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The Forrester Wave™: Cloud Data Warehouse, Q1 2021

The 13 Providers That Matter Most And How They Stack Up

by Noel Yuhanna
March 24, 2021

Why Read This Report

In our 26-criterion evaluation of cloud data warehouse providers, we identified the 13 most significant ones — Alibaba, Amazon Web Services, Cloudera, Exasol, Google, IBM, Micro Focus, Microsoft, Oracle, SAP, Snowflake, Teradata, and Yellowbrick — and researched, analyzed, and scored them. This report shows how each provider measures up and helps enterprise architecture professionals select the right one for their needs.

The Forrester Wave™: Cloud Data Warehouse, Q1 2021

The 13 Providers That Matter Most And How They Stack Up

by Noel Yuhanna
with Gene Leganza, Daniel Weber, and Jeremy Vale
March 24, 2021

Cloud Data Warehouse Helps Accelerate Modern Analytics And Lower Costs

Today, cloud data warehouse (CDW) solutions are changing the way we deliver modern analytics. They can provision any size data warehouse in minutes, autotune queries, scale resources such as compute and storage based on demand, and automatically upgrade to the latest version. To address the growing need for more integrated, real-time, and self-service analytics, CDW vendors continue to focus on native integration with data lakes and object stores; self-service to simplify access and administration for larger and more complex warehouses; and advanced capabilities on parallel processing, compression, partitioning, indexing, query optimization, and dynamic resource provisioning. The most common CDW use cases include customer analytics, AI/machine learning (ML)-based analytics, vertical-specific analytics, and real-time analytics.

As a result of these trends, cloud data warehouse customers should look for providers that offer:

- **A solution that simplifies a data warehouse deployment.** Finding new insights from data is an iterative, continuous, laborious process that requires a stable data warehouse. Look for solutions with expanded automation capabilities to automate data ingestion, query tuning, data processing, and data integration to accelerate various business use cases.

- **A solution that can deliver the performance and scale requirements you need.** As you start to store and process large amounts of data, performance and scale become critical. Look for solutions that support thousands of concurrent users and queries per second and offer the ability to scale up and down based on business requirements. Ask the vendor for customer references when storing and processing more than 100 terabytes of data or dealing with more than 100 concurrent users.

- **A roadmap that is as bold as your cloud ambitions.** Most providers continue to simplify their solutions by enabling nontechnical users to access data directly. Look at vendors' roadmaps that focus on integration with data lakes and object stores, enable AI and ML automation capabilities, expand integration with various cloud software-as-a-service (SaaS) sources, and support enhanced analytics capabilities natively.

Evaluation Summary

The Forrester Wave™ evaluation highlights Leaders, Strong Performers, Contenders, and Challengers. It's an assessment of the top vendors in the market and does not represent the entire vendor landscape. You'll find more information about this market in the Forrester report Now Tech: Cloud Data Warehouse, Q2 2020.

We intend this evaluation to be a starting point only and encourage clients to view product evaluations and adapt criteria weightings using the Excel-based vendor comparison tool (see Figure 1 and see Figure 2). Click the link at the beginning of this report on Forrester.com to download the tool.

FIGURE 1 Forrester Wave™: Cloud Data Warehouse, Q1 2021

THE FORRESTER WAVE™
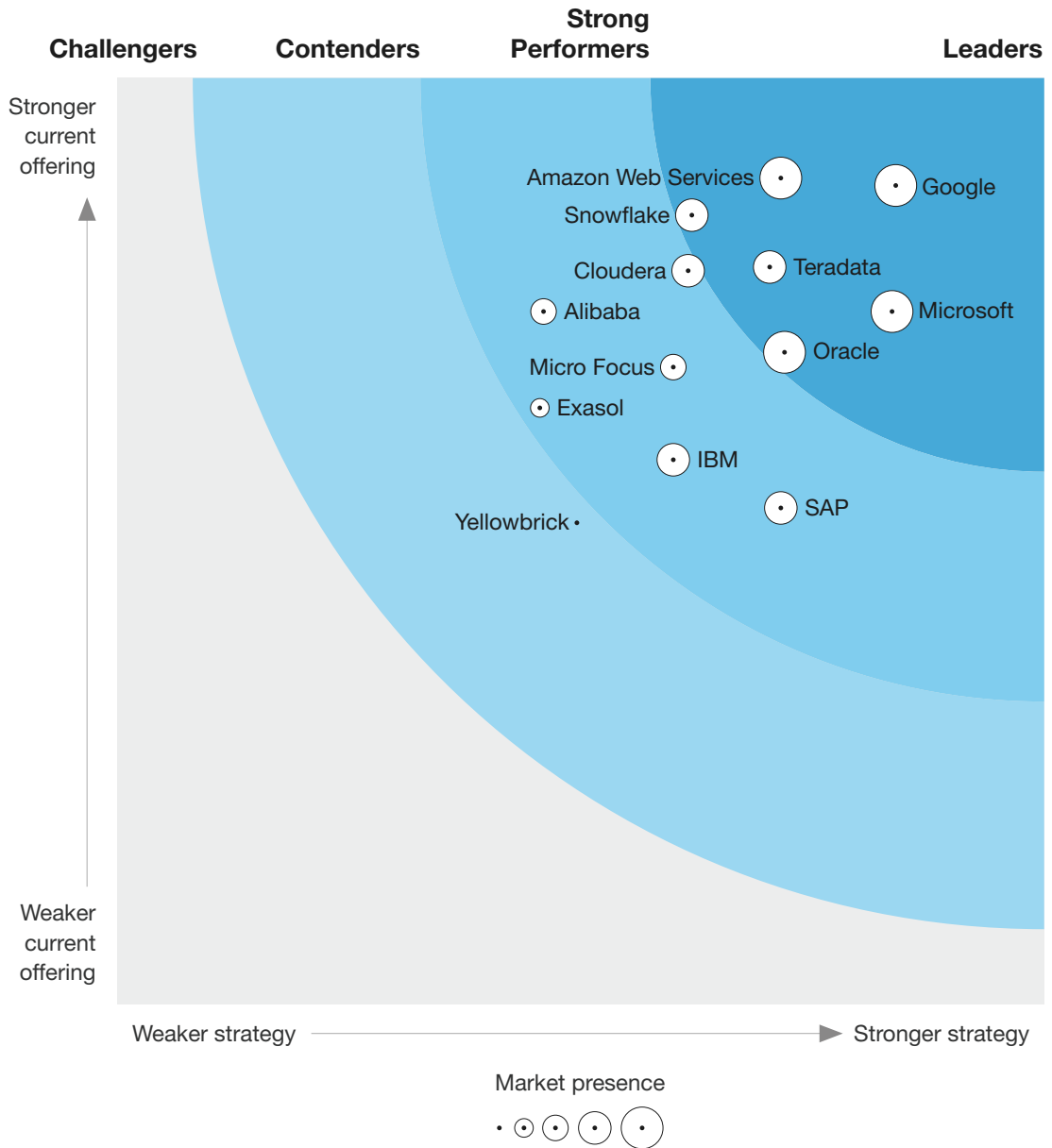
Cloud Data Warehouse

Q1 2021

FIGURE 2 Forrester Wave™: Cloud Data Warehouse Scorecard, Q1 2021

	Forrester's weighting	Alibaba	Amazon Web Services	Cloudera	Exasol	Google	IBM	Micro Focus	Microsoft	Oracle	SAP	Snowflake	Teradata	Yellowbrick
Current offering	50%	3.74	4.46	3.96	3.22	4.42	2.94	3.44	3.74	3.52	2.68	4.26	3.98	2.60
Data types	1%	5.00	5.00	5.00	3.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00	3.00
Data ingestion/loading	5%	5.00	5.00	5.00	3.00	5.00	1.00	5.00	3.00	3.00	3.00	5.00	3.00	3.00
Data lake integration	6%	5.00	5.00	3.00	3.00	5.00	3.00	5.00	3.00	3.00	3.00	3.00	5.00	3.00
Administration automation	8%	3.00	3.00	3.00	3.00	3.00	3.00	1.00	3.00	5.00	3.00	5.00	3.00	3.00
HA/DR features	6%	3.00	3.00	3.00	1.00	5.00	3.00	0.00	3.00	3.00	1.00	3.00	3.00	3.00
Deployment options	7%	3.00	3.00	3.00	3.00	3.00	5.00	5.00	3.00	3.00	3.00	3.00	5.00	3.00
Performance features	6%	3.00	5.00	5.00	3.00	5.00	3.00	5.00	5.00	3.00	3.00	3.00	5.00	5.00
Performance reference	10%	5.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	1.00	1.00	5.00	5.00	3.00
Scalability features	6%	5.00	3.00	3.00	3.00	5.00	3.00	3.00	5.00	3.00	3.00	5.00	3.00	3.00
Scalability reference	10%	3.00	5.00	5.00	3.00	5.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	3.00
Data security features	9%	5.00	5.00	3.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	5.00	3.00	3.00
Analytics capabilities	5%	3.00	5.00	5.00	3.00	3.00	1.00	3.00	3.00	5.00	3.00	3.00	5.00	1.00
ML/data science	7%	3.00	5.00	5.00	3.00	5.00	1.00	3.00	3.00	3.00	3.00	3.00	3.00	1.00
Horizontal use cases	7%	3.00	5.00	5.00	3.00	5.00	3.00	5.00	5.00	5.00	3.00	5.00	5.00	1.00
Vertical use cases	7%	3.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00	5.00	5.00	1.00

All scores are based on a scale of 0 (weak) to 5 (strong).

FIGURE 2 Forrester Wave™: Cloud Data Warehouse Scorecard, Q1 2021 (Cont.)

	Forrester's weighting	Alibaba	Amazon Web Services	Cloudera	Exasol	Google	IBM	Micro Focus	Microsoft	Oracle	SAP	Snowflake	Teradata	Yellowbrick
Strategy	50%	2.30	3.58	3.08	2.28	4.20	3.00	3.00	4.18	3.60	3.58	3.10	3.52	2.48
Roadmap	30%	3.00	3.00	3.00	3.00	5.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	1.00
Vision	40%	1.00	3.00	3.00	1.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Strategy execution	25%	3.00	5.00	3.00	3.00	5.00	3.00	3.00	5.00	5.00	5.00	3.00	5.00	3.00
Support	4%	5.00	5.00	5.00	5.00	5.00	3.00	3.00	5.00	5.00	5.00	5.00	3.00	5.00
Subscription	1%	5.00	3.00	3.00	3.00	5.00	3.00	3.00	3.00	5.00	3.00	5.00	5.00	3.00
Market presence	0%	2.20	5.00	3.40	1.20	4.80	3.40	3.00	4.40	4.40	3.20	3.60	3.40	1.00
Product revenue	40%	3.00	5.00	3.00	1.00	5.00	3.00	3.00	5.00	5.00	3.00	3.00	3.00	1.00
Customers	30%	1.00	5.00	3.00	1.00	5.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	1.00
Market awareness	10%	1.00	5.00	3.00	1.00	3.00	3.00	3.00	3.00	5.00	1.00	5.00	3.00	1.00
Partnerships	10%	3.00	5.00	5.00	1.00	5.00	5.00	3.00	1.00	5.00	5.00	5.00	5.00	1.00
Global presence	10%	3.00	5.00	5.00	3.00	5.00	5.00	3.00	5.00	5.00	5.00	5.00	5.00	1.00

All scores are based on a scale of 0 (weak) to 5 (strong).

Vendor Offerings

Forrester included 13 vendors in this assessment: Alibaba, Amazon Web Services, Cloudera, Exasol, Google, IBM, Micro Focus, Microsoft, Oracle, SAP, Snowflake, Teradata, and Yellowbrick (see Figure 3). We invited Actian and VMware to participate in this Forrester Wave, but they chose not to participate, and we could not make enough estimates about their capabilities to include them in the assessment as nonparticipating vendors.

FIGURE 3 Evaluated Vendors And Product Information

Vendor	Product evaluated	Product version evaluated
Alibaba	MaxCompute, DataWorks, AnalyticDB	3.36.2, 3.0.20201128, 3.0
Amazon Web Services	Amazon Redshift	
Cloudera	Cloudera Data Platform	
Exasol	Exasol	7.0
Google	BigQuery	
IBM	IBM Db2 Warehouse on Cloud	
Micro Focus	Vertica	10.0.1
Microsoft	Azure Synapse Analytics	
Oracle	Oracle Autonomous Data Warehouse	
SAP	SAP Data Warehouse Cloud	
Snowflake	Snowflake Data Cloud	4.39
Teradata	Teradata Vantage in the Cloud	2.x
Yellowbrick	Yellowbrick Data Warehouse	5.0

Vendor Profiles

Our analysis uncovered the following strengths and weaknesses of individual vendors.

Leaders

- **Google gains strong momentum across various industry verticals.** Google BigQuery is a fully managed, serverless cloud data warehouse that utilizes columnar storage and can scale to hundreds of petabytes leveraging standard SQL. BigQuery integrates with Cloud BigTable, Google Cloud Storage, Cloud AI Notebooks, and Google Sheets, giving users the ability to join data across various systems. Data engineers can access BigQuery's storage layer with Spark, Dataflow, and other processing tools, further uniting Google's data ecosystem. BigQuery has built-in machine learning capabilities, which allows the creation and execution of ML models using SQL queries. You can access BigQuery using Cloud Console, the command-line tool, or REST APIs using various client libraries such as Java, .Net, or Python.

Customers like Google's frequency of new data warehouse releases, business value, future-proof architecture, high-end scale, geospatial capabilities, strong AI/ML capabilities, good security capabilities, and broad analytical use cases. Top use cases include business intelligence (BI) acceleration, internet-of-things (IoT) analytics, customer intelligence, AI/ML-based analytics, data science, data collaboration, and data services.

- **Amazon Web Services' Amazon Redshift continues to have strong adoption.** Amazon Redshift is a mature cloud data warehouse with broad capabilities and an expanding ecosystem. It is a fully managed, petabyte-scaled data warehouse that's part of AWS Analytics Services, including Amazon Kinesis, Amazon Elasticsearch Service, Amazon CloudSearch, Amazon EMR, Amazon Athena, Amazon SageMaker, and AWS Glue. Amazon Redshift can save results back to an S3 data lake that can be leveraged by other analytical services such as Amazon EMR, Amazon Athena, and Amazon SageMaker. Amazon Redshift's federated query unifies analytics across data warehouses, data lakes, and databases.

  Customers like AWS's data lake integration, Postgres compatibility, performance at scale, serverless architecture, security and compliance, and high availability and disaster recovery capabilities. Top use cases include BI, data services, AI/ML-based analytics, data science, and customer intelligence.

- **Microsoft's Azure Synapse Analytics continues to have a strong adoption.** Microsoft Azure Synapse Analytics is an analytics service that brings together data warehouse, data integration, real-time operational analytics, and data analytics to deliver a unified experience to ingest, explore, prepare, manage, and serve data for BI and ML use cases in a single cloud service. The key service components include a serverless and dedicated SQL engine for data warehouse workloads, Apache Spark for big data processing, code-free data integration for extract, transform, load (ETL), and Synapse Link for real-time operational analytics. The distributed, cloud-native, scale-out, relational SQL data warehouse can store all kinds of data to support various analytical cases.

  Customers like Microsoft's product features, technical support, ease of use, scalability, availability, and ease of attracting skilled resources. Top use cases include BI acceleration, customer intelligence, AI/ML-based analytics, data warehouse modernization, risk analytics, data collaboration, and data services.

- **Teradata's Vantage delivers analytics at scale.** Teradata Vantage is a hybrid, multicloud data analytics platform that unifies data warehouses, data lakes, analytics, and new data sources. It combines open source and commercial technologies to operationalize insights; solve business problems; enable descriptive, predictive, and prescriptive analytics; and deliver performance for mixed workloads with high query concurrency using workload management and adaptive optimization. Teradata Vantage integrates multiple analytic languages — including SQL, R, Python, SAS, and Java — and supports various data types, including JSON, Avro, Parquet, relational, spatial, and temporal.

Customers like Teradata Vantage's hybrid cloud platform, reliability, data science, advanced analytics, and ease of management from an infrastructure perspective. Top use cases include BI acceleration, customer intelligence, real-time analytics, embedded data science functions, fraud detection, time-series analysis, data lake integration, data warehouse modernization, and data services.

- **Snowflake expands its offering to support more use cases.** Snowflake Data Cloud supports data warehousing, data lakes, data engineering, data science, data application development, and data sharing. Snowflake Data Cloud is a fully managed service that leverages a SQL database engine and can scale storage and compute independently. Snowflake offers a single and seamless experience across multiple public clouds and their regions. It empowers technical and business users to discover, share, and consume shared data with customers, suppliers, and partners.

  Customers like Snowflake's separation of storage from compute, as well as its scalability, time travel feature, ease of administration, data sharing across multiple lines of business, and consistent performance. Top use cases include BI acceleration, customer intelligence, AI/ML-based analytics, data science, data warehouse modernization, data collaboration, and data services.

- **Oracle improves autonomous capabilities to simplify all deployments.** Oracle Autonomous Data Warehouse is a cloud data warehouse service that simplifies provisioning, configuring, security, tuning, patching, and managing a data warehouse. Oracle Cloud Data Warehouse runs in Oracle Public Cloud, supporting shared and dedicated infrastructure and customer data centers. To ensure consistent performance and scale, Oracle Autonomous Data Warehouse runs on an Exadata Database appliance. Oracle offers simplified database migration, a built-in web-based notebook, broad SQL access, elastic scale, and concurrent workloads.

  Customers like Oracle's autonomous capabilities, fast time-to-value, good performance and scale, ease of configuration, and good security and integration offering. Top use cases include data warehouse modernization, AI/ML-based analytics, BI acceleration, IoT analytics, and real-time analytics.

Strong Performers

- **Cloudera simplifies large-scale analytics through automation.** Cloudera Data Platform (CDP) supports a full data lifecycle ecosystem across hybrid and multiple clouds, delivering a shared data experience. Cloudera Data Warehouse is fully integrated with CDP to provide easy-to-use self-service and advanced analytics use cases at scale. It supports autoprovisioning, cloud optimization, self-service workload management, and autoscaling capabilities. Cloudera's shared data experience provides consistent data security, governance, and control across all multifunction analytics and data discovery.

  Customers like Cloudera's business value, partner ecosystem, low cost, data governance, good automation, and solution flexibility. Top use cases include BI acceleration, customer intelligence, real-time BI, AI/ML-based analytics, data science, data warehouse modernization, and data services.

- **Micro Focus Vertica delivers a low-cost, reliable analytics platform.** Vertica is a unified analytics warehouse that combines a massively parallel processing (MPP) query engine with built-in advanced analytics and ML capabilities. Vertica's Eon Mode separates compute from storage and leverages low-cost S3 object storage and the ability to compute to variable workloads and optimized analytical performance. Vertica Analytics runs in all major public clouds and on-premises. It offers good scale, performance, advanced compression, advanced indexing, and workload management.

  Customers like Vertica's reliability, ease of use, low cost, business value, built-in ML and analytics capabilities, geospatial features, technical support, and hybrid cloud architecture. Top use cases include BI acceleration, customer intelligence, data science, real-time analytics, and data collaboration.

- **SAP joins the cloud data warehouse bandwagon with a viable offering.** SAP Data Warehouse Cloud is a modern, unified data and analytics solution that provides the data-warehouse-as-a-service layer that enables you to connect, transform, model, and visualize data and gain real-time insights. It is built on SAP HANA Cloud, which provides broad data management capabilities, including data transformation, virtualization, integration, catalog, modeling, and metadata management. It allows collaboration among groups through virtual workspaces so that you can use the same data set and share findings with others.

  Customers like SAP's frequency of releases, technical support, ease of use, establishment of a common semantic layer, business value, and integration with enterprise resource planning (ERP) data. Top use cases include BI acceleration, customer intelligence, data warehouse modernization, real-time analytics, data collaboration and sharing, and data services.

- **Alibaba has a viable analytical solution for global use cases.** Alibaba offers a broad range of infrastructure, platform, and analytics services, including MaxCompute, AnalyticDB, and DataWorks services to support various large-scale data warehouse use cases. Although most of Alibaba's cloud data warehouse deployments are in China, MaxCompute, AnalyticDB, and DataWorks are available in 16 countries and regions, with customers in finance, internet, biomedical, energy, transportation, and media industries. Together, Alibaba's MaxCompute, AnalyticDB, and DataWorks offer real-time and exabyte-scale capabilities to support any data warehouse requirement.

  Customers like Alibaba Cloud's CDW offering's multiple computational models, ML ability, geodistributed platform, technical support, business value, tooling, and high-end scalability. Top use cases include BI acceleration, AI/ML-based analytics, data warehouse modernization, data science, and real-time and risk analytics.

- **IBM offers a stable, reliable, and flexible cloud data warehouse.** IBM Db2 Warehouse on Cloud is an elastic, fully managed cloud data warehouse that delivers independent scaling of storage and compute. IBM is known for its in-database analytics, real-time streaming, automated resource management, vertical data models, security, and integration with Spark and Hadoop platforms. IBM's key strength lies in its hybrid data management platform, highly optimized columnar data store, actionable compression, and in-memory processing to deliver various analytics and ML workloads.

Customers like IBM's flexible infrastructure platform, stability, monitoring dashboard, reliability, vendor support, and good scalability. Top use cases include data science, data warehouse modernization, data collaboration, customer intelligence, and BI acceleration.

- **Exasol delivers a well-rounded solution for BI.** Exasol is a fully managed, column-oriented data warehouse that supports real-time analytical use cases. Although Exasol is designed to run in memory, data is persisted to disk with ACID compliance. The platform has self-tuning capabilities that optimize performance and minimize maintenance requirements. It also offers the ability to consolidate AI, ML, and BI for both standard and advanced analytics directly in the database, using any data science language. Exasol supports SQL and can integrate using ODBC, JDBC, ADO.NET, or SDK.

  Customers like Exasol's in-memory performance, reliability, BI platform, low maintenance, faster time-to-value, low cost, and ease of use. Top use cases include BI acceleration, AI/ML-based analytics, data science, and real-time analytics.

Contenders

- **Yellowbrick offers a viable hybrid cloud data warehouse.** Yellowbrick Data Warehouse is a full-service, MPP analytic database that runs in public clouds (AWS, Google Cloud Platform, and Microsoft Azure) and on-premises. It offers native, real-time streaming ingest; hybrid cloud georeplication across data centers; SQL access; and operational simplicity. Yellowbrick can access data from multiple public clouds simultaneously, enable private network for sensitive data, and have the same cloud control plane across deployments. Yellowbrick's self-healing feature allows the data warehouse to automatically recover from specific technical issues, reducing the risk of outages.

  Customers like Yellowbrick's low cost, integration with partners, geographic flexibility, ease of deployment, and good performance and scale. Top use cases include BI acceleration, customer intelligence, data warehouse modernization, real-time analytics, and data collaboration.

Evaluation Overview

We evaluated vendors against 13 criteria, which we grouped into three high-level categories:

- **Current offering.** Each vendor's position on the vertical axis of the Forrester Wave graphic indicates the strength of its current offering. Key criteria for these solutions are data lake integration, high availability/disaster recovery, performance, scalability, data security, analytics, and data security features.

- **Strategy.** Placement on the horizontal axis indicates the strength of the vendors' strategies. We evaluated roadmap, vision, strategy execution, support, and subscription.

- **Market presence.** Represented by the size of the markers on the graphic, our market presence scores reflect each vendor's product revenue, customers, market awareness, partnerships, and global presence.

Vendor Inclusion Criteria

Forrester included 13 vendors in the assessment: Alibaba, Amazon Web Services, Cloudera, Exasol, Google, IBM, Micro Focus, Microsoft, Oracle, SAP, Snowflake, Teradata, and Yellowbrick. Each of these vendors has:

- **A comprehensive cloud data warehouse offering.** A key component of the CDW architecture is leveraging the public cloud for all data warehouse functions, including provisioning, storing, processing, transforming, and accessing data within the CDW. The CDW should provide features to secure data, enable elastic scale, provide high availability and disaster recovery options, support loading and unloading of data, and provide various data access and monitoring tools or automation.

- **A standalone data warehouse service running in the public cloud.** The vendors included in this evaluation provide a CDW service that organizations can implement or use independently of analytics, data science, and visualization tools. The service should not be technologically tied or bundled to any particular application or broader non-data warehouse solution.

- **Data warehouse use cases.** The CDW service should have customers supporting one or more of the following use cases: IoT analytics, customer 360, advanced analytics, real-time analytics, and others.

- **A referenceable install base.** At least 25 unique, paying enterprise customers use the CDW service that span more than one major geographical region. Each vendor provided at least three customer references.

- **A publicly available CDW service.** The participating vendors must have had a general public release of a CDW service available as of October 27, 2020.

- **Customer interest.** Forrester included only vendors that were mentioned several times over the past 12 months by customers during Forrester inquiry calls related to CDW topics.

- **Client inquiries and/or technologies that put the vendor on Forrester's radar.** Forrester clients often discuss the vendors and products through inquiries and interviews; alternatively, the vendor may, in Forrester's judgment, warrant inclusion or exclusion in this evaluation because of technology trends and market presence.

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Supplemental Material

Online Resource

We publish all our Forrester Wave scores and weightings in an Excel file that provides detailed product evaluations and customizable rankings; download this tool by clicking the link at the beginning of this report on Forrester.com. We intend these scores and default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs.

The Forrester Wave Methodology

A Forrester Wave is a guide for buyers considering their purchasing options in a technology marketplace. To offer an equitable process for all participants, Forrester follows The Forrester Wave™ Methodology Guide to evaluate participating vendors.

In our review, we conduct primary research to develop a list of vendors to consider for the evaluation. From that initial pool of vendors, we narrow our final list based on the inclusion criteria. We then gather details of product and strategy through a detailed questionnaire, demos/briefings, and customer reference surveys/interviews. We use those inputs, along with the analyst's experience and expertise in the marketplace, to score vendors, using a relative rating system that compares each vendor against the others in the evaluation.

We include the Forrester Wave publishing date (quarter and year) clearly in the title of each Forrester Wave report. We evaluated the vendors participating in this Forrester Wave using materials they provided to us by December 11, 2020, and did not allow additional information after that point. We encourage readers to evaluate how the market and vendor offerings change over time.

In accordance with The Forrester Wave™ and New Wave™ Vendor Review Policy, Forrester asks vendors to review our findings prior to publishing to check for accuracy. Vendors marked as nonparticipating vendors in the Forrester Wave graphic met our defined inclusion criteria but declined to participate in or contributed only partially to the evaluation. We score these vendors in accordance with The Forrester Wave™ And The Forrester New Wave™ Nonparticipating And Incomplete Participation Vendor Policy and publish their positioning along with those of the participating vendors.

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