

The new independence

In the industrial image processing, there are more and more standards for consumer interfaces like Ethernet and USB, for example, GenICam, GigE Vision, and USB3 Vision. It is easy to get lost. But what's the meaning of the standards and what are the benefits? The following article shows, which standards MATRIX VISION supports and how you can benefit from MATRIX VISION cameras and from our knowhow concerning standards.

Part 1: Which standards are there for the industrial image processing market?

The GenICam standard, which is maintained by the European Machine Vision Association (EMVA), serves as a base for the image processing standards. This standard abstracts the user access to the features of a camera. The "Standard Feature Naming Convention" (SFNC) defines the features hence all manufacturers use the same feature names and each feature has the same behavior.

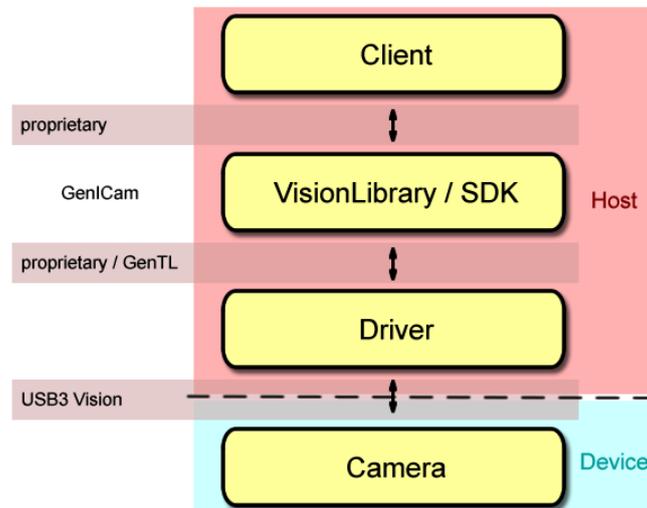


Figure 1 On-the-Wire standards

Additionally, it is possible to define specific features apart from the SFNC to differentiate from other manufacturers ("Quality of Implementation"). For example, MATRIX VISION's mvBlueCOUGAR-X camera offers specific features like frame average, flat field correction, logic gates etc. These features can also be used by GenICam/GigE Vision based driver and software solutions from other manufactures without any problem.

USB3 Vision and **GigE Vision** are "On-the-Wire" interfaces between driver and camera. They are maintained by the Automated Imaging Association (AIA). What does "On-the-Wire" mean? The standards define a transport layer, which controls the detection of a device ("Device Detection"), the configuration ("Register Access"), the data streaming ("Device Detection"), and the handling of events ("Event Handling") and establishes the interface to GenICam (Figure 1). Everybody is familiar

with the advantages of "on-the-wire" standards: USB sticks, USB mice or USB hard disks – just plug and play them. That's the same thing with GenICam/GigE Vision/USB3 Vision based driver / software solutions; they work together without any problem and the manufacturer does not matter.

USB3 Vision benefits from the experience of the GigE Vision standard and therefore includes the accessories manufacturers (e.g. cables), too. This means that the mechanics is part of the standard which defines, for example, lockable cable interfaces. This leads to a more robust interface. USB3 Vision thinks of everything and that's no wonder. Besides MATRIX VISION more than 20 companies have joined to set the course for a successful future of the USB 3.0 interface. For this reason, the whole industrial image processing knowhow is fully utilised for the benefit of the customers.

Part 2: Are standards a must have?

Of course, you do not need any standards. But would you drive a Porsche with an applied parking brake? The image processing market is a future market which creates new potential with its strengths. There was already a comparison between interface with and without standards: Ethernet with GigE Vision and USB 2.0 without a standard. USB 2.0 industrial cameras were introduced in 2004. Two years later, Gigabit Ethernet cameras were introduced with a suitable image processing standard GigE Vision. USB 2.0 industrial cameras only worked with proprietary drivers (Figure 2); on the one hand between client and VisionLibrary / SDK and on the other hand between driver and camera.

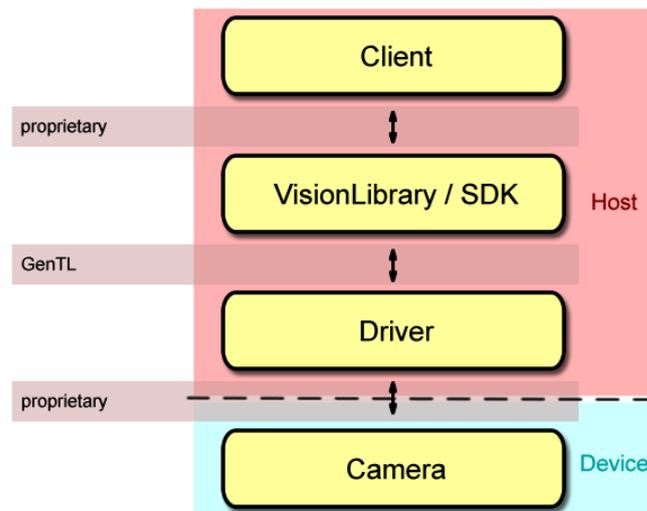


Figure 2 Proprietary "plurality" from client to camera

In the case of a system crash, customers won't know whether the proprietary driver or the software library was to blame and this was not easy to support. During the decision phase in regards to sensors and supported, the customer had to keep the product portfolio in mind. Afterwards, the application was implemented and only worked with the proprietary interfaces of the manufacturer. In case of future projects or adaptations, for example, if a new sensor was required, it would have been necessary that the manufacturer offers this sensor. Otherwise, a change of the manufacturer was obligatory which meant that a new implementation of the software was required. In contrast,

flexibility was a big advantage with Gigabit Ethernet cameras and GigE Vision: GigE Vision compliant cameras can be used without regards to the manufacturer. Good for the market. After three years the standard was established. According to the AIA's 2010 market survey, the market share of Gigabit Ethernet cameras was 30 % and higher than the market share of USB 2.0 cameras (about 14%). However, there is no question that USB cameras are more prevalent in other image processing fields like medicine given that the application defines the camera with regards to sensor resolution, image format and image frequency (bandwidth), and the environment for the purpose of cable length, frame grabber or digital camera solution.

Part 3: How's MATRIX VISION connected to the standards?

MATRIX VISION is an active player in both standard committees, GigE Vision and USB3 Vision. If you purchase a MATRIX VISION camera, you can be sure that you hold an up-to-date camera in your hands. But that's not all: MATRIX VISION improves the quality of implementation with special features, which can be used by compliant GigE Vision and USB3 Vision software SDK's from other manufacturers as well.

Part 4: MATRIX VISION offers which standard compliant products?

MATRIX VISION offers a wide range of sensors for different consumer interfaces. For Ethernet, there are two GigE Vision compliant industrial camera families. On the one hand the mvBlueCOUGAR-X family, which has a lot of smart features (excerpt):

- 2 temperature sensors with programmable alarm threshold
- Image recorder with pre-trigger functionality
- Extended I/O functionality
- Color correction matrix (for sensor and display color space)
- Frame average
- User data on camera
- Real-Time flatfield correction
- etc.

The bandwidth of Ethernet is 125 MB/s.

Link to the mvBlueCOUGAR-X family: <https://www.matrix-vision.com/GigE-vision-kamera-mvbluecougar-x.html#tab1>

For higher frame rates (up to 600 frames per second) and resolutions MATRIX VISION offers the Dual-GigE camera series mvBlueCOUGAR-XD. Because of channel bonding of two Gigabit Ethernet interfaces, bandwidths of up to 250 MB/s are possible.

Link to the mvBlueCOUGAR-XD family: <https://www.matrix-vision.com/Dual-GigE-Vision-Kamera-mvbluecougar-xd.html#tab1>

The USB 3.0 camera mvBlueFOX3 is the latest technological achievement. USB 3.0 offers a bandwidth of 300 MB/s and is suitable for higher sensor resolutions:

Link to the mvBlueFOX3 family: <https://www.matrix-vision.com/USB3-vision-kamera-mvbluefox3.html#tab1>

Link to the mvBlueFOX3-2 family: <https://www.matrix-vision.com/USB3-vision-kamera-mvbluefox3-2.html#tab1>

All three product families have one thing in common: Due to the GenICam/GenTL base, they have the same driver. As one of the first manufacturer, MATRIX VISION has consolidated the GigE Vision and USB3 Vision driver. On the MATRIX VISION website, you can find the “mvGenTL_Acquire” download on each product page. You can guess the advantage: With GenICam and „On-the-Wire“ you can not only change GigE Vision cameras but also the transport layer (e.g. from GigE Vision to USB3 Vision) or you can combine the different transport layers (Figure 3).

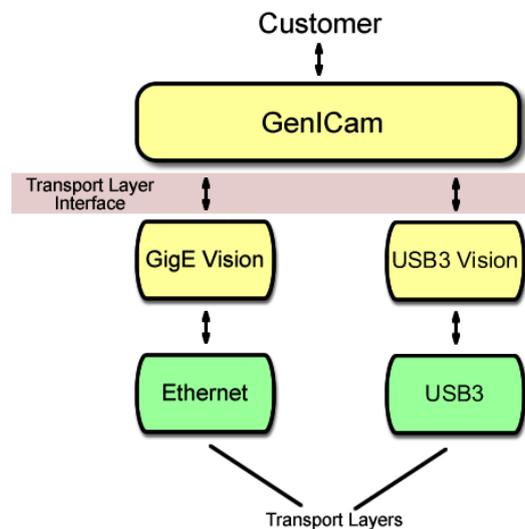


Figure 3 GenICam / On-the-Wire standards

Conclusion

It’s unbelievable, but few years ago, there weren’t any standards in the image processing market. Each manufacturer had its own solution. These times are gone – the whole market pulls together. The companies are comparable, however, the customer benefits from it. Because of the standard, the interaction between hardware, driver and software gives the impression of an uniform piece. The quality of the market is improved. For the customer it is easier to make product decisions, hence, they are not connected to a company. With standard compliant products, the customer has always the possibility to choose the best components independent from the company. With GenICam as a base, the image processing market offers for every application either with GigE Vision or USB3 Vision the best interface.

MATRIX VISION is an active player in standard committees. If you purchase a MATRIX VISION camera, you can be sure that you hold an up-to-date camera in your hands.