Addressing urgent access to HPC environments

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Mission and Vision of HLRS

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Urgent vs Urgent

- Definition: urgent (from: Oxford Languages)
  - requiring immediate action or attention
  - (of an action or event) done or arranged in response to an urgent situation
- Heavily case specific
- Challenges
  - Long time actions
    - May need new kind of interfaces for quick responses
  - Short notice
    - Needs mainly flexible services
- General challenge:
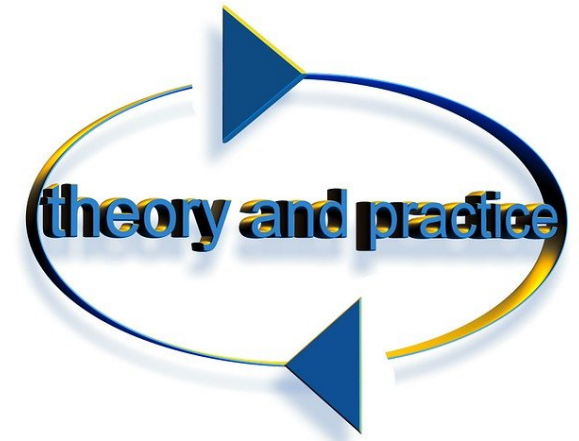 - Understand what the users need

What is needed?

- Users can be manifold in terms of background
  - Experienced users of HPC/AI/HPDA… infrastructure (group 1)
  - Users with moderate experience (group 2)
  - Users with nearly no experience (group 3)
- Theoretically users of infrastrucures:
  - Group 1 and 2
- In case of urgent access
  - All three groups

That means

- If a user (group) needs urgent access, at least:
  - the group needs a minimum of familiarity with the infrastructure and processes of the providing entity
  - the providing entity needs a minimum of familiarity with the relevant issues of the user group that wants to use the infrastructure
  - organisational alignment between the user group and the providing entity to ensure that the right contacts, data, processes and outcomes are immediately available.
  - internal organisational coordination of operations at the providing entity to ensure that needs can be met immediately and in a targeted manner (=> Urgent Computing).
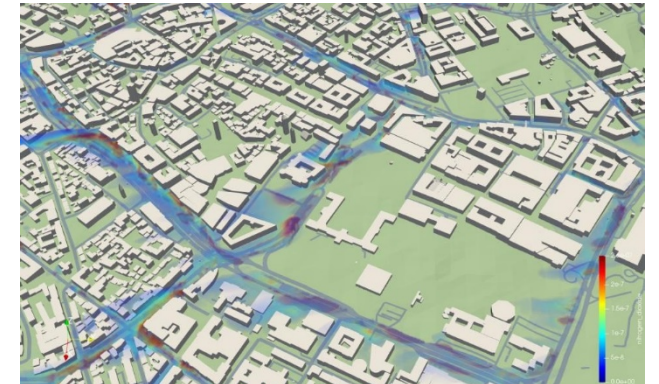
Theory and practice – Dealing with it when the COVID-crisis started

- We all know our business and have expertise
- When COVID started, every providing entity acted best possible
  - Not necessarily focused
- Programs started, but it was rather learning by doing in many cases
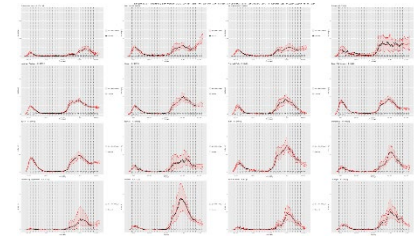- Much room for improvement

theory and practice

Example: HIDALGO – A Centre of Excellence for Global Challenges

- Helped us to understand better how HPC, HPDA and AI can support tackling global challenges

- Even though main uses cases tackle rather long term understanding, the results and how these activities can run optimal on our infrastructure can be applied to short term actions
  - Air Pollution
  - Social Network Analytics (Fake News)
  - Migration Streams

- COVID adaptation:
  - A Simulation Tool within HIDALGO (FACS) supports policy makers by providing the capability to predict the spread of diseases (Flu, COVID…)
  - Support of a diversity of governmental interventions, which can be used for prediction (quarantine, social distancing, lockdown of schools, etc).

Example: Collaboration HLRS <-> Federal institute

- Collaboration with the Federal Institute for Population Research
  - Spatial age-structured microsimulations to predict intensive care capacity coverage
  - Started from small problem size → covering Germany as a whole and on state level

- EXCELLERAT (European Centre of Excellence in Engineering), led by HLRS, deployed a intelligent data transfer platform, focused on industry
  - Was also applied in the collaboration with the Federal Institute as it supports simple usability and secured data transfer

Access Challenges

- Non-traditional access mechanisms (forget about peer reviews….)
- Guaranteed and reliable access
  - Questions popping up:
    - When is this urgent action needed vs costs of redundancy
    - What kind of infrastructure do I make available (on demand?, reserved?)
- Security (data, etc)
- Time to provisioning
  - Urgent means urgent
    - E.g. Desaster prediction (Earthquakes, Tsunami….)
- Data Transfer

Lessons learned

- Fully automated services…..may work for a small number of users, but realistically not for all

  – Classifications of requirements may help here

- Heterogeneity of access granting may cause trouble as users will be confused on how, what, when, where …..

- Urgent access still implies requests on frame parameters like security

- User Management and Accounting also impose challenges
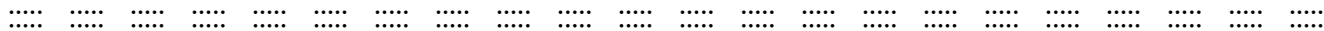
lesson 1

Further Lessons learned – activity started – the CIRCE project

- Supporting policy makers with sophisticated decision-making models, specifically during pandemics, is crucial
  - Simulations and predictions can significantly benefit from HPC to calculate complex models and yield results closer to time
- Challenges
  - Data is often unavailable for the public, incomplete, or extra pre-processing is necessary
  - Process of requesting and receiving data from public authorities is not properly defined
- Our Goal
  - Bring together stakeholders from different communities and authorities to perform a requirements analysis and come up with well-defined methodology for data provisioning and decision-making support trough HPC
- Runtime: 01.11.2021 to 31.10.2024; National Funding: BMBF and MWK

Conclusions

- Yes, we can apply our capabilities to urgent cases

- Even on-the fly

- Better:
  - Start thinking of potential use cases beforehand
  - Start thinking of possibile adaptations
    (in case of emergency) of operation models

- Long term:
  - Identify related initiatives all over Europe (e.g. the Hidalgo CoE) and elaborate on existing tools, mechanisms and procedures
  - Further interaction with the use case owners (from government, science, industry....)

HLRS @HLRS_HPC · 20 Std.
The COVID-19 pandemic and recent natural disasters have shown the importance of #simulation, #HPDA, and #AI in supporting decision making during crises. Our new project CIRCE will assess potential uses of #HPC for crisis preparedness and management ➡ bit.ly/3E8LXQC

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THANK YOU! QUESTIONS?