

## **Wikiprint Book**

**Title: Programming with OmpSs?-2**

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## Programming with [OmpSs?-2](#)

- Introduction
- Quick User Guide

### Introduction

[OmpSs?-2](#) is a programming model composed of a set of directives and library routines that can be used in conjunction with a high-level programming language in order to develop concurrent applications. Its name originally comes from two other programming models: **OpenMP** and [StarSs?](#). The design principles of these two programming models constitute the fundamental ideas used to conceive the [OmpSs?](#) philosophy.

[OmpSs?-2](#) **thread-pool** execution model differs from the **fork-join** parallelism implemented in OpenMP.

### File Systems

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

- the [?JSC GPFS filesystems](#), provided via [?JUST](#) and mounted on all JSC systems;
- the DEEP-EST (and SDV) parallel BeeGFS filesystems, available on all the nodes of the DEEP-EST system;
- the filesystems local to each node.

The users home folders are placed on the shared GPFS filesystems. With the advent of the new user model at JSC ([?JUMO](#)), the shared filesystems 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 has a folder within each of the projects he/she is part of. For the DEEP project, such 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** filesystems, as it is expected to provide similar functionalities with its own parallel filesystems.

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

| Mount Point | User can unbind/mount system | Cluster                                                                | Type                 | Global / Local | SW Version   | Stripes Pattern Details                               | Maximum Measured Performance (per hostname)                                                       | Description                                                                                                          | Other                                                               |
|-------------|------------------------------|------------------------------------------------------------------------|----------------------|----------------|--------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| /home       | @home/jusers                 | SDV DEEP-EST                                                           | GPFS mounted via NFS | Global         |              |                                                       |                                                                                                   | Home directory used only for configuration files.                                                                    |                                                                     |
| /project    | @project/jusers              | SDV DEEP-EST                                                           | GPFS mounted via NFS | Global         |              |                                                       |                                                                                                   | Project directory, GPFS root storage file system, not suitable for performance oriented applications or benchmarking |                                                                     |
| /work       | @work/jusers                 | DEEP-EST*                                                              | BeeGFS               | Global         | BeeGFS 7.1.2 |                                                       |                                                                                                   | Work file system                                                                                                     | *Also available in the SDV but only through a Gg network connection |
| /lab-work   | @lab-work/jusers             | SDV (deep-er) under the EXT4L, BeeGFS on GDE and DEEP-EST (1 GDE only) | BeeGFS               | Global         | BeeGFS 7.1.2 | Type: RAID0<br>Character: DDK<br>Number of stripes: 4 | 1021.05 MB/s read<br>1208.62 MB/s read<br>1202.02 MB/s read<br>(max 1011 MB/s)                    | Work file system                                                                                                     | *Test results and parameters used stored in JUMC                    |
|             |                              |                                                                        |                      |                |              |                                                       |                                                                                                   |                                                                                                                      | *Test results and parameters used stored in JUMC                    |
| /home       | @home/jusers                 | SDV                                                                    | N/A device           | Local          | BeeGFS 7.1.2 | Block size: 4K                                        | 1140 MB/s write<br>1201.46 MB/s read<br>1201.46 MB/s read<br>1201.46 MB/s read<br>(max 1011 MB/s) | 1 TB device available at each SDV compute node                                                                       | *Test results and parameters used stored in JUMC                    |
|             |                              |                                                                        |                      |                |              |                                                       |                                                                                                   |                                                                                                                      | *Test results and parameters used stored in JUMC                    |
| /home       | @home/jusers                 | SDV                                                                    | N/A device           | Local          | BeeGFS 7.1.2 | Block size: 4K                                        | 1140 MB/s write<br>1201.46 MB/s read<br>1201.46 MB/s read<br>1201.46 MB/s read<br>(max 1011 MB/s) | 1 TB device available at each SDV compute node                                                                       | *Test results and parameters used stored in JUMC                    |
|             |                              |                                                                        |                      |                |              |                                                       |                                                                                                   |                                                                                                                      | *Test results and parameters used stored in JUMC                    |

## 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"
ID: 0      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

- 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 KNMs) 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 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
```