

Smart Driving Behavior Monitoring System using Azure IoT

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CORPORATE FACTS

Established in 2000



90+

Customers Served



2300+

Employees



23%

CAGR since inception

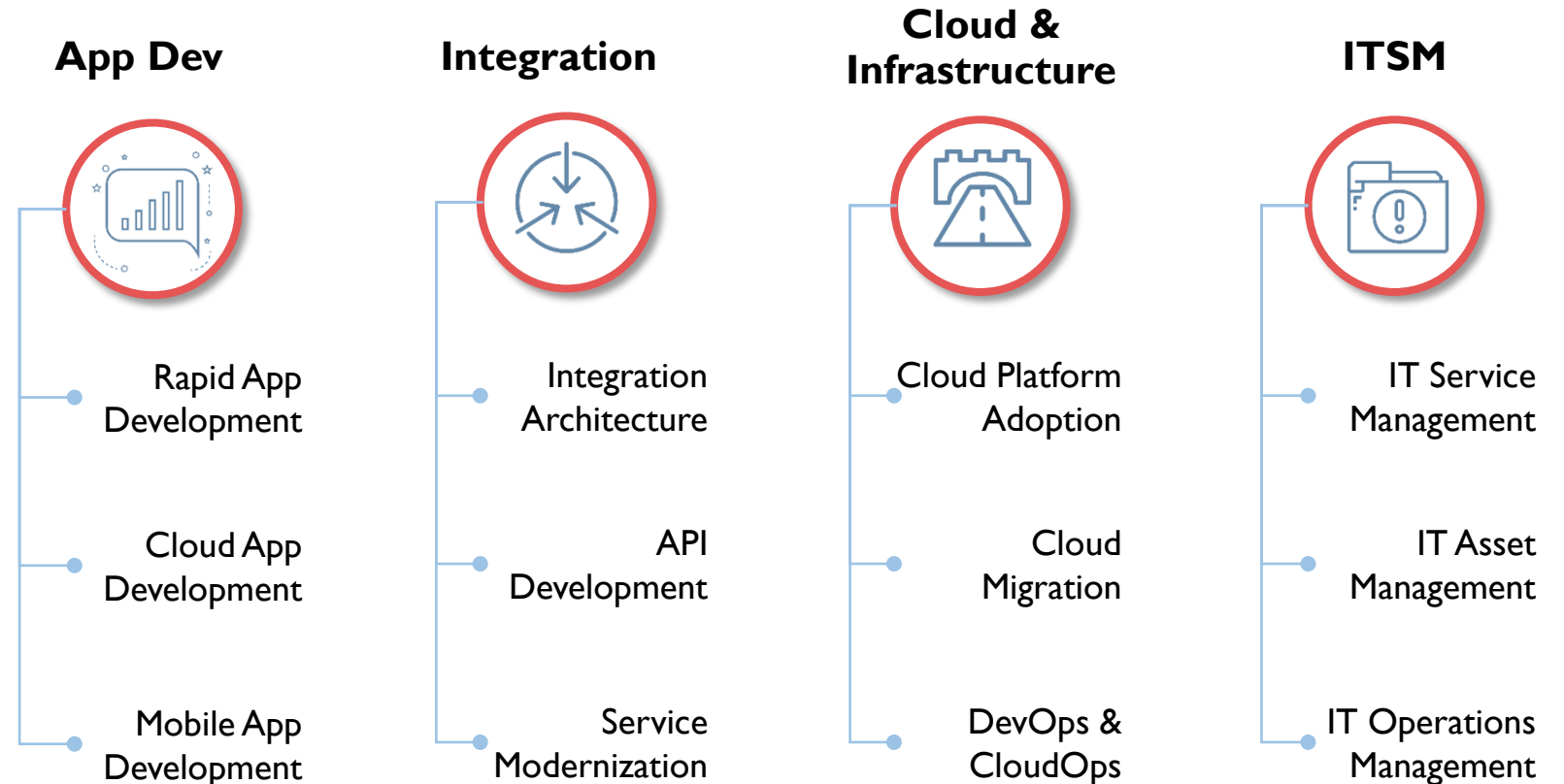


Top 10

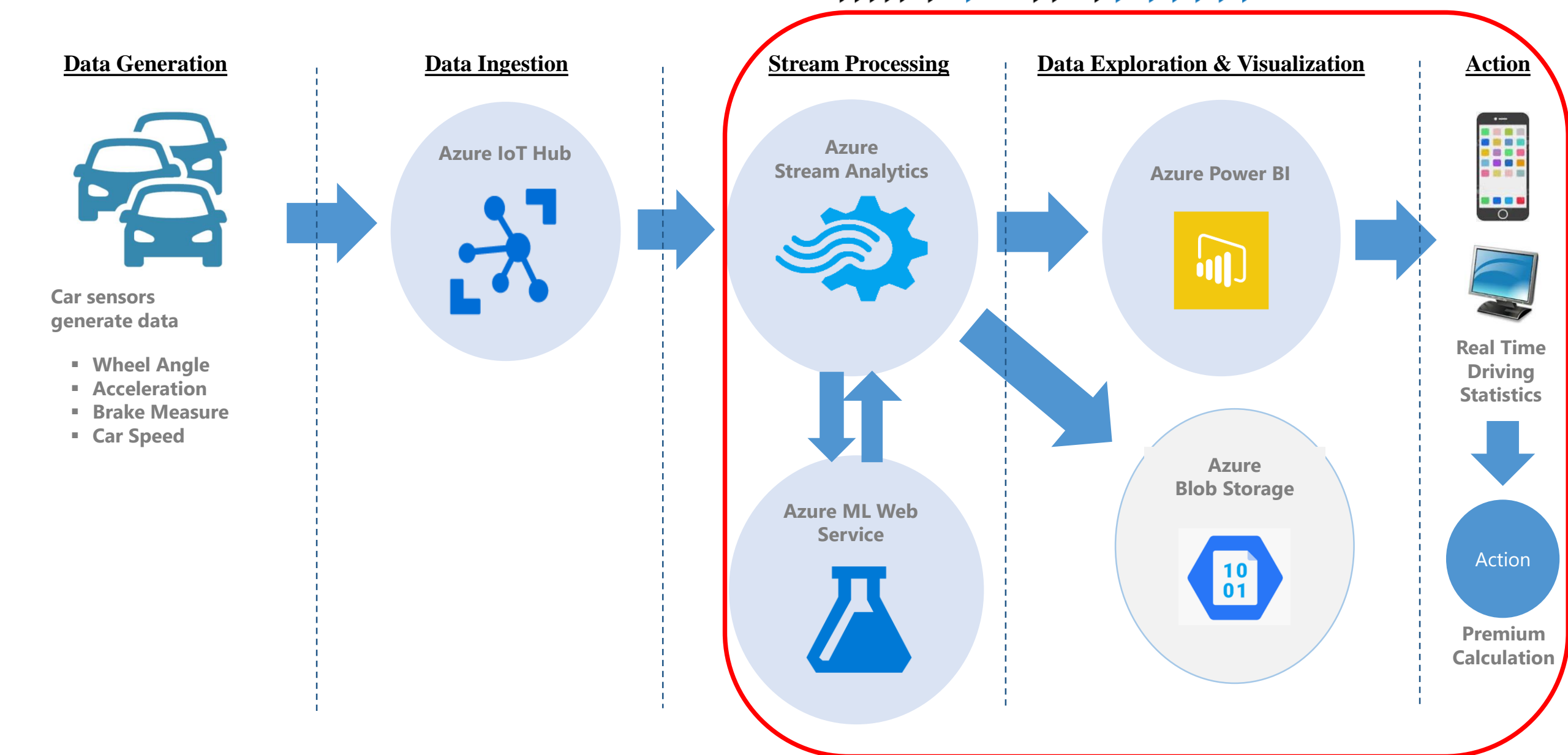
NA P/C IT Svs Provider
by # of customers

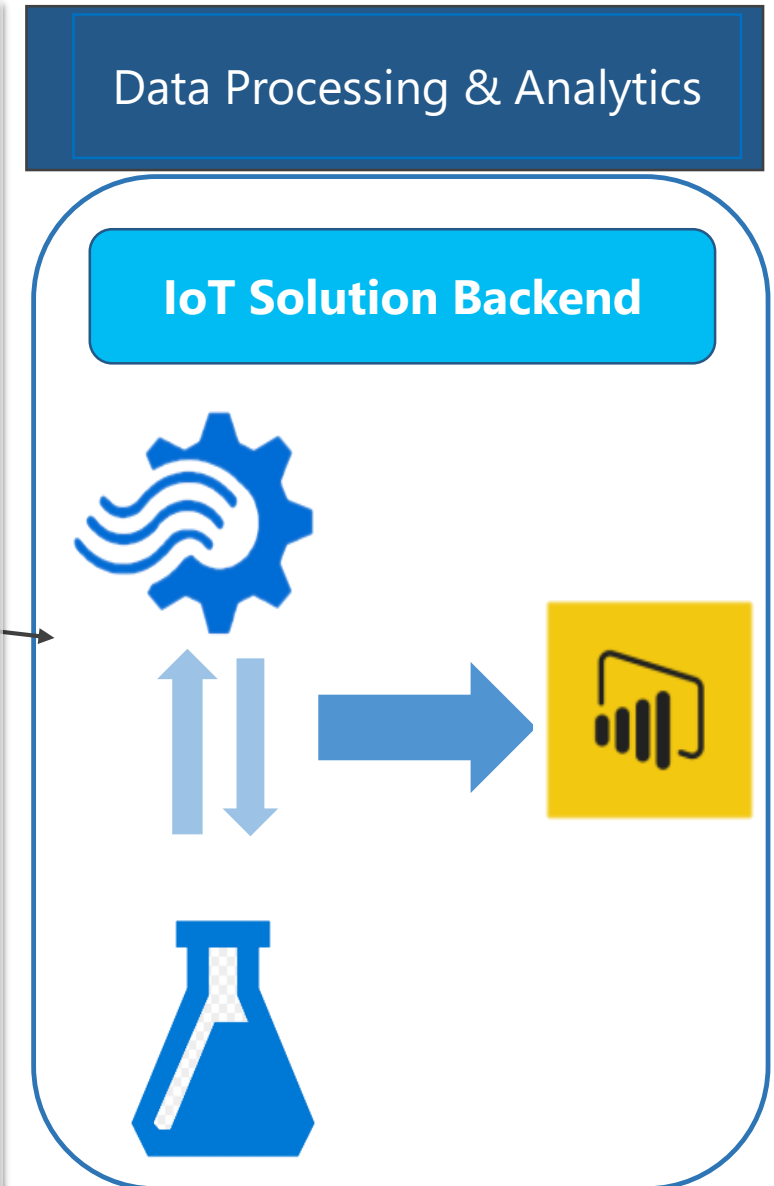
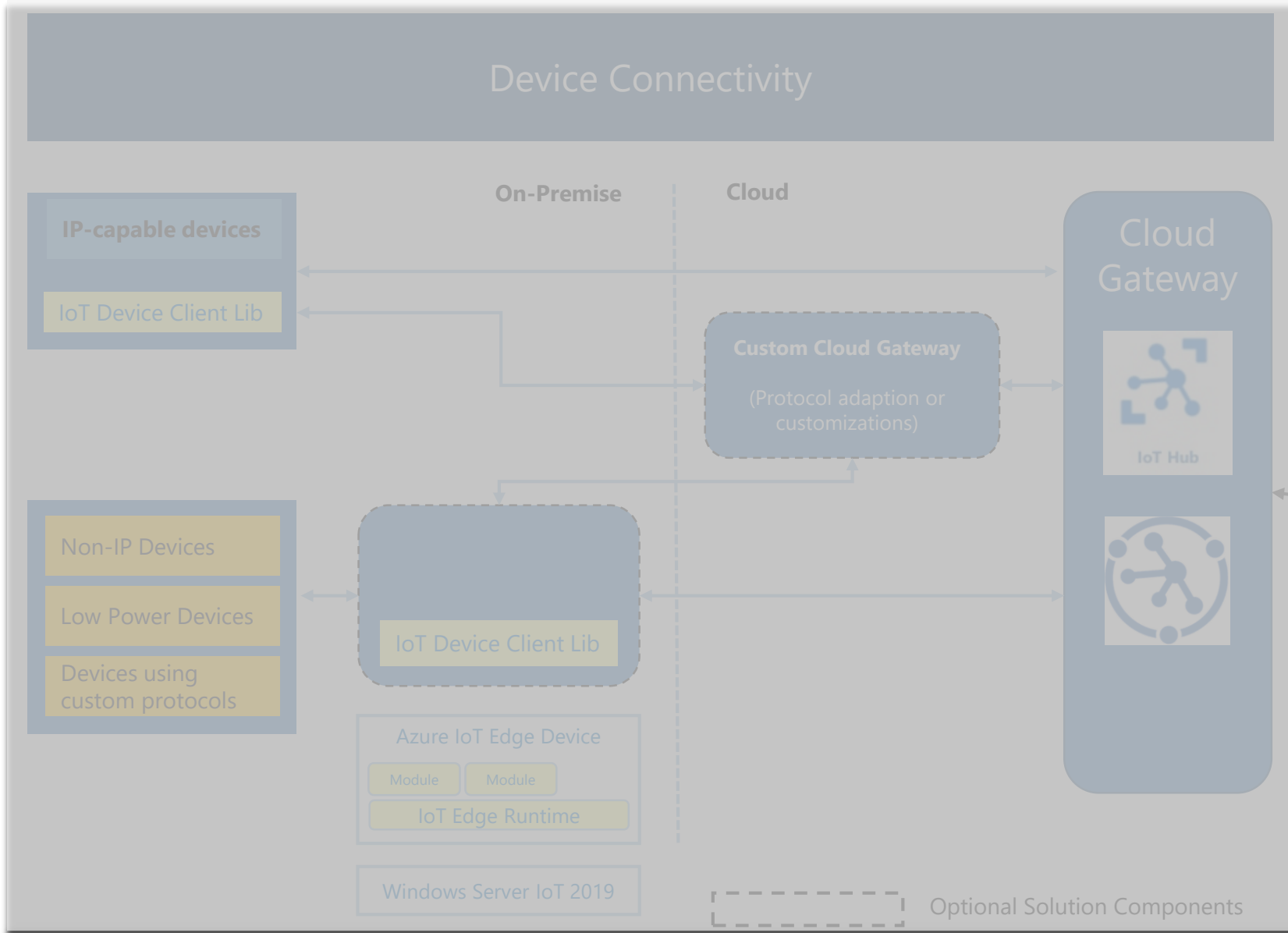
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Data Generation



Car sensors
generate data

- Wheel Angle
- Acceleration
- Brake Measure
- Car Speed

Data Ingestion

Azure IoT Hub



Stream Processing

Azure
Stream Analytics



Azure ML Web
Service



Data Exploration & Visualization

Azure Power BI



Azure
Blob Storage



Action



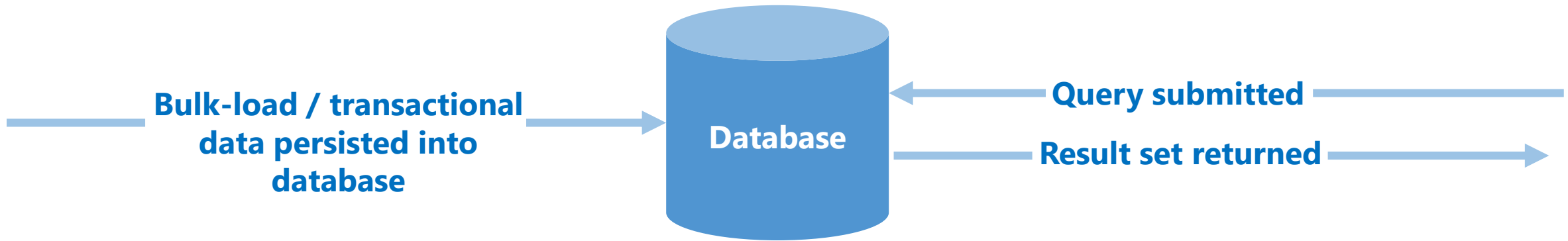
Real Time
Driving
Statistics



Action

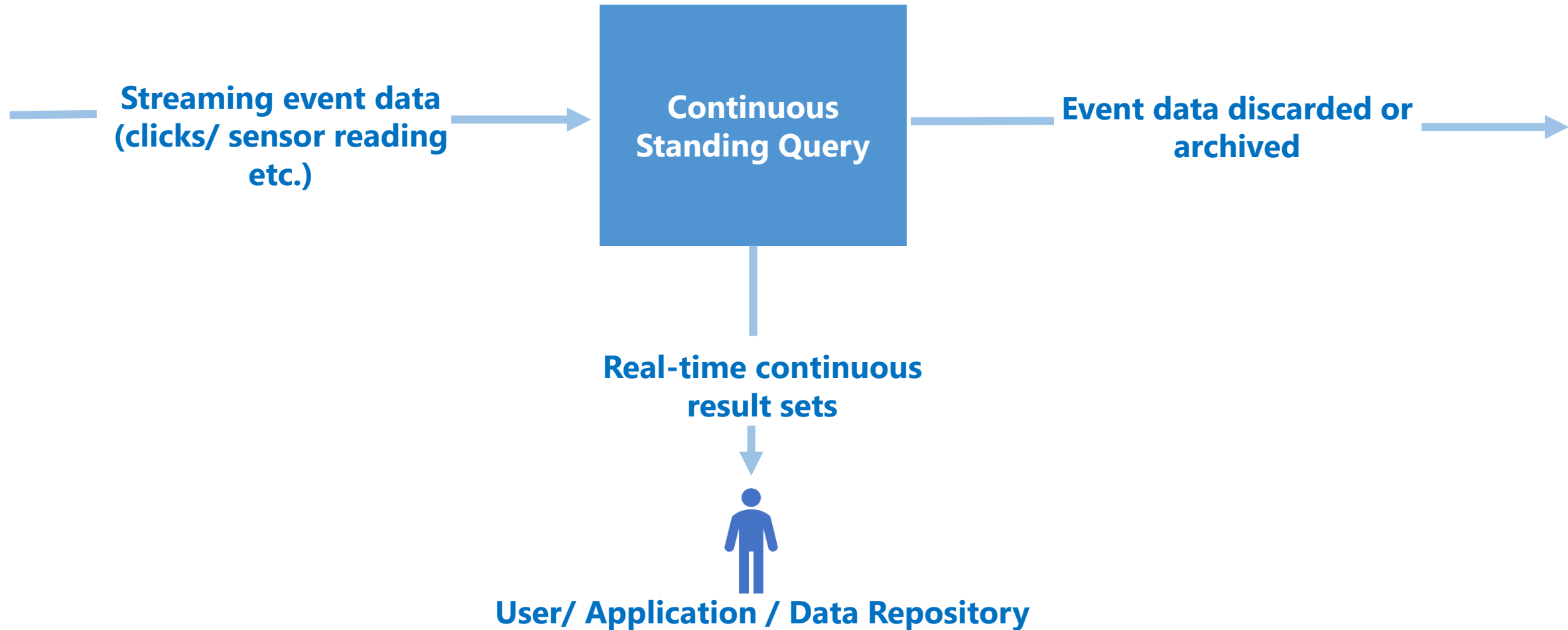
Premium
Calculation

Traditional Analytics Approaches

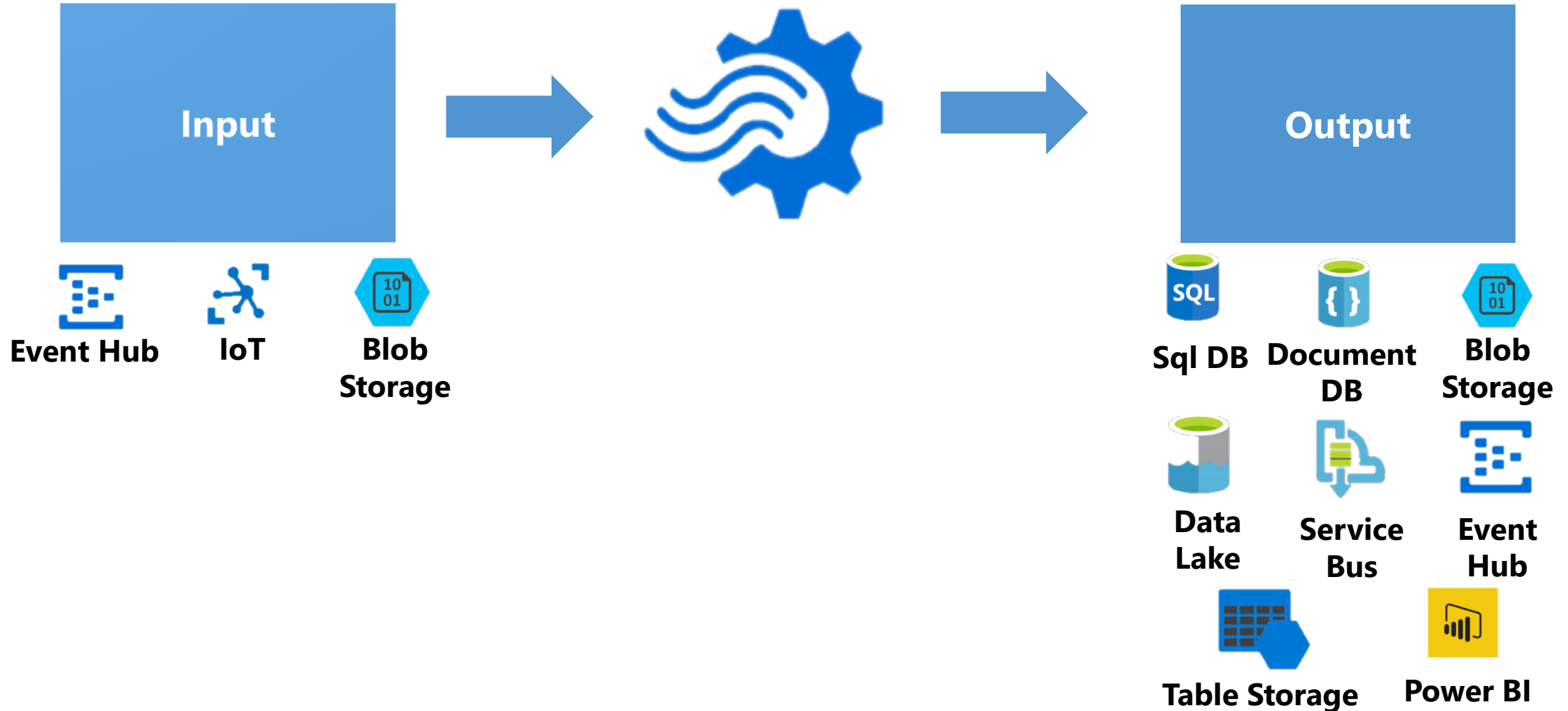


High-Level approach for analytics query submission / response for persisted data stores

Shifting to a Streaming Data Solution



High-Level approach for standing query to support moving data in-flight



Stream Analytics Query Language

- Data Manipulation, Date & Time Functions
- String and Scaling Extensions
- Temporal Joins
- Analytical and Geospatial Functions
- Aggregations
- Mathematical Functions

Scaling

- With streaming units
- With Query parallelization
- Increase throughput

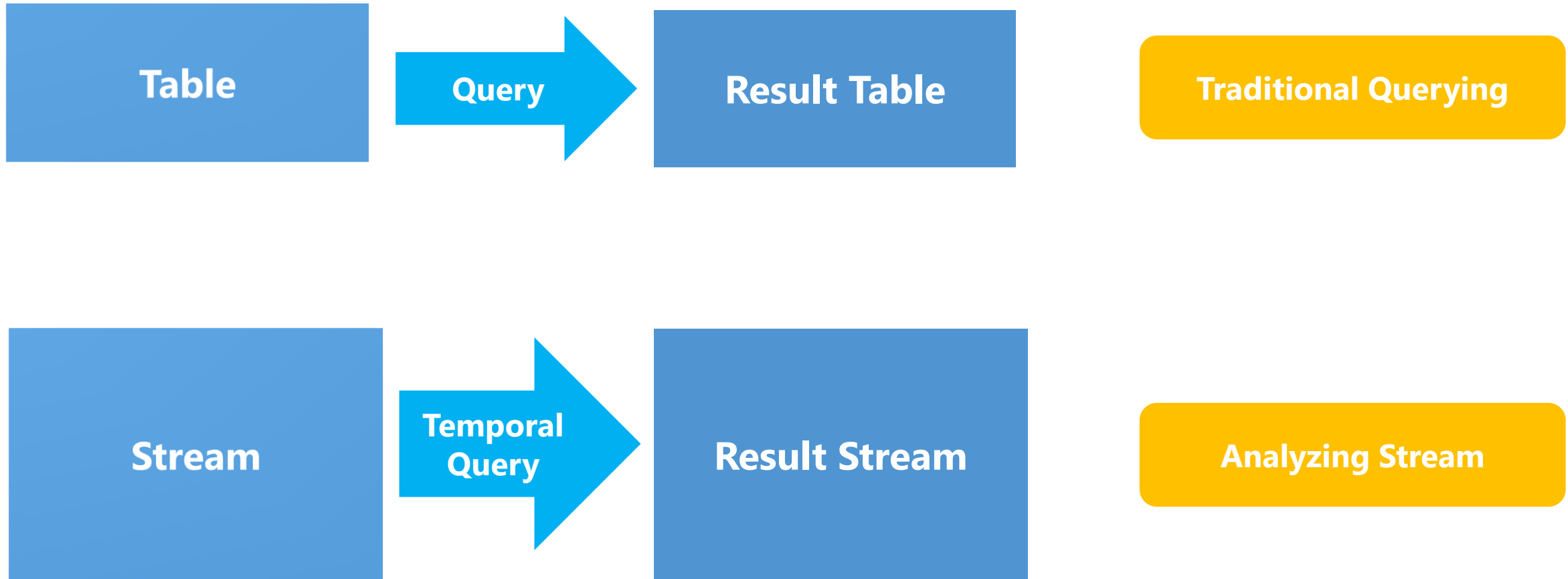


- Tumbling Window
- Hopping Window
- Session Window
- Sliding Window

Windowing

- Azure ML Callouts
- Javascript UDF Functions
- Javascript UDA Functions

Azure Functions



SELECT

```
cast(AVG(wheelangle) as float) AS wheel_angle_mean,
cast(AVG(acceleration) as float) AS acceleration_mean,
cast(AVG(speed) as float) AS speed_mean
```

INTO

```
[Output] Driving_Statistics
```

FROM

```
[Input] iothub TIMESTAMP by time
```

GROUP BY

```
HoppingWindow(SECOND, 40, 1)
```

Analytic Functions

- ISFIRST
- LAG
- LAST

Geospatial Functions

- CreatePoint
- CreatePolygon
- CreateLineString
- ST_DISTANCE
- ST_INTERSECTS
- ST_OVERLAPS
- ST_WITHIN

DML Statements

- SELECT
- FROM
- WHERE
- GROUP BY
- HAVING
- CASE
- JOIN
- UNION

Date And Time

- DATEPART
- DAY
- MONTH
- YEAR
- DATEDIFF
- DATEADD

Scaling Functions

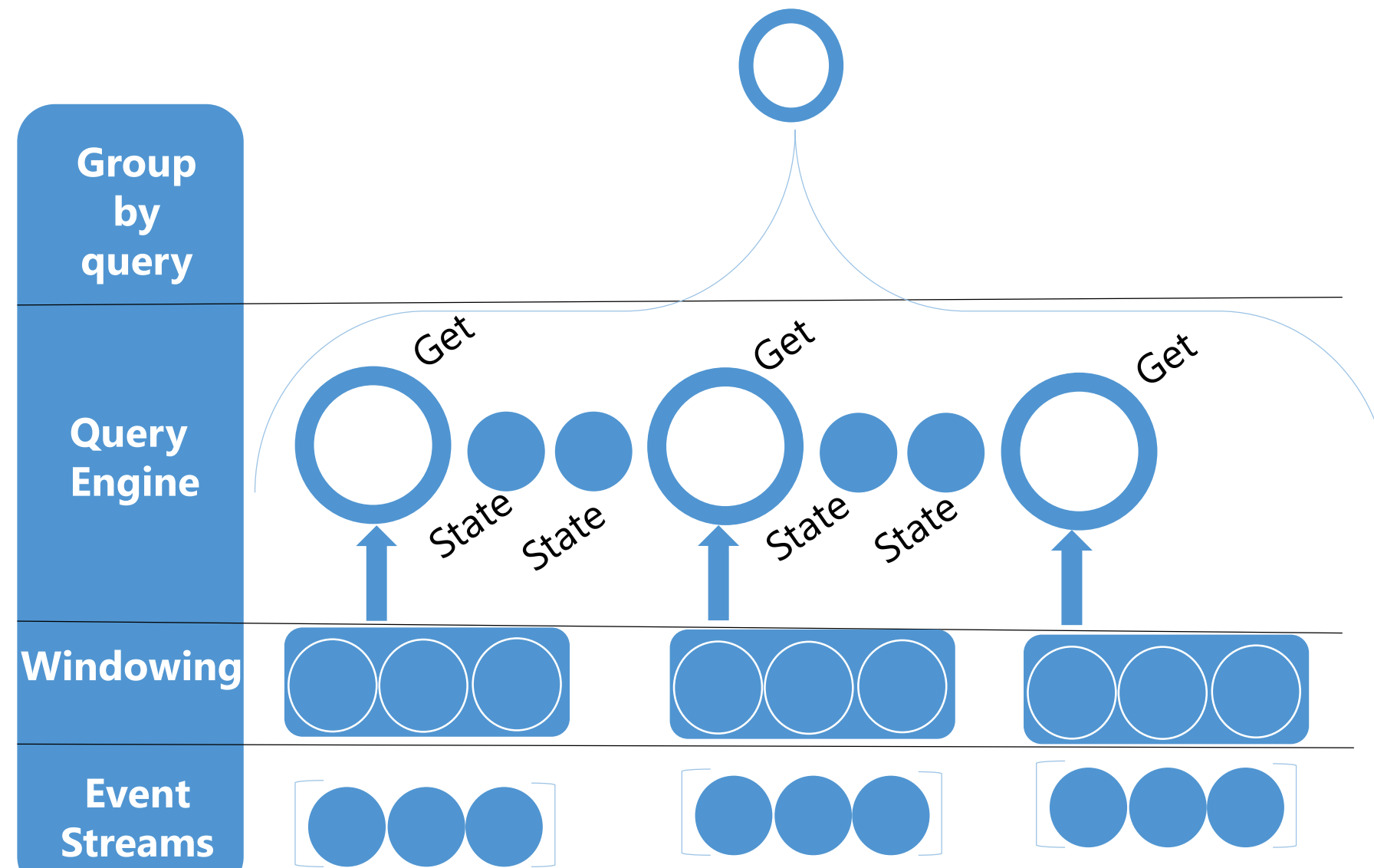
- WITH
- PARTITION BY

Aggregation Functions

- SUM
- COUNT
- AVG
- MIN
- MAX

String Functions

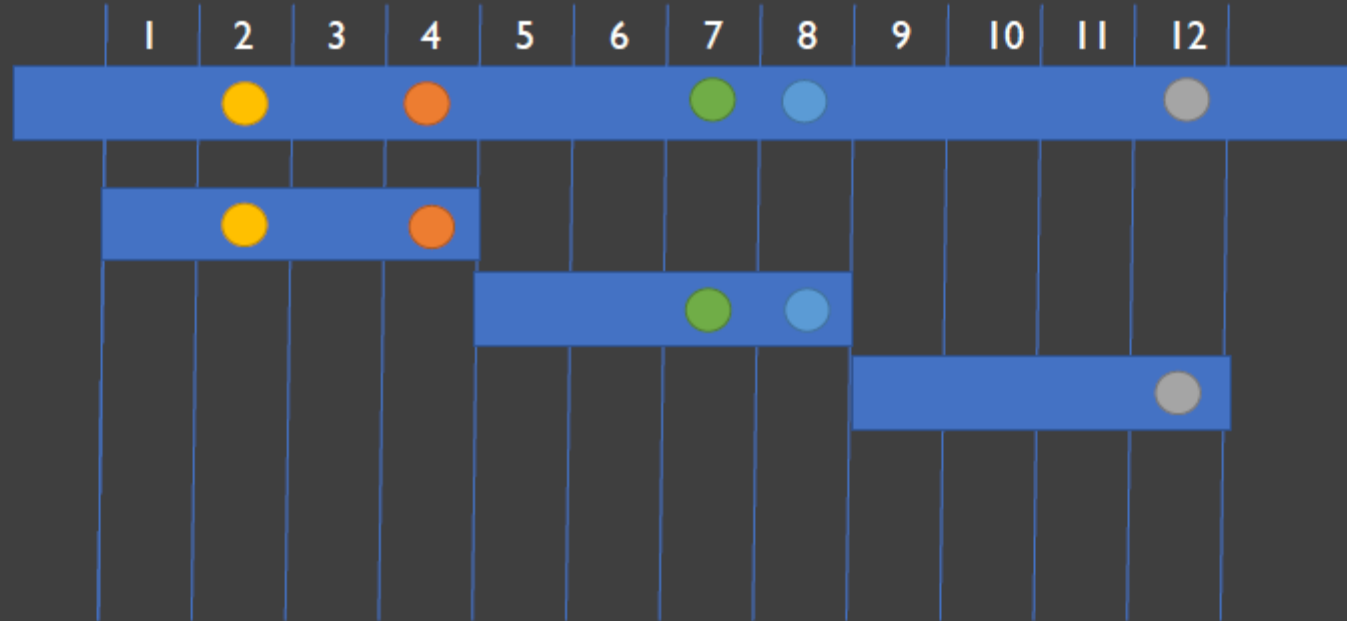
- LEN
- CONCAT
- CHARINDEX



Windowing is to represent groupings by time. A window contains event data along a timeline and enables you to perform various operations against the events within that window and every window operation outputs event at the end of the window.



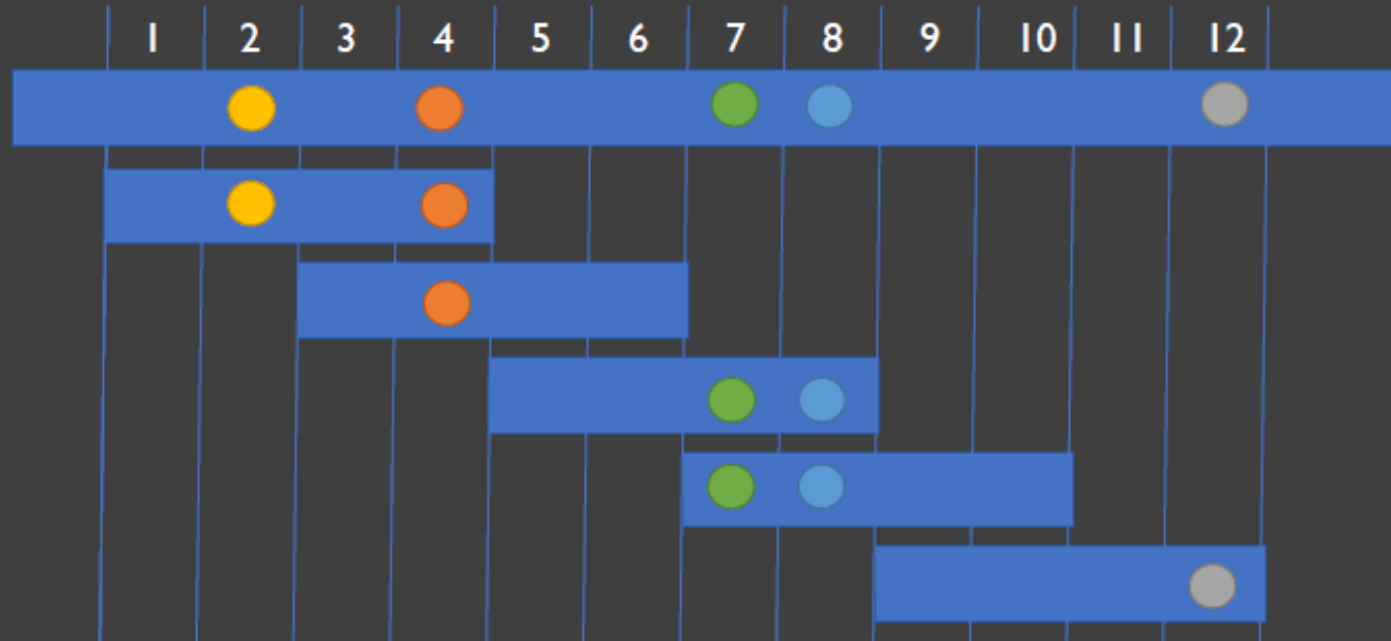
Tumbling
Window



```
TUMBLINGWINDOW ( timeunit , windowsize,[offsetsize] )
TUMBLINGWINDOW ( SECOND , 4)
```



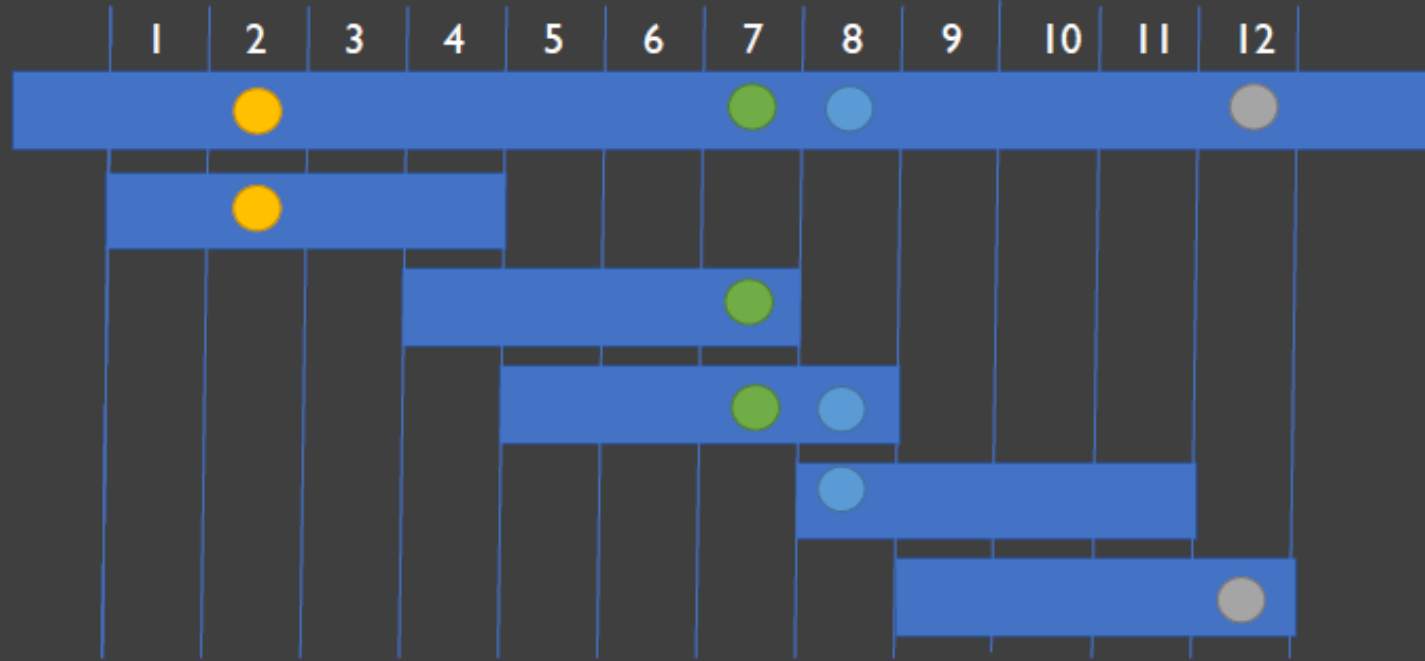
Hopping
Window



```
HOPPINGWINDOW ( timeunit , windowsize , hopsize, [offsetsize] )
HOPPINGWINDOW ( SECOND , 4 , 2 )
```



Sliding
Window



```
SLIDINGWINDOW ( timeunit , windowsize )
SLIDINGWINDOW (SECOND,4)
```

Demo – Stream Analytics

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Stream Processing

Azure
Stream Analytics



Data Exploration & Visualization

Azure Power BI



Action



Real Time
Driving
Statistics



Action

Premium
Calculation

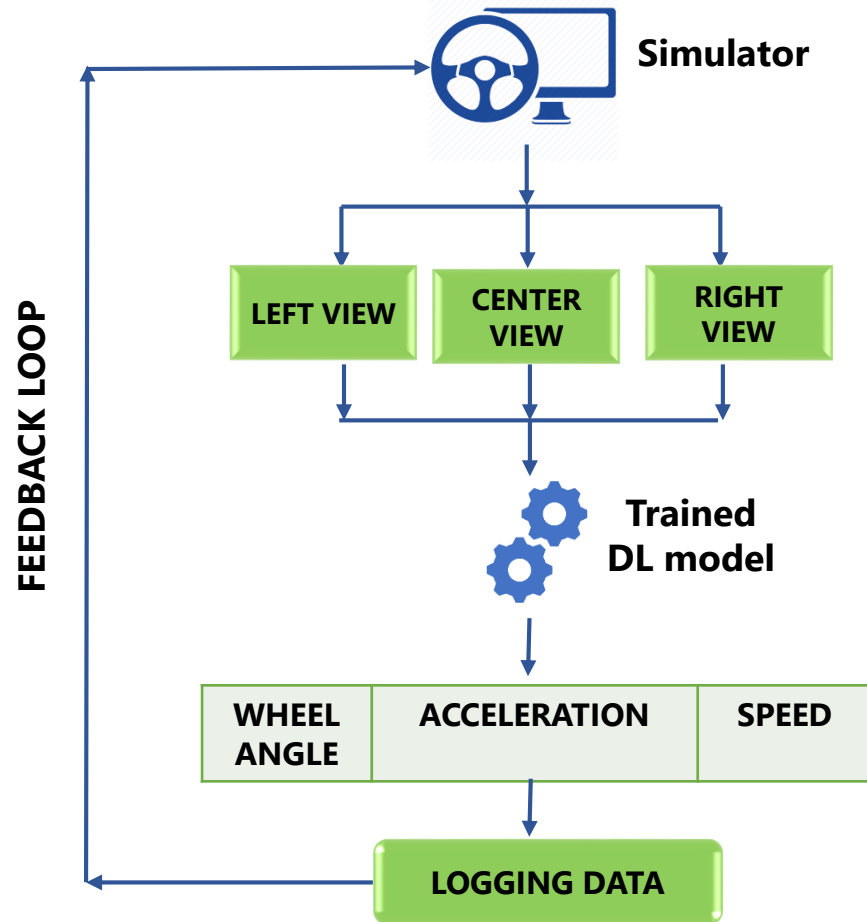
Azure ML Web
Service



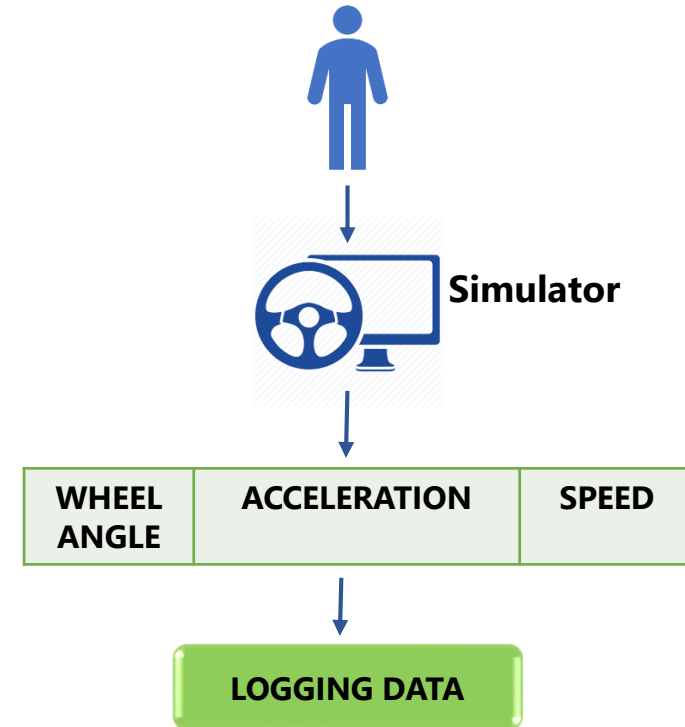
Azure
Blob Storage



AUTONOMOUS DRIVING BEHAVIOR DATA GENERATION

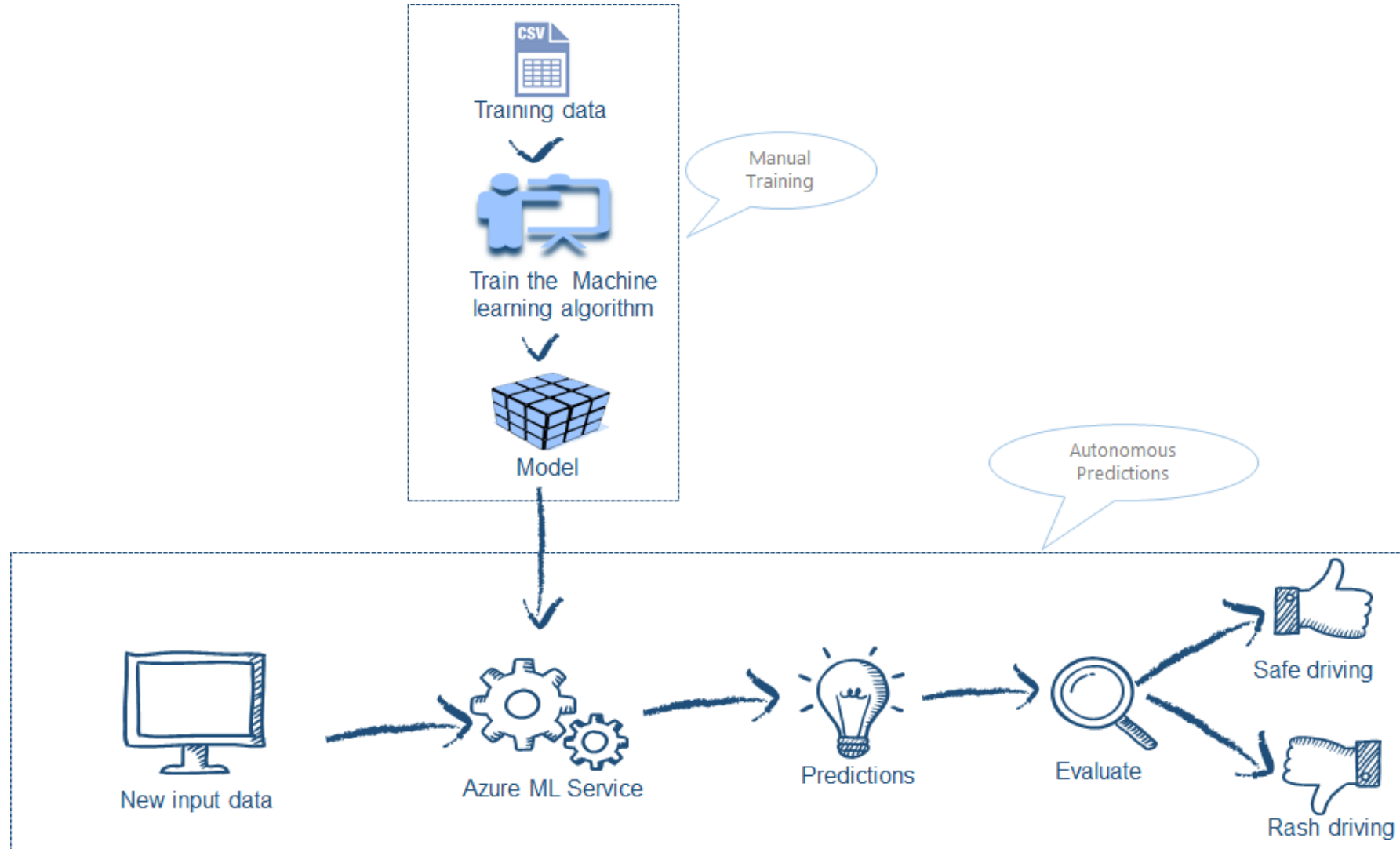


MANUAL DRIVING BEHAVIOR DATA GENERATION



2019 Azure ML Pipeline

Global Azure
BOOTCAMP



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Real Time
Driving
Statistics



Action

Premium
Calculation



Demo – Azure ML & Power BI

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Data Ingestion

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Azure
Stream Analytics



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Service



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Azure
Blob Storage



Action



Real Time
Driving
Statistics



Action

Premium
Calculation

Demo Contributors

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