Offload Reporting to Improve Oracle Database Performance

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Abstract
This technical brief examines a difficult issue facing businesses today: how to get the most relevant data for making business critical decisions from the Oracle production database, without affecting performance or productivity. Expensive hardware upgrades or maintaining several databases exclusively for ad hoc reporting will increase the cost of doing business and therefore are not ideal solutions.

A lower cost solution is to split online transaction processing (OLTP) and report generation to separate systems. This allows users to run reports against a separate Oracle instance that is constantly maintained to reflect the activity on the production system. The paper explains how to execute this solution using SharePlex™.

The causes of database I/O contention
Database I/O contention is one of the most common problems in today’s application environments. Problems arise when:
- End users complain if database performance is impacted, such as when a DBA runs a report against their data during the day.
- DBAs postpone running reports just to avoid negative performance on the production system.
- OLTP response times become unacceptable when ad hoc queries are run.

As organizations grow, more users update the databases, which increases system overhead. To accommodate the increased memory, disk space, and CPU requirements, companies purchase bigger and bigger systems.
A single Oracle instance attempting to be all things to all users ends up disappointing expectations.

Unfortunately, larger systems cannot always provide improved performance because of conflicting processing needs: users updating the database require quick inserts, while reports use large queries. These different work profiles do not mix well, since they work against each other’s disk I/O and caching patterns. The end result is slow throughput when OLTP and report processing are on the same system.

This problem is easily identified on a system whose resources are already stressed. To maximize online productivity, most organizations defer reports, running them during a shrinking batch window to avoid contention. The problem with this is it impacts the productivity of the report user when the information is needed now. Old data results in inaccurate reports and uninformed business decisions.

Another source of anxiety concerns the contention between OLTP and ad hoc queries. Initiating several unscheduled or ad hoc queries at the same time can degrade online transaction performance. Ad hoc queries cause spikes in performance, jeopardizing service level agreements (SLAs) that guarantee response rates.

A single Oracle instance attempting to be all things to all users ends up disappointing expectations. If online transactions, reports, and occasional ad hoc queries all work against the same instance, each of those processes will be slow.

How do you run reports and ad hoc queries against the most up-to-date data without affecting online productivity?

The solution is to split OLTP and report generation onto separate systems. Run reports against a separate Oracle instance that is constantly maintained to reflect the activity on the production system. Many businesses have already begun to implement this strategy, but unfortunately, the drawbacks of many available solutions often outweigh the benefits. For example, many solutions create a reporting instance with stale data that is hours old. Others create a reporting instance that dramatically slows response time on the production instance due to the overhead of the replication technology implemented. In contrast, some organizations use specialized data warehouse systems, which often use special cleaning and aggregation engines. In this case, the data in the reporting instance is an exact copy of the production environment, but such an infrastructure can be expensive to manage.

The SharePlex solution

SharePlex is an efficient and low cost solution for quality data replication for reporting functions.

SharePlex replicates selected tables and sequences to Oracle databases for reporting and disaster recovery. It begins by retrieving changes to the selected objects from the Oracle redo or archive log files. The captured changes are transferred in memory, or if necessary, stored in queues outside the database.

A dependable high-speed network protocol continuously transfers the data changes to remote systems via TCP/IP over a LAN or a WAN. At the destination database, SharePlex applies the changes using standard SQL.

SharePlex is platform agnostic, so source and target can be running different operating systems or Oracle versions. SharePlex supports a variety of operating and hardware platforms, including HP, AIX, Sun Solaris, Exadata, Red Hat, and Windows. SharePlex is also version agnostic and supports Oracle versions 9i to 11g.

The most important component to the offload reporting strategy is to have the target database open and accessible, as it lends itself to query and reporting.
SharePlex creates a fully accessible database for ad hoc querying and reporting to reduce contention and improve performance on your production system.

**Figure 1:** SharePlex replicates all or just the selected tables and data from the source Oracle database to one or more target instances for reporting.

purposes. Because SharePlex provides high-speed replication, reports run against up-to-date target data.

Offloading these reporting and inquiry processes from the production system (source) to the destination system (target) improves performance on the production system. It also reduces the time required to run reports because they do not contend with online transactions.

SharePlex creates a fully accessible database for ad hoc querying and reporting to reduce contention and improve performance on your production system. Because the reporting instance is independent, you might want to add additional indexes for faster reporting, or some materialized views for aggregation. These additions will have no impact on the production system and can increase the performance of your specialized reporting database.

**Minimal overhead**

As mentioned earlier, other data replication tools heavily tax the production instance, making users question whether the cure is any better than the initial problem.

SharePlex, however, replicates changes to the data without overloading the (source) production database. It does not use the Oracle database engine for the capture and propagation of the changes. Rather, it takes advantage of its own Oracle log reading and efficient queuing technologies to capture and transfer the data.

SharePlex provides fast, reliable, non-intrusive fault-tolerant Oracle data replication with minimal impact on production.

**Minimal latency**

SharePlex minimizes the latency between the source and replica by capturing each modification as soon as it is written to the Oracle log. Even before the commit hits the redo logs, a transaction is replicated to the target, where the transaction is completed upon receipt of the commit. If the transaction is cancelled, SharePlex replicates the rollback so that the target instance is an accurate representation of the source database.
**Fast and accurate**

SharePlex does not rely on any of the Oracle middleware protocols (that is, SQL*Net, Net8 or Oracle Net); instead, it uses a fast, streaming, asynchronous network protocol for high-speed transfer of large volumes of data—thousands of transactions for thousands of tables. However, speed is not gained at the cost of accuracy. SharePlex strictly adheres to the Oracle Read Consistency model, maintaining both operation order and session context all the way to the destination.

**Only the data that is needed**

When SharePlex is used for reporting, often only a subset of tables need to be replicated. By replicating only the tables required for reporting, SharePlex can reduce storage costs when compared to simply using a copy of the entire database.

SharePlex also offers horizontal and vertical partitioning. In horizontal partitioning, SharePlex will filter and replicate only rows that meet pre-defined conditions. Vertical partitioning allows you to limit which columns are replicated. Using this strategy reduces the resources required to run replication even more, and also increases throughput. It also saves on storage costs since unnecessary columns and rows are not replicated.

**A complete solution**

SharePlex replication offers a degree of completeness not found in other replication tools. SharePlex supports replication of tables with long columns, tables with referential integrity enabled, tables without a primary key, tables with LOB, Index Organized tables, user defined types, and sequences in the Oracle database. This functionality makes SharePlex the only software product to provide replication of objects for use with custom applications and common ERP suites, such as Oracle E-Business Suite (EBS), PeopleSoft, Cerner Millennium, SAP ERP, JD Edwards and Siebel. This degree of completeness allows ERP or custom reports to be moved and run against the target instance—offloading the report processing from the production instance to the target instance.

**Universal accessibility with flexible replication scenarios**

One problem with centralized data is that the data is not easily accessible to remote users. SharePlex solves that problem too, by allowing the Oracle instance to be replicated to any number of remote systems.

Instead of having remote users log on to the already taxed production system to perform their queries, SharePlex can replicate the data to the remote users. They can then perform local queries to obtain the data they want. By providing the data to the users who need it, SharePlex offloads the query processing and enables remote users to access critical data faster.

By replicating only the tables required for reporting, SharePlex can reduce storage costs when compared to simply using a copy of the entire database.
SharePlex is flexible. You can choose to replicate some tables to a single target location, while replicating other tables and sequences to a list of target systems. SharePlex can support virtually an unlimited number of target systems, located in different cities, states, provinces, and countries.

Additionally, SharePlex supports replicating some tables in one direction while replicating other tables in the opposite direction. With this replication scenario, a company could distribute departments on to different systems to improve online transactions to the different tables, and replicate each department’s tables to a different system for reporting against those selected tables.

SharePlex also supports multiple systems updating the same tables. In this case, SharePlex invokes a user-defined conflict resolution routine when a conflict is detected.

**Reliable replication**
SharePlex is dependable. Other replication tools for Oracle have a significant and inconsistent failure rate—the updates fail and the target needs to be completely restored and refreshed. SharePlex, on the other hand, is dependable, and constantly replicates changes as they occur.

The bottom line is if you can’t depend on the target’s availability, you can’t plan your offloading strategy. If you can’t count on your target instance being accurate and viable, what value does it really offer?

SharePlex satisfies the need for a separate reporting instance to improve your Oracle system’s performance.

**Conclusion**
SharePlex is a mature, time-tested, industrial-strength product that has been on the market since 1998. Replication architectures can be complex. SharePlex is the simplest replication technology for Oracle databases to configure and manage available today.

**About the author**
Bill has worked with Oracle databases since 1988, and has presented several times at Oracle Open World and its predecessor. He has worked with the SharePlex replication solution for Dell as well as a customer, helping hundreds of customers increase their system availability and deploy scalable infrastructures. His experience with Oracle includes database administration, architecture, data warehousing, Oracle E-Business Suite and application development. Including hands on experience with replication technology like change data capture, messaging queues, block level disk writes, enterprise application integration, extract transformation and load processing.