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Statewide Higher Education Counselling System Using Grid Computing

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Abstract: Grid computing is a virtualized distributed computing environment which aims at enabling the dynamic runtime selection, sharing and aggregation of distributed autonomous resources based on the availability, capability and performance. The performance of grid is improved in many aspect based on various research direction of last few year. In grid computing, load sharing is the major research issue. This study further explains various existing techniques, architectures, applications of grid computing. And this study proposed an application in which state wise counseling for higher studies is applied. The proposed system has many grid located in many places which spreads geographically in different places. Further these grids are interconnected using inter-grid architecture. The conclusion of the proposed research is proved that the optimal load sharing and efficient transmission of data is obtained in the proposed research.

Key words: Grid computing, load sharing, grid architecture, inter grid connectivity, capability

INTRODUCTION

In the mid-1990s the grid metaphor was applied to computing by extending and advancing the 1960s concept of computer time sharing. The grid metaphor strongly illustrates the relation to and the dependency on a highly interconnected networking infrastructure. According to IBM's definition (IBM Press Releases), grid is a collection of distributed computing resources available over a local or wide area network that appears to an end user or application as one large virtual computing system. The vision is to create virtual dynamic organizations through secure, coordinated resource-sharing among individuals, institutions and resources. Grid computing is an approach to distributed computing that spans not only locations but also organizations, machine architectures and software boundaries to provide unlimited power, collaboration and information access to everyone connected to a grid.

Key issues in grid computing: The key issues in the grid computing are:

- Benefits of grid and status of technology
- Motivations for considering computational grids
- Brief history of grid computing
- Grid computing ready for prime time
- Early suppliers and vendors challenges
- Future directions
- What are the components of grid computing systems/architectures
- Portal/user interfaces
- User security
- Broker function
- Scheduler function
- Data management function
- Job management and resource management
- There stable standards supporting grid computing
- Virtual organization creation and management
- Service groups and discovery services
- Choreography, orchestration and workflow
- Transactions
- Metering service
- Accounting service
- Billing and payment service
- Grid system deployment issues and approaches
- Generic implementations
- Security considerations can grid computing be trusted
- What are the grid deployment/management issues?
- Challenges and approaches
- Availability of products by categories
- Business grid types
- Deploying a basic computing grid
- Deploying more complex computing grid
- Grid operation
- What are the economics of grid systems
- The chargeable grid service

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- The grid payment system
- Communication and networking infrastructure
- Communication systems for local grids
- Communication systems for national grids
- Communication systems for global grids

Viruatilization in Grid System: From the key issues the Virtualization (Gannon *et al*., 2003; Foster *et al*., 2001) is a most important requirement of grid systems and the virtualization can span the following domains:

- Server virtualization for horizontally and vertically scaled server environments. Server virtualization enables optimized utilization, improved service levels and reduced management overhead
- Network virtualization, enabled by intelligent routers, switches and other networking elements supporting virtual LANs. Virtualized networks are more secure and more able to support unforeseen spikes in customer and user demand
- Storage virtualization (server, network and array-based). Storage virtualization technologies improve the utilization of current storage subsystems, reduce administrative costs and protect vital data in a secure and automated fashion
- Application virtualization enables programs and services to be executed on multiple systems simultaneously. This computing approach is related to horizontal scaling, clusters and grid computing in which a single application is able to cooperatively execute on a number of servers concurrently
- Data center virtualization whereby groups of servers, storage and network resources can be provisioned or reallocated on the fly to meet the needs of a new IT service or to handle dynamically changing workloads

ARCHITURAL DESIGN AND RECENT DEVELOPMENT IN GRID COMPUTING

The evolution of grid system and the architecture of grid system are shown in the Fig. 1 and 2. The following are the grid consortium (Brown, 2003; Myer, 2003) which focuses on grid computing and its engineering applications:

- Asia Pacific grid
- Australian grid forum
- Content alliance: about content peering
- Distributed.net
- eGrid: European grid computing initiative
- Eurotools SIG on metacomputing

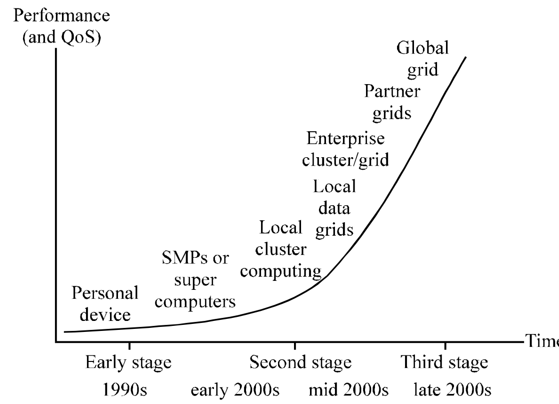

Fig. 1: Evolution of Grid System

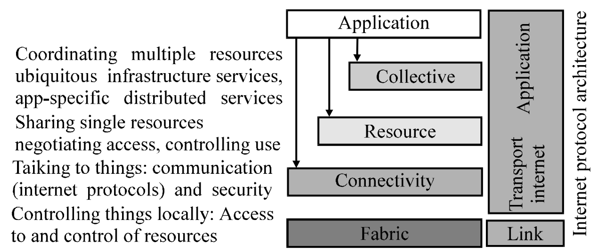

Fig. 2: Layered architecture of Grid System

- Global grid forum
- Global Grid Forum (GGF)
- Grid computing info centre
- Grid Forum Korea
- IEEE task force on cluster computing
- New Productivity Initiative (NPI)
- Peer to Peer (P2P) working group
- SETI@home
- The distributed coalition

And the following are the few grid applications in the recent world wide implementation:

- Access grid
- APEC cooperation for earthquake simulation
- Australian Computational Earth Systems simulator
- Australian virtual observatory
- Cellular microphysiology
- DataGRID, WP9: Earth observation science application (Chervenak *et al*., 2000)
- Distributed proofreaders
- DREAM project: evolutionary computing and agents applications
- EarthSystemGrid
- Fusion collaboratory
- Geodise: aerospace design optimisation
- Globus applications

- GRid seArch and Categorization Engine (GRACE)
- HEPGrid: High Energy Physics and the grid network
- Italian grid (GRID.IT) applications
- Japanese BioGrid
- NEESgrid: earthquake engineering virtual collaboratory (Foster *et al*., 2001)
- Knowledge grid (Buyya *et al*., 2001)
- Molecular modelling for drug design
- NC BioGrid
- Neuro science brain activity analysis
- NLANR distributed applications
- OpenMolGrid
- Particle physics data grid
- The international Grid (iGrid)
- UK grid Apps working group
- US virtual observatory
- Bayanihan computing group
- Cetacean acoustic communication study

Figure 3 is shown the architectural designs for connecting the local gird computing systems (Bahrami *et al*., 2010; Dabhi and Prajapati, 2008). Figure 4 is shown the architectural designs for connecting the intra grid computing systems (Jose and Seenivasagam, 2011; Wang *et al*., 2008). In which the local grid is located in one place, it means that the entire grid is located geographically in one place.

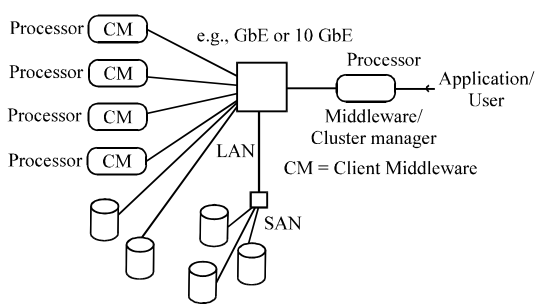

Fig. 3: Local grid architecture

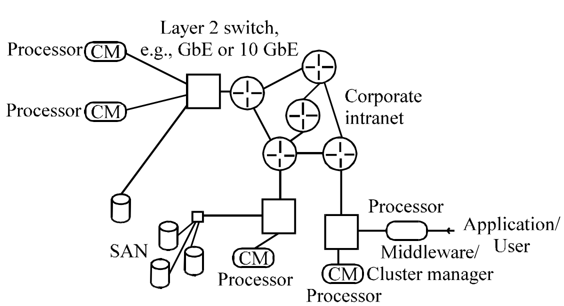

Fig. 4: Intra grid architecture

Whereas the intra grid and inter grid architecture are proposed to connect two various grid systems that located two or more different places.

PROPOSED WORK

In this study, researchers proposed a state wise higher education counselling system for engineering admission. Now a days, admission to professional courses become centralized which mostly under the control of affiliated university. In India, Tamil Nadu become one among best place for professional courses. Merely 500 engineering colleges running under single affiliated university. For admission into all courses and all colleges, counselling based on mark is arranged for students to get their choice. In order to arrange such counselling in the geographically large area, centralized and multiple nodal is required. Therefore, researchers proposed grid computing for professional course counselling.

The Fig. 5 and 6 shows that the grid which available on various places and its interconnection. In the proposed system, grid are interconnected and for optimized data transmission, a centralized contol system is proposed which is termed as Grid Control System (GCS). In order to meet more number of request from the users the proposed system using the Grid Control System (GCS). The functionalities of the GCS are:

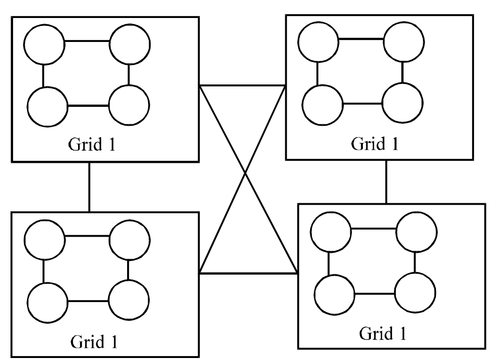

Fig. 5: Inter linked mesh grid architecture

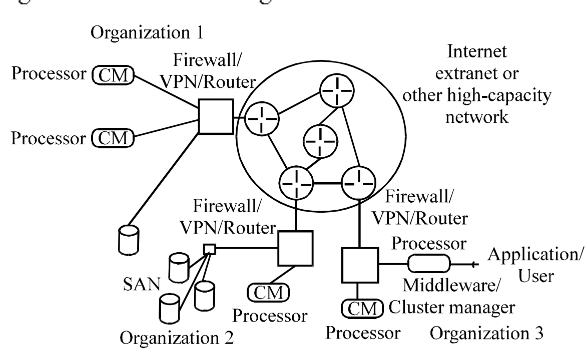

Fig. 6: Inter grid architecture

- Will receive the query from the user
- Assign effecively the job scheduing
- Splitting the job as tasks whenever required
- Scheduling the tasks in proper manner using optimised scheduing algorithm

Splitter will split jobs into one or more tasks, based on the following Eq. 1:

$$\text{No. of task} = \begin{cases} 1 & \text{if no. of job} < \text{no. of grid} \\ \dfrac{\text{no. of job}}{\text{no. of grid}} & \text{if no.of job} < \text{no. of grid} \end{cases} \tag{1}$$

Table 1: Various test case used for testing the grid performance

Test case	b	H	m1	m2	p1	p2
Case 1	0.0	1.0	2	1	0.67	0.33
Case 2	1.0	0.0	2	1	0.50	0.50
Case 3	0.5	0.5	2	1	0.56	0.44
Case 4	0.0	8.0	2	1	1.00	0.00

Table 2: Performance of grid on test Case 1

			POACO-test Case 1	
Time	T1	T2	G1	G2
0	180	30	140	70
100	90	25	77	38
200	98	10	72	36
300	111	6	78	39

Execution time: 367, 183; Max. execution time: 367; Idle time: 51, 156

Table 3: Performance of grid on test Case 2

			ACO-test 2	
Time	T1	T2	G1	G2
0	180	30	105	105
100	90	25	58	58
200	98	10	54	54
300	111	6	59	59

Execution time: 275, 275; Max. execution time: 275; Idle time: 89, 89

Table 4: Performance of grid on test Case 3

			ACO-test 3	
Time	T1	T2	G1	G2
0	180	30	118	92
100	90	25	65	50
200	98	10	61	47
300	111	6	66	51

Execution time: 310, 240; Max. execution time: 310; Idle time: 74, 111

Table 5: Performance of grid on test Case 4

			ACO-test 4	
Time	T1	T2	G1	G2
0	180	30	209	1
100	90	25	115	0
200	98	10	108	0
300	111	6	117	0

Execution time: 548, 2; Max. execution time: 548; Idle time: 0, 298

The proposed grid is tested on various test case and performance of grid based on execution time, maximum execution time and idle time are calculated. These recorded information and are shown in the Table 1-5.

CONCLUSION

The proposed research is carried out for professional admission for higher secondary students. In which many number of request from the user of the grid is to be performed. In order to perform such huge request, GCS is proposed and the functionalities of GCS is shown briefly in the earlier study. For task scheduling, Parameter Optimized Ant Colony Optimization (POACO) is proposed. Hence, the proposed system is tested on various test cases it is identified that the performance of grid is optimized in the test Case 2. Therefore, the parameter of ACO is adjusted based on test Case 2.

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