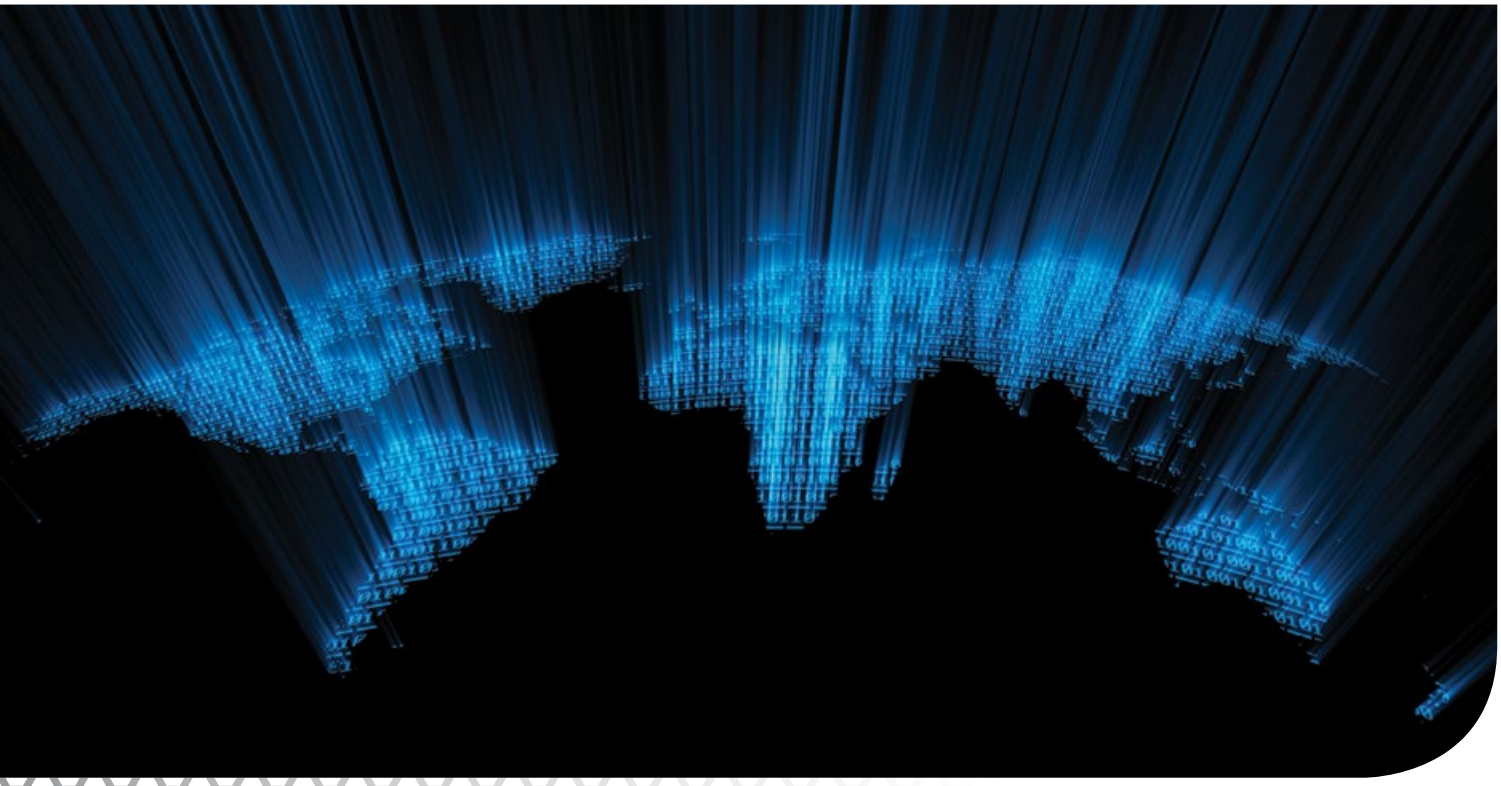
Metadata

The Details That Deliver Smarter Surveillance



SYNECTICS

Introduction

Effective surveillance solutions that can filter huge amounts of data from a vast array of information from different sources, delivering only the details operators need, can make the complicated simple. But what if operators do not know what information they need?

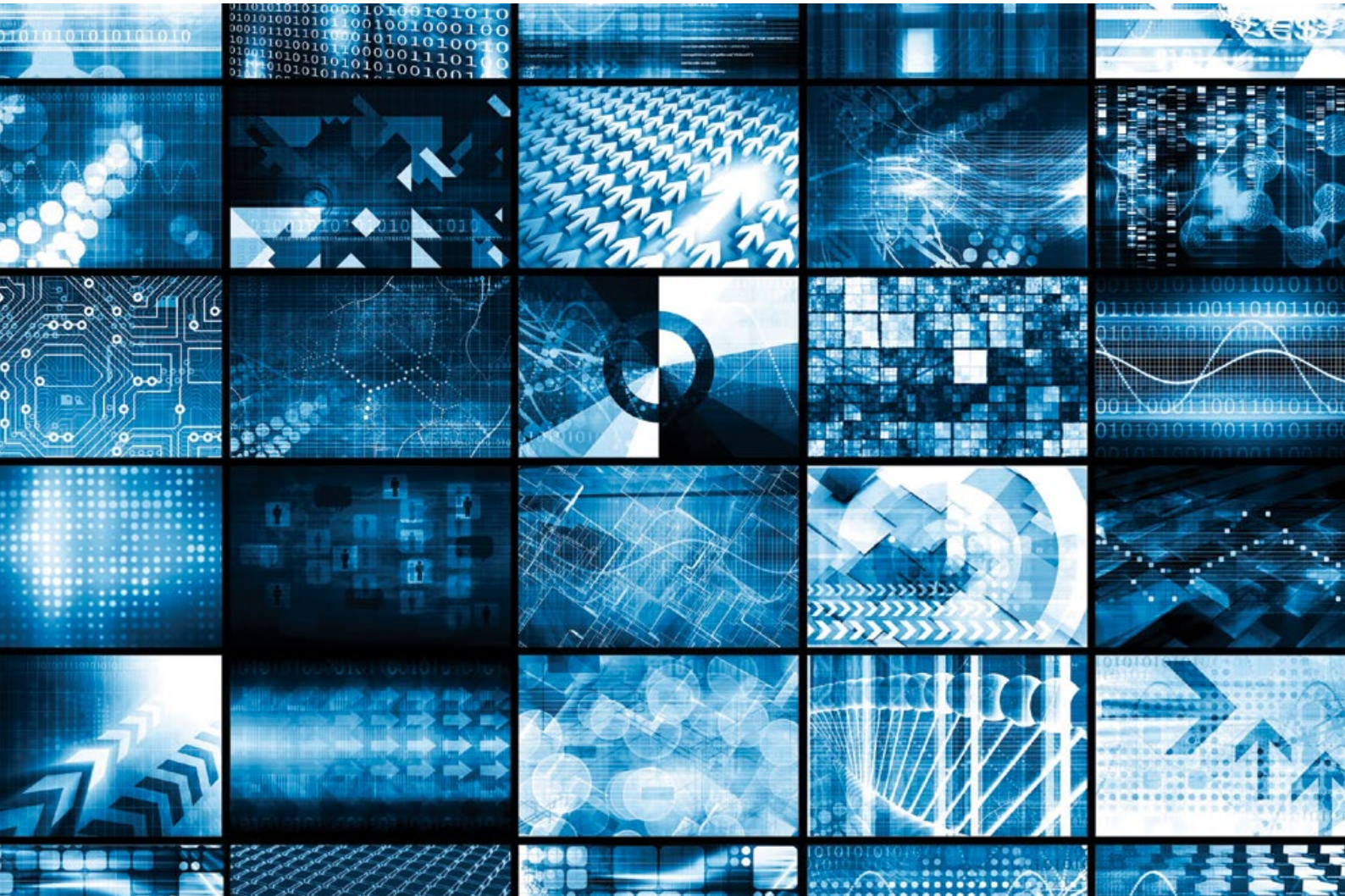
The reality of threat, incident detection, and reaction is that the irrelevant can become relevant in an instant and that deviations from the norm do not always fall into neatly segmented scenarios. Knowing what information will be needed is not always possible until it is needed.

And this is precisely why metadata is so important to modern day surveillance.

Metadata is essentially data that describes other data. Color, size, shape, position, volume, speed, voice, source, length, and direction; these are all 'meta' descriptions that can and do apply to any digital data – including video – captured for any purpose, from any number of systems used by an organization.

Being able to search, sort, and retrieve information using these descriptive tags, which provide uniformity across different hardware and software platforms, is a powerful resource that can deliver tangible benefits for improving site security and operations.

This white paper explores these benefits in detail and looks at how integrated surveillance command and control solutions are supporting and harnessing metadata search capabilities to deliver much more than video categorization.



Video and Metadata

Before exploring those wider capabilities however, it is first useful to understand how important metadata is in terms of video management.

Video content is different to other forms of digital information in that it is not readily searchable – surveillance software does not view footage on screen and 'understand' what it sees as a complete image. What it does understand is metadata that identifies visual elements. The metadata essentially assigns digital meaning to each frame (and the objects within it) by applying absolute descriptors that are identifiable, measurable, and trackable.

Once software can 'see' in this way it can understand and search with context, by object type, size, movement (including type of movement), time, location, and number plate, to name just a few possibilities.

Visual baselines can be set using metadata to define what is 'the norm' for any feed originating from any specific camera(s), thereby enabling software to recognise any degree of deviation.

As all data is seen, stored, and paired with the appropriate video content, making any detail that could potentially be relevant to events available in an easily searchable format that can be retrieved at any point is vital.

Searching and selecting video becomes as straightforward as a Google search, aiding actions including:

Threat Detection
Metadata enables integrated surveillance solutions to 'understand' (independently of operator input) changes in frame – from a package left for too long, to suspicious movement patterns. Importantly, it also enables independent analysis of which deviations matter; moving tree branches versus airborne objects; moving adults versus moving children; moving people versus repeated movement by one specific individual. Surveillance systems unable to differentiate in this way often operate with blind spot areas – zones that would otherwise be too susceptible to false alarms. This no longer needs to be the case, and means that threat detection capabilities are significantly improved.

Evidence Gathering
Using metadata to include and/or exclude footage can speed up evidence identification and retrieval considerably. Consider a police investigation of a vicious physical assault that took place in a city center car park.

The police report identifies that the attack happened between 10pm and 3am and that the suspect was wearing a red hoodie. The area of the alleged attack is covered by two PTZ cameras. Using metadata, local authority control room operators can immediately rule out footage that falls outside of the timeframe. Rather than sit through 5 hours of footage, they can then use metadata search algorithms to only show footage when the PTZ cameras were positioned to deliver a specific field of view (covering the alleged attack location). Applying a search for 'red' and 'moving' further concentrates the search to facilitate rapid identification of any supporting footage that exists.

Proactive Investigation
The same process can also be used to proactively investigate an incident. Consider this chemical plant example, for instance.

Only a set amount of barrels are permitted in a loading zone but metadata analysis by surveillance software reveals a numerical deviation that automatically alerts security teams to an additional barrel. The surveillance team then use movement-related data searches to scan recent footage revealing that the barrel was delivered by an individual in a van that would have had to pass through security gates. Footage from the gates is immediately called up and frames are searched for an ANPR match to verify clearance/authorization.

This process enables the team to quickly investigate a potential threat and, in this scenario, demonstrate supplier error rather than any malicious intent.

Data Sources and Integration

Metadata is an invaluable tool in terms of video management. But its true potential is realized when applied to multi-system searches that span visual, audio, and process-related inputs. Without system integration and consolidation, this is an almost impossible task for any site of scale.

RFID tracking, GPS coordinates, tampering alerts, meter readings (e.g. temperature or chemical levels), access control records, noise detection, and point of sale transactional data; these are invaluable and common data sources for the safe, secure, efficient and, where appropriate, profitable management of a site.

Unifying them with visual data via an open-protocol command and control platform creates a substantial databank, and metatags provide a universal 'language' to search, sort, and use that bank. System type becomes almost irrelevant in favour of information content.

The following are examples of metadata search applications where site systems are intelligently integrated.

Safety Policy Enforcement
A major infrastructure development requires workers to wear yellow high-visibility protective clothing in designated hazardous zones – zones that are not compartmentalized by any form of physical barriers. Metadata can be used to review adherence to such policies over a specified time period by looking at color, movement, location, head counts, clock-in/clock-out data, and access control. This can then be used for training purposes and/or disciplinary action where required.

Service Level Agreement Verification
Any organization working with suppliers to deliver against set service level agreements can utilize integrated metadata searches to monitor deliverables against agreed terms. Movement on specific days of the month in key site zones (e.g. deliveries, maintenance), stock levels, staffing provision, and access patterns can all easily be searched and verified.

Lone Working
A utilities or gas plant may employ lone workers to patrol and maintain remote site locations/substations. In this instance, metadata analytics may be used to monitor for warning signs such as delayed check-in times (perhaps via SMS or numerical code), thermal reading in multiple zones (i.e. more than one person), or GPS data showing no movement or minimal movement over a specified time period. The same approach could also be used to monitor the safety and progress of emergency response personnel.

Fraud Prevention
Control room operators – perhaps in a casino, leisure complex, or retail chain – could use metadata searches to interrogate cash refund data. They may request, for example, to be shown when refunds were issued (point of sale data) where only one person (surveillance footage) was present. This process could be used to detect fraudulent activity/staff issues.

Social Media, Context, and Investigation

Another increasingly relevant source of metadata is social media. Though some caution has to be applied in terms of information veracity, user-generated detail shared publicly via social platforms has increasing relevance to areas such as public space, high security, and critical asset protection.

Twitter, for example, is now often the first source of breaking news – from reports of banking malfunctions (people unable to access funds via ATMs), to first-on-scene accounts of people or scenarios posing a risk to public safety – and as such can provide valuable context.

As a result, many surveillance command and control platforms that unify site systems are also now evolving to integrate public social media feeds such as Tweets, RSS info, and video. Key phrases, location data (positional information via location services), and visual triggers are constantly being generated, making metadata searching a useful tool for operators to hone in on relevant details.

Repeated referencing on public posts of a geographic location close to a high-security site, for example, could be a key search used to generate an automatic alert for security teams to investigate. Crowd management, perpetrator tracking, and incident escalation monitoring are all areas where social platform metadata is likely to have a significant impact in the future.

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Considering Storage

Whether the source is visual, numerical, positional, operational, or social – the ability to search significant pools of data for information of such diversity and scope is a major development that will no doubt have dramatic implications for a number of sectors.

Is there an issue with 'always-on' data collection, classification, and search? Surely this level of detail requires increased storage capacity? It's a logical assumption but not an accurate one.

The primary purpose of metadata is to make searching data generated by an integrated surveillance solution more meaningful and manageable. There are some essential requirements when it comes to storage but also misconceptions.

True Assumptions

- Information must be stored and indexed. Without this, the effectiveness of its primary purpose is diminished.
- While this data could be stored within the surveillance solution server itself, it does not have to be. Separate Cloud, NAS, or SAN storage on/off site are other options.
- Metadata must have appropriate time and date stamps in order to accurately align with the broader data it relates to – video synchronicity for example.
- Metadata retention is not governed by the same rules as video surveillance storage. While public surveillance video footage is kept for a set period (often between 30 – 40 days) and then deleted, metadata can be stored for much longer.

False Assumptions

- Because metadata relates to absolute detail and clear categorization, a widely held belief is that – in terms of surveillance – it has to utilize a full HD stream and therefore requires greater bandwidth and storage. This is not the case.
- Metadata relates to changes in scene, rather than the complete image. It can therefore be produced using a lower bandwidth data stream and related back to HD footage when viewed on control center devices. Though consideration is required for storage space and management, demand on resource is often a lot less than organizations anticipate.
- This is also the case with integrated sub-system (non-image related) metadata. With GPS tracking, for example, metadata would only need to be updated every couple of seconds rather than continuously. This makes captured data more relevant and also reduces pressures on storage.

The Future of Metadata

Metadata is nothing new, yet with the right software it makes so much possible. A surveillance system that supports and simplifies the use of metadata as a search, sort, and retrieval tool makes activities such as object tracking, equipment tampering, behavioral analysis, efficiency monitoring, and safety adherence a straightforward operation.

The greater the level of integration facilitated by the surveillance solution, the more extensive the capabilities of metadata analytics become. In terms of system architecture, the ideal scenario is therefore an IP-based, open-protocol surveillance solution that seamlessly incorporates information from edge devices associated with a broad range of site sub-systems.

Critical infrastructure, high-security and large-scale industrial operations such as oil and gas plants, are likely to lead the field in adopting metadata analytics, particularly given the significant implications for improvements to site and personnel safety. Advances in social media integration are also likely to interest public space surveillance teams.

However, the true advantage of metadata and its potential to apply a universal language to different technology voices is that all markets dealing with high volumes of site data have the opportunity to benefit from advances in this field. With the right data management software, there is no reason why they can't.

For more information about Synectics technology solutions, visit our website: synecticsglobal.com.

Synectics designs integrated end-to-end surveillance control systems for the world's most demanding security environments. We excel at complex projects that require innovative, tailored solutions with high reliability and flexibility, specifically for casinos, oil and gas, marine, public space, banking, transport and critical infrastructure applications.

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Specifications subject to change. E & OE.
Literature Reference: METADATA-WP/1218/A4 Iss 3