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OPEN PLATINUM™

Cloudline Autonomous Driving Solutions

Accelerating insights through a new generation of data and analytics using open design principles

March, 2019

The 4G / Edge Autonomous Vehicle Computing Stack
Current Generation: 4G and Cloud Data Centers

A car can travel **4 feet** in the amount of time it takes for data to travel round trip at 80ms latency

500 Miles / ~80ms Latency

Autonomous Vehicles
A future with IoT at its center requires fast computing solutions that current infrastructure does not support. An autonomous car is said to require approximately **4,000 gigabytes per day.** Mashable

TOYOTA   TESLA

The 4G Network
This is the current generation of cellular networks that exist in the US today

AT&T   verizon

Cloud Data Centers
Not suitable for the low latency real-time predictive analytics autonomous vehicles will require. These could be used to store the large amounts of un-structured data for future data-mining and analytics. **A car would have traveled 4 feet with 80ms of data latency.**

amazon web services   Microsoft Azure

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The 5G / Edge Autonomous Vehicle Computing Stack
Next Generation: 5G and Micro Data Centers

A car can travel **4 inches** in the amount of time it takes for data to travel round trip at 5ms latency

5 Miles / ~5ms Latency

Autonomous Vehicles
A future with IoT at its center requires fast computing solutions that current infrastructure does not support. An autonomous car is said to require approximately **4,000 gigabytes per day. Mashable**

The 5G Network
The speed and latency requirements of autonomous vehicles will require 5G technology. The carriers are spending $100's billions in order to upgrade their infrastructure to handle the 5G demand

Micro Data Centers
With autonomous vehicles constantly on the move a requirement for data centers on the edge will evolve. Companies like Vapor IO are designing self-enclosed micro data centers that will be installed under cell towers.
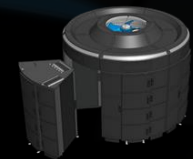
HPE Cloudline Building Blocks for Big Data Streaming
Purpose-built with Open Standards Based Hardware

Different requirements along the data pipeline stages demand different node geometries

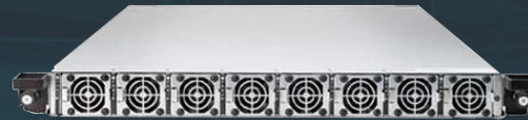**"IoT Event Producers"**
Edge Processing of data in motion

HPE Cloudline 2800

HPE Edgeline Products

"Fast Data"
Core Processing of data in motion
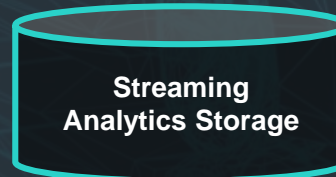
HPE Cloudline 3100 with NVME
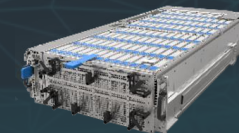
"Big Data"
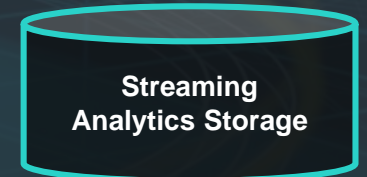Analysis of data at rest

HPE Cloudline 3100 with LFF HDDs

"Data Lake"
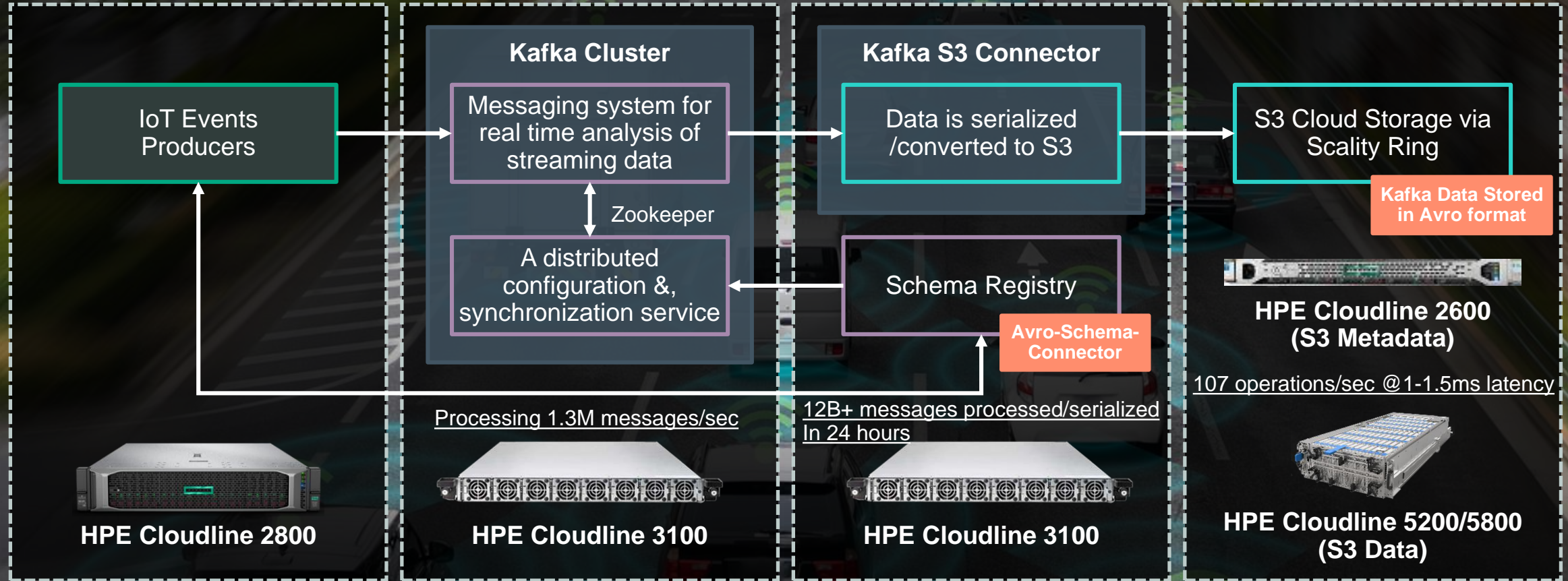Object Storage- Warm/Cold

Streaming Analytics Storage

HPE Cloudline 5200 or 5800

Streaming Analytics Storage

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Enterprise

HPE Cloudline for Autonomous Driving Solutions

IoT Events Producers

Kafka Cluster

Messaging system for real time analysis of streaming data

Zookeeper

A distributed configuration &, synchronization service

Kafka S3 Connector

Data is serialized /converted to S3

Schema Registry

Avro-Schema-Connector

S3 Cloud Storage via Scality Ring

Kafka Data Stored in Avro format

HPE Cloudline 2600 (S3 Metadata)

107 operations/sec @1-1.5ms latency

Processing 1.3M messages/sec

12B+ messages processed/serialized In 24 hours

HPE Cloudline 2800

HPE Cloudline 3100

HPE Cloudline 3100

HPE Cloudline 5200/5800 (S3 Data)

Data Ingest

Analytics

Object Storage

Edge to Cloud

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The SMACK Stack for Big Data / AI / ML

Apache Zookeeper™

An open source Apache project that provides centralized infrastructure and services that enable synchronization across a Hadoop cluster. ZooKeeper maintains common objects needed in large cluster environments. Examples of these objects include configuration information, hierarchical naming space, and so on. Applications leverage these services to coordinate distributed processing across large clusters.

| **APACHE Spark™**	**Apache MESOS™**	**akka**	**cassandra**	**APACHE kafka®**	**Flink**
A fast, in-memory data processing engine with elegant and expressive development APIs to allow data workers to efficiently execute streaming, machine learning or SQL workloads that require fast iterative access to datasets.	A cluster manager that provides efficient resource isolation and sharing across distributed applications or frameworks	A set of open-source libraries for designing scalable, resilient systems that span processor cores and networks	A distributed database for managing large amounts of structured data across many commodity servers, while providing highly available service and no single point of failure.	A fast, scalable, durable, and fault-tolerant publish-subscribe messaging system. Kafka works in combination with Apache Storm, Apache HBase and Apache Spark for real-time analysis and rendering of streaming data	An open-source stream processing framework for distributed, high-performing, always-available, and accurate data streaming applications

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Autonomous Driving Software Eco-System (Example)
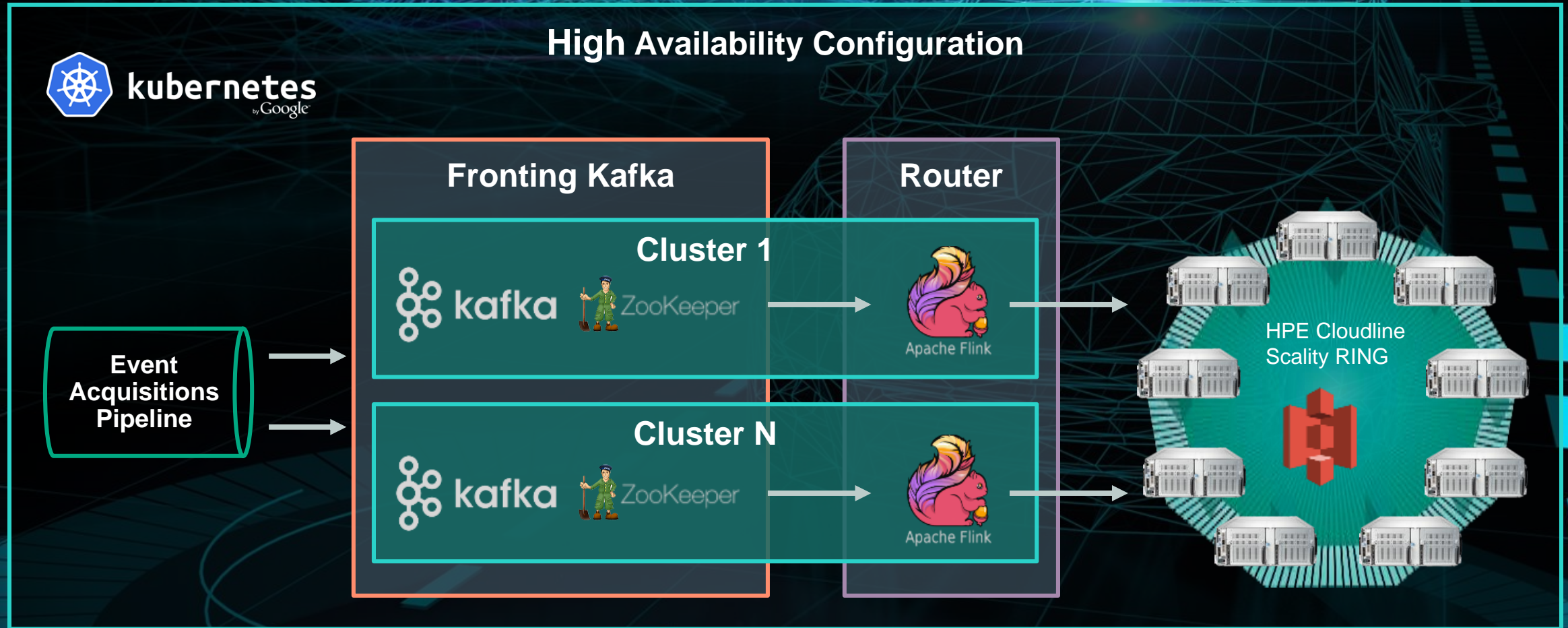
HPE Cloudline Portfolio

General Purpose Servers

HPE CL2600 Gen10

1U 2S, 8SFF

The 1U open standard in an HPE flagship design

HPE CL2800 Gen10

2U 2S, 24SFF or 12LFF or 16 NVMe

Expandable, open system in a 2U HPE flagship design

Compute Servers

HPE CL3100 Gen10

1U 2S, 12LFF or 20 NVMe

Cloud storage server for Hadoop, Casandra, real-time analytics

HPE CL4100 Gen10
Dual Nodes
Each 1U 2S, 8SFF or 2 NVMe

Optimized for high-density compute and NFV workloads
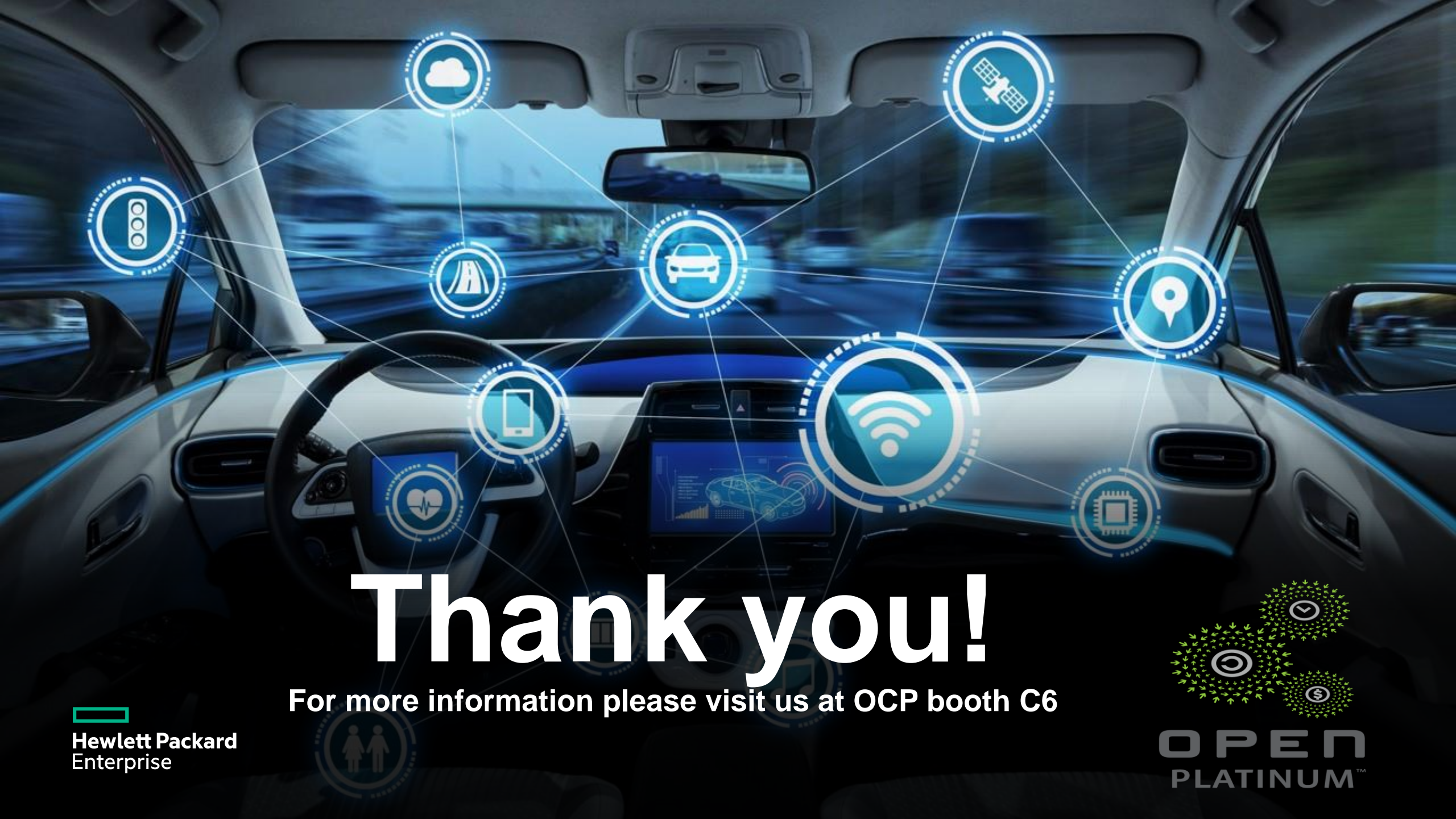
Storage Servers

HPE CL5200 Gen9

4U 2S, 80LFF

Very high density storage with and ultra-low $/GB price point

HPE CL5800 Gen9

4U 2S, 100LFF

Optimized for cloud storage and big data workloads

Thank you!

For more information please visit us at OCP booth C6