Development of a Self Configuring Mesh Network Architecture for Digital Oilfield Implementation

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Abstract

The Mesh network architecture provides a robust architecture for ad-hoc wireless communication networks utilizing low power transceiver for short hop links. The key advantages of this architecture include the ability of the network to configure itself and setup a transmission path between the different nodes. The requirement for all the nodes in the mesh network to be ON makes it unattractive for digital oilfield (DOF) implementations in both onshore and offshore Oil and Gas production installations due to the drain on the power supply. The self-configuring mesh network topology proposed in this work extends the coverage of the wireless sensor networks deployed in DOF implementations by maximizing the advantages of the mesh network and the power saving configurations of the star topology currently used in DOF implementations. It utilizes a set of algorithms which enables the Remote Terminal Units (RTU) to go into sleep mode without impacting on the real-time communication advantage of the mesh network. These algorithms enable the system to setup neighborhood cells comprising of RTUs within its coverage and identify multiple transmission paths in the event of a failure of the main link. This architecture allows more RTUs to communicate with the gateway using short hops thereby increasing

data reliability. The short transmit distance extends the battery life and maximizes the gateway license as more RTUs can be linked to access the same gateway. The synchronization algorithm also enables longer battery life for the RTUs by ensuring that the RTUs operate in the sleep mode. The topology will increase the data reliability and reduce both the OPEX and CAPEX required for setting up the communication links in DOF implementations in both onshore and offshore installations.

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