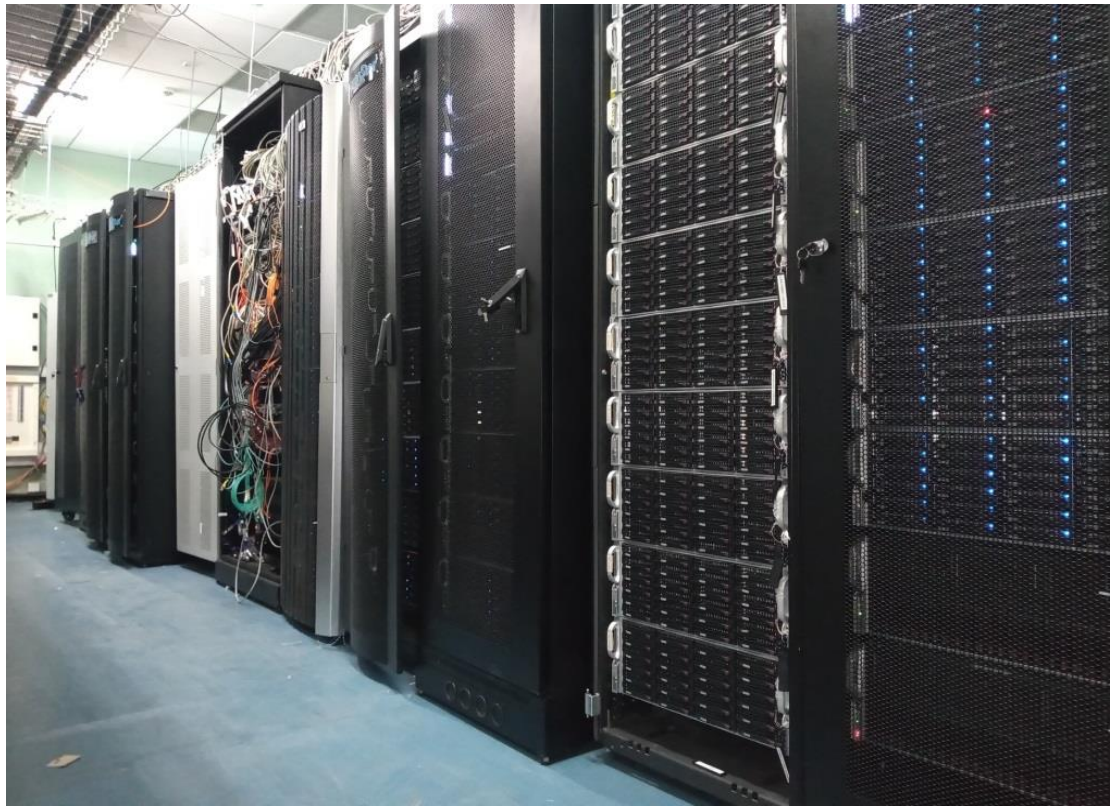
Tata Institute of Fundamental Research
टाटा मूलभूत अनुसंधान संस्थान

T2_IN_TIFR Site Report

The 8th Asian Tier Center Forum

Sep 02 - 04, 2024



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Facility

Compute node

Storage node

Firewall and switches

- **Facility**
  - Two data-center rooms
  - 150KVA UPS + 15 min. of power backup and 220KVA Isolation transformer
  - Dedicated Fire Suppression System
  - 17TR centralized + 11TR in-Row cooling
- **Hardware**
  - 18 Racks, more than 300 servers
  - 2U Twin configuration compute nodes
  - 4U - 53 storage nodes with RAID 6
  - 3 GPU nodes with 8 x Nvidia v100 card and additional 12 different cards
  - All are dual stack compatible
- **Network**:
  - 2 x 8 Gbps WAN Link (sharing with VECC T2 grid) with IPv4 & IPv6

Site Capacity

Federation	Year	Storage		CPU		Available Cooling (TR)**
		Pledge (TB)*	CMS % req.	Pledge (CPU cores)	CMS % req.	
T2	2022-23	11000	~ 11%	14000	~ 11%	**28TR**
T2	2021	11000	11.96%	14000	13.08%	**28TR**
T2	2020	3000	6.41%	3500	3.50%	**28TR**
T2	2019	3000	3.85%	3000	3.50%	**28TR**

Federation	Country	Tier	Pledge Type	Year	CMS	CMS % of req
IN-INDIACMS-TIFR	India	2	CPU	2024	140000	8.75 %
IN-INDIACMS-TIFR	India	2	Disk	2024	11000	7.38 %
Federation	**Country**	**Tier**	**Pledge Type**	**Year**	**CMS**	**CMS % of req**

*TB: Tera Byte **TR: Ton of Refrigeration

Local T3

- Dedicated T3 condor cluster for user analysis
- Total 1300 Job slots
- Tow entry points
- Dedicated storage (separate to the T2 storage quota) ~300 TB and growing
- Support for JupyterHub and HTTPs based access to data
- Dedicated GPU resources and Local Gitlab instance.

H/W resources - Storage and Computing

Type of nodes	Number	Rack size	Storage capacity	CPU cores on each node (HT enabled)	Memory in GB (each node)	Commissioning Year
Storage nodes	31	4U	~ 9 PB	64C@2.8GHz - AMD EPYC 7282	256 - DDR4	2019 - 2022
Storage nodes	9	4U	~ 1.8 PB	32C@2.10GHz - Intel E52620 40C@2.20GHz - Intel 4114	128 -DDR4	2017 - 2018
Storage nodes	5	4U	~ 1 PB	24C@2.4GHz - Intel	192 - DDR3	2016
Storage nodes	5	4U	~ 320 TB	16C@2.53GHz - Intel Xeon E5630	96	2015
Storage nodes	12	4U	~ 800TB	8C to 12C@2.3GHz - Intel	32	2012 - 2014
Storage nodes	8	4U	~ 200TB	8C@2.4GHz - Intel	24	2009 - 2011
Computing Nodes	96	2U4N	2 x 480GB SSD for OS	128C@2.35GHz - AMD EPYC 7452	256 - DDR4	2019 – 2022
Computing Nodes	16	2U4N	2 x 480GB SSD for OS	56C@2.3GHz – Intel	128 - DDR3	2017
Computing Nodes	~ 70	2U4N	SATA / SSD drives for OS	16C – 48C@2.0GHz - Intel	2GB per core	2012 - 2016

H/W resources - GPU

Type of nodes	Number	Rack Size	Storage capacity	CPU cores on per node (HT enabled)	Memory in GB (per node)	GPU Card per node	Commis-ioning Year
GPU nodes	1	4U	2 x 512GB NVME for OS 2 x 400GB SSD for scratch	72C@2.30GHz - Intel Xeon Gold 6140	128 - DDR4	7 x Nvidia Tesla V100 card - 32GB - NVLink	2019
						1 x Nvidia Tesla V100 card - 16GB - NVLink	2017
GPU nodes	2	4U	2 x 480GB SSD for OS	32C@2.3GHz - Intel Scalable Processor 5218	192 - DDR4	1 x Quadro RTX 6000 - 24GB 2 x RTX 2080 Ti - 11GB 1 X Nvidia Tesla4 - 16GB 2 x AMD Radeon7 16GB	2017

Evolution of network links in TIFR grid

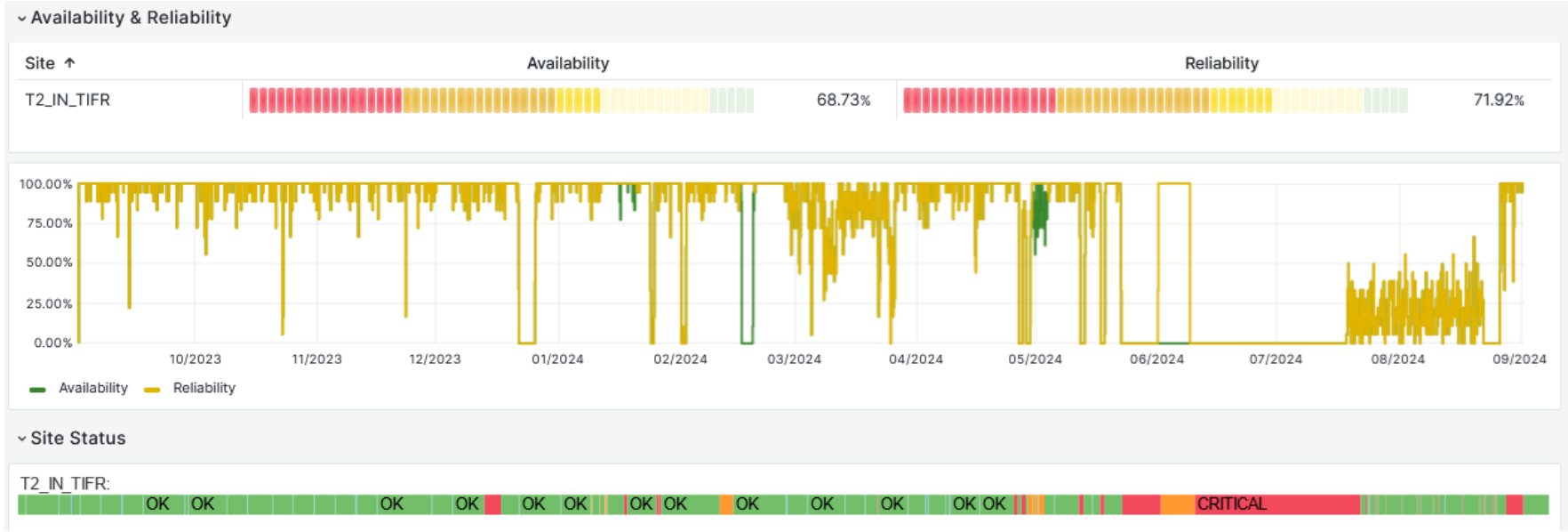
- Major force behind the development and upgradation are NKN and Indian R&E Network
- 2009: 1 G dedicated P2P link from TIFR ⇔ CERN
- 2012: Upgraded to 2Gbps
- 2014: Upgraded to 4Gbps
- 2015: Implemented fall back path using 10G shared TEIN link to Amsterdam

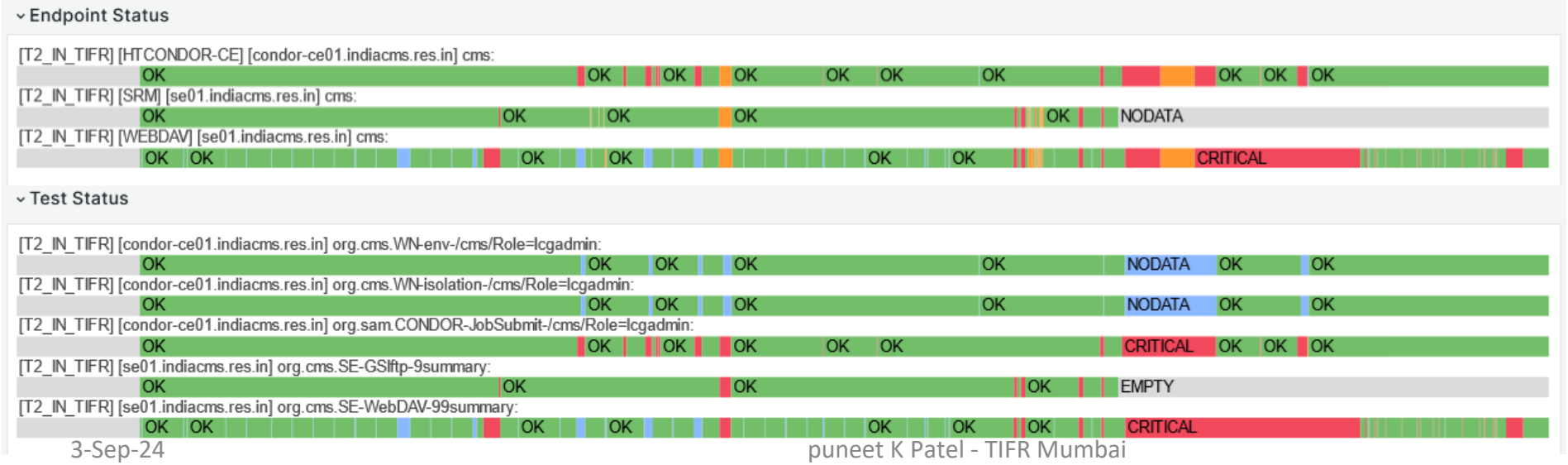
  2015: CERN P2P link Upgraded to 8G
- 2015-16: Implemented LHCONE peering and L3VRF over NKN, all collaborating Indian institutes
- 2017: Upgraded to full 10G dedicated circuit till CERN
- 2018-19: NKN implemented CERN PoP with 10G link
- 2022 - 2024: At present (8G + 8G) active links to LHC network.

Activities and Challenges

- Multiple scheduled and unscheduled downtimes this year:
  - OS upgradation CentOS7 to AlmaLinux 9 before June 2024
  - Storage migration:
    - Upgraded to latest dCache during CentOS7
    - Migrated to Alam9
    - Database incompatibility in EL7 vs EL9
    - Unavailability of UMD5
  - HTCondor upgraded to latest stable version 23.0.12 with Scitoken compatible
- Vulnerability mitigation in network and servers
- Interrupted fundings

Site Performance - A / R

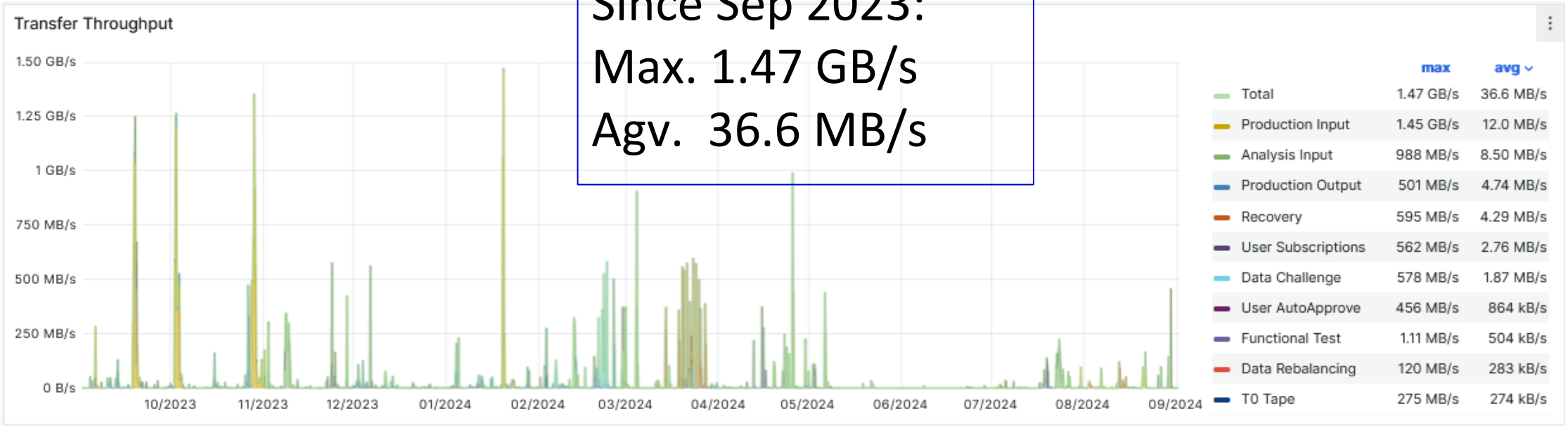




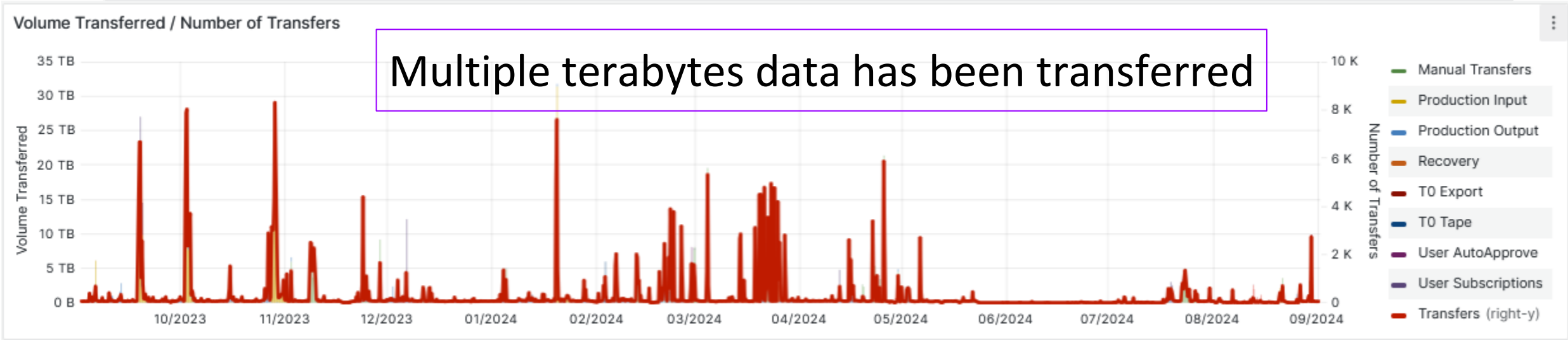
- Services have affected due to multiple downtimes for upgrade work
- Now, Availability and reliability are improving

Transfer Status

Since Sep 2023:
Max. 1.47 GB/s
Agv. 36.6 MB/s

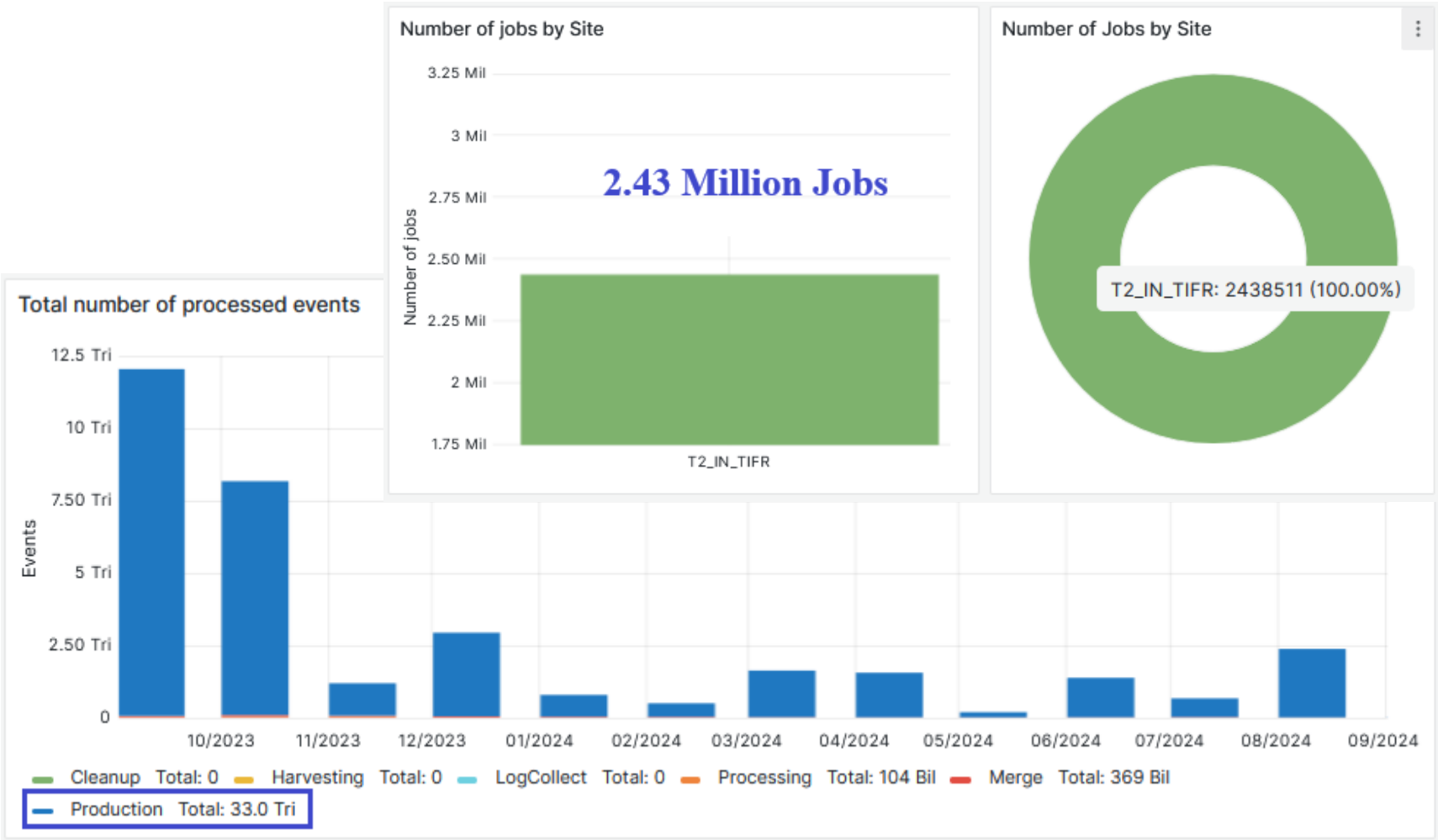


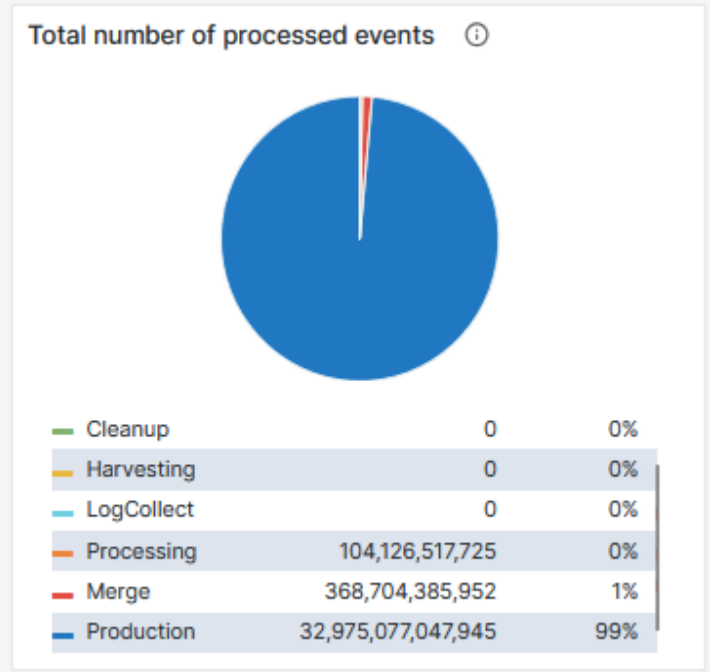
Multiple terabytes data has been transferred



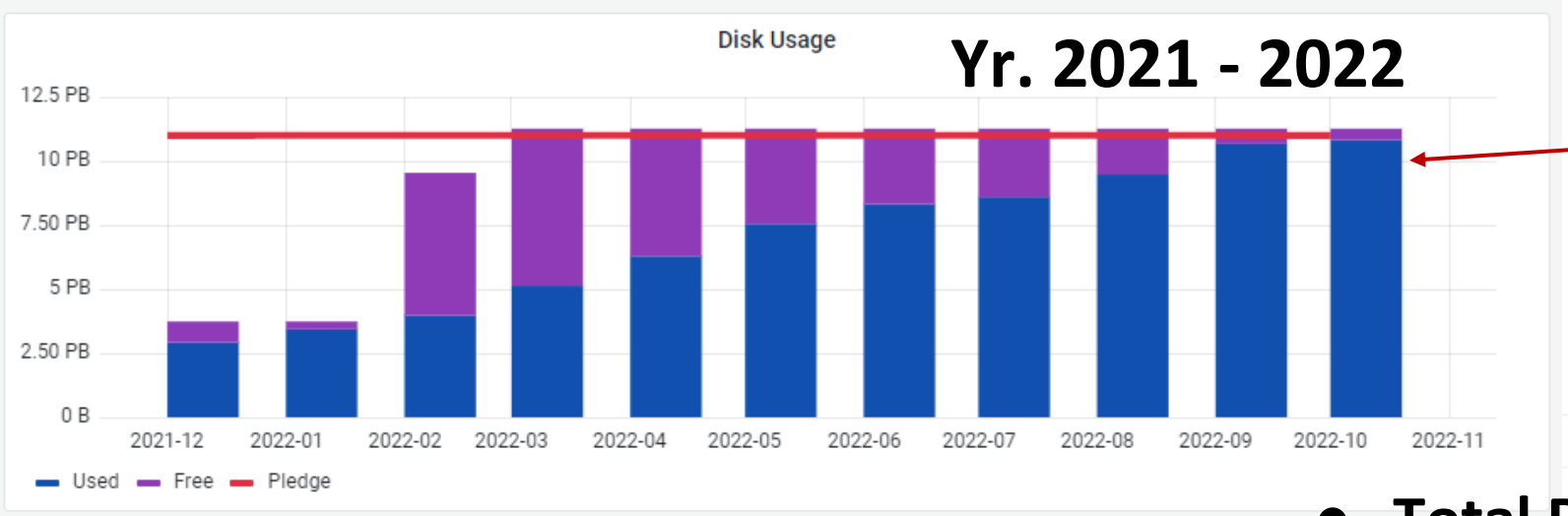
Job status in 1yr. duration

- Production events: 33 Trillion
- Merge events: 369 Billion

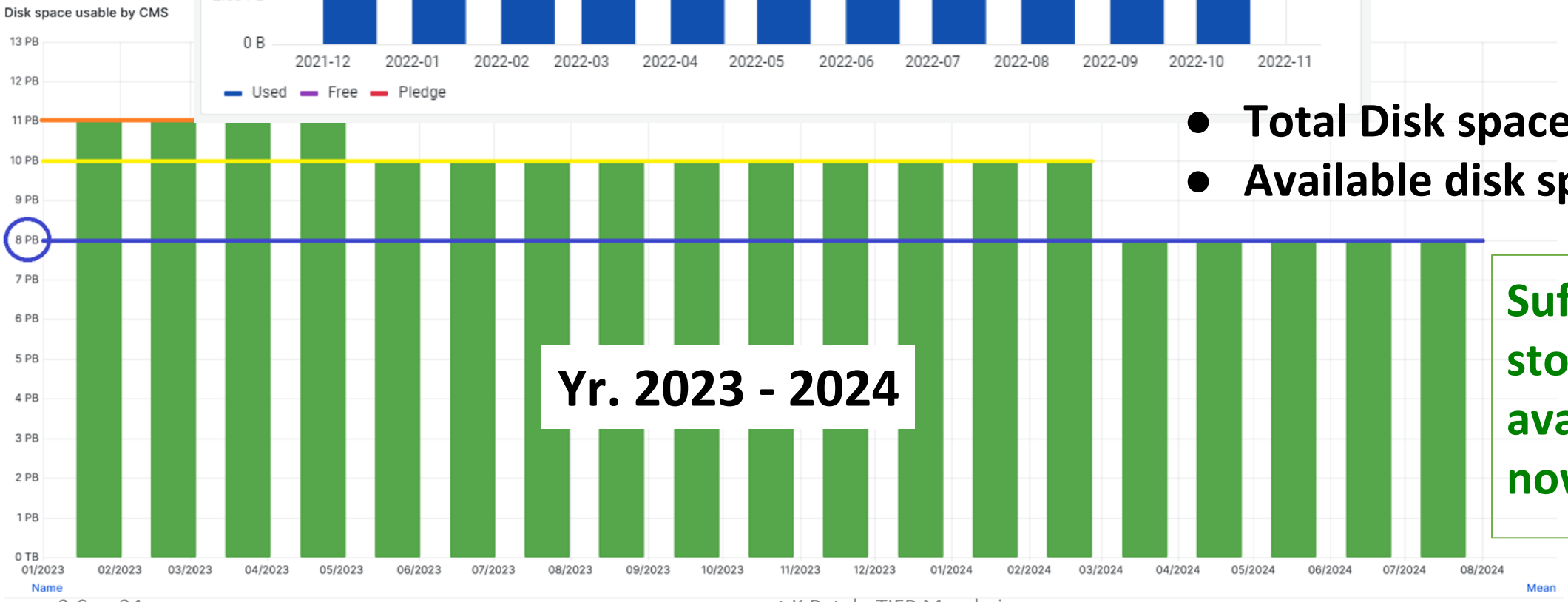




Disk utilization



Almost 100% utilization

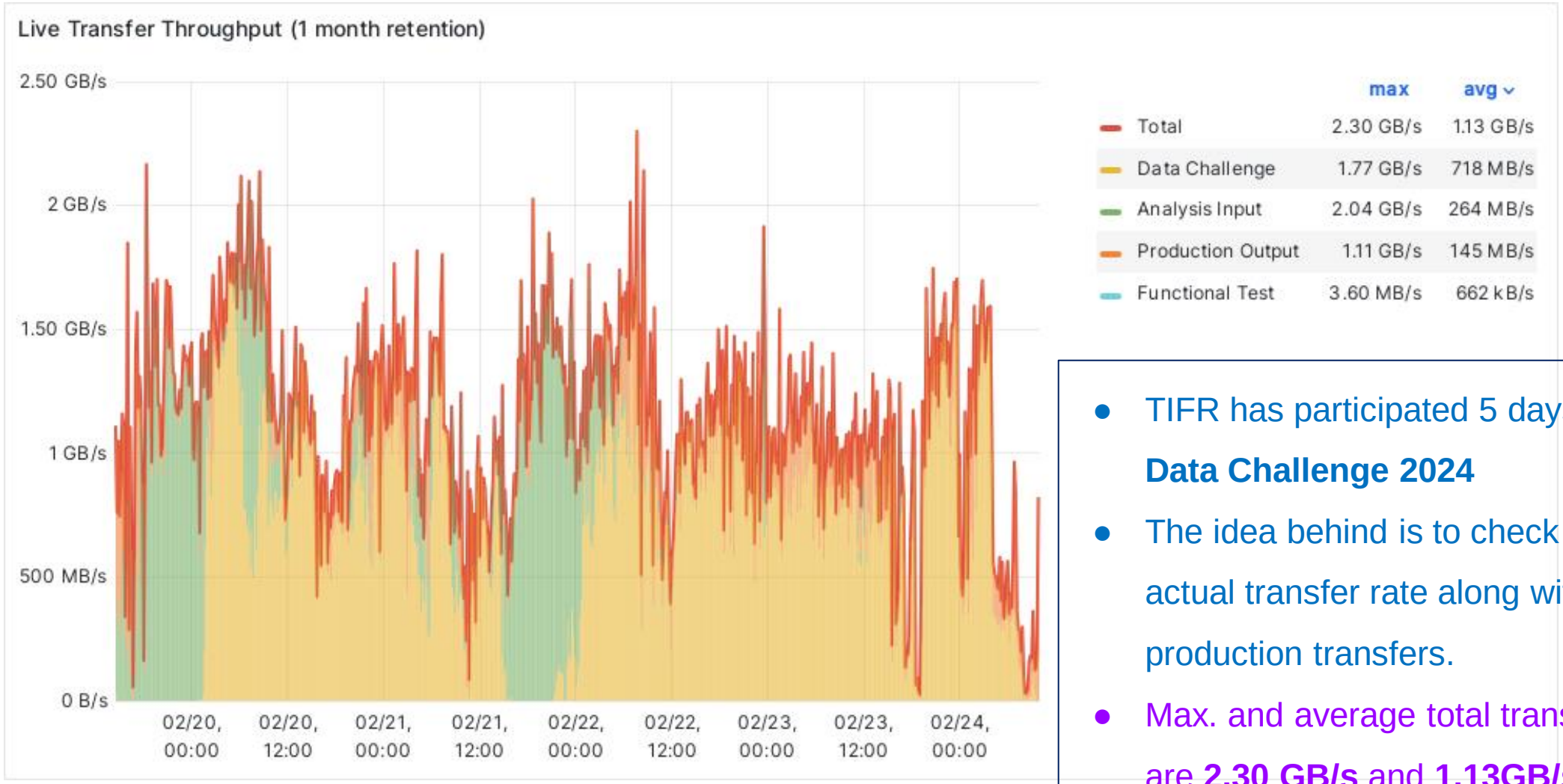


Yr. 2023 - 2024

- Total Disk space: 11PB
- Available disk space: 3PB

Sufficient storage is available now

Participation in DC24



During Feb 20 - 24, 2024

- TIFR has participated 5 days in the **Data Challenge 2024**
- The idea behind is to check the actual transfer rate along with existing production transfers.
- Max. and average total transfer rates are **2.30 GB/s** and **1.13GB/s** respectively.

Thank You !