This paper presents a GPU-accelerated nodal discontinuous Galerkin method for the solution of two- and three-dimensional level set (LS) equation on unstructured adaptive meshes. Using adaptive mesh refinement, computations are localised mostly near the interface location to reduce the computational cost. Small global time step size resulting from the local adaptivity is avoided by local time-stepping based on a multi-rate Adams–Bashforth scheme. Platform independence of the solver is achieved with an extensible multi-threading programming API that allows runtime selection of different computing devices (GPU and CPU) and different threading interfaces (CUDA, OpenCL and OpenMP). Overall, a highly scalable, accurate and mass conservative numerical scheme that preserves the simplicity of LS formulation is obtained. Efficiency, performance and local high-order accuracy of the method are demonstrated through distinct numerical test cases.