ProSoft TECHNOLOGY

Technical Note

Typical Scenario Performance Test

TN01-PLX32EIPMBTCPUA-18
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Document Information

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Contents

1 Overview

1.1 Introduction

This document presents the typical baseline performance test results for the PLX32-EIP-MBTCP-UA with firmware version 1.4.186. The set of tests will evaluate the impact on the module's performance while obtaining reliable EtherNet/IP™ communication connections.

1.2 Hardware Requirements

The following table lists the equipment used in the tests:

Part Number	Qty	Description	Vendor	Application
PLX32-EIP-MBTCP-UA	1	EtherNet/IP to Modbus TCP/IP to OPC UA Gateway	Prosoft Technology, Inc.	Allows data transfer from EtherNet/IP to Modbus TCP/IP to OPC UA Communication Protocol
1756-PA72/A	1	Power Supply	Allen Bradley®	Power supply for ControlLogix
1756-A7	1	7 Slot Chassis	Allen Bradley®	7 Slot Chassis for ControlLogix
1756-L63	1	ControlLogix Processor	Allen Bradley®	Transfers data to/from PLX32-EIP-MBTCP-UA
1756-EN2T/A	1	Ethernet Adapter for ControlLogix	Allen Bradley®	EtherNet/IP Bridge for ControlLogix processor

1.3 Software Requirements

The following table indicates the different software required for the tests performed:

Software	Vendor	Version	Application
PCB	Prosoft Technology, Inc.	4.4.15.0	Configure and monitor the PLX32-EIP-MBTCP-UA
RSLinx Classic	Allen Bradley®	3.80.00 CPR 9 SR 8	Provides access to between RSLogix5000 and processor
RSLogix5000	Allen Bradley®	20.14	Program and monitor processor
UaExpert	OPC Foundation	1.4.4.275	OPCUA client software

1.4 File Reference

The following files are referenced:

File	Application
L63_EIP_to_UAC_v28_1.ACD	Ladder logic used for performance measurements
Performance_Test.ppf	PCB used for performance test
Performance_Test1.ppf	PCB used for performance test
Performance_Test2.ppf	PCB used for performance test
C1_of_c5.uap	UaExpert performance test file
C2_of_c5.uap	UaExpert performance test file
C3_of_c5.uap	UaExpert performance test file
C4_of_c5.uap	UaExpert performance test file
C5_of_c5.uap	UaExpert performance test file
Test_Setup2_c1_of_c10.uap	UaExpert performance test file
Test_Setup2_c2_of_c10.uap	UaExpert performance test file
Test_Setup2_c3_of_c10.uap	UaExpert performance test file
Test_Setup2_c4_of_c10.uap	UaExpert performance test file
Test_Setup2_c5_of_c10.uap	UaExpert performance test file
Test_Setup2_c6_of_c10.uap	UaExpert performance test file
Test_Setup2_c7_of_c10.uap	UaExpert performance test file
Test_Setup2_c8_of_c10.uap	UaExpert performance test file
Test_Setup2_c9_of_c10.uap	UaExpert performance test file
Test_Setup2_c10_of_c10.uap	UaExpert performance test file
Variables-4000-Int16.xml	Importable variables for OPCUA Server
Variables-2000_1-Int16.xml	Importable variables for OPCUA Server
Variables-2000-Int16.xml	Importable variables for OPCUA Server

1.5 Measuring the Performance

The following system is used to measure a skipped incremented data value on the OPC UA Client and the OPC UA Client data deviation.

Using a timer in the ControlLogix processor, a value of the Controller Tag is incremented. That value is copied and transferred to the PLX32-EIP-MBTCP-UA using an EtherNet/IP Class 1 Output Connection, while maintaining no EtherNet/IP connection timeout.

In the PLX32-EIP-MBTCP-UA, the *DATA MAP* feature is used to copy the value to an area in the PLX32-EIP-MBTCP-UA database for the OPC UA Client to read.

The OPC UA Client reads the data from the PLX32-EIP-MBTCP-UA and logs the data to a CSV file. The values are then analyzed for incremented values that are missed by one logging client for one tag, and for OPC UA Client logged data deviation.

This procedure is performed overnight and the following values are obtained from the logged CSV file using OPC UA Client Application (UAExpert):

OPC UA Client Logged Data Deviation (of Publishing Time Interval)
- Maximum Time
- Minimum Time
- Average Time

% of Incremented Values Missed by One Logging Client for One Tag:

This document is intended for typical scenario (defined by Program Management Group) performance test in evaluating the data transfer reliability of the PLX32-EIP-MBTCP-UA.

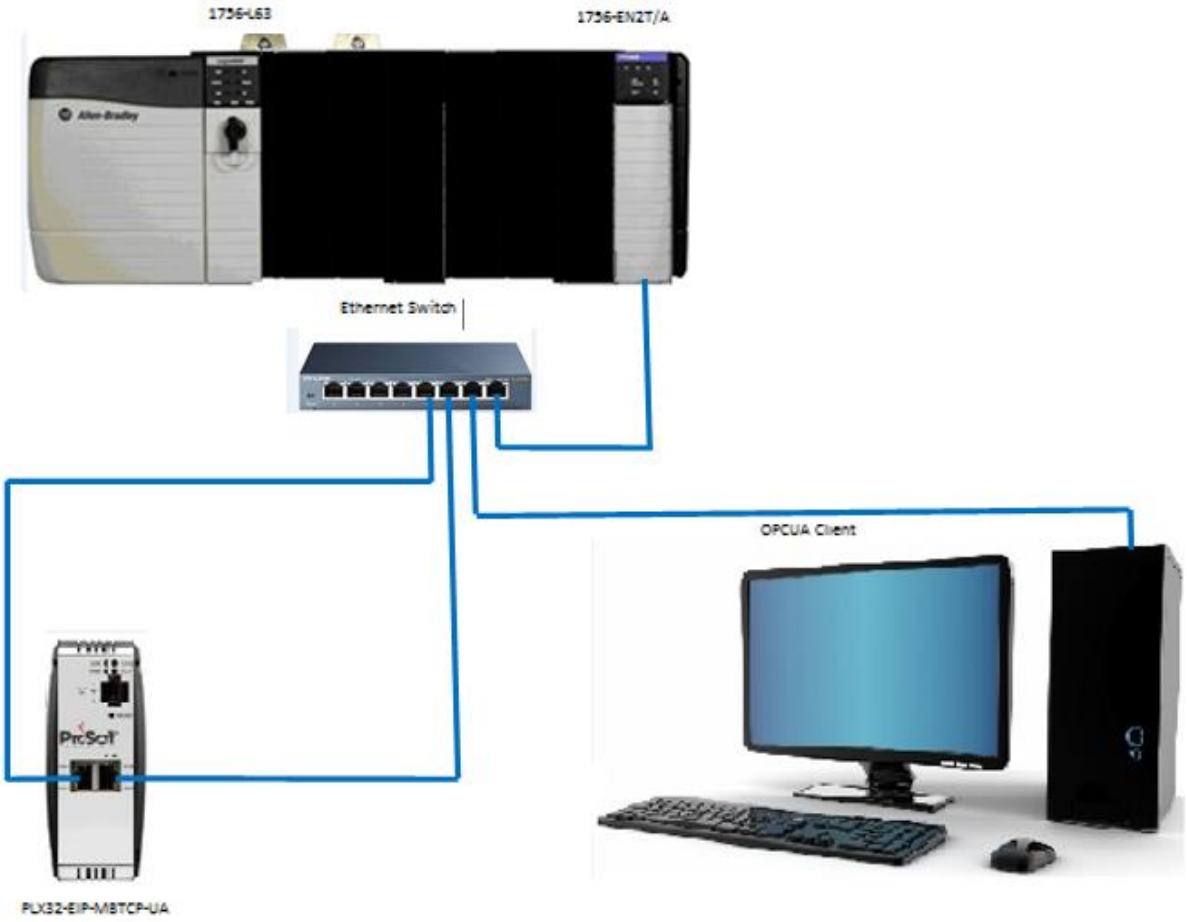
2 Setup

2.1 Typical Test Scenario Setup

2.1.1 Description

The 1756-L63 processor and the 1756-EN2T/A are set up using the *L63_EIP_to_UAC_v28_1.ACD* ladder logic file. This file contains the logic to trigger a value change and copy that data value to an EtherNet/IP output array. The file also monitors the connection timeout of the EtherNet/IP-to-PLX32-EIP-MBTCP-UA connection.

In the test, the ControlLogix processor sends the incremented data value (triggered by the *PLC Data Change Interval* controller tag) to the PLX32-EIP-MBTCP-UA, via the 1756-EN2T/A Ethernet Bridge. The OPC UA Client polls the PLX32-EIP-MBTCP-UA for this data.



The OPC UA Server settings are shown below:

OPC UA Server	MaxRevisedChannelLifetimeInMs	360,000 mS
	MinRevisedChannelLifetimeInMs	60,000 mS
	MaxConnections	12
	MaxChunkCount	1
	MaxMessageChunkSize	32768
	MaxMessageSize	32768
	Quantity of Variables – Int16 type	2000

The OPC UA Client settings are shown below:

OPCUA Client	General.SecureChannelLifetime	300,000 mS
	Stack.SecureConnection_MaxRevisedSecureChannelLifetime	360,000 mS
	Stack.SecureConnection_MinRevisedSecureChannelLifetime	60,000 mS

3 Test Results

The *Results* table displays the parameters and values used during the test.

3.1.1 Results: EIP to OPC UA (MBTCP is disabled)

TEST RESULTS	Skipped/total % of Incremented values missed by one logging client for one tag:			10/29333 = **0.03409%**	1/722 = **0.14%**	0/5913 = **0.0%**	0/5787 = **0.0%**	0/2949 = **0.0%**
	UA Client Logged Data Deviation		MAX sec AVG sec MIN sec	12.502 5.002 0.966	8.785 5.004 3.000	11.009 10.000 8.992	12.411 10.001 7.836	5.135 5.000 4.863
Protocol		Configuration Parameter	Default Settings	Test Setting 1	Test Setting 2	Test Setting 3	Test Setting 4	Test Setting 5
UA	Server	MaxRevisedChannelLifetimeInMs	360,000 mS	-//-	-//-	-//-	-//-	-//-
		MinRevisedChannelLifetimeInMs	60,000 mS	-//-	-//-	-//-	-//-	-//-
		MaxConnections	12	-//-	-//-	-//-	-//-	-//-
		MaxChunkCount	1	-//-	-//-	-//-	-//-	-//-
		MaxMessageChunkSize	32768	-//-	-//-	-//-	-//-	-//-
		MaxMessageSize	32768	-//-	-//-	-//-	-//-	-//-
		Quantity of Variables – Int16 type	2000	-//-	-//-	-//-	-//-	-//-
	Clients	General.SecureChannelLifetime	300,000 mS	-//-	-//-	-//-	-//-	-//-
		Stack.SecureConnection_Max RevisedSecureChannelLifetime	360,000 mS	-//-	-//-	-//-	-//-	-//-
		Stack.SecureConnection_Min RevisedSecureChannelLifetime	60,000 mS	-//-	-//-	-//-	-//-	-//-
		DaPlugin.SamplingInterval.Default	Will vary	1000 mS	1500 mS	1000 mS	700 mS	100 mS
		DaPlugin.PublishingInterval.Default	Will vary	1000 mS	1500 mS	1000 mS	700 mS	100 mS
		Client 1 – monitoring tags	0 to 399	0 to 99	-//-	-//-	0 to 99	0 to 99
		Client 2 – monitoring tags	400 to 799	400 to 499	-//-	-//-	400 to 499	Not connected
		Client 3 – monitoring tags	800 to 1199	800 to 0899	-//-	-//-	0800 to 0899	Not connected
		Client 4 – monitoring tags	1200 to 1599	1200 to 1299	-//-	-//-	1200 to 1299	Not connected
		Client 5 – monitoring tags	1600 to 1999	1600 to 1699	-//-	-//-	1600 to 1699	Not connected
		Client 6 – monitoring tags	2000 to 2399	Not connected	-//-	-//-	2000 to 2099	Not connected
		Client 7 – monitoring tags	2400 to 2799	Not connected	-//-	-//-	2400 to 2499	Not connected
		Client 8 – monitoring tags	2800 to 3199	Not connected	-//-	-//-	2800 to 2899	Not connected
		Client 9 – monitoring tags	3200 to 3599	Not connected	-//-	-//-	3200 to 3299	Not connected
		Client 10 – monitoring tags	3600 to 3999	Not connected	-//-	-//-	3600 to 3699	Not connected

(continued)

EIP	PLC Data Change interval.	5 sec	-//-	-//-	10 sec	10 sec	5 sec
	PLC reads	0 to 999	-//-	-//-	-//-	0 to 1999	0 to 249
	PLC writes	1000 to 1999	-//-	-//-	-//-	2000 to 3999	250 to 500
	RPI setting Jitter measurement… MIN, AVG MAX	100 mS	-//-	-//-	-//-	660 mS	10
	Connections (with maximum I/O count)	4	-//-	-//-	-//-	8	1
Data Map	In PCB, 10 Data Map is configured	10 commands, 100 words each , 0 delay.	-//-	-//-	-//-	-//-	-//-
MBTCP		DISABLED	-//-	-//-	-//-	-//-	-//-

3.1.2 Results: MBTCP to OPC UA. EIP is disabled.

TEST RESULTS		Skipped/total % of Incremented values missed by one logging client for one tag:		0/31860 = 0.000%	0/2492 = 0.000%
		UA Client Logged Data Deviation	MAX sec AVG sec MIN sec	7.667 5.000 2.945	8.989 5.000 1.875
Protocol		Configuration Parameter	Default Settings	Test Setting 1	Test Setting 2
UA	Server	MaxRevisedChannelLifetimeInMs	360,000 mS	-//-	-//-
		MinRevisedChannelLifetimeInMs	60,000 mS	-//-	-//-
		MaxConnections	12	-//-	-//-
		MaxChunkCount	1	-//-	-//-
		MaxMessageChunkSize	32768	-//-	-//-
		MaxMessageSize	32768	-//-	-//-
		Quantity of Variables – Int16 type	4000	-//-	-//-
	Clients	General.SecureChannelLifetime	300,000 mS	-//-	-//-
		Stack.SecureConnection_MaxRevisedSecureChannel Lifetime	360,000 mS	-//-	-//-
		Stack.SecureConnection_MinRevisedSecureChannel Lifetime	60,000 mS	-//-	-//-
		DaPlugin.SamplingInterval.Default	Will vary	1,000 mS	1,000 mS
		DaPlugin.PublishingInterval.Default	Will vary	1,000 mS	1,000 mS
		Client 1 – potential range for monitoring tags	0 to 799	0 + 100	0 + 500
		Client 2 – potential range for monitoring tags	800 to 1599	800 + 100	800 + 500
		Client 3 – potential range for monitoring tags	1600 to 2399	1600 + 100	1600 + 500
		Client 4 – potential range for monitoring tags	2400 to 3199	2400 + 100	2400 + 500
		Client 5 – potential range for monitoring tags	3200 to 3999	3200 + 100	3200 + 500
EIP	DISABLED			-//-	-//-
Data Map	In PCB, 10 Data Map is configured		10 commands, 100 words each , 0 delay.	-//-	-//-
MBTCP	4 Clients. 10 read commands. 100 words each.		Poll = 100 mS	-//-	-//-

3.1.3 Summary

Using PLX32-EIP-MBTCP-UA OPC UA Server default parameters, successful data transfers from the indicated protocols to the UA Clients were produced.

A tag value was monitored for a missed/skipped value increment. If all expected incremented values were recorded, then there were 0% errors in data transfer to the OPC UA Client. The following parameters produced 100% successful data transfer for one recorded tag/variable.

Data transfer from EIP to OPC UA Clients. MBTCP was disabled.

High OPC UA Client count and high number of EIP connections:

EIP settings:
Data change rate = 10 seconds
EIP Connections = 8
RPI = 660 mS for each connection

OPC UA Client settings:
Clients = 10
Variables = 100 / Client
Sampling rate = 700 mS in all clients
Publishing rate = 700 mS in all clients

MAXimum	12.411 Seconds
AVeraGe	10.001 Seconds
MINimum	07.836 Seconds

Low OPC UA Client count and low number of EIP connections:

EIP settings:
Data change rate = 5 seconds
EIP Connections = 1
RPI = 10 mS

OPC UA Client settings:
Clients = 1
Variables = 100
Sampling rate = 100 mS
Publishing rate = 100 mS

MAXimum	5.135 Seconds
AVeraGe	5.000 Seconds
MINimum	4.863Seconds

Data transfer from MBTCP to OPC UA Clients (EIP disabled)

MBTCP settings:
Data change rate = 5 seconds
Polling rate = 100 mS
Client 0: 10 commands, read 100 words
Client 1: 10 commands, read 100 words
Client 2: 10 commands, read 100 words
Client 3: 10 commands, read 100 words

OPC UA Client settings:
Clients = 5
Variables = 500 / Client
Sampling rate = 1000 mS in all clients
Publishing rate = 1000 mS in all clients

MAXimum	8.989 Seconds
AVeraGe	5.000 Seconds
MINimum	1.875 Seconds

Important note about the MIN, AVG and MAX results: The closer the MAX result gets to 2 x AVG result value, the higher the probability rises that the next incremented value will be missed or skipped by the UA Client.

These settings produced 100% successful data transfers from MBTCP to 5 UA Clients.