

War Story

Deployment of File Transfer Protocol (FTP) on robots in the GM plant environment.

Why did you use it?

A typical GM body shop is equipped with 300 to 600 robots. Maintaining control of robot software on the plant floor manually is extremely time consuming and prone to human error. General, as well as individual robot specific program backups have to be maintained for disaster recovery. Production integrity is served by tracking program changes. Distributing improved robot software has often been delayed due to the lack of the manpower and time required to reload a large number of robots.

To deal with the above issues, General Motors has been networking robots for many years, starting with MAP protocols and changing over to FTP over TCP/IP over ethernet.

How are you we using it?

GM requires all body shop robots to be equipped with ethernet hardware and support FTP over TCP/IP. The robots are connected through a plant-wide ethernet network to a server running a Version control application with Upload, Download and Compare capability. Robot programs are uploaded automatically on a scheduled basis or on demand by robot maintenance people. An uploaded program is compared with the previously stored version and, if different, stored as the latest version. Appropriate personnel are notified of all program changes.

What worked, What didn't?

The initial implementation of TCP/IP and Ethernet from some robot suppliers had to be redesigned because it significantly reduced robot performance. Due to the structure of robot files, simple binary file comparisons may indicate changes due to clocks, counters, etc. Due to language and file format differences, intelligent comparisons and change notification require robot vendor / model specific solutions.

Any Benefits?

The implementation of FTP over TCP/IP over ethernet allowed a standardized, relatively low cost connection of robots to the plant network infrastructure. Some benefits of having networked robots include:

- Reduced manual effort to back up robot systems
- Reduced downtime due to human error.

- Disaster recovery capability
- Quick implementation of software updates
- Improved process control by monitoring program changes

What needs to be done?

WEB based client software running on PC based maintenance work stations will reduce the training and skill level required for operation of the UDC system.

Issues?

1. Standardized groups of files for reduced storage (common vs. robot specific files).
2. Robot file structures which separate dynamic variables from static ones to ease UDC comparison configuration.
3. Translation of binary information into text at the robot before upload to eliminate server based robot specific translators which are required for the evaluation of the detected changes.

Suggested Validation?

Verify that files can be uploaded and downloaded and that the robot process cycle time is not effected by file upload operations.