



OSIsoft Substation Data Access Solutions

Substation Explorer
& OSIsoft PI

- ❑ Introductions
- ❑ Substation Data Gathering Interface Options
- ❑ What is OPC
- ❑ Substation OPC Server Interface
- ❑ Utility Implementation
- ❑ Summary



SUBNET Solutions Inc. Introductions

www.subnetsolutions.com

hamdon@subnetsolutions.com

Presenter Bio

Ameen Hamdon, P.Eng.

- ❑ President of SUBNET Solutions Inc. (SUBNET)
- ❑ Also the President of the DNP3 Users Group
 - a forum for the users and implementers of the DNP3 protocol responsible for the management and evolution of the protocol.
- ❑ Received B.SC in Electrical Engineering from the University of Alberta
- ❑ Began career in the electric utility industry working for Alberta Power Limited (ATCO Electric)
 - Generation Engineering
 - Load Research
 - Transmission Engineering
 - SCADA Telecontrol Engineer.



SUBNET Solutions Inc.

05 64 C4 FF FF 64 00 E3 9C C0 C0 02 32 01 07 01 DC AC CR

- ❑ Headquarters: Calgary, Alberta
- ❑ In business 10+ years
- ❑ Privately Owned
- ❑ SUBNET Merger March, 2000

- ❑ OSIsoft DATA Partner

- ❑ Ranked 29th in 2001 Canadian Fast50
- ❑ Ranked 319th in North American Fast500

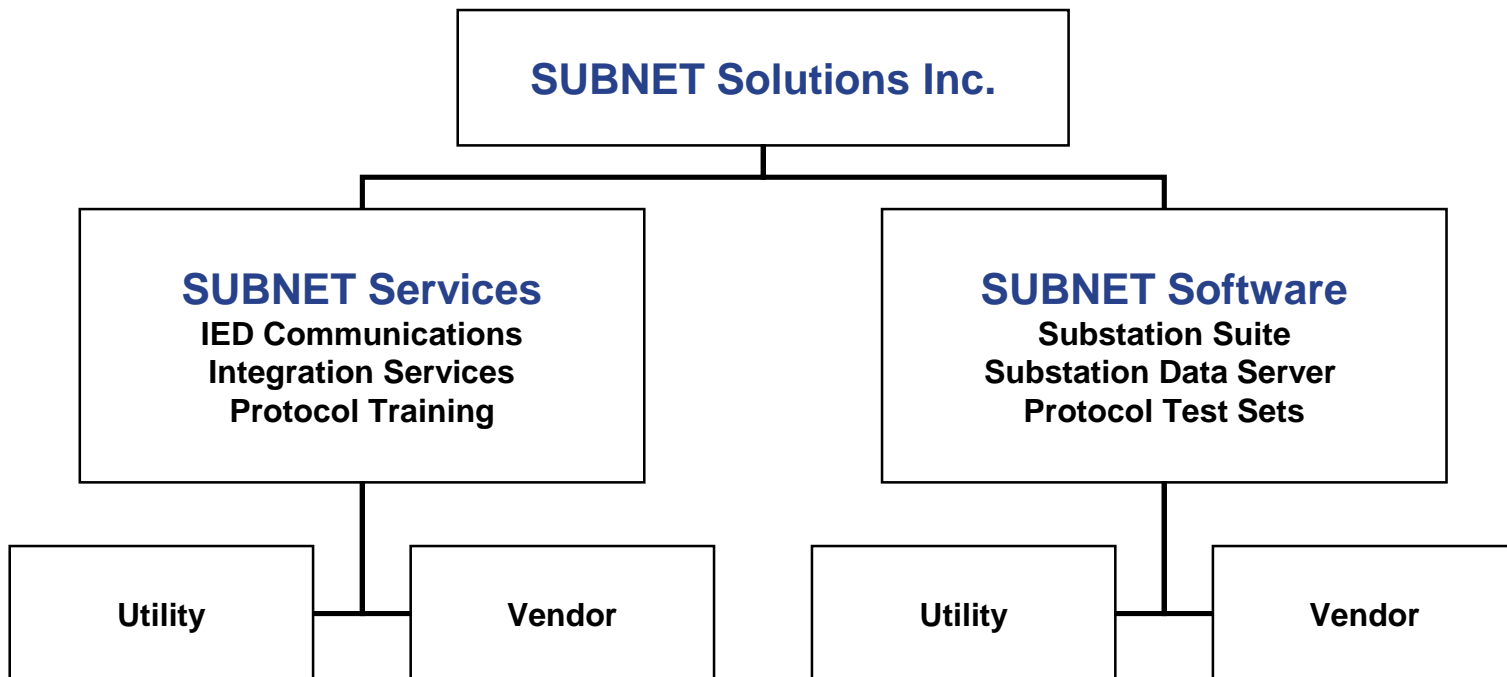
- ❑ Collaboration with ASE



PROTOCOL TECHNOLOGIES INC

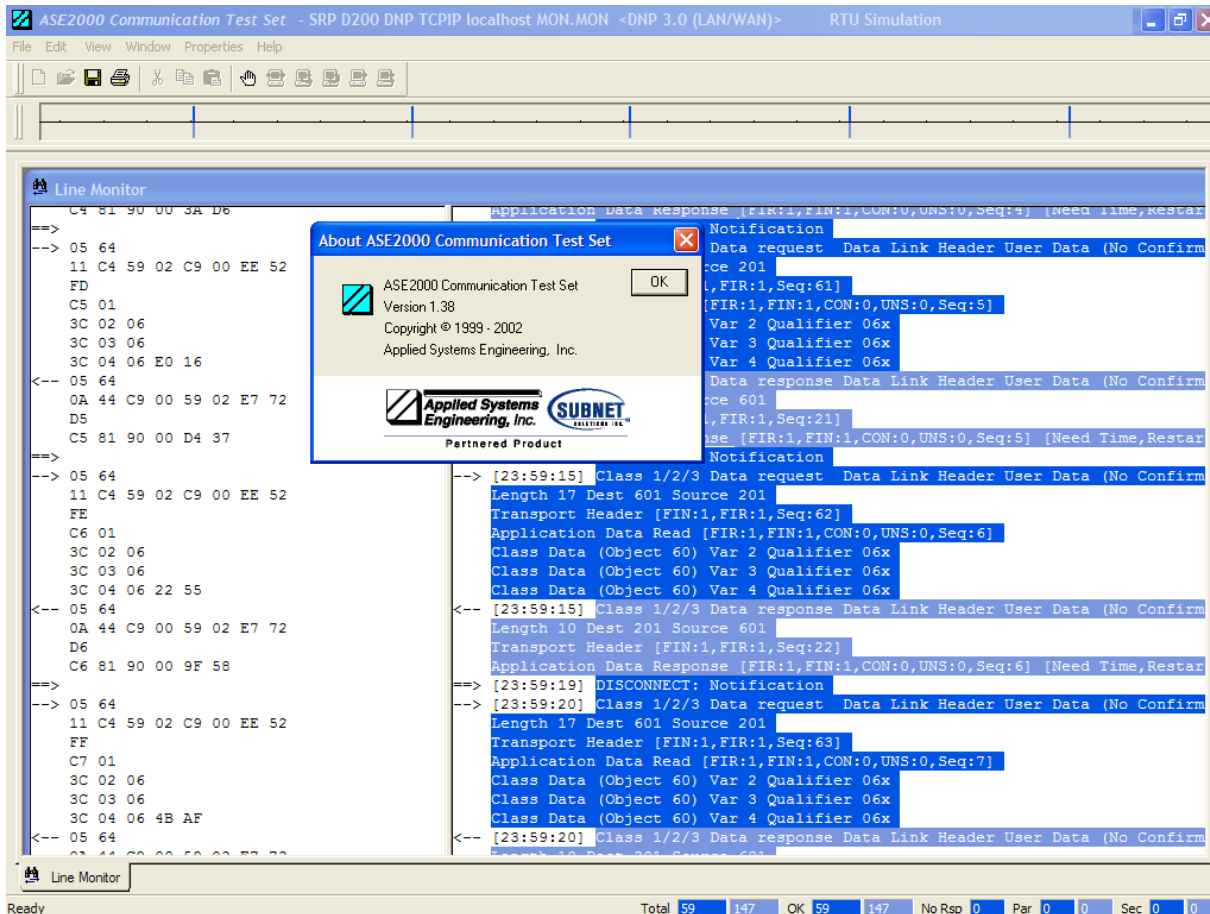


We are a
Substation Data Communications Company



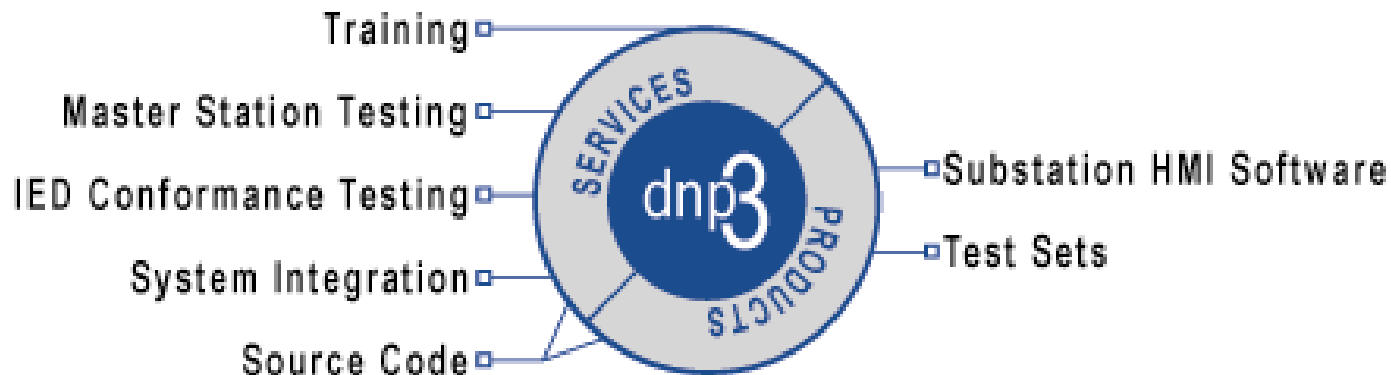
- ❑ Protocol Training
 - Trained 300+ Utilities and 50 Vendors on DNP3 and other protocols
- ❑ Digital Substation System Integration services
 - IED communications & configuration
 - Substation communications and networking
- ❑ DNP Conformance Testing
- ❑ SUBNET Software related services
 - Protocol Test Set Training
 - Substation Suite services

- ❑ Windows Based
 - ASE2000
 - PTI Plus
- ❑ Support for over 40 SCADA Protocols
 - Master Emulation
 - Slave Emulation
 - Monitor Mode
- ❑ Used by over
 - 300+ Utilities
 - 75+ vendors



Anything and Everything DNP Products and Services

- ❑ SUBNET is also known as the leader in Distributed Network Protocol (DNP)
- ❑ Worked with the protocol since its inception
- ❑ SUBNET actively involved with DNP3 User Group
 - Executive Committee
 - Technical Committee
- ❑ SUBNET offers many products and services to assist utilities and vendors who are utilizing DNP3 protocol communications



Solutions for Gathering Data and Events

05 64 C4 FF FF 64 00 E3 9C C0 C0 02 32 01 07 01 DC AC CB



□ Substation Suite

- Substation Explorer – Substation HMI
- Substation Communicator – Substation virtual Port Switch
- Substation Network Monitor – Network based protocol analyzer

□ SUBNET Data Server/OPC Drivers

- Ole for Process Control
- SQL, OleDb, XML
 - (Upcoming .net release)



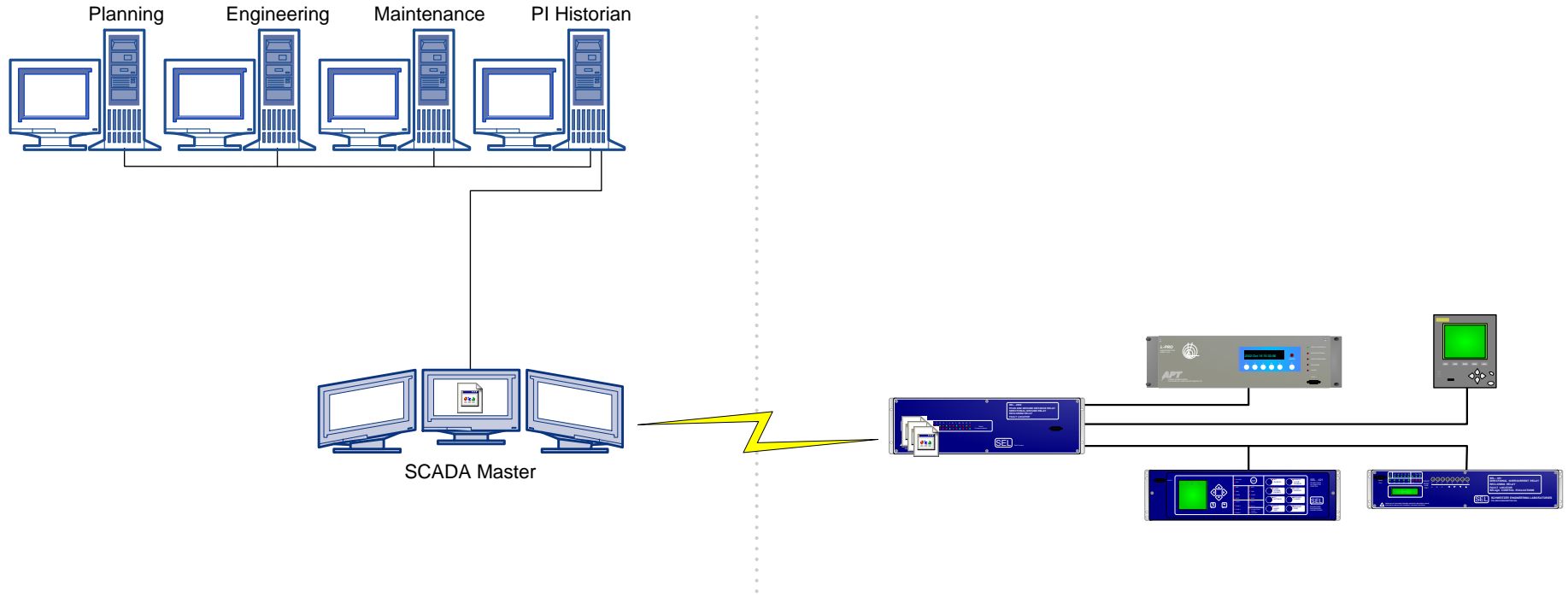


Current Substation Data Gathering Interfaces

Typical SCADA/PI Interface

05 64 C4 FF FF 64 00 E3 9C C0 C0 02 32 01 07 01 DC AC CB

Less than 10% of Substation Data Available

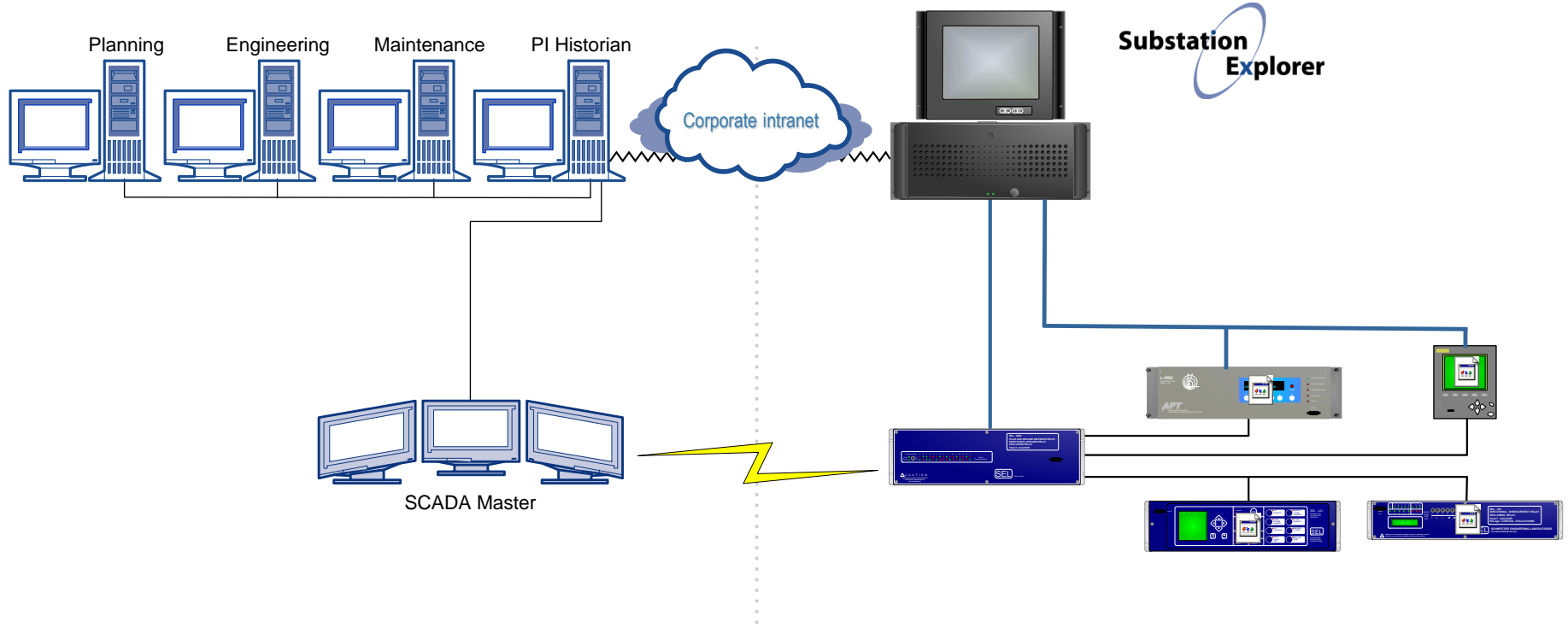


- ❑ SCADA Data represent less than 10% of available
- ❑ Bringing data back for others burdens SCADA/EMS with Non-SCADA data
- ❑ Gathering Data this way means
 - Reconfiguring RTUs or Comm Processors
 - SCADA/EMS Database Modification
 - SCADA/EMS to PI Data Exchange Modification
- ❑ Planning, Engineering, Maintenance, etc still need access to Non-SCADA data

- ❑ SUBNET has developed solutions that
 - enables **real-time** substation IED data to be interfaced directly with electric utilities' OSIsoft PI Historian
 - solution is independent of SCADA/EMS
 - provides access to any/all Substation IED Data
 - Substation Explorer also provide Substation HMI
 - Single Lines for Local Substation Control
 - Digital Alarm Annunciator, etc
 - **Configurable HMI** versus **Programmable**
- ❑ These solutions utilize
 - OSIsoft's PI - OPCINT Interface
 - SUBNET's Substation Explorer OPC Server
 - SUBNET's Substation Data Server (.net) *release soon

SCADA/PI Interface with Substation Explorer

100% of Substation Data Available





What is OPC

□ What is OPC

- OPC = OLE for Process Control
- OLE = Object Linking and Embedding
- Standards based infrastructure for exchanging process control data (higher performance OLE)
- Allows any OPC enabled device talk to any other
 - OPC Servers broadcast data
 - OPC Clients retrieve data, but can also write back to the Server

□ Benefits of OPC

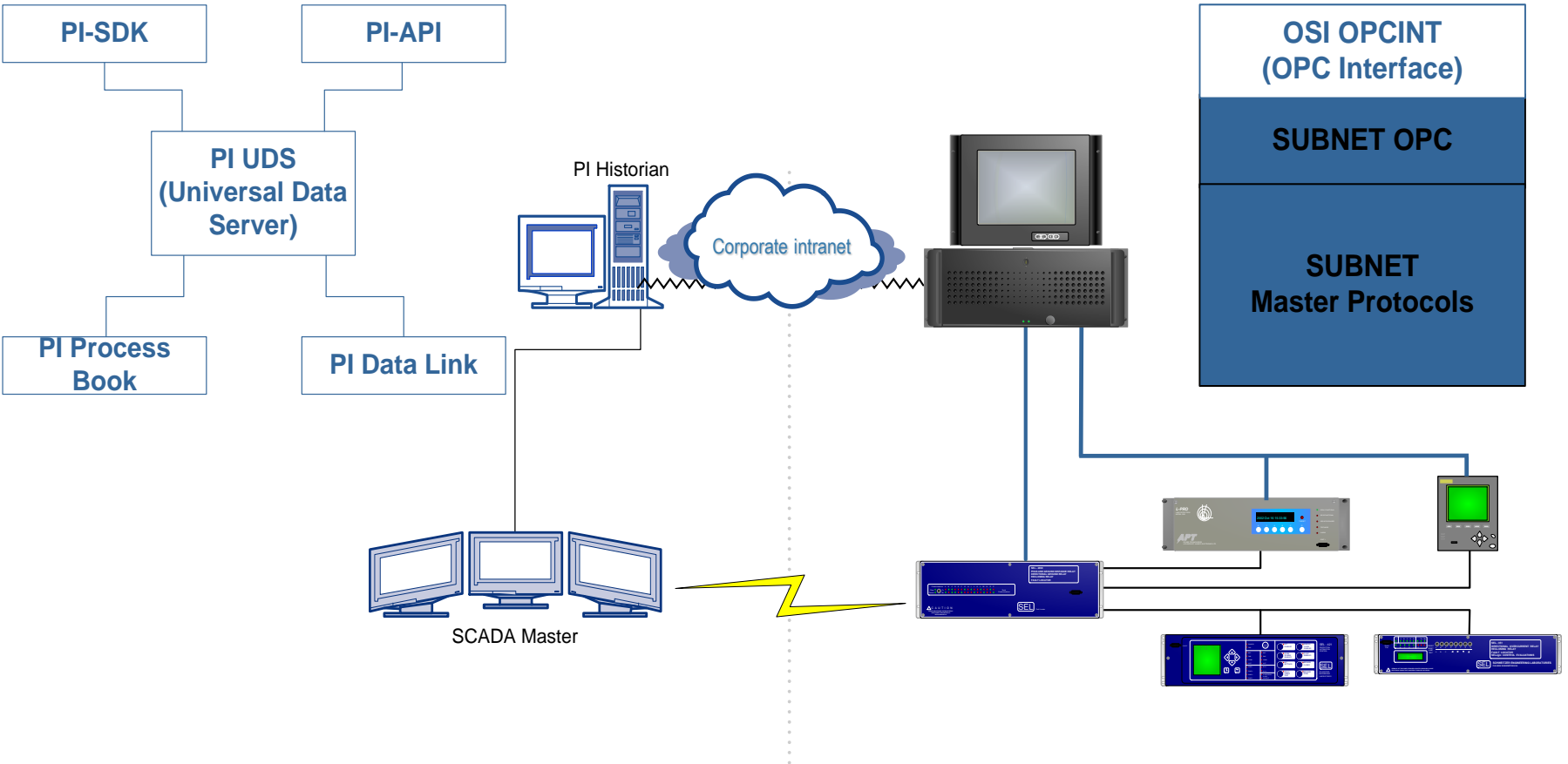
- Easy to implement
- Saves every system from writing multiple drivers
- Open standards require less development time and capital
 - Implementation is faster and cheaper
- Proven reliability, and constant incremental improvement
 - Vendors and clients contribute equally to the development process
- Adding to new OPC enabled devices to the system is painless
 - Any OPC client on a network can immediately see and request data from all available OPC servers.
- Evolving Standard
 - OPC XML, OPC HDA, other standards

- ❑ Both SUBNET and OSIssoft have developed
 - OPC Server
 - OPC Client
- ❑ Allows for bi-directional data transfer
- ❑ Paper will focus on
 - SUBNET OPC Server to
 - OSIssoft OPC Client



Substation OPC Server Interface

SCADA/PI Interface with Substation Explorer



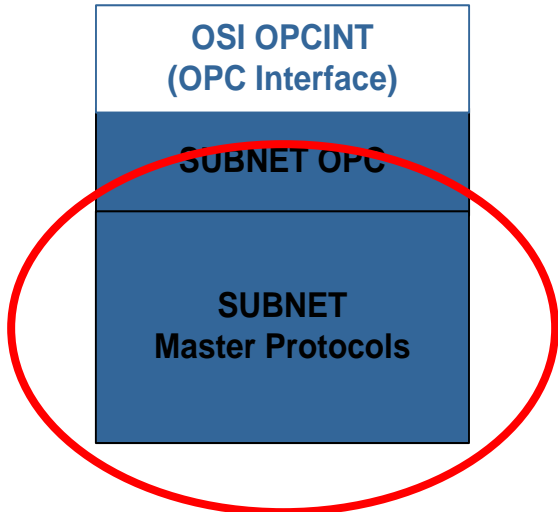
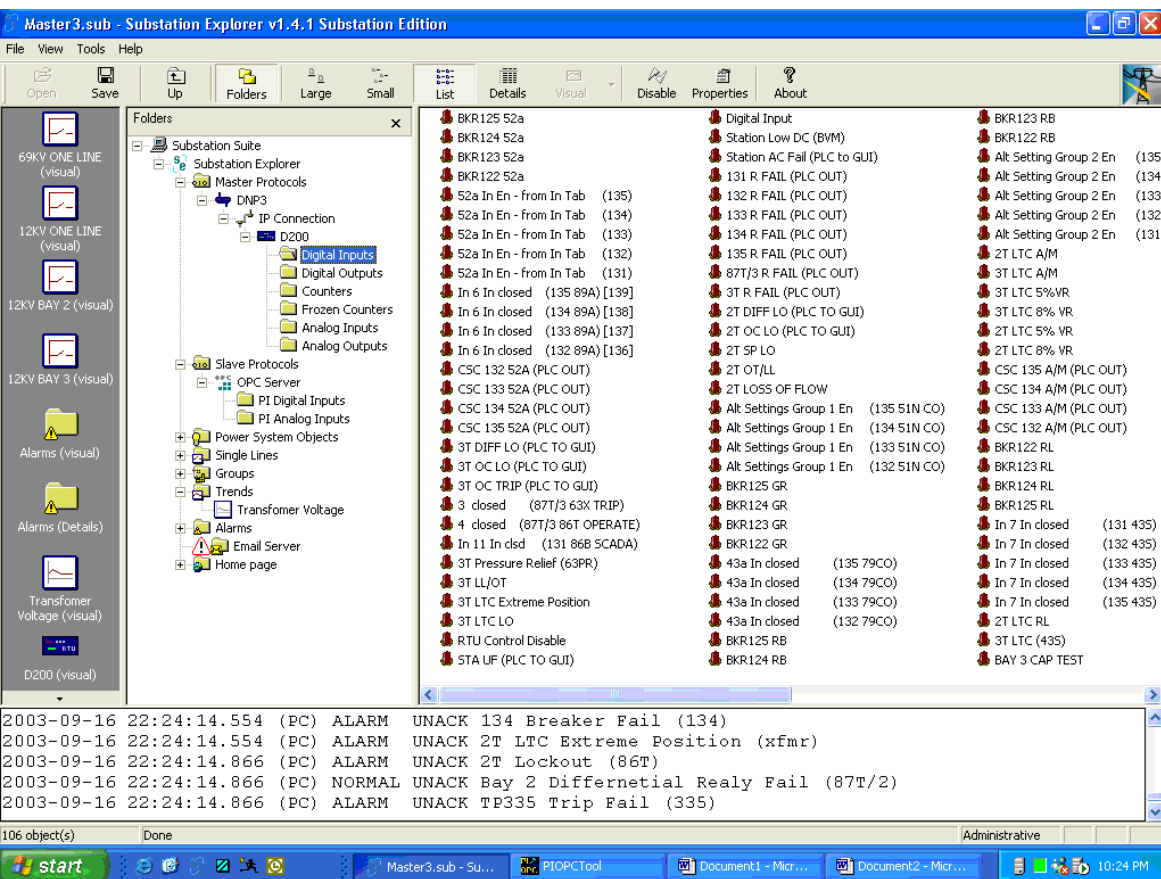
- ❑ Creating a data flow between physical data, Substation Explorer, and the PI UDS is a simple process:
 1. Collect IED Data via Master Protocols
 - DNP, Modbus, Telegyr 8979, or even OPC.
 2. Configure SUBNET OPC Server
 - Exposes the data points to the OPC Clients
 - Simple drag and drop process
 3. Configure OSIsoft OPC Client
 - Configure logging characteristics for the received points in the PI OPC Client.

1. Collect IED Data via Master Protocols



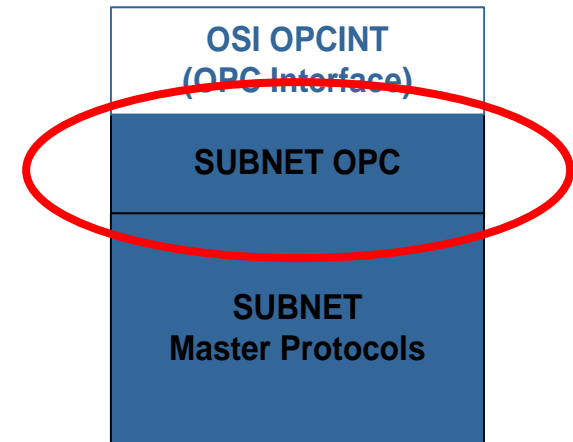
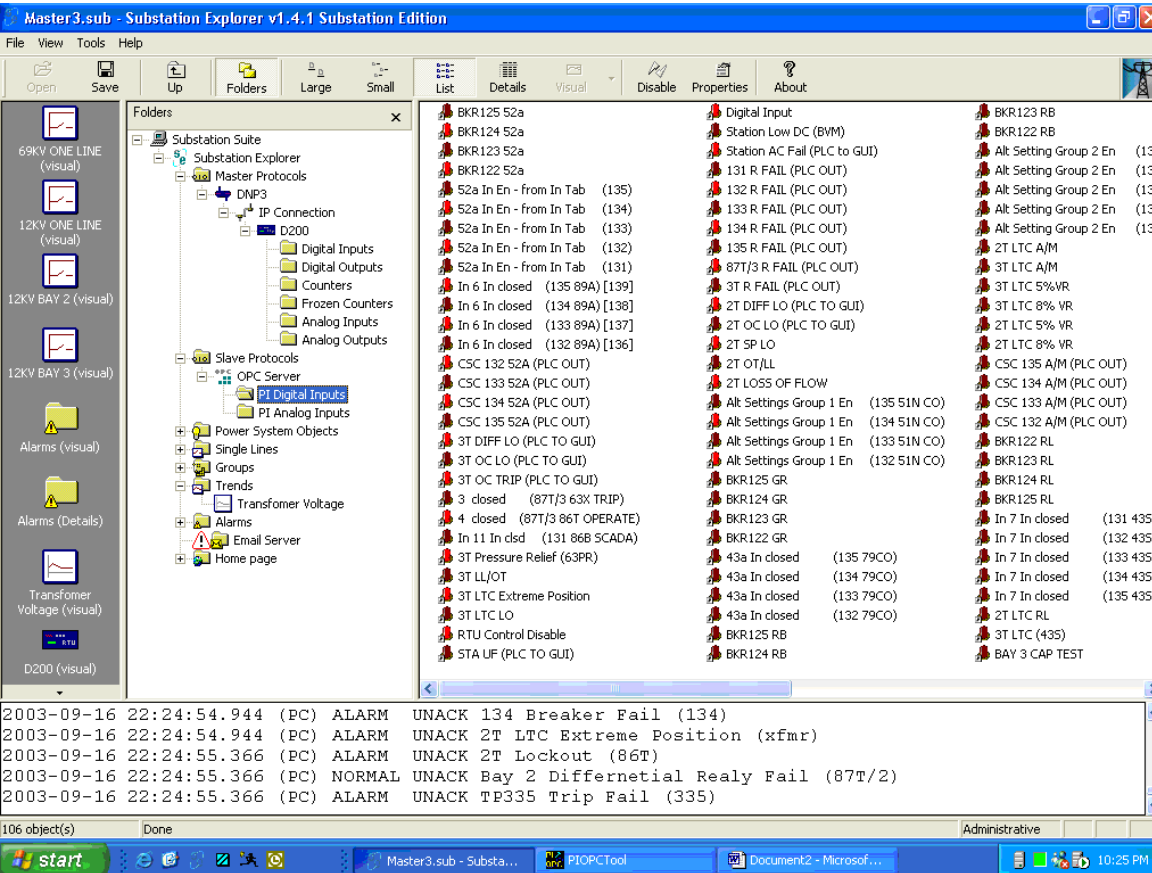
05 64 C4 FF FF 64 00 E3 9C C0 C0 02 32 01 07 01 DC AC CB

- ❑ Collect all Substation IED data
- ❑ Software acts as Protocol Master
- ❑ DNP, Modbus, SELFM, IEC, etc

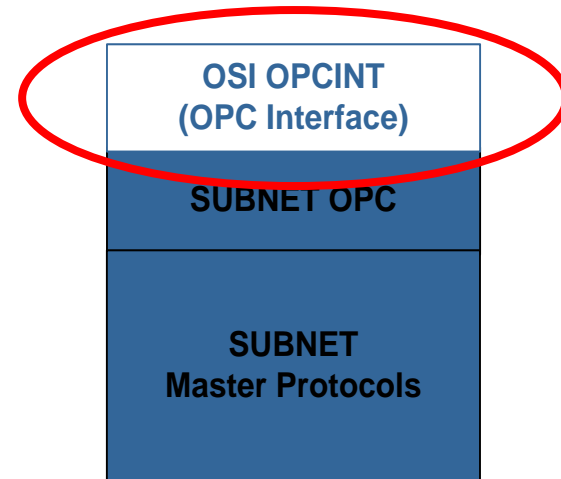
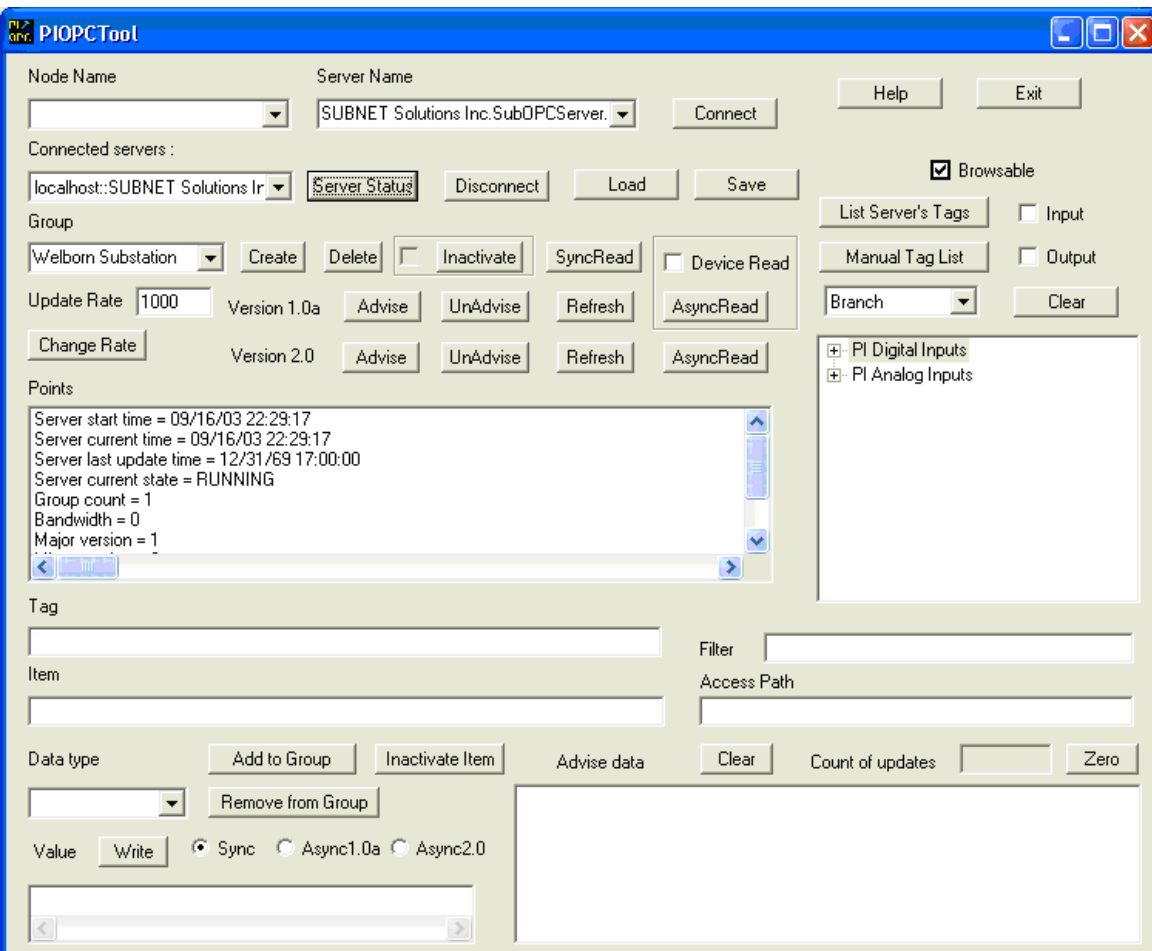


2. Configure SUBNET OPC Server

- Drag and Drop Configuration of Data to expose via SUBNET OPC Server



- OSIsoft PI OPCINT module is also installed on Substation PC
- Accesses SUBNET OPC data



3. Configure OSIsoft OPC Client



05 64 C4 FF FF 64 00 E3 9C C0 C0 02 32 01 07 01 DC AC CB

- ❑ Samples/Buffers data for input to Central PI Server
- ❑ Could also have small PI on Substation PC
- ❑ PI OPC Tool can be used to monitor data sent from the SUBNET Solutions OPC server to the PI Historian.
 - Data Quality

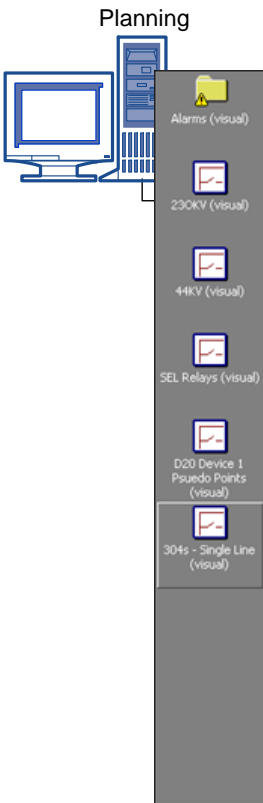
The screenshot shows the PIOPCTool interface with the following details:

- Node Name:** [Empty]
- Server Name:** SUBNET Solutions Inc.SubOPCServer
- Connected servers:** localhost::SUBNET Solutions Inc
- Group:** Welborn Substation
- Update Rate:** 1000
- Points Table:**

##	RW	Tag	Value	Type
00	##	Welborn Substation.BKR125 52a		VT_R8
01	##	Welborn Substation.BKR124 52a		VT_R8
02	##	Welborn Substation.BKR123 52a		VT_R8
03	##	Welborn Substation.BKR122 52a		VT_R8
04	##	Welborn Substation.52a In En -		VT_R8
- Tag:** Welborn Substation.52a In En - from In Tab (135)
- Item:** OPC Server\PI Digital Inputs\52a In En - from In Tab (135)
- Data type:** Boolean (BOOL)
- Value:** Write, Sync selected
- Count of updates:** 14
- Bottom Table:**

##	Tag	Value
00	Welborn Substation.BKR125 52a	0.000000
01	Welborn Substation.BKR124 52a	1.000000
02	Welborn Substation.BKR123 52a	0.000000
03	Welborn Substation.BKR122 52a	1.000000
04	Welborn Substation.52a In En -	0.000000

Other Substation Explorer Capabilities



Substation Explorer v1.3.69 Substation Edition

Address: MegaWatt Hours

Folders:

- Substation Suite
 - Substation Explorer
 - Master Protocols
 - DNP3
 - COM1
 - Imported DNP Device
 - Digital Inputs
 - Digital Outputs
 - Counters
 - Frozen Counters
 - Analog Inputs
 - Analog Outputs
 - IP Connection
 - Modbus
 - Telegyr 8979
 - Slave Protocols
 - Power System Objects
 - Single Lines
 - Groups
 - Trends
 - Bus Overview
 - Alarms
 - Email Server
 - Home page

MegaWatt Hours Graph:

Y-axis: -1000 to 1000
X-axis: 11:23:50 to 11:24:05

Legend:

- Main Bus Voltage (Red line with diamond markers)
- Aux Bus Voltage (Green line with square markers)
- Aux2 Bus Voltage (Blue line with circle markers)

Log Window:

2002-10-29	14:37:48.437	(PT)	ALARM	UNACK	B4V TRIP
2002-10-29	14:37:48.437	(PT)	ALARM	UNACK	D6V TRIP
2002-10-29	14:37:48.437	(PT)	ALARM	UNACK	E9V TRIP
2002-10-29	14:37:48.437	(PT)	ALARM	UNACK	D7V TRIP
2002-10-29	14:37:48.437	(PT)	ALARM	UNACK	B5V TRIP
2003-04-04	11:21:26.200	(PC)	ALARM	UNACK	C1 LTC MAX RAISE POSITION
2003-04-04	11:21:31.200	(PC)	NORMAL	UNACK	C1 LOW N BOTTLE PRESSURE (63/N20)
2003-04-04	11:21:31.200	(PC)	NORMAL	UNACK	C1 HI TANK PRESSURE (63/H)
2003-04-04	11:21:31.200	(PC)	NORMAL	UNACK	C1 HI HV HOT SPOT TEMP (26/H2)
2003-04-04	11:21:31.340	(PC)	NORMAL	UNACK	C1 LTC MAX RAISE POSITION



Utility Implementations

GTC UCA2 EPRI
Pilot Project

GTC- Yellow Dirt Substation UCA Demonstration Project

- ❑ Substation includes 3 SEL2030
 - Includes 2701 talking UCA2
- ❑ Substation Explorer communicating to SEL2030 via SISCO OPC UCA2 driver
- ❑ Substation Explorer also polling many IEDs via DNP3
- ❑ Substation Explorer connection to using OSIsoft OPCINT Client part of demonstration project
- ❑ Refer to Visio Diagram, [Yellow Dirt Diagram](#)
- ❑ Several other Substation Explorer Utilities to implement



- ❑ Substation Explorer can handle all your HMI needs
- ❑ PI Historian allows you to log data when you need it, in the format you want it
- ❑ These two programs will work together out of the box, using OPC intuitively and reliably
- ❑ The end result is a simple and elegant data retrieval, control, management, and analysis scheme.





Discussion



Contact Info

05 64 C4 FF FF 64 00 E3 9C C0 C0 02 32 01 07 01 DC AC CB

- ❑ SUBNET Solutions Inc.
- ❑ 303, 1220 Kensington Road NW
- ❑ Calgary, Alberta
- ❑ T2N 3P5

- ❑ Phone (403) 270-8885
- ❑ Fax (403) 270-9631
- ❑ Web www.subnetsolutions.com
- ❑ Email hamdon@subnetsolutions.com

- ❑ Configuring logging characteristics for a received OPC object
 - Tag all input data points as OPC points in the PI OPC Server.
 - Define point tags in the PI Database
 - Define SourceTag values for all points
 - Ensure all Scan fields for active values are set to 'On'
 - Make sure all tags share a common point source
 - Define Extended Description tags for
 - Event-based data collection
 - Long instrument tags
 - Dzero for scaled tags (set the Convers, TotalCode, and SquareRoot fields for any necessary scale values)
 - ItemIDs that will receive timestamps for output values

