Newsletter – April 2018
Hard Drive Failures

Pop Quiz: How many hard disks fail? Answer: ALL OF THEM! Some sooner, some later, but they all fail. This month we will look at failure rates and statistics, and how to avoid the dreaded disk failure (crash).

Why do hard drives fail? Simple – they have a lot of moving, mechanical parts that wear out with time. For example, there are electric motors, servos, relays, gears, and a swing arm that moves across the disk platters. All those pieces will wear out and then the trouble begins. Finally, there is a small motherboard on the bottom of the unit; it may suffer electrical failure due to burnouts, surges, or heat-related cracking of the board.

The newest disks available today are Solid State Disks, or SSD for short. These have no moving parts at all, just lots of Electronic Memory chips stuff inside. Think of them like a flash disk on steroids. Unfortunately, they are very expensive, and current capacities are low. More on that later. Meanwhile, if you need large storage capacity, we're stuck with HDD's for a few more years.

How do you pick a good hard disk that will last a long time? You could use the MBTF or "Mean Time Between Failure" statistic, but that is overly optimistic. For example, a Western Digital 4TB "Gold Level" Hard Disk is rated at 2,500,000 hours before failure. That calculates out to 292 years, which is impossible, so throw our MBTF as a measure. Hard Disk manufacturers also publish a statistic called "AFR" or average failure rate. The same Western Digital Gold hard disk is rated at .035 failure rate, which works out to 73 years… also bunk.

What is the best statistic to use? I use the manufacturer's warranty period + 1 year as a "reliability estimate". Let's call it the "John Becker Reliability Estimate" or "JBRE" stat. That previously-mentioned Western Digital disk with the 292 year MBTF or 73 year AFR now becomes (Warranty of 5 years) + (1 Year) = 6 year JBRE. That is more of a real-world gauge of what I have experienced when replacing failed hard disks. Page 2 has a chart furnished by BackBlaze, a cloud storage provider that tracks the reliability of disks used in their cloud servers. Note that disk reliability varies between manufacturers and for one brand, within similar model types.

Having said all that, I have had the occasion to work on hard disks that were older than 6 years; the record for me personally is one disk I found in a client's desktop that was 14 years old and still working. But that was a miracle, most of the disks I have tried to recover failed in the 6 to 8 years-old zone.

How about SSD's? Well, bad news folks, SSD's wear out too… the memory chips lose their electrical properties and cannot hold a charge after a certain number of read/write cycles. Typically, this fade-out of storage is just about exactly the same as Hard Disks: 6 years. The lesson learned here is to proactively replace disks, whether HDD or SSD, every 6 years BEFORE they fail. The computer itself can run much longer, so it does make economic sense to replace disks. Of course, you still need local backup storage via portable backup disks and/or cloud storage should your disk fail sooner than the calculated lifetime.

-John Becker

Chart provided by BackBlaze.com – https://www.backblaze.com/blog/hard-drive-stats-for-2017/

Annual Hard Drive Failure Rates by Year

Reporting Periods - 2015: (1/1/15-12/31/15) 2016: (1/1/16-12/31/16) 2017: (1/1/17-12/31/17)

			2015		2016		2017	
MFG	Model	Drive Size	Drive Count	Failure Rate	Drive Count	Failure Rate	Drive Count	Failure Rate
Seagate	ST12000NM0007	12 TB					7,220	2.01%
Seagate	ST10000NM0086	10 TB					1,220	0.89%
HGST	HUH728080ALE600	8 TB	45	4.93%	45	0.00%	45	0.00%
Seagate	ST8000DM002	8 TB			8,660	1.63%	9,886	0.96%
Seagate	ST8000NM0055	8 TB			60	0.00%	14,396	1.21%
Seagate	ST6000DX000	6 TB	1,882	2.22%	1,889	0.85%	1,881	0.70%
WDC	WD60EFRX	6 TB	458	6.05%	446	5.49%	437	2.06%
Toshiba	MD04ABA500V	5 TB	45	2.69%	45	2.22%	45	0.00%
Hitachi	HDS5C4040ALE630	4 TB	2,699	0.90%	2,700	0.52%	2,391	0.34%
HGST	HMS5C4040ALE640	4 TB	7,085	0.62%	7,014	0.40%	6,032	0.33%
HGST	HMS5C4040BLE640	4 TB	3,091	0.39%	9,362	0.51%	14,797	0.63%
Toshiba	MD04ABA400V	4 TB	145	3.04%	146	0.00%	146	0.70%
Seagate	ST4000DM000	4 TB	29,024	3.15%	34,737	2.77%	32,070	3.17%
Seagate	ST4000DM001	4 TB					392	15.19%
Seagate	ST4000DM005	4 TB					60	29.08%
WDC	WD40EFRX	4 TB	46	4.45%	46	2.17%	45	2.21%
WDC	WD30EFRX	3 TB	1,046	7.81%	1,102	3.27%	180	1.09%
		Totals	**45,566**	**2.35%**	**66,252**	**2.00%**	**91,243**	**1.83%**

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