REVIEW OF FAULT DETECTION TECHNIQUE IN WSN AND MANET

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Abstract
Dependable mobile ad-hoc networks are being consideredto provide reliable and continuous service despite thefailure of some of their components. One of the basicbuilding block that has been identified for such fault tolerant systems is the failure detection service which goals at providing some information on which hosts have crashed. In this paper, we present a review of WSN and MANET of failure detection technique., we studied Clustering ,Faults and Exciting faults recovery algorithms such as fault node recovery (FNR), Directed Diffusion (DD) Algorithm, Grade Diffusion(GD) Algorithm,Clusted consensus time synchronization (CCTS) algorithm ,Round Trip Delay(RTD) time.

Keywords –CCTS, DD ,FNR, GD,WSN, MANET

1.Introduction

Wireless sensor networks **(WSN)** have drawn much consideration from the academia to industry in recent years due to their broad range of application , such as object localization or tracking, environmental monitoring, scientific exploration in dangerous environments and so forth, In particular, many applications require global time synchronization, that is, all the nodes of the network achieve and maintain a common notion of time for most sensor network applications, the data detected are meaningless and useless without time and space information of an event. The accurate time synchronization is required in many circumstances in network applications. For example, media access control using TDMA needs correct time information, so that transmissions do not interfere, the sleep scheduling needs nodes to sleep and wake up at the same time. In addition, some special applications such as mobile target localization and event detection also need synchronization[6].The QoS of such WSNs is mainly affect by the failure of sensor nodes. Probability of sensor node failure growths with increase in number of sensors. In order to retain the better QoS under failure conditions, identifying and detaching such essential faults[9].

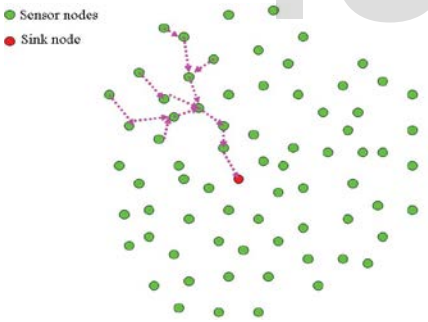

Fig. 1. Wireless sensor node routing[4].

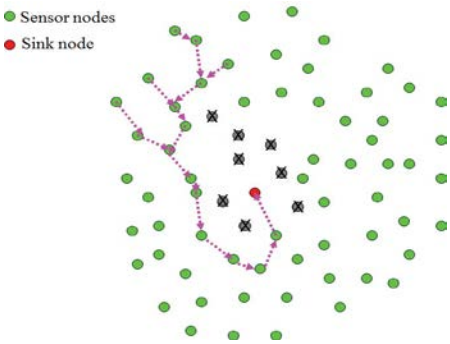

Fig. 2. Wireless sensor node routing path when some nodes are not[4].

1.2 MANET:

A mobile ad hoc network (MANET) is a self-organize wireless network made up of mobile nodes and needing no fixed infrastructure. In order to provide communication throughout the entire network, nodes are designed to serve as routers. The result is a distributed multi-hop network with a time-unstable topology. Hence, the topology and capacity control are vital issues. As it is very inflexible to get the entire topology of the MANET, a localized algorithm is desired to be used for topology control. Routing in such network is a critical task.

1.2.1 Evolution of MANET

In 1970, Normanl Abramson and his fellow researchers at the University of Hawaii made-up ALOHA net.

- In 1972 DARPA Packet Radio Network (PRNet)
- In 1980 Survivable Radio Networks (SURAN).

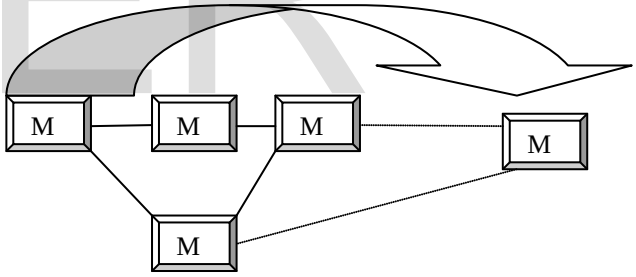

Fig 3: An example of a mobile ad - hoc net[7].

- During 1980 emergence of Internet Emerging Task Force (IETF), named the mobile ad hoc networking group.
- In 1994 emergence of Bluetooth by Ericsson[8].

1.2.2 Characteristics of MANET

Network is not be subject to on any fix infrastructure for its operation.

- Easy of deployment.
- Speed of deployment.
- Dynamic Chanigng Topology of nodes.
- Multi-hop network.
- Each node is working as intelligent node.
- Not any mediator networking device is compulsory forcommunicatons.

- Each node is effort as a DTE (Data Terminal Equipment) and DCE (Data Communication Equipment)[8].

1.2.3 AD-HOC Application

- Tactical networks : Military Communication automated Battle fields .
- Sensor Network : Isolated weathers for sensors, earth activities.
- Emergency Services : Disaster recovery, earthquakes,crowd control and commando operations.
- Educational Applications : Setup virtual class & conference rooms.
- Entertainment : Multi-user games.
- Location Aware Services : Automatic Call forwarding,advertise location specific services, Location–dependent travel guide[8].

In this describe the ongoing research activities and the challenge in some of the main research areas within the mobile adhoc network domain. To nearby the huge amount of research behavior on ad hoc networks in a systematic/organic way, we will use, as a reference, the simplified architecture shown in as shown[8].
In the figure, the research activities will be group, according to a layered approach into three main areas:

• Enabling technologies.
• Networking.
• Middleware and applications.

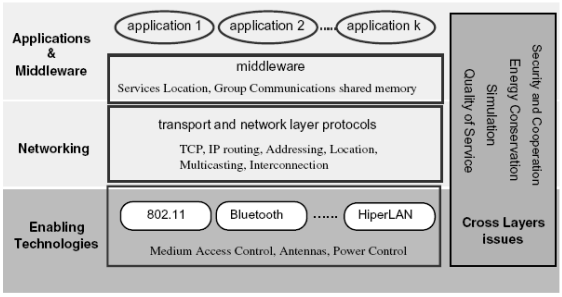

Fig.4. MANETArchitecture[8]

1.3 CLUSTERING:

Sensor nodes are randomly distributed within the goal area and form a cluster-based network by Low-energy Adaptive Clustering Hierarchy (LEACH) a protocol architecture for microsensor networks. The gateway nodes which are responsible for the message exchange between clusters are elected from the overlap-nodes.Each node is assigned with an ID number for identification.After the formation of the network, cluster-heads broadcast a message containing their own ID numbers to their cluster member nodes to notice them the identity of their clusterheads. Cluster member nodes receive the messages and record the ID numbers. Nodes recording only one ID number mark themselves as the ordinary cluster member nodes, whereas nodes at the overlapping regions record more than one ID numbers and exhibit themselves as the overlap-nodes[6].After receiving the message from the cluster-head, cluster member nodes respond with a message containing their own ID numbers and the ID numbers of their cluster-heads which they can communicate with.Cluster-heads calculate the middling values of the skew compensation parameters of intra-cluster effective clocks of nodes within their clusters and the average values of intra-cluster virtual clocks of nodes, and then they update the clock compensationparameters of intra-cluster virtual clocks and simultaneously put out them to the neighboring nodes[6].

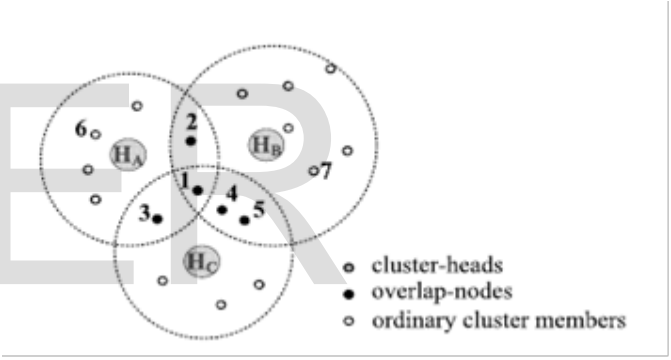

Fig 5: Schematic illustration of the local topology of a network[6].

1.4 Faults

Each node in the system can be in one of two position faulty or fault-free. In order to exchange information, a node requires multiple hops in the WSNs because of the restricted transmission power in the network. Due to constraints like unreliability of wireless medium, unpredictability of environment, resource constrained nodes and dynamic topology, WSN are prone to various types of faults.

Based on the Duration- Based on duration faults can be of three types:

- **Transient fault**: A transient fault can fade away without any visible event; it appears in a network for short time. The recovery of transient faults from system is addressed using repeated-round techniques. A probabilistic model used for the action of faulty periods,

and a fault analysis is used to manage the optimum retry period.

- **Intermittent fault**: It is problematic kind of transient fault; can't predict its appearance and disappearance in the network. An intermittent fault is occurred by a number of factors. These factors can only be identified when malfunction is occurred. Intermittent faults are hard to identify and repair.
- **Permanent fault**: Once it appears in network it remains until it removed and repaired by some external administrator. Permanent faults are simple to deal.

Based on the Behavior-Based on behavior faults can be of two types:

- **Soft Fault**: Soft faulted units can commune with its neighboring units but with unexpected behaviors and always give incorrect response.
- **Hard fault**: Hard faulted units cannot commune with its neighbors. It neither sends nor gets any information from the network.

Based on the Occurrence -Based on occurrence faults can be of two types:

- **Static fault**: All faulty nodes are faulty from the starting of diagnosis conference. The fault-free node can't be faulty through diagnosis session.
- **Dynamic fault**: Fault-free node may become faulty during diagnosis session. It is hard to diagnosis because any node may fail after it diagnose fault-free by any fault-free node.

2.Literature Review

Jie Wu wireless sensor networks, named clustered agreement time synchronization (CCTS). This algorithm is developed on the base of the distributed consensus time synchronization (DCTS) algorithmclustering technique is included into the algorithm.The CCTS includes two parts: 1) intra cluster time synchronization and 2) inter cluster time synchronization. In the intra cluster time organization, the better DCTS is applied[6].

RavindraNavanathDuche The proposed method of fault detection is based on RTD time size of RTPs. RTD times of discrete RTPs are compared with threshold time to determine failed or malfunctioning sensor node. The conventional approaches to sensor network routing include the directed diffusion (DD) algorithm and the grade diffusion (GD) algorithm. [9].

Zijian Yang Fault diagnosis in networks comes from the equipment fault diagnosis, and was first presented in the 1960s. There are four central protocols for managing in network fault diagnosis: the Internet Engineering Task Force Internet (IETF) defines the Simple Network Management Protocol (SNMP) ; International Organization for Standardization (ISO) defines the Common Management Information Protocol (CMIP); Transaction Language 1 (TL1)[11].

GeethaJayakumarMobile ad hoc networks(MANET) represent complex distributed systems that comprise wireless mobile nodes that can freely and with dynamism self organize into arbitrary and temporary ad hoc network topologies, permitting people and devices to seamlessly internet work in areas with no preexisting communication infrastructure e.g., disaster recovery environments.The goal of the routing protocol is to have an efficient route establishment between a couple of nodes, so that messages can be delivered in a timely manner[3].

PravinGhosekarA mobile ad hoc network (MANET), sometimes called a mobile mesh network, is a self-configuring network of mobile devices connected by wireless links. The Ad hoc networks are a new wireless networking pattern for mobile hosts. Unlike traditional mobile wireless networks, ad hoc networks do not rely on any fixed infrastructure[8].

D. Ben Khedher et al Node failures and message losses are frequent in MANETs. Nodes form a self organizing overlay network that is over layed on the physical network.Heartbeat protocols are broadly used for failure detection in network systems In these protocols, a node periodically sends a heartbeat message (“I am alive”) to a detector node. If the time between consecutive heartbeat messages exceeds a timeout value, then the node is measured failed. Heartbeat architectures are used in many areas: system diagnosis, network protocols, reaching contract, and fault detection in computer networks[2].

3. Exciting Fault Node Recovery Algorithm for a Wireless Sensor Network

3.1 FNR Algorthim

A fault node recovery (FNR) algorithm to enhance the lifetime of a wireless sensor network (WSN) when several of the sensor nodes shut down, either because they no longer have battery energy or they have reached their working threshold. Using the FNR algorithm can result in fewer replacements of sensor

nodes and more recycled routing paths. Thus, the algorithm not only enhance the WSN lifetime but also reduces the cost of replacing the sensor nodes[4].

3.2 Directed Diffusion Algorithm

A series of routing algorithms for wireless sensor networks have been projected in recent years. C. Intanagonwiwat*et al*. presented the Directed Diffusion (DD) algorithm in 2003. The target of the DD algorithm is to reduce the data relay transmission counts for powermanagement. The DD algorithm is a query-driven transmission protocol. The collect data is transmitted only if it matches the query from the sink node. In the DD algorithm, the sink node provide the queries in the form of attribute-value pairs to the other sensor nodes by spreading the query packets to the whole network. Subsequently, the sensor nodes send thedata back to the sink node only when it fits the queries[7].

3.3 Grade Diffusion Algorithm

The Grade Diffusion (GD) algorithm in 2012 to get better the ladder diffusion algorithm using ant colony optimization (LD-ACO) for wireless sensor networks. The GD algorithm not only create the routing for each sensor node but also identifies a fixed of neighbor nodes to decrease the broadcast loading. Each sensor node can select a sensor node from the fixed of neighbor nodes when its grade table lacks a node able to execute the relay. The GD algorithm can also record some information about the data relay. Then, a sensor node can select a node with a lighter load or more available energy than the other nodes to execute the additional relay operation. That is, the GD algorithm bring up-to-date the routing path in real time, and the event data is thus sent to the sink node quickly and correctly[9].

3.4. RTD Algorithm

Faulty sensor node is detected by measuring the round trip delay (RTD) time of discrete round trip paths andequating them with threshold value. Firstly, the optional method is experimented on WSNs with six sensor nodes deliberate using microcontroller and ZigBee. Scalability of proposed method is verified by simulating the WSNs with large numbers of sensor nodes in NS2. The RTD time results resulting in hardware and software implementations are almost equal, justifying the actual time applicability of the investigated method. Necessity of received signal strength extent in cluster head variation and assigning distinct wavelength for each link in other fault detection techniques are defeat here[10].

3.5Clusted consensus time synchronization (CCTS) algorithm.

The algorithm is divided into corresponding clusters and the time synchronizationprocess is separated into intra-cluster time synchronization andinter-cluster time synchronization The CCTS [1]includes two parts: 1) intracluster time synchronization and 2) intercluster time synchronization. In the intracluster time synchronization, the enhanced DCTS is applied. The cluster head is dependable for exchanging messages within the cluster. The middling value of skew damages parameters ofintracluster virtual clock and the middling value of intracluster virtual clocks are used to bring up to date the skew compensation parameter and offset compensation parameter, individually. In the intercluster time synchronization, cluster heads exchange messages via gateway nodes. To bring up to date the clock compensation parameters of the network virtual clocks, clock compensation parameters of intracluster virtual clocks of every cluster head are assign with equivalent weights base on the series of each cluster. The simulation results show that the proposed algorithm decreases the communication traffic compare with the DCTS algorithm, and improves the convergence rate due to the combination of clustering topologies[6].

CONCLUSION

In this paper we purposeda review of WSN and MANET of failure detection technique., we studied Clustering ,Faults and Exciting faults recovery algorithms such as fault node recovery (FNR), Directed Diffusion (DD) Algorithm, Grade Diffusion(GD) Algorithm,Clusted consensus time synchronization (CCTS) algorithm ,Round Trip Delay(RTD) timeDependable mobile ad-hoc networks are being designed to present reliable and unceasing service despite the failure of some of their components. One of the basic building block that has been recognized for such fault tolerant systems is the failure detection service which aims at provided that some information on which hosts have crashed.

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