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File Systems

Available file systems

On the DEEP-EST system, three different groups of file systems are available:

- the 2JUST and mounted on all JSC systems;
- the DEEP-EST (and SDV) parallel BeeGFS file systems, available on all the nodes of the DEEP-EST system;
- the file systems local to each node.

The users home folders are placed on the shared GPFS file systems. With the advent of the new user model at JSC (?JUMO), the shared file systems are structured as follows:

- \$HOME: each JSC user has a folder under /p/home/jusers/, in which different home folders are available, one per system he/she has access to.

 These home folders have a low space quota and are reserved for configuration files, ssh keys, etc.
- \$PROJECT: In JUMO, data and computational resources are assigned to projects: users can request access to a project and use the resources associated to it. As a consequence, each user can create folders within each of the projects he/she is part of (with either personal or permissions to share with other project members). For the DEEP project, the project folder is located under /p/project/cdeep/. Here is where the user should place data, and where the old files generated in the home folder before the JUMO transition can be found.

The DEEP-EST system doesn't mount the \$SCRATCH and \$ARCHIVE file systems from GPFS, as it is expected to provide similar functionalities with its own parallel file systems.

The following table summarizes the characteristics of the file systems available in the DEEP-EST and DEEP-ER (SDV) systems:

Mount Point	User can write/read to/from	Cluster	Туре	Global / Local	SW Version	Stripe Pattern Details	Maximum Measured Performance (see footnotes)	Description	Other	
/phome	(phone)user	Signition .	GPFS exported via NFS	Global				Home directory; used only for configuration files.		
/piproject	aja lprojecti i cideni	SDV. BEEP-EST	GPFS exported via NFS	Global				Project directory; GPFS main storage file system; not suitable for performance relevant applications or benchmarking		
/work	Asorkicdeep	DEEP-EST*	BeeGFS	Global	BeeGFS 7.1.2			Work file system, no backup, hence not meant for permanent data storage	"Also available in the SDV but only through 1 Gig network connection	
/acratich	Ascratich	DEEP-EST	sfs local partition	Local*				Scratch file system for temporary data. Will be cleared up after job finishes!	"Recommends to use instead of /mp for storing temporary files	d
/nvme/scratch	.invme/scratch	DAM partition	local SSD (sh)	Local*				Scratch file system for temporary data. Will be cleaned up after job finishes!	"1.5 TB Intel Optane SSD Data Center (DC) P4800X (NVMe PCIe3 x4, 2.57, 3D XPoint()	
/nyme/scratch	Shvme/scratch	DAM partition	local SSD (ext4)	Local				Scratch file system for temporary data. Will be cleaned up after job finishes!	*1.5 TB Intel Optane SSD Data Center (DC) P4800X (NVMe PCIe3 x4, 2.57, 3D XPoint()	
/pmem/scratch	l-ljimem/scralcl	DAM partition	DCPMM in appdirect mode	Local			2.2 GB/s simple dd test in dp-dam01		*3 TB in dp-dam(01,02) 2 in dp-dam(01,02) 2 in dp-dam(03-16 intel Optane DC DC Persistent Memory (DCPMM) 256GB DMMMs based on Intel® 3 D XPoint non-volatile memory technology	
/tells-work	Audv-work/cde	SDV (deeper-adv nodes via EXTOLL, (SELISME mf-gpu via GalE-only). DEEP-EST (1 GbE-only)	BeeGFS	Giobal	BeeGFS 7.1.2	Type: RAID0, Chunksize: 512K, Number of storage targets: destruct: 4	1831.85 MSBIR write, 1306.62 MSBIR read 15302 opals create, 5111 opals serricus*	Work file system, no backup, hence not meant for permanent data storage	usersdeep 2 od /usr/local, usersdeep 3 jube2 result	deng-en/abr-bencimanta/apptlantis/isor deng-en/abr-bencimanta/apptlantis/mit set
Anoma	Jovenskep.	SOV	NVMe device	Local	BeeGFS 7.1.2	Block size: 460	1145 MIEN write, 3108 MiEN read 120148 opals create, 60587 opals remove*	1 NVMe device available at each SDV compute node	"Test results and parameters used stored in JUBE: unexwideep 2 od /usry/local, userwideep 2 juized results beschmarks unexwideep 2 od /usry/local, userwideep 2 od /usry/local, userwideep 2 juized results results beschmarks	deng-en/abr-bencimaanka/ayysthetis/ior deng-en/abr-bencimaanka/ayysthetis/abrasc
/metheeand	Insthesond	SDV	BeeGFS On Demand running on the NVMe	Local	BeeGFS 7.1.2	Block size: 512K	1130 MBNs webs, 2447 MBNs read 12511 opuls create, 18424 opuls semove*	1 BeeCMD instance running on earch NVMe device	"Test results and parameters used stored in AUDE: uservaleep 3 od 5, yaar/loos), uservaleep 2 od seen alle becohesevite uservaleep 2 od uservaleep 3 julied uservaleep 3 julied result becohesevite becohesevite becohesevite becohesevite becohesevite	deng-en/abr-bencimmente/ayystleri.ir/isor

Stripe Pattern Details

It is possible to query this information from the deep login node, for instance:

```
manzano@deep $ fhgfs-ctl --getentryinfo /work/manzano
Path: /manzano
Mount: /work
EntryID: 1D-53BA4FF8-3BD3
Metadata node: deep-fs02 [ID: 15315]
Stripe pattern details:
+ Type: RAID0
+ Chunksize: 512K
+ Number of storage targets: desired: 4
manzano@deep $ beegfs-ctl --getentryinfo /sdv-work/manzano
Path: /manzano
Mount: /sdv-work
EntryID: 0-565C499C-1
Metadata node: deeper-fs01 [ID: 1]
Stripe pattern details:
+ Type: RAID0
+ Chunksize: 512K
+ Number of storage targets: desired: 4
```

Or like this:

```
manzano@deep $ stat -f /work/manzano
File: "/work/manzano"
         Namelen: 255
                              Type: fhgfs
Block size: 524288 Fundamental block size: 524288
Blocks: Total: 120178676 Free: 65045470 Available: 65045470
Inodes: Total: 0
                      Free: 0
manzano@deep $ stat -f /sdv-work/manzano
File: "/sdv-work/manzano"
  ID: 0 Namelen: 255
                             Type: fhgfs
Block size: 524288 Fundamental block size: 524288
Blocks: Total: 120154793 Free: 110378947 Available: 110378947
Inodes: Total: 0
                        Free: 0
```

See http://www.beegfs.com/wiki/Striping for more information.

Additional infos

Detailed information on the **BeeGFS Configuration** can be found ?here.

Detailed information on the BeeOND Configuration can be found ?here.

Detailed information on the Storage Configuration can be found ?here.

Detailed information on the Storage Performance can be found ?here.

Notes

• dd test @dp-dam01 of the DCPMM in appdirect mode:

```
[root@dp-dam01 scratch]# dd if=/dev/zero of=./delme bs=4M count=1024 conv=sync
1024+0 records in
1024+0 records out
4294967296 bytes (4.3 GB) copied, 1.94668 s, 2.2 GB/s
```

- The /work file system which is available in the DEEP-EST prototype, is as well reachable from the nodes in the SDV (including KNLs and ml-gpu nodes) but through a slower connection of 1 Gig. The file system is therefore not suitable for benchmarking or I/O task intensive jobs from those nodes
- Performance tests (IOR and mdtest) reports are available in the BSCW under DEEP-ER → Work Packages (WPs) → WP4 → T4.5 Performance measurement and evaluation of I/O software → Jülich DEEP Cluster → Benchmarking reports:
 ?https://bscw.zam.kfa-juelich.de/bscw/bscw.cgi/1382059
- Test results and parameters used are stored in JUBE:

```
user@deep $ cd /usr/local/deep-er/sdv-benchmarks/synthetic/ior
user@deep $ jube2 result benchmarks

user@deep $ cd /usr/local/deep-er/sdv-benchmarks/synthetic/mdtest
user@deep $ jube2 result benchmarks
```