

Abstract

OPC communication provides process automation connectivity and interoperability between various analytical instrumentation and supervisory control and data acquisition (SCADA) systems. A novel OPC communication device, FlowWeb™ OPC Controller, was developed to improve and/or increase functionality of existing bioprocess SCADA applications. This device was designed to interface analytical devices, regardless of data communication protocol used, to any OPC-enabled SCADA and facilitate a more comprehensive information management system for bioprocess monitoring and control. This presentation describes the application of the FlowWeb™ OPC Controller for upstream bioprocessing. Real-time data from an on-line biochemistry analyzer, in-line turbidity sensor, on-line gas analyzer, and off-line analytical balance were simultaneously collected and integrated into a Sartorius BioPAT® MFCS SCADA application. Each instrument required either a serial, TCP/IP, or analog signal to send its respective data to the OPC Controller which processed the streaming data for OPC communication. OPC-tagged data were subsequently sent to the MFCS SCADA via the FlowWeb OPC Server/SCADA OPC Client interface. The FlowWeb™ OPC Controller technology optimized bioprocess knowledge, monitoring, and control by providing real-time data acquisition of in-line, on-line, and off-line analytical instrumentation, improving data management through integration and centralization of critical process information and allowing remote control of analytical instrumentation through the host SCADA application.

Technology Implementation – 2 Phase Approach

Phase 1:

- FlowWeb OPC Controller implemented into fermentation process analytical technology (PAT) scheme.
- Basic unit provided serial (RS-232) & TCP/IP communication interface with YSI® 2700 Biochemistry Analyzer, Mettler-Toledo analytical balances & Magellan TandemPro gas analyzers.

Phase 2:

- Analog Input Module (AIM) added for analog signal reception.
- AIM used for Optek® Turbidity Sensor system requiring 4-20 mA and 0-10V signal outputs.

Process Analytical Interfaces

In-line

- **Optek® Turbidity Sensor (FC-22 Fermenter Converter)**
 - Fermentation culture growth monitoring
 - 4-20 mA/0-10 V (analog) communication

On-line

- **YSI® 2700 Biochemistry Analyzer**
 - Nutrient & metabolite monitoring
 - Remote control of analyzer
 - RS-232 serial communication
- **Magellan TandemPro Gas Analyzer**
 - Exhaust O₂/CO₂ gas analysis
 - RS-232 serial communication

Off-line

- **Mettler-Toledo XS-32001L/XS-16001L analytical balances**
 - Nutrient feed monitoring
 - TCP/IP communication

SCADA/OPC Connectivity

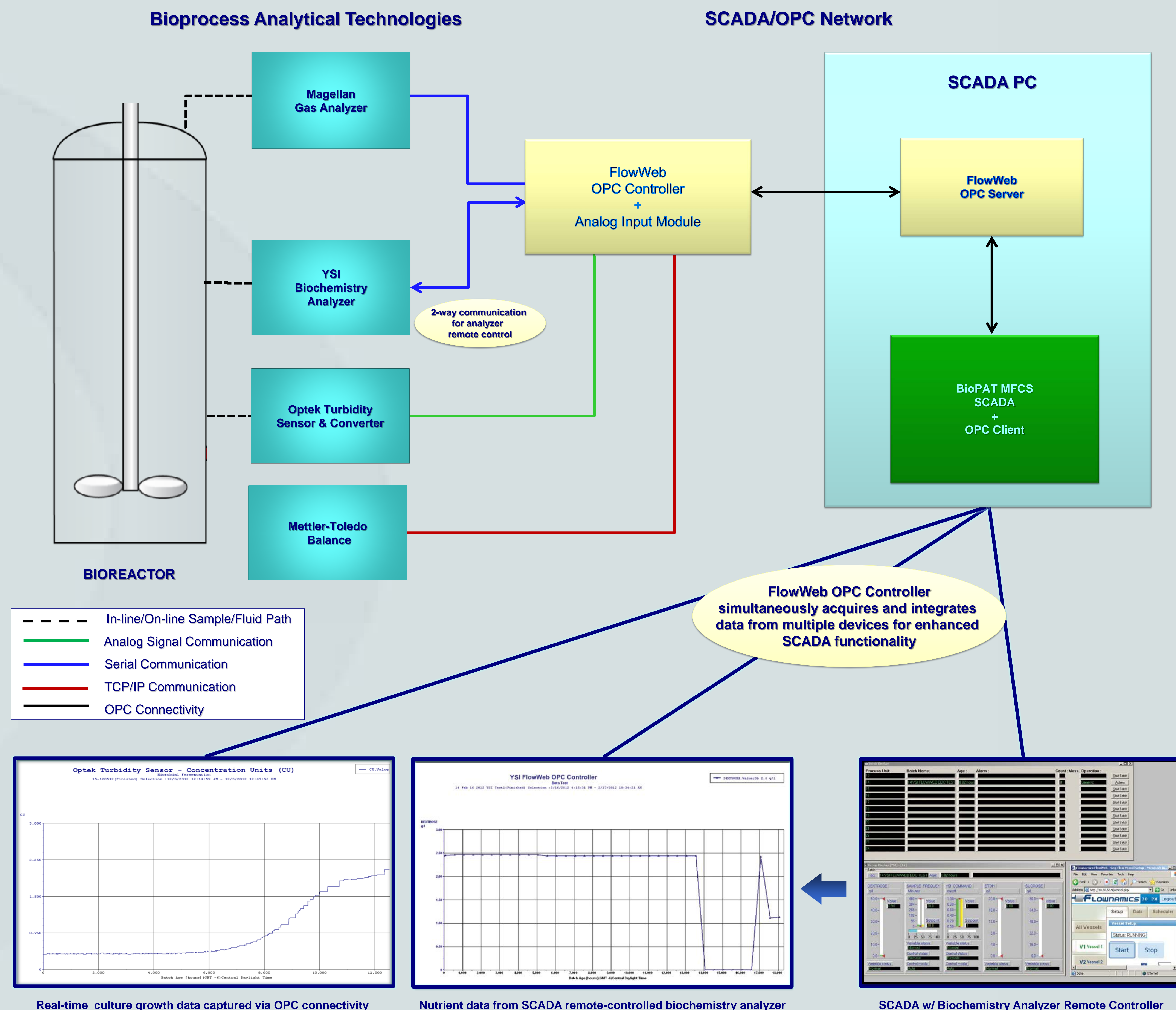
SCADA Application

- Sartorius BioPAT® MFCS – OPC Client

OPC Server

- Flownamics FlowWeb™ OPC Server

FlowWeb OPC Controller - Architecture for Bioreactor Process Application



Conclusions

- FlowWeb OPC Controller technology seamlessly interfaced with multiple analytical devices providing more comprehensive real-time data for improved process monitoring and control
- Seamless integration of in-line, on-line and off-line process data allowed centralization of critical process information and improved SCADA functionality
- Provided non-existent PAT options by harnessing various communication protocols and OPC connectivity for simultaneous data acquisition
- OPC-enabled remote control of biochemistry analyzer through enhanced SCADA functionality

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