Better Forecasts Save Lives

By Rick Gregory

Baron Advanced Meteorological Services (BAMS, http://www.baronams.com) is a home grown North Carolina company that is improving the accuracy of weather and atmospheric forecasting through applied science that pushes the limits of computing technology.

The company was thrust into the national spotlight in 2004 when its prediction of landfall for Hurricane Charley at Punta Gorda, Florida, turned out to be accurate while other weather service forecasts called for landfall 150 miles further north. They were in the news again in 2005, accurately predicting that Hurricane Rita would make landfall in southwestern Louisiana rather than in Houston as called for in most other forecasts.

“While they were evacuating Houston, our forecast was centering on southwest Louisiana,” said John McHenry, chief scientist at BAMS. “The unfortunate thing is that people died during the Houston evacuation.”
“One of our main goals is to provide high quality, reliable information that can help protect lives and mitigate property loss,” McHenry said.

**Supercomputing**

BAMS is an outgrowth of the Microelectronics Center of North Carolina (MCNC) super computing initiative in the 1990’s. In a cooperative venture with the Environmental Protection Agency (EPA), MCNC established an environmental modeling team that worked with the EPA on contracts, grants and other cooperative agreements.

“The EPA was engaged in developing the ‘next generation’ of atmospheric modeling systems and we assembled a marquee team of meteorologists and atmospheric scientists at MCNC,” said McHenry. “Everyone brought a different expertise to the group and the overall strength of the organization was quite high. It was one of the leading modeling groups in the US,” he said.

The group’s goal was to unify the modeling of atmospheric chemistry and meteorology, which had historically been studied with separate models, and to develop interfaces that enabled the model to work in high performance computing environments. The group flourished at MCNC for over ten years until a confluence of events threatened their continued existence.

In the late 1990’s, the EPA changed their business model to deemphasize cooperative arrangements like the modeling initiative and universities began to pull away from the supercomputing model in favor of lower cost, commodity computing environments. At about the same time, the State began to reduce their funding of MCNC projects and encourage them to form commercial ventures. Combined with the economic downturn in the early 2000’s, the modeling group faced an uncertain future.
Commercialization

“I had several ideas for commercializing some of the work that we had started at MCNC, said McHenry, “and I began to concentrate seriously on them in 1998.”

McHenry developed a system that combined meteorological, atmospheric chemistry and emissions modeling in a real time, operational system that enabled forecasting of air quality.

“Nobody else was doing that,” he said. “Existing models allowed you to evaluate air pollution for regulatory purposes, but there had never been a model that was run as a forecast system.”

McHenry was also doing additional research on hydrological modeling (what happens to water after precipitation hits the ground) and developing a meteorological modeling component as a separate commercially viable product.

WRAL-TV

To push these products toward the commercial realm, McHenry formed a partnership with Greg Fishel, chief meteorologist at WRAL-TV in Raleigh, NC, and Sethu Raman, NC State Climatologist and head of the NC State Climate Office. Their goal was to develop a forecast meteorological model that ran on local television.

The partnership managed to cobble together a mix of commercial and grant funding to put together a shoestring budget for the venture. “We utilized a very low budget and a very high energy group of people to develop a product that was, by objective opinion, a better forecasting model than those available from the major commercial weather service providers,” said McHenry.

The product was NC Weatherscope, which still airs on WRAL-TV, and it was a successful proof of concept that convinced McHenry that he had the
basis for a successful commercial venture. “It was a small start,” he said, “but it was a big success locally and it gave us a solid foundation to build from.”

Their first target for air quality forecasting was state weather agencies that had historically relied on statistical models for air quality. “Statistical models just give you a number,” said McHenry. “You don’t see a map associated with it. We were providing a numerical, map based approach that lets you see air quality patterns distributed over the map of a city or region, so we had to chip away at some preconceived notions.” They eventually developed a clientele of 15 states that are still subscribers to the service.

**Weatherscope**

With the success of Weatherscope, McHenry began shopping the concept to major weather service providers, including Accu Weather, WSI, Weather Central and the Weather Channel. There was a lot of interest, a lot of discussions, and a lot of visits, but none of them were willing to invest in the venture.

“The major weather service providers concentrate on taking freely available government weather data and repackaging it for broadcasters,” McHenry said. “They don’t have a lot of people involved in modeling, so they were reluctant to make an investment in the computing infrastructure required to produce a numerical weather model.”

However, through Greg Fischel, McHenry had developed contacts with Baron Services (http://www.baronservices.com), a Huntsville, Alabama, based weather services company. “Baron was unique because they weren’t in the weather forecasting business per se. They were more involved in the storm analysis business,” McHenry said. “They were developing technologies to disseminate highly accurate storm scale information to broadcast meteorologists when severe weather is imminent.”
“At that time, Baron was getting requests from their customers to solve problems that they couldn’t address without a forecasting component,” said McHenry, “And our forecast model was the technology they needed.”

Baron was also more experienced with maintaining a technical infrastructure. They manufacture the familiar Doppler 5000 radar systems that are used at hundreds of television stations in the US and had developed a computing capability to support their storm analysis technology.

Baron decided to acquire not only the technology, but the hardware and software systems that supported it and the core group of scientists and engineers who drove it. “A significant part of the strategy behind the acquisition was the intellectual component required to continue developing and advancing the state of the science,” said McHenry.

**Partnership**

Barons Advanced Meteorological Services was formed on January 1, 2003. A core research and development group remained at MCNC while several individuals deployed to Asheville.

“The initial strategy was to locate the corporate headquarters for BAMS in Asheville,” said McHenry. Baron had relationships with the National Climactic Data Center, a major NOAA lab, there and there was an initiative underway to develop a supercomputing capability in Asheville. “However, as a team, we decided that it made eminent sense for the R&D capability of the company to remain in Raleigh. There are just more research opportunities in the Triangle area,” he said.

The Triangle based group spent their first year at MCNC before moving to the NC State campus. In addition to getting new office space, four of the BAMS scientists were awarded appointments as adjunct faculty or visiting scholars.
Collaboration

“That is consistent with our strategy of keeping our technology grounded in science,” McHenry said. “We collaborate with the faculty and staff and we maintain a strong presence by publishing in the scientific literature and by participating in national and regional scientific meetings. Our strategy is to legitimize commercial meteorology through scientific research.”

One of BAMS functions is to serve as the R&D engine for Baron Systems, developing new products through scientific advancement and handing them off to the commercial arm of the company. They receive royalties from the product sales that provides a significant share of their revenue, although they continue to pursue traditional grant based research. “Research is the underpinning that allows us to continue to develop advanced products,” McHenry said.

Another component of BAMS’ business is developing large scale, advanced integrated systems that provide the technology for observation, forecast models, display systems and decision support systems. “Baron is unique because we are the only company with an end to end capability from observation to forecasting. We build our own radars and our own forecasting models and display systems that provide critical data to emergency managers and forecasters,” McHenry said.

They are currently working on a multi-million dollar project with the Romanian government to install an advanced hydrological forecasting system and McHenry sees this as a growth area for the company.

Incubator

“We are focusing on developing a number international project to install integrated systems,” said McHenry. “We are the leader in providing end to end solutions. Our goal is to produce and disseminate high quality information that can be
communicated effectively to the public, especially in life threatening situations.”

Having offices on the NC State Centennial Campus has been a big plus for BAMS. “I love being in the Incubator,” says McHenry, “And I work hard to make sure the faculty and staff know where we are. We develop proposals with the faculty and are in the process of bringing in student interns.”

“The location offers a lot of advantages,” he said. “Not only are we close to MEAC (the Marine, Earth and Atmospheric Sciences department), the NC Climate Office is here, the local National Weather Service office is here, and we are very close to WRAL, which is our flagship television broadcaster. Our long term strategy is definitely to have an R&D component of the company in the Triangle.”