



Association for  
Computing Machinery

# Distributed Ledger Technologies

RESEARCH & PRACTICE • 2024

---

## Special Issue on Recent Advances of Blockchain Evolution: Architecture and Performance

---

**Article 8**      **Introduction to the Special Issue on Recent Advances of Blockchain Evolution: Architecture and Performance**  
(2 pages)      *X. Liang, X. Wang, C. Wang, W. Pedrycz*

---

**Article 9**      **GBT-CHAIN: A System Framework for Solving the General Trilemma in Permissioned Blockchains**  
(15 pages)      *H. Wang, H. Li, A. Smahi, M. Xiao, S.-Y. R. Li*

---

**Article 10**      **Dispatcher: Resource-aware Nakamoto Blockchain via Hierarchical Topology and Adaptive Incentives**  
(20 pages)      *H. Jin, S. Dong, X. Dai, Y. Cai, J. Xiao*

---

**Article 11**      **Subnetworks in BlockDAG**  
(23 pages)      *O. Antonenko, S. Grybniak, D. Guzey, O. Nashyvan, R. Shanin*

---

**Article 12**      **Improving Blockchain Scalability with the Setchain Data-Type**  
(27 pages)      *M. Capretto, M. Ceresa, A. Fernandez-Anta, A. Russo, C. Sánchez*

---

*continued on back cover*

[dlt.acm.org](https://dlt.acm.org)

NUMBER

VOLUME

ASSOCIATION FOR COMPUTING MACHINERY

DISTRIBUTED LEDGER TECHNOLOGIES: RESEARCH & PRACTICE

VOLUME 3 • NUMBER 2 • 2024

ARTICLES 8-15

---

**Article 13**  
(21 pages)

**A Local-First Approach for Green Smart Contracts**  
*Q. Stokkink, J. Pouwelse*

---

**Article 14**  
(24 pages)

**Accelerating Blockchain Applications on IoT Architecture Models—Solutions and Drawbacks**  
*R. Kromes, F. Verdier*

---

**Article 15**  
(31 pages)

**Authenticated Range Querying of Historical Blockchain Healthcare Data Using Authenticated Multi-Version Index**  
*S. Linoy, S. Ray, N. Stakhanova, E. Scheme*

---

# ACM Distributed Ledger Technologies: Research & Practice

ACM  
1601 Broadway, 10th Floor  
New York, NY 10019-7434  
Tel.: (212) 869-7440  
Fax: (212) 869-0481  
<https://www.acm.org>

Home Page: <https://dl.acm.org/>

## Editors-in-Chief

Kim-Kwang Raymond Choo	University of Texas San Antonio, United States
Mohammad Hammoudeh	Manchester Metropolitan University, United Kingdom

## Senior Associate Editors

Joseph Liu	Monash University, Australia
Carsten Maple	University of Warwick, United Kingdom
Edgar Weippl	SBA Research and University of Vienna, Austria

## Associate Editors

Mamoun Alazab	Charles Darwin University, Australia
Cristina Alcaraz	University of Malaga, Spain
Dragan Boscovic	Arizona State University, United States
Richard R. Brooks	Clemson University, United States
Ümit Cali	University of York, United Kingdom
Sherman Chow	Chinese University of Hong Kong, Hong Kong
Gregory Epiphaniou	University of Warwick, United Kingdom
Keke Gai	Beijing Institute of Technology, China
Sri Nikhil Gupta	Pacific Northwest National Laboratory, United States
Gourisetti	Wuhan University, China
Debiao He	University of Texas at San Antonio, United States
Murtuza Jadliwala	University of Notre Dame, United States
Taeho Jung	Samsung SDS R&D Center, South Korea
Hyojung Lee	University of New Brunswick, Canada
Rongxing Lu	Indian Institute of Technology, India
Sudip Misra	Universidade de Lisboa, Portugal
Catherine Mulligan	Queen's University, Canada
Jianbing Ni	Marquette University, United States
Terence Ow	Kennesaw State University, United States
Reza Parizi	Cardiff University, United Kingdom

Ellie Rennie	RMIT University, Australia
Laura Ricci	University of Pisa, Italy
Khaled Salah	Khalifa University, United Arab Emirates
James Short	BlockLAB, SDSC, United States
Anna Shugol	IBM, France
Chee-Wee Tan	Copenhagen Business School, Denmark
Claudio J. Tessone	Universität Zürich, Switzerland
Mohamed Toub	FeverTokens, France
Sara	University of Paris-Saclay, France
Tucci-Piergiovanni	
Zheng Yan	Xidian University, China and Aalto University, Finland
Jiangshan Yu	University of Sydney, Australia
Jun Zhao	Nanyang Technological University, Singapore
James Xi Zheng	Macquarie University, Australia

## Information Directors

Hanan Faour	Hamdan Bin Mohammed Smart University, Dubai, United Arab Emirates
Franklin Ward	Digital Media Lab, Panama

## Journal Administrator

Rebecca Malone	KGL Editorial, USA
----------------	--------------------

## Headquarters Staff

Scott Delman	Director of Publications
Sara Kate Heukerott	Associate Director of Publications, Journals
Yubing Zhai	Editor
Stacey Schick	Senior Associate Editor
Craig Rodkin	Publications Operations Manager
Barbara Ryan	Intellectual Property Rights Manager
Bernadette Shade	Print Production Manager
Anna Lacson	Content QA Specialist
Darshanie Jattan	Administrative Assistant

ACM Distributed Ledger Technologies: Research & Practice (ISSN: 2769-6480) is published quarterly in Winter, Spring, Summer, and Fall by the Association for Computing Machinery (ACM), 1601 Broadway, 10th Floor, New York, NY 10019-7434.

For manuscript submissions, subscription, and change of address information, see inside backcover.

Copyright © 2024 by the Association for Computing Machinery (ACM). Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists, requires prior specific permission and/or a fee. Request permission to republish from: [permissions@acm.org](mailto:permissions@acm.org) or fax Publications Department, ACM, Inc. Fax +1 212-869-0481.

For other copying of articles that carry a code at the bottom of the first or last page or screen display, copying is permitted provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.



Association for  
Computing Machinery

Advancing Computing as a Science & Profession

## ACM Distributed Ledger Technologies: Research & Practice

<https://dlt.acm.org/>

### Guide to Manuscript Submission

Submission to the *ACM Distributed Ledger Technologies: Research & Practice* is done electronically through <https://mc.manuscriptcentral.com/dlt>. Once you are at that site, you can create an account and password with which you can enter the ACM Manuscript Central manuscript review tracking system. Proceed to the Author Center to submit your manuscript and your accompanying files.

You will be asked to create an abstract that will be used throughout the system as a synopsis of your paper. You will also be asked to classify your submission using the ACM Computing Classification System through a link provided at the Author Center. In addition to clarifying the area where your paper belongs, classification often helps in quickly identifying suitable reviewers for your paper.

The ACM Production Department prefers that your manuscript be prepared in either LaTeX or MS Word format. Style files for manuscript preparation can be obtained at the following location: <https://www.acm.org/publications/authors/submissions>. For editorial review, the manuscript should be submitted as a PDF or Postscript file. Accompanying material can be in any number of text or image formats, as well as software/documentation bundles in zip or tar-gzipped formats.

Questions regarding editorial review process should be directed to the Editor-in-Chief. Questions regarding the post-acceptance production process should be addressed to the Editor, Yubing Zhai at [zhai@hq.acm.org](mailto:zhai@hq.acm.org).

### Ceasing Print Publication of ACM Journals and Transactions

ACM has made the decision to cease print publication for ACM's journals and transactions as of January 2024. There were several motivations for this change: ACM wants to be as environmentally friendly as possible; print journals lack the new features and functionality of the electronic versions in the ACM Digital Library; and print subscriptions, which have been declining for years, have now reached a level where the time was right to sunset print.

Please contact [acmhelp@acm.org](mailto:acmhelp@acm.org) should you have any questions.

### Subscription and Membership Information.

All papers published in ACM's Distributed Ledger Technologies: Research & Practice (DLT) will be published as Gold Open Access (OA) and will be free to read and share via the ACM Digital Library. For an initial two-year period DLT authors will not be asked to pay an Article Processing Charge (APC) to underwrite the cost of OA publication, as these costs will be underwritten by ACM. For additional information about ACM's various Open Access publication initiatives, visit <https://www.acm.org/publications/openaccess>.

For information, contact:

ACM Member Services Dept.  
1601 Broadway, 10th Floor  
New York, NY 10019-7434

**Phone:** +1-212-626-0500

**Fax:** +1-212-944-1318

**Email:** [acmhelp@acm.org](mailto:acmhelp@acm.org)

**Catalog:** <https://www.acm.org/publications/alacarte>

**About ACM.** ACM is the world's largest educational and scientific computing society, uniting educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

**Visit ACM's Website:** <https://www.acm.org>.