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A Survey on Federated Clouds Environment

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Abstract- Cloud federation, inter-cloud can be viewed as natural evolution of Cloud computing. Cloud federation research is still in early stage and the body of knowledge in this area has not been well defining yet.
The goal of research in the field of Cloud Federation is to achieve Quality of service (QoS) ,reliability and cost efficiency by interconnected Clouds and using federation concept among them.
In this article, we present a detailed survey of the state of the art in the field of cloud federation (Centralized and Decentralized approaches).
Finally, we identify open challenges and trends in the area of Inter-Cloud application brokering.

Keywords: Cloud Computing ,Cloud Federation, Inter-cloud, multi-cloud

I. INTRODUCTION

Cloud computing is a new paradigm for providing computing services on demand over the Internet. The vision that computing will be one days as five utility after (water, electricity, gas, and telephony) [3].
Computing services in Cloud can be divided into, IaaS (Infrastructure-as-a-Service), PaaS(Platform-as-a-service) and SaaS (Software-as-a-Service).
People in cloud computing scenarios can be divided into a) cloud computing providers, b) cloud computing customers and c) end-users[14]. Cloud service providers own the physical resources as datacenters. Cloud customers; use these resources to provide service to users. And end-users access those services "anytime, anywhere".
Computing services in cloud computing will be provide according to the agreement between Cloud service provider and customer witch called SLA (Service Level Agreement).
Conditions may arise where a cloud service provider is unable to provide services agreed in the service level agreement due to the lack of resources or sudden increase in incoming workload. In these situations, the cloud service provider rents the services from other cloud service providers and provides them to the client. Thus the cloud service providers form a union called a federated cloud.
Federation brings new business opportunities for clouds .where cloud providers can buy and/or sell computing/storage capabilities and services to other Clouds.

A. ADVANTAGE OF CLOUD FEDERATION (GROZEV, & BUYYA [10])

- Cost-effectiveness: federated Clouds provide a larger amount of resources, which may help improve cost-effectiveness. This include improvement for both the user and the provider such as, for a given cost, reducing the time to completion, increasing the system throughput or optimizing the resource utilization.
- Under-utilized: as the data center cannot be turned off, a cloud can decide to provide resources to other clouds when it realizes that its data center is under-utilized at given times. Typically, data centers are under-utilized during the night and over-utilized during the morning. And this is different from geographic area to other.
- Diverse geographical locations: most important that cloud service providers have to establish data centers worldwide. However, it is not possible that any provider will be able to establish datacenters in every country.
- Avoidance of vendor lock-in.: By using multiple clouds and being able to freely transit Workload among them, a cloud client can easily avoid vendor lock-in. In case a provider Changes a policy or pricing that impact negatively its clients, client could easily migrate elsewhere.
- Better SLA to customers: a cloud provider can provide better Service Level Agreements (SLA) to customers, as the result of competitive.
- Guaranteed performance: Due to limited resources, that are available with a single cloud service provider, sudden increase in workload may lead to decline of performance. Cloud federation is facing this disadvantage by renting resources from foreign cloud service providers, there by guaranteeing the agreed QoS.
- Guaranteed availability: During unexpected disasters, the cloud system will be able to recover the services by federating with other cloud service providers in unaffected areas.

This survey is organized as follows: In Section 2, we define several different terms and descriptions in the area of Federated clouds environments. In Section 3, we explore the possible federation approaches. Then, we survey the state-

of-the-art projects and developments in Section 4. Challenge is provided in Section 5. And in section 5 we concluded the work.

II. DEFINITIONS

Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. (Armbrust et al. [14]).

Buyya et al. [3] define cloud computing "A Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service level agreements established through negotiation between the service provider and consumers"

A. Computing services in Cloud computing can be divided into three models:

1) SaaS (Software-as-a-Service): In this model, a complete application is offered to the customer, as a service on demand. Today SaaS is offered by companies such as Google, Salesforce, Microsoft, Zoho, etc.
2) PaaS(Platform-as-a-service) : Here, a layer of software, or development environment is offered as a service. The customer builds his own applications using programming languages and tools supported by the provider. Google's App Engine, Force.com, etc are some of the popular PaaS examples.
3) IaaS (Infrastructure-as-a-Service): customer has full control to manage underlying provider's infrastructure such as " Servers, storage systems, networking equipment, data centre space etc. Some common examples are Amazon, GoGrid, 3 Tera, etc

B. The main Beneficiaries in cloud computing scenarios are:

1) Cloud users
2) Cloud providers (CPs).

Cloud users can be either software/application service providers (SPs), or end-users who use the cloud computing services directly. SPs offer efficient services using hardware resources provisioned by CPs.

C. The following are some of the deployment models:

1) Public Cloud: When a Cloud is made services available to all consumers through the Internet in a pay-as-you-go, we call it a Public Cloud
2) Private Cloud: This deployment model is used by organizations for their private application Deployments. The difference to the public Cloud is that access is being granted only to the members of the organization
3) Hybrid Cloud: This is a combination of public and private Cloud in different fashions.

D. Clouds federation

Federation in the political concept is:

- The formation of a political unity, with a central government, by anumber of separate states, each of which retains control of its own internal affairs
- Also known as a federal state is a political entity characterized by a union of partially self-governing states or regions under a central (federal) government.

In the area of cloud there are several terms used with the same meaning of federation:

1) Clouds federation
2) Inter- cloud
3) Multi- Clouds

1) The term cloud federation implies the creation of a group of providers that are collaborating to share their resources in order to improve each other's services (Kurze et al. [11]).

In (Rochwerger et al. [18])

Federations of providers such that they can collaborate and share their resources...Any federation of cloud computing providers should allow virtual applications to be deployed across federated sites. Furthermore, virtual applications need to be completely location free and allowed to migrate in part or as a whole between sites. At the same time, the security privacy and independence of the federation members must be maintained to allow computing providers to federate.

A Federation in (Ferrer et al. [7]), (Rochwerger et al .[17]) Is achieved when a set of cloud providers voluntarily interconnect their infrastructures in order to allow sharing of resources among each other.

Cloud Federation can be defined as:

- A relationship between two or more independent homogeneous/heterogeneous cloud Platforms which establish a trusted federation agreement in order to benefit of a particular form of business advantage
- Union of Clouds
- a collaborative network of Clouds that facilitate resource sharing with different service layers or models in order to achieve increased dynamic scalability, and effective resource utilization while provisioning during amount of demand

2) Inter-cloud has been introduced by Cisco Bernstein et al.[1]

According Vint Cerf, who is recognized as one of "the fathers of the Internet"

… It's time to start working on Inter-cloud standards and protocols so your data doesn't get trapped in one of the problems with cloud computing …we now need protocols and standards that will "allow people to manage assets in multiple clouds, and for clouds to interact with each other," and that mobiles could be part of that.

The Global Inter-cloud Technology Forum (GICTF), a Japanese organization that aims to develop standardization of network protocols and interfaces through cloud systems, defines Inter-cloud computing as:

A cloud model that, for the purpose of guaranteeing service quality, such as the performance and availability of each service, allows on-demand reassignment of resources and transfer of workload through a interworking of cloud systems of different cloud providers based on coordination of each consumer's requirements for service quality with each provider's SLA and use of standard interfaces.

3) The term Multi-Cloud In (Ferrer et al .[7]):

Denotes the usage of multiple, independent clouds by a client or a service. SPs (service provider)or end-users are responsible to manage resources across multiple clouds.

Unlike a federation, a multi-cloud environment does not imply volunteer interconnection and sharing of providers' infrastructures Clients or their representatives are directly responsible for managing resource provisioning and scheduling.

As expressed in Figure 1 Both federations and multi-clouds are types of Inter-Clouds. However, some experts prefer to give different definitions to these terms. Ellen Rubin, founder and VP of Products at CloudSwitch, . Define the primary difference between the Inter-cloud and Federation is that the Inter-cloud is based on standards and open interfaces, while federation uses a provider version of the interfaces

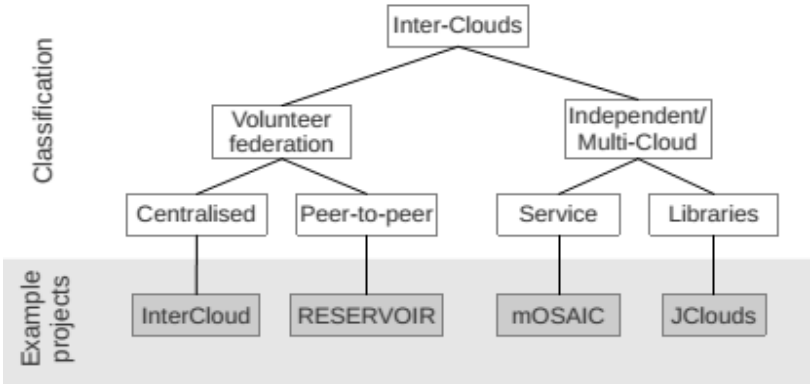

Figure 1 Classification of intercloud (Grozev,& Buyya [10])

III. POSSIBLE FEDERATION APPROACHES SCHEME IN (Calcavecchia et al.[19])

A. CENTRALIZED APPROACH:

That is, a single broker common to all clouds is in charge of establishing the federation.

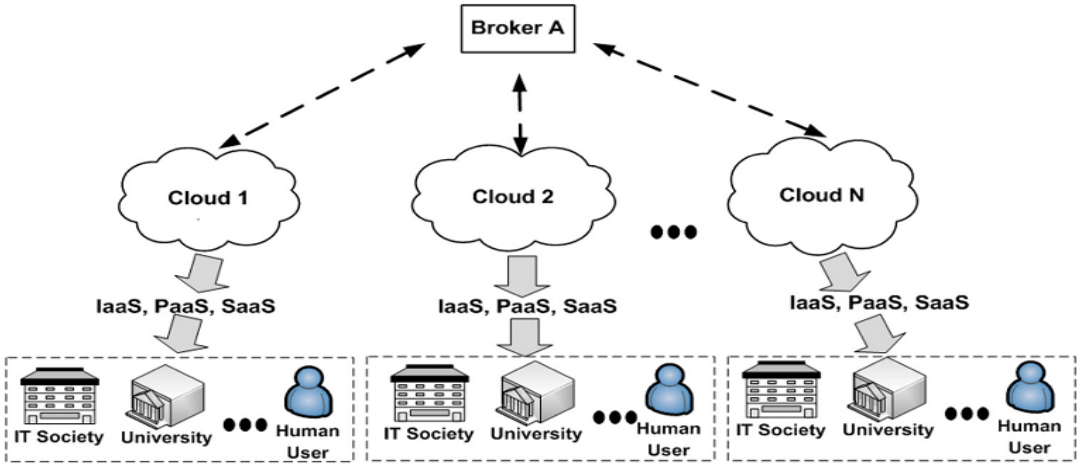

Figure 2 Centralized approach (Calcavecchia et al.[19])

In the centralized scheme (Figure 2) there is a third party entity allowing a cloud to look for other clouds federation according to its requirements. And its main task is to perform a matching between a cloud requiring federation and clouds offering federation.

B. DECENTRALIZED APPROACH:

That is, the function is embedded within all clouds that do not need any third party to perform it.

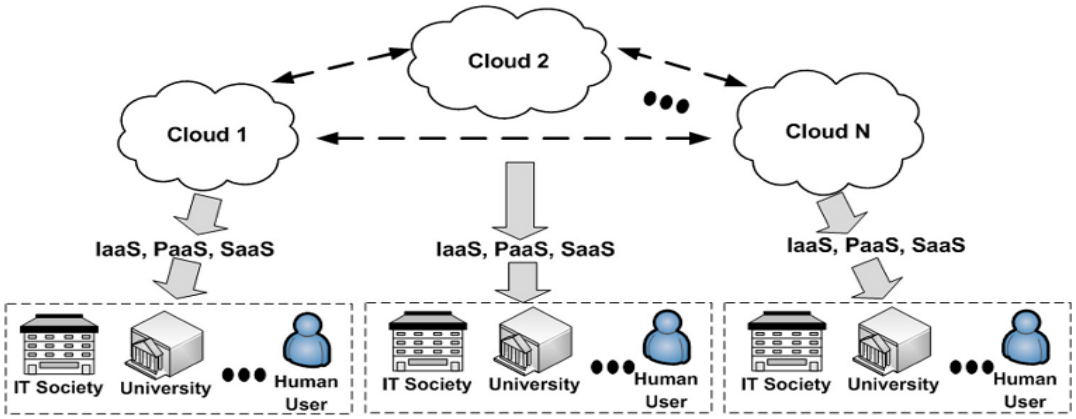

Figure 3 Decntralized approach (Calcavecchia et al.[19])

In the decentralized scheme (Figure 3) clouds negotiate the partnership by themselves.
They manage discovery, communication, negotiation of agreements, and matching and selection of the best Partners for federation according to their requirements by themselves

C. HIERARCHICAL APPROACH

That is a number of brokers interact among each other to establish the federation (Figure 4)

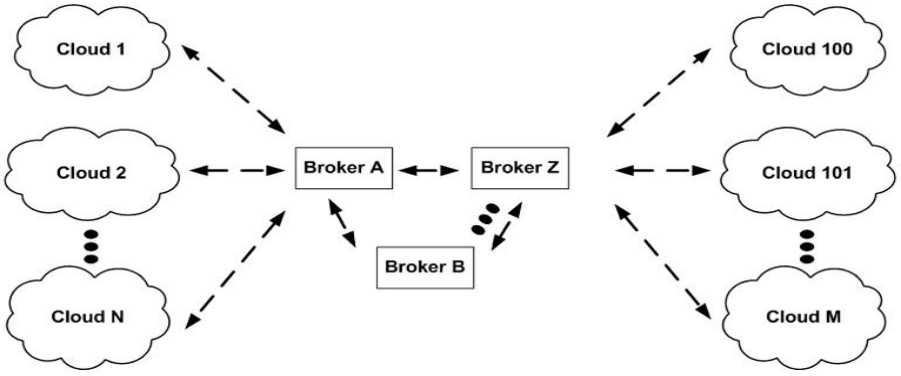

Figure 4 Hierarchical approach (Calcavecchia et al.[19])

Clouds are connected to a broker, and, at the same time, each Broker can also interact with other brokers in order to look for clouds whose requirements match the requirements of clouds requesting partnerships.

IV. RELATED WORK

This section provides an overview of currently existing models in the field of Cloud federation, taking into account proposal started in academia, industry and major Research projects as summarized in figure 5. Most of the work in this field study of architectural models to support the collaboration between different cloud providers

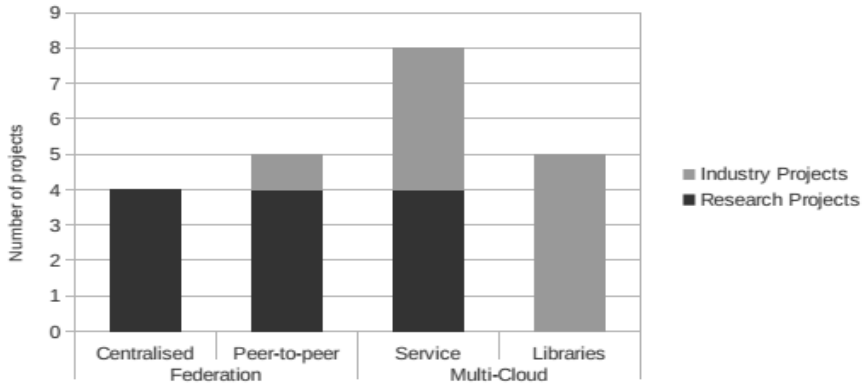

Figure 5. Inter-Cloud projects by architecture (Grozev, & Buyya [10])

Table 1 describes an analysis of the main research and industry projects in the field of cloud federation. T he analysis considers three dimensions that is, “research and industry projects” “Brokerage Strategy (Centralized or Decentralized), “Service Level”,

Table 1. Classification of the current research works

research / industry projects	Brokerage Strategy	Service Level
Buyya, Ranjan and Calheiros (2010) [2]	Centralized Architecture	IaaS, PaaS, SaaS
Carlini et al (2011) [4]	Centralized Architecture	IaaS, PaaS, SaaS
Distefano, Cunsolo, Puliafito, Scarpa (2010) [6]	Centralized Architecture	IaaS
Ranjan, Buyya (2009) [15]	Decentralized Architecture	PaaS
Celesti, Tusa, Villari and Puliafito (2010) [5]	Decentralized Architecture	IaaS
Rochwerger et al (2009)[17]	Decentralized Architecture	IaaS
Goiri, Guitart, and Torres (2010)[8]	Decentralized Architecture	-

A. Centralized Federated Clouds approaches

As mention in section 3, in the centralized scheme there is a third party entity allowing a cloud to look for other clouds for federation according to its requirements. Centralized resource discovery systems are lying to third party, single-point failure, lack scalability and fault-tolerance ability. This type of system relies totally on the central party. Should the central computer crash, the entire system will "go down" (i.e. will be unavailable).in the following we overview the research and industry project that used centralized federated clouds approach.

1. In Buyya et al.[2] authors mentioned that the Cloud computing providers have several data centers at different geographical locations over the Internet in order to serve needs of their customers around the world. However existing systems do not support mechanisms and policies for dynamically coordinating load distribution among different Cloud- in order to determine optimal location for hosting application services to achieve QoS levels. The key elements for enabling federation of Clouds are: Cloud Coordinators, Brokers, and Cloud Exchange.(Figure 6)

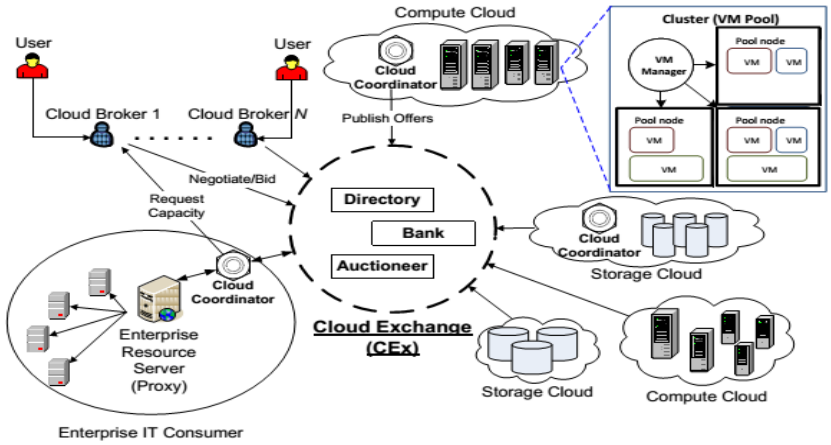

Figure 6: Federated Network Of Clouds Mediated By A Cloud Exchange (Buyya Et Al.[2])

Cloud Coordinator (CC): any member of Cloud federation has Cloud Coordinator. The Cloud Coordinator exports the services from it is Cloud to a cloud federation by implementing basic functionalities for resource management such as scheduling, allocation, (workload and performance) models, virtualization, dynamic sensing/monitoring, discovery, and application composition

Cloud Broker (CB): The Cloud Broker acting on behalf of users, through the Cloud Exchange Cloud Broker identifies suitable Cloud service providers. And negotiates with Cloud Coordinators for an allocation of resources that meets QoS needs of users

Cloud Exchange (CEx): It collective the infrastructure demands from the application brokers and compare them against the available published by the Cloud Coordinators.

Authors present experiments and evaluation using CloudSim framework. Evaluating Performance of Federated Cloud Computing Environments Aims to show that, federated infrastructure of clouds deliver better performance and service quality as compared to existing non-federated approaches .To prove that, simulation environment that models federation of three Cloud providers and a user (Cloud Broker) is modelled

Table 2: Performance Results (Buyya et al.[2])

Performance Metrics	With Federation	Without Federation	% Improvement
Average Turn Around Time (Secs)	2221.13	4700.1	> 50%
Makespan (Secs)	6613.1	8405	20%

The simulation results summarized in Table 2, described that the availability of federated infrastructure of clouds reduces the average turnaround time by more than 50%.

2. (Carlini et al. [4]), Contrail is an open source and integrated approach that are designed to combine a number of independent cloud in to one integrated federated cloud, which aims offering(IaaS)Infrastructure as a Service , and (ConPaaS) Contrail Platform as a Service. User can submitted work to the cloud federation and let the federation to select the best resource provider for execution. Contrail is built around a centralized entity .and works based on the broker services (federation support) that act as mediators between cloud users and cloud providers.

The federation architecture is composed of three layers, interface, core, and Adapters.

The interface layer: gathers requests from users as well as other Contrail components. The interface layer includes (CLI) a Command-line interface and a web interface, from which it is possible to access REST services.

The mid layer, called core: contains modules These modules solve the three main commitments demanded to support federation, namely identity management, application deployment and SLA coordination..

The bottom layer, called adapters, contains the modules that retrieve information. The (FRM) Federation Runtime Manager component in the core layer is responsible for application deployment. FRM provides discovery and selection to minimize economical costs and to maximize performance levels. Moreover, FRM is responsible for the application life cycle management. One of the main components in the core layer is the SLA Organizer. This is a collection of three modules: SLA Coordination, SLA Negotiation, and SLA Template Repository.

The adapters layer contains the internal and external modules that enable access to infrastructural services for both the Contrail cloud and external clouds. The adapters facilitate the communication between the federation management components and the clouds. The adapters can be classified as:

Internal adapters - for clouds running the Contrail software. These are called Contrail clouds. The components of the internal adapters module are: (i) the Virtual Infrastructure Network (VIN) which provides network, (ii) the Global Autonomous File System (GAFS) which provides storage and (iii) the Virtual Execution Platform (VEP) which provides computing power.

External adapters - for clouds that do not run the Contrail software.

3. In (Distefano, et al.[6]) Cloud@Home. The idea behind Cloud@Home, that computing resources of single users accessing the Cloud can be shared with the others.

This new computing paradigm (Cloud@Home) gives back the power and the control to users, who can decide how to manage their resources/services in a global, geographically distributed context. They can voluntarily scientific projects by providing their resources to scientific research centers for free, or they can earn money by selling their resources to Cloud computing providers in a pay per use/share context. Cloud@Home users voluntarily share their resources without any problem.

The scenario authors are composed of several coexisting and interoperable Clouds, in Fig.7. Open Clouds identify open VO (virtual organization) for free Volunteer computing; Commercial Clouds identify companies selling their computing resources for business; Hybrid Clouds can both sell or give for free their services. Both Open and Hybrid Clouds can interoperate with any other Clouds.

In this way it is possible to make federations of Clouds working together on the same project.

This can take users to choose the best provider that matches their requirements in easy way. Cloud providers can establish business relationships, agreements and strategies to achieve the best market performance, reducing costs and maximizing revenues.

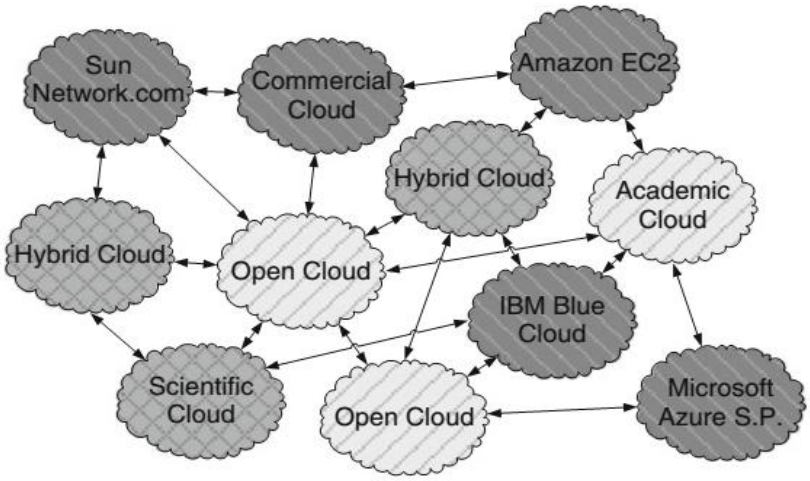

Figure 7 : Cloud@Home scenario(Distefano, et al.[6])

Cloud@Home architecture:

A possible Cloud@Home architecture is identifying three hierarchical layers: frontend, virtual and physical.

Frontend Layer: The Cloud@Home frontend layer is responsible for the resources and services management from the global Cloud systems (enrolling, discovery, allocation, coordination, monitoring, scheduling, etc.). The frontend layer provides tools for translating end-user requirements into physical resources' demand, considering QoS/SLA.

Three options solutions can be offered by the frontend layer for accessing a Cloud: (a) Cloud@Home frontend client, (b) Web 2.0 user interface and (c) low level Web interface (directly specifying REST or SOAP queries (Simple Object Access Protocol)).

Virtual Layer: Two basic services are provided by the virtual layer to the frontend layer and, to the end-user: execution and storage services:

The execution service is the tool provided by the virtual layer for creating and managing virtual machines. From the end-user an execution Cloud is seen as a set of virtual machines available and ready-to-use.

The storage service implements a storage system distributed across the storage hardware resources composing the Cloud. From the end-user point of view, a storage Cloud appears as a locally mounted remote disk, similarly to a Network File System or a Network Storage

Physical Layer: The physical layer is composed of a "cloud, nodes" and/or devices geographically distributed across the Internet.

B. Decentralized Federated Clouds approaches

In Decentralized federated Clouds, the brokerage function is embedded within all clouds , so we do not need any third party. Clouds negotiate the partnership by themselves. They manage discovery, communication, negotiation of agreements, and matching and selection of the best Partners for federation according to their requirements by themselves. While decentralized federation strategies leaves the maximum freedom among cloud providers, which can decide with whom to cooperate, thus ensuring independency from third party, Decentralized federation strategies require a greater degree of complexity than centralized federation architecture. In the following we overview the research and industry project that used decentralized federated clouds approach

1. In (Ranjan& Buyya [15]), to create scalable wide-area networking of compute nodes, authors describes Aneka-Federation, a decentralized and distributed system that combines enterprise Clouds, and structured peer-to-peer techniques . Authors have two objectives the first is to design and development of decentralized, scalable, self-organizing, and federated Cloud computing system.

The second is to introduce the Aneka-Federation software system that includes various software services, peer-to-peer resource discovery protocols and resource provisioning methods to deal with the challenges in designing decentralized resource management system.

Aneka-Federation: The components of Aneka-Federation system (figure 8) (nodes, services, clouds) based on a Distributed Hash Table (DHT). Each Cloud site in the Aneka-Federation represents a new software service, called Aneka Coordinator.

The Aneka Coordinator basically implements the resource management functionalities and resource discovery protocol.

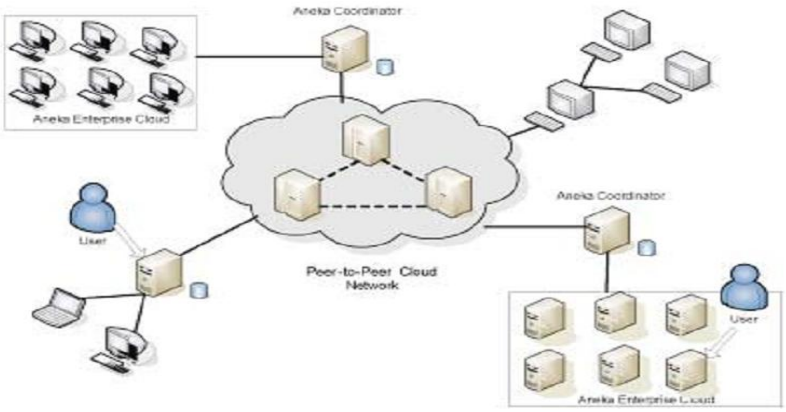

Figure 8. Aneka-Federation network Clouds (Ranjan& Buyya, [15])

The unique features of Aneka-Federation are:

(i) wide-area scalable of distributed Aneka Enterprise Clouds

(ii) Understanding of a peer-to-peer based decentralized resource discovery technique as a software service, which can handle complex resource queries.

(iii) The ability to enforce coordinated interaction among end-users through the implementation of decentralized resource provisioning method. A central point in this approach is represented by the Distributed Hash Table (DHT)

In literature, structured peer-to-peer are more commonly referred to as the Distributed Hash Tables (DHTs). DHTs do not require an expensive hardware platform for hosting. And distributed data structure that associates a key with a data Entries in a DHT are stored as a (key, data) pair. However, it is not clear how this approach deals with dynamism as discovery and matchmaking is carried out by a third party node (imposed by the DHT) which can be subject to failures.

2. In (Celesti, et al.[5]), the authors define three subsequent stages of cloud computing services in the term of federation:

Stage 1"Monolithic" (now), cloud services are based on independent proprietary architectures

Stage 2 "Vertical Supply Chain", cloud providers will request cloud services from other providers

Stage3 "Horizontal Federation", smaller, medium, and large cloud Providers will federate themselves. Currently, the major clouds are planning to the stage 2

Authors describe how to implement heterogeneous cloud environment in Stage3"Horizontal Federation" where clouds can work together and providing new business opportunities such as cost-effective, power saving, and on demand resources provisioning .Authors propose a solution based on the Cross-Cloud Federation Manager (CCFM), which is a new component inside the cloud architectures, allowing a cloud to establish the federation with other clouds. In cross-cloud federation model ,where the federation establishment, between a cloud needing external resources and a cloud offering resources, passes through three main phases discovery, match-making and authentication

Discovery: the cloud looks for other available clouds.

Match-making: the cloud selects between the discovered clouds the ones which equal as much as possible its requirements.

Authentication: the cloud establishes a trust context with the selected clouds

In a scenario of "cross-cloud federation", each cloud operator is able to increase its own virtualization resources amount. asking further computing and storage capabilities to other clouds. Authors define two types of cloud . Home cloud is a cloud provider which is unable to provided further virtual machines. Foreign cloud is a cloud provider which leases part of the storage and computing capabilities of its virtualization infrastructure to home clouds.

For each cloud authors are considering the internal architecture as the three-layered (figure 9): Starting from the bottom: Virtual Machine Manager, Virtual Infrastructure (VI) Manager and Cloud Manager

Authors introduced a new component within the Cloud Manager layer named Cross-Cloud Federation Manager (CCFM). The CCFM for enabling each cloud to perform all the operations needed to follow the target of the federation establishment.

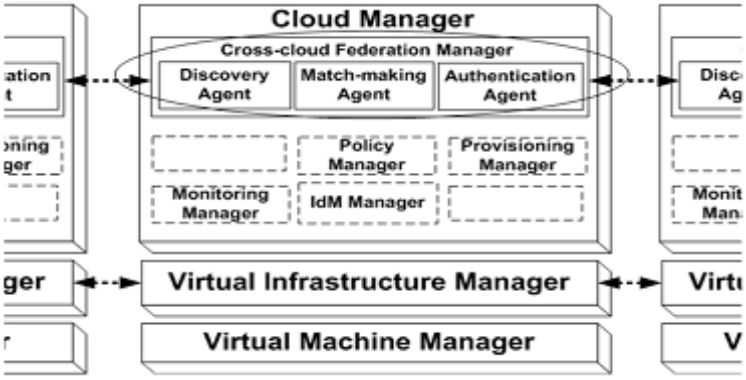

Figure. 9 General three-layers cloud architecture (Celesti et al.[5])

When a home cloud needs to "rent" external resources from a foreign cloud, the first phase refers to the discovery of the foreign cloud which properly matches its requirements (phase 2). Once the best foreign cloud has been found, in order to establish a secure interaction between the home cloud and the selected foreign cloud, an authentication
(phase 3) process will begin.

The Three CCFM Agents in (Celesti et al.[5]):

The CCFM consists of three different subcomponents (agents), each addressing one phase of the federation model.

First agent: The Discovery Agent: It manages the discovery process among all the available clouds. All the discovery agents must communicate using a peer-to-peer (p2p) approach

Second agent: The Match-Making Agent: is responsible for choosing the more suitable foreign cloud(s).

Third agent The Authentication Agent: is responsible to create a security context between home and foreign clouds. Technologies which could be employed to design the above three agents: Authors used XMPP, XACML and SAML for the design of the discovery agent, the match-making agent and the authentication agent.

3. In (Rochwerger et al. [17]) European Project focusing on cloud federation is)RESERVOIR(The Resources and Services Virtualization. , the authors define a RESERVOIR cloud as decentralized federation of collaborating sites.

Its architecture does not feature a central entity and is peer-to-peer - clouds communicate directly with each other.

In the RESERVOIR model there is a clear separation between the functional roles of service providers and infrastructure providers.

Service providers are the entities that understand the needs of a particular business and offer service applications to address those needs. Service providers do not own the computational resources needed by these service applications, instead, they lease resources from infrastructure providers

Infrastructure provider own and manage the Computational resources, which allow dynamic mapping of service components to the physical computational.

All RESERVOIR site contains three different abstract layers: Service Manager, Virtual Execution Environment Manager (VEEM), and Virtual Execution Environment Host (VEEH). The Service Manager, the highest layer, receives a service from the service provider. Several tasks are doing by Service Manager such as deploying and provisioning VEEs, billing, accounting, and monitoring SLA. The second layer is VEEM, responsible for interacting with VEEM on remote sites allowing federation of infrastructures. The lowest level, VEEH, supports different virtualization platforms also VEE migration within the federated cloud is supported by VEEH.

4. In(Goiri et al.[8]) authors present a complete characterization of providers' federation in the Cloud, including decision equations to outsource resources to other providers, rent free resources to other providers, or shutdown unused nodes to save power, and characterize these decisions as a function of several parameters

Then authors evaluation how a provider can enhance its profit by using these equations to develop federation. The authors' approach is based on a global scheduler deployed on each cloud. That is responsible for allocated resources for all the VMs running in that provider. This includes both the movements among the different nodes in that provider and between that provider and other federated Cloud providers.

For saving power consumption of the provider the Scheduler can shut down nodes that remain unused in order to reduce power consumption in the provider.

V. CLOUD FEDERATION CHALLENGES

In the cloud federation there are, several issues need to be addressed. In the following we provide an overview of the major challenges:

Autonomics: system management becomes too complex to be carried out only with human intervention and manual administration in cloud federation. So, to overcome this issue, we need for autonomics computing. Autonomic computing means self managing of computer-based systems while hiding the complexity of the system.

Using techniques provided by autonomic computing, we can handle different system requirements such as performance, fault tolerance, reliability, security, QoS, without manual intervention.

Autonomic management tasks including self-configuration (i.e., automatic configuration of components), self-healing (i.e., automatic discovery and correction of faults), self-optimization (i.e., automatic optimization of resource allocation), and self-protecting (i.e, automatic system security and integrity).

Interoperability: in Cloud federation each cloud comes with its own solution and interfaces for services (Amazon, Microsoft, Google, and SalesForce) . In a heterogeneous cloud federation scenario, interoperability is a key concept. Current Cloud computing offerings usually "lock" customers into a single Cloud infrastructure, platform, or application, preventing the portability of data or software created by them.

create standard interfaces that will enable interaction between distributed sites, allowing the federation of infrastructures issues must be taken into account when platform for interoperability among different cloud vendors is create.

Security: in federated Clouds each cloud could use different Authentication and Identity Management (IdM) this is first issue to be overcome, in order to perform authentication among heterogeneous clouds .

Effective identity management in Inter-cloud environments requires support for established standards such as X.509 certificates SAML, and WS-Federation Bernstein and Vij [20]

Service-Level Agreement (SLA): In federated cloud environments each participant 'cloud provider' has its own SLA management mechanisms. We need to set up a global SLA. By global SLA, we mean comprehensive SLAs between the user and the federation including all SLAs for each cloud provider.

VI. CONCLUSIONS

Clouds Federation is achieved when a set of cloud providers interconnect their infrastructures in order to allow sharing of resources among each other which establish a trusted federation agreement. A fundamental problem in building large scale resource sharing system is the need for efficient and scalable techniques for discovery and provisioning of resources for delivering expected Quality of Service (QoS).

In this article we present adetailed survey of the state of the art in the field of cloud federation (Centeralized and Decenteralized approaches).

In the centralized federation architecture, centralized resource discovery systems are lying to third party, single-point failure, lack scalability and fault-tolerance ability. This type of system relies totally on the central party. Should the central computer crash, the entire system will "go down" (i.e. will be unavailable).

While decentralized federation strategies leaves the maximum freedom among cloud providers, which can decide with whom to cooperate, thus ensuring independency from third party, Decentralized federation strategies require a greater degree of complexity than centralized federation architecture. A new model enhancing for scalability and reliability by building large scalable and automated resources discovering and provisioning in Clouds Federation is needed.

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