

Technical Note

Allen-Bradley ControlLogix Protocol Options

1. Introduction

Allen-Bradley ControlLogix devices offer a variety of protocols. This document provides an overview of each protocol, how and when it is used, and advantages and disadvantages to consider.

The protocol mode determines how ControlLogix tag data is read from the controller. This option should only be changed by advanced users who are looking to increase client / server tag update performance. There are three options: Symbolic mode, Physical Non-Blocking mode, and Physical Blocking mode. A server project is interchangeable across these three modes.

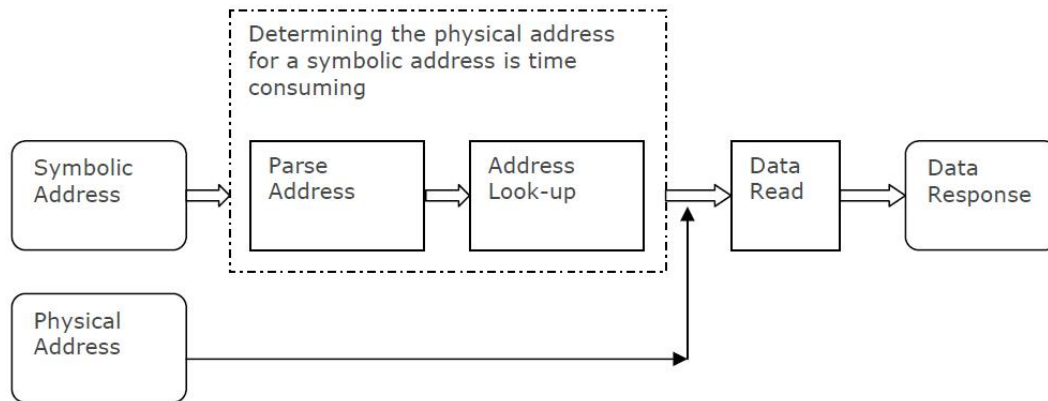
2. Symbolic Mode

Each client / server tag address is represented in the packet by its ASCII character name. Prior to Allen-Bradley ControlLogix Ethernet driver version 4.6.0.xx, the driver used Symbolic mode. Symbolic mode is convenient because all the information needed to make a data request is in the client / server tag address. To take advantage of the Multi-Request Packet optimization, you want as many tags represented in a single packet as possible. Since tag addresses are represented by their ASCII character name in the packet, this implies tag addresses should be made as short as possible. For example, MyTag is preferred over MyVeryLongTagNameThatContains36Chars.

Pros	Cons
<ul style="list-style-type: none">• Low initialization overhead: all information needed lies in client / server tag's address• Only the data being accessed in the client / server tags is requested from the PLC• Backward compatibility	<ul style="list-style-type: none">• High device turn-around time to process symbolic address• Fewer requests per multi-request packet as each request is of variable size

3. Physical Modes

In the physical protocol modes, the physical address in the controller for each client / server tag (member for structures / element for arrays) is retrieved in a controller project upload sequence performed automatically by the driver. For large projects, this upload sequence can be time consuming, but pays off as transactions are processed much faster than its symbolic mode counterpart because the physical modes avoid the address parsing and lookups required by every symbolic request. Physical protocol modes are non-blocking and blocking.



3.1 Physical Non-Blocking Mode

Non-blocking physical mode is identical to symbolic in that all client / server tags are requested individually, utilizing the Multi-Request Packet. In physical mode, however, the client / server tags are specified in the packet with their physical address, not their symbolic address. This is considerably faster than symbolic mode because the device turn-around time is reduced.

Pros	Cons
<ul style="list-style-type: none">• Low device turn-around time to process physical address• Maximum request per Multi-Request Packet since each request is a fixed size• Only the data being accessed in client / server tags is requested from the PLC	<ul style="list-style-type: none">• Initialization overhead uploading project to determine physical addresses

3.2 Physical Blocking Mode

In physical blocking mode, all data for a ControlLogix tag is retrieved in a single request. It takes only one client/server tag to initiate this request. When the data block is received, it is placed in a cache in the driver and time stamped. Subsequent client / server tags that belong to the ControlLogix tag get their data from this cache. When all tags are updated, a new request is initiated if the cache is not old. The cache is old when the current time is greater than (>) cache timestamp plus (+) tag scan rate. If the cache is

old, another block request is made to the device, the cache is refreshed, and the cycle repeats. Blocking is possible because each tag has a base physical address. The data for each client / server tag for the given ControlLogix tag is located at a specific offset from the base address. Each ControlLogix tag (member for structures / element for arrays) has a physical address assigned during the initialization upload sequence. The offset for each client/server tag is the client / server tag physical address - tag base physical address. Physical blocking mode is best when most or all members / elements for a given tag are being referenced by a client. Regardless of how many client/server tags are referencing the ControlLogix tag, the entire contents of the ControlLogix tag is retrieved on every read. Performance may not be optimal if there are not enough client/server tags referencing the ControlLogix tag. Studies have shown that if fewer than one third of tags belonging to a ControlLogix tag are being referenced at any given time, physical blocking should not be used. That scenario is better suited for physical non-blocking mode. Otherwise, physical blocking is preferred.

Pros	Cons
<ul style="list-style-type: none"> • If majority (1/3 or greater) of ControlLogix tags are referenced, faster than Physical Non-Blocking • Low device turn-around time to process physical address • Maximum request per Multi-Request Packet since each request is a fixed size 	<ul style="list-style-type: none"> • Initialization overhead uploading project to determine physical addresses • If minority (1/3 or less) of the ControlLogix tags are referenced, slower than physical non-blocking; more data being accessed from the PLC than referenced in client / server tags