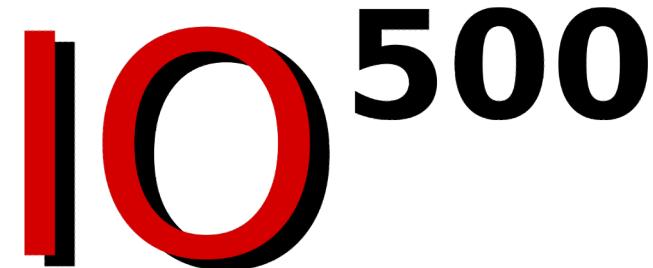


IO500: The High-Performance Storage Community

Committee

- George Markomanolis - AMD
- Jean Luca Bez - NERSC
- Andreas Dilger - Whamcloud/DDN
- Dean Hildebrand - Google
- Julian Kunkel - Georg-August-Universität Göttingen/GWDG
- Jay Lofstead - Sandia National Laboratories



BoF Agenda

- 1. Welcome – George Markomanolis**
- 2. The New IO500 List Analysis – Andreas Dilger**
- 3. Award Presentations – George Markomanolis**
- 4. Roadmap**
 - Website Update and Rules - Jay Lofstead
- 5. Community Presentation**
 - I/O performance in CLAIX23 infrastructure - Radita Liem
 - IOR Mockup for testing alternative interfaces with IO500 - Julian Kunkel
- 6. Submission system changes - Jean Luca Bez**
- 7. Community Discussion - Julian Kunkel**

IO500 Organization Status

- A US non-profit, public charity organization: IO500 Foundation
 - Domain, mailing list, servers, GitHub belongs to IO500 Foundation
- Website contains results with links to details, CFS, BoF slides, etc.
 - io500.org
 - Contribute fixes at github.com/IO500/webpage
- Please join our mailing list for announcements:
 - io500.org/contact
- Please join our Slack for discussions:
 - io500workspace.slack.com/
 - Join link: rb.gy/sn8esm

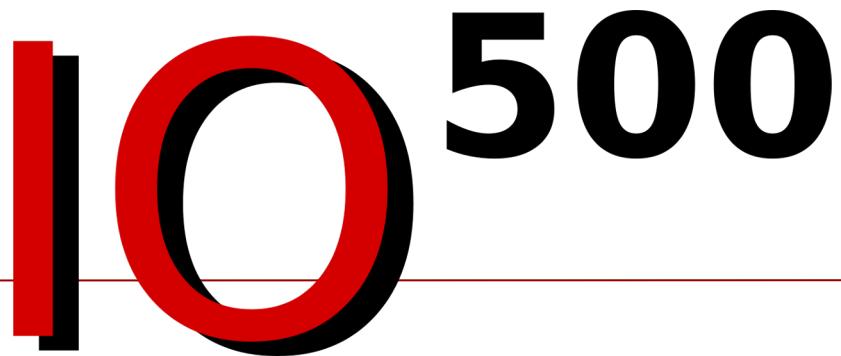


Welcome to the new member of IO500 committee



Jean Luca Bez! LBNL

IO500 List Analysis

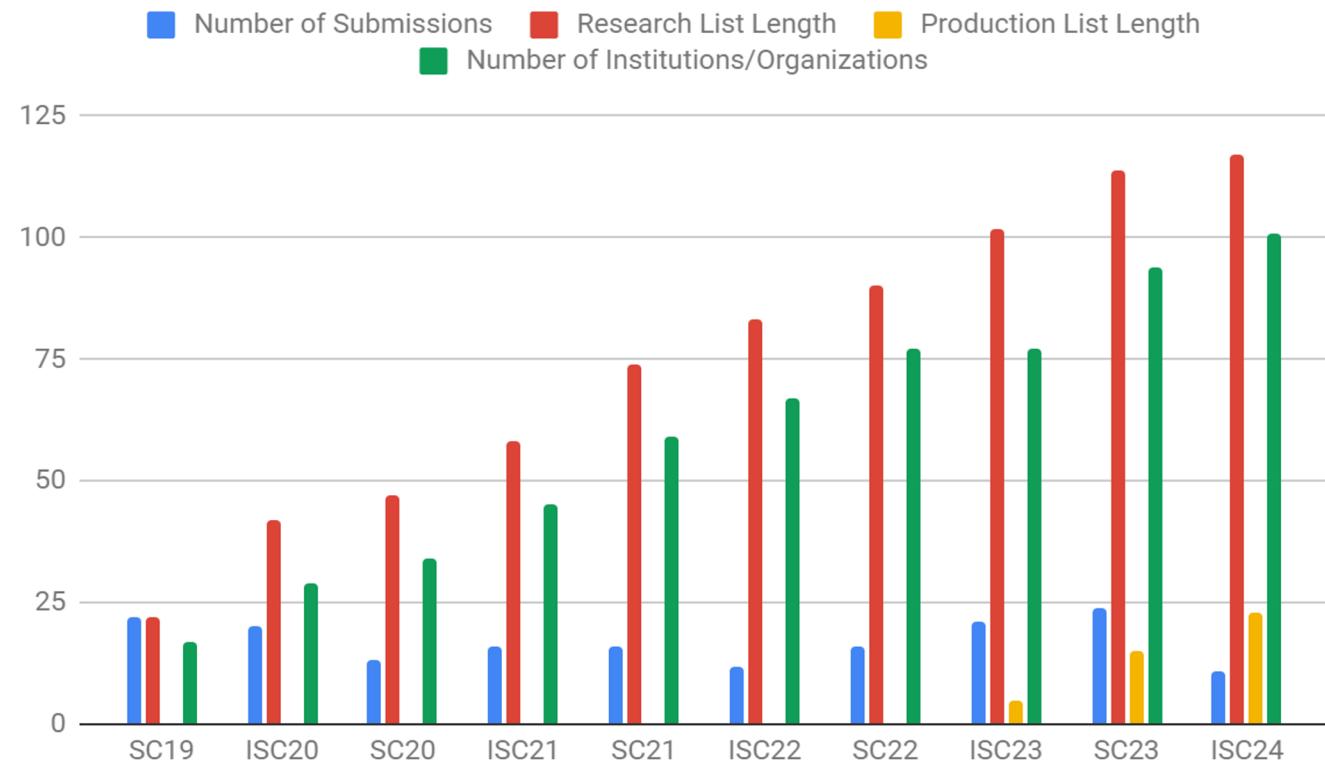
A large, stylized logo consisting of the letters "IO" in red and black, followed by the number "500" in black.

IO 500

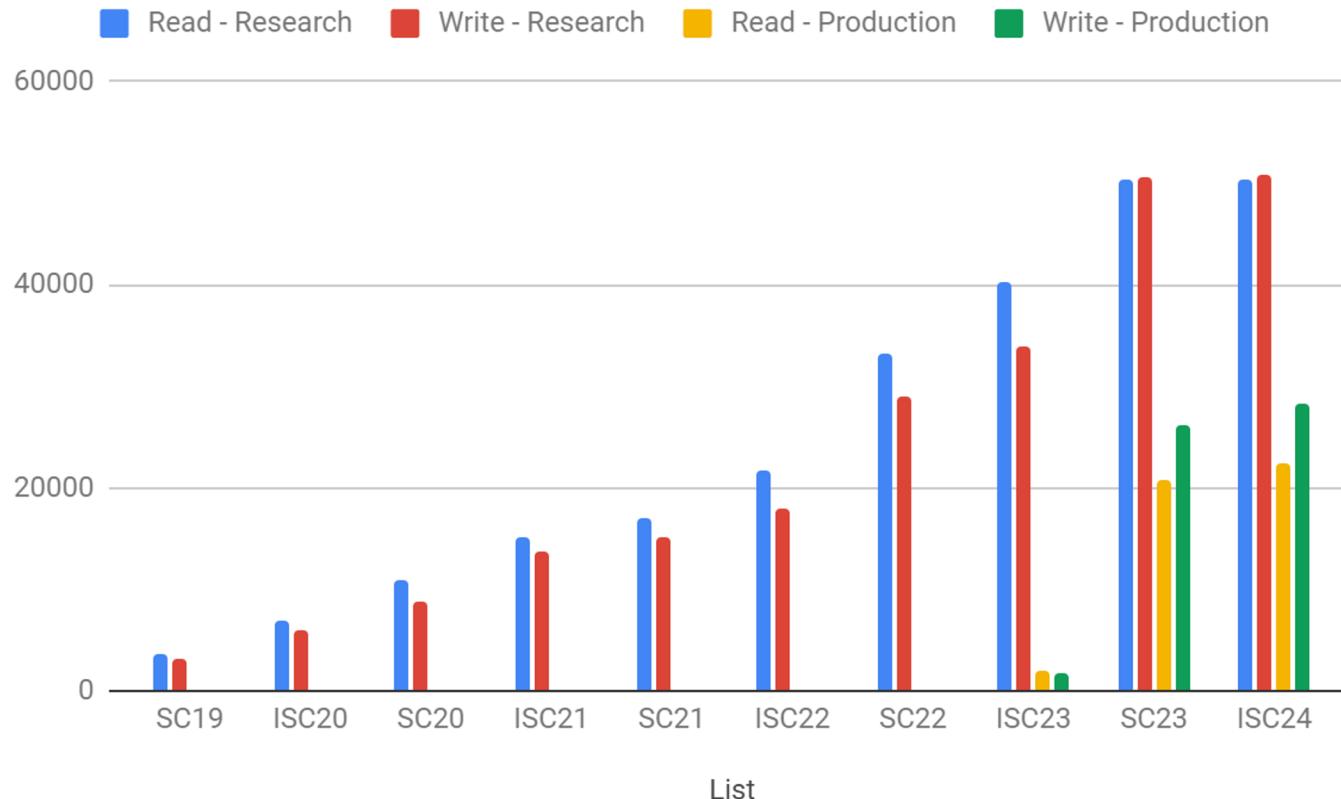
Overall Thoughts

- Production lists submissions had a great boost
- We really appreciate the detailed information in the schema and questionnaire
 - We know it is a lot of work...
 - The questionnaire is really becoming the best source for a quick overview of the submissions
- Really great to see submissions from various HPC systems
 - Starting to realize IO500's mission to build a wealth of data on HPC storage systems
 - Interesting to see advances in systems with submissions over multiple lists
- 248 entries across the 4 lists (half-way to 500)

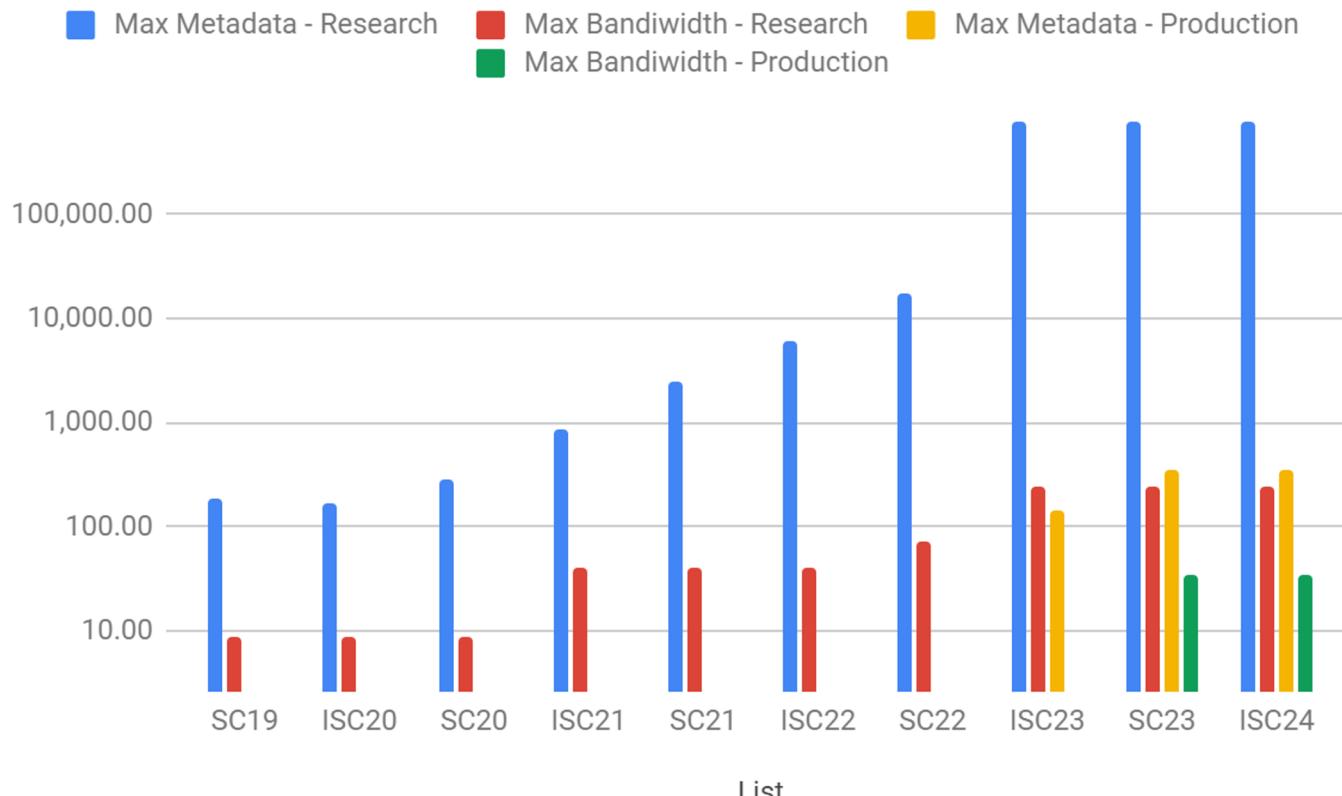
IO500 List - Growth in Entries and Institutions



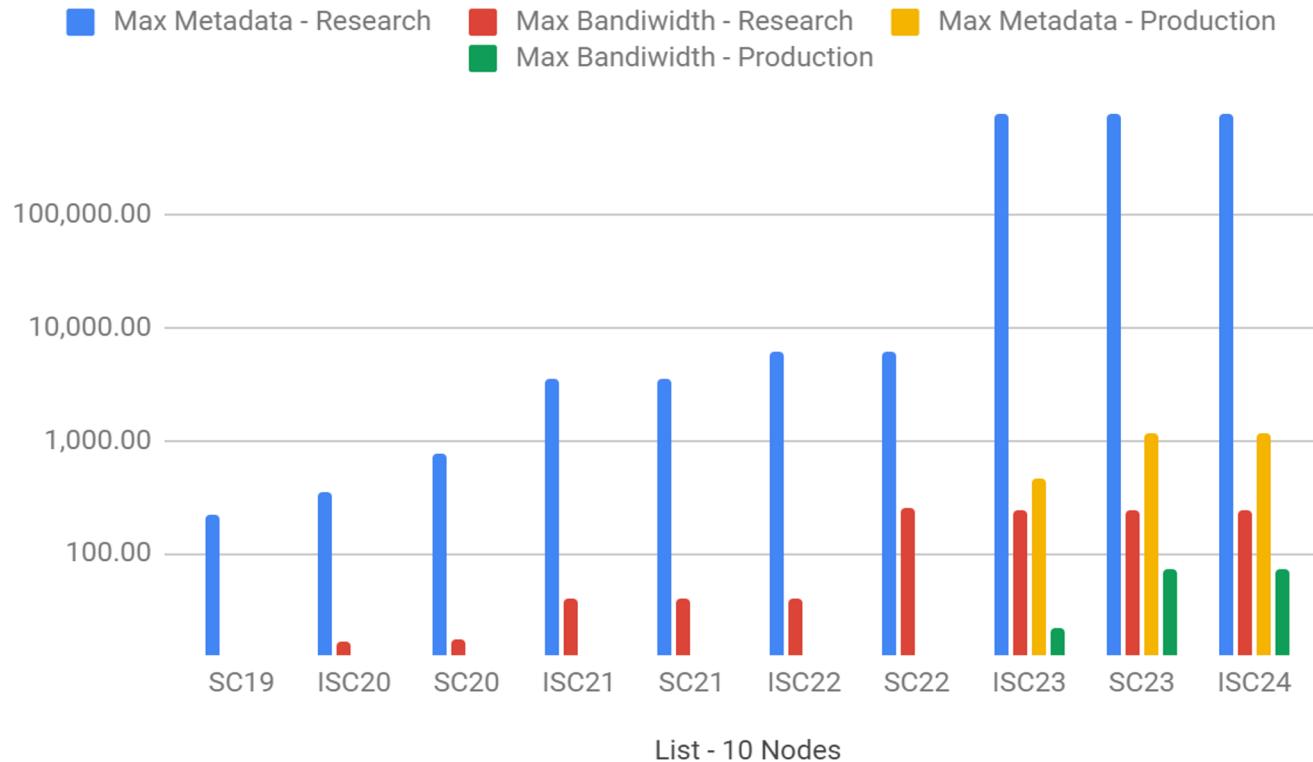
IO500 List - Aggregate List Bandwidth (GB/s)



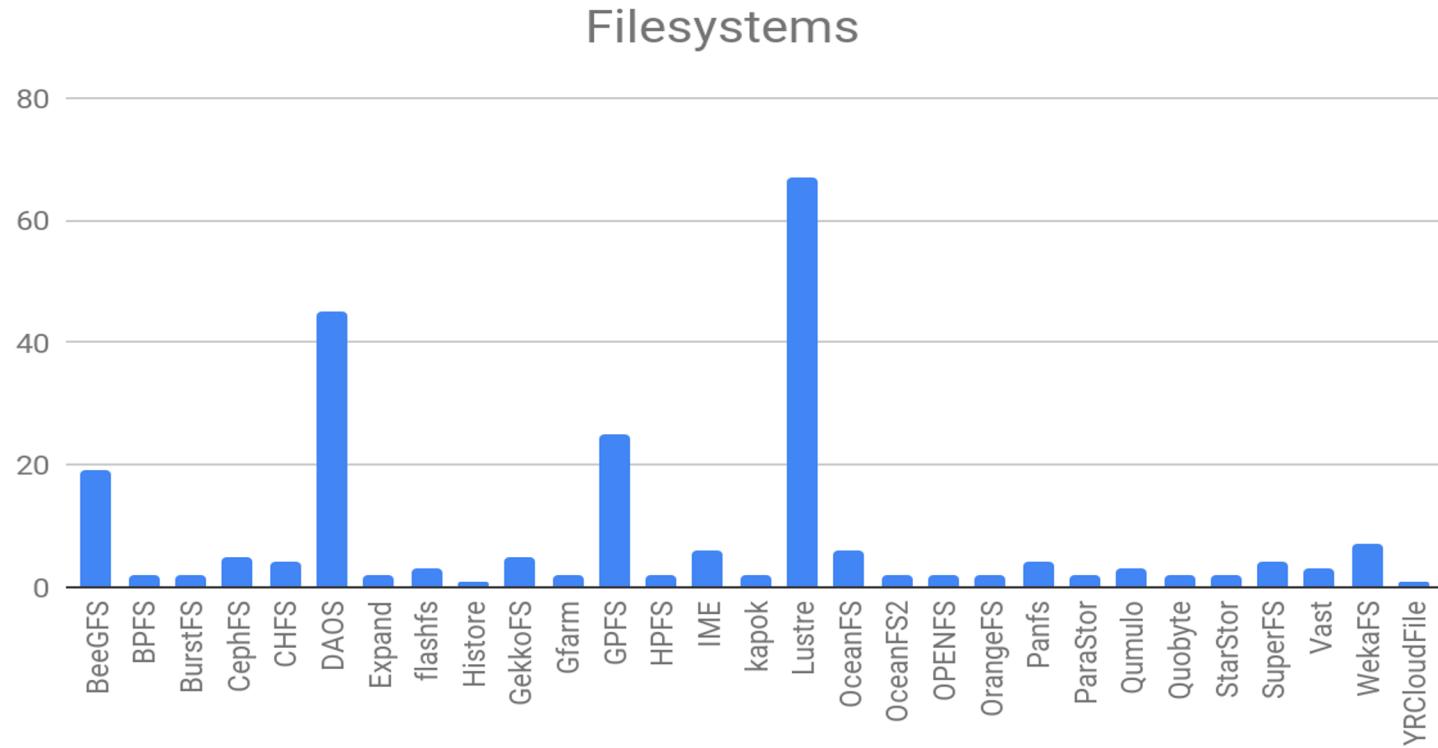
IO500 List - Growth in Max Score per Client



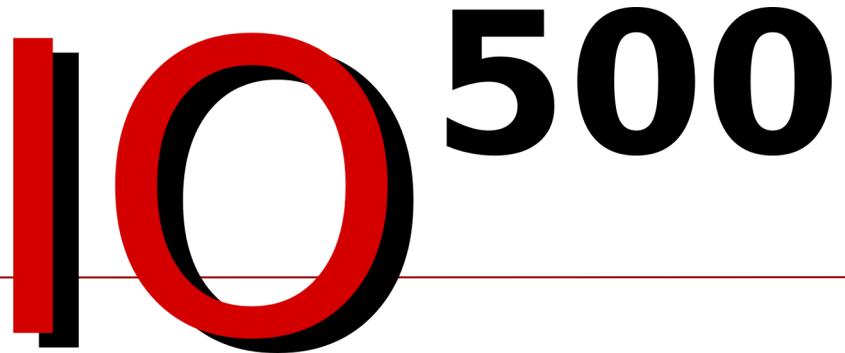
10-Client List - Growth in Max Scores per Client



IO500 List - Number of File System Entries



Award Ceremony



IO 500

Five Awards

Aggregate awarding of Bandwidth, Metadata, Overall for same winner

- 10-Client Node Production List
 - Overall
- 10-Client Node Research List
 - Overall
- IO500 Production List
 - Overall
- IO500 Research List
 - Overall, Bandwidth

10 Client Node Production - Overall Winner

# ↑	RELEASE	SYSTEM	INSTITUTION	FILESYSTEM TYPE	SCORE ↑	BW (GIB/S)	MD (KIOP/S)
1	SC23	Aurora	Argonne National Laboratory	DAOS	2,885.57	734.50	11,336.27
2	ISC23	SuperMUC-NG-Phase2-EC-10	LRZ	DAOS	1,008.81	218.38	4,660.23
3	ISC24	Lise	Zuse Institute Berlin	DAOS	324.54	65.01	1,620.13
4	ISC24	NHN CLOUD GWANGJU AI	NHN Cloud Corporation	EXAScaler	176.57	62.58	498.22
5	ISC24	Afton	University of Virginia	WEKA	105.94	33.28	337.29
6	SC23	Earth Simulator 4	Japan Agency for Marine-Earth Science and Technology	EXAScaler	101.88	48.19	215.38
7	ISC24	Altair	Poznan Supercomputing and Networking Center	Lustre	73.50	15.24	354.60
8	SC23	Randi	Center for Research Informatics at University of Chicago	Spectrum Scale	60.88	31.05	119.36
9	SC23	Orion	Mississippi State University High Performance Computing Collaboratory	Lustre	20.83	5.01	86.67
10	SC23	Orion	Mississippi State University High Performance Computing Collaboratory	Lustre	17.57	6.43	48.03

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Certificate

IO500 Performance Certification

This Certificate is awarded to:

**Argonne National Laboratory
(Aurora DAOS EC)**

#1 in the 10 Client Node Production Overall, Bandwidth and
Metadata Score

IO⁵⁰⁰



May 2024

10500 Steering Board

<https://io500.org/list/ISC24/ten-production>

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10 Client Node Research - Overall Winner

# ↑	RELEASE	SYSTEM	INSTITUTION	FILESYSTEM TYPE	SCORE ↑	BW (GIB/S)	MD (KIOP/S)
1	ISC23	Cheeloo-1 with OceanStor Pacific	JNIST and HUST PDSL	OceanFS2	137,100.00	2,439.37	7,705,448.04
2	ISC23	Pengcheng Cloudbrain-II on Atlas 900	Pengcheng Laboratory	SuperFS	11,516.40	263.97	502,435.85
3	SC22	ParaStor	Sugon Cloud Storage Laboratory	ParaStor	8,726.42	718.11	106,042.93
4	SC22	StarStor	SuPro Storteck	StarStor	6,751.75	515.15	88,491.65
5	SC22	SuperStore	Tsinghua Storage Research Group	SuperFS	5,517.73	179.60	169,515.95
6	SC23	Aurora	Argonne National Laboratory	DAOS	3,748.85	934.00	15,046.98
7	ISC22	Shanhe	National Supercomputing Center in Jinan	flashfs	3,534.42	207.79	60,119.50
8	SC21	Athena	Huawei HPDA Lab	OceanFS	2,395.03	314.56	18,235.71
9	SC21	OceanStor Pacific	Olympus Lab	OceanFS	2,298.69	317.07	16,664.88
10	ISC21	Endeavour	Intel	DAOS	1,859.56	398.77	8,671.65
11	ISC23	SuperMUC-NG-Phase2-10	LRZ	DAOS	1,533.28	266.73	8,813.96
12	ISC24	Songshan	Institute of Computing Technology Chinese Academy of Sciences and National Supercomputing Center in Zhengzhou	HiStore	1,349.22	43.78	41,580.79

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**JNIST and HUST PDSL (Cheeloo-1)
with OceanStor Pacific from Huawei**

#1 in the 10 Client Node Research Overall, Bandwidth, and
Metadata Score

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10500 Steering Board

<https://io500.org/list/ISC24/ten>

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IO500 Production List - Overall Winner

# ↑	RELEASE	SYSTEM	INSTITUTION	FILESYSTEM TYPE	SCORE ↑	BW (GiB/S)	MD (KiOP/S)
1	SC23	Aurora	Argonne National Laboratory	DAOS	32,165.90	10,066.09	102,785.41
2	SC23	SuperMUC-NG-Phase2-EC	LRZ	DAOS	2,508.85	742.90	8,472.60
3	SC23	Shaheen III	King Abdullah University of Science and Technology	Lustre	797.04	709.52	895.35
4	ISC23	Leonardo	EuroHPC-CINECA	EXAScaler	648.96	807.12	521.79
5	ISC24	Lise	Zuse Institute Berlin	DAOS	324.54	65.01	1,620.13
6	SC23	IRIS	Memorial Sloan Kettering Cancer Center	WekaIO	308.94	104.79	910.80
7	ISC22	CTPAI	China Telecom Research Institute	DAOS	187.84	25.29	1,395.01
8	ISC24	NHN CLOUD GWANGJU AI	NHN Cloud Corporation	EXAScaler	176.57	62.58	498.22
9	ISC24	Helios	ACC Cyfronet AGH	Lustre	153.39	122.31	192.36
10	ISC23	Imperial - hx cluster	Imperial College London	Spectrum scale	119.56	44.63	320.31

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**Argonne National Laboratory
(Aurora DAOS EC)**

#1 in the IO500 Production Overall, Bandwidth, and
Metadata Score

IO⁵⁰⁰



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10500 Steering Board

<https://io500.org/list/ISC24/production>

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IO500 Research List - Overall Winner

# ↑	RELEASE	SYSTEM	INSTITUTION	FILESYSTEM TYPE	SCORE ↑	BW (GiB/S)	MD (KiOP/S)
1	ISC23	Pengcheng Cloudbrain-II on Atlas 900	Pengcheng Laboratory	SuperFS	210,255.00	4,847.48	9,119,612.35
2	ISC23	Cheeloo-1 with OceanStor Pacific	JNIST and HUST PDSL	OceanFS2	137,100.00	2,439.37	7,705,448.04
3	SC23	Aurora	Argonne National Laboratory	DAOS	43,218.80	11,362.27	164,391.73
4	SC22	ParaStor	Sugon Cloud Storage Laboratory	ParaStor	8,726.42	718.11	106,042.93
5	SC22	StarStor	SuPro StorTeck	StarStor	6,751.75	515.15	88,491.65
6	SC22	SuperStore	Tsinghua Storage Research Group	SuperFS	5,517.73	179.60	169,515.95
7	SC23	SuperMUC-NG-Phase2	LRZ	DAOS	4,585.68	1,054.72	19,937.45
8	ISC22	Shanhe	National Supercomputing Center in Jinan	flashfs	3,534.42	207.79	60,119.50
9	SC22	HPC-OCI	Cloudam HPC on OCI	BurstFS	3,033.03	278.48	33,033.54
10	SC21	Athena	Huawei HPDA Lab	OceanFS	2,395.03	314.56	18,235.71

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Certificate

IO500 Performance Certification

This Certificate is awarded to:

**Pengcheng Laboratory (Cloudbrain-II)
with SuperFS from Tsinghua University**

#1 in the IO500 Research Overall, and Metadata Score

IO⁵⁰⁰



May 2024

10500 Steering Board

<https://io500.org/list/ISC24/io500>

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Certificate

IO500 Performance Certification

This Certificate is awarded to:

**Argonne National Laboratory
(Aurora DAOS EC)**

#1 in the IO500 Research Bandwidth Score

IO⁵⁰⁰



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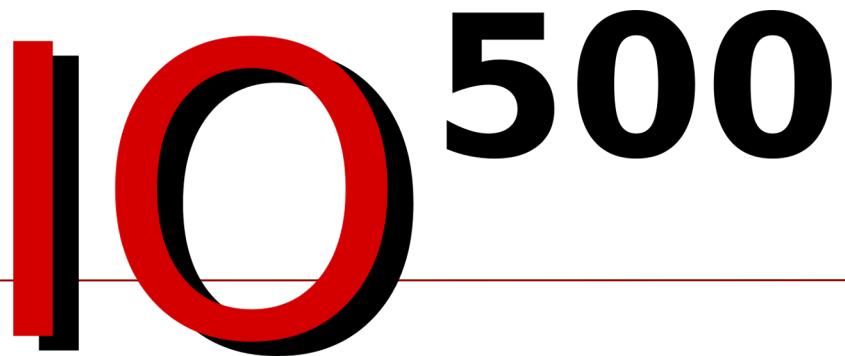
<https://io500.org/list/ISC24/production>

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List of Awarded Systems in the Ranked Lists

10 Client	Bandwidth Metadata Overall	Argonne National Laboratory	DAOS	734,50 11,336.72 2,885.57	GB/s KIOPS/s score
10 Client Research	Bandwidth Metadata Overall	JNIST and HUST PDSL	OceanFS2	2,439.37 7,705,448.04 137,100.00	GB/s KIOPS/s score
IO500 Production	Bandwidth Metadata Overall	Argonne National Laboratory	DAOS	10,066.09 102,785.11 32,165.90	GB/s KIOPS/s score
IO500 Research	Bandwidth Metadata Overall	Argonne National Laboratory Pengcheng Laboratory Pengcheng Laboratory	DAOS SuperFS SuperFS	6,048.49 9,119,612.35 210,255	GB/s KIOPS/s score

Roadmap



IO 500

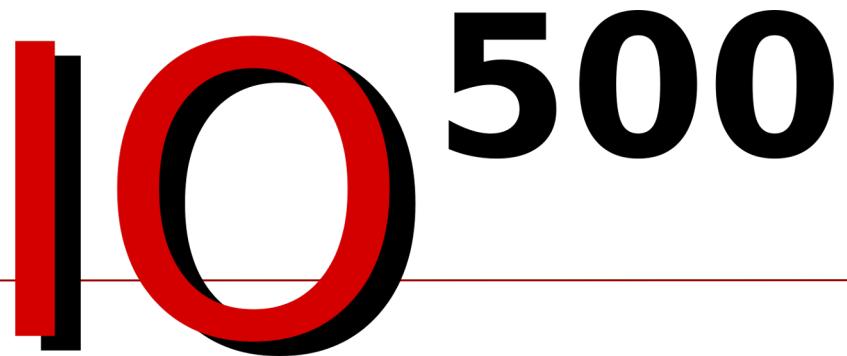
Roadmap for the IO500

- New committee rules
 - Streamlined from founding organizational rules
 - Decision process centralized in the document to keep clear process for all actions
 - Shifted to majority/supermajority for decisions
 - A bit of trust when acting in the best interest of IO500
- New phase submission process/requirements
 - Intended workload represented and how it represents it
 - Where in the phase list to insert and how it affects other phases

SC 24 (Nov 17-22, 2024)

- Call for submission: Sept 27th
- Testing phase ends: October 11th
 - Code freeze, but please test before!
- Submission deadline: Nov 8th
- List release: BoF date TBD (SC'24 during Nov 17-22)
- Looking forward to many more Production and Research submissions

Presentations

A large, stylized logo consisting of the letters "IO" in a bold, black font. The letter "I" is vertical and the letter "O" is horizontal, overlapping it. Both letters have a thick red outline. To the right of the "IO" logo is the number "500" in a large, black, sans-serif font.

IO 500

IO500 Submission Form

IO 500

IO500 Submission Platform

- Migrate platform to new framework version
 - Improve stability and security
- Bug-fixes on mandatory fields
- Additional options on selection fields
 - e.g. interconnect and architecture
- Storage schema given higher visibility

- Website:
 - Fixes on JSON system details visualization
 - Allow full list download (including historical)

The form fields for the IO500 category include:

- EXCLUSIVE_CLUSTER_USAGE
- VERSION
- NODETYPENAME
- NUMBER_CLIENTNODES
- PROCSPERNODE
- NUMBER_SERVERNODES
- STORAGE_TYPE
- STORAGE_NET_CAPACITY (1TB)
- CLIENTS_NETWORK_BANDWIDTH
- SERVERS_NETWORK_BANDWIDTH (MiB/s)
- TYPE_OF_FILESYSTEM
- NOTE

IO500 Submission Platform Roadmap

- Make Research/Test vs. Production submission selection more prominent
- Finalize migration of historical submissions data
- Allow JSON submission for Reproducibility Questionnaire
- Fine-tune mandatory fields
- Improve description of input fields (on hover)
- Improve notification of calls/submissions/decisions (email)
- Claim submissions to profile (before new system was in place)

Soliciting volunteers to help with ongoing maintenance and improvements

Voice of the Community & Open Discussion

The logo consists of the letters "IO" in a large, bold, sans-serif font. The letter "I" is red and positioned to the left of the letter "O", which is black with a thick red outline. To the right of the "O" is the number "500" in a large, black, sans-serif font.

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Open Floor

- How to collect storage system metadata more easily?
 - Soliciting volunteers to write storage-specific scripts to generate this
 - Would simplify filling out forms and improve metadata accuracy
- Can we encourage vendors to support tool and schema development?
- How to improve the reproducibility submission?