

# **2019 IEEE/ACM International Workshop on Containers and New Orchestration Paradigms for Isolated Environments in HPC (CANOPIE-HPC 2019)**

**Denver, Colorado, USA  
18 November 2019**



**IEEE Catalog Number: CFP19W54-POD  
ISBN: 978-1-7281-6029-0**

**Copyright © 2019 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:	CFP19W54-POD
ISBN (Print-On-Demand):	978-1-7281-6029-0
ISBN (Online):	978-1-7281-6028-3

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2019 IEEE/ACM Workshop on Containers and New Orchestration Paradigms for Isolated Environments in HPC (CANOPIE-HPC) **CANOPIE-HPC 2019**

## Table of Contents

Message from the Workshop Chairs .....	v
Organization .....	vi

### Full Papers

Evaluation and Benchmarking of Singularity MPI containers on EU Research e-Infrastructure .....	1
<i>Victor Sande Veiga (International Centre for Numerical Methods in Engineering (CIMNE), Spain), Manuel Simon (Nokia Enterprise, France), Abdulrahman Azab (University of Oslo, Norway), Carlos Fernandez (Galician Public Foundation Galician Supercomputing Technology Center (CESGA), Spain), Giuseppa Muscianisi (CINECA, Italy), Giuseppe Fiameni (CINECA), and Simone Marocchi (CINECA, Italy)</i>	
Enabling HPC workloads on Cloud Infrastructure using Kubernetes Container Orchestration Mechanisms .....	11
<i>Angel M. Beltré (State University of New York at Binghamton, USA), Pankaj Saha (State University of New York at Binghamton, USA), Madhusudhan Govindaraju (State University of New York at Binghamton, USA), Andrew Younge (Sandia National Laboratories, USA), and Ryan E. Grant (Sandia National Laboratories, USA)</i>	
Long-term Preservation of Repeatable Builds in Occam .....	21
<i>David Wilkinson (University of Pittsburgh, USA), Luis Oliveira (University of Pittsburgh, USA), Daniel Mosse (University of Pittsburgh, USA), and Bruce Childers (University of Pittsburgh, USA)</i>	

### Short Papers

KBase: A Platform for Reproducible Bioinformatics Research .....	31
<i>William J. Riehl (Lawrence Berkeley National Laboratory, USA), Richard S. Canon (Lawrence Berkeley National Laboratory, USA), Boris Sadkhin (Argonne National Laboratory, USA), and Jay R. Bolton (Lawrence Berkeley National Laboratory, USA)</i>	

HPC container runtimes have minimal or no performance impact .....	37
<i>Alfred Torrez (Los Alamos National Laboratory, USA), Timothy Randles (Los Alamos National Laboratory, USA), and Reid Priedhorsky (Los Alamos National Laboratory, USA)</i>	
On-node resource manager for containerized HPC workloads .....	43
<i>Geoffroy Vallee (Sylabs Inc, USA), Carlos Eduardo Arango Gutierrez (University of Valle, Colombia), and Cedric Clerget (Sylabs Inc, USA)</i>	
A Case for Portability and Reproducibility of HPC Containers .....	49
<i>Richard S. Canon (Lawrence Berkeley National Laboratory, USA) and Andrew Younge (Sandia National Laboratories, USA)</i>	
<b>Author Index</b> .....	<b>55</b>