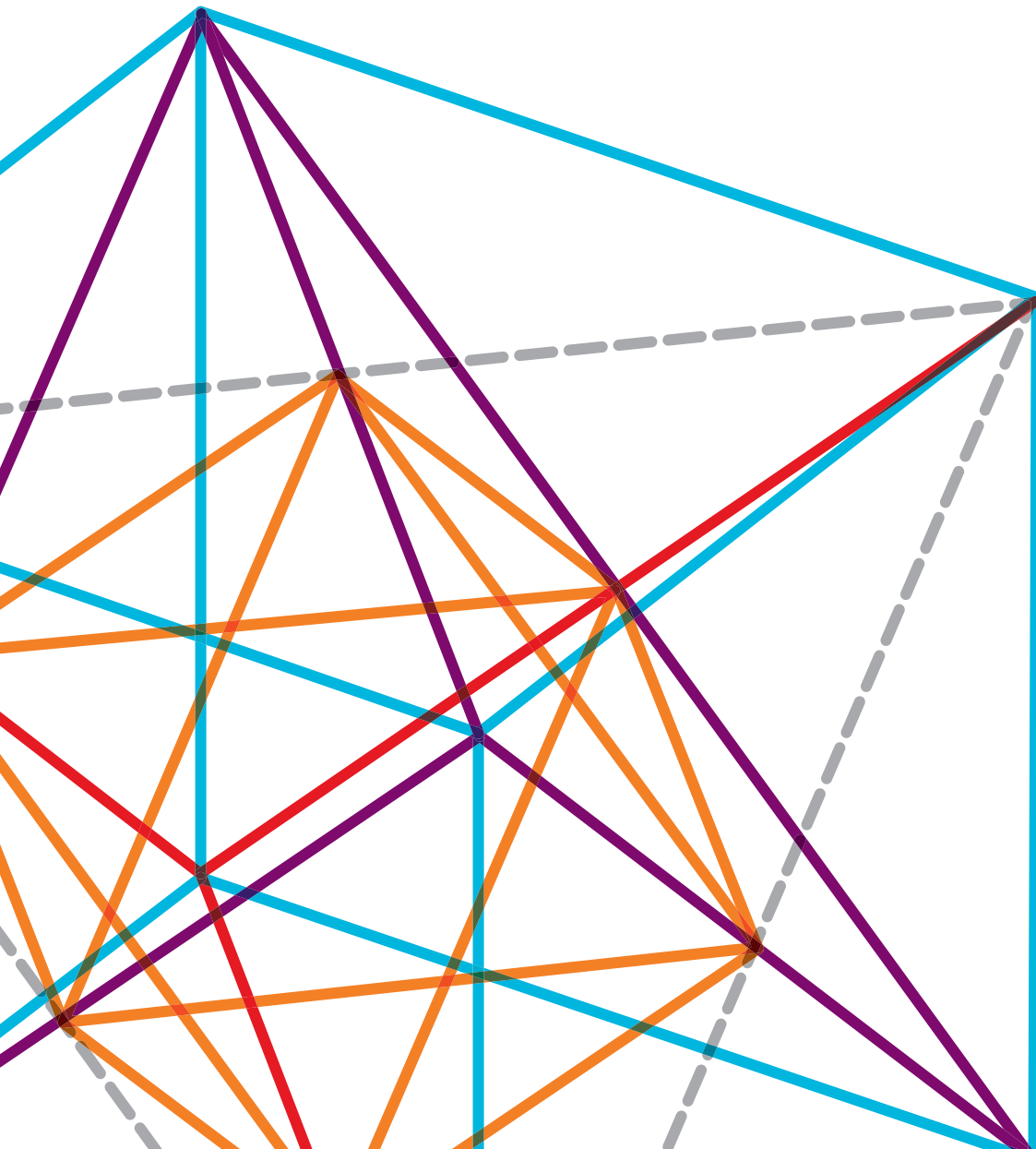


ELECTRONIC CITATION SYSTEMS: Improving Officer Safety, Saving Time and Improving Accuracy



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INTRODUCTION

Electronic citation systems enable law enforcement agencies to meet ever-growing data collection and reporting requirements without compromising officer safety or effectiveness. Public safety officers can use handheld devices, mobile computers and printers to complete traffic stops faster and more safely and efficiently while focusing more of their attention on the offender. Computer-assisted operations, such as e-ticketing with handheld devices, also provide more accurate information than manual methods—producing complete, enforceable citations that improve conviction rates, reduce court administration time and increase collections.

The safety and efficiency improvements that electronic citation systems provide are not cost-prohibitive. Automated systems provide a solid and measurable financial payback by removing clerical data entry requirements, improving officer efficiency and safety, and increasing revenue by producing more accurate, enforceable citations. Information collected electronically requires no manual data entry at headquarters, and can be easily integrated into legacy computer systems for access and sharing without delay. The systems also facilitate convenient compliance with the recent Justice Department Consent Decree on traffic stop data collection, and automatically provide documentation of procedure compliance.

The benefits of electronic citation systems are well-documented. Various studies of electronic citation and processing systems have found the following:

- Electronic systems can transfer records to courts within seconds of the citation being issued. In contrast, the average time to transfer paper-based citation records is 12 days according to the University of Pittsburgh School of Law.
- Mobile computing and automated data collection systems enable crash reports to be completed with 750 fewer keystrokes, and eliminate 200 keystrokes from traffic citations according to the U.S. Department of Transportation (DOT).
- The Los Angeles Police Department estimates it can record all data required for compliance with the Department of Justice Consent Decree within 30 seconds by using handheld computers.
- The DOT found accident reports can be completed, reviewed and circulated to all interested agencies within 18 hours by using a multi-state software system.
- Approximately 10 percent of all citations received by courts contain at least one error, according to a University of Pittsburgh School of Law study that concluded “Electronic ticketing has the ability to eliminate most, if not all, of these types of errors...”

This white paper will explain how electronic citation systems work, describe the required mobile computing and printing technology, and provide examples of how electronic citations save money while improving officer safety and accuracy.

HOW ELECTRONIC CITATION SYSTEMS WORK

Electronic citation systems replace conventional citation pads with mobile printers and mobile computers or handheld e-ticketing devices. The physical citations are produced on a mobile printer that can be carried by hand, worn on a belt or shoulder strap, or mounted in a police vehicle. Personal digital assistant (PDA)-style handheld computers are the most common computer option, but laptop and tablet computers may also be used.

Software running on the mobile computer manages the citation issuance process. Aside from the input device, the ticketing procedure can be virtually the same as with paper citations. Software that makes it intuitive to collect information and that maintains some consistency with paper-based procedures makes it extremely easy for users to adopt the new system.

The citation software also can simplify data entry and help prevent errors. The software may be a simple forms-based application that mimics the paper citation, which requires minimal training to use. Software may make data entry easier with multiple-choice radio buttons, pull-down menus and other response

prompters. Menus, check-boxes and other limited-response mechanisms help ensure that only correct information is recorded and that violation codes are consistent with other information associated with the citation. Because approximately 10 percent of citations contain errors, according to the University of Pittsburgh study, software that provides error proofing and other quality checks can significantly improve citation accuracy, streamline processing operations, and discourage challenges. Notations, sketches and even voice recordings can be added for future use during court proceedings.

Once all of the offender data is collected and entered in the computer or handheld e-ticketing device, the officer saves it to the computer's memory or uploads it to a remote host computer using "real-time" wireless communication, and a citation is automatically printed. The resulting citation is neat, accurate and completely legible. Multiple instances of the same citation can be printed, and multiple infractions can often be combined onto a single citation. Improved legibility eliminates much of the confusion and discrepancies that can lead to contested citations being waived or overturned.

ADVANCED FEATURES

Beyond these basic features, citation applications can take advantage of additional mobile technology, such as automated card reading, imaging and payment processing, to provide greater functionality leading to improved efficiency.

States whose driver's licenses include a magnetic stripe or barcode can take advantage of readers built into the handheld device, mobile computer or printer to automatically populate relevant driver identification information required to complete the citation. No manual data entry is required, so there is no chance for human error. Scanning or swiping the license takes only a second and enables the officer to keep his or her eyes on the offender, not on a notepad.

Mobile computers and handheld devices also are available with integrated imagers that could be used to take a digital picture to document the infraction and permanently attach it to the citation record. The imager could be used to record accident damage, read barcodes on driver's licenses, and to document vehicle locations for accident reporting or provide visual proof that a vehicle was parked illegally.

Additionally, handheld e-ticketing devices and mobile computers are capable of supporting wireless wide-area data communications for real-time data access and exchange. Data traffic can be carried over a dedicated public safety network or through cellular services offered by commercial carriers like AT&T Wireless, Cingular, Nextel, Sprint, and Verizon.

Wide-area communications give officers in the field anytime, anywhere access to information in host computer systems. Wireless data networks can be used to check host databases for repeat offenders, outstanding warrants and other information in real time, instead of requiring that the officer download the latest data at the start of a shift. Other uses include license checks, two-way messaging and dispatch.

The city of Vancouver, Canada, increased its collections from repeat offenders by \$300,000 the first year it began checking ticketed vehicles against its repeat offender database over a wireless network. Vancouver also ticketed and towed significantly more vehicles for parking permit abuse by using database access to verify that handicapped parking and other special privilege passes were used in the vehicles for which they were issued.

Additional memory could be used to load an updated scofflaw database into the mobile computer or handheld device before every shift. When issuers enter the vehicle license number while preparing the citation, software checks the database to determine whether the vehicle is registered to a repeat offender with an excessive amount of outstanding citations. If so, a request for towing is made in addition to the issuance of the citation.

Some handheld devices, mobile printers and computers have integrated card readers that can be used with payment processing software to collect credit or debit card payment from offenders when parking tickets are issued. Transactions may be verified immediately over a wireless connection or processed in batch mode when the computer is docked in its cradle at the end of the shift.

Printing Considerations

The mobile printer provides the bridge between the paper citation issued to the offender and the electronic issuance and processing systems. The printer must produce legible, durable, high-quality citations or else the accuracy benefits of electronic issuance will be lost. Printers must also work quickly and reliably to improve officer efficiency and prevent wait time. Reliability, convenience and print quality are the most important characteristics for a mobile printer.

Choosing the right printer requires a basic understanding of the features and factors that affect these performance criteria.

Reliability is imperative because citation operations stop if the equipment doesn't work. The leading factors that affect reliability are the printer's design and construction, battery life, media and method of connection to the handheld device or mobile computer. Printers should be tested to verify that they can perform in all weather and working conditions and will continue to work, even after being dropped.

Battery Performance

Battery life varies widely based on print volume, citation size, media and the amount of wireless communication between the printer and the mobile computer or handheld device. Additionally, power management is important to overall battery life and application effectiveness.

It is critically important in citation applications to have enough battery life to power computers and printers for the entire shift or else workers may not be able to complete their daily jobs. The lowest-cost batteries are often not the most inexpensive option because they may require more frequent replacement, driving up the total cost of ownership. For example, lithium-ion cells offer the highest power-to-volume and power-to-weight ratio of any battery technology used in mobile printers, but their initial purchase cost is higher than the more common nickel cadmium or nickel metal-hydride cells.

Media

Matching the media stock with the printer is extremely important for citation legibility and durability, and significantly impacts battery performance and the printer lifespan.

Selection of appropriate media requires consideration of the application requirements, including weather conditions the citation will be exposed to, durability requirements, plus any state or local regulations about acceptable sizes and materials.

Choosing the wrong media can result in poor print quality and cause the printhead to work extra hard to produce text, which drains battery charge and leads to premature printhead failure. The electronic citation solutions provider or printer manufacturer can analyze operational requirements and recommend suitable media options. Optimizing the media and the printer for the application—even if other supplies are initially less expensive—saves money in the long run. Using quality citation material and quality printers projects professionalism and ensures readability that facilitates efficient citation payment and processing.

Communications

There are several methods to communicate data from the handheld device or mobile computer to the printer. These methods are classified into three groups: cable, infrared (IrDA) and radio frequency.

Cables are the oldest method of communication. They are relatively inexpensive, and coiled cables provide adequate trade-off between cable length and ease of use. Over time, cables fail for a variety of reasons, including abuse, fatigue and age. Additionally, there are costs associated with preventive maintenance and periodic inspection to ensure reliable communication. Cable care is especially important in citation applications because the user is often miles away from headquarters and does not have immediate access to replacement parts.

Infrared communications use infrared (IR) light to eliminate the need for cables and operate on a principle similar to that of TV remote controls. Nearly every IR device conforms to the IrDA standard for infrared communication, which provides interoperability among equipment from different manufacturers. Infrared data transmission, like remote controls, requires direct line of site between the devices to complete the communication. Obstructions will interrupt the communication between the two devices. It may take several tries to transmit data at night because it can be difficult to line up the infrared signal in the dark. IrDA is also highly susceptible to ambient light that can overpower infrared signal. This is a major limitation to citation operations because the sun is a very powerful source of infrared light that can easily wipe out communications on a bright day.

Bluetooth® technology is emerging as the leading wireless technology to replace cables between handheld devices or mobile computers and printers. Bluetooth is a standardized, short-range wireless technology that enables up to eight computers, printers, and other devices to interface with each other from up to 30 feet (9 m) away in peer-to-peer networks, without going through a centralized hub or server. Bluetooth provides extremely fast and reliable printing. Because Bluetooth operates with radio frequencies, it isn't affected by light, does not require line of sight, and is immune to physical sources of interference.

Handheld devices and mobile printers also can connect directly to wireless local area networks (WLANs). There is limited opportunity to use wireless LAN connectivity in law enforcement operations, but the emergence of wireless "hot spots" for public Internet access within campuses, entertainment districts, restaurants and shops may create opportunities to support operations with network access. These hot spots use 802.11b-standard wireless LAN technology, which offers greater security and higher speeds than other forms of wireless connectivity.

Convenience

Because handheld e-ticketing devices and mobile printers are lightweight and battery operated, police officers on foot, bicycles or even horseback can easily transport them. Wireless communication also improves user convenience because there are no cables to tangle and impair the user. Other factors that contribute to user convenience include printer speed, weight, balance and the position of controls. The printer should be able to generate citations quickly so that the issuer doesn't waste time waiting for output. Ergonomic factors like weight and balance are most important if the printer will be carried and worn all day. The position and feel of controls and the ease of media loading also impact convenience and productivity.

IMPROVED PROCESSING PROCEDURES

Aside from helping officers pay more attention to offenders and complete citations faster, electronic issuance systems do not significantly change procedures in the field. However, the computer-assisted data collection builds a foundation of accurate information that streamlines processing requirements; eliminates redundant data entry and the need for clerical support; facilitates rapid, easy information sharing; and results in citations that discourage challenges and hold up in court.

A fully integrated electronic citation system synchronizes the data captured by the handheld device or mobile computer with host computers and databases, to electronically transfer data for citation processing. There are added costs both in integration and hardware requirements for a fully integrated system, but the benefits of eliminating data reentry and ensuring immediate data access can have profound financial benefits.

Data can be integrated in real time or in a batch mode. In batch mode operations, officers typically place their computers into docking cradles to upload the complete activity record for the day. Instantly, all the citation information is transferred to the computerized record systems and is available for access by multiple agencies. Databases in the handheld device or mobile computer can be updated with new information at the same time.

There is no need for clerks or officers to transcribe and type records into the system, which provides a tremendous time and labor savings and provides no

new chance of errors to enter the record. With electronic citation systems, information is recorded once, in the field; never requires additional manual processing; and is quickly available to everyone with access to the records system. For example, a DOT analysis of the multi-state TraCS (Traffic and Criminal Software System) found that accident reports could be communicated to all interested parties within 18 hours of the information being entered. For comparison, the DOT cited one state that relies on manual report preparation and exchange takes up to 18 months to gather and circulate the same information. The TraCS system, currently used by 16 states, also reduced commercial vehicle inspection reporting time from 100 days to 14.

Similarly, IT service provider REJIS helped automate citations in the greater St. Louis region. Officers use a mobile device to verify the driver's license, view the driver's photo, obtain vehicle registration, and inquire to determine if the vehicle is stolen or the individual is wanted or considered dangerous. The application captures data to populate the ticket form. An in-car printer produces a copy of the ticket for the violator. REJIS analyzed several printers prior to selecting the Zebra® RW 420™ printer based on several factors, including portability of size and weight (6.3" x 6.9" x 3.0" and 2.0 lbs); wireless capability option; print flexibility and ease of use; durability to meet dust and water resistance ratings; ribbonless direct thermal printing; and speed of printing. The project improved all aspects of the ticket-writing process, resulting in improved accuracy, less time needed to process tickets and minimal additional costs to the municipality.

IMPROVED DATA ACCURACY AND OFFICER SAFETY

The Zebra RW 420 mobile printers are also a key component of an electronic citation solution recently purchased and implemented by the Oregon Department of Transportation's Governor's Office of Highway Safety for its public safety agencies responsible for enforcing traffic regulations. The solution deployed is APS PocketCitation™ software, an innovative electronic citation system from Advanced Public Safety (APS), designed to automate and streamline the process of issuing traffic tickets.

According to Jeffrey D. Rubenstein, founder and CEO of APS, approximately 20 to 30 percent of all handwritten traffic citations are dismissed because of incorrect statute numbers, illegible handwriting and other administrative data errors. PocketCitation's

on-board intelligence solves these problems by ensuring that the citation information entered is correct and that the citation itself is printed in clear, legible type. Using Zebra's high-performance mobile printers, law enforcement officers can issue a traffic citation in less than 60 seconds, dramatically minimizing risk to officers, who spend less time on the side of the road and in contact with traffic offenders.

The full mobile suite aids officers in automating their jobs, offering a faster ability to print summonses and track tickets and citations, while dramatically improving officer safety; 70 percent of officer fatalities happen when officers are outside of the car. The e-citation solution gets them back in the car faster and gets them on the move.

FASTER PROCESSING, MORE ACCESSIBLE DATA

Automated data entry and sharing also benefits court processing. Many citation software packages use common or standardized data formats that make it relatively simple to share data with multiple databases and other software applications. As a result, multiple departments, agencies and organizations can access the data and integrate it into their own computer systems. It takes an average of 12 days to process a paper citation and send it to court, according to a University of Pittsburgh School of Law study. Software-based systems can conduct the data processing and communications in seconds, helping to ease administrative backlog at both law enforcement agencies and the courts.

One-time data entry greatly reduces the need for administrative support, which improves departmental efficiency and provides significant cost savings. The city of Fall River, Mass., is saving more than \$100,000 annually in processing costs for parking tickets since implementing an electronic ticketing system. The city previously outsourced all its ticket processing to a

third party, which cost about \$5.50 per ticket plus added time to the processing and collection cycle. The system provided a fast payback because of the elimination of processing fees and increased revenues resulting from fewer unenforceable tickets.

Fully integrated systems with real-time wireless communications eliminate the manual docking process by having an "always on" connection between the mobile computer or handheld device and the back-end processing system. Offender data and citation data are passed back and forth in real time. Citation processing can occur minutes after the citation is written. The benefits of this approach are numerous and need to be balanced against the implementation costs. Vancouver city officials calculated the city would receive an annual benefit of \$235,000 during its wireless ticketing system's first six years of operation and \$393,000 annually thereafter, with many of the benefits deriving from real-time communication and information exchange.

MEASURING THE BENEFITS

Electronic citation systems produce a strong return on investment because they improve multiple areas of operations, without imposing new burdens on others. For example, e-citations can be processed faster and with significantly less clerical labor, but not at the expense of requiring officers to gather and process more information in the field. Improved convenience enables officers to issue more citations, but because software handles processing, costs do not rise along with volume. And, multiple departments and agencies can access information from databases, without relying on the issuing agency to perform manual data entry or generate custom reports.

Moreover, officer safety is greatly increased because public safety officers no longer need to spend as much time outside of the car, where the majority of fatalities happen. Allowing officers to process and print tickets and citations much more quickly, e-citation systems get them off the road, back into their cars and on the road.

The time savings and improved accuracy that electronic citation systems provide create real financial benefits for the department, municipality, county and state. In an integrated system, where citation records are downloaded from the handheld device or mobile computer to the host computer and processed with system software, there is no need to manually enter data into the host computer system. By eliminating manual data entry, electronic citation systems save money on every citation issued. The total value of the savings depends on the issuance volume, the time required to input and process each citation, and wages and benefits paid to administrative or clerical workers who perform data entry and processing.

Automated data entry also improves accuracy by eliminating a potential source of errors to enter the record. Experienced typists make one error approximately every 300 keystrokes according to widely respected studies on data entry accuracy conducted by the barcode industry. Improving citation accuracy is a sure-fire way to improve enforcement and collection. Recall the University of Pittsburgh study that found errors in approximately 10 percent of citations in the court system. Other studies have found error rates ranging from 5 to 20 percent. These prevailing error rates encourage offenders to contest citations, which puts a burden on police and courts that could be prevented through improved accuracy. Legible, accurate citations can provide a deterrent to challenges and enhance the department's reputation for professionalism.

Because of results like these, electronic citation systems often pay for themselves fairly quickly and continue to provide significant financial benefits long after the system is paid for. The City of Vancouver, whose system is more expensive than most because of the number of officers who were equipped (100) and the wide-area wireless data communication feature, calculated it would receive an annual benefit of \$235,000 during the system's first six years of operation and \$393,000 annually thereafter. The Fall River tax department decided to purchase the electronic citation system for the police department after analyzing the revenue and administrative benefits it would provide the city.

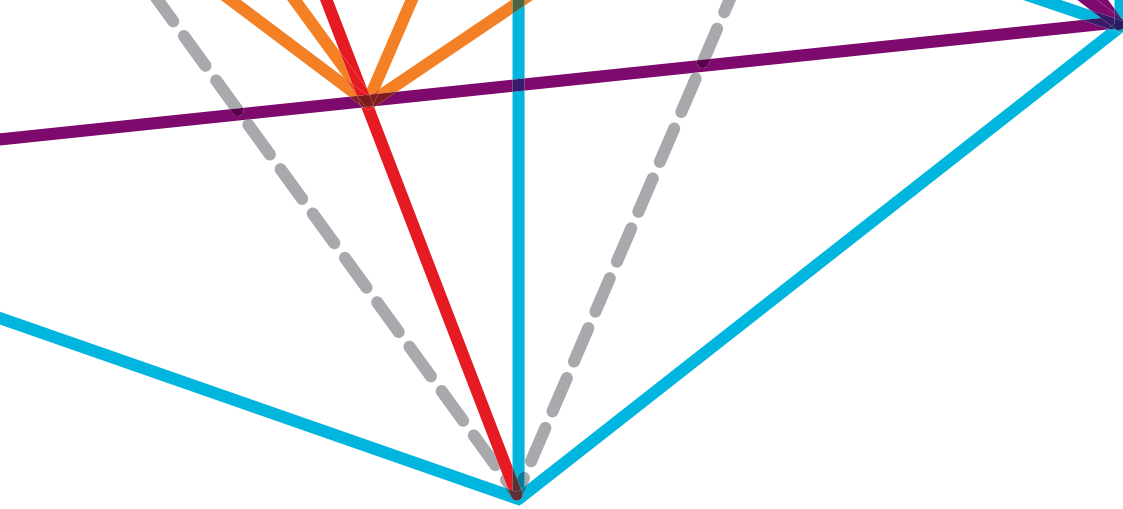
To get an idea of the potential financial impact of an electronic citation system on your operations, consider the following questions:

- What is the cost of citation processing? Automated procedures can eliminate most of the clerical activity associated with processing.
- How much time is clerical staff spending processing each citation and entering data into multiple databases?
- How much time do court and administrative personnel spend handling contested citations resulting from inaccurate or incomplete citation issuance?
- What percentage of your citations is unenforceable due to illegible or inaccurate data?
- What is the average revenue collected per citation?
- How many more enforceable citations would be created annually if issuance procedures were improved by just one percent? Five percent? Ten percent?
- If officers could issue citations more quickly and conveniently, would they write more citations?

CONCLUSION

Procedural and reporting requirements are growing for law enforcement agencies, even if budgets aren't. Electronic citation systems are the safe choice for efficiently meeting new administrative requirements while improving safety and accuracy in the field. Agencies of all sizes, from the Fall River, Mass., parking control department to the Los Angeles Police Department, are proving that automated systems can meet many types of enforcement, officer safety and reporting challenges. The improved safety, information accuracy and availability, and administrative savings these systems provide ensure even more agencies will adopt them in the future.

Zebra Technologies offers the widest range of mobile printers in the industry, supports all the leading communications options, and has partners and integrators who specialize in citation, ticketing and law enforcement applications. Contact Zebra today to learn more about how our products and expertise can help improve your citation operations.



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