CLAIMS

1. A printed circuit board assembly (PCBA) for a storage device comprising:

   a non-volatile memory (NVM); and

   a multi-core processor;

   wherein a first core of the multi-core processor is devoted to external interface management; and

   a second core of the multi-core processor is devoted to internal data management.

2. The PCBA in accordance with claim 1, wherein another core of the multi-core processor is devoted to servo management.

3. The PCBA in accordance with any one of claims 1 or 2, wherein another core of the multi-core processor cooperates with the second core for the internal data management and file system management.

4. The PCBA in accordance with any one of claims 1 to 3, wherein another core of the multi-core processor is devoted to caching and tiering.

5. A hard disk drive (HDD) comprising the PCBA of any one of claims 1 to 4.

6. The HDD in accordance with claim 5, wherein the NVM is used with disk media of the HDD for hybrid data storage.

7. A multi actuator, multi HDD comprising the PCBA of any one of claims 1 to 4.

8. A Solid State Drive (SSD) comprising the PCBA of any one of claims 1 to 4.

9. A HDD for data storage comprising:

one or more disk platters, each of the one or more disk platters having magnetic disk media on one or both sides;

an axial motor for rotating the one or more disk platters;

one or more actuators for reading and writing data from the one or more disk platters;

one or more interfaces coupled to the one or more actuators; and

a PCBA coupled to the axial motor, the one or more actuators, and the one or more interfaces, wherein the PCBA comprises:

an NVM; and

a multi-core processor, wherein a first core of the multi-core processor being devoted to external interface management and a second core of the multi-core processor being devoted to internal data management.

10. The HDD for data storage in accordance with claim 9, wherein another core of the multi-core processor of the PCBA is devoted to servo management.

11. The HDD for data storage in accordance with any one of claims 9 or 10, wherein another core of the multi-core processor of the PCBA cooperates with the second core for the internal data management and file system management.

12. The HDD for data storage in accordance with any one of claims 9 to 11, wherein another core of the multi-core processor of the PCBA is devoted to caching and tiering.

13. The HDD for data storage in accordance with any one of claims 9 to 12, wherein the NVM is used with the magnetic disk media for hybrid data storage.

14. A system for distributed data storage, the system comprising:

one or more storage devices, the one or more storage devices comprising a PCBA, the PCBA comprising:

an NVM; and

a multi-core processor, wherein a first core of the multi-core processor is devoted to external interface management and a second core of the multi-core processor is devoted to internal data management of the corresponding one of the one or more storage devices;

one or more client terminals, wherein the one or more storage devices and the one or more client terminals are coupled to a network and configured to perform a distributed data storage operation within the one or more storage devices in response to a request by any one of the one or more client terminals, the distributed data storage operation performed in cooperation with the first core's external interface management.

15. The system for distributed data storage in accordance with claim 14, wherein the network further comprises one or more metadata servers coupled to the network.

16. The system for distributed data storage in accordance with any one of claims 14 to 15, wherein the multi-core processor of the PCBA of each of the one or more storage devices is configured to perform autonomous data clustering in response to a request by any one of the one or more client terminals.

17. The system for distributed data storage in accordance with any one of claims 14 to 16, wherein the multi-core processor of the PCBA of each of the one or more storage devices is configured to execute a program on any one or more storage devices in response to a request by any one or more client terminals.

18. The system for distributed data storage in accordance with any one of claim 14 to 17, wherein the first core of the multi-core processor of the PCBA of each of the one or more storage devices is configured to perform data interfacing to the client terminal.

19. The PCBA in accordance with any one of claims 14 to 18, wherein another core of the multi-core processor is devoted to servo management.

20. The PCBA in accordance with any one of claims 14 to 19, wherein another core of the multi-core processor cooperates with the second core for the internal data management and file system management.

21. The PCBA in accordance with any one of claims 14 to 20, wherein another core of the multi-core processor is devoted to caching and tiering.

22. The system for distributed data storage in accordance with any one of claims 14 to 21, wherein the one or more storage devices is a HDD.

23. The system for distributed data storage in accordance with claim 22, wherein the HDD is a multi actuator, multi disk HDD.

24. The system for distributed data storage in accordance with any one of claims 22 and 23, wherein the NVM is used with disk media of the HDD for hybrid data storage.

25. The system for distributed data storage in accordance with any one of claims 14 to 21, wherein the one or more storage devices is an SSD.

CLAIMS

1. A printed circuit board assembly (PCBA) for a storage device comprising:

a non-volatile memory (NVM); and

a multi-core processor;

wherein a first core of the multi-core processor is coupled to one or more devices external to the PCBA and the storage device, and wherein the first core is configured for external interface management of the one or more devices external to the PCBA and the storage device including one or more of distributed file system management and management of a multi-device storage cluster, and wherein a second core of the multi-core processor is configured for internal data management of the storage device and/or the NVM.

2. The PCBA in accordance with claim 1, wherein another core of the multi-core processor is configured for servo management.

3. The PCBA in accordance with any one of claims 1 or 2, wherein another core of the multi-core processor cooperates with the second core for the internal data management and file system management.

4. A hard disk drive (HDD) comprising:

disk media; and

a printed circuit board assembly (PCBA) coupled to the disk media for external interface management and internal data management, the PCBA comprising:

a non-volatile memory (NVM); and

a multi-core processor,

wherein a first core of the first core of the multi-core processor is coupled to one or more devices external to the HDD including one or more storage devices external to the HDD, and wherein the first core is configured for the external interface management of communication with the one or more devices external to the HDD including one or more

of distributed file system management on at least a portion of the one or more storage devices external to the HDD and management of a multi-device cluster including storage on at least a portion of the one or more storage devices external to the HDD, and wherein the NVM is used with the disk media of the HDD for hybrid data storage, and wherein a second core of the multi-core processor is configured for the internal data management of the NVM and the HDD.

5. The HDD of claim 4, wherein the disk media comprises multiple disk platters, the HDD further comprising multiple actuators for reading data from and writing data to the multiple disk platters, wherein the second core of the multi-core processor of the PCBA is coupled to the multiple disk platters and the multiple actuators for internal data management.

6. A Solid State Drive (SSD) comprising a printed circuit board assembly (PCBA), the PCBA comprising:

a non-volatile memory (NVM); and

a multi-core processor, wherein a first core of the multi-core processor is coupled to one or more devices external to the SSD including one or more storage devices external to the SSD, and wherein the first core is configured for external interface management of the one or more devices external to the SSD including one or more of distributed file system management on at least a portion of the one or more storage devices external to the SSD and management of a multi-device cluster including storage on at least a portion of the one or more storage devices external to the SSD and a second core of the multi-core processor is configured for internal data management of the SSD.

7. A hard disk drive (HDD) for data storage comprising:

one or more disk platters, each of the one or more disk platters having magnetic disk media on one or both sides;

an axial motor for rotating the one or more disk platters;

one or more actuators for reading and writing data from the one or more disk platters;

one or more interfaces coupled to the one or more actuators; and

a printed circuit board (PCBA) coupled to the axial motor, the one or more actuators, and the one or more interfaces, wherein the PCBA comprises:

a non-volatile memory (NVM); and

a multi-core processor, wherein a first core of the multi-core processor coupled to one or more devices external to the HDD including one or more storage devices external to the HDD, and wherein the first core is configured for external interface management of the one or more devices external to the HDD including one or more of distributed file system management on at least a portion of the one or more storage devices external to the HDD and management of a multi-device cluster including storage on at least a portion of the one or more storage devices external to the HDD and a second core of the multi-core processor is coupled to the NVM and/or the one or more interfaces and is configured for internal data management of the NVM and/or the magnetic disk media.

8. The HDD for data storage in accordance with claim ~~9~~7, wherein another core of the multi-core processor of the PCBA is configured for one or more of servo management and/or caching and tiering.

9. The HDD for data storage in accordance with claim 7, wherein another core of the multi-core processor of the PCBA cooperates with the second core for the internal data management and file system management of the NVM and/or the magnetic disk media.

10. The HDD for data storage in accordance with claim 7, wherein the NVM is used with the magnetic disk media for hybrid data storage, and wherein the second core of the multi-core processor is configured for internal data management of both the NVM and the magnetic disk media.

11. A system for distributed data storage, the system comprising:

a plurality of storage devices, each of the plurality of storage devices comprising

a printed circuit board assembly (PCBA), the PCBA comprising:

a non-volatile memory (NVM); and

a multi-core processor, wherein a first core of the multi-core processor is configured for external interface management and a second core of the multi-core processor is configured for internal data management of the corresponding one of the plurality of storage devices;

a network; and

one or more client terminals, wherein the plurality of storage devices and the one or more client terminals are coupled to the network, and wherein the multi-core processor of the PCBA of one or more of the plurality of storage devices are further configured to perform distributed data storage operations within the one or more of the plurality of storage devices in response to a request by any one of the one or more client terminals, the distributed data storage operations performed in cooperation with the first core's external interface management.

12. The system for distributed data storage in accordance with claim 11, wherein the network further comprises one or more metadata servers coupled to the network, the multi-core processor of the PCBA of the one or more of the plurality of storage devices performing the distributed data storage operations within the one or more of the plurality of storage devices in cooperation with at least one of the one or more metadata servers.

13. The system for distributed data storage in accordance with claim 11, wherein the multi-core processor of the PCBA of each of the one or more storage devices is further configured to perform autonomous data clustering in response to a request by any one of the one or more client terminals.

14. The system for distributed data storage in accordance with claim 11, wherein the multi-core processor of the PCBA of each of the one or more storage devices is further configured to execute a program on any of the one or more storage devices the first core's external interface management in response to a request by any one or more client terminals.

15. The system for distributed data storage in accordance with claim 11, wherein the first core's external interface management is further configured to perform data interfacing to the one or more client terminals.

16. The PCBA in accordance with claim 11, wherein the multi-core processor of at least one of the plurality of storage devices is further configured for one or more of servo management and/or caching and tiering.

17. The PCBA in accordance with claim 11, wherein the multi-core processor of at least one of the plurality of storage devices cooperates with the second core of the multi-core processor of the at least one of the plurality of storage devices for the internal data management and file system management.

18. The system for distributed data storage in accordance with claim 11, wherein at least one of the plurality of storage devices further comprises a hard disk drive (HDD), and wherein the HDD is selected from the group comprising a single actuator, single disk HDD, a multi actuator, single disk HDD and a multi actuator, multi disk HDD.

19. The system for distributed data storage in accordance with claim 18, wherein the NVM of each of the plurality of storage devices is used with disk media of the HDD for hybrid data storage.

20. The system for distributed data storage in accordance with claim 11, wherein at least one of the plurality of storage devices comprises a solid state device (SSD).