

Development of native HMIs for iOS devices.

This document goes into the various ways existing today to present an industrial Human Machine Interface on an electronic tablet device. It starts by discussing the most commonly used technologies: Web and VNC. Then focus into Native app based HMI development.

Web Based HMIs.

Virtually all solutions existing today to display PLC data on mobile devices are based on Web or Remote Desktop technologies. During recent years, a number of Web based applications for presenting HMIs on tablets have appeared. Web browsers are readily available on most mobile devices and they are a low cost technology which, for the most part, do not require any new development for HMI system vendors.

At the same time, Remote Desktop software, also known as VNC, has been used for some time to connect remotely with existing SCADAs or HMIs already running on PCs. In such case the idea is enabling a personal computer's desktop environment to be displayed remotely on a mobile device, thus replicating all the PC features on the tablet.

Additionally, a number of vendors have started providing their own mobile apps for connecting to their systems. These applications either use a web browser component wrapped on a custom interface, or a proprietary implementation of a VNC based technology.

Although these solutions for HMI on tablets are relatively common today, the reality is that these technologies are not characterized by high performance, efficiency, or flexibility, especially when used for industrial process monitoring purposes.

The lack of performance is due to a multitude of factors starting with the execution in a web browser, which was never designed for real-time monitoring of data.

On Remote Desktop based solutions an issue that frequently surfaces is the requirement of high bandwidth on the network. This is because full screens including graphics or charts are transferred through the network as opposed to just relevant data point values. In addition, these solutions tend to be inflexible as the tablet screen is exclusively reproducing what already is displayed on the server PC, thus limiting any possibility to enhance the interface according to the tablet capabilities.

When it comes to representing information on an electronic tablet the technology used largely determines the result we can expect, both from the functional and visual standpoints. To understand what difference a Native app brings when compared with a Web based one we can look at what a company like LinkedIn did. At some time they replaced their old web based application by a fully native one. The current app is fast, feature rich and very user friendly. When compared with the old Web based one the difference is very noticeable.

It is therefore undeniable that applying the Native app concept to the field of HMIs for electronic tablets can provide great benefits.

HMI based on a Native App.

A remaining alternative is to enable mobile devices to run HMIs in a Native way. This can be done by developing a native app that, instead of relying on a web browser, is able to run HMIs directly on top of tablet hardware.

HMI applications implemented in this way are decoupled from the execution in a Web browser and they are not attached to a server or PC box. The resulting HMIs run on the tablet as opposed to being retrieved from a server.

Access to process data is immediate and all the features available on mobile devices can be used with no compromises. In turn, perceived user interface feedback is much improved and overall HMI responsiveness is better than with any other technology.



The development of a Native app for HMI creation.

After looking at what was available on the market, and not finding anything that really matched the concept we envisioned, at SweetWilliam we decided to begin development of an app inspired by such a concept.



Starting on the basis of high performance, extensively proven, industrial grade PLC communication drivers already available to us for the iOS platform, and building on top of them, the engineers at SweetWilliam defined a fully configurable app for building HMIs.

The goal was to provide an easy to configure iOS app to give automation professionals with no iOS programming knowledge the means to create their own industrial HMI applications.

After many months of hard work and real field tests, the HMI Pad system was released. The system consists of a set of components to help automation engineers and machine manufacturers to create graphic HMIs that would run natively on iOS devices .

A Native app for Automation Engineers.

Automation engineers can now fully exploit mobile device capabilities and provide the best possible user experience by building their HMIs on top of a native app. Following this approach, functionality, visual appeal, user action feedback and raw performance are aspects that are not compromised.

Compared to web based solutions, this technology is especially suitable when the end user experience is a key consideration or when intermediate hardware running server code is not available or desirable.

The following comparative list shows important differences that characterize a native platform with relation to web based systems for implementing HMIs on tablet devices.

Web based HMI	Native HMI
Single threaded execution in the environment of a Web Browser. High bandwidth requirements.	Fully multithreaded application designed from the ground up for maximum efficiency and speed. Low bandwidth requirements.
User Interfaces usually based on old designs, sometimes inflexible and with limitations.	Better user interface and more adaptable to specific user needs.
Sluggish user interface and slow PLC updates or response to PLC value changes	Excellent user experience through immediate response to user actions and to PLC value changes.
Additional hardware is required even to serve real-time data.	No need for intermediate boxes or PCs running server code. The application is able to communicate directly with PLCs from major international brands.
Tablet device capabilities beyond what is possible on a web browser are not supported.	Integrated support for the iPad sensors such as accelerometer, gravity, geolocation, interface rotation and other features such as multi-touch, gesture recognizers, and the standard iOS user interface controls.
Multiple component solution.	Single component solution. An Apple iPad is all you need, no more hardware required or involved.
Security is highly dependable on the server. It is not available or even possible at the client side.	Security is implemented at all levels.
Difficult or impossible to deploy on individualized user base. "One size fits all" approach.	System engineers can deploy or update projects online for particular end users devices with a single 'tap', this is not the "one size fits all" approach of web based HMIs.
Web based.	A web browser component is still available and can be used to display any web based content, including web based HMIs, and seamlessly integrate them on the Native interface.

HMI architecture using a Native app.

An Apple iPad running an HMI app can replace or complement traditional HMI touch screen panels while bringing more features, full mobility and convenience. Roughness can be greatly enhanced by using one of the protector cases available. The combination can become more robust and reliable than conventional HMI panels.

Traditional HMI architectures consist of one or more PLCs connected to several fixed touch screen panels, generally one panel per machine or PLC. Optionally, touch screens incorporate a web server for remote access through an internet router and a web interface.

Traditional HMI Architecture



The architecture using a Native app for HMI consists of one or more iPads communicating directly with PLCs through a wireless network. Since there is no need for other devices the conceptual structure is greatly simplified. Mobility is added for free as a plus. Also, remote access is possible from the same iPads by just adding an internet router.

Modern Architecture using a Native App for HMI



About SweetWilliam.

Based in Barcelona, SweetWilliam, S.L develops native mobile apps for real time monitoring of PLC based industrial systems and processes. It was the developer of the ScadaMobile and Modbus Gem iOS apps which have been jointly downloaded by tens of thousands of automation integrators worldwide, and it has a well deserved reputation for producing reliable, high quality, innovative products at affordable prices.

The HMI Draw app is the most advanced native app for HMI development on the iOS platform available today. For more information about the company and products please visit <http://www.sweetwilliamsl.com/>. Or follow our twitter feed at @HMI_Pad.