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Soft Computing in Smart Grid as Cloud based Service

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***Abstract*— Smart Grid empowers the electrical utilities improve the potency and therefore the availableness of the ability system whereas perpetually observance, dominant and managing the strain of consumers. machine necessities for good Grid applications are often met by utilizing the Cloud Computing model. Cloud could be a knowledge center that provides hosted services to the folks and it provides a climbable access to computing resources. At present, Cloud primarily based massive Scale massive knowledge integration continues to be in analysis Purpose. not like ancient utilities wherever one supplier theme could be a common apply, the ever present access to cloud resources simply allows the concurrent use of various clouds. during this paper, to deploy a computing cluster on the highest of a multi cloud infrastructure, for determination loosely coupled Many-Task Computing (MTC) applications. during this method, the cluster nodes are often provisioned with resources from completely different clouds to enhance the price effectiveness of the readying, or to implement high-availability methods. we have a tendency to use Balanced Partition rule uses a simple thanks to classify a given knowledge set through a definite variety of clusters. This algorithm is used to prioritize the cloud data center. We deploy on a multi cloud server spanning a local data center in dropbox. Entire Data is splitted and stored in two servers parallely. User request is handled by the first Cloud and balance part is handled by another cloud in all Applications.**

***Index Terms*—Smart Grid, Cloud computing, MTC, load balancing algorithm cluster, multicloud.**

I. Introduction

Computing clusters are one in all the foremost standard platforms for resolution MTC issues, specially within the case of loosely coupled tasks (e.g., high-throughput computing applications). However, building and managing physical clusters exhibits many drawbacks:

1) major investments in hardware, specialised installations (cooling, power, etc.) and qualified personal;
2) long periods of cluster underutilization; and
3) cluster overloading and shy procedure resources throughout peak demand periods. relating to these limitations, cloud computing technology has been planned as a viable resolution to deploy elastic computing clusters, or to enrich the in-house knowledge center infrastructure to satisfy peak workloads.

Regarding these limitations, cloud computing technology has been planned as a viable resolution to deploy elastic computing clusters, or to enrich the in-house knowledge center infrastructure to satisfy peak workloads. The coinciding use completely different|of various} cloud suppliers to deploy a computing cluster spanning different clouds will give many advantages. High handiness and fault tolerance: the cluster employee nodes are often unfold on completely different cloud sites, therefore within the case of cloud period of time or failure, the cluster operation won't be noncontinuous.

Furthermore, during this state of affairs, we will dynamically deploy new cluster nodes during a completely different cloud to avoid the degradation of the cluster performance. Infrastructure price reduction: since {different|totally completely different|completely different} cloud suppliers will follow different rating methods, and even variable rating models (based on the amount of demand of a selected resource sort, daytime versus nighttime, weekdays versus weekends, spot costs, so forth), the various cluster nodes will modification dynamically their locations, from one cloud supplier to a different one, so as to scale back the infrastructure price. This work is conducted during a real experimental work that includes resources from our in-house infrastructure, and external resources from 2 completely different cloud sites below Dropbox server. we have a tendency to analyze the performance of various cluster configurations, mistreatment the cluster output as performance metric, proving that multi cloud cluster implementations don't incur in performance slowdowns, compared to single-site implementations, and showing that the cluster performance scales linearly once the native cluster infrastructure is complemented with external cloud nodes. Implementation of a simulated infrastructure model to test larger sized clusters and workloads, proving that results obtained in the real testbed

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can be extrapolated to large-scale multicloud infrastructures.

II. Literature Review

Recently, ton of labor has appeared within the literature on the issues of the machine grid. a number of the analysis work ar explained as follows.

Sulistio et al. (2006) bestowed their work on a knowledge grid simulation infrastructure as AN extension to GridSim, a widely known machine grid machine. The extension provides essential building blocks for simulating information grid situations. Since it's uphill take a look at|to check} many alternative usage situations on real information grid test beds, it's easier to use simulation as a method of finding out advanced situations. This technology is extremely anticipated by scientific communities, like within the space of natural philosophy, supermolecule simulation and high-energy physics. information grids ar AN rising new technology for managing massive amounts of distributed information. this can be as a result of experiments in these fields generate huge quantity of knowledge, which require to be shared and analyzed.

Agustin et al. (2007) projected AN involuntary network-aware programming infrastructure that's capable of adapting its behavior to the present standing of the surroundings. Grid technologies have enabled the aggregation of geographically distributed resources, within the context of a selected application. The network remains a very important demand for any grid application, as entities concerned in an exceedingly grid system (such as users, services, and data) ought to communicate with one another over a network. The performance of the network should thus be thought-about once concluding tasks like programming, migration or observation of jobs. creating use of the network in AN economical and fault tolerance manner, within the context of such existing analysis, results in a big range of analysis challenges. a method to deal with these issues is to form grid middleware incorporate the idea of involuntary systems. Such a amendment would involve the event of ``self-configuring" systems that ar ready to build selections autonomously, and adapt themselves because the system standing changes.

Alexandre et al. (2007) projected a linguistics approach to integrate choice of equivalent resources and choice of equivalent package artifacts so as to boost the schedule of resources appropriate for a given set of application execution needs. A triple-crown grid resource allocation depends, among alternative things, on the standard of the on the market info concerning package artifacts and grid resources. programming parallel and distributed applications with efficiency onto grid environments could be a tough task and a good kind of programming heuristics are developed attending to address this issue.

Romulo et al. (2007) targeted on analysis ways to realize economical execution of parallel applications in an exceedingly grid computing infrastructure. The paper presents WSPE,

a grid programming surroundings for grid-unaware applications. WSPE's runtime system employs a brand new programming mechanism, known as spherical Stealing, impressed on the concept of labor stealing. WSPE consists of a straightforward programming interface and a completely localised runtime system following a peer-to-peer organization. they need conjointly incontestable however AN acceptable alternative for a network overlay mechanism will any improve execution potency.

Singh and Srivastava (2007) devised a strategy to calculate Queue Length and Waiting Time utilizing entrance Server info to cut back time interval variance in presence of bursty traffic. the foremost widespread contemplation is performance, as a result of entrance servers should supply efficient and high-availability services within the elongated amount, therefore they need to be scaled to satisfy the expected load. Performance measurements may be the bottom for performance modeling and prediction. With the assistance of performance models, the performance metrics (like buffer estimation, waiting time) may be determined at the event method.

Wang et al. (2008) bestowed a brand new service-oriented approach to the look and implementation of mental image systems in an exceedingly grid computing surroundings. The approach evolves the normal dataflow mental image system, supported processes human action via shared memory or sockets, into AN surroundings during which mental image internet services may be joined in an exceedingly pipeline mistreatment the subscription and notification services on the market in Globus Toolkit four. a particular aim of their style is to support cooperative mental image, permitting a geographically distributed analysis team to figure collaboratively on visual analysis of knowledge.

III. Proposed System

The system architecture for the Grid based cloud service consists of a source '.txt' file extension, grid server, cloud 1 and cloud 2 modules.

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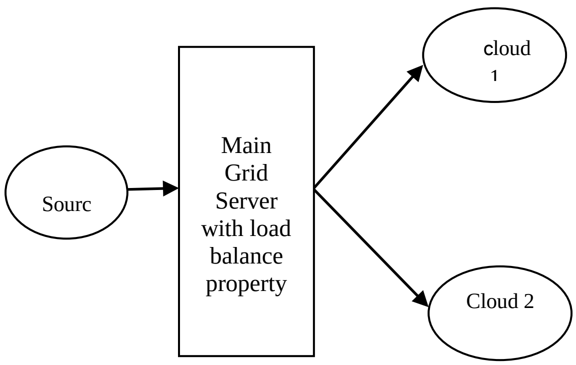

Figure 1Grid Cloud service architecture

The grid server uses the algorithm load balancer for our proposed system. The load balancer algorithm using Round robin algorithm which process the source data and calculate the load taken time for processing. Based on the load processing time the source data passes to cloud modules either 1 or 2.

IV. Load Balancing Algorithm

It's important to choose the algorithm that best suits the resources we have and the expected workload for each resource. In most cases, the Random, Round Robin, or Least Connections algorithms are sufficient when load-balancing two identical servers for increased web traffic. However, if servers are unequal in size or RAM, we should consider using a weighted algorithm that favors your server with the maximum available resources.

The different load balancing algorithms are as follows:

Round robin - This algorithm directs traffic in a circular pattern to each node of a load balancer in succession. If your servers are comparable in size and RAM, this algorithm is a good choice, since it directs traffic to the next node in succession, regardless of its current workload or number of open connections. This algorithm works well in most situations.

Weighted round robin - This algorithm directs traffic in a circular pattern to each node of a load balancer in succession, with a larger portion of requests being serviced by nodes with a greater weight. This algorithm works well when you have two or more Cloud Servers that are unequal in computing power and available resources. For example, you want the majority of traffic to go to the server that has the most RAM. Or if one of your servers hosts several mission critical applications, you may want to direct the majority of traffic to a different server that hosts fewer applications.

Random - This algorithm directs traffic to a randomly selected node. Consider using this algorithm when nodes are equally matched in computing power and available resources. For example, you have two Cloud Servers with the same size disk and RAM.

Least connections - This algorithm directs traffic to the node with the fewest open connections. This algorithm works best in environments where the servers you are load balancing have similar capabilities.

Weighted least connections - This algorithm directs traffic to the node with the fewest open connections, however nodes with a larger weight will service proportionally more connections at any one time. This algorithm uses more computation time than the Least Connections algorithm. However, the additional computation results in distributing the traffic more efficiently to the node that is most capable of handling the request.

V. Implementation

The implementation of Smart grid based cloud computing consists of following modules:

1. Deployment of Multicloud
2. Loosely coupled MTC Clouds
3. Computing cluster
4. Performance and Cost Extrapolation

Deployment of Multicloud:

Deployment of a multicloud virtual infrastructure spanning four different sites. our local data center are Amazon EC2 Europe, Amazon EC2 US, and ElasticHosts, and implementation of a real computing cluster testbed on top of this multicloud infrastructure. Implementation of a simulated infrastructure model to test larger sized clusters and workloads, proving that results obtained in the real testbed can be extrapolated to large-scale multicloud infrastructures.

Loosely coupled MTC Clouds:

The cluster worker nodes can be spread on different cloud sites, so in the case of cloud downtime or failure, the cluster operation will not be disrupted. Furthermore, in this situation, we can dynamically deploy new cluster nodes in a different cloud to avoid the degradation of the cluster performance. The different cluster nodes can change dynamically their locations, from one cloud provider to another one, in order to reduce the overall infrastructure cost.

Computing cluster:

We analyze the performance of different cluster configurations, using the cluster throughput (i.e., completed jobs per second) as performance metric, proving that multicloud cluster implementations do not incur in performance slowdowns, compared to single-site

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implementations, and showing that the cluster performance (i.e., throughput) scales linearly when the local cluster infrastructure is complemented with external cloud nodes. we have implemented a simulated infrastructure model, that includes a larger number of computing resources (up to 256 worker nodes), and runs a larger number of tasks (up to 5,000).

Performance and Cost Extrapolation:

Performance analysis of the cluster tested for solving loosely coupled MTC applications (in particular, an embarrassingly parallel problem), proving the scalability of the multi cloud solution for this kind of workloads. Compare the different cluster configurations, and proving the viability of the multi cloud solution also from a cost perspective.

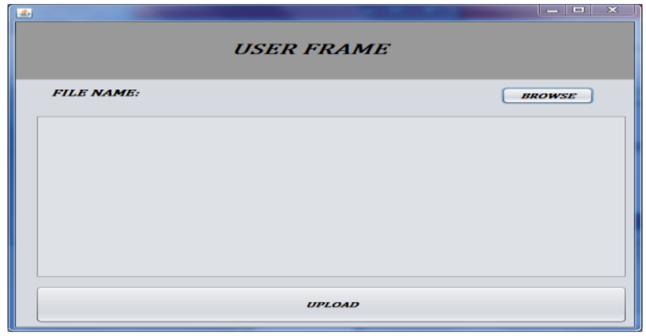
VI. RESULTS

The experimental results for the grid cloud service with login page, user frame, main server and the cloud 1 are shown as follows.

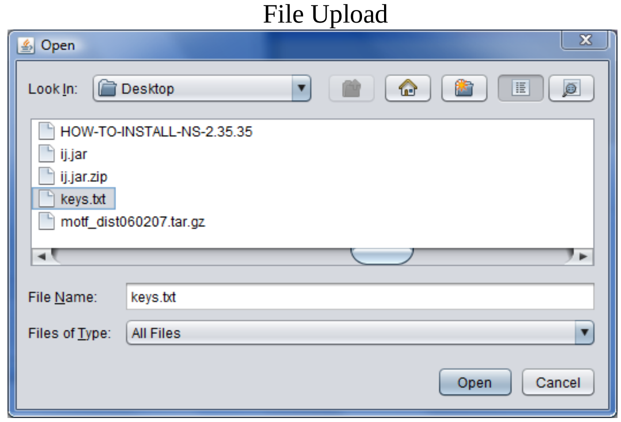
Start Page

User Login

User Frame



File Upload



User Frame

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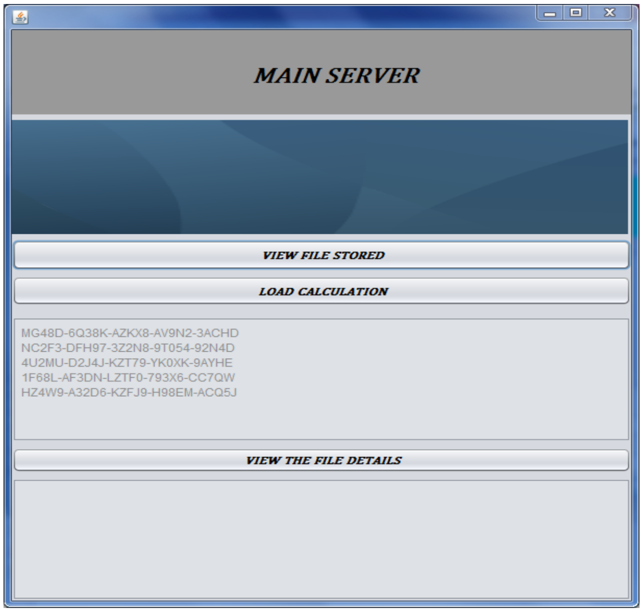
Main server



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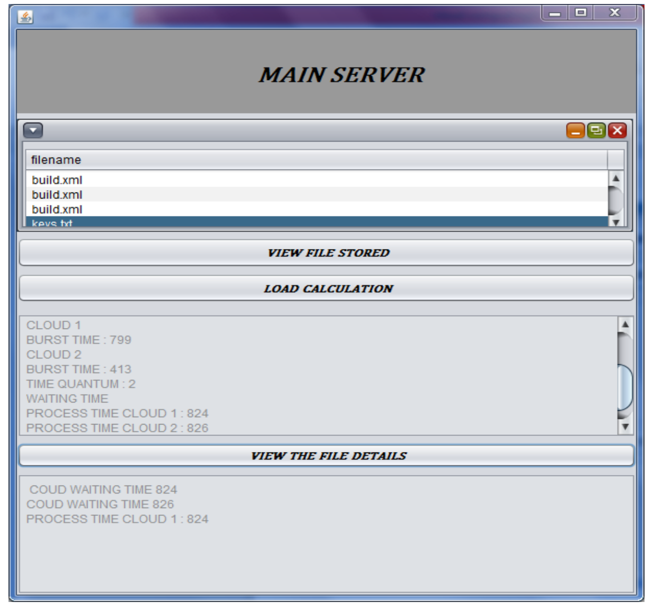
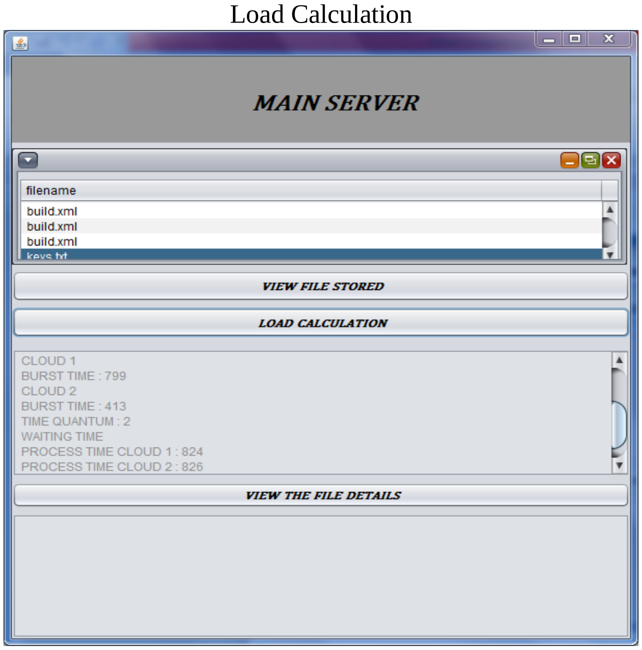
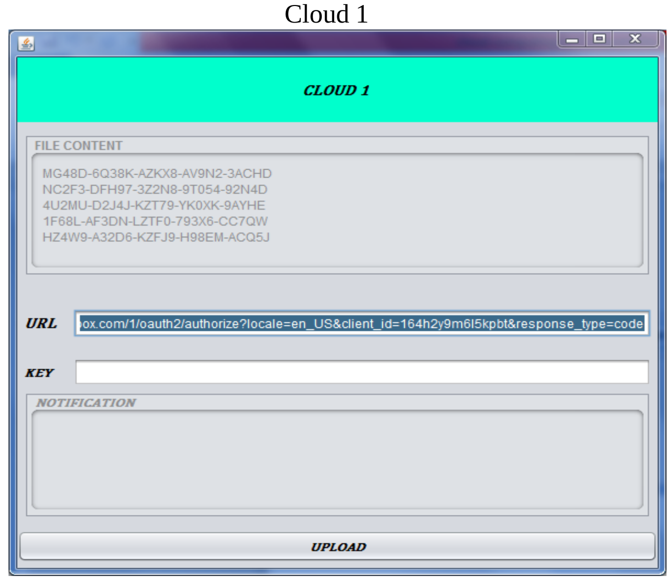


Load Calculation



Cloud 1



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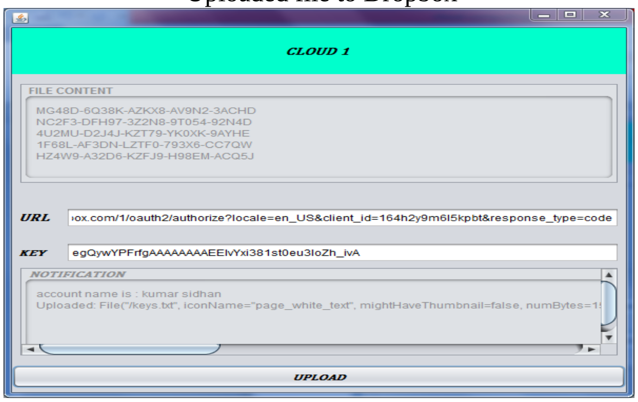
Uploaded file to Dropbox



VII. Conclusion And Future Work

We provide an overview of soft grid information layer of smart grid storing, management and process of massive data is complex costly and may be beyond the capacity of existing data management systems in the smart grid cloud computing is the emerging trend that can help the power grid get smarter. Manipulating the data directly from the cloud is more productive and efficient than transporting and storing it in local facilities. Besides computing on the cloud has additional advantages as it is ubiquitous and it can be accessed from anywhere. Lastly we propose a system schema for soft grid as a service in cloud infrastructure. Our future work could incorporate heterogeneity in the access control mechanism.

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