RENAM
RESEARCH & EDUCATIONAL NETWORKING ASSOCIATION OF MOLDOVA

RENAM Computing Infrastructure

RENAM Computing Infrastructure and Services

For Research and Education

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Current RENAM Computing Infrastructure Equipment

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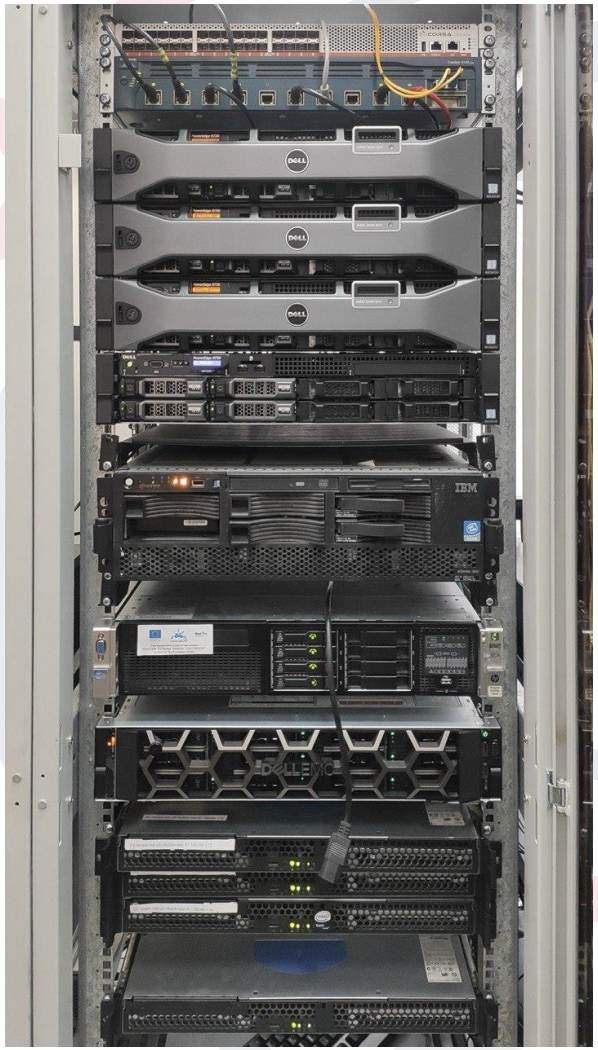
4 x DELL PowerEdge R730 Servers with:

- 2 x Intel Xeon Silver E5-2630 v4 2.2G, 10C/20T CPUs
- 256 Gb RAM
- 4 x 4Tb SAS HDDs
- 2 x 10GbE SFP+ Connections
- 4 x 1GbE BASE-T Adapter

2 x DELL PowerEdge R740xd Servers with:

- 2 x Intel Xeon Silver 4108 1.8G, 8C/16T CPUs
- 256 Gb RAM
- 12 x 8Tb SAS HDDs
- 4 x 480Gb SAS SSDs
- 2 x 10GbE SFP+ Connections
- 4 x 1GbE BASE-T Adapter

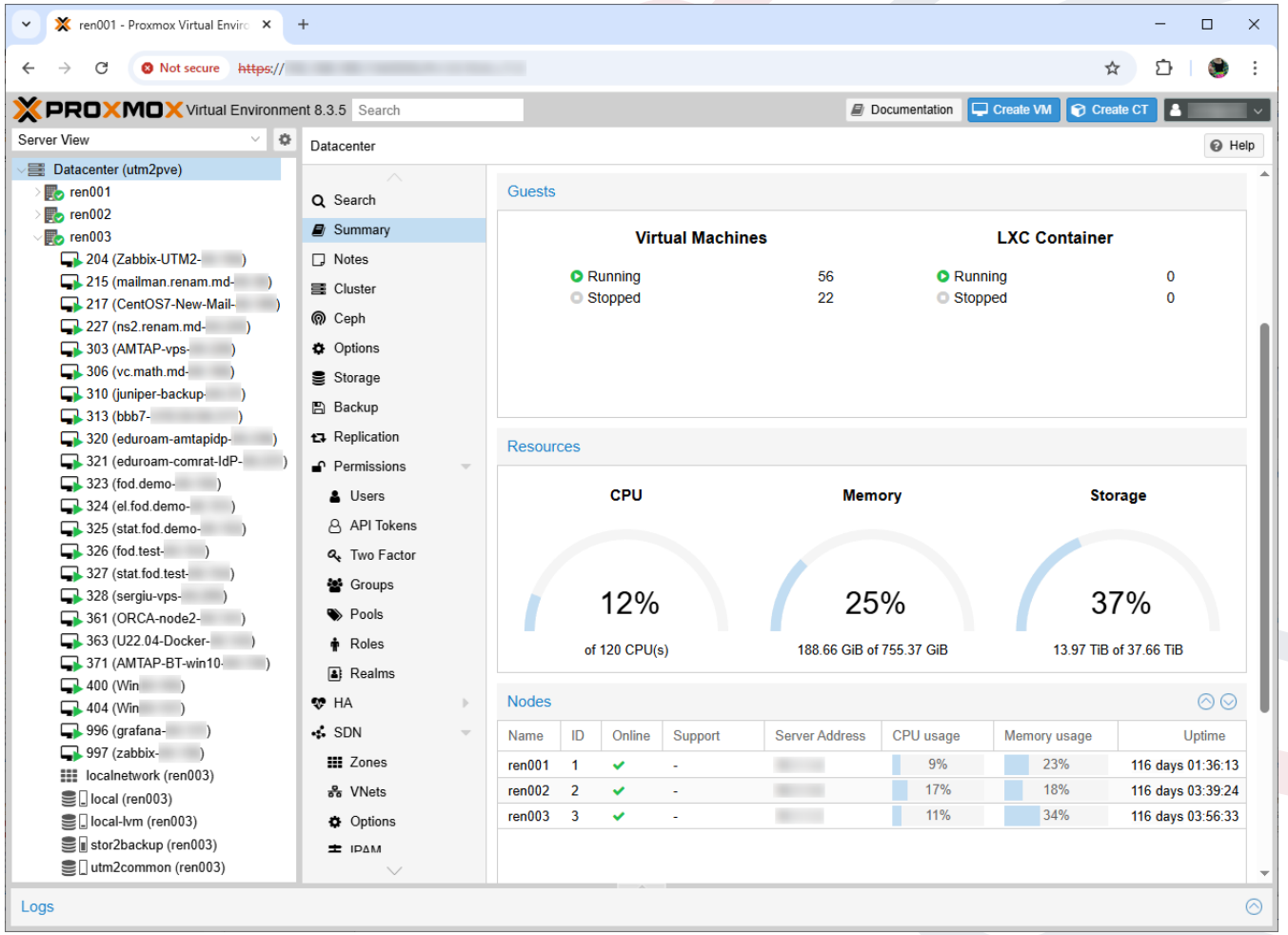


RENAM Computing Infrastructure Middleware: Proxmox

Proxmox Virtual Environment is a complete open-source platform for enterprise virtualization. With the built-in web interface you can easily manage VMs and containers, software-defined storage and networking, high-availability clustering, and multiple out-of-the-box tools using a single solution.

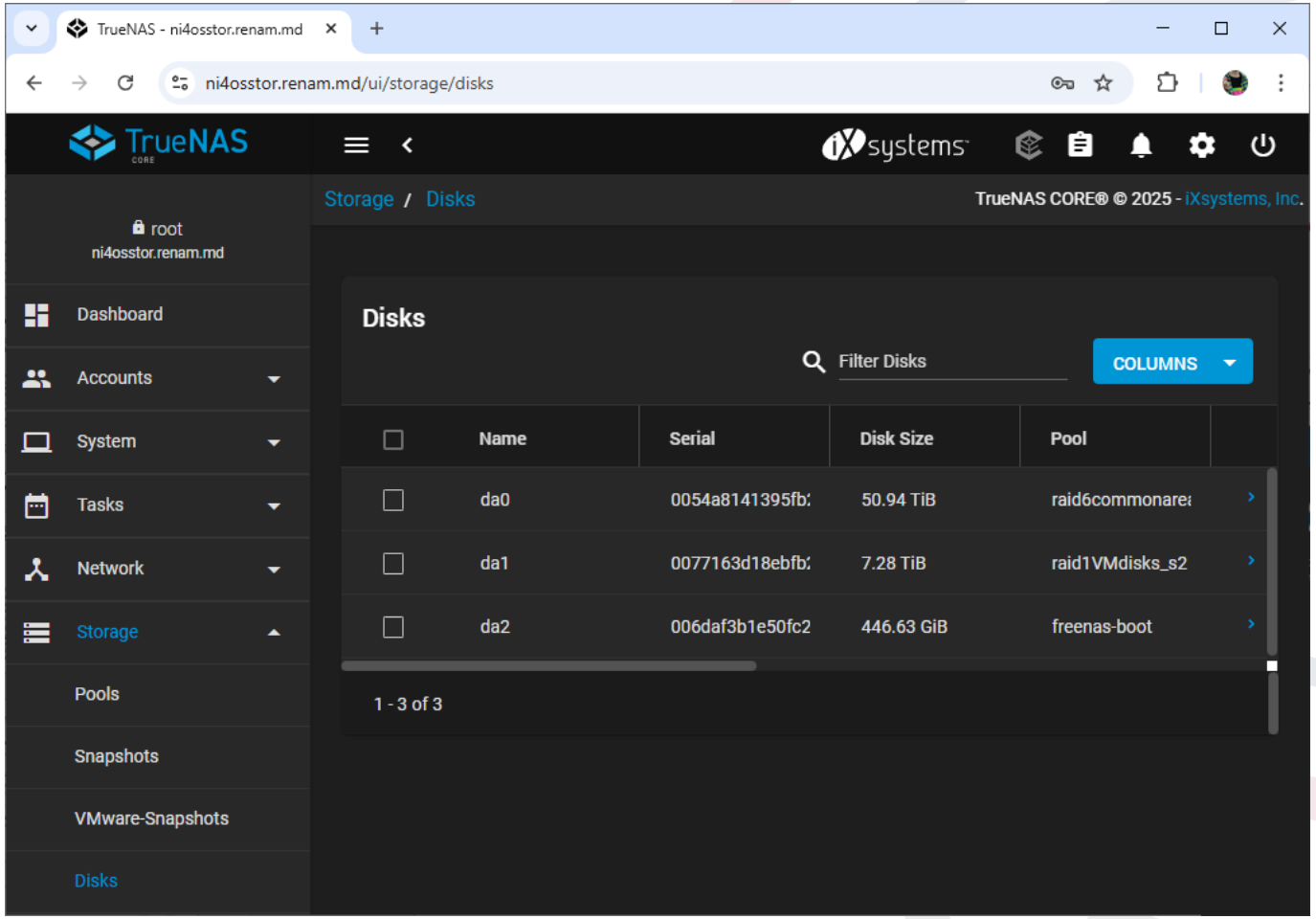
Proxmox Computing Cluster Configurations

- Automatic Backups to NAS storage
- Live Migrations without downtime
- 10GbE Connection to NAS
- 10GbE Connection of VMs to the Internet
- Monitoring with alerts via Zabbix



RENAM Computing Infrastructure Middleware: FreeNAS (TrueNAS)

FreeNAS (TrueNAS) is a family of network-attached storage (NAS) products produced by iXsystems, incorporating both FOSS, as well as commercial offerings. Based on the OpenZFS file system, TrueNAS runs on FreeBSD as well as Linux and is available under the BSD License It is compatible with x86-64 hardware and is also available as turnkey appliances from iXsystems.



- RENAM has 2 TrueNAS instances in 2 locations: NOC (UTM bloc 2) and IMI VA (Telecentru)
- Each FreeNAS server has 50Tb storage pools providing storage for VM backups and all kinds of hosting services (eg. FTP, NFS, SMB, WebDAV, etc.)
- Accessible via https://ni4osstor.renam.md

RENAM Computing Infrastructure Middleware: OpenStack

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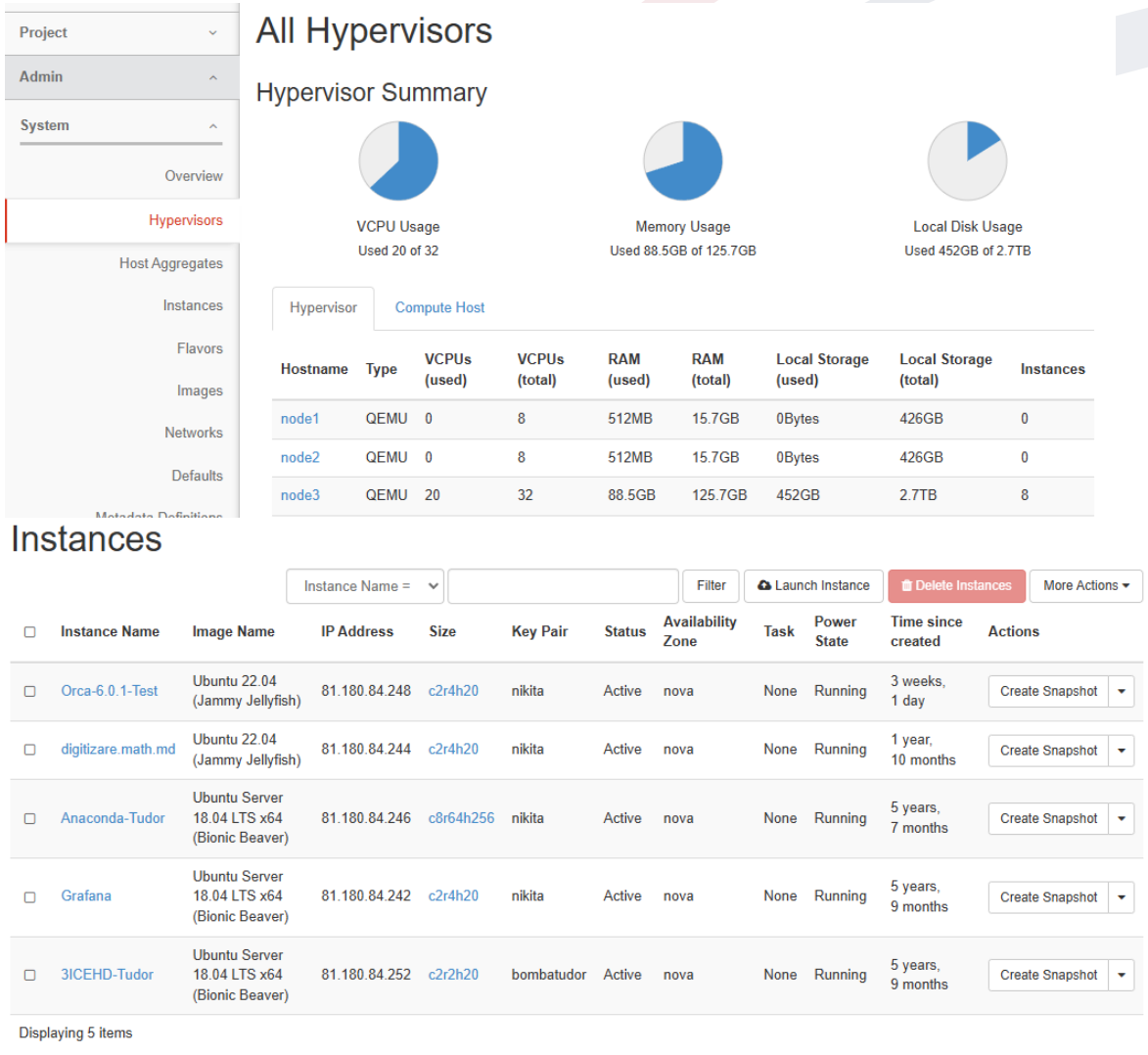
openstack

OpenStack is a free, open standard cloud computing platform. It is mostly deployed as infrastructure-as-a-service (IaaS) in both public and private clouds where virtual servers and other resources are made available to users.

RENAM's IaaS Cloud powered by OpenStack is accessible at https://cloud.renam.md and provides resources to couple of IMI VA projects using ML and AI: ICE3HD, Digitization of Old Cyrillic Textes and also acts as a testbed platform.



Types of Hosting offered by RENAM

RENAM offers different types of hosting services, including:

- **Shared hosting** where multiple websites share resources on the same server;
- **Dedicated hosting** where a single website has exclusive use of a server;
- **Virtual Private Server** (VPS) hosting which provides a virtualized private environment within a shared server;
- **Storage services** such as FTP, SMB, NFS, WebDAV and other protocols;
- **Software as a Service** (SaaS) hosting which provides a Software hosted on RENAM premises to the end users as a service.

A few words about hosting. What is it?

- **Hosting services** provide the necessary infrastructure and technologies to keep your website, data and software operational and accessible at all times.
- **RENAM offers** various features such as **storage space**, **high bandwidth network**, **domain name registration**, **databases**, and **security measures**, including **SSL certificates**, **automatic data backups** and more.

Benefits of using RENAM hosting solutions

- By utilizing the **RENAM hosting service**, individuals and businesses **can establish an online presence**, **publish their content**, and **reach a global audience** through their websites.
- **Our** knowledgeable **support team** is available to **assist you with any technical queries** or concerns, **ensuring a seamless hosting** experience from start to finish.

Software as a Service, Hosted by RENAM example – Jupyter Notebook

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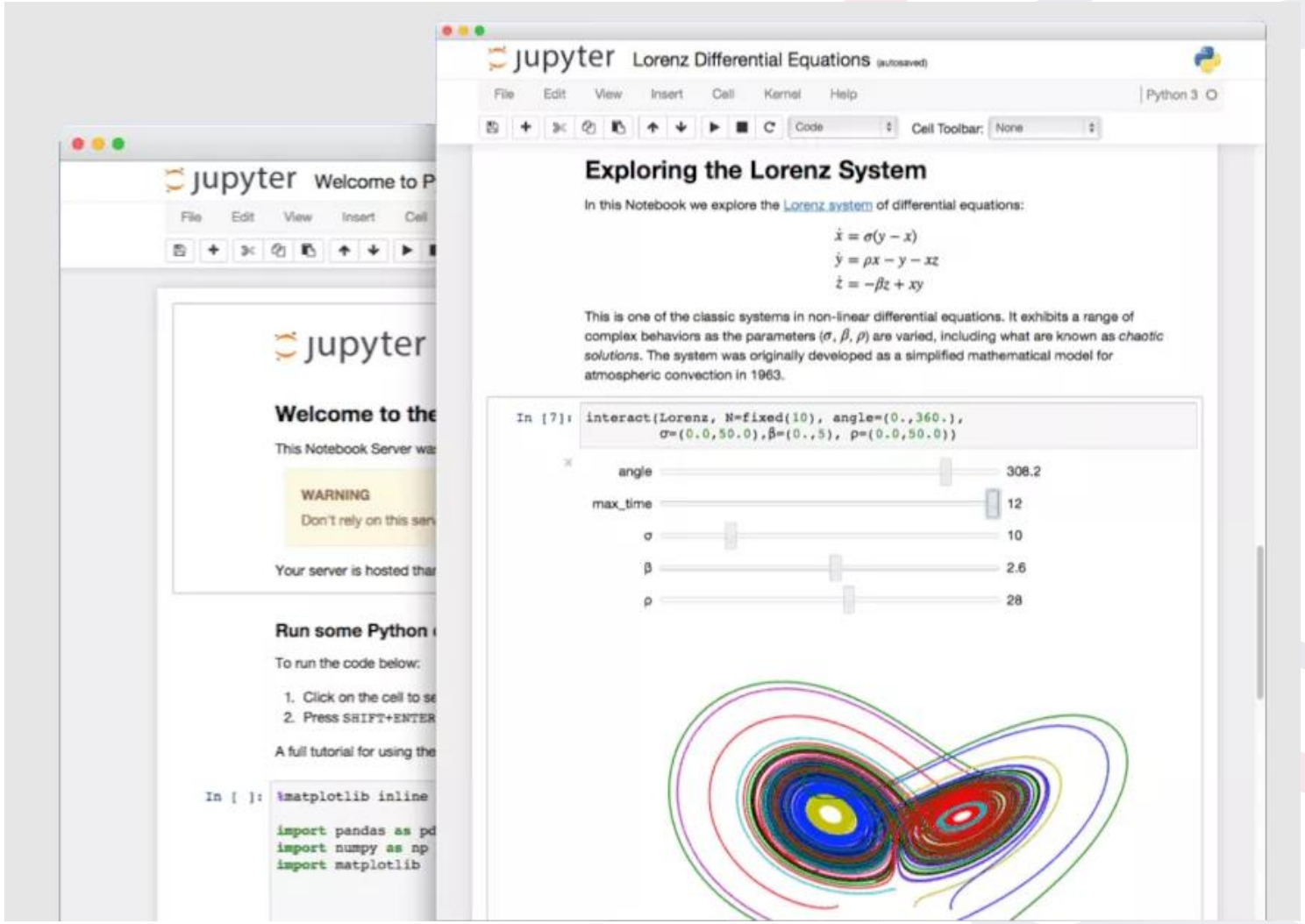
A notebook is a shareable document that combines computer code, plain language descriptions, data, rich visualizations like 3D models, charts, graphs and figures, and interactive controls. A notebook, along with an editor (like JupyterLab), provides a fast interactive environment for prototyping and explaining code, exploring and visualizing data, and sharing ideas with others.

Jypyter Notebook deployed at RENAM resources for IMI VA users is accessible at https://notebook.math.md



Software as a Service, Hosted by RENAM example – Nextcloud

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Nextcloud is a free and open-source software platform designed for file synchronization and sharing. It allows you to create your own cloud storage and collaboration platform, similar to services like Dropbox or Google Drive. Nextcloud provides a suite of applications that include file storage, calendar, contacts, and more, enabling users to manage and share their data in a secure and private environment.

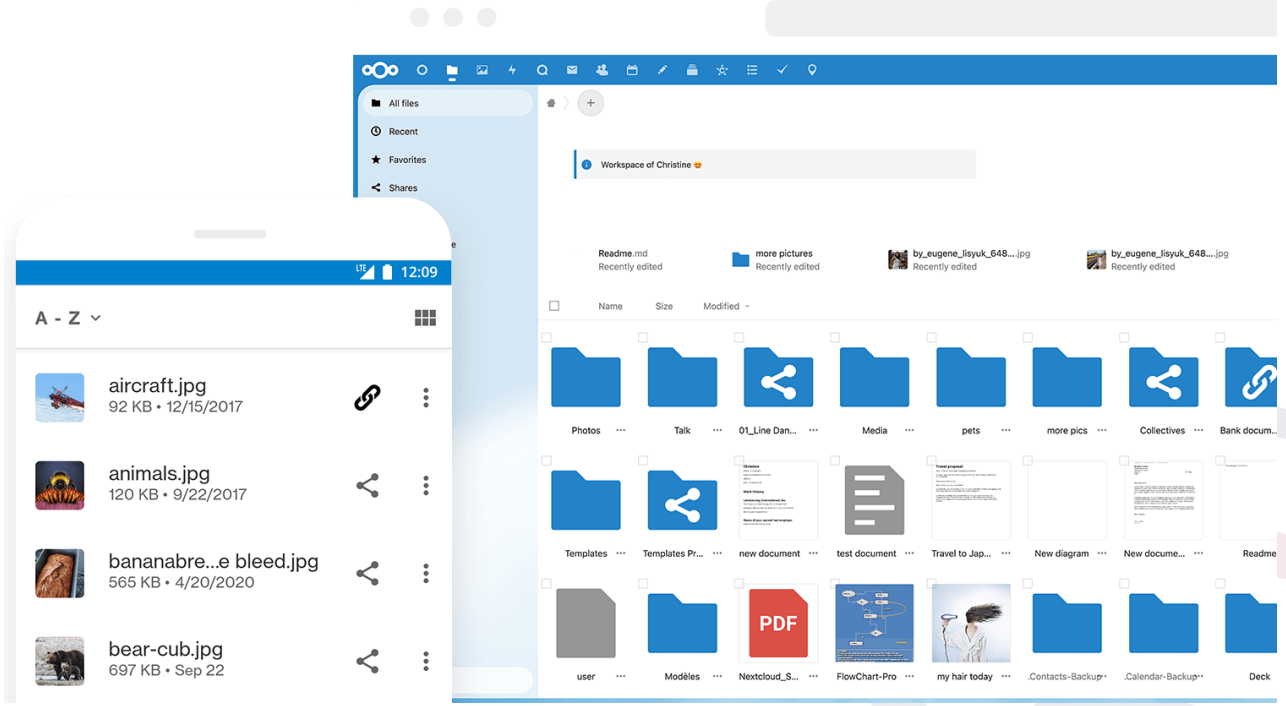
Key features of Nextcloud include:

1.File Storage and Sharing: Users can store files in their Nextcloud instance and share them with others. It supports sharing both within the Nextcloud server and with external users through shareable links.

2.Calendar and Contacts: Nextcloud includes applications for managing calendars and contacts, allowing users to organize their schedules and maintain a centralized address book.

3.Collaboration Tools: It offers collaborative tools such as document editing, task management, and chat, facilitating teamwork and communication within the platform.

4.Extensibility: Nextcloud is extensible, allowing users to enhance its functionality by adding third-party apps and plugins. This flexibility makes it adaptable to various use cases and requirements.



NextCloud service provisioned for IMI VA employees is accessible via https://cloud.math.md

Software as a Service, Hosted by RENAM example – ORCA (quantum chemistry program)

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ORCA is a powerful and versatile quantum chemistry software package, primarily developed by the group of Prof. Frank Neese. It is free for academic use, while commercial licenses are available through FACCTs. ORCA is also the computational engine inside our workflow tool WEASEL.

```
SCS3T200.out

Timings for individual modules:

Sum of individual times         ...    16390.185 sec (= 273.170 min)
GTO integral calculation        ...       12.717 sec (=   0.212 min)   0.1 %
SCF iterations                  ...    16377.468 sec (= 272.958 min)  99.9 %
                          ****ORCA TERMINATED NORMALLY****
TOTAL RUN TIME: 0 days 4 hours 33 minutes 13 seconds 172 msec
```

Figure: our orca4 installation with 16 CPU cores completed calculation in 4h33m (compared with a reference result of 3h54m on a 32 CPU European cluster).

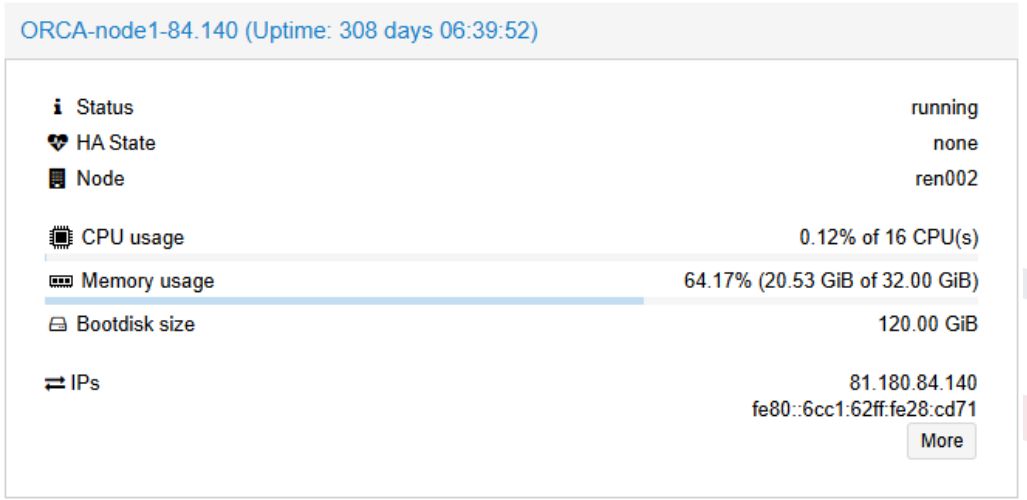
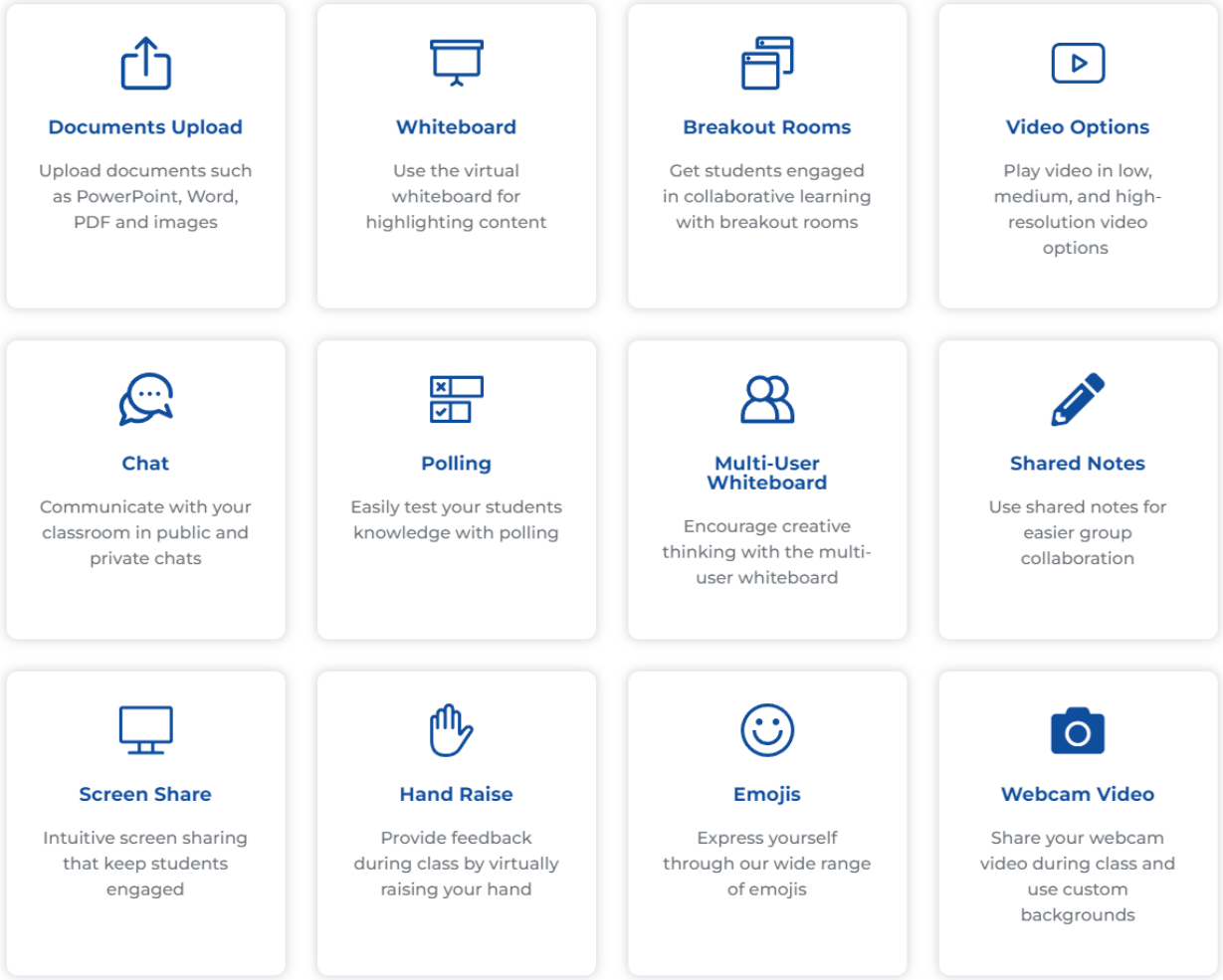


Figure: Parameters of ORCA computing node provide for IFA.

RENAM Video Conferencing Support



RENAM VCS service is…

A **Distant Learning Platform** and **Video-conferencing** solution based on BigBlueButton software.

RENAM VCS provides:

- ✓ Installations based on VPS or Bare Metal;
- ✓ Integration with Moodle Learning Platform;
- ✓ Possibility to use Scalelite as a load balancer for very large installations;
- ✓ Configured with STUN server for users behind restrictive firewalls;
- ✓ Access to your Recordings in both Presentation and Video formats;
- ✓ And many more!

Accessible at https://vc.renam.md, https://bbb12.renam.md, https://vc.math.md and many others.

RENAM VCS Capacity and Achievements

RENAM VCS service proved its high capacity, peaking almost at 1,5k of concurrent online users in 2021, while providing Video Conferencing Support to students and users from many institutions, such as USM, IMI, RENAM and others during the Covid-19 pandemic. This was achieved using a pool of 10 BigBlueButton installations using both Bare-Metal and VPS servers with a load balancer.

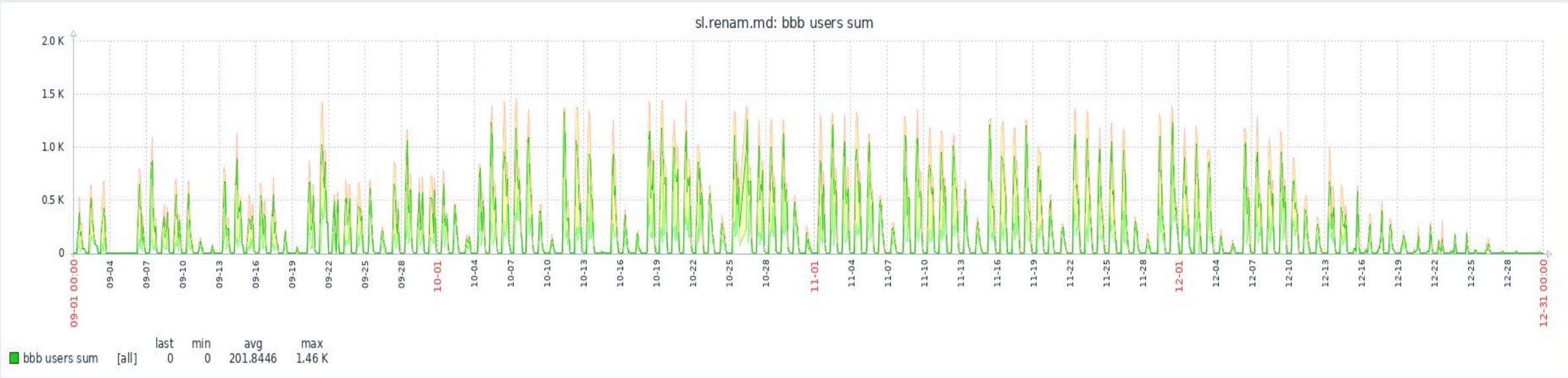


Figure: Daily numbers of RENAM VCS users during the covid period, from 01/09/2021 to 31/12/2021.

RENAM Computing Infrastructure equipment for near future expansion

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Dell EMC PowerEdge R650

DELL Technologies

Spec Sheet

Compelling performance, high scalability, and density

The Dell EMC PowerEdge R650, is a full-featured enterprise server, designed to optimize workloads performance and data center density.

PowerEdge R650

The Dell EMC PowerEdge R650 offers compelling performance, high-speed memory and capacity, I/O bandwidth and storage to address data requirements – Ideal for:

- Traditional corporate IT
- Database and Analytics
- Virtual Desktop Infrastructure
- AI/ML and HPC

8 x PowerEdge R650 Servers with:

- 2 x Intel Xeon Silver 4316 2.3G, 20C/40T CPUs
- 256 Gb RAM
- 4 x 960Gb SSDs
- Intel X710 Dual Port 10GbE SFP+ Adapter
- Broadcom 5719 Quad Port 1GbE BASE-T Adapter

2 x NVIDIA® Tesla™ T4 16GB Video Cards for AI and ML Projects

New RENAM servers are planned to be distributed at **4 locations**, creating a robust distributed computing infrastructure:

- RENAM NOC (UTM2)
- IMI VA
- USM
- IMU

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Thank you!

Any questions?

RENAM, Chisinau, Moldova

Website: www.renam.md
Social media: @RENAM.MD @RENAM_AO