Siemens Wind Power

EXECUTIVE SUMMARY

Siemens needed to network and control hundreds of wind power generators across wind farms for better control and optimization. The challenge was to provide more consistent power generation in fast varying wind conditions. Siemens chose standard Industrial Internet protocols, middleware and hardware to network wind generators to each other and back to the control center. Generator-to-generator communication ensured rapid response to wind gusts and optimal turbine settings for changing wind conditions.

THE CHALLENGE

Wind provides clean, renewable energy. The core concept is simple: wind turbines spin blades to generate power. However, today's systems are anything but simple. Modern wind turbines have blades that sweep a 120 meter circle, cost more than 1 million dollars and generate multiple megawatts of power. Each turbine may include up to 1,000 sensors and actuators – integrating strain gages, bearing monitors and power conditioning technology. The turbine can control blade speed and power generation by altering the blade pitch and power extraction. Controlling the turbine is a sophisticated job requiring many cooperating processors closing high-speed loops and implementing intelligent monitoring and optimization algorithms.

But the real challenge is integrating these turbines so that they work together. A wind farm may include hundreds of turbines. They are often installed in difficult-to-access locations at sea. The farm must implement a fundamentally and truly distributed control system. Like all power systems, the goal of the farm is to match generation to load. A farm with hundreds of turbines must optimize that load by balancing the loading and generation across a wide geography.

Wind, of course, is dynamic. Almost every picture of a wind farm shows a calm sea and a setting sun. But things get challenging when a storm goes through the wind farm. In a storm, the control system must decide how to take energy out of gusts to generate constant power. It must intelligently balance load across many turbines. And a critical consideration is the loading and potential damage to a half-billion-dollar installed asset. This is no environment for a slow or undependable control system. Reliability and performance are crucial.

THE SOLUTION

Siemens Wind Power is one of the world's largest wind turbine manufacturers. Siemens Wind Power decided to use an Industrial Internet-based solution powered by RTI Connext® DDS to integrate its systems. Industrial Internet with Connext DDS enables fast control within turbines, distributed gust mitigation across the array, and integration back to the control center for predictive

Siemens Wind Power farm comprises 500 turbines with over 50 meter long blades.

maintenance and business diagnostics. With Connext DDS, a Siemens Wind Power farm is a smart, distributed machine. It optimizes power, monitors its own health and reacts to its environment. Industrial Internet with DDS provides fast communication and control within the turbines, distributed gust mitigation across the entire wind farm, and communication and integration with the back-end control center for predictive maintenance and business diagnostics.

RESULTS

With RTI DDS middleware powering its Industrial Internet-based solution, Siemens can monitor and control wind farm arrays with up to 500 wind turbines. The DDS real-time messaging and quality of service (QoS) characteristics enable Siemens to manage turbulence through the wind farm so that performance and wear is uniform in the highly distributed operational environment. Additionally, the RTI Connext DDS platform's ability to integrate smoothly with other systems, including business enterprise applications, will allow Siemens to remotely monitor and troubleshoot the wind farm's operations.

ABOUT RTI

RTI provides the connectivity platform for the Industrial Internet of Things. RTI Connext DDS messaging software forms the core nervous system for smart, distributed applications. RTI Connext allows devices to intelligently share information and work together as one integrated system. RTI was named "The Most Influential Industrial Internet of Things Company" in 2014 by Appinions and published in Forbes.

Our customers span the breadth of the Internet of Things, including medical, energy, mining, air traffic control, trading, automotive, unmanned systems, industrial SCADA, naval systems, air and

missile defense, ground stations, and science. The total value of system designs that trust RTI for their fundamental architecture exceeds $1 trillion.

RTI is committed to open standards, open community source and open architecture. RTI provides the leading implementation of the Object Management Group (OMG) Data Distribution Service (DDS) standard.

ABOUT THE INDUSTRIAL INTERNET CONSORTIUM

RTI has been a member of the Industrial Internet Consortium (IIC) since April 2014. The Industrial Internet Consortium is a global public-private organization of over 140 members, formed to accelerate the development, adoption and wide-spread use of interconnected machines and devices, intelligent analytics, and people at work. Founded by AT&T, Cisco, General Electric, IBM and Intel in March 2014, the Industrial Internet Consortium catalyzes and coordinates the priorities and enabling technologies of the Industrial Internet. Visit www.iiconsortium.org.

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