E-SCIENCE: AN INTRODUCTION

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ABSTRACT

E-science refers to the type of scientific research that uses large-scale computing infrastructure to process very large amount of data. It is an interdisciplinary branch of science that explores and implements information technology platforms, which include
computer networks, computer information technology, telecommunication, and computational methods. This paper provides a brief introduction to e-science.

Key words: *e-science, Electronic Science, Enhanced Science, e-research.*

1. INTRODUCTION

Computation has become a third pillar of science alongside theory and experiment. Many areas of science are becoming increasingly collaborative, multidisciplinary, computation intensive. Research on many fronts is becoming more and more dependent on computation.

E-Science (or eScience) is computationally intensive science or science that uses staggering amounts of data set. It dates back to the 1950's when engineers and scientists first used computers as part of their research process. The term 'e-science" was coined in 1999 by John Taylor, the Director General of the UK Office of Science and Technology (OST). It promotes innovation in collaborative data-intensive research across all disciplines [1]. Thus e-Science is used to describe computational intensive science, which uses immense data sets that require grid. The term "data set" is used to refer to any form of data such as files, tables, and collections. The grid promotes sharing, managing, and controlling distributed computing resources. Some regard e-science as a contemporary information phenomenon. It has made profound implications for the nature of scientific practice.

2. APPLICATIONS

Several initiatives have been made under the umbrella of e-science, with large-scale funding and a wide range of projects. So far, the main programs have been in the U.S. and the U.K. Other countries have started participating in e-science. Applications of e-science generally require non-trivial amounts of computational resources. E-Science is

basically a collaborative activity, which enables researchers from different institutions and organizations to share computational resources. To do this, they must use resources that are provided by different distributed systems, e.g. clouds, grids, local clusters.

More choice of resources by the e-scientists can contribute to increased success rate of jobs [2]. Cost benefits for data-intensive applications, ease of access, rich and varied offers for services are examples of positive returns by users who adopt cloud computing.

Two typical examples of e-Science projects are from particle physics and astronomy.

Particle physics is the branch of physics that deals with the properties and behavior of particles that constitute matter and radiation. Astronomy is a relatively small community of researchers with a clear and relatively well-defined task. The e-science technologies have been used successfully in science, technology, and medicine. It is increasingly being applied in the arts, social sciences, and humanities as well [3].

3. CHALLENGES

E-Science as an emerging discipline has faced many problems. E-scientists face many challenges in extracting value from the increasingly large volumes of data they generate.

Preserving and providing access to data produced through research process is difficult because of the heterogeneous nature of the data. Privacy issues related to certain types of sensitive data are of special concerns [4].

Collaboration in scientific research is challenging and the need of computational resources is not trivial. The advent of e-science and big data applications has created the need for working with increasingly larger data sets**.** The survival of this data is in question since the data are not housed in long-lived institutions such as libraries. If libraries fail to engage in the task, then society may find a new way for institutions to curate digital data [5].

A comprehensive security architecture is necessary for any data sharing platform,

There is the need for understanding e-Science as an integral part of scholarship and how libraries should support.

4. CONCLUSION

E-science can radically restructure current power relations in research institutions. It is pursued in many interdisciplinary endeavors. Some computer science departments in Australia have introduced courses on “eScience” [6]. In the future, e-science will deal with the large scale science that will increasingly be carried out through distributed global collaborations among scholars, utilizing Internet-based tools. Three different distributed computing technologies have been highlighted as enablers for e-science: grid computing, desktop grids, and cloud computing [7]. E-Science is paving the way to modernization of science and technology.

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