

REPORT: CoreGRID Fellowship Period-1 (Jan-Sep 2006) at CETIC

Validation and Verification of Grid Application Security Requirements and Derivation of Quality of Service Parameters for Using Semantic Grid Services

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Abstract

This report summarizes the research activities that I performed during the first part of my CoreGRID Fellowship at the Centre of Excellence in Information and Communication Technologies (CETIC), Belgium. This report provides a concise account of the accomplishments; list of publications and scientific talks; list of tutorials and the conferences served as program committee member; list of the specialised courses and meeting attended; and the award won during this fellowship period.

Acknowledgements

I would like to express my sincere gratitude to my scientific host, Philippe Massonet. His vision and committed concentration towards technical quality was the beacon light for my research activities. Moreover, his generous support and valuable personal favours helped me a lot in settling down in the new environment. I am grateful to Alvaro Arenas for his sincere help and significant feedback at various occasions.

I owe gratitude to the CETIC researchers with whom I frequently engaged in scientific and technical discussions. I am equally indebted to the administrative staff members of CETIC and CoreGRID Network of Excellence who have been kind enough to help in their respective roles.

Last but certainly not the least, I would like to thank the CETIC Director, Pierre Guisset, for his enduring motivations and support for producing high quality results.

Fellowship Assignments

The fellowship assignment – validation and verification of Grid application security requirements and derivation of quality of service parameters for using semantic Grid services – contributes to the general objective of the CoreGRID workpackage-2 (WP2) roadmap: providing an integrated view of data and knowledge management in Grids. The first part of the fellowship at CETIC deals with system-level, distributed storage management issues (Task 2.1 of the WP2). Issues related to *storage management policies* were addressed by modelling security requirements at the application level.

A comprehensive study of the requirements engineering tools and the policy specification languages was carried out to skim the best means of pursuing this activity. An existing distributed file system was thoroughly analysed with special focus on its security requirements. Based on this solid groundwork, requirement models were developed and refined to reflect the intrinsic security requirements of the Grid Data Management Systems (GDMS). Emphasis was given to the secure fault-tolerant replica generation of the distributed files. Next logical step of this research activity was the derivation of security policies from these requirement models. Policies templates are developed to properly interpret and rationale the security requirements. The derived policies are then refined and translated into operational policies. These operational policies are ready to be implemented in a real system. This work is still in progress and the follow-up of this work during the second part of the fellowship at CCLRC will explore techniques that will turn storage systems into knowledge representation systems (Task 2.2 of the WP2).

Publications

Research Papers

1. Naqvi S., Massonet P., Arenas A., 'Scope of Forensics in Grid Computing – Vision and Perspectives', International Workshop on Information Security and Digital Forensics 2006 (ISDF 2006), Sorrento, Italy, 01-04 December 2006
2. Naqvi S., Arenas A., Massonet P., 'Deriving Policies from Grid Security Requirements Model', CoreGRID Integration Workshop, Krakow, Poland, 19-20 October 2006
3. Naqvi S., Massonet P., Arenas A., 'Formalizing Security Requirements for Grids', Cracow Grid Workshop 2006 (CGW'06), Krakow – Poland, 15-18 October 2006
4. Naqvi S., Massonet P., Arenas A., 'Pragmatic Security Analysis of the Grid – A Requirements Engineering Perspective', 4th International Conference on Information Systems Security 2006, Mostar, Bosnia-Herzegovina, 10-12 September 2006
5. Naqvi S., Massonet P., Arenas A., 'Security Requirements Model for Grid Data Management Systems', International Workshop on Critical Information Infrastructure Security 2006 (CRITIS'06), Samos Island, Greece, 30 August – 02 September 2006
6. Naqvi S., Poitou O., Massonet P., Arenas A., 'Security Requirements Analysis for Large-scale Distributed File Systems', CoreGRID Workshop on Middleware, Dresden, Germany, 29 August – 01 September 2006

Technical Reports

1. Naqvi S., Massonet P., Arenas A., 'Security Requirements Analysis for *FileStamp* Distributed File System', CoreGRID European Network of Excellence Technical Report TR-0038, July 28, 2006
2. Naqvi S., Massonet P., Arenas A., 'A Study of Languages for the Specification of Grid
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Security Policies', CoreGRID European Network of Excellence Technical Report TR-0037, April 14, 2006

Scientific Talks

Apart from presenting the above mentioned research papers in the respective conferences, I delivered the following talks:

1. Naqvi S., 'Deployment of a gLite-based Grid Platform at CETIC', Enabling Grids for E-Science Conference 2006 (EGEE'06), Geneva – Switzerland, September 26, 2006
2. Naqvi S., 'Security Requirements Analysis – Formal Models, Policy Derivation, and Security Rationales', International School on Foundations of Security Analysis and Design 2006 (FOSAD2006), Bertinoro – Italy, September 15, 2006
3. Naqvi S., 'Grid Data Management Systems and their Security Requirements', Information Society Technologies Framework Programme 6 (IST FP6) Inter-Project Security Workshop, Sankt Augustin, Germany, June 9, 2006
4. Naqvi S., 'The Outcomes and Lessons Learned from the SEINIT Project and the Ongoing Challenges', IFIP International Information Security Conference “Security and Privacy in Dynamic Environments”, Karlstad, Sweden, May 23, 2006
5. Naqvi S., 'Security for the Grid Applications', Department of Computer Science – Catholic University of Louvain, Louvain-la-Neuve, Belgium, March 22, 2006
6. Naqvi S., 'Grid Security', Department of Computer Science – University of Science and Technology, Lille, France, February 23, 2006
7. Naqvi S. et al., 'How to guarantee your IT security, especially in the mobile world? Which risks? Which solutions? How to launch a global security plan?', Technical Session 1, Business Solution Forum, Charleroi, Belgium, February 09, 2006

Accepted Tutorials

1. Naqvi S., 'Grid Security – Operational Requirements', Grid5000 Winter School, Rouen, France, 27-28 November 2006
2. Naqvi S., 'Grid Security – Principles and Practices', Cracow Grid Workshop 2006 (CGW'06), Krakow, Poland, 15 October 2006

Program Committee Member

1. IEEE International Conference on e-Science and Grid Computing 2006 (e-Science 2006), Amsterdam, Netherlands, 4-6 December 2006
2. IEEE International Symposium on Parallel Distributed Processing and Applications 2006 (ISPA'06), 4-6 December 2006, Sorrento, Italy

Specialized Courses Attended

- 10-16 Sep. **International School on Foundations of Security Analysis and Design**,
2006 Bertinoro – Italy
Organized by European Association for Theoretical Computer Science – Italian

Chapter (EATCS-IT), European Educational Forum (EEF), European Research Consortium in Informatics and Mathematics (ERCIM) Working Group on Security and Trust Management, International Federation for Information Processing (IFIP) Working Group 1.7 – Theoretical Foundations of Security Analysis and Design

12-16 Jun. **Summer School on Cryptographic Hardware, Side-Channel and Fault Attacks,**
2006 Louvain-la-Neuve – Belgium
Organized by ECRYPT Network of Excellence

Meetings Attended

In-House

1. CETIC regularly organise **Technical Information Meetings (TIM)** where not only CETIC's researchers present their work but also external experts are invited to present their work.
2. Catholic University of Louvain, one of the CETIC's founder universities, regularly organise **Information Research Meetings (IRM)** where university's researchers, graduate students, and invited speakers present research results.
3. The KAOS (Knowledge Acquisition in autOmedated Specification) research group of the Computer Science and Engineering department of Catholic University of Louvain regularly organise **KAOS Research Meetings (KRM)** where recent advances in Requirements Engineering are presented and debated.
4. Information Security Research Group of the University of Namur (which is also a founder university of CETIC) occasionally organises **research symposia**

External

1. NESSI Grid Strategic Research Agenda Workshop, Brussels, Belgium, 18 September 2006
2. NESSI Trust, Security & Dependability Working Group Meeting, Paris, France, 8 September 2006
3. ESFORS Workshop on Software and Service Development, Security & Dependability, Paris, France, 6-7 September 2006
4. IEEE International Symposium on High Performance Distributed Computing 2006 (HPDC-15), Paris, France, 19-13 June 2006
5. GridTrust Kick-off Meeting, Charleroi, 1-2 June 2006
6. Security Task Force Workshop on Security & Dependability in Mobile and Wireless: Future Requirements for R&D, Brussels, Belgium 11-12 May 2006
7. SecurIST Workshop, Brussels, Belgium 22 March 2006
8. NESSI Forum Conference, Brussels, Belgium, 26 January 2006

Awards

May 2006 Elevation to the grade of **Senior Member** Institute of Electrical and Electronics Engineers (IEEE)

“... This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning ...”