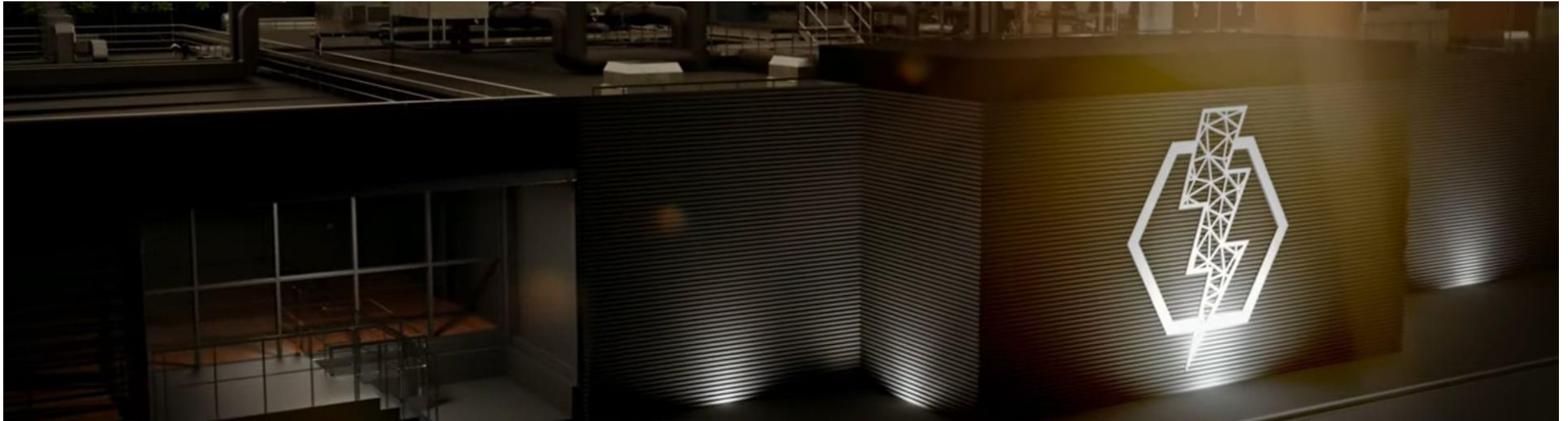




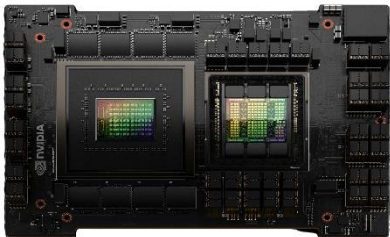
JUPITER and an Overview of its Support Infrastructure

June 05, 2025 | Thomas Breuer & colleagues from the Jülich Supercomputing Centre | HPCKP Annual Meeting 25

JUPITER MODULES

JUPITER **Booster**

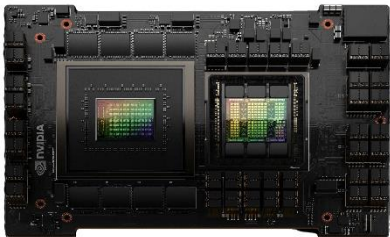
- ~125 Racks BullSequana XH3000
- Node design
 - ~6000 nodes, 4× NVIDIA CG1 per node
- CG1: NVIDIA Grace-Hopper
 - 72 Arm Neoverse V2 cores (4×128b SVE2); 120 GB LPDDR5
 - H100 (132 SMs); 96 GB HBM3
 - NVLink C2C (900 GB/s)



JUPITER MODULES

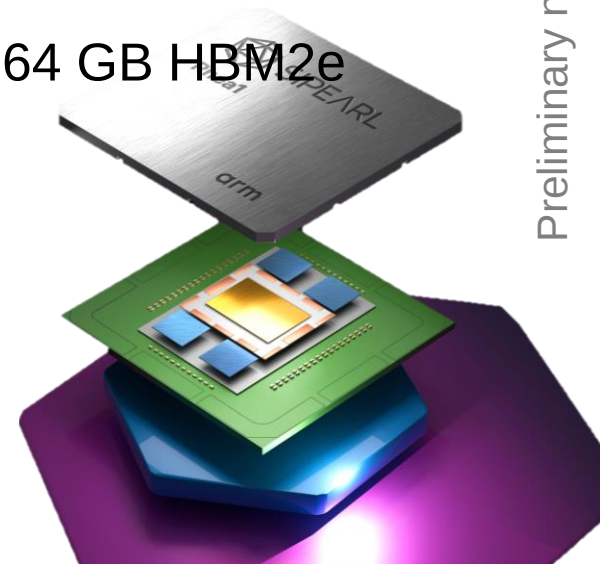
JUPITER Booster

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JUPITER Cluster

- ~15 Racks BullSequana XH3000
- Node design
 - ~1300 nodes
 - 2× SiPearl Rhea1 per node
- Rhea1
 - 80 Arm Neoverse V1 cores (2×256b SVE)
 - 256 GB DDR5, 64 GB HBM2e



JUPITER MODULES

JUPITER Booster

- ~125 Racks BullSequana XH3000
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 - ~6000 nodes, 4× NVIDIA CG1 per node
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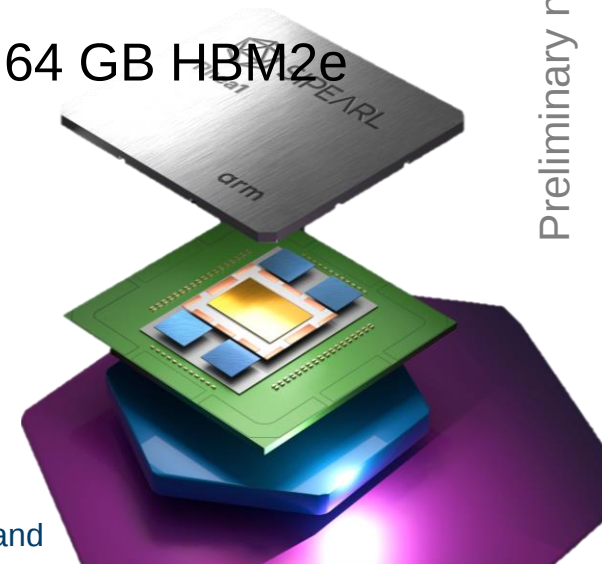
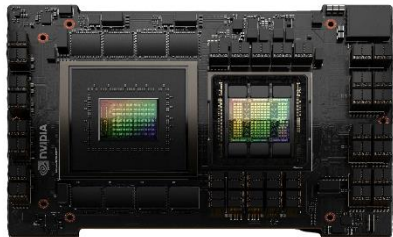
JUPITER Cluster

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 - 2× SiPearl Rhea1 per node
- Rhea1
 - 80 Arm Neoverse V1 cores (2×256b SVE)
 - 256 GB DDR5, 64 GB HBM2e

ExaFLASH: 29PB (raw) NVMe, IBM SSS6000

ExaSTORE: 308PB (raw) HDD*, IBM SSS6000

ExaTAPE: 370PB Tape*, LTO9



BENCHMARKS & FUNDING

- Application & synthetic benchmarks
- Execution targets
 - JUPITER Booster (GPU, CPU)
 - JUPITER Cluster (CPU)
 - MSA
- Application benchmark categories
 - Total Cost of Ownership (TCO)
 - High-Scaling
- JUPITER Benchmark Suite published: <https://github.com/FZJ-JSC/jubench>

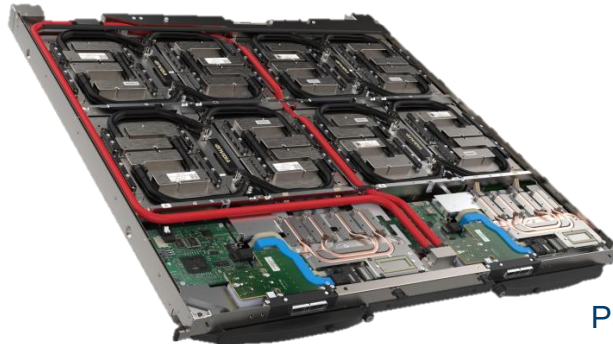
	Booster			Cluster	MSA
Name	GPU	GPU High-Scale	CPU	CPU	
Amber	✓				
Arbor	✓	✓			
Chroma	✓	✓			
Gromacs	✓				
ICON	✓				
JUQCS	✓	✓			✓
nekRS	✓	✓			
ParFlow	✓				
PICongPU	✓	✓			
Quantum ESPRESSO	✓				
SOMA	✓				
AI-MMoCLIP	✓				
AI-NLP	✓				
AI-ResNet	✓				
dynQCD				✓	
NAStJA				✓	
Graph500			✓		
HPCG	✓			✓	
HPL	✓			✓	
IOR			✓	✓	
LinkTest			✓	✓	✓
Multi-Flow IP			✓		
OSU	✓		✓	✓	
STREAM	✓			✓	

Funding: 500Mio € (50% EuroHPC; 25% BMBF; 25% MWK NRW)

JEDI - JUPITER EXASCALE DEVELOPMENT INSTRUMENT

EuroHPC / Forschungszentrum Jülich

- JEDI: JUPITER test system 
 - 48 nodes (JUPITER design)
 - **Top 1 Green500!** (05/2024)
- Usage
 - System management preparations
 - Application porting
 - JUREAP

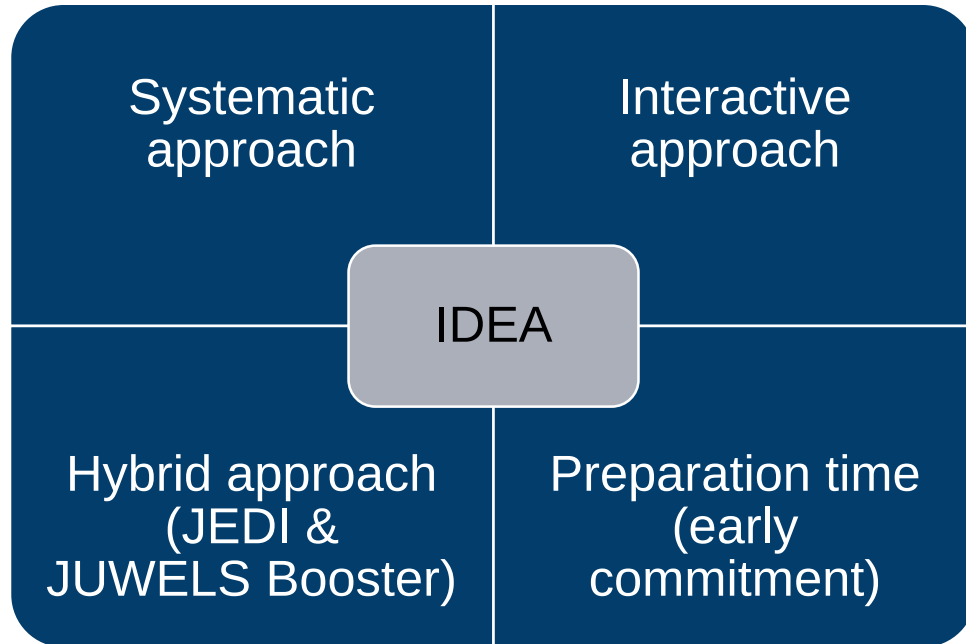


JUREAP

JUPITER Research and Early Access Program

Largest system, new hardware!

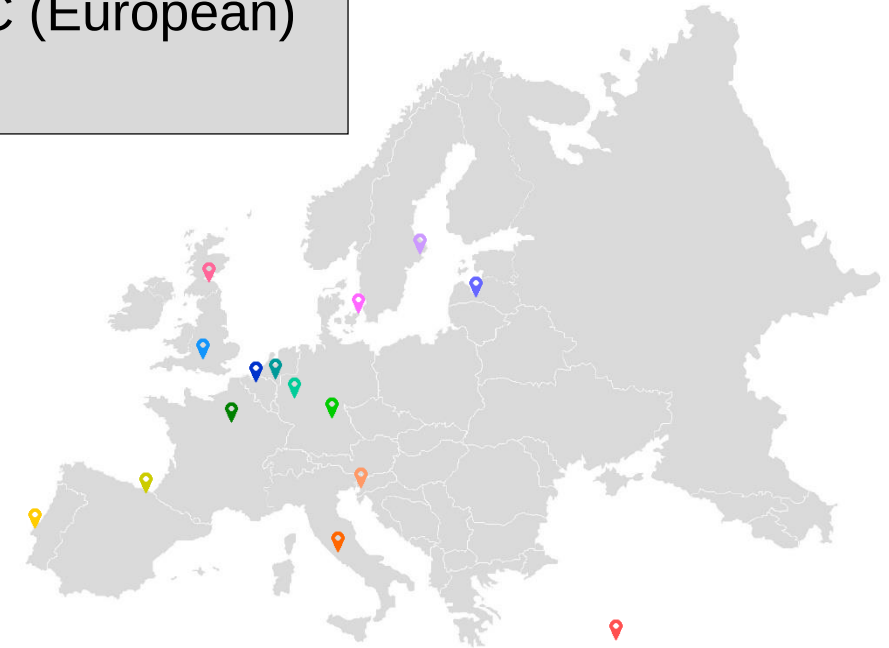
How to prepare? How to evaluate? How to prioritize?



>120 projects participated

Selected lighthouse projects:

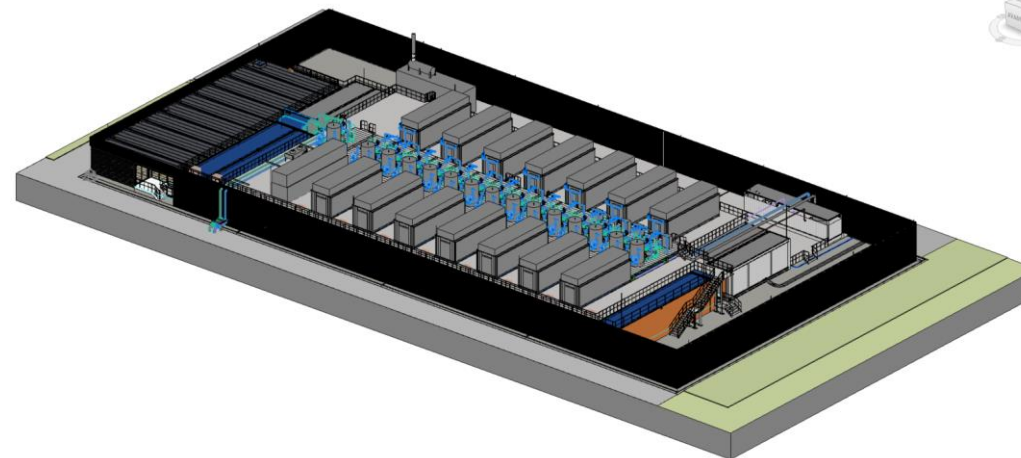
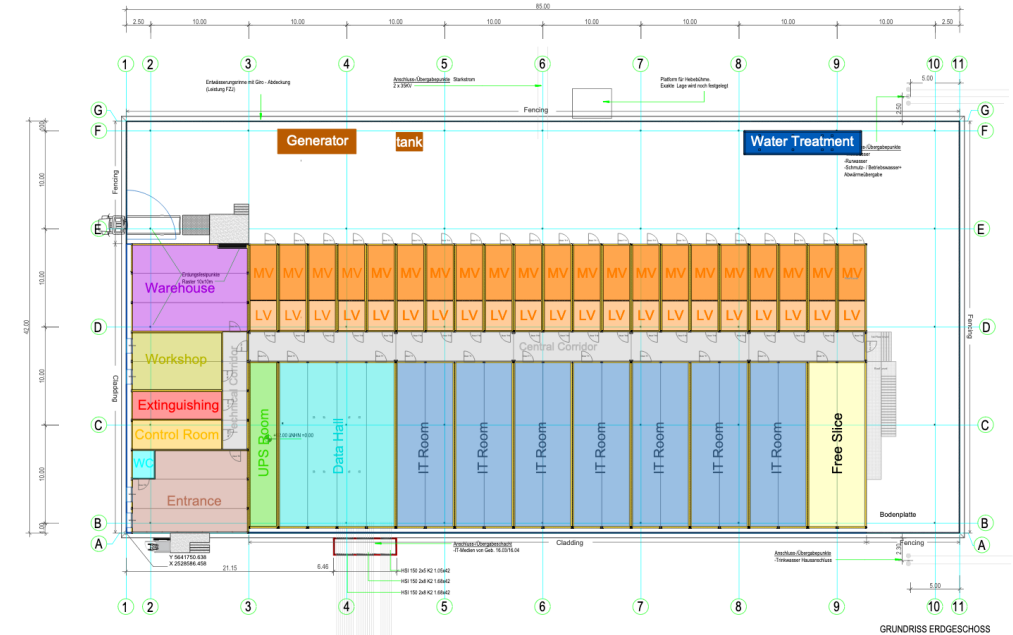
- 18 GCS (German)
- 15 EuroHPC (European)



MODULAR DATA CENTER FOR JUPITER

EVIDEN

- Vendor: Eviden
- Area: ~2300m²
- 1x Datahall (Storage, Management)
- 7x IT Modules (20 Racks per module)
- UPS, Generator
- Entrance area
- Workshop, Warehouse
- 15x 2,5 Megawatt Power Stations



CONCRETE FOUNDATION

Construction of concrete slab 85 m x 42 m x 0.5 m



12/2023



01/2024



08/2024

MODULAR DATA CENTER



09/2024



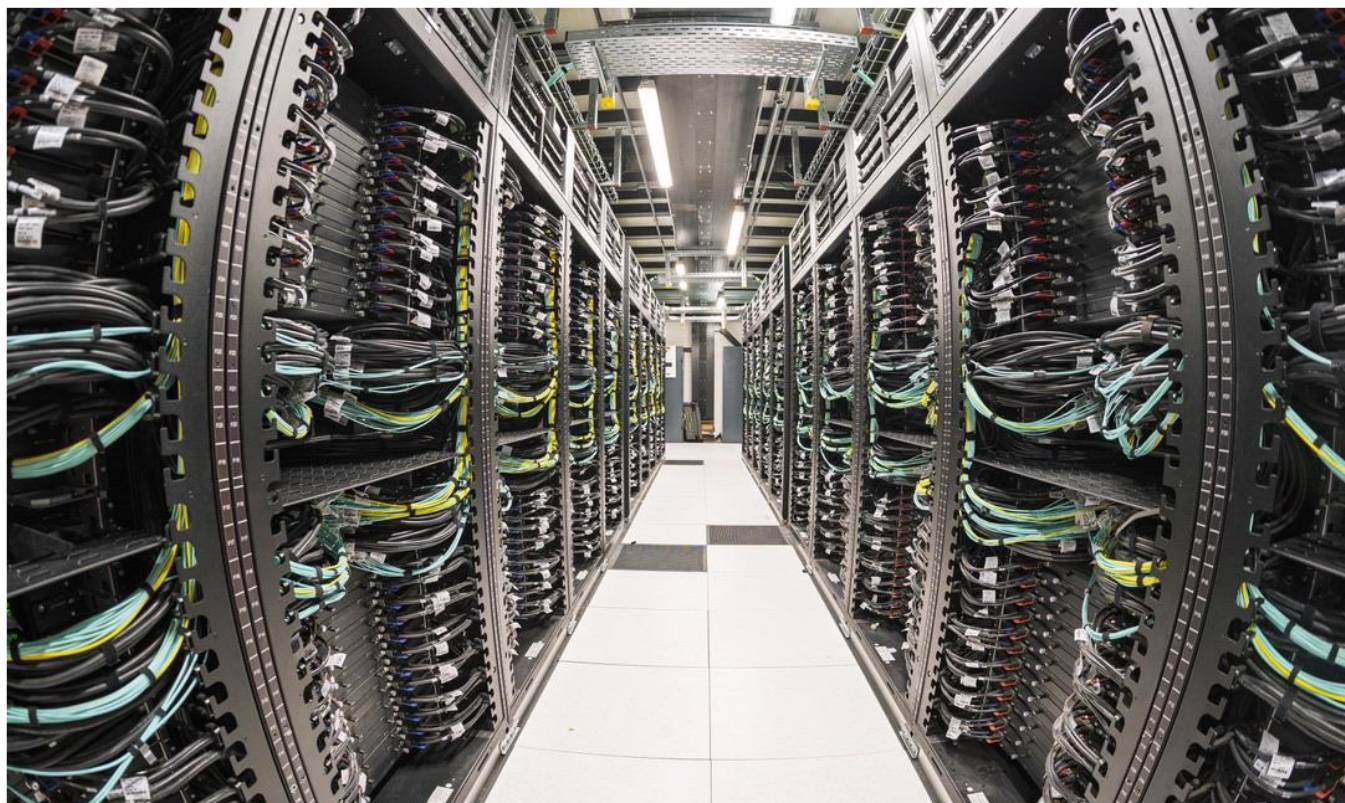
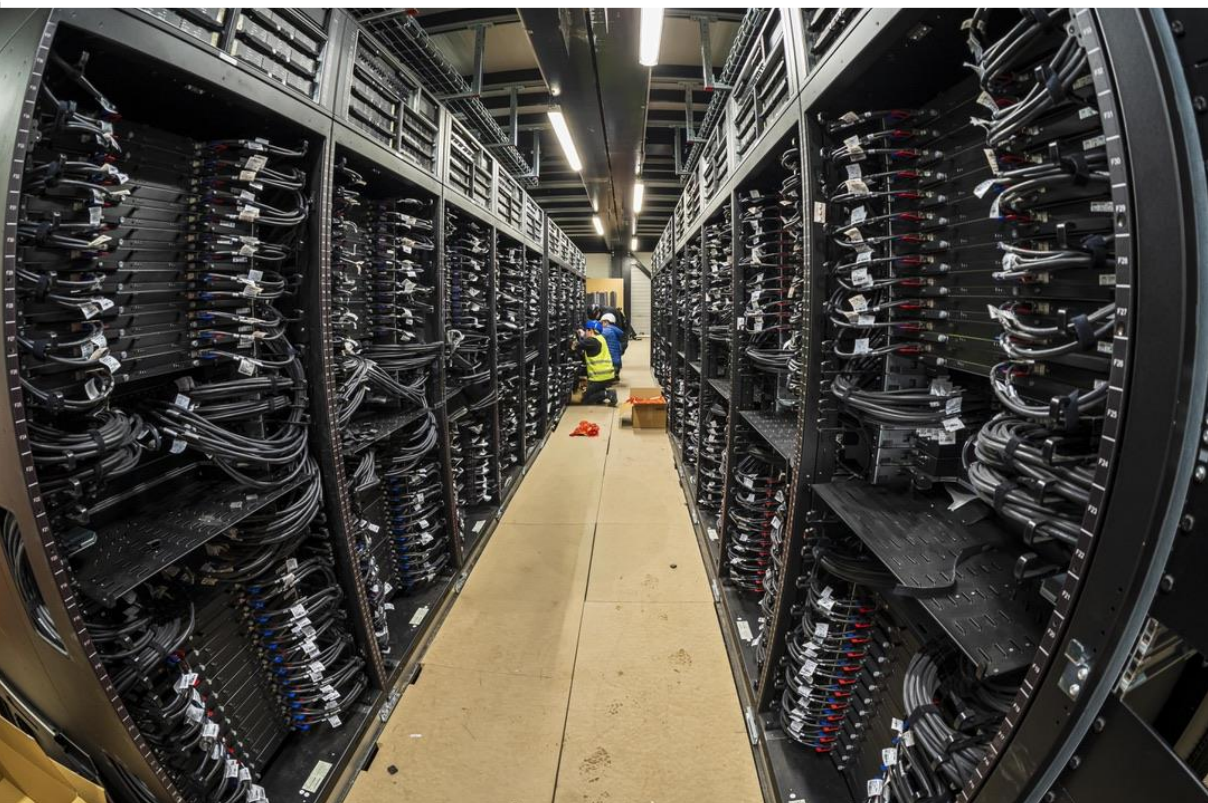
02/2025



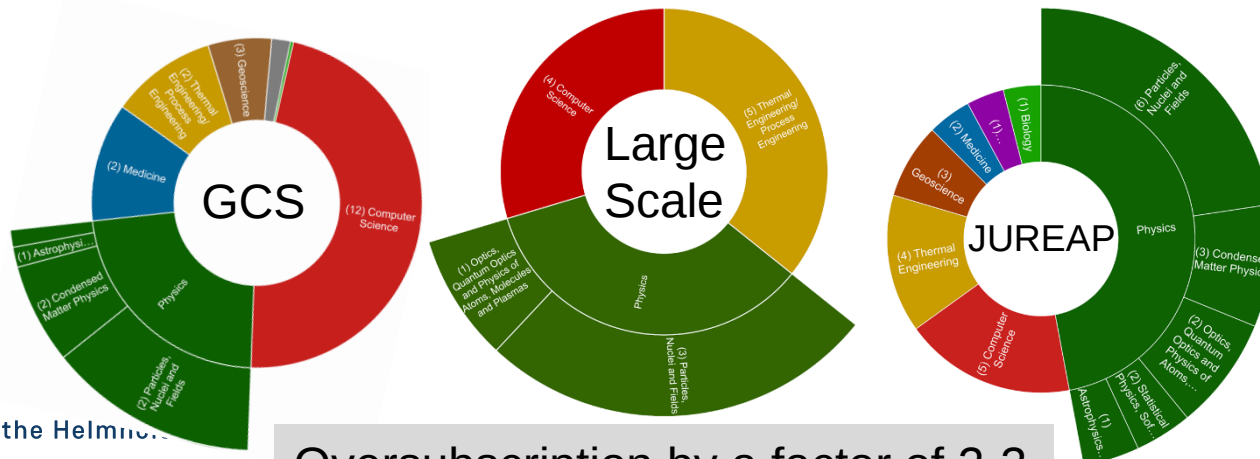
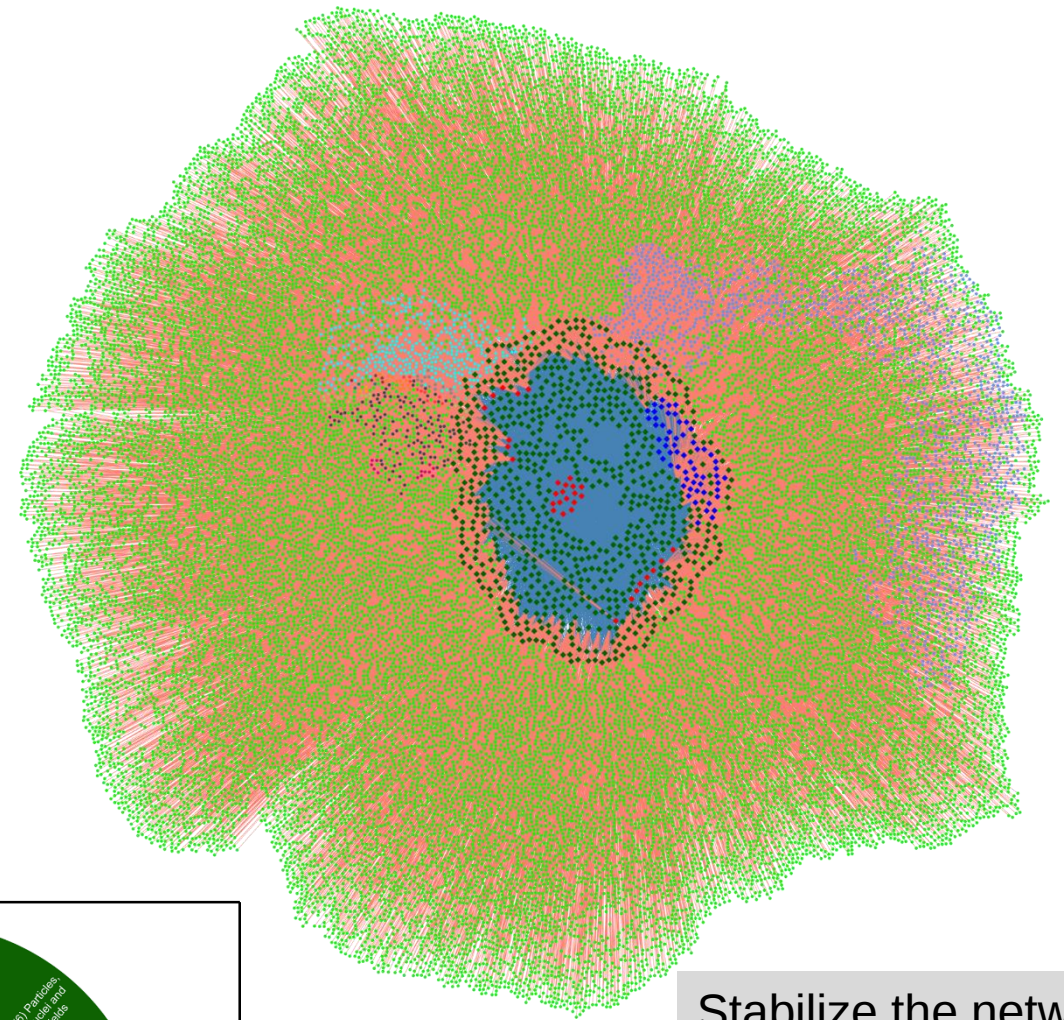
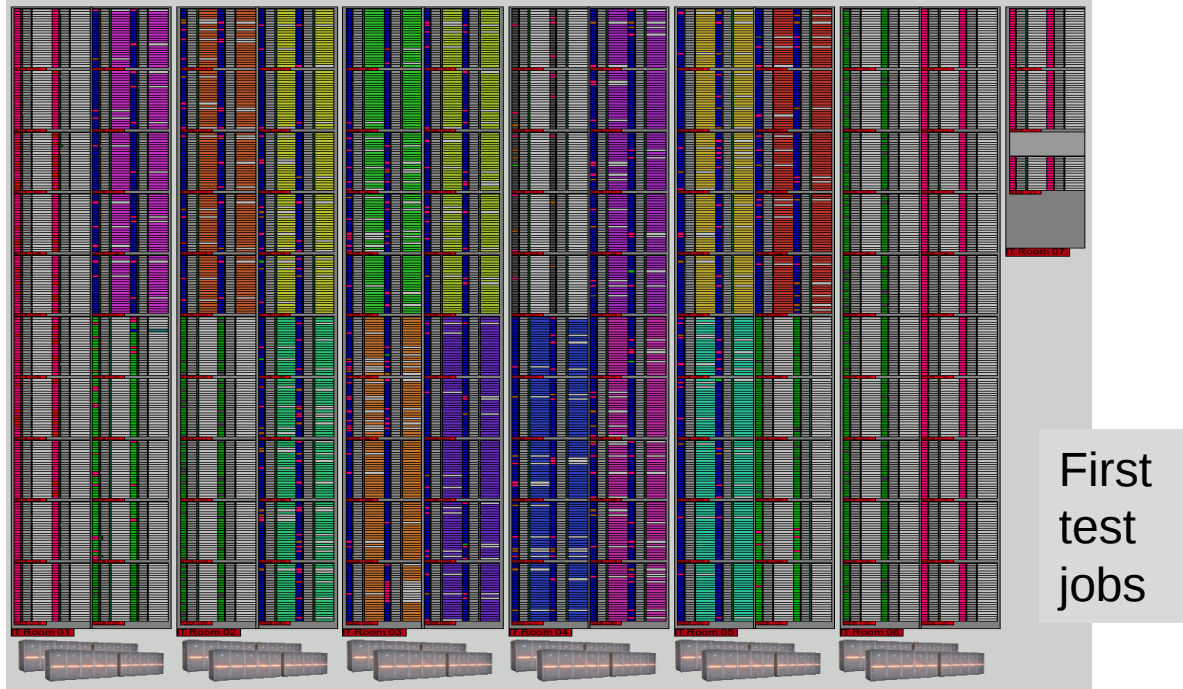
03/2025



05/2025



CURRENT STATE

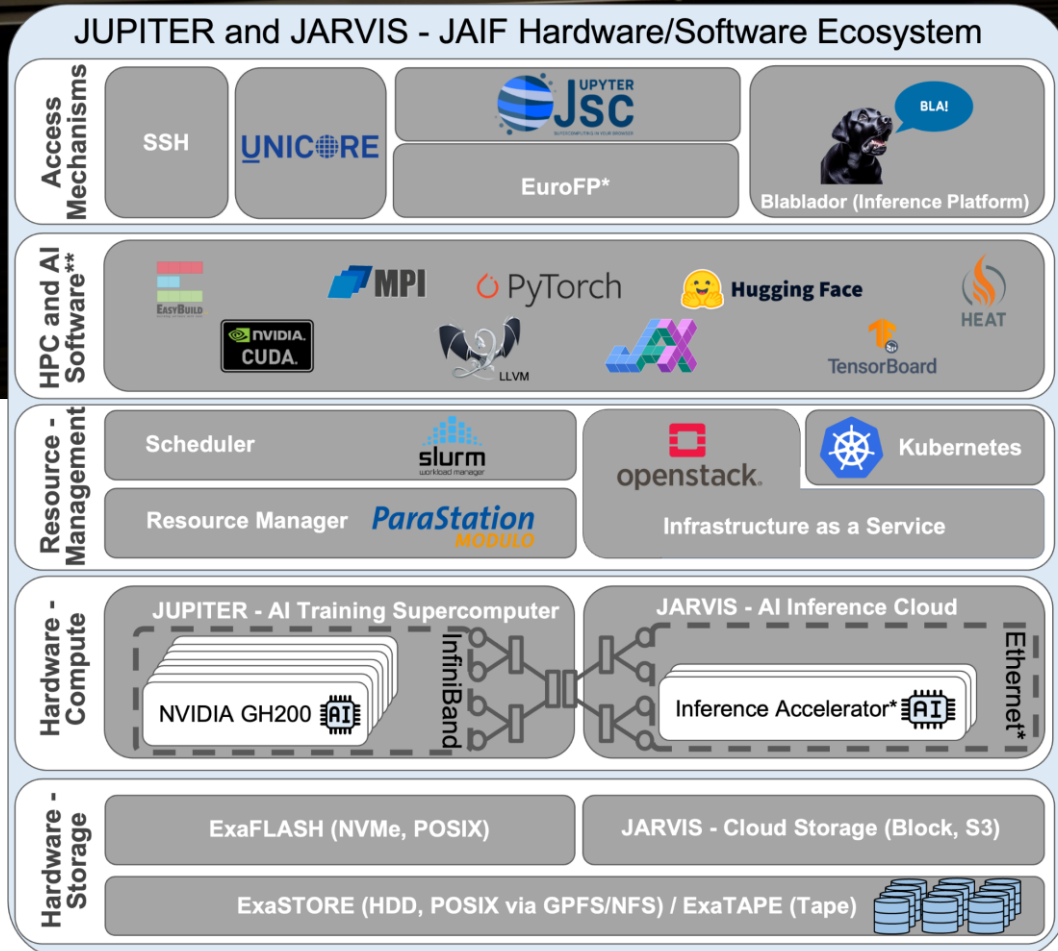


Stabilize the network:

- 51000 links
- 102000 logical ports
- 25400 endpoints
- **867 switches**

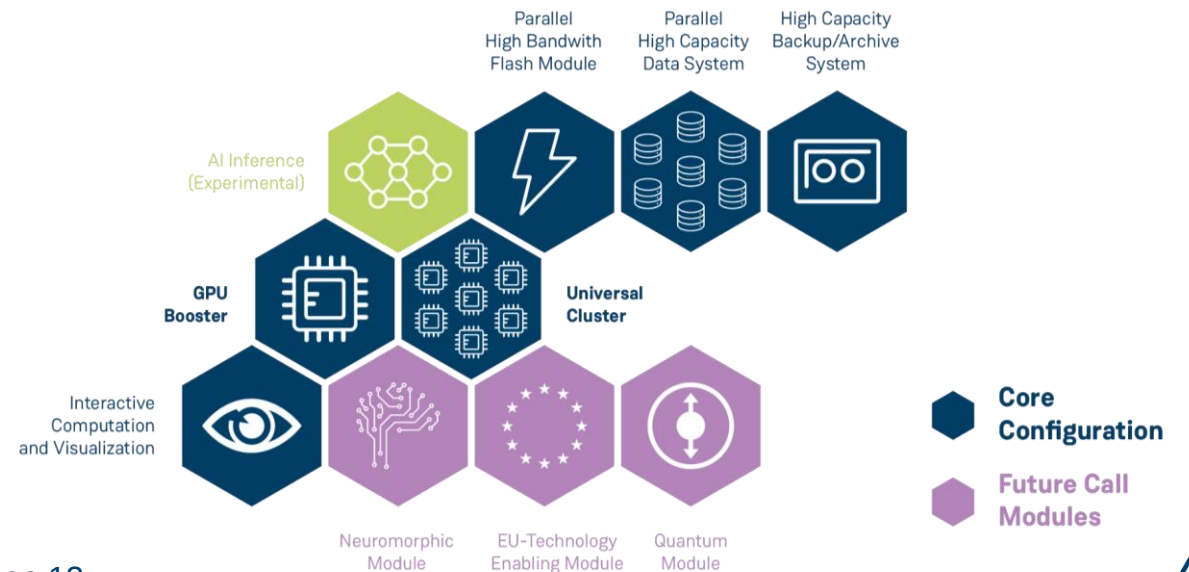
JAIF - JUPITER AI Factory

Modular JUPITER- Hybrid Training/Inference AI System

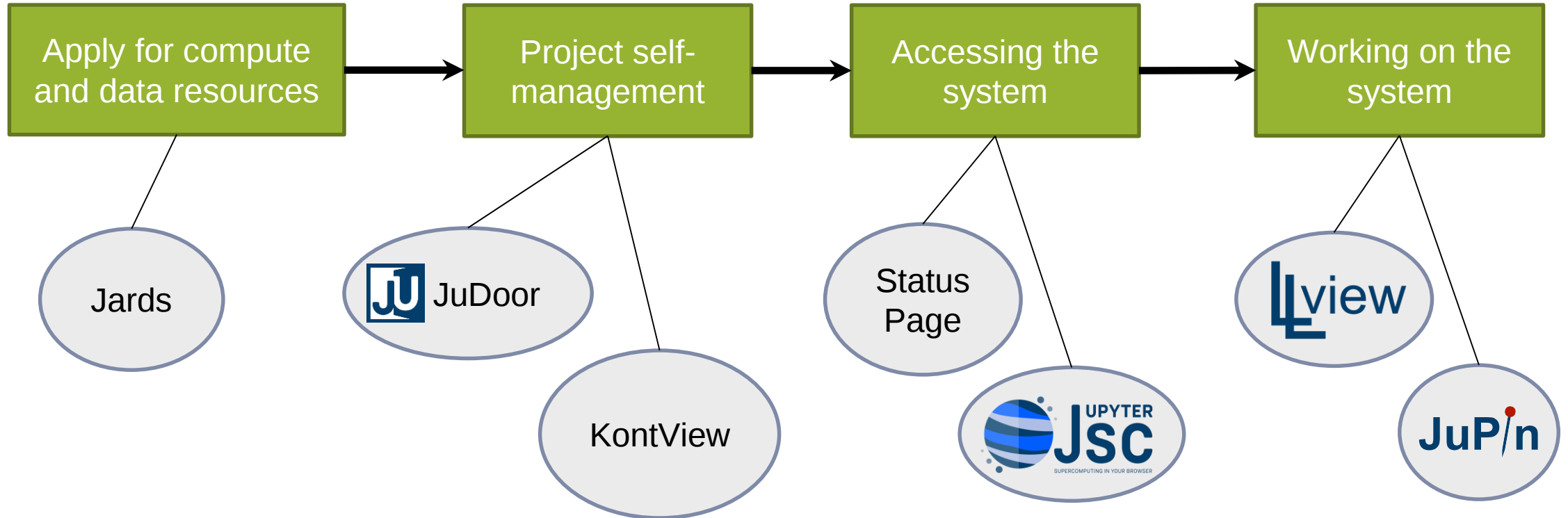


*Depending on procurements and available functionality

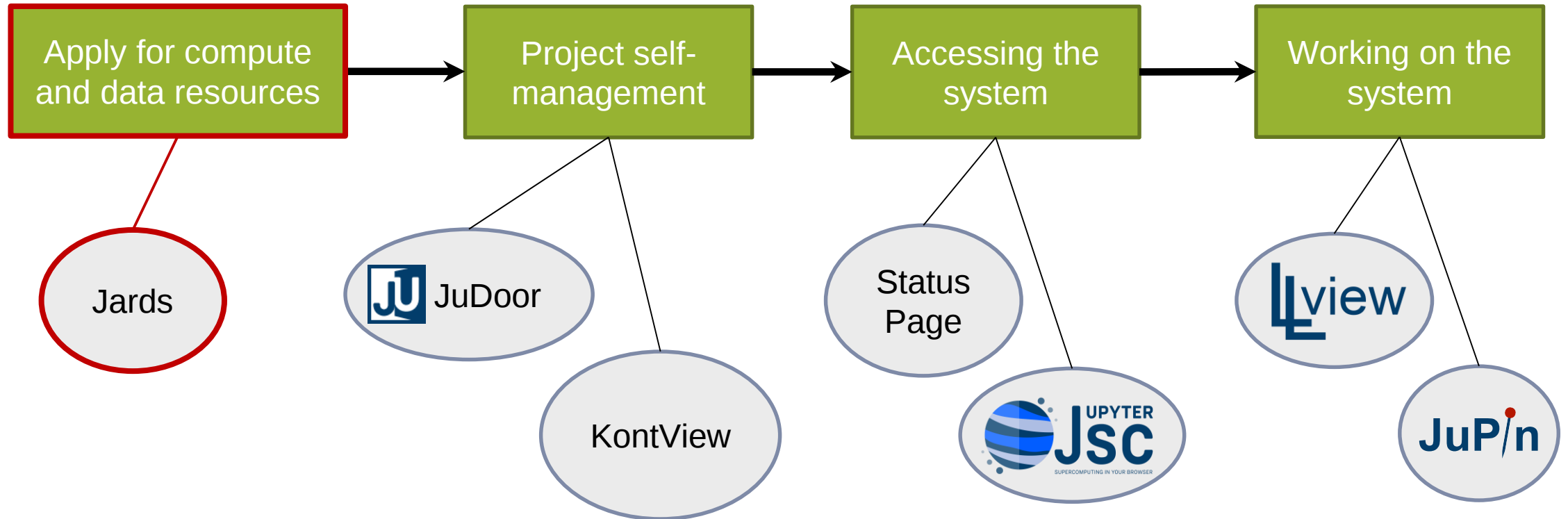
**This is a subset of the available software



Tools Overview



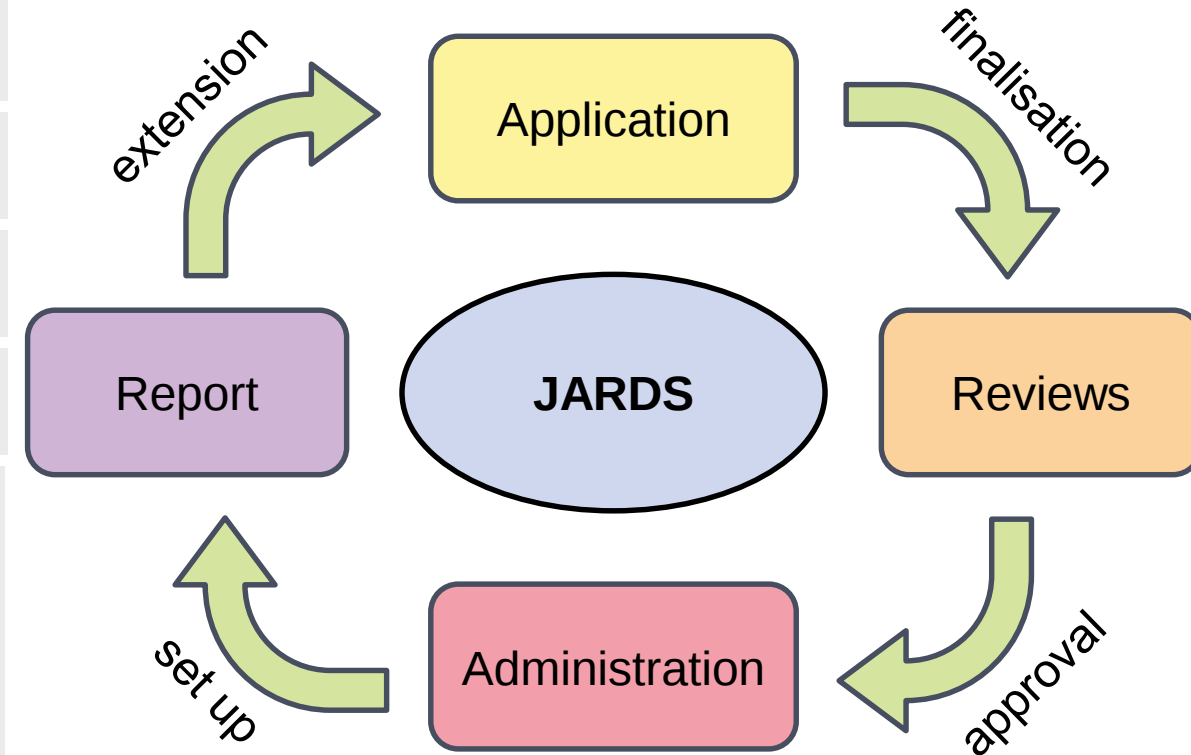
Tools Overview



JARDS – Apply for compute & data resources

Joint Application, Review, and Dispatch Service

- ▶ central tool for application, review and management of compute & data projects
- ▶ PHP/JavaScript-based web application, GPLv3
- ▶ Modular structure for different process phases
- ▶ Differentiated role model, different workflows
- ▼ Used Germany-wide
 - ▶ GCS
 - ▶ NHR (Nationales Hochleistungsrechnen)
 - ▶ Universities (Erlangen, Köln)
- ▶ Open Source



JARDS – Application Panel

JUWELS CPU res.

APPLICATIONS LOGOUT HELP SAVE EXIT RESET

ID #45924: Application list Choose PI and PC Applicant's data Project type Resources Scientific Objectives JUWELS CPU res. Data Mngmt. JSC Upload files

Finalize

Rolling Call for regular GCS projects on HAZELHEN and SUPERMUC-NG, Test projects on HAZELHEN, SUPERMUC-NG or JUWELS

Computing time - JUWELS CPU resources

JUWELS consists of about 2500 compute nodes. Each node contains a dual-socket Skylake Platinum 8168 (24 cores, 2.7 GHz) CPU with at least 96 GB of memory.

How much CPU compute time is required for your project in the upcoming application timeframe? *

⚠

in million core-h, floating point expected, range 0.0-0.01 for Testprojects, 4 decimal places

- This value is invalid.
- Must be a number without any commas. Decimal is optional.

Simulation Codes for CPU

Number of used simulations

1

Name of your application code *

Programming languages used for this code *

☐ Fortran77 ☐ Fortran90/95 ☐ Fortran2003 ☐ C ☐ C++ ☐ Java ☐ Python

☐ Other

Cool, it works so smooth to apply my project with JARDS



JARDS – Peer-Review Panel

2019 / Overview

Search

GCS
Gauss Center for Supercomputing

OVERVIEW CATEGORY VIEWS USERS ADMIN MAILS ACCOUNT ? HELP

Logout in 119 minutes

CONTENT

Select active call:

2019 select

Collection of your applications to review in call 2019

Show/hide/move columns (6) Export Config Search: test

Review	App ID	Principal investigator	Title of project	Topic	Pages	Akronym	Project ID	Merg docum
edit review	45754	Karbach Carsten	Rolling call test LRZ SUPERMUC		0	rollinglrz1	rollinglrz1	show
edit review	45690	Karbach Carsten	branchtest	Human Genetics	1	branchtest		show
edit review	45689	Karbach Carsten	mastertest	Chemical Solid State and Surface Research	1	mastertest		show

Showing 1 to 34 of 34 entries (filtered from 75 total entries)

Overview

Show/hide/move columns (2) Config Search: jrd

Category	Kind	Pool	Close at	Reviews	Description	Applications
JSC Prep access	Technical	JSC PrepAccess		6 3 1		55
JSC Test projects	Technical	JSC SC Support	30.11.2021	6 1		80
JSC Normal Commission 2019	Commission	JSC Technical				135
JSCReady	Commission	JSC Supporters				1
JSC SciJSC	Scientific	JSC Technical		2		3
JSC Topic3	Scientific	JSC Technical				0

JARDS – Peer-Review Panel

2019 / Overview

Search

OVERVIEW CATEGORY VIEWS USERS ADMIN MAILS ACCOUNT ? HELP

CONTENT

Select active call:

2019

select

Collection of your applications to review in call 2019

Show/hide/move columns (6)

Export

Config

Search: test

Review	App ID	Principal investigator	Title of project	Topic	Pages	Akronym	Project ID	Merg docum
	45754	Karbach Carsten	Rolling call test LRZ SUPERMUC		0	rollinglrz1	rollinglrz1	
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	45689	Karbach Carsten	mastertest	Chemical Solid State and Surface Research	1	mastertest		

Showing 1 to 34 of 34 entries (filtered from 75 total entries)

Overview

Show/hide/move columns (2)

Config

Search: jrd

Category	Kind	Pool	Close at	Reviews	Description	Applications
JSC Prep access	Technical	JSC PrepAccess		6  3  1 		55
JSC Test projects	Technical	JSC SC Support	30.11.2021	6  1 		80
JSC Normal Commission 2019	Commission	JSC Technical				135
JSCReady	Commission	JSC Supporters				1
JSC SciJSC	Scientific	JSC Technical		2 		3
JSC Topic3	Scientific	JSC Technical				0

2019 / JSC Prep access / 44672 / Add review

Search

OVERVIEW CATEGORY VIEWS USERS ADMIN MAILS ACCOUNT ? HELP

☒ yes ☐ no

Is JSC support requested by the applicant? *

☐ yes ☒ no

Code basis type *

☐ community code

☒ open source

☐ small in-house

☐ other

Is the code based on commercial software? *

☐ yes  ☐ no 

Required person weeks: * 1

Recommended K-core-h: * 

Only for JURECA/JUWELS: additional resources

Select unknown for other systems than JURECA/JUWELS

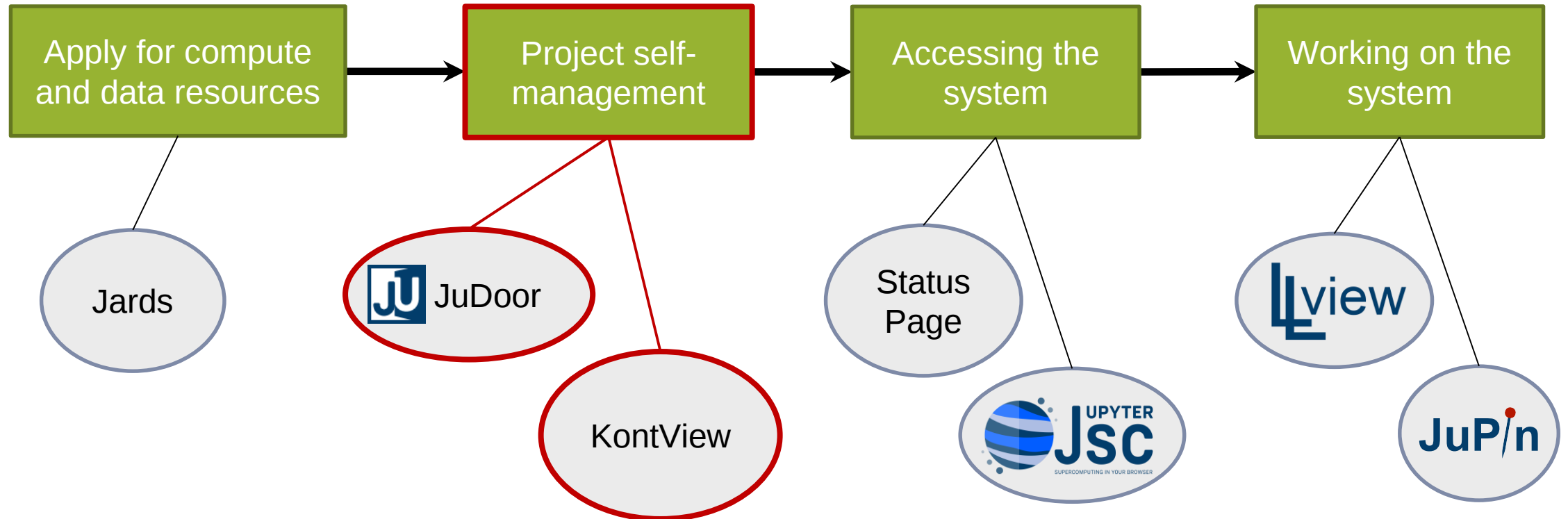
Grant access to GPU partition? * ☐ yes  ☐ no  ☐ unknown 

Total result

Result: *

☒ suitable

Tools Overview



JuDoor – User & project self-management portal

- PHP-based web application
- Management of accounts, projects, resources
- Role-based
 - User, PI/PA, Support, Administrator
- Paperless account creation
- Managing of ssh-keys
- View/Accept usage agreement
- Change contact data
- Get software access
- Get and access web services
- Full **overview** for users/PIs
 - Incl. budgets usage (overview/extended)
- MFA possible
- On avg. 150 single users per day

JuDoor Your account

mustermann1 Logout

Max Mustermann

JÜLICH
Forschungszentrum

Account

mustermann1

E-mail address

max.mustermann@example.com

Telephone

1234-5678

Fax

1234-5678

Address

Systems

judac

Manage SSH-keys

Usage agreement confirmed on 14.11.2018

CPROJ1 CPROJ2 DATAPROJ

jureca

Manage SSH-keys

Usage agreement confirmed on 14.11.2018

JURECA: CPROJ10 JURECA_GPUS: CPROJ10 JURECA_VIS: CPROJ10

juwels

You need to [sign the usage agreement](#) to access this system

JUWELS: CPROJ27 JUWELS_GPUS: CPROJ27

Projects

Compute project title one CPROJ1

Compute project title two CPROJ2

Dataproject title DATAPROJ

Join a project

Software Licenses

Request access to licensed software

Connected Services

jards liview trac

Make changes

JuDoor – User & project self-management portal

- PHP-based web application
- Management of accounts, projects, resources
- Role-based
 - User, PI/PA, Support, Administrator
- Paperless account creation
- Managing of ssh-keys
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- Get software access
- Get and access web services
- Full **overview** for users/PIs
 - Incl. budgets usage (overview/extended)
- MFA possible
- On avg. 150 unique users per day

The screenshot displays the JuDoor 'Your account' page for user 'mustermann1'. The page is divided into several sections: Account, Systems, Projects, Software Licenses, and Connected Services. Annotations highlight specific features: 1. 'Join a project' link in the Projects section. 2. 'Manage SSH-keys' link in the Systems section. 3. 'Detailed project information' link in the Projects section. A 'Click-able status page link' is also indicated in the Systems section.

JuDoor Your account mustermann1 Logout

Max Mustermann

Account mustermann1

E-mail address max.mustermann@example.com

Telephone 1234-5678

Fax 1234-5678

Address

Systems

judac [Manage SSH-keys](#)
Usage agreement confirmed on 14.11.2018
CPROJ1 CPROJ2 DATAPROJ

jureca [Manage SSH-keys](#)
Usage agreement confirmed on 14.11.2018
JURECA: CPROJ10 JURECA_GPUS: CPROJ20 JURECA_VIS: CPROJ10

juwels You need to [sign the usage agreement](#) to access this system
JUWELS: CPROJ22 JUWELS_GPUS: CPROJ22

Projects

[Join a project](#)

Software Licenses

[Request access to licensed software](#)

Connected Services

jards liview trac

[Make changes](#)

JuDoor – 1. Granting access to resources

JuDoor Your account

[← Back to CPROJ1](#)

Modify access for user in CPROJ1

Max Mustermann

Account mustermann1

E-mail address max.mustermann@example.com 

As [PI](#) or [PA](#) of the project you are obliged to follow data protection regulations, in particular to maintain confidentiality. That means not to communicate or make data accessible to other persons without authorization by the data provider (even after the end of the project).

Data access

☒ JUDAC

Contingent proj1 

☒ JUWELS 

☒ JUWELS_GPUS 

You can restrict the available resources for this user before adding the user to the project.

[Save](#) [Remove from project](#) [Promote user to PA](#) [Cancel](#)

[Legal Notice](#) [Privacy Policy](#) [Forschungszentrum Jülich, JSC](#) [Contact Dispatch](#)

Open project join requests:

Name	Account	E-mail address	Action
Max Mustermann	mustermann1	max@mustermann.de	Respond...

PI/PA

- receives notification
- manages project members
- grants access to specific resources
- manages data inheritance
- has access to all project information
- Bulk actions possible

JuDoor – 2. Manage SSH-keys

SSH keys on **jureca** HPC system

Here you can upload an SSH public key to the system. Information on how to create an SSH public key can be found [here](#). Link to documentation for further details

It might take up to 15 minutes until the newly added SSH key is activated.

Upload SSH public keys

To use our systems your public key options have to include a **from=**-clause to restrict the usage of the key to your personal IP address range. Your current IP address is **134.94.52.69**. Your current public IP see **the documentation** for more information.

☐ Remove all other existing public keys.

Your public key and options string

from="134.94.52.69" ssh-ed25519 AAAAC3N...

Paste the content of your **.pub**-file here or upload a file below.

Your public key file

Additional public key options Can be a list of static IP, a static network range, a static hostname or a hostname suffix using * as a wildcard symbol

e.g. from="134.94.52.69", ...

You can specify your **from=** clause and other public key options here

WELL, GOOD THING
IT'S SO EASY NOW TO JOIN
THE PROJECT,
THANKS TO JUDoor



JuDoor – 3. Project: compute & data quota

Active Budgets

Budget **cstao** ?

Budget name to submit a job

Used

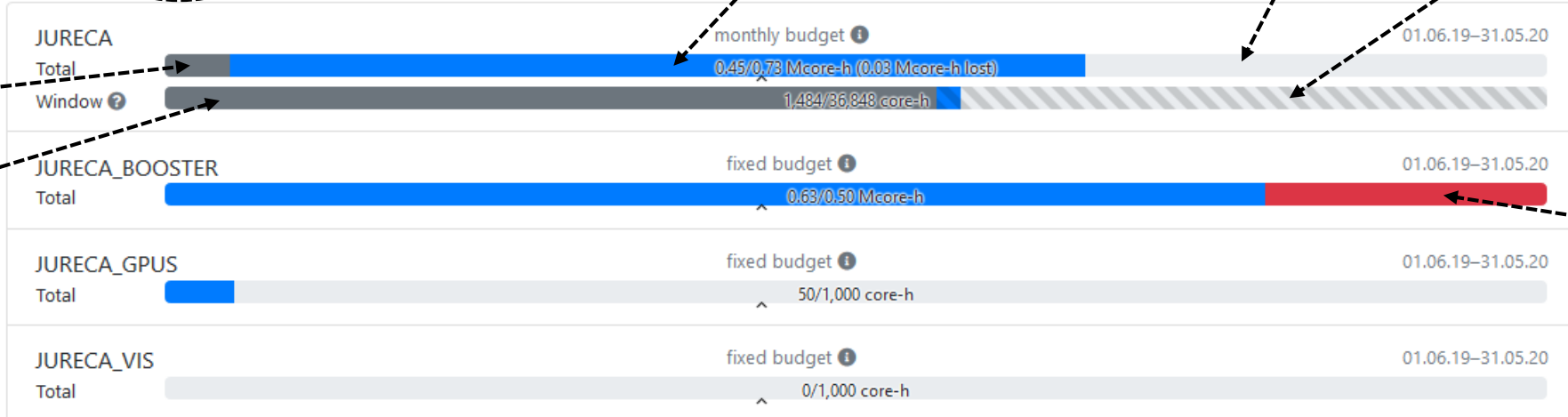
Available

Consumable budget of next month

Lost

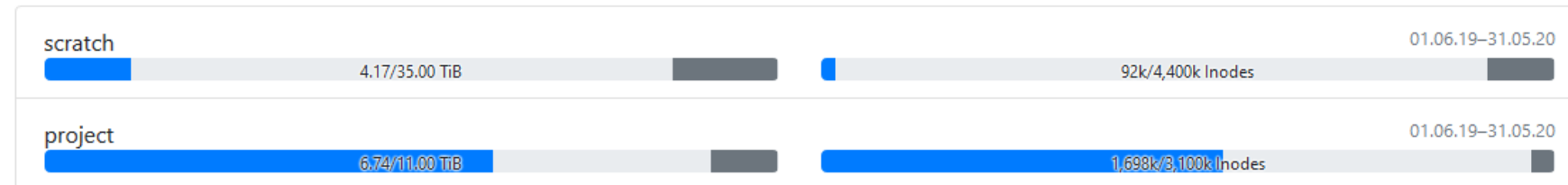
Consumed before this month

Over Budget



Storage Quota

Storage on just



Link to Kontview

Show extended statistics

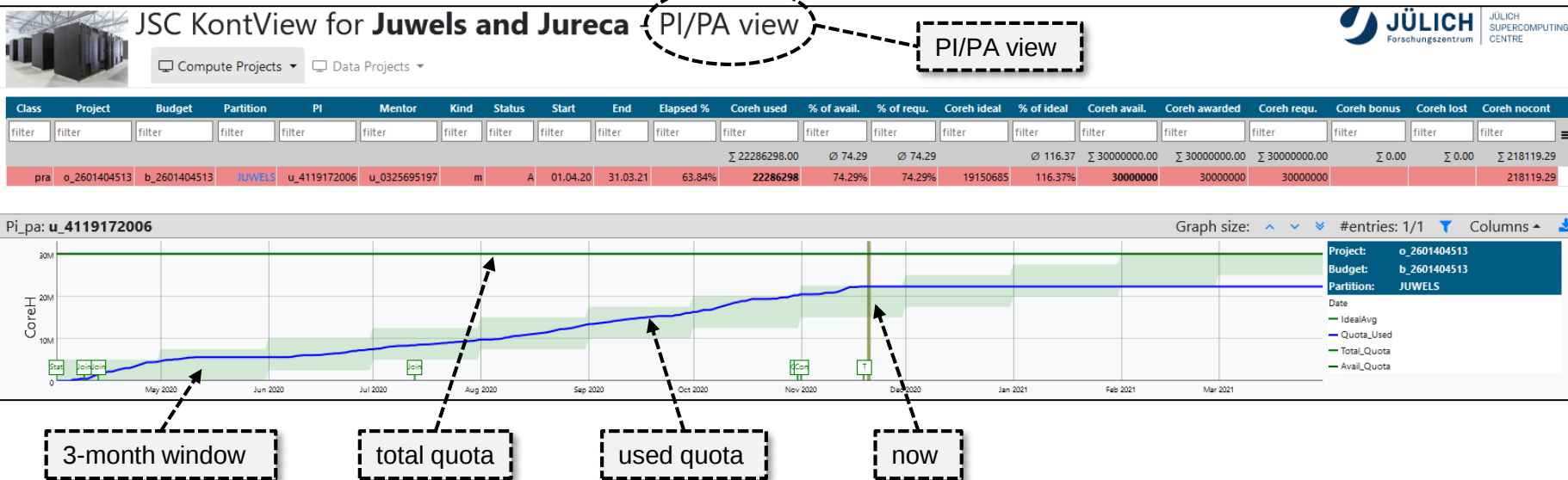
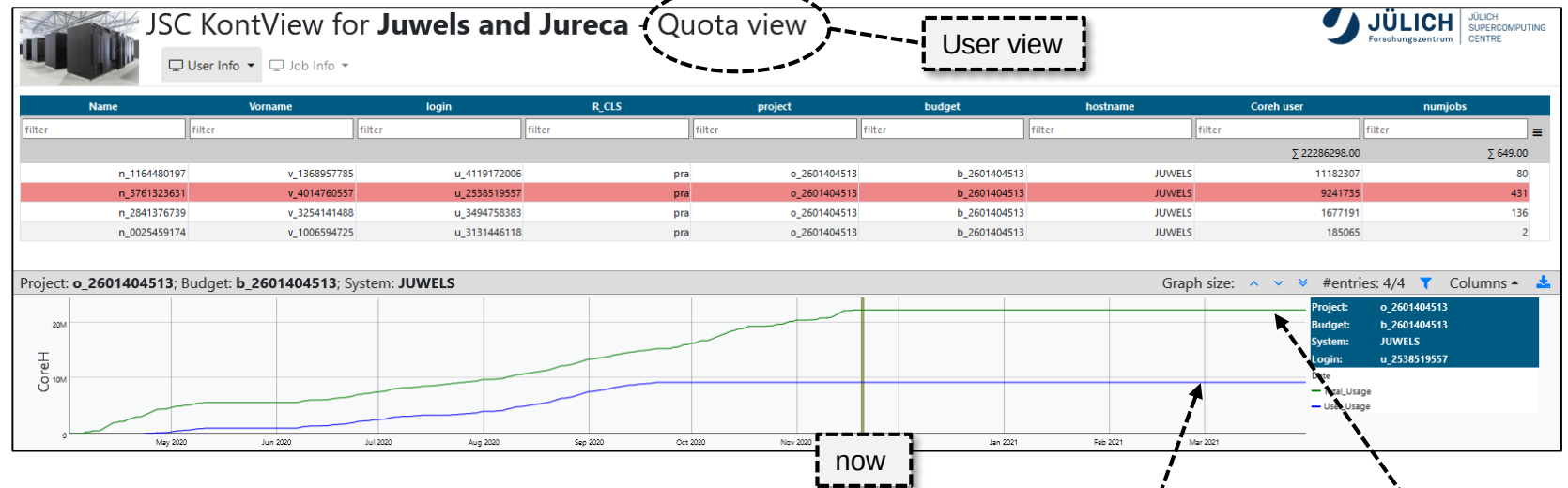
KontView – detailed **compute** quota

- Accessible from JuDoor:

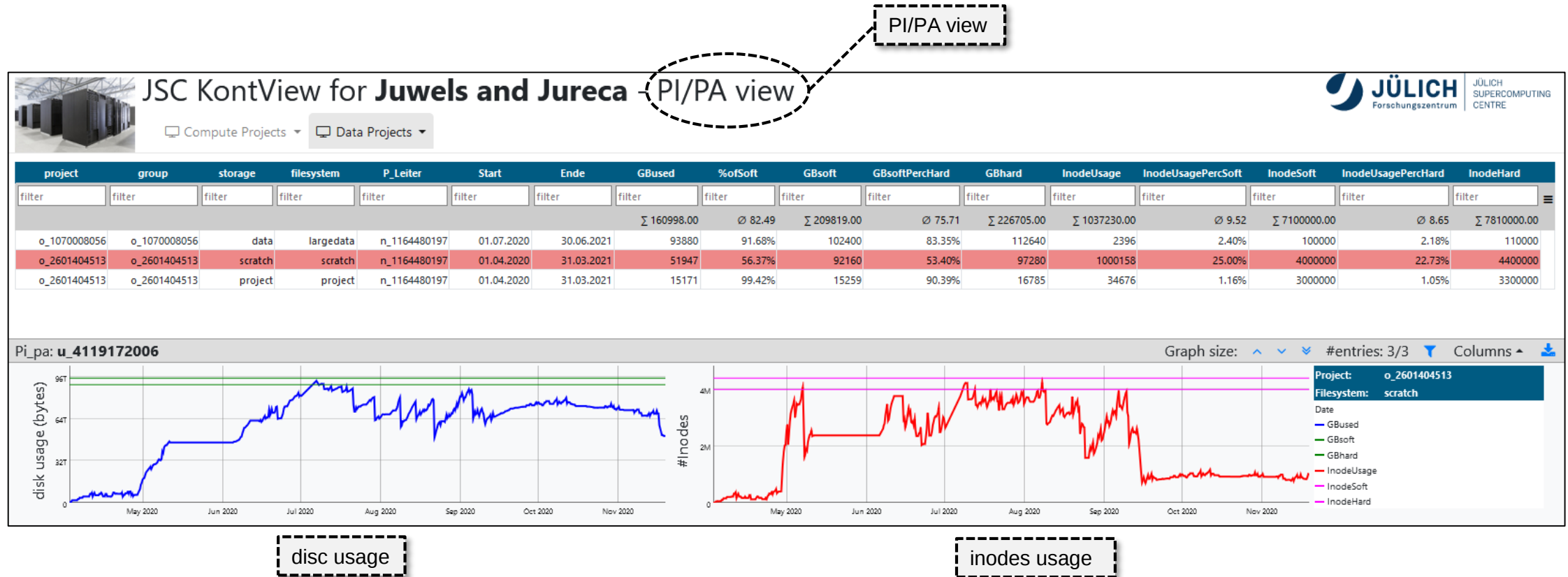
Show extended statistics

Further views:

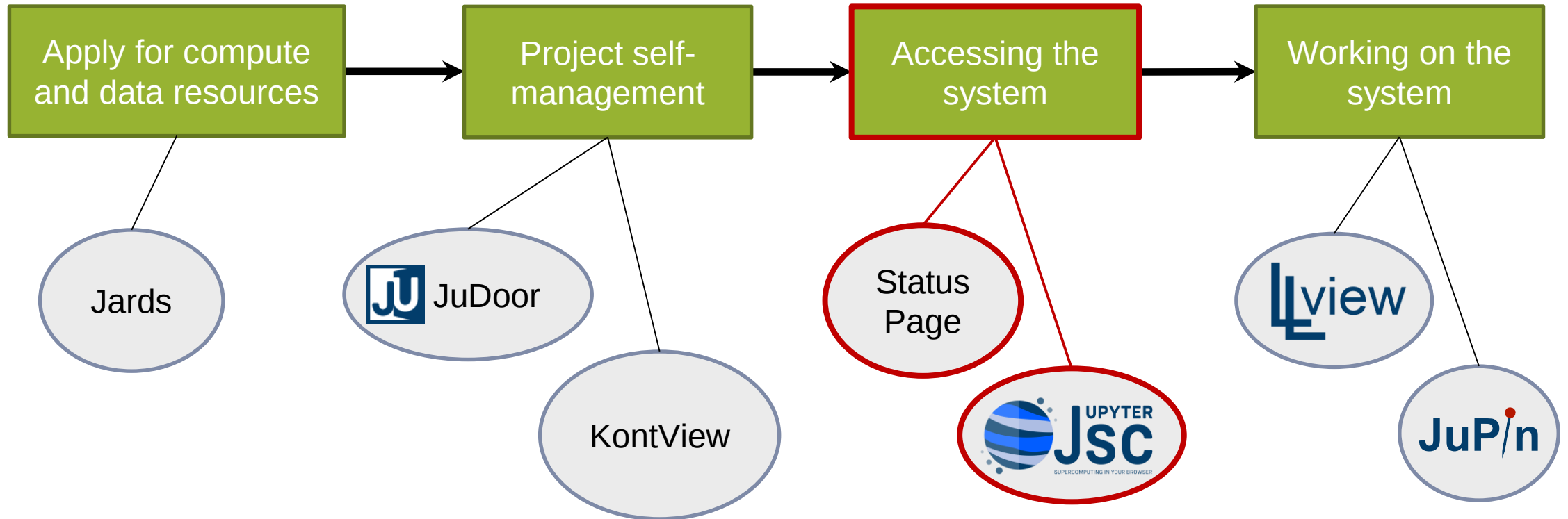
- List of jobs per user
- Resource usage per user



KontView – detailed data quota



Tools Overview



JSC Status Page

- Cluster Systems

 JUWELS Cluster	Next Maintenance at 24. Juni 2025, 09:00	 JUWELS Booster	Next Maintenance at 24. Juni 2025, 09:00
 JURECA DC	Next Maintenance at 17. Juni 2025, 09:00	 JURECA HWAI	Next Maintenance at 17. Juni 2025, 09:00
 JUSUF HPC	Next Maintenance at 3. Juni 2025, 09:00	 JEDI	
 JUDAC		 QLM	
 JUZEA1	Next Maintenance at 12. Juni 2025, 08:00	 DEEP	

- File Systems

 \$HOME	 \$PROJECT
 \$SCRATCH	 \$ARCHIVE
 \$DATA	

- Services

 JuDoor	 Jupyter-JSC
 JSC Cloud	 Backup
 Job reporting	 UNICORE
 Cloud Object Storage	 JUSTCOM

- Support

 SC Support
--

JSC Status Page

- Cluster Systems

 JUWELS Cluster	Next Maintenance at 24. Juni 2025, 09:00	 JUWELS Booster	Next Maintenance at 24. Juni 2025, 09:00
 JURECA DC	Next Maintenance at 17. Juni 2025, 09:00	 JURECA HWAI	Next Maintenance at 17. Juni 2025, 09:00
 JUSUF HPC	Next Maintenance at 3. Juni 2025, 09:00	 JEDI	
 JUDAC		 QLM	
 JUZE A1	Next Maintenance at 19. Juni 2025, 09:00	 DEEP	



JEDI is currently unavailable

Current state

JEDI decommissioning

11. Mai 2025, 14:00 - 30. Mai 2025, 14:00 (due for 1 day)

With the progressing JUPITER installation, JEDI will be in its current form decommissioned. The nodes and rack of JEDI will be integrated into JUPITER. They'll be kept into operation for as long as possible, but their decommissioning is imminent and will happen on short notice at any point during the next 2 weeks. Once that takes place, access to the JEDI login nodes will still be possible, but no compute nodes will be available again on this platform.

We are aiming to allow access to JUPITER for JUREAP users in waves as soon as possible, as the system is stabilized and it approaches a state suitable for a first set of experiments for early users. This will be communicated via email once this is possible.

History

 Login update

JUPYTER-JSC

Supercomputing in a browser

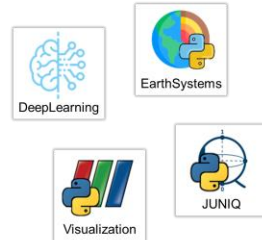
Multi-purpose working environment

- **Easy access** to HPC
- **Execution** on login or compute node
- Language **agnostic**: Python, R, Julia, C++, ...
- **Extensible** design: in-browser-terminal, file-browsing, ...
- **Combines** code execution, rich text, math, plots and rich media
- 551 unique users in May/2025

WebUIs

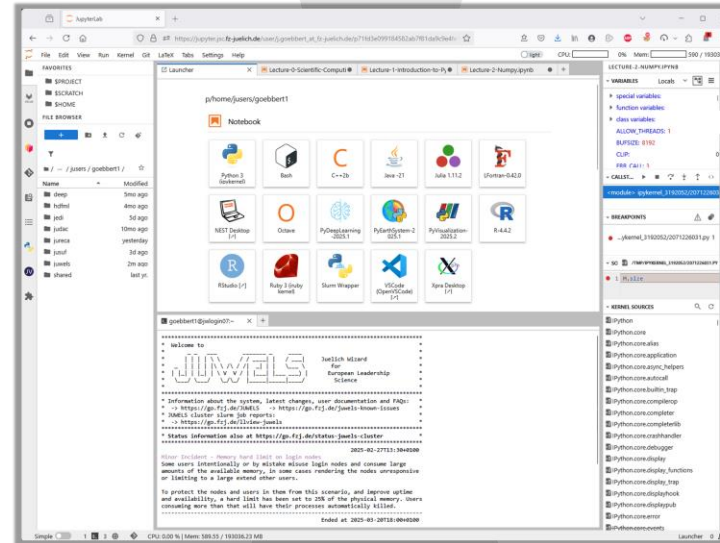
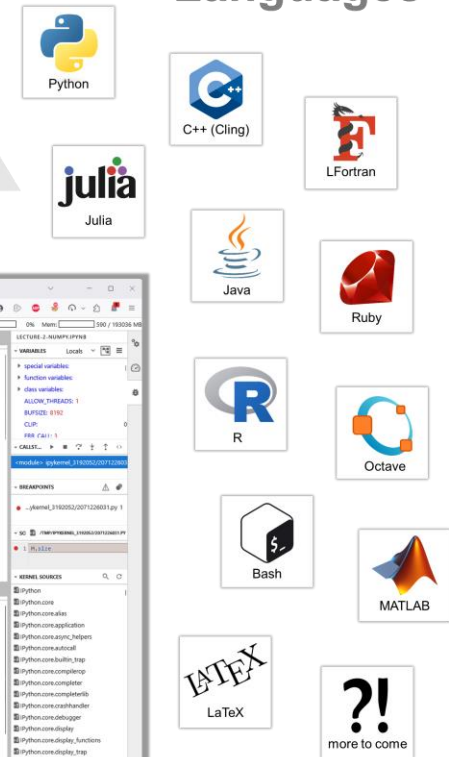


Topics-specific



Increase Productivity

Languages



Member of the Helmholtz Association

JUNIQ

Quantum Computing Platform
JUQCS, Qaptiva 800
D-Wave, PASCAL, QSolid,
OpenSuperQplus

JSC Cloud

12,384 vCPUs
NVIDIA 16x V100, 3x A100
14 TiB memory, 1 TiB NVMe
OpenStack Cluster

JUST Storage

14750 HDD + 48 NVMe
= **211 PByte**
+
43.000 Tapes
= **478 PByte**

JUWELS Cluster

122,768 cores Intel Skylake
224 NVIDIA V100 GPUs
275 TByte memory
12.27 PFlops

JUWELS Booster

44,928 cores AMD EPYC Rome
3,744 NVIDIA A100 GPUs
629 TByte memory
73.02 PFlops

JURECA-DC

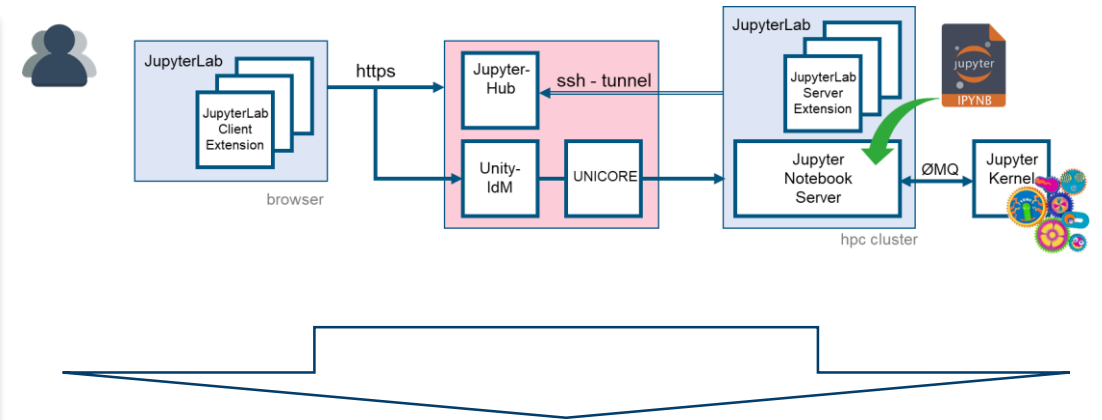
98,304 cores AMD EPYC Rome
768 NVIDIA A100 GPUs
443 TByte memory
18.51 PFlops

JUPITER

**1st European Exascale
Supercomputer**
> 1 EFlops

JUPYTER-JSC WEBSERVICE

The image shows two screenshots of the Jupyter-JSC web service. The top screenshot is the 'Your server is starting up...' page, which includes a progress bar and logs showing the server's status. The bottom screenshot is the main JupyterLab interface, displaying a table of available JupyterLab instances with columns for Name, Configuration, Status, and Actions. Below the table, there is a section titled 'Supercomputing in Your Browser' with a description of the service and a 'Login' button.



The image shows a screenshot of the JupyterLab interface. On the left, there is a GPU dashboard with various metrics like GPU Utilization, GPU Memory, GPU Resources, PCIe Throughput, and Network Throughput. On the right, there is a code editor showing a Python script. The script is a simple addition function that takes two numbers as input and returns their sum. The code is as follows:

```

[1]: 1 import math
2 import numpy as np
3 from numba import cuda
4 import matplotlib.pyplot as plt
5 import time

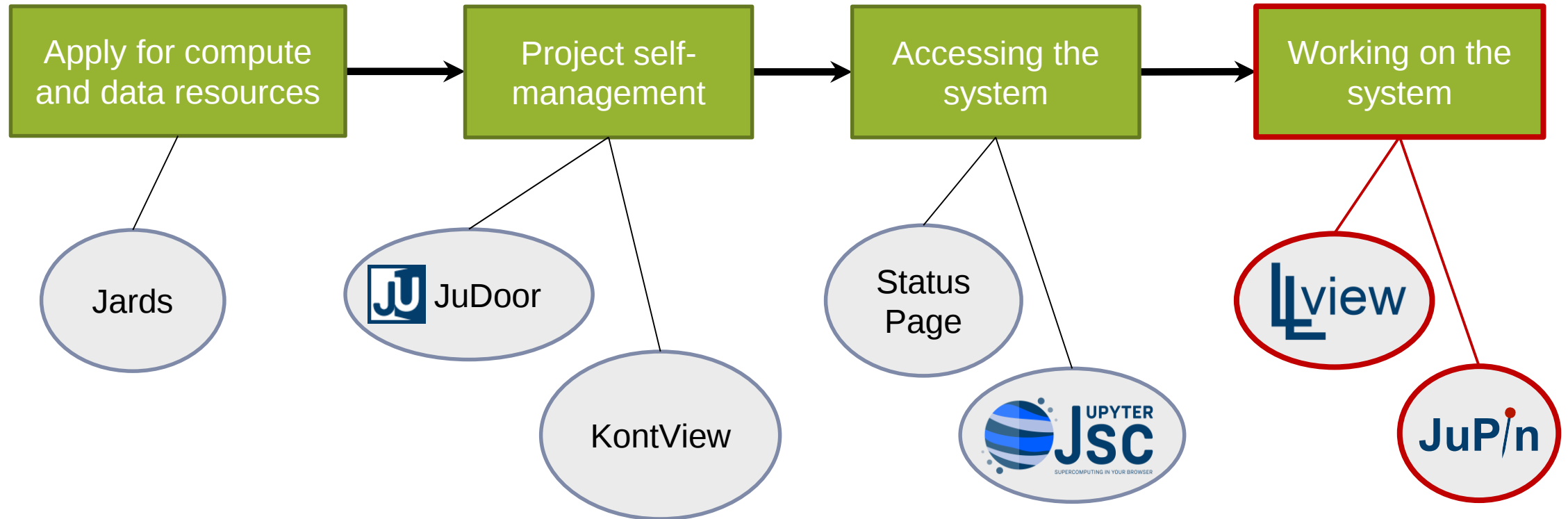
[2]: 1 len(cuda.gpus)

[3]: 1 cuda.gpus[0].name

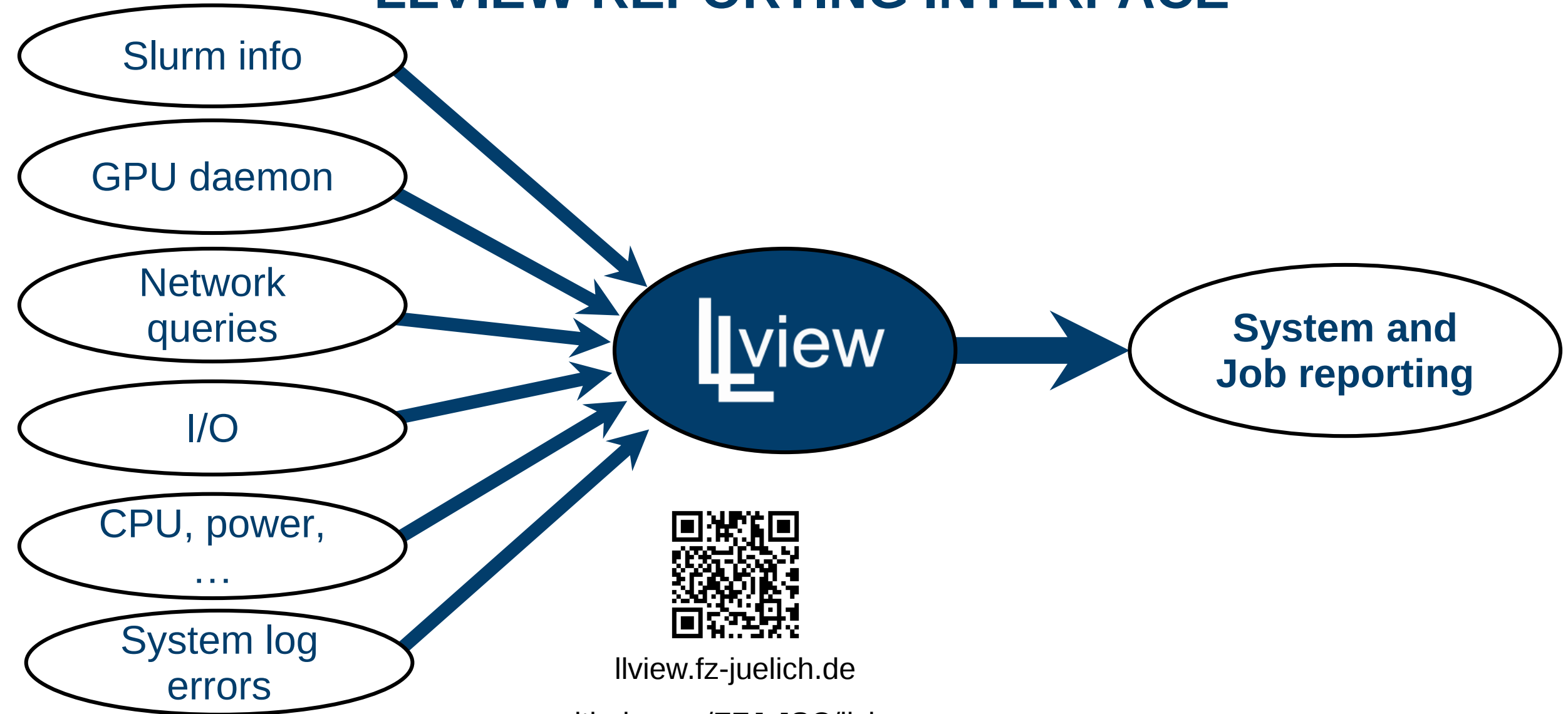
[4]: 1 @jit
2 def mandelbrot_points(n, iterations):
3     # Create a grid of points
4     x, y = cuda.grid(2)
5     size = n.shape[0]
6     # Skip points outside the matrix.
7     if x > size or y > size:
8         return
9     # Run the simulation.
10    a = 1.2 + 0.5j * size * 1j
11    z = 0
12    for i in range(iterations):
13        z = z**2 + a
14        if abs(z) >= 100:
15            break

```

Tools Overview



LLVIEW REPORTING INTERFACE



llview.fz-juelich.de

github.com/FZJ-JSC/llview

LLVIEW REPORTING INTERFACE

Slurm info

GPU daemon

Network queries

I/O

CPU, power, ...

System log errors

llview



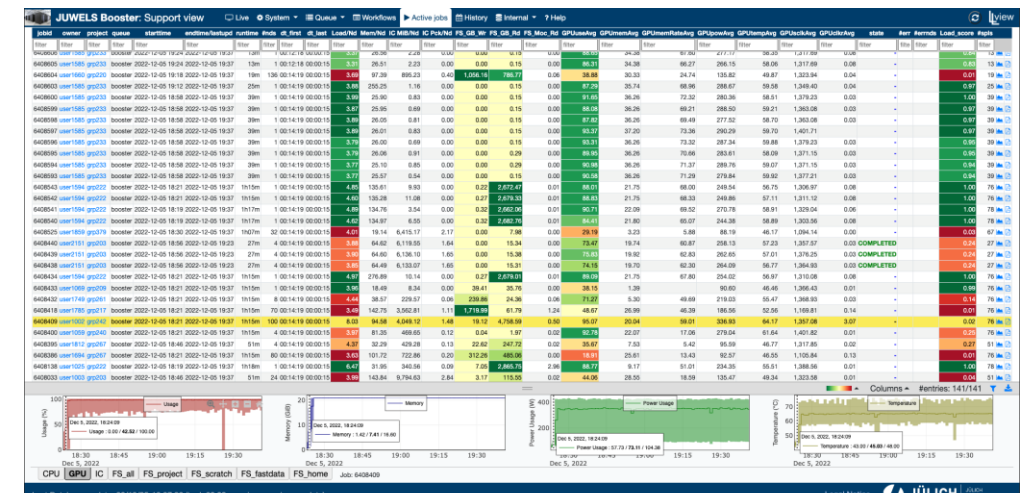
llview.fz-juelich.de

github.com/FZJ-JSC/llview

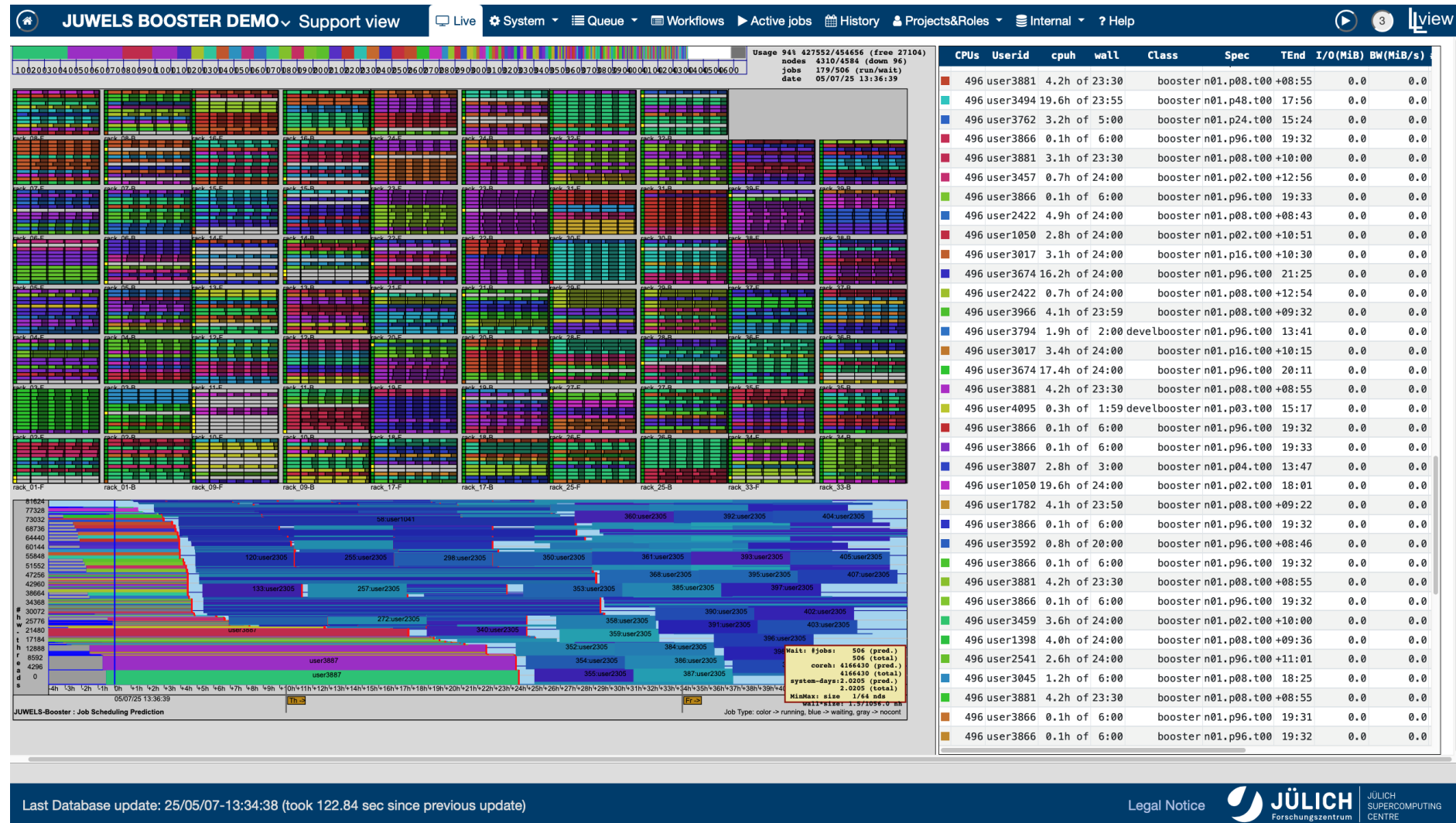
Updates every ~1min
using existing sources

➔ Negligible overhead!
➔ Scalable!

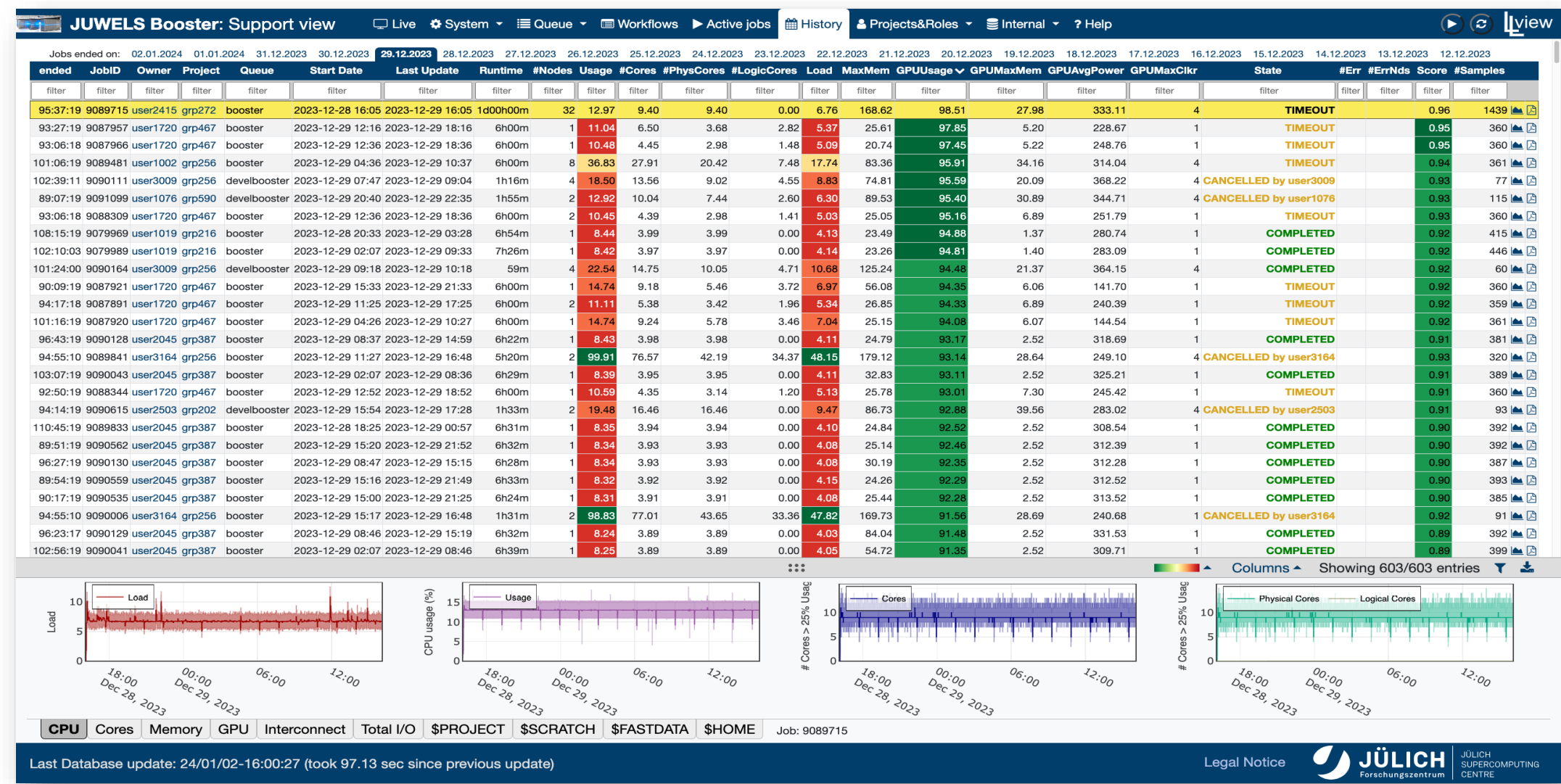
System and
Job reporting



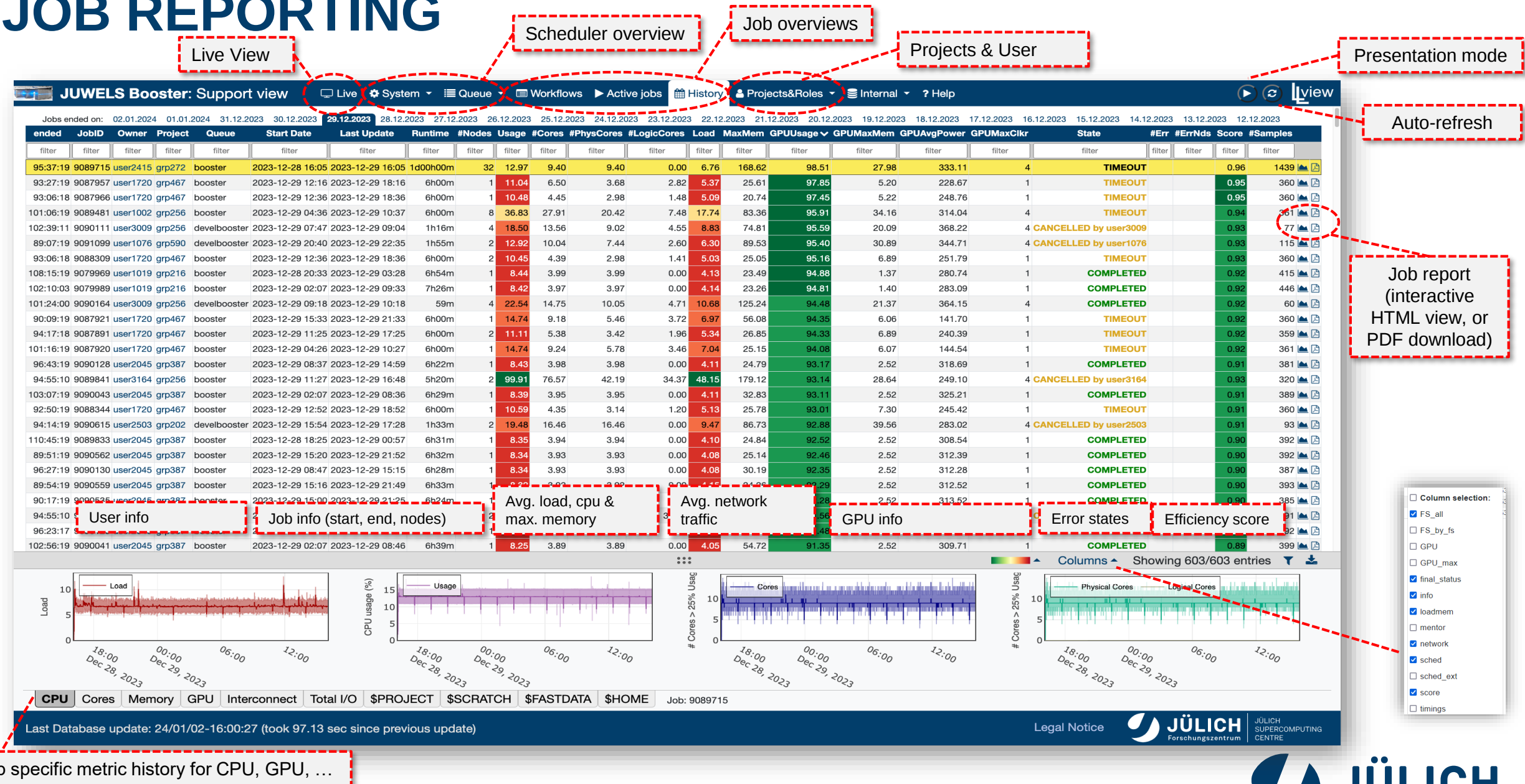
LIVE VIEW OF THE SYSTEM



JOB REPORTING



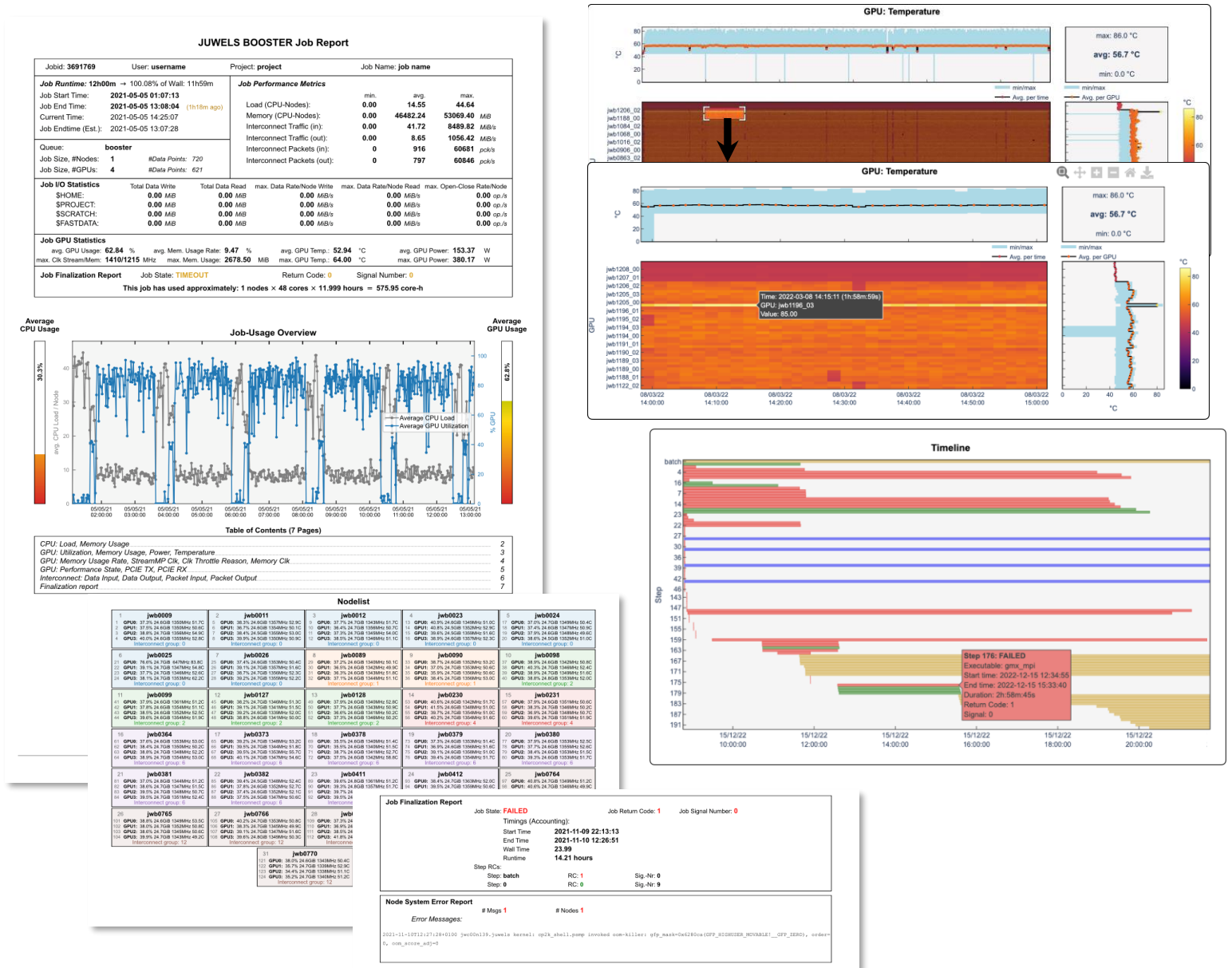
JOB REPORTING



JOB REPORTS

PDF and interactive HTMLs

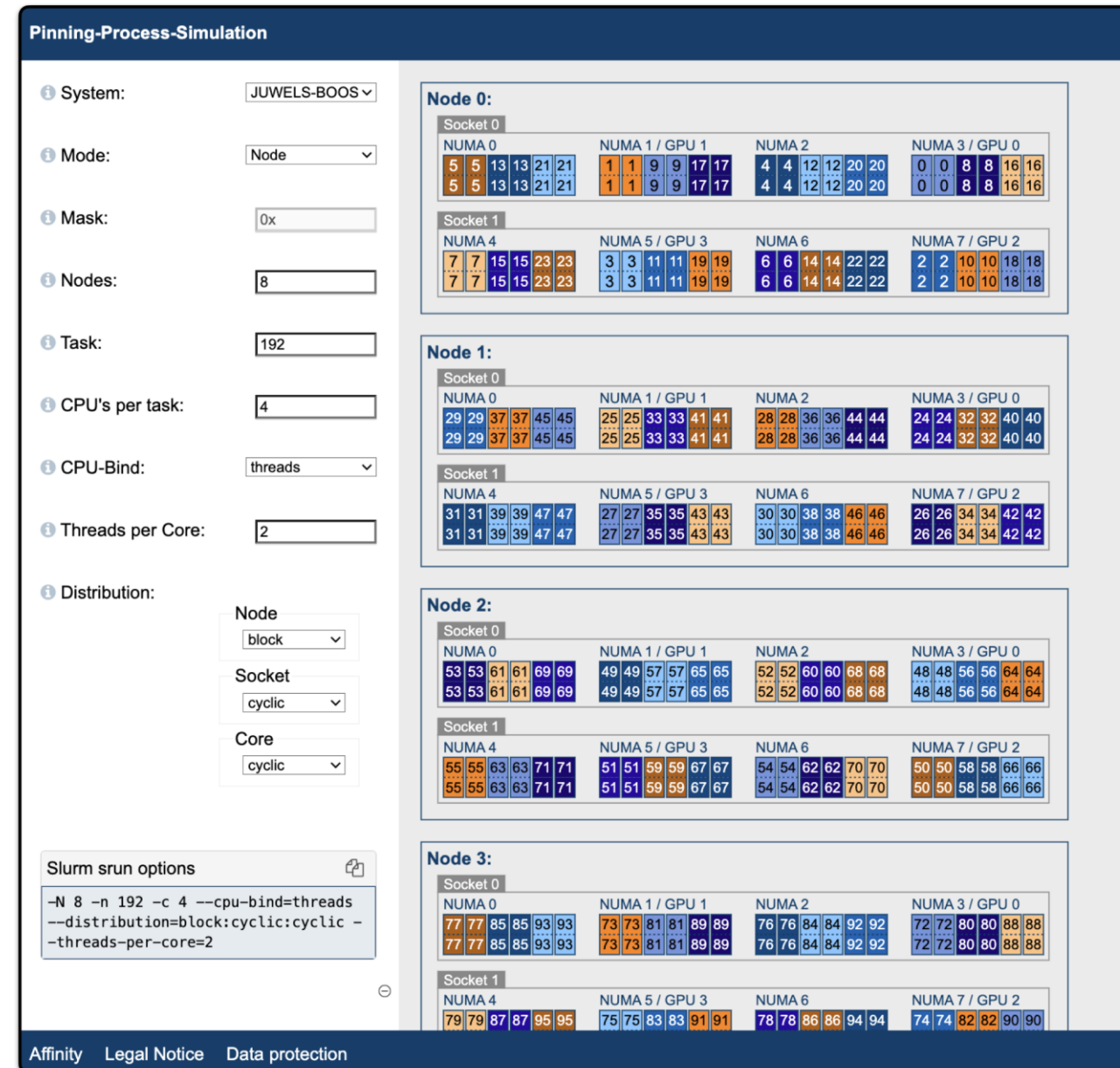
- Basic job information
- General average usage
- Computing time spent/estimation
- Status
- CPU, Core
 - Usage, Load, Memory usage
- GPU
 - Usage, Power, Temperature, ...
- I/O
- Network traffic
- Nodelist (with interconnected cells)
- Error messages
- Timeline



JuPin

Pinning visualization & verification

JuPⁿ provides an interactive web interface to explore and evaluate pinning options

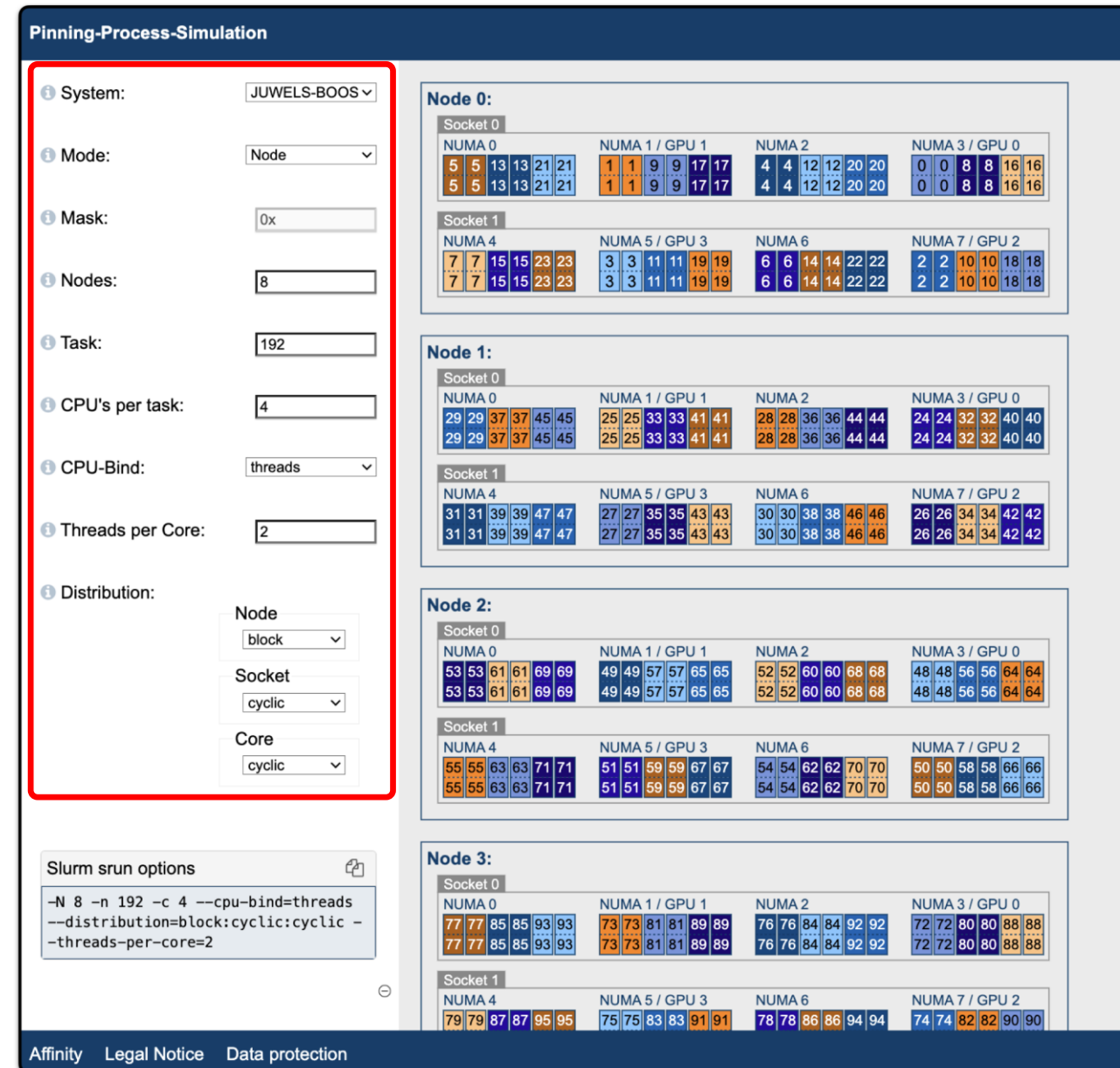


JuPin

Pinning visualization & verification

Options

JuPⁿ provides an interactive web interface to explore and evaluate pinning options



JuPin

Pinning visualization & verification

JuP/n provides an interactive web interface to explore and evaluate pinning options

Options



JuPin

Pinning visualization & verification

JuPin provides an interactive web interface to explore and evaluate pinning options

Options

JuPin does not perform the pinning itself, but assist users

Pinning-Process-Simulation

Distribution

System: JUWELS-BOOS

Mode: Node

Mask: 0x

Nodes: 8

Task: 192

CPU's per task: 4

CPU-Bind: threads

Threads per Core: 2

Distribution: Node
block
Socket
cyclic
Core
cyclic

Slurm srun options

```
-N 8 -n 192 -c 4 --cpu-bind=threads  
--distribution=block:cyclic:cyclic -  
-threads-per-core=2
```

Node 0:

Socket 0

NUMA 0				NUMA 1 / GPU 1				NUMA 2				NUMA 3 / GPU 0			
5	5	13	13	1	1	9	9	4	4	12	12	0	0	8	8
5	5	13	21	1	1	9	17	4	4	12	20	0	0	8	16
5	5	13	21	1	1	9	17	4	4	12	20	0	0	8	16

Socket 1

NUMA 4				NUMA 5 / GPU 3				NUMA 6				NUMA 7 / GPU 2			
7	7	15	15	3	3	11	11	6	6	14	14	2	2	10	18
7	7	15	23	3	3	11	19	6	6	14	22	2	2	10	18
7	7	15	23	3	3	11	19	6	6	14	22	2	2	10	18

Node 1:

Socket 0

NUMA 0				NUMA 1 / GPU 1				NUMA 2				NUMA 3 / GPU 0			
29	29	37	37	25	25	33	33	28	28	36	36	24	24	32	40
29	29	37	45	25	25	33	41	28	28	36	44	24	24	32	40
29	29	37	45	25	25	33	41	28	28	36	44	24	24	32	40

Socket 1

NUMA 4				NUMA 5 / GPU 3				NUMA 6				NUMA 7 / GPU 2			
31	31	39	39	27	27	35	35	30	30	38	38	26	26	34	42
31	31	39	47	27	27	35	43	30	30	38	46	26	26	34	42
31	31	39	47	27	27	35	43	30	30	38	46	26	26	34	42

Node 2:

Socket 0

NUMA 0				NUMA 1 / GPU 1				NUMA 2				NUMA 3 / GPU 0			
53	53	61	61	49	49	57	57	52	52	60	60	48	48	56	64
53	53	61	69	49	49	57	65	52	52	60	68	48	48	56	64
53	53	61	69	49	49	57	65	52	52	60	68	48	48	56	64

Socket 1

NUMA 4				NUMA 5 / GPU 3				NUMA 6				NUMA 7 / GPU 2			
55	55	63	63	51	51	59	59	54	54	62	62	50	50	58	66
55	55	63	71	51	51	59	67	54	54	62	70	50	50	58	66
55	55	63	71	51	51	59	67	54	54	62	70	50	50	58	66

Node 3:

Socket 0

NUMA 0				NUMA 1 / GPU 1				NUMA 2				NUMA 3 / GPU 0			
77	77	85	85	73	73	81	81	76	76	84	84	72	72	80	88
77	77	85	93	73	73	81	89	76	76	84	92	72	72	80	88
77	77	85	93	73	73	81	89	76	76	84	92	72	72	80	88

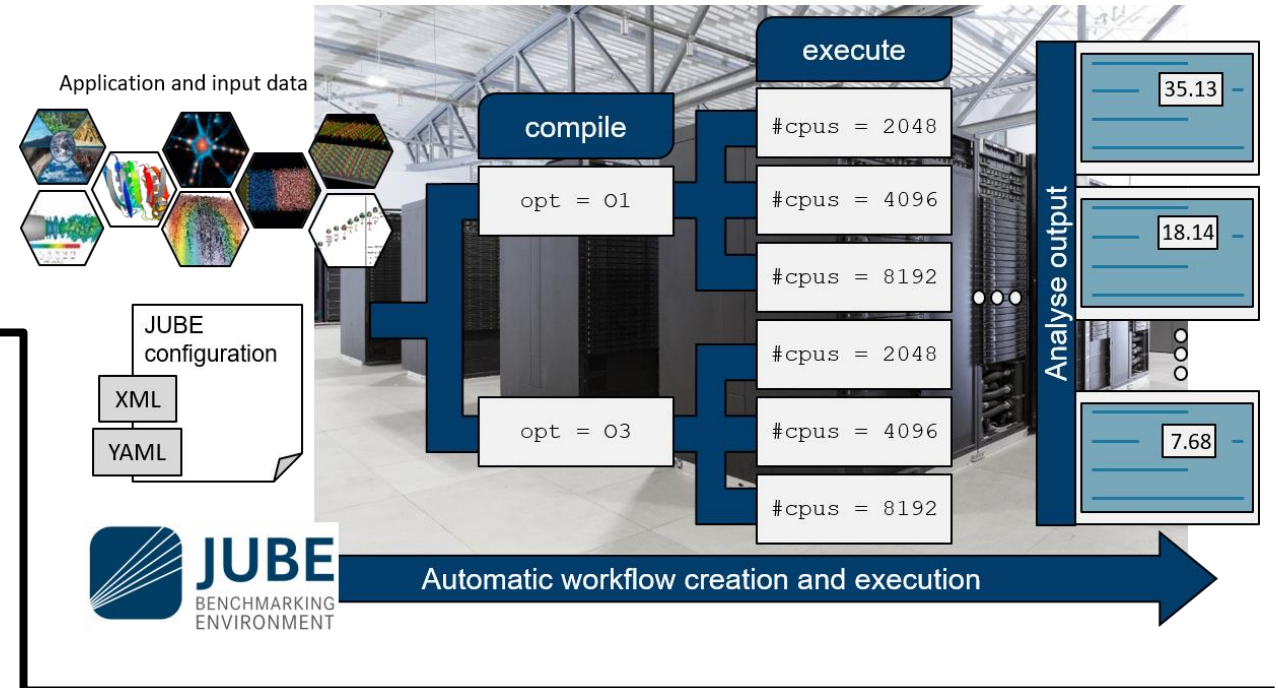
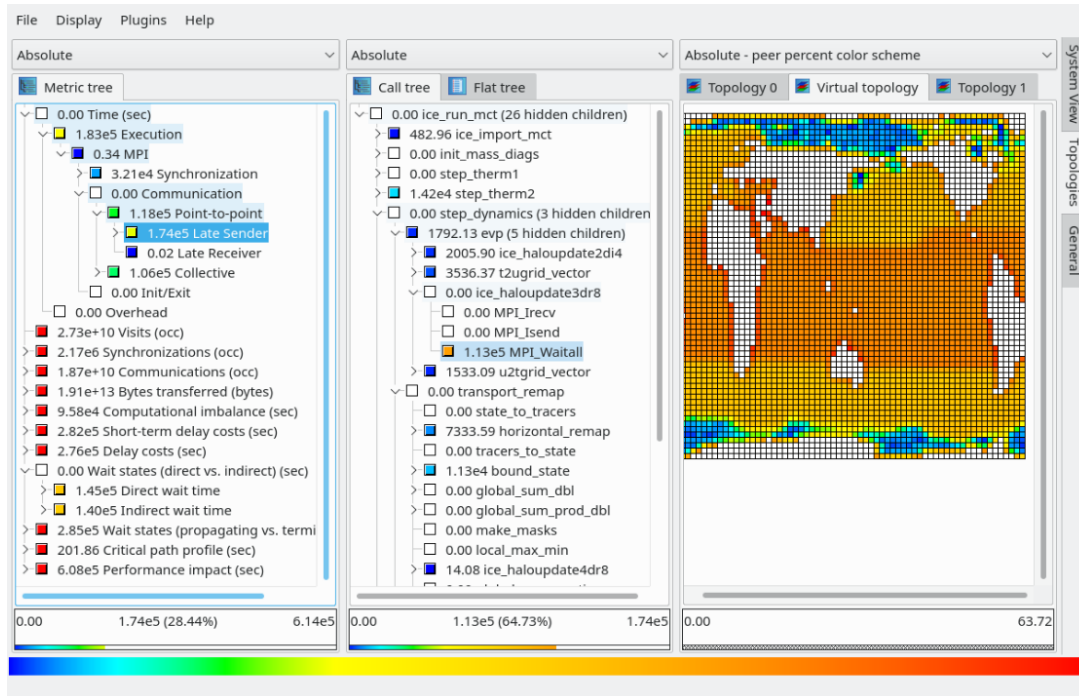
Socket 1

NUMA 4				NUMA 5 / GPU 3				NUMA 6				NUMA 7 / GPU 2			
79	79	87	87	75	75	83	83	78	78	86	86	74	74	82	90
79	79	87	95	75	75	83	91	78	78	86	94	74	74	82	90
79	79	87	95	75	75	83	91	78	78	86	94	74	74	82	90

Affinity Legal Notice Data protection

Examples of further tools from JSC

JUBE: Workflow & benchmarking environment

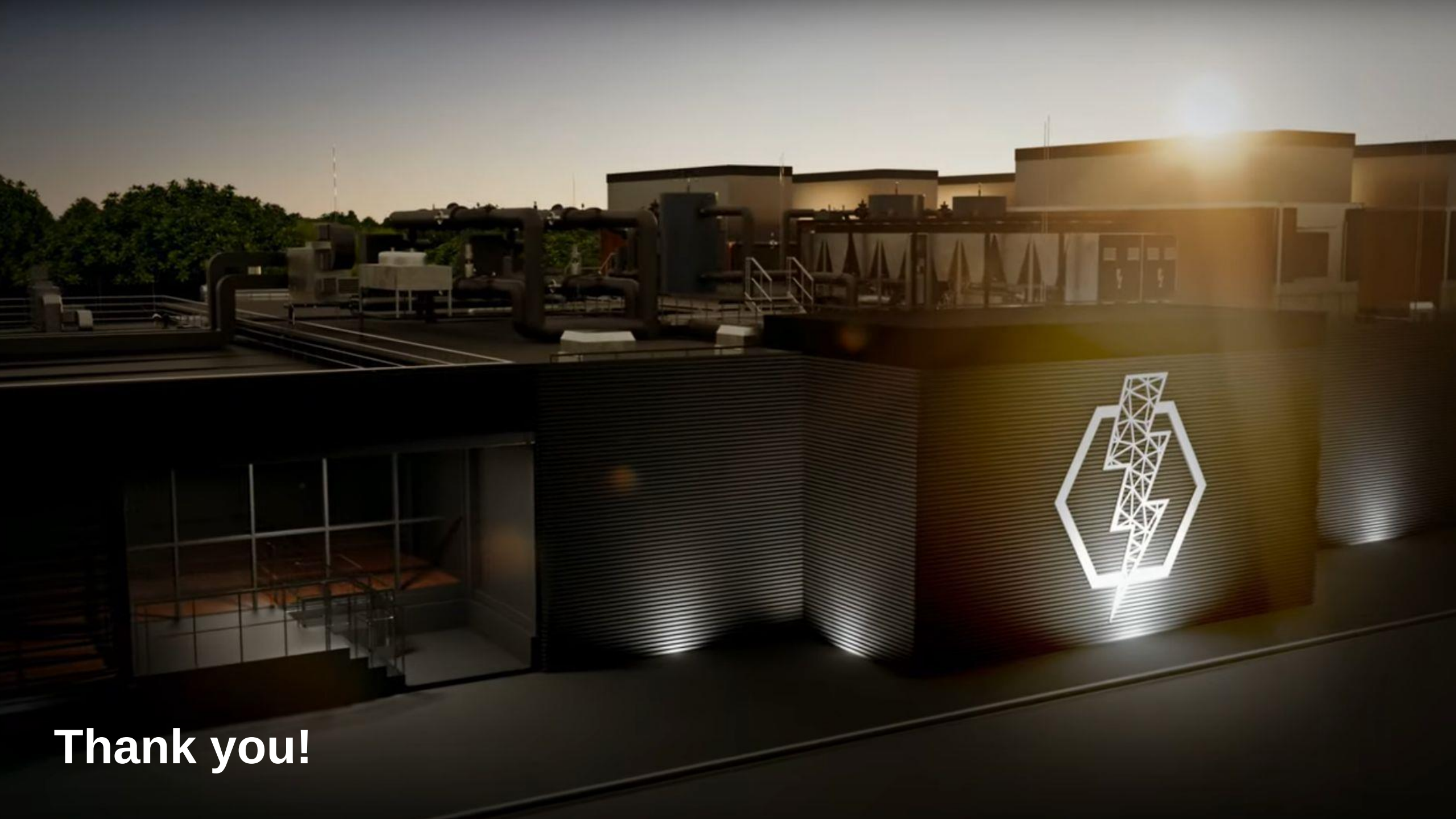


Scalasca: Scalable Analysis of Large Scale Applications



Ready for take off





Thank you!