating system. Use a unique password, as a system administrator can view this password. This password cannot be changed after it is set. If you do not set a password for your instance, a random password will be set and you will be unable to access the instance. If this is a shared instance, use a password that can be shared among project members.
- If you have more than one network in your project, click the Networking tab and select at least one network for the instance to be attached to. If there is only one network in your project, that network will already be pre-selected.
- Other customization options are available but are not explained in this document. Click Launch to launch the instance.

openstac	к . ■ м.	_Demo •											🛎 openstackdemo 👻
Project	~	Pro	ect / Compute / I	nstances									
F	API Access												
Compute	~	Ins	stances										
	Overview												
	Instances							Insta	nce ID = 🕶	Filte	er 🔒 Launch	Instance 📋 Delete II	nstances More Actions -
	Images	Displ	aying 1 item										
	Key Pairs	0	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
Volumes	>		demoVM	H 3	172.16.1.111	ml.cpu.medium	-	Build	🔊 nova	Block Device Mapping	No State	0 minutes	Associate Floating IP 💌
Container Infra	• >	Displ	aying 1 item										
Network	>												
Orchestration	>												
Object Store	>												
Share	>												
Identity	>												

- After the image has been launched, it will go through the build stage. It will schedule, allocate an IP address, map a block device, and spawn. Block device mapping can take some time to complete depending on the size of the image, as the image will be decompressed into the newly created volume for the image.
- Once the image has spawned, it is advised to lock the image. Locking the image will prevent other project members from shutting down, rebooting, deleting, or otherwise altering an instance. Locking the instance can be done from the actions menu on the right side of the instance list.

Using an Instance

- In the ML-client, select the project and instance name you wish to access. If you do not see the instance listed, click the refresh C button in the top right.
- Remote-viewer will open and you will be prompted to enter the instance password. This is the password you set in the 'Access and Security' tab when launching the instance. If you do not have remote-viewer installed, you will be directed on where to download it.

Au	thentication require	x be					
Authentication is required for the SPICE connection to:							
127.0.0.1	127.0.0.1						
Username:							
Password:							
	Show password						
	Cancel	ОК					

• <u>The pre-provided Linux and Windows images will have credentials of root/default and</u> <u>Administrator/default respectively</u>. On first login, the system will prompt to change the password.

ML Home Folder

- The ML home folder is your home folder on the system login nodes. This can be used to store long-term persistent data, as well as to transfer data from within your instance to your local computer using the File Transfer window in the ML client.
- For both provided Linux and Windows images, a mount script to mount your ML home folder will be on the desktop. You will need to supply your ML username and password (same credentials when logging in with the client)
- For shared instances, it is advised to <u>not mount any users ML home folder</u>. Another project user could access the instance console at any time and gain access to the current session and any mounted folders/drives. A network share is the best way to move files in and out of a shared instance.

Networks

openstack.	I ML	_Demo ▼								🛔 openstackdemo 👻
Project API	✔ Access	Project / Network / Networks								
Compute	>	Networks								
Volumes	>									
Container Infra	>					Name = 🕶		Filter	+ Create Network	Delete Networks
Network	~	Displaying 1 item								
Network T	opology	□ Name	Subnets Associated	Shared	Externa	l Status	Admin State	Availabili	ity Zones	Actions
N	etworks	ML_Demo_Network	ML_Demo_Subnet 172.16.1.0/24	No	No	Active	UP	nova		Edit Network 👻
	Routers	Displaying 1 item								
Security	Groups									
Float	ing IPs									
	Trunks									
Orchestration	>									
Object Store	>									
Share	>									
Identity	>									

The networks tab lists all networks in the project. From here you can create new private networks, edit existing networks and subnets, and delete networks.

An administrator will have setup a starting network for your project when the project is created. This network will have a virtual router and DHCP server attached, and will serve instances with metadata, IP addresses, name servers, and internet access. System users are not able to create or attach virtual routers.

Create Network	×
Network Subnet Network Name MyNetwork Image: Create Subnet Availability Zone Hints Image: Nova	Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.
	Cancel « Back Next »

- Click create network
- Enter a name for the new network
- Leave admin state and create subnet checked, if you want to create an addressable space

Create Network	×
Network Subnet Subnet Name MySubnet Network Address ? 172.16.100.0/24 IP Version IPv4 Gateway IP ? Disable Gateway	Creates a subnet associated with the network. You need to enter a valid "Network Address" and "Gateway IP". If you did not enter the "Gateway IP", the first value of a network will be assigned by default. If you do not want gateway please check the "Disable Gateway" checkbox. Advanced configuration is available by clicking on the "Subnet Details" tab.
	Cancel « Back Next »

- Enter a subnet name
- Enter a range of IP addresses in CIDR notation
- IPv4 is most commonly used in ML private networks, but IPv6 can also be used.
- Leave gateway blank. If there will be no gateway, click disable gateway. The network pre-created by an admin will have a router/gateway, so additional networks usually do not need one. If required, submit a request to have a router/gateway attached to your network.

Create Network	×
Network Subnet Subnet Details	Specify additional attributes for the subnet.
DNS Name Servers @	
Host Routes @	
	Cancel « Back Create

- Check enable DHCP if you would like instances to automatically receive an IP address on this network.
- Enter a comma separated start and end range for DHCP allocation. If a gateway is enabled, make sure to exclude it from this range.
- If you have a virtual DNS server setup in your project, you can specify it here. Otherwise, if this is just a private network for inter-instance communication, leave DNS blank, and click create.

Volumes

openstack.	■ ML_I	Demo 🔻									🛔 openstackdemo 👻
Project	×	Project / Volumes / Volumes									
Compute	>	Volumes									
Volumes	✓ olumes						Filter	Q. + Creat	e Volume 🛛 ∓	* Accept Transfer	📋 Delete Volumes
Sna	apshots	Displaying 2 items									
Consistency	Groups	Name	Description	Size	Status	Туре	Attached To	Availability Zone	Bootable	Encrypted	Actions
Consistency Group Sna	apshots	562751e2-1839-495c-a8cd-5313e31e85f0		25GiB	Available	nfstype		nova	Yes	No	Edit Volume 💌
Container Infra	>	b21a1fa7-8164-44e0-9b2d-415d27fe4ae4		25GiB	Available	nfstype		nova	Yes	No	Edit Volume 💌
Network	>	Displaying 2 items									
Orchestration	>										
Object Store	>										
Share	>										
Identity	>										

From the volumes screen you can:

- Create volumes
- Delete volumes
- Update volume metadata
- Create volume snapshots
- Manage volume attachments
- Upload a volume to the Image Service as an image
- Transfer an image to another project

Creating a Volume

Create Volume		×
Volume Name	5	
MyDisk	Description:	
Description	Volumes are block devices th instances.	at can be attached to
This is my portable block device	Volume Type De nfstype No description available.	scription:
Volume Source	Volume Limits	
No source, empty volume	Total Gibibytes	150 of 10,000 GiB Used
Туре	Number of Volumes	2 of 100 Used
nfstype 👻		
Size (GIB) *		
1000		
Availability Zone		
nova 👻		
	c	ancel Create Volume

- Enter a volume name, and optionally, a description
- Leave source, type, and zone as default
- Enter a volume size, in GB, and click create volume

Manage Volume Attachments			
Instance	Device	Actions	
	No items to disp	blay.	
Attach To Instan Attach to Instance * @ demoVM (26b7c483-1db9	1 CE -40ea-9563-37327985423c)		•
		Cancel	ach Volume

- Click the drop down menu on the right hand side of your volume
- Click manage attachments
- Select the Instance you would like to attach the volume to and click 'Attach Volume'
- Additionally, volumes can be attached and detached from the Instances screen by using the drop down menu to the right of an instance
- The volume is now attached to your instance. In linux, use disk manager to format and mount the volume. In windows, follow the new hardware prompts.

<u>Shares</u>

Shares enable you to create virtual file sharing services using a Volume as a backend storage mechanism. Before creating a share, a share network must be setup.

openstack.		Demo 🕶						🛔 openstackdemo 👻
Project	► Access	Project / Share	/ Share Networks					
Compute	>	Share N	letworks					
Volumes	>							
Container Infra	>						Filter	Q + Create Share Network
Network	>	Name	Neutron Net	Neutron Subnet	IP Version	Network Type	Segmentation Id	Actions
Orchestration	>				No items to display	с.		
Object Store	>							
Share	~							
	Shares							
Share Si	napshots							
Share I	letworks							
Security	Services							
Shar	e Groups							
Share Group S	napshots							
Identity	>							

Creating a Share Network

Create Share Network	×
Name * MyNewShare Description	Description: Share networks contain network data, that will be used for creation of service VM, where will be hosted shares.
Neutron Net *	Cancel

- Enter a name for the share network, and optionally, a description.
- Chose a virtual network for the share network to be attached to.
- Click 'Create' to create the share network.

Creating a Share

• On the shares tab, click create share

Create Share	ж
Share Name *	
MyDataShare	Description:
Description	Select parameters of share you want to create.
	Metadata:
	One line - one action. Empty strings will be ignored. To add metadata use:
Share Protocol *	key=value
NFS	Share Limits
Size (GIB) *	Total Gibibytes 0 of 1,000 GiB Used
500	
•	Number of Shares 0 of 50 Used
Share Type	
generic	
Availability Zone	
nova	
Share Group	
-	
Share Network *	
MyNewShare	
Metadata	
□ Make visible for all ❷	
	Cancel Create

- Enter a name for the share and optionally, a description.
- Select the protocol to be used for the share. CIFS is recommended and can be accessed natively from both Windows and Linux.
- Set a size for the share, in GiB. This will count towards your project's share size quota.
- Select generic for share type, and nova for zone. Leave share group empty.
- Select a share network to use, usually the one you created in the previous section.
- Click 'Create' to create the share.

Share Security

- By default, shares deny access to all. You must explicitly grant access to a share.
- On the shares tab, select manage rules on the actions menu drop-down of the share.

Add Rule		×
Access Type * ip Access Level * read-write Access To *	v	Description: Add policy rule to share, 'ip' rule represents ipv4 address, 'user' rule represents username or usergroup, 'cephx' rule represents ceph auth ID.
172.16.1.7		Cancel Add

• Click on Add Rule

- Only IP-based security is supported.
- Choose whether the IP will have read-only or read/write access.
- Enter the IP address of the system to have access. Optionally, you can allow access for all instances in the project network by entering the subnet in CIDR format. In the example above, this would be 172.16.1.0/24 to allow access to all IPs in the range 172.16.1.1 172.16.1.254

Accessing a share

File Edit View Search Terminal Help

- Click on the share name you wish to access in the web UI
- Note the share path this is the path to the share that you will enter in the instance
- For <u>Windows</u>, click the search bar and type cmd, then open the command prompt. Type: net use x: <share path> where <share path> is the path noted previously. The share will appear as a mapped network drive, x:



- For <u>Linux</u>, open a terminal and type: <u>mkdir -p /mnt/<dirname></u> where <dirname> is any name for a mount directory you'd like.
- Then type: mount -t cifs //<share path> where <share path> is the path noted previously. Make sure to change the backslashes to forward slashes for linux.

```
root@test-mnt:~
```

```
_ 0 ×
```

[root@test-mnt ~]# mkdir -p /mnt/test [root@test-mnt ~]# mount -t cifs //10.254.0.19/share-6e71910d-3a36-457d-abbb-93336a81cc88 /mnt/test Password for root@//10.254.0.19/share-6e71910d-3a36-457d-abbb-93336a81cc88: [root@test-mnt ~]#