

# **Third EAGE Workshop on High Performance Computing for Upstream 2017**

Athens, Greece  
1 – 4 October 2017

ISBN: 978-1-5108-5082-8

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2017) by the European Association of Geoscientists & Engineers (EAGE)  
All rights reserved.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact by the European Association of Geoscientists & Engineers (EAGE)  
at the address below.

European Association of Geoscientists & Engineers (EAGE)  
PO Box 59  
3990 DB Houten  
The Netherlands

Phone: +31 88 995 5055  
Fax: +31 30 634 3524

[eage@eage.org](mailto:eage@eage.org)

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

# TABLE OF CONTENTS

<b>SCALE OUT VS. SCALE UP FOR ULTRA-SCALE RESERVOIR SIMULATION</b> .....	1
<i>K. Mukundakrishnan, R. Gandham, K. Esler, D. Dembeck, J. Shumway, V. Natoli</i>	
<b>SELECTING A CPU FOR RESERVOIR SIMULATION OPTIMIZED FOR COST, ENERGY AND PERFORMANCE</b> .....	3
<i>O. Al-Saadoon, M. Baddourah, A. Alturki, M. Al-Hagri</i>	
<b>RAPID DEVELOPMENT OF SEISMIC IMAGING APPLICATIONS USING SYMBOLIC MATH</b> .....	9
<i>N. Kukreja, M. Louboutin, M. Lange, F. Luporini, G. Gorman</i>	
<b>ACHIEVING COMPUTATIONALLY SCALABLE PARALLELISM IN A GEOSTATISTICAL INVERSION ALGORITHM</b> .....	13
<i>A. Ephanov, R. Bornard, H. Debeye</i>	
<b>A GENERIC MULTI-PARAMETERS FWI FRAMEWORK BASED ON SYMBOLIC EXPRESSIONS</b> .....	18
<i>E. Bergounioux, C. Rivera, B. Duquet, M. Dolliazal</i>	
<b>HPC CLOUD FOR O&amp;G</b> .....	23
<i>D. Klahr</i>	
<b>HPC CONTAINERS WITH SINGULARITY</b> .....	26
<i>P. Souza, G. Kurtzer, C. Gomez-Martin, P. Silva</i>	
<b>CONTAINERIZING PARALLEL MPI-BASED HPC APPLICATIONS</b> .....	31
<i>A. Schonewille, A. Bukhamsin</i>	
<b>PERFORMANCES ANALYSIS OF A HYBRIDIZABLE DISCONTINUOUS GALERKIN SOLVER FOR THE 3D HELMHOLTZ EQUATIONS IN GEOPHYSICAL CONTEXT</b> .....	37
<i>M. Bommasse-Gahot, H. Calandra, J. Diaz, S. Lanteri</i>	
<b>BETTER PRODUCTIVITY AND PORTABLE FINITE DIFFERENCE WAVE EQUATION PROPAGATORS USING DIRECTIVE BASED PROGRAMMING</b> .....	42
<i>G. Hugues, H. Calandra</i>	
<b>FROM CPU TO GPU IN TWO DAYS: 3D ELASTIC ORTHORHOMBIC MODELING WITH OPENACC</b> .....	44
<i>V. Kazei, N. Masmoudi, J. Oh, C. Tzivanakis, T. Alkhalifah</i>	
<b>HIGH-PERFORMANCE SEISMIC MODELING WITH FINITE-DIFFERENCE USING SPATIAL AND TEMPORAL CACHE BLOCKING</b> .....	49
<i>V. Etienne, T. Tonellot, T. Malas, H. Ltaief, S. Kortas, P. Thierry, D. Keyes</i>	
<b>OPTIMIZING PERFORMANCE OF A TTI RTM FINITE DIFFERENCE KERNEL FOR X86 INSTRUCTION SET ARCHITECTURES</b> .....	54
<i>G. Skinner, A. St-Cyr, M. Bosmans, D. Vaneijkereen</i>	
<b>METHODS TO OVERLAP COMMUNICATION WITH COMPUTATION</b> .....	59
<i>N. Kayum, A. Baddourah, O. Hajjar</i>	
<b>IMPROVING THE TRUNCATED SPIKE ALGORITHM VIA NEUMANN SERIES APPROXIMATIONS</b> .....	69
<i>S. Bernabeu, E. Sanchez, M. Hanzich, S. Fernandez</i>	
<b>ADAPTIVE PARALLELIZATION OF THE ALGORITHM FOR ELECTROMAGNETIC LOGGING DATA SIMULATION IN A 2D FORMATION MODEL</b> .....	79
<i>D. Kushnir, N. Tropin, G. Dyatlov, A. Dashevsky</i>	
<b>DYNAMIC HOST-AWARE I/O WRITERS ASSIGNMENT AMONG MPI RANKS IN HIGH PERFORMANCE COMPUTING SYSTEMS</b> .....	84
<i>O. Hajjar, M. Baddourah, A. Alturki, R. Al-Harbi</i>	
<b>EXSEISPIOL: A SEISMIC PARALLEL I/O LIBRARY FOR INCREASING DEVELOPER PRODUCTIVITY</b> .....	89
<i>C. Broin, R. Short, M. Fisher, S. Delaney, S. Dagg, G. O'Brien, J. Acquaviva, M. Lysaght</i>	
<b>ADVANCED IO IMPLEMENTATION &amp; PERFORMANCES FOR SEISMIC APPLICATIONS</b> .....	93
<i>P. Aquilanti, M. Hugues, S. Jha, H. Calandra</i>	
<b>IBM DATA COGNITIVE SYSTEMS STRATEGY AND DIRECTIONS – INNOVATIONS FOR HPC, HPDA AND MACHINE &amp; DEEP LEARNING MERGING, IN OIL AND GAS</b> .....	95
<i>P. Vezolle</i>	

<b>MACHINE LEARNING ECOSYSTEM FOR THE O&amp;G INDUSTRY</b> .....	97
<i>P. Demichel, E. Orloff</i>	
<b>THE THREE SILVER BULLETS OF HPC FOR OIL AND GAS</b> .....	101
<i>A. Jones</i>	
<b>BIG DATA ROLE IN THE UPSTREAM BUSINESS RESEARCH</b> .....	104
<i>S. Nimmagadda, A. Aseev</i>	
<b>ON A ROBUST DATA MODELLING APPROACH FOR MANAGING THE FRACTURED RESERVOIRS IN AN ONSHORE COLOMBIAN OIL &amp; GAS FIELD</b> .....	109
<i>S. Nimmagadda, L. Chavez, J. Castaneda, A. Lobo</i>	
<b>THREE DIMENSIONAL PARALLEL SOBEL SEISMIC FAULT DETECTION</b> .....	114
<i>A. Al-Naeem, S. Al-Dossary, Z. Zhou</i>	
<b>Author Index</b>	