

Security Middleware Infrastructure for Medical Imaging System Integration and Monitoring

Weina Ma, Kamran Sartipi

*Department of Electrical, Computer and Software Engineering, University of Ontario Institute of Technology,
2000 Simcoe St N, Oshawa, Ontario, Canada*

{Weina.Ma, Kamran.Sartipi}@uoit.ca

Abstract— With the increasing demand for electronic medical records sharing, it is a challenge for medical imaging service providers to protect the patient privacy and IT infrastructure security in an integrated environment. In this paper, we present a novel security middleware infrastructure for seamlessly and securely linking legacy medical imaging systems, diagnostic imaging web applications as well as mobile applications. In this infrastructure, software agents such as user agent and security agent have been integrated into medical imaging domains that can be trained to perform their tasks. The proposed security middleware utilizes both online security technologies such as authentication, authorization and accounting, as well as post security operations to discover system security vulnerability. By integrating with the proposed security middleware, both legacy system users and Internet users can be uniformly identified and authenticated; access to patient diagnostic images can be controlled based on patient’s consent directives and other access control policies defined at a central point; relevant user access activities can be audited at a central repository; user access behavior patterns are studied by utilizing data mining techniques; the explored behavior patterns provide system administrators valuable knowledge to refine existing security policies; behavior-based access control is enforced by capturing user’s dynamic behavior and determining their access rights through comparing with the discovered knowledge of common behaviors. A case study is presented based on the proposed infrastructure.

Keyword—Behaviour Pattern, Data Mining, Medical Diagnostic Imaging, Middleware, Security



Weina Ma was born in Baoding/China, in 1982. She obtained her B.Sc and M.Sc both in Computer and Software Engineering from Northwestern Polytechnic University in Xi’an/China, in 2005 and 2008, respectively. She started Ph.D study in Software Engineering in University of Ontario Institute of Technology in Oshwa/Canada from 2013. Her major research interests are knowledge engineering and data mining, eHealth services, and high performance computing and cloud computing.



Kamran Sartipi received B.Sc and M.Sc in Electrical Engineering from University of Tehran, and MMath and Ph.D in Computer Science (Software Engineering) from University of Waterloo. Dr. Sartipi has over 70 publications in Computer Science with focus on Information Security, Software and Knowledge Engineering, Data Analytics, and Medical Informatics. He has supervised more than 30 graduate students in inter-disciplinary fields, and developed several software tools in different scientific areas. He has collaborated with researchers in computer science, health science, business, and entrepreneurship fields for several years.