June 7, 2021 Virtual Event, Hong Kong



Association for Computing Machinery

Advancing Computing as a Science & Profession

BSCI '21

Proceedings of the 3rd ACM International Symposium on Blockchain and Secure Critical Infrastructure

Sponsored by: ACM SIGSAC

Program & Steering Committee Chairs:

Keke Gai, Beijing Institute of Technology, China Kim-Kwang Raymond Choo, University of Texas at San Antonio, USA

Co-located with: **ASIA CCS 2021**



The Association for Computing Machinery 1601 Broadway, 10th Floor New York, NY 10019-7434

Copyright © 2021 by the Association for Computing Machinery, Inc. (ACM). Permission to make digital or hard copies of portions 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. Copyright 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 or Fax +1 (212) 869-0481.

For other copying of articles that carry a code at the bottom of the first or last page, copying is permitted provided that the per-copy fee indicated in the code is paid through www.copyright.com.

ISBN: 978-1-4503-8400-1

Additional copies may be ordered prepaid from:

ACM Order Department PO Box 30777 New York, NY 10087-0777, USA

Phone: 1-800-342-6626 (USA and Canada) +1-212-626-0500 (Global) Fax: +1-212-944-1318 E-mail: acmhelp@acm.org Hours of Operation: 8:30 am – 4:30 pm ET

Printed in the USA

Program Chairs' Welcome

It is with great pleasure to welcome you to *The 3rd ACM International Symposium on Blockchain and Secure Critical Infrastructure (BSCI 2021).* Under extenuating circumstances due to Covid-19, BSCI 2021 will be fully virtual, instead of the planned June 7-11, 2021, in Hong Kong, China.

Despite the additional challenges due to the pandemic, this symposium still serve as a platform to share and discuss state-of-the-art research advances on blockchain and secure critical infrastructure, ranging from security and privacy issues in blockchain to attack methods on blockchain to securing the smart grid, etc. As part of the discussion, we hope to foster new, cutting-edge research collaboration between researchers and practitioners with complementary interests and background.

This is the third symposium organized as part of ACM AsiaCCS, which builds on success of the prior editions, 2019 (New Zealand) and 2020 (Taipei, China). In this year, we attracted a total of 34 submissions from Asia, Australia, Europe, and the United States. All submissions were subject to rigorous reviews by subject matter experts, and eventually only six (6) submissions were accepted to appear in the symposium as regular papers (i.e. acceptance rate is 17.65%). Six (6) submissions were accepted as short papers.

We are also honored to have Dr. Samee U. Khan from Mississippi State University as our keynote speaker, who will be speaking on "Blockchains, Security, and Infrastructures: What we Know and What we Can Know".

Putting together BSCI 2021 was a team effort. We first thank all authors for their confidence by submitting their high-quality work to the symposium. We are also grateful to the technical program committee members, who have selflessly devoted their time to review and critique the submissions. Finally, we thank the host universities, sponsors, ACM SIGs, and AsiaCCS organizing committee for their support.

We hope you will find the discussions and interactions at BSCI 2021 intellectually stimulating, as well as enjoying the virtual event!

Keke Gai BSCI 2021 Program Chair Beijing Institute of Technology, China Kim-Kwang Raymond Choo BSCI 2021 Program Chair University of Texas at San Antonio, USA

Table of Contents

The 3rd ACM International Symposium on Blockchain and Secure Critical Infrastructure (ACM BSCI 2021) Organization			
	BSCI Keynote Session Chair: Kim-Kwang Raymond Choo (University of Texas at San Antonio),		
•	Blockchains, Security, and Infrastructures: What we know and what we can know Samee U. Khan (Mississippi State University)	.1	
	SCI Session 1 ssion Chair: Jiamou Liu <i>(The University of Auckland)</i>		
•	Decentralised Peer-to-Peer Crop Insurance Vinayak Iyer (Sardar Patel Institute of Technology), Kshitij Shah (Sardar Patel Institute of Technology), Saurabh Rane (Sardar Patel Institute of Technology), Radha Shankarmani (Sardar Patel Institute of Technology)	. 3	
•	Revealing and Concealing Bitcoin Identities: A Survey of Techniques Karolina Bergman (<i>Embry-Riddle Aeronautical University</i>), Saeed Rajput (<i>Embry-Riddle Aeronautical University</i>)	13	
•	MultiCall: A Transaction-batching Interpreter for Ethereum William Hughes (<i>University of Gothenburg</i>), Alejandro Russo (<i>Chalmers University of Technology</i>), Gerardo Schneider (<i>University of Gothenburg</i>)	25	
	SCI Session 2 ssion Chair: Dragan Peraković <i>(University of Zagreb)</i>		
•	Distributed Decentralized Chain (DDC) and <i>k</i> -Queue Variable Bulk Arrival and Static Bulk Service Model Abhilash Kancharla (<i>Oklahoma State University</i>), Jongho Seol (<i>Oklahoma State University</i>), Hye-Young Kim (<i>Hongik University</i>), Nohpill Park (<i>Oklahoma State University</i>)	37	
•	Eth2Vec: Learning Contract-Wide Code Representations for Vulnerability Detection on Ethereum Smart Contracts Nami Ashizawa (<i>Osaka University</i>), Naoto Yanai (<i>Osaka University</i>), Jason Paul Cruz (<i>Osaka University</i>), Shingo Okamura (<i>National Institute of Technology & Nara College</i>),	47	
•	DecFL: An Ubiquitous Decentralized Model Training Protocol and Framework Empowered by Blockchain Felix Morsbach (<i>Karlsruhe Institute of Technology</i>), Salman Toor (<i>Uppsala University</i>)	61	
	SCI Short Paper Session 1 ssion Chair: Jong-Hyouk Lee (Sejong University)		
•	An Optimization Strategy for PBFT Consensus Mechanism Based On Consortium Blockchain Feilong Wang (Yanshan Univerity), Yipeng Ji (Beihang University), Mingsheng Liu (Shijiazhuang Institute of Railway Technology), Yangyang Li (CAEIT), Xiong Li (Beijing Biwei Network Technology Co., Ltd. & Beijing Xindatek Technology Co., Ltd.), Xu Zhang (CNCERT), Xiaojun Shi (China Electronics Technology Group Corporation)	71	
•	FutureText: A Blockchain-based Contract Signing Prototype with Security and Convenience Qing Zhang (Shanghai Financial Futures Information Technology Co., Ltd), Jian Gao (Shanghai Financial Futures Information Technology Co., Ltd), Qiqiang Qin (Shanghai Financial Futures Information Technology Co., Ltd), Chenyu Wang (Shanghai Financial Futures Information Technology Co., Ltd), Keting Yin (Zhejiang University)	77	

	A Novel Approach for Developing Decentralized Storage and Sharing Systems
•	An Anomaly Event Detection Method Based on GNN Algorithm for Multi-data Sources
•	Beyond Uber and Lyft: A Decentralized Cab Consortium over Blockchains

	Sanup Chakraborty (muun institute of Technology Knurugpur)	
•	A Tool for Moving Blockchain Computations Off-Chain	3
	Christian Liu (Dalhousie University), Peter Bodorik (Dalhousie University),	
	Dawn Jutla (Saint Mary's University)	

The 3rd ACM International Symposium on Blockchain and Secure Critical Infrastructure (ACM BSCI 2021) Organization

Program & Steering	
Committee Chairs:	Keke Gai, Beijing Institute of Technology, China
	Kim-Kwang Raymond Choo, University of Texas at San Antonio, USA
Publicity Chairs:	Jiamou Liu, The University of Auckland, New Zealand
	Dragan Peraković, University of Zagreb, Croatia
Program Committee:	Xuyun Zhang, Macquarie University, Australia
	Christophe Feltus, Luxembourg Institute of Science & Technology, Luxembourg
	Edgar Weippl, University of Vienna, Austria
	Marko Periša, University of Zagreb, Croatia
	Mohamed Sellami, Telecom SudParis, France
	Constantinos Patsakis, University of Piraeus, Greece
	Yuji Suga, Internet Initiative Japan Inc., Japan
	Arcangelo Castiglione, University of Salerno, Italy
	Zhen Zhao, University of Wollongong, Australia
	Xue-Yang Zhu, Chinese Academy of Sciences, China
	Panayiotis Kotzanikolaou, University of Piraeus, Greece
	Regio Michelin, UNSW, Australia
	Bruno Defude, Télécom Sudparis, France
	Md Ali, Rider University, USA
	Qi Jiang, Xidian University, China
	Reza M. Parizi, Kennesaw State University, USA
	Junggab Son, Kennesaw State University, USA
	Wolfgang Mayer, University of South Australia, Australia
	Mengmeng Yang, Nanyang Technological University, Singapore
	Yunguo Guan, University of New Brunswick, Canada
	Muhammad Rizwan Asghar, The University of Auckland, New Zealand
	Fran Casino, Rovira i Virgili University, Greece
	M. Emre Gursoy, Koc University, Turkey
	Virginia Franqueira, University of Kent, UK
	Marko Krstić, Republic Agency for Electronic Communications, Serbia
	Lei Xu, University of Texas Rio Grande Valley, USA
	Silvio Ranise, University of Trento and Fondazione Bruno Kessler, Italy
	Shiyan Hu, University of Southampton, UK
	Shaojing Fu, National University of Defense Technology, China
	Wei Cai, The Chinese University of Hong Kong, China
	Wenjuan Li, Hong Kong Polytechnic University, China Bernardi Branggona, Shaffield Hellom University, UK
	Bernardi Pranggono, Sheffield Hallam University, UK

Program Committee

(continued): Steven Furnell, University of Nottingham, UK Ian Tan, Monash University, Malaysia Georgios Kambourakis, University of the Aegean, Greece Cong Pu, Marshall University, USA Yandong Zheng, University of New Brunswick, Canada Yee Wei Law, University of South Australia, Australia Kwok Yan Lam, Nanyang Technological University, Singapore Hyoungshick Kim, Sungkyunkwan University, South Korea Raul Monroy, Tecnologico de Monterrey, Campus estado de México, Mexico Umit Karabiyik, Purdue University, USA Christos Troussas, University of West Attica, Greece Konstantinos Rantos, International Hellenic University, Greece Chunpeng Ge, Nanjing University of Aeronautics and Astronautics, China Prasun Ghosal, Indian Institute of Engineering Science and Technology, India Sofiane Hamrioui, ESAIP Engineering School, Finland Jong-Hyouk Lee, Sejong University, South Korea Mamoun Alazab, Charles Darwin University, Australia Gang Wang, University of Connecticut, USA Antonio Di Maio, University of Luxembourg, Luxembourg Sk Hafizul Islam, IIIT Kalyani, India

