OR217 Active Traffic Management (ATM) Project

Oregon Department of Transportation
355 Capitol Street NE
Salem, Oregon 97301

Category: Improving State Operations

Initiation Date – March 15, 2013
Completion Date - October 31, 2014

Sponsor

Kurtis Danka
ODOT Chief Information Officer (CIO)

Project Manager

Allan Hansen
Intelligent Transportation Systems (ITS)
ODOT Information Systems Branch (ISB)

Executive Summary

Oregon Route 217 is a limited access freeway that serves the southwestern suburbs of Portland, Oregon. Over 2 million people live in the Portland metropolitan area and of these, over 115,000 vehicles per day on average travel highway route 217. Traffic on this highway has more than doubled over the last three decades, which has significantly degraded its mobility and safety, as it is operating at or above capacity. To address these concerns, the corridor has been the subject of several studies which identified traditional reconstruction improvement options. Such options came with high costs, which resulted in funding gaps that the Oregon Department of Transportation (ODOT) was unable to bridge.

In 2011, ODOT completed the OR 217 Interchange Management Study that evaluated low-cost improvements to improve the corridor's reliability, mobility, and safety. The study identified a menu of improvement alternatives, which were rated according to key performance measures such as travel time reliability, crash reduction potential, incident recovery time, and affordability. The OR217 Active Traffic Management (ATM) project, which includes: traveler information, advisory speed, and congestion management systems, was initiated in the fall of 2012 as a result of the 2011 study.

The Active Traffic Management (ATM) project includes variable advisory speed signs based on measured flows and speeds, posting real time travel times. The OR217 ATM project was deployed to the traveling public on July 22, 2014. The system consumes a variety of input data about traffic and weather to calculate travel times and advisory speeds, as well as warn drivers of congestion and adverse weather conditions. The information is displayed on Variable Message Signs (VMS) spaced along the corridor so that drivers never have to take their eyes off the road.

- **Cost Savings.** Through the use of an innovative system management approach, the OR217 ATM project delivered a solution that addressed both mobility and safety issues within the corridor at a cost that was substantially less than traditional roadway improvement options.

- **Model for future use.** The project can serve as a model for future implementations, both internally and by others, and was designed to be easily adapted to future interfaces for connected vehicle technology.

- **Improved Travel Times and Safety.** Analysis indicates that operation of the OR217 ATM system has improved vehicle travel times, increased daily traffic volumes, and reduced variability of travel time throughout the day.

- **Positive Measurable Results.** No other ATM system in the country has experienced better results. Reaction to the project from elected officials and the public has been very positive.

Description of Project

Problem

Oregon Route 217 (OR217), located in the southwestern suburbs of Portland, Oregon, is a 7.5 mile limited access freeway that was constructed in the 1970s. OR217 runs north south through the cities of Beaverton and Tigard connecting Interstate 5 (I-5) with US Route 26 (US26). The freeway has two travel lanes in each direction with a third weave lane throughout most of its length to accommodate exiting and merging traffic. OR217 outflows onto surface streets at each end, unless drivers exit onto US26 or I-5.

OR217 has nine closely spaced interchanges which contribute to conflicts between entering and exiting traffic, particularly during peak commuter times. The freeway's crash rates and congestion were higher than regional averages for this type of facility. When it comes to understanding current traffic conditions on Oregon highways, like OR217, drivers have a small number of tools available to them

Over the past decade OR217 has been the subject of several extensive studies that recommended capacity and interchange improvements with cost estimates approaching $1 billion. Previous studies proposed costly capital projects, such as widening to six lanes, braiding ramps, and adding collector-distributor roadways to address OR217's mobility and safety issues

The vast majority of travelers relied on their own historical commuting experience to select their driving route and the proximity of the bumper in front of them to detect the occurrence of traffic incidents.

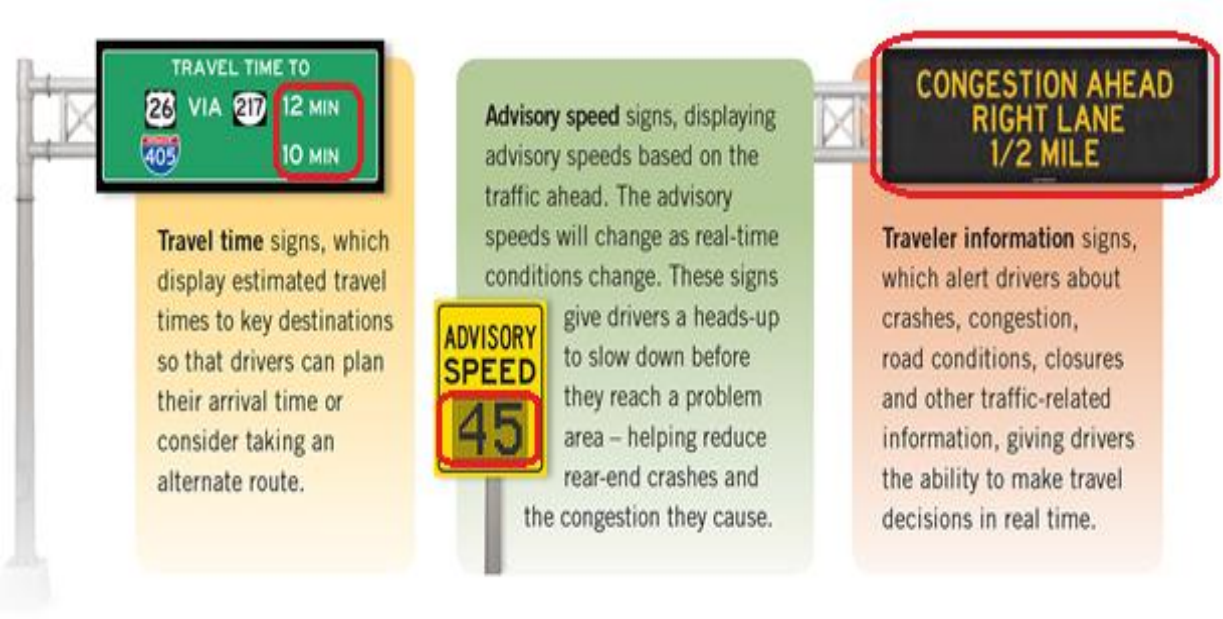
Due to significant funding shortfalls, it became apparent that a major reconstruction project for OR217 was not on the Agency's horizon. Therefore, the Oregon Department of Transportation (ODOT) shifted its focus to systems management solutions.

Such solutions typically involve ramp metering, crash mitigation, travel time information, and congestion pricing. In the current financial climate the public expects ODOT to carefully spend taxpayer dollars and do more with less. The Agency met that challenge on this project through innovation.

Solution

In 2013, ODOT and its partners initiated a project to design and build an **Active Traffic Management (ATM) system** to increase the reliability, mobility, and safety on OR217. The purpose of ODOT's ATM project is to:

- Improve safety
- Reduce secondary crashes
- Provide real time travel information
- Increase mobility
- Avoid high cost of major new construction

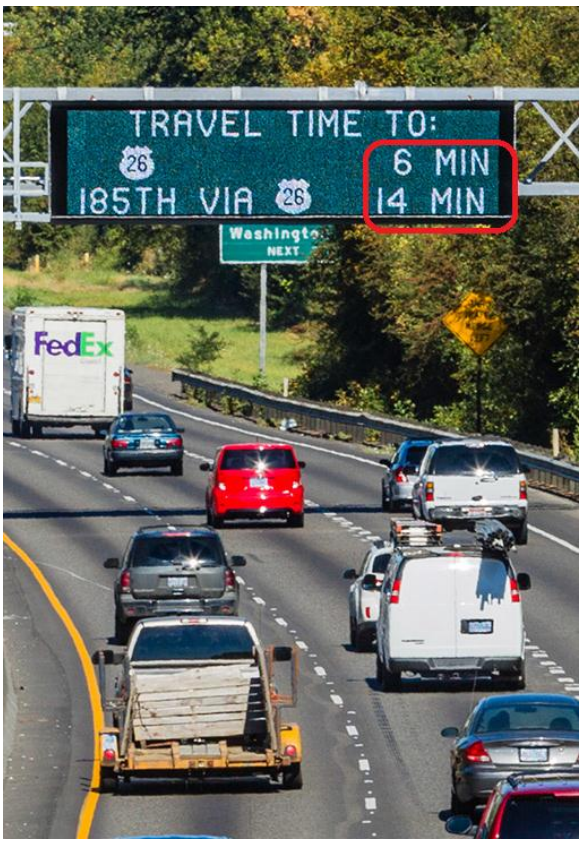


The ATM system was designed as a **long-term solution.** It consumes data from a variety of sources including field VOS (Volume Occupancy Speed) devices that gather information about vehicle traffic, as well as weather and highway traveler condition databases.

The ATM system uses the information to **dynamically calculate** traffic and weather based variable advisory speeds, congestion warnings, and travel times between common destinations.

ATM uses a **modular architecture** that affords a high degree of flexibility with respect to adaptability and integration. ATM is fully automated, includes numerous configurable parameters, and uses national standards for data and communications, which allow it to be expanded to support future interfaces to other data inputs. **Connected vehicles is one anticipated future expansion** of the variable speed component of ATM that will use real time telemetry from vehicles to calculate speeds and inform drivers of current posted speeds.

Significance of the Project



The primary beneficiary of the ATM project is the traveling public and the business entities that move goods throughout the surrounding communities. **Public reaction has been positive.** The ATM system helps drivers slow down before they encounter stopped traffic or congestion. The full color travel time and traveler information signs help drivers consider alternative routes or adjust their schedules to better plan their destination arrival times, all without taking their eyes off of the road. All of these elements have contributed to driver confidence in travel time reliability.

As mentioned earlier, system management solutions like the ATM system, are an innovative means to **make measurable improvements** to mobility at a fraction of the cost of traditional highway construction projects.

As part of the OR217 ATM project, ODOT developed a concept of operations that detailed the system in operation within the OR217 corridor. This concept of operations was then leveraged statewide, so that ODOT can now deploy additional ATM instances anywhere throughout Oregon based on the design and guidance from the OR217 ATM project. This model can be applied to any highway in Oregon, rural or urban, provided that the roadway has the necessary technology infrastructure, which can be implemented at a fraction of the cost of traditional roadway construction options.

No other active traffic management system in the country has experienced improvements of this magnitude. ODOT attributes these results to the fact that its OR217 ATM project delivered a comprehensive array of traffic systems including ramp metering, curve and queue warning signs, variable speed signs, traveler information, and travel time signs. This project demonstrates that a lower cost systems management solutions can set the stage for improved performance.

The OR217 ATM project aligns with ODOT's mission and values including safety, efficiency, and trouble-shooting. The project also aligns with the NASCIO "State CIO Priorities for 2015" of Budget, Cost Control, and Strategic IT Planning.

Benefit of the Project

Project Impact

In 2010, OR217 experienced a crash rate of 0.66 crashes per million vehicle miles. By contrast, the statewide average crash rate for urban limited access freeways was 0.52 crashes per million vehicle miles. OR217 carries approximately 110,000 vehicles per day, often operating at or above capacity. Its total traffic volumes doubled between 1985 and 2005. By 2025, traffic volumes are expected to increase by another 30 percent.

ODOT activated the ATM system in July 2014. Although the system is too new for a full statistical analysis, early trends show that in addition to improvements in travel time reliability, which provides drivers confidence in how long it will typically take to travel along the freeway corridor, **travel times have actually decreased while traffic volumes have been steadily increasing.**

Since the project was implemented, average travel times have improved. Travel times during morning and evening peaks **decreased by 9 percent,** while midday travel times experienced between an **8 and 18 percent reduction**. During peak hours when all systems are operating, a higher number of vehicles can traverse the corridor. The system also regulates the flow of traffic, which keeps traffic moving more rapidly during peak operation.

During rush hour, in both the morning and evening, the average travel time for both northbound and southbound directions is 18 minutes. Initial results also indicate that travel **time variability has been reduced by as much as 50 percent along the corridor**, fostering improved driver confidence. In addition to decreased overall travel times, increased daily volumes, and more consistent travel times, the ATM system demonstrated the capacity to assist in maintaining corridor speeds.

9%
Reduction in travel times during morning and evening peaks

8% to 18%
Reduction in midday travel times

50%
Reduction in travel time variability

Speeds
Increased during peak periods

25%
Reduction in crash-related incidents in November 2014

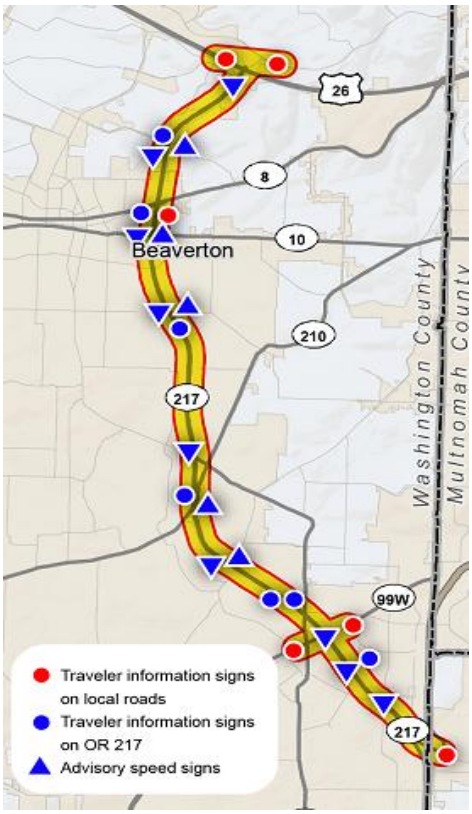
The ATM system was designed to be both congestion and weather responsive, alerting drivers to deteriorating conditions so that they can take appropriate action. In some cases, the speed actually increased during the peak period. For example, the afternoon peak period showed an 8 percent increase in average speed in the northbound direction. Early studies have also shown that in November 2014, during winter weather conditions, the number of **crash-related incidents was reduced by 25 percent**.

Project Outcomes

Drivers using OR217 now have travel time, variable speed, incident, and weather warnings being posted to numerous VMS throughout the corridor. The OR217 ATM project can serve as a model for subsequent deployments based on the following two points:

- The software is designed as an enterprise system, sufficiently configurable to match any rural or urban highway condition in the state.
- The system's architecture and design are compatible with forthcoming connected vehicle technologies.

Throughout project development, system turn-on remained the primary single concern of project leadership. The ATM system had to function properly from day one because technical flaws can quickly erode public confidence in new traffic control systems. The ATM system underwent multiple testing cycles before it was deployed and it was monitored for an additional 3 – 4 weeks prior to sign turn-on. During that period the ATM system performed all calculations using live traffic data, which afforded both engineering and IT staffs the opportunity to review and prove operation without unnecessary impacts to the public.



The successful launch of the OR217 ATM project helped ODOT obtain a $10 million federal Transportation Investment Generating Economic Recovery (TIGER) grant. ODOT and local governments have already started planning additional system expansion to improve highway efficiency and safety along busy Washington County transportation corridors.

Summation from a State Representative

"RealTime (OR217 ATM project) resulted from years of conversations between ODOT, state legislators, federal and local governments, and Washington County. We decided together to advance the Traveler Information and Variable Speed project because it's a cost effective way to make a difference in people's lives today."

--Representative Tobias Read, District 27, Oregon State Legislature