Android Devices

HMI, IOT and Cloud Gateways

A Low Cost, Touchscreen HMI and Scalable to The Cloud

ErgoTech Systems, Inc.
Los Alamos, NM 87544

May 2016

Introduction

The hugely competitive marketplace of Android tablets means that fast, robust, secure, touchscreen systems are available for under $100. Industrial tablets and open-frame products are available from more specialized vendors, but still leverage the technologies of consumer tablets to make them affordable, capable and reliable.

Inexpensive Dedicated HMI

The Mobile-Web has brought HMI interfaces to tablets and smart phones but these solutions require a remote web-server and don't utilize the full capabilities of the mobile device.

Traditional HMI solutions use custom, proprietary hardware and software, limiting choice and functionality. Relatively small production quantities also add cost to these products. To reduce cost they frequently skimp on features, such as quality touchscreens.

Modbus TCP/IP Logging and Historian

Using native Android apps for HMI panels solves both these problems and presents new opportunities and solutions. A self-contained native Android application can communicate to local factory automation devices and provide a rich HMI display. This mimics that capabilities of traditional HMI panels and this alone, coupled with the low cost of the solution would make them an attractive choice. However Android devices also support all major database (SQLite, MySQL, SQLServer, Oracle, and many more). Local databases, such as SQLite are useful for building a full-featured historian in a non-proprietary format. The advanced and flexible networking capabilities of Android devices allow access to remote databases and disks. This can be used to interact with an MES system, to retrieve recipes or just to store data collection values. It also give the ability to push data to the “Cloud”.

The high performance of modern Android tablets and phones means that neither memory or processing power are likely to limit the solution. Mass availability makes them cost-effective even with high quality touch screens and both local and mobile networking options.

Wired and Wireless Connectivity

Everyone is familiar with the wireless capabilities of mobile platforms. It's a powerful feature that conveniently allows mobility and connectivity to automation systems as well as business intelligence. WiFi and even cellular data mean that information is available almost anywhere at any time.

Modbus RTU Temperature Controller Monitoring

While convenient for hand-held applications, many industrial installations prohibit the use of WIFI for Factory Automation applications. Fortunately, the flexibility of Android allows other options.

All modern tablets support USB. When the tablet is being used as a fixed HMI panel, this provides hardwire support for connectivity to PLCs and other systems over RS232/485/422. USB Ethernet allows the direct connection of Ethernet enabled devices. There's even limited support for CAN USB Devices.

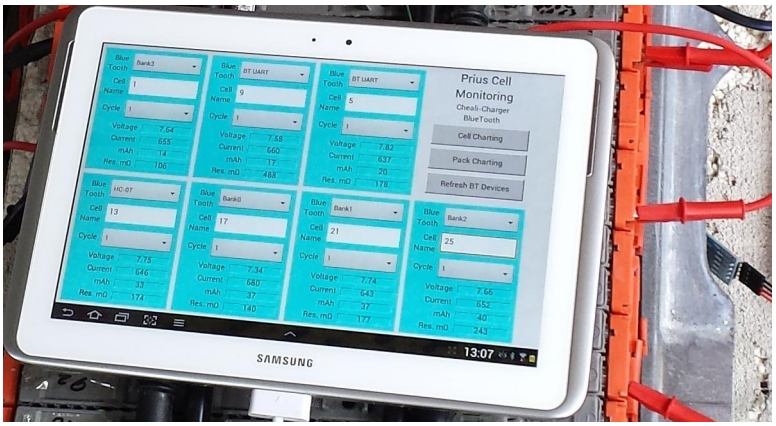
Although there's an emotional distrust of USB it is an extremely reliable solution in these application, indeed, most systems with serial ports now provide those internally over a USB bus – so even the 9-pin serial on an industrial computer is probably USB. The only additional challenge with external USB is the need to ensure that connectors do not come loose. In fixed application this can be achieved by proper strapping. Standard hot-glue is also a common, reversible, solution for fixing cables.

For short-range communications, tablets provide wireless BlueTooth connections which can be used to replace hard-wired serial links. This allows a little more flexibility and ease of connection.

Up to seven BlueTooth devices – so seven RS232/485 links - can be connected to a typical tablet or phone. These can replace serial links for Mobus or other protocols or be used with custom protocols.

When WIFI is permitted this allows the complete range of Ethernet/TCP connectivity.

This range of connectivity options enables tablets as extremely low-cost,



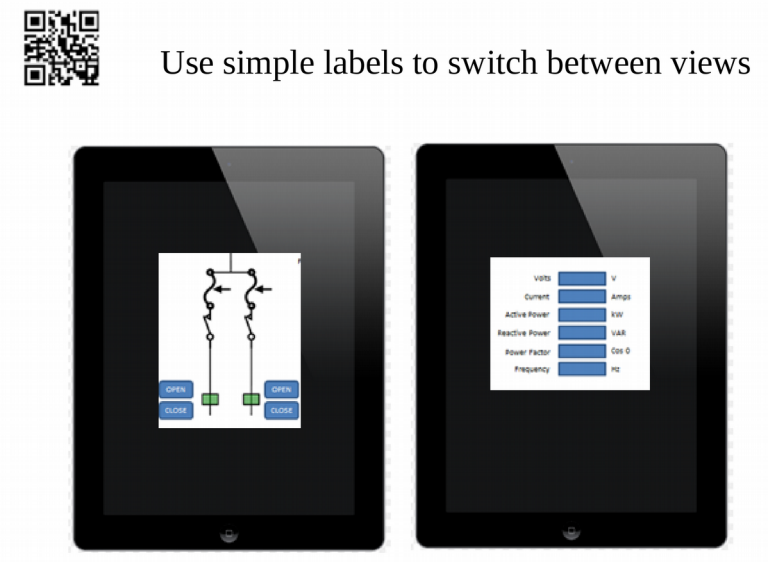
BlueTooth Charge Monitor with Seven BlueTooth/RS232 connections

touch screen, dedicated HMIs, communicating directly to automation devices over serial or the tool network.

Cameras and Sensors

Tablets and Android phones bring a whole range of new sensors to augment traditional factory automation with the ability to capture Location (GPS coordinates), Images (Camera), Direction (Magnetometer), and Acceleration/Tilt. Mobile has revolutionized the consumer spaces, and brings the same opportunities to manufacturing.

A simple example is the ability to read QRCodes and Barcodes using the Android Camera. Now, instead of navigating through screens using buttons or the touchscreen, you can just scan the code at the location and go straight to the appropriate page.

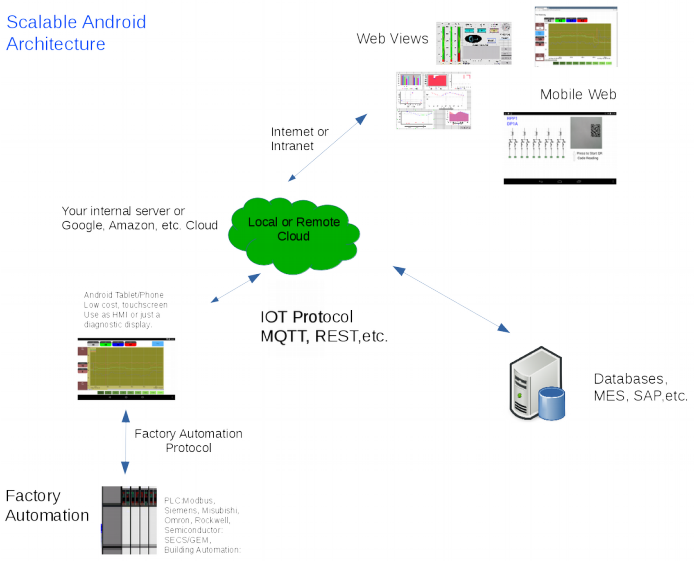


Android also supports a range of new machine learning or machine intelligence solutions. This includes image processing, but also time-series and target predictions for tools and equipment. Advanced process control based on feed-forward and data analytics is no longer a research project.

Gateway to the Cloud

Android makes a powerful HMI solution with the ability to view both real-time and historical data at the display, but it's much more than an HMI. Android has networking and mobile data capabilities that make it an ideal solution for building a full IOT/Cloud solution.

With a complete range of IOT protocols, REST, MQTT, XMPP, etc. , both Ethernet and Mobile networking and support for almost all SQL databases the Android HMI can push data to the next level. Once in the Cloud, data from the factory floor can be viewed anywhere. The Cloud also provides the ability of aggregating data from multiple sources into views, or for analytics and machine intelligence.



IOT/Cloud Architecture

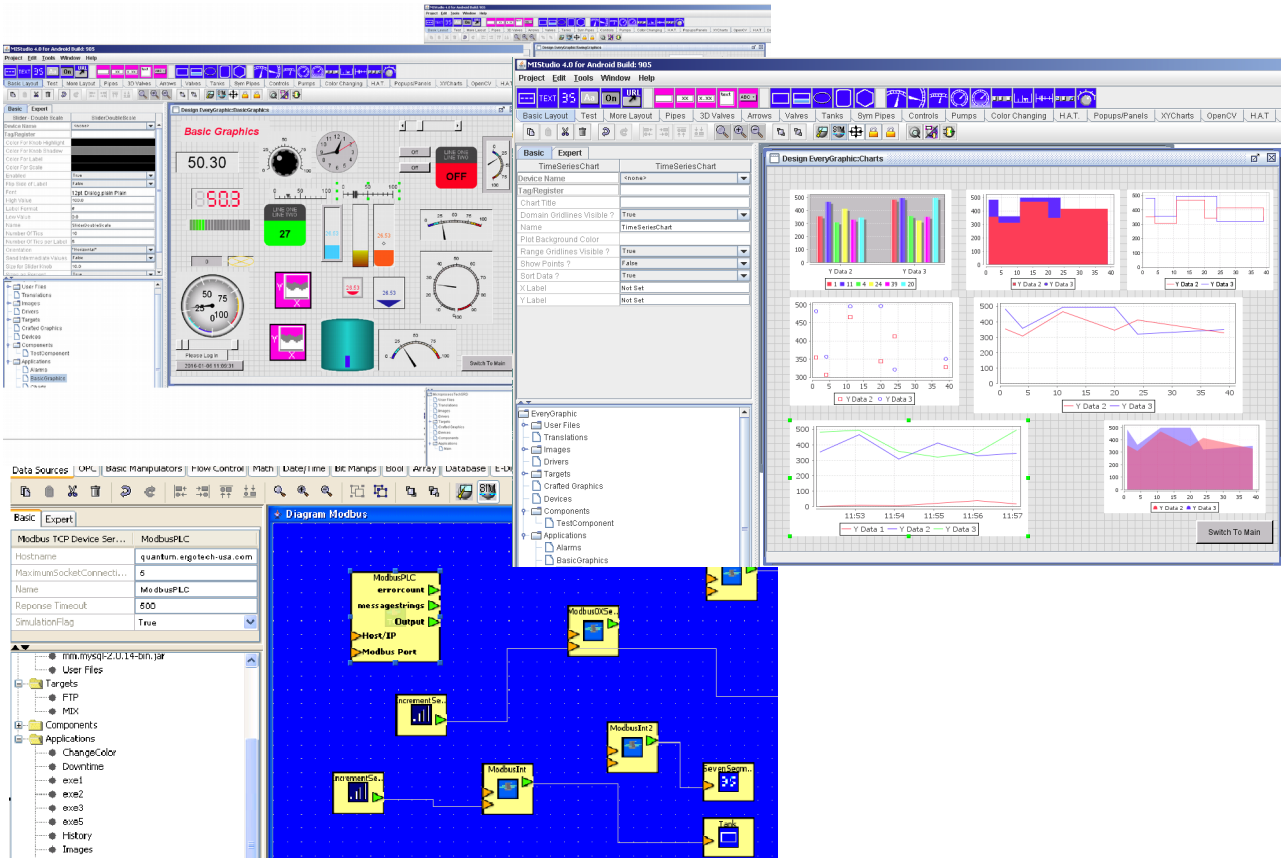
Drag-and-Drop Development

Native programming on Android can be quite complex and expensive, but ErgoTech has pioneered a new class of applications that allow drag-and-drop configuration for Android and Cloud deployment. This allows easy connectivity to PLCs, Database, and more.

No programming is required to build serial or Ethernet connections to any major PLC including Rockwell, Modbus, Siemens, Omron, Mitsubishi, and more.

With support for traditional HMI components including Trending, historical logging, recipes, workflow as well as context-sensitive screens and popups the tools match the flexibility of the platform.

About ErgoTech



MIStudio Drag-and-Drop Builder

ErgoTech has been building solutions for what would now be the “Internet of Things” and the “Cloud” since 1995. Specializing in manufacturing and the semiconductor industry, ErgoTech was providing solutions on tiny embedded platform, including headless 233MHz Pentuim systems and embedded 90MHz Power PC and tiny ARM-based processors as well as the same deployment to large servers, including Sun server clusters in the late 1990s.

ErgoTech supports a great many industry protocols, including support for all major PLCs (Modbus, Rockwell, Mitsubishi, Omron and more) as well as protocols for smart-grid, semiconductor and building automation and IOT protocols (REST, MQTT, etc.). Together with HTML5 graphics and native Android support this makes MIStudio the solution for all IOT, desktop, Cloud and mobile requirements.