HiDALGO

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DON´T MISS!

Winter Simulation Conference virtual conference in Orlando, Florida, USA

14/12 – 18/12/2020
http://meetings2.informs.org/wordpress/wsc2020/

HiPEAC 2021
virtual conference in Budapest, Hungary

18/01 – 20/01/2021
https://www.hipeac.net/2021/budapest/#/

NEWSLETTER

HiDALGO

Welcome from the Quality Manager

Dear Colleagues,
We are more than the halfway of the project lifetime. During this period, we had a chance to get to know each other well and work as a team. We elaborated project standards for communication, deliverables, sharing meeting notes and many other project documents. Taking into account the current situation on the world, these mechanisms pay off perfectly, allowing us to work effectively despite of any communication limits.

Our design activities have recently been focused on improving the existing and developing new functionalities, providing more and more accurate calculation results, improving the efficiency of simulation tools and implementing applications for data analysis. Efforts to integrate the developed tools are also important so that they operate within a coherent system. One of the prominent application that shows our flexibility and responsiveness to the Covid-19 outbreak is Flu And Coronavirus Simulator (FACS) developed by BUL. FACS is an agent-based model that approximates the viral spread at the sub national level and provide estimations of the spread of infections and hospital arrivals, given a range of public health interventions.

The apple of the eye in the project activity is paving the way towards Exascale systems by developing applications which are able to efficiently utilize a significant amount of cores. We are on the right track in this regard, our applications (Flee – 16k cores, OpenFOAM – 4k cores, Social Networks Eigenvalue – 32k cores) are performing better and better. Notwithstanding, we do not limit our investigations to resources provided by PSNC and HLRS. In order to test our solutions on other architectures we successfully established collaboration with PRACE. It gave us access to best machines in Europe like: MareNostrum4, Piz Daint, Marconi 100, Joliot-Curie Rome and SuperMUC-NG where benchmarks will be pursued.

In September this year, a project was officially reviewed by the Project Officer and European commission reviewers. The entire review was successful and our efforts to achieve the project ambitions were appreciated. It also resulted with list of recommendations giving us hints how to improve the quality of our work, which we are going intently implement in the future endeavors.

The field were HiDALGO operates is extremely complex, therefore it seems to us immensely essential to cooperate with other projects and organizations dealing with similar topics. This approach allows us to look at many problems from a different perspective and to develop a common position for the construction of more universal solutions. Following this reasoning the project ECM board decided to establish "Associate Partners" program facilitating collaboration and communications as well as to carry out certain undertakings together. So far seven projects joined this initiative: Energy-oriented Center of Excellence, ESiWACE, EXCELLERAT, ITFLOWS, ODYCCEUS, SODALITE and VECMA. We are looking for fruitful partnership.

The recent period was brimming with publication and dissemination actions (ICCS'2020, PODC'20, Journal of Artificial Societies and Social Simulation and many others). However, there are still many interesting challenges ahead of us, like "HiPEAC 2021" and "First joint CoEs Technical Workshop" (in collaboration with ChEESE, EXCELLERAT), where we will have the opportunity to present our achievements and conduct many interesting conversations.
Stay tuned and healthy.

Marcin Lawenda
Poznan Supercomputing and Networking Center

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HiDALGO's Dissemination and Communication

One of the most important tasks in the HiDALGO project is to disseminate and communicate our goals, methods, and results.

The main objectives of HiDALGO are the design, optimization, and engineering of methods and tools that can efficiently handle scientific problems arising in the context of global challenges. The target groups of HiDALGO are the scientific community, the industry, political decision makers, the general public, as well as non-governmental organizations (NGOs). As we develop models, which properly describe the processes arising from global challenges and implement tools to simulate these processes, the scientific community and academia are interested in all these new developments. Parts of the industry are interested in the results and the products of the project, as these might be useful for the software and solutions they develop for their customers. Governments and civil society organizations are keen on our simulation outcomes, which support them to make the right decisions.

Our dissemination and communication activities follow two major lines. Firstly, we disseminate our objectives and results widely, using our main communication channels, such as our website, the social media, as well as mass media. Secondly, we initiate targeted communication, which is directed toward our stakeholders as well as the scientific community working in this area. Apart from these dissemination lines, we organize a number of workshops and pursue training activities to educate young researchers working in this field.

In order to evaluate the efficiency of our dissemination activities, we defined a number of Key Performance Indicators, which focus on the number of (high-quality) publications, the number of users and visitors reached through our website and social media, and the quantity and quality of our training activities. All these performance indicators are key to measure the success of our work within the HiDALGO project. Our achievements are summarized in the corresponding deliverables, which we refer to for further reading: https://hidalgo-project.eu/reports/wp7.

Robert Elsässer
University of Salzburg

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Flu and Coronavirus Simulator (FACS)

The Flu and Corona virus Simulator (FACS) is a simulation tool that models the spread of infectious disease at the sub-national level and incorporates geospatial data sources from Open Street Map to extract buildings and residential areas within a predefined region. Using FACS, we can both model Covid-19 spread at the local level and provide estimates of the spread of infections and hospital arrivals for different scenarios.

A. Key features and benefits:
FACS provides an open-ended platform for the specification and implementation of the primary components of ABS: (i) Agents; (ii) Virtual environment and (iii) Rule-set using a systematic Simulation Development Approach. It mainly specializes in modeling the complex dynamics e.g., agent movements and provides the ability to simulate a large population of agents with microscopic details using remote supercomputers, thus offers numerous benefits including: high performance, high scalability and greater re-usability. FACS generalizes the process of disease modelling and provides a template to model any infectious disease. Thus, allowing non-programmers (e.g., epidemiologists and healthcare data scientists) to use the framework as a disease modelling suite. FACS offers a built-in location graph construction tool that allows import of large spatial data-sets (e.g., Open Street Map), automated parsing and pre-processing of the spatial data and generating buildings of various types, thus allowing an ease in the synthesis of the virtual environment for the region under consideration

B. Modeling and Simulation Process
A six-step process to model and simulate a particular disease (e.g., COVID-10) using FACS simulator is illustrated In Figure 1. In step 1 a region and the time period for the simulation is selected. In step2, the requisite data is gathered. In step 3 the input data of the model is prepared and stored in the form of CSV and YAML files. In step 4 different healthcare measures e.g., lockdown scenarios are configured. Step 5 deals with the execution of the model using local machine or remote super computing

environment. The execution requires configuration of the FabSim3 environment for creating ensemble and replication runs. Step 6 deals with the visualization, analysis and the validation of the simulation results.
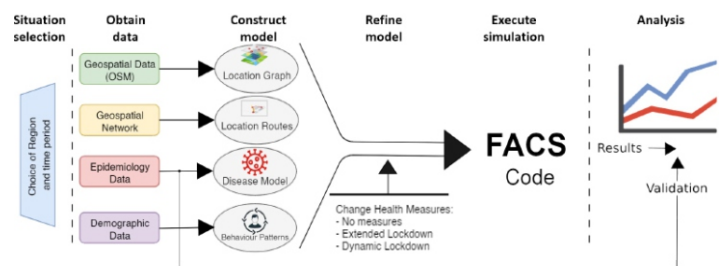

Figure 1: Six step process for FACS simulations

C. FACS – Architecture, Design and Execution
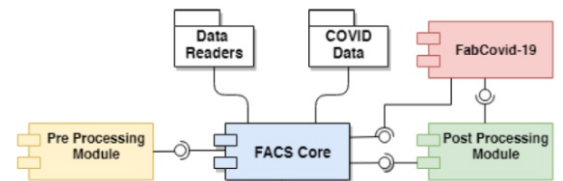The architecture of the FACS framework is shown in figure 2.

Figure 2: FACS Architecture

FACS Core is the main component that takes inputs from the Pre-Processing Module which helps in the preparation of input data as shown in figure1. This data is stored in the COVID data package and can be parsed using Data Readers. The Core component is used to prepare an ensemble run or multiple-runs (replicas) to simulate using the FabCovid-19 module. The outputs from FACS Core are post-processed for visualization using Post-Processing Module.

We have tested FACS framework with an agent population more than 300K and with the number of location graph nodes more than 100K and observed the execution time less than 20 minutes on remote supercomputing machines and between 20-40 minutes on local PC. With the parallel version of FACS framework under development, we hope to achieve a higher speedup and greater scalability.

Imran Mahmood
Brunel University London

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HiDALGO Customer Portal and Services
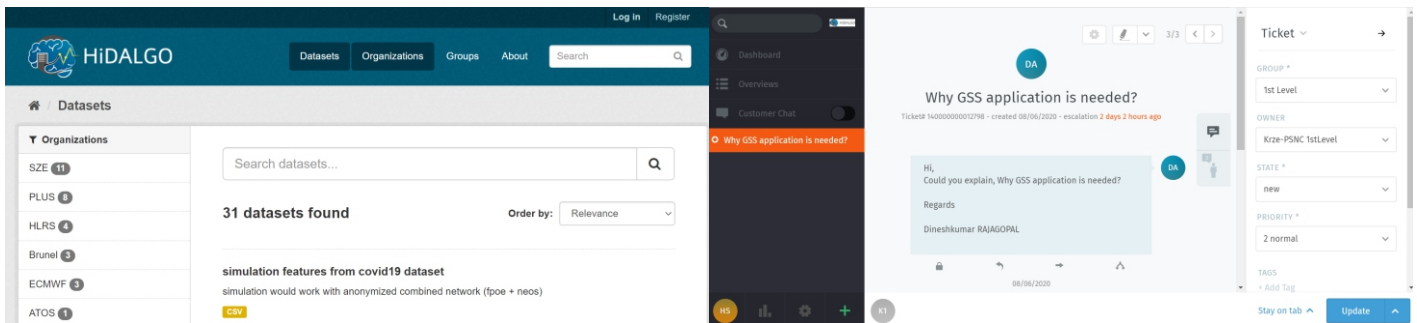
HiDALGO's mission is to develop great products and offer good services to add value in the customers' business, which are accessible easily in a single place: The HiDALGO Customer Portal. The portal is wrapping the complex technologies (HPC, HPDA and AI) and infrastructures with a graphical interface to hide the technical details from the users, so the non-technical users can run the complex workflows by submitting a simple web form. The user has a dedicated dashboard to get all the submitted jobs and its results for further analysis. If the users want to run their custom applications in the portal, then they can include their custom workflow in their dashboard with the assistance of our support team. The web portal also provides value-added services to customers such as:

1) Customer support
2) Matchmaking
3) Public data management system
4) Co-design experiments
5) Customer training

HiDALGO provides both free and commercial customer support to ensure high quality in resolving customer issues. HiDALGO's public forum and ticketing tool are the two services accessible through the portal to raise the customer issues and track the status of the issues online. The HiDALGO forum is available for the community to share their challenges and experiences in public in order to build an active community within the Global System Science (GSS) domain. The HiDALGO ticketing tool is available for resolving the confidential customer issues by ensuring security and privacy to handle the customer tickets by our dedicated support team. If the user is requesting a new feature or commercial consultation, then we can offer online face to face consultation from HPC and GSS experts, as well as business teams for resolving their issues.

Matchmaking is the service provided through the portal to build strong social networking within HiDALGO community by suggesting users based on their technical interest. This service provides suggestion to the users to connect with the similarly interested persons to grow their community and follow their activities online.

The data management system is the service provided for storing and sharing the data within the group through the portal. The data can be used in the custom notebook scripts for further analysis and visualisation. JupyterHub is the web IDE used for analysing small and simple data for custom visualisation by using Python and basic data analytics libraries.

Co-design is the service provided for defining the GSS-HPC benchmark suite to define the benchmarking standards within the GSS and HPC community. Co-design experiments were conducted on the cutting edge HPC systems to analyse the GSS applications' behaviour and provide recommendations to both the hardware and software designers.

HiDALGO supports free and open-source initiatives via sharing the source codes and training materials in public through the portal and public repository to enrich the community. We have been conducting free and commercial trainings to educate the community and show the power of HiDALGO toolbox.

Dineshkumar Rajagopal
HLRS (Höchstleistungsrechenzentrum Stuttgart)

HiDALGO

Partner Institutions

Atos · HLRS · PSNC · ICCS · Brunel University London · MAGYAR KÖZÚT · DIALOGIK

KNOW Center · SZÉCHENYI EGYETEM UNIVERSITY OF GYŐR · UNIVERSITÄT SALZBURG · ECMWF · MOONSTAR COMMUNICATIONS · ARH Adaptive Recognition Hungary

Events HiDALGO participated in

16/11 - 19/11/2020 virtual conference **SC'20** Participants: HLRS, BUL	03/08 - 07/08/2020 virtual conference **PODC 2020** Participant: PLUS
22/06/2020 virtual conference **ISC'2020** Participant: HLRS	11-12/06/2020 virtual conference **ICCS, Workshop "Multiscale Modelling, Uncertainty Quantification and the Reliability of Computer Simulations"** Participants: BUL, ATOS, HRLS, ECMWF, SZE, PLUS
04/05 – 08/05/2020 virtual conference **EGU 2020** Participant: ECMWF	11/02/2020 in Graz, Austria **AI – Know – World AI Congress for AI Enthusiasts** Participant: KNOW
01/02/2020 in Brussels, Belgium **FOSDEM 2020** Participant: ECMWF	13/01/2020 in Boston, USA **100th AMS Annual Meeting** Participant: ECMWF

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