Impact of the energy crisis on e-INFRA CZ

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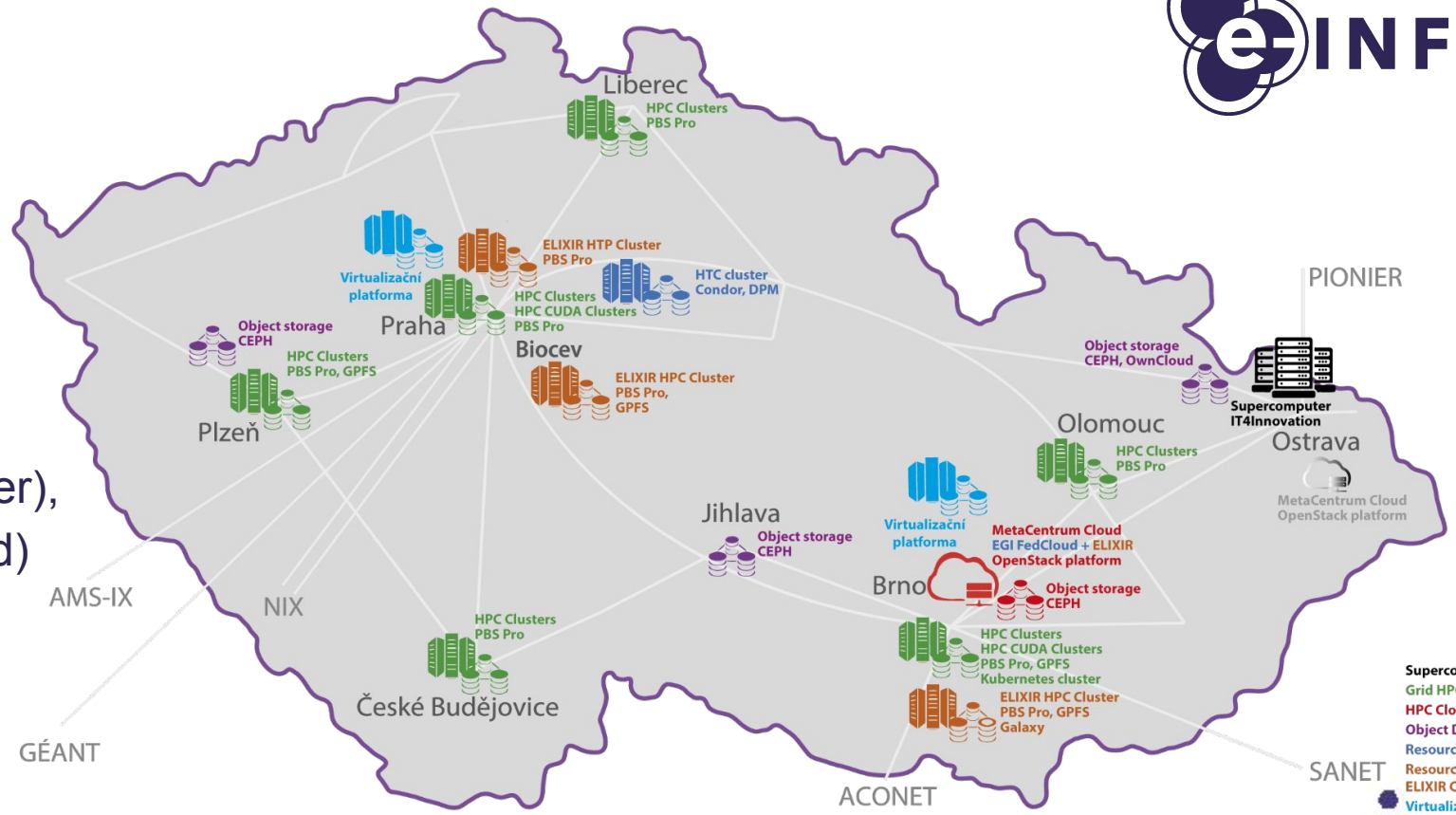
Jan Růžička, Jiří Sitera

Introduction

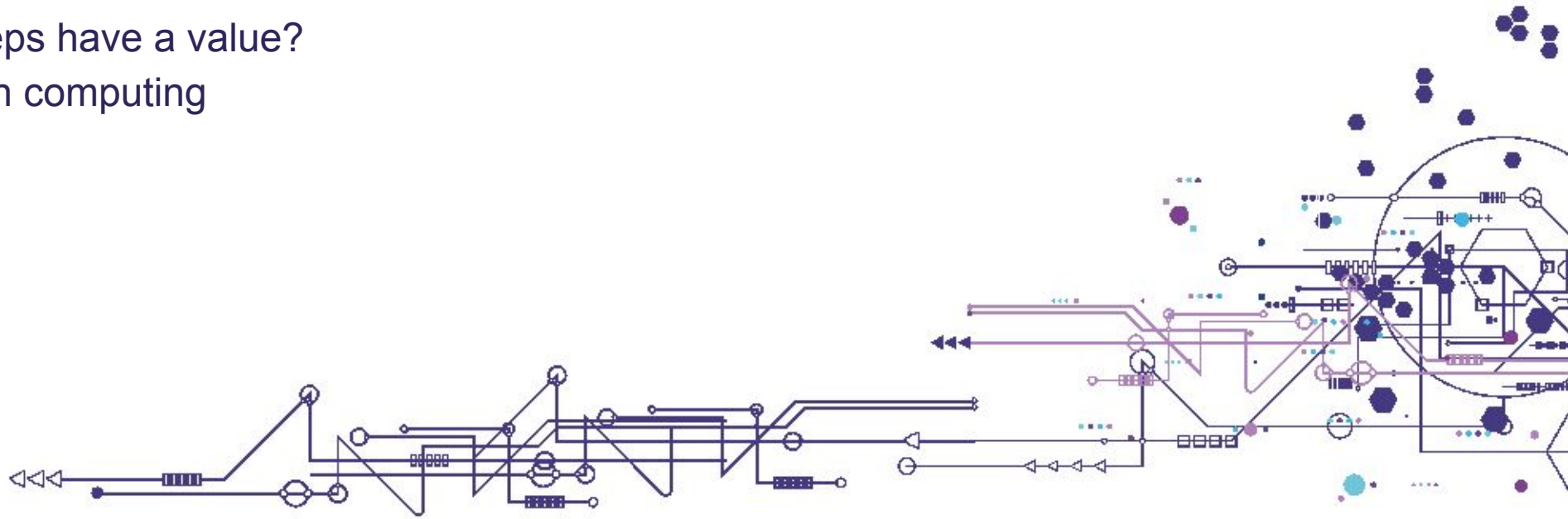
- e-INFRA CZ is consortium of
  - CESNET (NREN, EOSC mandated organisation),
  - IT4Innovations (HPC Center),
  - CERIT-SC (Scientific Cloud)
- Operator of the national e-infrastructure and research institutions
- International cooperation - GEANT, EGI, EuroHPC, EOSC



Just a problem or also an opportunity?

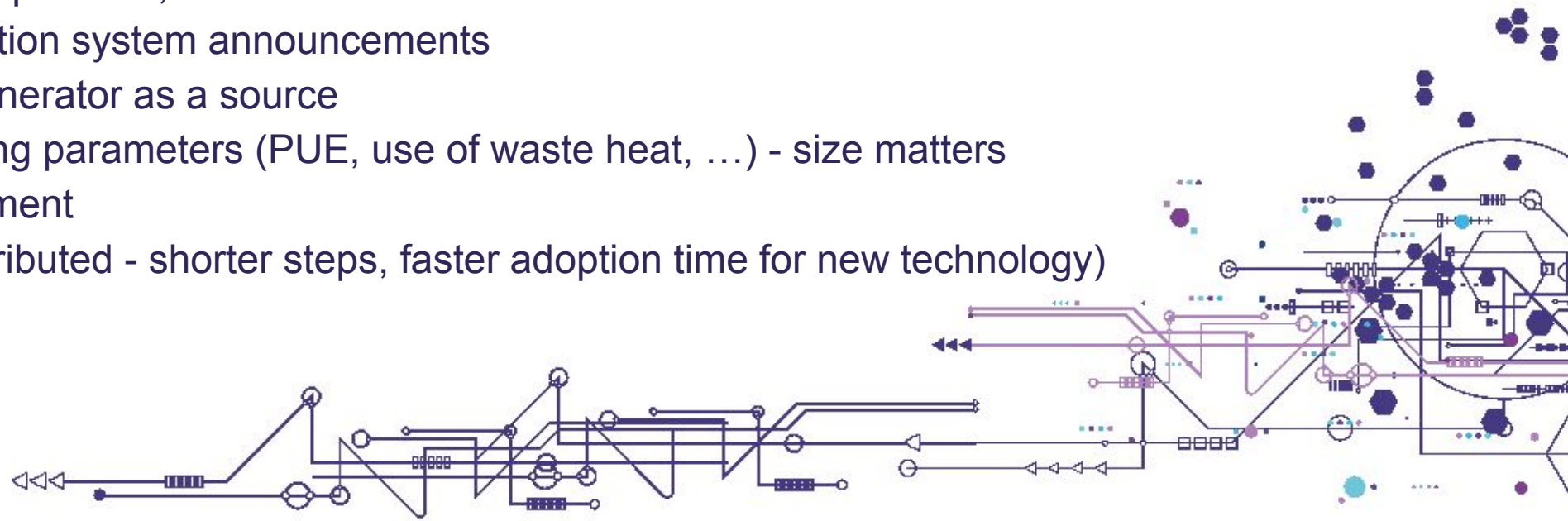
- From 0.11Eur/kWh to 0.29EUR/kWh (with Price Cap)
- CESNET Metacentrum Grid/Cloud from 350K EUR for 2022 to 700K EUR expected for 2023
  - 180kW IT
  - Additional Community resources (the same amount of CPUs) = Community expenses
  - We are not alone in the problem
- CESNET distributed CEPH storage infrastructure - 600K EUR expected for 2023 for (160kW)
- Large research university ~ 8,5M Eur in 2022

- Could even small steps have a value?
- Opportunity → Green computing



Green Computing

- Current effort - analyse effectivity of computations
  - Categories of SW and their usual behaviour
  - Targeted user support, workflow optimisation
  - Match HW + SW better with task, CPU/Memory/IO bound slots
  - GPU, AI, RISC, research and development of new algorithms and numerical methods
  - Network upgrade, large chassis → smaller boxes (less energy and flexibility)
- Service Ecosystem
  - Peak hours, Price per hour, ...
  - Electricity distribution system announcements
  - Backup Diesel generator as a source
  - Datacenter/housing parameters (PUE, use of waste heat, …) - size matters
  - Precise measurement
  - HW lifecycle (distributed - shorter steps, faster adoption time for new technology)

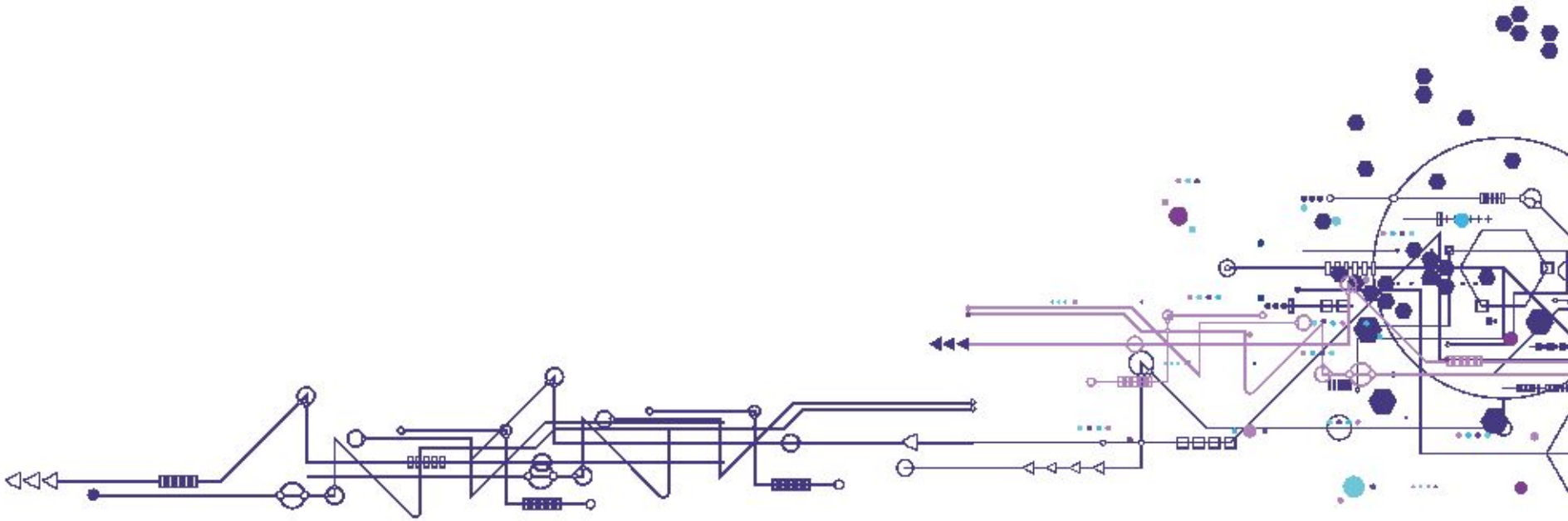


Green Computing II

- New/Increased emphasis on energy efficiency
  - Generic optimisation of HW (and SW) on consumption (impact of 10% cpu frequency?)
  - HW with more precise energy consumption monitoring
  - Dynamic optimisation by task (EAR), HW performance control for parallel tasks (IT4I)
  - Change in the planning (type of nodes vs tasks – RAM, GPU, disk, interconnect)
  - Large effort with limited gain, need to combine more approaches and implement it at large
- Optimisation goals
  - Effectivity (costs of the computational performance) FLOPS/kWh (GREEN500)
  - Carbon footprint
- Responsibility and PR
  - Green campus, energy data/research centers
  - Educations of users (reduce the unnecessary tasks, tests …)
  - Carbon footprint (at least report carbon footprint)

Conclusions

- Large centers - bigger effect (Northern Europe advantage)
- Distributed computed and storage infrastructure is a bit complicated area but might have geographically distributed effects
- Cooperation (Universities, Companies, Regulator/Operator)
- Costs vs benefits
- Education and support



Thank you

Questions?