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Trust value calculation for Cloud Resources

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Abstract *- The trust is the important factor in the cloud computing environment for delivering the services for the users. In a cloud infrastructure the best cloud resources can be chosen by the users based on the Trust value. Therefore, this paper provides a methodology, for calculating the trust value of cloud resources, which uses the naive Bayesian mining technique for finding the trust values. By using the naive Bayesian algorithm to predict the test set results by visualizing the training dataset by using classifier classification. The reputation values for resources performance graph can be analyzed. Trust values are calculated by using parameters including accessibility, reliability, ability-based trust value of the resources Turnaround Efficiency and Reputation value of the resource. it generates reputation performance graph.*

Key Words: Accessibility, reliability, *Ability,* Turnaround Efficiency, Reputation.

1. INTRODUCTION

This paper is used for calculating Trust value for the Cloud resources. Previously some works are done on trust calculation, now here an extension to the previous works is done by adding the attributes and calculating those trust values based on the dataset which uses the naive Bayesian mining technique, which makes trust evaluation is more effective in cloud computing environment.

In Cloud computing platform, providing highly trustworthy services is most important and primary task. Because the users wish to send sensitive information as well as the computing tasks to the cloud data centers to secure and to maintain safe their information. Cloud providers used to controls maintains and manages the data that is stored in the physical servers for example like Apple in regards to the icloud and so on. For making cloud technology for commercialization purpose, The resource providers should build or maintain the trust with the cloud users by completing their submitted jobs based upon mutual SLA established b/w the users and the Service provider, not only that but also it is required to see that the processed data is secured and safe at any cost[1].

The most important part of commercial aspects of cloud technology is the trust management [7, 12]. Now-a-days In distributed technology the cloud services are becoming popular because they allow the cloud users to rent best cloud resources from Cloud Service providers and provides the best services to customers, and also the storage infrastructure. Users pay as a rental basis for their use of services without spending huge amounts for maintenance, integration, and management of the IT infrastructure. Before the interaction happened between the cloud providers and the users it is very much important to build trust in the cloud relationship in order to reduce the malicious attacks and also security risk in the cloud.

In this paper, the main objective is to propose a methodology for calculating trust value for the cloud resources based on the formulas of Accessibility, reliability, ability-based trust value of the resources, Turnaround Efficiency and *Reputation* Value of a resource. By using the naive Bayesian algorithm to predict the test set *results* the obtained results are mentioned in Fig.3, Fig.4.

2. RELATED WORK

Grandison [6] Here many existing trust models are surveyed by them, and they have described trust is a belief that a particular entity, that acts as reliably, securely, and consistently in a precisely Context in Cloud technology. They said the trust is combination of different attributes for example truthfulness, reliability, honesty, security, and Quality of Service in cloud environment. Currently Now-a-days, there are key challenging issues faces for Trust computing mechanism in collaboration Cloud computing environment. At First, the trust is further side of security and the extended trust models should get embodied with multi dimensional Trust factors [2]. The newly extended trust Computing model contains the data from the existing

attributes i.e., Accessibility Security, reliability etc. to generate a heterogeneous multi dimensional Trust model in cloud [3].

Hwang and Li[4][10] They have suggested for implementation of reputation system in order to establish the trust b/w the Data owners and the service providers with using Trust overlay networks in many data centers, in the Cloud technology. Here they did not mention about problem that exists in Server side trust, they only mentioned on trust issues from user side.

Fan and Perros[4][9] The trust management framework have proposed by them in multi cloud environments that they intended for addressing necessary problems for the trust management in the multi-cloud environment of distributed environment of Trust Service Providers by using a Trust management architecture.

3. PROPOSED WORK

A method is proposed for calculating the trust values for the cloud resources by considering the formulas of attributes such as accessibility, reliability, ability of cloud resource, and turnaround efficiency these obtained values are computed using formula of Reputation value of the resource to generate the trust values, finally trust evaluation is calculated which uses the naive Bayesian mining technique for finding the trust values. By using the naive Bayesian algorithm to predict the test set results by visualizing the training dataset by using classifier classification and the obtained values are mentioned in the Fig.3 and Fig.4.

For enhancing the description, there are some of the notations used for the time period T is defined:

Su indicates the no. Of jobs that are submitted to resource, similarly Acc indicates the no. of jobs that are accepted by the resource and Com indicates the no. Of jobs that are successfully completed, For the purpose of R resource, PS indicates the processor Speed, MS indicates the memory Speed, Band indicates total data transferred, Lat indicates the delay for reaching R resource, PSMax indicates the max speed of processes, MSMax indicates the max speed of memory, LatMin indicates the min delay existing in any link of the system.

Accessibility (ACC):

Accessibility is when a particular component or a system is readily available when they require need for usage purpose - IEEE90 [9]. Basically in case of software engineering, the accessibility is calculated with the mean time that is taken b/w the failures and the mean time for repairing them [9]. The resource is said to be unavailable in one of the following situations mentioned below:

1. The resource may be busy to handle the job request.
2. Due to network problem.
3. The resource is not working properly or in a shut down state.

And, also there will be various reasons for the resource to be in unavailable state.

Accessibility of the Resource defines the total no. of jobs that are submitted i.e., Su ,Among them how many no. of jobs are accepted i.e., Acc.

$$\text{Accessibility of the Resource Acc} = \frac{\text{Acc}}{\text{Su}} \quad (1)$$

Reliability (RE):

In case of trust, the key component is reliability. It is also called as Success rate. Reliability defines ability of particular system or a component for performing required functions based upon mentioned conditions for specific time period - IEEE90[9]. When a particular job is accepted b a resource, Then how reliably, it completes the job is to be identified. So, finally it can be defined as a finding jobs that are successful completed from the accepted jobs i.e., Acc by a cloud resource.

Reliability of the Resource defines the total no. Of jobs that are accepted by a resource i.e., Acc, among them how many no. Of jobs are completed i.e., Com.

$$\text{Reliability of Resource RE} = \frac{\text{Com}}{\text{Acc}} \quad (2)$$

Ability-based trust value of the resources R (Abr) [5]:

$$\text{Abr} = \frac{((2\text{xPs})+\text{Ms})+(\text{Band}/\text{Lat})}{((2\text{xPsmax})+\text{Msmax})+(\text{Band}/\text{Latmin})} \quad (3)$$

Turnaround Efficiency (TE):

The turnaround Efficiency indicates that the actual time that is taken b/w a job submission and the processing of that finished job again back for the user. The promise TAT can be defined as, the expected time from the resource provider b/w a job submission and processing of that finished job back to the user based on SLA, that resource provider is promised. When comes to Actual TAT, The normal time taken to complete the users job by the resource provider.

Turnaround Efficiency TE

$$= \frac{\text{Promised Turn around time (TAT) by R in SLA}}{\text{Actual Turn around time (TAT) by R to complet the job}} \quad (4)$$

Reputation value of the resource (Rep):
= W1*ACC+W2*RE+W3*Abr+W4*TE (5)

The trust build on the QoS requirements [3].where the weights W1, W2, W3, and W4 these are taken as a +ve weights such that these weights are equalized to 1 i.e., W1+W2+W3+W4 = 1. Here the priority is considered for the weights and these are predestined. For Example, We will Considered the weights as W1= 0.2, W2= 0.2,W3= 0.2 and W = 0.4.

3.1 TECHNOLOGY USED

The technology used is Python; it is an interactive, object-oriented, interpreted, and high level programming language. It provides a syntax and the code readability of the python language and also provides a way of calculating the posterior probability with given predictor and allows the programmers to write their code in a fewer lines and conveying their concepts.

3.2 MODULES DESCRIPTION

Load the dataset: This module functionality is to load the dataset of 1000 records, which is used for prediction process. it helps to view the already loaded dataset. The dataset for different operations performed for prediction of reputation values. Preprocessing the data; it is basically used to analyze the given dataset. After analysis the data will apply the clustering processing, which is used to calculate the particular values. Prediction of performance: The Prediction of reputation values of dataset of 1000 records of different resources groups which consists of set of resources are analyzed and predicted. it has an ability to perform operations such as preprocessing techniques, feature extraction, prediction on the dataset and provides predicted output after performing the algorithm on the dataset are shown in Fig.2. Naïve bayes: This theorem is used to predicting the test set results by visualizing the Training set by using classifier classification: In this classification process different set of reputation values based on resources will be classified.

In Naïve Bayes theorem is a machine learning algorithm which is used for classification problems and quick prediction purposes it is primarily used for calculating the conditional probability. First step is importing the dataset. The second step is splitting of the dataset in the form of Training set and the Test set. Third step is feature scalingprocess with X_test and X_train.In the fourth step fitting the Naive bayes for the Training set by using the classifiers and GaussianNB. Fifth step is prediction of the test set results of X_test, Sixth step is Making the Confusion Matrix Using y_test and y_pred. Seventh step is visualising the Training set results by equalizing X_set,y_set with the X_train, y_train, eight step is Visualizing the Test set results by X_set,y_set with the X_train, y_train with the matplotlib the obtained results are mentioned in Fig.4. The Prediction of resource group count consists the dataset of 1000 records as input the performance of the proposed approach is evaluated. In the classification process different set of resources are grouped together based on the resource groups for analysis purpose.

ALGORITHM: Naive Bayesian

```
# Step1: Importing the Dataset
                dataset = pd.read_csv('Datset.csv')
                X = dataset. Values()
                y = dataset. Values()
# Step2: Splitting the dataset into the Training set
          and Test   set
           fromsklearn.model_selection
           import  train_test_split

 X_train,  X_test,  y_train,  y_test  =  train_test_split(X,  y,
test_size = 0.25)
# Step3: Feature Scaling
            Fromsklearn.preprocessing
            Import StandardScaler
                sc = StandardScaler()
                X_train = sc.fit_transform (X_train)
                X_test = sc.transform (X_test)
# Step4: Fitting Naive Bayes to the Training set
            from sklearn.naive_bayes import GaussianNB
                Classifier = GaussianNB ()
                classifier.fit (X_train, y_train)
# Step5: Predicting the Test set results
                y_pred = classifier. Predict(X_test)
# Step6: Making the Confusion Matrix
            from sklearn.metrics import confusion_matrix
               cm = confusion_matrix (y_test, y_pred)
# Step7: Visualising the Training set results
            From matplotlib.colors import ListedColormap
                X_set, y_set = X_train, y_train
                X1, X2 = np.meshgrid
                plt.contourf (classifier. predict)
                      plt.legend()
                    plt.show ()
# Step8: Visualizing the Test set results
          From matplotlib.colors import ListedColormap
                X_set, y_set = X_test, y_test
                plt.title ('Naive Bayes (Test set)')
                      plt.legend ()
                      plt.show ()
```

For Example: Resouces_Group consists of Resources i.e., Res_A, Res_B, Res_C, Res_D, Res_E in Fig.3. Here classification technique is used for calculating the sum of resources and the mean of the resources for the resource group, which it consists of set of resources with attributes such as accessibility, reliability, ability-based trust value of the resources, Turnaround Efficiency(TAT), resource group. Final total obtained results are mentioned in Fig.1, Fig.2, Fig.3 and Fig.4.

4. EXPERIMENTAL RESULTS

The experiment is done by using PyCharm with Python code using the naive Bayesian mining technique. Here the approach is tested and the generated outputs are mentioned in Fig.1, Fig.2, Fig.3, and Fig.4. The experimental detail is based on the dataset 1000 records as input the performance of the proposed approach is evaluated. For calculating the reputation value of cloud resources, Here four sets of weights which are of different values are considered, for example As for the 1st experiment the weights that considered is as W1 is 0.2,W2 is 0.2, W3 is 0.2, and W4 is 0.4. For the 2nd experiment different scenarios are considered, The weights are changed to W1 is 0.2,W2 is 0.2,W3 is 0.4, and W4 is 0.2. As for the 3rd experiment the weights as W1 is 0.2, W2 is 0.4,W3 is 0.2, and W4 is 0.2. for the 4th experiment, Weights are consider as W1 is0.4, W2 is0.2, W3 is 0.2, and W4 is 0.2.

To implement a methodology, For calculating the Trust value for the cloud resources, which uses the naive Bayesian mining technique for finding the values. Here the experiment is done using PyCharm by taking the dataset of 1000 records as input which it consists of the attributes such as accessibility, reliability, ability-based trust value of the resources, Turnaround Efficiency(TAT), resource_id, resource group and reputation values. Each attribute values are calculated by using the formulas (1) (2) (3) (4) (5). it generates reputation performance modules of Bar graph from PyCharm in the Fig.1.

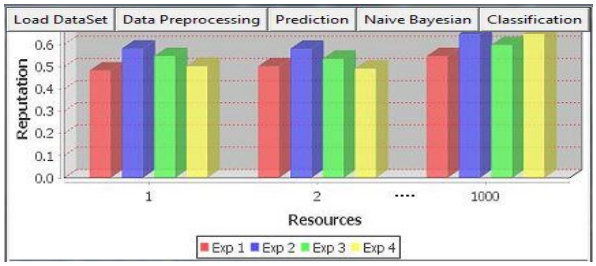

Fig.1. Modules of Bar graph from PyCharm

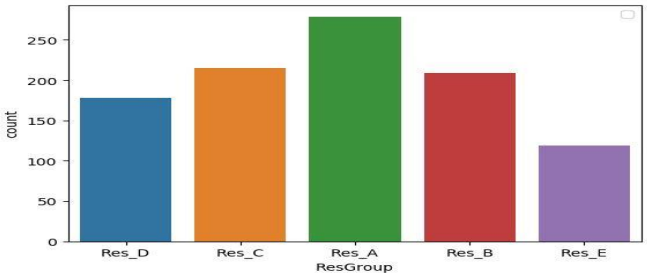

Fig. 2. The Prediction of resource group count using Navie Bayes thereom in PyCharm.

According to sum of Resources:

ResGroup	Accessibility	Reliability	Ability	TAT	TrustValues
Res_A	2091.9	2162.7	2171.0	2136.9	2115.6
Res_B	1576.0	1627.9	1604.1	1591.7	1604.8
Res_C	1592.6	1656.2	1689.0	1644.7	1649.4
Res_D	1349.7	1352.7	1397.8	1359.1	1343.5
Res_E	891.3	913.9	935.0	911.8	901.5

According Mean of Resources :

ResGroup	Accessibility	Reliability	Ability	TAT	TrustValues
Res_A	7.497849	7.751613	7.781362	7.659140	7.582796
Res_B	7.540670	7.788995	7.675120	7.615789	7.678469
Res_C	7.407442	7.703256	7.855814	7.649767	7.671628
Res_D	7.582584	7.599438	7.852809	7.635393	7.547753
Res_E	7.489916	7.679832	7.857143	7.662185	7.575630

Fig.3. Results of Classification process using Naive Bayes theorem in PyCham

	ResID	Accessibility	...	TAT	TrustValues
ResID	1.000000	-0.015944	...	-0.015068	0.002837
Accessibility	-0.015944	1.000000	...	-0.028555	0.022110
Reliability	-0.005505	0.157147	...	-0.011192	0.162997
Ability	-0.003540	-0.098484	...	0.078465	-0.021581
TAT	-0.015068	-0.028555	...	1.000000	0.040681
TrustValues	0.002837	0.022110	...	0.040681	1.000000

Fig.4. Results of Trust values for Resources through Naïve Bayes in PyCharm

5. CONCLUSION AND FUTURE WORK

The classification is for calculating the trust value for the cloud resources using PyCharm with python. Here Naive theorem is used here to predict the test set results by visualizing the training dataset by using classifier, By using four attributes including Accessibility, reliability, ability based trust value of the resources and Turnaround Efficiency are used and predicted the performance of the trust value of the resources, which makes trust evaluation is more effective in cloud computing environment. Future work includes applying huge dataset and processing techniques for better economical results and also it is planned to examine and identify the influence of other algorithms and methodologies for the trust evaluation. This approach is still very challenging in the cloud computing environment.

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