

# Risorse di calcolo dell'esperimento ALICE

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- Organizzazione
- Uso delle risorse
- Richieste per il 2025

# Organizzazione

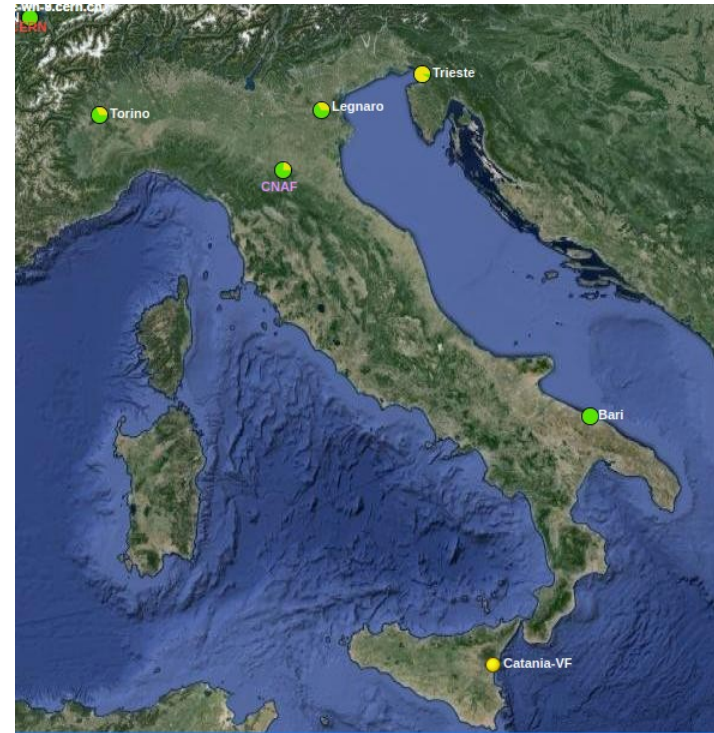
- Responsabile Nazionale del Calcolo
  - Mario Sitta
- Deputy RNC nel Computing Board e Coordinatore TIER-2
  - Rosario Turrisi
- Referente TIER-1
  - Francesco Noferini

# Organizzazione

- Meeting periodici (via Zoom)
  - ogni ~ 3 mesi
- Workshop annuale
  - ultimi: 2023 Bologna, 2022 Trieste, 2021 Frascati
- Meeting mensile Comitato di Gestione del Tier-1 CNAF
- Resource Computing Board durante le ALICE week

# Risorse ALICE Italia

- 1 TIER-1
  - CNAF Bologna, condiviso con altri esperimenti (LHC e non)
- 4 TIER-2 ufficiali
  - Bari, Catania, Padova-LNL, Torino
- Altre risorse
  - Trieste



# Uso delle risorse al Tier-1

## Wallclock Work in HEPSP06 Days

Search: 

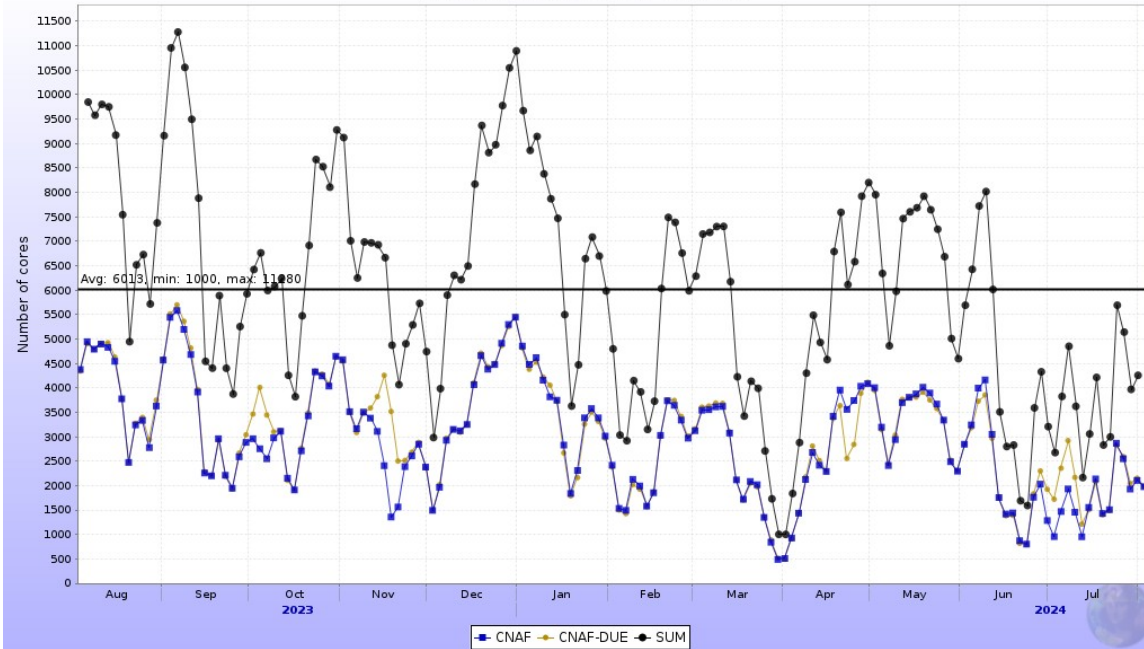
Wallclock Work in HEPSP06 Days	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024	Jun 2024	Jul 2024	Total
Total ALICE	4,903,643	4,818,892	4,559,236	3,491,828	3,653,681	3,334,520	2,564,281	2,376,990	2,400,064	3,618,371	2,564,947	2,295,532	40,581,985
<b>Total TOTAL</b>	<b>4,903,643</b>	<b>4,818,892</b>	<b>4,559,236</b>	<b>3,491,828</b>	<b>3,653,681</b>	<b>3,334,520</b>	<b>2,564,281</b>	<b>2,376,990</b>	<b>2,400,064</b>	<b>3,618,371</b>	<b>2,564,947</b>	<b>2,295,532</b>	<b>40,581,985</b>
MoU pledge*	3,191,760	3,088,800	3,191,760	3,088,800	3,191,760	3,191,760	2,985,840	3,191,760	3,780,000	3,906,000	3,780,000	3,906,000	40,494,240

111.2 kHS06 used / 110.9 kHS06 pledged = 100.2%

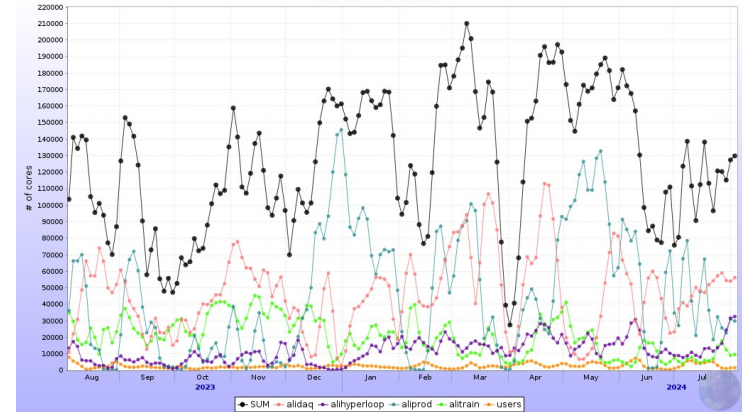


# Uso delle risorse al Tier-1

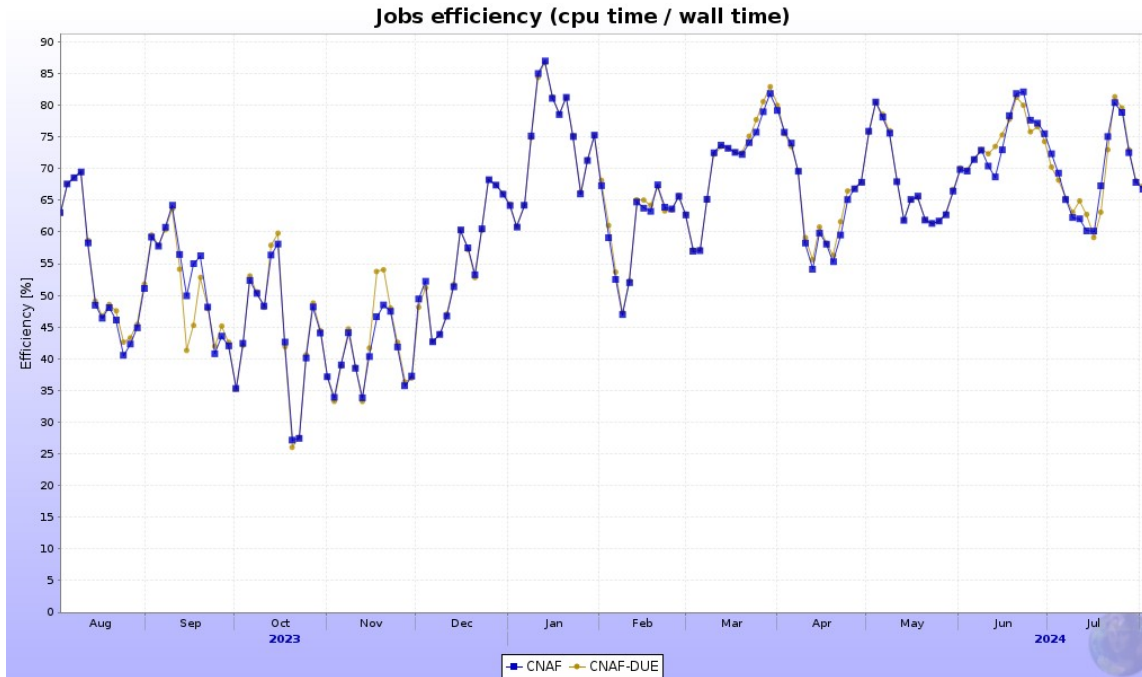
Total allocated cores per site



CPU Cores in use



# Uso delle risorse al Tier-1



Jobs efficiency (cpu time / wall time)

	Series	Last value	Min	Avg
1.	■ CNAF	66.54	0.144	60.73
2.	■ CNAF-DUE	67.15	0.077	60.89
<b>Total</b>		<b>66.85</b>		<b>60.81</b>



# Uso delle risorse al Tier-1

## Disk Space - TBytes

Search: 

Disk Space - TBytes	Aug 2024	Total	% MoU
ALICE allocated	16,895	16,895	
ALICE used	10,033	10,033	
<b>Total allocated</b>	<b>16,895</b>	<b>16,895</b>	<b>118%</b>
<b>Total used</b>	<b>10,033</b>	<b>10,033</b>	<b>70%</b>
installed capacity	0	0	
MoU pledge	14,300	14,300	

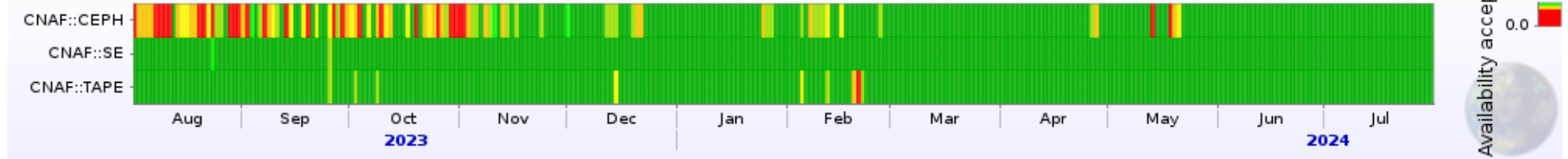
## Tape Space - TBytes

Search: 

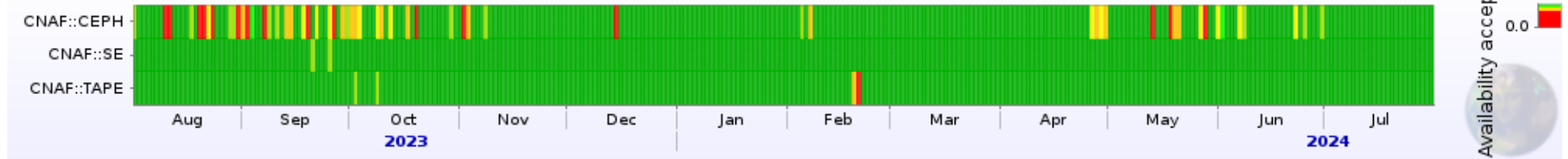
Tape Space - TBytes	Aug 2024	Total	% MoU
ALICE	17,035	17,035	
<b>Total</b>	<b>17,035</b>	<b>17,035</b>	<b>51%</b>
installed capacity	0	0	
MoU pledge	33,170	33,170	

# Uso delle risorse al Tier-1

AliEn SEs availability for reading

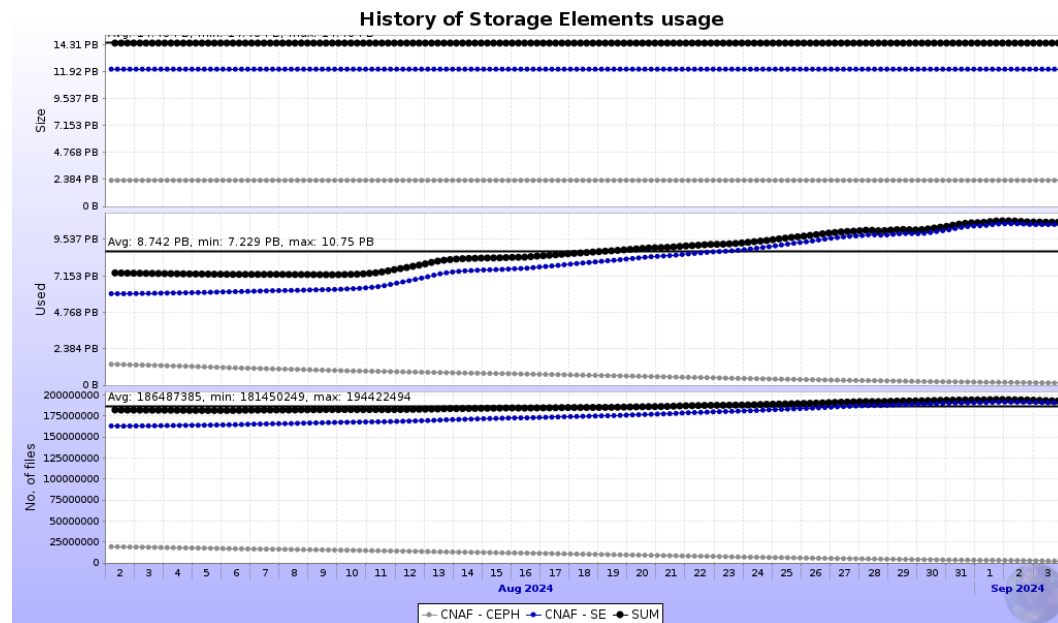


AliEn SEs availability for writing



# Uso delle risorse al Tier-1

- Storage CEPH in dismissione
- Trasferimento dei dati su GPFS in corso
  - a cura del team ALICE CERN
  - completamento previsto per il 7 settembre



# Data Challenge 2024

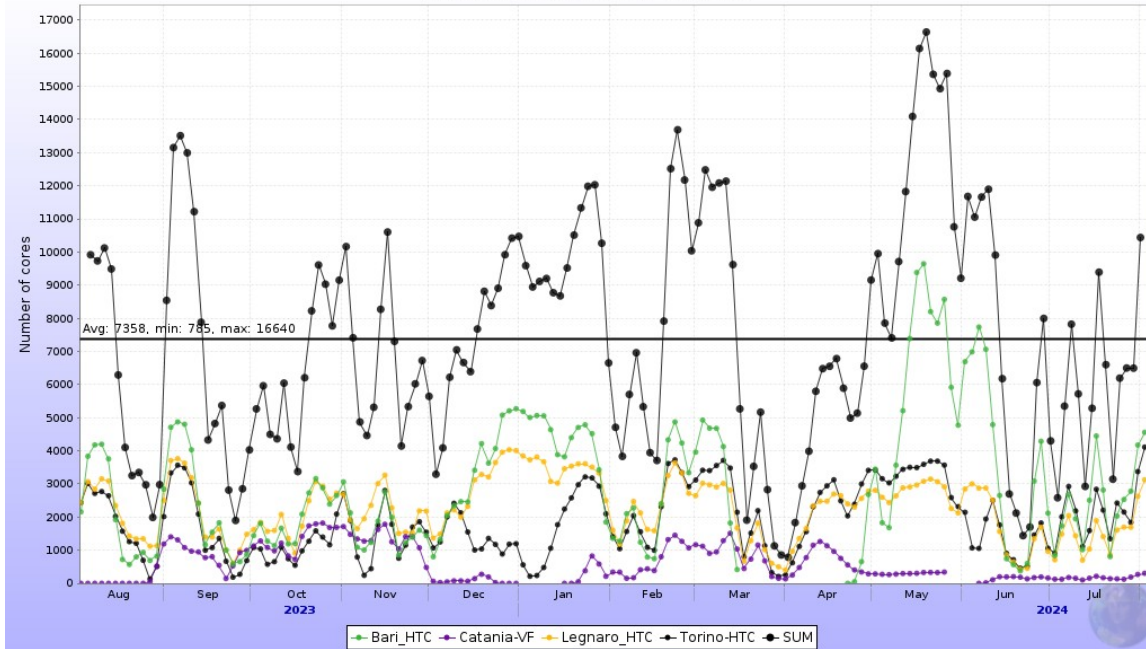
- 4 Esp. LHC + DUNE + Belle-2
- Coinvolti tutti i Tier-0 e Tier-1 + alcuni Tier-2 (nessuno di ALICE)
- Per ALICE:
  - verifica della capacità di sostenere il traffico dati end-to-end
    - target 25% di HL-LHC (minimo 130 GB/s)
    - totale 34 PB di run PbPb 2023

# Data Challenge 2024

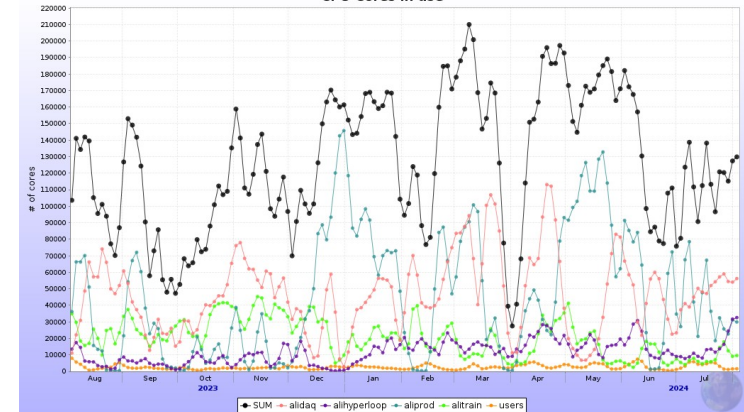
Centre	Target rate GB/s	Average achieved GB/s
CNAF	0.8	0.98 (+20%)
IN2P3	0.4	0.6 (+40%)
KISTI	0.2	0.25 (+22%)
GridKA	0.6	1.12 (+90%)
NDGF	0.3	0.35 (+15%)
NL-T1	0.1	0.25 (+150%)
RAL	0.1	0.58 (+500%)
<i>CERN</i>	<i>10</i>	<i>14.2 (+40%)</i>

# Uso delle risorse ai Tier-2

Total allocated cores per site

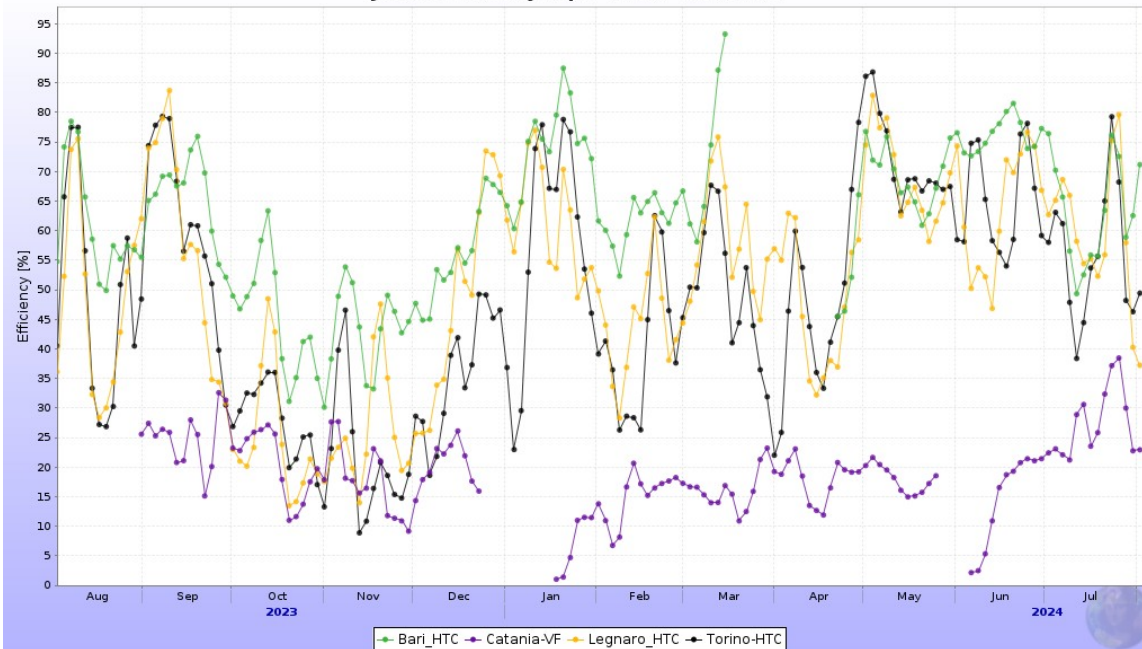


CPU Cores in use



# Uso delle risorse ai Tier-2

Jobs efficiency (cpu time / wall time)



Jobs efficiency (cpu time / wall time)

	Series	Last value	Min	Avg
1.	Bari_HTC	71.16	0.012	61.87
2.	Catania-VF	22.92	0	18.79
3.	Legnaro_HTC	37.21	0	50.73
4.	Torino-HTC	49.41	0	48.4
	<b>Total</b>	<b>45.17</b>		<b>44.95</b>

# Uso delle risorse ai Tier-2

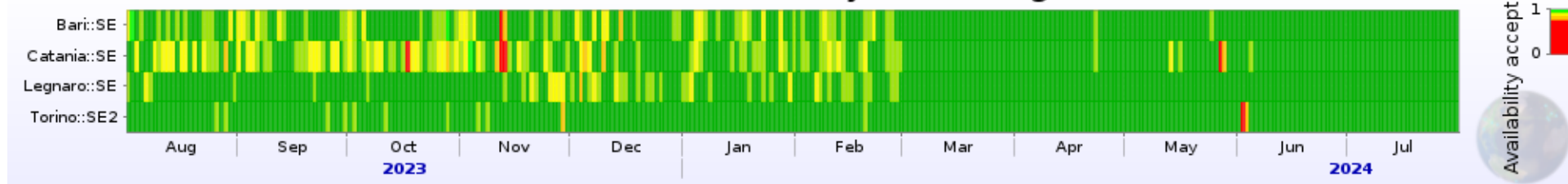
## Disk storage elements

Bari													
AliEn SE			Catalogue statistics						Storage-provided information				
SE Name	AliEn name	Tier	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version
1. Bari - SE	ALICE::Bari::SE	2	2.2 PB	1.745 PB	465.9 TB	79.31%	33,919,888	FILE	2.09 PB	1.647 PB	453.8 TB	78.8%	Xrootd v5.4.3
<b>Total</b>			<b>2.2 PB</b>	<b>1.745 PB</b>	<b>465.9 TB</b>		<b>33,919,888</b>		<b>2.09 PB</b>	<b>1.647 PB</b>	<b>453.8 TB</b>		
Catania													
AliEn SE			Catalogue statistics						Storage-provided information				
SE Name	AliEn name	Tier	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version
1. Catania - SE	ALICE::Catania::SE	2	3 PB	2.572 PB	438.2 TB	85.73%	27,963,387	FILE	3 PB	2.454 PB	558.8 TB	81.81%	Xrootd v5.5.1
<b>Total</b>			<b>3 PB</b>	<b>2.572 PB</b>	<b>438.2 TB</b>		<b>27,963,387</b>		<b>3 PB</b>	<b>2.454 PB</b>	<b>558.8 TB</b>		
Legnaro													
AliEn SE			Catalogue statistics						Storage-provided information				
SE Name	AliEn name	Tier	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version
1. Legnaro - SE	ALICE::Legnaro::SE	2	3.276 PB	2.782 PB	506 TB	84.92%	36,365,427	FILE	3.276 PB	2.909 PB	375.8 TB	88.8%	Xrootd v5.5.1
<b>Total</b>			<b>3.276 PB</b>	<b>2.782 PB</b>	<b>506 TB</b>		<b>36,365,427</b>		<b>3.276 PB</b>	<b>2.909 PB</b>	<b>375.8 TB</b>		
Torino													
AliEn SE			Catalogue statistics						Storage-provided information				
SE Name	AliEn name	Tier	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version
1. Torino - SE2	ALICE::Torino::SE2	2	1.646 PB	1.206 PB	450.7 TB	73.27%	20,009,829	FILE	1.646 PB	1.21 PB	446.7 TB	73.5%	Xrootd v4.11.1
<b>Total</b>			<b>1.646 PB</b>	<b>1.206 PB</b>	<b>450.7 TB</b>		<b>20,009,829</b>		<b>1.646 PB</b>	<b>1.21 PB</b>	<b>446.7 TB</b>		

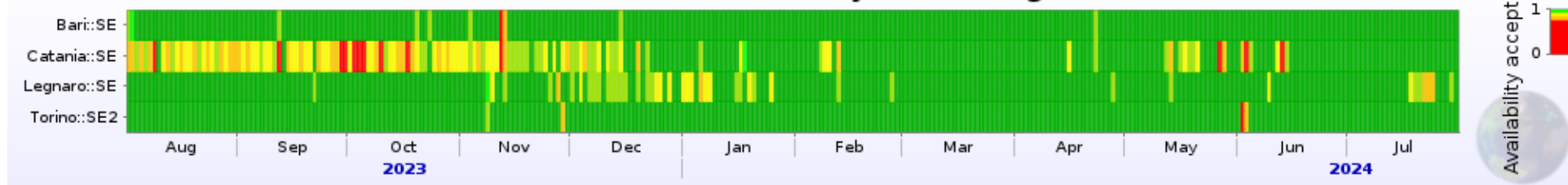


# Uso delle risorse ai Tier-2

### AliEn SEs availability for reading



### AliEn SEs availability for writing



# Stato delle risorse ai Tier-2

- Bari:
  - interruzione dei job fra Marzo e Aprile per mancanza di comunicazione vobox ↔ HTCondor
  - ultima settimana problema al gruppo di continuità ReCaS → HTCondor spento
  - calcolo opportunistico permette di recuperare

# Stato delle risorse ai Tier-2

- Catania:
  - a Maggio allagamento della sala calcolo dovuto a guasto al circuito antincendio del Dipartimento
  - incremento delle prestazioni di rete in corso
- Legnaro:
  - upgrade dei link di rete da 20 a 200 Gb/s ancora non effettuato (comunque entro fine anno)
  - lavori per il nuovo Data Center in corso

# Stato delle risorse ai Tier-2

- Torino:
  - a inizio Giugno blocco del chiller della sala calcolo (Dipartimento) → T2 down per ~ 1 settimana
  - impossibilità di usare macchine virtuali come WN (flag avx\*) in corso di risoluzione
  - aggiornamento di XRootd e uso di IPv6 non ancora disponibili

# Richieste 2025

ALICE		2024					2025			
		Req.	C-RSG	Pledge	RU + JINR pledge	Pledge - (RU+JIN R)	Prev. Est.	Req.	Req. 2025 / C-RSG 2024	Req. 2025 / (Pledges - RU) 2024
CPU [kHS23]	Tier-0	600	600	600		600	690	680	113%	113%
	Tier-1	630	630	540	0	540	725	690	110%	128%
	Tier-2	650	650	641	33	608	750	730	112%	120%
	<b>Total</b>	<b>1880</b>	<b>1880</b>	<b>1782</b>	<b>33</b>	1748	<b>2165</b>	<b>2100</b>	<b>112%</b>	<b>120%</b>
Disk [PB]	Tier-0	67.5	67.5	67.5		67.5	78.5	78.0	116%	116%
	Tier-1	71.5	71.5	61.9	0.0	61.9	82.5	79.0	110%	128%
	Tier-2	66.5	66.5	69.8	3.2	66.5	77.5	77.0	116%	116%
	<b>Total</b>	<b>205.5</b>	<b>205.5</b>	<b>199.2</b>	<b>3.2</b>	195.9	<b>238.5</b>	<b>234.0</b>	<b>114%</b>	<b>119%</b>
Tape [PB]	Tier-0	181.0	181.0	181.0		181.0	226.0	220.0	122%	122%
	Tier-1	107.0	107.0	102.4	0.0	102.4	135.0	123.0	115%	120%
	<b>Total</b>	<b>288.0</b>	<b>288.0</b>	<b>283</b>	<b>0</b>	283.4	<b>361.0</b>	<b>343.0</b>	<b>119%</b>	<b>121%</b>

- Standard growth for CPU (+10%) and disk (+14%) in 2024 compatible with flat budget
  - Without the RU+JINR contribution, the estimated growth exceeds the flat budget in particular for the T1 sites
- Large step for tape:
  - Considered compression strategy A
- Priority order for the T1 is 1) Tape 2) Disk 3) CPU.
- The strategy for the missing T1 resources will be to balance them between T1 and T2 sites

# Share INFN 2025

- Basato su M&O-A al 01/09/2023
  - esclusa Russia, incluso JINR (8 M&O-A)

	2024	2025
Tier-1 Tape	31%	37%
Tier-1 e Tier-2 Disco + CPU	20%	21.5%

# Share INFN 2025

Italia	110
Germania	68
Francia	45
Nordic <sup>(*)</sup>	36
Corea	19
UK	11
Olanda	9

Share Italia Tier-1:  $110/298 = 36.9\%$

<sup>(\*)</sup> Svezia, Norvegia, Danimarca, Finlandia

# Richieste 2025

ALICE		2023			2024		2025			
		C-RSG recomm.	Pledged	Used	C-RSG recomm.	Pledged	Request	2025 req. / 2024 C-RSG	C-RSG recomm.	
CPU	Tier-0	541	541	660	600	600	680	113%	680	21.5%
	Tier-1	572	506	446	630	540	690	110%	690	
	Tier-2	592	567	555	650	641	730	112%	730	
	HLT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	<b>Total</b>	<b>1705</b>	<b>1614</b>	<b>1661</b>	<b>1880</b>	<b>1781</b>	<b>2100</b>	<b>112%</b>	<b>2100</b>	
	<i>Others</i>			222						
Disk	Tier-0	58.5	58.5	51.6	67.5	67.5	78.0	116%	78.0	21.5%
	Tier-1	63.5	57.6	50.2	71.5	61.9	79.0	110%	79.0	
	Tier-2	57.5	60.4	47.3	66.5	69.8	77.0	116%	77.0	
	<b>Total</b>	<b>179.5</b>	<b>176.5</b>	<b>149.1</b>	<b>205.5</b>	<b>199.2</b>	<b>234.0</b>	<b>114%</b>	<b>234.0</b>	
Tape	Tier-0	131.0	131.0	115.0	181.0	181.0	220.0	122%	220.0	37%
	Tier-1	82.0	87.7	42.5	107.0	102.4	123.0	115%	123.0	
	<b>Total</b>	<b>213.0</b>	<b>218.7</b>	<b>157.5</b>	<b>288.0</b>	<b>283.4</b>	<b>343.0</b>	<b>119%</b>	<b>343.0</b>	

**Table 5** ALICE resource requests for 2025 and C-RSG recommendations. For reference, the 2023 utilization and 2024 pledged resources are also given.



# Monetizzazione

	2024	2025
CPU	10 €/HS06	10 €/HS23
Disco	120 €/TB	100 €/TB
Tape	10 €/TB	10 €/TB

# Tier-1

	Pledge 2024	Extra Pledge 2023-2024	Installato 2024	Richieste 2025	Delta	
<b>CPU (HS23)</b>	126000	0	126000	148500	22500	18%
<b>Disco (TB)</b>	14300	0	14300	17000	2700	19%
<b>Tape (TB)</b>	33170	5350	38520	45510	6990	18%

Il CNAF ha dichiarato che le dismissioni saranno coperte internamente (su Leonardo) senza richieste aggiuntive

# Richieste Tier-1

Capitolo	Richieste kE	Descrizione
Inventario	225.0	Crescita netta CPU Tier-1 22500 HS23 x 10 Euro/HS23
Inventario	270.0	Crescita netta Disco Tier-1 2700 TB x 100 Euro/TB
Inventario	0.0	Dismissioni CPU Tier-1
Inventario	0.0	Dismissioni Disco Tier-1
Consumo	70.0	Crescita TAPE Tier-1 6990 TB x 10 Euro/TB
G.Totale	565.0	

# Tier-2

	Pledge 2024	Installato 2024	Richieste 2025	Delta	
<b>CPU (HS23)</b>	130000	130000	157000	27000	21%
<b>Disco (TB)</b>	13300	13300	16600	3300	25%

Dismissioni	CPU (HS)			Disco (TB)		
	2024	I sem 25	II sem 25	2024	I sem 25	II sem 25
<b>Bari</b>	3576	0	0	498	0	325
<b>Catania</b>	0	0	0	0	0	0
<b>PD/LNL</b>	11910	5310	0	850	340	0
<b>Torino</b>	3748	0	0	0	672	0

# Richieste Tier-2

Capitolo	Richieste kE	Descrizione
Inventario	600.0	Crescita netta risorse Tier-2 italiani 27000 HS23 x 10 Euro/HS23 + 3300 TB x 100 Euro/TB
Inventario	87.0	Dismissione risorse Tier-2 Padova LNL 5310 HS23 x 10 Euro/HS23 + 340 TB x 100 Euro/TB
Inventario	32.5	Dismissione risorse Tier-2 Bari 325 TB x 100 Euro/TB
Inventario	67.5	Dismissione risorse Tier-2 Torino 672 TB x 100 Euro/TB
Consumo	55.0	Overhead server 7%
Consumo	42.5	Overhead rete (6% CPU+5% disco)
G. Totale	884.5	

# Stima delle dismissioni Tier-2

	CPU (HS)				Disco (TB)			
	2026	2027	2028	2029	2026	2027	2028	2029
<b>Bari</b>	26608	0	0	0	0	1770	0	873
<b>Catania</b>	0	47200	0	0	0	4032	0	0
<b>PD/LNL</b>	5310	11700	0	0	500	1100	0	1500
<b>Torino</b>	3500	0	0	0	1000	250	0	0