WINTER CORPORATION

AUTONOMOUS TRANSACTION PROCESSING

Oracle's Self-Driving Operational Database

Summary: Oracle has announced its Autonomous Transaction Processing (ATP), a revolutionary cloud database offering for operational use of data. It is the companion to ADW, the autonomous data warehouse offering announced in March.

Both ATP and ADW are self-driving databases and are cloud versions of the long-established Oracle database. With an Oracle "autonomous" database the customer need be concerned only with the logical design of the database and the development and maintenance of the application(s). For operational databases, ATP thus aims to deliver a dramatic simplification of the role of the customer, resulting in large reductions of staffing and skill requirements and reduction in total cost to the customer, increased speed to market and other major benefits.

In addition, ATP offers genuinely elastic capacity for operational databases. Unlike other comparable services, which require taking down the database to scale up or down, the Oracle Cloud executes scale up/scale down requests immediately, without interrupting database operation.

ATP is a new offering, which will become fully autonomous for more demand-ing, mission critical, requirements over a period of time.

WinterCorp recommends that customers begin experimenting with Oracle ATP without delay to experience the simplicity, speed to market and cost savings available. ●

AUTONOMOUS TRANSACTION PROCESSING (ATP), Oracle's newest self-driving database, is now available in the Oracle Cloud. The database itself, in combination with the underlying hardware, software and services, is positioned as a capability well beyond any other operational database offering in the market. ATP is the operational database companion to ADW, Oracle's self-driving data warehouse, which was announced in March.

Both ATP and ADW are self-driving, self-securing and self-repairing databases. The idea is that the customer need be concerned only with the logical design of the database and the development of the application. The machine learning capabilities of the Oracle Cloud will handle provisioning, physical database administration, maintenance, backup, data availability and system security—each in a value-added, highly differentiated fashion. For operational databases, this is a dramatic simplification of the role of the customer. For customers who have skilled Oracle database administration staff, this frees them from much unwelcome drudgery and enables them to focus their time on higher value activities. For many customers who don't have such skilled staff—or don't have enough of it—ATP opens the door to implementing more and better operational database solutions.

In addition, ATP offers genuinely elastic capacity for operational databases. I have used the Oracle cloud hands-on and verified that it takes just a few clicks, and no special skill, to increase or decrease the processors, memory or storage allocated to a running database. This elasticity provides customers with agility to accommodate changing business needs; it also offers cost savings, for example, when transaction volumes are cyclical, a common situation. Unlike other comparable services, the Oracle Cloud executes scale up/scale down requests immediately. In addition, ATP allows the customer to scale processor capacity, memory and storage independently.

ATP uses Oracle's extensive mission critical functionality including Exadata Infrastructure, Real Application Clusters, and Active Data Guard to provide far more mature and extensive mission critical capabilities than other cloud database offerings. Mission critical functionality has traditionally been complex to implement and manage, but Oracle Autonomous Database automatically provisions and manages it.

What ATP Actually Is

Oracle ATP is the combination of three things:
1. Oracle Database 18c, a new version of the product, featuring expanded database automation;
2. Oracle Cloud, a database-optimized infrastructure-as-a-service, cloud offering; and,
3. Policy-driven automation and machine learning.

Previously, creating an operational database required skilled customer personnel to perform a complex series of tasks such as provisioning and configuring a server; installing database software; allocating storage; creating a database; selecting indexes; choosing partitioning methods; making other physical design decisions; and, correctly setting a good number of parameters.

Oracle's goal with ATP is to have the system do all this automatically. To create an ATP database, the customer provides a logical schema; loads the data; and, defines who may access it. At that point the database is ready for use—and the DBA has been saved a great deal of work.

This is dramatically simpler than the equivalent process with past versions of Oracle Database—and with other widely used on-premise database products.

More significantly, Oracle promises that ATP, via automation and machine learning, will continue to provide the physical administration of the database over its lifetime. ATP will automatically deal with such issues as growth and changes in usage patterns; growth in data; and, the simpler forms of growth in the schema, via the addition of new tables. Tuning is automatic.

Significance of ATP

The most significant aspects of ATP for most customers will be cost reduction, simplicity of operation, increased data security, increased uptime and reduced skill requirements.

The single largest cost in most operational database applications—often 30% to 50% of total cost—is the labor required for physical database design, tuning, administration, operation and software maintenance. These costs either disappear

or are greatly reduced with ATP. People performing these duties will be freed up to focus on logical database design and administration, data modeling and similar activities that add more business value. In most cases, users will require less IT help to use the data for query, operational reporting and operational analytics.

Security and Maintenance. Oracle automates all required maintenance on Autonomous Databases while keeping the application fully online. In comparison to on-premises operation for most Oracle customers, this is a large advantage. Oracle data shows that most customers do not apply patches in a timely way to databases running in their own facilities. These late or absent patches create security vulnerabilities, operational problems and performance problems. For Autonomous Databases, Oracle applies all patches at the optimal time, without interrupting the customer's access to data. Both the timeliness of software maintenance and the rigorous security practices that Oracle follows in its cloud contribute to a data security environment that few, if any, customers can match.

Exadata Hardware. Customers run the Oracle database on a wide range of hardware configurations, leveraging its ability to run on almost any server. But Oracle databases run best on Exadata, the hardware/software combination that was engineered specifically for Oracle database. ATP runs exclusively on Exadata hardware, which provides efficiency, highly parallel data stor-age I/O, and Remote Direct Memory Access (RDMA) for inter-node messaging and I/O that many customers and cloud providers cannot match. This is unique to the Oracle cloud.

Statistics. Database optimizers make use of statistics about the data when creating a query plan. These statistics are invisible to the user. Unfortunately, most customers do not keep the statistics up to date, which hurts query response time and wastes system resources. But, on ATP the policy-driven automation makes sure that statistics are updated in real-time as data changes. That alone has a major impact on query performance by ensuring that the plan used to execute the query is nearly always the most optimal plan that the Oracle database can generate.

Self-Tuning. The up-to-date statistics coupled with machine learning provide the opportunity for automated tuning with ATP. Thus, if queries begin to run more slowly because the workload or the data have changed, ATP is intended to make changes automatically.

- Mature Enterprise Database Utility not Matched by "Cloud First" or "Cloud Only" Databases
- Mission Critical Capabilities including fault tolerant Exadata Infrastructure, Real-Application Clusters for scale-out performance and availability, and Active Data Guard for disaster protection
- Full Oracle SQL Including Stored Procedures
- Continuous Availability
- Real Elasticity Without Interruption of Service
- Independent Scaling of Storage and Server Capacity
- Autonomous Operation, Self-Repairing
- Self-Securing
- Automatic Software Maintenance without Interruption of Service
- Autonomous Statistics Maintenance & Tuning

Table 1:
Key Capabilities of Oracle ATP

Tuning is an especially vexing task for customers running demanding operational database applications. Often a tuned system runs well for a period of time and then, because of changes to data volumes or workloads, begins missing service level objectives. As any DBA will tell you, this almost always happens at the least convenient time. It falls to the DBA to work out which transaction(s) are now running too slowly, why and what to change to fix it. Often the apparent solution is some change to the physical database design (say, adding an index) which turns out to decrease response time for one transaction type but increase it for another. Oracle ATP takes over the responsibility for tuning, along with the responsibility for keeping statistics up to date. It assures that changes made to decrease response time for one transaction have minimal effects on others by applying its built in knowledge and machine learning. Via machine learning, the automatic tuning will get better and better over time

Elasticity. All cloud vendors promote the elasticity of resources in the cloud: the idea that you only pay for resources when you need them. When you face peak demand, you can expand the configuration on which you run your workload.

With other cloud services, to significantly scale up or down, typically you must take the database down; reconfigure; then bring it back up. In our example, this interrupts the capability to process orders as well as visibility into the order processing data. Of course, the worst time to take a database down is when some unexpected spike in demand happens.

With ATP, you can have continuous uptime with elasticity. That means you can expand your configuration to accommodate peak demand without interrupting service. You can also contract the configuration after the peak has passed. This provides meaningful elasticity with the intended cost savings, even for a continuously operational database. Finally, with ATP, you can scale compute resources up or down independently of data storage. This can provide a considerable cost advantage, for example, when the data volume is large but the workload is light.

Complete, mature database function. Unlike the more widely advertised cloud database products, Oracle enjoys an advantage due to its maturity. ATP is the same Oracle database that customers run on-premise, for many of the most demanding, mission critical transaction processing databases in the world. ATP includes the complete Oracle code base that has been in use on a very large number of production databases for years. It has a robust complement of functions and features that only exist in their complete form as a result of widespread use and years of incremental development. Thus ATP includes many features of SQL, including stored procedures, which are not available on other cloud database products. In addition, via its maturity, ATP protects users from the maddening flaws that make real projects difficult to implement on many recently created cloud products.

Oracle ATP brings a battle tested, full function, mature operational database to the cloud in a self-driving, fully autonomous form. Existing operational Oracle databases should run as is or with minor changes, and be much simpler and less costly to maintain than in the past. New Oracle operational databases and applications should be easier to build and operate than before, with much reduced skill requirements.

Oracle has declared that its ATP is ready for Mission Critical workloads. As Oracle points out, ATP uniquely uses fault-tolerant Exadata Infrastructure. Exadata already runs the most critical applications in many of the world's leading banks, telecoms, and retailers so it is fully proven. ATP uses Oracle's Real Application Clusters (RAC) technology to provide both scalability and availability for real-world OLTP applications. RAC enables online security and maintenance patching, eliminating the need for planned downtime for database maintenance. ATP uses Oracle's Active Data Guard technology to create a remote real-time replica of the production database to provide protection from regional disasters and database corruptions.

As a long time expert on large scale databases, I have rarely heard that Oracle was unable to meet an operational database requirement. If an operational application could be supported by a relational database, it could be implemented with Oracle. When there were complaints, they were about the difficulty of setting up the database (or the system it was to run on), the physical design of the database, or the tuning of the database. A strength of Oracle is that it has a wide variety of mechanisms (indexing, partitioning, storage options, etc.) so that it can meet a wide variety of requirements. The problem for customers — other than those steeped in Oracle skills and experience — was the challenge of choosing the right options and then successfully tweaking them as requirements grew and changed.

Oracle ATP radically changes the game. As Oracle fully realizes the vision for ATP, Oracle customers will end up getting all the benefits of Oracle — its ability to meet

nearly every operational database requirement—without having to deal with the underlying complexity.

A car is a good analogy for ATP. A car is an engineering marvel in which there is a great deal of complexity under the hood. Most of us never think about or see that complexity. Modern engines require little tuning and what tuning is required is not done by the customer, unless the customer is a hobbyist. Oracle ATP now aims to provide an operational database service where the customer does not need to tune, manage or secure the database. Metaphorically, the database just takes the customer where the customer needs to go. Most of us are used to cars in which we don't tinker with the engine—now we can have operational database applications where we don't tinker with the database implementation.

With ATP, Oracle aims to take it a step farther, where we don't even have to drive the car. This is a large challenge, and it may take a while for Oracle to fully realize the ATP concept for more demanding operational databases. But, I believe they will get there with a combination of product engineering, machine learning and cloud service engineering. And the result—Oracle database transaction processing with the operational complexity managed by the system—adds up to a compelling value proposition for the customer.

WINTERCORP BELIEVES that Oracle ATP will provide large, game changing benefits to Oracle customers, making it easier, faster and less expensive to deliver business value from operational databases. The resulting databases will be more available, more secure and better performing than most, if not all, operational databases that we have today. The customer will benefit from reduced risk due to the built-in security and reduced skill requirements inherent in an Oracle ATP database operation. ●