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# WGNE Computer table

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# Overview

- DWD's next HPC system
- News from other centers
- General remarks



## Requirements

- Phase 0
  - Migration system; needs to have at least the same computing power as the operational Cray XC40 system (measured by ICON-EPS benchmark)
  - Deterministic ICON forecast and data assimilation benchmark need to fulfill a specified runtime limit with a given percentage of compute nodes
- Phase 1: Increase compute power by a factor of about 3 (w.r.t. current machine); to be installed 6 months after the end of the migration phase (Q4/2020)
- Phase 2: Increase compute power by a factor 4.5 – 6; important evaluation criterion; targeted availability Q3/2022
- In all phases, research/development system must be 30% larger than operational system, and be installed on a separate site (geo-redundancy)

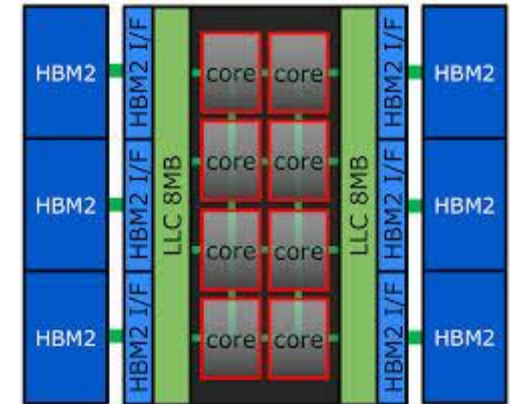
## Offers

- There were offers based on
  - Intel Xeon Cooper Lake / Sapphire
  - AMD Rome / Genoa
  - Vector processors
- with a performance factor for Phase 2 ranging from 4.45 to 6.0
- And the Winner is NEC



## Technical Details

- A computing node consists of
  - a vector host: 24-core AMD Rome  
(2.8 GHz; 256 GB memory)
  - 8 vector engines: SX-Aurora 1 TSUBASA Typ 10AE
  - Every vector engine has
    - 8 cores (1.584 GHz; 304.1 GF/s (DP); 608.3 GF/s (SP) per core)
    - 48 GB HBM2 3D-stacked memory (6 GB/core; 1.35 TB/s)
    - and is direct liquid cooled



→ Number of nodes / engines

Phase	Operations	Experiments
0	178 / 1424	232 / 1856
1	224 / 1792	292 / 2336
2	224+101/3408	292+132 / 4448

1.3x

## Technical Details (cont'd)

- Infiniband HDR
- Peak Performance (DP, op. system): 0: 3383 TF/s; 1: 4260 TF/s; 2: 8332 TF/s
- Power efficiency is competitive with GPUs:
- typical power usage in Phase 2: 777 kW (operations); 981 kW (research); this is about 70 % compared to Intel and about 80 % compared to AMD for 75% of the computing power offered by NEC.

- **New computer systems at JMA (Cray XC50 installed by Hitachi already in 2018), HMC Russia (Cray XC40), ECCO (Cray XC40) and NCEP (Dell)**
- **NCEP: ‘NGGPS’ based on FV3 dycore has become operational; ensemble prediction system will switch to new dycore in 2020**
- **ECMWF: data center is moving to Bologna, HPC procurement is ongoing**



- At several centers, plans for model resolution upgrades were postponed / reduced compared to previous WGNE tables
- This probably reflects the slow-down of progress in compute power combined with rising prices (recently also for GPUs)
- But it may also play a role that higher resolution does not automatically imply better forecast skill