AWR.ai: New LLM-Powered Investigations into Database Performance

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Safe harbor statement

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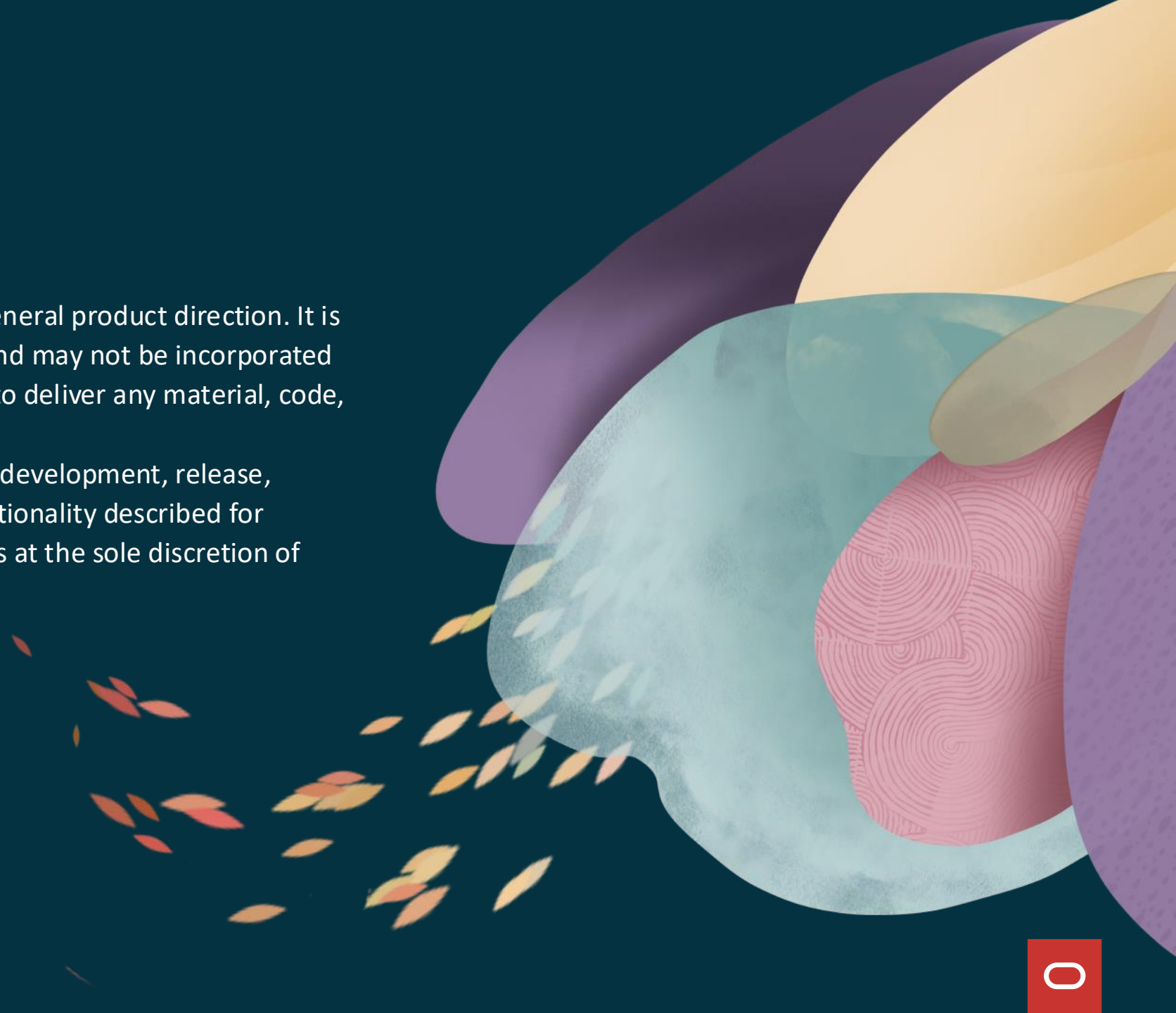


Agenda

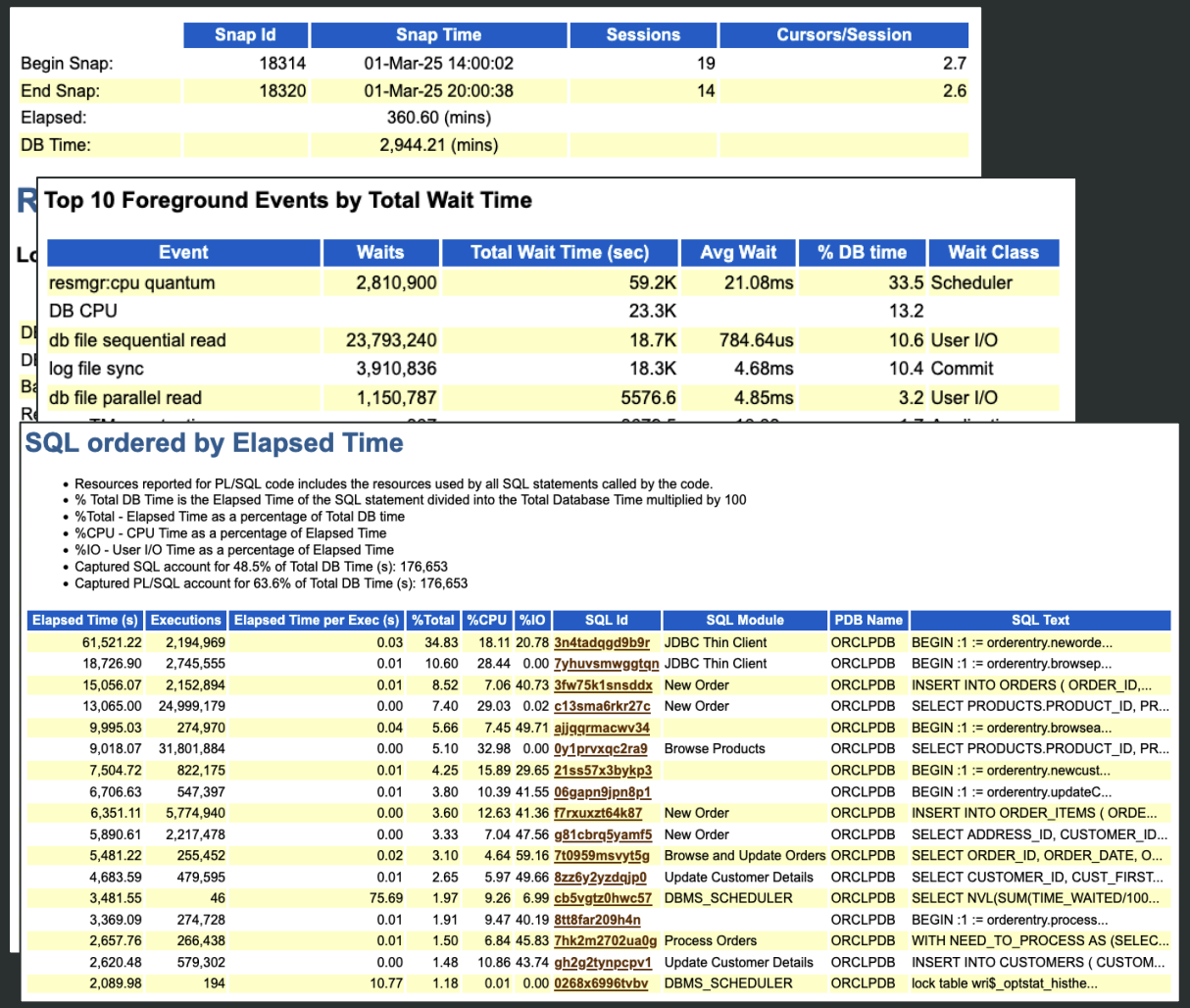
1. AWR and LLM: Background and challenges
2. AWR.ai: GenAI powered solution
3. SQLPerf.ai: SQL performance AI analysis
4. Extensible ADDM
5. Conclusion

Critical Tool with Learning Curve

Requires domain expertise

AWR requires existing knowledge to utilize as a performance investigation tool:

- Complex system details
- Raw data, text only reading and interpretation
- Requires knowledge of detailed wait events
- Difficult to diagnose heavy workload
- Single issue can expand to other sessions making root cause difficult to identify
- Multiple AWR snapshots can spread across single problem
- Scoped investigation to single database and SQL load at the time
- AWR contains ADDM report but deep technical knowledge is still required



	Snap Id	Snap Time	Sessions	Cursors/Session
Begin Snap:	18314	01-Mar-25 14:00:02	19	2.7
End Snap:	18320	01-Mar-25 20:00:38	14	2.6
Elapsed:		360.60 (mins)		
DB Time:		2,944.21 (mins)		

Top 10 Foreground Events by Total Wait Time

Event	Waits	Total Wait Time (sec)	Avg Wait	% DB time	Wait Class
resmgr:cpu quantum	2,810,900	59.2K	21.08ms	33.5	Scheduler
DB CPU		23.3K		13.2	
db file sequential read	23,793,240	18.7K	784.64us	10.6	User I/O
log file sync	3,910,836	18.3K	4.68ms	10.4	Commit
db file parallel read	1,150,787	5576.6	4.85ms	3.2	User I/O

SQL ordered by Elapsed Time

- Resources reported for PL/SQL code includes the resources used by all SQL statements called by the code.
- % Total DB Time is the Elapsed Time of the SQL statement divided into the Total Database Time multiplied by 100
- %Total - Elapsed Time as a percentage of Total DB time
- %CPU - CPU Time as a percentage of Elapsed Time
- %IO - User I/O Time as a percentage of Elapsed Time
- Captured SQL account for 48.5% of Total DB Time (s): 176,653
- Captured PL/SQL account for 63.6% of Total DB Time (s): 176,653

Elapsed Time (s)	Executions	Elapsed Time per Exec (s)	%Total	%CPU	%IO	SQL Id	SQL Module	PDB Name	SQL Text
61,521.22	2,194,969	0.03	34.83	18.11	20.78	3n4tadqgd9b9r	JDBC Thin Client	ORCLPDB	BEGIN :1 := orderentry.neworde...
18,726.90	2,745,555	0.01	10.60	28.44	0.00	7yhuvsmwggtqn	JDBC Thin Client	ORCLPDB	BEGIN :1 := orderentry.browsep...
15,056.07	2,152,894	0.01	8.52	7.06	40.73	3fw75k1snsddx	New Order	ORCLPDB	INSERT INTO ORDERS (ORDER_ID,...
13,065.00	24,999,179	0.00	7.40	29.03	0.02	c13sma6rkr27c	New Order	ORCLPDB	SELECT PRODUCTS.PRODUCT_ID, PR...
9,995.03	274,970	0.04	5.66	7.45	49.71	ajjqqrmacwv34		ORCLPDB	BEGIN :1 := orderentry.browsea...
9,018.07	31,801,884	0.00	5.10	32.98	0.00	0y1prvxqc2ra9	Browse Products	ORCLPDB	SELECT PRODUCTS.PRODUCT_ID, PR...
7,504.72	822,175	0.01	4.25	15.89	29.65	21ss57x3bykp3		ORCLPDB	BEGIN :1 := orderentry.newcust...
6,706.63	547,397	0.01	3.80	10.39	41.55	06gapn9jpn8p1		ORCLPDB	BEGIN :1 := orderentry.updateC...
6,351.11	5,774,940	0.00	3.60	12.63	41.36	f7rxuxzt64k87	New Order	ORCLPDB	INSERT INTO ORDER_ITEMS (ORDE...
5,890.61	2,217,478	0.00	3.33	7.04	47.56	g81cbrq5yamf5	New Order	ORCLPDB	SELECT ADDRESS_ID, CUSTOMER_ID...
5,481.22	255,452	0.02	3.10	4.64	59.16	7t0959msvyt5g	Browse and Update Orders	ORCLPDB	SELECT ORDER_ID, ORDER_DATE, O...
4,683.59	479,595	0.01	2.65	5.97	49.66	8zz6y2yzdqjp0	Update Customer Details	ORCLPDB	SELECT CUSTOMER_ID, CUST_FIRST...
3,481.55	46	75.69	1.97	9.26	6.99	cb5vgtz0hwc57	DBMS_SCHEDULER	ORCLPDB	SELECT NVL(SUM(TIME_WAITED/100...
3,369.09	274,728	0.01	1.91	9.47	40.19	8tt8far209h4n		ORCLPDB	BEGIN :1 := orderentry.process...
2,657.76	266,438	0.01	1.50	6.84	45.83	7hk2m2702ua0g	Process Orders	ORCLPDB	WITH NEED_TO_PROCESS AS (SELEC...
2,620.48	579,302	0.00	1.48	10.86	43.74	gh2g2tynpcpv1	Update Customer Details	ORCLPDB	INSERT INTO CUSTOMERS (CUSTOM...
2,089.98	194	10.77	1.18	0.01	0.00	0268x6996tvbv	DBMS_SCHEDULER	ORCLPDB	lock table wri$_optstat_histhe...

AWR.ai

AWR assistant

How Do We Make AWR More Approachable?

*AWR.ai strives to turn AWR **non-experts** into **experts.***

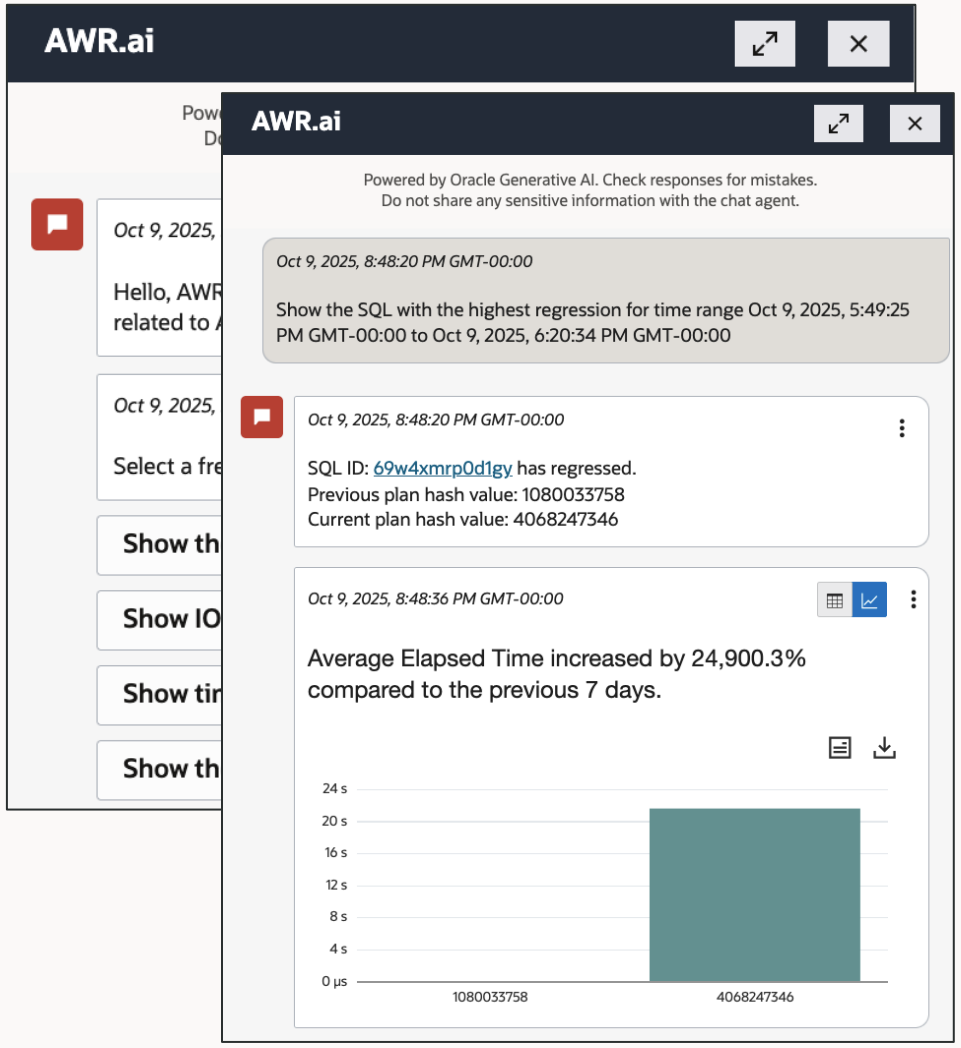
AWR.ai offers several key features:

No More Complex Queries
Users no longer need to write intricate SQL statements to retrieve insights - just ask in plain language.

Enhanced User Experience
An intuitive and user-friendly interface allows interaction with AWR through conversational prompts or GUI interface.

Smarter, More Capable Answers
AWR.ai can handle complex, nuanced questions that traditional tools are unable to process or interpret, can map questions directly to underlying AWR views and even **correlate or compare multiple snapshot intervals**.

AWR.ai integrates with existing tools.



What is AWR.ai?

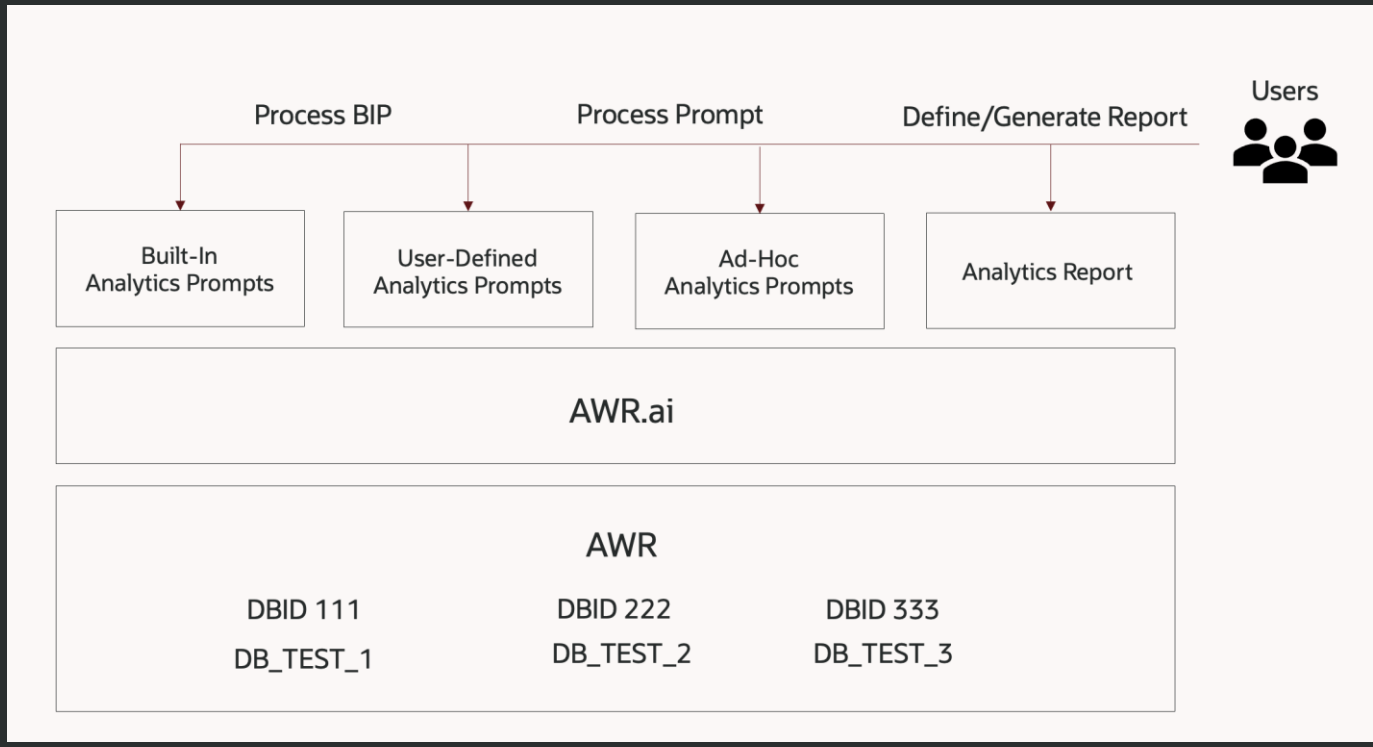
AWR.ai enables users to access powerful AI-driven AWR analysis through four core functionalities delivered in a database package:

Built-in Analytic Prompts (BIP): A collection of built-in analytic prompts to help users deep dive into AWR data. ***Responses are backed by guaranteed accuracy.***

User-defined Analytic Prompts (UDP): Allow AWR experts to go beyond the Built-in Prompts by defining own prompts in natural language. Once a UDP is defined, it will be saved and reusable in the future.

Ad-hoc Analytic Prompts (AHP): Similar to User-defined Prompts, but it is one-time use and is not for future use.

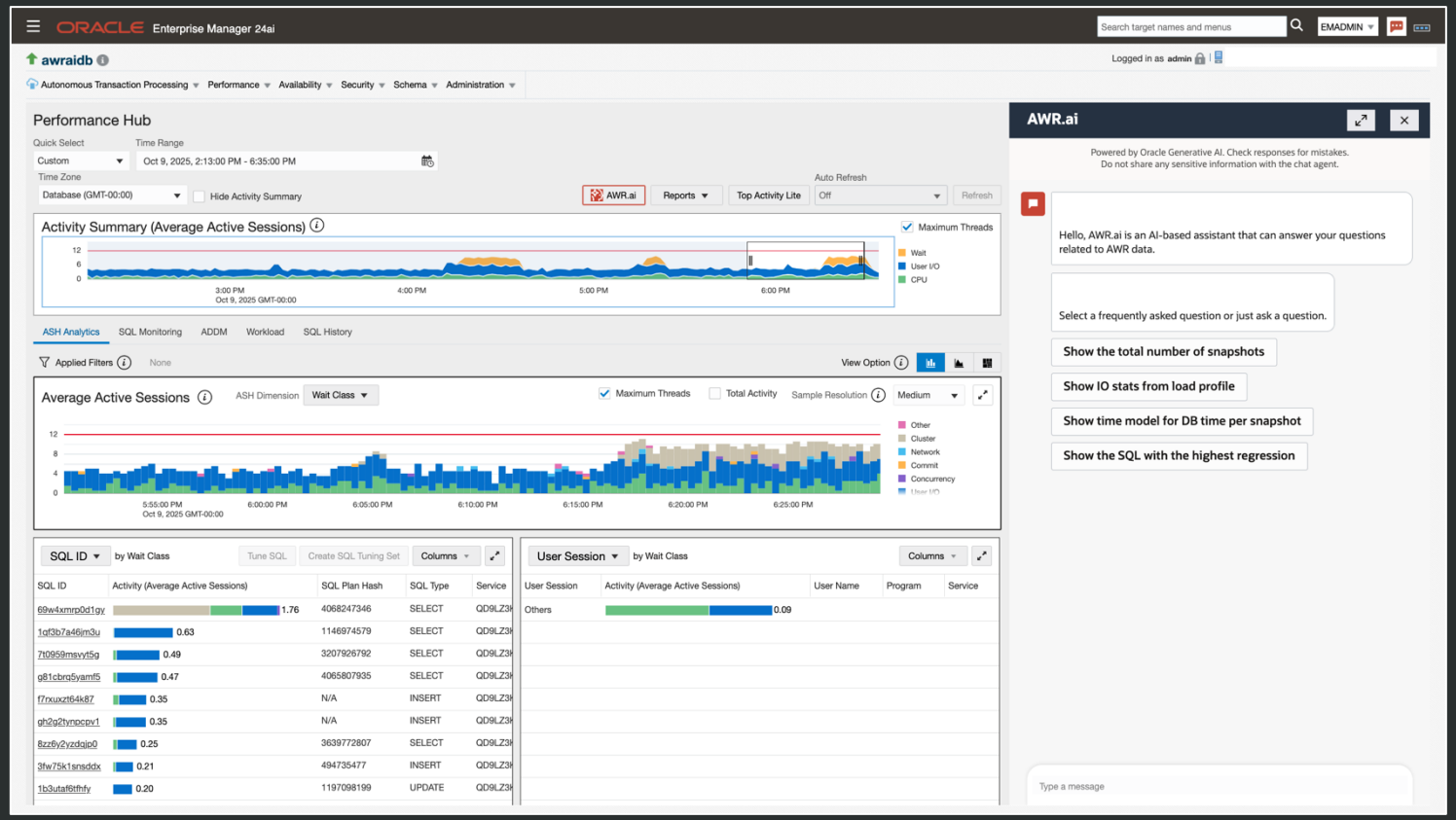
Analytic Report: Allow users to create fully tailored reports by grouping multiple Prompts together. The prompts can be all types of Prompts mentioned above including BIP, UDP and AHP.



AWR.ai from Performance Hub

AWR.ai will be integrated into Performance Hub to enhance database monitoring capabilities.

- Interactive UI with seamless navigation to SQL Details
- AWR.ai renders output in a human-readable format including tabular data as well as charts
- Persists through navigation within Performance Hub for consistency
- Out-of-the-box prompts or natural language queries from the user



SQLPerf.ai

AI-assisted analysis of SQL performance

Why SQL Performance Tuning Is Hard

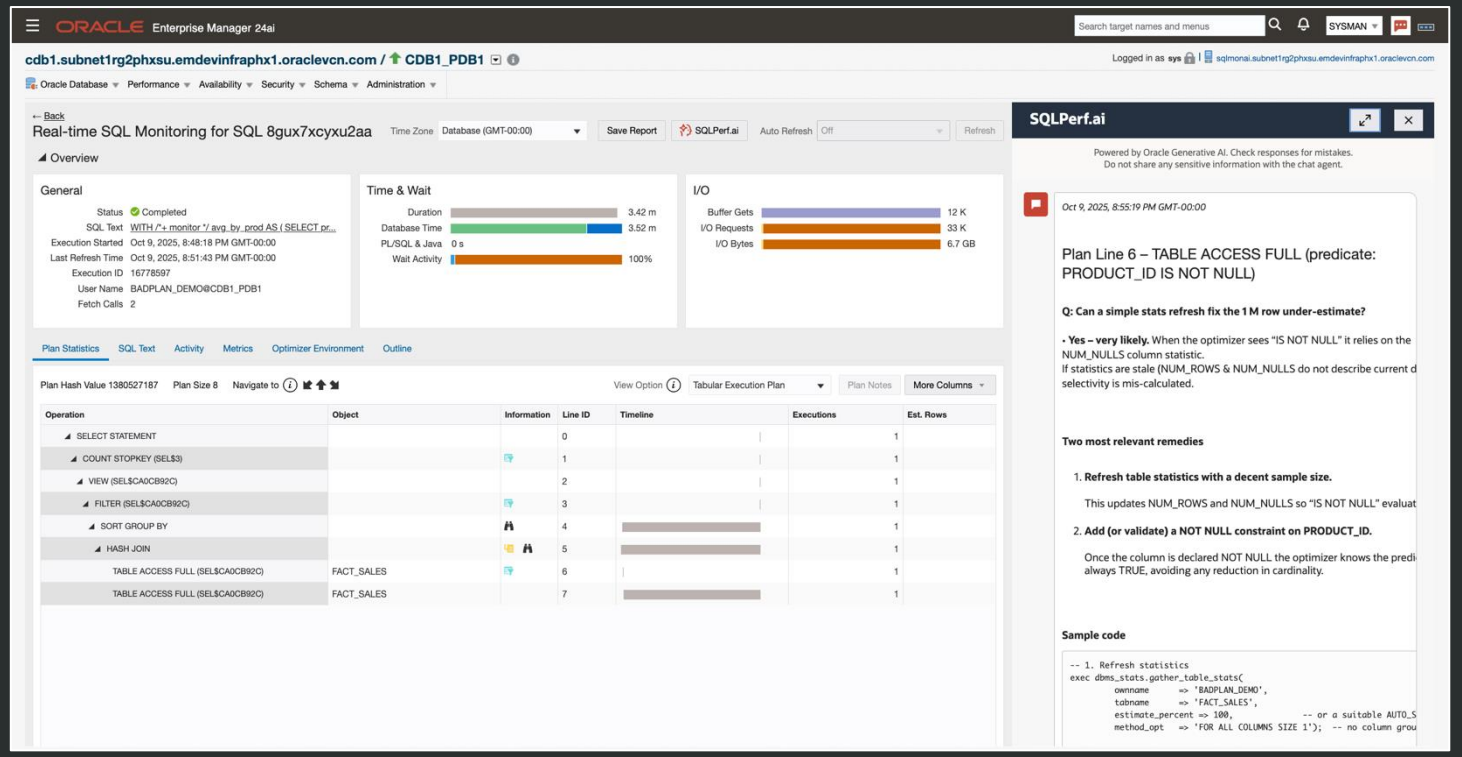
- **Complex queries** with multiple joins, subqueries, and nested views are hard to analyse.
- **Execution plans** require deep knowledge of data cardinality, join order, and optimizer behaviour.
- **Changing data volumes** and distributions can degrade previously good plans.
- **Indexing decisions and optimizer hints** are tricky and can backfire if misused.
- **Diagnosing** waits, latches, I/O patterns, and dynamic SQL adds complexity.
- Correlated subqueries and functions in **WHERE** clauses hinder efficient execution.
- **Limited visibility across** environments makes tuning repeatable only with difficulty.

Analyze and Improve SQL Performance with SQLPerf.ai

Obtain recommendations about SQL execution to improve its performance:

Integration with SQL Monitoring:

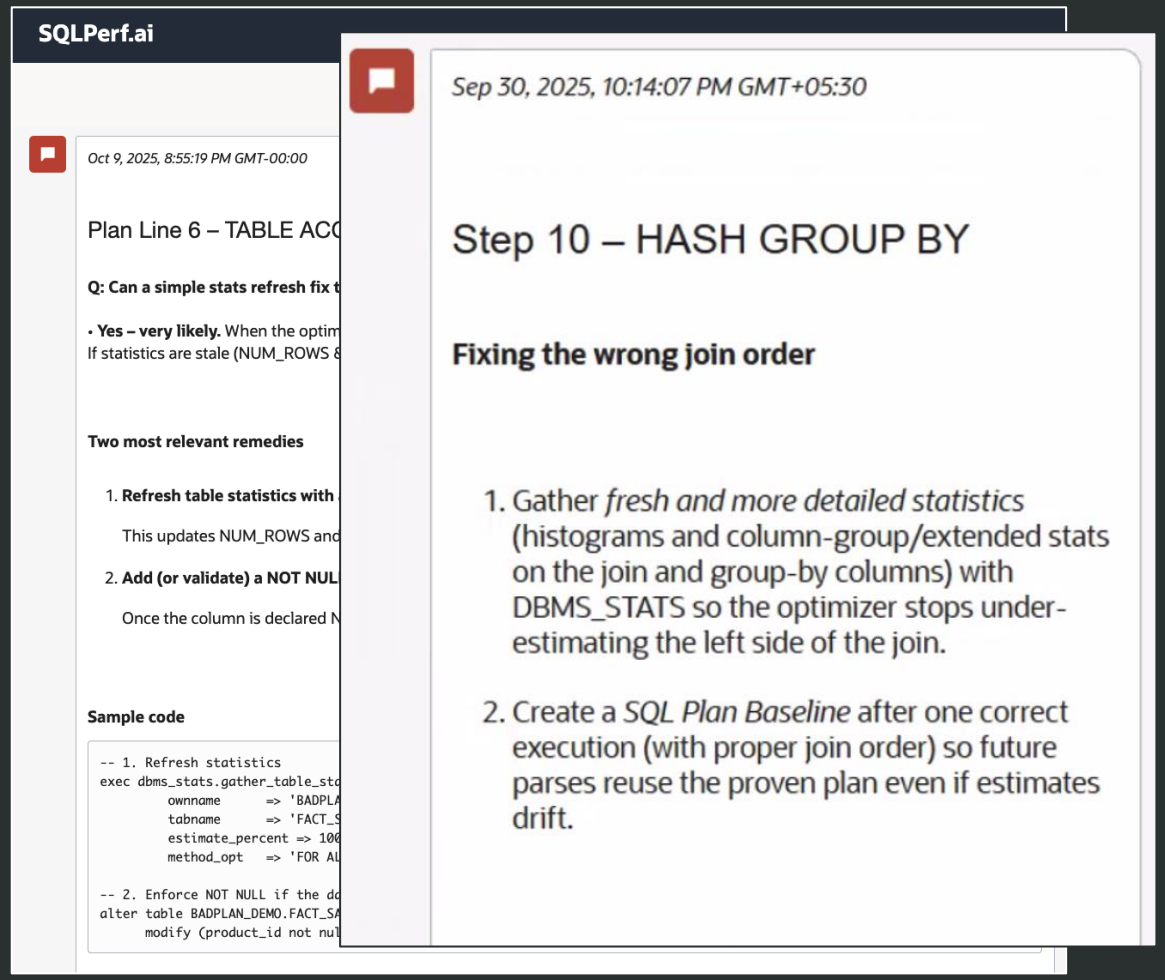
- SQL Monitoring Identifies poor performing or most resource intensive queries
- Quickly launch AI analysis of query performance
- Utilize with existing statistics in Performance Hub for guided resolution



Powerful Insights to SQL Execution Details

Obtain recommendations for execution plan:

- Root cause analysis for poor performing queries
- Identifies bottlenecks in execution plan
- Provides feedback on performance improvement such as join orders, index utilization, statistics, etc.
- Recommendations provided for improved plan performance
  - Detailed resolution plan to improve query execution
  - Guided resolution with code



Extensible ADDM

Custom extension rules for ADDM

Challenges With Custom Scripts for Performance Analysis

- DBAs often rely on **custom scripts** for performance analysis.
- **Inconsistent formats** make it hard to compare or consolidate results.
- **Manual scheduling and orchestration** increase maintenance overhead.

Extend ADDM for your own Database

Extensible ADDM will allow DBAs or developers to write their own analysis logic and register them as ADDM rules

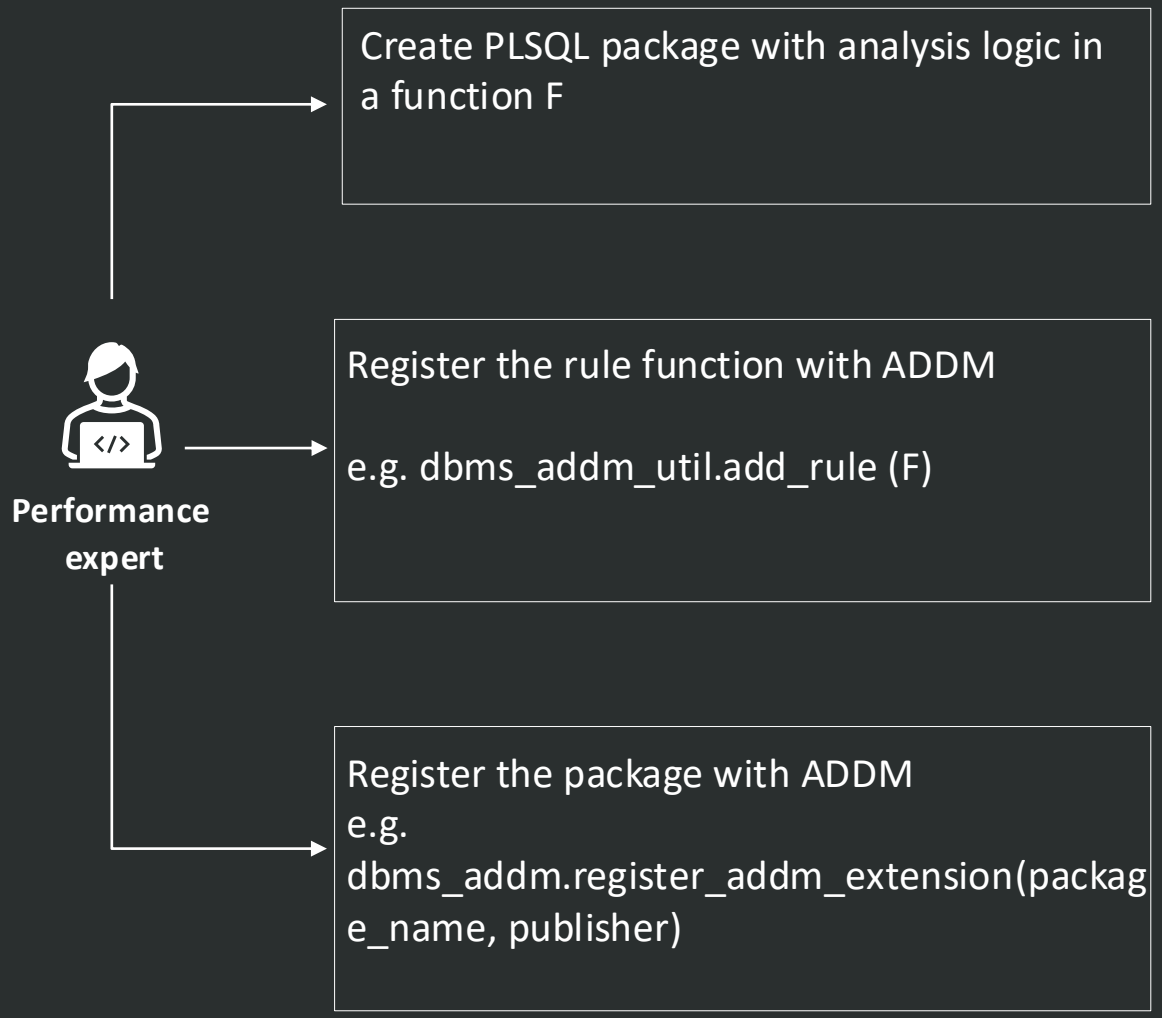
- Built-in library of PL/SQL APIs to help write extension rules
- Reduction of custom code deployments

Extension rules are enabled by DBA to be run automatically by ADDM with every AWR snapshot

- Extension rules will run as the DB user that registers them, not as SYS
- Strict time limits will be enforced for rules
- Findings and recommendations from extension rules will appear in existing ADDM report
- Identified with special “Publisher” attribute to distinguish from built-in rules provided by Oracle

Extensible ADDM

Custom extension rules for ADDM



Finding 1: Usage of DBMS_LOCK

Publisher: PerfDBA

Impact is 17.24 active sessions, 99.48% of total activity.

Waits from DBMS_LOCK package were consuming significant database time.

Recommendation 1: Application Analysis

Estimated benefit is 17.36 active sessions, 99.48% of total activity.

Action

Investigate application logic using DBMS_LOCK package. Consider using finer granularity of locks.

Sample ADDM report

AskEM

GenAI Assistant

Navigating Complex Observability Environments

- **Fleet-level complexity:** Analyzing performance across large-scale deployments is difficult.
- **Scope definition:** It’s hard to narrow down which systems or components to investigate first.
- **Outlier detection:** Identifying performance anomalies across Exadata or shared infrastructure takes time and expertise.
- **Drill-down challenges:** Moving from fleet-level views to pinpointing specific database or instance issues is often cumbersome.
- **Telemetry sources:** Data comes from databases, hosts, Exadata, applications, and more.
- **Deployment flexibility:** Collects data from on-premises, multicloud, and hybrid environments.

Observability Telemetry and Challenges

Problem statement:

Heterogenous observability telemetry

- Databases, hosts, Exadata infrastructure, applications, etc.

Diverse telemetry origins

- On-premises, multicloud, hybrid environments

How do you leverage power of AI to provide rich user experience for self-diagnostics?

AskEM is the solution:

- Enable users to ask questions conversationally (Natural Language Processing)
- Leverage telemetry data to provide contextually relevant, reliable, and efficient responses
- Dynamically generate metric widgets in a dashboard framework
- Deliver capabilities for both on-premises and cloud EM deployments
- Streamline search of product documentation, knowledge bases, etc.

Solution: Observability GenAI Assistants

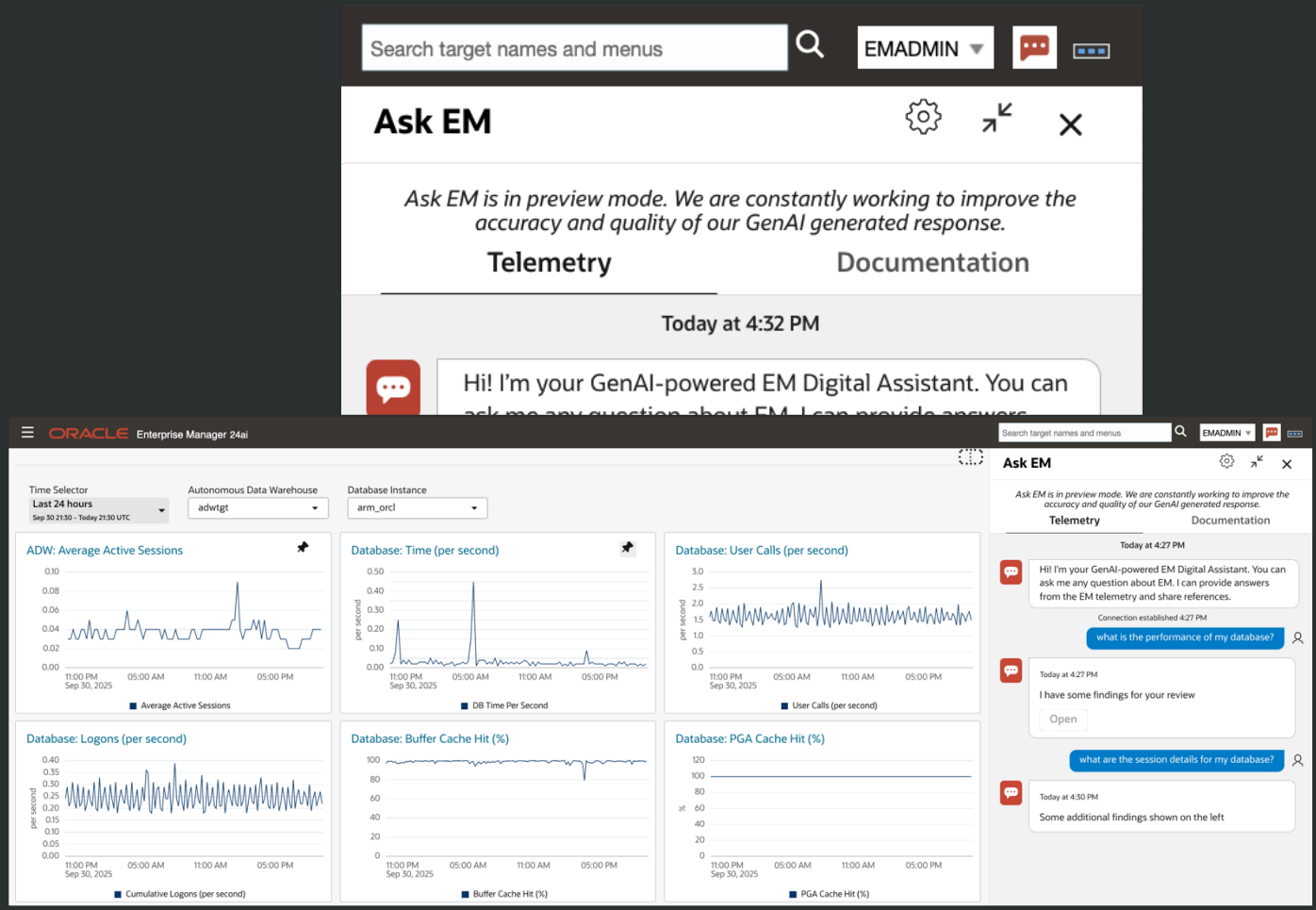
Deliver fast and reliable insights

State-of-the-art AI assistants for EM and OCI Observability & Management

- Advanced AI-driven chatbot technology
- Augmented with metrics metadata and Oracle documentation
- Trained on EM repository metadata

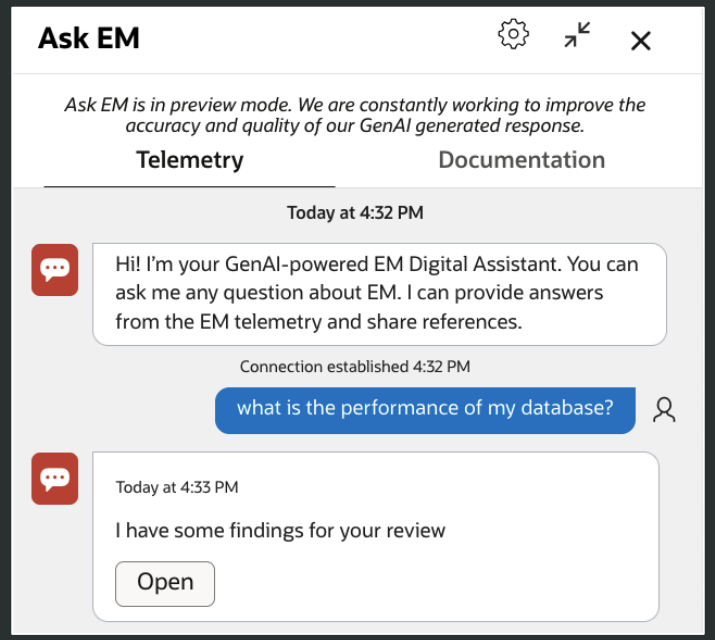
Enhanced user experience

- Native language interface to the observability telemetry
- Delivers quick and relevant responses
- Shorten learning curve for new users, reduce reliance on subject matter experts



Some GenAI-powered observability use cases

Ask in natural language and get AI-generated responses



Troubleshooting of app & infrastructure performance, errors, availability, and more

Q: Why is the manufacturing database slow?

Summarization of results

Q: What kind of Exadata I/O patterns do I have?

Dashboard generation

Generates metric widgets for simplified data exploration

Product usage help

Covers frequent user actions like agent deployment, config changes, API lookup, etc. via Oracle documentation

Q: Can I get information on buffer busy waits?

Q&A
Learn More

Web: oracle.com/enterprisemanager

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