Role of federated Polish HPC Centers in Polish AI initiatives and EuroHPC program

Presented by Marek Michalewicz
Interdisciplinary Centre for Mathematical and Computational Modelling (ICM), University of Warsaw, Poland

with contributions from
Krzysztof Kurowski, Cezary Mazurek, Norbert Meyer, Maciej Stroinski, Jan Weglarz
Poznań Supercomputing and Networking Center
Kazimierz Wiatr, Cyfronet, Kraków
Wojciech Wiślicki, NCNR, Świerk
Today on the 11th of November 2018

Republic of Poland

celebrates the 100th anniversary of regaining independence after 123 years of partitions
Polish e-infrastructure as a component of ERA
PSNC – Operator of the Polish NREN "PIONIER"

Services:
- HD Videoconferencing (>12k users)
- Eduroam (>9M auth's in 2017)
- Digital library framework (>3.3M digital objects)
- Scientific HD Television PLATON (>5k films)
- National Data Storage and archiving on demand
- Content Delivery Platform for media streaming
- Virtual Firewall
- Applications, databases, infrastructure on demand
- Pionier.ID
- RA for Certificate Service
- DOI registration
Dedicated network "100net" connecting Polish HPC Centers

✓ 400Gb/s connection between Poznan and Warsaw
✓ n*100Gb/s between all HPC Centers
✓ High reliability and automatic reconfiguration of the optical network in the national dimension
✓ 100Gb/s link from MANs
✓ Distributed lab for future HPC tools and algorithms
✓ Deployment of PSNC's QCG software stack
Number of Polish HPC systems in Top500 list
Position of the top Polish HPC system at Top500 list (lower is better)
Rmax of the top Polish HPC system at Top500 list

- PFLOPS
- TFLOPS
- GFLOPS

## Polish HPC systems in Top500 list

### June 2017

<table>
<thead>
<tr>
<th>Rank</th>
<th>System</th>
<th>Cores</th>
<th>Rmax [TFlop/s]</th>
<th>Rpeak [TFlop/s]</th>
<th>Power [kW]</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>Prometheus - HP Apollo 8000, Xeon E5-2680v3 12C 2.50GHz, Infiniband FDR, NVIDIA Tesla K40, HPE Cyfronet</td>
<td>55,728</td>
<td>1,670.1</td>
<td>2,348.6</td>
<td>807.6</td>
</tr>
<tr>
<td>131</td>
<td>HETMAN - Huawei E9000 Blade Server, Xeon E5-2679v3 14C 2.6GHz, 56G Infiniband FDR, Huawei Technology Company Ltd. PCSS Poznan, Poland</td>
<td>32,984</td>
<td>1,013.7</td>
<td>1,372.1</td>
<td>549.6</td>
</tr>
<tr>
<td>135</td>
<td>Tryton - HP ProLiant XL230a Gen9/Huawei RH1288/50LAR 820 55, Xeon E5-2670v3 12C 2.3GHz, Infiniband , Megate/Action Academy Computer Centre in Gdansk, Poland</td>
<td>38,400</td>
<td>1,010.9</td>
<td>1,413.1</td>
<td>864</td>
</tr>
<tr>
<td>161</td>
<td>OKEANOS - Cray XC40, Xeon E5-2690v3 12C 2.6GHz, Aries interconnect , Cray Inc. Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw, Poland</td>
<td>26,016</td>
<td>909.6</td>
<td>1,082.3</td>
<td>585.4</td>
</tr>
<tr>
<td>274</td>
<td>BEM - Actina Solar 820 S6, Xeon E5-2670v3/E5-2679v3 14C/12C 2.6/2.3GHz, Infiniband FDR , ACTION Wrocław Centre for Networking and Supercomputing, Poland</td>
<td>22,656</td>
<td>695.6</td>
<td>859.5</td>
<td>353</td>
</tr>
<tr>
<td>489</td>
<td>RH1288 V3 Cluster, Xeon E5-2680v3 12C 2.50GHz, Infiniband FDR , Huawei Technology Company Ltd. Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw, Poland</td>
<td>14,540</td>
<td>439.1</td>
<td>591.2</td>
<td>394.9</td>
</tr>
</tbody>
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### June 2018

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<td>Prometheus - HP Apollo 8000, Xeon E5-2680v3 12C 2.50GHz, Infiniband FDR, NVIDIA Tesla K40, HPE Cyfronet, Poland</td>
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<tr>
<td>259</td>
<td>EAGLE - Huawei E9000 Blade Server, Xeon E5-2679v3 14C 2.6GHz, 56G Infiniband FDR, Huawei Technologies Co., Ltd. PCSS Poznan, Poland</td>
<td>32,984</td>
<td>1,013.7</td>
<td>1,372.1</td>
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</tr>
<tr>
<td>263</td>
<td>Tryton - HP ProLiant XL230a Gen9/Huawei RH1288/50LAR 820 55, Xeon E5-2670v3 12C 2.3GHz, Infiniband , Megate/Action Academy Computer Centre in Gdansk, Poland</td>
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<td>1,010.9</td>
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<td>320</td>
<td>OKEANOS - Cray XC40, Xeon E5-2690v3 12C 2.6GHz, Aries interconnect , Cray Inc. Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw, Poland</td>
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<td>909.6</td>
<td>1,082.3</td>
<td>585.4</td>
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Prometheus
➢ 2.4 PFLOPS
➢ 53 568 cores
➢ 1\textsuperscript{st} HPC system in Poland

Zeus
➢ 374 TFLOPS
➢ 25 468 cores
➢ 1\textsuperscript{st} HPC system in Poland (from 2009 to 2015)

Computing portals and frameworks
➢ OneData
➢ PLG-Data
➢ DataNet
➢ Rimrock
➢ InSilicoLab

Storage
➢ 48 PB
➢ hierarchical data management

Research & Development
➢ distributed computing environments
➢ computing acceleration
➢ software optimization
➢ machine learning

Data Centres
➢ 3 independent data centres
➢ dedicated backbone links
Prometheus and Zeus clusters
- 3700+ active users
- 350+ computational grants
- 7.7+ millions of jobs in 2016
- 214+ millions of CPUhours spent in 2016
- 2016 biggest jobs
  - 24 024 cores
  - 261 152 CPUhours in one job
- 550+ software modules
- Custom users’ helper tools developed in-house
Poznan Supercomputing and Networking Center (PSNC)

✓ Founded in 1993

✓ Affiliated to the Institute of Bioorganic Chemistry Polish Academy of Science

✓ 305 employees in 2018

✓ Research and development center as well as leading operator of Polish e-Infrastructure
PSNC locations

Polish Optical Internet Research Centre

Headquarter

Labs and offices

Primary Data Centre

Living Labs

Co-working area, spin-off

Metropolitan Area Network POZMAN

287 km of fibre optic cables
110 institutions connected

Secondary Data Centre
HPC at ICM - 2017 Statistics

- 350 Computational Grants
- Over 180 M coreh
- Over 280 Scientific Publications
- 480 Active Users
- Over 100 institutions

www.icm.edu.pl
ICM as an interdisciplinary centre

UM (Unified Model):

- spatial resolution: 4 km and 1.5 km, length: up to 72 hours.
EuroHPC: European entry into Exascale race

Opinions presented in this presentation are my personal observations based on publicly available information. I do not have any formal ties with EU authorities nor Polish Government.
Palazzo Doria Pamphilj
Rome, Italy, 23 March 2017
60 Digital Day
European Commission - Press release

Commission proposes to invest EUR 1 billion in world-class European supercomputers

Brussels, 11 January 2018

The European Commission unveiled today its plans to invest jointly with the Member States in building a world-class European supercomputers infrastructure.
Article 4

Union’s financial contribution

(1) The Union financial contribution to the Joint Undertaking including EFTA appropriations shall be up to EUR 486 000 000, distributed as follows:

(a) EUR 386 000 000 from the Horizon 2020 Programme, including up to EUR 10 000 000 for administrative costs;

(b) EUR 100 000 000 from the CEF Programme;

(2) The Union’s financial contribution referred to in point (a) of paragraph 1 shall be paid from the appropriations in the general budget of the Union allocated to the Specific Programme, implementing Horizon 2020, established by Decision 743/2013/EU.
European High Performance Computing Joint Undertaking

France, Austria, Belgium, Bulgaria, Croatia, Czech Republic,
Germany, Denmark, Estonia, Finland, Greece,
Italy, Hungary, Ireland,
Luxembourg, Latvia, Lithuania,
Netherlands, the Netherlands,
Portugal, Norway, Poland,
Spain, Romania, Slovakia,
Slovenia
Założenia do strategii AI w Polsce

Plan działań Ministerstwa Cyfryzacji

EU
High-Level Expert Group on Artificial Intelligence
KEYNOTE SPEAKERS

WHITFIELD DIFFIE USA
Title: Supercomputing Security or Supercomputing for Security

DIMITRI KUSNEZOV DEPARTMENT OF ENERGY, USA
Tentative Title: Precision Medicine as an Accelerator for Next Generation Supercomputing

KARLHEINZ MEIER HEIDELBERG UNIVERSITY, GERMANY
Title: Neuromorphic computing – From biology to user facilities

THOMAS STERLING INDIANA UNIVERSITY, USA
Topic: Simultac Fonton
SUPERCOMPUTING FRONTIERS EUROPE 2019

INVITED SPEAKERS

HAMISH CARR UNIVERSITY OF LEEDS, UK
Tentative Topic: Computational Topology

CHARLIE CATLETT ARONNE NATIONAL LABORATORY, USA
Title: Understanding C4I: Measurement and Embedded Intelligence

EVANGELOS ELEFTHERIONOS ETH ZURICH, SWITZERLAND
Tentative Topic: Non-von Neumann Computing: Computational Phase-change Memory

TORSTEN HOEFER ETH ZURICH, SWITZERLAND
Tentative Topic: Extreme Scale Graphs

ELI KLEINER NATIONAL CENTER FOR SUPERCOMPUTING APPLICATIONS, USA
Title: Driving innovation at the interface of high performance computing and artificial intelligence for Multi-Messenger

TOMÁŠ NOUCKLÉN UNIVERSITY OF CALIFORNIA SAN DIEGO, USA
Tentative Topic: Global Scale Micro-biome Projects

ALEX WRIGHT-GLADSTONE ARM LABS, USA
Tentative Topic: Optical Interconnect Technology

LEON CHUA UNIVERSITY OF CALIFORNIA BERKELEY, USA
Tentative Title: Memristor – Remembrance of things Past

PAUL MESSINA ARGONNE NATIONAL LABORATORY, USA
Tentative Topic: Exascale Supercomputing
Warsaw Team:
Piotr Konopelko - Pt;
Jarosław Ławnicki - MiM UW;
Marcin Mielniczuk - MISMaP UW;
Szymon Pajzert - MIM UW;
Dominik Psujek - PW;
Adam Sobecki - MIM UW

2017
ASC17, Wuxi, China
24-27 kwiecień 2017
6th place, ~200 Universities

SC17 Student Cluster Competition,
11-17 listopad 2017, Denver USA

2018
ASC18, Nanchang, China
- 21st place (missed the final)
over 300 Universities

ISC18, Frankfurt, Germany
Finalists

SC18, Dallas, TX, USA
Finalists
PIONIER Polish Optical Network	Booth 1015
ICM, University of Warsaw	Booth 4417
Warsaw Team	Booth 4465