



**SDC** 18

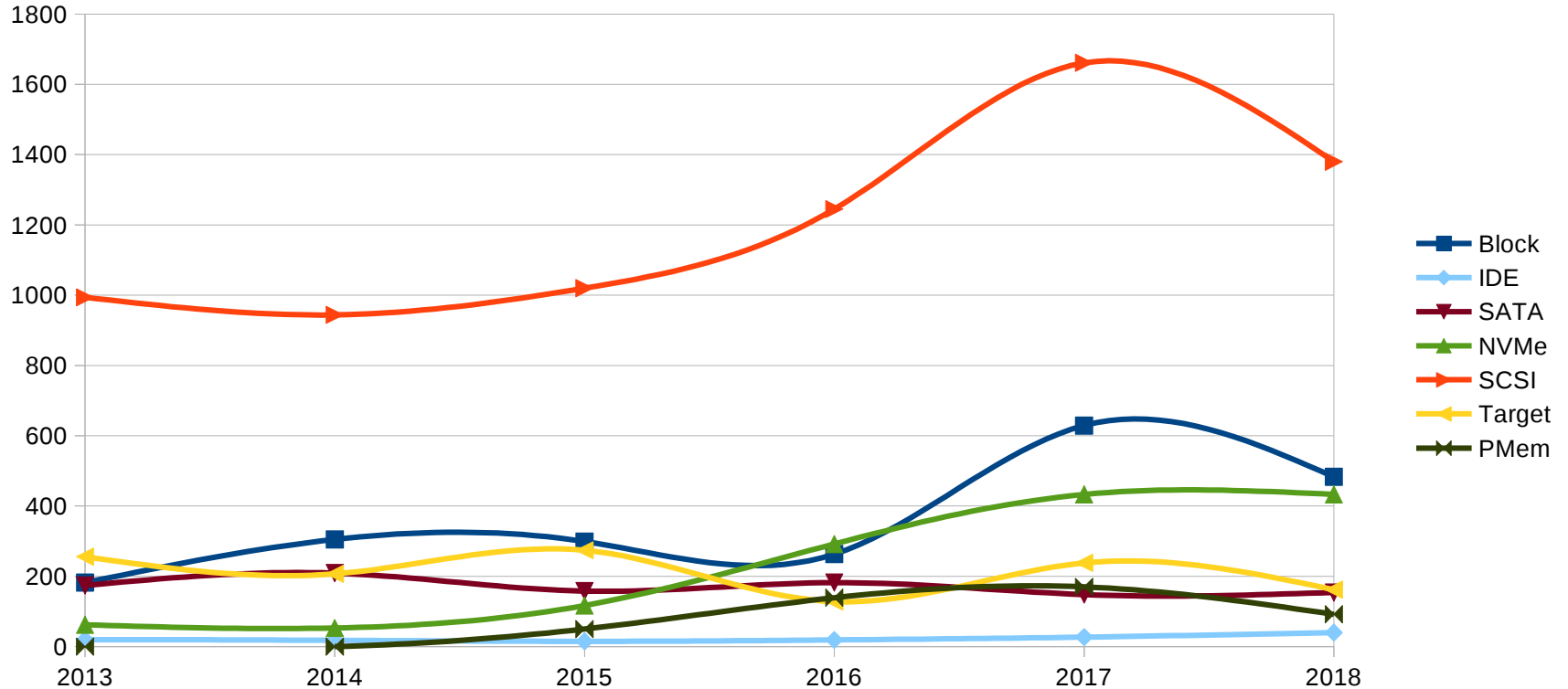
September 24-27, 2018  
Santa Clara, CA

[www.storagedeveloper.org](http://www.storagedeveloper.org)

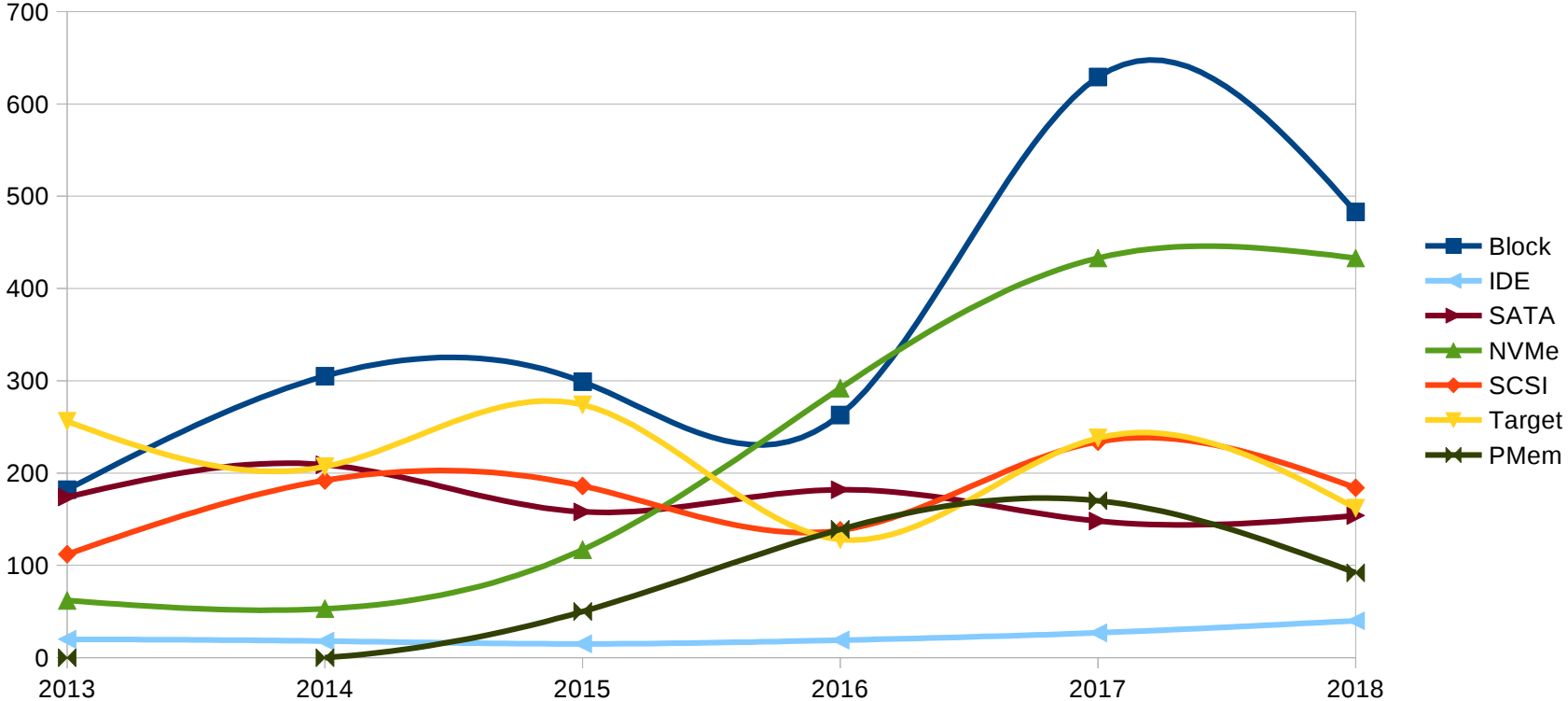
# Recent Developments in The Linux I/O Stack

Martin K. Petersen  
**Oracle**

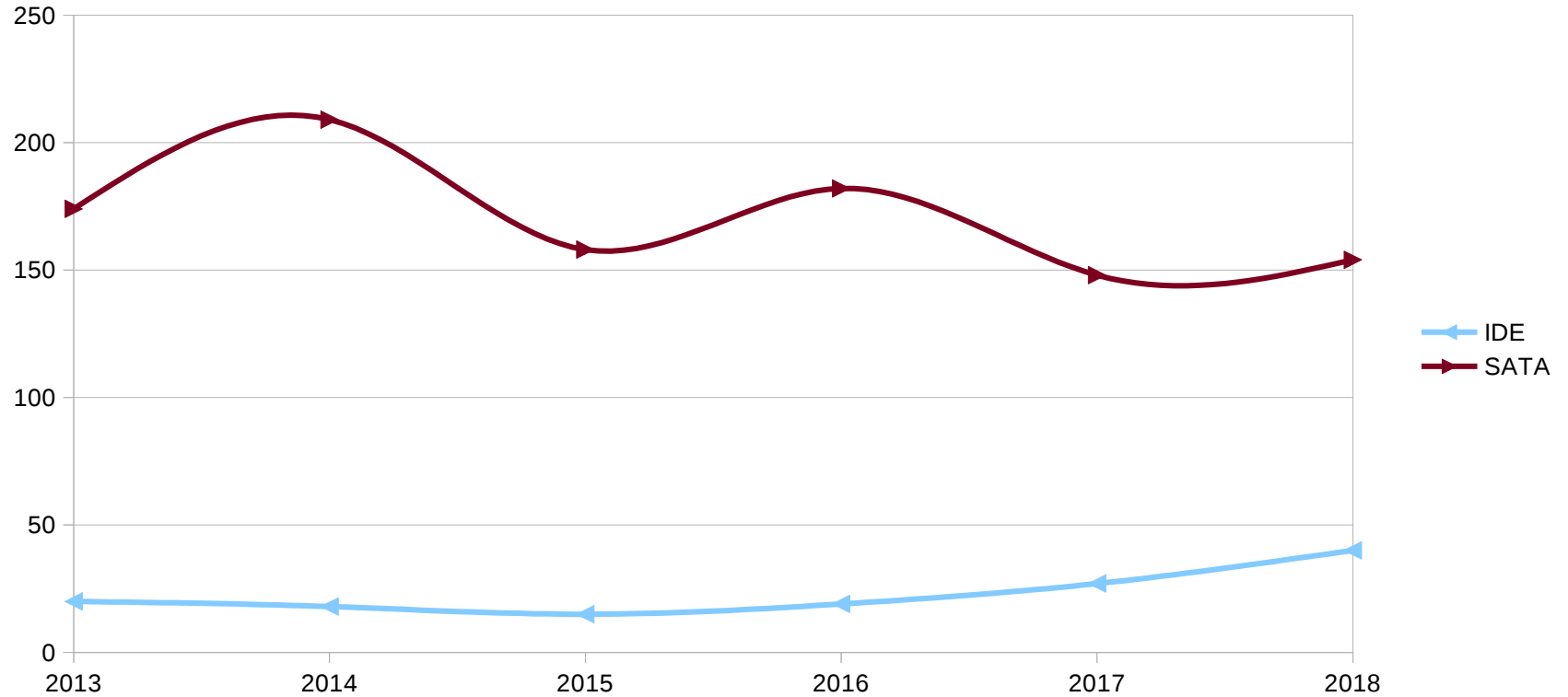
# Linux I/O Development Activity



# Subway Map Development Activity



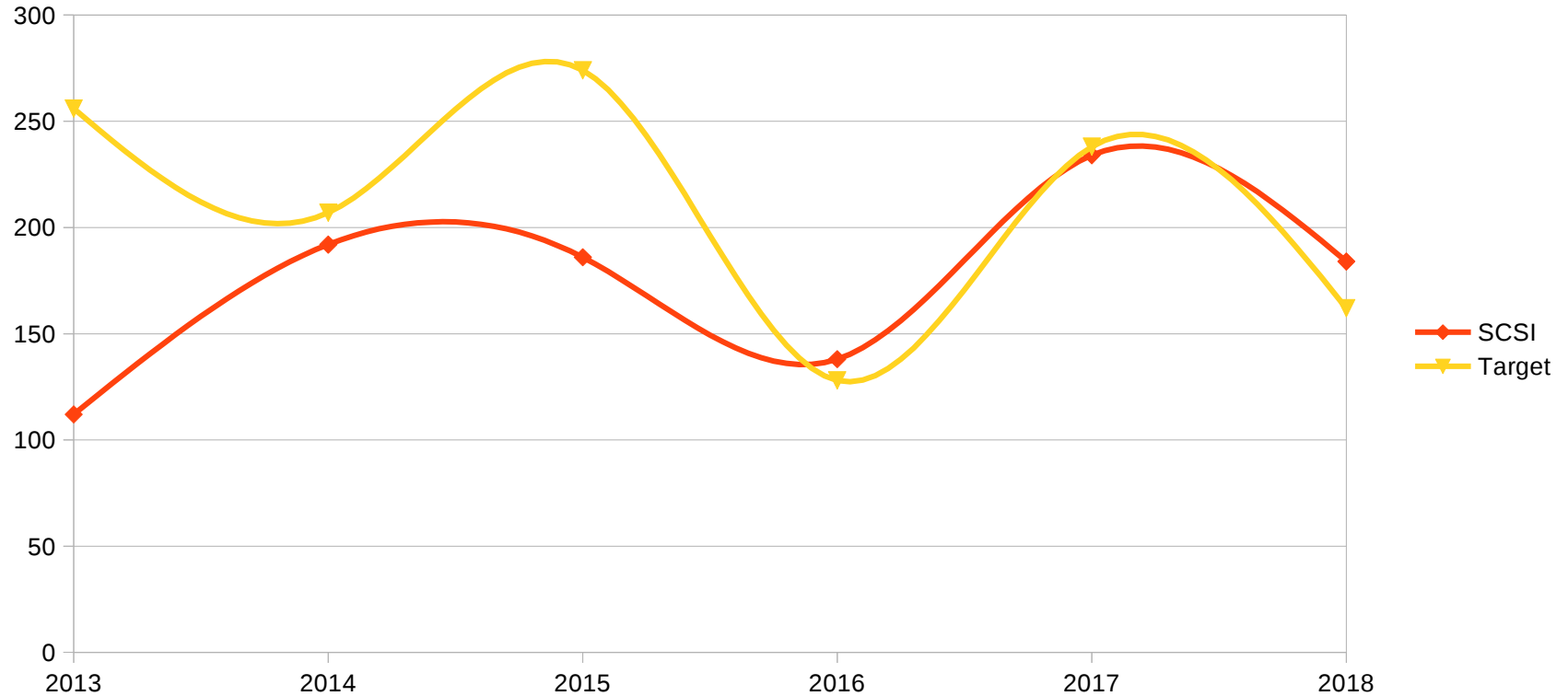
# IDE & SATA



# 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

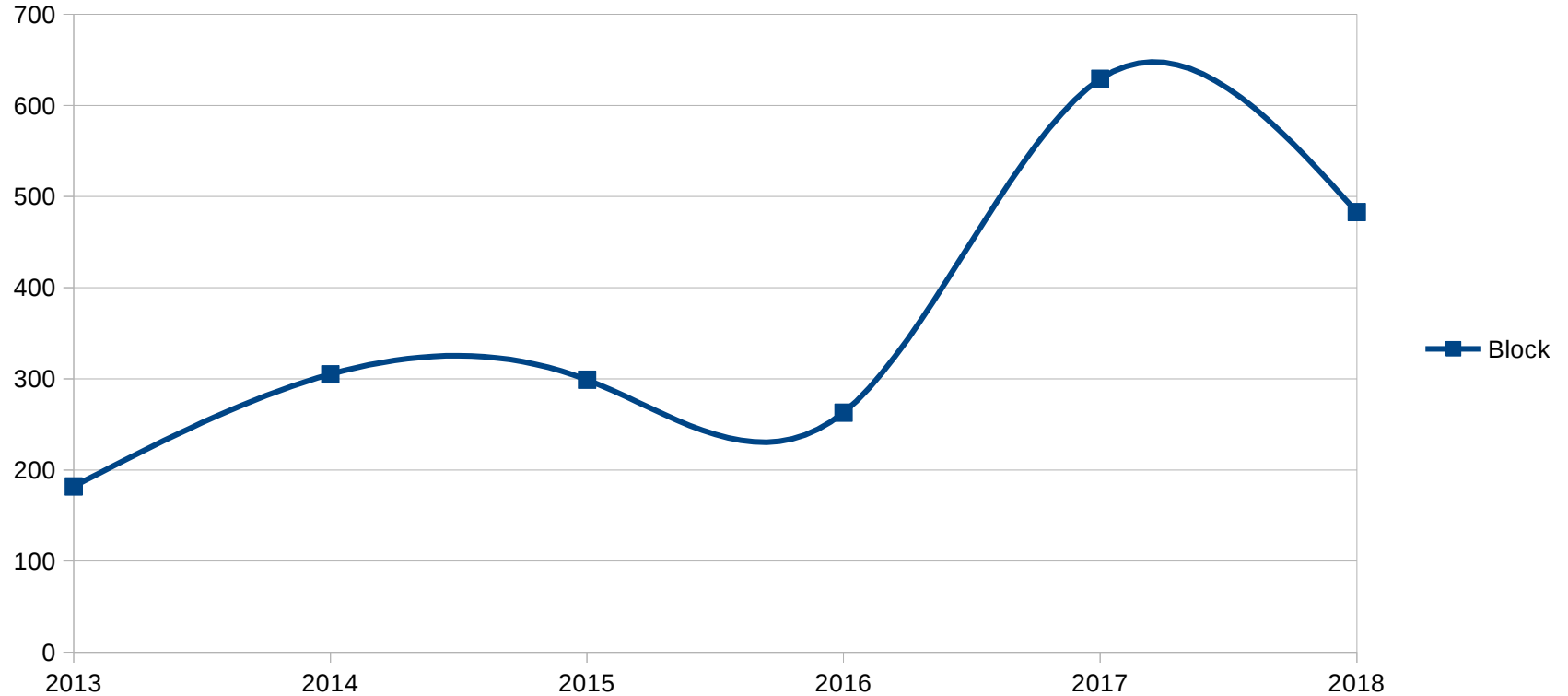
- ❑ SCSI Initiator
  - blk-mq enablement
  - ZBC enhancements
  - UFS
  - NCR5380!
  - Storage array quirks
  - FC-NVMe

# SCSI Initiator & Target

- SCSI Target
  - tcmu
  - Bug fixes



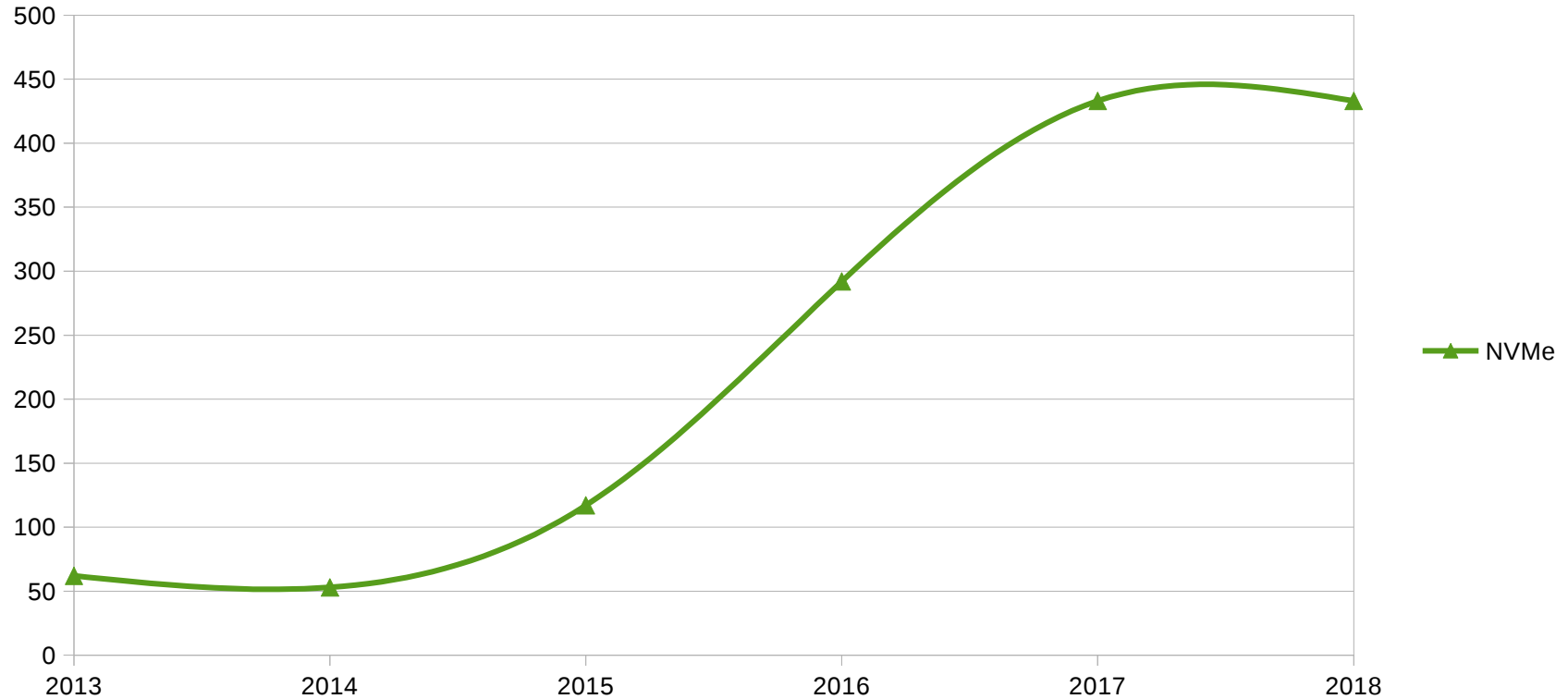
# Block Layer



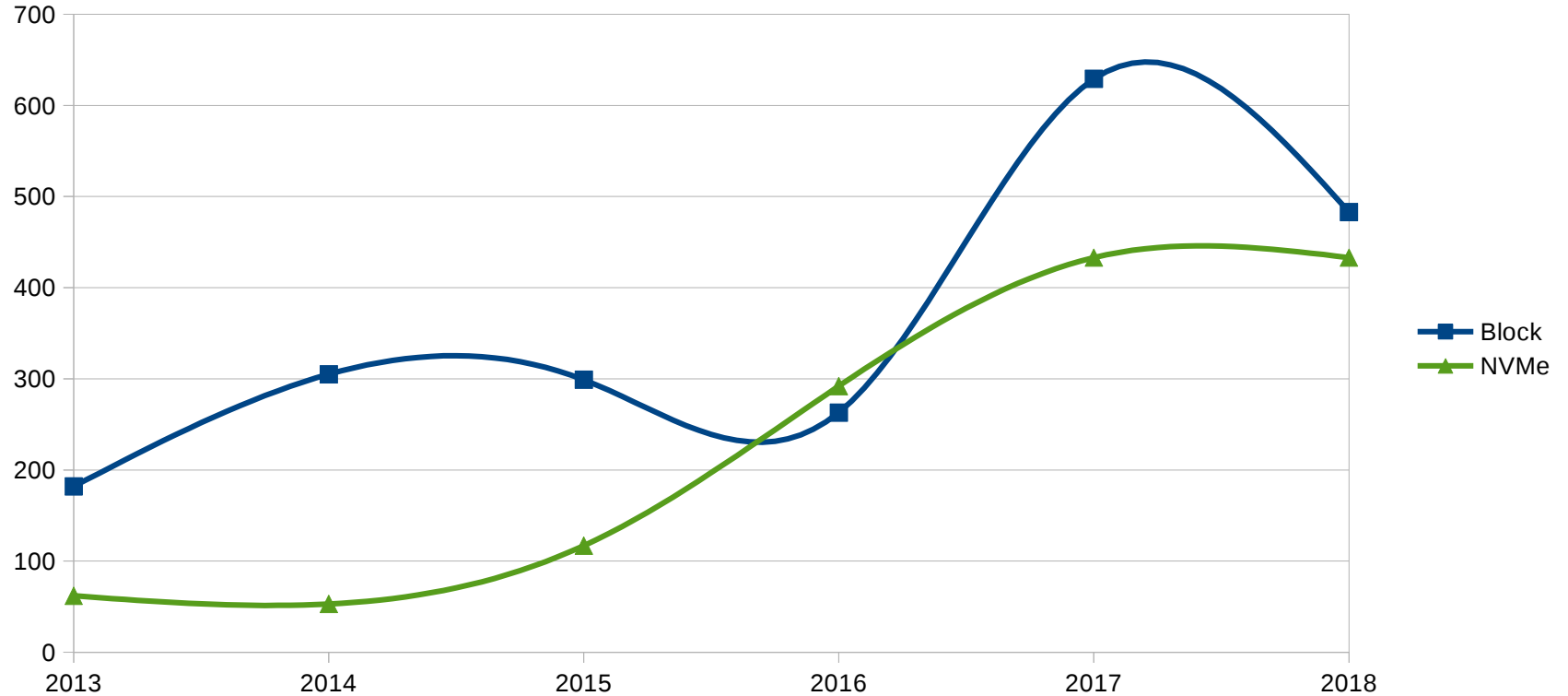
# Block Layer

- ❑ Zoned device enhancements and multiqueue support
- ❑ Kyber
- ❑ BFQ
- ❑ Planned obsolescence for legacy I/O path

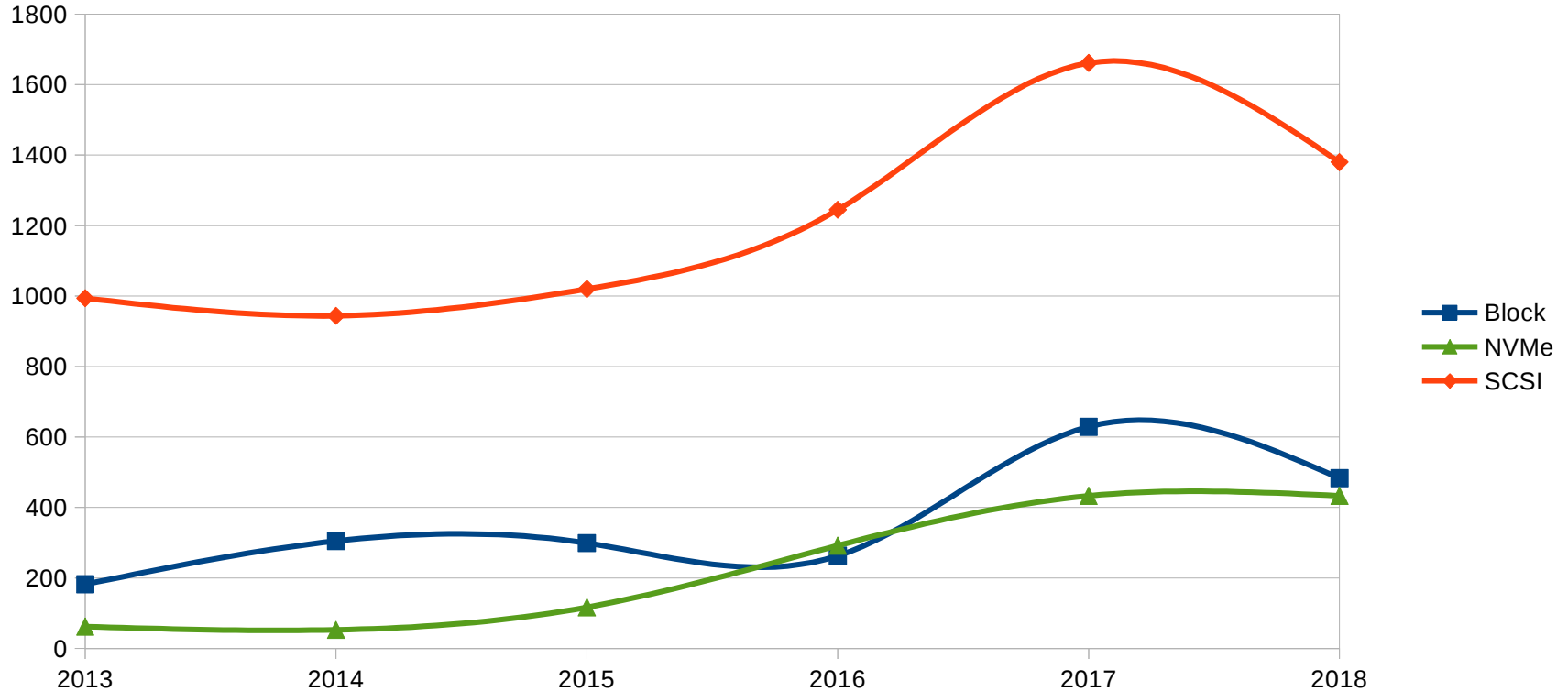
# NVM Express



# NVM Express + Block Layer



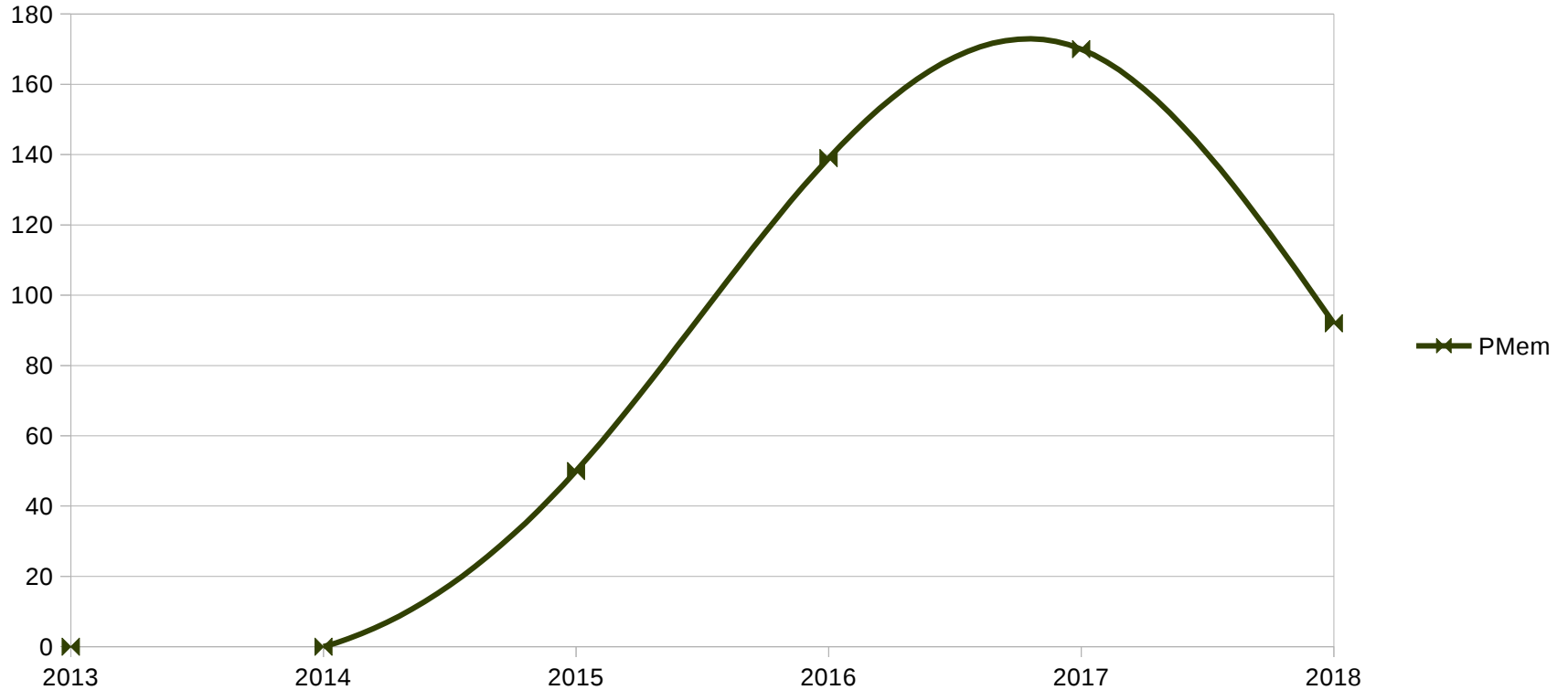
# NVM Express + Block Layer + SCSI



# NVM Express

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

# Persistent Memory

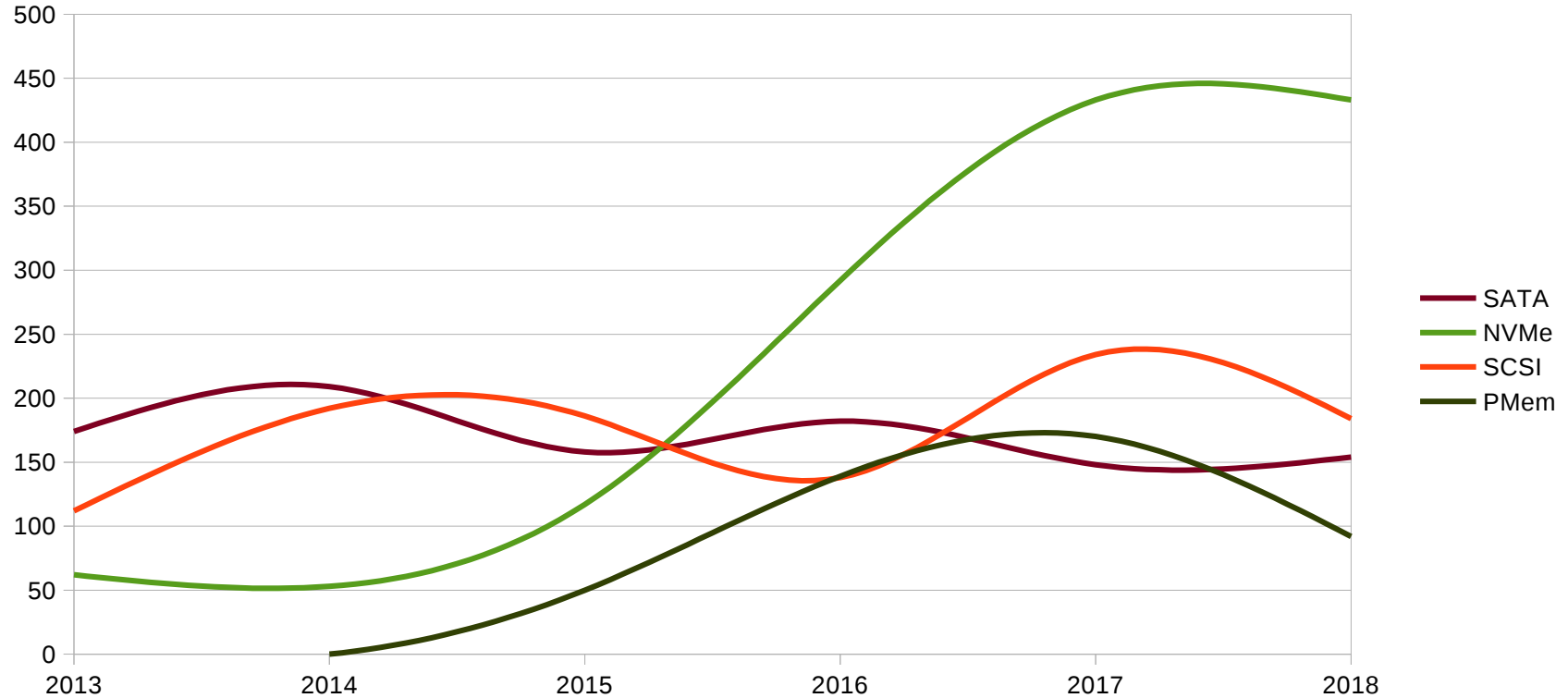


# Persistent Memory

- ❑ NV-DIMM vs. ACPI
- ❑ MAP\_SYNC
- ❑ Poison handling



# Development Activity Trends



# 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