

## Wireless Palm Pilot Connection for LabVIEW

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**The Challenge:** Finding a way to make the current status of critical operating parameters in three process plants available to a group of engineers working at and traveling between these plants and their nearby engineering headquarters offices.

**The Solution:** Providing each engineer with a wireless Palm Pilot, equipped with an SES developed graphical user interface application, SesVIEW, to retrieve and display the current plant operating data from specially formatted Web pages. These pages are continuously updated by a LabVIEW process monitoring application operating at each plant.



Figure 1. SES developed an application for the wireless Palm Pilot VII to graphically display data collected by a LabVIEW application running at a remote location.

Workers in process plants and on manufacturing floors are becoming increasingly mobile at the same time that both the complexity and the size of automated process and test systems are dramatically increasing. The quality, quantity, and timeliness of collected data is improving but it is becoming increasingly difficult to get this data to workers where and when they need it.

The first generation solution was to create applications with one-way numeric or text paging, or e-mail notification, which provided either periodic updates or alerts of out-of-limit operation conditions. The primary limitation of this approach was that we could not provide information “on-demand.” Some developers have moved to the second generation, where a plant Supervisory Control and Data Acquisition (SCADA) system maintains a periodically or continuously updated homepage showing current operating conditions on either a local area network (LAN) or, in

some cases, on the Internet. This approach provides data “on-demand” at predetermined locations where system users with the appropriate network access can use a computer terminal to receive the data. The third generation of connectivity involves wireless communication technologies to provide two-way access where and when it is needed.

## **LabVIEW Everywhere**

Wireless connections including wireless modems for laptop computers, PDAs, and more recently wireless LANs are readily available in many facilities and parts of the country. One of the first devices to enter this market was the Palm Pilot VII handheld PDA. This device has a small, low resolution, 153x144 pixel display, 8 MB of memory, and a built-in 14.4 kbps wireless modem. It has a list price of around \$400.

The Palm VII comes with a wireless service called Palm.Net, which provides a limited form of Internet access known as “Web clipping.” Due to the combination of low screen resolution, slow Internet connection, and the fact that Palm VII users pay on a per-transmitted-byte basis, traditional Web browsing is not practical on this device. Instead, Web clipping works by efficiently exchanging information requests and responses between Palm Query Applications (PQAs) running on the Palm Pilot and specially formatted HTML and CGI Web pages. With this approach a user can first request small chunks of data via a wireless Internet connection and then view the graphical display of the results. This is an ideal architecture to provide on-demand, small amounts of real-world data from a SCADA system or other LabVIEW application.

A simple approach for this solution is to have a LabVIEW application simply create a static Web page and then post that HTML page onto the Web. In order to keep the information up to date, the HTML file periodically overwrites old data and replaces it with current data. This is a particularly easy way to provide small amounts of alpha-numeric data to a Palm VII. Graphical data, in the JPEG and GIF file formats, is sent this way, but is slow and relatively costly. One way to greatly improve the speed and reduce the transmission costs associated with handling graphical information on the Palm VII is to embed small graphics libraries into the PQA and then reference these elements using a pointer transferred in the HTML Web page coming from the LabVIEW application.

A much more powerful approach is to create PQAs which can interact with the LabVIEW server using CGI scripting. In this way, the Palm Pilot user is able to formulate a specific information request, such as a specific reading taken at a certain time or on a certain date and then have only that specific information returned. CGI permits two-way communication between the Palm Pilot and the LabVIEW application, which could theoretically permit simple types of remote control. The low bandwidth and fairly high latency, typically on the order of 5-15 seconds of the connection, however, make such a scheme impractical for most types of applications.

An important consideration for any data placed onto a public network is that of data integrity and security. The Palm VII provides both data encryption capabilities for secure transmission as well as tools for server authentication, and client authentication. Additional authentication for sensitive data is also implemented through the use of user names and passwords in the server application. Because the developer has control over both the server application and the PQA, there are a wide variety of methods available for further data encryption if necessary.

## **Simplifying the Process**

The setup of a wireless LabVIEW to Palm Pilot link requires several steps:

- 1) Creating the PQA
- 2) Uploading the PQA to the Palm Pilot Desktop software
- 3) Performing a Palm Pilot ‘Hot Sync’ to move the PQA to the Palm Pilot
- 4) Extracting the provided data from the LabVIEW application
- 5) Creating a PQA-compatible HTML file containing the data
- 6) Moving the created HTML file to an accessible location on the Web

In order to simplify this process, SES created a LabVIEW application to automate steps one through three and some LabVIEW VIs that we can use within our LabVIEW SCADA system software to automate the remaining steps. The result is an easy-to-use toolkit that enables us to quickly add wireless remote monitoring capabilities into almost any

application. In this way, the data collected by today's SCADA systems is provided quickly and easily where and when it is needed.