White Paper

WiseStream II Technology

10th 02, 2017
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1. Introduction

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.
2. Background

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)

![Image 1. Composition of GOV](image.png)
3. **WiseStream II Technology**

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 dynamically controls GOV length to achieve both excellent video quality and low bandwidth consumption.

### 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.

### 3.3. Smart ROI

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.
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.

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 modes (low/mid/high).
4. WiseStream II Setup

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 set up

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.

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

![Image 4. Bandwidth comparison of WiseStream Off and On (High, Dynamic GOV enabled)](image_url)
4.3. **Changes of data size**

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

Image 5. Test environment – Day & high motion(left), Night & low motion(right)

<table>
<thead>
<tr>
<th>Camera Setting</th>
<th>Resolution</th>
<th>Codec</th>
<th>Average Bitrate</th>
<th>Bitrate Saving</th>
<th>Codec</th>
<th>Average Bitrate</th>
<th>Bitrate Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>WiseStream II Off</td>
<td></td>
<td>H.264</td>
<td>4.5Mbps</td>
<td></td>
<td></td>
<td>3 Mbps</td>
<td>33%</td>
</tr>
<tr>
<td>WiseStream II High</td>
<td>2560x1920</td>
<td></td>
<td>2.6Mbps</td>
<td>42%</td>
<td></td>
<td>1.9 Mbps</td>
<td>57%</td>
</tr>
<tr>
<td>+ Dynamic GOV(480)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H.265</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WiseStream II High</td>
<td></td>
<td></td>
<td>2.0Mbps</td>
<td>55%</td>
<td></td>
<td>1.6 Mbps</td>
<td>64%</td>
</tr>
<tr>
<td>+ Dynamic GOV(480)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>+ Dynamic FPS</td>
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</tbody>
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**Table 1. Day, normal motion**

<table>
<thead>
<tr>
<th>Camera Setting</th>
<th>Resolution</th>
<th>Codec</th>
<th>Average Bitrate</th>
<th>Bitrate Saving</th>
<th>Codec</th>
<th>Average Bitrate</th>
<th>Bitrate Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>WiseStream II Off</td>
<td></td>
<td>H.264</td>
<td>6.9Mbps</td>
<td></td>
<td></td>
<td>4.4Mbps</td>
<td>36%</td>
</tr>
<tr>
<td>WiseStream II High</td>
<td>2560x1920</td>
<td></td>
<td>0.9Mbps</td>
<td>86%</td>
<td></td>
<td>0.2Mbps</td>
<td>97%</td>
</tr>
<tr>
<td>+ Dynamic GOV(480)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H.265</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WiseStream II High</td>
<td></td>
<td></td>
<td>0.8Mbps</td>
<td>88%</td>
<td></td>
<td>0.06Mbps</td>
<td>99%</td>
</tr>
<tr>
<td>+ Dynamic GOV(480)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Dynamic FPS</td>
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**Table 2. Night, very low motion**
5. Conclusion

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

WiseStreamII 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 WiseStreamII.