Hewlett Packard Enterprise

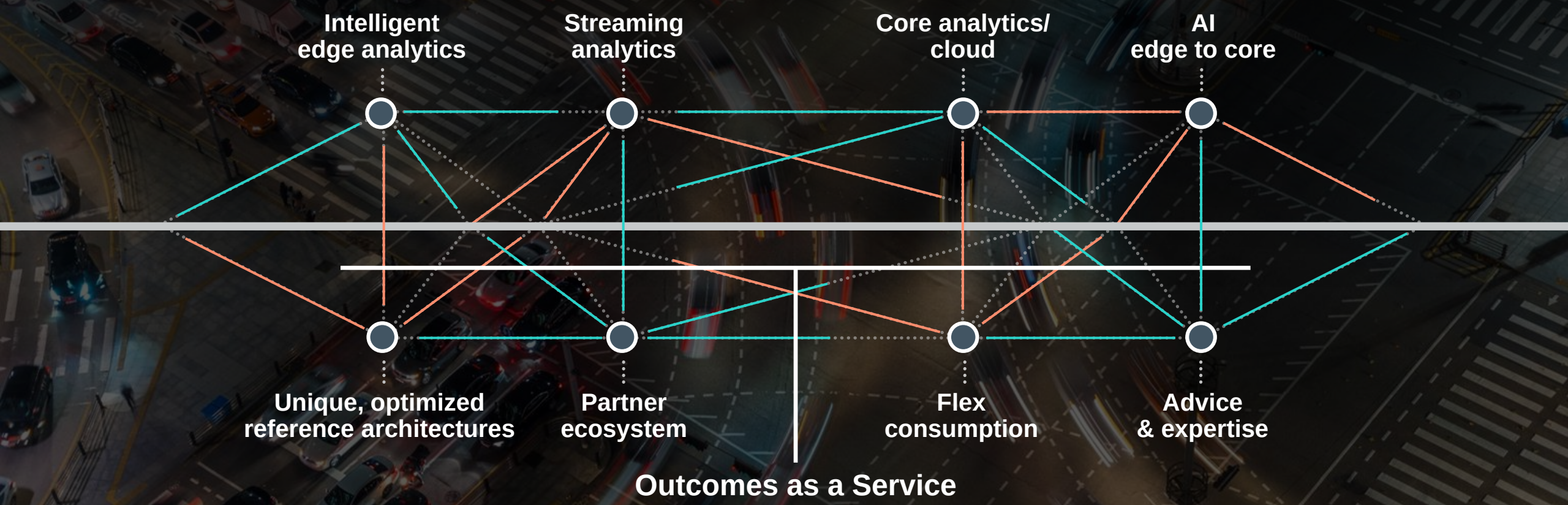
Cloudline Autonomous Driving Solutions

Accelerating insights through a new generation of Data and Analytics

October, 2018

HPE big data analytics solutions power the data-driven enterprise

Secure, workload-optimized platforms that power:



“The industry is expected to see a compound annual growth rate (CAGR) of 43.6% through 2022, according to the report Machine Learning: Global Market to 2022.” Source

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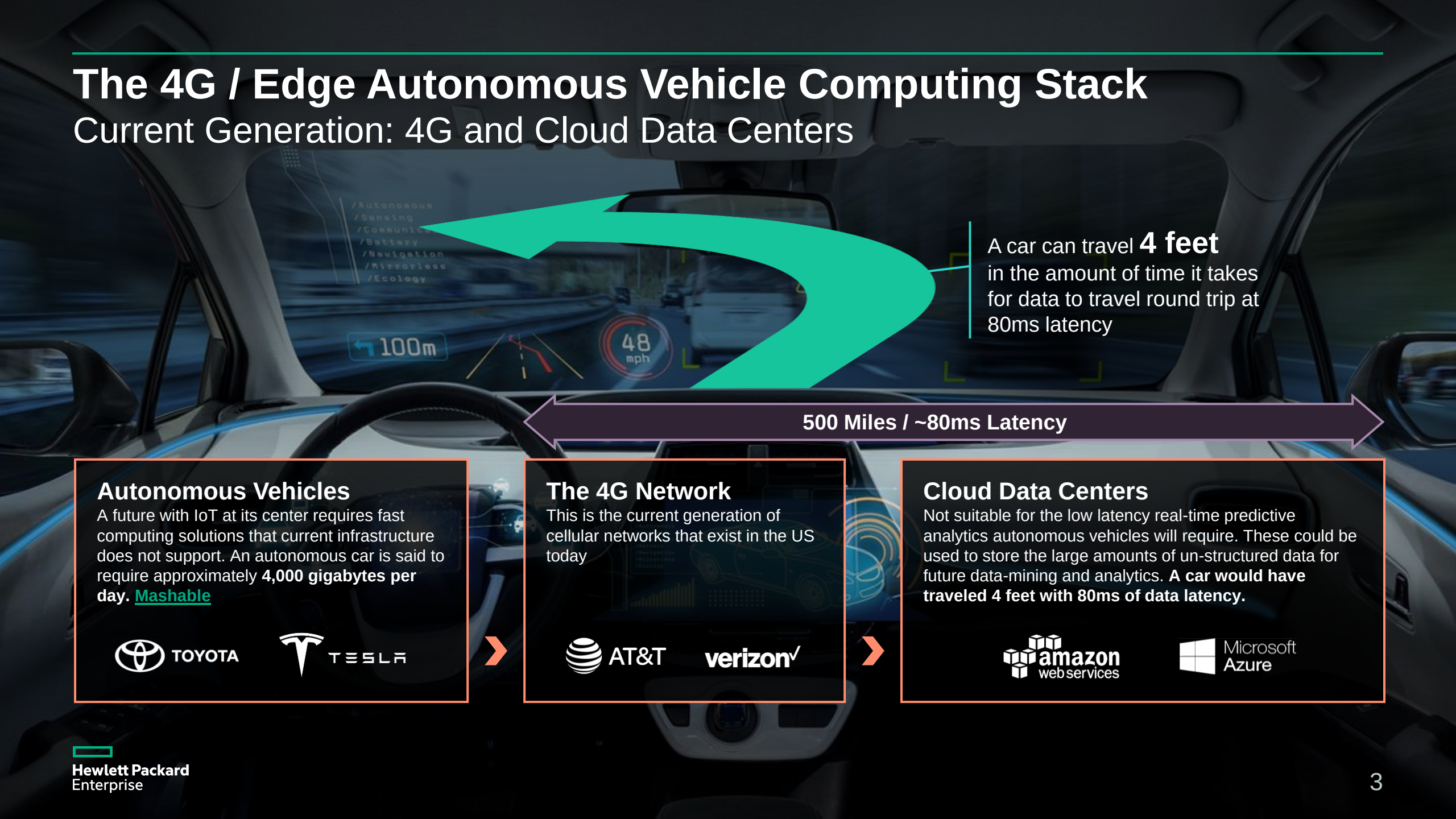
The 4G / Edge Autonomous Vehicle Computing Stack

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 80ms 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

TOYOTA TESLA

The 5G Network

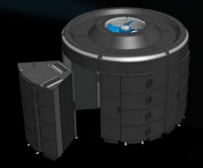
The speed and latency requirements of autonomous vehicles will require 5G technology. The carriers are spending $100's billions in order to upgrade their infrastructure to handle the 5G demand

AT&T verizon

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.

Vapor Hewlett Packard Enterprise



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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 2200 or 2800

HPE Edgeline Products

"Fast Data"
Core Processing of data in motion

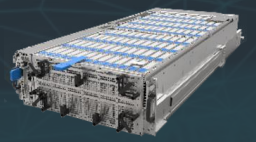
HPE Cloudline 3100 with NVME

"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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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 2100/2600 (S3 Metadata)

107 operations/sec @1-1.5ms latency

HPE Cloudline 5200/5800 (S3 Data)

HPE Cloudline 2200/2800

Processing 1.3M messages/sec

HPE Cloudline 3100

12B+ messages processed/serialized In 24 hours

HPE Cloudline 3100

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.

hadoop

Apache Spark

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.

Apache Mesos

A cluster manager that provides efficient resource isolation and sharing across distributed applications or frameworks

akka

A set of open-source libraries for designing scalable, resilient systems that span processor cores and networks

cassandra

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.

Apache kafka

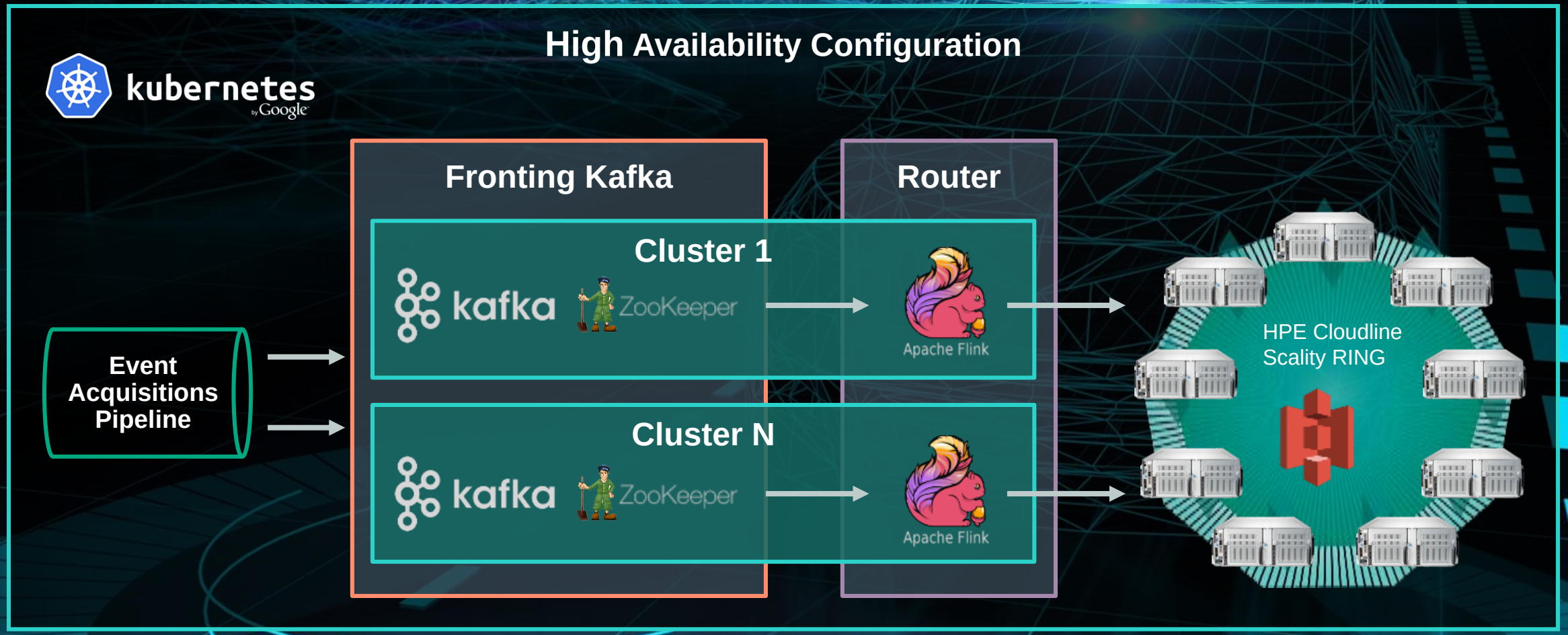
A fast, scalable, durable, and fault-tolerant publish-subscribe messaging system. Kafka works in combination with Apache Storm, Apache HBase and Apache Spark for real-time analysis and rendering of streaming data

APACHE HBASE

Flink

An open-source stream processing framework for distributed, high-performing, always-available, and accurate data streaming applications

Autonomous Driving Software Eco-System (Example)



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