

BMKT-101B-1 Annual Update on Flash Arrays

2019 Key Technology Trends and Marketplace Drivers

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Flash Memory Summit



What Businesses Want From Their Technology Investments

Create more revenue

Reduce expenses

... with an “Easy” button



Advances in Front-end Connectivity

Speed

- FC
- Ethernet
- InfiniBand



Advances in Front-end Connectivity

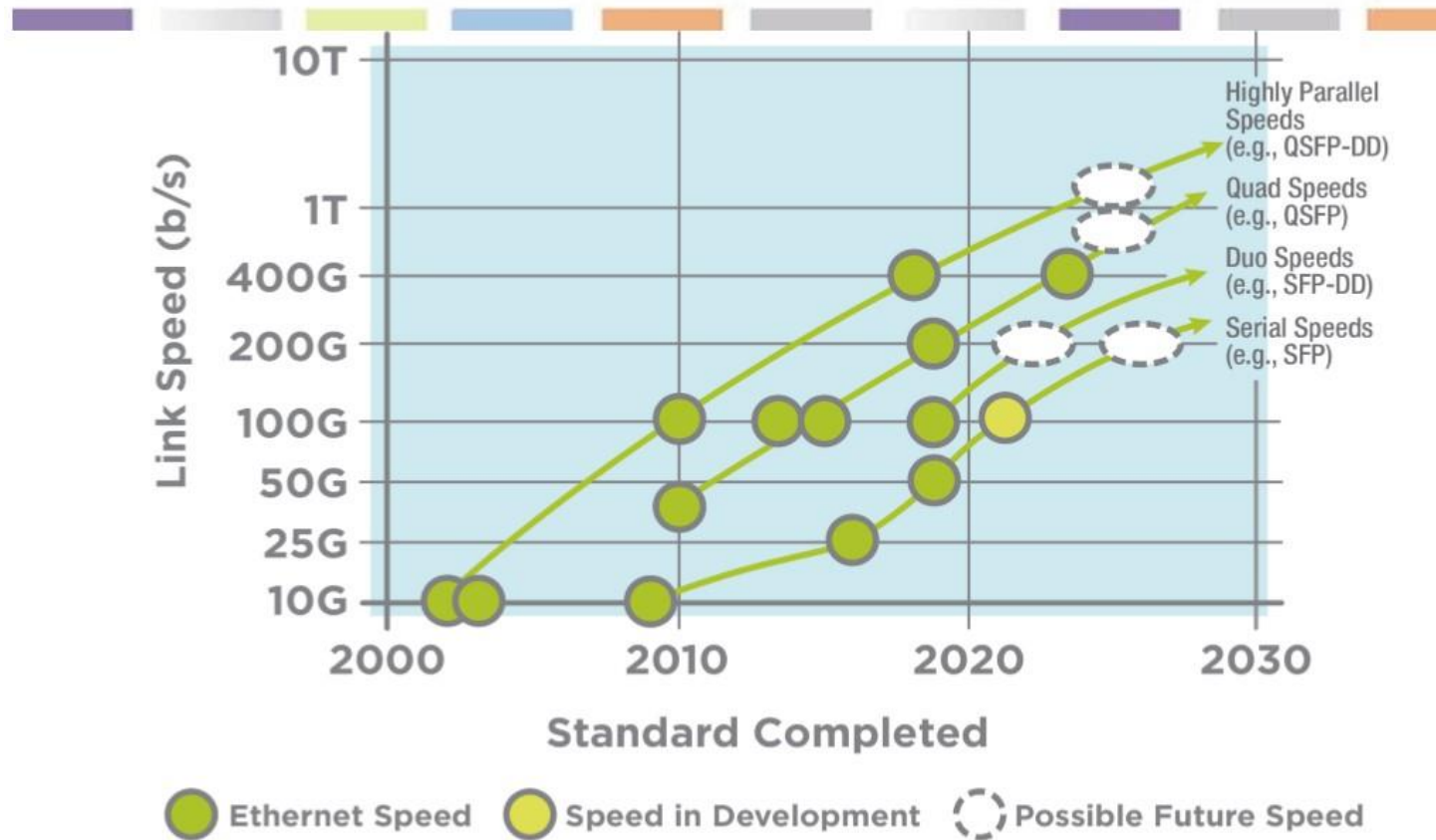
Speed

| Connectivity | AFA Models |
|-------------------|------------|
| 32 Gb FC | 37 |
| 100 Gb Ethernet | 17 |
| 100 Gb InfiniBand | 10 |



Near-term Future Developments

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Advances in Front-end Connectivity

NVMe-oF over Multiple Transports

- NVMe-oF (RoCE, iWARP)
- FC/NVMe
- NVMe/TCP
- PCIe



Advances in Back-end Connectivity

- 12 Gb SAS
- NVMe
- PCIe AIC
- NVDIMM



Storage Class Memory Integration

SCM Form Factors

- NVDIMM
- SSD



Storage Class Memory Integration

SCM Uses in Arrays

- Caching
- Tiering



Storage Class Memory Integration

SCM Technology

- Optane
- MRAM
- Low-latency NAND
- Other SCM variants



Data Center Integration

- Applications
- Automation & Orchestration
- Containers – persistent storage
- Data protection
- Management



Data Center Integration

Data Protection

- ISVs
- Backup appliances
- Cloud



Delivery Models

- Appliance
- Cloud-based
- Cloud-hosted
- Software-defined Storage
 - Reference architecture
 - Solution sale through distributor or VAR



Cloud Connectivity

- Snapshots
- Replication
- Multi-cloud



Storage-as-a-Service (OpEx)

- Basis
- Duration
- End-of-term options



Storage-as-a-Service (OpEx)

Lenovo TruScale



NO REQUIRED MINIMUM CAPACITY COMMITMENT

Scale from 0%-100% based on customer needs



DEDICATED CUSTOMER SUCCESS MANAGER

Consistent service on any commercial, technical or operational issues



PROPRIETARY METERING SOLUTION BASED ON POWER CONSUMPTION

Customer's data plane remains untouched, giving the advantages of cloud-like economics with the security of on-premise hardware



REAL TIME DASHBOARD PROVIDING ACTUAL USAGE, BILLING, ETICKETING SERVICES

Control and predict costs



ENTIRE THINKSYSTEM AND THINKAGILE PORTFOLIOS AVAILABLE AS HAAS DEPLOYMENTS

Flexibility and scalable options



Predictive Analytics

- Array vs global installed base
- Array health
- Avoiding downtime
 - Configuration issues
 - Issue identification and remediation



Predictive Analytics

- Forecasting capacity requirements
- Modeling impact of adding applications
- Recommendations



Proactive Support

- Based on alerts
- Based on predictive analytics
- Notify
- Intervene



Licensing

- All-inclusive
- Bundles + a-la-carte
- Perpetual



Guarantee Programs

- Availability
- Data efficiency
- Durability



Near-term Future Developments

Standards Evolution

- DDR5
- NVDIMM-P
- NVMe
- NVMe-oF



Near-term Future Developments

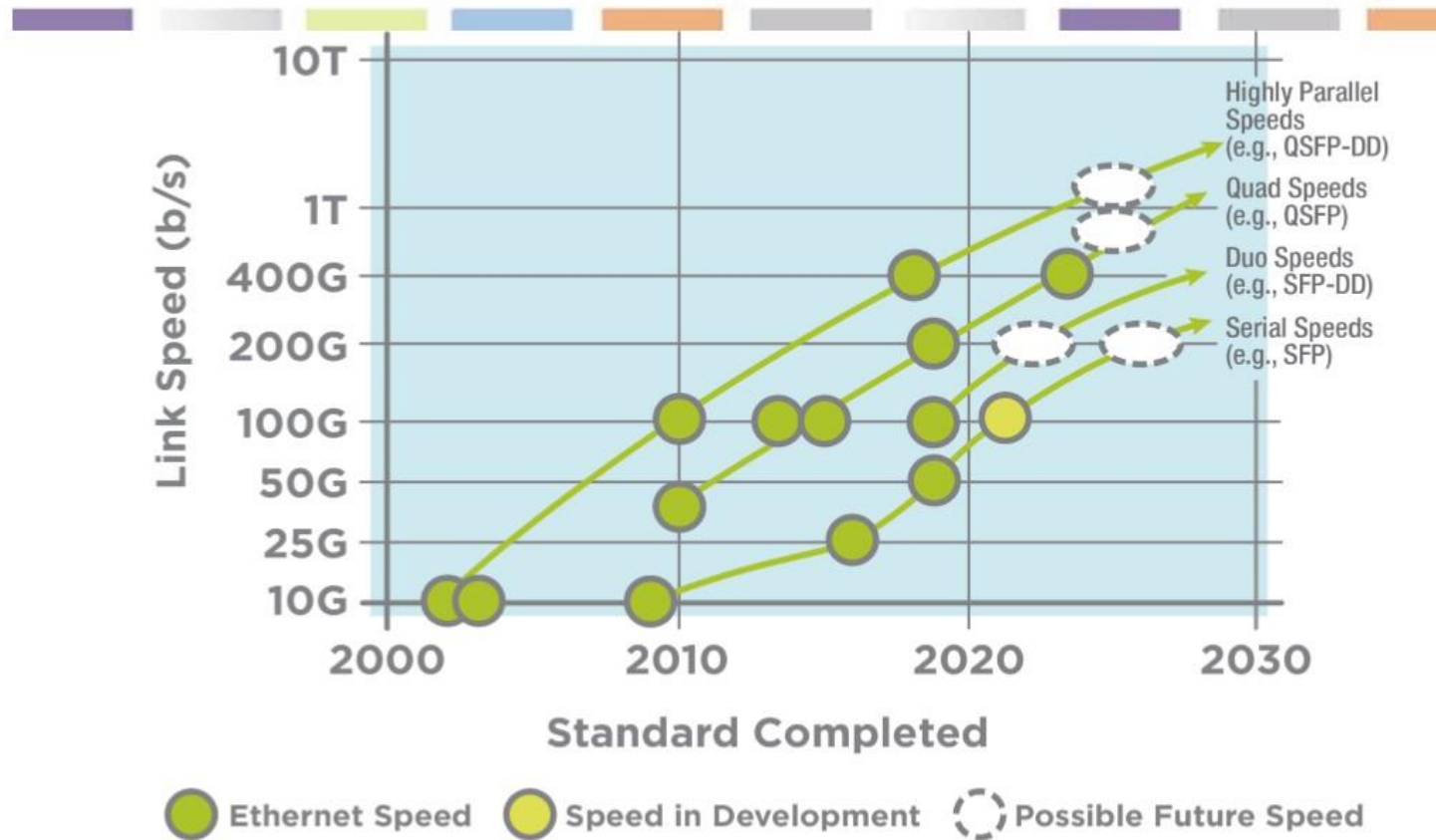
Technical Innovations

- Accelerators on the NVMe-oF fabric
- Faster front-end & back-end connectivity
- Composability



Near-term Future Developments

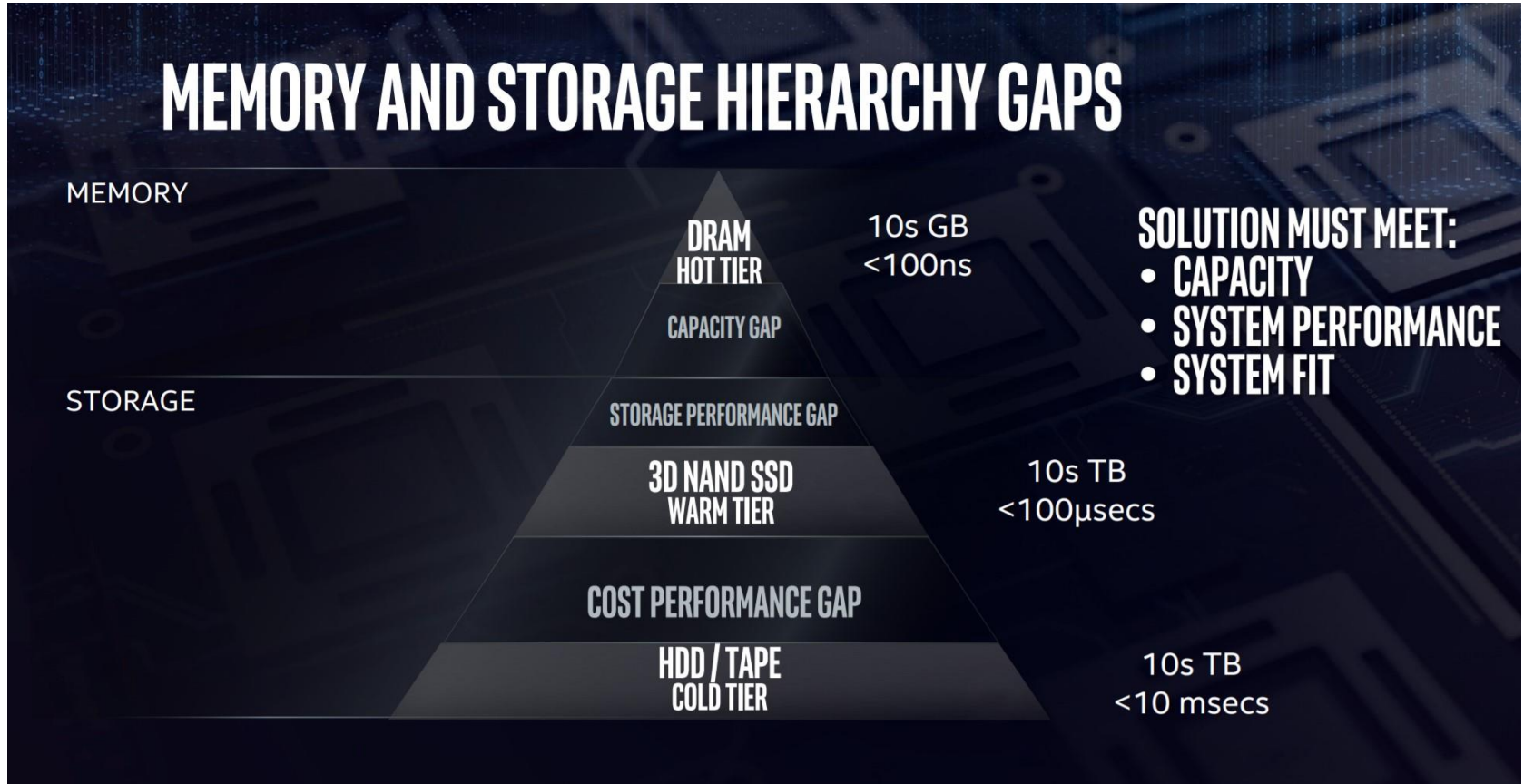
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Near-term Future Developments

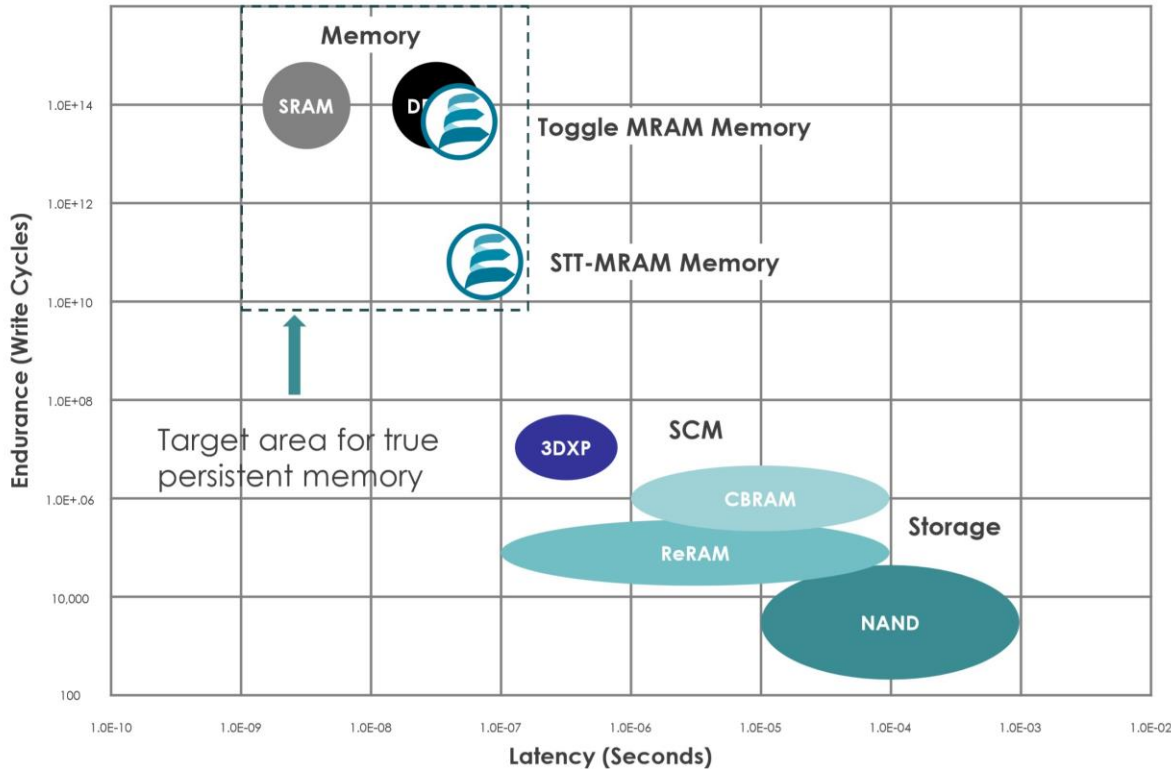


Source: Intel



Near-term Future Developments

MRAM Brings Native Persistence to Memory Workloads



MRAM COMBINES PERFORMANCE OF MEMORY WITH PERSISTENCE OF STORAGE

- Non-Volatile: Maintains memory without power
- Fast Read/Write Speeds: Similar to DRAM
- Superior Endurance: Survives memory workloads
- High Data Retention

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Source: Kevin Conley's presentation at the PM Summit



Questions?

Thank you

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