

Course: Advanced parallel programming

Wednesday, February 10, 2021 - Thursday, February 11, 2021

Scientific Program

Opis /Description:**SLO:**

Za izkoriščanje velikih masivno vzporednih paradigem grozdov, ki združujejo MPI in OpenMP, se uporablja. Poleg tega se razvijajo standardi MPI in OpenMP, vključno z novimi idejami in funkcijami, ki postajajo vedno bolj učinkovite v novih strojih. To daje razvijalcem HPC aplikacij nemoteno pot razvoja njihovih aplikacij, ne da bi se morali ukvarjati s težkim ponovnim faktoringom, da bi začeli uporabljati nove tehnologije.

Dvodnevni tečaj bo zajemal teme, povezane z vzporednostjo, nalogami OpenMP, pomnilniškim modelom OpenMP, prilagajanjem zmogljivosti, hibridnimi izvedbami OpenMP + MPI in OpenMP. Tečaj je namenjen programerjem, ki želijo poglobiti svoje razumevanje OpenMP.

Tečaj se izvaja v intenzivnem dvodnevem formatu z uporabo učnih prostorov UL-FME. Poučuje se z različnimi metodami, vključno s formalnimi predavanji, praktičnimi vajami, primeri programiranja in neformalnimi vajami. Po tečaju bi morali udeleženci znati pisati učinkovitejše programe OpenMP.

ENG:

To exploit large massively parallel cluster paradigms combining MPI and OpenMP is used. Moreover MPI and OpenMP standards are evolving including new ideas and features to become increasingly effective in new machines. This gives developers of HPC applications a smooth path of evolution of their applications without having to deal with heavy re-factoring to take up new technologies.

The 2-day course will cover topics related to parallelism, OpenMP tasks, the OpenMP memory model, performance tuning, hybrid OpenMP + MPI and OpenMP implementations. The course is aimed at programmers seeking to deepen their understanding of OpenMP.

The course is delivered in an intensive two-day format using UL-FME's training facilities. It is taught using a variety of methods including formal lectures, practical exercises, programming examples and informal tutorial discussions. After the course the participants should be able to write more efficient OpenMP programs.

Udeleženci/Attendees

SLO: Ciljno publiko sestavljajo podiplomski študentje in mladi raziskovalci naravoslovnih in tehničnih ved, inženirji iz industrije, kjer je superračunalništvo mogoče uporabiti kot konkurenčno prednost (avtomobilska, elektronska, materialna industrija), logistika itd. Število prijav je omejeno na **30**.

ENG: The target audience consists of postgraduate students and young researchers of natural and technical sciences, engineers from industry where supercomputing can be used as competitive advantage (automotive, electronic, material industry), logistics, etc.

The number of applicants is limited to **30**.

Predhodnje znanje/ Prerequisite knowledge**SLO:**

Za praktične seje bi morali udeleženci znati delati v ukazni vrstici Unix / Linux in imeti vmesne spretnosti pri programiranju s C / C ++. Ker je poudarek šole na paralelizaciji, morajo biti udeleženci seznanjeni s temo in morajo imeti osnovno znanje o OpenMP in MPI

ENG: For the hands-on sessions participants should know how to work on the Unix/Linux command line and have intermediate skills in programming with C/C++. Since the focus of the school is on parallelization, participants have to be familiar with the topic and must have basic knowledge of

OpenMP and MPI

Pridobljena znanja / Skills to be gained

SLO:

Razumevanje modela posredovanja sporočil
Implementiranje standardnih algoritmov za posredovanje sporočil v MPI
Odpravljanje napak s preprostimi kodami MPI
Izmeriti in komentirati delovanje MPI kod
Razumevanje najboljših praks za programiranje MPI + OpenMP.

ENG:

Understand the message passing model
Implement standard message passing algorithms in MPI
Debug simple MPI codes
Measure and comment on the performance of MPI codes
Understanding of best practice for MPI+OpenMP programming.

Predavatelji/About the authors

* Dr. Janez Povh *

Je izredni profesor na ULFME z dolgim poučevanjem na univerzi (nekdanji dekan na Fakulteti za informacijske študije v Novem mestu v Sloveniji). Z matematičnim ozadjem je specialist za metode velikih podatkov in njihovo izvajanje v Hadoop in RHadoop. Poleg tega je dobro izkušen z ustvarjanjem in izvajanjem vzporednih algoritmov za probleme matematične optimizacije. Je eden vodilnih pedagogov v PRACE MOOC-ju za upravljanje velikih podatkov z R in Hadoop. Je tudi slovenski nosilec več državnih in mednarodnih projektov.

Dr. Leon Kos *

Je docent na ULFME in je dobro usposobljen za več tem, povezanih s HPC. Je kvalificirani trener iz programa HLRS za usposabljanje in je bil ključni razvijalec PRACE MOOC Managing Big Data with R in Hadoop. Bil je vodja PRACE poletja HPC treningov v letih 2014, 2015, 2016, 2017, 2018 in 2019. Je tudi slovenski nosilec več državnih in mednarodnih projektov.

Mag. Leon Bogdanović *

Je študent magisterija in razvijalec programske opreme v laboratoriju LECAD ULFME in nekdanji tehnični sodelavec pri ULFMST. Ima izkušnje z razvojem rekonstrukcije / simulacije nesreč in s simulacijskimi kodami pospešene fizike plazme z GPU. Trenutno ga zanimajo zelo vzporedne kode za sledenje plazemskih linij v fuzijskih reaktorjih tipa tokamak.

Mag. Ivona Vasileska *

Je asistentka in raziskovalka na ULFME in tudi doktorska študentka na področju jedrske tehnike na ULFMF. Od leta 2016 se ukvarja z modeliranjem kinetične in tekoče plazme z uporabo različnih vrst kod. Večinoma je imela izkušnje s kinetičnimi kodami delcev v celici (PIC) in tekočinsko kodo SOLPS-ITER. Tudi leta 2020 je bila mentorica na PRACE Summer of HPC school. Tema tega projekta je bila prenos obrazca CPU na GPU kode PIC. Ima več kot 12 publikacij in je sodelovala pri več projektih na področju fuzije in HPC računalništva.

Dr. Borut Cerne *

Je asistent raziskovalca in dela na ULFME. Njegovo raziskovalno delo je bilo doslej v glavnem osredotočeno na termomehansko modeliranje homogenih in kompozitnih polimerov, ki temelji na metodi končnih elementov, za uporabo v zobniških aplikacijah. Poleg analitičnega / numeričnega

modeliranja ima bogate izkušnje z eksperimentalnimi testiranjmi polimerov in drugih nekovinskih materialov. Trenutno je vključen v več projektov raziskovanja in širjenja znanja, povezanih z uporabo HPC-jev na področju strojništva. Del njegovih nalog, ki delajo na ULFME, vključuje tudi pedagoško delo asistenta pri več fakultetah, povezanih s CAD / CAE. Poleg tega je bil vključen v različne raziskovalne in razvojne industrijske projekte.

Janez Povh, PhD

He is an associate professor at ULFME with a long track of teaching duties at university (a former Dean at Faculty of Information studies in Novo Mesto, Slovenia). With mathematical background he is a specialist in Big Data methods and their implementation in Hadoop and RHadoop. Beside this he is a well experienced with creating and implementing parallel algorithms for mathematical optimization problems. He is one of the leading educators in PRACE MOOC Managing Big Data with R and Hadoop. He is also Slovenian holder of several national and international projects.

Leon Kos, PhD

He is an assistant professor at ULFME and is well qualified for several HPC related topics. He is a qualified trainer from the HLRS train-the-trainers program and was the key developer of PRACE MOOC Managing Big Data with R and Hadoop. He has been the leader of PRACE Summer of HPC trainings in 2014, 2015, 2016, 2017, 2018 and 2019. He is also Slovenian holder of several national and international projects.

Leon Bogdanovic, MSc

He is an MSc student and software developer at LECAD lab ULFME and a former technical collaborator at ULFMST. He has experience in developing accident reconstruction/simulation and GPU accelerated plasma physics simulation codes. His current interest are highly parallel codes for plasma field-line tracing in tokamak type fusion reactors.

Ivona Vasileska, MSc

She is an assistant and researcher at ULFME and also PhD student in field of nuclear engineering in ULFMF. Since 2016 she has been worked on kinetic and fluid plasma modelling using different kind of codes for it. Mostly she has experienced in Particle In Cell (PIC) kinetic codes and SOLPS-ITER fluid code. Also in 2020 she was a mentor in PRACE Summer of HPC school. The topic of that project was make a transfer from CPU to GPU of the PIC code. She has more than 12 publication and has been working on several project in fusion and HPC computing.

Borut Cerne, PhD

He is an assistant researcher, working at ULFME. His research work has so far mainly been focused on finite element method based thermomechanical modelling of homogeneous and composite polymers, used in gearing applications. Apart from analytical/numerical modelling he has substantial experience in experimental testing of polymer and other non-metal materials. Currently, he is involved in several research and knowledge dissemination projects related to the application of HPCs in the field of mechanical engineering. Part of his duties working at ULFME also involve pedagogical work as a teaching assistant on several CAD/CAE related faculty subjects. Additionally, he was involved in various R&D oriented industrial projects.

SLO

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ENG

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