Detecting Node Failures in Mobile Wireless Networks: A Probabilistic Approach

**ABSTRACT**

Detecting node failures in mobile wireless networks is very challenging because the network topology can be highly dynamic, the network may not be always connected, and the resources are limited. In this paper, we take a probabilistic approach and propose two node failure detection schemes that systematically combine localized monitoring, location estimation and node collaboration. Extensive simulation results in both connected and disconnected networks demonstrate that our schemes achieve high failure detection rates (close to an upper bound) and low false positive rates, and incur low communication overhead. Compared to approaches that use centralized monitoring, our approach has up to 80% lower communication overhead, and only slightly lower detection rates and slightly higher false positive rates. In addition, our approach has the advantage that it is applicable to both connected and disconnected networks while centralized monitoring is only applicable to connected networks.

**SYSTEM ANALYSIS**

In this phase a detailed appraisal of the existing system is explained. This appraisal includes how the system works and what it does. It also includes finding out in more detail- what are the problems with the system and what user requires from the new system or any new change in system. The output of this phase results in the detail model of the system. The model describes the system functions and data and system information flow. The phase also contains the detail set of user requirements and these requirements are used to set objectives for the new system.

**2.1 CURRENT SYSTEM:**

This approach assumes that there always exists a path from a node to the central monitor, and hence is only applicable to networks with persistent connectivity. In addition, since a node can be multiple hops away from the central monitor, this approach can lead to a large amount of network-wide traffic, in conflict with the constrained resources in mobile wireless networks. Another approach is based on localized monitoring, where nodes broadcast heartbeat messages to their one-hop neighbors and nodes in a neighborhood monitor each other through heartbeat messages. Localized monitoring only generates localized traffic and has been used successfully for node failure detection in static networks.

**2.2 SHORTCOMINGS OF THE CURRENT SYSTEM:**

* Therefore, techniques that are designed for static networks are not applicable. Secondly, the network may not always be connected.
* Therefore, approaches that rely on network connectivity have limited applicability.
* Thirdly, the limited resources (computation, communication and battery life) demand that node failure detection must be performed in a resource conserving manner.

**2.3 PROPOSED SYSTEM:**

In this paper, we propose a novel probabilistic approach that judiciously combines localized monitoring, location estimation and node collaboration to detect node failures in mobile wire-less networks. Specifically, we propose two schemes. In the first scheme, when a node A cannot hear from a neighboring node B, it uses its own information about B and binary feedback from its neighbors to decide whether B has failed or not. In the second scheme, A gathers information from its neighbors, and uses the information jointly to make the decision (see Section V for details). The first scheme incurs lower communication overhead than the second scheme. On the other hand, the second scheme fully utilizes information from the neighbors and can achieve better performance in failure detection and false positive rates.

**2.4 ADVANTAGE OF PROPOSED SYSTEM:**

* In addition, since a node can be multiple hops away from the central monitor, this approach can lead to a large amount of network-wide traffic, in conflict with the constrained resources in mobile wireless networks.
* Another approach is based on localized monitoring, where nodes broadcast heartbeat messages to their one-hop neighbors and nodes in a neighborhood monitor each other through heartbeat messages.
* Localized monitoring only generates localized traffic and has been used successfully for node failure detection in static networks.

**3.1 MODULES:**

We consider both connected and disconnected net-works. For a connected network, we assume there exists a manager node; alarms of node failures will be sent to the manager node. For a disconnected network, we assume a node carries information of node failures and uploads the information opportunistically to a sink. There may exist multiple sinks, which are connected to a manager node. The sinks relay information to the manager node.

1. Calculating Failure Probability
2. Upper Bound of Failure Detection Rate

**3.1.1 Calculating Failure Probability:**

In the basic case, a node sends a single heartbeat packet at each time. When node A cannot hear from B, one of the following conditions must hold: node B has failed; node B is not failed but A is out of the transmission range of B; or node B has not failed and A is in the transmission range of B, but the packet sent from B is lost. Let R denote the event that A is in the transmission range of B at time t + 1.

**3.1.2 Upper Bound of Failure Detection Rate:**

Consider an arbitrary node, A, that fails at time t +1. When using our approach, a necessary condition for the failure of A to be detected is that there exists at least one live node in the transmission range of A at time t (so that there exists a node that hears A at t but no longer hears from A at t +1). Let M be a random variable that denotes the number of nodes that are in A’s transmission range at time t. Then the probability that the failure of node A is detected successfully is no more than Pr(M > 0).

**METHODOLOGY**

**DETECTION ALGORITHM**

We evaluate the performance of our schemes through exten-sive simulations using a purpose-built simulator. The simulator is built using Matlab. The main reason for using the purpose-built simulator instead of other simulators is because it provides much more flexibility in implementing the node failure detection algorithms that are proposed in the paper.

**SYSTEM SPECIFICATION**

The purpose of system requirement specification is to produce the specification analysis of the task and also to establish complete information about the requirement, behavior and other constraints such as functional performance and so on. The goal of system requirement specification is to completely specify the technical requirements for the product in a concise and unambiguous manner.

**6.1 HARDWARE REQUIREMENTS**

* System : Pentium IV 2.4 GHz.
* Hard Disk : 40 GB.
* Floppy Drive : 1.44 Mb.
* Monitor : 15 VGA Colour.
* Mouse : Logitech.
* Ram : 512 Mb.

**6.2 SOFTWARE REQUIREMENTS**

* Operating system : Windows XP/7.
* Front End : ASP.net, C#.net
* Tool : Visual Studio 2010
* Back End : SQL SERVER 2008