

Industry

Linear Road benchmark simulation for calculating variable expressway tolls

Solutions Addressed

- Massive data ingest and scalability
- Lowest latency processing
- Right-now analysis
- Massive scale for online transaction processing (OLTP)
- Real-time query response with low latency and accuracy
- Interactive content delivery
- Right-now data personalization
- Large-audience content delivery

XPRESSmp Use

- Streaming sensor data ingest and high-volume processing
- Running queries on the data as it is processed, and running aggregated calculations from tables
- Issuing alerts to vehicles regarding toll status

Results

- Exceeded benchmark by 300%
- Loaded data in under 26 microsec.
- 12 times throughput improvement over Postgress on Linear Road
- Processed 95% of data in under three seconds
- Processed average of 1,106 records per second

Using XPRESSmp™ for Sensor Processing and Variable Alerting in an Urban Traffic Tolling System (Linear Road)

Business Requirements

- Utilization of dynamic data streaming from sensors on roadways (average speed, vehicle congestion, number of stopped vehicles, accident proximity) to determine tolling fees for highways and to issue accident alerts to vehicles
- Process data records for toll and accident analysis for every vehicle—within three seconds of receiving vehicle position/speed report
- Process high-volume continuous queries while maintaining accuracy in real-time query response requirements

The Story

Linear Road is a benchmark simulation program that analyzes the traffic conditions of a sample urban expressway system and models variable tolling, where toll fees are dynamically calculated based on traffic congestion, accident proximity, and other factors. The application processes input from a sensor-derived data stream that provides information on the position of vehicles on the expressway. Using input data, Linear Road determines whether the vehicle is or is not eligible for a toll fee. For example, if the vehicle were in a high-density, slow moving section of the road, it would be tolled. When an accident is detected, a vehicle would not be tolled. The application must then issue an alert to the appropriate vehicle regarding toll status.

uCIRRUS benchmarked itself on the Linear Road requirements, where the ideal system would provide a high degree of accuracy and low latency while processing a fixed set of continuous real-time queries and responses. (In this benchmark, uCIRRUS did not address the historical data in the model.)

Linear Road sets a goal to process a “Linear Road second” record containing vehicle position information in under three seconds. XPRESSmp averaged a load time of 12 milliseconds per one Linear Road second. XPRESSmp surpassed the Linear Road benchmark goal by more than 300 percent, processing each record end-to-end (load to alert) in under one second, on average. This includes applying 20 SQL statements per simulated second as well as sending alerts to tolled vehicles. XPRESSmp processed an average of 1,106 records per second—as quickly as Linear Road streamed the data in.

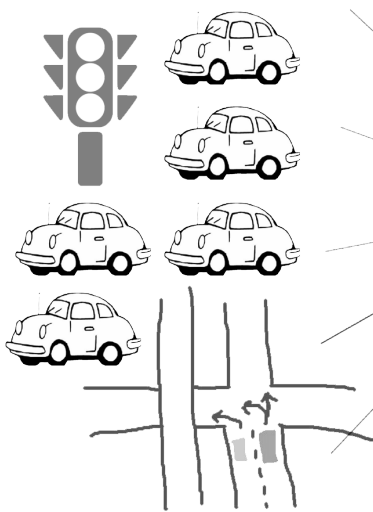
In the real world, the capabilities of XPRESSmp with this type of application enable municipalities and urban centers to optimize the flow of traffic to help make driving conditions safer for motorists, reduce highway wear and tear, and curtail carbon emissions during peak commute hours. Additionally, construction and road repair could be scheduled to avoid contributing to traffic congestion at certain times of day. And, the scalability and performance of XPRESSmp ensure that the resources required for this application would be utilized efficiently and effectively.

XPRESSmp™ Capabilities

- + Accelerate.
- + Time-Critical.
- + Dynamic Data.

- Supports a congestion pricing model for traffic tolls
- Streams inbound data from smart sensors in a variety of environments
- Processes a feedback loop at extremely low latency
- Issues customized alerts to any number of destinations

INBOUND SENSOR DATA, 1 'LINEAR ROADS
SECOND' OF VEHICLE POSITION REPORT



POST-CALCULATION, ALERTS ISSUED:
VEHICLE TOLLED? ACCIDENT NOTIFICATION?



REAL-TIME QUERIES TO RUN CALCULATIONS FROM TABLES

Results

- Processed one Linear Road second (end-to-end) in under one second, exceeding benchmark by 300 percent
- Loaded data in 26 microseconds or less
- Processed 95% of data in under three seconds
- Processed 12 million records in three hours
- Processed an average of 1,106 records per second
- 12 times throughput improvement over Postgress performance on Linear Road benchmark

uCIRRUS

uCIRRUS Corporation

1510 Fashion Island Blvd., #380
San Mateo, CA 94404

800.695.6021

www.ucirrus.com

XPRESSmp™: In-Memory Processing for Time-Critical Big Data. Only from uCIRRUS.