Example of Incorporating Web-Technologies and Cloud Computing into the Application of Urban Travel Models

Michael Clarke, Citilabs
George Naylor, Planning Manager, Valley Transportation Authority

Travel forecasting models started as main-frame-based applications and migrated to the microcomputer in the early 1980s. They have remained in that platform, essentially 'locked' making it difficult to provide shared access and to use the models and their results actively in the collaborative process of transportation planning.

The Valley Transportation Authority is responsible for transit operations for Santa Clara County, the center of the Silicon Valley. It has developed comprehensive travel forecasting models based on the regional models developed by the San Francisco region's MPO. These models are applied and used to test a wide range of infrastructure and policy improvements covering roadways, public transit and environmental analysis.

Through 2008, these models were applied within a high-speed desktop PC. The model has 2958 traffic analysis zones, has 8 sub-mode choice alternatives, uses congestion feedback loops to mode choice and models six-auto vehicle time periods. Within the desktop this system required 50 hours for a complete run. Using computer-clustering technologies, these runs times were reduced to a more manageable 7 hours. The VTA modeling staff had remote access to the server.

The VTA models are shared with member jurisdictions and with consultants to support VTA and the local jurisdictional planning efforts.

In 2008, VTA and Citilabs discussed a research endeavor to move models from desktop to the Internet. VTA embraced the concept and specified several goals:

- broaden the number of users of the models both internally and externally
- provide access to the outputs to managers and decision-makers
- reduce computer and software upgrades with ever-increasing complexity of modeling

VTA also noted their concerns:

- is it secure?
- can access be limited/restricted?
- can the costs be covered by a access fee structure?
- is it reliable?

Citilabs felt that moving to a web-based platform offered:

- the creation of an open, sharable, 'work from anywhere/anytime' environment
- the creation of a true community resource where the model can become an active element in the collaborative process of transportation planning
- lower hardware costs, faster run times and the possibility of essentially unlimited resources enabling the model to be applied many, many times without it being restricted to local desktops
- a variety of business models that would likely result in lower costs
- a movement of the IT complexity away from the local agency to the vendor/cloud computing vendor
- a better platform for data and software integration---to integrate data from data probes, detectors, static data sources and to integrate with external local and regional planning and operations systems

Citilabs was concerned that:

- modelers would not embrace the technology due to loss of 'control'
- that clients would be concerned about data security
- that the environment might not prove to be stable
- that costs may not be cheaper

During 2009, the following aspects of the system were put into place and are today, fully functioning:

- a model administration component:
    - creation of client types and assignment of roles and rights
    - creation of model clients and association of the client type
    - creation of specific client login and work areas ('sand box')
    - creation of a common work area and capabilities to share data and model versions between clients
- a model application component:
    - scenario creation, running and management
    - pay as you go capability
    - full advantage of cloud computing capabilities within the Amazon EC2 Elastic Compute Cloud environment
    - messenging between clients and status email/text
    - data management for uploading/downloading

The VTA model was modified to make it 'minty' – capable of being easily uploaded to the Mint web-environment. It was uploaded along with data. All of the functions listed above have been applied and tested. Other beta test sites are testing this technology.

Results to date are:

- has provided a clear path forward to move models from the desktop to the internet/cloud computing environment
- provided a clear success of hosting a model and data entirely on the internet

- has highlighted the cost and time savings possible by applying the models in a cloud computing environment by reducing local hardware costs and providing a vast amount of resources
- has provided an elegant solution to sharing a model with multiple model clients, securely and efficiently

At the time of writing of this paper, it remains early in the process. The system has not be rolled out to the greater user community at this point—and has only be used by experts.

Work continues and we expect to be able to provide further results on how this approach can satisfy the objectives listed earlier in the paper at the time of the conference.

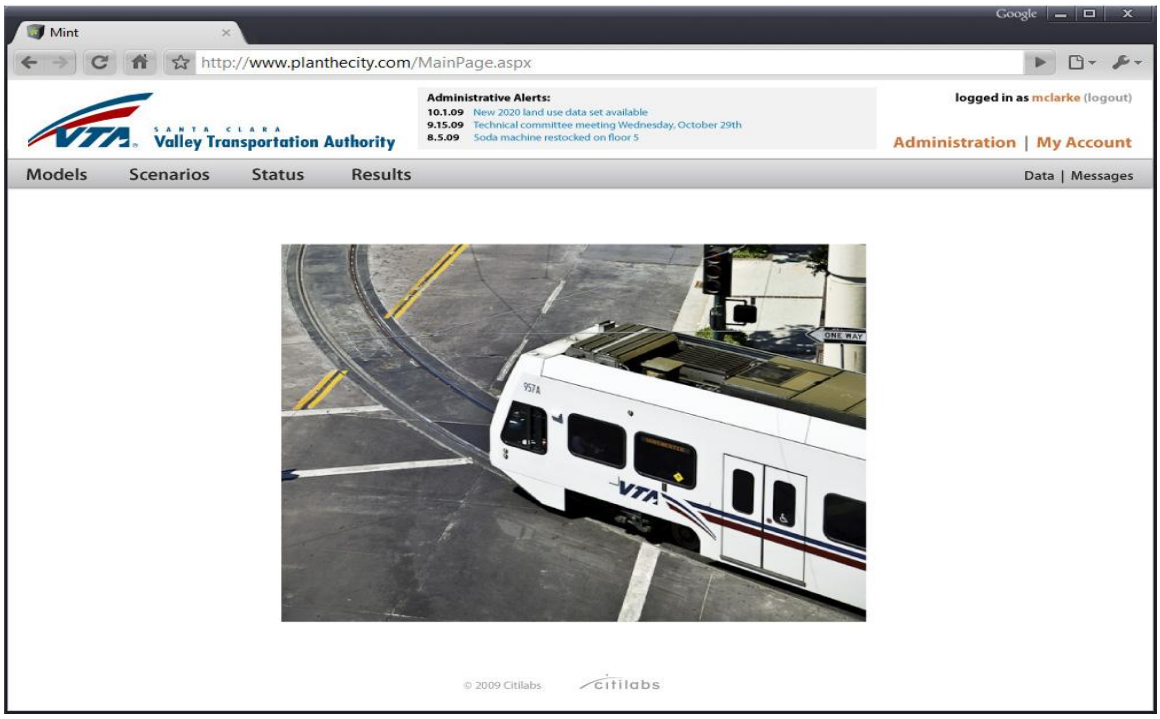
Current work:

- on-line analysis, mapping and charting
- creation of a non-expert interface for data analysis, comparisons and sharing of information
- creation and management of 'dashboards' for management and decision makers
- various statistical analysis
- publishing of data/results to other systems – for systems integration

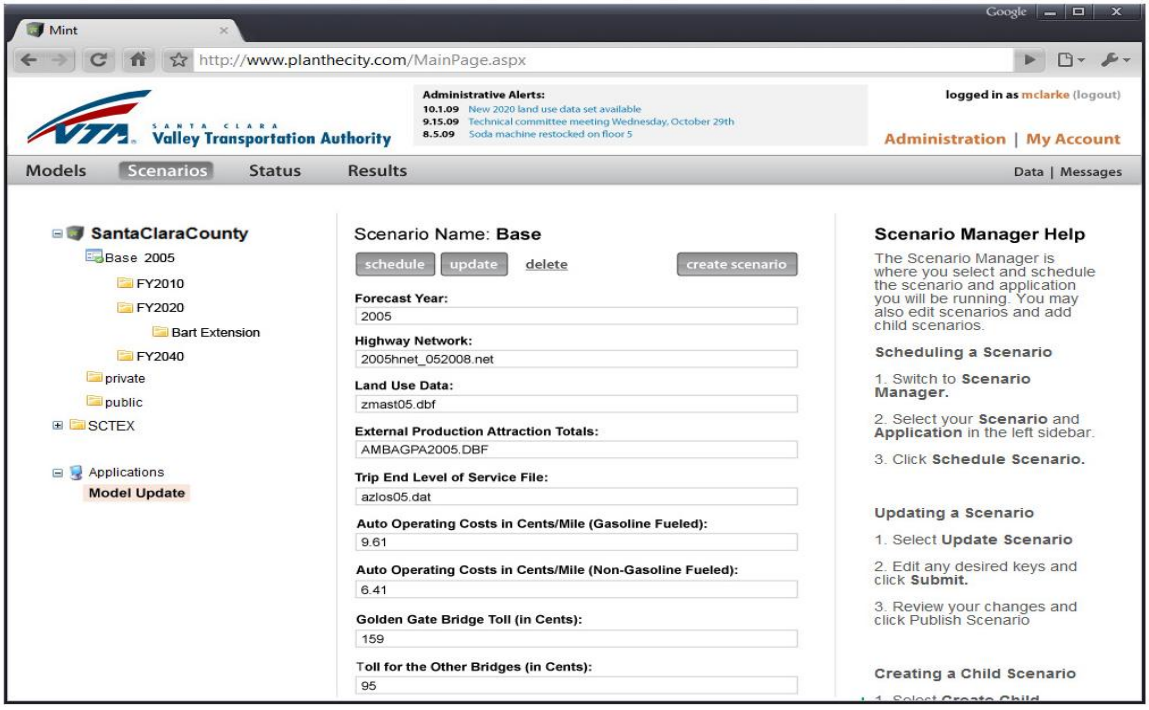
The authors feel that models are great, regional resources that have not been properly shared within the overall transportation planning process. Moving models to the internet provides the opportunity for transportation modeling to move from 'locked' desktop to an open, shareable community resource that can be used actively in transportation planning as well as integrated much more easily with other local and regional software systems. This platform also makes it much easier to integrate new data sources with models and cloud-computing offers vast amounts of resources, at a low cost, to foster the development of improved modeling techniques.

Screen shots of current state follow:

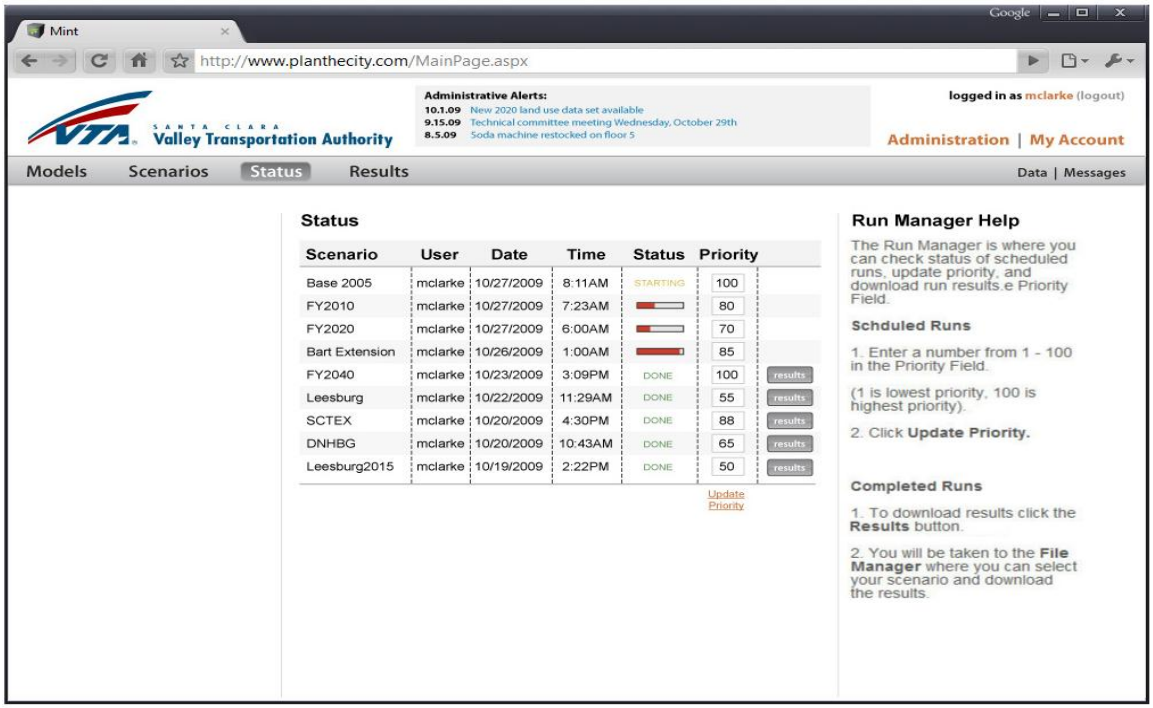
VTA Model Home Page



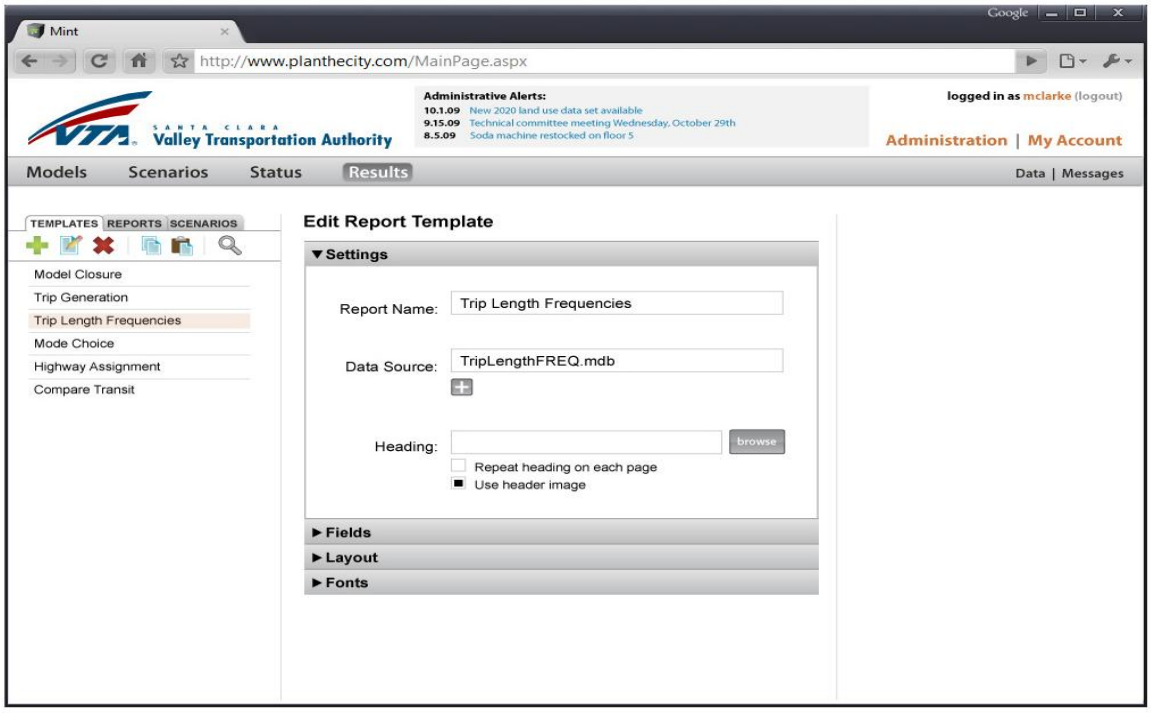
Scenario development and application



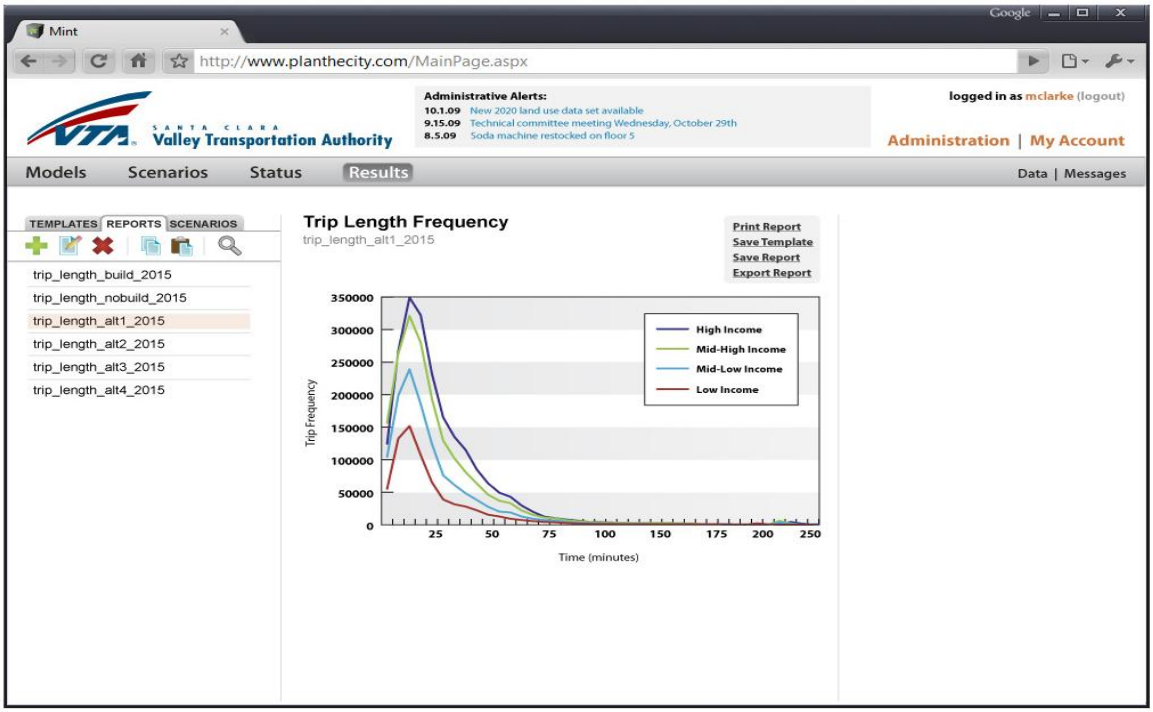
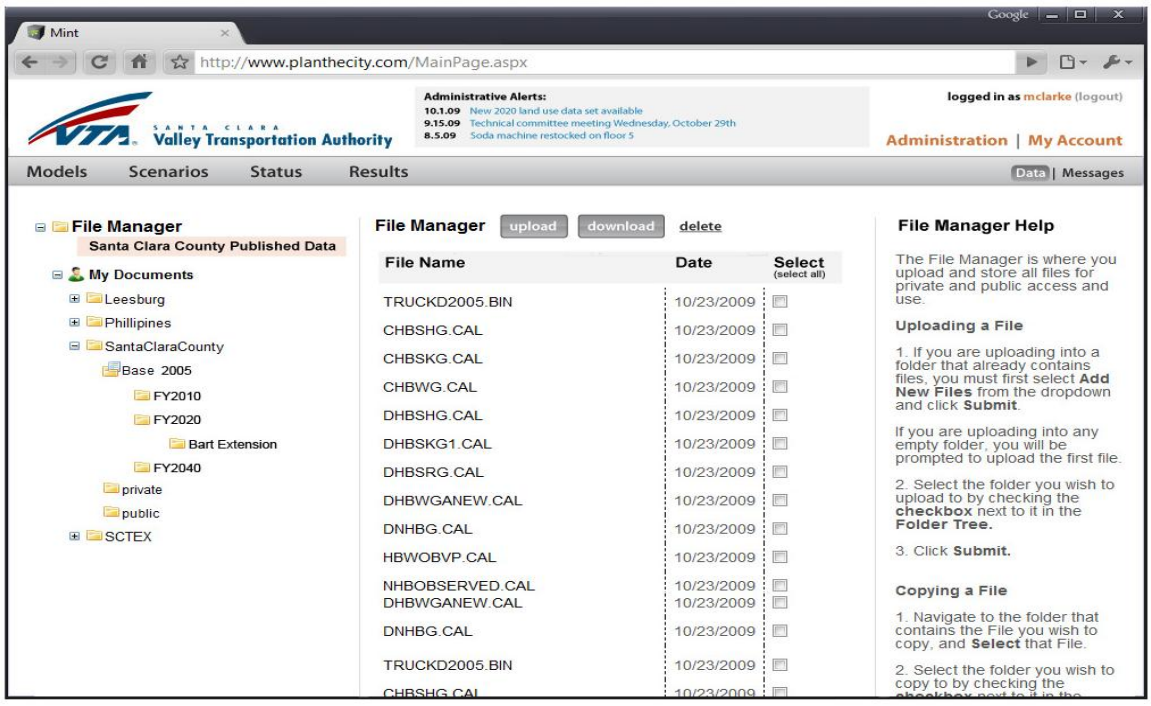
Run status



Creation of reporting templates



Interactive analysis



Data management