The Open Standard for Particle-Mesh Data

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DMA ST1 Synergy Workshop
DESY Hamburg

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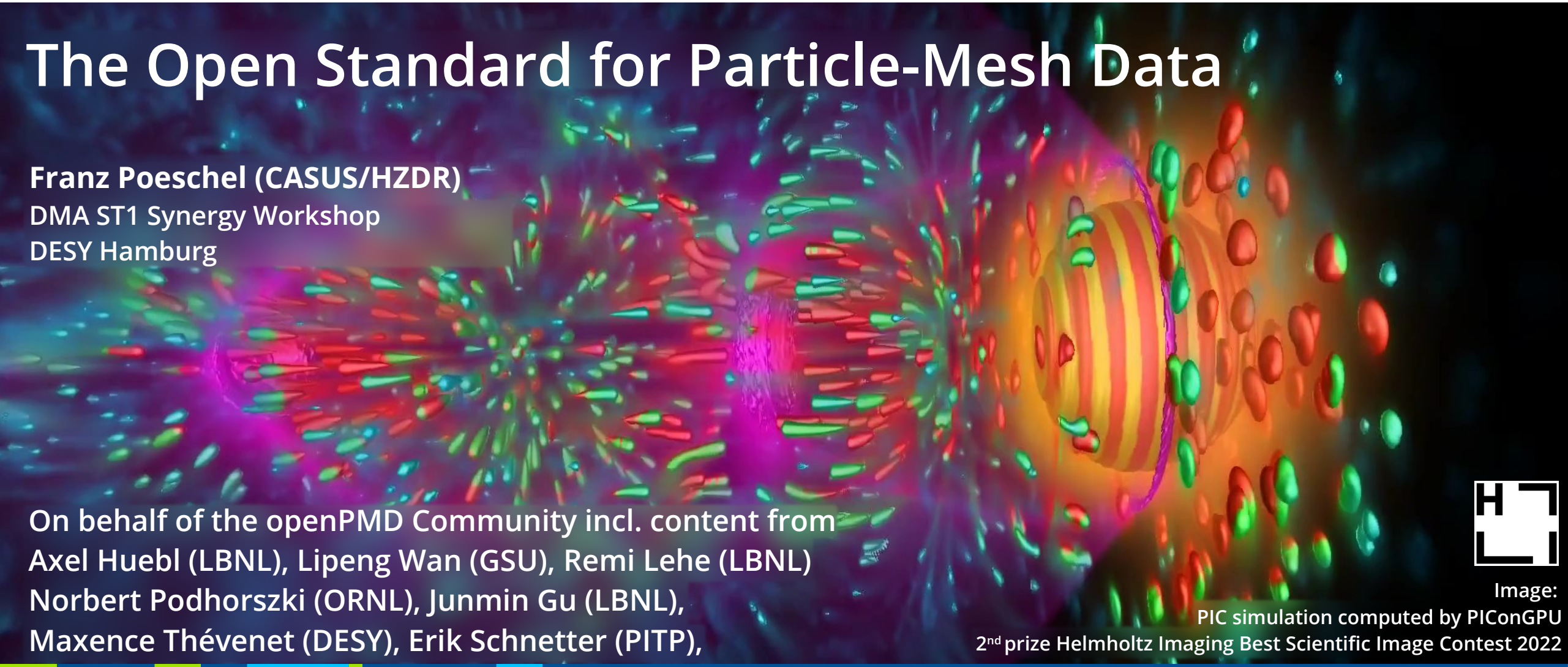
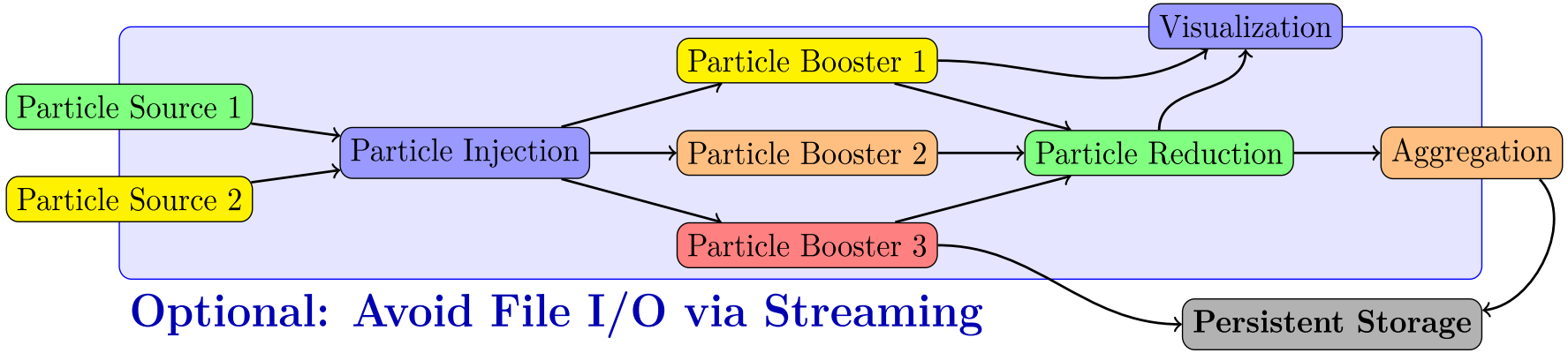


Image:
PIC simulation computed by PIConGPU
2nd prize Helmholtz Imaging Best Scientific Image Contest 2022

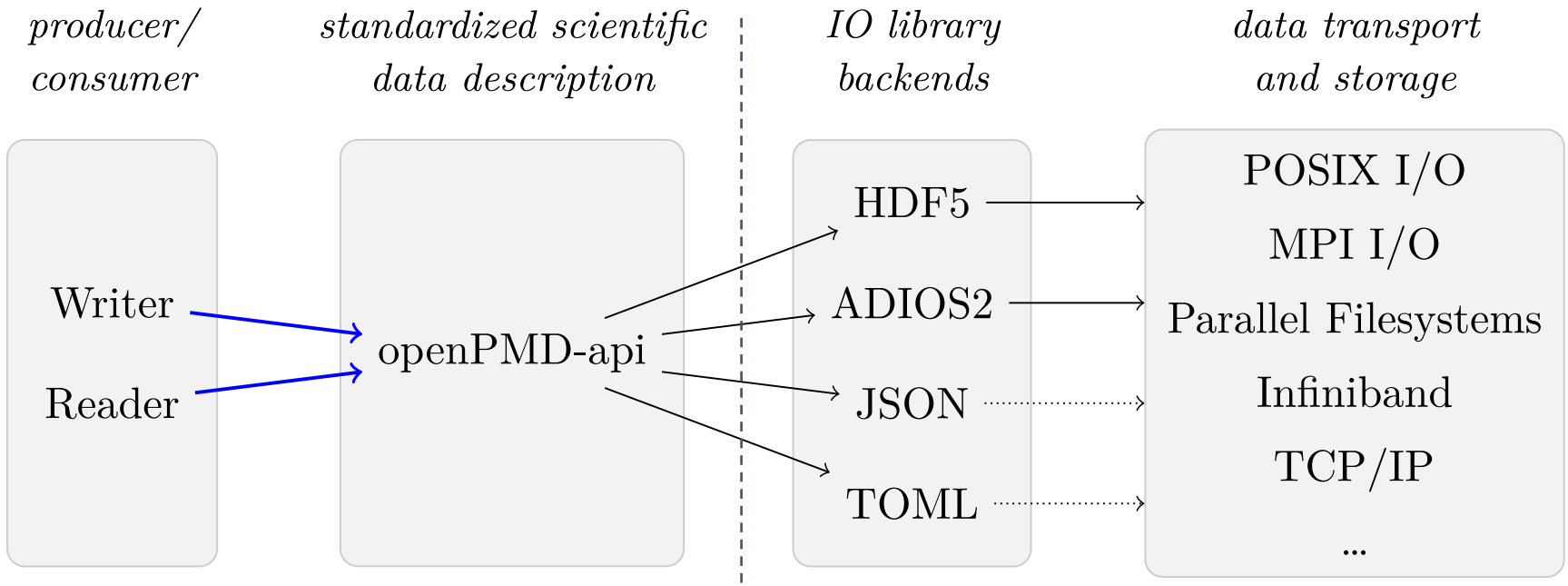
FAIR data meets Exascale I/O

Complex workflows
→ need F.A.I.R. data



	Titan	Summit	Frontier	*Growth Factor*
Peak Performance:	27 Pflop/s	200 Pflop/s	1.6 Eflop/s	~60
FS Throughput:	1 TiByte/s	2.5 TiByte/s	5.5 TiByte/s	~5
FS Capacity:	27 PiByte	250 PiByte	679 PiByte	25

Bringing F.A.I.R scalable I/O to software



C++17

Python

alpha: Julia

dev: C

I/O workflow expressed
in scientific domain language

Runtime parameters:

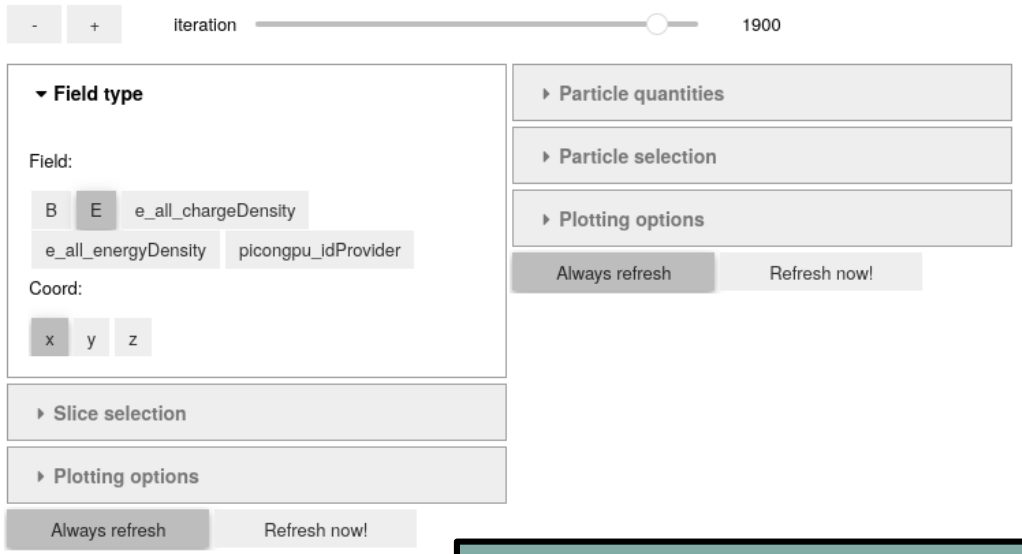
backend • data transport • streaming/file I/O
node-level aggregation strategies • compression
parallel FS configuration (e.g. OST usage)
buffering and serialization (e.g. chunking)

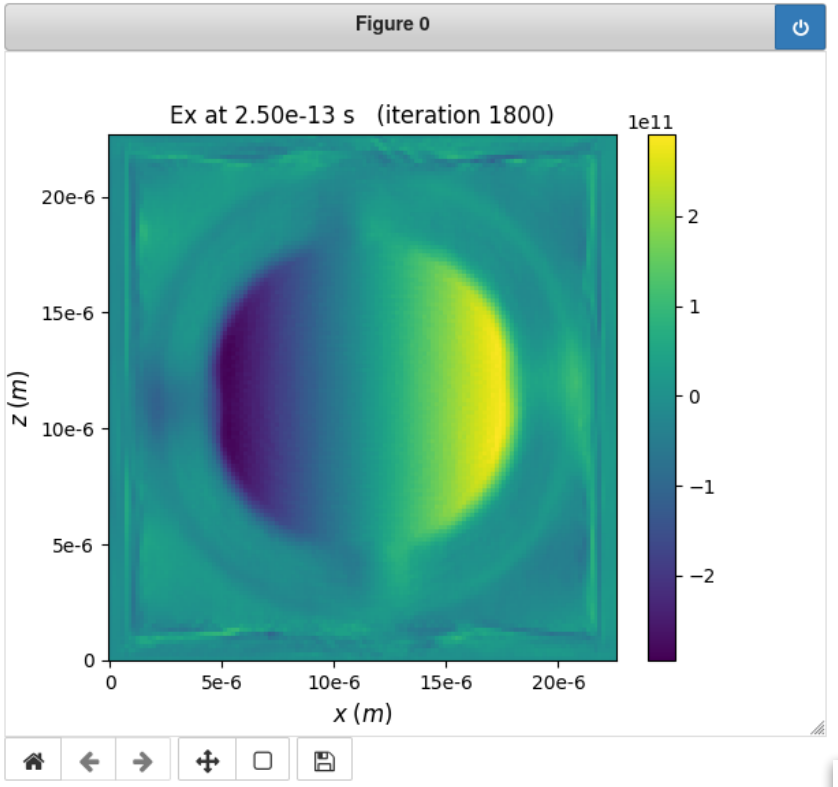
Analysis and Visualization

```
In [1]: import numpy as np
        %matplotlib notebook
        # or `%matplotlib inline` for non-interactive plots
        # or `%matplotlib widget` when using JupyterLab (github.com/matplotlib/jupyter-matplotlib)
        import matplotlib.pyplot as plt
        from openpmd_viewer import OpenPMDTimeSeries

In [2]: # Replace the string below, to point to your data
        ts = OpenPMDTimeSeries('/home/franzpoeschel/singularity_build/pic_run/openPMD')

In [3]: # Interactive GUI
        ts.slider()
```





openPMD/openPMD-viewer

Standardization of data

→ integration into modern scientific compute workflows