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RAPID DATA TRANSMISSION THROUGH TREE GENERATION& EVENT AGGREGATION TO ACHIEVE LOW LATENCY & ENERGY SAVING IN WIRELESS SENSOR NETWORKS

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Abstract: WSNs event aggregation is a process of compounding some low-level events to a high-level event to removeduplicate information to be transmitted and thus save latency and energy. Current work on event aggregation reflects either latency restraint or aggregation job, but not both. Furthermore, current works only consider best aggregation for single high-level event, but many applications are composed of several high-level events. This paper studies the problem of aggregating multiple high-level events in WSNs with dissimilar latency restraints and aggregation functions. We propose relative matrix to describe aggregation function, which labels the resemblance among partial number of primitive events rather than the rising number of high-level events. Based on it, we suggest an event aggregation algorithm togetherseeing the two matters for single high-level event. This algorithm chains partial combination which is more general than completely aggregation. Through range the ideal base events, the work is stretched to multiple high-level events and consider the applied reliable constraint. The simulation results show that our algorithm outperforms currentmethods and saves substantial amount of energy (up to 15%in our system).

1. Introduction

WSNs (Wireless Sensor Networks) have experienced rapid growth in past years, with an increasing count of applications in study and industry initiatives. The earliest studies in WSNs are mostly concerned with data processing, whereas the most recent ones begin to address event processing. In WSNs, event handling is a natural expansion of data handling, in which gathered data is encapsulated in events. Event aggregation, on the other hand, deducts high-level events from subordinate events, whereas data aggregation creates an outline of information from raw data. Event aggregation is a good way to decrease the amount of data in WSN transmission. Some previous studies have looked at the impact of modules on aggregated architecture, where the aggregation function specifies the relationships between distinct events. Others look at latency limits to suit time-sensitive needs. A combination of both aspects would be broader, but it hasn't been examined yet. The problem stems in element from the aggregation work, that is typically assumed to be completely accumulation, because of this that that

subordinate occasions with the equal unit facts quantity can merge right into a composite occasion with the equal unit facts quantity, or a greater trendy feature that takes low-degree occasions as enter and composite occasions as output.More importantly, very few previous works for several high-level events have been completed. Many events are essential by diverse users for various reasons in a WSN-based intelligent traffic system. Some people may be interested in vehicle average speeds, while others may be interested in specific vehicle speeds. The occasions have distinctive relationships among low-level occasions subsequently have distinctive accumulation capacities. In addition, the idleness prerequisites too may be diverse. Currentmethods have not explored the differing qualities of necessities in occasion conglomeration [1].

In this paper, we explore the conglomeration issue of different high-level occasions with diverse idleness imperatives and accumulation capacities in WSNs. We propose a connection framework as a basic approach to characterize conglomeration work, which utilizes the similitude among a restricted number of primitive occasions instead of developing a number of high-level occasions. After that we plan a calculation named Event Aggregation Algorithm to construct the accumulation tree for a single high-level occasion considering both the two issues. This calculation underpins fractional conglomeration which is more general than complete conglomeration. The clashing ideal parent candidates in building the tree is additionally considered. Finally, we use energetic programming to choose a few of the high-level events as base occasions subject to a solid limitation, and then construct the conglomeration tree utilizing Event Aggregation Algorithm. Our contribution includes three folds: firstly, we propose a basic approach to depict accumulation work and empower them to combine with inactivity limitations. Furthermore, we consider both latency constraint and conglomeration work in person high-level event accumulation. Thirdly, we expand the approach for multiple high-level occasions of conglomeration and consider the practical reliable imperative. To our best of information, this can be the first paper to investigate occasion accumulation in these viewpoints. The rest of the paper is organized as follows: Area II formulates the issue. Area III outlines the arrangement of this issue. Recreation comes about and is detailed and examined in section IV. At long last, we conclude the paper in segment V [1].

2. System Model, Data & Event Aggregation

The WSN is demonstrated as a chart G(V,E), where V is a set of sensor hubs and E is a bunch of possible correspondence joins between a couple of sensor hubs. A subset S of V are source hubs which screen the climate and produce low-level occasions; a sink hub r ∈ V issues occasion discovery demands and gets the outcomes. For effortlessness, we consider just a tree as the conglomeration structure, where every sensor hub stores just a pointer to the parent hub in the tree Two issues have effect on occasion total: inertness requirement and collection work. In this paper, dormancy is characterized as the time term from the time moment that the first occasion is sent at a source hub to the time moment that the last occasion is gotten by the sink hub. In a standard WSN, the idleness is not entirely settled by correspondence distance. At the point when inactivity limitation is tight, the conglomeration tree patterns to be the briefest tree

and little chance to embrace the conglomeration. On the other hand, assuming that dormancy requirement is free (eg. no inactivity limitation), ideal conglomeration can be accomplished. Total capacity likewise influences occasion collection, which portrays connections among the occasions and subsequently the information sum decreases. A bigger information sum decrease implies the occasion is more delicate to occasion accumulation. Existing works experience two issues while building the total tree. Right off the bat, they thought about just total work yet no inactivity requirement. Also, they can't be straightforwardly embraced for various significant level occasions with various inactivity requirements and conglomeration capacities. For the first issue, in later areas we will present an answer for a single occasion. For the subsequent issue, a few direct methods can be planned yet all have inadequacies. The first is to construct the accumulation tree each opportunity an occasion comes which brings about inadmissible above and inertness. The elective methodologies incorporate structure the conglomeration tree with the base idleness and an extraordinary collection capacity, or building all accumulation trees, which might prompt a less than ideal arrangement or unreasonable huge stockpiling not upheld by current sensor hubs Mica2 and Micaz individually The sensible methodology is to construct various m conglomeration trees ahead of time as per various m "idleness imperative collection work" matches, where not entirely settled by accessible information memory in a sensor hub. For effortlessness, m occasions are chosen as base occasions to get the m "inactivity limitation accumulation work" matches.We call the idleness limitations of base occasions as base inactivity imperatives, and the total elements of base occasions as base collection capacities. As a general rule, every one of the occasions with base inertness imperatives are expected to meet a dependable prerequisite. For instance, on the off chance that li is a base inertness requirement, every one of the occasions with li need bound their presentation debasement somewhat [1].

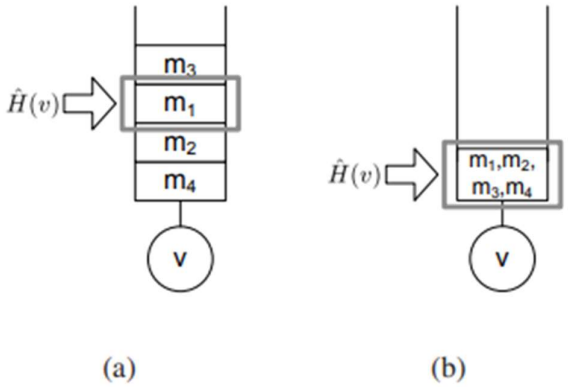


Fig. 1. (a) Without in-network aggregation. (b) With in-network aggregation.

Using the delays that each communication suffers, we rephrase the issue above. When there are no other messages, hm is the shortest time period for m to arrive at the sink. When there are many messages in the network, two packets with distinct messages may fight for scheduling resources. Because wireless interfering prevents nearby nodes from broadcasting packets at the same time, messages in those nodes must be delayed in order to stay at their present position. The feasibility of in-network accumulation in the context of total deferral is

the focus of this part. We investigate a case in which each sensor hub produces a sink given a tree structure of n hubs containing the sink. and all (n − 1) messages are similarly significant. In particular, all loads wm are set to 1. We display that without total, the ideal delay is lower-limited by O(n2), while it is upper-limited by O(n log n) with total. Consequently, the increase is very significant O(n/log n) [2].

A. Delay Performance check without the aggregation function

For a specified tree organization, let ˜d and W indicate the most extreme profundity and the most extreme width of the tree, individually. At time t, a message m is supposed to be situated at profundity d if h(fm(t), versus) = d [2]. The accompanying suggestion gives a sure on the ideal postpone execution. Without in-network total, the postponement is lower limited by

$$\sum_{m \in \hat{V}} D_m \geq O(n^2),$$

B. Delay Performance check with the aggregation function

In-network conglomeration can altogether diminish the deferrals by incorporating various messages into a solitary bundle. Since the decrease in the quantity of transmissions suggests less obstruction, messages can be sent quicker. We expect that messages can be totaled into a solitary bundle with no cost on the off chance that they are situated in a similar hub [2]. With in-network accumulation, the postponement is upper limited by

$$\sum_{m \in \hat{V}} D_m \leq O(n \log n),$$

Event Aggregation Algorithm

We propose Postpone Limited Occasion Conglomeration Calculation (Event Aggregation Algorithm) to assemble the collection tree seeing both inactivity requirement and collection work. Not the same as complete conglomeration, Event Aggregation Algorithm upholds fractional collection. During the tree building, on the off chance that a source hub participates in the tree, the distance expanded isn't the distance between this hub also, the tree, however the distance between this hub and the sink hub[2].

For instance, fig. in accumulation tree T as of now contains v1, v2 and v3; the space amongst v4 and T is 1, that's the very elevated distance in absolutely accumulation due to the fact that while a parcel navigates from v4 to v3, it converges into the parcel of v3 therefore now no longer increment the cost from v3. This isn`t authentic in midway collection, the package deal crossing to v3 can also additionally generally right into a parcel with facts sum greater than 1, then it has greater cost from v3 to the sink hub. We likewise gift the concept of achievable distance, in mild of the truth that numerous activities can also additionally have clashed perfect discern Participators. As in Figure, v1, v2 and v3 at the moment are in T; When event e1 communicates to v3, an appropriate distance is two challenges to the discern of v2, whilst for event e2, an appropriate distance is three challenges to the discern of v2. In the full

tree, v3 has only a unmarried discern. This is purported "achievable" and desires alternate while a supply hub participates withinside the tree. The subtleties are displayed in Calculation 1 [2].

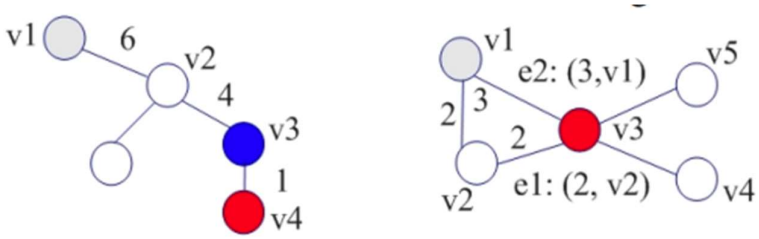


Fig. 2. Ne node insertion in event aggregation algorithm

Our information collection booking (DAS) calculation comprises two stages: 1) conglomeration tree development and 2) accumulation planning. As a representation of our techniques, we first present a unified rendition of our information conglomeration booking. We take on a current strategy for the primary stage furthermore, the subsequent stage is the center of our calculation. We will present these two stages in the accompanying two segments. At the end of the segment, we present a circulated execution in light of our unified accumulation booking calculation [2].

A. Aggregation Tree Building

In the primary stage we build a conglomeration tree in an appropriate way utilizing a current methodology. We utilize an associated ruling set (CDS) in this stage since it can act as the virtual spine of a sensor organization. A circulated approach of building a Discs has been projected by Wan et al. In their calculation, an uncommon overwhelming set employing a MIS of the grid is constructed to begin with and after that a CDS is developed to put through dominating nodes and the other hubs. All hubs within the MIS are colored dark and all other hubs are colored dark. This CDS tree can be utilized as the conglomeration tree in our planning calculation with a little alteration as taken after.We select the topology center of the undirected graph as the root of our BFS tree. Take note that, past strategies will utilize the sink hub as the root. Our choice of the topology center empowers us to decrease the idleness to a work of the organize sweep R, rather than the net- work breadth D demonstrated by past strategies. Take note that for most systems, the topology center is distinctive from the sink hub. After the geography place accumulated the collected information from all hubs, it will then, at that point, send the conglomeration result to the sink hub by means of the briefest way from the geography community v0 to the sink hub versus This will bring about an extra inactivity dG(v0, versus) of at most R.The position of a hub u is (level, ID(u)), where level is the jump distance of u to the root in the BFS. The positions of hubs are thought about utilizing lexicographic requests[2][5].

B. Centralized Tree Approach

Aggregation scheduling is primarily based totally at the aggregation tree built withinside the first section. As an illustration, we first give a green centralized algorithm. We will then give our disbursed scheduling implementation in Section III-C. Calculation 1 shows

how the information from the dominitees are amassed to the dominating nodes. Our technique is a covetous methodology, wherein at each schedule opening, the arrangement of dominating nodes will assemble information from as numerous dominating nodes (whose information has not been accumulated to a dominating node yet) as could be expected. Notice that since the greatest level of hubs in the correspondence chart is Δ, our technique ensures that after probably Δ schedule openings, every one of the dominating nodes' information will be assembled to their comparing dominating nodes while considering the obstruction. The fundamental concept is as follows: every dominating node will randomly choose a dominatee whose records isn't suggested to any dominating node yet. Clearly, those decided on dominate might not be capable of shipping their records to corresponding dominating nodes in a single time-slot because of ability interfering. We then reconnect those dominitees to the dominating nodes (and might not time table a number of the chosen dominates withinside the present day time-slot), the use of Algorithm 2, such that those new hyperlinks can speak concurrently.

For every energetic transmitter v, v 6= ui and v 6= uj , we delete all dominating nodes from D(ui) (and additionally from D(uj)) which can be inside the transmission variety of v. Notice that we will discard those dominating nodes when you consider that their ranges are already reduced through at the least 1 due to the lifestyles of a few energetic transmitter v[2].

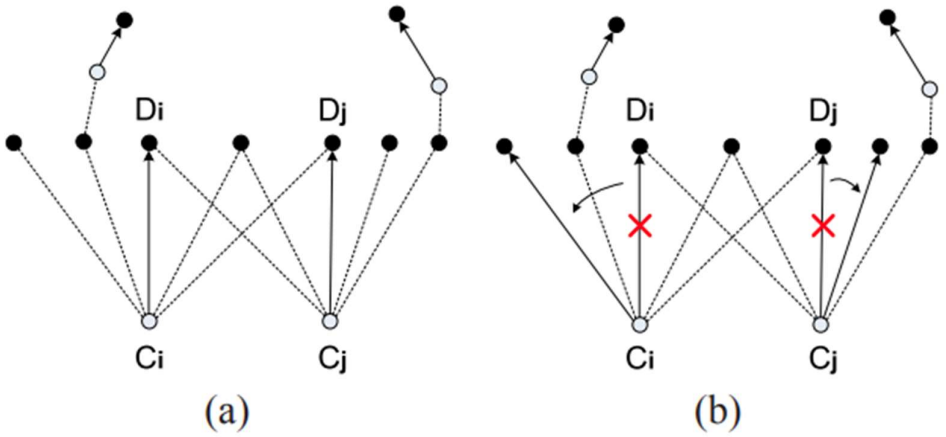


Fig. 3. (a) An interferingamong 2 links. (b) A state afterwardsrearranging two links.

Both Di and Dj can be empty and might not be empty. Algorithm 2 indicates a way to re-join dominitees to dominating nodes to keep away from the interfering.

After all of the statistics withinside the dominitees were aggregated to dominating nodes, our subsequent step is to combine all of the intermediate effects withinside the dominating nodes to the root. We can see that during every layer of the BFS tree, there are a few dominating node(s) and a few dominant(s). For each dominant, it has at least one dominating node neighbor withinside the equal or higher degree. Thus, each dominating node (besides the basis) has at least one dominating node withinside the higher degree inside two-hops. Using this property, we are able to make certain that each one the facts withinside the dominating nodes can attain the basis in the end if each dominating node transmits its facts to

a few dominating nodes in higher degree inside two-hops. From some other factor of view, thinking about dominating nodes withinside the reducing order in their levels, a dominating node u in degree L aggregates facts from all dominating nodes in degree L+ 1 or L+ 2 which might be inside two-hops of u. This will make certain that each one of the facts could be aggregated to the basis. Algorithm three provides our approach in detail. In Algorithm three we most effectively focus on communications among dominating nodes. Since dominating nodes can't communicate directly. We should depend on a few dominating nodes, every of which acts as a bridge among dominating nodes. Hereafter we rename those dominates as connectors. The set of rules runs from decrease degree to top degree in aggregation tree, each dominating node will stay silent till the extent wherein it locates begins running. When it's far from its turn, the dominating node will attempt to gather all of the information from different denominators in decreasing stages that have now no longer been aggregated. If a dominating node's information has been gathered before, then it's far pointless to be gathered again. Actually, we should assure this for each information to be and most effective be used once. Our set of rules implements this via way of means of discarding the dominating nodes after their information were accrued to top stages. Notice that during our set of rules when we manage dominating nodes Bi (all dominating nodes in stage i), there can also additionally nonetheless have a few dominating nodes in Bi+1 whose records aren't aggregated. This ought to appear due to the fact a dominating node in Bi+1 might be inside 2-hops of a few dominating nodes in Bi−1, however now no longer inside 2-hops of any dominating node from Bi. We finish that once the execution of all of the dominating nodes in Bi, all dominating nodes in Bi+2 have already been aggregated [2].

C. Distributed Implementation

Now we give a dispensed implementation for our data aggregation scheduling. The dispensed implementation includes 3 stages:

1) Every dominatee transmits its information to the neighboring dominating node with the bottom level,
2) Data is aggregated from the lower-level dominator to the upper-level dominator, and finally to the root of the aggregation tree, which is the topology center of the network.
3) The Topology Center then uses the shortest route to send the aggregated data back to the original sink.

The disbursed implementation differs from the centralized one in that the disbursed one seeks to transmit greedily: we are able to try to allocate a node v a time-slot to transmit on every occasion v has collected the aggregated records from all its children`s nodes withinside the records aggregation tree T. Thus, the number one ranges can also moreover interleave in our disbursed implementation. The interleaving will reduce the latency notably as it will increase the extensive sort of simultaneous transmissions [2].

To course our algorithm, each node vi must keep some neighborhood variables, which are

1) LAst indicator: LAst[i] ∈ , to suggest whether or not the node vi is a LAst node withinside the statistics aggregation tree.

2) Participator Set: CS[i], the establishedset of nodes such that for every j ∈ CS[i], nodes vi & vj can not communicate concurrently to their dad and mom because of interfering. In different words, if j ∈ CS[i], we've both the figure pT (i) of node vi withinside the statistics aggregation tree T is in the interfering variety of node vj ; or the figure pT (j) of node vj withinside the statistics aggregation tree T is in the interfering variety of node vi ; or both. Notice that below the interfering version studied on this paper, every node in CS[i] is within a small steady range of hops of i.
3) Ready Participator Set: ReadyCS[i], that is the set of nodes that collides with i and it is prepared to ship statistics to its figure, i.e., it has acquired the statistics from all its kids' nodes.
4) Time Slot to Transmit: T.S.T.[i], that is the assigned time-slot that node vi certainly sends its statistics to its figure.
5) Number of Children: N.O.C.[i], that is the range of kids nodes of vi withinside the statistics aggregation tree T .

Observe that here, at some time, if we allow Rdy be the set of nodes which might be equipped to transmit. The T.S.T. of all nodes are initialized to 0. The info of our allotted set of instructions are deep-rooted in Algorithm 4. When a node vi qualities its scheduling, it sends a message FINISH to every node in its Participator set CS[i]. When a node i obtains a message FINISH, it unites its T.S.T.[i] to the bigger one of its unique T.S.T.[i] and T.S.T.[j] + 1. When all of the youngsters of node vi completed their transmission, the node vi is equipped to compete for the transmission time slot and it'll send a message READY(i, ri) to all nodes in its Participator set. When a node vi obtains a message READY from another node vj , it'll upload the sender j to its equipped Participator set ReadyCS[i] if j is in CS[i]. When the scheduling ends, all nodes will transmit their information primarily based totally on T.S.T.[i]. In the end, the topology middle aggregates all of the information and sends the end result to the sink node through the shortest path [2].

3. Event Aggregation Algorithm

1) Every dominatee spreads its data to the adjacentdominating node with the lowest level (Greedy Approch)

2) Aggregated Data from dominating nodes from below levels to dominating nodes in higher levels and to end to the root of the aggregation tree which is the topology center of the network,

3) Topology center communicates the aggregated data to the sink through the shortest path.

Algorithm Phase 1: Aggregate Data to Dominating nodes: Advertising Phase
1: For i = 1, 2, …,D do
2: Each dominating nodearbitrarilyselects 1 adjacent dominate, where data is not assembledyet, as source. The set of such selected links from a link set L.
3: If there are struggles among selected links, solve interferingusing Algorithm phase 2.
4: Entirely the residual links in L now communicateconcurrently.
5: i ++.

Algorithm Phase 2: Re-joinDominitees to Dominating nodes
1: while (occur a couple of differing links) do
2: Let ui-zi and uj-zj be one of the couples of differing links.
3: Discover the sets Di and Dj founded on directionsdesignatedformerly.

Algorithm Phase 3: Centralized Pillar EAS : Cluster Formation Phase
1: Construct the event aggregation tree T ′ by removing the jobless connectors to confirm that individuallydominating node uses at maximum 12 connections to join itself to all dominating nodes in the lesser level and is inside 2-hops. Here a connection node x (a dominante of a dominating node u) is redundant for the dominating node u, if eliminating x will not separate any of the 2-hop dominating nodes of u from u. Let T be the final tree.
2: for i = R-1,R-2,…,0 do
3: Select all dominating nodes, signified as Bi, in level i of BFS tree.
4: for eachdominating node u ∈ Bi do
5: Node u is unmarked dominating nodesdiscovers the set D2(u) that are inside two-hops of u in BFS, and in lower level i+1 or i+2.
6: Spot all nodes in D2(u).
7: All node w in D2(u) directs f(Aw,X1,X2, … ,Xd) to the parental node (a connection node) in T. Now Aw is the unique data set node w has, and X1, X2, ..,Xd are data that node w acknowledged from its d offspring nodes in T.
8: All node z that is a parental of some nodes in D2(u) directs f(X1,X2, … ,Xp) to node u (which is the parental of z in T). Now X1, X2, … , Xp are data that node z acknowledged from its p offspring nodes in T .
9: i--.
10: The root communicate the results to the sink by the shortestpath algo.

Algorithm Phase 4: DistributedDataAggregationScheduling : TDMA
Input: A network G&tree T ;
Output: T.S.T.[i] for all node vi
1: The node vi sets the value N.O.C.[i], and LAst[i] founded on the built aggregation tree T .
2: Sets CS[i] grounded on the tree T and the novelinterfering relation,
3: ReadyCS[i] ← CS[i]∩{j | j is a LAst in T }.
4: T.S.T.[i]←0; DONE←FALSE;
5: Node i arbitrarilychooses an integer ri. Then say (ri, i)<(rj , j) if (1) ri<rj or (2) ri=rj and i<j.
6: while (not DONE) do
7: if N.O.C.[i]=0 then
Direct message READY(i, ri) toall the nodes in CS[i].
8: if (ri, i)< rj , j) for every j ∈ReadyCS[i] then
Send message FINISH(i) to all the nodes in CS[i];
DONE←TRUE;
9: if i established a message FINISH(j) then
Remove j from ReadyCS[i];
T.S.T.[i] ← max {T.S.T.[i],T.S.T.[j] + 1};

10: if j is a descendent of i then
N.O.C.[i] ← N.O.C.[i] − 1;
11: if i acknowledged a message READY[j, rj] then
if j is in CS[i] then
Add j to ReadyCS[i].
12: Node i communicates data based on the time slot in T.S.T.[i].
13: The topologic canter communicates aggregated data to the sink.

4. Simulations & Results

The simulation has200 nodes are positioned right into a 100 × 100 space. Any nodes inside the communique radius r can speak with one another. We use the strength intake because the overall performance metric. The range of hops are used to explain the latency

We use Event Aggregation Algorithm to construct aggregation trees and calculate the most latency. The test is repetitive with extraordinary aggregation feature Figure indicates the end result and every factor signifies 50 instances performances.All the outcomes are among the minimum latency and latency constraint, which indicates all latency constraints are firmly meet, on the equal time the method receives gain in comparison with the method clearly choosing the minimum latency. Growing gain is going with growing aggregation features. The aggregation tree which islengthier than all others. For occasion 12, the latency of the aggregation tree with that's thirteen at the same time as that which is simplest 8. The aggregation feature is diagnosed withinside the set of rules and generates an extended aggregation tree as a result extra possibilities for overall performance improvement [5]

Event Aggregation Algorithm with Different Parameters

Several trials are undertaken to research the overall performance of our answer for Event Aggregation Algorithm (Event Aggregation Algorithm for short). For contrast, we pick numerous base algorithms along with complete aggregation, common aggregation and random choice. In complete aggregation, the minimal latency constraint and complete aggregation characteristic are used for all activities. The common aggregation analyzes all of the aggregation features and

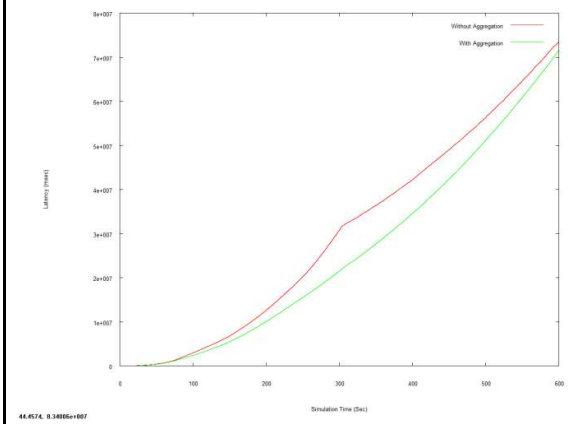


Fig.4 (a) Data Aggregation with 100 Nodes

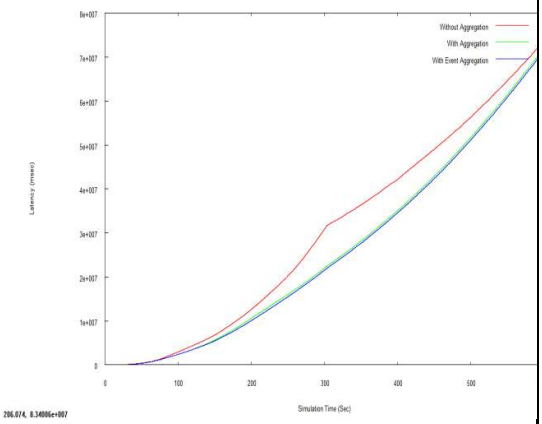
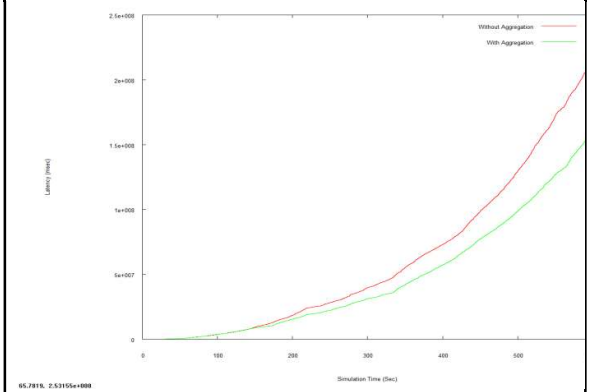
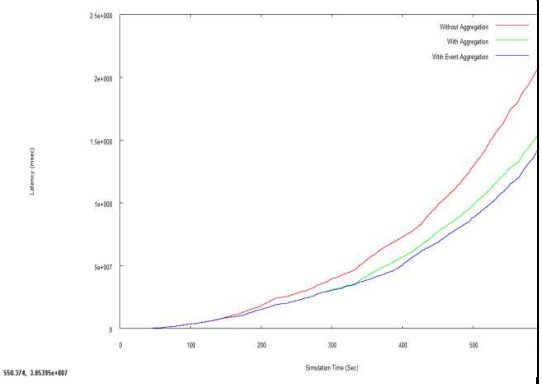
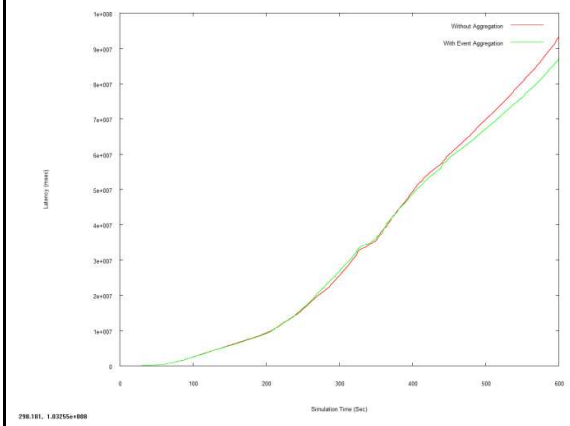
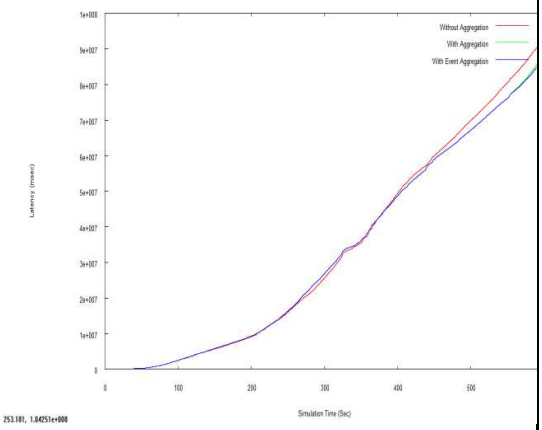


Fig. 4 (b) Event Aggregation with 100

	Nodes
 Fig. 5(a) Data Aggregation with 500 Nodes	 Fig. 5(b) Event Aggregation with 500 Nodes
 Fig. 6(a) Data Aggregation with 1500 Nodes	 Fig. 6(b) Event Aggregation with 1500 Nodes

calculates a mean one. Random choice makes use of a couple of base activities like Event Aggregation Algorithm, however best selects them randomly. The consequences are proven in Figure. In Figure, we repair base occasion wide variety as 20 and alternate the full occasion wide variety from 20 to 100. As a result, Event Aggregation Algorithm continually has the least power intake amongst those 4 approaches. One thrilling aspect right here is that common aggregation is sort of the identical with complete aggregation, because of this that the calculation of common fee has limited help. This is due to the fact with the range of the activities, best one common fee can't efficiently lower latency and aggregation hole. Random choice and Event Aggregation Algorithm use greater base activities consequently have a whole lot higher overall performance. When an occasional wide variety is 20, it saves 50% more power than completely aggregation. As the occasion wide variety increases to 50, the power stored decreases to 30 percentage however the quantity). Between Event Aggregation Algorithm and random choice, Event Aggregation Algorithm continually has higher overall performance. Similar evaluation may be positioned to latency wide variety (graph unnoticed

right here), and Event Aggregation Algorithm additionally has higher overall performance than others.[1]

The end result approximately exclusive base occasion numbers ought to serve as a guiding principle to determine right base occasion variety withinside the system. The electricity intake declines sharply from base occasion variety zero to 20. In the Event Aggregation Algorithm, approximately 15% electricity is saved. After 20, the plot declines much greater slowly. From 20 base occasions to forty base occasions, much less than 10% electricity is saved. So, on this system, 20 base occasions is a right choice. In above figure, it's very clear that Event Aggregation Algorithms outclass different techniques in phrases of amount and reducing speed [1].

Conclusion: After Studying & implementing the event aggregation approach role and latency coercein many high-level events. After studding the problem of distributed& centralized aggregation scheduling in WSNs and event aggregation schedulingalgorithm with latency destined 16R+Δ−14. This is a closelyapproximate algorithm which significantly reducesthe aggregation latency. The theoretical study and the simulation results demonstration that our algorithm outclasses previousalgorithms. We projected enlightenments to thisproblem together with a modest method to state aggregationfunction, the Event Aggregation algorithm considering both latency restriction and aggregation role for sole high-level eventand the ideal base events choice algorithm for accumulatingfrequent high-level events given a dependableconstraint. Simulation outcomesdemonstrate that substantial energy (up to 15% inour system) can be protected by using our algorithm.

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