

NXP i.MX 8M Plus family Bring Machine Learning in Industrial application

ARROW TEAM

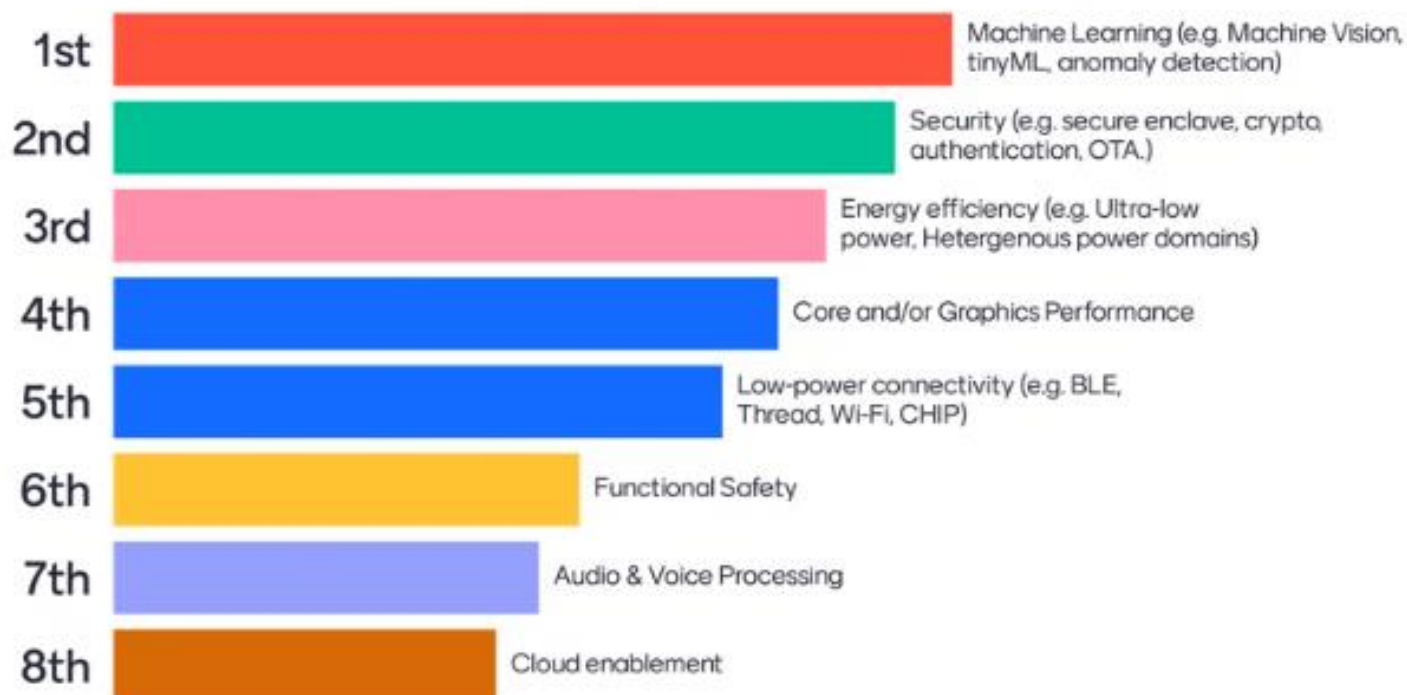
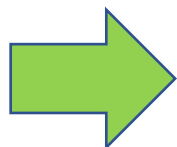
March 18, 2020

NXP

ARROW

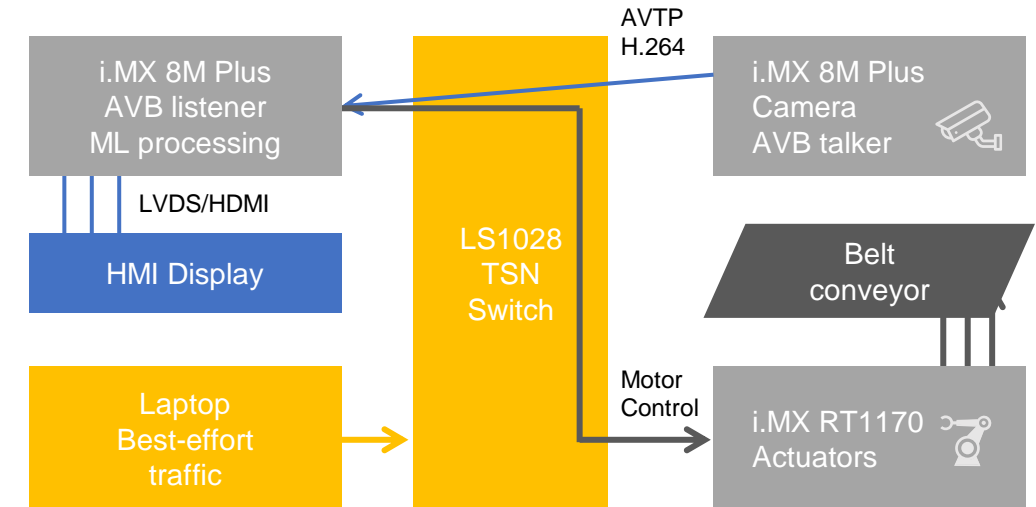
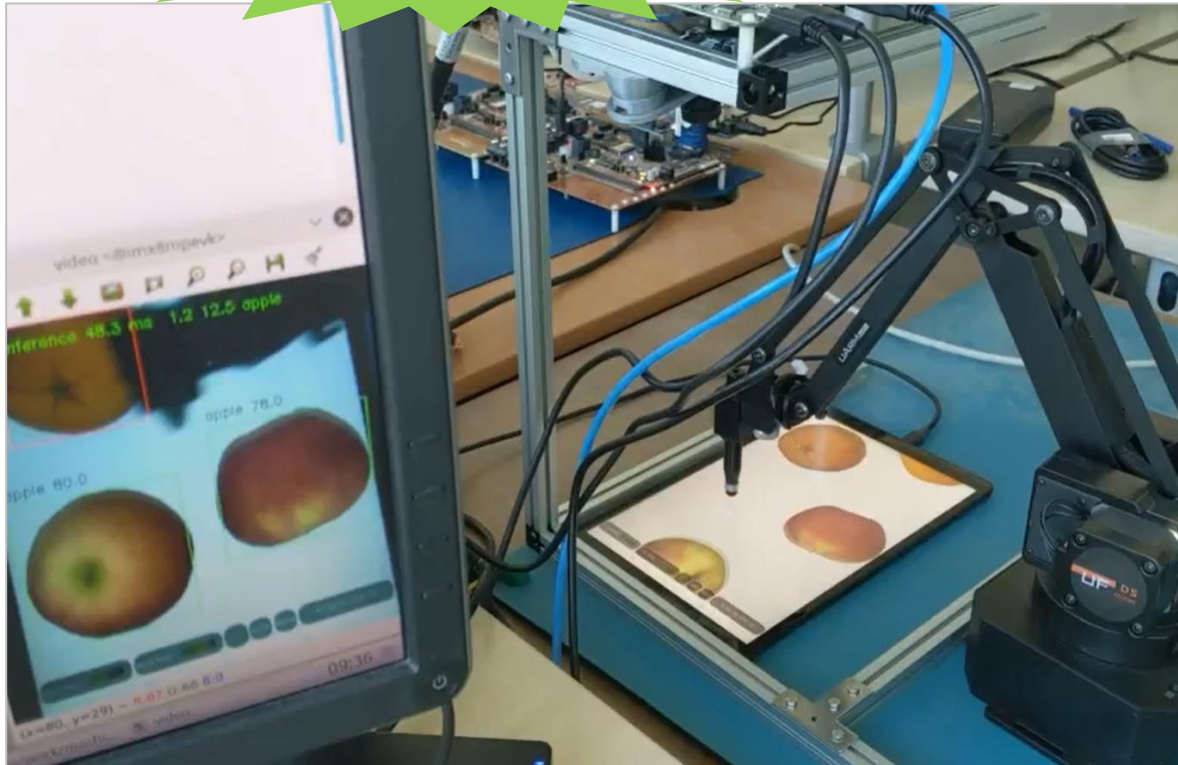
Looking at the next two-three years, rank the technology trends in the order of their impact to your customers (1st - highest to 8th - lowest)

Mentimeter



TSN in ACTION – COMBINING OPERATIONAL TECHNOLOGY and INFORMATION TECHNOLOGY

Video on : Youtube



Time Synchronization (**TSN network**)

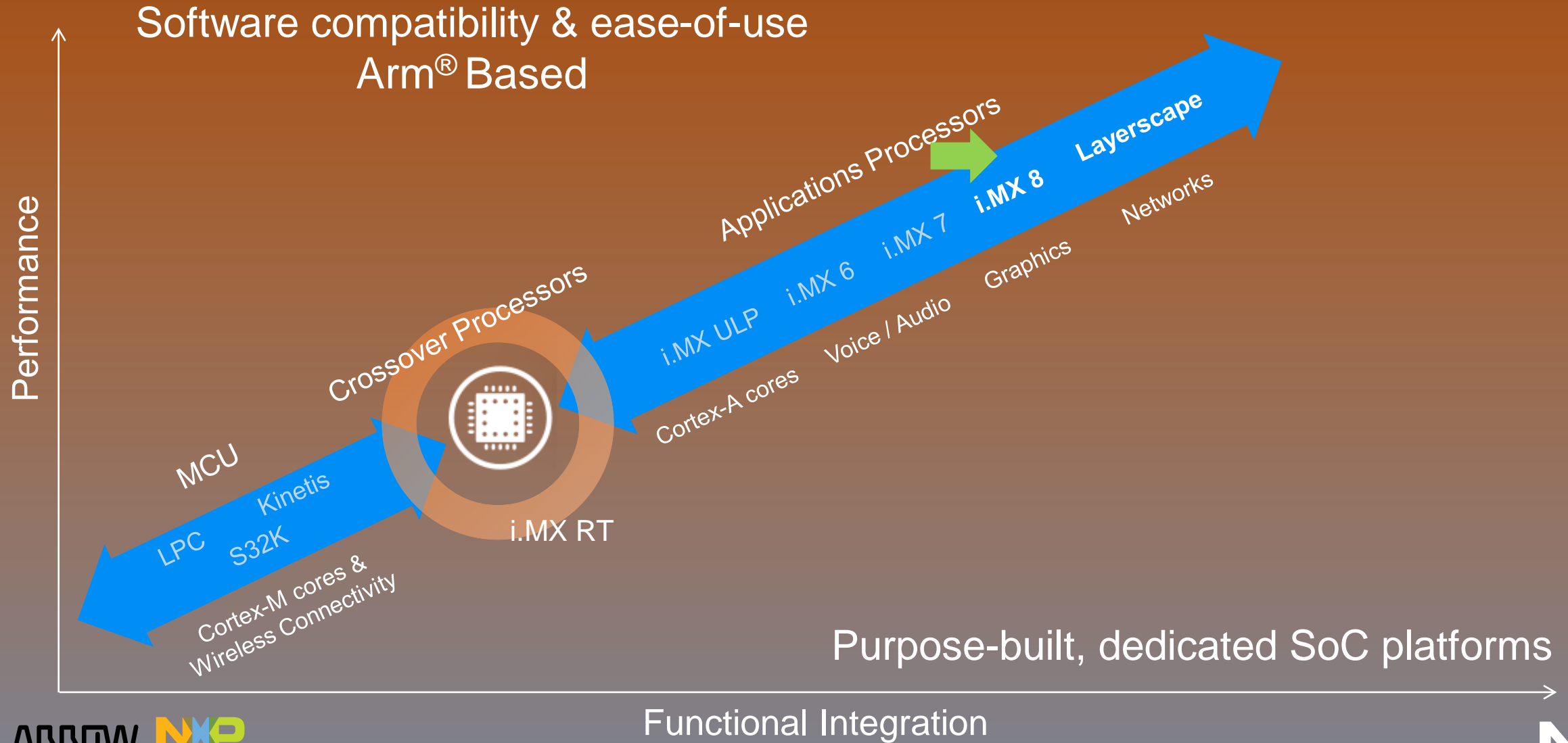
Time-Aware Shaping to protect operational technology traffic from best effort information technology traffic

Audio Video Bridging to support remote video transport

Machine Learning Object recognition

https://www.youtube.com/watch?v=Zpq619clBZk&list=PLPtvbG7RC0Tgosf9EwCgHvQyxig9L-F8_&index=4

NXP Scalable Processing Continuum



Targeting Industrial Applications –



i.MX 8M Plus

Human machine interface

Industrial HMI, Building control panel,
Kiosk, Two-way radio
Avionics display, Fitness equipment,
Health care, Industrial vehicle display



i.MX 8M Plus

Machine vision & learning

Scanner, Service robot,
Room monitor, Industrial printer,
Machine vision



i.MX 8M Plus

Industrial control & network

Factory Robot, Motion control,
Building control, Gateway,
Process manager, Avionics control,
Solar inverter boost,
Test & Measurement



Longevity



Extreme Operating
Conditions



Security



Safety and Reliability




Scalable Solutions



i.MX 8M Family Added to 15yr Longevity Program!

Product Longevity



The Product Longevity program ensures a stable supply of products for your embedded designs. Participating products are available for a minimum of 10 years from product launch (15 years from product launch for many products developed for the automotive, telecom and medical segments), and are supported by standard end-of-life notification policies.

Longevity products remain in the program even if the manufacturing site changes. We manufacture a number of facilities, including our own factories and qualified outside vendors. If we transfer a longevity product to another facility, we requalify the product to maintain its status in the Longevity Program. In addition, we may need to migrate your product to one that is form, fit, and function compatible (in the event of a large volume decrease, technology or manufacturing change).

For additional information, please visit our [support page](#).

ACTIVE LONGEVITY PRODUCTS

ARCHIVED

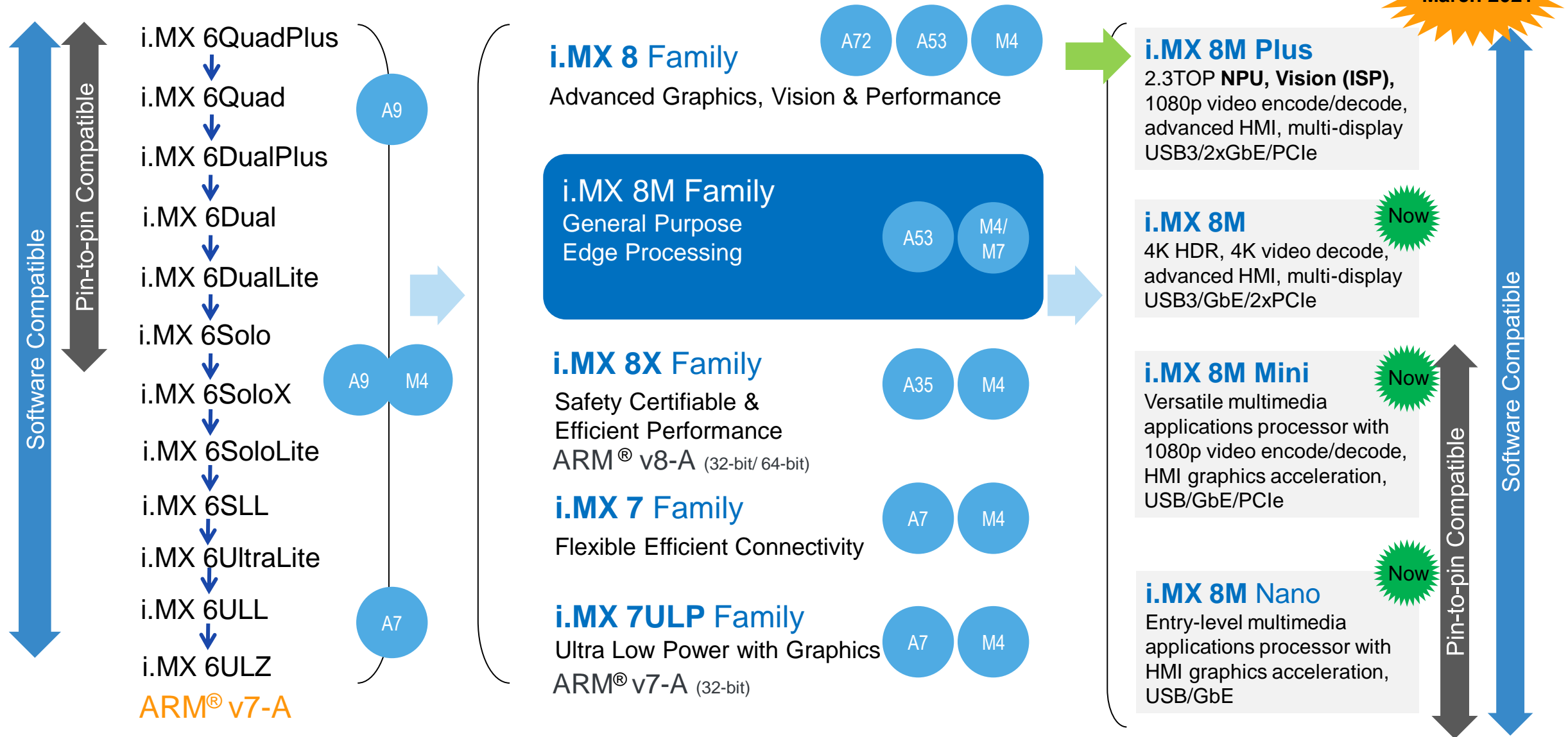
Product longevity increased from 10 years to 15 years!

Active Longevity Products

Search:

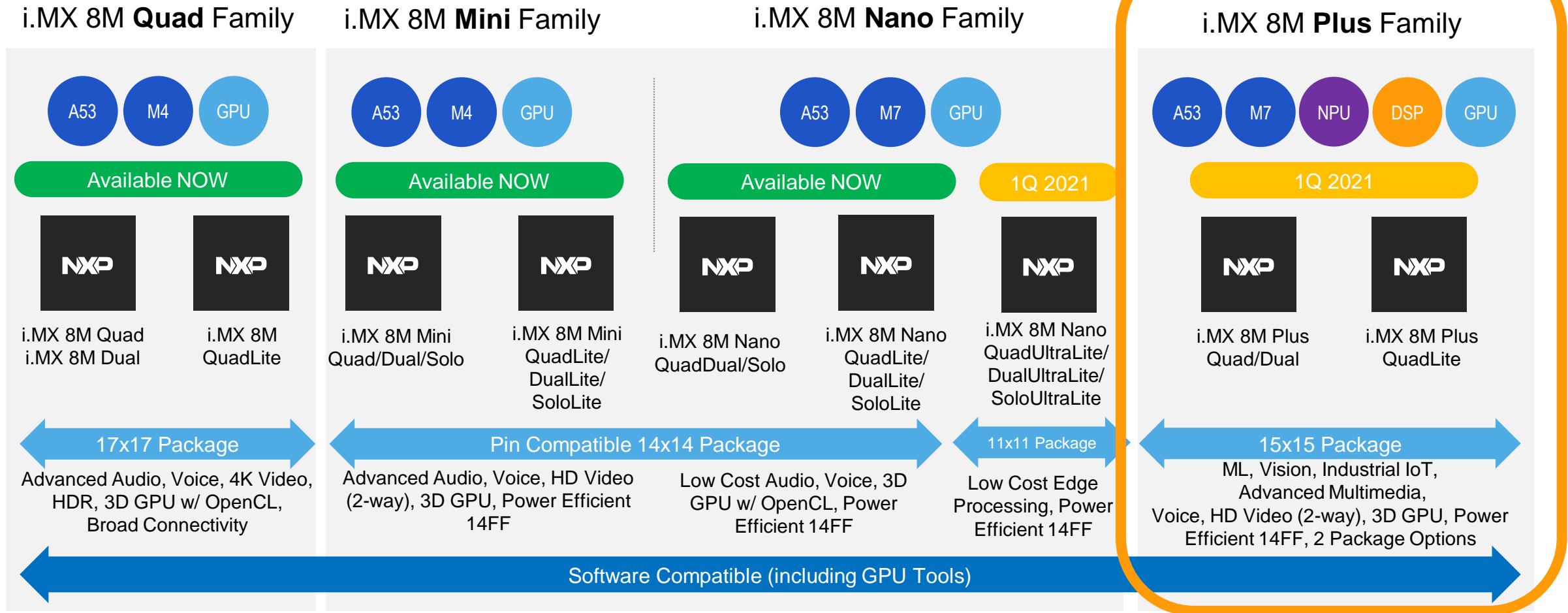
Category	Family/Series	Products	10 Year	15 Year	Launch Date
<div></div>	<div>i.MX 8M Family</div>	<div>Filter by...</div>			
Processors	i.MX 8M Family	i.MX 8M Nano		✓	Dec 2019
Processors	i.MX 8M Family	i.MX 8M		✓	Jan 2018
Processors	i.MX 8M Family	i.MX 8M Mini		✓	Feb 2019

i.MX 8M Family of Applications Processors



i.MX 8M Family: Scalable broad market Solutions

March 2021:
Full Market Launch



Scalable series of **FOUR** Arm V8 64-bit (/32-bit) based SoC Families

i.MX 8M Plus - Feature / Benefit

	Capability	Benefits	Features
Machine Learning Vision & Voice	Machine Learning	<ul style="list-style-type: none"> Edge Smartness with Machine Learning Inference. No cloud dependency, privacy, better user experience ~80x faster than 4xCA53 up to 1.8GHz 	Neural Processing Unit (NPU) up to 2.3 TOPS NXP eIQ Library and Tools
	Vision System	<ul style="list-style-type: none"> UHD Vision / HD Stereo Vision Image Signal Processor (ISP) 	2x ISP + MIPI-CSI up to 375MPixel/s, ISP de-warp engine
	Voice	<ul style="list-style-type: none"> Voice systems with processing at the edge. Privacy and less cloud bandwidth required. 	8ch-PDM, Low Power Voice processor
Advanced Multimedia	HD Video	<ul style="list-style-type: none"> High resolution video compression for cloud upload or local storage 	1080p60 encode/decode H.264, H.265/HEVC
	3D/2D Graphics	<ul style="list-style-type: none"> Advanced 3D and 2D graphics for rich HMI and user experience 	3D/2D GPU, 1GPix/s, OVG1.1, OGLES3.1, Vulkan,OCL1.2FP
	Advanced Audio	<ul style="list-style-type: none"> Enables the latest and greatest audio standards for soundbars and AV Receivers. Dolby Atmos. High performance HDMI audio path with eARC 	Audio Interfaces, eARC, ASRC
Industrial Network & Reliability	Industrial Network	<ul style="list-style-type: none"> Support low latency network with GbE/TSN network. Widely adopted CAN control Interface. Gateway support with dual Ethernet. 	2x Ethernet (1w/ TSN), 2x CAN-FD
	Memory Reliability	<ul style="list-style-type: none"> High Industrial system reliability for SafetyApplications. 	DDR Inline ECC ECC on internal memories, low SER rates
	Real time Processing	<ul style="list-style-type: none"> High performance MCU integrated Reduce system BOM 	Cortex-M7 @ 800MHz
Performance & Connectivity	High Performance Low power	<ul style="list-style-type: none"> Up to 21,600 DMIPS. Applications running <2.0W. Deep Sleep Mode < 20mW 	4xCortexA53 @1.8GHz, 14FinFet, Low Power Modes
	Display Interfaces	<ul style="list-style-type: none"> Multiple interface options capable to be used simultaneously. Up to 1080p60 	MIPI-DSI, HDMI 2.0b, LVDS 4/8-lane
	High-Speed Interfaces	<ul style="list-style-type: none"> Fast connections to WiFi, FPGAs, co-processors. Seconds to move media files or large data set 	2xUSB 3.0, PCIe 3.0, 3x SDIO 3.0/ eMMC

Arrow i.MX 8M Plus Support



COLLATERAL & TOOLS

Launch Communications

- Full visibility of launch schedule
- Availability of early engagement programs
- First mass market stock availability incl sample quantities
- Earliest availability of development kits
- Loan kits available through Arrow TestDrive program
- Arrow technical resource trained to Expert level at point of product release

Free Customer Training

- Early access to NXP boards & partner modules
- Webinar Series** (English & German)
- Unboxing & Board bring-up
 - Selecting the right NXP MPU for your design
 - AI/ML implementations with Machine Vision
 - Industrial Networking with TSN

Digital Content

arrow.com

- Product Spotlight & Hosted Articles (5 European languages)
- Videos – Unboxing, Use Case Demos
- Featured Case Studies

Social Media

- LinkedIn & Facebook - Promotion of webinars.
- YouTube – Tutorial & demo videos

SOLUTIONS & PARTNERS

Vertical Market Use Case Experience

- **Industry 4.0 Examples**
 - AI/ML - AI/ML demo with MX 8M Plus board + Basler camera module.
 - Machine Vision
 - HMI
 - Industrial Networking / TSN
- **Automotive, Smart City, Smart Home, IoT**

Solutions/Reference Designs

- **Solutions**
 - AI/ML using Machine Vision for Industrial applications
 - Various TSN & Industrial Networking implementations
- **Full Reference Designs Available**
 - Support device recommendations & Design Guidelines
 - e.g. PMIC support, WiFi & other connectivity

MORE BEING ADDED

Related Partners

- Basler Camera Module w/OnSemi Image Sensor
- i.MX 8M Plus SoM Partners
 - Variscite
 - SolidRun
 - iWave
- Boards available in Arrow



TECHNICAL SUPPORT (LARGEST TEAM IN EMEA)

Hardware Development (Largest team in EMEA)

- Design architecture support
- Component recommendation
- H/W & S/W Dev Kit training from super-users
- Peripheral integration
- Security

Software Support

- Board bring-up
- OS, BSP, Driver support
- Debug
- PoC & MVP implementation
- Cloud integration – MS Azure, AWS, Google

Engineering Services

- Various customer engagement models available
- Arrow eInfochips for full turnkey or partial design
- Arrow Partner Program can introduce specialist expertise as needed



Comprehensive support gives you confidence choosing NXP

i.MX 8M Family Highlights & Value Proposition

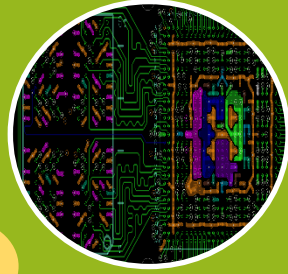
1



Power Efficient and Scalable

- 14LPC FinFET: performance and power efficiency.
- Cortex-A53: 1x, 2x or 4x cores, up to 1.8 GHz per core.
- Cortex-M: for task offload and power optimizations.
- Hardware media accelerators for high-performance, power-efficient graphics and video.
- Pin-compatible options enables scalable performance using the same hardware design.

2



Cost-optimized System Design

- Full-featured packages with cost-effective PCB design references (6-8 layer board design and no microvias).
- LPDDR4 for highest performance and lowest power, and DDR4 for lowest system cost.
- Linux/Android/Windows10 IoT Core (Cortex-A) and FreeRTOS (Cortex-M) BSP and solutions software (eIQ, Voice, Music).

3



ML, HMI, Video, Music, Voice

- Cost-effective AI/ML platform for local inferencing at the edge.
- Integrated graphics and video co-processors for advanced HMI and video applications.
- Multi-channel audio and for high-fidelity music and surround sound systems.
- Supports low-cost MIPI displays and cameras. Some devices contain LVDS for industrial HMI applications.
- Strong Ecosystem partnership for voice solutions.

4



Industrial Reliability, Supply, High-speed I/O

- -40C to 105C (junction) and Industrial-tier qualification (10yrs, continuous ON).
- Minimum 15 year supply longevity on commercial and industrial devices.
- High-speed I/O for industrial connectivity.
- Fanless design for reduced cost in hot environments.

i.MX 8M Family – Features and Benefits



Feature*	i.MX 8M Best Fit
High-performance HMP processing 4x Cortex-A53 @ 1.3-1.8GHz per core 1x Cortex-M @ 266-750MHz	<ul style="list-style-type: none"> All, depends on customer application
Machine learning acceleration for inferencing at the edge	<ul style="list-style-type: none"> 2 TOPS – i.MX 8M Plus Cortex-A53 – i.MX 8M Quad, 8M Mini, 8M Nano GPU (OpenCL) – i.MX 8M Quad, 8M Nano
High-speed Interfaces PCIe, USB2.0/3.0, CAN-FD GbE (1x available on all devices) SD/eMMC (2-3x available on all devices)	<ul style="list-style-type: none"> 2x PCIe – i.MX 8M 1x PCIe - i.MX 8M Plus, 8M Mini USB 3.0 – i.MX 8M Plus, 8M 2x GbE (w/ 1x TSN) – i.MX 8M Plus CAN-FD – i.MX 8M Plus
Flexible display interfaces HDMI, DP/eDP, LVDS MIPI-DSI (available on all devices)	<ul style="list-style-type: none"> HDMI Tx – i.MX 8M Plus, 8M DP/EDP – i.MX 8M LVDS – i.MX 8M Plus
Multiple display support	<ul style="list-style-type: none"> i.MX 8M Plus (up to 3) i.MX 8M (up to 2)
3D graphics acceleration OpenGL ES 3.1, Vulkan, OpenCL 1.2 OpenGL ES 2.0 (available on all devices)	<ul style="list-style-type: none"> OpenGL ES 3.1 / Vulkan / OpenCL 1.2 – i.MX 8M Plus, 8M, 8M Nano
Up to 4Kp60 video decode h.265, h.264, VP9	<ul style="list-style-type: none"> 4Kp60 – i.MX 8M 1080p60 – i.MX 8M Plus, 8M Mini
Up to 1080p60 video encode h.265, h.264, VP8	<ul style="list-style-type: none"> 1080p60 h.265, h.264 – i.MX 8M Plus 1080p60 h.264, VP8 – i.MX 8M Mini
Single- or dual- camera input ISP, MIPI-CSI (available on all devices)	<ul style="list-style-type: none"> ISP, 2x MIPI-CSI – i.MX 8M Plus 2x MIPI-CSI – i.MX 8M
High-end audio support 20+ audio channel inputs/outputs, ASRC	<ul style="list-style-type: none"> ASRC – i.MX 8M Plus, 8M Nano

*Not all features available on all devices

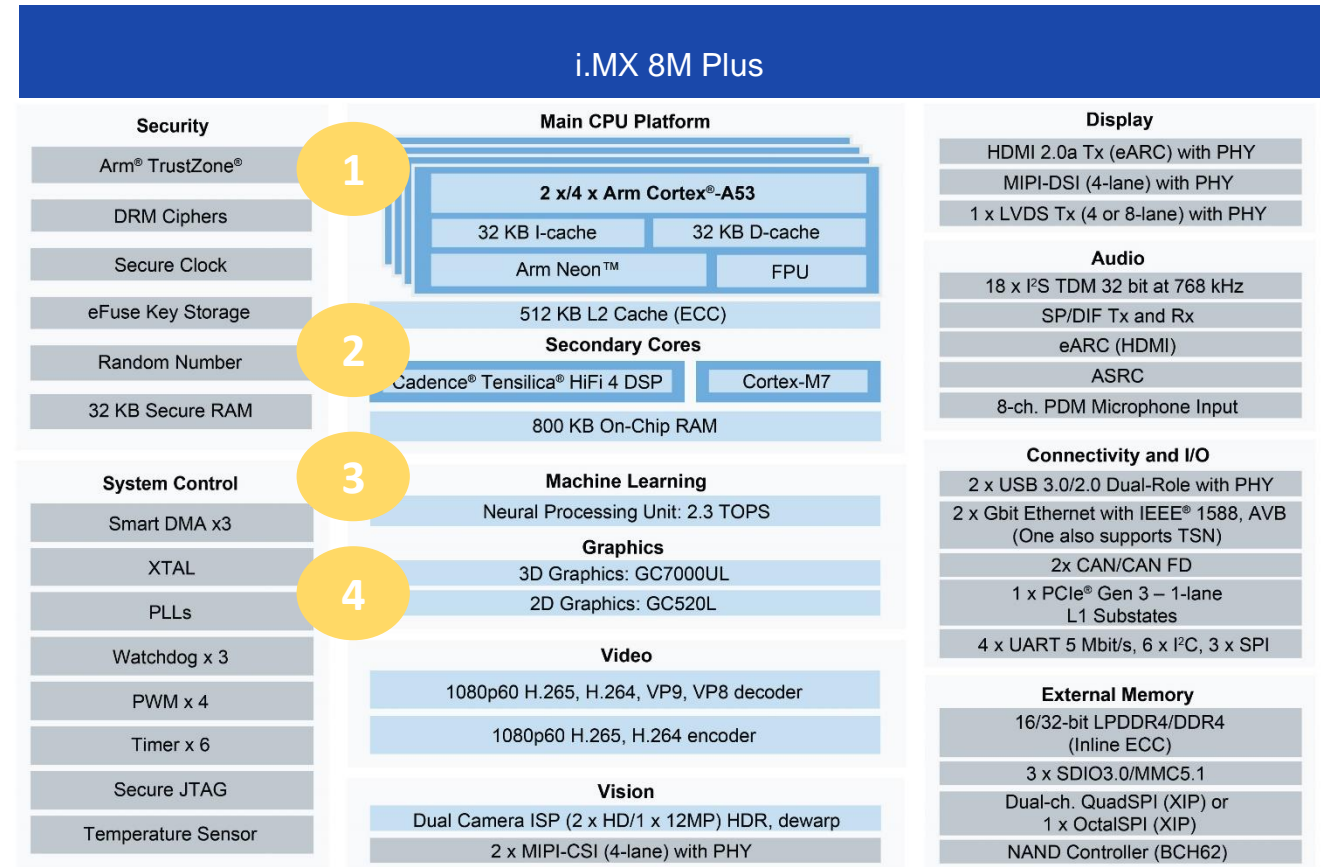
Benefit	Application
<ul style="list-style-type: none"> Advanced computational performance capability 	<ul style="list-style-type: none"> Gateways, single board computers Soft DSP, local embedded voice AVS with MRM, GVA with Cast
<ul style="list-style-type: none"> Low latency inferencing at the edge More secure systems Reduced cloud infrastructure costs 	<ul style="list-style-type: none"> Machine vision, robotics, drones Surveillance Access control
<ul style="list-style-type: none"> High speed Wi-Fi connection High speed interface with other ICs like FPGAs and TPUs Fast media data transfer High speed input for USB cameras 	<ul style="list-style-type: none"> Connected industrial applications Smart edge devices Machine learning applications Gateways
<ul style="list-style-type: none"> Flexible options to connect to TVs, monitors, local displays and “distant” display (e.g. LVDS) 	<ul style="list-style-type: none"> Fitness equipment, in-flight infotainment, patient monitor, digital signage, media streaming, vending machines
<ul style="list-style-type: none"> Multiple displays with different content 	<ul style="list-style-type: none"> Media streaming box, fitness equipment, kiosks, digital signage, patient monitor
<ul style="list-style-type: none"> graphical user interfaces Machine learning acceleration 	<ul style="list-style-type: none"> Industrial HMI, fitness, in-flight infotainment, gaming, vending machines, kiosks Robot vision, machine vision
<ul style="list-style-type: none"> Provides up to 4K UHD content Dedicated VPU minimizes CPU usage and power consumption 	<ul style="list-style-type: none"> Media streaming box, fitness equipment, in-flight infotainment, patient monitor, digital signage, gaming, video surveillance
<ul style="list-style-type: none"> High-resolution, power efficient video capture 	<ul style="list-style-type: none"> IP cameras, video doorbell, surveillance systems, video conferencing
<ul style="list-style-type: none"> Single: Image capture Dual: Support stereo vision ISP: Improves image quality 	<ul style="list-style-type: none"> Robotic vision, machine vision, scanners
<ul style="list-style-type: none"> Highest levels of pro audio fidelity 	<ul style="list-style-type: none"> Sound bar, audio video receivers, portable audio products, media streaming devices



i.MX 8M Plus Applications Processor

Feature Highlights:

- **Quad Arm® Cortex-A53** up to **1.8 GHz** (up to 20,988 DMIPS)
- ARMv8 fully 64-bit capable, 512KB L2 cache (ECC)
- **Arm Cortex-M7** up to **800MHz** with 512KB RAM (ECC)
- **Voice Acceleration co-processor:** HiFi4 DSP up to 800MHz with 256KB RAM (ECC)
- **Machine Learning accelerator:** Neural Processing Unit (NPU) 2.3 TOPS performance
- **Package:** FCBGA 15x15mm, 0.5mm pitch, depop (consumer and industrial)
- **Operating System targets:** Linux OS, Android OS, HiFi4 SDK, FreeRTOS
- **Qualification:** Consumer (0C to +95C); Industrial (-40C to +105C)
- **External memory:**
 - x32/x16 LPDDR4/DDR4 (Inline ECC)
 - 3x SDIO3.0/eMMC5.1
 - Dual-channel QuadSPI (XIP) or 1x OctalSPI
 - NAND Controller (BCH62)
 - SPI NAND
- **Graphics processors:**
 - GC7000UL (3D GPU, 2-shaders, OpenGL® ES 3.1, Vulkan®, Open CL™ 1.2 FP)
 - GC520L (2D GPU, OpenVG™ 1.1)
- **Video processors:**
 - Decode: 1080p60 H.265, H.264, VP9, VP8
 - Encode: 1080p60 H.265, H.264
- **Display controllers** (up to 3 simultaneous displays):
 - 1x HDMI 2.0a Tx (eARC) with PHY
 - 1x LVDS Tx (4 or 8-lane) with PHY
 - 1x MIPI-DSI (4-lane) with PHY
- **Vision:**
 - Camera (up to 2 cameras): 2x MIPI-CSI (4-lane) with PHY
 - Image Signal Processor (ISP): 12MP resolution, 2x187MP or 1x375MP input rate, HDR, Dewarp
- **Audio:**
 - 18x I²S TDM (32-bit @ 768KHz), DSD512, SP/DIF Tx + Rx
 - 8 channel PDM microphone input
 - eARC, ASRC
- **Connectivity and I/O:**
 - 2x USB 3.0/2.0 Type C with PHY
 - 1x PCIe Gen 3.0 (1 lane) with L1 Substates for fast wake from low power mode
 - 2x Gigabit Ethernet with IEEE 1588, EEE and AVB (one with TSN, but no EEE)
 - 2x CAN-FD



i.MX 8M Plus Configurations

Streaming Media

Voice Assistants

AI, Machine Learning

Industrial IoT

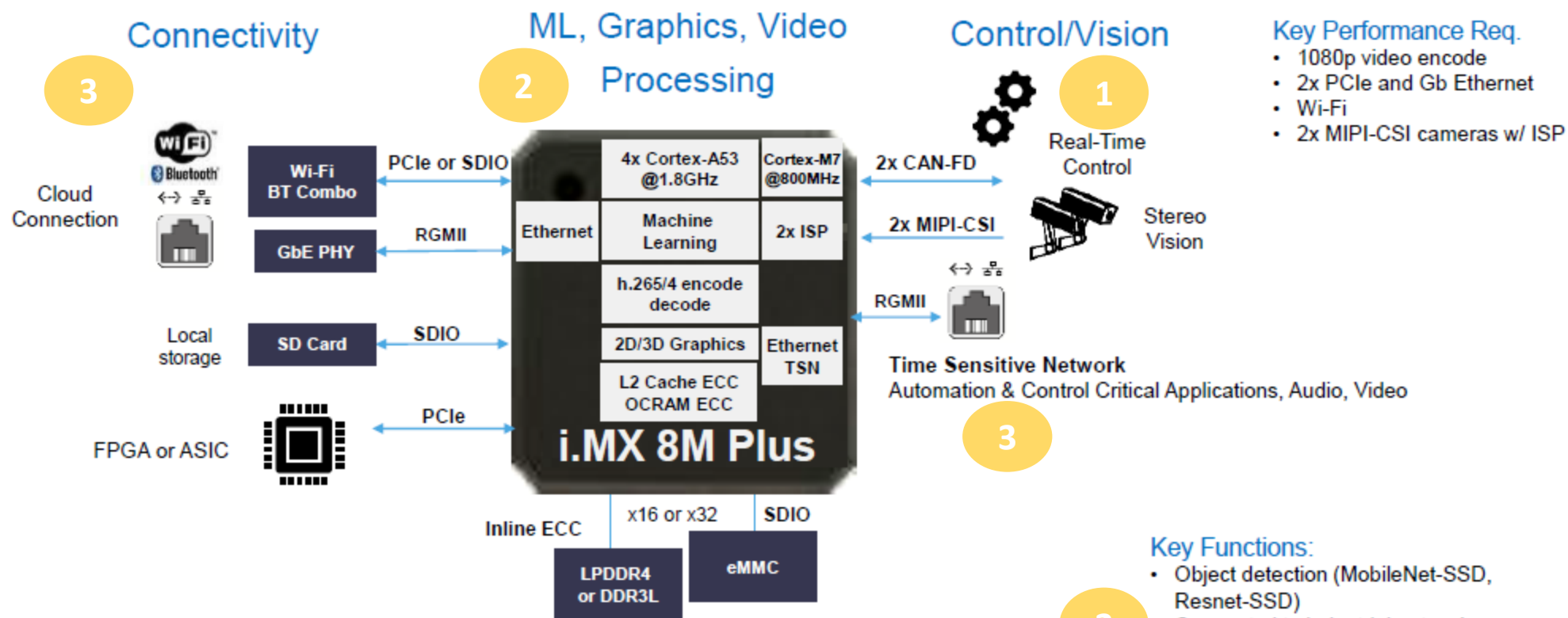
Edge Compute

Machine Vision

Part Number	Sub Family	Application Requirements	Arm CPU	NPU	ISP	Video	HiFi4 DSP	CAN-FD	Family Common Features
MIMX8ML8DVNLZAB	i.MX 8M Plus Quad	Machine Learning, Vision & Video	4x Cortex-A53 Up to 1.8GHz	2.3 TOPS	12MP resolution Up to 375MP/s	Decode: 1080p60 (h.265/4, VP8/9) Encode: 1080p60 (h.265/4)	YES	2X CAN	Cortex-M7 @800MHz GPU OpenVG 1.1, G2D, OpenGL ES3.1 Vulkan, OpenCL 1.2 FP Display/Camera HDMI Tx, LVDS, MIPI-DSI 2X MIPI-CSI Connectivity 2x USB 3.0, PCIe Gen3 2x Gb Ethernet (1x TSN) 3x SDIO Audio 18x I2S TDM (32b@768KHz) SP/DIF Rx & Tx, eARC ASRC, 8ch PDM
MIMX8ML8CVNKZAB	i.MX 8M Plus Quad		4x Cortex-A53 Up to 1.6GHz					2X CAN-FD	
MIMX8ML6DVNLZAB	i.MX 8M Plus Quad	Vision & Video	4x Cortex-A53 Up to 1.8GHz	–	12MP resolution Up to 375MP/s	Decode: 1080p60 (h.265/4, VP8/9) Encode: 1080p60 (h.265/4)	–	2X CAN	
MIMX8ML6CVNKZAB	i.MX 8M Plus Quad		4x Cortex-A53 Up to 1.6GHz					2X CAN-FD	
MIMX8ML4DVNLZAB	i.MX 8M Plus <u>QuadLite</u>	Compute & High-speed Industrial Interfaces	4x Cortex-A53 Up to 1.8GHz	–	–	–	–	2X CAN	
MIMX8ML4CVNKZAB	i.MX 8M Plus <u>QuadLite</u>		4x Cortex-A53 Up to 1.6GHz					2X CAN-FD	
MIMX8ML3DVNLZAB	i.MX 8M Plus Dual	Machine Learning, Vision & Video	2x Cortex-A53 Up to 1.8GHz	2.3 TOPS	12MP resolution Up to 375MP/s	Decode: 1080p60 (h.265/4, VP8/9) Encode: 1080p60 (h.265/4)	YES	2X CAN	
MIMX8ML3CVNKZAB	i.MX 8M Plus Dual		4x Cortex-A53 Up to 1.6GHz					2X CAN-FD	

Software, Package, and Pin Compatible

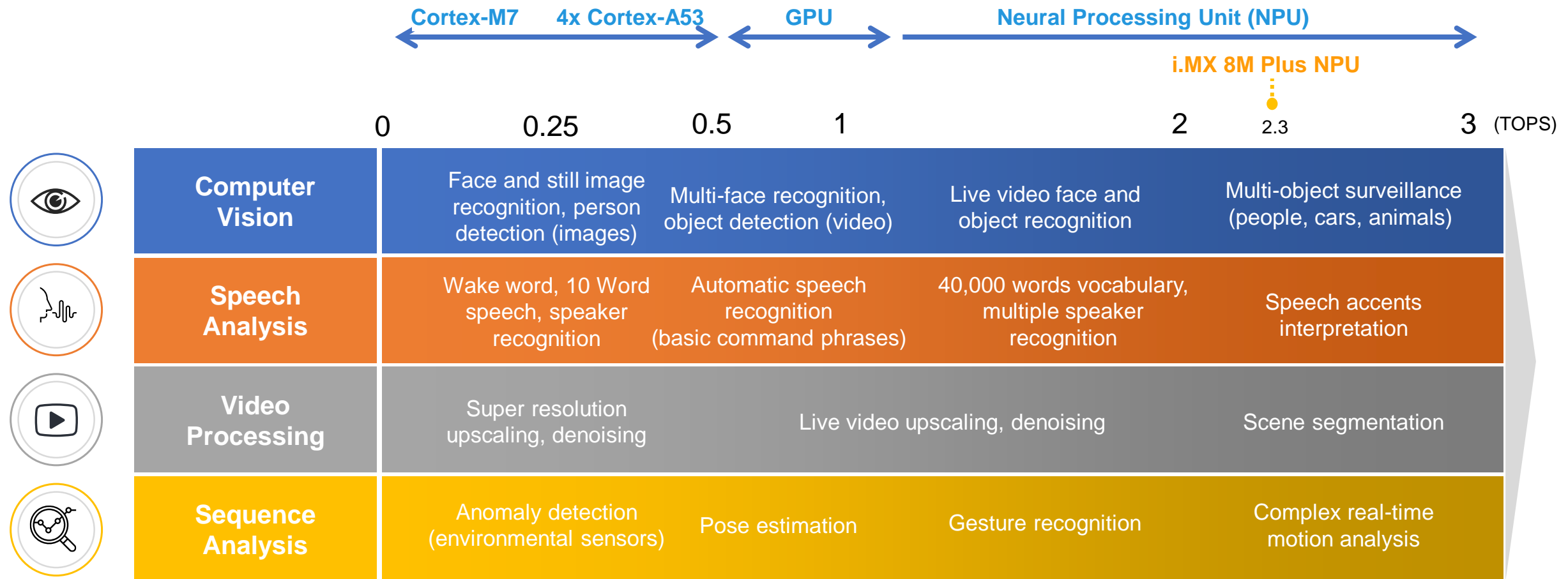
I.MX 8M PLUS FOR INDUSTRIAL MACHINE VISION



Overview:

- 2 Stereo vision camera feeds, connected to industrial network, connection to the cloud, object detection with Machine Learning at the edge

Machine learning use cases and accelerators



i.MX 8M Plus machine learning compute engines

Machine Learning Accelerator (1GHz)

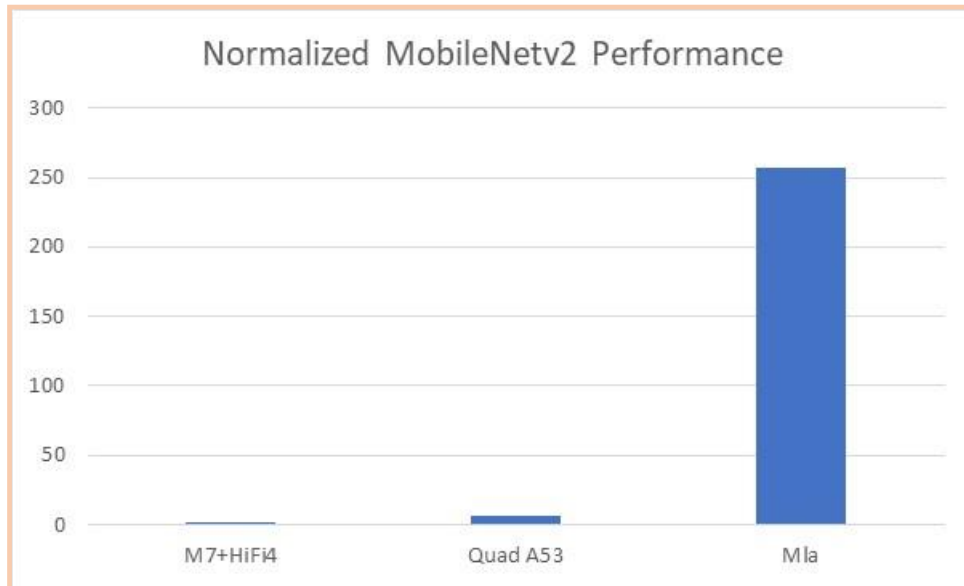
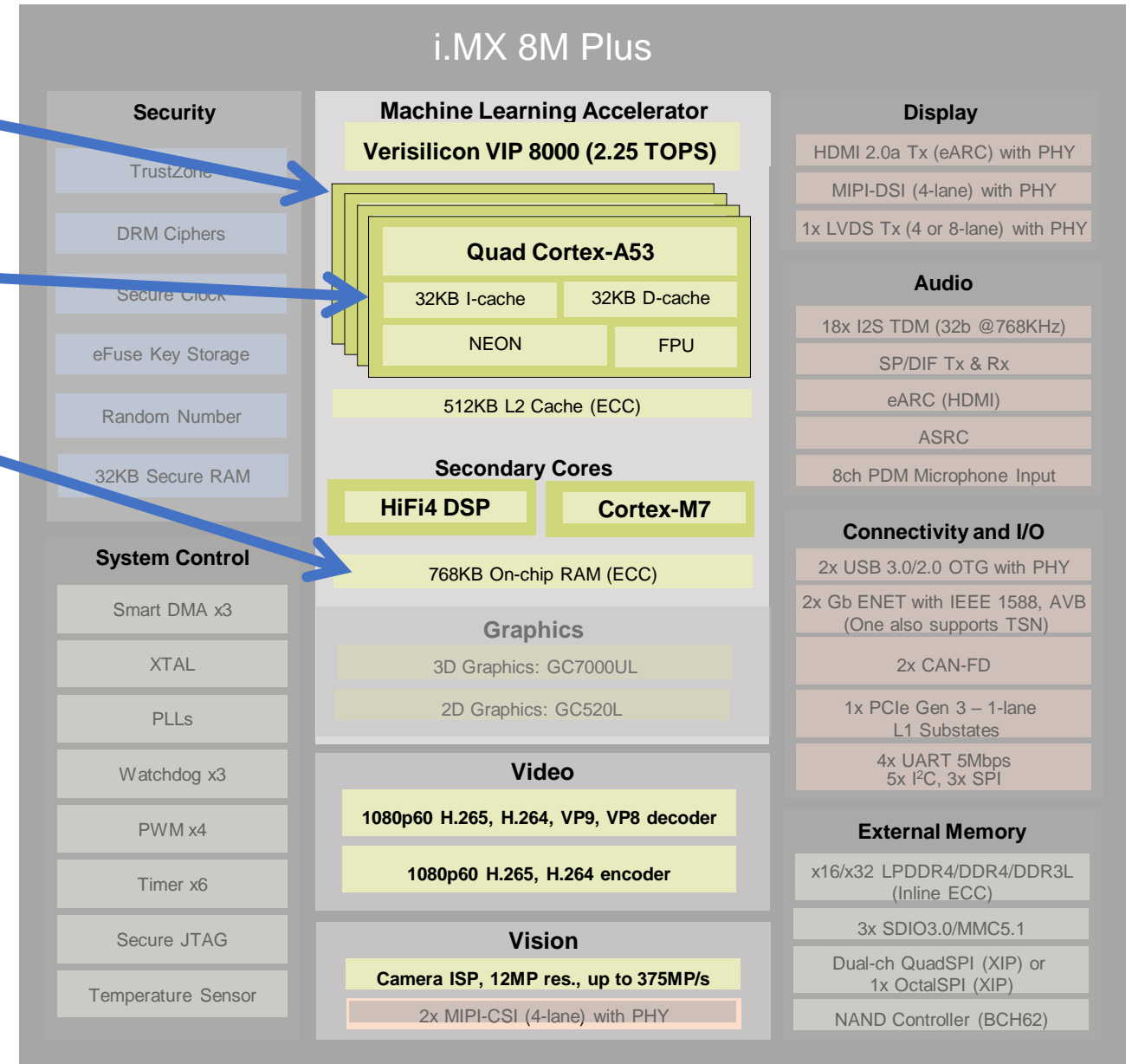
- Primary Use: Multi-camera classification/detection

Quad Arm® Cortex-A53 (1.8GHz)

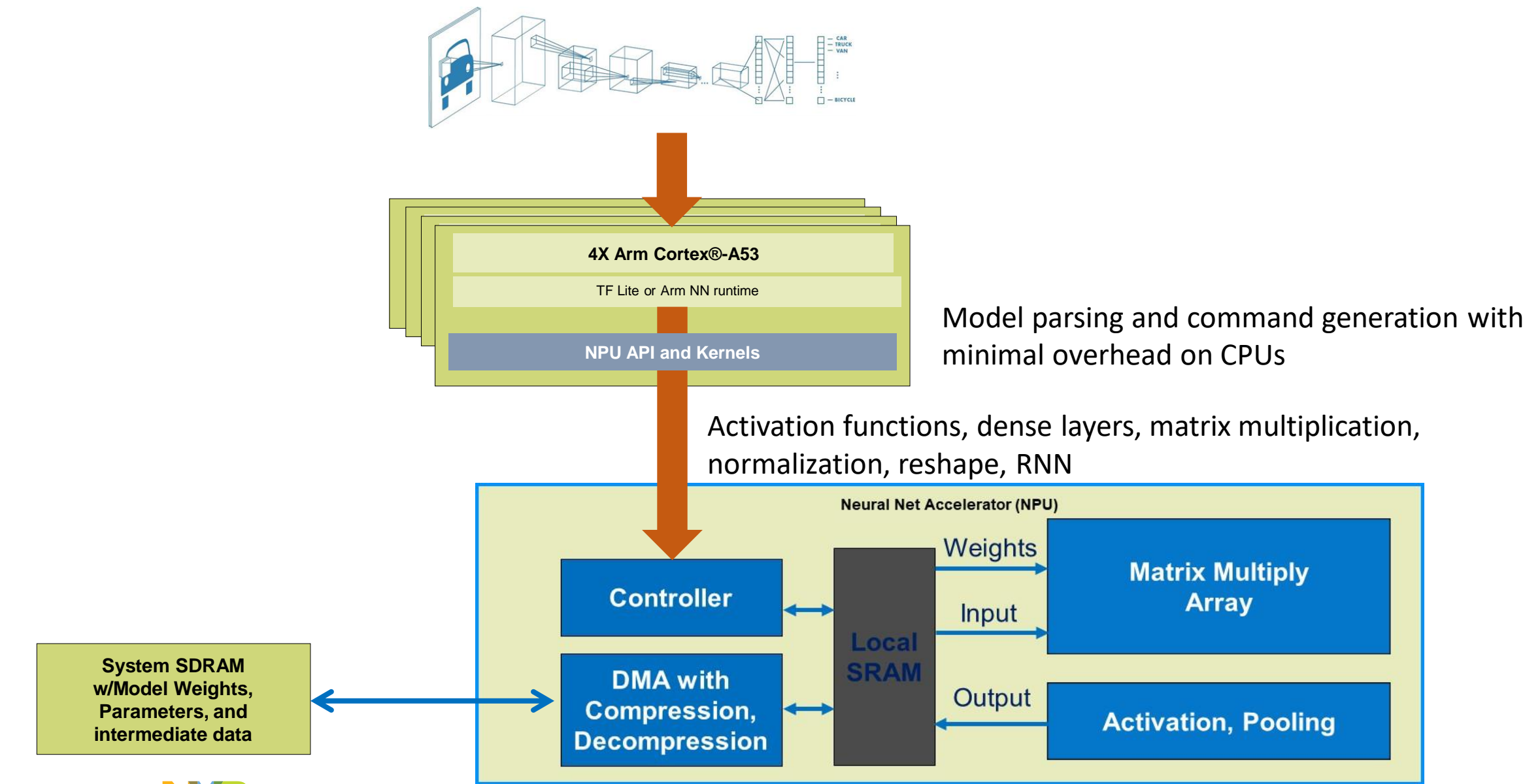
- Primary Use: Speech command recognition, object detect/classification

Cortex-M7+HiFi4 DSP (800MHz)

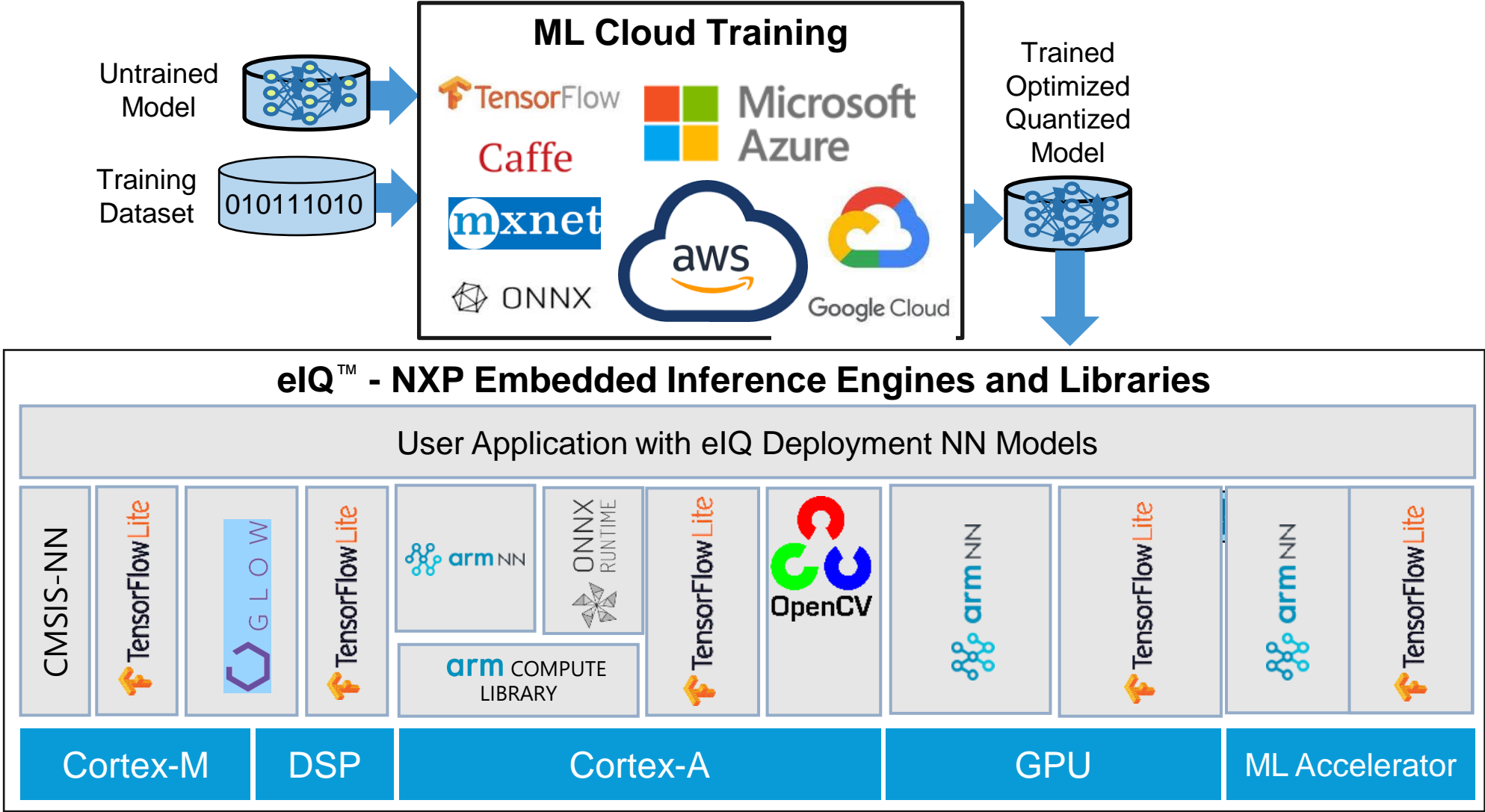
- Primary Use: Keyword detection, sensor fusion



Model Deployment on NPU



NXP eIQ™ - Machine Learning at the Edge



Enablement | 8MPLUSLPD4-EVK

Base Kit: Compute Module + Base Board

Kit Contents

- i.MX 8M Plus CPU module
- Base board
- USB 3.0 to Type C cable.
- USB A to micro B cable
- USB Type C power supply.

Compute Module: Overview

- NXP i.MX 8M Plus
- Murata Wi-Fi Type 1MW (CYW43455) 802.11 a/b/g/n/ac 1x1
- PMIC NXP PCA9450C
- 6GB LPDDR4; 16 GB eMMC5.1
- 64MB QSPI Flash
- Target: 8-layer PCB
- Target Size: 2"x2"

OS Support

- Linux, Android and FreeRTOS
- BSPs from NXP
- Others: 3rd parties



Part Numbers:
8MPLUSLPD4-EVK



Base Board: Overview

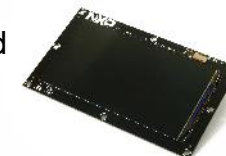
- MiniSAS Display Connectors
 - 1x MIPI-DSI
 - 1x LVDS
- MiniSAS Camera connectors
 - 2x mini-SAS MIPI-CSI
- 1x HDMI
- Audio DAC
- Microphone/headphone jacks (TBD)
- 1x micro SD card slot
- 2x 10/100/1000 Ethernet port (1x w/ TSN)
- USB 3.0 Type C for power
- 1x USB 3.0 Type A
- 1x USB 3.0 Type C
- Connectivity expansion:
 - M.2 connector (PCIe)
- General purpose expansion connector (RPI-like): UART, PDM, SPI, SAI
- 2x CAN-FD
- 10-pin JTAG
- Micro USB for console
- Target Size 8" x 6"

Optional Add-ons

MIPI CSI Board
miniSAS based
MINISASTOCSI



OLED MIPI DSI Board
miniSAS based
MX8-DSI-OLED1



MIPI-DSI to HDMI
miniSAS based
IMX-MIPI-HDMI



Audio Board
MCIMX8M-AUD

Enablement | ISP and the Basler Camera Module

Production ready 8MP camera module by **BASLER**

Camera Drivers:

- Basic feature set
- 4VL support
- Integrated on NXP BSP



Camera Module Performance Package:

Powered by Basler

Camera Driver Performance

- Full Feature Set
- Important Machine Vision Features
 - Triggering
 - Individual image capture
 - Highly differentiated camera configuration options
- Easy access to custom features
- Integrated into **GEN<i>i</i>CAM** standard

Pylon Software Suite

- Unified SDK for all interfaces & platforms
- Camera access from
 - Source code
 - GUI
 - 3rd party software
- Full feature support incl. guidance, tooltips, error handling,...



Mass Production Design

- Longevity
- Scalability
 - Other sensors and lenses available in portfolio
- Easy design in and optimized time to market

MIPI CSI-2

- For stable image transmission
- Standardized Basler dart BCON for MIPI interface

ISP Calibration & Tuning

- Bridging between ISP and Basler Pylon SDK to realize machine vision control and parameter sequencing

Industrial Proven

- Exchange lens
- Industrial standards and feature set
- Industrial OnSemi 8MP sensor



Kit Contents

Ready for production
camera module



OnSemi AR0821
4K sensor



M12 lens
easy to exchange



Mini-SAS to Basler
dart BCON MIPI connector
& flat flex cable



Part Number:
108225

Enablement | EVK and Accessory Part Numbers



Part Number	Description	Price	Availability
8MPLUSLPD4-EVK	i.MX 8M Plus Evaluation Kit	\$449	Available
IMX-MIPI-HDMI	MIPI to HDMI adapter card (mini-SAS)	\$149	Available
MX8-DSI-OLED1	MIPI-DSI 1080p OLED display with mini-SAS connector	\$450	Available
MINISASTOCI	OV5640 MIPI-CSI camera board with mini-SAS connector,	\$59	Available
MCIMX8M-AUD	i.MX Audio Board	\$1600	Available
1088225*	i.MX 8M Plus Reference Camera by Basler	\$159	Available

More on the i.MX 8M Plus. Check it out!



“NXP Debuts i.MX Applications Processor with Dedicated Neural Processing Unit for Advanced Machine Learning at the Edge” [NXP Press Release](#)

“The NXP i.MX 8M Plus Brings High-Performance Machine Learning to the Edge” [White paper](#)

“The Future is Now! i.MX 8M Plus Leading Machine Learning to the Edge” [Blog](#)

“Why add an ISP and ML Accelerator to the i.MX 8M Family” [Blog](#)

i.MX 8M Plus Fact Sheet – [web](#)

i.MX 8M Plus Product Webpage – www.nxp.com/imx8mplus



Thank you