

MongoDB NoSQL Injection Analysis and Detection

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Abstract— A NoSQL, also called a “Non-Relational” or “Not only SQL,” database system provides an approach to data management and database design for very large sets of distributed data and real-time web applications. A NoSQL database system is also a popular data storage for information retrieval because it supports better scalability, availability, and faster data access while comparing with traditional relational database management systems (RDBMS). What the RDBMS data needs is predictable as its data is stored in structured tables by defining the relationship between the different columns. In contrary the data in NoSQL databases does not need to be stored in a structured or fixed fashion. When performance and real-time access are more concerned than consistency, such as indexing and retrieving large numbers of records, NoSQL databases are more suitable than relational databases. With their obvious advantages in better performance, scalability, and flexibility, NoSQL databases have been adopted lately by many small businesses as they are moving their increasing business data into the clouds. However, the research on the security of a specific NoSQL database system or NoSQL database systems in general is very limited. Although there are many storage advantages in NoSQL databases, the need of quick and easy access to data has been seriously affected by the security issue of NoSQL databases. This paper examines the maturity of security measures for MongoDB, a typical NoSQL database system, with aspects in both attack and defense at the code level. The experimental testing on NoSQL injections is performed with JavaScript and PHP. After the demonstration on how a server-side JavaScript injection attack against a NoSQL database system reveals the customer’s private data, two methods are discussed in preventing this type of security problems from happening. It is believed that our study will help database developers not only realizing that NoSQL database systems are not designed with security as a priority but also learning how to build a security layer to their organizations’ NoSQL applications to avoid NoSQL injections.

Keywords—NoSQL, Injection, Security Analysis, Defense, Detection Level

1. INTRODUCTION

Database security has been and will continue to be one of the most critical aspects of application security. Access to a database grants an attacker a dangerous amount of control

over the most critical information. For example, SQL injection is a code injection technique that is used to attack data driven applications, in which malicious SQL statements are inserted into an entry field for execution. The malicious user can use SQL commands insert to the Web form submission or enter the domain name to achieve the purpose of tricking the server to execute malicious SQL commands.

Recently, the NoSQL databases have become more and more popular because NoSQL databases provide looser consistency restrictions than traditional SQL databases do. By requiring fewer relational constraints and consistency checks, NoSQL databases often offer performance and scaling benefits [1]. Some examples are MongoDB [2], and Cassandra [3]. MongoDB can be adapted to all sizes of businesses and individuals since it is open source database. The data pattern can be updated flexibly with the development of the application while providing a secondary index and complete inquiry system. But does that mean NoSQL database systems are immune to injections? As an alternative to traditional relational database, NoSQL is a broad class of database management systems that are not traditional relational database management systems. They do not use SQL language as the primary query language, nor do they typically require fixed table schemas. NoSQL database system allows a user to change data attributes at any time, and data can be added anywhere. There is no need to specify a document design or even a collection up-front. NoSQL databases pay more attention to real-time data processing capability and they are good at directly operation on data access, which greatly promote the development of interactive software system. One of the biggest advantages is the ability to change attributes because of the weakening of structural, so modification process is very convenient.

However, this big advantage also affects its safety where the highest incidence of attacks is injection attacks. It has also been ranked in public enemy number one in the field of database relations. The fact that NoSQL does not use SQL language in queries does not mean it is immune to the threat of injection attacks. Many claim that SQL injection does not

Mongo Db Ieee Paper 2012

Luca Foschini, Spyros Kontogiannis



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Internet and Distributed Computing Systems Wenfeng Li, Shawkat Ali, Gabriel Lodewijks, Giancarlo Fortino, Giuseppe Di Fatta, Zhouping Yin, Mukaddim Pathan, Antonio Guerrieri, Qiang Wang, 2016-09-20 This book constitutes the proceedings of the 9th International Conference on Internet and Distributed Computing Systems IDCS 2016 held in Wuhan China in September 2016 The 30 full papers and 18 short papers presented in this volume were carefully reviewed and selected from 78 submissions They were organized in topical sections named body sensor networks and wearable devices cloud computing and networking distributed computing and big data distributed scheduling and optimization internet of things and its application smart networked transportation and logistics and big data and social networks **Computer Science And Technology - Proceedings Of The International Conference (Cst2016)** Ning Cai, 2016-11-28 This proceedings consists of selected papers presented at the International Conference on Computer Science and Technology CST2016 which was successfully held in Shenzhen China during January 8 10 2016 CST2016 covered a wide range of fundamental studies technical innovations and industrial applications in 7 areas namely Computer Systems Computer Network Security Databases and Information Systems Artificial Intelligence and Multimedia Theory and Software Engineering and Computer Applications CST 2016 aims to provide a forum for researchers engineers and students in the area of computer science and technology It features unique mixed various topics in computer science and technology including big data system architecture hardware and applications CST 2016 attracted more than 300 submissions Among them only 142 papers were accepted in to the conference after a stringent peer review process *Intelligent Strategies for ICT* M. Shamim Kaiser, Juanying Xie, Vijay Singh Rathore, 2024-05-10 This book contains best selected research papers presented at ICTCS 2023 Eighth International Conference on Information and Communication Technology for Competitive Strategies The conference was held in Jaipur India during 8 9 December 2023 The book covers state of the art as well as emerging topics pertaining to ICT and effective strategies for its implementation for engineering and managerial applications This book contains papers mainly focused on ICT for computation algorithms and data analytics and IT security The work is presented in three volumes Recent Advances in Signals and Systems Omid Ansary, Meng Lin, B. R. Shivakumar, 2024-11-19 This book comprises select peer reviewed papers from the International Conference on VLSI Signal Processing Power Electronics IoT Communication and Embedded Systems VSPICE 2023 The book provides insights into various aspects of electronics and communication engineering as a holistic approach The various topics covered in this book include VLSI embedded systems signal processing communication power electronics and the Internet of Things The contents mainly focus on the most recent innovations trends concerns and practical challenges and their solutions This book is useful for academicians professionals and researchers in the area of electronics and communications and electrical engineering **Conceptual Modeling** Juan C. Trujillo, Karen C. Davis, Xiaoyong Du, Zhanhuai Li, Tok Wang Ling, Guoliang Li, Mong Li Lee, 2018-09-25 This book constitutes the refereed

proceedings of the 37th International Conference on Conceptual Modeling ER 2018 held in Xi'an, China in October 2018. The 30 full and 13 short papers presented together with 3 keynotes were carefully reviewed and selected from 151 submissions. This event covers a wide range of the following topics: Conceptual modeling, studies, ontological modeling, semi-structured data modeling, process modeling and management, spatio-temporal modeling, cloud-based modeling, schema and view modeling, languages and models, NoSQL modeling, conceptual modeling for machine learning and reasoning, applications of conceptual modeling.

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compact book on the popular domain of NoSQL databases for IT professionals practitioners and professors Articulates and accentuates big data analytics and how it gets simplified and streamlined by NoSQL database systems Sets a stimulating foundation with all the relevant details for NoSQL database researchers developers and administrators **High**

Performance Computing Juan Luis Crespo-Mariño, Esteban Meneses-Rojas, 2020-02-12 This book constitutes the refereed proceedings of the 6th Latin American High Performance Computing Conference CARLA 2019 held in Turrialba Costa Rica in September 2019 The 32 revised full papers presented were carefully reviewed and selected out of 62 submissions The papers included in this book are organized according to the conference tracks regular track on high performance computing applications algorithms and models architectures and infrastructures and special track on bioinspired processing BIP neural and evolutionary approaches image and signal processing biodiversity informatics and computational biology **Metadata**

and Semantic Research Emmanouel Garoufallou, Fabio Sartori, Rania Siatri, Marios Zervas, 2019-02-23 This book constitutes the thoroughly refereed proceedings of the 12th International Conference on Metadata and Semantic Research MTSR 2018 held in Limassol Cyprus on October 23 26 2018 The 19 full and 16 short papers presented were carefully reviewed and selected from 77 submissions The papers are organized in topical sections on metadata linked data semantics ontologies and SKOS digital libraries information retrieval big linked social and open data cultural collections and applications Knowledge IT Artifacts KITA in professional communities and aggregations Digital Humanities and Digital Curation DHC European and national projects agriculture food and environment open repositories research information systems and data infrastructures

Decision Analytics for Sustainable Development in Smart Society 5.0 Vikram Bali, Vishal Bhatnagar, Joan Lu, Kakoli Banerjee, 2022-06-23 This book covers sustainable development in smart society s 5 0 using data analytics The data analytics is the approach of integrating diversified heterogeneous data for predictive analysis to accredit innovation decision making business analysis and strategic decision making The data science brings together the research in the field of data analytics online information analytics and big data analytics to synthesize issues challenges and opportunities across smart society 5 0 Accordingly the book offers an interesting and insightful read for researchers in the areas of decision analytics cognitive analytics big data analytics visual analytics text analytics spatial analytics risk analytics graph analytics predictive analytics and analytics enabled applications *Proceedings of 2nd International Conference on Communication, Computing and Networking*

C. Rama Krishna, Maitreyee Dutta, Rakesh Kumar, 2018-09-07 The book provides insights from the 2nd International Conference on Communication Computing and Networking organized by the Department of Computer Science and Engineering National Institute of Technical Teachers Training and Research Chandigarh India on March 29 30 2018 The book includes contributions in which researchers engineers and academicians as well as industrial professionals from around the globe presented their research findings and development activities in the field of Computing Technologies Wireless Networks Information Security Image Processing and Data Science The book provides opportunities for the readers to

explore the literature identify gaps in the existing works and propose new ideas for research

The Role of Cybersecurity in the Industry 5.0 Era Christos Kalloniatis, 2025-02-26 In the Industry 5.0 era technology and human innovation converge to redefine industries and societies bringing unprecedented opportunities and challenges Central to this transformation is cybersecurity the essential foundation for protecting digital assets ensuring trust and enabling sustainable progress This book delves into the evolving role of cybersecurity offering insights to help stakeholders navigate this dynamic landscape This book is structured into 14 chapters and four thematic sections each addressing a core aspect of cybersecurity's interplay with Industry 5.0 These themes reflect the multidimensional nature of cybersecurity challenges and the collaborative solutions required to address them effectively Whether you are a technologist policymaker academic or business leader this book offers valuable perspectives to help you identify the potential cybersecurity challenges that will be raised in the Industry 5.0 era

Pervasive Computing and the Networked World Qiaohong Zu, Bo Hu, Atilla Elci, 2013-03-14 This book constitutes the refereed post proceedings of the Joint International Conference on Pervasive Computing and the Networked World ICPCA SWS 2012 held in Istanbul Turkey in November 2012 This conference is a merger of the 7th International Conference on Pervasive Computing and Applications ICPCA and the 4th Symposium on Web Society SWS The 53 revised full papers and 26 short papers presented were carefully reviewed and selected from 143 submissions The papers cover a wide range of topics from different research communities such as computer science sociology and psychology and explore both theoretical and practical issues in and around the emerging computing paradigms e.g. pervasive collaboration collaborative business and networked societies They highlight the unique characteristics of the everywhere computing paradigm and promote the awareness of its potential social and psychological consequences

Handbook of Research on Cloud Infrastructures for Big Data Analytics Raj, Pethuru, Deka, Ganesh Chandra, 2014-03-31 Clouds are being positioned as the next generation consolidated centralized yet federated IT infrastructure for hosting all kinds of IT platforms and for deploying maintaining and managing a wider variety of personal as well as professional applications and services Handbook of Research on Cloud Infrastructures for Big Data Analytics focuses exclusively on the topic of cloud sponsored big data analytics for creating flexible and futuristic organizations This book helps researchers and practitioners as well as business entrepreneurs to make informed decisions and consider appropriate action to simplify and streamline the arduous journey towards smarter enterprises

New Trends in Database and Information Systems II Nick Bassiliades, Mirjana Ivanovic, Margita Kon-Popovska, Yannis Manolopoulos, Themis Palpanas, Goce Trajcevski, Athena Vakali, 2014-08-16 This volume contains the papers of 3 workshops and the doctoral consortium which are organized in the framework of the 18th East European Conference on Advances in Databases and Information Systems ADBIS 2014 The 3rd International Workshop on GPUs in Databases GID 2014 is devoted to subjects related to utilization of Graphics Processing Units in database environments The use of GPUs in databases has not yet received enough attention from the database community The

intention of the GID workshop is to provide a discussion on popularizing the GPUs and providing a forum for discussion with respect to the GID s research ideas and their potential to achieve high speedups in many database applications The 3rd International Workshop on Ontologies Meet Advanced Information Systems OAIS 2014 has a twofold objective to present new and challenging issues in the contribution of ontologies for designing high quality information systems and new research and technological developments which use ontologies all over the life cycle of information systems The 1st International Workshop on Technologies for Quality Management in Challenging Applications TQMCA 2014 focuses on quality management and its importance in new fields such as big data crowd sourcing and stream databases The Workshop has addressed the need to develop novel approaches and technologies and to entirely integrate quality management into information system management

Euro-Par 2015: Parallel Processing Workshops Sascha Hunold,Alexandru Costan,Domingo Giménez,Alexandru Iosup,Laura Ricci,María Engracia Gómez Requena,Vittorio Scarano,Ana Lucia Varbanescu,Stephen L. Scott,Stefan Lankes,Josef Weidendorfer,Michael Alexander,2015-12-17 This book constitutes the thoroughly refereed post conference proceedings of 12 workshops held at the 21st International Conference on Parallel and Distributed Computing Euro Par 2015 in Vienna Austria in August 2015 The 67 revised full papers presented were carefully reviewed and selected from 121 submissions The volume includes papers from the following workshops BigDataCloud 4th Workshop on Big Data Management in Clouds Euro EDUPAR First European Workshop on Parallel and Distributed Computing Education for Undergraduate Students Hetero Par 13th International Workshop on Algorithms Models and Tools for Parallel Computing on Heterogeneous Platforms LSDVE Third Workshop on Large Scale Distributed Virtual Environments OMHI 4th International Workshop on On chip Memory Hierarchies and Interconnects PADAPS Third Workshop on Parallel and Distributed Agent Based Simulations PELGA Workshop on Performance Engineering for Large Scale Graph Analytics REPPAR Second International Workshop on Reproducibility in Parallel Computing Resilience 8th Workshop on Resiliency in High Performance Computing in Clusters Clouds and Grids ROME Third Workshop on Runtime and Operating Systems for the Many Core Era UCHPC 8th Workshop on UnConventional High Performance Computing and VHPC 10th Workshop on Virtualization in High Performance Cloud Computing

Algorithmic Aspects of Cloud Computing Luca Foschini,Spyros Kontogiannis,2023-05-25 This book constitutes revised selected papers from the refereed proceedings of the 7th International Symposium on Algorithmic Aspects of Cloud Computing ALGO CLOUD 2022 which took place in Potsdam Germany on September 6 2022 The 6 full papers included in this book were carefully reviewed and selected from 16 submissions They were organized in topical sections as follows Cloud Based Urban Mobility Services New Results in Priority Based Bin Packing More Sparking Soundex based Privacy Preserving Record Linkage and Privacy Preserving Queries of Shortest Path Distances

Intelligent Computing and Innovation on Data Science Sheng-Lung Peng,Le Hoang Son,G. Suseendran,D. Balaganesh,2020-05-14 This book covers both basic and high level concepts relating to the intelligent

computing paradigm and data sciences in the context of distributed computing big data data sciences high performance computing and Internet of Things It is becoming increasingly important to develop adaptive intelligent computing centric energy aware secure and privacy aware systems in high performance computing and IoT applications In this context the book serves as a useful guide for industry practitioners and also offers beginners a comprehensive introduction to basic and advanced areas of intelligent computing Further it provides a platform for researchers engineers academics and industrial professionals around the globe to showcase their recent research concerning recent trends Presenting novel ideas and stimulating interesting discussions the book appeals to researchers and practitioners working in the field of information technology and computer science Innovations in Data Analytics Abhishek Bhattacharya,Soumi Dutta,Paramartha Dutta,Vincenzo Piuri,2023-05-31 This book features research papers presented at the 1st International Conference on Innovations in Data Analytics ICIDA 2022 held at Eminent College of Management and Technology ECMT West Bengal India during November 29 30 2022 The book presents original research work in the areas of computational intelligence advance computing network security and telecommunication data science and data analytics and pattern recognition The book is beneficial for readers from both academia and industry

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Table of Contents Mongo Db Ieee Paper 2012

1. Understanding the eBook Mongo Db Ieee Paper 2012
 - The Rise of Digital Reading Mongo Db Ieee Paper 2012
 - Advantages of eBooks Over Traditional Books
2. Identifying Mongo Db Ieee Paper 2012
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Mongo Db Ieee Paper 2012
 - User-Friendly Interface
4. Exploring eBook Recommendations from Mongo Db Ieee Paper 2012
 - Personalized Recommendations

- Mongo Db Ieee Paper 2012 User Reviews and Ratings
- Mongo Db Ieee Paper 2012 and Bestseller Lists
- 5. Accessing Mongo Db Ieee Paper 2012 Free and Paid eBooks
 - Mongo Db Ieee Paper 2012 Public Domain eBooks
 - Mongo Db Ieee Paper 2012 eBook Subscription Services
 - Mongo Db Ieee Paper 2012 Budget-Friendly Options
- 6. Navigating Mongo Db Ieee Paper 2012 eBook Formats
 - ePub, PDF, MOBI, and More
 - Mongo Db Ieee Paper 2012 Compatibility with Devices
 - Mongo Db Ieee Paper 2012 Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Mongo Db Ieee Paper 2012
 - Highlighting and Note-Taking Mongo Db Ieee Paper 2012
 - Interactive Elements Mongo Db Ieee Paper 2012
- 8. Staying Engaged with Mongo Db Ieee Paper 2012
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Mongo Db Ieee Paper 2012
- 9. Balancing eBooks and Physical Books Mongo Db Ieee Paper 2012
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Mongo Db Ieee Paper 2012
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Mongo Db Ieee Paper 2012
 - Setting Reading Goals Mongo Db Ieee Paper 2012
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Mongo Db Ieee Paper 2012
 - Fact-Checking eBook Content of Mongo Db Ieee Paper 2012

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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