TIMCO aviation services

TIMCO Majic Conversion Project

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Introduction

This case study provides details of an application conversion project undertaken by TIMCO Aviation Services ("TIMCO") and Golden Code Development. This groundbreaking project was the first time a Progress 4GL application was ever converted to a drop-in Java-based replacement using a fully automated conversion process.

Since the FWD technology used for this conversion is available under an open source license, this project's results can be duplicated by all users of the Progress 4GL.

At the time this project was completed, TIMCO was the largest U.S. provider of aircraft maintenance, repair, and overhaul (MRO) services to commercial, private and government customers.

Kevin Carter, former CEO of TIMCO was intimately involved from early in the project through its successful completion. He continued his involvement until 2014, when TIMCO became a wholly-owned subsidiary of the HAECO Group, one of the largest providers of MRO services in the world.

The results of the project continue to be used to this day.

Business Need for the Project

TIMCO's primary line of business application, Majic, was written in the proprietary Progress 4GL language. Majic was a heavily customized version of the Symix ERP system. TIMCO was interested in eliminating the Progress 4GL environment due to:

- high costs
  - large annual maintenance fees to be paid to Progress Software Corporation (PSC)
  - high fees for adding capacity (users or servers)
  - high maintenance, support and upgrade costs for the proprietary hardware platform on which the application operated (PSC would have charged significant fees to move the Progress 4GL application to a different platform)
- limited availability of technical information and technical resources
- limited long-term technology potential
- various challenges and frustrations in dealing with a large vendor (PSC)

TIMCO had evaluated multiple alternatives for switching away from the Progress 4GL. Due to the size and complexity of Majic (approximately 840,000 lines of 4GL source code), a rewrite from scratch was not a feasible alternative. Another option was to replace Majic with a comparable application from an outside supplier. Again, the approach was too expensive to justify. The licensing cost of most ERP software is very high and in addition, there are customization and implementation costs that can easily accumulate to be as much as 5 times the acquisition costs.

Either switching option was going to cost millions of dollars to implement. Costs of this magnitude were not justified by the hard cost savings. This didn't reduce TIMCO's interest in switching, but it seemed as if there was nothing else that could be done.

"Our level of frustration was high. We were running out of options, or so it seemed until we made contact with Golden Code Development.", said Kevin Carter, the CEO of TIMCO.

Golden Code Development (GCD) is a software and systems engineering firm with a proven track record of solving very difficult problems for enterprise clients.

The Progress 4GL environment is based on a traditional interpreter plus runtime library model. This is the same design principle as the Java Virtual Machine. GCD developers have extensive knowledge of the internals of the JVM, language design, compilers, interpreters as well as strong experience in traditional application

development facilities such as transaction processing and relational database support. With its thorough understanding of how such environments work, GCD had the capabilities to effectively and efficiently migrate 4GL projects to other environments (especially to Java) with the least effort and with very solid results.

Working with Golden Code Development, TIMCO recognized that there was one more option available: technology conversion. By using automation to convert the Progress 4GL source code of the Majic application into native Java source code, TIMCO would divest itself from all the disadvantages of the Progress 4GL environment while leveraging the considerable advantages of retaining the Majic application itself.

Keeping the application intact while changing the underlying infrastructure is a unique advantage of fully automated language to language conversion. After 15+ years of investment in their custom application, Majic was an important asset to the company. Majic is a heavily customized version of an original ERP application called Symix, with 840,000 lines of 4GL code. TIMCO had long had a source license that allowed it to create derivative works of Symix. Using those rights, the TIMCO development staff has tailored Majic to specifically meet TIMCO's requirements and handle TIMCO's processes.

All other methods of switching would have required a combination of custom feature development, business process modification and significant retraining for all system users.

“For any other switching option there would have been a significant risk due to the huge amount of change to the business. One of the most positive attributes of the conversion approach is the avoidance of risk. This was critical in obtaining buy-in from the business.”, noted Kevin Carter.

Automated Conversion, Drop-In Replacement

The Golden Code automated conversion approach is different than a rewrite or replacement. Using its unique language translation technology, GCD has fully automated the process of converting Progress 4GL source code into pure Java. This was not a “quick and dirty” use of automation for converting 80% or 90% of the code. The automation converts 100% of the code to Java. More importantly, there is no need to edit the Java code written by the automated process. The code will compile and work immediately.

GCD has created a set of Java class libraries and an application server that provide a runtime compatibility layer duplicating the behavior and function of the Progress 4GL environment. The converted Java code uses the runtime as needed to ensure that the semantics of the original application are retained completely. The result is a drop-in replacement of the Progress 4GL version.

The conversion tools and runtime technology created by GCD for this Progress 4GL to Java conversion is called **FWD** (pronounced “Forward”).

As a result of using **FWD**, TIMCO now has a pure Java version of Majic with all of the same function as the original application. Of equal importance is the fact that the user interface is identical between the Progress version of Majic and the Java version of Majic. This eliminated any need to modify business processes and retrain users. From the user perspective, the application is the same.

“Our end-users simply could not tell the difference between using the Progress 4GL version and the Java version of the application! But our IT staff certainly could see the benefits.”, said Kevin Carter.

The application had a character-based user interface (CHUI) and used a wide range of language and database features. The converted application has 100% fidelity to the original application. The **FWD** runtime environment includes Java implementations of all used language features in a manner that is functionally compatible with the 4GL. The compatibility of the resulting application was verified by passing an automated test suite comprised of over 1000 tests, including user interface and report conformance on a byte for byte basis.

All the advantages of Java accrued to the new Java version. All ongoing costs from Progress Software Corporation were eliminated, as none of their technology was in use in the new solution. Without the licensing constraints of PSC, TIMCO decided to run the Java version of Majic on an industry standard platform (Linux and Intel x86-64 based servers). This allowed TIMCO to avoid the high maintenance and upgrade costs of the proprietary hardware platform on which they were previously captive.

Kevin Carter stated: “The conversion project allowed us to eliminate all the costs that were caused by our dependence upon Progress Software Corporation. Rarely can a single project have such a positive leverage on an IT department's cost structure.”.

Seamless Cutover

When all testing and other preparation was complete, deployment was the next step. Deployment was

performed on a staged basis. The idea was to start by migrating a small number of production systems and let them operate for some time before moving the next set.

The converted application and its environment was fully set up ahead of the planned cutover window for the matching legacy 4GL production environment. This means that during the cutover window for that system, only the data needed to be migrated.

On the night of the cutover, users were told in advance about a 12 hour window of system maintenance. At the beginning of the cutover window, the legacy (Progress) system was shut down and the data was exported from the database. That data was then transferred to the replacement system and the Golden Code tools were used to import the data into the target PostgreSQL DBMS. At that point the system was ready for use and some final testing was done to confirm that the environment was functional.

The data migration process took 4-5 hours and the system was tested and functional well before the end of the cutover window.

No user training was needed. When users started accessing the system the next day, they did not know it was a completely new technology infrastructure. Not a single call came in to the help desk to report a bug. The system just worked! This is because it was in fact the same application, just running on a new, modern infrastructure and written in a modern language (Java).

Mission Critical Success

TIMCO runs its entire business on the converted Java application 24 hours a day, 365 days a year. This is the very definition of a mission-critical application, supporting round the clock activity (3 shifts per day).

No show-stopper defect has been found since the application went into production nearly a decade ago!

Advantages

From a technology perspective, Java is one of the most popular and capable application environments. It provides complete portability across hardware and operating system platforms (from mainframe to mini to PCs to handhelds). There are more than 9 million (and growing) Java developers available worldwide along with countless books, sample code and other technical resources. This eliminates the artificial limitations due to the proprietary nature of the Progress environment. Finally, there is an entire industry investing in the Java environment and there is a virtually unlimited pool of Java based technology available, which Majic is now able to leverage. The Java environment has extremely strong technological potential and thus the Progress 4GL issues in this regard are also eliminated.

In the process of converting the application to Java, the automated tools implemented many technical improvements to the application's internals. As one example, the application was re-factored to separate the user interface, business logic and data access to the greatest extent possible while still maintaining complete compatibility. This resulted in a cleaner and more modern design for the source code.

Golden Code provided this service and technology for a total cost which was a small fraction of the cost of any other alternative. Most importantly the price was also smaller than the cost of doing nothing (staying with the Progress 4GL environment).

TIMCO retained all ownership and rights in the converted source code of the Majic application. All of the conversion tools and runtime technology in **FWD** was written from scratch by GCD using a “clean room” approach. Golden Code owns all of this enabling technology. This technology is not Majic or TIMCO specific but it is necessary to run the Majic application.

TIMCO has a source license to the **FWD** technology. This ensures that there is no requirement for any additional fees to GCD, ever. Complete independence was achieved. TIMCO may modify, fix or enhance **FWD** as needed, or they can choose to have GCD enhance or maintain the libraries over time, but this is an option, not a requirement.

Documentation and training was provided for the TIMCO application development staff, to ensure they were ready to maintain, enhance and administer the new Majic application.

Open Source, Game Changing Technology

“Through this tremendous feat of engineering, TIMCO freed itself from the lock-in of the proprietary Progress 4GL environment. Majic is a mission critical software asset through which the entire business is managed. That asset has gained a new lease on life!”, said Kevin Carter.

From the beginning, GCD approached this project with a core design requirement that the resulting technology and methodology be reusable. This has been achieved. For this reason, the **FWD** technology was open sourced to make it easy for thousands of Progress 4GL applications to be migrated to a better future. With Golden Code's proven track record at TIMCO and the game changing **FWD** technology, this *truly changes the economics and feasibility of switching from Progress 4GL.*

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