A Review on Data Centric Routing for Wireless sensor Network

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Abstract: Sensor networks are quite different from traditional networks in different ways: sensor networks have severe energy concerns, redundant low-rate data, and many-to-one flows. Routing protocols developed for other adhoc networks cannot be applied directly in WSN because of the energy constraint of the sensor nodes. Data-centric technologies are needed to perform in-network aggregation of data to yield energy-efficient dissemination. Sensor networks are used in many applications like environment monitoring, health, industrial control units, military applications and in the various computing environments. Since sensor the entire sensor node are battery powered devices, energy consumption of nodes during transmission or reception of packets affects the life-time of the entire network. In this paper we model data-centric routing and compare its performance with traditional end-to-end routing schemes.

Index Terms - Wireless sensor networks, Data-centric routing protocols, Data aggregation, Directed diffusion, One-shot complex queries, Novel adaptive approach, Resource adaptation.

1. INTRODUCTION

Routing in wireless sensor network (WSN) is divided in four categories:

- Data-centric protocols
- Hierarchical protocols
- Geographical protocols
- Quality of service(QOS) based protocols

In WSN it is not feasible to assign a global identification to a node due to high density and overhead it. The features of these sensor nodes include small size, low cost, low computation power, multifunctional(can perform sensing, data processing, routing etc.), easily communicate within short distances etc. Originally wireless sensor networks were designed for military applications (which include battlefield surveillance, object protection, intelligent guiding, remote sensing etc.) but nowadays it has wide range of civilian applications also in the areas like environment, health, home, space exploration, chemical processing, disaster relief and other commercial areas.

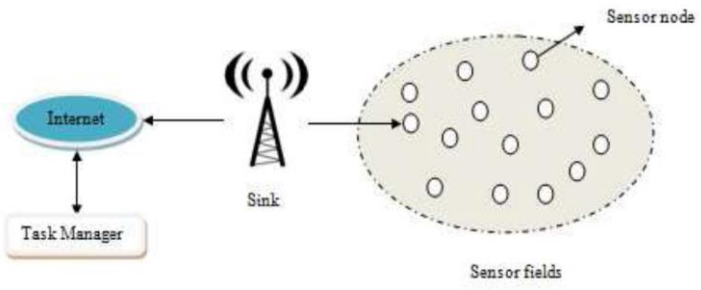


Figure 1: Wireless Sensor Networks Model

A Wireless sensing element Network (WSN) consists of spatially distributed autonomous devices that hand and glove sense physical or environmental conditions, like temperature, sound, vibration, pressure, motion or pollutants at totally different locations. Wireless sensing element Networks (WSNs) may be a category of wireless unplanned networks during which sensing element nodes collect, process, Associate in Nursing communicate knowledge no inheritable from the physical surroundings to an external Base-Station (BS) . Future WSNs are unreal to revolutionize maintenance free and fault tolerant platform for assembling and process info in various environments. a significant technical challenge for WSNs, however, lies within the node

energy constraint and its restricted computing resources, which can cause a basic limit on the network time period. Therefore, innovative techniques to eliminate energy inefficiencies that may otherwise shorten the time period of the network. sensing element nodes are energy-constrained devices and also the energy consumption is mostly related to the quantity of gathered knowledge, since communication is usually the foremost dear activity in terms of energy. For that reason, algorithms and protocols designed for WSNs ought to think about the energy consumption in their conception. Moreover, WSNs are data-driven networks that sometimes manufacture an outsized quantity of knowledge that has to be routed, typically during a multihop fashion, toward a sink node, that works as a entrance to a observation center. Given this state of affairs, routing plays a crucial role within the knowledge gathering method. the most plan of {the knowledge the info the information} central routing or data aggregation and in-network process approaches is to mix the info returning from totally different sources (sensor nodes) at bound aggregation points (or merely aggregators) and route, eliminate redundancies by playacting easy process at the aggregation points, and minimize the overall quantity {of knowledge of knowledge of information} transmission before forwarding data to the external Base station. Removing redundancies ends up in transmittal fewer numbers of bits, and thence reduces energy consumption and will increase the sensing element nodes' lifetimes. A attainable strategy to optimize the routing task is to use the offered process capability provided by the intermediate sensing element nodes on the routing methods. this can be referred to as knowledge-centric routing or in-network data aggregation. For a lot of economical and effective knowledge gathering with a minimum use of the restricted resources, sensing element nodes ought to be designed to well report knowledge by creating native choices. For this, knowledge aggregation is an efficient technique for saving energy in WSNs. because of the inherent redundancy in information gathered by the sensing element nodes, in-networking aggregation will typically be accustomed decrease the communication value by eliminating redundancy and forwarding solely smaller aggregate info. Since marginal communication leads on to energy savings, that extends the network time period, in network knowledge aggregation may be a key technology to be supported by WSNs. during this paper, the terms info fusion and knowledge aggregation ar used as synonyms. during this context, the utilization {of information of knowledge of knowledge} fusion is twofold: (i) to require advantage of information redundancy and increase data accuracy, and (ii) to cut back communication load and save energy.

2. Data-Centric Routing Protocols

Data-centric protocols take issue from ancient address-centric protocols within the manner that the info is distributed from supply sensors to the sink. In address-centric protocols, every supply detector that has the acceptable knowledge responds by causing its knowledge to the sink severally of all alternative sensors. However, in data-centric protocols, once the supply sensors send their knowledge to the sink, intermediate sensors will perform some style of aggregation on {the knowledge|the info|the information} originating from multiple supply sensors and send the mass data toward the sink. This method may end up in energy savings due to less transmission needed to send the info from the sources to the sink. during this section, we have a tendency to review a number of the data-centric routing protocols for WSNs.

2.1 Sensor Protocols for Information via Negotiation (SPIN) (SPIN):

SPIN protocol was designed to boost classic flooding protocols and overcome the issues they will cause, for instance, implosion and overlap. The SPIN protocols square measure resource aware and resource adaptative. The sensors running the SPIN protocols square measure able to figure the energy consumption needed to figure, send, and receive knowledge over the network. Thus, they will create hip to selections for economical use of their own resources. The SPIN protocols square measure supported 2 key mechanisms specifically negotiation and resource adaptation. SPIN uses meta-data because the descriptors of the info that the sensors need to publicize. The notion of meta-data avoids the prevalence of overlap given sensors will name the fascinating portion of the info they need to induce. it {should} be noted here that the scale of the meta-data should positively be but that of the corresponding detector knowledge. this permits the sensors to use their energy and information measure with efficiency. There square measure 2 protocols within the SPIN family: SPIN-l (or SPIN-PP) and SPIN-2 (or SPIN-EC).While SPIN-l uses a negotiation mechanism to cut back the consumption of the sensors, SPIN-2uses a resource-aware mechanism for energy savings. each protocols permit the sensors to exchange data concerning their perceived knowledge, therefore serving to them to get the info they're fascinated by.

2.2 Directed Diffusion (DD):

Direct diffusion may be a knowledge centrical question primarily based and application-aware protocol wherever knowledge aggregation is allotted at every node within the network. The nodes won't advertise the perceived knowledge till a call for participation is formed by the baccalaureate, and every one the info generated by detector node is called by attribute-value pairs. The gradient specifies rate and also the direction within which to send the events. The node that receives the events data from the supply makes an attempt to search out an identical entry in its interest cache. All detector nodes during a directed-diffusion-based network square measure application-aware, that permits diffusion to realize energy savings by choosing by trial and error sensible ways, and by caching and process knowledge within the network. Caching will increase the potency, robustness, and quantifiability of coordination between detector nodes, that is that the essence of the info diffusion paradigm.

2.3 Rumor Routing (RR):

Rumor routing is another variation of Directed Diffusion and is especially supposed for contexts within which geographic routing criteria don't seem to be applicable. usually Directed Diffusion floods the question to the complete network once there's no geographic criterion to diffuse tasks. However, in some cases there's solely a touch quantity of information requested from the nodes and therefore the employment of flooding is not sensible. another approach is to flood the events if range of events is tiny and range of queries is massive. Rumor routing is between event flooding and question flooding. the thought is to route the queries to the nodes that have discovered a specific event instead of flooding the complete network to retrieve data concerning the occurring events. so as to flood events through the network, the rumor routing formula employs long packets, known as agents. once a node detects an occurrence, it adds such event to its native table associated generates an agent. Agents travel the network so as to propagate data concerning native events to distant nodes. once a node generates a question for an occurrence, the nodes that understand the route, will reply to the question by referring its event table. Hence, the price of flooding the entire network is avoided. Rumor routing maintains only 1 path between supply and destination as against Directed Diffusion wherever knowledge will be sent through multiple ways at low rates.

2.4 COUGAR:

A data-centric protocol that views the network as an enormous distributed information system. the most plan is to use declarative queries so as to abstract question process from the network layer functions like choice of relevant sensors etc. and utilize in-network knowledge aggregation to avoid wasting energy. The abstraction is supported through a brand new question layer between the network and application layers. panther proposes design for the detector information system wherever detector nodes choose a frontrunner node to perform aggregation and transmit the info to the entranceway (sink).The entranceway is liable for generating a question set up, that specifies the mandatory data concerning the info flow and in-network computation for the incoming question and send it to the relevant nodes. The question set up additionally describes a way to choose a frontrunner for the question. The design provides in-network computation ability for all the detector nodes. Such ability ensures energy potency particularly once the quantity of sensors generating and causing knowledge to the leader is large. though panther provides a network-layer freelance resolution for querying the sensors, it's some drawbacks: initial of all, introducing further question layer on every detector node can bring additional overhead to detector nodes in terms of energy consumption and storage. Second, in network knowledge computation from many nodes would require synchronization, i.e. a relaying node ought to wait each packet from every incoming supply, before causing the info to the leader node. Third, the leader nodes ought to be dynamically maintained to stop them from failure.

2.5 Active question Forwarding in detector Networks (ACQUIRE):

ACQUIRE is another knowledge centrically querying mechanism used for querying named knowledge. It provides superior question improvement to answer specific styles of queries, known as one-shot advanced queries for replicated knowledge. ACQUIRE question (i.e., interest for named data) consists of many sub queries that many straightforward responses square measure provided by many relevant sensors. every sub-query is answered supported the presently hold on knowledge at its relevant detector. ACQUIRE permits a detector to inject a lively question during a network following either a random or a specified flight till the question gets answered by some sensors on the trail employing a localized update mechanism. in contrast to alternative question techniques, ACQUIRE permits the queries to inject a posh question into the network to be forwarded stepwise through a sequence of sensors.

2.6 DRUG:

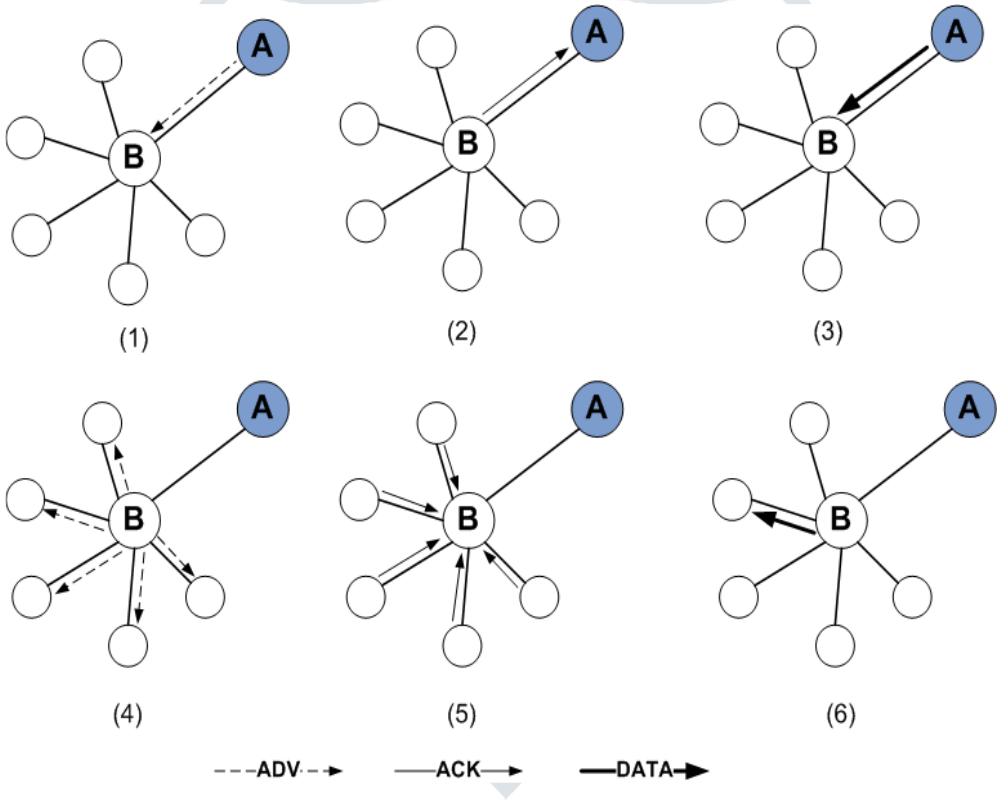
This protocol introduces a unique adaptative approach to search out associate best routing path from supply to sink once the detector nodes square measure deployed every which way deployed during a restricted place with single sink. This additionally aggregates {the knowledge the info the information} in intermediate node to cut back the duplicate data. knowledge centrically protocols additional concentrate on knowledge instead of the address of the destination. Here our approach focuses on each knowledge additionally because the destination address. DRUG protocol uses 3 styles of messages to speak between totally different nodes as shown in Figure three, such as:

(i) ADV: new knowledge promotional material. once a detector node has knowledge to share, it will advertise this reality by transmission associate ADV message containing meta-data.

(ii) ACK: request for knowledge. A SPIN node sends associate ACK message once it needs to receive knowledge.

(iii) DATA: knowledge message. knowledge messages contain actual detector knowledge with a meta-data header. ADV and ACK messages contain solely meta-data.

In networks wherever the price of causing and receiving a message is basically determined by the messages size, ADV and ACK messages can thus be cheaper to transmit and receive than their corresponding knowledge messages. DRUG protocol is economical than each spin and flooding. The representation of the DRUG protocol is as follows.



3. Comparission Of Routing Protocols

ROUTING PROTOCOLS	CLASSIFICATION	MOBILITY	POWER USAGE	DATA AGGREGATION	SCALABILITY	MULTI PATH
SPIN	FLAT	POSSIBLE	LIMITED	YES	LIMITED	YES
DD	FLAT	LIMITED	LIMITED	YES	LIMITED	YES
RR	FLAT	VERY LIMITED	N/A	YES	GOOD	NO
COUGAR	FLAT	NO	LIMITED	YES	LIMITED	NO
ACQUIRE	FLAT	LIMITED	N/A	YES	LIMITED	NO
DRUG	FLAT/ HIERARCHICAL	LIMITED	LIMITED	YES	GOOD	NO

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5. CONCLUSION

Routing in sensor networks is a new area of research, with a limited, but rapidly growing set of research results. In this paper, we investigated a comprehensive list of data-centric protocols. There are many issues need to be addressed by researchers e.g.: energy efficiency and life time. Great advantages are achieved because of not using ID instead a general question regarding a special phenomenon to be asked and a response to be gathered. The best algorithm which an implement this idea is ACQUIRE and is strongly recommended to be used in future..

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