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An Overview of Distributed System for Wireless Sensor Network

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Abstract: ***In this paper we are presenting an overview of distributed system for wireless sensor network. In terms of computation, the WSN localization algorithms can be classified into centralized and distributed schemes. Further each category divided in to corresponding methods to solve localization problem. In the centralized scheme, sensor nodes send control messages to a central node whose location is known. In this paper we are showing what a distributed system and wireless sensor network and discuss the relation between distributed computing theory and sensor network applications.***

Keywords: Distributed System, Central Node, WSN, Location.

1. Introduction

Awareness of location is one of the important and critical issue and challenge in wireless sensor network. Knowledge of Location among the participating nodes is one of the crucial requirements in designing of solutions for various issues related to Wireless sensor networks. Wireless sensor networks are being used in environmental applications to perform the number of task such as environment monitoring, disaster relief, target tracking, defenses and many more. In many such tasks, node localization is inherently one of the system parameters. Node localization is required to report the origin of events, assist group querying of sensors, routing and to answer questions on the network coverage. So, one of the fundamental challenges in wireless sensor network is node localization. The overview of the schemes proposed by different scholars for the improvement of localization in wireless sensor networks is also presented. Future research directions and challenges for improving node localization in wireless sensor networks are also discussed. Various models and architectures for scheduling in grids may be found both in the literature and in practical applications. They differ in the number of scheduling components, their autonomy, general strategies, and the level of decentralization. The major aim of our research is to study impact of these differences on the overall performance of a Grid. To this end, in the paper we compare performance of two specie Grid models: one centralized and one distributed. We use GSSIM simulator to perform accurate empirical tests of algorithms. This paper is a starting point of an experimental study of centralized and decentralized approaches to Grid scheduling within the scope of the Core Grid Resource Management and Scheduling Institute. Various models and architectures for scheduling in grids may be found both in the literature and in practical applications. They differ in the number of scheduling components, their autonomy, general strategies, and the level of decentralization. The major aim of our research is to study impact of this deference on the overall performance of a Grid. To this end, in the paper we compare performance of two specific Grid models: one centralized and one distributed. We use GSSIM simulator to perform accurate empirical tests of algorithms. This paper is a starting point of an experimental study of centralized and decentralized approaches to Grid scheduling within the scope of the Core Grid Resource Management and Scheduling Institute.

2. Distributed Scheduling

- Resource and CPU queue lengths are good indicators of load.
- Artificially increment CPU queue length for transferred jobs on their way.
- Set timeouts for such jobs to safeguard against transfer failures.
- Little correlation between queue length and CPU utilization for interactive jobs: use utilization instead.
- Monitoring CPU utilization is expensive.

3. Distributed Algorithm

Distributed algorithms are an established tool for designing protocols for sensor or networks. In this article we discuss the relation between distributed computing theory and sensor network applications. For many decades the study of distributed network algorithms was treated like a pure research topic. Maybe too pure for the real world of messy distributed systems. As such the area fell asleep in the 1990's. The advent of sensor (and its close relatives such as ad hoc or mesh) networks in the current millennium reignited interest in the area again, as all of a sudden there were applications matching the local communication model well.

4. Distributed Computing

Distributed computing theory has to offer more evolved algorithms. In general, when devising distributed algorithms, one tries to achieve (or balance between) multiple objectives. A main objective is always to guarantee a small running time. Apart from this, we usually want messages to be not too large. A size restriction of O (log n) bits per message is the golden standard. Smaller messages often imply that algorithms become restricted, as one cannot encode a node identifier any more in a single message. In addition, computations should be `reasonable'. This in particular excludes just collecting the entire topology and inputs at a single (or each) node and solving the whole problem, or dealing with NP-hard (sub) problems. Luckily, small messages imply that nodes do not obtain much information, quite often resulting in computations remaining simple without special consideration. In addition, often the number of messages sent by each node should be small, and memory consumption should be small. Finally, the nodes should need as little knowledge on the network as possible.

5. Wireless Connectivity

As we know, the strength of a radio transmission decreases with distance. Thus, it is a key characteristic of wireless (sensor) networks that, unless the network is small, it is unlikely that every node can communicate directly with every other node. On the other hand, it is much more likely that two nearby nodes can communicate to each other directly than it is for two far-away nodes. That is, the connectivity between nodes is fundamentally governed by some kind of geometry.

6. Wireless Interference

Usually, sensor networks communicate by radio. An immediately evident result is that nodes are not able to send a different message to each neighbor at the same time. On the other hand, directed antennas are uncommon, i.e., in principle it is feasible that all neighbors receive a sent message. In other words, we prefer distributed algorithms where nodes transmit the same uniform message to all their neighbors. A more subtle consequence of the use of radio communication is that the trans-mission medium is shared: Transmissions are exposed to interference. Concretely, a node may not be able to correctly receive a message of an adjacent node because there is a concurrent transmission going on nearby. While for higher layer protocols it may be accurate enough to model interference by having random transmission failures, interference must be a first-class citizen for understanding the basic communication infrastructure. In some sense, an interference model explains how concurrent transmissions block each other. A signal might for example interfere with itself due to multi-path propagation (e.g., an electromagnetic wave of a direct path cancelling with the wave on a longer path reflecting at an object).

7. Physical Interference

All these protocol model definitions have in common that interference ends abruptly, as if there was an invisible wall, and that interference does not sum up, i.e., if there are several concurrent transmissions just outside the interference range, they will not a affect a receiver. Physical interference models strive for capturing these effects. The relation between the nodes is given by a distance matrix, either derived from actual distances in a Euclidean space, or by a metric space, or by an arbitrary abstract gain matrix (without direct physical representation). Most distributed algorithms work in a protocol model. Apart from exceptions, media access is usually done probabilistically. A simple idea is to let nodes transmit randomly, with a probability inversely proportional to the `competition'.

8. Centralized Scheduling Algorithm

This algorithm assumes that all the jobs in the system are scheduled by a centralized Grid scheduler; hat produces schedules for all clusters. Each organization must accept decisions of the Grid scheduler, which means that Grid scheduler is the single decision maker and enforcement point within the system. The algorithm works in batches. The algorithm consists of two independent policies. The first policy defines the order of jobs in a batch while the second determines the way job is assigned to a given cluster.

9. Distributed Systems with Wireless Sensor Networks

Conventional distributed system courses follow a syllabus in which a list of topics is discussed independently and at different levels of abstractions. We propose to use a wireless sensor network environment to pin all topics down to concrete applications and to maintain issues such as fault tolerance and coordination continuously present. A syllabus with eight conceptual modules, each of them associated to a hands-on experience with wireless sensor networks, which may be assigned either as homework or as a hands-on class, depending on the number of classroom hours that are available.

10. Conclusion

The study of the complexity of distributed algorithms leads to fascinating and deep research questions. In the context of wireless sensor networks, these research questions remain theoretically interesting, but they obtain an additional practical dimension. We have shown that this power very much depends on the underlying network model. We plan to extend the algorithms to support features or constraints present in current grid scheduling software, such as reservations, preemption or limitation to FCFS scheduling. Conventional distributed system courses follow a syllabus in which a list of topics is discussed independently and at different levels of abstractions. , we prefer distributed algorithms where nodes transmit the same uniform message to all their neighbors.

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