Minimizing Customer Interruptions Due to SSD Failures

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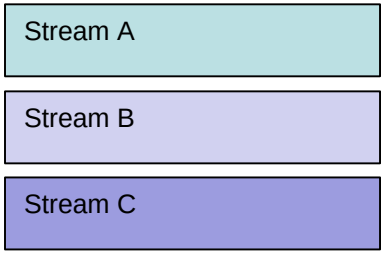
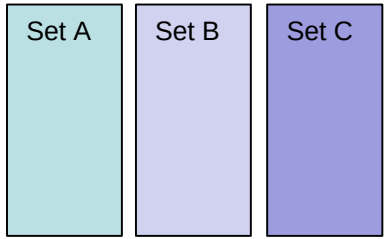
Exciting Things are Happening…

Data Segregation



Performance Isolation



Smart SSDs

Failure Handling

Importance of Availability

MONTHLY UPTIME PERCENTAGE	SERVICE CREDIT
< 99.9%	10%
< 99%	25%
< 95%	100%

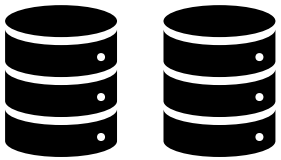
Microsoft will pay customers back when SLA is not met

Failure Definition

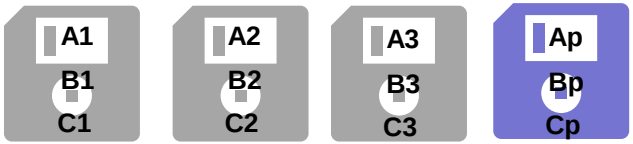
For IaaS, any time we cannot get the data in a reasonable amount of time

Disk failures are more than just asserts. Think like a VM

Solutions

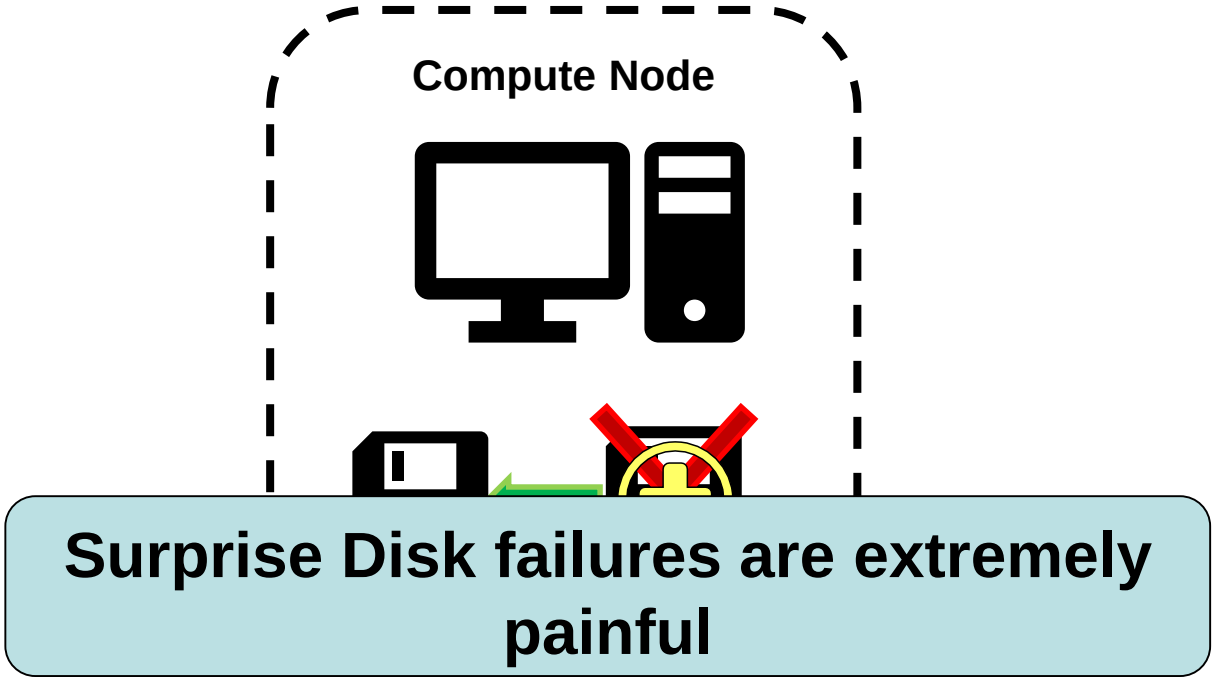


Data Replication

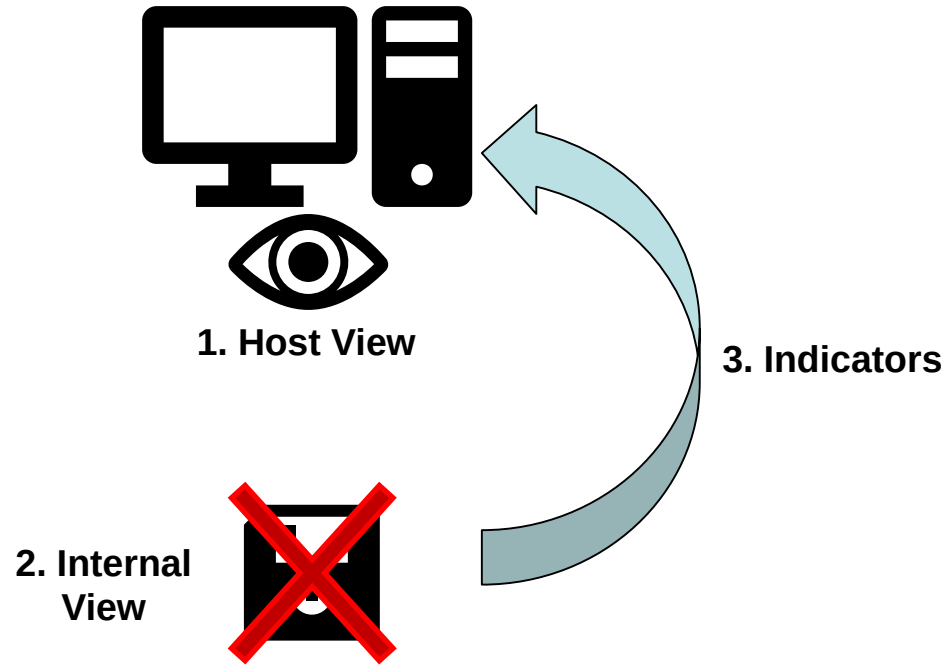


Data Protection

Failure Prediction



SSD Failures



Why SSDs Fail: Host View

1. SSD returned uncorrectable status

2. SSD in FW protected mode

3. SSD not responding to IO

Why SSDs Fail: Internal View

- Media Wear out
- DRAM Uncorrectables
- Capacitor Failures
- Firmware Logic Bugs

Failure Indicators

- **Symptoms:**
  - Data errors (uncorr and CRC)
  - Sector reallocations
  - Program/Erase failures
  - SATA Downshift
- **DC Decisions**
  - High write volume
  - High write amplification

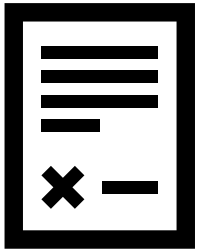
Able to identify 71% of failures using these indicators w/ 13% false positive

Emerging Failure Indicators

- DRAM single bit flips
- Capacitor degradation

Expanding Telemetry Data to Cover All Dominant Failure Signatures

Call to Action



SMART data is only scratching the surface of useful information

Collections view enables superior insight into failure trends

Microsoft is collaborating with vendors to provide more telemetry data to enable more accurate failure predictions