



Streamlining Embedded Vision Development with Smart Vision Components

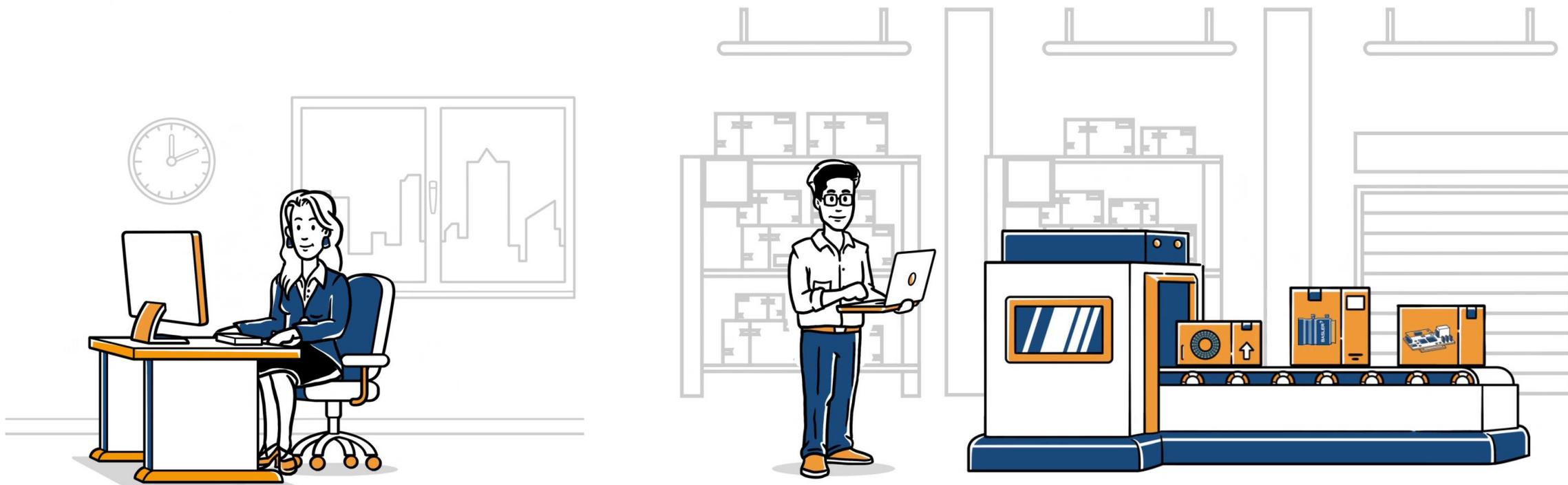
Selena Schwarm
Team Lead Global Partner Management
Basler AG

- Customer challenges solving vision problems
- Core components of a smart vision solution
- Towards a hybrid software architecture
 - Introduction vTools for classical image processing
 - Introduction vTools for AI applications
- Interoperability of smart vision components
- Summary

Customer challenges solving vision problems

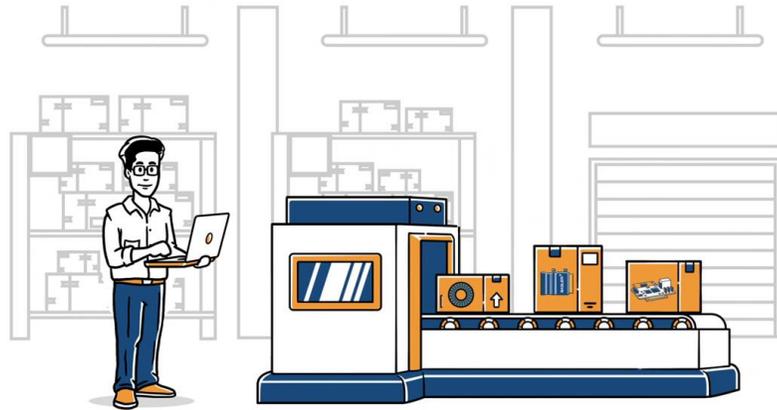
BASLER 

Customer use case: Finding a smart computer vision solution for an application



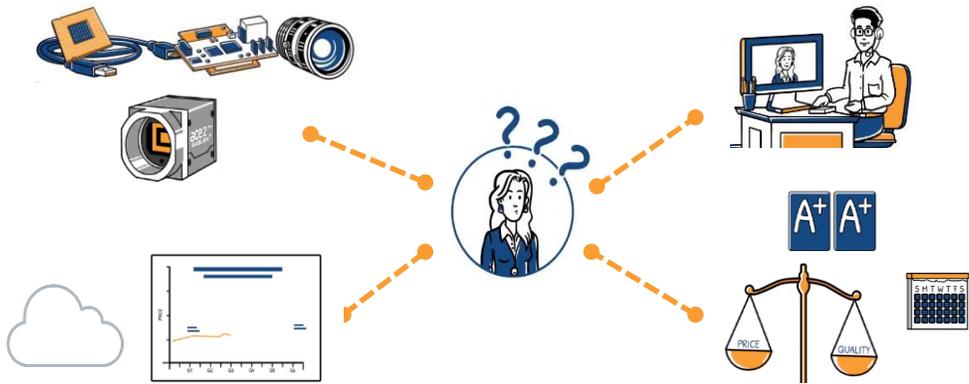
Customer use case: Key aspects to consider when setting up an embedded vision solution

How to set up a fully **integrated embedded vision system** with the following functionalities:



- ✓ **Data acquisition:** A data stream of images, generated by a Basler camera and accessories
- ✓ **Data processing:** Embedded hardware to pre-process image data
- ✓ **Data analytics:** Classical image processing or deep learning algorithms
- ✓ **Connectivity:** Ability to use cloud services and send data to the cloud via automated cloud connection

Customer challenges when developing a seamlessly running embedded vision solution



Wide range of hardware and software components lead to complex development environment



Selection of interoperable components for my application is time consuming and costly

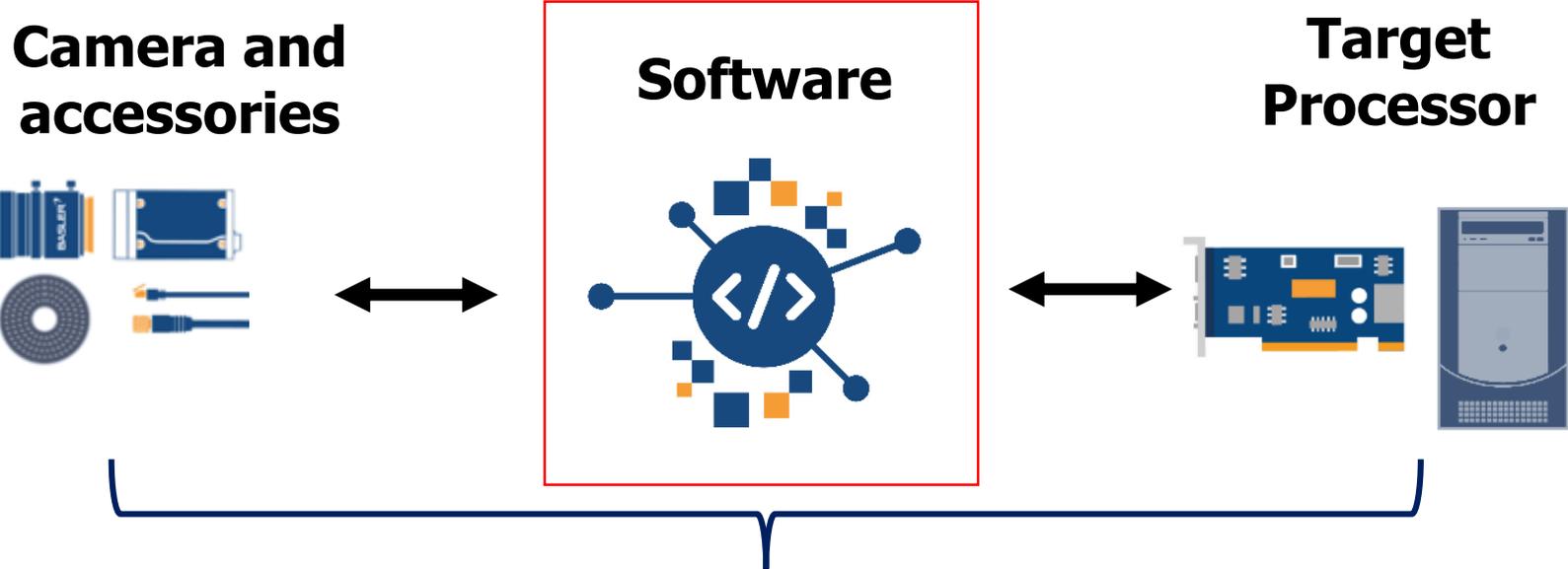


Optimizing software for hardware requires strong expertise in both embedded hardware and software

Core components of a smart vision solution



Overview of smart vision components

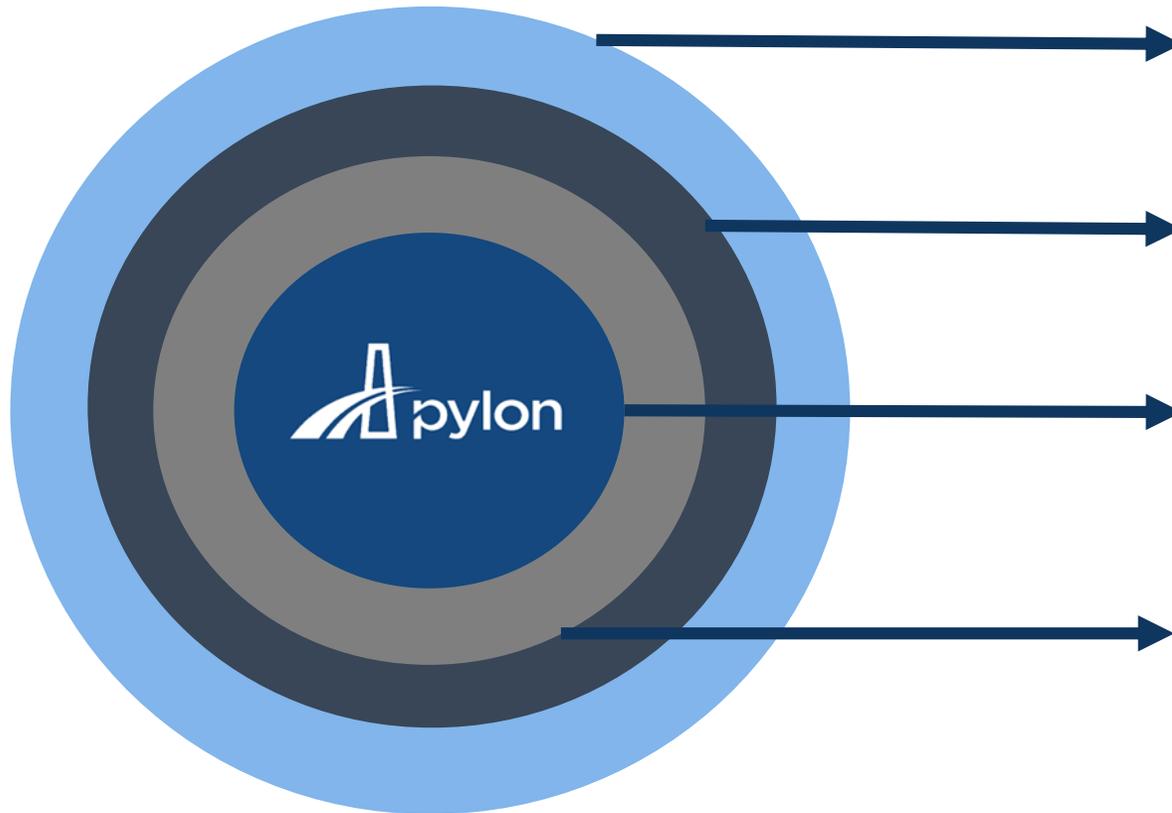


Smart Vision Components

Towards a hybrid software architecture

Basler has extended its software offering as part of the pylon software framework

pylon Software Framework



Integrated Development Environment

- Customer Interface and Development Tools
- Ease-of-Use and Integration of vTools

Artificial Intelligence Functionality

- Data Management, Model Training
- Optimization, Deployment, Inference

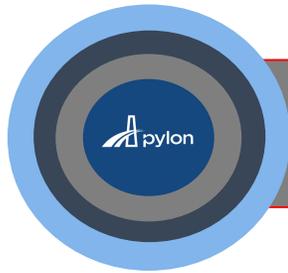
Core Driver Package: Camera Control + Image acquisition

- Support of all interfaces (USB; LVDS; MIPI)
- Support of all Basler products

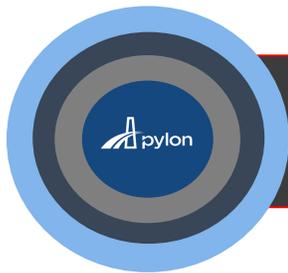
Classical Image Processing functionality

- Basler Vision Tools: e.g., Measurement, Code Reading

Seamlessly integrated image processing with modular Basler vTools



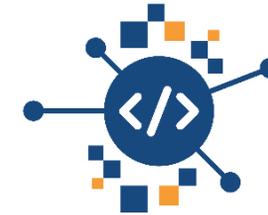
Classical Image Processing functionality
e.g., Measurement, Code Reading



Artificial Intelligence Functionality
Model building, Training, Deployment
Inference, Optimization

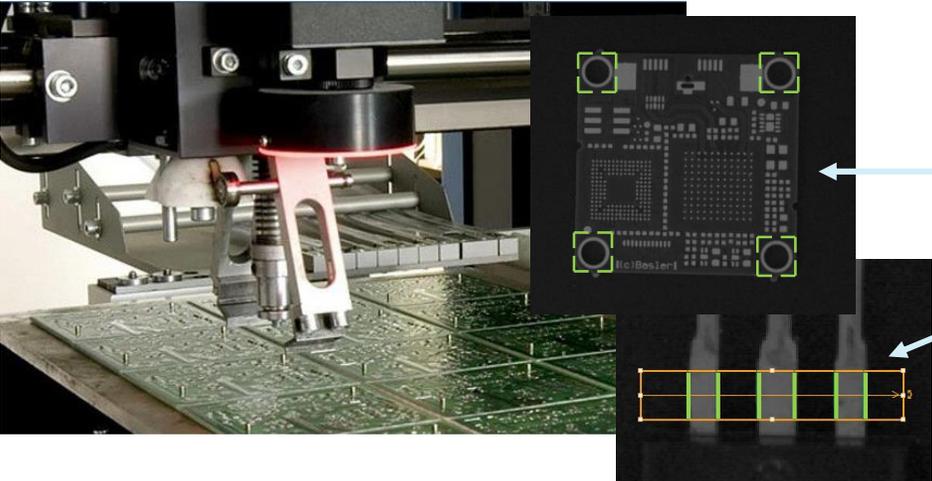


Basler pylon vTools



- Functional-based Basler Vision Tools
- Selected functionality at small price, but premium performance
- Development without cost, only pay runtime-licenses
- ***Modular classical image processing and AI functionalities***

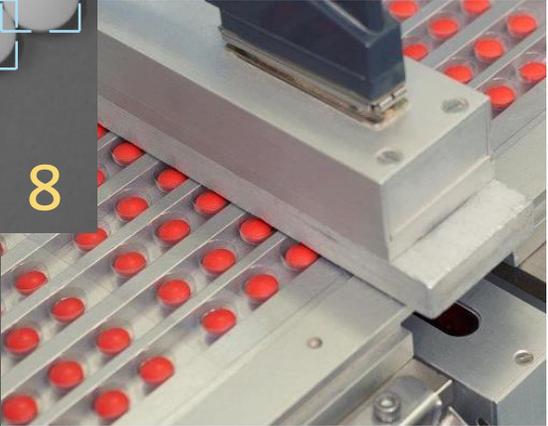
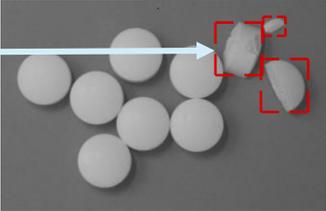
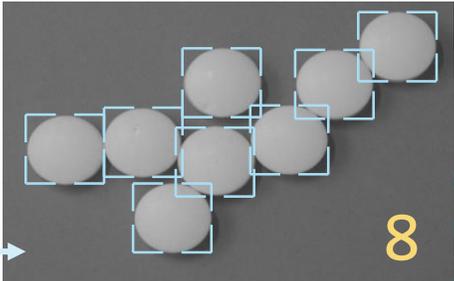
Use case example: Factory automation with Basler vision tools



Determination of positions of items
Inspection of sizes and distances

Counting, monitoring of completeness

Detection of cracks and scratches



Customer need: Hybrid software architecture



Combining classical image processing and AI



vTools
*classical
image processing*

+



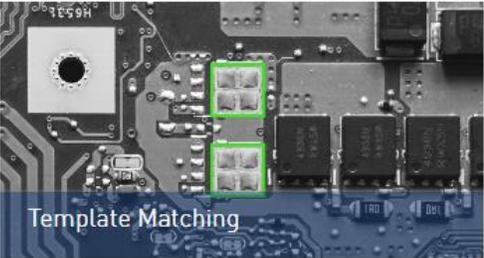
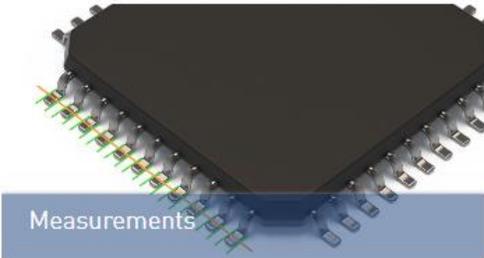
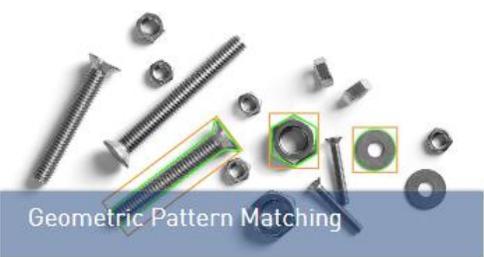
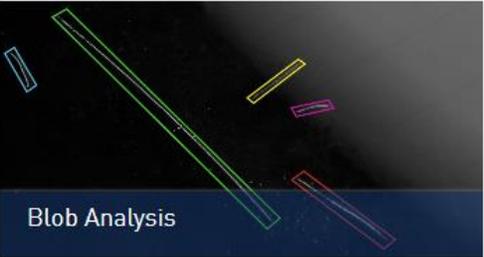
vTools
*AI application based
on deep learning*

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Hybrid software
architecture

Overview of Basler vTools: Classical image processing

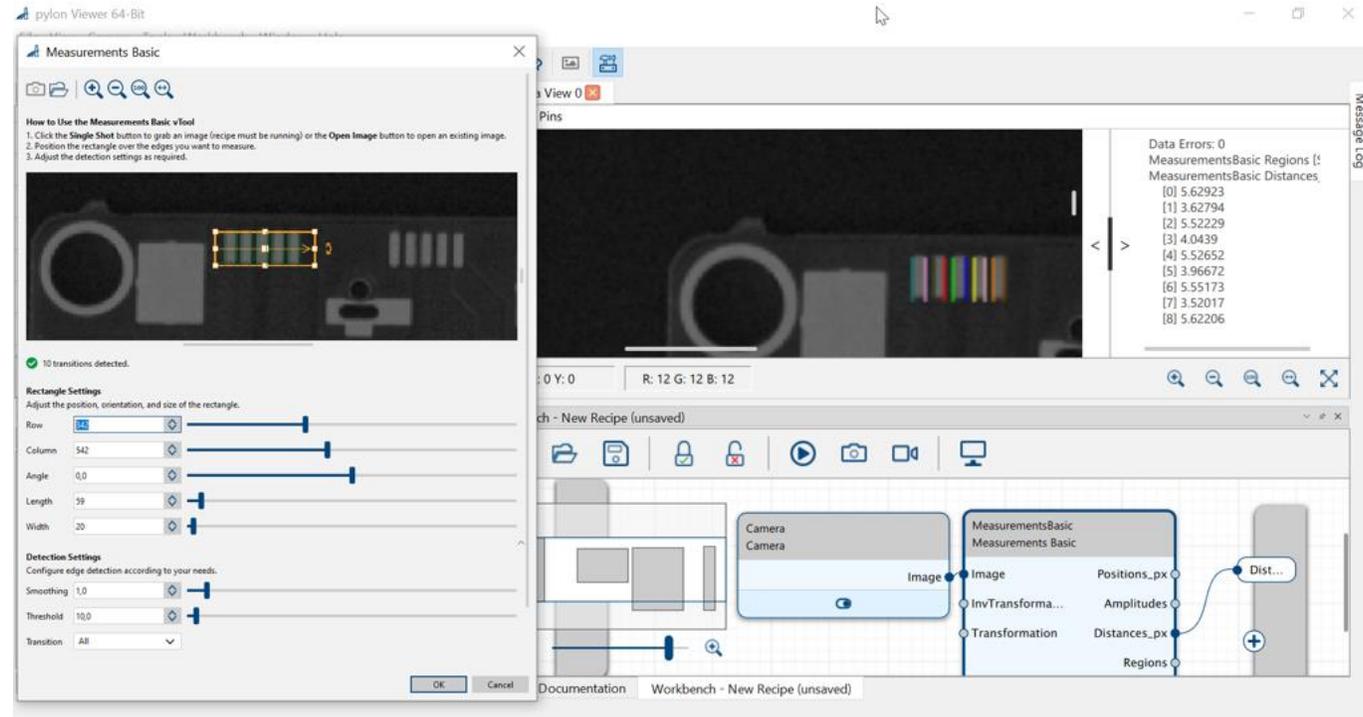


Deep dive: User interface and customer workflow

Classical image processing vTool



vTools
classical
Image processing e.g.
Measurement



Customer Workflow



Use pre-configured image processing algorithm



Configure algorithm for specific use case



Result: vTool for specific vision task
Algorithm optimized by Basler for target processor (x86 and ARM support)

Customer need: Hybrid software architecture



Combining classical image processing and AI



vTools
classical
Image processing

+



vTools
AI application based
on deep learning

=



Hybrid software
architecture

Pylon AI: Introduction core functionalities AI framework



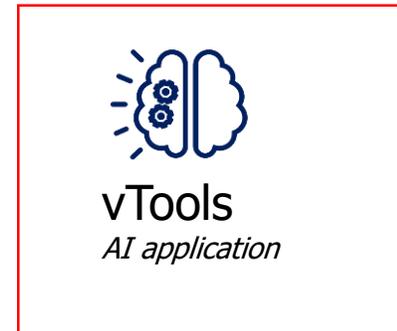
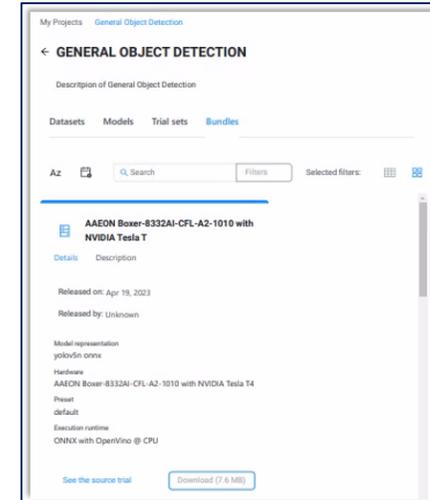
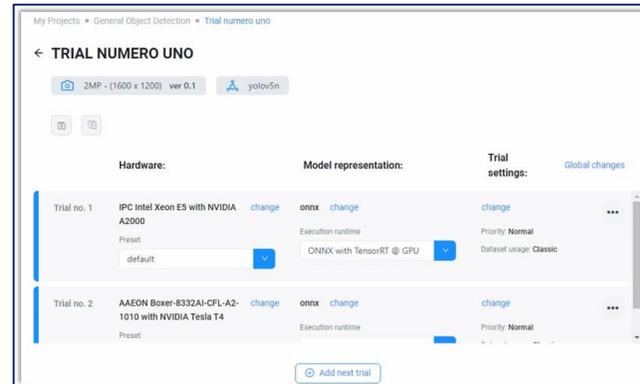
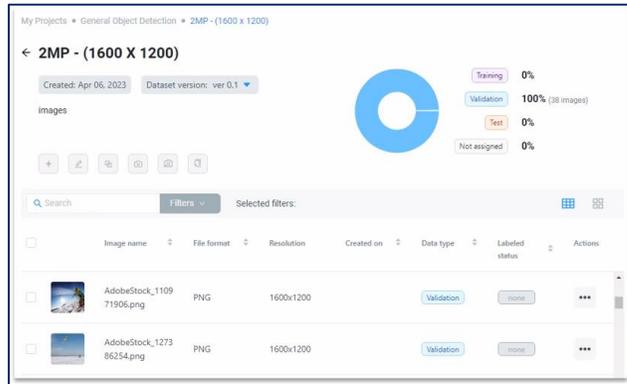
Data Uploading & Labelling



Training & Development



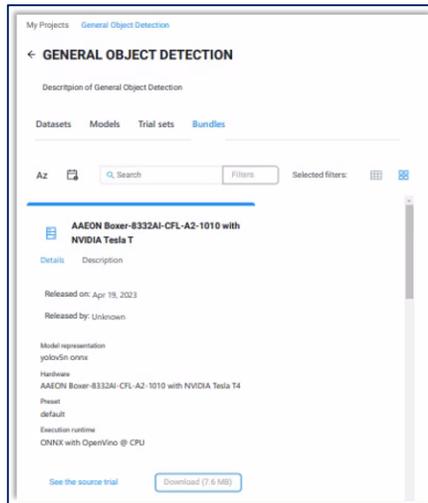
Optimization & Deployment



pylon AI framework

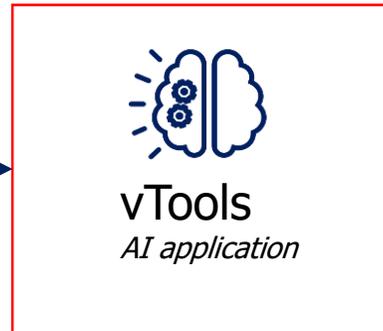
Deployment of trained AI model from AI framework to pylon viewer

pylon AI framework



Trained and Optimized

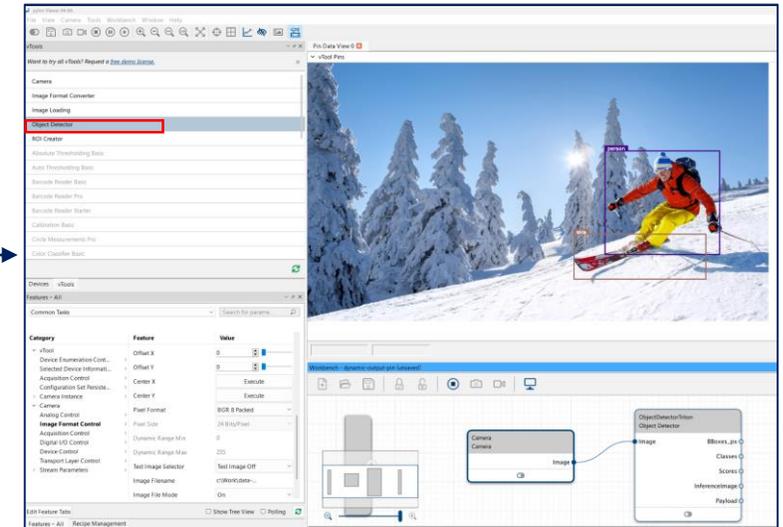
AI model for target hardware



Ready for deployment

vTool Bundle

pylon Viewer



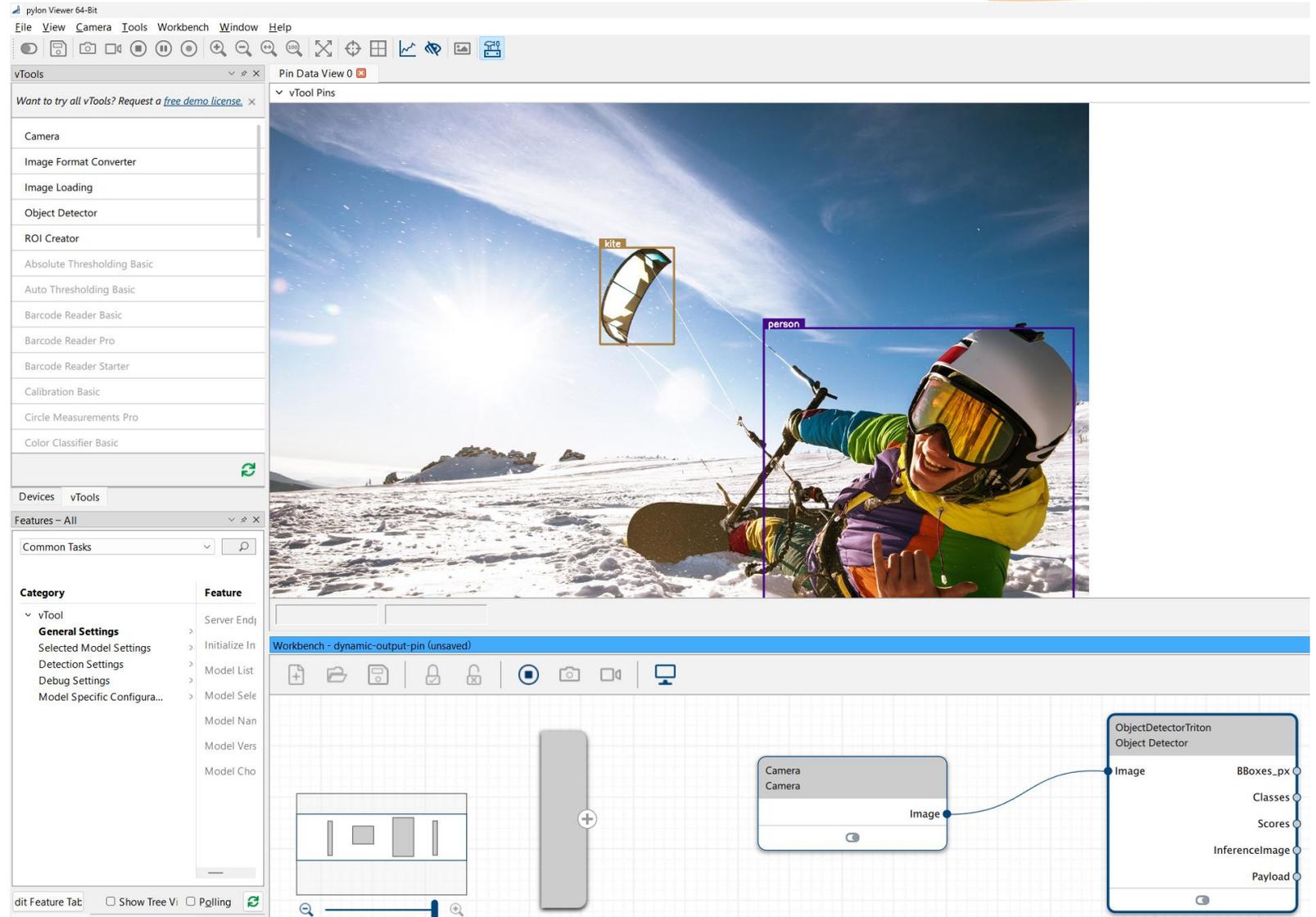
Integration

AI model in pylon viewer

Example: Integrating AI based model in pylon framework

pylon Viewer

- (1) Export trained AI model as pylon vTool via AI agent in pylon viewer
- (2) Choose model from available vTools
- (3) Create your data flow process in pylon viewer
- (4) Configure each tool via GUI

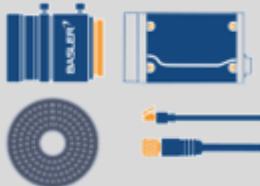


Interoperability of smart vision components

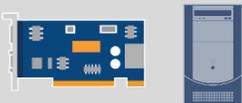
The Solution: Seamless development and smooth deployment of embedded vision applications

Hardware

Camera + Accessories

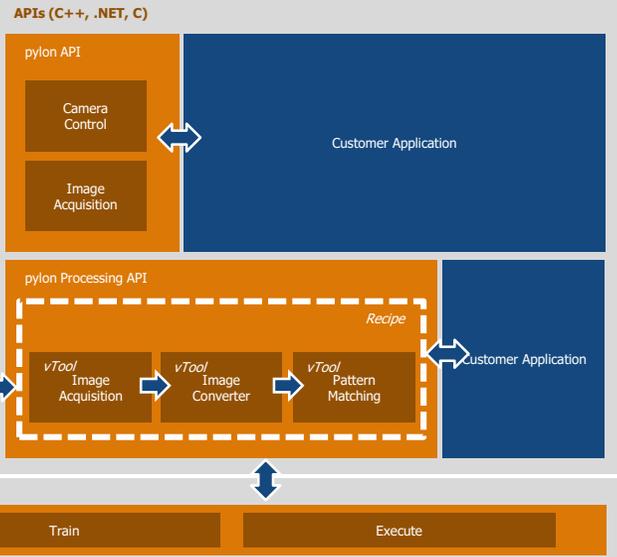
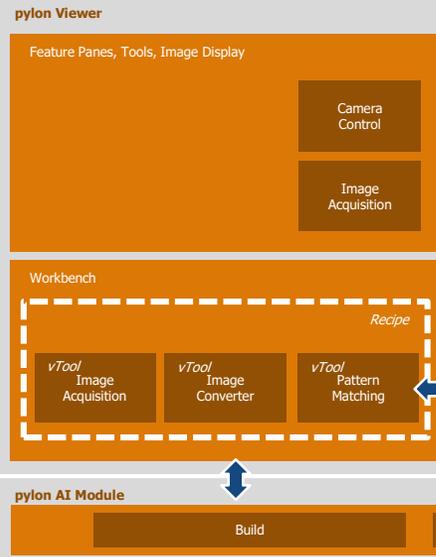


Edge Processor x86 / ARM



Software

Pylon framework



Industry standards and frameworks



Smart vision components by Basler ensure:

- ✓ Seamlessly working vision system (hardware and software)
- ✓ Hybrid software architecture: classical image processing and AI
- ✓ Optimized software architecture for embedded hardware



Thank You

BASLER 

Websites

Basler AG

<https://www.baslerweb.com>

Pylon framework

[https://www.baslerweb.com/de/produkte/basler-
pylon-camera-software-suite/](https://www.baslerweb.com/de/produkte/basler-pylon-camera-software-suite/)

Embedded Solutions

[https://www.baslerweb.com/de/embedded-
vision/ecosystem-support/](https://www.baslerweb.com/de/embedded-vision/ecosystem-support/)

2023 Embedded Vision Summit

We have a booth – give us a visit for deeper discussions