Fourth EAGE Workshop on High Performance Computing for Upstream

HPC THROUGH THE 4TH INDUSTRIAL REVOLUTION

7-9 OCTOBER 2019 • DUBAI, UNITED ARAB EMIRATES

Final Announcement
WORKSHOP OVERVIEW

Comparing across multiple industries, our energy business undoubtedly exploits the largest High-Performance-Computing capacity. HPC plays a central role in seeking higher productivity, lowering costs and making better use of our data through high-performance simulation and data analytics. This is especially true while our industry experiences change through this fourth industrial revolution (4IR): digitalization. Algorithms performing as fast as possible on the best available hardware either on premise or in the cloud have a direct role and impact on many of the decisions shaping our business. The overlap and cross pollination opportunities between data analytics, big data, AI, simulation and HPC is the underlying theme of this fourth instance of our HPC workshop: HPC through the 4IR.

Upstream simulation and modelling is our principal mechanism for the accurate location of hydrocarbons and their optimal production. The reliance on data for making better business decisions at a lower cost is becoming critical. Seismic data are explored using traditional imaging algorithms such as Reverse Time Migration (RTM), Full Waveform Inversion (FWI) and Electromagnetic Modelling (EM) to illuminate the hidden subsurface of the earth and reservoir simulation is used to optimally produce fields and predict the time evolution of assets. Both are highly compute-intensive activities, which push the leading edge of HPC storage, interconnect and calculation. The industry is evolving on several fronts. Changes in the underlying hardware with the advent of coprocessing technologies and many-core CPUs are challenging practitioners to develop new algorithms and port old ones to reap the most performance from modern hardware. The explosion of data and the recent rapid development in machine learning (ML) are leading to non-traditional ways of interpreting seismic and reservoir data. The emergence of significantly faster reservoir simulation technology is breathing new life into multi-resolution and uncertainty quantification workflows.

The ability to create and mine these data relies on the optimal utilisation of supercomputers. This is the result of various synergies between industries, companies, departments and, most importantly, people. HPC IT departments (or even HPC cloud solution providers) are focused on minimising turnaround times for various workloads, but also deploy the various compute architectures in a cost competitive fashion while adapting to the fast-paced innovation in the semiconductor industry. Research groups and software application teams in both academia and industry develop new algorithms and keep abreast with the latest while adapting and optimizing existing or new production frameworks to the latest parallel programming model, language and architecture. The workshop brings together experts in order to understand state-of-the-art key applications employed in the upstream industry and anticipate what ambitions are enabled by increased computational power.

The 3-day workshop will feature both oral & poster presentations, discussion sessions and keynotes from the leading experts in the industry, as well as insightful and interesting short courses embedded into the workshop technical programme.

TECHNICAL PROGRAMME

Oral Presentations | Monday 7 October

<table>
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<tr>
<th>Time</th>
<th>Session Title</th>
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<tr>
<td>08:00</td>
<td>Registration &amp; Welcome Coffee</td>
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<td>08:30</td>
<td>HSE from Hotel</td>
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<tr>
<td>08:45</td>
<td>Keynote: David Keyes (KAUST)</td>
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Seismic Modelling & Imaging - Part I
Session Chairs: V. Etienne (Saudi Aramco), A. St-Cyr (Shell Global Solutions)

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<tr>
<th>Time</th>
<th>Title</th>
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<tbody>
<tr>
<td>09:30</td>
<td>HPC01 - GeoDRIVE, an HPC flexible platform for seismic applications - G. Sindi, V. Etienne, A. Momin, T. Tonellot. 1 Saudi Aramco, EXPEC Advanced Research Center</td>
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<tr>
<td>10:00</td>
<td>HPC02 - One-way wave equation migration of common-offset vector gathers: parallel multi GPU/GPU implementation - A. Pleshkevich, V. Listratov, D. Vishnevsky, V. Levchenko. 1 Trofimuk Institute of Petroleum Geology &amp; Geophysics SB RAS, 2 Sobolev Institute of Mathematics, 3 Institute of Applied Mathematics RAS, 4 Central Geophysical Expedition JSC of Rosgeo</td>
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<td>10:30</td>
<td>Coffee Break</td>
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Performance Analysis & Optimization - Part I
Session Chairs: S. Momose (NEC Deutschland GmbH), Thierry Carron (Intel)

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<th>Time</th>
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<tr>
<td>11:00</td>
<td>HPC03 - A Checkpoint of research on the implementation of geophysical stencils on multicore platforms. - F. Dupros, C. Hillairet. 1 Arm</td>
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TECHNICAL COMMITTEE

<table>
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<tr>
<th>Name</th>
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<tr>
<td>Amik St-Cyr (Co-chair)</td>
<td>Shell</td>
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<td>Vincent Etienne (Co-chair)</td>
<td>Saudi Aramco</td>
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<td>Alecio Binotto</td>
<td>IBM Research</td>
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<td>Ali A. Alturki</td>
<td>Saudi Aramco</td>
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<td>Andrew Jones</td>
<td>NAG Ltd</td>
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<td>David Latino</td>
<td>Cray</td>
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<td>Detlef Hohl</td>
<td>Shell Technology Center Houston</td>
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<td>Fabrice Dupros</td>
<td>ARM</td>
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<td>Gaël Youinou</td>
<td>CEG</td>
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<td>Gerard Gorman</td>
<td>Imperial College London</td>
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<td>Issam Said</td>
<td>Nvidia</td>
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<td>JC Baratault</td>
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<td>Jean-Yves Blanc</td>
<td>CEG</td>
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<td>Jonathan A. Phillips</td>
<td>ExxonMobil Technical Computing Company</td>
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<td>Ken Esler</td>
<td>Stone Ridge Technology</td>
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<td>Patrick Demichel</td>
<td>Hewlett-Packard Enterprise</td>
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<td>Paulo Souza</td>
<td>Rotor</td>
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<td>Philippe Thierry</td>
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<td>Raed Abdelkhalek</td>
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<td>Saber Feki</td>
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<td>Shintaro Momose</td>
<td>NEC</td>
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<td>Stuart Midgley</td>
<td>DownUnder GeoSolutions</td>
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<td>Tau Leng</td>
<td>Supermicro</td>
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<td>Thierry Carron</td>
<td>Hewlett-Packard Enterprise</td>
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<td>Yuhe Wang</td>
<td>Texas A&amp;M University</td>
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GRAND BALLROOM

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Special Sessions:

- Oral Presentations
- Technical Sessions
- Keynote Talks
- Panel Discussions
- Poster Sessions

Venue:

- Grand Ballroom
- Suir Hall
- Other venues as per schedule

Schedule:

- Monday, October 7
- Tuesday, October 8
- Wednesday, October 9

Accommodation:

- On-site lodging available
- Nearby hotels for convenience

Transport:

- Shuttle service provided
- Public transportation options nearby

Partners:

- Organized by EAGE
- Support from industry partners

Contact:

- Workshop Coordinator: info@eage.org
- Technical Program Chair: tech@eage.org

Registration:

- Online registration available
- Early bird rates
- Cancellation and refund policy

Materials:

- Handouts and booklets
- Digital copies available

Networking:

- Coffee breaks
- Evening social events

Additional:

- Poster Session:
- Special Interest Groups
- Exhibition space available

Acknowledgments:

- Sponsorship from industry partners
- Support from technical committees

Notes:

- Check the official website for updates
- Follow on social media for the latest news
Oral Presentations | Tuesday 8 October

08:00 Morning Coffee

GRAND BALLROOM

08:30 Keynote: Felix J. Herrmann (Georgia Institute of Technology)

Emerging HPC Technologies - Part I
Session Chairs: P. Demichel (HPE), A. Alturki (Saudi Aramco)

  1 Imperial College London; 2 DownUnder GeoSolutions; 3 Shell

09:45 HPC07 - Total takes the deep dive into GPU for Seismic Imaging - L. Boillot*, D. Klah*, L. Go, A. Lucot*, M. Bonnasse-Gahot, J. Monet*, E. Bergouinroux, J. Briche
  1 Total

10:15 Coffee Break

Performance Analysis & Optimization - Part II
Session Chairs: J. Phillips (ExxonMobil), P. Souza Filho (Atrio Inc)

10:45 HPC08 - CGG: A Journey from Software to Hardware - V. Anslan*, F. Pautre*, J. Blanc*, T. Barragy
  1 CGG

11:15 HPC09 - Weak scalability analysis of GPGPU-based iterative solvers in a two-phase pore-scale flow simulator - C. Thiée, M. Araya-Polo, F. Alpak, B. Riviere*, D. Hohl*
  1 Rice University; 2 Shell International Exploration & Production, Inc.

11:45 HPC10 - Scalable High-Resolution Seismic Tomography - L. Boillot*, P. Basim
  1 Total

12:15 Lunch

Emerging HPC Technologies - Part II
Session Chairs: S. Feki (King Abdullah University of Science & Technology), G.Y. Younou (CGG)

13:45 HPC11 - Seismic Processing with Hybrid HPC - P. Souza Filho*, A. Sardinha, C. Avila, A. Azambuja2, F. Sienna, D. de Paula*, M. Vecino*, L. Silva*, N. Ji
  1 Atrio Inc; 2 Petrobras

15:00 HPC12 - Potential applications of quantum computing in upstream - M. Dulakski

15:30 Coffee Break

16:00 Panel Discussion: Opportunities & Challenges in HPC for Oil & Gas
  Moderator: Andrew Jones (NAG)

16:45 Wrap-up Discussion

17:00 End of Day 2

19:30 Workshop Dinner

Oral Presentations | Wednesday 9 October

08:00 Morning Coffee

GRAND BALLROOM

09:00 Keynote: Suha Kayum (Saudi Aramco)

Reservoir Modelling & Simulation / Digital Rock Physics
Session Chair: K.P. Esler (Stone Ridge Technology)

  1 Saudi Aramco

10:45 Coffee Break

Seismic Modelling & Imaging - Part II
Session Chairs: I. Said (NVIDIA), P. Thierry (Intel)


  1 IBM Research Brazil; 2 IBM Research Australia

12:15 Lunch

13:45 Breakout Session: Quantum Computing 101 - IBM

15:30 Best Presentation Recognition Award

15:45 End of Workshop

Poster Presentations

GRAND BALLROOM FOYER

POS01 - Incorporating Lossless Compression in Parallel Reservoir Simulation - M. Rogowski (Saudi Aramco)*, S.N. Kayum (Saudi Aramco), F. Mannuss (Saudi Aramco)

POS02 - Digital Twin of Multiscale Geological Media: Faults, Fracture Corridors, Caves. Seismic simulation and imaging - V. Cheverda (Trofimuk Institute of Petroleum Geology & Geophysics SB RAS)*, G. Reshetova (Trofimuk Institute of Petroleum Geology & Geophysics SB RAS), M. Protasov (Trofimuk Institute of Petroleum Geology & Geophysics SB RAS)

POS03 - A Scientific Workflow for Reverse Time Migration under Uncertainty - C.H. Barbosa (Federal University of Rio de Janeiro)*, B. Silva (Federal University of Rio de Janeiro), C. Alves (Federal University of Rio de Janeiro), R. Silva (Federal University of Rio de Janeiro), L. Kunstmann (Federal University of Rio de Janeiro), H. Costa (Federal University of Rio de Janeiro), J. Alves (Federal University of Rio de Janeiro), M. Mattoso (Federal University of Rio de Janeiro), F. Rochinha (Federal University of Rio de Janeiro), D. Filho (Petrobras), A. Coutinho (Federal University of Rio de Janeiro)

POS04 - Optimal Order in Explicit Time Stepping - S. Delaney (Tullow Oil)*, T. Downes (Dublin City University)

POS05 - Exposing Fine-Grained Parallelism in Sequential Gaussian Simulation - M. Khait (TU Delft)*, K. Eler (Stone Ridge Technology)

POS06 - GPU Implementation of Line Solve Power Series Preconditioner used in Reservoir Simulation - O. Hajjar (Saudi Aramco)*, M. Rogowski (Saudi Aramco)

POS07 - Accelerating seismic parameter estimation with Adaptive Differential Evolution (JADE) and graphics processing units (GPUs) - J. Ribeiro (CETPETRO / UNICAMP), N.T. Okra (CETPETRO / UNICAMP), T.A. Combra (CETPETRO / UNICAMP), M. Tygel (CETPETRO / UNICAMP)

POS08 - High-Performance Computing Applications Transition to the Cloud in Upstream - S. Kayum (Saudi Aramco)*, M. Rogowski (Saudi Aramco)
REGISTRATION

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<tr>
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<td>Student Non-member*</td>
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*Memberships are provided for Non-Member registrations and the activation will only take place after the event, between 2-3 weeks.

All fees are in Euros (€). One Euro of your total registration fee is donated to the EAGE Green Fund. Please note that all fees are subject to 5% VAT as per UAE regulations.

Members please note: To qualify for the member registration fee, your EAGE membership dues for 2019 must have been paid and confirmed. The processing time for membership applications or renewals is 10 working days.

To qualify for the reduced student registration fee:
- Students must be enrolled in a full-time study programme at a recognized university or institute
- The registration must be accompanied by a copy of a student ID card and/or official proof of enrolment.

Please note: Student non-members cannot be older than 34 years of age (when registering). The non-member fee includes EAGE membership for the remainder of 2019.

Please note that EAGE reserves the right to cancel the workshop due to low participation. In this case, payment will be refunded in full.

EAGE registration fees differentiate between EAGE membership recognition levels and non-members. First-year members have Green membership status which gives you a €50 discount (€25 for students) on the Non-member fee for each EAGE event registration; starting from Bronze status, you can benefit from an even greater reduced EAGE member registration fee. Please visit the EAGE website for more information about the recognition programme.

IMPORTANT DATES

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<tr>
<td>Early Registration Close</td>
<td>7 September 2019</td>
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<tr>
<td>Regular Registration Open</td>
<td>8 September 2019</td>
</tr>
<tr>
<td>Online Registration Close</td>
<td>3 October 2019</td>
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BEST PRESENTATION RECOGNITION AWARD

The Technical Committee will be selecting one oral presentation to receive a recognition award, as well as the opportunity for the author to have their abstract published in First Break. The winner will be announced at the end of the workshop.

VENUE DETAILS

Grand Plaza Mövenpick Media City
Sheikh Zayed Road, opposite Innovation Hub Media City
Dubai, United Arab Emirates

EAGE negotiated rates are available at the workshop venue for event attendees, please visit eage.eventsair.com/hpc2019 for more information.

SOCIAL PROGRAMME

Icebreaker Reception
Sunday 6 October from 18:00
Twenty Three Rooftop Bar @ Grand Plaza Mövenpick Media City

Workshop Dinner
Tuesday 8 October 19:30

SPONSORSHIP

We would like to thank the workshop sponsors:

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Dinner Sponsor
ExxonMobil

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Lanyards

Cray

Icebreaker

Registration desk

See you in Dubai!