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Scaling for high-end HPC systems: New features in OSIRIS 2.0 RICARDO FONSECA, DCTI, Inst. Sup. Ciencias Trabalho e da Empresa, Portugal; GoLP/CFP, Inst. Sup. Tecnico, Portugal, MICHAEL MARTI, LUIS GARGATE, LUIS SILVA, GoLP/CFP, Instituto Superior Tecnico, Lisboa, Portugal, JOHN TONGUE, FRANK TSUNG, WARREN MORI, University of California Los Angeles, CA 900095, U.S.A. — The OSIRIS 2.0 framework [1] is an integrated framework for particle-in-cell (PIC) simulations. This framework is based on a three-dimensional, fully relativistic, massively parallel, object oriented particle-in-cell code, that has successfully been applied to a number of problems, ranging from laser-plasma interaction and inertial fusion to plasma shell collisions in astrophysical scenarios. One-to-One modeling of ongoing and future experiments require state of the art computer systems, with a number of computing nodes going up to tens of thousand. To make efficient of such systems it is crucial to maintain an evenly balanced load on all computing nodes. We describe the dynamic load balancing algorithm that we implemented in OSIRIS to allow for near perfect scaling up to tens of thousand of computing nodes. Details on the partition selection scheme and simulation space repartition routines are given. We present the results on the performance impact for simulation using large number of nodes. Some details on other issues pertaining efficient use of large computer systems, such as parallel I/O and hardware tuning, are also shown. [1] R. A. Fonseca et al., LNCS 2331, 342-351, (Springer, Heidelberg, 2002)

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