

Revenue assurance in an interoperable world



While the U.S. toll industry continues its discussions and debate on interoperability, some industry groups favor video imaging as the one and only solution for vehicle identification and billing record processing. Although video tolling has its merits, a better approach to this problem statement is to consider the best solution that addresses the highest possible revenue assurance capability for toll system operators.

Moving Toward Interoperability

We enjoy the convenience of interoperability every day, whether it's using our cell phones and GPS devices anywhere we travel or when we make a credit card transaction in another state or country. Applying this concept to tolling, interoperability enables a vehicle equipped with one transponder to flow through an electronic toll facility anywhere in the U.S. with the assurance that the toll will be paid from one customer account through a choice of payment methods and the vehicle's driver will not be identified as a violator.

Unfortunately, the flexibility provided by the cellular and banking industries is currently not implemented in the U.S. toll industry. Customers want mobility without boundaries but their expectations are not met when their toll tag or transponder does not work at an out-of-state facility.

The good news is the U.S. toll industry is planning to change that. Within the next few years, toll agencies across the country will take a big step toward achieving nationwide interoperability and work together to deliver the same level of connectivity and transparency other industries enjoy.

A convergence of events indicates the U.S. toll industry is gaining momentum toward its goal:

- Congress has made it a high priority targeting a four year implementation of technologies or business practices that provide for interoperability of electronic toll collection through the approval of "Moving Ahead for Progress in the 21st Century Act" or MAP-21.
- The International Bridge, Tunnel and Turnpike Association (IBTTA) named nationwide interoperability one of its strategic imperatives, assigning a 2016 deadline.
- Agencies in Texas, Colorado, California and Washington have established statewide interoperability.
- Maine, New Hampshire and Massachusetts signed agreements that allow each state to impose sanctions on intentional toll violators who reside in those states.
- The Alliance for Toll Interoperability (ATI), a trade association of thirty-four U.S. and Canadian toll agencies, is working to connect existing regional tolling agencies through a phase one trial of vehicle image capture and billing interoperability.

Tackling the How

Indeed, the question among U.S. toll agencies is not whether interoperability should be achieved but how. During a June 2012 IBTTA webcast on migrating to nationwide interoperability, attendees were asked which method of toll collection they favored most as a nationwide standard:

- 36 percent preferred a multiprotocol reader
- 24 percent preferred video imaging
- 29 percent supported a combination of options
- 12 percent favored a single electronic toll collection technology or multiprotocol transponders

The outcome of this straw poll provides an accurate snapshot of the industry: opinions vary strongly on the right path to interoperability. Let's take a closer look at three electronic revenue collection options and their benefits and barriers to adoption.

Option 1: Video Imaging

A contingency of U.S. toll agencies favors a video imaging option for good reason. Video imaging – which captures images of vehicles' license plates – is assumed to be a low-cost interoperability option. With little standardization and vendor promises of delivering 96 percent to 98 percent human-readable images at first blush, video imaging seems like a viable solution.

On the consumer side there is no barrier to entry. Customers need nothing more than a license plate to travel on virtually any toll facility in the United States.

Despite these benefits, few, if any, toll agencies rely on video imaging as their sole means of revenue capture. There is good reason for this:

Leakage. Anywhere from 2 percent to 4 percent of the images captured may be unreadable and the tolls uncollectable. Outside influences such as weather, lighting, and normal highway dirt and grime will always present a challenge to image capture quality. With some toll agencies processing a million transactions a day, the number of unreadable plates can add up fast, resulting in significant amounts of lost revenue. One U.S. toll facility reported a multi-million dollar revenue loss due to unreadable license plates in fiscal year 2011 alone. In addition, reciprocity between states to collect unpaid tolls is still in its infancy with many states not allowing other states to invoke any civil actions to collect a toll or late fee penalties.

Operating costs. Video imaging is the most time and resource intensive option due to the amount of manual processing involved. While agencies rely on automatic license plate recognition (ALPR), a surveillance method that captures a vehicle's license plate and vehicle registration information in real-time, agencies still hire bull pens of reviewers either to confirm each validation or to serve as fallback when ALPR is unable to read a plate.



These reviewers face several hurdles when attempting to identify a vehicle and collect the subsequent toll. The “home” state’s department of motor vehicles’ database may not be readily accessible. Or, the vehicle may have temporary license plates that are not yet recorded in the home state’s database, a chronic problem with video imaging.

Furthermore, the agency has to pay a fee to access a state’s department of motor vehicle’s database. If the access fee is high, a toll agency may wait and bundle their license plate image requests to minimize the expense. As a result, revenue collection could be delayed for several months. To add insult to injury, many U.S. toll agencies are prohibited or reluctant to charge a video tolling fee that is in line with this higher cost toll transaction.

These opportunity costs – what an organization gets and what it sacrifices in return – should not be overlooked. The potential for revenue leakage and the absolute certainty of increased operating costs make video-only tolling a less than optimum solution for nationwide interoperability.

Option 2: Video Imaging + AVI

A better option to consider is video imaging as part of an integrated system that includes automatic vehicle identification (AVI). This powerful combination provides a holistic approach to revenue assurance and significantly improves an agency’s ability to automatically and accurately identify and classify vehicles.

Most open-road tolling and all-electronic tolling systems in the U.S. use video imaging plus AVI. Acting as the primary revenue collection method, AVI utilizes transmission signals from an on-board transponder to a roadside receiver to correctly identify a vehicle and collect data. Video imaging reinforces this process by identifying occasional roadway users who do not have a transponder, motorists who do not have a transponder but are registered, violators and toll evaders.

AVI read rates for certain protocols can be as high as 99.9 percent and can dramatically reduce the number of unidentified vehicles and the need for manual processing. To the extent a vehicle can be positively identified automatically – without someone manually confirming it – can result in significant cost savings for toll agencies. Operating costs are lower with an AVI-based solution.

Another compelling AVI statistic is the key performance requirement including a transponder association rate (correctly associating the transponder to the specific vehicle transponder read) as high as 99.5 percent. This capability assures that the right vehicle was invoiced for their road usage.

An AVI-based solution does have higher deployment and maintenance costs, but unlike video imaging only, agencies recoup their investments over a shorter period of time. Another point of contention is the cost of a transponder. But since the 1990’s, the price of an E-ZPass® transponder has dropped more than 50 percent. As previously mentioned, the total cost of a video-only based solution will have a greater impact on toll rates and do more to deter customers compared to the one-time expense of a toll tag.

Option 3: Video Imaging + AVI + Fingerprinting

The best revenue collection method builds on the powerful combination of video imaging and AVI and includes Fingerprinting (also known as enhanced video imaging). This relatively new software works as an extension of ALPR and compares the graphical elements of two vehicles without attempting to read the numbers.



For example, a video camera captures an image of license plate **XIH 223** and compares it with **XIH-223**. ALPR might consider these plates the same and bill the wrong account, but enhanced video imaging discerns the graphical differences of the two vehicle images, such as a sticker placed above the license plate, recognizes the images as different and prevents errant billing. Every time an image is processed by the enhanced video imaging system, the Back-Office System (BOS) generates a list of similar license plate numbers and any associated digital signatures and compares it to the image taken. When there is a match, there is no need for manual review. This feature allows for the maximum revenue assurance.

Furthermore, advanced ALPR systems can run fingerprinting software on images collected with existing high quality cameras – no additional lane level hardware is required for this solution. This triple deployment of video imaging, AVI, license plate fingerprinting has been shown to reduce erroneous classifications to nearly zero while increasing correctly identified vehicles by 3 percent¹.

Outlined below is a summary of the different options discussed previously.

Account Type	Option 1 Video Imaging	Option 2 Video Imaging + AVI	Option 3 Video Imaging + AVI + Fingerprinting
Customer with tag inside network	Not Applicable	AVI Tag will be read and associated to customer Performance varies by protocol Video imaging enhances overall revenue assurance	AVI Tag will be read and associated to customer Performance varies by protocol Video imaging enhances overall revenue assurance Fingerprinting further enhances the video
Customer with tag outside network	Video will identify some Issues with temporary plates and DMV database delays	Multiprotocol readers will read roaming tags and associate to customer Performance varies by protocol Video imaging greatly enhances revenue assurance and enforcement	Multiprotocol readers will read roaming tags and associate to customer Performance varies by protocol Video imaging greatly enhances revenue assurance and enforcement Fingerprinting further enhances the video
Customer with no tag	Video will identify some Issues with temporary plates and DMV database delays	Video will identify some Issues with temporary plates and DMV database delays	Video will identify some Issues with temporary plates and DMV database delays Fingerprinting further enhances the video

Summary

This moment in U.S. toll history is not only an opportunity to achieve interoperability but to showcase the toll industry's business acumen, technological advances and its commitment to continually improve the customer experience. In short, it is an opportunity to advance our industry and bolster public opinion at a time when tolling is becoming a realistic alternative to the current infrastructure funding crisis.

When presented with the aforementioned options, it is imperative that the toll industry continues to keep its eyes on the road and work together to achieve nationwide interoperability. Video imaging is a good solution and it has matured well over the years in our industry. However, video imaging alone is not the optimum solution and does not depict the evolution of electronic revenue collection methods in our industry.

The right path to interoperability should safeguard the toll operator's income, minimize operating costs, promote fairness among all road users, enhance an agency's public image and preserve the integrity of the system. The best way to ensure revenue assurance and thwart revenue leakage is through the triple deployment of video imaging, AVI and license plate fingerprinting.

For additional information, contact:

Brian J. McNiff, vice president, marketing and product management
Kapsch TrafficCom IVHS
1-303-859-8054
brian.mcniff@kapsch.net

¹Plate Fingerprinting for Enhanced Video Tolling by M. Lettner, C. Ohreneder and H. Ramoser

Kapsch TrafficCom is a provider of high-performance intelligent transportation systems (ITS) in the application fields of toll collection, urban access management and traffic safety and security. Kapsch TrafficCom covers the entire value creation chain of its customers as a one-stop shop by providing products and components as well as subsystems as open market products, by integrating them into turnkey systems or by developing end-to-end solutions, including services for the technical and commercial operations of systems. Within its current core business of electronic toll collection (ETC), Kapsch TrafficCom designs, builds and operates primarily electronic toll collection systems, in particular for multi-lane free-flow traffic. With 280 references in 41 countries on all 5 continents and with almost 70 million on-board units delivered and about 18,000 lanes equipped, Kapsch TrafficCom has positioned itself among the internationally recognized suppliers of electronic toll collection worldwide. In North America, the company operates offices in Virginia, Texas, California, Maryland, Pennsylvania, Ontario, and Mexico. For additional information, please visit www.kapsch.us.