

APPENDIX A

ARTIFACT DESCRIPTION APPENDIX: DISTRIBUTED FAST
BOUNDARY ELEMENT METHODS

A. Abstract

In this appendix we present a computational environment used for evaluation of performance of the parallel implementation of the ACA algorithm in the BEM4I library. The library was optimized for the Intel architecture and is usually compiled using the Intel Compiler and linked against the Intel Math Kernel Library. The results obtained using the GNU compiler are not as satisfactory especially in the case of SIMD vectorization. However, the code is not yet publicly available.

B. Description

1) *Check-list (artifact meta information): Fill in whatever is applicable with some informal keywords and remove the rest*

- **Algorithm:** BEM, ACA
- **Program:** bem4i-helmholtz, not publicly available
- **Compilation:** Intel Compiler v. 2017.0.0 with `-xHost -O2 -qopenmp`, Intel MPI v. 2017.0.098
- **Run-time environment:** CentOS release 6.9
- **Hardware:** Salomon cluster at IT4Innovations consisting of 1008 nodes equipped with two Intel Xeon E5-2680v3 CPUs per node, 128 GB DDR4@2133 MH per node, InfiniBand FDR56 / 7D Enhanced hypercube network
- **Execution:** 2 MPI processes per node, 12 OpenMP threads per MPI process, MPI process pinned to socket, OpenMP setting: `KMP_HW_SUBSET=1s,12c,1t`, `KMP_AFFINITY=compact`
- **Publicly available?:** No

2) *Hardware dependencies:* Intel Xeon server CPUs ideally equipped with at least AVX2 instruction set.

3) *Software dependencies:* METIS v. 5.1.0., Intel Math Kernel Library 2017.0.098

4) *Datasets:* Datasets (input meshes) were generated using the NetGen software. In the case of the perforated plate, the input meshes consist of 546,000, 1,228,590, and 4,914,360 surface elements. In the case of the half space scattering problem off a sound barrier, the input mesh consists of 5,259,264 surface elements.