Teradata and VoltDB:
Action and Insight on IoT Data

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The Internet of Things (IoT) has brought about some great challenges, and great opportunity. While companies are struggling with the volume of data, they are also coming to terms with how to understand the incoming data quickly so they can identify opportunity and act in timely and targeted manner. Once the action is complete, the data must then be retained for historical persistence and further business analytics. These "after the fact" insights are then used to refine the real time models and improve immediate outcomes.

This has created the need for data engines that can quickly ingest data, understand opportunity, make decisions to intelligently act, and finally close the loop with refinement of predictive models. To further complicate matters, all those engines must be able to integrate into the larger ecosystem of corporate data and analytics.

To address this changing dynamic, Teradata has assembled the Unified Data Architecture (UDA). The UDA is an integrated set of ingestion tools, data engines, analytic processes, and services to provide the full spectrum of capabilities to your business. As part of that solution, Teradata has partnered with VoltDB to take action as real time opportunities arise from the lot streams.

Teradata UDA—Powerful Analytics

Teradata offers a wide range of analytic capabilities that can provide insights to help refine current, or create new, business processes. These analytics include Teradata's world class data warehouse with extensive in-database

"Analytics are essential to the success of IoT systems. They are arguably the main point of the IoT as they support the decision-making process in operations that are created in business transformation and digital business programs."

– Roy Schulte and Rita Sallam, Gartner, *Three Best Practices for Internet of Things Analytics*, October 23, 2015

analytics as well as more than 150 out-of-the-box analytic functions with Aster's Multi-Genre Advanced Analytics. The UDA also allows for integration of hadoop-based data within Teradata's QueryGrid offerings.

These analytic tools allow a business to understand affinity, paths to outcome, attribution effectiveness, sentiment, and "connect the dots" between the data of the enterprise.
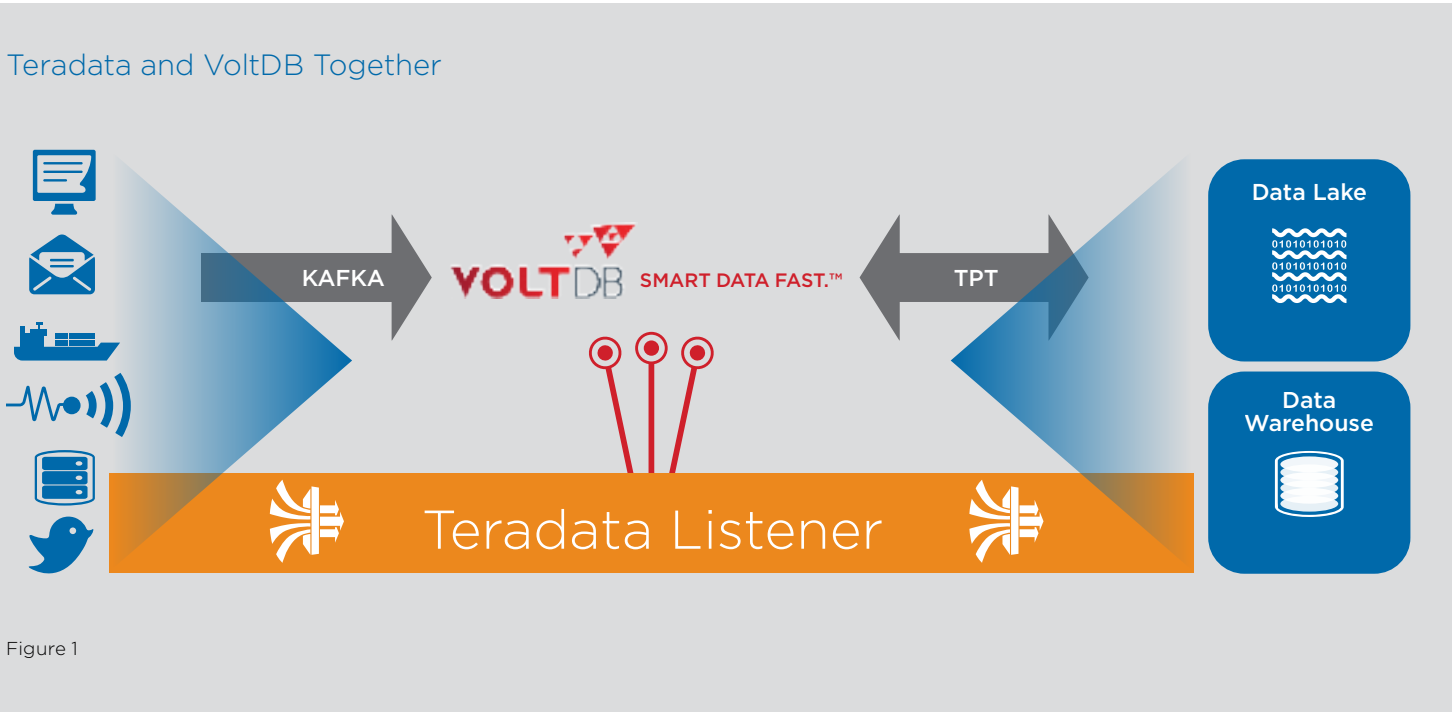
Teradata and VoltDB Together

Figure 1

Once completed, the insights from iterative analysis and predictive models can be fed into VoltDB's in memory process to act on real time opportunities.

VoltDB and Teradata working together

VoltDB is the fast data market leader, enabling applications to make smart decisions in real-time, with millisecond response times and full consistency to increase high-value interaction with customers. Together, VoltDB and Teradata deliver an end-to-end solution that allows for the real time action and enables deep analytics on historical, and corporate wide data.

Currently, VoltDB can work with the traditional Teradata tools sets such as Teradata Parallel Transporter (TPT) for bidirectional movement of data between the various systems. This can be used to either move data from VoltDB for historical persistence, or to feed in data such as reference data, or output from predictive models which are then used in-memory by VoltDB processes.

Another approach to interfacing between VoltDB and Teradata is being developed to leverage the recently released Teradata Listener product. Teradata Listener is an intelligent, self-service software solution for ingesting and distributing fast moving data streams.

The end result of the joint engineering is that the Listener architecture will be able to direct source streams to VoltDB for real time processing. Within VoltDB, data is detected, understood, and acted upon directly. As VoltDB is not intend for long-term data storage, any changes to

operational data, as well as other session and operational records no longer needed for real-time applications in VoltDB, can then be streamed into Teradata Listener for loading into the UDA environment for long term storage, exploration and deep analytics.

Teradata and VoltDB in action together

The use cases for the VoltDB-Teradata partnership are many, from sensor data requiring immediate attention to customer weblog activity signaling retail opportunities or network anomalies indicating issues. One example is to market to customers in the moment, by understanding where they are and what they'll buy.

In such an example, a customer may be part of a loyalty program and has the company's app on their smartphone. As the customer nears the retail location, a geo-fence alert is triggered. This message indicates a real time opportunity. The data is streamed to VoltDB, where the next best offer (NBO) information is stored in memory. By knowing the person, the location, and the opportunity an offer is made in real time. The customer gets a personalized message that is relevant to them in the moment, increasing both the frequency of sales as well as the amount spent each time.

Of course, once the moment has passed, the company wants to understand what offer was made, what was the resulting purchase, update next best offer details, and run many other analytics to improve the next set of events. This is made possible by sending the data into Teradata's

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• Smart Meters • Digital Oil Field • Delivery • Refinement • Wind/Solar Management	• Lights Out Production • Smart Warehouses	• Smart Cities • Waste Management • City Works	• Sowing and Harvesting • Yield Prediction • Plant Disease Diagnostics	• Delivery • Efficiency • Driver Safety • Truck Maintenance	• Insurance Based on Driving • Market Predictions Based on These Other	• Smart Hospitals • Smart Home + Healthcare

Gartner: Internet of Things: The Foundation of the Digital Business, Jan. 6, 2016

UDA environment for persistence, analysis and closing the loop by sending the new NBO details to VoltDB for the next opportunity. Other such examples of IoT driven opportunities are shown in figure 2.

About VoltDB and Teradata Corporation

VoltDB makes business applications smarter and faster while simplifying system architecture. The industry's only purpose-built database for fast data, VoltDB's in-memory operational database is the world's leading platform for building fast data applications on a massively parallel, elastic scale-out architecture that runs on commodity hardware.

Customers use VoltDB to build applications that make immediate, per-event, context-aware decisions with the interactivity of SQL and transactional guarantees. VoltDB transforms mission-critical applications, enabling new levels of features, functionality and performance that deliver superior business value in a wide range of business verticals, including mobile, financial services, IoT, energy, advertising, and security industries.

Teradata is a global leader in analytic data platforms, analytic applications, and consulting services. The Teradata Unified Data Architecture integrates all data for the best insights to help organizations know more about their customers and businesses so they can do more of what's really important.

For more Information

Contact your VoltDB or Teradata representative or visit Teradata.com or VoltDB.com

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