The Virtual Institute of I/O

Limitless Storage
Limitless Possibilities
https://hps.vi4io.org

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IO500 Release SC 2020

LIMITLESS **POTENTIAL** | LIMITLESS **OPPORTUNITIES** | LIMITLESS **IMPACT**

Introduction

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Goals of the Virtual Institute for I/O

- ■ Provide a platform for I/O enthusiasts for exchanging information
  - ▶ The organization uses a wiki as central hub
  - ▶ Supported by mailing lists
- ■ Foster training and collaboration in the field of high-performance I/O
  - ▶ Collaboration with the HPC Certification Forum (`hpc-certification.org`)
- ■ Track and encourage the deployment of large storage systems
  - ▶ Hosting information about high-performance storage systems
  - ▶ Supporting the IO-500 and the Data Center List

`https://www.vi4io.org`

Outline

Comprehensive Data Center List (CDCL)

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The CDCL contains system characteristics for sites, supercomputer and storage

System Model

- Based on an extensible JSON schema, optimized editor
- Supports now (all) logical components and subcomponents
- Characteristics and peak values
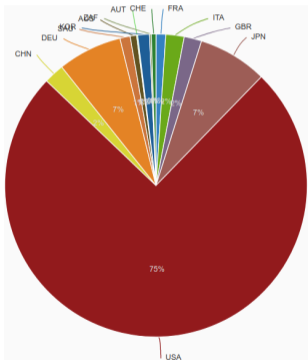- Measured values *-500

Components with characteristics

- Site, supercomputer, online storage, tape archives
- Compute nodes, storage nodes, local storage, accelerators, ...
- Supporting: e.g., CPU type, memory available, costs, ...

CDCL Storage List 2020: 56 Sites

Features

- Table view with selectable columns
- Flexible metrics and aggregation

#	site.institution	site.storage system.net capacity	site.supercomputer.compute peak	site.supercomputer.memory capacity
		in PiB	in PFLOPS	in TB
1	Oak Ridge National Laboratory	250.04	220.64	3511.66
2	National Energy Research Scientific Computing Center	197.65	37.71	857.03
3	Los Alamos National Laboratory	72.83	11.08	2110.00
4	German Climate Computing Center	52.00	3.69	683.60
5	Lawrence Livermore National Laboratory	48.85	20.10	1500.00
6	RIKEN Advanced Institute for Computational Science	39.77	10.62	1250.00
7	National Center for Atmospheric Research	37.00	5.33	202.75
8	National Center for Supercomputing Applications	27.60	13.40	1649.27
9	Global Scientific Information and Computing Center	25.84	17.89	275.98
10	Joint Center for Advanced HPC	24.10	24.91	919.29

#	site.institution	site.storage system.net capacity	site.supercomputer.compute peak	site.supercomputer.memory capacity
46	Center for Scientific Computing	0.75	0.51	77.57
47	University of Bristol	0.44	0.38	43.01
48	Joint Institute for Nuclear Research	0.00	0.00	0.00
49	NVIDIA	0.00	0.00	15.00
50	Howard Hughes Medical Institute/Janelia Research Campus	0.00	0.00	0.00

Capacity grouped by country
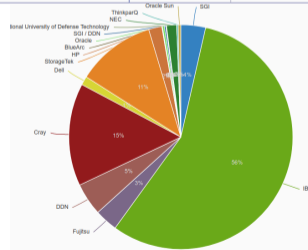
Capacity grouped by vendor

Relevant Features

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Webpage integration

- **■** Provide a HTML stub for embedding into any data center web page
    - ⇒ Toward a **standardized presentation** of systems!
    - ▶ Allowing the site to describe and visualize their system
    - ▶ Can be hosted by a site directly
    - ▶ Allowing a simple export into VI4IO data center list
- **■** Editor: `https://www.vi4io.org/hpsl/addpage`

Simple usage for VI4IO hosted information

- **■** Create wiki stubs for a data center/storage system:
    `https://www.vi4io.org/cdcl-add`
- **■** Edit the page, save

Editor

- Flexible schema (updated as needed)
  - Recursive component model
- Users may add (optional) components
- Compute information
  - e.g., two types of nodes, compute total memory
- Keep "model" data in database (to be extended)
- May also draw relation between components

Outline

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1 Overview

2 Comprehensive Data Center List (CDCL)

3 Roadmap for 2021

The Comprehensive Data Center List & The IO500

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- Support IO500 by extending the current practice
  - ▶ Users can submit CDCL schema for an IO500 submission defining their system
- Provide storage-system specific schemas
  - ▶ Use language common to the storage/file system
  - ▶ For Lustre, allow to input details for OSTs, MDTs, +configuration flags
- Define rules and automatically compute comparable quantities
  - ▶ e.g., capacitiy, storage interface
- Capture production-relevant settings as well
- The basic tool is there...
  - ▶ We need your/vendor help to create most-approriate schema

The Journal of High-Performance Storage

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New journal, tested approach/tools successfully in 2020

- LaTeX and GoogleDoc workflows
- Goal 2021: Scale up, involve more editors

Features

- Open reviews, i.e., anyone can provide feedback
- Living papers, i.e., can improve over time
- Digital replicability (of analysis/experiments)
- Free open access

J∞HPS

https://jhps.vi4io.org

Several papers are available for open review in the incubator

Other Activities

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Supporting IO Benchmarking

- Evolving the IO benchmarks in HPC/IOR further
  - ► E.g., added md-workbench lately
  - ► Documentation ...
  - ► Testing using the IO500
  - ► Deploying performance regression with Jenkins
- Supporting users to run/discuss IO benchmarks

Next Generation IO Interfaces

- Goal: create a community forum to discuss next generation API
- Must revitalize past approach...

Everyone is welcome to participate