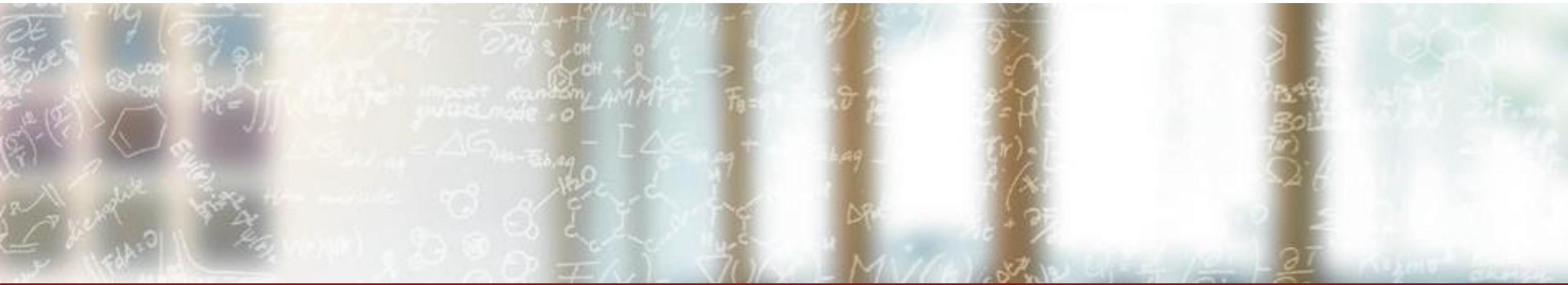




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Parallel data visualization

PDC Summer School 2023

Jean M. Favre, CSCS

August 24, 2023

What you will learn

- How to run an SMP-based ParaView session on the desktop
- How to run an MPI-based ParaView parallel session on the PDC cluster
- Bottlenecks, or limitations
 - Parallel I/O
 - Parallel data extraction
 - Parallel graphics
 - Parallelism in a ParaView Python script
- Time parallelism



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Parallel data visualisation on the desktop

Multi-core desktops

- Threaded, shared-memory data processing on CPUs

A thread of execution is a sequence of instructions that can be executed concurrently with other such sequences in multithreading environments, while sharing a same address space.

- **coarse-grained** shared-memory computing. In ParaView/VTK, the [SMPTools](#) provide an abstraction over
 - TBB
 - OpenMP
 - STD Thread

Multi-core desktops

- In ParaView, many filters, will, by default, take advantage of some form of multi processing
- Accelerated Algorithms

VTk-m

- This is a toolkit of scientific visualization algorithms for emerging processor architectures (GPUs and coprocessors). VTK-m is designed for **fine-grained** concurrency and provides abstract data and execution models that can be utilized to construct a variety of scalable algorithms.
- Blog [article](#)



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Parallel data visualisation on the cluster

MPI-based parallelism

1. pvbatch
2. paraview + pvserver

You may test simple things on your desktop, and later move to the [Dardel](#) supercomputer

The [self-directed](#) tutorial has collected together the best recipes to learn.



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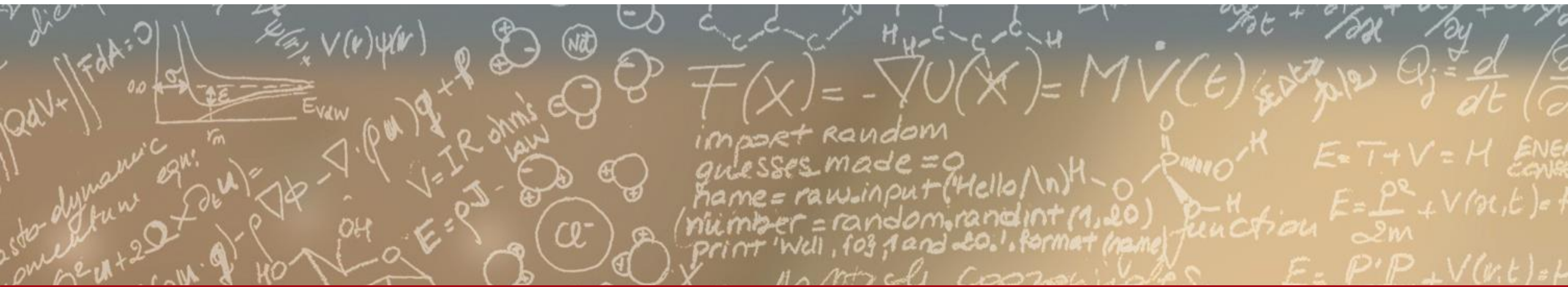
Mixed-mode parallelism (MPI + SMP)



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Thank you for your attention.