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Relational and XML Data Exchange

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Foundations of Data Exchange Marcelo Arenas, Pablo Barceló, Leonid Libkin, Filip Murlak, 2014-03-06 The problem of exchanging data between different databases with different schemas is an area of immense importance. Consequently, data exchange has been one of the most active research topics in databases over the past decade. Foundational questions related to data exchange largely revolve around three key problems: how to build target solutions, how to answer queries over target solutions, and how to manipulate schema mappings themselves. The last question is also known under the name metadata management, since mappings represent metadata rather than data in the database. In this book, the authors summarize the key developments of a decade of research. Part I introduces the problem of data exchange via examples, both relational and XML. Part II deals with exchanging relational data. Part III focuses on exchanging XML data, and Part IV covers metadata management.

Foundations of Query Answering in Relational Data Exchange André Hernich, 2010 Relational data exchange is the problem of translating relational data according to a given specification. It is one of the many tasks that arise in information integration. A fundamental issue is how to answer queries that are posed against the result of the data exchange so that the answers are semantically consistent with the source data. For monotonic queries, the certain answers semantics by Fagin, Kolaitis, Miller, and Popa (2003) yields good answers. For many non-monotonic queries, however, this semantics was shown to yield counter-intuitive answers. This dissertation deals with the problem of computing the certain answers to monotonic queries on the one hand. On the other hand, it presents and compares semantics for answering non-monotonic queries and investigates how hard it is to evaluate non-monotonic queries under these semantics.

Veracity of Data Laure Berti-Equille, Javier Borge-Holthoefer, 2022-05-31 On the Web, a massive amount of user-generated content is available through various channels, e.g., texts, tweets, Web tables, databases, multimedia sharing platforms, etc. Conflicting information, rumors, erroneous and fake content can be easily spread across multiple sources, making it hard to distinguish between what is true and what is not. This book gives an overview of fundamental issues and recent contributions for ascertaining the veracity of data in the era of Big Data. The text is organized into six chapters focusing on structured data extracted from texts. Chapter 1 introduces the problem of ascertaining the veracity of data in a multi-source and evolving context. Issues related to information extraction are presented in Chapter 2. Current truth discovery computation algorithms are presented in detail in Chapter 3. It is followed by practical techniques for evaluating data source reputation and authoritativeness in Chapter 4. The theoretical foundations and various approaches for modeling the diffusion phenomenon of misinformation spreading in networked systems are studied in Chapter 5. Finally, truth discovery computation from extracted data in a dynamic context of misinformation propagation raises interesting challenges that are explored in Chapter 6. This text is intended for a seminar course at the graduate level. It is also to serve as a useful resource for researchers and practitioners who are interested in the study of fact checking, truth discovery, or rumor spreading.

Non-Volatile Memory

Database Management Systems Joy Arulraj, Andrew Pavlo, 2022-06-01 This book explores the implications of non volatile memory NVM for database management systems DBMSs The advent of NVM will fundamentally change the dichotomy between volatile memory and durable storage in DBMSs These new NVM devices are almost as fast as volatile memory but all writes to them are persistent even after power loss Existing DBMSs are unable to take full advantage of this technology because their internal architectures are predicated on the assumption that memory is volatile With NVM many of the components of legacy DBMSs are unnecessary and will degrade the performance of data intensive applications We present the design and implementation of DBMS architectures that are explicitly tailored for NVM The book focuses on three aspects of a DBMS 1 logging and recovery 2 storage and buffer management and 3 indexing First we present a logging and recovery protocol that enables the DBMS to support near instantaneous recovery Second we propose a storage engine architecture and buffer management policy that leverages the durability and byte addressability properties of NVM to reduce data duplication and data migration Third the book presents the design of a range index tailored for NVM that is latch free yet simple to implement All together the work described in this book illustrates that rethinking the fundamental algorithms and data structures employed in a DBMS for NVM improves performance and availability reduces operational cost and simplifies software development

Data Exploration Using Example-Based Methods Matteo Lissandrini, Davide Mottin, Themis Palpanas, Yannis Velegrakis, 2022-06-01 Data usually comes in a plethora of formats and dimensions rendering the exploration and information extraction processes challenging Thus being able to perform exploratory analyses in the data with the intent of having an immediate glimpse on some of the data properties is becoming crucial Exploratory analyses should be simple enough to avoid complicate declarative languages such as SQL and mechanisms and at the same time retain the flexibility and expressiveness of such languages Recently we have witnessed a rediscovery of the so called example based methods in which the user or the analyst circumvents query languages by using examples as input An example is a representative of the intended results or in other words an item from the result set Example based methods exploit inherent characteristics of the data to infer the results that the user has in mind but may not be able to easily express They can be useful in cases where a user is looking for information in an unfamiliar dataset when the task is particularly challenging like finding duplicate items or simply when they are exploring the data In this book we present an excursus over the main methods for exploratory analysis with a particular focus on example based methods We show how that different data types require different techniques and present algorithms that are specifically designed for relational textual and graph data The book presents also the challenges and the new frontiers of machine learning in online settings which recently attracted the attention of the database community The lecture concludes with a vision for further research and applications in this area

Answering Queries Using Views, Second Edition Foto Afrati, Rada Chirkova, 2022-05-31 The topic of using views to answer queries has been popular for a few decades now as it cuts across domains such as query optimization information integration data

warehousing website design and recently database as a service and data placement in cloud systems This book assembles foundational work on answering queries using views in a self contained manner with an effort to choose material that constitutes the backbone of the research It presents efficient algorithms and covers the following problems query containment rewriting queries using views in various logical languages equivalent rewritings and maximally contained rewritings and computing certain answers in the data integration and data exchange settings Query languages that are considered are fragments of SQL in particular select project join queries also called conjunctive queries with or without arithmetic comparisons or negation and aggregate SQL queries This second edition includes two new chapters that refer to tree like data and respective query languages Chapter 8 presents the data model for XML documents and the XPath query language and Chapter 9 provides a theoretical presentation of tree like data model and query language where the tuples of a relation share a tree structured schema for that relation and the query language is a dialect of SQL with evaluation techniques appropriately modified to fit the richer schema

The Four Generations of Entity Resolution George Papadakis, Ekaterini Ioannou, Emanouil Thanos, Themis Palpanas, 2022-06-01 Entity Resolution ER lies at the core of data integration and cleaning and thus a bulk of the research examines ways for improving its effectiveness and time efficiency The initial ER methods primarily target Veracity in the context of structured relational data that are described by a schema of well known quality and meaning To achieve high effectiveness they leverage schema expert and or external knowledge Part of these methods are extended to address Volume processing large datasets through multi core or massive parallelization approaches such as the MapReduce paradigm However these early schema based approaches are inapplicable to Web Data which abound in voluminous noisy semi structured and highly heterogeneous information To address the additional challenge of Variety recent works on ER adopt a novel loosely schema aware functionality that emphasizes scalability and robustness to noise Another line of present research focuses on the additional challenge of Velocity aiming to process data collections of a continuously increasing volume The latest works though take advantage of the significant breakthroughs in Deep Learning and Crowdsourcing incorporating external knowledge to enhance the existing works to a significant extent This synthesis lecture organizes ER methods into four generations based on the challenges posed by these four Vs For each generation we outline the corresponding ER workflow discuss the state of the art methods per workflow step and present current research directions The discussion of these methods takes into account a historical perspective explaining the evolution of the methods over time along with their similarities and differences The lecture also discusses the available ER tools and benchmark datasets that allow expert as well as novice users to make use of the available solutions

Generating Plans from Proofs Michael Benedikt, Julien Leblay, Balder ten Cate, Efthymia Tsamoura, 2022-06-01 Query reformulation refers to a process of translating a source query a request for information in some high level logic based language into a target plan that abides by certain interface restrictions Many practical problems in data management can be seen as instances of the

reformulation problem For example the problem of translating an SQL query written over a set of base tables into another query written over a set of views the problem of implementing a query via translating to a program calling a set of database APIs the problem of implementing a query using a collection of web services In this book we approach query reformulation in a very general setting that encompasses all the problems above by relating it to a line of research within mathematical logic For many decades logicians have looked at the problem of converting implicit definitions into explicit definitions using an approach known as interpolation We will review the theory of interpolation and explain its close connection with query reformulation We will give a detailed look at how the interpolation based approach is used to generate translations between logic based queries over different vocabularies and also how it can be used to go from logic based queries to programs

Full-Text (Substring) Indexes in External Memory Marina Barsky,Alex Thomo,Ulrike Stege,2022-05-31 Nowadays textual databases are among the most rapidly growing collections of data Some of these collections contain a new type of data that differs from classical numerical or textual data These are long sequences of symbols not divided into well separated small tokens words The most prominent among such collections are databases of biological sequences which are experiencing today an unprecedented growth rate Starting in 2008 the 1000 Genomes Project has been launched with the ultimate goal of collecting sequences of additional 1 500 Human genomes 500 each of European African and East Asian origin This will produce an extensive catalog of Human genetic variations The size of just the raw sequences in this catalog would be about 5 terabytes Querying strings without well separated tokens poses a different set of challenges typically addressed by building full text indexes which provide effective structures to index all the substrings of the given strings Since full text indexes occupy more space than the raw data it is often necessary to use disk space for their construction However until recently the construction of full text indexes in secondary storage was considered impractical due to excessive I O costs Despite this algorithms developed in the last decade demonstrated that efficient external construction of full text indexes is indeed possible This book is about large scale construction and usage of full text indexes We focus mainly on suffix trees and show efficient algorithms that can convert suffix trees to other kinds of full text indexes and vice versa There are four parts in this book They are a mix of string searching theory with the reality of external memory constraints The first part introduces general concepts of full text indexes and shows the relationships between them The second part presents the first series of external memory construction algorithms that can handle the construction of full text indexes for moderately large strings in the order of few gigabytes The third part presents algorithms that scale for very large strings The final part examines queries that can be facilitated by disk resident full text indexes Table of Contents Structures for Indexing Substrings External Construction of Suffix Trees Scaling Up When the Input Exceeds the Main Memory Queries for Disk based Indexes Conclusions and Open Problems

Query Processing over Uncertain Databases Lei Chen,Xiang Lian,2022-05-31 Due to measurement errors transmission lost or injected noise for privacy protection uncertainty exists in the data of many real

applications However query processing techniques for deterministic data cannot be directly applied to uncertain data because they do not have mechanisms to handle data uncertainty Therefore efficient and effective manipulation of uncertain data is a practical yet challenging research topic In this book we start from the data models for imprecise and uncertain data move on to defining different semantics for queries on uncertain data and finally discuss the advanced query processing techniques for various probabilistic queries in uncertain databases The book serves as a comprehensive guideline for query processing over uncertain databases Table of Contents Introduction Uncertain Data Models Spatial Query Semantics over Uncertain Data Models Spatial Query Processing over Uncertain Databases Conclusion **Scalable Processing of**

Spatial-Keyword Queries Ahmed R. Mahmood, Walid G. Aref, 2022-05-31 Text data that is associated with location data has become ubiquitous A tweet is an example of this type of data where the text in a tweet is associated with the location where the tweet has been issued We use the term spatial keyword data to refer to this type of data Spatial keyword data is being generated at massive scale Almost all online transactions have an associated spatial trace The spatial trace is derived from GPS coordinates IP addresses or cell phone tower locations Hundreds of millions or even billions of spatial keyword objects are being generated daily Spatial keyword data has numerous applications that require efficient processing and management of massive amounts of spatial keyword data This book starts by overviewing some important applications of spatial keyword data and demonstrates the scale at which spatial keyword data is being generated Then it formalizes and classifies the various types of queries that execute over spatial keyword data Next it discusses important and desirable properties of spatial keyword query languages that are needed to express queries over spatial keyword data As will be illustrated existing spatial keyword query languages vary in the types of spatial keyword queries that they can support There are many systems that process spatial keyword queries Systems differ from each other in various aspects e g whether the system is batch oriented or stream based and whether the system is centralized or distributed Moreover spatial keyword systems vary in the types of queries that they support Finally systems vary in the types of indexing techniques that they adopt This book provides an overview of the main spatial keyword data management systems SKDMSs and classifies them according to their features Moreover the book describes the main approaches adopted when indexing spatial keyword data in the centralized and distributed settings Several case studies of SKDMSs are presented along with the applications and query types that these SKDMSs are targeted for and the indexing techniques they utilize for processing their queries Optimizing the performance and the query processing of SKDMSs still has many research challenges and open problems The book concludes with a discussion about several important and open research problems in the domain of scalable spatial keyword processing

Database Repairing and Consistent Query Answering Leopoldo Bertossi, 2022-05-31 Integrity constraints are semantic conditions that a database should satisfy in order to be an appropriate model of external reality In practice and for many reasons a database may not satisfy those integrity constraints and for that reason it is said to be inconsistent However

and most likely a large portion of the database is still semantically correct in a sense that has to be made precise After having provided a formal characterization of consistent data in an inconsistent database the natural problem emerges of extracting that semantically correct data as query answers The consistent data in an inconsistent database is usually characterized as the data that persists across all the database instances that are consistent and minimally differ from the inconsistent instance Those are the so called repairs of the database In particular the consistent answers to a query posed to the inconsistent database are those answers that can be simultaneously obtained from all the database repairs As expected the notion of repair requires an adequate notion of distance that allows for the comparison of databases with respect to how much they differ from the inconsistent instance On this basis the minimality condition on repairs can be properly formulated In this monograph we present and discuss these fundamental concepts different repair semantics algorithms for computing consistent answers to queries and also complexity theoretic results related to the computation of repairs and doing consistent query answering

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Databases on Modern Hardware Anastasia Ailamaki, Erietta Liarou, Pınar Tözün, Danica Porobic, Iraklis Psaroudakis, 2022-06-01 Data management systems enable various influential applications from high performance online services e g social networks like Twitter and Facebook or financial markets to big data analytics e g scientific exploration sensor networks business intelligence As a result data management systems have been one of the main drivers for innovations in the database and computer architecture communities for several decades Recent hardware trends require software to take advantage of the abundant parallelism existing in modern and future hardware The traditional design of the data management systems however faces inherent scalability problems due to its tightly coupled components In addition it cannot exploit the full capability of the aggressive micro architectural features of modern processors As a result today s most commonly used server types remain largely underutilized leading to a huge waste of hardware resources and energy In this book we shed light on the challenges present while running DBMS on modern multicore hardware We divide the material into two dimensions of scalability implicit vertical and explicit horizontal The first part of the book focuses on the vertical dimension it describes the instruction and data level parallelism opportunities in a core coming from the hardware and software side In addition it examines the sources of under utilization in a modern processor and presents insights and hardware software techniques to better exploit the microarchitectural resources of a processor by improving cache locality at the right level of the memory hierarchy The second part focuses on the horizontal dimension i e scalability bottlenecks of database applications at the level of multicore and multsocket multicore architectures It first presents a systematic way of eliminating such bottlenecks in online transaction processing workloads which is based on minimizing unbounded communication and shows several techniques that minimize bottlenecks in major components of database management

systems Then it demonstrates the data and work sharing opportunities for analytical workloads and reviews advanced scheduling mechanisms that are aware of nonuniform memory accesses and alleviate bandwidth saturation

Transaction Processing on Modern Hardware Mohammad Sadoghi, Spyros Blanas, 2022-05-31 The last decade has brought groundbreaking developments in transaction processing This resurgence of an otherwise mature research area has spurred from the diminishing cost per GB of DRAM that allows many transaction processing workloads to be entirely memory resident This shift demanded a pause to fundamentally rethink the architecture of database systems The data storage lexicon has now expanded beyond spinning disks and RAID levels to include the cache hierarchy memory consistency models cache coherence and write invalidation costs NUMA regions and coherence domains New memory technologies promise fast non volatile storage and expose uncharted trade offs for transactional durability such as exploiting byte addressable hot and cold storage through persistent programming that promotes simpler recovery protocols In the meantime the plateauing single threaded processor performance has brought massive concurrency within a single node first in the form of multi core and now with many core and heterogeneous processors The exciting possibility to reshape the storage transaction logging and recovery layers of next generation systems on emerging hardware have prompted the database research community to vigorously debate the trade offs between specialized kernels that narrowly focus on transaction processing performance vs designs that permit transactionally consistent data accesses from decision support and analytical workloads In this book we aim to classify and distill the new body of work on transaction processing that has surfaced in the last decade to navigate researchers and practitioners through this intricate research subject

Query Answer Authentication HweeHwa Pang, Kian-Lee Tan, 2022-05-31 In data publishing the owner delegates the role of satisfying user queries to a third party publisher As the servers of the publisher may be untrusted or susceptible to attacks we cannot assume that they would always process queries correctly hence there is a need for users to authenticate their query answers This book introduces various notions that the research community has studied for defining the correctness of a query answer In particular it is important to guarantee the completeness authenticity and minimality of the answer as well as its freshness We present authentication mechanisms for a wide variety of queries in the context of relational and spatial databases text retrieval and data streams We also explain the cryptographic protocols from which the authentication mechanisms derive their security properties

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Declarative Networking Boon Thau Loo, Wenchao Zhou, 2022-05-31 Declarative Networking is a programming methodology that enables developers to concisely specify network protocols and services which are directly compiled to a dataflow framework that executes the specifications Declarative networking proposes the use of a declarative query language for specifying and implementing network protocols and employs a dataflow framework at runtime for communication and maintenance of network state The primary goal of declarative networking is to greatly simplify the

process of specifying implementing deploying and evolving a network design In addition declarative networking serves as an important step towards an extensible evolvable network architecture that can support flexible secure and efficient deployment of new network protocols This book provides an introduction to basic issues in declarative networking including language design optimization and dataflow execution The methodology behind declarative programming of networks is presented including roots in Datalog extensions for networked environments and the semantics of long running queries over network state The book focuses on a representative declarative networking language called Network Datalog NDlog which is based on extensions to the Datalog recursive query language An overview of declarative network protocols written in NDlog is provided and its usage is illustrated using examples from routing protocols and overlay networks This book also describes the implementation of a declarative networking engine and NDlog execution strategies that provide eventual consistency semantics with significant flexibility in execution Two representative declarative networking systems P2 and its successor RapidNet are presented Finally the book highlights recent advances in declarative networking and new declarative approaches to related problems

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Instant Recovery with Write-Ahead Logging Goetz Graefe, Wey Guy, Caetano Sauer, 2022-05-31 Traditional theory and practice of write ahead logging and of database recovery focus on three failure classes transaction failures typically due to deadlocks resolved by transaction rollback system failures typically power or software faults resolved by restart with log analysis redo and undo phases and media failures typically hardware faults resolved by restore operations that combine multiple types of backups and log replay The recent addition of single page failures and single page recovery has opened new opportunities far beyond the original aim of immediate lossless repair of single page wear out in novel or traditional storage hardware In the contexts of system and media failures efficient single page recovery enables on demand incremental redo and undo as part of system restart or media restore operations This can give the illusion of practically instantaneous restart and restore instant restart permits processing new queries and updates seconds after system reboot and instant restore permits resuming queries and updates on empty replacement media as if those were already fully recovered In the context of node and network failures instant restart and instant restore combine to enable practically instant failover from a failing database node to one holding merely an out of date backup and a log archive yet without loss of data updates or transactional integrity In addition to these instant recovery techniques the discussion introduces self repairing indexes and much faster offline restore operations which impose no slowdown in backup operations and hardly any slowdown in log archiving operations The new restore techniques also render differential and incremental backups obsolete complete backup commands on a database server practically instantly and even permit taking full up to date backups without imposing any load on the database server Compared to the first version of this book this second edition

adds sections on applications of single page repair instant restart single pass restore and instant restore Moreover it adds sections on instant failover among nodes in a cluster applications of instant failover recovery for file systems and data files and the performance of instant restart and instant restore

Answering Queries Using Views Foto Afrati,Rada

Chirkova,2022-11-10 The topic of using views to answer queries has been popular for a few decades now as it cuts across domains such as query optimization information integration data warehousing website design and recently database as a service and data placement in cloud systems This book assembles foundational work on answering queries using views in a self contained manner with an effort to choose material that constitutes the backbone of the research It presents efficient algorithms and covers the following problems query containment rewriting queries using views in various logical languages equivalent rewritings and maximally contained rewritings and computing certain answers in the data integration and data exchange settings Query languages that are considered are fragments of SQL in particular select project join queries also called conjunctive queries with or without arithmetic comparisons or negation and aggregate SQL queries

Information and Influence Propagation in Social Networks Wei Chen,Carlos Castillo,Laks V.S. Lakshmanan,2022-05-31

Research on social networks has exploded over the last decade To a large extent this has been fueled by the spectacular growth of social media and online social networking sites which continue growing at a very fast pace as well as by the increasing availability of very large social network datasets for purposes of research A rich body of this research has been devoted to the analysis of the propagation of information influence innovations infections practices and customs through networks Can we build models to explain the way these propagations occur How can we validate our models against any available real datasets consisting of a social network and propagation traces that occurred in the past These are just some questions studied by researchers in this area Information propagation models find applications in viral marketing outbreak detection finding key blog posts to read in order to catch important stories finding leaders or trendsetters information feed ranking etc A number of algorithmic problems arising in these applications have been abstracted and studied extensively by researchers under the garb of influence maximization This book starts with a detailed description of well established diffusion models including the independent cascade model and the linear threshold model that have been successful at explaining propagation phenomena We describe their properties as well as numerous extensions to them introducing aspects such as competition budget and time criticality among many others We delve deep into the key problem of influence maximization which selects key individuals to activate in order to influence a large fraction of a network Influence maximization in classic diffusion models including both the independent cascade and the linear threshold models is computationally intractable more precisely P hard and we describe several approximation algorithms and scalable heuristics that have been proposed in the literature Finally we also deal with key issues that need to be tackled in order to turn this research into practice such as learning the strength with which individuals in a network influence each other as well as the practical aspects of this research including the

availability of datasets and software tools for facilitating research We conclude with a discussion of various research problems that remain open both from a technical perspective and from the viewpoint of transferring the results of research into industry strength applications

Perspectives on Business Intelligence Raymond T. Ng, Patricia C. Arocena, Denilson Barbosa, Giuseppe Carenini, Luiz Gomes, Stephan Jou, Anthony Leung, Evangelos Milios, Renée J. Miller, John Mylopoulos, Rachel A Pottinger, Frank Tompa, Eric Yu, 2022-05-31

In the 1980s traditional Business Intelligence BI systems focused on the delivery of reports that describe the state of business activities in the past such as for questions like How did our sales perform during the last quarter A decade later there was a shift to more interactive content that presented how the business was performing at the present time answering questions like How are we doing right now Today the focus of BI users are looking into the future Given what I did before and how I am currently doing this quarter how will I do next quarter Furthermore fuelled by the demands of Big Data BI systems are going through a time of incredible change Predictive analytics high volume data unstructured data social data mobile consumable analytics and data visualization are all examples of demands and capabilities that have become critical within just the past few years and are growing at an unprecedented pace This book introduces research problems and solutions on various aspects central to next generation BI systems It begins with a chapter on an industry perspective on how BI has evolved and discusses how game changing trends have drastically reshaped the landscape of BI One of the game changers is the shift toward the consumerization of BI tools As a result for BI tools to be successfully used by business users rather than IT departments the tools need a business model rather than a data model One chapter of the book surveys four different types of business modeling However even with the existence of a business model for users to express queries the data that can meet the needs are still captured within a data model The next chapter on vivification addresses the problem of closing the gap which is often significant between the business and the data models Moreover Big Data forces BI systems to integrate and consolidate multiple and often wildly different data sources One chapter gives an overview of several integration architectures for dealing with the challenges that need to be overcome While the book so far focuses on the usual structured relational data the remaining chapters turn to unstructured data an ever increasing and important component of Big Data One chapter on information extraction describes methods for dealing with the extraction of relations from free text and the web Finally BI users need tools to visualize and interpret new and complex types of information in a way that is compelling intuitive but accurate The last chapter gives an overview of information visualization for decision support and text

Eventually, you will very discover a further experience and capability by spending more cash. nevertheless when? accomplish you receive that you require to acquire those all needs in imitation of having significantly cash? Why dont you attempt to get something basic in the beginning? Thats something that will lead you to comprehend even more with reference to the globe, experience, some places, as soon as history, amusement, and a lot more?

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Relational And Xml Data Exchange Pablo Barcelo Introduction

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