



What is a PLC?

Programmable Logic Controllers (PLC) continue to evolve as new technologies are added to their capabilities. The PLC started out as a replacement for banks of relays. Gradually, various math and logic manipulation functions were added. Today they are the brains of the vast majority of automation, processes and special machines. PLCs now incorporate smaller cases, faster CPUs, networking and various internet technologies.

You can think of PLC technology as a small industrialized computer that has been highly specialized for reliability in the factory environment. At its core, a PLC looks at digital and analog sensors and switches (inputs), reads its control program, makes mathematical calculations and as a result controls various hardware (outputs) such as valves, lights, relays, servo motors, etc. in a time frame of milliseconds.

While PLCs were very good at quickly controlling automation, they did not share data easily. At best, PLCs would exchange information with operator interfaces (HMI) and Supervisory Control and Data Acquisition (SCADA) software packages on the factory floor. Any data exchange with the Business Level of the company (information services, scheduling, and accounting and analysis systems) had to be collected, converted and relayed through a SCADA package.

Typical of most PLCs, the communication networks were unique to the brand and limited in speed. With the acceptance of Ethernet, communication network speeds have increased but are still sometimes using proprietary protocols.

Trends: More Power, Wider Data Sharing

Overall, PLCs are getting faster, smaller, cheaper and more powerful. As a result, they are gaining capabilities that used to be the exclusive domain of the Personal Computer (PC) and workstation arena. This translates into critical data quickly and cheaply being shared directly between the PLCs on the Factory Floor and the Business Level of the company. These are not your father's PLCs.

Some of the features that a PLC can bring to your automation projects are Web Servers, FTP Servers, sending E-mail and Internal Relational Databases. The following is a brief overview of these features and some of their uses.

Web Server



PLCs can host a Web site on the internet or your company intranet. So what's that going to do for you? How about give you access to Real Time Data and Data Logging for starters. Do you need a backup Human Machine Interface (HMI) for a machine(s) or work cell? How about as a tool for your Maintenance group? Did you know that with some PLCs you can store documentation with the web server that lets you view machine drawings, schematics, maintenance and operator manuals and short video clips? They are all just a mouse click away with your web browser.

Web servers in PLCs are probably the most varied and widely used of the newer technologies. PLC web server capabilities vary depending on the manufacture and model from a single "canned" page to full blown sites using XML and JAVA based technology.

JAVA web servers can provide a high degree of versatility for interacting with a PLC. Three of the JAVA classes of small programs that enhance web server technology are; Applets, Modlets and Servlets. In general terms, the "lets" let you view, manipulate and transfer data faster.

Applets are small JAVA application programs that are sent from the web server to your web browser the first time you open a web page the speed up the data transfer for values.

Modlets are JAVA modules that run independently of the PLC control program for servicing non-process event driven tasks of data handling or updating calculations separate of the PLC control program. Modlets are very useful for parallel processing functions that interact with the PLC database.

Servlets run in the web server after they are requested by your web browser. They are very useful for displaying live data and dynamically creating data log files (CSV).

Send E-mail

A Send E-mail functions automates and simplifies exporting critical and production data out of a PLC. Production data and material usage reports, status changes, alarms,

internal PLC data and maintenance requests can be issued from within a PLC control program. With a little time and imagination you can send your alarm messages to the Maintenance personnel who carry alphanumeric pagers or cell phones.

FTP Server

File Transfer Protocol (FTP) is your tool for easily and quickly moving or copying files in and out of a computer through an TCP/IP ethernet connection. Now it is available in some PLCs. While on the surface it does not sound like a big deal, this handy tool can be a major time saver. Why walk out to the PLC to copy files when you can access it though a network from your desk? How much time would you save by dialing into the Ethernet network the PLC is on (or a stand alone modem/router) if the PLC is in another city, state or country?

Internal Relational Database

One of the most exciting and useful new features that just showed up in the market from SoftPLC Corporation is the “Internal Relational Database” embedded in a PLC. As an internal database it allows crucial data to be accessed in one program scan (milliseconds) rather than having to wait for it from an external source (another computer or PLC) sending the data through a communications port.

This feature opens the door for a whole host of cost savings. For example in a sorting conveyor with a bar code reader, the bar code reader usually connects to a PC. The PC looks up the bar code in the database that it hosts and then sends the resulting information to the PLC. Only then can the PLC use the data to control a diverter, gate or bin. There are usually a minimum of 6 steps to get the information to the PLC.

1. Scan the bar code.
2. Send the data to the PC.
3. PC decodes the bar code.
4. PC looks up the resulting information from the database.
5. Move the data to the PC communications port.
6. Send the information to the PLC across a serial communication connection.
7. Move the data from the PLC communications buffer to the PLC program memory and use it (in some cases).

Using a PLC with an internal relational database reduces this to four steps:

1. Scan the bar code.
2. Send the data to the PLC.
3. PLC decodes the bar code.
4. PLC looks up the resulting information from the internal relational database and use it.

Using a PLC with an internal relational database eliminates the weak link of the communications from the PC to the PLC. A PC will usually perform the database lookup faster than a PLC. However, moving the data from the PC database across a serial network connection (usually limited to 19.2k baud) rate is much slower than a PLC that can retrieve usable data in one scan of the control program.



With this sorting conveyor example the first cost savings is reduced computer hardware by eliminating the PC with the database and the database software. A second savings is realized by eliminating the integration time required to get the PC and the PLC communicating. Another cost savings is from the lack of needing the Information Technology department to continuously maintain, backup and upgrade the PC.

There are many different applications that a PLC with an internal relational database can control in a more cost effective way for both the Integrator as well as the End User. Manufacturing machines and processes that assemble product based on recipes or build multiple products on the same machine are all good candidates for this technology. Also, projects that require setting “environment variables” for configuration of a machine or custom written instructions and drivers as well as fast keyed look ups for control values would find the power of a internal relational database especially useful.

Summary

The technologies discussed are available in as many flavors and options as there are PLC manufactures. This overview only scratches the surface of the ongoing improvements in PLCs. It can't begin to cover all the features and uses available among these four technologies let alone the important related subjects of networking, security and the continuing shift to Open Architecture.

The significance of the technologies is that control system complexity is rapidly being simplified for greater company wide information exchange so there no longer needs to be “islands of automation”.