Advanced Wind Turbine Control Architecture

High Availability DCS With Integrated Safety Used by Vestas

www.tttech.com/energy

> **Deterministic Ethernet solutions from TTTech enable us to greatly improve wind turbine uptime. TTTech's state of the art solution provides integrated safety and precision in control that helps to reduce the overall LCOE (Levelized Cost of Energy).**

Jorge Magalhaes
Senior Vice President at Vestas Wind Systems

Wind turbine manufacturer Vestas was looking for a smarter distributed control system (DCS) that would help lower the material cost of turbines and reduce operating costs for utilities. Wind turbine control systems are in many cases a complex mix of fieldbus and point-to-point networks, with safety and control functions physically separated. This can lead to expensive integration, higher material costs and limited access to data from critical systems.
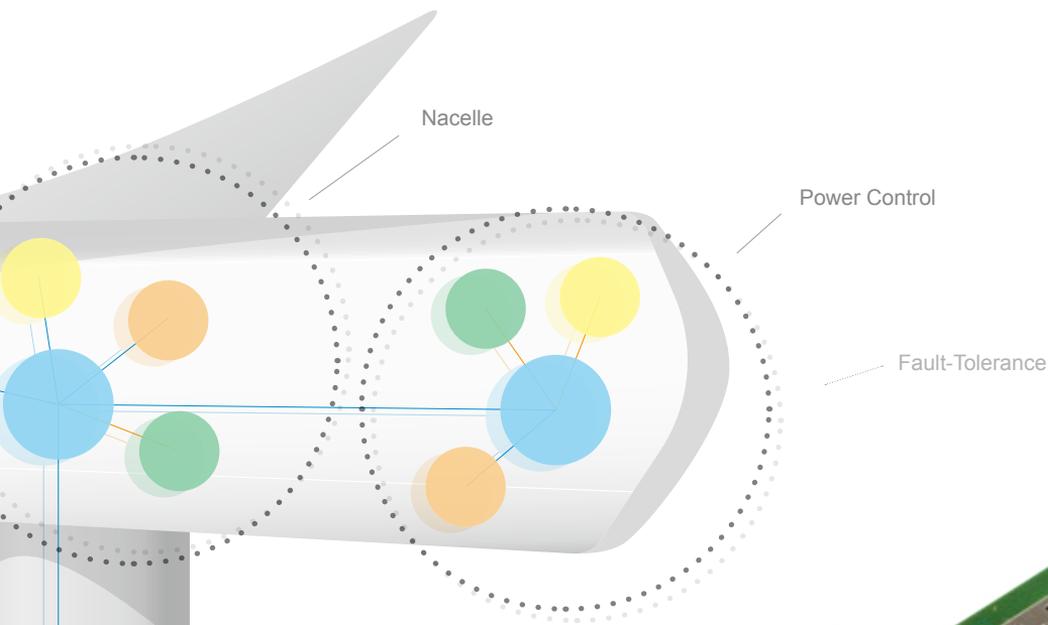
TTTech's High Availability DCS based on Deterministic Ethernet was chosen to address these challenges. TTTech offers control devices with integrated safety features, and Deterministic Ethernet switches and NICs that allow the convergence of different traffic classes on one wire. These elements are brought together by TTTech into a high availability system architecture which means that faults can be isolated whilst the system continues to run as normal.

Use of the High Availability DCS resulted in an overall reduction in components and system complexity. Safety certification was also made easier by the IEC 61508 certifiable products provided by TTTech. The high availability system architecture will lead to improved turbine uptime and productivity for utilities.

Nacelle

Power Control

Fault-Tolerance

Key Benefits

- Reduced system complexity and cost due to integrated safety and control
- Improved turbine uptime with high-availability architecture
- Support for predictive maintenance and other smart turbine / park functions
- Ready for Industry 4.0 with standard Ethernet technology
- Easier safety certification with IEC 61508 certifiable switches, controllers and boards

🔵 Deterministic Ethernet Switch
🟡 Safety Nodes
🟠 Control Nodes
🟢 Data & Analytics Nodes
— Deterministic Ethernet
— Standard Ethernet

Driving the Digitalization of Safe Energy Production

About TTTech

TTTech is a global leader in the field of robust networking and safety controls. TTTech solutions improve the safety and reliability of electronic systems in the industrial and transportation sectors, with a portfolio of products that are helping to make the Industrial Internet of Things and autonomous driving a reality.

Thanks to the proven platform-based architecture, TTTech products enable simple system integration with shorter time-to-market and significant cost reductions for customers. Beyond this, TTTech solutions support highly scalable and modular open real-time architectures based on Deterministic Ethernet, including the upcoming IEEE TSN and the established SAE Time-Triggered Ethernet standard.

Further information on TTTech available at

www.tttech.com

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About Vestas

Every single day, Vestas wind turbines deliver clean energy that supports the global fight against climate change. Wind power from Vestas' more than 54,900 wind turbines currently reduces carbon emissions by over 60 million tons of carbon dioxide every year, while at the same time building energy security and independence. Vestas has delivered wind energy in 74 countries, providing jobs for around 18,800 passionate people at our service and project sites, research facilities, factories and offices all over the world. With 52 percent more megawatts installed than anyone else in the industry and more than 69 GW of cumulative installed capacity worldwide, Vestas is the world leader in wind energy.

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www.vestas.com

TTTech

Ensuring Reliable Networks