Discrete Simulation of DDN IME for architecture prototyping

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Program

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- Live session

Introduction

Many scientific applications need to interact with a large amount of data, not necessarily permanent.

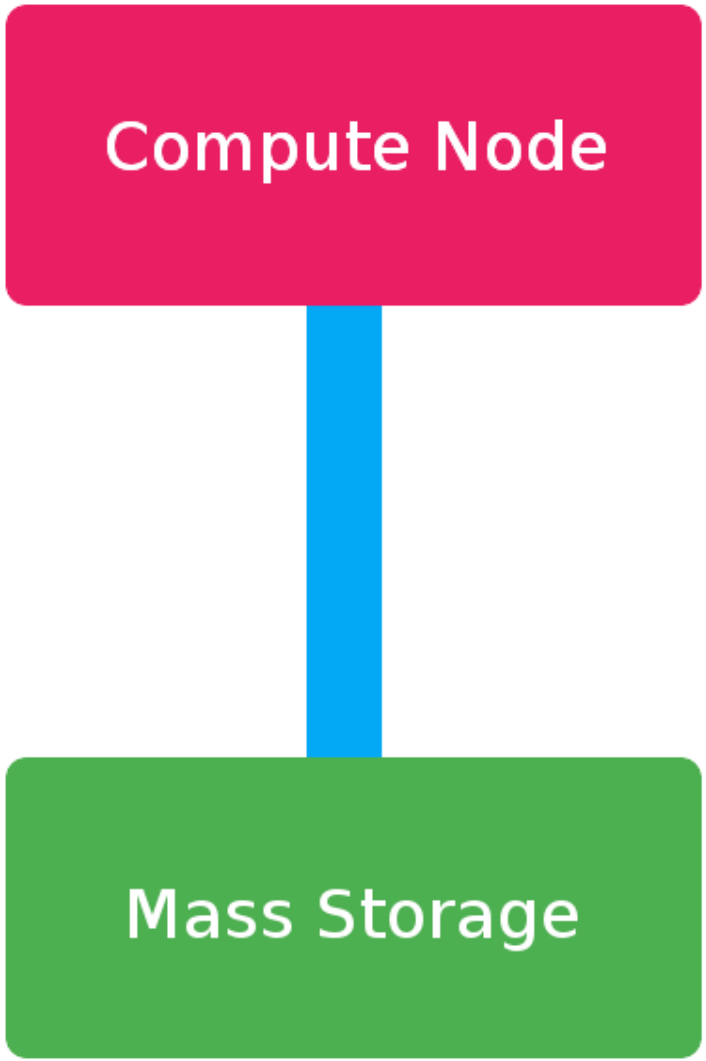
IO operations represent the main bottleneck in these cases, blocking compute nodes until these are completed.

SSD and NVMe memories allowed the development of **Burst Buffers** technologies, acting as a **cache** between Mass Storage and RAM, adding a layer in the **memory hierarchy**

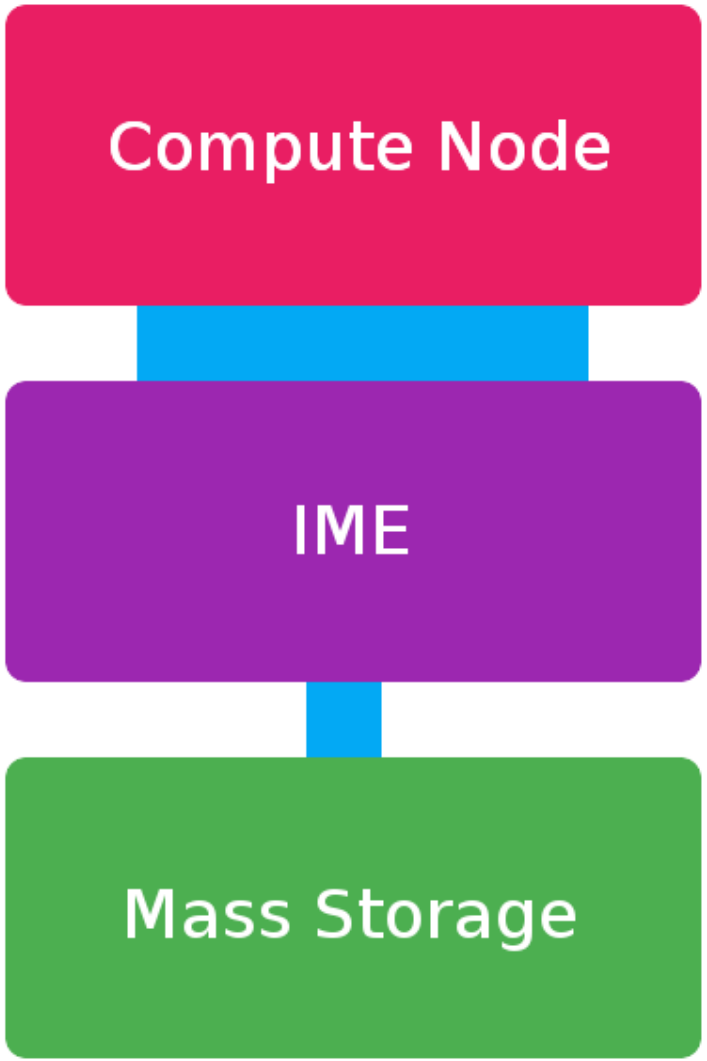
IME, Infinite Memory Engine, is the DDN burst buffer solution.

Burst Buffer Architecture

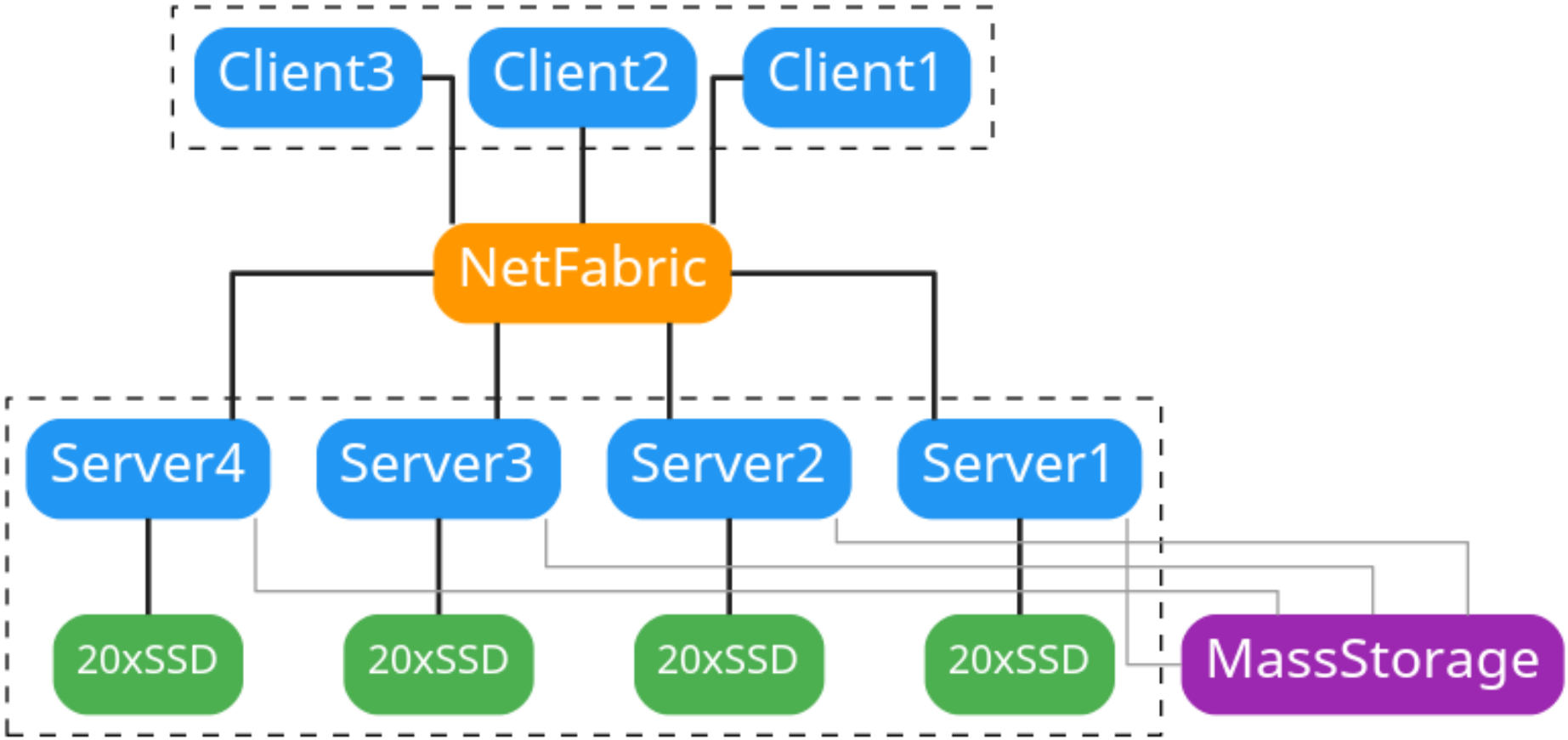
Traditional setup



Using Burst Buffer



IME Architecture



Problem

Issues

- Highly complex system with different bottlenecks based on the configuration
- Difficult way to determine the importance of a parameter in the final performance equation

Solution

DDN proposed the implementation of a **Discrete Event Simulator** to investigate the behaviour of the already existing system.
The usage of this tool should quickly evaluate the quality of the system through microbenchmarks without configuring a real machine

Development

- Iterative process
- **Python 3.5**
- **SimPy**, a python discrete event simulation library
- **Vmprof**, a statistical profiler, and **Flamegraph**, data plotter from profile data
- General UNIX tools

Results - Disk Bandwidth