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Engineering Transformation

DEVELOPMENT
ACCELERATOR
DPI FRAMEWORK

WHITE PAPER

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Why Device Programming Interface (DPI) Framework is useful in building cross-platform applications and how it helps developers to build easily maintainable software

This white paper is intended for the technology evaluators, decision makers, and technical enthusiasts who are interested in development of software with customizable & rich user interface using Rapid Application Development framework having readily available, re-usable components including the libraries supporting several globally adapted standards and major Industrial Communication protocols. Though the DPI framework supports development of standards oriented applications like DTMs, UIPs,OPC Servers etc. this paper targets at custom application development and does not include comparison with any standards or tools.

Overview

Extensibility and adaptability of the system to cater to the unique customer needs, ensuring compliance to the standards and conventional procedures is a challenge for every automation solution provider. Interoperability, multi-platform support, capability to cope and perform under an increased or expanding workload are essential for any software to be usable in the Industry.

Keeping these needs in mind, combining the industry and technical expertise gained over the years, Utthunga has developed the Device Programming Interface Framework to enable developers to rapidly build the prototypes, simulators and applications that suits every OEM and End user's needs.

About DPI

DPI is a rapid application development framework that is an SDK. SCADA and other device application development are made easy with DPI. DPI gets integrated with OPC, FDT or similar technologies. Comes with inbuilt stack and drivers for HART, Modbus, Foundation Fieldbus, Profibus and others. The architecture of DPI is done keeping scalability as primary objective.

DPI incorporates technology stacks consisting .NET, WPF, WCF, Prism, Managed Extensibility Framework, XML, SQL Server, SQLite, SQLCE which can be configurable based on the need. XML configurations help in reusability and definition of functionalities between devices with different versions, can be extendable to perform add/remove/refine the configuration in the newer version.

All user interfaces are defined in the format of XML. Complex business rules like condition logic, expressions and data types like enumeration are supported. DPI allows Normalized access to complex device data.

The Connectivity options supported include

- *Multiple client connection*
- *Multiple server connection*
- *Remote connection*
- *Multi-drop support*
- *Multi-port support*
- *Cloud connectivity*

Predominant Features of DPI

Developed with the aim to provide a common development platform for all applications around the field devices using a defined algorithm that can be adapted to the customizable logic, DPI has below key features

The Connectivity options supported include

- *Support for secondary & tertiary app development*
- *Code consolidation and consistency*
- *Platform Agnostic architecture to build cross platform apps*
- *Ease of hardware & software revision management*
- *Conformance to standards*
- *Ease to maintain and upgrade*
- *Hassle free integration to myriad of applications*
- *Built in offline/online/simulation support*
- *Ready to use protocol libraries, smart controls*

Custom Application Development on DPI Framework

DPI Framework thus helps in building applications that can transform the data from plant floor into executive dash boards that provide the information required to and relevant for field service engineers, plant operators, supervisors and management personnel.

Cross platform & centralized Process monitoring and configuration software are developed on DPI framework for some of the US based Fortune 500 companies that have common architecture for desktop and mobile devices, support centralized and peer-to-peer networking and synchronization services. This is a solution to customer with third party device hosting capabilities, extensible protocol Independent architecture that helps addition of features, supporting new devices without altering existing design.

Addressing Common Requirements

DPI framework addresses the common requirements of end users and comes ready with below built-in components:

- *Alarm Management*
- *Trend Display& Reports*
- *Data Acquisition and Analysis*
- *Simulation packages*
- *Audit Trail*
- *Task Scheduler*
- *Reports*
- *Scripting capability*
- *Protocol Drivers – Industrial and Custom*
- *Custom built, template based UI engine*
- *XML based Data Model*
- *Import/Export configuration*
- *Upload/Download, Print configuration*
- *Historical data access*
- *Data interchange following JSON format*
- *Role based authentication*
- *Licensing*

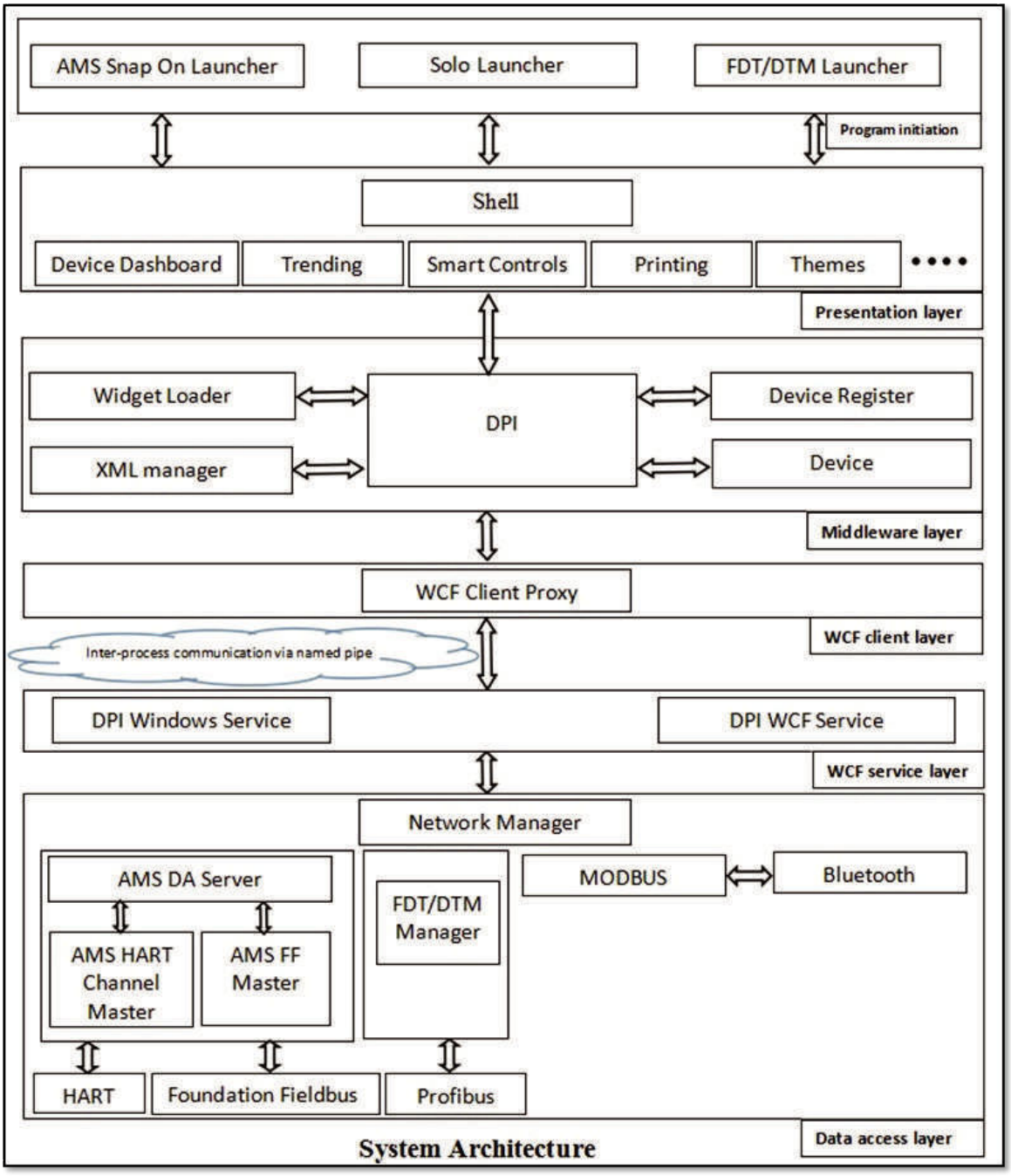
Next generation software for Configuration & Monitoring of Electric Actuators

The next generation software built on top of DPI Framework is capable of offering a single platform with consistent, uniform user interface for all of the electric actuators from world's leading automation solution provider in US.

Below are the prominent functionality supported by the application:

- Supports multiple devices using dedicated or multi-drop connections.
- Supports extension to DCS systems like AMS.

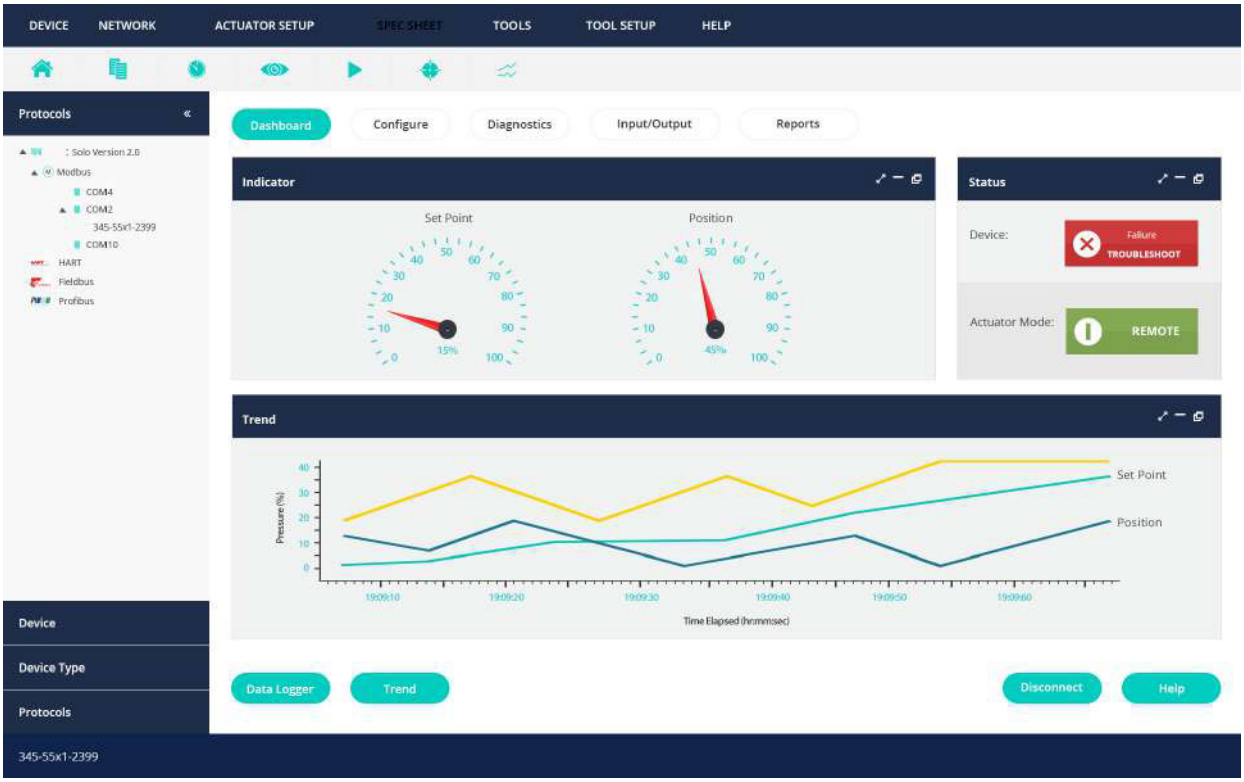
- Supports hosting of Device DTMs.
- Component plug in architecture allows to plug-in any protocol stack into the application.
- Supports pluggable OPC UA integration for client-server communication.
- Customizable to support cross platform SCADA application for mobile devices.



The N-Tier System Architecture

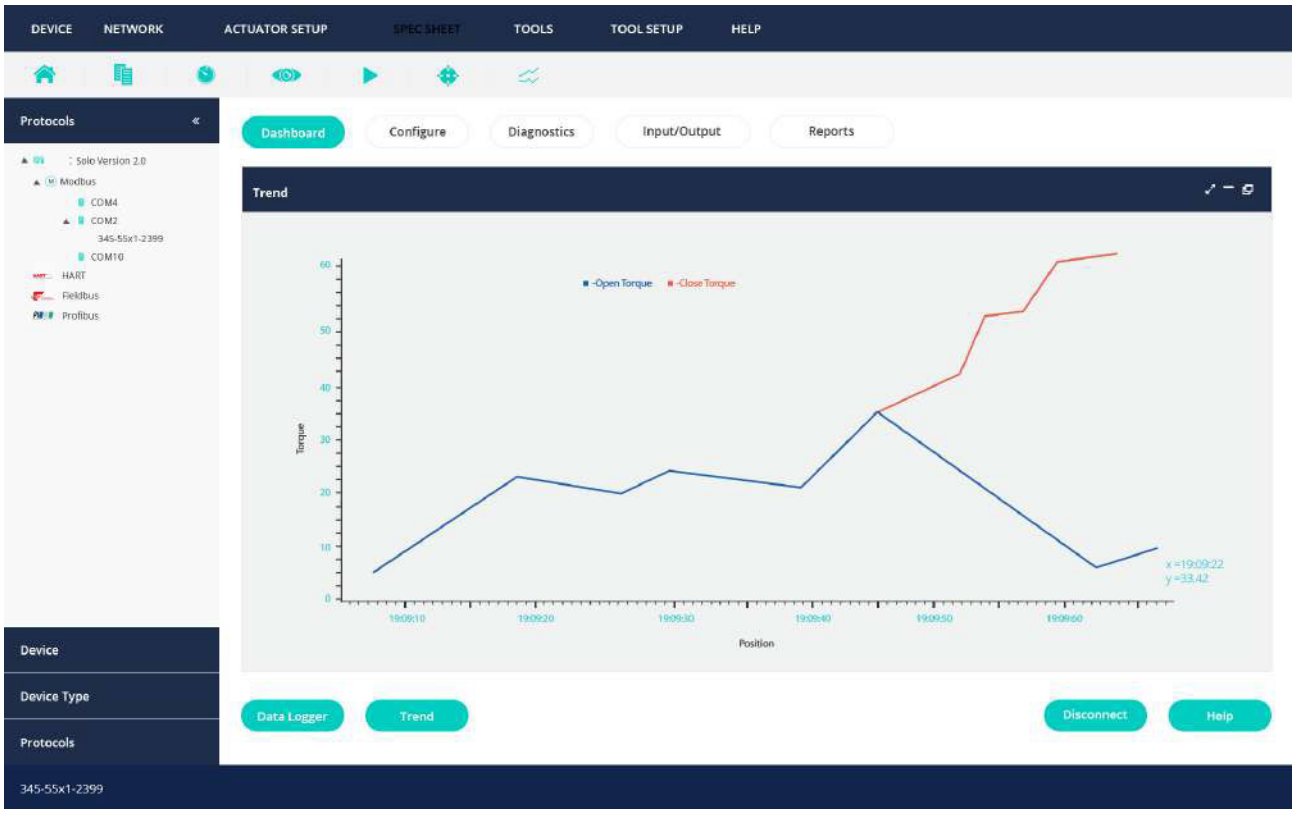
As a standalone Windows Application, It provides the facility to host multiple devices using dedicated and multi-drop connections.

On Start up, BootStrapper configures the module Catalogue and configures the container. It registers necessary framework classes, initializes the modules and loads the menu and View. DPI framework provides flexibility to be hosted as plug-in to DCS System. It allows the application which is a DPI host application to be launched as Snap-On to AMS system.



DPI Host implements AMS Snap-On Launch interface &when Snap-on launches, it uses the BootStrapper that initializes application Shell (The startup project that defines the common layout as regions) and other modules.

DPI host could be launched as separate out of process application from FDT frame containers. GenericDtm template class implements the DTM interfaces in DPI Framework which along with the other factory classes allows applications built on it act as bundle of Device DTMs which can be instantiated and launched from the frame applications.



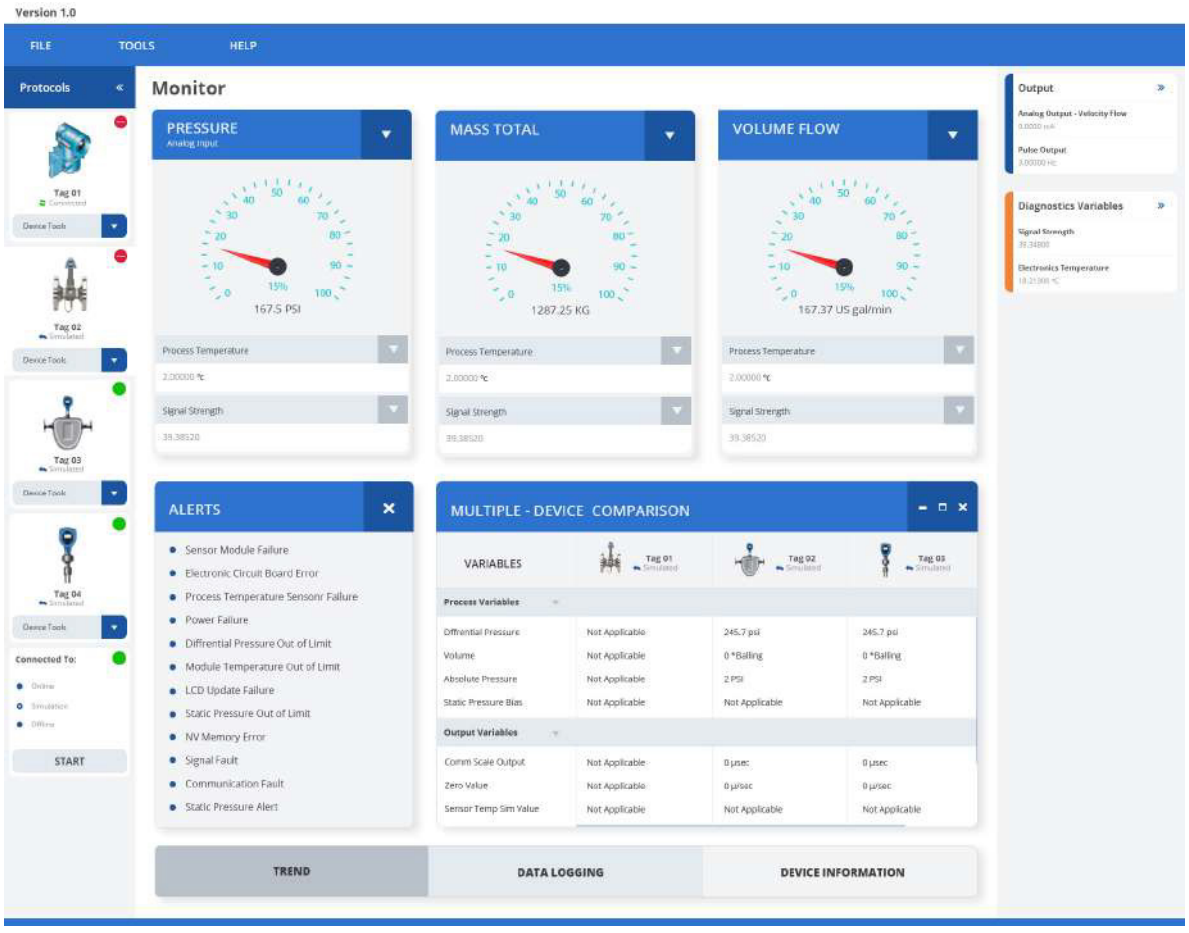
Adding a new protocol to the application requires plugging-in a new protocol module that comprises of implementation of protocol specification and the supporting device specific protocol implementation without altering any other existing modules. The UI does not change with protocol addition unless it is a requirement. In the above screenshot, the graph and the Detail Setup screen remains the same irrespective of the protocol used for communication.

Multiplatform Configuration & Service Tool for Flow, Density & Viscosity meters

With an intuitive user interface, this multiplatform application empowers the users to easily access all information required to commission, configure, access and manage the Flow, Density and Viscosity meters from a Desktop or a Mobile device.

This application is used to

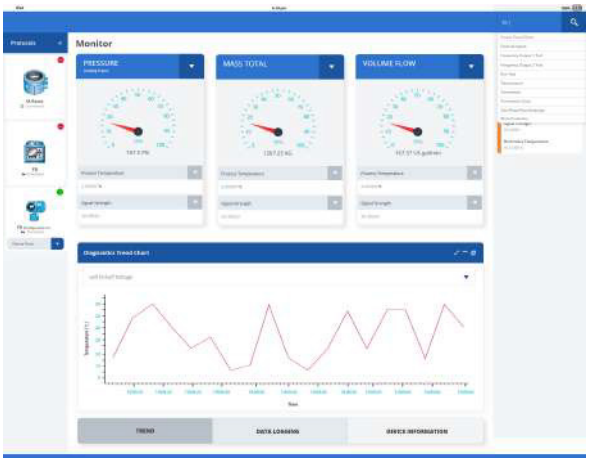
- Access a clear, concise data portrayal using an intuitive interface
- Easily view calibration and configuration data in a printable report to quickly reference a device's setup
- Highlight process-control opportunities with an online process-variable-trending tool
- Improve connectivity through HART, Modbus and Modbus/TCP support
- Diagnose meters remotely using a Modbus/TCP connection
- Simultaneously view process data from more than one meter
- Reduce connection time to meters in hazardous areas with offline configuration



The application supports Modbus TCP/RTU/ASCII, HART & Foundation Fieldbus protocols and can be extended to support other protocols like Ethernet/IP, Profibusetc

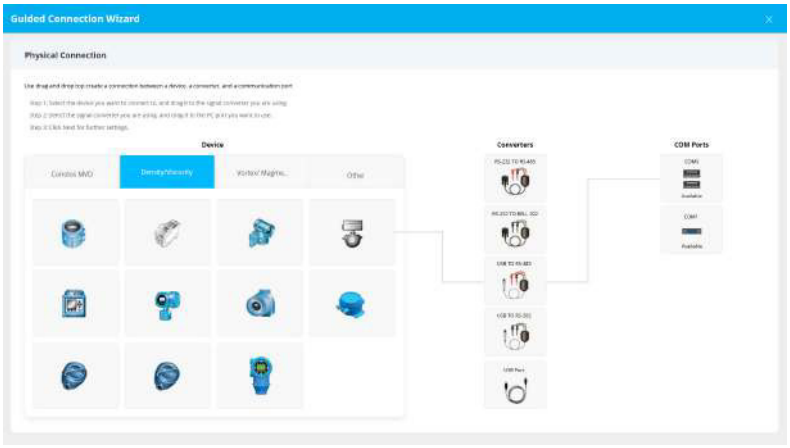
Special Functions

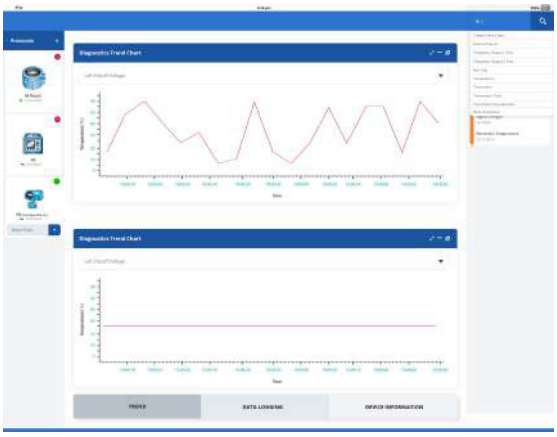
XML driven User Interface design provides flexibility to list all the occurrences of a given sequence of characters across the application making it easier for the user to locate a menu or widget or a label with the given string anywhere in the application with minimal clicks.



This application has several other advanced features like

- Guided connection to device
- Device Commissioning Wizard
- Multi device connection
- Save & Load device configuration
- Multi parameter trending
- Multi device data logging





The Inversion of Control (IoC) and Dependency Injection (DI) patterns are used far and wide across the framework which enables speedy implementation of special custom functions like the above.

The modular design and flexibility provided by the framework to build the customized and intuitive UI using DPI controls that are compatible with Windows WPF & Mobile UI standards, makes it suitable for rapid application development for different platform be it Windows, android or iOS while retaining the underlying business logic.

Conclusion

DPI Framework with its component plug-in architecture, generic XML based configuration, scripting support, simple and flexible cross platform development capabilities is a right choice for accelerated development of small to enterprise level SCADA applications for OEMs and end users. This framework ensures faster time to market and better ROI with ample extensibility, scalability options that it provides.

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Utthunga is niche Industrial Software and Solution provider for diverse domains including Process, Power and Factory Automation. Utthunga is specialized in Industrial standards, specifications, communication protocols and working closely with various Industrial leaders and consortiums.

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