Internet of Things

Embedded Vision Solutions Guide

Picture Source: Basler

Five Years Out

arrow.com/embedded-vision

“Embedded Vision” refers to the practical use of computer vision in machines that understand their environment through visual means.

– Embedded Vision Alliance

Embedded Vision

An Embedded Vision system refers to a combination of hardware and software that provide operational guidance to devices in the execution of their functions based on the capture and processing of images.

Machine vision systems have been around for decades and have found application in a variety of industrial and commercial applications. However, these systems were expensive, physically cumbersome and required elaborate componentry. Miniaturization of not just cameras but also computing devices has opened up a vast new exciting application space for next generation machine vision systems, now termed Embedded Vision systems. Simultaneously, dramatic pace of developments in image analysis and machine learning systems has provided new modes for utilizing images in a variety of industry verticals.

Embedded Vision systems are characterized by small size, light weight, low unit cost and low energy consumption. These features provide ease of use and portability, driving the proliferation of cameras in a wide gamut of applications. It is no longer cost prohibitive to deploy multiple cameras to get multiple images, and when sophisticated machine learning algorithms are utilized for image analyses new operational and business insights drive new efficiencies.

Embedded Vision Applications: Expanding Possibilities

Emerging use cases

Augmented Reality

- Visual operation guidance
- Tracking in 3D environments
- Education and training
- Situational analysis

Automotive

- ADAS (blind spot detection, traffic sign recognition, lane departure warning, pedestrian detection, 3D surround view, etc.)
- Heads-up display
- Guidance systems

Commercial Drones

- Infrastructure inspection
- Supply chain precision agriculture
- Surveying and mapping
- Search and rescue

Consumer

- Gesture and facial recognition
- Augmented reality
- Home appliances
- Gaming and set-top boxes

Medical

- 3D imaging for better quality diagnosis
- Motion analysis in rehab
- Sight for the blind
- Computer-aided detection and diagnosis

Mil-Aero

- Enhanced Vision Systems (EVS) and Synthetic Vision Systems (SVS)
- Inspection
- Heads-up-displays for soldiers
- Surveillance and drones

Retail

- Store traffic analysis
- Facial recognition for personalized shopping experiences
- Object detection

Robotics

- Collaborative robots
- Object identification
- Remote controlled robots
- Inspection and predictive maintenance

Security

- Access control
- Facial detection
- People counting
- Gun-shot/fire detection

Supply Chain

- Automated Guided Vehicles (AGVs)
- Product recognition
- Automated data capture
- Intelligent vending machines

Mature use cases

Machine Vision Applications

- Factories – quality inspection, semiconductor electronic inspection, etc.
- Intelligent Traffic Systems (ITS)
- Medical imaging
- Logistics – parcel pick and place machines, bar code readers
- Unmanned missiles and vehicles

- PC-based/non-portable
- Fixed function
- Work in predictable environments
- Limited market appeal
- Expensive

- Integrated system with camera, processing, etc.
- Broad applicability and many new emerging applications
- Power-optimized
- Complex software, algorithms and machine learning frameworks incorporated for inference and prediction

Components of Embedded Vision Systems

Applications/Management

- **Algorithms:** Pre-built modules for applications (image recognition, gesture control, tracking, etc.)
- **Deep Learning Tools:** Pre-built modules for applications (image recognition, gesture control, tracking, etc.)
- **Frameworks:** Caffee, Tensor Flow, PyTorch, CNTK
- **Video Management System (VMS):** Remote management of users, cameras, rules, alerts, analytics, dashboards, and data management, etc.

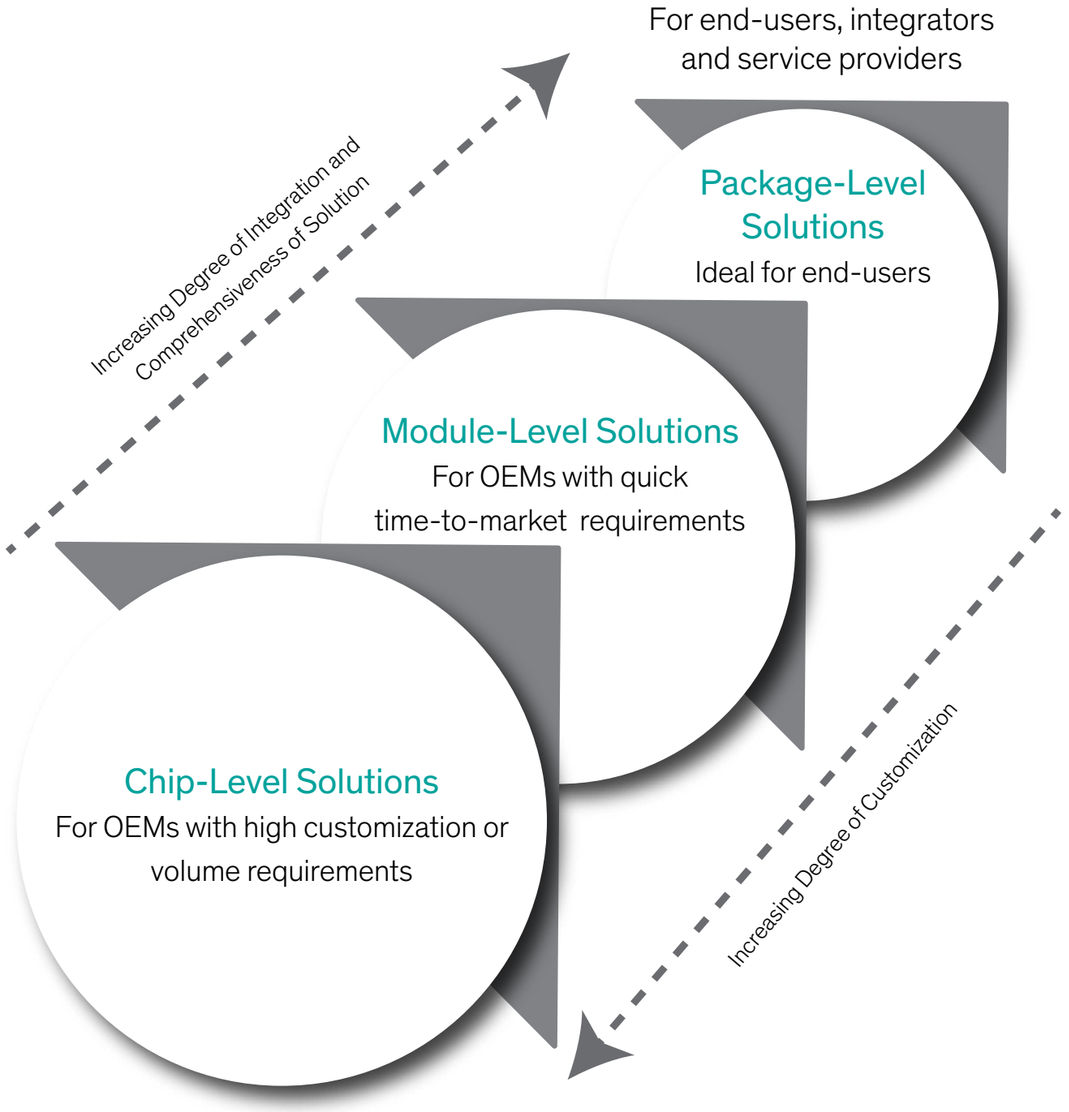
Development Firmware/ Software

- **Drivers:** Drivers for interfaces, connectivity protocols, etc
- **Codecs:** Video coding, compression, decompression formats, and tools
- **SDKs:** Tools to enable quick prototyping/development (ex: Intel® Computer Vision SDK)
- **Image Signal Processor (ISP) software:** Software for processing images captured by sensors (image correction, noise reduction, etc.)
- **Libraries/Toolkits:** Intel OpenVINO™ toolkit, OpenCV, VisionWorks, JetPack
- **Inference:** Intermediate compiler (for ex: Transfer Tensor Flow to dedicated hardware/end devices)

Hardware

- **Sensors:** Cameras, LiDAR/RADAR, optical, etc. for signal acquisition
- **Processors:** ARM®, FPGA, x86 or GPU-based for image processing & interpretation
- **Connectivity (Wired, Wireless):** Connectivity from sensor to the processor, and from processor to other systems/cloud for further action
- **Memory and Storage:** Memory for data caching and local storage (Flash) as needed by application
- **Other:** Includes networking, power, motor control (if needed), connectors

Arrow Offerings for Embedded Vision



Services for camera design, integration, software, application developement, and management

Arrow Solutions Overview

Technology	Sensors	Processors	Connectivity	Memory	Development kits
Package-Level Solutions	• **ADLINK:** Plug-and-play smart camera and industrial Embedded Vision system • **Advantech:** Real-time traffic analytics solution with 2D and 3D technology • **Hitachi:** Crime prevention and real-time safety smart-city solution • **V5 Systems:** Self-powered, portable edge computing platform for remote surveillance				
Module-Level	• Basler • D3 Engineering • Leopard Imaging	• Dream Chip* • Critical Link* • Leopard Imaging* • NovTech*	Arrow's connectivity offerings includes a comprehensive list of wired and wireless solutions from leading industry players. Developers can select the ideal connectivity standard to meet application objectives (power, size, portability, etc.)	Arrow offers popular memory products from top industry manufacturers for NAND Flash (cards and modules), RAM (all DRAM variants, SRAM, EEPROM, etc.) and memory controllers	• Analog Devices • Basler • Critical Link • D3 Engineering • Dream Chip • IEI • Lattice • Leopard Imaging • NovTech • ON Semi
Chip-Level	• Image sensors: ON Semi, ams • LiDAR/Radar: Analog Devices, Infineon	• ARM: NXP, Qualcomm®, Intel FPGA • FPGAs: Intel FPGA, Lattice • DSP: Analog Devices • GPU: NVIDIA • x86: Intel®			
Services	• **eInfochips:** Services for designing camera modules, integrated solutions and sensor-to-cloud applications • Processor module providers: Basler, Dream Chip, D3 Engineering, Helion Vision, Kappa, NovTech				

*Helion Vision and Kappa for EMEA are additional services partners for the EMEA market.

Resources from Basler

Embedded Vision interfaces and standards

Learn about the interface options (MIPI CSI-2, LVDS, USB 3.0, etc.) for Embedded Vision systems – both from the camera to the processor, and from the processor to other systems.

Camera selection criteria

Get step-by-step guidance on determining the right camera based on system requirements.

Selection criteria for the camera lens

Clear, sharp images require more than a good camera but also the right lens. Learn about the types of lenses and factors used to determine the right fit.

Basics of image processing

Learn how image processing systems are constructed and system requirements that need to be met.

Intel® OpenVINO™ Toolkit

Develop applications and solutions that emulate human vision with the Open Visual Inference & Neural Network Optimization (OpenVINO™) toolkit. Based on convolutional neural networks (CNN), the toolkit extends workloads across Intel® hardware and maximizes performance.

- Enables CNN-based deep learning inference on the edge
- Supports heterogeneous execution across computer vision accelerators—CPU, GPU, Intel® Movidius™ Neural Compute Stick, and FPGA—using a common API
- Speeds time-to-market via a library of functions and preoptimized kernels
- Includes optimized calls for OpenCV and OpenVX*

Packaged Solutions

Summary of Packaged Solutions for Embedded Vision Applications

Arrow offers integrated solutions which include hardware, firmware and application software to enable easy adoption of vision systems by service providers and end-users. These scalable solutions, based on Intel's x86 processors, have edge compute capabilities and also connect seamlessly to cloud platforms for further analytics. They are built to operate in industrial settings.

For Industrial Applications

NEON Series: Smart Camera and Embedded Vision Systems

Ready-to-Go, high-performing and ruggedized solutions with built-in FPGA and GPU co-processors

For Retail Applications

UShop SRP-700 Store Traffic Analytics

Real-time retail traffic analytics solution with 2D and 3D technologies

For Public Safety and Smart City Applications

Hitachi Visualization Suite for Public Safety and Smart City Solutions

Crime prevention and real-time safety solutions for cities

V5 System's Self-Powered, Portable Edge Computing Platform

Gain situational intelligence anywhere with outdoor security and edge computing solutions

ADLINK Leading EDGE COMPUTING

intel

NEON Series: Smart Camera and Embedded Vision Systems

Ready-to-Go, High-performing and ruggedized solutions with built-in FPGA and GPU Co-processors

ADLINK's new generation x86 NEON Smart Camera product portfolio features 4MP 60fps global shutter sensor and the Intel® Atom™ quad core 1.9 GHz processor, featuring minimal footprint and rugged IP67-rated construction. The quad core CPU increases computing power and FPGA coprocessors and GPU deliver advanced image processing. Rich software support and API compatibility enable easy migration from original x86 platforms, eliminating software and development language burdens across the platform, reducing time to market.

Key Features

- Quad core Intel® Atom™ processors E3845 1.91GHz
- VGA output, max. 2048×1152 at 60 Hz
- Global shutter CMOS sensors available
- 4MP 60 fps (NEON-1040), 2MP 120 fps (NEON-1020) and 2MP 60 fps (NEON-1021) resolution
- 4 GB DDR3L RAM, 16 GB and 32 GB SSD Storage
- IP67-rated housing and M12 connectors
- GeniCam, GenTL, and OpenCV compatible
- Flexible software support with MVTec HALCON, MVTec MERLIC, COGNEX VisionPro, and many others

Applications

- Process control/automation
- Security
- Robotics
- Medical
- Retail
- Automotive

Additional information

- Product brief
- Part numbers and more information is available upon request

UShop SRP-700 Store Traffic Analytics

Real-time retail traffic analytics solution with 2D and 3D technologies

Advantech's UShop SRP-700 Store Traffic Analytics solution enables retailers to evaluate sales potential and establish customer service and marketing strategies for maximizing profit. UShop SRP-700 integrates 2D and 3D video analysis technology with POS transaction data for further analysis.

Analysis of customer traffic data provides retailers with an in-depth knowledge of consumer shopping and purchasing habits, as well as insights into sales performance during periods of high/low traffic for each branch store.

Solution Components

- 2D and 3D cameras: Smart cameras with high counting accuracy
- Wi-Fi Analyzer: Senses shopper intent based on analyzing Wi-Fi signal of shopper mobile device within 5-15 meters
- UShop+ Store BI Software: Integrates several store analytic solutions, includes features like people counting, conversion rate, shopper's heatmap, and dwell time analysis

Key Benefits of the Solution

- Data integration and analytics
- Traffic and conversion measurement
- Cross-store performance benchmarking
- Real-time monitoring
- Data security & 3rd-party software integration
- Easy management with the UShop+ Mobile Manager APP

Additional information

- Advantech uShop SRP-700 web page
- Part numbers and more information is available upon request

Hitachi Visualization Suite for Public Safety and Smart City Solutions

Crime prevention and real-time safety solutions for cities

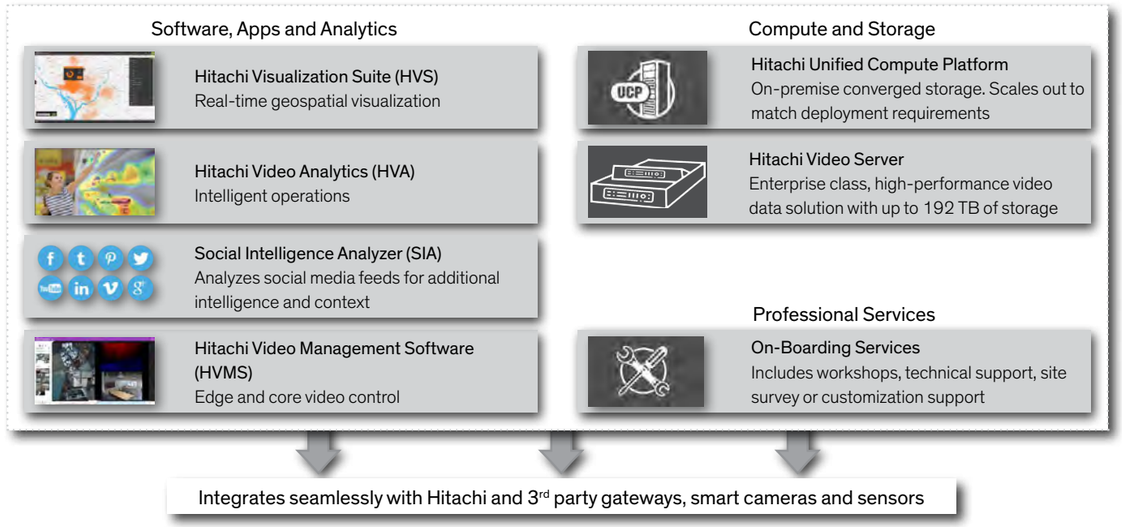
Powered by Intel® processors, Hitachi Visualization Suite (HVS) helps smart cities integrate IoT sensor data from buildings, utilities, transportation, and transit with public safety systems. Intel® hardware within the Hitachi Visualization Platform (HVMP) powers data capture, analytics, and workflow, from edge devices to the cloud and data center. It can integrate hundreds of simultaneous events for geospatial visualization and monitoring and solves the problem of integrating and aggregating disparate point solutions used by cities, organizations, and public safety officials.

Arrow Public Safety & Transportation Starter Pack:

The Hitachi Public Safety and Transportation Starter Pack is intended to get cities onto a smart infrastructure rapidly. It is aimed at providing a base set of hardware, software and cloud application capabilities that can become the foundation of a dynamic and scalable smart city.

Starter Pack Features

- > Activity visualizer
- > Intrusion detector
- > Object detector
- > People counter
- > Camera health monitor
- > Direction controller
- > Social media analyzer
- > Live face match



Additional information

- Product brief
- Part numbers and more information is available upon request

V5 SYSTEMS

intel

V5 System's Self-Powered, Portable Edge Computing Platform

Gain situational intelligence anywhere with outdoor security and edge computing solutions

The Dell and V5 System's Portable Computing Platform is an easy-to-deploy outdoor IoT security and edge computing solution. The self-powered system is easily installed and avoids the expense, time consuming nature and delays that come with trenching. The system is re-deployable and can be moved freely for short-term or temporary needs. Solutions from V5 Systems include an Intel® ATOM™-based dell gateway which offers manageability, security, connectivity, and performance for edge analytics.

Benefits of the Solution

- Real-time notifications with intelligence at the edge
- Portable, self-powered
- Wireless solution, easy installation
- Eliminates trenching costs
- Cloud-based system for easy management
- Setup time < 30 mins (traditional systems take months to years)

Applications

- Cities and municipalities
- Law enforcement agencies
- Government offices
- Schools/campus
- Transportation
- Sporting venues/events
- Commercial buildings

Additional information

- Product brief
- Part numbers and more information is available upon request

Development Kits for Embedded Vision Applications

Picture Source: Basler

Embedded Vision Development Kits from Arrow Electronics

Supplier	Board Name	Board Part #	Processing Platform
Analog Devices	► ADZS-BF707 Blackfin Low-power Imaging Platform (BLIP)	ADZS-BF707-BLIP2	Anlog Devices Blackfin® processors
Basler	► dart BCON for MIPI Development Kit daA2500-60mc-SD820	107784	Qualcomm® Snapdragon™ 820E
Critical Link	► MitySOM-5CSX Embedded Vision Development Kit	80-001005	Intel® Arria 10 FPGA
D3 Engineering	► DragonBoard™ 410c Camera Kit	DRAGONBOARD 410C CAMERA	Qualcomm® Snapdragon™ 410E
D3 Engineering	► Jetson™ Serdes Sensor Interface Card	Contact Arrow for more information	Compatible with NVIDIA Jetson TX1 or TX2 evaluation kits
Dream Chip	► Arria 10 SoM Reference Design for dart BCON for LVDS	DCT10A-EVAL-BCON	Intel® Arria® 10 FPGA
IEI	► Intel x IEI TANK AIoT Development Kit	• TANK-870AI-i7/8G/2A-R10 • TANK-870AI-i5/8G/2A-R10	Intel® Core® i5, i7
Lattice	► iCE40 UltraPlus Mobile Development Platform	ICE40UP5K-MDP-EVN	Lattice ECP5™ FPGA
Lattice	► Embedded Vision Development Kit	LF-EVDK1-EVN	Lattice CrossLink™ FPGA and ECP5™ FPGA
Leopard Imaging	Nvidia TX1/TX2 Camera Kit	Contact Arrow for more information	Compatible with NVIDIA Jetson TX1 or TX2 evaluation kits
NovTech	► Chameleon96™ - Vision, a 96Boards with a Basler LVDS Camera	• Chameleon96-Vision_001-130-0102_KIT • Chameleon96-Vision_001-130-0102-3X_KIT	Intel® Cyclone® V SoC FPGA
ON Semi	► Evaluation kit for the monochrome version of the PYTHON 1300 CMOS Image Sensor	NOIP1SN1300A-QDI-A-GEVK	Includes Gen 3 FPGA evaluation board from ON Semi

ANALOG DEVICES

ADZS-BF707 Blackfin Low-Power Imaging Platform (BLIP)

Low-cost hardware solution for evaluating a vast array of real-time vision applications

The Blackfin Low-Power Imaging Platform (BLIP) is a low cost, low power embedded computer vision platform targeting a vast array of real-time sensing applications. BLIP leverages a low-power blackfin processor family and optimized software library deliverables. This development platform includes multiple functional profiles covering intelligent motion sensing, people counting, vehicle detection, and face detection deployable in both indoor and outdoor use cases. An intuitive configuration GUI enables real-time analysis of captured video,. A video output/display through an on-board USB port makes it a highly valuable tool for product development.

Part #: ADZS-BF707-BLIP2

THE ADZS-BF707-BLIP2 board includes:

- Hardware platform based on the Blackfin DSP
- Development tool chain: CrossCore® Embedded Studio™
- Application software: Video Occupancy Sensor (VOS) 3.2.0 (indoor/outdoor)
- Documentation: user guide, PCB schematics

Key Features

- Processor: ADSP-BF707BBCZ-4
- Imagers: OVM7692 (VGA SoC sensor with integrated lens), ASX-340 (VGA sensor)
- Memory: MT46H128M16LFB7 (256 MB)
- Flash: W25Q32 (32 MB)
- BLIP2 Board Support Package
- ADVision sensor controller GUI (Rev. 1.0.2) for product evaluation

Applications

- Indoor/outdoor lighting control
- HVAC system control
- Access control system
- Premise monitoring system
- In-vehicle occupancy detection
- Logistics/retail analytics

About Analog Devices

Analog Devices (Nasdaq: ADI) is the leading global high-performance analog technology company dedicated to solving the toughest engineering challenges. We enable our customers to interpret the world around us by intelligently bridging the physical and digital with unmatched technologies that sense, measure, power, connect, and interpret.

Ordering information
Part #: ADZS-BF707-BLIP2

dart BCON for MIPI Development Kit daA2500-60mc-SD820

Enables quick prototyping and easy testing of camera and system performance

The Basler dart BCON for MIPI Development Kit is ready-to-go with installed BSP and driver package for Linux (Linaro). This driver package for the supported Snapdragon™ SoCs includes the ISP logic, which now implements former camera firmware functionality on the Snapdragon's Spectra™ ISP. The driver package also implements the interface to the pylon camera software suite and thus provides the same level of convenience as is offered by USB 3.0. The kit enables easy testing of the camera performance and the overall system for fast development.

dart BCON for MIPI Development Kit includes:

- Camera module, lens
- Processing board
- Mezzanine board
- Power supply
- Cables (USB, HDMI, FFC, Ethernet)
- Other accessories

Part #: 107784 Contact Arrow for more information

Key Features

- Based on Qualcomm® Snapdragon™ 820E processing platform with 96Board CE specification
- ON Semiconductor AR0521, 1/2.5", CMOS, rolling shutter, 2560×1920 resolution, color
- 10/100/1000 Ethernet, Wi-Fi, USB 2.0, USB 3.0, HDMI, PCIe 2.0, MIPI CSI-2
- 3GB LPDDR4 RAM, 64GB UFS Flash
- Linux OS, Basler pylon camera software suite for development

Applications

- Basler dart BCON for MIPI camera evaluation
- Industrial mass production
- Medical technology and life sciences
- Retail applications
- Intelligent traffic systems

About Basler

Basler is a global provider of premium quality industrial cameras for a wide range of applications. Basler is the largest unit volume producer of digital cameras for industrial applications in the world. Manufacturers of equipment, machines, and plants incorporate Basler's cameras into their own products.

Arrow Electronics and Basler can provide assistance with interfacing other image sensors and custom camera development.

Ordering information & Services

Part #: 107784 Contact Arrow for more information

MitySOM-5CSX Embedded Vision Development Kit for Basler dart BCON

Ideal for industrial applications that require advanced image processing capabilities

The MitySOM-5CSX Embedded Vision Development Kit (VDK) for Basler dart provides all the hardware and software support for system designers and developers to implement an Embedded Vision system utilizing the dart series cameras from Basler. The kit comes complete with the MitySOM-5CSX module, camera(s), and necessary cabling to start working on your project. The MitySOM-5CSX Embedded VDK for Basler dart includes on-board Debug UART to USB converter, 10/100/1000 Ethernet, Universal Serial Bus (USB 2.0) USB-On-The-Go (OTG) communication interfaces. The device, including attached Basler dart BCON cameras, is powered from a single +5VDC input (adapter included).

MitySOM-5CSX Embedded Vision Development Kit includes:

- Basler dart camera modules (color or monochrome)
- MitySOM-5CSX SoM
- Embedded vision base board
- Power adapter, Micro B USB and Ethernet cables
- Software: Linux Kernel, uBoot, Basler pylon Camera Software Suite

Part #: 80-001005 or 80-001002

Key Features

- SoM based on Cyclone V SoC with 110 KLEs and dual-core ARM® Cortex®-A9 processors (800 MHz per core)
- Two available Basler dart camera module options
  - Single-camera package with a 5MP dart BCON for LVDS color module (daA2500-14lc)
  - Stereo camera package with two dart BCON for LVDS mono modules (daA1280-54lm)
- Interfaces supported: 10/100/1000 MBit Ethernet Interface, Debug UART to USB, USB OTG, HDMI, Dual Basler dart BCON Camera, SD/MMC Card Socket, M.2 Quad PCIe Connector

Applications

- Basler dart BCON for LVDS camera evaluation
- Intelligent imaging
- Factory automation
- Industrial automation
- Embedded instrumentation
- Test and measurement

About Critical Link

Established in 1997, Critical Link develops embedded solutions for a wide range of applications. They are a platinum member of the intel design services network and Intel® IoT solutions alliance, and a certified member of the Arrow Consulting Engineering Services (ACES) network. Critical Link is based in Syracuse, NY.

Arrow Electronics and Critical Link can provide assistance with interfacing other image sensors and custom camera development.

Ordering information & Services

Part #: 80-001005 or 80-001002

DRAGONBOARD™ 410C CAMERA KIT

Starter kit for fast evaluation of Embedded Vision with the DragonBoard™ 410c

Designed for rapid development of Embedded Vision applications, this kit includes a DragonBoard™ 410c by Arrow Electronics, based on the Qualcomm® Snapdragon™ 410E processor, with a D3 DesignCore™ camera mezzanine board, and a 5MP micro camera module. Direct MIPI CSI-2 access to camera data allows more realistic evaluation of Embedded Vision designs. Direct access eliminates the need to decode USB or Ethernet protocols, resulting in lower power and higher performance. The kit includes demonstration software running Linux to display 1080p video via HDMI. It is ideal for algorithm development, end application development, and evaluation of image sensors and optics.

THE DRAGONBOARD™ 410c CAMERA KIT includes:

- DragonBoard™ 410c
- D3 Engineering DesignCore™ camera mezzanine board OV5640
- Leopard imaging micro camera module OV5640 with autofocus
- Autec 12V power supply

Part #: DRAGONBOARD 410C CAMERA

Key Features

- Conforms to 96Boards consumer edition specification
- Processing platform: Qualcomm® Snapdragon™ 410E processor
- Camera interfaces: Two MIPI CSI-2 (2-lane)
- Expansion Interfaces: Two UART, two SPI, one I2C, one PCM, GPIO
- 5MP autofocus camera module included
- Available output formats include 5MP at 15fps and 1080p at 30fps
- Software support: Linux (Debian)

Applications

- Industrial
- Medical
- Instrumentation
- Drones

About D3 Engineering

D3 Engineering provides embedded electronic design services for original equipment manufacturers in commercial, industrial, transportation, infrastructure, medical, and defense industries. Systems development services include hardware and firmware design, validation testing, transition to production, and OEM/ODM products.

Arrow Electronics and D3 Engineering can provide assistance with interfacing other image sensors and custom camera development.

Ordering information & Services

Part #: DRAGONBOARD 410C CAMERA

DesignCore® NVIDIA® Jetson™ SerDes Sensor Interface Card

Add-on sensor interface card for NVIDIA Jetson TX1 or TX2 evaluation kits

The NVIDIA® Jetson™ SerDes Sensor Interface card is an add-on for the NVIDIA Jetson TX1 or TX2 Evaluation Kit. Connect multiple tethered sensors to the powerful NVIDIA® Jetson™ embedded platform. A direct MIPI CSI-2 connection allows interface to sensors directly to the Jetson™ Evaluation Kit. Use with camera modules and radar modules from D3 Engineering.

Contact Arrow for more information

DesignCore® NVIDIA® Jetson™ SerDes Sensor Interface Card requires

- NVIDIA® Jetson TX1 or NVIDIA® Jetson TX2 base boards
- D3 DesignCore® D3RCM-IMX390-953 Rugged Camera Module or the DesignCore® D3CM-IMX390 Camera Module

Key Features

- Interfaces to NVIDIA's Jetson TX2 evaluation kit. Based on 256 core NVIDIA® Pascal GPU, ARMv8 (64-bit) Multi-Processor CPU
- Interfaces to NVIDIA's Jetson TX2 evaluation kit. Based on NVIDIA® Maxwell™ GPU with 256 NVIDIA®
- CUDA® cores and Quad-Core ARM® Cortex®-A57 MPCore processor
- MIPI CSI-2 interface
- 4 GB/8 GB LPDDR4
- Linux BSP, Jetson SDK and JetPack (all included with the Jetson™ evaluation kits)

Applications

- Intelligent video analytics
- Drones
- Robotics
- Portable medical devices

Partners

Arrow Electronics and D3 Engineering can provide assistance with interfacing other image sensors and custom camera development.

Ordering information & Services

Contact Arrow for more information

Arria10 SOM Basler BCON for LVDS Evaluation Kit

Shorten time-to-market for multi-camera designs

This evaluation kit shows the integration of up to six cameras running in parallel at full frame rate. Image processing is done in the Basler BCON for LVDS cameras, and the 480KLE of the Arria 10 SoC FPGA can be utilized for custom algorithms.

Essential IP to realize the solution is available from Dream Chip and Intel® PSG. One application example is robotics, as the cameras can be arranged as three stereo pairs for pick and place and inspection tasks.

THE KIT INCLUDES:

- Intel® Arria 10 System on Module (SoM)
- Six dart BCON for LVDS camera modules (daA1280-54bc)

Part #: DCT10A-EVAL-BCON

Key Features

- Features 6 Basler BCON cameras
- Processor: Intel® PSG Arria 10 SoC
- Camera Control: Basler pylon Camera Software Suite
- Interfaces: 6 × BCON for LVDS, PCIe Gen 3 x4, DisplayPort, 12G SDI, Video Genlock, Gigabit Ethernet, 10 Gbit Ethernet (SFP+), USB Host, Mini-USB, FMC-Connector
- Software support: Linux

Applications

- Evaluation of systems that require up to six camera
- Robotics (ex: Pack-and-place robots)
- Inspection
- Industrial use cases

About Dream Chip Technologies

Dream Chip Technologies is Germany's largest independent engineering service provider with over 25 years of experience in the development and design of ASICs, SoCs, FPGAs, embedded software and discrete systems. End application expertise includes automotive, broadcast, consumer, industrial, and medical markets.

Arrow Electronics and Dream Chip can provide assistance with interfacing other image sensors and custom camera development.

Ordering information & Services

Part #: DCT10A-EVAL-BCON

IEI TANK AIoT Development Kit with Intel® OpenVino™ Toolkit

Rapid development & fast time-to-market of image analysis applications with intel® openVINO™ toolkit

IEI Tank AIoT Development kits are intended for rapid application developed and fast time to market. The development kit comes with a variety of pre-built training models to simulate and infer the status or appearance of objects recognized by cameras. These features can be applied in facial recognition systems and number plate reading systems as well as in industrial applications.

Part #: TANK-870AI-i7/8G/2A-R10
TANK-870AI-i5/8G/2A-R10

THE KIT INCLUDES:

Hardware

- IEI TANK 870-Q170
- Power cable
- Wi-Fi with antenna

Software & Documentation

- OpenVINO™ Toolkit
- Intel® Media SDK
- Ubuntu 16.04 desktop LTS
- Intel® System Studio 2018
- Quick start guide

Key Features

- 6th Gen Intel® Core™ processor platform with Intel® Q170 chipset, chipset, and DDR4 memory
- Dual independent display with high resolution support
- Rich high-speed I/O interfaces on one side for easy installation
- On-board internal power connector for providing power to add-on cards
- Great flexibility for hardware expansion
- High-speed HIROSE FXC8-60S-SV connector for MIPI CSI four lanes, MIPI DSI 2 lanes, MLB, GPIO, and other interfaces

Applications

- Facial recognition
- License Plate Recognition (LPR)
- Retail traffic analysis
- Access control & security
- Parking & road tolls
- Product quality control
- Regulatory & safety compliance

About IEI

IEI Integration Corp. is a leading industrial computer provider. IEI's products are applied in computer-based applications such as factory automation, computer telephony integration, networking appliances, security, systems, and in fields like IoT (Internet of Things), national defense, police administration, transportation, communication base stations, and medical instruments.

Ordering information & Services

Two versions are available.

Part #: TANK-870AI-i7/8G/2A-R10
TANK-870AI-i5/8G/2A-R10

iCE40 UltraPlus Mobile Development Platform

Flexible, scalable inferencing solutions from 1mW-1W with Lattice sensAI stack

This Mobile Development Platform board is an easy-to-use platform for demonstrating various features of the iCE40 UltraPlus for mobile applications. It comes loaded with four iCE40 UltraPlus devices, each interfacing to a variety of different sensors, a display and microphones, to develop smart low power IoT solutions. The MDP form-factor is similar to a mobile device (cell phone), with various sensors, display, Bluetooth communication, and others. The board contains four individual iCE40 UltraPlus devices, each configured with a unique set of interfaces to support multiple demonstrations.

iCE40 UltraPlus Mobile Development Platform includes:

- PCB, case, and integrated Li-ion battery featuring four iCE40 Ultraplus devices, SPI Flash, control switches
- Pre-loaded MIPI LCD mobile display demo
- Standard USB connector cable

Part #: ICE40UP5K-MDP-EVN

Key Features

- Mobile display (Onboard 1.54 inch 240 × 240 RGB wearable type display with MIPI DSI interface)
- Camera (Onboard VGA 640 × 480 sensor with CSI and parallel video interface option)
- Microphones
- Sensors with expansion connector: RGB LED, Pressure, Compass, Gyroscope, and Accelerometer
- Demos to speed up the solution development including sensAI based always-on key phrase detection and face detection under 1 mW average power consumptio

Applications

- Image and facial recognition
- Voice recognition
- Proof-of-concept for always-on, context aware, battery powered IoT applications including smart-home devices (smart speakers, door bell, and security camera)

About Lattice Semi

Lattice Semiconductor (NASDAQ: LSCC) provides smart connectivity solutions powered by low power FPGA, video ASSP and IP products to the consumer, communications, industrial, computing, and automotive markets worldwide.

Arrow Electronics and Helion Vision offer a wide variety of design services to make camera development efficient, fast, and agile.

Ordering information & Services

Part #: ICE40UP5K-MDP-EVN

Embedded Vision Development Kit

Modular platform for Embedded Vision processing at the edge

The Embedded Vision Development Kit features CrossLink™, ECP5™ and Sil1136 devices and integrates a Sony IMX dual-cameras-to-HDMI® bridging. The kit creates the basis for an easy development platform and offers modular design for expandability. Kit includes stereo vision support, and dual MIPI® CSI-2 to 1080p HDMI® demo. The CrossLink input board includes dual-camera HD image sensors supporting the MIPI CSI-2 interface, eliminating the need for external video sources. The ECP5 base board enables low-power pre/post processing and includes support for HD image signal processing (ISP) intellectual property (IP) from Helion Vision.

Embedded Vision Development Kit includes:

- ECP5 VIP processor board
- CrossLink VIP input bridge board
- HDMI VIP output bridge board
- Power supply 12V
- Quick start guide
- Embedded vision development kit diamond license

Part #: LF-EVDK1-EVN

Key Features

- CrossLink VIP Input Bridge Board with two sony IMX 214 high-speed MIPI D-PHY interface camera sensors
- Standard image sensor connector for easy sensor exchange
- ECP5 VIP Processor Board with ECP5-85 FPGA for optimized image signal processing
- HDMI VIP Output Bridge Board for seamless connection to HD displays
- On-board USB programming interface eliminates the need for external programming hardware
- Includes dual MIPI CSI-2 to 1080p HDMI demo
- Free evaluation version of Helion IONOS ISP available

Applications

- Robotics
- Drones
- ADAS
- Smart surveillance
- AR/VR systems

Lattice Semiconductor's Partnership for Image Processing

Lattice and Helion Vision have partnered on IONOS Image Signal Processing (ISP) for Lattice ECP3 and ECP5 devices. Helion Vision's IONOS IP cores provide plug and play processing solutions. IONOS provides pre-configured, ready-to-use ISP by utilizing a portfolio of IP cores for customized camera systems, imaging modules, and complete camera and display systems. Helion Vision is a member of the Arrow Partner Program (APP) in EMEA.

Ordering information & Services

Part #: LF-EVDK1-EVN

Chameleon96™ - Vision, a 96Boards with a Basler LVDS Camera

Chameleon, able to change how it presents itself to the world by adapting to the environment

The Chameleon96™ board, based on Intel® Cyclone V SoC FPGA, is a member of 96Boards community and complies with consumer edition board specifications. The Chameleon96™ meets all 96Boards mandatory specifications (excluding MIPI SDI Interface) and most optional specifications. The Chameleon96™ features Dual ARM® Cortex®-A9 processors and a set of peripherals allow direct interfacing and connecting to MMC/SD card, HDMI out, USB, WLAN and BLE. Two expansion connectors provide additional interfaces to cameras, USB, UARTs, I2C, SPI and GPIOs. The use of the FPGA fabric for the video processing allows development of custom IPU/GPU/VPU solutions on this platform.

THE KIT INCLUDES:

- CV 96Boards -Chameleon96™
- SD card with Linux image
- Power supply
- UART to USB cable
- Micro USB cable for on-board Blaster II
- Quick start guide

Part #: Chameleon96-Vision_001-130-0102_KIT
Chameleon96-Vision_001-130-0102-3X_KIT

Key Features

- Processor: Intel® Cyclone V SoC FPGA
- Camera Support: MIPI CSI interface (Mobile Industry Processor Interface - Camera Serial Interface) 2× lane. (requires a custom IP for the FPGA)
- Audio: HDMI Audio, Bluetooth Audio, and I2S 4Wire interface via expansion connector
- I/O Interfaces: One 40-pin Low Speed (LS) expansion connector, One 60-pin High Speed (HS) expansion connector
- The board can be made compatible with Arduino using an add-on mezzanine board

Applications

- Industrial & manufacturing
- Machinery
- Robotics
- Artificial intelligence

About NovTech

NovTech, Inc. was founded in 1998 by a group of engineers with a wide assortment of skills. With the goal to provide rapid system solutions to OEMs, NovTech has designed and produced over 300 turnkey solutions for the aerospace, automotive, consumer, industrial, medical, and home automation industries. NovTech solutions range from System on Module (SoM), Single Board Computers (SBC), application specific solutions, and custom designs.

Ordering information & Services

Two versions are available.

Part #: Chameleon96-Vision_001-130-0102_KIT
Chameleon96-Vision_001-130-0102-3X_KIT

ON Semiconductor has a wide range of CMOS and CCD image sensors for industrial, medical, automotive, and security applications. Contact Arrow for more details.

PYTHON 1300 Image Sensor Evaluation Kit

Enable easy and quick evaluation of the PYTHON 1300 CMOS Image Sensor

The NOIP1SN1300A-QDI-A-GEVK evaluation kit enables evaluation of the monochrome version of the PYTHON 1300 CMOS Image Sensor, a 1/2 inch SXGA CMOS image sensor with a pixel array of 1280 by 1024 pixels. This kit includes required hardware components to perform a full evaluation of this device, including the monochrome image sensor, the image sensor headboard, Gen 3 FPGA evaluation board, and accessories. Sensor Studio II software is also required for operation of the evaluation kit, and includes operating manuals and timing information as part of the help system in that software. Note that the appropriate lens must be supplied by the user.

Part #: NOIP1SN1300A-QDI-A-GEVK
(for PHYTON 1300 Monochrome image sensor)

PYTHON 1300 Image Sensor Evaluation Kits includes:

- Image capture board with integral tripod mount
- Headboard (sensor installed & lens mount affixed)
- USB 3.0 Cable (2 meter length)
- Quick start guide

Key Features

- Full access to image sensor register settings
- Supports HDR operation and ROI readout
- USB interface for sensor control, image capture, and firmware downloads
- Socketed sensor for easy sensor replacement
- Integrated tripod mount (1/4—20 thread)
- Additional headboards, lens mount kits for C and F mount lenses (sold separately)

Applications

- Machine vision
- Motion monitoring
- Security
- Barcode scanning
- Traffic surveillance (Intelligent Traffic Surveillance (ITS))

About ON Semiconductor

ON Semiconductor is driving energy efficient innovations, empowering customers to reduce global energy use. The company is a leading supplier of semiconductor-based solutions, offering a comprehensive portfolio of energy efficient power management, analog, sensors, logic, timing, connectivity, discrete, SoC, and custom devices.

NOIP1SN1300A-QDI-A-GEVK(for PHYTON 1300 Monochrome image sensor)

eInfochips: Arrow's Premier Service Provider for Embedded Vision Systems

eInfochips has been a strategic partner to the industry leaders across video analytics, surveillance, biometric security, identity management, and public safety. With a strong pool of IPs to accelerate the product development lifecycle, eInfochips has delivered products that are deployed for various applications in retail, city surveillance, and transportation.

Services Include

Camera Design

Custom camera design, image processing, NVR/DVR deployments, identity management, multi-camera designs with real-time video stitching

Video Analytics

Motion detection, face recognition, privacy masking, object tracking, tripwire, face recognition

Video Management Software

Interfaces with other systems and 3rd party applications, identity management, access control, etc.

Customer Deployments Examples

4k camera with FPGA, IP Camera

NVR

Vigil 360 – Video Management Software

Access control

Arrow Embedded Vision Solution Partners

Chip-Level

Module-Level

Package-Level Solutions

Services

Embedded Vision Solutions Guide

Are You Five Years Out?

Most people live in the present. The world of now. But a handful of us work in a unique world that doesn't quite exist yet—the world of Five Years Out.

Five Years Out is the tangible future. And the people who live and work there know that new technologies, new materials, new ideas and new electronics will make life not only different, but better. Not just cheaper, but smarter. Not just easier, but more inspired.

Five Years Out is an exciting place to be. So exciting that, once you've been there, it's hard to get excited about the present. Because we know what's coming is going to be so much better.

Five Years Out is a community of builders, designers, engineers and imaginers who navigate the path between possibility and practicality. Creating the future of everything from cars to coffeemakers.

Are you one of them? Then you're probably working with us.

Via Phone

Contact your local Arrow representative at
North America **+1 855 326 4757**
Europe, Middle East, &Africa **+4 420 39365486**
Asia-Pacific **+8 640 0920 0628**
Or visit us at **arrow.com**

Online

arrow.com/embedded-vision
Visit our website for everything from the latest news to line card information.

Five Years Out

Arrow Electronics, Inc.
Frankfurter Straße 211
63263 Neu-Isenburg, Germany