MAX-PLANCK-INSTITUT
FÜR METEOROLOGIE

Modelling Climate and Weather

ICON in a Nutshell

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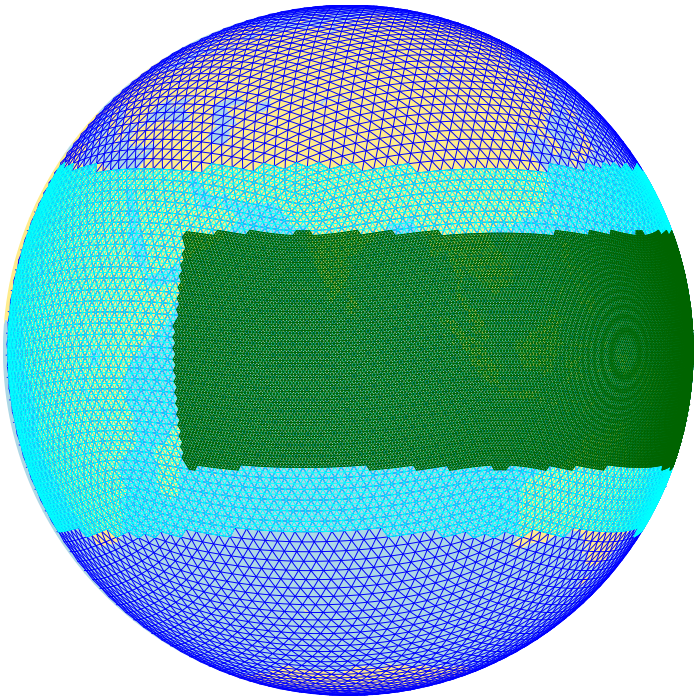
ICON: The Model

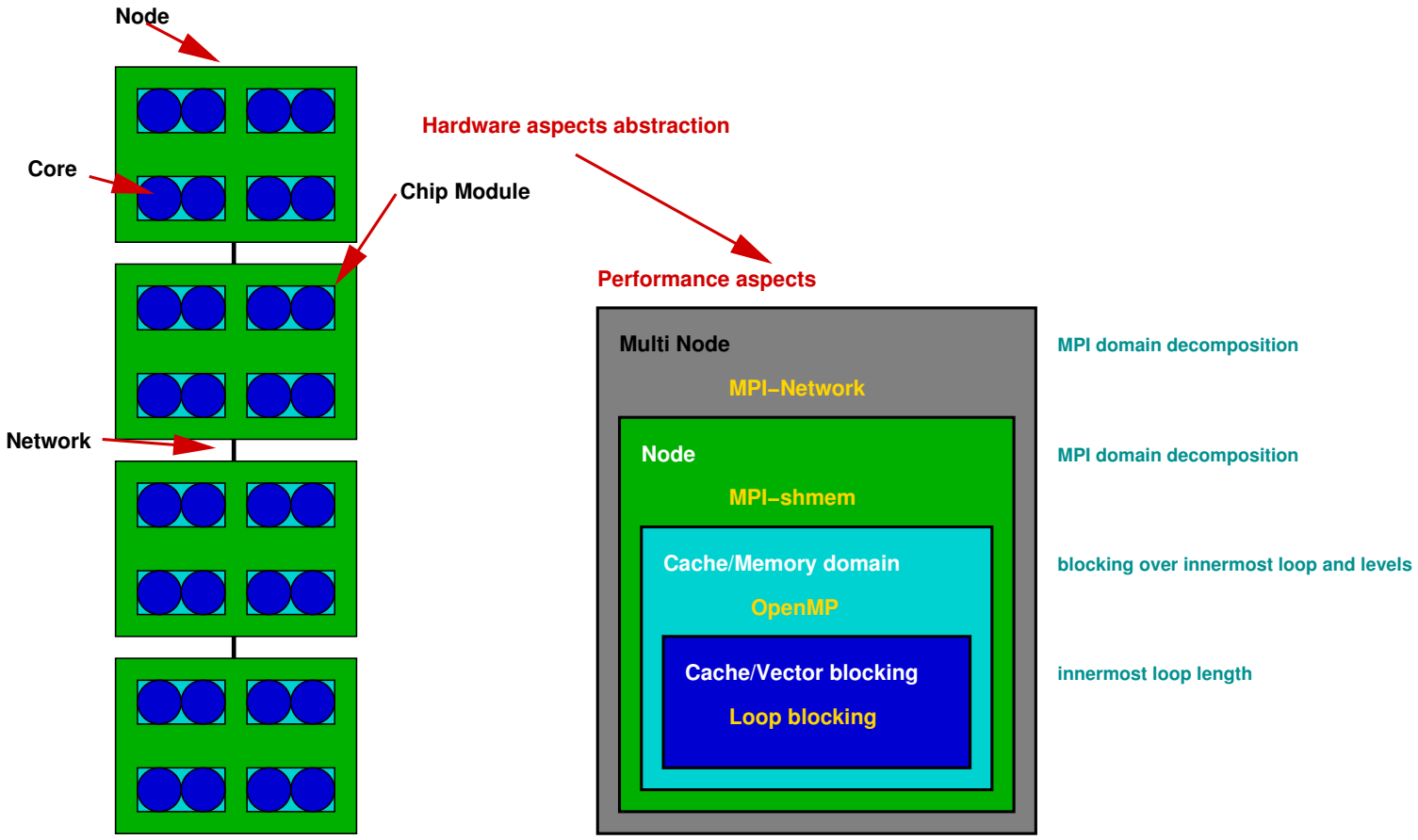


- Purpose: Coupled climate modeling and numerical weather prediction
- Features: Non-hydrostatic hydrodynamics multi-physics code
- Component models: atmosphere, ocean, land, and sea-ice, carbon-cycle, ...
- Implementation: Unstructured grid with nesting (no AMR!) up to 340 million gridcells and 200 levels) based on icosahedron subdivision

ICON: The size

languange	lines	percentage
Fortran 2018	500000	(60%)
C/C++	140000	(18%)
shell	70000	(9%)
python	more and more	increasing

ICON: Performance adaptation



ICON: Development support

- Builtin parallelization test environment (one - many, many - many, one - one with multiple threads)
- Some unit-testing in libraries
- Weak CI (buildbot, required to pass on to gatekeeper)
- 50+ developer, 10 gatekeeper (technical and science)
- Code with operational requirements (critical infrastructure)

ICON: a Framework

- Builtin timer and counter(PAPI) framework (including database and web app)
- Several I/O libraries for GRIB and NetCDF (Zarr to come) included in the model, pre- and post-processing tools
- Asynchronous model components, asynchronous output, event triggered post-processing
- On-line visualization
- Meta-scheduling, heterogenious jobs

MPI

- Serious use of MPI datatypes
- Extensive use of onesided MPI (RDMA)
- Use of MPI 3.1 features

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Collaborative and sustainable development

- git (gitlab)
- buildbot

A new world?