Magic Quadrant for Operational Database Management Systems

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Data and analytics leaders evaluating OPDBMS options must balance their current and future needs in an increasingly competitive, "cloud-first" market. Nontraditional vendors offer new opportunities for global enterprises, which can use this Magic Quadrant to make better modernization choices.

Strategic Planning Assumptions

By 2021, cloud database management system (DBMS) revenue will account for 50% of total DBMS market revenue.

Through 2021, relational DBMS technology will continue to be used for at least 70% of new DBMS applications and projects.

By 2022, open-source-based DBMS products will account for more than 25% of DBMS revenue, which will increase their attractiveness to mainstream buyers.

By 2023, 75% of all databases will be on a cloud platform — a development that will drastically change the DBMS vendor landscape.

Market Definition/Description

This document was revised on 27 November 2019 and 6 December 2019. The document you are viewing is the corrected version. For more information, see the Corrections page on gartner.com.

The operational database management system (OPDBMS) market has been defined by relational and nonrelational DBMS products suitable for the traditional transactions used to support business process applications, both purchased (such as ERP and CRM applications) and custom-made. Gartner's definition of an OPDBMS also includes DBMS products that support interactions and event processing (data in motion). (For Gartner's use of the term "nonrelational DBMS," see Note 1. For our definition of an OPDBMS workload, see Note 2.) Increasingly cloud-first, the OPDBMS market is moving toward a state in which analytics capabilities are also a requirement, in a development that blurs vendors' traditional separation from data management solution for analytics (DMSA) uses.

Gartner defines a DBMS as a complete software system used to define, create, update, manage and query a database. The term “database” here refers to an organized collection of data that may consist of multiple formats and be stored in some form of storage medium (which can include hard-disk drives, flash memory, solid-state drives, DRAM and nonvolatile memory). A database must include mechanisms to isolate and manage workload requirements and control various parameters of end-user access within managed instances of data. Additionally, a DBMS should provide interfaces to independent programs and tools, and permit and govern the performance of a variety of concurrent workload types. Our definition accommodates relational and nonrelational offerings, and those which support a subset of possible data types in use today. We do not stipulate that the DBMS must be a closed-source product; commercially supported open-source DBMS products are included.

OPDBMSs may support multiple different delivery models, such as stand-alone DBMS software, cloud (public and private) images or containerized versions, certified configurations and database appliances. These are discussed and evaluated together in the analysis of each vendor.

In this Magic Quadrant, we treat all of a vendor’s OPDBMS products as a set. If a vendor markets more than one DBMS product that can be used as an OPDBMS, we describe them in the section specific to that vendor, and we evaluate all of that vendor’s products together as a single entity. If any Strengths and Cautions relate to a specific offering or offerings, this is noted in the individual vendor sections. In the accompanying “Critical Capabilities for Operational Database Management Systems,” one individual product per vendor is assessed in terms of defined use cases and capabilities. It may be important for organizations to evaluate separate vendors’ offerings as the range of choices broadens and as purchasers more frequently pursue best-of-breed strategies.

Magic Quadrant

Figure 1. Magic Quadrant for Operational Database Management Systems

Source: Gartner (November 2019)

Vendor Strengths and Cautions

Alibaba Cloud

Alibaba Cloud is a global cloud computing company headquartered in Hangzhou, China, with international operations based in Singapore and its largest investor, SoftBank, based in the Cayman Islands. Alibaba Cloud is the largest provider of public cloud platforms in China. It offers ApsaraDB for HBase, ApsaraDB for MongoDB, ApsaraDB for Redis, ApsaraDB for RDS (relational database service) for MySQL, Apsara DB for MariaDB TX, ApsaraDB RDS for SQL Server, ApsaraDB RDS for PostgreSQL, and ApsaraDB RDS for PPAS (developed with EnterpriseDB). There is also Tablestore, a

key-value and document DBMS; Distributed Relational Database Service (DRDS); Elastic MapReduce; ApsaraDB for POLARDB, a serverless MySQL- or Postgres-compatible distributed relational DBMS (RDBMS); and Time Series Database (TSDB). Open-source versions of AliSQL and ApsaraCache are available. Apsara Stack offers an on-premises private cloud implementation. Integrated tools provide backup, data movement, synchronization and other functions.

Strengths

- **Extensive product portfolio:** Alibaba Cloud has the largest portfolio of DBMS services of the cloud service providers (CSPs) in this Magic Quadrant, and like them, it mixes commercial and open-source offerings with its own internally developed or extended products. Multiple choices are available for some types (such as PostgreSQL and MySQL for RDBMS). Additionally, Alibaba Cloud contributes to Apache HBase.

- **Market presence:** Alibaba Cloud climbed to ninth place in Gartner's 2018 DBMS revenue standings, with 116% growth over 2017. It is the third-largest company in terms of cloud DBMS service revenue and the largest public cloud provider in China. It also supports 12 data center regions outside China, including two in the U.S. It fields local teams, and hosts events and training in the cloud and in each of its regions. Partners include companies such as Vodafone in Germany. Alibaba Cloud hosts the Computing Conference, one of the world's largest events of this type.

- **Cloud and hybrid potential:** Apsara Stack, a complete private cloud for on-premises deployment, enables Alibaba Cloud to share data between the cloud and on-premises systems across all services — a capability not available from most other CSPs. It gives "lift and shift" flexibility to all the Apsara DBMS products. The addition of Oracle compatibility features to Alibaba Cloud's MySQL offering signals an increasingly aggressive targeting of existing installations that are ripe for migration.

Cautions

- **Concentration on China:** Alibaba Cloud is a Chinese CSP with a sizable and rapidly growing presence in Asia. However, to compete with the large U.S. CSPs for global business, Alibaba Cloud must continue to increase its number of regional data centers in the Western Hemisphere. Some websites are becoming available in English, Korean and Japanese, but documentation is lagging behind — for example, HBase's documentation and console are still available only in Chinese.

- **Stability and integration:** Surveyed reference customers for Alibaba Cloud reported a higher-than-average amount of outage time and an above-average number of crashes. They also identified issues with supporting complex implementations and integrating with other DBMSs and data. Reference customers' scores for Alibaba Cloud have improved year-over-year, but they point to issues with backup settings and retention periods. Nonetheless, reference customers scored its support very highly, which is an improvement from last year.

- **High-end competition:** ApsaraDB for POLARDB — the company's flagship distributed RDBMS service, built for cloud and compatible with mainstream DBMS such as Oracle DBMS, Microsoft SQL Server, MySQL and PostgreSQL — has yet to be proven in easily verified sites. The planned Postgres capability has yet to be delivered. Additionally, support from Alibaba Cloud's internal tools, such as CloudDBA, has lagged behind. To compete effectively at the high end, Alibaba Cloud will have to invest more in marketing, sales and product delivery.

Amazon Web Services

Amazon Web Services (AWS) is a wholly owned subsidiary of Amazon, based in Seattle, Washington, U.S. It offers Amazon DynamoDB (a nonrelational document and key-value DBMS), DocumentDB (a document DBMS with MongoDB compatibility), ElastiCache (offering both Redis and Memcached), Neptune (a graph DBMS), QLDB (a ledger DBMS) and Timestream (a time series DBMS). Amazon EMR provides a number of Apache Hadoop stack components. Additionally, AWS markets the Amazon Relational Database Service (RDS), with relational database engines for MariaDB, Microsoft SQL Server, MySQL and Oracle (Standard Edition), and Amazon Aurora for MySQL and PostgreSQL.

Strengths

- **Market momentum:** In 2018, AWS took third place for DBMS revenue from IBM, with almost 75% growth by Gartner's estimate. AWS's established services (such as Amazon Aurora, Amazon DynamoDB and Amazon Neptune) continued to grow, and AWS added new services in 2019, such as Amazon QLDB and Amazon Timestream. In December 2018, AWS announced AWS Outposts, an on-premises private cloud offering. AWS has publicly said that it will launch this in late 2019, and that it will be a fully managed, cloud-connected, on-site expansion of the same infrastructure and services used by the AWS cloud. Finally, AWS continues to enhance its Database Migration Service, which makes it easier for customers to migrate from on-premises and cloud-based systems to the AWS platform.

- **Innovation:** AWS has a continuous roadmap for innovation. New features and functions are added to all services as soon as they are ready — they do not have to wait their turn in a release schedule. Most new features are driven by customer demand, which leads to stronger products and customer satisfaction. An example is DocumentDB, which was prompted by customers asking for a MongoDB-compatible service.

- **Customer loyalty and support:** Although most of AWS's survey scores were at the mean, its surveyed reference customers all said they would recommend AWS to others. They highlighted its offerings' ease of setup and use, the flexibility in the choice of services, the company's continuous innovation, and especially the access to and quality of its support.

Cautions

- **Vertical and regional pushback:** For several years, retail customers have been concerned that AWS competes with Amazon. They have now been joined by customers in the insurance sector and other sectors that Amazon is starting to participate in. Additionally, Gartner's interactions with clients via our inquiry service and at conferences indicate that potential customers in Europe are reluctant to use AWS. Although the reasoning behind this reluctance is elusive, we do observe other CSPs gaining market share in this region.

- **Missing functionality:** AWS's surveyed reference customers scored its overall product capabilities one standard deviation (STD) below the mean. Their responses identified missing features such as multiregion writes and autosharding. Although AWS's database platform as a service (dbPaaS) offerings have most of the basic functions, users are beginning to scale systems and require more substantial support. Also, several respondents remarked on a comparatively long learning curve, which may also account for a lack of understanding of the functionality available.

- **Limited on-premises and multicloud capabilities:** Although AWS has moved into third position in terms of DBMS revenue, it still has not delivered an on-premises offering. As noted above, although it has announced AWS Outposts, nothing has been delivered yet. Although we believe Outposts will start to become available in 2019, AWS is behind Alibaba Cloud, Google, Microsoft and Oracle when it comes to on-premises and hybrid deployments. An arrangement with VMware for additional support of RDS, announced in 2018, has helped, but there remains a gap in AWS's overall strategy. Moreover, at a time when other CSPs are embracing multicloud, AWS seems to be lagging behind in this regard.

DataStax

DataStax, which is based in Santa Clara, California, U.S., provides DataStax Enterprise (DSE), a nonrelational multimodel DBMS in an integrated platform. DSE is aimed at mixed workloads and built on the Apache Cassandra DBMS, with wide-column, key-value and document/JavaScript Object Notation (JSON) support, plus a graph store. The product is available in two subscription package levels: DataStax Distribution of Apache Cassandra and DataStax Enterprise. There are two add-on options: DSE Analytics Solo and DSE Advanced Workloads Pack, which includes enterprise search, analytics, in-memory and graph database functionality. DSE is available on-premises, through multiple cloud providers and for hybrid cloud deployment. DataStax also offers a managed dbPaaS, DataStax Managed Services, that provides a fully managed service in multiple public cloud environments, on-premises and in hybrid deployment scenarios.

Strengths

- **Data distribution and ingestion:** Scores from reference customers for DSE's automated data distribution and high-speed ingestion were both one STD above the mean. Their feedback indicates that they view DataStax as a provider of a robust platform for building distributed systems, but they stress the need to check thoroughly the use cases for which its platform will be used.

- **Service, support and professional services:** Many survey respondents identified customer support as a strength of DataStax, and scored it one STD above the mean. The DataStax Academy was frequently named as an example of the value of its ecosystem.

- **Alignment with industry trends:** DataStax positions itself as a natural beneficiary of the trends for hybrid, multicloud, API-centric and artificial intelligence (AI)-enabled applications. Additionally, the integration of Apache Solr and graph processing are seen as valuable by its customers. DataStax continues to provide substantial support for Apache Cassandra.

Cautions

- **Programmability for augmented transactions:** Reference customers for DataStax scored DSE below the average in this regard. However, this is somewhat understandable as DSE is not intended to be an analytical DBMS in the general sense. Rather, DataStax aims it at the distributed operational transaction space, where it acquits itself well. DataStax supports tunable consistency.

- **Administration and management:** Reference customers scored DataStax below the mean in this regard. Troubleshooting using the OpsCenter was mentioned as a particular concern. They also scored DataStax below the mean for ease of operation.

- **Learning curve:** Reference customers pointed out that use of DataStax products involves a steep learning curve. New concepts need to be learned and applied — there is a different approach to data modeling, for example. However, reference customers consider the training and education materials very good, and they observed that the concepts are simply different and that user organizations need to plan for this. Customers seem to surmount the learning curve fairly readily, but do need to pay attention to it.

EnterpriseDB

EnterpriseDB is a privately held vendor based in Bedford, Massachusetts, U.S. It sells subscriptions to the Oracle-compatible EDB Postgres Platform, EDB Postgres Advanced Server and open-source PostgreSQL. Cloud offerings include the EDB Postgres Cloud Database Service, the EDB Managed DBaaS Service, and EDB Postgres Ark for provisioning databases in multiple cloud platforms. Bare-metal, Kubernetes deployment and a private cloud built on OpenStack are available. EDB is considered a company-standard OPDBMS by nearly half of the survey respondents. EnterpriseDB received an infusion of funds via an acquisition in mid-2019 by Great Hill Partners, a private equity firm.

Strengths

- **Growth and community leverage:** EnterpriseDB's revenue growth exceeded the market average in 2018. It remains the largest contributor to open-source Postgres, and releases of EDB typically follow closely upon those of the open-source version. With over 4,000 customers worldwide,

offices in 16 countries, and free introductory training available on demand from its website, EnterpriseDB remains a community leader as Postgres closes the gap with MySQL for leadership in terms of open-source RDBMS popularity.

- **Functional richness and cost competitiveness:** EnterpriseDB received the highest scores in the survey for support for multiple data types, driven by the rich ecosystem of extensions that the Postgres community helps produce. Key features include EnterpriseDB's rich SQL, with arrays and windowing, declarative table partitioning and multimaster logical replication support using Apache Kafka and Apache ZooKeeper. There is also support for Oracle, Microsoft SQL Server and SAP Adaptive Server Enterprise (ASE), as well as integration with Amazon Simple Storage Service (S3). Survey respondents' comments on EnterpriseDB's Oracle compatibility and price relief were highly favorable.

- **Customer satisfaction:** Surveyed reference customers highlighted EnterpriseDB's value by giving it the highest score. They also gave it high marks for customer satisfaction and support. EnterpriseDB scored above the mean in terms of the number of reference customers indicating that they would recommend it to others or that they intended to purchase more from the company themselves.

Cautions

- **Operating features:** With EDB Postgres Advanced Server, EnterpriseDB received the lowest score in this Magic Quadrant for integration and deployment. Additionally, it scored more than one STD below the mean for automated data distribution capabilities, ease of operation and documentation (although online training and conferences were singled out for praise). Security scores were on the low side for data masking, activity monitoring and encryption.

- **Intensifying competitive environment:** Most of EnterpriseDB's surveyed reference customers were relatively new to the company. The company's renewed focus on customer success will play a key role in maintaining and expanding its footprint, especially in light of competing Postgres offerings — Microsoft's acquisition of Citus Data being a signal that things will heat up. Additionally, MariaDB now also competes for Oracle replacement opportunities with its implementation of Oracle's Procedural Language/Structured Query Language (PL/SQL).

- **Cloud-based Postgres:** Competition from CSP-supplied Postgres versions is a significant threat. However, EnterpriseDB announced an expanded technology partnership with Alibaba Cloud in 2019. Also, its availability on AWS, Microsoft Azure and Google Cloud Platform may provide an opportunity to offer its customers consistent usage in a multicloud, hybrid deployment world. From 2017 to 2018, EnterpriseDB's cloud revenue grew but remained flat as a percentage of its total revenue — a warning sign in light of the threat posed by the widespread availability of cloud-based Postgres.

Google

Google, based in Mountain View, California, U.S., is a wholly owned subsidiary of the Alphabet holding company. Google dbPaaS offerings in Google Cloud Platform (GCP) include the Cloud Spanner RDBMS, Cloud Bigtable, Cloud Firestore (for nonrelational DBMS uses) and Firebase Realtime Database (for web and mobile apps). To provide support for managed versions of other database engines, Google offers Cloud Memorystore for Redis for in-memory data storage, and Cloud SQL-managed MySQL, PostgreSQL and Microsoft SQL Server. Recently, Google announced managed services for Confluent, DataStax, Elastic, InfluxData, MongoDB, Neo4j and Redis Labs, thus placing greater emphasis on its open-platform approach. Google also has partnerships with many database vendors to enable easy creation and administration of database images on optimized virtual machines and Kubernetes containers.

Strengths

- **Emphasis on enterprise customers:** Google's management changes for GCP and its stated emphasis on growing its enterprise customer base are beginning to have an effect. Reference customers repeatedly commented on Google's ease of use and implementation, reliability and integration (with other services and other systems). In addition, their scores put Google in the top two or three for ease of contract negotiation, value for money, outage rates and ease of implementation. These are all characteristics recognized by enterprises as being necessary for DBMS vendors, especially in the cloud.

- **Partnership ecosystem support:** Over the past year, Google has continued to establish partnerships with software vendors by, for example, expanding its open platform to include managed services from Confluent, DataStax, Elastic, InfluxData, MongoDB, Neo4j and Redis Labs. Google's GCP business unit has also strengthened its relationships with several DBMS vendors (Aerospike, Redis Labs and SAP) to provide early support for Intel Optane DC persistent memory.

- **Pricing and support:** Reference customers scored Google a full STD above the mean for satisfaction with GCP's pricing; it received the second-highest satisfaction score of any vendor in this Magic Quadrant. Although Google's customer support was scored at the mean, this is major increase over past years, when Google scored near the bottom. Both increases demonstrate Google's desire to listen to enterprise customers and address important issues regarding GCP.

Cautions

- **Functionality gaps:** One-third of Google's surveyed reference customers stated that the GCP OPDBMS suite has some weak or missing functionality. They identified different functionality gaps, depending on the service used, in relation to automatic backup, audit capabilities, query optimization and pricing controls. Before using a Google service, we recommend verifying that the required functionality is present by conducting a proof of concept.

- **Database activity monitoring and professional services:** Google received low scores from reference customers for security database activity monitoring and for satisfaction with professional services.

- **Market awareness:** GCP's "evaluated but not selected" rate, across the base of over 500 reference customers for all vendors in this Magic Quadrant, was higher than that of Google's most direct competitors. However, following the senior management changes of 2019, we have noted an increase in the number of users of Gartner's inquiry service who ask about GCP, which indicates that awareness is growing.

IBM

IBM, which is based in Armonk, New York, U.S., offers Db2 for z/OS, accompanied by Db2 AI for z/OS and the Db2 Analytics Accelerator for z/OS. Db2 for Linux, UNIX and Microsoft Windows includes Db2 (on-premises), Db2 Hosted, Db2 on Cloud, Db2 Event Store, Db2 Warehouse, Db2 Warehouse on Cloud and Db2 Big SQL — all available under a single subscription. Db2 is also available as an appliance in IBM Integrated Analytics System (IAS). In addition, IBM continues to offer Information Management System (IMS), Informix, and a range of open-source offerings including MongoDB and Cloudera Hadoop. IBM also supports a range of multicloud data management options that run on IBM Cloud, as well as on AWS, Microsoft Azure and GCP.

Strengths

- **Rich features and open-source support:** IBM's DBMS portfolio is one of the most feature-rich and varied. The SQL engine is supported across a broad set of offerings, including Db2 Event Store for streaming data, and IBM has begun to add machine learning to the optimizer and natural language query capabilities. IBM Db2 received high marks in our survey for its high-speed transaction processing, security, stability and high availability. IBM continues to aggressively support and incorporate open-source components into its commercial products, and now includes other open-source software DBMS products in its cloud portfolio.

- **Hybrid and multicloud direction:** IBM has broadened its embrace of hybrid and multicloud deployment. The recent purchase of Red Hat is IBM's largest single acquisition ever, and plans to draw on Red Hat's OpenStack Platform are already in place. IBM has recently rolled out elastic scaling, quick startup, universal containers and cross-platform management. IBM's DBMS portfolio runs not only on its own cloud, but also on Alibaba Cloud, AWS, Microsoft Azure and GCP, and IBM plans to move beyond "bring your own license" (BYOL) deployment into stronger partnerships. Reference customers did not acknowledge these relatively recent capabilities in the survey, however.

- **Service, support and upgrades:** A perennial strength of IBM is its global organization for support, video training and events (although the recent pace of change has caused some issues with

documentation, which were highlighted by several reference customers). Additionally, several reference customers had high praise for recent upgrade experiences.

Cautions

- **Sales execution:** IBM's DBMS revenue fell for the fifth successive year in 2018, in a market that grew by over 18%, according to Gartner's information. As a result, IBM dropped to fourth place. A lack of expansion into new markets still seems to be holding IBM back: Most of its reference customers had been using Db2 for over 10 years. IBM received the lowest score in this Magic Quadrant for "overall experience with this vendor." On the other hand, new digital marketing has simplified the sales process, and IBM claims self-service sales are growing, which could help stabilize its numbers and fuel a return to growth.

- **Pricing and packaging:** IBM slightly improved its standing in terms of both "suitability of pricing method" and "satisfaction with value for price" in this year's survey of reference customers, but its scores for these criteria remained below the mean. It has continued its efforts to simplify its pricing and packaging: Whereas once there were 13 Db2 editions, there are now only three, which differ only in the number of cores and memory, and one of these editions is free. Even more aggressive is IBM's approach to license portability in the single-subscription Hybrid Data Management Platform model. These changes raise the possibility of significant improvement in 2020.

- **Cloud growth:** IBM's cloud DBMS revenue growth was strong at over 60% in 2018, but six of the seven vendors above IBM in terms of cloud revenue grew theirs faster, and from a larger base. IBM is responding with new offerings that provide open-source databases (Postgres, Elasticsearch and others) built natively on IBM Cloud and integrated with IBM's security and governance functionality. IBM needs to communicate its story more effectively within its customer base: Surveyed reference customers perceived an absence of marketing, and it was not even clear that they saw all the available offerings.

InterSystems

InterSystems, based in Cambridge, Massachusetts, U.S., was founded in 1978. Building on the success of Caché, a hybrid, multimodel DBMS supporting relational and nonrelational access, InterSystems introduced the IRIS Data Platform in January 2018 to increase its focus on scalability, heterogeneous data and fast data.

Strengths

- **Functionality and marketing:** InterSystems' multimodel DBMSs support SQL across object and nonrelational models. Surveyed reference customers for InterSystems again identified flexibility and functionality as key advantages, with almost all stating that functionality and performance were key factors in their purchasing decision. InterSystems has been expanding its marketing

outside the healthcare sector for several years, and this is beginning to pay off, especially in the financial services sector. InterSystems' strong functionality (coupled with the other strengths discussed here) and expansion beyond healthcare position it for continued growth.

- **Customer loyalty:** None of InterSystems' reference customers stated they were planning on replacing InterSystems; two-thirds identified InterSystems as a standard in their organization, and more than three-quarters had been using InterSystems for greater than five years. InterSystems received the highest score overall in the survey for the extent to which its product met customers' needs. All of InterSystems' reference customers said they would recommend it to others. This loyalty is another reason why InterSystems is becoming successful outside the healthcare industry.

- **Support and professional services:** InterSystems again received high scores for service and support — and this year had the highest score for this of any vendor in the Magic Quadrant. It also received the highest score for professional services across all the vendors. Additionally, many of the surveyed customers' comments praised its support and professional services.

Cautions

- **Cloud:** InterSystems has been slow to move to the cloud. Like most DBMS vendors, it has supported hosting of its software in the cloud for several years, but it lacks a managed service — something every DBMS vendor will need to survive. InterSystems' strong presence in the healthcare sector, which is reluctant to use the public cloud for perceived issues of privacy, is one reason for its slow move to managed cloud services. InterSystems has, however, stated that its focus for 2019 is to deliver a managed cloud service.

- **Skills and market recognition:** Limited availability of skills remains the No. 1 issue among the surveyed reference customers for InterSystems. This is always a potential problem for small vendors, and, for InterSystems, it is exacerbated by the vendor's strength in just one industry. The market still perceives InterSystems as a vendor for the healthcare sector. However, its focus on other industries, such as financial services and manufacturing, coupled with its marketing in regions other than North America, is beginning to pay off. This will increase the market's awareness of InterSystems, and the availability of relevant skills in the DBMS market.

- **Documentation:** InterSystems has typically scored below the average for its documentation. This year, again, its only score below the average in the customer survey was for documentation, for which it received the second-lowest score. This is a concern, especially as its product still requires skills that are in short supply.

MarkLogic

MarkLogic, which is based in San Carlos, California, U.S., offers a nonrelational multimodel DBMS, which it describes as "operational and transactional." The product is available in three editions: Data

Hub Service, an elastic “serverless” database as a service; a free developer edition; and Essential Enterprise. All are available in the major public clouds. On-premises servers and private clouds are supported on Linux and Microsoft Windows, as well as container platforms from Red Hat and Docker.

Strengths

- **Functionality and security:** MarkLogic’s survey scores for security and support for multiple data types were higher than the average. Customers also observed that MarkLogic’s product “simply works.” This enables them to concentrate on solving the business problems at hand, especially when dealing with mixes of structured and unstructured data. The ability to grow data structures in a flexible manner while using ACID updates is also highly valued by MarkLogic’s customers.

- **Data harmonization:** Reference customers frequently praised MarkLogic’s suitability for data harmonization and for building multimodel data hubs. They praised the ability to incrementally build flexible data structures and query both data and semantics. This ability is further enhanced by the availability of the cloud-based MarkLogic Data Hub Service. Customers also noted that MarkLogic has many years of experience in this part of the market.

- **Multimodel capabilities:** Many survey respondents praised the flexibility of MarkLogic’s multimodel capabilities, spanning XML, JSON, SQL, graphs and text. This was especially true for its graph processing and search capabilities, an original feature of the product.

Cautions

- **Developer skills and training:** MarkLogic is not a traditional RDBMS vendor. Reference customers reported that it is important that user organizations understand this and prepare accordingly. Respondents again identified difficulty finding relevant developer skills. MarkLogic scored below the mean both in this regard and for ease of programming. Some respondents expressed surprise at the level of training necessary to use the product effectively. However, several indicated that this requirement would have been reduced had they spent more time planning and helping their organization understand the different nature of MarkLogic’s DBMS.

- **Support:** Reference customers’ overall score for MarkLogic’s support slipped a little from last year, to below the mean. Some respondents noted that they needed to engage professional services, and that they found those services valuable. It should be remembered that MarkLogic’s is a very different type of DBMS, so it is understandable that more support would be needed in the early stages of adoption.

- **Adoption challenges:** MarkLogic’s survey scores for integration with other DBMS environments and for deployment improved but remained below the mean. We believe this is due, on the one hand, to better integration and better understanding of where MarkLogic should be used, and, on the other, to the nonrelational nature of MarkLogic’s DBMS (rather than any deficiency in the

product). Reference customers also said that early planning and identification of the correct use case for MarkLogic would help avoid difficulties. MarkLogic's new Data Hub Service may alleviate matters as well, as the service automates most integration and deployment tasks.

Microsoft

Microsoft, based in Redmond, Washington, U.S., markets SQL Server, Azure SQL Database (a DBMS PaaS based on SQL Server) and Azure SQL Database Edge as its flagship RDBMS products for the OPDBMS market. It also offers Azure Database for PostgreSQL, MySQL and MariaDB; Azure Cache for Redis; and Azure Cosmos DB, a nonrelational, globally distributed document DBMS PaaS solution that is compatible with SQL, Azure Tables, MongoDB, Cassandra and Gremlin graph APIs. The Microsoft Analytics Platform System is delivered as an appliance for massively parallel processing data warehousing in partnership with Dell, Hewlett Packard Enterprise and Quanta Computer (in the U.S. and China.)

Strengths

- **Execution:** Gartner's 2018 data for the DBMS market shows that Microsoft's revenue grew by over 31% — well above the market rate for the fifth consecutive year. Cloud success is the driver: Microsoft recorded the highest cloud DBMS revenue growth of the top nine vendors, at 134%, and it and Amazon are the only vendors with multibillion-dollar totals. Microsoft claims 5 million relational database instances in Azure, 1 million migrations using its Azure Database Migration Service, and 100 trillion transactions per day on (nonrelational) Azure Cosmos DB.

- **Mind share and usability:** Gartner's data and analytics teams received more inquiries about Microsoft in the period covered by this research than any other vendor. Additionally, reference customers gave Microsoft the highest score for ease of programming. Microsoft also scored well above the average for service and support and for documentation.

- **Cloud portfolio adoption:** Over 40% of Microsoft's surveyed reference customers were using more than one of its DBMS offerings. Azure Cosmos DB offers APIs for Cassandra, etcd, Gremlin and HBase, in addition to early support for MongoDB. Augmentation features include built-in Apache Spark analytics in Azure Cosmos DB, and inbuilt Python and R capabilities in Azure SQL Database, as well as machine-learning-based tuning recommendations and automated tuning.

Cautions

- **Pricing concerns:** Reference customers' scores put Microsoft among the bottom-three vendors for suitability of pricing method. Although Microsoft was in the middle of the pack for evaluation and contract negotiation, several survey respondents noted that its prices had increased in recent years. The vCore model attracted criticism from several respondents.

- **Product maturity:** Several respondents noted that Microsoft's early release process made them feel like beta testers, and added that sometimes, after release, missing features remained missing. Concerns included the inability to scale MySQL without downtime (Microsoft has recently addressed this issue), the absence of a strategy for cold storage with Azure Cosmos DB, and complex and hard-to-use high-availability/disaster recovery features.

- **Operational challenges:** Reference customers noted that management across multiple collections in Azure Cosmos DB is burdensome, and that analyzing system behavior is difficult. Authentication methods differ between SQL Server and Azure SQL Managed Instances, which leads to rework during migrations (but results in improved security). As with the product maturity issue, these challenges reflect Microsoft's fast pace of innovation and require that it focus on responding to customers' needs.

Neo4j

Neo4j is headquartered in San Mateo, California, U.S. and has offices in Sweden, Germany and the U.K. It offers a graph DBMS, the Neo4j Graph Platform, which has the following major components: a native graph database for transactional applications; graph analytics; data integration for distilling tabular data and big data into graphs; Neo4j Bloom for data visualization. The Cypher graph query language is supported to connect with analytic tools. Neo4j's product is available both on-premises and in the cloud. The Neo4j database is based on an open-core model backed by a sizable and active global developer community.

Strengths

- **Customer experience:** Reference customers scored Neo4j more than one STD above the average for their overall experience with the vendor and, separately, for its support. This above-average scoring extends to Neo4j's documentation, and is backed up by respondents' repeated mention of the quality of its training, blogs, YouTube materials and field staff assistance. Clearly, Neo4j has an enthusiastic base of customers who highly value the support they receive.

- **Graph-native architecture:** Neo4j offers a native graph database, not simply an extra layer on top of an RDBMS system. Reference customers value features specifically designed for graph processing, such as index-free adjacency, which makes graph processing more efficient. They are enthusiastic about the ease of development and performance. They repeatedly stated that, for the right use cases, they can develop faster, aided by much faster performance.

- **Graph processing language:** Responses from Neo4j's reference customers show that they value and are very supportive of the Neo4j-developed Cypher query language specifically designed for property graphs. Neo4j supports the openCypher project to encourage wider adoption of the language, and this has been taken up by other vendors. Cypher has also been a major input to the formulation of the Graph Query Language (GQL). GQL is the first query language to be developed as an ISO standard since SQL.

Cautions

- **Graph focus:** Neo4j does not offer (and does not claim to offer) a general-purpose OPDBMS. It aims its product at business problems that are best solved with the aid of graph data structures. However, Neo4j's reference customers provided very positive feedback about the system when it is used for such problems. With Neo4j, it is important to adopt a graph processing mindset and to use its product for the right business requirements.

- **Requirement for graph mindset:** Surveyed reference customers emphasized that organizations planning to use Neo4j must ensure their developers are properly trained. Managers and developers need to understand that programming with a graph database is fundamentally different than programming with a traditional relational database.

- **Need for specialized visualization:** Reference customers for Neo4j stressed that it is useful to undertake a parallel effort to work out the visualization of the graph processing. This can be done using the Neo4j Bloom product or other visualization software.

Oracle

Oracle, which is based in Redwood Shores, California, U.S., markets a complete set of DBMS products for operational systems. They include Oracle Database, Autonomous Database (a dbPaaS), Oracle TimesTen In-Memory Database, Oracle Berkeley DB, Oracle NoSQL Database and MySQL. In addition to stand-alone software and cloud versions, several of Oracle's DBMSs are available in appliance form.

Strengths

- **Innovation:** Oracle continues to innovate in the DBMS space, both with each new release and with entirely new products. The Oracle Autonomous Database sets a new standard for dbPaaS services by adding new automated features, such as automated partitioning, performance improvements and enhanced, automated security — all driven by machine learning. Furthermore, Oracle has announced that this product, now available in the cloud, will be available for on-premises deployment in 2019 through its Autonomous Database Cloud at Customer. Oracle has also announced the use of Intel Optane DC persistent memory in the Exadata Storage Servers for Exadata X8. Oracle's track record of consistently introducing new functionality helps it retain existing customers and attract new ones.

- **Functionality and performance:** Oracle received some of the highest scores from reference customers for functionality (in all categories) and performance, but especially for high-speed performance, high-speed data distribution, overall product capabilities and security permission management. Additional security features continue to be added to the free Data Safe cloud-based service. Oracle received the highest score of any vendor in this Magic Quadrant for high availability/disaster recovery, with almost all its reference customers reporting no outages.

- **Product satisfaction:** On average, Oracle's reference customers had used its software for over nine years. All would recommend Oracle to others, with only its pricing attracting qualifications. Oracle also improved its overall score for customer satisfaction, by scoring just above the mean — much higher than in previous years.

Cautions

- **Cloud competition:** Gartner's PaaS market share numbers place Oracle fourth. Oracle now has the Oracle Autonomous Database in order to compete in the dbPaaS space, but, as a CSP, it continues to focus primarily on the Oracle DBMS, whereas other major CSPs offer multiple DBMS services. This is a major concern of many of the DBMS inquiries that Gartner receives from clients, who also express concern that running Oracle on other CSPs increases the cost. Oracle has recently engaged in some cooperative interaction with Microsoft Azure's tools. However, to attract customers in the public cloud Oracle will need to change pricing policy, host services from other DBMS vendors, and allow Oracle licenses to be used on other CSPs using the same metrics as in the Oracle Cloud.

- **Pricing and license complexity:** Business practices remain an issue for Oracle, with contract complexity and pricing being identified as issues by most of its surveyed reference customers. Oracle's survey score for contract negotiations was at the mean, which was better than in previous years. However, Oracle continues to require double the number of licenses for using its cloud competitors, while reducing the available functionality. We believe Oracle must address these issues for on-premises customers, which represent the majority of its clients.

- **Support:** Oracle received the lowest survey score of any vendor for service and support. This result was echoed in the comments made by almost one-quarter of its respondents. However, those using Oracle's cloud services did not mention poor support — a finding in line with Gartner's impression that Oracle customers using the cloud not only receive stronger support but require less of it.

SAP

SAP, which is based in Walldorf, Germany, offers SAP Adaptive Server Enterprise (ASE), SAP SQL Anywhere and SAP HANA. SAP HANA is available as an appliance or as software only (via the SAP HANA Tailored Data Center Integration program). Both SAP ASE and SAP HANA are available as cloud offerings including SAP Cloud Platform, SAP HANA service.

Strengths

- **System stability:** SAP reference customers reported that they are satisfied with the stability and support of SAP HANA for their production S/4HANA systems. Many reference customers drew specific attention to the reliability of SAP's systems and the robustness of SAP HANA, as well as of the migration process.

- **Corporate focus:** SAP HANA remains the focus of SAP's long-term vision. The September 2017 announcement of the SAP Data Hub revealed a well-thought-out data interchange platform for both analytics and transactional systems. Development is driven by the vision for SAP HANA, its key enabling engine.

- **Performance and integration enhancements:** Surveyed reference customers for SAP praised SAP HANA's performance, speed, and ability to combine transactions and analytics in the same database (augmented transactions). They were also satisfied with the high-speed ingestion capabilities. These comments reflect growing customer awareness of how systems and design can be simplified by using SAP HANA. A common observation was that, when converting to SAP HANA, customers should take the opportunity to change business processes using the new capabilities, rather than simply "lift and shift."

Cautions

- **Perceived value for money:** Cost remains a concern of SAP's reference customers, their score for this being significantly below the mean. On the other hand, some customers noted that, despite the perceived higher costs, SAP also delivered extra value in terms of performance, simplification and flexibility. Some remarked on the importance of undertaking adequate planning and sizing in advance to ensure future needs are taken into account.

- **Ease of adding capacity and administration:** SAP scored below the mean for these aspects. Some reference customers noted that upgrading the system could be cumbersome. However, as more customers move to the cloud, upgrading is likely to become easier. Although SAP also scored below the mean for administration, it is unclear whether this reflects a deficiency on the part of SAP HANA or the unfamiliarity of customers with the different type of system that SAP HANA represents.

- **SAP HANA in the cloud:** SAP was late to the cloud sector and has struggled to succeed as a CSP using its own cloud infrastructure. Lacking its own global infrastructure, SAP must compete with hyperscale providers, which all have their own DBMSs, to support HANA as a DBMS offering in the cloud. However, SAP HANA is now available as a multicloud service on AWS, Google and Microsoft Azure.

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may be a reflection of a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

- Neo4j

Dropped

- Actian
- MapR
- MongoDB: This vendor did not respond to requests to participate in our research for this Magic Quadrant. Since this is the third consecutive year of nonparticipation for MongoDB, our information on this vendor is significantly outdated. Therefore, we have not attempted to assess MongoDB in this Magic Quadrant.

Inclusion and Exclusion Criteria

To qualify for inclusion in this Magic Quadrant, vendors had to meet all the following criteria:

Software availability: Vendors must have had OPDBMS software generally available for licensing or supported download for at least a year, as of midnight, U.S. Eastern Daylight Time on 1 July 2019. We used the most recent generally available release of the software to evaluate current technical capabilities. We did not consider beta, "early access," "technology preview," "ramp up" or other not generally available releases. For reference customers and their survey responses, all versions currently used in production environments were considered. When older versions were in use, we considered whether later releases may have addressed reported issues, but also the rate at which customers move to newer versions. Capabilities, product features or functionalities released after this date were considered at Gartner's discretion and in a manner that Gartner deemed appropriate to ensure the quality of this publication for our nonvendor clients.

Industry presence: Vendors' OPDBMS products must have had referenceable production presence in accounts in a minimum of three of the following industry sectors:

- Accommodation and food services
- Administrative and support and waste management and remediation services
- Agriculture, forestry, fishing and hunting
- Arts, entertainment and recreation
- Construction
- Educational services
- Finance and insurance

- Healthcare and social assistance
- Information
- Management of companies and enterprises
- Manufacturing
- Mining
- Professional, scientific and technical services
- Public administration
- Real-estate rental and leasing
- Retail trade
- Transportation and warehousing
- Utilities
- Wholesale trade

Use-case support: Each vendor had to support at least two of the following four use cases: traditional transactions, distributed variable data, event processing/data in motion, and augmented transactions (formerly hybrid transactional/analytical processing [HTAP]).

Geographic presence: Each vendor had to have market presence in a minimum of three of the following regions: North America; Latin America; Europe, the Middle East and Africa; Asia/Pacific; and Japan. Regional market presence was demonstrated by having a minimum of 5% of revenue and dedicated sales offices or distribution partnerships in a specific region.

Market share/revenue: Only named vendors in the DBMS market with OPDBMS products were eligible for inclusion:

- Vendors' inclusion was based on verifiable OPDBMS revenue and growth from the prior year. Each vendor must have had either a minimum of $50 million (U.S. dollars) in revenue with at least 50% growth from calendar year 2017 to calendar year 2018, or more than $75 million in revenue during the same period.
- Qualification for inclusion was verified by consulting Gartner's "Market Share: Enterprise Infrastructure Software, Worldwide, 2018." Only named vendors in the DBMS market with OPDBMS products were considered; of those, only vendors with estimated 2018 DBMS revenue that met the above criteria were included.

Software releases (feature availability): Product evaluations included technical capabilities, features and functionality present in the product or supported for download through midnight, U.S. Eastern Daylight Time on 1 July 2019.

Customers: Gartner requested that each vendor provide contact information (names and email addresses) for at least 50 reference customers. Our hope was that at least 40% of those named would respond to Gartner's approved survey questionnaire (produced in English only this year). We also drew on information available from other sources, including publicly available information, feedback from users of our client inquiry service and our industry contacts.

Support: Each vendor had to provide support for its OPDBMS product(s). For an open-source DBMS, maintenance and support had to be available from a vendor that owned or substantially controlled the source code and that offered it under an open-source license, such as the General Public License or Apache License. However, only the core DBMS engine had to be under the open-source license to classify as an open-source DBMS. The products in this report are enhanced with vendor additions, but the vendors also offer and support open-source-only versions of those products.

Services: Vendors participating in the OPDBMS market had to demonstrate their ability to deliver the necessary services to support operational systems via the establishment and delivery of support processes, professional services and/or committed resources and budget.

Excluded products: Some products are explicitly excluded from this Magic Quadrant. They include:

- Highly specialized engines, such as embedded-only, text-only or object-only databases, which may perform some transactions for small subsets of operational use cases. Product categories specifically excluded from this Magic Quadrant are:
  - Data warehousing-only DBMS and DMSA-only products
  - Prerelational DBMS products
  - Desktop DBMS products
  - Object DBMS products
  - Data grid products
  - Complex-event processing (CEP) or streaming data-only engines
  - "Streaming" engines, whose use cases are dominated by immediate event processing and that are rarely, if ever, used for subsequent management of the data involved
  - OPDBMS products for which over 50% of production deployments are embedded.

- Products that “add a layer” to, and require or embed, a complete or near-complete implementation of an open-source or other commercially marketed product such as MySQL, HBase or PostgreSQL.

Honorable Mentions

Other vendors participated in our research for this Magic Quadrant and may be worthy of consideration, depending on requirements, even though they did not meet all the criteria for inclusion in this year’s report. They include:

- Aerospike
- Cockroach Labs
- Couchbase
- InfluxData
- MariaDB
- NuoDB
- Redis Labs
- SequoiaDB
- Splice Machine
- Tencent
- VoltDB
- ZTE

In this list, Tencent and ZTE did not meet the geographical criterion; the other vendors did not fulfill the revenue criterion.

Evaluation Criteria

The generic Magic Quadrant Evaluation Criteria, defined at the end of this document, were adapted for this particular Magic Quadrant as follows.

Ability to Execute

Ability to Execute criteria are primarily concerned with a vendor’s capabilities and maturity. They also consider products’ portability and ability to scale and run in different operating environments, thereby

giving the customer a range of options.

Ability to Execute criteria are critical to customers' satisfaction and success with vendors' products, so interviews with, and survey responses from, reference customers are weighted heavily throughout.

Product or service: This criterion covers the technical attributes of the DBMS, as well as features and functions built specifically to manage the DBMS when used as a platform for transactions, interactions and observations. Included are high availability/disaster recovery, performance and scalability, and support for multiple deployment options (such as virtualization, the cloud and hybrid cloud/on-premises), multiple development languages, and new hardware and memory models. These attributes are evaluated across a variety of database sizes and application workloads. We also consider the automated management, tools and resources necessary to manage a database environment, especially as it scales to accommodate more complex application workloads. Finally, we consider the flexibility of the DBMS to incorporate new types of data and application, as well as new requirements for distributing data across servers and geographies.

Overall viability: This criterion covers corporate aspects, such as the skills of the vendor's personnel, financial stability, research and development (R&D) investment, and merger and acquisition activity. It also covers the management's ability to respond to market changes and the company's ability to weather market difficulties (crucial for long-term survival). Vendors are further evaluated on their capability to establish dominance in meeting a specific market demand.

Sales execution/pricing: This criterion covers the price/performance and pricing models of the DBMS, and the ability of the sales force to manage accounts (judging from feedback from interviews, surveys and inquiry interactions with our clients). We also consider the market share of the DBMS software product(s). Also considered are the diversity and innovative nature of the vendor's packaging and pricing models, and the ability to promote and sell the products globally.

Market responsiveness/record: This criterion includes the diversity of the vendor's offerings in response to changing market demand (for example, its ability and flexibility to offer cloud/hybrid deployment, new data types and new programming requirements). We consider general market perceptions of vendors and their products. We assess vendors' ability to adapt to market changes during the previous 18 months, and their flexibility in response to market dynamics over a longer period.

Marketing execution: This criterion evaluates such activities as lead generation, including traditional methods and internet-enabled trial software delivery, and the execution of channel development through partnering agreements (including co-seller, co-marketing and co-lead management arrangements). We consider vendors' coordination and delivery of education and marketing events throughout the world and across vertical markets. Also evaluated are vendors' creation and support of "community" activities that help to raise awareness and develop skills among buyers and prospective buyers.

Customer experience: This criterion is assessed primarily on the basis of interviews with, and survey responses from, vendors' reference customers, as well as discussions with users of Gartner's inquiry service. We consider vendors' track records in proofs of concept, customers' perceptions of their products, and customers' loyalty to vendors (this reflects their tolerance of vendors' practices and can indicate their level of satisfaction). Additionally, customer input regarding the applicability of products to limited use cases can be considered significant, depending on the success or failure of a vendor's approach to this market.

Operations: This criterion covers the alignment of a vendor's organization, as well as whether and how this enhances its ability to deliver. Aspects considered include field delivery, manufacturing (including identification of diverse geographical cost advantages), internationalization of products in light of both technical and legal requirements, and adequate staffing.

Table 1: Ability to Execute Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Product or Service	High
Overall Viability	Medium
Sales Execution/Pricing	Medium
Market Responsiveness/Record	High
Marketing Execution	Medium
Customer Experience	High
Operations	Low

Source: Gartner (November 2019)

Completeness of Vision

Completeness of Vision encompasses a vendor's ability to understand the functional capabilities needed to support operational environments, to develop a product strategy that meets the market's requirements, to comprehend market trends, and to influence or lead the market when necessary. A visionary leadership role is necessary for the long-term viability of both a company and a product. A vendor's vision may be demonstrated — and improved — by a willingness to extend its influence throughout the market by working with independent third-party application software vendors that

deliver both added functionality for the operational environment and commercial off-the-shelf software. A successful vendor will be able not only to understand the competitive landscape of operational transactions, but also to shape its future.

Market understanding: This criterion assesses a vendor's ability to understand the market and to shape its growth. In addition to examining a vendor's core competencies in this market, we consider its awareness of new trends. These include the increasing sophistication of end users; growing scalability needs (especially across server clusters); the cloud as a platform for DBMSs; demand for in-memory computing and augmented transactions; the use of new consistency models; and the growing desire to use data structures other than relational ones.

Marketing strategy: This criterion evaluates a vendor's marketing themes, product R&D focus, and ability to choose appropriate target markets and third-party software vendor partnerships to enhance the marketability of its products. For example, we consider whether the vendor encourages and supports independent software vendors in its efforts to support its DBMS in native mode (via, for instance, co-marketing or co-advertising with "value-added" partners). This criterion includes the vendor's responses to the market trends identified above and any offers of alternative solutions in its marketing materials and plans.

Sales strategy: This criterion assesses how a vendor designs and targets its channels and partnerships to assist with selling. It is especially important for younger organizations, because a good sales strategy can enable them to greatly increase their market presence, while maintaining lower sales costs (for example, through downloadable free community editions, co-selling and joint advertising). This criterion also covers a vendor's strategy for communicating its vision to its field organization and, therefore, to existing and prospective customers.

Offering (product) strategy: This criterion covers the design of product packaging and deployment options, including the availability of developer editions, cloud versions, managed offerings and appliances based on the vendor's DBMS. Vendors should demonstrate a diverse strategy that enables customers to choose what they need to build a complete solution for an operational environment. Also covered are partners' offerings that include technical, marketing, sales and support integration.

Business model: This criterion assesses how a vendor's model of a target market combines with its products and pricing, and whether the vendor can generate profits with this model, judging from its packaging and offerings. Also considered are pricing innovations and strategies, such as new licensing arrangements and cloud-based models for elastic provisioning to support peak demand. Additionally, we consider reviews of publicly announced earnings and forward-looking statements relating to an intended market focus. For private companies, and to augment publicly available information, we use proxies for earnings and new customer growth. An example is the number of Gartner clients who have indicated interest in, or awareness of, a vendor's products during calls to our inquiry service.

Vertical/industry strategy: This criterion concerns a vendor's ability to understand the specific needs of its clients in individual vertical-market segments. We consider aspects such as vertical-market sales teams and partnerships with vertical-market service providers.

Innovation: This criterion assesses a vendor's approach to developing new functionality that meets the needs of its market, offering new strategies by allocating and managing R&D expenditure, and leading the market in new directions. The use of new cloud/hybrid deployment, storage and hardware models is a key indicator of such an approach.

Geographic strategy: This criterion considers a vendor's worldwide reach. It is evaluated by considering a vendor's plan to use its resources in different regions, as well as the resources of its subsidiaries and partners. This criterion considers a vendor's plan for supporting clients throughout the world, around the clock and in many languages. Anticipation of regional and global economic conditions is also considered.

Table 2: Completeness of Vision Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Market Understanding	High
Marketing Strategy	High
Sales Strategy	Medium
Offering (Product) Strategy	High
Business Model	Low
Vertical/Industry Strategy	Medium
Innovation	High
Geographic Strategy	Medium

Source: Gartner (November 2019)

Quadrant Descriptions

Leaders

Leaders generally demonstrate the most support for a broad range of operational applications, based on support for a wide range of data types and multiple use cases. These vendors demonstrate consistent customer satisfaction and strong customer support. Many have competed in this market for many years, and have built a broad partner ecosystem for their products. Hence, Leaders generally represent the lowest risk for customers in the areas of performance, scalability, reliability and support. As the market's demands change, Leaders demonstrate strong vision in support not only of the market's current needs, but also of emerging trends. These include hybrid deployments and management, serverless DBMS delivery, containerization, and diversity of operational processing and query capabilities. Finally, the messaging, product R&D and delivery of Leaders suit today's market and address new trends in both DBMS software and hardware technology.

Challengers

Challengers are stable vendors with strong, established offerings, but a relative lack of vision — it can be difficult for relatively small vendors to improve both at the same time. It is normal for some to have high scores for execution but to lag in terms of the adoption levels and vision needed for leadership. Challengers normally show strong corporate viability and financial stability, and demonstrate strong customer support. However, they lack some features to support the latest trends in the OPDBMS market, such as support for interaction and observation data in transactions, and a roadmap for moving toward multimodel DBMS capabilities. Although they may be lacking in relation to some of the market's innovative concepts, Challengers offer stability, simplicity of installation and support, and strong performance. As with Niche Players, Gartner considers support for only a limited number of data types and deployment models as evidence of limited vision.

Visionaries

Visionaries take a forward-thinking approach to managing the hardware, software and end-user aspects of an OPDBMS environment. Visionaries typically have innovative ideas for new functionality and demonstrate advanced use of new deployment models. They have the requisite number of production customers, but lack the market momentum of Leaders. In this market, Visionaries are often young, small and innovative vendors with great new ideas that are spurring on the more mature vendors and the market in general.

Niche Players

Niche Players generally deliver a highly specialized product with limited market appeal. A Niche Player frequently provides an exceptional OPDBMS product, but is isolated or limited to a specific end-user community, region or industry. Although the solution itself may not have limitations, adoption is limited. The Niche Players quadrant contains vendors that may lack one or all of the following:

- A strong or large customer base
- The breadth of functionality of Leaders

■ Sufficient general customer acceptance or proven functionality to move beyond niche status

Context

This Magic Quadrant deals with the vendors who supply DBMSs used for operational processing. It should therefore interest anyone involved in defining, purchasing, building or managing an operational data processing environment — notably, CIOs, CTOs, data and analytics leaders, infrastructure managers, database and application architects, database administrators and IT purchasing managers.

The cloud's impact as the dominant vector affecting the OPDBMS market has grown even greater in the past year. Extremely large companies, defined as having over 10,000 employees and several billion dollars of annual revenue, are building roadmaps with a view to being "all in" on public cloud infrastructure in three to five years. Market growth — at its highest level ever — was driven by cloud spending.

The vendor landscape is shifting dramatically as established leaders are challenged by cloud-capable newcomers. The top ten by cloud DBMS revenue now includes Google, Alibaba Cloud, Tencent, and Huawei. Amazon and Microsoft are the only multibillionaires in terms of cloud revenue. Megavendors must focus on accelerating their cloud transition. Buyers have a new set of vendors to consider.

Market Overview

Gartner estimates that the DBMS market grew by 18.4% from 2017 to 2018, to $46.1 billion — its largest increase ever. It is on track to exceed $50 billion in 2019. The changes we described last year have continued, as IBM was replaced in the top three by AWS. New entrants in the top 10 include Alibaba Cloud, Google and Huawei, reflecting the insurgency of cloud providers and their "portfolio of services" model. Although the combined share of the (new) top-three vendors — Oracle, Microsoft and AWS — continued to climb, Gartner expects that the double- or even triple-digit growth of the newer cloud players will continue to reshape the landscape in the years ahead (as will that of Microsoft, whose 31% growth in 2018 dramatically outpaced that of other established vendors). Oracle's overall share decline continued, however, as it dropped to 31.5% — its lagging cloud revenue, now in a distant fourth place, contributed greatly to this decline.

The vendors in this year's Magic Quadrant represent the portion of a volatile market that has understood and harnessed the dramatic factors changing operational use cases. Many other vendors, which do not appear in this Magic Quadrant, have demonstrated vision, but their execution has not enabled them to reach the revenue levels required for inclusion. The Niche Players quadrant remains sparsely populated. Many of the smaller vendors will not thrive in the transition to the cloud, and will either be acquired or remain small in comparison with the vendors represented here.

Once again, cloud adoption drove growth in 2018. Cloud DBMS revenue grew to $10.5 billion, representing 22.8% of total DBMS revenue — and 81% of that cloud growth was attributable to AWS

and Microsoft, the only vendors with cloud DBMS revenue of more than $1 billion. It is no accident that both are leading cloud platform providers. AWS again moved up the revenue rankings on the strength of 116% growth. Microsoft's 134% growth in cloud DBMS revenue fueled its overall growth of 31.3%. Gartner forecasts continue to reflect dbPaaS's status as a major driver by showing dbPaaS nearly quadrupling in revenue over the next five years, with a 31% compound annual growth rate for the period 2018 through 2023 (see "Forecast: Public Cloud Services, Worldwide, 2017-2023, 2Q19 Update"). For more discussion, see "The Future of the DBMS Market Is Cloud."

Among the overall cloud DBMS leaders, Alibaba Cloud and Tencent registered triple-digit percentage growth. AWS, Google, Huawei and MongoDB all grew in the 70% range. As global enterprises evaluate cloud OPDBMS options, they must consider a very different set of players, many of which are seeking to supplement or displace the leaders by means of aggressive product and pricing strategies, including migration and conversion assistance.

The market's revenue shifts reflect changes in the deployments and plans of customers surveyed for this Magic Quadrant. Only 38% described their deployments as being exclusively on-premises; the same percentage are using cloud options. As many as 23% said their deployments are hybrid (both cloud and on-premises) — a finding that poses a challenge to many vendors whose support for the hybrid option is new and often immature. It also represents a challenge for the cloud-only vendors that have not participated in such deployments at all. For the first time, our survey also examined customers' choices for containers and orchestration, which may represent an intermediate step to true hybrid deployment for many organizations. Nearly half of the respondents were using at least one product, with Docker and Kubernetes leading. So far, OpenStack lags far behind, which suggests that IBM's attempt to capitalize on it (following the acquisition of Red Hat) will be an uphill battle.

Finally, we have noted in the past that the open-source movement has had a substantial impact on the market, but that open-source offerings often generate little revenue, which makes their impact less easy to quantify. Results for vendors with significant open-source roots varied. Several open-source-based vendors (those that derive revenue from offerings based on open-source DBMSs) grew faster than the market's remarkable 18.4% growth: EnterpriseDB, DataStax and Couchbase all did well (from relatively small bases). However, these vendors' cloud growth lagged behind their overall growth, which suggests they will need to move fast if they are not be thwarted by the increasing availability of competing offerings from CSPs. The same issue afflicted some leading proprietary players. Oracle, IBM, SAP, Teradata and InterSystems all grew by less than the overall DBMS market's rate — and all had cloud growth that lagged behind the market's 87% overall growth. The impact of open-source-based offerings cannot be separated from their success in the cloud; without the cloud, they are likely to miss their window of opportunity as CSPs offer alternatives.

Evidence

The analysis in this Magic Quadrant is based partly on information gathered from interactions with Gartner clients during the 12 months to June 2019 and a survey of the featured vendors' reference

customers (see below). 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: Enterprise Infrastructure Software, Worldwide, 2018."

Survey of vendors' reference customers: As part of the Magic Quadrant research process, we sought the views of vendors' reference customers (details of whom were supplied by the vendors) via an online survey conducted during April and May 2019. The survey included requests for feedback about:

- Vendors' maturity: For example, typical use cases, provision of innovation, responsiveness to new requests, total cost of ownership and pricing.
- Vendors' product capabilities: For example, high-availability/disaster recovery capabilities, support for high-speed ingestion of data, performance, support for multiple data types, and problems encountered with products.

More than 480 organizations, representing all the featured vendors' customers, responded to the survey, and there was an average of 29 respondents per vendor. For the first time, more participants indicated that their deployments included Asia/Pacific (42%) than Europe (38%).

The respondents were generally pleased with their vendors and products, but gave relatively low marks in some areas, which we detail in the analysis of each vendor. Some of the low scores might reflect historical problems, because not all organizations are on the latest product versions.

This year's survey introduced the description "augmented transactions," in which analytics occur and affect processing through multiple states within the scope of transactions in a single database, while maintaining low latency. This topic was formerly called hybrid transactional/analytical processing (HTAP).

Gartner's client inquiry service data: Gartner maintains an extensive database of information about all inquiries to our client inquiry service. Our information management team received more than 4,700 inquiries from end-user clients during the Magic Quadrant research period from May 2018 through July 2019. We used the sentiments apparent from these inquiries to formulate some of the opinions expressed in this Magic Quadrant.

Note 1
Nonrelational DBMS

Previously, we have used the term "NoSQL" to imply nonrelational; NoSQL formerly implied alternative data types and scaling strategies, in comparison with relational DBMSs. However, relational DBMSs

have added, or are adding, features from NoSQL, while NoSQL DBMSs have added, or are in the process of adding, features from relational DBMSs. Therefore, the term “NoSQL” is no longer useful as a product distinction.

Although SQL is frequently associated with relational DBMS products, the availability of SQL does not define a relational DBMS. SQL is a data access language and can be used to access data in any DBMS, whether relational or nonrelational. Further, many nonrelational DBMSs support an SQL or SQL-like language (for example, those of MarkLogic and DataStax).

Note 2
Definition of an OPDBMS Workload

For the purposes of this evaluation, workloads we expect to be managed by an OPDBMS include:

- Batch/bulk loading
- Real-time or continuous data loading
- Concurrent online and web-based new/update transactions
- Operational reporting
- Management of externally distributed processes, such as “look-aside” queries

OPDBMS products must provide the ability to prioritize these workloads in order to ensure SLAs are met when they operate concurrently.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service, and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.