Recommendation System for Service Integration and Composition Based on Policy Evaluation and Detection

S.Tiroumal Mouroughane[1], G.Amirthayogam[2]

[1]Assistant Professor, Department of Information Technology, Perunthalaivar Kamarajar Institute of Engineering and Technology, Karaikal, Puducherry, India

[2]Assistant Professor, Department of Computer Science and Engineering, Arunai Engineering College, Thiruvanamalai, Tamilnadu, India

Abstract: Service Oriented Architecture (SOA) is the latest popular paradigm for system integration and interoperation which revolutionized the distribution of applications over World Wide Web. A web service is the current technology used by SOA in the field of business processes. Where the services offered by the organization are overseen through the system called Change Management Framework (CMF). By this system any progressions for the Services offered by the Organization can be included, adjusted or supplanted as the service request offered by either the client or different business parties, hence it is useful for the organization to create itself by fulfilling the client necessities in a self-sufficient way. In order to offer value added service to the customer we need to integrate the different services. While integrating the various services we should be concise in business policy of on organization. In the event that the business policy is violated while integrating the services it will be precluded in the centre from securing the exchange. In this paper, we have displayed a strategy for distinguishing the business policy violation with Total Turing Machine (TTM).

Keyword: Service Oriented Architecture, Service Integration, Change Management Framework (CMF), Business Policy Violations, Total Turing Machine.

I. INTRODUCTION

In the context of cloud computing, the storage and computing resources are framed as a service that can be utilized or delivered as needed utilities for the needed one. Internet gives an expanding number of web services that makes it hard to choose important web services physically to fulfill complex client necessities. The fast advancement of service-oriented computing and distributed computing, the internet gives an expanding number of web services that makes it hard to choose important web services physically to fulfill complex client necessities [1]. A Web Service is a standards-based, language-agnostic software entity that accepts specially formatted requests from other software entities on remote machines via vendor and transport neutral communication protocols producing application specific responses.

The simplest Web service system has two participants one is service producer and a service consumer the provider presents the interface and implementation of the service and the requester uses the web service. The concept of Web Service based on the standards, language- uncertain entity software that accepts mainly structured requests from the other entities software on the remote machines through transport neutral and vendor oriented Communication protocol that making the positive application responses. The standard Web service structure has only two participants. The service consumer and then the service producer. The role of the services provider is to interface and execution of service, whereas the requester practices on the web service.
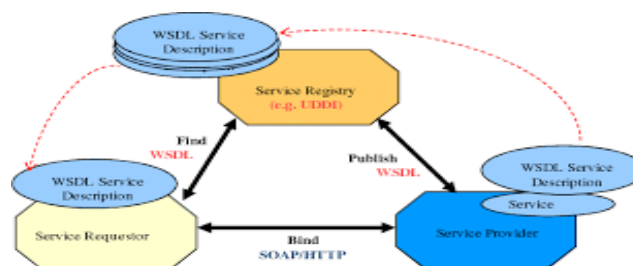

Fig 1: -Web Service

A. Web service Integration

Service integration has been proposed to permit the attempt to arrive at incorporation development to Integrates between association applications among partners. However the present market solicitation does not get satisfied with incorporating solicitations or administrations as a whole. It involves incorporating web administration rationales in useful level or business rule for various essential unexpectedly

There are three key difficulties in this degree of Integration. To start with, Degree of approximately coupled framework ought to be keeping up particularly when business partner need to tie up or on the other hand merging. Second, essential logic must to be situated what's more, take out from the whole service. Third, the recuperated logic should be incorporated intensely as interoperability is come to. It is a troublesome errand which expects designers to understand the entire services and identify unrivalled route for integration. So the order is to devise a computerized framework to incorporate the web benefits progressively.

Nowadays the enterprises must exchange information frequently on the Web. However, lots of data are located on different enterprise servers. Therefore, enterprise data integration is no longer limited to the interior of enterprises, but always beyond the business boundaries. When it comes with integration, we have to face the heterogeneity in platforms, programming languages and data structures and Business policy. In this paper we mainly concentrate on detecting the business policy violation during service integration.

Change management is the movement in charge of controlling and taking care of the lifecycle of all varieties in IT environment [1]. The objective line of progress the board is to "ensure that steady strategies and systems are reused for effective and fast administration of changes, so as to lessen the impression of progress related occasions upon web administration prominence and, subsequently, increment the everyday assignments of the endeavour.

B. Composed Service

A Web Service which is made out of many Web Services is dependably on demand. They are the coordinated effort of independent Web benefits that gives an esteem services dynamically. The self-governing Web service are spent significant time in their very own space and thus furnish an expanded nature of Service with diminished expense to different business substances and their clients [3]. Composed service (CS) is services that are available online by combining various services to provide a value added service to the customers.

C. Business Policy

Business processes are event-driven, when more than one service is required, multiple services can be integrated as a single composite service and it should be capable of handling the dynamism of enterprise [4]. Dynamism includes change in partner, partner strategies, policies, and exception handling. Business Policy defines the scope of an organization within which the decisions can be made by the members and the tasks that can be carried out. This policy should be considered during the service integration and care should be taken in order to not violate the policies [3]. In case the business policy is violated during the run time of the service the transaction gets aborted in the middle.
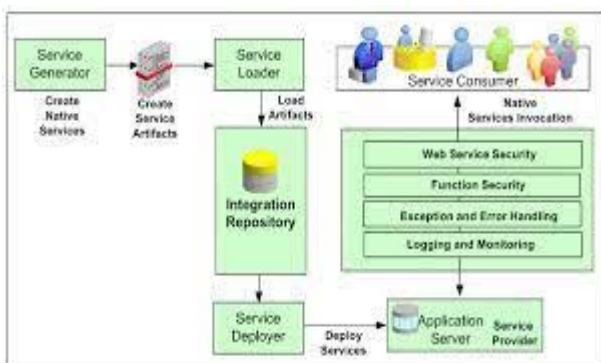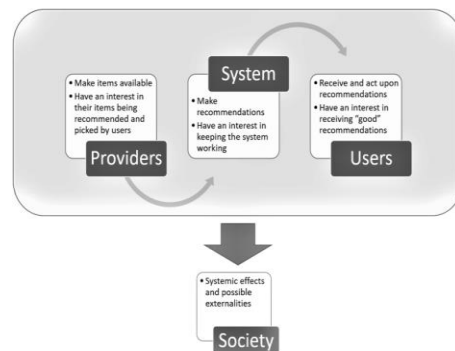

Fig2:-Service Integration

Fig3:-Service Recommentation

In this paper, we have proposed a methodology to detect the business policy matching in service integration. The main contribution of this paper is to detect the business policy violation with the help of the Total Turing Machine (TTM). The remainder of the paper is structured as follows: Section 2 gives the recent studies related to the web service integration. Section 3 shows the processes methodology and the section 4 shows the conclusion followed by reference.

II. RELATED WORK

The work related to web service integration and detection of business policy violation is discussed below.

Jihen et al. had introduced a mechanized strategy that broke down the element model advancement, follows their effect on the Software product offering (SPL) plan, and offered a lot of suggestions to guarantee the dauntlessness of the two models [5]. They characterized the pack of various measurements that was adjusted for the SPL plan in request to recognize the exertion required for the support of the SPL models in an enduring state likewise with the quality as like the first models. They had exhibited their proposed strategy and the instrument with content editing area a case of SPL. They additionally confirmed the viability of their proposed system tentatively in wording of both the nature of the safeguarded SPL models and the precision of the effect change the board.

Yan Hu et al had propose an improved neighborhood-based Collaborative filtering (CF) way to deal with make increasingly precise QoS expectation, in this way to give higher-quality Web administration proposal to service clients [5]. It joins time data into both the similitude calculations and QoS forecasts to improve QoS forecast exactness, and lightens information sparsely adequately lightly effectively by performing the hybrid personalized random walk mechanism on both the client chart and the service chart.

Tiroumalmouroughane et al had proposed a definitive structure for programmed service integration which rearranges association to trade their administration rationale further stylish with their endeavor organize adherents [7]. The suggested structure coordinates the basic administration rationales precisely shy of designer's contribution at any level. Arrangement based model anticipated in this examination effectively perceives wanting among the administration rationales and helps to coordinate potentially with the utilization of PDP and PEP. Usage philosophy and assessment result are given the model. The incorporated administration is evaluated with a few reaction time, data sources and execution time are expressed and plotted graphically.

Li (Li et al.) had presented a dynamic policy and charging control (PCC) framework [8]. This framework helps to control and optimize network usage and to provide network information-measure resources to their subscriber. It also works according to the user's real time profile and subscription information of the user and to avoid or minimize operator's network congestion. It also helps in optimizing the operator's existing and potential network investment. The authors predicated the key value of optimization that was based on the convergent competence of the rating and charging functions on knowledge service flows and the subscriber account profile and lifecycle.

Thirumaran et al. had proposed a change impact analysis framework for the Long term composed services with following features. The framework made the business people by themselves to implement the changes by means of their analysts [9]. The cost of the framework was reduced by eliminating the need for the IT developers once after the services related to the application was developed and delivered by them. Ensured the efficient incorporation of the changes and then finite state automaton was used by them to verify the compatibilities made during the runtime also change evaluation and probabilistic cellular automaton was used to impact analysis and prediction. They proved that the knowledge gained by the analysts over the service logics and the incorporation of changes were increased by means of the probability measures as well as the incident matching.

Mariano Vargas-Santiago proposed a diagnostic approach based on fuzzy logic [10]. In these approaches fuzzy non-functional requirements are define to make inferences, it can take necessary action in the system change in different workload conditions. This method will increase the functionalities of the web services platform.

Budi J.Achmadi et al proposed the Business Process Deviation Detection (BPDD) system for proficient deviation identification [11]. The approval of this structure is checked by infusing a few deviations to the first work process, to see the impact and execution of the system. Here the Markers of usefulness and reusability of programming can be utilized to distinguish deviations approval business process structure.

III.   PROPOSED ALGORITHM

Regularly before integrating the service of the business procedure the arrangement of the most current policy will be confirmed against with the current characterized strategies and if the approaches are not coordinated at various levels implies it will be throw to the exception handler however the approaching web service solicitation might be of a proficient one adapting to future offices of the customers who are getting to the service from the specific site and may prompt the improvement of the business and henceforth the cross checking of the request is important to make the framework totally powerful for the evolving condition. Likewise while checking the nature of the service demand the demonstration of malignant goals additionally should be mulled over as this may prompt the reconciliation of service that is totally redundant for the business procedure.

A. Composed service integration and its analysis

Web service is designed for the communication between different organizations or between different parts of an organization, such as Enterprise Application Integration (EAI) and Cross Organization Integration (B2B), EAI is used for integrate legacy software systems within an organization in order to allow systems to have a more complete and consistent world-view. B2B is used to allow partners and customers to interact with internal systems in a programmatic fashion. The web service is commonly portrayed by methods for the language called Web Service Description Language (WDSL) and each service is spoken to by service ID, Name, Location, Functional and Non-Functional depiction. At first they got solicitation for change is sent to the change demand chief to recognize the part of the business procedure where the change needs to be made. Think about that a solicitation for coordinating a web Service, CS_i, $I = 1, 2 . . . N$ (where is the aggregate number of Web services) is experienced by the CMF what's more, this solicitation is first broke down as far as its past rate, area and business rationale after that it is explored that whether it fits in with the predefined policy of the business rationale and this is cultivated by recognizing the strategy focuses to which level they are fulfilled the policies. The investigation of the relating service is done in three stages as point by point beneath.

➢   Request Analysis
➢   Business logic Analysis
➢   Domain Analysis

The solicitation for new service integration might be experienced beforehand and by breaking down its past occurrence on contrasting and the service ID and the choice for its incorporation can be tried and time. On the off chance that the solicitation is another one methods and not experienced beforehand implies then it is analyses, in which space it has a place with, for example, travel, carriers and so forth and after that ordered to the comparing area and the relating strategy control is produced for that service.
In this stage just the business rationale of the solicitation is broke down to such an extent that it adapts to the current rationale of the business and this can be cultivated by strategy discovery and the degree of arrangement infringement of the separate administration. The discovery of approach focuses is performed with the assistance of the TTM and this is clarified in detail in the accompanying area.

B. Policy detection with Total Turing machine (TTM)

In order to detect the policy violation at first we have to identify which are the policies that are satisfied by Composed Service (CS) and this is evaluated by the policy detection points. Here we are using TTM to detect the policy points of the service which is requested by the user.

In Turing machine we cannot determine in advance if any particular program will halt for any set of input data, we do know that a program must halt on a system that is Turing complete if it is indeed decidable and that only decidable programs are known to run to completion on a Turing complete system. As such, we know that there is necessarily a point where the decidable program halts. It becomes the problem of determining the most effective means to minimize the size of the decidable program for when a recursive loop structure is "unrolled". The unrolled program can grow exponentially in size. For the set of all programs, it is not possible to determine if a program is decidable and will halt or even if a system can run it to completion within the time constraints available when run on a standard Turing Machine.

The Total Turing Machine is the Turing Machine in which it only accepts input that is defined within a bounded time parameter that is constructed. So the time complexity of policy matching and making decision for integrating service is reduced in TTM. Multi tapes Turing machine are used to detect the policy point of the service which is requested by user.

As given in figure 1 the TTM will detect the policy detection points from N number of CS using N number of TTMs. If the request to integrate N number of CS is received means, then the compatibility among those services is verified for all the tapes as specified. In this case, there are four possible outcomes may appear such as universal, existential, accepting and rejecting and based on this their compatibility is decided.

The working principle of TTM is similar to that of Turing Machine the difference is that the TTM will not have infinite loop. The transition function for TTM is shown below.

$$\gamma : Q \times \Pi \times \{L, R\}$$ -----------1

Thus the acceptance and rejection results for TTM is decided by the transition function based on the universal and existential states and the corresponding conditions are show in figure2.

B-Business Rule Tape
F-Function Tape
V-Parameter Tape
D-Dependency Tape
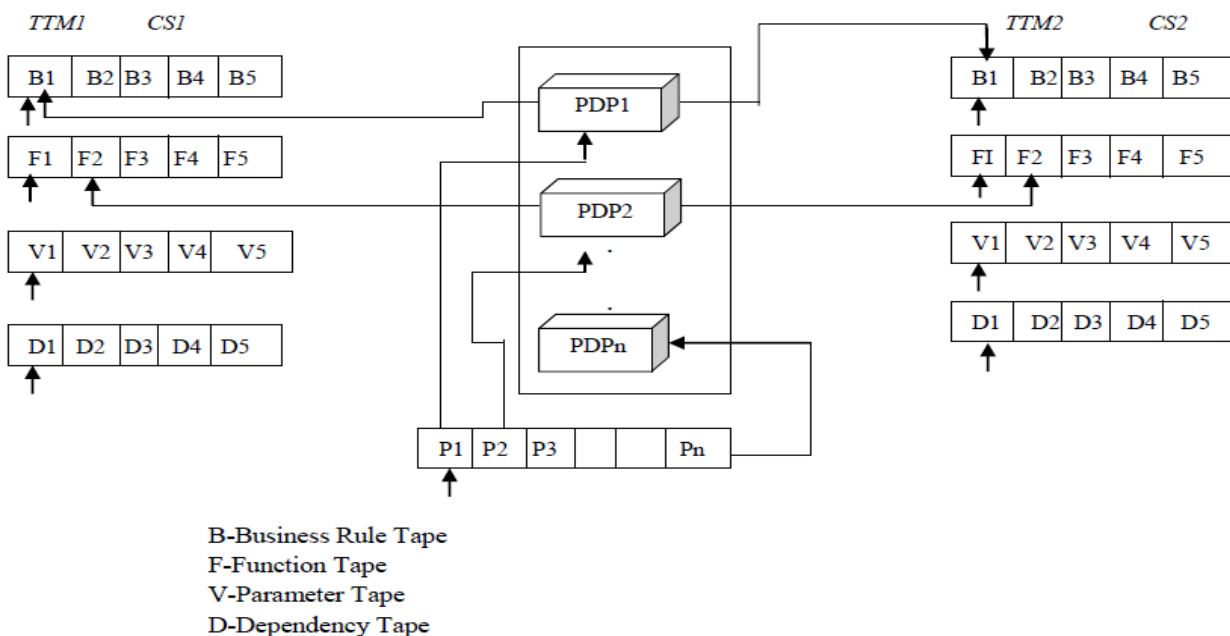
Policy Violation Detection (PDPn[])

//Input: PDPn[] – Policy detection point exhibit where the strategy focuses recognized in the services are put away for the each services that will be integrated.

// PDPn [ ] → {PDP1 [ ], PDP2 [ ] ….PDPn[ ]

BEGIN status =0
While PDP []! = empty
For each i= 2 to n do
If (PDPi-1 == PDP i) then status status+1;
End If
End For
If (status ==n)
then
policy_violation =0 //There is no policy violation
Else policy_violation =1//There is policy violation.
END

Fig 4: Algorithm for Policy violation detection
According to above method the deadline for universal is accepted state and the deadline for existential is rejected state for the tape. Based on the acceptance the policy detected points (PDP) are obtained once after the application of transition

rules and the corresponding PDPs and the associated transitions are stored in the state transition table and used in the process of policy violation detection.

C.A Performance Comparison

A step of a Turing machine (TM) is one event where the TM takes a transition while running a TM on different inputs might take a different number of steps. The number of steps a TM takes on some input is sensitive to the structure of that input and the length of the input. In the proposed system an Multi tape Turing machine (MTTM) is used here the input tape holds the original input and each tape head can move independently of the rest and also each tape head can base its transition on the symbols under all tape heads. MTTM can decide balance in O (n) time. So the MTTM is inherently faster than the single-tape TM.

SIZE	O(1)	O(n)	O(n log n)	n
50	1μs	7μs	0.7ms	50μs
100	1μs	8μs	1.5ms	100μs
150	1μs	8μs	2.5ms	150μs
200	1μs	9μs	3.5ms	200μs
250	1μs	10μs	4.5ms	250μs
300	1μs	10μs	5.5ms	300μs

Table 1: - Comparison of Runtimes

The above table 1 shows the runtime comparison of the multi tape Turing machine at different size which shows the balanced state compare to the single tape Turing machine.

IV. CONCLUSION AND FUTURE WORK

In this paper we have proposed a methodology for business policy violation detection in the Change management framework. In business logic analysis of the request Total Turing Machine is used to detect the policy violated points the service request and integrated to CMF. Using of TTM will reduce the time complexity of detecting the policy violation and in future the work can be enhanced using probabilistic Total Truing Machine (PTTM) and Neural Truing Machine (NTT) with reputation measurement which will lead to increase the degree of automation of the change management framework and the time complexity will be further reduced.

REFERENCES

1. Xiong, Ruibin, Jian Wang, Neng Zhang, and Yutao Ma, "Deep hybrid collaborative filtering for web service recommendation", Expert systems with Applications 110, (2018), pp: 191-205
2. Thirumaran. M, Dhavachelvan.P and Naga VenkataKiran.G "A Collaborative Framework for Evaluation of Run-Time Changes in Enterprise Web Services", International Journal of Web & Semantic Technology (IJWesT) Vol.3, July 2012.
3. G.Amirthayogam, C. Anbu Ananth, "A Survey on Business Policy Violation in Web Service Integration" Intentional journal for Computer Science and Engineering (IJCSE), Volume7, Issue6, June 2019.
4. Zakir Laliwala, Amee Desai, Sanjay Chaudhary "Policy-based Services Aggregation in Grid Business Process", Annual IEEE India conference, 2009.
5. [4] Jihen, M., Nadia, and Hanene, B "Change impact analysis for software product lines", Journal of King Saud University Computer and InformationSciences, 2016.
6. Yan Hu, Qimin Peng, Xiaohui Hu, and Rong Yang,"Time Aware and Data Sparsity Tolerant Web Service Recommendation Based on Improved Collaborative Filtering", IEEE transactions on services computing, vol. 8, no. 5, September/October 2015.
7. S.Tiroumalmouroughane,P.Thambidurai,"Automatic policy based web service integration using Ontology", Proceedings of the international conference on informatics and analytics, Article No 74,2016.
8. Lu Liu , Jie Xu, Duncan Russell, John K. Davies, David Webster, Zongyang Luo and Colin Venters, "Dynamic service integration for reliable and sustainable capability provision", International Journal of Systems Science ,Volume 43, Issue 1, 2010.
9. Thirumaran M., Jannani, M. and Sivakumar, N., "A formal approach for change impact analysis of long term composed services using Probabilistic Cellular Automata', Journal of King Saud University-Computer and Information Sciences, 2015.
10. Mariano Vargas-Santiago, Saul Pomares Hernndez, Luis, Morales-Rosales, Houda Khlif,Hatem Hadj-Kacem "Towards Dependable Web Services in Collaborative Environments Based on Fuzzy Non-functional Dependencies" 5th International Conference in Software Engineering Research and Innovation (CONISOFT),2017.
11. Budi J. Achmadi, Bayu Hendradjaya, Wikan D. Sunindyo, "Implementation and Validation of Business Process Deviation Detection Framework", International Conference on Data and Software Engineering, 2015.
12. FanJiang, Y. Y., & Syu, Y. (2014). Semantic-based automatic service composition with functional and non-functional requirements in design time: A genetic algorithm approach. Information and Software Technology, 56(3), 352-373