

CCTV and Video Analytics initiatives in transit operations



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Infrastructure Security Technology Standards Mission

- Promote the appropriate use of standardised infrastructure Security related technology in mission critical applications amongst the US transit community.
- Aid ANSI and DHS initiative to deliver security related standards
- Reduce ‘risk’ in adopting new technologies in transit related projects
- Ensure that key CCTV and Video Analytics technologies are reviewed and evaluated
- Communicate findings of evaluations to wider APTA, Transit working groups and transport / security community
- Lead development of transit related standards and training for bus, train and ferry operators.



APTA statistics

- A US based NGO and SDO with over 4000 operator members in the US, Canada, Puerto Rico and Mexico
- In excess of 27 Million passengers carried daily
- More than 350,000 transit personnel
- In excess of 100,000 vehicles operating daily
- Security provided by a mixture of dedicated transit Police agencies, Local Police and Sheriff's departments



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Why do we need a CCTV standard for transit related applications?

- No current guidelines for transit ‘systems’ level of functionality for static or mobile applications (ASIS , SIA & BSIA have no technical RP)
- Need to Provide a Uniform baseline standard to ensure quality of service (QOS) for systems design in one standard covering:-
 - Cameras, Recording systems, high speed Trainline/Networks, Design and Testing
- Operators need guidelines in order to design, specify and procure CCTV, high speed digital networks and digital recording systems **THAT WORK.**
- Ability to identify areas of benefit where CCTV and VA can be applied operationally



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- The APTA CCTV standard will improve the ability to :
 - Run advanced analysis software for post event evaluation
 - Introduces usable and realistic resolution requirements for playback systems
 - Identify operational benefits of testing and maintaining systems
 - Enable interchange of data between agencies
 - Clarify periods for data retention and use of data at judicial proceedings
- Ensure that transport users ‘design’ systems that can be used, maintained and tested as necessary in various types of applications and locations to :
 - Detect
 - Monitor
 - Recognize
 - Identify
- Provides DHS, TSA and other depts with baseline standard for grant applications - (DfT - TRANSEC, HSDB, BTP, ATOC’s CCTV users group)



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Main areas of CCTV standard

- Development of 'Systems requirement Specification (SRS)
- Review of on-board and static (wayside) camera technology
- Review of Digital recording technologies
- Review of high speed digital networks (onboard and wayside)
- Review of operational requirements for testing and evaluating systems (ROTAKIN)
- Evaluation of 'effective' next generation Video Analytics systems



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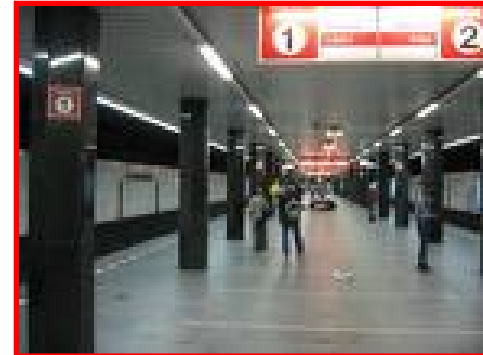
Main areas of Video Analytics standards:

- Interoperability with various codex and platforms
- Network architecture considerations
- Definition of minimum camera/sensor resolution
- Processing timings and overheads
- Use of new 'ONVif IP network protocol (Sony/Bosch/AXIS)
- Review of and grading of VA tasks:
 - Behavioral tasks;
 - Abandoned bag tasks;
 - Zone protection / volume tasks;
 - Identification and biometrics tasks:



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Designed for CCTV and Analytics?



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Detection Level	Analytics Task	Program location	Performance expectations / considerations
1	Tripwire, direction and zone protection	Edge / Center	Camera and system tuning / Lighting etc
2	Volume estimation and passenger counting	Edge / Center	
3	Abandoned / left bag detection	Center	
4	Abnormal behavioral tasks	Center	
5	Identification and facial recognition	Center	



Need for improved networks

Requirements and opportunities for CCTV network transmission

- Rail Transit operators OCC connectivity with stations, depots, law enforcement and intermodal locations
- BRT operators needs to monitor dedicated rights of way and remote stops
- New Green Field LRV operations building out metropolitan based systems
- Use of improved camera technologies for ITS and traffic control on highways
- Introduction of Video analytics systems throughout CCTV network
- Need to use higher bandwidth cameras and ANPR systems
- Improvement of processing timings and overheads for Analytics based systems



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Areas of application of CCTV and Video Analytics standards

- APTA based passenger rail applications (mobile and static locations)
- Global transit applications for Metro, Commuter, High Speed and LRV's
- Intelligent Transportation Systems applications for highways and city centres
- Energy and high security applications areas
- Chemical installations and 'TIH/ Haz-Chem' yard monitoring
- Marine installations
- Baseline standards / RP for general CCTV installations
- Baseline document for Police/ Safety agency use



5 yr 'look-a-head' LRT opportunities

- In the US there are over 66 LRT networks underway or in planning, Canada has 5 systems under consideration
- Globally there are at least 12 countries and 22 systems underway or in planning
- These projects represent major opportunities for communications and high bandwidth networks infrastructure installations or improvements
- Events to watch:
 - 11th Joint national LRT Conference April 19-22 LA
 - APTA Rail Transit Conference June 14-18 Chicago



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Standards Status

- TSWG1 vote on current draft Oct 6th 2008 - complete
- Review of comments Nov 2008 - complete
- Hand over to Communications Committee for vote March 2009
- Approval by APTA standards committee anticipated June 2009.
(Available to DHS to reference in G&T funding March 2009).
- Recommended practice for Video Analytics started at APTA annual mtg in San Diego Oct 2008 target completion Dec 2009.
- Follow on meeting for Video Analytics Technical RP June 09, Chicago.

www.transitcommtech.com/cctv.htm



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Contributing & Supporting organisations



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TSWG1 (CCTV & VA) subcommittee members and contributing organisations

- NYCT
- CTA
- LA -Metro
- Tri-Met
- WMATA
- Honolulu Transit
- Lane Transit
- King County Metro
- Valley Metro
- Sound Transit
- IACOP (Int' Association Chiefs of Police)
- British Transport Police
- SouthWest Trains
- Transport for London
- Association of Train Operating Companies (ATOC's)
- Home Office Scientific Development Board
- FBI Video analysis labs Quantico
- ADT
- Bombardier Transportation
- Alstom Transportation
- Siemens Transportation
- Sumitomo Corporation
- LTK Engineering
- Parsons Brinkerhoff
- Digital Grape
- Teumim Technical
- March Networks
- NICE Systems
- Stantec
- Pelco
- Alcatel Lucent
- Smiths Detection
- Transdyn.
- CIRA Defence
- AXIS
- Vidient



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- CCTV Test equipment info: www.rotakin.org



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Cameras

- All cameras in use will need to be 4CIF (D1) as a minimum.
- Frame rates that are configurable must record at 5 (4) FPS ‘minimum’ inside car, 15 (12) FPS when PEI activated. Non configurable must record at 15 (12) FPS.
- External facing cameras (forward / rear facing mobile cams) will run at 30 (25) FPS (capture of external events, grade crossings, platform events etc)
- All camera locations must be designed for purpose with a ‘Systems Requirements Specification’(SRS) and tested against a Rotakin, or similar, resolution test target.
- 4CIF Mega-pixel (progressive scan) should also be considered for Hi res’, uses as long as the compression systems can meet the ROTAKIN tests.



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Recorders.

- All camera outputs must be recorded individually in high res' and recorders must be able to download / transfer recorded images .
- Compression systems must comply with MPEG2, MJPEG or MPEG4 standards and ensure that latency and use of I frames allows playback images to meet ROTAKIN test standards.
- Static systems must retain recordings for 31 days, Mobile 7 days - unless specific processes and procedures allow for 3rd party review (e.g. Police)
- No 're-compression' allowed in order to preserve Digital Multimedia Evidence (DME) for use in legal proceedings



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Digital Train Lines and WAN and LAN Networks

- Capable of carrying digital CCTV data throughout network in real-time
- Trainline to Comply with the 100BaseTX Ethernet industry standard (IEEE 1473E June 2009 estimate)
 - Allow for connection within the auto-coupler with minimum attenuation
 - Provide a minimum of 1 in 10⁻⁸ average BER at 20c running at 100Mb/sec
- Wireless networks should not be used for primary CCTV transmission of data to recording medium (Must be locally recorded where possible via cable) unless licensed PMR or high bandwidth dedicated LAN used
- OCC's should ensure that video analytics methods are used to ease operator fatigue when observing multiple images.

