AN IDEA OF ADOPTING GRID-BASED REMOTE ENVIRONMENT FOR CIVIL ENGINNERING IN INDIA

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Abstract: In recent times, there is a huge need for researchers in engineering field to share the resources as well as the result of the pre-evaluations experiments without any relocation. Especially in the civil engineering, researchers feel the need for participating in a number of experiments conducted at distant places. This idea of sharing the resources without commuting is very beneficial for solving big problems in projects and gives best results as the project is now globally connected . This paper proposes an idea for developing a remote environment which connects major civil engineering experiment facilities using grid technology. This environment enables re-searchers to participate in a remote experiment, and allows the experiment results shared by remote researchers automatically. The paper is divided into five sections where the first section is an introduction to the grid technology, second section describes grid collaboration with civil engineering and third section discribe the benefits of using this grid technolog. Fourth section consist of various grid projects developed for civil engineering. Finally we end up the paper with a general conclusion.

Keywords: Civil Engineering, Grid, Grid Computing, Remote Environment

I. INTRODUCTION TO GRID COMPUTING

With the enormous increase in the demand for computing capacities, solutions with least investment have to found out. In this direction Grid technology is finding its way out of the academic incubator and entering into commercial environments. Here geographically distributed resources, such as storage devices, data sources, and supercomputers, are interconnected and exploited by users around the world as single, unified resource. Grid computing can be used in any area of engineering and in many other fields. Figure 1 describes the main application area of grid computing where it is contributing a lot to manufacturing industry.

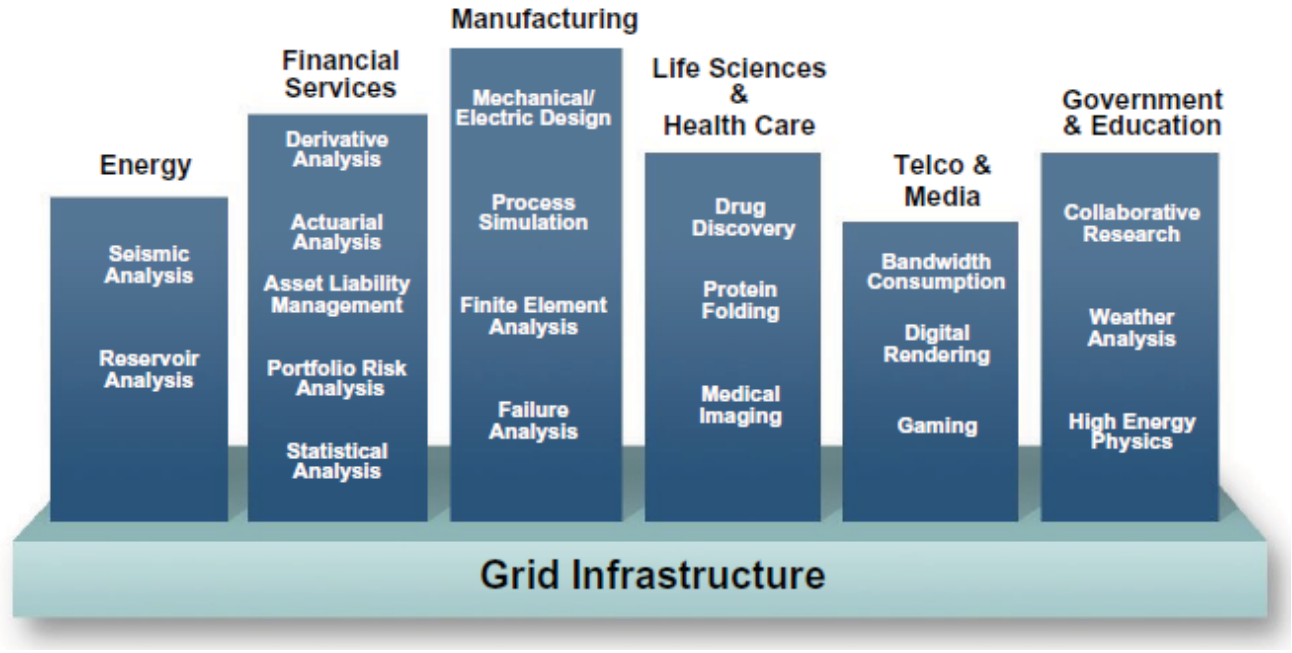

Figure 1: Application of Grid computing in various fields. [1]

II. GRID TECHNOLOGY AND CIVIL ENGINEERING- A BIG IDEA

The flow of information brings a tremendous change in the area of civil engineering research as well as the economy, politics and culture of a society. This trend induces the combination of information technology with construction technology and provides web services for remote users.

In order to bring the efficient design of grid-based collaborator research to large-scale civil engineering technologies, such as experimentation, simulation, and design, a grid computing software system and tools for the research facilities can be used [2]. The purpose of this large-scale grid design is to share the facilities and maximize the effectiveness of their use, through information technology innovation [2]. By connecting all the research facilities across the nation with grid computing infrastructure, we expect to have a balanced development of all the regions nation-wide as well as the combination of research and education. Figure 2 shows a demonstration of grid collaboration.

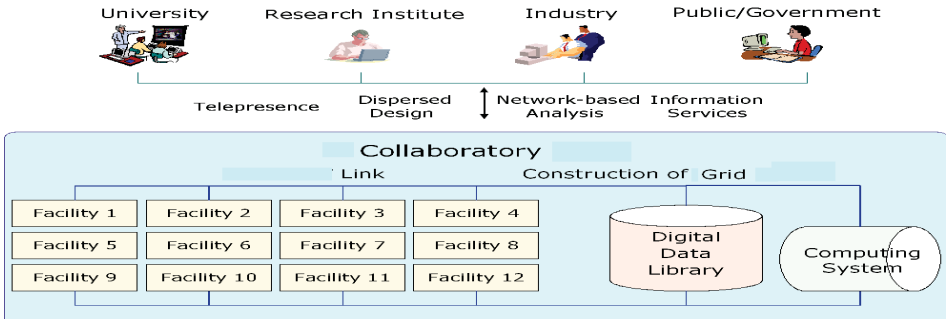

Figure 2: Collaboration of Grid Technology with Civil Engineering

III. BENEFITS OF GRID TECHNOLOGY IN CIVIL ENGINEERING

- Reduces cost by optimising existing infrastructure [2]: The grid facilitate reduction of costs by optimising the use of existing infrastructure investments and by enabling data sharing and distributed workflow across partners, and therefore enabling faster design processes.
- Reduces Computational Time: Computational time is reduced for complex numerical and data analysis problems.
- Offers improved reliability: Grid technology offers alternate approach to achieving improved reliability. Parallelization can boost reliability by having multiple copies of important jobs run concurrently on separate machines on the grid. Their results can be checked for any kind of inconsistency, such as failures, data corruption and tempering.
- Effective management and balancing of resources [3]: With grid technology, management of organization can easily visualize resource capacity and utilization to effectively control expenditures for computing resources over a larger organization.
- Interoperability of virtual organizations: The grid offers collaboration facilities and interoperability of different virtual organization by allowing the sharing and interoperation of the heterogeneous resources available.
- Access to additional resources: The grid offers access to other specialized devices such as the cameras and embedded systems.
- Harnessing heterogeneous systems together: Grid computing can be used to harness heterogeneous systems together into a mega computer by applying greater computational power to a task.
- Grid virtualization: Grid computing offers grid virtualization, thereby making a single, local computer to undertake powerful applications.

IV. LIST OF ACTIVE GRID-BASED CIVIL ENGINEERING PROJECTS WORLDWIDE

- NEES (Network for Earthquake Engineering Simulation) in US focuses on accelerating innovations in infrastructure design and construction practices to minimize damage during earthquakes or tsunamis. It was created by the National Science Foundation (NSF) to aggressively move forward the development of improvements and innovations in infrastructure design and construction practices to prevent or minimize damage during such an event [4].

  Earthquake engineering researchers and students have the opportunity through the NEES collaborator of 14 experimental equipment sites and a robust cyber infrastructure featuring online simulation tools to conduct more advanced research of designs, materials, construction techniques and monitoring tools. Research results will enable engineers to develop better and more cost-effective ways of mitigating earthquake damage.

- G-CIVIL is a project in UK that supports remote monitoring of experimental facilities and collaboration tool using grid technology. It provides real-time monitoring of civil engineering experiment site through portal on the Internet and allows teams geographically apart to share data and collaborate [5,6].

- KOCED (Korea Construction Engineering Development Program) has made significant progress in the civil engineering during the past three decades. Many leading Korean construction companies had participated in the several landmark construction projects worldwide.

It is a grid-based collaborator for construction project. The KOCED grid system is nation-wide distributions of computing systems associated with each research facility connected by a wired communication information network and integrated to a grid system, which makes the facilities become one facility [7]. This grid system is aimed to integrate the computing facilities and share the resources such as simulation data and experiments for remote users.

V. CONCLUSION

The paper propose an idea of adopting grid computing technology for civil engineering for the nation as it is already being used by many other countries and successfully working. Grid computing idea has numerous advantages in its own and its adaptation will surely bring a revolutionary change in the development of construction and manufacturing industry in India.

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