Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
terabit

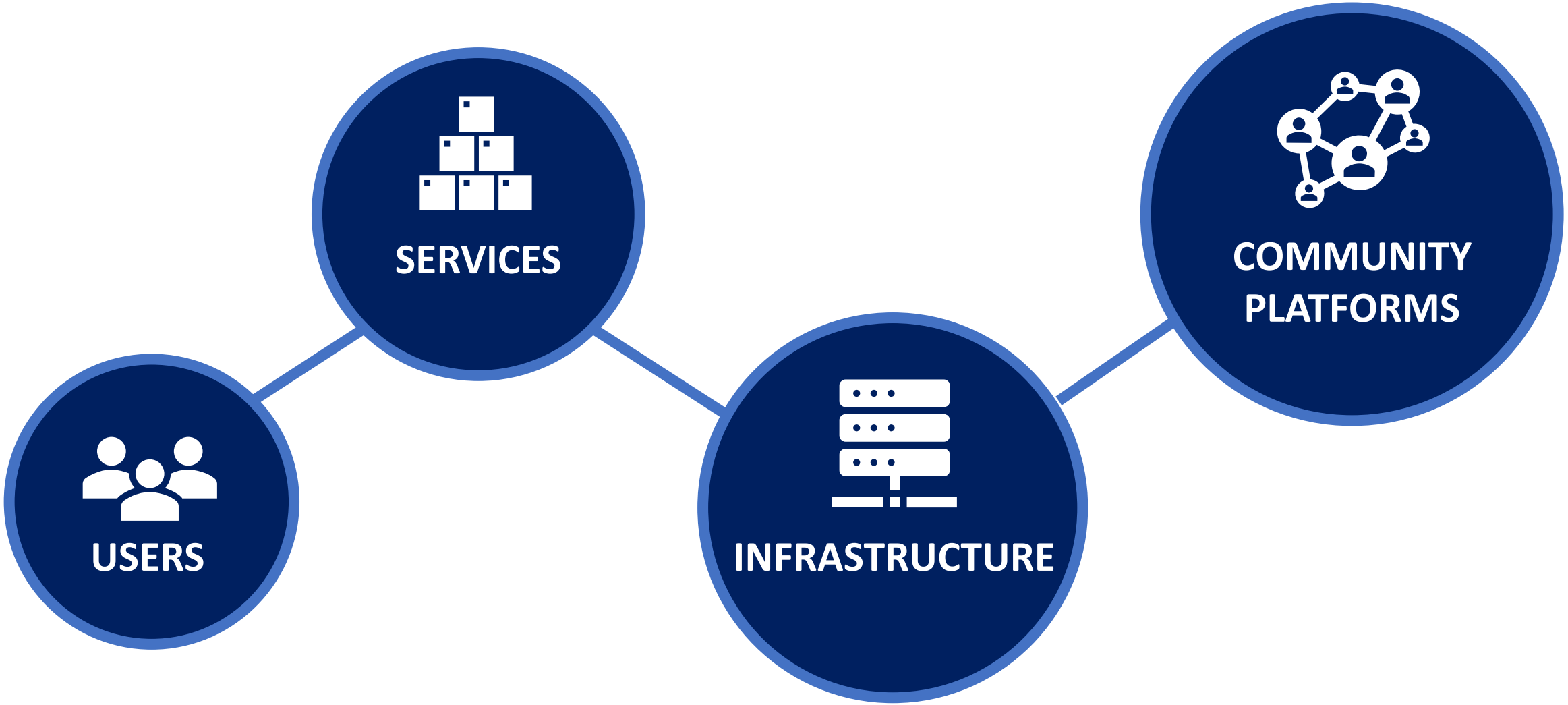
Servizi e risorse di PRACE-Italy

Centralized Tier-1 HPC system (WP3)

Mirko Cestari

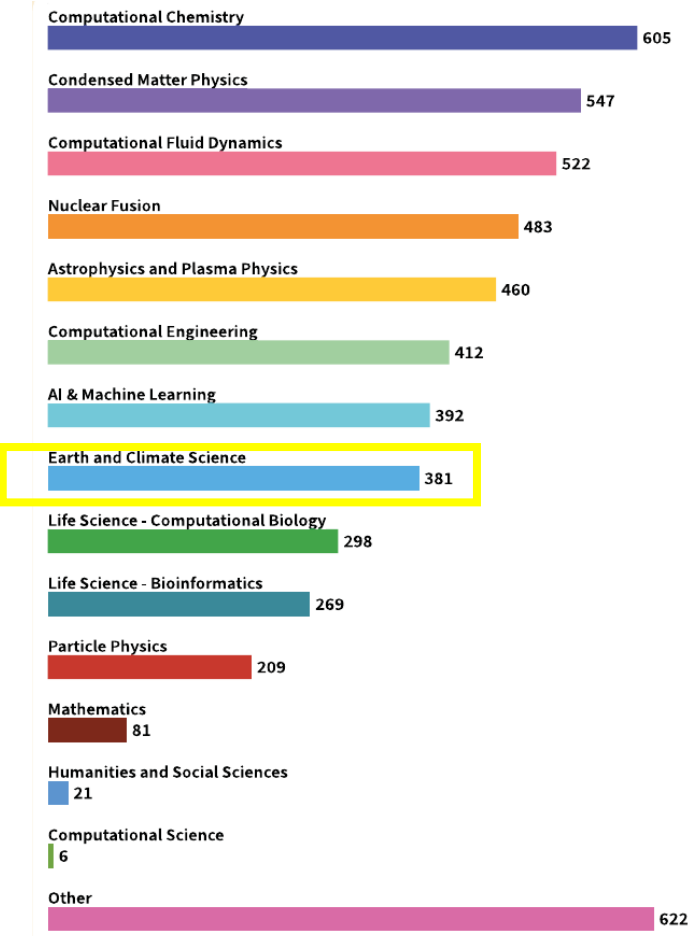
Bologna, 25 Giugno 2024

Conferenza TeRABIT

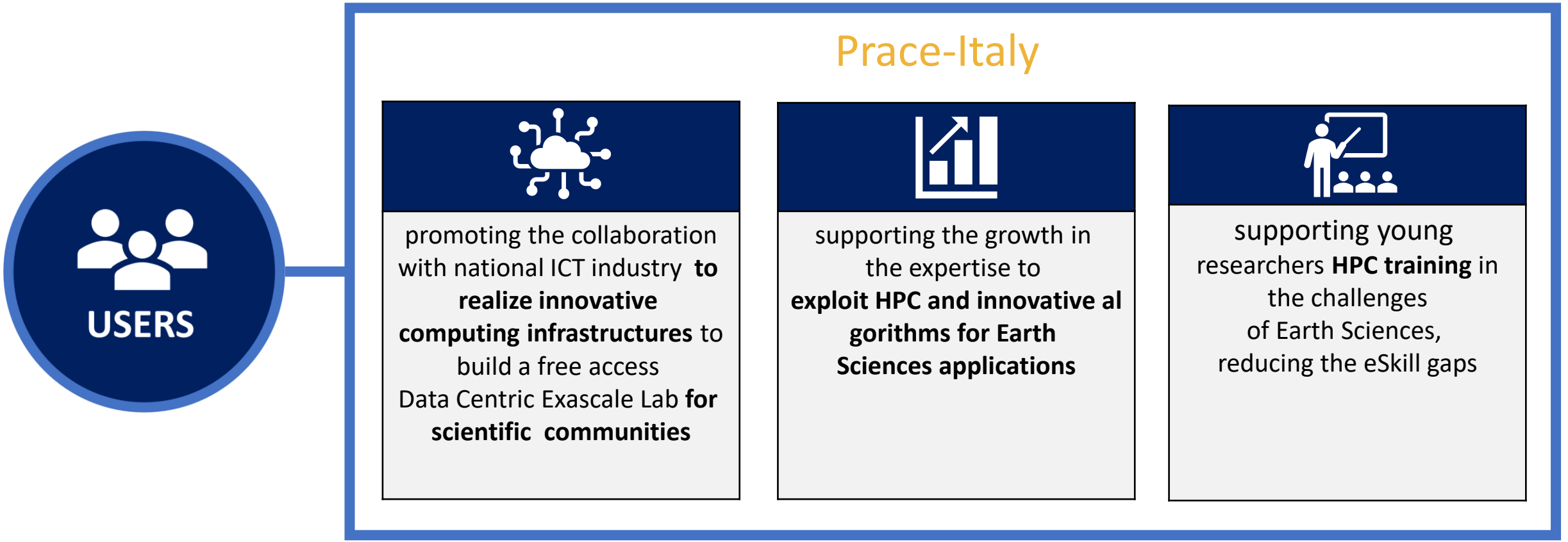

SERVICES
USERS
INFRASTRUCTURE
COMMUNITY PLATFORMS

Prace-Italy

- Through PRACE-Italy, **OGS and Cineca sustain the evolution of the national HPC facility located at Cineca**
- For PRACE-Italy community, Cineca has made available the facility **Galileo100 (Tier-1 system)**
- PRACE-Italy contributes to skill building through the **HPC Training and Research for Earth Sciences (HPC-TRES)** initiative,
  - co-funded 60 grants (**PhDs, postdocs, scholarships**) in different Italian research institutes and universities since 2015.
- OGS coordinates the **Joint Research Unit HPC-TRES** CNR, INGV, CMCC, Politecnico Torino, ICTP

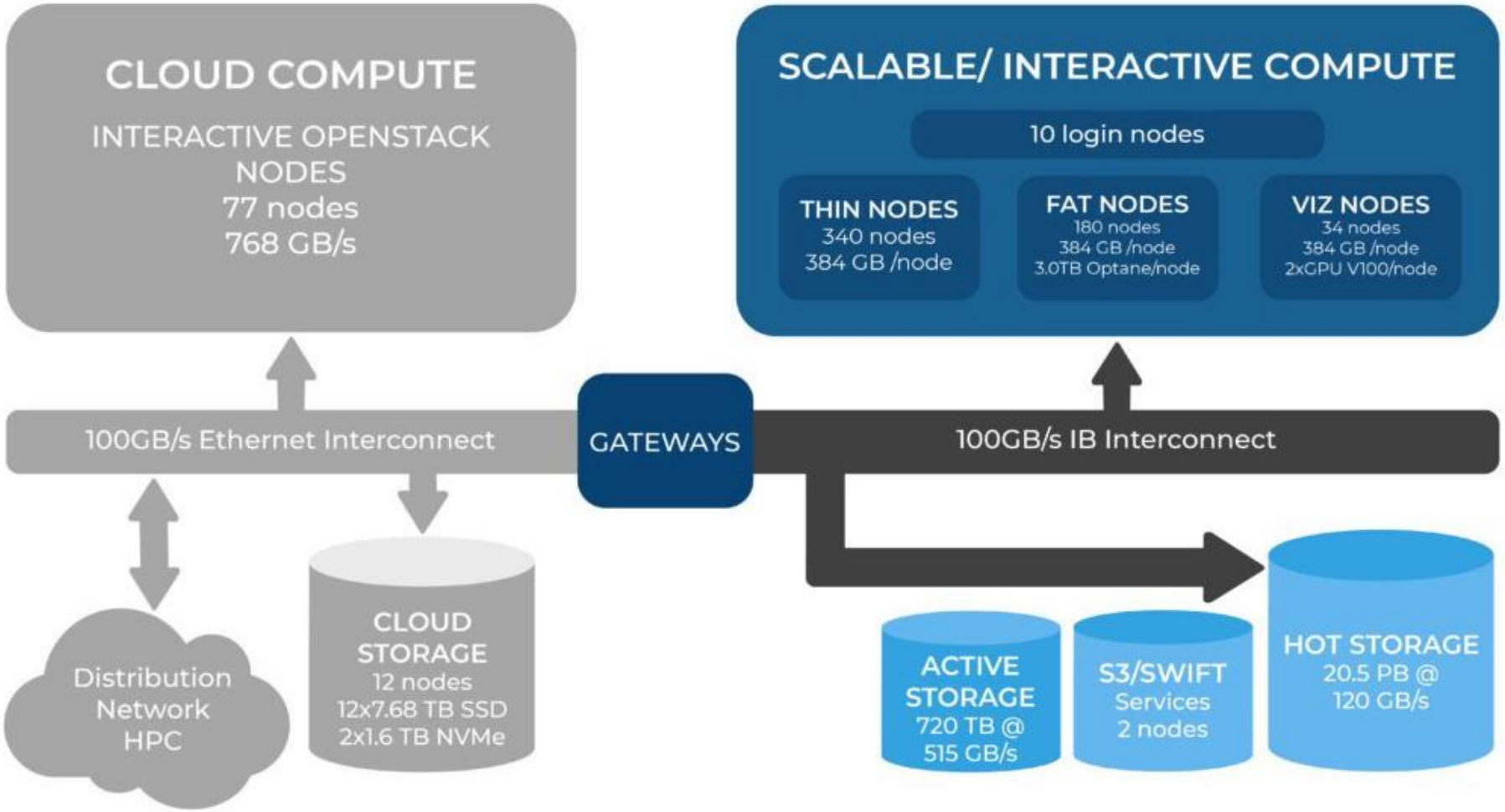


PRACE-Italy is the Italian node of the EU PRACE ESFRI research infrastructure. PRACE-Italy is included in the PNIR 2021-2027 as high-priority national RI. PRACE-Italy follows PRACE and EuroHPC roadmaps



SERVICES

02/2023



GALILEO100

https://www.hpc.cineca.it/systems/hardware/galileo100/

Cloud

- OpenStack cloud
- ~ 7000 vCPUs
- 77 x (2x CPU 8260, 768 GB RAM)
- 100Gbs Ethernet interconnection.

Storage services

- File (POSIX), Block, Object
- ~ 20 PB parallel FS storage
- ~700 TB block storage for cloud (full flash)
- ~ 700 TB IME burst storage

Low- mid HPC

- HPC resources
- Fat nodes
- CPU/GPU nodes
- Fast interconnect hi-bw low latency (NVIDIA HDR)

Interactive comp.

- Prompt response
- Dedicated resources (GPU/CPU)
- Close to data repository
- Framework for processing data (Jupyter, R, Julia, ...)

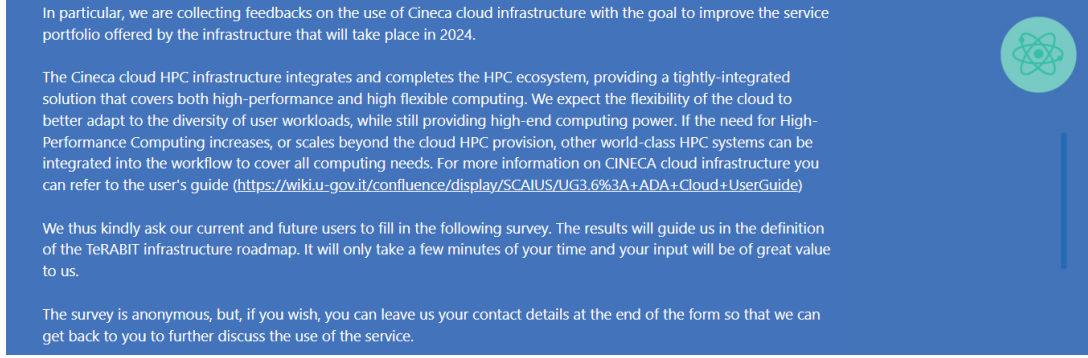
TeRABIT?

SERVICES

Cloud	Storage services	Low- mid HPC	Interactive comp.
?	?	?	?

User Survey

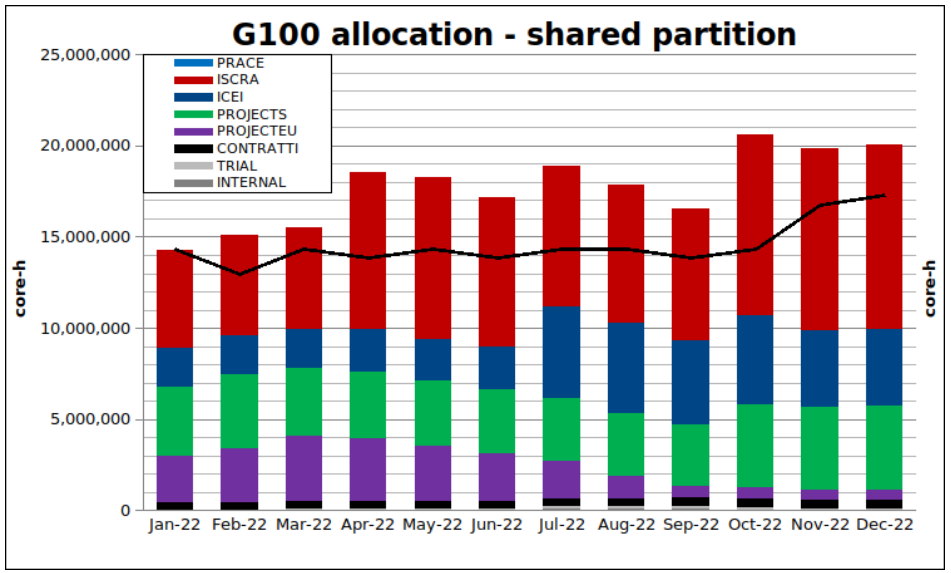
- 32 questions
- Two main targets
- **Cloud user**
  - **Satisfaction** on the current offering
  - **New requirements**
- **HPC user**
  - Potential **interest in cloud** resources
  - Requirements in terms of **features**
- 56 replies received

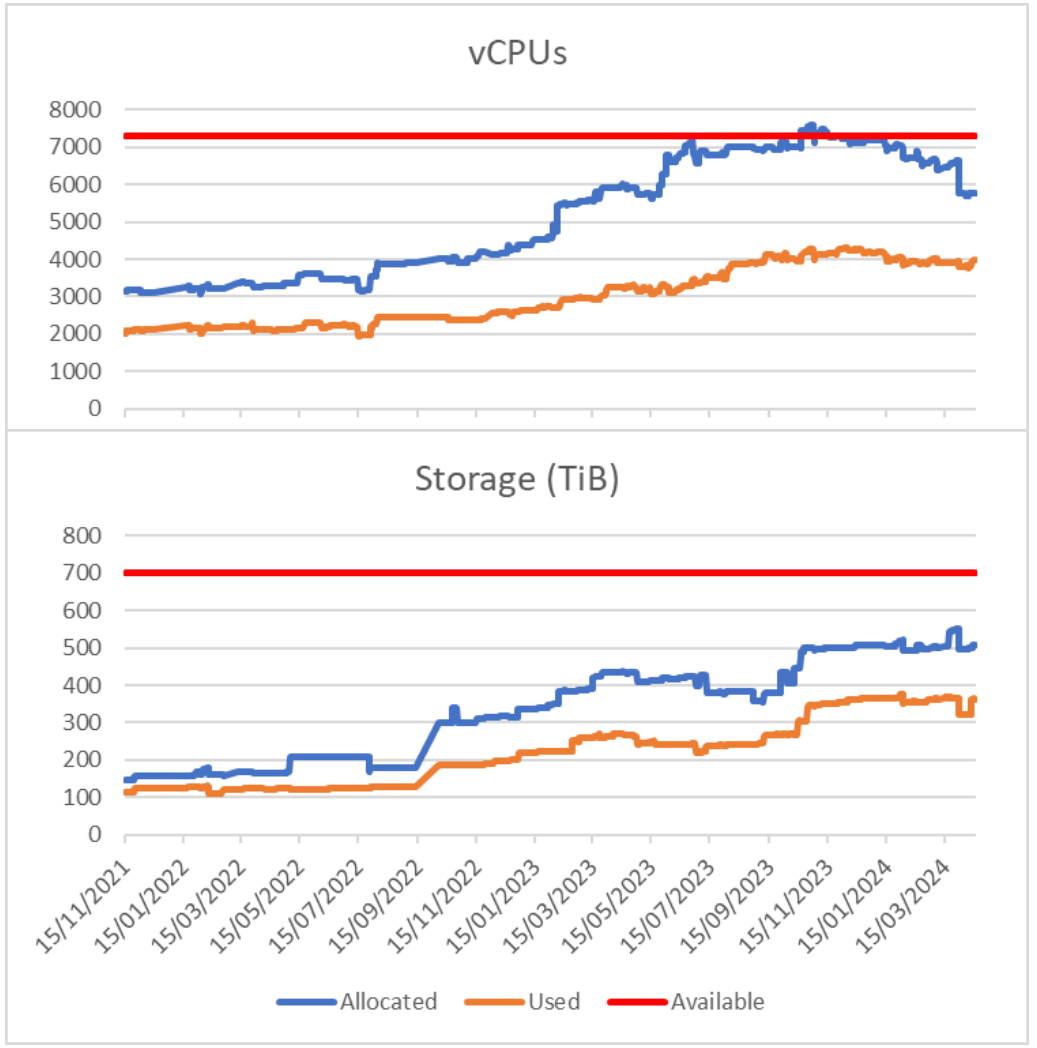


User Survey

	Survey results	*Tier-1 upgrade projection*	*Notes*
vCPUs	2000	**200000**	A target of 100000 cores is attainable. With multi-threading activated 200000 vCPUs can be provided
RAM	7 TB	**700 TB**	While 700 TB of RAM could be obtained, 400 TB should be enough for the user needs satisfying the common requirement of 2GB per vCPU and complying with an overall better energy efficiency
Storage	91 TB	**9100 TB**	At least an amount of 9 PB of storage for the cloud must be planned

Resources


G100 allocation - shared partition
core-h
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
PRACE
ISCRA
ICEI
PROJECTS
PROJECTEU
CONTRATTI
TRIAL
INTERNAL
Jan-22 Feb-22 Mar-22 Apr-22 May-22 Jun-22 Jul-22 Aug-22 Sep-22 Oct-22 Nov-22 Dec-22


vCPUs
8000
7000
6000
5000
4000
3000
2000
1000
0
Storage (TiB)
800
700
600
500
400
300
200
100
0
15/11/2021
15/01/2022
15/03/2022
15/05/2022
15/07/2022
15/09/2022
15/11/2022
15/01/2023
15/03/2023
15/05/2023
15/07/2023
15/09/2023
15/11/2023
15/01/2024
15/03/2024
Allocated
Used
Available

TeRABIT and ICSC

ICSC Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

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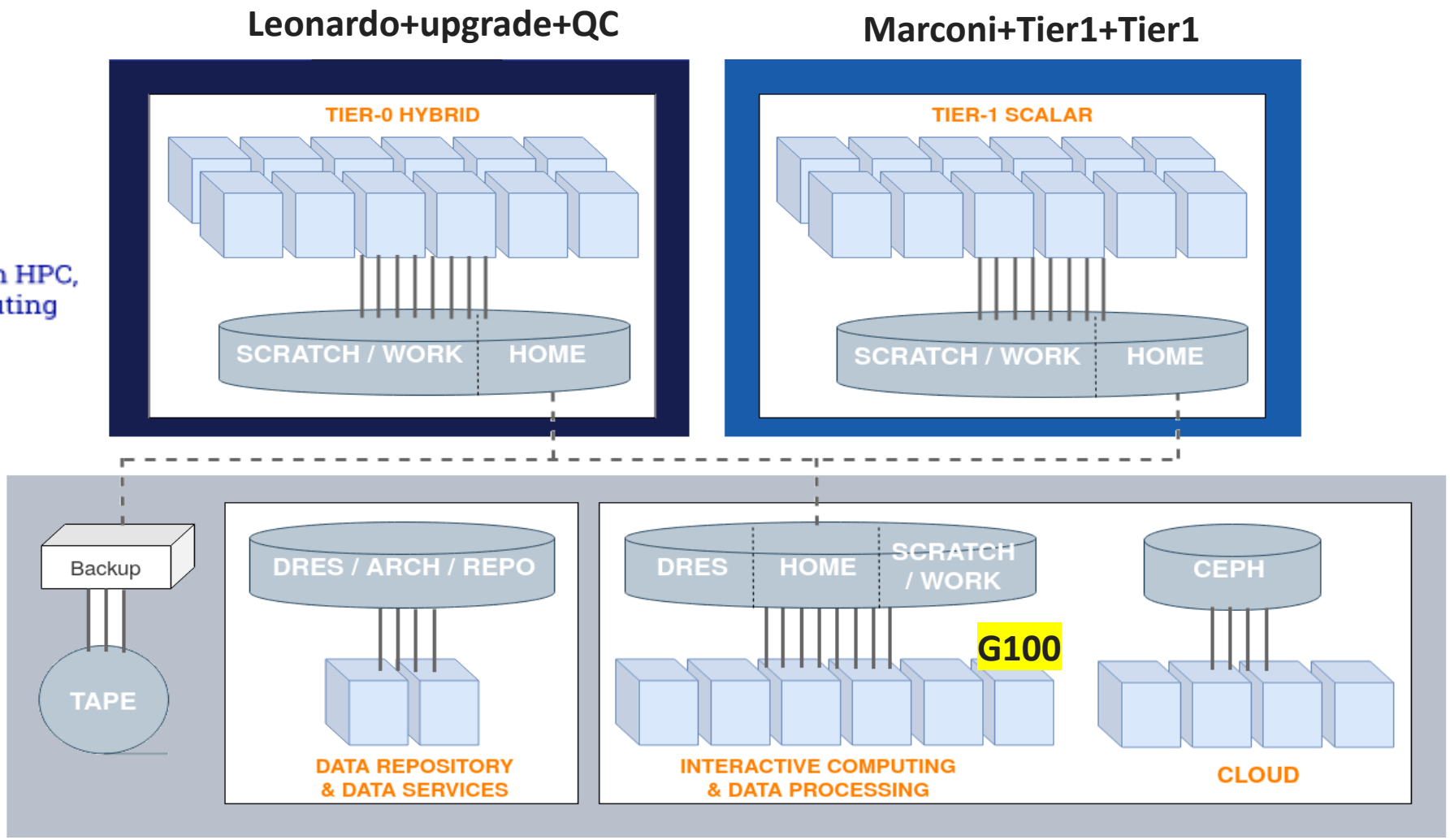
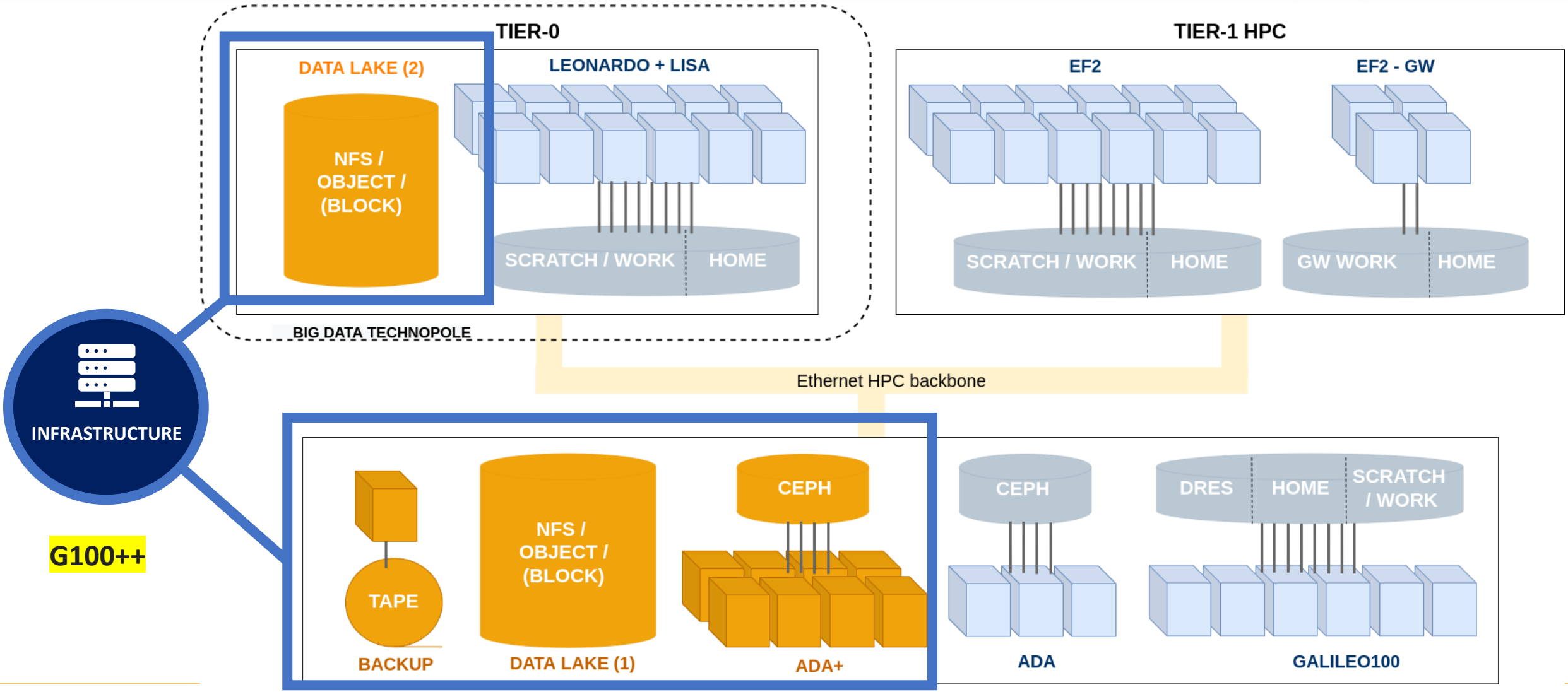
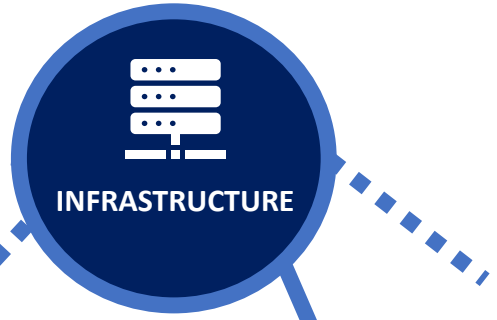



TIER-0
DATA LAKE (2)
NFS / OBJECT / (BLOCK)
LEONARDO + LISA
SCRATCH / WORK
HOME
BIG DATA TECHNOPOLE
TIER-1 HPC
EF2
SCRATCH / WORK
HOME
EF2 - GW
GW WORK
HOME
Ethernet HPC backbone
INFRASTRUCTURE
G100++
TAPE
BACKUP
NFS / OBJECT / (BLOCK)
DATA LAKE (1)
CEPH
ADA+
CEPH
ADA
DRES
HOME
SCRATCH / WORK
GALILEO100
TIER-1 INTERACTIVE COMPUTING / DATA SERVICES / CLOUD

TeRABIT

Procurements details:

- Tender release: October 2023
- Full production: H2 2024



Technical specifications:

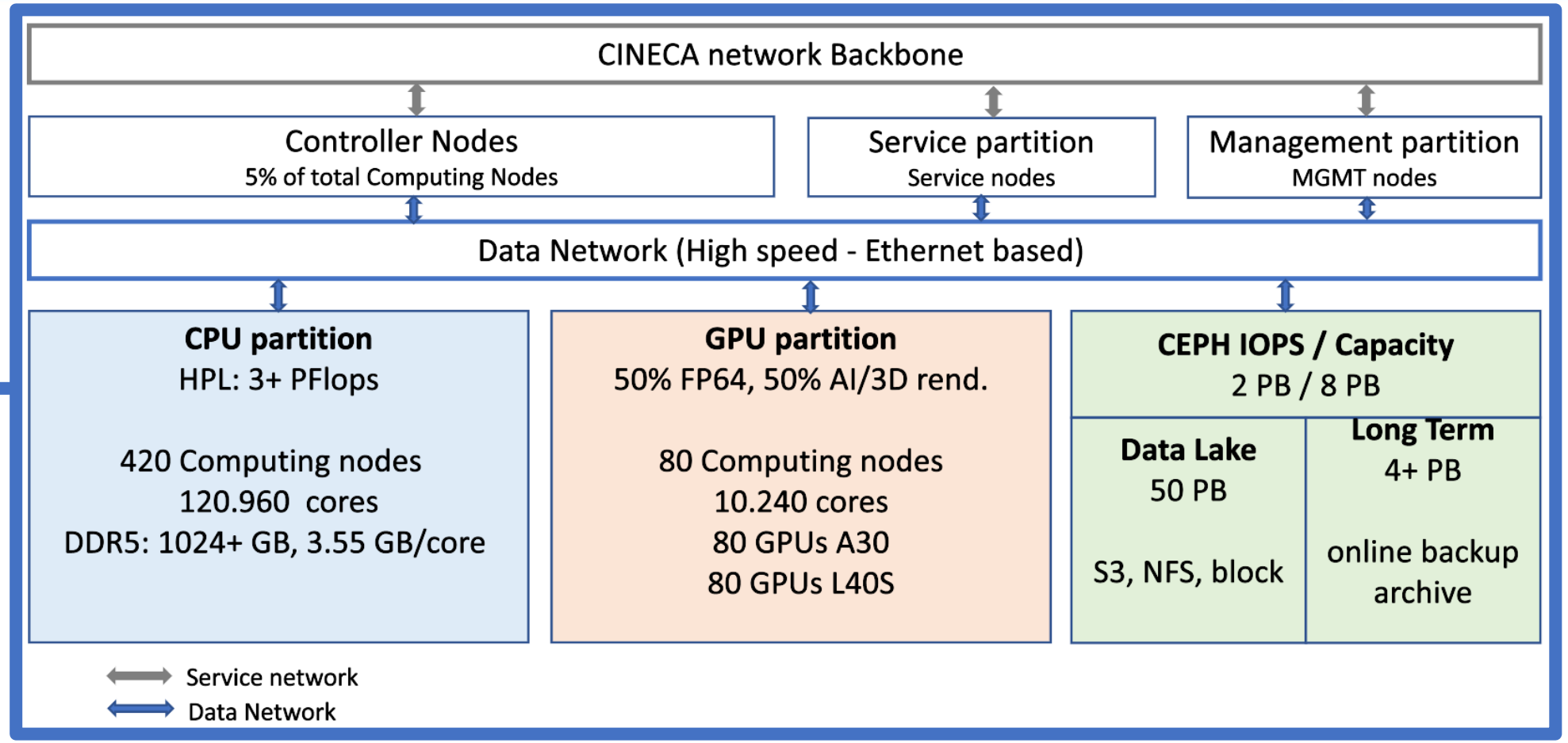
- **Cloud infrastructure**: based on OpenStack
- **Data Network**: 400G spine-leaf
- **CPU partition**: >100k cores
- **GPU partition**: >70 nodes (>140 GPUs)
- **Cloud storage**: >8PB CEPH storage
- **Data lake**: >30PB full-flash multi protocol storage (NFS, S3, Block, PFS, GDS, etc.)
- **Backup storage infrastructure**: for G100's backups

N.	ELEMENTI DI VALUTAZIONE	FATTORE PONDERALE DISCREZIONALE MAX	FATTORE PONDERALE VINCOLATO MAX
1	Valore tecnico della soluzione per il sottosistema di calcolo	35	
2	Valore tecnico della soluzione per il sottosistema di memorizzazione dati	25	
3	Capacità dello storage Data Lake		15
4	Qualità dei servizi	15	
5	Relazione su promozione di: imprenditoria giovanile, inclusione lavorativa delle persone con disabilità, parità di genere e assunzione di giovani con età inferiore a trentasei anni e donne	3	
6	Impatto ambientale	7	
TOTALE PUNTEGGIO OFFERTA TECNICA			100

AWARDED

E4 COMPUTER ENGINEERING
DELL Technologies VAST

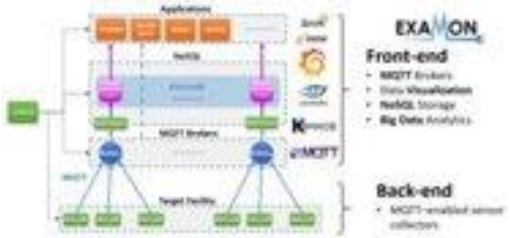
INFRASTRUCTURE



2nd half 2024

Targets

- Data processing and analysis services **complementing** High Performance Computing services
- **Bridging** HPC infrastructure (Cloud to host front-end services for the user)
- Data management services **exposing** simulation data to the web via community-defined services
- Workload **requiring ISO27001** certification (processing sensitive data)
- Flexible and **automated deployment** via Kubernetes and containerized workflows
- **Collaborative** infrastructure deployment (Infrastructure as code)



COMMUNITY PLATFORMS

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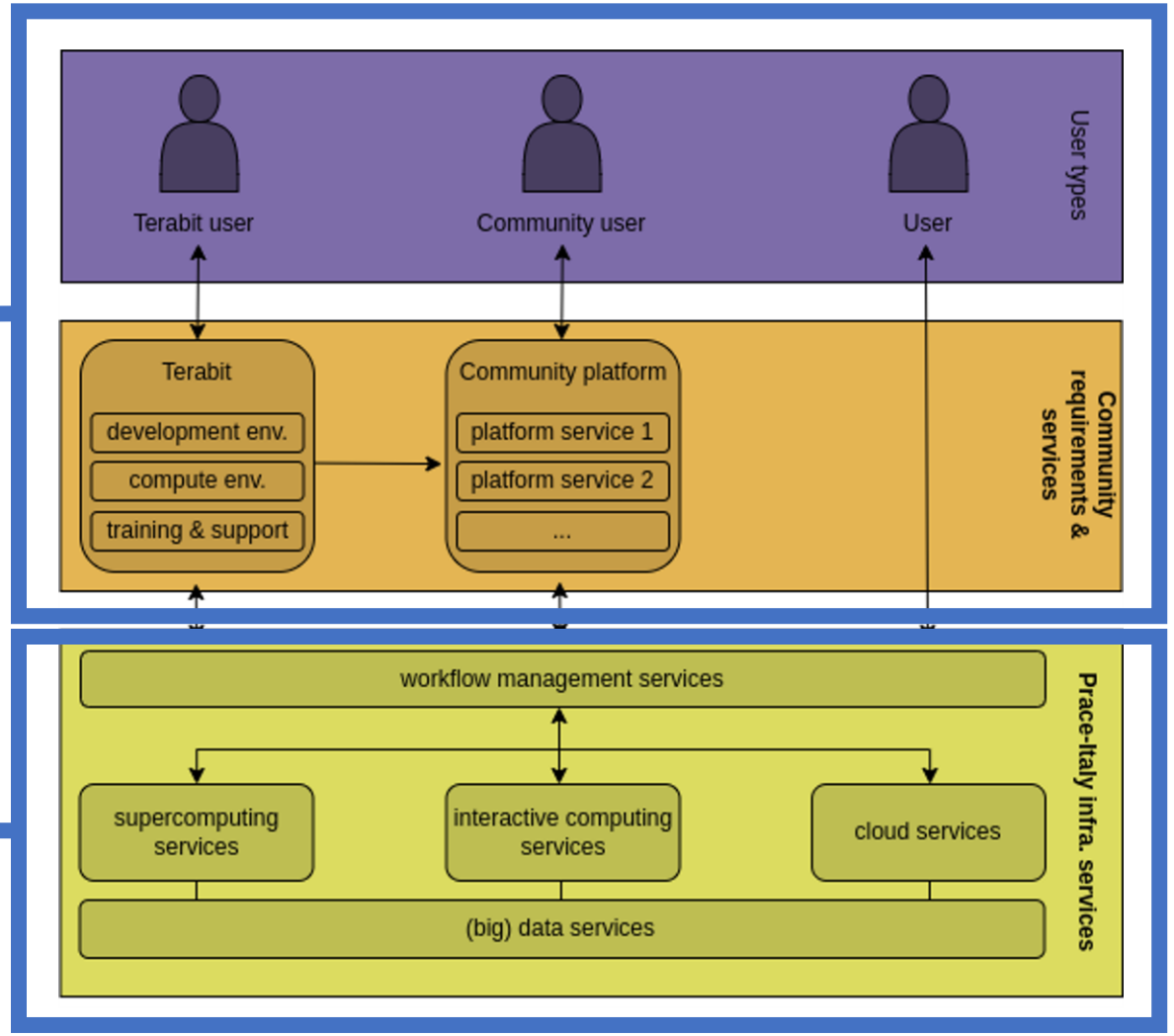

Thanks for your attention

The WP3 gang