CIP Legacy Table

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Legacy Register Model

- Most devices today still use the older “array of register” data paradigm
- This makes implementing object oriented CIP difficult
- Case in point – Rockwell has not converted SLC5 or PLC5 supply true CIP
- All support the concept of: Read N 16-bit registers from area X starting at the M^{th} register
- CIP doesn’t have a class that supports “range read” in this manner (Groups support GetSingle or GetAll only)

Existing Legacy Option

- Rockwell talks to legacy PLC by defining a “legacy protocol class object” as a vendor-specific object
- Give it a byte string that is a PCCC request, it mystically returns a PCCC response
  - PCCC is application commands in the DF1 manual
  - Problem is it inherits the complexity of DF1 where one needs to know which PLC to select supported commands
- So implementer needs to understand 3 things: 1) CIP plus Ethernet/IP, 2) legacy protocol, and 3) issues introduced by the implement of the legacy object
- This makes for risky interoperability.

Propose a “Legacy Table Object”

- Based on Legacy devices with arrays of same-sized data that can be accessed (read/write) in continuous ranges within the array.
- Creates named tables with of same-sized data and services to read and write these tables in a legacy manner
- Allow users with ONLY CIP+Ethernet/IP knowledge to query any legacy device

Example: MicroLogix 1000

- Default Data Tables:
  - O0, I1, S2, B3, T4, C5, R6, N7
- Which table is identified as parameter within each DF1 protocol command
- These are types like bit, structure, and 16-bit word

Example: Modicon 984 PLC

- Default Data Tables:
  - 0x (1-bit R/W) 1x (1-bit R/O)
  - 3x (16-bit R/W) 4x (16-bit R/O)
- The command identifies the table

Example: Siemens S5

- Default Data Tables:
  - IW, QW, MW, T, and C (plus other notations)
- I don’t really know AS-511, but assume the commands identify the table.

Instance Attributes

- Total number of data elements (0 based)
- Type of each data element (per CIP Spec)
- Size of each data element in bits
- Table Flags (read-only etc)
- Estimated Access Delay (guide for clients – mainly to distinguish “slow” verse “fast” tables)
- Table Name

Instance Services

- LGTAB_GET_RANGE
  - Legacy READ of a block of data starting with N^{th} data element and including M elements
- LGTAB_SET_RANGE
  - Legacy WRITE of a block of data starting with N^{th} data element and including M elements
- LGTAB_BIT_WRITE
  - Need a masked bit write for many protocols

Derived Tables

- Many legacy products provide data in inconvenient forms.
- For example, some Modbus devices supply floating points as 3 x 16-bit words for value, span, and intersect. A CIP Legacy Table of 32-bit floating points could be created to combine these in the CIP server.

Main Benefit

- Enables rapid porting of a legacy device to Ethernet/IP
- Enables standard bridging of Ethernet/IP to legacy serial devices like Modbus/RTU, AB/DF1, etc
- Enables standard bridging of Ethernet/IP to other buses ModbusPlus, Profibus, DH+, etc