PMIx in the Modular Supercomputer Architecture (MSA)
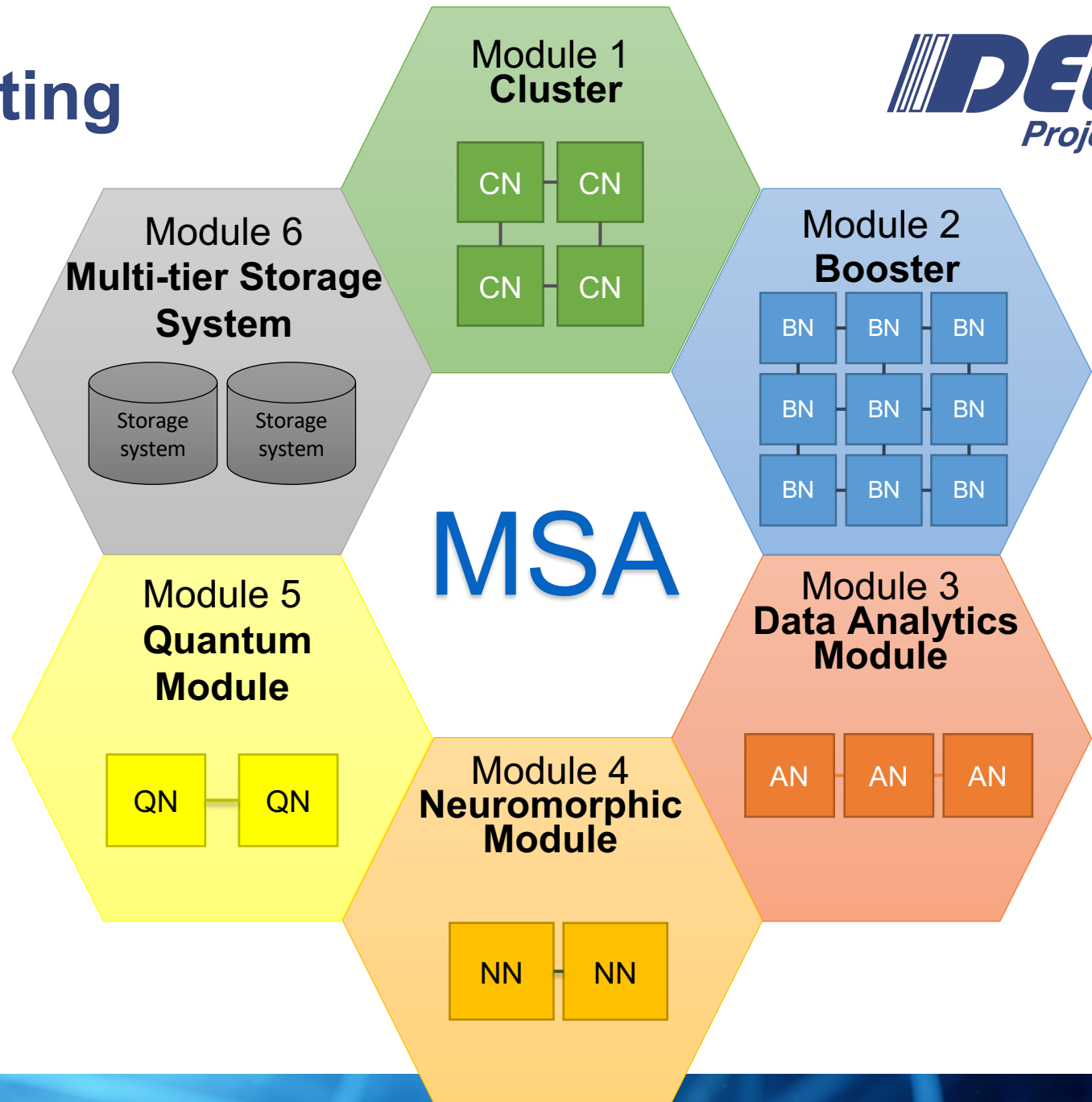
Isaías A. Comprés Ureña, Technical University of Munich (TUM)

12.05.2022 – PMIx ASC

Modular Supercomputing

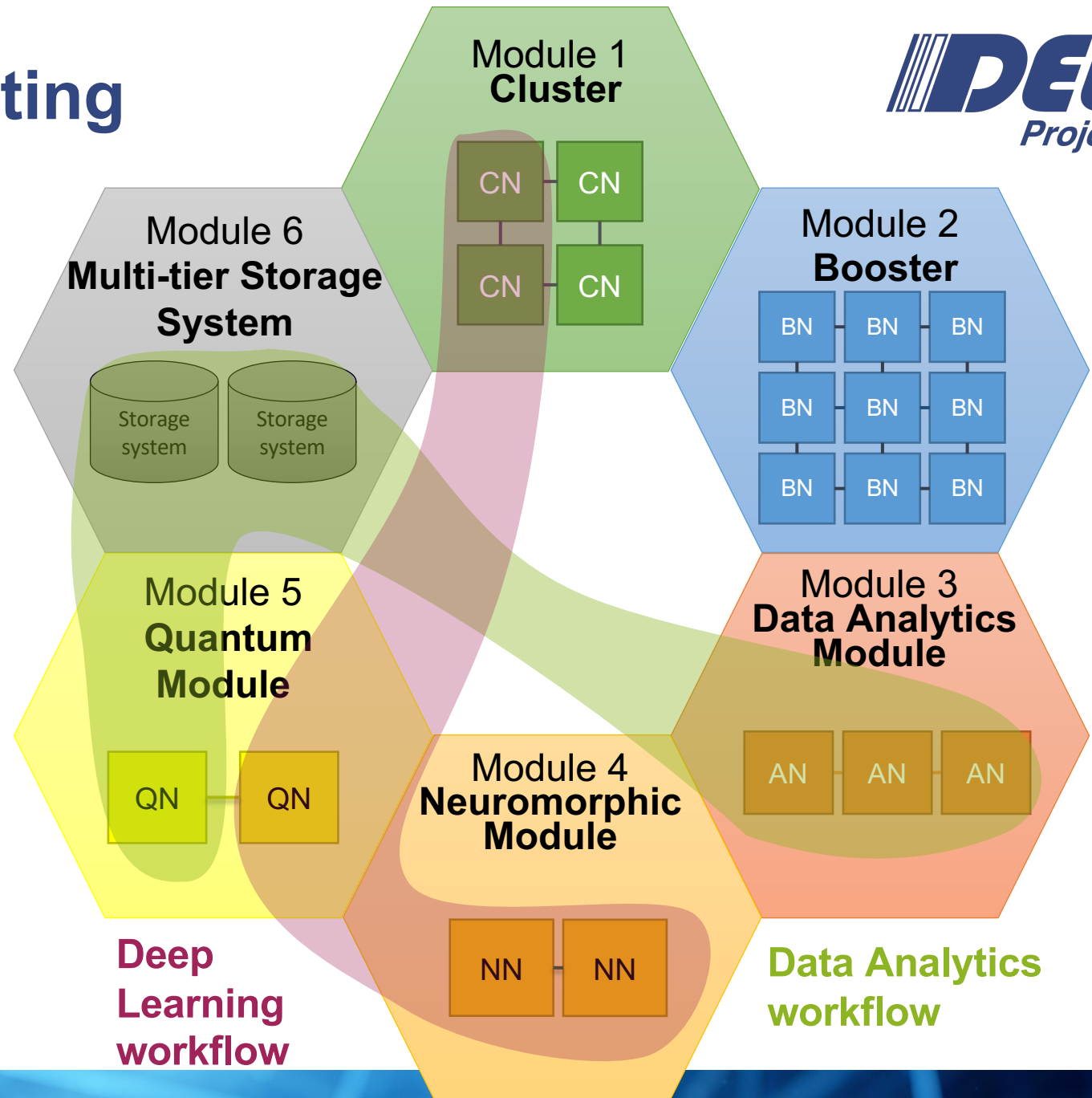## Composability of heterogeneous resources

- **E. Suarez**, N. Eicker, Th. Lippert, "*Modular Supercomputing Architecture: from idea to production*", Chapter 9 in Contemporary High Performance Computing: from Petascale toward Exascale, Volume 3, pp 223-251, CRC Press. (2019)

- **E. Suarez**, N. Eicker, and Th. Lippert, "Supercomputer Evolution at JSC", Proceedings of the 2018 NIC Symposium, Vol.49, p.1-12, (2018) [online: http://juser.fz-juelich.de/record/844072].

Module 1
Cluster
CN CN
CN CN

Module 6
Multi-tier Storage System
Storage system Storage system

Module 2
Booster
BN BN BN
BN BN BN
BN BN BN

MSA

Module 5
Quantum Module
QN QN

Module 4
Neuromorphic Module
NN NN

Module 3
Data Analytics Module
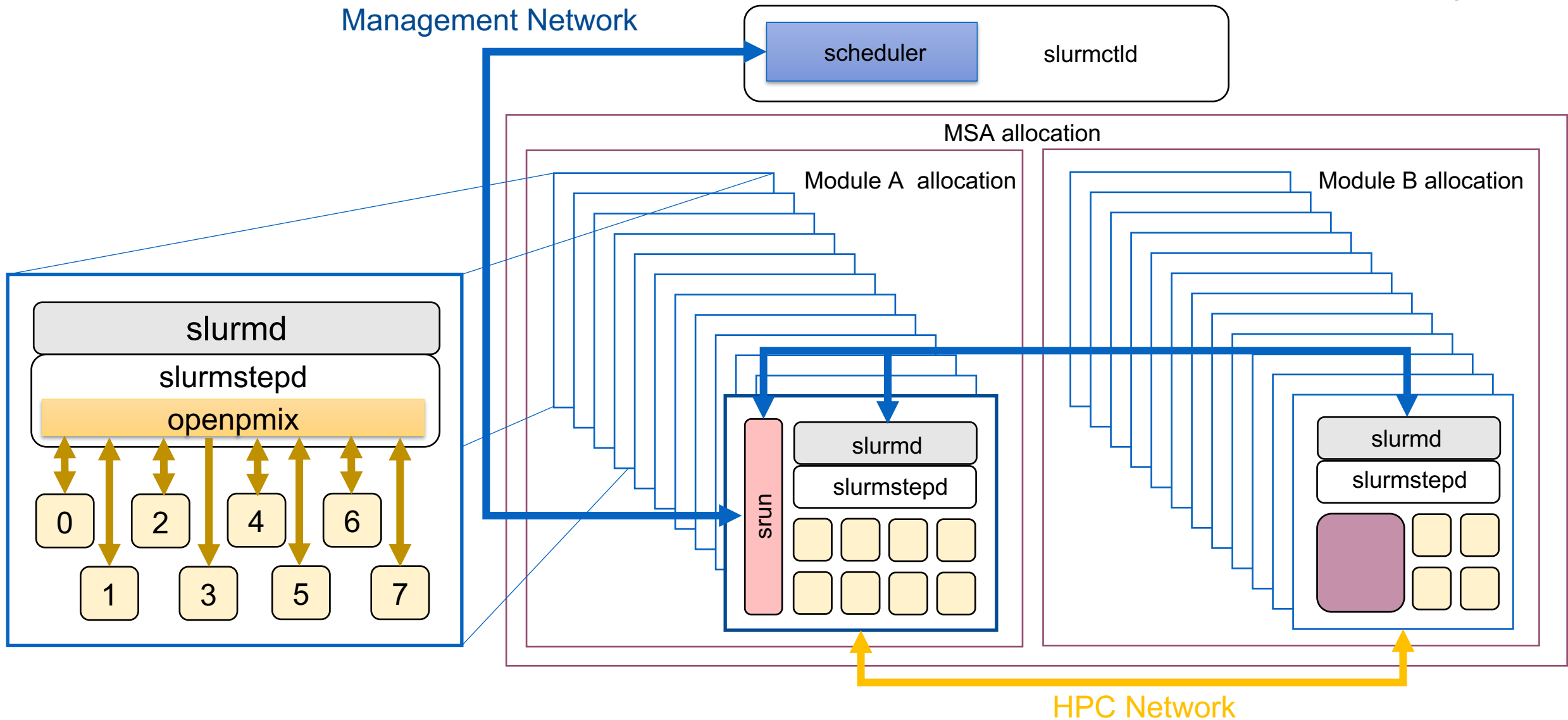AN AN AN

Modular Supercomputing

- Cost-efficient scaling
- Effective resource-sharing

Composability of heterogeneous resources

- **E. Suarez**, N. Eicker, Th. Lippert, "*Modular Supercomputing Architecture: from idea to production*", Chapter 9 in Contemporary High Performance Computing: from Petascale toward Exascale, Volume 3, pp 223-251, CRC Press. (2019)
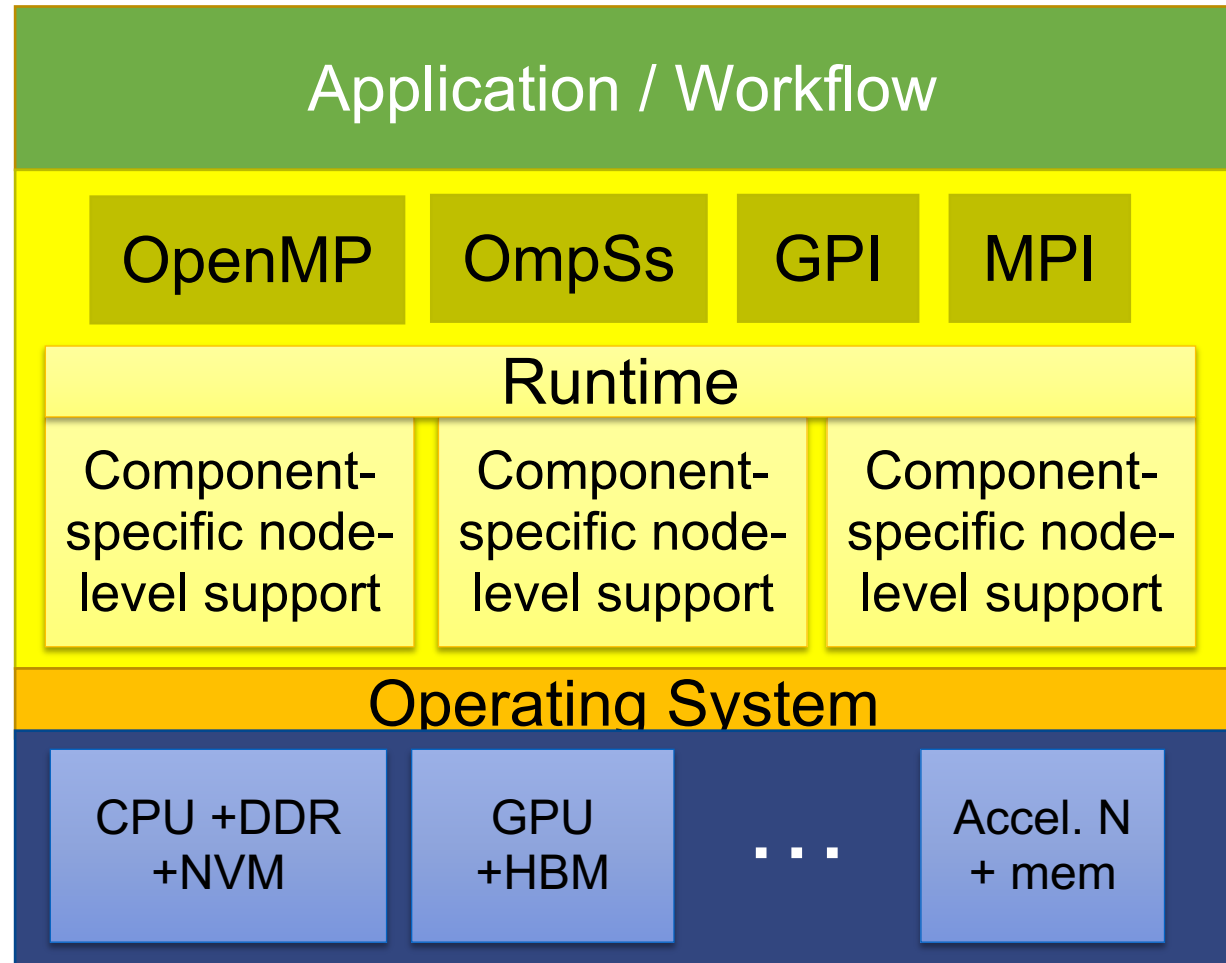- **E. Suarez**, N. Eicker, and Th. Lippert, "Supercomputer Evolution at JSC", Proceedings of the 2018 NIC Symposium, Vol.49, p.1-12, (2018) [online: http://juser.fz-juelich.de/record/844072].

Process Interactions on MSA Allocations

PMIx in MSA System Software

- PMIx enables interoperability
  - Programming models:
    - *MPI, GPI2, GPI-Space, OmpSS*
  - Tools support:
    - *Trace analyzers, memory analyzers, monitors*
  - Network endpoints setup:
    - *Tools over management network*
    - *HPC network*
  - Heterogeneous task mappings
- Integration primarily with Slurm

Application / Workflow			
OpenMP	OmpSs	GPI	MPI
Runtime			
Component-specific node-level support	Component-specific node-level support	Component-specific node-level support	
Operating System			
CPU +DDR +NVM	GPU +HBM	...	Accel. N + mem

5

DEEP-SEA

Partners	
FZJ	BADW-LRZ
PaTec	TUM
Bull/Atos	KU Leuven
CEA	ETHZ
BSC	TUDA
FHG	KTH
Forth	ECMWF

Start: 01.04.2021
Duration: 3 years
Funding: 15 M€