

# RENAM Computing Infrastructure

RENAM Computing Infrastructure and Services  
For Research and Education

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# Current RENAM Computing Infrastructure Equipment

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

The screenshot shows the Proxmox Virtual Environment (VE) web interface. The browser address bar indicates a secure connection to the Proxmox VE 8.3.5. The interface is divided into several sections:

- Server View:** A tree view on the left showing the hierarchy of the datacenter, including VMs and containers.
- Datacenter:** The main navigation menu on the right, with 'Summary' selected.
- Guests:** A summary section showing the status of Virtual Machines (56 Running, 22 Stopped) and LXC Containers (0 Running, 0 Stopped).
- Resources:** Three gauge charts showing resource usage: CPU at 12% (of 120 CPU(s)), Memory at 25% (188.66 GiB of 755.37 GiB), and Storage at 37% (13.97 TiB of 37.66 TiB).
- Nodes:** A table at the bottom showing the status of the cluster nodes.

Name	ID	Online	Support	Server Address	CPU usage	Memory usage	Uptime
ren001	1	✓	-		9%	23%	116 days 01:36:13
ren002	2	✓	-		17%	18%	116 days 03:39:24
ren003	3	✓	-		11%	34%	116 days 03:56:33

# RENAM Computing Infrastructure Middleware: FreeNAS (TrueNAS)



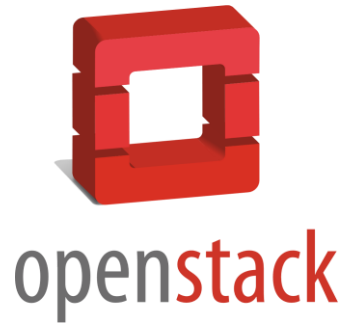
FreeNAS (TrueNAS) is a family of network-attached storage (NAS) products produced by iXsystems, incorporating both FOSS, as well as commercial offerings. Based on the OpenZFS file system, TrueNAS runs on FreeBSD as well as Linux and is available under the BSD License. It is compatible with x86-64 hardware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

Name	Serial	Disk Size	Pool
da0	0054a8141395fb:	50.94 TiB	raid6commonare:
da1	0077163d18ebfb:	7.28 TiB	raid1VMdisks_s2
da2	006daf3b1e50fc2	446.63 GiB	freenas-boot

# RENAM Computing Infrastructure Middleware: 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.

A screenshot of the OpenStack dashboard. The top left shows a navigation menu with "Project", "Admin", and "System" sections. The main area is titled "All Hypervisors" and "Hypervisor Summary". It features three pie charts: "VCPU Usage" (Used 20 of 32), "Memory Usage" (Used 88.5GB of 125.7GB), and "Local Disk Usage" (Used 452GB of 2.7TB). Below these is a table with tabs for "Hypervisor" and "Compute Host". The table lists three hosts: node1, node2, and node3, with columns for Hostname, Type, VCPUs (used/total), RAM (used/total), Local Storage (used/total), and Instances. The "Instances" section below shows a list of five instances with columns for Instance Name, Image Name, IP Address, Size, Key Pair, Status, Availability Zone, Task, Power State, Time since created, and Actions. The instances listed are Orca-6.0.1-Test, digitizare.math.md, Anaconda-Tudor, Grafana, and 3ICEHD-Tudor.

Hostname	Type	VCPUs (used)	VCPUs (total)	RAM (used)	RAM (total)	Local Storage (used)	Local Storage (total)	Instances
node1	QEMU	0	8	512MB	15.7GB	0Bytes	426GB	0
node2	QEMU	0	8	512MB	15.7GB	0Bytes	426GB	0
node3	QEMU	20	32	88.5GB	125.7GB	452GB	2.7TB	8

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
Orca-6.0.1-Test	Ubuntu 22.04 (Jammy Jellyfish)	81.180.84.248	c2r4h20	nikita	Active	nova	None	Running	3 weeks, 1 day	Create Snapshot
digitizare.math.md	Ubuntu 22.04 (Jammy Jellyfish)	81.180.84.244	c2r4h20	nikita	Active	nova	None	Running	1 year, 10 months	Create Snapshot
Anaconda-Tudor	Ubuntu Server 18.04 LTS x64 (Bionic Beaver)	81.180.84.246	c8r64h256	nikita	Active	nova	None	Running	5 years, 7 months	Create Snapshot
Grafana	Ubuntu Server 18.04 LTS x64 (Bionic Beaver)	81.180.84.242	c2r4h20	nikita	Active	nova	None	Running	5 years, 9 months	Create Snapshot
3ICEHD-Tudor	Ubuntu Server 18.04 LTS x64 (Bionic Beaver)	81.180.84.252	c2r2h20	bombatudor	Active	nova	None	Running	5 years, 9 months	Create Snapshot

# 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.

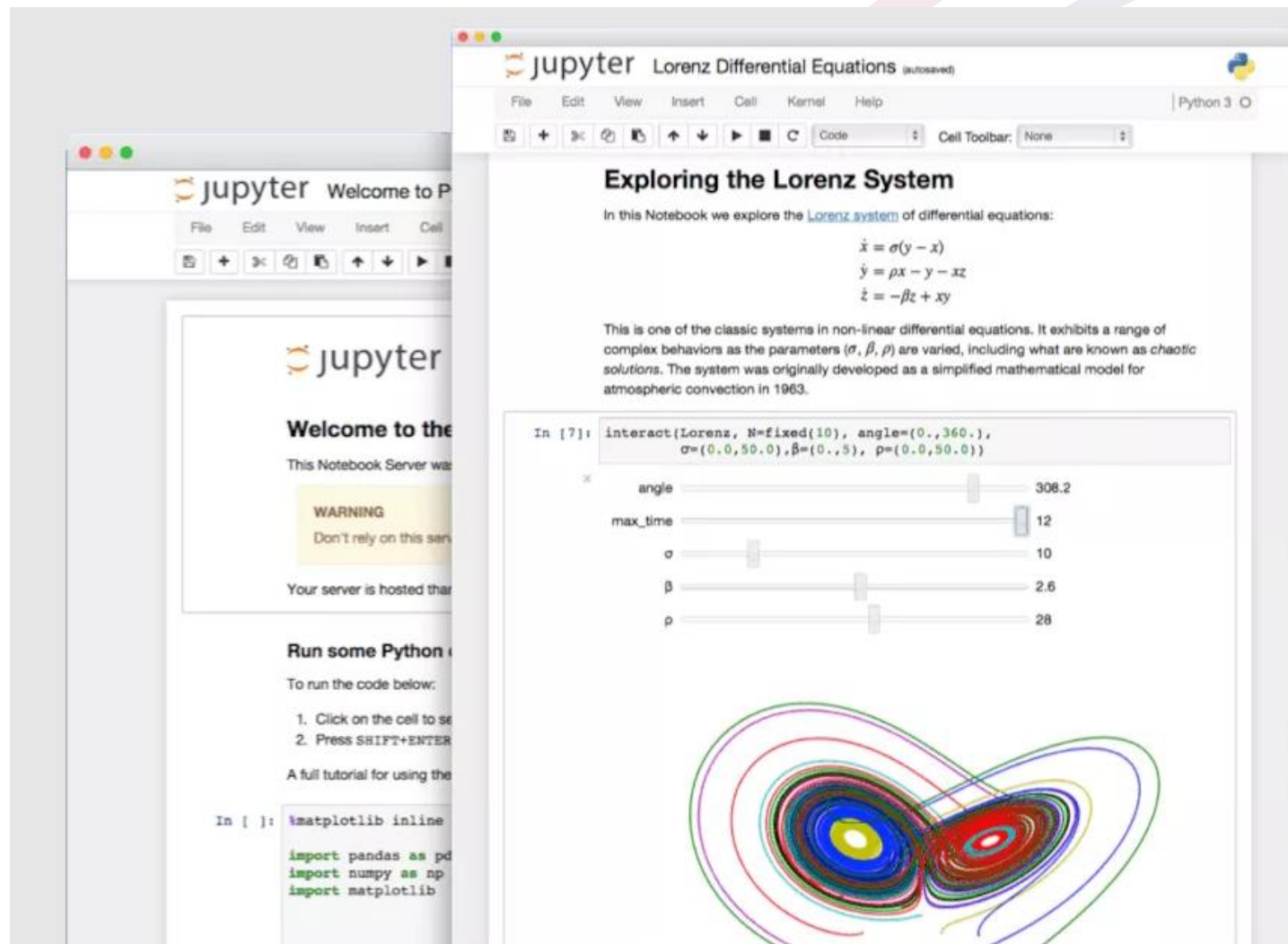


# Software as a Service, Hosted by RENAM example – Jupyter Notebook



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.

Jupyter 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



## 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.

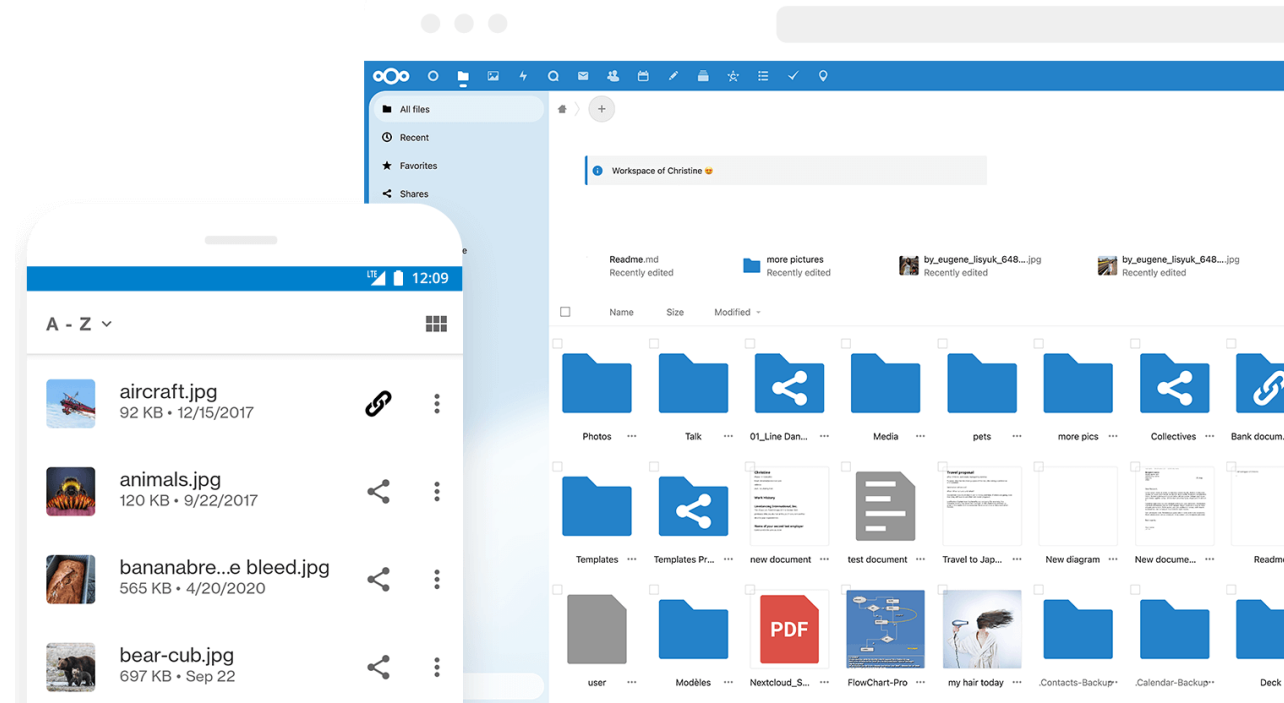
**2. Calendar and Contacts:** Nextcloud includes applications for managing calendars and contacts, allowing users to organize their schedules and maintain a centralized address book.

**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>

**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.



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



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).













ORCA-node1-84.140 (Uptime: 308 days 06:39:52)

 Status	running
 HA State	none
 Node	ren002
 CPU usage	0.12% of 16 CPU(s)
 Memory usage	64.17% (20.53 GiB of 32.00 GiB)
 Bootdisk size	120.00 GiB
 IPs	81.180.84.140 fe80::6cc1:62ff:fe28:cd71

More

Figure: Parameters of ORCA computing node provide for IFA.

# RENAM Video Conferencing Support

 <p><b>Documents Upload</b></p> <p>Upload documents such as PowerPoint, Word, PDF and images</p>	 <p><b>Whiteboard</b></p> <p>Use the virtual whiteboard for highlighting content</p>	 <p><b>Breakout Rooms</b></p> <p>Get students engaged in collaborative learning with breakout rooms</p>	 <p><b>Video Options</b></p> <p>Play video in low, medium, and high-resolution video options</p>
 <p><b>Chat</b></p> <p>Communicate with your classroom in public and private chats</p>	 <p><b>Polling</b></p> <p>Easily test your students knowledge with polling</p>	 <p><b>Multi-User Whiteboard</b></p> <p>Encourage creative thinking with the multi-user whiteboard</p>	 <p><b>Shared Notes</b></p> <p>Use shared notes for easier group collaboration</p>
 <p><b>Screen Share</b></p> <p>Intuitive screen sharing that keep students engaged</p>	 <p><b>Hand Raise</b></p> <p>Provide feedback during class by virtually raising your hand</p>	 <p><b>Emojis</b></p> <p>Express yourself through our wide range of emojis</p>	 <p><b>Webcam Video</b></p> <p>Share your webcam video during class and use custom backgrounds</p>

**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.

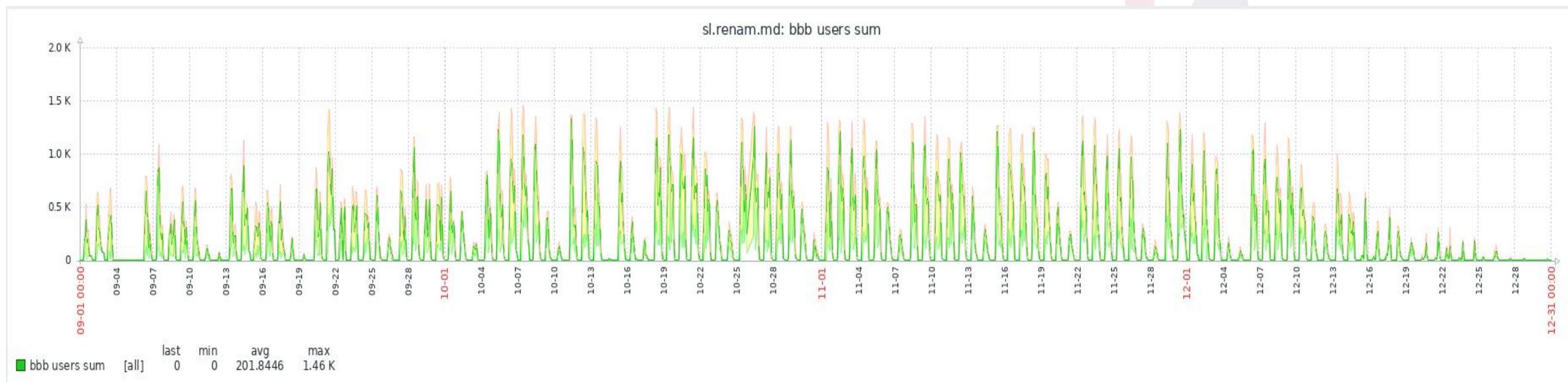


Figure: Daily numbers of RENAM VCS users during the covid period, from 01/09/2021 to 31/12/2021.

# RENAM Computing Infrastructure equipment for near future expansion

## 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.



### 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



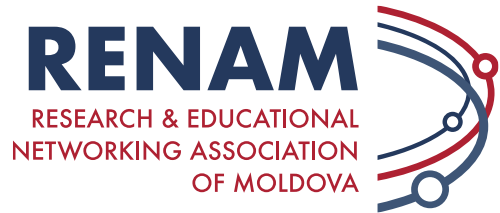
### PowerEdge R650

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

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

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



# Thank you!

Any questions?

**RENAM, Chisinau, Moldova**

Website: [www.renam.md](http://www.renam.md)

Social media:  @RENAM.MD  @RENAM\_AO

