Performance of ALADIN-NH on the NEC SX-6 multinode computer

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Installation

- Installation of ALADIN CY28T3 on NEC SX-6 at DMI based on a SX-6 version from the Czech Hydrometeorological Institute in Prague.
- Thanks to CHMI and Filip Vana who kindly delivered the necessary software.
- In addition to the problems reported by Filip Vana, a few problems that was hard to localize but easy to overcome occurred during runtime.

Tested features of ALADIN

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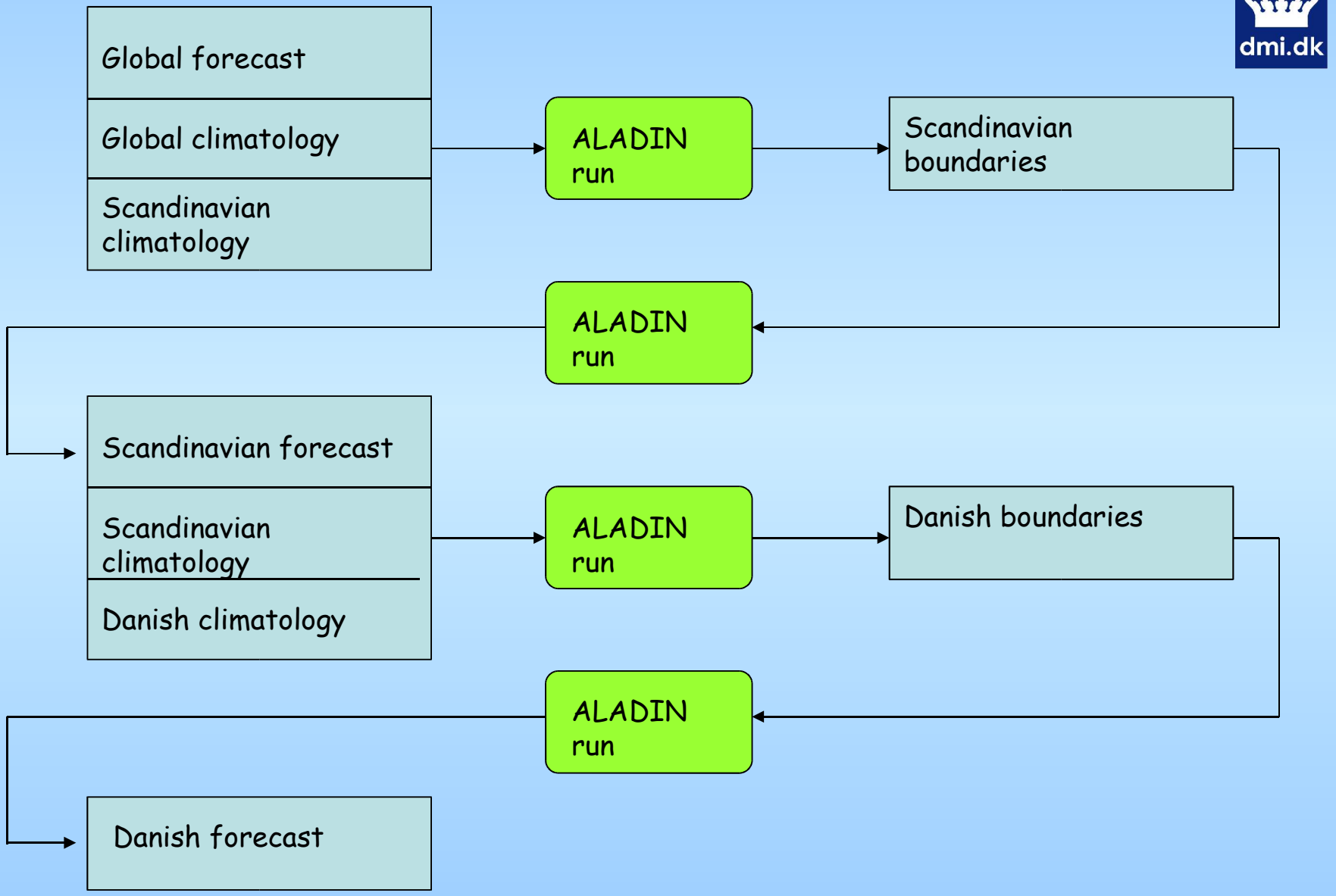
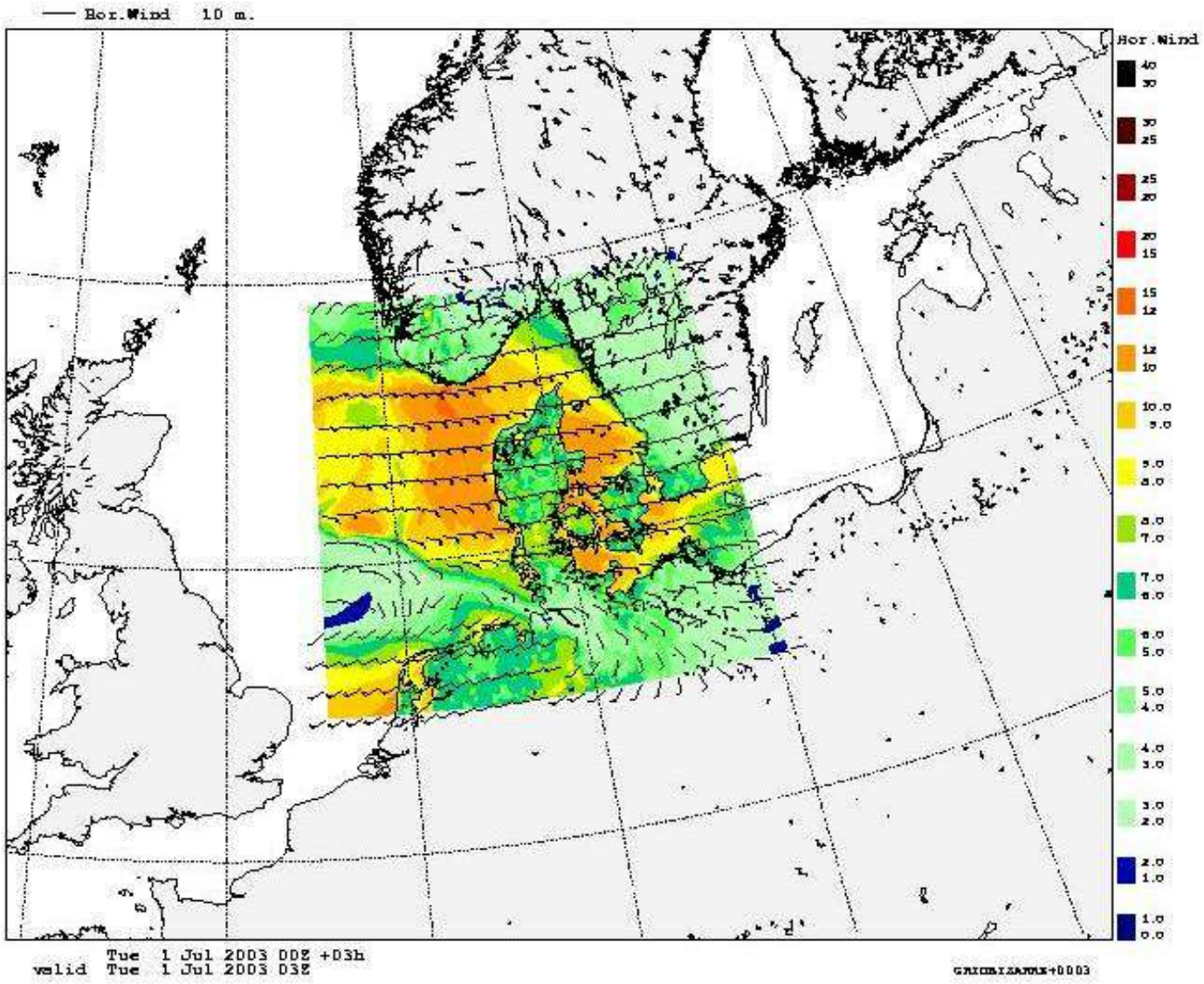
- Postprocessing to create boundaries to a nested domain based on global ARPEGE result files.
- Postprocessing to create boundaries to a further nested domain based on ALADIN result files, with preparation for both hydrostatic and non-hydrostatic forecast.
- Forecast with ALADIN in hydrostatic mode.
- Forecast with ALADIN in NH mode.
- Conversion from FA to GRIB file format with PROGRID.
- Examine FA files with TESTFA

Nesting down to the Danish Domain

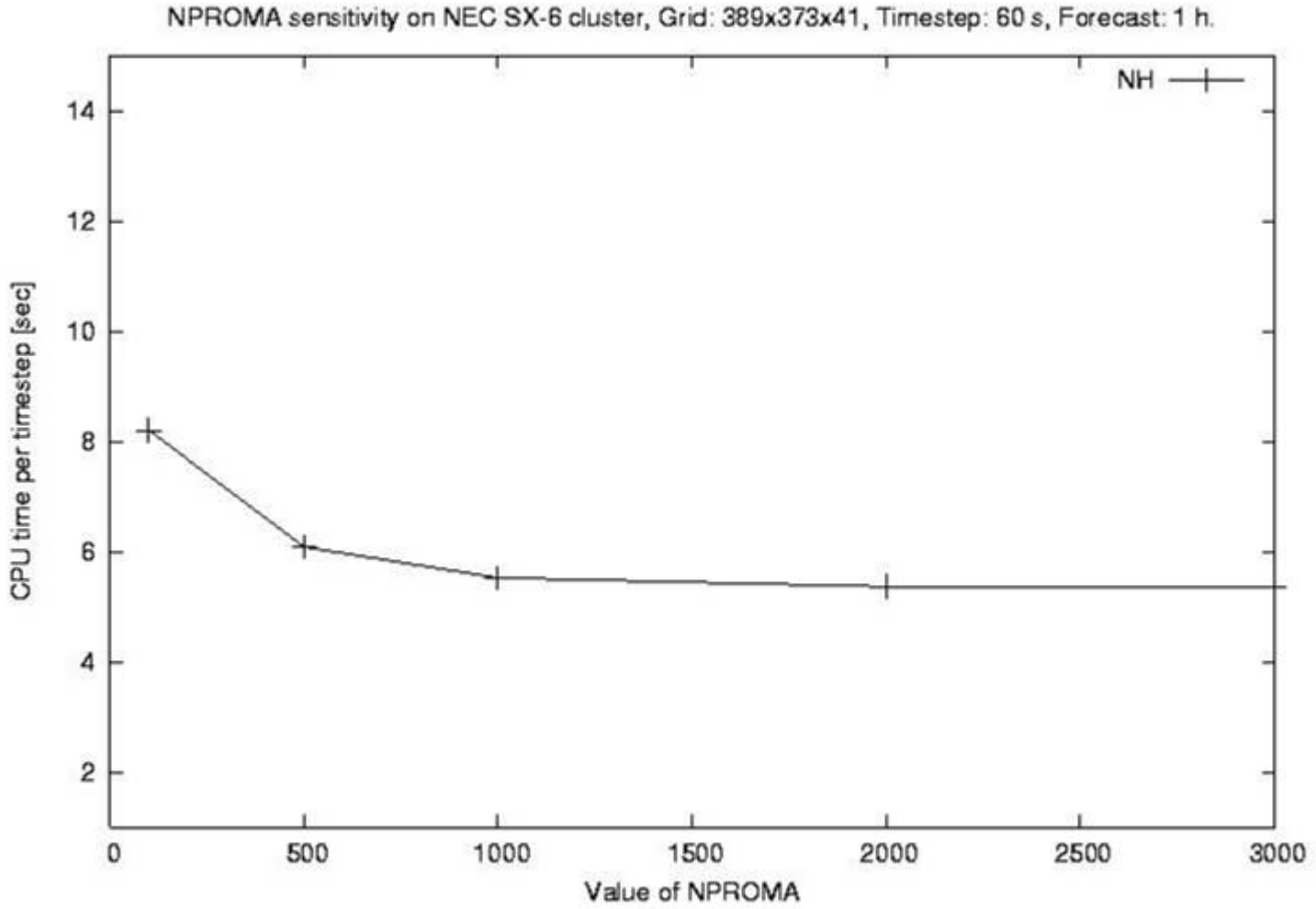


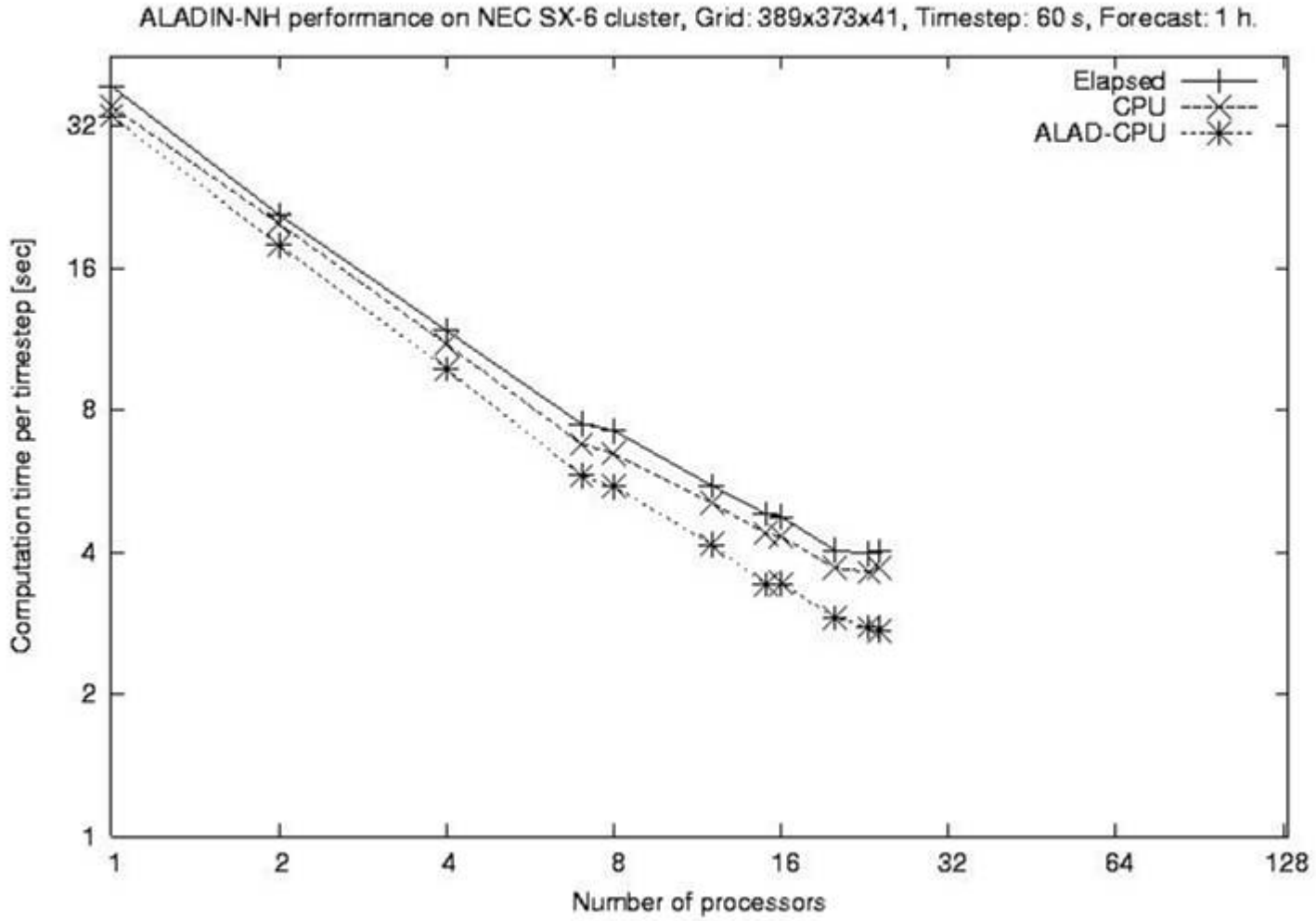
The Danish Domain

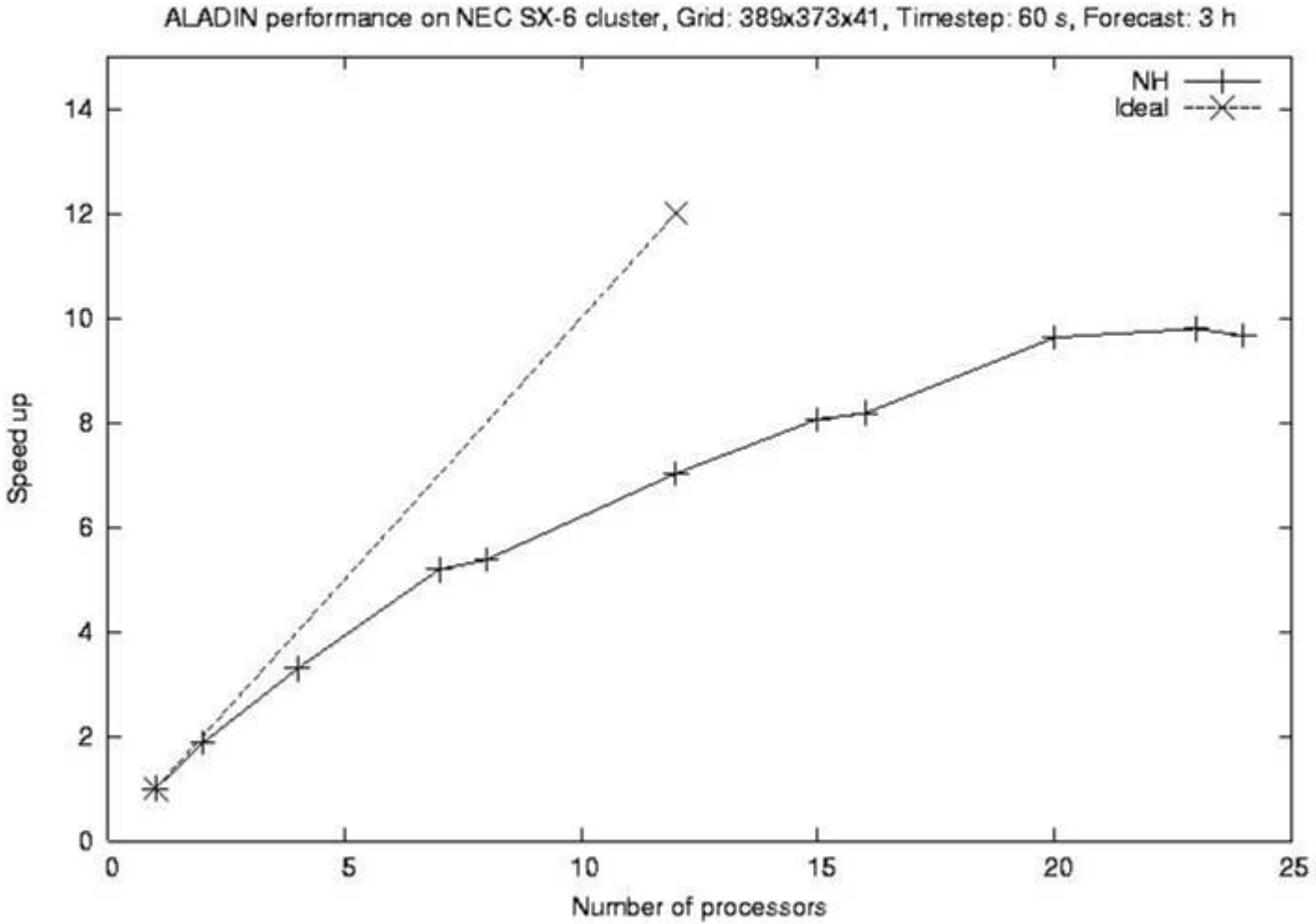


ALADIN NH performance on NEC SX-6 Cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 1 h.

$nproc$	$Elapsed$	CPU_{Tot}	$\frac{Elapsed}{nstep}$	$\frac{CPU_{Tot}}{nstep\ nproc}$	CPU_{Ave} $ALADIN$
1	2329	2213	38.82	35.22	33.54
2	1244	2383	20.73	19.86	17.89
4	708	2650	11.80	11.04	9.78
7	449	2845	7.48	6.77	5.81
8	434	3104	7.23	6.47	5.51
12	332	3666	5.53	5.09	4.15
15	289	3940	4.82	4.38	3.42
16	285	4133	4.75	4.31	3.43
20	242	4443	4.03	3.70	2.90
23	238	5007	3.97	3.63	2.77
24	241	5343	4.02	3.71	2.73

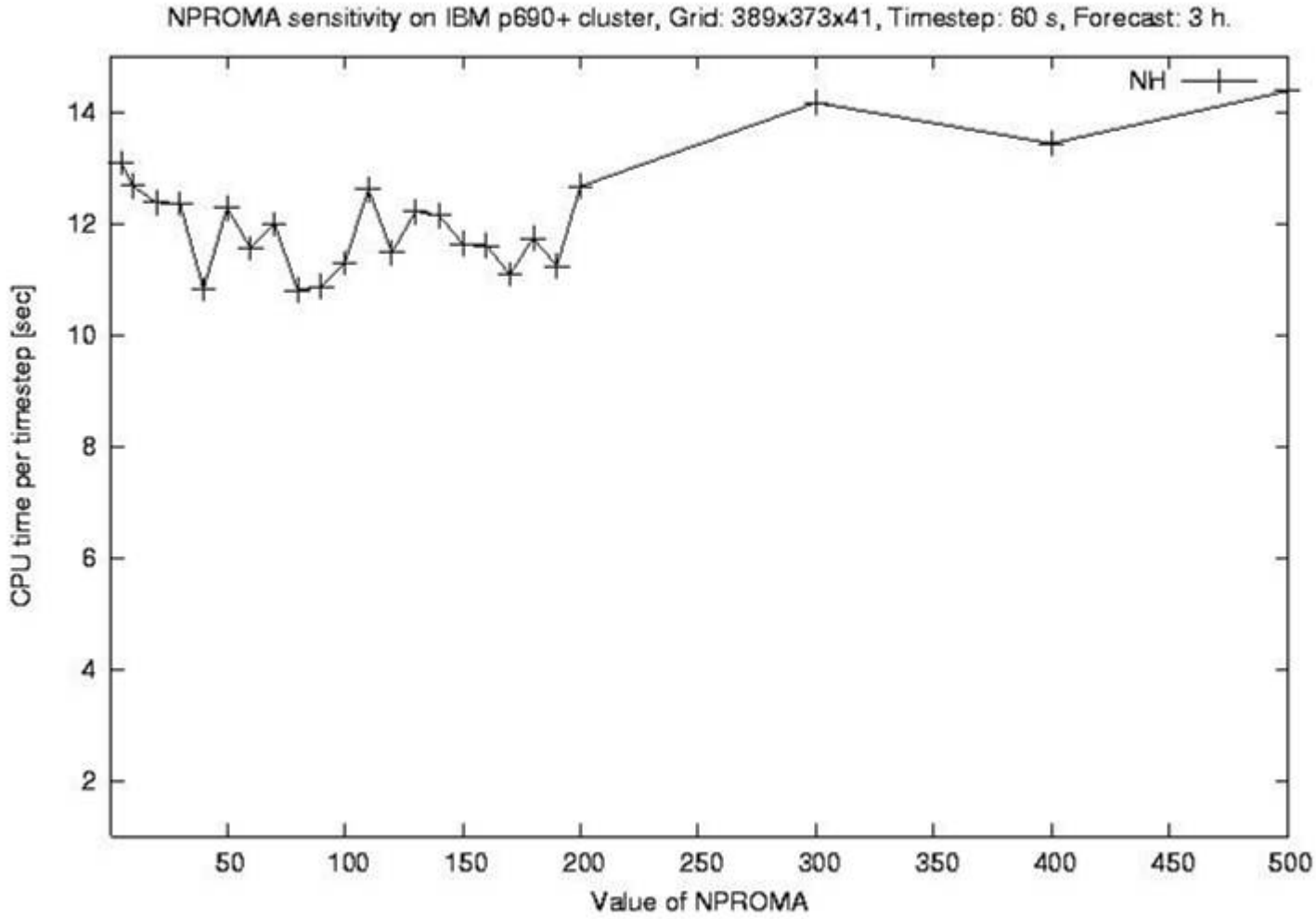

NPROMA sensitivity on NEC SX-6 cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 1 h.
NH
CPU time per timestep [sec]
14
12
10
8
6
4
2
0
500
1000
1500
2000
2500
3000
Value of NPROMA

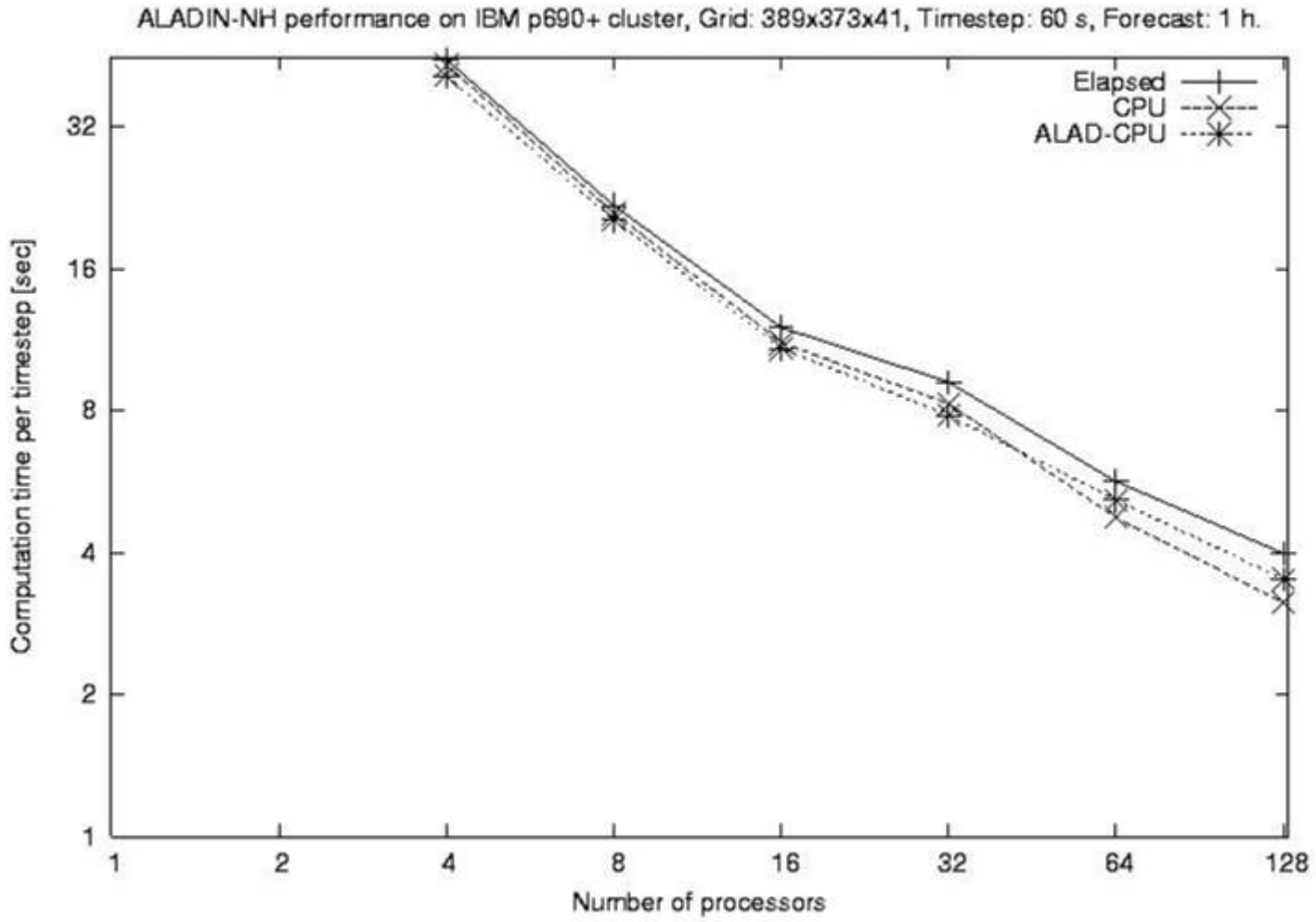

ALADIN-NH performance on NEC SX-6 cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 1 h.
Elapsed
CPU
ALAD-CPU
Computation time per timestep [sec]
32
16
8
4
2
1
1
2
4
8
16
32
64
128
Number of processors

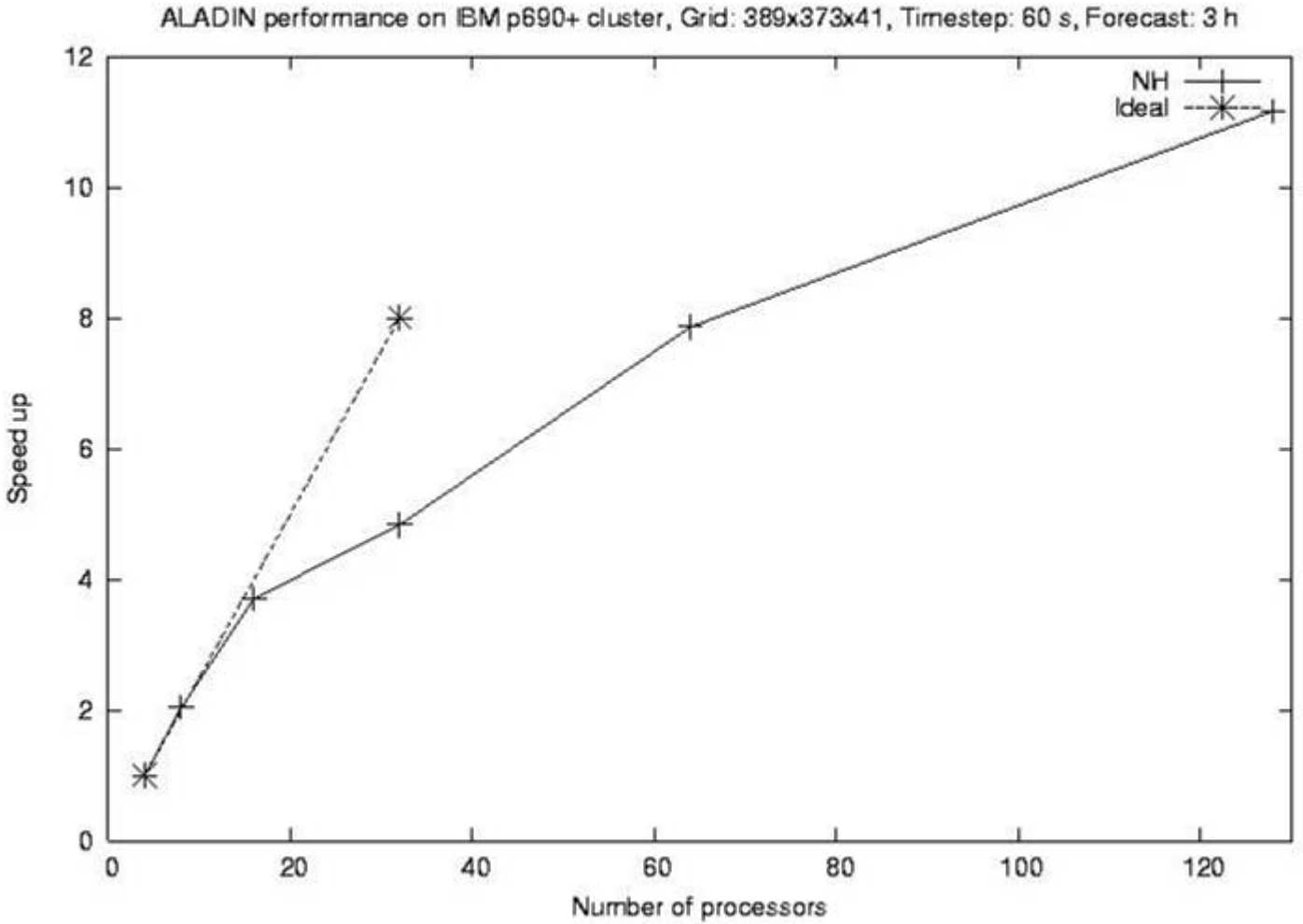

ALADIN performance on NEC SX-6 cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 3 h
NH
Ideal
Speed up
Number of processors
0
2
4
6
8
10
12
14
0
5
10
15
20
25

ALADIN NH performance on IBM p690+ cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 3 h.

$nproc$	$Elapsed$	CPU_{Tot}	$\frac{Elapsed}{nstep}$	$\frac{CPU_{Tot}}{nstep\ nproc}$	$CPU_{Ave.}\ ALADIN$
4	7993	31143	44.41	43.25	41.03
8	3919	30235	21.77	21.00	20.30
16	2160	32112	12.00	11.15	10.84
32	1654	47649	9.19	8.27	7.81
64	1017	54637	5.65	4.74	5.17
128	716	72221	3.98	3.13	3.51


NPROMA sensitivity on IBM p690+ cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 3 h.
NH
CPU time per timestep [sec]
Value of NPROMA
2
4
6
8
10
12
14
50
100
150
200
250
300
350
400
450
500


ALADIN-NH performance on IBM p690+ cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 1 h.
Elapsed
CPU
ALAD-CPU
Computation time per timestep [sec]
32
16
8
4
2
1
1
2
4
8
16
32
64
128
Number of processors


ALADIN performance on IBM p690+ cluster, Grid: 389x373x41, Timestep: 60 s, Forecast: 3 h
Speed up
Number of processors
NH
Ideal
0
2
4
6
8
10
12
0
20
40
60
80
100
120

Conclusion

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- ALADIN scales fairly well for the number of processors tested.
- After further optimization we believe that we can run a 24 hour forecast with 60 sec. timestep in 48 min. corresponding to 2 sec. per timestep.