Basler Components

Using Multistreaming on Basler IP Cameras to Maximize Bandwidth Conservation

APPLICATION NOTES

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1 The Use Case

To understand how the multistreaming feature available on Basler IP Cameras can be used to maximize bandwidth, consider the following use case:

- Images will be acquired by a Basler BIP-1600c, which has two megapixel resolution. The images must be transmitted to an operator and to a network video recorder (NVR).
- With the camera set for full resolution, the observed scene can be displayed at 240 pixels per meter.

The operator and the NVR, have different typical requirements:

- The operator needs to view live video with an acceptable frame rate, a minimum of 12 frames per second (fps), in "general surveillance" quality. Sixty pixels per meter would be enough.
- The NVR needs the highest quality (240 pixels per meter), but with a lower minimum frame rate of one fps. Recording is required only if motion has been detected.

2 The Problem

The standard approach would be to have the camera continuously send one high quality video stream (MJPEG to minimize compression artefacts) at 12 fps to a computer equipped with Video Management Software (VMS). The VMS would transcode the stream into two different streams, one as a continuous live stream for the operator and one for the NVR (whenever motion has been detected by the VMS).

With a Basler BIP-1600c, this approach would cause a bandwidth load of about 13 MBit/s. The Fast Ethernet type of network to which IP cameras are typically connected can only handle up to 100 MBit/s of network traffic. So this could easily lead to bandwidth problems, especially if you plan to operate multiple cameras on the same network at the same time.
3 The Solution

The BIP’s multistreaming and dual encoding capabilities can be used to significantly reduce the required bandwidth:

Solution A

The camera would be configured to provide two different video streams simultaneously:

- Stream 0 would be set up for the operator. It would be an MPEG4 stream with a good quality setting (70*), an image size of 400 x 300 pixels (which in this example is same as 60 pixels per meter), and a 12.5 fps rate. The stream would be continuously acquired by the VMS and used to continuously display the scene to the operator.
- Stream1 would be set up for the NVR. It would be an MJPEG stream with a high quality setting (70*), an image size of 1600 x 1200 pixels (which in this example is same as 240 pixels per meter), and a 1.5 fps rate. The stream would be continuously acquired by the VMS, but only recorded by the NVR if motion is detected.

The overall bandwidth load caused by the camera in this scenario is about 1.3 to 1.6 MBit/s (depending on the scene). This is just 1/8th to 1/10th of the bandwidth required by the standard solution!

* The camera’s quality settings operate on a somewhat different scale depending on the type of encoder a stream is using. When a stream is set to use the MPEG4 encoder, a setting of around 70 will result in the transmission of good quality images; increasing the setting above this point will result in a noticeable additional increase in quality. When a stream is set to use the MJPEG encoder, a setting of around 70 will result in the transmission of high quality images; increasing the setting above this point will result in only a minimal additional increase in quality.

Solution B

The camera would be configured for two different video streams as described in Solution A.

The VMS would be set to continuously acquire Stream 0 only and would use the stream to continuously display the scene to the operator. Also, the VMS’s motion detection function would set to operate on this stream to detect motion.

In parallel, the camera would be configured to write Stream1 (set up as described in Solution A) into the camera’s internal ring buffer. Stream 1 would not normally be transmitted to the VMS, which means that Stream1 would not normally cause any network load!

If the VMS’s motion detection function should detect motion, it can begin acquiring Stream 1 from the camera and begin recording the stream on the NVR. To avoid the latency that would normally be seen between the moment when motion was detected and the start of recording, the VMS could be set to access the camera's internal ring buffer with a timeshift parameter. This would allow the VMS to access the video stream at a point that occurred shortly before the motion was detected.
As long as no motion is detected, the bandwidth requirement for Solution B is about 0.1 - 0.2 MBit/s, which is about 1/10th of the bandwidth needed with Solution A and only 1/100th of the requirement for the standard solution!

When motion is present, the bandwidth requirements for Solution B are identical to Solution A.
## Revision History

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<thead>
<tr>
<th>Doc. ID Number</th>
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<tbody>
<tr>
<td>AW00084501000</td>
<td>24 Jul 2009</td>
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<tr>
<td>AW00084502000</td>
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