

# Broadwell migration

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# What's required to run on Broadwell

- Changes to job submission script
  - Taking account of #CPU's/node & memory
- Use of new compiler version
  - cdt/15.11
  - A few environment variables
  - Together allow reproducible results on Broadwell/Ivybridge
- Small script branch
- Changes to prepIFS defaults
  - ccb\_bw & cca\_bw for testing (will revert to ccb & cca after transition)
  - Changes to #tasks & #threads
    - To fit the nodes (36 cpus cf 24 cpus)
    - To utilize the memory well
    - To improve throughput
  - Changes to pick up new compiler / new libraries

## Cycles migrated

Cycle	prepIFS overlay	cdt/15.11 libraries	Script branch	Notes
31r2	“an” only	Use existing	<input type="checkbox"/>	ERA Interim only cdt/15.11 not working
36r4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>Libraries</b> for seasonal forecast system. Will also require overlays for ecEarth
41r1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
41r2	<input type="checkbox"/>	<input type="checkbox"/>	esuite branch	
42r2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
43r1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	cdt/16.04 libraries under test

# Tuning tasks & threads for Broadwell

- 18 CPUs per NUMA core (or 36 hyperthreads)

- Threads

- Generally 6 threads works well
- 9 threads can sometimes give better performance, and better memory scaling

- Tasks

- For poorly scaling jobs (4DVAR) we can reduce #tasks because we have more memory than before
  - Substantial reduction of CPUs used, but only minor increase in runtime
  - Example : T1279, 2<sup>nd</sup> minimisation:
    - Ivybridge : 480 x 6 (120 nodes) takes 1564s (52.13 Node-hours)
    - Broadwell : 300 x 6 (50 nodes) takes 1581s (21.96 Node-hours)  
=> x2.4 Increase in machine throughput
- Generally 4DVAR tasks give around ~2x throughput by retuning #tasks
- This doesn't work so well for forecast where we have better scaling
  - Further investment/tuning will be necessary