



Management & Monitoring

Technical Deep Dive on Observability and Management



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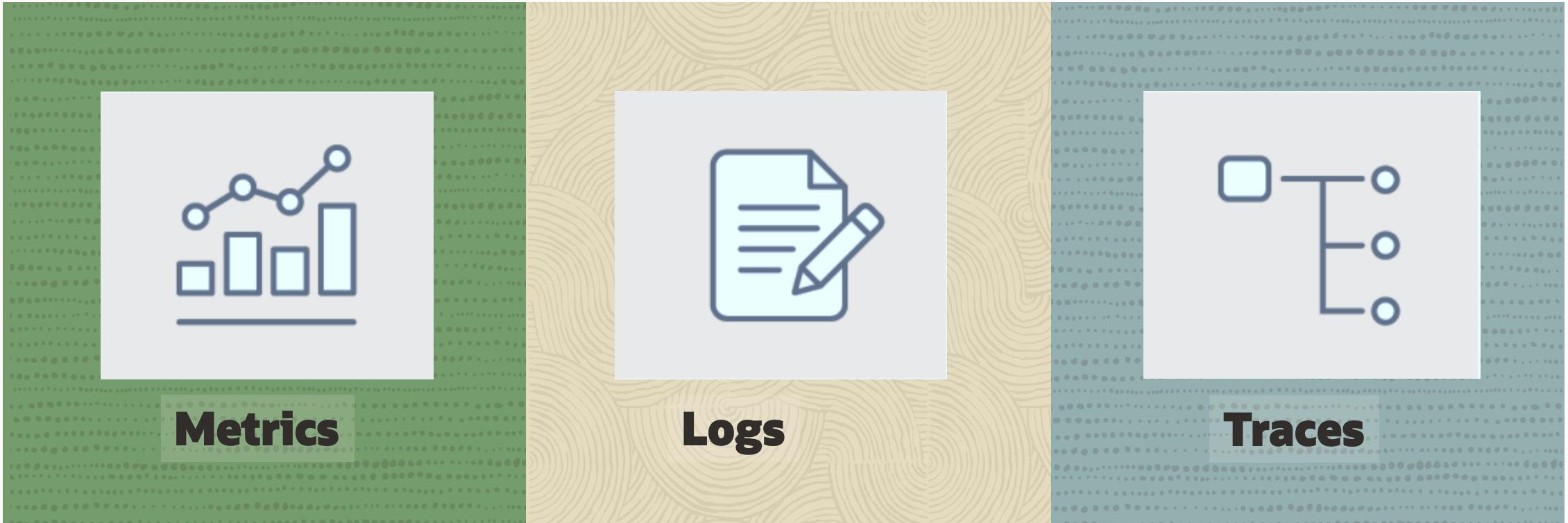


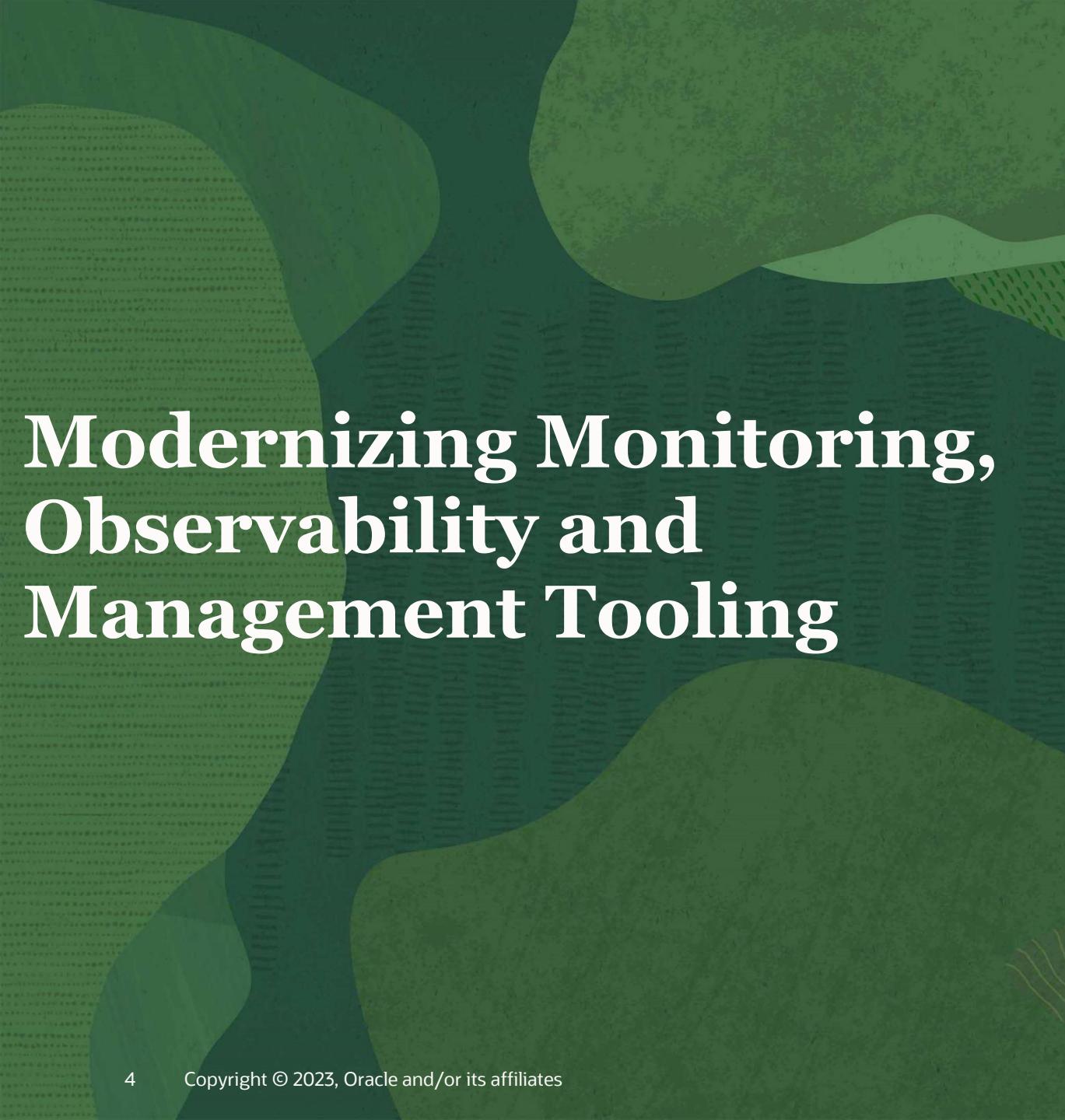
Cloud Architect | Oracle Latin America

Outline

- 3 Pillars
- Challenges
- Key use cases & Oracle Solutions
- Resources and Next Steps

The three pillars of observability





Modernizing Monitoring, Observability and Management Tooling

Prior Generation Methods and Tools

Existing tools don't work, were not designed to support cloud, hybrid and multi-cloud management workloads

No Insight

New types of telemetry data and greater amounts of it have made it impossible for humans to analyze or gain insight from it using existing tools, so they miss critical information

This has led to a need for a new generation of systems management utilizing AI and Machine Learning technology that go with the modern apps

Main Aspects of Modernization

Feature	Benefit	Challenge
Availability / Resiliency	Apps gracefully survive the failure of individual VMs, servers, data centers, & networking	High availability often requires specialized clustering and networking
Performance	Always fast	High performance requires dedicated resources and predictable low latency
Scalability	Scale out and in automatically	Stateful apps aren't designed to scale out
Management	<i>Infrastructure as Code:</i> new deployments in minutes vs. weeks <i>Agile development:</i> user experience or functionality updated frequently	Infrastructure isn't fully API enabled, applications are monolithic
Security	Best practice security by default Easy for anyone to run apps at a high security posture	Security is still highly manual and susceptible to human errors

Modern Observability and Management Solutions

Adherence to service levels, fast diagnosis, and rapid resolution

Rapid response to application issues that impact productivity, and revenues of a company

Offense

Improved quality of service for hundreds of databases with no increase in IT staff

Efficiency

Quick resolutions for “slowness”, degradation in customer experience/performance

Defense

Key Use Cases to Boost Your Observability and Management

Gain end to end application observability

- Solution: Application Performance Monitoring

Oracle Database hybrid cloud and multi-cloud management

- Solution: Database Management

Analytics insights

- Solution: Operations Insights

Simplify ITOps: Monitor Health, Faster Troubleshooting & Alarms

- Solution: Monitoring & Notifications



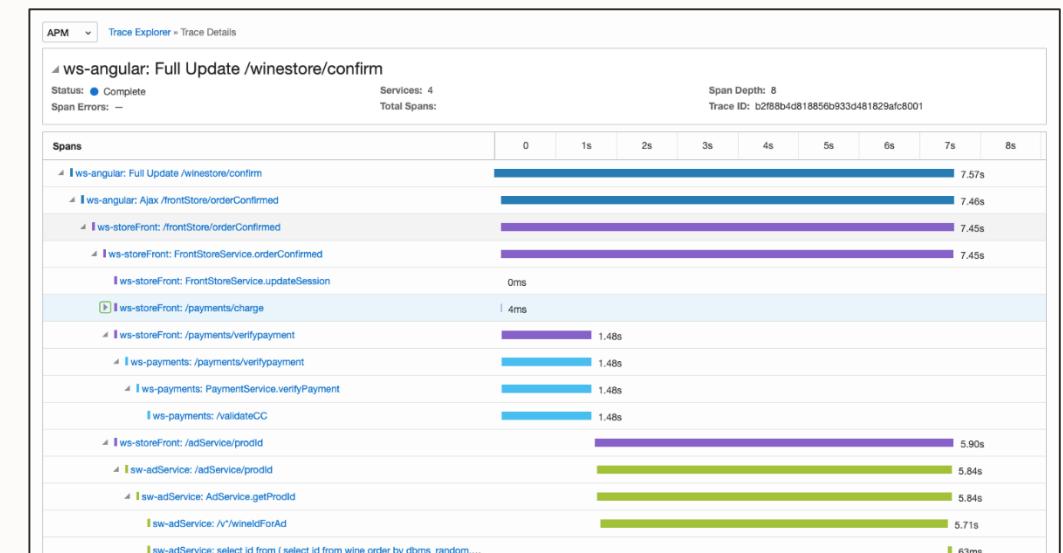
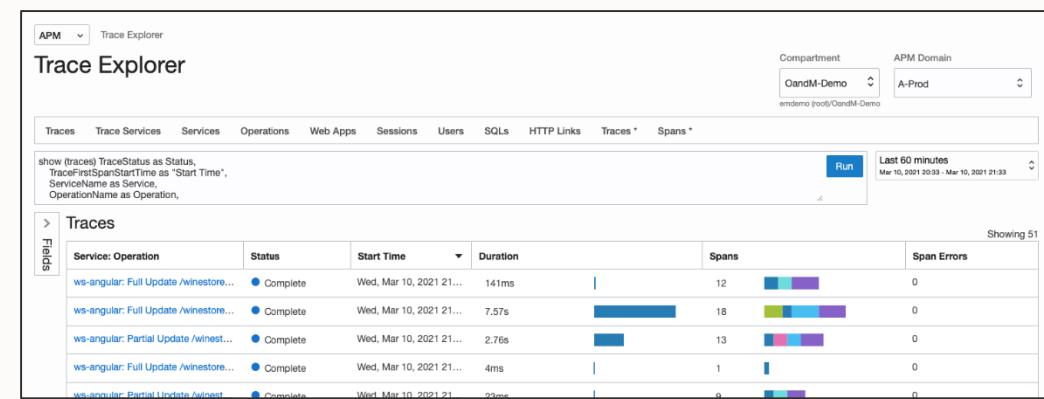
Gain end to end application observability

Full-stack hybrid, multi-cloud monitoring of Oracle and non-Oracle technology



End-to-End Transaction Tracing and Service Diagnostics

- Capture all steps (spans) of all transactions (traces) all the time
- Trace sync and async transactions, from browser to database
- Accept and store 100% of the traces
- Long term data retention for diagnostics, comparison, and analytics
- Explore and analyze trace data using an intuitive, strong query-language based UI
- Pre-defined and customizable tagging (dimension) for rich, meaningful, segmentation
- Service topology discovery and visualization
- Dedicated, customizable views for different consumers (SRE, ops, dev, business, etc.)
- Alerts, notification and automation



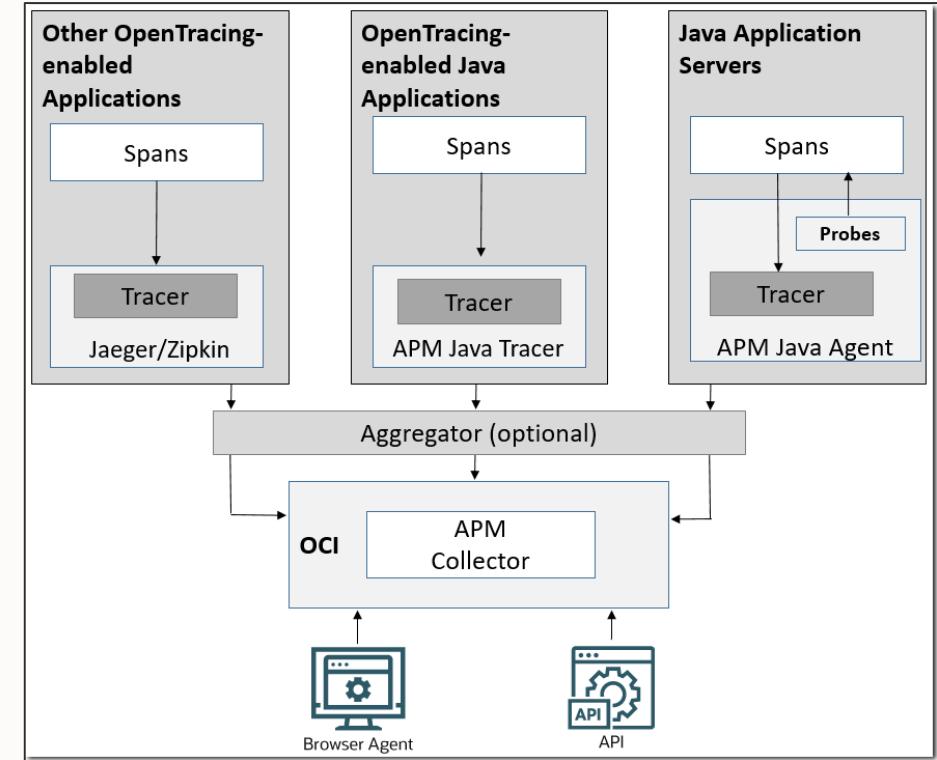
End-to-End Coverage – Monitor Browsers, Microservices and Functions

Distributed Tracing

- OpenTracing/OpenTelemetry support
- Automatic instrumentation for Java
- Automatic instrumentation on the browser
- Oracle Cloud Function tracing
- CI/CD integration

Metrics

- JVM and AppServer metrics
- Prometheus like metric collector
- Pre-configured and customizable metric calculated on in-stream span data
- Apdex value for any operation



Real User Monitoring

Browser agent via JavaScript

- Manually inserted to the application or via APM server agent

Generate and send spans directly to the APM collector for each:

- Page load
- Page updates
- Ajax calls

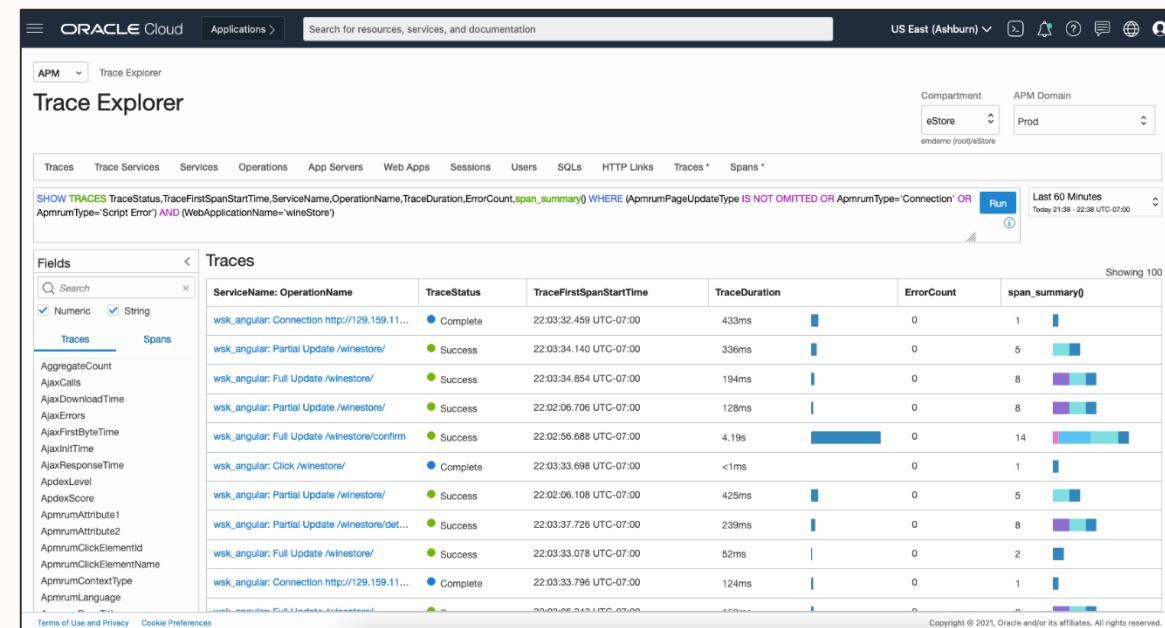
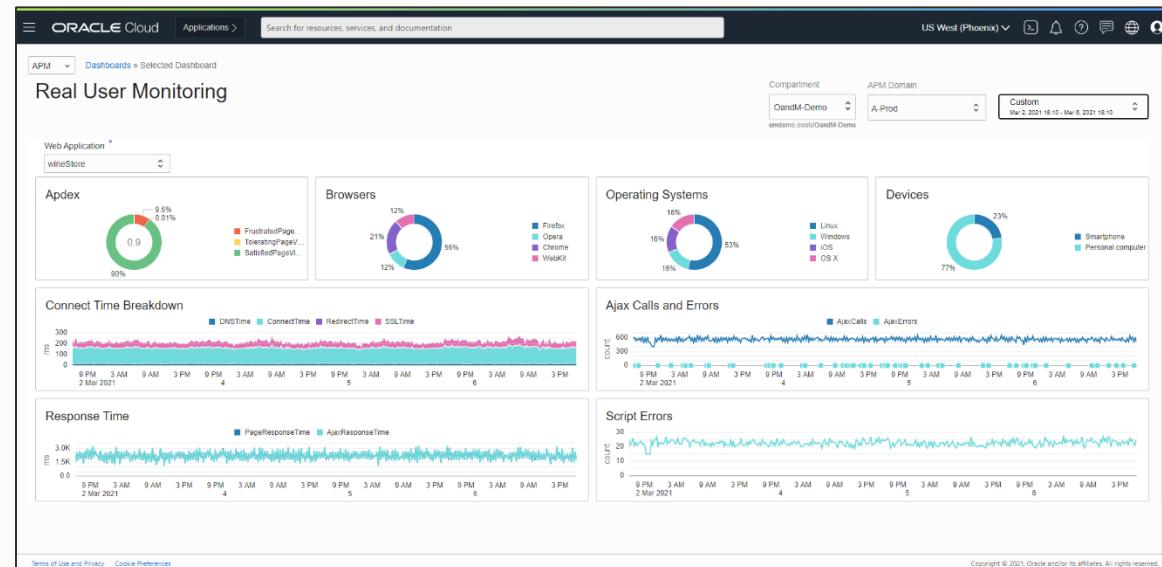
Metrics per span

- Load time, time to first byte, errors, size, etc.

Session Diagnostics (single user session reporting)

Include dimensions collected from the browser

- Device type
- Browser type and version
- IP address (location/ISP)
- Metrics are available in the monitoring service UI
- Visualize, set and manage alerts
- Metrics are available in RUM dashboard



Synthetic Monitoring

Capability to run scheduled Monitors

- Scripted Browser Monitor (Selenium test scripts)
- Browser Monitor
- Scripted REST Monitor (Postman scripts)
- REST Monitor
- Collect and retrieve HAR file & Screenshots

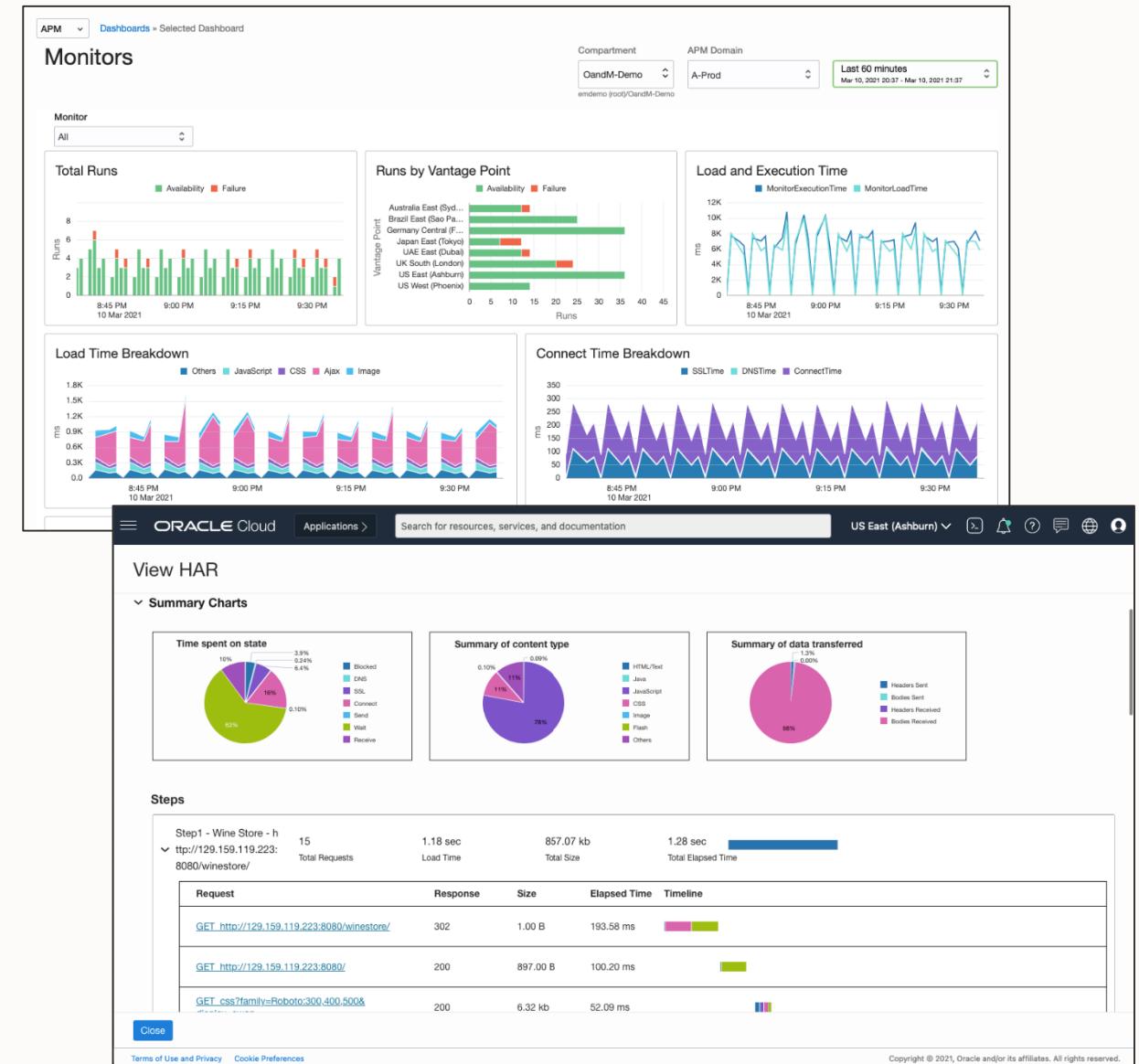
Oracle hosted Vantage Points (to execute Monitors)

Combined with server-side tracing

- The actions of each Monitor run are connected to the back-end trace, span collection

Metric collected for each Monitor run

- Load time, time to first byte, errors, size, etc.
- Metrics are available in the monitoring service UI
 - Visualize, Set and manage alerts
- Metrics are available in Monitor dashboard



Oracle Database Hybrid Cloud and Multi-cloud Management

Administer databases seamlessly across cloud boundaries offering single pane-of-glass for monitoring and management



Oracle Cloud Infrastructure Database Management Service

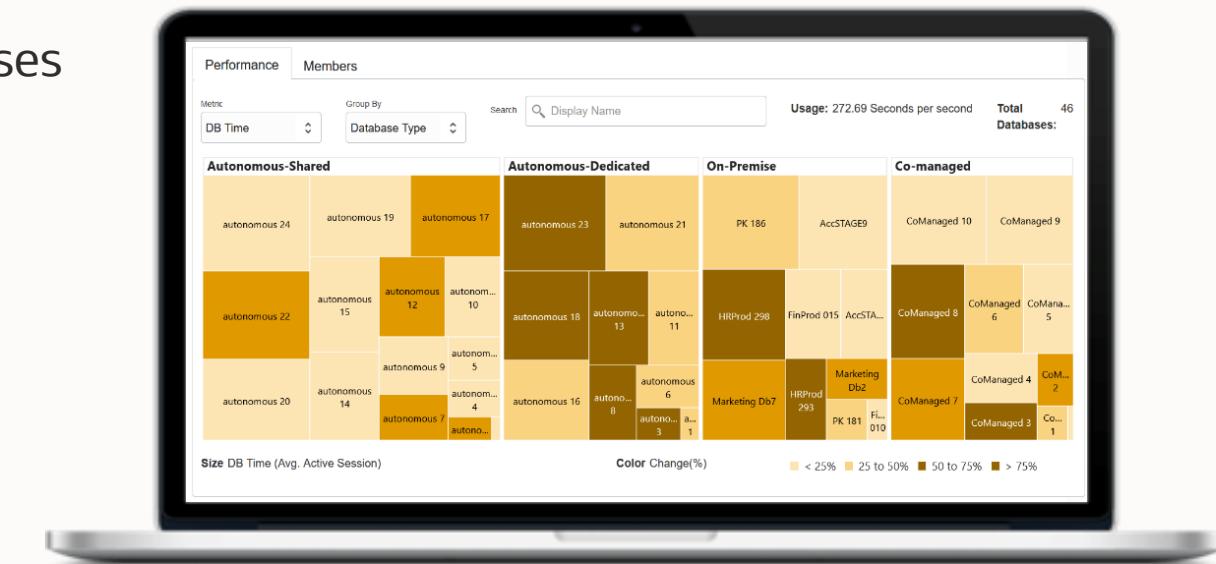
Market-leading database management solution now available as a fully managed service

Industry leader for database performance diagnostics

- Combines superior back-end instrumentation and tools with visualization-driven interfaces
- Single pane of glass management view for databases

Cloud native

- Fully managed by Oracle: upgrades, patching, etc.
- True cloud elasticity, low operations cost
- Connects to on-premises, any Oracle 11.2.0.4+



Key use cases

- Fleet monitoring and management
- Real-time performance diagnostics and administration
- Databases deployed on multi-cloud or on-premises

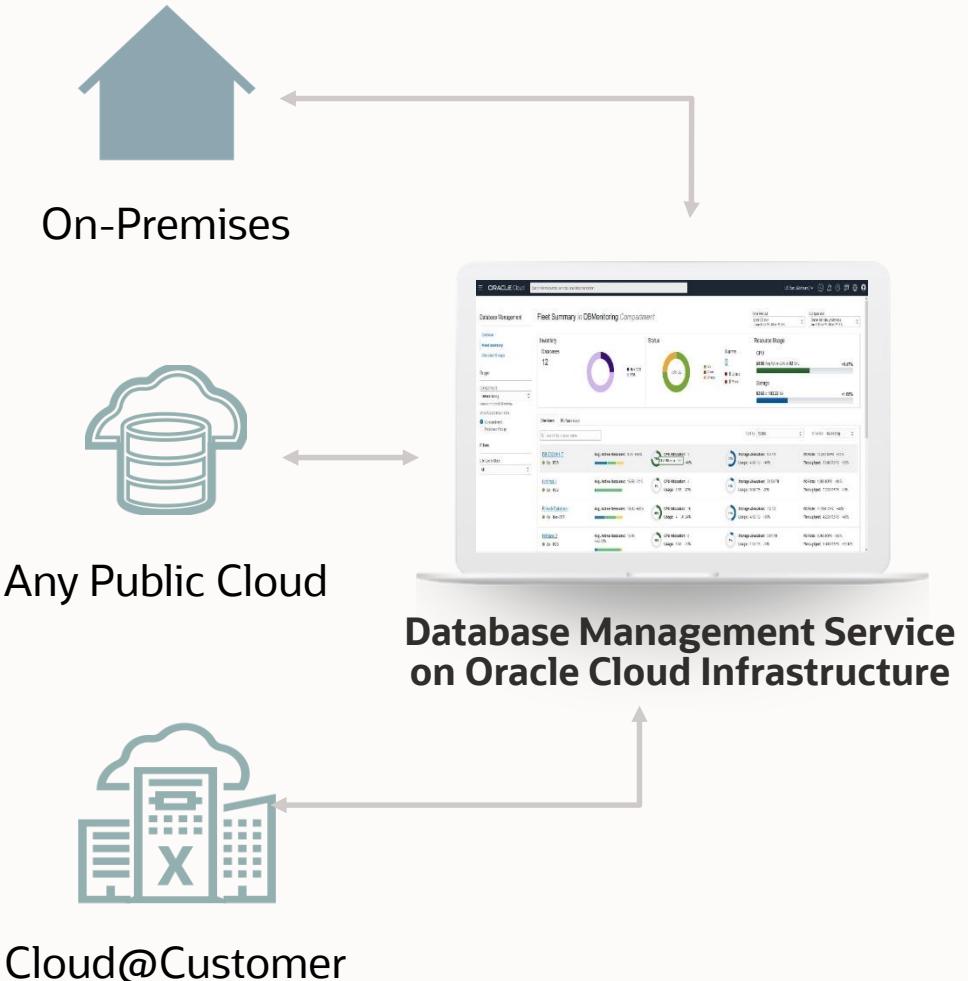
Manage Oracle Database Everywhere - Database Management Service

Single unified console for fleet monitoring and management

- Simple to adopt and use - fully managed service
- Fleet-wide administration for highest operational efficiency

Advanced database diagnostics and tuning

- Full database lifecycle management
- Quickly troubleshoot issues
- Optimize SQL with real-time SQL monitoring
- Optimize database performance



Database Management Features

Fleet monitoring and management

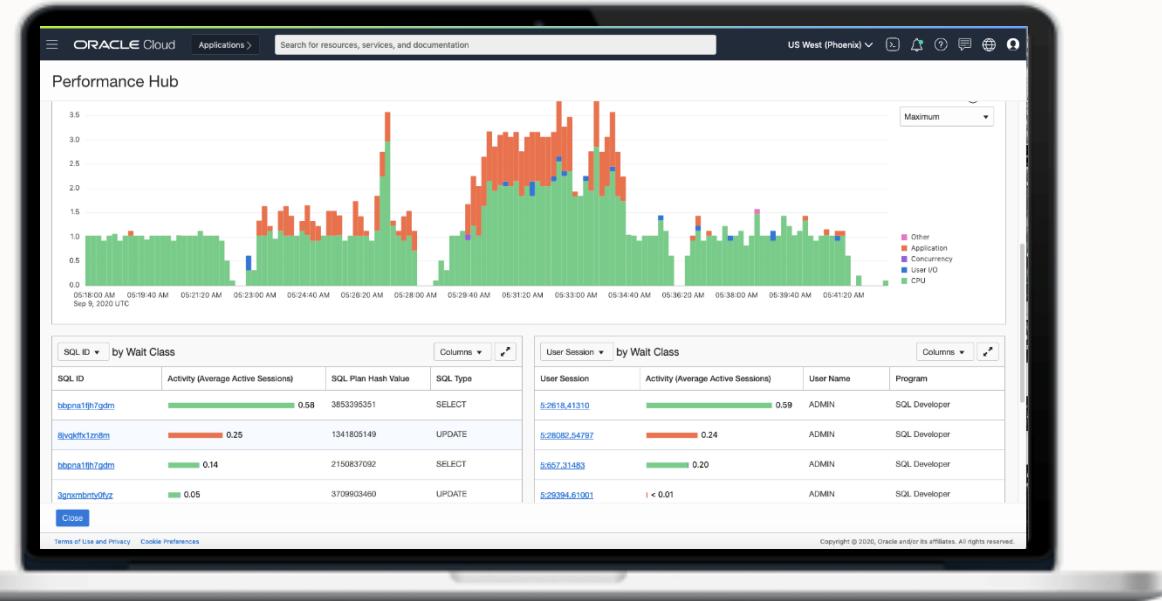
- Unified view for monitoring and managing Oracle Database fleet across on-premises and cloud

Performance diagnostics

- Integrated view of database activity for easy performance diagnostics
- Includes ASH Analytics, SQL / Session details, blocking sessions and metrics exploration, etc.
- Advanced execution plan analysis for monitoring and optimization

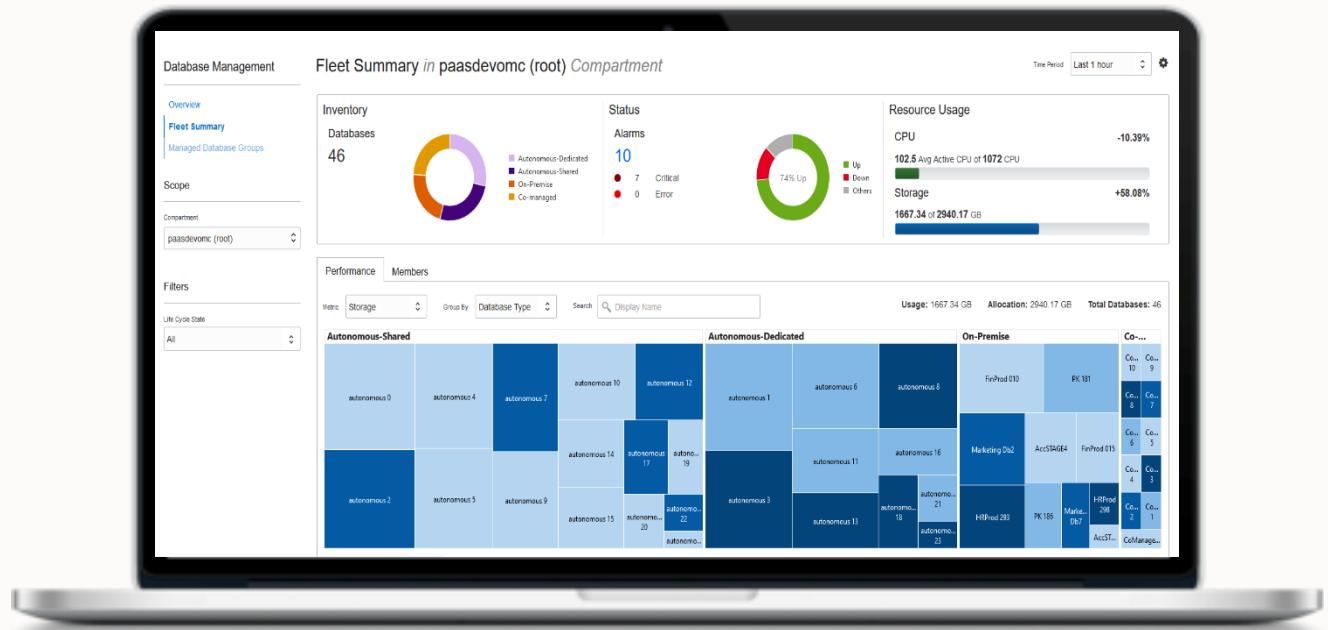
Database administration

- Tablespace management, database parameter configuration, user management and backup management, etc.



Fleet Monitoring and Management

- Unified NOC-style view of entire Oracle Database fleet (in-cloud and on-premises)
- Native OCI telemetry for DevOps events and monitoring
- Fleet-level management
 - SQL job execution
- Database Groups enable cross-compartment fleets



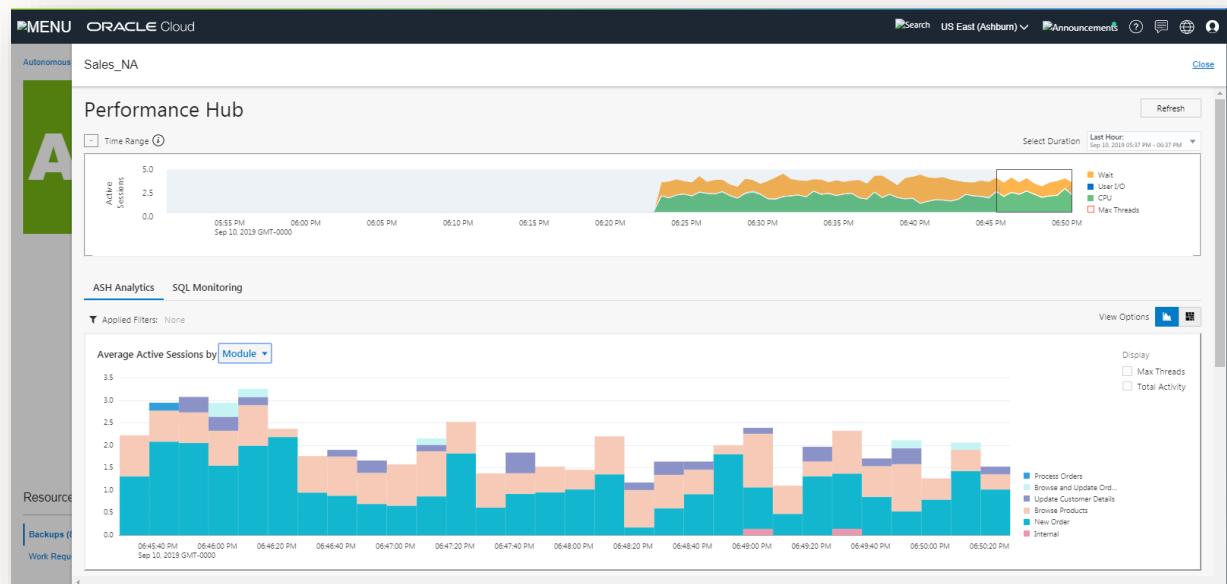
Performance Hub

Integrated system-wide and session-specific views of database activity

- ASH Analytics
- SQL Details
- Blocking Sessions
- Guided problem resolution

Single view of database performance

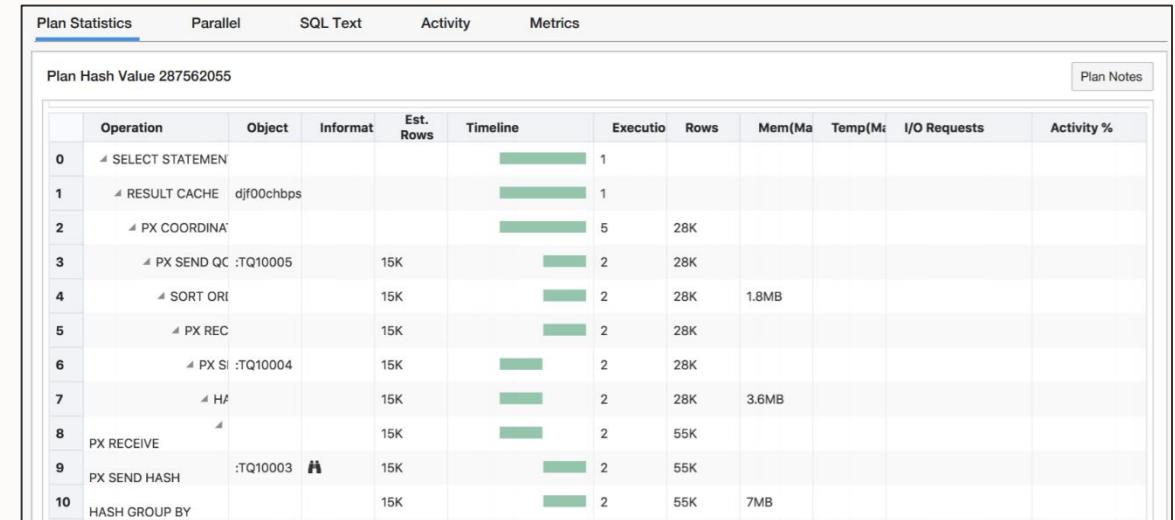
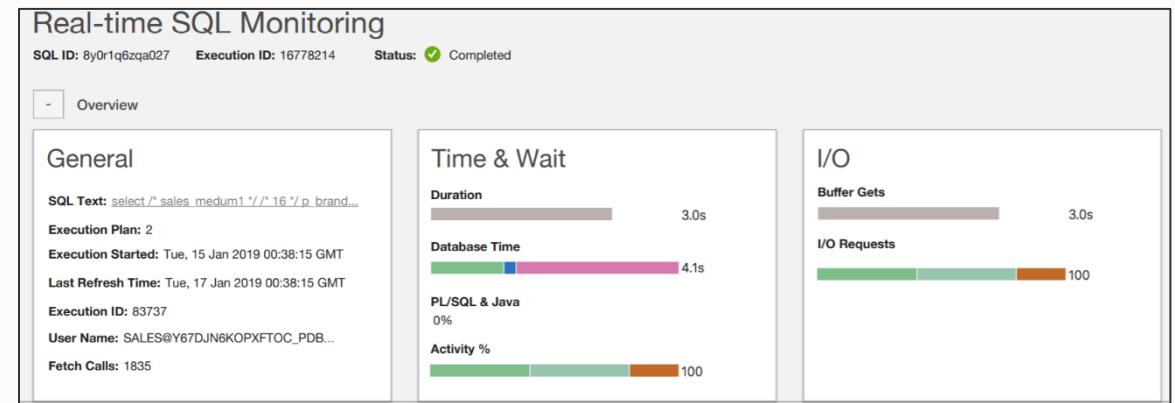
- ADDM, Real-Time SQL Monitoring, ASH Analytics
- Switch between ASH analytics, workload view, ADDM findings and SQL monitoring seamlessly
- Supports both real-time & historical mode
- Historical view of SQL Monitoring reports



Real-time SQL Monitoring

In-depth application performance analysis

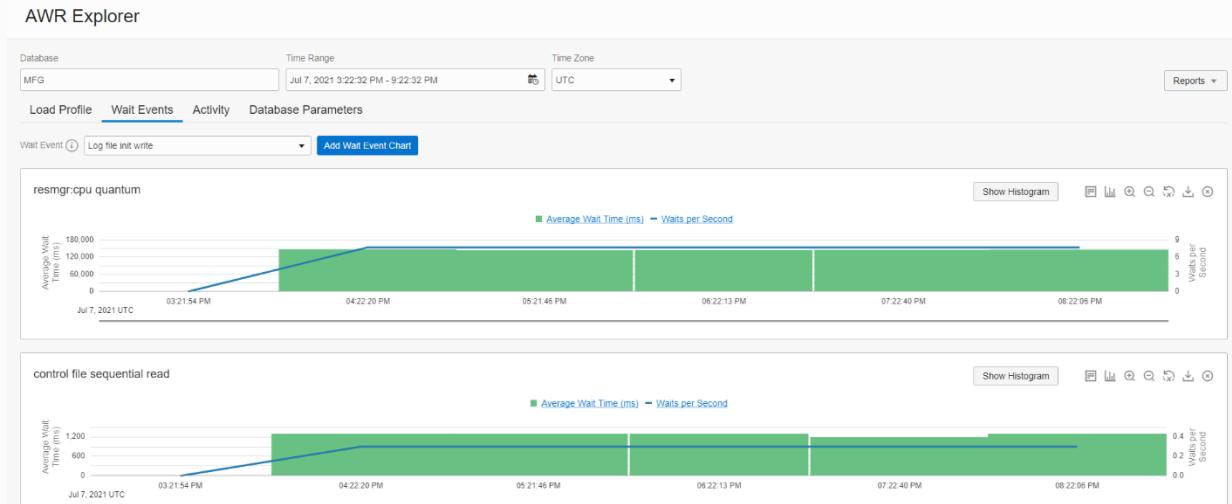
- Identifies poorly written and designed SQL statements
- Identify and guide optimization of application calls in the data tier
- Captures fine-grained SQL statistics at each step of the execution plan
- Interactive visualization
- Analyze current and historical SQL statements



AWR Explorer

Explore AWR data for advanced diagnostics

- Advanced performance analysis tool for Expert DBA's
- Provides different aspects of Oracle Database performance data which is very helpful in issue detection
- Visualize performance trends easily without needing to toggle between hourly AWR reports
- Generate AWR report, ASH report, Perfhub report, SQL report, etc.



AWR Explorer is **available only** on Oracle Cloud Infrastructure Database Management Service

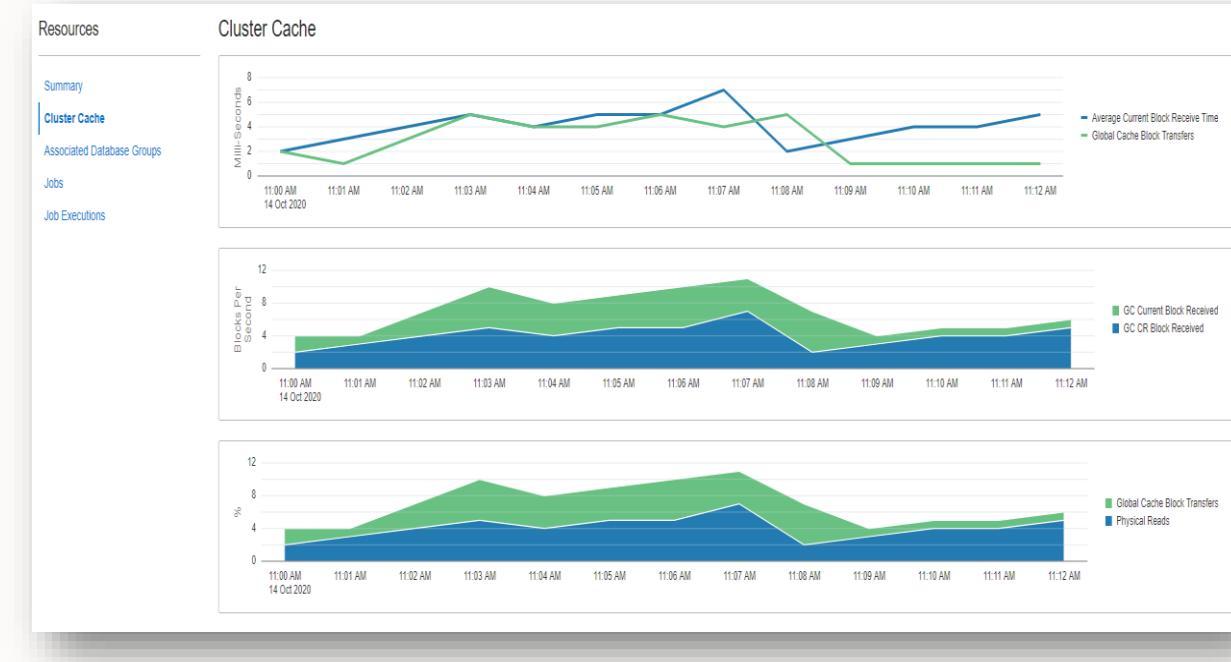
Oracle RAC Monitoring

RAC-Aware fleet dashboard

- Identify databases contending for CPU and memory

RAC-centric Database Summary page

- Database instance specific details
 - DB Time and Average Active Sessions
 - IO Throughput and Bandwidth
 - Memory Components
- Cluster Cache
 - Monitor the interconnect traffic and RAC cluster wait events



Database Administration

Basic administration

- Database parameters

Manage database storage

- Tablespaces and data files

Job Executions

- Activity log tracks database jobs

The screenshot displays two main sections of the Oracle Database Management interface.

Managed Database Groups: This section shows a "Demo Group" with a large blue circular icon containing the letters "MDG". It includes details such as:

- Description: Created From UI
- OCID: ...2557la
- Compartment: dbanalytics
- Compartment Id: ...pmfs2a
- Created: 2020-08-28T16:05:33.316Z
- Last Updated: 2020-08-28T17:14:48.152Z

Database Parameters: This section shows a table of current parameter values:

Name	Value	Comment	Dynamic	Type	Description
approx_for_aggregation	FALSE		✓	Boolean	Replace exact aggregation with approximate aggregation
approx_for_count_distinct	FALSE		✓	Boolean	Replace count distinct with approx_count_distinct
approx_for_percentile	none		✓	String	Replace percentile_* with approx_percentile
awr_pdb_autoflush_enabled	TRUE		✓	Boolean	Enable/Disable AWR automatic PDB flushing
cursor_sharing	none		✓	String	cursor sharing mode
ddl_lock_timeout	0		✓	Integer	timeout to restrict the time that ddls wait for dml lock

Analytics Insights

DevOps Insights - Empower better quality of service



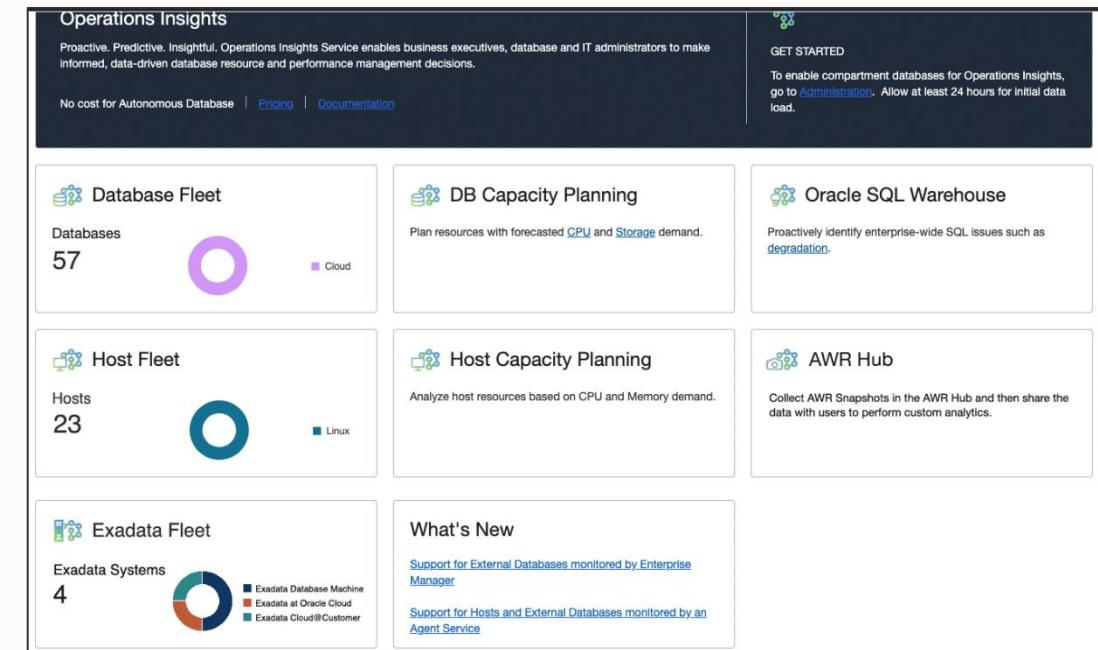
Oracle Cloud Infrastructure Operations Insights Service: Overview

Operational Warehouse

- Stores various types of telemetry data from Oracle databases, Enterprise Manager, AWR for long term
- Combines with machine learning for powerful analytics

Automated Insights

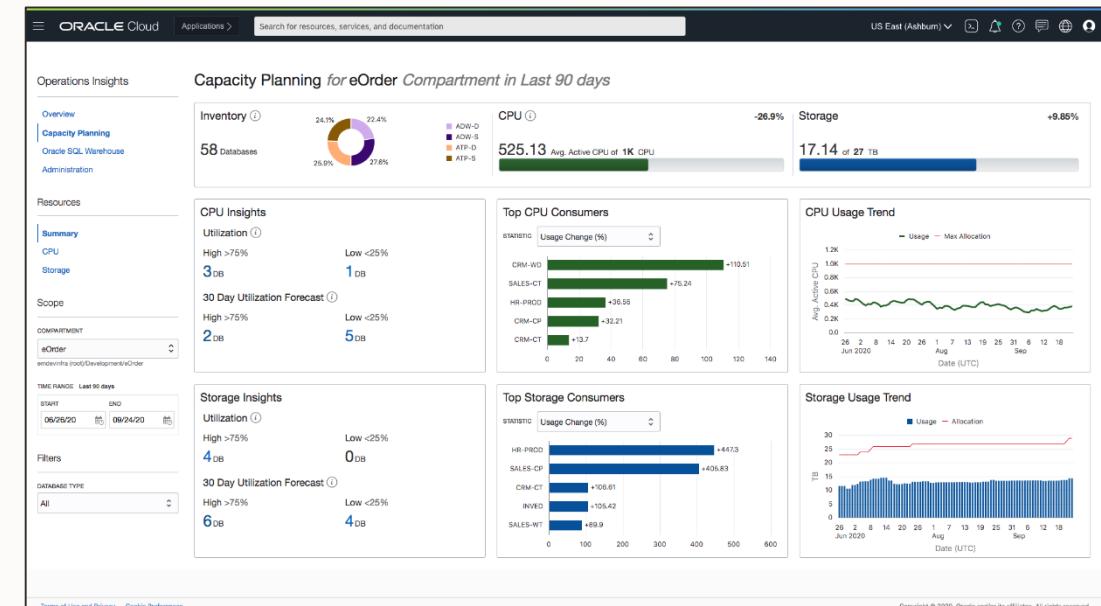
- Using operational and predictive analytics such as linear regression, trending, correlation helps to maximize performance, optimize resource utilization, increase uptime, predict capacity requirements
- Reduces the cost of operations



Oracle Cloud Infrastructure Operations Insights Service: Key Capabilities

Database and host capacity planning

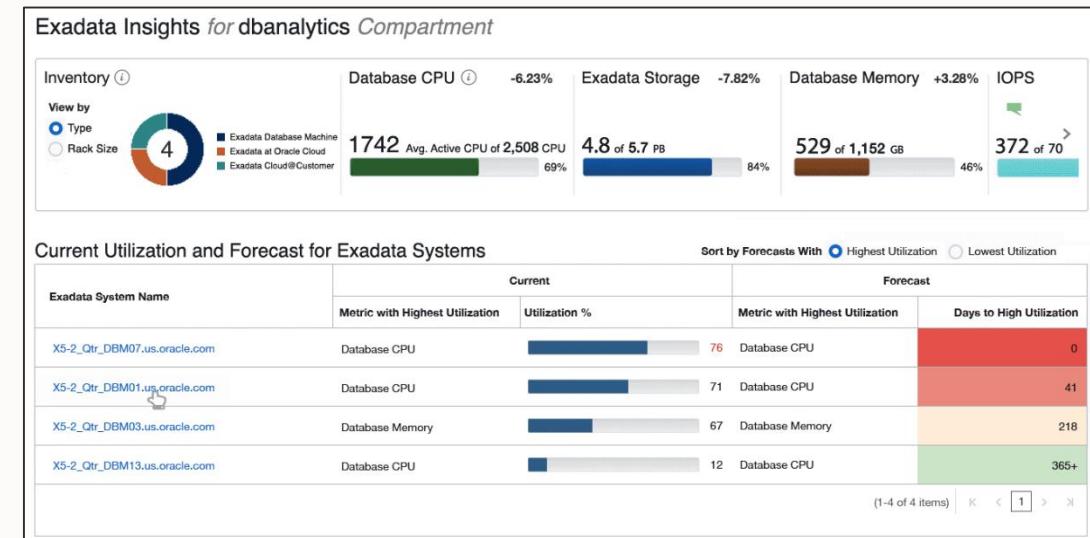
- Trend and forecast database resource demand using up to 25 months historical data for Oracle Autonomous, external on-premises databases and hosts
- Linear and machine learning forecast models
- Automated daily forecasting predicts near-term (30-90 day) capacity utilization issues
- Quickly isolate the largest, most utilized, and fastest growing databases
- Identify under-utilized servers for repurposing to reduce operational costs



Oracle Cloud Infrastructure Operations Insights Service: Key Capabilities

Exadata Insights

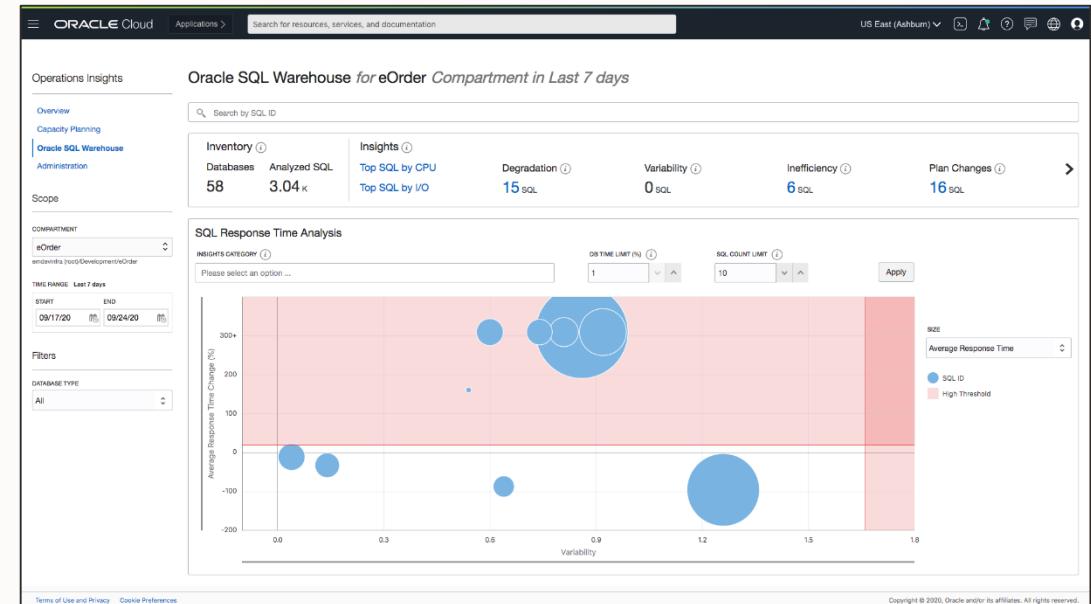
- Enterprise-wide analysis of resource utilization, capacity planning for Exadata
- Improve resource utilization by identifying under & over utilized resources
- Identify Exadata systems projected to reach high utilization
- Identify total lead time to expand capacity using machine learning based forecast based on long term historic data to project future resource growth



Oracle Cloud Infrastructure Operations Insights Service: Key Capabilities

Oracle SQL Warehouse

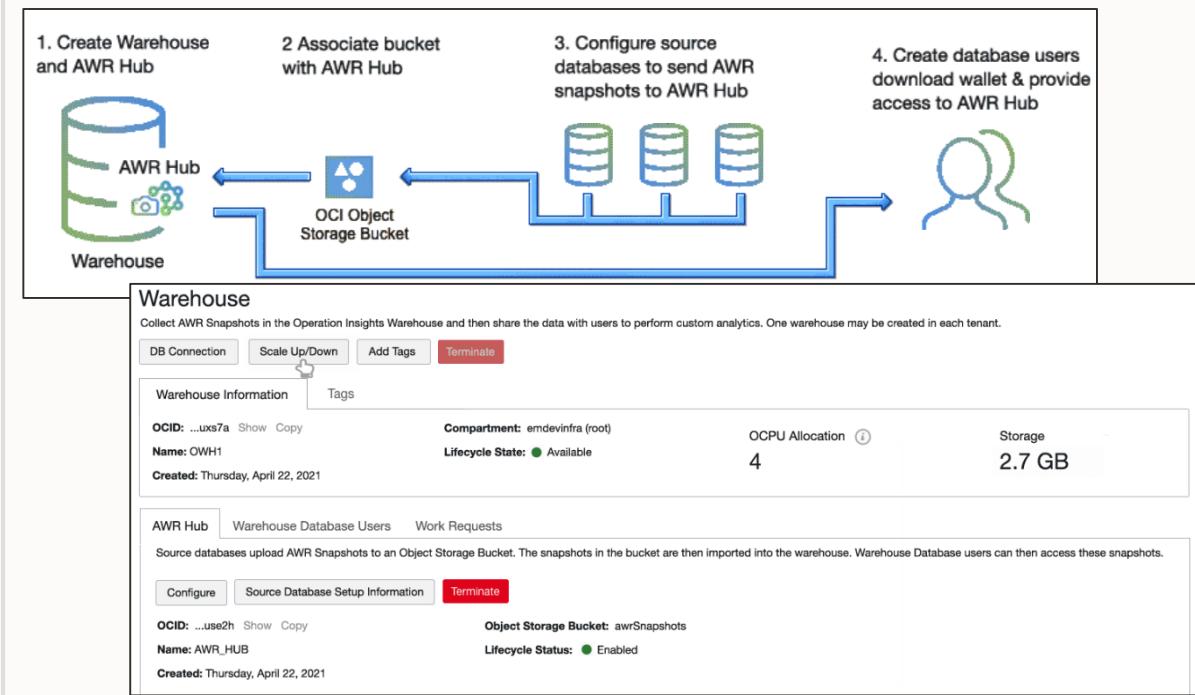
- Long term SQL store for entire Oracle Autonomous and external on-premises database fleet that enables application SQL performance analysis up to 25 months historical data
- Find common patterns of SQL performance issues across fleet of Oracle Autonomous and external on-premises databases
- Automated insights into SQL performance
 - Top resource consuming SQL
 - Degraded and unpredictable performance
 - Application inefficiency and plan volatility



Oracle Cloud Infrastructure Operations Insights Service: Key Capabilities

AWR Hub for expert DBA

- Cloud based warehouse to store the AWR data for long term
- Ability to perform offline Oracle database performance analysis
- Analytics to solve various custom use cases which is not done out-of-the-box today
- Search, compare, and contrast systems data to acquire insight on applications and systems
- Advanced analysis such as aggregation, trending, correlation, categorical, overlay, seasonality, forecasting, clustering



AWR Hub is available only on Oracle Cloud Infrastructure Operations Insights Service

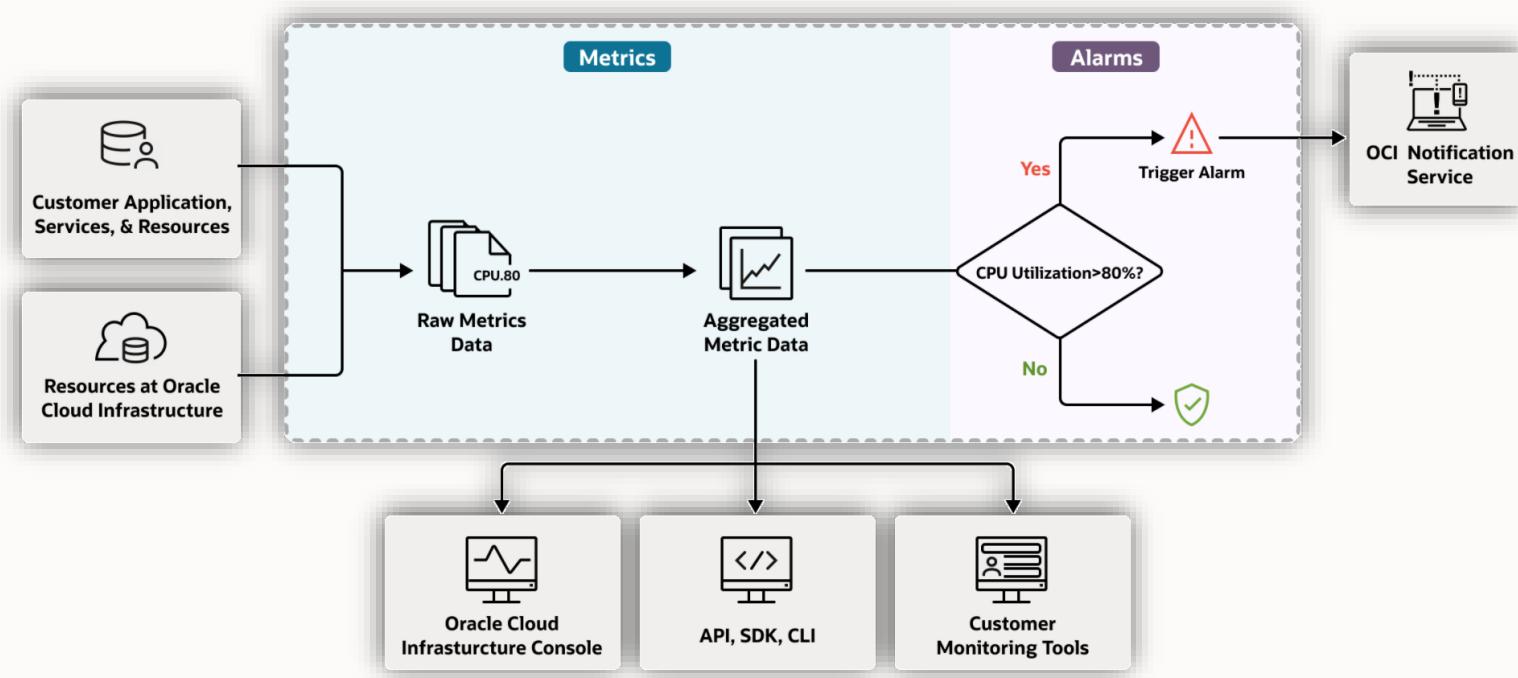
Simplify ITOps: Monitor Health, Faster Troubleshooting & Alarms

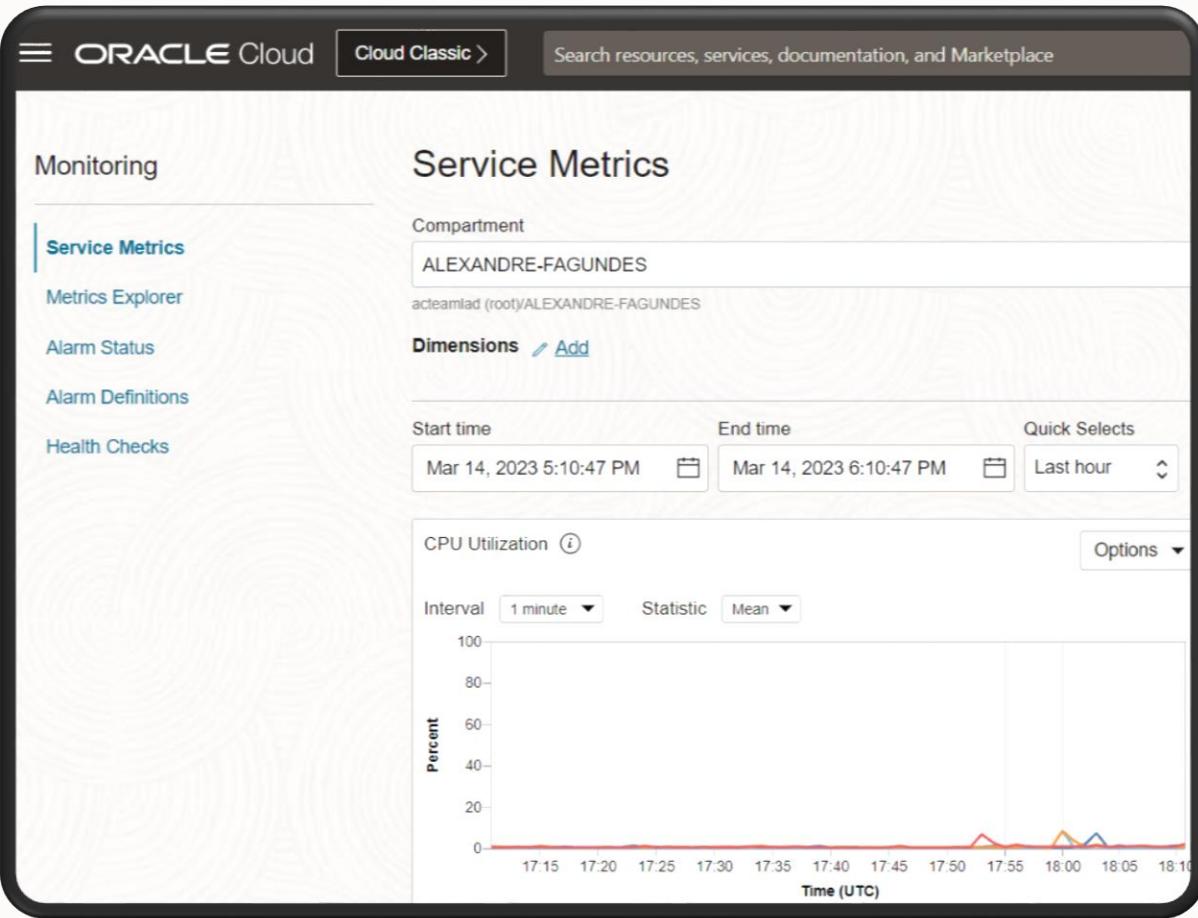
OCI Monitoring Service



- OCI Monitoring service enables you to monitor your cloud resources
- Currently, supports Metrics and Alarms features
- Current supported services include compute, VCN, Load Balancer, Block and Object storage
- Metrics feature relays metric data about the health, capacity, and performance of your cloud resources
 - Offers a standard set of pre-defined metrics for most common OCI resources
 - Includes advanced Monitoring Query Language (MQL) for deeper insights
 - Supports custom metrics (customer can bring their own metrics)
- Alarms feature to notify you when metrics meet alarm-specified triggers
 - Notifications sent via the OCI Notification service for Email and PagerDuty
- OCI Monitoring service is available via the OCI Console, API, SDK, and Terraform

OCI Monitoring Service





Metrics

- **Metric:** a measurement related to health, capacity, or performance of a given resource. E.g. CpuUtilization metric measures usage of a compute instance
- **Metric -> Namespace + Dimension + Metadata**
 - **Namespace:** an indicator of the resource, service, or application that emits the metric. E.g. the CpuUtilization metric lists the metric namespace `oci_computeagent` as its source
 - **Dimension:** a qualifier to filter or group metric data. E.g. dimension name-value pair for filtering by AD: `availabilityDomain = "VeBZ:PHX-AD-1"`
 - **Metadata:** A reference provided in a metric definition. E.g. unit (bytes), for `oci_computeagent` metric `DiskBytesRead` (provides additional information for a metric)
- **Metric Stream:** An individual set of aggregated data for a metric. A stream can be either specific to a single resource or aggregated across all resources in the compartment



Metric Queries

Monitoring Query Language (MQL)

expressions can be used to evaluate returning aggregated data. The query must specify a metric, statistic, and interval

The screenshot shows the Oracle Cloud Metrics interface. At the top, there's a toolbar with icons for delete, edit, and refresh. Below it, a dropdown menu shows a partial query: `CpuUtilization[1m]{deploymentType = "Shared"}.mean()`. To the right of the menu is a button labeled "Add Query". On the left, there's a sidebar with "Query 1" and "Compartment" set to "DB-SYSTEMS". To the right, there's a "Metric namespace" dropdown set to "oci_autonomous_database". Below these are the results: "acteamiad (root)/ALEXANDRE-FAGUNDES/DB-SYSTEMS". Underneath, a "Query code editor" pane contains the MQL query. A note below it says: "When using Tab to navigate, press Enter to update text. To go back to tabbing, press Esc.". At the bottom, there are "Documentation", "Update Chart" (which is highlighted in black), and "Create Alarm" buttons.

- Syntax: metric[interval]{dimensionname=dimensionvalue}.groupingfunction.statistic
 - Interval: frequency at which data points are aggregated. E.g. 5 min
 - Statistic: available functions include count, max, mean, rate, min, sum, and percentile
- Examples
 - Max CPU utilization at 1 min intervals, `CpuUtilization[1m].max()`
 - Maximum CPU Utilization at a one-minute interval, filtered to a single resource, `CpuUtilization[1m]{resourceId="ocid1.instance.oc1.phx.exampleuniqueID"}.max()`
 - All read IOPS at a one-minute interval, filtered to a compartment, aggregated for the maximum, `lopsRead[1m]{compartmentId="ocid1.compartment.oc1.phx..exampleuniqueID"}.grouping().max()`

Alarms

- The Alarms feature of the Monitoring service publishes alarm messages to configured destinations managed by the OCI Notification service
- Monitoring Query Language (MQL) expression can be used to evaluate for the alarm. An alarm query must specify a metric, statistic, interval, and a trigger rule (threshold or absence)
- Alarm states
 - Firing
 - Reset - The alarm is not detecting the metric firing; the metric is no longer being emitted
 - Suspended

The screenshot shows the Oracle Cloud interface with the navigation bar "ORACLE Cloud" and "Cloud Classic >". The main area is titled "Monitoring" and contains links for "Service Metrics", "Metrics Explorer", "Alarm Status", "Alarm Definitions" (which is highlighted in blue), and "Health Checks". To the right, a large modal window titled "Create Alarm" is open. It has a section titled "Define alarm" with fields for "Alarm name" (empty) and "Alarm body" (with placeholder text "Enter notification content. Example: alarm fired") which is limited to 1000 characters. Below the modal, there are two partially visible sections: "Health Checks" and "Alarm Definitions".

Use case

- Service Metrics: same metrics as the resource specific ones, but for all the resources in a compartment.
Allows for filtering with Dimensions
- Metric Explorer: Dive into detail on a specific metric and show multiple resource metrics together. Also includes a powerful Metric Query Language (MQL) interface for complex queries
- Alarm Definition: create an alarm based on a metric and create a notification via OCI Notifications Service (email and PagerDuty)
- Alarms Status: review the status of the configured firing alarms
- Both Monitoring pages plus the Resource specific charts allow the customer to create Alarms directly, prepopulating the query
- **IMPORTANT:**
 - Create custom metrics, understanding the workload of your customers
 - [Reference Link](#)
 - [OCI Reference Documentation](#)

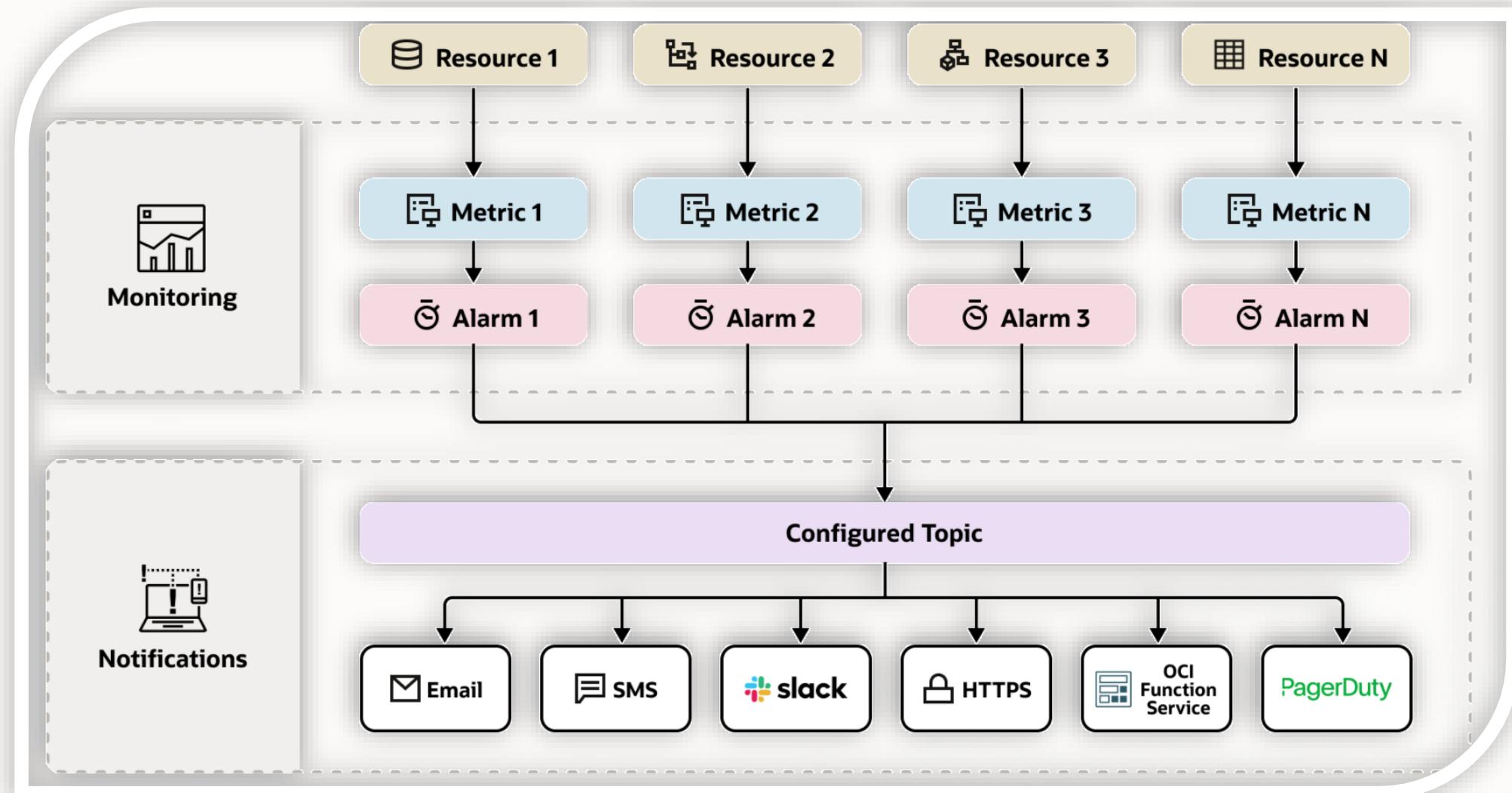


Simplify ITOps: Monitor Health, Troubleshoot Issues & Detect Outliers

OCI Notifications Service



OCI Notification with Monitoring



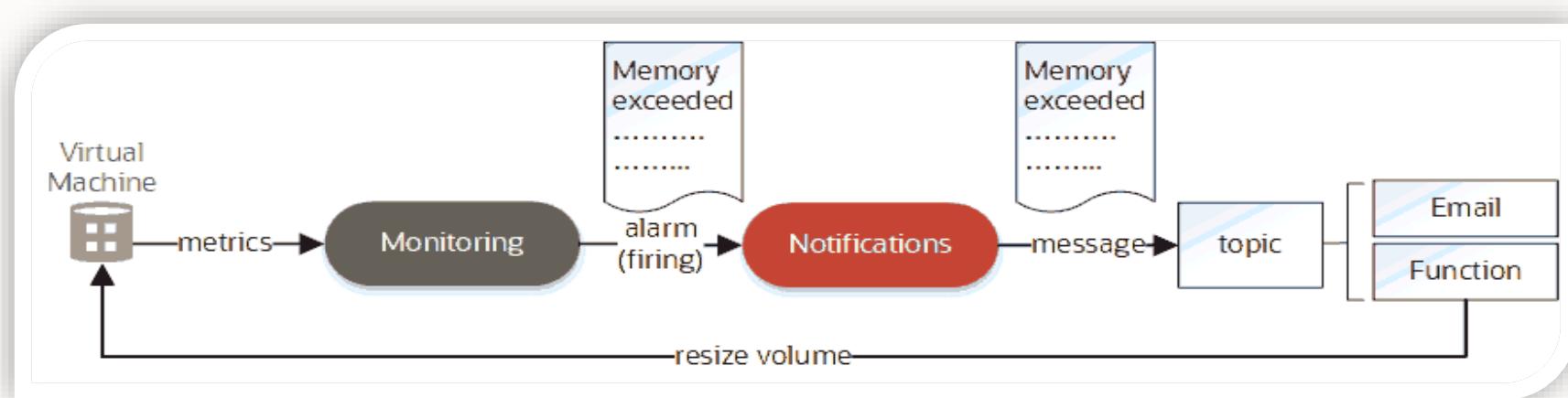
Use case

- The Oracle Cloud Infrastructure Notifications service broadcasts messages to distributed components through a publish-subscribe pattern, delivering secure, highly reliable, low latency and durable messages for applications hosted on Oracle Cloud Infrastructure and externally.
- Use Notifications to get notified when event rules are triggered or alarms are breached, or to directly publish a message. Monitoring Query Language (MQL) expression can be used to evaluate for the alarm. An alarm query must specify a metric, statistic, interval, and a trigger rule (threshold or absence)
- How Notifications Works:
 - The Notifications service enables you to set up communication channels for publishing messages using topics and subscriptions . When a message is published to a topic, the Notifications service sends the message to all of the topic's subscriptions.



OCI Notifications Scenarios

- Automatic Resize VM
 - This scenario involves writing a function to resize VMs and creating an alarm that sends a message to that function. When the alarm fires, the Notifications service sends the alarm message to the destination topic, which then fans out to the topic's subscriptions. In this scenario, the topic's subscriptions include the function as well as your email. The function is invoked on receipt of the alarm message. The Notifications service has no information about a function after it's invoked.



Strong Customer, Partner Adoption and Analyst Validations

Customers



Partners



Analysts



Oracle's focus on monitoring and observability is meeting customer challenges



puts Oracle to the test, assessing its capabilities for multicloud observability and active management



Oracle is a leader in multicloud management



Oracle enables holistic observability

Takeaways

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Our mission is to help people see data in new ways,
discover insights, unlock endless possibilities.

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