

Greatest Performance Hard Drive - Claim

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The purpose of the 'Greatest Performance Hard Drive' invention is intended to replace the existing hard drive with the new Dual CPUs and Dual Actuators Hard Drive that provides greatest performance and better data tracks and sectors in geometry layout with RDMA Technology that allows data accessing faster. The Greatest Performance (GP) Hard Drive comes with 25% outer zones LBAs to provide temporary area for faster data writing continuously with Dual CPUs system which can prevent data lost in reality when writing data and to support random and sequential with the same performance. The GP Hard Drive can simultaneously read and write at the same time with the Dual CPUs and Dual Actuators that can synchronize write and read operations nicely then re-arrange and manage data on the disk whenever the system is idle. This invention claim shows the overview figure of this invention which was submitted on 2021/11/23 with U.S. PCT/US21/72563 and International PCT/IB2021/000961 Patent Numbers, which can be used as the representing invention drawing to print on the patent frame and the following functions and features of this invention.

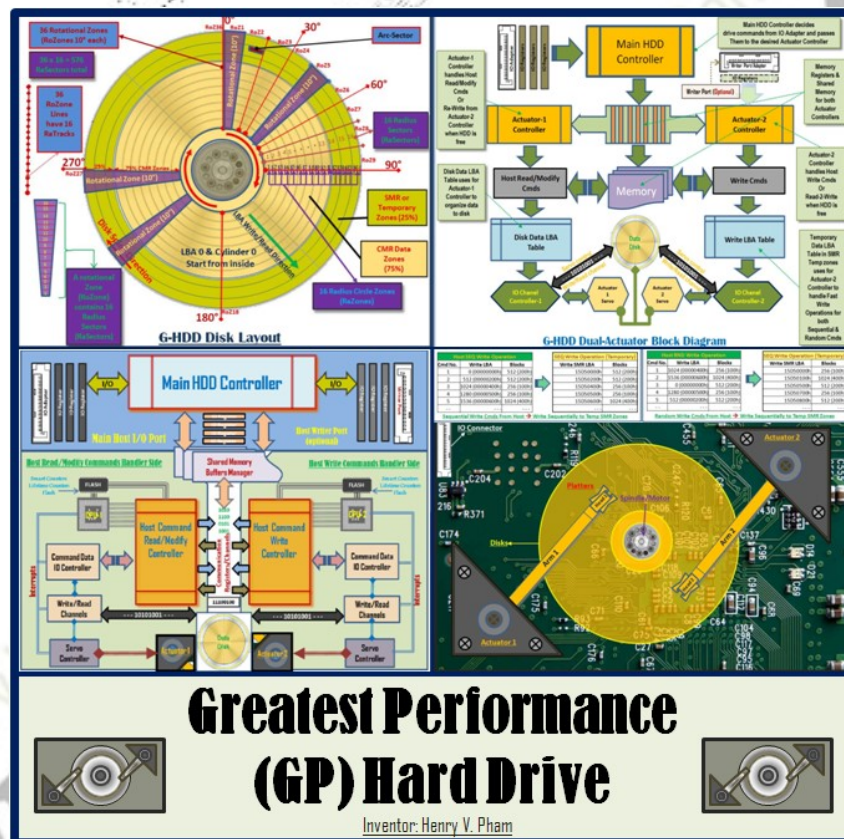


Figure-A: Greatest Performance Hard Drive -- Overview

1. The main apparatus for the GP Hard Drive, comprising:

The GP Hard Drive comes with Dual CPUs and Dual Actuators, the disk layout in geometry with 36 Rozones (Rotational Zones) with 10° per zone, 16 Razones (Radius Zones) with 16 radius divisions from the inner track to outer disk and with default allocation of 25% outer disk for temporary CMR/SMR writing zones plus optional LED for RPM tracking to support servo better that were mentioned in the original invention document which has been posted on the website www.TheGreatestDrive.com or www.TheCloudOSCenter.com. Wherein, Actuator-1 Controller process host Read/Modify commands

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directly from/to target disk LBAs, and Actuator-2 Controller handles host Write commands and write to the temporary zones. The GP Hard Drive come with 36 Rozones and 16 Razones for better hard drive disk layout, data management and performance statistics reports.

2. The disk layout and writing direction apparatus for the GP Hard Drive, comprising:

The GP Hard Drive disk layout comes each platter or disk will be divided with default 75% target data LBAs at the inner cylinders and 25% SMR or temporary LBAs at the outer cylinders with the disk layout in geometry of 36 Rozones with 10° per zone, 16 Razones with 16 equal radius divisions. The LBAs will be written outward direction in reverse of the existing hard drive, and LBA zero is started from inside. Wherein, The 36 Rotational Zones are divided by 10° degree each within 360° degree circle. These 36 Rotational Zones will create total of 36 radius starts with Radius 1 (R1) at 0° degree, Radius 2 (R2) at 10° degree, Radius 3 (R3) at 20° degree, etc... The 16 Radius Zones create 16 Circular Tracks; these tracks will be the Radius Sector Info Tracks (RaSector Info Track). The Radius Sector Info Track will contain info record and lifetime counters of its Radius Sectors. The GP Hard Drive would have 16 Radius Sectors per Rozone and total of 576 Radius Sectors.

3. The hardware designed apparatus for the GP Hard Drive, comprising:

The GP Hard Drive comes with Dual CPUs, Dual Actuators, 1 Host Controller and Actuator-1 Controller on CPU-1 and Actuator-2 Controller on CPU-2. Wherein, the Actuator-1 will be controlled by Servo Controller of the CPU-1 to handle Host Read/Modify Commands, and Actuator-2 will be controlled by Servo Controller of the CPU-2 to handle Write Commands; both controllers would communicate via Dual Port Shared RAM to synchronize commands for LBAs or Blocks Write/Read operations. The GP Hard Drive comes with optional Host Writer Port which is used to support continue writing for the system with Data Continue Recording while the main port is used as the regular operation. The GP Hard Drive would also come with flash memory to store Drive Smart Statistics Lifetime Counters.

4. The main operational apparatus for the GP Hard Drive, comprising:

The GP Hard Drive with Dual CPUs and Dual Actuators plus the great geometry layout provides greatest performance with Sequential and Random in equivalent performance with both Actuators synchronize operating and handling host commands faster. Wherein, the main Host Controller would handle host request commands then send Read/Modify commands to the Actuator-1 and send Write commands to the Actuator-2; the Actuator-1 would handle reading data from the disk, and Actuator-2 would handle writing data to the temporary zone with managing and sorting LBAs on the Write LBAs Mapping Table; when the system is idle, both Actuator Controllers would synchronize and handle data writing to the actual location on the disk.

5. The GP Hard Drive Operation Scenarios of claim 4, further comprising:

There are four scenarios of the process flow of the GP Hard Drive. First, both Actuator-2 Controller (A1C) and Actuator-2 Controller (A2C) controllers are busy. Second, A1C controller is busy with host Read/Modify commands while A2C controller is free from host. Third, A2C controller is busy with host Write commands while A1C controller is free from host. Fourth, both A1C and A2C controllers are free from host commands. Wherein, scenario-1 when both controllers are busy processing commands from host, A1C controller will handle host Read/Modify commands directly to the target LBAs, and A2C

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controller will handle Write commands to the SMR temporary zones. Scenario-2, when A1C controller is busy and A2C controller is free from host, A1C controller handles host Read/Modify commands directly to the target LBAs. A2C controller has no host commands to process; then this controller will read the beginning written data in SMR temporary zones to their target disk LBAs and reset or empty SMR zones that have been moved and go to next data in SMR temporary zones or synchronize with the A1C for read command queuing faster for optimization read performance. Scenario-3, When A1C controller is free from host and A2C controller is busy processing Write commands from host. A2C controller handles host Write commands to the SMR temporary zones. A1C controller has no host commands to process; then this controller will read the beginning written data in SMR temporary zones by A2C controller to their target disk LBAs and reset or empty SMR zones that have been moved and go to next data in SMR temporary zones. Scenario-4, When both A1C and A2C controllers are free from the host, then both controllers will synchronize with each others to move the temporary data that have been written in SMR temporary zones to their target disk LBAs. When this scenario happens, A2C controller starts reading the beginning data in SMR temporary zones and passes the data to A1C controller and let the A1C controller write the data to their target disk LBAs. By passing read data from A2C controller to A1C controller to handle data migrating to their target disk LBAs is to minimize the tracks seek process for both Actuators.

6. The GP Hard Drive additional supporting functions of claim 1,2 & 4, further comprising:

The GP Hard Drive would come with introduced additional Drive Modify Sectors commands as mentioned in the Reference Section of the original invention document to support large files modification and ready for Cloud OS, and this Hard Drive would be the greatest performance hard drive for any spinning disk recording technology. Wherein, the Quantum Technology is on the rise and the Hard Drive is reliable for decades of usage at datacenter; the Quantum Recording Technology can be used in GP Hard Drive to store Quantum Number for faster and larger data storage, the number can be very big which can be represent for a file where data is in hexadecimal which can be any number.

7. The GP Hard Drive additional hardware supports of claim 1 & 3, further comprising:

The GP Hard Drive data cable can be modified to support cable lock to prevent losing connection and simplified to use lower voltage and smaller adapter and prepare for better protocol for data rate improvements. Wherein, the data lines voltage from 5 volts to 3.2 volts or lower for data signal integrity since current IC chip technology goes with lower voltage to reduce heat and signal noise. The GP Hard Drive would have negotiate communication protocol which would be secured and protected from unwanted access into the hard drive; the negotiate communication protocol would be applied on top of the SATA/SAS protocol, and the GP Hard Drive would request for the correct Communication Keys before allowing to start the read or write data access.

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