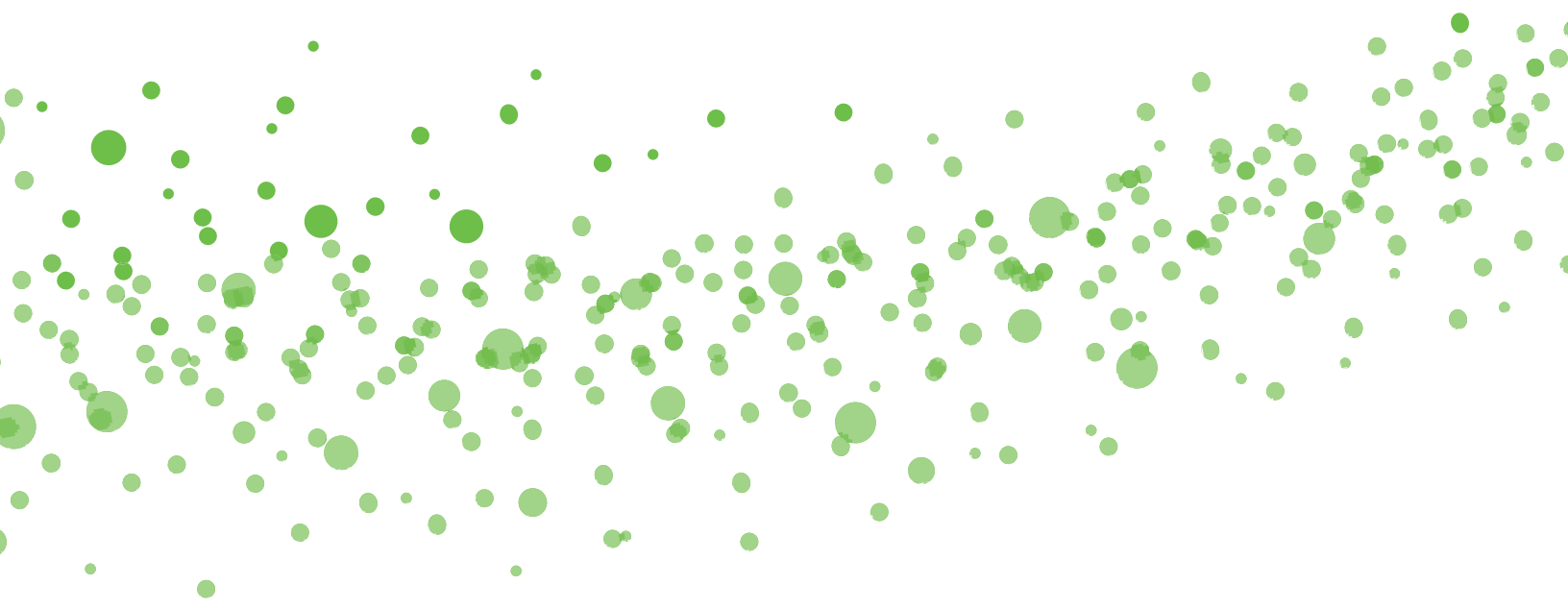


HOW TO OVERCOME THE STORAGE CHALLENGES OF ADOPTING SURVEILLANCE AI



EXECUTIVE SUMMARY

Businesses are using sensors, Internet of Things (IoT) devices, and surveillance cameras to manage assets and resources more efficiently than ever before. Facial recognition, remote patient monitoring, and wrong-way driver detection are just a few of the advanced, insight-driven technologies seeing greater adoption today. At the center of it all is data, which is continuously being gathered, analyzed, and utilized for real-time decision-making. This data collection places a greater workload on the storage systems behind the sensors. Smart solutions are only as good as the data they store, analyze, and deliver in a timely manner. This white paper discusses rapid changes in the global datasphere, the impact of real-time data analysis in safe and smart cities, and the storage best practices system integrators should implement to improve data flow and insights for customers.

ABOUT SEAGATE TECHNOLOGY

Seagate Technology was founded on the belief that data is potential, and Seagate is committed to helping humanity maximize that potential by harnessing the datasphere all around us. For 40 years, Seagate has driven innovation with precision-engineered hard drives and technology solutions that have empowered billions of people and businesses to realize their full potential. Over a decade ago, Seagate pioneered surveillance-optimized storage for security applications. Today the company is an industry leader in reliability, capacity, and innovation.

ABOUT SURVEILLANCE PORTFOLIO EDGE TO CLOUD

From edge to cloud, Seagate provides a suite of high-performing storage solutions for surveillance, artificial intelligence (AI), and smart cities applications. For businesses solely recording video, Seagate's SkyHawk™ drives are tuned for 24x7 workloads and equipped with ImagePerfect™ firmware to enable smooth, clear video streaming. For applications using edge-computing solutions, SkyHawk AI is an optimal hard drive that records up to 64 HD cameras and supports 32 streams of AI metadata. Data centers that aggregate and analyze petabytes of data for trending and reporting benefit from Seagate's enterprise-class Exos® drives. Compliant with Federal Information Processing Standards and Trade Act Agreement protocols, these drives provide peace of mind as well as expanded storage capacity. They also come with Seagate Secure™ cybersecurity features, including self-encrypting drives. For cloud users using hot data, where insights need to be delivered immediately for real-time decision making, Seagate's Nytro® solid-state drives enable instant data availability.

ABOUT RASILIENT SYSTEMS

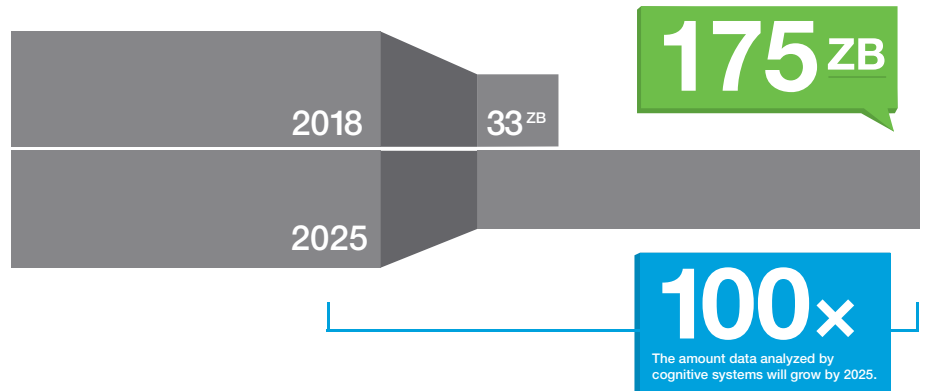
Rasiliant Systems is a global supplier of servers and storage systems. Its purpose-built technologies enable forensic-grade IP video surveillance applications, demanding the ultimate surveillance quality and reliability to protect customer interests. Rasiliant's solutions deliver streamlined recording, information integrity, and scalable architecture. The company is known for its patented technologies and storage algorithms that provide the ultimate performance.

Rasiliant's new patent-pending NFDCloud solution is a VMS-agnostic, video surveillance cloud platform designed for enterprises utilizing video cameras at multiple branches. It is a fully redundant, highly scalable centralized storage system with ultra-high data integrity and reliability. With NFDCloud, surveillance recordings at branch offices are uploaded via NFDLink to the central storage, NFDStack. NFDCloud architecture enables the use of low-cost, commonly available broadband or wireless services to transmit video, which generates savings in both capital expenditures and operating expenses. Featuring powerful storage drive technology from Seagate with the latest cybersecurity mitigation capabilities, NFDCloud deploys 256-bit encryption and TLS v1.2. Experts in surveillance, the Rasiliant team is fully committed to providing personal customer support for the life of its server, storage, and cloud solutions.

GLOBAL DATASPHERE EVOLUTION

Data is in flight all around us and has become an essential part of the human experience.

IDC forecasts the global datasphere will increase from 33 zettabytes in 2018—where one zettabyte equals a trillion gigabytes—to 175 zettabytes in 2025. Global market intelligence firm IDC reports that by 2025, “every connected person in the world on average will have a digital data engagement over 4900 times per day.”¹ This breaks down to about 1 digital engagement every 18 seconds. The number of IOT devices will grow to 80 billion² by 2025 as well, and these smart solutions will monitor business processes and enhance everyday life activities.



¹ David Reinsel, John Gantz and John Rydning, “Data Age 2025: The Digitization of the World from Edge to Core,” IDC, published November 2018, accessed September 4, 2019, <https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-data-age-whitepaper.pdf>

² Michael Kanellos, “152,000 Smart Devices Every Minute In 2025: IDC Outlines The Future of Smart Things,” Forbes, published March 3, 2016, accessed September 4, 2019, <https://www.forbes.com/sites/michaelkanellos/2016/03/03/152000-smart-devices-every-minute-in-2025-idc-outlines-the-future-of-smart-things/#27a910d34b63>

Harnessing the Power of Data

Executives are ultimately looking to interpret the data aggregated by IoT devices, sensors, and security solutions and leverage it to improve operations, cost-savings, and customer satisfaction. The deployment of cognitive systems—such as machine learning, natural language processing, and AI—that actively analyze this data for proactive decision-making are on the rise. IDC indicates that “the amount of analyzed data that is ‘touched’ by cognitive systems will grow by a factor of 100 to 1.4 zettabytes in 2025.”³ The use of cognitive systems is opening the door to new business opportunities and a greater return on investment in all markets.

Storage in the Era of AI

New enhancements allowing security solutions to be used for business intelligence is driving the demand for data-hungry applications. The increased use of AI systems in security has warranted a shift in recording and storage technologies.

Standard surveillance systems primarily recording footage were typically write-only applications. Today surveillance systems with AI have mixed read/write workloads. Previously, users relied on cloud data centers to manage the unstructured data and analysis. However, this setup often causes latency and delays as all video and metadata must be transferred off-site for analysis.

To remedy this issue, storage providers are building AI into video NVR systems and harnessing the power of micro-datacenters so that initial processing, analysis and pattern recognition occurs in real time at the edge. The edge refers to servers and appliances outside of data centers that are located regionally and are closer to endpoints, like surveillance cameras and sensors, where the data is first captured.

Development of AI-enabled NVRs and edge computing devices are driven by cheaper graphics processing units (GPU) with enhanced analysis capabilities, as well as better storage options. In particular, new hard disk drives with fast writing data speeds, high read performance, and support for both AI and video workloads have become attractive solutions for system integrators. Innovation in telecommunications with 5G, advanced sensors, and intelligent surveillance cameras are also driving the evolution of surveillance beyond traditional security for AI applications.

After the initial video ingestion and analytics at the edge, video is pushed to the back end or cloud. In this centralized environment, video and AI metadata are consolidated for deep learning activities to train the system to be more predictive and provide a more holistic view of the video data collected. In the past, users primarily used cloud storage to satisfy legal and corporate retention policies; however, that has since changed. Data no longer languishes in the back end to eventually be discarded. Now data in the cloud is used to bring predictive power and intelligence for better decision-making like never before. Ultimately, implementing robust storage solutions from edge to cloud enables smarter surveillance systems over time through AI training and rapid insights for command center operators to quickly respond to time-sensitive scenarios.

³ David Reinsel, John Gantz, and John Rydning, “Data Age 2025: The Evolution of Data to Life-Critical.” IDC, published April 2017, accessed September 4, 2019, https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/workforce/Seagate-WP-DataAge2025-March-2017.pdf

⁴ Jacky Zhang, “The World Market for City Surveillance Equipment Exceeded \$3 Billion in 2017,” IHS Markit, published March 28, 2018, accessed September 4, 2019, <https://technology.ihs.com/601377/the-world-market-for-city-surveillance-equipment-exceeded-3-billion-in-2017>

Biggest Impact: Safe and Smart Cities

The development of safe and smart cities continues to be one of the sectors where surveillance systems and data will have the greatest impact. Research firm IHS Markit indicates the global market for city surveillance exceeded \$3 billion in 2017 and is expected to increase each year by 14.6% from 2016 through 2021.⁴

The research firm also reports that China is one of the strongest adopters of safe city surveillance technologies.

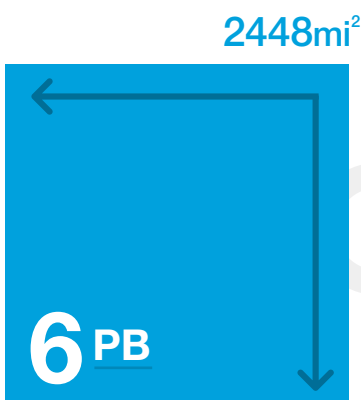


Real-World Example: Shanghai

With approximately 24 million residents, Shanghai is the most populous city in China. When it hosted the World Exposition in 2010, Shanghai attracted even more people as the Expo welcomed 73 million visitors. To improve public safety and security for the Expo and throughout the metropolis, Shanghai implemented a safe city surveillance system that utilized 15,000 cameras.

These cameras monitored 2448 square miles. They also generated six petabytes of data. To ensure smooth recording without dropped video frames, Shanghai partnered with storage provider, Rasilient Systems. The city deployed an IP-SAN solution from Rasilient that comprised 120 PixelStor 3000 2U / 12-bay storage bridge bay enclosure units. An additional 360 PixelStor 100e expansion enclosures were also deployed.

Having a reliable storage system helped ensure the success of the entire surveillance operation so that areas were continuously monitored to detect and deter crime. Because of Shanghai's positive experience with Rasilient's storage system, Rasilient was awarded a contract to extend the project for several years.



SMART CITY SECTORS

Beyond citywide surveillance, smart cameras, IoT sensors, and edge computing devices with AI are being deployed in smart cities to equip businesses and citizens with data that can enhance the urban experience. IHS Markit predicts there will be at least 88 smart cities worldwide, a substantial increase from 21 cities in 2013.⁵ The collection and delivery of data is the crux of the smart cities operation. Here are three segments within smart cities where organizations are using data to address urban woes.

⁵ "Smart Cities to Rise Fourfold in Number from 2013 to 2015," IHS Markit, published July 29, 2014, accessed September 4, 2019, <https://news.ihsmarkit.com/press-release/design-supply-chain-media/smart-cities-rise-fourfold-number-2013-2025>

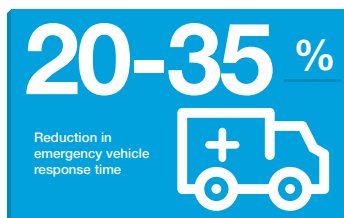
HEALTHY LIVING AND SAFETY: Data captured by IoT devices and video are utilized to not only improve the quality of healthcare, but also the kind of preventative measures implemented to ensure a healthier population.

In hospitals, IoT sensors and video devices enable remote patient monitoring, providing real-time alerts of blood pressure and other body indicators to staff who can intervene before a situation escalates to a crisis.

The end result is lower mortality rates. When it comes to preventive health measures, advanced IoT devices and video solutions are employed for air quality monitoring, alerting sensitive groups to potentially dangerous conditions. Population health programs are using data collection and analysis of large sample sizes to identify the demographics most at risk for specific health issues. With data driven insights, these entities provide citizens with more tools, such as free wellness guides, to inspire behavior changes that mitigate the risk for certain health conditions. Safe city policies that reduce violence and crime rates also aid in keeping healthy citizens out of healthcare facilities. Body-worn cameras, video cameras with analytics, gunshot detectors, and home security systems are some of the notable technologies enhancing public safety efforts. These sensors enable real-time crime mapping and predictive policing, which can help to reduce assault, robbery, and burglary incidents by 30% to 40%, according to McKinsey Global Institute's 2018 Smart Cities report.⁶

MOBILITY: Traffic congestion and roadway infrastructure are often the top struggles that growing metropolises face. Intelligent traffic lights allow for optimized routes based upon mobility patterns. As a result, roads are made safer, commutes can be shortened, and emergency response times are reduced by as much as 20% to 35%, as stated by the McKinsey Global Institute. Parking shortages, another common challenge for thriving cities, can also be ameliorated. Advanced parking systems that use

sensors to determine occupancy levels help drivers determine space availability, creating a better user experience. Interconnected smart city technology also provides the infrastructure framework for autonomous vehicles, vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications, help in identifying pedestrians approaching intersections, road hazards, and accidents in real time. All of this data is being acted upon to ease congestion and improve traffic flow.



ECONOMIC DEVELOPMENT, HOUSING AND COMMUNITY

ENGAGEMENT: Deploying smart city technology can have positive economic impacts, enabling urban centers to better appropriate resources and disseminate information to residents. Smart energy usage meters allow for more frequent readings and energy consumption tracking, providing citizens with information that can be used to facilitate lifestyle adjustments that generate cost savings. With a smart water meter and monitor, families can assess how much water was used for a particular sprinkler interval and choose whether to water lawns for a shorter amount of time. McKinsey Global

⁶ "Smart Cities: Digital Solutions for a More Livable Future," McKinsey Global Institute, published June 2018, accessed September 4, <https://www.mckinsey.com/~media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.ashx>

⁷ "Smart Cities: Digital Solutions for a More Livable Future," McKinsey Global Institute, published June 2018, accessed September 4, 2019, <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/smart-cities-digital-solutions-for-a-more-livable-future>

Institute reports that water-consumption tracking systems can help reduce residential water usage by as much as 15% in cities.⁷



Additionally, platforms are becoming available to the public providing helpful insights, such as roadblocks to avoid, disturbances to be aware of, and inviting real-time incident reporting.

The result is enhanced safety and community engagement. For enterprises, smart sensors deliver valuable insights about the local population, such as high foot-traffic areas. Business owners may use this information to choose the best business location, maximize advertisement placements, and deliver more focused marketing messages, which creates a higher marketing ROI.

STORAGE CONSIDERATIONS FOR DATA HUNGRY APPLICATIONS

To accommodate this deluge of data collection for smart cities and other AI deployments, system integrators and solution architects need to ensure they have the proper storage configuration. Otherwise, customers will be subject to dropped frames and data loss, which inhibits deep learning and predictive analysis. Here are the top storage best practices for security professionals.

- 1. IMPLEMENT IT 4.0 ARCHITECTURE** – In this era of unprecedented data collection and analysis, a new storage architecture is needed. Because of the plethora of sensors used for advanced applications, integrators can no longer rely on the cloud alone as a viable or even cost-effective solution. Instead, integrators need to deploy high-performing storage solutions at each stage of the data flow, from the endpoints, edge, and cloud. This is referred to as IT 4.0. For more information, refer to the [IT 4.0 Storage Framework infographic](#).
- 2. SELECT THE RIGHT HARD DRIVE** – Not all hard drives are created equal. When it comes to powering your DVR, NVR, or server, choose a hard drive that is purpose built for surveillance. Standard desktop drives are best suited for applications that operate 8 hours a day, 5 days a week. This is not the case for surveillance systems, especially for heavy analysis use cases. For AI and smart city deployments, cameras are recording 24x7, and storage systems often have longer retention periods for deep learning. Integrators would do well to utilize a hard drive like Seagate's [SkyHawk](#) and [SkyHawk AI](#), which are seventh-generation products optimized for surveillance with 3x the workload of typical desktop drives. They record up to 64 HD cameras—storing 10,000 hours of video—and feature ImagePerfect™ firmware to improve streaming. SkyHawk AI also supports 32 streams of AI metadata. Built-in rotation vibration sensors ensure SkyHawk and SkyHawk AI perform optimally in 16+ NVR bay environments. For centralized storage locations that need to scale to petabytes of data from thousands of cameras, Seagate [Exos enterprise-class drives](#) features higher capacities, SED and cybersecurity features. Seagate [Nytro solid-state drives](#) also improve speed and performance for blade servers managing hot data.
- 3. EMPLOY DRIVE MONITORING SOFTWARE** – To ensure the longevity of the overall surveillance and storage system, select hard drives with embedded monitoring software, such as SkyHawk Health Management (SHM). Built into SkyHawk drives, SHM provides continual updates on how the drive

is operating and makes recommendations to improve functionality and limit deterioration. SHM may alert the user to modify the temperature settings to keep the drive from overheating. Before a drive fails, SHM will recognize the symptoms and recommend a backup. By using SHM, integrators can proactively support surveillance systems with prevention, intervention, and recovery from adverse conditions. Gaining live alerts on potential issues or threats reduces the need for costly maintenance services.

4. **ENROLL IN DATA PROTECTION SERVICES** – For additional peace of mind, integrators should opt into data recovery services. In the event of a power outage, vandalism, equipment malfunction, or natural disaster, customers can still retrieve their data for up to two years with Seagate's Rescue Data Recovery Services plan.

RIGHT PLACE, RIGHT TIME, RIGHT SOLUTION

From small businesses to large enterprises to smart cities, entities are relying on data to improve operations, safety, and the user experience. Thanks to AI, integrators and solution architects are using IoT devices, surveillance cameras, and other sensors to capture data in more creative ways. However, this data is rendered useless unless it is securely recorded, analyzed, and delivered for actionable results. It is critical that robust storage systems are implemented from edge to cloud for intensive recording and heavy analysis applications. When powered by the right drives optimized for 24x7 workloads, these storage systems can accommodate everything from real-time data aggregation and analytics to deep learning in the cloud.

By implementing the best storage architecture and technologies, businesses can leverage data in real time to respond more quickly to high-risk scenarios and make smarter decisions that have a tangible impact.

