

Variables in Communications Performance

This document is designed to help you think about all the parts of your system when you think about how to achieve the best performance for a data collection, HMI or other system that must talk to PLCs.

Starting at the PLC and working our way to the HMI – not all variables apply to all PLCs and all situations:

- **Nature of the data being moved**
 - How much data is being moved,
 - How often is it needed
 - What data types (i.e. word, bit, array, structures, etc.)
 - Native PLC addresses or Tag names ?
 - Length of tagnames if the pLC is addressed using tag names
 - Global or local tagnames if PLC is addressed using tag names
- **PLC Related**
 - PLC Scan Time
 - % of PLC scan time allotted to communications
 - Number of ports connections available for Ethernet
 - Method of PLC communications
 - Raw speed of communications network – i.e. 10 Mb, 19.2 Kbaud
 - Type of network – point to point, multi-drop, token passing, etc., serial (RS-232/422/485) or Ethernet or proprietary (i.e. DH+, Modbus Plus, etc)
 - Protocol efficiency
- **Network Related**
 - Integrity of the network cable media
 - Network traffic – competition for limited capacity
- **PC Related**
 - Speed of the Network Interface card in the PC (i.e. how fast can it get the data in from the network and hand it over to the PC backplane)
 - Speed of the PC Backplane – how fast can you get the data from the network card to the PC memory and CPU ?
 - Competition between multiple applications on the PC using the network interface
 - Operating System
 - CPU Speed of the computer
 - Amount of memory (RAM) in the computer
 - Resource requirements of other programs running on same PC
 - Programs on the local Machine
 - Client requests from other PC's
- **Protocol specific driver (i.e. OPC Server, DDE server)**
 - Multi-threaded architecture or not



- How the driver is configured – i.e use of groups, group update rates, use of item update rates, write optimization tuning, use of multiple threads, timeout settings, retry settings, etc.
- **Interface from Protocol Specific Driver to Client application –**
 - i.e. DDE, FastDDE, Suitelink, OPC, proprietary
 - Same machine as driver or separate machines
 - Is there intervening software – i.e. OPC Link with InTouch
 - Are there other client applications contending for the use of that same interface in the Protocol specific driver
- **Client Application Related**
 - What is the client application ?
 - Configuration of the driver interface in the client application
 - How many points ?
 - How often ?
 - What types of points ?
 - How does client manage requests and replies from the driver ?
 - Client application configuration
 - What is being done with the data once the client application gets it ?
 - How much is the client application trying to do at one time ?
 - How complex are the client screens (graphics requirements key)?
- **AB ControlLogix Specific Variables**
 - Length of tagnames
 - Global or Local (i.e. Program) Tags
 - Length of program names if using Local/Program tags
 - Arrays or non arrays
 - Structures
 - Number of Structure levels
- **Wonderware InTouch Specific Variables**
 - FastDDE or Suitelink or OPC?
 - Number of Access Names
 - Advise all or Advise Only When Active ?
 - Number of Active Tags in use at any one time
- **Design Best Practices - General**
 - If you don't need the item in the HMI, get rid of it in the TOP server before you run the Tag Import wizard
 - Use Aliases to setup groups of tags with scan rates for each group independent of each other – only scan those tags that need fast updates at a high rate – others slower
- **Design Best Practices – ControlLogix**
 - Plan, plan, plan – oh did I say plan ?
 - Keep tagnames in the PLC short
 - Keep PLC program names short





- Use global tags for communications whenever possible
- Use arrays in the PLC whenever possible
- If you don't need every item of a structure, delete what you don't need after you run the L5K import
- Get rid of items you won't need in the TOP server BEFORE you run the Tag Import Wizard
- If you have more than 400 tags in the TOP server don't launch it from the TOP server. The Quick Client default to automatic project generation when first installed. The OPC Quick Client's auto project generation subscribes to every tag in your tag database and sets a group update rate of 100 ms, which can quickly overwhelm a ControlLogix PLC. Instead Launch the OPC Quick Client from the Start→Programs menu and click Tools→Options then clear the auto generate project check box. You can now open the Quick Client from the TOP Server using the OPC Icon in the future without concern. In the Quick Client you can subscribe to individual tags you want to monitor, control their update rates and read or write to them. In many cases it is a good idea to create groups of tags matching the project you are using in your Client Software for testing purposes. These groups can be deactivated and activated and update rates changed to test specific for testing and simulation.
- With the effect it has on your PLC logic solve time in mind, adjust the CPU time slice in the PLC allotted to communications upwards – linear gains in speed seen going from 10 to 40% -- over 40% improvements taper off – limited to no improvements seen over 60%.
- Make sure your AB PLC firmware is > version 8.2 or higher so that you can use the Multi-item request packet capability.

