



Cisco Expo
2010

Networks Ready for Video



Configuring Cisco Video Surveillance - Mihai Spiridonescu
mspirido@cisco.com

AGENDA

1. Cisco Video Surveillance System Overview
2. Network Characteristics of IP Video Surveillance
3. Demo
 - Configuring Video Surveillance Operations Manager

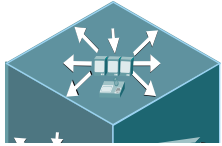
Cisco IP Video Surveillance System Overview



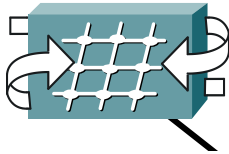
Remote & Multi-site Networked Video Surveillance

Accessibility, Interoperability, Flexibility

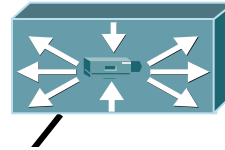
Single - Server
Cisco VS Software



Cisco VS
Virtual Matrix



Cisco VS
Media Server



Cisco VS Storage
Or 3rd Party



Cisco VS
Operations Manager

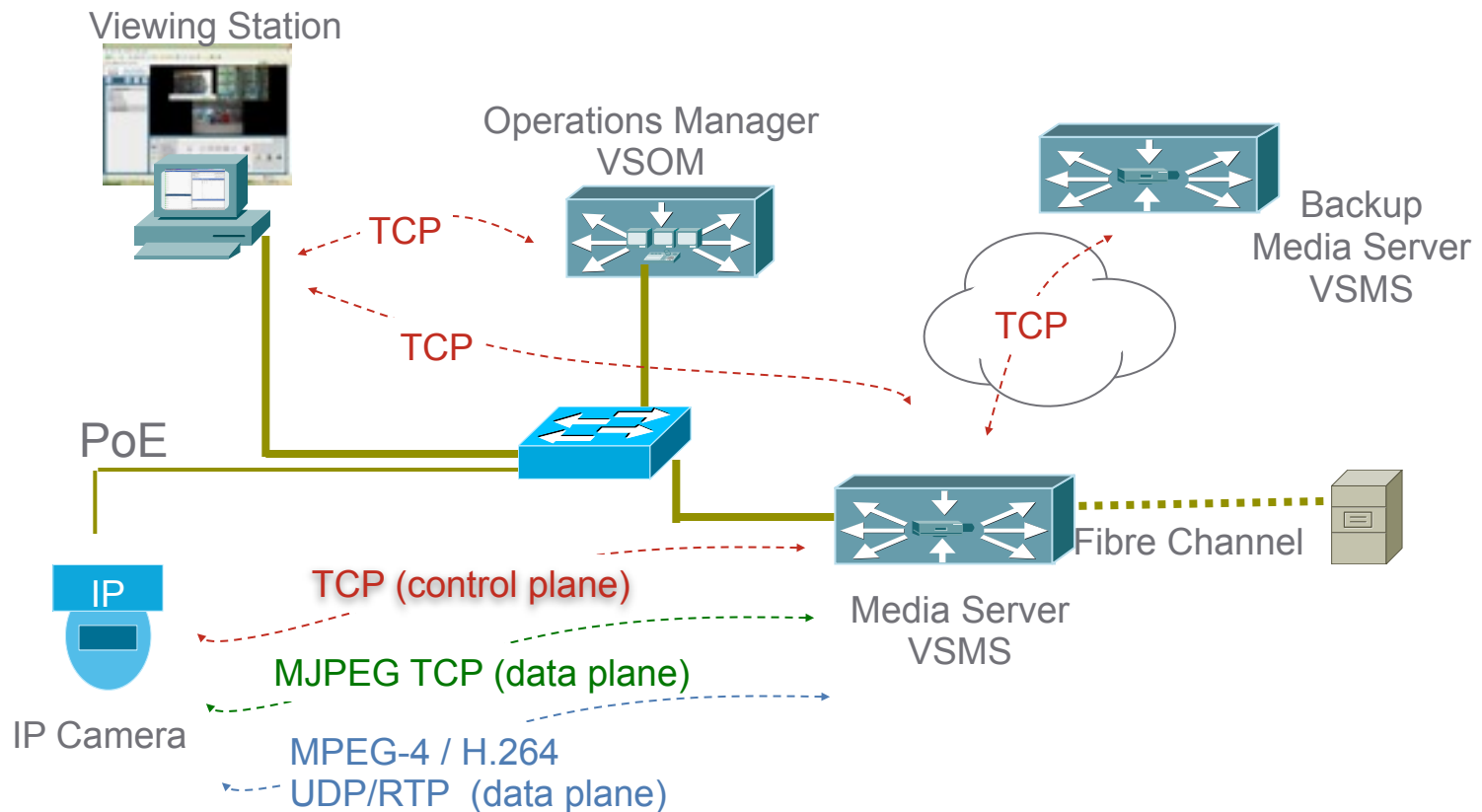


C
S
IT-Cali
Flexibl
Scalab

All in one Appliance
Cost-effective
Easy Operational Management

Network Data Flows - Transport Layer Protocols

Small business deployment – single switch



Network Characteristics of IP



Network Characteristics of IP Video Surveillance

1. Bandwidth

SD (4CIF/D1 MPEG-4 15fps **1Mbps** / 30fps **2Mbps**)

SD (Motion JPEG **2-8Mbps**)

HD (1920 x 1080 H.264 30fps **4-6 Mbps**)

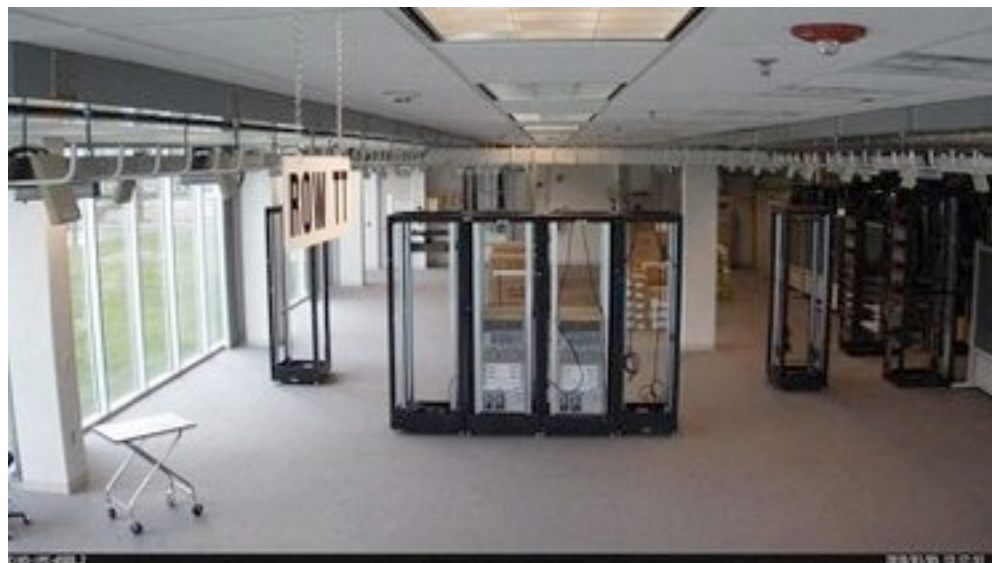
2. Bursts

3. Packet Loss

4. Latency

5. Jitter

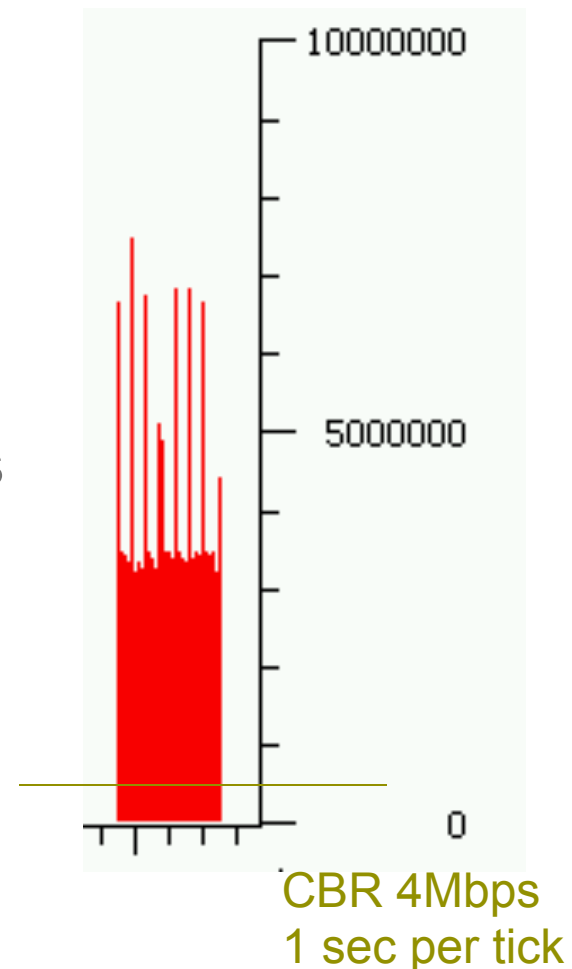
6. Quality of Service (QoS)



HD Camera H.264 1920x1080 CBR 8M

Bursts

1. In MPEG-4 / H.264, the bursts are associated with the transmission of reference frames, or I-frames.
2. Standard Definition (D1) ~ 16-30 packets
3. High Definition (1080p) ~300 packets
4. As Image resolution and complexity increases, so does the number of IP packets necessary to transport slices



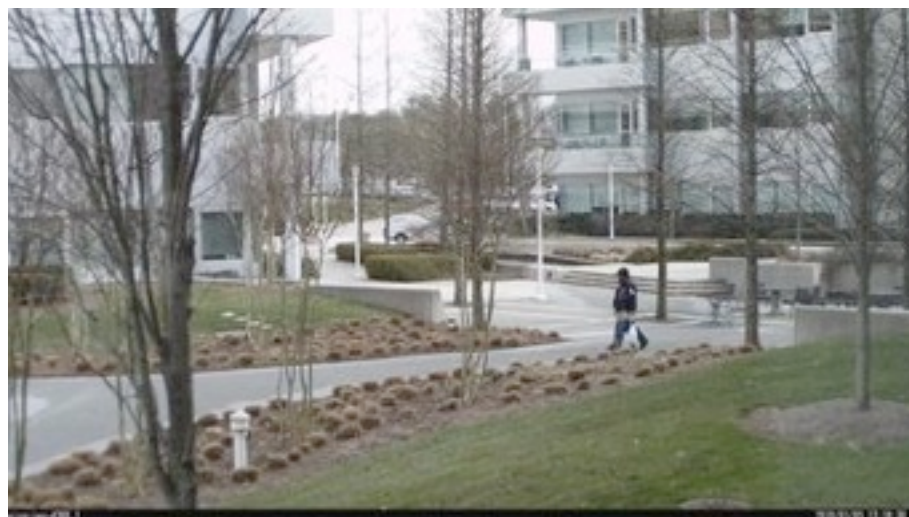
I/O Graph of H.264 High Definition Video (bits per second)

High Definition IP Cameras

Bursts

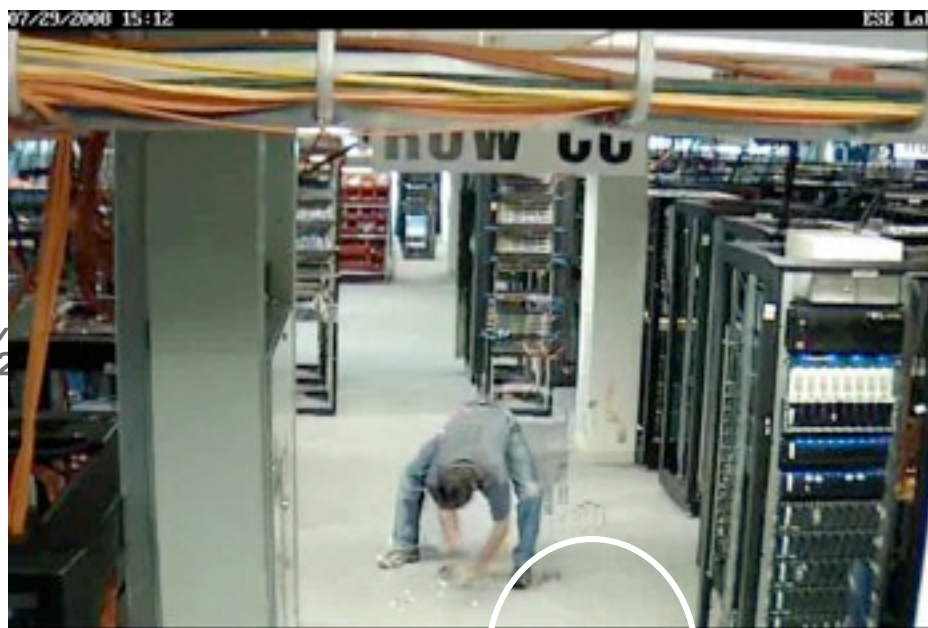
1. I-frame generated every ~ 4 sec. (128 GOV /30 fps)
2. CBR 4M = 383 pps and ave. packet size ~ 1,400 bytes
3. Network load approaches 100Mbps during I-frame transmission – appx 50ms (1/20th second)
4. P/B frames every 33ms

Note:
Video Surveillance
images can be far more complex
than Telepresence



Packet Loss

1. Packet loss in the network will be noticeable in the video quality of MPEG-4 and H.264 video feeds.
2. Standard Definition below $\frac{1}{2}$ of 1% may be acceptable
3. High Definition even 1/10th of 1% may be noticeable.



SD Camera MPEG-4 720x480 1% loss

Latency

1. Depends on the transport protocol
2. MPEG4 / H.264 transported in TCP is not tolerant of high latency
3. IP cameras with two-way (PAN-TILT-ZOOM) need low latency
4. MPEG4 / H.264 in UDP/RTP tolerant of high latency

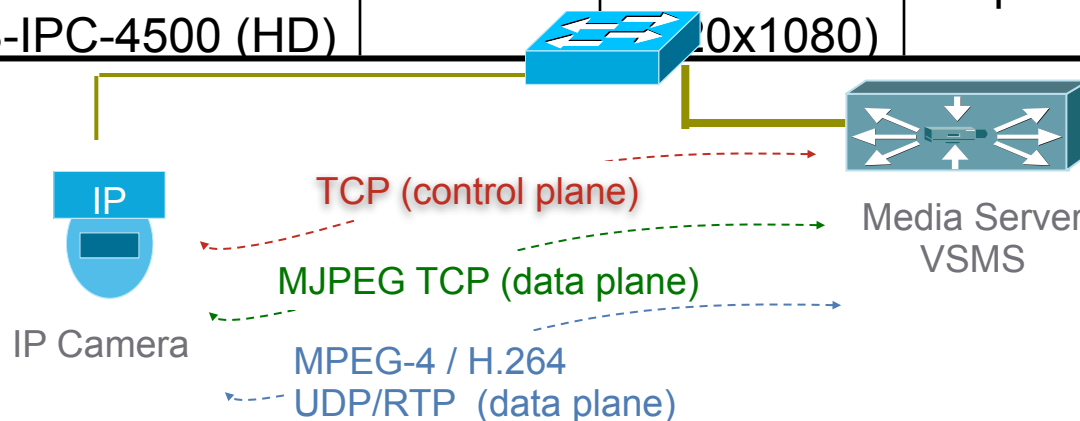
Jitter

1. Jitter generally increases as latency increases.
2. If Jitter is high, latency will likely also be an issue
3. Address the latency issue first - jitter will take care of itself
4. Jitter is more of an issue with VoIP than with IP VS deployments
5. IP Video Surveillance requires
 1. Adequate Bandwidth
 2. No Loss
 3. Low / Reasonable Latency

IP Cameras

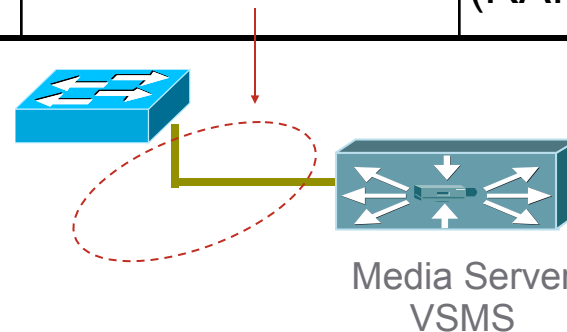
Per Camera Network Bandwidth Estimates

Camera	CODEC	Resolution	Frame Rate	Average Load
CIVS-IPC-2500 (SD)	MPEG-4	D1 (720x480)	15 fps	1 Mbps
CIVS-IPC-2500 (SD)	MPEG-4	D1 (720x480)	30 fps	2 Mbps
CIVS-IPC-2500 (SD)	MJPEG	D1 (720x480)	5 fps	2.2 Mbps
CIVS-IPC-4300 or CIVS-IPC-4500 (HD)	H.264	HD (1280x1080)	30 fps	4-6 Mbps



Media Servers

Server	Maximum I/O	Maximum Internal Storage
CIVS-MSP-1RU 1RU chassis	60 Mbps	4 TeraBytes (no RAID-5)
CIVS-MSP-2RU 2RU chassis	200 Mbps	12 TeraBytes (RAID5)
CIVS-MSP-4RU 4RU chassis	200 Mbps	24 TeraBytes (RAID5)



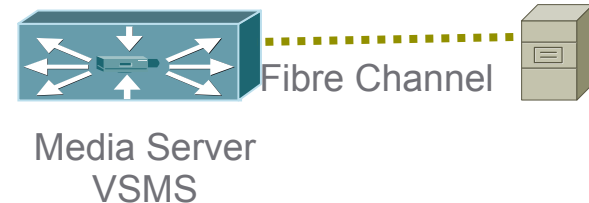
HD IP camera - CBR 6Mbps - maximum I/O value of 200Mbps - estimated that a 2RU/4RU chassis can support approximately 32 cameras (minus number of feeds viewed live)

<http://wwwin.cisco.com/etg/physec/files/>

Disk Storage Requirements

Camera Configuration	Megabytes per 5 min. of archive
HD Camera H.264 1920x1080 CBR 4M	100
HD Camera H.264 1920x1080 CBR 5M	225
HD Camera H.264 1920x1080 CBR 8M	240
SD Camera MPEG-4 D1 (720x480) CBR 2M	76
SD Camera MJPEG D1 (720x480) 5 FPS	75
SD Camera MJPEG D1 (720x480) 10 FPS	150

Given the 100 Mbytes for a 5 minute archive, the disk requirement per day is 28 Gigabytes per day (100Mbytes * 12 * 24). 32 Cameras = 1TB per day



DEMO

