

# ANNUAL REVIEW HPC-UGENT

2022



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# 1 ABOUT HPC-UGENT

**In scientific computing\*, computers are used to solve complex problems. (\*aka: supercomputing or high-performance computing - HPC)**

## 1.1 Our mission

HPC-UGent provides centralised scientific computing services, training, and support for researchers from Ghent University, industry, and other knowledge institutes.

HPC-UGent is part of the central ICT department of Ghent University, and is a strategic partner of the Flemish Supercomputer Center (VSC - <http://vscentrum.be/>).

## 1.2 Our vision

HPC-UGent offers a professional scientific computing environment that is stable, user-friendly, and serves the diverse purposes of researchers from Ghent University, industry and other research institutions.

We provide a structural training curriculum for new and advanced users, and provide supporting course material.

We present a supercomputing portfolio that is well known within Ghent University and beyond, and we establish ourselves in the international community via contributions to centralised solutions, such as EasyBuild (<https://easybuilders.github.io/easybuild/>).

## 1.3 Personnel

In 2022, the HPC-UGent team consists of 9 people:

Álvaro Simón García, Andy Georges, Ewald Pauwels, Kenneth Hoste, Kenneth Waegeman, Stijn De Weirdt, Wouter Depypere, Balázs Hajgató and Bart Verheyde.

Tasks include:

- User support
- Training
- Infrastructure installation and upkeep (both hardware and software)
- Outreach and marketing
- Collaboration with other supercomputing centers

Additionally, several consultants (Inuits) are also regularly engaged to help solve software installation requests, for OpenStack Cloud and sysadmin expertise and for python expertise: Jakub Zárbynický, Denis Kristak, Filip Kruzik, Peter Hardon, Martin Sakin, Petr Kral, Hafsa Naeem, Eva Tilborghs, Richard Klem.

Jobstudent Jasper Janin also helped out HPC-UGent helpdesk in 2022.

## 2 INFRASTRUCTURE

### 2.1 Overview

The Ghent University compute infrastructure (Tier-2) consists of several specialised clusters, jointly called Stevin, hosted in the S10 datacenter.

In 2022, the following changes to the infrastructure were applied:

- The storage hardware hosting the HPC-UGent Tier2 shared filesystems (HOME, DATA, SCRATCH) was replaced with the latest generation storage servers, opening up a total storage space of more than 3.6 PB.
- Cluster *accelgor* was taken in production. This is a GPU cluster, featuring 9 worker nodes with in total 432 AMD Milan CPU cores and 36 NVIDIA A100 GPUs, each with 80GB of GPU memory.
- Interactive debug cluster *slaking* was taken in production. This cluster has a special configuration: by imposing strict user limits and oversubscribing the available resources (cores, memory, local disk), user almost instantly get access to a modest amount of resources, without waiting for job(s) to start. This meets the frequent requests for a quick way to start interactive sessions, or to have a quick feedback loop when testing/debugging job scripts.
- All clusters and login nodes were uniformly migrated to Red Hat Enterprise Linux 8 (RHEL8). This brought all clusters in line with the most recent clusters that were already running RHEL8, as well as the Tier-1 cluster Hortense. This makes the maintenance of the HPC-UGent Tier-2 infrastructure significantly easier.
- A new Tier2 Globus endpoint '*VSC UGent Tier2 filesystems*' was introduced, using the latest Globus version.



## 2.1.1 Compute clusters

CPU clusters					
Cluster name	#nodes	CPU / GPU per node	Usable memory per node	Local disk per node	Network interconnect
<b>Swalot</b>	128	2 x 10-core Intel E5-2660v3 (Haswell-EP @ 2.6 GHz)	116 GiB	1 TB	FDR InfiniBand
<b>Skitty</b>	72	2 x 18-core Intel Xeon Gold 6140 (Skylake @ 2.3 GHz)	177 GiB	1 TB 240 GB SSD	EDR InfiniBand
<b>Victini</b>	96	2 x 18-core Intel Xeon Gold 6140 (Skylake @ 2.3 GHz)	88 GiB	1 TB 240 GB SSD	10 Gb ethernet
<b>Kirlia</b>	16	2 x 18-core Intel Xeon Gold 6240 (Cascade Lake @ 2.6 GHz)	738 GiB	1.6 TB NVME	HDR-100 InfiniBand
<b>Doduo</b>	128	2x 48-core AMD EPYC 7552 (Rome @ 2.2 GHz)	250 GiB	180 GB SSD	HDR-100 InfiniBand

GPU clusters					
Cluster name	#nodes	CPU / GPU per node	Usable memory per node	Local disk per node	Network interconnect
<b>Joltik</b>	10	2 x 16-core Intel Xeon Gold 6242 (Cascade Lake @ 2.8 GHz)  4x NVIDIA Volta V100 GPUs (32GB GPU memory)	256 GiB	800 GB SSD	Double EDR InfiniBand
<b>Accelgor</b>	9	2 x 24-core AMD EPYC 7413 (Milan @ 2.8 GHz)  4x NVIDIA Ampere A100 GPUs (80GB GPU memory)	500 GiB	180 GB SSD	HDR-100 InfiniBand

Interactive debug cluster					
Cluster name	#nodes	CPU / GPU per node	Usable memory per node	Local disk per node	Network interconnect
<b>Slaking</b>	10	2 x 12-core Intel Xeon E5-2680 (Haswell@ 2.5 GHz)	500 GiB	1.1 TB SSD	FDR InfiniBand

### 2.1.2 Shared storage

Partition	Size
<b>\$VSC_HOME</b>	90 TB
<b>\$VSC_DATA</b>	1.9 PB
<b>\$VSC_SCRATCH</b>	1.7 PB
<b>\$VSC_SCRATCH_KYUKON</b>	
<b>\$VSC_SCRATCH_ARCANINE</b>	70 TB NVME

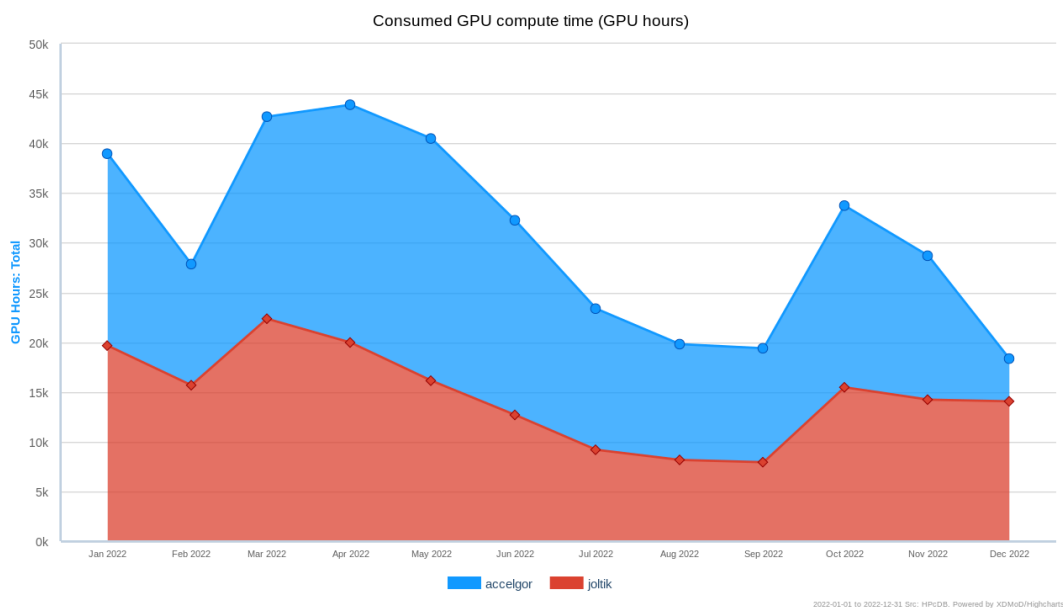
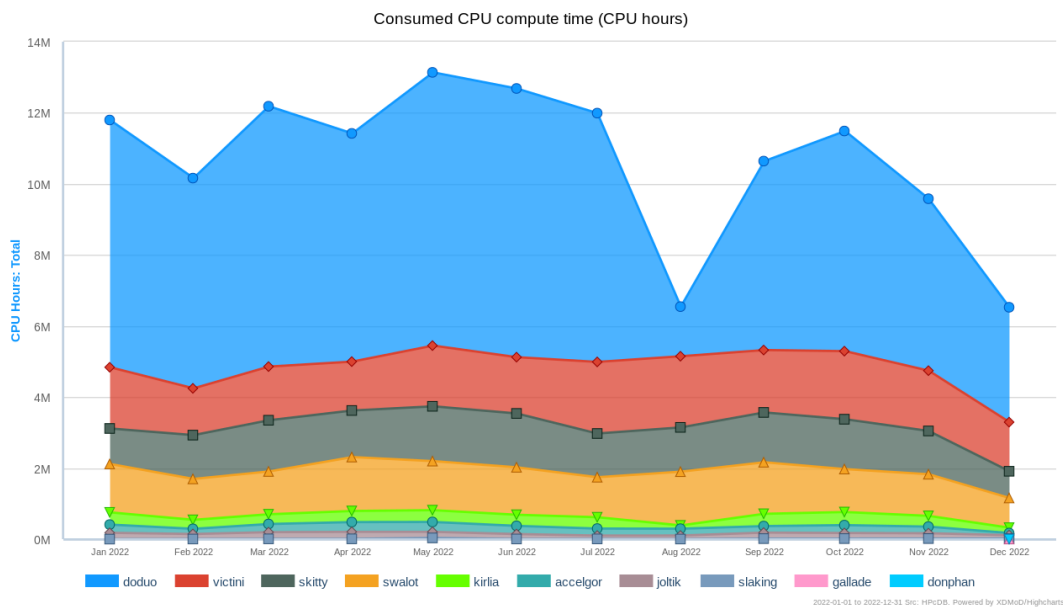
## 2.2 Usage

In the graphs below, the used or available compute time on the compute clusters is typically expressed in *CPU hours* or *GPU hours*.

- 1 GPU hour corresponds to the work done by a graphical processing unit for one hour of time.
- Modern CPU processors contain many cores that can run a computational task. Since the number of cores varies a lot between processor types and production years, 1 CPU hour is used here to mean the work done by one core in a CPU processor for one hour of time.

### 2.2.1 Consumed compute time in 2022

#### 2.2.1.1 Consumed compute time per month



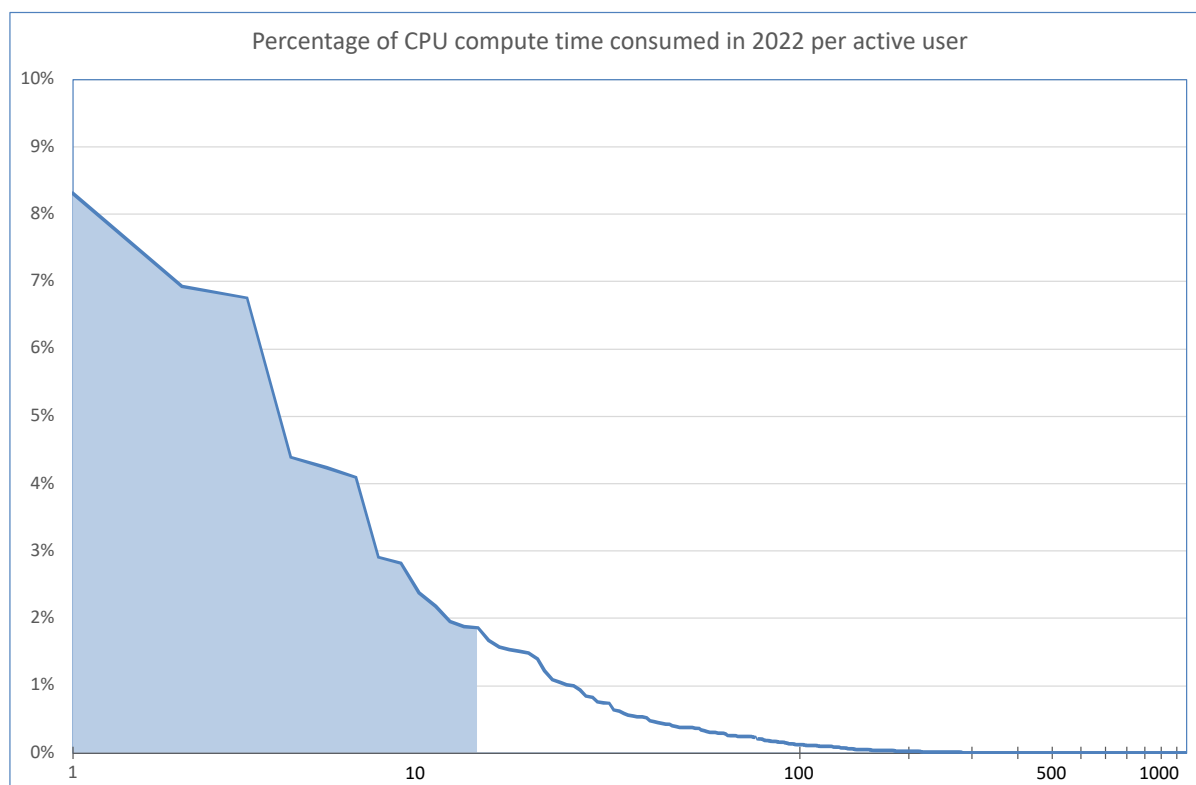
### 2.2.1.2 Consumed compute time per compute cluster

Cluster name	Compute time consumed		Effective use percentage	
	CPU hours	GPU hours	CPU	GPU
<b>Doduo</b>	69 859 911		68%	
<b>Victini</b>	19 989 375		69%	
<b>Skitty</b>	15 293 704		71%	
<b>Swalot</b>	15 258 878		71%	
<b>Kirlia</b>	3 406 301		71%	
<b>Slaking</b>	131 112		7%	
<b>Joltik</b>	1 785 859	193 874	67%	58%
<b>Accelgor</b>	2 426 200	175 504	67%	65%
<b>Gallade (pilot)</b>	2 710			
<b>Donphan (pilot)</b>	12			

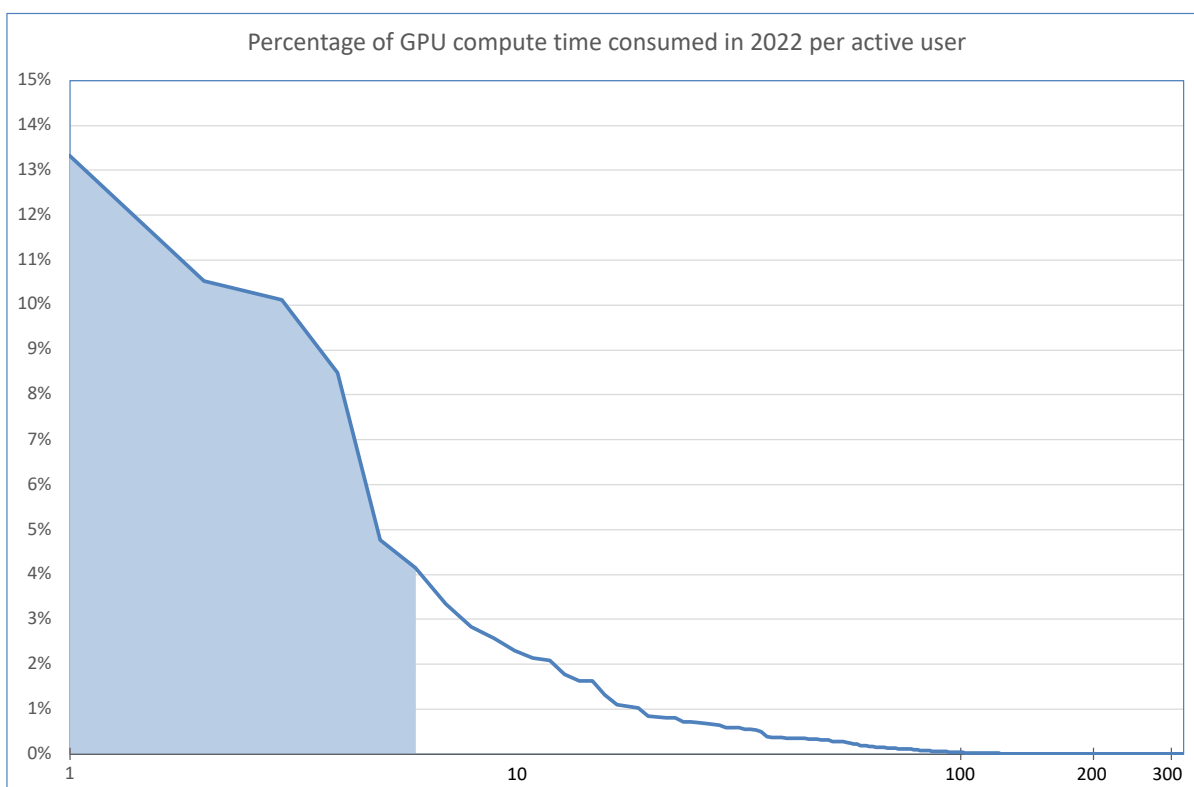
In 2022, a total of 128 154 061 CPU core hours (this corresponds to 14 629 core years) and 369 379 GPU hours have been consumed on the Tier-2 compute clusters of Ghent University.

The effective use percentage expresses how much of the theoretically available compute power in one year (#nodes x #cores/node or #GPUs/node) was used. The extended maintenance window of 28/11-14/12/2022 was taken into consideration. But other down-times and unavailabilities were not taken into account, so the percentages represent a lower bound.

### 2.2.1.3 Consumed compute time versus active users







In 2022, 1175 persons actively used CPU compute time on the Tier-2 compute clusters of Ghent University, 321 persons actively used GPU compute time. Both for CPU and GPU, the user base typically contains a limited number of power users in addition to regular users with a lower usage profile. The plots above graph per user (x axis) what percentage of all compute time produced in 2022 this user consumed. The blue area indicates the 50% level of all Tier-2 CPU/GPU compute time consumed.

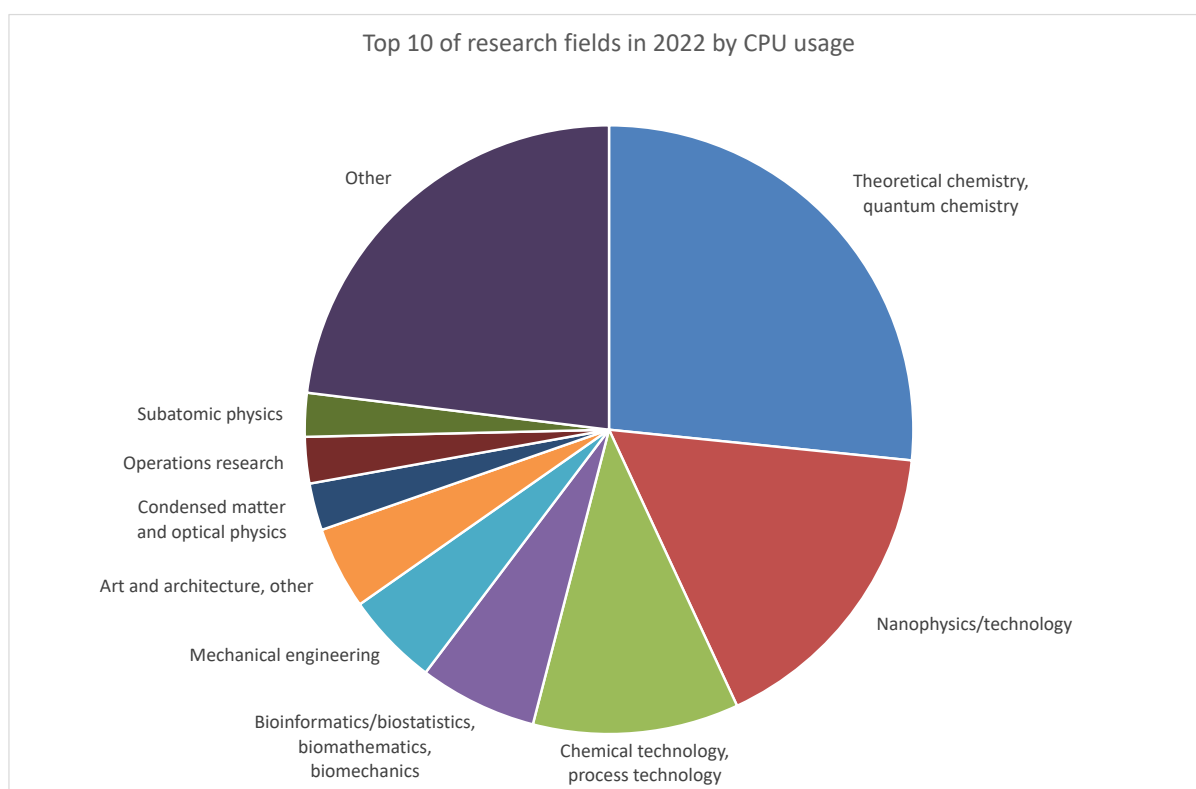
Everyone can get access to the Tier-2 compute clusters of Ghent University. The conditions that apply depend on the affiliation of the researcher. Researchers affiliated with Flemish university associations (constituting the Flemish Supercomputer Center – VSC) get free access. Other Flemish or federal research institutes can get access for their researchers on a contract basis, with 1500 euro worth of compute time given out free of charge per year. Industry can buy compute time in a pay-what-you-use model.

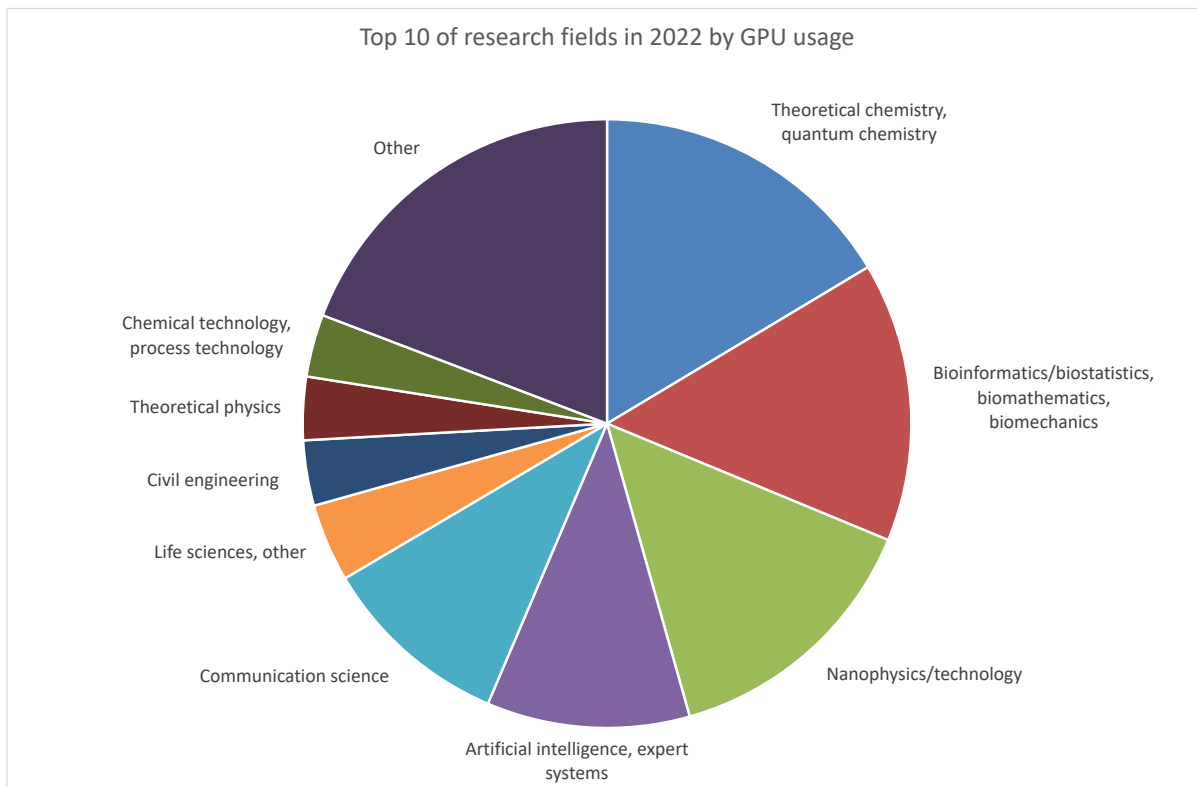
Breakdown of consumed compute time by affiliation		
	<i>CPU time</i>	<i>GPU time</i>
<b>UAntwerpen</b>	2.48%	0.69%
<b>VUB</b>	0.22%	2.18%
<b>UGent</b>	96.46%	96.16%
<b>KULeuven / UHasselt</b>	0.31%	0.45%
<b>Industry and other research institutes</b>	0.54%	0.51%
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>

Master or Bachelor students enrolled in a Flemish university association can also get access to the Tier-2 compute clusters of Ghent University. Several teachers effectively rely on the infrastructure for training purposes, stimulating several students to become a user. Master students often rely on the infrastructure to perform research included in their Master thesis.

Number of students/researchers versus breakdown of consumed compute time by category		
	<i>CPU time</i>	<i>GPU time</i>
<b>Ma/Ba students</b>	20.65%	15.61%
<b>Researchers</b>	79.35%	84.39%
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>

### 2.2.1.4 Consumed compute time versus research field



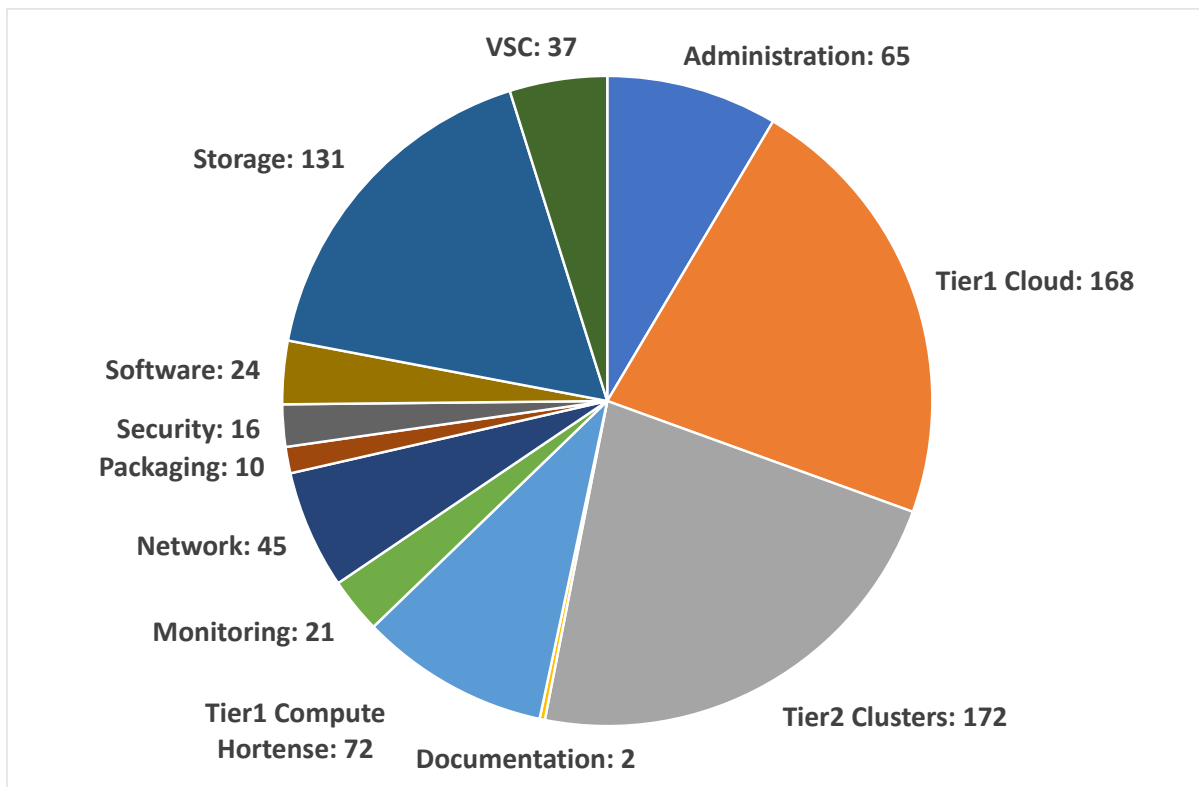


These are the research fields that users enter when requesting their account to access HPC-UGent resources. No doubt, there is overlap between certain fields and some users have not listed a research field at all. As such, the above distributions merely gives an indication of the top research fields that actively use scientific computing, and which ones actively use either CPU or GPU resources.

### 3 DEVELOPMENT AND MAINTENANCE

To maintain compute infrastructure capabilities, HPC-UGent continuously performs maintenance works. On hardware, such as installing new components or replacing broken ones, and on software, ranging from the operating system to higher-level software that enables services directly available to the end user. To report, plan and follow-up hardware and software bugs, issues or developments, these are managed with the aid of a tracker, JIRA. Larger developments, grouping many individual or interrelated issues are grouped as 'Epics'. These effectively track the main development and maintenance projects that HPC-UGent executes. Github services are used to facilitate software development and Jenkins services for continuous integration. The number of 'pull requests' (PRs) by HPC-UGent staff to the various repositories is indicative of the effort spent over the last year.

#### 3.1 Number of JIRA issues resolved in 2022, grouped per main component



## 3.2 Projects finalized in 2022

### 3.2.1 Projects related to Tier2 and UGent

	Title	Summary
1	Install new storage hardware	All tasks related to the Tier2 storage replacement
2	New Tier2 GPU cluster accelgor	New GPU cluster
3	Set up a debug cluster	Interactive debug cluster slaking
4	New logging infrastructure	Set up of more robust monitoring setup
5	Tier2 site update 2021Q4	General maintenance of all Tier2 clusters and servers.
6	Tier2 site update 2022Q4	General maintenance of all Tier2 clusters and servers.
7	Redhat Enterprise Linux 8 (RHEL8)	Homogenization of all clusters and servers to RHEL8
8	Deploy kerberos infrastructure with FreeIPA	Tokenization to achieve an improved security baseline

### 3.2.2 Projects related to VSC Tier1

	Title	Summary
1	Resource App	Webportal for Tier1 Compute Hortense users to consult usage
2	Accountpage: scripts covering the synchronisation of account data around the HPC environment	All integration tasks relating to update and maintenance work to the VSC accountpage
3	Implement Slurm crediting system	Configuration of Slurm on Tier1 Compute Hortense, to prevent users consuming more compute time than allocated via projects
4	Lustre/tier1 storage things to do	All tasks related to setup and configuration of Tier1 Compute Hortense storage
5	Irods storage setup	Finalization of VSC Tier1 Data proof of concept
6	Second phase after VSC Tier-1 Cloud production release	All tasks related to debugging and follow-up the Tier1 Cloud setup

7	Tier1 cluster Dodrio	All tasks related to setting up Tier1 Compute Hortense and making it available to end-users
8	EuroCC tasks and activities by UGent	In 2022, the EuroCC 1.0 project came to end; this epic grouped all required tasks for this project

### 3.3 Github PRs in 2022 by HPC-UGent staff, per repository

github.ugent.be/hpcugent and github.com/hpcugent	
Repository	#PRs
quattor	980
software-stack	61
legacy-rpms	34
vsc_user_docs	28
vsc-ood	22
vsc-administration	16
vsc-cluster-modules	16
vsc-base	14
vsc-project	13
vsc-reporting	11
vsc-install	10
vsc-filesystems	8
icinga-checks	7
vsc-ugent	7
clusterbuildrpm-server	6
slurm	5
documents	4
pbsmon-web	4
quattor-host-mngmt-tools	4
vsc-filesystems-quota	4
vsc-hostkeys	4
vsc-mympirun	4
vsc-quattor	4
oncall-service	3
openstack-templates	3
ownership_transfer	3
service_sanity	3
slurm-prepilogue	3
vsc-manage	3
generatemotd	2

logstash-patterns	2
openstack-image-fixes	2
vsc-cloud	2
vsc-storage	2
hpc-resource-reservation	1
Lmod-UGent	1
pakiti-client	1
pakiti-server	1
pyslurm	1
vsc-data	1
vsc-firewall-client	1
vsc-gridftp	1
vsc-host-tools	1
vsc-modules	1
vsc-profiles	1
vsc-testing	1
vsc_user_docs_mkdocs_inuits	1
vsc-utils	1
website-support-faq	1

github.com/easybuilders	
Repository	#PRs
easybuild	23
easybuild-containers	4
easybuild-docs	6
easybuild-easyblocks	49
easybuild-easyconfigs	511
easybuild-framework	74
easybuild-tutorial	12

## 4 STRATEGIC PARTNER OF VSC

### 4.1 Responsibilities of HPC-UGent within VSC

HPC-UGent is a strategic partner of the Flemish Supercomputer Center (VSC). As a Tier-1 site, HPC-UGent takes on the responsibility for UGent to host and maintain the Tier-1 Compute (<https://www.vscenrum.be/compute>) and Tier-1 Cloud infrastructure (<https://www.vscenrum.be/cloud>).

### 4.2 Tier-1 Compute Hortense

On 15 March 2022, the Tier-1 Compute supercomputer within the VSC 'Hortense' went into production. This is the third VSC Tier-1 cluster, following muk (hosted by HPC-UGent, 2012-2016) and BrENIAC (hosted by HPC-Leuven, 2016-2022). Tier-1 Compute Hortense is hosted by Ghent University, and maintained and supported by the HPC-UGent team.

Tier-1 Compute Hortense consists of 3 partitions:

- **dodrio/cpu\_rome** – main partition, with 294 workernodes, each with:
  - 2x 64-core AMD Epyc 7H12 CPU 2.6 GHz (128 cores per node)
  - 256 GiB RAM (~2GB/core), no swap
  - 480 GB SSD local disk
- **dodrio/cpu\_rome\_512** – large-memory partition, with 42 workernodes, each with:
  - 2x 64-core AMD Epyc 7H12 CPU 2.6 GHz (128 cores per node)
  - 512 GiB RAM (~4GB/core), no swap
  - 480 GB SSD local disk
- **dodrio/gpu\_rome\_a100** – GPU partition, with 20 workernodes, each with:
  - 2x 24-core AMD Epyc 7402 CPU 2.8 GHz (48 cores per node)
  - 4x NVIDIA A100-SXM4 (40 GB GPU memory), NVLink3
  - 256 GiB RAM (~5GB/CPU core), no swap
  - 480 GB SSD local disk



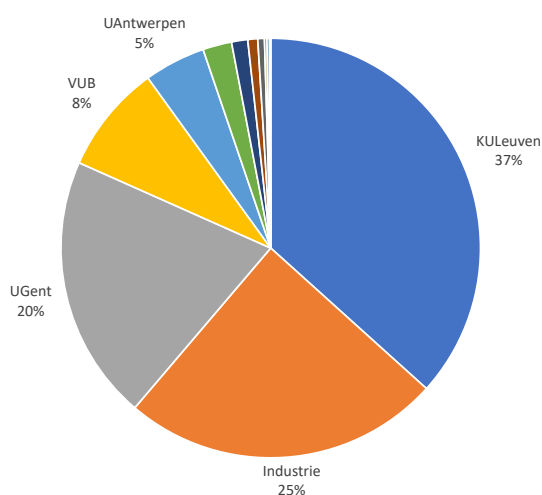
Access to Hortense is project-based and under supervision of the VSC (<https://www.vscentrum.be/compute>)

In the course of 2022, 212 projects were supported in running on Tier-1 Hortense. This included a sizeable cohort of industry users, in addition to full projects, one collaborative grant and numerous starting grants. The table below summarizes the number of projects per category and corresponding allocated compute time.

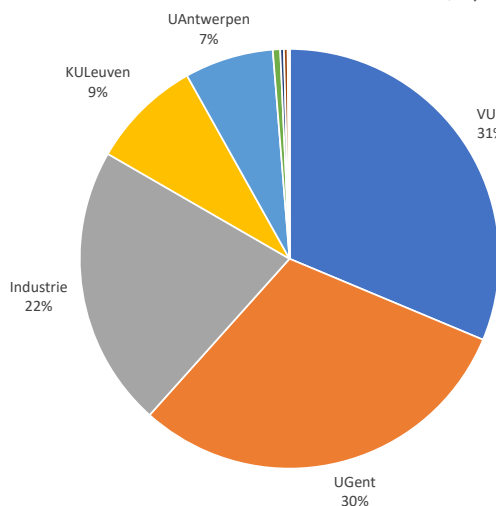
Projects supported on Tier-1 Hortense in 2022			
Category	# projects	Allocated compute time	
		CPU hours	GPU hours
Large scale pilots	8	43.581.440	64.800
2021 projects	22	63.407.510	64.984
2022-cutoff 1	16	61.389.085	166.844
2022-cutoff 2	25	99.545.144	69.900
2022-cutoff 3	20	67.916.270	140.968
2022 Collaborative grant	1	22.200.000	0
Starting grants	89	38.534.000	44.750
Industry exploratory grants	15	13.988.854	112.301
Industry contract project	16	114.976.000	40.800

The following graphs illustrate the allocation of CPU time and GPU time on Tier-1 Hortense, drilled down by research institute. Only the top 5 of research institutes is labelled. Other research institutes include Flanders Make, KMI, VIB, VLIZ, Von Karman Institute for Fluid Dynamics, UHasselt, IMEC and Royal Museum for central Africa.

Allocated CPU time on Tier-1 Hortense in 2022, by institute



Allocated GPU time on Tier-1 Hortense in 2022, by institute





### 4.3 Tier-1 Cloud infrastructure

On 20 May 2021, the Tier-1 Cloud infrastructure was officially launched. This is an Infrastructure as a Service (IaaS) facility that provides the capacity to deploy resources such as virtual machines (VMs), storage and networking with full control by the users of those resources. This infrastructure meets the demand of power users for a more flexible 'cloud-like' environment, in which they can use custom software packages, interactive data analysis tools, workflow portals, data visualization and specific pre- and post-processing packages.

The Tier-1 Cloud infrastructure hardware features:

- 80 CPUv1 hypervisors, each with
  - 16 cores Intel Xeon CPU E5-2670 2.60 GHz
  - 128 GB RAM
- 9 UPSv1 hypervisors, each with
  - 128 cores AMD Epyc 7542 2.9 GHz
  - 512 GB RAM
  - Connection to UPS
- 18 GPUv1 hypervisors, each with
  - 128 cores AMD Epyc 7542 2.9 GHz
  - 5126 GB RAM
  - 2 NVIDIA Tesla 4 GPUs
  - Connection to UPS
- 635 TB usable storage volume
- Various VM images, flavours and instance types

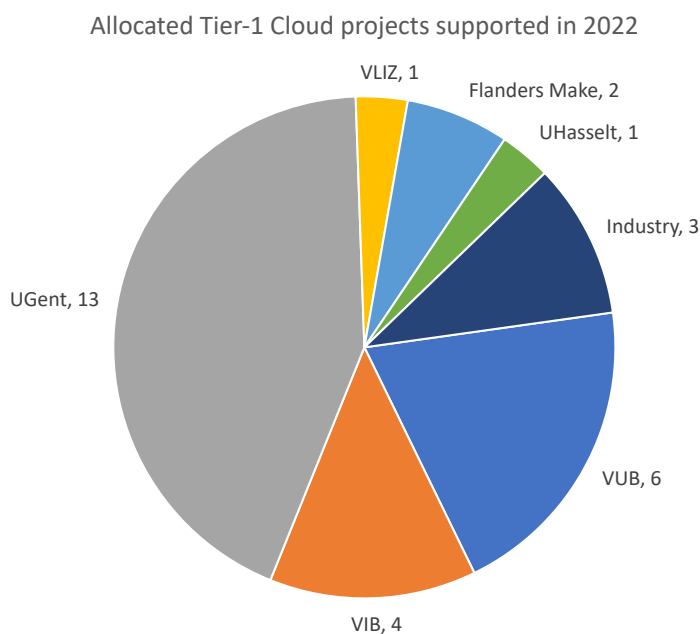
This infrastructure is hosted by Ghent University, and maintained and supported by the HPC-UGent team.



Access to the Tier-1 Cloud infrastructure is project-based and under supervision of the VSC (<https://www.vscentrum.be/cloud>). The table below summarizes the number of projects that were supported in 2022, listed by category.

Projects supported on Tier-1 Cloud in 2022	
Category	# projects
Pilot projects	6
2021 projects	15
2022 projects	5
Starting grants	9
Industry	3

The graph below illustrates how these projects are distributed over research institutes.



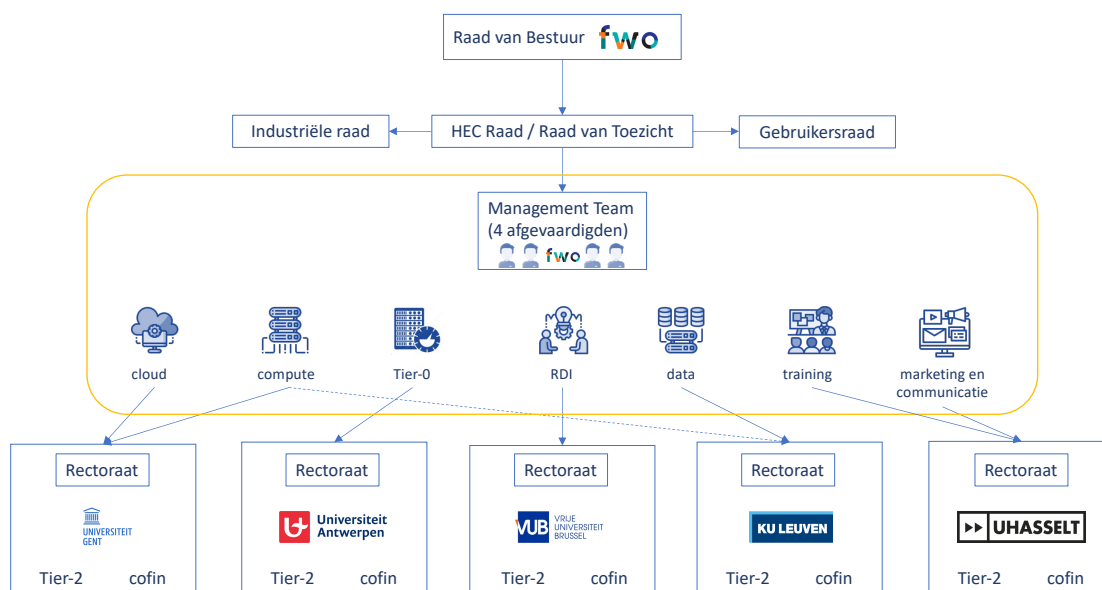
## 4.4 Transition to VSC 2.0 plan

In the second half of 2022, a lot of VSC activities went into the VSC 2.0 plan. This strategic/operational plan is the follow-up to the VSC Tier1 Supercomputing-as-a-Service plan of 2018-2022.

Important take-away of the VSC 2.0 plan is a new structure for the VSC governance as of 2023 (see also <https://www.vscentrum.be/org>), with several operational, strategic and advisory boards:

- High-end Computing Board Flanders
  - UGent representative Johan Van Camp (DICT)
- Management Team
  - UGent representative Ewald Pauwels (DICT)
- User committee
  - UGent representative Jan Goedgebeur
- Industrial board
  - Advisory board to promote and facilitate interaction with the Flemish industry
- Tier-1 evaluation committee
  - Evaluates applications for Tier-1 access on technical grounds

In addition, specific roles are more clearly defined for the VSC consortium partners, spanning cloud, compute, tier-0, research/development/innovation (RDI), data, training, marketing/communication services.



More elaborate information on the VSC 2.0 plan will appear in the VSC annual report of 2022 (<https://www.vscentrum.be/publications>).

## 4.5 Strategic/operational meetings in 2022

Date	Event
24/01/2022 7/02/2022 23/02/2022 21/03/2022 25/04/2022 23/05/2022 21/06/2022 31/08/2022 8/09/2022 19/09/2022 27/09/2022 24/10/2022 10/11/2022 17/11/2022 21/11/2022 28/11/2022 19/12/2022	VSC operational team meetings Regular (monthly) meeting and ad-hoc meetings to discuss VSC 2.0 plan Virtual meetings and at FWO offices, Brussels (Belgium)
6/10/2022 25/11/2022	Presentation by VSC operational team on VSC high-end computing council meeting Virtual meetings
7/02/2022 25/02/2022 1/07/2022 14/10/2022	Tier1 allocation board Virtual meeting or at FWO offices, Brussels (Belgium)
24/10/2022	VSC user council FWO offices, Brussels (Belgium)

## 5 TRAINING AND SUPPORT

### 5.1 Training overview and evaluations



#### 5.1.1 Introduction to HPC @ Ghent University

Trainer: Kenneth Hoste (HPC-UGent)

Date	#participants
13/05/2022 (remote)	67 (2 external)
18/11/2022 (hybrid)	41 (1 external)

Satisfaction scores <sup>1</sup>	
Training content	94%
Lecturer	100%
Hands-on	74%

Selected suggestions for improvement and remarks:

- This was a nice introduction on how to get started using the HPC services at Ghent.
- More code demo and examples would be nice. Thanks!
- Very to-the-point presentation. Basic theory, exciting visit to the datacenter, possibility to experiment. Perfect concept.

#### 5.1.2 Intro to Materials AI

This training session was organized in collaboration with ePotentia (<https://www.epotentia.com>), VSC and EuroCC, as part of an industry promotion track: <https://www.eventbrite.be/e/intro-to-materials-ai-tickets-347191949467>

This was a live event, taking place at Multimediazal S9, campus Sterre, Krijgslaan 281, 9000 Gent. The training also featured a practical session on Tier1 Hortense which was supported by the HPC-UGent team.

<sup>1</sup> These satisfaction scores indicate positive response of evaluation respondents on questions "The presentation gave me all the information I wanted" (Yes or Mostly) or "This course helped build up my knowledge of the topic at hand" (Strongly Agree or Agree); "The lecturer presented well" (Strongly Agree or Agree) or "The lecturer(s) had the expertise required to meaningfully elaborate upon the subject of the course" (Strongly Agree or Agree); and "The hands-on session was in accordance with my expectations" (Strongly agree or Agree).

Trainers (ePotentia): Michael Sluydts, Dietmar Hertsen, Catharina Jaeken

Date	#participants
27/06/2022	27 (10 external)



## 5.2 Community meetings and lectures

### 5.2.1 HPC-UGent user meeting

Purpose of this meeting is to inform all users about future plans for the HPC-UGent infrastructure, and to bring together users and the HPC-UGent team. Featured presentation “HPC-UGent update”.

Date	#participants
8/07/2022	26

## 5.2.2 AlphaFold community @ VSC

Keynote presentation “Getting started with AlphaFold: installation and performance”, part of first VSC AlphaFold community meetup 30/03/2022 (virtual).

<https://www.vscentrum.be/alphafold>

AlphaFold has been called one of the biggest breakthroughs in biology and AI, generating new insights and understanding of fundamental processes related to health and disease, with biotechnology, medicine, agriculture, food science, and bioengineering applications.

## 5.2.3 EasyBuild introduction training @ VSC

Introduction training session for VSC staff collaborating in the VSC central software installation project 29/06/2022 (virtual).

## 5.2.4 VSC user day @ UGent

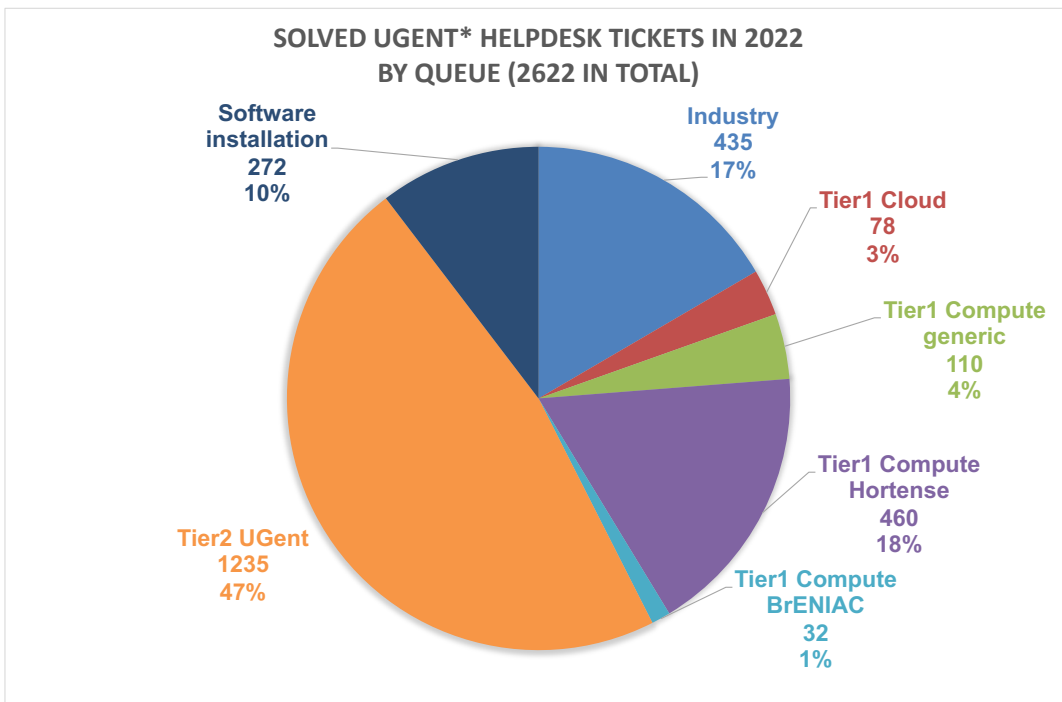
HPC-UGent and VSC organized a live event at Ghent University, gathering users and consortium partners of the VSC. HPC-UGent also presented the new Tier-1 supercomputer Hortense by presentation “*Introduction of VSC Tier-1 Compute Hortense features*” and organized a tour of the UGent datacenter for all participants.

Date	#registered
21/06/2022	82

## 5.3 Helpdesk

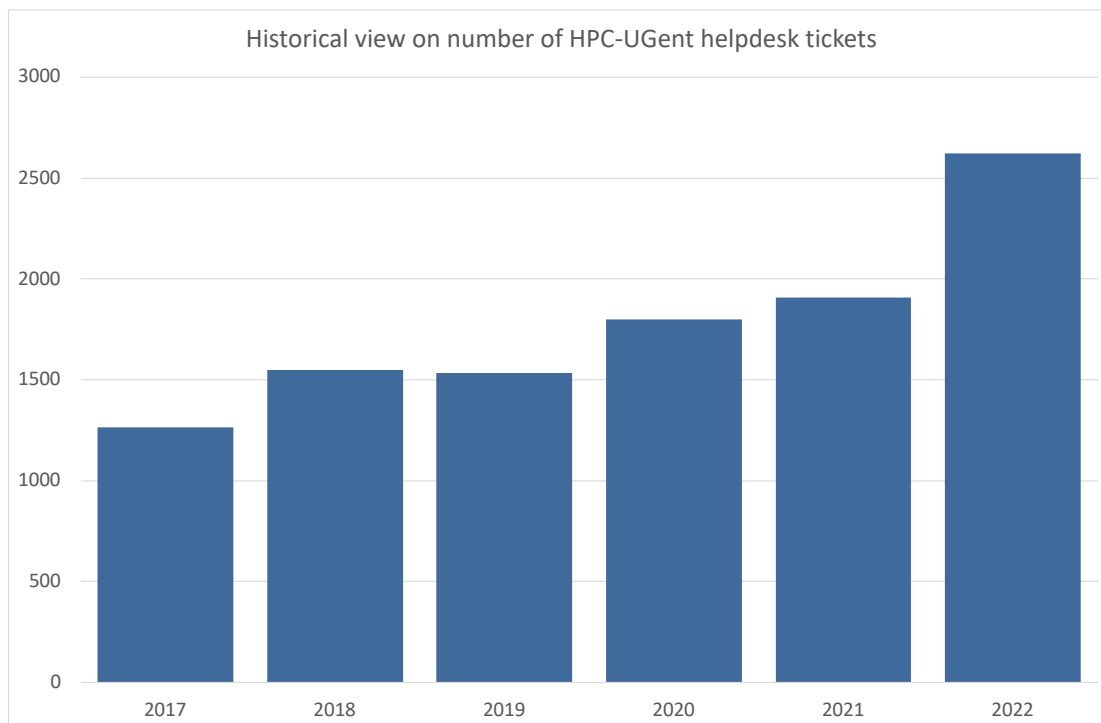
### 5.3.1 Number of tickets

In all, 2622 tickets were resolved in 2022, distributed over 7 different helpdesk queues. These queues were installed to better deal with the support questions relating to different infrastructure platforms and services, whether within Ghent University or VSC. The tickets in the Tier1 Compute BrENIAC queue were resolved by the VSC colleagues from KU Leuven, relating to the BrENIAC Tier1 Compute infrastructure.



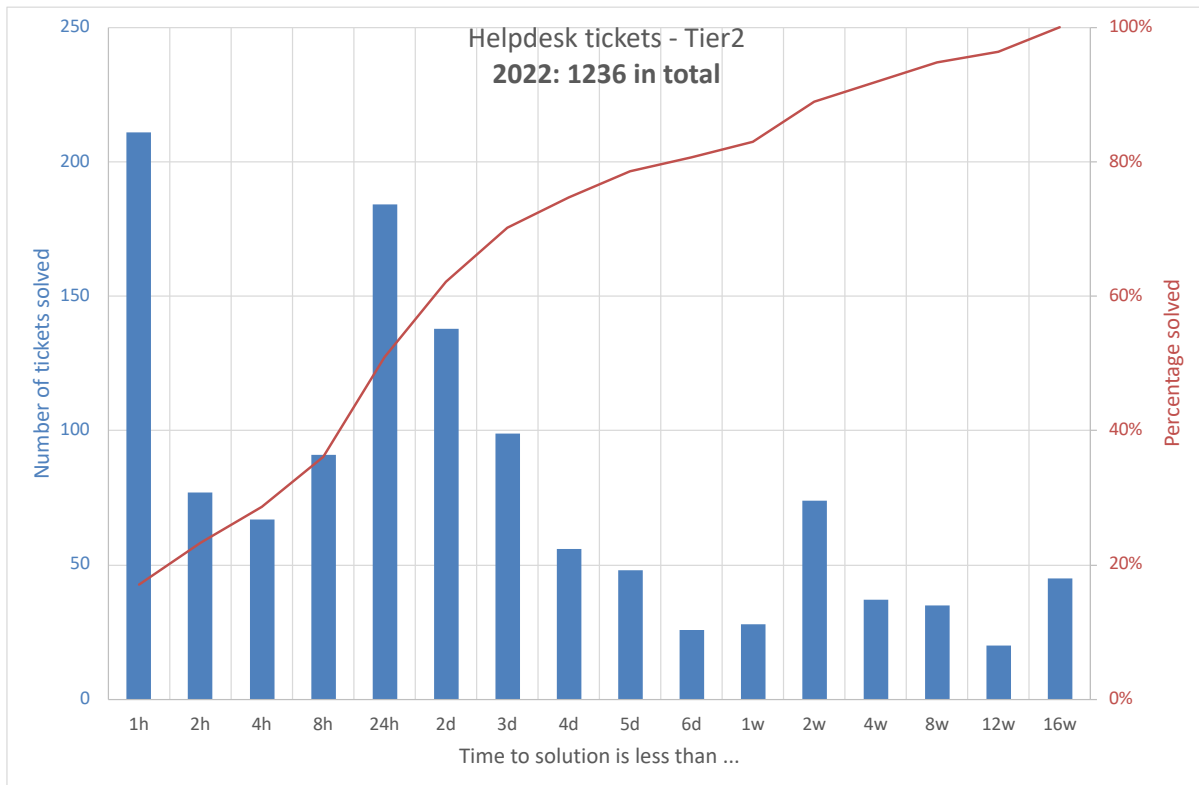
### 5.3.2 Historical perspective on number of tickets

Quite clearly, the number of tickets that HPC-UGent receives and solves is on the rise. To some extent, this is related to the Tier1 Compute and Tier1 Cloud infrastructures, which HPC-UGent supports for VSC. However, the rise also reflects that gradually more, new research fields are actively venturing into scientific computing.

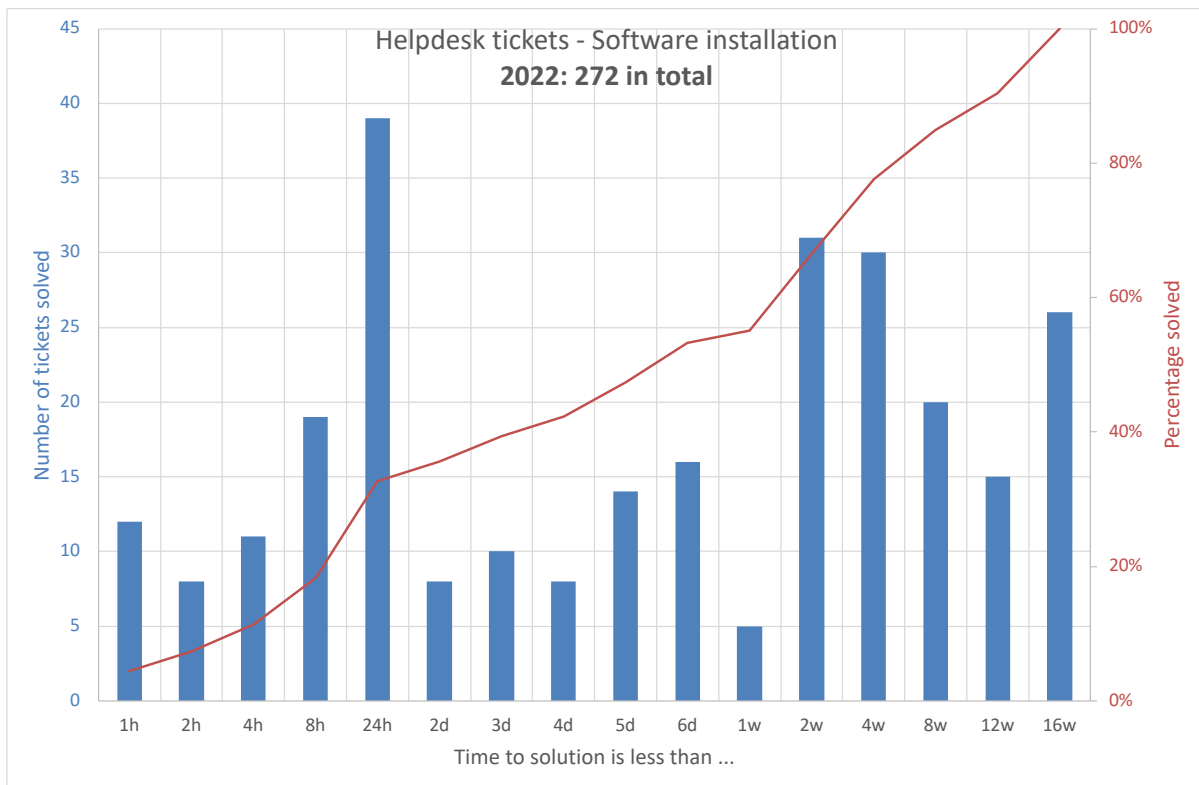




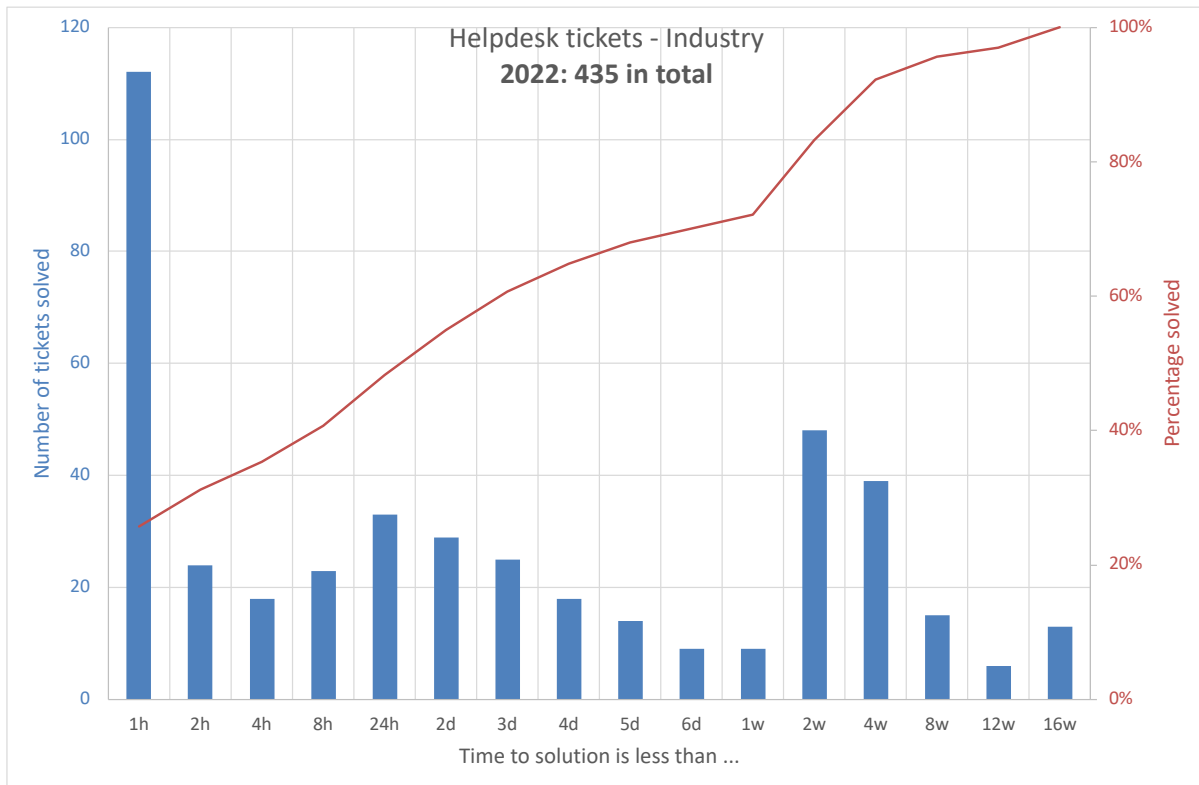
### 5.3.3 Average time to resolution – Tier2 tickets



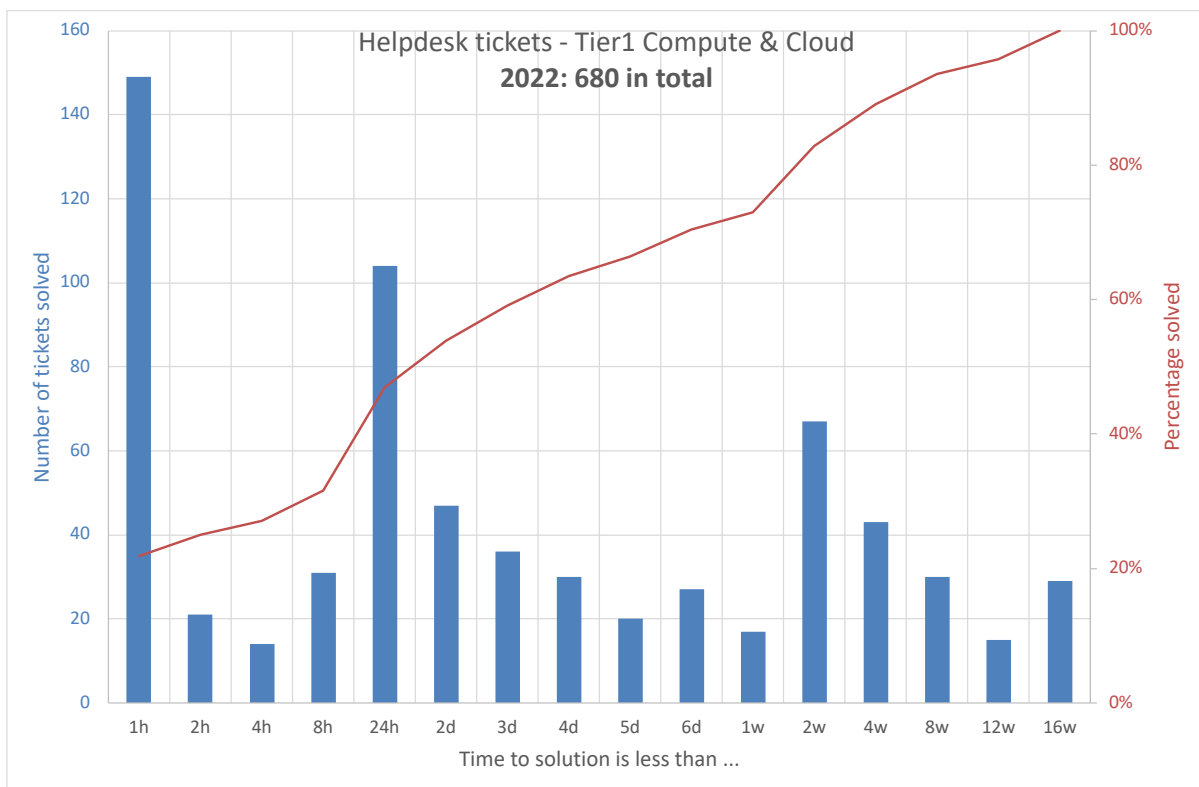
### 5.3.4 Average time to resolution – software installation requests



### 5.3.5 Average time to resolution – Industry tickets



### 5.3.6 Average time to resolution – Tier1 Compute and Tier1 Cloud tickets



## 5.4 User evaluation

As part of the strategic/operational transition towards the VSC 2.0 plan, the VSC management team will organize a user evaluation in 2023, a.o. relating to the services performed in 2022. This evaluation will also offer the opportunity for users to reflect on HPC-UGent services. As such, we have decided not to organize a separate user evaluation.

The results of the evaluation will be published on the VSC website in 2023.

## 6 OUTREACH

### 6.1 Within Ghent University

Date	Event
11/02/2022 17/03/2022 9/05/2022 23/06/2022	The HPC-UGent team regularly meets with the UGent data stewards. The scope here is broader than the typical HPC-UGent community of users, comprising all UGent researchers and all infrastructure and services of the ICT department (DICT).
22/04/2022	<i>"HPC-UGent update"</i> UGent ICT user committee
16/05/2022	HPC and UGent datacenter tour for students Bachelor of Physics and Astronomy (UGent)



20/05/2022	<i>"HPC-UGent update"</i> UGent ICT user committee
26/09/2022	Visietraject Universiteitsbibliotheek UGent Vandenhove Paviljoen, UGent <i>"HPC-UGent and scientific software"</i> presentation

11/10/2022	Short Sessions on Hot Topics (SSHT) – Faculty of Economics and Business Administration Virtual meeting “Overview of DICT storage platforms” Lecture providing overview of DICT storage platforms, highlighting applied use cases and practical usage of platforms.
15/11/2022	HPC and UGent datacenter tour for students in the course “Python for Scientists” (UGent)

## 6.2 To policy makers, industry and general public

Date	Event
16/02/2022	“EESSI: A cross-platform ready-to-use optimised scientific software stack” Journal of Software: Practice and Experience Volume 53, Issue 1 Pages 176-210 Bob Dröge, Victor Holanda Rusu, Kenneth Hoste, Caspar van Leeuwen, Alan O’Cais, Thomas Röblitz <a href="https://doi.org/10.1002/spe.3075">https://doi.org/10.1002/spe.3075</a>
15/03/2022	VSC Tier-1 Hortense kickoff meeting Virtual meeting Organized by HPC-UGent <a href="https://www.youtube.com/watch?v=ENQrgMc2BAY">https://www.youtube.com/watch?v=ENQrgMc2BAY</a>
1/11/2022	CoderDojo meets VSC HPC and UGent datacenter tour for volunteers of Belgian CoderDojo foundation <a href="https://www.coderdojobelgium.be">https://www.coderdojobelgium.be</a>



### 6.3 Within the EuroCC project

Within the EuroCC project under the European Union's Horizon 2020 program (H2020), participating countries are tasked with establishing a single National Competence Centre (NCC) in the area of high-performance computing (HPC) and high-performance data analytics (HPDA). Each NCC will coordinate activities in all HPC-related fields at the national level and serve as a contact point for customers from industry, science, (future) HPC experts, and the general public alike.

For Belgium, the NCC (<https://www.enccb.be>) is a consortium of 12 entities, including Ghent University. HPC-UGent represents Ghent University in this consortium and is joint task-leader of WP30.5, set on mapping HPC/Big Data/AI technical competences within Belgium. UGent is further involved as a contributor in WP30.3 focusing on 'Technology Transfer/Business Development' and WP30.4 'Collaboration with Industry'.

The EuroCC 1.0 project was finalized in 2022. A follow-up project – EuroCC 2.0 – has been submitted and is accepted by EuroHPC. However, Ghent University and HPC-UGent are no longer part of this consortium. HPC-UGent will remain in contact with the Belgian NCC, which will carry out the EuroCC 2.0 project.

Date	Event
20/01/2022 23/02/2022 22/03/2022 26/04/2022 9/06/2022	EuroCC Belgium regular WP30.3/WP30.4/WP30.5 meetings Virtual meetings
11/02/2022	EuroCC Mentoring Workshop: Programming Best Practice and Industrial Software Development Virtual meeting
7/03/2022	EuroCC Mentoring Workshop - HPC Disruptive Technologies for Industry Virtual meeting
14/03/2022	EuroCC-CASTIEL Studio Session: NCCs and Big Industry Virtual meeting
15/03/2022	EuroCC lecture: The ecosystems of HPC and Big Data/AI: what can they learn from each other Virtual meeting
28/03/2022	EuroCC Belgium - best practices with industry Virtual meeting
1/04/2022	EuroCC Belgium (all hands) meeting Virtual meeting
7/04/2022	EuroCC Belgium - Marketplace demo Virtual meeting

26/04/2022	From Edge computing to HPC: EuroCC and CASTIEL meet ETP4HPC Virtual meeting
28/04/2022	Meeting on EuroCC, EuroCC2, CASTIEL, CASTIEL2 Virtual meeting
3/05/2022	EuroCC Belgium feedback Virtual meeting
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22/06/2022 26/09/2022 29/11/2022	EuroCC Belgium general meeting Virtual meeting
3/12/2022	Virtual EuroCC & CASTIEL Joint Conference Final EuroCC 1.0 workshop Virtual meeting

## 6.4 Within international HPC community

Date	Event
24-28/01/2022	7th EasyBuild User Meeting (EUM'22) Virtual meeting <a href="https://easybuild.io/eum22/">https://easybuild.io/eum22/</a> Co-organised by HPC-UGent
5/02/2022	FOSDEM 2022 Virtual meeting Co-organization and support of "HPC, Big Data, and Data Science devroom" <a href="https://archive.fosdem.org/2022/schedule/track/hpc_big_data_and_data_science/">https://archive.fosdem.org/2022/schedule/track/hpc_big_data_and_data_science/</a>
24/02/2022	TETRA OpenCloudEdge Remote participation Presentation "VSC Tier-1 Cloud: Typical use cases" <a href="https://www.opencloudedge.be">https://www.opencloudedge.be</a>
9/03/2022	HPC-AI Advisory Council Swiss Conference Virtual meeting "From EasyBuild to EESSI" presentation <a href="https://www.hpcadvisorycouncil.com/events/2022/swiss-conference/agenda.php">https://www.hpcadvisorycouncil.com/events/2022/swiss-conference/agenda.php</a>

29/05/2022	ISC'22 EasyBuild introductory tutorial Co-organised HPC-UGent <a href="https://tutorial.easybuild.io/2022-isc22/">https://tutorial.easybuild.io/2022-isc22/</a>
31/05-2/06/2022	OpenNebulaCon 2022 Virtual event "HPC workloads and services on OpenNebula" presentation <a href="https://opennebula.io/opennebula-conferences/opennebula-con-2022/">https://opennebula.io/opennebula-conferences/opennebula-con-2022/</a>
16/06/2022	"From EasyBuild to EESSI" Presentation for Cuban HPC system administrators, as part of VLIR project. S10, campus Sterre, UGent (Belgium)
23/06/2022	EasyBuild Tech Talks VI Virtual meeting "mold: A Modern Linker" by Rui Ueyama Co-organised by HPC-UGent <a href="https://easybuild.io/tech-talks/006_mold.html">https://easybuild.io/tech-talks/006_mold.html</a>
30/06/2022	EasyBuild Tech Talks VII Virtual meeting "ISC'22 Student Cluster Competition" by Team NotOnlyFlops (UPC/BSC) + Team RACKlette (CSCS) Co-organised by HPC-UGent <a href="https://easybuild.io/tech-talks/007_scc_isc22.html">https://easybuild.io/tech-talks/007_scc_isc22.html</a>
24/08/2022	RISC2 invited webinar (virtual) "Getting Scientific Software Installed: From EasyBuild to EESSI" <a href="https://www.risc2-project.eu/events/1st-webinar-series-hpc-system-tools/">https://www.risc2-project.eu/events/1st-webinar-series-hpc-system-tools/</a>
12-13/09/2022	CernVM workshop Amsterdam, the Netherlands Presentation "The European Environment for Scientific Software Installations (EESSI)" <a href="https://indico.cern.ch/event/1079490/timetable/">https://indico.cern.ch/event/1079490/timetable/</a>
14-16/09/2022	EESSI Community Meeting Amsterdam, the Netherlands Co-organised by HPC-UGent <a href="https://eessi.github.io/docs/meetings/2022-09-amsterdam/">https://eessi.github.io/docs/meetings/2022-09-amsterdam/</a>
7-11/11/2022	BioHackathon Europe (ELIXIR Europe) Remote participation <a href="https://2022.biohackathon-europe.org">https://2022.biohackathon-europe.org</a>



14/11/2022	<p>"EasyBuild: into a new decade"  Virtual webinar, commemorating 10 years of EasyBuild  <a href="https://www.youtube.com/watch?v=crXchK5SRys">https://www.youtube.com/watch?v=crXchK5SRys</a></p>
6/01/2022 11/01/2022 3/02/2022 18/02/2022 3/03/2022 7/04/2022 5/05/2022 2/06/2022 7/07/2022 4/08/2022 1/09/2022 6/10/2022 28/10/2022 3/11/2022 1/12/2022 9/12/2022	<p>Monthly "<i>European Environment for Scientific Software Installations (EESSI)</i>" update meetings  Remote  <a href="https://github.com/EESSI/meetings/wiki#2022">https://github.com/EESSI/meetings/wiki#2022</a><a href="https://www.eessi-hpc.org/">https://www.eessi-hpc.org/</a></p>

## 7 PARTICIPATION AND ACTIVITIES IN EUROCC

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## 8 BUDGET

Budget line	Funding
FWO recurrent subsidy for personnel (Tier1+2)	700.000
FWO recurrent subsidy for investment and operations	1.181.316
FWO project subsidy Tier1 compute	6.500.699
FWO project subsidy Tier1 cloud	950.000
FWO project subsidy Tier1 compute and cloud – power	408.907
FWO project subsidy Tier1 integration	100.000
FWO project subsidy Tier1 operational management team – staff	63.333,33
FWO project subsidy Tier1 cloud – staff	190.000
	euro

## 9 USERS IN THE SPOTLIGHT

Several UGent researchers in the field of digital humanities featured in engaging video testimonials for the Flemish Supercomputer Center (VSC) in 2022.

Sally Chambers, Coordinator Digital Humanities Research, Ghent Centre for Digital Humanities

<https://www.ghentcdh.ugent.be>



Check out the full testimonial at <https://youtu.be/uOOTmZLSIbA>

Julie Birkholz, Assistant Professor Digital Humanities at UGent and Lead of the Royal Library of Belgium's Digital Research Lab

<https://www.kbr.be/en/projects/digital-research-lab/>



Check out the full testimonial at <https://youtu.be/ziOUGqymbYY>

PathoSense – a UGent spin-off – specializes in offering revolutionary and complete diagnostics of infectious diseases in veterinary medicine, with added support.

Sebastiaan Theuns, co-founder

Nick Vereecke, R&D scientist

<https://www.pathosense.com>



Check out the full testimonial at <https://youtu.be/NdCVcDwUJic>