



White paper

WiseStream II Technology

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Contents

1. Introduction

2. Background

2. 1. Frame composition of H.264/H.265

3. WiseStream II Technology

3. 1. Dynamic GOV

3. 2. Dynamic FPS

3. 2. Smart ROI

3. 3. Predictive Bitrate Control (PBC)

3. 4. Other technologies

4. WiseStream II Setup

4. 1. Dynamic GOV setup

4. 2. WiseStream mode setup

4. 3. Changes of data size

5. Conclusion

The expansion of high quality contents of broadcasting and digital camera raised expectations on video quality. Likewise, the demand on high quality camera is increasing in video surveillance market. In addition, the data size from surveillance system is getting bigger as the number of high quality camera in surveillance system is increasing.

Enlarged system scale affects the system infrastructure. For example, broadband network environment is required for large video data transmission. More storage capacity is required as well and it is proportional to system development and maintenance cost.

It will be able to install more cameras and records more footage without system expansion if data size is reduced with well preserved video quality. This advantage will be more valuable for large scale surveillance system. Security camera is developing for both high video quality and low data size to follow this trend.

Hanwha Techwin introduces WiseStream II technology that provides high video quality at low data size. The WiseStream II can reduce data size by up to 99% in very low-motion environments.

Data compression is required for efficient network streaming due to huge data size of original video. Video codec is used for compression and restoration. H.264, H.265 and MPEG is the common compression format in video surveillance field. In addition, H.264 and H.265 is mostly used as they provides good video quality at substantially lower bit rates than other formats.

2.1. Frame composition of H.264/H.265

Unlike each and all frame compression method such as MJPEG, H.264/H.265 codec doesn't transmit duplicated data to reduce the data size.

H.264/H.265 codec video consists of I-frame which has complete data and multiple P-frames which have updated data from its previous frame. This combination of I-frame and P-frames is called GOV (Group of Video)

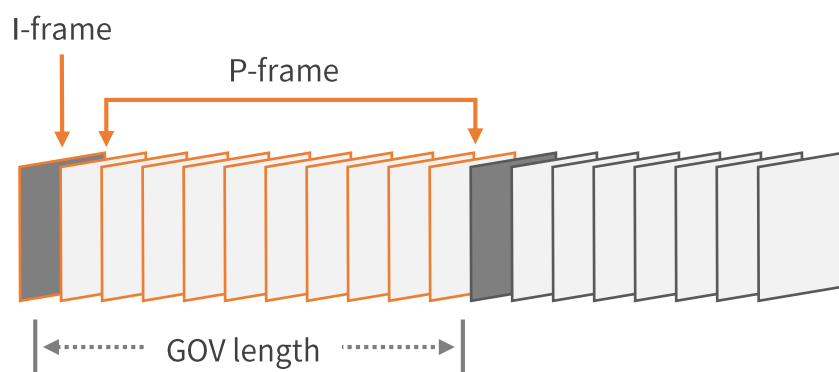


Figure 1. Composition of GOV

Hanwha Techwin WiseStream II is an advanced video compression technology based on motion analytics to keep video quality at lower data size. WiseStream II works on H.264 and H.265, especially more effective with H.265.

3.1. Dynamic GOV

Since the data size of the I-frame composing the H.264/H.265 video is larger than P-frame, the longer GOV length, the smaller number of I frames constituting smaller size of the video data. Therefore, the optimal setting is long GOV for less movement and short GOV for a lot of movement.

Hanwha Techwin Dynamic GOV technology analyses motion and complexity in video, then controls intervals between I-frames to achieve both excellent video quality and low bandwidth consumption.

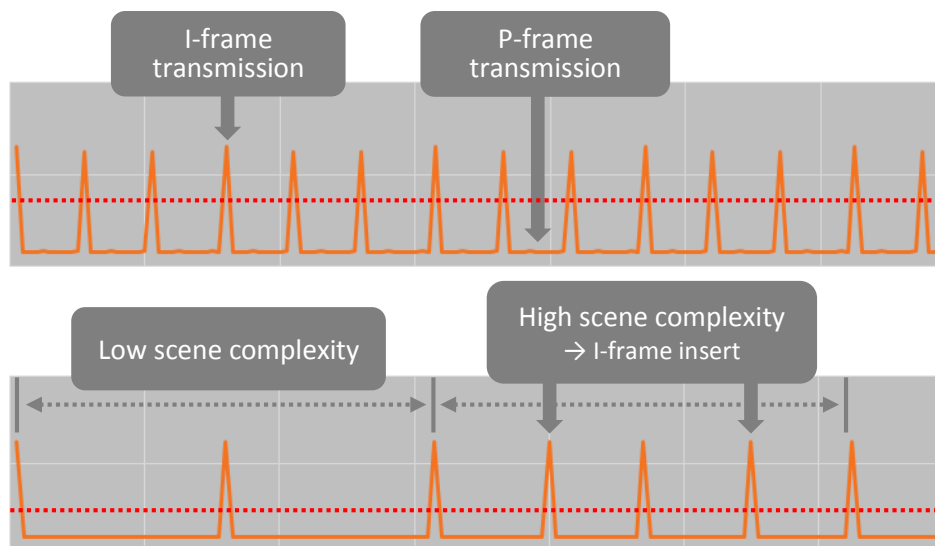


Figure 2. Normal(up) and Dynamic GOV enabled(down) bitrate

3.2. Dynamic FPS

In addition to adjusting the length of the GOV, Dynamic FPS technology is also provided to adjust the number of frames transmitted from the camera depending on the degree of motion in the video.

The Dynamic FPS function detects the motion level within the image, reduces the frame rate to 1 fps if there is no motion, and increases the frame rate if there is motion. This reduces unnecessary frame encoding when the captured frame is similar to the previous frame, and provides overall savings in accumulated data over a period of time.

3.3. Smart ROI

In video, there are dynamic and static areas and users are normally interested in viewing dynamic areas containing a lot of movement than static areas containing little movement.

Hanwha Techwin Smart ROI(Region of Interest) technology analyses static and dynamic areas in video based on Hanwha Techwin's advanced intelligent video analytics. It then applies a different compression rate on each area for both video quality and bandwidth reduction.

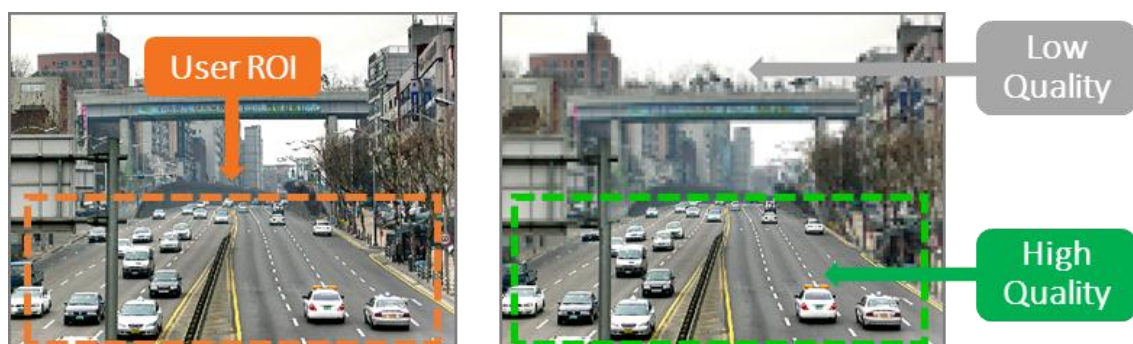


Figure 3. Compression rate adjustment by user interest area

3.4. Predictive Bitrate Control (PBC)

H.264/H.265 codec predicts and calculates the complexity of a scene for compression. However, higher bitrate often occurs due to difficulty of real-time calculation.

Hanwha Techwin PBC technology has an improved logic for real-time complexity calculation. It detects changes in scene ahead and controls compression rate (quantization parameter) stable. This prevents unnecessary bitrate increase and optimizes the streaming data.

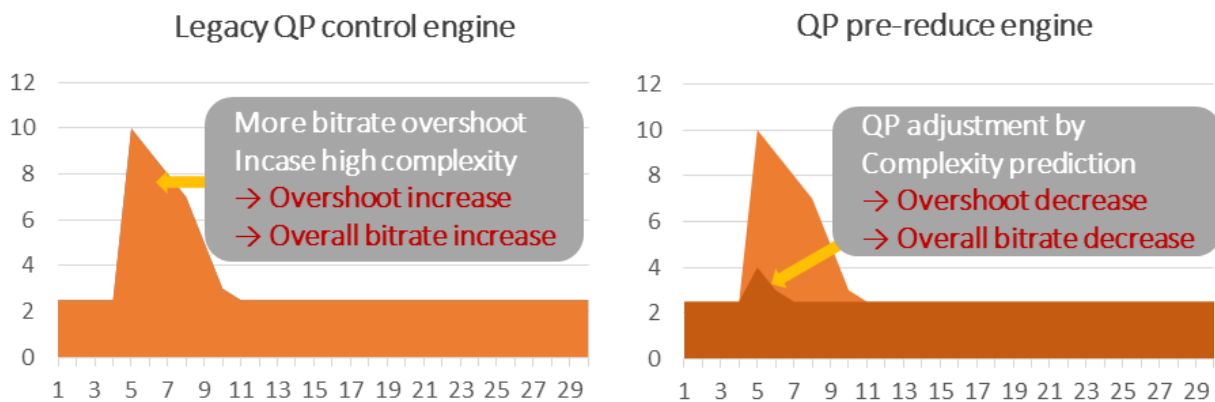


Figure 4. QP control comparison

3.5. Other technologies

WiseStream II reduces the noise and minimizes the image quality degradation caused by the image compression by applying a low pass filter and noise reduction technique with different intensity depending on its three mode (low/mid/high).

When using WiseStream II, it is necessary to consider how to compress data, how to adjust GOV length and how to adjust the length of GOV, and make the appropriate settings for the required video level and network environment.

4.1. Dynamic GOV setup

If video contains no motion, GOV length will be kept as user set up, but if there is movements, I-frame will be added immediately. Camera GOV length setup range is from 30 to 480.

If a camera is placed in an environment where not many motion occurs, camera composes a GOV as long as dynamic GOV setting. It is more effective than fixed GOV length. I-frame insert frequency is up to video framerate and GOV length setting.

- 30fps / GOV length 30 → 1 I-frame per max. 1 second
- 30fps / GOV length 240 → 1 I-frame per max. 8 seconds
- 30fps / GOV length 480 → 1 I-frame per max. 16 seconds

4.2. WiseStream mode setup

It is able to set compression rate by choosing each different mode of WiseStream. Below is the average reduction rate for each mode.

- Low: Avg. 15% data reduction
- Mid: Avg. 30% data size reduction
- High: Avg. 50% data reduction

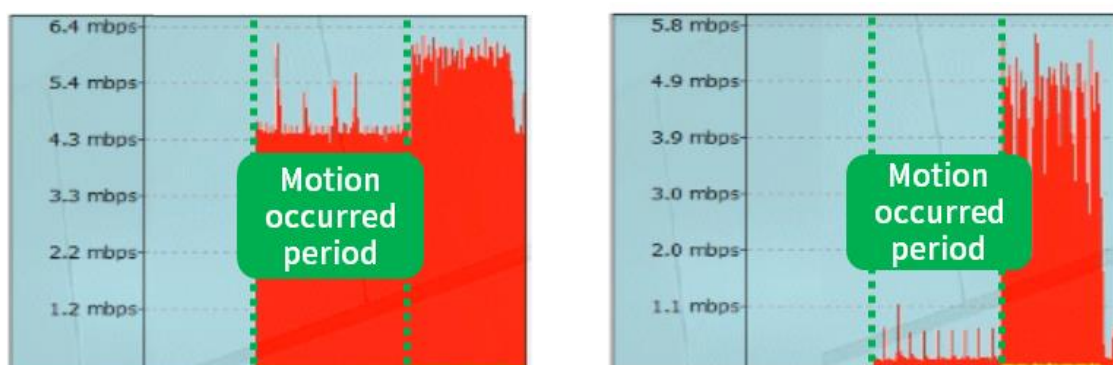


Figure 5. Bandwidth comparison of WiseStream Off and On (High, Dynamic GOV enabled)

4.3. Changed of data size

Hanwha Techwin has tested WiseStream II in various ways and got results that data size is significantly reduced.

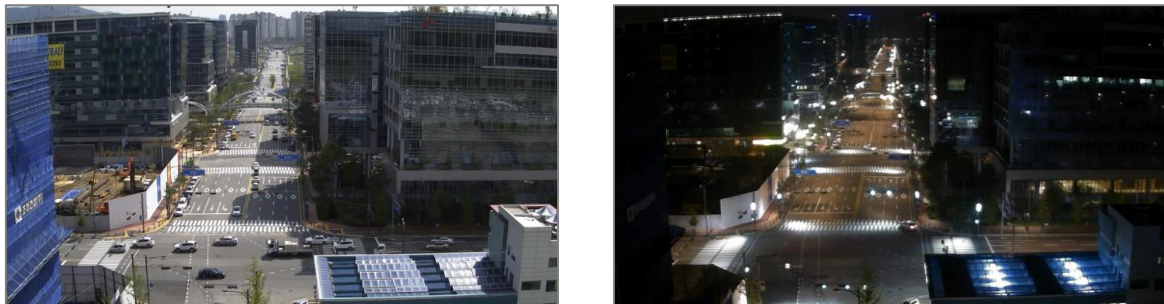


Figure 6. Test environment – Day & high motion(left), Night & low motion(right)

< Table1 – Day, normal motion >

Camera Setting	Resolution	Codec	Average Bitrate	Bitrate Saving	Codec	Average Bitrate	Bitrate Saving
WiseStream II Off	2560x1920	H.264	4.5Mbps	-	H.265	3 Mbps	33%
WiseStream II High + Dynamic GOV(480)			2.6Mbps	42%		1.9 Mbps	57%
WiseStream II High + Dynamic GOV(480) + Dynamic FPS			2.0Mbps	55%		1.6 Mbps	64%

< Table2 – Night, very low motion >

Camera Setting	Resolution	Codec	Average Bitrate	Bitrate Saving	Codec	Average Bitrate	Bitrate Saving
WiseStream II Off	2560x1920	H.264	6.9Mbps	-	H.265	4.4Mbps	36%
WiseStream II High + Dynamic GOV(480)			0.9Mbps	86%		0.2Mbps	97%
WiseStream II High + Dynamic GOV(480) + Dynamic FPS			0.8Mbps	88%		0.06Mbps	99%

As the video data size to be handled in the video surveillance area increases, the importance and necessity of data reduction technology increases.

WiseStream II is a technology that effectively reduces the data size while maintaining the best image quality. It can reduce the data size by more than 50% when used with the H.264 codec, and has an additional data saving of 25% or more when using the H.265 codec. It also provides up to 99% data reduction in very small motion scenes.

We hope that you will be able to add more cameras without expanding the network equipment, or save video for a longer period using the same storage as the reduced data size using Hanwha Techwin's WiseStream II.

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