



**SEANERGY**  
ENERGY EFFICIENT EXASCALE



# Towards Energy Efficient Computing: Challenges, Innovations & Synergies

Sai Narasimhamurthy, ParTec AG

Workshop

January 26<sup>th</sup> 2026, Krakow, Poland



# Workshop Agenda



9:00 - 9:20 Introductions & SEANERGYS Big Picture [**Sai Narasimhamurthy, ParTec AG**]

9:20 - 9:40 Global Architecture & Requirements [**Yiannis Georgiou, RYAX**]

9:40 - 10:00 Monitoring Infrastructure

10:00 - 10:30 Coffee Break

10:30 - 10:50 Data Analytics Framework [**Andrea Bartolini, Unibo**]

10:50 - 11:10 Dynamic Resource Management [ Simon Pickartz, ParTec AG]

11:10 - 11:20 Software Development Process [**Ondrej Vysocky, IT4I**]

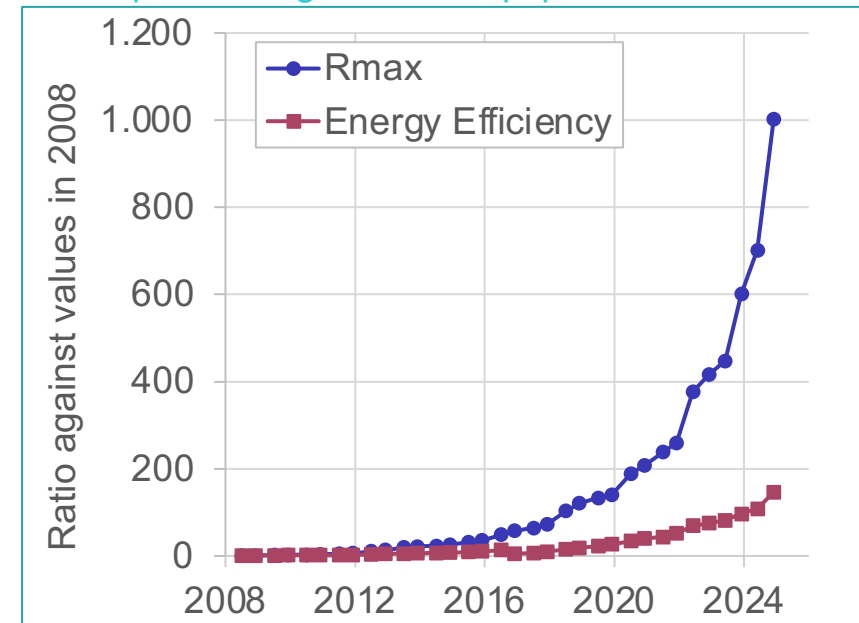
11:20 - 11:30 Hosting sites Evaluation [**Ondrej Vysocky, IT4I**]

11:30 - 12:00 Open Discussion



# Motivation

- HPC systems are among the most energy-intensive facilities
- Raising compute demands → more HPC systems and infrastructures
- Two main issues
  - Economic viability, rising electricity prices
  - Environmental impact of generating this electricity
- **Multiple vectors to tackle energy efficiency in HPC:**
  - Infrastructure and cooling
  - Selection of efficient hardware
  - **Software for efficient system operation**
  - Application optimisation



SEANERGYS focus

# The SEANERGYS Project: Our Focus Today



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



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 when requirements and KPIs are reached (in H1/2029)
  - Project year 4 focuses on such evaluation and validation

# Approach



Close interaction of the three main modules

## Monitoring

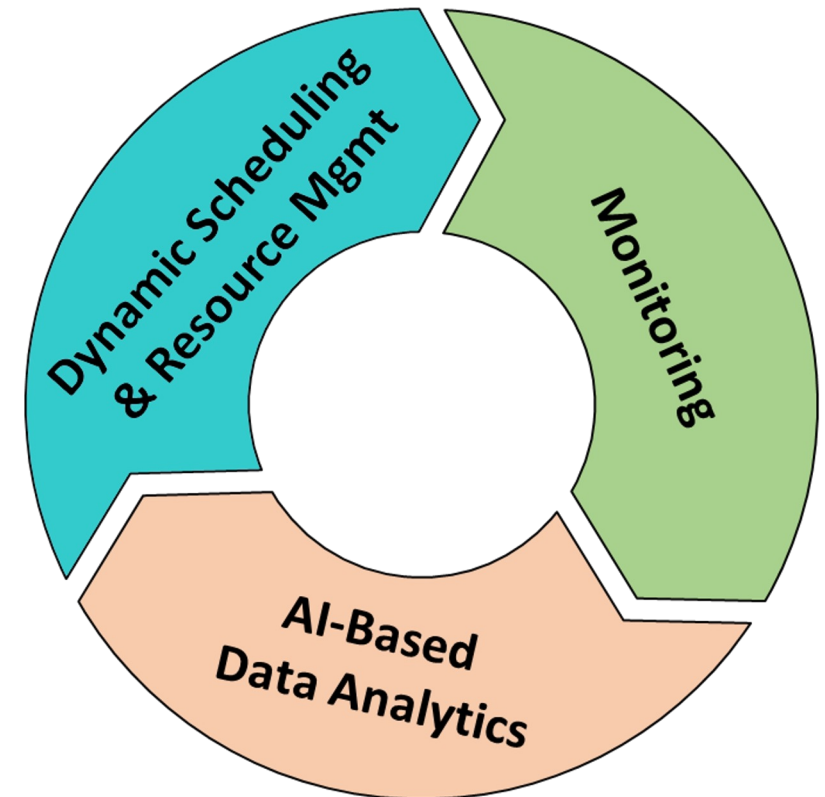
- Scalable capture of system/facility/environment data and application information
- Inclusion of non-structured data
- Establishment of a system data plane

## AI-based data analytics

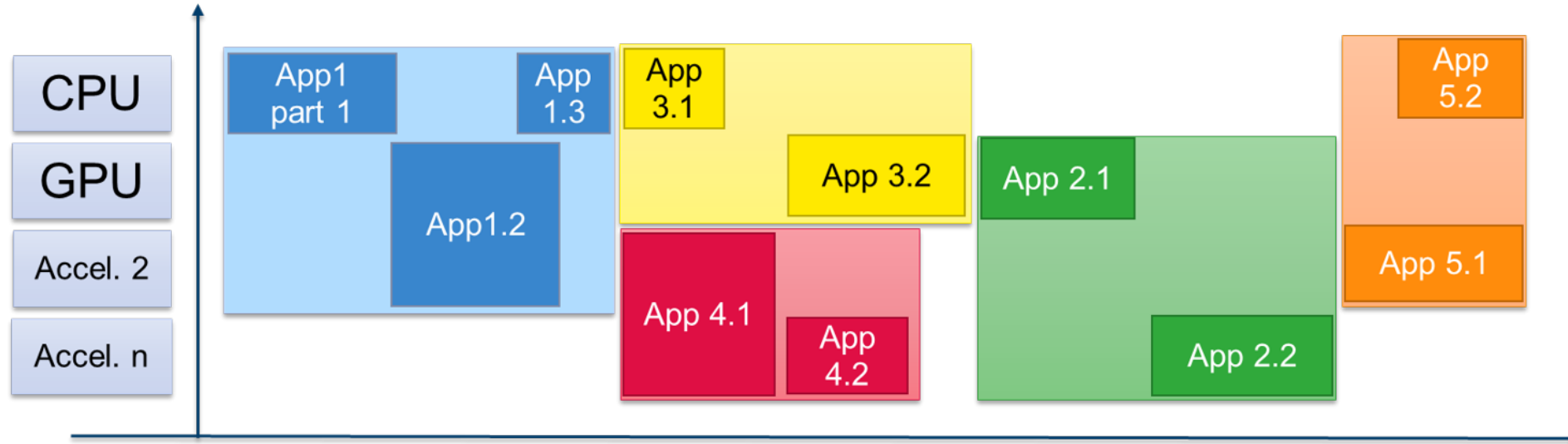
- Automatic workload characterization and prediction
- Direction of scheduling & resource management decisions
- Actionable feedback to application developers and users

## 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

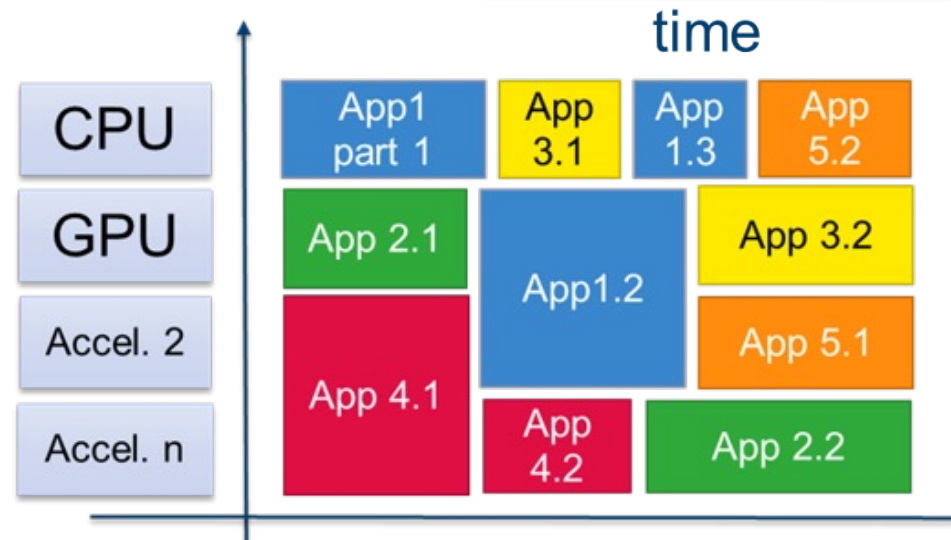


# Dynamic/Adaptive Scheduling – Vision

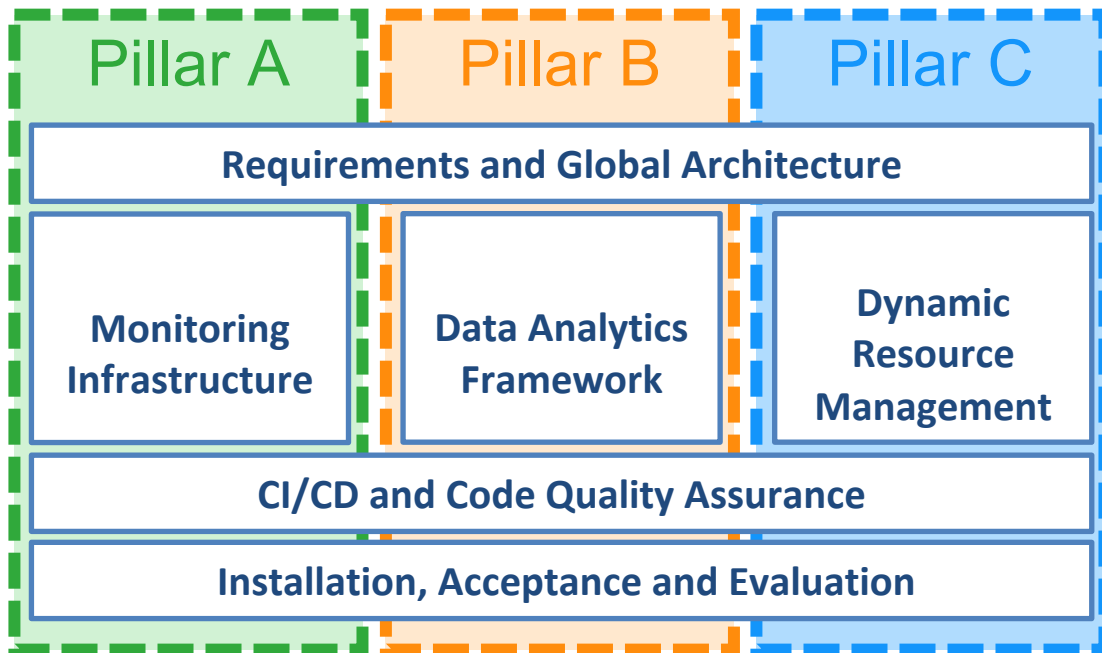


Allocate exactly matching resources for each job step

Co-locate jobs steps to avoid wasting resources

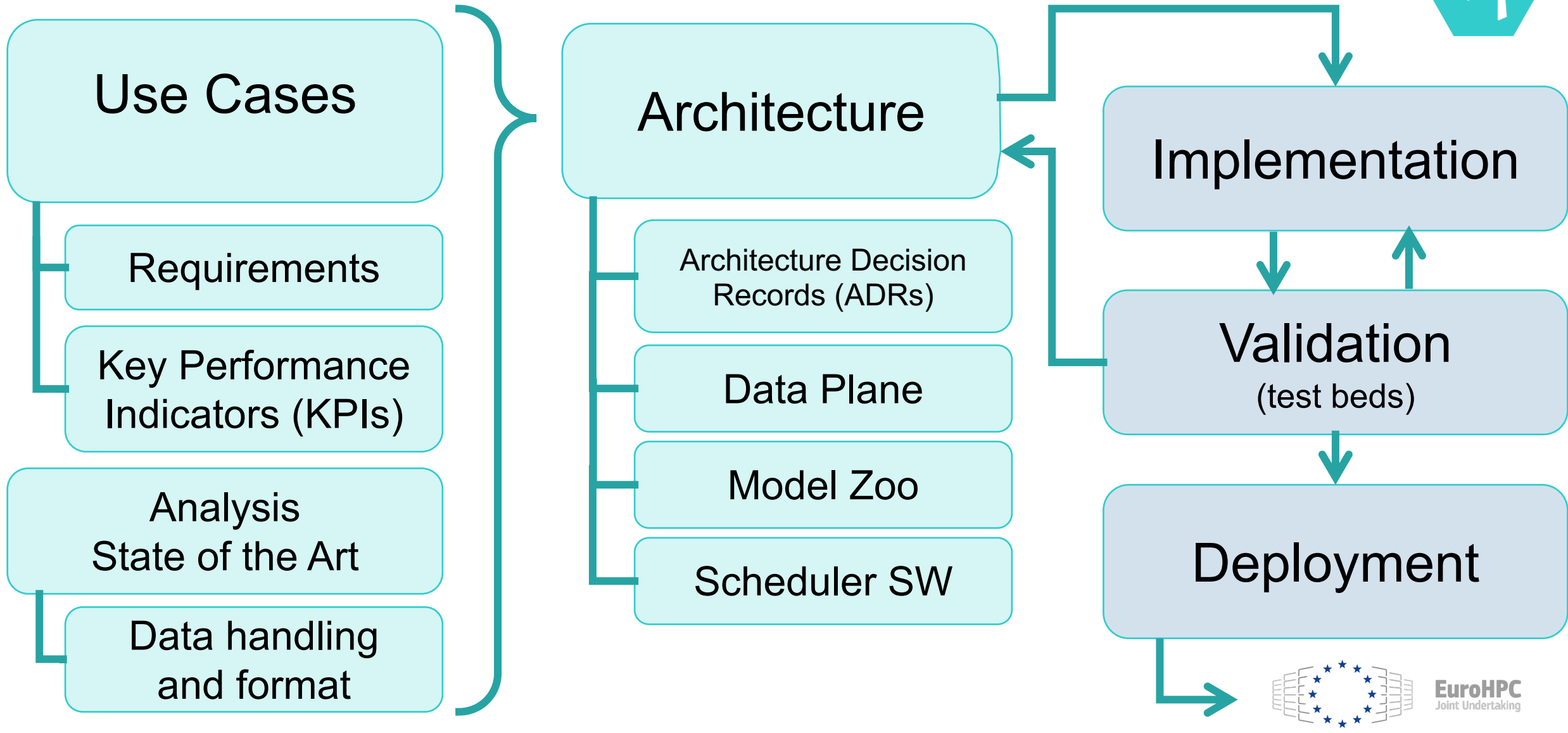


# Work Streams & Leaders



Name	Lead
Requirements and Global Architecture	TUM
Monitoring Infrastructure	BADW-LRZ
Data Analytics Framework	UniBO
Dynamic Resource Management	PARTEC
CI/CD and Quality Assurance	TUD
Installation, Acceptance and Evaluation	IT4I
Dissemination and Communication	PARTEC
Coordination	FZJ

# Project Status – Zooming in on current status



# Introduction of Speakers



- Sai Narasimhamurthy, ParTec AG
- Yiannis Georgiou, RYAX
- Simon Pickartz, ParTec AG
- Andrea Bartolini, Unibo [ Remote]
- Ondrej Vysocky, IT4I

# Thank you for your attention!



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