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iCOMCOT: Real-time Tsunami Simulation Based on Parallelized COMCOT

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Impact

Usually, it takes longer time to run a typical scientific computing program that is realistic enough for natural phenomena since it requires large computing power. Even equipped with advanced CPUs, the computing power still might not be efficient enough. The significance of this study is to make the real-time tsunami simulation possible. The iCOMCOT portal is a user-friendly interface with a fast system, low simulation cost, and trustworthy results. Parallelized by ASGC, iCOMCOT now is able to use multi-core CPU resources and faster than it used to be. When testing on a new 32-core server, a case used to need 30 minutes to be done can be finished in 2 minutes. The portal is compatible with both PCs and hand-held devices. Not only does the iCOMCOT portal be capable of generating real-time simulation, but also provides users with the results of the maximum wave height, the inundation area, the maximum flux, and the map of arrival time.

Summary

Tsunami simulation requires a large amount of computation resources. Lacking resources might impede the real-time simulation for hazard mitigation. In this study, a cloud service for real-time tsunami simulation was established, especially for the Southeast Asia countries. The system is fast and user-friendly. COMCOT (Cornell Multi-grid Coupled Tsunami Model) was chosen as the kernel to provide functions such as source modeling, nested grids, propagation, etc. After optimization and parallelization, the revised COMCOT version has improved its performance up to 32 times faster than the original one. In addition, a flexible portal service was built by using grids/clouds . The web-based iCOMCOT portal allows users to create their own nested grids, input the fault parameters, set up tidal gauges, and perform the tsunami simulation. Users will get results of the maximum wave height, the inundation area, the maximum flux, the time-series gauge data, and the map of arrival time.

URL

http://worker01.grid.sinica.edu.tw/icomcot/

Description

COMCOT is a complicated scientific computing program which requires large computing power. To better improve its efficiency, it is important to develop Grid-base/Cloud-based COMCOT. The iCOMCOT architecture allows simulation job to be run on different types of computing resources. The job management system can be integrated with cluster, grid, or cloud computing environment to provide scalable computing power. iCOMCOT has five major components, they are: web UI, CGI, storage and database, workload management system, and distributed computing resources. CGI is responsible for communication between web UI and job management system. The entered simulation parameters are stored in the database. When a simulation is triggered from the web UI, the simulation job is sent to the job management system. The job management system will first retrieve simulation parameters from the database. Data preprocess will be done. Necessary computing resource will then be looked up and matched for the simulation job. The simulation job will then be sent to the matched computing resource. If no computing resource is matched, the job will be hold in the queue and wait until there is computing resource available. The simulation result will be retrieved from the computing resource after the simulation job is done. Lastly, necessary data process will be done to generate visualized result.

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