

Testing SSDs at the System Level

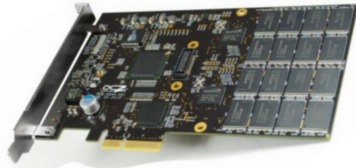
August, 2012

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Varieties



SSD



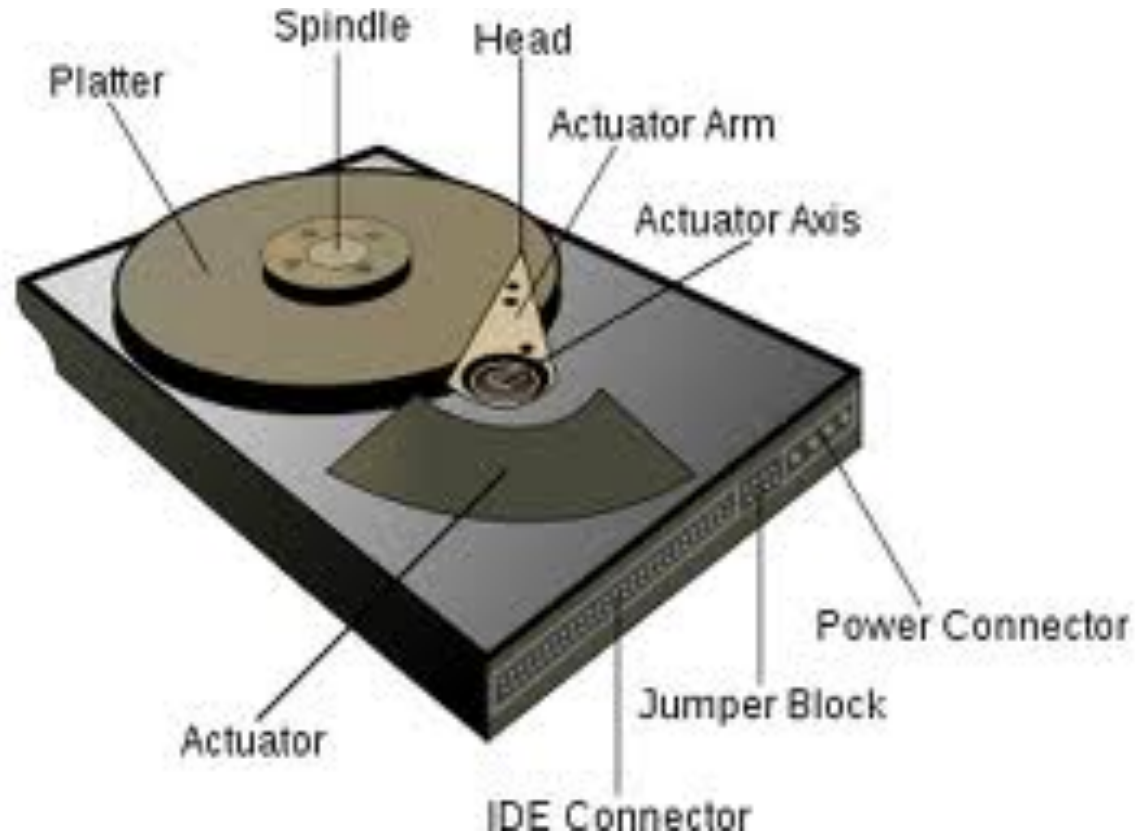
PCIe

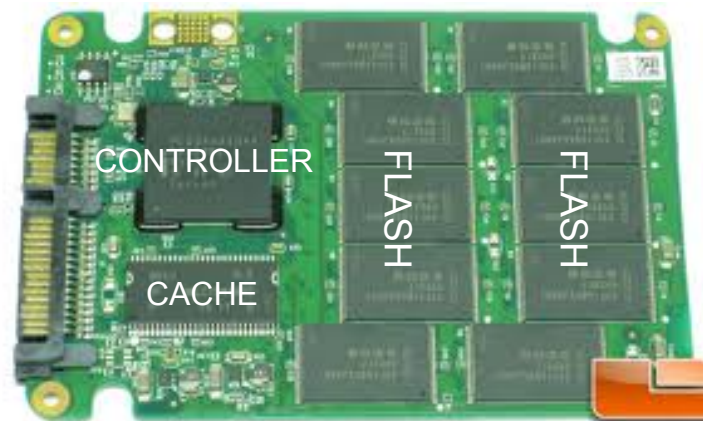


mSATA

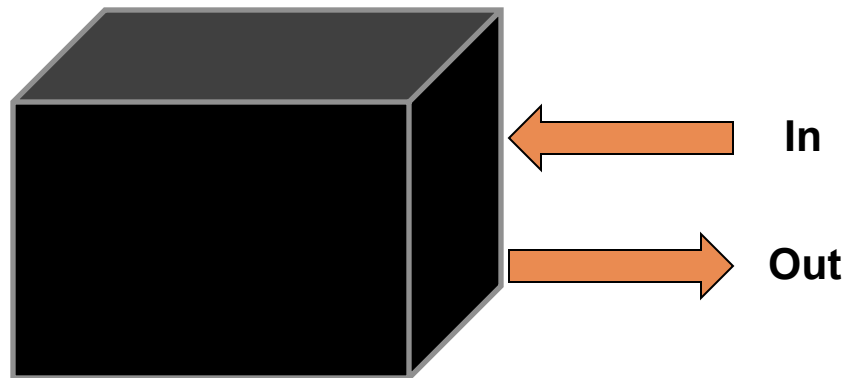


Storage Array





System Component	Description
Device Driver	Software created by the OEM to run on the target host processor family under a particular OS and File System. The device driver provides host access to the particular SSD product
Interface Components	The electrical interface between the host processor and the SSD peripheral device
SSD Controller	The electronic component(s) that provide SSD device level interfacing and firmware execution. Included is an embedded processor, data ROM data RAM, flash component interfacing, error correction code (ECC), wear leveling/TRIM, and security features.
Cache Components	This is high speed RAM memory components used for speed matching and to increase data throughput.
Controller Firmware	Software written and stored in electrically erasable memory for execution by the controller. Can be upgraded once in service. (Some advanced techniques include NCQ, TRIM and wear leveling)
Flash Memory Components	Individual Flash die or devices using either NAND or NOR technology. Densities vary from 2GBytes to 64GBytes.
Packaging	Various physical form factors



Test as a customer – at the system level using:

- The actual application environment – OS Driver/User Context
- The actual interface – SAS, SATA, PCIe NVMe
- The actual application – PC, Data Center etc.
- The actual duty cycle

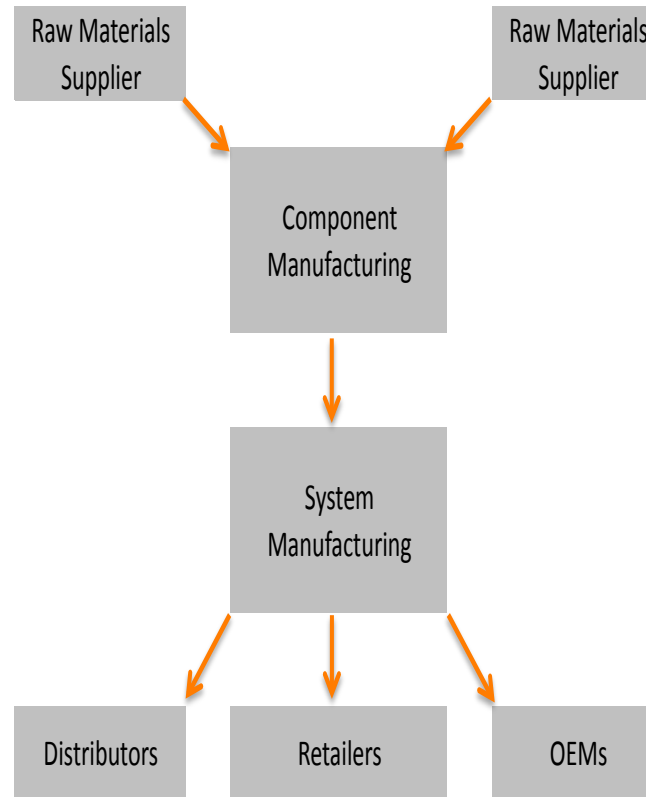
Testing for harmony among all components

Necessary but not Sufficient

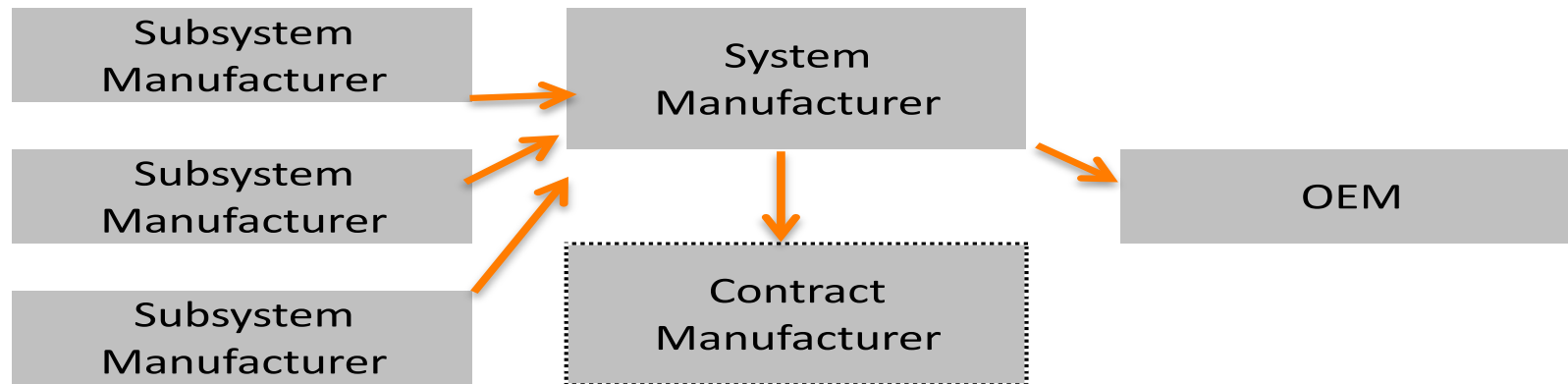
Components are tested in **isolation**

Standard components are sourced from multiple suppliers:

- differing levels of testing
- differing “4-corner” parameter ranges
- standards allow latitude – not always definitive
- resulting compounding of +/- tolerances

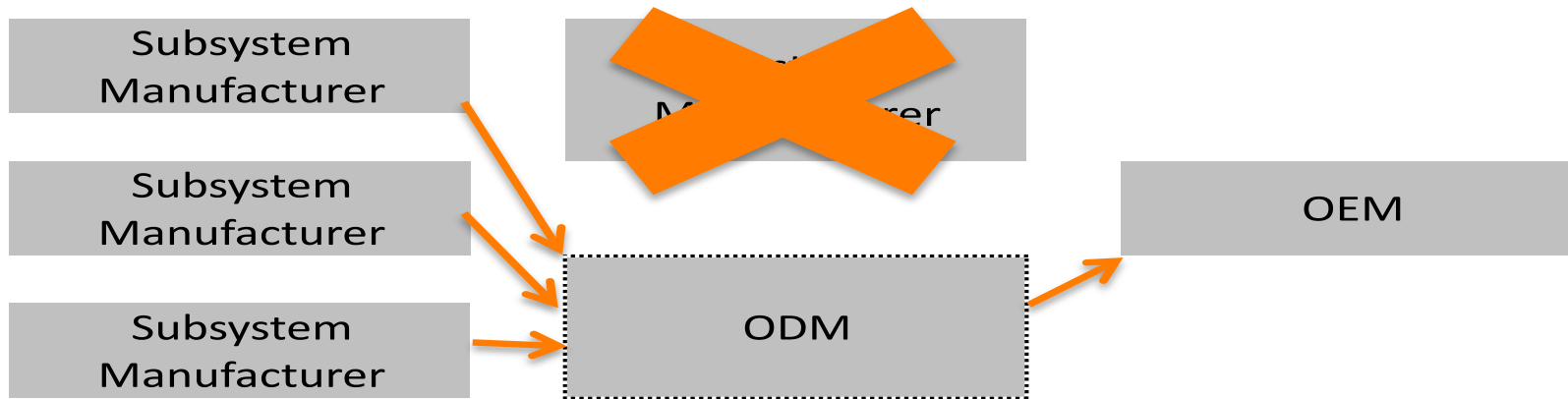


Vertical Supply Chain



System manufacturing is a “simple” assembly process:

- using pre-tested components
- using reference designs
- using pre-developed firmware



Eliminating the middle man puts onus on system validation:

- validate specifications
- guarantee consistency
- forecast warranty accrual

The whole is even *more greater* than the sum of its parts

- **SSD is causing Sea Changes:**
 - in technology
 - in functionality
 - in industry structure
- **Vertical Manufacturers → Horizontal Distributors**
- **System testing → Product quality**