

# PyStager : General purpose parallel I/O & Pre/Post-Processing tool

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**DeepRain**



# DATA STAGING

## Necessity



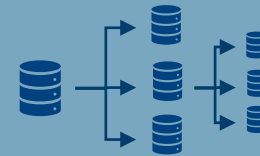
Our I/O, pre/post – processing scripts



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How to answer it ?

Exploit time – series hierarchical data structure



Written in easy & popular language compatible with HPC



Easy to use in compare to traditional MPI (mpi4py)

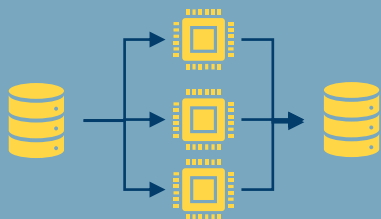


Easy to adopt to a working code



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## PyStager



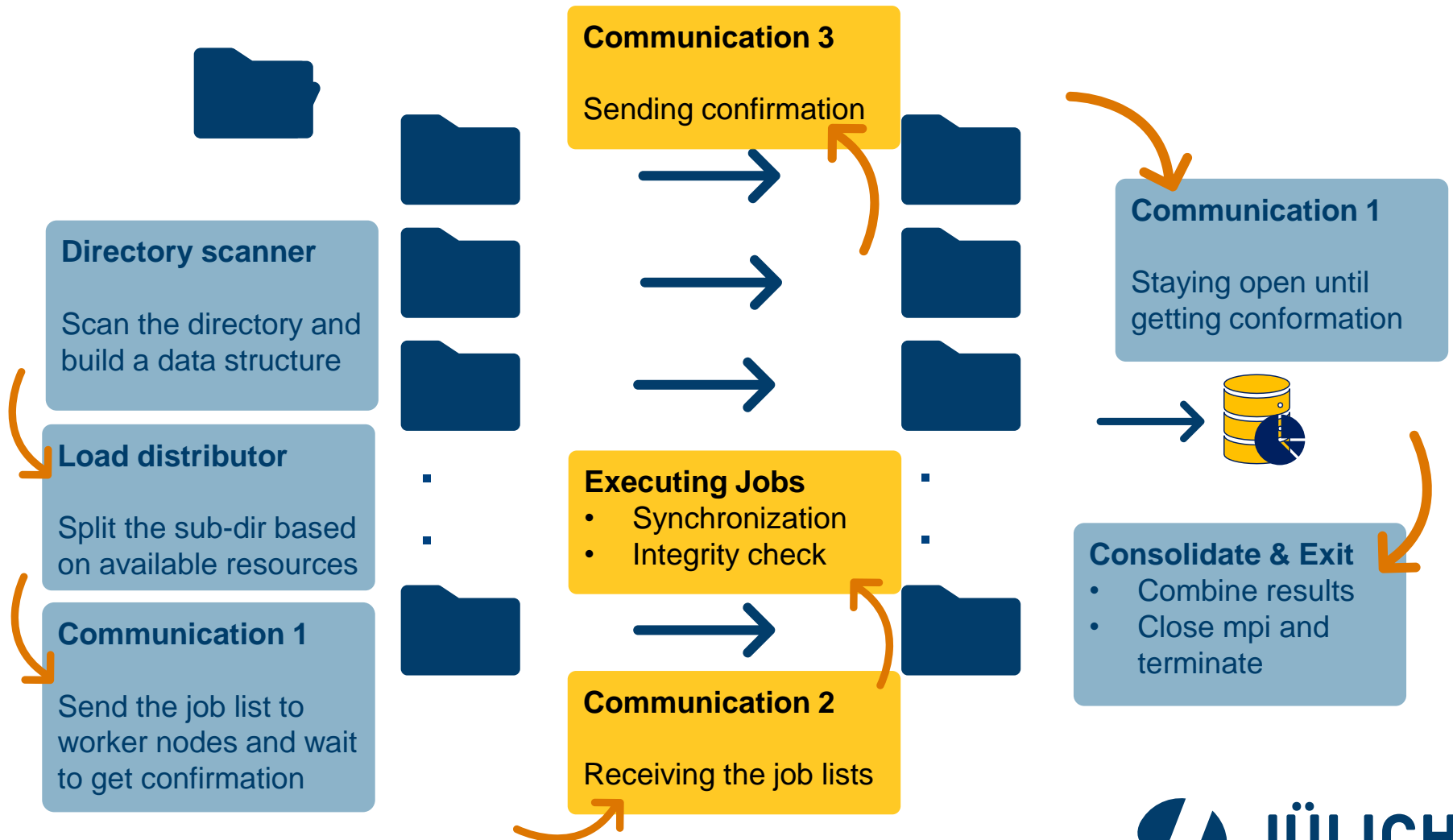
- General purpose parallel I/O and pre/post processing  
Written in Python (mpi4py)
- rsync and checksum integrated
- Logfile

<http://bit.ly/PyStager1>

```
PyStager is Running ...
# ===== Directory scanner : start =====#
1 ['02', '05', '08', '21', '24', '27', '11', '19', '14', '17', '31', '01', '09', '04', '07', '23', '26', '29', '13', '16', '30']
2
3 Total size of the source directory is:6113.583488Gb.
4
5 Total number of the files in the source directory is: 28520
6
7 Total number of the directories in the source directory is: 31
8
9 # ===== Load Distribution : start =====#
10 (1: None, 2: None, 3: None, 4: None, 5: None, 6: None, 7: None, 8: None, 9: None, 10: None, 11: None, 12: None, 13: None, 14:
11 (1: '01', 2: '02', 3: '03', 4: '04', 5: '05', 6: '06', 7: '07', 8: '08', 9: '09', 10: '10', 11: '11', 12: '12', 13: '13', 14:
12 # ===== Communication : start =====#
13
14 PyStager is finished
15 source: 25 and destination: 25 files are identical
16 source: 02 and destination: 02 files are identical
17 source: 04 and destination: 04 files are identical
18 source: 07 and destination: 07 files are identical
19 source: 05 and destination: 05 files are identical
20 source: 11 and destination: 11 files are identical
21 source: 20 and destination: 20 files are identical
22 source: 08 and destination: 08 files are identical
23 source: 18 and destination: 18 files are identical
24 source: 15 and destination: 15 files are identical
25 source: 09 and destination: 09 files are identical
26 source: 17 and destination: 17 files are identical
27 source: 16 and destination: 16 files are identical
28 source: 13 and destination: 13 files are identical
29 source: 14 and destination: 14 files are identical
30 source: 06 and destination: 06 files are identical
31 source: 23 and destination: 23 files are identical
32 source: 03 and destination: 03 files are identical
33 source: 12 and destination: 12 files are identical
34 source: 22 and destination: 22 files are identical
35 integrity of source: 01 and destination: 01 files could not be verified
36 source: 21 and destination: 21 files are identical
37 source: 19 and destination: 19 files are identical
38 source: 10 and destination: 10 files are identical
39 source: 28 and destination: 28 files are identical
40 source: 24 and destination: 24 files are identical
41 source: 30 and destination: 30 files are identical
42 source: 29 and destination: 29 files are identical
43 source: 31 and destination: 31 files are identical
44 source: 26 and destination: 26 files are identical
45 source: 27 and destination: 27 files are identical
```

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## PyStager : Folder Level



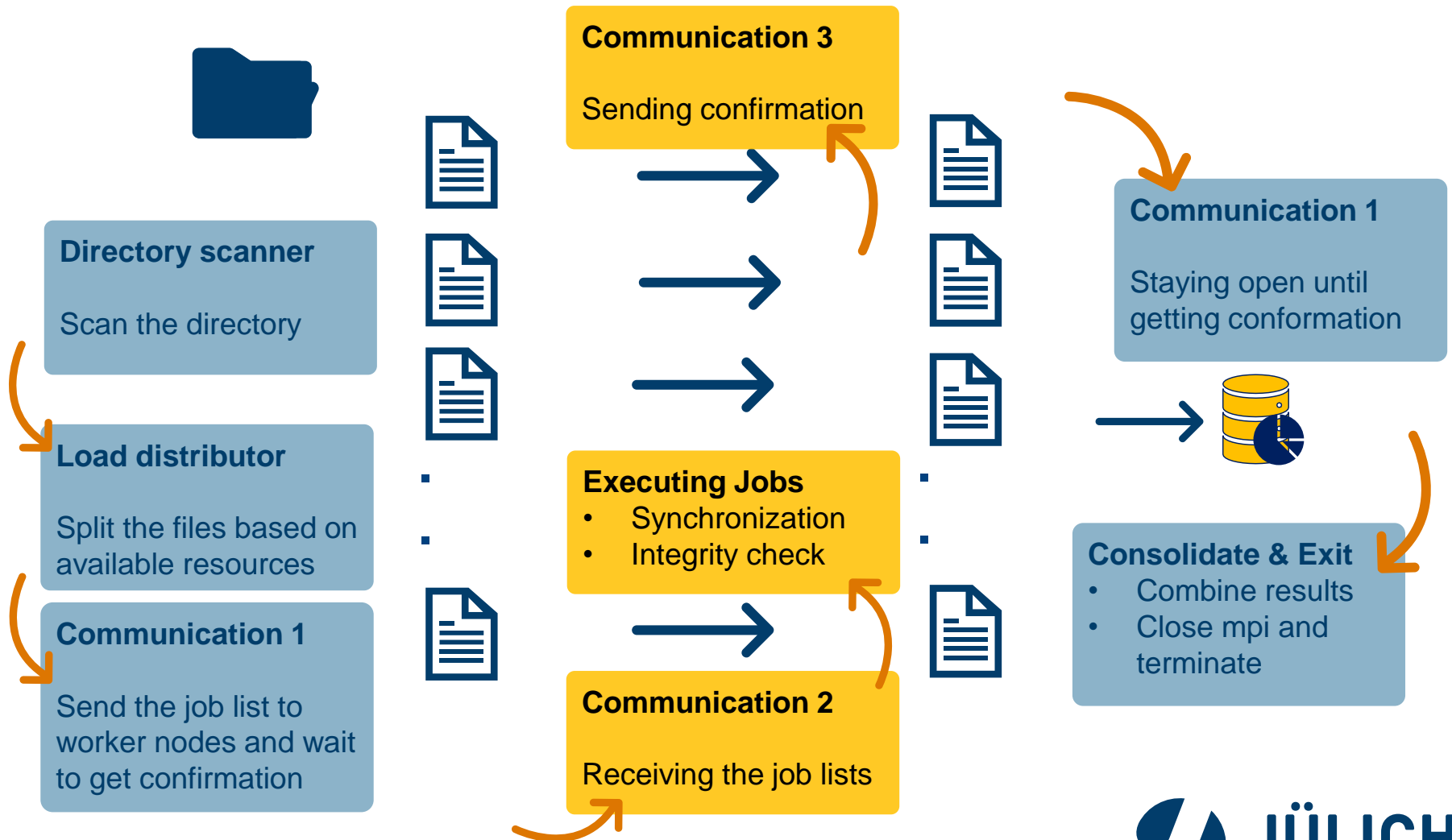
# DATA STAGING

## PyStager : Folder Level



# DATA STAGING

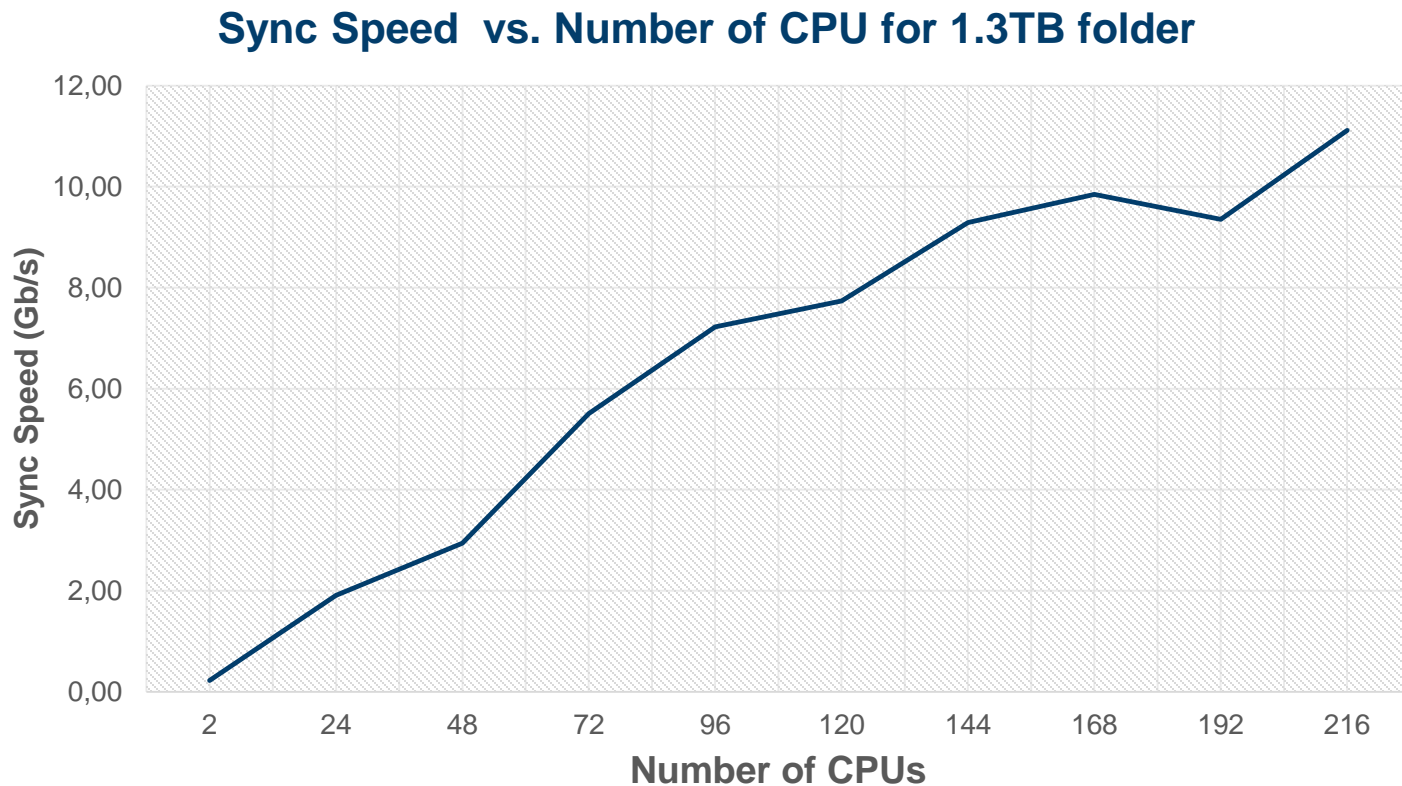
## PyStager : File Level



# DATA STAGING

## PyStager : File Level - – speedup

Communication 3



ion 1  
until  
mation

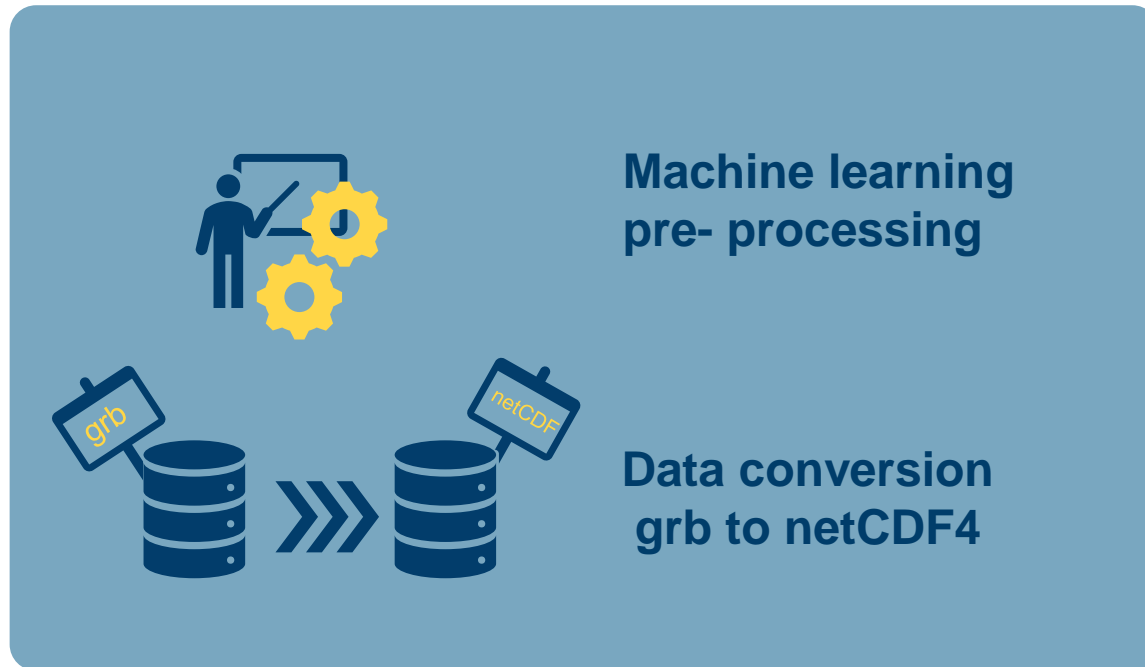
Exit  
ults  
d

Receiving the job lists




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## PyStager : Use Cases



# DATA STAGING

## PyStager : Use case 1 - Workflow, Parallelization

 /p/fastdata/slmet/slmet  
111/met\_data/ecmwf/e  
ra5/nc/2017/



**PyStager**

**PyStager**


**Horovod**

**Horovod**

### 1. Parallel Data Extraction

 ./DataExtraction/mpi\_st  
ager\_v2.py


### 2. Parallel Data Pre-processing


 /p/scratch/deepacf/de  
eprain/bing/processDa  
ta/


### 3. Parallel DNN Training


 ./Training/  
kitti\_train\_horovod.py


### 4. Data Post-processing

 /p/project/deepacf/dee  
prain/bing/DataPostproc  
ess/results/

 /p/scratch/deepacf/bin  
g/extractedData/

 ./DataPreprocess/mpi\_stager  
\_v2\_preprocess\_netCDF.py

 /p/project/deepacfdeep  
rain//bing/Training/model  
\_data\_keras2/

 ./DataPostProcess/mpi\_stag  
er\_v2\_kitti\_evaluate\_paral.  
py

Courtesy of Bing Gong

Code: [http://bit.ly/Workflow\\_Parallel\\_PredNet](http://bit.ly/Workflow_Parallel_PredNet)

Mitglied der Helmholtz-Gemeinschaft

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## PyStager : What is next



- **Multiple file simultaneous access and process**
- **Breakdown of single file into multiple smaller pieces**
- **Granular asymmetrical dispatching system**
- **Generating performance metrics on air for further use**

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PyStager : New use case ?



**Interested in trying it?**

**We are happy to support you!**