



Flash Memory Summit



BGA SSDs Lead the Way in Embedded Applications

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Agenda



- Application of BGA Storages
- Known BGA SSD Advantages
 - Compact size / Vibration-Proof / Performance
- How to utilize and save infrastructure cost by centralizing SSD storage
 - Stream operation, Namespace, SR-IOV
 - Application
- Key Takeaways



Harsh Environment Application



- **Vibration-Proof Storage is Needed**



CNC Machine



Automation Production Line

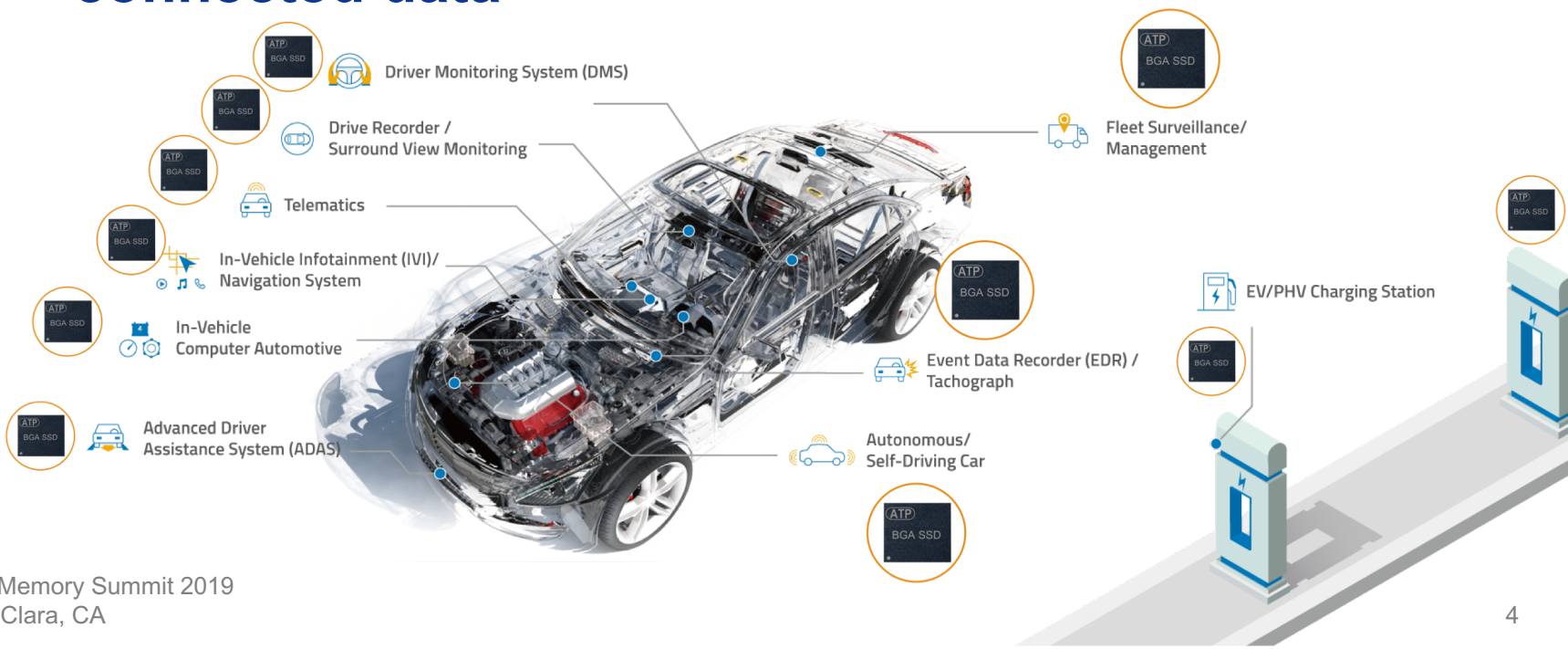


Mission Equipment Control



Current Situation of Features Car

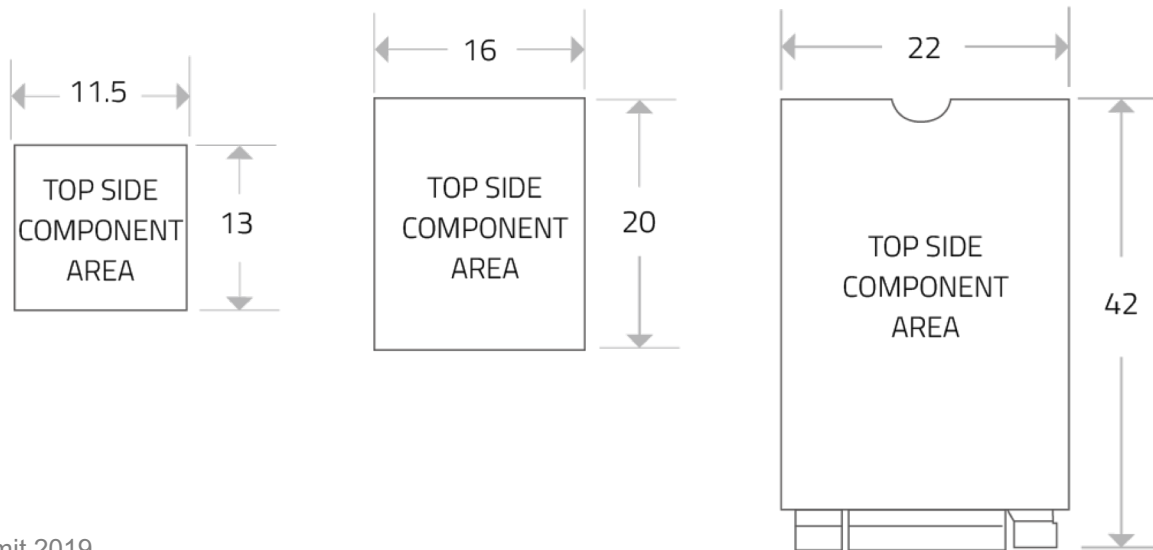
- **Storages increased by more electronics and connected data**





Known Benefits of BGA SSD

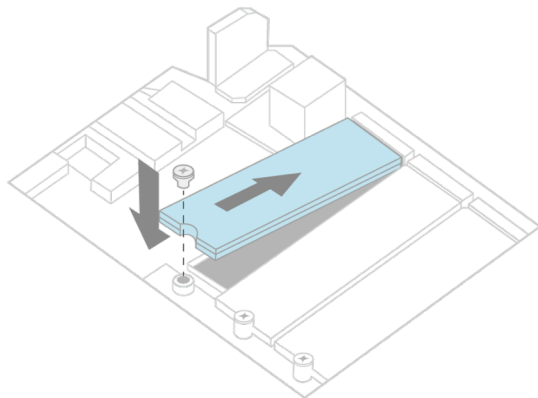
- **Compact Size with Big Capacity**
 - M.2-2242: 5X of Type 1113, 3X of Type 1620



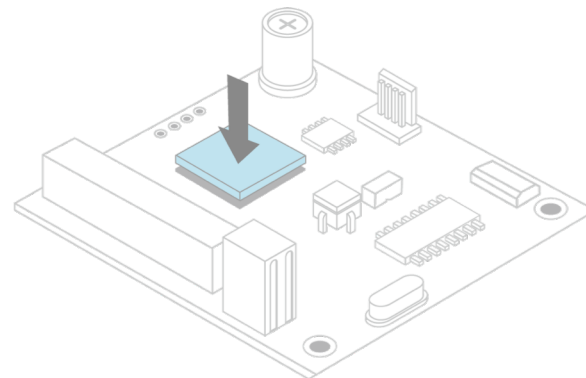


Known Benefits of BGA SSD

- **Vibration-Proof**
 - Directly solder-down to save connector and solid design



M.2 module

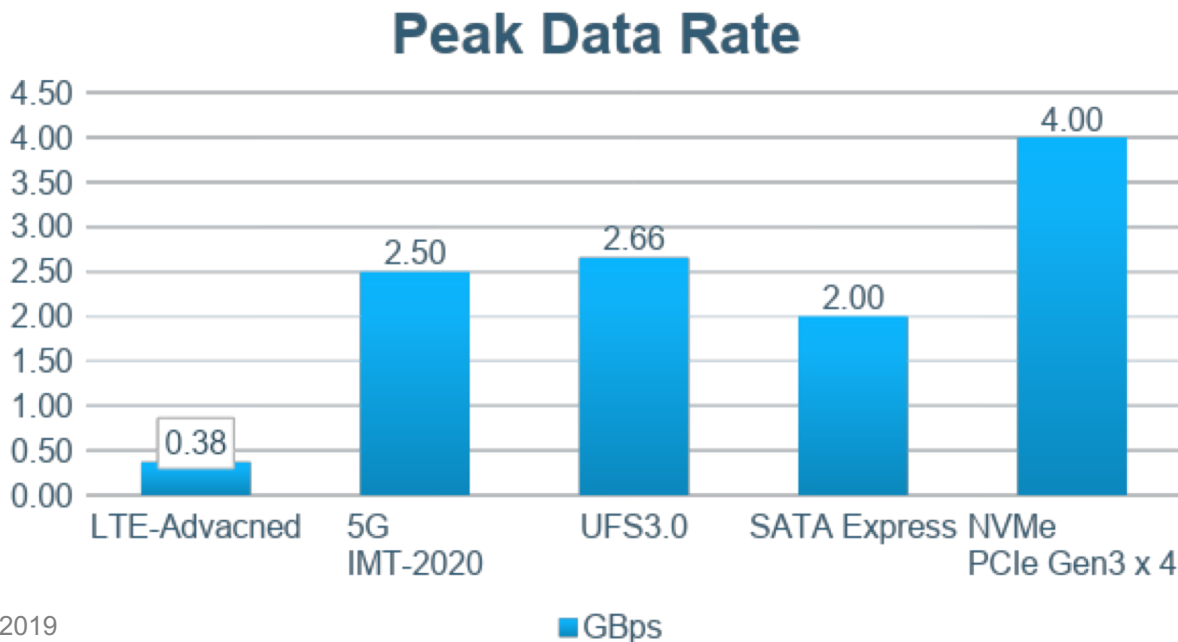


M.2 BGA SSD Solder down



5G-Connected Bandwidth

- Performance comparison (GBps)



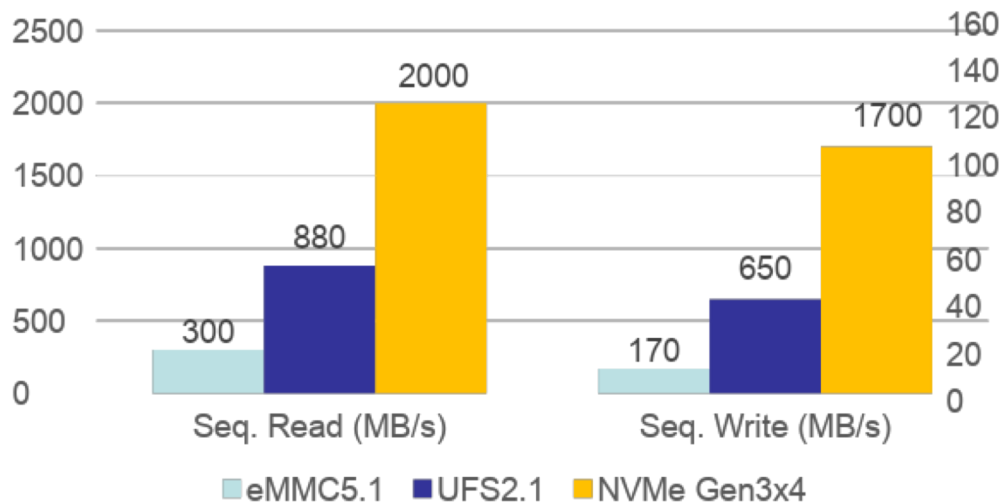


NVMe BGA Gen3x4 vs UFS2.1

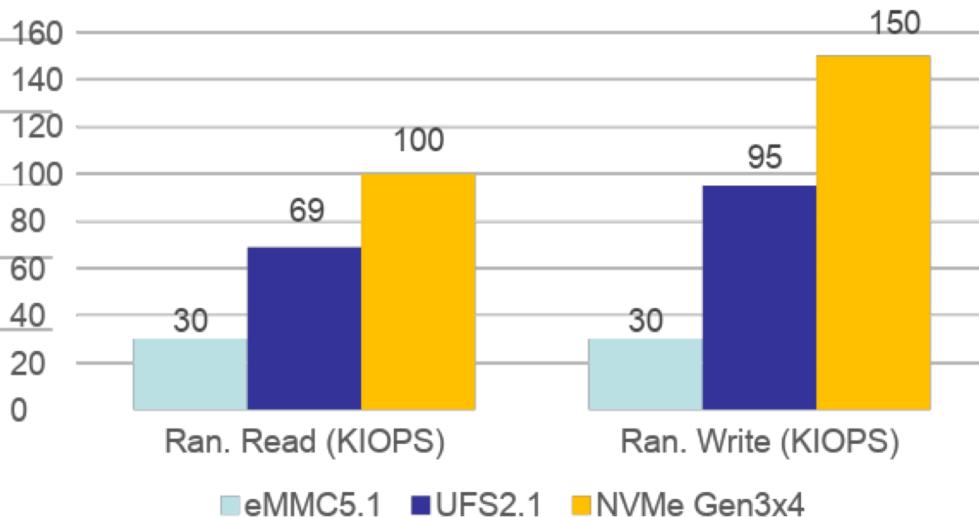


Real Test Data

Burst Performance



Random Performance



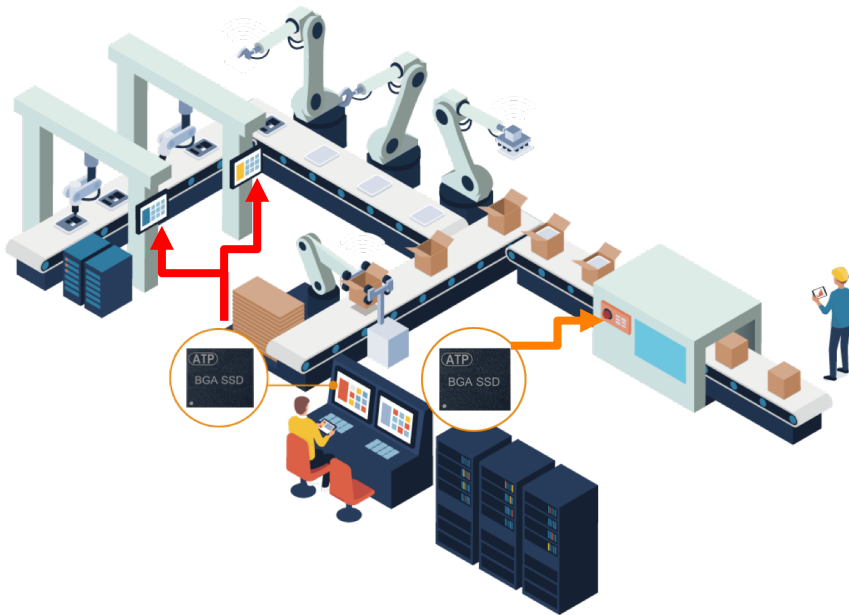
Test under below configuration, which explores max. performance

eMMC – 128GB (1-CH, 8-Die) ; UFS2.1 – 240GB (2-CH, 8-Die); NVMe Gen3x4 – 480GB (4-CH, 16-Die, Non-DRAM)



Concept on Industrial 4.0 Factory

- **Storage increased by AI-controlled Endpoints**
 - Same OS + Platform, Different Monitoring Tool / App
 - Bottleneck of Storage on Virtualization & Centralization





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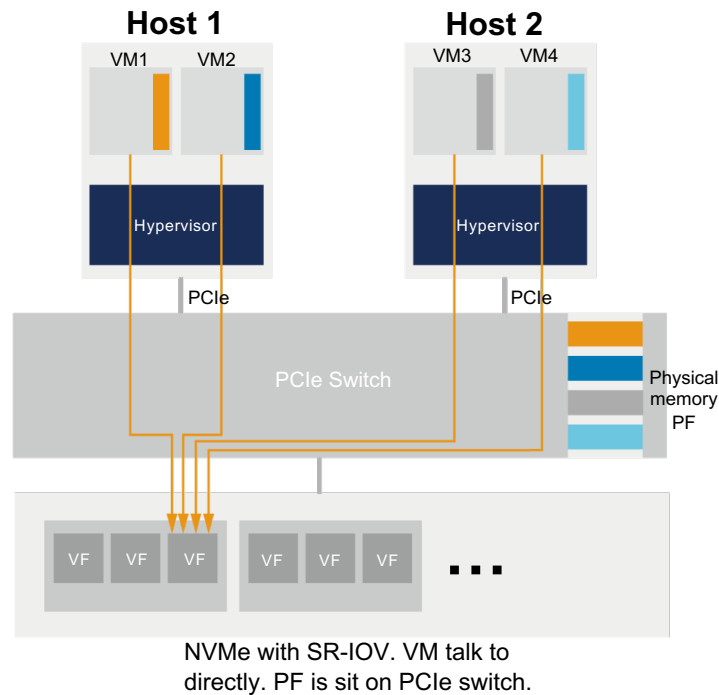
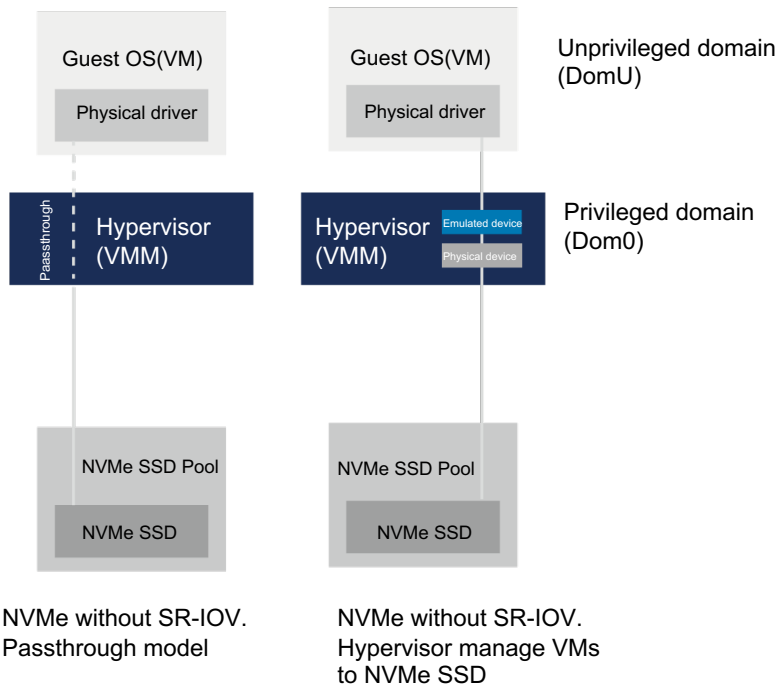
How can Storage Solution Provider Join This Evolution?



SR-IOV in PCIe-SIG, NVMe v1.3



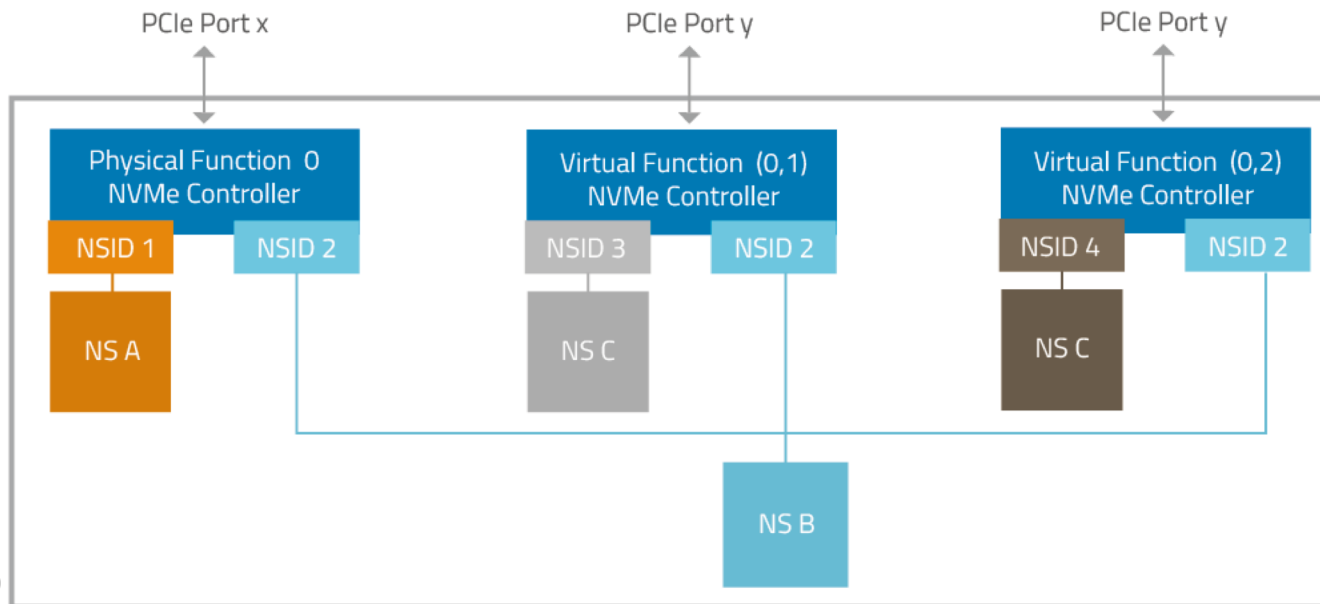
▪ Hypervisor Latency Overhead Reduced





Namespaces + SR-IOV

- One storage directly support virtual I/Os to multiple VFs



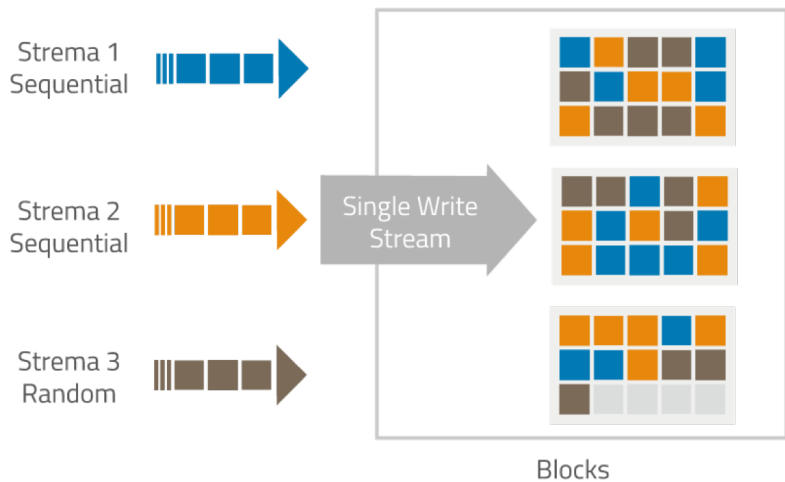


Directive and Stream Operation

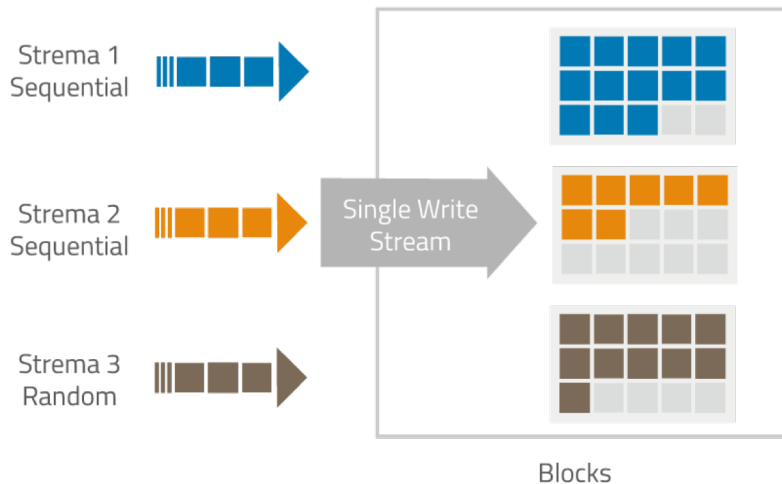


- WAI Efficiency Improved

SSD with no Stream Separation



SSD with Stream Separation

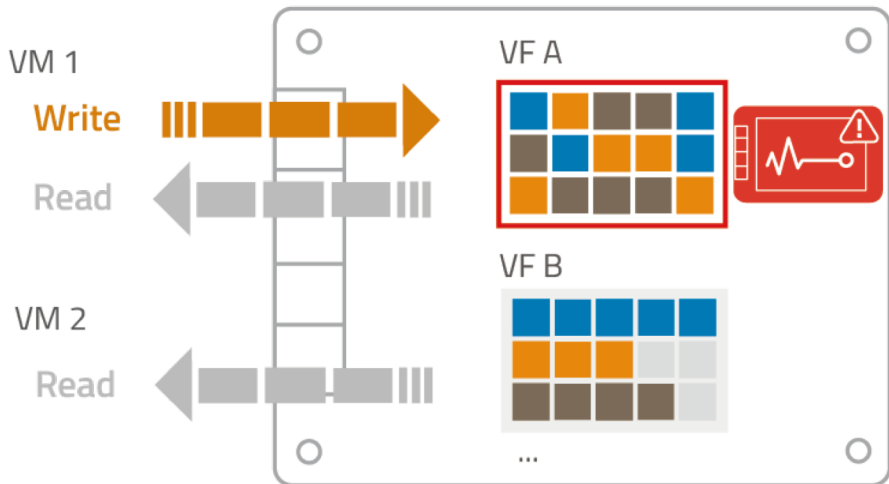
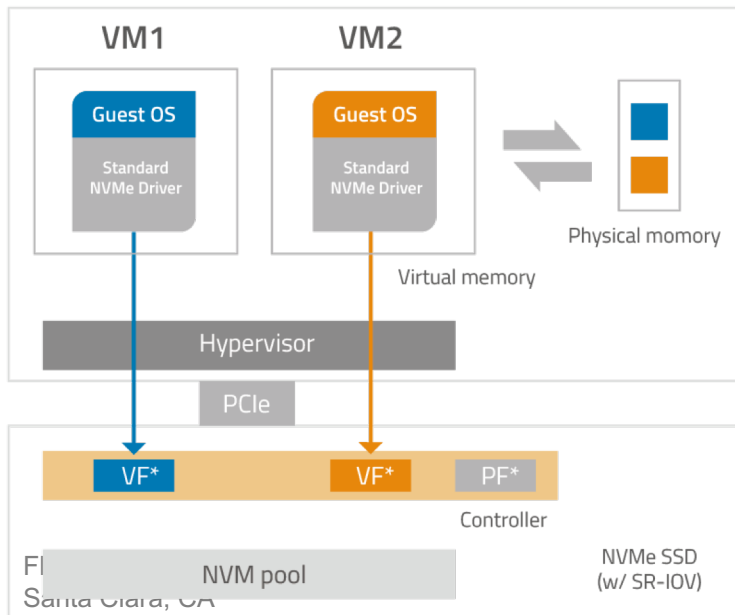




Challenge on SR-IOV with Write intensive applications



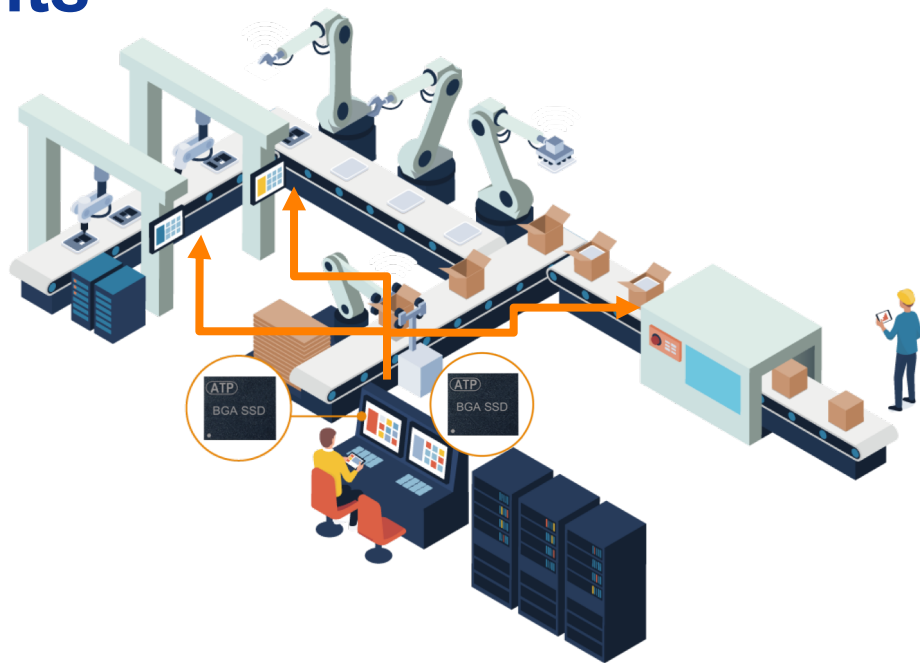
- Write Intensive App Consume TBW Faster. One EOL VF Impact All





Application on Industrial 4.0 Factory

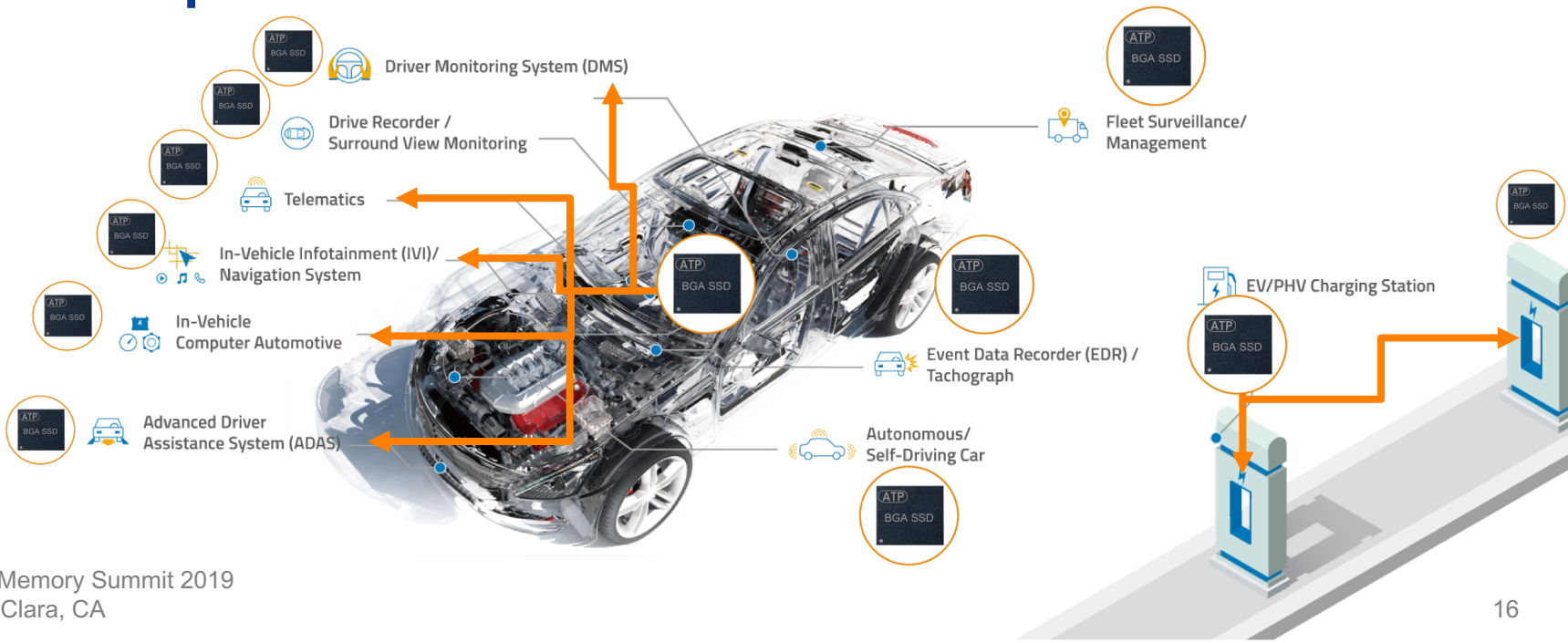
- **One Centralized Storage for Multiple Endpoints**





Application on Connected Car

One Centralized Storage Support Multiple Selected Endpoints





Key Benefits on NVMe BGA

- Compact size with Big Capacity
- Vibration-Proof
- Performance
- Write Intensive: Keep single storage
- Read Intensive: Consider centralization (SR-IOV) to reduce infrastructure cost, space saving
- Easier management in Center Control Panel



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August 6 – 8, 2019 Santa Clara Convention Center



VISIT ATP ELECTRONICS

Meeting Room 205

Reserve a meeting with the ATP Team now.



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