



The Computerworld Honors Program

Honoring those who use Information Technology to benefit society

Final Copy of Case Study

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STATUS:
Laureate

Organization:

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Organization URL:

<http://www.semcc.gov.cn>

Project Name:

Shanghai Air Quality Forecasting System

What social/humanitarian issue was the project designed to address? What specific metrics did you use to measure the project's success?

After the success of the U.S. National Air Quality Forecasting system, which was developed by U.S. EPA and NOAA, a joint effort was launched between Shanghai Environmental Monitoring Center, the Atmospheric Modeling and Analysis Division at the U.S. EPA and the Department of Civil and Environmental Engineering, University of Tennessee at Knoxville, to establish a similar system for Shanghai, China. This project was designed to meet the requirements necessary to establish an Air Quality Forecasting System by the start of the Shanghai Expo 2010.

Please describe the technologies used and how those technologies were deployed in an innovative way. Also, please include any technical or other challenges that were overcome for the successful implementation of the project.

An entire forecasting system operates automatically everyday to predict the concentration of the pollutants Ozone and PM2.5 (particulate matter) in the next 48 hours. This system involves a nest down of four domains from 81km (entire China) to 3km (Shanghai vicinity region). Within each domain, the system consists of two parts: preparing input in which boundary conditions, emission data, and meteorology are created, and executing the CMAQ (Community Multi-scale Air Quality) air quality model. This MPI-based air quality model runs on a multi-processor Linux cluster with a

high-performance interconnect network. The output of the inner most domain is analyzed and visualized by experienced air quality modeling experts. The analysis translates into an air quality index that is broadcasted to the public. A network of air quality monitoring stations sends hourly measurement data back to a centralized location through wireless networks. This observation data is used to validate the predicted numerical air quality model result. This is an ongoing research activity intended to enhance the numerical model as well as the prediction.

Please list the specific humanitarian benefits the project has yielded so far.

Studies have shown that air pollutants such as PM_{2.5} and Ozone are related to infant mortality [1], heart problems [2], respiratory ailments such as asthma [3], and various other health issues. Knowing the air quality prediction allows sensitive groups, particularly the elderly and children, to act accordingly to minimize the documented detrimental effects of pollution. This can translate into a decrease of medical treatment, a minimization of productivity losses due to the need to care for sick family members, and a reduction of lives lost due to air pollution. 1. T. J. Woodruff, J. D. Parker, and K. C. Schoendorf, "Fine Particulate Matter (PM_{2.5}) Air Pollution and Selected Causes of Postneonatal Infant Mortality in California," *Environ Health Perspect.* 2006 May; 114(5): 786790. 2. J. M. Cavallari¹, E. A. Eisen, S. C. Fang, J. Schwartz, R. Hauser, R. F. Herrick and D. C. Christiani, "PM_{2.5} metal exposures and nocturnal heart rate variability: a panel study of boilermaker construction workers," *Environmental Health* 2008, 7:36 3. K.M. Mortimer, I. B. Tager, D. W. Dockery, L. M. Neas, and S. Redline, "The Effect of Ozone on Inner-City Children with Asthma Identification of Susceptible Subgroups," *Am. J. Respir. Crit. Care Med.* November 1, 2000, vol. 162, no. 5, 1838-1845.

Please provide the best example of how the project has benefited a specific individual, enterprise or organization. Feel free to include personal quotes from individuals who have directly benefited from the work.

With this Air Quality Forecasting System, numerous polluted days were accurately predicted during the Expo, which played the important role for the Air Quality Guarantee during the Expo 2010. This system provides air quality information to the public only. It does not work with any health official to measure any benefit.