

2022 IEEE International Conference on Cyber Security and Resilience (CSR 2022)

Virtual Conference
27 – 29 July 2022



IEEE Catalog Number: CFP22Y52-POD
ISBN: 978-1-6654-9953-8

**Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP22Y52-POD
ISBN (Print-On-Demand):	978-1-6654-9953-8
ISBN (Online):	978-1-6654-9952-1

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

Table of Contents

Cover page	i
Copyright notice	ii
Table of contents	iii
Message from the chairs	x
Conference sponsors	xii
Program committees	xiii
Authors' index	xxi

Cyber Security

Flood control: TCP-SYN flood detection for software-defined networks using OpenFlow port statistics	1
<i>T. Das, O. Abuhamdan, S. Sengupta, and E. Arslan</i>	
A stable generative adversarial network architecture for network intrusion detection	9
<i>R. Soleymanzadeh and R. Kashef</i>	
LSTM-based anomalous behavior detection in multi-agent reinforcement learning	16
<i>C. Lischke, T. Liu, J. Mccalmon, M. Rahman, T. Halabi, and S. Alqahtani</i>	
H4rm0ny: A competitive zero-sum two-player Markov game for multi-agent learning on evasive malware generation and detection	22
<i>C. Molloy, S. Ding, B. Fung, and P. Charland</i>	
Ensemble of random and isolation forests for graph-based intrusion detection in containers	30
<i>A. Iacovazzi and S. Raza</i>	
On usability of hash fingerprinting for endpoint application identification	38
<i>J. Heino, A. Gupta, A. Hakkala, and S. Virtanen</i>	

Data volume reduction for deep packet inspection by multi-layer application determination	44
<i>M. Vogel, F. Schuster, F. Kopp, and H. Konig</i>	
Host-based cyber attack pattern identification on honeypot logs using association rule learning	50
<i>A. Papoutsis, C. Iliou, D. Kavallieros, T. Tsikrika, S. Vrochidis, and I. Kompatsiaris</i>	
Using CyberScore for network traffic monitoring	56
<i>L. Deri and A. Cardigliano</i>	
An approach to improve the robustness of machine learning based intrusion detection system models against the Carlini-Wagner attack	62
<i>M. Pujari, B. Cherukuri, A. Javaid, and W. Sun</i>	
Semantic-aware vulnerability detection	68
<i>Z. Huang and M. White</i>	
OGMA: Visualisation for software container security analysis and automated remediation	76
<i>A. Mills, J. White, and P. Legg</i>	
Configuration vulnerability in SNORT for Windows operating systems	82
<i>S. Guarino, M. Grassi, R. Setola, L. Faramondi, and C. Alcaraz</i>	
IPASS: A novel open-source intelligence password scoring system	90
<i>J. Hubbard, G. Bendiab, and S. Shiaeles</i>	
Auditing a software-defined cross domain solution architecture	96
<i>N. Daughety, M. Pendleton, R. Perez, S. Xu, and J. Franco</i>	
ICT in healthcare: The role of IoT and the SECANT solution	104
<i>M. Caballero, D. Kavallieros, A. Spyros, A. Tavernarakis, A. Tziouvaras, S. Bonacina, K. Chandrarmouli, M. Coriou, L. Chen, T. Dounia, I. Giannoulakis, N. Gligoric, E. Kafetzakis, T. Kasig, V. Koumaras, T. Krousalis, K. Lapidaki, A. Markakis, S. Marin, M. Manulis, S. Menesidou, S. Nifakos, L. Meng, S. Mhiri, M. Nati, K. Ntafloukas, D. Oniga, D. Papamartzivanos, S. Papastergiou, K. Sanchez, C. Sakkas, K. Stelliou, L. Trujillo, T. Tsikrika, E. Venegas, S. Vrochidis, and D. Xydiás</i>	
SENTINEL: Approachable, tailor-made cybersecurity and data protection for small enterprises	112
<i>T. Trantidou, G. Bravos, P. Valoggia, I. Skourtis, M. Falelakis, K. Poulios, I. Spais, S. Ioannidis, T. Oudin, R. Costa, C. Konialis, D. Holkham, Z. Kasapi, and A. Karantjias</i>	

A blockchain-based trustworthy cloud services digital ecosystem	118
<i>E. Bellini, S. Cimato, A. Esposito, and I. Aversa</i>	
CIDS: Collaborative intrusion detection system using blockchain technology	125
<i>G. Gurung, G. Bendiab, M. Shiaeles, and S. Shiaeles</i>	
Blockchain-enabled digital forensics for the IoT: Challenges, features, and current frameworks	131
<i>S. Brotsis and N. Kolokotronis</i>	
Android device incident response: Viber analysis	138
<i>A. Vasilaras, D. Dosis, M. Kotsis, and P. Rizomiliotis</i>	
SeeShells: An optimized solution for utilizing shellbags in a digital forensic investigation	143
<i>E. Amoruso, R. Leinecker, and C. Zou</i>	
Evaluating perceptual hashing algorithms in detecting image manipulation over social media platforms	149
<i>M. Alkhawaiter, K. Almubarak, and C. Zou</i>	
On the (in)security of memory protection units	157
<i>M. Grisafi, M. Ammar, and B. Crispo</i>	
ETHERLED: Sending covert morse signals from air-gapped devices via network card (NIC) leds	163
<i>M. Guri</i>	
How to build a SOC on a budget	171
<i>R. Vaarandi and S. Mases</i>	

Cyber Resilience

SoK: Demystifying cyber resilience quantification in cyber-physical systems	178
<i>H. Lee, S. Kim, and H. K. Kim</i>	
An approach to address risk management challenges focused on IT governance framework	184
<i>H. Alessa, R. Boodai, and A. Alanazi</i>	
CoReTM: An approach enabling cross-functional collaborative threat modeling	189
<i>J. Von der Assen, M. Figueiredo Franco, and C. Killer</i>	

Enhancing the aggregation of the federated learning for the industrial cyber physical systems	197
<i>S. Guendouzi, S. Ouchani, and M. Malki</i>	
Improving resilience in cyber-physical systems based on transfer learning	203
<i>M. Saman Azari, F. Flammini, and S. Santini</i>	

Cyber Physical Systems Security

ML-based anomaly detection system for DER DNP3 communication in smart grid	209
<i>M. Abdelkhalek and M. Govindarasu</i>	
Moving target defense routing for SDN-enabled smart grid	215
<i>M. Abdelkhalek, B. Hyder, M. Govindarasu, and C. Rieger</i>	
Neural network based temporal point processes for attack detection in industrial control systems	221
<i>G. Fortino, C. Greco, A. Guzzo, and M. Ianni</i>	
Control logic obfuscation attack in industrial control systems	227
<i>N. Zubair, A. Ayub, H. Yoo, and I. Ahmed</i>	
ML-based anomaly detection for intra-vehicular CAN-bus networks	233
<i>S. Purohit and M. Govindarasu</i>	
Powertrace-based fuzzing of CAN connected hardware	239
<i>M. Dunne and S. Fischmeister</i>	
A comparative overview of automotive radar spoofing countermeasures	245
<i>M. Vu, W. Headley, and K. Heaslip</i>	
BLEND: Efficient and blended IoT data storage and communication with application layer security	253
<i>J. Hoglund and S. Raza</i>	
Modelling and assessing the risk of cascading effects with ResilBlockly	261
<i>I. Bicchierai, E. Schiavone, and F. Brancati</i>	

CSR WS Actionable Cyber Threat Intelligence

Towards continuous enrichment of cyber threat intelligence: A study on a honeypot dataset	267
<i>A. Spyros, A. Papoutsis, I. Koritsas, N. Mengidis, C. Iliou, D. Kavallieros, T. Tsikrika, S. Vrochidis, and I. Kompatsiaris</i>	
Combining text analysis techniques with unsupervised machine learning methodologies for improved software vulnerability management	273
<i>M. Anastasiadis, G. Aivatoglou, G. Spanos, A. Voulgaridis, and K. Votis</i>	

CSR WS Cyber Resilience and Economics

Policy-based profiles for intrusion response systems	279
<i>K. Hughes</i>	
Using potential effects on threat events (PETE) to assess mitigation effectiveness and return on investment (ROI)	287
<i>D. Bodeau, R. Graubart, and R. Mcquaid</i>	
Process mining for asymmetric cybersecurity audit	293
<i>R. Turner</i>	

CSR WS Cyber Ranges and Security Training

Leveraging cyber ranges for prototyping, certification and training: The ECHO case	299
<i>N. Mengidis, M. Bozhilova, C. Ceresola, C. Colabuono, M. Cooke, G. Depaix, A. Genchev, G. Koykov, W. Mees, M. Merialdo, A. Voulgaridis, T. Tsikrika, K. Votis, and S. Vrochidis</i>	
Design and proof of concept of a prediction engine for decision support during cyber range attack simulations in the maritime domain	305
<i>M. Antonopoulos, G. Drainakis, E. Ouzounoglou, G. Papavassiliou, and A. Amditis</i>	

CSR WS Data Science for Cyber Security

Employing social network analysis to dark web communities	311
<i>S. Nikoletos and P. Raftopoulou</i>	
Phishing detection using machine learning algorithm	317
<i>J. Tanimu and S. Shiaeles</i>	
Machine learning-based ransomware detection using low-level memory access patterns obtained from live-forensic hypervisor	323
<i>M. Hirano and R. Kobayashi</i>	
A Bayesian model combination based approach to active malware analysis	331
<i>A. Hota and J. Schonwalder</i>	
A comprehensive API call analysis for detecting Windows-based ransomware	337
<i>P. Mohan Anand, P. V. Sai Charan, and S. K. Shukla</i>	

CSR WS Electrical Power and Energy Systems Security, Privacy and Resilience

Protecting IEC 60870-5-104 ICS/SCADA systems with honeypots	345
<i>E. Grigoriou, A. Liatifis, P. Radoglou-Grammatikis, T. Lagkas, I. Moscholios, E. Markakis, and P. Sarigiannidis</i>	
Risk analysis of DNP3 attacks	351
<i>V. Kelli, P. Radoglou-Grammatikis, T. Lagkas, E. Markakis, and P. Sarigiannidis</i>	
Privacy preserving human activity recognition using microaggregated generative deep learning	357
<i>A. Aleroud, M. Shariah, and R. Malkawi</i>	
Current drainage induced by bias injection attack against Kalman filter of BLDC motor	364
<i>Y. Boiko, I. Kiringa, and T. Yeap</i>	

CSR WS Maritime Cyber Security

A multi-level trust framework for the Internet of underwater things	370
<i>A. Almutairi, Y. He, and S. Furnell</i>	

FFDA: A novel four-factor distributed authentication mechanism	376
<i>J. Edwards, F. Aparicio-Navarro, L. Maglaras, and C. Douligeris</i>	
A supply chain service cybersecurity certification scheme based on the cybersecurity act	382
<i>A. Michota and N. Polemi</i>	
Training the maritime security operations centre teams	388
<i>M. Raimondi, G. Longo, A. Merlo, A. Armando, and E. Russo</i>	
Cybersecurity at merchant shipping	394
<i>E. D. Charitos, N. A. Kounalakis, and I. Kantzavelou</i>	