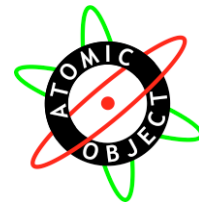


# Michigan Medical PC and Atomic Object: Automated Testing for InterSystems Ensemble Productions



## The Backstory & Challenges

Michigan Medical P.C. (MMPC) embarked upon an Epic EMR conversion and implementation project requiring 3 years, \$10M, and 40 people. In 2008, the head of this team engaged Atomic Object (AO) to provide project management services and improve the quality and speed of Ensemble development projects.



The size and critical nature of the project demanded transparency and measurability not often present in traditional software project management techniques. The team lead desired to improve the process used within his team and sought AO's experience with agile practices.

The critical nature of the conversion and permanent interface productions demanded rigorous, ongoing testing. MMPC saw an opportunity to pioneer automated testing with AO's recognized software testing expertise, decreasing the cost of testing and improving project predictability.

## The Approach

Immunization lot management was the first interface developed with the Atomic Ensemble test framework. AO used InterSystem's Ensemble to create a custom web application available to all MMPC remote sites. The application used an Ensemble production to convert the collected immunization lot data into an Epic import file format. The entire web application was developed in a test-driven fashion resulting in a full suite of automated tests run at the push of a button within the Ensemble Studio environment.

"Atomic Object's team delivered on a challenging project by applying superior project management skills and applying highly developed testing skills to new problem domains. The AO team brings the goods and they consistently deliver very satisfying results."

*Matt Beaverson, MMPC Epic Implementation Lead*

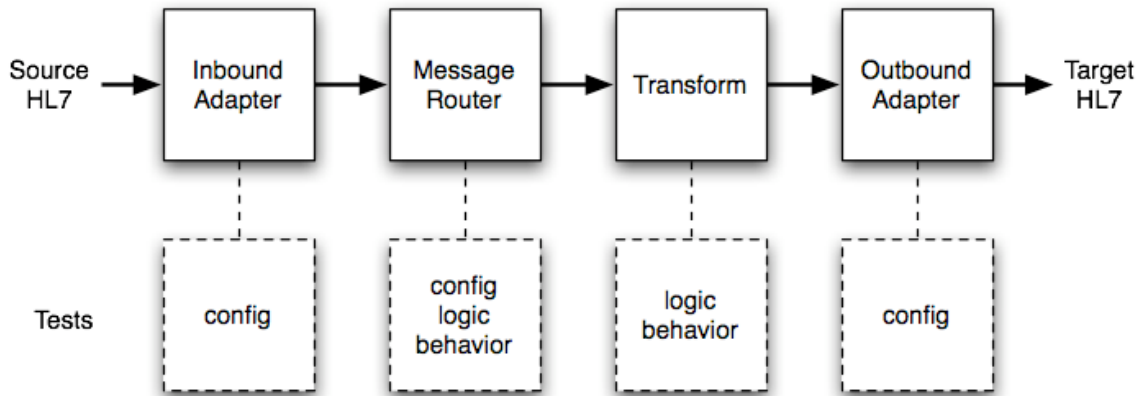
AO further assisted in introducing agile software project management practices and metrics. Work was estimated and broken into weekly iterations with completion of tasks each iteration measured against tests.

## Atomic Ensemble Test Framework

MMPC uses Ensemble for interfaces and conversions. Inbound and outbound interfaces are in continuous use; conversions are generally a one-time event. Example uses of outbound interfaces include lab orders from Epic to an internal lab system or regional hospital system. Lab results are returned via an inbound interface. Ensemble formed the basis for an extensive conversion from a legacy EMR to Epic in the summer of 2008. In the future, MMPC's growth through mergers will continue to provide a need for conversions.

An Ensemble production consists of four common components. An inbound service typically receives HL7 messages, or reads a file to be converted. The inbound services passes messages to a message routing process. The message routing process determines which transformation and outbound operation a message passes through. The outbound process concludes the production by passing along an HL7 message or writing a file.

Each of the four components of a production has configuration, logic, or behavior that should be tested to be confident of proper operation of the production. Figure 1 shows the four components and what is tested for each.



**Figure 1.** Tests for each aspect of an Ensemble production.

The Atomic Ensemble testing framework supports test-driven development (TDD) for Ensemble productions. TDD is a four-step process:

1. A test that specifies the correct behavior of the component is written.
2. The test is run and fails, showing that it does indeed test the component.
3. The production component is then programmed until the test passes.
4. When all tests necessary have been written, and are passing, the production can be refactored to be simpler, smaller, or more efficient, as required.

Because the tests are fully automated, the cost of running them is essentially zero — just push a button and see the results. Being able to run all tests for a production automatically means regression testing is very easy and inexpensive. By lowering the cost of regression testing, maintenance and modifications of existing interfaces become much more certain and safe. The automated test suite built around each production acts like a watchdog — introduce a defect and the test suite barks to tell you about it. Automated test suites make Ensemble upgrades much less stressful. If a production behaves differently when run with a new version of Ensemble, the test suite for that production warns you in advance.

The Atomic Ensemble testing framework lets you run a single test at a time, or a suite of tests. Test results show up on the Studio console. For an entire suite, a test report can be viewed as a web page, with the results for each individual test. Running each production's test suite when a change is made to the configuration, logic, or behavior of the production, or on a regular basis (say nightly), is the role of a continuous integration server. Continuous integration (CI) is achieved in the Atomic Ensemble test framework with a persistent production that runs all tests periodically. In the event the CI server finds an error in one of the production's test suites, email is sent to notify the development team.

## **The Results**

Unit testing for production DTL logic provides confidence that transformations perform as expected for all possible cases of input. Configuration testing actively documents proper configuration of productions. Integration testing the behavior of routing rules proves that messages are routed through the proper DTL and outbound adapter.

We've seen that developing Ensemble productions in a TDD fashion causes DTL code and routing rules to be simpler and smaller. Smaller modules are easier to test, and hence easier to understand and maintain. Complex logic moves to more easily testable and reusable functions.

Our experience at Michigan Medical shows traditionally trained staff can quickly and easily learn the Atomic Ensemble testing framework, can write tests for existing productions, and can develop new productions on their own in a test-driven fashion.

## **About Michigan Medical, P.C. (mmpc)**

Michigan Medical, P.C. (mmpc) is the largest physician owned, multi-specialty group in West Michigan, with a vision to be the best in the country. Currently, mmpc has over 300 health care providers serving patients in more than 30 specialties. By "putting patients first," mmpc is committed to offering the highest standard of healthcare for our patients. mmpc takes seriously our commitment to quality, safety, and the communities we serve, and we invest significantly in clinical improvement and integration, including the implementation of a state-of-the-art electronic medical record in 2008. Comprehensive, confidential care, exceptional physicians, and patient satisfaction are hallmarks of mmpc's success. To learn more about mmpc and the services we provide, please visit the web site, at [www.mmpc.com](http://www.mmpc.com).

## **About Atomic Object**

Atomic Object is the second largest custom software firm in West Michigan. A pioneer and expert in agile development practices, Atomic teams have delivered the highest quality software, on-time and on-budget, since 2001. Atomic Object projects span a broad range of technologies, from web and desktop to embedded and enterprise. AO first worked with MMPC in 2004. More information at [atomicobject.com](http://atomicobject.com).