Recent Developments in The Linux I/O Stack

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Linux I/O Development Activity

- Block
- IDE
- SATA
- NVMe
- SCSI
- Target
- PMem

Year:
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
IDE & SATA

[Graph showing IDE and SATA trends from 2013 to 2018]
IDE & SATA

- Legacy IDE subsystem
  - Quirky controllers on quirky platforms
  - Recent activity mostly kernel housekeeping

- Libata for modern ATA devices
  - New controller support, mostly embedded systems
  - Otherwise mostly controller or SSD quirks
  - Plumbing for ZAC
SCSI Initiator & Target
SCSI Initiator & Target

- SCSI Initiator
  - blk-mq enablement
  - ZBC enhancements
  - UFS
  - NCR5380!
  - Storage array quirks
  - FC-NVMe
SCSI Initiator & Target

- SCSI Target
  - tcmu
  - Bug fixes
Block Layer

- Year: 2013 to 2018
- Units: 0 to 700
- Line: Block
Block Layer

- Zoned device enhancements and multiqueue support
- Kyber
- BFQ
- Planned obsolescence for legacy I/O path
NVM Express
NVM Express + Block Layer

Block and NVMe trends from 2013 to 2018.
NVM Express + Block Layer + SCSI
NVM Express

- FC-NVMe
- Multipathing, ANA
- Trace points
- PCIe SGL support
- Support for files as backing store for target
- Controller quirks
Persistent Memory

![Graph showing the growth of Persistent Memory (PMem) from 2013 to 2018. The graph indicates a steady increase from 2013 to 2016, reaching a peak in 2017, and then a decline towards 2018.]
Persistent Memory

- NV-DIMM vs. ACPI
- MAP_SYNC
- Poison handling
Development Activity Trends

- SATA
- NVMe
- SCSI
- PMem
What’s in the pipeline?

- NVMe multipathing refinement
- NVMe over TCP/IP
- Peer-2-peer DMA
- Zoned devices not just for disks anymore
- Multi-actuator disk drives