

## Dell EMC Powerscale for ADAS and autonomous driving development

### BENEFITS

Ingest and store all of your sensor data with scalability to 10's of petabytes capacity in a single volume

Grow quickly without sacrificing performance

Simplify management and eliminate unnecessary islands of storage with seamless, policy-based automated tiering

Rapidly re-simulate data to meet SLAs with affordable, near-line archives

Accelerate AI adoption and utilize existing data stores without the need to move or replicate data

Extend to the cloud and choose the services you need from the vendors you love

### Accelerating ADAS development with powerful storage solutions

#### Competition in the era of autonomy

The automotive industry is in a highly competitive, transitional period where success is not about winning, it's about survival. Once an industry of pure hardware and adrenaline, automotive design is increasingly dependent upon, and differentiated by software. This is especially true for Advanced Driver- Assistance System (ADAS) development, which is introducing disruptive requirements on engineering IT Infrastructure – particularly storage, where even entry- level capacities are measured in petabytes.

The Society of Automotive Engineers (SAE International®) has defined different levels of automation and most modern cars today have features that are at level 2-3. Today's SAE level 3 ADAS projects have already outstripped legacy storage solutions, and with level 4 and 5 projects around the corner, the need for storage solutions optimized for high performance, high concurrency and massive scalability has never been greater.



### SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
<b>What does the human in the driver's seat have to do?</b>	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in "the driver's seat"		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
<b>What do these features do?</b>	These are driver support features			These are automated driving features		
	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
<b>Example Features</b>	<ul style="list-style-type: none"> <li>• automatic emergency braking</li> <li>• blind spot warning</li> <li>• lane departure warning</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering OR</li> <li>• adaptive cruise control</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering AND</li> <li>• adaptive cruise control at the same time</li> </ul>	<ul style="list-style-type: none"> <li>• traffic jam chauffeur</li> </ul>	<ul style="list-style-type: none"> <li>• local driverless taxi</li> <li>• pedals/steering wheel may or may not be installed</li> </ul>	<ul style="list-style-type: none"> <li>• same as level 4, but feature can drive everywhere in all conditions</li> </ul>

## Key benefits for ADAS

### Scalability

*Up to 10s of PB per volume*

- Single namespace
- Best ROI with up to 85% disk efficiency

### Performance at Scale

*Performance increases with capacity*

- Designed for concurrency
- Ready for Machine-learning
- Multiple price-performance tiers

### Automated Tiering

*Restart archived simulation environment in minutes*

- Seamless, policy-based tiering
- Tier to on-prem and public cloud
- Precisely match performance requirements to \$/GB

### Ease of Management

*Single point of management*

- Eliminate islands of storage
- Consolidate workloads including ADAS, CAD/CAE/PLM, Analytics, IoT/IoV/ConnectedCar

### Predictability

*Eliminate the unexpected*

- Consistent performance even as capacity and workloads grow
- Transparent, just-in-time expansion
- Buy for today; expand tomorrow
- Non-disruptive OS upgrades
- Hardware upgrades without migration

## The value of data

Advanced Driver Assistance System / Autonomous Driving (ADAS/AD) development relies on massive amounts of real-world training data, consisting of sensor data gathered over the course of millions of miles of test driving, which is used across tens to hundreds of thousands of concurrent simulations. Just one front-looking radar sensor can generate 2800Mbits of data per second.

For SAE level 3 automation, up to 200,000 km of sensor data is commonly required. That's over 3300 hours of data when captured at 60km/hr. That's 4.2PB for just one sensor! Cars today have many sensors. In the future, when cars evolve to SAE level 5, fully autonomous operation, you can expect more sensors – including higher resolution sensors - an estimated 1000x more data per sensor.

Ideally architected for ADAS development and certification, Dell EMC PowerScale provide the scalability, performance, parallelism and easy management tools to help OEMs and Tier-1 suppliers accelerate their ADAS projects. PowerScale supports simultaneous ingest from thousands of concurrent streams from around the globe, provides simultaneous access for Mil/HiL/SiL testing and Deep Learning / AI, and includes archive options to meet regulatory re-simulation SLAs.

## Flexible solutions for changing needs

Storage needs can be unpredictable in the automotive market – especially ADAS – making storage forecasting and investments difficult. PowerScale's flexibility makes it possible to mix and match node types to meet the needs of your data today, while laying a foundation for future growth and upgrades. This enables engineering organizations to start with an infrastructure that fits their immediate needs without overbuying performance or capacity. A single cluster can scale from tens of terabytes to tens of petabytes, with the system automatically provisioning capacity, monitoring system health, and rapidly self-healing failures. New nodes can be added to a cluster in about 60 seconds, making upgrades easy and predictable without adding complexity or impacting time-to-market. As new nodes become available, parallel node upgrades make it easy to initiate large scale upgrades, without downtime.

## Maximum performance at maximum scale

As autonomous vehicle development advances toward SAE level 5, your storage investment today must be architected to handle ever increasing demands in performance – even as cluster capacity grows. With traditional scale-up storage architectures, cluster performance degrades as capacity is added. With PowerScale, expanding a cluster's capacity increases its aggregate and peak performance, making it an ideal choice for the ADAS workloads of today and tomorrow. PowerScale's scale-out architecture and OneFS operating system eliminate I/O bottlenecks that are common with legacy storage solutions when highly concurrent automotive workloads are at play. This eliminates last minute performance surprises that arise when alternative solutions grow beyond their "sweet spot."

## A deep learning storage platform

From object localization, semantic segmentation, road and lane marking annotation and metadata attribution, Artificial Intelligence is becoming more and more critical to remaining competitive as progress continues towards SAE level 5 autonomy. PowerScale provides the performance, parallelism, scalability and management required to support increasingly complex AI workflows. PowerScale also integrates easily with the Dell EMC Data Streaming Platform, making it simple to gain insights into real-time and historical data.

## PowerScale Options



### PowerScale F200/F600 **NEW!**

All-flash systems combining performance and enterprise grade features, in an affordable 1U form factor.



### All-Flash Isilon F800 & F810

Ultra-performance and scalability for massively concurrent automotive workloads.

### Hybrid Isilon H500, H600 and H5600

Realize performance, capacity, and value for a wide range of automotive and other enterprise workloads

### Archive Isilon A200, A2000

Lower the cost to store and protect long-term business critical project data including ADAS simulation data

## Affordable archive for data that's minutes away

A key challenge of ADAS development is contractual and regulatory commitments surrounding test data retention. Keeping hundreds of petabytes to exabytes of data in high performance storage is certainly a requirement during the simulation and validation phase. This data must be retained for multiple decades, and with service contracts commonly mandating restoration and re-simulation times measured in days to weeks, traditional tape archive is simply not an option. PowerScale offers multiple tier options and tools like SmartPools® and CloudPools® -- policy-driven automated tiering solutions that allow you to move data to the optimal price/performance tiers across PowerScale, object storage and cloud, depending on the needs of your project. For example, keep performance-critical data, such as recently ingested ADAS sensor data, on a high-performance tier, and less critical data, including previous ADAS projects, on low-cost, high-density archive tiers. Setup policies to automatically migrate archived ADAS data back to higher performance tiers should an urgent need to restore a simulation environment arise – such as a recall. Because archived data can remain within the same cluster and name-space transparently, an ADAS simulation environment can become operational quickly and with little effort. For data that isn't subject to strict SLAs, Dell EMC ECS, in combination with CloudPools, can be used to store data long-term in cost-effective object storage with support for geo-distributed archives.

## The foundation for a data first cloud strategy

Public cloud vendors offer a range of cost-effective, highly flexible services ranging from basic compute infrastructure, to DL/ML/AI toolsets to software simulations. Dell EMC PowerScale makes it possible to build the data storage solution that meets the needs of your data and maximizes the value of that data whether on-premises or in the cloud. If you have the networking to support low-latency connections, extend to the cloud vendor of your choice directly from your own on-prem. storage. Make your data available to multiple cloud providers with the fully managed Dell Technologies Cloud Storage for Multi-cloud or take advantage of Dell EMC PowerScale systems available natively through select cloud providers.

## Small footprint for tight spaces

When facing the reality of ADAS storage requirements, the last thing you want to worry about is physical space requirements. PowerScale offers massive scalability in a single chassis (up to 800TB with archive nodes), the F200 and F600 nodes take space saving a step further, with a slim 1U form factor. PowerScale's modular architecture delivers maximum flexibility and capacity in a small form factor. Thanks to its modular architecture, you can take advantage of higher density PowerScale nodes as they become available.

## Multi-protocol support for centralized storage

Streamline your automotive and non-automotive storage infrastructure by consolidating large-scale file and unstructured data assets, eliminating islands of storage across the enterprise. PowerScale provides integrated support for a wide range of industry-standard protocols including Internet Protocols IPv4, and IPv6, NFS, SMB, HTTP, FTP, HDFS and S3. As a result, you can simplify workflows, accelerate business analytics projects, support cloud infrastructure initiatives, unlock data capital and get more value from your enterprise applications and data. New support for the S3 protocol enables you to easily run modern cloud-enabled applications. With native Hadoop Distributed File System (HDFS) support, PowerScale even allows you to run analytics on your manufacturing data. You can combine this data with your CAD/CAE design data on a single cluster and volume. PowerScale helps simplify workflows, accelerate business analytics projects, support cloud infrastructure initiatives, and get more value from your enterprise applications and data, all from a single storage platform.

## Ready for the enterprise

Dell EMC PowerScale is enterprise-ready and provides the highest levels of reliability, availability, and serviceability in the industry, making it an ideal platform for storing business critical data. Key enterprise ready features include:

- Fast and efficient data backup and recovery with scheduled snapshots
- Reliable disaster recovery protection with extremely fast data replication
- Push-button failover and failback simplicity
- File system auditing
- Data at Rest Encryption (DARE) with self-encrypting drives (SEDs)
- Write once, read many (WORM) data protection to help you meet regulatory requirements – including the stringent SEC 17a-4 rule.
- Role-based access control (RBAC) options and, if needed, isolated storage pools for specific essentials.

## Manage development workflows – Not storage

Dell EMC PowerScale makes managing your storage infrastructure and petabytes of file data a “part-time job” with tools that make it easy to consolidate divisions, projects, teams and entire automotive workflows into a unified storage solution that reduces costs and improves operational efficiency. Some of these tools include:

- **DataIQ**- Manage and move data across multiple data centers, and into the cloud. Easily manage ADAS/AD sensor data (and project data) even when distributed worldwide.
- **Data Management System (DMS)** – This custom-built dashboard allows you to track and index vehicle sensor data via metadata (speed, throttle position, GPS, road surface, weather conditions, etc). Integrate with DataIQ and third party plugins for maximum flexibility
- **CloudIQ** - Monitor, analyze, and troubleshoot your storage environment with this free cloud-based application

## About Dell Technologies

Dell Technologies helps automotive companies pursue new data-driven business opportunities in the data era by offering massively scalable, easily managed, high performance storage systems that can support both traditional workflows and data-intensive emerging workflows such as Advanced Driver Assistance Systems (ADAS), autonomous vehicles and connected cars.



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automotive data  
storage solutions



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