CHAPTER – 6

EFFICIENCY PERFORMANCE AUDIT TRAIL ASSESSMENT (EFPAT)-ALGORITHM

6.1 Inception

SaaS provisioning environment enhances with service selections and service delivery issues where these features are not monitored at all the time successfully. The optimistic role of auditor plays a vital role in monitoring of consumer preferences of services and providers provision of services. The computation of these services efficiency utilization rate can be clearly measured by an audit trail. As the performance audit addresses efficiency as time employed towards delivery which showcase the quality of service. In the proposal of EFPAT algorithm the baseline attributes of consumer preferences towards the request of services and the services offered by the provider is synchronized with service access time and service completion time.

6.1.1 EFPAT Design background

The construction part of this EFPAT algorithm process carries in reading some importance research contributions which will support and help in designing of efficiency audit assessment. Service oriented architectures consists of aggregation of heterogeneous services which are loosely coupled at some time where these services are communicated using protocols like SOAP, XML etc,. The advantage of using data provenance and ensure data quality, reliability and trust worthiness. GIS Geo Information System and many scientific business applications adopts data provenance and track their workflow activities in comparison with metadata.

Provenance usage exhibits the features of scalability, data reproducibility, verifiability and accountability. SOA architectures are deployed with SOA life cycle that consists of creation, processing, storing and routing of data. OpenDB mechanism helps in retrieving of data from provenance store. Many algorithms related to policy checking, estimation of data integrity and reliability of service issues are considered for adoption of data provenance. [75]

In the way of efficiency attributes consideration for performance audit trail assessment the method of resource allocation triggers a key role. As cloud computing environment consists of many data centres which are in a network exhibit network delays. Most of these situations are not accountable but fall on the lagging of quality of service what was expected. Total processing time was considered in resource allocation optimization. One functional procedure for the above said demerits preventing the downfall rate of quality of service when the demand of expectation is more. The second functional procedure tagged in aggregation of total time of network delay for the allocation of resources computation time. [76]

In part of ensuring privacy and security of data many cloud storage providers showcase their trustworthiness. The point of trusting these parties blindly cannot be guaranteed authenticated task. Many methods and approaches in the market for the above said demerit can be achieved by showing an authenticated provider with cryptography characteristics. The approach uses elliptic curve cryptography as encryption and decryption modes in ensuring of data security and privacy. Many RSA schemes can also used for the above said issue. [77]

In choosing of ideal cloud service provider in SOA landscape of cloud computing as the provider provision services are quite similar exhibits a burdensome task. SMI cloud (Service Measurement Index) consortium can assess the provider priorities to some extent. Many multi criteria decision making approaches helps in choosing provider efficiencies of defined parameters. Relative service ranking vector method was addressed to the above said issue with ranking voting method and information entropy theory. First service last audit was complimented for trust outcomes. [78]

Cloud platform enables virtual machines for utilization of resources. Many application services can be deployed in virtual machines which are synchronized with task are jobs. In efficiency spectrum maximizing the throughput lead in incrementing of high performance systems for computation targets. The overall jobs, computation of resources and i/o data re the striking elements to compute the performance levels. The problem notices data centres, locations, data transfer time; job completion time and scheduling process of jobs are key agenda in this research. [79]

6.2 Design assumptions of (EFPAT) – Algorithm

In targeting the attribute of efficiency every service provider forwards his service provisions for the customer preferences. The services of the provider will have time bounds which are tagged towards policy monitoring and choosing a potential service provider. Wastage of resource utilization, idling of data centres with no proper scheduling can be avoided if the auditor assessment on resource utilization is properly assessed.

6.2.1 Allotment phase

The efficiency attribute for this performance audit trail assessment consider service assess time for a service and service completion time of a service. These service access time and service completion time assumptions are strictly represented as a novel optimal solution in the aggregate procedure of performance audit. There may be a chance of service access time of a particular service which may be distinguished with identities and time logs. There is chance of predicting the service completion time for a particular service which may be identified with identities and time logs. In the calculation part of these time based tasks we endorsed by taking Table 3.2.4 as input which was in an reorganized consistent form as Table 6.3.2.1. This reorganized table elevate the provider services with clear identities and time logs for consumer utilization of resources.

6.2.2 Assimilation phase

The aggregation of allotment phase attributes for justifying the efficiency in assessment of performance undertakes strong mathematical approach. As the service access time of a particular service for a particular service provider was predefined. Similarly the service completion time of a particular service for a particular service provider was predefined the above deployed metric variables give a mathematical idea in calculation of total service access time and total service completion time. The auditor assessment carried in computation of service accessible time and service completion times of a particular service provider enlights in finding average number of services. Finally the utilization of services by the consumer of a particular service provider can be calculated.

6.3 Formulating the Algorithm

As the problem is defined the path of formulation the problem with flow chart gives an idea in solving the problem with optimal solution. The output of flow chart delivers the preparation of algorithm helps in mathematical baseline.

6.3.1 Flowchart for the (EFPAT)-Algorithm

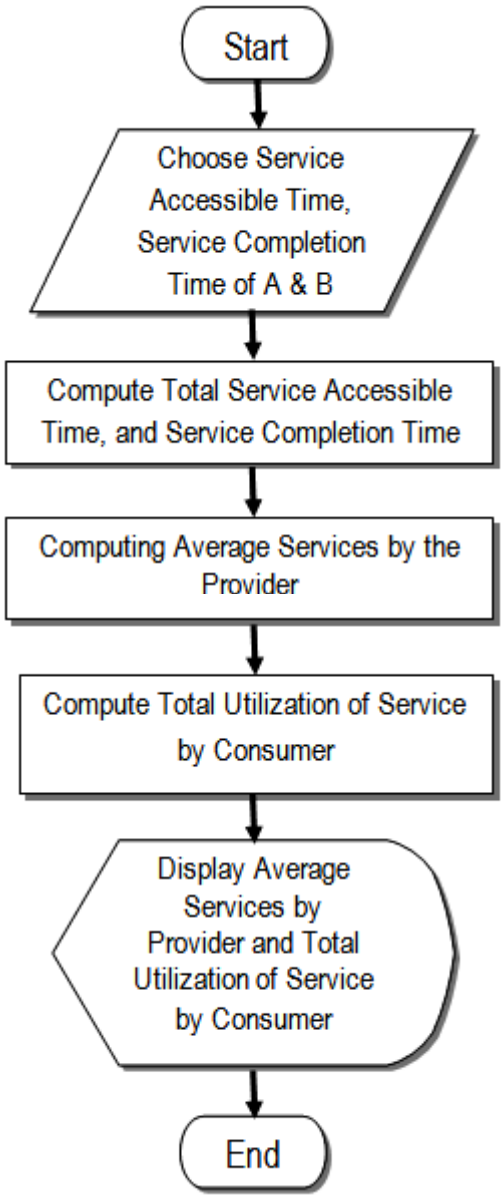


Fig 6.3.1 Flowchart of EFPAT Algorithm

6.3.2 Algorithm-(EFPAT) process

Step1: Let Quality of Service attributes defined as Q= {q_1, q_2 ....q_n}

ie., q_1 be the Quality of Service attribute... may be
[Availability, Reliability, Response time and Cost]
Where Q is normalized for the consistency of computations,
So that, the values lie between [0 and 1]

Step2: Let Potential Service Provider list with their service offerings is denoted as

SP= {SP1, SP2 ....SPk}
Where SP1= Q{q_1,q_2,....q_n}
Where SP2= Q{q_1,q_2,....q_n}
....
....
Where SPk= Q{q_1,q_2,....q_n}

ie., q_1 be the Quality of Service attribute... may be
[Availability, Reliability, Response time and Cost]

Step3: Let Potential Service Provider offer his services in Time slots as Service Access Time to consumer

ie., Time slots may beT={a,b,c....z}
ie., Service Access Time of particular time slot TS=T(Ta,Tb,....Tz)
ie., Total Service Access Time TSAT=TS(Ta+Tb+....Tz)

Step4: Let Potential Service Provider offer his services in Time slots and determine the Services Completion Time

ie., Time slots may beTx={a,b,c....z}
ie., Service Completion Time of particular time slot $TS^{!}$=Tx(Ta,Tb,....Tz)
ie., Total Service Completion Time TSCT=$TS^{!}$(Ta+Tb+....Tz)

Step5: Let Auditor assessment for Average Time that SP provision towards consumer utilization

ie., Auditor assessment for Average Time AAT

$$AAT = \frac{\text{Total Service Completion Time TSCT}}{\text{Total Service Access Time TSAT}}$$

Step6: Let Auditor assessment for Utilization of Services by consumer with respect to Auditor assessment for Average Time AAT

ie., Auditor assessment for Utilization of Services

$$AUS = (1/ AAT) * 100$$

Step7: Finally Efficiency of Utilization of resources by the consumer are compared with the values of AUS percentage which helps in prediction of Potential service provider

6.3.2 Working Illustration of (EFPAT) Algorithm

The potentiality of the proposed algorithm should represent with strong mathematical procedures. Presentation of the proposed algorithm with illustration on the taken sample data elevates the role of transparency and robustness in computations. We undertake the service providers data from the given reference Table 6.3.2.1. The illustration is not possible for all the dataset so, we try to illustrate in a curtail form and limited to randomly selected data records. The randomly selected data records are not shown any partiality in selecting and mathematical process was demonstrated.

SaaS_ID	Service Accessible time for Service A	Service Accessible time for Service B	Service Completion Time for Service - A	Service Completion Time for Service - B
SP1	0.2	0.4	0.97379333	1.947586667
SP2	0.066666667	0.1333333	0.98707	1.97414
SP3	0.1	0.2	0.82232333	1.644646667
SP4	0.1	0.2	1.03450667	2.069013333
SP5	0.133333333	0.2666667	0.88371	1.76742
SP6	0.2	0.4	1.01440333	2.028806667
SP7	0.233333333	0.4666667	1.12103333	2.242066667
SP8	0.066666667	0.1333333	0.90164333	1.803286667
SP9	0.233333333	0.4666667	1.10528333	2.210566667
SP10	0.1	0.2	0.92771333	1.855426667
SP11	0.233333333	0.4666667	1.05172	2.10344
SP12	0.233333333	0.4666667	0.94452333	1.889046667
SP13	0.1	0.2	0.86632667	1.732653333
SP14	0.166666667	0.3333333	0.91102333	1.822046667
SP15	0.166666667	0.3333333	0.99830667	1.996613333
SP16	0.1	0.2	0.91773667	1.835473333
SP17	0.166666667	0.3333333	1.04573	2.09146
SP18	0.066666667	0.1333333	0.89253667	1.785073333
SP19	0.1	0.2	0.99106333	1.982126667
SP20	0.166666667	0.3333333	0.97105	1.9421
SP21	0.166666667	0.3333333	0.96381333	1.927626667
SP22	0.066666667	0.1333333	0.91445333	1.828906667
SP23	0.133333333	0.2666667	0.93574	1.87148
SP24	0.266666667	0.5333333	1.00263667	2.005273333

Table 6.3.2.1 Service Providers Provision of Services with Time bounds

SaaS_ID	Service Accessible time for Service A	Service Accessible time for Service B	Service Completion Time for Service - A	Service Completion Time for Service - B
SP3	0.1	0.2	0.822323333	1.644646667
SP10	0.1	0.2	0.927713333	1.855426667
SP17	0.166666667	0.333333333	1.04573	2.09146
SP24	0.266666667	0.533333333	1.002636667	2.005273333

Table 6.3.2.2 For Illustration-Service Providers Provision of Services with Time bounds

For SaaS_ID SP3

Total Service Accessible Time =

Service Accessible time for Service A + Service Accessible time for Service B

0.1+ 0.2 = 0.3

For SaaS_ID SP3

Total Service Completion Time =

Service Completion Time for Service - A + Service Completion Time for Service – B

0.822323333 + 1.644646667 = 2.46697

For SaaS_ID SP3

Auditor assessment for Average Time for Services provisioned AAT

$$AAT = \frac{\text{Total Service Completion Time TSCT}}{\text{Total Service Access Time TSAT}}$$

$$= \frac{0.3}{2.46697} = 8.223233$$

For SaaS_ID SP3

Auditor assessment for Utilization of Services AUS

AUS = (1/ AAT) * 100

= (1/8.223233) * 100

= 12.16067 %

For SaaS_ID SP10

Total Service Accessible Time = 0.3

Total Service Completion Time = 2.78314

Auditor assessment for Average Time for Services provisioned AAT= 9.277133

Auditor assessment for Utilization of Services AUS = 10.77919 %

For SaaS_ID SP17

Total Service Accessible Time = 0.5

Total Service Completion Time = 3.13719

Auditor assessment for Average Time for Services provisioned AAT= 6.27438

Auditor assessment for Utilization of Services AUS=15.93783 %

For SaaS_ID SP24

Total Service Accessible Time = 0.8

Total Service Completion Time = 3.00791

Auditor assessment for Average Time for Services provisioned AAT=3.759888

Auditor assessment for Utilization of Services AUS=26.59654 %

The above data records from the Table 6.3.2.2 are presented with computed values and the step by step EFPAT algorithm illustration was focused on service provider SaaS_ID SP3

SaaS_ID	Total Service Accessible Time	Total Service Completion time
SP1	0.6	2.92138
SP2	0.2	2.96121
SP3	0.3	2.46697
SP4	0.3	3.10352
SP5	0.4	2.65113
SP6	0.6	3.04321
SP7	0.7	3.3631
SP8	0.2	2.70493
SP9	0.7	3.31585
SP10	0.3	2.78314
SP11	0.7	3.15516
SP12	0.7	2.83357
SP13	0.3	2.59898
SP14	0.5	2.73307
SP15	0.5	2.99492
SP16	0.3	2.75321
SP17	0.5	3.13719
SP18	0.2	2.67761
SP19	0.3	2.97319
SP20	0.5	2.91315
SP21	0.5	2.89144
SP22	0.2	2.74336
SP23	0.4	2.80722
SP24	0.8	3.00791

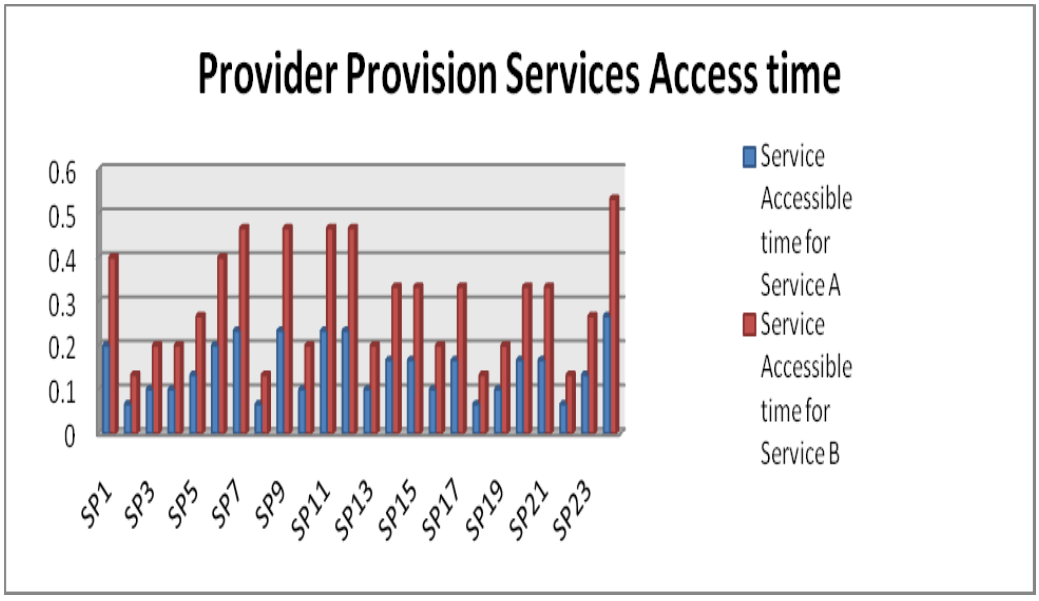
Table 6.3.2.3 Total Service Accessible Time and Total Service Completion Time

The above Table 6.3.2.3 discloses the information about the service provider provision services for Total Service Accessible Time for different instances and Total Service Completion Time for different instances. Total Service Accessible Time is that Service Accessible time for Service A + Service Accessible time for Service B and Total Service Completion Time is that summation of Service Completion Time for Service A and Service Completion Time for Service B.

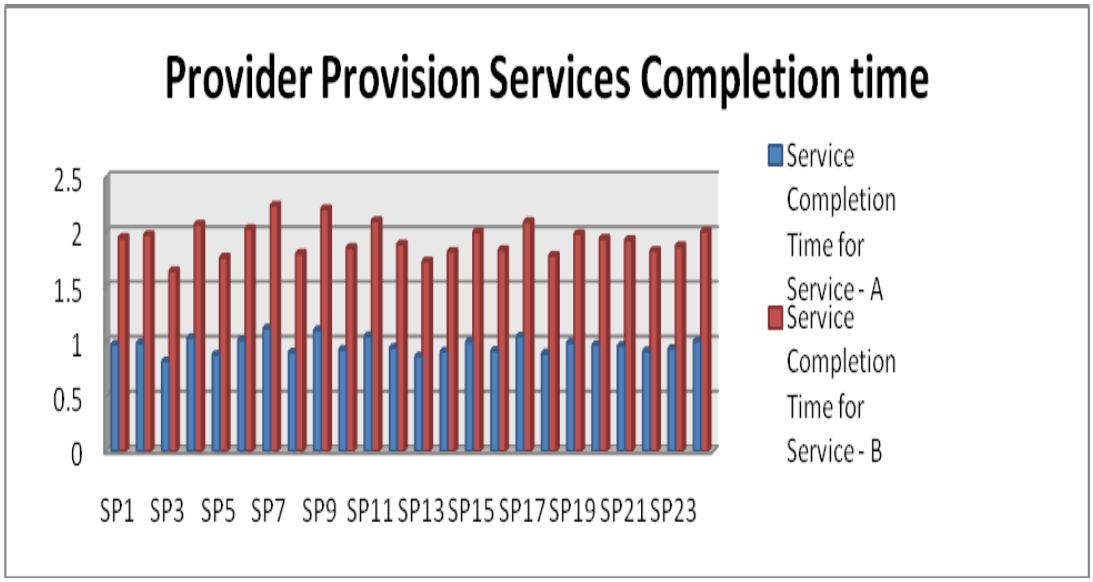
SaaS_ID	AVG No. of Services by the provider	Utilization(%) of services to customer
SP1	4.868967	20.53824
SP2	14.80605	6.753996
SP3	8.223233	12.16067
SP4	10.34507	9.666443
SP5	6.627825	15.08791
SP6	5.072017	19.71602
SP7	4.804429	20.81413
SP8	13.52465	7.393907
SP9	4.736929	21.11073
SP10	9.277133	10.77919
SP11	4.507371	22.18588
SP12	4.047957	24.70382
SP13	8.663267	11.54299
SP14	5.46614	18.29445
SP15	5.98984	16.69494
SP16	9.177367	10.89637
SP17	6.27438	15.93783
SP18	13.38805	7.469348
SP19	9.910633	10.09017
SP20	5.8263	17.16355
SP21	5.78288	17.29242
SP22	13.7168	7.29033
SP23	7.01805	14.24897
SP24	3.759888	26.59654

Table 6.3.2.4 Average Number of Service by Provider and Utilization rate of Services by Consumer

The above Table 6.3.2.3 discloses the information about the Average Number of Service by Provider and Utilization rate of Services by Consumer. The Average Number of Service by Provider is that Total Service Completion Time divided by Total Service Access Time.



Graph 6.3.2.1 Service Providers Services Access Time at Instances A & B
X-axis: Service Providers Time Variations of provision services at Instances of A & B
Y-axis: Deviation with respect to Time



Graph 6.3.2.2 Service Providers Services Completion Time at Instances A & B
X-axis: Service Providers Time Variations of provision services at Instances of A & B
Y-axis: Deviation with respect to Time

6.4 Chapter Summary

In the scenario of computing efficiency by auditor in performing audit trail acknowledges the services and its boundaries. In our EFPAT algorithm the addressed research contributions enables to study about workflow of data in querying process, provenance for quality of service, resource allocation methods ensuring privacy, parameters for ideal service provider and optimizing of service jobs. The attributes considered in this EFPAT algorithm process was clearly categorized and aggregated with lucid descriptions. Finally EFPAT algorithm working outline was demonstrated.