SEANERGYS
Energy Efficient Exascale

SEANERGYS Towards Energy Efficient Operation of HPC and AI Supercomputers

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SC25 BoF on “Where could Europe add value?”
St. Louis, November 19, 2025

SC25
St. Louis, MO | hpc ignites.

The SEANERGYS Project

Project term: June 1, 2025 – May 31, 2025

Funding: total grant requested ~ 33 M€

Carrying on the torch from the DEEP-SEA and REGALE Projects

DEEP-SEA

Red border denotes HPC centres

High−Level Objectives

- Reduce energy waste & operating costs while maximising scientific and industrial benefits for Europe's investments in HPC and AI infrastructures

- Design a production-quality SW suite for energy-efficient operation of European HPC(/AI) systems

- Validate the SEANERGYS SW suite in operational environments and make it available under permissive licenses
  - The participating centres contribute use cases, requirements and KPIs
  - Uptake of the SEANERGYS SW is expected by funding agency if requirements and KPIs are actually reached (in H1/2029)
  - Project year 4 focuses on such evaluation and validation

Approach

Close interaction of the three main modules

Monitoring

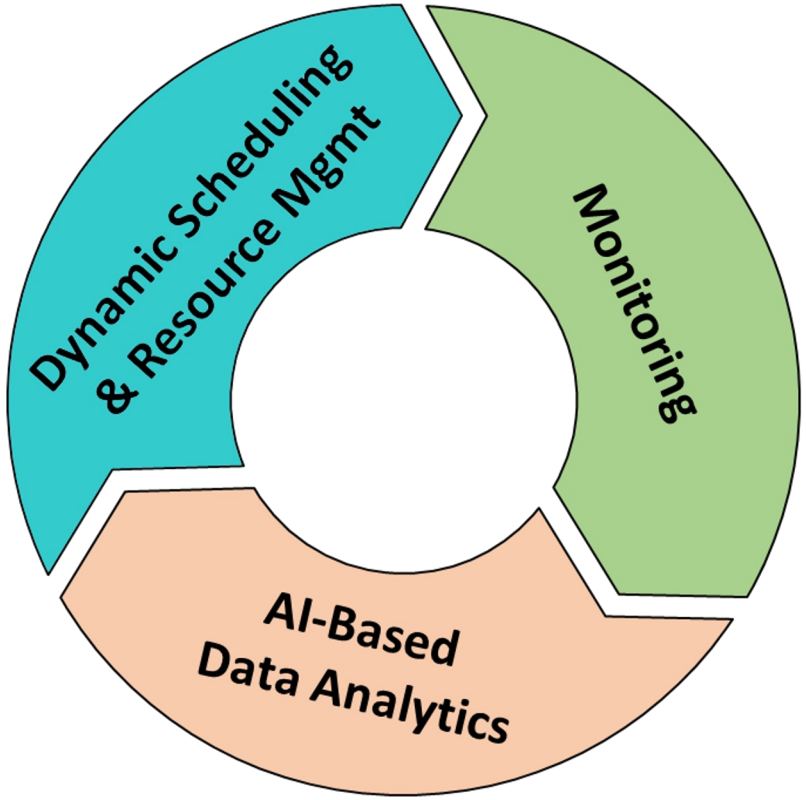
- Scalable capture of system/facility/environment data and application information
- Inclusion of non-structured data
- Establishment of a system data plane

AI-based data analytics

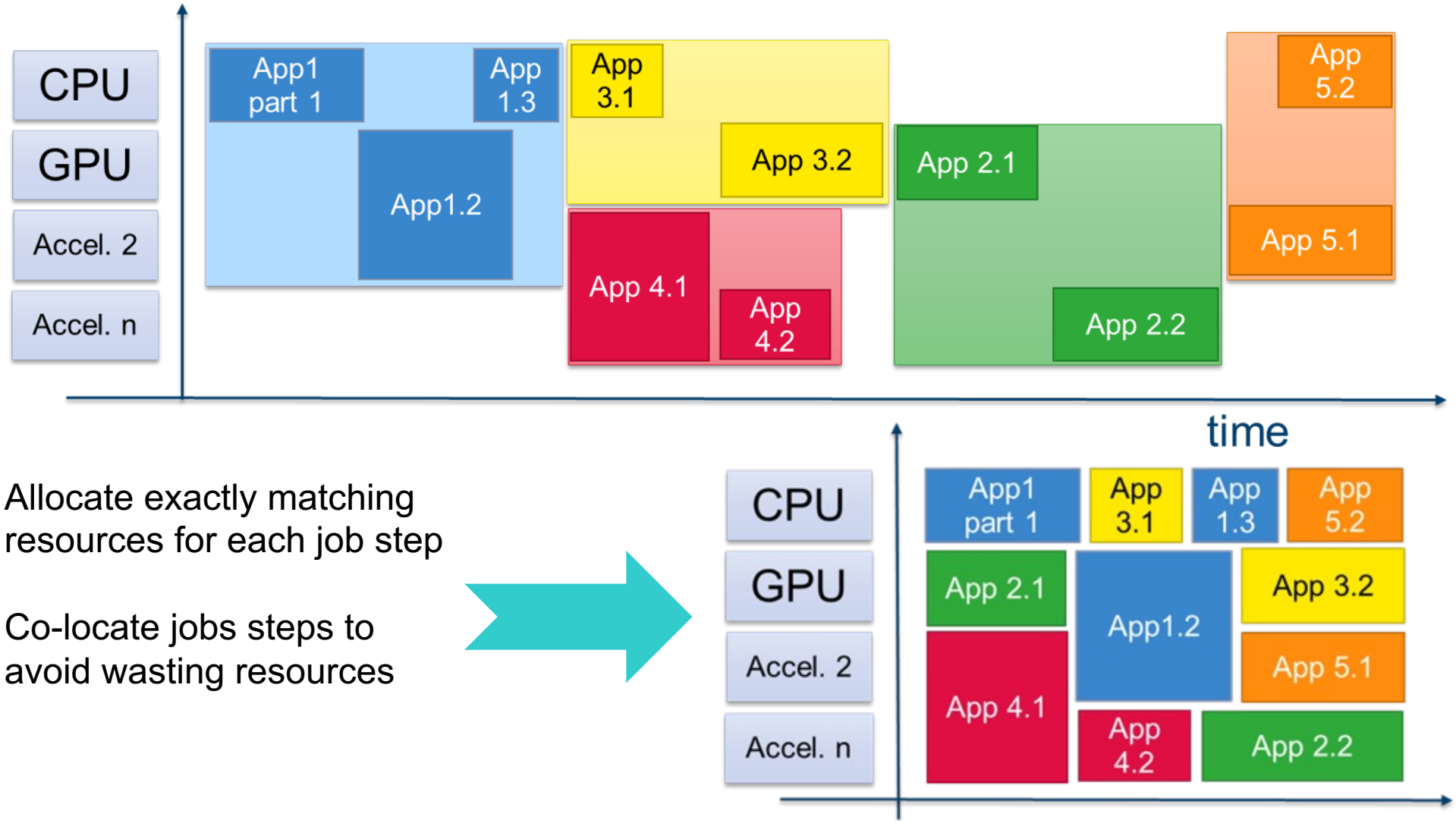
- Automatic workload characterisation and prediction
- Direction of scheduling & resource management decisions
- Actionable feedback to application developers and users

Dynamic scheduling & resource management

- Dynamically control system & facility operating points
- Exploit dynamic behavior of applications and workflows
- Right-size moldable workload resource requirements
- Use node-sharing where it makes sense



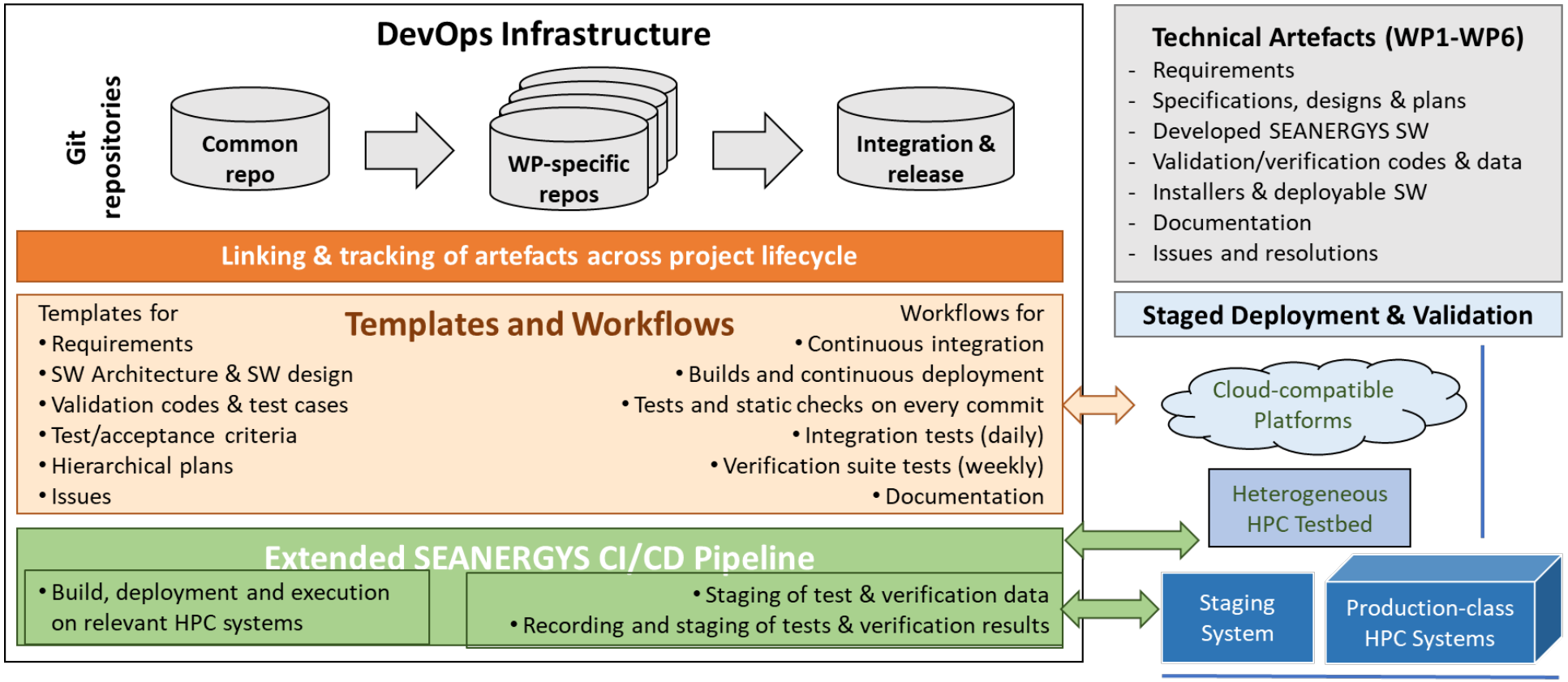
Dynamic/Adaptive Scheduling – Vision



Allocate exactly matching resources for each job step

Co-locate jobs steps to avoid wasting resources

SEANERGYS SW Development Approach



- Ensuring full “traceability” and professional development methodologies
- Project-dedicated Gitlab Premium as DevOps infrastructure (licenses funded by the project)
- Re-use and extend CI/CD pipelines from previous project

Current Status

- First six project months are dedicated to collect use cases and requirements, and prepare architecture decisions

- Agreement on formalisation of use cases, requirements and architecture decisions
  - Using the “architecture definition record” methodology
  - Discussions documented in issues, decisions expressed as merges
- Contributed use cases (~30) consolidated, cross-referenced and documented
  - Requirements and KPIs are next
- Analysis of existing SW components and strengths/weaknesses
  - Including comparison between schedulers/resource management systems (Slurm, Flux, OAR …)
- Initial decisions on key architecture elements
  - Central “data plane” connecting sources and consumers of monitoring and analytics data

Footnote | Source: XXX

Thank you for your attention!

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