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RESEARCH ARTICLE

NOVEL APPROACH FOR BEST SIGNAL PROCESSING AND NETWORK STRUCTURE TO IMPROVE CLOUD ERP RELIABILITY AND HIGH SPEED

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Abstract

If the companies face difficulties in using ERP systems because of its complicated integrating and customising functions, the company can consider some other software for processing their data. On the other hand, those who are using ERP system should make precise settings for providing accurate data and timely service. An error-free network structure must be maintained by cloud ERP systems for providing enhanced service. Based on the network structure and best optimization methods, it must focus on nodes, clusters, LANs, and WANs. The novel data pre-processing consists of three core areas, and they are Pattern Recognition, Data Clustering, and Signal Processing. In this paper, Dynamic cluster formation and pattern recognition are given special weightage. For offering high-speed data transactions with data shrinking, Hybrid dynamic clustering algorithm is explained. As there is a shortage of electricity, the priority is given to energy savings by WSN (Wireless Sensor Network). The consumption of energy has decreased by permitting few cluster heads in the network, also known as nodes for communicating with the base station. A simple, effective, and computationally efficient optimization approach known as Particle swarm optimization (PSO) is utilized. With the usage of fitness function every particle poss the fitness value and even their speed it controlled using velocity. These values have been utilized by WSN for rectifying the issues like optimal deployment, clustering, node selection, and data aggregation. Efforts have been made to reduce the energy consumption occurs by the nodes and for extending the life of the network by proposing a PSO-based technique which selects the best nodes as cluster heads and a reselect mechanism for extending the network lifetime.

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Introduction:-

ERP software application provides a single integrated platform by combining various components. Previously, disjointed departmental solutions and some other ERP alternative systems have been utilized and it made their process time-consuming, and expensive. Which one made them to gather various data from different software resource systems? It resulted in consolidating several databases into a single report which might get duplicated or lost or rewritten data in the databases. Majority of the companies wish to have a proper system for consolidating,

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providing timely and accurate data that will support in producing strong strategic decisions and achieving a competitive edge over their competitors. For satisfying these expectations, ERP solutions can be implemented, which provides access to gathered data from the level below through high-level decision centre and for retrieving comprehensive data, this system can also “drill down” into the information system (Grabot et al. 2008). Through centralisation of data for all enterprise modules like human resources, finance, and sales in a single database, ERP enables the collection and processing of business intelligence on the same platform (Zigman 2011).

The contributions of this paper

1. There is an approach termed as cloud service selection which utilizes cloud service brokers. It consists of 3 layers like a cloud service broker layer, user layer, and a cloud service resource layer. The dynamic cloud service selection process is taken care by these three layers. In this, cloud service broker has the authority over few clouds service information that was recorded by the cloud service providers.
2. In cloud service brokers, a dynamic cloud service selection approach is created. Real-time service selection along with an adaptive learning system for dynamic service selections are provided through it. For achieving self–adaptive regulation for optimising next service selection based on present service selection status, incentive, forgetfulness, and degenerate functions are utilized by the mechanism.
3. The cloud service selection process is explained in detail in which a series of dynamic cloud service selection methodology based on the proposed method are described.
4. The effectiveness of our method was examined by detailed simulation tests and the benefits and efficiency were displayed through multi-profile results.

On-Premise ERPand Cloud-Based ERP

The environment of a cloud computing is the cloud-based ERP. Unlike, cloud, ERP programme is not visible, and it runs under a computational resource which exists somewhere on the internet (Lim, 2012). Conversely, An on-premise ERPis installed directly on one or more visible servers. Hence it creates the need of technology, software, and humans’ intervention(Mija, 2013).ERP package provider is also utilized by which infrastructure as a service (IaaS), and SaaS or PaaSERP packages that are run in part or wholly are delivered. Reduction in the cost of access and demanding less IT support and maintenance are the key significance of a cloud-based ERP when compared with on-premise ERP. The benefits extend like having access to reliable information, minimising data duplication in the database, reducing adoption and cost savings, cycle time, greater scalability, and fewer care (Elbahri, 2019). Yet the simplicity of control is the key benefit of on-premise ERP.

A feasible alternative to on-premise ERP is the cloud-based ERP which emerged with the advancement of cloud computing technologies. In accordance with Grabski et al. (2011),the potential to radically alter the ERP environment is termed as cloud computing. Therefore, all the data and application are with the providers, and they provide the access to the applications along with customization as per the client’s requirements and securely stores the data on the Internet. The evolutionary technique of ERP system made few research questions to get arise. “ERP companies are offering hosting or cloud solutions, as the market transitions to cloud environments,” Arnesen (2013) stated. “A serious alternative to on-premises ERP is the Cloud-based ERP and it appears as if the organisations are likely to push for cloud solutions,” writes Mezghani (2014). The hidden relationship among one of Industry 4.0's key pillars (for example, cloud-based ERP) and the features of long-standing business performance, since the influence of variables like cloud service type, company size, and possible bids as control variables and achieving long-term corporate performance (Gupta, 2020).

Technology-Organization-Environment (TOE) Framework

The TOE framework was created by Tornatzky and Fleischer for investigating technological adoption. Technology, organisation, and environment are the three key aspects that drive new technology adoption considered by the framework (Priyadarshinee, 2017). For doing a study on cloud-based ERP and cloud computing adoption, the TOE framework has been widely used (Sohaib, 2017). For SaaS ERP adoption by perceived value, SMEs, configurability, security issues, and customization, vendor attributes, organisational readiness, competitive pressure, and top management are investigated with the utilization of TOE framework Juiz et al. (2019). For discovering the top management’s support is significantly and positively associated with manufacturing SMEs' intention in adopting cloud-based ERP systems, Qian et al. (2016) used the TOE framework for developing a theoretical model based on 102 valid data records from the service and sectors manufacturing in Malaysia.

While looking at cloud-based ERP adoption, the major influences on cloud-based ERP adoption are competitive pressure, enterprise preparedness, top management support, technological readiness, enterprise scale, and technical hurdles which were discovered by AL-Shboul (2019) with the utilization of TOE framework. ICT skill, competitive environment, regulatory environment, top management support, and ICT infrastructure were all significantly related to cloud-based ERP adoption, while organisational culture was not, and this was found by AlBar and Hoque (2017) while they investigated on cloud-based ERP adoption intention based on the TOE framework. The switching intention of cloud-based ERP was studied by Yu-Wei Chang (2020) and found that financial benefit, system quality, and industry pressure had a deep connection with cloud-based ERP switching intention, though government support and information quality were not connected.

Standard steps of Single/Multiple VM migration

While observing, VMs with the same OS, programmes, or libraries might consists of many similar pages and this is termed as Multiple VM migration. Hence all the identical pages from co-located VMs are collected by migration controller and a single copy of these identical pages are transferred to the source server during the multiple VM migration track. Simultaneously, the migration of all co-located VMs to the destination machine is done by the migration controller. For the arrival of incoming migrant VMs, the migration controller prepares the destination server. In the figure 1, a few VM migration steps are represented.

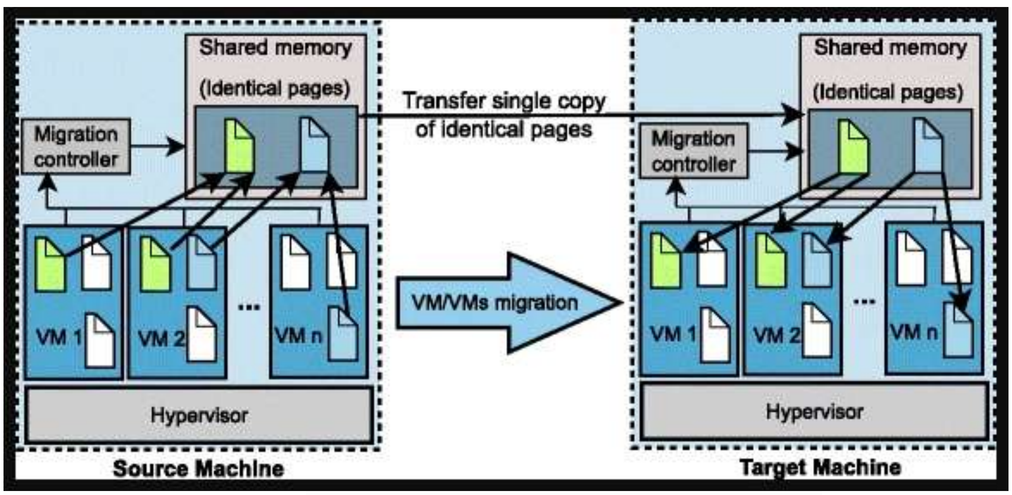

Figure 1:- Standard steps of single/multiple VM migration.

Replication based VM migration

Wasteful memory page migration is occurred during the migration process since VMM detects duplicate copies of the same page on a single VM, many VMs, or multiple servers. And greater network capacity or increased network traffic is required while migrating numerous pages. Compression based, De-duplication based, Redundancy based and Replication based are the few Memory compression algorithms are utilized for compressing the memory.

Type of migration

Single VM migration: Only one VM is migrated at a time.
Multiple VM migration: Two or more VM’s are migrated simultaneously.
Single & Multiple VM migration: One or more VM’s are migrated simultaneously.

The existing works in two major types multiple VM migrations and single & multiple VM migrations arecategorized in the following sub-sections.

Live virtual machine migration frameworks

The prevailing live VM migration frameworks are compared and discussed in this section. The procedures that have been put into practise are termed as "framework". It also includes the recommended implementation and their techniques. Classification of Migration mechanism: in Figure 2, VM migration mechanism’s classification is displayed and in depends on the authors' migration strategy. It is divided into three categories based on the goal and procedures utilised by researchers and they are type of context-aware migration, migration, and duplication-based migration. This is also displayed with the usage of generic model for each of the three groups.

Problem scenario and cloud service selection model

In a cloud computing environment, specific Web services (computing units) like computing, storage, and application services are thought to be Cloud services. For satisfying the needs of users in terms of service integration, cloud services may be chosen and yet managing dynamic service selection directly might be difficult for semantic service technologies. For makingthe cloud service selection easier, service broker technology can be adopted which will be a cost-effective way to manage intermediary services and self-learn.

Thus, a dynamic cloud broker-based service model (DCBRSM) is developed for managing and selecting cloud services. When one or more pieces of cloud service information are encapsulated in a cloud service broker (CBR), the selection of cloud service becomes more controllable and flexible. Through an adaptive learning technique, the dynamic user required cloud service selection tasks are then carried out. Three layers: a cloud service broker layer, a user layer, and a cloud service resource layer are found in the making of the DCBRSM, as shown in Figure 3. Many cloud services, makes their invocation APIs available on the Internet for providing consumers with resources and the consumers quickly select the services they want through cloud service brokers. Therefore, utilization of CBR for helping the users in selecting the best matched services when faced with so many cloud providers dynamically is mainly focused here. The structure of the DCBRSM is described below.

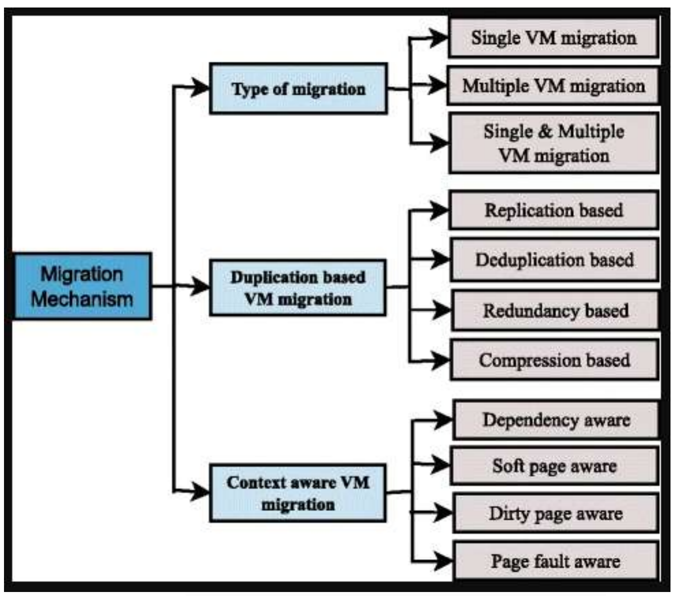

Figure 2:- Classification of migration mechanism.

Internet users from all over the world and their user agents (UAs) are the user layer. The users have to submit tasks with different preferred performance (number of CPUs or storage capacity) and also the prices for the user agents who are responsible for performing the tasks like collecting respective requirement tasks sending them to the CBR in the collecting selected cloud services, cloud service broker layer, and outputting service invocations to users. Then before delivering user requests to the cloud service broker layer, suitable CBR to push an optimal cloud service for each one of the tasks must be chosen by the UA. The cloud service broker layer is responsible for cloud service selection. Multiple cloud service brokers (CBRs) are grouped, based on the terms of performance (for instance the number of CPUs or storage capacity) and costs of the various cloud services by the algorithms. The registered cloud service information is in control by its CBR.

For performing cloud service selection work, user agent selects a cloud service broker, and they mainly focus on utilizing different levels of clustered CBRs for improving cloud service selection efficiency. By the dynamic change of cloud service statuses, adaptive learning can optimise its selection. For finding the best matching cloud service, the relevant cloud service brokers are chosen. Registration messages send to each of the CBRs for the cloud service by the cloud service resource layer.

For finding the best cloud service as quickly as possible by the CBR, 1 or more early registered cloud services might be deleted because of the beyond the time limit or waiting. To be considered for the next round of service selection, other new or updated cloud service information can be entered into the CBR. In UA, the outcome of the selected CBR's cloud service selection is returned for launching the service API, and users can utilize it and the other service selection tasks are completed.

A variety of cloud service providers provides many cloud services that consists of cloud service resource layer and for monitoring cloud services, service monitors (SMs) are utilized which are under few specific providers. CS, the Cloud Service, are the broad public clouds and Web services provided with cloud computing capabilities and units. Registering cloud service information in the CBRs and monitoring current statuses to see if any cloud services fail (go offline) are done by the SMs by helping the respective providers. The CS APIs are the CS interfaces as the means used by users which is used after completing the cloud service selection procedure.

The formal definition of the DCBRSM is given in terms of the above depiction, as follows

Based on the cloud service broker, the cloud service selection model is defined as a tuple DCBRSM = (UA, CBR, SM, DCS), where,

UAisasetofuseragents, $UA_1, UA_2, \ldots, UA_K, \ldots, UA_I\}$

CBRdefinesasetofcloudservicebrokershavingbeenclustered,

$CBR = \{CBR_1, CBR_2, \ldots, CBR_j, \ldots, CBR_m\}$, a$CBR_j \in$ CBRdenotesalevelofservicegroup

andmanagessomecloudserviceinformationregistered.

SMisasetofservicemonitors, $SM = \{SM_1, SM_2, \ldots, SM_i, \ldots, SM_n\}$andthe

numberofprovidersisgenerallymuchmorethanthatofcloudservicebrokers$n \gg m$.

DCS: $CBR \rightarrow CBR_j$withupdated $\sum_{x\in[1,F,D]} f_x$ denotesadynamiccloudserviceselectionstrategy

thatinvolvesanadaptivelearningmechanismoftheclusteredCBRsetand

itsfunctionistoselectabestmatchingCBR_jfromtheCBRset, where

$\sum_{x\in\{I,F,D\}} f_x$ isthesumofadaptivelearningfunctionsvalueandtheI, F, Drespectively

denotesincentive, forgetting&degeneratestrategiesconstitutingthelearningmechanism.

Dynamic Cloud Service with Algorithmic approach

Mapping VMs to PMs (Physical Machine) is the common formulation for the Single-DC problem. Analysing the mapping of jobs to VMs in the Multi-IaaS scenario is more common. Virtual machines is a technology that assist the user for mapping their tasks to PM and this is more visible in hybrid cloud environment in which either, users' tasks are directly mapped to eCPs' VMs or it is wrapped into VMs assigned to local PMs.

One of the examples of how power consumption might be reduced is the location of virtual machines and its optimization techniques are also utilized in server level (Example: Dynamic Voltage and Frequency Scaling), at the component level (memory banks, switching unused cores, discs, cache ways, and other components to a low-energy state) in network equipment (routers and switches) causing in a complex system. A deeper understanding is required in understanding how all these operations are done and their relationships.

In present problem formulations, frequently overlooked issue is the Data transfer between VMs mainly in the case of the Single-DC problem and it has significant impact on total system performance. The more commonly considered in the Multi-IaaS literature is the communication among tasks and it is merged with the notion that all dependencies are given in the form of a DAG. Yet, cyclic communication situations are common, and communication pathways are often dynamic and based on real-time data, it changes during runtime.

In addition, finish-to-start relationships between adjacent activities was implied by DAG (directed acyclic graph) modelling of workflows. Once some partial results of the first activity are available, the execution of second task can normally begin. The usage of DAG scheduling strategy is restricted to minimum fields because of its theoretical clarity. While determining where to putVMs, organizations must ensure that the size of it doesn’t exceed the PM’s capacity. The probability of how the resource consumption of numerous VMs would raise at the same time has to be calculated which on also known as Correlation.

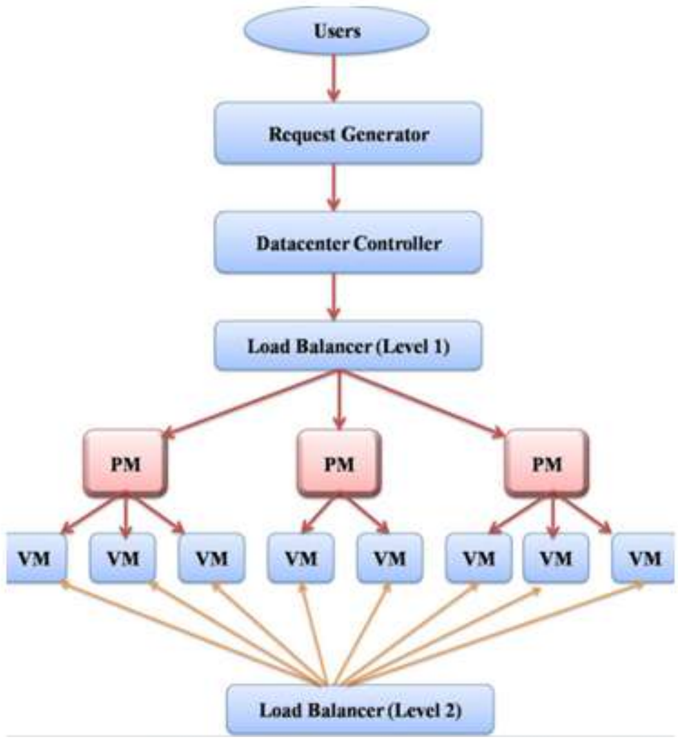

Figure 3:- VM-PM for Load Balancing.

The "noisy neighbour" effect is another factor that must be consider. If one of them uses a resource excessively, the performance of the others may suffer, it happens because, the current virtualization solution does not provide total performance isolation of co-located VMs. All these structural scheduling approaches are compared to an algorithmic technique, for discovering the best results. In this study (figure 4), DCDS was compared to GA, PSO, and ACO. For structuring dynamic cloud and cluster selections, algorithmic approaches to path selection and network scheduling will be utilized.

Figure 4:- Flow chart of ACO.

Table 1:- Summary of Comparative Results.

Indicator	GA	PSO
Complexity	$O(n^2)$	$O(n)$

Accuracy	Feasible solutions are obtained by the outcome achieved by the solutions in large variables and constraints that are near to optimal.	Optimal solutions are produced by the Resolution.
Iterate	More iterations are required if there is more variables and constraints. Generally, it will be higher than the PSO.	More iterations are required if there is more variables and constraints. It takes a small number of duplications of the GA.
Additional techniques used	For approaching the optimum solution, in certain generations, it will take the extra of chromosome extermination techniques.	Additional techniques are not required.

A cross between GA and PSO is GA-PSO (table 1).the GA's natural selection operator is combined with the PSO algorithm's limiting function. For tackling antenna problems, this technique is utilized because it is a robust and effective heuristic optimization technique. Based on the behavioural characteristics of ants seeking food, a met heuristic technique present termed as ACO by releasing pheromones along a viable path. The length of the path chosen determines the rate of pheromone evaporation. Hence, more efficient and practical solution is delivered by the algorithm.

Table 2:- Study of GA and PSO.

	GA	**PSO**	**DE**
Require ranking of solutions	Yes	No	No
Impact of inhabitant’s size on solution time	Exponential	Linear	Linear
Impact of best solution on population	Medium	Most	Less
Normal fitness cannot get worse	False	False	True
Trend for premature convergence	Medium	High	Low
Continuity (density) of search space	Less	More	More
Capability to reach good solution without local search	Less	More	More
Homogeneous sub-grouping enhances convergence	Yes	Yes	NA

Table 3:- Comparative study table of GA, PSO and ACO.

Advantages of GA	**Advantages of PSO**	**Advantage of ACO**
✓ GA can acquiresignificant benefit of large reduction in time and search space ✓ Computational competence ✓ Decreasing the cost of coding ✓ To attain near optimal solution using GA ✓ Excellent quality decoded image	✓ PSO can effectively decrease the encoding time while maintaining the condition of retrieved image ✓ PSO method tofast up the encoder ✓ Steep compression ratio ✓ High decompression speed ✓ High bit rate	✓ A fast fractal encoding algorithm ✓ ACO is to decrease the encoding time ✓ ACO is used to keep same image quantity ✓ ACO achieves almost same compression ratio

An estimation of the algorithms' asymptotic worst-case runtime and memory usage should be provided in the rare scenario. If mathematically feasible, the estimation of the algorithms' asymptotic average-case behaviour will be very useful. In the absence of a full analytic evaluation, empirical evaluation of the suggested algorithms is complicated to be calculated. For the VM placement problem (and its special instances), there are no commonly accepted benchmarks and many distinct problem formulations coexist which makes it impossible to compare.

Yet, not thinking of these issues, researchers often compare their techniques to trivial algorithms or algorithms that does not think of a key feature of the problem, and they will compare different versions of their own algorithm against one other, or do not compare at all. Currently no method is available for comparing and finding out the most effective proposed algorithm. The community will require adopting more rigour in terms of empirical examination of algorithms, for further assisting the field's future progress.

Transition state of clusters (C) in dynamic cluster selection

The nodes are assumed to be initially in a state of sleep, ensuring that energy intake is kept to a minimum. The nodes are also expected to be aware of their geographical locations, and the first objective detection is performed. Assess the distance $d(N_i, N_j)$ from the collected signal.

$$r_i = \begin{cases} \dfrac{\beta}{d^{\alpha}(N_i, N_j)} if d(N_i, N_j) \leq r_s else \\ 0 \end{cases}$$

R_t	Nodecommunicationrange
r_s	Node detection radius
$R(n_i, r_s)$	Detection region of node $N_i$with the detection range r_s
G	Wireless sensor network
E	Set of linkeds between nodes
V	Set of all nodes
C_i	Cluster head node

The average energy of all nodes is computed for ensuring that only nodes with enough energy are selected to be cluster heads and to become cluster chiefs, nodes with energy levels higher than the average energy are eligible. The PSO algorithm is then run son both eligible and the lowest cost from the cluster heads by the base station. The main problem of this technique is that the cluster heads get stuck when the particles have reached their global best and it will not alter until their energy is reduced. Structure building relies on dynamic structure(figure 6)and all cluster heads (CH) should be functional and connected but to reach nearest clusters from public/private networks K-means algorithm and PSO (Prasanth, 2019) approach. The nearest cluster must take over as a backup (CH-ready, CH, CH-for, and member), if any clusters are in the sleeping stage or have a deadline.

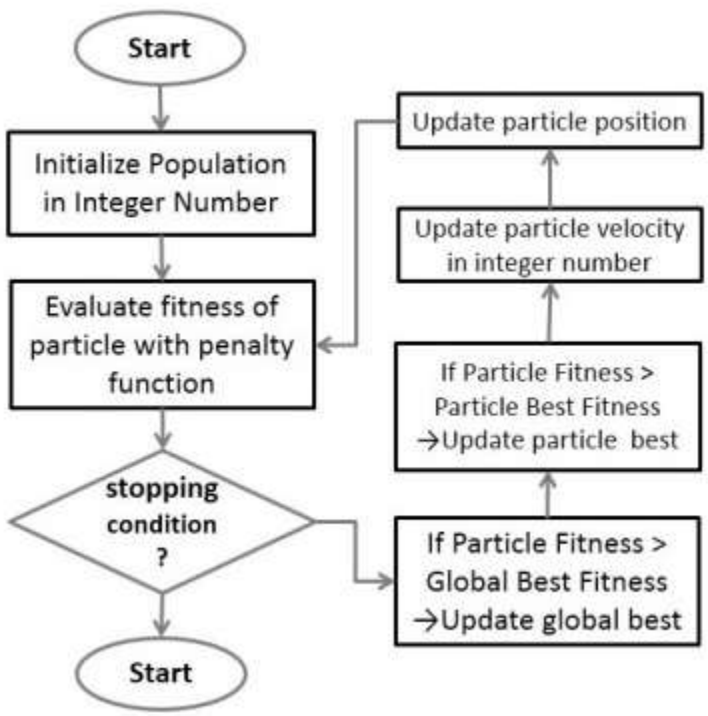

Figure 5:- The PSO concept.

Initiallyall nodes are in the state of "sleep when there is no target activity in the network. Msg-data packet from another node j belonging to the active cluster is received when node is in "sleep" state. if dij<r_snode, i goes to the CH-For stateor CH-ready state otherwise. the distance between the two nodes is Dij and the detection range is r_s.

After their detections of the target, only the nodes with the CH-ready state can become CH; in reverse, the nodes j with the CH-For state can only become members.

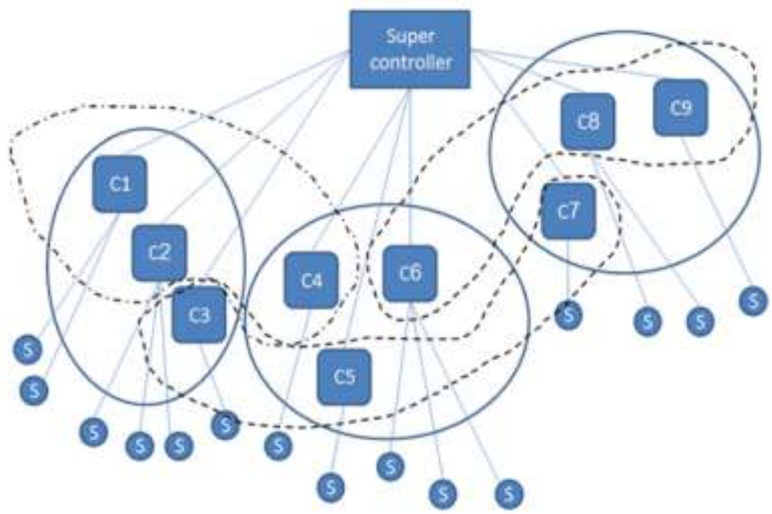

Figure 6:- Network (super controller) Structure of Dynamic Cloud.

A node i in CH-ready state and having MSG-data to another node j , which is be appropriate to the active cluster with dij<r_s , must pass to the CH-for state and stays there until becoming a member of a cluster or return to the sleep state, if the sleep counter timer expires. A node i in CH-ready state and detecting the target triggers T timer. If node receives a MSG-inv, another CH before the expiry of the T timer, node i switch to the member state. When a node in the CH-ready or CH-for state receives an MSG-inv invitation message, it automatically switches to the state member. After a system time, a member who has not received MSG-data messages sends a cluster destruction message to his CH and returns to the sleep state. When a CH receives cluster destruction signals, it removes members of the member vector until there are none left; it then returns to the sleep state. Because of its dynamic consistency structure, the K-means method is more flexible than the PSO algorithm. The PSO has been successfully utilised in WSN on stationary nodes. Its optimization approach is simple to incorporate into a WSN swarm-based routing system. The following is a rudimentary WSN implementation of the particle swarm optimization technique.

Randomly initialize all the particles in a network space with an initial energy as E_0 and initial velocity as 0. Calculate fitness function for each particle using the formula:

$$fitness = af_1 + (1 - a)f_2$$

Where α is a constant value and $f1$ &$f2$ are functions that can be calculated using the following formula:

$$f_1 = \sum_{i=1}^{n} E(n_i) / \sum_{m=1}^{M} E(CH_m)$$

$$f_2 = max_{m=1,2,\ldots M}\{\sum_{i \in m} d(n_i, CH_m)/|C_m|\}$$

Where f_1 is the energy representative part, and it is equal to the sum of all member node energy $E(n_i)$ (not including CH) divided by the sum of all CHs (Cluster Heads) energy$E(CH_m)$. f_2 Represents the density and it is equal to cluster with highest average distance between CH and joined member nodes $d(n_i, CH_m)$ divided by the total member nodes in the same cluster$|C_m|$. Each particle updates its global and local best. Update position and velocity for each CH using the equations:

where, w is the inertia weight for particle; $C_1$is the cognition learning factor; $c_2$is the social learning factor; r is a random number distributed between [0, 1]. Repeat this same until maximum number of iterations is reached. The optimal cluster heads are then broadcast. The optimal cluster heads are then broadcast.

Clustering Strategy Based on PSO (CS)

Clustering technique based on PSO (CS) introduces an algorithm that provides mixed inertia weight and mutant method to avoid premature stagnation. The formula suggests a mixed inertia weight:

$$w = w_{max} - (w_{max} - w_{min}) * \frac{iter}{maxiter}$$

Half of the normal nodes are restarted while the global best remains constant for a maximum of 10% of iterations. An optimum function is used, and the distance between each normal node and CH should be approximately equal for making the distance between CH and normal nodes as narrow as possible. An even cluster is generated, when a CH meets both above-mentioned criteria. The best function is that to avoid premature stagnation, while later-stage stagnation is not addressed, solutions are offered in CS.

Double Cluster-Head Clustering (PSO-DH)

A PSO-based double cluster head method is presented by the PSO-DH. And while choosing cluster heads, the optimal selection and node energy balance are considered. Before sending it to the Vice Cluster Head (VCH), the data is received by the Master Cluster Head (MCH), who aggregates it.The VCH provides aggregated data, and it is sent directly to the sink. Currently the world's best clusters are MCH and before that it was VCH. MCH saves energy and extends the network lifetime as it doesn't interact with sink directly.

Cluster Head Distribution via Adaptive PSO (CHD)

For CHD the cluster head selection takes place according to PSO algorithm. The value of the constants c_1 and c_2 is calculated from the formula:

$$C_1 = C_2 = 2 - \exp\left(\frac{\frac{P_i}{P_G}}{iteration}\right)$$

For overcoming CH selection stagnation, a reselect mechanism is proposed in CHD. 25% of the particles in the worst set are re-selected if the global best does not change after several iterations. The simulation results show that CHD consumes less energy and has a longer lifespan than LEACH.

When the sensor node transmits k-bit data by its transmitter, the energy dissipation is:

$$E_{Tx}(k,d) = E_{elec} * k + \in_{fs} k * d^2 if d < d_0$$
$$= E_{elec} * k + \in_{mp} k * d^4 if d < d_0$$

When the sensor node receives k-bit data packet, the energy dissipation is,

$$E_{Rx}(k) = E_{elec} * k$$

Eelec is the amount of energy used to run the electronics circuits, k is the packet size, Efs and Emp are the transmitter amplifier's characteristics, and d is the distance between the two communicating ends.The radio characteristics and energy due to electronics are:

$$Eelec = 50\ nJ/bit$$
$$Efs = 10\ pJ/bit/m2$$
$$Emp = 0.0013\ pJ/bit/m4$$

CHs also disperses energy in data aggregation,in addition to the above energy indulgences. The data aggregation energy EDA has the value of 5nJ/bit/signal.

For solving a variety of optimization issues, the PSO (Particle Swarm Optimization) algorithm has been used. For cluster head selection in the proposed technique,PSO helps and for assigning normal nodes to cluster headsthe LEACH protocol is used. In Figure 7, flowchart for Basic PSO in a wireless sensor network for CH selection is shown.

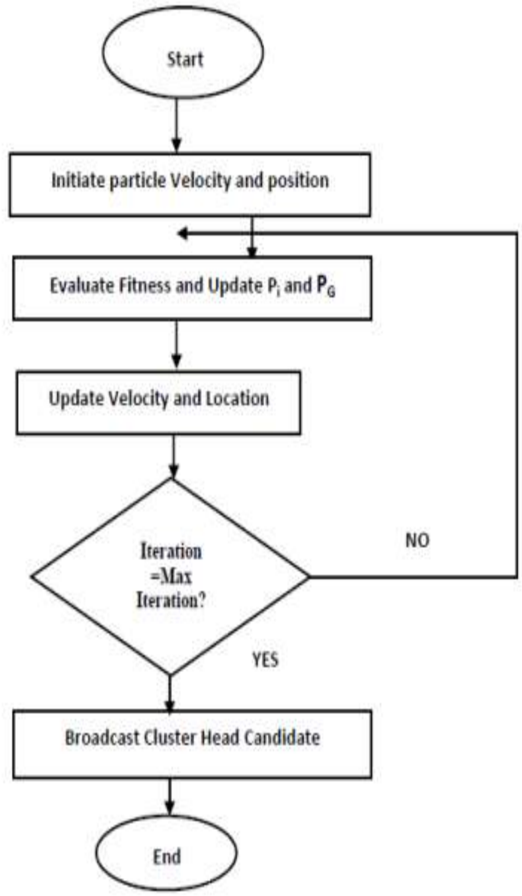

Figure 7:- Flow Chart of Basic PSO

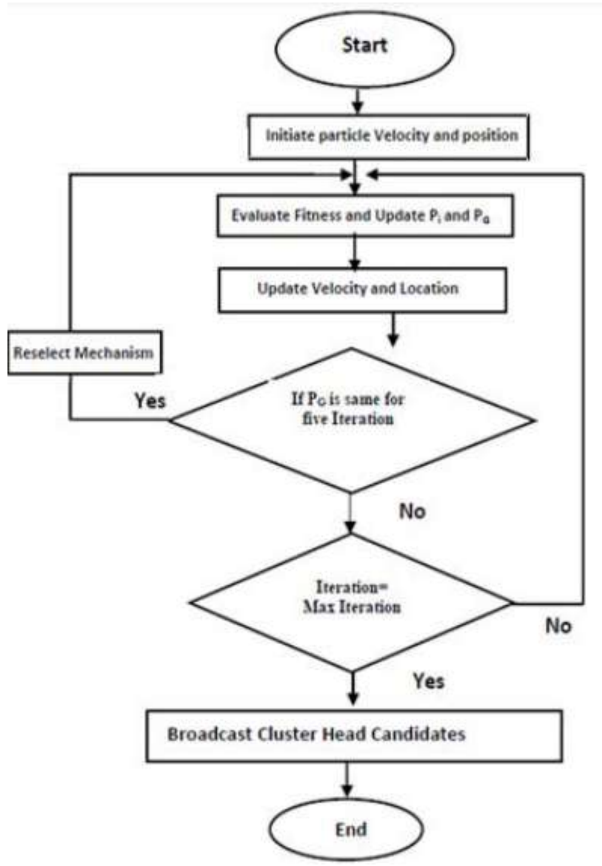

Figure 8:- Flowchart of Proposed Approach.

In the proposed technique, DCDS-PSO is used for discovering Cluster Heads (CHs) and for transporting data from the sensor node to the base station, the LEACH protocol is utilized. If the global best does not change after a certain number of iterations, 25% of the particles from the worst set will be re-selected and this concept comes from CHD. The cluster heads are assigned to the position of the nearest sensor node and the particle's velocity is adjusted to 0, if the position of cluster heads remains the same for a defined number of repetitions and it is described by the reselect process in our approach. Thus, it makes former cluster head to roam for finding its global best, ensuring that it does not become stuck in one place, and it is displayed in the flowchart below. For all sensor nodes, the simulation is carried out in a homogeneous environment with the same initial energy and the procedures listed below must be followed for implementing the proposed approach.

Particle Initialization
All the sensor nodes are set up with an initial energy of E0 and a velocity of 0.

Fitness evaluation
Using a fitness function, determine the fitness of each particle.

Update Local and Global Best
On the basis of the fitness function, each particle updates their local best Pi and global best PG.

Reselect mechanism
If the cluster heads remain in the same place for a certain number of iterations, in our instance five, the cluster heads are assigned to the position of the nearest sensor node, and the velocity of that particle is changed to 0.

Velocity and Position Update
Every particle's position and velocity are updated.
The value of constants c1 and c2 used and calculated by the formula:

$$c_1 = c_2 = c_{initial} + random\ (0,1)$$

The value of inertia can be calculated from the following equation:

$$w = w_{initial} + \frac{random\ (0, 50)}{100}$$

Repeat this maximum number of iterations is reached. Eligible CH candidates are broadcasted by the Base Station.

Conclusion:-

In finding the best solution, the PSO algorithm is better in terms of accuracy and iteration, and it is revealed through the outcomes of GA and PSO implementation in the bus scheduling problem. And due to their simplicity, these PSO algorithms beat all the other strategies used. When compared on small scale, there is no visible changes noted yet while it is compared on a medium and large scale there appears the difference because of the genetic algorithms that can only yield plausible solutions that are close to optimal. This method is simple and provides higher accuracy in the calculations. For determining the maxima and minima of functions, a mathematical technique, termed "optimization" is used and for attaining best results number of approaches is utilized. For finding the global optimum solution in a large search area, DCDS-PSOis widely utilised which is relatively new, timely, and effective optimization approach. Utilizing a re-selection mechanism and a particle swarm algorithm, the relevant cluster heads are selected through suggested framework which is a cluster-based technique.

The proposed approach is efficient in producing the best results which is revealed through simulation results demonstrated. In this study, data is directly transmitted to the base station through the Cluster Head. To improve energy efficiency even more, it is aimed to make use of an algorithm for choosing the best way for transmitting data from the cluster head to the base station in future. For routing data packets from the cluster head to the base station, Ant colony optimization approach can be utilized for saving the energy and extend the wireless sensor network's life span. Based on overhearing messages from the active cluster's nodes, dynamic clusters are created on demand by the DCDS algorithm, and it also includes a phase when the sensors were activated. Load balancing depends on the network path and balance across all streams. As the Dynamic clustering schedules transaction paths based on busy and failure situations and generate alerts by the network control system which is like hieratical clustering. In the whole, data shrinking, thread discovery, and architecture flows are the influencing factors of the performance.

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