WARP*fs* (Lustre+ZFS)
HPC Distributed Filesystem

In High Performance Computing (HPC, aka “Super Computing”) clusters, CPU power has increased exponentially. This requires moving vast quantities of data very quickly, particularly when “checkpoint” solutions are used. Otherwise, performance and scale of the whole cluster will be limited by the storage: the investment in faster CPUs will be wasted.

The **WARP*fs*** HPC distributed file system achieves the throughput and scale needed by the largest clusters in the world.

WARP*fs* is based on a combination of WARP’s tools, ZFS, and Lustre: the underlying file system used by most of the largest super computers in the world, including the USA’s “Titan” system at Oak Ridge National Labs and “Sequoia” system at Lawrence Livermore National Labs, both in turn ranked number one on the supercomputer Top500.

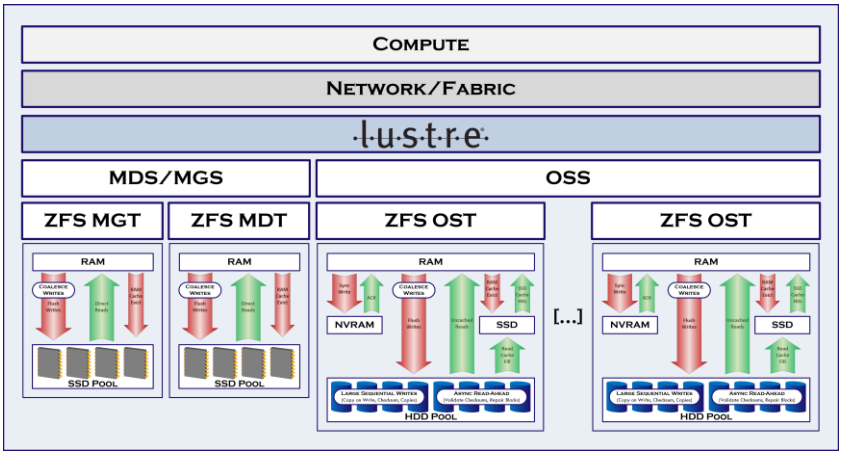
Building on a fully-integrated Lustre+ZFS stack as a robust open source foundation, WARP*fs* expands functionality with superior management tools, factory-performed industry-vertical tuning, advanced data integrity code, industry-standard methodologies, enterprise support, security measures, and incremental features.

Because it is derived from the leading HPC file system, WARP*fs* offers the fastest, most scalable infrastructure for Big Data, while tuning performed at the factory makes it practical to deploy in the broader market. WARP*fs* offers the best of all worlds: the easy manageability of an appliance with the scale and throughput of a super computer.

Powerful Management Options

Many super computers use custom software built in-house to manage the cluster and its filesystem. WARP supports these tools and methods natively – more so than any other OEM-class storage vendor.

For example, it is possible to put the WARP*ware* OS image onto a PXE server to boot an entire multi-petabyte filesystem. In other words, you can manage a WARP system the way that you manage the *compute layer* of the super computer. You no longer need to individually manage “array firmware” using proprietary OEM tools and methods.



However, mainstream corporate environments typically do not have the staff or time to operate custom cluster management software and need a built-in, turnkey management solution. For these customers, the WARP*fs* management interface allows easy configuration of the filesystem via a suite of powerful CLI tools. An administrator can add storage and expand the file system with a few simple commands.

A “point and click” web GUI is available for customers that require it. Cluster management is integrated into enterprise-class hardware and OS, including system health and performance reports.

The software supports too many features to detail in this document. For a complete list, or to schedule an evaluation, contact your WARP Mechanics authorized reseller. Briefly, WARP*fs* provides:

- No known theoretical upper limit on scalability
  - Systems using Lustre exceed 70PB today
  - Integrated ZFS allows individual zettabyte-range OSTs
- Optimal for write-intensive workloads
  - Full scale Lustre systems have demonstrated over 1Terabyte *per second* in real world applications
  - The ZFS layer's copy-on-write functions provide even further optimization
- Supports SSD hybrid and pure SSD solutions, optimal for *read*-intensive workloads
  - Most Lustre systems bog down on reads, and grind to a halt on small random IO
  - Not so with WARP: our SSD accelerators unlock the power of Lustre for *all* workload profiles
  - Multi-tiered caching, using optimized HW for each type of cache
- Prevents write-holes and protects against bit rot / silent data corruption
- Unlimited storage pool snapshots & replication
- Support for white-listing clients & SELinux & iptables compatible security options
- Optimal performance via InfiniBand or OmniPath RDMA fabric at 56Gb & 100Gb speeds
  - Also supports 10/40Gbps Ethernet Lustre clients
- Supports scale-out NAS gateways (NFS+SMB) for non-Lustre clients

All Lustre-based WARP*fs* appliances accelerate business operations by storing information centrally and sharing it simultaneously across multiple protocols and platforms, including NAS support, for Linux, Windows, UNIX, and Mac. In addition to native Lustre and NAS protocols, WARP OSSs also support block access via iSCSI, and object access via Swift or Ceph. This allows any connected client of the filesystem to access the data at precisely the right performance and cost-points to maximize business agility and value.

WARP Mechanics is the most comprehensive *Scalable Unified Storage* platform on the market today.