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PRACE Sixth Implementation Phase Project

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Interim report on the PRACE and EuroHPC Operational Services

Final

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References and Applicable Documents

[1] EasyBuild framework: https://easybuild.io/
[2] PRACE Training Portal: https://training.prace-ri.eu/
[3] PRACE Materials Repository: https://materials.prace-ri.eu/
[4] FirecREST: https://github.com/eth-cscs/firecrest

List of Acronyms and Abbreviations

AAA	Authorisation, Authentication, Accounting
AAI	Authorisation and Authentication Infrastructure
AARC	Authentication and Authorisation for Research and Collaboration
AEGIS	AARC Engagement Group for Infrastructures
aisbl	Association International Sans But Lucratif (legal form of the PRACE-RI)
APGridPMA	The Asian Pacific Grid Policy Management Authority
BGP	Border Gateway Protocol
BSS	Batch Scheduling System
BDW	Intel Broadwell CPU family
CA	Certificate Authority
CLI	Command Line Interfaces
CoE	Center of Excellence
CPU	Central Processing Unit
CP/CPS	Certificate Policy/Certification Practice Statement
CSIRT	Computer Security Incident Response Team
CUDA	Compute Unified Device Architecture (NVIDIA)
DARPA	Defense Advanced Research Projects Agency
DART	Distributed Accounting Reporting Tool
DEISA	Distributed European Infrastructure for Supercomputing Applications EU project by leading national HPC centres
DoA	Description of Action (formerly known as DoW)
EC	European Commission
EESI	European Exascale Software Initiative
EoI	Expression of Interest
EOSC	European Open Science Cloud
ESFRI	European Strategy Forum on Research Infrastructures
EUDAT	European Data Infrastructure
EUGridPMA	European Grid Policy Management Authority
Fenix	Fenix Research Infrastructure
GB	Giga (= 2^{30} ~ 10^9) Bytes (= 8 bits), also GByte
Gb/s	Giga (= 10^9) bits per second, also Gbit/s
GB/s	Giga (= 10^9) Bytes (= 8 bits) per second, also GByte/s
GCT	Grid Community Toolkit
GÉANT	Collaboration between National Research and Education Networks to build a multi-gigabit pan-European network. The current EC-funded project as of 2015 is GN4.
GFlop/s	Giga (= 10^9) Floating point operations (usually in 64-bit, i.e. DP) per second, also GF/s
GHz	Giga (= 10^9) Hertz, frequency =10^9 periods or clock cycles per second
GPU	Graphic Processing Unit
GridCF	Grid Community Forum
GSI	Grid Security Infrastructure
GT	Globus Toolkit
HET	High Performance Computing in Europe Taskforce. Taskforce by representatives from European HPC community to shape the European HPC Research Infrastructure. Produced the scientific case and valuable groundwork for the PRACE project.
HPC	High Performance Computing; Computing at a high performance level at any given time; often used synonym with Supercomputing

HPL	High Performance LINPACK
HTML	HyperText Markup Language
IGTF	Interoperable Global Trust Federation
ISC	International Supercomputing Conference; European equivalent to the US based SCxx conference. Held annually in Germany.
KB	Kilo (= 2^{10} ~10^{3}) Bytes (= 8 bits), also Kbyte
KPI	Key Performance Indicator
KNL	Intel Knights Landing CPU family
LoA	Level of Assurance
LDAP	Lightweight Directory Access Protocol
LINPACK	Software library for Linear Algebra
MB	Management Board (highest decision making body of the project)
MB	Mega (= 2^{20} ~ 10^{6}) Bytes (= 8 bits), also MByte
MB/s	Mega (= 10^{6}) Bytes (= 8 bits) per second, also MByte/s
MD-VPN	Multi Domain Virtual Private Network
MFlop/s	Mega (= 10^{6}) Floating point operations (usually in 64-bit, i.e. DP) per second, also MF/s
MOOC	Massively open online Course
MoU	Memorandum of Understanding.
MPI	Message Passing Interface
NDA	Non-Disclosure Agreement. Typically signed between vendors and customers working together on products prior to their general availability or announcement.
NeIC	Nordic e-Infrastructure Collaboration
OoD	Operator on Duty
OS	Operating System
PA	Preparatory Access (to PRACE resources)
PATC	PRACE Advanced Training Centres
PCPE	PRACE Common Production Environment
PFlop/s	Peta (= 10^{15}) Floating-point operations (usually in 64-bit, i.e. DP) per second, also PF/s
PKI	Public Key Infrastructure
PMA	Policy Management Authority
PRACE	Partnership for Advanced Computing in Europe; Project Acronym
PRACE 2	The upcoming next phase of the PRACE Research Infrastructure following the initial five year period.
PTC	PRACE Training Centres
RHEL	Red Hat Enterprise Linux
RI	Research Infrastructure
RT	Request Tracker, same as TTS
SCI	Security for Collaborating Infrastructures
SSH	Secure Shell
SVN	SubVersioN: software versioning and revision system
TAGPMA	The Americas Grid PMA
PPRT	PRACE Project Proposal Review Tool
PRACE BoD	PRACE Board of Directors
PRACE TB	PRACE 5IP Technical Board (group of Work Package leaders)
PUHURI	Puhuri Project, NeIC
REFEDS	Research and Education FEDerations group
TB	Tera (= 2^{40} ~ 10^{12}) Bytes (= 8 bits), also TByte

TCO	Total Cost of Ownership. Includes recurring costs (e.g. personnel, power, cooling, maintenance) in addition to the purchase cost.
TDP	Thermal Design Power
TFlop/s	Tera (= 10^{12}) Floating-point operations (usually in 64-bit, i.e. DP) per second, also TF/s
Tier-0	Denotes the apex of a conceptual pyramid of HPC systems. In this context the Supercomputing Research Infrastructure would host the Tier-0 systems; national or topical HPC centres would constitute Tier-1
TTS	Trouble Ticket System, same as RT
UNICORE	Uniform Interface to Computing Resources. Grid software for seamless access to distributed resources.
VPN	Virtual Private Network
WISE	Wise Information Security for collaborating E-infrastructures
WP	PRACE Work Package

List of Project Partner Acronyms

BADW-LRZ	Leibniz-Rechenzentrum der Bayerischen Akademie der Wissenschaften, Germany (3rd Party to GCS)
BILKENT	Bilkent University, Turkey (3rd Party to UHEM)
BSC	Barcelona Supercomputing Center - Centro Nacional de Supercomputacion, Spain
CaSToRC	The Computation-based Science and Technology Research Center (CaSToRC), The Cyprus Institute, Cyprus
CCSAS	Computing Centre of the Slovak Academy of Sciences, Slovakia
CEA	Commissariat à l'Energie Atomique et aux Energies Alternatives, France (3rd Party to GENCI)
CENAERO	Centre de Recherche en Aéronautique ASBL, Belgium (3rd Party to UANTWERPEN)
CESGA	Fundacion Publica Gallega Centro Tecnológico de Supercomputación de Galicia, Spain, (3rd Party to BSC)
CINECA	CINECA Consorzio Interuniversitario, Italy
CINES	Centre Informatique National de l'Enseignement Supérieur, France (3 rd Party to GENCI)
CNRS	Centre National de la Recherche Scientifique, France (3 rd Party to GENCI)
CSC	CSC Scientific Computing Ltd., Finland
CSIC	Spanish Council for Scientific Research (3rd Party to BSC)
CYFRONET	Academic Computing Centre CYFRONET AGH, Poland (3rd Party to PNSC)
DTU	Technical University of Denmark (3rd Party of UCPH)
EPCC	EPCC at The University of Edinburgh, UK
EUDAT	EUDAT OY
ETH Zurich (CSCS)	Eidgenössische Technische Hochschule Zürich – CSCS, Switzerland
GCS	Gauss Centre for Supercomputing e.V., Germany
GÉANT	GÉANT Vereniging
GENCI	Grand Equipement National de Calcul Intensif, France
GRNET	National Infrastructures for Research and Technology, Greece
ICREA	Catalan Institution for Research and Advanced Studies (3rd Party to BSC)

INRIA	Institut National de Recherche en Informatique et Automatique, France (3rd Party to GENCI)
IST-ID	Instituto Superior Técnico for Research and Development, Portugal (3rd Party to UC-LCA)
IT4I/VSB-TUO	Vysoka Skola Banska - Technicka Univerzita Ostrava, Czech Republic
IUCC	Machba - Inter University Computation Centre, Israel
JUELICH	Forschungszentrum Jülich GmbH, Germany
KIFÜ (NIIFI)	Governmental Information Technology Development Agency, Hungary
KTH	Royal Institute of Technology, Sweden (3rd Party to SNIC-UU), also PDC-KTH
KULEUVEN	Katholieke Universiteit Leuven, Belgium (3rd Party to UANTWERPEN)
LiU	Linkoping University, Sweden (3rd Party to SNIC-UU)
MPCDF	Max Planck Gesellschaft zur Förderung der Wissenschaften e.V., Germany (3rd Party to GCS)
NCSA	NATIONAL CENTRE FOR SUPERCOMPUTING APPLICATIONS, Bulgaria
NTNU	The Norwegian University of Science and Technology, Norway (3rd Party to SIGMA2)
NUI-Galway	National University of Ireland Galway, Ireland
PRACE	Partnership for Advanced Computing in Europe aisbl, Belgium
PSNC	Poznan Supercomputing and Networking Center, Poland
SDU	University of Southern Denmark (3rd Party to UCPH)
SIGMA2	UNINETT Sigma2 AS, Norway
SNIC-UU	Uppsala Universitet, Sweden
STFC	Science and Technology Facilities Council, UK (3rd Party to UEDIN)
SURF	SURF is the collaborative organisation for ICT in Dutch education and research
TASK	Politechnika Gdańska (3rd Party to PNSC)
TU Wien	Technische Universität Wien, Austria
UANTWERPEN	Universiteit Antwerpen, Belgium
UC-LCA	Universidade de Coimbra, Labotatório de Computação Avançada, Portugal
UCPH	Københavns Universitet, Denmark
UEDIN	The University of Edinburgh
UHEM	The National Center for High Performance Computing, Turkey
UIBK	Universität Innsbruck, Austria (3rd Party to TU Wien)
UiO	University of Oslo, Norway (3rd Party to SIGMA2)
UL	UNIVERZA V LJUBLJANI, Slovenia
ULIEGE	Université de Liège; Belgium (3rd Party to UANTWERPEN)
U Luxembourg	University of Luxembourg
UM	Universidade do Minho, Portugal, (3rd Party to UC-LCA)
UmU	Umea University, Sweden (3rd Party to SNIC-UU)
UnivEvora	Universidade de Évora, Portugal (3rd Party to UC-LCA)
UnivPorto	Universidade do Porto, Portugal (3rd Party to UC-LCA)
UPC	Universitat Politècnica de Catalunya, Spain (3rd Party to BSC)
USTUTT-HLRS	Universitaet Stuttgart – HLRS, Germany (3rd Party to GCS)
WCSS	Politechnika Wroclawska, Poland (3rd Party to PNSC)

Executive Summary

The deliverable presents the activities in the reporting period (August 2020 - December 2021) to operate and coordinate the common PRACE Operational Services, foreseen by Task 6.1 of WP6 within PRACE-6IP project. The operation of PRACE distributed HPC infrastructure involves the coordination of a set of services which integrate the Tier-0 systems and a number of national Tier-1 systems into a single pan-European HPC infrastructure.

This work is the continuation of the work done by Task 6.1 in the previous period of PRACE-6IP as well as previous PRACE-IP projects to provide continuity to the PRACE Operational Services for the HPC ecosystem.

Nine Tier-0 systems in five countries were operational in the first year of the PRACE-6IP project period. Furthermore, operational support has been provided to twenty national Tier-1 systems that provide services for Tier-0 (i.e. used from SMEs for the SHAPE activity, as stepping stone towards Tier-0 systems, or to prototype and asses new operational services). These Tier-1 systems are distributed among thirteen different countries, ensuring a wide distribution of the European HPC ecosystem and hosting DECI project call awardees.

Continuation of adopting the last revision of the PRACE Service Catalogue, which describes the common services of PRACE to further guide the operational activity, has been completed. The PRACE Service Catalogue represents a living document currently in version 3.4.

Based on the procedures for incident and change management, the complete set of common services as defined in the PRACE Service Catalogue (Networking, Data, AAA, User, Monitoring and Generic) has been operated and monitored on a day-by-day basis to assure continuity and integrity of the services.

Further development to establish a new federated approach to PRACE AAI was pursued with work addressing the architecture both from technical as well as procedural point of view.

The Security Forum, responsible for all security related activities, was also coordinated by Task 6.1.

All activities are coordinated with videoconferences of all participating partners on bi-weekly period to monitor the infrastructure and prevent possible incidents which could cause vulnerabilities on the PRACE RI. A continuous operator on duty service is provided by partners overseeing the state of systems, network and help desk.

Activity towards EuroHPC started to establish a way for knowledge transfer focused on the operational procedures and setups from PRACE to new EuroHPC petascale hosting sites.

1 Introduction

This deliverable describes the activities performed in Task 6.1 "Operation and coordination of the comprehensive common PRACE Operational Services" of WP6 "Operational Services for the HPC ecosystem" in PRACE-6IP. This task is responsible for the operation of the set of common services, which present the PRACE Tier-0 and Tier-1 systems as an integrated pan-European HPC ecosystem. The task supports the PRACE calls, the DECI calls, the SHAPE activity towards SMEs, the prototyping and assessment of new operational services investigated in Tasks 6.2 and 6.3 of PRACE-6IP WP6. Other supported activities are the testing and utilisation of specific architectures and technologies, which are only available in specific countries. Finally, the task also supports the daily operations of PRACE itself and other work packages in the project including the PRACE Website, Training Portal, Events Portal, CodeVault, and User Repository Service.

The operation and coordination of the common PRACE Operational Services provided in Task 6.1 continue well-established management procedures and organisation as set up already since PRACE-1IP. The operation and coordination provided by the task continues an established management procedures and organisation set up already since PRACE-1IP. The task further continues the implementation of the roadmap to a professional service level of sustainable services with a defined quality of service.

This report focuses on the activities conducted in the second reporting period (August 2020 – December 2021) and follows-up the activity undertaken during the first reporting period of PRACE-6IP.

In the reporting period, the operation of the common PRACE Operational Services has been coordinated and monitored constantly by means of bi-weekly videoconferences. Due to the COVID-19 pandemic, two WP6 Face-to-Face meetings have been organised in a virtual format, on 14th–15th of January 2021 and 5th–7th of October 2021. These meetings aimed to discuss the status of the operational activity and to plan the activity for the subsequent periods.

Section 2 describes the status of the Tier-0 systems and the Tier-1 systems involved in the Tier-1 for Tier-0 activity, composing the PRACE HPC ecosystem. Section 3 describes the activities done in the reporting period by the different service areas:

- Network services;
- Data services;
- Authorisation, Authentication and Accounting;
- Operational security;
- User services;
- Monitoring services for operations;
- Generic services.

Section 4 then lists the interaction with EuroHPC followed by Section 5 with conclusions.

2 PRACE HPC ecosystem: Tier-0 and Tier-1 sites, system upgrades and new systems

This section presents the changes implemented during the reporting period (August 2020 – December 2021) concerning the status of Tier-0 sites and the Tier-1 national sites providing Tier-1 for Tier-0 services. The chronology and the status of the performed system upgrades is reported in detail. In the reporting period, the main tasks of the operational procedures used to offer the PRACE services have been kept similar to what we had in the previous reporting period, mainly organising and overseeing the operator and helpdesk on duty shifts, operational status of the integrated systems and network monitoring from the systems access point of view. The work was the continuation and evolution of the activity already in progress. Efforts have been made to keep the documentation up-to-date and feedback has been periodically inquired from the participant sites.

2.1 Status of Tier-0 & Tier-1 sites

The Tier-0 and Tier-1 systems constitute a HPC eco-system, offering high-level services to the European computational community. At the end of the reporting period, according to the information recorded by all partners, 9 Tier-0 systems and 20 Tier-1 systems are fully or partially integrated and in service. All systems are continuously monitored and the operational quality is assured by employing a specific regular activity provided daily by the members of PRACE-6IP WP6 task 6.1. This On-duty Activity is described below.

2.1.1 On-duty Activity

The On-duty Activity is carried out by the partners on a daily basis following a schedule with weekly shifts. Each shift lasts one week and the schedule is prepared in advance for every calendar year. The topics/incidents reported through this service are mainly related to operational issues and activities needed to maintain the distributed infrastructure in good shape. Specific requests from users are rare and normally are redirected to the local help desk of each individual site.

A weekly report on the On-duty Activity is produced, where the operator has to report any change of the status of the infrastructure, all the problems, the status and any other notification regarding the core services. The related internal documentation is constantly updated, using the report template agreed at the beginning of PRACE-5IP and confirmed for PRACE-6IP.

Starting from January 2020, a schedule has been defined for the 25 PRACE partners involved in the On-duty Activity. Each of them has been in charge for monitoring the infrastructure, and reporting the related issues into the PRACE Operations wiki. The 25 partners involved in the schedule are reported in Table 1 below.

1 BSC	14 NCSA
2 CASTORC	15 KIFÜ
3 CEA	16 PDC
4 CINECA	17 PSNC
5 GRNET	18 WCNS
6 CSC	19 SURF

7 CYFRONET	20 VSB-TUO
8 EPCC	21 UC-LCA
9 JUELICH	22 UHEM
10 HLRS	23 ETH-CSCS
11 ICHEC	24 UNILUX
12 CESGA	25 CCSAS
13 UL	

Table 1: PRACE partners involved in on duty activity for 2020-2021

Each partner was involved in the shift one week out of 25, i.e. every 6 months.

For the six months extension period, the list of sites involved in the On-duty activity has been agreed already and now comprehends 19 sites, listed in Table 2 below.

1 BSC	11 KIFÜ
2 LRZ	12 PDC
3 CEA	13 PSNC
4 CINECA	14 ICHEC
5 GRNET	15 SURF
6 CSC	16 VSB-TUO
7 CYFRONET	17 UC-LCA
8 EPCC	18 ETH-CSCS
9 JUELICH	19 UNILUX
10 HLRS	

Table 2: PRACE partners involved in on duty activity for the 2022 extension period

The Trouble Ticketing System (TTS) tool used by the On-duty Activity staff is the Best Practical RT 4.2.8, an enterprise-grade issue tracking system. It is freely available under the terms of Version 2 of the GNU License. It is hosted by CINECA on a virtual machine and maintained since its deployment during the PRACE-3IP project.

The TTS system is organised in queues where every site is responsible for its own, apart from the "Generic" queue that is in charge of the Operator On Duty. Table 3 lists the sites that have a specific queue defined for themselves and that they are asked to keep monitored.

In the General queue there were 80 tickets created in the last twelve months: 6 of them are still open or new and 74 have been resolved. This means the percentage of resolved tickets with respect to the opened tickets is 92.5%. The activity is related to the traffic on the General Queue where all the tickets are normally created; however, the operator is still responsible to report if a ticket moved into a site queue is not updated for more than a week, and/or if the owner is missing.

1 BSC	17 IDRIS
2 CASTORC	18 IUCC
3 CCSAS	19 JUELICH
4 CEA	20 KIFÜ
5 CESGA	21 LRZ
6 CINECA	22 NCSA
7 CINES	23 PDC

8 CSC	24 PSNC
9 CYFRONET	25 VSB-TUO
10 EPCC	26 RZG
11 ETH-CSCS	27 STFC
12 GRNET	28 SURF
13 HLRS	29 UHEM
14 ICHEC	30 UIO
15 ICM	31 WCSS
16 UC-LCA	32 UL

Table 3: PRACE partners involved in the monitoring of their own TTS queue

2.1.2 Production systems

As of November 2021, the Tier-0 ecosystem is made up of nine systems, distributed in seven sites, operated by seven different partners in the five Hosting Members countries (France, Germany, Italy, Spain and Switzerland) as reported in Table 4.

The peak performance of the Tier-0 systems ranges from just above 2 PFlop/s up to more than 70 PFlop/s for the JUWELS (Booster module) system in Germany. Four Tier-0 systems have accelerator components: JUELICH/JUWELS (cluster module) and CINECA/MARCONI100 with Nvidia V100, JUELICH/JUWELS (Booster module) with Nvidia A100 and CSCS/PizDaint with Nvidia Tesla P100. The most dominant vendors are ATOS/Bull Sequana (four systems) and Lenovo (two systems).

All but one of the Tier-0 systems are ranked in the Top500 (June 2021) and the highest ranked system (JUWELS – Booster module) is in 8th position. Irene (KNL) is currently out of the Top500.

As for the Tier-1 ecosystem, 20 systems are operating as Tier-1 for Tier-0 services. These Tier-1 systems are distributed in 16 different PRACE sites, operated by 14 partners in 13 different European countries. Table 5 presents the list of the Tier-1 systems.

The peak performance ranges from very small system partitions (<30 TFlop/s) up to large systems in excess of 6.8 PFlop/s. Eight systems deliver more than 1 PFlop/s.

More than half of the Tier-1 systems is accelerated, either with Intel Xeon Phi or Nvidia accelerators. Several different vendors and architectures are present and this is a real advantage for the PRACE HPC infrastructure: HPE, SGI, ATOS/Bull, Cray, IBM, Dell and Lenovo are all represented.

In the last twelve months, 5 systems were decommissioned (ARCHER, Abel, Anselm, Galileo, Aurel), and 4 new systems have been integrated or are in the process of being integrated (ARCHER2, Snellius, Puthi, Mahti, Navigator).

The whole infrastructure is constantly in operational status and incidents are infrequent. In the last 12 months, only two unscheduled maintenances have been reported. They all effected one site at a time.

Partner	Country	Tier-0	Architecture - CPU - Accelerator	Rpeak (TFlop/s)
FZJ-JUELICH	Germany	JUWELS (Booster Module)	Atos Sequana XH2000 - AMD EPYC Rome 24-core - Nvidia A100	73,008.0
		JUWELS (Cluster Module)	ATOS Sequana X1000 - Dual Intel Xeon Platinum 8168 - Nvidia V100	9891.1
GCS-LRZ		SuperMUC - NG	Lenovo OceanCat SD650 DWC - Intel SkyLake 24 core; 2.7 GHz	26,900.0
GCS-HLRS		Hawk	HPE Apollo - AMD EPYC Rome 7742; 64-core; 2.25 GHz	25,159.7
GENCI-CEA	France	Irene (SKL)	ATOS/Bull Sequana - Intel SkyLake 8168; 24-core; 2.70 GHz	6,635.5
		Irene (KNL)	ATOS/Bull Sequana - Intel Knights Landing; 68-core; 2.70 GHz	2,339.6
BSC	Spain	Mare Nostrum4	Lenovo SD530 - SkyLake Intel Xeon Platinum 8160; 2x24-core; 2.10 GHz	11,150.0
ETH-CSCS	Switzerland	Piz Daint	Cray XC50 - Intel Xeon E5-2609 v3; 12-core; 2.60 GHz - Nvidia P100	15,988.0
CINECA	Italy	MARCONI 100	IBM Power 9 AC922 (Witherspoon) - 2x16 cores; 2.6 GHz (3.1 GHz) -	32,768.0

Partner	Country	Tier-0	Architecture - CPU - Accelerator	Rpeak (TFlop/s)
			NVidia V100	

Table 4: PRACE Tier-0 systems

Partner	Country	Tier-1	Architecture - CPU - Accelerator	Rpeak (TFlop/s)
EPCC	UK	ARCHER2	HP CRAY EX - AMD EPYC 774; 64-core ; 2.25 GHz -	28,000.0
BSC	Spain	Minotauro	Bull Bullx B505/R421-E4 - Intel Haswell E5-2630 v3; 8-core; 2.60 GHz - Nvidia K80	250.9
SURF	Netherlands	Cartesius	Bull Bullx B720/B710 - Intel Haswell; 12-core; 2.6 GHz + Intel Ivy Bridge; 12-core; 2.4 GHz + Intel Sandy Bridge; 8-core; 2.7 GHz	1,349.0
			Bull Bullx B515 - Intel Ivy Bridge 8 core; 2.5 GHz - Nvidia K40	210.0
			Bull Sequana X1110 - Intel Broadwell 16 core; 2.6 GHz	236.0
			Bull Sequana X1210 - Intel Knights Landing 64 core; 1.3 GHz	48.0
		Snellius	Lenovo - AMD Rome 7H12@2.6GHz - Nvidia A100	CPU >1,500.0 GPU >1,500.0
PDC-KTH	Sweden	Beskow	Cray XC40 - Intel Haswell; 32-core; 2.3 GHz	1,973.0
PSNC-CYFRONET	Poland	Zeus BigMem	HP BL685c G7 AMD - AMD Interlagos; 16-core; 2.3 GHz	61.2
		Prometheus	HP Apollo 8000 -	2,400.0

Partner	Country	Tier-1	Architecture - CPU - Accelerator	Rpeak (TFlop/s)
			Intel Xeon E5-2680 v3; 12-core; 2.5 GHz	
PSNC	Poland	Eagle	Intel Cluster - Intel Haswell E5-2697 v3; 14-core; 2.60 GHz	1,380.0
PSNC - WCSS	Poland	Bem	Intel Cluster - Intel Xeon E5-2670 v3; 2x12-core; 2.30 GHz	860.0
ICHEC	Ireland	Kay	Intel/Penguin Computing - Intel SkyLake Xeon 6148 CPU; 2x20-core; 2.4 GHz	665.0
IT4I/VSB-TUO	Czech Republic	Salomon	SGI ICE-X - Intel Xeon E5-2680v3; 12-core; 2.5 GHz - Intel PHI	2,000.0
KIFÜ	Hungary	Leo	HP SL250s - Intel Xeon E5-2650 v2; 2.60 GHz - Nvidia K20, K40	254.0
		PHItagoras	HP SL250s - Intel Xeon E5-2680 v2; 2.80 GHz - Intel/PHI 7120	27.0
GRNET	Greece	ARIS	IBM NeXtScale nx360 M4 - Intel(R) Xeon(R) CPU E5-2680 v2 @ 2.80 GHz * 2	190.8
			Dell PowerEdge R820 - Intel(R) Xeon(R) CPU E5-4650 v2 @ 2.40 GHz * 4	36.6
			Dell PowerEdge R730 - Intel(R) Xeon(R) CPU E5-2660 v3 @ 2.60 GHz * 2	244.3

Partner	Country	Tier-1	Architecture - CPU - Accelerator	Rpeak (TFlop/s)
			- Nvidia Tesla K40m and Intel Xeon Phi 7120	
			Supermicro SYS-4028GR-TVRT - Intel(R) Xeon(R) CPU E5-2698 v4 @ 2.20 GHz * 2 - Nvidia Tesla V100-SXM2	63.1
CESGA	Spain	Finisterrae	Bull Bullx B505/R424-E4 - Intel Haswell 12-core E5-2680v3; 2.50 GHz - NVidia K80	328.0
UL	Slovenia	HPCFS-U	Intel x64 HPE + Supermicro blades - Intel Xeon E5-2680V3 - NVIDIA Tesla K80	40.0
UHEM	Turkey	Sariyer	Intel x64 (Super Micro / Huawei / DELL) - Intel Xeon (E5-2680V3; 2.50 GHz, E5-2680V4; 2.40 GHz, Gold 6148; 2.40 GHz) - NVIDIA Tesla K20m	225.0
CSC	Finland	Puhti	Atos BullSequana X400 - Intel Xeon Gold 6230 - Nvidia V100	2,688.0
		Mahti	Atos BullSequana XH2000 - EPYC 7H12	7,060.0
UC-LCA	Portugal	Navigator	Fujitsu Primergy - Intel(R) Xeon(R) CPU E5-2697 v2 @ 2.70 GHz+ Intel(R) Xeon(R) Gold 6148 CPU @ 2.40 GHz+ Intel(R) Xeon(R) Gold 6154 CPU @ 3.00 GHz+	246.0

Partner	Country	Tier-1	Architecture - CPU - Accelerator	Rpeak (TFlop/s)
			- NVIDIA V100	

Table 5: PRACE Tier-1 systems

2.2 System Upgrades

This section describes the activities related to the upgrades and integration of Tier-0 or Tier-1 systems into the PRACE eco-system. These Tier-0 or Tier-1 systems provide the Tier-0 for Tier-1 services.

In the current period this activity has been included under WP6 subtask 6.1.2 and is led by Barcelona Supercomputer Centre.

2.2.1 Operational procedures for new systems and system upgrades

Current operational procedures are well documented in the PRACE wiki and BSCW including:

- Integration of new Tier-0/Tier-1 sites
    - Procedure/Template:
        - Updated wiki template, that accurately reflects latest PRACE Service Catalogue, that new sites must fulfil in order to complete their integration into PRACE infrastructure. This template includes links to help guide the user towards completion of core/optional tasks related to system integration.
    - Information for new Tier-1 sites
        - BSCW presentation about basic concepts that new sites should know before starting their integration into PRACE infrastructure.
        - Introduction email outlining steps for obtaining access to relevant online resources for system integration and the corresponding service contacts.
- Upgrade of systems (Tier-0/Tier-1)
    - Procedure for upgrade of systems:
        - Wiki guide with information to upgrade systems in the PRACE infrastructure.
    - Report template for upgrades
        - Wiki template for the completion of the upgrade procedure.

This documentation ensures that all systems follow identical procedures and are in line with the Service Catalogue requirements.

2.2.2 Overview of System Upgrades in PRACE-6IP

The systems ARCHER2, Snellius, and Beskow have been considered in the integration effort of PRACE operations as upgrades, with two of them actual replacements of their predecessors and one being reintegrated after an upgrade. For the two systems (ARCHER2 and Snellius) this

means additional steps like changing the user access points and monitoring end points definition.

- UK – EPCC – ARCHER2 will replace ARCHER
- Netherlands – SURF – Snellius replaced Cartesius and is now considered integrated into PRACE services. Due to Snellius being a new system and not just an upgrade a new system integration page was created for this system

Sweden – Beskow – This system had undergone upgrades in 2015, 2017, and 2019. Its service to users was extended until end of 2020. After several delays with delivery of the new system Dardel, Beskow was still operational (e.g. for DECI-16). Unfortunately, with the upgrades and staff changes at PDC-KTH the integration of the system needed to be restarted. Therefore, a new system integration page was created to track the re-integration of Beskow.

2.3 Integration of Tier-0/Tier-1 sites and systems

This section presents the overview of all sites and systems that are planned to be integrated in the PRACE infrastructure during the whole PRACE-6IP. For a complete understanding of the state of this activity, also all the cancelled integrations, systems decommissioned before the full integration, and integrations in progress are listed.

During PRACE-6IP, sixteen systems have been planned to be integrated into the PRACE infrastructure and to start providing services to it, as can be seen in the Table 6 below. Of these 16 systems, 1 system began integration in 4IP and is still in progress, 6 systems began integration during 5IP, and 9 systems began integration during 6IP. Additionally, 3 systems from PRACE-3IP were decommissioned.

Nr.	Site	System Name	System Details URL	Tier	Integration Start Date	Status
1	CASTORC (Cyprus)	Cy-Tera	https://www.cyi.ac.cy/index.php/castorc/research-information/castorc-completed-projects/cy-tera-cy-tera-high-performance-computing-facility-for-cyprus.html	Tier-1	04/2021	Cancelled
2	CCSAS (Slovakia)	Aurel	http://vs.sav.sk/?lang=en&section=departments&sub=vvt&sub2=config	Tier-1	05/2017	Decommissioned before integration
3	CINECA (Italy)	Galileo	https://wiki.u-gov.it/confluence/display/SCAIUS/UG3.3%3A+GALILEO+UserGuide	Tier-1	01/2019	Decommissioned before integration
4	IT4I/VSB-TUO (Czechia)	Anselm	https://docs.it4i.cz/anselm/hardware-overview/	Tier-1	12/2012	Decommissioned
5	EPCC (UK)	ARCHER	https://www.archer2.ac.uk/about/	Tier-1	12/2013	Decommissioned
6	UiO (Norway)	Abel	https://www.uio.no/english/services/it/research/hpc/abel/	Tier-1	04/2013	Decommissioned
7	UHEM (Turkey)	Sariyer	http://wiki.uhem.itu.edu.tr/w/index.php/English	Tier-1	03/2019	Completed
8	UC-LCA (Portugal)	Navigator	https://www.uc.pt/lca/ClusterResources/Navigator/description	Tier-1	10/2018	Completed
9	SURF (NL)	Snellius	https://userinfo.surfsara.nl/systems/snellius	Tier-1	08/2021	Completed
10	HLRS (Germany)	Hawk	https://www.hlrs.de/systems/hpe-apollo-hawk/	Tier-0	01/2020	Completed
11	UL (Slovenia)	HPCFS	http://hpc.fs.uni-lj.si/hardware	Tier-1	07/2017	In progress
12	CESGA (Spain)	FinisTerrae	https://www.cesga.es/en/infraestructuras/computacion/FinisTerrae2	Tier-1	04/2016	In progress
13	CEA (France)	Irene	http://www-hpc.cea.fr/en/complexe/tgcc-Irene.htm	Tier-0	03/2018	In progress
14	IT4I/VSB-TUO (Czechia)	Barbora	https://docs.it4i.cz/barbora/introduction/	Tier-1	05/2017	In progress
15	CSC (Finland)	Puhti	https://research.csc.fi/csc-s-servers	Tier-1	1/2020	In progress
16	CSC (Finland)	Mahti	https://research.csc.fi/-/mahti	Tier-1	10/2019	In progress
17	EPCC (UK)	ARCHER2	https://www.archer2.ac.uk/about/	Tier-1	06/2021	In Progress
18	MACC (PT)	BOB	https://macc.fccn.pt/resources	Tier-1	04/2020	In Progress
19	PDC-KTH (Sweden)	Beskow	https://www.pdc.kth.se/hpc-services/computing-systems/beskow-1.737436	Tier-1	09/2019	In Progress

Table 6: New systems integration

Table 7 lists architecture and performance information about the integrated systems in PRACE-6IP. Such information is not provided for systems which have been decommissioned, their integration was cancelled or their specification is already available in Table 4 or Table 5 above.

Nr.	Site	System Name	Architecture/Platform - CPU - Accelerator	Rpeak (TFlop/s)	Tier
1	CASTORC (Cyprus)	Cy-Tera	CANCELED system integration		Tier-1
2	CCSAS (Slovakia)	Aurel	DECOMMISSIONED system		Tier-1
3	CINECA (Italy)	Galileo	DECOMMISSIONED system		Tier-1
4	IT4I/VSB-TUO (Czechia)	Anselm	DECOMMISSIONED system		Tier-1
5	EPCC (UK)	ARCHER	DECOMMISSIONED system		Tier-1
6	UiO (Norway)	Abel	DECOMMISSIONED system		Tier-1
7	UHEM (Turkey)	Sariyer	See Table 5 for details.		Tier-1
8	UC-LCA (Portugal)	Navigator	See Table 5 for details.		Tier-1
9	SURF (NL)	Snellius	See Table 5 for details.		Tier-1
10	HLRS (Germany)	Hawk	See Table 4 for details.		Tier-0
11	UL (Slovenia)	HPCFS	See Table 5 for details.		Tier-1
12	CESGA (Spain)	FinisTerrae	See Table 5 for details.		Tier-1
13	CEA (France)	Irene	See Table 4 for details.		Tier-0
14	IT4I/VSB-TUO (Czechia)	Barbora CPU	ATOS/Bull Sequana X1120 - Intel Cascade Lake 6240; 18-core; 2.6 GHz -	848.8	Tier-1
		Barbora GPU	ATOS/Bull Sequana X410 - Intel Skylake Gold 6126; 12-core; 2.6 GHz - NVIDIA Tesla V100-SXM2		
		Barbora FAT	ATOS/Bull Sequana X808 - Intel Skylake 8153; 16-core; 2.0 GHz -		
15	CSC (Finland)	Puhti	See Table 5 for details.		Tier-1
16	CSC (Finland)	Mahti	See Table 5 for details.		Tier-1
17	EPCC (UK)	ARCHER2	See Table 5 for details.		Tier-1
18	MACC (PT)	BOB	DELL PowerEdge C8220 - Intel SandyBridge E5-2680; 8-core; 2.7GHz -	207.4	Tier-1
19	PDC-KTH (Sweden)	Beskow	See Table 5 for details.		Tier-1

Table 7: Details of system integrated

3 Operational Services

Common services are divided into thematic categories: Network, Data, AAA, User, Monitoring and Generic. Each service category has a responsible person who is in charge of managing all the information and decisions related to a specific service area. The selection of common services is published in the PRACE Service Catalogue and once chosen, the responsibility for a service is taken by the respective service area. The following sections provide an update of the status of each service category and the main achievements within the current reporting period.

3.1 Network services

The main task within network services handled in the second reporting period of PRACE-6IP has been the continuation of the general operation of the PRACE-MDVPN network including integration of new and removal of old Tier-0 and Tier-1 PRACE HPC systems into the network infrastructure. Also continued user support concerning network problems and optimal network usage have been important activities.

During this reporting period, the PRACE partner IDRIS removed the Turing system and did not provide a new one, which led to removal of IDRIS from the PRACE-MDVPN. Also, RZG has provided no more resources to PRACE, as well as the Slovakian system Aurel has been withdrawn, so that these connections have been removed also.

PRACE partition reachability

last page update: 2021-11-09 10:11:10

BSC BSC:212.128.224.2 42.4/42.5/42.6 2021-11-03 22:06:02	**CASTORC** CASTORC:82.116.198.110 55.0/55.3/55.7 2021-10-22 04:01:01	**CEA-TGCC** irene-eu.prace-ipw.ccrc.cea.fr. -/-/- 2021-09-27 07:31:01	**CINECA** r000u07l02-prace.marconi.cineca.it. 26.6/26.6/26.6 2021-11-06 05:56:01	**CINECA** r000u08l03-prace.marconi.cineca.it. 26.6/26.6/26.7 2021-11-06 05:56:01	**CINECA** r000u06l01-prace.marconi.cineca.it. 26.6/26.6/26.7 2021-11-08 12:16:02
CSC puhti-prace.csc.fi. 38.6/38.7/38.7 2021-11-03 14:11:01	**CSCS** CSCS:148.187.128.41 18.8/18.8/18.9 2021-10-14 20:31:01	**EPCC** dtn01-prace.rdf.ac.uk. 32.0/32.2/32.4 2021-10-28 16:16:01	**EPCC** dtn02-prace.rdf.ac.uk. 32.0/32.1/32.1 2021-10-28 16:16:01	**FZJ** judac04p.zam.kfa-juelich.de. 0.12/0.14/0.17 2021-11-05 16:36:01	**FZJ** judac03p.zam.kfa-juelich.de. 0.14/0.20/0.25 2021-11-04 13:11:01
FZJ monctl.net.prace.fz-juelich.de. 0.02/0.03/0.05 2015-12-17 12:58:42	**FZJ** judac05p.zam.kfa-juelich.de. 0.20/0.23/0.27 2021-11-04 09:36:01	**FZJ** judac05.fz-juelich.de. 0.21/0.24/0.30 2021-11-04 09:36:01	**GRNET** gssh-prace-02.aris.grnet.gr. 48.4/48.4/48.4 2021-10-07 20:41:01	**GRNET** gssh-prace-01.aris.grnet.gr. 50.1/50.2/50.2 2021-10-07 20:41:01	**ICHEC** prace-gw.kay.ichec.ie. 34.8/34.8/34.8 2021-10-12 15:51:01
ICHEC prace-login.kay.ichec.ie. 34.9/34.9/35.0 2021-10-12 15:51:01	**ICHEC** prace-gridftp-fe.kay.ichec.ie. 34.8/34.9/34.9 2021-11-09 06:31:01	**LCA-UC** gsissh.prace.lca.uc.pt. 46.8/46.8/46.9 2021-10-27 08:46:01	**LECAD** LECAD:193.2.78.225 24.8/25.7/29.2 2021-11-09 00:56:01	**LRZ** skx.supermuc-prace.lrz.de. 13.9/13.9/14.0 2021-11-06 00:26:01	**LRZ** skx.supermuc-prace.lrz.de. 13.9/14.0/14.0 2021-10-05 02:51:01
LRZ skx.supermuc-prace.lrz.de. 13.9/14.0/14.0 2021-10-05 02:51:01	**LRZ** skx.supermuc-prace.lrz.de. 13.9/13.9/14.0 2021-10-05 02:51:01	**NIIF** login-vlan907.debrecen2.hpc.niif.hu. 22.1/22.1/22.2 2021-10-25 17:56:01	**NIIF** login-vlan907.budapest2.hpc.niif.hu. 21.6/21.7/21.7 2021-10-25 17:56:01	**PSNC** PSNC:150.254.128.1 22.2/22.3/22.5 2021-10-07 15:11:01	**SURFSARA** int1-pub.snellius.surf.nl. 11.2/11.3/11.3 2021-11-09 09:16:01
SURFSARA int3-pub.snellius.surf.nl. 11.2/11.3/11.3 2021-11-09 09:16:01	**UHEM** UHEM:160.75.120.180 37.1/37.1/37.1 2021-11-08 22:56:01	**VSB-TUO** gridftp-prace.salomon.it4i.cz. 18.6/18.6/18.7 2021-10-05 02:51:01	**WCSS** prace-bem-int.wcss.pl. 27.9/27.9/28.1 2021-10-27 07:41:01		

Remarks	Reachability	Colour
Tests are executed every five minutes. Boxes include: • Name of PRACE partition, • min,avg,max in milliseconds of 5 consecutive ping packets, • time of last status change This reachability overview has been created by "fping -c5 {deisanodes}" from a testsystem at FZ-Juelich to all PRACE nodes in Germany, France and Italy. So the min/avg/max values of nodes at Juelich are surely quite small.	100%	green
	80%	lightgreen
	60%	blue
	40%	yellow
	20%	pink
	0%	red

Figure 1: PRACE partition reachability

Vice versa, the systems at UC-LC in Portugal and the Turkish system were integrated into the PRACE-MDVPN network.

Besides the integration of new partners, several partners installed new HPC systems, which had to be integrated, sometimes in parallel to old systems still operational. A web page displays the reachability of relevant HPC systems, shown in Figure 1 above.

PRACE-6IP WP6 has created a services configuration file, prace_service_config, where each partner can manage entries concerning the services provided to PRACE. The network services task reads this file continuously and extracts all active services. Every five minutes, a ping is issued to all those servers providing the mentioned services. The reachability of the services is continuously displayed on a second webpage on the PRACE network monitoring server.

PRACE server/services reachability

last page update: 2021-11-09 09:32:48

SITE	SERVICE	SERVERNAME	IP-ADDRESS	REACHABILITY	NET-LOCATION	LAST CHANGED
BSC	Iperf	212.128.224.2	212.128.224.2	42.4/42.5/42.7	PRACE-MDVPN	2021-11-03 11:22:01
BSC	internal gridftp	gftp.prace.bsc.es	212.128.224.7	42.4/42.4/42.5	PRACE-MDVPN	2021-11-03 11:22:01
CEA	internal gsissh	irene-amd-prace.ccc.cea.fr	132.167.142.120	not reachable	PRACE-MDVPN	2021-09-27 07:32:01
CEA	internal gsissh	irene-eu-prace.ccc.cea.fr	132.167.142.112	not reachable	PRACE-MDVPN	2021-09-27 07:32:01
CESGA	MyProxy	dtn.srv.cesga.es	193.144.32.30	53.3/53.3/53.4	extern	2021-11-05 08:17:02
CINECA	Iperf	130.186.26.7	130.186.26.7	26.6/26.6/26.7	PRACE-MDVPN	2021-11-08 12:17:02
CINECA	MyProxy	grid.hpc.cineca.it	130.186.17.234	35.8/35.9/35.9	extern	2021-11-03 06:37:01
CINECA	external gsissh	login.marconi.cineca.it	130.186.17.131	29.6/29.6/29.7	extern	2021-11-08 12:02:02
CINECA	external gsissh	login.marconi.cineca.it	130.186.17.132	23.2/23.2/23.3	extern	2021-10-26 08:17:01
CINECA	external gsissh	login.marconi.cineca.it	130.186.17.133	29.6/29.6/29.7	extern	2021-11-08 13:02:01
CINECA	external gsissh	login.marconi.cineca.it	130.186.17.136	35.9/35.9/36.0	extern	2021-10-28 23:32:01
CINECA	internal gsissh	gssh-prace.marconi.cineca.it	130.186.26.8	26.6/26.6/26.7	PRACE-MDVPN	2021-11-01 19:27:01
CINECA	internal gsissh	gssh-prace.marconi.cineca.it	130.186.26.9	26.6/26.6/26.6	PRACE-MDVPN	2021-11-01 19:27:01
CSC	external scp	mahti.csc.fi	86.50.165.195	36.7/36.7/36.7	extern	2021-11-09 08:47:01
CSC	external scp	mahti.csc.fi	86.50.165.196	36.6/36.7/36.7	extern	2021-11-09 08:47:01
CSC	internal scp	mahti-prace.csc.fi	128.214.250.31	38.7/38.7/38.8	PRACE-MDVPN	2021-10-20 05:12:02
CSC	internal scp	mahti-prace.csc.fi	128.214.250.32	38.7/38.7/38.7	PRACE-MDVPN	2021-10-05 02:52:01
CSCS	Iperf	148.187.128.41	148.187.128.41	18.9/19.0/19.2	PRACE-MDVPN	2021-10-05 02:52:01
CYFRONET	external gridftp	prace-ui.cyfronet.pl	149.156.9.104	29.4/29.5/29.5	extern	2021-10-11 22:42:01
CYFRONET	external gridftp	prace.prometheus.cyfronet.pl	149.156.9.156	29.4/29.6/29.9	extern	2021-10-11 22:42:01
CYFRONET	internal gridftp	prace-int.cyfronet.pl	150.254.128.65	29.9/30.0/30.0	PRACE-MDVPN	2021-10-11 22:37:02
CYFRONET	internal gridftp	prace-int.prometheus.cyfronet.pl	150.254.128.67	29.8/29.9/30.0	PRACE-MDVPN	2021-10-11 22:37:02
CaSToRC	Iperf	82.116.198.110	82.116.198.110	55.0/55.2/55.3	PRACE-MDVPN	2021-11-05 12:02:01
EPCC	external scp	login.archer2.ac.uk	193.62.216.43	27.1/27.3/27.6	extern	2021-11-03 16:07:01

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GRnet	Iperf	195.251.114.117	195.251.114.117	47.9/47.9/47.9	PRACE-MDVPN	2021-10-07 20:42:02
GRnet	external gridftp	gftp.aris.grnet.gr	195.251.23.89	46.0/46.1/46.2	extern	2021-09-23 09:12:02
GRnet	external gsissh	login.aris.grnet.gr	195.251.23.78	46.0/46.0/46.0	extern	2021-09-23 09:12:02
GRnet	external gsissh	login.aris.grnet.gr	195.251.23.79	46.7/46.8/46.8	extern	2021-10-13 20:37:01
GRnet	internal gridftp	gftp-prace.aris.grnet.gr	195.251.114.116	47.0/47.1/47.1	PRACE-MDVPN	2021-10-07 20:42:02
GRnet	internal gsissh	gssh-prace.aris.grnet.gr	195.251.114.114	48.1/48.1/48.1	PRACE-MDVPN	2021-10-07 20:42:02
GRnet	internal gsissh	gssh-prace.aris.grnet.gr	195.251.114.115	48.4/48.4/48.5	PRACE-MDVPN	2021-10-07 20:42:02
ICHEC	external scp	prace-login-ext.kay.ichec.ie	87.44.64.197	33.0/33.0/33.2	extern	2021-10-22 13:27:01
ICHEC	internal gsissh	prace-login.kay.ichec.ie	193.1.201.19	34.8/35.0/35.1	PRACE-MDVPN	2021-10-05 02:52:01
IT4I	Iperf	195.113.250.173	195.113.250.173	18.6/18.6/18.7	PRACE-MDVPN	2021-10-05 02:52:01
IT4I	external scp	barbora.it4i.cz	195.113.250.114	16.5/16.5/16.6	extern	2021-10-27 12:47:01
IT4I	external scp	barbora.it4i.cz	195.113.250.115	16.5/16.5/16.6	extern	2021-11-01 16:27:01
IT4I	external scp	salomon.it4i.cz	195.113.250.131	16.5/16.5/16.6	extern	2021-07-05 17:37:01
IT4I	external scp	salomon.it4i.cz	195.113.250.132	16.5/16.5/16.6	extern	2021-07-05 17:37:01
IT4I	external scp	salomon.it4i.cz	195.113.250.133	16.5/16.5/16.5	extern	2021-07-22 15:37:02
IT4I	external scp	salomon.it4i.cz	195.113.250.134	16.5/16.5/16.5	extern	2021-09-09 21:17:01
JUELICH	Iperf	134.94.115.218	134.94.115.218	0.02/0.02/0.04	PRACE-MDVPN	2021-07-14 06:07:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.100	0.23/0.25/0.32	extern	2021-11-05 14:12:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.101	0.18/0.20/0.25	extern	2021-10-26 16:17:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.102	0.23/0.25/0.26	extern	2021-11-04 14:52:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.103	0.24/0.26/0.28	extern	2021-11-02 16:12:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.104	0.20/0.22/0.26	extern	2021-09-25 03:17:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.105	0.23/0.26/0.33	extern	2021-10-26 17:17:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.98	0.21/0.23/0.30	extern	2021-09-25 03:17:01
JUELICH	external ssh	juwels.fz-juelich.de	134.94.0.99	0.20/0.23/0.29	extern	2021-09-25 03:17:01
LRZ	external ssh	skx.supermuc.lrz.de	129.187.1.1	12.8/12.9/12.9	extern	2021-09-21 18:02:01
LRZ	external ssh	skx.supermuc.lrz.de	129.187.1.2	12.8/12.9/13.2	extern	2021-09-21 18:02:01
LRZ	external ssh	skx.supermuc.lrz.de	129.187.1.3	12.8/12.9/12.9	extern	2021-09-21 18:02:01
LRZ	external ssh	skx.supermuc.lrz.de	129.187.1.4	12.8/12.8/12.9	extern	2021-09-21 18:02:01
LRZ	internal ssh	skx.supermuc-prace.lrz.de	195.37.7.1	14.0/14.0/14.0	PRACE-MDVPN	2021-10-05 02:52:01
LRZ	internal ssh	skx.supermuc-prace.lrz.de	195.37.7.2	14.0/14.0/14.0	PRACE-MDVPN	2021-10-05 02:52:01
LRZ	internal ssh	skx.supermuc-prace.lrz.de	195.37.7.3	14.0/14.0/14.1	PRACE-MDVPN	2021-10-05 02:52:01
LRZ	internal ssh	skx.supermuc-prace.lrz.de	195.37.7.4	14.0/14.0/14.1	PRACE-MDVPN	2021-10-05 02:52:01
NIIF	internal gridftp	leo-login.sc.niif.hu	193.224.66.200	22.1/22.1/22.2	PRACE-MDVPN	2021-10-25 17:57:01
NIIF	internal gridftp	phitagoras.sc.niif.hu	193.224.66.196	21.6/21.7/21.7	PRACE-MDVPN	2021-10-25 17:57:01
PSNC	external gridftp	eagle.man.poznan.pl	150.254.160.193	20.2/20.2/20.2	extern	2021-11-07 22:57:01
PSNC	internal gridftp	eagle-prace.man.poznan.pl	150.254.128.4	22.1/22.1/22.1	PRACE-MDVPN	2021-10-11 22:37:02
SURF	external scp	snellius.surf.nl	145.136.63.187	11.1/11.2/11.3	extern	2021-11-09 08:37:01
SURF	external scp	snellius.surf.nl	145.136.63.189	11.2/11.3/11.3	extern	2021-11-08 12:32:01

UC-LCA	Iperf	iperf.prace.lca.uc.pt	193.236.156.10	46.8/46.9/46.9	PRACE-MDVPN	2021-10-08 10:37:01
UC-LCA	internal gridftp	gsiftp.prace.lca.uc.pt	193.236.156.12	46.8/46.9/46.9	PRACE-MDVPN	2021-11-05 18:12:01
UC-LCA	internal gsissh	gsissh.prace.lca.uc.pt	193.236.156.11	46.8/46.9/46.9	PRACE-MDVPN	2021-10-08 10:37:01
UHEM	internal gsissh	pracegw.uhem.itu.edu.tr	160.75.120.180	37.1/37.1/37.1	PRACE-MDVPN	2021-11-09 07:42:01
UNDEF	external scp	t04n27.pdc.kth.se	193.10.157.178	26.6/26.6/26.7	extern	2021-11-08 10:57:01
UNDEF	external ssh	beskow.pdc.kth.se	193.11.167.133	26.7/26.7/26.8	extern	2021-11-08 03:42:02
WCSS	external gridftp	prace-bem.wcss.pl	156.17.5.146	25.2/25.3/25.4	extern	2021-10-27 00:07:01
WCSS	internal gridftp	prace-bem-int.wcss.pl	150.254.128.34	27.8/28.0/28.1	PRACE-MDVPN	2021-10-27 17:57:01

Remarks	Reachability	Colour
Tests are executed every five minutes. Boxes include: • PRACE site, where service resides • Type of service, • Servername, • IP Address of server • min,avg,max in milliseconds of 5 consecutive ping packets, • Net, to which service is connected, • Last time reachability changed This reachability overview has been created by "fping -c5 {services nodes listed in PRACE service config file}" from a testsystem at FZ-Juelich. So the min/avg/max values of nodes at Juelich are surely quite small.	100%	green
	80%	lightgreen
	60%	blue
	40%	yellow
	20%	pink
	0%	red

Figure 2: PRACE server/service reachability

Last but not least the “PRACE Path Discovery” web page lists the reachability of the different partners (ping to sample HPC system at every partner site) and showing additionally traceroute information.

PRACE Path Discovery

last page update: 2021-11-09 10:53:00

PRACE Site	System	HPC site or test IP address	traceroute info	PRACE VPN
	PRACE-Mon (Germany)	monctl.net.prace.fz-juelich.de. 134.94.115.218	Traceroute: 134.94.115.218	MD-VPN Realized on GÉANT GÉANT infrastructure
	NONE.cy (Cyprus)	[CastoRC-NONE.cy] 82.116.198.110	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * 82.116.198.110	
	Salomon (Czech Republic)	gridftp-prace.salomon.it4i.cz. 195.113.250.173	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * * * 195.113.250.173	
	Puhti (Finland)	puhti-prace1.csc.fi. 128.214.250.21	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * * 128.214.250.21	
	Irene (France)	irene-eu-prace-gw.ccc.cea.fr. 132.167.142.112	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * * * * * * *	
	JuDACsrv (Germany)	judac05p.zam.kfa-juelich.de. 134.94.115.217	Traceroute: 134.94.115.217	
	SuperMuc (Germany)	skx.supermuc-prace.lrz.de. 195.37.7.4 195.37.7.3 195.37.7.2 195.37.7.1	Traceroute: 134.94.115.193 134.94.111.38 * * * * * 195.37.7.4	
	Aris (Greece)	gssh-prace.aris.grnet.gr. 195.251.114.114 195.251.114.115	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * 195.251.114.115	
	Leo (Hungary)	login-vlan907.debrecen2.hpc.niif.hu. 193.224.66.200	Traceroute: 134.94.115.193 134.94.111.38 * * * * * 193.224.66.200	
	PHItagoras (Hungary)	login-vlan907.budapest2.hpc.niif.hu. 193.224.66.196		
	Fionn (Irland)	[ICHECK-Fionn] 193.1.201.17	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * * * * * * *	
	Marconi (Italy)	gssh-prace.marconi.cineca.it. 130.186.26.9 130.186.26.8	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * 130.186.26.61 130.186.26.9	
	Eagle (Poland)	eagle-prace.man.poznan.pl. 150.254.128.4	Traceroute: 134.94.115.193 134.94.111.38 * * * * * 150.254.128.30 150.254.128.4	
	Zeus (Poland)	prace-int.cyfronet.pl. 150.254.128.65	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * 150.254.128.94 150.254.128.65	
	Supernova (Poland)	prace-bem-int.wcss.pl. 150.254.128.34	Traceroute: 134.94.115.193 134.94.111.38 * * * * * 150.254.128.60 150.254.128.34	
	NAVIGATOR (Portugal)	gsissh.prace.lca.uc.pt. 193.236.156.11	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * * 193.236.156.11	
	LECAD (Slovenia)	[LECAD-LECAD] 193.2.78.225	Traceroute: 134.94.115.193 134.94.111.38 * * * * * 193.2.78.225	
	Marenostrum (Spain)	gftp.prace.bsc.es. 212.128.224.7	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * * * 212.128.224.7	
	Minotauro (Spain)	gftp.prace.bsc.es. 212.128.224.7		
	Piz_Daint (Switzerland)	[CSCS-Piz_Daint] 148.187.128.41	Traceroute: 134.94.115.193 134.94.111.38 * * * * 148.187.128.41	
	PRACEGW (Turkey)	pracegw.uhem.itu.edu.tr. 160.75.120.180	Traceroute: 134.94.115.193 134.94.111.38 * * * * * * 160.75.120.180	
	Archer (United Kingdom)	dtn01-prace.rdf.ac.uk. 193.62.216.70	Traceroute: 134.94.115.193 134.94.111.38 * * * * * 193.62.216.70	
	Hazelhen (Germany)	gridftp-fr1.hww.de. 193.196.155.183	Traceroute: 134.94.32.1 134.94.109.98 188.1.231.201 188.1.238.102 193.197.63.23 * 193.196.155.183	currently not using PRACE infrastructure
	Snellius (The Netherlands)	snellius.surf.nl. 145.136.63.189 145.136.63.187	Traceroute: 134.94.32.1 134.94.109.98 188.1.231.201 62.40.124.217 62.40.98.186 62.40.124.39 145.145.34.50 * 145.136.63.189	
	Beskow (Sweden)	beskow.pdc.kth.se. 193.11.167.133	Traceroute: 134.94.32.1 134.94.109.98 188.1.231.201 62.40.124.217 62.40.98.69 62.40.125.206 109.105.97.56 109.105.102.123 130.242.4.70 130.242.4.63 130.242.4.54 130.242.4.53 130.242.4.79 130.242.4.59 130.242.6.73	

Figure 3: Overview of the PRACE Network by sites connected via PRACE-MDVPN

The Figure 3 describes the network monitoring status of the connected systems as of November, 9th 2021.

The HPC systems of HLRS (Germany) and PDC-KTH (Sweden) have not been and will presumably not be integrated into the PRACE dedicated virtual network infrastructure. Reasons for this are mostly technical. SURF will connect its new system Snellius in a later phase.

In the last months, GÉANT contacted PRACE to rearrange the MD-VPN internally, since changes within the GÉANT infrastructure do not allow the current configuration anymore. The future implementation will change the internal network to a L3VPN solution. For this, no updates on any PRACE partner site is required. Changes are limited to the GÉANT and NRENs backbone. The changes will be scheduled within the next months and only require a short maintenance interrupt. PRACE partners and users will be informed in advance.

3.2 Data Services

During the PRACE-6IP project, the corresponding PRACE sites have been providing its users with the tools for data transfers. As already reported in the first interim report, all the high performance data transfer tools, GridFTP and UFTP, are currently specified as an optional service in the PRACE Service Catalogue. Nevertheless, the majority of the sites decided to continue to provide these tools, which includes software updates and server certificate renewal. A significant contribution to the maintenance and development of GridFTP and GSI-OpenSSH software, as part of the Grid Community Toolkit (GCT) has been provided by the staff from the service leader (HLRS). The latest version of the GCT v6.2.20210826 released in September 2021 includes major improvements and will stay up to date for the project duration period including the six months extension in 2022. New features include the support for the Transport Layer Security (TLS) v1.3 and OpenSSL v3.0. Also a new version of the GSI-OpenSSH v8.6p1 with HPN (high performance SSH/SCP) patches is included. The software is also available as packages for the major Linux distributions in the standard repositories, which makes the installation and update procedure simple.

Regarding monitoring activities of the data services provided, most frequent errors include server unavailability, configuration mismatch such as server's wrong network interface used for the data transfer, and server hostnames that do not match those in the server certificate. The issues are solved through the ticket system and support provided by service staff members. The operational data services were a base for the collaboration with the Centers of Excellence HiDALGO and EXCELLERAT in a Task 6.3.

3.3 AAA Services

The main activity in the reporting period in context of AAA, besides the continuation of maintenance and operation of the PKI, user administration (PRACE LDAP) and accounting services (DART), was the continuation of the development of the new PRACE Federated AAI. After the first technical discussions in the working group (led by CSCS and CINECA) the proposal was to build the solution on an OIDC technology approach. This discussion took into account the partners' security and GDPR policies as well as further compatibility and interoperability requirements with other major European activities like PUHURI, EUDAT, EOSC, Fenix, or others. Since five of the hosting partners are already active and more advanced on this topic in the Fenix project a natural synergy between these activities was identified and followed.

That said, the main goal of this activity is to leverage EU project synergy, especially the Fenix IdM solution, oriented to a federated/cloud environment. Ultimately we will help the end users building their workflows without having any additional specific site configuration to bear in mind. This in turn will improve the infrastructure portability, especially for data transfers or any other similar middleware service oriented to a federation environment.

Analysing the AAI architecture proposed by Fenix in the ICEI project, it became clear that the first step is that PRACE must query all the partners if they are ready to adopt a new protocol such as OIDC (OpenID Connect) as it is the key technology used to promote the federation concept. In this respect, CSCS sent out a survey asking who was, could, or will become an OIDC compliant site. It came out that majority of the sites (57%) are already or are willing to be OIDC compliant. Analysing these data and discussing among the partners, it became clear that there was need for a workshop to explain in depth what OIDC means in order to get the rest of the partners on board. There was a half-day OIDC workshop organised with GÉANT. The important outcomes from the workshop were the agreement on the OIDC as the basis technology on which to build up the federation and the need to split and drive the further development in technical and policy focused tasks. This led to definition of two action points linked to the tasks:

- Define a pilot and run it before the end of PRACE 6IP extension.

Nr.	Timeframe	Milestone	Leader	Status
1	March 2021	Analysis of Existing AAA PRACE solution versus PRACE services	IT4I	Done
2	July 2021	Policy and Technical representative	CINECA (Policy), CSCS (Technical)	Done
3	September 2021	OIDC workshop	GÉANT	Done
4	December 2021	Configuration test	CSCS	Work in progress
5	January 2022	Policy Draft	CINECA	Work in progress
6	January 2022	Pilot result review	CSCS	Work in progress
7	February 2022	Adding other sites to the Pilot	CSCS	Work in progress

Table 8: Pilot milestones definition and timeline

- Agree among the partners what policy could serve all PRACE needs and decide what level of assurance would be accepted by PRACE as minimum requirement.

Currently two documents are being finalised before the end of the year.

The first document focuses on the architecture from the technological perspective with the use case and requirements definitions for the PRACE services following the Service Catalogue.

With the contribution of the service leaders of Task 6.1 and verification by the partner sites active in the task a complete list of the PRACE services was produced with clear definition for each service stating: scope of usage (staff or end user), authentication and authorisation source and processor, underlying authentication and authorisation technology, scope of installation and operation, priority of transition to the federated authentication.

Services marked with highest priority have then undergone analysis choosing the technology for the federated authentication approach and partner for the implementation. The highest priority was given to services which are either marked as core in the Service Catalogue, are mostly used by the end users, currently depend on X.509 certificate authentication, for which authentication is done only locally per each site, or if there is a clear path for the implementation and technology using the federated authentication approach. The most prominent are interactive

access to compute resources and data transfer, mostly addressing the replacement of GSI-SSH and GSI-SCP with OIDC compliant SSH and SCP or other suitable technologies. These services will be addressed first in the pilot activity.

Similar analysis was done for medium priority services where the major criterion was the access by the end users and dependence on X.509 certificate or local authentication. Examples of such services are access to site's ticketing systems, PRACE PPRT, Training Portal, Events Portal, Materials Portal, and Summer of HPC Portal. These services will be addressed in the pilot in the later stages.

Defined was the workflow for the highest priority services on which to test the architecture deployment:

1. Login using ID credential of site1 through the federation
2. Connect (automatic user mapping after first login) and submit to a site2 using the token coming from the federation (point1):
    a. Unity (using UNICORE as submission tool)
    b. SSH session using OIDC token
    c. Any other submission tool compatible with batch scheduler submission and OIDC token (e.g. FirecREST [4])
3. Transfer data [option as per point2] from site2 to site1 using the same token:
    a. Token has to have a life longer than the job submitted if the 2 actions are submitted at the same time

If the transfer will be submitted in a separate session it will require another login action as per point 1.

The second document describes the policy definition for trust levels, registration procedures, and levels of assurance for the PRACE AAI. During the OIDC presentation the different standards and setups of LoAs (e.g. REFEDS) covering identity, ID proofing, attribute freshness, and multi-factor authentication were presented which laid the basis for the design and future agreement among the partners on the definition of the minimum level of assurance that will be required for identities used in the federated AAI. The first analysis showed that there needs to be a further description of some of the predefined levels of the LoA to be fully accepted by the majority of the partners. As a good example the need of ID proofing of a person at least over a videoconference call to verify that the supplied ID is in possession of the person means either a huge overhead in the process of introduction of the identities to the federation or risk of fraud if the processes are not described and followed in more detail. Such topics will be described in the policy document for approval by the partners in the Task 6.1 before handed to approval by the management board.

After the first edition is finalised by the working group according to the planned pilot, these documents will be further validated by the management level of PRACE, most importantly the management board of PRACE-6IP.

3.4 Operational Security and Security Forum

The main task of operational security within PRACE-6IP includes the user support on IT security issues within the PRACE dedicated network as well as the operation of the PRACE CSIRT itself.

After a very busy period that had two major security incidents in the first half of 2020, the situation relaxed in this reporting period again, since no new incidents have been noticed.

The information exchange the PRACE CSIRT had during both incidents in beginning of 2020 with other Europe-wide CSIRTs, e.g. from EGI, EOSC-Hub (now EOSC-Future), EUDAT, DFN, GÉANT, and the GAUSS alliance in Germany, has been strengthened. Discussions on standards concerning trust relationships between partners in collaborating infrastructures have been intensified. Also, information exchange on access methods like two-factor or multi-factor authentication have been made highlighting pros and cons of this kind of solutions. Several partners are still evaluating which solution they want to use in the future.

The individual security procedures at the PRACE partner sites for incident handling and risk analysis are working without any problems. Harmonising security policies will be a very welcomed add-on for the security of the PRACE infrastructure and a prerequisite for further collaborations. A "Security Incident Policy and Procedures" document is in development, which describes the rules and tasks the partners have to follow and fulfil in case of a security incident.

A second document "PRACE Security – A general overview", describing the different parties involved in security, is in preparation, also. Both documents will be discussed in the PRACE Security Forum and with all the PRACE partner sites and their CSIRTs in the near future, before it is handed over to the PRACE management board for approval.

One further task is the discussion of operational security within PRACE for potential future PRACE services. Within the reporting period no new services have gone into production.

The PRACE CSIRT team is listed in the GÉANT's Trusted Introducer program as contact point for security issues within the PRACE infrastructure. Every three years a relisting is required. During the reporting period the relisting has been performed without any complications.

3.5 User Services

The User Service subtask in this period focused on an overhaul of the user documentation provided by the partner sites. Previously, the user documentation on the PRACE website had to be often written twice by each partner. Once for the users looking for the documentation on the sites' web pages and again for the PRACE website. The latter had a prescribed document format (Markdown) which was not always used by the partners' websites, creating double editing and resulting in lower update frequency and thus accuracy. It was agreed that with the introduction of the new PRACE website, the user documentation will have a fixed structure defining the context and language (English), but instead of producing an independent text just for the PRACE site, only links to the partners' sites will be placed to the PRACE site. This rework leads to more fresh end user documentation and less overhead to the service leader, site representatives and PRACE web team.

Another important task is fixing the *prace_service* and *prace_service.config* files. The update is made to extend both the script and the config file format to distinguish and enable the SSH/SCP access differently from the GSI-SSH/GridFTP access as a result of the changes introduced by the new PRACE Service Catalogue.

Finally, few recommendations are suggested for the PRACE Common Production Environment (PCPE). In particular, it is suggested to use the EasyBuild framework [1]. The EasyBuild framework is an open source software application that has different software modules (compilers, numerical libraries and application software) which is easy to install and maintain.

Each year EasyBuild releases two software set releases, for example, 2021a and 2021b. So far it supports 2248 software packages in the latest release of 4.3.3

3.6 Monitoring Services

Operating and supervising infrastructure that is distributed among several project partners is a very challenging task. The goal of the monitoring service activity is to provide insight into the current and past state of services hosted and delivered by the project partners as well as monitor service interoperability in this complex setup. The task activity is also focused on developing the current monitoring system by addressing issues, deploying functional changes and adding functionalities based on the project requirements. Infrastructure monitoring capabilities are provided by the solution initially developed and deployed during PRACE-5IP and extended over time. The monitoring system collects the health status data for hosts and services, provides alerting capabilities and collects all the data necessary to estimate service availability and quality for reporting and analytic purposes.

The current solution used for PRACE systems monitoring is based on the Icinga2 software and incorporates several modifications and additions required by the project. The changes include: configuration generators based on the prace_service.config file, integration with the PRACE LDAP user database for authentication and finally a set of executors and checks - main scripts providing data of the host and service status information to the system for project specific services.

The service is available at: https://mon.prace-ri.eu/

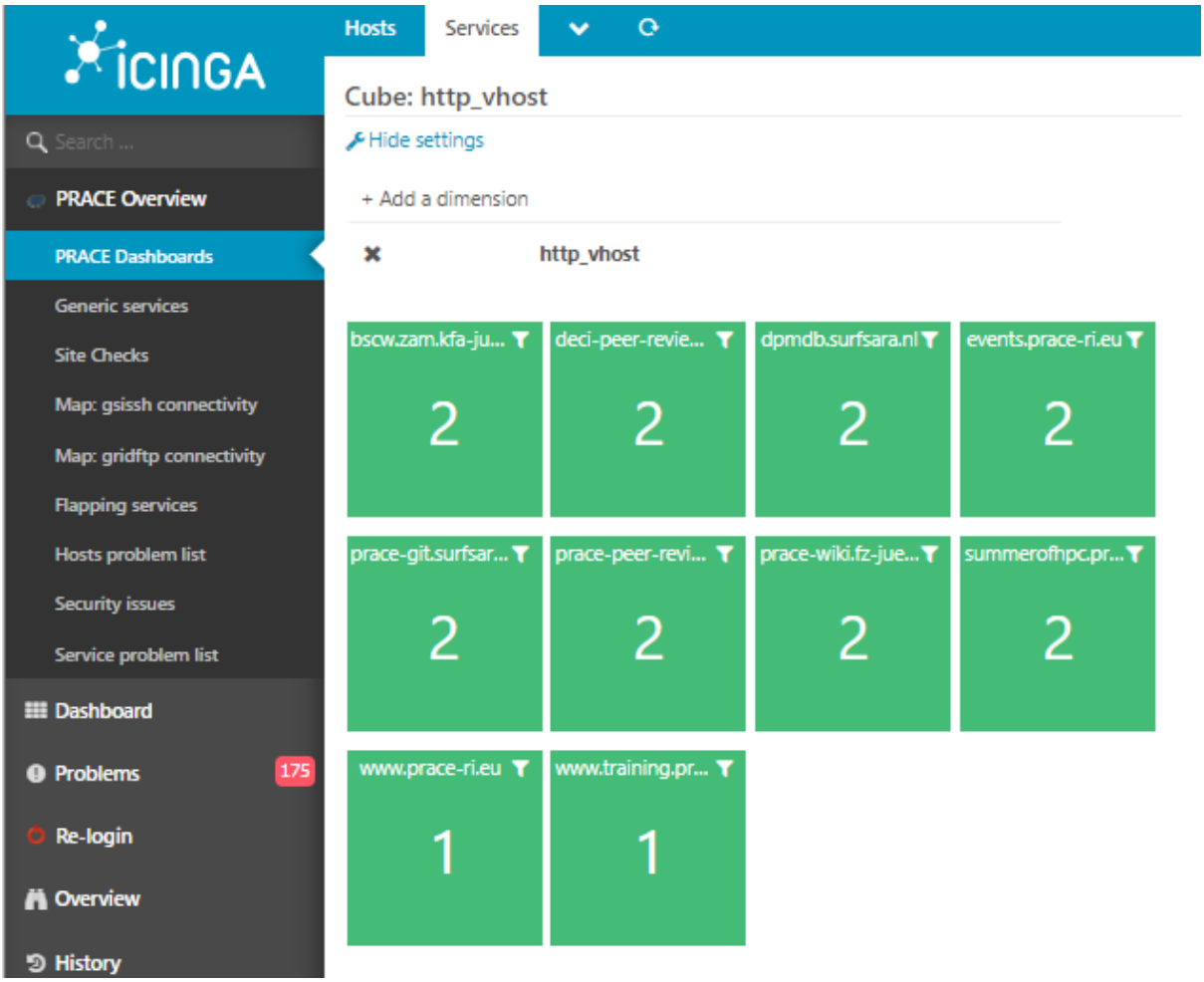

Figure 4: PRACE monitoring user interface

To date, the monitoring system keeps track of **559 service instances** and **61 hosts** provided by **22 sites**.

This number is subject to change over time as it heavily relies on the services provided by sites and registered in the prace_service.config file - primary data source for the monitoring infrastructure.

In the covered reporting period, the following sites have been added to the monitoring system:

- EPCC (UK) – ARCHER2
- FZJ-JUELICH (Germany) – JUWELS
- UC-LCA (Portugal) – NAVIGATOR
- UHEM (Turkey) – SARIYER
- CSC (Finland) – MAHTI
- IT4I/VSB-TUO (Czechia) – BARBORA
- SURF (Netherlands) – SNELLIUS
- PDC-KTH (Sweden) – BESKOW

Sites altered to rely on SSH instead of GSI-SSH (due to GSI-SSH service decommissioning)

- LRZ (Germany) – SUPERMUC-NG
- IT4I/VSB-TUO (Czechia) – SALOMON

Sites removed from the monitoring (decommissioned machines)

- IT4I/VSB-TUO (Czechia) – ANSELM
- UIO (Norway) – ABEL
- SURF (Netherlands) – CARTESIUS

3.6.1 Task Activities during reporting period

The monitoring system is in a stable production phase and most tasks related to the system were of maintenance nature also during this period, however, development of changes required by the project evolution was being carried out and concluded with the deployment on the production instance.

Maintenance and support activities performed regularly within the task include:

- Watching for operating system level vulnerabilities and installing necessary updates and mitigations,
- Monitoring mailing lists and web for icinga2 and web interface updates and security issues,
- Addressing bugs and issues reported via TTS system related to monitoring service,
- Periodically reviewing system and service logs to ensure constant proper operation of the service,
- Providing help and expertise related to monitoring system operation to newly integrating sites and current ones facing operational issues.

Due to the production status of the service, maintenance tasks were performed with keeping in mind service availability on the highest level possible. Apart from the above, one significant change was made to the system during reporting period:

- Introduction of SSH based monitoring as a replacement for GSI-SSH based monitoring. This change is due to the service catalogue update. Required changes developed during the previous reporting period have finally been tested, confirmed to work properly and deployed in production. This allowed new site integrations to appear in the monitoring interface (as new systems no longer provide globus based services). The change has also enabled the UHeM machine to switch to SSH based monitoring to avoid issues caused by legacy globus based services.

The monitoring team has also prepared updated and revised documentation on the PRACE wiki, describing the monitoring system and providing the better and clearer integration guide for the new systems especially those without the GSI-SSH service.

Regarding the transition from GSISSH based monitoring to one based on SSH - this process is not just a simple switch. For the time of writing this report, nine out of 22 monitored systems expose public SSH endpoints registered in prace_service file. Having in mind the mandatory nature of this service and the fact that not all sites are SSH ready we have decided to allow some transition period before SSH monitoring is enforced. Since the change is not technically demanding on the resource provider side we predict all sites to register their SSH endpoints by the end of 1Q2022. In our opinion, this date seems a reasonable deadline for the monitoring team to decommission the GSI-SSH based metric execution method.

3.6.2 Task activities for the next period:

During transition to SSH based monitoring we have received some feedback regarding the security constraints that sites have. To improve overall security of monitoring infrastructure and solutions used we plan to research and implement some suggestions, i.e. restriction of executed commands, possibility to use non-standard logins, support for Kerberos based tokens, etc.

Apart from standard service maintenance for the future, we also consider enabling auto ticket creation mechanism. This functionality is almost ready, however, it requires an update of the PRACE ticketing system software version to make API interaction between systems possible.

EuroHPC infrastructure monitoring support.

PSNC and Cyfronet are involved in deployment of the monitoring environment. The Icinga software stack is available at the temporary address https://mon-eurohpc.psnc.pl/. After receiving the right domain credentials, the service can be available in the EuroHPC domain.

Now, the basic tests are implemented in the pilot infrastructure on PSNC's virtual machine. The thematic working group has been established.

3.7 Generic Services

In general, all services that need an operational basis and a centralised distribution for the PRACE project (or a part of it) could be assumed as Generic Services.

The goal of this task is the provisioning of these services and the supervision of their operation, as they are crucial for the day-by-day work of the project.

The leader of generic services is acting as a liaison / consultant to consult with PRACE aisbl, other work packages and external providers upon request when IT or operational issues or requests of these entities arise.

The following activities have been carried out in the reported period:

- Questions of another WP related to the operation of new or existing services
    - Finalised integration between Training, Events portals and PRACE web site
    - Negotiated and established new training portal systems with WP4 (new Wordpress and ePrints instances) with WP4 to be put as a core service in Service Catalogue
    - Operational aspects of Single Sign On mechanism at Events Portal
    - Supporting new Training Platform pilot testing
    - Supporting operational aspects of Events Portal to GÉANT eduGAIN federation
    - Planning of Events Portal upgrade
    - Supporting git based configuration and document versioning system migrated from SVN to go into production
    - Extending CodeVault service to support creation of web pages based on repositories using CI/CD and hosting them on a webserver
    - Integration of Time.ly event calendar service onto Training Portal and integrating with Events Portal
- Questions of PRACE aisbl when negotiating with service providers offering service for PRACE
    - Consulting with PRACE aisbl IT service hosts upon request

  - Helping managing domain portfolio
  - Helping with managing certificates portfolio
  - Monitored KPIs related to generic services
  - Review/analysis of PRACE service portfolio for possible future integrations efforts with sites of other HPC stakeholders (with WP3 and WP4, and in connection with HPC in Europe portal)
  - Helping WP3 with the usage of the hosting platform for the new prace-ri.eu website
  - Support for migration to new hosting platform, discussion and adjustment of technical requirements with provider
  - Detect problems of the new hosting platform, suggest possible resolutions
  - Support migration and hosting of the previous website containing data not available on the current website
  - Finalisation of GDPR aspects of new Training and PRACE web portal
  - Supporting migration between Training and Events portal
- Helping internal workflows of using a shared PRACE-owned resource
  - Handling *.prace-ri.eu wildcard certificate, helping with new certificate requests and renewal
  - Handling prace-ri.eu domain: subdomain requests, helping with resolving domain issues related to changes

One of the main tasks during this period was supporting the new prace-ri.eu and training.prace-ri.eu portal to go into production. The task included introducing a new host for prace-ri.eu, requiring domain and certificate changes along with setting up the hosting and migrating the previous version of the site, defining requirements with developers and fixing initial hosting issues.

Two new services including a new Wordpress based Training Portal [2] and an ePrints based material repository [3] were put into production to support online learning, becoming especially important during COVID-19. An additional step was the integration of Time.ly functionality into the Training Portal enabling quick access to the online courses organised in the Events Portal. The Training Portal now refers to different portals including Events Portal, Material Portal, and CodeVault to navigate through training related events, material , other documents and videos provided by PRACE. Time.ly is showing Events Portal data offering an integration at backend level with metadata added to it to enable nice dynamic rendering of events ordered by their date offering advanced filtering based on location, level and type.

A pilot including a digital learning platform had been launched, requiring joining the eduGAIN federation and deploying the integration of Events Portal to provide a uniform entry point and Single Sign On methodology for trainees to be used to participate in video and hands-on sessions.

A new service supporting online learning with software carpentry style pages was introduced as part of the Gitlab service (PRACE CodeVault). This required installation of a new CI/CD and web service onto the repository.prace-ri.eu server.

Prace-ri.eu wildcard certificates were renewed, requiring all subdomain certificates to be renewed as a duplicate containing eighteen certificates for twenty-two subdomains requiring coordination between eight different hosting providers to avoid downtime caused by invalid certificates.

4 EuroHPC operations support

During the reporting period, PRACE reached out to EuroHPC JU and several Euro HPC hosting entity (HE) representatives to establish support for the new petascale sites. After the initial steps of presenting the PRACE operational procedures and activities as carried out in Task 6.1, presenting the concept and detailed explanation of the Service Catalogue topical working groups were setup where PRACE service leaders and HE technical staff should work on the knowledge transfer from PRACE to EuroHPC, definition on service development provided by PRACE to EuroHPC and additional coordination in daily activities (e.g. collaboration in cyber security). The general meetings were covered by PRACE PMO, Task 6.1 leader and WP6 leader, later also by the WP2 co-leader (for the portal activity):

- June 26th 2020 (also with the participation of the EC Project Officer). Topic: petascale support
- Sept 4th 2020 (representatives of the HEs). Topic: petascale support
- September 14th 2020 (Leonardo Flores, Evangelos Floros, PMO). Topic: petascale support
- October 2nd 2020 (also with WP6). Topic: Follow up Telco - PRACE support for EuroHPC Petascale Sites
- November 3rd 2020 (also with WP6). Topic: Follow up Telco - PRACE support for EuroHPC Petascale Sites
- December 11th 2020 (also with WP6). Topic: Follow up Telco - PRACE support for EuroHPC Petascale Sites
- January 20th 2021 (also with WP6). Topic: Follow up Telco - PRACE support for EuroHPC Petascale Sites
- June 17th 2021 (WP6, WP2): Petascale support and HPC in Europe portal
- September 22nd 2021 (WP6, WP2): Petascale support and HPC in Europe portal

The technical meetings of the working groups held were:

- February 18th 2021: Networking WG meeting
- February 11th 2021: Monitoring WG meeting

In addition, several documents for the knowledge transfer were prepared covering the topics of networking, accounting, user services, monitoring, security and AI/ML environment setup. As was mentioned in the monitoring chapter a dedicated instance of ICINGA (platform used for internal PRCE monitoring service) to provide central monitoring for EuroHPC sites was deployed and is ready to be operational.

5 Conclusions

In this reporting period, Task 6.1 has continued the coordinated operation of the PRACE common services for the Tier-0 sites and the Tier-1 sites. The operational procedures have continued to deliver the compute resources to the users of the different PRACE activities including PRACE calls, SHAPE calls, DECI calls, all training activities, COVID Fast Track access and others.

This has been heavily supported by the periodic bi-weekly gathering of the partners using a videoconference as well as by the on-duty activity with weekly schedule of daily operation monitoring with regular reporting each week the status of the infrastructure, the core services and the issues identified and resolved.

Furthermore, the generic services continued to support the operations and extended the functionalities of the PRACE 'backend' including the PRACE website, Training platform, CodeVault, Events portal and others.

The adoption of the latest PRACE Service Catalogue mostly focusing on the transition to certificate-less access both internally for staff and externally for the end users began with the first transition to SSH based monitoring of the systems.

Thanks to the procedures for incident and change management, Task 6.1 operated and monitored on a day-by-day basis the complete set of PRACE common services, as defined in the PRACE Service Catalogue with zero security incidents reported.

Several new Tier-0 and Tier-1 systems were integrated while some older were decommissioned in favour for the new ones which increases the total compute power available for the European HPC users.

The federated approach for the new PRACE AAI was addressed with the aim to become the preferred approach to identities internally used by all PRACE partners and also to be interoperable with other major European computing endeavors.

A link to EuroHPC was established to provide them support in the operations of the new petascale EuroHPC systems, mainly with a knowledge transfer of the procedures, setups, and best practises used in PRACE operations. First topics already started are the monitoring and networking activity.