Earth System Modelling at the Met Office : Scalability and Performance

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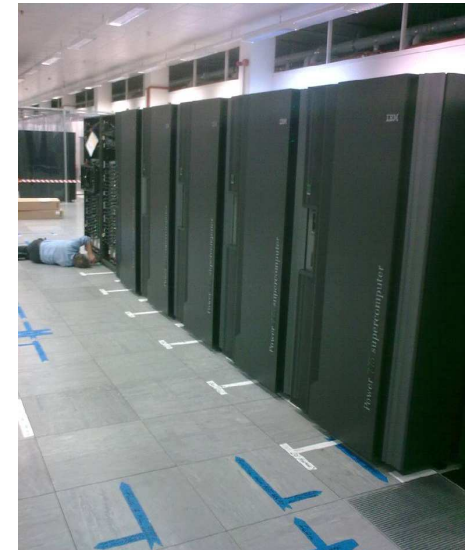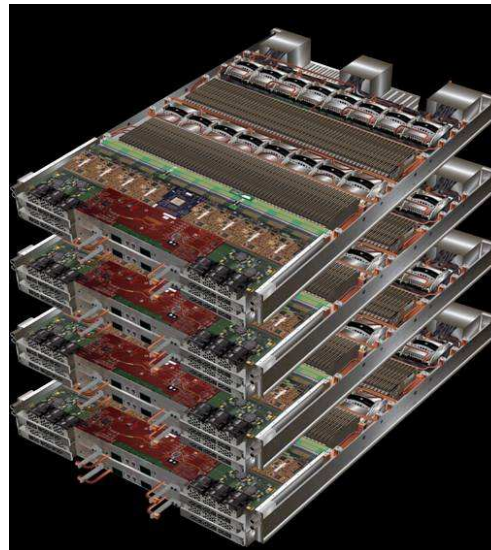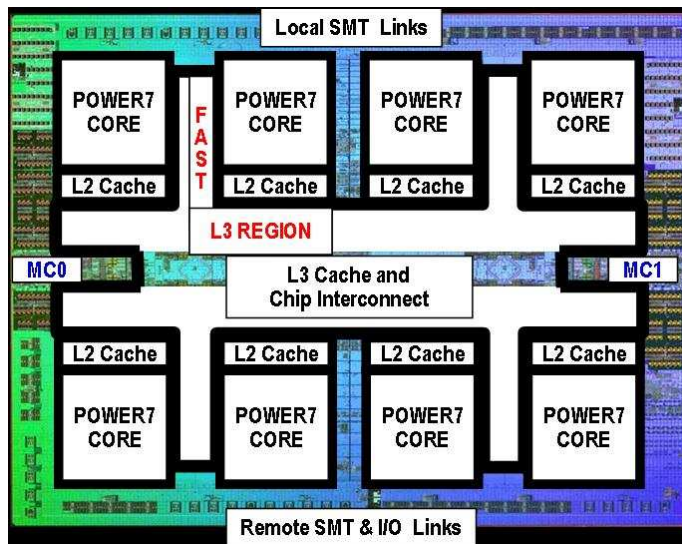
Met Office, Exeter, Devon

The Met Office

- Hadley Centre for climate change research
- Dedicated HPC optimisation team

HPC System : IBM Power7

P7 Chip	8 Cores	L2 : 256Kb
P7 node	4 P7 Chips / 32 Cores	Shared L3 : 32M / RAM : 64GB
Supernode	32 Nodes / 1024 Cores	HFI Interconnect
38 Supernodes (3 clusters)	Peak Perf : 1166 Tflops	Total Storage : 1500TB

Earth System Modelling

Objective : Integrated earth system model

Atmosphere < 10 kms	Ocean $1/12$ degree
Sea-ice	Land-ice
Atmospheric chemistry	Atmospheric aerosols
Land surface module	Interactive vegetation
Ocean biogeochemistry	More ?

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+ Ensemble runs

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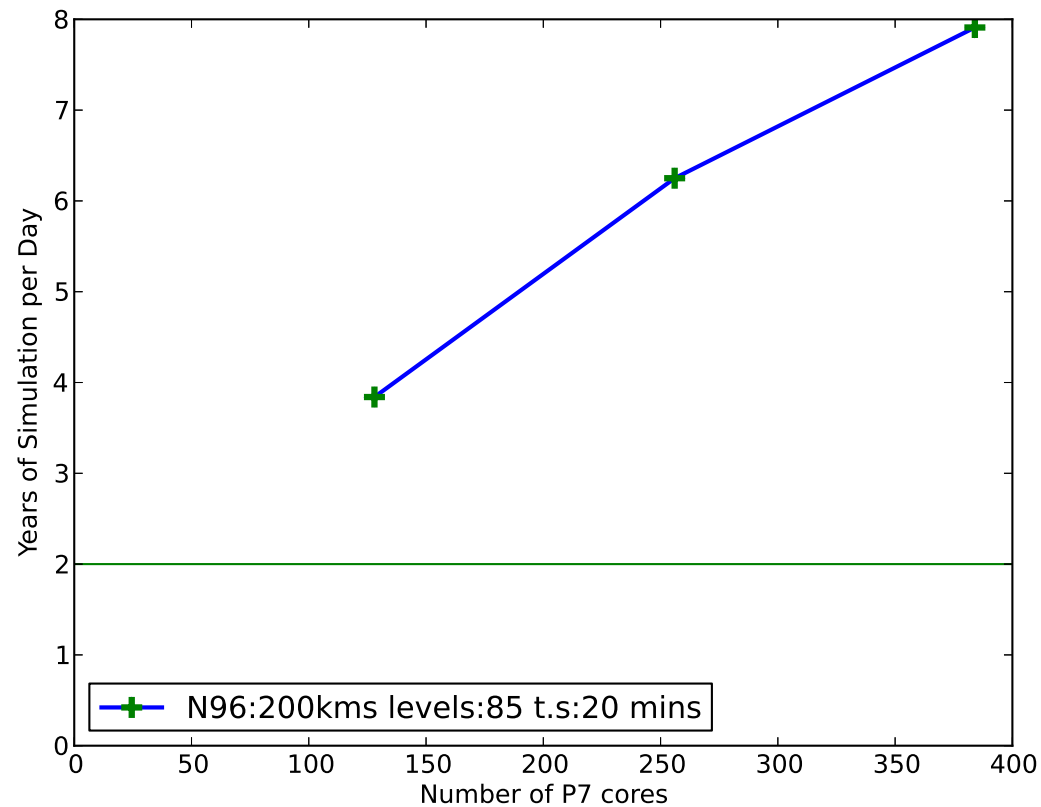|	
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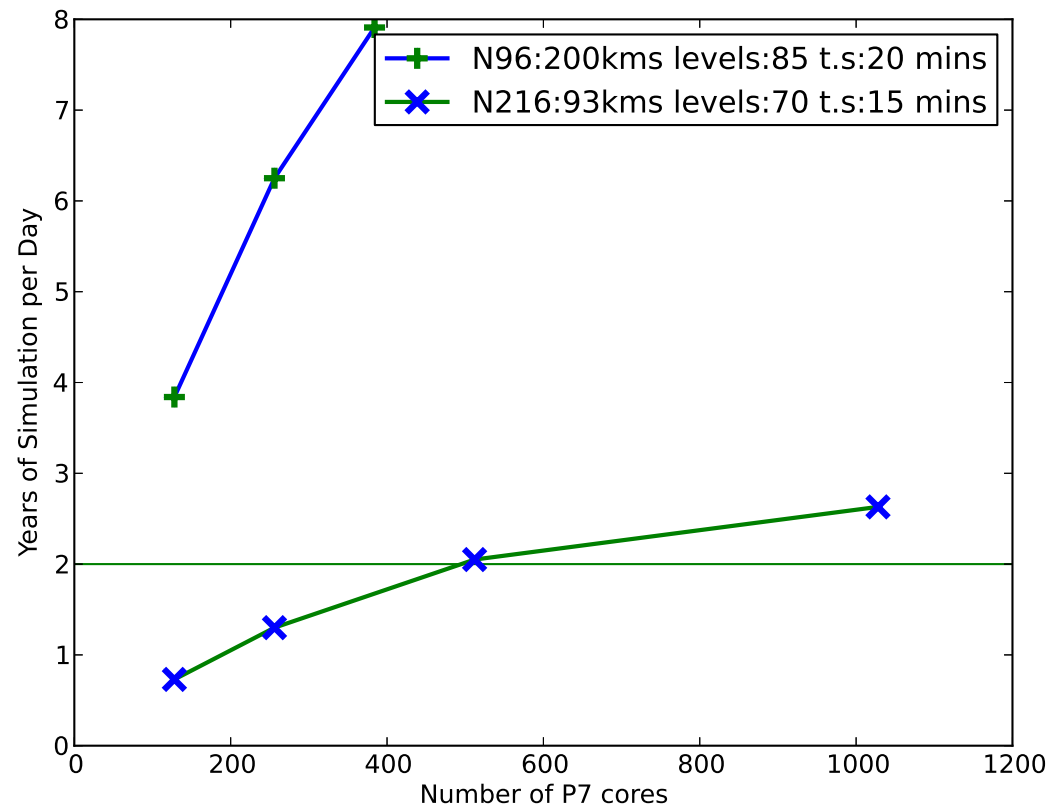**Performance target** : 2 years of simulation per day

How far are we ?

Atmosphere Component - Unified Model
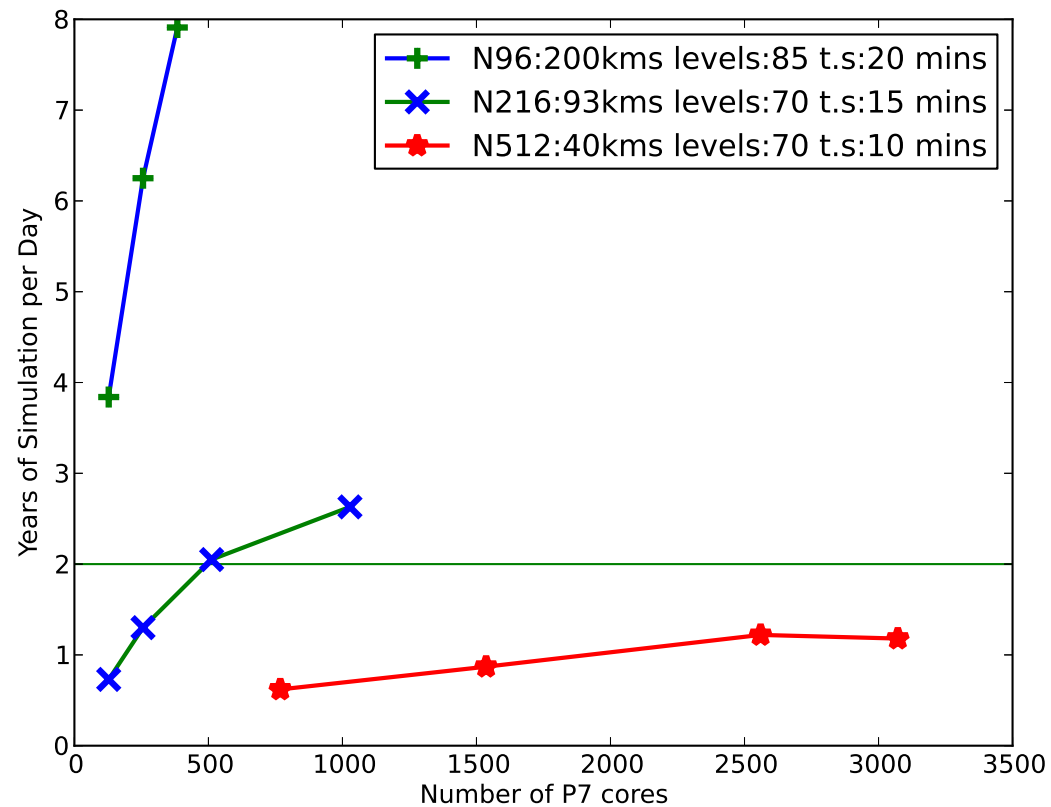
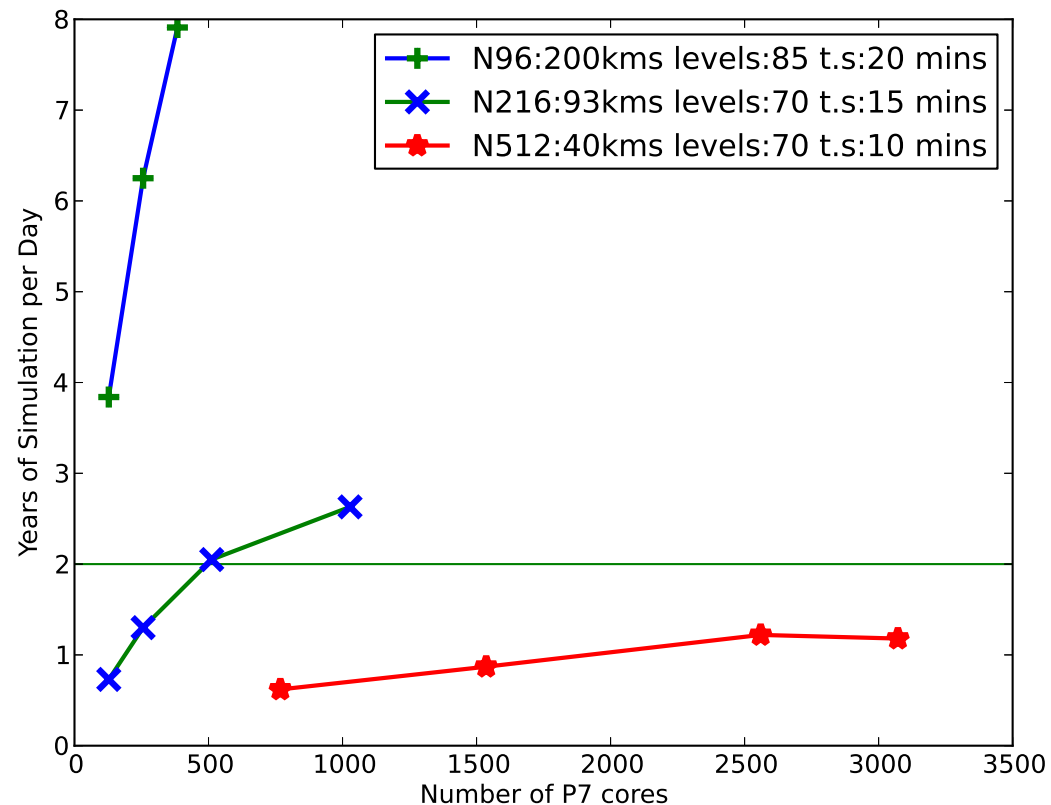Used by Climate and NWP

Atmosphere Component - Unified Model

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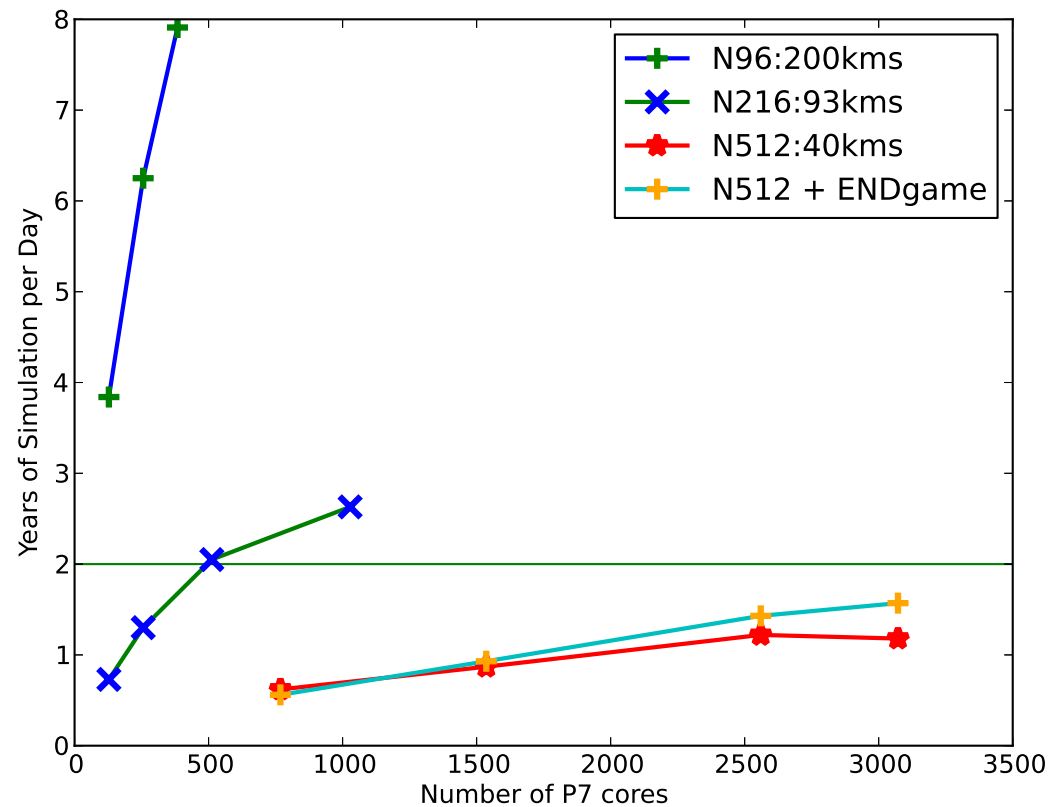# Atmosphere Component - Unified Model

Key Performance Enablers

- IO server

Atmosphere Component - Unified Model

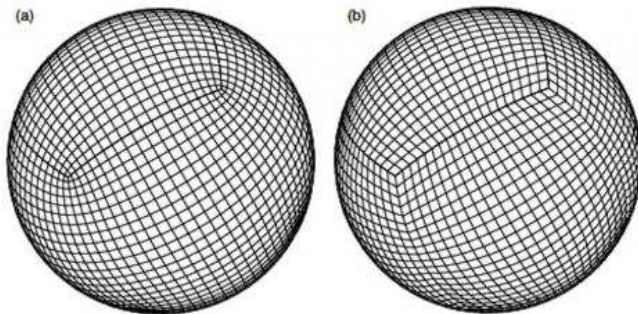Key Performance Enablers

- IO server
- ENDgame Dynamical Core

Atmosphere Component - Unified Model

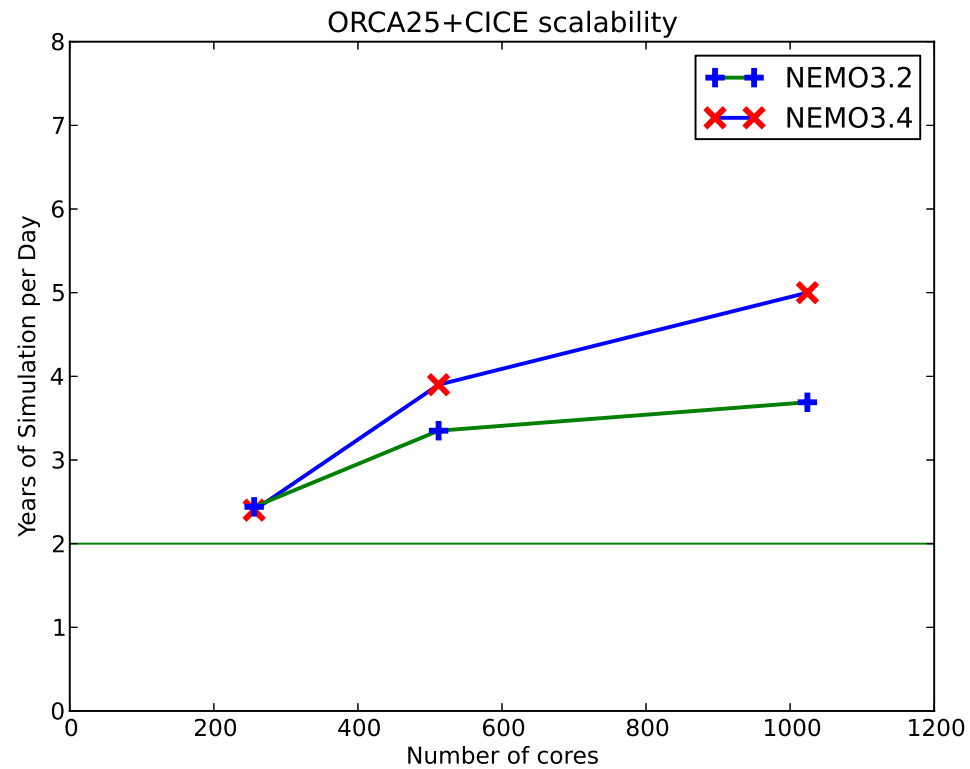Key Performance Enablers

- IO server
- ENDgame Dynamical Core

Future Developments

- GungHo project: New Dynamical core
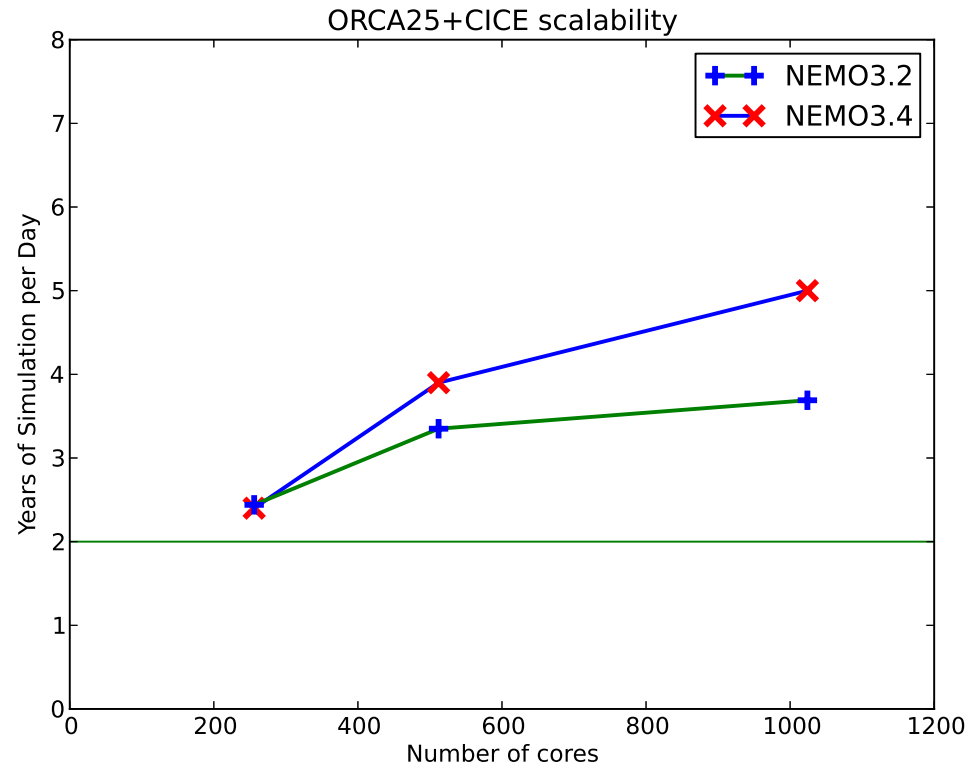- Rewrite of the UM based on GungHo 2018-2020

Ocean-Seaice

NEMO model coupled with CICE model.

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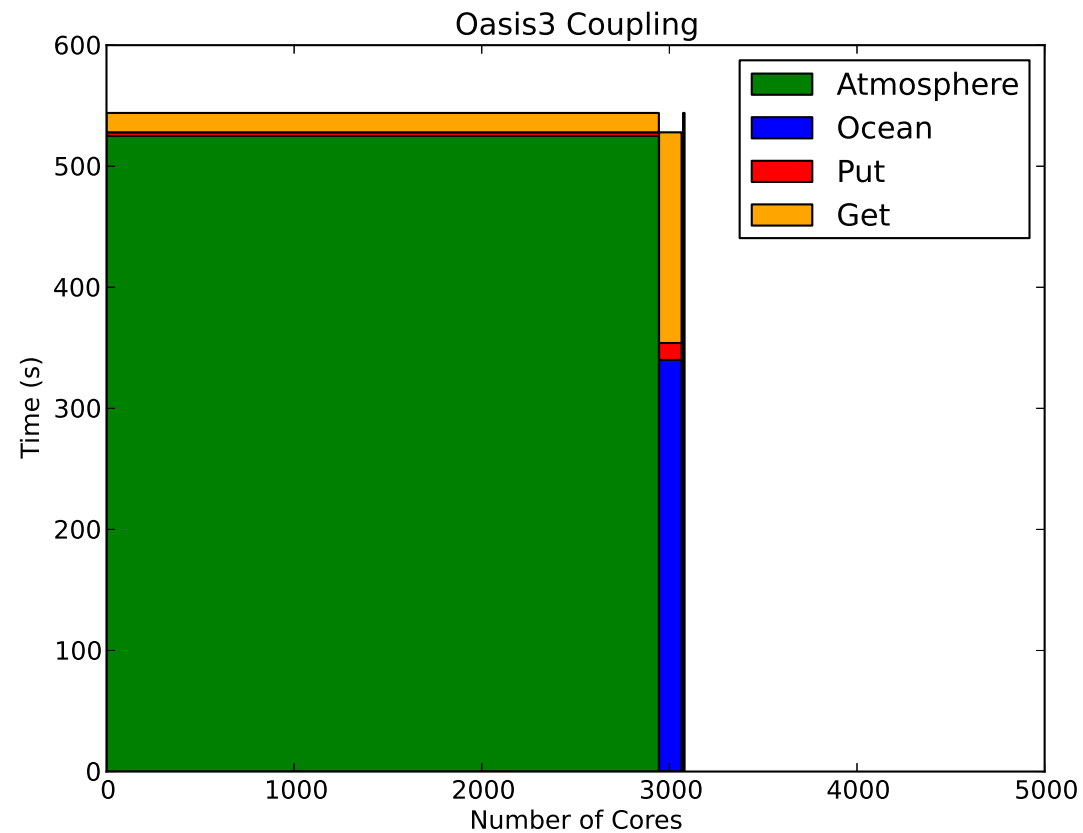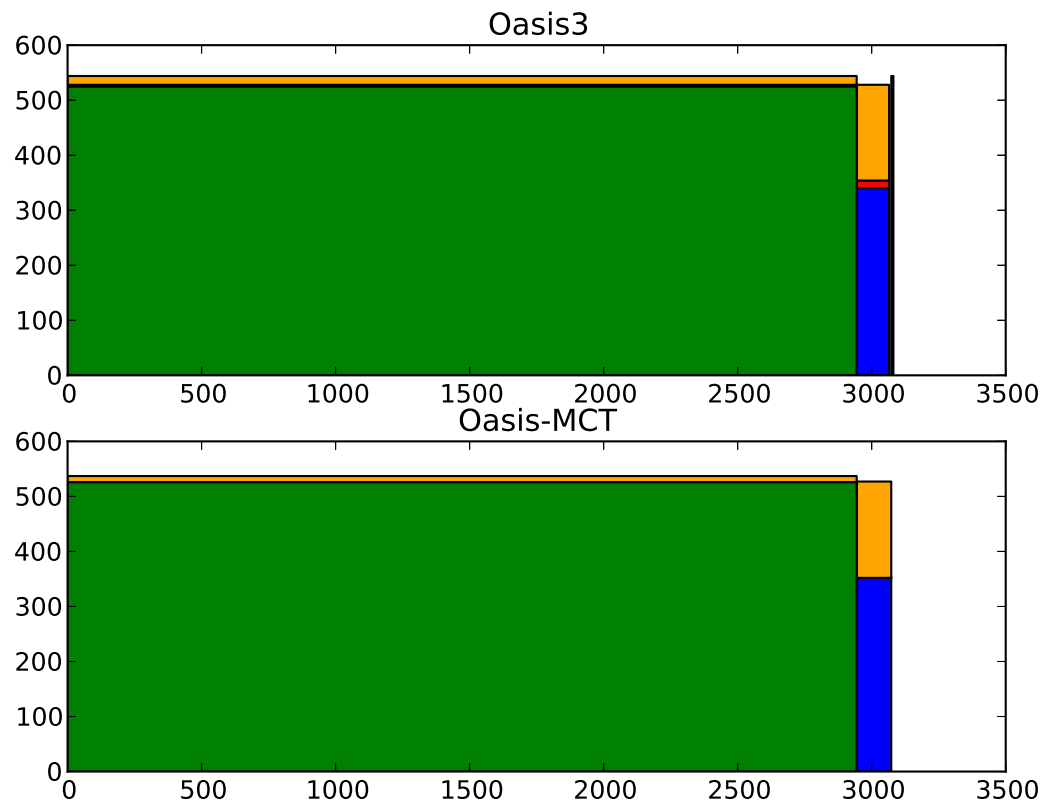

ORCA25+CICE scalability

ORCA12 ?

IO server ?

Coupling : Atmosphere + Ocean-Seaice

UM(N512) + OASIS + NEMO(ORCA25)CICE

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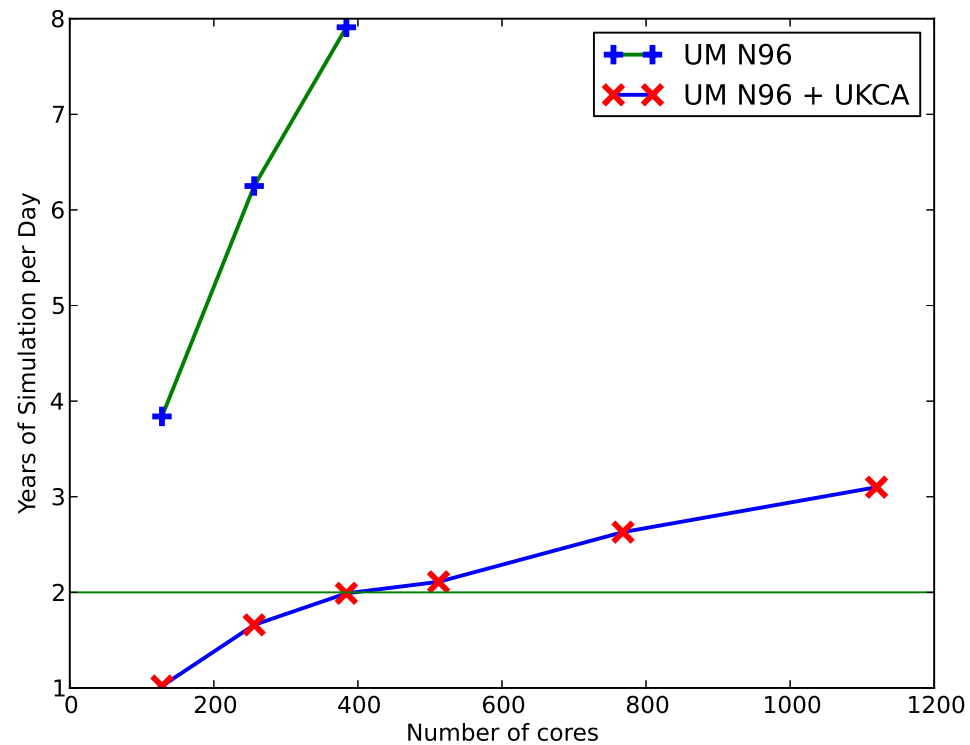
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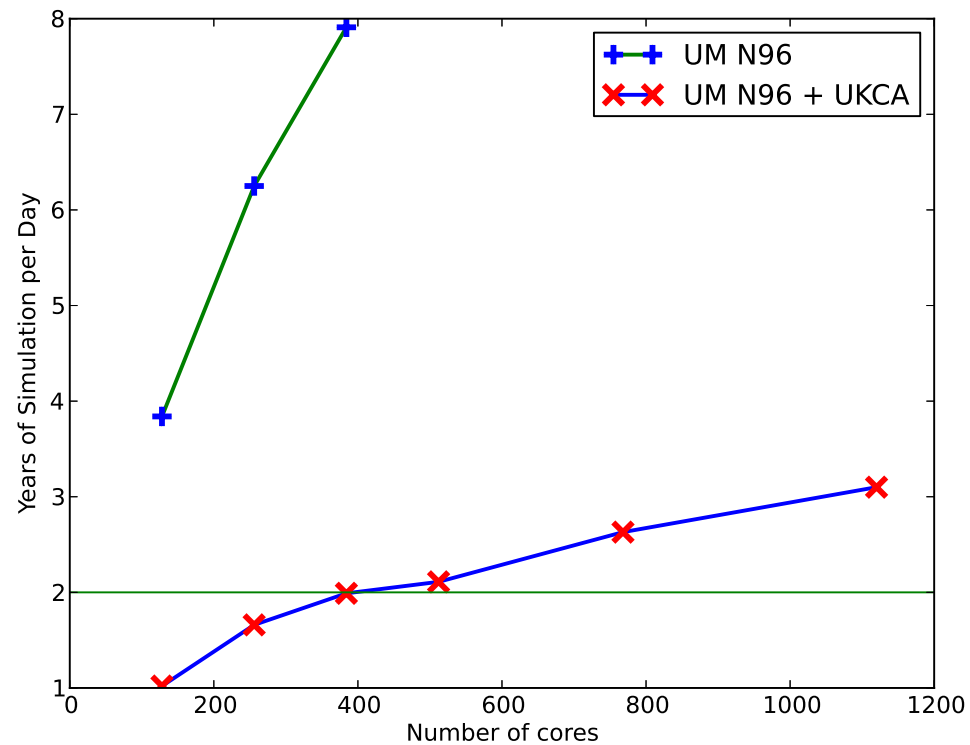

Not too expensive, *for now*.

Earth System Modelling : Chemistry

UKCA model for aerosols, called by the UM.

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Expensive !

Earth System Modelling : Future Plans

- Increased resolution vs Increased complexity
    - UKCA optimisation
    - Ocean Biogeochemistry
    - etc....
- Seasonal to Decadal/Regional predictions
- Plugging all the components together : coupling, technical infrastructure
- GungHo

HPC Replacement Timetable

- Started informal engagement with HPC vendors

- Draft ITT and initial benchmark in April 2013

- Iterating above with vendors until formal ITT Autumn 2013 (if funding approved)

- 120 working day tender process = Spring 2014 for contracts

- Autumn 2014 initial install

- Summer 2015 operational on new machine