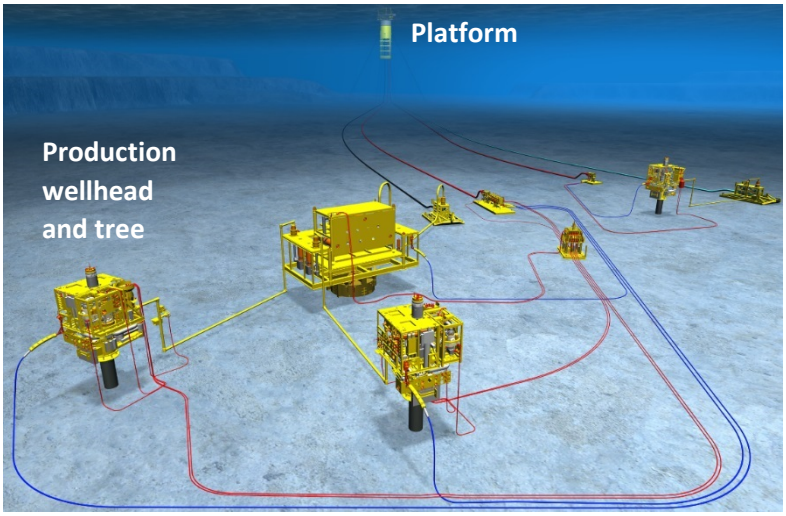
Softing just extended connectivity to the bottom of the ocean

By Deane Horn

November 10, 2017

In Oil & Gas offshore production, a tree, a series of valves, chokes, instrumentation, and a SEM (Subsea Electronic Module) sits on top of a wellhead controlling the flow into and out of the well on the ocean floor.

Wellheads are used during drilling and production. The tree is only used during production. Image credit: Croft

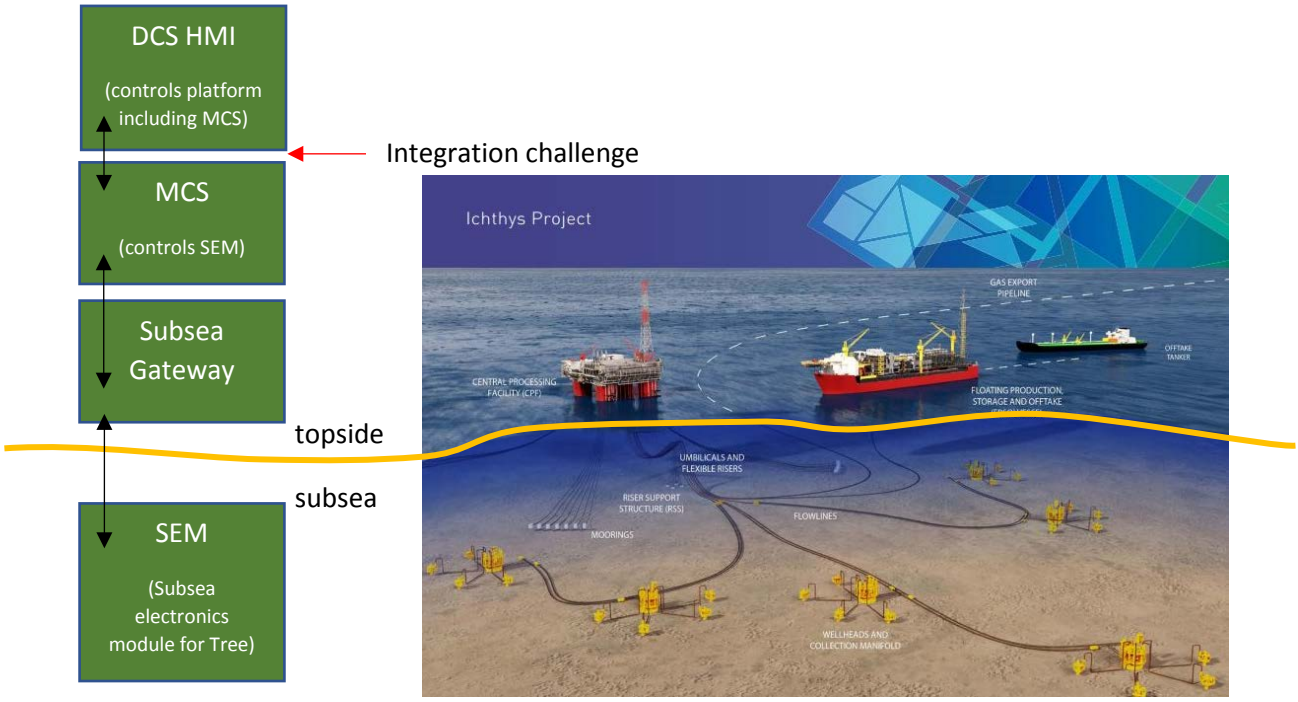


Subsea production tree on top of wellheads piping oil or gas to topside production platform for processing and storage.

Graphic credit: Drilling Contractor

Typically, topside a PLC like Rockwell's ControlLogix is where the OEM's proprietary logic is loaded that controls the SEM on the subsea tree (called an MCS or Master Control Station).

The challenge has always been the integration process of the PLC that controls the subsea tree with yet another vendor's DCS like Emerson's DeltaV that operates the entire production platform. In the past, Modbus was used for integration between the PLC and DCS that was extremely time consuming to setup, testing intensive, slow, limited, no security, and prone to errors that were hard to find and solve.



Imagine all the integration effort required for a seemingly simple action from the DCS like “open valve” that requires an orchestrated interaction between DCS, PLC (MCS), and the valve on the ocean floor.

A group of Oil & Gas experts, OEMs, and vendors got together and said, “let’s eliminate Modbus integration between the DCS and PLC and make the integration more plug and play.”

The group decided the basic PLC and DCS integration needs were…

1. Open protocol (we don’t want to invent another one)
2. Secure communication
3. Platform (operating system) independent
4. Facilitate PLC and DCS integration of different vendors

…and would be even better if…

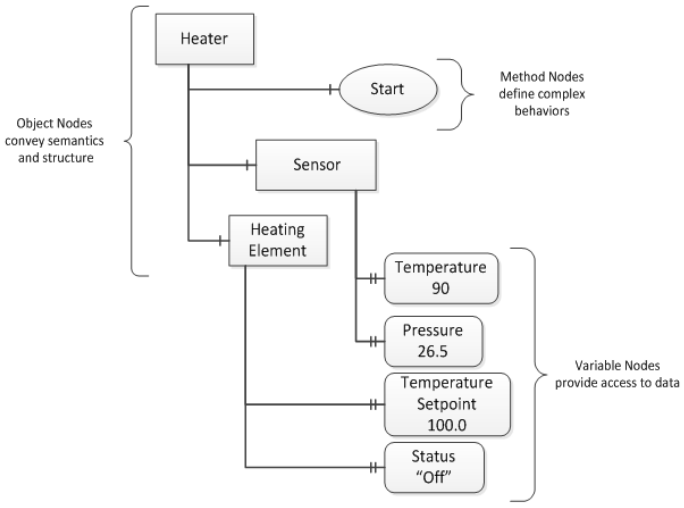
1. Tree assets (chokes, valves, instrumentation, etc) were pre-defined
2. Tree process actions were pre-defined

The result?

OPC UA was the chosen protocol. It’s platform independent, has built-in security, already exists, and is open for anyone to use. Not only did OPC UA meet the basic needs, but the capabilities of OPC UA include what’s called an Information Model, which lends itself to the possibility to pre-define application specific assets, in this case modeling the assets for the subsea tree.

What does the Information Model mean for the subsea tree? It means that assets of the subsea tree which always include devices like valves, chokes, instrumentation, are now pre-defined by the Information Models agreed upon by a group of industry experts. The Information Models for these tree assets are now written into a specification called the OPC UA MDIS companion specification. What's powerful is that vendor products with an MDIS compliant Information Model are delivered to recognize the subsea tree Information Model; that is, they are delivered ready to use. The assets, their behaviors, and their values don't have to be built from scratch with every project.

Included in the Information Model are OPC UA Methods. Methods are behaviors or control actions (Move Valve, Step Choke, etc) that have been pre-defined and agreed upon by this group of industry experts. Methods are also included in the OPC UA MDIS companion specification. Again, these methods are delivered ready to use in MDIS compliant products so that they don't have to be built with every project.

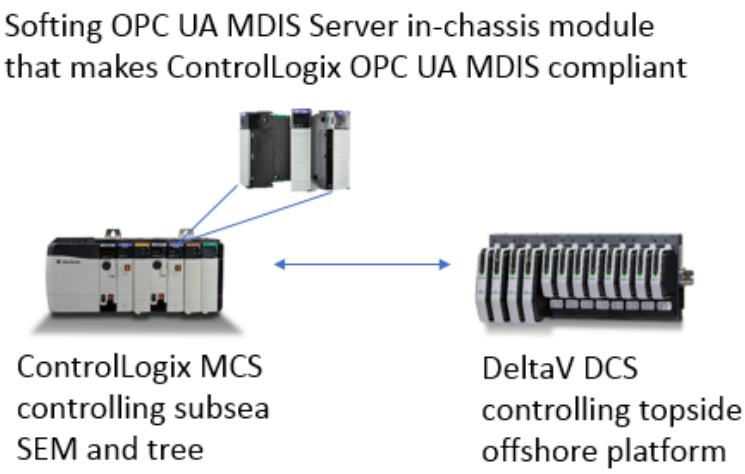


OPC UA provides a framework that can be used to represent field devices, for example. A heater (or other object like a motor, pressure transmitter, valve) can be represented as a heater object. The heater object can have subcomponents like a heating element object. The heater object can have method objects that define behaviors for the heater object like start heater. The heater object can have variables like temperatures and pressures that can be read/write values.

The MDIS committee described the assets required for the subsea tree application using the OPC UA framework. The MDIS specification now has pre-defined objects, like valves, chokes, and transmitters, with their variables and methods, so these assets don't have to be built from scratch for every future project.

If you have a ControlLogix PLC being used as the MCS, how can you make use of the OPC UA MDIS spec and bypass the old Modbus integration to the DCS? Softing has developed an OPC UA MDIS compliant server module that inserts into the ControlLogix chassis and creates the

"ready to use" communication between the PLC controlling the subsea tree and the topside DCS controlling the platform.



Softing's OPC UA MDIS module discovers the subsea tree Information Model with Methods in the PLC and exposes this information to the OPC UA MDIS compliant DCS. Now, the Information Model objects in the PLC (like valves, chokes, instrumentation) are pre-defined and recognized, and Methods (Move Valve, Step Choke) are pre-defined and recognized by the DCS which drastically reduces integration time and produces a higher quality integration.

About the Author: Deane Horn is Director of Product Management for Softing Inc