EuroHPC Joint Undertaking

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WHO ARE WE?

- A legal and funding entity (Art 187 of the Treaty on the Functioning of the European Union -TFEU)
- Created in 2018 and autonomous since September 2020
- Based in Luxembourg (Cloche d'Or district)
- A small team of 21 employees and still in the process of recruiting additional employees throughout 2022

THE EUROHPC JU POOLS THE RESOURCES OF ITS MEMBERS TO:

- Develop, deploy, extend & maintain in Europe a **world-leading supercomputing, quantum computing, service** & **data infrastructure** ecosystem;
- Support the development of **innovative supercomputing components, technologies, knowledge** & **applications** to underpin a **competitive European supply chain**;
- Widen the use of **HPC** & **quantum infrastructures** to a large number of public & private users wherever they are located in Europe and support the development of **key HPC skills** for European science and industry.

OUR MEMBERS

- 32 participating countries
- The European Union (represented by the European Commission)
- Private partners

BDV BIG DATA VALUE ASSOCIATION

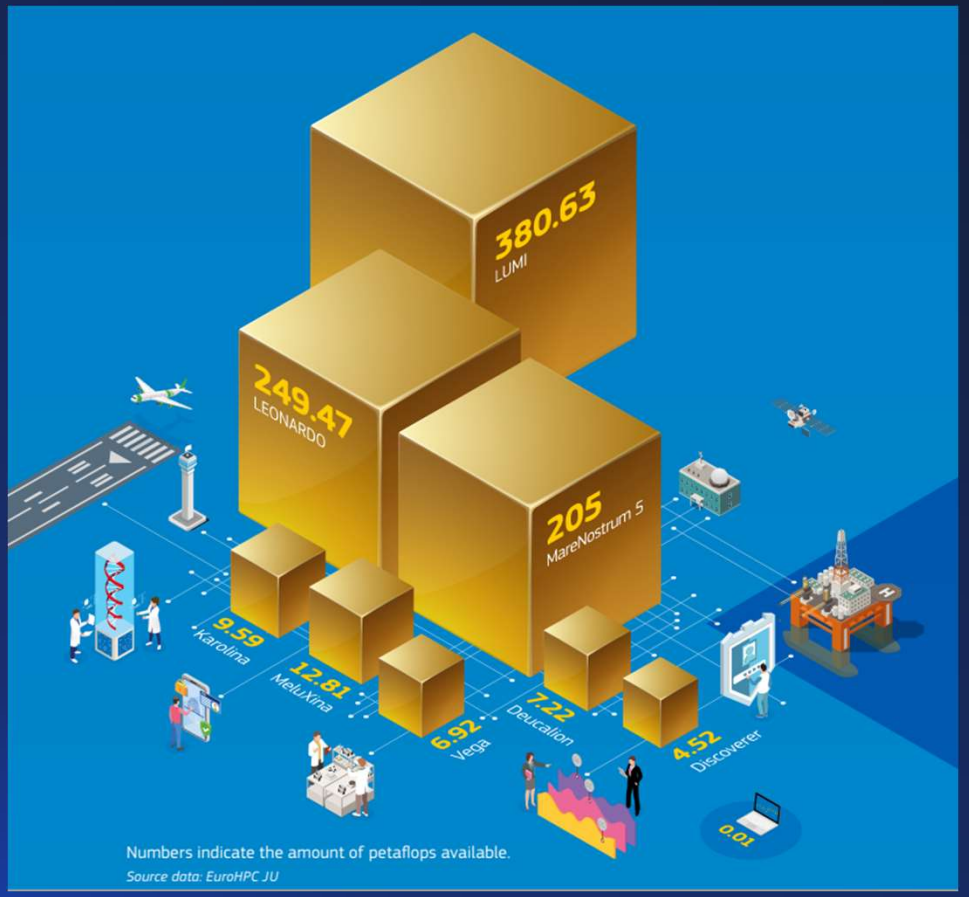
QUIC European Quantum Industry Consortium

ETP 4 HPC EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

Infrastructure Activities

encompasses the activities for the:

- acquisition,
- deployment,
- upgrading and
- operation of a
  - secure, hyper-connected world-class supercomputing, quantum computing and data infrastructure,
- access and usage,
  - promotion of the uptake and systematic use of research and innovation results generated in the Union;



EuroHPC
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Up to now, the EuroHPC JU has procured 8 supercomputers:

- **5 operational systems,** all ranking among the world's most powerful supercomputers:
  - Slovenia,
  - Luxembourg,
  - Czechia,
  - Bulgaria,
  - & Finland.

- **3 systems underway** in
  - Italy,
  - Spain,
  - & Portugal.

PURSUING A SUSTAINABLE HPC INFRASTRUCTURE

The EuroHPC JU is committed to building supercomputers which are both **powerful** and **eco-efficient** by:

- Procuring **energy efficient systems**, with low requirements for cooling. All our systems are **water cooled**, removing the requirement of high operational costs of air-cooled systems and in parallel reducing the energy footprint.
- Investing in the development of **next generation "green" microprocessors** that rely on energy efficient architectures.

Green and sustainable technologies are a priority for the JU, as part of the European Green Deal's aim to make Europe climate neutral by 2050

LUMI Pre-exascale system

CSC – IT Center for Science, Kajaani, Finland

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Cray EX, Hewlett Packard Enterprise

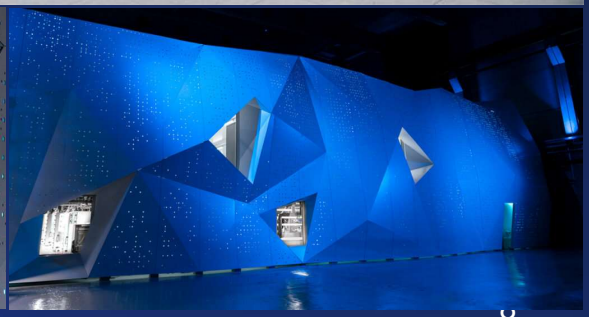
Sustained performance: 375+ petaflops (expected),
Peak performance: 552 petaflops

Compute partitions:

- GPU partition (**LUMI-G**), The GPU partition will consist of **2560** nodes, each node with one 64 core AMD Trento CPU and four AMD MI250X GPUs.
- x86 CPU-partition (**LUMI-C**) **1536** nodes, 2xAMD EPYC 7763 (64C, 2.45GHz), **6.3** Petaflops sustained
- data analytics partition (**LUMI-D**),
- container cloud partition (**LUMI-K**),

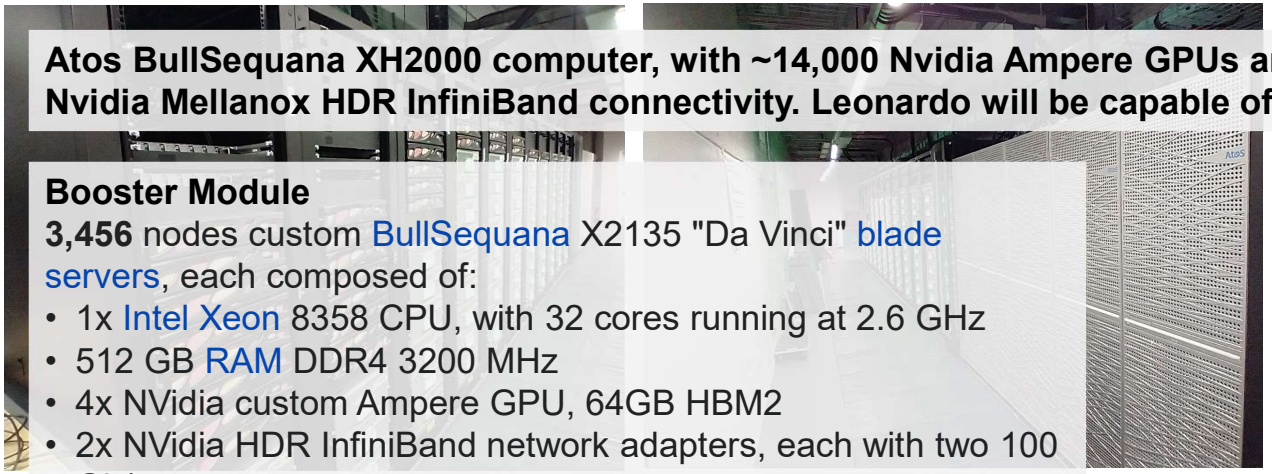
CPU: AMD EPYC™ CPUs,
GPU: AMD Instinct™ GPU (MI250X),

Storage capacity: 117 PB multi-tiered 2 Tbit/sec



LUMI-G,
#3 Top500, June 2022
#3 Green500
#3 HPCG

Leonardo (under installation)

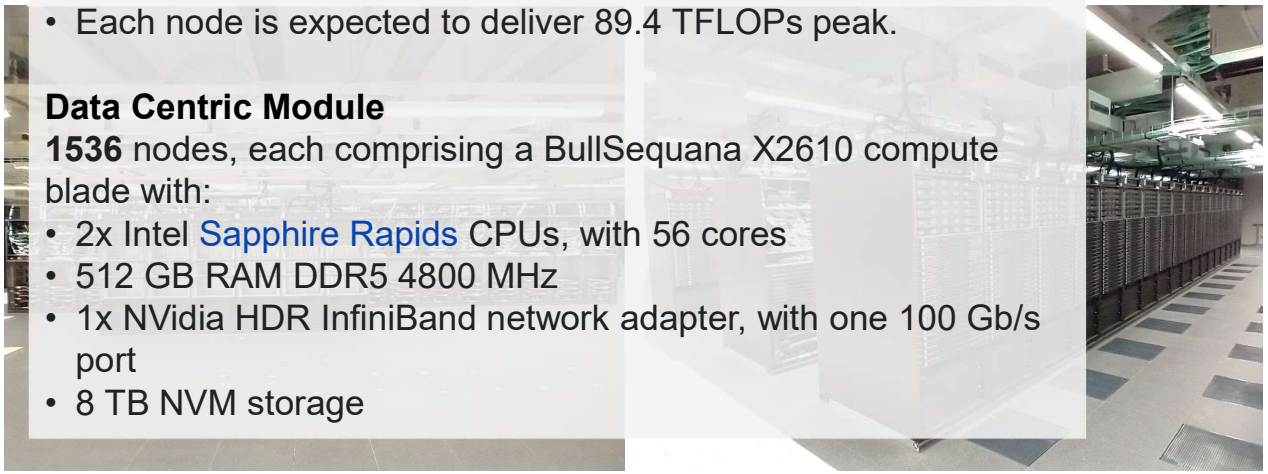


Atos BullSequana XH2000 computer, with ~14,000 Nvidia Ampere GPUs and 200Gb/s Nvidia Mellanox HDR InfiniBand connectivity. Leonardo will be capable of 250 petaflops

Booster Module

3,456 nodes custom BullSequana X2135 "Da Vinci" blade servers, each composed of:

- 1x Intel Xeon 8358 CPU, with 32 cores running at 2.6 GHz
- 512 GB RAM DDR4 3200 MHz
- 4x NVidia custom Ampere GPU, 64GB HBM2
- 2x NVidia HDR InfiniBand network adapters, each with two 100 Gb/s ports
- Each node is expected to deliver 89.4 TFLOPs peak.



Data Centric Module

1536 nodes, each comprising a BullSequana X2610 compute blade with:

- 2x Intel Sapphire Rapids CPUs, with 56 cores
- 512 GB RAM DDR5 4800 MHz
- 1x NVidia HDR InfiniBand network adapter, with one 100 Gb/s port
- 8 TB NVM storage

MareNostrum 5 (under installation)

Modular architecture – 4 x Partitions / 8032 Nodes (Atos, Lenovo) - IBM Storage - Nvidia, Intel.

	Partitions	Racks	Cooling	Nodes	Processor/Accelerator	Memory	PFlops (HPL)	
Main	General Purpose	89	DLC (+RDHX)	6192	2x Intel Sapphire R.	>2GB/core 256GB DDR5	35.43	>205
				216		>8GB/core 1024GB DDR5		
		1		72	2x Intel Sapphire R.	> 0.5GB HBM/core 128GB HBM + 32GB DDR5	0.34	
	Accelerated	35		1120	2x Intel Sapphire R.	512GB	163	
					4x Nvidia Hopper 64GB HBM			
Next Gen	General Purpose	6	AC +RDHX	408	2x Nvidia Grace	240GB LPDDR5	2	
	Accelerated	1	DLC +RDHX	24	2x Intel Emerald R.	512GB DDR5	4.24	
					4x Intel Rialto Bridge 128GB HBM2E			

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EuroHPC Petascale Systems (operational)

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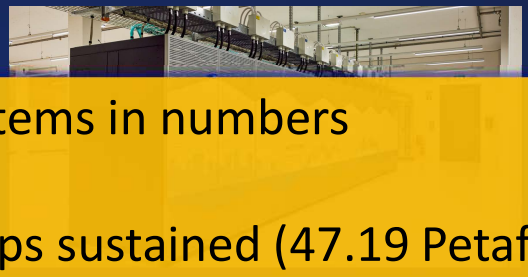
Vega

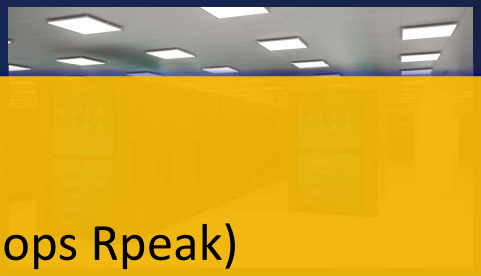
Sustained performance	6,9 petaflops
Compute partitions:	CPU (560 nodes), GPU (60 nodes), Cloud (20 nodes)
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
Interconnect	Infiniband HDR
Storage capacity:	Lustre (30PB multi-tiered), Ceph (6PB)
TOP500 ranking:	#32 in EU; #36 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	IZUM, Maribor, Slovenia

MeluXina



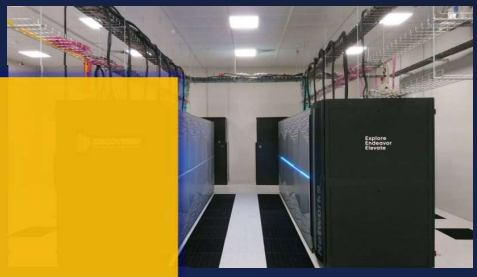
Sustained performance:	12,8 petaflops
Compute partitions:	CPU (573+20 nodes), GPU (200 nodes), FPGA (20 nodes), Cloud (20 nodes)
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
Interconnect	Infiniband HDR
Storage capacity:	Lustre (20PB multi-tiered), Ceph (96TB)
TOP500 ranking:	#10 in EU; #38 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	LuxProvide, Bissen, Luxembourg

Karolina



Sustained performance:	9,13 petaflops
Compute partitions:	CPU (720 nodes) GPU (72 nodes) Cloud (36 nodes) Data analytics (1 node)
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
Interconnect	Infiniband HDR
Storage capacity:	Lustre (1PB) +NFS
TOP500 ranking:	#20 in EU; #69 globally (June 2021)
Vendor/model	HPE Apollo 2000/Sen10 Plus and Apollo 6500
Operated by	IT4I, Ostrava, Czech Republic

Discoverer



Sustained performance:	**4,45 petaflops**
Compute partitions:	CPU (1110+18 nodes)
CPU:	AMD Epyc Rome
GPU:	-
Interconnect	Infiniband HDR
Storage capacity:	Lustre (2PB)
TOP500 ranking:	#27 in EU; #91 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	PSB consortium, Sofia, Bulgaria

Petascale systems in numbers

33.83 Petaflops sustained (47.19 Petaflops Rpeak)

- **11** partitions
- **3401** CPU Nodes
- **332** GPU Nodes
- FPGA, Visualisation and Cloud capabilities
- **24PB** Lustre Storage
- AMD Epyc Rome CPUs
- **1616** Nvidia A100 GPUs

WHO CAN ACCESS OUR SUPERCOMPUTERS?

- **What organisations are eligible for access to EuroHPC JU machines?**

Any organisation from a participating state is eligible for free access to perform Open Science research.

This includes **public** and **private academic and research institutions**, **public sector organisations**, **industrial enterprises and SMEs**.

- **What are the participation conditions?**

Participation conditions depend on the specific access call that a research group has applied. In general users of EuroHPC systems commit to:

- ✓ acknowledge the use of the **resources** in their related publications,
- ✓ contribute to **dissemination** events,
- ✓ produce and submit a **report** after completion of a resource allocation.

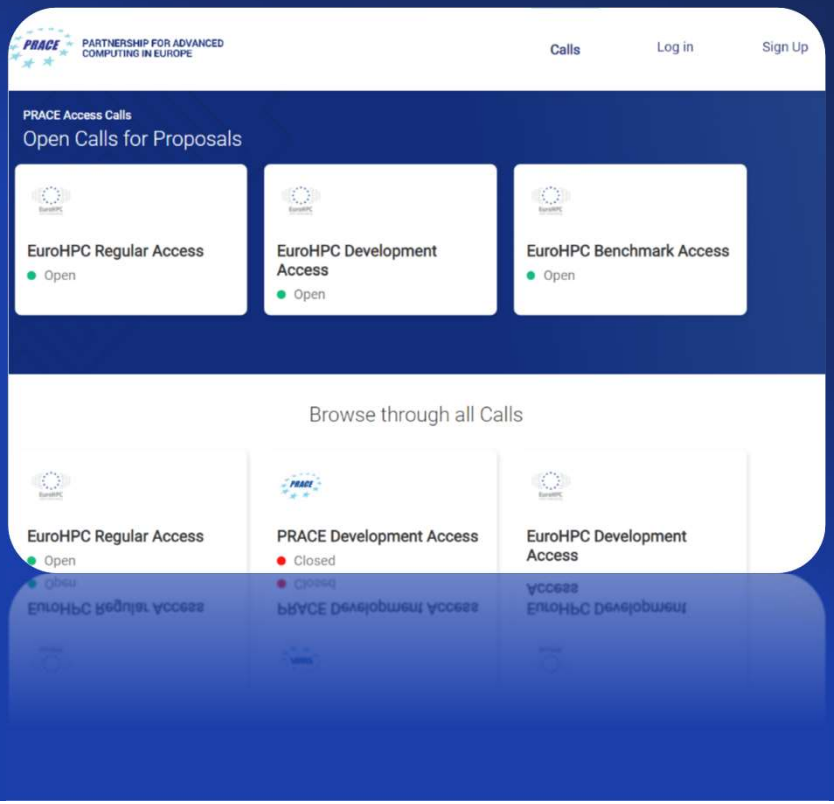
Access Policy

Access Policy document defines the procedures and conditions for access the EuroHPC Supercomputers

- **Multiple Access Modes offering resources on a periodic and continuously-open call basis.**
  - **Extreme scale:** Large applications, Pre-exascale systems. Peer-reviewed
    - 2 cut-offs per year
  - **Regular:** Medium to large applications, Petascale systems. Peer-reviewed
    - 3 cut-offs per year
  - **Development.** All systems. Up to 1 year access. Limited resources.
    - Monthly cut-offs
  - **Benchmark.** All systems. Up to 3 months access. Limited resources.
    - Monthly cut-offs
- Special conditions for **Urgent/Emergency** Computing & Access for **Strategic Initiatives/Projects** – Decided by the Governing Board.

How to Apply for Access

Visit https://pracecalls.eu. Peer review process supported by PRACE!



Regular Access

Deadlines and allocation periods

- **4 November 2022 cut-off**: 1 March 2023 – 29 February 2024
- **March 2023 cut-off**: 1 July 2023 – 30 June 2024

Extreme Scale

Bi-yearly cut-off dates:

- 1st cut-off: 30 November 2022
- 2nd cut-off: April 2023

Resources per call type

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Extreme Scale (1.7 Billion core-hours)

System	Site (Country)	Total Core Hours (node hours)	Minimum core hours
Leonardo BOOSTER	CINECA (IT)	189 million (5.9 million)	20 million
LUMI-C	CSC (FI)	826.7 million (6.5 million)	80 million
LUMI-G	CSC (FI)	689 million (10.8 million)	55 million

Regular Access (706.7 Million core-hours)

System	Site (Country)	Total Core Hours	Minimum core hours
Vega CPU	IZUM Maribor (SI)	150 million	10 million
Vega GPU	IZUM Maribor (SI)	4.1 million	1 million
MeluXina CPU	LuxProvide (LU)	65.5 million	10 million
MeluXina GPU	LuxProvide (LU)	11.1 million	2 million
Karolina CPU	VSB-TUO, IT4Innovations, (CZ)	60 million	10 million
Karolina CPU	VSB-TUO, IT4Innovations, (CZ)	6 million	1 million
Discoverer CPU	Sofiatech (BG)	104 million	10 million
LUMI-C	CSC (FI)	306 million	20 million

HPC Infrastructure next steps

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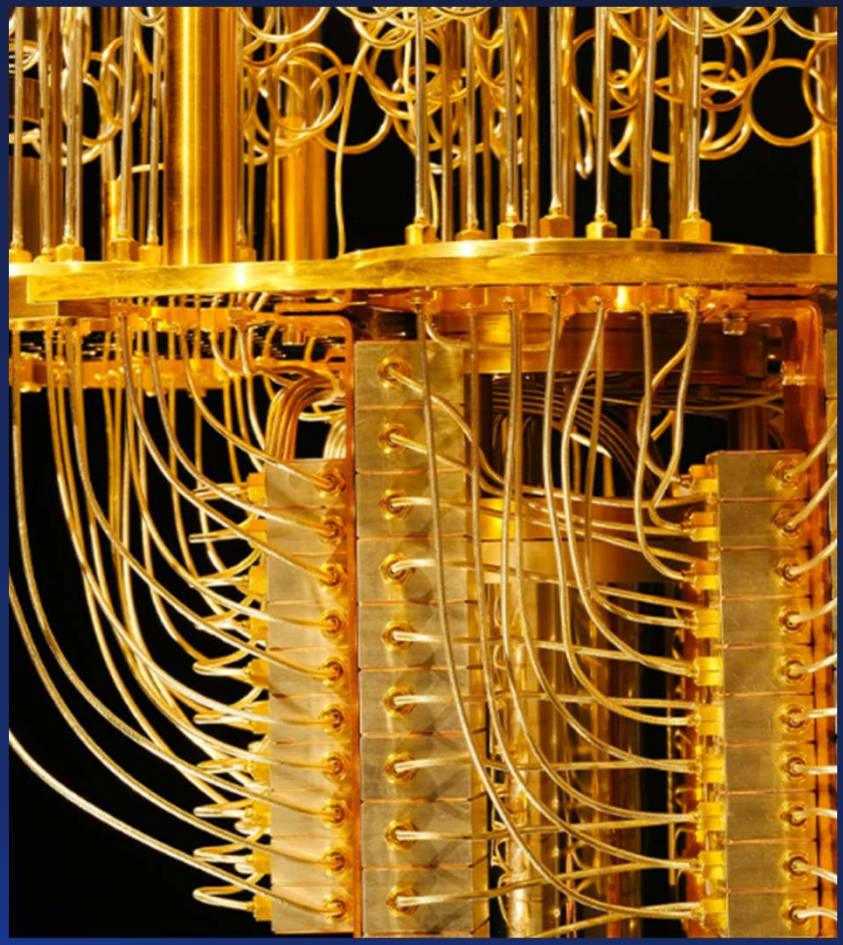
Planned systems

- 1st EU Exascale system – to begin installation in 2023
- Additional mid-range supercomputers (15+ Petaflops)
- Quantum computers – co-located and integrated with existing supercomputers

2nd Exascale system and mid-range planned for 2024



Keep up with EuroHPC news:

https://eurohpc-ju.europa.eu

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