Diagnosis of Intermittent Connections for DeviceNet

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Received April 7, 2010; revised August 24, 2010; accepted August 31, 2010; published electronically September 3, 2010

Abstract: An intermittent connection is one of the major problems that affect the network reliability and communication quality. However, little attention has been paid to the detection, analysis and localization of the intermittent connections. Partially due to the limitations of the DeviceNet protocol, there is no effective online diagnostic tool available to identify the location of intermittent connection. On the basis of different DeviceNet fault scenarios induced by intermittent connections, a new graph-based diagnostic method is developed to analyze DeviceNet fault patterns, identify the corresponding fault scenarios, and infer the location of the intermittent connection problem by using passively captured network faults. A novel error source analysis tool, which integrates network data-link layer analysis and feature based network physical layer information, is developed to restore the snapshots of the network communication at each intermittent connection induced error. A graph based location identification method is developed to infer the location of the intermittent connections based on the restored error patterns. A 3-node laboratory test-bed, using master-slave polling communication method, is constructed to emulate the intermittent connection induced faults on the network drop cable by using digital switches, whose on/off states are controlled by a computer. During experiments, the network fault diagnosis is conducted by using information collected on trunk cable (backbone). Experimental study shows that the proposed method is effective to restore the snapshots of the network errors and locate the drop cable that experiences the intermittent connection problem.

Key words: network fault diagnosis, fieldbus, DeviceNet, intermittent connection

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