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A Survey on Grid Computing and Grid Services

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Abstract: The idea behind grid computing is to make multiple machines that may be in different physical locations, behave like they are one large virtual machine. In grid computing, the total work load is distributed among many computers which are linked together through some kind of local or global network topology. There is no restriction of work it could be of any type like mathematical calculations or processor performing different tasks. Grid uses Grid Services to access and use a set of Grid resources. Subsequently, these Grid Services need to be discovered, selected and invoked quickly and efficiently to satisfy the needs of a demanding environment such as Grid.

Keywords: Grid Computing, Grid services, Infrastructure.

I. INTRIDUCTION

The growth of the internet along with the availability of powerful computers and high-speed networks as low cost components is changing the way scientists and engineers do computing, and is also changing how society in general manages information and information services. These new technologies have enabled the clustering of a wide variety of distributed resources, such as supercomputer, storage system, data sources, special drives and services. The new technology which is currently widely used termed as “Grid Computing”.

II. GRID COMPUTING

Grid computing is a form of distributed computing that involves coordinating and sharing Computing, application, data and storage or network resources across dynamic and geographically dispersed organization [6]. Grid computing is rapidly emerging as dominant paradigm for wide area distributed computing. Its goal to provide a service-oriented infrastructure that leverages standardized protocols and service to enable access to and coordinated sharing of geographically distributed hardware, software and information resources [12]. To know about and to have great command on those changes surely new technologies having greater flexibility are required. But for the knowledge of those new technologies there is a lot of work to do because there are some features like cost, reusability, speed and quality that have great impact on them. So the ideas like super computer, which is made by connecting several computers through a computer bus having fast speed, are gaining fame in which several machines work together by linking through a network for a common task [1]. This mechanism is known as Grid computing and is expected to play an important role in the field of computing in future. Grid is analogy with the electrical power grid that has also known as GRID computing. We do not need to know where electrical power is being produced. All that is important to us is that it is delivered to our home in a reliable way. Grid community and the Global Grid Forum are investing considerable effort in developing and deploying standard protocols and services that enable seamless and secure discovery, access to, and interactions among resources, services, and applications [2]. The evolution of Grid computing from its roots in parallel and distributed computing to its current state and emerging trends and visions.

1.1 Origins of the Grid

While the concept of a “Computing utility” providing “continuous operation analogous to power and telephone” can be traced back to the 1960’s and the multics project [13]. There are different thoughts about the beginning of grid computing. It could be more right to say that the keyword Grid computing came into being by the start of 1990 decade due to the work of two people Carl Kesselmen’s and Ian Foster’s [1]. They gave the main theme of grid computing. The Grid computing gained real fame in 2007. Electricity is an example of a kind of tool for which grid computing was been developed. While the concept of a computing utility which providing continuous operation analogous to power and telephone. Can be traced back to the 1960s and the Multics Project [3], the origins of the current Grid revolution can be traced to the late 1980’s and early 1990’s and the tremendous amounts of research being done on parallel programming and distributed systems. Parallel computers in a variety of architectures had become commercially available, and networking hardware and software were becoming more widely deployed. To effectively program these new parallel machines, a long list of parallel programming languages and tools were being developed and evaluated [4].

1.2 Grid Computing Networks

Grid computing instead of relying on high performance focuses on sharing networks [1].

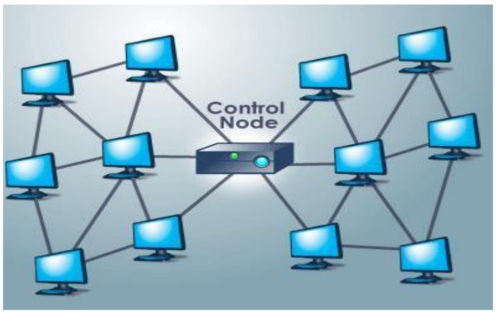

Fig 1. Grid Computing Network.

The complexity of grid computing is more than normal distributed computing. Normal distributed computing has an environment in which machines are distributed and managed individually and separately. Those machines rely on their own resources like own processing and memory. While the grid computing tries to make use of its linked machines work for same task. Grid computing creates a pond of computing resources.

1.3 Grid Computing Infrastructure

Computing can be composed of devices having different in sense of capabilities like speed. Grid computing is the combination of computer resources from multiple administrative domains for a common goal [5]. Many problems of science and engineering can be solved through grid computing as lot of data can be transferred through it and also it provides a good networking security. Grid computing can provide a solo accessing position to whole of network. But the grid computing is expensive and it also has a limit to its resources due to having a specific structure in its network. Grid computing is best suitable for small networks having a very few resources.

1.4 Configuration Settings

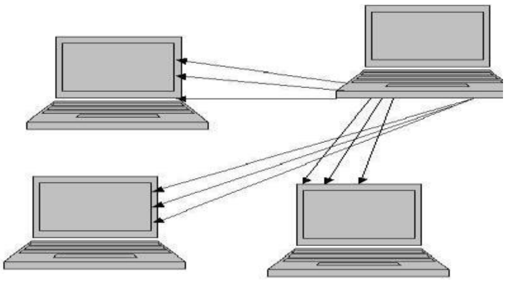

Fig. 2 Resources Allocation in Grid Computing.

Nearly all usage of grid computing is dependent on its configuration [1]. It can be used for small advertisement and it also supports the type of database management systems that is the reason oracle has its own grid engine. The grid standards today are in a stage of underdevelopment and still the grid computing is present in its early stage. Restrictions can be made for example in security networking all the resources are surely not to shown to all of its users so there grid makes some resources available to some of its users. It depends on the configuration of the grid network. The grid computing also depends on the requirement like in the above case the requirement is security that should be provided by grid computing so that its user satisfies.

III. GRID SERVICES

Grid computing has nearly the same structure as of a supercomputer. The network of Grid Services are software components which provide access to a set of Grid resources such as data sources, high performance equipment and computational resources [18]. GS are the base of the Open Grid Services Architecture (OGSA) [21]

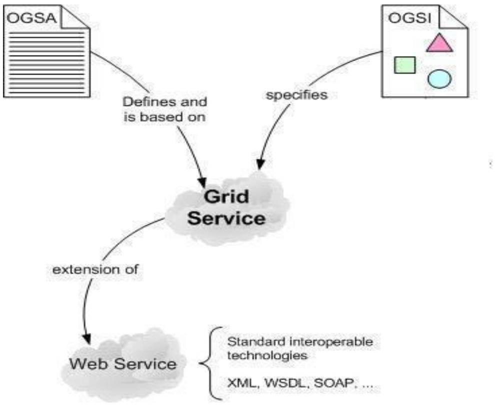

Fig. 3 Grid Services in Grid Computing

A Grid Service is simply a Web Service with a lot of extensions that make it adequate for a grid-based application (and, in particular, for OGSA). Grid Services are an extension of Web Services (see fig 2). Finally, since Grid Services are going to be the distributed technology underlying OGSA, it is also correct to say that OGSA is based on Grid Services [21]. The Open Grid Services Infrastructure (OGSI) is related to OGSA. OGSI defines a set of conventions and specifications for the use of WSDL and XML Schema to enable GS [7].It defines how the client interact with Grid Services and also managing ,creating and exchanging information in the Grid Services. OGSA provides the overview of Grid Services and for grid applications. While working of grid Services defined by OGSI. Grid Services are specified by OGSI Grid services are the extension of Web Services. GS solve the problems of WS have for their use within Grid Computing (i.e stateless and persistence).

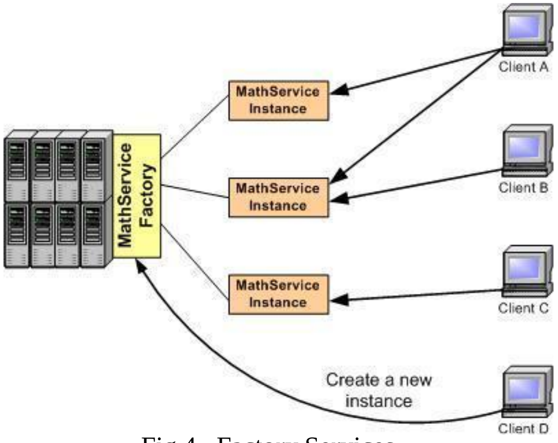

Fig 4. Factory Services

A web service is always stateless and non-transient. A grid service is state full means that the grid service can remember previous information from the last client-server interaction. When a grid service is stateless, the grid service does not retain state about an interaction with a client and thus the grid service is not aware of what happened during previous interactions with the same client (or any other client). A transient service instance is one that can be created and destroyed. Usually, they are created for specific clients and do not outlive its clients. An instance of a service is *non-transient* if it outlives its client. So in Grid Service One instance of service assigned to each client and only that client can access stored information. The information is retained between accesses and pertains to the client. Service usually destroyed when its purpose has been fulfilled. Where as in Stateful Non-Transient Service Several clients share one instance of the service, and the stored information is available to all clients. Factory services are used to overcome the stateless and persistence in WS. It means that we could have a central service factory which maintains a set of service instances instead of having one big stateless service shared by all users.

When a client needs to invoke an operation of the service, it would talk to the instance, not to the factory. In the same way, if the client wants to create or destroy an instance, it will talk to the factory. Each client could have access to more than one instance of the service, and one instance could be shared by many clients (see in fig 3). These instances are transients (the opposed to persistent) because they have a limited lifetime which is not bound to the lifetime of the GS container. It means that one client can create and destroy instances of a GS instead of having one persistent service permanently available. It avoids the risk that another client might destroy the operations performed over the GS by the first client.

Thus, the main improvements Introduced in Grid Services are:

GS support portType extension: It means we can define a portType as an extension of a previously existing portType [10].

GS are state full services: It means they retain the state after each invocation and subsequent execution [9].

GS are transients: It means they are not linked to the lifetime of the server, but they can be created and destroyed as required [9].

GS have Service Data: Service Data allows including a set of structured data to any service, which can be accessed through its interface. Service Data is an extension that allows attributes and any type of data (classes, arrays, etc.) [8].

IV. SOFTWARE-INFRASTRUCTRE

In GRID computing, the link between the applications and the physical GRID infrastructure is provided by a middleware and these middleware are software components. Following are the list of some software components used for Grid Computing.

Globus Toolkit: GT is open-source software that simplifies collaboration across dynamic, multi-institutional virtual organizations [20]. It includes tools for authentication, scheduling, file transfer and resource description.

Condor: Condor emphasizes high throughput computing (HTC) to deliver processing capacity over longer periods of time [17].

Unicore: Unicore allows for seamless interoperation of supercomputers over WAN[19].

gLite :gLite provides a framework for building grid applications tapping into the power of distributed computing and storage resources across the Internet.[20]

ARC: **Advanced Resource Connector** is middleware integrates computing resources (usually, computing clusters managed by a batch system or standalone workstations) and storage facilities, making them available via a secure common Grid layer [16].

Oracle Grid Engine is the most widely deployed workload management solution in the industry and offers unmatched scalability. On top of a rich set of advanced scheduling capabilities and the flexibility to adapt to any computing environment and application workload [14].

OMII-UK is an open-source organization that empowers the UK research community by providing software for use in all disciplines of research [15].

V. CONCLUSION

Grid computing is gaining more importance as the days are been passed. GRID computing is still very much “work in progress “or it buzzing the world. While, thanks to the involvement of many commercial and non-commercial institutions, It is safe to conclude that GRID computing will play an important role in the future, it is not yet possible to exactly determine all areas in which GRID computing will have an impact on society. In future the grid computing would be used for those purposes which so far are invisible to scientists and researchers. OGSA and OGSI allow manipulating Web services as Grid services.

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