Masterclass: From IP Video to IoT: Security and Smart Cities

Steve Surfaro
Chairman, Public Safety Working Group, Security Industry Association

BICSI

Digital Imaging, introduction to sensors, systems, infrastructure, power

- Visible Light Imaging
- Uncooled Thermal Imaging
- PoE systems in IP Video

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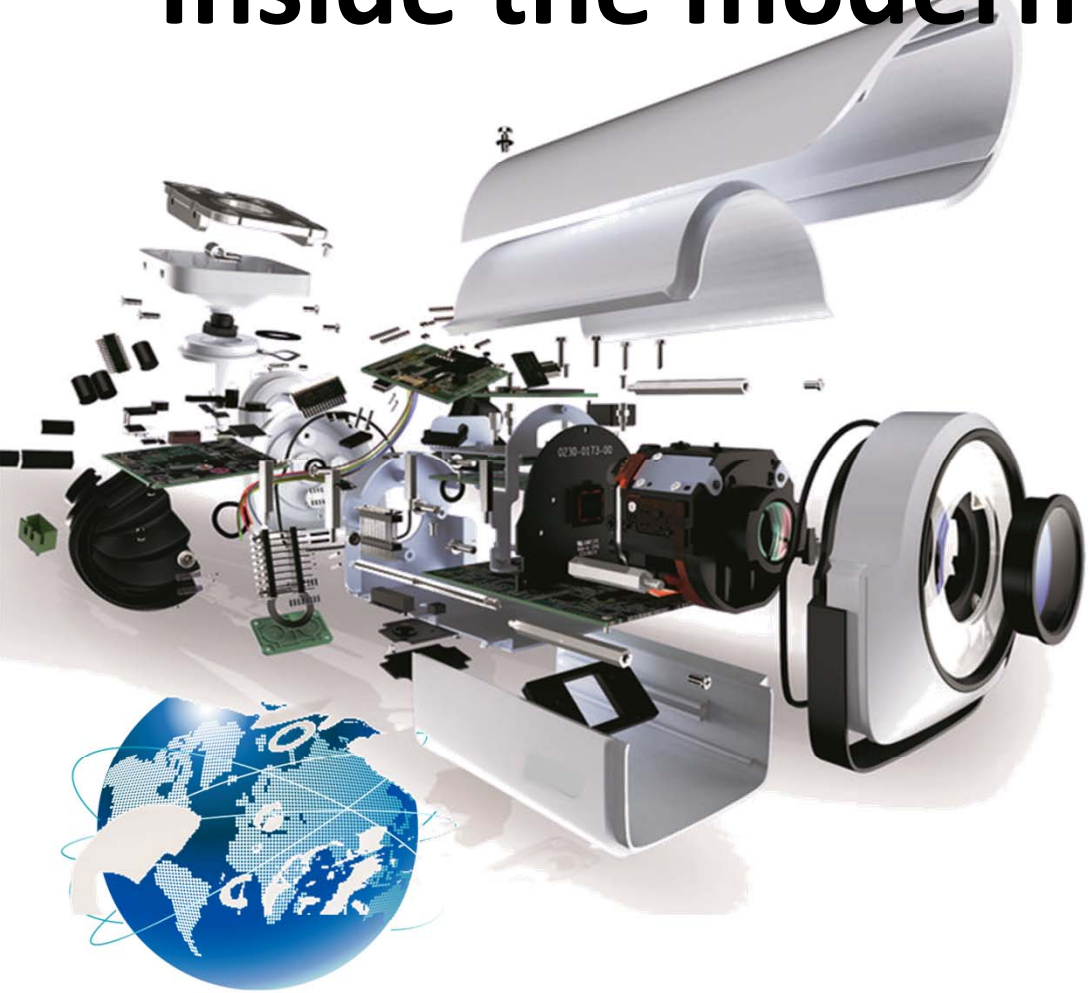
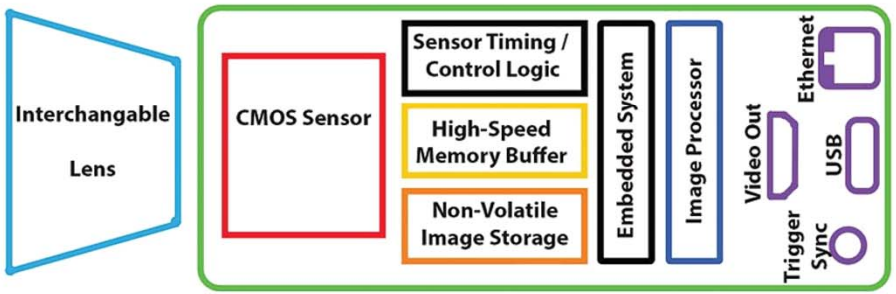
Inside the modern Network Camera





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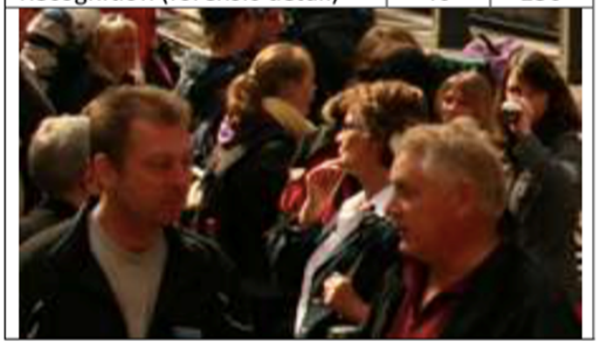
Imaging - Resolution

Resolution level	*Pix/ft*	*Pix/m*
Identification (high detail)	60	200

Resolution level	*Pix/ft*	*Pix/m*
Recognition (forensic detail)	40	130



Resolution level	*Pix/ft*	*Pix/m*
Detection (general security)	20	70

Resolution level	*Pix/ft*	*Pix/m*
Overview (motion, tracking)	10	30

Imaging Field of View

1.7mm fl = 125° HFOV

5mm fl = 65° HFOV

Imaging Field of View

15mm fl = 24° HFOV

50mm fl = 7° HFOV

Lens Distortion

Rectilinear wide angle lens

Barrel distortion wide angle lens

Lens Distortion

Rectilinear wide angle lens

Barrel distortion wide angle lens

Wide Angle Lens Distortion

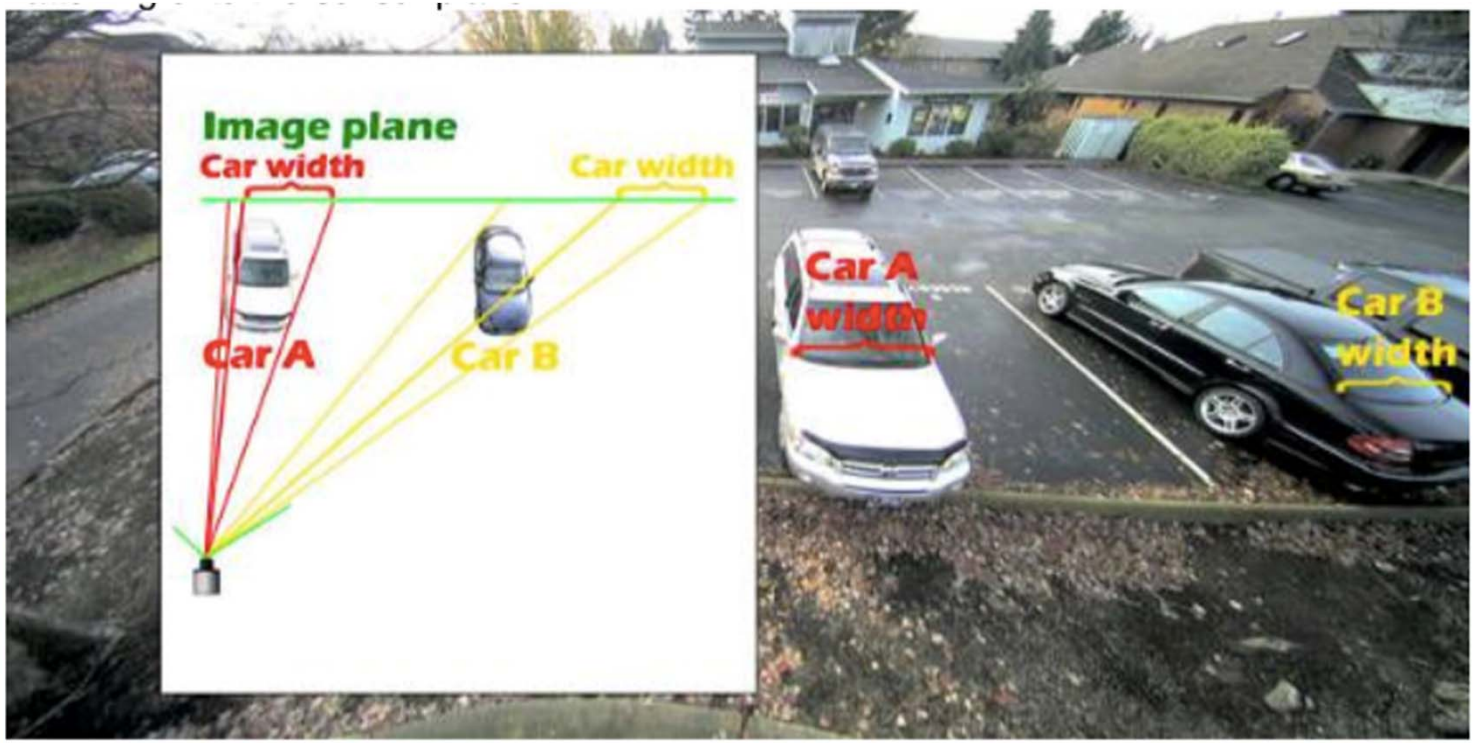


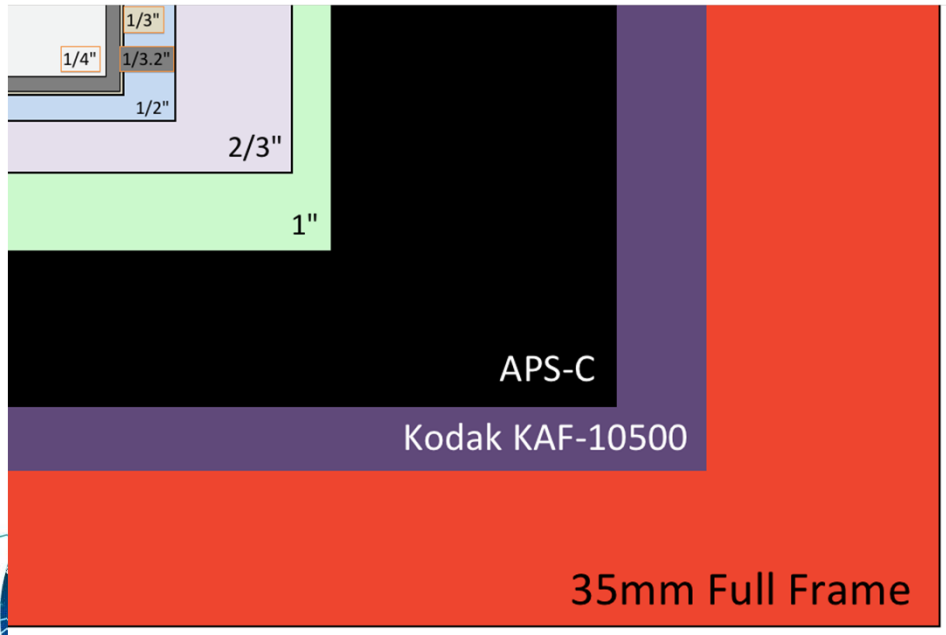
Image showing 3D stretching from an ultra wide angle rectilinear lens.

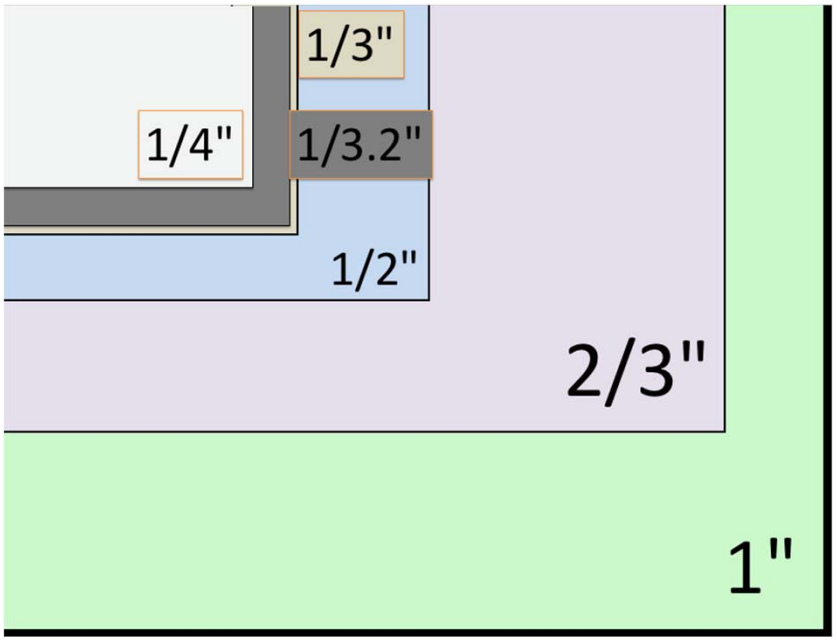
Lens Distortion reduces usable pixels

Distortion reduces the object width the further it is from the image center.

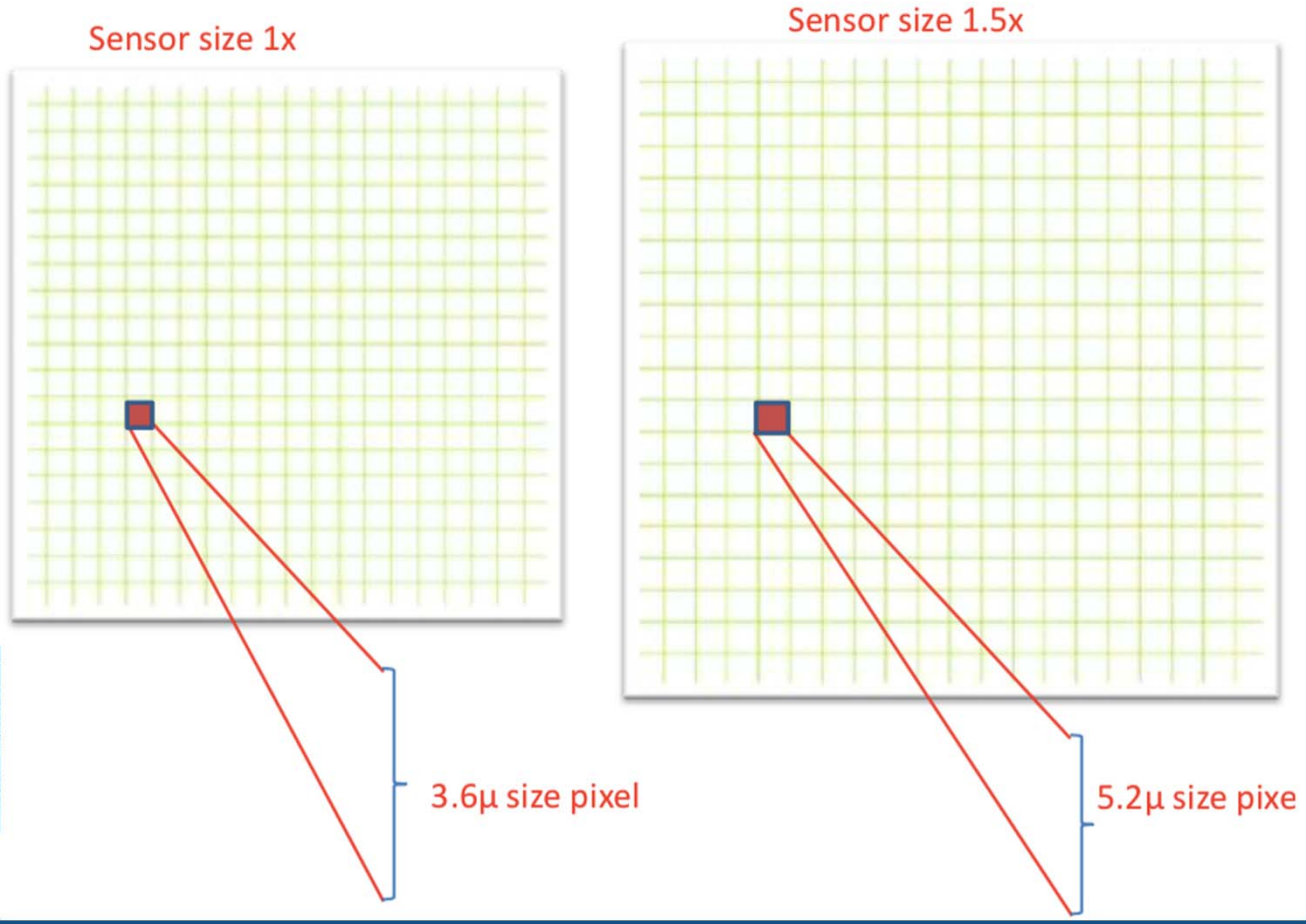
The same image taken with a rectilinear lens shows increased resolution towards the edge of the image.

Imaging Sensor Size Comparison

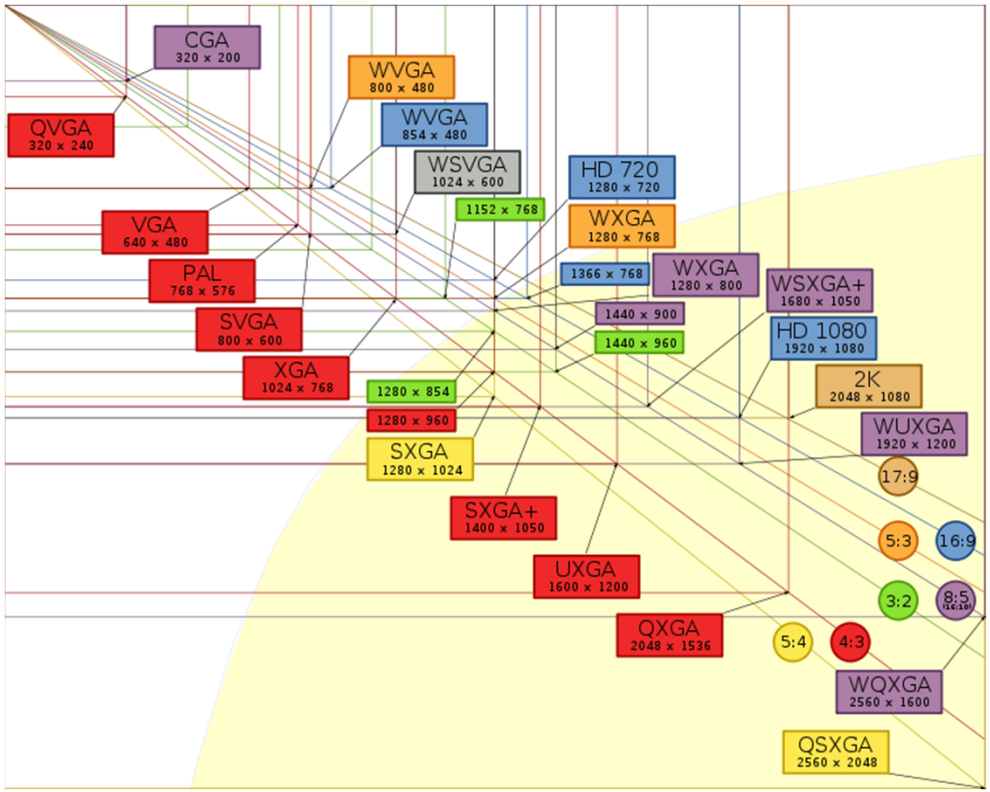




Larger Sensor Size – Megapixel Lens Req'd



Summary of Display Resolutions



Pixels on Target by Function

SURVEIL-LANCE VIDEO FUNCTION	RESOLUTION	HORIZONTAL RESOLUTION	VERTICAL RESOLUTION	HORIZONTAL FIELD OF VIEW	VERTICAL FIELD OF VIEW
	(PIXELS PER FOOT)	(PIXELS)	(PIXELS)	(FEET)	(FEET)
OBSERVATION	20	1280 1920	720 1080	64 96	36 54
FORENSIC REVIEW	40	1280 1920	720 1080	32 48	18 27
RECOGNITION	80	1280 1920	720 1080	16 24	9 24

Figure 23: 16:9 Imager Chart

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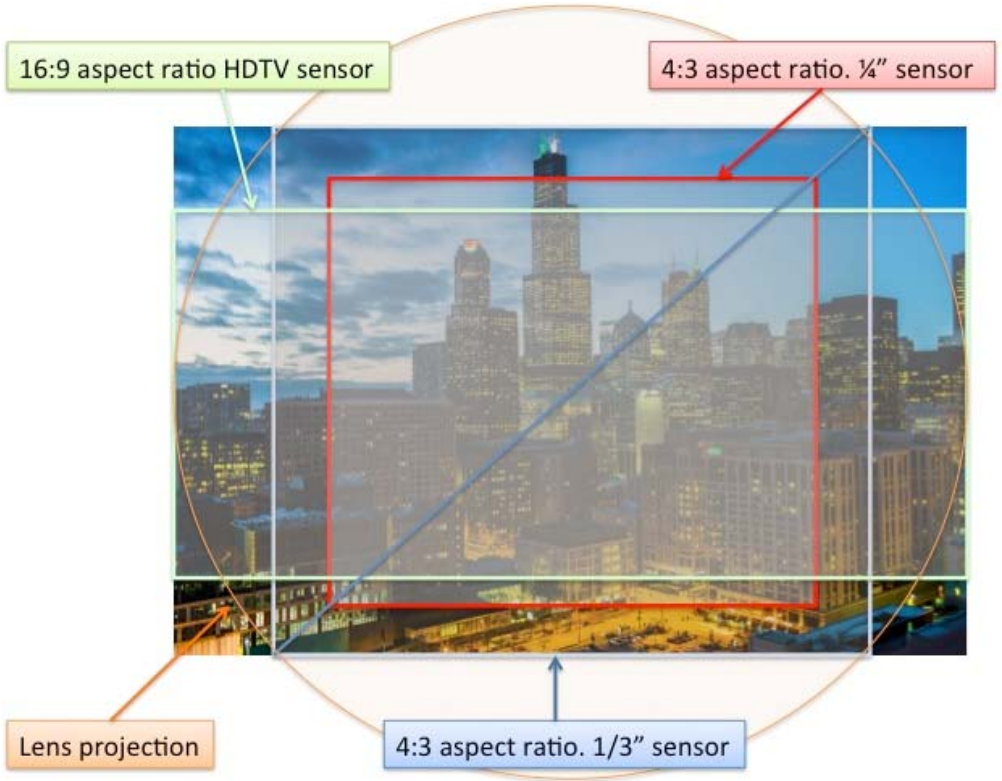
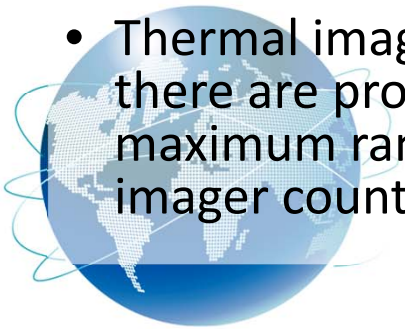
HDTV Lens Projection



Thermal Imaging

- Thermal cameras capture heat or temperature values of a scene rather than light values, regardless of how bright or dark the scene appears to the human eye.
- Identification of colors and details are impossible with thermal cameras (because they view temperature only), these cameras are especially useful in viewing dark scenes for activities that have heat signatures.

- Security practitioners and designers must routinely specify outdoor camera solutions for varying applications and need a camera that can supplement visual and physical perimeter facility patrols.
- Thermal imaging cameras have been too costly a solution in the past, but now there are products using uncooled thermal imagers that might have a shorter maximum range (1500 feet), but at about 25 percent of the cost of their cooled imager counterparts.



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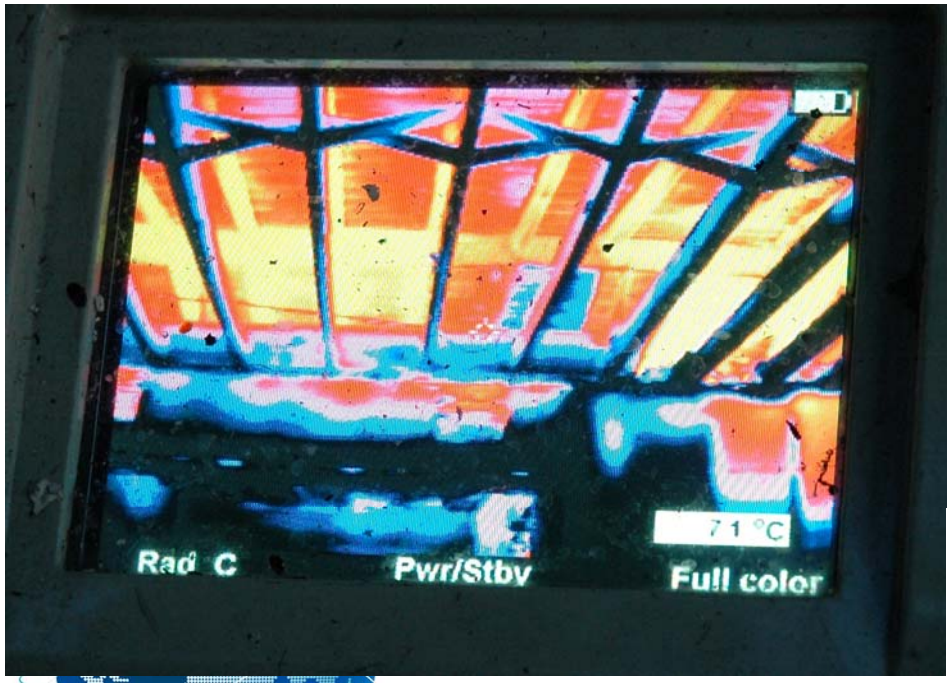
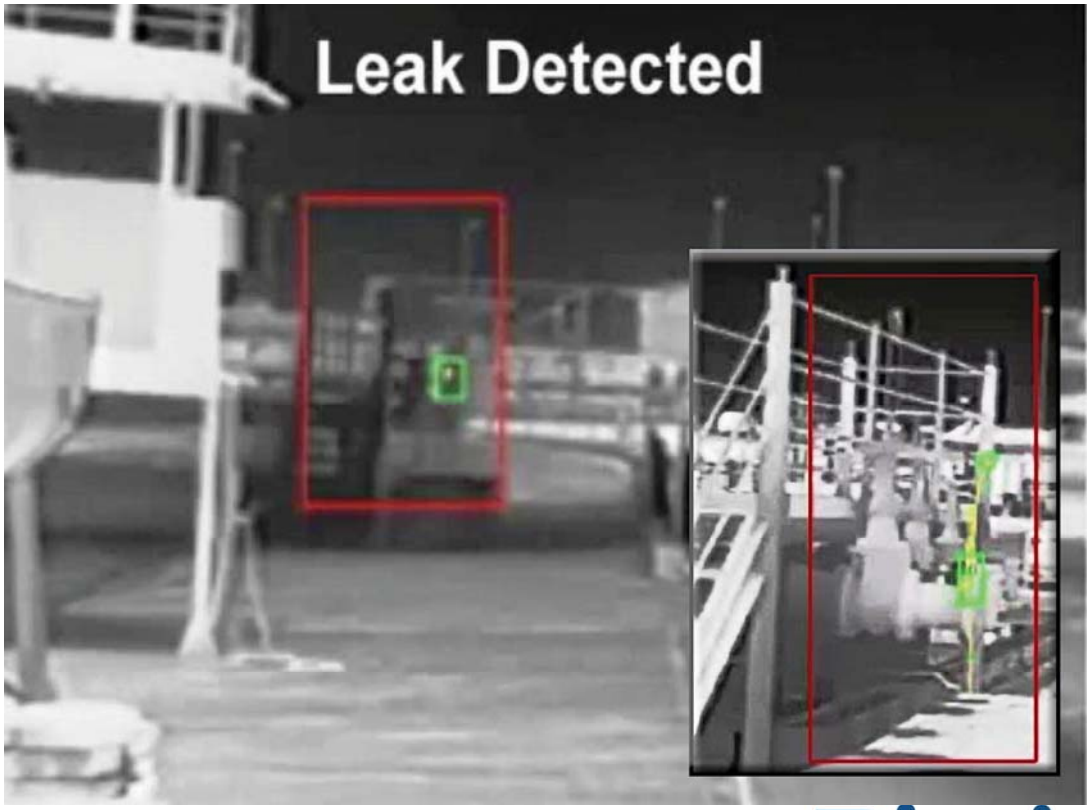
Thermal Imaging Applications





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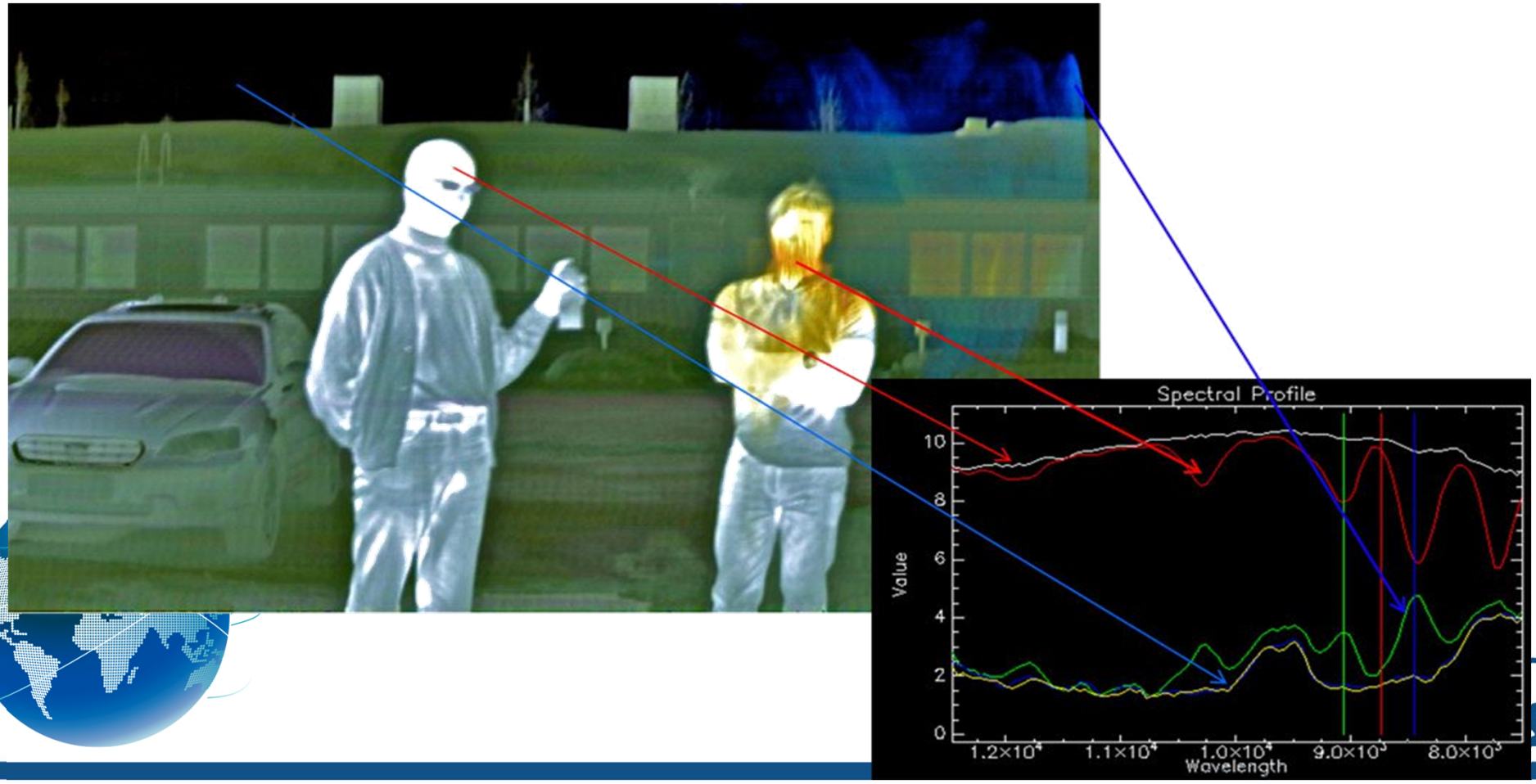
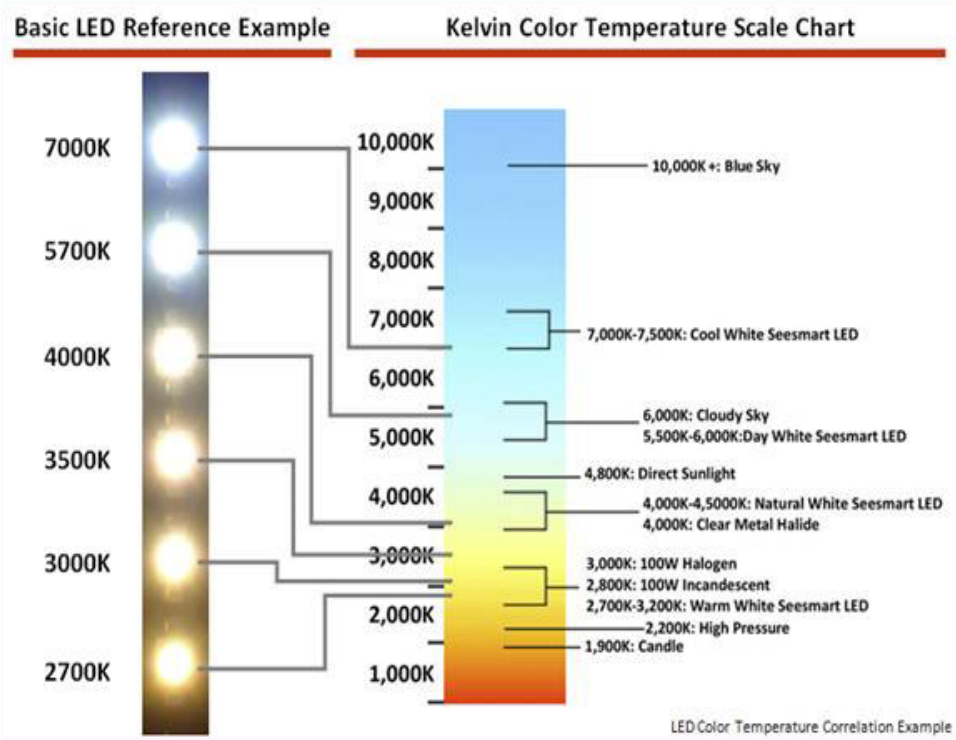
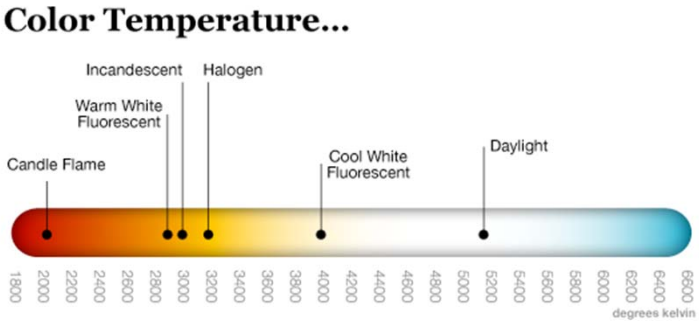
Thermal Spectral Imaging

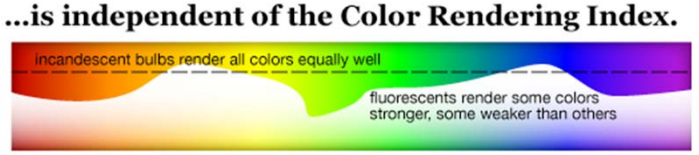


Lighting and Color Temperature

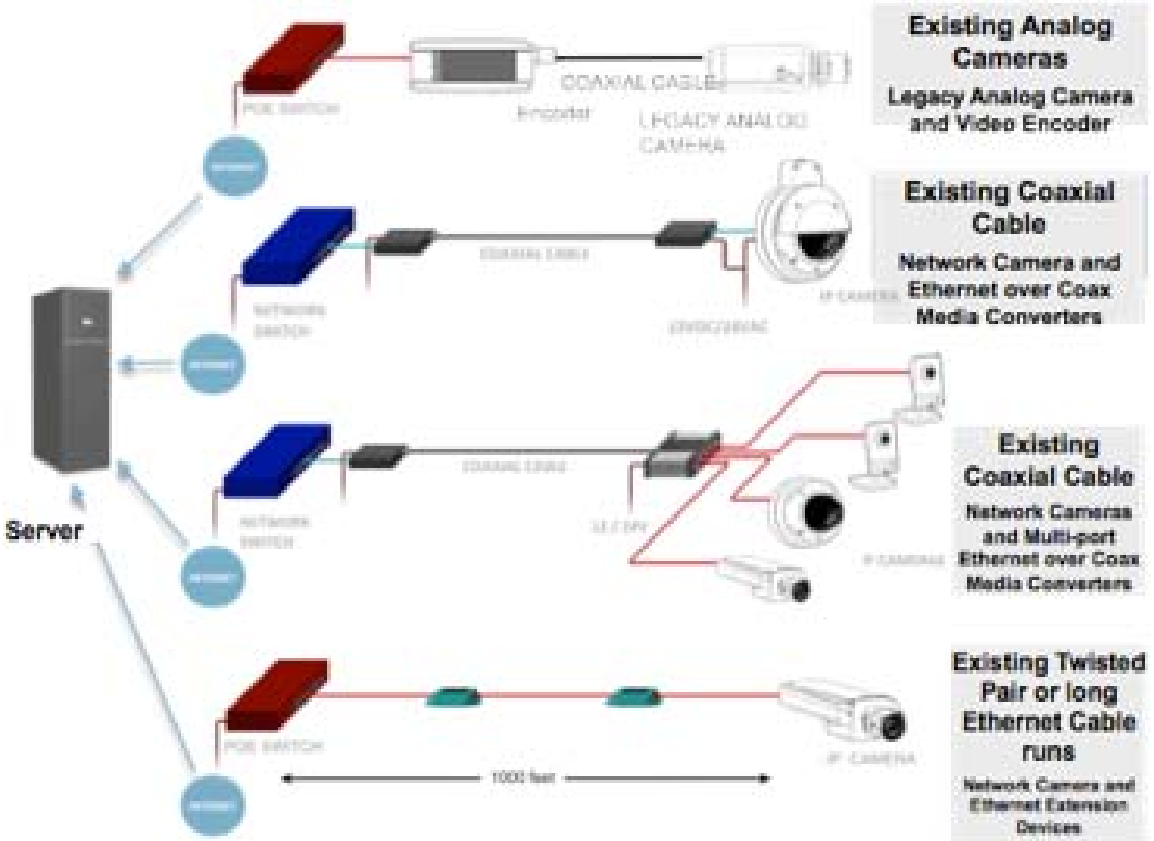


Lighting Type	Color Rendition Index	Relative Image Reproduction
Daylight	100	Excellent
Incandescent	97	Excellent
Fluorescent	87-94	Excellent
Halogen	90-97	Excellent
LP Sodium	5	Poor
HP Sodium	30	Poor => Fair
Mercury Vapor	43	Poor => Fair
Metal Halide	70	Good





Transmission Systems – Upgrade Path



PoE Classes

Class	Minimum Supported Power Level at the Output of the PSE	Supporting PoE Types
1	4.0 W	Type 1, Type 2, and Type 3
2	7.0 W	Type 1, Type 2, and Type 3
3	15.4 W	Type 1, Type 2, and Type 3
4	30.0 W	Type 2 and Type 3
5	45.0 W	Type 3
6	60.0 W	Type 3
7	75.0 W	Type 4
8	90.0 W	Type 4

POWER-LIMIT COMPARISON: LTPOE++ PD, PSE VS. 802.3AT

Device			PSE					
	Standard		802.3at		LTPoE++			
	802.3at	Type	Type 1	Type 2	38.7 W	38.7 W	70 W	90 W
PD	802.3at	Type 1	13 W	13 W	13 W	13 W	13 W	13 W
		Type 2	13 W	25.5 W	25.5 W	25.5 W	25.5 W	25.5 W
	LTPoE++	38.7 W	13 W	25.5 W	38.7 W	38.7 W	38.7 W	38.7 W
		52.7 W	13 W	25.5 W	–	25.5 W	52.7 W	52.7 W
		70 W	13 W	25.5 W	–	–	70 W	70 W
		90 W	13 W	25.5W	–	–	–	90 W

(Courtesy of Linear Technology Corp.)

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Fiber Transmission Systems

Advantages of Fibre Optic Cable over Copper

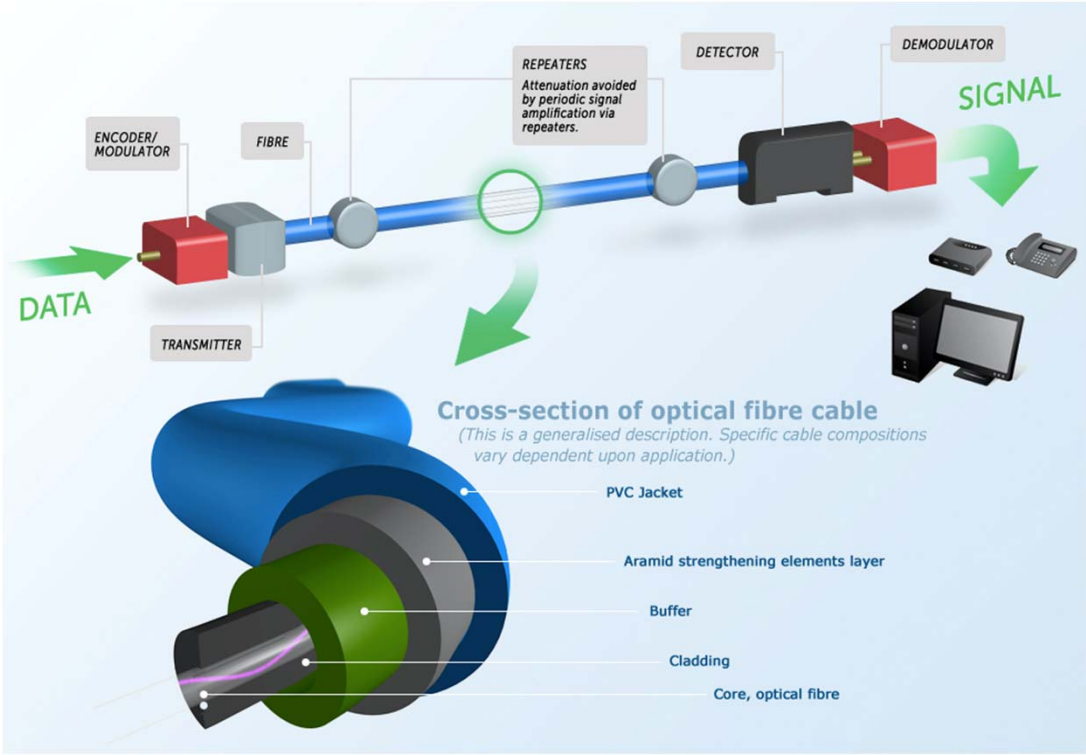
Speed Fibre optic networks operate at high speeds - the NBN promises to deliver up to 100Mbps initially, but the network can be updated to deliver content into the gigabyte range.

Bandwidth Large carrying capacity.

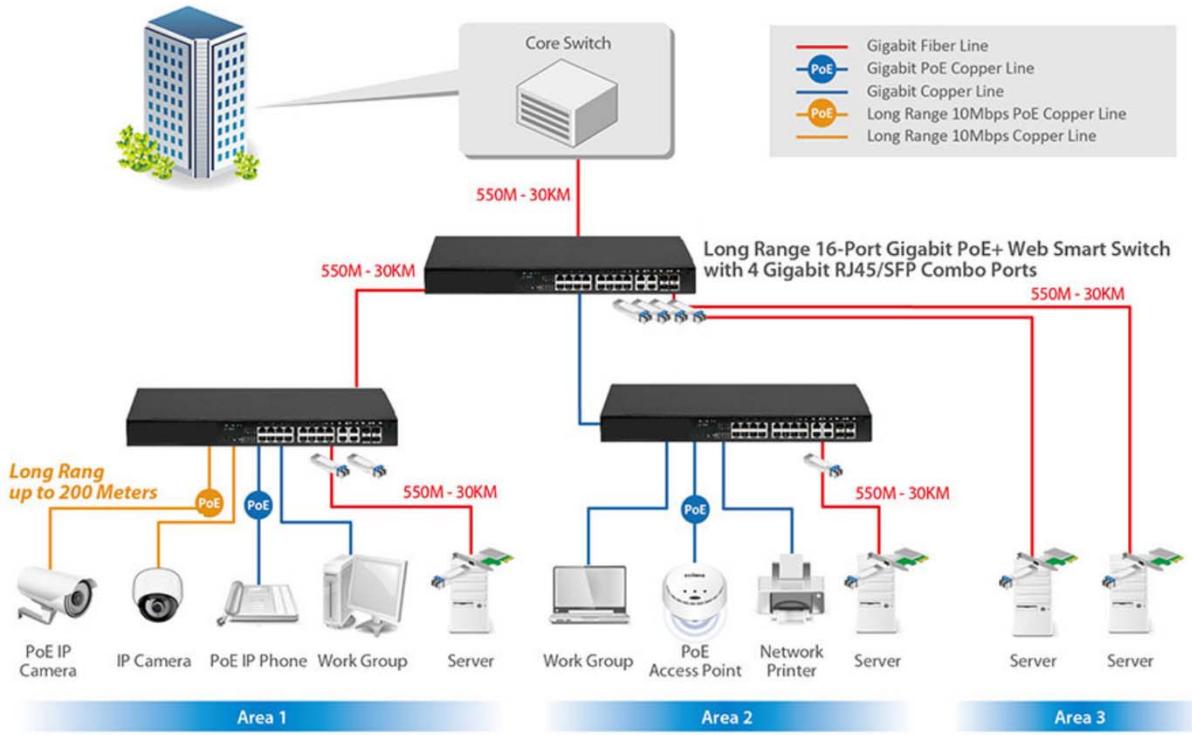
Distance Signals can be transmitted further without needing to be "refreshed" or strengthened. In high quality fibre signals can be sent 30km before losing strength.

Resistance Fibre optic has far greater resistance to electromagnetic noise such as radios, motors or other nearby cables.

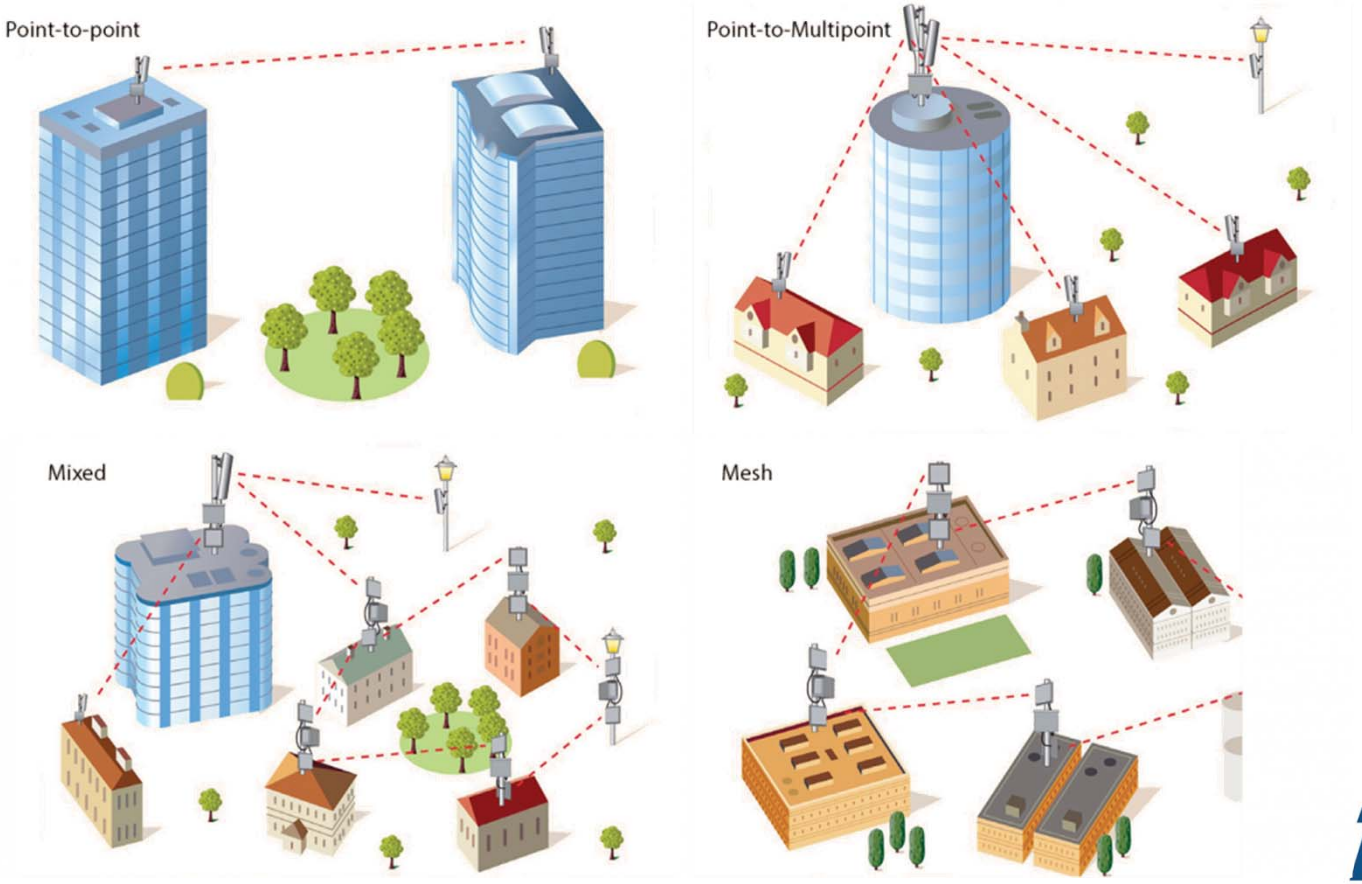
Maintenance Fibre optic cable networks cost less to maintain than copper networks.



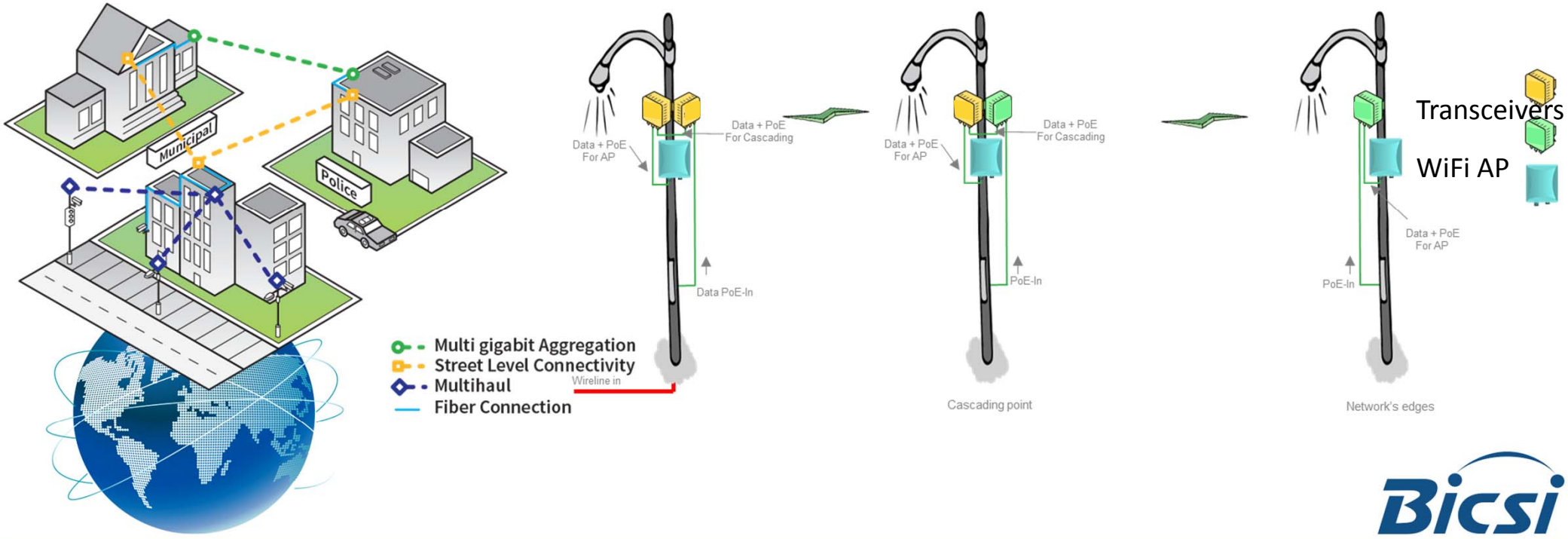
Multi-device fiber optic system



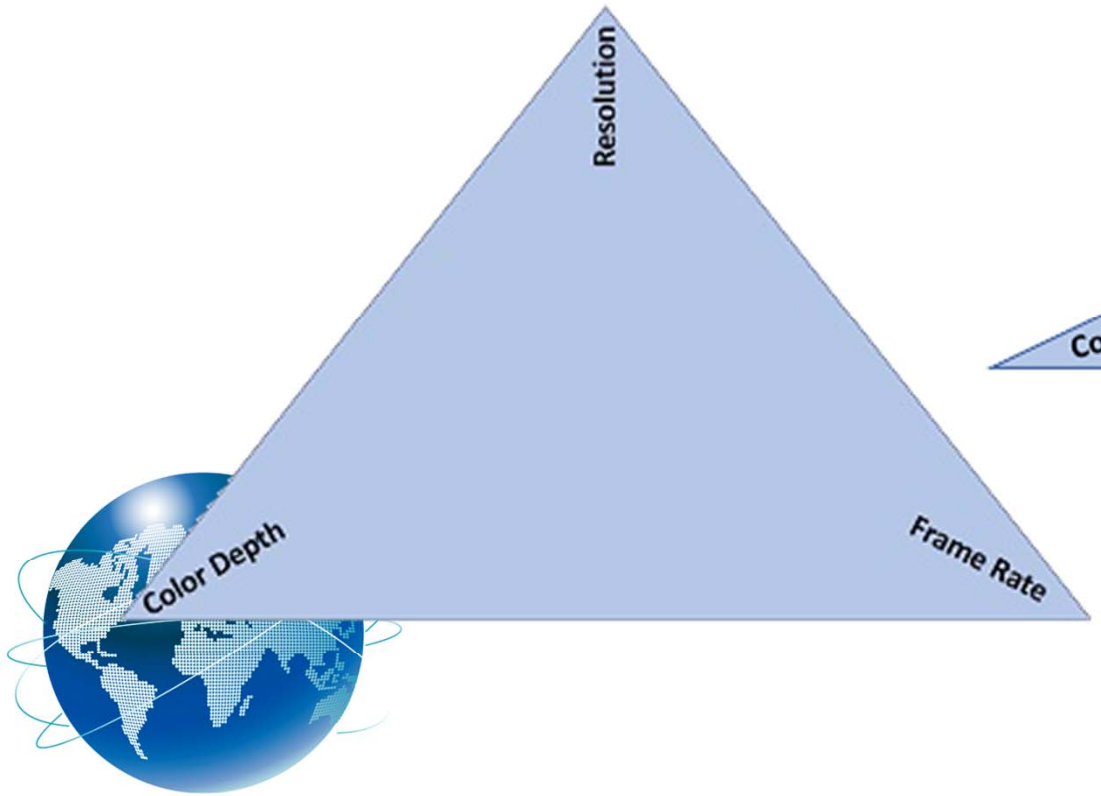
Wireless Systems

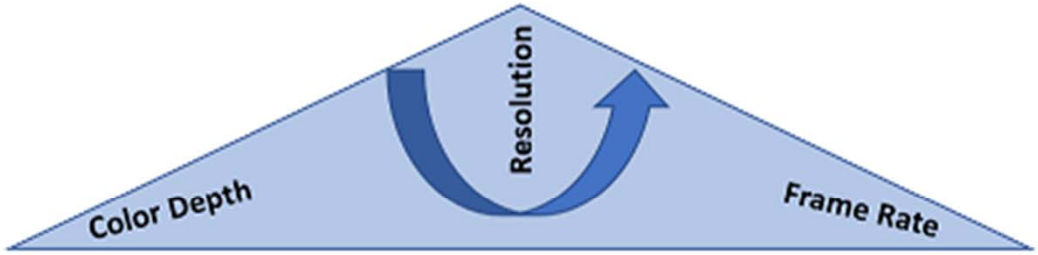


Wireless IP Video using PoE

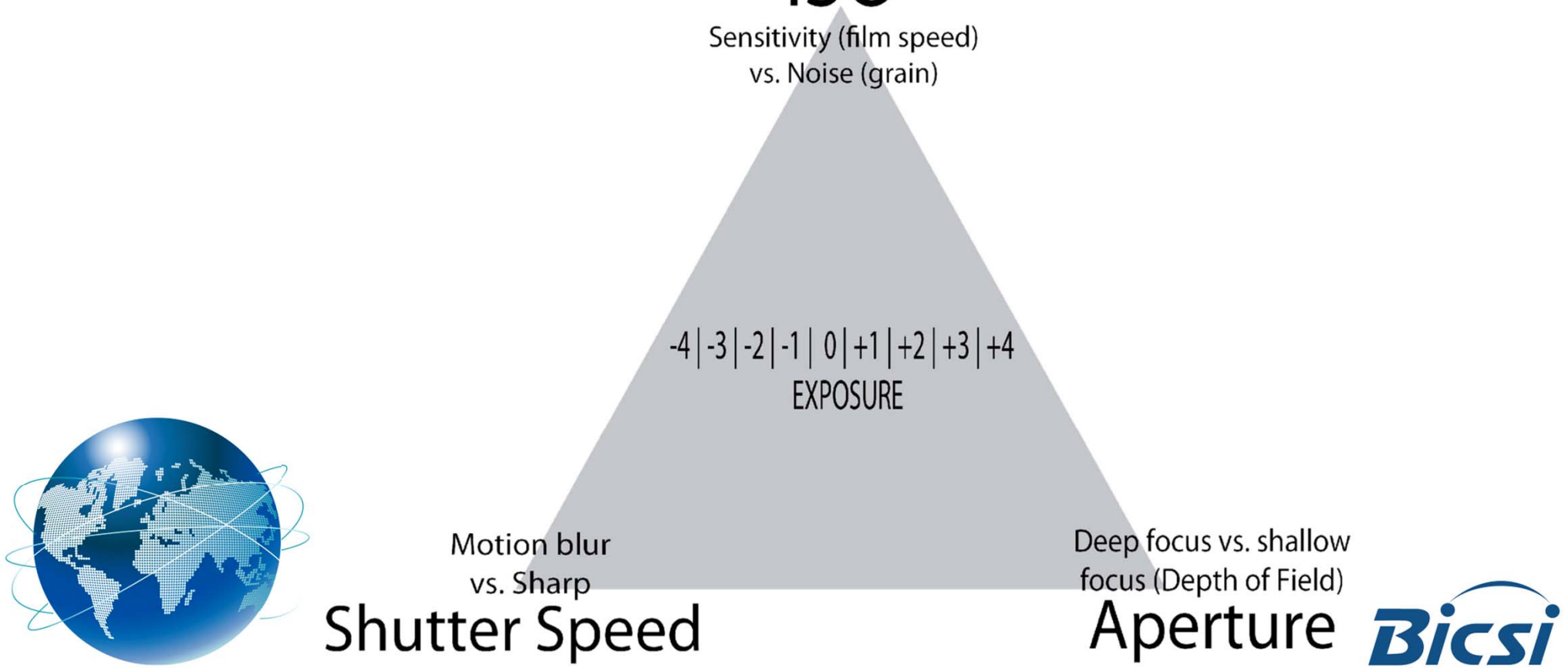


Legacy approach: Solving the IP Video Networking Triangle: Bandwidth, Storage and Image Quality

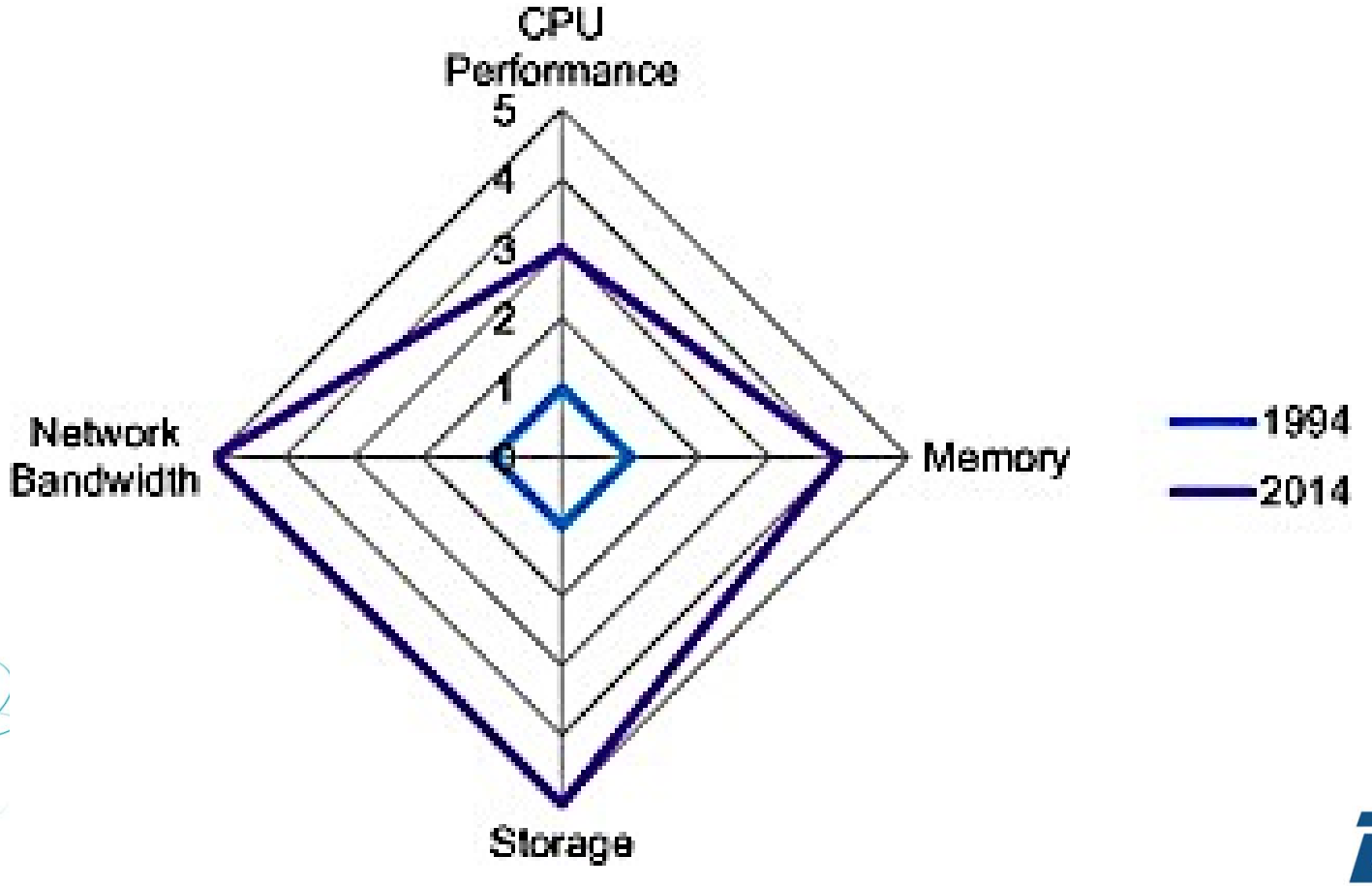




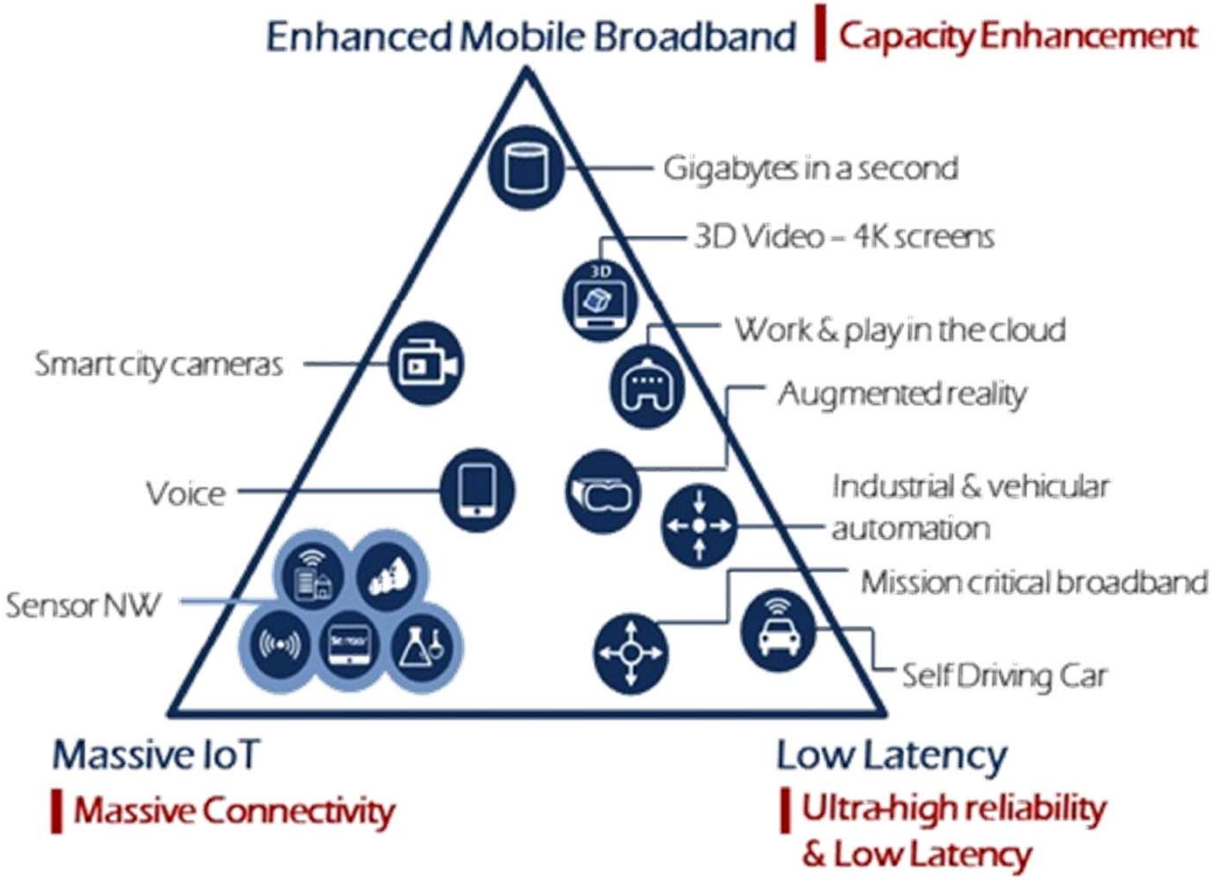
Similarity to Exposure Triangle



Modern IP Video Design Considerations



The IoT Networking Triangle



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Storage Cost Impact

Requirements and Cost Comparison of a single Digital Surveillance Camera				
Quality	Bandwidth Usage (Mbps)	24h of video storage (1 GB = 8000Mb)	Hard Disk Drive 24h @ 3 cents per GB	Solid State Drive 24h @ 20 cents per GB
SD (480p)	2	100GB	$3	$20
HD (720p)	4	200GB	$6	$40
Full HD (1080p)	8	400GB	$12	$80
UHD /4k	25	1600GB	$48	$320

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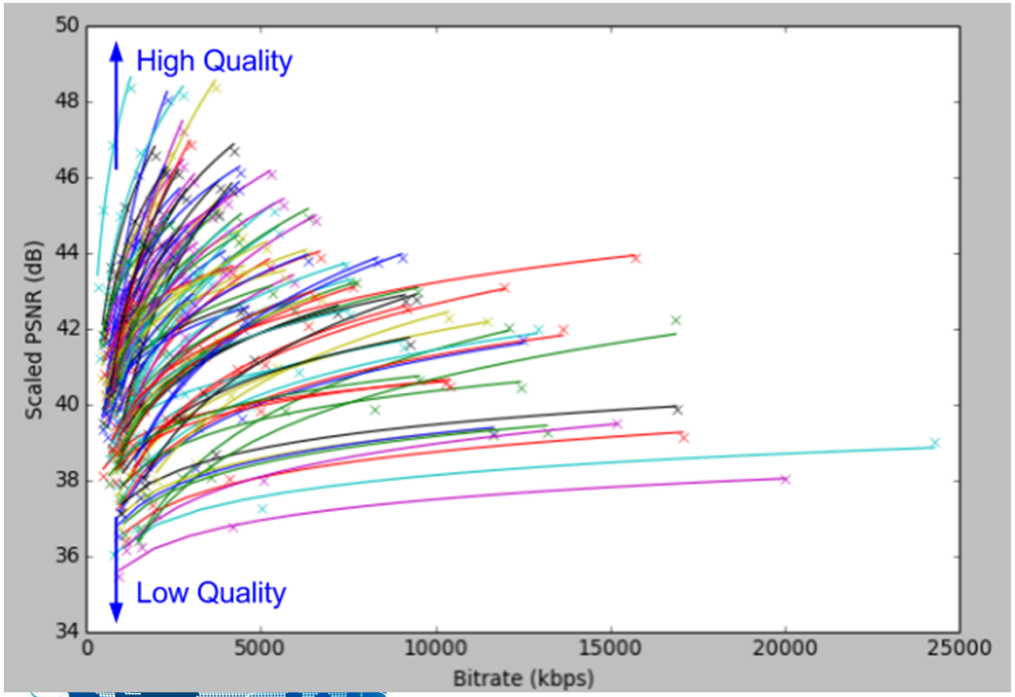
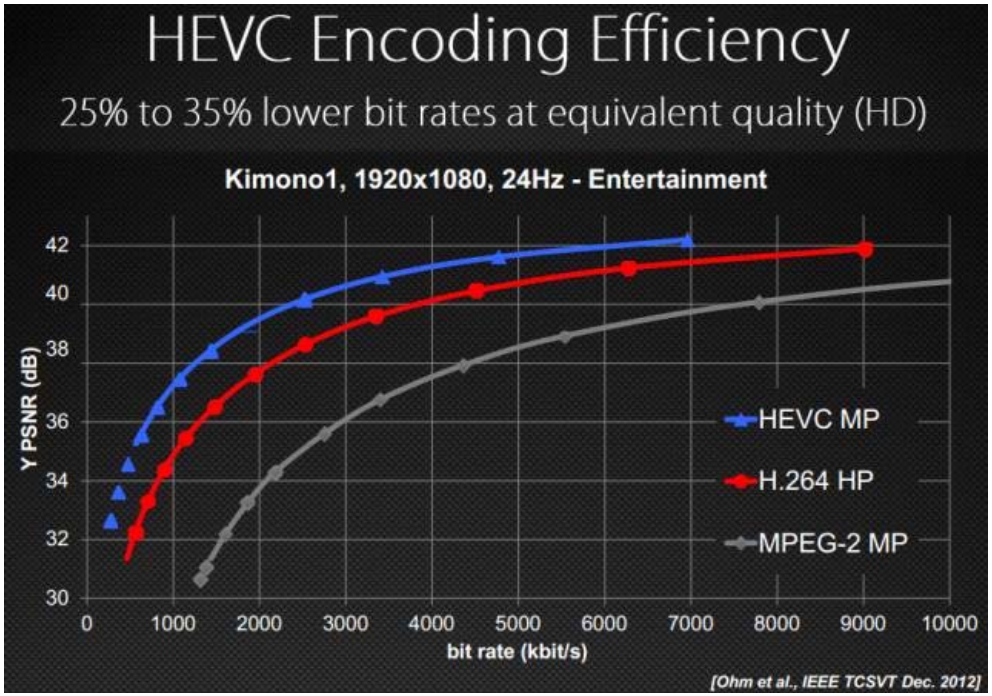
HEVC and IP Video Efficiency





Comprehensive Bandwidth Summary

Resolution	Compression	Frame Size*, KB	FPS	Days	Cameras	Bandwidth, Mbit/s	Disk Space, GB	Bitrate,kbit/s	Comment
3840x2160 (8 MP)	H.264-10 (High Quality)	114	12	7	1	11.21	847.2	11207	Overview Cam
1920x1080 (Full HD)	H.264-10 (High Quality)	26	20	14	4	17.04	2576.4	4260	Internal Cameras
2288x1712 (4 MP)	H.264-10 (High Quality)	52	15	14	10	63.9	9661.3	6390	External Cameras
6576x4384 (29MP Pro)	H.264-10 (High Quality)	413	10	30	1	33.83	10961.9	33833	Overkill?

Total FPS	Disk space,GB	Bandwidth, Mbit/s
252	24046.8	125.98

From Small Systems to Cloud: IP Video Network Design by Use Case

- Small Systems
- Mid to Large Server-Based Systems
- Edge to Cloud Systems
- Upgrading from Analog to IP Video

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VIDEO DATA FEATURE STREAMS

VIDEO ANALYTICS AGENT

RUNS ON EMBEDDED NETWORK CAMERAS INGESTING & BASIC ANALYSIS OF METADATA

(OBJECT CLASSIFICATION, SPEED, QUANTITY, TRAJECTORY)

NETWORK TRANSPORT

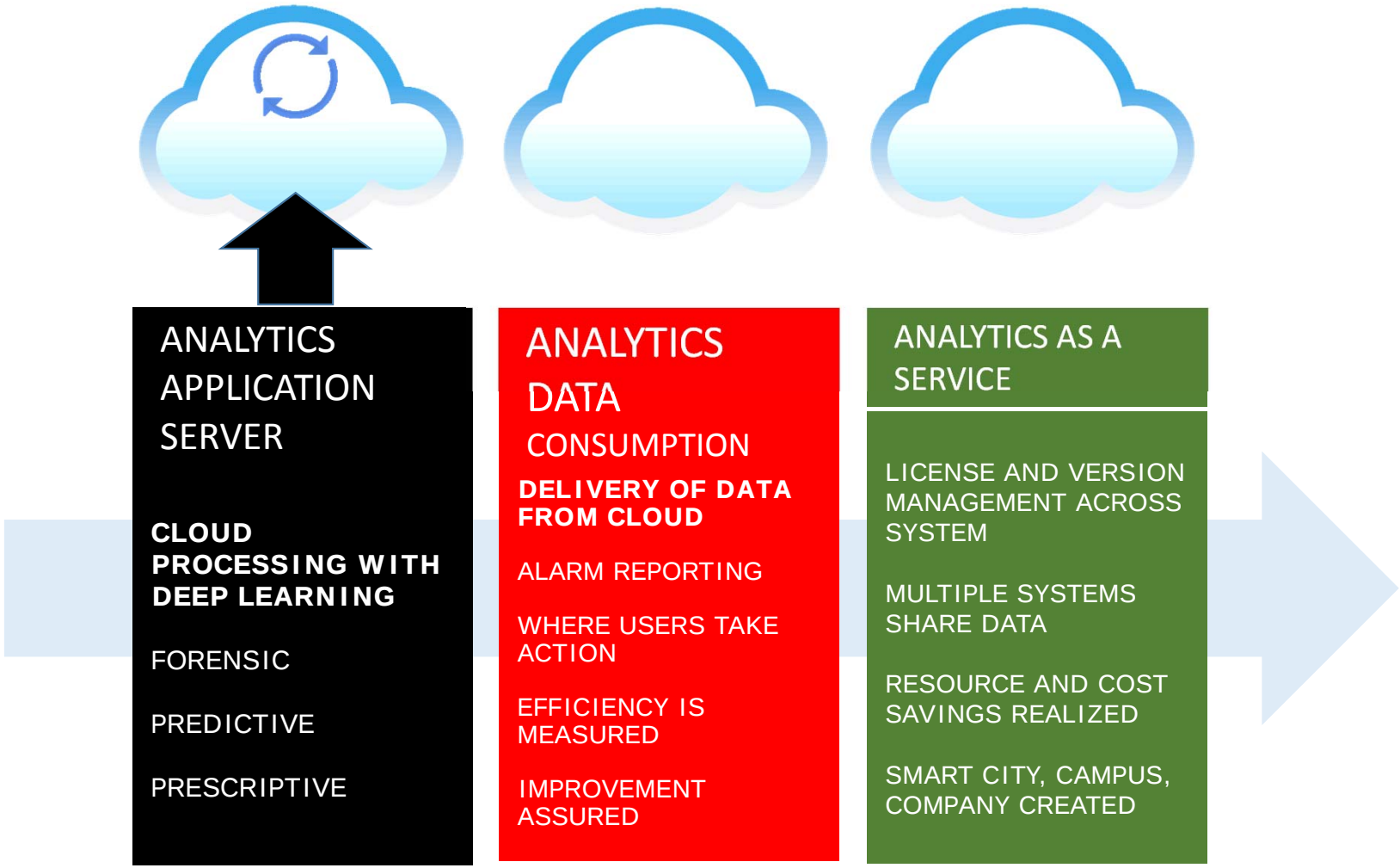
LOW BITRATE CONSUMPTION OF ACTIONABLE DATA

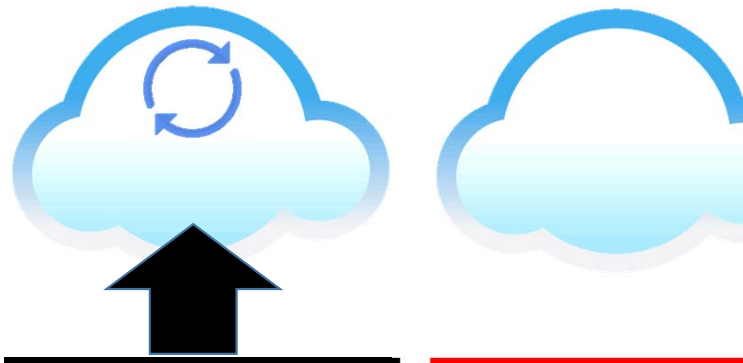
USERS HAVE OPTION TO RECEIVE PROCESSED FEATURE DATA AT LOW LATENCY & USING LOW BANDWIDTH

VIDEO MANAGEMENT APPLICATION PROCESS

VIDEO & ALARM DATA AUTOMATICALLY VERIFIED USING PRIORITY & APPLICATION RULES

CENTRAL STATION AUTOMATION SYSTEM DISPATCHES APPROPRIATE RESPONSE


ANALYTICS APPLICATION SERVER
CLOUD PROCESSING WITH DEEP LEARNING
FORENSIC
PREDICTIVE
PRESCRIPTIVE
ANALYTICS DATA CONSUMPTION
DELIVERY OF DATA FROM CLOUD
ALARM REPORTING
WHERE USERS TAKE ACTION
EFFICIENCY IS MEASURED
IMPROVEMENT ASSURED
ANALYTICS AS A SERVICE
LICENSE AND VERSION MANAGEMENT ACROSS SYSTEM
MULTIPLE SYSTEMS SHARE DATA
RESOURCE AND COST SAVINGS REALIZED
SMART CITY, CAMPUS, COMPANY CREATED



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Forensic/Predictive/Prescriptive: Use of analytics with digital multimedia content

- IP Video + Audio + Metadata = Digital Multimedia Content
- Process/Incident/Threat: The Table of Analytics
- Privacy, retention, information sharing
- Forensic Video Best Practices

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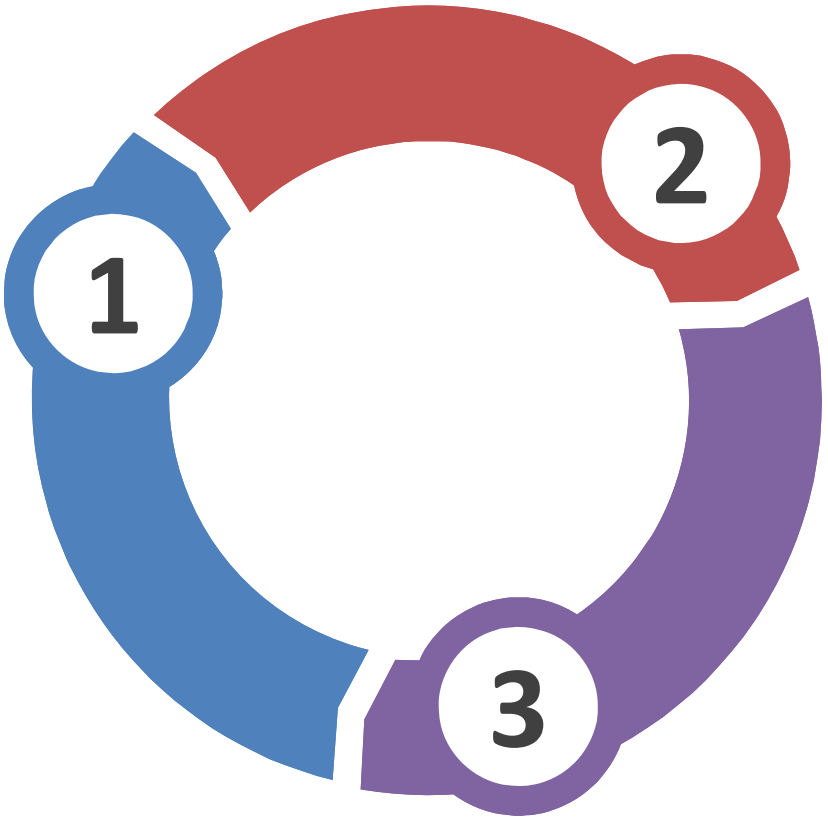
The Security Data Analytics Cycle



1 FORENSIC

What has happened – your security evidence, analyzed quickly!

2 PREDICTIVE

Security models created are reviewed on the basis of what might happen. Actionable security data is used and a feedback system that tracks the outcome successful or not, produced by the action taken.

3 PRESCRIPTIVE

What is the best course of action and response scenario based on security intelligence?

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Checklist: preparing for digital forensics – Issues/opportunities

- Digital multimedia content (DMC), incorporating forensic video
- Cost assessment for prep: balance cost-effective with the technically feasible
- Target collection capability on the risks to the business/event/assets
- Consider implementing ALICE: alert, lockdown, inform, counter and evacuate*
- Collect admissible evidence within the legal compliance requirements: review the legality of any monitoring; not a technical issue of what can be obtained through forensic video review
- All forms of potential evidence should be considered, not only IP cameras or legacy CCTV cameras, personnel records, access control systems, still images
- Understand the functional differences between systems: Observation, Forensic Review and Recognition/Content Analysis
- Understand the difference between pixel density and visual acuity/image processing and how the highest quality video content is produced
- Differentiate between video content analysis/recognition systems optimized for “pro-active” vs “reactive”, understanding that many “reactive” tools are best for forensic video review

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Checklist: implementing a forensic video readiness program

- Define the business/industrial/first responder scenarios that require digital multimedia content (DMC), incorporating forensic video
- Identify available sources and different types of potential evidence
- How will you retrieve the DMC?
- Establish the capability for securely gathering legally admissible evidence to meet the requirement
- Establish a policy for secure storage and handling of potential evidence Ensure monitoring is targeted to detect and deter major incidents (consider ALICE and proactive vs reactive technologies)
- Specify circumstances when escalation to a formal investigation (which may use the digital evidence) should be launched
- Train staff in incident awareness, so that all those involved understand their role in the digital evidence process and the legal sensitivities of evidence
- Document a sample case with forensic video evidence, use as a model to describe incident and its impact
- Ensure legal review to facilitate action in response to the incident

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Technology considerations in forensic video

Simplified high quality redundancy of recording: “edge” camera recording

High quality, High Definition, low light tech (full color, thermal)

“Proactive” “Ahead of the threat” advance warning video tech (abnormal detection)

“Reactive” video technologies help investigations (video summarization, synopsis, LPR, face location)

Video + Mobility and/or Alarm Automation

Leveraging Technology for City and Campus Sustainability and Public Safety

- Smart Buildings Defined
- Smart Cities Defined
- IP Video for Traffic Incident Management
- IP Video for Traffic Flow
- IP Video for Critical Infrastructure Monitoring
- Location based services
- Computer aided dispatch, video verification and the PSAP

Command Centers and Operations

Item	SCENARIO (below)	DISPLAY (across)	ACS activity display	ACS event display	VSS Primary Displays			VSS Investigate Display	VSS Review Display	VSS Alarm Display	BAS Display	FAS Display	CAD or GIS Display	News / Weather / Environmental Status Display	Communications
					1	2	3								
	Description of scenario or activity	**Automated or Manual Trigger**													
1	Fire alarm condition	Automatic (from Fire Alarm System)	Personnel location, evacuation or mustering status	Door status	Perimeter	Perimeter	Perimeter	Available for Operator	Available for Operator	Elevator banks	Elevator / HVAC status	Event / Location	Site plan / traffic for first responders	Current news / Weather	Corporate response team communications
2	Workplace violence event	Manual	Personnel location, evacuation or mustering status	Lockdown or Full unlock condition, depends on policy	Event coverage	Event coverage	Shelter-in-place	Shelter-in-place	Event review; personnel tracking	Dark (available for new incident)	Normal status display	Normal status display	Site plan / traffic for first responders	Campus display / signage system / content distribution	Emergency messenging
3	Hazardous materials	Automatic or manual	Personnel location, evacuation or mustering status	Corporate response team locations	Event coverage	Event coverage	Shelter-in-place	Shelter-in-place	Event review; personnel tracking	Dark (available for new incident)	HVAC status near incident	HVAC system activation and reset status	Site plan / traffic for first responders	Campus display / signage system / content distribution	Corporate response team communications
4	Search and rescue (missing employee)	Manual	Employee trace (real time)	Employee trace (reports)	ACS control of employee trace, last locations known	ACS control of employee trace, last locations known	ACS control of employee trace, last locations known	Available for Operator	Event review; personnel tracking	Dark (available for new incident)	Normal status display	Normal status display	Site plan / traffic for first responders	Campus display / signage system / content distribution	Corporate response team communications
5	Medical emergency	Manual	Corporate response team locations	Corporate response team location report	Event coverage	Event coverage	Perimeter	Available for Operator	Event review	Dark (available for new incident)	Normal status display	Normal status display	Site plan / traffic for first responders	Campus display / signage system / content distribution	Corporate response team communications
6	Explosives / Bomb threat	Manual	Personnel location, evacuation or mustering status	Corporate response team locations	Event coverage	Event coverage	Shelter-in-place	Shelter-in-place	Event review; personnel tracking	Dark (available for new incident)	Normal status display	Normal status display	Site plan / traffic for first responders	Campus display / signage system / content distribution	Corporate response team communications
7	Normal condition	None	Exception events	Restricted area exception events	Perimeter	Perimeter or Interior	Perimeter or Interior	Available for Operator	Available for Operator	Dark (available for new incident)	Normal status display	Normal status display	Site Plan	Current news / Weather	Non-emergency communications

Trends, Smart Buildings, Smart Cities

BICSI

SMART CITY SOLUTION: ESSENTIAL TOOLS FOR OUR FUTURE

TRAFFIC INCIDENT CONGESTION AVOIDANCE

AIRPORT QUEUE LINE MGT ENTRY SCREENING

PARKING MGT VEHICLE SCREENING

PERIMETER DEFENSE OF CRITICAL INFR

VOIP WARNING SYS

WATER DEFENSE FLOOD MONITORING

VIDEO & ACOUSTIC SENSORS LINKED TO SOCIAL MEDIA GEOFENCING

VOIP ENTRY WITH ACOUSTIC DETECTION

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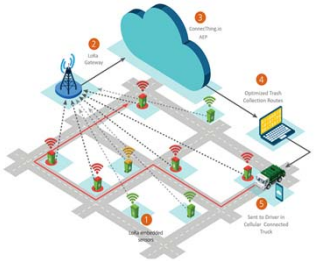
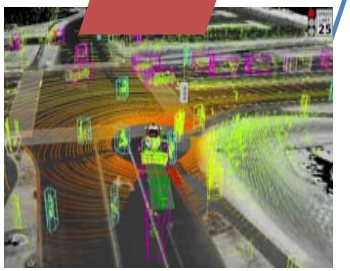
EMERGING TECHNOLOGY TRENDS



IoT Solutions Safe/Smart City Ballistic Detect.



LIDAR Low Cost, Life-saving analytics

Micro Drones for Security Officers & First Responders

VR Visual Perimeter Breach Detection Real Time Occupancy and People Counting Traffic Incidents

AI – Everywhere Cyber Threat Response Physical Treat Procedures - Lockdowns

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Solution: IoT

Connected devices growing exponentially: Low Power Connectivity Drives IoT expansion in the Security and Wearables Markets

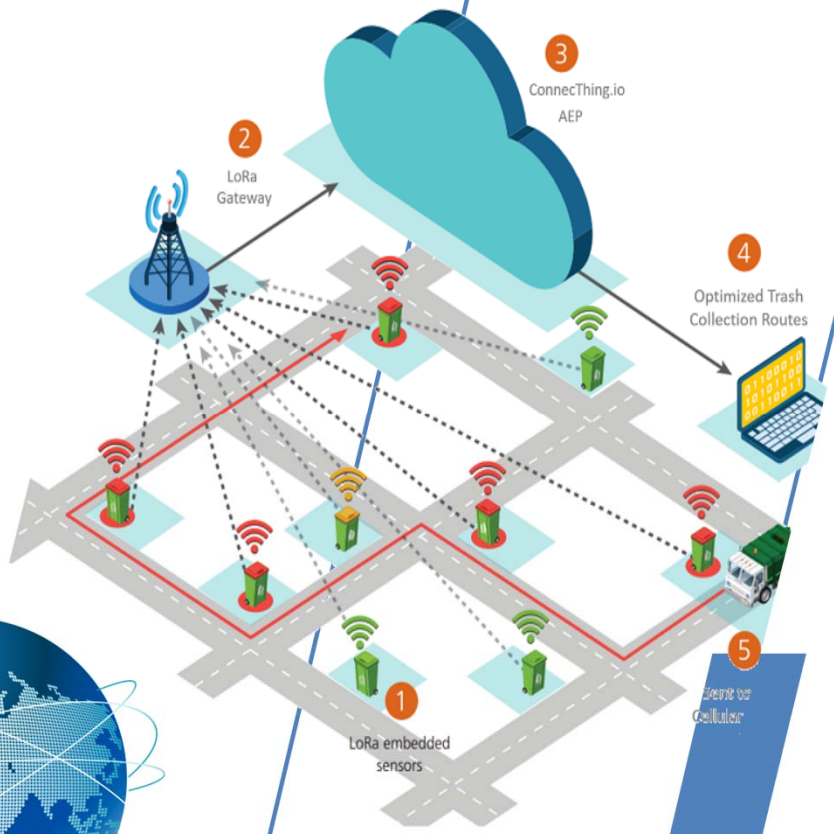
Body worn camera costs are now affordable for security professionals and can be easily integrated into user cloud and server solutions

Gunshot detection devices are now ultra-low power, wireless sensors

A key theme from CES2018 and Q1 Security Industry Solution Providers is the expansion of sensors in both their numbers and their capabilities

More efficient battery tech is allowing solution providers to “cut the cord”

Qualcomm is working on tech that could triple the battery life of Bluetooth-powered wireless headphones



LIDAR Wins at Autononomous Vehicles; Intersections and Perimeter

10% the cost of a sophisticated security camera

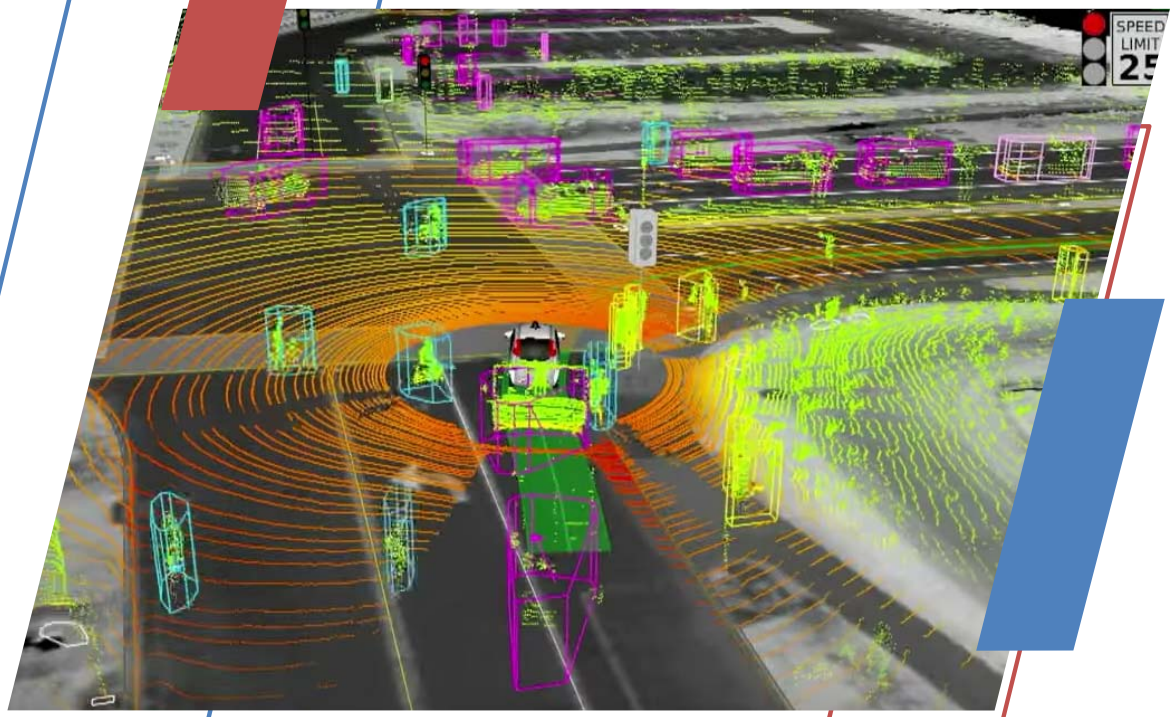
LIDAR devices can produce visual representation of perimeter, boundary detection and advanced object detection at a fraction of the cost of today's video surveillance analytic technologies

LIDAR was one of the dominant technologies at CES2018, fueled by autonomous vehicles

Stationary LIDAR devices are being deployed in Las Vegas at vehicle intersections for safety use cases

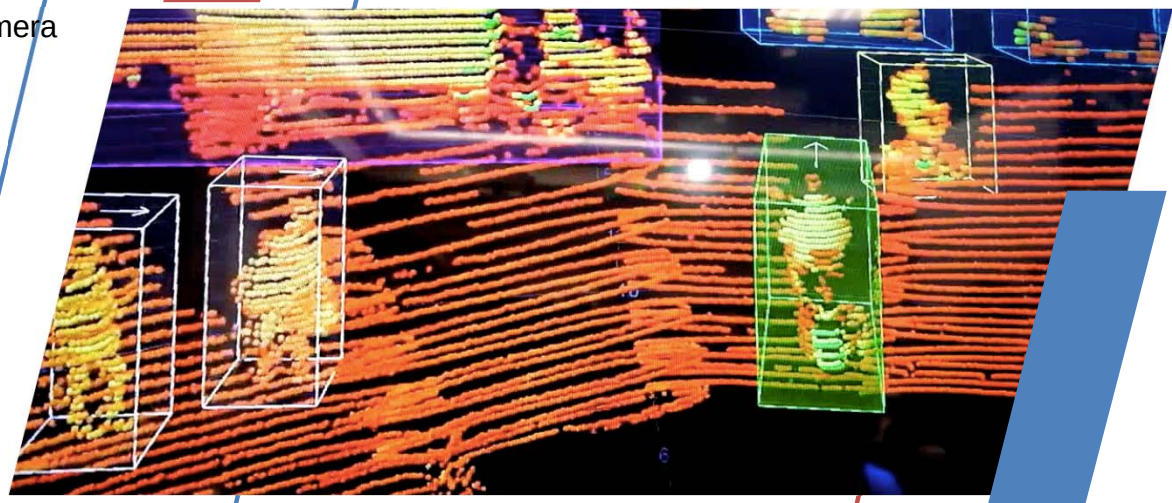
LIDAR Wins at Autononomous Vehicles; Intersections and Perimeter

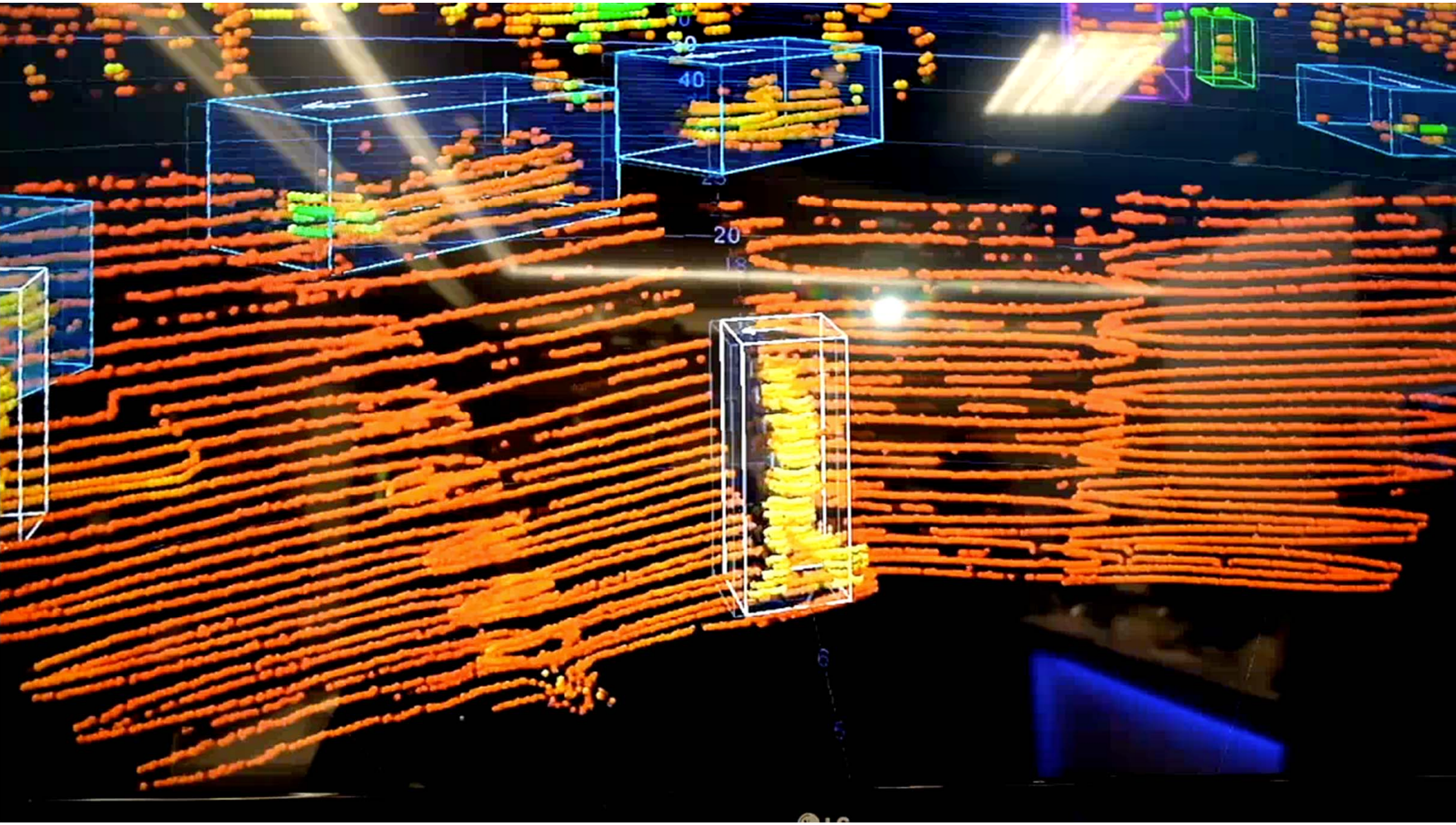
50% the size of a sophisticated security camera



LIDAR Wins at Autononomous Vehicles; Intersections and Perimeter

10% the power consump. of a sophisticated security camera



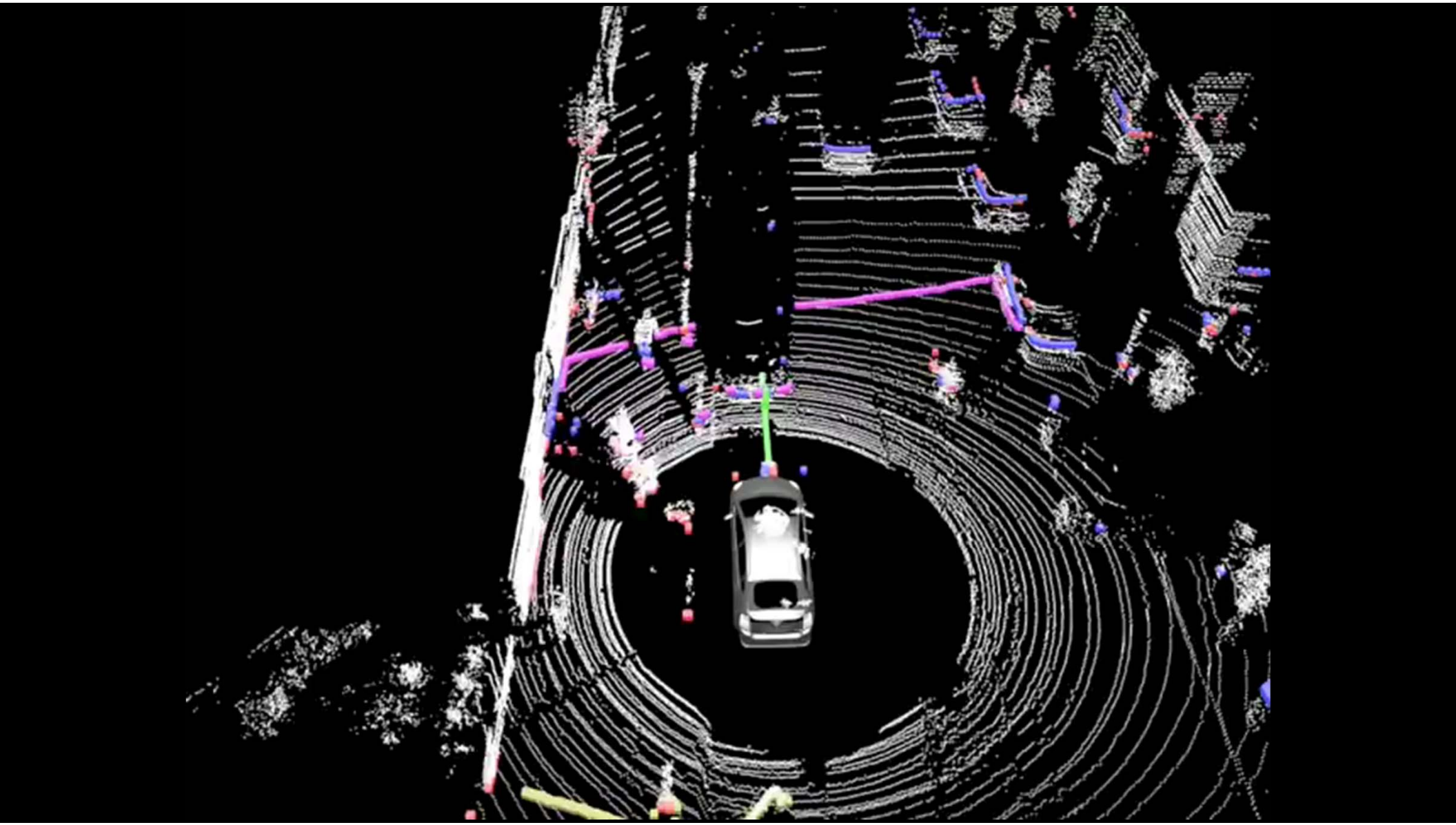

40
20

LIDAR Wins at Autononomous Vehicles; Intersections and Perimeter

10X the use cases vs unmodified security camera

LIDAR solution providers will be entering the public safety and security markets but need help from associations like BICSI to navigate

LIDAR, together with Positive Traction Control, would have most likely eliminated the rash of rail accidents in 2017



Lidar: Perimeter Surveillance

NOT JUST FOR SELFIES!

New Micro Drones introduced for First Responders and Security Professionals to anti-UAS countermeasures –

CES2018 grew from a drone pavilion to an entire show floor!

SMART CITIES

- SMART GOVERNANCE
- SMART EDUCATION, SMART PEOPLE
- ENVIRONMENTAL SUSTAINABILITY
  ENERGY CONSUMPTION
- INTELLIGENT TRANSPORTATION
  SMART MOBILITY

- **Smart people:** Increasing inclusion by delivering a more consistent educational experience in both urban and rural areas through the use of e-education solutions (remote learning and collaboration) to help eliminate rural/urban educational disparities.
- **Smart environment:** Dramatically reducing energy consumption through the application of novel technology innovations while promoting energy conservation and material re-use.
- **Smart mobility:** Promoting more efficient and intelligent transportation systems—effectively leveraging networks to ensure more efficient movement of vehicles, people, and goods, thus reducing gridlock; and promoting new 'social' attitudes such as car sharing, car pooling, and car-bike combinations.

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SMART CITIES

- SMART GOVERNANCE
- SMART EDUCATION, SMART PEOPLE
- ENVIRONMENTAL SUSTAINABILITY
  ENERGY CONSUMPTION
- INTELLIGENT TRANSPORTATION
  SMART MOBILITY
- SMART LIVING, SECURITY,
  SMART HEALTHCARE
- SMART ECONOMY
  CITY, REGIONAL COMPETIVENESS

• **Smart living:** Access to high-quality healthcare services (including e-health or remote healthcare monitoring), electronic health records management, home automation, smart home and smart building services, and easier access— via the Internet— to social services of all kinds."

• **Smart economy:** Creating business opportunities, providing broadband access for all citizens and businesses, helping maintain population in rural areas by leveraging networks to expand business opportunities outside the city centre, and using electronic means in business processes of all kinds (e.g., e-banking, e-shopping, e-auction).

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CAN YOU BUY INTO A SMART CITY?

$500M TO SECURITY – SAFETY - SUSTAINABILITY

Smart Cities: Las Vegas Taps Smart City Initiatives to Improve Security, Mobility, Quality-of-Life and invests $500M.

More municipalities are beginning to integrate sensor technology into infrastructure in ways that impact public health, safety and security.

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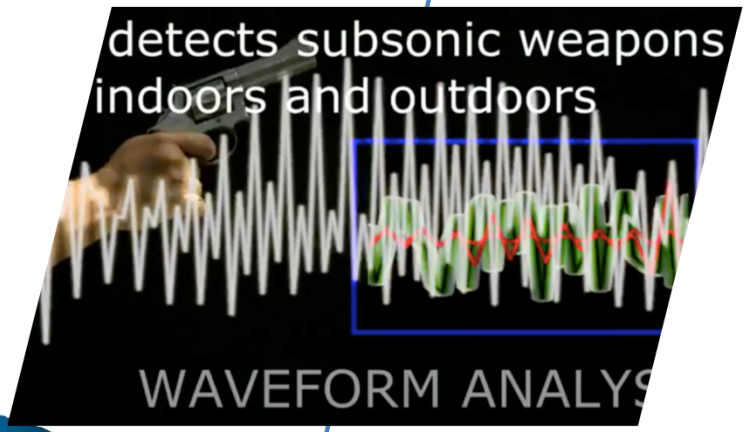
Key Public Safety Tech: “Ballistic” + Lockdown + IoT



Just released: advanced sensors can pinpoint the location of a gunshot, perform ballistic identification, and in the future will themselves dispatch police instantly

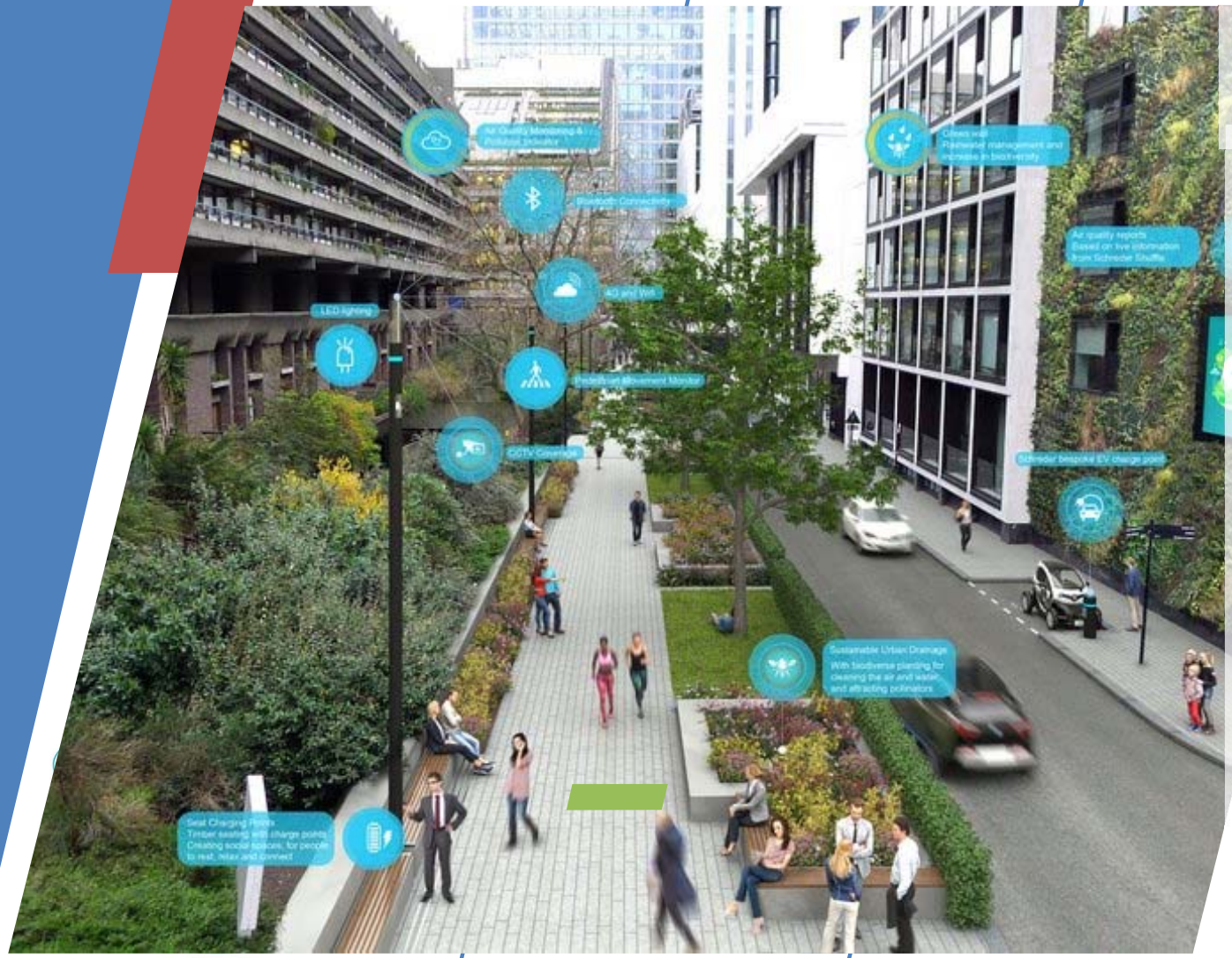
Lockdown + IoT

Wireless PACS, driven from the hotel industry, lowers the cost of school and industry lockdown solutions

Lockdown + IoT

Wireless PACS, driven from the hotel industry, lowers the cost of school and industry lockdown solutions

Augmented Reality



Augmented Reality: VR is still growing, AR with its immersive data is likely to explode this year, providing experiences and learning opportunities for users while keeping them connected.

Augmented analytics is a particularly strategic growing area which uses machine learning to automate data preparation, insight discovery and insight sharing for a broad range of business users, operational workers and citizen data scientists.

DATA GOVERNANCE AND THE SMART CITY

Infonomics and Cognitive Engines become mainstream. Veritone, the company that automatically tracked the mention of political candidates, has now entered the public safety, security and smart city markets. Is this the beginning of the passing of PSIM or Video Management Systems? It will be essential for the Security Industry to embrace this growth area:

Today, there are about 5,000 cognitive engines available commercially, many of them capable of performing both video and audio analytics, up from just five engines in 2012.

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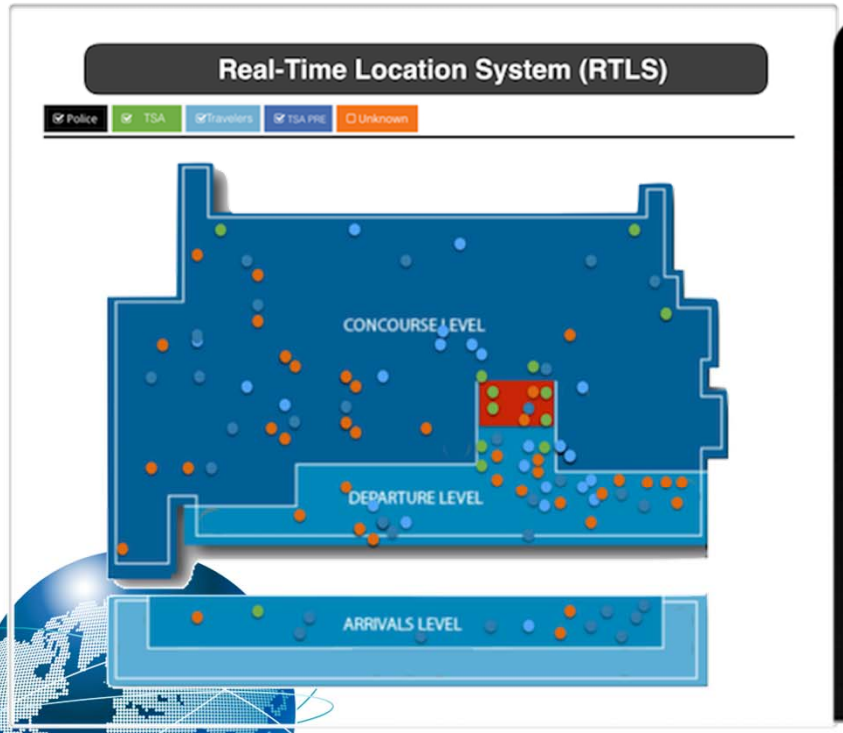
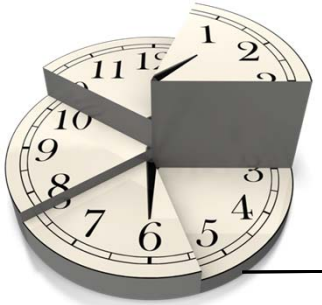
Smart Buildings: Leveraging WiFi system for personnel location





The Security IoT ecosystem: a timeline

First Responders – Remote Video Communications system is tested for potential use by Law Enforcement, Fire, EMS, HAZMAT and other response teams.



Wireless Spectrum – Security officers test the alert notification system for availability and network response in preparation for the evening sporting event.



1200 1400 1700

0800

Authentication – Arena teams use their smartphones with secure credentials and Bluetooth to gain entry to authorized areas on the access control system. Last known user locations are logged for use in an emergency.

0400

Entry PoS – Ticket validation kiosks are set up and tested. Event pass is scanned and cross checked with driver's license via built-in scanner. Event wristband is dispensed.

Premises Alert- A camera with an embedded license plate capture application detects an unknown vehicle at an open service entrance and sends a notification and last known location to the closest security officer

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Entry Screening – as event attendees arrive, screeners perform rapid bag scans and store all entry data for potential future use.

Traffic Automation – real time street congestion alerts sent to field staff to expedite attendee exit.

Social Media Monitoring – a keyword filter is activated as an attendee posts about a fight breaking out; security response is immediate to location using video as verification.

Smart Lighting – Unattended vehicles are verified through LPR; Audio detection monitors for potential firearms and aggressive voices; Audio and Video Vehicle Crash Detection monitors any incidents;

Mobility – night security shift monitors facility after hours, catalogs items left behind, documents event responses, prepares facility for next day opening.

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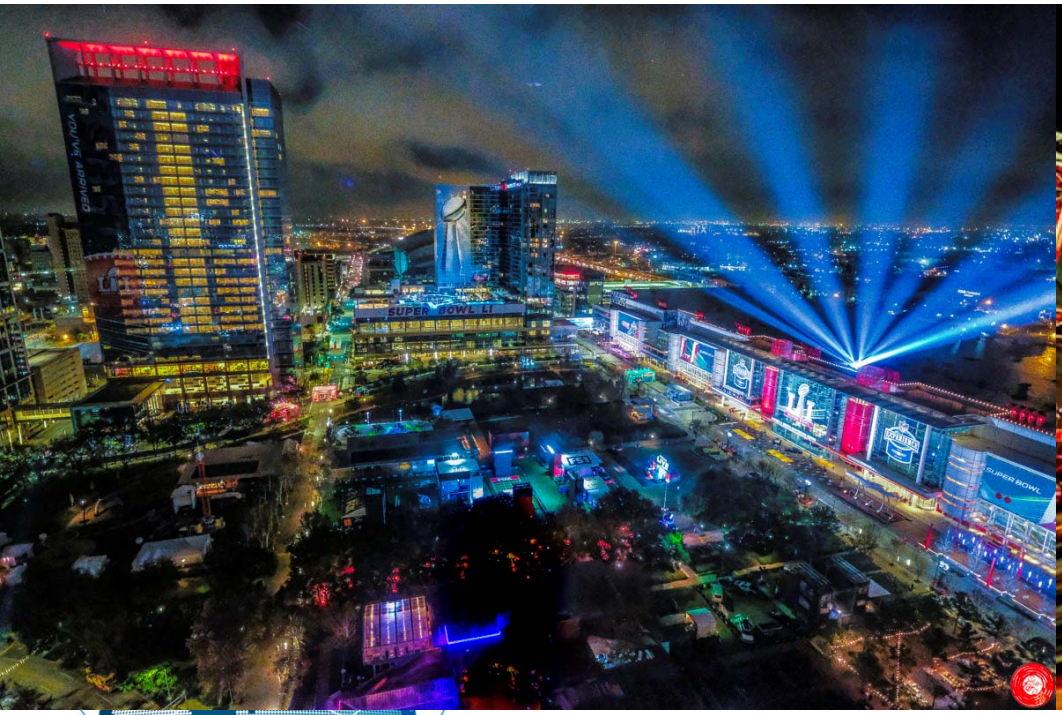
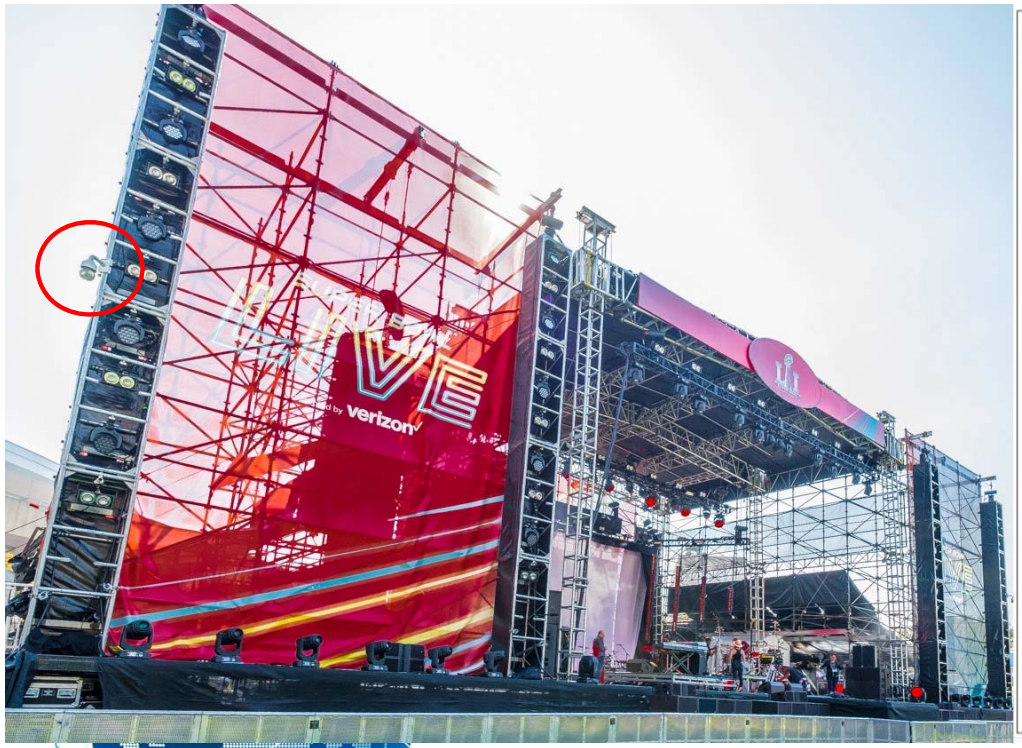
The Super Bowl LIVE Case Study: Situation

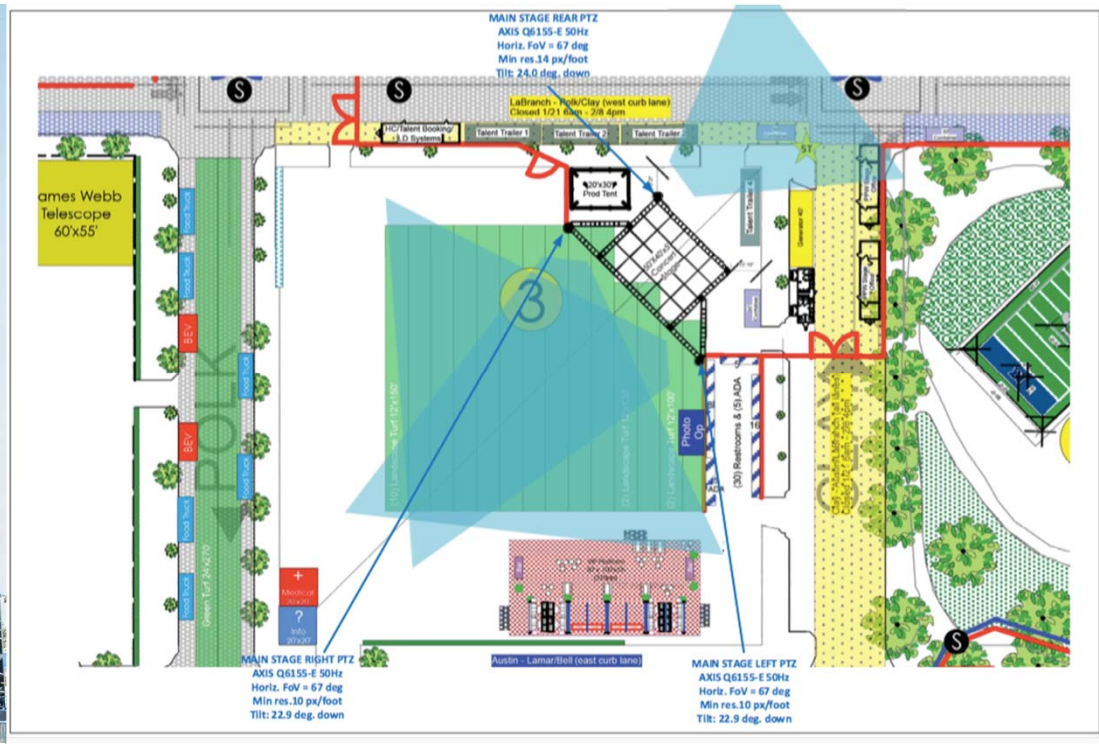
- Super Bowl LIVE is the official name of the 10-day fan festival in downtown Houston leading up to Super Bowl LI. More than one million people attended Super Bowl LIVE over the 10 days leading up to Super Bowl LI
- The festival, a free event with music, food, games and attractions, was in and around Discovery Green Park in downtown Houston, twice the size of San Francisco's event that was held at the Embarcadero

NFL “Fanfest” in Downtown Houston

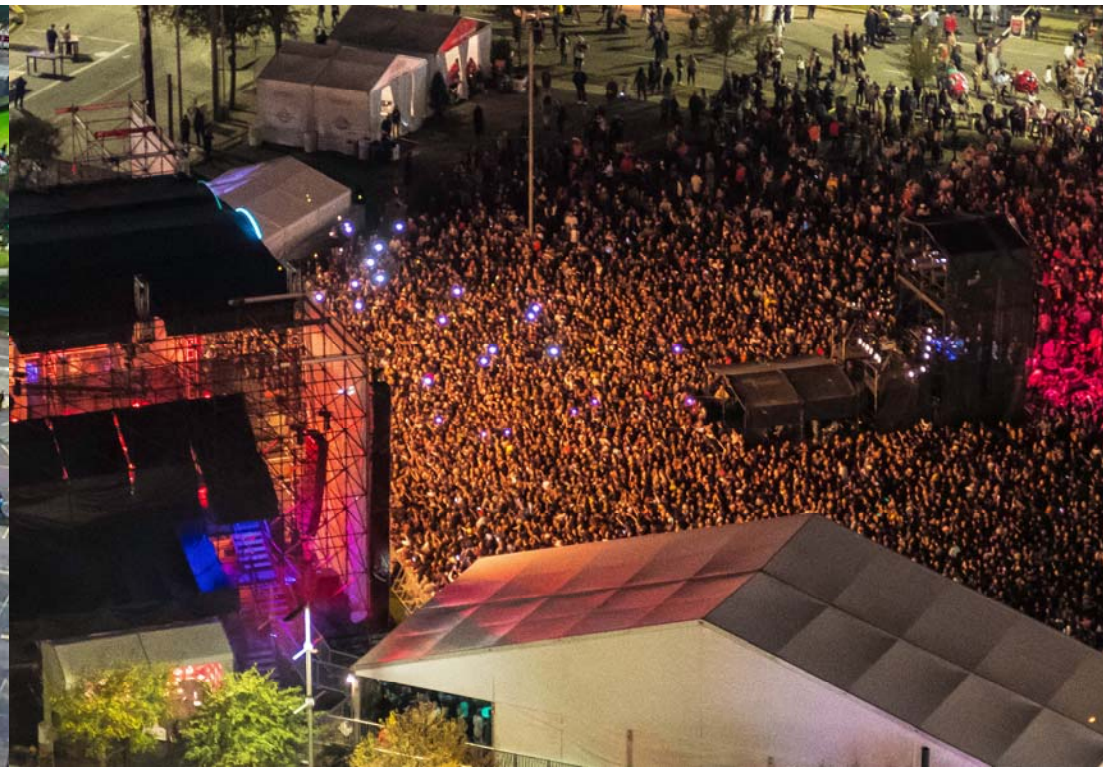


The Main Stage



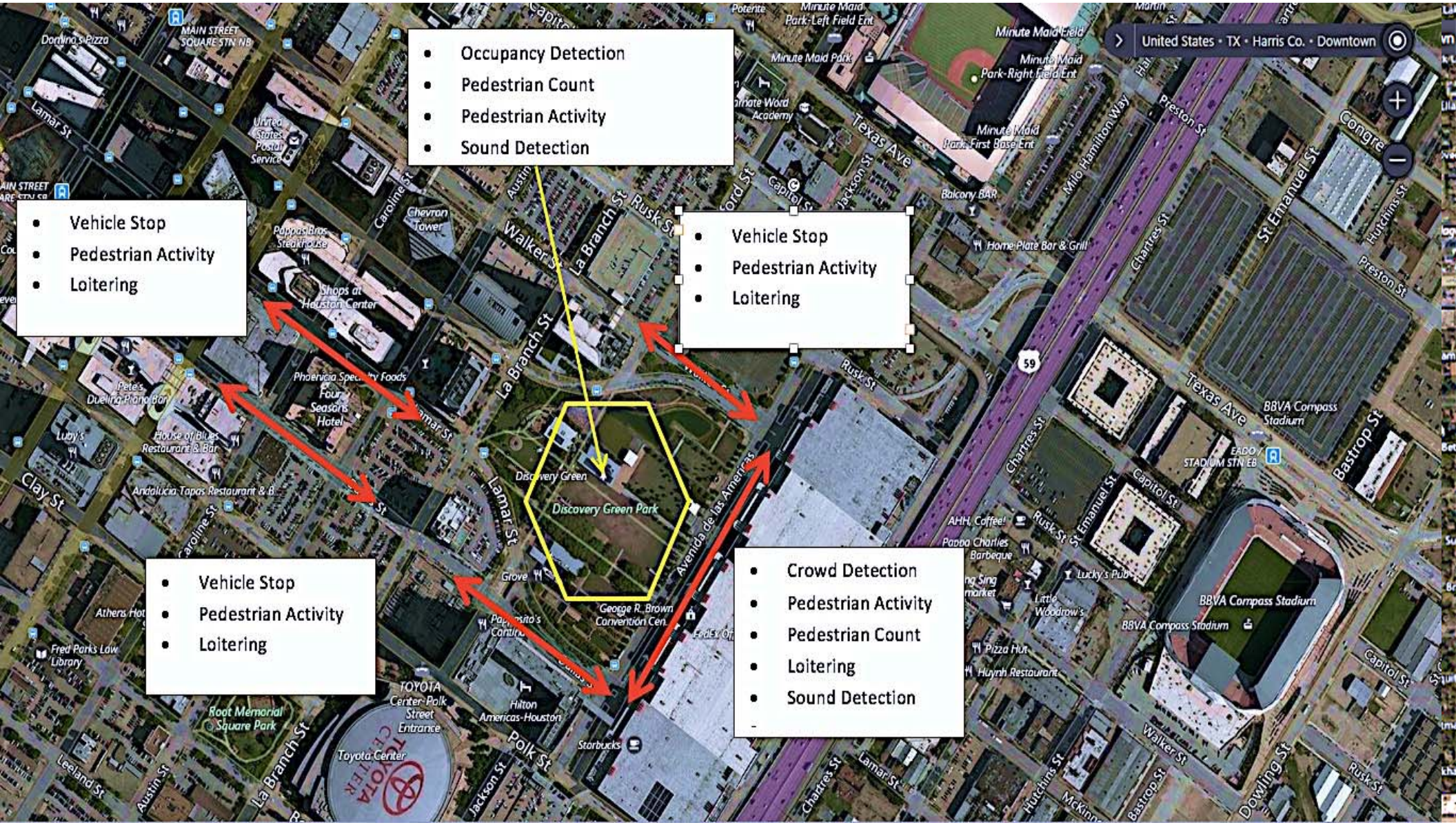


Before and After: Over 10K concert attendees



Tactical and Smart City Solution

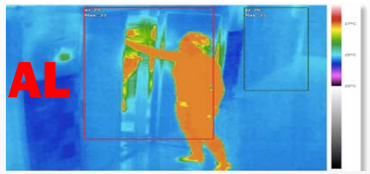
- Wide coverage in the security industry for a single event. Event paved the way for four new case studies in Houston for expanding markets and latest Crime Reduction Initiatives.
- Perimeter protection of Discovery Green and live event monitoring using thermal cameras with perimeter analytics and PTZ
- Transportation and “Domain Awareness” solution using fixed cameras, traffic analytics for busiest feeder roads leading to downtown Houston.
- “Smart City” expansion of Houston’s Light Rail line for intelligent monitoring of crowds, aggressive behavior and rail crossing safety.
- Early warning detection of most vulnerable “hotspot” in Houston’s Galleria area for crowd behavior, aggressive behavior, gunshot detection, explosives detection and overall crowd safety for EMS, Fire and Law Enforcement.


Occupancy Detection
Pedestrian Count
Pedestrian Activity
Sound Detection
Vehicle Stop
Pedestrian Activity
Loitering
Vehicle Stop
Pedestrian Activity
Loitering
Vehicle Stop
Pedestrian Activity
Loitering
Crowd Detection
Pedestrian Activity
Pedestrian Count
Loitering
Sound Detection
United States • TX • Harris Co. • Downtown
Discovery Green
Discovery Green Park
Minute Maid Park
Minute Maid Field
Minute Maid Park-Left Field Ent
Minute Maid Park-Right Field Ent
Minute Maid Park-First Base Ent
Toyota Center
TOYOTA Center-Polk Street Entrance
Root Memorial Square Park
Hilton Americas-Houston
George R. Brown Convention Cen
Shops at Houston Center
Four Seasons Hotel
Chevron Tower
Pappas Bros. Steakhouse
Pete's Dueling Piano Bar
House of Blues Restaurant & Bar
Andalucia Tapas Restaurant & B
Balcony BAR
Home Plate Bar & Grill
AHH, Coffee!
Pappa Charles Barbeque
Lucky's Pub
Little Woodrow's
Pizza Hut
Huynh Restaurant
Starbucks
BBVA Compass Stadium
EADO / STADIUM STN EB
MAIN STREET SQUARE STN NB
Domino's Pizza
United States Postal Service
Fred Parks Law Library
Texas Ave
Rusk St
Preston St
Capitol St
Walker St
Polk St
Clay St
Lamar St
La Branch St
Caroline St
Chartres St
St Emanuel St
Bastrop St
Avenida de las Americas
Milo Hamilton Way
Jackson St
Austin St
Leeland St
Dowling St
59

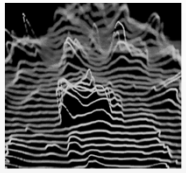
Emergency Operations Center

VIDEO ANALYTICS: *windows to intelligence*

THERMAL



FACIAL RECOGNITION



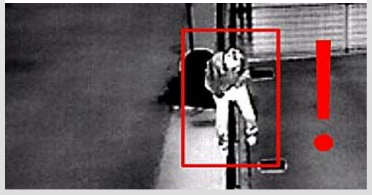
ACOUSTIC DETECTION

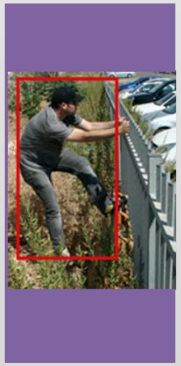
SAFETY

PERIMETER

THREAT DETECT

RETAIL
FINTECH





AUTONOMOUS DEVICES
COLLISION AVOIDANCE
LOCATION SERVICES

CRITICAL INFRASTRUCTURE
PUBLIC SAFETY

Poll: What technology/service will have the greatest impact on public safety? (Choose one)

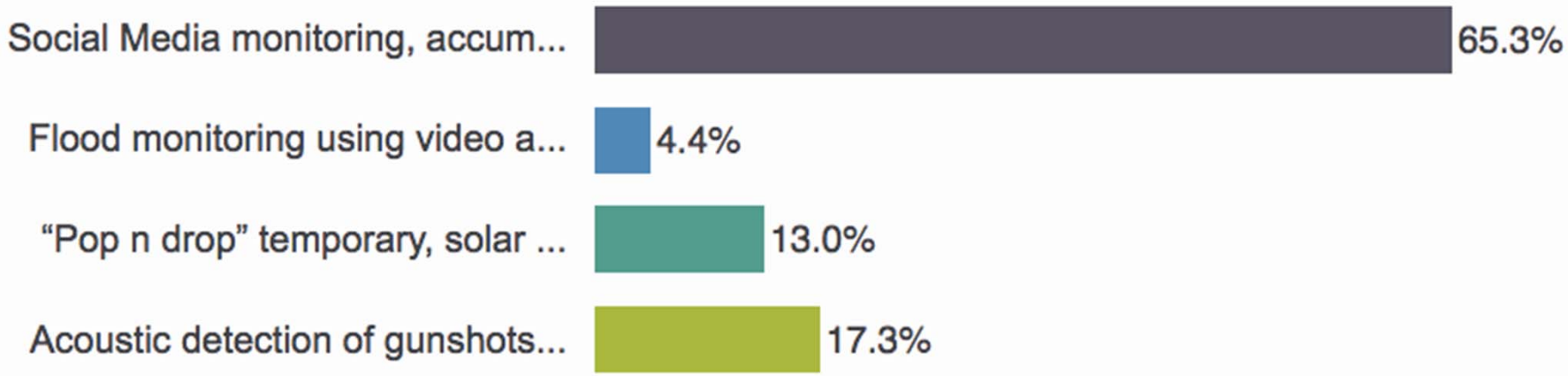
1. Social Media monitoring, accumulator or geofencing
2. Flood monitoring using video analytics
3. “Pop n drop” temporary, solar powered tactical video cameras for events
4. Acoustic detection of gunshots, explosives, vehicle accidents and vehicular terrorism

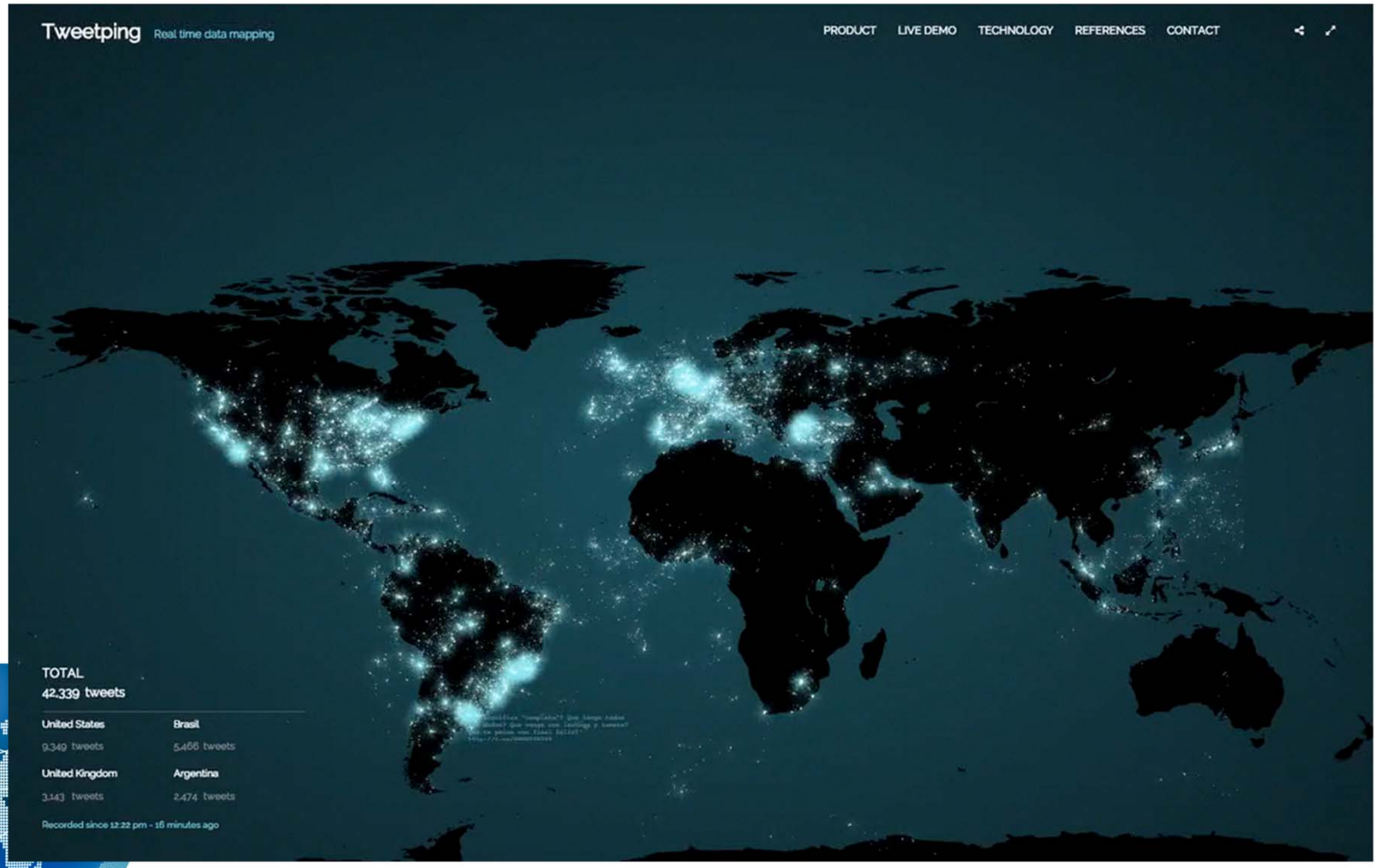
WHAT TECHNOLOGY/SERVICE WILL HAVE THE GREATEST IMPACT ON PUBLIC SAFETY? (SELECT ONE)

What technology/service will have the greatest impact on public safety? (Select one)

23 Total Votes

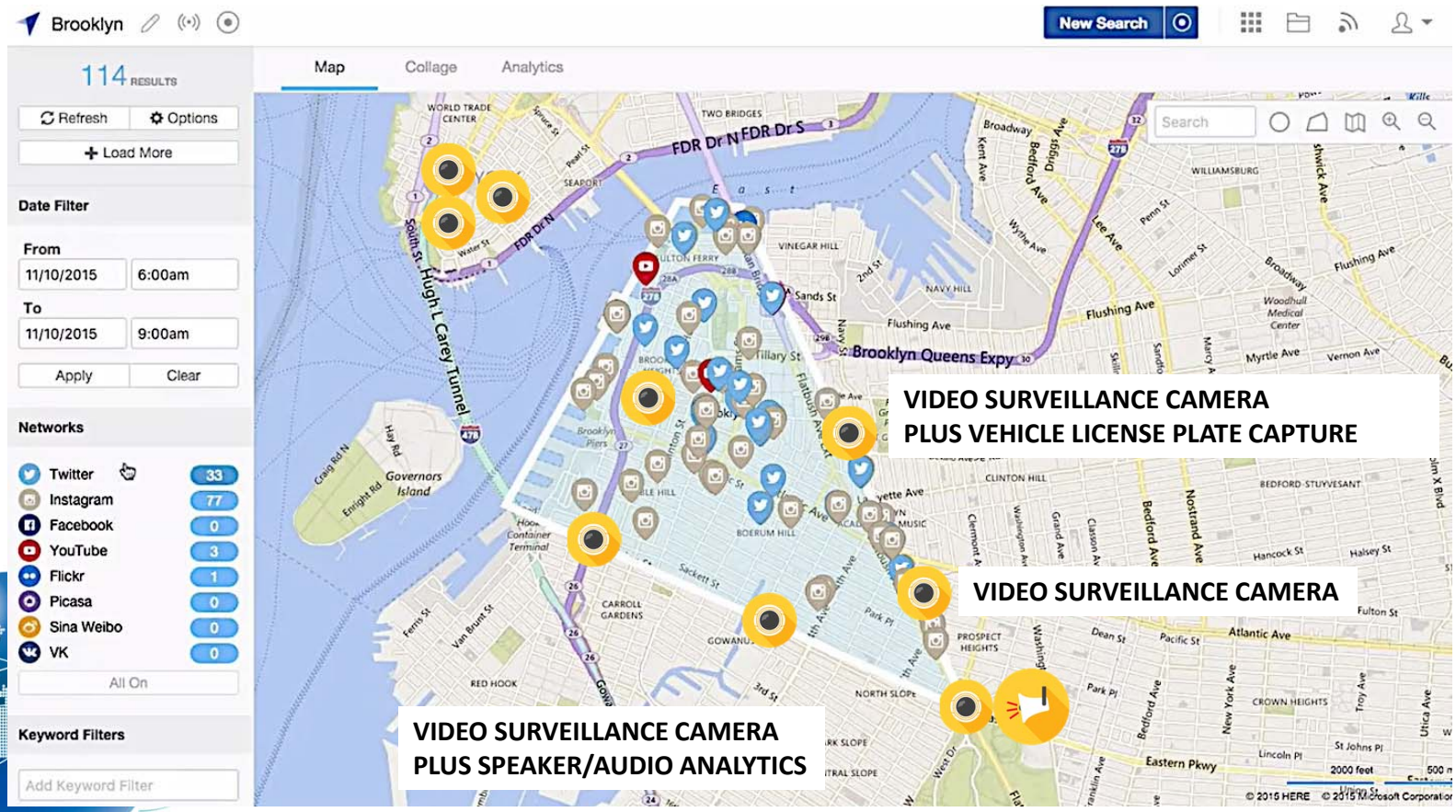
Back to Overview



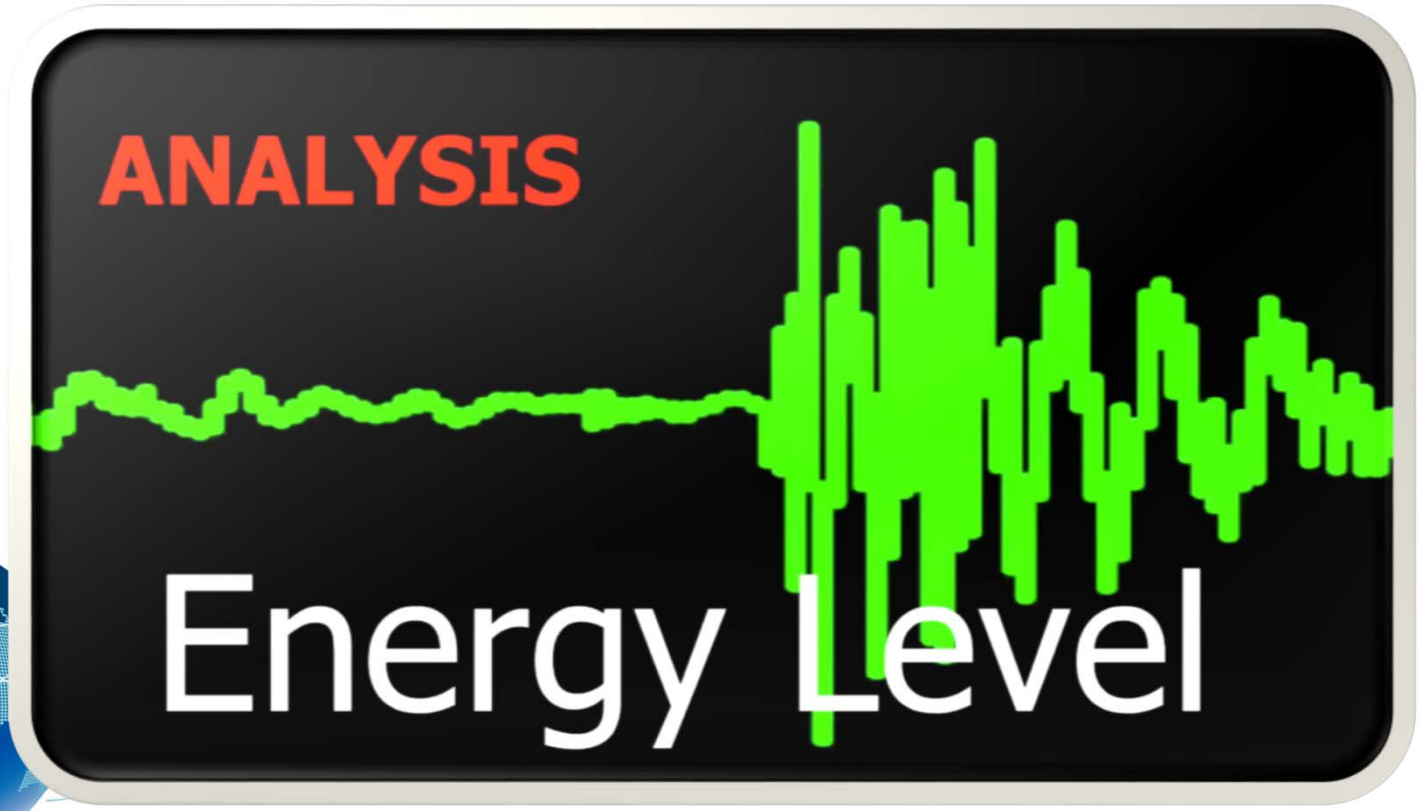

Tweetping
Real time data mapping
PRODUCT
LIVE DEMO
TECHNOLOGY
REFERENCES
CONTACT
TOTAL
42.339 tweets
United States
9.349 tweets
Brasil
5.466 tweets
United Kingdom
3.143 tweets
Argentina
2.474 tweets
Recorded since 12:22 pm - 16 minutes ago

BICSI

Social Media Alerts and Nearby Video Surveillance Assets



Ballistic Detection with Video Interface



Poll: If I had three analytics applications to use for Cities, Schools and Healthcare, they would be… [Choose any three]

1. People Counting, Crowd Behavior
2. Vehicle License Plate Capture, Hot List Alert
3. “Angry Voices,” people fighting, aggressive behavior
4. Facial Recognition, Hot List Alert
5. Long or Short Range Object Detection, Perimeter Defense

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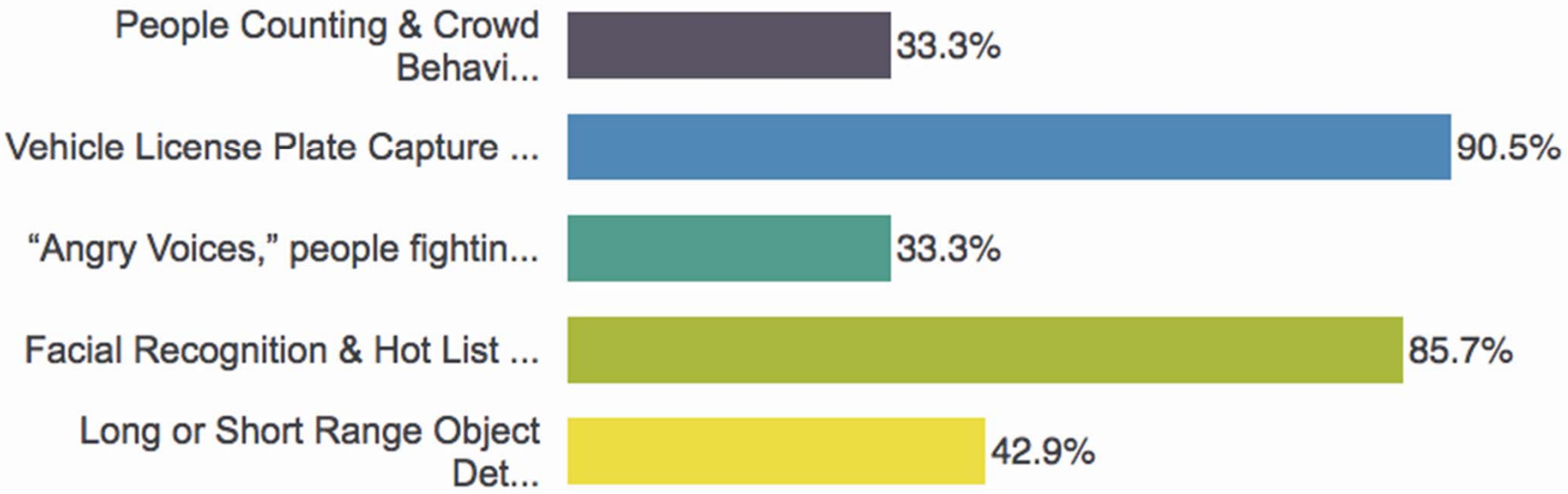
IF I HAD THREE ANALYTICS APPLICATIONS TO USE FOR CITIES, SCHOOLS AND HEALTHCARE, THEY WOULD BE (SELECT UP TO THREE)

If I had three analytics applications to use for Cities, Schools and Healthcare, they would be (Select up to three)

21 Total Votes

View Details



”Incident” Category: Facility Analytics Solutions

	AREAS							
RECOGNITION (of PROCESS, ACTION, INCIDENT AND/OR THREAT)	**EXTERIOR CAMPUS**	**PARKING AREAS**	**INTERIOR COMMON**	**INTERIOR EMPLOYEE**	**INTERIOR EXECUTIVE**	**INTERIOR CRITICAL INFRASTRUCTURE (DATA CENTER, POWER, HVAC, ELEVATOR)**	**SENSORS**	**VALUE ENGINEERED AS SHARED SENSOR**
Aggressive voices; verbal aggression (pre-fight)		✅	✅		✅	✅	FIXED CAMERAS W/NON-RECORDING MICROPHONES	✅
People in restricted areas (after hours)					✅	✅	THERMAL IMAGING	✅
People sleeping in public	✅						FIXED CAMERAS	✅
Traffic Incident (vehicle abandoned)	✅	✅					FIXED CAMERAS OR PTZ	✅
Traffic Incident (vehicle disabled)	✅	✅					FIXED CAMERAS OR PTZ	✅
Traffic Incident (multi-vehicle accidents)	✅	✅					FIXED CAMERAS OR PTZ	✅
Data Center, Switchgear, Elevator, HVAC, Thermal Imaging for Temp Setpoint						✅	THERMAL IMAGING	✅
Data Center, Switchgear, Elevator, HVAC, Mobile Notification						✅	IPIO MODULE	
Personnel Location by Mobile Device Connection (eg. Shelter in Place, Mustering)		✅	✅	✅	✅	✅	NONE (VIA WIFI INFRASTRUCTURE)	

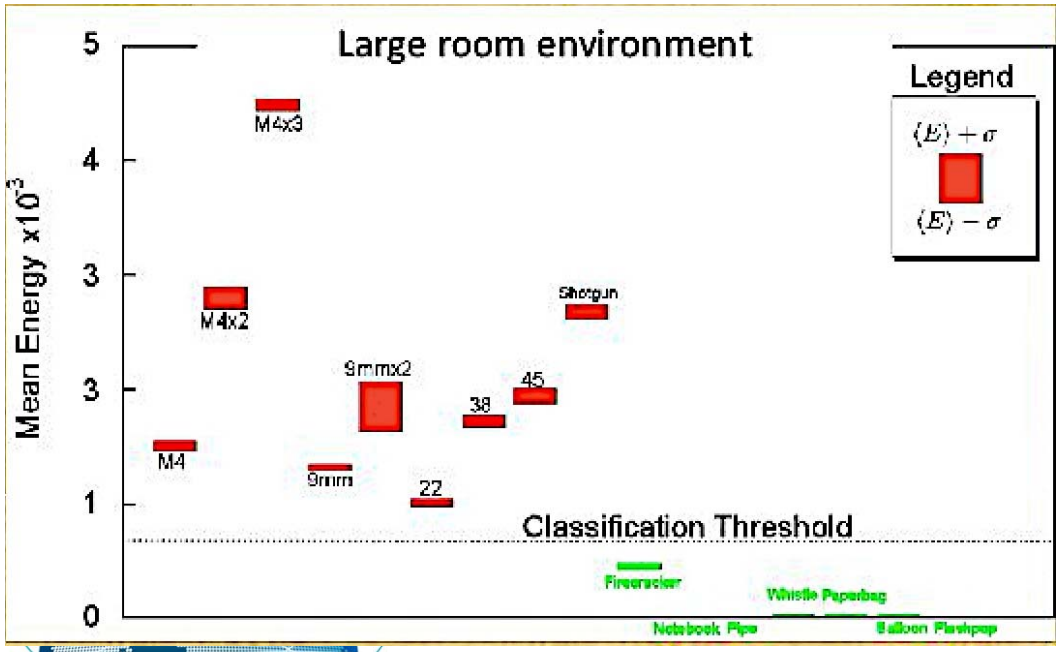
”Normal Process” Category: Facility Analytics Solutions

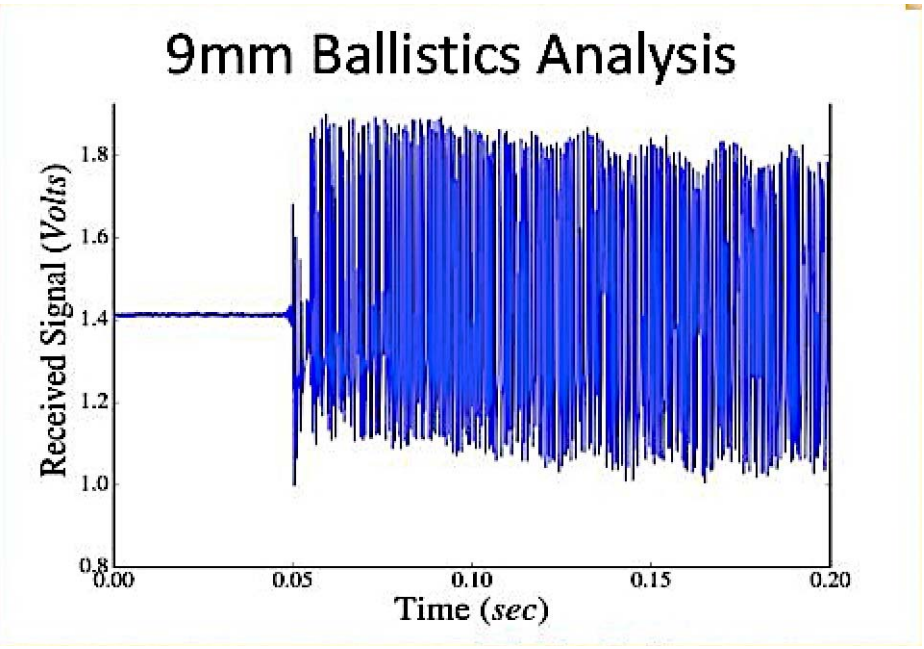
	AREAS							
RECOGNITION (of PROCESS, ACTION, INCIDENT AND/OR THREAT)	EXTERIOR CAMPUS	PARKING AREAS	INTERIOR COMMON	INTERIOR EMPLOYEE	INTERIOR EXECUTIVE	INTERIOR CRITICAL INFRASTRUCTURE (DATA CENTER, POWER, HVAC, ELEVATOR)	SENSORS	VALUE ENGINEERED AS SHARED SENSOR
Crowd movement	✅	✅					FIXED CAMERAS	✅
Crowd density	✅	✅					FIXED CAMERAS	✅
Crowd in traffic lanes	✅	✅					FIXED CAMERAS	✅
LPR or ANPR		✅					FIXED CAMERAS OR PTZ	✅
Vehicle Tag NCIC query		✅					FIXED CAMERAS OR PTZ	✅
Personnel Facility Access Self Serve Via PACS			✅		✅	✅	READER	
Personnel Facility Access Self Serve After Hours Via PACS			✅		✅	✅	READER	
Personnel Facility Access After Hours via VOIP/VIDEO Door Station with Facial Recognition			✅			✅	ENTRY STATION AND READER	✅
Visitor Facility Access After Hours via VOIP/VIDEO Door Station			✅				ENTRY STATION AND READER	✅
Vehicle Undercarriage Screening System		✅					FIXED CAMERAS	
Manned X-Ray Vehicle Screening		✅					PORTABLE X-RAY & BACKSCATTER DEVICE	
Parking Detection with LPR		✅					FIXED CAMERAS	✅
Parking Facility Access Self Serve Normal Via PACS+LPR		✅					FIXED CAMERA & READER	✅
Parking Facility Access Self Serve After Hours Via PACS+LPR		✅					FIXED CAMERA & READER	✅
Parking Facility Access After Hours Via LPR and VOIP/VIDEO Entry Station		✅					FIXED CAMERA & ENTRY STATION	✅

”Threat” Category: Facility Analytics Solutions

	AREAS							
RECOGNITION (of PROCESS, ACTION, INCIDENT AND/OR THREAT)	**EXTERIOR CAMPUS**	**PARKING AREAS**	**INTERIOR COMMON**	**INTERIOR EMPLOYEE**	**INTERIOR EXECUTIVE**	**INTERIOR CRITICAL INFRASTRUCTURE (DATA CENTER, POWER, HVAC, ELEVATOR)**	**SENSORS**	**VALUE ENGINEERED AS SHARED SENSOR**
Gunshot detection	✅	✅	✅	✅	✅	✅	FIXED CAMERAS W/NON-RECORDING MICROPHONES	✅
Vandalism, Glass Breakage detection	✅	✅					FIXED CAMERAS W/NON-RECORDING MICROPHONES	✅
Weapon Detection Ballistic & Location Identification, Explosion Detection & Location	✅	✅	✅				FIXED OR PTZ CAMERAS	✅
Weapon, Explosives Detection Automatic Pan-Tilt-Zoom to Threat Source	✅	✅					FIXED OR PTZ CAMERAS	✅
Weapon, Explosives Detection Facility Automated Lockdown	✅	✅	✅		✅		FIXED OR PTZ CAMERAS	✅
Workplace Violence Manual Facility Unlock	✅	✅	✅	✅	✅	✅	MANUAL PROCESS VIA VOIP OR MOBILE	
Smoke Detection		✅			✅	✅	FIXED CAMERAS	✅
Radiation Detection		✅			✅	✅	FIXED CAMERAS	✅
Person injured	✅	✅					FIXED CAMERAS	✅
Vehicular accident (parking)		✅					FIXED CAMERAS W/NON-RECORDING MICROPHONES	✅

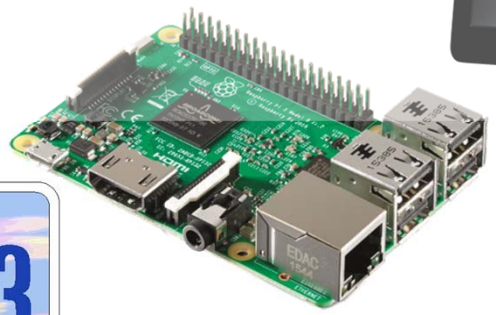
The Power of Location and Ballistic Detection





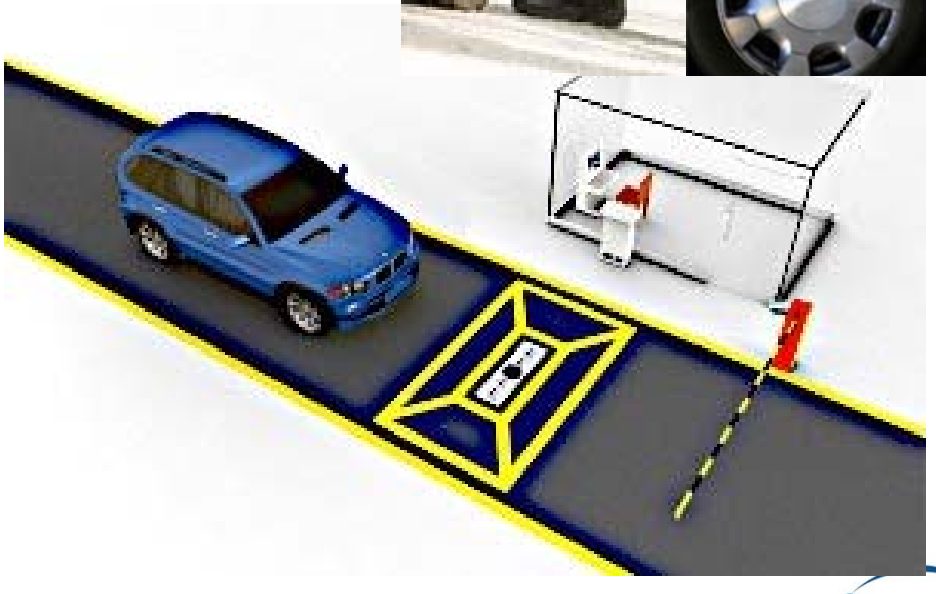
Track every vehicle - License Plate Capture

- The most mature security-based analytic process
- Capable of running on a simple appliance/device microcomputer
- Distributed processing and storage lowers storage requirements and risk of server failure
- Most newer solution deployments support Mobile Edge Computing (MEC) for a lower latency surveillance experience.



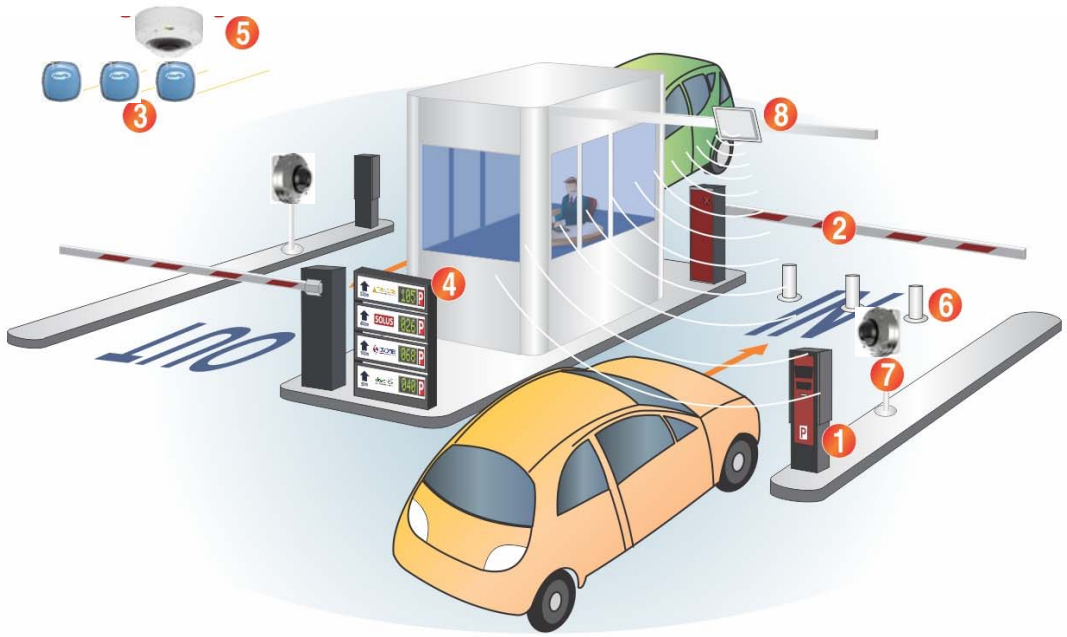
Under Vehicle Inspection

- Single Camera Control Module, four inputs
- Dedicated LPR camera with NCIC query
- GammaPix radioactivity sensing software
- Allows security to compare undercarriage of known vehicle make and model for foreign objects or modifications
- Weight sensors for known vehicle characteristics



Security Sciences: Advanced Vehicular Screening

Parking Gate Entry/Exit System

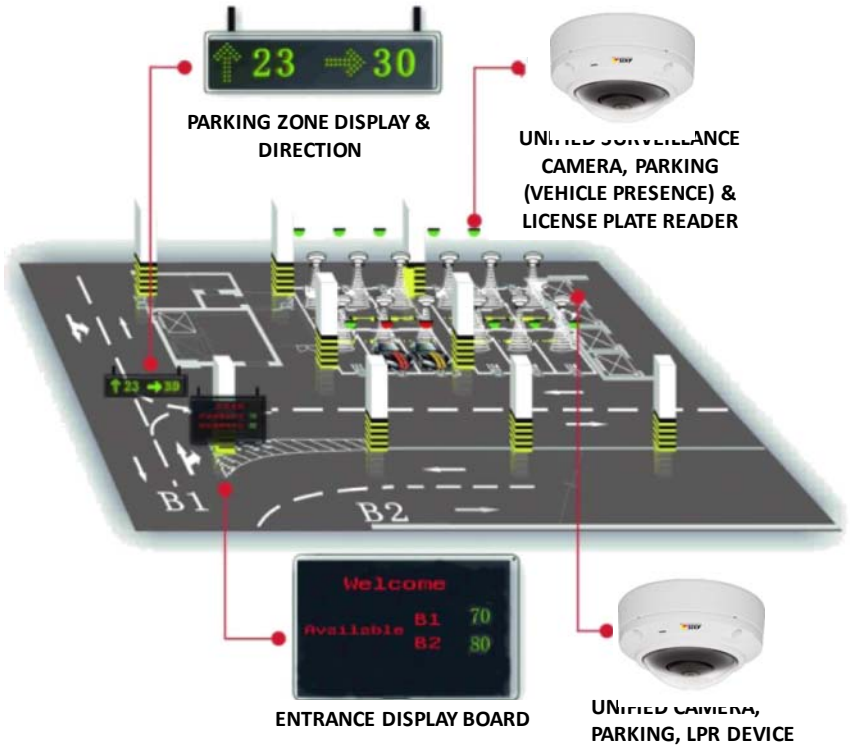


1	Ticket Dispenser	5	Parking Reader
2	Boom Barrier	6	Bollards
3	Ballistic Explosive Detector	7	ANPR Camera (Automatic Number Plate Reading)
4	Occupancy	8	Long Range Reader

BICSI

Parking Occupancy System

- Leverage Surveillance Cameras for License Plate Capture
- Surveillance Cameras also used for vehicle presence and counting
- Occupancy tracking
- Cameras also used for smoke detection, gunshot detection, vandalism, glass break detection, vehicle accident and radiation detection



Linking Digital Content to Policy

DMC[15] *Acquisition*	DMC *Usage*	DMC *Storage*	DMC *Compliance*
Object, incident capture	Search	Retention	Solution[16] Interoperability
Categorization of Content	Monitoring, Analysis, and Analytic Applications	Dissemination and Information Sharing	Auditing
Access	Secure Transmission	System/Content Security	Video Content Management Systems and Technology
Sources	Relationship to other databases	Back-Up/Continuity of Operations Planning (COOP) Issues	Operational Impacts
Compliance		Retention, release and DMC destruction req't	Governance Issues
Community	Privacy		Social and Environmental Issues

BICSI

Steve Surfaro
stevesurfaro@gmail.com
steve@Surfaro.net
+5514824000

Policy Considerations for Smart City Video Programs

BICSI Middle East Conference
Dubai, UAE
April 14, 2018

Donald R. Zoufal
Safety & Security Consultant
SDI Presence, LLC

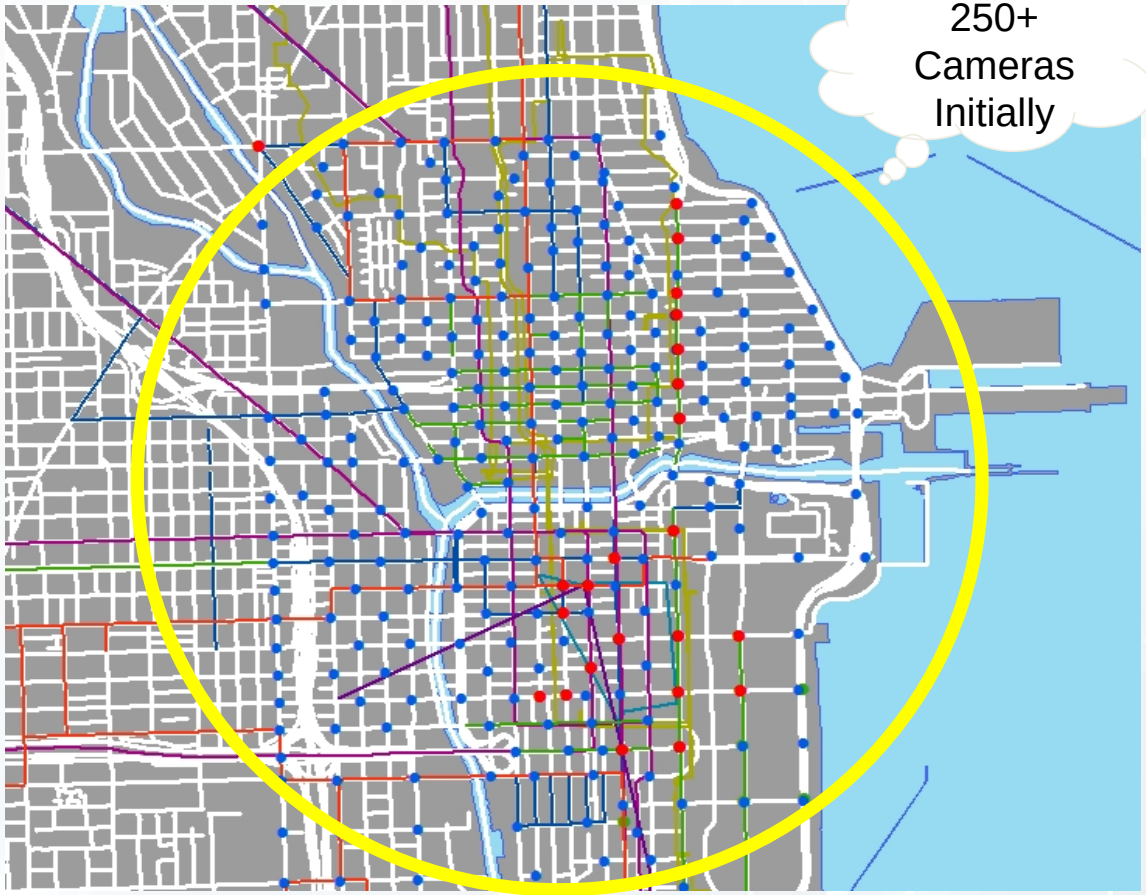
Agenda

- Models of Cooperation Programs
- Factors for Consideration
  - Resource Sharing
  - Fiscal Resource
  - Policy Issues
  - Communities of Interest
  - Use and Purpose
  - Technology Support
- Key Challenges

Public/Private Models

- Real Time Access Integrations
  - Chicago-Operation Virtual Shield
  - NYC-Domain Awareness Program
  - Downtown DC BID
- Real Time Data Submission Program
  - MBTA (ELERTS)
  - MARTA (ELERTS)
- Forensic Data
  - Elgin Camera Mapping
  - LA Sherriff (LEEDIR)

Operation Virtual Shield

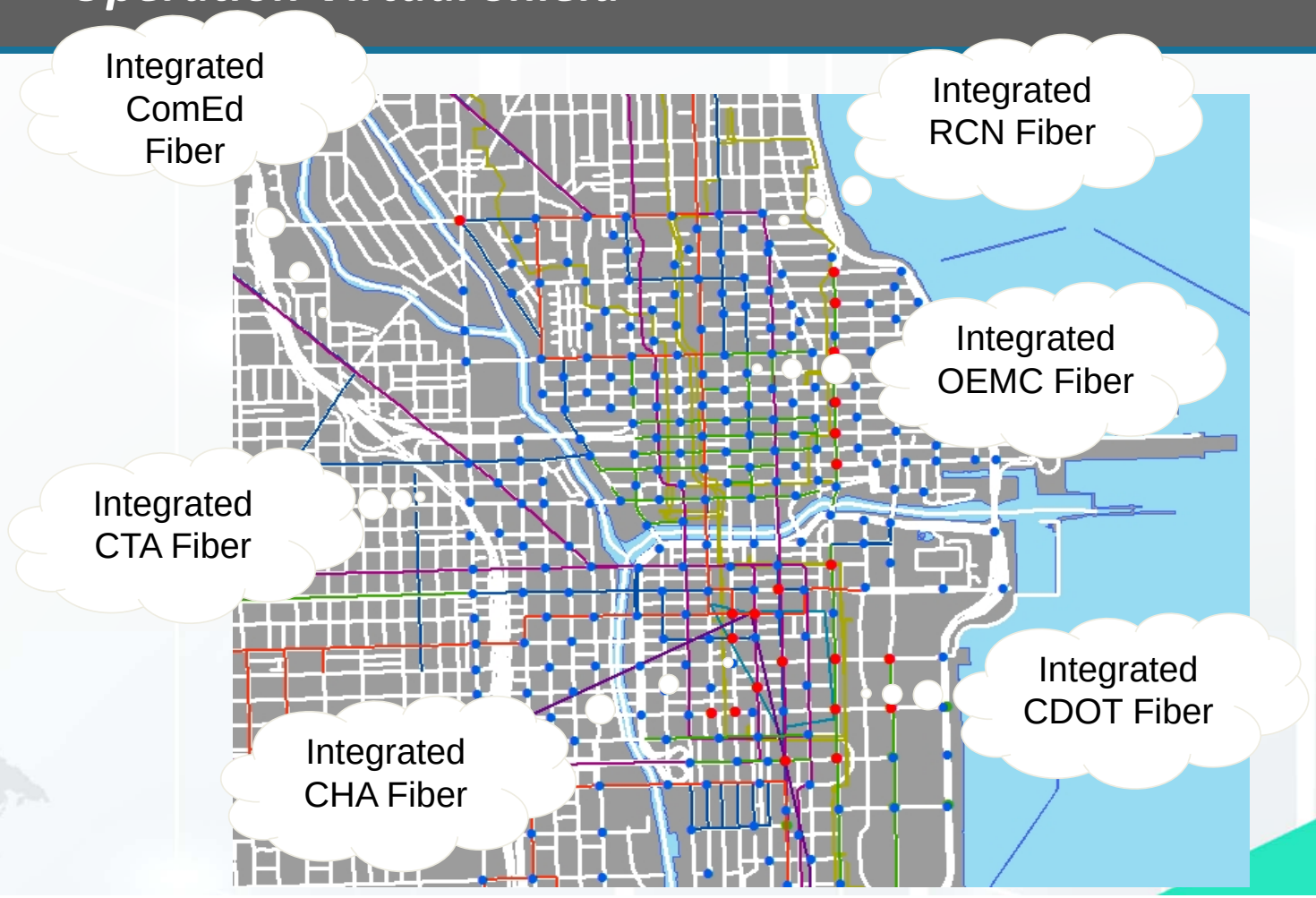


Resource /Sharing Issues

- Fiber
- Wireless
- Power
- Back-End/Platforms
- Images
  - Wired and Wireless Access for Private Cameras
  - Internet Access for Private Cameras
  - Applications for Private Cameras

Technology Support Resources:

Operation Virtual Shield



Sharing/CCTV Resources Internal Challenges

- Legacy systems – Traffic Cameras and Facility Security Cameras
- Chicago Police Department Operation Disruption (Police PODs)
- Red Light Monitoring Cameras
- Homeland Security Cameras
- Aldermanic PODs
- Violence Reduction Cameras

Fiscal Resources

- **Fund Source**
  - **Urban Area Security Initiative**
  - **State Grant**
  - **Asset Forfeiture**
  - **Capital Budget**
- **Fund Restrictions**
  - **Use**
  - **Location**
  - **Purpose**

Policy and Procedure

- Sighting
- Retention
- Dissemination
- Authenticity
- Controls and Audit

Communities of Interest

- General Public
- Private Commercial and Industrial Interests
- First Responder, Public Safety and Security Communities
- Elected Officials
- Interest Groups (Including Civil Liberties Organizations)

Communities of Interest

AREAS OF FOCUS

- Finding Common Touch Points
- Understanding “Big Brother” Concerns
- Outlining the Use and Purpose
- Focusing on Mitigation
- Managing Expectations

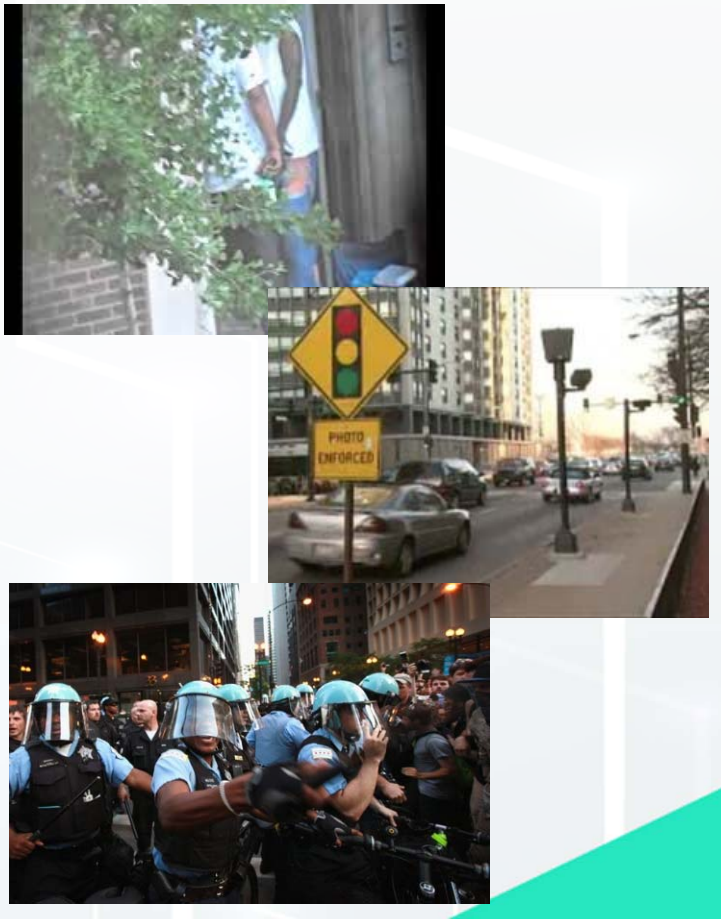
Communities of Interest

- Crime Reduction/Prevention/Terrorism
- Situational Awareness
- Event/Incident Management
- Traffic Control/Enforcement
- Criminal Proceedings

Use and Purpose

AREAS OF FOCUS

- Differing Uses and Purposes Create Different Image/System Requirements
- Cameras May Have Multiple Uses and Purposes
- Some Uses and Purposes May Cause Substantial Resistance



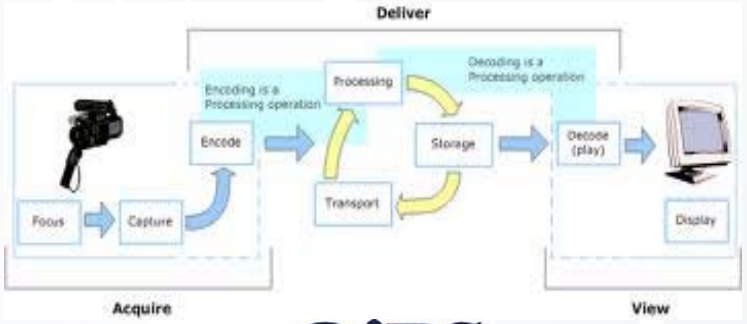
Technology Support

- Mechanical Restrictions
- Virtual Restrictions
- Permissions/Restrictions
- Watermarks and Like Technology
- Automated Audit
- Analytics

Technology and Support

AREAS OF FOCUS

- **Aligning the Technology to the Requirements (Video Quality in Public Safety Project)**
- **Integrating New and Existing Systems**
- **Implementing Technology that Supports CONOPS in All Aspects**
- **http://www.pscr.gov/outreach/vqips/vqips_guide/define_vid_qual_reqs.php**



VQiPS

Key Challenges

- Understanding the Power of Developing Surveillance Technologies
- Affording Law Enforcement and Emergency Responders Flexibility to Employ Technology for Public Safety
- Addressing both the Privacy Implications of Collection and Data Retention and Dissemination
- Aligning System Design to Fiscal Constraints

Questions

Donald R. Zoufal, C.P.P.
J.D., M.A. Homeland Security, M.A. Public Administration
SDI
33 West Monroe, Suite 400
Chicago, IL 60603
(312) 580-7514
dzoufal@sdisolutions.com

Thank you

dzoufal@sdipresence.com

Sailing the Sea of Video Data
Privacy Considerations for Data Usage

Donald R. Zoufal
SDI Presence, LLC

Presenter

Donald R. Zoufal

C.P.P., ICAO AVSEC PM,
J.D., M.A. Homeland Security,
M.A. Public Administration

SDI PRESENCE LLC
dzoufal@sdipresence.com
www.sdipresence.com

University of Chicago, Lecturer
dzoufal@uchicago.edu

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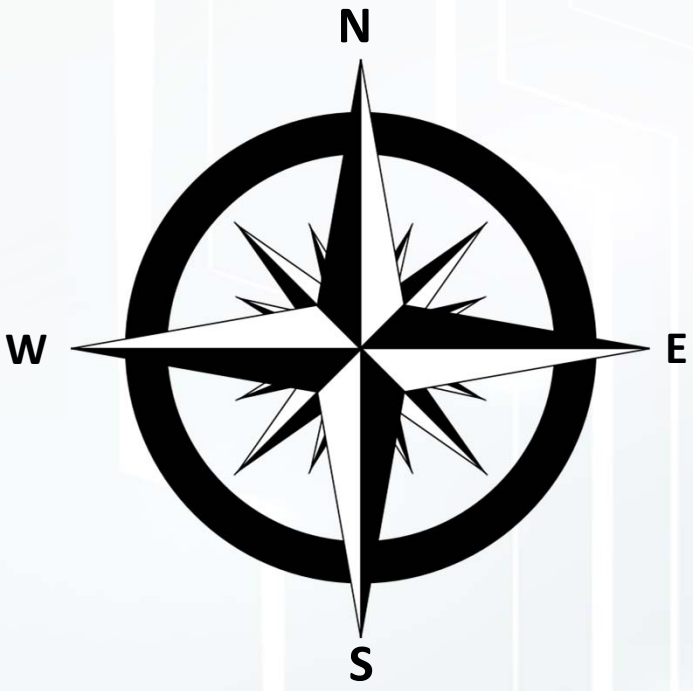
Importance of a Compass

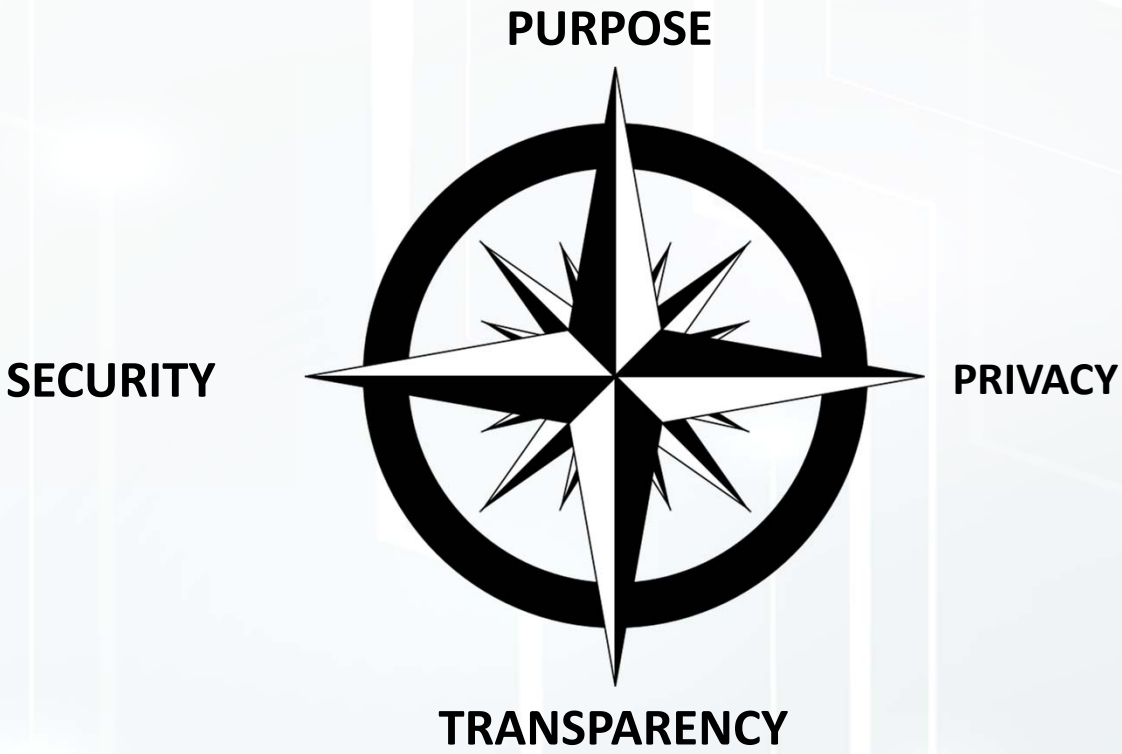
"Truth lies within a little and certain compass, but error is immense."

Henry St. John



Importance of a Compass

THE VIDEO DATA COMPASS



Purpose

WHY AM I COLLECTING VIDEO DATA?

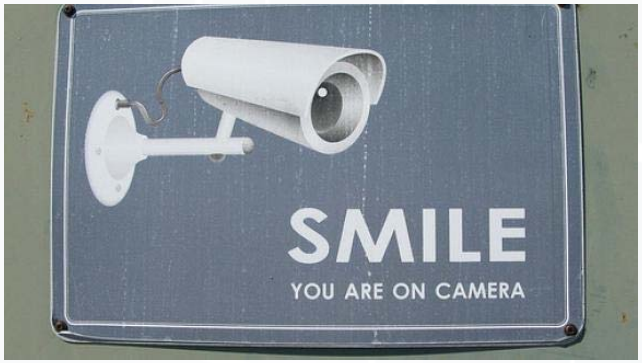
Legitimate Organizational Purpose

- Crime Prevention/Deterrence
- Traffic Control
- Incident and Event Management
- Response Management
- Situational Awareness

Does the Selected Technology and Policies Relate to the…

Privacy

- Privacy in Locations
- GeoSlavery
- Data Privacy Concern
- Multi-Sensor Analysis



Key Privacy Questions

- **Why**
  - Collect
  - Retain
- **Collection Process**
  - Covert
  - Overt
- **Use**
  - Who
  - What
  - When
  - Where
  - Why
  - How
- **Analytic Applications**

Key U.S. Supreme Court Privacy Cases

- ***Whelan v. Roe*, 429 U.S. 589 (1977).**
- ***Department of Justice v. Reporters Committee for Freedom of the Press,* 489 U.S. 749 (1989).**
- ***City of Ontario v. Quon*, 560 U.S. 746 (2010).**
- ***United States v. Jones*, No. 10-1259, 2012 U.S. LEXIS 1063.**
- ***Riley v. California*, No. 13-132 and 13-212, 2014 U.S. LEXIS 4497.**

Transparency

Transparency
Strategic & Operational

- Understanding and Responding to Community Concerns over Video and Data
- Openness in Policy Formulation
- Audit and Accountability of Programs and Actions

Transparency in Policing

"There should be no secrets in the NYPD. We are going to do more to open up the organization, to make it more inclusive, to make our information more readily available to the public, and to try and format it in a way that is more easily retrievable. That is our commitment to shared responsibility. If we want you to work with us, we have an obligation to let you know what we are doing, why, and the help we need to finish it."

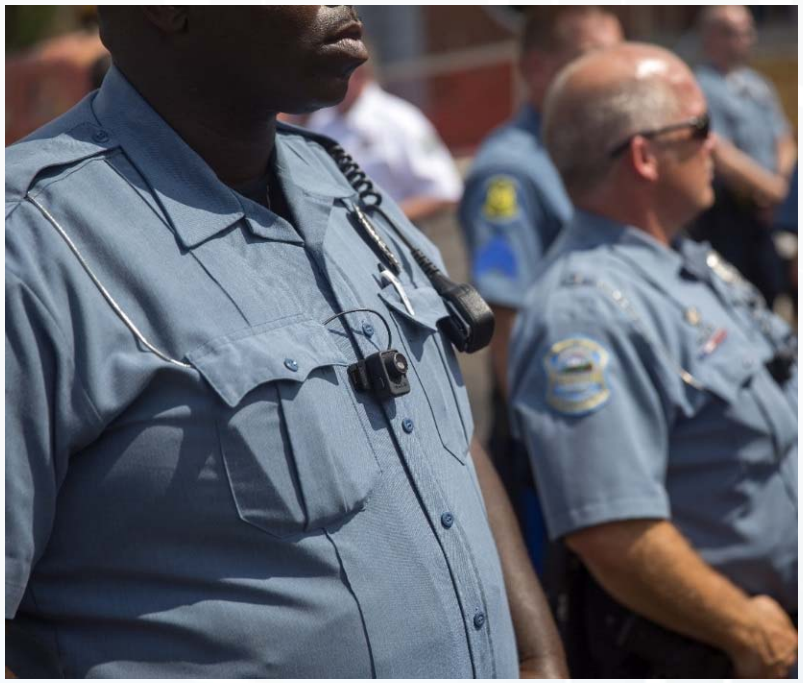
William Bratton, *Remarks to the Citizens Crime Commission*, on "Data Transparency" February 7, 2014

Data Security

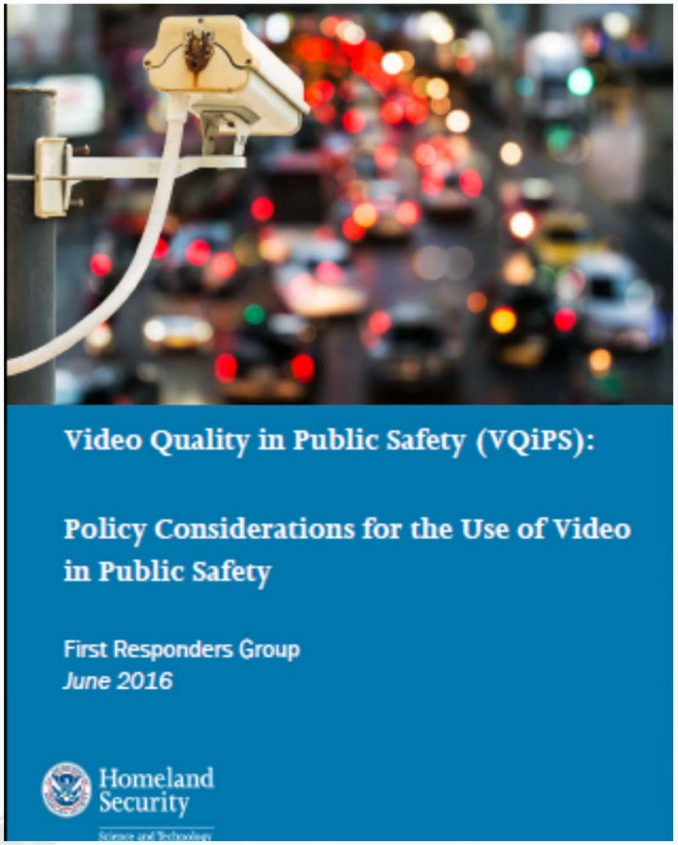
Issues of Data Security are of Growing Importance

- Both Physical and Logical Security Considerations
- Key to Twin Issues
  - Integrity
  - Availability
- Controls and Permissions
- Safeguarding Sensors and Communication Channels

Resources



Video Quality in Public Safety (VQiPS)



Description

A guide designed to help decision makers identify key aspects of policy necessary to successful operation of video in support of public safety activities. NOT a Policy Manual!

Value

- *Educates end users* about essential policy choices and the need to make those decisions.
- Provides a *framework of considerations* for policy maker review and decision making.
- Affords *independent support* based on a review of actual user experience in successful policy formulation related to technology requirements.

https://www.dhs.gov/sites/default/files/publications/Policy_Considerations_for_the_Use_of_Video_in_Public_Safety_Final_v5.pdf

Policy Considerations for the Use of Video in Public Safety

INTRODUCTION AND BACKGROUND

- Multi-disciplinary User group Inputs
- Not Focused on any Particular Type of Camera System Usage (Fixed Temporary or Mobile)
- Focused on Collecting a “Set of Considerations” for the Preparation Written Policy.
- Not a Best Practices or Policy Recommendation Document
- No “One Policy” Solution, but Common Policy Considerations

OVERARCHING SUBSTANTIVE ISSUES

- Public Safety Goals
- Privacy Issues
- Security Issues
- Transparency Issues
- Common Technical Issues in the operation of Public Video Systems
    - Technology Considerations for Video Data
    - Interoperability Considerations for Video Data
    - Continuity of Operations (COOP)

Policy Considerations for the Use of Video in Public Safety

ISSUE ANALYSIS FORMAT

- Background and Description
- Assumptions
- Strategic Objectives
- Operational Measures
- Technical Measures
- Stakeholders
- Impacts

ISSUE ANALYSIS DISCUSSION

- Sighting and Location Considerations
- Access and Use (Real Time and Forensic) of video Systems and Data
- Sources Considerations
- Notice Considerations
- Monitoring Analysis and Analytic Applications
- Retention of Video Data (Imagery and Metadata)
- Dissemination of Video Data (Imagery and Metadata)
- A Well Defined Governance Structure is Important for Video System Success.

Questions