

CLIENT:

Trace Environmental Systems, Inc. is the industry leader in providing stack monitoring solutions and provides monitoring systems, software, and services to help manage, organize, and report stack monitoring data.

PROBLEM:

Trace's core products were developed initially as desktop based applications using Visual FoxPro and Visual Basic. Trace's clients' needs had evolved to require web based applications and keep their Database in FoxPro itself for the initial rollout as Microsoft had ended their support of VFP.

SOLUTION:

Macrosoft developed a thorough understanding of Trace's business requirements, and developed a two phased approach to migrate to .NET Trace's business critical applications, and architected a multi-tiered solution that met all their operational and technical requirements, while optimizing scalability and maintainability of the applications. For this migration, the Client created a DLL which communicates to FoxPro DB and Macrosoft needs to convert the application to Web solution and use the DLL to communicate to VFP Database. They did encounter some technically challenging issues detailed in the full case study.

About the Client

Trace Environmental Systems, Inc. founded in 1995, is the industry leader in providing stack monitoring solutions. It is one of the few fully integrated companies in the industry. Trace has deployed an industry leading Predictive Emissions Monitoring System (PEMS) which significantly lowers the operational costs of a stack monitoring system. Trace brings together expertise in environmental engineering and process control.

A great deal of Trace's success in a competitive marketplace is due to their core Continuous Emissions Monitoring Systems (CEMS) tools, their DAS200 Data Acquisition System (DAS), and their Predictive Emission Monitoring System (PEMS). The DAS system was groundbreaking when it was first developed and remains the only user configurable product of its kind. It is without question, the most flexible and easy to use product in the market.

Trace Environmental's proprietary, mission critical applications were originally developed using Visual FoxPro and Visual Basic which Microsoft has stopped supporting. In 2014, Trace made the strategic decision to migrate to .NET two of their core products.

The Challenge

The tool was initially developed as a 32-bit desktop based application. It provides real time analyses of emission information to allow engineers to make decisions and set various system controls. The company could no longer rely on the database engine and the programming language used to develop the application as Microsoft had stopped supporting them, and would no longer provide fixes, which was a security risk. Additionally, many customers required a tool with a web interface to provide real time reporting so they could access their data from anywhere, not by remote desktop.

Trace's robust tools are based on a proprietary algorithm which is fully compliant with local, state and federal requirements. To support and maintain the original product's functionality and add new features, Trace required knowledgeable FoxPro resources, which are very difficult and costly to acquire. Combined, these factors put the future of the product in jeopardy.

The Migrate to .NET Approach

The client provided the FoxPro source code and executable file for the applications. The Macrosoft team then carried out in-depth analysis and a source code walkthrough by our Visual FoxPro experts. The team prepared a detailed technical specification document to clearly describe the application's core functions including all proprietary algorithms, government regulations, and process flow for each of the forms and reports.

The team designed a solution to create new forms and reports to work with all legacy data. In the end, this reduced the testing time significantly and provided Trace with confidence in the data validation process. The new application would have zero footprint and run on any browser with same capabilities as the desktop FoxPro application. The new web based application proved to be fast, portable, secure, and easy to maintain from centralized servers, instead of maintaining copies of the desktop application on every machine.

The application's architectural solution was carefully designed to meet all the operational and technical

Macrosoft Approach



***FoxPro Code
Walkthrough by Experts***



***Prepare Technical Analysis
Document***



***Submit Analysis document
for Client review***



***Start Migration of the
application in .NET***

requirements of the client, while optimizing scalability and maintainability. The multi-tiered solution broke the system down into its various levels. Based on the architectural solution, the team then could chose the development tools to best meet the clients requirements.

Macrosoft approached the solution as a two phased process as the application relies heavily on real time data and reporting. Macrosoft first developed a Proof-of-Concept (POC) to demonstrate the how to interact with Magic DLL created by Client to communicate to FoxPro DB from .NET application and shows the benefits of migration and how to mitigate the risks involved in these complex migrations. The team of Macrosoft migration experts developed a plan to safely migrate the application to the more robust Microsoft .NET platform as a web application in two phases in order to release the application to production in logical small pieces. They also had the ability to compare the behavior of application from new application as well as old application as the data remains same.

During Phase I the objective was to develop the .NET based custom web application framework for the Trace Data Explorer application. This was designed to provide all the basic functionalities of the original Data Explorer; the framework could then also be utilized for all future development. This logical division of the application involved migration of all the base functionalities to the new web based application. This required maintaining multiple reports and forms requiring CRUD operation capability (create, read, update and delete) as well as the functionality to update report data. Development involved the use of multiple object oriented languages and tools supported by the .NET Framework.

During Phase II of the development effort, Macrosoft's team converted Trace's Data Monitor application to .NET, which was also comprised of multiple complex forms and reports. The application was built to include dynamic screens and reporting with the custom functionality to design forms and reports on demand. Users would be able to add monitoring controls (objects) to represent live data streams from the emission machines being monitored. All data would be captured by the backend application and converted into binary files. These monitoring controls would then

Microsoft Approach



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Walkthrough by Experts***



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Document***



***Submit Analysis document
for Clent review***



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represent data as line graphs, flow process, and graphical gages, while monitoring all alarms in real time.

The Trace project was managed in adherence to agile methodologies. Macrosoft executed the project in scrum sprints with durations of 3-4 weeks each. At the end of every sprint, the build was passed onto Macrosoft's QA team for testing. QA followed a thorough and stringent testing process encompassing manual testing and regression testing. Upon completion of each phase the team tested the application as a whole and this ensured a bug-free application that successfully met the client's requirements prior to client turnover.

As a result of Macrosoft having developed the web based Emissions Monitoring System for Trace, they can now deploy the application from a centralized location and users can monitor their stack from anywhere through a secure web portal. Trace is now only responsible for a single machine instead of many desktop installations, thereby significantly reducing support calls. All future modifications can now be done using ASP.NET and the VB.NET language which should ensure their ability to support the application for many years to come.

About Macrosoft

Macrosoft Inc., is a leading edge software design and development company based out of Parsippany, NJ. Macrosoft has a powerful combination of business experience and technological expertise that provides clients best-in-class solutions for their software development projects. Macrosoft delivers high-quality, cost-effective, full lifecycle solutions to complex software development projects. The company has over 20 years of successful engagements and over 300 professionals working for an exceptional client list.

Macrosoft offers cost-effective, risk free practices to transform your legacy applications to the latest technologies and architectures. Through our.NET migration team, we aim to retain the value of your legacy applications and data while meeting your future business needs.

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