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Oracle NoSQL Database and Oracle Relational Database - A Perfect Fit

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Program Agenda

- ***Overview of Oracle NoSQL Database***

- Use Cases – NoSQL and the RDBMS working together

- Integration Scenarios
  - External tables
  - Event processing

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RDBMS vs NoSQL

Rationale for choosing a persistent store

- Relational Architecture
  - High value, high density, complex data
  - Complex data relationships
  - Schema-centric
  - Designed to scale up & out
  - Lots of general purpose features/functionality

- High overhead ($ per operation)

- NoSQL Architecture
  - Low value, low density, simple data
  - Very simple relationships
  - Schema-free, unstructured or semi-structured data
  - Distributed storage and processing
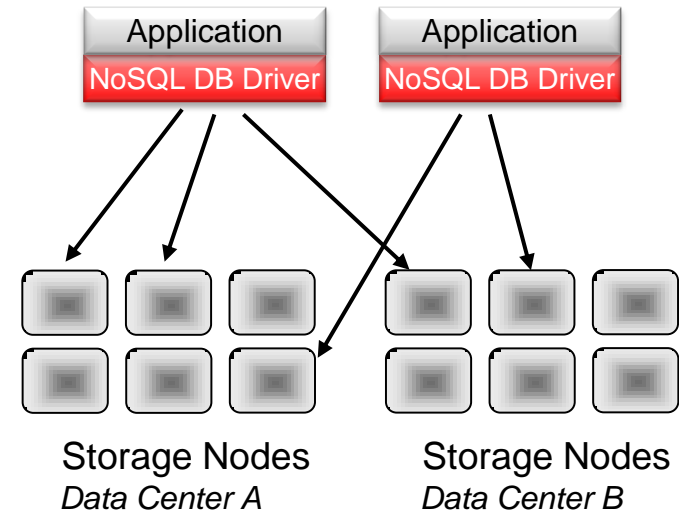 - Stripped down, special purpose data store

- Low overhead ($ per operation)

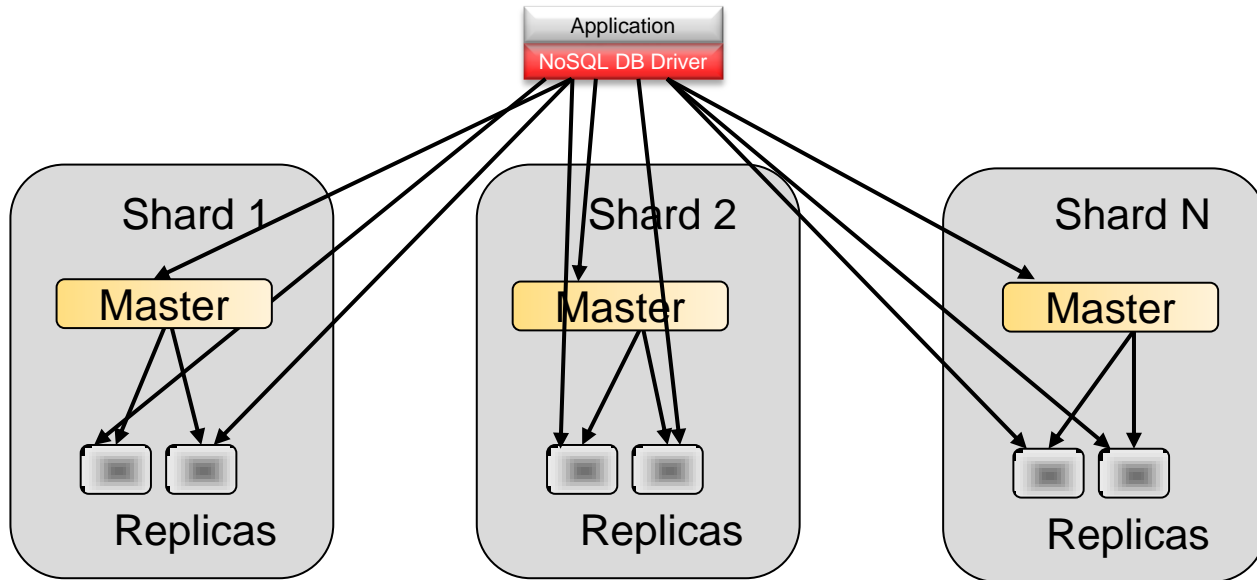ORACLE

What Problems does NoSQL try to Address?

- Cost
    - Lower $ per operation (hardware and RDBMS license fees)
- Scalability
    - Horizontal scale on commodity hardware
- Performance
    - High rate of data capture, high volume of simple queries
- Agility
    - Schema-less data model
- Availability
    - Availability over consistency is the typical tradeoff

Oracle NoSQL – A Distributed Key-Value Database

- Simple Data Model
  - Key-value paradigm
- Scalability
  - Automatic sharding
- High availability
  - No single point of failure
- Transparent load balancing
  - Intelligent driver, topology aware
- Elastic Expansion

Application	Application
NoSQL DB Driver	NoSQL DB Driver

Storage Nodes
Data Center A

Storage Nodes
Data Center B

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Architecture – The Application's Perspective

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Use Case – Online Display Advertising

- **Problem**

  - Very low latency requirements – Publishers require < 75 ms response time from the ad serving platform

  - Extreme data velocity – Multi-millions of requests per second

  - Highly available – 24/7 sites

  - Revenue maximization – Deliver the most relevant ad to maximize revenue

- **Solution – Where to use a NoSQL Database?**

  - Cookie store – NoSQL database used to store cookies and associated behavioral segments

  - Track behavioral data – Beacons utilized during browsing to store timestamp, frequency, and behavioral segments by cookie

  - Optimize ad delivery – Recency, frequency, and behavioral segments used to determine optimal ad to deliver to user

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Use Case – Online Display Advertising Solution Architecture

RDBMS

Hadoop Cluster

Ad Server

Multi Dimensional Reporting

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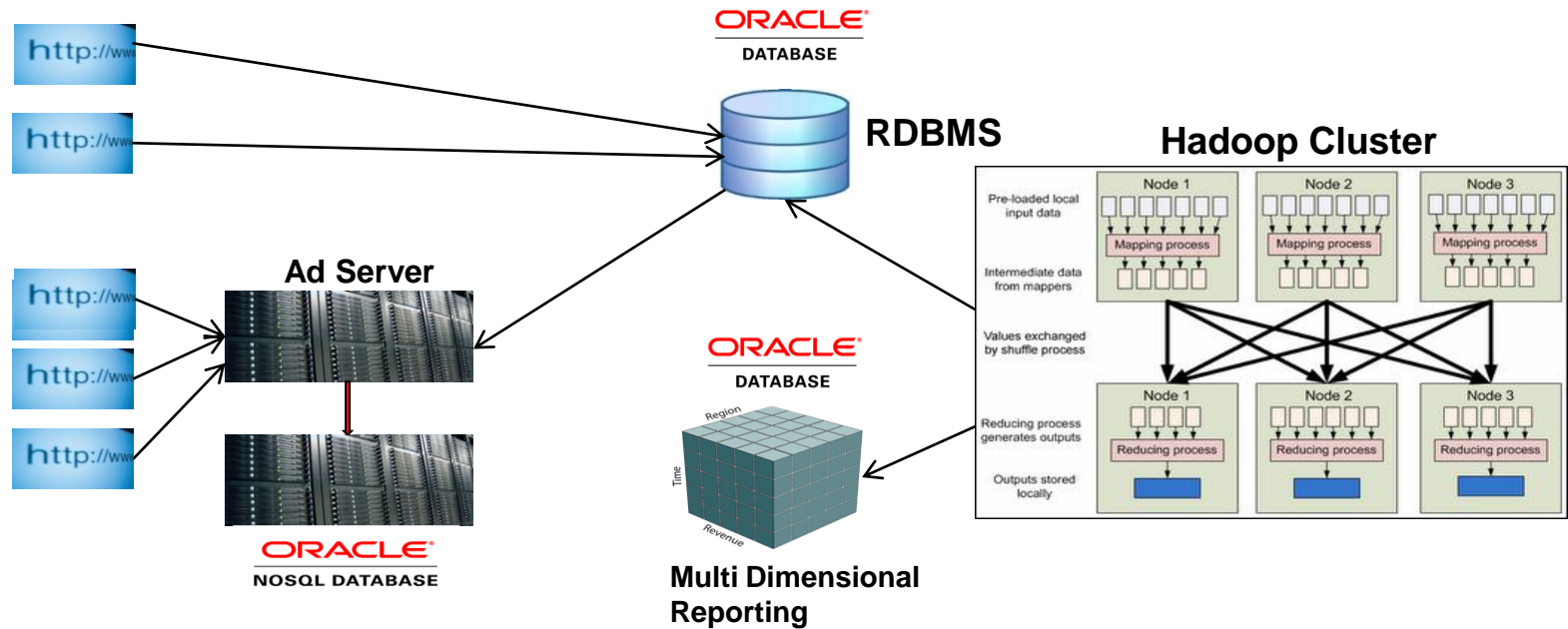
Online Display Advertising – Database Usage Characteristics

- **NoSQL Database**

  - ✓ Scale - Millions of ad serving requests per second

  - ✓ Stringent latency requirements from publishers

  - ✓ Loose consistency

  - ✓ Cookie data used for ad targeting – Increase probability of click on ad

- **Relational Database**

  - ✓ Campaign booking information

  - ✓ Real time business metrics for publishers and advertisers

  - ✓ Business financials for ad serving provider

    - • Year to date revenue, quarter over quarter etc.

    - • Billing

    - • SOX reporting for public providers

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Use Case – Online Social Gaming

- **Problem**
  - Very low latency requirements – Player movement must feel like a real time operation, while being tracked on the server
  - Extreme data velocity – Popular games, large scale user base (Farmville boasts 80 million active users)
  - Highly available – 24/7 sites
  - Write heavy workloads

- **Solution – Where to use a NoSQL Database?**
  - Player interaction data store – Database to track player movement and game interaction
  - Game play statistics – Per player usage statistics
  - Persistent chat store – For games that allow player communication via chat, the NoSQL database is used as a persistent message store (auditing and COPA compliance)

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Use Case – Online Social Gaming Solution Architecture

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DATABASE

RDBMS

Hadoop Cluster

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NOSQL DATABASE

Weblog Processing

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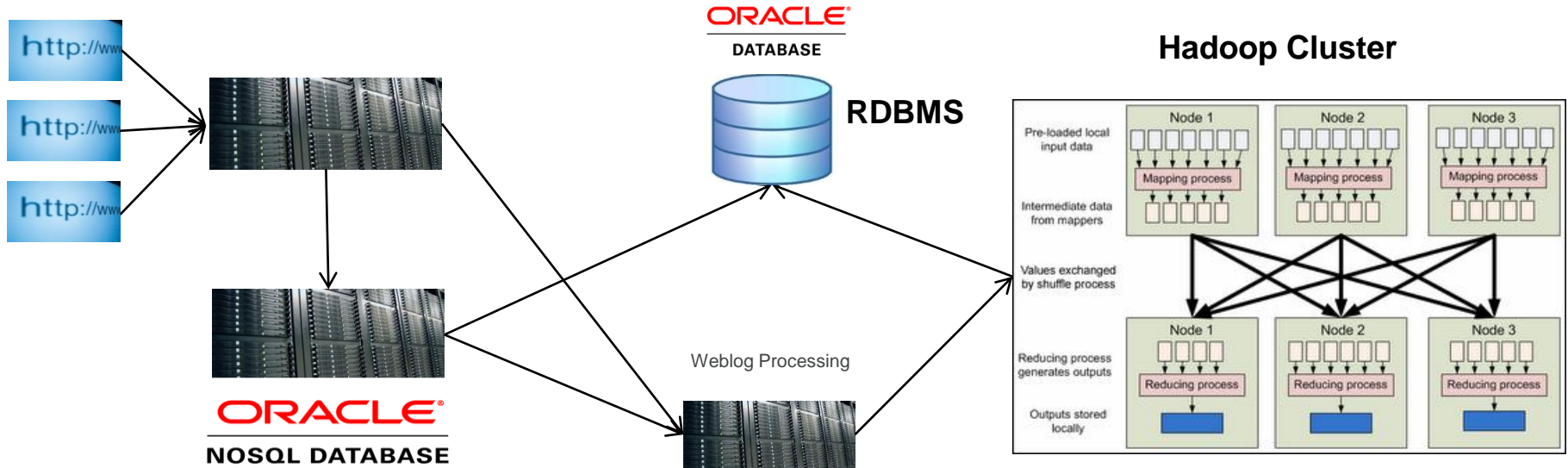
Online Social Gaming – Database Usage Characteristics

- **NoSQL Database**

  - ➤ Low latency, high volume

    - Potentially very large numbers of requests per second

    - Game play actions must be perceived as "real time" by players

  - ➤ Loose consistency for some interactions

    - Player proximity for discovery

  - ➤ ACID transactions

    - "In-game" micro transactions

- **Relational Database**

  - ➤ Business financials

    - Subscription billing and payment processing

    - Year to date revenue, quarter over quarter etc.

    - SOX reporting for public companies

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NoSQL and Oracle External Tables - How it Works

- **External Table DDL**
  - Standard Oracle External Table DDL
  - Each location file denotes a "degree of parallelism"
  - Location file contains connectivity and key range parameters for NoSQL Database and are created by the publish utility
- **Publish**
  - Utility program shipping with NoSQL Database
  - Figures out how to parallelize access to the data and writes location files
- **Pre-processor**
  - nosql_stream – Preprocessor shipping with NoSQL Database
  - Invoked by Oracle RDBMS during read from external table
  - Parallelizes the read across shards, optionally invokes formatter class
- **Formatter**
  - User supplied class for transforming NoSQL record into SQL Loader format

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NoSQL and Oracle External Tables – Use Case

Online Social Gaming

- Micro-transactions – In-game purchases
  - Low latency, potentially high velocity
  - Stored in Oracle NoSQL database using ACID parameters

- Player subscriptions stored in Oracle RDBMS
  - Master data for all players
  - Payment processing

- Micro-transaction data via Oracle External Tables
  - How did the transaction business do in the last 6 weeks?
  - What geography's are performing better than others?
  - What product lines are bringing in the most revenue?

NoSQL and Oracle Event Processing - How it Works

- Configure connectivity to NoSQL Database
  - NoSQL Database cartridge for OEP (distributed as a library)
  - Configured in OEP epn.xml file
  - NoSQL store element describes mapping of NoSQL values to Java classes
  - Link the NoSQL store with OEP's CQL by declaring a table source
- Access NoSQL data in CQL query
  - NoSQL Database key used for query predicate
  - Attributes from de-serialized value used for query projection

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NoSQL and Oracle Event Processing – Use Case

Centralized Building Energy Management

- Large commercial real estate holding company
  - Hundreds of commercial buildings under management
  - Optimize energy consumption via sensors and centralized management

- Sensor event processing
  - Temperature readings every fifteen minutes by floor (~1,000,000 events per day)
  - Stored in NoSQL database indexed by building ID
  - For each event
    - Trailing average temp by time-of-day read by building
    - OEP rules utilized for sending signal to building based on outliers

Hardware and Software

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