Storage Industry Update

Ross Stenfort, Meta

Form Factors Today:

E1.S Capacity Scaling:

Assume: 8 Placements & 32 Die stacks
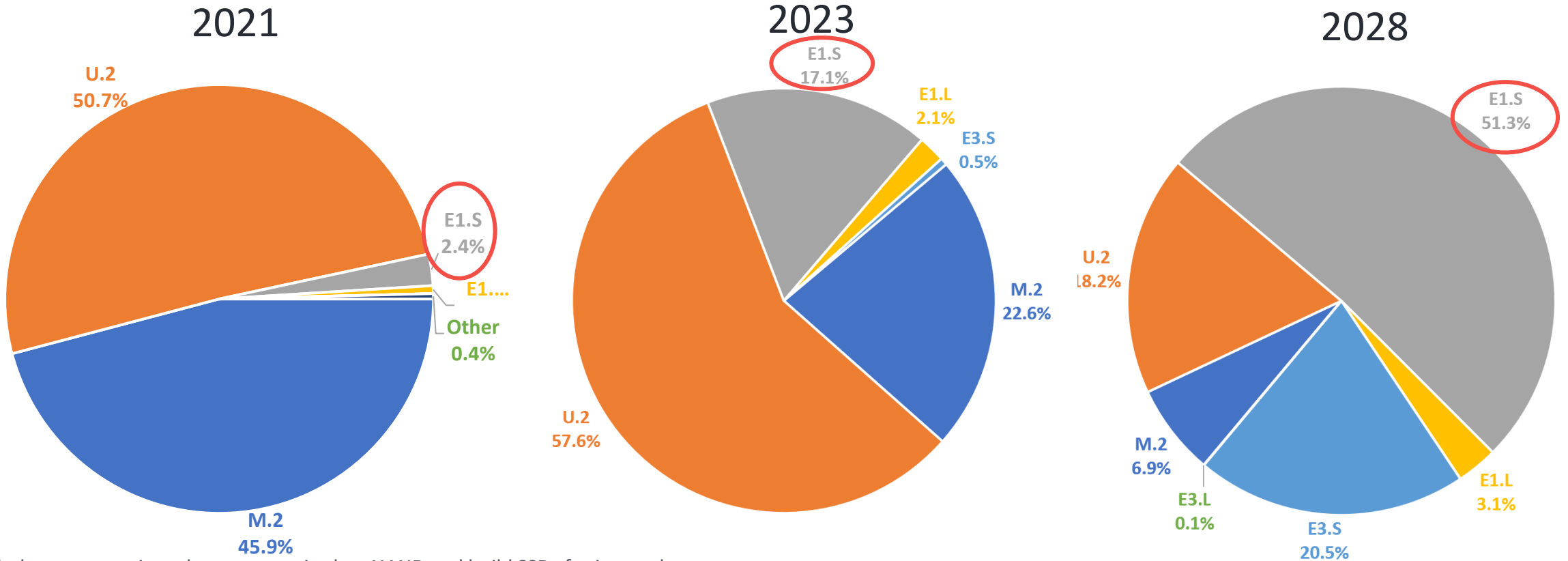
- TLC (1 Tb Die): 32 TB
- QLC (2 Tb Die): 64 TB
- QLC (4 Tb Die): 128TB

Key Take Aways:

- **E1.S Market Growth**
  - 2021: 2%
  - 2023: 17%
  - 2028: 51%
- **Capacity**
  - E1.S scales to 128 TB
- **E1.S Gowth due to:**
  - Density, Power, Performance capabilities

Industry Adoption Trend (Units*)

2021

- U.2 50.7%
- E1.S 2.4%
- E1....
- Other 0.4%
- M.2 45.9%

2023

- E1.S 17.1%
- E1.L 2.1%
- E3.S 0.5%
- M.2 22.6%
- U.2 57.6%

2028

- E1.S 51.3%
- U.2 18.2%
- M.2 6.9%
- E3.L 0.1%
- E3.S 20.5%
- E1.L 3.1%

TRENDFOCUS

*Data excludes consumption where companies buy NAND and build SSDs for internal use.

Flexible Data Placement (FDP) Update

❖ *Benefits*
  ▪ Improves Endurance, Performance, Quality of Service through data placement
❖ *Key Adoption Drivers:*
  ▪ Low development effort with high benefits
  ▪ Backwards compatibility
    • Applications are not required to understand FDP to get benefits
    • Applications which understand FDP have increased benefits
  ▪ Open-Source Support
❖ *Open-Source Support:*
  ▪ **Linux Kernel**:
    • Full support through I/O Passthru (Complete)
    • Lifetime Hints (In progress)
  ▪ **xNVMe**:   Full Support (Complete)
  ▪ **QEMU**:   FDP Emulation (Complete)
  ▪ **Fio**:   Full Support (Complete)
  ▪ **nvme-cli**: Full Support (Complete)
  ▪ **Cachelib**: Full Support (Complete)

OCP Datacenter NVMe SSD Specification

OPEN Compute Project

Datacenter NVMe® SSD Specification

Version 2.5 (10302023)

Author: Ross Stenfort, Meta
Author: Lee Prewitt, Microsoft
Author: Paul Kaler, HPE
Author: David Black, Austin Bolen, Dell Technologies
Author: Chris Sabol, Charles Kunzman, Google

❖ **Latest Released Specification**
  - **OCP Datacenter NVMe SSD Specification V2.5**
  - **Key Updates:**
    - Debuggability – Human Readable Telemetry with open-source tooling (OCP NVMe CLI)
    - Security
    - Flexible Data Placement (FDP)
    - Issues found in deploments, clarifications, bug fixes

❖ **Next Version 2.6**
  - In Progress – Targeting 2024 Release
  - **Key Updates**
    - Additional Telemetry Improvements
    - Additional Health Statistics
    - Open-Source Tooling Support Required
      - OCP NVMe CLI
    - Clarifications, bug fixes

Key Features for Managing at Scale

❖ **OCP Health Information Log**

❖ **OCP Latency Monitoring Feature**

❖ **OCP Formatted Telemetry for Human Readable Logs**

❖ **Open-Source OCP NVMe CLI**

Improved Debug Method Results:
- Faster Debug & Qualification Cycles
- Effective Debug at Scale

Improvements Based On Deployment @Scale

OCP Storage Project Update

2023	NVMe HDD rev. 1.0	[spec]	Microsoft, Seagate, Western Digital
	Datacenter SAS-SATA Device rev. 1.0	[spec]	HPE, Meta, Microsoft
	Datacenter NVMe SSD rev. 2.5	[spec]	Dell, Google, HPE, Meta, Microsoft
	NVMe Telemetry Scripts	[scripts]	Samsung
	2nd OCP Storage Teck Talk	[virtual]	May 16th
2024	Datacenter SAS-SATA Device rev. 1.5	Coming	HPE, Dell, Meta, Microsoft
	Datacenter NVMe SSD rev. 2.6	Coming	Dell, Google, HPE, Meta, Microsoft
	EDSFF SSD Reference Design	Coming	ScaleFlux
	OCP Marketplace	Growing Fast	8 SSDs (including OCP V2.5 support) and Multiple OCP SSD Testing Services
	Meta Open-Source SSD Qualification Tests	Complete	OCP Test Framework OCP Storage Test Cases
	3rd OCP Storage Teck Talk	[virtual]	May 15th

❖ OCP Storage Project Link
❖ Meetings are 2nd Thursday of the month
  ▪ If you have ideas to present in monthly storage project meetings reach out

Thank You