Preface

INTRODUCTION

The chapters in this volume examine the impact of data communications and networking technologies, policies, and management on business organizations, capturing their effect on IT-enabled management practices. This book includes analytical and empirical research articles, business case studies, and surveys that provide solutions and insight into challenges facing telecommunication service providers, equipment manufacturers, enterprise users, and policy makers. The goal is to disseminate practical and theoretical information, which will enable readers to understand, manage, use, and maintain business data communication networks more effectively. This is why this volume addresses key technology, management, and policy issues for utilizing data communications and networking in business and the current best practices for aligning this important technology with the strategic goals of the organization.

OVERVIEW OF THE BOOK

The first chapter is "Linking the Popularity of Online Trading with Consumers' Concerns for Reputation and Identity Theft," by Alan D. Smith. Although online trading has its benefits, such as convenience and the ability to compare prices online, there are still many concerns about the integrity of the buyer, the seller and/or the online action service provider (OASP). This paper investigates these relationships via multivariate statistical analysis of a stratified sample of working professionals, resulting in 198 useable questionnaires from an initial sampling frame of over 550 professional personnel from five relatively large Pittsburgh, Pennsylvania, firms. The author found that buyers that felt feedback systems were viable were more willing to engage in online trading activities and pay a premium price for merchandise being sold by a seller with a better reputation, regardless of gender. Customers were especially concerned with the total price, including shipping cost, regardless of gender. In terms of the convenience of payment method, electronic forms were preferred in transacting online trading activities, regardless of age and gender.

"Antecedents of Security Pillars in E-Commerce Applications," by Amin A. Shaqrah investigates the relationship between internet security and e-business competence at banking and exchange firms in Jordan. The proposed conceptual model examines the antecedents and consequences of e-business competence and tests its empirical validity. The sample of 152 banking and exchange firms tests the posited structural equation model. The results consistently support the validity of the proposed conceptual model, the results also found that organizations realize the importance of e- business and are willing to proceed further with e-business. Beyond concerns about internet security, their awareness of security

hazards and internet performance is minimal. The author concludes that the public awareness of ICT in general is low. In light of the data collected, the author makes recommendations for the interested authorities to improve e-business in Jordan.

The next chapter is "A Novel Dynamic Noise-Dependent Probabilistic Algorithm for Route Discovery in MANETs," by Hussein Al-Bahadili and Alia Sabri. In mobile ad hoc networks (MANETs), broadcasting is widely used in route discovery and other network services. The most widely used broadcasting algorithm is simple flooding, which aggravates a high number of redundant packet retransmissions, causing contention and collisions. Proper use of dynamic probabilistic algorithm significantly reduces the number of retransmissions, which reduces the chance of contention and collisions. In current dynamic probabilistic algorithm, the retransmission probability (pt) is formulated as a linear/non-linear function of a single variable, the number of first-hop neighbors (k). However, such algorithm is suffers in the presence of noise due to increasing packet-loss. In this paper, the authors propose a new dynamic probabilistic algorithm in which pt is determined locally by the retransmitting nodes considering both k and the noise-level. This algorithm is referred to as the dynamic noise-dependent probabilistic (DNDP) algorithm. The performance of the DNDP algorithm is evaluated through simulations using the MANET simulator (MANSim). The simulation results show that the DNDP algorithm presents higher network reachability than the dynamic probabilistic algorithm at a reasonable increase in the number of retransmissions for a wide range of noise-level. The effects of nodes densities and nodes speeds on the performance of the DNDP algorithm are also investigated.

"Semantic Mobile Applications for Service Process Improvement" by Markus Aleksy, Bernd Stieger, and Thomas Janke, holds that the ongoing evolution of industrial field service is mainly driven by demographical changes, increasing complexity of products, and tremendous amounts of product information from enterprise information systems as well as from the emerging Internet of Things. To cope with these challenges, a combined approach utilizing semantic and mobile technologies fosters the provision of the right information, at the right time, in the right place, and to the right people. This paper investigates the exploitation potential of semantic mobile applications to support industrial service processes. Based on identified application scenarios, the authors developed concepts for process improvement and, thus, derived requirements. The necessary semantic data federations are considered in the presented architecture, which enables an integrated approach for tailored information retrieval from heterogeneous information sources.

Internet-based social network services (SNSs) have grown increasingly popular and are producing a great amount of content. Multiple users freely post their comments in SNS threads, and extracting the gist of these comments can be difficult due to their complicated dialog. In "Acquiring the Gist of Social Network Service Threads via Comparison with Wikipedia," Akiyo Nadamoto, Eiji Aramaki, Takeshi Abekawa, and Yohei Murakami propose a system that explores this concept of the gist of an SNS thread by comparing it with Wikipedia. The granularity of information in an SNS thread differs from that in Wikipedia articles, which implies that the information in a thread may be related to different articles on Wikipedia. The authors extract target articles on Wikipedia based on its link graph. When an SNS thread is compared with Wikipedia, the focus is on the table of contents (TOC) of the relevant Wikipedia articles. The system uses a proposed coverage degree to compare the comments in a thread with the information in the TOC. If the coverage degree is higher, the Wikipedia paragraph becomes the gist of the thread.

In "Query Processing in a Mediator Based Framework for Linked Data Integration," Vânia M. P. Vidal, José A. F. de Macêdo, João C. Pinheiro, Marco A. Casanova, and Fábio Porto present a three-level mediator based framework for linked data integration. In the approach, the mediated schema is

represented by a domain ontology, which provides a conceptual representation of the application. Each relevant data source is described by a source ontology, published on the Web according to the Linked Data principles. Each source ontology is rewritten as an application ontology, whose vocabulary is restricted to be a subset of the vocabulary of the domain ontology. The main contribution of the paper is an algorithm for reformulating a user query into sub-queries over the data sources. The reformulation algorithm exploits inter-ontology links to return more complete query results. The approach is illustrated by an example of a virtual store mediating access to online booksellers.

Context-aware software provides adapted services to users or other software components. On the other hand, Autonomic Pervasive Computing uses context to reduce the complexity of pervasive system utilization, management and maintenance. "Micro Context-Awareness for Autonomic Pervasive Computing," by Bessam Abdulrazak, Patrice Roy, Charles Gouin-Vallerand, Yacine Belala, and Sylvain Giroux, describes two context-awareness models, the macro and micro approaches, that define and integrate contextual views of individual pervasive components (micro level) and global knowledge of the system (macro level), and provides a more detailed overview of a micro Context-aware programming model for open smart space problems. These models are presented and compared with respect to their ability to meet the requirements of the Autonomic Pervasive Computing concept of the four selves.

In "Semantic Federation of Product Information from Structured and Unstructured Sources, " the authors present a generic architecture for federating heterogeneous information from various sources, including the Internet of Things, and argue how this process benefits from using semantic representations. Product-related information can be found in various data sources and formats across the product lifecycle. Effectively exploiting this information requires the federation of these sources, the extraction of implicit information, and the efficient access to this comprehensive knowledge base. Existing solutions for product information management (PIM) are usually restricted to structured information, but most of the business-critical information resides in unstructured documents. A reference implementation tailor-made to business users is explained and evaluated. The authors also discuss several issues they experienced that they believe to be valuable for researchers and implementers of semantic information systems, as well as the information retrieval community.

"The Role of Twitter in the World of Business," by Kevin Curran, Kevin O'Hara, and Sean O'Brien, examines the services people seek out on Twitter and the integration of Twitter into businesses. Twitter has experienced tremendous growth in users over the past few years, from users sharing to the world what they had for lunch to their opinions on world events. As a social media website, Twitter has become the third most popular behind only Facebook and YouTube. Its user base statistics ensure a wide audience for business to engage with. However, many find this a daunting prospect as there are no set guidelines as to how business might use the service. The ability to post quick short messages for the whole of the social network to see has encouraged people to use this microblogging platform to comment and share attitudes on company brands and products. The authors present how the business world is using the social network site as a new communication channel to reach customers and examine other possible uses for Twitter in a business context. This chapter also discusses how Twitter plans to move forward and evolve with its service, ensuring that personal, business and third party developers' best interests are catered to.

The next chapter is "Performance-Enhanced Caching Scheme for Web Clusters for Dynamic Content," by A. Raghunathan, and K. Murugesan. In order to improve the QoS of applications, clusters of web servers are increasingly used in web services. Caching helps improve performance in web servers, but is largely exploited only for static web content. With more web applications using backend databases today, caching of dynamic content has a crucial role in web performance. This paper presents a set of

cache management schemes for handling dynamic data in web clusters by sharing cached contents. These schemes use either automatic or expiry-based cache validation, and work with any type of request distribution. The techniques improve response by utilizing the caches efficiently and reducing redundant database accesses by web servers while ensuring cache consistency. The authors present caching schemes for both horizontal and vertical cluster architectures. Simulations show an appreciable performance rise in response times of queries in clustered web servers.

Mobile ad-hoc network, (MANET) is a collection of wireless mobile nodes dynamically forming a temporary communication network without using any existing infrastructure or centralized administration. To reduce routing overhead, computational complexity and overcome the problem of low bandwidth utilization, MANET is divided into several clusters. In "Fuzzy Logic-Based Mobility Metric Clustering Algorithm for MANETs," by P. Venkateswaran, Mousumi Kundu, Srishti Shaw, Kanika Orea, and R. Nandi, the authors propose a fuzzy logic based mobility metric for MANET that had been utilized as the basis of cluster formation in the algorithm viz., fuzzy clustering. This algorithm leads to more stable cluster formation compared to the existing MOBIC algorithm as evidenced by significant reduction in the number of clusterhead changes. As the frequency of cluster reorganization is a significant attribute, the proposed algorithm is expected to yield improved performance for MANETs.

"How Evolving Network Access and Network Management Technologies are Redefining the Competitive Wireless Markets," by Fernando Beltrán, Jairo A. Gutiérrez, and José Luis Melús, examines some of the key problems users encounter when accessing current generation wireless networks. Using a case study of a hypothetical user, the authors explore the emerging services and the new broadband wireless network technologies necessary to carry them out. This chapter analyses the issues associated with an observed trend in the industry that exposes potential changes to the long-term, rigid commercial relation between wireless providers and users: as a result of a range of evolved broadband wireless access standards and technologies, autonomic communications and policy-based management, and new pricing schemes, consumers will likely face new opportunities to enter short-term and spot contracts with the new wireless providers. This new landscape also allow multiple competing Access Providers (APs) to dynamically assign prices, and poses new and interesting challenges to the regulatory function. The paper also discusses a framework for the integration of heterogeneous technologies and management policies based on the network context that make up this emerging, hybrid wireless landscape, and describes the economic characteristics of new markets likely to arise.

Mobile Adhoc Networks (MANETs) are open to a wide range of attacks due to their unique characteristics like dynamic topology, shared medium, absence of infrastructure, and resource constraints. Data packets sent by a source node may reach destination through a number of intermediate nodes. In the absence of security mechanism, it is easy for an intermediate node to intercept or modify the messages, thus attacking the normal operation of MANET. One such attack is Black hole attack, in which, a malicious node called Black hole node attracts all the traffic of the network towards itself, and discards all the packets without forwarding them to the intended recipients. "Secure Video Transmission Against Black Hole Attack in MANETs," by M. Umaparvathi and Dharmishtan K. Varughese, evaluates the performance of Adhoc on-demand Distance Vector (AODV) and its multi-path variant Adhoc On-demand Multi-path Distance Vector (AOMDV) routing protocols under black hole attack. Non-cryptographic solutions Secure Blackhole AODV (SBAODV) and Secure Blackhole AOMDV (SBAOMDV) have been proposed to mitigate the effect of black hole attack. Through NS-2 simulations, the performance of the proposed protocols with video streaming is analyzed. The results show that the proposed solutions provide better performance than the conventional AODV and AOMDV.

The authors of the chapter "Enhancing Clustering in Wireless Sensor Networks with Energy Heterogeneity," Femi A. Aderohunmu, Jeremiah D. Deng, and Martin Purvis, propose a modified clustering algorithm with a three-tier energy setting, where energy consumption among sensor nodes is adaptive to their energy levels. While wireless sensor networks (WSN) are increasingly equipped to handle more complex functions, in-network processing still requires the battery-powered sensors to judiciously use their constrained energy so as to prolong the elective network life time. There are a few protocols using sensor clusters to coordinate the energy consumption in a WSN, but how to deal with energy heterogeneity remains a research question. A theoretical analysis shows that the proposed modifications result in an extended network stability period. Simulation has been conducted to evaluate the new clustering algorithm against some existing algorithms under different energy heterogeneity settings, and favorable results are obtained especially when the energy levels are significantly imbalanced.

The next chapter is, "New Strategies and Extensions in Kruskal's Algorithm in Multicast Routing," by Mohamed Aissa, Adel Ben Mnaouer, Rion Murray, and Abdelfettah Belghith. Multimedia applications are expected to guarantee end-to-end quality of service (QoS) and are characterized by stringent constraints on delay, delay-jitter, bandwidth, cost, and so forth. The authors observe that Kruskal's algorithm is limited to minimal (maximal) spanning unconstrained tree. As such, the authors extend Kruskal's algorithm to incorporate the delay bound constraint. Consequently, a novel algorithm is proposed, called EKRUS (Extended Kruskal), for constructing multicast trees. The EKRUS' distinguishing features consists of a better management of Kruskal's priority queues, and in the provision of edge priority aggregation. Preliminary results show that the proposed EKRUS algorithm performs as well as the best-known algorithms (such as the DDMC, DMCTc algorithms) while exhibiting reduced complexity. The authors conducted an intensive analysis and evaluations of different strategies of assigning edges into the classes of the queue as well as edge selection. As a result, the EKRUS algorithm was further extended with different edge assignment and selection strategies. Through extensive simulations, the authors have evaluated various versions of the EKRUS and analyzed their performance under different load conditions.

The last chapter is "Emerging Areas of Research in Business Data Communications," by Debashis Saha and Varadharajan Sridhar. Much like the financial crisis that precipitated a new world order, a quiet revolution of some sorts is happening in the telecom industry worldwide. The bankruptcy of stalwarts such as Nortel and the impregnation of Google and Apple into the mobile phone space at an amazing alacrity are changing the world order once dominated by the likes of biggies such as AT&T. What are these changes and what can we expect in the future? The authors in this chapter explore the emerging technologies, market evolution, business models, and regulatory interventions and indicate possible research directions in the area of data communications and networking in the coming days.

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