NXP i.MX 8 Applications Processors

Patrick Stilwell

Product Marketing i.MX 8 Applications Processors

November 2019

SECURE CONNECTIONS FOR A SMARTER WORLD

i.MX 8 Update

Qualification Update

- All read points for Automotive qualification have PASSED.
- The i.MX 8QuadMax and 8QuadPlus automotive qual has been completed.
- The i.MX 8QuadMax and 8QuadPlus industrial Qual is on target for Dec 5th completion.

Production Shipments

All “M” marked units in backlog will now be scheduled with shipment dates.

i.MX 8 – More Information www.nxp.com/imx8

Product Summary:
- Fact Sheet

Product Documentation:
- Datasheet
- Reference Manual
- Errata

Application Note:
- Power Consumption
- Product Life Time

community.nxp.com

NXP i.MX Community

Evaluation Kit Summary:
- EVK Fact Sheet

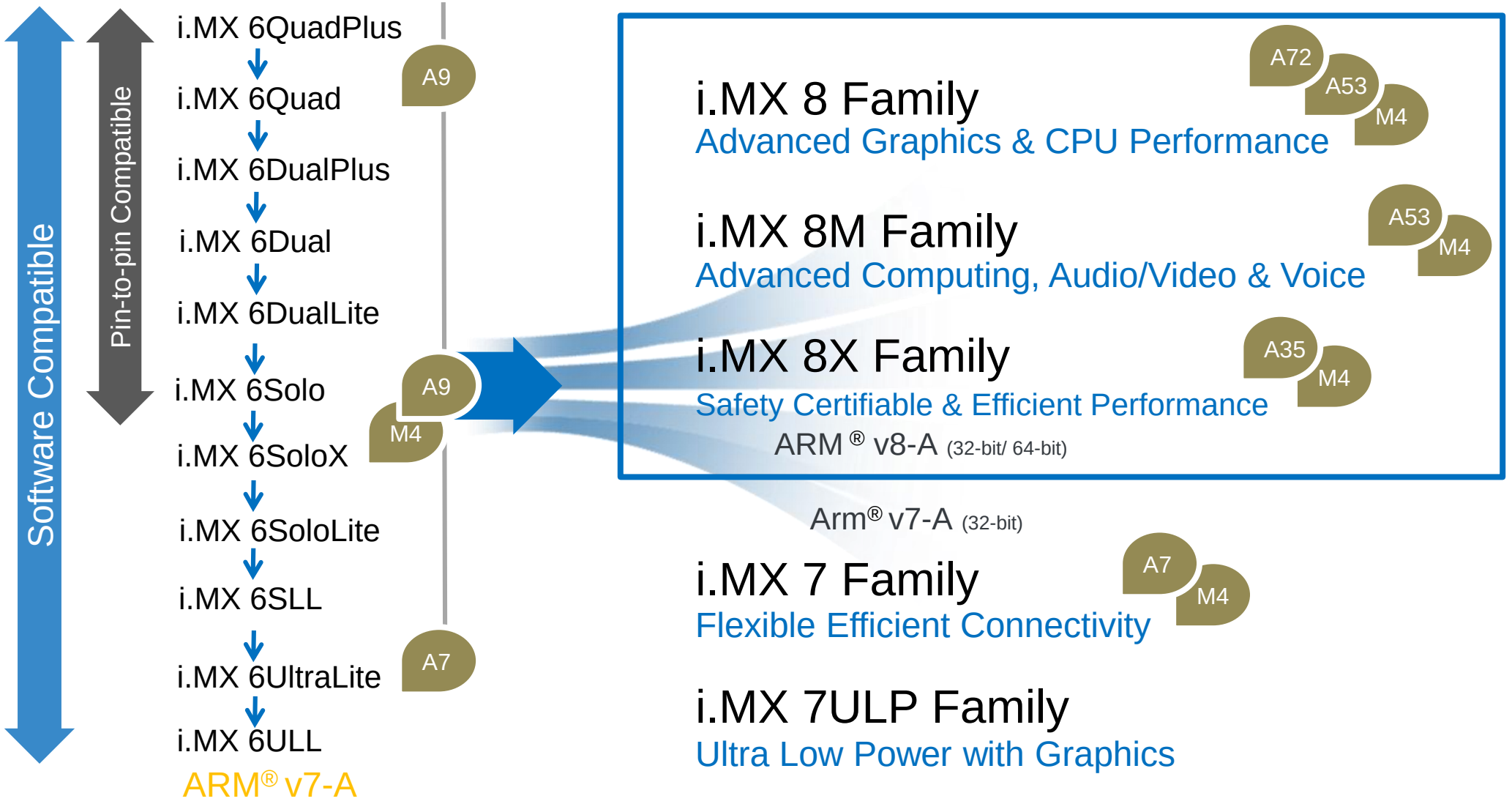
EVK Documentation:
- Quick Start Guide
- EVK Hardware User's Guide

Hardware Design:
- Hardware Developer's Guide
- EVK Design Files
- BSDL Files
- IBIS Model

System on a Module
- Partners SOMs

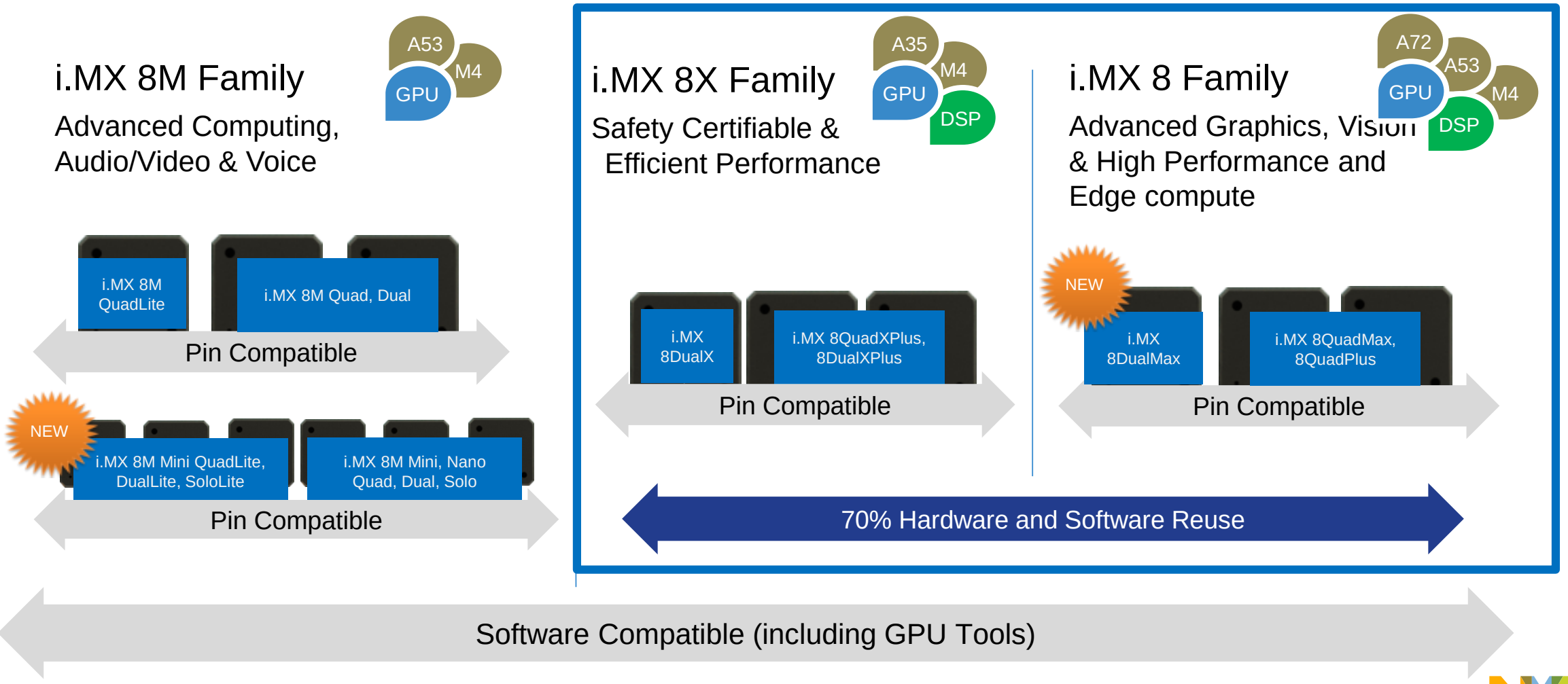
Board Support Package:
- Software and Development Tools

i.MX Applications Processor Scalability



i.MX 8 Series: Scalable Solutions

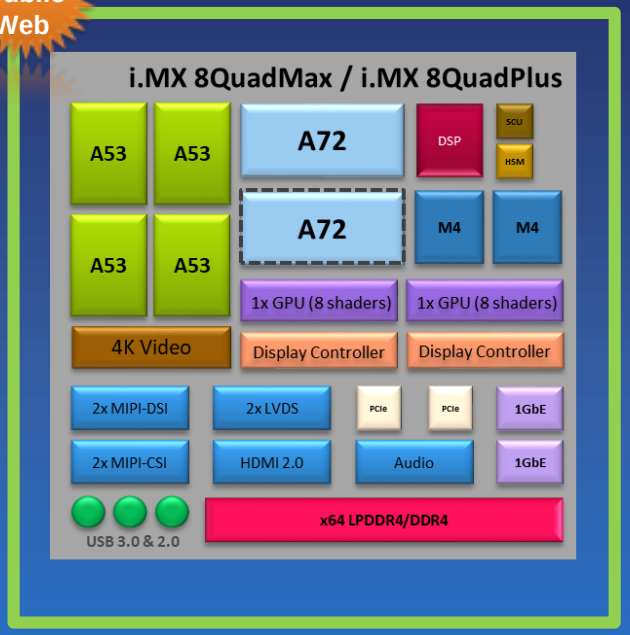
Scalable series of three Arm® V8 64-bit (/32-bit) based SoC Families

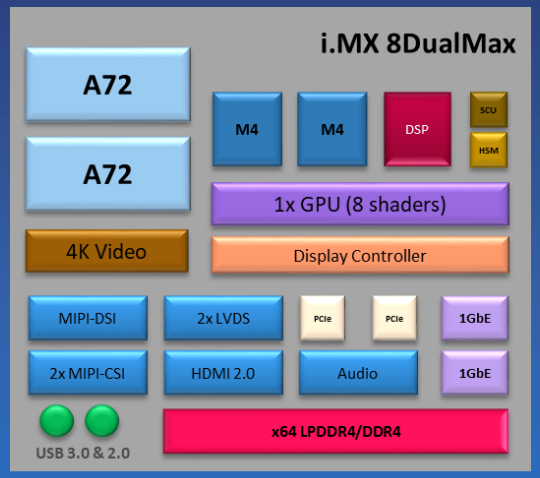


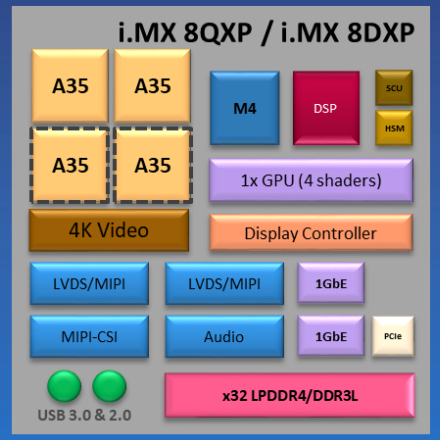
i.MX 8 and 8X Family Subsystem Reuse

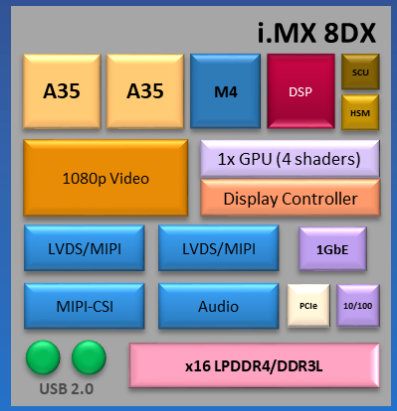
Scalable Embedded Processors for Automotive & Industrial Applications

On Public Web

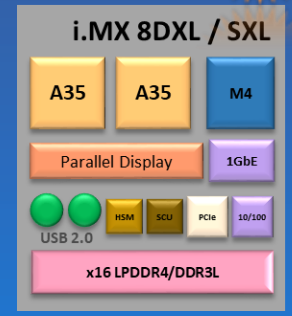








NEW



HMI, Vision, Audio and Voice Enabled with i.MX

DSP, Vision Acceleration, Real Time Domain, Safe Camera/Display/Audio, Simplified eCockpit

Unmatched range of cost-performance scaling with pin-compatible options and the highest level of software reuse

70% Subsystem re-use: Enables faster hardware and software development time between programs

New Connectivity & Headless Optimization with i.MX 8DualXLite / 8SoloXLite

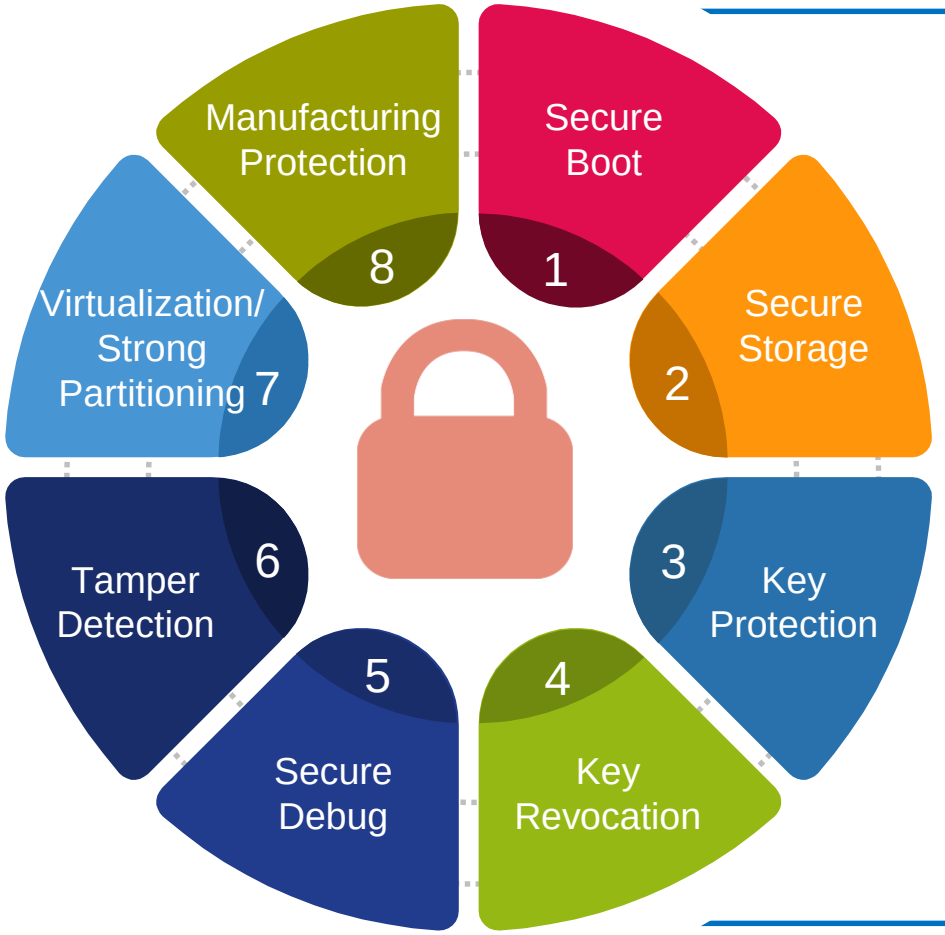
NXP Leverages Core Competence in End-to-End System Security

Mobile and stationary machines want full access to cloud-based knowledge

This requires faster, more reliable and secure connectivity

NXP is at the forefront of secure communications and tamper resistance

Leadership experience in security markets: over 10 Billion smart cards sold



Baseline Security
Secure Boot
Secure Debug
Secure Storage

Tamper Detection
Detect Tamper Events
Tamper Response

Advanced Security
Key Protection
Key Revocation
Strong Partitioning

Qualification Specifications for i.MX Applications Processors

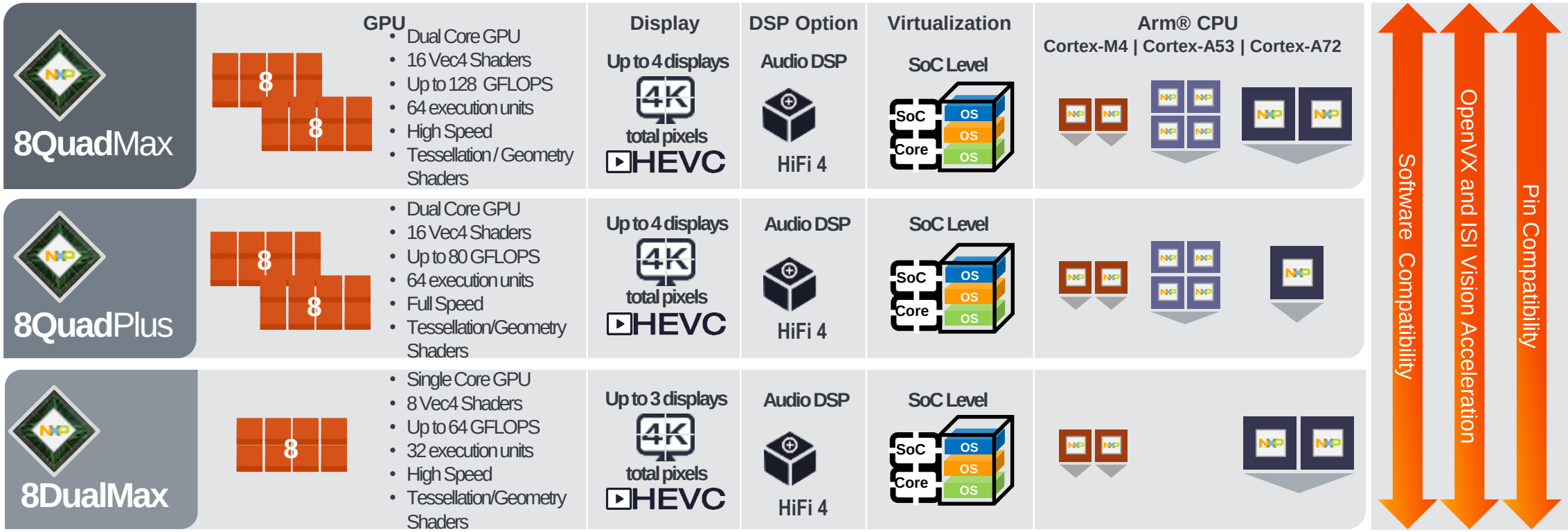
Qualification Level	Characteristics
Commercial or Consumer Highest MHz	5-year life, 50% on Typically: 0C to +85C Tj
Automotive Widest temperature range	15-year life, 10% on Typically: -40C to +125C Tj
Industrial Longest operating life	10-year life, 100% always on Typically: -40C to +105C Tj

i.MX 8/8X Safety and Reliability Features

Safety Feature	8QuadXplus, 8DualXPlus, 8DualX	8QuadMax, 8QuadPlus
Ultra Low Alpha (ULA) package	✓	✓
Manufacturing Process	28nm FD-SOI	28nm FD-SOI
Memory Protection (ECC, parity)		
Arm® Cortex-A L1 cache	Parity	Parity
Arm Cortex-A L2 cache	ECC	ECC
Arm® Cortex-M4 tightly coupled memory	ECC	ECC
DDR memory interface	ECC on DDR3L	-
Failover Displays and Cameras	✓	✓
Highest Automotive Safety Certifiable*	QM	QM
Targeted Industrial Safety Certifiable *	SIL3	SIL2

*Targeted for ASIL A/B and SIL 2/3 platforms

i.MX 8 Family of Industrial / Automotive Applications Processors



Family of Scalable Automotive Multimedia Processors

eCockpit

Infotainment

Graphical Instrument Clusters

i.MX 8 Family Targets Multi-Domain Applications

- Automotive
  - Full digital electronic cockpit (eCockpit)
    - Infotainment, instrument cluster, head unit, heads-up display (HUD), rear seat entertainment
- Industrial, Building and Home Automation
  - Advanced industrial human machine interface (HMI) and control
  - **Machine Learning**, object classification, vision recognition and AI
  - Computer vision and surround view
  - Environmental monitoring
  - Multiple domain security systems
- Autonomous Robots and Vehicles

Industrial Applications

Human machine interface

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

Machine vision & learning

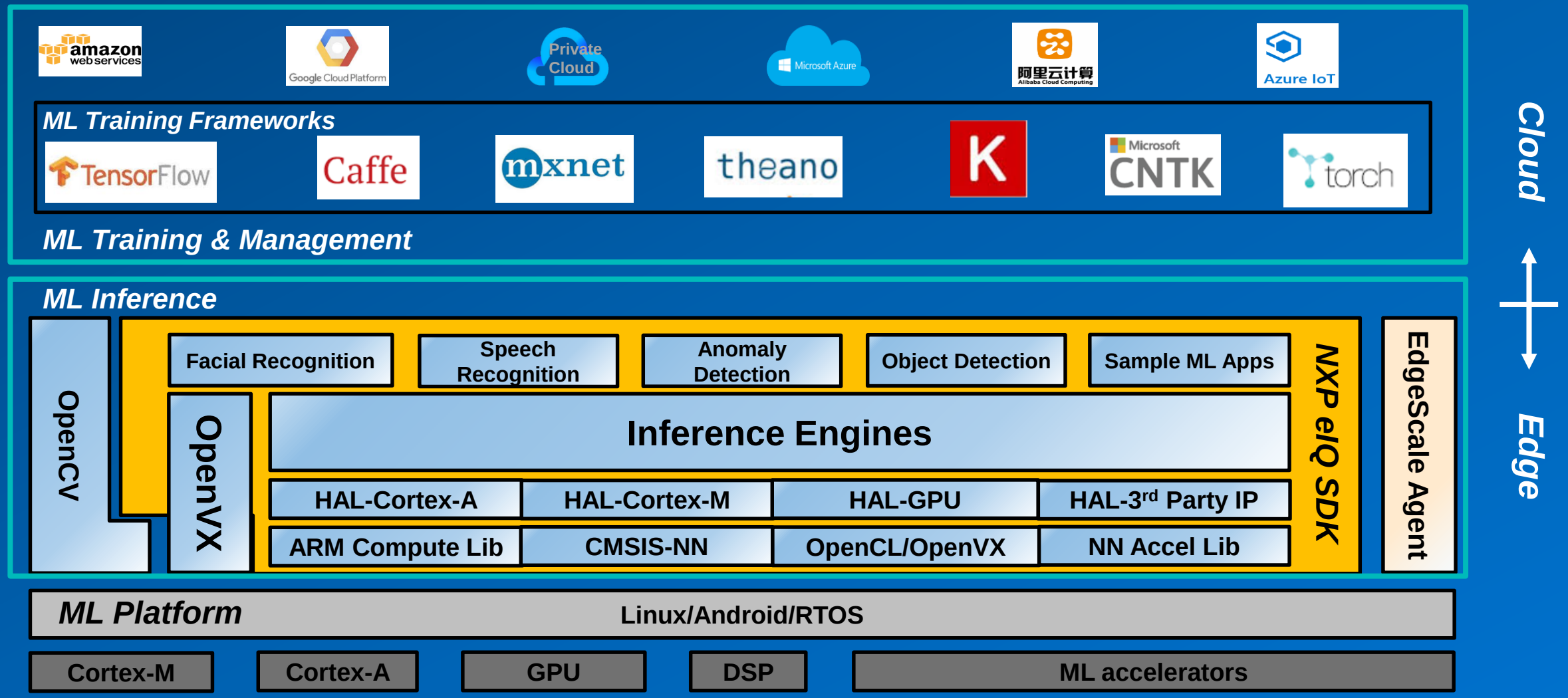
Scanner, Service robot,
Room monitor, Industrial printer,
Machine vision

Industrial control & network

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

- Longevity
- Extreme Operating Conditions
- Security
- Safety and Reliability
- Scalable Solutions with Broad Packages

Machine Learning Functions on i.MX 8 – eIQ SDK



i.MX 8QuadMax and 8QuadPlus

Multiple Systems, One Processor

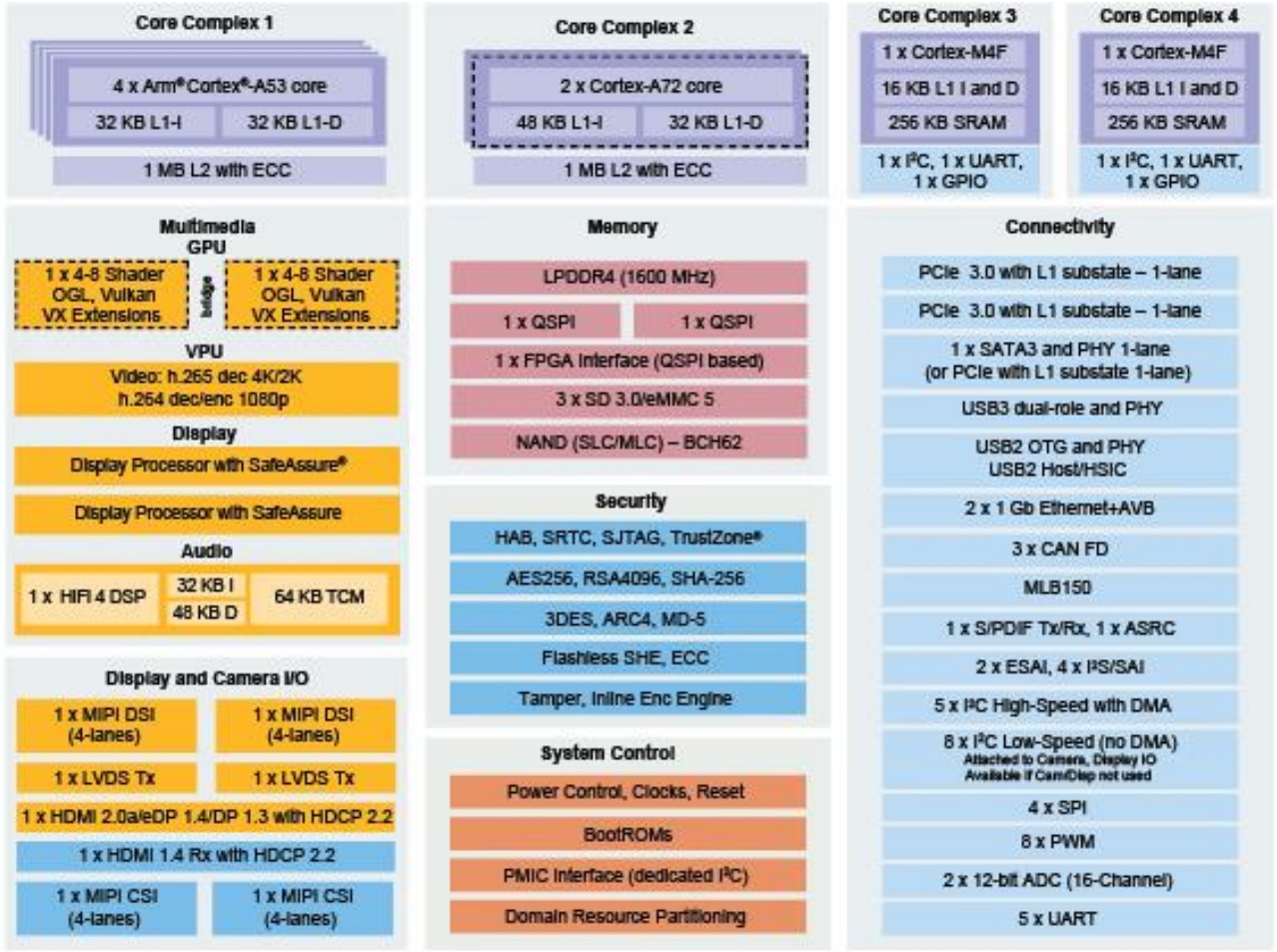
- Combine multiple systems into one, easily
- Run-time system partitioning & isolation
- Advanced, programmable security (e.g. Flashless SHE)

Multi-Display and Multi-Domain Functionality

- Up to four screens with independent content
- Split Media Architecture: Rich Graphics, faster deployment
- SafeAssure ASIL-B targeted hardware
- Failover capable display and audio controller: Alive during reset or OTA updates

Enabling the New World of Seamless Machine Interfaces

- Advanced vision-based HMI systems (gesture, object): Local and cloud
- View the world in 360º via multi-camera support & image stitching
- Multi-domain voice-recognition and audio processing



i.MX 8 Production Part Numbers Now Available to Order

Production Part Numbers

- MIMX8QM6AVUFFAB
- MIMX8QM5AVUFFAB
- MIMX8QP5AVUFFAB
- MIMX8QP6AVUFFAB

Sample Part Numbers

- PIMX8QP5AVUFFA7
- PIMX8QM6AVUFFA7

SECURE CONNECTIONS
FOR A SMARTER WORLD

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NXP

Joint Webinar:

Develop faster with the i.MX 8QuadMax Applications Processor

Presented by
Toradex and NXP

EMBEDDED COMPUTING MADE EASY

WITH YOU TODAY…

Patrick Stilwell
Product Marketing Manager - i.MX 8
NXP

Samuel Imgrueth
CEO
Toradex

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AGENDA

Toradex Introduction

Introduction to the NXP® i.MX 8 QuadMax Applications Processor

Introduction to the Apalis SoM based on the i.MX 8 QuadMax Applications Processor family

Operating Systems and Software Solutions

Partner Ecosystem around the i.MX 8 Platform

Heterogeneous Multicore and Functional Safety

Live Q&A

WHAT WE DO

Reliable Arm® System on Modules (SoMs)

Make embedded computing easy

Lowest cost of ownership

Industry-leading support

POLL
HAVE YOU USED AN NXP i.MX APPLICATIONS PROCESSOR BEFORE?

No

Yes, NXP i.MX 6 Family

Yes, NXP i.MX 7 Family

Yes, NXP i.MX 8 Family

Yes, other i.MX Family

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APALIS SoM WITH
NXP i.MX 8QM/8DM

Highest performance i.MX 8QM Applications Processor

NXP® i.MX 8QuadMax (i.MX 8QM)
i.MX 8QuadPlus (i.MX 8QP)

Up to 4GB of LPDDR4 Memory

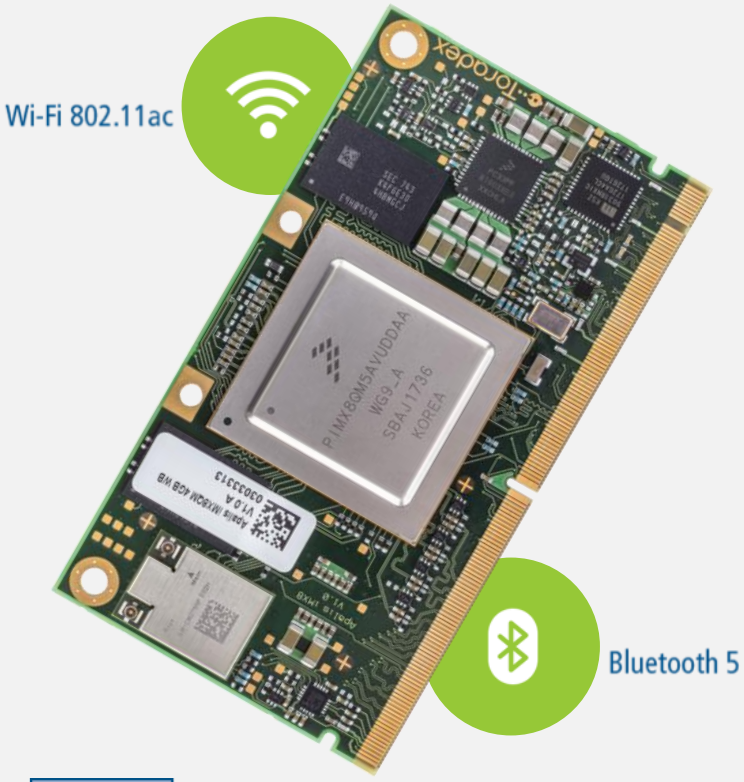
16 GB Industrial Grade eMMC Flash

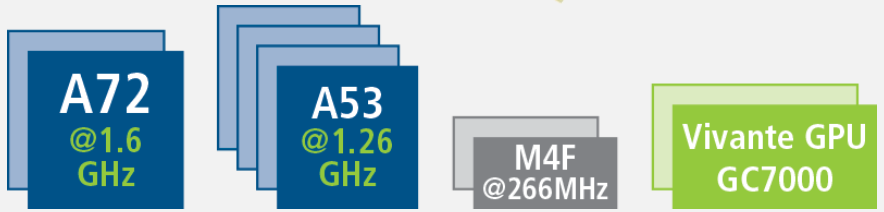
802.11ac 2x2 Wi-Fi & Bluetooth 5

Dual Quad-Lane MIPI CSI-2

Dual Gigabit Ethernet

USB 3.0, PCIe and SATA





Torizon

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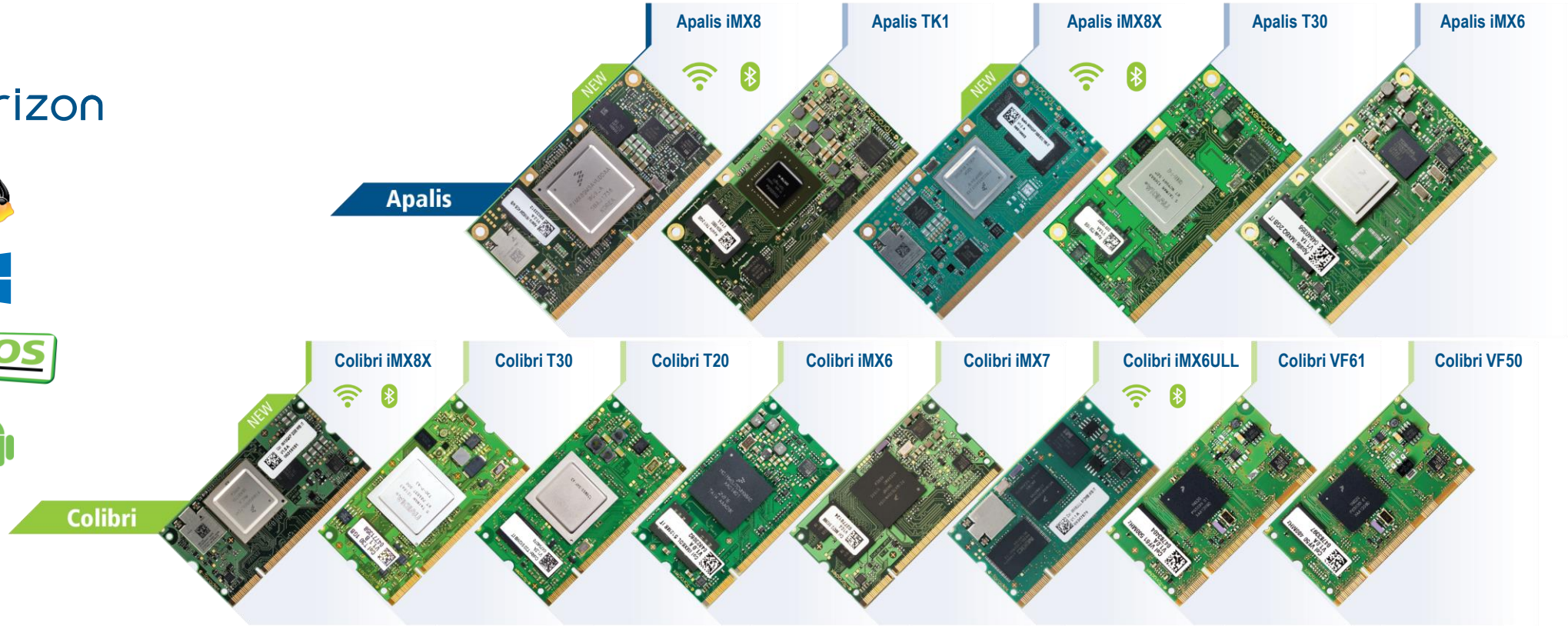
PRE-INSTALLED
TORADEX EASY INSTALLER

www.toradex.com/computer-on-modules/apalis-arm-family/nxp-imx-8

PRODUCT PORTFOLIO

Torizon

freeRTOS



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APALIS SoMs IN COMPARISON

Apalis iMX8

A72 @1.6 GHz

A53 @1.26 GHz

M4F @266MHz

Vivante GPU GC7000

RAM: 4GB

FLASH: 16GB

Torizon

Apalis TK1

A15 @2.1 GHz

M4 @100MHz Companion core

Kepler GPU with 192 CUDA® cores

RAM: 2GB

FLASH: 16GB

NVIDIA CUDA

Apalis iMX8X

A35 @1.2 GHz

M4F @266MHz

Vivante GPU GC7000 Lite

RAM: 2GB

FLASH: 8GB

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Apalis iMX6

A9 @1.0 GHz

Vivante GPU GC2000

RAM: 2GB

FLASH: 4GB

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APALIS WITH NXP i.MX 8 VARIATIONS

	Apalis iMX8 - QuadMax 4GB Wi-Fi/Bluetooth IT	Apalis iMX8 - QuadMax 4GB IT	Apalis iMX8 - QuadPlus 2GB Wi-Fi/Bluetooth	Apalis iMX8 - QuadPlus 2GB
Product Number	00371001	00471000	00481000	00491000
CPU Details				
CPU Name	NXP® i.MX 8QuadMax	NXP® i.MX 8QuadMax	NXP® i.MX 8QuadPlus	NXP® i.MX 8QuadPlus
CPU Type	2x Arm Cortex™-A72 4x Arm Cortex™-A53	2x Arm Cortex™-A72 4x Arm Cortex™-A53	1x Arm Cortex™-A72 4x Arm Cortex™-A53	1x Arm Cortex™-A72 4x Arm Cortex™-A53
DSP	HiFi4 DSP	HiFi4 DSP	—	—
Memory				
RAM	4GB LPDDR4 (64 Bit)	4GB LPDDR4 (64 Bit)	2GB LPDDR4 (64 Bit)	2GB LPDDR4 (64 Bit)
Flash	16GB eMMC (8 Bit)	16GB eMMC (8 Bit)	16GB eMMC (8 Bit)	16GB eMMC (8 Bit)
Connectivity				
Wi-Fi	Dual-band 802.11ac 2x2 MU-MIMO	—	Dual-band 802.11ac 2x2 MU-MIMO	—
Bluetooth	Bluetooth 5	—	Bluetooth 5	—
Multimedia				
Display Controller	Quad, Independent	Quad, Independent	Quad, Independent	Quad, Independent
Graphics Controller	Dual Vivante GC7000 XSVX	Dual Vivante GC7000 XSVX	Dual Vivante GC7000Lite XSVX	Dual Vivante GC7000Lite XSVX
Physical				
Temperature	-40° to +85° C (1)	-40° to +85° C	-25° to +85° C	-25° to +85° C

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CARRIER BOARDS

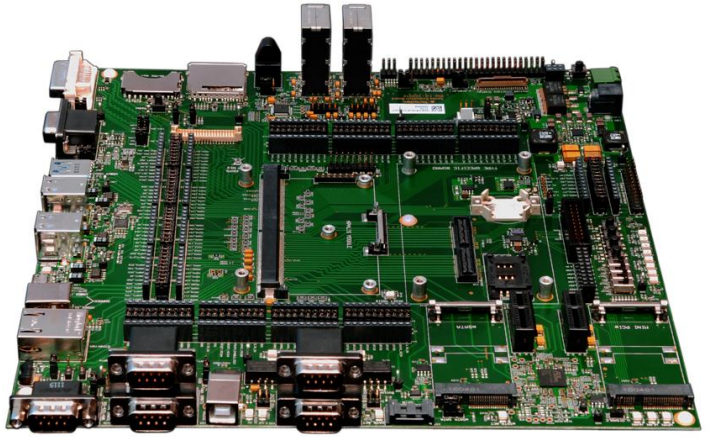
Compatible with Ixora and Apalis evaluation board

Will work in most cases with existing customer boards

- Pinout Designer

Third-party carrier boards available

Gumstix Geppetto integration on its way



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PRODUCTION QUALITY
LINUX® BSP

Built with Yocto Project

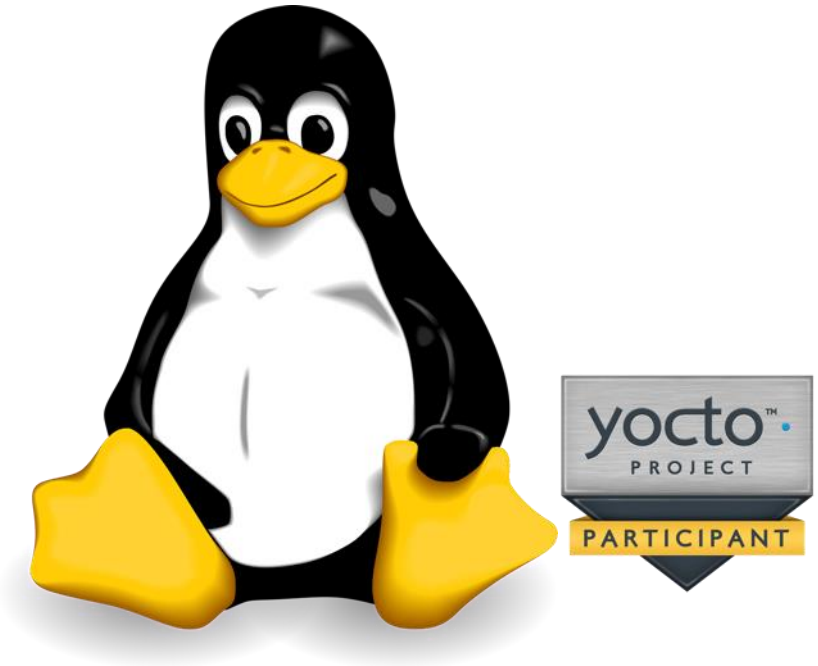
Ideal starting point for your customization

Free and open source

Free technical support

Open issues/feature tracker

Active Community moderated by Toradex engineers



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Torizon

EASY-TO-USE INDUSTRIAL LINUX SOFTWARE PLATFORM

Fast time-to-market
Ready-to-use
Linux distribution

Simple updates
Built-in, automotive-grade,
over-the-air update capabilities

Secure
Frequent updates, accessible
security features

Real-time
Optimized
real-time option

Stable
Modern continuous integration
infrastructure and verification

Open Source
Based on open projects
No lock-in

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YOU FOCUS ON APPLICATION DEVELOPMENT. NO YOCTO SPECIALISTS REQUIRED!

ADDITIONAL OPERATING SYSTEMS
ANDROID

Android 9.0 Pie

Support by Partner Kynetics

Evaluation image ready via the Toradex Easy Installer

Source code freely available

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ADDITIONAL OPERATING SYSTEMS

Real-time and safety certifiable for automotive, medical, industrial applications

Partner Network for further customizations

Public BSP available soon

BlackBerry | QNX

Green Hills® SOFTWARE

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POLL

WHAT OPERATING SYSTEMS DO YOU PLAN TO USE ON YOUR DEVICE?

Yocto Project

Linux Distribution (Debian, Ubuntu, OpenWRT, Torizon…..)

Android

Windows 10 IoT Core

Others (QNX, INTEGRITY, VxWorks,…..)

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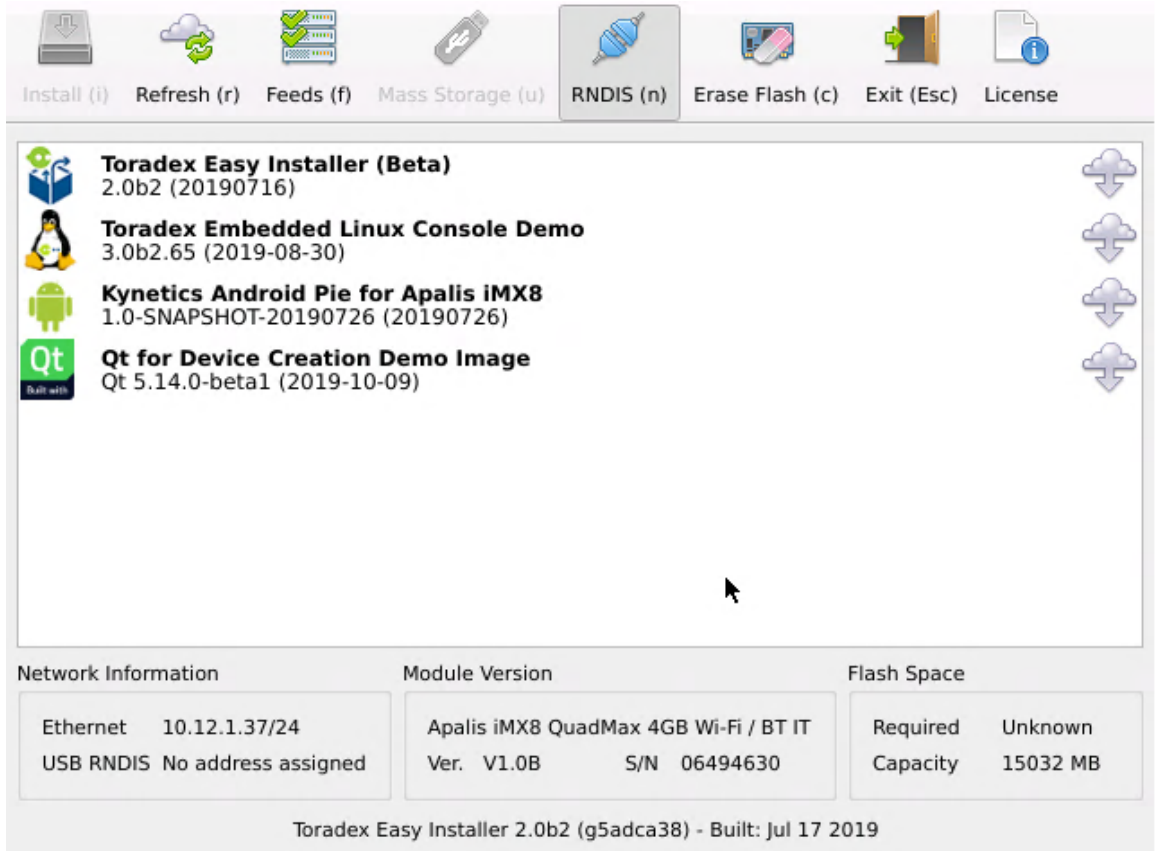
OUT-OF-THE-BOX EXPERIENCE
TORADEX EASY INSTALLER

Toradex Easy Installer preinstalled on all modules

One-click OS and demo images installation

Online and offline capabilities

Simplified volume production



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TORADEX
EASY INSTALLER
BOOT2QT IN MINUTES

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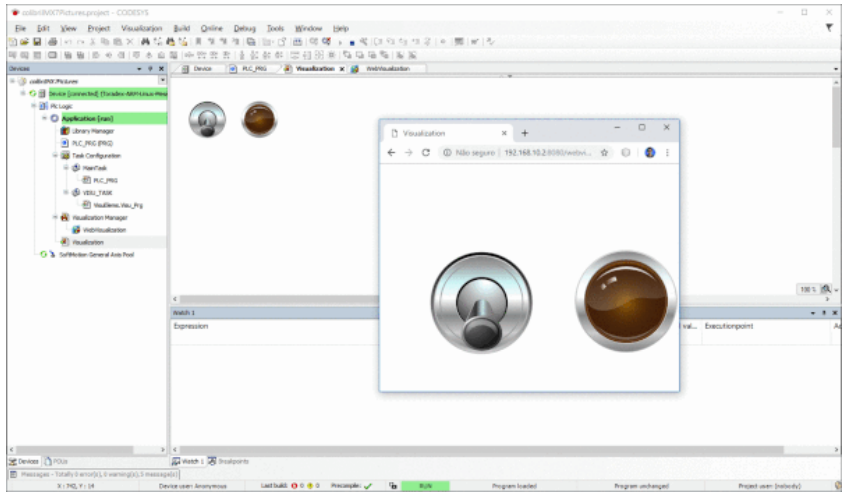
PARTNER DOCKER CONTAINER
CODESYS

docker pull torizonextras/codesys

docker run --rm -dt --name codesys --network host --privileged torizonextras/codesys

Getting Started on Toradex Developer Center

https://developer.toradex.com/knowledge-base/codesys-partner-container



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PARTNER DOCKER CONTAINER
CRANK

Available on DockerHub

Evaluate it on Apalis with NXP i.MX 8 in a few minutes

Free Trial of Development Environment available

Getting Started on Toradex Developer Center

https://developer.toradex.com/knowledge-base/partner-demo-container-crank-storyboard

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AI AT THE EDGE
i.MX 8 IDEAL FIT

6x High Performance 64-bit ARMv8 CPU Cores with NEON

Dual GPUs with OpenCL and OpenVX capabilities

Dual Quad-Lane MIPI CSI-2 Camera Interfaces

Gigabit Ethernet / USB 3.0 / PCIe High-speed I/Os

OpenCL

OpenVX™

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AI AT THE EDGE
ALLIED VISION

Alvium Camera Series for Embedded Vision

Industrial grade MIPI CSI camera

Cost optimized

Allied Vision

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AI AT THE EDGE
XNOR.AI

Highly Optimized on device AI

Multicamera Demo

xnor.ai

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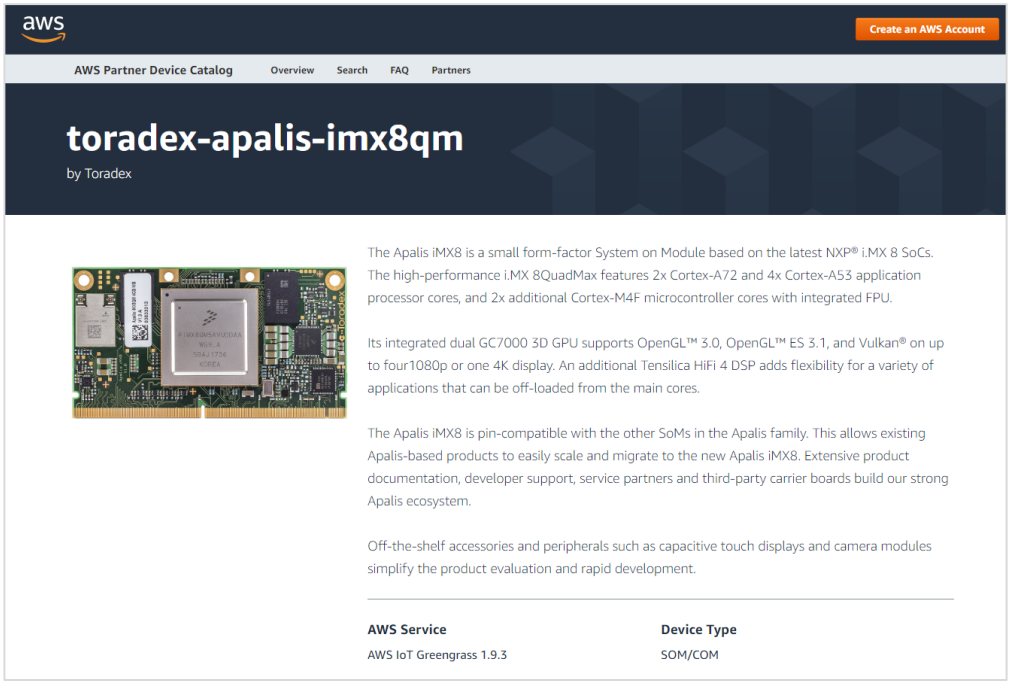
AI AT THE EDGE

AWS IoT GREENGRASS AND SAGEMAKER NEO

AWS SageMaker Neo – Optimized NN Model for NXP i.MX 8

Apalis with i.MX8 is AWS IoT Greengrass qualified



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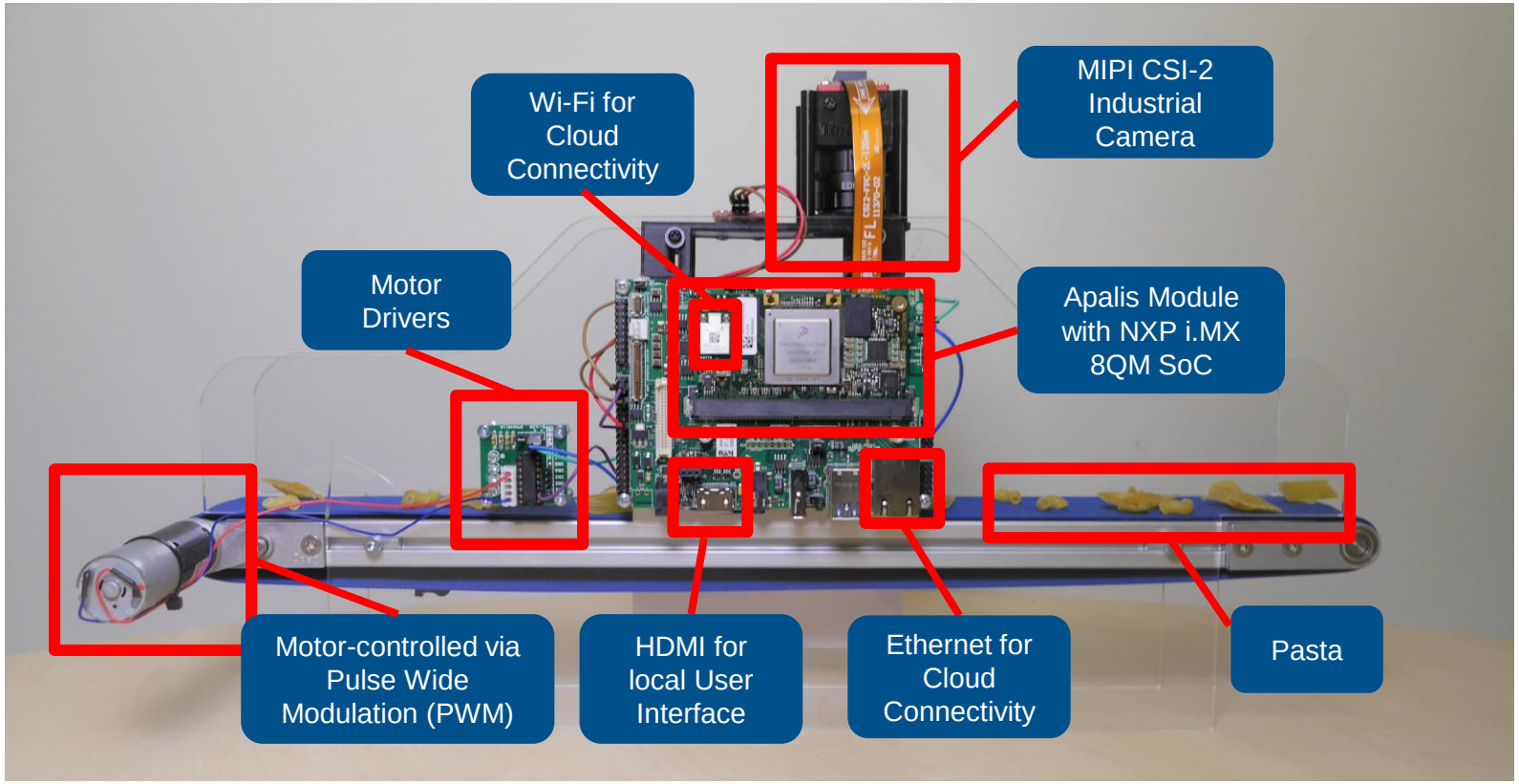
AWS IoT GREENGRASS AND SAGEMAKER NEO



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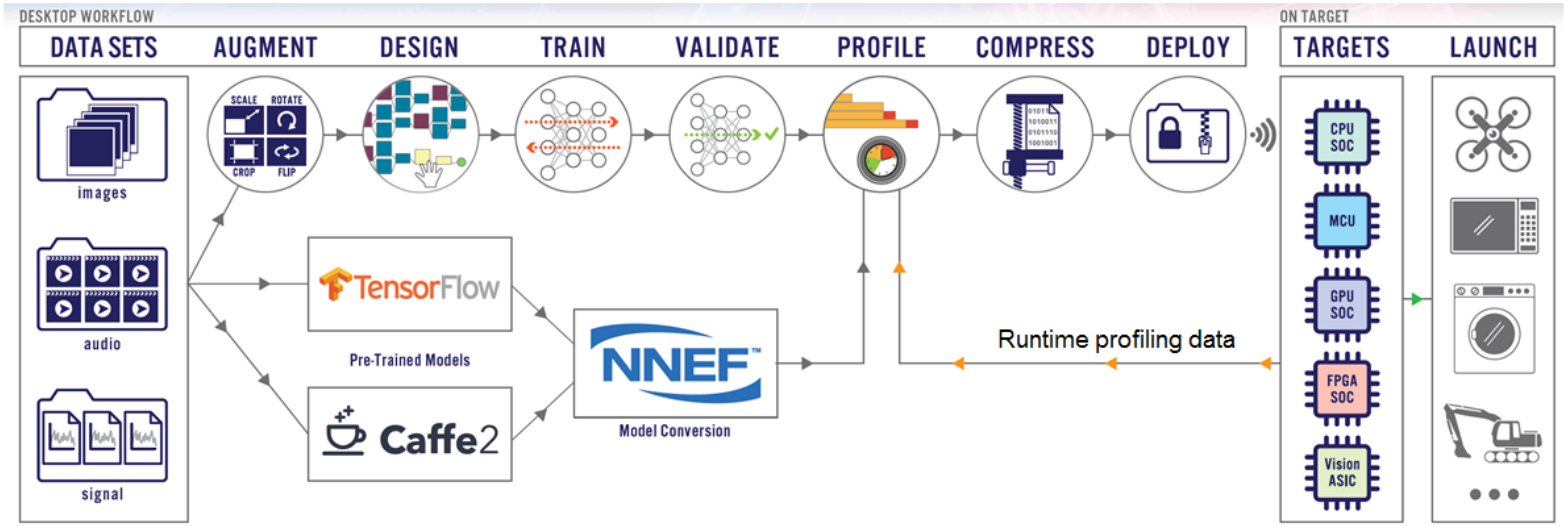
AI AT THE EDGE

AU-ZONE

Au-Zone Technologies Inc.

DeepView™ 2.0

Read More: https://www.cnx-software.com/2019/02/05/adding-machine-learning-image-processing-embedded-product/



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HETEROGENEOUS
MULTICORE

Two Cortex-M4F MCU cores

M4 can be used for real-time, low power or functional safety applications

Toradex simplifies development for M4 with Visual Studio Code integration

Visual Studio Code

freeRTOS

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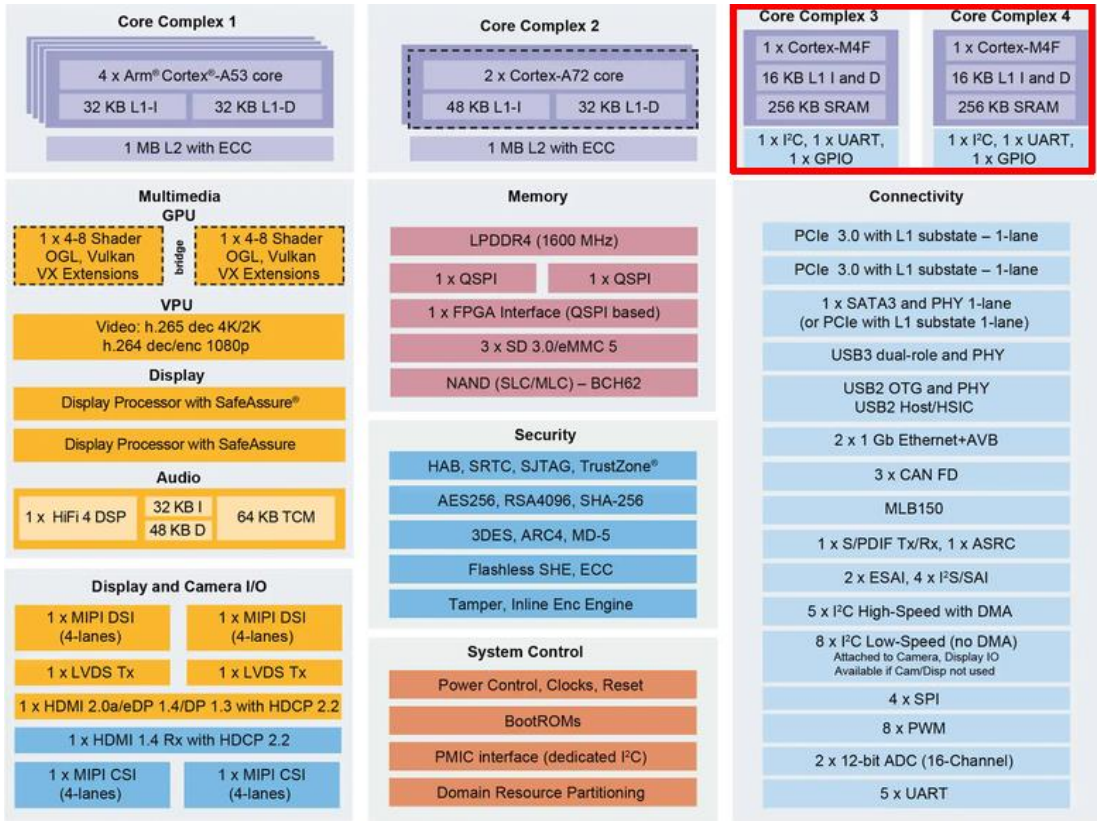

HETEROGENEOUS MULTICORE
FOR FUNCTIONAL SAFETY

Development of ASIL-B certified cluster

Linux and Qt on Cortex-A application processor cores

M4 MCU doing the CRC check on Framebuffer to check critical warning icons

RIMAC AUTOMOBILI

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POLL

ARE YOU PLANNING TO USE HETEROGENEOUS MULTICORE PROCESSING?

No

Yes, I plan to use it for Realtime Offloading

Yes, I plan to use it for Low Power

Yes, I plan to use it for Safety

Yes, I plan to use it for other Purposes

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Q&A

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NXP

THANK YOU FOR YOUR INTEREST.

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