TRACE3

YIELD MANAGEMENT SYSTEM – REDUCING COMPLEXITY AND COST

How Trace3 helped a Fortune 500 semiconductor design and manufacturing company improve quality and yield management

BENEFITS

- Improved decision-making with near real-time monitoring of yield management data

- Strengthened business continuity with high availability and DR for yield management system

- Saving millions of dollars a year in lost yield due to unreported errors

SOLUTION COMPONENTS

- MapR M5 Enterprise 4.0

- DataTorrent RTS 1.0.1

- Cisco UCS Common Platform Architecture for Big Data

- Trace3 Big Data Intelligence Methodology and Services

THE CHALLENGE

Yield Management Systems (YMS) are critical in the semiconductor industry to maximize productivity and minimize defects. This Trace3 client, a Fortune 500 semiconductor design and manufacturing company, relied on a highly customized legacy YMS that parsed individual chip testing reports (generated either internally or by suppliers) for unique data-point analysis, appended several databases with summary information, and updated executive dashboards on manufacturing quality and performance.

The client used NAS storage appliances and Hadoop clusters to store test results, parse the data for processing, perform computational analysis of each file, and offload files for long-term archiving. The workflow contained many unique steps that represented potential failure points, each depending on the previous process to complete before moving to the next. The system used a batch process that ran into the next business day, taking more than eight hours to complete. This time delay could cause production to dip below quality thresholds for several hours, costing the company thousands of dollars due to low-quality semiconductors that could not be sold to customers. This complex architecture also did not allow for high availability (HA) and offered limited disaster recovery (DR) capabilities.

> With Trace3's new architecture design based on generally available individual point solutions, the client can leverage an open-source Hadoop framework architecture combined with closed-source, highly specialized solutions from DataTorrent and MapR to provide high availability and performance for its YMS system 24x7x365.

THE SOLUTION

Following a detailed analysis of the client's long-term needs and a review of current and emerging Big Data technologies, Trace3's Big Data Intelligence (BDI) group architected a high-speed analytical platform to improve the client's yield management process. Trace3's goal was to design the following:

1. Develop a highly available "stretched" Hadoop Architecture allowing ingesting and processing of data in Hadoop in two data centers while simultaneously cross-replicating data to each side

2. Allow for direct ingestion of small files into to the Hadoop ecosystem, eliminating the need for expensive NAS storage

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3. Integrate all existing Java applications and business logic into an in-memory streaming engine for high-speed data processing
4. Update existing databases and dashboards in as close to real-time as possible

Using a combination of the MapR 4.0 Hadoop distribution and its unique MapR File System to natively ingest small and extremely large files directly via NFS, Trace3 was able to provide the client with a robust Hadoop ecosystem that also includes data protection and disaster recovery features such as snapshots, tape archiving, data replication, and data center awareness.

To improve performance, Trace3 installed and configured DataTorrent Big Data Real Time Stream Processing platform for in-memory processing. DataTorrent is a 100% YARN compliant streaming engine, allowing Java-based applications to run natively in YARN containers. This allows the client's existing Java applications to be processed completely in-memory and in parallel, bypassing the latency issues that occurred when writing to a disk subsystem.

With Trace3's new architecture design based on generally available individual point solutions, the client can leverage an open-source Hadoop framework architecture combined with closed-source, highly specialized solutions from DataTorrent and MapR to provide high availability and performance for its YMS system 24x7x365. By moving the YMS system into an in-memory engine, reports are produced as the data is generated instead of batch processed the next business day, and are updated in real-time.

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