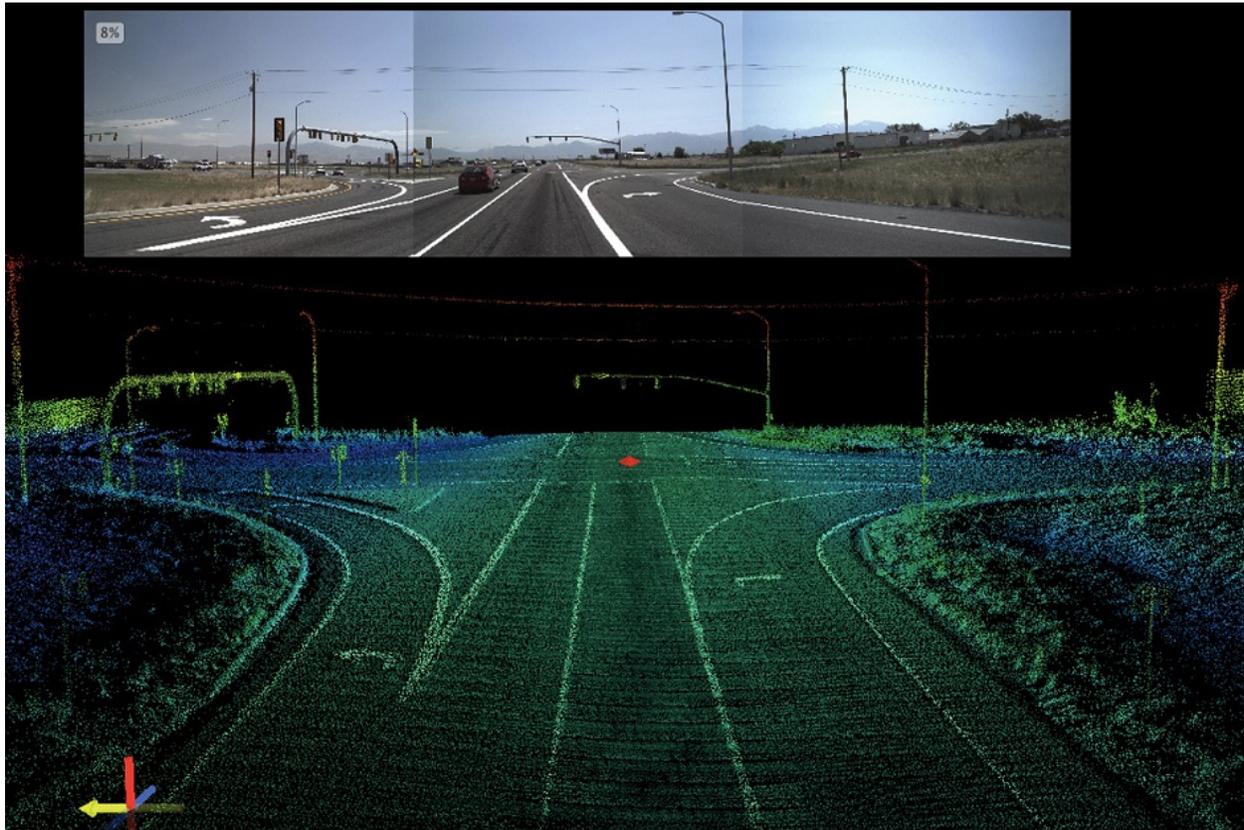


Utah Finds Unexpected Benefits from Statewide Road Data Project

Ryan McCauley | March 6, 2017



How many stop signs do you pass on your way to work? How long is each guardrail on your local highway? Most people don't know, but Utah, however, is able to figure out the answers.

Thanks to a program initiated in 2011 to begin surveys of state-owned roadways using light detection and ranging (lidar), the state now has a comprehensive list of all major roadway assets. Lidar uses 40 sensors strapped to a vehicle to collect 2,000 points of data per second, creating a visual representation of the streets. "It is a lot of data fast and furious," said Utah CIO [Mike Hussey](#). Lidar provides data sets in the form of a collection of points or point clouds that record the location and condition of everything within the instrument's field of view.

The technology, originally developed to measure clouds and map the surface of the moon, has been co-opted to serve several functions. Police employ lidar to measure the speeds of oncoming vehicles, while several models of self-driving cars use it to act as the vehicle's "eyes." Utah has turned the technology toward the streets. "The whole project started simply from collecting pavement condition," said Chris Meredith, GIS

analyst for the Utah Department of Transportation (UDOT). This technology allows the department to have a “live snapshot” of all its assets, he said.

Once the data started coming in, the trickle turned into a fountain. “I don’t think the folks who originally were looking for the pavement data knew, relatively speaking, how easy it would be to collect everything else,” said Meredith. “And until we had that data, we did not realize that we wanted it as often,” added statewide GIS Manager Becky Hjelm.

Road sign placements, shoulder length and guardrail locations were all added into the data set as somewhat of a bonus.

The wealth of information was so rich, in fact, that multiple departments began to show an interest in roadway asset management. “ Maintenance didn’t realize how many people wanted access to things like shoulder or lane striping data,” said Hjelm. From performing street maintenance to planning connected infrastructure projects, knowing where assets are is key.

“Having a complete database of all roadway assets can serve multiple functions,” said Dave Fletcher, CTO of Utah. One of the most successful applications of lidar-gathered data combined the efforts of roadway construction heads, environmental experts and public safety representatives to map out hydrologic modeling. Getting an accurate picture of roads, as well as side banks, surrounding topography and road elevation data, is crucial in gauging the location and intensity of water runoff in times of flash floods.

The true value of asset collection data emerges when it’s available to different departments. Data can be rich, but if it is siloed off, accessible only by jumping through hoops and filling out requests, it cannot fulfill its potential.

By the Numbers Here are a few ways Utah has used asset data gathered by lidar.

Use Case	Prior Time and Cost	New Time and Cost	Non-Quantifiable Benefits
Billboard inventory and measurements	90 days: \$144,000	2 hours per region: \$400	Many billboards are extremely difficult to access in the field
Highway Performance Monitoring System reporting	3,300 hours: \$55,000	700 hours: \$35,000	Data can now be updated every year; per-diem and overtime costs are saved
Bike corridor inventory	300 hours: \$15,000	0.5 hours: \$25	This information was not previously available for project planning

SOURCE: FEDERAL HIGHWAY ADMINISTRATION

The way to extract the most value possible was to make all the data accessible on Esri’s ArcGIS cloud-based mapping platform. The decision to make the information completely open has driven much of the program’s success. In addition, the data can also be easily manipulated and played with through two tools: Report Auto Generator and Linear Bench. Both tools allow users to pull data from specific roads, put in the distance from point to point and get a detailed description about all the assets located

on the route. Linear Bench lets users see relationships of assets on the road, while Report Auto Generator pulls vast amounts of data off the portal and condenses it into an easily digestible report.

Allowing for an automated report on a target area has reduced the time necessary to plan a construction or road maintenance project. Before this system was online, Meredith said trucks were forced to go out into the field to measure the distance between posts, record it and then begin planning accordingly. Through the asset management list created with lidar, the prep work can be completed remotely, saving significant resources.

“We are now able to very preliminarily scope out a project area, get various cost estimates, service areas, signs, barriers, barrier conditions without taking one step out of the office,” said Meredith. All it needs at that point is for the information to be checked. Marking down assets is significantly easier than collecting the data in raw form.

Additionally, the reports combine information across the four different regions in Utah, building a statewide asset list. Hjelm explained that if there is a project to update a certain type of asset, it’s now much easier to locate the ones that need maintenance. “It is easier to know statewide, if we have to work on one asset, to know very early on the scale of that project. Are there five things or 500?”

With the vast amount of data supplied, demand has increased proportionally. Agencies are more frequently requesting up-to-date information, and maintaining the comprehensive asset list is no easy task. Roadway asset data collection is often a time-consuming and onerous process, and while lidar drastically cuts the amount of resources necessary, keeping the data set current is a delicate balance.

Hjelm has come across this issue many times and believes that the requests for up-to-date information demonstrate the benefit the program provides. “The fact that we’re looking at the problem of how to make it more current really speaks to the success of the data collection and asset extraction,” she said. Several pilots are being worked on in order to come up with the most efficient way to constantly gather data.

As of January, there have been three comprehensive roadway asset data collection cycles. The first collection took place in April 2012 and included 25 layers of GIS information. The next cycle was in spring 2014, and the most recent survey took place in September 2015. With each data collection cycle, lessons have been learned that, together with improving technology, have allowed UDOT and the contractor to improve, accelerate and reduce costs for the next one.

However, Utah didn’t formulate its lidar data collection program with the idea that it would drastically alter UDOT’s service delivery. “The primary purpose initially was for better planning and maintenance,” Fletcher said. “Obviously it serves potentially many other purposes as well, like vehicle-to-infrastructure communication.”

One use could be the automation of snowplows. With information already being collected on road temperatures, combined with guardrail location data, and adding in

the progress that self-driving vehicle technology has made in the last year, “we can see the stage is getting set there,” said Hussey.

It’s not difficult to envision how other states and smaller governments could use such data. Measuring roadway assets and pavement conditions could easily be used to measure highway floods in hurricane-prone regions or calculate how many sensors could be put into streetlights to enable vehicle-to-infrastructure communication.

It all starts with communication across the different agencies. “Be collaborative and really hammer out all the details within the organization,” Meredith said. “We have different areas of the department, and each area might look at assets in a different way. Engaging as many people as you can early on will lead to the long-term success of the project.”

<http://www.govtech.com/data/Utah-Finds-Unexpected-Benefits-from-Statewide-Road-Data-Project.html>