Cameras are one of the most cost-effective and efficient methods for incident verification.

Cameras help TRAFFIC MANAGEMENT in an organized, planned, and coordinated effort to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible.

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The Evolution of CCTV

*Areas of Discussion...*

- **IP Cameras**
  Internal vs External Encoding
- **High Definition Video**
  What’s all the hype?
- **H.264 Encoding**
  How is it Different?
- **Advanced Camera Functions**
IP Cameras

• Internally encoded analog video
  Digitized, IP Ethernet Format, Compressed

• Getting over the Hurdle
  Power, 10/100, serial, USB, Audio, Video, LED’s

• Holding to Standards & Spec’s
  TS-2, Pressurized, Sealed

• Simplicity
  Cable and Cabinet requirements
Exploring HiDef Video

- HiDef is a Video Compliance Standard
  720p, 1080p, 16:9 Aspect Ratio
- Difference Between HiDef & Megapixel cameras
  Resolution equivalence
- Difference Between HiDef & SD (analog) Video
  Visible Differences
HiDef Comparison to SD Video
A Look at the Network

I asked my dad where the children came from, he said people download them from the internet!
The Holy Grail.....

Better Image Quality
w/Less Bandwidth
Effects on Networks

- Frame Rates
- Resolution
- Bandwidth
Encoding Video
The Physics of Encoding – Doing the Math…

- NTSC analog video is 640 x 480 pixels per frame
- Total pixels per frame = 300,000
- Times 30 frames p/sec = 9,000,000 pixels p/sec
- Times 24 bits per pixel = 221,000,000 Mbits
- Divide by 8 bits per byte = \textbf{27 MB} (uncompressed)

- HDTV (720p) is 1280 x 720
- \textbf{83 MB} (uncompressed)
H.264 Video Compression

• Video Compression is Really Motion Compensation
  The difference between consecutive frames in terms of where the previous frame has moved to. Subsequent frames have a lot of redundancy.

• What is H.264?
  - MPEG4 Part 10 or AVC
  - Covers low bit-rate Internet Streaming, to HDTV Broadcast & Digital Cinema
  - Contains new features that allow it to compress video more effectively

• A Truly Open Format
  Windows Browser, VLC, QuickTime

• Universal Usage
  YouTube, Skype, Blu-ray, iPhone, iTunes Store
VIDEO COMPRESSION

With the MJPEG format, the three images in the above sequence are coded and sent as separate unique images.

With H.264 difference coding, only the first image is coded in its entirety. In the two following images references are made to the first picture for the static elements. Only the portions of the frame which have changed are re-coded.
What to look for in a camera

- Analog or IP Camera
- Standard versus High Definition
- Easily integrated in existing architecture
- Sealed / Pressurized
- Fixed position or PTZ camera
- Dome camera or Barrel camera

- Pan/Tilt
- Multi Focal
- Auto Focus
- Auto Iris
Combining Technologies

**H.264 & HDTV**

- Made available with increase in processing power
- Until Recently, HD Video Over IP Performed Poorly Over Most LAN/WAN Networks
- H.264 & HiDef TV are Found in Nearly Every New Video Product in the Market Today
- ONVIF Makes it Compatible
  - Consortium camera manufactures
  - For standardizing interoperability
  - Defines a common protocol how network video devices should exchange information
Advanced Camera Functionalities...

• Traffic Analytics
  Speed / Occupancy
• Wide Dynamic Range (WDR)
• Internal Web Server
  Admin, Control, View
• Multiple Outputs H264, MJPEG & Analog Video
• Motion Detection
• NTCIP over IP
Traffic Analytics – Speed & Occupancy
Wide Dynamic Range On

Wide Dynamic Range Off
Internal Web Server User Interface
QUESTIONS

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