

**Table 16.1** Types of Storage with Capacity, Access Time, Max Bandwidth (Transfer Speed), and Commodity Cost

| Type                    | Capacity*        | Access Time | Max Bandwidth       | Commodity Prices (2014)** |
|-------------------------|------------------|-------------|---------------------|---------------------------|
| Main Memory- RAM        | 4GB–1TB          | 30ns        | 35GB/sec            | \$100–\$20K               |
| Flash Memory- SSD       | 64 GB–1TB        | 50μs        | 750MB/sec           | \$50–\$600                |
| Flash Memory- USB stick | 4GB–512GB        | 100μs       | 50MB/sec            | \$2–\$200                 |
| Magnetic Disk           | 400 GB–8TB       | 10ms        | 200MB/sec           | \$70–\$500                |
| Optical Storage         | 50GB–100GB       | 180ms       | 72MB/sec            | \$100                     |
| Magnetic Tape           | 2.5TB–8.5TB      | 10s–80s     | 40–250MB/sec        | \$2.5K–\$30K              |
| Tape jukebox            | 25TB–2,100,000TB | 10s–80s     | 250MB/sec–1.2PB/sec | \$3K–\$1M+                |

\*Capacities are based on commercially available popular units in 2014.

\*\*Costs are based on commodity online marketplaces.

**Table 16.2** Specifications of Typical High-End Enterprise Disks from Seagate (a) Seagate Enterprise Performance 10 K HDD - 1200 GB

| <b>Specifications</b>                                  | <b>1200GB</b>                     |
|--------------------------------------------------------|-----------------------------------|
| SED Model Number                                       | ST1200MM0017                      |
| SED FIPS 140-2 Model Number                            | ST1200MM0027                      |
| Model Name                                             | Enterprise Performance 10K HDD v7 |
| Interface                                              | 6Gb/s SAS                         |
| <b>Capacity</b>                                        |                                   |
| Formatted 512 Bytes/Sector (GB)                        | 1200                              |
| External Transfer Rate (MB/s)                          | 600                               |
| <b>Performance</b>                                     |                                   |
| Spindle Speed (RPM)                                    | 10K                               |
| Average Latency (ms)                                   | 2.9                               |
| Sustained Transfer Rate Outer to Inner Diameter (MB/s) | 204 to 125                        |
| Cache, Multisegmented (MB)                             | 64                                |
| <b>Configuration/Reliability</b>                       |                                   |
| Disks                                                  | 4                                 |
| Heads                                                  | 8                                 |
| Nonrecoverable Read Errors per Bits Read               | 1 per 10E16                       |
| Annualized Failure Rate (AFR)                          | 0.44%                             |
| <b>Physical</b>                                        |                                   |
| Height (in/mm, max)                                    | 0.591/15.00                       |
| Width (in/mm, max)                                     | 2.760/70.10                       |
| Depth (in/mm, max)                                     | 3.955/100.45                      |
| Weight (lb/kg)                                         | 0.450/0.204                       |

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(Continued)

**Table 16.2** (b) Internal Drive Characteristics of 300 GB–900 GB Seagate Drives

|                            | ST900MM0006 | ST600MM0006 | ST450MM0006 | ST300MM0006 |                                     |
|----------------------------|-------------|-------------|-------------|-------------|-------------------------------------|
|                            | ST900MM0026 | ST600MM0026 | ST450MM0026 | ST300MM0026 |                                     |
|                            | ST900MM0046 | ST600MM0046 | ST450MM0046 | ST300MM0046 |                                     |
|                            | ST900MM0036 |             |             |             |                                     |
| Drive capacity             | 900         | 600         | 450         | 300         | GB (formatted, rounded off value)   |
| Read/write data heads      | 6           | 4           | 3           | 2           |                                     |
| Bytes per track            | 997.9       | 997.9       | 997.9       | 997.9       | KBytes (avg, rounded off values)    |
| Bytes per surface          | 151,674     | 151,674     | 151,674     | 151,674     | MB (unformatted, rounded off value) |
| Tracks per surface (total) | 152         | 152         | 152         | 152         | KTracks (user accessible)           |
| Tracks per inch            | 279         | 279         | 279         | 279         | KTPI (average)                      |
| Peak bits per inch         | 1925        | 1925        | 1925        | 1925        | KBPI                                |
| Areal density              | 538         | 538         | 538         | 538         | Gb/in <sup>2</sup>                  |
| Disk rotation speed        | 10K         | 10K         | 10K         | 10K         | rpm                                 |
| Avg rotational latency     | 2.9         | 2.9         | 2.9         | 2.9         | ms                                  |