

一种高效可扩展的自组织邻域故障检测协议

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Self-organized Neighborhood Fault Detection Protocol under Dynamic Dependable Network Environments

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摘要

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摘要 在面向大规模化、强动态性、可靠性要求较高的网络节点间故障检测中,传统的故障消息传递模式会引起网络阻塞、时延不稳等问题,导致检测系统可扩展性变差,检测有效性降低。该文提出一种基于故障消息随机散播的自组织邻域检测协议SONFDP。从自组织的思想出发构造了节点检测邻域,在每一邻域中自动生成用于域间检测的代理节点;设计了邻域内基于随机散播故障检测模式的检测算法,继而利用代理节点进行域间节点检测。另外,为防止故障消息随机散播时目标选择的盲目性,还设计了冗余消息避免机制,进一步减少了检测所产生的冗余故障消息数。对该协议的正确性进行了理论分析及证明,并在广域网环境中进行实验,结果表明SONFDP协议在避免泛洪引起网络拥塞的同时,能显著降低检测的系统耗费,增强传统故障检测方法的可扩展性和有效性。

关键词: 动态网络 故障检测 自组织邻域 检测模式

Abstract: To implement fault detection under large-scale, strong dynamic, high reliability required network environments, the traditional fault message dissemination would encounter network congestion, latency instability etc.. A fault detection protocol based on self-organized neighborhood construction is proposed, and agent nodes are chosen to implement detection between neighborhoods. In every single zone, a random dissemination fault detection algorithm called Self-Organized Neighborhood Fault Detection Protocol (SONFDP) is designed. This protocol can avoid network congestion caused by flood, reduce the network overhead and extend the scalability of fault detection. Meanwhile, a mechanism of redundant message avoidance is designed to further reduce the number of messages generated by detection. SONFDP is proven to be correct and effective by relevant mathematical analysis and experiments.

Keywords: Dynamic network Fault detection Self-organized neighborhood Detection mode

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