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Comparative Study of Various Cloud Architectures

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Abstract: ***Computing needs number of equipment and programming assets which are changing or getting updated in this way requiring clients to reliably pump in speculations to overhaul their infrastructure. This obliged specialists to land at an answer where clients would have entry to most recent renditions of equipment and programming without requiring new speculations. This prompted the very idea of Cloud computing where a client pays just for the administration as opposed for the item. In this paper we are exhibiting cloud testing measures and near examination between the three structures to be specific private, public and p2p on the premise of security, protection, accessibility and respectability.***

Keywords: Cloud Computing, Service Models, P2P, SOA, SOAP, SaaS, PaaS, IaaS etc

1. Introduction

To serve a quality item, testing is the last answer for any sort of issue we would confront in future from client site. Cloud testing is a type of programming testing wherein testing is done through utilizing assets over cloud applications under the cloud base. This is the place cloud testing has developed as a new way to deal with testing where cloud computing situations are utilized to reproduce true with application's execution, consistency , velocity, security and usefulness.

Over view of private, public and p2p cloud computing paradigm:

A. Private Cloud

The private cloud is a common multi-occupant environment based on an exceedingly productive, computerized, and virtualized base. Other key components of the cloud incorporate institutionalized application stages gave as an administration and a self-administration entry that empowers business gatherings to ask for and oversee limit for their applications.

The normal advantages endeavor private cloud include:

- Increased readiness, including altogether lessened provisioning times.
- Greater proficiency, including vitality investment funds, because of better asset usage.
- High accessibility with negligible incremental expense, by exploiting upgrades to industry standard equipment and programming.
- Improved limit administration, exploiting new business knowledge apparatuses.

On account of the broad extent of this activity, we plan to convey private cloud abilities in stages throughout the following three or more years. As we include these capacities, we expect that the cloud will get to be fit for facilitating exceedingly requesting, mission-basic business applications.

B. P2P Cloud

Cloud clients can procure registering assets on a need premise, accomplishing on interest adaptability; Cloud suppliers can augment asset uses of datacenters, expanding their arrival onventures. While Cloud frameworks are normally facilitated in vast datacenters and are halfway overseen, different sorts of Cloud models can be envisioned. In this paper we depict the configuration and model usage of a completely decentralized, P2P Cloud. A P2P Cloud permits associations or even individual to construct a figuring foundation out of existing assets, which can be effectively apportioned among various assignments. We concentrate on the issue of keeping up a lucid structure over an arrangement of untrustworthy figuring assets.

In the accompanying vital qualities of a Cloud are distinguished:

- On-interest self-benefit; the capacity to give figuring abilities (e.g. CPU time, stockpiling) progressively,
- System access; assets can be gotten to through the system utilizing standard instruments
- Asset pooling; virtual and physical assets can be pooled and appointed progressively to customers concurring
- Flexibility; assets can be provisioned progressively with a specific end goal to empower a client application to scale up.

C. Public Clouds

A type of cloud computing in which an organization depends on an outsider cloud administration supplier for administrations, for example, servers, information stockpiling and applications, which are conveyed to the organization through the Internet. People in general cloud has regularly been outside of the area of big business designers. At first glance, it is viewed as an outer storehouse where acquirement choices have been driven by line of business administrators. For instance, Software asa Service (SaaS) applications are regularly acquired by a specific office or line of business, not generally with the inclusion of the IT division. Correspondingly, Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) arrangements might be gained by a little improvement gather and utilized freely from other IT foundation and stages.

2. Related Works

Cloud computing is a rising processing worldview [1]. It intends to share information, computations, and administrations straightforwardly among clients of a monstrous framework. In spite of the fact that the business has begun offering cloud computing items, research challenges in different ranges, for example, UI plan, assignment decay, undertaking dissemination, and errand

coordination, are still hazy workloads. Execution Evaluation of Clouds and Virtualized Environments There has been a late goad of examination action in surveying the execution of virtualized assets, in cloud computing situations [3], [4]. Execution concentrates on utilizing universally useful benchmarks have demonstrated that the overhead brought about by virtualization can be underneath 5% for calculation [8], [9] and beneath 15% for system services [8], [10]. The cloud framework is worked exclusively inside a solitary association, and oversaw by the association or an outsider in any case whether it is found preface or off reason. The inspiration to setup a private cloud inside an association has a few angles [11].Public Cloud computing is a model for empowering advantageous, on-demand system access to a common pool of configurable processing assets (e.g., systems, servers, stockpiling, applications, and administrations) that can be quickly provisioned and discharged with negligible administration exertion or administration supplier cooperation [12].

There are at present two alternate points of view on "cloud testing" and both cases can be considered as substantial types of "Testing as a Service" [13]. Improvements in system base set off a goad in Web-based administration conveyance. Riungu et.al. Examine the conditions that impact programming testing as an on-line benefit and inspire critical exploration issues [6]. Particularly acknowledgment testing of those applications should be very much organized with a specific end goal to profit from cloud. Ding et al. portray why post-relocation testing is essential while moving a mind boggling application to cloud in [13]. . There have been past works for recognizing research issues for programming testing in the cloud [14]. Yang at al. [9] talked about that product testing can be conceptualized as an administration as opposed to being seen as a successive line of obligation in programming improvement. In their perspective, TaaS has two key viewpoints: (1) an administration to designers, and (2) a support of end clients. Their paper examines programming testing as an administration from programming quality confirmation points of view

An alternate proposition for a circulated Cloud design is given in [1, 2].Building on the primary thought of [5], in this paper we introduce a down to earth engineering, with a model execution, of a P2P Cloud. In [6], Leah Muthoni Riungu et al. reports their late study on programming testing as online administrations from specialists in the business. The paper compresses the discoveries in view of their Interviews with programming testing suppliers and clients. The fundamental exploration inquiry was: "What conditions impact programming testing as an online administration?" Based on the got reactions, they talk about the prerequisites, advantages, difficulties, and some examination issues from the viewpoints of online business merchants and professionals.

Dura Space, a joint association by Fedora Commons and D Space Foundation, reported that they would be exploiting distributed storage and cloud computing [7].

3. Framework Overview

As more people have a tendency to use the cloud for application use, environment and system, the acknowledgment and check of the most ideal workings of these organizations are crucial. As showed by IBM bits of knowledge, cloud organizations came to $42 billion by the year of 2012. Moreover, the use of disseminated figuring for relative examination infers less costs and less utilize. Since examination of the offerings of the cloud is compulsory, specific methodologies, strategies, and mechanical assemblies ought to be associated with this new kind of testing. In the blink of an eye a days, Diversion of programming associations towards appropriated figuring in light of various reasons, for instance, cost diminishment. Testing in the cloud, impacts the cloud applications, sinking the expense of figuring, while constructs testing sufficiency.

We are doing relative examination of different cloud building as we have to find which cloud outline is most suitable in different circumstances as demonstrated by the steady environment. Testing will enable us to understand that what variables will have its effect in different circumstances. Close examination will draw out the accommodation of different cloud outline perspective. The report furthermore reflect weak centers conversely with private, open and cross breed disseminated figuring.

4. Methodology

A. Cloud Testing and Its Requirement

The actual testing of applications is performed by the testing team of the organization which owns the application or third party testing vendors. Companies pretend real world Web users by using cloud testing (A testing process that involves using cloud resources) services that are provided by cloud service. The main objective behind cloud testing is:

To ensure the quality of cloud-based applications organized in a cloud, with their function amenities, business procedures and system performance as well as scalability based on a set of applications based requirements.

- To test cloud compatibility in cloud infrastructure. To run a suite of test cases over a cloud application you may
- need to perform following steps such as:
- Create and configure cloud computers.
- Start them.
- Upload tested applications and test data to be tested over the cloud.
- Run your tests.
- Get test results.

B. Architecture Support For Cloud Testing

The genuine testing of uses is performed by the testing gathering of the affiliation which has the application or untouchable testing merchants. Associations envision certifiable Web customers by using cloud testing (A testing process that incorporates using cloud resources) advantages that are given by cloud organization. The essential objective behind cloud testing is:

To ensure the way of cloud-based applications sorted out in a cloud, with their down to earth. Solaces, business strategies and system execution and also versatility in perspective of a game plan of usages based necessities.

- To test cloud likeness in cloud system. To run a suite of trials over a cloud application you may
- need to perform making after strides, for instance,
- Create and organize cloud PCs.
- Start them.
- Upload attempted applications and test data to be attempted over the cloud.
- Run your tests.
- Get test results.

C. Various Testing To Be Performed Over Cloud Applications

Cloud testing is often seen as only performance or load tests, however, as discussed earlier it covers many other typesof testing. Cloud computing itself is often referred to as Software as a Service (SaaS) and utility computing. In regardto test execution, the software offered as a service may be a transaction generator and the cloud provider's infrastructure software.

There are various testing methods to be performed; we are here using basic and general testing approaches:

- Stress test over Cloud application
- Load & performance test over Cloud application
- Functional testing on Cloud application
- Compatibility testing on Cloud application
- Capacity test on Cloud

a) Stress Test Over Cloud Application

Stress testing is used to performance testing which focused on determining an application's robustness, convenience, and consistency under extreme conditions. The aim of stress testing is to recognize application issues that become apparent under risky conditions

b) Load Test & Performance Over Cloud Application

The process of analysing software applications and supporting infrastructure to determine acceptable performance, capacity and transaction handling capabilities of real world data with usage conditions and executing them against the application and supporting infrastructure under test.

c) Functional Testing Over Cloud Applications

All software are designed and developed to meet and satisfy certain functional basic requirements. A functional requirement may be nominal, business, or process based. Functional Testing is the process by which expected behaviour of an application can be tested. The traditional testing life cycle processes that are likely to be impacted

- Test Requirements
- Test Planning
- Availability
- Accessibility
- Data Security
- Privacy

Table 1: Cloud test services

Test Objective	Cloud Test Service
Determine Limits	Load Test
Measure User Experience	Performance Test
Test Specific Silos	Targeting Infrastructure Test
Verify Redundancy	Failover Test
Exceed Break Points	Stress Test
Plan For The Future	Capacity Test
Reliability Over Time	Soak Test

d) Compatibility Testing Over Cloud Applications

Compatibility testing is used to resolve compatibility issues that are significant for the product or software and design a cost-effective matrix of platforms against which product tested.

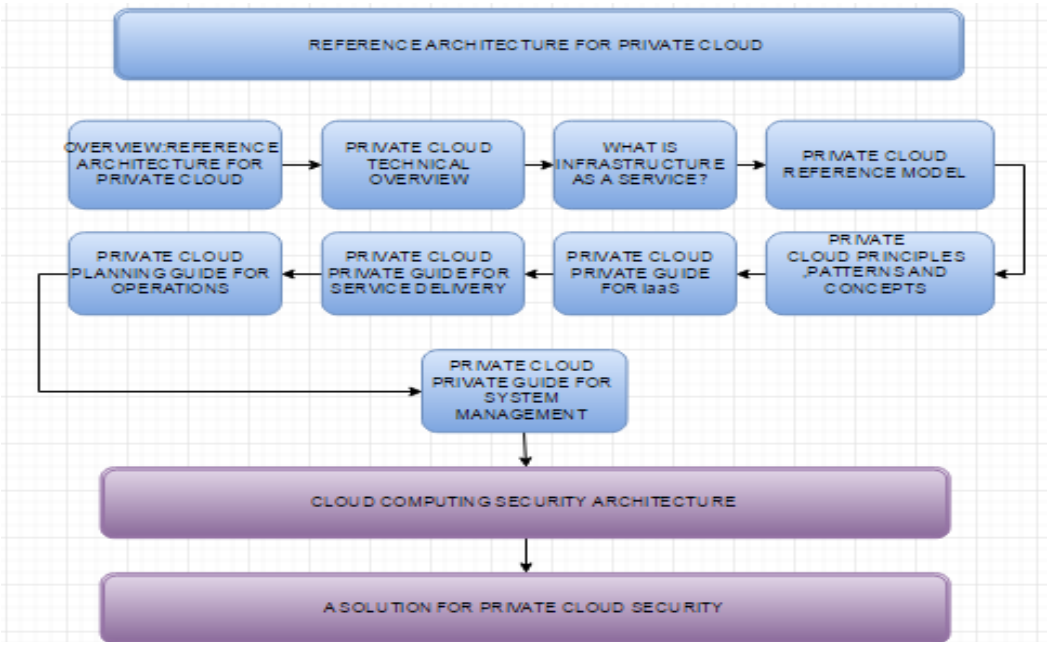

Figure 1: Architecture for Private cloud

A key goal is to engage IT relationship to impact the norms and thoughts portrayed in Reference Architecture for Private Cloud content set to offer Infrastructure as a Service (Iaas), allowing any workload encouraged on this establishment to thusly gain a course of action of Cloud-like qualities. Basically, the buyer should have the perspective of inconceivable cutoff and predictable availability of the organizations they eat up. They should in like manner see a sensible relationship between the measure of organizations they exhaust and the worth they pay for these organizations.

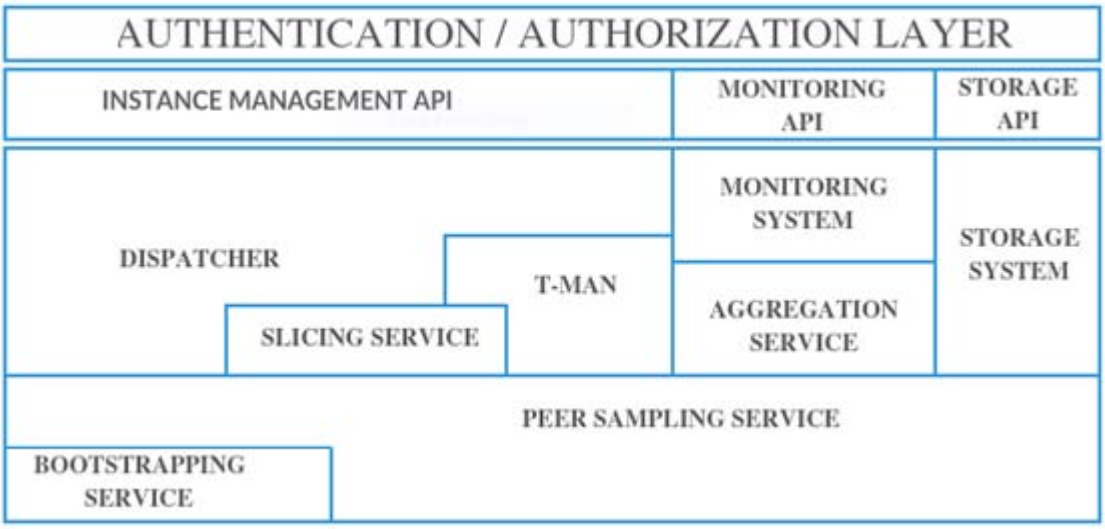

Figure 2: Architecture for peer to peer cloud

A P2P Cloud outline to upgrade the circulated registering system which contains Center P2P Network and Side P2P Network. 1) Center P2P which supplant Master of united configuration can keep up a key separation from bottleneck of the consolidated building, give figuring organization to client using Center P2P Server and development the amount of customers to get to the system.2) Side P2P Network which supplant Slave of the concentrated outline would give enrolling and limit capacity, which can improve the transmission of data and the execution of the structure effectively. Through the examination and appraisal, this structure has better openness and versatility.

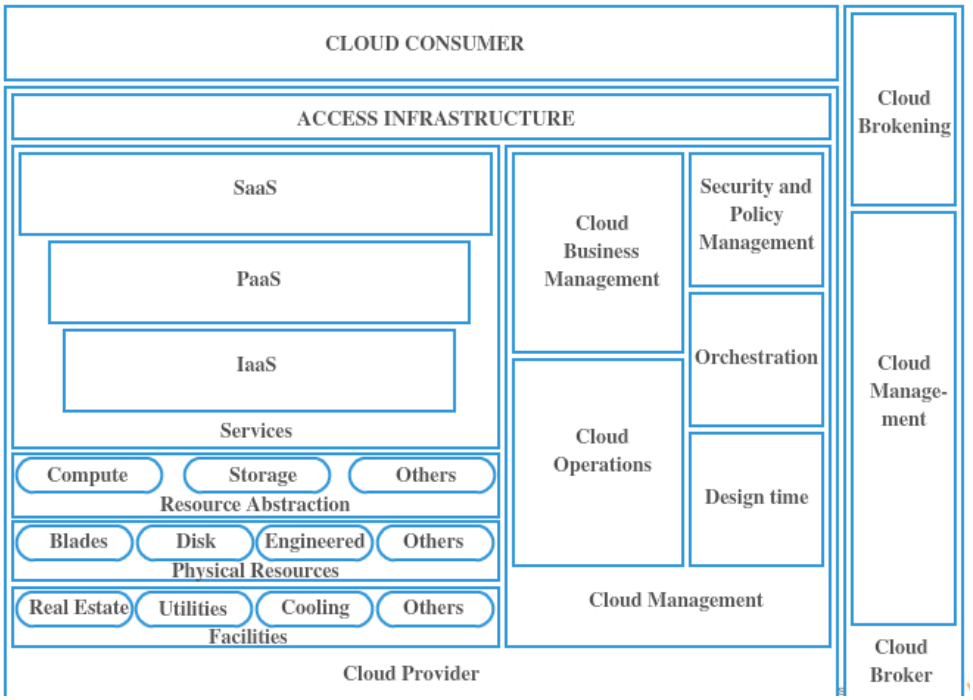

Figure 3: Architecture for public cloud

The Power of Oracle in the Cloud:World-class Oracle technology stack combined with Oracle's enterprise cloud delivery helps customers achieve operational excellence and business performance. Proactive, incremental change management, with patching and point releases included in core service, ensure customers are leveraging the full power of Oracle all the time. Flexible deployment model provides seamless integration of all cloud and on premise software and systems to support end-to-end business processes—no matter where customers run their IT.

End-to-end Cloud Services:A complete set of services, from transition through run-and-maintain, to ensure customer success before, during, and after implementation. Provides seamless integration of all cloud and on premise software and systems to support end to end business processes no matter where customers run their IT Achieve world-class service levels by leveraging ITIL based, audited processes and operational intelligence. Single Point of Accountability:Strong financial foundation and performance drives leading industry position and long term relationships

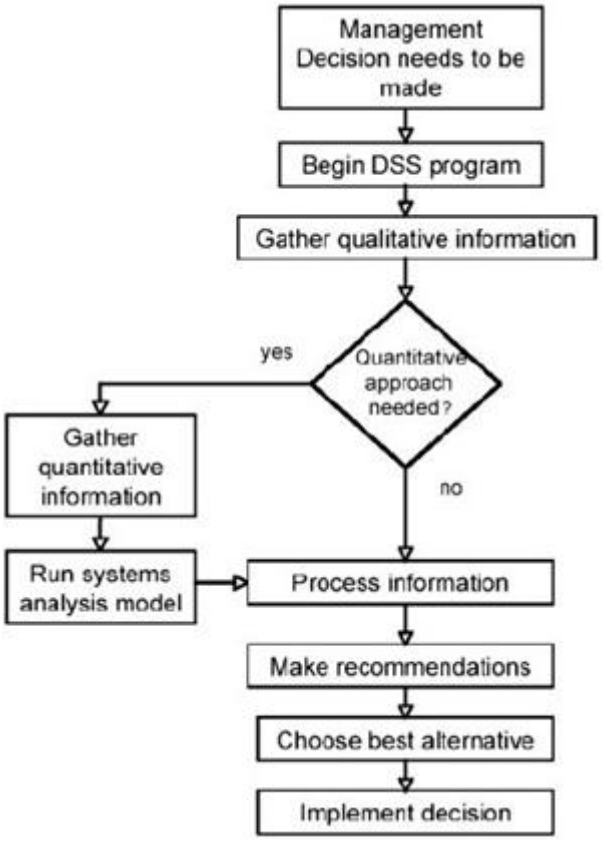

Figure 4: DFD of decision support system

5. Experiments and Results

Here we have done the data analysis of various users of different cloud providers for predicting the best service for use, for specifying different characteristics cloud architectures

This (fig 6) shows the process of the paper that has been done using a tool for analytics. This has steps like preprocessing data which makes the continuous values in the table above into discrete values, also it has the classification tree algorithm included which finds the probability of a yield to be good or bad. The predictions predict for values to decide whether to adopt certain cloud service provider or not. Finally the results are show by means of distribution graph, data table, scatter plot, and confusion matrix.

The following four pictures (fig 8, 9, 10, 11) show the distribution graph output and scatterplot output of our experiments explaining the density of availability and price possibilities according to cloud providers and hence helping in decision making process.

Cloud_Service_Name	Availability	Price	Technical_Support	Trust5result	High tech
1and1	1.8	3.5	3.5	3.3	1
1and1	0	0	0	0	0
1and1	1	1.5	0	0.8	0
1and1	1.5	1.3	0	0.6	0
1and1	0	0	0	0.8	0
1and1	0	0	0	0	0
1and1	4.5	4.5	0	2.1	0
1and1	0.1	0.1	0.1	0	0
1and1	5	5	5	5	1
1and1	0	0	0	0	0
1and1	0	0	0	0	0
1and1	3.5	3.5	0.5	2	0
1and1	0	0.1	1.5	0.5	0
1and1	2	0	0	0.4	0
1and1	0.1	0.5	0.1	0.1	0
1and1	4	3.5	3.5	2.4	1
1and1	0	0	0	0	0
1and1	0.1	0	0.1	0	0
1and1	5	4.5	0	1.9	0

Figure 5: Initial Data Set

This is a part of sample data set of about 600 entries which has been taken for analysis. The various attributes taken in the table for dividing and measuring any cloud service are availability, price, Technical support, Trust Result, High Tech. Here high-tech attribute I used as a class level or as a threshold for classifying the data.

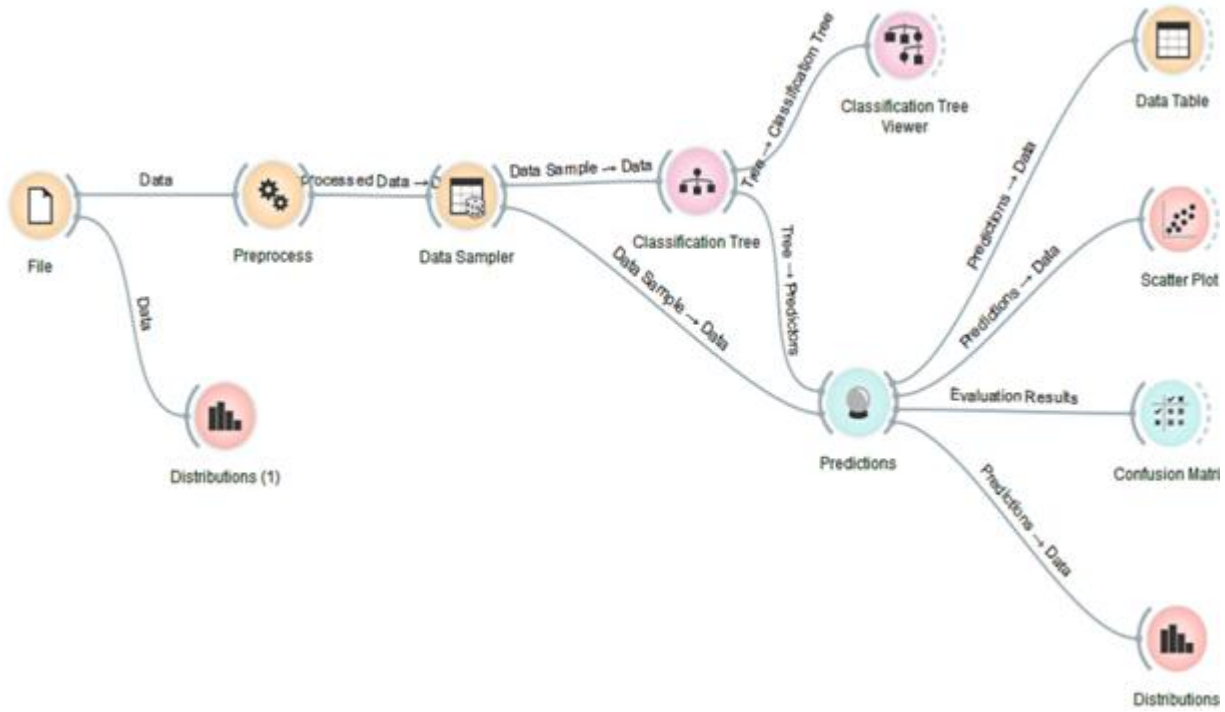

Figure 6: Implementation Circuit Diagram

Orange is a data mining tool which has been used here for analysing various cloud services data. It gives us an interface for applying various data mining operations on our finger tips.

Various operations are:

1) File: Read a data from an input file and send a data table to the output.
2) Data Table: View Data set in a spreadsheet.
3) Pre-processing: Construct a data processing pipeline
4) Data Sampler: Randomly draw a subset of data points from the input data set.
5) Classification Tree: classification tree algorithm with forward pruning
6) Classification tree viewer: Graphical visualization of classification tree.
7) Predictions: Display predictions of models for a input data set.
8) Confusion Matrix: Display Confusion matrix constructed from results of evaluation of classifiers.
9) Distributions: Display value distributions of a data feature in a graph.
10) Scatter Plot: Scatter plot visualization.

Table 2: Final output matrix

Cloud_Service	Availability	Price	Technical_Support	Trust5result	High tech	Classification Tree	Classification Tree(0.0)	C;assification Tree(1.0)
1and1	1.05-4.7	2.9-4.55	< 1.15	< 2.05	0	0	1	0
1and1	< 1.05	< 2.9	< 1.15	< 2.05	0	0	1	0
1and1	< 1.05	< 2.9	< 1.15	<2.05	0	0	1	0
1and1	1.05-4.7	>= 4.95	1.15-4.4	2.05-4.45	0	0	0.625	0.375
1and1	>= 4.95	>= 4.95	>= 4.95	>= 4.95	1	1	0	1
1and1	< 1.05	2.9-4.55	1.15-4.4	< 2.05	0	0	1	0
1and1	< 1.05	< 2.9	< 1.15	< 2.05	0	0	1	0
1and1	1.05-4.7	2.9-4.55	1.15-4.4	2.05-4.45	1	0	0.625	0.375
1and1	1.05-4.7	2.9-4.55	1.15-4.4	2.05-4.45	0	0	0.625	0.375
1and1	1.05-4.7	2.9-4.55	< 1.15	2.05-4.45	1	0	0.625	0.375
1and1	1.05-4.7	2.9-4.55	< 1.15	2.05-4.45	0	0	0.625	0.375
1and1	1.05-4.7	2.9-4.55	1.15-4.4	2.05-4.45	0	0	0.625	0.375
1and1	>= 4.95	>= 4.95	4.4-4.95	2.05-4.45	1	1	0.167	0.833
Ace-host	< 1.05	< 2.9	<1.15	<2.05	0	0	1	0
Ace-host	< 1.05	< 2.9	<1.15	<2.05	0	0	1	0
Ace-host	>= 4.95	2.9-4.55	>= 4.95	4.45-4.95	1	1	0	1
Ace-host	1.05-4.7	2.9-4.55	< 1.15	2.05-4.45	0	0	0.625	0.375
Ace-host	< 1.05	2.9-4.55	1.15 - 4.4	< 2.05	0	0	1	0
Ace-host	>= 4.95	>=4.95	1.15 - 4.4	>= 4.95	0	1	0.167	0.833

The following picture (Table-2) shows the result of the data table in the last step the last column of the table shows values between 0 and 1 each of these values imply to an answer i.e. 0 is for not adoption, 1 is for immediate adoption, any other value tells the option of adoption or non-adoption .

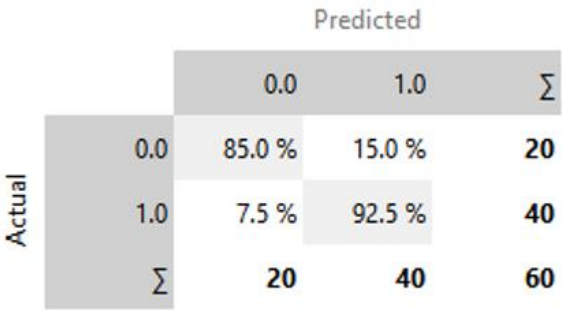

Figure 7: Confusion Matrix

The next picture (fig 7) describes the confusion matrix which shows the accuracy and precision of data which has been analyzed by the data set.

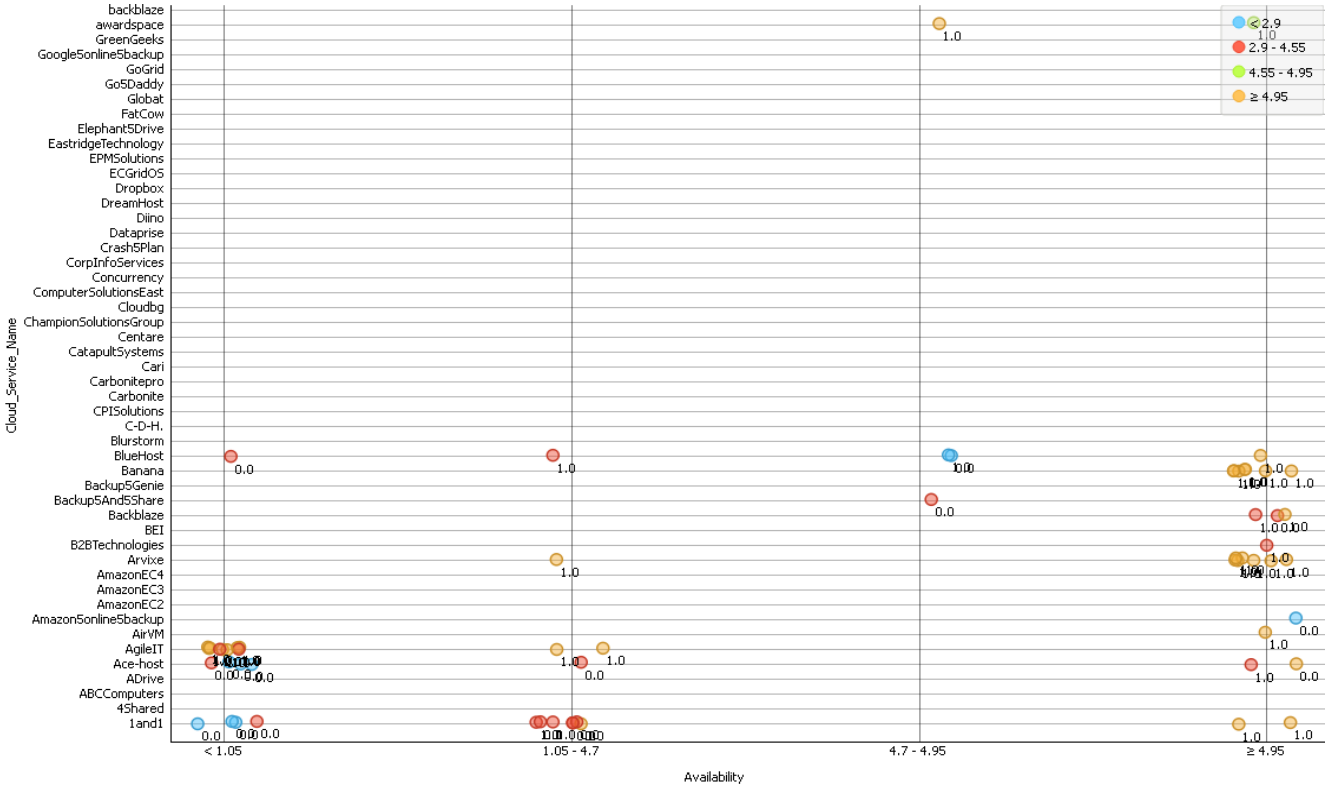

Figure 8: Scatter plot VS Availability

Figure 9: Scatter plot VS Price

In these two pictures, the output of our experiments are shown in the scatter plot, this shows the density of particular cloud service provider according to availability. On x- axis availability values are shown and on y-axis name of cloud service providers are there. Various colour formats are used for specifying the values described in the corner.

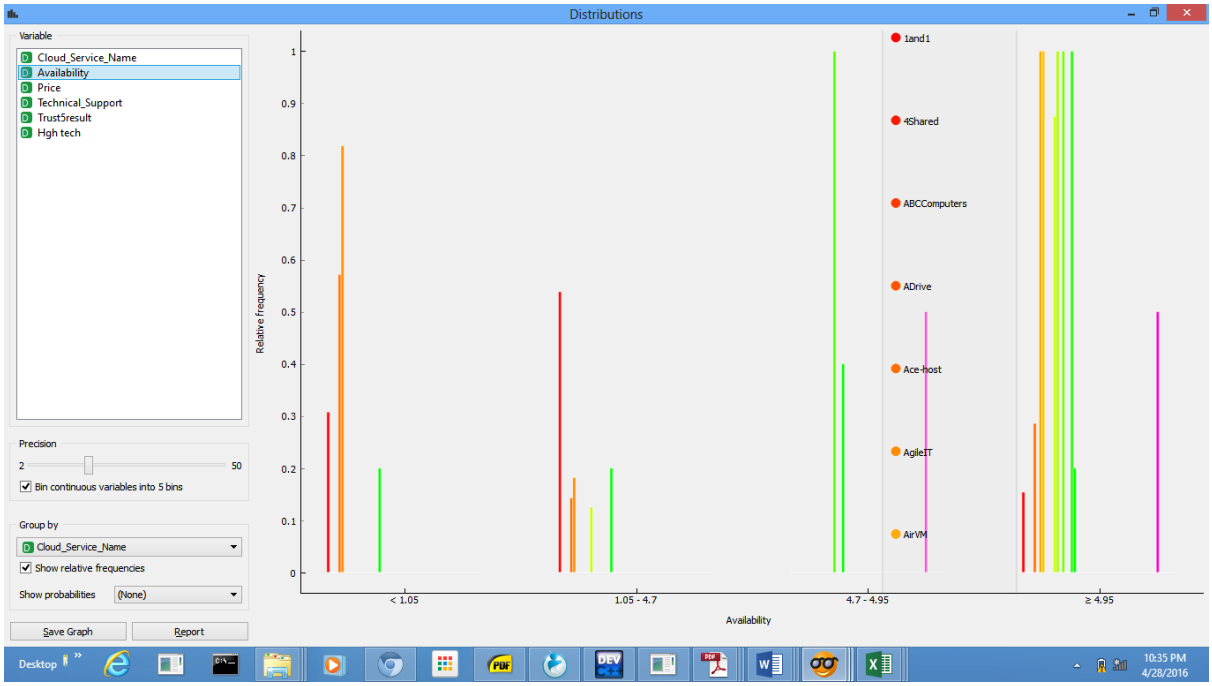

Figure 10: Distribution for Availability

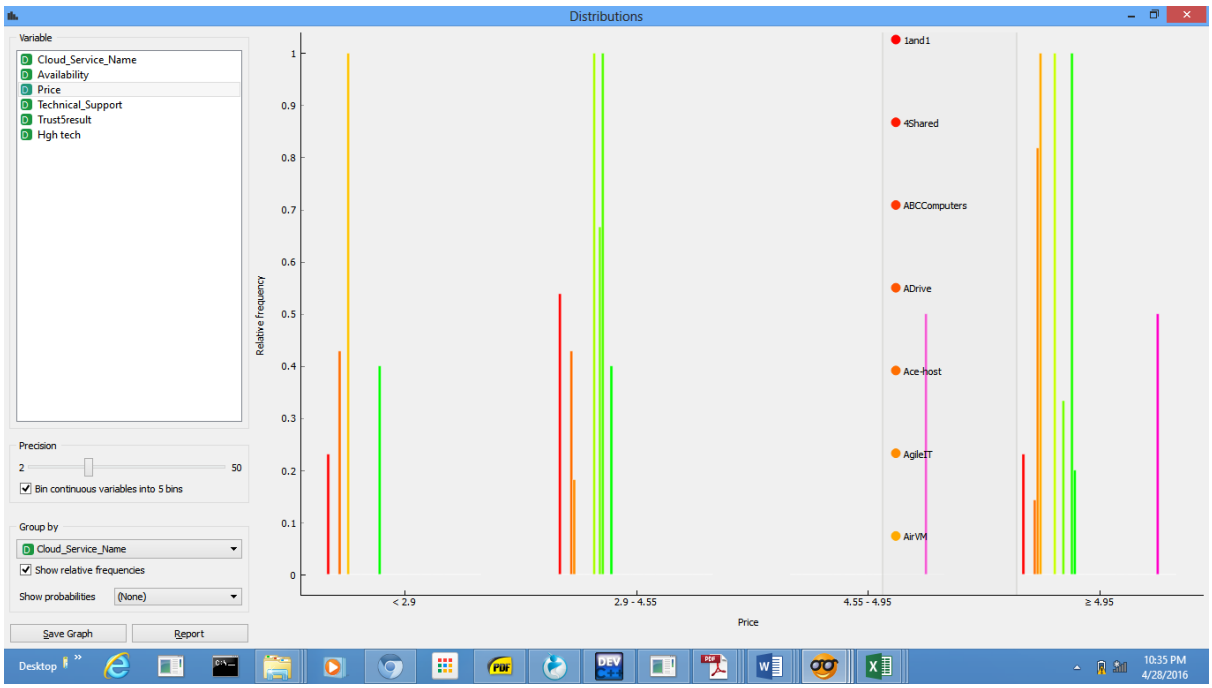

Figure 11: Distribution for Price

In the distribution graph Fig-11 we have showed distribution between price and relative density with the respect to different cloud services and same is shown in Fig-10 but the distribution is taken between availability and relative density with respect to cloud services. The bars in different colours representing cloud services help us to decide which cloud service is better in case of availability and price if these factors are considered.

Table 3: Characteristics of various cloud architectures

S No.	Characteristics	Public	Private	P2P
1	**Scalability**	Strong	Weak	Weak
2	**Security**	Good but depends on the security measures with the service providers	Most Secure as all the storages is on premise	Very secure ; Integration option add an additional layer of security
3	**Availability**	Least	High	High
4	**Privacy**	Least	High	High
5	**Reliability**	Medium, depends on internet connectivity and service provider availability	High, as all equipment is on premise	Medium to high, as cached content is kept on premise but also depends on connectivity and service provider availability
6	**Cost**	Very good, pay as you go model and no need for on-premise storage infrastructure	Good, but requires on premise resources, such as data center space, electricity and cooling	Improved, since it allows moving some storage resources to pay as you go model
7	**Shared Resources**	Multi-tenant: Public shared computing resources.	On Promise: Private shared computing resources.	Mix: Public and private share computing resources.
8	**Performance**	Low to medium	Very good	Good as active content is cached on premise

6. Conclusion

Cloud computing has starting late ascended as a persuading perspective for administering and passing on organizations over the Inter-net. The rose of cloud computing is rapidly changing the photograph of information development, and prompts the changing of obtaining the surety of utility enlisting into a reality. In this paper we have illustrated about the various differences and similarities in various cloud architectures, shown some testing measures for testing various cloud services and in the end, we have done the data analysis of various cloud service providers and predicted that which should be the best cloud service provider for our for implementing in an organization. And after getting this analysis report we therefore have generalized the various characteristics of the three recommended architectures which we were trying to compare initially. Hence on the basis of this table one can decide which architecture needs to be used for certain infrastructure.

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