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MANETs versus MWSNs

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Abstract: ***A mobile ad hoc network (MANET) is a continuously self-configuring, infrastructure-less network of mobile devices connected without wires. .Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. They may contain one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology and Mobile wireless sensor networks (MWSNs) can simply be defined as a wireless sensor network (WSN) in which the sensor nodes are mobile. MWSNs are a smaller, emerging field of research in contrast to their well-established predecessor. MWSNs are much more versatile than static sensor networks as they can be deployed in any scenario and cope with rapid topology changes.***

Keywords: Mobile Ad Hoc Network; Mobile Wireless Sensor Networks; Internet, Topology; Autonomous; Sensor Node

I. INTRODUCTION

MANETs can be used for facilitating the collection of sensor data for data mining for a variety of applications such as air pollution monitoring and different types of architectures can be used for such applications. It should be noted that a key characteristic of such applications is that nearby sensor nodes monitoring an environmental feature typically register similar values. This kind of data redundancy due to the spatial correlation between sensor observations inspires the techniques for in-network data aggregation and mining. By measuring the spatial correlation between data sampled by different sensors, wide class of specialized algorithms can be developed to develop more efficient spatial data mining algorithms as well as more efficient routing strategies. **WSNs**, which can be considered as a special case of ad hoc networks with reduced or no mobility, are expected to find increasing deployment in coming years, as they enable reliable monitoring and analysis of unknown and untested environments. These networks are "data centric", i.e., unlike traditional ad hoc networks where data is requested from a specific node, data is requested based on certain attributes such as, "which area has temperature over 35°C or 95°F". Therefore a large number of sensors need to be deployed to accurately reflect the physical attribute in a given area.

II. APPLICATIONS

2.1MANETs APPLICATIONS

2.1.1 Military Battlefield

Ad-Hoc networking would allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, and military information head quarter.

2.1.2 Collaborative Work

For some business environments, the need for collaborative computing might be more important outside office environments than inside and where people do need to have outside meetings to cooperate and exchange information on a given project.

2.1.3 Local Level

Ad-Hoc networks can autonomously link an instant and temporary multimedia network using notebook computers to spread and share information among participants at an e.g. conference or classroom. Another appropriate local level application might be in home networks where devices can communicate directly to exchange information.

2.1.4 Personal Area Network and Bluetooth

A personal area network is a short range, localized network where nodes are usually associated with a given person. Short-range MANET such as Bluetooth can simplify the inter communication between various mobile devices such as a laptop, and a mobile phone.

2.1.5 Commercial Sector

Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed

2.2 MWSNs APPLICATIONS

2.2.1 Area Monitoring

Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors detects enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines.

2.2.2 Health Care Monitoring

The medical applications can be of two types: wearable and implanted. Wearable devices are used on the body surface of a human or just at close proximity of the user. The implantable medical devices are those that are inserted inside human body.

2.2.3 Machine Health Monitoring

Wireless sensor networks have been developed for machinery condition-based maintenance (CBM) as they offer significant cost savings and enable new functionality.

2.2.4Data Logging

Wireless sensor networks are also used for the collection of data for monitoring of environmental information, this can be as simple as the monitoring of the temperature in a fridge to the level of water in overflow tanks in nuclear power plants. The statistical information can then be used to show how systems have been working. The advantage of WSNs over conventional loggers is the "live" data feed that is possible.

2.2.5 Structural Health Monitoring

Wireless sensor networks can be used to monitor the condition of civil infrastructure and related geo-physical processes close to real time, and over long periods through data logging, using appropriately interfaced sensors.

III. CHALLENGING FACTORS

There are some challenging factors for both the networks

3.1 MANETs (Mobile Ad hoc Network)

3.1.1Dynamic Topologies

Nodes are free to move arbitrarily with different speeds; thus, the network topology may change randomly and at unpredictable times. Energy-constrained .Operation Some or all of the nodes in an ad hoc network may rely on batteries or other exhaustible means for their energy. For these nodes, the most important system design optimization criteria may be energy conservation.

3.1.2Limited Bandwidth

Wireless links continue to have significantly lower capacity than infra structured networks. In addition, the realized throughput of wireless communications – after accounting for the effects of multiple access, fading, noise, and interference conditions, etc., is often much less than a radio's maximum transmission rate

3.1.3Security Threats

Mobile wireless networks are generally more prone to physical security threats than fixed-cable nets. The increased possibility of eavesdropping, spoofing, and minimization of denial-of-service type attacks should be carefully considered

3.2 MWSNs (Mobile Wireless Sensor Networks)

3.2.1Ad hoc Deployment

Sensor nodes are randomly deployed which requires that the system be able to cope up with the resultant distribution and form connections between the nodes. In addition, the system should be adaptive to changes in network connectivity as a result of node failure.

3.2.2 Computational Capabilities

Sensor nodes have limited computing power and therefore may not be able to run sophisticated network protocols leading to light weighted and simple versions of routing protocols

3.2.3 Energy Consumption without Losing Accuracy

Sensr nodes can use up their limited energy supply carrying out computations and transmitting information in a wireless environment. As such, energy conserving forms of communication and computation are crucial as the node lifetime shows a strong dependence on the battery lifetime. In a multi-hop WSN, nodes play a dual role as data sender and data router. Therefore, malfunctioning of some sensor nodes due to power failure can cause significant topological changes and might require rerouting of packets and reorganization of the network.

3.2.4 Communication Range

The bandwidth of the wireless links connecting sensor nodes is often

Limited, hence constraining inter sensor communication. Moreover, limitations on energy forces sensor nodes to have short transmission ranges. Therefore, it is likely that a path from a source to a destination consists of multiple wireless hops

3.2.5 Fault Tolerance

Some sensor nodes may fail or be blocked due to lack of power, physical damage, or environmental interference. If many nodes fail, MAC and routing protocols must accommodate formation of new links and routes to the data collection BSs. This may require actively adjusting transmit powers and signaling rates on the existing links to reduce energy consumption, or rerouting packets through regions of the network where more energy is available. Therefore, multiple levels of redundancy may be needed in a fault tolerant WSN.

3.2.6 Connectivity

High node density in sensor networks precludes them from being completely isolated from each other. Therefore, sensor nodes are expected to be highly connected. This, however, may not prevent the network topology from varying and the network size from shrinking due to sensor nodes failures. In addition, connectivity depends on the, possibly random, distribution of nodes.

IV. SIMILARITIES

4.1 Distributive Wireless Network

WSNs immediately resemble an ad hoc network is because both are distributed wireless networks (i.e., there is not a significant network infrastructure in place) and the fact that routing between two nodes may involve the use of intermediate relay nodes (also known as multichip routing).

4.2 Minimum Power Consumption

There is also the fact that both ad hoc and sensor nodes are usually battery powered and therefore there is a big concern on minimizing power consumption. Both networks use a wireless channel placed in an unlicensed spectrum that is prone to interference by other radio technologies operating in the same frequency.

4.3 Self Management

Self-management is necessary because of the distributed nature of both networks. . The key Internet paradigm that the network core should be kept simple (i.e., only care for the delivery of data packets) while the intelligence is at the edges, does not fit well in commercial ad hoc networks, which several people argue are quite different from traditional Internet or WLAN. New applications are changing the face of traditional ad hoc networks (i.e., pure routing) to networks where there is need for networking, processing, and storage.

V. DIFFERENCES BETWEEN MANETS & MWSNS

5.1 Controlling Power

A mobile ad-hoc network (MANET) even is MWSNs if its scope is that of sensing the environment around the network. However, the words "mobile" and "ad-hoc" are often used to refer to all those networks consisting of nodes continuously moving in any direction. Consequently, this kind of network must repeatedly reconfigure its routes. All this work is done by every node in the network since MANET doesn't have a fixed central controller Furthermore; this kind of networks usually uses different devices with respect to other WSNs because the management of energy and communications is totally different.

5.2 Environment Dependency

MANETs are usually “close” to humans, in the sense that most nodes in the network are devices that are meant to be used by human beings (e.g., laptop computers, PDAs, mobile radio terminals, etc.); conversely, sensor networks do not focus on human interaction but instead focus on interaction with the environment.

5.3 Metrics

The rapid rate of manet is very redundant and dissemination latency to improve the speed of this en vironment whereas MWSN is the Efficient, robustness and scalable environment.

5.4 Population Density Of Nodes

MANETs nodes having sparsely populated due to its environment and architecture whereas MWSNs nodes having densely populated due to its speed and nature of network.

5.5 Standards & Topology

MANETs having works on fixed standard IEEE 802.11 whereas MWSNs works on different standards like ZigBee, IEEE 802.15.4, ISA100,IEEE 1451 and both the networks works on dynamic topology.

5.6 Routing In a Network

The routing layer is responsible for node addressing and routing in a network that is commonly multi hop. Terms such as unicast and multicast common in MANETs are hardly applicable in MWSN where we find other forms of routing such as one-to-many, many-to-one, many-to-many, etc.

5.7 Identification of NODES

MANETs identify every node by its own MAC address and there is unique address for every node whereas MWSNs don’t Identify the node address because they dont5 have unique address for every node

5.8 Routing Protocols

MANETs having Pro-active, reactive and hybrid protocols and MWSNs Flooding, Gossiping, Flat routing, hierarchical and location based.

5.9 Technologies

MANETs use the fixed technique to satisfy the different nodes but MWSNs use the IEEE 802.15.4 standard and Zigbee wireless technology are designed to satisfy the market's need for a low-cost, standard-based and flexible wireless network technology, which offers low power consumption, reliability, interoperability and security for control and monitoring applications with low to moderate data rates.

5.10 Number of Nodes

As a consequence, the number of nodes in wireless sensor networks, as well as the density of deployment, can be orders of magnitude higher than in ad hoc networks.

VI. CONCLUSIONS

MANETs, although requiring similar design considerations (e.g., energy-saving, mobility, etc), normally present less stringent requirements, as they are by definition spontaneous, short lived networks with more powerful nodes. MWSNs have very distinctive characteristics that imply particular considerations not commonly present in other types of networks. MANETs consist of a peer-to-peer, self-forming, self-healing network in contrast to a mesh network has a central controller and MWSNs consists of development techniques.

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