Critical Capabilities for Cloud Database Management Systems for Analytical Use Cases

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Initiatives: Data Management Solutions

The move to cloud continues apace. Data and analytics leaders can now choose from a wide variety of cloud-based DBMS for analytical use cases. This research will help in the evaluation of the strengths and weaknesses of both native services offered by CSPs and fully cloud-based systems.

This Critical Capabilities is related to other research:

Magic Quadrant for Cloud Database Management Systems

View All Magic Quadrants and Critical Capabilities

Overview

Key Findings

- **Vendors now embrace the cloud.** In previous years, different vendor offerings did not fully embrace cloud attributes, instead using "cloudwashing to appear to have products." This is no longer true. Vendors with decades of experience on-premises now offer fully cloud-based services.
- **Vendors are moving toward richer data ecosystems.** Many solution areas that relate to database management, such as data quality, data governance, master data management and data integration, are becoming more tightly integrated with (and within) cloud analytic platforms. This richer functionality is being offered through new product capabilities and partners.
- **Mature vendors are getting more cloudy; cloud-native vendors are getting more mature.** Vendors with a rich depth of capabilities developed on-premises have adapted to the cloud environment, and less mature cloud offerings are increasing the depth and capabilities of their services. Qualities central to the cloud are areas like dynamic elasticity and new pricing models. Mature qualities are characteristics like advanced workload management. Both types of vendors see there are things they can gain by emulating the strengths of the other type of vendor.

Recommendations

Data and analytics leaders responsible for choosing data management solutions:

- **Select a vendor based on your commitment to a particular CSP or an incumbent vendor.** Cloud-native offerings for a particular CSP will, by and large, be better integrated with other services from the CSP. Cloud offerings from an incumbent vendor will benefit from existing skill sets, familiarity and reduced migration expenses.
- **Judge on results, not promises or architecture.** One of the fundamental attributes of the cloud is the opaque nature of implementation. As a consumer, you cannot see nor modify the underlying implementation. Therefore, look at results when making decisions for a cloud analytic platform, whether those results be in performance, workload scalability or cost.

- **Evaluate your needs for multicloud and intercloud.** Multicloud is the ability to run a service on multiple clouds; and intercloud is the ability to access data transparently across multiple clouds. Both can be valuable features. Although your overall data estate will probably be spread over multiple clouds, individual use cases may very likely not need data outside of their silos. Depending on use cases, simple solutions such as replication between clouds and other service offerings can provide the required access to diffuse data, so multicloud or intercloud capabilities will not provide explicit value.

Strategic Planning Assumptions

By 2023, cloud preference for data management will reduce the vendor landscape, while the growth in multicloud increases the complexity for data governance and integration.

By 2022, cloud DBMS revenue will account for 50% of the total DBMS market revenue.

What You Need to Know

Data and analytics leaders can use this research to guide evaluation and initial vendor selection for cloud database management systems (DBMS) offerings for analytical use cases. This document is one of a family of three documents that should be considered together:

1. Magic Quadrant for Cloud Database Management Systems. This research evaluates selected vendors of DBMS that run in the cloud — for both analytical and operational use cases. The Magic Quadrant is used to judge the suitability of cloud DBMS vendors for either analytical or operational use, or for both.

2. **Critical Capabilities for Cloud Database Management Systems for Analytical Use Cases (this document).** This evaluates particular cloud DBMS products provided by the vendors in the Magic Quadrant for their suitability to support four analytical use cases, using nine core capabilities. The findings from this document feed into the evaluations of the cloud DBMS vendors in the Magic Quadrant.

3. Critical Capabilities for Cloud Database Management Systems for Operational Use Cases. This research evaluates particular cloud DBMS products provided by the vendors in the Magic Quadrant for their suitability to support four operational use cases, using 12 core capabilities.

Most of the capabilities are common to the two Critical Capabilities documents, but may be scored differently for the analytical and operational use cases. The scores for each capability may also carry different weights in each document. For each vendor in the Magic Quadrant, there may be the same, or two different, products in each of the Critical Capabilities documents. The Critical Capabilities research evaluates individual products that each vendor has chosen.

Previous Gartner research has documented the move of DBMS to the cloud — the majority of the growth in the DBMS market is taking place in the cloud (see The Future of the DBMS Market Is Cloud).

Enterprises use cloud DBMS for analytical use cases to provide support for the following capabilities:

- **Tactical and ad hoc analysis of structured information.** The information used by mainstream business processes — such as finance, HR, supply chain, customer relationship management and supplier relationship management — requires the analysis and provision of results to a large number and a wide range of user types. This is typically the domain of the traditional data warehouse, which structures data for efficient access by many different use cases and frequently combines data from multiple sources.
- **Data science and other advanced analytics.** Artificial intelligence (AI), machine learning (ML) and advanced statistics require the provision of reliable data of known quality. Algorithms may run within the cloud DBMS, or interface to a separate service. Cloud DBMS can also be used for data engineering, which is a precursor to the analysis.
- **Multiple levels of data structure.** It is now common for analysis to be performed on a wide variety of data other than structured information. The Internet of Things (IoT), social media, video, audio, documents and weblogs are commonly used to provide a fuller analytical picture. These data types can be used in data lakes, which typically provide less structure and validation for the data.
- **Virtualized data.** The Gartner concept of the logical data warehouse (LDW) is now firmly established in architectural best practice for analytics (see The Practical Logical Data Warehouse). It is now common to find products with preintegration between the data warehouse and data lake, and with access to many remote sources.

- **Real-time or near-real-time analysis.** The need for analytical results in real time or near real time to provide information to mainstream business processes is now the norm. This may be real-time querying of analytical data stores, the mixing of real-time and offline analytics, real-time data ingestion, real-time analytics on an event stream, or feeding real-time data through APIs.
- **Intercloud, multicloud and hybrid operations.** Data is being spread across multiple cloud platforms and on-premises. The ability to run products on different platforms, as well as access data across platforms, is becoming increasingly relevant.

The following trends are also appearing in the marketplace:

- **The emergence of the data and analytics ecosystem as the basis for competition.** This is where products or vendors are evaluated not on single product solutions, but on an ensemble of solutions that are integrated to work together. Integration of the data warehouse, data lake and ML services are a few typical scenarios. This research evaluates individual products.
- **The use of a single database product for both transactional and analytical use cases, rather than separate products.** In some cases, the same product may be used, but it may be configured differently for the two types of use cases.

How to Use This Research

Data and analytics leaders should use this research to learn how the evaluated cloud DBMS solutions support the nine capabilities defined by Gartner as relevant to the analytical use cases. They should then consider how those capabilities, in turn, support the four analytical use cases. The interactive version of this document can be used to customize the weighting of the scores. All the while, the organization should take into account the weighting of these factors that reflects what is important to them — the interactive version allows users to adjust the weightings to reflect their own requirements.

While all the products evaluated address the cloud DBMS analytical use cases, they can be very different in nature and achieve their ends in different ways. In particular, there are relational and nonrelational products, and CSP-specific and CSP-independent products. Buyers should ensure that they understand the implications for their organization of the type of product that they are acquiring.

The vendor product scores reflect Gartner analyst input combined with Gartner client feedback. However, this does not provide a complete evaluation of either vendor or tool. It is essential to also consider each vendor's market presence, track record, financial and organization strength, availability of skills, product support, and outlook — such as its vision and adaptability to market changes and disruption. In that regard, this research should be used in conjunction with Magic Quadrant for Cloud Database Management Systems.

The critical capabilities used for the following evaluations are chosen for their usefulness in creating differences between vendor offerings. If a capability is common in its availability and implementation across all vendors, the capability will not be used as a critical capability in this research.

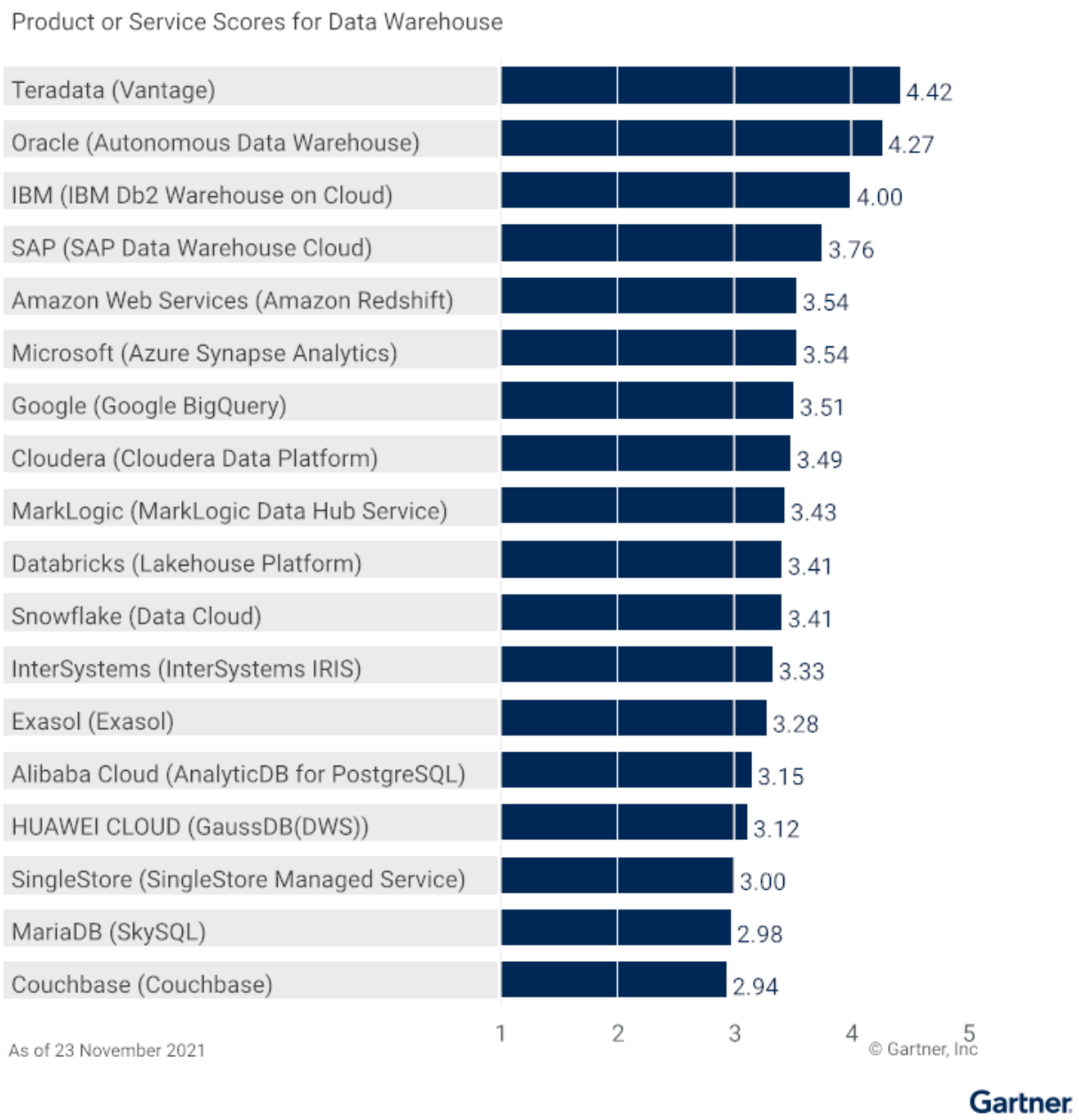
The scoring system used for the critical capabilities ranges from a low of 1 to a high of 5. A score of 3 indicates that the offering meets the requirements for that capability. As would be expected, most offerings score a 3 or higher on all use cases, as the vendors that qualify for this research represent the best offerings available. A score of less than 3 does not mean that the service cannot be used for the use case; rather, users may have to do additional work on their own to meet the standard requirements for that use case.

The critical capabilities assessed in this document represent a subset of the evaluation criteria that Gartner recommends when selecting vendors and tools. Therefore, the positioning of vendors in the graphics and tables do not represent overall vendor positioning in the market, and do not always coincide with positioning of vendors in the corresponding Magic Quadrant.

Analysis

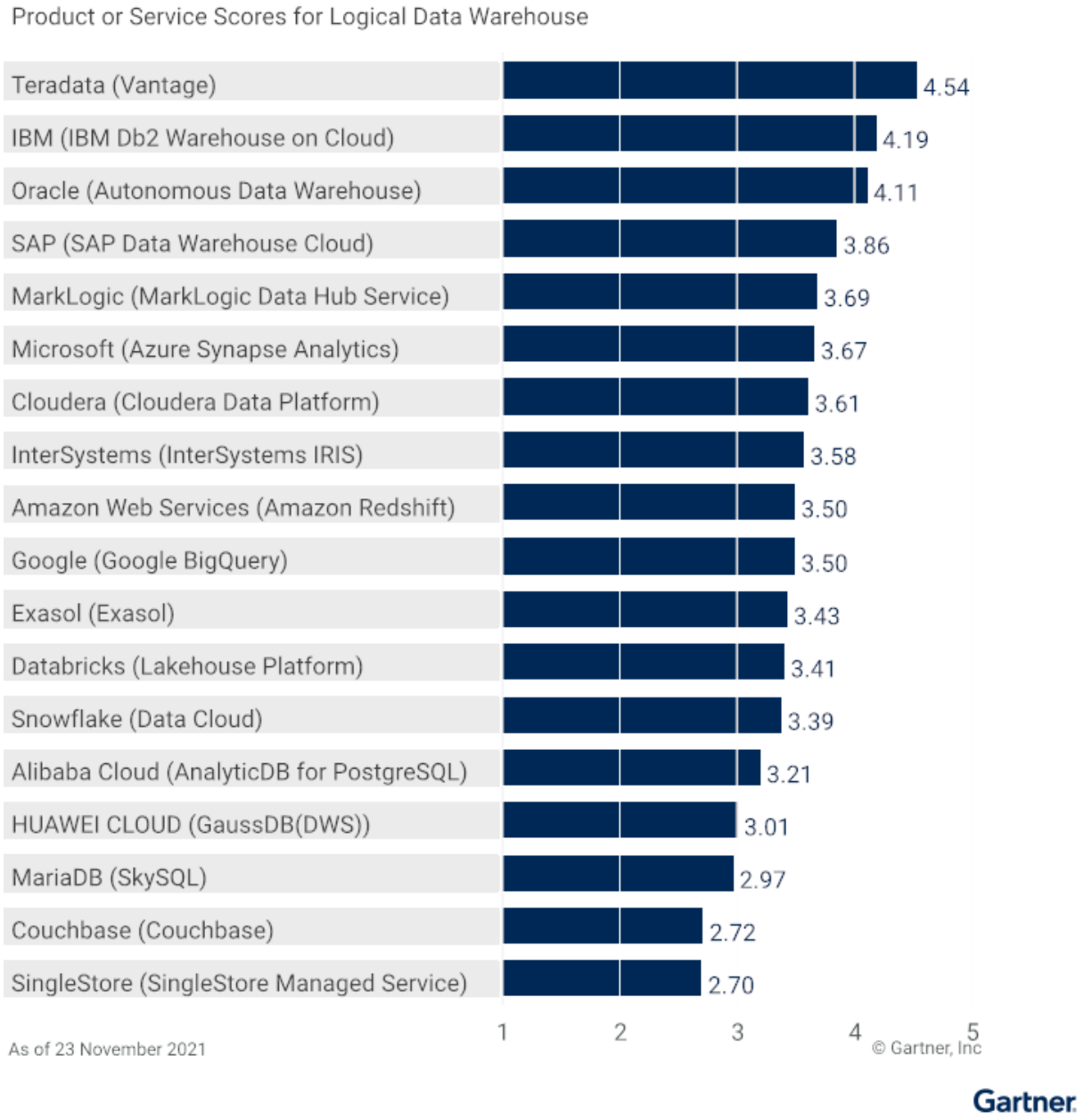
Critical Capabilities Use-Case Graphics

Vendors' Product Scores for the Data Warehouse Use Case



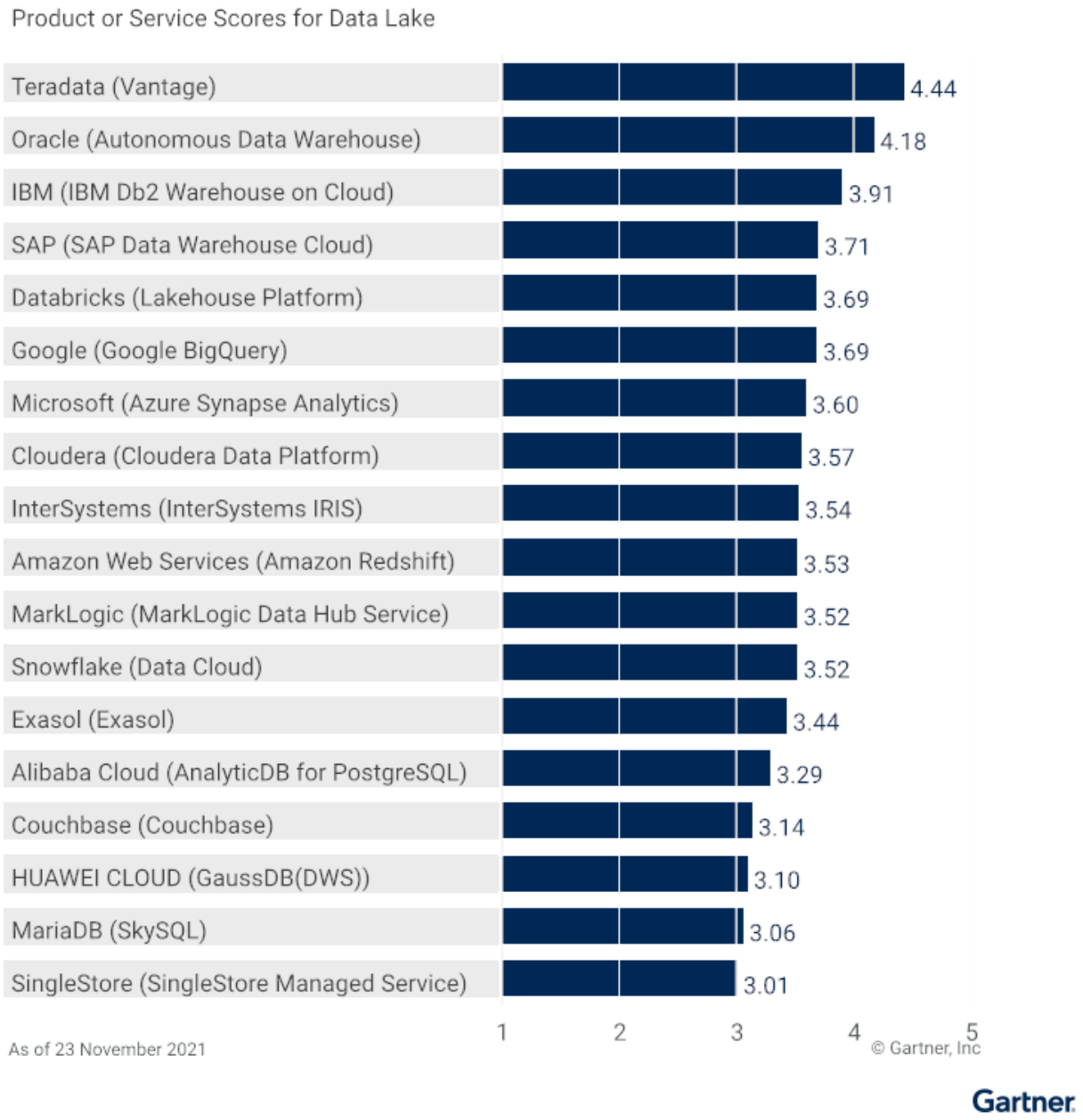
Source: Gartner (December 2021)

Vendors' Product Scores for the Logical Data Warehouse Use Case



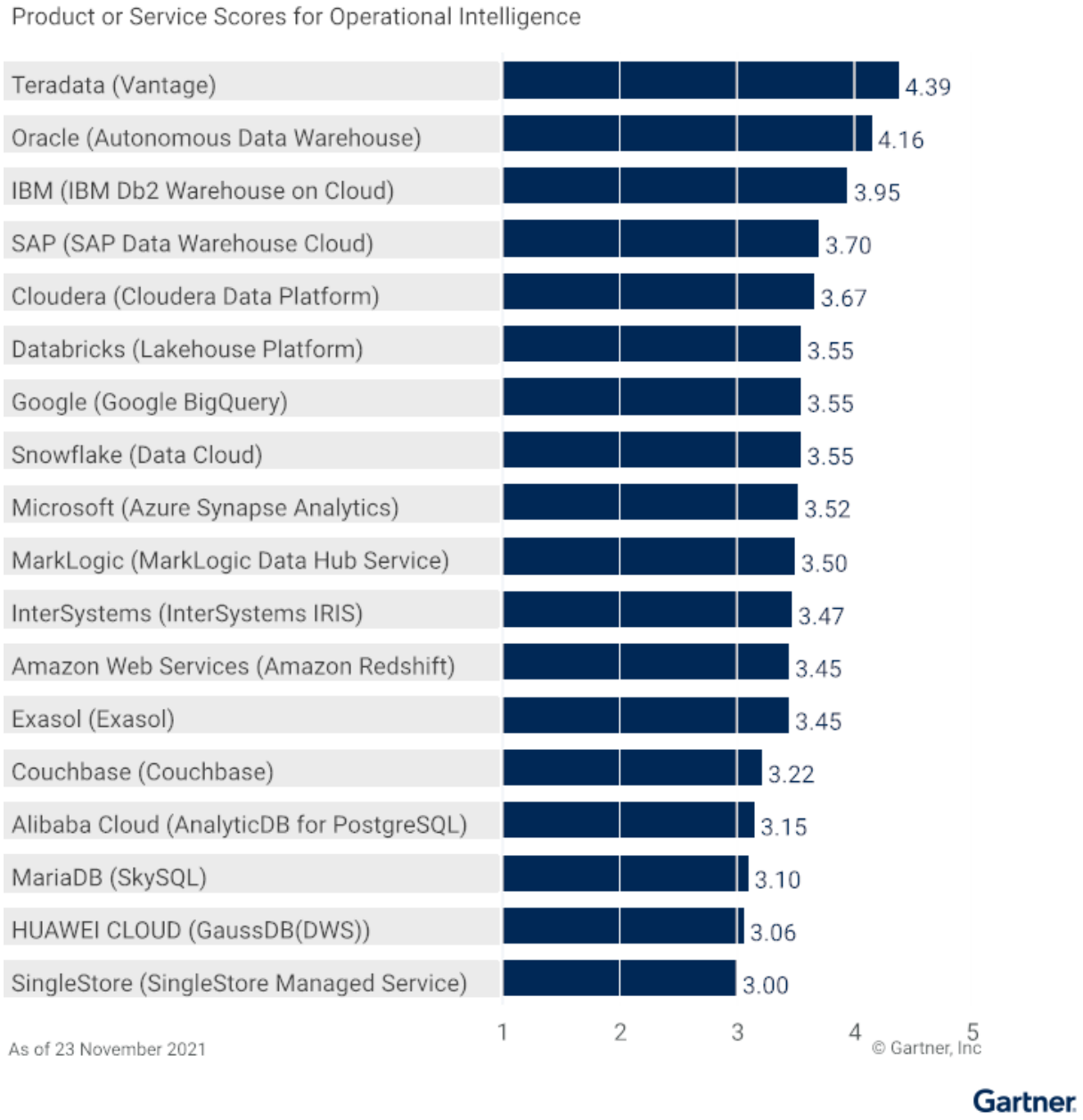
Source: Gartner (December 2021)

Vendors' Product Scores for the Data Lake Use Case



Source: Gartner (December 2021)

Vendors' Product Scores for the Operational Intelligence Use Case



Source: Gartner (December 2021)

Vendors

Alibaba Cloud (AnalyticDB for PostgreSQL)

Alibaba Cloud has products that address both operational and analytical use cases as well as a wide range of other cloud-based services. Its operations are primarily based in China and Asia/Pacific, but it also has an expanding presence in Europe and North America.

Analytic database services include AnalyticDB for PostgreSQL, AnalyticDB for MySQL, MaxCompute, Data Lake Formation and E-MapReduce (EMR).

The product considered here is AnalyticDB for PostgreSQL. This product is based on the open-source Greenplum Database, which has a long history in the analytical DBMS market. Alibaba contributes modifications to the Greenplum project.

Alibaba Cloud's AnalyticDB for PostgreSQL meets the requirements for all the analytic use cases, scoring over 3.15 for all cases.

For the data warehouse use case, AnalyticDB for PostgreSQL meets requirements. For the logical data warehouse use case, AnalyticDB for PostgreSQL meets requirements due to its integration and data interchange with the underlying cloud object store. This supports the general trend Gartner sees in the integration of data warehouses and data lakes, which most products in this category now support.

The product received its highest score for the data lake use case. It provides access to cloud object store-based and Hadoop- and Spark-based data lakes. It also incorporates the Apache MADlib library of over 300 data science algorithms. This allows data scientists to operate directly on the data without it having to be extracted from the data warehouse database.

AnalyticDB for PostgreSQL meets requirements for the operational intelligence use case, as it has performance features that allow it to be configured to provide low response time and high throughput for this type of workload.

Amazon Web Services (Amazon Redshift)

Amazon Web Services (AWS), headquartered in Seattle, Washington, offers a wide range of database management services and capabilities. Some are aimed at operational use cases, as is the case with Amazon Relational Database Service (RDS), Amazon Aurora and Amazon DynamoDB, for example. Others are aimed at analytic use cases, as is the case with offerings such as Amazon Redshift, Amazon Athena and Amazon EMR. AWS also offers memory-intensive services and offerings aimed at specialized use cases.

AWS is one of the largest cloud service providers in the world by revenue. Its international presence and a global client base across all major industries give its products and ecosystem a broad reach and large amounts of production experience.

The product evaluated here is Amazon Redshift, an analytic platform built on a massively parallel processing (MPP) architecture.

Amazon Redshift rated well above a 3 in all four use cases, and in the upper half in half of the four use cases. The highest relative rating for the offering was on the data warehouse use case, where Redshift placed fifth as the most mature cloud-only service and has the largest cloud production base, with a score nearly as high on the data lake use case. Amazon Redshift had its highest score on dynamic elasticity and a high score on financial governance, which contributed to good scores across all four use cases.

Amazon Redshift scored lowest in the category of multicloud, intercloud and hybrid deployment, because it only runs on the AWS platform, which affected its ratings across all use cases.

Cloudera (Cloudera Data Platform)

Cloudera Data Platform (CDP) offers multiple integrated cloud data services including CDP Data Hub, CDP Data Warehouse, CDP Machine Learning, CDP Operational Database, CDP DataFlow and CDP Data Engineering for both operational and analytic uses. In the cloud, users can switch from one to another seamlessly by using available credits. Cloudera Workload Experience Manager (WXM) is used to analyze, optimize, scale and migrate workloads. Cloudera Shared Data Experience (SDX) provides intercloud and multicloud unified security, governance and metadata management.

Cloudera meets requirements for all use cases in this Critical Capabilities research, with its highest result coming in operational intelligence. It scored highest of all vendors for multicloud, intercloud and hybrid operations, a core design element of its architecture that affects governance and security, as well as the more obvious ability to interact with data in multiple forms and locations. In addition, Cloudera scores above average for advanced analytics, present both in its data warehouse and machine learning offerings and offering a rich set of choices.

As more of Cloudera's customers have begun to migrate to the cloud, its workload management and automated performance optimization continue to improve to accommodate higher numbers of concurrent users. These functions are typically more developed in more mature traditional products that evolved in an era of fixed resource limits that required effective management to deliver performance to large populations of simultaneous users.

Couchbase (Couchbase)

Couchbase, new to this year's Magic Quadrant and Critical Capabilities research, offers a multimodel, nonrelational DBMS with a heritage in high-performance operational use cases. Much of Couchbase's roadmap is targeted toward enhancing its cloud capabilities and delivering availability on leading cloud platforms.

Couchbase does not position itself today for use in data warehouses or data lakes, and at this time it does not meet requirements for the data warehouse or logical data warehouse use case. It is below average for advanced analytics and automated performance tuning, both of which tend to be important for those use cases, as well as workload management.

However, the data lake result is more positive, driven in part by Couchbase's well-above-average score for the multicloud, intercloud and hybrid deployment capability. This reflects its early investment in computing at the edge. That capability is not featured strongly in this analysis, but for customers with a requirement in this area, Couchbase is a good candidate.

Databricks (Lakehouse Platform)

Databricks is headquartered in San Francisco, California. It offers the Databricks Lakehouse Platform on Alibaba, AWS, Google Cloud Platform and Microsoft Azure (Azure Databricks).

The Lakehouse Platform consists of data stored in a data lake, including open-source formats. This data can also be used through Delta Lake, which adds metadata and structures to the underlying data to deliver the capabilities of a traditional data warehouse.

The Databricks Lakehouse Platform received a rating of 3.41 or higher on all four use cases, significantly exceeding the “meets expectations” score of 3. Its highest rating was on the data lake use case.

Databricks scored highest in high-speed processing and ingest, based on user references as well as architecture. Databricks and its founders are closely associated with Spark, which helped to deliver its second-highest rating, on the advanced analytics capability.

Exasol (Exasol)

Exasol is headquartered in Nuremberg, Germany. It provides the Exasol database, an in-memory analytics database. Exasol is a specialist vendor that focuses solely on analytic database solutions such as data warehouse and data lake. It is new to the Critical Capabilities research this year. Historically, most of its business has been in Europe, but it has a growing presence in North America and the Middle East.

Exasol has experience in data warehousing, starting as an on-premises product. Its product provides the main features that customers in this market expect, such as in-memory, columnar, data lake integration and the ability to work with machine learning.

Exasol exceeds requirements for the data warehouse use case as would be expected given their focus.

Its score of 3.43 for the Logical Data Warehouse use case reflects its successful interface with data lakes and remote systems.

Exasol has good support for AI and machine learning, and more than meets requirements for data lake and analytics processing.

It also meets requirements for operational intelligence, while not being a transactional online transaction processing (OLTP) system since its proven in-memory technology allows for the use of high-volume dashboard and operational reporting alongside a more traditional transaction system.

Exasol received scores lower than 3 (“meets expectations”) on dynamic elasticity and workload management, which dropped them into the middle of rankings in all four use cases.

Google (Google BigQuery)

Google Cloud Platform (GCP), a subsidiary of Google, is located in Santa Clara, California. GCP supports many database platform as a service (dbPaaS) products. This includes fully managed versions of products from third-party providers and its own dbPaaS products — Cloud SQL (PostgreSQL, MySQL and SQL Server), Cloud Spanner, Cloud Bigtable, BigQuery, Dataproc, Cloud Firestore and Firebase Realtime Database.

GCP’s operations are geographically diversified, with presence in all regions of the world. It has clients of every size across all industries. Google BigQuery is the dbPaaS product evaluated here.

Google BigQuery meets requirements in all four use cases, and places in the upper half of three out of four use case ratings. Its highest scores, in advanced analytics, high-speed processing and ingest, and financial governance, led to a strong showing in the data lake use case, where BigQuery placed in the top third. Big Query’s lowest relative placement is in the logical data warehouse use case, though no single score significantly impacted Big Query’s rating here. Rather, its middle-of-the-pack rating reflects the competitive nature of this market.

Of note, Google BigQuery provides a blended pricing model supporting consumption-based, resource-based and burst capabilities in a single product. This is beneficial in addressing some financial governance concerns. In addition, its management console can be used for BigQuery Omni on other cloud platforms and on GCP.

HUAWEI CLOUD (GaussDB(DWS))

HUAWEI CLOUD is headquartered in Shenzhen, China. It provides GaussDB in a range of offerings. Relational DBMS offerings include GaussDB(for MySQL), GaussDB(for openGauss), GaussDB(for PostgreSQL) and GaussDB Data Warehouse Service (DWS). Nonrelational offerings include GaussDB(for Mongo), GaussDB(for Influx), GaussDB(for Cassandra) and GaussDB(for Redis). All are available on HUAWEI CLOUD and HUAWEI CLOUD Stack for on-premises deployment.

GaussDB(DWS) is a fully PostgreSQL-compatible cloud data warehouse offering that runs on HUAWEI CLOUD infrastructure. It uses a node-based MPP architecture that is designed to handle petascale data volume. As competitive products have raised the bar in the past year, the vendor no longer meets requirements for the use cases here.

Reflecting its Postgre heritage, GaussDB(DWS) scored well for both high-speed, high-volume processing and high-speed ingest. As a node-based offering, GaussDB(DWS) provides solid financial governance capabilities that meet requirements for cost predictability, though it may lack some of the flexibility of more modern serverless architectures.

Automated performance tuning and optimization, an area where vendors are adding significant capability, is somewhat below average for GaussDB(DWS). Similarly, it is below average for multicloud, intercloud and hybrid deployment — running in its own cloud and some Asia-based public clouds, but none of the leaders, and without the ability to query cloud and on-premises data in the same query.

IBM (IBM Db2 Warehouse on Cloud)

IBM, based in Armonk, New York, offers a broad range of dbPaaS offerings coalescing around Cloud Pak for Data, a unified integration layer for containerized DBMS services built on Red Hat OpenShift. Cloud Pak for Data serves as a platform for many other IBM data management offerings, including IBM Db2 on Cloud, IBM Db2 Warehouse on Cloud, IBM Cloud SQL Query, IBM Cloudant and the IBM Cloud Databases family. The IBM Cloud Databases family provides a variety of managed data technologies including PostgreSQL, MongoDB, Elasticsearch, Redis, RabbitMQ, DataStax and EDB. IBM Cloud Object Storage serves as a landing zone and clearinghouse to complete IBM's offerings for operational and analytic use cases. IBM's multicloud support covers AWS, Microsoft Azure, Google Cloud Platform, IBM Cloud and private cloud deployment (most offerings are also available on-premises). IBM Cloud Satellite service provides multicloud and edge capabilities with "single pane of glass" management.

IBM's operations are global, with significant penetration of all industries and all sizes of organization. IBM invests broadly in leading data management technologies. Db2 Warehouse on Cloud is the dbPaaS product evaluated here.

Db2 Warehouse on Cloud meets requirements for all four use cases, placing in the top three among all solutions evaluated for each. Db2 Warehouse on Cloud scored a 4 or above in six out of nine evaluated criteria, and did not score below a 3.6 in any of them. Of particular note were high scores for distributed access, automated performance tuning and optimization, and multicloud, intercloud and hybrid cloud deployment, which drove IBM's second place showing for the logical data warehouse use case. Db2 Warehouse on Cloud, via Cloud Pak for Data, can be deployed on the end user's cloud of choice or on-premises, providing continuity for hybrid use-case requirements. As with many larger vendors with deep portfolios, Db2 Warehouse on Cloud should be evaluated in the context of the broader ecosystems provided in Cloud Pak for Data, and the additional functionality that is provided from this approach.

InterSystems (InterSystems IRIS)

InterSystems is headquartered in Cambridge, Massachusetts. It markets InterSystems IRIS, a multimodel, hybrid DBMS. InterSystems has presence across the globe in all regions, primarily in healthcare, but also in other industries like financial services.

InterSystems IRIS is available as a public, fully managed dbPaaS cloud service on AWS, GCP, Microsoft Azure and Tencent. A private fully managed dbPaaS version is also available.

InterSystems IRIS meets requirements in all four analytical use cases, and it consistently places in the middle of products evaluated. Intersystems IRIS did best in the logical data warehousing and data lake use cases.

InterSystems IRIS received only one critical capability rating below "meets requirements" — for workload management. Highlights among its many other capability scores at or near 4 ("meets or exceeds some requirements") include the product's support for advanced analytics, due to its strength in embedded analytics, ML and AI. InterSystems IRIS also exceeds requirements for multicloud, intercloud and hybrid deployment, high-speed processing and ingest, and distributed data access.

MariaDB (SkySQL)

MariaDB has headquarters in Redwood City, California. It offers MariaDB SkySQL, a fully managed cloud offering of the MariaDB database which is also available as an on-premises offering in both MariaDB Enterprise and fully open-source MariaDB Community Server.

MariaDB's operations are primarily split between North America and Europe, with a limited presence in the Asia/Pacific region. Its customers span a wide range of industries and enterprise sizes. MariaDB SkySQL is the dbPaaS product evaluated here.

SkySQL scored above a 3 ("meets requirements") for two of the four use cases evaluated in this research, with its strongest showing in the operational intelligence use case, followed by the data lake use case. Strong capabilities around pluggable storage engines and a converged row and column store support their relatively strong showing in these areas.

Relatively low scores for workload management and distributed access capabilities impacted SkySQL's rating for the data warehouse and logical data warehouse use case. In all other evaluated critical capabilities, SkySQL scored a 3 or above.

MarkLogic (MarkLogic Data Hub Service)

MarkLogic has headquarters in San Carlos, California. The MarkLogic Data Hub Service is offered on the AWS and Microsoft Azure clouds.

MarkLogic focuses on data management, built around a transactional document store and an integration hub. The integration hub enables users to access data stored remotely through a universal index, which enables reduced remote data movement through optimization of remote access.

MarkLogic's Data Hub Service scored in the middle in three of the four use cases. Its highest rating was on the logical data warehouse, driven by their focus on overall data integration and distributed access.

The MarkLogic Data Hub Service scored highest on the distributed access capability. The offering scored over 3 on all capabilities, with the exception of workload management, where it was just below with a 2.9.

Microsoft (Azure Synapse Analytics)

Microsoft is headquartered in Redmond, Washington. It provides a broad range of cloud DBMS offerings, including Azure Synapse Analytics, which is evaluated here. Microsoft's operations are geographically diversified, and its customers are spread across a wide range of industries and deployment sizes worldwide.

Microsoft delivers a comprehensive cloud data management ecosystem, in that its data and analytics offerings span all the use cases and critical capabilities we have defined for this market. This ecosystem is also cohesive, in that Azure Synapse Analytics has end-to-end metadata and security, plus broad integration via Synapse Link and Azure Purview.

Azure Synapse meets requirements for all four analytical use cases, and it currently ranks in the upper half of the competitors evaluated for each analytical use case. This high ranking is an advancement over the "middle of the pack" positioning Azure Synapse experienced in a previous edition of this report. The advancement is due to Microsoft releasing more pieces of its vision for a comprehensive and cohesive ecosystem. Highlights include high use case scores for logical data warehousing (due to Synapse's tight interoperability among its data platforms and integration tools) and the data lake.

Azure Synapse received its highest capability scores for advanced analytics, financial governance and distributed access.

Oracle (Autonomous Data Warehouse)

Oracle is based in Austin, Texas. Oracle Autonomous Data Warehouse (ADW) is available in Oracle Cloud Infrastructure (OCI), as well as on Oracle Exadata Cloud@Customer (ExaCC) private cloud. ADW is also available in Oracle Dedicated Region Cloud@Customer private cloud that runs in the customer's data center.

Oracle ADW ranks in the top three for all use cases in this research, with all of its scores exceeding a 4.1.

Oracle's cloud offering offers a level of automatic management that includes performance tuning. ADW scores well above average for automated performance tuning and optimization. It leads with automated security patching, upgrades and other patches with zero downtime, automated index maintenance, and enhanced optimization using ML.

ADW also scores well above average for its dynamic elasticity, considerably helped by its ownership of the cloud environment it runs in. Its multicloud, intercloud and hybrid deployment score falls slightly below average because while Oracle Database is generally portable to other clouds, ADW runs only on OCI. ADW does support hybrid partitioned tables that allow a single table to span both OCI and other cloud providers and can query that table as a single statement, a leading capability. ADW has full compatibility with the Oracle Database, making hybrid usage a compelling opportunity for customers.

ADW also scores well above average for financial governance.

SAP (SAP Data Warehouse Cloud)

SAP Data Warehouse Cloud is well-placed in the data warehouse use case. Although SAP Data Warehouse Cloud may not be as widely used as other vendors' solutions that have been in the cloud analytical DBMS marketplace for many years, it has been well-received by SAP customers. Customers react positively to the use of personal analytical development areas called Spaces. These are dynamic sandboxes that can be created within the data warehouse, making data, both local and remote, easy to work with.

SAP is well-placed to support the LDW use case, as it provides several important features that allow collaboration between multiple analytic systems. The underlying SAP HANA Cloud system can connect with a very wide range of SAP and non-SAP data sources. Data virtualization is included as a native capability, and the system can make metadata available for external tools to be able to query, export and load data.

For the data lake use case, SAP Data Warehouse Cloud is rated well because it can provide a range of different data science capabilities, and it provides interfaces to object storage and external data lake systems, such as Spark.

SAP Data Warehouse Cloud inherits the transactional performance of its underlying SAP HANA Cloud database instances, which provides for operational intelligence use cases.

SingleStore (SingleStore Managed Service)

SingleStore is headquartered in San Francisco, California. It offers SingleStore Managed Service, a fully managed cloud DBMS with Universal Storage technology, which provides an automated, life-cycle-aware tiered storage model across in-memory rowstore, persisted columnstore and cloud object storage, while also providing multimodel and serverless capabilities. SingleStore's operations and customers are mostly located in North America and Europe, clustered in the financial, insurance and IT industries.

SingleStore Managed Service is available as SaaS on AWS, GCP and Microsoft Azure. The Dedicated Edition of the SingleStore Managed Service product can be deployed on private clouds, and SingleStore instances can interoperate across multiple clouds and on-premises deployments.

SingleStore Managed Service meets the requirements for three out of four analytical use cases: data warehousing, data lake and operational intelligence.

SingleStore scored below a 3 (“meets requirements”) for a few analytical capabilities, including dynamic elasticity, distributed access, advanced analytics and automated performance tuning. Requirements were met for the other analytical capabilities, including high-speed processing and ingest, workload management, and multicloud, intercloud and hybrid deployment.

Snowflake (Data Cloud)

Snowflake, based in Bozeman, Montana, offers the Snowflake Data Cloud, available on AWS, GCP and Microsoft Azure. It is focused on delivering a global, integrated analytics-focused data environment. The platform also supports document-style data (such as JSON data), a data science development environment called Snowpark, and a private cloud offering called Virtual Private Snowflake.

Snowflake’s operations are mostly in North America, but it continues to gain traction in EMEA. Asia/Pacific operations remain limited at this time. Snowflake continues to focus on an expanded vision of a ubiquitous data cloud spanning cloud service providers though this has not fully materialized yet.

Snowflake meets requirements for all four use cases. Snowflake scored above a 3 for all evaluated criteria except financial governance. Its strongest positioning is in the operational intelligence use case, reflective of a strong score in dynamic elasticity, and relatively high scores for high-speed processing and ingest, and performance monitoring and administration.

Snowflake’s “middle of the pack” ratings for advanced analytics and distributed access are reflected in relatively lower scores for the data lake and logical data warehouse use cases. Snowflake’s advanced analytics capabilities are still emerging. At the time of this evaluation, generally available support for Python was still pending, and the vendor does not yet provide a set of prebuilt, in-database advanced analytic algorithms. Additionally, Snowflake works best when all data is managed by Snowflake, with limited optimizations when accessing external tables, although using a materialized view can address these limitations by bringing the data into Snowflake.

Teradata (Vantage)

Teradata is based in San Diego, California. It delivers data management solutions for analytics across any deployment environment. Teradata Vantage is successfully established as a cloud-based analytical system and is available on AWS, GCP and Microsoft Azure. It is also available on the Teradata Cloud (optimized infrastructure) and on-premises via the IntelliFlex appliance hardware or customer hardware through the use of virtual machines. Teradata Vantage supports SQL query with spatial and temporal support, JSON, a wide variety of ML algorithms and graph processing within the Teradata Hybrid Multi-Cloud Ecosystem, which supports the LDW use case.

Teradata QueryGrid provides multisystem query support via Teradata's own software, as well as via open-source Presto, including support for and integration with Apache Hadoop and Spark.

Teradata Vantage was the top-rated solution for all four use cases, with a score of 4.39 or higher for all use cases. Teradata Vantage achieved its highest score for the logical data warehouse use case, reflective of the depth of its distributed access capabilities. Teradata Vantage also scored very well in the data warehouse use case, based on its traditional strengths in this area.

Teradata Vantage had scores of over 4 for eight of nine critical capabilities, with scores of 4.8 or higher for advanced analytics, distributed access and workload management.

Context

Analytics continues to be a top priority for many organizations. This, combined with the trend toward adoption of the cloud, has meant that the ability of cloud DBMS solutions to address analytical use cases has become very important. There is a wide variety of solutions to choose from. Existing analytics database vendors have moved to the cloud; there are offerings from each of the main CSPs, and also vendors that run on multiple clouds. Cloud DBMS can be a relational DBMS or a nonrelational DBMS. They can also vary considerably in their functional richness and maturity. This provides a good degree of choice, but can also make it difficult for data and analytics leaders to compare the offerings. In addition, the market is moving at a fast pace with new features being frequently added — and then matched by competition.

A trend is for these systems to interoperate with other analytic components. In particular, the ability to integrate data warehouses, data lakes, and artificial intelligence and machine learning services is well-established. This has given rise to what are termed “analytical ecosystems” that span multiple types of analysis and that are becoming a new basis for competition.

With long-term traditional vendors, such as Oracle and Teradata, entering the market space with full-blown cloud offerings, some more mature capabilities such as workload management are now part of the overall feature landscape. Younger products typically have not been able to add this type of sophisticated capability in their services yet.

Product/Service Class Definition

Cloud DBMS for analytical use cases consist of the following types of system:

- Relational DBMS (RDBMS)
- Nonrelational DBMS
- Hadoop/Spark distributions (No specific rating advantage was given with regard to the type of data store used — for example, RDBMS, graph DBMS, HDFS, key-value DBMS, document DBMS, wide-column DBMS.)

Critical Capabilities Definition

As part of the research process for the companion Magic Quadrant, we relied on ongoing briefings from the vendors selected, an RFI issued in relation to document-specific features, and ongoing interactions with Gartner clients as part of the inquiry process.

Advanced Analytics

The product’s ability to perform advanced analytic operations within the dbPaaS. We evaluate what functionality is offered in the current version of the product and what functionality is used by customers. In addition, the depth and variety of available AI/ML algorithms is taken into consideration.

Automated Perf Tuning/Optimization

The ability to optimize performance for queries, transactions and workloads to meet performance SLAs. This can include the availability of performance-enhancing features.

Distributed Access

The ability to access data outside of the internal storage of a database management system. This includes products that can optimize access to outside storage through sharing processing or reducing data transfer.

Dynamic Elasticity

The ability to easily scale both up and down based on policy in response to changing workloads or user specifications, to deliver predictable cost and performance against SLAs when confronted with workload variability.

Financial Governance

The ability to forecast, budget usage, and monitor and control costs by throttling, workload or user prioritization or other means. It can include governing types and numbers of resources used, and recommending and implementing less costly storage strategies.

Tools for modeling costs and blended pricing models facilitate this capability.

High-Speed Processing and Ingest

The ability to continuously process and load data from multiple endpoints and in different formats (including in-stream computations), and to durably write and make data quickly available.

Multi/Intercloud/Hybrid Deployment

The ability to deploy and operate analytic and operational activities across one or more cloud environments and on-premises.

Performance Monitoring and Admin

This capability includes resource utilization, database activity monitoring, role-based activities, security alerts and intelligent advisors in distributed, multicloud and hybrid deployments.

Workload Management

The ability to perform different types and sizes of workloads simultaneously while enforcing or extending policy-based resource limits; handle varying and conflicting workloads while optimizing response times; and prioritize the workloads to meet policy-defined service levels.

Use Cases

Data Warehouse

Managing structured historical data from multiple sources. Data is structured to make it flexibly available to a wide variety of use cases.

Logical Data Warehouse

Managing data variety and volume for structured and other content data types, acting as a logical tier to a variety of data sources both internal and external.

Data Lake

Storage and processing of semantically flexible data. Uses include data engineering, machine learning, artificial intelligence and predictive modeling.

Operational Intelligence

Analytical support for operational business operations. Analytics may be performed on a different database from the operational data; it may run on a different cloud service.

Vendors Added and Dropped

Added

The following vendors have been added to this year's Critical Capabilities for Cloud Database Management Systems for Analytical Use Cases that were not in last year's research:

- Couchbase
- Exasol
- MariaDB
- SingleStore

Dropped

Tencent was dropped from this year's Critical Capabilities for Cloud Database Management Systems for Analytical Use Cases.

Inclusion Criteria

Inclusion Criteria

The following inclusion criteria represent the specific attributes that Gartner analysts considered necessary for a vendor to be included in this research.

Vendors must:

- Offer a generally available software product that met Gartner's definition of a cloud DBMS.
- Support at least three of the following cloud DBMS use cases:
  - Data warehouse
  - Logical data warehouse
  - Data lake
  - Operational intelligence
- Rank among the top 20 organizations in a market momentum index defined by Gartner for this research. Data inputs used to calculate market momentum include the following measures, among others:
  - Gartner customer search and inquiry volume and trend data.
  - Volume of job listings on a range of employment websites in the U.S., Europe and China.
  - Frequency of mentions as a competitor to other cloud DBMS vendors in reviews on Gartner's Peer Insights forum during the year ending March 2021.

- Have market presence in at least three of the following regions (regional market presence is defined as a minimum of 5% of the cloud revenue of the verified production customer base, as well as the existence of dedicated sales offices or distribution partnerships in a specific region):
  - North America (Canada, Mexico and the U.S.)
  - Central and South America
  - Europe (including Western Europe and Eastern Europe)
  - Middle East and Africa (including North Africa)
  - Asia/Pacific
  - Japan
- Have a cloud DBMS service generally available as of midnight, U.S. Eastern Daylight Time on 1 July 2021. This included any new functionality added to the service(s) by the specified date. We did not consider beta, "early access," "technology preview," or other not generally available functionality or services. Additionally:
  - Any acquired product or service must have been acquired and offered by the acquiring vendor as of 1 July 2020. Acquisitions after this date were considered under their preacquisition identities, if appropriate, and are represented separately until the publication of the following year's Magic Quadrant.

These criteria match those for inclusion in the Magic Quadrant for Cloud Database Management Systems.

Exclusion Criteria

Vendors marketing only products from the list below are explicitly excluded from this Critical Capabilities research. They include:

- "Streaming" services, whose use cases are dominated by immediate event processing and which are rarely if ever used for subsequent management of the data involved
- Prerelational DBMS products

- Object-oriented DBMS products
- Data grid products
- BI and analytical solutions that offer a cloud DBMS that is limited specifically to the vendor's own BI and analytical tools
- Analytics query accelerators (SQL interfaces to object stores or file systems)
- Data virtualization, data fabric and data federation that do not provide data persistence of the vendor's own

These criteria match those for exclusion in the Magic Quadrant for Cloud Database Management Systems.

Table 1: Weighting for Critical Capabilities in Use Cases

(Enlarged table in Appendix)

Critical Capabilities	*Data Warehouse*	*Logical Data Warehouse*	*Data Lake*	*Operational Intelligence*
Advanced Analytics	10%	10%	25%	10%
Automated Perf Tuning/Optimization	15%	10%	5%	10%
Distributed Access	10%	40%	10%	10%
Dynamic Elasticity	10%	10%	15%	15%
Financial Governance	15%	10%	5%	10%
High-Speed Processing and Ingest	10%	0%	20%	15%
Multi/Intercloud/Hybrid Deployment	5%	10%	5%	15%
Performance Monitoring and Admin	10%	5%	10%	10%
Workload Management	15%	5%	5%	5%
As of 23 November 2021				

Source: Gartner (December 2021)

This methodology requires analysts to identify the critical capabilities for a class of products/services. Each capability is then weighted in terms of its relative importance for specific product/service use cases.

Each of the products/services that meet our inclusion criteria has been evaluated on the critical capabilities on a scale from 1.0 to 5.0.

Critical Capabilities Rating

Table 2: Product/Service Rating on Critical Capabilities

(Enlarged table in Appendix)

Critical Capabilities	*Alibaba Cloud (AnalyticDB for PostgreSQL)*	*Amazon Web Services (Amazon Redshift)*	*Cloudera (Cloudera Data Platform)*	*Couchbase (Couchbase)*	*Databricks (Lakehouse Platform)*	*Exasol (Exasol)*	*Google (Google BigQuery)*	*HUAWEI CLOUD (GaussDB(DWS))*	*IBM (IBM Db2 Warehouse on Cloud)*	*InterSystems (InterSystems IRIS)*	*MariaDB (SkySQL)*	*MarkLogic (MarkLogic Data Hub Service)*	*Microsoft (Azure Synapse Analytics)*	*Oracle (Autonomous Data Warehouse)*	*SAP (SAP Data Warehouse Cloud)*	*SingleStore (SingleStore Managed Service)*	*Snowflake (Data Cloud)*	*Teradata (Vantage)*
Advanced Analytics	3.8	3.4	3.8	2.9	3.8	3.8	4.0	2.8	4.0	4.0	3.0	3.6	3.9	4.0	4.0	2.8	3.0	4.8
Automated Perf Tuning/Optimization	3.5	3.7	3.3	2.0	3.2	3.6	3.2	2.9	4.1	3.1	3.0	3.2	3.4	5.0	3.4	2.6	3.5	4.4
Distributed Access	3.3	3.6	3.5	2.1	3.5	3.5	3.5	3.0	4.5	3.9	2.8	4.1	3.9	4.0	4.0	2.4	3.2	4.8
Dynamic Elasticity	3.0	4.0	3.2	3.2	3.5	2.5	3.8	3.5	3.7	3.0	3.1	3.4	3.5	4.3	3.5	2.4	5.0	3.8
Financial Governance	3.0	3.6	3.5	3.6	3.0	3.4	4.0	3.0	4.2	3.0	3.0	3.6	3.9	4.0	3.8	3.0	2.8	4.0
High-Speed Processing and Ingest	3.3	3.6	3.5	3.9	4.6	3.9	4.0	3.3	3.6	3.6	3.2	3.5	3.6	4.4	3.2	3.9	3.4	4.4
Multi/Intercloud/Hybrid Deployment	2.7	2.5	5.0	4.3	3.5	4.3	3.0	2.5	4.0	4.0	3.5	3.5	3.2	3.5	3.9	3.2	3.4	4.7
Performance Monitoring and Admin	3.1	3.3	3.4	3.4	3.0	3.0	3.1	3.2	3.7	3.3	3.2	3.4	3.0	4.0	3.8	3.1	3.8	4.1
Workload Management	2.6	3.5	3.2	2.2	3.1	2.3	2.9	3.5	4.0	2.9	2.5	2.9	3.3	4.5	4.2	3.6	3.0	4.9
As of 23 November 2021																		

Source: Gartner (December 2021)

Table 3 shows the product/service scores for each use case. The scores, which are generated by multiplying the use-case weightings by the product/service ratings, summarize how well the critical capabilities are met for each use case.

Table 3: Product Score in Use Cases

(Enlarged table in Appendix)

Use Cases	Alibaba Cloud (AnalyticDB for PostgreSQL)	Amazon Web Services (Amazon Redshift)	Cloudera (Cloudera Data Platform)	Couchbase (Couchbase)	Databricks (Lakehouse Platform)	Exasol (Exasol)	Google (Google BigQuery)	HUAWEI CLOUD (GaussDB(DWS))	IBM (IBM Db2 Warehouse on Cloud)	InterSystems (InterSystems IRIS)	MariaDB (SkySQL)	MarkLogic (MarkLogic Data Hub Service)	Microsoft (Azure Synapse Analytics)	Oracle (Autonomous Data Warehouse)	SAP (SAP Data Warehouse Cloud)	SingleStore (SingleStore Managed Service)	Snowflake (Data Cloud)	Teradata (Vantage)
Data Warehouse	3.15	3.54	3.49	2.94	3.41	3.28	3.51	3.12	4.00	3.33	2.98	3.43	3.54	4.27	3.76	3.00	3.41	4.42
Logical Data Warehouse	3.21	3.50	3.61	2.72	3.41	3.43	3.50	3.01	4.19	3.58	2.97	3.69	3.67	4.11	3.86	2.70	3.39	4.54
Data Lake	3.29	3.53	3.57	3.14	3.69	3.44	3.69	3.10	3.91	3.54	3.06	3.52	3.60	4.18	3.71	3.01	3.52	4.44
Operational Intelligence	3.15	3.45	3.67	3.22	3.55	3.45	3.55	3.06	3.95	3.47	3.10	3.50	3.52	4.16	3.70	3.00	3.55	4.39
As of 23 November 2021																		

Source: Gartner (December 2021)

To determine an overall score for each product/service in the use cases, multiply the ratings in Table 2 by the weightings shown in Table 1.

Acronym Key and Glossary Terms

AI	artificial intelligence
CSP	cloud service provider
DBMS	database management system
LDW	logical data warehouse
ML	machine learning
MPP	massively parallel processing
SLA	service-level agreement

Evidence

Our analysis in this Critical Capabilities research is based on information gathered from interactions with Gartner clients during the 12 months leading up to June 2021.

We also took account of:

- Earlier information and any news about vendors' products, customers and finances that came to light during the time frame for our analysis.
- The findings in:
  - Market Share: All Software Markets, Worldwide, 2020
  - Market Share: Enterprise Platform as a Service, Worldwide, 2020
  - Gartner Peer Insights

Critical Capabilities Methodology

This methodology requires analysts to identify the critical capabilities for a class of products or services. Each capability is then weighted in terms of its relative importance for specific product or service use cases. Next, products/services are rated in terms of how well they achieve each of the critical capabilities. A score that summarizes how well they meet the critical capabilities for each use case is then calculated for each product/service.

"Critical capabilities" are attributes that differentiate products/services in a class in terms of their quality and performance. Gartner recommends that users consider the set of critical capabilities as some of the most important criteria for acquisition decisions.

In defining the product/service category for evaluation, the analyst first identifies the leading uses for the products/services in this market. What needs are end-users looking to fulfill, when considering products/services in this market? Use cases should match common client deployment scenarios. These distinct client scenarios define the Use Cases.

The analyst then identifies the critical capabilities. These capabilities are generalized groups of features commonly required by this class of products/services. Each capability is assigned a level of importance in fulfilling that particular need; some sets of features are more important than others, depending on the use case being evaluated.

Each vendor's product or service is evaluated in terms of how well it delivers each capability, on a five-point scale. These ratings are displayed side-by-side for all vendors, allowing easy comparisons between the different sets of features.

Ratings and summary scores range from 1.0 to 5.0:

1 = Poor or Absent: most or all defined requirements for a capability are not achieved

2 = Fair: some requirements are not achieved

3 = Good: meets requirements

4 = Excellent: meets or exceeds some requirements

5 = Outstanding: significantly exceeds requirements

To determine an overall score for each product in the use cases, the product ratings are multiplied by the weightings to come up with the product score in use cases.

The critical capabilities Gartner has selected do not represent all capabilities for any product; therefore, may not represent those most important for a specific use situation or business objective. Clients should use a critical capabilities analysis as one of several sources of input about a product before making a product/service decision.

Document Revision History

Critical Capabilities for Cloud Database Management Systems for Analytical Use Cases - 7 September 2021

Recommended by the Authors

Some documents may not be available as part of your current Gartner subscription.

How Products and Services Are Evaluated in Gartner Critical Capabilities

Magic Quadrant for Cloud Database Management Systems

Critical Capabilities for Cloud Database Management Systems for Operational Use Cases

The Future of the DBMS Market Is Cloud

There Is Only One DBMS Market

Predicts 2020: Data Management Solutions

How to Plan for Optimal Multicloud and Intercloud Data Management

The Impacts of Emerging Cloud Data Ecosystems: An Architectural Perspective

Overcome Economic Uncertainty Through Financial Governance of Your Cloud Data Management Environment

Mind the Gaps in DBMS Cloud Migration to Avoid Cost and Performance Issues

The Practical Logical Data Warehouse

Benefit From AI and Logical Data Warehouse Synergy

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Financial Governance	15%	10%	5%	10%
High-Speed Processing and Ingest	10%	0%	20%	15%
Multi/Intercloud/Hybrid Deployment	5%	10%	5%	15%
Performance Monitoring and Admin	10%	5%	10%	10%
Workload Management	15%	5%	5%	5%
As of 23 November 2021				

Source: Gartner (December 2021)

Table 2: Product/Service Rating on Critical Capabilities

Critical Capabilities	*Alibaba Cloud (AnalyticDB for PostgreSQL)*	*Amazon Web Services (Amazon Redshift)*	*Cloudera (Cloudera Data Platform)*	*Couchbase (Couchbase)*	*Databricks (Lakehouse Platform)*	*Exasol (Exasol)*	*Google (Google BigQuery)*	*HUAWEI CLOUD (GaussDB(DWS))*	*IBM (IBM Db2 Warehouse on Cloud)*	*InterSystems (InterSystems IRIS)*	*MariaDB (SkySQL)*	*MarkLogic (MarkLogic Data Hub Service)*	*Microsoft (Azure Synapse Analytics)*	*Oracle (Autonomous Data Warehouse)*	*SAP (SAP Data Warehouse Cloud)*	*SingleStore (SingleStore Managed Service)*	*Snowflake (Data Cloud)*	*Teradata (Vantage)*
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Automated Perf Tuning/Optimization	3.5	3.7	3.3	2.0	3.2	3.6	3.2	2.9	4.1	3.1	3.0	3.2	3.4	5.0	3.4	2.6	3.5	4.4
Distributed Access	3.3	3.6	3.5	2.1	3.5	3.5	3.5	3.0	4.5	3.9	2.8	4.1	3.9	4.0	4.0	2.4	3.2	4.8

Dynamic Elasticity	3.0	4.0	3.2	3.2	3.5	2.5	3.8	3.5	3.7	3.0	3.1	3.4	3.5	4.3	3.5	2.4	5.0	3.8
Financial Governance	3.0	3.6	3.5	3.6	3.0	3.4	4.0	3.0	4.2	3.0	3.0	3.6	3.9	4.0	3.8	3.0	2.8	4.0
High-Speed Processing and Ingest	3.3	3.6	3.5	3.9	4.6	3.9	4.0	3.3	3.6	3.6	3.2	3.5	3.6	4.4	3.2	3.9	3.4	4.4
Multi/Intercloud/Hybrid Deployment	2.7	2.5	5.0	4.3	3.5	4.3	3.0	2.5	4.0	4.0	3.5	3.5	3.2	3.5	3.9	3.2	3.4	4.7
Performance Monitoring and Admin	3.1	3.3	3.4	3.4	3.0	3.0	3.1	3.2	3.7	3.3	3.2	3.4	3.0	4.0	3.8	3.1	3.8	4.1
Workload Management	2.6	3.5	3.2	2.2	3.1	2.3	2.9	3.5	4.0	2.9	2.5	2.9	3.3	4.5	4.2	3.6	3.0	4.9
As of 23 November 2021																		

Source: Gartner (December 2021)

Table 3: Product Score in Use Cases

Use Cases	*Alibaba Cloud (AnalyticDB for PostgreSQL)*	*Amazon Web Services (Amazon Redshift)*	*Cloudera (Cloudera Data Platform)*	*Couchbase (Couchbase)*	*Databricks (Lakehouse Platform)*	*Exasol (Exasol)*	*Google (Google BigQuery)*	*HUAWEI CLOUD (GaussDB(DWS))*	*IBM (IBM Db2 Warehouse on Cloud)*	*InterSystems (InterSystems IRIS)*	*MariaDB (SkySQL)*	*MarkLogic (MarkLogic Data Hub Service)*	*Microsoft (Azure Synapse Analytics)*	*Oracle (Autonomous Data Warehouse)*	*SAP (SAP Data Warehouse Cloud)*	*SingleStore (SingleStore Managed Service)*	*Snowflake (Data Cloud)*	*Teradata (Vantage)*
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Logical Data Warehouse	3.21	3.50	3.61	2.72	3.41	3.43	3.50	3.01	4.19	3.58	2.97	3.69	3.67	4.11	3.86	2.70	3.39	4.54
Data Lake	3.29	3.53	3.57	3.14	3.69	3.44	3.69	3.10	3.91	3.54	3.06	3.52	3.60	4.18	3.71	3.01	3.52	4.44
Operational Intelligence	3.15	3.45	3.67	3.22	3.55	3.45	3.55	3.06	3.95	3.47	3.10	3.50	3.52	4.16	3.70	3.00	3.55	4.39

As of 23 November 2021

Source: Gartner (December 2021)