Cisco IP Video Surveillance

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Agenda

- Trends and Evolution
- Open IP Components
- Cisco's Solution
- Deployment Models
- Design Issues:
  - Camera Types
  - Digital Video and VS Operations
  - VS Storage Example
- Various tools: lens calculation etc
- Sizing VSS BOM
- Various solution in India
Trends and Evolution
Video Evolution

Analog Cameras

- VCR & Analog
  - Standalone box
  - Poor image
  - Hard to search
  - No remote access

- DVR
  - Easier to search
  - Consistent Quality

- NVR
  - DVR benefits
  - More storage options
  - Limited network connection

Cisco Video Surveillance Platform

- Secure viewing from anywhere
- Fail-safe redundant storage
- Easy integration with other systems
- Enterprise class storage and support

Cisco Enabled Storage/Archiving

Open IP Platform
IP Video Surveillance Trends

*IP Cameras and Servers Dominate Market*

![Graph showing the trend of video surveillance spending from 2004 to 2010. The graph compares CCTV Cameras and IP Cameras and Servers. The spending for IP Cameras and Servers increased over the years, while CCTV Cameras showed a decline.](image-url)
Commitment to Open Standards

Support of new IP Media Device API specification introduced by the PSIA to standardize how devices communicate with the network

- Defines uniform methods for how devices communicate with the network
  - Discovery and Configuration
  - Command and Control
- Ensures Systems Integrators can focus on value added capabilities rather than writing new device drivers
- Provides physical security and IT with cost effective options to evolve and customize solutions

The initial Physical Security Interoperability Alliance (PSIA) specification is endorsed by the following industry leaders: Adesta LLC, ADT Security Services, Cisco, CSC, DVTel, GE Security, Honeywell, IBM, IQinVision, Johnson Controls, March Networks, ObjectVideo, Orsus, Panasonic, Pelco, Santa Clara Consulting Group, Texas Instruments, Verint and Vidyo.
Total Addressable Market

- **PSS:-**
  
  VSM market for India:- USD 250 Million  
  (Products :- USD 200 Million  
  Software :- USD 50 Million)

  CAGR :- 23.4%

  IP VSM market :- USD 50-75 Million (20-30%)  
  (Cisco Direct AM)
Customer Segments

- **Higher Education**
  - **Main User:** Campus Security
  - **Who Has The Money:** Housing
  - **Care About:** Emergency Management
  - **Primary Products:** VSM, ISR, Access, IPICS

- **Retail:**
  - **Main User:** Loss Prevention
  - **Who Has The Money:** Marketing and Liability
  - **Care About:** Loss, Employee left, risk, liability
  - **Primary Products:** VSM, ISR

- **Enterprise/Banks:**
  - **Main User:** Security Director
  - **Who Has The Money:** Marketing and Liability
  - **Care About:** Emergency Management, risk, liability
  - **Primary Products:** VSM, ISR, Access, IPICS

- **PSU:**
  - **Main User:** Perimeter and internal Security, IT, Security
  - **Who Has The Money:** Marketing and Liability
  - **Care About:** Emergency Management, Safety
  - **Primary Products:** VSM, ISR, Access, IPICS

- **Commercial:**
  - **Main User:** Facilities, IT
  - **Who Has The Money:** Owners, IT, Facilities
  - **Care About:** Cost, Employee theft, asset protection
  - **Primary Products:** VSM, ISR, Access
What do you ask your customers???

- Do you know what your company is doing for Video Surveillance? Or Peoples and asset safety?

- Do you have any video camera’s deployed? Are you using IP or analog systems?
  Analog conversion is easier to sell than replacing an IP Vendor

- Who controls the decision for this physical security/video surveillance system? IT or Admin?
  IT involvement is a key to success

- Do you have any projects coming up?
  Campus buildout, Building moves
  Data center buildout
  Theft, loss, etc
  Data not accessible when they need it???

- How can we get an introduction to the team responsible for Safety and security?

- Call us!!!!
Pain of Traditional CCTV

- Central station access only
  - No remote access
  - No on-scene collaborative access

- Investigation delays
  - Locate tape in archive
  - Ship from remote location
  - Review hours of video

- Low probability of threat detection and high false alarms
More Pain of Traditional CCTV

- Video value limited to security Installation costs of traditional coax or fiber
- Number of monitoring stations is limited as costly cabling must be duplicated
- Matrix switcher cannot be easily expanded without new hardware

Overall scalability, including the cost of expansion, is poor
“Convergence is not about the unification of security into one environment, but about collaboration between environments.”
# Comparison of Analog and IP Video

<table>
<thead>
<tr>
<th>Feature</th>
<th>Analog</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wired and wireless cameras for anytime, anywhere surveillance on campus</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Video recorded digitally for immediate access, enabling real-time incident response, investigation, and resolution on campus</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Control and monitoring can be transferred to any other point on the network</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Feeds can be digitally monitored to detect and flag incidents</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Supports existing analog cameras or newer, IP-based cameras</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Flexibility to add sensors and apply analytics (e.g., facial recognition detection)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Network keeps operating, even if one link or switch goes down</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Every device can be continuously monitored, and an alarm raised if anything fails</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Open, standards-based infrastructure enables deployment of new security applications and maximizes value of total system</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Lowest total cost of ownership</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
What Does a Good Physical Security Customer Look Like?

- Sees **value in a Cisco relationship**.
- Is an existing **UC customer**.
- IT has a **relationship with the security team** and/or owns the purchase decision for physical security.
- The decision **is not based on a feature checklist**.
- **Price** is not the only factor.
- **Technology Integration** is important.
- Places value on the **roadmap**.
- Wants to purchase from **current IT partner**.
- A **platform** is important.
- **Incident Response** is important.
Open IP Components
Solution Components: Infrastructure

- Network
  - TCP/IP network, typically on Ethernet.
  - Conventional switches and routers.

- Storage
  - Redundant RAID storage
  - Direct Attached, SAN or iSCSI
Video Surveillance System Components: Transmission Media

- **Coaxial cabling (75Ω)**
  - Most popular cable used
  - 90%–99% EMI protection

- **Fiber Optic**
  - Capable of longer distances
  - No interference
  - Immune to EMI—Better for outdoor
  - Resists lightning strikes

- **Twisted Pair**
  - CAT5/5e/6
  - Easiest to install
  - Requires transmitter and receiver
  - Baluns—From Coax to UTP/UTP to Coax

Cabling is more important with Video than most realize!
Solution Components: Cameras and Applications

- **Video Encoders/IP Cameras**
  Source of digital video over IP. Compressed MJPEG, MPEG2, MPEG4.

- **Video and Application Servers**
  Open servers for streaming video between cameras, storage and viewers. May also run a Web server or application server for delivering a Web application.

  (e.g. VSMS - VSOM – VSVM)
Solution Components: Client Side

- **Client Stations**
  Windows PCs for video decoding, display and control. Running Web browsers or specialized Windows applications.
Video Surveillance System Components: Monitors/Displays

- Color or B&W—resolution higher than TVs
- Designed to be always on
- Analog CRT are most popular
- Digital (LCD/Plasma)—inferior image and Lifespan
- Size determined by application
- Comparative Resolution to IT centric displays is very different!
Video Surveillance System Components: Analytics

- Security Operators cannot effectively monitor multiple video monitors simultaneously. Studies have shown a 95% drop off in event detection after only 22 minutes of observation.

- Analytics process video to detect events.

- Integrated IP-based analytics:
  - Real time at the Camera or Encoder (IP Gateway)
  - Post-processing from an operator's PC on recorded video
  - Identify events as they occur and provide tools to analyze previous situations.
Video Surveillance System Components: Analytics

Sample Algorithms/Behavior Detection:

- Erratic/suspicious behavior—stopping at more than one car in a parking lot
- Congestion detection—too many people in a space
- Motion detection—object/person moving across a scene
- Abandoned object detection—suitcase abandoned in airport
- Wrong Way flow—object/person moving against a route
- Tripwire—detection and alarm upon breach of a defined line
- Shape-based detection—vehicle detection
- Object missing detection—object removed from a scene
Cisco’s Solution
Video Surveillance Manager (VSM)

Video Surveillance Media Server

Video Surveillance Operations Manager

Video Surveillance Virtual Matrix
Video Surveillance Media Server (VSMS)

- VSMS is the core component enabling distribution, archiving and management of video feeds.
- Open, modular architecture that is Future Proof with Open Standards—100% Linux
- Support different encoding, analytic, and storage technologies
- Support multiple codecs simultaneously
- Highly scalable—cameras, clients, storage
- Share IT infrastructure and storage systems
- Flexible archiving—simultaneous archives at different frame rates, durations, locations
- Retro-fit friendly
- Customizable, Open and distributed
  - Add custom UIs
  - Integrate with other systems
- Video Middleware and Abstraction Layer
  - Use best-of-breed codec: Motion JPEG, MPEG-2, MPEG-4
  - Highly Scalable – Cameras, Clients, Storage
    - Expand system as needed
- Proxy and stream live feeds
Media Server Proxy Feature

- IP Camera
- PARENT
- CHILD
- VSMS
- 3rd-Party CLIENT
- VSOM CLIENT
- VSVM MONITOR
Video Surveillance Operations Manager (VSOM)

- Enterprise solution
- Highly configurable to effectively manage complex video applications
- Browser-based UI
- Set up and manage multiple servers, cameras, and encoders
- Multiple web-based consoles to configure, manage, display, and control video throughout a customer's IP network.
- Unlimited cameras, storage, viewers
Video Surveillance Virtual Matrix (VM)

- Controls an infinite number of video displays on network
- Easily integrates with other systems
- Flexible delivery of live & archived video
- Distributes to Video Wall
- Controls multiple video displays from a single station
- Event/Action
  - Push video to remote screens
New line of Multiservice Platforms

- Leading Multiservice and IP Network capabilities
- Industry standard hardware
- Cost Effective, flexible for distributed systems

Scalability, Resiliency, Serviceability
Integrated Services Router (ISR) Video Surveillance Modules

Cisco IP Video Surveillance Solution

EVM-IPVS-16A: Analog Video Encoding Module

NME-VMSS: Video Management and Storage System

Cisco 2821
Cisco 2851
Cisco 3825
Cisco 3845

Multiple Services
Extended Modular Connectivity (EVM, NM, AIM, WIC/VIC)

High-Density Services
Modularity with Performance Optimized for “All-in-one” Solution (HSDM, NM, EVM, AIM, WIC/VIC)

Enterprise Branch Office
“Router-Integrated” Video Surveillance

The network is the platform reinvents safety and security

- Easier to deploy new and extend existing sites
- Greater monitoring flexibility, anywhere anytime
- Tighter linkage between video surveillance and other branch applications

Operational Efficiency
- Fewer devices at the branch
- Converged UC-VS platform
- One management system
- Simplified troubleshooting
- Lower TCO

Investment Protection
- Leverages existing IP network
- Smooth analog to IP transition
- Leverages installed base of ISRs
IP Video Surveillance Encoders
Cisco IPVS Fixed Box Cameras
Cisco IPVS Fixed Dome Cameras

Excellent Image Quality in Variable Lighting Conditions

- Same core Cisco IP Camera as the Standard Definition (SD) wired version
- Fixed Dome Form Factor
- Power Over Ethernet (Indoor)
- Multiple Options
  - Indoor Flush Mount, Surface Mount
  - Indoor Vandal Resistant
  - Outdoor Vandal Resistant
- API for interfacing with third party vendors
Why Cisco Designed an IP Camera

- Variable or low image quality in difficult lighting conditions
- Camera Installation and configuration was tedious
- Multiple cameras needed for single deployments
- Poor Bandwidth Control
- Weak Network security
- Limited System scalability
- Not Integrated with Video Surveillance systems
Cisco IP Cameras Features Wide Dynamic Range (WDR) Imaging

- CMOS based digital imager and dedicated co-processor that replaces traditional CCD technology
- Every pixel has its own dedicated Analog to Digital Converter (ADC) vs. CCD with only 1 ADC for an entire array
- Pixel-independent shutter speed
- Pixel-independent exposure
WDR from Pixel Independent Multi-Sampling

- Every pixel can be sampled multiple times per video field
- Exposure is computed for each pixel by calculating the slope of the light energy hitting it
- All pixels receive the optimal exposure with best Signal to Noise Ratio (SNR)
- Result – wide dynamic range & natural color; eliminating fixed pattern noise
Cisco SD IP Cameras Benefits

Optimal image in multiple lighting conditions

WDR Imager

Typical Imager

Cisco imager can pick up details in extreme lighting conditions - a common in warehouse applications.
Cisco SD IP Cameras Benefits
No Saturation with strong lighting

WDR Imager          Typical Imager

Cisco imager provides color detail even in extreme lighting with a manual iris lens, CCD technology is completely over-saturated.
Cisco SD IP Cameras Benefits
Improved Color Rendering

WDR Imager

Typical Imager

Cisco imager provides superior color rendering which can distinguish between chip colors, typical imager technology cannot.
Day and Night Imaging

- Automatic IR Cut-Filters
Light Compensation

- Since lighting can change frequently in a given scene, the camera has the ability to compensate for different lighting conditions in the following ways:
  
  **Auto-Iris**
  
  Auto Iris lens has an amplifier built in which responds to amount of scene light and will **open or close iris automatically to maintain same amount of light coming to imager**

  **Electronic Shutter**

  Shutter speed **controls how long light enters the camera**, the larger the number the shorter the time. A short time lets in light quickly which will stop the motion an object might have as it travels across the imager while being exposed

  **Automatic Gain Control (AGC)**

  Camera supports AGC which automatically **reduces the gain (measured in DB) as the average signal level increases** resulting in the clear image regardless of the light condition
Cisco IP Video Surveillance Camera

- **IP Cameras**
  - High Quality Camera
  - Easy to install, minimize camera setup (tweaking)
  - Easy to deploy with Power over Ethernet (POE)
  - Easy to configure and manage, browser based

- **Excellent Image Quality in Variable Lighting Conditions**
  - Wide dynamic range
  - High total resolution
  - Zero bloom and smear
  - Exposure across ALL lighting conditions
  - Superior color rendering

- **Migration Path for Existing Deployments**
  - Analog cameras can be migrated to IP VS System with encoders
  - Future Proof solution, Investment Protection
Cisco IP Camera Features

- Implementation flexibility
  Simply “point, focus and forget”

- Day/Night Capability
  Automatically movable infrared (IR) cut filter, which enables color video in high and low light conditions and as IR sensitive black/white video at night, automatic or manual

- Dual streaming
  Cisco IP Camera offers dual streaming capability, users can adjust frame rate, and/or resolution to control the quality of the video for different purposes simultaneously, this cannot be done with strictly analog cameras and systems

- Analog Output
  There is an analog output with a standard BNC connector for ease of installation
IP Camera Features (Cont.)

- **MPEG-4 compression technology**
  
  Provides DVD quality D1 video at frame rates of up to 30 fps NTSC, 25 fps PAL
  
  Reduces system bandwidth requirements
  
  Minimizes network traffic, increases the number of video streams that can be transmitted over a digital network
  
  Minimizes Storage Cost & Increases Capacity

- **Progressive Scan**
  
  Samples complete frames of video up to 5 times more often than traditional interlaced imager
  
  Minimize color artifacts, especially in high motion scene
  
  Eliminate jagged edges within the scene

- **Audio**
  
  Options are available for one or two-way audio
  
  Built-in or external microphone, and external speaker output
IP Camera Features (Cont.)

- **Motion Detection**
  
  Ability to designate specific zones in which motion triggers alarms, and to configure the sensitivity in these zones. No information is sent across the network and stored until an event occurs. Information is captured in great detail and will trigger actions such as alarms or email alerts.

  Motion detection is used to send an alarm to the operator and start streaming the video for recording.

- **Alarm I/O**

  Two alarm inputs that can be received and handled anywhere on the network, even by multiple recipients.

  Two alarm outputs allows the operator to switch anything on and off and allow operator control from anywhere in the world.

  Configurable pre & post alarm recording—capture the lead-up to events.
IP Camera Features (Cont.)

- **Browser Based Configuration**
  - Web Server built into the Camera
  - Configuration via Browser (Internet Explorer 6.X with Service Pack 2 and above)
  - Save/upload configuration to a server
  - Download configuration to camera(s)

- **Event Schedule**
  - If an event occurs during the day or range of days, the camera can perform pre-configured actions
  - Action that the IP camera takes when the event occurs
    - E-Mail message to be delivered to the SMTP server
    - FTP video file to upload to the FTP server
    - Alarm outputs
IP Camera Networking Features

- **Cisco Discovery Protocol (CDP)**
  
  Cisco IP cameras provide for discovery and management through CDP

- **Multicasting**
  
  When multicast is enabled, the IP camera sends video and audio to designated multicast addresses. Multicast enables multiple devices to receive the video signal from the IP camera simultaneously. This feature saves bandwidth, which is a vital component to a scalable solution.

- **HTTPS**
  
  Secure HTTP to protect from eavesdroppers and other attacks

- **QoS**
  
  The ability to prioritize traffic and allow critical flows to be served before flows with lesser priority

  DSCP Marking
IP Camera Networking Features (Cont.)

- **IP Address Filtering**
  Use IP Address Filtering to either allow or deny access to a Cisco IP Camera from specific IP addresses.

- **802.1X**
  802.1x is an IEEE standard for port-based Network Admission Control. It provides authentication to devices attached to a network port, establishing a point-to-point connection.
  
  **Wireless Network Security**
  Several security features are provided to protect wireless networks
  WPA and WEP
  Security options: WPA/WPA2-PSK & Enterprise, WEP

- **User Access Rights**
  The camera administrator can create up to 20 roles and configure rights for each user
  User types: Administrator, root, user
Deployment Models
Example 1: Small Single Site System

Single Location
1 VSOM
No VSVM
51 Cameras
1 VSMS
1 MSP Server Hardware

Running on a single MSP server hardware

VSOM Client (Internet Explorer)

HTTP (80)
Browser Requests and Screens

Video Requests and Streams

PTZ Commands

VSMS

Cam 1
Cam 2
Cam 50
Cam 51
Small Single Site System Example With Video Wall

- Single Location
  - 1 VSOM
  - 1 VSVM
  - 3 Virtual Monitor Clients
  - 12 Physical Monitors
  - 51 Cameras
  - 1 VSMS
  - 1 MSP Server Hardware

OM, VM and MS all running on a single MSP server hardware.
Larger Single Site System Example With Video Wall

Single Location
1 VSOM
1 VSV
3 Virtual Monitor clients
12 Physical Monitors
200 Cameras
4 VSMS
5 MSP Server Hardware

Operations Manager and Virtual Matrix Running on a single MSP server hardware

One MSP per Media Server (VSMS)
Multi-Site with Central Operations

- 10 Locations
- 1 VSOM
- 1 VSVM
- 3 Virtual Monitor Clients
- 11 VSMS
- 500 Cameras
- 12 MSP Server Hardware

**HQ/Central Operations Site**

Additional VSMS needed to perform proxy feature to optimize WAN usage
Design Considerations
Solution Design Requirement

- Business and technical Requirements
- Camera Selection
- Lens Sizing
- Storage Sizing
Solution Design Requirement

- Understanding the customer Segment
- Benefits of the Surveillance to customer
- Risks and Potential Problems
- Solution Considerations
- Best Practices

Important Design Aspects

- Camera Selection
- Lens Sizing
- Storage Sizing
Camera requirement

- How many cameras will be used indoor and how many used outdoor?
- How much light is available during the day and nighttime hours?
- Color or Black/White
- What will you be mounting the cameras to?
- Here are some common examples of Lux ratings
  - Direct sunlight 100,000 - 130,000 Lux
  - Overcast day 1,000 Lux
  - Deep twilight 1 Lux
  - Full moon 0.1 Lux
  - Quarter moon 0.01 Lux
General Camera Types

- Fixed vs. PTZ
- Dome
- Indoor vs. Outdoor (Indoor + Enclosure)
Cameras by Movement and Optical Zoom

- Fixed Cameras
- PTZ Cameras
  (Pan Tilt Zoom)
Dome Cameras

- Dome Fixed
- Dome PTZ
Outdoor Enclosures for our Cameras

- Aigis
- Videoalarm
Digital Video and VS Operations
Common Digital Video Attributes

- **Compression:** MPEG-4, MPEG-2, H.264, MJPEG
  Good Average: MPEG-4

- **Frame Rate:** 3.75 - 30 fps (frames per second)
  Good Average: 15 fps

- **Resolution:** CIF, 2CIF, 4CIF, D1, HD720, HD1080
  Good Average: D1/4CIF
# Video Resolution

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Resolution</th>
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<tbody>
<tr>
<td>VGA</td>
<td>640 x 480</td>
</tr>
<tr>
<td>SVGA</td>
<td>800 x 600</td>
</tr>
<tr>
<td>XGA</td>
<td>1024 x 768</td>
</tr>
<tr>
<td>QCIF</td>
<td>176 x 144</td>
</tr>
<tr>
<td>CIF</td>
<td>352 x 288</td>
</tr>
<tr>
<td>2 CIF</td>
<td>704 x 288</td>
</tr>
<tr>
<td>4 CIF</td>
<td>704 x 576</td>
</tr>
<tr>
<td>D1</td>
<td>720 x 576</td>
</tr>
<tr>
<td>HD 720</td>
<td>1280x720</td>
</tr>
<tr>
<td>HD 1080</td>
<td>1920x1080</td>
</tr>
</tbody>
</table>
# Typical Resolutions

User Expectation of Image Quality is Increasing with Adoption of HDTV

<table>
<thead>
<tr>
<th>Size / Format</th>
<th>NTSC based</th>
<th>PAL based</th>
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</thead>
<tbody>
<tr>
<td>QCIF</td>
<td>176 x 120</td>
<td>176 x 144</td>
</tr>
<tr>
<td>CIF</td>
<td>352 x 240</td>
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</tr>
<tr>
<td>2CIF</td>
<td>704 x 240</td>
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</tr>
<tr>
<td>4CIF</td>
<td>704 x 480</td>
<td>704 x 576</td>
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<tr>
<td>D1</td>
<td>720 x 480</td>
<td>720 x 576</td>
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</table>

<table>
<thead>
<tr>
<th>Size / Format</th>
<th>Pixels</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M</td>
<td>2048 x 1536</td>
</tr>
<tr>
<td>HDTV</td>
<td>1920 x 1080</td>
</tr>
<tr>
<td>2M</td>
<td>1600 x 1200</td>
</tr>
<tr>
<td>1M</td>
<td>1280 x 1024</td>
</tr>
<tr>
<td>1M</td>
<td>1280 x 960</td>
</tr>
<tr>
<td>HDTV</td>
<td>1280 x 720</td>
</tr>
<tr>
<td>VGA</td>
<td>640 x 480</td>
</tr>
<tr>
<td>QVGA</td>
<td>320 x 240</td>
</tr>
<tr>
<td>QQVGA</td>
<td>160 x 120</td>
</tr>
</tbody>
</table>

Megapixel camera in MJPEG may drop to 4CIF resolution for MPEG-4

Advanced Image Processing also Enhances Image Quality
Resolution Comparison
CIF [VCD] Resolution (352x240) vs. 1080 (1920x1080)
Resolution Comparison
4CIF/D1 [SDTV] Resolution (720x480) vs. 1080 (1920x1080)
Resolution Comparison
1080 (1920x1080)
High Definition Video Surveillance Cameras
High Definition IPVS Cameras, 4000 Series

- 1080p (1920 x 1080) 30 FPS
- 720p (1280 x 720) 60 FPS
- H.264, MJPEG Compression
- USB Memory Card
- IPv6 Capable
- Dedicated Digital Signal Processor (DSP) for Video Analytics

4 Models:
- CIVS-IPC-4500 (DSP)
- CIVS-IPC-4500W (DSP)
- CIVS-IPC-4300W
- CIVS-IPC-4300
High Definition

True or Full High Definition is defined by the Advanced Television Systems Committee (ATSC) and the Digital Video Broadcasting (DVB) suite of internationally accepted open standards for digital television. These worldwide HD standards are characterized by 4 distinct components: 1920x1080 resolution, progressive scan, frame rate and H.264 AVC video compression.
Why h.264 Matters

The Cisco HD IP Camera uses the H.264 AVC (MPEG4 part 10) Main Profile for compressing the HD video before transmitting to the IP network. In addition to decreasing network bandwidth requirements, the AVC also dramatically reduces storage requirements. This results in decreased overall system costs. A typical surveillance application would require video storage for one week. The H.264 video would occupy only 30MB of hard drive space, while MJPEG video would occupy 400MB of space per video stream.
Dedicated DSP

- First HD surveillance video camera that utilizes a fully-dedicated Digital Signal Processor (DSP) for processing video analytics.
- Future-proof design is ideal for next generation video analytics and computer vision applications.
- Reduces the need for additional servers.
- The demand for video analytics on the rise
- Example video analytics applications:
  - people counting, queue management, counting the number of vehicles within a parking garage, alerting security personnel to a speeding vehicle, evaluating how long a package has been left in an area, identifying suspicious movement of people or assets, license plate identification, and more.
Camera Placement—Overview or Detail
Influences codec, Frame Rate, Resolution

Overview

- Traffic cameras—viewing congestion
- Parking lots
- Single Megapixel or multiple SD cameras
- Wide angle lens
- MPEG-4

Detail View

- Point of sale transactions
- Face or license plate recognition
- Megapixel (HD) cameras
- Zoom lens
- Camera close to subject
- M-JPEG
Camera Placement
Pixels per Foot

- Face recognition may require 150 pixels per foot or more
- Given a 7’ high doorway—resolution of 1050 pixels required

~ 100 pixels per foot

345 pixels
~ 4 feet
85 pixel per foot

44 pixels
Camera Placement/Number of Cameras Meeting Pixel per Foot Requirements

Both Interior and Exterior Required
Overview - 20 to 30 pixels per foot sufficient

Cisco ISR Video Surveillance Network modules targeted at <16 or <32 cameras
Frame Rates
What Frame Rate Should I Use?

- Movies use 24 FPS (frames per second)
- TV uses 25 (PAL) or 30 (NTSC) FPS
- Full motion rates typically not required for surveillance
- Sample rates for video surveillance
  - 2–3 fps parking lots with wide field of view
  - 5 fps school hallways
  - 12-15 fps cash registers
- Camera positioning
Frame Rates
Camera Positioning Is Important

- Areas with static objects
- Objects which are moving vertically—toward camera need less FPS than horizontally
- Time of day—special events
  Eg. Stadiums on game day need higher FPS than on non-event days
IP Camera Selection

Other Factors

- Backlighting
- Wide Dynamic Range (WDR) imaging
- Progressive scan versus interlaced scan
- One/two way audio—external speakers/microphone
- Standard definition vs. high definition vs. megapixel
- Lens selection—Varifocal—3–8mm, 3–11mm, 5–50mm

Pilot different models of IP cameras before large scale deployments
Key Points

- IP based video surveillance has technical advantages to analog systems
- However, physical security managers may be reluctant to adopt
- Resolution, CODECS, camera placement, area to be monitored, are factors in number of cameras per site
- Nature of business, movement of people through and around facility must be considered
- Site and business requirements impact bandwidth and local storage requirements
Lens Selection
Lens Availability

- CIVS-IPC-VF38
  - Fujinon 3 - 8 mm
- CIVS-IPC-VT38
  - Tamron 3 – 8 mm
- CIVS-IPC-VF31
  - Fujinon 3 - 11 mm
- CIVS-IPC-VT31
  - Tamron 3 – 11 mm
- CIVS-IPC-VF55
  - Fujinon 5 – 50 mm
- CIVS-IPC-VT55
  - Tamron 5 – 50 mm
Lense Selection

- Key parameters
  - Distance of the object?
  - CCD/CMOS type?
  - Field of View?

- If you are looking for prosecutable evidence then a good rule of thumb to use is for every mm of lens multiply that by 4. So a 4mm lens will give you facial features of someone about 16 feet away.
**LENS FOCAL LENGTH**

**IMAGER FORMAT**

**DISTANCE IN FEET**

**FIELD of VIEW**

## Lens (mm)

\[
\text{Lens (mm)} = \frac{\text{Distance (ft)}}{\text{Field of View (ft)}} \times \text{Imager Format (mm)}
\]

## Distance (ft)

\[
\text{Distance (ft)} = \frac{\text{Field of View (ft)}}{\text{Imager Format (mm)}} \times \text{Lens (mm)}
\]

## Field of View (ft)

\[
\text{Field of View (ft)} = \frac{\text{Distance (ft)}}{\text{Lens (mm)}} \times \text{Imager Format (mm)}
\]
Tools: Lens Estimator

- When deciding on what lens you need, consider:
  - What distance will the camera be placed from the object to be viewed?
  - How much area do you want to view on screen around the object to be viewed?

- Enter information in any two fields
  - ✔ Press Calculate

Lens Estimator
Tools: Lens Estimator

- Result
Tools: Lens Estimator

- When deciding on what lens you need, consider:
  - What lens will be installed on the camera and how far the camera will be placed from the object to be viewed?
  - How much area do you want to view on screen around the object to be viewed?

- Enter information in any two fields
  - ✓ Press Calculate
Tools: Lens Estimator

- Result
When deciding on what lens you need, consider:

- What CCD format you have?
- Sample Target you want to monitor?
- Distance of the Object?
- Select preset to check the object in various types Monitoring, Detection, Identification, Recognition
VS Storage Example
Design Input

- Number of Cameras, and camera types: Fixed, PTZ, dome, etc.
- Resolution: HD, 4CIF, CIF, etc.
- Frames Per Second: 30, 25, 20, 15, etc.
- Days of Storage/Archive
- Number of Sites. Repeat above per site.
- Video Wall needed?
Example Storage Calculations

Initial System Requirements:

- Compression: MPEG4
- Resolution: 4CIF
- Frame Rate: 15fps
- Archive Period: 30 Days
- No. of Cameras: 500

Results:

- Data Rate: MPEG4, 4CIF, 15fps = 1.5 Mbps
- Daily storage/Camera: 1.5 x 3600x24/8 = 16 GB/day
- Daily Storage for 500 Cameras: 500x16 = 8 TB/day
- 30 Day Storage for 500 Cameras: 30x8 = 240 TB

PSS Configuration Tool
## Integration & Interoperability
Cisco ICE Ecosystem System & Application Providers

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<tr>
<th>Video Sources</th>
<th>Transport &amp; Route</th>
<th>Local/Central Aggregation &amp; Storage</th>
<th>Specialty Applications</th>
<th>Application, Data, Integration</th>
<th>Command &amp; Control</th>
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Summary
Account Engagement
What We Need To Know (Video)

- How Many Cameras Per Location
- Analog or IP
- What Quality
  2CIF is middle of the road. Most common.
- What Frame Rate / Bit Rate
  5-10 fps. Anything higher is usually wasted.
- How Many Days
  14-30 days is most common.
- Any other requirements
  Pan/Tilt/Zoom
  Specific Features
  Integration Requirements
  etc.
- If it is an ISR Solution
  Do they have an available NM slot (Analog)
  Do they have an available EVM slot (IP/Analog)