

## Autonomous Vehicle Data Collection

### INDUSTRY

Autonomous cars

### RESULT

- In-vehicle data can be reliably moved out daily to a collection point
- The data gathered at each collection point can be transported to data center and cloud for further analytics
- Scale-out architecture and efficient data transport meet future data growth

### THE CHALLENGE

- In-vehicle data is too much to transfer in bulk at the end of day
- The collected data is also too much to transfer efficiently with current data mover technologies
- Without fresh data available timely for analytics, autonomous vehicles may not have the most up-to-date intelligence

### THE SOLUTION

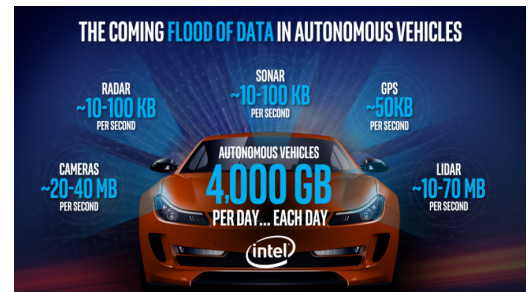
- In-vehicle data is append streamed, and buffered as needed
- Data at each collection center leverage the scale-out and multi-level parallelism for high performance transport to data center and cloud
- Leveraging the “data routing” of Zettar zx for optimal data transport to the final destinations

### BACKGROUND

Autonomous vehicles with their numerous sensors generate large amounts of data daily. Back when Intel ex-CEO Brian Krzanich stated that Data is the new oil in the future of automated driving in 2016, the per vehicle data /day was estimated as 4TB. But now in early 2020, the amount has risen to ~10TB (1TB = 1000GB).

### PROBLEM STATEMENT

A data mover that takes data from each autonomous vehicle within a day to the first stage data collection point, then transports the collected data to data centers or cloud. The in-vehicle data must be moved out each vehicle before the end of each day. The collected data also must be transported to data centers or clouds daily.



Picture Credit: Intel Corp 2016.

### LIMITATION OF CURRENT SOLUTIONS

With the most advanced data reduction techniques available today, even the 1Gbps data rate achieved in ideal situation by 5G mobile cannot transfer so much data at the end of the day. This is easy to see: 1Gbps = 1Gbps/8bit/byte = 125MB/s = 0.125GB/s. 1Day = 24 hours x 60 minutes/hour x 60 seconds/minute = 86400 seconds/day. So, even at the ideal situation of 5G, with 1Gbps at most 10800GB (~10TB) can be transferred over a 24 hours period. But note that

- There is only 24 hours / day, period. So end-of the day bulk transfer of 10TB is impossible.
- The WiFi connection from the car may not be always stable.
- As more sensors are added to each vehicle, more data will be generated in the foreseeable future.

### ZETTAR SOLUTION

- zx provides append streaming so the data is transferred over the entire 24 hours in each day is one way to overcome the above mathematical impossibility.
- In case network connectivity has hiccups or not fast enough, newly generated data can be buffered in an in vehicle storage, which can be taken out to offload the data later on. zx's ability to accelerate data intake and offloading for physical data shipping devices also come in handy.

### MAJOR FEATURES EMPLOYED

Append streaming; RESTful API; parallel processing of multiple storage systems and volumes; single-site mode

### ALSO APPLICABLE

- An IT project that employs edge computing extensively
- A large scale IoT deployment with high output edge devices
- Large telescopes that output high-fidelity images continuously