

High-performance law enforcement

Technology-powered policing for the twenty-first century



Law enforcement is increasingly an information management business. Getting the right information into the right hands at the right time can prevent crime and save lives. To get the most out of the new tools available to fight crime, law enforcement agencies need an integrated, end-to-end technology strategy—one that delivers the capabilities they need to protect and serve the public in a cost-effective manner.

During the past three decades, there have been two major changes in the way law enforcement agencies fight crime. First, there has been a shift to more closely integrate police resources with the communities they serve. These “community-oriented” policing strategies leverage local relationships as a means to fight crime and focus on the prevention of crime by eliminating the conditions that foster criminal behavior. More closely connecting police officers to residents and business owners can be highly effective in driving down crime.

Interestingly enough, at the same time law enforcement agencies have been emphasizing the importance of personal relationships to their success in reducing crime, they have also been making substantial investments in new technologies.¹ For the most part, these technologies complement community-focused strategies by:

1. Extending the reach of police in the field through the use of video surveillance, shot spotters and license plate detection technologies
2. More effectively deploying resources based on data analytics
3. Increasing the speed and accuracy of core reporting functions, such as report preparation and evidence handling
4. Improving the effectiveness of investigations by giving officers access to a broader array of integrated, actionable intelligence needed to solve crimes.

Collectively, these advances mean that police personnel are able to spend more time in the field, closer to their constituents and closer to would-be criminals. Huge strides have been made in putting technology tools into the hands of law enforcement professionals to make them more productive and effective.² However, the adoption of discrete technologies and solutions for individual processes has also created an increasingly complex operating environment that many agencies find difficult to manage.³

Given that law enforcement agencies have only scratched the surface of what is possible in applying technology to policing operations, the complexity and difficulty created by implementing and managing separate solutions will only increase.⁴ To realize the promise of these technologies to deliver an unprecedented ability to harness and use information to identify threats, more rapidly respond to incidents, identify and arrest suspects, and prevent crime, law enforcement agencies need to take a more integrated approach.⁵

Today’s public safety agencies have to contend with a virtual tsunami of new data sources. Ninety percent of all data in the world has been created in the last two years.⁶ Much of this new data will be harder for legacy systems to manage and exploit because by 2015, 80 percent of the world’s data will be collected in unstructured formats such as text or video.⁷ Yet, it is the blending of this unstructured data—from mass media, social media and streaming data sources—with traditional forms of structured data that will generate much of the insight needed by law enforcement agencies to effectively fight crime.

We are already seeing technological advances that are empowering communities with instant access to a wide variety of data that enables them to identify and respond to criminal activity. The expectation is that law enforcement agencies will be similarly well informed and responsive to the needs of the community. Unfortunately, public safety agencies often struggle to achieve an appropriate level of insight from this information. Often times, they manage stand-alone

information systems that do not easily integrate with these new forms of data. Investments in “point solutions”—that is, software that addresses specific public safety issues but does not provide “end-to-end” capabilities—have tended to create complex environments that do not yield promised results. Simultaneously, public safety agencies are expected to effectively address these growing challenges in the face of static or declining budgets and resources. The police forces in England and Wales, for example, are anticipating a loss of 34,100 officers and staff by 2015, and Canada’s public safety services are facing cuts of \$687.9 million, or 9.9 percent, between 2011 and 2015.⁸

This paper sets out how law enforcement agencies can improve public safety outcomes by developing an integrated technology strategy that supports the wide variety of specific capabilities needed to prevent and solve crime. Central to this approach is the acknowledgement that the core business process of law enforcement—to prevent, detect, respond to and solve crime—is a single end-to-end process that requires a single, end-to-end technology solution.

For the purposes of this paper, we will rely on the seven major elements of the law enforcement business process to illustrate how an integrated solution can mutually support all of the key operations of law enforcement (Figure 1). We describe how this is being done already and suggest potential areas to further exploit the integrated use of technology on a more extensive basis.

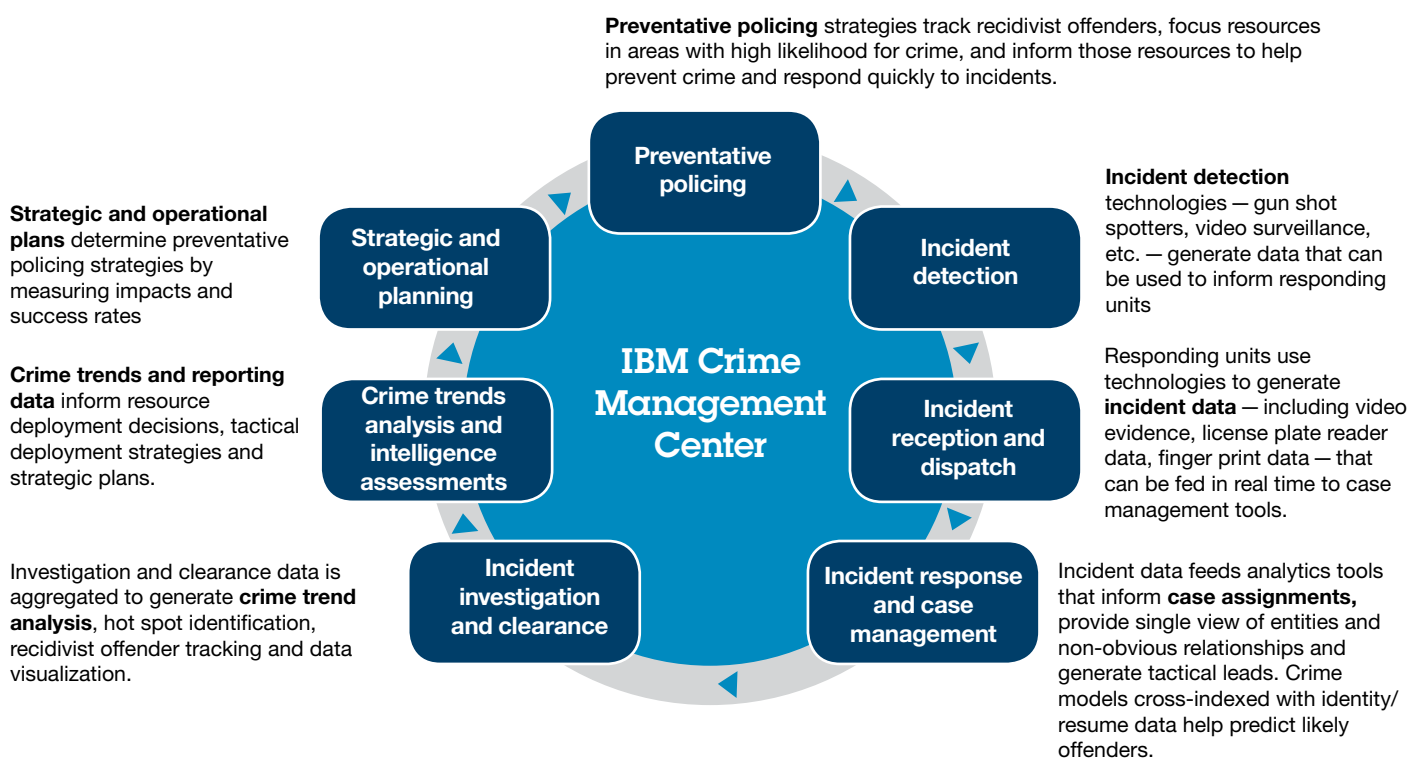


Figure 1: Integrating operations and the supporting technologies across core law enforcement processes is key to optimizing performance.

1. Detection technologies can improve incident detection and engage public safety resources sooner.

While police departments continue to rely on 911 calls as the primary means for incident detection, new incident detection technologies are increasingly being utilized to provide more timely alerts, as well as additional information.

Cameras are helping make crimes easier to detect and prevent.⁹ Video surveillance technologies enhanced with sophisticated analytics can detect suspicious activity or crimes in progress, and many cities are using them. Paris installed more than 1,000 cameras between 2010 and 2012 to improve safety and security in the city.¹⁰ Detroit Police Department realized the benefit of video technology after it installed video intrusion alarms as part of a district-wide security initiative. Vacant buildings had recently become a target for criminals looking to strip them of their copper wiring, pipes, etc. After the cameras were installed, the statistics for burglary arrests rose to the highest in the department's history, and the burglary closure rate increased to 70 percent.¹¹ And, video surveillance systems are also constantly being upgraded to include new technology features such as facial recognition software, which helps officers identify suspects.

Gun fire detection systems are another example of technology that can aid incident detection by rapidly locating the source of shots fired and providing police with location-based intelligence that can be used to mobilize responding units in advance of a 911 call (see sidebar: Incident detection). An increasing number of cities in the United States, including New York and Milwaukee, are using gunshot detection systems to pinpoint the location of gunfire seconds after it occurs.¹²

Incident detection

At 1 a.m., a gunshot sensor detects shots in a commercial district, and the location is displayed on a map in the city's Crime Center. A closed-circuit television camera also detects unusual activity at a supermarket and provides an alert, along with video footage. An alarm is then triggered at the supermarket, and the supermarket's location is displayed on the map.

2. Swifter incident reception and dispatch can improve response times.

Although voice-based emergency calls continue to be the predominant source of incident detection, Next Generation 9-1-1 (NG9-1-1) systems are changing the way calls are received and dispatched, enabling more flexible, secure and robust Public Safety Answering Point (PSAP) operations. These systems offer increased capabilities for sharing data and resources, as well as more efficient procedures and standards to improve emergency response. NG9-1-1 allows connections to a wide range of technologies, enabling 911 calls from any networked device. In addition, the system allows operators to record information from multiple sources in files that can be easily distributed to and accessed by other stakeholders involved in an emergency response, facilitating the distribution of more accurate information in a timely manner. NG9-1-1 can also enable call access, transfer and backup among and between PSAPs and other authorized emergency services providers, e.g., fire-rescue, hospitals and ambulance services (see sidebar: Dispatch).

Once officers have been dispatched, technology can allow incident-related information to be pushed out to all forms of field devices, including car-based laptops and mobile devices. Officers might acquire critical location and tactical information from information posted on Twitter, Facebook or other social media, while images from a geospatial database could inform responding officers of potential suspect escape routes or the possibility of hostile fire from suspects in or around a building. Real-time access to surveillance systems or traffic cameras via a handheld device can help an officer more effectively plan and execute a response. These technologies not only can improve response times, but also situational awareness—which could save an officer's life.

Dispatch

An emergency call is received in the command and control (C&C) suite, providing an alert and location. Patrols and scene-of-crime teams are assigned. Additional information gathered from phone records and the detection of gun shots imply casualties, so an ambulance and local hospital are automatically alerted. Additional information from C&C and other sources, including the fact that the road adjacent to the supermarket is a dead end and that gunshots were fired, is passed on to attending patrols via in-car terminal and/or mobile device. Video taken by a witness on the scene is transmitted to the responding officers in their patrol units.

3. Technology can improve accuracy and efficiency of incident response and reporting and allocation of investigative resources.

Incident response

At the scene of a crime or directly confronting it, front-line police officers and detectives depend on reliable information drawn from disparate law enforcement information systems. Officers require easy-to-use, intuitive tools that allow retrieval of information, which is clearly labeled with hypertext links to underlying data and originating documents. They need a display that includes such search results as organization, location, vehicle, weapon, property, phone, event, media and document.

In any law enforcement agency, there exists a continuum of data, information and knowledge—both structured and unstructured. Data is mostly structured, factual and frequently numeric. Numbers of citations, arrests and calls-for-service, as well as information included in national systems, such as the U.S. Uniform Crime Reporting (UCR) Program and National Incident-Based Reporting System (NIBRS), are examples of structured data. Unstructured data, such as text or images, also often contain important information—a law enforcement

media release, for example. Inferential and abstract knowledge is needed to support law enforcement operations. An officer in the field seeks to identify *who* is committing the offenses and needs strong lead generation support.

One technique used by investigators to solve criminal incidents is the association of the known elements of a crime. Effective front-line officer technology emulates and automates the association technique of a “good memory” and the association of past events with the present situation. Information used and gathered by law enforcement is most effective when it is leveraged through cross-jurisdictional collaboration that is compliant with security policy standards and access and privacy protocols.

For an important example of how the right information and technology can make all the difference, consider the June 2013 case of a 7-year-old child who was kidnapped from an apartment complex in Metairie, Louisiana, and sexually assaulted. Using information from the on-scene investigation, including surveillance footage of the suspect vehicle and lead-generation technology accessed from the patrol car, officers were able to identify the vehicle, match the description of the suspect with the vehicle and determine a recent address from traffic citations. As a result, the suspect was located and arrested approximately three hours after the initial reporting in the same vehicle depicted in the surveillance footage.

Incident reporting

Capturing information related to an incident has traditionally been a slow and labor-intensive process, and yet accurate and timely information is critical to solving crimes. Incident reporting remains a paper-intensive, highly manual process in many police departments. New technologies can increase the speed, efficiency and accuracy of such reports, allowing officers more time to investigate and respond. Automated field reporting tools—via handhelds or laptops—allow officers to more rapidly enter information directly into a records management system. These tools also provide officers with immediate information on links to existing cases and suspects (see sidebar: Incident response).

Incident response

Officers arrive on the scene of a recent crime — suspected gun shot — and collect witness statements. These statements and crime reporting forms are completed using tablets. License plate readers are used to scan all vehicles in the vicinity to determine if any of the cars have been reported missing or are associated with known felons. The information is analyzed against the public safety information hub (PSIH) to provide insights on suspects and prompt on-site officers. CCTV images are analyzed for facial recognition and matched to known suspect data. Police are able to show witnesses a mug book on the scene using a mobile device. Forensic evidence is gathered and logged to PSIH. Information from witness statements, forensics and CCTV is used to build a case file. Analytics software determines the case's "solvability." Based on this information, the case is assigned to an appropriate investigator.

For example, license plate readers give officers immediate access to car identification information, while fingerprint scanners collect suspect data in real time. In addition, video data can be immediately analyzed for facial recognition and matched to known suspect databases. All of this helps increase officers' productivity and shorten investigation cycles.

Resource allocation

Whether a case is assigned for a field follow up, assigned for office follow-up or suspended should be based on the case's relative solvability. However, decisions regarding which cases deserve investigation and the level of resources dedicated to the investigation are often driven by subjective judgments made by shift supervisors or watch commanders.

Today's more advanced police departments are leveraging data to make better decisions about the allocation of their scarce investigative resources. Analytics can help determine how cases should be prioritized, assigned and worked. Software solutions can assess a case's solvability based on historical crime data, the

case's relationship to other cases (e.g., shared modus operandi, geographic proximity, etc.) and other factors to determine whether further investigation is warranted, as well as how resource intensive the investigation should be. These indices are constantly refreshed based on actual case outcomes, making them dynamic rather than static. Caseload data can also be used to ensure that cases are optimally assigned among the existing pool of investigators, helping ensure cases with higher solvability rankings get priority in staffing decisions.

4. Technology can enhance the efficiency of incident investigations and help increase clearance rates.

Once cases are assigned, automating the investigative process is becoming increasingly important. Many law enforcement agencies still use time-consuming and largely manual investigative techniques to conduct criminal investigations and apply crime scene and other evidentiary sources to suspect databases. However, the process for identifying suspects is also being transformed by technology. Case management technology helps arm investigators with all known information surrounding an investigation by integrating vast quantities of structured and unstructured data from multiple sources, including cross-jurisdictional crime databases, identification systems, video and other databases to generate leads (see sidebar: Incident investigation).

Intelligence analysts, in the field or in their office, using advanced analysis technologies apply capabilities to identify key targets, associations, commodity flows and complex networks and build a single common intelligence picture to develop a clear operational view of threats being tracked. By identifying emerging threats, they enable decision makers to choose appropriate responses.

The Miami-Dade Police Department uses a system that pulls data from solved cases to fill in gaps and answer questions on unsolved ones. Through advanced analytics models, the solution utilizes data from a crime to make a profile and matches it against historical data to create a data-driven list of high-probability suspects. Analysis that once took days can now be done in as little as a minute.¹³

These types of case management systems also help investigators safely and securely manage and share information, as well as automate tasks and processes and collaborate across departments and even agencies, thus increasing effectiveness and solvability while reducing case handling errors and costs. Because the systems interface with other law enforcement agencies, information can be quickly disseminated when needed to thwart mobile offenders.

For example, the U.S. Federal Bureau of Investigation is rolling out an ambitious multimodal biometrics information system. The Next Generation Identification (NGI) system, which will be used by state, local and federal authorities, will expand fingerprint processing capacity and will also include palm prints, iris scans and facial recognition capabilities.¹⁴

Incident investigation

Potential suspects identified by witnesses, as well as other information gathered at the scene of a crime, are used to identify possible culprits. An identified suspect (based on past history) is linked to a specific vehicle known to be in the area at the time of the robbery. Vehicle details are broadcast to all patrols. The vehicle is then identified by CCTV through the registration plate, and an arrest is requested via broadcast to in-car terminals and mobile devices. The suspect is stopped and arrested, and details of the arrest are added to PSIH. The case is closed, and the case file goes to judicial services.

5. Analytics can identify trends to improve operational effectiveness and efficiency.

Long-term analysis of crimes is important in identifying trends and patterns to support future investigations and planning and to improve the efficiency of resource allocation. The problem is storing and sifting through the massive and growing amounts of crime and other data. Again, technology provides an answer.

A data warehouse can store and provide access to all sources of public and private structured and unstructured data to which police departments have access. And analytics solutions can help uncover the insights buried within the data. Crime analytics serves as an umbrella term and includes various analytic applications. The insights generated through analytics can help law enforcement agencies better anticipate, measure, deter and respond to crime and focus resources more effectively.

In addition, analytics can enable the use of reporting tools that facilitate performance reviews and operational effectiveness assessments (see sidebar: Crime analytics). Crime mapping tools—inspired by the success of the COMPSTAT program in New York City—are now broadly deployed globally in cities such as London and Chennai.¹⁵

The New York Police Department has proven that data-driven police tactics can produce dramatic reductions in crime rates. With its Crime Information Warehouse, NYPD is demonstrating that integrated crime data, delivered in real time, can change law enforcement by providing the ability to see trends as they form—instead of in the rear-view mirror. The ability to see connections helps officers break cases faster and make life-saving decisions based on the seeing the “big picture.”¹⁶

Social media analytics is another emerging technology being used by several larger agencies to provide real-time intelligence. For example, the New York City Police Department has created a social media unit within its intelligence division.¹⁷ Most posts on social media provide no useful information to public safety officials and obscure the posts that could enhance emergency responders’ situational awareness. However, the NYPD has been successful in accessing valuable information from social media posts across various online platforms using data aggregation and decision support tools.

As social media continues to exponentially grow, so will the sheer volume and type of content. Public safety will be forced to develop solutions that better automate today’s response efforts, many of which are still manual.¹⁸

Crime analytics

A case is closed and added to existing records. Analytics solutions use the information from this case and others to help detect patterns and enhance future performance. Examples of crime analytics solutions include the following:

- *Descriptive analytics* solutions mine historical data to categorize, classify and group information to reveal patterns, trends and performance.
 - *Proactive analytics* involve a variety of statistical techniques to model data and analyze historical crime, event, geographic, demographic and other data to anticipate crime before it happens.
 - *Entity analytics* solutions focus on improving the accuracy and consistency of data across disparate data sets by resolving identity, event and location records. For instance, a criminal might go by several names and aliases within a records management system and across other datasets and may be a witness to one crime while being the victim in another. Entity analytics will connect the dots between the data to form a complete profile of a criminal, address or object (such as a vehicle).
 - *Content analytics* solutions unlock valuable data that is trapped in narratives, case files and other documents. Semantic and context analysis of unstructured text allows the volumes of information captured this way to be utilized as effectively as database information to identify new insights.
 - *Social media analytics* solutions provide a constant stream of information. By leveraging this highly unstructured data in real time using streaming social media analytics, officers are able to identify and locate potential threats and evolving events, find evidence through photos or track down witnesses.
 - *Intelligent video analytics* can help identify events and spot patterns of behavior in real time. In addition to providing alerts and improving situational awareness, video analytics solutions provide event and pattern classification to dramatically improve forensic searches from huge volumes of stored video.
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6. Advanced analytics can drive planning to improve the use of resources.

Perhaps no decision for a command staff is more important than how resources will be deployed. Like most organizations, law enforcement agencies often find it difficult to shift resources in response to changes in the public safety environment, regardless of how justified they might be. Nevertheless, as law enforcement agencies collect better and timelier information regarding the effectiveness of their tactical strategies, they are likely to become more nimble given the increasing need to do this with limited or declining financial and human resources.

Here is where end-to-end integrated law enforcement technology solutions can improve decision making. Data collection and analytics tools can measure performance across all operational functions, as well as measure the return on investment of alternative use of resources, such as patrol, investigations and support services. Analytics tools also enable the review of tactical crime-fighting strategies and can help determine how resources—both human and capital—should be deployed (see sidebar: Resource planning). This all serves to help improve productivity.

As an example, the Fort Lauderdale Police Department is using technology and data analysis to derive new insights, make informed decisions, uncover trends before they become systemic issues or criminal events, and enhance resource coordination.¹⁹ Analytic insights help determine how patrolling resources can best be deployed depending on services demands, community policing goals and other requirements. Analytic tools can also reveal insights regarding how investigative resources should be deployed.

Resource planning

Crime analysis assessments reveal that violent crime is on long-term decline in the city, and that which does occur is increasingly related to domestic disputes. Property crime is on the rise, although only in the geographies where drug offenses are spiking, suggesting a link between burglaries and drug activity. Calls for emergency service are also in decline in many neighborhoods. Based on these trends, the command staff decides to reduce staffing in patrolling and violent crime investigations and increase staffing in the drug and property crime units. Based on the modeling of calls for service and the implementation of dynamic beat designs, the deputy chief of field operations is convinced that he can maintain response time levels despite the reduction in staff. He is also persuaded that the shift of investigative resources toward property crimes will increase clearance rates by a substantial level. His plan is to track the performance of these units over the course of the next several months to determine if these changes deliver the results he expects.

7. Proactive policing can help stop crime before it happens.

Crime prevention, defined as efforts to restrict crime from occurring, is generally considered to encompass three pillars:²⁰

- **Law enforcement strategies** focus on decreasing the probability that crime occurs in a particular area.
- **Criminal justice strategies** address known offenders; juvenile correctional facilities and prison rehabilitation aim to prevent convicted criminals from offending again.
- **Primary prevention strategies** attempt to minimize the risk factors associated with criminal behavior. These programs, often housed in schools and community centers, are intended to improve the health and well-being of children and young adults.

Law enforcement and other agencies are using new technologies across these three areas. For example, the mere presence of video surveillance technologies has proven useful in preventing crime in some urban areas.²¹ And analytics tools that help anticipate future crime trends are increasingly used by law enforcement agencies to make more informed decisions, improve strategies and improve outcomes. By compiling and analyzing data from multiple sources, proactive crime analysis identifies crime patterns and generates recommendations about where crimes are likely to occur and who is likely to commit them. This new-found knowledge enables agencies to prevent crime, rather than react to it.

Memphis Police Department (MPD) enhanced its crime-fighting techniques with analytics software—and was able to reduce serious crime by more than 30 percent, including a 15 percent reduction in violent crimes since 2006. MPD is able to evaluate incident patterns throughout the city and forecast criminal “hot spots” to proactively allocate resources and deploy personnel, resulting in improved force effectiveness and increased public safety. MDP can better anticipate trends and thereby make smarter decisions regarding directed patrol, targeted traffic enforcement, task forces, operations, high-visibility patrol and targeted investigations.²²

Law enforcement can also use analytics insights to help make resource decisions based on projections about when and where resources will be most needed. “Dynamic” police beats, for example, replace fixed police beats with more flexible patrols that focus on areas where statistical analysis suggests crime and calls for service are more likely to occur (see sidebar: Proactive policing).

Criminal justice strategies can also be enhanced through tracking recidivist offenders, which can give investigators a head start in suspect identification. Proactive analytics can also support primary prevention strategies through identifying high-risk individuals. Cities and regions, such as the state of Florida, have created programs that target high-risk juveniles, with whom officers engage in an attempt to steer them away from future criminal activities.²³

Proactive policing

In the past few months, the city has seen a spike in burglaries. The deputy chief for field operations knows, based on the reports generated by her Intelligence-Led Policing unit, that several “serial” burglars were recently released from county jail. She also knows that the geographic distribution of these burglaries is consistent with the areas in which several of these previous offenders are known to operate. Based on this intelligence, the deputy chief implements a “hot spots” tactical plan, redirecting her patrol units to the target neighborhoods and directing her investigative resources to focus on these recidivist offenders.

Conclusion

Law enforcement agencies have made great progress in improving the safety of our communities. However, crime does persist, and the financial challenges facing many national and local governments will continue to put pressure on law enforcement resources. To continue to improve public safety outcomes in a future of constrained resources, agencies need to put officers in the right place at the right time and provide them with the right tools and best information. Strategic investments in technologies—specifically end-to-end integrated law enforcement solutions—can automate core policing processes and help ensure law enforcement personnel are deployed in a way that maximizes their productivity and effectiveness. In turn, agencies can more effectively meet the expectations of those they serve and help build more prosperous and safer communities.

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