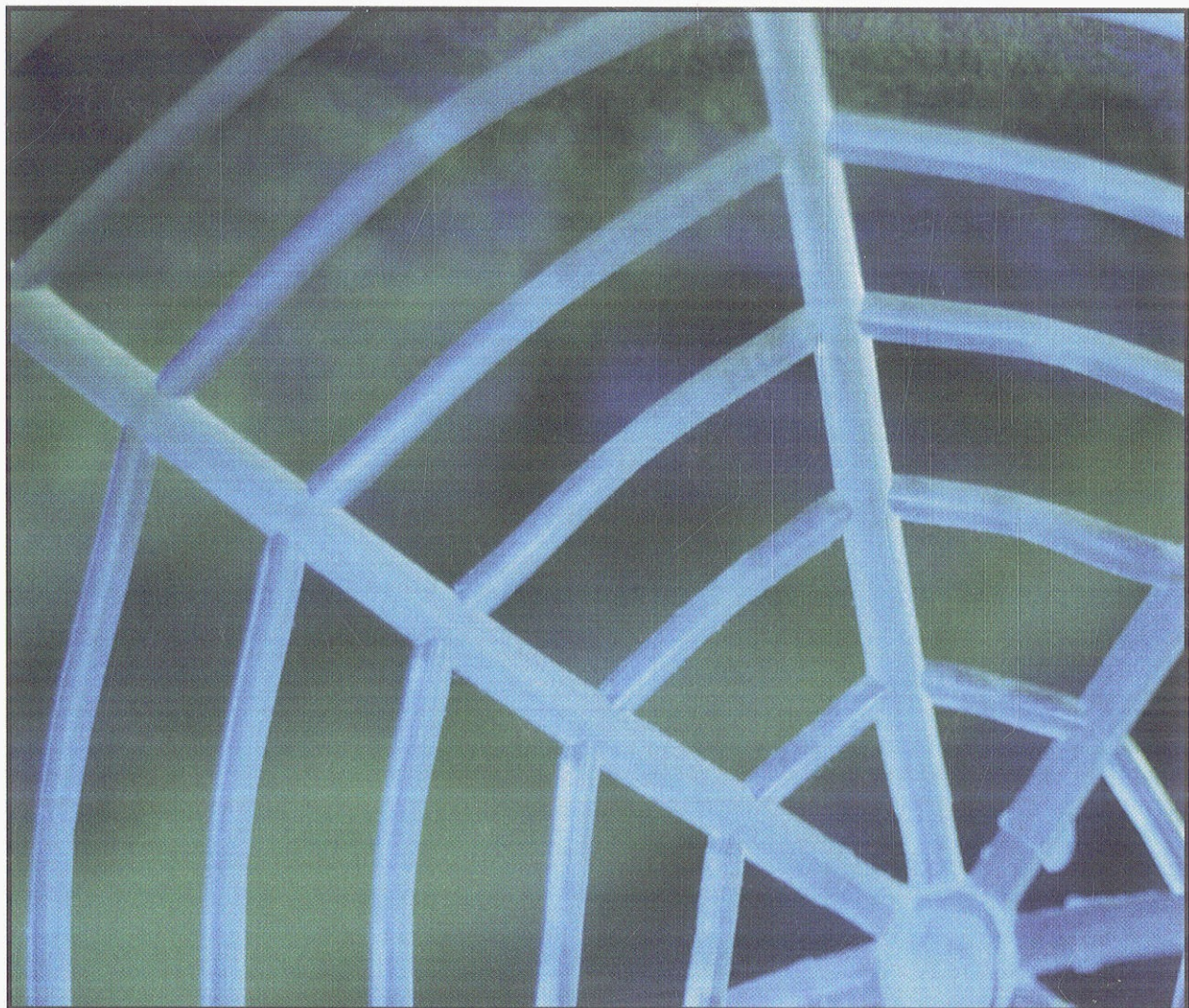


PREMIER REFERENCE SOURCE

Integrated Approaches in Information Technology and Web Engineering

Advancing Organizational Knowledge Sharing



Ghazi Alkhatib & David Rine

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Chapter I

Integration of Libre Software Applications to Create a Collaborative Work Platform for
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Libre software provides powerful applications ready to be integrated for the build-up of platforms for internal use in organizations. The authors of this chapter describe the architecture of the collaborative work platform which they have integrated, designed for researchers at GET. They present the elements learned during this project in particular with respect to contribution to external libre projects, in order to better ensure the maintainability of the internal applications, and to phpGroupware as a framework for specific applications development.

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FLOSSmole: A Collaborative Repository for FLOSS Research Data and Analyses 18

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This chapter introduces and expands on previous work on a collaborative project, called FLOSSmole (formerly OSSmole), designed to gather, share and store comparable data and analyses of free, libre, and open source software (FLOSS) development for academic research. The project draws on the ongoing collection and analysis efforts of many research groups, reducing duplication, and promoting

compatibility both across sources of FLOSS data and across research groups and analyses. The chapter outlines current difficulties with the current typical quantitative FLOSS research process and uses these to develop requirements and presents the design of the system.

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Source code management repositories of large, long-lived libre (free, open source) software projects can be a source of valuable data about the organizational structure, evolution and knowledge exchange in the corresponding development communities. Unfortunately, the sheer volume of the available information renders it almost unusable without applying methodologies which highlight the relevant information for a given aspect of the project. Such methodology is proposed in this chapter, based on well known concepts from the social networks analysis field, which can be used to study the relationships among developers and how they collaborate in different parts of a project. It is also applied to data mined from some well known projects (Apache, GNOME, and KDE), focusing on the characterization of their collaboration network architecture. These cases help to understand the potentials of the methodology and how it is applied, but also show some relevant results which open new paths in the understanding of the informal organization of libre software development communities.

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Understanding the context, structure, activities, and content of software development processes found in practice has been and remains a challenging problem. In the world of free/open source software development, discovering and understanding what processes are used in particular projects is important in determining how they are similar to or different from those advocated by the software engineering community. Prior studies have revealed that development processes in F/OSSD projects are different in a number of ways. In this chapter, the authors describe how a variety of modeling perspectives and techniques are used to elicit, analyze, and validate software development processes found in F/OSSD projects, with examples drawn from studies of the software requirements process found in the NetBeans.org project.

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The aim of this chapter is to report the results of a migration to Open Source Software (OSS) in one Public Administration. The migration focuses on the office automation field and, in particular, on the OpenOffice.org suite. The authors have analysed the transition to OSS considering qualitative and quantitative data collected with the aid of different tools. All the data have been always considered from the point of view of the different stakeholders involved, IT managers, IT technicians, and users.

The results of the project have been largely satisfactory. However the results cannot be generalised due to some constraints, like the environment considered and the parallel use of the old solution. Nevertheless, the authors think that the data collected can be of valuable aid to managers wishing to evaluate a possible transition to OSS.

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Business and recreational activities on the global communication infrastructure are increasingly based on the use of remote resources and services, and on the interaction between different, remotely located parties. In such a context, Single Sign-On technologies simplify the log-on process allowing automatic access to secondary domains through a unique log-on operation to the primary domain. This chapter evaluates different Single Sign-On implementations focusing on the central role of Open Source in the development of Web-based systems. This chapter outlines requirements for Single Sign-On systems and evaluate four existing Open Source implementations in terms of degree of fulfilment of those requirements. Finally, the authors compare those Open Source systems with respect to some specific Open Source community patterns.

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Conventional desktop software applications are usually designed, built, and tested on a platform similar to the one on which they will be deployed and run. Wireless mobile application development, on the other hand, is more challenging because applications are developed on one platform (like UNIX or Windows) and deployed on a totally different platform like a cellular phone. While wireless applications can be much smaller than conventional desktop applications, developers should think in the small in terms of the devices on which the applications will run and the environment in which they will operate instead of the amount of code to be written. This chapter presents a systematic approach to engineering wireless

application and offers practical guidelines for testing them. What is unique about this approach is that it takes into account the special features of the new medium (mobile devices and wireless networks), the operational environment, and the multiplicity of user backgrounds; all of which pose new challenges to wireless application development.

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In this chapter, a novel prediction technique is proposed, which uses road topology information for prediction. The proposed scheme uses real time positioning information and road topology information, which matches with the real environment. The scheme uses flexible channel assignment to maintain a better tradeoff between forced termination and call blocking probabilities. For reservation of resources in advance, the information about future handoffs is obtained from the road topology prediction technique. To show the effectiveness of the prediction scheme and flexible channel assignment scheme, this work aims at simulation of other channel assignment strategies viz., fixed and dynamic channel assignment strategy with and without incorporating the prediction based on road topology information. It gives accurate prediction results which helps to maintain a better QoS and resource management.

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High Performance Scheduling Mechanism for Mobile Computing Based on Self-Ranking

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Due to the rapidly increasing of the mobile devices connected to the internet, a lot of research is being conducted to maximize the benefit of such integration. The main objective of this chapter is to enhance the performance of the scheduling mechanism of the mobile computing environment by distributing some of the responsibilities of the access point among the available attached mobile devices. To this aim, the authors investigate a scheduling mechanism framework that comprises an algorithm provides the mobile device with the authority to evaluate itself as a resource. The proposed mechanism is based on the proposing of “self ranking algorithm (SRA)” which provides a lifetime opportunity to reach a proper solution. This mechanism depends on event-based programming approach to start its execution in a pervasive computing environment. Using such mechanism will simplify the scheduling process by grouping the mobile devices according to their self -ranking value and assign tasks to these groups. Moreover, it will maximize the benefit of the mobile devices incorporated with the already existing grid systems by using their computational power as a subordinate value to the overall power of the system.

Chapter X

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This chapter proposes hierarchal scheduling schemes for Grid systems: a self-discovery scheme for the resource discovery stage and an adaptive child scheduling method for the resource selection stage. In addition, the authors propose three rescheduling algorithms: (1) the Butterfly algorithm in order to re-schedule jobs when better resources become available, (2) the Fallback algorithm in order to reschedule jobs that had their resources taken away from the Grid before the actual resource allocation, and (3) the Load-Balance algorithm in order to balance load among resources. A hybrid system to combine the proposed hierarchal schemes with the well-known peer-to-peer (P2P) principle is also proposed. The authors compare the performance of the proposed schemes against the P2P-based Grid systems through simulation with respect to a set of predefined metrics.

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Object replication is a well-known technique to improve performance of a distributed Web server system. This chapter first presents an algorithm to group correlated Web objects that are most likely to be requested by a given client in a single session so that they can be replicated together, preferably, on the same server. A centralized object replication algorithm is then proposed to replicate the object groups to a cluster of Web-server system in order to minimize the user perceived latency subject to certain constraints. Due to dynamic nature of the Web contents and users' access patterns, a distributed object replication algorithm is also proposed where each site locally replicates the object groups based on the local access patterns. The performance of the proposed algorithms is compared with three well-known algorithms and the results are reported. The results demonstrate the superiority of the proposed algorithms.

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In wireless communication environments, backoff is traditionally based on the IEEE binary exponential backoff (BEB). Using BEB results in a high delay in message transmission, collisions and ultimately wasting the limited available bandwidth. As each node has to obtain medium access before transmitting a message, in dense networks, the collision probability in the MAC layer becomes very high when a poor backoff algorithm is used. The Logarithmic algorithm proposes some improvements to the backoff algorithms that aim to efficiently use the channel and to reduce collisions. The algorithm under study is based on changing the incremental behavior of the backoff value. The Binary Exponential Backoff (BEB) is used by the Local Area Networks standards, IEEE 802.11, Medium Access Control (MAC).

BEB uses a uniform random distribution to choose the backoff value; this often leads to reducing the effect of window size increment. This chapter carries out a deeper study and analysis of the logarithmic backoff algorithm that uses logarithmic increment instead of exponential extension of window size to eliminate the degrading effect of random number distribution. Results from simulation experiments reveal that the algorithm subject to study achieves higher throughput and less packet loss when in a mobile ad hoc environment.

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Domain Name System (DNS) is the system for the mapping between easily memorizable host names and their IP addresses. Due to its criticality, the Internet Engineering Task Force (IETF) has defined a DNS Security Extension (DNSSEC) to provide data-origin authentication. In this chapter, the authors point out two drawbacks of the DNSSEC standard in its handling of DNS dynamic updates: 1) the on-line storage of a zone security key, creating a single point of attack for both inside and outside attackers, and 2) the violation of the role separation principle, which in the context of DNSSEC requires the separation of the roles of zone security managers from DNS name server administrators. To address these issues, the authors propose an alternative secure DNS architecture based on threshold cryptography. Unlike DNSSEC, this architecture adheres to the role separation principle without presenting any single point of attack. To show the feasibility of the proposed architecture, a threshold cryptography toolkit based on the Java Cryptography Architecture (JCA) is developed and a proof-of-concept prototype is built with the toolkit. The running results of the prototype on a representative platform show that the performance of this proposed architecture ranges from one to four times of DNSSEC's performance. Thus, through small performance overhead, the proposed architecture could achieve very high level of security.

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In mobile ad hoc networks, routing protocols are becoming more complicated and problematic. Routing in mobile ad hoc networks is multi-hop because of the limited communication range of wireless radios. Since nodes in the network can move freely and randomly, an efficient routing protocol is needed in order for such networks to be able to perform well in such an environment. In this environment the routing strategy is applied such that it is flexible enough to handle large populations and mobility and be able to minimize the use of the battery. Also it should be designed to achieve maximum packet delivery ratio. Furthermore, the routing protocol must perform well in terms of fast convergence, low routing delay, and low control overhead traffic. In this chapter an improved implementation of the Fisheye State Routing (FSR) protocols is presented, where a new selection routing criteria that utilizes a minimum number of hops is a selection metric. The results obtained from simulation indicate that the fewer number of hops used the better and more efficient the output for packet delivery ratio was generated

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Modeling Variant User Interfaces for Web-Based Software Product Lines 212

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Software product line (SPL) is a software engineering paradigm for software development. A software product within a product line often has specific functionalities that are not common to all other products within the product line. Those specific functionalities are termed “variant features” in a product line. SPL paradigm involves the modeling of variant features. However, little work in SPL investigates and addresses the modeling of variant features specific to user interface (UI). Unified Modeling Language (UML) is the de facto modeling language for object-oriented software systems. It is known that UML needs better support in modeling UIs. Thus, much research developed UML extensions to improve UML support in modeling UIs. Yet little of this work is related to developing such extensions for modeling UIs for SPLs in which variant features specific to UI modeling must be addressed. This research develops a UML extension -Web User Interface Modeling Language (WUIML) to address these problems. WUIML defines elements for modeling variant features specific to user interfaces for Web-based SPLs. The model elements in WUIML extend from the metaclass and BasicActivity of the UML2.0 metamodel. WUIML integrates the modeling of variant features specific to user interfaces to UML. WUIML defines a model element, XOR, to represent exclusive or conditions in a product line user interface model. WUIML would reduce SPL engineers’ efforts needed in UI development. To validate the WUIML research, a case study was conducted. The results of indicate that modeling UIs for Web-based SPLs using WUIML is more effective and efficient than using standard UML.

Section III Open Source

Chapter XVI

Experience Report: A Component-Based Data Management and Knowledge Discovery

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Organizations are beginning to apply data mining and knowledge discovery techniques to their corporate data sets, thereby enabling the identification of trends and the discovery of inductive knowledge. Many times, traditional transactional databases are not optimized for analytical processing and must be transformed. This article proposes the use of modular components to decrease the overall amount of human processing and intervention necessary for the transformation process. The authors’ approach configures components to extract data-sets using a set of “extraction hints”. This framework incorporates decentralized, generic components that are reusable across domains and databases. Finally, the authors detail an implementation of their component-based framework for an aviation data set.

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This article outlines a four-point strategy for the development of secure Web-based applications within an agile development framework and introduces strategies to mitigate security risks that are commonly present in Web-based applications. The proposed strategy includes the representation of security requirements as test cases supported by the open source tool FIT, the deployment of a highly testable architecture allowing for security testing of the application at all levels, the outlining of an extensive security testing strategy supported by the open source unit-testing framework HTTP Unit, and the introduction of the novel technique of security refactoring that transforms insecure working code into a functionally-equivalent secure code. Today, many Web-based applications are not secure, and limited literature exists concerning the use of agile methods within this domain. It is the intention of this article to further discussions and research regarding the use of an agile methodology for the development of secure Web-based applications.

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This chapter proposes a data warehouse integration technique that combines data and documents from different underlying documents and database design approaches. The well-defined and structured data such as Relational, Object-oriented and Object Relational data, semi-structured data such as XML, and unstructured data such as HTML documents are integrated into a Web data warehouse system. The user specified requirement and data sources are combined to assist with the definitions of the hierarchical structures, which serve specific requirements and represent a certain type of data semantics using object-oriented features including inheritance, aggregation, association and collection. A conceptual integrated data warehouse model is then specified based on a combination of user requirements and data source structure, which creates the need for a logical integrated data warehouse model. To evaluate the conceptual integrated data warehouse model a case study is developed using prototype in a Web-base environment. The evaluation of the proposed integration Web data warehouse methodology includes the verification of correctness of the integrated data, and the overall benefits of utilizing this proposed integration technique.

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<i>Mohammed Odeh, University of the West of England (UWE), UK</i>	
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This chapter studies the differences and similarities between domain ontologies and conceptual data models and the role that ontologies can play in establishing conceptual data models during the process of information systems development. A mapping algorithm has been proposed and embedded in a special purpose Transformation Engine to generate a conceptual data model from a given domain ontology. Both quantitative and qualitative methods have been adopted to critically evaluate this new approach. In addition, this chapter focuses on evaluating the quality of the generated conceptual data model elements using Bunge-Wand-Weber and OntoClean ontologies. The results of this evaluation indicate that the generated conceptual data model provides a high degree of accuracy in identifying the substantial domain entities along with their relationships being derived from the consensual semantics of domain knowledge. The results are encouraging and support the potential role that this approach can take part in the process of information system development.

Chapter XX

Modeling Defects in E-Projects 317

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It is now widely accepted that software projects utilizing the Web (e-projects) face many of the same problems and risks experienced with more traditional software projects, only to a greater degree. Further, their characteristics of rapid development cycles combined with high frequency of software releases and adaptations make many of the traditional tools and techniques for modeling defects unsuitable. This chapter proposes a model to explain and quantify the interaction between generic defect injection and removal processes in e-projects. The model is based upon published research and development from the field of quantitative ecological population modeling. This basic modeling approach is then subsequently tailored to fit the software production process within an e-project context.

Chapter XXI

Tool Support for Model-Driven Development of Web Applications 331

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This chapter describes the engineering foundations of VisualWADE, a CASE tool to automate the production of Web applications. VisualWADE follows a model-driven approach focusing on requirements analysis, high level design, and rapid prototyping. In this way, an application evolves smoothly from the first prototype to the final product, and its maintenance is a natural consequence of development. The chapter also discusses the lessons learned in the development of the tool and its application to several case studies in the industrial context.

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