ERCIM "Alain Bensoussan"
Fellowship Scientific Report

Fellow: Georgios Karopoulos
Visited Location :   CNR, Italy
Duration of Visit: 1/10/2010 – 30/09/2011

I - Scientific activity
(1 page at maximum)

Nowadays, multimedia delivery is a very important service class and it is one of the most promising ways to increase the income of telecommunication organizations. Multimedia have great importance in today's and future networks no matter whether these are wired or wireless and services like VoIP, MMS and video broadcasting can be realized in a variety of platforms ranging from desktops to mobile devices.

In these heterogeneous networks, security is one of the most challenging issues towards the integration of systems belonging to different providers, irrespective of whether these are network or content providers. This integration will create an environment where trusted operators are mixed with untrusted and/or unknown ones. However, preserving security in multimedia services should not come in the cost of systems interoperability or efficiency since perceived delays are not tolerated by the end users.

My previous research was focused on offering a multilevel approach with solutions to network and application levels which can be used together or as standalone solutions in all-IP heterogeneous networks. Under this perspective I have designed network level solutions based on the Context Transfer Protocol that protect end user privacy. Also, I have designed, implemented and experimentally evaluated a privacy framework for VoIP services based on SIP. The design of these solutions was made having security as well as efficiency and ease of deployment as the primary targets.

During my stay in CNR, I had the opportunity to work on a novel access control model, namely Usage Control (UCON) proposed by Park and Sandhu in 2004. The difference of this model compared to existing ones is that it supports mutable subject/object attributes which can change and continuous authorizations which can be revoked even during the access. In this context, I conducted research on the adoption of UCON in the environment of multimedia delivery in all-IP heterogeneous networks and especially SIP-based architectures. CNR had previous experience on working with UCON and had also developed an authorization server supporting the UCON model. Using this server and setting up the rest of the infrastructure (SIP proxies, Back-2-back user agent, normal user agents, intercepting and stressing tools) I manage to create a proper testbed for conducting experiments for a SIP architecture that supports the UCON model. In this testbed we had the opportunity to conduct several different types of experiments and prove our statements experimenting on different security policies and implementing different parts of the UCON model.

II- Publication(s) during your fellowship

Please insert the title(s), author(s) and abstract(s) of the published paper(s). You may also mention the paper(s) which were prepared during your fellowship period and are under reviewing.

G. Karopoulos, F. Martinelli, ``IMS session management based on Usage Control", The 8th FTRA International Conference on Secure and Trust Computing, data management, and Applications (STA 2011), 28-30 June 2011, Loutraki, Greece, Springer CCIS Communications in Computer and Information Science Series

Abstract. Multimedia applications have made their way to the wireless/mobile world and this is not likely to change. However, people have not stopped using multimedia services through wired networks and this is also something that is not foreseen to change. What really is changing in the coming networks is the separation of network and service providers; this separation is creating new security challenges since the end user does not have the same trust relationships with all these providers. This paper proposes an architecture for protecting end users from untrusted and unreliable multimedia service providers in Next Generation Networks (NGNs) that utilize the IP Multimedia Subsystem (IMS) for multimedia delivery. Our proposal is based on the Usage Control (UCON) model for monitoring continuously the multimedia content delivered to the end user and ensure that it is the proper content requested by the user.

G. Karopoulos, P. Mori, F. Martinelli, ``Continuous Authorizations in SIP with Usage Control", *accepted for publication*, 20th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2012), Special Session on "Security in Networked and Distributed Systems", February 15-17, 2012, Garching, Germany

Abstract. The Session Initiation Protocol (SIP) is an application layer signaling protocol for the creation, modification and termination of multimedia sessions and VoIP calls with one or more participants. SIP is widely accepted as the protocol that will dominate multimedia communications in the future and one of the reasons is that it can inherently support multidomain heterogeneous networks. While SIP operates in highly dynamic environments such as this, in current deployments its access control related operations are based on traditional access control models. The main problem these models face is that they were designed many years ago and under certain circumstances tend to be inadequate in today highly dynamic environments. Usage Control is an access control model that supports the same operations as traditional models do, but further enhances them with novel ones. In a previous work, an architecture supporting continuous authorizations on SIP based on the Usage Control model was presented. Here this architecture is further elaborated, extended and described in more detail. Moreover, a testbed has been set up to experimentally evaluate the performance of the proposed mechanism.

III -Attended Seminars, Workshops, and Conferences

Please identify the name(s), date(s) and place(s) of the events in which you participated during your fellowship period.

Internet Festival event, 5-8 May 2011, Pisa, Italy

Policy 2011: IEEE International Symposium on Policies for Distributed Systems and Networks Pisa, Italy, June 6-8, 2011

STA 2011: The 8th FTRA International Conference on Secure and Trust Computing, data management, and Applications, 28-30 June, 2011, Loutraki, Greece

NIS '11: The 4th Network and Information Security Summer School, 1 July 2011, Heraklio, Crete, Greece

IV – Research Exchange Programme (12 month scheme)

Please identify the name(s), date(s) and place(s) of your Research Exchanges during your fellowship period and detail them .

Fraunhofer FOKUS, 5-9 September 2011, Berlin, Germany

My first visit was at the NGNI (Next Generation Network Infrastructures) Center of Fraunhofer FOKUS institute where I had the opportunity to cooperate with Dr. Yacine Rebahi, who is a senior researcher in FOKUS, and with other scientists of the institute. I had some interesting discussions with him about my work in my PhD thesis, my postdoctoral research in CNR and the related research in FOKUS. My second day there, September 6th, I gave a presentation on the work I have done in CNR during my fellowship on applying the UCON model on SIP architectures. The same date another presentation followed presenting the work that is been done in FOKUS and the related research projects that are in progress. The next few days I had the opportunity to attend some more presentations of researchers presenting their personal research and have some discussions. These discussions where about SIP security, mobile voting security and AAA architectures; actually, the NGNI center is very active on these areas which are very closely related to my work and the whole visit turn out to be of particular interest.

University of Malaga, 19-23 September 2011, Malaga, Spain

My second visit was at the Information Security group of the University of Malaga where my scientific contact was Dr. Javier Lopez. I gave a presentation about my postdoctoral research to the members of the research group followed by an interesting discussion on the presented work. Some members of the group work on QoS so the discussions where also related to this area, and even if QoS is not the main issue I am investigating in my work, these discussions created many open questions which can be helpful in the future as new lines of research. During this week I had also private discussions with the members of the group about their research work and also the opportunity to attend a PhD thesis defense of one of the group members. I found my visit to the University of Malaga very interesting and I believe that the discussions with the scientist there will be of value in my future research plans.