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Edited by
L.M. Venter
R.R. Lombard
Foreword

This book contains a collection of papers presented at a Research and Development conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT). The conference was held on 13 & 14 November 1997 at the Riverside Sun, Vanderbijlpark. Most of the organization for the conference was done by the Department of Computer Science and Information Technology of the Vaal Triangle Campus, Potchefstroom University for Christian Higher Education.

The programming committee accepted a wide selection of papers for the conference. The papers range from detailed technical research work to reports of work in progress. The papers originate mainly from Academia, but also describe work done in and for Industry. It is hoped that the papers give a true reflection of the current research scene in Computer Science and Information Technology in South Africa. Since one of the aims of the conference is Research development, the papers were not subjected to a refereeing process.

A number of people spent numerous hours helping with the organization of this conference. In this regard, we wish to thank the members of the Organizing committee, and the Programming committee who had very little time to screen the abstracts and compile the program. A special thanks goes to the secretary of the department, Mrs Helei Jooste, whose very able work was interrupted by the birth of her first child.
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Table of Contents

Foreword

Organizing Committee

List of Contributors

Software Objects Change: Problems and Solution
S.A. Ajila

Liming-like Curve Constructions
M.L. Baart and R. McLeod

A Model for Evaluating Information Security
L. Barnard and R. von Solms

Integrating Spatial Data Management and Object Store Technology
S. Berman, S. Buffler and E. Voges

Metamodelling in Automated Software Engineering
S. Berman and R. Figueira

Using Multimedia Technology for Social Upliftment in Deprived Communities of Southern Africa
L. Bester and E. de Preez

Extending the Client-Server Model for Web-based Execution of Applications
L. Botha, J.M. Bishop and N.B. Serbedzija

Access Control Needs in an Electronic Workflow Environment
R.A. Botha

The Use of the Internet in an Academic Environment to Commercially Supply and Support Software Products
B. Braude and A.J. Walker

Explanation Facilities in Expert Systems Using Hypertext Technology
T. Breetzke and T. Thomas

Theoretical Computer Science: What is it all about, and is it of any relevance to us?
C. Brink

Representing Quadrics on a Computer
M.A. Coetzee and M.L. Baart
The Generation of Pre-Interpretations for Detecting Unsolvable Planning Problems
D.A. de Waal, M. Denecker, M. Bruynooghe and M. Thielscher

The Emerging Role of the Chief Information Officer in South Africa
B. Dekenhah

A Java-Implemented Remote Respiratory Disease Diagnosis System on a High Bandwidth Network
A. Foster

Early Results of a Comparative Evaluation of ISO 9001 and ISO/IEC 15504 Assessment Methods Applied to a Software Project
C. Gee and A.J. Walker

A Neural Network Model of a Fluidised Bed
M. Hajek

The Effects of Virtual Banking on the South African Banking Industry
M.L. Hart and M. Dunley-Owen

Linear Response Surface Analysis and Some Applications
J.M. Hattingh

Model Checking Software with Symbolic Trajectory Evaluation
A. Hazelhurst

A Risk Model to Allocate Resources to Different Computerized Systems
H.A. Kruger and J.M. Hattingh

Returns on the Stock Exchange
J.W. Kruger

Cardinality Constrained 0-1 Knapsack Problems
M.F. Kruger, J.M. Hattingh and T. Steyn

An Investigation in Software Process Improvement in the Software Development of a large Electricity Utility
M. Lang and A.J. Walker

Design and Implementation of a C++ Package for Two-Dimensional Numerical Integration
D.P. Laurie, L Pluym and Ronald Cools

Algebraic Factorization of Integers Using BDE's
H. Messerschmidt and J. Robertson
Global Optimization of Routes after the Process of Recovery
M. Mphahlele and J. Roos

Using a Lattice to Enhance Adaptation Guided Retrieval in Example Based Machine Translation
G.D. Oosthuizen and S.L. Serutla

Information Systems Development and Multi Criteria Decision Making / Systems Thinking
D. Petkov, O. Petkova

The Development of a Tutoring System to Assist Students to Develop Answering Techniques
N. Pillay

Combining Rule-Based Artificial Intelligence with Geographic Information Systems to Plan the Physical Layer of Wireless Networks in Greenfield Areas
K. Prag, P. Premjeeth and K. Sandrasegaran

A Distributed Approach to the Scheduling Problem
V. Ram and P. Warren

More readings than I thought: Quantifier Interaction in Analysing the Temporal Structure of Repeated Eventualities
S. Rock

Ray Guarding Configuration of Adjacent Rectangles
I. Sanders, D. Lubinsky and M. Sears

Developing Soft Skills in Computer Students
C. Schröder, T. Thomas

Information Security Awareness, a Must for Every Organization
M. Thomson and R. von Solms

Pia Va: A Lightweight Persistent Java Virtual Machine
S. Tjasink and S. Berman

Beliefs on Resource-Bounded Agent
E. Viljoen

Object-Orientated Business Modelling and Re-engineering
M. Watzenboeck
On Indexing in Case Based Reasoning Applied to Pre-Transportation Decision Making for Hazardous Waste Handling
K.L. Wortmann, D. Petkov and E Senior

Author Index
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Access control needs in an electronic workflow environment

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Abstract

This paper defines an electronic workflow environment as being conducive to the performance of business processes according to certain policies and practices in an electronic fashion. The workflow procedure will be facilitated by the flow of information (frequently contained in non-structured or semi-structured documents) on different routes between business roles according to certain rules.

It is important that a business should be able to trust the information which is distributed through and generated in the workflow mechanism. Information security therefore is an extremely important aspect in the electronic workflow environment. The protection of the integrity of the information can be considered one of the principle building blocks in securing the environment. It is furthermore important to be able to prove that the information is authentic. The controls exercised by the electronic workflow environment should be able to keep information from being disclosed to unauthorized parties. Access control is, therefore, an important aspect, however the success of all access control mechanisms is reliant on the availability of authenticated identities.

This paper evaluates the access control needs of the electronic workflow environment by studying the burdens that each of the components of the workflow environment places on the access control mechanism. The needs are illustrated by referring to electronic documents as one of the principle communication mechanisms in the workflow environment. Subsequently a checklist for the access control needs of the electronic workflow environment is presented.

The paper then presents certain access control mechanisms and techniques that are frequently used. These are evaluated for use in an electronic workflow environment in terms of the presented checklist.

This paper provides proof that conventional access control mechanisms and their related management techniques are insufficient for the much more dynamic electronic workflow environment.
1. INTRODUCTION

Several newer technologies are strongly reliant on modern telecommunication facilities. Strauss (1993) claims: "LAN boom paves the way for client/server". Multimedia technologies requires large bandwidth and sophisticated compression techniques. The increasing use of the internet in business requires network connectivity and large bandwidth.

Symonds (1994) points out that the use of these different technologies provides the "glue" to bind the organization into a fully functional unit. If used properly then these technologies can effectively support the organizations in its business venture – the organization can become more responsive to customer needs, communication (both internally and externally) can be enhanced and overall productivity can be increased.

Very few (if any) objectives that a company wants to meet will only involve an individual. Usually the collective efforts of several employees or groups of employees will be needed. Certain people must therefore do specific parts of the work. Some parts of the work can only be done when another part or other parts have been completed. From this description it is clear that work "flows" in an organization between different people or groups of people – from there the term workflow. Section 2 will define the workflow environment more rigorously.

2. DEFINING THE WORKFLOW ENVIRONMENT

Workflow software provides the environment to design, manage, execute and monitor business processes (Abbot and Surin, 1994). It is important to realize that this stretches further than automation. Although automation does potentially form a small part in the bigger workflow paradigm it should be noted that the real advantages in workflow reside in the facilitation of "flow" in the process. The focus is on the ability to manage processes using information, rather than automation through information technology (Abbot and Surin, 1994).

A workflow environment can therefore be defined by looking at the components present in such an environment:

**Business Processes** are initiated to achieve a specific goal. The goal can be seen as the "what" of the process (Abbot and Surin, 1994).

In order to achieve the goal a **procedure** can be followed. This represents the "how" of the process (Abbot and Surin, 1994).
These procedures are handled according to different policies, however occasionally they may be replaced by certain practices (Marchak, 1994).

Employees performing different business roles perform the different units of work. Different rules will be used to route the work on different routes in the organization (Marchak, 1994).

3. INFORMATION SECURITY NEEDS

Information security deals with different aspects. From a security perspective it is important to ensure that the information is sound (integrity) and that it is authentic. It is furthermore necessary to be able to proof that an identity is who it claims to be (authentication). Furthermore access to information needs to be controlled (authorization).

Although this paper will only address the authorization (access control) aspect of security it is important to note that access control mechanisms cannot be successful unless a proper authentication mechanism exists.

The next paragraph will specifically investigate the access control mechanisms for the workflow environment.

4. ACCESS CONTROL FOR THE WORKFLOW ENVIRONMENT

Under certain circumstances a "need-to-know" policy must be followed. This necessitates the inclusion of the business processes in the access control mechanism. Essentially people will only have access to certain information if they need it to complete a specific task (Holbein, Teufel, Morger & Bauknecht, 1997).

Access control mechanisms should also allow for the dynamic changing environment. People may frequently join or leave workgroups. This would require continuous management of the access control mechanisms (Ellis and Wainer, 1994).

Routes may include "non-electronic" routes, as well as routes that are defined outside the workflow environment. Abbott and Sarin (1994) points out that this will be the case until workflow systems become truly ubiquitous.

Certain types of rules have an obvious access control aspect. Using temporary staff or contractors for certain jobs need special consideration in the workflow process.

Business practices can "bypass" certain authority under certain conditions. It is important to control this through the security mechanisms as to prevent unnecessary bypassing of security mechanisms.
Although these needs represent an extremely limited subset of the security needs of the workflow environment it can already be seen that the workflow environments requires dynamically changing access control mechanisms. The next section evaluates currently used access control mechanisms.

5. CURRENT ACCESS CONTROL MECHANISMS

This section evaluates three access control techniques and points towards their strengths and weaknesses with respect to the workflow environment.

*Access control matrixes* specify the type of access by a subject to an object. It could therefore specify that user A has read access to object X (Shen & Dewan, 1992).

This basic matrix model can be extended to include other operations, e.g. allow statistical operations, but not individual read access (Frank, 1988). Since the matrix are evaluated every time the subject attempts to access an object the matrix can be enhanced to contain other kinds of information, e.g. the time of day which the access is valid (Frank, 1988). The same concept can be used to include information about during which business processes which kind of access is allowed. Doing it this way would, however, significantly increase the management overhead. If a new employee joins, for example, he needs to be registered for all possible business processes that he may partake in.

*Role based access control mechanisms* essentially work the same, except that access is not specified per subject, but per subject role. For example all engineers will have certain rights. To maintain such profiles per business process, however still represent a major management effort (Pottas, 1993).

*Access control lists* (ACLs) can be associated with subjects and/or objects. An ACL associated with a subject contains information regarding the objects that the subject may access, whereas an ACL associated with objects contains information regarding the subjects that may access that object. In both cases it will also contain information on the type of access allowed. Kaufman, Perlman and Speciner (1995) points out that it can be a very cumbersome exercise to maintain these access control list. Zykowski (1996) points out that the ACLs can be changed programmatically according to certain business rules to allow for it to adapt itself according to the business processes. This makes the access control mechanisms slightly more dynamic, but it cannot be implemented on a generic basis as those security features are not implemented as a security service, but as part of the application. It would therefore require special application programming.
The security mechanisms discussed could therefore be "forced" on the workflow environment, but could potentially incur a management burden that far outweighs the possible advantages.

6. CONCLUSION

Currently popular mechanisms have a problem in so far as dynamism and therefore management techniques are concerned. If current access control mechanisms are adapted to be used in the workflow environment the management burden increases to an unacceptable level. A need to develop access control mechanisms specifically suited for the electronic workflow environment therefore exists.

REFERENCES


