What do you get when you cross a pathology group and a national reference laboratory? If you are lucky, you get Mid American Clinical Laboratories (MACL) in Indianapolis. In a conversation at the 2006 Executive War College on Lab & Pathology Management, Mark Ballard, MACL’s CIO, and Paula Lancaster, its senior applications specialist, outlined for MLO how almost 10 years ago they solved several challenges in a joint venture between two local hospitals that initiated a rapid expansion of services. Ballard and Lancaster were charged with fitting multiple systems together, building an efficient STAT-testing outreach program, and reducing in-patient turnaround time (TAT). Just how did they accomplish all three of these major goals for MACL? That question has an intriguing threepart answer: Middleware. Middleware. Middleware.

**MLO:** When you were presented with these challenges by the partnering hospitals, what was your initial reaction? What was the first obstacle you confronted?

**Ballard:** The two hospitals wanted to collaborate on outsourcing their diagnostic testing in order to drive better cost efficiencies and quality initiatives. Then, they brought in a national reference lab partner to enhance their outreach testing, both for the hospitals and for area physicians. That meant that MACL started with three different laboratory information systems (LISs).

**Lancaster:** A daunting challenge, as we look back on it. Since the lab was formed, its testing volume and revenues have doubled. Today, 10 healthcare facilities, seven of which have rapid-response laboratories, and literally thousands of the Indianapolis area’s physicians employ MACL’s central reference lab’s outreach testing services.

**Ballard:** We took a good, long look at what products we had and determined that we could standardize the hospital testing on a Misys Flexilab LIS. At that time, this product did not have a component for outreach testing, so we used the information system that our reference lab partner brought to the dance. For the first few years, we successfully ran these two systems side-by-side. But then, as business increased and volume grew, more labor was required just for the relabeling process. The slow dial-up interfaces of both the Misys instrument and the outreach LIS further burdened the process because, in order to run both routine hospital and outreach samples through the lab for testing, all outreach samples had to be manually relabeled for instrument processing through the Flexilab.

**Lancaster:** Delays caused by these problems pushed outreach testing back into the busiest testing time for the hospitals. This, in turn, caused capacity problems on the instruments. Our customers were not happy, to say the least.

**Ballard:** Then, we implemented a middleware package. Over the past five years, we have leveraged middleware to launch three different applications to improve our operational efficiency and that has spurred our rapid growth. The middleware we used was designed with built-in rules. These rules could handle unique sample I.D. from the two different systems, and the barcoded samples from each could be placed concurrently on the instruments, be tested, and then be reported back to their respective LIS systems for billing and physician reporting.

**MLO:** Mark, you are the CIO, and Paula, you are the senior applications specialist. What did that mean in terms of who did what in this changeover?

**Lancaster:** I did most of the troubleshooting and initial validations of all the instrument connections and autovalidation rules. I think it is important to keep in mind some basic suggestions for selecting middleware. We looked at flexibility, software availability, the availability of instrument drivers and how fast the new driver was available upon the release of a new device, and — naturally — we examined cost and customer service.

**Ballard:** I was responsible for selecting the software, determining the overall software design and feasibility, and managing most of the projects. I did some of the bits and bytes work on the instrument connections on the middleware and the LIS as well. Paula was the primary analyst. She is now our “middleware queen,” if you will.

**MLO:** When you got to the point in your planning where it was time for the “switch to be thrown,” what occurred? What was the major result?

**Lancaster:** It all went off without a hitch. The whole preparation process took only four months to complete. Cost was a huge factor because we were converting 15 analyzers from different manufacturers. For the system to work properly, the whole implementation hinged on making this conversion all at once. We set a target date, and worked with the middleware vendor to ensure that everything we needed to launch was available and operational. We found that the middleware vendor responded with better speed and cost efficiency compared to most LIS vendors when it came to producing new instrument interfaces. So, over those five years, we estimate that MACL saved more than $200,000 in instrument licensing fees. This paid for our system many times over, just in interface savings alone.

**Ballard:** On launch, when Misys was removed as the intermediary between the instruments and the LIS for the lab’s outreach, there was no interruption of service to the lab’s clients. The first thing we noticed was that TAT decreased immediately by nearly five hours. We gained several more hours just by removing the result interface and the Misys receive and relabel steps. We reduced seven full-time specimen-processing positions here. The lab was able to move its workload back three hours, which meant that they could avoid hospital “rush hours.” We have increased overall job satisfaction by reducing monotonous, repetitive work, and other position elimination occurred simply by natural attrition.

**MLO:** Once you had completed this ini-
tial phase, what other issues did MACL have to accomplish by this time. You are now into what, the fourth or fifth year of this business expansion?

Ballard: That first middleware installation just affected the outreach testing. This only required the connection of instruments at the main reference lab site. By now, we had rapid-response labs dotting the metropolitan area, and we had physicians clamoring for STAT outreach testing from those facilities.

Lancaster: Initially, we patched together some manual billing and reporting processes, but as we already knew, manual processes increased the chances for errors. Besides, many of the physicians did not like the particular visual report structure we were using. They did not like the report-delivery method either. Because the billing was confusing, we had clients and patients complaining. We started mulling over ways in which we could use middleware to solve this problem. Here, we ended up routing all of the individual rapid-response lab instruments through our middleware solution. In this implemenation, we were able to convert one hospital at a time. We managed to get individual specimens ordered within the appropriate system and labeled at collection for the appropriate LIS. Once the tests are processed, results get routed automatically to the correct LIS system where reporting and billing are then triggered.

Ballard: Training on the outreach LIS has been the major change for the hospitals because it is different from our Misys system. Even so, we can now easily move staff from one location to another, as the workload demands, because we now have standardized training for entering orders. We also standardized the patient-results reports that are now automatically sent directly to our clients. Even with the gradual conversion, we were able to reduce billing and reporting errors by 60% for our hospital-based STAT orders.

MLO: So, now you have managed in a space of about four or five years to implement this middleware solution to resolve two difficult challenges at MACL. Who was thinking outside the proverbial box to find other hills to climb?

Ballard: We had a little bit of difficulty when we announced the implementations. I do not think that is particularly unusual for people to have a real resistance to change. Some of the hospital operators feared job loss; others did not like learning a new computer interface for order entry and results verification.

Lancaster: Oddly enough, once the system was up and running, these same people became its biggest supporters.

Ballard: In fact, after the improvements from the first two installations, our third middleware implementation was inspired by yet another customer-service issue. We set out to improve service levels for specific critical-care tests in the emergency departments. If we could reduce turnaround times for these tests, the belief was that the MACL initiative to improve patient and customer satisfaction would succeed.

Lancaster: At that time, the average TAT was approximately 60 minutes, and the new initiative defined a TAT of 45 minutes.

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**Did you know middleware can:**
- autoverify the majority of results?
- reduce turnaround time (TAT)?
- eliminate relabeling of tubes from multiple sources?
- reduce labor costs?
- increase capacity?
- increase customer and staff satisfaction?
- give the laboratory control over their IT systems?
- reduce errors and standardize results processing?
- enhance your LIS?
- manage your maintenance tasks electronically?
- pay for itself via archiving and retrieving of samples savings?
- enhance the gathering of data for correlation studies?
- notify based on pre-defined criteria?
- provide troubleshooting tools for connectivity and data flow?
- act as an LIS downtime patient and order management system?
- simultaneously connect to multiple LIS systems?
- support multiple languages?
- create customizable reports?
- support design and print of barcode labels?
- effectively determine and route specimen workflow?
- help with inspection documentation requirements?
- integrate QC from laboratory instruments?
When we reviewed the testing process, our investigation pointed to result verification as a major time component. Highly qualified med techs were spending loads of time looking at normal test results. We knew we could still meet regulatory requirements and find a better way to process workloads. The middleware solution offered us autoverification capabilities.

Ballard: We set up the autoverification process with the assistance of medical directors and med techs. You know those “If … then …” rules. We then entered these rules into the middleware software. Results from samples being run through the analyzer now get compared with our defined rule set. Those samples that do not match the rules are displayed for the med tech’s review. The solution even automatically appends comments indicating the reason for the failure.

Lancaster: Results that do not fail automatically pass to the LIS with comments, when appropriate, attached. If a test result fails, the med tech can release the results to the LIS or re-run the sample. In our process, only test results that fail are manually verified. For regulatory purposes, the system even identifies the system operators for all manually verified results. This information is captured, along with the date and time of testing operations, making it much easier to retrieve during an inspection or review by CAP or JCAHO.

Ballard: With about 60% of our testing converted to autoverification, we already have significantly improved lab operations across all of our testing sites. One of the exciting discoveries was that we had reduced TAT by 20 minutes, which was far more than our original goal. Over eight of our facilities, we were able to convert 12 med-tech slots to lab assistants, saving more labor costs. And once again, staff was thrilled to have a monotonous task simplified.

Lancaster: Because of the capabilities and flexibility we have found with middleware, our organization is now looking at even more opportunities to solve the problems we face in running this business and serving our customers.

Ballard: Middleware changed the game for MACL. It has allowed us to accomplish a good number of positive goals like reducing labor and operational costs. We have improved customer service because we have few, if any, complaints. We enhanced overall control of our own systems and made it possible to manage growth more effectively. All of this, in turn, has increased the revenue potential of the business. That is, after all, what the bottom line is all about.

MLO: Thanks for taking the time to clue us in on your experiences with middleware. Perhaps your success can inspire others to take the plunge and see if middleware can solve a particular lab challenge.

Ballard: Our pleasure.

Lancaster: We always enjoy sharing this story, thanks.

Editor’s Note: Mark Ballard and Paula Lancaster used Data Innovations’ Instrument Manager in their middleware implementations.