



TECHNISCHE
UNIVERSITÄT
DARMSTADT

RWTHAACHEN
UNIVERSITY

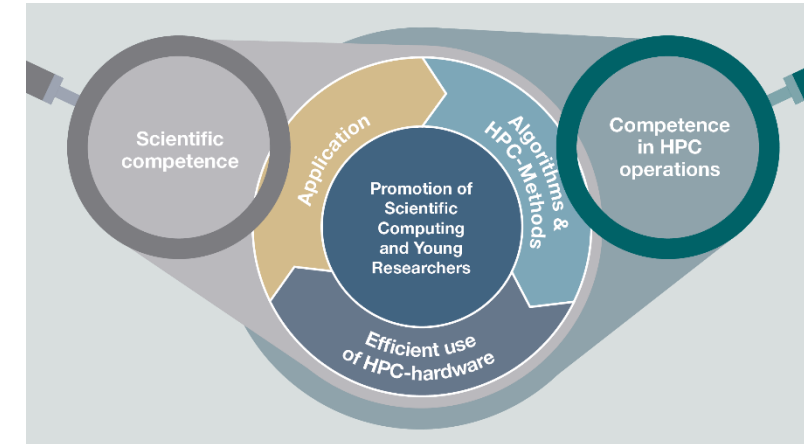
Application for computing time NHR4CES / HPC.NRW / RWTH

How can I get access to supercomputers?

Tim Cramer

National High Performance Computing Center for Computational Engineering Sciences

- Part of the association for National High Performance Computing (NHR)
- Aims to provide scientists at German universities with
 - the computing capacity they need for their research
 - skills for the efficient use of this resource
- NHR4CES collaborate in topic-specific Simulation and Data Laboratories and Cross-Sectional Groups
- Common computing time application processes

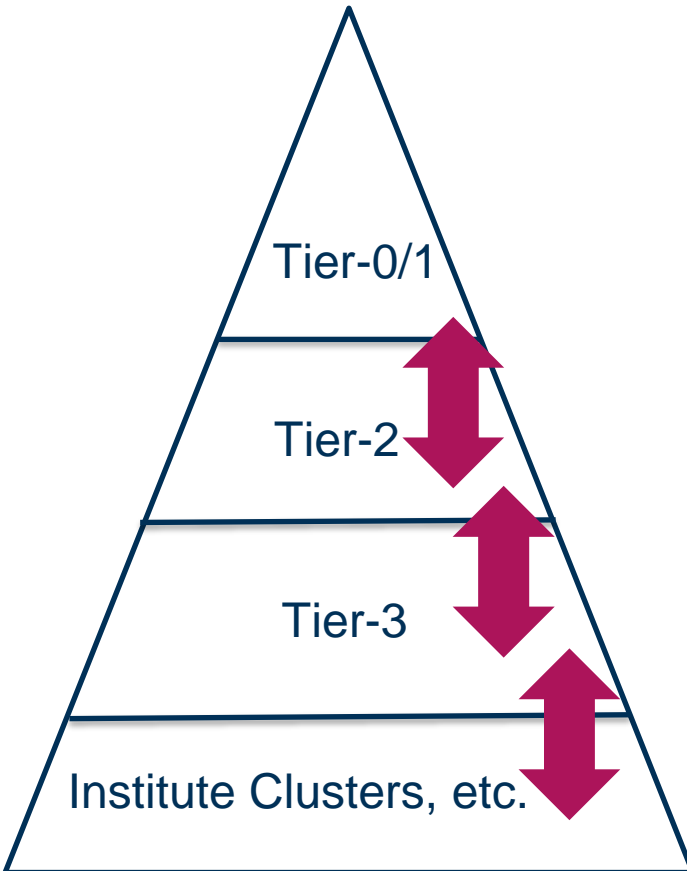


IT Center at RWTH Aachen (picture: © Quadflieg)



University Computing Center at TU Darmstadt

- HPC resources are expensive
 - Up to 15 Mio € per Tier-2 system (expected life time: ~5 years)
 - Local staff for administration, maintenance, support, review processes, procurements, etc.
 - ~ 1 Mio € power consumption per year / system (depending on system size)
- Funding agencies (DFG, NRW, Bund, etc.)
 - Usage only for scientific purpose (e.g. crypto mining strictly forbidden)
 - HPC operators have to ensure scientific usage
 - Compute time application & review
 - Project monitoring
 - Project reports



Tier 0: European Level

- Partnership for Advanced Computing in Europe (PRACE)
- <https://prace-ri.eu/hpc-access/calls-for-proposals>

Tier 1: National Level (large scale)

- Gauss Centre for Supercomputing (GCS)
- Jülich (JSC), Munich (LRZ), Stuttgart (HLRS)
- <https://www.gauss-centre.eu/for-users/hpc-access>

Tier 2: Regional-National Level

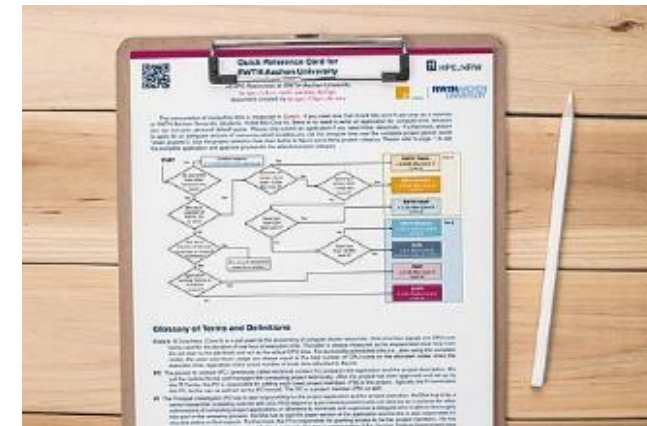
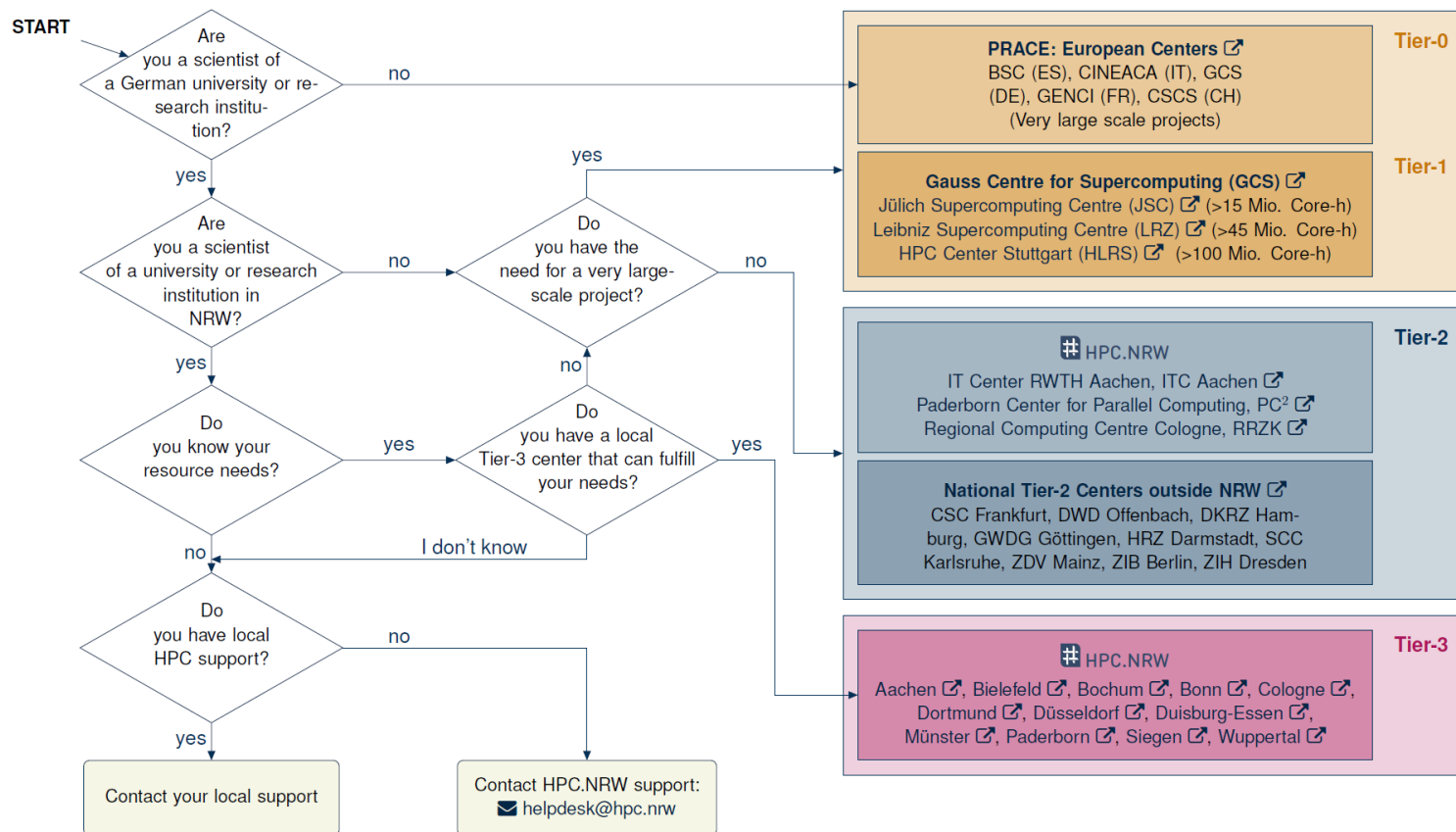
- Nationales Hochleistungsrechnen (NHR): <https://www.nhr-verein.de>
- Gauss Allianz (GA): <https://gauss-allianz.de>
- Aachen, Cologne, Paderborn (and others outside NRW)

Tier 3: Regional Level

- E.g. local universities

Quick Reference Cards

- Information as quick reference cards: <https://hpc.dh.nrw/en/hpc-access/application-for-hpc-resources>



- Principal Investigator (PI)
 - Responsible for the project application
 - Needs to be a senior researcher (e.g., a leading scientist with a Dr./PhD degree)
 - Can also act as reviewer for other NHR projects
 - Has to sign the proposal
 - Responsible for status report
 - Can grant access to further Project Members (PM)
- Person of Contact (PC) [*formally known as Technical Contact (TC)*]
 - Prepares the application and the project description
 - Fills out the (online) forms
 - Manages the computing project technically
 - Can grant access to further Project Members (PM)
 - Responsible for adding members to the project
- Project Member (PM)
 - Can use the granted computing time
 - Can be ANY person selected by the PI/PC, independent of the affiliation

Who can use the computing resources at RWTH Aachen University?

- Authorized users without computing project application
 - Members of RWTH Aachen University
 - Members of the UKA for research and teaching (FB10)
 - Persons with partner status of RWTH Aachen University
- Authorized users through JARDS computing project application
 - Members of German public or government-approved teaching and research institutions
 - Members of non-university research institutions need a PI who owns a Ph.D. / professorship from a German university
 - Members of non-university research institutions are still welcome as project members (PMs)
- Projects require a Principle Investigator (PI)
 - Leading researcher (usually with doctorate)
- Citizens of countries that are subject to the export control policy of the German Federal Government may need additional authorization from the German Federal Office for Economic Affairs and Export Control (BAFA) before they are allowed to use HPC resources

Exception: RWTH projects for members of FZJ

How to apply for computing resources?



Most effort for you here, we will take care about the other steps

Really? So complicated? I just want to do research!

→ Don't be afraid! It is not that bad ;-)



- Effort for proposal depends on amount of required resources
- Resource estimation (allocation in Mio-Core-h)
 - Core-h := Usage / reservation of one core for one hour
 - Example Core-h: Using one compute node with 96 cores for one year (24/7):
 $96 \text{ cores} * 24 \text{ h} * 365 \text{ days} = 0.84 \text{ Mio Core-h}$
 - Example Memory: Many HPC systems are equipped with 2-4 GB per core.
- Trial accounts / test projects possible (“PREP”)



I want to use GPUs! Why are you talking about Core-h?

- GPU resources are **not** accounted in a specific metric like "GPU hours (GPU-h)"
- We account all resource in Core-h for historical reasons / simplification
- Mapping Core-h \leftrightarrow GPU-h exists:

One GPU-h corresponds to 24 Core-h

- Example: Using one GPU for one year (24/7):
 $24 \text{ cores} * 24 \text{ h} * 365 \text{ days} = 0.21 \text{ Mio Core-h}$

Project Preparation 3/6



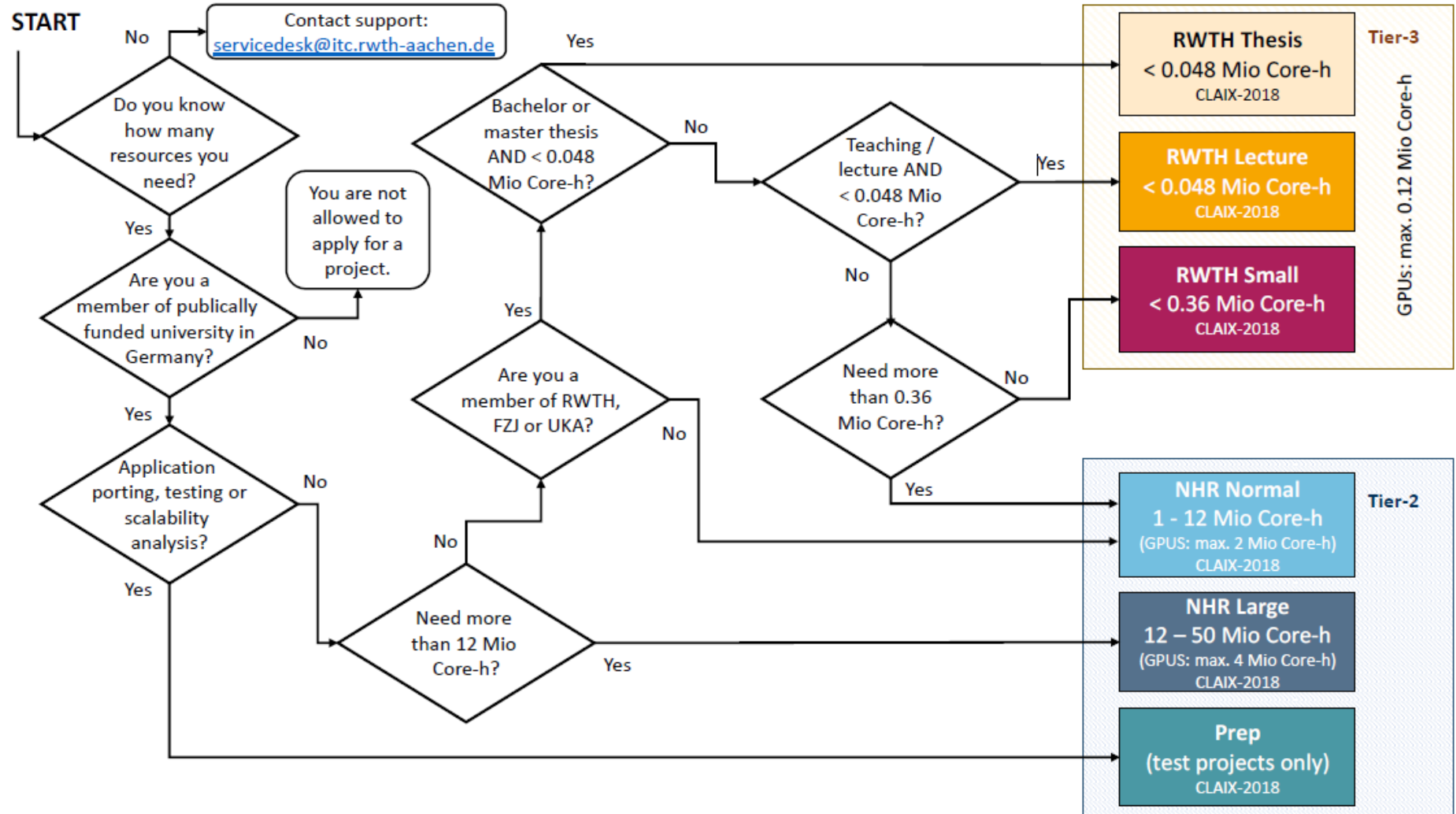
– Identify a fitting project category New limits

New category	Mio. Core-h <i>CPU</i> per year / project	Mio. Core-h <i>GPU</i> per year / project	Calls	Scientific Review	Tier	CLAIX-2023 Contingent <i>CPU</i> per year [Mio. Core-h]	CLAIX-2023 Contingent <i>GPU</i> per year [Mio. Core-h]
RWTH Thesis	< 0.048	< 0.048	Rolling	No	Tier-3	-	-
RWTH Lecture	< 0.048	< 0.048	Rolling	No	Tier-3	40	2
RWTH small	< 0.24	< 0.12	Rolling	No	Tier-3	140	2
NHR Prep	Test projects only (really!)	Test projects only (really!)	Rolling	No	Tier-2	16	2
NHR Normal	1 – 12	< 2	4x p.a. / rolling conditional approval as soon as scientific reviews are available	Yes	Tier-2	200	15
NHR Large	12 - 50	< 4	4x p.a.	Yes	Tier-2	130	10

Project Preparation 4/6



Identify a fitting project category



Coming soon: Additional WestAI projects



- For larger projects you need to provide scaling information
 - **Tutorial:** https://hpc-wiki.info/hpc/Scaling_tutorial
- Prepare a project description (templates can typically be found on the local websites)
 - **Most important part, will be scientific reviewed**
- NHR categories
 - **Only** the Resource Allocation Board (RAB) decides about computing resources

Submission Deadline	TecRev Deadline	SciRev Deadline	RAB Meeting	Project Start
01.01.	15.01.	20.02.	End of February	01.04.
01.04.	15.04	20.05.	End of May	01.07.
01.07.	15.07.	20.08.	End of August	01.10.
01.10.	15.10.	20.11.	End of November	01.01.

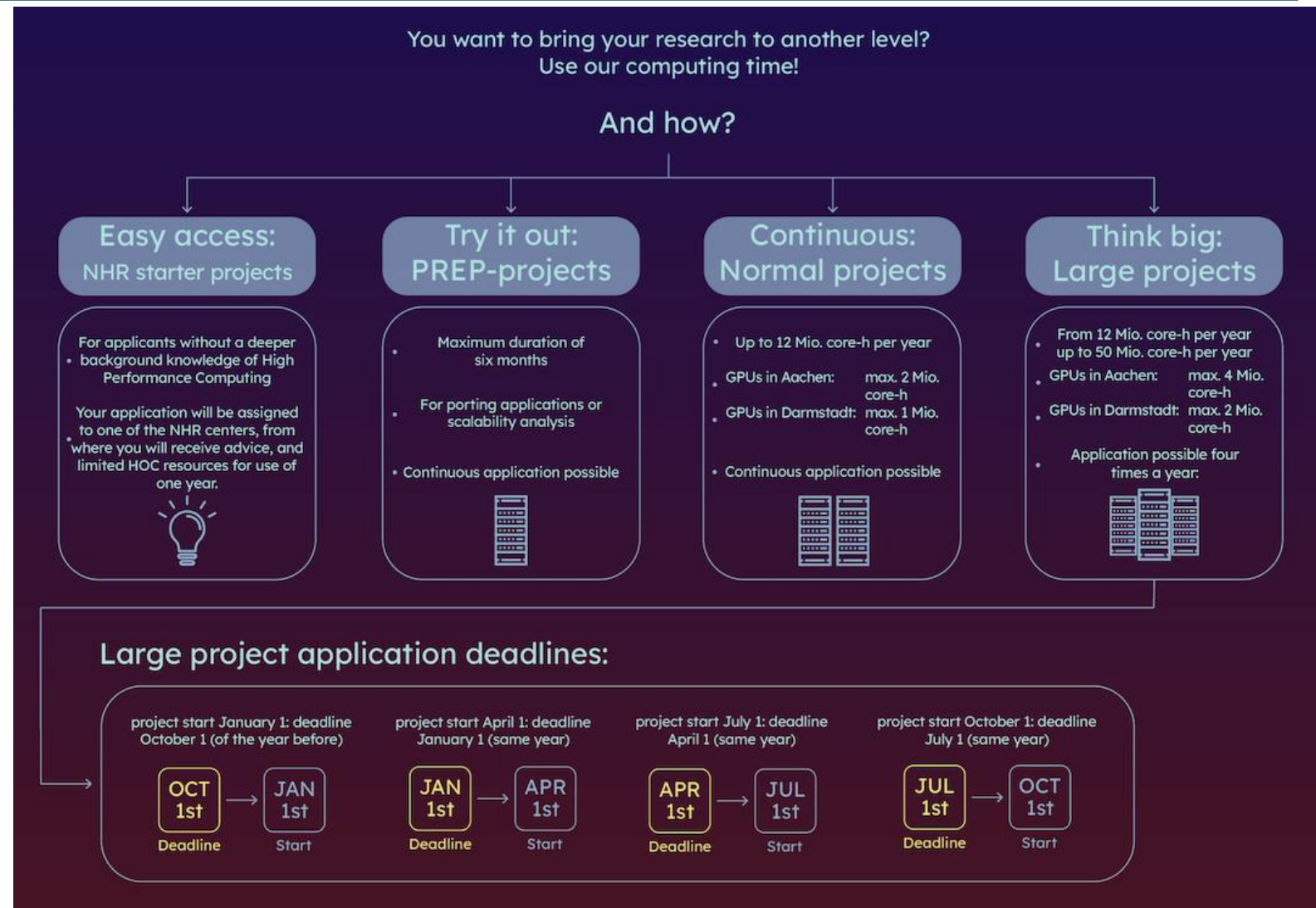
“periodical procedure”
(German: “getaktetes Verfahren”)

→ Even for NHR normal: Formal resource allocation only after the meeting of the RAB

NHR4CES Projects

– New step by step guide

– <https://www.nhr4ces.de/hpc-access/>





1. Use the local submission system (JARDS)
 - **RWTH categories** <https://www.itc.rwth-aachen.de/hpc-project>
 - **NHR4CES:** <https://www.nhr4ces.de/hpc-access/>
2. An external Principal Investigator (PI) has to sign the application
3. Send signed and scanned proposal

Formal Evaluation & Technical Review



Formal Evaluation

- Formal aspects of a project are verified by the HPC center (e.g., Is the PI a professor or owns an Ph.D?)
- PI (or contact person) will be contacted if questions/problems show up
- Duration: usually some work days

Technical Review

- HPC experts will check your proposal for technical feasibility (e.g., availability of requested resources, software, etc.)
- Duration: up to two week



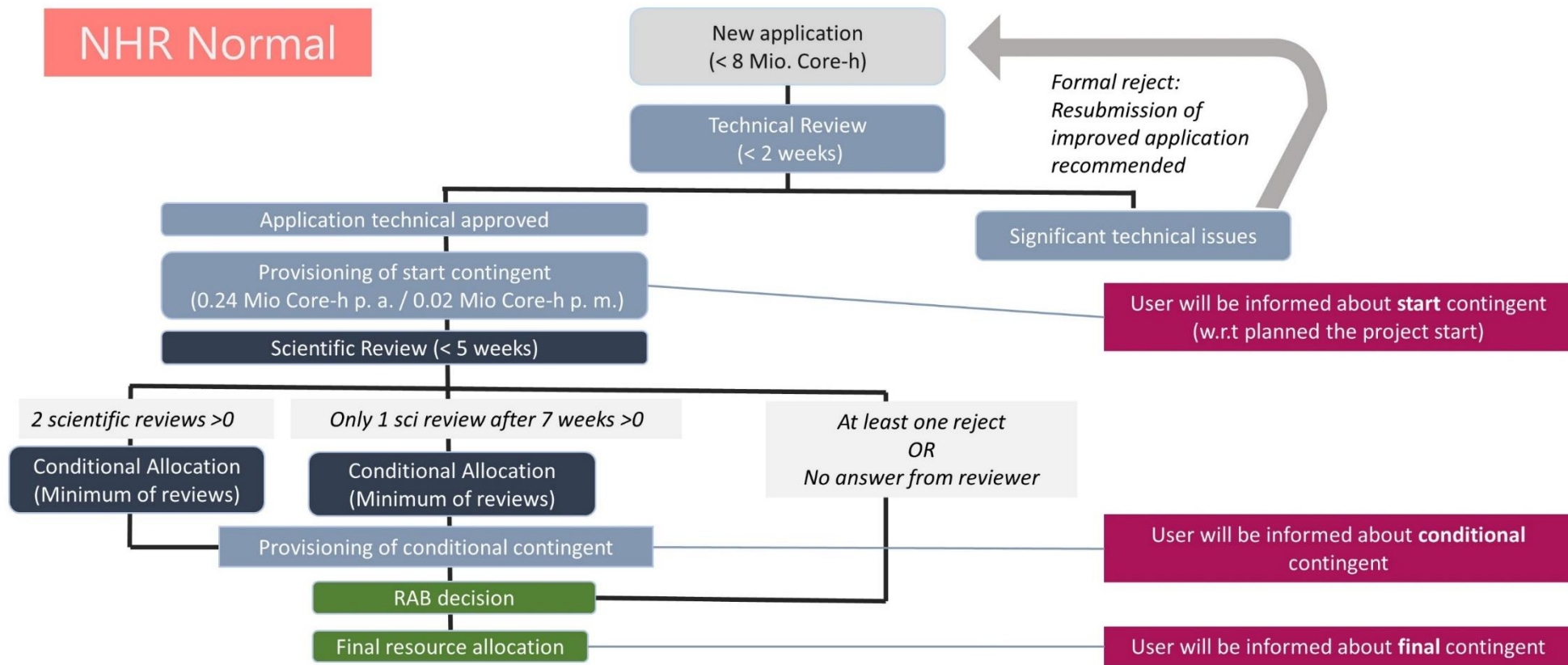
- Not done for test (or smaller) projects
- We select 1-3 reviewer (=experts in the corresponding scientific domain)
- Depending on project size: Internal (=RWTH) or external experts
- Single-blind review
- Reviewers check the scientific soundness
- Duration:
 - Rolling calls: usually 4-6 weeks
 - Fixed date calls: up to 10 weeks (depending on deadlines)
- Note: If your project proposal is successful, you might be requested as review for other projects in future (also from other NHR centers!)

Resource Allocation and Monitoring 1/3



- The Resource Allocation Board (RAB, “Vergabegremium”) decides about the resources for the project
- In case of success:
 - generate an account (if not done already)
 - add members to the approved compute project
 - prepare and submit job scripts for the project
 - obtain the project account information (quota, usage, etc.)
- Typical time for a project: One year
 - Uniform resource consumption on monthly-base expected
 - You might borrow Core-h from next month or use from last month

Resource Allocation and Monitoring 2/3



Resource Allocation and Monitoring 3/3



- Technically every project on the cluster has a certain budget
- Example Aachen (command line tool):
 - Sliding Window (3 months)
 - 1000 (remainder from previous month)
 - + 50000 (for the current month)
 - + 50000 (for next month)
 - 59000 (consumed this month)
 - = 40000 Core-h left over to be consumed this month at most!

OR:

Core-h left over for this month*:
 $50000 * -20\% = -10000$

```
$ r_wlm_usage -p bund1234 -q
Account:                                bund1234
Type:                                    bund
Start of Accounting Period:              01.11.2020
End of Accounting Period:                 31.10.2021
State of project:                          active
-----
Quota monthly (core-h):                   50000
Remaining core-h of prev. month:          -1000
Consumed core-h current month:            59000
Consumed core-h last 4 weeks:              65000
Consumable core-h (%):                     -20
Consumable core-h:                          40000
-----
Total quota (core-h):                       0.600 Mio
Total consumed core-h so far:               0.500 Mio
-----
Default partition:                          c18m
Allowed partitions:                          c18m,c18g
Max. allowed wallclocktime:                 24.0 hours
Max. allowed cores per job:                  384
```

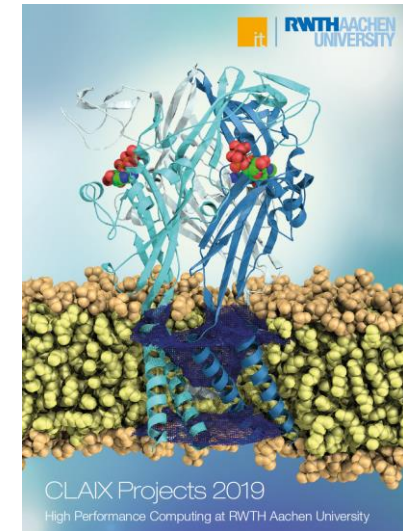
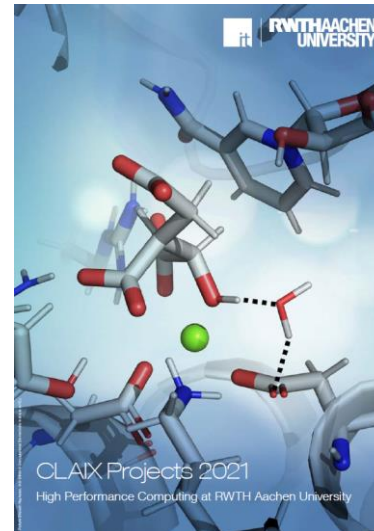
* 200%: No core-hours were used during the previous and the current month
-101%: The usage for the current and the previous month is > three months' quota

Project Reports



- After the project you have to provide a report about the scientific results
- Acknowledgments in related publications required

→ Both helps the HPC centers to argue for new future HPC resources



<https://www.itc.rwth-aachen.de/cms/it-center/IT-Center/Publikationen/~Ijja/Jahresberichte/?lidz=1>



Questions?