



EXPERT LABVIEW CONSULTING SERVICES

# Help Is on the Way: Building a *FIRST* Robotics Support System Using JKI's EasyXML Toolkit

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## Inspiring Science and Technology

National Instruments is a major sponsor of the *FIRST*<sup>®</sup> Robotics Competition (FRC), an international robotics competition that brings together more than 2,000 high school teams from around the world. Teams program their robots using LabVIEW<sup>™</sup>, Java<sup>™</sup>, or ANSI C, running on NI CompactRIO<sup>™</sup> hardware. Because the teams use so much NI hardware and software, NI provides on-the-ground “control system advisors” at FRC events to help teams solve technical issues during competition.

The biggest FRC event is the annual *FIRST* championship, which involves about 350 teams. During the competition, many teams experience programming, hardware, or other technical issues. They depend on us, the control system advisors, to quickly fix their problems or get them the help they need. No matter what's wrong with their robot, it's our job to fix it, or get it to the point where the team can take over and do it themselves.

## Quick, Responsive, Cross-Platform, and Mobile

The teams need a quick, easy and reliable way to contact us when they run into trouble. In previous years, we've had to roam the floor to provide help, and with hundreds of teams to support we were never in the right place at the right time. Unfortunately, there are no commercially available systems that we can just plug into that provide the kind of solution we need, so we created one.

Because we're NI engineers, we obviously chose LabVIEW to build our own solution. However, in addition to being fast and reliable, our application has to be simultaneously accessible by multiple teams and support staff via web browser, mobile devices, and from the main console in the “pit area” at the competition. To meet these requirements, we built a web service that uses XML as the data



FRC Team Support  
Mobile Interface

## THE GOAL

Quickly create a cross-platform web service to handle live “pit support” at the 2011 *FIRST* (For Inspiration and Recognition of Science and Technology) championship in Saint Louis, MO.

## THE SYSTEM

- Custom backend data engine (NI LabVIEW software)
- Web and mobile front ends for support requests and status (LabVIEW Web UI Builder)
- Web and mobile front ends for on-duty support personnel



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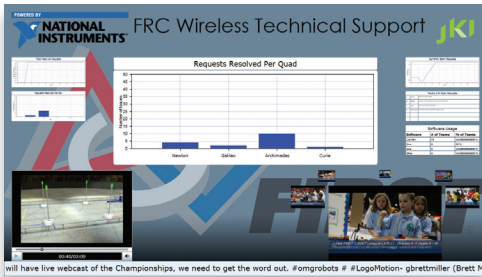


format because XML is supported by Android™, iOS™, Silverlight™, and every other major platform.

## XML Can Be Hard – EasyXML Makes It Easy

When NI Engineer Mark Black developed a proof of concept for our application, he started out using the built-in LabVIEW XML functions, which are based on XPath queries. We quickly concluded that the work required to build an API around the built-in functions would cost us about two extra weeks of development time in comparison to JKI's off-the-shelf EasyXML Toolkit for LabVIEW. EasyXML provides a seamless way to

convert almost any LabVIEW data cluster to and from XML using just a couple of VIs, whether the data is in memory or in files on disk. Because our application needed to be ready for the 2011 *FIRST* championship, it was advantageous for us to use a ready-built tool like EasyXML rather than rolling our own parser.



FRC Team Support System Console

## A Standard API Means a Robust, Extensible Application

EasyXML allowed us to spend more time producing a great application instead of worrying about the details of XML. Using EasyXML, we easily created a common API for all our client devices, so we spent most of our time focusing on adding real value for our users. Even with a tight schedule, we created a multi-user system with separate interfaces for teams and support staff. Each interface provides the features each type of user needs, and EasyXML provides a common “pipe” for all the data.

## Exceptional Support from JKI

EasyXML made passing data between our backend server and all our clients so easy, we may have gotten a little spoiled and used it too much! As our application evolved, we started passing larger and larger datasets around until the overhead of XML parsing started to noticeably affect its responsiveness. JKI responded by giving us a private EasyXML build with significant optimizations that resulted in XML parsing as much as six times faster, allowing us to keep moving forward.

Thanks to EasyXML and JKI, we're confident that we'll be able to provide better, faster support to more *FIRST* teams than ever before.

*“JKI’s EasyXML made XML easy, to the point that we may have gotten spoiled with it.”*

*– Patrick Corcoran*



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