



# VISA Deployment at SOLEIL

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These projects have received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreements No 857641 and No 823852.

# Summary

- ExPaNDS WP4 -> VISA @ SOLEIL context.
- Consideration for modeling WP4 demonstrator/prototype.
- Openstack Infrastructure for VISA
- Complementary infrastructure
- VISA Infrastructure
- VISA Image building process
- VISA Service at SOLEIL
- VISA TODO list at SOLEIL
- OpenStack TODO list at SOLEIL



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# ExPaNDS WP4 -> VISA @ SOLEIL context

- WP4 D4.4 Analysis Services Prototype objective for SOLEIL mid 2022.
- Resources :
  - Sept 2021 : 1 ½ people full-time\* on the WP4 demonstrator.
  - Majid Ounsy (co-leader WP4),
  - and 3 members of IT infrastructure team (ISI) :
    - Alain Buteau (Lead),
    - Ryan Persée and Eric Moge (SysOps/DevOps).
- Knowledge in 2021 :
  - Virtualization at SOLEIL is VMWare/Proxmox (business applications, infrastructure services, Remote Access service).
  - No Docker, OpenStack or K8s knowledge.



# Consideration for modeling WP4 D4.4 prototype

- Follow the lead or head our own way?
  - Proxmox vs VMWare vs unknown solution (OpenStack) => OpenStack
  - VISA or own development? => VISA
- Hardware capabilities : Virtual or Physical demonstrator?
  - 1 physical stack for demonstrator/prototype.
  - 1 physical stack for development.
  - 1 virtual stack (on Promox) for test purposes.



# OpenStack infrastructure for VISA

- A stack with 3 controller nodes + 3 compute nodes, including one with A16 GPUs, 1 dedicated NAS node.
- Multinodes deployment tested
  - Manual : Long, complex, impractical.
  - OpenStack Ansible: LXC container grouping services.
  - Kolla Ansible : Docker containerized OpenStack services
- Other solutions not evaluated: OpenStack Helm, OpenStack Charms, etc.
- **Using kolla-ansible => Full OpenStack deployment in less that 2h.**



# OpenStack with VISA Instances

Instances - OpenStack Dashboard

sup-vis-02: Dashboard

https://os-vip.reos.synchrotron-soleil.fr/project/instances/

SOLEIL | TECH | PERSO | EXPANDS | DATA-ANALYSIS | INFRA | TOOLS | HedgeDoc - Collabora... | Synchrotron SOLEIL | Login - OpenStack Da... | Home | VISA REOS | EXPANDS : WP4 - EXP... | ExPaNDS - GitLab | Formation Kubernetes... | MEGARAC SP-X | Other Bookmarks

openstack admin

admin

Compute

Instances

Overview

Instances

Images

Key Pairs

Server Groups

Volumes

Container Infra

Network

Orchestration

Admin

Identity

App Catalog

Instance ID

Filter

Launch Instance

Delete Instances

More Actions

Displaying 15 items

| <input type="checkbox"/> | Instance Name     | Image Name                                      | IP Address    | Flavor        | Key Pair | Status | Availability Zone | Task | Power State | Age                  | Actions         |
|--------------------------|-------------------|---|---------------|---------------|----------|--------|-------------------|------|-------------|----------------------|-----------------|
| <input type="checkbox"/> | VISA-INSTANCE-141 | visa-image-hcl2-5-isi-software-matlab-visa-apps |               | m3.large_a16  | -        | Error  |                   | None | No State    | 0 minutes            | Edit Instance   |
| <input type="checkbox"/> | VISA-INSTANCE-140 | visa-image-hcl2-2-isi-software-visa-apps        | 10.21.128.5   | m1.large      | -        | Active | nova              | None | Running     | 1 minute             | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-139 | visa-debian-dev                                 | 10.21.129.12  | m1.medium     | -        | Active | nova              | None | Running     | 1 minute             | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-138 | visa-debian-dev                                 | 10.21.129.34  | m1.medium     | -        | Active | nova              | None | Running     | 1 minute             | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-137 | visa-image-hcl2-5-isi-software-matlab-visa-apps | 10.21.129.173 | m3.large_a16  | -        | Active | nova              | None | Running     | 1 minute             | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-136 | visa-image-hcl2-5-isi-software-matlab-visa-apps | 10.21.131.22  | m1.large      | -        | Active | nova              | None | Running     | 8 minutes            | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-134 | visa-image-hcl2-5-isi-software-matlab-visa-apps | 10.21.131.150 | m3.large_a16  | -        | Active | nova              | None | Running     | 16 minutes           | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-133 | visa-image-hcl2-2-isi-software-visa-apps        | 10.21.128.190 | m1.large      | -        | Active | nova              | None | Running     | 17 minutes           | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-132 | visa-image-hcl2-main-visa-apps                  | 10.21.130.192 | m1.medium     | -        | Active | nova              | None | Running     | 17 minutes           | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-131 | visa-image-hcl2-5-isi-software-matlab-visa-apps | 10.21.128.238 | m3.xlarge_a16 | -        | Active | nova              | None | Running     | 18 minutes           | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-130 | visa-debian-dev                                 | 10.21.130.210 | m1.medium     | -        | Active | nova              | None | Running     | 20 minutes           | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-129 | visa-image-hcl2-2-isi-software-visa-apps        | 10.21.131.133 | m1.large      | -        | Active | nova              | None | Running     | 20 minutes           | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-128 | visa-image-hcl2-5-isi-software-matlab-visa-apps | 10.21.129.159 | m1.large      | -        | Active | nova              | None | Running     | 4 hours, 31 minutes  | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-127 | visa-image-hcl2-2-isi-software-visa-apps        | 10.21.128.123 | m1.large      | -        | Active | nova              | None | Running     | 4 hours, 43 minutes  | Create Snapshot |
| <input type="checkbox"/> | VISA-INSTANCE-126 | visa-image-hcl2-main-visa-apps                  | 10.21.129.142 | m1.medium     | -        | Active | nova              | None | Running     | 19 hours, 54 minutes | Create Snapshot |

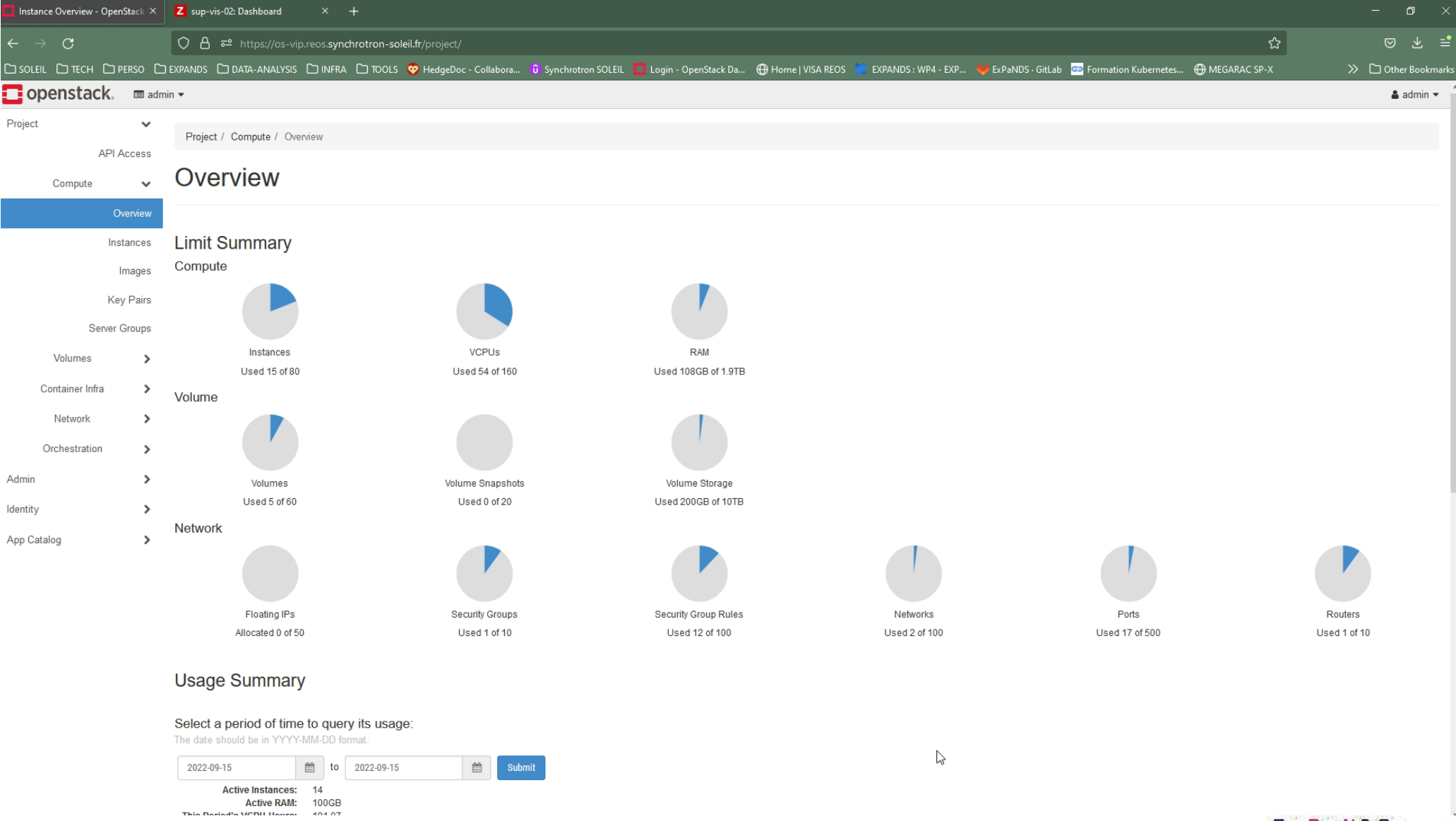
Displaying 15 items



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# OpenStack Overview



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# Complementary infrastructure

- 1x Storage server (NAS with NFS, and object storage).
- 2x Proxmox Hypervisors hosting VISA, VMs for the Openstack virtual stack, and other tools/services.
- 2x DELL S4148T switches (10G Ethernet)



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# VISA Infrastructure

- VISA is deployed with Docker Compose.
- VISA Web service, VISA API and Jupyter Proxy services are behind a containerized reverse proxy (Traefik 2.6)
- VISA Authentication is made through Keycloak IDP. Keycloak use our “Experiences Network” Directory (RE-LDAP) for authentication.
- VISA Applications and dependencies are hosted in a Proxmox single virtual machine == No load-balancing. No high-availability.
- ETL with UserOffice data: No Access => Not yet implemented



# VISA Instances during a test (User view)

The screenshot shows the VISA web interface in a browser window. The address bar displays `https://visa.reos.synchrotron-soleil.fr/home`. The left sidebar contains navigation links: VISA, Home, Support, Help, Admin, and Sign out. The main content area lists several virtual machine instances, each with a thumbnail, name, OS, configuration, status, and action buttons.

| Instance Name                                   | OS                                | Config         | Status   | Created / Expires  | Actions                   |
|---|-----------------------------------|----------------|----------|--|---------------------------|
| No experiments are associated to this instance. |                                   |                |          |  |                           |
| dapper_teeth                                    | Ubuntu 22.04 v2 (ISI) (0.0.2)     | 8 GB - 4 VCPUs | active   | Instance 133 created on Sep 15, 2022 and due to expire on Nov 14, 2022 | Connect, Settings, Delete |
| No experiments are associated to this instance. |                                   |                |          |  |                           |
| zigzag_blouse                                   | Ubuntu 22.04 (ISI) (0.0.1)        | 4 GB - 2 VCPUs | active   | Instance 132 created on Sep 15, 2022 and due to expire on Nov 14, 2022 | Connect, Settings, Delete |
| No experiments are associated to this instance. |                                   |                |          |  |                           |
| gainful_sword                                   | Ubuntu 22.04 Matlab (ISI) (0.0.3) | 8 GB - 4 VCPUs | starting | Instance 128 created on Sep 15, 2022 and due to expire on Nov 14, 2022 | Connect, Settings, Delete |
| No experiments are associated to this instance. |                                   |                |          |  |                           |
| discreet_lobster                                | Ubuntu 22.04 v2 (ISI) (0.0.2)     | 8 GB - 4 VCPUs | starting | Instance 127 created on Sep 15, 2022 and due to expire on Nov 14, 2022 | Connect, Settings, Delete |
| No experiments are associated to this instance. |                                   |                |          |  |                           |
| ubu22isi  | Ubuntu 22.04 (ISI) (0.0.1)        | 4 GB - 2 VCPUs | active   | Instance 126 created on Sep 14, 2022 and due to expire on Nov 13, 2022 | Connect, Settings, Delete |
| No experiments are associated to this instance. |                                   |                |          |  |                           |



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# VISA Instances during a test (Admin view)

The screenshot displays the VISA Admin dashboard at <https://visa.reos.synchrotron-soleil.fr/admin/dashboard>. The dashboard provides an overview of system metrics and a detailed list of active instances.

**Summary Metrics:**

- Number of instances: 15
- Number of open sessions: 1
- Number of active sessions: 0
- Number of Jupyter sessions: 0
- Number of images: 4
- Number of flavours: 4
- Number of activated users: 9

**Latest active instance sessions:**

| Instance | User      | Role  | Created     | Time connected |
|----------|-----------|-------|-------------|----------------|
| ubu22isi | Eric MOGE | OWNER | 7 hours ago | 06:54:42       |

[View all sessions](#)

**Latest active Jupyter sessions:**

There are no active Jupyter sessions.

**Latest instances:**

| Instance           | Owner            | IP            | State    | Created        | Flavour           | Image                             |
|--------------------|------------------|---------------|----------|----------------|-------------------|-----------------------------------|
| overjoyed_countess | Eric MOGETEST    | No IP address | Error    | 18 minutes ago | m3.large.GPU_A16  | Ubuntu 22.04 Matlab (ISI) (0.0.3) |
| habitual_silene    | Eric MOGETEST    | 10.21.128.5   | Starting | 18 minutes ago | m1.large          | Ubuntu 22.04 v2 (ISI) (0.0.2)     |
| brook_enemy        | Eric MOGETEST    | 10.21.129.12  | Active   | 19 minutes ago | m1.medium         | Debian 11 Cloud dev (ISI) (0.0.1) |
| breezy_practice    | Eric MOGETEST    | 10.21.129.34  | Active   | 19 minutes ago | m1.medium         | Debian 11 Cloud dev (ISI) (0.0.1) |
| foremost_cobalt    | Eric MOGETEST    | 10.21.129.173 | Starting | 19 minutes ago | m3.large.GPU_A16  | Ubuntu 22.04 Matlab (ISI) (0.0.3) |
| checkered_golf     | Eric MOGE        | 10.21.131.22  | Starting | 25 minutes ago | m1.large          | Ubuntu 22.04 Matlab (ISI) (0.0.3) |
| common_ear         | Eric MOGE        | 10.21.131.150 | Starting | 34 minutes ago | m3.large.GPU_A16  | Ubuntu 22.04 Matlab (ISI) (0.0.3) |
| dapper_teeth       | Eric MOGE        | 10.21.128.190 | Active   | 35 minutes ago | m1.large          | Ubuntu 22.04 v2 (ISI) (0.0.2)     |
| zigzag_blouse      | Eric MOGE        | 10.21.130.192 | Active   | 35 minutes ago | m1.medium         | Ubuntu 22.04 (ISI) (0.0.1)        |
| silicon_fernleaf   | Alexandra MOUGIN | 10.21.128.238 | Starting | 36 minutes ago | m3.xlarge.GPU_A16 | Ubuntu 22.04 Matlab (ISI) (0.0.3) |
| oil_glazer         | Alexandra MOUGIN | 10.21.130.210 | Active   | 37 minutes ago | m1.medium         | Debian 11 Cloud dev (ISI) (0.0.1) |

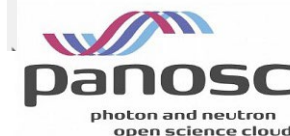
**Cloud Limits:**

- Instances: Used 15 of 80
- VCPUs: Used 54 of 160
- Memory Used: 108.00 GB of 1.91 TB

**Instance States:**

|          |   |
|----------|---|
| Active   | 6 |
| Building | 0 |
| Deleted  | 0 |
| Deleting | 0 |
| Error    | 1 |
| Starting | 8 |
| Stopped  | 0 |

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# VISA Image building process

- Uses Gitlab CI/CD (pipelines/runners) => Much easier to debug application deployment.
- Spawns VISA images on OpenStack.
- Image names are constructed from branch name and stage.
- Uses HCL2 instead of packme.



# Gitlab VISA Image Building process



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| Status  | Pipeline  | Triggerer   | Stages                     |
|---|---|---|----------------------------|
| <div>passed</div> <div>00:29:49</div> <div>1 week ago</div> | <div>Merge branch 'main' into '2-isi-software-matlab'</div> <div>#1393 - ece9cece</div> <div>latestmerge request</div>                            |    | <div>✓✓✓</div> <div></div> |
| <div>passed</div> <div>00:29:57</div> <div>1 week ago</div> | <div>corrected apt install</div> <div>#1382 - 2-isi-software-matlab - ad0e0108</div> <div></div>  |    | <div>✓✓✓</div> <div></div> |
| <div>passed</div> <div>00:23:10</div> <div>1 week ago</div> | <div>Merge branch '3-add-nfs-mounts' into 'main'</div> <div>#1372 - main - 87dd0732</div> <div>latest</div>                                       |    | <div>✓✓✓</div> <div></div> |
| <div>passed</div> <div>00:22:30</div> <div>1 week ago</div> | <div>Merge branch '4-run-pipeline-on-merge-or-main-bra...</div> <div>#1362 - main - 0f98fe3a</div> <div></div>                                    |    | <div>✓✓✓</div> <div></div> |
| <div>passed</div> <div>00:24:02</div> <div>1 week ago</div> | <div>Run pipeline on merge or main branch</div> <div>#1352 - 1851bc34</div> <div>latestmerge request</div>  |    | <div>✓✓✓</div> <div></div> |
| <div>failed</div> <div>00:00:07</div> <div>1 week ago</div> | <div>Run pipeline on merge or main branch</div> <div>#1342 - d2cd1f74</div> <div>merge request</div>  |    | <div>✗»»</div> <div></div> |
| <div>failed</div> <div>00:02:27</div> <div>1 week ago</div> | <div>Nvidia drivers install</div> <div>#1332 - 2-isi-software-matlab - b0366e66</div> <div></div>   |  | <div>✓✗»</div> <div></div> |
| <div>failed</div> <div>1 week ago</div>                     | <div>Run pipeline on merge or main branch</div> <div>#1322 - 4-run-pipeline-on-merge-or-main-branch - d5b95c37</div> <div>yaml invaliderror</div> |  | <div></div> <div></div>    |
| <div>failed</div>   | <div>Renamed image prefix to avoid name clashes betwee...</div> <div></div>   |  | <div>✗»»</div> <div></div> |

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# Gitlab Pipelines for VISA Image : Job log

Abstract - HedgeDoc

sup-vis-02: Dashboard

build (#1220) - Jobs - ExpANS

Runners - ExpANS - GitLab

Pipelines - ExpANS / VISA Image

[CTRLDESK-25586] Mise à j

https://re-gitlab-01.exp.synchrotron-soleil.fr/expands/visa-image-hcl2/-/jobs/1220

90%

SOLEIL

TECH

PERSO

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```
4964 openstack.visa-apps: systemctl restart supervisor.service
4965 openstack.visa-apps: systemctl restart udisks2.service
4966 openstack.visa-apps:
4967 openstack.visa-apps: Service restarts being deferred:
4968 openstack.visa-apps: systemctl restart ModemManager.service
4969 openstack.visa-apps: systemctl restart networkd-dispatcher.service
4970 openstack.visa-apps: systemctl restart unattended-upgrades.service
4971 openstack.visa-apps:
4972 openstack.visa-apps: No containers need to be restarted.
4973 openstack.visa-apps:
4974 openstack.visa-apps: No user sessions are running outdated binaries.
4975 openstack.visa-apps:
4976 openstack.visa-apps: No VM guests are running outdated hypervisor (qemu) binaries on this host.
4977 ==> openstack.visa-apps: /tmp/script_5225.sh: line 37: unexpected EOF while looking for matching `"'
4978 ==> openstack.visa-apps: Provisioning step had errors: Running the cleanup provisioner, if present...
4979 ==> openstack.visa-apps: Terminating the source server: e4ef33a8-7bf8-492f-a6a5-85d4516e9718 ...
4980 openstack.visa-apps: [DEBUG] Request DELETE https://os-vip.reos.synchrotron-soleil.fr:8774/v2.1/servers/e4ef33a8-7bf8-492f-a6a5-85d4516e9718 204
4981 openstack.visa-apps: [DEBUG] Request GET https://os-vip.reos.synchrotron-soleil.fr:8774/v2.1/servers/e4ef33a8-7bf8-492f-a6a5-85d4516e9718 200
4982 openstack.visa-apps: [DEBUG] Request GET https://os-vip.reos.synchrotron-soleil.fr:8774/v2.1/servers/e4ef33a8-7bf8-492f-a6a5-85d4516e9718 404
4983 openstack.visa-apps: [DEBUG] Response Error: {"itemNotFound": {"code": 404, "message": "Instance e4ef33a8-7bf8-492f-a6a5-85d4516e9718 could not be found."}}
4984 openstack.visa-apps:
4985 Build 'openstack.visa-apps' errored after 23 minutes 41 seconds: Script exited with non-zero exit status: 2. Allowed exit codes are: [0]
4986 ==> Wait completed after 37 minutes 23 seconds
4987 ==> Some builds didn't complete successfully and had errors:
4988 --> openstack.visa-apps: Script exited with non-zero exit status: 2. Allowed exit codes are: [0]
4989 ==> Builds finished. The artifacts of successful builds are:
4990 --> openstack.visa-base: An image was created: fa107169-231b-476a-b5e7-8ce9ad99e9f1
4991 --> openstack.system-base: An image was created: c4b35bb7-8223-40e9-9a35-eb9b1ee8676d
4992 Uploading artifacts for failed job
4993 Uploading artifacts...
4994 packer-build.log: found 1 matching files and directories
4995 Uploading artifacts as "archive" to coordinator... 201 Created id=1220 responseStatus=201 Created token=3-nLs5EK
4996 Uploading artifacts...
4997 WARNING: build.env: no matching files. Ensure that the artifact path is relative to the working directory
4998 ERROR: No files to upload
5000 Cleaning up project directory and file based variables
5002 ERROR: Job failed: exit code 1
```

build

New issue

Duration: 37 minutes 41 seconds

Finished: 2 days ago

Timeout: 1h (from project)

Runner: #2 (vZX8-D-F) packer-02.reos

Job artifacts

The artifacts will be removed in 3 weeks

Keep Download Browse

Commit cf7e53be in i5

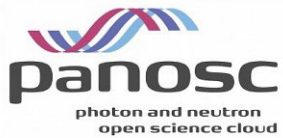
Fixing Fastosh install script

Pipeline #156 for i5 with 5-isi-software-matlab

build

→ build

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# VISA Service at SOLEIL

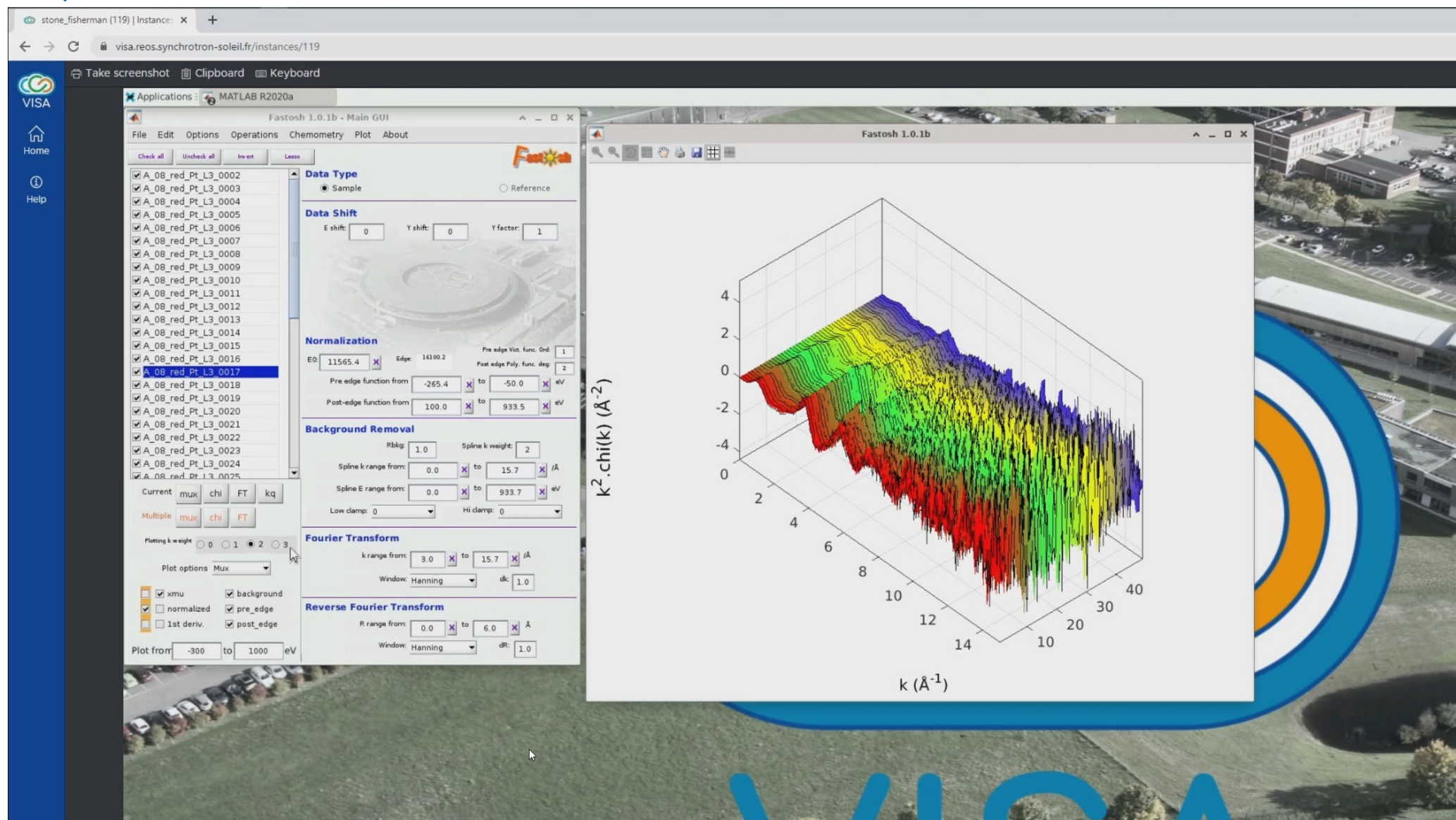
- Only available internally for test at <https://visa.reos.synchrotron-soleil.fr>
- Pre-alpha stage.
- Provides Linux Ubuntu 22.04, 20.04 and Debian 11 system images.
- GPU capable (2x A16 = 8 GPU core).
- Access to SOLEIL storage platform (RUCHE) for scientific user data.
- Software integration in progress...  
Currently providing Matlab 2021a, Jupyter Notebook, fastosh, conda, nexpy...



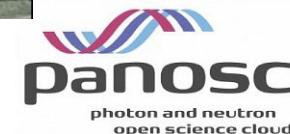


# Testing Fastosh XAFS data analysis software on a VISA instance

<https://www.synchrotron-soleil.fr/en/beamlines/samba>



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# Running Matlab GPU Benchmark on VISA instance

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MATLAB R2021a - non-d...

Xfce Terminal

Web Browser - GPU Comparison Report: Intel Xeon Processor (Icelake)

GPU Comparison Report: Intel Xeon Processor (Icelake)

Location: file:///tmp/GPUBenchReport/index.html

## GPU Bench

### GPU Comparison Report: Intel Xeon Processor (Icelake)

#### Summary of results

The table and chart below show the peak performance of various GPUs using the same version of MATLAB. Your results (if any) are highlighted in bold in the table and on the chart. All other results are from pre-stored data. The peak performance shown is usually achieved when dealing with extremely large arrays. Typical performance in day-to-day use will usually be much lower.

Results captured using the CPUs on the host PC (i.e., without using a GPU) are included for comparison.

Results are shown for calculations in both single and double precision. For all results, higher is better.

Shareable data files: [file:///tmp/GPUBenchReport/NVIDIA\\_A16\\_gpubench.json](file:///tmp/GPUBenchReport/NVIDIA_A16_gpubench.json)

|                              | Double precision results (in GFLOPS) |               |              | Single precision results (in GFLOPS) |                |               |
|------------------------------|--------------------------------------|---------------|--------------|--------------------------------------|----------------|---------------|
|                              | MTimes                               | Backslash     | FFT          | MTimes                               | Backslash      | FFT           |
| Tesla V100-PCIE-32GB         | 6884.95                              | 563.73        | 728.71       | 13727.99                             | 1210.42        | 1365.11       |
| TITAN V                      | 6779.73                              | 674.40        | 534.65       | 13515.42                             | 1336.39        | 985.36        |
| Tesla P100-PCIE-12GB         | 4510.03                              | 929.00        | 357.65       | 8435.34                              | 1647.83        | 687.13        |
| Tesla K40c                   | 1189.54                              | 677.12        | 135.88       | 3187.76                              | 1334.17        | 294.86        |
| Tesla K20c                   | 1004.06                              | 641.42        | 106.09       | 2657.01                              | 1230.28        | 235.20        |
| TITAN Xp                     | 421.00                               | 369.32        | 209.45       | 10823.05                             | 1272.06        | 797.17        |
| GeForce RTX 2080 SUPER       | 373.37                               | 345.32        | 164.30       | 10813.12                             | 1330.64        | 746.20        |
| GeForce GTX 1080             | 280.84                               | 223.05        | 137.66       | 7707.01                              | 399.37         | 424.60        |
| <b>Your CPU</b>              | <b>751.93</b>                        | <b>206.94</b> | <b>23.08</b> | <b>1491.82</b>                       | <b>408.85</b>  | <b>31.26</b>  |
| <b>Your GPU (NVIDIA A16)</b> | <b>60.29</b>                         | <b>61.57</b>  | <b>33.46</b> | <b>2665.77</b>                       | <b>1436.98</b> | <b>273.70</b> |
| Quadro K620                  | 25.45                                | 22.77         | 12.75        | 716.71                               | 350.31         | 75.00         |

(Sort the results by clicking on any column title. To see detailed performance data, click on an individual result or a device name.)

#### Performance Summary

Workspace

| Name | Value |
|------|-------|
|      |       |

ance-115: ~

```
ted on

/shm
/lock
t/efi
/user/10108
```

# VISA : TODO list at SOLEIL

- ETL : To be developed with limited experiments/projects information from our LDAP Directory. Currently UserOffice data is not accessible.
- Host VISA with loadbalancer and High-Availability with Traefik.
- Integrate Apptainer/Singularity.
- Migrate VISA services and dependencies to K8s.
- Define a strategy for Machine/Software categories.



# OpenStack : TODO list at SOLEIL

- Integrate Ironi (Baremetal provisioning)
- Centralized OpenStack log service.
- Migration to production grade hardware for control and compute nodes.
- Define an update/upgrade strategy (already upgraded from Xena to Yoga)



# Credits / Thank you

- Jamie Hall and Stuart Caunt at ILL for their help on VISA,
- Michael Schuh and Patrick Fuhrman at DESY for their great help and support on OpenStack and VISA integration.
- We hope to develop closer collaboration and exchanges with all the VISA/OpenStack community in ExPaNDS/PaNOSC.  
Working with ILL and DESY has been a great human experiences.



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# Questions?

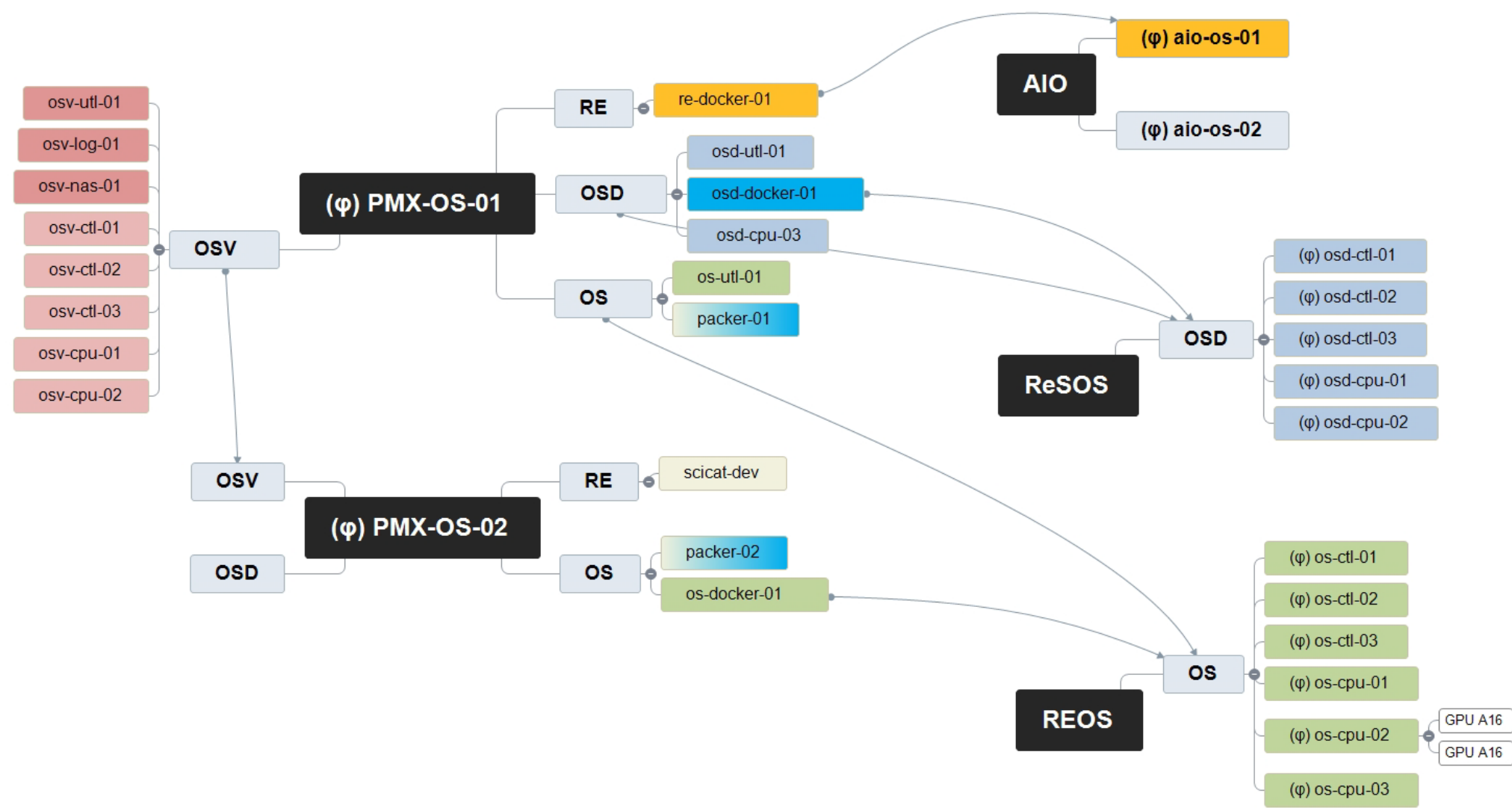


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# Simplified SOLEIL OpenStack Infrastructure and Dependencies



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