



Security and Surveillance

Critical Infrastructure Protection
Situational Awareness
Threat Detection
Advanced Video Analytics



Autonomy
VIRAGE

Contents

<i>An Introduction to Autonomy Virage</i>		
	1	<i>Technology and Architecture</i>
		Video Analytics Engine
	3	Intelligent Video Analysis
		Instant Recognition and Analysis
	4	Behavioral Analysis
		Face Recognition
	5	Video Motion Detect
		Non Motion Detect
	5	Optical Character Recognition
		Object Tracking
	7	Object Sizing
		Analyze & Respond
	8	Configuration and Training
		Advanced Data Analysis and Review
	8	Understanding Brings Recognition
		Mapping and Understanding Events
	10	Hyperlinking
		Automatic Profiling and Personalized Agents
	13	Clustering & Spectrographs
		Intelligent Alerting
	13	Database Integration
		Audio Processing
	13	
		<i>Digital Security</i>
	17	Intellectual Asset Protection System (IAS)
		Autonomy's Unique IAS Mapped Security
	18	Secure Data Authentication & Personnel Verification
		Archiving
	19	Recording and Retrieval
	21	<i>Conclusion</i>
		40
<i>Company Background</i>		
Meaning of Success	3	
Rich Broad Customer Base	4	
Innovation	5	
Awards	5	
<i>Limitations of Traditional Approaches</i>	7	
<i>Autonomy Virage's Approach to Security and Surveillance</i>	8	
IDOL - Understanding Meaning	8	
Connecting the Dots	10	
The Needs for Situational Awareness	10	
<i>Products and Solutions</i>	13	
Protecting Public Infrastructure	13	
Public Safety – City Center	13	
Roads	13	
Sea Ports	15	
Airports	15	
Private Infrastructure	17	
Health and Safety	17	
Retail	17	
Corporate Facilities	18	
Perimeter Security	19	
Investigations	21	
Product Portfolio	22	
Command and Control	22	
Intelligent Scene Analysis System	25	
Automatic Number/License Plate Recognition	25	
Container Surveillance Management	25	
Electronic Point of Sale	25	
Digital/Network Video Recording	25	

An Introduction to Autonomy Virage

Enhanced security and surveillance have become an increasingly important consideration at a corporate, national and global level. While security and surveillance operations form an integral part of any security strategy, the ability to understand, analyze and interpret the significance of information gathered as part of day-to-day operations is a fundamental requirement for all security environments.

Autonomy Virage's security and surveillance solutions support every stage of security and surveillance operations, improve and promote situational awareness, provide an extensive range of advanced recognition and recording systems as well as capabilities for instant and post-event retrieval and analysis.

At the heart of Autonomy's groundbreaking technology is the Intelligent Data Operating Layer (IDOL), a single platform which is optimized for fast processing and retrieval of data in all formats. By forming an understanding of the inherent meaning and potential significance of any piece of information, Autonomy's technology brings fresh, intelligent insight and immediate analytical capabilities to all operational and security environments. Advanced recognition technologies originally developed for security services provide a strong foundation for a sophisticated product range.

The core platform includes:

- *Command and Control*
- *Digital/Network Video Recording (DVR/NVR)*
- *Automatic Number Plate Recognition (ANPR)*
- *Intelligent Scene Analysis System (iSAS)*
- *Electronic Point of Sale Monitoring (EPOS)*
- *Container Surveillance Management System (CSM)*
- *Face Recognition*

All products may be used as individual components on a standalone basis or as part of a wider integrated solution to create a centralized control and management center. Increasing volumes and types of data create the need to adopt comprehensive strategies which encompass all security data and where relevant, integrate these with operational data as well.

Autonomy's unique technology allows organizations to monitor vast quantities of information from disparate sources, understand all data gathered at a conceptual level and place each piece of information in context with other known intelligence. This ensures that operations are more efficient, productivity is improved, results are enhanced and significant ROI is achieved.

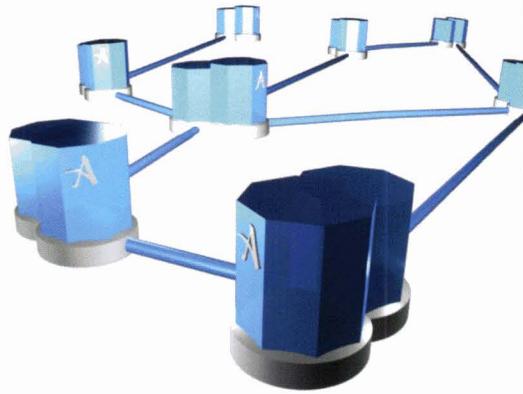




“Autonomy leads in security, capabilities breadth, and corporate strategy.”

Forrester Group

Company Background



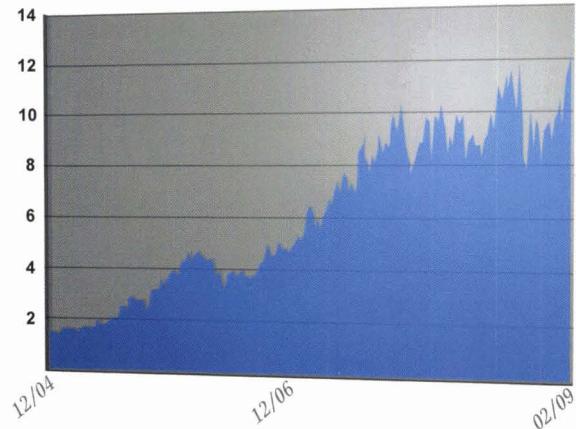
Founded in 1996, Autonomy is a financially stable company, profitable in every quarter for over eight years with solid cash generation and no net debt. Autonomy has a global presence with dual headquarters in Cambridge, UK, and San Francisco, USA, and offices throughout the world including North America, Western Europe, Australia, Asia Pacific, Japan and China.

An extensive partner network combining the expertise of local integrators and global consultancy services provides a strong route to market. Autonomy is listed on the London Stock Exchange (AU. or AU.L) and reports quarterly under the stringent standards set by International Financial Reporting Standards (IFRS).

Over 400 of the world's software companies build their products on Autonomy's technology, including leading companies such as Oracle, Siemens, EMC, Citrix, EDS, IBM Global Services, Novell, Oracle, Vignette, Symantec, Sybase, Iron Mountain and Dassault Systèmes by embedding it at the core of their products and services. More than 400 VARs and Integrators have acknowledged the power and business potential of Autonomy's technology.

Meaning of Success

Autonomy continues to deliver outstanding results across the board, with record revenue and profits driven by strong organic growth and strategic acquisitions. Full year 2008 results broke all company records and the company looks set to continue this trend into the coming year.



“Over the last five years Autonomy Corporation (AU:LSE) consistently outperformed the FTSE 100 index”

Financial Times

Rich Broad Customer Base

An extensive range of blue chip customers and public sector agencies from around the world use Autonomy's Meaning Based Computing technology for advanced audio and video analysis.

Government and public sector agencies throughout the world such as the US Securities and Exchange Commission, US State Department, US Department of Justice, US Department of Commerce, US Department of Labor, US Department of Education, UK Houses of Parliament, the British Tourist Authority and the UK Department of Trade and Industry use Autonomy to connect people and resources.



Intelligence and Defense organizations across the world use Autonomy to protect against security threats. Worldwide customers include the US Department of Homeland Security, US Department of Defense, French MOD, Italian Ministry of Interior, Swedish Defense, Romanian Security, Spanish MOD, British MOD, the Olympic Games Security Committee and the National Nuclear Security Administration, Autonomy's ability to process information has had a significant impact upon the efficacy of many world renowned security agencies.



Department of Trade and Industry



MINISTÈRE DE LA DÉFENSE



Innovation

As a groundbreaking company founded out of pioneering research at Cambridge University, Autonomy is proud to maintain its reputation as one of the most innovative companies in the world. Autonomy continues to be research and development (R&D) led, focusing on consistent delivery of increasingly innovative products to customers, and thereby consolidating its position as market leader. Autonomy's commitment to R&D is evident in the company's continued product innovation.

Autonomy owns 100% of the technology in its portfolio and hence eliminates the uncertainty of sourcing and integrating solutions from multiple vendors in a consolidated market space. No matter what changes take place in the broader market, Autonomy customers will never be left with unsupported technology or software licenses that become non-renewable. As the largest department in the group, the R&D team continues to represent the lifeblood of the company. Autonomy holds over 130 patents.

Awards

Autonomy CEO and founder Dr Mike Lynch Named "Innovator of the Year"

Autonomy - 2008 European Business Leaders Awards



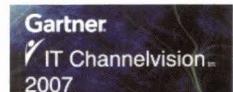
"Best Performing Software Company in Europe"

Autonomy - 2008 Truffle 100 - Presented by European Commissioner for Information Society and Media



"Best Government Solution and Best Technology Provider"

Autonomy - 2007 Gartner IT ChannelVision



"Award for Excellence in Technology"

Autonomy Virage - 2007 Frost & Sullivan Award



"Best Government Solution, 2006"

Autonomy - Gartner Government Solution Summit

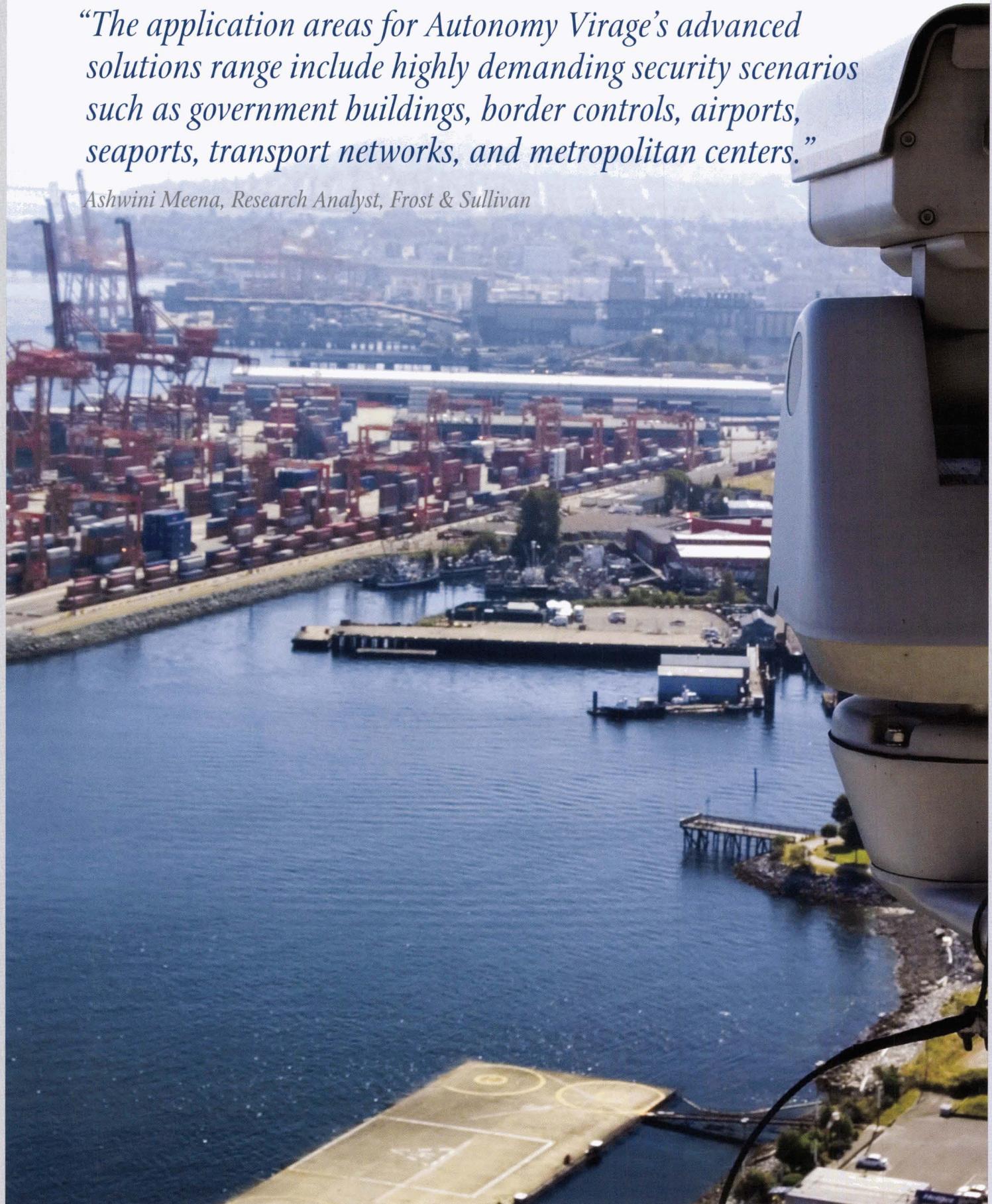
"One of the 50 Fastest-Growing Software Companies"

Autonomy - Baseline Magazine



“The application areas for Autonomy Virage’s advanced solutions range include highly demanding security scenarios such as government buildings, border controls, airports, seaports, transport networks, and metropolitan centers.”

Ashwini Meena, Research Analyst, Frost & Sullivan



Limitations of Traditional Approaches

The overall efficiency of any monitoring system is entirely dependent upon the extent to which individuals are able to recognize and respond to the video surveillance signals presented to them. Human error accounts for virtually all failures to respond appropriately to video surveillance signals. Numerous studies suggest that up to 85% of onscreen information goes unnoticed once a system operator has been on duty for a mere fifteen minutes, rendering a traditional command center system desperately inefficient.

- *Multiple duties and discontinuity in personnel, such as shift changes and high staff turnover, contribute to reduced efficiency and dramatically decrease the quality of surveillance operations*
- *Human concentration span typically wanes after 45 minutes according to scientific studies*
- *Typical surveillance shifts lasting up to 12 hours and far exceed the normal human concentration span and contribute significantly to failures to identify and respond to unusual, illegal or suspicious behaviors*
- *Human operators are unable to identify links or patterns across different information sets*

Traditional approaches to Security and Surveillance rely on indiscriminate recording and manual processing of video, which are frequently proven to be costly and ineffective. Disparate data sources, information delivered in incompatible formats, and the inability to automate processes and interactions, mean that traditional approaches often miss or fail to pick up important events and identify potential threats to security, or malpractice within the organization. Resources can be added to overcome these shortcomings, but this is far from the optimal solution.

The fundamental issue is that traditional security systems do not actually understand what is occurring or how it might relate to other events that have occurred in the local vicinity during a short time period. Relationships can therefore not be identified using traditional approaches. Additionally, traditional systems cannot effectively describe the footage for real-time reporting or later reuse as part of a case or investigation. To manage this data effectively, security systems need a new way to process information, moving away from manually monitoring and tagging video footage to an approach whereby computers can understand the information and process it in the same way a human would – that is, by comprehending its meaning to reveal patterns and trends which may have gone unnoticed otherwise.

“With its suite of powerful technologies, Autonomy Virage is able to meet a wide range of security and surveillance applications ranging from highly complex command and control center deployments to small-scale security functions.”

Frost & Sullivan

Autonomy Virage's Approach to Security and Surveillance

Autonomy was founded on the basis that technology should map to the human world, not the other way around. This methodology is the foundation for Autonomy's Intelligent Data Operating Layer (IDOL), a data-agnostic technology that overcomes the barriers of language, format, and connectivity that typically hinder traditional technologies. IDOL, the underlying platform technology of all Autonomy solutions, provides a level of interoperability, secure access, scalability and understanding that cannot be achieved by traditional solutions.

In high level security and surveillance operations the need has never been greater for advanced technologies that can make sense of rich media information and instantly alert the relevant parties to crucial intelligence.

While observation forms an integral part of any security strategy, the ability to understand, analyze and interpret the significance of information gathered as part of surveillance operations is a fundamental requirement for all security environments today. Increasing volumes and types of data, including video footage, camera stills, vehicle registration plates, traffic records, police databases, immigration records, telephone conversations and transaction reports are integral to security operations and necessitate the adoption of comprehensive strategies that encompass all security data.

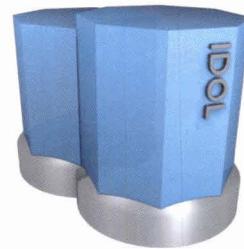
Autonomy Virage delivers a complete infrastructure solution for security operations by leveraging IDOL, which forms a conceptual and contextual understanding of content in any file format - video, text or voice-based, structured or unstructured - regardless of where it is stored, how it was created, or which application is associated with the data. Because of this "data-agnostic" approach, IDOL can identify relationships between disparate data types and form important connections vital to discovering security breaches that previously hinged on costly and unreliable manual labor. By forming a conceptual understanding of unstructured content, IDOL automates key processes, thereby driving substantial cost savings for the security and surveillance industry.

IDOL - Understanding Meaning

IDOL is the information processing platform that lies at the heart of Autonomy Virage solutions. IDOL uniquely forms an understanding of all content in an enterprise so that the relationships between concepts can be detected, no matter the form in which they are expressed. Based on that understanding, real-time information can be automatically processed and analyzed. This not only improves operational productivity but also offers enhanced situational awareness and threat detection as relationships between seemingly unrelated events can be identified and reacted to.

"Autonomy is the market leader in the provision of software that automates the analysis of unstructured data, whether in the form of text, audio, images or video."

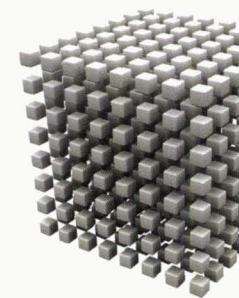
UBS, July 2008



Autonomy's meaning-based technology is based on advanced pattern-matching algorithms and probabilistic modeling and protected by over 130 patents. Its market-leading technology allows IDOL to extract information from within the video footage, security reports and data from over 1,000 file formats, including video, email, documents, presentations, and audio. This ability to process and intelligently analyze all data types in any language makes IDOL best suited to grapple with the proliferation of digital content, particularly in the security area, that plague today's global enterprise with security vulnerabilities.

By forming an understanding of all content, IDOL automates the capture, analysis, reporting and retrieval of security information and uncovers threats that would otherwise be missed. This unique conceptual approach to security and surveillance enables officers to gain an acute sense of situational awareness and provides security professionals with a critical asset for risk assessment and incident response planning. IDOL does not require manually-added metadata to search video and audio; in fact, it automates the metatagging process by generating the pertinent information based on its understanding of the content.

Leveraging IDOL, Autonomy Virage solutions can seamlessly cross-reference assets with other content types. IDOL's understanding of all content allows holistic monitoring and analysis of security data in real-time, as the system is able to understand the significance of an event and automatically link to relevant intelligence, regardless of file format. It is possible to visualize, alert and manage information based on common trends, ideas, threats, and risks. These interdependencies can be tracked and monitored over time.



Meaning Based Computing

Intelligent Scene Analysis System

Sentiment Analysis

Categorize, Cluster, Alert

All Data Types

Audio & Video Processing

Facial Recognition, OCR

Parametric Search

Keyword Search

Connecting the Dots

The ability to process all forms of digital information including video, audio, and text, on a single platform enables Autonomy to offer unique solutions to a growing number of organizations and enterprises that are increasingly dependent on utilizing unstructured information. With the organization standardized on IDOL as its only information access platform, all electronic structured, semi-structured and unstructured information existing within the enterprise can be automatically indexed for quick and easy identification and retrieval whenever necessary.

A single backbone that connects all business applications, security systems, and data repositories is essential if holistic solution is to be attained. The ability to monitor and track all forms of information and relate them to one another is critical in this information age.

The convergence of operational, compliance and security needs is occurring rapidly. No longer can an organization have separate systems for each of these important operations. Effective threat detection needs to occur within the organization as well as at its boundary and needs to encompass all data types, particularly video and audio.

Autonomy is unique in its ability to offer this level of connectivity, understanding and risk assessment on a real-time basis.

The Need for Situational Awareness

Situational awareness is the perception of environmental elements within a period of time and space, the comprehension of their meaning, and the projection of their impact into the future. It is a field of study that extends far beyond security requirements and is critical when dealing with complex, dynamic scenarios that can span from intelligence gathering, air traffic control, power plant operations, military command and control to more ordinary but nevertheless complex tasks such as driving an automobile or monitoring a crowd at a sporting event.

Lacking or having inadequate situational awareness has been identified as one of the primary factors in accidents attributed to human error. It thus becomes a critical goal when there is a high volume of information flow and where poor decision making leads to serious consequences.

By providing outstanding Situational Awareness, Autonomy Virage empowers companies to:

- *Increase operational efficiencies*
- *Better allocate resources to areas in which the technology has indicated a future impact*
- *Provided with real-time analysis, companies can respond quickly and precisely to prevent further damage*
- *Optimize resources and cost distribution to focus on their most critical areas*

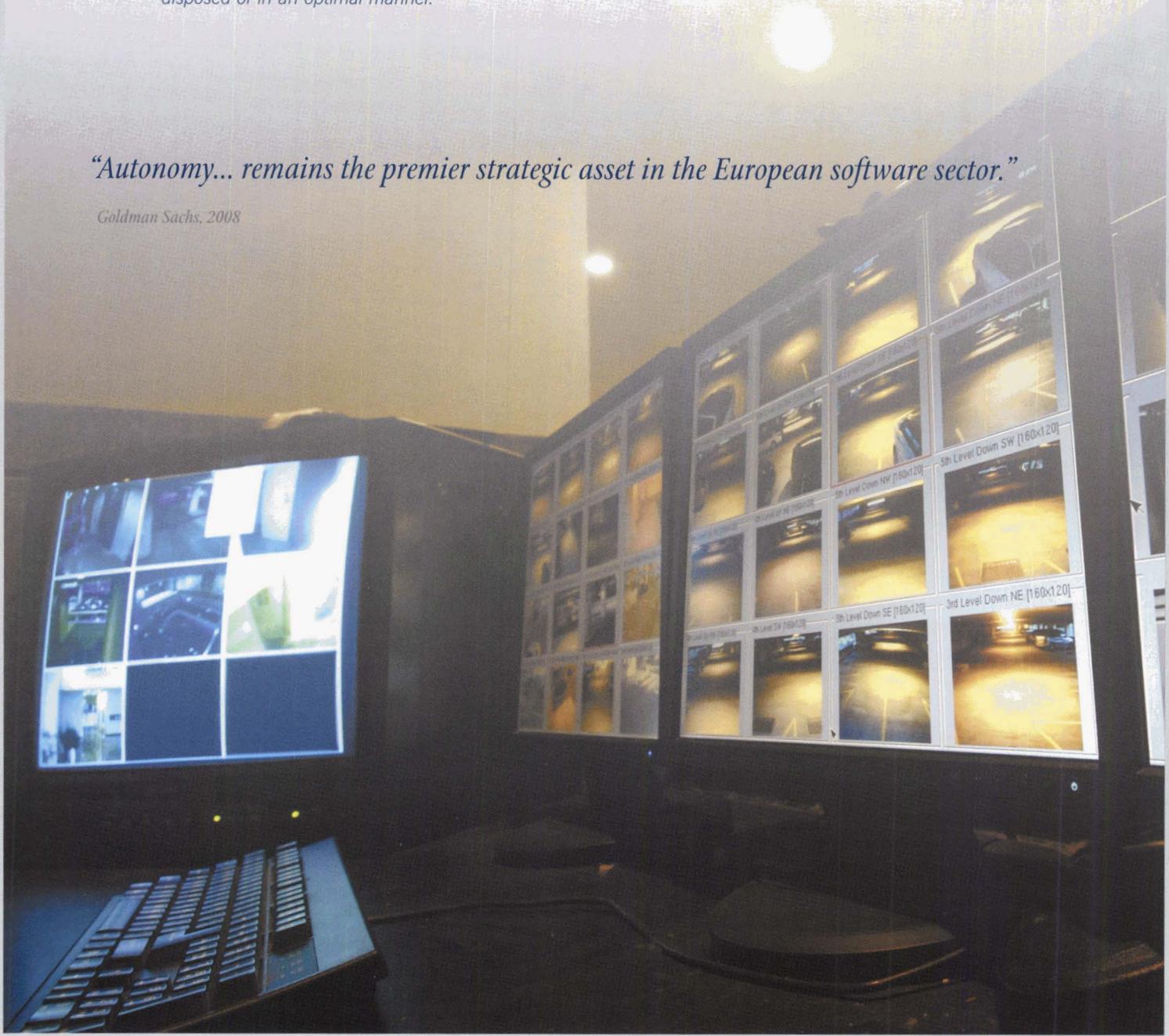


Autonomy Virage's approach to achieving Situational Awareness is to build a framework that extends from the monitoring of single events to building complex networks of related activity to offer reactive and proactive capabilities.

- Event Stream Processing (ESP): *the ability to monitor CCTV footage, understand the content and alert accordingly, e.g., if person walks too close to the edge of the platform, it can raise an alarm so closer monitoring can occur*
- Security Processing Management: *building on ESP capabilities and allowing for business rules to be captured, e.g., if a car license plate is recorded in the HR system, then a parking lot barrier can be raised automatically*
- Complex Event Processing: *by adding IDOL's conceptual understanding, more complex events can be built and unseen relationships between different events can be discovered, e.g., a car seen loitering near a retail bank branch and an the employee card used in an access-denied event share the address of a recently terminated employee*
- Secure Policy Archiving: *as the volume of security and operational information increases, strong corporate and regulatory-driven policies need to be applied to ensure this information is captured, distributed, archived and disposed of in an optimal manner.*

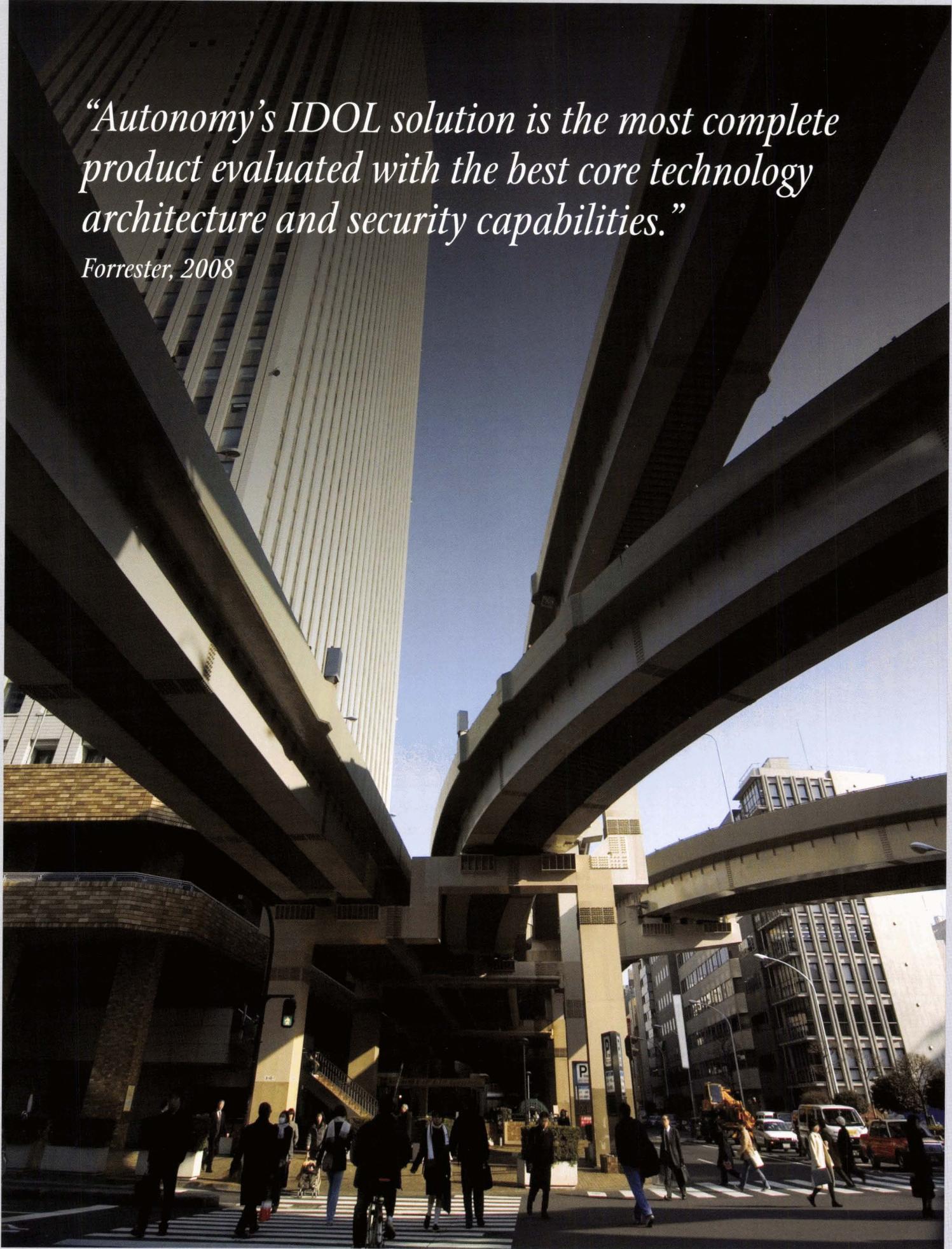
“Autonomy... remains the premier strategic asset in the European software sector.”

Goldman Sachs, 2008



“Autonomy’s IDOL solution is the most complete product evaluated with the best core technology architecture and security capabilities.”

Forrester, 2008



Products and Solutions

The sensitive nature of these products and the type of operations they are managing makes it inappropriate to offer actual case studies. References can be obtained on request but for the purposes of this document we are providing generic customer use cases to demonstrate how the powerful Autonomy Virage solution is used in real world situations.

Protecting Public Infrastructure

Continued urbanization is putting growing pressure on the metropolitan environment. With close to half of the world's population now living in cities, protecting and improving the urban landscape is an increasing priority for local and central government.

This requires flexible technology and integrated policies to address diverse challenges such as reducing anti-social behavior, street crime, protecting infrastructure and public buildings, and improving transportation networks.

Public Safety – City Center



Autonomy Virage's broad suite of IP-based applications offer automated solutions for preventing crime and vandalism, implementing effective infrastructure management and identifying how best to invest resources in the future. Bringing together best-of-breed technologies in video surveillance and analytics, Autonomy Virage provides state of the art monitoring solutions, including Digital and Network Recording (DVR/NVR), Autonomy Virage Intelligent Scene Analysis System (iSAS), Automatic License Plate Recognition (ALPR) and Autonomy Virage

Command and Control. Autonomy's open architecture allows seamless connectivity with old or new systems to leverage existing investments and create a complete intelligent security network. The infrastructure has been specifically designed to allow easy integration of third party equipment such as display units and alarm panels. All of Autonomy Virage's technology is massively scalable to meet changing user requirements and is easy to use with minimal training through a single intuitive interface.

Key Benefits:

- *24/7 intelligent surveillance across large areas*
- *Automatic alerting based on pre-defined triggers or abnormal behavior*
- *Direct lines to law enforcement*
- *Advanced recording capabilities offer video evidence which can lead to successful prosecution*

Roads

The growing number of public and private vehicles on the road is putting increasing pressure on urban infrastructure. In order to tackle congestion and other issues effectively, local transportation authorities must have reliable, real-time data on the problems they face and a complete picture of changing transportation trends.

Autonomy Virage offers a range of proactive solutions to automate the monitoring and management of transportation networks on any scale, such as dynamic traffic surveys, incident detection and enforcement, real-time infrastructure management and speed monitoring. Solutions include Autonomy Virage Command and Control, Automatic Number/License Plate Recognition (ANPR/ALPR), Autonomy Virage Intelligent Scene Analysis System (iSAS), and Container Surveillance & Management System (CSM). Autonomy Virage automates proactive network management to reduce costs and deliver significant ROI.

Automating the processes of identifying and tracking vehicles has valuable applications for both commercial and law enforcement purposes. With the capability to connect to multiple databases and automatically cross reference and correlate identified license plates with other data, Autonomy Virage provides numerous benefits for organizations that must tap into multiple sources of data to make quick, informed decisions.

In addition to assisting in traffic law enforcement and vehicle identification, Autonomy Virage ANPR is also used to streamline logistics operations such as loading and unloading goods at distribution centers. By automatically matching vehicle number/license plates with information held in local databases, Virage ANPR triggers entry authorization and automatically directs vehicles to designated bays where relevant documentation will be waiting so that loading and unloading can commence immediately.

Case Study – Protecting Motorways

Motorways present a difficult challenge for security and surveillance operations. With a large number of possible infringements, illegal maneuvers and dangerous driving to look out for, most intelligent video monitoring solutions fail to correctly identify infractions and potential threats as the dynamics of the events constantly change. Autonomy Virage won the contract for a Government project which uses the Intelligent Scene Analysis System (iSAS) to monitor, detect and penalize lane violations and illegal overtaking on motorways.

By recognizing abnormal patterns of activity, iSAS can identify erratic driving, dangerous overtaking, speeding and accidents all through one platform solution. The system automatically identifies any infringements, records images of the offense and transmits them back to the control center. The police computer system then uses the plate details to identify the driver and issue a ticket and fine notification to the offending driver instantaneously. This is all made possible with Autonomy Virage's technology, which allows the system to form an understanding of the video and recognize dynamic of the event.

Autonomy Virage was also commissioned to deploy iSAS across service areas along the motorway. These monitor strategic areas to detect and deter dangerous or illegal parking and suspicious behavior associated with car theft as well as monitor the length of time cars have been parked and abnormal behavior such as running crowds, which may suggest an emergency has occurred.

Real-time analysis and alerting translate directly to expedited response so that the necessary action can be taken. Since the deployment of Autonomy Virage's solution, road traffic accidents have decreased by over 70%.

High Performance in All Conditions

Automatic format checking places each plate reading in context by verifying the identified number plate against typical templates in any given territory. By taking multiple readings of each plate and using sophisticated probability matching techniques to analyze and calculate the likelihood that any given reading is correct, ANPR is able to recognize number plates extremely accurately.

Autonomy Virage's ANPR can accurately identify number/license plates even in the most demanding conditions, such as when visibility is low due to adverse weather or poor light conditions. In addition, ANPR is able to capture and identify square, inverse, borderless and foreign plates automatically. Where required, adjustments to contrast, plate size, country number/license plate format, skew and rotation settings can be made by the operator to fine tune the system in order to achieve optimum performance in specific conditions. In addition, Autonomy Virage enables recording via digital triggering to achieve a 100% capture rate.

Whether your need is defined by reducing traffic, protecting installed assets or planning urban developments, Autonomy Virage's next-generation technology can help you maximize your transport network, now and in the future.

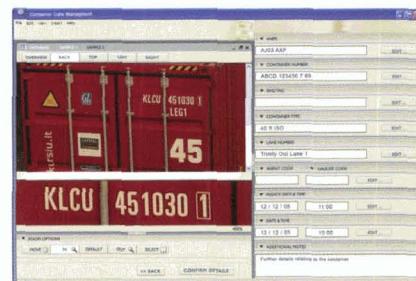
Sea Ports

It has been estimated that there are up to 19 million containers currently in transition globally and that traffic is increasing at a rate of about 10 percent annually. Given the ever increasing volumes of traffic, vehicle and container identification and tracking has never been so important to the logistics industry. Organizations need to know not only where containers are and when they will be delivered, but also more detailed information such as what condition the containers were in at various stages throughout their journey and by whom and where they were accessed along the way. Autonomy Virage's Container Surveillance Management (CSM) enables comprehensive vehicle and container identification and tracking in logistics environments; from seaports and inland container terminals to rail container terminals. Automation within CSM removes the need for costly additional manual input and makes the identification, tracking, control and management of logistic processes highly efficient. A unique combination of core technologies and superior analytical capabilities gives CSM the power to provide added intelligence, such as cross-referencing with existing databases and advanced information processing operations such as clustering and hyperlinking of related material. Such intelligent processing can be used to improve future operations and deliver significant benefits to businesses.



Virage CSM automatically captures vehicle and container information, including:

- Vehicle number/license plate
- Container ISO numbers
- Container type
- Container damage recording
- Site and gate location
- Date/time



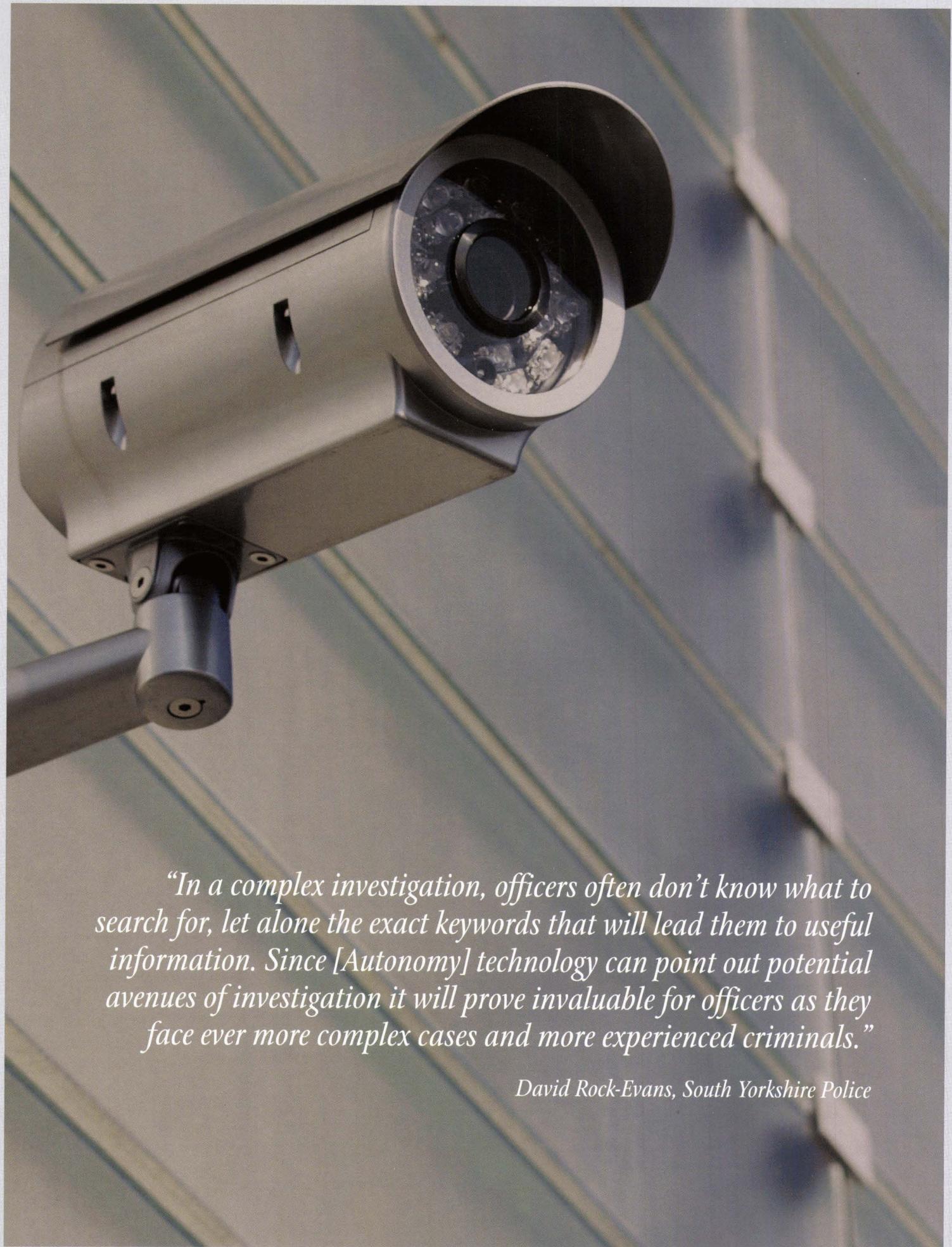
By capturing this information accurately and efficiently, Autonomy Virage CSM not only enables businesses to keep an accurate record of exactly when and where containers pass through certain points in the transport network. In addition, through high quality digital video recording and management, Virage CSM automatically keeps track of what condition containers are in at various stages of their journey throughout the world. By capturing this cross section of data, Autonomy Virage provides complex cross referencing for 24/7/365 operations. CSM can significantly increase traffic efficiency as the system works on moving vehicles as well as those which are static. CSM works on standard 20, 30, 40, 45 and 20x20 foot containers.



Airport

Airports face a wide variety of daily security challenges ranging from the protection of the aircrafts and staff to the mitigation of crime such as drugs trafficking and weapons smuggling.

By providing security operations through a single platform, Autonomy Virage takes a holistic approach to airport security, identifying patterns and trends which may be overlooked if separate systems are operating in parallel. Autonomy Virage's Control Center is ideal for this type of large installation where disparate events and sources need to be addressed individually but considered part of the big picture.



“In a complex investigation, officers often don’t know what to search for, let alone the exact keywords that will lead them to useful information. Since [Autonomy] technology can point out potential avenues of investigation it will prove invaluable for officers as they face ever more complex cases and more experienced criminals.”

David Rock-Evans, South Yorkshire Police

Case Study – Airport Security

A major international airport was seeking to upgrade its ten-year old security surveillance system in order to better protect public safety in the face of the threat of international terrorism and crime. Its existing system consisted of 27 time-lapse video recorders and CCTV multiplexers that multiplexed the incoming camera video signals to be recorded on the VCRs.

The airport wanted to replace its video security and surveillance system with a much more efficient and effective digital recording system. The airport proposed to replace all the existing VCRs with a new, state of the art digital recording system capable of recording up to 800 camera signals and storing all footage securely for 4 weeks before being over-written. Another specification was that the system would be able to automatically archive any specified video footage with suspicious-looking activity, and this archived footage would remain in a secure place should access be needed.

Autonomy Virage was selected to provide flexible remote surveillance capabilities, offering auto dial-out on alarm, dial-in, or continuous image transmission, all across wide or local area networks. Live images can be retrieved and reviewed and system parameters can be configured and diagnosed remotely.

Private Infrastructure

The challenges posed to private infrastructure are highly complex and can come from both internal and external sources. There can be specific threats that need assessing; or health and safety (including public safety) requirements that need to be monitored at high risk locations such as oil refineries or nuclear power stations.

Because of this dual threat, insights offered from the relevant operational data that exists within the organization such as HR or customer records should be considered when trying to pre-empt issues or resolve outstanding actions.

Health and Safety

Increasing regulation and more stringent penalties mean that health and safety initiatives cannot be taken lightly. Rather, health and safety policies need to be strictly monitored and enforced. For instance, what should happen if a diesel spillage occurs on a petrol forecourt and no employee has had appropriate training? Enforcing and monitoring policies can be achieved by training the surveillance system to understand when a breach of policy has occurred and what needs to occur when this happens. This makes corporations more aware and ensures that they meet the minimum requirements and guarantee the safety of all employees, customers, partners and the general public.

Retail

Detecting fraudulent activity is a key concern, particularly amongst petrol stations, confectioners, tobacconists, newsagents, convenience stores, supermarkets, pubs and clubs and fast food outlets. More than ever, companies are seeking new measures to combat this illegal activity; however, many businesses still only rely on manual surveillance techniques alone. With internal employee theft on the rise and current systems falling short of the mark, businesses need to implement new measures to detect and prevent fraudulent activity.

Combined with synchronous capture of cash register transactional data, Autonomy Virage offers retailers the most versatile and efficient surveillance and retail management system available. Full data capture, including time synchronized image and transactional data together with centralized reporting and management enable retailers to monitor multiple locations simultaneously and correlate results from multiple cash registers both locally and remotely. Multiple site data and daily reports can be sent to and managed from a central location and remote access enables off site reports and investigations.



Virage offers an unrivalled combination of high quality DVR/NVR and EPOS monitoring in one powerful package. Designed to detect and deter fraudulent activity at the Point of Sale, EPOS synchronization associates POS transactional data with DVR/NVR CCTV footage. In this way, Autonomy Virage EPOS acts as an early warning system by alerting surveillance staff to suspicious or illegal activity at the cash register, as it happens. Rules-based keyword matches, based on given requirements, allow alerts to be triggered at the POS when transactions such as voids, refunds, discounts and cashback are activated.

In addition to providing live EPOS monitoring, Virage enables playback of pre-recorded images. DVR/NVR data can be analyzed post event by reviewing data stored on the HDD. All data is stored in a database at the time it is created and can be quickly and easily located as and when required for future analysis. Retrospective investigation options support a full range of retrieval options such as transaction data, video images or multiple parameters.

Transaction data is searchable by:

- *Date*
- *Time*
- *Product*
- *Price*
- *Till Number*
- *Other search parameters (including multiple parameters) based on pre-defined rules e.g. void plus cashback*

Under no circumstances is transactional data automatically burned onto the video imagery as this could render the CCTV footage useless. In the event that users wish to display transactional data with the video footage, users can choose to overlay transactional data on top of video footage. Where multiple cameras are in use, users can search all cameras simultaneously through a single interface, or simply narrow their search to results from a specified camera.

Advanced analytics such as clustering (identifying related groups of data) enable the discovery of trends and correlations across the entire data set, providing the ability to spot unusual activity spanning multiple cash registers which may have otherwise gone undetected. Conceptual analytics which use unique pattern matching techniques to detect underlying trends and anomalies in any given data set, enable retailers to gain greater insight into all transactional data and corresponding video images.

Corporate Facilities

Corporate facilities can range from simple car park access to monitoring a global network of retail bank branches. The flexibility of the Autonomy Virage system means that a hub and spoke approach to security can be applied allowing for real-time actionable operational intelligence. Increasing regulation and continuous terrorist threats mean that base level of monitoring at facilities such as refineries, wells, chemical plants, manufacturing plants, and sensitive corporate locations is increasing. The minimum requirement is now for advanced video analytics that understand and process events as they unfold and ensure the security staff are continuously operating at an optimum productivity level.

Case Study – Corporate Security

A large business complex comprising of a hotel, a business center, an amusement park, a mosque, and a supermarket, needed a comprehensive security and surveillance installation. Autonomy Virage was selected to roll out a large-scale security implementation to monitor the premises, control access points, monitor the entry and exiting of vehicles, run facial recognition to help identify known criminals or suspects, and protect retail activity against crime and fraud. All the information then needs to be connected to the police's database for legal action to be taken where necessary.

Two key advantages of Autonomy Virage's holistic methodology include its proactive approach to addressing potential risks as they arise and providing high quality video recording for retrospective analysis and investigations.

Perimeter Security

Securing restricted areas, access points, and perimeters is where intelligent video solutions such as iSAS bring great benefits to an organization. By automatically detecting events at these points, security guards can view and respond to the relevant events rather than watching still images of CCTV. This also frees up their time to engage in higher level activity increasing productivity.

- *Controls access into rooms/restricted areas*
- *Monitors sterile areas*
- *Delivers real-time alerts to security breaches and intrusions*
- *Alerts proximity as objects approach your perimeter*

“We need our staff and soldiers to have information at their fingertips to make decisions that may be critical to our country's national security. Autonomy retrieves the most relevant information so that Army personnel can spend their time analyzing data instead of searching for it. Autonomy's solution beat the competition in delivering a scalable technology that effectively connects our users to the information they need.”

Lieutenant Colonel Kenneth Blakely, Chief of Army Knowledge Online, US Army

"In the case of Homeland Security, the investigators are looking not only for the known, but also for the unknown... The Autonomy model fits well with this need."

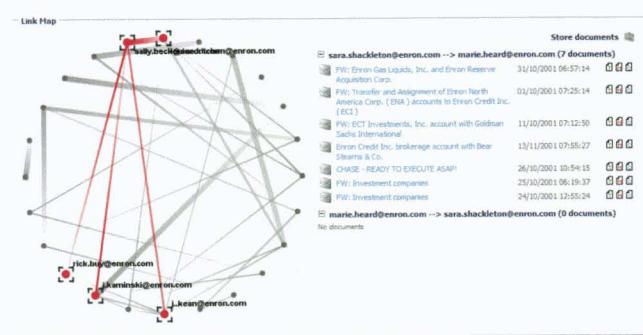
Daniel W. Rasmus - Giga Information Group, Inc.

Investigations

IDOL's ability to form a conceptual and contextual understanding of the data allows for advanced investigative capabilities. By analyzing the data set as a whole, IDOL can carry out advanced data analysis to reveal emerging patterns, potential threats, and similarities and links between cases. Manual investigations traditionally fall short when faced with the vast amount of data to be analyzed. By putting data into context, IDOL can cross reference intelligence from disparate sources and run automatic analysis to streamline investigations.

For example, an intercepted radio conversation can be used to automatically identify the speakers, understand what is being discussed, and retrieve any existing intelligence regarding the subject. This helps to streamline traditional investigative methods and facilitate investigative work by performing conceptual analysis to reveal trends and patterns hidden in the data set.

In another instance, the ripple effect of an idea and the parties involved can be measured as it jumps from mail to phone conversation to document. Person A receives a call from Person B who then relays it out of ear shot in the parking lot to Person C who then e-mails these ideas to Person D. This powerful mechanism can be applied to detect relationship dynamics and pinpoint the cause of a certain action taking place.

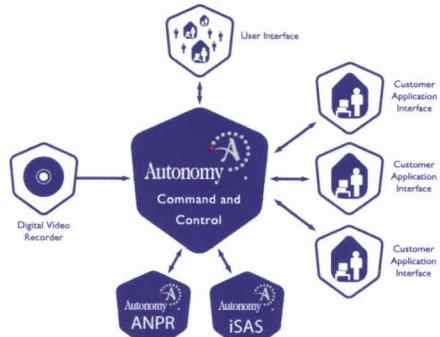


Understand communication patterns with advanced visualization



Product Portfolio

The Autonomy Virage Security and Surveillance suite is modular and flexible and can be expanded and adapted over time depending on local requirements or specific budget constraints. It is based on IDOL technology enabling it to operate as a stand-alone security solution or as a component of a much larger distributed corporate IT environment. The Autonomy Command and Control module is the pivotal clearing-house for information via the intuitive Visor interface and is often the central hub of any implementation. The overall solution utilizes a pre-configured three tier architecture that includes functions that range from a standard rules-base solution to a highly sophisticated solution that leverages most cutting edge conceptual analysis capabilities. Each standard configuration offers an easy starting-point solution that may be further customized for the unique and specialized needs of the client.



Autonomy's extensive investment in Research and Development results in a continual stream of innovation and functionality advances. The remainder of this section will highlight specific Autonomy Virage technologies utilized in one or more of the functional areas listed below.

Command and Control

Given the complex nature of security and surveillance operations and the vast amount of heterogeneous data that requires aggregation and analysis, the need for advanced technologies that can make sense of information and alert the relevant parties to crucial intelligence has never been so great. Bringing together best-of-breed technologies in video surveillance and analytics, Business Process Management, and Meaning Based Computing, Command and Control proactively helps security officers retrieve relevant intelligence in real-time.



Command and Control is operated through Autonomy Visor, a cohesive, user-friendly interface which provides users with the functional tools required to configure security settings and control the scene. Since Command and Control is fully modular, additional functionality can be added and controlled through the interface, as an enterprise's security needs dictate.

Autonomy Virage's Security and Surveillance Command and Control infrastructure enables all Autonomy Virage products to interact seamlessly. It has been specifically designed to allow easy integration of third party equipment such as alarm panels and display units. Although certain products can be deployed for simple functions such as standalone capture and archive, in order to perform more advanced functions, Autonomy Virage provides three levels of Command and Control for a range of different environments and needs from simplistic rule-based models to highly complex, intelligent solutions based on conceptual analysis.

Level I: Event Stream Processing

Command and Control Level I offers a simple rule-based solution. Any number of Autonomy Virage products can be connected with the Command and Control system, which performs per instructions defined by a systems administrator. For example, if Autonomy Virage's DVR and EPOS were set up with Level I, the system could be programmed to highlight particularly unusual till transactions such as large sums of cash-back on the logged till transaction data. Network Video Recording and Container Surveillance Management might also be deployed with Level I to monitor traffic at a port and could be trained to raise a barrier for particular vehicles whilst disallowing entry for others.

Level II: Security Process Management

In addition to performing simple rule-based functions, Command and Control Level II handles logical interactions between disparate pieces of data. The Security Process Management offered with Level II, powered by Autonomy's Liquid Office, automates the reporting process, reducing the cost of data entry and distribution of information to relevant users. This approach enables each report to provide richer and more relevant content and automatically classifies and distributes it to the relevant department.

Digital Video Recording, Intelligent Scene Analysis System and Command and Control Level II might be used, for example, to monitor vehicle speeds between points. By identifying the same object and calculating the distance between the two points, the system can calculate distance traveled within a given time frame and therefore the speed at which the vehicle/s must have been traveling. Another example might be deploying Network Video Recording and Automatic Number Plate Recognition to monitor car park usage in multiple locations and calculate usage percentages based on initial numbers collected to highlight which car park has the greatest usage.



Level III: Complex Event Monitoring

Command and Control Level III provides state-of-the-art security infrastructure software solution for all the most complex security operations, automating a vast range of tasks and bringing conceptual understanding to all data. Halo, powered by Autonomy's award-winning Intelligent Data Operating Layer (IDOL), employs advanced analytics to add intelligence to a wide range of security operations and information retrieval. Halo is able to form a conceptual understanding of the meaning of any piece of data, be it in the form of text, video, or audio. By deriving an understanding of the available information assets, Halo automatically provides users with relevant background information, cross-referencing data according to its conceptual content to reveal emerging trends and identify potential threats, delivering it directly to the user in the form of hyperlinks or thematically similar clusters.

Autonomy's core technology is used by some of the most prestigious intelligence and defense agencies including: the U.S. Department of Homeland Security, U.S. Department of Defense, The British Ministry of Defense, the Olympic Games Security Committee, National Nuclear Security Administration and numerous others. One of the key reasons organizations choose Autonomy, is its ability to discover "the unknown" which has a significant impact upon the efficacy of many world-renowned security agencies.

At this sophisticated level, Autonomy's cutting-edge Meaning Based Computing technology forms a conceptual understanding of all forms of unstructured, semi-structured and structured data be it video, audio or textual in format. At its core, the technology uses a combination of Bayesian Inference and Shannon's Information Theory to automatically extract the key concepts from any piece of information. As a mathematical platform, it is not constrained by the limitations of linguistic or rules-based models. Distinct concepts, ideas and behaviors are exposed within any data set on the basis of mathematically derived coherence and not rigid conformity to predefined structures or characteristics. This enables the technology to recognize the potential threat for the first time, both at a tactical and strategic level, without prior training or insight. Operationally, this results in an intelligent surveillance infrastructure capable of instantly and automatically fusing vast quantities of heterogeneous data, identifying interrelationships, spotting important trends and alerting surveillance officers to this vital intelligence.

Additional functionality can be seamlessly added in order to perform further advanced data fusion operations.

Level IV: Secure Archiving, Retention and Disposition Management

Providing evidence for court cases, compliance regulations, and risk management are just a few of the primary reasons why video needs to be archived. Many organizations and police forces are swamped with CCTV footage which is neither properly filed nor securely managed.

Autonomy Virage offers an enhanced video archiving solution that ensures digital video is efficiently controlled and protected, only accessible to those with the right access, and duly retained according to corporate and legislative rules. Videos that are to be used for evidential purposes are required to be held for a predetermined period in a guaranteed unchanged state. Legacy approaches have required the manual identification of such videos and the movement of these into a stand-alone secure repository - a costly and time-consuming approach.

Unlike traditional solutions, Autonomy Virage automates the retention and disposition of video footage by understanding the meaning of all information regardless of format, language or repository through the power of Autonomy IDOL.

Case Study – Securing the City Center

A few years ago, growing crime figures and disorder were causing increasing problems for a bustling European city center. Disruptive, violent and drunken behavior was becoming the bane of people's lives, and policing strategies were proving difficult to enforce without concrete evidence.

Having been set a target of reducing crime and anti-social behavior by 40%, the city council invested £6 million in what has become one of the largest metropolitan CCTV installations. After a competitive procurement, Autonomy Virage was chosen to provide a vast network of Digital Video Recording (DVR) software and integrate over 280 cameras throughout the city. Autonomy Virage was chosen as the only vendor able to accommodate the vast amounts of data created every day and offer suitable archiving solutions. Users are able to access and retrieve evidence from multiple incidents simultaneously through a single, intuitive interface. Virage's digital recording technology also offers unrivalled imaging, delivering 'directed surveillance' for multiple enforcement agencies and ensuring prosecutions through high-quality ID recognition shots.

Since the installation there has been a dramatic reduction in the amount of crime and disruptive behavior in the city center. Evidence from CCTV has helped various law enforcement organizations make more than 6,500 arrests over the past three years and operators in the control center are being called upon up to 60 times per day to provide footage as evidence. CCTV footage provides concrete evidence in cases that otherwise may have gone unresolved, and officers estimate that footage will provide vital evidence in 8,700 cases this year ranging from murder, speeding, and vandalism.

"Autonomy's scene detection capabilities, together with advanced image recognition (for example, 3D face recognition) enables Autonomy to identify patterns in images and text."

Forrester Research

Intelligent Scene Analysis System



Intelligent Scene Analysis System (iSAS) is an advanced solution to assist users of any live or record CCTV system in the detection of important activity. The system is fully trainable enabling it to detect many types of complex activities including identifying potential threats, an illegal action or a situation where help is required. iSAS dramatically improves the efficiency of any CCTV system, automatically identifying specific or potential incidents to operators for verification, action or both.

Automatic License/Number Plate Recognition



Autonomy Virage's Automatic Number Plate Recognition (ANPR/ALPRR) is the world's leading plate recognition system, employing state of the art neural network techniques in its character recognition. This ensures efficiency and integrity of the system for use in either high volume or standard traffic flow situations. ANPR is utilized for many different applications, including car parks, traffic surveys, petrol filling stations (as a "drive-off" deterrent), and to detect stolen vehicles if used in conjunction with database searching. ANPR also has time scheduling as a standard facility to offer vehicle access control for commercial and industry entry/exit scenarios.

Container Surveillance Management



Container Surveillance Management (CSM) fully automates the recognition of both the vehicle and the container it is trailing in one smooth and simple process through the entry and exit lanes of sea ports, inland container terminals or rail container terminals. Due to the open architecture design of CSM, the system has the advantage of being able to communicate and interface with on-site management systems, eliminating a wide range of manual processes leading to significant return on investment.

Electronic Point of Sale



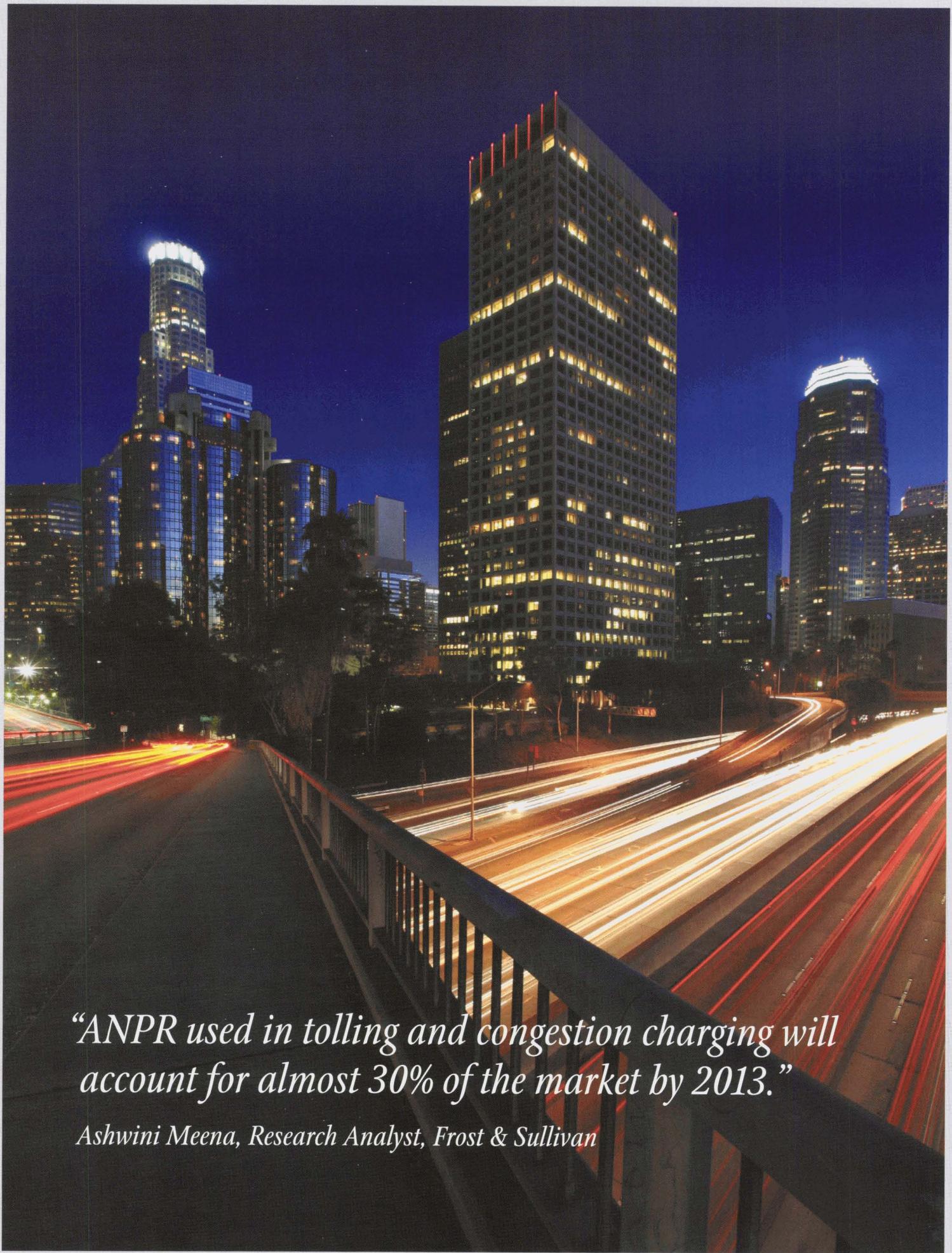
Electronic Point of Sale (EPOS) offers an unrivalled combination of high quality digital video recording and EPOS monitoring in one package. Designed to detect and deter fraudulent activity at the "point of sale," the system functions as a management tool that can reduce stock losses and increase profits. The combination of capturing high quality digital images and synchronized till data gives the operator access to powerful image and till data both locally and remotely.

Digital/Network Video Recording



The Digital/Network Video Recording (DVR/NVR) solution offers a range of high quality video recorders with advanced remote access capabilities. The line is designed to allow you to start at any capacity and expand as needed without any change to the underlying platform. With a minimum of 1 input and a maximum of 65,000 inputs the system can be configured to accommodate any organizations current and future requirements.

"The world market for ANPR is forecast to exceed \$440 million by 2013."



“ANPR used in tolling and congestion charging will account for almost 30% of the market by 2013.”

Ashwini Meena, Research Analyst, Frost & Sullivan

Technology and Architecture

Autonomy was founded on the basis that technology should map to the human world, not the other way around. This basic premise led to the development of the IDOL technology that is inherently agnostic to the barriers that typically stymie traditional technologies.

Autonomy's technology is highly sophisticated, efficient and fully scalable. Our scalability has been proven time and time again among our customer base, where our technology has been used to power some of the largest systems in the world. Autonomy delivers linear scalability through a multi-threaded, multi-instance approach with load balancing to distribute the indexing and query workload whilst also supporting 64-bit architecture. This enhanced scalability results in hardware cost-savings as well as the ability to address larger volumes of documents.



Video Analytics Engine

Autonomy Virage's advanced video analytics have been proven to increase the efficiency and efficacy of CCTV-based surveillance operations dramatically by automatically detecting, analyzing and interpreting all activity within a field of view.

Intelligent Video Analysis

In consultation with key security agencies, Autonomy Virage has developed a range of products designed to improve the efficiency and efficacy of surveillance operations. By adding intelligence to the camera and understanding what is happening at the video level, Autonomy Virage is able to automatically identify elements within the video and automatically alert security officers to breaches or events in real-time. This translates directly to operational advantages as Autonomy Virage enables organizations to anticipate and detect potential threats or illegal action, instantly and automatically, and take proactive preventative action against any security concerns. By detecting suspicious behaviors, identifying potential security threats and providing alerts entirely automatically, Autonomy Virage enables CCTV operators to focus their activities on behaviors which require attention and verification by a security professional.

Instant Recognition and Analysis

In order to correctly identify suspicious behavior, it is essential that any object or movement is placed in context. Using advanced techniques, Autonomy identifies and categorizes objects in a scene by size, shape, color, speed, direction, location and time of day and, over time, builds up a history of these objects. By then putting each object and motion in context, using techniques such as comparing object histories, Video Motion Detect (VMD), Non Motion Detect (NMD), object sizing, object tracking, object counting and behavioral analysis, Autonomy enables surveillance staff to more accurately interpret the threat that any given object or motion may pose. Autonomy performs multiple levels of recognition and analysis on video data from simple tasks such as identifying movement within a scene through to complex behavioral analysis.



Behavioral Analysis

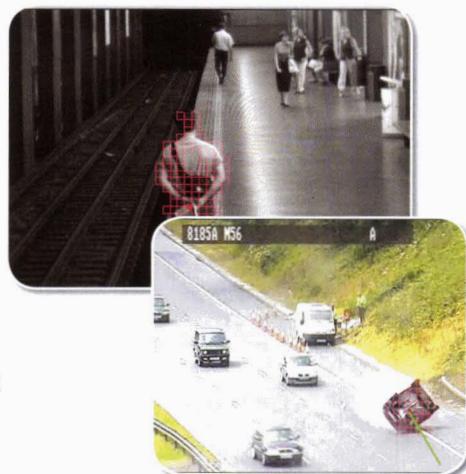
Behavioral analysis offers the most advanced form of scene recognition. Once an object has been identified and is being tracked by Autonomy Virage's Security and Surveillance technology, the system is capable of employing more sophisticated techniques for further analysis. Virage iSAS is able to differentiate between various scenarios by placing all identified behavior within the context of normal behaviors as specified by the user. By applying an associated motion history to an object, iSAS can automatically undertake complex behavioral analysis in order to recognize unusual or suspicious activity and alert surveillance staff to this immediately.

Face Recognition

Autonomy Virage also offer other powerful biometric identification tools in addition to audio recognition. The Virage fingerprint recognition solution uses the same established fingerprint minutiae techniques as a police fingerprint expert – this enables fingerprints to be located and matched against a database of millions in order to successfully identify individuals. In addition, Autonomy Virage provides facial recognition technology where other biometrics, such as fingerprint analysis, are not suitable. Facial recognition techniques are often used, for example, if suspects need to be identified at a distance and/or non-cooperatively.

Video Motion Detect

The most basic form of recognition, VMD identifies movement of objects within a specified field of view. The movement is detected as a change within the scene and an alarm triggered. Because of this, current VMD systems have a tendency to have a high level of false alarms. Autonomy Virage offers improved VMD capabilities which go beyond simple detection of movement by identifying the elements within the video that have moved and only triggering alarms when appropriate. The VMD system can therefore be set to alert when pedestrians are walking down a motorway alerting supervisors to the fact that there may be a safety issue. By identifying pedestrians moving we are able to investigate and take action quickly.



Non Motion Detect

NMD recognizes static objects within a scene such as unattended baggage in an airport. Users may set parameters to define the types of object which should be detected and also define the length of time an object should be static in order to be classed as a stationary object.

Optical Character Recognition

Neural Network (NN) based Optical Character Recognition (OCR) techniques lie at the heart of Autonomy Virage's video capabilities, supporting advanced character recognition in all conditions, providing much greater tolerance for matching poorly defined characters. Fully automated OCR in conjunction with Autonomy Virage's high quality recording of digital video images, offers users the ability to centralize all of their data and cross-reference it in order to repurpose the information quickly and efficiently for further analysis.

Object Tracking

In addition to identifying objects, Autonomy Virage can track objects entirely automatically between multiple cameras. While an object remains in a field of view, it is tracked automatically using the coordinate information to control a Pan Tilt Zoom (PTZ) camera.

Object Sizing

Detecting the size of an object or a group of objects in a field of view alerts surveillance staff to situations which may require a response. For example, where Autonomy Virage's technology is used for monitoring traffic flow, the detection of a traffic jam immediately alerts the surveillance staff and, if necessary, an additional lane could be opened to ease congestion.

Analyze & Respond

Autonomy Virage automatically monitors large volumes of video surveillance and feeds highly-targeted information to investigators in real-time, ensuring that threats are identified immediately and responded to rapidly.



Configuration and Training

As each surveillance and monitoring environment is unique, Autonomy Virage gives organizations the flexibility to set and refine their own definitions as to what behavior could constitute a potential security threat and also define the precise action to be taken once a potential threat has been correctly identified. Training and configuring an Intelligent Scene Analysis System (iSAS) does not require any specialist input from Autonomy Virage and may be performed by any system operator.

Using an intuitive user interface and live or recorded images, operators can train the system, to recognize unusual behavior which may present a threat and establish multiple definitions for multiple locations. For example, the user can train the system to trigger an alert to unattended baggage in the arrivals hall of an airport which would automatically result in a prerecorded message over the PA system. Baggage being held by airline staff however would not trigger such a response.

Virage supports a range of training methods including:

- *Non alerting content: where the system is introduced to video containing no specific events.*
- *Alerting content: involves training the system on specific events contained within the video.*
- *Simulating alerts: by inserting objects into the scene which can then be used to generate example events.*
- *Alert verification: the most sophisticated training procedure consists of using pre-generated alerts in order to enhance system training and improve performance. By allocating a series of pre-generated alerts into specific categories, such as examples of suspicious and unsuspicious behavior, the system can be configured to identify behaviors more accurately. Such user verification allows the system to build up a model of known behaviors and gives the system greater insight into what constitutes usual and unusual behaviors.*

To allow organizations to monitor a wide area against a set of diverse criteria, iSAS can be applied to any new or existing CCTV system and loaded with different configurations for different cameras or camera positions. Moreover, iSAS can be configured to identify multiple categories of alarms within a scene at the same time, each with its own set of specified alert actions. Other configuration options include masking a scene so that objects within a certain perimeter are not detected, masking alerts generated by any object within a specified area, setting time or occurrence limits on alarms generated per incident and full customization of results notification with the inclusion of metadata associated with system, camera, data, time and alarm code.

Advanced Data Analysis and Review

Understanding Brings Recognition

By automatically understanding and interpreting large volumes of video, audio and text files, Autonomy's technology identifies what is relevant and allows security personnel to focus on critical activities and confidently make more informed decisions.

Mapping and Understanding Events



Autonomy Virage automates the capture, encoding and indexing of video surveillance, creating a highly detailed index. This makes it faster and easier for security personnel to find the correct information needed in order to protect both people and corporate assets.

Content can be searched simultaneously in any language and any format, wherever it is stored.

Search options include: Conceptual Search, Natural Language Retrieval, Query By Example, Refine By Example and Cross-Language Search. The technology retrieves and returns references to conceptually related information and results are presented with summaries and hyperlinks to similar information instantly and automatically.

Extensive event viewing and searching options include instant plate matching and partial plate matching, as well as a full range of options to search by specific parameters including camera, date, time, alert code, plate and category. Where multiple cameras are in operation, users can search all cameras simultaneously through a single interface, or if desired, narrow their search to results from a specified camera. Users can create 'hot lists' of specified vehicles they wish to track closely and compare any identified number/license plate to predefined lists or perform full vehicle and driver database matching in order to match identified vehicles with any entry within the database.

If images from an overview camera are available, they can be displayed adjacent to the footage of the number plate enabling operators to view driver or vehicle images alongside number plate images. Any metadata that has been included in the database entry, such as registered vehicle owner, address or traffic records, is presented alongside each recognized number plate to enable operators to gain instant visibility into the history of any identified vehicle.

Hyperlinking

The Hyperlinking feature enables automatic matching and identifying of similar pieces of information. By automatically identifying vital relationships between information, hyperlinking enables intelligent contextual cross-referencing of content without the need for user input.

By completely removing the requirement for manual input through its use of intelligent conceptual and contextual association, Autonomy ensures the instantly generated links are always up-to-date and highly relevant to users. For example, when monitoring vehicles and containers at a port, the technology can make intelligent associations between information in a police database, imagery captured by DVR/NVR and data monitored by Autonomy to report stolen or illegitimate vehicles and/or drivers. Not only are people kept informed of the latest, most relevant information, but content duplication, time spent navigating for information, and overall costs are significantly reduced.

Hyperlinking effectively:

- Reduces the cost of maintaining unstructured information within any environment
- Reduces the time taken to navigate to related information
- Reduces duplication of effort
- Keeps people informed and up-to-date
- Retains browsers or consumers on a website through dynamically recommending further content and products

Automatic Profiling and Personalized Agents

Automatic Profiling can be used by organizations to accurately understand individual analysts' (user) interests based on their history and actions. By generating a multi-faceted conceptual profile of the user, based on explicit profiles (pre-configured agents) and implicit profiles (click-through and submission), the feature creates a very current understanding of user interests without the need for any explicit input on their part. Profiling facilitates and speeds up surveillance operations as it enables vital intelligence to be delivered to the user without requiring them to actively search for it.

Personalized Agents may be set up to proactively deliver highly relevant, accurate information to users. Agents can be trained to look for conceptually related themes from concepts a user defines either implicitly or explicitly as part of their profile. By continuously monitoring live information streams and matching relevant, conceptually related content against profiles, Agents can uncover data that may potentially hold new significance for intelligence operations, increasing overall knowledge and improving response rates. Through its automatic approach, Agents assist surveillance staff to monitor activity and information that may potentially be critical and which might otherwise have been missed or required significant investigative processes to discover.

Clustering & Spectrographs

Automatic graphical 2D Clusters and 3D Spectrographs enable organizations to analyze large sets of document data, audio or even user-profile information and automatically identify inherent information clusters, and, consequently trends and themes. Clustering provides organizations with instant high-level visibility of the knowledge base, eliminating knowledge gaps and enabling the organization to react quickly where necessary. For example, number/license plates captured by ANPR could be clustered and matched against a police database. In this way, potential correlations within data - such as repeat offences committed by the same driver attempting to disguise his actions by using different vehicles - could be uncovered and action taken to prevent future occurrences of the same instance.

Other benefits include:

- Instant high-level visibility of the knowledge base
- Automatic identification of information trends and themes
- Eliminated knowledge gaps
- Optimized information flow
- Automatic reaction information changes



2D Cluster Map



Automatic clustering of communications visualized through the Spectrograph Pane

Powerful visualization tools make it easy for users to understand and interpret data sets. Autonomy provides two intuitive Java-based user interfaces to make clusters visible:

- *2D Cluster Map: used to identify conceptual similarities and differences between clusters and display them in 2D. Based on Java Server Pages (JSP), the landscape is generated from the interrelationships between clusters and the documents contained within those clusters. Clustering provides a single overview of the clusters contained within the data, clusters that are close together correlate to higher degrees of similarity, whilst dissimilar clusters are situated further apart.*
- *Spectrograph: this user interface displays the relationship between clusters in successive periods and sets of data. Clusters are presented as a JSP-based 3D spectrograph whereby the x-axis represents information over time (enabling users to visualize how clusters develop over a given time period), whilst the y-axis represents the range of concepts defined within the knowledge base.*

Intelligent Alerting



Advanced alerting functionality monitors information in order to automatically and instantly alert users to information which may be of interest to them based on their profile or the agents they have set up. For example, if a surveillance officer had set up agents to monitor and deliver information on a particular suspect, and if the agents detected similarly conceptually related activity being discussed by another person, the system could automatically trigger an alert to this potential correlation. Instant alert mechanisms could be web interfaces, e-mails, SMS or digital alarms amongst others.

Database Integration



Autonomy Virage may be configured with existing databases containing vehicle, container, personnel and other information, or configured with a dedicated database.

A common usage is for plate recognition: once vehicles are entered into the databases, actions can be associated with each plate by assigning a code to each entry. This ensures that once a vehicle is correctly identified, pre-defined instructions will be followed. For example, a code can be assigned to authorized cars to trigger a barrier to be raised so that authorized vehicles can gain access. Where an unrecognized vehicle is detected, the system could be configured to play a WAV file which would refuse the vehicle entry and trigger a live audio/video connection which would be relayed to security staff. Codes and actions may be assigned depending on what time or date any given vehicle is identified. In addition, the system may be instructed to record footage of the vehicle and notify the driver's supervisor that they were onsite during the weekend.

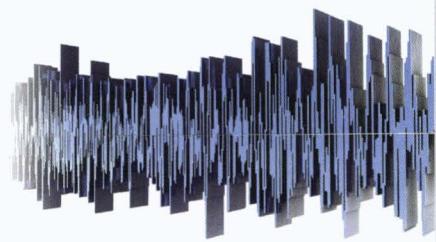
The list below provides a sample of typical actions upon vehicle recognition:

- *Raise barrier*
- *Change traffic lights*
- *Display LCD text*
- *Trigger recording via DVR/NVR (including pre-recording)*
- *Increase frame rate for higher quality recording*
- *Deny access*
- *Open live video/audio connection*
- *Alert supervisor via SMS/email*
- *Play WAV file*
- *Store image of vehicle/plate/driver*

If using the dedicated database, records can be individually entered or imported once, or periodically integrated, enabling a mass data transfer from the third party system to the Autonomy system.

Audio Processing

Autonomy Virage speech recognition technology enables security organizations to search files in video, radio and telephony systems instantly. Autonomy's speech technology is fundamentally different because it leverages IDOL's conceptual understanding of content. Whereas other technologies adopt a simple phonetic approach using only acoustic information, Autonomy achieves a higher level of understanding through advanced language modeling.



Language modeling involves concept extraction in conjunction with acoustic-phonetic methods to achieve significantly greater accuracy and better results. Simple acoustic-phonetic methods alone fail to achieve good speech to text translation. The acoustic-phonetic approach cannot differentiate, for example, between "can I" and "can eye". In this example, where the desired option is "can I", Autonomy Virage's speech technologies employ IDOL's intelligent probabilistic language modeling to understand the context of what is being said and in this way select the appropriate option "can I."

Virage's audio recognition functionality includes:

- *Speaker independence: the system is trained on a large balanced corpus of data encompassing many different variables such as different accents or male-female pitch and tone. This means the acoustic models are speaker independent. The solution works out-of-the-box with no manual training, although customization for specific accents or speakers can be done.*
- *Extensive vocabularies: there is no arbitrary limit on vocabulary size*
- *Speaker identification: audio recognition can be trained to enable individual speakers to be identified*
- *Word spotting and phrase recognition: audio can be searched by standard keyword as well as conceptual methods. Conceptual searching returns references to conceptually related information ranked by relevance or contextual distance.*
- *Patented Autonomy technology: reduces CPU and memory usage for increased speed of operations and improved performance*
- *Support for both high quality audio such as broadcast and telephony*

"Autonomy has invested significantly in the ability to locate and transcribe video and audio objects... it possesses a market-leading roster of connectors for external content sources."

Gartner, 2007

“Autonomy assists in the construction of large and complex integrations, including those involving multiple sites or networks with structurally or geographically disparate data sources.”

Forrester Research



Digital Security

Internal threats, the risk of industrial espionage and the increased value of digital assets such as computer code or HD film footage mean that logical and physical security requirements cannot be separate strategies or systems. They need to be converged and they need to refer to the operational systems used by the business as well.

Autonomy is unique in its ability to provide a single information infrastructure that can manage the lifecycle of all information assets, including how they change and who has interacted with them, across all the views of business (operational, compliance, security). Autonomy's broad Meaning Based Computing can link into every repository and data source within the organization and ensure the business information is processed, understood and acted upon.

Maintaining security and ensuring only authorized personnel gain access to sensitive data is key to almost every organization. Increasingly complex IT environments mean there are often several systems in place each requiring a different set of authentication procedures. Virage's infrastructure exactly mirrors the security entitlement required to deliver the right information to the right people according to who is entitled to see it. The World's largest and most secure intelligence organizations have deployed Autonomy to safeguard their most sensitive information assets.

Autonomy Virage is unique in its approach to managing and maintaining security and is able to seamlessly integrate with existing third party systems whilst respecting existing security. Advanced methodologies for, user authentication, data protection and verification ensure the right people have access to legitimate data. In addition, advanced functions such as mapping significantly improve system performance within even the largest, most complex environments. These unique advantages make it the number one choice for many leading organizations today.



Intellectual Asset Protection System (IAS)

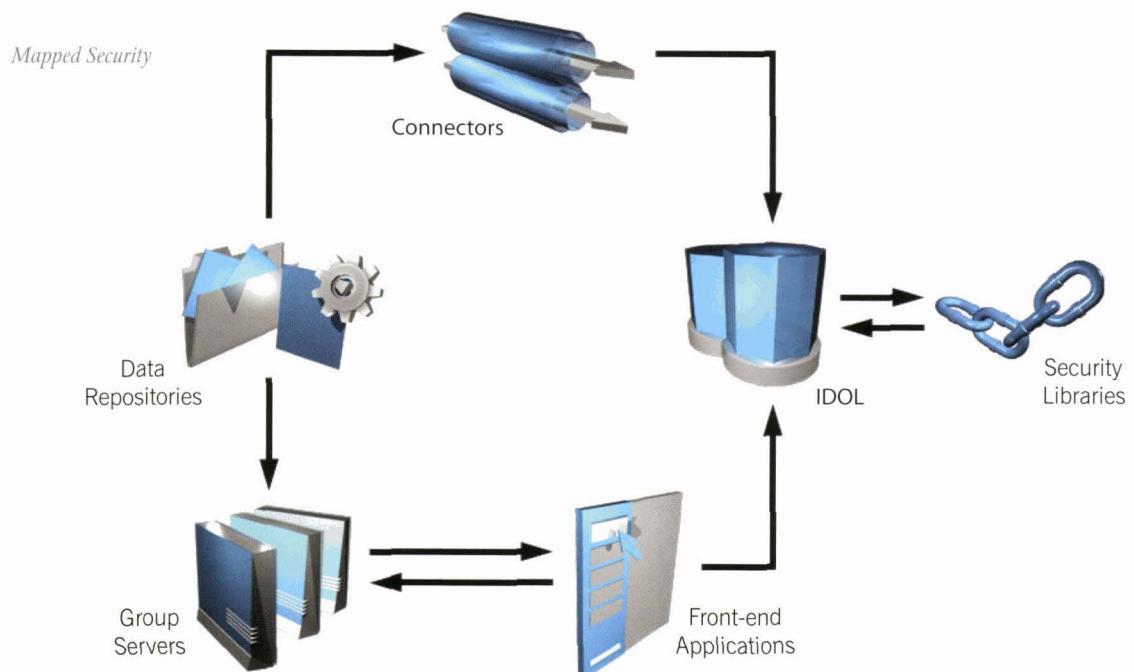
The world's largest and most secure intelligence organizations have deployed Autonomy's Intellectual Asset Protection System (IAS) Connectors to safeguard their most sensitive information assets. Autonomy provides all aspects of security management, including front-end user authentication, back-end entitlement checking and secure encrypted communication between the IDOL Server and its client applications with 128-bit Block Tiny Encryption Algorithm (BTEA). IDOL's mapped security model is the only empirically proven index security model.

Autonomy's Unique IAS Mapped Security

Only Autonomy offers mapped security - a highly configurable, secure, accurate, and fast method for respecting third party security entitlements. Existing security, including permissions based security, is mapped directly to the IDOL engine, encrypted, and stored. As a result, IDOL does not need to send any requests across the network to the data stores when building up a results list. What the user is allowed to see is assessed inline within the IDOL kernel at speeds that exceed the response times of the native repository. Unlike other techniques, the security model is never out of date as the transitional signaling mechanism within the connector layer informs IDOL in real-time of any updates or permission changes.

Since IDOL's architecture is inherently modular by design, it requires multiple subsystems to communicate with each other, often across insecure networks. All communication between these processes may be encrypted (Secure Sockets Layer), so that packet sniffers who are able to break past a firewall are unable to read the content of traffic between IDOL modules. All of the system's modules are capable of operating in a secure communications mode providing, at minimal processing overhead, the protection of 128-bit encryption. Additionally, IDOL can leverage SSL for both aggregation and querying of content, including access to SSL encrypted sites.

- Asset scalability through Mapped Security
- Group membership scalability through Group Servers
- Operational granularity via a Document-centric model enabling secure real time operation and total flexibility over your security policies



Secure Data Authentication and Personnel Verification

Extensive user authentication, data protection and verification procedures make Virage suitable for the most demanding security and surveillance environments. Virage can provide all aspects of security management including document and intra-document access control against user, group and role level entitlement; this ensures only authorized personnel gain access to sensitive data. Encrypted inter-machine and intra-process communication protocols are woven into the fabric of Virage's modular design at a fundamental level, providing secure transmission of information throughout the architecture. In addition, Virage ensures the integrity of all data captured is preserved through results encryption and image watermarking. Full audit tracking enables authorized personnel to gain immediate visibility into the history associated with any record in the system.

Archiving

Historically, the challenges and costs of storage for high quality audio and video meant that archiving assets only took place if required by corporate regulations or law. Autonomy's consolidated archive is now a viable option for the long-term storage and management of surveillance assets. The Autonomy consolidated archive is the first and only solution with the functionality, performance and scalability needed to address the requirements of collecting, consolidating, making available and ultimately destroying information from multiple proprietary systems, in numerous languages and hundreds of different content formats, in order to prepare the infrastructure for upcoming regulatory and legal challenges.

The unique architecture of the IDOL platform ensures that the search, management and retrieval of content are as scalable and high performing as the archival process. This allows for legacy CCTV footage, and processed alerts to be cross-referenced and used for ongoing investigations or as part of a complaint or insurance process.

Recording and Retrieval

Autonomy Virage supplies and supports the full range of analogue and digital video sources, allowing your organization to realize even greater value from its entire existing infrastructure.

As an integral part of crime control policy, social control theory and community consciousness, CCTV is a defining feature of today's society and a powerful tool used by corporations and governments worldwide. High quality digital and network recording facilities are a critical component of any successful CCTV strategy to ensure that potentially vital images are captured and retained safely for further analysis. While CCTV footage is popularly believed to play an important role in crime detection and prevention, in order for a system to be truly effective, robust recording equipment is a priority.

Moreover, simply capturing and storing images indiscriminately does not, in itself, constitute an effective solution; recording technologies which merely capture and store footage fall desperately short of the levels of complexity required by most security and surveillance environments. Autonomy Virage's Digital and Network Video Recorders (DVR/NVR) offer organizations state of the art recording technology together with advanced retrieval functionality for rapid image recall to ensure that key images can be located quickly and easily for further analysis.



Bringing fresh intelligence to digital and network recording and transmission, Autonomy Virage's DVR/NVR is sophisticated enough to alter its function in response to changing circumstances and distinguish between different types of behavior and alarm. With a totally flexible system configuration and a storage capacity expanding into petabytes, DVR/NVR can be tailored for the widest range of applications, and its ability to record at full resolution across multiple channels and prioritize its activity dynamically, really does make Autonomy Virage a new breed of DVR/NVR.



Dynamic Resources Prioritization

Surveillance staff can link straight to live images from multiple cameras and locations linked to a DVR/NVR unit. All images captured and retained by DVR/NVR resolve fine detail and allow users accessing images, either on the fly or in retrospect, to analyze detailed, high resolution images.

Unlike other systems which require extensive configuration by an administrator or are limited to one simple recording option, Autonomy Virage DVR/NVR is entirely flexible and can perform multiple recording functions simultaneously and reconfigure itself dynamically based on an alarm. Increasing the frame recording rate, switching between cameras or switching between storage buffer types, ensures resources are prioritized dynamically according to demand. In order to ensure a commitment to recording and storing high quality images likely to be required for post event analysis, cameras may be configured to change their frame recording rate according to certain pre-defined conditions. For example, when integrated with Intelligent Scene Analysis System (iSAS), if certain activity is detected within the field of view, such as someone leaving a bag unattended, DVR/NVR can be programmed to react to this alarm and automatically increase the recording frame rate prior to, during and after the event.

- *Video Motion Detection: DVR/NVR can be configured to react once motion is detected within a specified scene or particular area within a scene*
- *Digital: these can be generated by physical movements including the opening of a barrier or door; when such movement is detected, DVR/NVR can be configured to respond automatically*
- *Time multiplexing: using the VMD capabilities on every IP camera feed, Autonomy Virage can optimize the use of advanced iSAS analytics as and when a situation dictates. This way TCO can be improved while all video feeds are effectively monitored*
- *Surveillance alarms: when integrated with other systems such as ANPR or iSAS, pre-defined alarms are automatically relayed to the DVR/NVR unit to ensure appropriate images are captured and stored upon recognition of certain vehicles or behaviors*

Storage Capacity and Principles

Autonomy Virage ensures that storage requirements are actively managed for optimum performance by automatically overwriting all captured images after a specified time.

Autonomy Virage's DVR/NVR offers extensive storage capabilities and hard disk drive (HDD) capacity which can be adapted to suit individual project requirements. While storage costs have decreased significantly in recent years, and Autonomy continues to lead the market in providing comprehensive storage facilities, in most circumstances, it is neither necessary nor desirable to store large quantities of irrelevant video footage.

DVR/NVR can be configured to prioritize the storage of images accordingly. All images are stored to a HDD which is integrated within each DVR/NVR unit. The system uses HDD circular buffers working on a first-in first-out (FIFO) principle to ensure that there is always storage capacity available for new images. Buffer size determines the maximum length of storage period available, so by using multiple buffers of differing sizes, images can be stored for different lengths of time. Autonomy Virage can record and store all background images routinely for a specified time, e.g. for 7 days or 30 days, depending on buffer size. When required, Autonomy Virage can also store footage from immediately before, during and/or after an event on a separate buffer so that it is available for retrospective analysis. If policies dictate C&C can be used to automatically manage the longer-term archiving, retrieval and disposition of important video footage so that it can be utilized as a potential asset for years in the future.

Storage levels are automatically monitored to make sure that all necessary images are captured and archived correctly. Should storage be consumed faster than expected, either as a result of a higher than expected number of events or due to a miscalculation, the user will be automatically alerted to this in order to ensure that images may be continually recorded and stored according to requirements. In order to increase the amount of images stored within any given DVR system, the compression level of images may be modified at any time, thereby making the system extremely flexible to changing requirements.

Pre-event recording can be triggered to ensure that images which precede a significant event can be appropriately captured and stored for later analysis. These storage techniques ensure that all images surrounding potentially significant activity can be kept without the need for extensive storage capacity.

Predefined events can be configured to increase the recording frame rate on key words or hard wired alarm inputs. HDD performance remains unaffected by both search and playback features. The storage capacity of the installed system will determine how long images are kept. In addition, limits can be set on individual users to limit how far back they are able to search through footage.



Conclusion

Security and surveillance operations are widely regarded as an integral and essential part of today's society. As organizations at all levels, ranging from law enforcement agencies and governments to large corporations and public bodies seek to enhance the security and safety of assets and personnel, security and surveillance technologies are an increasingly commonplace and necessary part of our daily lives. Growing demands to protect public safety, buildings and commercial assets accentuate the need for robust security and surveillance solutions in a wide range of environments. Consequently, surveillance techniques are increasingly prevalent, especially in many European countries where CCTV systems are now extremely customary. While CCTV cameras in themselves do much to establish public and corporate confidence, the effectiveness of such systems when used in isolation is often limited. Organizations seeking to implement a truly effective and responsible security and surveillance strategy must consider embracing additional systems such as EPOS, CSM, ANPR, iSAS and BIS as well as addressing the way in which data and images obtained from such techniques are recorded and stored. Furthermore, as security requirements become increasingly complex and threats posed to individuals, corporations and nations more sophisticated, it is ever more critical that organizations gain a holistic view of their security and surveillance procedures.

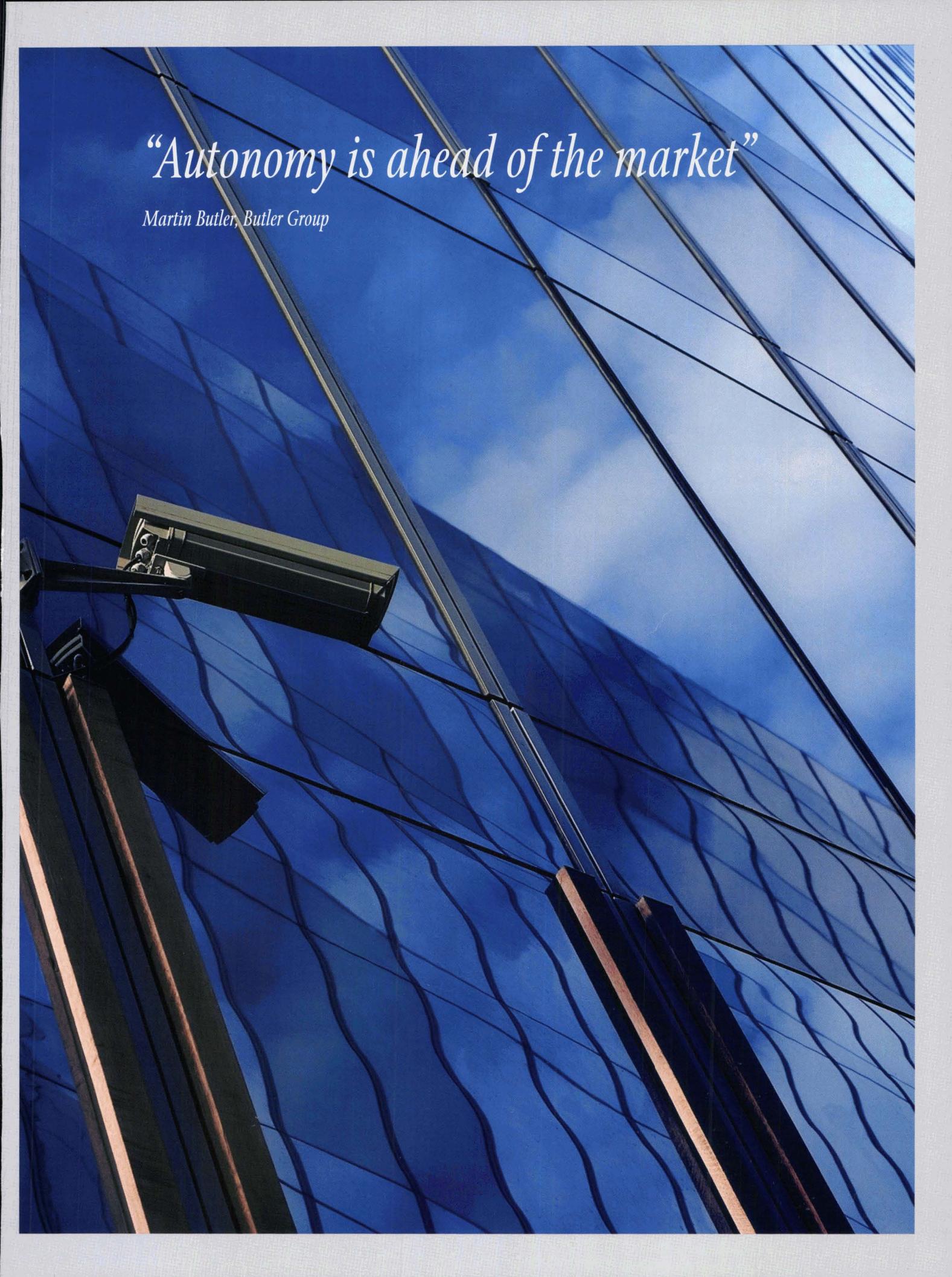
The ability to correlate and cross reference data gained from multiple applications such as ANPR and iSAS with other sources allows organizations to adopt an intelligence led approach to security and surveillance operations. Autonomy Virage offers a comprehensive solution which enables organizations to implement key solutions for specific requirements and support the overall objectives of their security and surveillance strategy. By incorporating core IDOL technology, Autonomy Virage Security and Surveillance is able to automatically understand and interpret the potential significance of multiple pieces of security data, and correlate that information with other known intelligence to enable organizations to implement comprehensive security and surveillance solutions. Autonomy Virage's unique approach brings new visibility and intelligence to security and surveillance operations and equips organizations with the technology they need in order to safeguard public, private and corporate assets and respond effectively to security threats today and in the future.

Trusted by key law enforcement agencies, governments, retailers and major transport service providers, Autonomy Virage significantly complements all surveillance operations.



“Because it's being used in a legal application, there was a major focus on using a software product that ensures reliable results. Autonomy's language analysis and relevance ranking gained our confidence that the system is reliable and that it meets expectations for precise information delivery.”

Dan Graser, US Nuclear Regulatory Commission



“Autonomy is ahead of the market”

Martin Butler, Butler Group

Headquarters:

Autonomy Inc.

One Market, 19th Floor, Spear Tower,
San Francisco, CA 94105, USA
Tel: +1 415 243 9955
Fax: +1 415 243 9984
Email: info@us.autonomy.com

Autonomy Systems Ltd

Cambridge Business Park,
Cowley Rd, Cambridge, CB4 0WZ, UK
Tel: +44 (0) 1223 448 000
Fax: +44 (0) 1223 448 001
Email: autonomy@autonomy.com

Other Offices:

Autonomy has additional offices in Antwerp,
Barcelona, Beijing, Bogota, Boston, Buenos Aires,
Calgary, Cambridge, Chicago, Dallas, Darmstadt,
Kuala Lumpur, London, Madrid, Mexico City, Milan,
Munich, New York, Oslo, Ottawa, Paris, Pleasanton,
Rome, San Francisco, Santa Clara, Shanghai,
Singapore, Santiago, Sao Paulo, Stockholm, Sydney,
Tokyo, Utrecht and Washington, D.C.

www.autonomy.com

Copyright © 2009 Autonomy Corp.
All rights reserved. Other trademarks are
registered trademarks and the properties
of their respective owners.

[AUT AO] 02.09