Customer Driven Database Design

2 Trillion Rows of DNS Query Volume

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Quick Agenda

1. Who is Oracle Dyn
2. The Problem
3. Solutions Evaluated and Benchmarks
4. Deployed Solution Architecture
5. Benefits and Next Steps
Dyn Strengthens Oracle Cloud Infrastructure

Mission | Create the World’s Most Capable Enterprise Cloud Infrastructure from Edge to Core

- Expectation [High quality experience]
- Users [Customers, Partners, Employees, Things]
- IT [DevOps, Administrators, Architects]

The Next Generation Cloud
Trusted by Over 3,500 Customers, Including Some of the Most Preeminent Digital Brands

Over 40 Billion DNS Queries Per Day
Over 214 Billion data points - powering analytics and steering decisions

Visit dyn.com/OOW17 for more information and downloads.
Visit our product experts in the Oracle Cloud Infrastructure expo
The Problem – High-Scale Billing, Reporting & Analytics

• Globally Distributed Name servers answering DNS Queries
  – Fully attributed with ASN, GEO-ID, Country Code

• Data Volume Generated:
  – Estimated at 2 Trillion Rows for 90 days of query data
  – Raw data of 1.6 TB/day working out to over 144 TB across 90 days

• Query Latency Measured across Multiple Systems:
  – UI
    • Splash page queries < 5s
    • Detailed investigation queries <20s
  – API
    • Single customer queries <20s
    • Multiple customer queries (billing/metering) <1min
## Solutions Evaluated

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<th>Solutions</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Amazon Redshift</td>
<td>Good Performance and Ingest speed</td>
<td>Limited expertise at Dyn</td>
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<tr>
<td>Amazon EMR</td>
<td>Complex query support</td>
<td>Unable to support complex queries, forcing application to implement complex query processing logic</td>
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<td>Druid</td>
<td>Superior Ingest speeds</td>
<td>Performance and Storage limited to Single Database</td>
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- Complex system design
- Data loads could not keep up with incoming data volume
- Queries were unacceptably slow
- Could ingest and index at scale
- Required large shared storage
- Difficulties running multiple GROUP BY queries
- Good Performance and Ingest speeds
- Complex query support
- Performance and Storage limited to Single Database
- Superior Ingest speeds
- Scale queries by distributing across as many servers as needed (up to 1000)
- Near limitless TB of storage by adding more Shards (up to 1000)
Evaluation Results

• Loading from S3 to Redshift
  – 3 to 4 minutes

• Loading from Oracle Object Storage to Shards
  – 500k rows / second
  – Full load in 1 minute
  – 4 minutes of headroom for queries
Deployed Solution

Oracle Sharded Database

• Proven linear scalability
• Ingest speeds scale with number of shards
• Constant query time even as we grew size of dataset
• Geo-distributed to be close to our customers

Shards are replicated across 2 different Availability Domains for availability and disaster recovery

Utilized powerful Bare Metal Cloud servers (36 OCPUs, 512 GB memory, 12.8 TB local NVMe SSD storage)
High Speed Data Load

- Utilized fully parallel direct-to-shard data loader
- Sharded architecture scales the CPU, flash, and network interfaces
- Can add shards as needed to accommodate higher ingest rates
- Architecture applies to IIoT, IoT and edge compute scenarios
Testing the User Interface

- Basic query time < 2 seconds
  - Total requests over period of time
- Complex query time <20 seconds
  - Requests by geography, operator, recursive over period of time
Wrap Up

• Oracle Sharding Allows Dyn to...
  – Deliver fast, real-time analytics to our customers, billing and analytics systems
  – Dynamically scale our computing infrastructure to handle ever-growing ingest rates, while keeping query times constant even though the data volume grows
  – Easily support geographic data distribution so that we can keep data closer to our customers
  – Collect more data per customer, so that we can make better traffic steering decisions and provide more value to customers
  – Create our data lake for analytics – including recursive, RUM, synthetic, remote access, CDN and WAF data sets

• Oracle Dyn DNS and Email services officially launch at OOW – leveraging the sharded DB