Chapter 1.4
The Ubiquitous Grid

Patricia Sedlar
Johannes Kepler University, Austria

VISION

Grid computing is an emerging technology providing the possibility to aggregate resources for the solution of computation- or data-intensive scientific tasks. Taking the evolution of mobile computing into consideration, new Grid concepts are conceivable, fully exploiting the advantage of mobile devices and ubiquitous access. By decoupling resource availability from the core grid infrastructure and hardware, the user has always the same computational power, data or storage available, regardless of a device or location. Thus restricted capabilities of thin clients can be extended and new fields of application can be made accessible.

The key concept is "The invisible grid" – the grid environment should just be there for the use of applications in science, business, health care, environment, or culture domains. Having this concept in mind, the following scenario is conceivable: Equipped with your mobile phone, which you always have with you, you are walking around and are taking a picture of an object you are interested in. You are sending the picture to the grid, where the visual information is extracted. After the analysis, information about the captured object is sent to you. Thus you have a search engine on a visual base at your permanent disposal, information captured as seen by your eyes – without the need of textural translations or the need to know the object's name or ID in order to retrieve information about it.

Realizing the scenario above, the user obtains a smart tool, easing information retrieval considerably by making use of ubiquity in combination with grid computing. But the scenario has even more potential in terms of pervasiveness. The use of mobile devices can provide a user with additional location bound information. With a portable device the user is able to access location-based services or to collect environmental information to be processed within a grid. At this stage research activities in the field of pervasive computing come

Copyright © 2010, IGI Global, distributing in print or electronic forms without written permission of IGI Global is prohibited.

into play. Pervasive computing pursues the goal to enhance the environment with sensors and smart objects in order to provide the user with suitable context-based and/or location-based services.

Expanding the introduced setting with the capabilities from pervasive computing, the following scenario is conceivable: You are an invited speaker on a conference and you are moving through the rooms of the venue. All rooms are equipped with cameras covering all perspectives of view. You are looking at a person from whom you want to know the research interests. You flick with your finger, to capture the camera picture from your perspective. The picture is processed within the grid and the ambient display next to you shows the requested information.

INTRODUCTION

The scenarios described in the foregoing section aim to combine strengths of three main disciplines: grid computing, pervasive computing, and mobile computing.

Grid Computing

The term "grid" was coined in the mid-1990s to refer to a proposed distributed computing infrastructure for advanced science and engineering (Foster & Kesselman, 2004). A grid is an infrastructure of geographically distributed resources, comprising hardware components such as processors, memory media, or scientific instrumentation and software components such as services, applications, licenses, and so forth. Its infrastructure consists of hard- and software elements to aggregate and to coordinate resources.

The first grid that has been developed, for the European Organization for Nuclear Research (CERN) to support the research of the particle physics laboratory (Colasanti, 2004), uses a large scale distributed system by taking the advantage of the rich infrastructure provided by the Internet. By using a grid of computers, it is possible to aggregate computational power to generate a huge virtual multi-computer ready for processing, storage, and communication. Since a grid can be made up of a set of geographically separate networks, enormous computational power can be made available for solving complex or data intensive problems.

Grid computing is still at its early stages of evolution. Anyhow it is no longer the exclusive realm of researchers aiming to solve sophisticated scientific tasks (Gentsch, 2004). Alike the evolution of the Internet, main grid initiatives aim to successively establish a global grid, providing users with infinite resources, just by plugging the computer.

Pervasive Computing

Pervasive computing was inspired by Mark Weiser in 1991, when he introduced his vision of the computer of the 21st century with the central statement: *"The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it"* (Weiser, 1991). His assumption that, *"we are trying to conceive a new way of thinking about computers in the world, one that takes into account the natural human environment and allows the computers themselves to vanish into the background"* has fertilized the embedding of ubiquitous computing technology into a physical environment which responds to people's needs and actions (Ferscha, 2003).

To bring interaction "*back to the real world*" (Wellner et al., 1993) was the second historical vision impacting the evolution of pervasive computing. Instead of interacting with digital data via keyboard and screen, physical interaction with digital data, for example, via "graspable" or "tangible" interfaces, was proposed (Ferscha, 2003).

Present research activities in the field of pervasive computing aim to enhance the human

7 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/ubiquitous-grid/37775

Related Content

Developing Learning Communities: Improving Interactivity of an Online Class
Pawan Jainand Smita Jain (2010). *Strategic Pervasive Computing Applications: Emerging Trends (pp. 280-294).*
www.irma-international.org/chapter/developing-learning-communities/41596

An Internet Framework for Pervasive Sensor Computing
Rui Peng, Kien A. Hua, Hao Chengand Fei Xie (2009). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 1-22).*
www.irma-international.org/article/internet-framework-pervasive-sensor-computing/37492

Performance Studies of FTP, Voice and Video over ATM-Wireless Backbone Network
Nurul I. Sarkar, Ritchie Qiand Akbar Hossain (2015). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 38-54).*
www.irma-international.org/article/performance-studies-of-ftp-voice-and-video-over-atm-wireless-backbone-network/165178

Journal: Application of Artificial Intelligence in Cyber security
Varun Kharbanda, Seetharaman Aand Maddulety K (2023). *International Journal of Security and Privacy in Pervasive Computing (pp. 1-13).*
www.irma-international.org/article/journal/318676

From Fixed to Mobile Convergence
John Ayoade (2009). *Auto-Identification and Ubiquitous Computing Applications (pp. 167-179).*
www.irma-international.org/chapter/fixed-mobile-convergence/5462