dyn@sys Bergmans Mechatronics LLC

SportJury*: A Multi-User LabVIEW Application Employing Mobile Browsers*

April 2011

Dynasys, D. Kölliker (Oberwangen, Switzerland) and Bergmans Mechatronics LLC (Newport Beach, CA, USA) are pleased to announce the development of *SportJury*, a distributed, multi-user software application to aid ski competition judging. The primary objectives of the application are to improve the accuracy of score data entry and speed the aggregation of judge scores relative to previous paper based systems.

SportJury hardware includes multiple Apple iPod touch devices for use by ski competition judges and a server PC controlled by a system operator. A wireless Local Area Network router enables communication between the iPods and PC at the competition site.

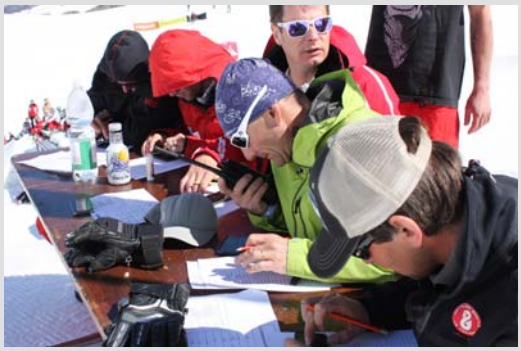
SportJury was developed under contract by Dynasys for Sport Timing Schönried (Schönried, Switzerland). The system was first deployed at the Swiss Snow Happening in Saas-Fee, Switzerland on Apr 6-10, 2011. Pictures from the event are shown at right.

Johny Wyssmüller, co-owner of Sport Timing Schönried expressed his satisfaction with the system by stating, "We are pleased with the *SportJury* system design and performance. It allows rapid and reliable score data entry from multiple judges. The simple and intuitive user-interface on the iPods touch devices enables the judges to be trained in the use of the system in about five minutes."

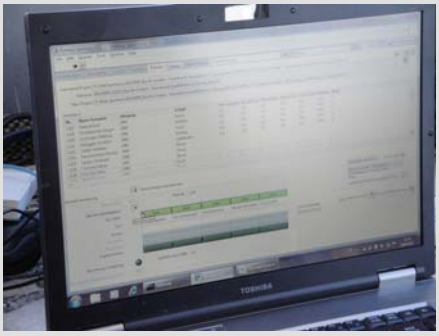
The server and client software for *SportJury* were developed by Dynasys using i) the LabVIEW programming environment from National Instruments; and, ii) Bergmans Mechatronics' *LabSocket* system. As discussed below, the *LabSocket* system extends LabVIEW applications to web browsers through the use of HTML5 WebSockets, a new standard for continuous, bi-directional data exchange between web browsers and servers.

Due to the set of technologies involved in the development of this program, *SportJury* is believed to have the distinction of being ***the first commercial LabVIEW application to employ WebSockets.***

Competitor with Judges in Background



Five Judges Entering Scores on SportJury *iPod touch devices*



Data Aggregated on Server PC

Swiss Snow Happening 2011, Saas-Fee, Switzerland

SportJury *Technical Information*

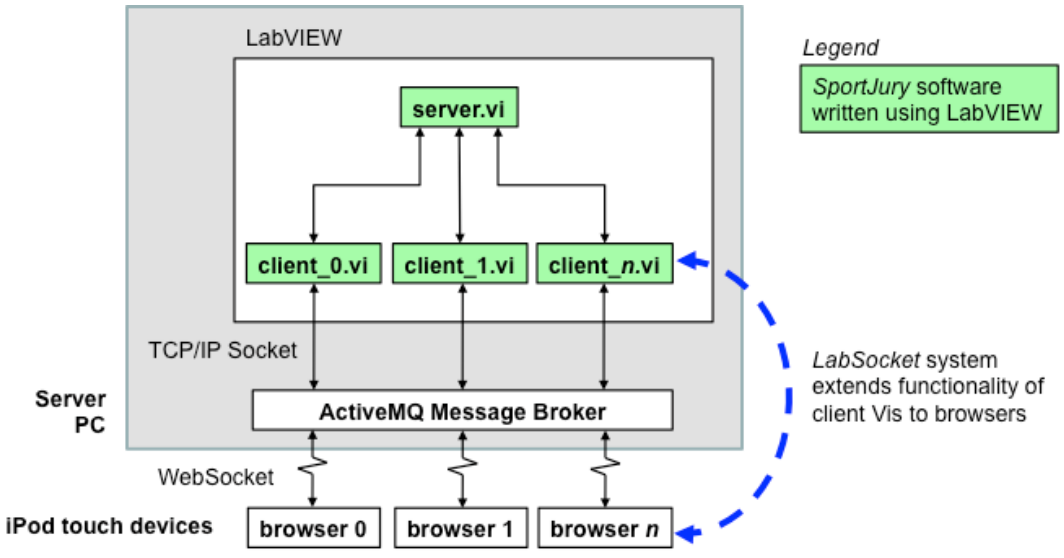
SportJury features a unique system architecture that combines the power and simplicity of traditional LabVIEW programming techniques and Bergmans Mechatronics' *LabSocket* system for extending LabVIEW applications to the browser, without the need for browser plug-ins.

System Overview As shown in the figure below, the server software and multiple instances of the client software for *SportJury* all operate on a single Server PC and are written in LabVIEW. (An individual LabVIEW program is referred to as a Virtual Instrument, or "VI" and typically uses the filename extension ".vi", as is done in the figure.) Communications between the client VIs and server VI in *SportJury* is via standard LabVIEW mechanisms.

To enable multiple competition judges to enter data into the system using the iPod devices from a judges' table located a distance from the server PC, the *LabSocket* system performs two key functions:

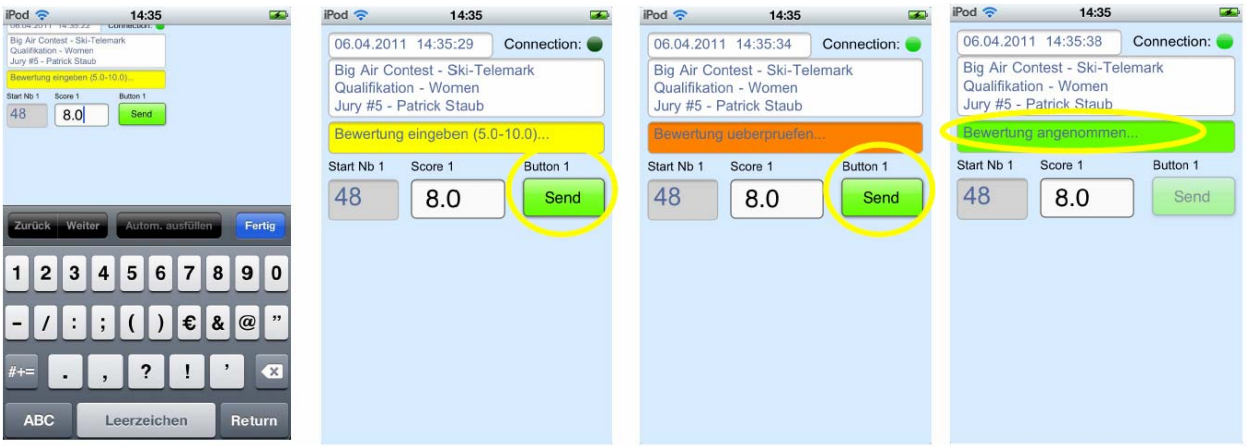
1. First, it automatically creates a web browser based representation on the GUI elements of the prototype client VI. This page is subsequently served in the Safari browser of each iPod touch.
2. Second, the system establishes a communications link over TCP/IP sockets and WebSockets between each client VI and its corresponding iPod-based browser. During system operation, this bi-directional link transmits i) updates in a client VI front panel to the corresponding browser; and, ii) data entered by the user in a browser to the corresponding client VI.

Due to the modular design of the *LabSocket* system, its operation is transparent to the LabVIEW application. Therefore, developers can create applications for the web using LabVIEW, without worrying about the details of how to render the user interface and communicate with the application in the browser.



Overview of* SportJury *Software Architecture

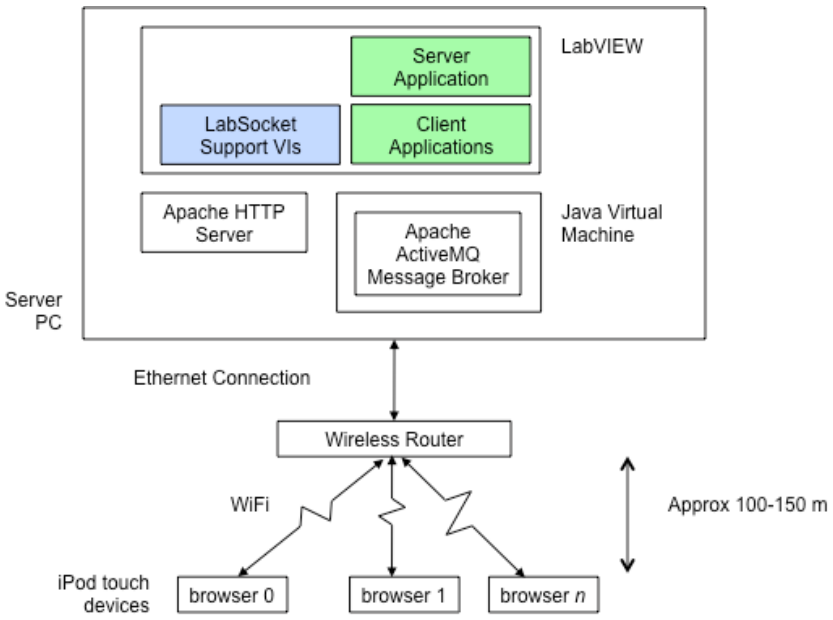
***LabSocket* in Action** The *LabSocket* system dynamically reproduces not just the values of elements of the client VIs in the browser, but also several important properties of key elements as well. The screenshots below show the *SportJury* client VI recreated in an iPod touch browser using the *LabSocket* system and illustrate how LabVIEW VI properties such as text field value and background color and push button disabled status can be dynamically controlled in the browser.



Screenshots of* SportJury *Score Entry Steps on iPod touch device

System Components The main physical components of the *SportJury* system (see figure below) are: i) a Toshiba Tecra A10-1HJ laptop PC which acts as the Server, ii) a TP-Link TL-WR1043ND wireless Ethernet router; and, iii) the Apple iPod touch devices.

The software components of the system are the previously mentioned server and client software, written in LabVIEW; the *LabSocket* support VIs, also written in LabVIEW; an Apache 2.2.17 HTTP server; and, an Apache ActiveMQ 5.4.2 Message Broker which runs within a Java Virtual Machine. The operating system for *SportJury* is Windows 7. Additional software is the HTML and JavaScript code which is automatically generated by the *LabSocket* system and executes on each of the iPod devices.



Physical Configuration of* SportJury *System

An attribute of note about *SportJury* is that the system is able to achieve reliable communications outdoors over a distance of approximately 100 to 150 meters between the server PC and iPod touch devices.

Comments from the Developers

According to Daniel Kölliker, owner of Dynasys, D. Kölliker, "For *SportJury*, we could have created a native application for the mobile component of the system, but that would have required either contracting out to a specialized development firm or going up a learning curve for native application development."

"Instead, since Dynasys has a long history of developing complex LabVIEW applications, we decided to employ Bergmans Mechatronics' *LabSocket* system to allow us to create the client software as LabVIEW VIs and then to extend these VIs to the browsers on the iPod touch devices. This approach allowed us to rapidly and inexpensively develop the mobile component and to write all of our code in-house in LabVIEW."

John Bergmans, Principal Engineer and Owner of Bergmans Mechatronics said, "*SportJury* is a great example of the capability of the *LabSocket* system to extend LabVIEW to the web. From a more general perspective, *SportJury* is also a nice demonstration of the use of WebSockets to create dynamic, multi-user, browser-based applications. I look forward to future collaborations with Dynasys and other LabVIEW developers."

About Dynasys, D. Kölliker

Dynasys specializes in custom LabVIEW software development and the development of test and measurement hardware and electronic circuit boards. Customized training and data processing services are also provided by Dynasys. The firm was founded in 1996.

Contact:
Daniel Kölliker
Dipl. El. Ing HTL and Owner
Freiburgstrasse 742
CH-3173 Oberwangen, Switzerland

phone: 0041 31 748 03 30
mobile: 0041 79 415 60 17
e-mail: d.koelliker@dynasys.ch
web: www.dynasys.ch

About Bergmans Mechatronics LLC

Bergmans Mechatronics, established in 2003, develops LabVIEW-based data acquisition and control systems and specialized instrumentation. BML is also active in the development and promotion of WebSocket-based real-time web applications. BML's client base includes firms in the communications, industrial, medical, scientific, and defense sectors.

Contact:
John Bergmans
Principal Engineer and Owner
1616 Bedford Lane, Unit A
Newport Beach, CA, USA
92660

phone/mobile: 001 714 474 8956
e-mail: jbergmans@bergmans.com
web: www.bergmans.com