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The Weight Based Technique for Fault Recovery in Mobile Cloud Computing

Navjot Kaur[1], Amit Verma[2]
[1]*research Scholar Chandigarh Engineering College, Landran (Mohali), India*
[2]*professor And Head Chandigarh Engineering College, Landran (Mohali), India*
Corresponding Auther: Navjot Kaur

Abstract : *The Objective Of This Research Is Study Various Fault Tolerance Algorithms For Cloud Distribution Networks And Implement An Algorithm To Reduce The Fault Detection Time In The Network And Reduces The Resource Consumption To Execute The Allocated Tasks Using Weight Based Technique .The Enhanced Algorithm Is Implemented In Matlab And The Results Were Compared Graphically With The Existing Algorithms. A Novel Technique Has Been Proposed Based On Weights To Overcome Faults Occurrence Problem ,Where In An Improvement Is Proposed In Algorithm Of Base On Load Balancing, For Reallocation Of Task And Reduction In Fault Detection Time In Cloud Architecture..It Is Concluded That We Can Balance The Load Among The Nodes According To Their Weight And The Time At Which The Execution Is Completed.*

Keywords *- Deployment Models, Load Balancing, Fault Tolerance, Resource Allocation*

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I. Introduction

Cloud Computing Has Become One Of The Most Important Research Field Adopted By Both Academic World And Industry. The Growth Of Internet Users And Various Services Has Highlighted The Need For Intelligent Tools That Can Used By Users And Applications Is Delivering The Variety Of Quality Of Services

The Main Focus Of This Technology Is To Distribute Computing Resources And Services To User.These Resources Include Storage, Servers, Networks, Applications, Services, Etc. The Word Cloud Derives From Internet, Thus Cloud Computing Called As Internet Based Computing1. Cloud Resources Are Not Only Shared But Also Reallocated At Run Time Which Is Dynamic In Nature. A Number Of Distributed Host Machines Are Grouped In A Cloud. Cloud Computing System Consist Several Servers, Virtual Machines, Datacenters And Storage Devices Etc As Resources; Interconnected In A Parallel Approach. Whenever There Is Any Demand From Any User Of The Cloud Then Cloud System Creates A Virtual Machine Inside Host Machine From That Cloud To Fulfill The Clients Demand In The Form Of Resources On Pay Per User Demand Criteria. Due To This Reason Each Node Has Variable Load As Virtual Machines Are Created Randomly On Client's Demand.

Some Host Machines May Get Overloaded And Some Are Not. This Load May Be The Cpu Load, Memory Load, Storage Load Or Network Related Load. As The Cloud Systems Gain Complexity Owing To Increasing User Needs, Monitoring And Adaptations Are Necessary To Keep Them Fit And Running. Cloud Technology Has Become A New Paradigm For Distributed Real-Time Systems Because Of Their Inherent Advantages. The Cloud Distributed Systems Can Reduce The Load On The Central Authority. The Central Authority Is Responsible For Distribution Of Task Among Nodes .This Approach Will Increase The Network Throughput, Reduce Execution Time And Reduce Battery Consumption. The Network In The Cloud Mobile Network And Network's Topology Will Change Suddenly. As The Cloud Mobile Network Is Defined As A Crowded Network Of Collection Of Mobile Entities Connected By A Wireless Link. As The Cloud Can Be Accessed From Any Mobile Location So User Name And Password And Related Measures Are In Trend. But These Security Measures Are Not Very Rigid And Safe. Cloud Storage As A Service Is Main Concerned In Now A Days Like Amazon, Azure And Google Provides The Storage To The User[2]

In The Cloud Mobile Network No Central Authority Is Present Due To Which The Network Disconnection Is Very Frequent Between The Mobile Nodes And Uses The Distributed Network. Due To Above Reasons Chances Of Errors In The Cloud Mobile Network Is Very High. User Don't Know Where The Date Is Store At Cloud. The Load Is Equally Distributed Among The Cloud Mobile Node To Increase The Network Efficiency And To Reduce The Task Execution Time .In Centralized Algorithm, Data Is Distributed Among The Nodes By Single Scheduler And While In Decentralized Each Node Has Its Own Task Scheduler For Assigning The Task[3]

II. Load Balancing Types

The Load Balancing Can Be Classified According To Initiation Channel[6]:

- **Sender Initiated**:
- **Receiver Initiated**
- **Symmetric**

Moreover, It Can Also Be Divided Further Into 2 Categories, Depending Upon The Present State Of The Process:

A) Static: The Current Knowledge Of The System Is Not Required In It. Previous Knowledge Of The System Is Required. In This Cloud Server Provider Is Installed Homogenous Resources. Also The Resources Are Not Flexible In Static Environment. The Resources Requires Processing Power, Performance, Memory And Capacity Of The Statics User Requirement. In Static Environment, Changes Are Not Accepted At The Run-Time. It Is Well Suited And Easy To Implement In The Static Environment. In This Environment Resources Are Served As First Come First Serve[7].

B) Dynamic: The Present State Of The System Is Required In It. It Does Not Depend Upon The Previous Knowledge. In This Environment Cloud Suppliers Install Separate Resources. Resources Are Dynamic In Nature In This Environment. It Does Not Rely On The Prior Knowledge It Uses Execution Time Statistics. The Main Requirement Of The Client Is Sure Flexible

Load Balancing Matching Technique:

In[4]author Explained That With Latest Advent Of Technology, Load Balancing In Cloud Becomes The Major Challenge In Cloud Computing Field. There Are Some Existing Algorithms Which Provide Better Job Scheduling For Resource Allocation. Thus Optimized Algorithms Along With Efficient Utilization Of Resources Are Necessary Forgaining Most Benefits Out Of This. This Paper Throws Light On Numerous Such Algorithms. The Paper's Main Aim, Is To Identify And Simulates Various Qualitative Components In A Typical Cloud Environment And Then On Basis Of These Identified Components, They Also Present Analysis Of Execution Of Load Balancing Algorithms.

In[5]discussed The Cloud Computing Attracts Intention Of The Users Due To Its Dynamic Nature And Efficient Data Storage Techniques. The Load Balancing Is The Major Issues Which Are Raised In Cloud Architecture. In This Paper, Dynamic Load Balancing Algorithm Has Been Proposed Which Is Based On Three Parameters Cpu Utilization. Memory Used And Fitness Value. On The Basis Of These Three Parameters Condition Of The User Is Defined That Whether It Is Normal Or In Critical Condition. In This Algorithm Some Migrating Agents Are Selected On Which Load Is Migrated At The Time Failure. The Migrated Agents Are Selected On The Basics Of Their Condition. This Proposed Algorithm Works Well In Terms Of Load Detection Rate And Load Migrating Time Is Very Less. The Algorithm Performance Degrades When All The Migrating Agents Are In The Destroy Conditions.

III. Proposed Methodology

In The Existing Techniques, Node Failure Is A Common Drawback. A Node Failure Problem Occurs Due To Mobility Of The Node. In This Research, Candidate Node Will Be Chosen Among The Many Nodes That Are Available, On The Basis Of Failure Rate And Minimum Execution Time. Here Master Node Set Threshold Value Which Includes Two Parameters One Is Failure Rate And Other Is Maximum Execution Time. The Nodes Which Have Equal Or Lesser Failure Rate And Minimum Execution Time Are Elected As Candidate Nodes By The Master Node.

After The Selection, Candidate Node Will Start Performing Their Tasks. We Will Also Enter Number Of Task In This Scenario. Suppose During Execution Of Task One Nodemoves From Its Location Than Failure Occurs At That Point. To Overcome This Problem A Novel Technique Has Been Proposed Which Overcome The Problem Of Failure Due To Mobility Of The Node.

The Proposed Work Is Based On Task Reallocation In Mobile Cloud Computing When Fault Is Occurred In The Network Due To Node Mobility. Task To All The Nodes In The Network Are Allocated By Virtual Machine Depending Respective Failure Rates And Execution Times. The Threshold Values Of Rate Of Failure And The Execution Time Is Set By The Virtual Machine[8]. These Threshold Values Are Then Used To Select Nodes. The Nodes Having Rate Of Failure And Execution Time Less Than The Threshold Values Are Selected As The Candidate Nodes And These Nodes Are Responsible For Task Execution. The Candidate Nodes Are Mobile Nodes, Due To Its Mobility Fault May Occur In The Network. In This Work, Novel Technique Is Proposed For Task Reallocation When Fault Is Occurred On Any Node. The Weight Is The Parameter Which Is Added To The Existing Technique For Task Reallocation. The Weight Is The Node Is Calculated On The Basis Of Execution And Failure Rate And Node Which Has High Weight Is Responsible To Execute The Task Of The Faulty Node.

In This Work, Enhancement Had Been Proposed For The Task Reallocation In Cloud Computing Architecture. The Proposed Algorithm Will Reassign The Task In Case Of Fault When Node Changes Its Place. The Objectives Have Been Defined According To Required Needs For Task Reallocation.

In The First Objective, Various Techniques For Task Allocation Have Been Studied And More Efficient Technique For Task Allocation Has Been Selected For Task Allocation. In The Second Objective Node Change Its Position And Fault Raised In The Network Which Degrades Network Performance. In The Third Objective Technique Has Been Proposed For Task Reallocation To Most Appropriate For Task Execution. In The Fourth And Last Objective Proposed Technique Have Been Implemented And Compared Results With Existing Technique In Terms Of Time And Energy Consumption.

Algorithm 1: Load Scheduling Algorithm

Step1:
Input: Failure Rate, Execution Time
// Enter The Failure Time And Execution Time Of Node
Output: Fault Recovery
Step 2: For(I=0;I=Number Of User;I++)
{
// Range For Row To Column
Step 3: Assign Task()
}
//For Loop
Check (Execution Time && Failure Rate)
Step 4: If (Node(I)<Node(I+1))
Candidate Node = Node (I)
End
End
Step 6: Fault Detection()
{
// Calculate The Fault In The Node
Step 7: If (Node Position!=Old Node Position)
// Checking The Node Position From The Vm
Step 8: Fault Occurred
Step 9: Fault Recovery()
Step 10: If (Weight(I)<Weight(I+1)
// Calculating Weight Of Each Node
Step 11: Recovery Node = Node(I);
End

In This Algorithm User Can Input The Failure Rate And The Execution Time Of The Node At Which Task Is Executed. In The Next Step Task Is Assigned To The Node Using For Loop. If The Previous Node Weight Is Less Than Next Node Than The Candidate Node Is Equal To The Node 1. If The Node Whose Data Is Overloaded And Move To Its Position Than The Load Balancer Check The Wt. Of Remaining Nodes And Data Is Distributed To That Node Whose Weight And Execution Time Is Less. The Complete Data Flow Diagram Is Shown Below In The Figures 1 To 2 In Form Of Context Dfd, Level 0 Dfd. The Data Flow Diagram Describes The Simple View Of Research. It Describe The Data Is Fetched From The Cloudserver Process Which Perform The Operations On The Data Set And Evaluate The Parameters Through.

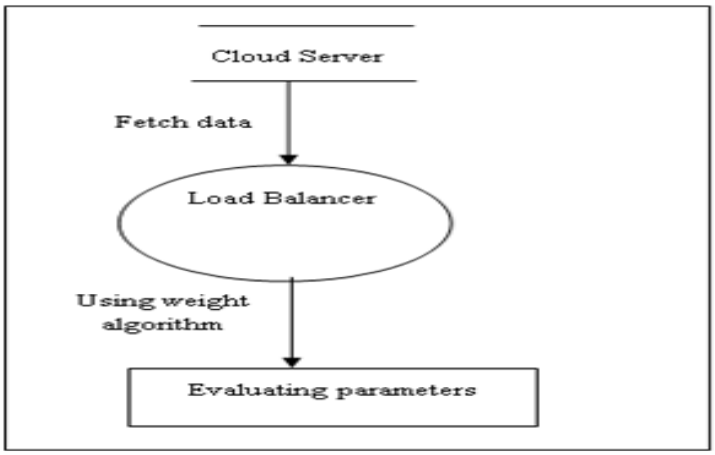


Figure. 1 Zero Level Diagram

Figure 1describes That Firstly The Network Is Deployed By The User And Task Is Fetched From The Cloud Server. Here I Can Apply Load Scheduling Algorithm Which Assign The Task To The Node According To The Failure Rate And Minimum Execution Time Of The Node.

If There Is Node Failure The Master Node Reassign The Task To The Node Which Has Less Failure Time And Minimum Execution Time.

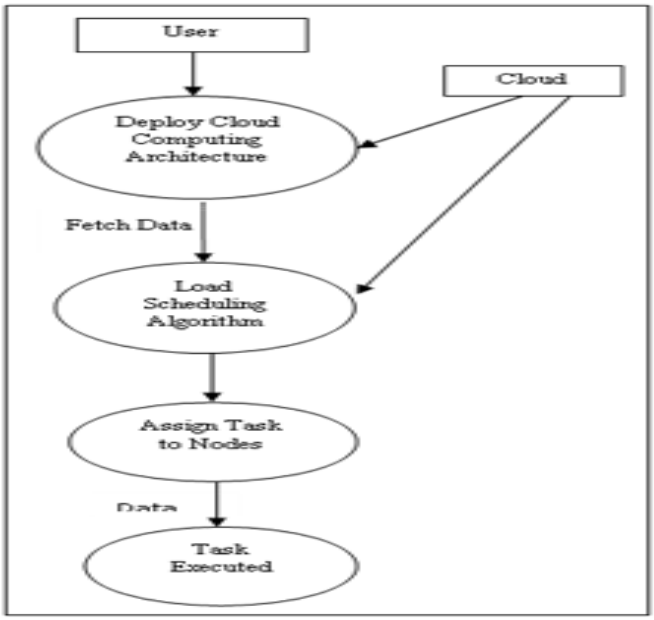


Figure. 2 context Level Diagram

Figure2shows The Context Level Diagram. It Shows We Can Fetch The Data From The Cloud Server. In The Next Step, Tasks Can Be Scheduled By Load Balancer According To Their Weight. The Tasks Would Then Be Assigned To The Node In Such A Way That It Took Less Response Time And Less Energy Consumption While Increasing The Throughput. This Is Done By Evaluating The Parameters Like Response Time, Throughput And Energy Consumption And Space Allocation

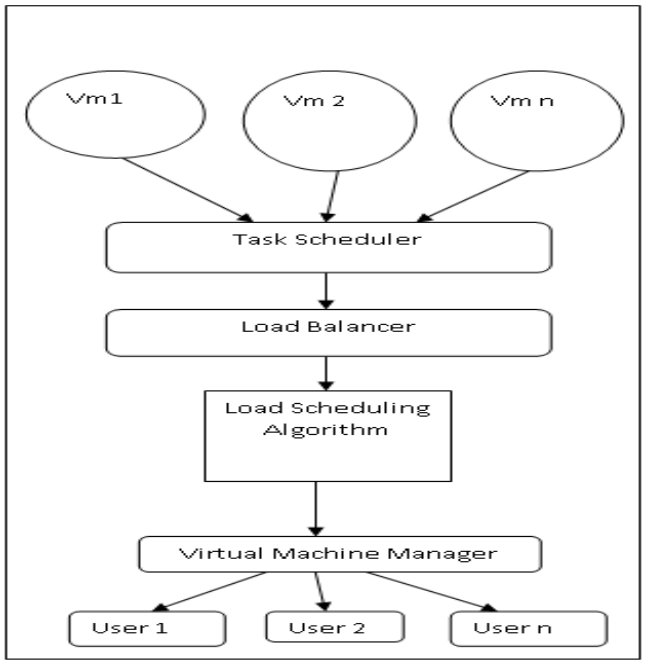


Figure. 3 working Level Diagram

Figure 3virtual Machine Sends The Data To Task Scheduler For Scheduling The Task. Task Scheduler Makes Tables Of Task And Sends It To The Load Balancer. The Main Task Of Load Balancer For Balancing The Load By Applying Load Scheduling Algorithm, And Task Is Distributed To User Node By Virtual Machine Manager. In The Proposed Algorithm, We Have Added A New Parameter In The Present Algorithm That Is Master Node Time. Master Node Time Is The Result Time To Join The End Users. It Is For Node Collaboration. For This We Have Formulae Which Are As Follow:

1. E-Cost= Maximum Execution Time + Time Taken By The Master Node (Master Node Time)

After That We Will Calculate Profit Of Each Node.

2. Profit Of Each Node = E-Cost+ Failure Node Of Each Node

3. Weight Of Each Node= No. Of Tasks + Maximum Execution Time

Profit

During Mobility Of Node, The Node Which Has Been Moved From Its Location, The Task Of That Node Will Be Assigned To The Node Which Has The Highest Weight. Weight Will Be Calculated According To The Above Mention Formulae.

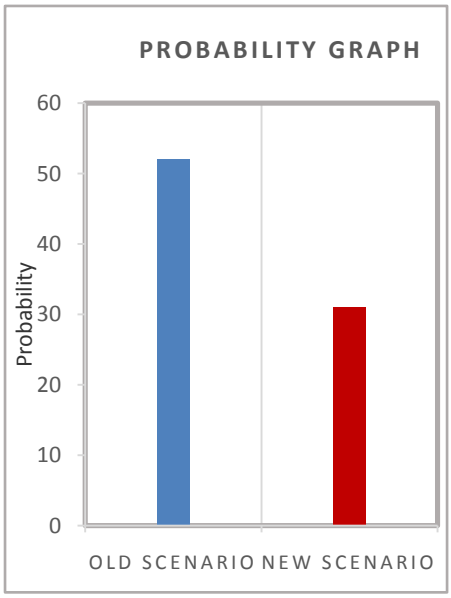
IV. Experimental Results

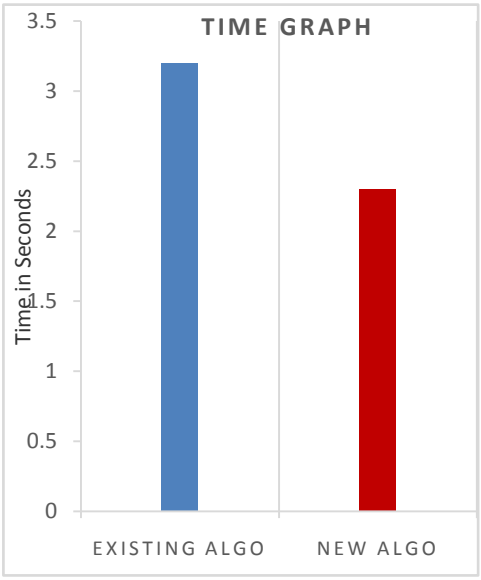
Matlab (Matrix Laboratory) Was Used To Implement The Whole Scenario. The Name Matlab Stands For ***Matrix Laboratory*.**

Matlab Is A High-Performance Language For Technical Computing. It Integrates Computation, Visualization, And Programming In An Easy-To-Use Environment Where Problems And Solutions Are Expressed In Familiar Mathematical Notation. The Results Were Very Encouraging

Figure 4(A):Probability Graph Figure 4(B): Time Graph

As Per Figure 4 (A) The Task Execution Is Determined By Time Parameter. In Which The Existing Algorithm Take More Time For Execution As Compared To The New Algorithm.





As Per Figure4 (B) The Fault Tolerance Probability Of Old And New Techniques Have Been Shown. The New Technique Outperforms Compare To Old Technique Cum Scenario As Per Table 1.

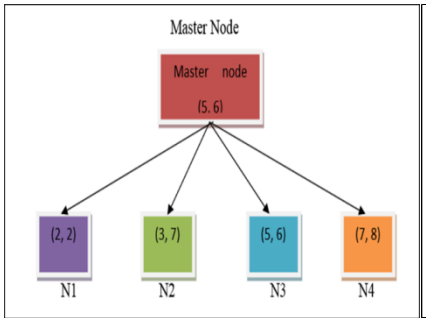


Figure 5(A)

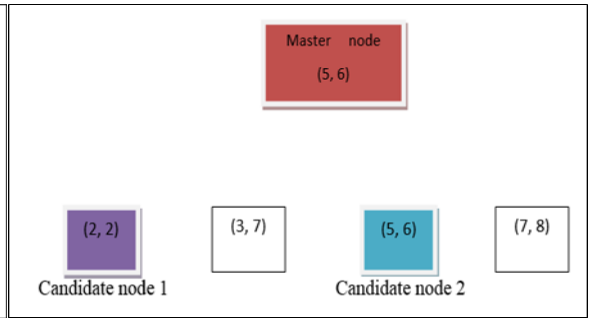


Figure 5(B)

Figure 5(A) Represents That There Is Master Node And The Child Node. Threshold Failure Rate And Maximum Execution Times Are Allocated To Node By The Virtual Machine. Task Are Assign To The Node According To Their Failure Node And Execution Time.

Figure 5(B)Shows That Task Is Assigned To The Node According To The Failure Rate And Execution Time. Nodes Having These Parameters Less Than The Threshold Value Will Be Selected. The Node Which Is Elected For Task Allocation Is Said To Be Candidate Node.

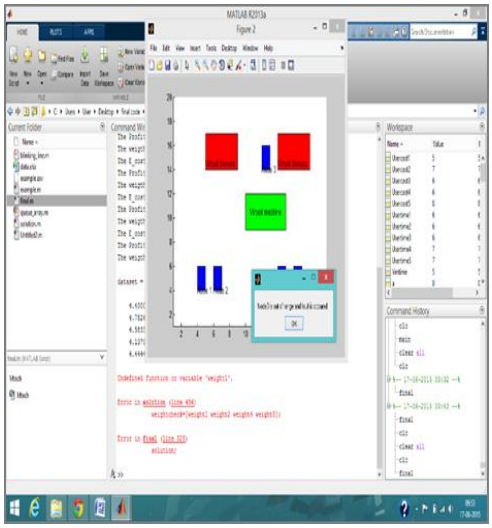


Figure 5(C)

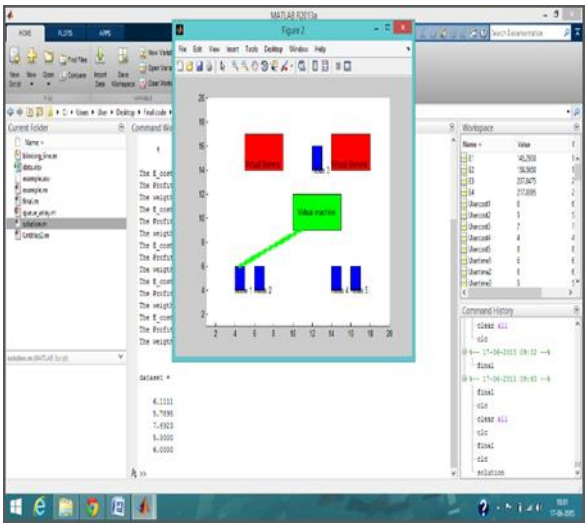


Figure 5(D)

In Figure 5(C), Output From Matlab Is Shown.The Network Is Formed In Which Available Nodes, Virtual Servers And Virtual Machines Are Deployed. The Node Is Asking For The Time Taken By The Virtual Machine To Complete The Task. The Interface Is Asking For The Cost Of The User For Executing Task Which Is User Wants To Execute. The Node Is Asking For The Time Of User To Execute For The Task Which Is Assigned By The User. The Weight Of The User Is Calculated For The Task Assigned To User.

Figure 5(D) Shows The Network Which Is Formed In Which Available Nodes Are Deployed, Virtual Servers And Virtual Machines Are Deployed. The Node Is Asking For The Time Taken By The Virtual Machine To Complete The Task. The Interface Is Asking For The Cost Of The User 3 To Executing Task Which Is User Wants To Execute. The Node Is Asking For The Time Of User To Execute For The Task Which Is Assigned By The User. The Weight Of The User Is Calculated For The Task Assigned To User.

Parameter	Existing Scheme	Proposed Scheme
Time	3.3 Seconds	2.3 Seconds
Probability	52 Percent	31percent

Table 1

As Illustrated In **Table 1**, The Comparison Is Done Between The Proposed And Existing Scheme And It Is Been Analyzed That Proposed Technique Performs Well In Terms Of Time And Probability Of Fault Occurrence

V. Conclusion

The Proposed Technique Results In Reduction In The Fault Detection Time In The Network And With The Help Of Weight Based Technique Also Leads To Reduction In The Resource Consumption For Executing The Allocated Tasks. This Proposed Algorithm Is Based On The Failure Rate, Minimum Execution And Time Is Taken By The Master Node Scheme For Fault Recovery And Concurrent Execution Of Processes For The Process Execution. This Technique Leads To Reduction Of The Processing Time And Energy Consumption.

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