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Oracle Coherence Data Sheet

Oracle Coherence is the #1 IN-Memory Data Grid

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Oracle Coherence

Oracle Coherence is the world's first and leading in-memory data grid that enables organizations to predictably scale mission-critical applications by providing fast access to frequently used data, offloading back-end systems, and providing horizontally scalable capacity for both data caching and in-place processing. As data volumes and customer expectations increase, driven by the artificial intelligence, the Internet of Things, social media, and mobile applications, so do the needs to handle more data in real time, to offload over-burdened shared data services, and to provide availability guarantees.

Oracle Coherence offers a rich set of features enabling the most sophisticated enterprise application architectures in the world. Among these are indexed querying, multiple transaction models, reentrant in-place processing, client and grid side event listening, data source integration to invisibly read from and write to backing data sources, change data capture to keep caches in sync with volatile databases, durable scalable messaging and streaming, data federation in multi-site architectures, integrations with popular frameworks including those for microservices, distributed process coordination through standard Java APIs, and best-in-class observability and operability tooling. The feature set is equally available in cloud-native or on-premise contexts, leveraging industry standard technology stacks.

At its foundation, Oracle Coherence automatically and dynamically partitions, distributes, and backs up data, ensuring continuous data availability and transactional integrity even in the event of a node, machine, rack, or site failure.

Benefits

- Fast, reliable access to application data
- Offloading shared data services
- Enables in-memory data analytics and event processing
- Native integration with Oracle Fusion Middleware products
- Automatically detects and corrects service disruptions
- Seamlessly manage data across memory and disk- based devices
- Built-in load balancing of client connections
- Simplifies the configuration of large-scale environments

Introducing Oracle Coherence 15.1.1

Oracle Coherence 15.1.1 contains a massive amount of new functionality developed since the previous 14.1.2 release, continuing the product's market-leading innovation and evolution. It runs on Java 17 and 21 and is compatible with the Jakarta EE 9.1 specifications.

Vector Storage and Search - For more information, see Storing and Searching Vectors in Coherence in Developing Applications with Oracle Coherence. Coherence 15.1.1 adds support for the optimized storage of dense vector embeddings within the Coherence cluster, and the ability to perform similarity searches across those embeddings in parallel, using Coherence aggregators. It also allows users to create HNSW and Binary Quantization-based vector indices, which can significantly improve search performance.

Coherence RAG - Coherence RAG builds on the core Vector DB and Lucene indexing functionality, and adds higher level APIs that allow you to easily integrate similarity or hybrid search results with remote LLMs in order to implement end-to-end RAG solution using Generative AI. It also provides support for massively parallel ingestion and vectorization of document content from multiple document sources, including custom ones, and seamless integration

with local and remote embedding, re-ranking and chat models. Coherence RAG allows you to utilize hundreds, or even thousands of CPU core to perform vector embeddings creation at the speed comparable, or even faster, than when running on a GPU, and will take the advantage of the GPUs as well, if they are available.

Lucene Full-Text Indexing - Coherence 15.1.1 also adds support for partitioned Lucene full-text indices, and parallel search across those indices, with sophisticated re-ranking of the results that ensures that the best possible matches are returned to the client.

OpenTelemetry support for Coherence*Extend for Java - For more information, see Distributed Tracing in Developing Applications with Oracle Coherence. Coherence 15.1.1 adds OpenTelemetry support to remote Extend and gRPC Java clients as well, allowing users to trace the requests within Coherence application truly end-to-end: from a remote client, all the way to the external data store that is used to ultimately store the data, if one is present, or Coherence storage layer, including built-in disk persistence, if not.

Feature Highlights from the Oracle Coherence 14.1.2 Release

Microservice Framework Integrations – Oracle Coherence 14.1.2 integrates broadly and closely with Helidon, Micronaut, and Spring Boot, allowing developers of microservices applications to easily leverage Oracle Coherence's caching capabilities, often by simply annotating code, in the areas of data abstractions, injection / inversion of control, messaging, method result caching, metrics, session state storage, and tracing.

Polyglot gRPC Clients and Server – Oracle Coherence 14.1.2 introduces a gRPC-based proxy server as an alternative to Coherence*Extend, and new native-language clients for GoLang, JavaScript, and Python that use the gRPC proxy server. This advance enables asynchronous client/server interaction patterns e.g. reactive styles. The gRPC proxy server implementation is also asynchronous, allowing maximum throughput and utilization of both the gRPC proxy server and the Oracle Coherence cluster / data grid it belongs to.

Bootstrap and Repository APIs – Oracle Coherence 14.1.2 introduces two new APIs for application developers. The Bootstrap API is an evolved, next-generation way for applications to bootstrap an Oracle Coherence client or server, with layers of configurability via Java API. It is used in Oracle Coherence integrations with microservices frameworks. The Repository API is a framework implementing the Repository pattern from Domain-Driven Design. A Repository represents the collection of all entities of a given type and implements behavior for reading and writing entities of that type, abstracting applications from data persistence details. The Oracle Coherence Repository API supports advanced features like data projections, declarative indexing, event listening, and query pagination.

GraphQL Interface – When used with Helidon, Oracle Coherence 14.1.2 offers a GraphQL interface to the data it manages, complementing its native-language and REST interfaces. GraphQL is a solution for querying REST services, allowing applications to retrieve a custom projection of data in a single HTTP roundtrip. It represents a completely different type of interface to Oracle Coherence, at the same level as native language clients and the REST interface and is very powerful.

Kafka Integration – in release 14.1.2, Oracle Coherence can act as a Kafka data sink or data source. This enables smooth integration of Oracle Coherence in architectures using Kafka, allowing Kafka to push data into Oracle Coherence and vice-versa.

Coherence-concurrent – the coherence-concurrent module in Oracle Coherence14.1.2 contains Oracle Coherence - backed implementations of types from the package java.util.concurrent, like Atomics, Executors, Latches, Queues, and Semaphores. The module provides factory classes through which applications can obtain named instances of those types, ensuring identity integrity. This allows applications to achieve distributed process coordination, and work scheduling in the grid, using standard Java interfaces.

Coherence CLI – on the observability and operability front, Oracle Coherence 14.1.2 offers a new Command Line Interface (CLI) tool for monitoring and managing Coherence clusters. This open-source tool installs separately from Oracle Coherence and is compatible with multiple Oracle Coherence versions including 14.1.2. It allows organizations that are not using Kubernetes to monitor and manage Oracle Coherence clusters from a powerful CLI. Command coverage in the Coherence CLI includes the ability to obtain metrics from Oracle Coherence clusters and their members, services, and caches, and to control processes in the cluster. The tool is scriptable, offers multiple output formats including JSON and basic or wide options, and has a "watch" mode to continue polling metrics.

Oracle Coherence 14.1.2 Continues the Evolution

Following on the 14.1.1 release, Oracle Coherence 14.1.2 continues the evolution and innovation of the world's first and leading in-memory data grid. The 14.1.1 release, in turn, added major new features to Oracle Coherence in comparison to the previous 12c releases. Those features included the following.

Topics – a messaging feature in Oracle Coherence, with the typical notions of publishers, topics, subscribers, and subscriber groups. Oracle Coherence's implementation exhibits patented scalability, as a result of distributing the topics and their contents, as well as the subscriptions, over the data grid. So, message delivery capacity increases as the Oracle Coherence cluster scales out. The implementation also includes advanced features like grid-side message filtering and transformation.

Distributed Tracing – Oracle Coherence 14.1.1 introduced the implementation of distributed tracing in the product, representing a major advance in observability and performance diagnosis for Oracle Coherence -based applications. The implementation adheres to the OpenTracing standard (and now OpenTelemetry), is agnostic to the collector used, supporting both Jaeger and Zipkin, and can be turned on and off at runtime. The tracing spans collected in Oracle Coherence code can be embedded in upstream spans, for example of Helidon when using Oracle Coherence with it, enabling a complete picture of response time breakdown in a distributed microservices application.

GraalVM Support – Oracle Coherence 14.1.1 introduced support for GraalVM, specifically its polyglot language capabilities, to allow grid-side code to be written in languages other than Java. Examples were provided in JavaScript, to facilitate e.g. Node.js applications using Oracle Coherence. Future enhancements to this integration will focus on grid-side Python support, which is important for AI use cases.

Feature Highlights from the Oracle Coherence 12c Releases

Oracle Coherence 12c provided automated recovery from partial or complete outages, increased developer productivity, operational efficiency, and density, and improved support for multi-datacenter deployments. It delivered efficiencies in performance and management, while allowing you to scale your applications to meet increasing mobile and cloud demands on your infrastructure. Important features of the 12c releases included the following.

Persistence – A persistence mechanism enables automated recovery from partial or complete cluster outage. The solution can be used with local storage for speed or network-attached storage for the ultimate in availability.

Federated Caching – Supports complete built-in multi-datacenter deployments. Customers can choose from out-of-the-box multi-way active-active, active-passive, and hub-and-spoke topologies, or define their own custom topology.

Developer Productivity and API Enhancements – Coherence now offers one-of- a-kind distributed support for Java 8 lambdas and streams. Developers can now program against Coherence with standard Java APIs to take advantage of clusterwide lambdas and map-reduce aggregations without deploying classes on the cluster. Enhanced generic support for new default methods further improve developer productivity and reduces time to market.

Security Enhancements – New Authorization and Audit capabilities provide complete fine-grained control of who can access or modify cached objects, and optionally record those operations for full regulatory and traceability purposes.

GoldenGate HotCache - Keeps your database and Coherence cached data in sync so "stale data" is never delivered to your applications from an outdated cache.

Managed Coherence Servers - Provides a managed, templated environment for Coherence clusters and application. This feature streamlines application lifecycle management and provides an integrated solution for management of standalone Coherence or combined WebLogic Server and Coherence applications.

JCache (JSR-107) Compliance – Complement native language and REST client support to offer developers even more flexibility when integrating with in-memory data grids or sharing data among applications. JCache is the standard for distributed caching on the Java Platform. By using Coherence as the provider, you get access to the breadth and depth of Coherence features such as HotCache, flexible topology support, and the robustness of the market leading distributed caching platform.

Coherence Live Events - Allows you keep customer experiences rich and lag-free by powering application with always-accurate, real-time data.

The Oracle Coherence Advantage

Performance – Oracle Coherence solves latency problems and drives dramatic increases in performance by caching and processing data in the memory of a cluster of Java Virtual Machines. In-memory performance alleviates bottlenecks and reduces data contention, improving application responsiveness. Parallel query, computation and map-reduce aggregation improves the performance and scalability of data-intensive calculations.

Reliability – Oracle Coherence is built on a fault-tolerant mesh that provides data reliability and consistency. Organizations can meet data availability demands in mission-critical environments with Oracle Coherence support for data tolerance and continuous operation. The reliability of the data grid minimizes the need for applications to compensate for server and network failures, streamlining the development and deployment process.

Scalability – Oracle Coherence enables applications to scale linearly and dynamically for predictable cost and improved resource utilization (the processing power of the grid scales linearly with data capacity). For many applications, it offers a straightforward approach to increasing the effective capacity of shared data sources. Oracle Coherence handles continually growing application loads without risking data loss or interruption of service.

Disaster Recovery – With its capability to replicate data and maintain transactional integrity, Coherence can serve as a great tool for disaster recovery. Coherence clusters maintained throughout the enterprise and across geographies constitute an automatic 'backup store' for organizational data. Individual machines, racks and data centers can all be flexibly backed up to ensure continuous availability.

Key features

- Fault-tolerant distributed data caching and processing
- Persistence for fast recovery from planned or unplanned outage
- True linear scalability and capacity on demand
- JCache (JSR-107) Compliant
- Native C++/Java/.Net clients, REST clients, JCache API
- Parallel grid-wide query, data processing and map/reduce aggregation
- Distributed support for Java 8 Lambdas and Streams
- Real-time continuous query
- Read-through, Write-Through and Write-Behind Caching
- Client near-caching
- Managed Coherence Servers
- Live Events server-side programming model
- HotCache provides real-time database to cache updates
- Elastic Data tiered storage
- improves density of large data grids
- Full range of security features including audit capabilities
- Transaction Management • Developer to Data Center management and monitoring solutions.
- Oracle TopLink, Hibernate, and JPA support Lorem ipsum dolor sit amet, consectetur adipiscing elit 5 to 7 bullets at no more than 10 words per bullet
- Coherence*Web – Java EE HttpSession management
- Session Provider for the Microsoft .NET Framework
- Federated Caching provides
- multi-datacenter support
- Multitenant support improves

Oracle Coherence at Work

Fast Data Access and Backend Offload at Omni-Channel Scale – Applications cache data in the data grid, avoiding expensive requests to back-end data sources. The shared data cache provides a single, consistent view of cached data. Reading from the cache is faster than querying back-end data sources and scales naturally with the application tier.

Grid Computing Platform for Analytics and Execution – Applications query and analyze data in memory, leveraging the massive parallel capabilities of the data grid. Oracle Coherence provides out-of-the-box support for searching, aggregating, and sorting data, with support for custom analytical functions. It parallelizes operations across the entire data grid, ensuring that server failures or slowdowns do not affect calculation results.

Event-Driven Architecture – Applications respond in real time to data changes throughout the data grid. Every transaction can potentially trigger many events, each of which may need to be processed in a matter of milliseconds. Oracle Coherence provides event-handling technologies capable of handling intense event rates, including server-side stream processing and interactive technologies such as “continuous query” for real-time desktop applications.

System of Record for Microservices Applications – With Oracle Coherence's optional disk-based persistence mechanism, and its microservice framework integrations, it can be used to store the state of microservices applications without need for any traditional backing database, enabling an agile and lightweight architecture capable of streaming events to or from external systems

Artificial Intelligence – Oracle Coherence 15.1.1 release delivered some key functionality like vector storage , vector search and Coherence RAG capabilities.

Oracle Coherence Integration into Other Oracle Offerings

Oracle Coherence provides integration points with the leading application server WebLogic, to bring the power of the data grid to applications without requiring any code changes.

Coherence*Web manages HTTP session state in clustered environments, bringing Oracle Coherence's data scalability, availability, reliability and performance to inmemory session management and storage. Coherence*Web provides support for WebLogic Server (as well as Tomcat and other application servers).

Several Oracle Fusion Middleware products provide native integrations with Oracle Coherence out of the box to provide linearly scalable, fault tolerant, in-memory data management. Such integrations include Oracle WebLogic Server, Oracle Stream Analytics, Oracle SOA Suite, and Oracle Service Bus.

Finally, an ever-growing number of other Oracle offerings, across applications, global industry units, and Oracle Cloud Infrastructure services, for example PeopleSoft, Oracle Communications Billing and Revenue Management, and Oracle CX Commerce, integrate Oracle Coherence to leverage the strengths it brings to enterprise software. Integrated into some fifty other Oracle offerings, Oracle Coherence is strategic technology at Oracle.

Oracle Coherence Editions

Oracle Coherence offers three different editions: Standard Edition One, Enterprise Edition and Grid Edition.

Standard Edition One is a low-priced offering for smaller Coherence deployments. Oracle Coherence Standard Edition One provides for 1- or 2-node Hot-Standby deployments and provides the full Coherence API. Standard Edition One is included in Java SE Advanced Edition, meaning that customers who Java SE Advanced Edition can now deploy Coherence for free.

Enterprise Edition is a scale-out solution. It adds application lifecycle support

(packaging, deployment, monitoring and management) via the Managed Coherence Servers feature, which leverages the WebLogic Management Framework. Also included are a number of data management features, like parallel queries, parallel processing, and JTA support.

Grid Edition offers all the features of Enterprise and adds features for multi- datacenter support via Federated Caching, change data capture via GoldenGate HotCache, and Elastic Data (filesystem-based cache contents management)

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Related products

To Oracle Coherence enables in-memory data management for clustered applications and application servers. Coherence makes sharing and managing data in a cluster as simple as on a single server.

To provide seamless support for cloud to on-premise deployments, Oracle brings together key industry-leading technologies:

- Oracle WebLogic Suite
- Oracle WebLogic Server
- Oracle Enterprise Manager
- Oracle ExaLogic Elastic Cloud
- Java Technology