"IoT-based IP video surveillance - an irreversible trend for the future"

By
Fawzi Behmann, Founder & President
TelNet Management Consulting, Inc.
Fawzi.behmann@telnetmanagement.com

July 17, 2014
Topics

- Introduction
- Key Concepts
- Pricing Examples
- Application Examples
- Network Configuration Examples
- Specification sample
- Market size, Opportunity landscape
- New Trend
- Tips
Introduction

All types of Videos not covered in the presentation
- Video cameras,
- Smart phone videos
- Machine vision
- Robotic videos
- Other services – information gathering, asset management, risk mitigation, …

Focus is on Video Surveillance
In the absence of video surveillance, current methods for protection and safety are limited, man-power intensive:
- Security based on only motion detector/time
- Crossing red traffic light
- Arsenal – fire/crime
- Traffic accident
- ……
Introduction

Key Drivers

- Advancement of technology
  - Camera technology & connectivity
    - Analog Camera to IP Camera
    - Resolution, features, capabilities at lower pricing (due to increasing adaption and economy of scale)
  - Embedded and SP multicore processing
    - Processing of advanced features and capabilities
    - Digital video recorder (DVRs)
    - Networked Video Recorders (NVRs)
    - Smart IP Camera tracking simultaneous events including: Motion detection, Object counting, Object recognition, vehicle detection, license plate recognition, behavior analysis, …
  - Wireless technology (WiFi, LTE)
  - Infrastructure & Bandwidth capacity to handle multimedia
  - Cloud & Emerging video analytics

- Wide market adoption

- Creative business models

- Future innovative solutions crossing multiple markets
Classes of Application

- Monitoring: Cluster of video cameras are to stream videos to the cloud server and at the same time, video streaming can be viewed from a mobile device, website or communication monitoring centre.

- Action triggered: Certain class of application, trigger action upon a condition being met. Examples: Red-light Camera, TxTag toll,..

- Smart Cameras: Intelligent cameras – local processing and execution to meet specific demand (search for license plate, facial recognition,..)
Image Sensor and IP Camera

- **Pixel Resolution:**
  - 720p: 720x486 (NTSC) or 720x576 (PAL)
  - HD720p: 720x1280 high quality images/videos
  - HD1080p: 1080x1920

- **Compression rate**
  - Motion JPEG, MPEG4,
  - H. 264 AVC, future SVC H.265

- **Video Analytics**
  - Technology advancement for facial recognition, license plate recognition, compare images,..

Work in diverse operational environment

Operate remotely. Some equipped for camera zoom, pan and tilt
Key Concepts Cont’d

Connectivity/powering

- Wireless
- PoE – Power over Ethernet
- Connectivity to switch
- Concentration
- Routing to WAN
- Server
  - NVR – Network Video Recorder
  - Analytics
Operations

Remote viewing
- Remotely view and manage your video surveillance system from anywhere through the internet or smart phone/tablet in real time.
- Flexibility of viewing by sequence of camera, cluster of cameras, single camera, auto/on-demand viewing, etc.
- Features/Flexibility of viewing stored videos

Management Platform
- Flexible surveillance management platform that can be integrated with other systems for a consolidate view of public safety
- Application flexibilities for client custom features such as video analytics
Installation

Installs like analog!

- Integrated PoE switch makes install easy! Just plug in the IP cameras and you're ready to go!
- Use 2nd USB port to plug in a mouse or keyboard
- HDMI output for high-def live viewing
- Standard VGA port for monitor

- Plug-and-play support for IP cameras
- 4 or 8 independent PoE network ports
- Integrated network switch
- Supports 2 hard drives up to 4TB each
- Linux embedded operating system
- VGA and HDMI video outputs
- H.264 video compression
- Multiple recording modes
- Event log, with email and event notification
- Free iOS/Android mobile app
Wide variety of hidden camera options

Examples: Smoke detectors and alarm clock radios, they are easy to set up and are almost impossible to detect.
Pricing Examples

**Alibi 1.3 Megapixel 65 ft IR IP Vandal-proof Outdoor Dome**
- $179.99
  - ALI-IPV3013R

**Alibi 3.0 Megapixel 65 ft IR IP Vandal-proof Outdoor Dome**
- $229.99
  - ALI-IPV3030R

**Alibi 2-Camera 1.3 Megapixel 65 ft IR Network IP System**
- $799.99
  - SYS4213IP
  - View Details

**Alibi 2-Camera 3.0 Megapixel 65 ft IR Network IP System**
- $874.99
  - SYS4230IP
  - View Details

**Alibi 4-Camera 3.0 Megapixel 65 ft IR Network IP System**
- $1,399.99
  - SYS8430IP
  - View Details

**Alibi 8-Camera 1.3 Megapixel 65 ft IR Network IP System**
- $1,849.99
  - SYS8813IP
  - View Details
Sample Pricing Cont’d
Sample Pricing Cont’d
Application Examples

Low Cost Video Surveillance

Network Recorder NVR + PoE Switch in One
Network IP recording solution—NVR includes a built-in 4 to 8 port PoE switch to power IP cameras directly

$299-$499

Watch your home or business from anywhere in the world

Alibi IP Cameras & NVRs
Simple, Smart, Plug-and-Play IP Security
Car Security Camera System and Vehicle Surveillance Systems

3 and 4-camera in-car camera kits provide a cost-effective vehicle monitoring solution designed for school buses, law enforcement, other commercial vehicles and private cars.

Designed to protect car and assets from fraudulent liability and theft. $499+
Application Examples
Cont’d

Emergency Control and Management Center
Merging computer and video technology to police the streets.
Smart Pole – smart lighting, camera, sensors

Intelligent Streets - Many capabilities: intelligent light pole system, including homeland security, video surveillance, public safety, traffic control, energy conservation, advertising features, bi-directional voice communications,..
Small-Sized Network
In a Point of Sale (POS) and security camera installation with a limited number of cameras, a single or small group of Power over Ethernet (PoE) switches is an ideal solution because of its simplified network configuration and maintenance requirements.

Potential Uses for this Architecture
- Retail stores and POS (powering cameras, cash registers and kiosks)
- Branch offices
- Restaurants

IP Video Surveillance Solutions

Source: Allied Telesis
Medium-Sized Network

In medium-sized IP Surveillance networks, or a LAN, the video surveillance system is typically distributed with one or more switches in each location connected together.

Potential Uses for this Architecture

Schools
Large Retailer
Sports Stadium
Shopping Malls
Large-Sized Network

In large IP Surveillance networks, or a metro-area network, the video surveillance system is typically overlaid on an infrastructure that has been designed to carry multiple applications and services. Such a network, supporting a significant number of end-users, needs to be very reliable, manageable and scalable. These requirements are best met by a network design in which different services are partitioned into separate VLANs and transported over resilient rings that are protected by an extremely fast failover mechanism.

Potential Uses for this Architecture

- Larger Shopping Malls
- Larger Discount Stores
- Corporate Campus
- Higher Education
- Manufacturing Facilities
- Hospitals
Sample Specifications

Specifications

- Advanced H.264 Stand Alone DVR
- Audio Input/Output
- Auto Disk Info Recovery
- Central Management Software
- Digital Zoom: Live and Playback
- Firmware Upgrade: Auto via FTP Server and Manual
- Help Menu on Major Functions
- Mobile Application: iOS and Android Smartphones and Tablets, Kindle Fire Tablet
- Multiple Recording Schedules
- Multiplex: Live, Playback, Recording, Backup, Network Configuration
- NAS- Network Attached Storage
- NTP- Network Time Protocol
- Network Bandwidth Control
- One Touch: Video Backup, Reverse Playback, and Emergency Recording

<table>
<thead>
<tr>
<th>Environmental*</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDD Interface</td>
</tr>
<tr>
<td>Max. Internal Storage</td>
</tr>
<tr>
<td>Power Requirements</td>
</tr>
<tr>
<td>Power Consumption</td>
</tr>
<tr>
<td>Operating Temperature</td>
</tr>
<tr>
<td>Operating Humidity</td>
</tr>
<tr>
<td>Dimensions</td>
</tr>
</tbody>
</table>
### Video*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Codec</td>
<td>G723.1</td>
</tr>
<tr>
<td>Display Framerate</td>
<td>4 Channels: 120fps 8/16 Channels: 480fps</td>
</tr>
<tr>
<td>Display Modes</td>
<td>1, 4, 9, 16, Sequence, full screen</td>
</tr>
<tr>
<td>Looping Output</td>
<td>16 Channel model Optional (VLOOP accessory not included)</td>
</tr>
<tr>
<td>Screen Resolution</td>
<td>D1, 2CIF, CIF</td>
</tr>
<tr>
<td>Serial Interface</td>
<td>2x RS-485 for PTZ Camera and Joystick Controller</td>
</tr>
<tr>
<td>User Interface-Control Options</td>
<td>IR Remote Controller, USB Mouse</td>
</tr>
<tr>
<td>Operating System</td>
<td>Linux Embedded</td>
</tr>
<tr>
<td>Video Input</td>
<td>BNC, 4/8/16 Channels</td>
</tr>
<tr>
<td>Video Output</td>
<td>HDMI (16 Channel Only), VGA, Composite, Spot monitor</td>
</tr>
<tr>
<td>Display Resolution (NTSC/PAL)</td>
<td>NTSC/ PAL Auto Detection 4 Channels: 120fps display speed 8 Channels: 240fps display speed 16 Channels: 480fps display speed</td>
</tr>
<tr>
<td>Sensor Input</td>
<td>4/8 channels: 1 Sensor Input 16 Channel: 16 Sensor Input</td>
</tr>
<tr>
<td>Sensor Alarm Output</td>
<td>1 Alarm Output</td>
</tr>
<tr>
<td>Audio Input (RCA)</td>
<td>1 Audio Output</td>
</tr>
<tr>
<td>Audio Output</td>
<td>1 Audio Output</td>
</tr>
</tbody>
</table>

### Network*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Monitoring Software</td>
<td>ACS (Client S/W), MAC (Apple S/W), Pivot (CMS S/W), DW Spectrum (Synergy S/W)</td>
</tr>
<tr>
<td>Mobile Applications</td>
<td>iPhone, Android Phones, Blackberry (up to Version 8), iPad, Android Tablets, Kindle Fire</td>
</tr>
<tr>
<td>Web Viewer Operations</td>
<td>Live, Playback, Remote Configuration, up to 10 Simultaneous Connections (in Live)</td>
</tr>
<tr>
<td>Network Connection</td>
<td>10/100 Base-Tx Ethernet (RJ45)</td>
</tr>
</tbody>
</table>

---

*TelNet Management*
<table>
<thead>
<tr>
<th>Performance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera Image Control</td>
</tr>
<tr>
<td>Covert Channel</td>
</tr>
<tr>
<td>Firmware Upgrade</td>
</tr>
<tr>
<td>Playback Functions</td>
</tr>
<tr>
<td>Recording Mode</td>
</tr>
<tr>
<td>Recording Rate</td>
</tr>
<tr>
<td>Recording Resolutions</td>
</tr>
<tr>
<td>Search Modes</td>
</tr>
<tr>
<td>Special Features</td>
</tr>
<tr>
<td>Compression Type</td>
</tr>
<tr>
<td>Pre Alarm Recording</td>
</tr>
<tr>
<td>Digital Zoom</td>
</tr>
<tr>
<td>External Export Devices</td>
</tr>
</tbody>
</table>
Market

Global Video Surveillance and VSaaS Market is $42.81 Billion by 2019
CAGR i1 19.1% 2013-2019

Video surveillance - an irreversible trend for the future

Source: Transparency Market Research
Regional Market Penetration (Revenue)

- North America accounted for around 35% share

- Asia Pacific with around 31% share.
  - Asia Pacific is expected to be the fastest growing market during the forecast period, growing at a CAGR of 23.4% and registering a market size of USD 17.12 billion in 2019.
  - Growth in the Asia Pacific market is mainly spurred by demand from China.

- RoW 44%
Highest Market Opportunities

- Commercial, industrial, institutional, residential and infrastructural applications.
- Amongst the commercial applications,
  - the office segment is observed to hold the highest share.
- In the infrastructure market
  - encapsulating highways, streets & bridges, transportation, communications and stadiums
  - highways, streets and bridges is expected to increase with the highest CAGR of 12.9%.
Application Size

- Transportation segment which comprises 15% share of total market
  - city surveillance,
  - public transits, and
  - highways is the largest segment.
  - expected to grow at a CAGR of 21.2% during the forecast period from 2013 to 2019.
- Other important application areas for video surveillance and VSaaS include:
  - residential,
  - retail,
  - hospitality,
  - stadiums, and
  - healthcare among others.
Key Players – Video Surveillance & VSaaS

- Hikvision Digital Technology Ltd. Dominated with share of 9.4% in 2012
- Axis Communications with 5.2% share.
- Other important players include
  - Honeywell,
  - Dahua Technology,
  - Canon Inc,
  - Bosch Security,
  - Pelco,
  - Panasonic, and
  - others.
Future: Military to Commercial

After Afghanistan, Exelis, a $3B, 10K employees adapts Surveillance System for use in domestic law enforcement, border security and make it more affordable.

CoryusEye 1500, a wide-area surveillance system developed by the geospatial technology unit of defense contractor Exelis (XLS)

- Coryus was conceived to offer domestic law-enforcement agencies the kind detailed, birds-eye view of events on the ground that previously was available only to warfighters.
  - The system weighs a mere 83 pounds, generates streaming color video of an area the size of Disneyworld — including ten tightly-focused shots from different angles that can be viewed simultaneously by diverse users.
- Can be installed on a wide variety of aircraft, both manned and unmanned.
- It archives all the imagery it collects, when users on the ground see something of interest, they can quickly conduct a forensic investigation to figure out how it came about.
- CorvusEye 1500 doesn’t just offer streaming video of a city-size area at low cost, it enables users to understand the context of what is happening.
- Patterns of social interaction, the origin of ongoing developments, and other dynamics that unfold over time can be tracked, analyzed and dealt with in tailored fashion.
Drones Approved: FAA Gives OK To First Commercial Use Over Land (June 10, 2014)

- An AeroVironment Puma drone undergoes pre-flight tests in Prudhoe Bay, Alaska, on Saturday, June 7.
- The drone will be used to survey roads, pipelines and other equipment at the largest oil field in the United States.

Surveillance Drone

- Drones can carry various types of equipment including live-feed video cameras, infrared cameras, heat sensors, and radar.
- Mission planning software and tablet application to streamline data transport and processing
- Upload images and flight logs to cloud server for fast data processing, analytics and access anywhere and viewed on mobile or desktop devices

Concern- Privacy

- Drone carry wifi crackers and fake cell phone towers that can determine your location or intercept your texts and phone calls. Drone manufacturers even admit they are made to carry “less lethal” weapons such as rubber bullets.
- Concern of use among commercial, hobbyist and others
TIPS in designing Video Surveillance Networks

Considerations in designing Video Surveillance Networks

- Processing and power management
- IPv6 for mobile devices
  - As more of the applications associated with video surveillance, such as sending feeds to mobile devices, operate over IPv6 there will be increasing momentum towards using IPv6 natively within video surveillance networks.
  - Governments are also beginning to mandate the use of IPv6 in public sector networking systems.

System Powering/Connectivity/Reliability/Security

- Powering PoE+ (Camera’s power is delivered via data cable)
  - POE standard provides 15 watts of PoE
  - Advanced camera’s capabilities (zoom, pan, tilt,..) would require 30 watts of power (PoE+ standard)
- Use network’s multicast signaling protocol to deliver video streams to multiple locations
- Redundancy
  - Double up on data paths
  - Ensure switch equipment support dual power supply units (PSUs)
  - Double up on power supply
System Powering/Connectivity/Reliability/Security

- Resilient backbone supporting multiple head-ends for data recording, network management, disaster recovery
- Bandwidth
  - Higher resolution images mean higher data rates. A 1 gigabit uplink from a switch connecting 48 cameras might be enough today, but may well be inadequate within a few years.
  - Bandwidth should be provisioned to allow for up to a 5-fold increase in bandwidth requirements within the installation’s lifetime.
- Security
  - Configure high-security authentication on all camera-connected ports
  - Configure switches to send alarm messages if cameras are ever unplugged
  - Ensure that any switch ports to which cameras have not yet been attached are shut down

- Video Analytics
  - Create custom criteria based alerts
  - Send Alerts to you mobile device
  - Technology advancement to smart camera for facial recognition, license plate recognition, compare images,..
THANKS