Digitizing Health Records: Overcome Barriers and Maximize Opportunities
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Executive Overview

Digitizing patient records helps healthcare organizations increase efficiency and improve patient care. Now, as part of President Obama’s economic stimulus package, healthcare organizations can also receive financial benefits, and avoid penalties, by implementing digital record systems. For healthcare IT systems to live up to their true potential, however, they must maintain high levels of availability to ensure uninterrupted service delivery. Unfortunately, the most common approaches to providing continuous availability require too much downtime to recover from system outages and failures. In addition, they lack the ability to eliminate downtime necessary for planned outages such as migrations, upgrades, and maintenance. This white paper highlights how Oracle GoldenGate provides continuous availability for digital records—despite any type of interruption—to enable healthcare organizations to develop highly effective, trusted record systems that enhance patient care.

Introduction

The economic stimulus package signed into law on February 19, 2009, has profound implications for healthcare providers. In particular, the portion called the Health Information Technology for Economic and Clinical Health Act earmarks US$19 billion for the development of health information technology, with specific incentives for healthcare organizations developing electronic health record (EHR) technology by 2011—and penalties for those that have not developed such technology after 2015.

In response, companies such as GE Healthcare are pursuing projects in the medical software market that, according to Health Industry Insights, are worth US$11 billion and forecasted to grow at a rate of 7 percent per year.

This market is expected to grow in large part because healthcare organizations have much to gain—beyond qualifying for incentives and avoiding penalties—by implementing EHR systems. On January 8, 2009, when still president-elect, Barack Obama described the goals behind his
administration’s push toward digital health and medical records: “To improve the quality of our healthcare while lowering its cost,” he said, “we will make the immediate investments necessary to ensure that, within five years, all of America’s medical records are computerized. This will cut waste, eliminate red tape, and reduce the need to repeat expensive medical tests. But it just won’t save billions of dollars and thousands of jobs; it will save lives by reducing the deadly but preventable medical errors that pervade our healthcare system.”

Healthcare institutions that have already developed EHR systems, or electronic medical record (EMR) systems, are beginning to see benefits. By making the transition from paper-based systems to digital systems, these organizations have significantly reduced time spent on transcription, dictation, note taking, and document retrieval, which has translated into overall increased efficiency and cost savings. After an EMR system was implemented at the Westchester Medical Group, Simeon Schwartz, MD, CEO of the Westchester Medical Group, summarized the results: “After five years, the [Westchester Medical] Group has gone from 5 FTEs [full-time equivalents] per physician to 3.2. At our current size, that means we are saving the equivalent of approximately 180 FTEs. Since our average FTE salary cost is US$40,000, that represents over US$6 million dollars in savings each year. Our transcription costs are now less than US$20,000 a year, and before, at half our current size, they were over US$300,000. In current dollars, we are saving more than US$500,000 per year in transcription costs alone.”

In addition to cutting back expenses, organizations that have implemented EHR systems have greatly improved data accuracy by reducing the potential for human error in transcription, dictation, and the copying of handwritten information. As a result, claims are processed more quickly, and because they go through more-electronic review cycles, they experience fewer monetary losses due to billing inaccuracies. In the first year after implementing an EMR system, Winona Health increased its billings by US$500,000 by more-accurately coding patient visits.

The most important benefit that healthcare organizations are obtaining from EHR technology is improved patient care, which results from the enhanced ability to search digital storage media compared to paper-based records and the speed with which digital records can be accessed.
“Before we had an EMR,” says Martin Serota, MD, president of Alliance Medical Group, “When the patient came in, the doctor would tell him, ‘Your diabetes isn’t controlled.’ Now, we can find patients with an HbA1C above a certain cutoff—we started at 8 [percent] and above, and now we’re using 9 [percent] and above—then go out to find them and bring them in for care….We could do spot audits, but not disease management. The best we could do before was rate physicians. Now, we can target populations and really improve their care.”

For a reliable infrastructure that effectively supports EHR systems, however, it is critical to maintain the availability of digital records so that service delivery and critical processes are uninterrupted. Traditional backup and disaster recovery solutions will not suffice in an environment that is 100 percent electronic. Many such solutions can take hours to recover after a system, application, or network failure, which could lead to downtime that results in inaccurate diagnosis—literally meaning the difference between life and death in a healthcare setting. Additionally, IT teams need to consider routine system operations such as maintenance, migrations, and upgrades, which often require downtime and can have a detrimental impact on day-to-day operations.

By contrast, Oracle GoldenGate can provide continuous access to electronic medical systems during both planned and unplanned outages. Using real-time change data capture (CDC) technology, Oracle GoldenGate allows healthcare organizations to gain the maximum value from EHR systems to enhance efficiency, cut costs, and improve patient care.
Maintaining the High Availability of Electronic Medical Systems

In designing digital record systems for maximum availability, it is important that systems perform continuously not only during unplanned outages, but also during planned outages taken for routine maintenance and other necessary operations. In addition, healthcare organizations need to ensure that their systems are scalable to handle sudden spikes in lookups or query activity, which can impact the performance of critical systems, rendering them unavailable.

Unplanned Outages

Unplanned outages, which are caused by power failure, human error, malicious activity, and any number of other unforeseen events, are impossible to completely prevent. Such outages can result in immediate downtime that seriously impedes patient care delivery.

Planned Outages

Organizations schedule outages for activities such as migrating from one system to another, upgrading to a more-recent application version, or performing maintenance on an existing system. During this time, users cannot access the system, so organizations plan these outages during slow times or off-peak hours when there is minimal application and system activity. However, hospitals cannot afford to allow EHR/EMR systems to go down for extended periods, because such delays can impact quality of care and overall operational efficiency. In an EHR/EMR environment, any downtime could be highly detrimental to the overall flow of processes around the hospital, because it could result in the immediate unavailability of critical, frequently used medical records.

Performance Issues

Healthcare organizations might not consider performance issues as a threat to the overall continuity of service; however, systems that are overloaded with a large number of users or stressed with high processing demands can experience performance issues—even though all the underlying components are up and running. In such instances, practitioners or administrators could experience significant delays in response times, or even receive error messages when they attempt to access a patient record. Some organizations might not have performance issues when they first implement digital record systems. However, they have a good chance of encountering such issues if they expand their user base, implement extended reporting systems, or share patient information with affiliate and partner organizations.

Supporting a modernized paperless medical record environment will require mission-critical infrastructure solutions for uninterrupted availability. Healthcare organizations must address all three of these availability issues—unplanned outages, planned outages, and performance degradation—to ensure users have access to the critical applications under any circumstances, including migrations, maintenance, and upgrades, as well as when transaction volumes or processing requirements increase.
Limitations of Traditional Disaster Recovery Solutions

For disaster recovery, organizations typically deploy storage-level replication solutions to establish synchronized copies of the primary production database, which they can activate should the primary database be compromised. Such approaches are also referred to as block-level replication solutions, because they move large amounts of data piece by piece, or block by block (a block being a small multiple of a hard disk sector). Storage-level replication tools are available from a wide selection of vendors, making them a popular choice for disaster recovery. They are also able to easily replicate unstructured data, such as images or text files.

The disaster recovery tools packaged with database applications are another popular choice for disaster recovery. Their popularity is driven by their requiring little or no additional investment, and organizations can turn to the database vendor for support. However, block-level replication and native database disaster recovery tools both have key limitations, especially in an EMR environment.

Extended Recovery Time

Storage-level replication solutions target unplanned outages and do not eliminate downtime and data loss during planned outages. Also, when the database shuts down improperly, restarting and using the standby system can be time consuming due to the necessary database recovery process. With this time-consuming failover process, end users cannot completely eliminate downtime.

In addition, because storage-level replication solutions copy all data “indiscriminately,” corruption at the source is copied to the target, making the standby system obsolete for an immediate switchover to support operations. It takes a lot of effort to fix data issues so that the standby system can be used, and in some cases, data changes made since the last snapshot could be lost.

Similarly, native replication solutions often require downtime during initiation, as well as during migrations and upgrades.

Heterogeneity Limitations

Physical replication solutions require primary and secondary databases and operating systems to be of the same type, which limits a healthcare organization’s choices, potentially leading to a higher cost of ownership. In many cases, there is an option to deploy the native database replication solution. However, once the environment demands heterogeneity either in terms of the database or the operating system, that can be limiting. In the rare cases where these tools do provide limited heterogeneity support, it requires complex programming and additional products.

Lack of Dynamic Rollback and Point-in-Time Recovery

Storage-level replication solutions do not maintain the Atomicity, Consistency, Isolation, and Durability properties of transactions as they move data blocks. Because they are not transaction aware, they don’t offer the ability to recover to a specific point in time or reverse a particular erroneous transaction. Similarly, native database replication solutions do not provide reverse processing.
capabilities for specific transactions or allow users to change the replication starting point during recovery—changing the replication starting point could lead to quiescing and restarting the system, which can take hours. For logical failures, selective reverse processing capabilities are important, because they provide the ability to reverse a human error or malicious activity that can cause major data loss.

Other Limitations
With storage-level replication, the standby database is often unavailable for data processing; users cannot run reporting or testing activities on the secondary system. In addition, many storage-replication solutions require secondary databases to be in the same datacenter as the primary database, or in close proximity, when data delivery needs to be guaranteed.

The Oracle GoldenGate Approach to Continuous Availability
Oracle GoldenGate’s high-availability solutions provide continuous database availability, improved system performance and scalability, and complete data recovery for healthcare organizations—despite unplanned outages, planned outages, or performance degradation. With its unique transactional data replication capabilities, Oracle GoldenGate enables healthcare organizations to cost-effectively achieve five 9s availability for their IT systems.

How Oracle GoldenGate Works
Oracle GoldenGate moves high volumes of changed data between heterogeneous databases with subsecond latency, while preserving transaction integrity. The product uses a decoupled componentized architecture to allow a variety of solutions for high availability/disaster tolerance and real-time data integration (see the figure). The application consists of three primary components—Oracle GoldenGate Capture, Oracle GoldenGate Trail Files, and Oracle GoldenGate Delivery—each of which can perform its tasks independently of the others to optimize efficiency.
Capture

The Oracle GoldenGate Capture module resides with the source database and looks for new transactional activity. It reads the result of insert, update, and delete operations by directly accessing the database’s transaction (redo) logs, and immediately captures the data for distribution. The Capture process supports a wide range of database versions from Oracle; Microsoft SQL Server; IBM DB2 mainframe and LUW; Sybase; Enscribe; SQL/MP; SQL/ Mx; and Teradata running on Linux, UNIX, Windows, z/OS, and HP NonStop platforms.

Oracle GoldenGate Capture moves only committed transactions—intermediate activities and rolled-back operations are filtered out—which not only reduces infrastructure load but also eliminates potential data inconsistencies. Further optimization is achieved through transaction grouping and optional compression features.

Trail Files

Oracle GoldenGate Trail Files are part of Oracle GoldenGate’s queuing mechanism and store the changed data in a transportable, platform-independent universal data format. Trail Files reside on the source or target server but exist outside the databases to ensure heterogeneity, improve reliability, and minimize data loss. This architecture approach significantly reduces the impact on the source system, because no additional tables or multiple queries to the database are required to support the capture processes. The Capture process reads once, then immediately moves the captured data to the external Trail Files for delivery to the target.

If there is an outage at the source or target, the Trail Files contain the most recently changed data up to the point of the outage, and is applied once the systems are back online again.

Delivery

The Oracle GoldenGate Delivery module takes the data transactions from the latest Trail Files and applies that data to the target using the native SQL for that database. Delivery can be made to any Open Database Connectivity–compliant database. The Delivery process applies each transaction in the same order as it was committed and within the same transactional context as at the source, to ensure consistency and referential integrity at the target. The Oracle GoldenGate Delivery module uses a number of techniques to optimize the application of data to the target. Changed data can also be provided as flat files to integrate with third-party extract, transform, and load products. Oracle GoldenGate can format text in any way, including, but not limited to, XML and delimited formats to be published to enterprise messaging systems.

Partner Spotlight: Cerner Corporation
Oracle works with Cerner Corporation to improve the availability, performance, and accessibility of Cerner’s healthcare applications.

Cerner leverages Oracle GoldenGate’s continuous availability and query offloading solutions to provide continuous operations and real-time reporting for its customers running Cerner Millennium® applications, including Cerner Millennium PowerChart®, Cerner’s EMR.
Key Application Features

Oracle GoldenGate provides a robust set of features to enhance application value.

Enhanced Block-Level Replication

Because Oracle GoldenGate captures changes at the database level, it is unable to replicate unstructured data. However, it can complement existing block-level replication solutions, for a complete data-replication solution without distance limitations. Oracle GoldenGate enables rapid recovery from all types of failures, including data corruption, and it supports heterogeneous systems. In addition, it allows the target database to remain active, for zero-downtime system maintenance, testing, and reporting.

Transformations and Mappings

Oracle GoldenGate can flexibly accommodate data transformations and mappings within either its Capture or Delivery modules. No middle-tier server is required. The product supports table and row filtering based on user-defined criteria. Explicit mapping and transformation rules can be applied via built-in functions, user-supplied code, and stored procedures. Those rules can range from simple column assignments to more-complex transformations, for which Oracle GoldenGate provides a suite of date, math, string, and utility functions.

Flexible Topology Support

Oracle GoldenGate’s architecture allows customers to support a variety of topologies, including one-to-one, one-to-many, many-to-one, many-to-many, cascading, and bidirectional configurations. For example, the product allows a configuration in which a second Capture component, called a Data Pump, continuously pushes the Trail Files from the source system to multiple target systems.

Conflict Detection and Resolution

Bidirectional, active-active implementations require conflict detection and resolution capabilities, because both systems are actively processing and sharing database transactions. Oracle GoldenGate provides conflict detection and resolution options that can be implemented globally, object by object, based on data values and complex filters, and through event-driven criteria.

Routing and Compression

Oracle GoldenGate uses TCP/IP for sending data, so no geographical distance constraints are imposed between the source and target systems. It can apply additional compression as the data is routed.

Data Encryption

Oracle GoldenGate offers encryption to ensure secure data transmissions.
Coexistence with Other Database Availability Solutions

If you are running applications on an Oracle database environment, you can also leverage existing Oracle high-availability solutions in conjunction with Oracle GoldenGate.

A major existing replication solution is Oracle Active Data Guard. Oracle Active Data Guard is a homogenous solution optimized for disaster recovery and high availability for Oracle databases, and allows the protection of the whole database. It is a high-performance, simple, drop-in solution, which works for all applications and datatypes, including packaged applications that cannot be modified. Oracle Active Data Guard runs on the latest version of Oracle Database 11g.

Oracle GoldenGate complements Oracle Active Data Guard in several ways. Oracle GoldenGate is a heterogeneous replication solution and moves data from non-Oracle databases and addresses cross-operating system / cross-database version requirements. In addition, Oracle GoldenGate provides bidirectional data replication capabilities and supports active-active database configurations. In environments where only a subset of the primary database needs to be replicated, Oracle GoldenGate’s filtering capabilities can be used to move only a group of tables, rows, or columns from the source system. This capability is particularly useful when feeding analytical systems. Finally, Oracle GoldenGate allows comprehensive upgrade solutions with zero downtime and provides a strong solution for planned outages.

Combining these two powerful data replication solutions allows companies to completely protect their databases against planned and unplanned outages, and synchronize information across heterogeneous systems.

Oracle Streams and Oracle GoldenGate

Oracle Streams is a built-in changed data replication offering for Oracle-to-Oracle databases. Unlike Oracle Active Data Guard, Oracle Streams allows data movement across different Oracle database versions and operating systems.

With its heterogeneity, low-impact architecture, and many large deployments supporting mission-critical environments, Oracle GoldenGate is the strategic replication solution. Although Oracle Streams will continue to be supported, customers are advised to evaluate Oracle GoldenGate for their new and critical projects.

Partner Spotlight: GE Healthcare

GE Healthcare leverages Oracle GoldenGate’s high availability and real-time data integration solutions to support its medical imaging and information technologies, including the GE Centricity® electronic medical record (EMR) application.

Oracle GoldenGate continuous availability solutions enable GE Centricity® application users to perform system migration or upgrades without downtime. Additionally, Oracle GoldenGate is deployed with Centricity to provide a disaster tolerant environment for unplanned outages.

Oracle GoldenGate’s real-time data integration solutions provide GE’s customers with the ability to use the lowest latency data in downstream reporting and analytics environments, which aids in ongoing processes such as patient look-ups and queries, daily reports and longer-term analysis and trending research. By having the most up-to-date information at the fingertips of a researcher, more detailed and accurate analysis can be performed, which ultimately helps improve patient care.
Proven Customer Success

This section examines three different organizations in the healthcare sector that have successfully implemented systems to track patient records and critical healthcare information, and that have also leveraged Oracle GoldenGate to improve efficiency and patient care.

Therap Services

Therap Services is a Web-based software as a service organization that provides an integrated solution for the documentation and communication needs of agencies providing support to people with disabilities, particularly developmental disabilities. The company offers an easy, efficient alternative to the immense amount of paperwork that is executed manually by care providers, including health professionals, regulators, and family members, to improve the quality of life for people with developmental disabilities. Therap provides these care providers with a set of secure, cost-effective information, documentation, and communications services in the form of a hosted application tailored to each provider’s specific needs.

Therap’s complete suite of applications includes Health Tracking, Individual and Emergency Data Forms, Individual Service Plans, Behavior Plans and Tracking, T-Logs, T-Notes, Incident Reports, Management Summaries, Witness Reports, Supported Employment Tracking, Calendar, Secure Communications, Staff Scheduling, Training Management System, Attendance, and Electronic Billing. Within a few years, Therap has extended its solutions to satisfied users in more than 30 states nationwide, as well as in Asia, where its solutions are currently being used in Bangladesh and Nepal.

Customer organizations use Therap to reduce the time to create, review, edit, and approve reports; ensure accuracy of data, because the system automatically checks for errors and inconsistencies in data entry; guarantee reliable and secure access to patient data; and provide automatic notification to users with follow-up information.

The Challenge

With its applications being developed, maintained, upgraded, and hosted on its secure servers, Therap needed a reliable, scalable infrastructure in place to ensure that customer data would be readily available at all times, in case of a planned or unplanned outage. For several years, Therap used an independent database replication solution for its Oracle database systems to support the continuous availability of its customer applications. However, as the company continued to expand its solutions and customer base, it looked at upgrading its databases from Oracle 10g to Oracle 10g Real Application Clusters, and quickly realized that the solution in place could not scale to meet growing demands, which also included an eventual shift from a warm standby to an active-active configuration. In addition, the Therap IT team found itself spending countless hours resolving bugs created by the previous replication solution, which seemed to be increasing in frequency and draining IT resources.

Steve Graham, director of database engineering at Therap Services, evaluated other replication solutions and selected Oracle GoldenGate. “Given the nature of our business, Therap requires a solution that is flexible and can stand up to high volumes and strict SLAs [service-level agreements],
while maintaining transactional integrity of our mission critical data,” says Graham. “We truly wanted to find a provider who would partner with us over the long term to meet our growing and evolving infrastructure needs. When technologists we trust, who are intimately familiar with our former replication vendor, suggested Oracle GoldenGate for the job, I knew we had found the answer—there is no better recommendation than that of a trusted partner who has in-depth experience with a variety of replication platforms.”

With scalability being a primary concern, Therap performed initial testing of the Oracle GoldenGate product and found that its performance was impressive. Even running on “ancient hardware,” Graham and his team were seeing 60–70 transactions per second over a poor LAN line with near-zero latency. With a rapidly growing database, supporting various multimedia and image files, the Therap IT team was confident that Oracle GoldenGate was the answer to its needs.

The Solution

Upon selecting Oracle GoldenGate, Therap deployed the solution to move data from its Oracle 10g production environment located in New Jersey to an exact replica Oracle 10g backup system running on Oracle’s Sun Fire v490 servers in Virginia. By implementing the Oracle GoldenGate product for disaster recovery and data protection, Therap was able to meet its customer SLAs as well as Health Insurance Portability and Accountability Act enforced regulations, while customer end users were able to continue with business as usual—accessing patient charts, status reports, images, and records—which was critically important to Therap and its healthcare customers.

According to Graham, one of Therap’s many promises to its customers is that “unlike paper-based systems, which are subject to loss and delays, Therap customer data is maintained on secure servers. In doing so, Therap is able to eliminate the risk of losing important information, while also guaranteeing continuous access at all times, thanks to [Oracle] GoldenGate.” In addition to serving as a hot standby to maintain continuous availability during planned and unplanned outages, Therap also occasionally uses the secondary system for real-time reporting. This allows both internal employees and external customer users to run reports, queries, and analytics from real-time data, without impacting the source system. This hybrid system of sorts supports both transactional activity and after-the-fact reporting.

“We are thrilled to have one infrastructure solution that is flexible and scalable enough to meet our current and future needs and that will grow with the company as we continue to add disparate systems and higher volumes of data,” concludes Graham.

Kettering Memorial Hospital

Opened in 1964, Kettering Memorial Hospital has grown into a comprehensive healthcare network made up of 52 facilities and 1,268 beds, consistently awarded for innovation, excellence, and service. Today, Kettering Health Network comprises five main hospitals, the Kettering College of Medical Arts, and various clinics throughout southwest Ohio.

Across the network, 6,500 employees place significant demand on the IT infrastructure, databases, and applications. To maintain a high quality of care and education, Kettering Health Network facilities rely
on world-class technologies, including GE Healthcare, for integrated clinical software solutions to automate workflow and enable access to comprehensive patient information.

The Challenge

Kettering Health Network links its organizationwide clinical systems via HP NonStop servers, integrating core processes for orders, results, pharmacy and clinical details, as well as administrative and financial processes for scheduling, registration, admitting, and patient billing. In the past, to perform maintenance or application upgrades, the IT team was forced to schedule regular windows of downtime. But as the number of users and the volume of data on the system—up to 1 TB—increased, these windows became inadequate, and production system performance began to suffer.

With a complete system overhaul planned to update applications, hardware, and the operating system, the IT team at Kettering Health Network would need to mastermind an overall system upgrade and migrate the network’s most valuable asset—patient data—with minimal impact to the system and day-to-day operations on the teaching and hospital floors.

Oracle GoldenGate was selected to address business availability, data protection, application integration, and business visibility for Kettering Health Network throughout the life of the project, which included a significant upgrade to GE Centricity Enterprise, including the GE Centricity EMR application.

The Solution

With Oracle GoldenGate onboard, Kettering Health Network began upgrading its clinical applications to GE Centricity Enterprise and converting data from an Enscribe database to a SQL database. Typically, this type of system upgrade and data conversion can take six months to a year to complete, with up to a week or more of downtime allotted. But for a healthcare provider like Kettering Health Network, this amount of downtime was unacceptable.

In all, 52 facilities share the enterprise systems, clinical applications, and patient data. A key concern was reducing downtime. System administrators were pleased that by using Oracle GoldenGate, they only needed to bring the system down three times—each occasion for less than four hours.

According to Juanita Brison, system administrator for Kettering Health Network, “Using Oracle GoldenGate, the migration and overall system upgrades went much more smoothly than expected. Oracle GoldenGate worked very well, and the migration piece of the overall project was without doubt the most seamless.”

Oracle GoldenGate was instrumental in the upgrade, rapidly transforming the data and bringing the new systems online with as little downtime as possible. The software was used to capture transactions from the primary Enscribe database, and then transform and load the data to the second SQL database. Because of Oracle GoldenGate’s unobtrusive transactional replication technology, the team was able to accomplish the entire conversion in the same box as the production environment, without creating interruption or response issues on the production sites. For the extended network, it remained business as usual.
“Without Oracle GoldenGate, we would have been down for days trying to convert all the files to SQL,” explains Dan Townsend, technical integration manager for Kettering Health Network. “With [Oracle] GoldenGate, we were able to perform conversions while the production system was running. [Oracle] GoldenGate definitely reduced downtime, and overall its efficiency saved us time and money in additional resources.”

Based on the experience, Kettering Health Network plans to have Oracle GoldenGate play a larger role in additional projects, including business continuity and further step and maintenance releases. Next up, the network plans to implement new nurse charting and computerized physician order entry (CPOE) modules on the GE Centricity Enterprise system. CPOE will automate a range of critical healthcare processes, further saving Kettering Health Network money and streamlining access to data.

Planning ahead to support the new nurse charting and CPOE applications, Kettering Health Network requires zero downtime and a reliable disaster recovery system up and running before deployment. The team has already installed a second HP NonStop system 50 miles away, with a link back to the hospitals via a fiber network. Oracle GoldenGate will provide the technology to move transactions in real time between the production and the backup systems for business continuity and disaster recovery, in the event of future outages.

Kettering Health Network understands that new technologies and knowledge sharing provide the foundation for better care. Townsend comments, “GE Healthcare and Oracle GoldenGate have proven a powerful technology combination for integrated clinical processes, reliable access to real-time data, and increased operational efficiencies—all toward our single objective of providing superior patient care.”

Real-Time Data is Healthier Data

In addition to overcoming availability issues to maintain continuous operations, healthcare organizations also need to overcome data integration issues, so that data can be available for reporting and analysis with minimal latency. The extract, transform, and load (ETL) products that are often employed in data warehouse environments process data in batches, introducing latency into the process, and they also impact the performance of the source systems. Oracle GoldenGate offers low-impact, real-time data integration solutions, built on the same technology at the core of its high-availability solutions.

Adventist Health System of Winter Park, Florida, is comprised of 37 hospitals that provide care for nearly 4 million patients annually in inpatient, outpatient, and emergency room visits. Adventist wanted to implement a better solution for its clinical information system, to give doctors, nurses, clinicians, and hospital care workers access to timelier data for reports and queries to improve the overall quality of patient care.

Adventist deployed Oracle GoldenGate’s real-time data integration technology to continuously move the most recently changed data from several distributed Cerner Millennium clinical information systems into an enterprise data warehouse. From there, Cerner products provide reporting and analytics against the near real-time data delivered by Oracle GoldenGate to track patients as they move through the hospital network, including specific reports on length of stay, diagnosis, discharge summary reports, pharmacy orders and financial reports.

Oracle GoldenGate’s real-time data integration solutions offer continuous data feeds across heterogeneous environments, with transaction integrity, to facilitate decision making with accurate, real-time information.
Memorial Hermann

In late 1997, the hospitals formerly known as Memorial Healthcare System and Hermann Healthcare System completed their merger, becoming the largest not-for-profit healthcare system in the nation. Today, Memorial Hermann is an integrated health system known for world-class clinical expertise, patient-centered care, leading-edge technology, and innovation. Memorial Hermann serves the greater Houston, Texas, community through 11 hospitals and many specialty programs and services, including three premier Heart & Vascular Institutes, TIRR Memorial Hermann, Children’s Memorial Hermann Hospital, a Sports Medicine Institute, the Mischner Neuroscience Institute, seven comprehensive Cancer Centers, 27 sports medicine and rehabilitation centers, a substance abuse treatment center, and dozens of other specialty and outpatient centers. Memorial Hermann operates one of two Level 1 trauma centers in Houston, Texas, and provides the Life Flight air ambulance program, as well as the city’s only burn treatment center.

The Challenge

When the merger took place, Memorial Healthcare System and Hermann Healthcare System were operating completely independently of one another. It was not until 2001 that the healthcare organization decided to standardize on Cerner healthcare information technology systems and roll out its suite of solutions to all the healthcare facilities.

Based on technology changes and application requirements, plans were made to migrate the Cerner Millennium application, including Cerner Millennium PowerChart, Cerner’s EMR, from OpenVMS to a new hardware and operating system platform. Memorial Hermann turned to its partner Cerner for recommendations and best practices for migrating its system off OpenVMS. Being a hardware-agnostic vendor, Cerner helped Memorial Hermann complete a thorough ROI analysis on the different platform options. Although most of the platforms tested came out about equal in terms of technical requirements, Memorial Hermann chose HP-UX as the new platform based on the overall ROI.

Once the new hardware platform had been decided, Memorial Hermann again turned to Cerner for guidance on how to migrate its Millennium system from OpenVMS to HP-UX, without taking a major outage and interrupting patient care throughout all its healthcare facilities. Cerner’s Advanced Technology Group, which provides a complete continuum of technology solutions and services for its customers’ healthcare environments, recommended its trusted partner to complete the migration from OpenVMS running Oracle 9i to HP-UX running Oracle 10g.

“Having been a longtime Cerner customer, we look to them to help us devise the best plan and help us select the most appropriate solutions for the task at hand,” says Amanda Hammel, systems executive for technical services at Memorial Hermann Healthcare System. “Cerner worked with the Oracle team to provide the best solution for migrating the database with minimal impact to clinical users.”

The Solution

Once Memorial Hermann Healthcare System’s IT team decided on Oracle GoldenGate as its migration solution. Memorial Hermann implemented Oracle GoldenGate to capture transactional data from its
Cerner Millennium clinical information system running on an Oracle 9i database and OpenVMS hardware and delivering to the new target environment running on Oracle 10g and HP-UX.

Memorial Hermann’s IT team did a significant amount of planning in preparation for the migration to ensure the entire project went smoothly and as planned. The team also turned on its homegrown Downtime Clinical Access (DTCA) system during the outage. The DTCA system extracts data out of the Cerner Millennium application for read-only historical reference every two hours. The hospital staff also resorted to printed copies of rounds reports to use for reference until the Cerner Millennium application was back online.

Originally estimating an outage of three hours and 15 minutes to complete the migration, Memorial Hermann’s staff was surprised by how quickly the migration was completed. In fact, the process went so smoothly and efficiently that the testing team in the information systems department had to be alerted to begin verifying that all data had been moved to the new environment earlier than planned. In the end, users within the healthcare network were back up and running 23 minutes earlier than expected. In a large hospital network, every minute counts and ultimately helps reduce overall risk.

In addition to the benefits of the seamless migration, Memorial Hermann also saw an immediate return on their investment. According to Hammel, “Performing the migration allowed us to gain back capacity on our database. We were able to optimize the database in the process, almost like ‘defragmentation,’ which allowed us to improve overall transaction times. The ‘trash compactor’ process left us with a smaller, more-efficient database. Oracle GoldenGate made the migration process so seamless and easy, we are considering the use of this solution in the future to regain storage space and improve speed and efficiency.”

In the end, Memorial Hermann’s primary database went from 8TB prior to the migration to 4.5TB after the migration, which equates to the hospital only using about 60 percent of available space today—allowing plenty of growth capacity.

Conclusion

Healthcare organizations have strong incentives for adopting digital record systems. The transition will not happen overnight, and it will likely involve a list of technical and institutional preparations that go well beyond the scope of this white paper, and will vary from organization to organization. However, one aspect of this process is inescapable: Organizations will need to enable the continuous availability of critical digital records.

Supported by the right technologies, healthcare organizations can achieve a reliable infrastructure for digital records that allow continuous access despite unplanned outages, planned outages, or performance degradation due to heavy usage.

The Oracle GoldenGate team has a long history of partnering with application providers for healthcare, including GE Healthcare and Cerner, to deliver continuous availability and real-time data integration and reporting solutions to more than 50 hospital networks across the United States. Oracle GoldenGate’s continuous availability solutions provide
- Immediate failover to standby systems
- Elimination of downtime during upgrades, migrations, and maintenance
- Bidirectional data movement without distance constraints
- Load balancing and continuous availability support for active-active database implementations
- Subsecond latency even at high data volumes
- Query offloading from the production system to the backup instance
- Heterogeneous database and platform support
- Transaction integrity
- Point-in-time data recovery and selective rollback of erroneous transactions

Industry leaders rely on Oracle GoldenGate’s solutions to leverage timely data for better business insights and to improve uptime of their mission-critical systems.