

RAIDIX ERA:

disruptive storage technology to create high performance DataLogger for autonomous vehicles

Introduction

Advanced autonomous vehicles and industrial Internet of Things set new standards for DataLoggers: supporting high data transfer rates (10GBps and more) and storing 50-200TB of data before transferring it to the data center.

Critical requirements for DataLoggers:

- 1) Sustained write performance over 10GBps.
- 2) Storage capacity of 50-200TB.
- 3) Ability to work in restricted environments:
 - no good cooling,
 - high vibration level,
 - size or weight limitations.

It makes it critical to have a compact box with more than ten drives.
- 4) Availability of required certificates and interfaces.
- 5) Ability to transfer data from the box to the data center quickly.

Challenge

For DataLoggers RAID becomes a bottle neck because:

- its resources are limited,
- high performance is absolutely critical.

Up to date RAID technologies (HW or SW) in this case don't work as good and **performance / capacity losses comprise 50-80%**. This is because RAID 5/6 (HW or SW) limits us to 5-6GBps write performance from one side. RAID10 takes half the capacity and half the write performance from another side.

Solution

RAIDIX ERA is the only technology allowing to get the highest possible performance on platforms with NVMe drives.

This software RAID was explicitly developed for Flash devices and can achieve up to **95% of total combined drives performance**, which is better than alternate solutions by 2-4 times.

It can be illustrated by the following example. Let's compare three systems using eight drives (because of the size limits) based on 2GBps SSD (single drive capacity is 7.68 TB).

RAID5 (SW RAID or RAID card)	RAID10 (SW RAID or RAID card)	RAID5 (RAIDIX ERA SW RAID)
4-5GBps	8GBps	14GBps
53TB	30TB	53TB

As a result, RAIDIX ERA increases the overall system performance by 2-4 times.

What makes it possible

RAIDIX ERA is the SW RAID developed by RAIDIX, software development company with more than 1000 installations and 30 partners (Builders and Integrators) worldwide.

RAIDIX ERA key features:

- 1) The resulting system performance is as close to the maximum combined performance of the elements (drives, buses, interfaces) as it can be.
 - Highly parallelized processing of read and write requests with no locks.
 - Merging of multithreaded write requests to fight read-modify-write. Entries are merged to fill an entire strand in order to avoid recalculating old checksums when hitting a boundary. The parameters of such aggregation are set by engineers to achieve an optimal performance/latency ratio.
- 2) Minimal consumption of system resources.
 - Limitable RAM and CPU cores provide the remaining services with guaranteed resources for work.
 - No caching on the host side.
- 3) RAID 5 and 6 are the main types of arrays: maximum reliability and minimum redundancy (expensive SSD).
- 4) The least possible performance loss in case of a drive failure. High performance computing library providing fast checksum encoding and fault recovery. We have invented and patented the original design of calculation vectorization.
- 5) Flexible work with any drives and a wide range of platforms, easy start with minimal requirements and custom development opportunities.
- 6) Patented array scaling mechanism allowing resources to scale quickly and efficiently as requirements change, starting with the minimum configuration.

Case Study

Read a [press release](#) on RAIDIX ERA usage in Eurotech autonomous driving applications.

RAIDIX ERA specification			
RAID levels	0, 1, 10, 5, 6, 7.3, 50, 60, 70	Level Migration	Yes
Write Performance	Up to 50GBps	Volume Expansion	Yes
Read performance	Up to 80GBps		