

Critical Software Testing Using Cloud Computing Tools

Manish Sharma^{1*}, H.P. Singh², Vibhakar Pathak³

¹Department of Computer Science and Information Technology, Suresh Gyan Vihar University, Jaipur (India)

²Department of Computer Science and Information Technology, Suresh Gyan Vihar University, Jaipur (India)

³Department of Computer Sci. and Information Technology, Arya College of Engineering and IT, Jaipur (India)

Available online at: www.ijcseonline.org

Accepted: 25/Jul/2018, Published: 31/Jul/2018

Abstract- ‘Software Testing’ is a demanding action on behalf of numerous projects on software engineering. Amongst all the five core technological action areas of the ‘software engineering lifecycle’, it is the main which still fronts considerable confronts. Software Testing necessitates an adequate amount of sources as well as finances on the way to attain the objective productively. But most of the organizations face the challenges to provide enough resources to test their software in distributed environment, with different loading level. This leads to severe problem when the software deployed into different client environment and varying user load. ‘Cloud computing’ is one of the important up-coming proficiency. This releases innovative access for ‘software testing’. Presented paper examines the ‘software testing’ in the platform of cloud computing and this comprises of models of testing of cloud, latest investigation on the same, marketable tools as well as investigative concerns.

Keywords: Marketable Tools, Software testing, Cloud Computing, Cloud Testing, Software Engineering Life cycle etc.

I. INTRODUCTION

To talk about Software testing, it is obligatory to mention that it is an essential as well as vital segment of the software advancement performance. Software testing is a broad term encompassing a variety of activities along the development cycle and beyond, aimed at different goals. Hence, software testing research faces a collection of challenges

Here cloud testing has materialized as an unmarked loom to testing anywhere environment of cloud computing are influenced to replicate traffic of actual globe consumer by means of considerably declining expenses [1]. Further, we can moreover extend it to traditional serviceable, regression analysis as well as further testing of customary yields in a PDC (product development cycle) as of a standpoint of outlay. In quintessence, testing of cloud is a structure of software testing in which testing is completed by means of possessions, equipments, etc from the cloud infra. Moreover, the whole environment of testing be able to be acquired as of the cloud going on demand by the side of outlay which is realistic as well as rational suitable to the ‘pay-for-use’ character of cloud computing moreover by means of a direct instance which is close to unfeasible inside own data center of the company. Originally, this perception took outline as soon as companies ongoing by means of numerous equipments started up in the cloud with the intention of simulating traffic of the web as well as bring out presentation tests on the websites. Currently secluded equipments in the cloud are used to endow with a regular view for testers to test in addition to developers to separate

in addition to determine the experimental software shortcomings. In fact, conventionally, cloud testing has been used to submit to stack and routine testing of websites. Conversely, by means of escalating development of expertise, every part of endeavor software is able to be tested for practical along with presentation issues prior to leaving in for full fledged endeavor consumption.

The figure 1 signifies that ‘websites are the most likely workload to put into the cloud (61%) followed by test and development (57%) with email & PC applications (51%) being the third, HR and payroll (41%) followed by finance and accounting workload to be put into the cloud (just 35% would select this). For this reason the cloud proposal endows with cost efficient offering to the software testing,



Figure 1: Best Relevance in Cloud

The remaining paper is prearranged in the following way; Part II shows the model of cloud testing, Part III Previous work. Part IV presents the probable risks in the testing of cloud. Part V shows the Marketable cloud testing tools. Part VI Contribution as well as lastly Part VII winds up the paper.

II. MODEL OF CLOUD TESTING

Software Testing in Cloud has following 3 models i.e.

A. TaaS

Testing as a Service notion was primarily pioneered by 'Tieto in Denmark in 2009'. TaaS is a representation of software testing which is used to analyze the request as a service offered to clientele transversely the 'Internet'. As a result of eradicating the requirement to analyze the request on the computer of the customer by means of testers on location, Testing as a Service improves the load of the customer for mounting as well as sustaining sourcing, test environments along with support. By means of Testing as a Service can moreover decrease the outlay of testing, in the course of fewer expensive, pricing for on-demand.

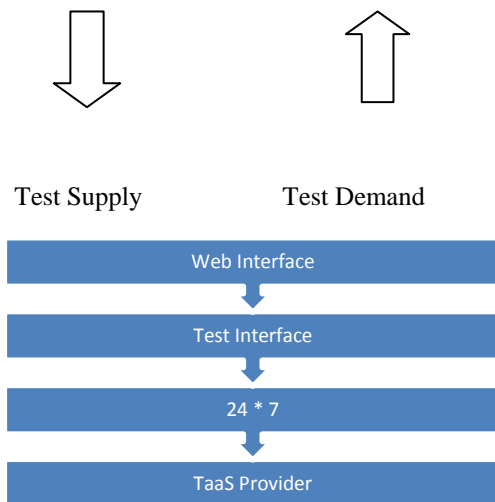


Figure 2: TaaS Process

B. TSaaS

TSaaS stands for Testing Support as a Service. It was proposed to augment autonomic services' testability. Test tasks for instance condition, implementation, arrangement in addition to reporting is uncovered as API services. King, et al., [5],[6] applied concepts of autonomic computing to testing of adaptive systems, known as autonomic self-testing (ATC). The method was then transferred to the platform of cloud [7], which is called Testing Support as a Service; in order that services which are implanted on secluded platform of cloud can depict their test sustain APIs in favor of collaborator contributors. A personal test to connect is

enlarged to administer testing activities and testing workflow. It supervises transformations or else renews on hosted services, employs essential infrastructure services, as well as summons 'Testing Support as a Service' sustaining services to authenticate the transformations. Test procedures uncovered like sustaining services embrace test arrangement, input, declarations, in addition to rip down procedures. These services are endowed in favor of cloud associates for the duration of the growth, testing in addition to preservation of custom-made cloud relevance also services. They are capable of being used for blueprint, construct, as well as operation of mechanized tests transversely directorial realms.

C. Testing within Cloud Testing relevance which is depicted along with organized in an environment called cloud environment. [Figure-1]

III. PREVIOUS WORK

This segment momentarily analyses the investigative effort connecting to software testing by means of Platform of Cloud. Vengattaraman et al. in [8] suggested the preliminary effort on sculpting of cloud based relevance environment in favor of software testing via edging 'On-Premises Applications' above clouds. The key purpose is to bring the associations amid diverse relevance services above clouds as well as peripheral customer services. However it does not concentrate on how to employ this sculpt in cloud testing. Yu, et al., [12] explained a Five-layer TaaS structure dependent on cloud infra services, together with the following:

- 1) Test occupant as well as test service provider layer
- 2) Test chore executive stratum
- 3) Test reserve executive stratum
- 4) Test stratum
- 5) Test stratum of record.

The paper projected a mechanized platform for testing TaaS scheduled on a cloud. This platform implements procedure of cloud computing to construct the flexible source infra as well as endow with diverse varieties of testing services to testing users.

Yang Yang et al. [9] stated that testing of software to be idealized as a service moderately than being observed as a chronological procession of accountability in the development of software. As per their observation, TaaS has 2 main phases:

- (1) A service to developers
- (2) A service to end users.

Their paper discussed software testing as a service from software superiority declaration perspectives. Candea [10] recognized 3 classes of testing services:

- (1) TaaS for developers
- (2) TaaSH for end users
- (3) TaaSC as certification service.

They argued that by way of a pricing sculpt; TaaS can be maneuvered as a public service plus as a business, aiming at the “long-tail” minute business companies. Liviu Ciortea et al. in [11] initiate Cloud9, a cloud based service testing with the intention of promises to craft good worth testing swift, economical, along with realistic. Cloud9 is the initial comparable representational implementation engine to sprint on big shared- clusters of computers, as well as its test attach uses the collective memory as well as CPU resources based on utilities such as Amazon EC2. The manuscript reports their preliminary trial product consequences. In accumulation, various preliminary cloud-based test experiments are reported. Banzai et al [12] from University of Tsukuba in Japan developed “D-Cloud”, is a devoted replicated test environment built upon Eucalyptus, an open source cloud infrastructure providing comparable functionalities as Amazon EC2. It uses QEMU, open source essential machine software, to fabricate essential machine for replicating errors in hardware together with disk, network along with memory. Praveen et al [13] transfers J-Unit test scaffold to Hadoop platform. J-Unit test cases are produced as autonomous Hadoop Map Reduce jobs. The map () utility obtains test jobs as < test name; test command> duo. At every nodule, the authority is implemented as a procedure. The reducer gets < test name; test result> commencing every plot furthermore merges all the penalties. Research shows that a 150 nodule bunch can construct 30 times enhancement contrasted amid chronological test implementations on a confined computer. Moreno et al [14] projected a fresh disseminated testing building for replicating analogous jobs. This structure includes 2 types of nodes - Master and Slave. Master is inimitable recognized, which is accountable for allocation, harmonization in addition to executive of all slave nodes. Master is started by means of a known test. It remains in favor of adequate slaves to attach to it, after that propels all slave analogous errands. All through the implementation, the master reins the implementation succession of slaves to warranty that every tasks in a step launch at the identical point. The slaves dash testing tasks as well as accumulate test consequences locally, together with nodes’ states composed by daemon thread at every nodule. At the conclusion of the test, master recalls each slave’s consequences, examines moreover then creates graphs as

well as statistics used for examining test implementation. Baride, et al [15] projected a cloud based loom for mobile relevance testing wherever infrastructure services are used to replicate expanded mobile devices, hardware configurations, assorted application platforms, as well as composite reliance.

IV. RISKS CONNECTED WITH CLOUD TESTING

In this segment, the paper presents several of the prospective risks connected through cloud testing [16].

A. Security

Security in the public cloud is the most important apprehension. Cloud test is dependent upon the internet, as a result it could arrive up to the circumstances regarding the outflow of concealed information, internet delaying, along with service contributor possibly will unexpectedly broadcast commotion of service owing to a preservation casement, slow internet velocity, bug hit, furthermore. Measures are improved to advance security as well as act in the public cloud.

B. Deficiency of standards

Currently, there are no widespread standard or results to incorporate public cloud possessions by means of client companies’ in-house records hub possessions. Public cloud contributors have their personal construction; working sculpts as well as pricing instruments plus proposes extremely minute interoperability which means the aptitude of computer systems or software to substitute as well as make use of information. These facades an immense confronts intended for companies whilst they necessitate toggling merchants.

C. Infrastructure

Various cloud contributors recommends barely restricted kinds of arrangements, expertise, servers along with storage space, networking plus bandwidth, building it tricky to generate concurrent test environments.

D. Procedure

Inappropriate handling of cloud based test environments knows how to amplify costs.

E. Forecast

Testing groups ought to meticulously plan their test environments, starting consumption phases during dis-assembly. They ought to be conscious of the connected operating cost, for example outlay of data encryption, prior to setting testing in a cloud environment, because these necessities will put away supplementary Central Processing

Unit as well as memory. It is vital to observe consumption of cloud possessions to evade in excess of handling along with in excess of disbursement.

V. MARKETABLE CLOUD TESTING TOOLS

This segment commences the Marketable Cloud Testing Tools.

A. SOASTA Cloud Test

SOASTA Cloud Test [16] is a construction presentation testing tool for Web-applications. It is capable of simulating 1000s of practical consumers going through the website concurrently; by means of whichever public or private cloud infra service.

B. iTKO LISA

iTKO LISA [17] intends to grant access to a cloud based environment as well as essential services intended for

compound relevance growth, confirmation along with legalization. It declares to trim down software deliverance time line by 30 percent or further by means of its pioneering loom to sustain unremitting incorporation for growth plus testing. Vital to LISA architecture is its virtualization expertise. For occupied or unapproachable possessions, LISA offers virtualized services via replicating the vibrant performance of target system consequently they can react as systems on air. In this mode, it ruptures reliance constrictions of system incorporation as well as ropes uninterrupted testing.

C. Cloud Testing

Cloud Testing [18] has been commenced via a cluster of recital expert along with architects from largest ‘Website Performance Monitoring & Load Testing Company’ of UK. It endeavors to sustain traverse browser as well as efficient testing of Web applications.

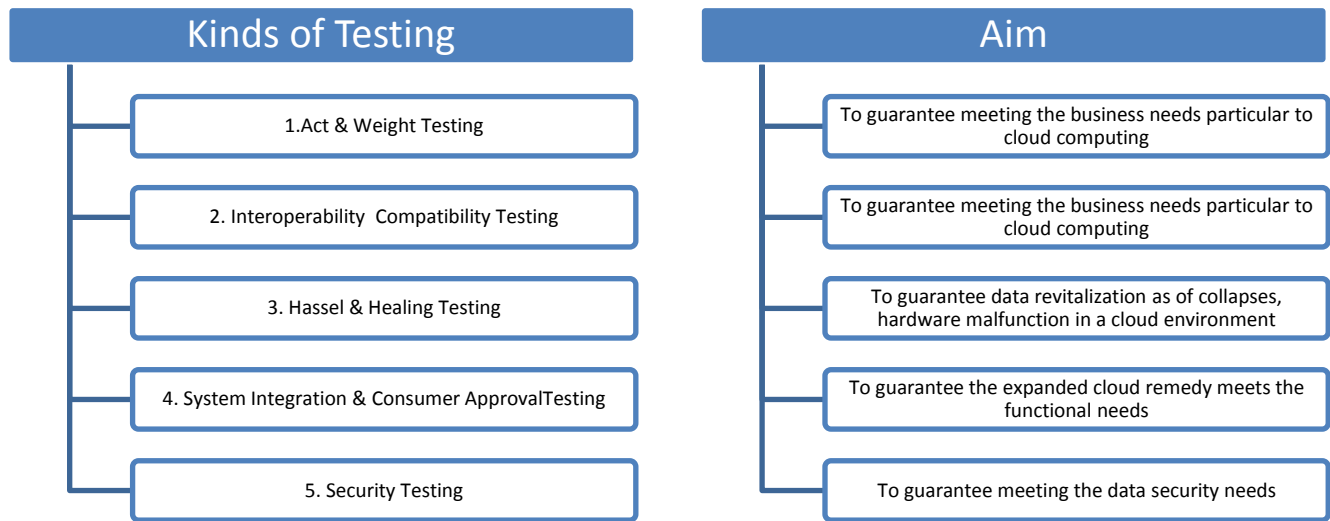


Figure 3: Kinds of Cloud Testing

VI CONTRIBUTIONS

This segment draws attention to various important investigative problems [21].

A. It describes the distinctiveness of relevance under the test in addition to the categories of testing prepared on the relevance. Praveen and Tilley [20] emphasizes the uniqueness of a relevance beneath cloud testing are test case enslavement, the working environment surrounded by which to accomplish testing as well as the capability of a boundary of relevance to be planned. The categories of testing

acknowledged to be suitable for testing in the cloud are unit testing, elevated size mechanized testing plus recital testing.

B. Estimates whether assured testing infra in the cloud actually assists to congregate a precise presentation quality. SOASTA, a cloud testing contributor, has for approximately 2 years been given that presentation testing of network relevance in the cloud [16]. On the other hand, numerous supplementary relevancies in addition to the cloud itself necessitate being experienced for assorted presentation characteristics for example reaction instance, velocity as well as through put. Therefore an appropriate loom to tackle

this concern is by running a test cot that would persuade investigators to investigate diverse characteristics of recital testing, replicate on the knowledge stumbled upon in the procedure moreover subsequently grant commendations based on the consequences.

C. Authenticates the superiority of applications tested by cloud at every stage. Superiority is from time to time an extremely prejudiced aspect, anecdotal attributable to diverse customer prospects. Therefore the investigators boast to increase a testing line of attack to authenticate as well as legalize the eminence of on the whole cloud testing.

D. Scrutinizing plus organizing the testing of the software processes. Amid the budding figure of suppliers of cloud, consumers have an extensive variety of preference as of wherever to acquire services of cloud. Pretentious a consumer desires to obtain the services as of extra as compared to testing provider of 1 cloud; it would be proficient to boast various techniques, amenities as well as tools in favor of observing along with running the process of software testing as of the diverse contributors during an “all-in-one” trend.

E. Administration of assessment records

The administration of assessment records is an insubstantial concern. Consecutively for successful testing to capture place, various testing errands depend extremely on the authentic client or else production records. In various cases, owing to regulations in addition to policies, consumers are forbidden as of delivering private or production records to 3rd parties. An explanation towards this dilemma might be the growth and expansion of fresh sculpts or algorithms with the intention to engender approximately “indistinguishable” test records to smooth the progress of prolific testing consequences.

VII. CONCLUSION

Contrast in the midst of methods of testing which are conservative; cloud testing give emphasis to more on testing of system as well as online testing. The reason is apparent due to the new blueprint as well as expansion techniques forced by cloud computing. The paper has highlighted the recent cloud testing architecture, tools and research issues. This will in actuality provide the foundation for the new researchers and students those who are really interested in software testing using cloud.

REFERENCES

- [1]. Nivedan Prakash, “Cloud testing: attracting demand”, <http://www.expresscomputeronline.com/20100201/trend01.shtml>.
- [2]. Fujitsu, “Confidence In Cloud Grows, Paving Way For New Levels Of Business Efficiency” 2010.
- [3]. P.Jogalekar, M.Woodside, “Evaluating the scalability of distributed systems” IEEE Trans. Parallel and Distributed Systems vol.11, no 6, 589-603,2000.
- [4]. L. Yu, W. Tsai, X. Chen, L. Liu, Y. Zhao, L. Tang, and W. Zhao, “Testing as a Service over Cloud,” in 2010 Fifth IEEE International Symposium on Service Oriented System Engineering, 2010, pp. 181–188.
- [5]. T. King, A. Ramirez, R. Cruz, and P. Clarke, “An Integrated Self-Testing Framework for Autonomic Computing Systems,” *Journal of Computers*, vol. 2, no. 9, pp. 237–249, 2007.
- [6]. T. King, “A Self-Testing Approach for Autonomic Software,” Ph.D. dissertation, Florida International University, 2010.
- [7]. T. King and A. Ganti, “Migrating Autonomic Self-Testing to the Cloud,” in Third International Conference on Software Testing, Verification, and Validation Workshops, 2010, pp. 438–443.
- [8]. T. Vengattaraman, P. Dhavachelvan, R. Baskaran, “Model of Cloud Based Application Environment for Software Testing,” (IJCSIS) International Journal of Computer Science and Information Security, Vol. 7, No. 3, 2010.
- [9]. Y. Yang, C. Onita, J. Dhaliwal, X. Zhang, “TESTQUAL: conceptualizing software testing as a service,” In the 15th Americas conf. on information systems, 6-9.08, San Francisco, California, USA, paper 608, 2009.
- [10]. G. Candea, S. Bucur, and C. Zamfir, “Automated Software Testing as a Service,” in Proceedings of the 1st ACM symposium on Cloud computing, 2010, pp. 155–160.
- [11]. L. Ciortea, C. Zamfir, S. Bucur, V. Chipounov, G. Candea, “Cloud9: A software testing service,” In The 3rd SOSP Workshop on Large Distributed Systems and Middleware (LADIS), Big Sky, MT, October 2009.
- [12]. T. Banzai, H. Koizumi, R. Kanbayashi, T. Imada, T. Hanawa, and M. Sato, “D-Cloud: Design of a Software Testing Environment for Reliable Distributed Systems using Cloud Computing Technology,” in Proceedings of the 2010 10th IEEE/ACM International Conference on Cluster, Cloud and Grid Computing, 2010, pp. 631–636.
- [13]. T. Praveen, S. Tilley, N. Daley, and P. Morales, “Towards a Distributed Execution Framework for JUnit Test Cases,” in IEEE International Conference on Software Maintenance, 2009., sept. 2009, pp. 425 –428.
- [14]. J. Moreno, D. Kossmann, T. Kraska, and S. Loesing, “A Testing Framework for Cloud Storage Systems,” Master’s thesis, Swiss Federal Institute of Technology Zurich, 2010.
- [15]. S. Baride and K. Dutta, “A Cloud Based Software Testing Paradigm for Mobile Applications,” *ACM SIGSOFT Software Engineering Notes*, vol. 36, no. 3, pp. 1–4, 2011.
- [16]. Cognizant reports, “Taking Testing to the Cloud”. March 2011.
- [17]. SOASTA. [Online]. Available: <http://www.SOA STA.com/>
- [18]. ITKO. [Online]. Available: <http://www.itko.com/>
- [19]. CloudTesting.[Online].Available:<http://www.CloudTesting.com/>
- [20]. T. Praveen, and S. Tilley, “When To Migrate Testing to the Cloud,” In proc. 2nd International Workshop on Software Testing in the cloud (STITC), 3rd IEEE International Conference on Software Testing, Verification and Validation (ICST), April 2010, pp. 424-427, doi:10.1109/ICSTW.2010.77.
- [21]. Leah Muthoni Riungu, Ossi Taipale, Kari Smolander, “Research Issues for Software Testing in the Cloud” IEEE International Conference on Cloud Computing Technology and Science, 2010
- [22]. B. Wrenn, CISSP, ISSEP, —Unisys Secure Cloud Addressing the Top Threats of Cloud Computing, (white paper).
- [23]. AppLabs, —Testing the Cloud, (white paper, Internet: http://www.pplabs.com/html/TestingtheCloud_786.html.
- [24]. P. Jogalekar , M. Woodside. —Evaluating the scalability of distributed systems, IEEE Trans. Parallel and Distributed Systems, vol. 11, no. 6, 589–603, 2000.

- [25]. [25] G. Goth, — Googling test practices? Web giant’s culture encourages process improvement,| IEEE Software, vol. 25, no. 2, 92-94, 2008.
- [26]. R. Collard, —Performance innovations, testing implications,| Software Test & Performance Magazine, Vol. 6, No. 8, 19-20 August 2009.
- [27]. Y. Yang, C. Onita, J. Dhaliwal, X. Zhang, —TESTQUAL: conceptualizing software testing as a service,| In the 15th Americas conf. on information systems, 6-9.08, San Francisco, California, USA, paper 608, 2009.
- [28]. Y Liu, —Testing as a Service over Cloud,| In the Fifth IEEE International Symposium on Service Oriented System Engineering, 2010.
- [29]. L. Ciortea, C. Zamfir, S. Bucur, V. Chipounov, G. Candea, —Cloud9: A software testing service,| In The 3rd SOSP Workshop on Large Distributed Systems and Middleware (LADIS), Big Sky, MT, October 2009.
- [30]. IBM Smart Business Development and Test Cloud,| IBM Global Technology Services, 2010. URL: <http://www935.ibm.com/services/us/index.wss/offering/middleware/a1030965>.
- [31]. Lian Yu, Shuang Su, Jing Zhao, et al, —Performing Unit Testing Based on Testing as a Service (TaaS) Approach,| In the International Conference on Service Science (ICSS), 2008.
- [32]. L. Ciortea, et al, “Cloud9: a software testing service”, IACM SIGOPS Operating Systems Review, Vol. 43, No. 4, January, 2010.
- [33]. Manish Sharma, Bright Keswani, Vibhakar Pathak, “Cloud Testing: Enhanced Software Testing Framework”, International Journal of Engineering, Science and Mathematics, Vol. 6 Issue 4, pp. 1-6, August 2017.

Author Profiles

Manish Sharma is pursuing Ph.D in Computer Science & Engineering from Suresh Gyan Vihar University, Jaipur. He has done his M.Tech. (Computer Science) from Birla Institute of Technology, Mesra, Ranchi in 2000, and M.Sc. in Mathematics from University of Rajasthan, Jaipur in 1992.



He is currently working as Director IQAC, Suresh Gyan Vihar University. He has participated and presented many papers in various Conferences and Seminars of National/International repute. He has undertaken various projects like Market Gold (Developed in VB-6 and SQL-Server) in BIPS Info-tech, Jaipur, Stock Gold (Developed in VB-6 and SQL-Server) in BIPS Info-tech, Jaipur, Electricity Billing System in BIPS Info-tech, Jaipur, Computer Integrated Home security System (Developed in C++), Electronic controlling integrated in C language.



Dr. H.P. Singh is an academic administrator & educationist presently appointed as Pro President, Suresh Gyan Vihar University, a NAAC accredited and one of the best self financed Universities in the state of Rajasthan.. A specialist in Artificial Intelligence, Network security, cyber security and communication

engineering, he is also heading the school of Engineering & Technology at the university and is the Director of the Distance Education programme under the University Grants Commission. Dr. H. P. Singh has to his credit a number of research papers related to Predictive technologies & Artificial Intelligence. Prior to his current appointment, he was the CEO of Podar Educational Institutions in Rajasthan in the year 2016-17. He is a Post graduate Engineer from IIT Kharapur and Ph D from the Andhra University.

Dr. Vibhakar Pathak is currently, Professor in the Department of information Technology, Arya College of Engineering and IT, Kukas, Jaipur. He is having teaching and research experience of more than 16 years. Prior to joining Arya College of Engineering and IT, he was associated with Suresh



Gyan Vihar University as Associate Professor where he is instrumental in developing High performance computing network with help of National Knowledge Network. He has published more than 25 papers in national/international journals and conference proceedings ,which includes more than 10 in cloud computing His research interests include modeling of perception and it’s applications in system intelligence, Cloud based publish subscribe protocols for robotic applications based High performance Computing in Grid computing environment and Location Intelligence. He is the key personal involved in development of skill up gradation center in Arya College of Engineering and I.T.