Cloud-Based Numerical Weather Prediction for Near Real-time Forecasting and Disaster Response

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The use of cloud computing resources continues to grow within the public and private sector components of the weather enterprise as users become more familiar with cloud-computing concepts, and competition among service providers continues to reduce costs and other barriers to entry. Cloud resources can also provide capabilities similar to high-performance computing environments, supporting multi-node systems required for near real-time, regional weather predictions. Referred to as "Infrastructure as a Service", or IaaS, the use of cloud-based computing hardware in an on-demand payment system allows for rapid deployment of a modeling system in environments lacking access to a large, supercomputing infrastructure. Use of IaaS capabilities to support regional weather prediction may be of particular interest to developing countries that have not yet established large supercomputing resources, but would otherwise benefit from a regional weather forecasting capability.

Recently, collaborators from NASA Marshall Space Flight Center and Ames Research Center have developed a scripted, on-demand capability for launching the NOAA/NWS Science and Training Resource Center (STRC) Environmental Modeling System (EMS), which includes pre-compiled binaries of the latest version of the Weather Research and Forecasting (WRF) model. The WRF-EMS provides scripting for downloading appropriate initial and boundary conditions from global models, along with higher-resolution vegetation, land surface, and sea surface temperature data sets provided by the NASA Short-term Prediction Research and Transition (SPoRT) Center. This presentation will provide an overview of the modeling system capabilities and benchmarks performed on the Amazon Elastic Compute Cloud (EC2) environment. In addition, the presentation will discuss future opportunities to deploy the system in support of weather prediction in developing countries supported by NASA's SERVIR Project, which provides capacity building activities in environmental monitoring and prediction across a growing number of regional hubs throughout the world. Capacity-building applications that extend numerical weather prediction to developing countries are intended to provide near real-time applications to benefit public health, safety, and economic interests, but may have a greater impact during disaster events by providing a source for local predictions of weather-related hazards, or impacts that local weather events may have during the recovery phase.