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A Survey on Event Detection and Transmission Protocols in Wireless Sensor Network

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Abstract— **Wireless Sensor Networks (WSNs) can be typically used to achieve Continuous Monitoring or Event-Detection inside the supervised area. Event detection is a central component in numerous wireless sensor network (WSN) applications. Accurate event detection as well as reliable and real time transmission is basic needs of a good WSNs. This paper describes a survey on event detection and event transmission protocols in Wireless Sensor Networks. Classification of protocols are based on mainly two types i.e. sink centric event detection and transmission protocols and node centric event detection and transmission protocols. Paper also consists of the advantages and disadvantages of each protocol .Finally the paper concludes with the comparison of each protocol with different parameters.**

Index Terms— **wireless sensor network, routing, event, detection, energy efficiency.**

I. INTRODUCTION

A Wireless sensor network (WSN) is a set of tiny wireless devices deployed in a large geographical area to sense different physical events and to monitor the surrounding environment. WSNs having a wide range of potential applications to science, industry, transportation, civil infrastructure, and security. A sensor network consists of multiple detection stations called sensor nodes, each of which is small, lightweight and portable. Every sensor node is equipped with a transducer, microcomputer, transceiver and power source.Fig.1 shows the Components of a Sensor Node.

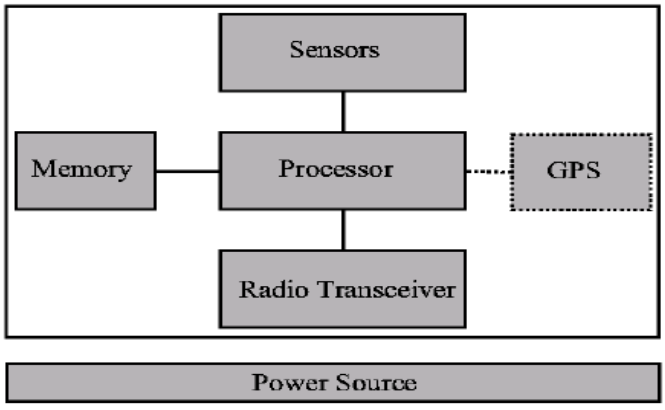

Fig 1: Components of a Sensor Node

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In WSN each of the sensor nodes is capable of event of detecting different events such as fire detection, Pressure Detection, noise detection, etc., and each node is capable to send the detected event messages to the sink (Fig.2). The most important benefit of WSN is to detect the events where the human beings cannot reach.

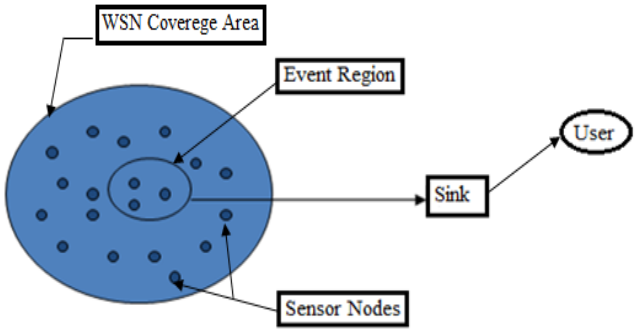

Fig 2: A Relative Communications Between Sensor Node and User

Some application areas for WSNs are as follows:

- Habitat and Ecosystem Monitoring
- Seismic Monitoring
- Civil Structural Health Monitoring
- Monitoring Groundwater Contamination
- Rapid Emergency Response
- Industrial Process Monitoring
- Perimeter Security and Surveillance

The rest of this paper is organized as follows. In Section 2, we discuss about related work. In section 3 we discuss proposed work, and conclusion is presented in section 4

II. RELATED WORK

Event Detection and Transmission Protocols (EDTPs) in WSNs

This paper is a dedicated to the study of the Event Detection and Transmission Protocols based on sink centric and node centric parameters [1]. In this paper there is also consideration of energy efficiency, reliability and congestion control as sub-parameters for each subcategory.

Event Detection and Transmission Protocols (EDTPs) are categorized into two types:

A. sink centric

B. node centric

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A. *Sink centric:* in sink centric event Detection and Transmission Protocols sink makes decision based on data or information gathered from number of sensor nodes present in event occurring region.

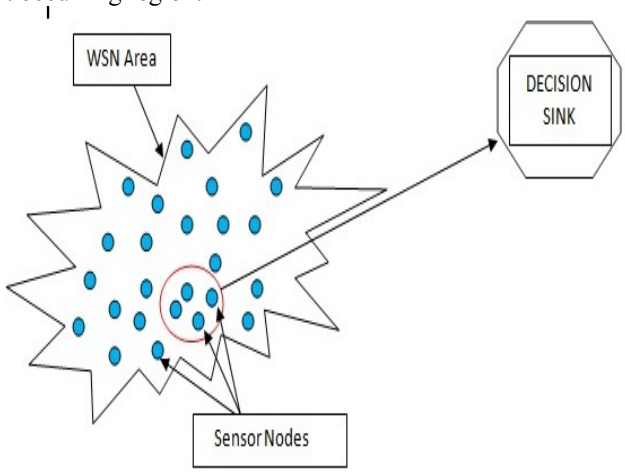

Fig 3: Sink Centric Event Detection And Transmission in WSN.

The sink centric event Detection and Transmission Protocols are classified under as follows:

I. Reliability based event Detection and Transmission Protocols (RBEDTPs):

The Sink Centric Protocols Which Supports The Reliability Based Event Detection And Transmission Are As Follows:

- ESRT: Event-to-Sink Reliable Transport (ESRT) Protocol
- RRRT: Reliable Robust and Real-Time (RRRT) Protocol
- SMESRT: Simultaneous Multiple Event-to-Sink Reliable Transport (SMESRT) Protocol

II. Congestion Resolution Based event Detection and Transmission Protocols (CRBEDTPs):

The Sink Centric Protocols Which Supports The Congestion Resolution Based Event Detection And Transmission Are As Follows:

- CODAR: Congestion and Delay Aware Routing (CODAR) Protocol
- LTRES: Loss Tolerant Reliable Event Sensing (LTRES) Protocol
- DST: Delay Sensitive Transport (DST) Protocol

III. Energy Efficiency Based event Detection and Transmission Protocols (EEBEDTPs):

The Sink Centric Protocols Which Supports The Energy Efficiency Based Event Detection And Transmission Are As Follows:

- OEDSR: Optimized Energy-Delay Sub-network Routing (OEDSR) Protocol
- RT2: Real-Time and Reliable Transport $(RT)^2$ Protocol

B. *Node centric:* in node centric event Detection and Transmission Protocols individual Node Makes Decisions about Occurred Event and Passed Results to Sink.

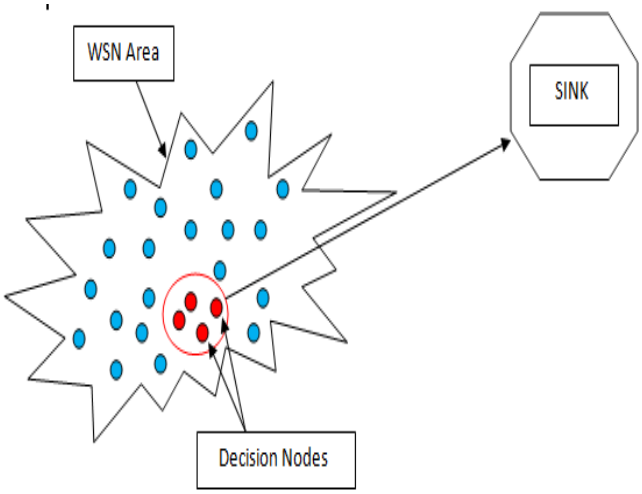

Fig 4: Node Centric Event Detection and Transmission in WSN.

The node centric event Detection and Transmission Protocols are classified as follows:

I. Reliability based event Detection and Transmission Protocols (RBEDTPs):

The Node Centric Protocols Which Supports The Reliability Based Event Detection And Transmission Are As Follows:

- ERP: Event Reliability Protocol (ERP)
- COLLECT : COLLaborative Event deteCtion and Tracking (COLLECT) protocol
- REAR: Reliable Energy Aware Routing (REAR) Protocol

II. Congestion Resolution Based event Detection and Transmission Protocols (CRBEDTPs):

The Node Centric Protocols Which Supports The Congestion Resolution Based Event Detection And Transmission Are As Follows

- EEDP: Efficient Event Detection Protocol (EEDP)
- SWIA: Stop-and Wait-Implicit Acknowledgement (SWIA) Protocol

III. Energy Efficiency Based event Detection and Transmission Protocols (EEBEDTPs):

The Node Centric Protocols Which Supports The Energy Efficiency Based Event Detection And Transmission Are As Follows:

- EELLER: Energy Efficient-Low Latency Express Routing Protocol (EELLER)
- IQAR: Information Quality Aware Routing (IQAR) Protocol

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Detailed Description is as follows:

1. Event-to-Sink Reliable Transport (ESRT) Protocol

ESRT is reliable event detection with minimum energy expenditure and congestion resolution [1]. The sink is only collected information of sensor nodes within the event region of WSN. Mainly there are 5 features as follows.

- Self-configuration - ESRT is self-configuring and achieves execution under dynamic topologies by self-adjusting the Operating point.
- Congestion Control - Packet loss due to congestion can be minimized in ESRT.
- Energy awareness – ESRT is reliable as well as Energy efficient Protocol. It minimizes power consumption during event detection and transmission.
- Collective identification - ESRT does not require individual node IDs for operation. This can ease implementation costs and reduce overhead.
- Biased Implementation - The algorithms of ESRT mainly run on the sink with minimum functionalities required at sensor nodes. This helps conserve limited sensor resources and shifts the burden to the high-powered sink. Such a graceful transfer of complexity is possible only due to the event-to-sink reliability notion.

ESRT Requirements

- Sink is powerful enough to reach all source nodes.
- Nodes must listen to the sink broadcast at the end of each decision interval and update their reporting rates.
- A congestion-detection mechanism is required.

Algorithm for ESRT

- If congestion and low reliability: decrease reporting frequency aggressively. (exponential decrease)
- If congestion and high reliability: decrease reporting to relieve congestion. No compromise on reliability (multiplicative decrease)
- If no congestion and low reliability: increase reporting frequency aggressively (multiplicative increase)
- If no congestion and high reliability: decrease reporting slowing (half the slope)

Advantages of ESRT:

- ESRT achieves energy efficiency, reliability, congestion control easily.

Disadvantages of ESRT:

- ESRT follows central control method which is not an energy efficient method

2. Reliable Robust and Real-Time (RRRT) Protocol

The RRRT protocol [2] is useful to achieve reliable and timely event detection with minimum possible energy consumption. The RRRT uses a fault tolerant optimal path (FTOP) for data delivery. It includes a combined congestion control mechanism that serves the dual purpose of achieving reliability and conserving energy. The RRRT protocol operation is determined by the current network state based on the delay constrained event reliability and congestion condition in the network.

RRRT protocol consists of two major concepts:

Event-to-action delay bound: to meet the application specific deadlines.

A combined congestion control mechanism: for achieving reliability and energy conservation. The event-to-action delay bound is based on assumptions such as

Observed delay-constrained event reliability (DRo): It is the number of packets that is received by the sink within a certain delay bound in an interval for decision

Desired delay-constrained event reliability (DRd): It is the minimum number of packets which are required for reliable event detection within a certain delay bound and

Delay-constrained reliability indicator (DRi): i.e., DRi = DRo/ DRd.

If the observed delay constrained event reliability is higher than the reliability bound i.e., DRo>DRd then the event is reliably detected within a specific delay bound.

Advantages of RRRT:

- Reliable event detection based on event-to-action delay bound.
- Improved energy conserving based on reporting frequency adjustments.

Disadvantage of RRRT:

- Congestion detection and control mechanisms lead to extra overhead.

3. Simultaneous Multiple Event-to-Sink Reliable Transport (SMESRT) Protocol

Simultaneous multiple event-to-Sink reliable transport protocol (SMESRT) [3] is designed to accomplish simultaneous multiple reliable event detection in WSN with minimum energy expenditure.

It includes a combined payload control component that serves the dual purpose of less traffic at the sink and conserving energy.

Working operation of SMESRT is as follows:

- All the nodes detecting the same event send their event packets to the cluster head (CH) at a predefined reporting frequency for one reporting period.
- At the decision interval the nodes wait for the adjusted reporting frequency sent by the CH. If no reporting frequency is adjusted during this time the nodes continue to send data packets at the same reporting frequency for the next reporting period.
- When a node is elected as a cluster head it continues to receive event packets in reporting period. If the CH detects that the minimum event sensing node or the

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minimum number of packets is less than the threshold value, it will not report to the sink.

- Otherwise in the decision interval CH aggregates the packets by a payload control component, send only one aggregated packet to the sink (figure 6) and waits for the acknowledgement and next reporting period's reporting frequency (figure 7). If CH can detect that the gathered event information is enough, it continues to drop packets coming from the event sensing nodes for that reporting period.
- When Sink gets an aggregated event packet, it calculates the reliability and acknowledges the packet with next reporting period's reporting frequency in the decision.

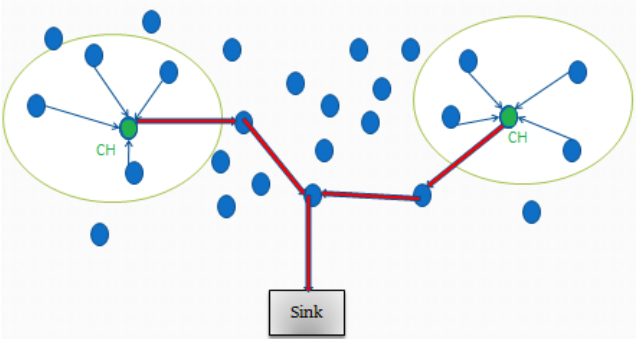

Figure 6: SMESRT Operations (Downstream)

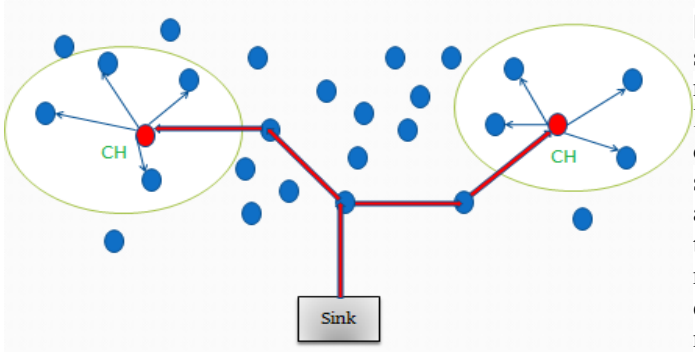

Figure 7: SMESRT Operations (Upstream)

Advantages of SMESRT:

- Payload control at the CHs provide less traffic
- SMESRT can assign different reporting frequency for different events.

Disadvantage of SMESRT:

- The assignment of different reporting frequency results into the extra overhead.

4. Congestion and Delay Aware Routing (CODAR) Protocol:

Congestion and Delay Aware Routing (CODAR) protocol [4] which tries to improve end-to-end data success rate of nodes near to an event and also tries to reduce the latency of these time critical data. It considers a static WSN with a single BS where nodes generate monitoring or regular data with a low generation rate. When some nodes sense a critical event, they generate critical data with a high generation rate. To detect the event successfully, the BS needs to receive a high number of critical data packets. Moreover, each critical data packet must reach the BS within certain time after its generation. Delay of regular data arriving at the BS is not detrimental. Critical data generating nodes are called critical nodes and other nodes are called regular nodes. When the event is no longer sensible, the critical nodes become regular nodes.

CODAR having six major parameters as follows:

1) Congestion Avoidance
2) End-to-end Delivery Delay Management
3) Ensuring Uniform Node-density
4) Congestion Mitigation
5) MAC Layer Queue Management
6) Improving the Success Probability of Control Data

Congestion and Delay Aware Routing (CODAR) protocol has the potential to reduce congestion by avoiding congested nodes during route selection process and also by dropping of futile data packets. It provides high success rate by accurately adjusting data rate of a node during congestion mitigation.

Advantages of CODAR:

- CODAR delivers high amount critical data within specified amount of delays

Disadvantages of CODAR:

- Not suitable for large number of critical nodes
- Less energy efficient.

5. Loss Tolerant Reliable Event Sensing (LTRES) Protocol

Loss-Tolerant Reliable Event Sensing protocol (LTRES) [5] is designed as reliable transport layer protocol in wireless sensor networks. LTRES depends upon reliability requirements for dynamic event observation in WSNs. The level of reliable event sensing for a particular application is determined by the sink at the transport layer. A distributed source rate adaptation mechanism is designed; incorporating a loss rate based lightweight congestion control mechanism, to regulate the data traffic injected into the network so that the reliability requirements can be satisfied. LTRES can provide event-based loss-tolerant reliable data transport service for multiple events with short convergence time, low loss rate and high overall bandwidth utilization. LTRES is responsible for early congestion detection and adjusts the source rates at the aggressive sensor nodes. It is based on event-to-sink reliability, where the end-to-end transport reliability requirement is guaranteed for an event area instead of from each source node.

Advantages of LTRES:

- LTRES provides adaptive end-to-end reliable data transport.
- LTRES Minimized packet transmission with less energy consumption.

Disadvantages of LTRES:

- Sometimes packet congestion occurred.

6. Delay Sensitive Transport (DST) Protocol

DST protocol [6] is used for faster and reliable transport event features from the sensor field to the sink with minimum energy consumption.

DST is also provides congestion control mechanism. It integrates the Time Critical Event First (TCEF) scheduling mechanism to meet the application-specific delay bounds at the sink node.

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DST consists of two components:

- A reliable event transport mechanism
- A real-time event transport mechanism.

A reliable event transport mechanism:

Reliable event transport mechanism measures the observed delay-constrained event reliability against the desired delay constrained event reliability to determine if appropriate action is needed to ensure the desire reliability level for event-to-sink communication.

A real-time event transport mechanism:

The real-time event transport mechanism uses this event-to-sink delay bound to achieve the application specific objectives.

For congestion detection, DST measures buffer overflow at each node and computes the average node delay. In DST protocol, a node is said to be congested whose buffer overflows due to excessive incoming packets or average node delay is above a certain delay threshold value. After detecting the congested node, it then informs the congestion information to the sink node by setting the Congestion Notification (CN) bit in the header of the event packet.

Advantage of DST:

- DST provides congestion control mechanism.

Disadvantage of DST:

- DST having overhead in reporting frequency rate adjustment.

7. Optimized Energy-Delay Sub-network Routing (OEDSR) Protocol

Optimized Energy-Delay Sub-network Routing (OEDSR) protocol [7] is a hierarchy based structure protocol, where only sub-networks are formed around an event/fault and elsewhere in the network nodes are left in sleep mode. OEDSR borrows the concept of relay-nodes (next hop node) selection from OEDR. In OEDR, relay node selection is based on maximizing the number of two hop neighbors. Whereas, the selection in OEDSR is based on maximizing the link cost factor. OEDSR assumes that the base station has a sufficient power supply, thus a high power beacon from the base station is sent to all nodes on the network. This assumption makes all nodes know their distance to the base station, which the link cost factor formula relies on this assumption.

In OEDSR, the nodes are either in idle or sleep state, but once an event is detected, the nodes which are near the event become active. The active nodes itself forms a cluster and choose Cluster Heads (CHs) among themselves. The packets from CHs are sent to the base station through relay nodes. The active nodes sends the HELLO message to other neighbor nodes which consists of attributes such as the active node ID, energy availability of the node, and the sensed attribute. Based on this information the active nodes in the network forms cluster in order to have efficient data aggregation are which helps to reduce the energy loss. In the start a Temporary Head (TH) is selected based on maximum energy and then TH chooses the CHs based on CH selection criterion. After the selection of CHs the TH sends a CH SELECT packet to all active nodes in the network and TH becomes a regular node. When nodes receives a beacon frame from the CHs, then nodes measures the Received Signal Strength Indicator (RSSI) for that particular beacon frame and also strength of each signal, based on these values the node joins into a particular cluster.

Advantages of OEDSR:

- Cluster formation leads to energy efficiency
- When event occurs then only a portion of the network is active.

Disadvantage of OEDSR:

- When the number of packets is transmitted between the sensor nodes, THs and CHs this may leads to delay.

8. Real-Time and Reliable Transport (RT)² Protocol

The objective of the $(RT)^2$ protocol is to reliably and collaboratively transport event features from the sensor field to the actor nodes with minimum energy dissipation [8]. The $(RT)^2$ protocol simultaneously addresses congestion control and timely event transport reliability objectives in WSANs.

Objectives of $(RT)^2$ protocol:

- Reliable and timely event detection
- Minimum possible energy consumption
- No congestion

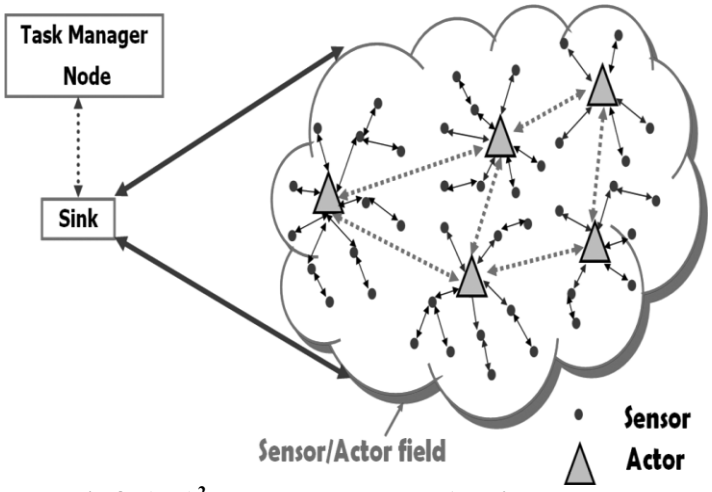

Fig 8: $(RT)^2$ Protocol – Network Architecture

Fig shows network architecture of $(RT)^2$ protocol

In $(RT)^2$, communication can be classified as follows:

***Sensor-Actor Communication*:** The process of transmission of event features from the sensor nodes to the actor nodes is referred as sensor-actor communication.

***Actor-Actor Communication*:** Actor-actor communication is referred as communication between the actors to make a decision on the most appropriate way to collaboratively perform the action.

- Actor ==> sensor
  – Broadcast control packet
- Sensor ==> actor
  – Report event packet periodically
- Actor <==> actor
  – Collaborate
  – One-to-one multi-hop communication

Congestion detection & control

- Detection by sensor nodes
  – Local communication delay
  – Buffer level
- Delivery to actor node

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– Piggybacking congestion notification (CN) bit
● Control by actor node
– Broadcast new f (event reporting frequency)

Advantages of $(RT)^2$:

- The $(RT)^2$ protocol have Reliable and timely event detection with Minimum possible energy consumption and No congestion

Disadvantage of $(RT)^2$:

- the configuration adjustment nature of $(RT)^2$ results into extra delay.

9. Event Reliability Protocol (ERP)

The Event Reliability Protocol (ERP) enables reliable transfer of packets containing information about an event to the sink [9]. ERP also minimizes similar redundant packets from nodes to node which avoid congestion in network.ERP uses region-based selective retransmissions of events.

Region-based selective retransmission mechanism:

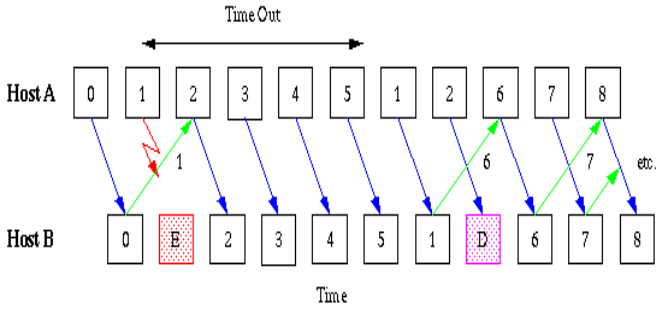

Fig 9: Region-Based Selective Retransmission In ERP

- when the sensor node sense an event it will then send the detected event information to the next hop node and then this next hop node store that event packet in its buffer and the packet at the head of its buffer is transmitted to the next hop.

- When the node hears that the next hop node is transmitting the packet that was sent by it, then it is known as implicit acknowledgement for notifying that the packet is forwarded successfully. And the node then erases the entry of the packet from the queue end and the next packet in the queue is processed.

- The region-based selective retransmission makes use of the source ID, source location and event's time at a source of a particular packet which is to be retransmitted.

- The distance between the nodes is calculated to check whether they are in the range of one another. If there is another packet for the same event region sends, then that packet is sent to the sink else s the first packet is sent again until a packet from the same event region is reached to the node's queue.

Advantages of ERP:

- Reliable and real time event transmission
- Low redundancy

Disadvantage of ERP:

- Low energy efficient

10. COLLaborative Event deteCtion and Tracking (COLLECT) protocol

CollECT protocol [10] is designed for event detection and tracking in a Wireless Heterogeneous Sensor Network.

In CollECT, three major procedures are used as follows:

1) Vicinity triangulation
2) Event determination
3) Border sensor selection

Vicinity triangulation is used to construct the logical triangle in the vicinity of a sensor.
Event determination is to determine the event.
Border sensor selection is to select the border sensor to identify the event boundary.

CollECT is promising for event detection and tracking due to satisfactory event accuracy and reasonable fitness of border sensors.

Advantages of CollECT:

- CollECT is promising for event detection and tracking

Disadvantage of COLLECT:

- It is not cost-effective.

11. Reliable Energy Aware Routing (REAR) Protocol

REAR [11] considers residual energy capacity of each sensor node in establishing routing paths and supports multi-path routing protocol for reliable data transmission. REAR allows each sensor node to confirm success of data transmission to other sensor nodes by supporting the DATA-ACK oriented packet transmission.

In REAR the acknowledgement signal or packet is sent to sensor node by base station after successful event delivery.

If the sensor node receives the ACK packet within the timeout, it then transmit new event packet otherwise it assumes that earlier packet is loss and it retransmits a packet.

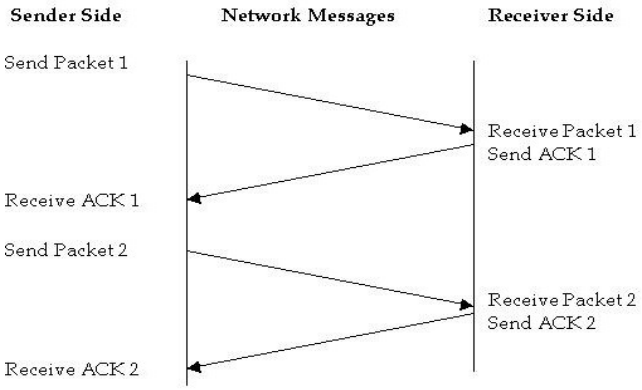

Fig 10: Acknowledgement in REAR

Advantage of REAR:

- It provides energy efficient routing.

Disadvantage of REAR:

- If acknowledgement is loss then there is unnecessary retransmission of packet.
- Data redundancy may be occurred.

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12. Efficient Event Detection Protocol (EEDP)

Efficient event detecting protocol (EEDP) is designed for event monitoring applications [12].

In the event occurring region each sensor node broadcasts its detected information to other nodes, so that a co-operative decision should be taken. After this a decision node chooses next hope to send an alarm packet. Simple Decision Rule (SDR) is used to select the decision node. EEDP uses dynamic multicopy scheme to improve the reliable transmission of the single alarm packet. For accurate decision Composite Decision Rule (CDR) is used in EEDP.

EEDP is based on two procedures:

Primary Detection Procedure (PDP): In PDP the event decision is made accurately which is based on SDR and CDR.

Emergency Routing Procedure (ERP): In ERP the event packet is transmitted to the sink by using greedy approach and for achieving reliability simple dynamic multi-copy scheme is used.

Advantages of EEDP:

- Accurate event detection
- No significant amount of data is send to the sink or base station.

Disadvantage of EEDP:

- It is less reliable.

13. Stop-and Wait-Implicit Acknowledgement (SWIA) Protocol

The SWIA protocol restricts the sensor node to transmit the next packet before it received an ACK packet for the previous packet sent [13]. The SWIA protocol uses the implicit acknowledgement. The iACK mechanism uses the broadcast nature of wireless sensor network. In iACK mechanism, the sensor node after transmitting the packet listens to the channel and thus reduces network traffic.

Advantages of SWIA:

- Traffic minimization by avoiding unnecessary packet transmission.

Disadvantage of SWIA:

- Use of iACK mechanism results into some delay in the network performance.

14. Energy Efficient-Low Latency Express Routing Protocol (EELLER)

The EELLER protocol [14] falls under the category of hierarchical routing protocol which is based on clustering in order to minimize the number of hops required for data reporting as well as achieving high energy efficiency. When the event is detected then detected data is forwarded hop-by-hop via cluster heads. The EELLER makes use of hierarchical routing to have energy-efficient routing in an event driven wireless sensor networks. In hierarchical routing, the nodes having high energy are used to send the information and the low energy nodes are used only to sense the event.

The EELLER consists of two phases:

- **Constructing expressways**: In the first phase, the first hop and the second hop are selected based on the link factor, where link factor is equal to the ratio of the energy of the node to the distance to the sink or base station.

- **Cluster formation and data communication**: In the second phase of EELLER, it results into a better data transmission after data aggregation and removing data redundancy by the cluster heads.

Advantages of EELLER :

- Energy efficiency is easily achieved
- Greater event accuracy.

Disadvantage of EELLER:

- Low Reliability

15. Information Quality Aware Routing (IQAR) Protocol

IQAR - an Information Quality Aware Routing protocol [15]for event-driven sensor networks considers the individual IQ contribution of each sensory data, and collects only sufficient data for a phenomenon of interest (PoI) to be detected reliably IQAR consider the information content of event during data aggregation and forwarding unlike other data aggregation schemes. The IQAR protocol has adopted tree based approach and its aim is to detect event in a sensor network. The quality of the information is concerned with the accuracy of the event information. In this protocol, each sensor nodes detects and collects data about an event independently and makes a per-sample binary decision, which is used to check if the event has happened or not. If an event happened the result of per-sample binary decision will be 1 else it is 0.

Advantages of IQAR:

- Achieves significant energy and delay savings while maintaining IQ

Disadvantages of IQAR:

- Redundant data need to suppress for time interval to reduce traffic load and alleviate medium access contention.

III. PROPOSED WORK

Aim of this paper is study of event detection and transmission in WSNs regarding to that, the Proposed Architecture for Event Detection and Transmission Is As Follows:

Proposed Architecture:

Event detection and transmission are the two major parts in event driven WSNs. First part is event detection and second one is event transmission, whenever an event occurs in the supervised area of WSNs, event should be detected exactly at the same time of occurrence and alarm packet or event packet should be sent to base station i.e. sink node. Sometimes the fake event detection occurs because of faulty node present in sensor network; this leads to wrong result generation. So event detection must be accurate. Accurate event detection achieved by setting threshold value and timer to each node in event region and whenever an event occurs then neighboring nodes in an event region must detect an event and communicate with other nodes in event area and make confirmation of event occurrence. There is formation of cluster in an event region and each cluster is having a cluster head. After communication with each other the decision of

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event occurrence is taken by cluster head and the event message or alarm packet is sent to sink node.

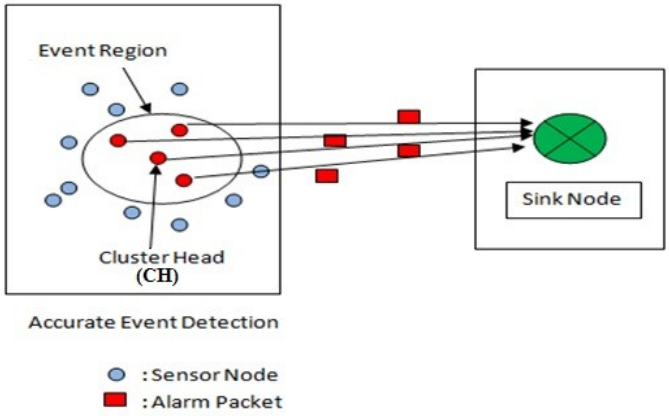

Fig 11: Architecture of Accurate Event Detection and Transmission in WSNs.

Here Cluster Head (CH) is only taking decision about event occurrence but actual event packet is sent by each node in an event area to sink node. This leads to reliability.

IV. CONCLUSION

This paper summarizes recent researches on Event Detection and Transmission Protocols in event driven WSNs. Each of these protocols performs the event detection and transmission based on various approaches in wireless sensor network. In Table 1, we are summarizing the event driven routing protocols covered in this survey.

PROTOCOLS	*SINK CENTRIC*	*NODE CENTRIC*	*RELIABILITY*	*CONGESTION CONTROL*	*ENERGY EFFICIENCY*
ESRT	YES	NO	EXCELLENT	MEDIUM	GOOD
RRRT	YES	NO	EXCELLENT	MEDIUM	GOOD
SMESRT	YES	NO	EXCELLENT	GOOD	GOOD
CODAR	YES	NO	MEDIUM	EXCELLENT	LOW
LTRES	YES	NO	GOOD	EXCELLENT	GOOD
DST	YES	NO	GOOD	EXCELLENT	LOW
OEDSR	YES	NO	MEDIUM	MEDIUM	EXCELLENT
$(RT)^2$	YES	NO	GOOD	GOOD	EXCELLENT
ERP	NO	YES	EXCELLENT	MEDIUM	MEDIUM
COLLECT	NO	YES	EXCELLENT	GOOD	GOOD
REAR	NO	YES	EXCELLENT	LOW	LOW
EEDP	NO	YES	LOW	EXCELLENT	MEDIUM
SWIA	YES	NO	GOOD	EXCELLENT	LOW
EELLER	NO	YES	GOOD	GOOD	EXCELLENT
IQAR	NO	YES	MEDIUM	LOW	EXCELLENT

Table 1. Comparative Table of Event Detection and Transmission Protocols in WSNs.

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