

# WISE-DeviceOn for Azure AI + Machine Learning

## MLOps for Custom Vision AI Model and Continuous Deployment

We all know that AIoT has become the main trend to solve as many as production or management problems. Therein, the key AI models are always customized and frequently adjusted for the problems to be solved. In addition, it's going to leverage IoT technologies to collect training data automatically and efficiently so we also need a stable, scalable and securable place to store those raw data. We also need to consider the tasks for computing performance and continuous deployment, which means to take care about how to realize optimized inference and model training.

### Challenge

It's hard for enterprises to leverage AI solutions efficiently because there are various complicated issues about data collection, AI model, computing performance and centralized deployment. Even though they may hire AI-related engineers, specialists and scientists, in the beginning they still need to take lots of efforts to set up an AI solution probably just for a POC. In addition, the followed maintenance about continuous training and AI model deployment will also be critical issues to be dealt with. It involves many complex techniques to be considered and integrated.

### Solution

WISE-DeviceOn can leverage certified AI models for object detection and image classification in Azure Custom Vision to help enterprises build up their own vision AI solution in an efficient way. Moreover, an overall lifecycle management from model training to edge AI inference is effectively implemented through the integration of DeviceOn and Azure, like the mentioned MLOps.

### Edge Inference with Optimized Computing

The adopted inference engine here is ONNX Runtime. Developers can use the same application development framework to support accelerated inference on various AI chips through related EP(Execution Provider). Within this solution, the inference runtime can directly support AI models pre-trained and re-trained by Azure Custom Vision.

### Highlights of Azure Custom Vision

Overall Azure AI + Machine Learning aims to create the next generation of applications using artificial intelligence capabilities for any developer and any scenario. Its Cognitive Services offer a comprehensive family of AI services and cognitive APIs to help you build intelligent apps. Therein Azure Custom Vision can easily customize your own state-of-the-art computer vision models that fit perfectly with your unique use case. Just bring a few examples of labeled images through friendly UI and let Custom Vision do the hard work. Start training your computer vision model by simply uploading and labeling a few images. The model tests itself on these and continually improves precision through a feedback loop as you add images. To speed development, use customizable, built-in models for retail, manufacturing, and food.

- **Customization to your scenario**  
Set your model to perceive a particular object for your use case
- **Intuitive model creation**  
Easily build your image identifier model using the simple interface
- **Flexible deployment**  
Run Custom Vision in the cloud or on the edge in containers
- **Built-in security**  
Rely on enterprise-grade security and privacy for your data and any trained models

## Project Solution

### Data Collection via DeviceOn

WISE-DeviceOn provides a generalized WISE-Agent to run IoT services at edges and connect to your DeviceOn server. For AI MLOps, WISE-Agent has additional plug-ins to route periodical images captured from cameras, videos or other resources. It also transmits the AI inference data and results to your cloud storage and DeviceOn Server.

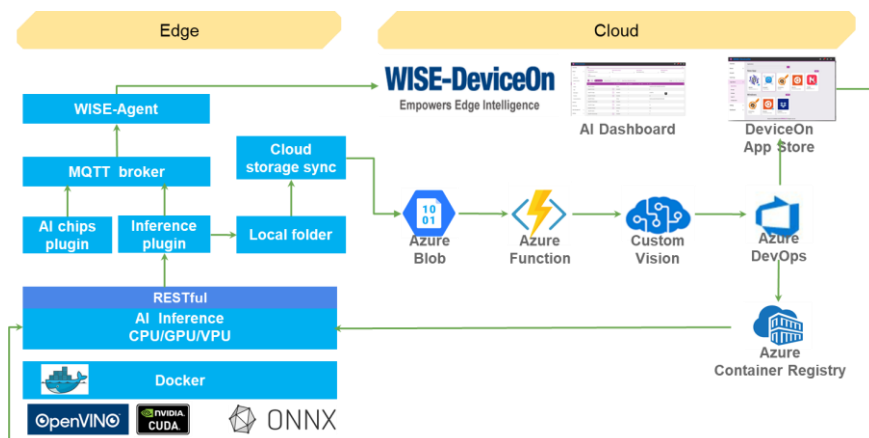
### Your Own AI Model via Azure Custom Vision

Azure Custom Vision provides pre-trained models about object detection and classification to train and re-train your own model. The former can detect multiple objects and their positions in a single image. The latter just can tell us if a single image represents a specific object or condition. When it needs to label massive new images, Azure Custom Vision has an auto pre-labeling function to help users create preliminary labeled data. After finishing data labeling, it's able to train/re-train and export a custom AI model for your specific application.

### Continuous Delivery for AI Model via DeviceOn

DeviceOn has not only realized enhanced OTA functions through the DeviceOn App store module, but also further leveraged OTA into MLOps pipelines. Once a custom model is exported by Azure Custom Vision, Azure Function service integrated in this solution will further build a docker image automatically for later edge inference deployment and then push the image onto the DeviceOn App store. Enhanced DeviceOn OTA with friendly GUI can efficiently apply version control on AI model management and continuously delivery any required AI model(s) to a batch of edges.

## Solution Architecture and Data Flow



## About Microsoft Azure

Microsoft Azure is an ever-expanding set of cloud computing services that help organizations address business challenges. With Azure, your business or organization has the freedom to build, manage, and deploy applications on a massive, global network using your preferred tools and frameworks.

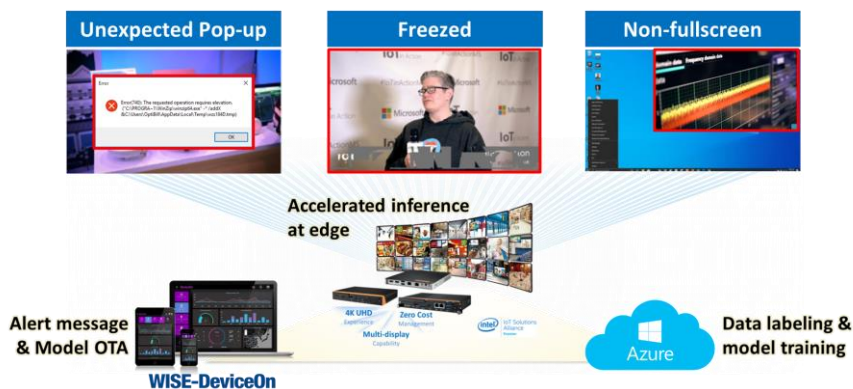
For more information, visit [www.microsoftazure.com](http://www.microsoftazure.com)



## Project Results

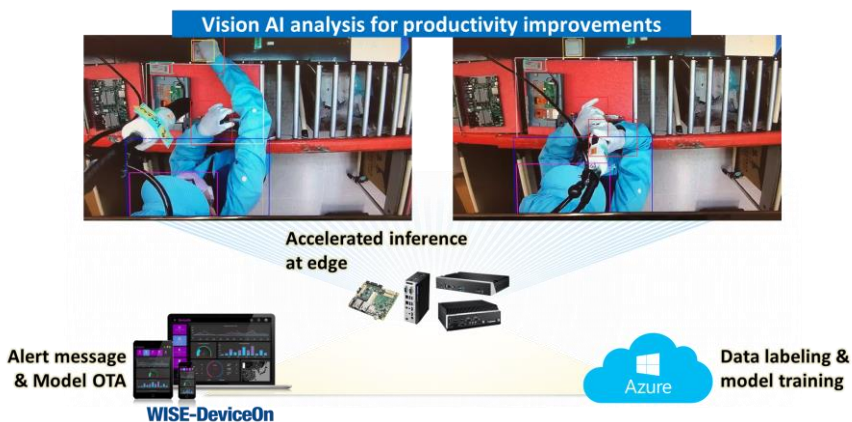
### Use Case #1: Signage Anomaly Detection via Azure Custom Vision within Azure Cognitive Services

There are more and more unattended digital signages around our lives. Some signage anomalies, such as frozen player screen and unexpected pop-up messages, may happen to hinder the playing content. However it's always hard to notify administrators instantly to save the downtime and unnecessary waste. Therefore this solution leverages Azure Custom Vision to train a custom AI model for detecting the three types of anomaly in red marks. Once the abnormal conditions are detected by the AI inference runtime at edge, administrators can be notified immediately through DeviceOn notification.



### Use Case #2: Production Line Balance for Smart Factory via Azure Percept to Accelerate Intelligence at the Edge

Line balance is a critical topic in factory to manage production efficiency, quality and safety. We trained a custom model to detect workpieces, hats, gloves and so on by Azure Custom Vision, and further adopted Azure Percept to realize accelerating edge AI. Once products or SOPs change over, DeviceOn server can facilitate MLOps to receive a re-trained model from Azure Custom Vision and then deploy it to any required Azure Percept efficiently.



## About Advantech WISE-DeviceOn

Advantech's IoT software solution, WISE-DeviceOn, is aimed at IoT device remote monitoring and management. This IoT Platform Architecture includes IoT device, system, and cloud layers. Advantech strives to integrate partner solutions and enable seamless, secure IoT solutions from the edge-to-the cloud by providing pre-integrated, pre-validated hardware and software building blocks.

For more information, visit:

<https://select.advantech.com/deviceon/>

## Advantech Certified Devices

Advantech's WISE-DeviceOn comes preloaded with over 600 Advantech certified board and system models that deliver device data and software management. WISE-DeviceOn facilitates diverse IoT management by offering free license support to certified devices.

For certified device information, visit:

<https://www.advantech.com/solutions/embedded-modules-and-design-in-services>