



VIDEO ANALYTICS GLOSSARY

**ALL YOU NEED TO KNOW ABOUT VIDEO
ANALYTICS**



CYRUSInnovations
Solutioning Your Future

**UNDERSTAND
THE BASICS**

**READ WHAT'S
AVAILABLE**

**APPLY TO
YOUR
INDUSTRY**

OUR STORY

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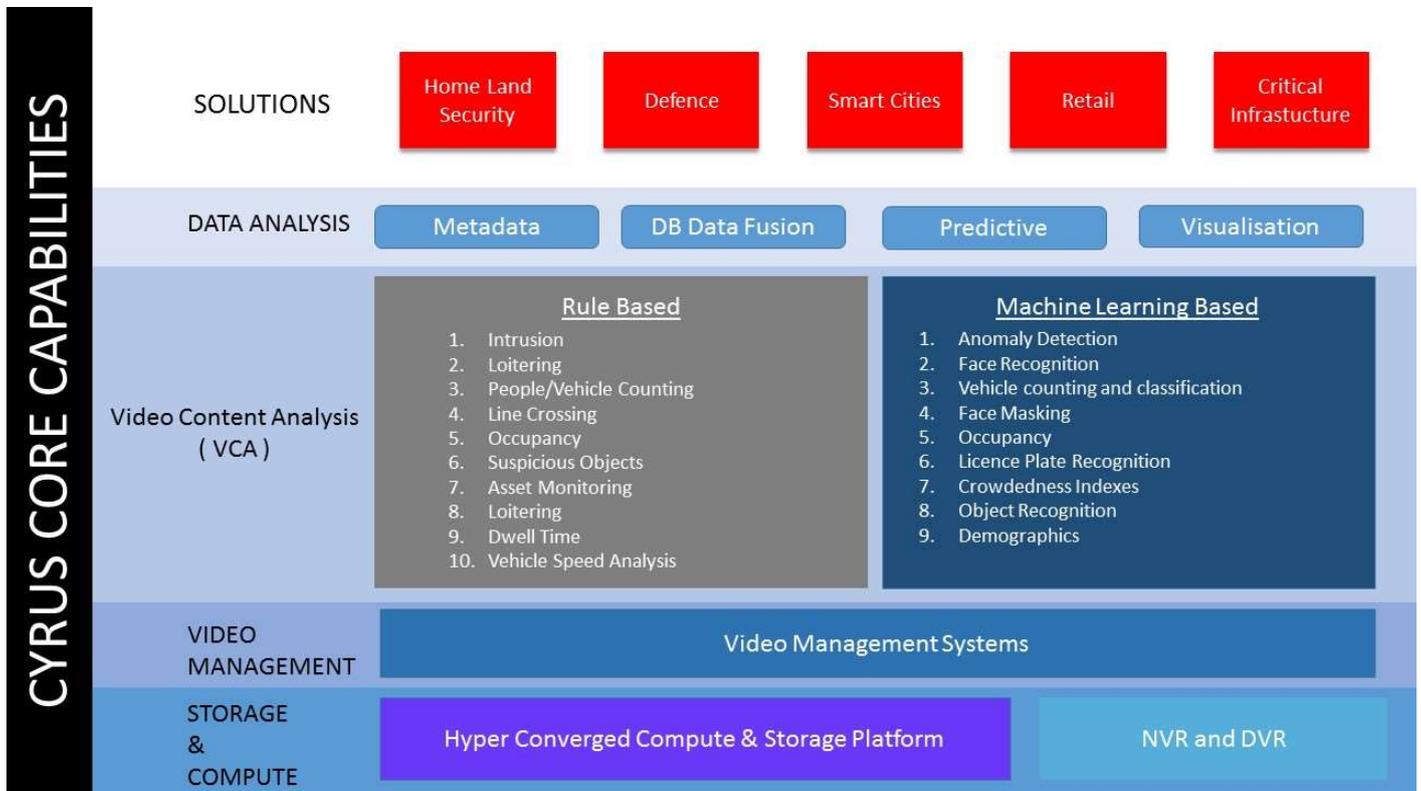
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CYRUS CORE COMPETENCIES

An introduction to Cyrus.



Cyrus is a value added distributor focusing on cutting edge technologies for video surveillance and video analytics used in solutions for Smart cities, Defence, Retail and Homeland security. We pride ourselves in bringing and delivering the best that technology can offer.

Our core competence stretches from storage and computing platforms to video management systems, video analytics , data analytics and visualization . Our expertise stems from many years of delivering projects from surveillance needs to enterprise wide IOT platforms. Be it improving operational efficiency, safety & security, or leveraging unstructured data (video) to structured data (metadata) for smart IOT initiatives, Cyrus has the capability and experience to support the clients’ objectives and vision.

Understand the Basics - What is Video Analytics?

Video Analytics, also referred to as Video Content Analysis (VCA), is a generic term used to describe computerized processing and analysis of video streams. Computer analysis of video is currently implemented in a variety of fields and industries, however the term “Video Analytics” is typically associated with analysis of video streams captured by surveillance systems. Video Analytics

applications can perform a variety of tasks ranging from real-time analysis of video for immediate detection of events of interest, to analysis of pre-recorded video for the purpose of extracting events and data from the recorded video.



Relying on Video Analytics to automatically monitor cameras and alert for events of interest is in many cases much more effective than reliance on a human operator, which is a costly resource with limited alertness and attention. Various research studies and real-life incidents indicate that an average human operator of a surveillance system, tasked with observing video screens, cannot remain alert and attentive for more than 20 minutes. Moreover, the operator's ability to monitor the video and effectively respond to events is significantly compromised as time goes by.

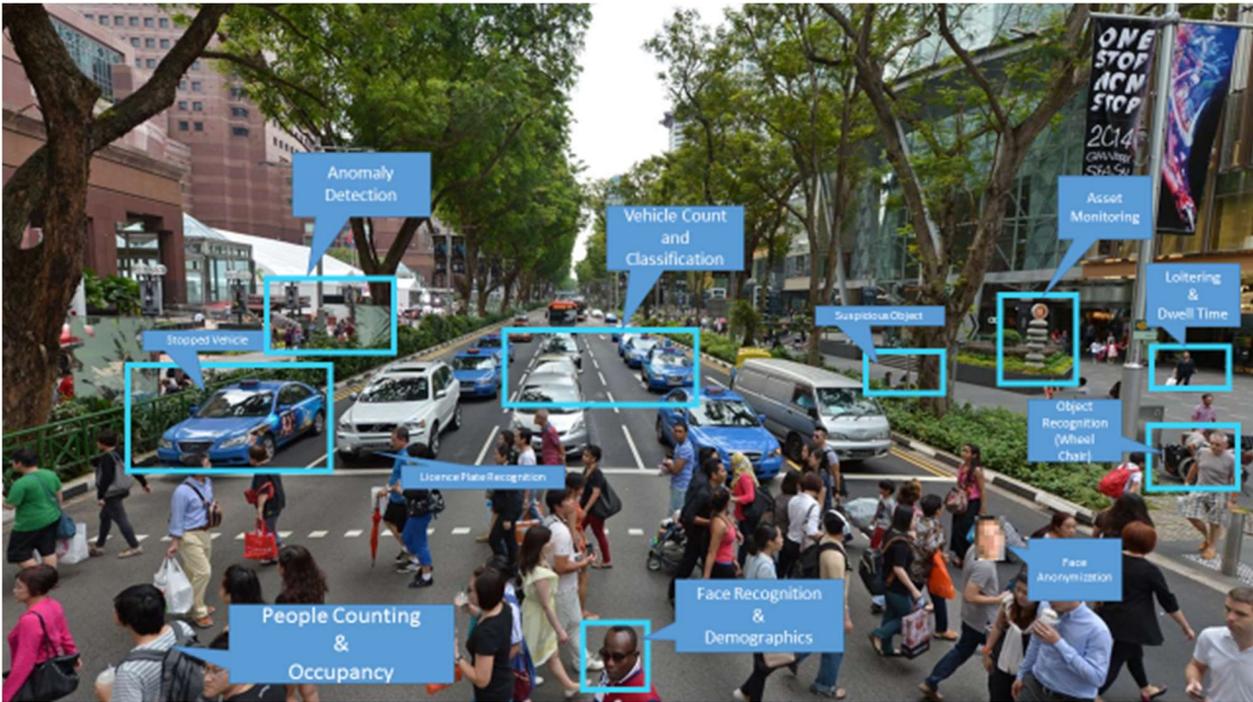
Furthermore, there is often a need to go through recorded video and extract specific video segments containing an event of interest. This need is growing as the use of video surveillance becomes more widespread and the quantity of recorded video increases. In some cases, time is of the essence, and such review must be undertaken in an efficient and rapid manner. Surveillance system users are also looking for additional ways to leverage their recorded video, including by extracting statistical data for business intelligence purposes. Analyzing recorded video is a need that can rarely be answered effectively by human operators, due to the lengthy process of manually going through and observing the recorded video and the associated manpower cost for this task.

While the necessity for, and benefits of, surveillance systems are undisputed, and the accompanying financial investment in deploying such surveillance system is significant, the actual benefit derived from a surveillance system is limited when relying on human operators alone. In contrast, the benefit accrued from a surveillance system can be significantly increased when deploying Video Analytics.

Video Analytics is an ideal solution that meets the needs of surveillance system operators, security officers, and corporate managers, as they seek to make practical and effective use of their surveillance systems

Applications for Video Analytics

The various applications is best illustrated in the picture below:



Types of Video Analytics

Video analytic algorithms could be best described in 3 main categories – Rule Based analytics, Machine Learning Based Analytics and Multi Modal analytics. These could be effectively applied in different scenarios to achieve desired outcomes or to drive the creation of useful metadata.

Rule Based Analytics

Rule based analytics are best used in deployments where you want to detect a specific behavior of a subject or vehicle. It is commonly deployed by drawing Areas of Interest (AOI) within a camera’s Field of View (FOV) and applying specific rule sets to detect specific activities .

Some common rule sets include :

PERSON	VEHICLE
Person moving in an area	Vehicle moving in an area
Person crossing a line	Vehicle crossing a line
Crowding	Stopped vehicle (Illegal Parking)
Person tailgating	Tailgating vehicle
Loitering	Moving water vessel
Grouping	Licence Plate Recognition

Demographics (Age, Gender, Mood)	Driving on wrong side of road
Face Masking (Anonymization)	Vehicle Speed Analysis
Facial Recognition	
STATIC OBJECT	COUNTING RULES
Object added/removed	Count people
Asset protection	Count vehicles
Traffic obstacle	Measure stickiness (dwell time)
Suspicious Objects	Crowd Density
	PTZ or Standard Cameras
	Camera Tampering or Video Streaming Defects
	Virtual Tour
	Subject Tracking

Machine Learning Based Analytics

With the advancement of computation power and a decline in the cost of computational resources gave rise to a new breed of Video analytics engines based on computer vision or machine based learning technologies.

Though relatively new, we have seen strong market demand in this area and have commissioned several projects with government agencies using machine learning based video analytics.

Some of the frontrunners of Machine Learning analytics include :

Machine Learning Analytics	Application
Anomaly Detection	Useful to be applied in Smart cities where thousands of cameras are deployed leveraging the algorithm's unique ability to detect variances from the norm in a camera scene. No rule configuration is required. The software self learns and flags out unique, abnormal events.

Vehicle Counting and Classification	Traditional counting analytics can only count quantity. But with the advent of machine learning technologies, the counting mechanism have matured to be able to recognize and count types of vehicles.
Object Recognition	Leveraging machine learning , video streams can be analysed to recognize and classify objects accordingly.
Angled People or Vehicle Counts	Applied in scenarios where overhead cameras can't be deployed.

Multi Modal Analytics –Supplementing Sight with Sound analytics

The is the next generation system that effectively combines vision, sound and passive sensor analytics to provide a multi-modal sensor based application for behavioral monitoring and detection in an enclosed space.

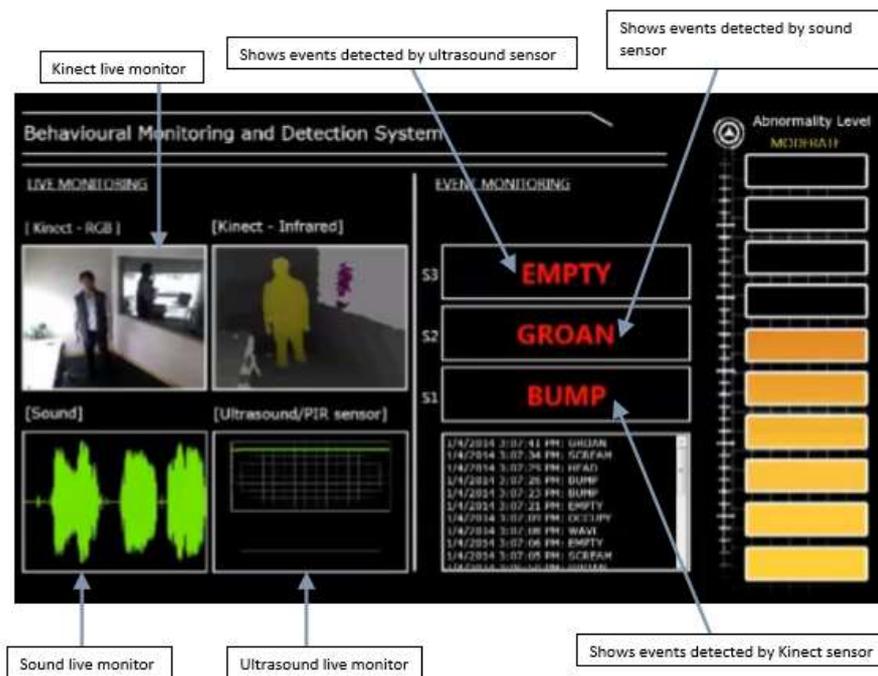
The solution employs an integrated approach using the Microsoft Kinect for both video and sound .

Kinect – Video Analytics

The use of depth-sensing capabilities in Kinect has advantage over normal RGB cameras in that it is able to greatly reduce false alarms from mere pixel differentiation and is especially suitable for an indoor environment. The Kinect also enables pose recognition which is very useful in this case for detection of human behaviours associated with these kinds of postures and movements. In addition we will also be able to use Kinect's built-in microphone to analyse sounds in order to detect abnormal events.

Sound Analytics

Activities such as shouting, groaning, fighting (loud noise) and talking can be detected through the use of sound event classification. Microphone array on the Kinect sensor of the proposed platform will be employed to acquire the audio signal of the proposed environment. Audio signal capture from the Kinect sensor will be utilized by the sound event classification module to detect the possible sound events (e.g. talking, shouting or groaning).



Vertical Solutions

Safe and Smart Cities

The Rise of Terrorist Threats

There has been an exponential increase in the number of surveillance cameras being used for citywide deployment but many recent events have indicated an ineffectiveness surveillance monitoring in pre-empting or preventing such security incidents.

While there has been fewer spectacular terrorist attacks like 9/11, we have definitely seen a shift in the tactics and kind of attacks recently. The Paris attacks were carried out on separate targets almost simultaneously, involved indiscriminate shooting, suicidal attackers and taking of hostages.

The rise in terrorist threats shows the vulnerability associated with public places. They are no longer confined to high value targets like power plants or nuclear facilities. Attacks can now take place easily leaving little time for forewarning of danger even with the proliferation of CCTV.

All these point to the fact that there is now a greater need to discover unusual and deviant behaviour and events as early as possible. The longer the hostage takers are left in control, the higher the

resulting death toll. There is a greater need to disperse crowds as quickly as possible and send a response team on the ground to free hostages and reduce casualties.

The Need for Better Analytics

The hard truth is that out of all the thousands of cameras deployed in a city, only a small fraction (less than 10%) are actually looking at perimeters, entrances or exits where an analytic rule can effectively be applied. If we look at this 10% of cameras, we can see that out of the all the possible behaviours or events that can be detected, perhaps another 10% of these events can be detected by applying simple analytic rules. Putting it together means that we are only detecting 1% of all possible events, essentially missing out on the 99.9% of the events that could be of interest to us.

The inherent problem with rule-based analytics is that each rule specified is to detect a specific behaviour (e.g. loitering) and have to make good that claim with 90% accuracy. Much time and effort is then put into configuring this one rule and fine-tuning it to achieve the desired accuracy. If this particular event (i.e. loitering) does not occur, then the rule is basically sitting there doing nothing and produces no value. Worse, if it is inappropriately applied, it produces false alarms instead, adding to frustration of the users.

Revolutionizing City Surveillance

Doing It Smarter - Our product is an unsupervised Machine Learning system that does not require human intervention to automatically discover dominant motion patterns. This also means it does not require a human to specify the rules for event detection. Our Abnormality Detection Algorithm is based on a unique and novel approach. We have adapted it for surveillance videos where multiple motion patterns are occurring simultaneously and it can effectively infer their various patterns and starting times. Since the system is autonomous, it provides the means to automatically analyse hours of video easily. Our proposed system consists of three main components, namely,

- a) The automatic abnormality detection (AAD) engine,
- b) The rules engine, and
- c) The AAD and rules fusion module.

AAD is a completely automatic, unsupervised algorithm to learn frequently occurring activity patterns in the scene that does not make use of any of the existing methods (i.e. Event-based, Rule-based or Object-centric). The functionality of AAD is the automatic detection of abnormal activities by looking for data out of the ordinary. With the set of frequently occurring activity patterns recovered by the unsupervised algorithm, the detection of abnormal activity will correspondingly be automatic. This detection is performed by matching the observed activity against the activity patterns recovered. In contrast to event or object centric methods described in the previous section, this method works automatically without requiring any human input.

Solution Capabilities

- Identify patterns – System is able to automatically identify patterns (i.e. motion, trajectories) of people, vehicles and objects in scenes.
- Discover deviant patterns and behaviours – System is able to find deviations and abnormalities to warn of potential threats (especially those not known beforehand).
- Fast and autonomous – It is able to do it fast and autonomously searching through vast amounts of constantly streaming (or archived) video from thousands of cameras using GPU.
- Not limited by prior human knowledge – Discovery of abnormal events is not limited by prior human knowledge because the system is intelligent enough to self-learn and adapt to different and continuously changing scenarios.

- User feedback – However, the system is able to take in prior human knowledge if necessary. It will speed up the learning for the obvious parts that can be easily accounted for by humans
- Integration with existing systems – We can easily add onto customers’ existing video analytic systems and video management systems so they can increase coverage of their cameras.
- Top 10 search – System is able to list the top 10 most abnormal events based on camera or geographical locations so that users can just focus on these events.

Retail Solutions

Shopping centers and stores are constantly looking to increase customer safety, improve operational performance and minimize loss prevention. Indeed, for this sector, surveillance systems are expected to not only serve security and safety applications, but to also serve as business process monitors, providing valuable data and insights that offer real benefit to the operations and people they serve.

Most organizations implement analytics in their online presence, and for good reason — it provides them with valuable metrics they can act on to achieve the best results. With our video analytics solution, you can now have the same comprehensive and actionable analytics for your brick-and-mortar business.

Insights For Marketing and Operations

- visitor demographics
- visitor traffic flow
- premises occupancy
- time spent on-premise
- identifying repeat customers
- entry rate and serving rate of queue
- individual queue waiting time
- Product positioning

Insights for Security

- Detect breaches of a secure zones like warehouses / storerooms and offices
- Detect unauthorized activity taking place outside of business hours
- Detect loitering in areas of interest, such as areas with high-value goods
- Automatically track the movement of suspicious people and vehicles using PTZ cameras

Insights for Safety

- Real-time Detection of Blocked Emergency Passages / Exits

Solutions For Critical Infrastructure



Power, chemical and nuclear plants, dams, telecommunication stations, government and military buildings, and correctional facilities – all of these sites demand advanced security and safety measures so as to prevent attacks and accidents with severe ramifications. Moreover, these sites face practical challenges such as ensuring a secure and safe environment for personnel and high-level decision-makers, and protecting valuable assets.

Cyrus have deep expertise deploying solutions for critical infrastructure sites as well as government and military facilities to effortlessly pinpoint security breaches, raise alert to safety hazards, protect valuable assets, provide data and information to enhance operational efficiency and offer powerful forensic analysis capabilities.

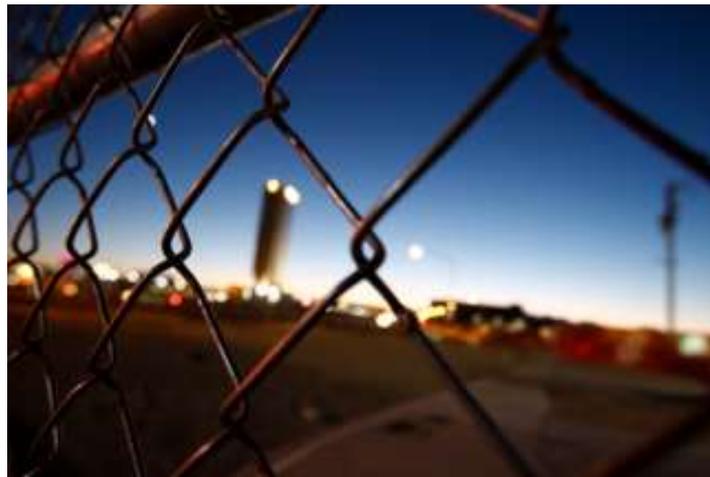
With the sensitive nature of such installations, a combination of 99.99% of availability of video data storage coupled with state of the art video analytics supports the safe and intelligent operations of the critical infrastructure.

Solution capabilities

- 99.9999% system uptime and data availability, no single points of failure.
- Perimeter intrusion detection
- Sterile zone implementation
- Abnormality detection (riots, fire , explosions etc)
- Identify suspicious activity
- Rapid video search and post event forensics
- Software PTZ
- Detect removal of assets
- Licence Plate Recognition

Solutions For Defence

Cyrus Innovations accumulated vast amounts of experience deploying state of the art video analytic systems to military bases, courts and homeland security bases.



Sensitive places and bases like these observe some commonality in requirements. They need to be able to detect intruders, monitor sterile zones with quick and accurate information. When there is a need for forensic activity, data have to be made readily available and search have to be quick.

All these have to be done with limited manpower through the supplement of physical security by virtual security.

Solution Capabilities

- Detect Perimeter Intrusion
- Identify suspicious activity
- Requires low manpower for monitoring
- Protect sterile zones
- Quick forensic search
- Tracking of person
- Licence plate recognition
- 99.9999% system uptime and data availability, no single points of failure.

Our Story

Cyrus Innovations seeks to be a value-added distributor with a difference. Our aim is to help system integrators successfully test, evaluate, design and implement new high tech solutions.

Our unique product offerings spread across different technologies but with a common framework of using the IP network as an infrastructure and platform. Cyrus Innovations' key strength lies in its ability to identify and bring to market innovative products and technologies from companies around the world that have a good track record in product quality and reliability. These companies have also won awards and patents through their strong in-house research and development.

Cyrus Innovations comprises a team of highly dedicated and specialized professionals in the field of technology, sales, pre-sales and marketing. Our team also has a proven track record of successful IP CCTV installations with Video Content Analytic functionality and we constantly keep abreast with the latest developments in technology and are also certified with regular updates and training from our product vendors.

We have also established a multi-purpose technology demonstration facility in our premise to serve our partners and their customers. We constantly hold seminars, workshops, product training, technology demonstrations, proof-of-concept, on-site product testing as part of our value-added services.

Cyrus Innovations works with its system integration partners to serve customers from a diverse marketplace that includes SMEs, MNC, government agencies and institutions. Cyrus is also in the process of building a global presence and already has partner representatives in China, Hong Kong, Taiwan, Brunei, Vietnam, Malaysia, Myanmar, Philippines, Thailand and Indonesia.

We believe our extensive experience and commitment will only serve to create the best value for our partners and their customers.

Cyrus Case References

a) Changi Airport – Video Analytic System for Perimeter Intrusion detection.

- b) Mindef – Video Analytic System for Perimeter Intrusion detection.
- c) Chengdu museum – Video Analytic System for people counting.
- d) Victoria Concert Hall – Video Analytic System for people counting, surveillance.
- e) Interpol new building – Video Analytic System for forensic search.
- f) Port of Singapore Authority – Video Analytic System for surveillance.
- g) Singapore Land Authority – Video Analytic System for surveillance.
- h) Sentosa Development Corporation – Video Surveillance Hyperconverged storage and smart video analytics
- i) Mega Bangna Thailand – Video analytics for business intelligence
- j) Singapore 2016 Airshow – Facial Recognition and Detection
- k) 2015 SEA Games – Wavestore VMS
- l) National Day Parade 2016 – Facial Recognition

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