The Utah Division of Air Quality, Scientific Modeling, and the University of Utah Center for High Performance Computing

The science of understanding air pollution and improving air quality in Utah relies on complex computer modeling done by meteorologists, environmental scientists, and atmospheric chemists. Air quality models take a lot of computer power to run. How much? Well, it depends on how fast you want them to give results that can inform environmental policy. For Utah's Division of Air Quality (DAQ), time is always of the essence. That's why DAQ scientists have partnered with the University of Utah's Center for High Performance Computing (CHPC) to get answers about Utah's air pollution issue more quickly than ever. Before, DAQ relied on what Planning Branch Manager Patrick Barickman described as a "poor man's supercomputer," a group of networked computers at DAQ's office, for their computing power. Now that the data is being run through CHPC's systems, Barickman said, these incredibly complex calculations are being completed more than five times faster than previously.

DAQ's collaboration with CHPC began in 2012 as there was a need for additional computational resources to handle new modeling projects for the Uintah Basin and Wasatch Front. DAQ has access to up to 45 computing processors on CHPC's cluster system that are dedicated to only DAQ's interests. Also, CHPC has provided DAQ with up to 7 terabytes of storage disk space, giving DAQ the ability to better manage the large datasets associated with its modeling needs. This access to CHPC cluster system and disk space gives DAQ more efficiency and flexibility with its modeling platform than the previous in-house capabilities. An additional benefit to DAQ is that having CHPC manage the system administration and software engineering allows DAQ environmental scientists to focus on what they do best without having to worry about keeping the computer system up and running.

DAQ is constantly adding refinements to its air quality models by including new data and researching ever more precise atmospheric equations. This allows the modelers to run the model several times with different control strategies applied in order to discover which strategy or combination of strategies is most effective at reducing air pollution in the state. In the 2014 legislative session, the Utah State Legislature provided funding to DAQ to work with researchers across the state to address specific scientific questions to improve air quality in Utah.

Several of these researchers have their own data and modeling located at CHPC and will be providing model inputs at much higher resolution than DAQ has been using up to now. While increasing resolution can improve the ability of the model to faithfully reproduce the underlying causes of pollution, this comes at a cost of increased computational demands. With DAQ housing its modeling operations at CHPC, this provides an unprecedented level of collaboration between outside researchers and DAQ scientists.