

Wear-Leveling Mechanism-1

- **Flash written/erase cycles:**

Generally the NAND type flash memory Guarantees 100000 written/erase cycles on each physical written/erase sector. Physical sector: Means the real sector on NAND flash device.

- **Logical sector:**

The accessed unit by operating system (WINDOWS series, Linux.....etc). A logical sector size is 512byte.

- A NAND type flash device without wear leveling algorithm might always program each logical sector to the same physical sector.

- For example: A 256MB NAND flash device writing 16Kbyte/sec data into **the same physical sector** on flash device. The life cycle (**without wear leveling**) will be as below:

$$\text{Flash Disk Lifetime (Theory)} = \frac{100,000 * 0.95}{60 * 60 * 24} = 1.099 \text{ days}$$

Wear-Leveling Mechanism-2

- To avoid this happened our controller provide wear leveling function that will ensure the data being evenly writing onto flash device.
- Example : A 256MB flash device writing 16KB data onto flash device the formula as below: (With wear leveling).

$$\text{Flash Disk Lifetime (Theory)} = \frac{(256\text{MB}-0\text{MB}) * 1024 * 100\text{K} * 0.95}{(16\text{KB}/\text{sec}) * 60 * 60 * 24} = 18,014 \text{ days}$$

- # The “0.95”: After the flash being format the capacity might lower than the certain capacity.
- **1MB=1024KB**
- # “60*60*24”: 86400 writing times per day. 1 time /sec
- #”0MB”: The size of your OS & AP. In this case we set it as “0”
- #“16KB/sec”: The data size that writing onto flash device per second.
If the data less than 16KB we recommend you still calculate it with 16KB.
- #”100,000”: The limitation of flash memory’s erase cycles.
- P.S. The above formula is an ideal condition, due each NAND flash device erase cycles may vary so the reality Flash Disk lifetime (Theory) need to times 0.7.
- **Expected Flash Disk lifetime = Flash Disk lifetime (Theory) * 0.7**