

1. Flash-based SSDs

solid-state storage device

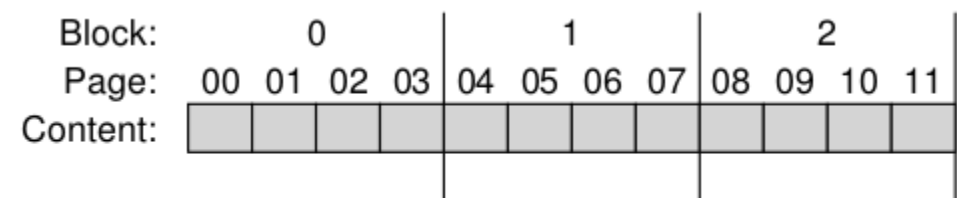


Figure 44.1: A Simple Flash Chip: Pages Within Blocks

Basic Flash Operations: read page (fast), erase block (slow), write page

block must be erased before writing any pages

rewrite page: read block, erase block, update block

		iiii	Initial: pages in block are invalid (i)
Erase()	→	EEEE	State of pages in block set to erased (E)
Program(0)	→	VEEE	Program page 0; state set to valid (V)
Program(0)	→	error	Cannot re-program page after programming
Program(1)	→	VVEE	Program page 1
Erase()	→	EEEE	Contents erased; all pages programmable

Device	Read (μs)	Program (μs)	Erase (μs)
SLC	25	200-300	1500-2000
MLC	50	600-900	~3000
TLC	~75	~900-1350	~4500

Figure 44.2: Raw Flash Performance Characteristics