MAPi DOCTORAL PROGRAM IN COMPUTER SCIENCE

2010/2013

Thesis Proposal

Title:

Medical Imaging Services over Cloud

Supervisor:

Carlos Costa, carlos.costa@ua.pt

Hosting Institution:

Ieeta - Aveiro University

Introduction

Nowadays, medical imaging is a valuable and indispensable tool in healthcare systems, representing to physicians a key factor for delivering high quality decisions. The PACS (Picture Archiving and Communication System) concept embraces a set of technologies for the archiving, distribution, visualization and acquisition of medical images over a computer network [1]. Compared with the traditional analogue film, PACS brings significant benefits in the productivity, economy and management of a healthcare institution. Its current success was boosted by the introduction of the DICOM standard, allowing interoperability between systems from different manufactures.

The deployment of PACS has enabled faster and broader access to medical image data. The movement from film-based processes to digital processes, allied to faster and more robust network infrastructure, reduced the costs associated with the storage and management of images, simplified data portability, and has paved the way for the development of new applications and working scenarios.

The spread of the PACS through the Internet has created unforeseen scenarios for the use of new technologies [2, 3] like, for instance, Peer-to-Peer and Cloud Computing. There has been a strong investment in building cloud computing infrastructures for health proposals. For instance the Harvard Medical School has built an internal computing cloud to enable collaborative research along several departments and partners. Another example, TC3Health Company is already providing health care payers with an integrated solution supported by Amazon Web Services, namely S3, EC2, and SQS technologies. However, despite this strategic movement, there are still relatively unexplored computation scenarios that use Internet services and protocols as a whole.

Computing devices and Internet access are now available anywhere and anytime, creating new opportunities to share and to use online resources [2, 3]. A tremendous amount of ubiquitous computational power, such as Google and Amazon, and an unprecedented number of Internet resources and services, such as email and storage, are used everyday as a normal commodity. Also, Internet bandwidth is plentiful, which allows storing data online.

Objective

This PhD project aims at setting up a new generation PACS network that allows medical and academic communities to access, share and discover clinical medical images, through open networks. It aims to use Internet cloud as the major provider for computational services to applications in ubiquitous computing environments. The student will investigate, propose and develop new distributed solutions to allow the sharing and the remote access to medical imaging repositories.

References

1. C. Costa, A. Silva, and J. L. Oliveira, "Current perspectives on PACS with a Cardiology case study " in Advanced Computational Intelligence Paradigms in Healthcare 2. p79-108. Studies in Computational Intelligence. Springer. 2007. (ISBN: 978-3-540-72374-5).

2. Indexing and retrieving DICOM data in disperse and unstructured archives, Carlos Costa, Filipe Freitas, Marco Pereira, Augusto Silva and José L. Oliveira, International Journal of Computer Assisted Radiology and Surgery, 2009, Volume 4, Number 1, Pages 71-77.

3. Dicoogle - an Open Source Peer-to-Peer PACS, Carlos Costa, Carlos Ferreira, Luís Bastião, Luís Ribeiro and Augusto Silva, et al., Journal of Digital Imaging, October 2010, DOI 10.1007/s10278-010-9347-9.