

i.MX 8 Product Overview

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SECURE CONNECTIONS
FOR A SMARTER WORLD

Agenda

- Relevant sessions you may want to check out
- i.MX 8 Roadmap Update
- i.MX 8 BSP Software
- i.MX 8 Middleware Components
- Brief look at what's next for i.MX automotive

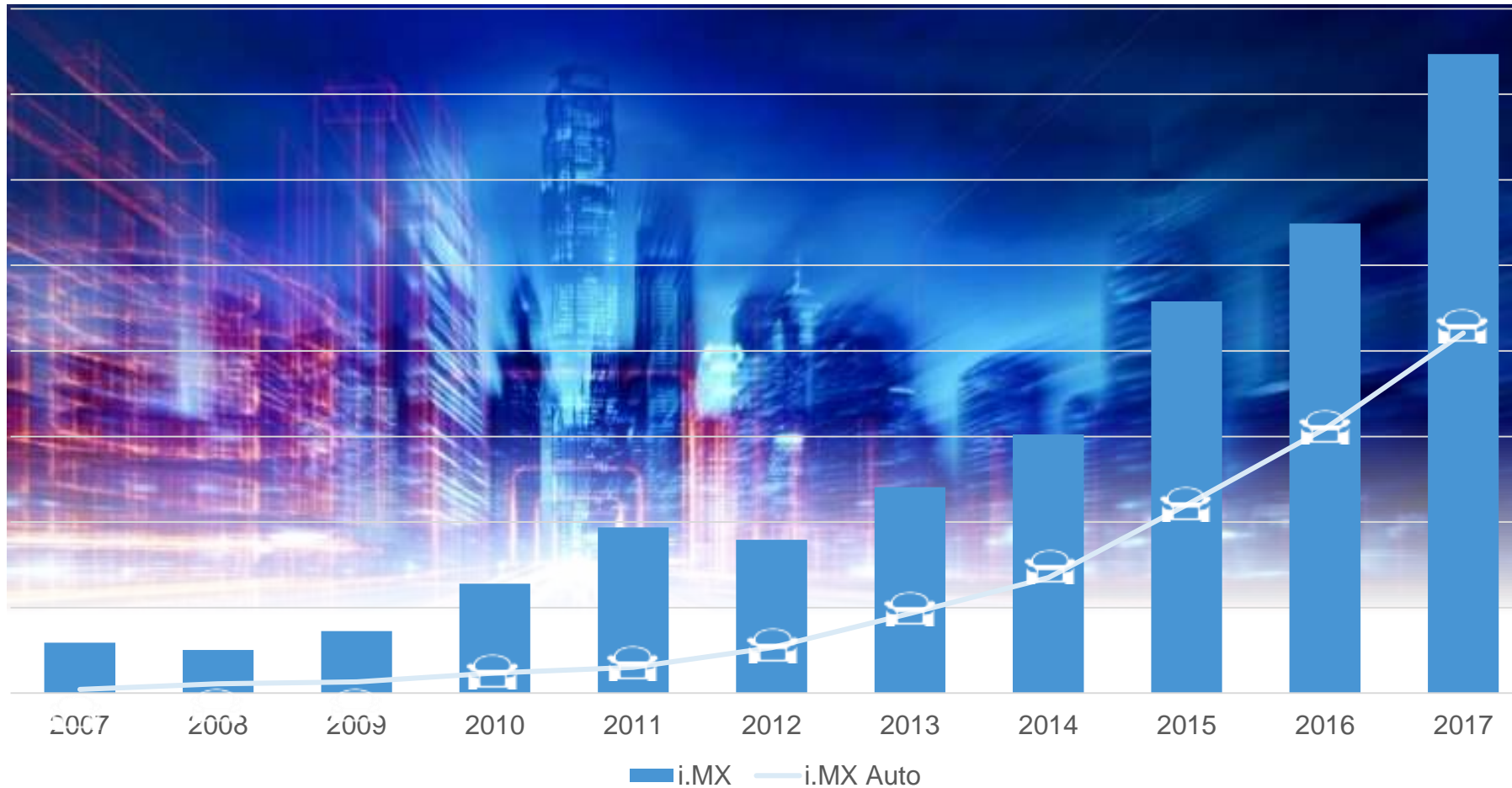
Relevant sessions you may want to check out

- AMF-AUT-T3361 - i.MX 8 DRAM Introduction and Tools Overview (now)
- AMF-AUT-T3369 - i.MX 8 Fast Packet Routing Software (Tues, 11am)
- AMF-AUT-T3363 - i.MX 8 Security Overview (Tues, 1:30pm)
- AMF-AUT-T3401 - Altia: Designing ISO 26262 Compliant HMIs for NXP i.MX (Tues, 1:30pm)
- AMF-AUT-T3360 - i.MX 8 System Controller Unit and System Controller Firmware (Tues, 2:30pm)
- AMF-AUT-T3362 - i.MX 8 Audio and Tensilica HiFi 4 (Wed, 9am)
- AMF-AUT-T3264 – IVI/eCockpit Platform on i.MX 8 (Tues, 2:30pm)
- AMF-AUT-T3365 - i.MX 8 SafeAssure - Camera, Video, Audio (Wed, 11am)
- AMF-AUT-T3230 - Green Hills Software: Secure Virtualization for Critical Applications on i.MX and S32 (Wed, 11am)
- AMF-AUT-T3226 - Micron® Technology: Micron's Memory Solutions for the New i.MX 8 Microprocessor Family (Wed, 11am)
- AMF-AUT-T3367 - i.MX 8 Universal Update Utility (UUU) Tools and Pins Tool (Wed, 4pm)
- Cool Demos in the Tech Lab (+ BEER!)
- Apologies for cancelation of the i.MX 8 GPU class – totally Dan's fault...

Agenda

- Why i.MX?
 - Trust. Scalability. Support.
- i.MX 8 Series Overview
 - i.MX 8 and 8X Families
- i.MX 8 Series Support
 - Operating Systems, Partners
- Summary

i.MX Explosive Growth – Trust. Scalability. Support.



Over 500M i.MX SOCs shipped to date

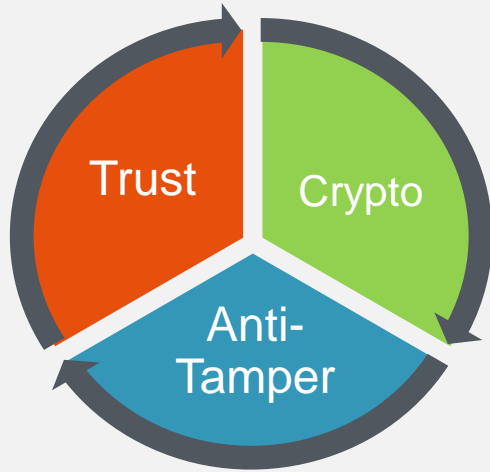
Over 140M i.MX shipped in vehicles since 2007

#1 in eReaders

#1 in Auto Infotainment Applications Processors

#1 in Reconfigurable Clusters

Product Longevity



i.MX Applications Processor Values

- **Trusted Supply**
 - Product longevity: Minimum 10 to 15 years
 - Security and safety: Hardware acceleration, software
 - Reliability: Zero-defect methodology, ULA, low SER FIT
 - Quality: Automotive AEC-Q100, Industrial/Consumer JEDEC
- **Scalability for Maximum Platform Reuse**
 - Pin compatibility and software portability
 - Integration: CPU (single/dual/quad, asymmetric), GPU, IO
 - Software: Linux, Android, Windows-embedded, RTOS
- **Support and Enablement**
 - Industry-leading partners and support community
 - Manufacturability: 0.65 to 0.8mm options, fewer PCB layers
 - System solutions: SoC, sensors, memory, PMIC, connectivity, standard products, software

Why i.MX?

Trust. Scalability. Support



NXP Product Longevity Program

- NXP formally offers many devices for a minimum of 10 or 15 years from the time of launch
- Participating NXP products and program terms are listed at www.nxp.com/productlongevity
- i.MX 8 series plans to launch with 10 and 15 year longevity options – 15 years for automotive



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 Series Safety and Reliability Features

Safety Feature	i.MX 8M Mini	8M Quad, Dual, QuadLite	8QuadXplus, 8DualXPlus	8QuadMax, 8QuadPlus
Ultra Low Alpha (ULA) package	✓	✓	✓	✓
Manufacturing Process	14nm FinFET	28nm HPC	28nm FD-SOI	28nm FD-SOI
Memory Protection (ECC, parity)				
ARM Cortex-A L1 cache	ECC	ECC	Parity	Parity
ARM Cortex-A L2 cache	ECC	ECC	ECC	ECC
ARM Cortex-M4 tightly coupled memory	-	ECC	ECC	ECC
DDR memory interface	-	-	ECC on DDR3L	-
Failover Displays and Cameras	-	-	✓	✓
Highest Automotive Safety Certification	-	-	ASIL-B	ASIL-B
Highest Industrial Safety Certification	SIL2	SIL2	SIL 3	SIL2

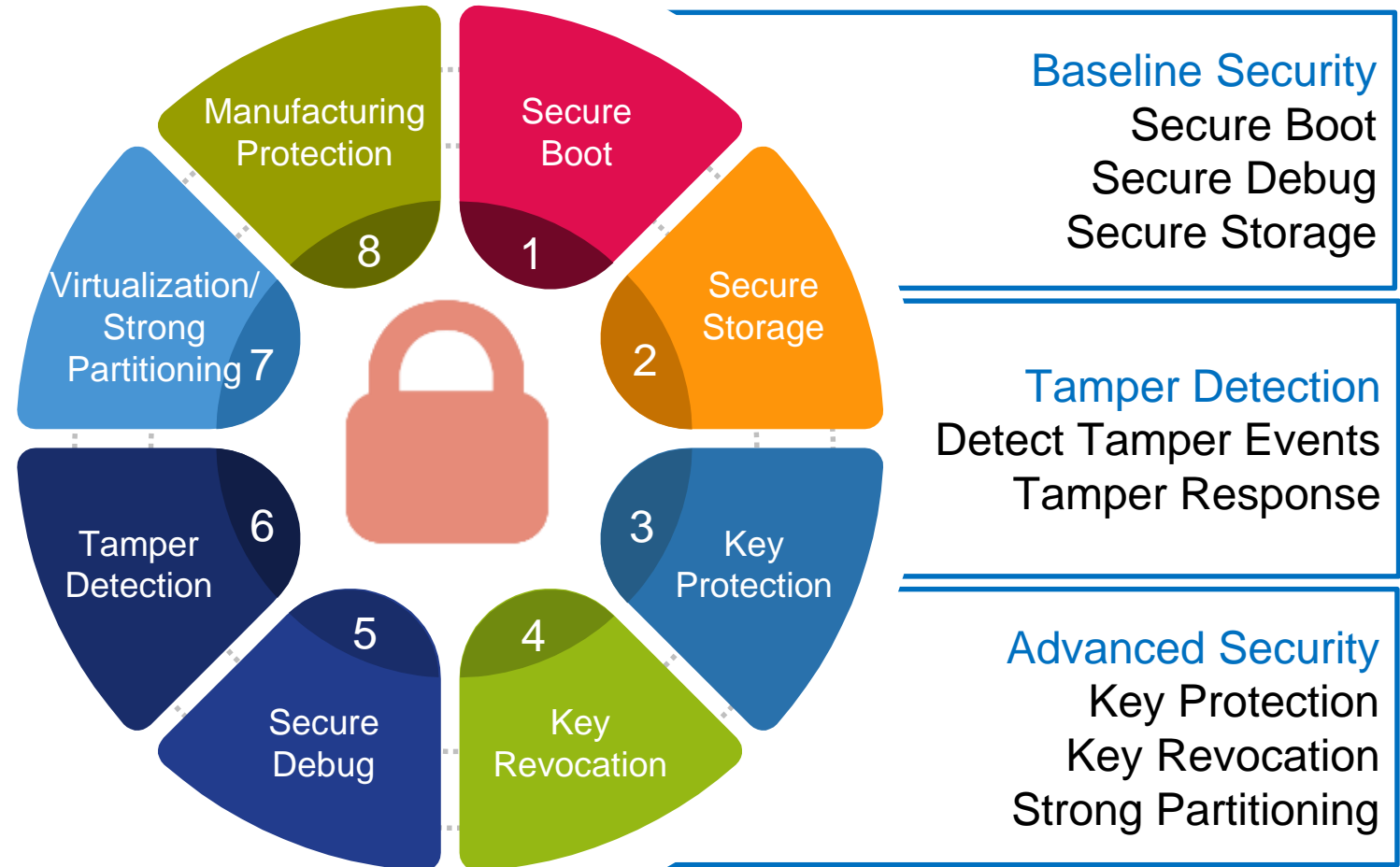
NXP Leverages Core Competence in End-to-End System Security

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

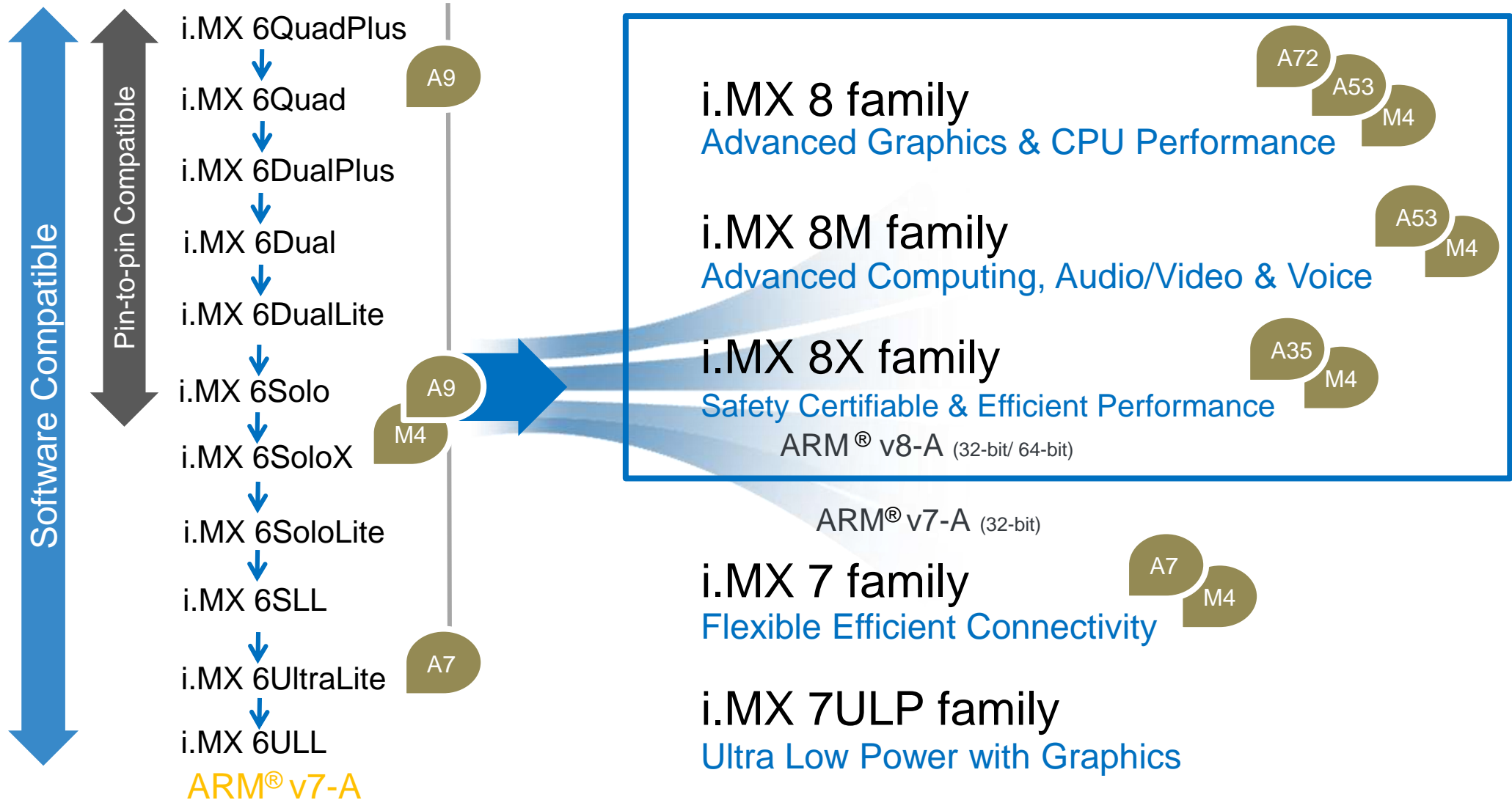
This requires faster, more reliable and secure connectivity

NXP is at the forefront of secure communications and tamper resistance

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



i.MX Applications Processor Scalability



i.MX Market Leading ECOSYSTEM and support

Professional Engineering Services



Commercial Software Products



NXP
i.MX Enablement

THE **LINUX** FOUNDATION

QNX

yocto PROJECT PARTICIPANT

free **RTOS**

Green Hills SOFTWARE

android things

i.MX Factory Support

i.MX Field Support

1000's of Customers

100's of Partners

NXP i.MX Community

Greater than **4,000** members

3500 new pieces of content added every year

Forums – Discussions – Groups – Blogs Posts – News – Multimedia Gallery – Training

Built to support **thousands of customers** with **world-class** enablement, ecosystem, community, services and field resources



i.MX 8 Series Overview

i.MX 8 and 8X Families

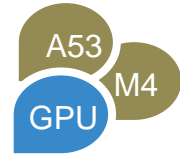
www.nxp.com/imx8



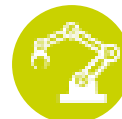
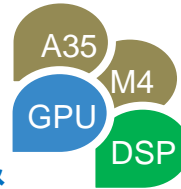
i.MX 8 Series: Target Applications

Advanced graphics, video, image processing, vision, audio, and voice

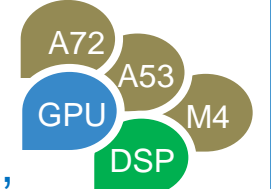
i.MX 8M Family
Advanced Computing,
Audio/Video & Voice



i.MX 8X Family
Safety Certifiable &
Efficient Performance



i.MX 8 Family
Advanced Graphics,
Vision & Performance

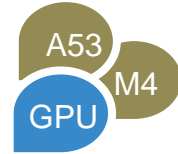


i.MX 8 Series: Target Applications

Advanced graphics, video, image processing, vision, audio, and voice

i.MX 8M Family

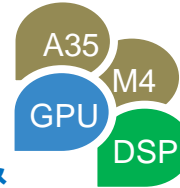
Advanced Computing,
Audio/Video & Voice



- Multimedia and HMI
 - Basic to advanced for home, building, factory, health, fitness, appliance, avionic infotainment
- Computing Performance
 - Battery operated and fanless



i.MX 8X Family Safety Certifiable & Efficient Performance

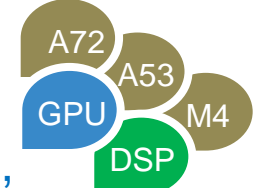


- Automotive Display Audio, reconfigurable cluster, eCockpit up to 2x 1080p +1x WVGA
- Multimedia and HMI
 - Mid-range for factory, building, health, fitness, appliance
- Industrial control
 - Factory and robotics



i.MX 8 Family

Advanced Graphics,
Vision & Performance

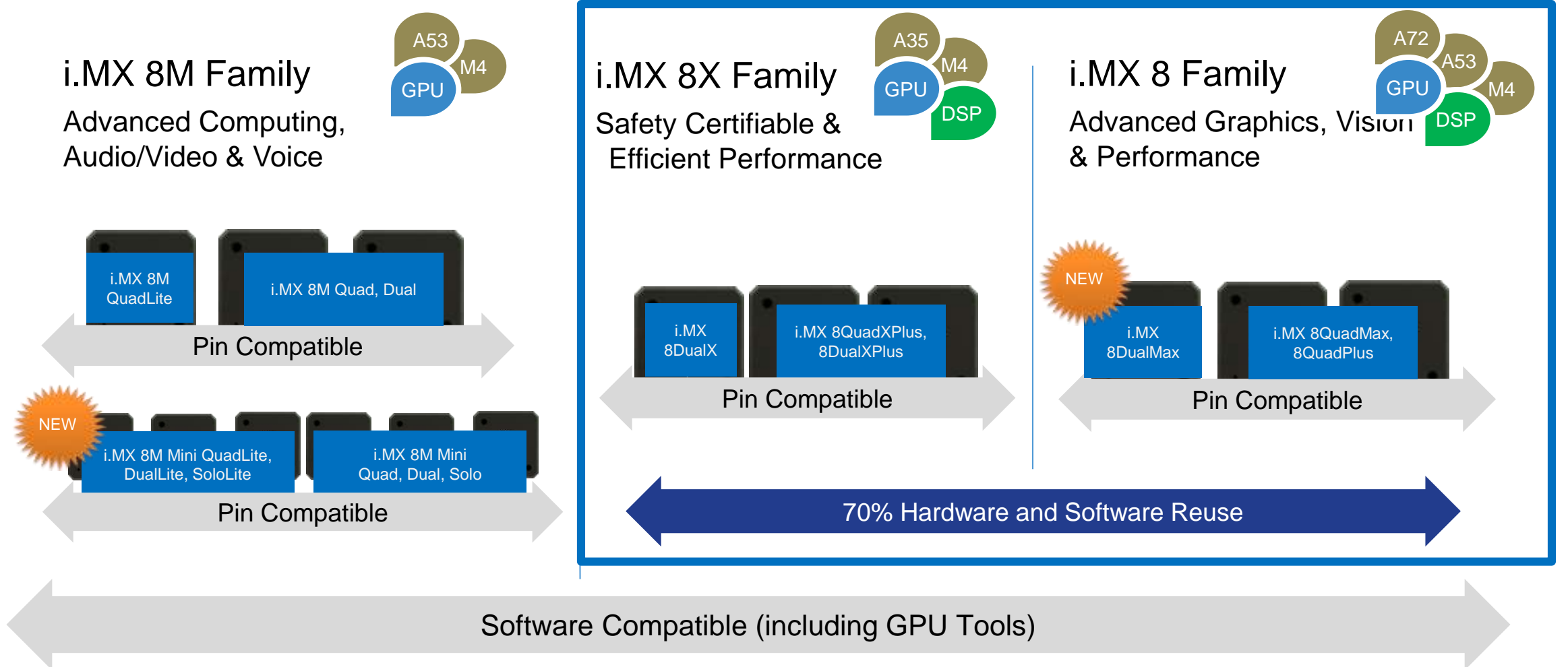


- Automotive eCockpit up to 4x 1080p or 1x 4kx2k
- Multimedia and HMI
 - Advanced for factory, building, health, avionics
- Machine Vision & learning
 - Autonomous Robots and Vehicles



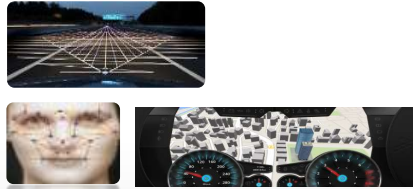
i.MX 8 Series: Scalable Solutions

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



i.MX 8 and 8X Families

32 - 64 bit OS compatibility from entry to premium segments



i.MX 8

Advanced Graphics & Performance

ARM® v8-A Cortex-A53 / A72

Scalable family of products for advanced multi-display HMI, eCockpit and vision-enabled systems with security and low virtualization software overhead


i.MX 8X

Safety Certifiable & Efficient Performance

ARM® v8-A Cortex-A35



Scalable family of products for display audio-enabled HMI, infotainment, reconfigurable instrument clusters and telematics / V2X applications.

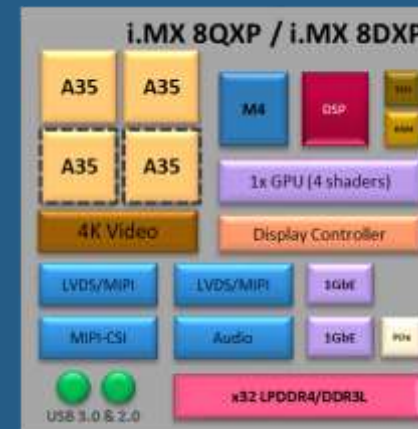
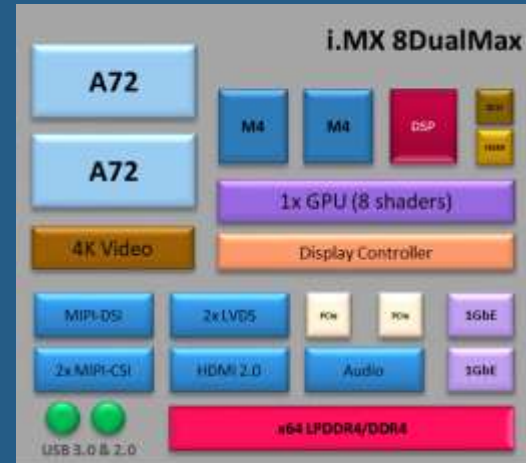
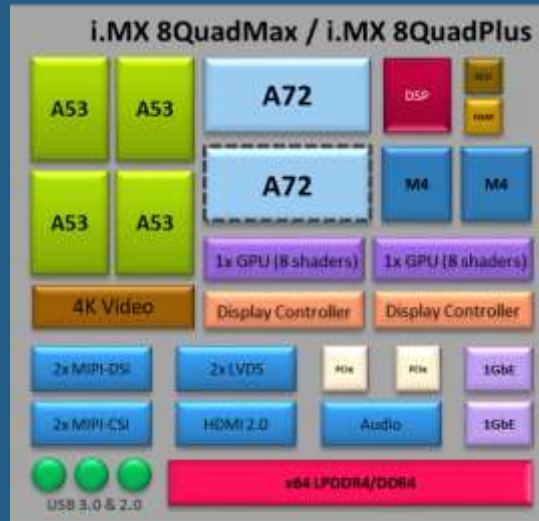
Safe 
Advanced support for ASIL-B Display and Camera Applications

Scalable
Common architecture with ~70% design reuse
ARM v8-A Compatibility to support common applications

Secure
Common security subsystem with advanced crypto and HSM support

SCALABILITY OF EMBEDDED PROCESSING

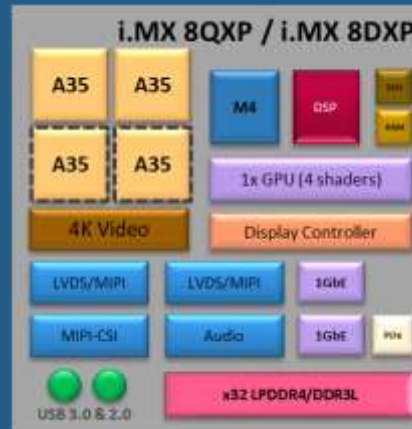
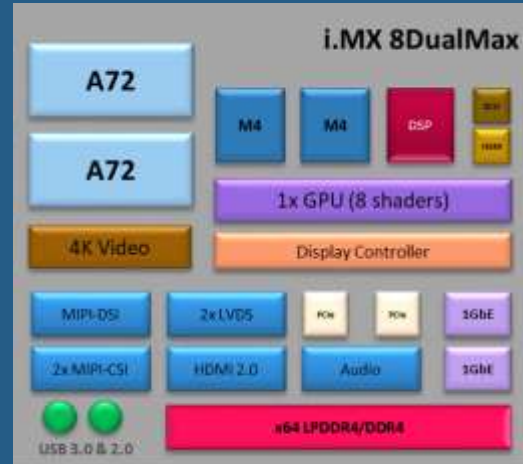
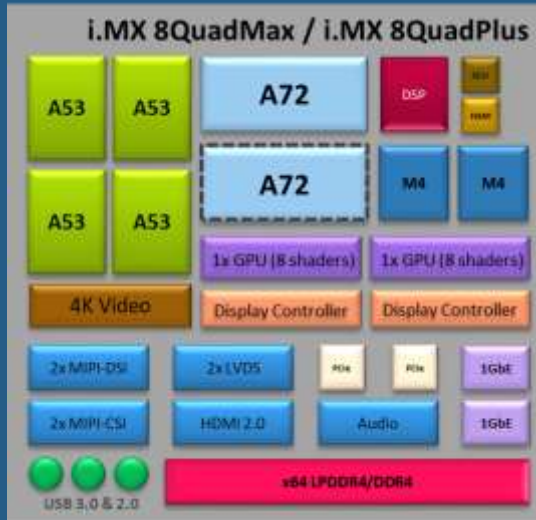
i.MX SUBSYSTEM REUSE



Pin Compatibility Within Families
Software Scalability Across Entire Series

SCALABILITY OF EMBEDDED PROCESSING

i.MX SUBSYSTEM REUSE



i.MX 8DXL & 8SXL Introduced to Roadmap for Low End Telematics & V2X

Sampling Now – i.MX 8 Family of Applications Processors

Scalable, Safe, Secure

The i.MX 8 family of processors is based on ARM® Cortex®-A72, Cortex-A53 and Cortex-M4F cores, with vision-enabled GPUs and a DSP, to provide advanced graphics, video, image processing, vision, audio and voice for automotive, industrial, robotics and machine learning applications.



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
 - Computer vision and surround view
 - Environmental monitoring
 - Multiple domain security systems
- **Autonomous Robots and Vehicles**



i.MX 8 Family of Applications Processors

	GPU	Display	DSP Option	Virtualization	ARM CPU	
8QuadMax	<ul style="list-style-type: none"> Dual Core GPU 16 Vec4 Shaders Up to 128 GFLOPS 64 execution units Tessellation/Geo High Speed 	Up to 4 displays 4K total pixels HEVC	Audio DSP HiFi 4	SoC Level OS OS OS	Cortex-M4 Cortex-A53 Cortex-A72 NP NP NP NP NP NP	Software Compatibility OpenVX Vision Processing Acceleration Fin Compatibility
8QuadPlus	<ul style="list-style-type: none"> Dual Core GPU 16 Vec4 Shaders Up to 64 GFLOPS 64 execution units Tessellation/Geo Full Speed 	Up to 4 displays 4K total pixels HEVC	Audio DSP HiFi 4	SoC Level OS OS OS	NP NP NP NP NP	
8DualMax	<ul style="list-style-type: none"> Single Core GPU 8 Vec4 Shaders Up to 64 GFLOPS 32 execution units Tessellation/Geo High Speed 	Up to 3 displays 4K total pixels HEVC	Audio DSP HiFi 4	SoC Level OS OS OS	NP NP NP NP	

Family of Scalable Multimedia Processors

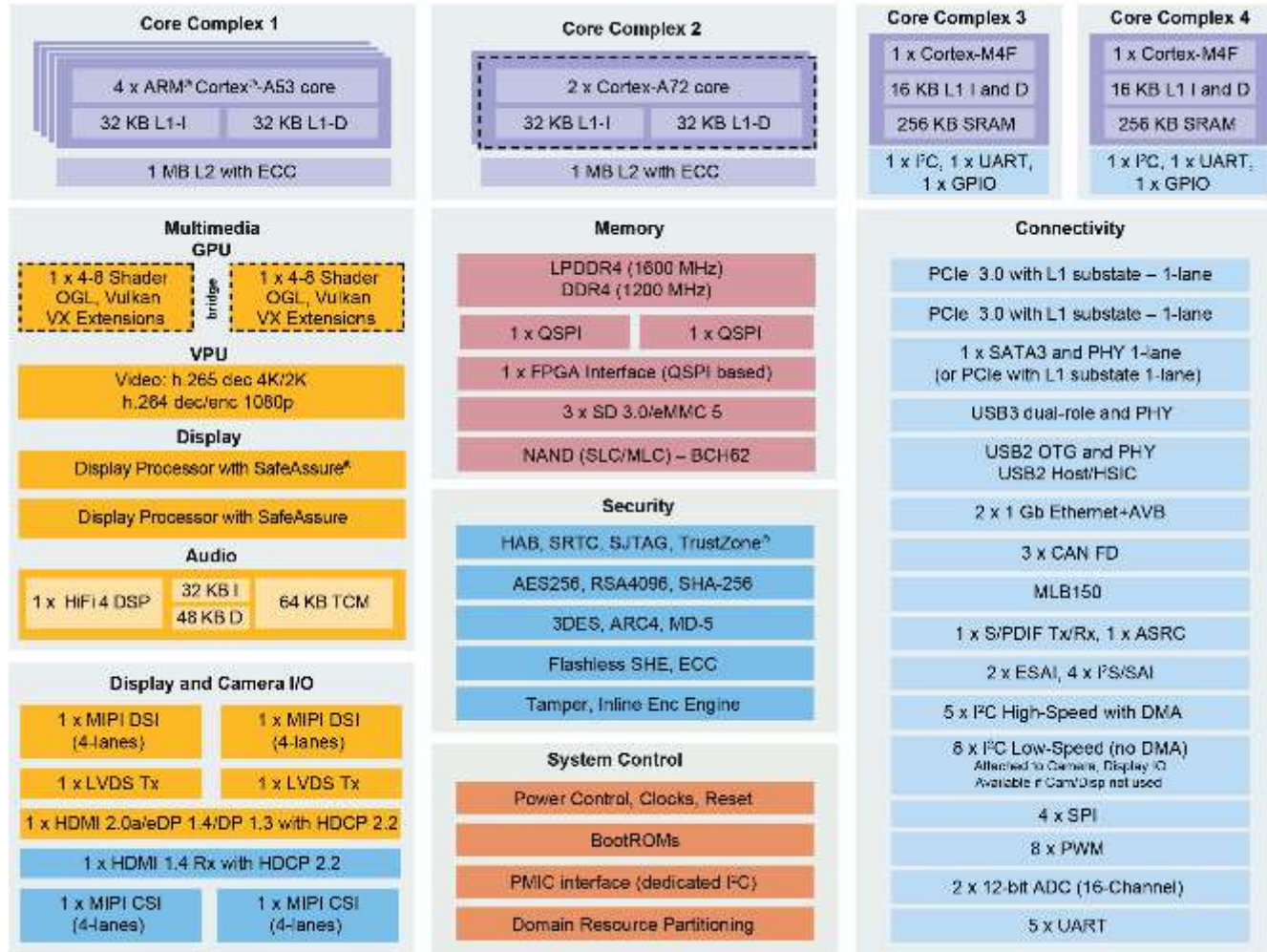
Multiple Operating Systems

Multiple Domains with Hardware Virtualization

Multiple Displays

Vision Processing Hardware Acceleration

i.MX 8 Family of Applications Processors



Feature	i.MX 8QuadMax	i.MX 8QuadPlus	i.MX 8DualMax
ARM® Core	2 x ARM Cortex®-A72	1 x Cortex-A72	2 x Cortex-A72
ARM® Core	4 x Cortex-A53	4 x Cortex-A53	-
ARM® Core	2 x Cortex-M4F	2 x Cortex-M4F	2 x Cortex-M4F
DSP Core	Tensilica® HiFi 4 DSP	Tensilica HiFi 4 DSP	Tensilica HiFi 4 DSP
GPU	2 x GC7000XSVX	2 x GC7000Lite/XSVX	1 x GC7000XSVX
PCIe	1 x PCIe (2-lane)* + 1 x PCIe (1-lane)	1 x PCIe (1-lane)	1 x PCIe (1-lane)

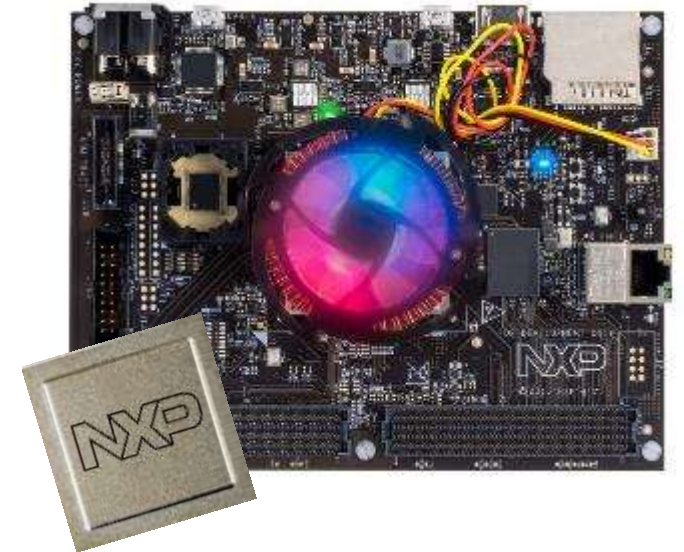
*2-lane PCIe can act as 2 x 1-lane PCIe

Available on certain product families Note: Accessing muxable controller's full capabilities is dependent upon board component choices.



i.MX 8 Family Key Feature Summary

- **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 ready 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



Pin Compatible
Subsystem Compatible
Software Compatible

Sampling Now – i.MX 8X Family of Applications Processors

Scalable, Safe, Secure

The i.MX 8X family of processors is based on ARM® Cortex®-A35 and Cortex-M4F cores and provides **graphics, video, image processing, audio and voice** for automotive applications, industrial control & automation systems, HMI and robotics.





















i.MX 8X Family Target Applications

- Automotive
- Industrial vehicle
- Advanced industrial HMI & control
- Robotics
- Building control
- Healthcare
- General purpose HMI solutions



i.MX 8X Family of Applications Processors

	GPU		Video	Displays	DSP	USB	DDR	ARM CPU
 8QuadXPlus		<ul style="list-style-type: none"> Single Core GPU 4 Vec4 Shaders high performance 16 execution units OpenGL ES 3.1 OpenCL Embedded 	 + Legacy	Up to 3 2x 1080p 1x WVGA	 HiFi 4		x32 DDR3L-1866 (ECC option) LP-DDR4-2400 (no ECC)	Cortex-A35 + M4 
 8DualXPlus		<ul style="list-style-type: none"> Single Core GPU 4 Vec4 Shaders high performance 16 execution units OpenGL ES 3.1 OpenCL Embedded 	 + Legacy	Up to 3 2x 1080p 1x WVGA	 HiFi 4		x32 DDR3L-1866 (ECC option) LP-DDR4-2400 (no ECC)	
 8DualX		<ul style="list-style-type: none"> Single Core GPU 4 Vec4 Shaders power optimized 16 execution units OpenGL ES 3.1 OpenCL Embedded 	 + Legacy	Up to 2 *1x 1080p + 1x WVGA	 HiFi 4		x16 DDR3L-1866 (no ECC) LP-DDR4-2400 (no ECC)	

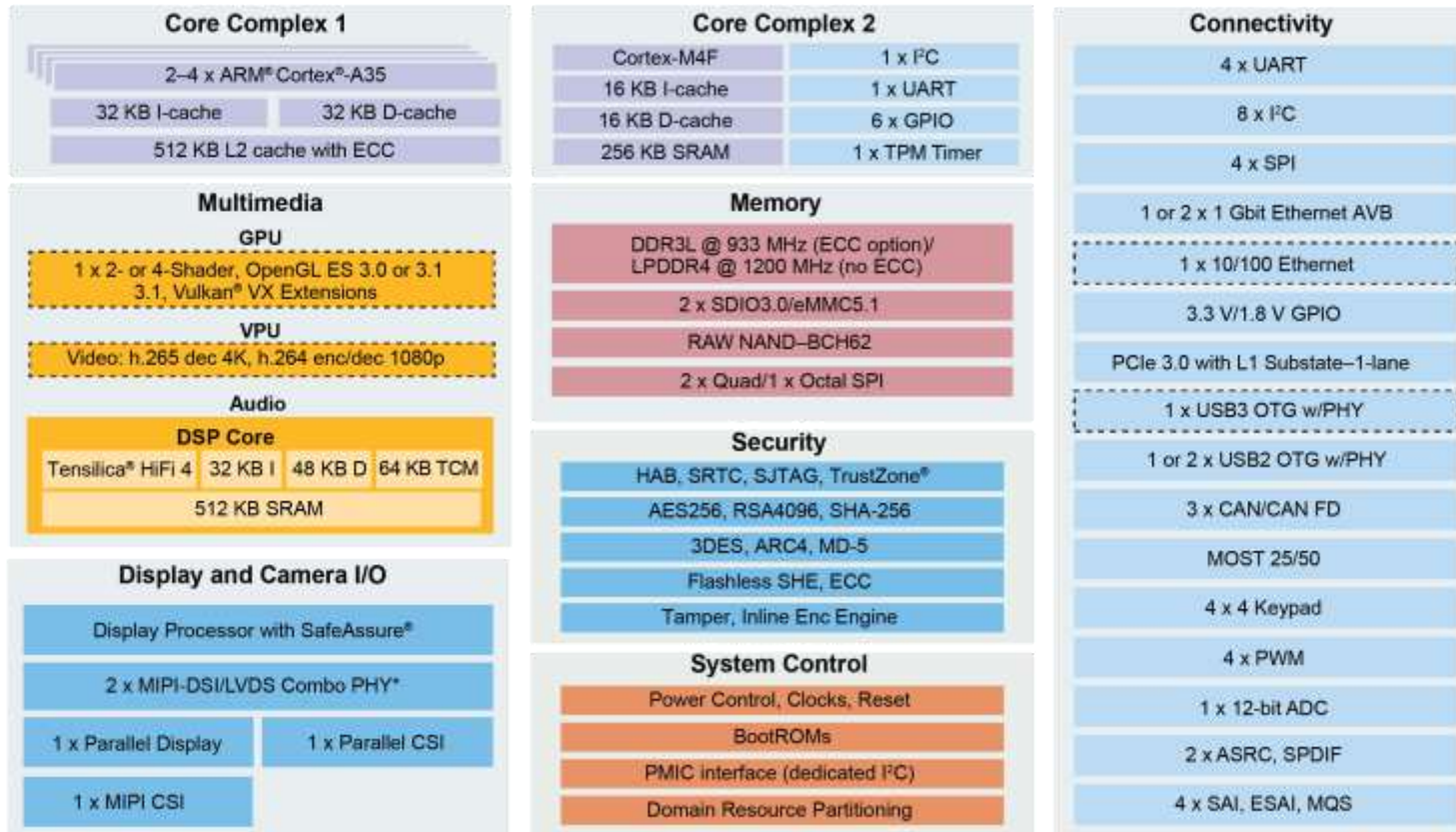


Family of Scalable Multimedia Processors

* Bandwidth limited

Industrial Grade Qualification with Error Correcting Code (ECC) on DDR3L interface
 Automotive Qualification for high temp, duty cycled applications

i.MX 8X Family of Applications Processors



Feature	i.MX 8DualXPlus / i.MX 8QuadXPlus	i.MX 8DualX
ARM® Core	2 x Cortex-A35 (i.MX 8DualXPlus) 4 x Cortex-A35 (i.MX 8QuadXPlus)	2 x Cortex-A35
ARM® Core	1 x Cortex-M4F	1 x Cortex-M4F
DSP Core	Tensilica® HiFi 4 DSP	Tensilica HiFi 4 DSP
DRAM	32-bit DDR3L (ECC option)/ LPDDR4 (no ECC)	16-bit DDR3L (no ECC) / LPDDR4 (no ECC)
GPU	1 x GC7000Lite (4-shader)	1 x GC7000Lite (4-shader) power optimized
VPU	4K h.265 dec, 1080p h.264 enc/dec	1080p h.264 enc/dec
Ethernet	2 x Gigabit with AVB	1 x Gigabit with AVB 1 x 10/100
USB with PHY	1 x USB 3.0 (can be used as USB 2.0) 1 x USB 2.0	2 x USB 2.0

* Each single PHY can either be a 1x 4 lane MIPI-DSI or a 1x1 channel LVDS interface for a total of 2 display interfaces. In combination, the two PHY's can be configured to be a single 2-channel LVDS interface.

Available on certain product families Note: Accessing muxable controller's full capabilities is dependent upon board component choices.



i.MX 8X Family

Natural extension of i.MX 6 series



CPU	GPU	M4	DSP	Display	VPU	DDR
1.2x i.MX 6QP	1.2x	New	New	2.25x	4x	1.2x i.MX6QP
1.2x i.MX 6Dual	1.2x	New	New	1.5x	4x	1.2x i.MX6D
~2x i.MX 6Solo	3x	New	New	1.5x	>>>	1.5x i.MX6Solo
1.2x i.MX 6QP	1.2x	New	New	2.25x	4x	1.2x i.MX6QP
1.2x i.MX 6Dual	1.2x	New	New	1.5x	4x	1.2x i.MX6D



i.MX 8X Key Feature Summary

- **Safeguard Mission Critical Displays and Control Functions**

- Increase system accuracy – ECC to support SIL 3
- Ensure displays stay up and correct – SafeAssure® ASIL-B ready HW protects critical info with fail-over-capability
- Advanced programmable security
- Improved system reliability with FD-SOI
- Offload time-critical tasks

- **Advanced Integration**

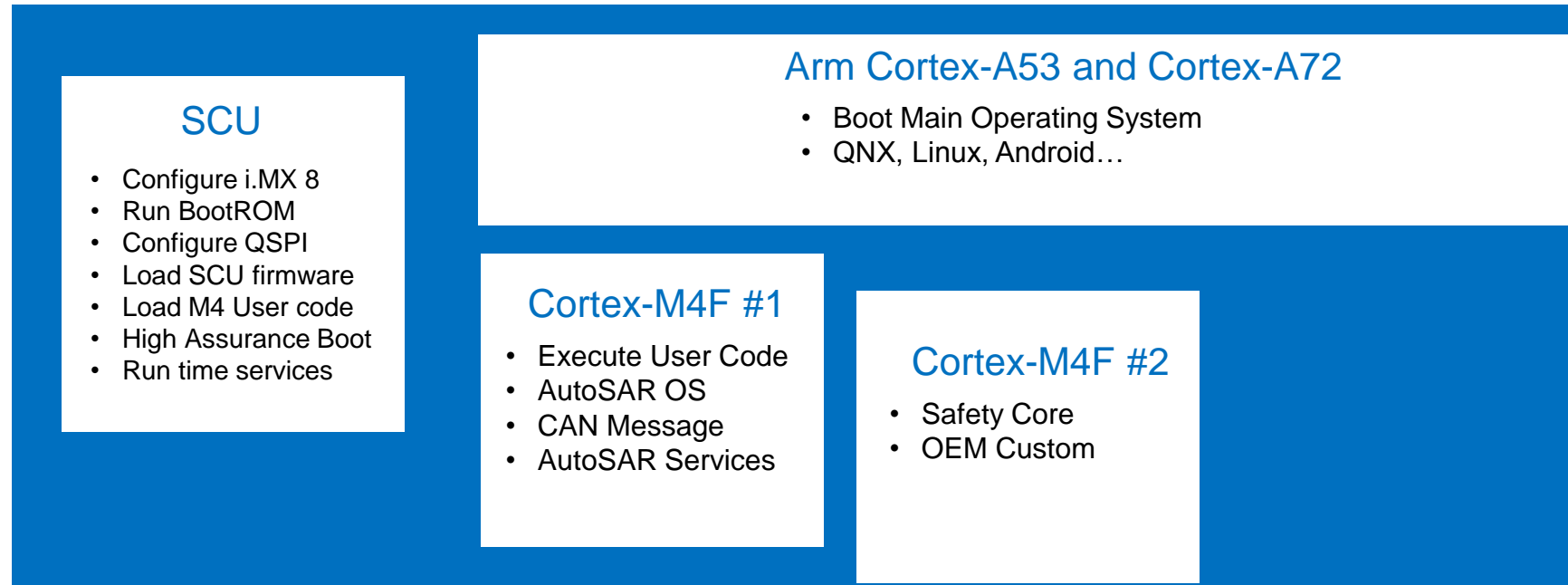
- Multi-domain voice recognition: ARM core & DSP
- Up to 3 screens of independent content
- Flexible memory options
- Unmatched range of cost-performance scaling with pin-compatible options and the highest level of software reuse
- Flexible audio partitioning between radio and apps processor

- **Low-power Optimized Performance**

- Up to four 1.2 GHz Cortex-A35 processors
- Multiple systems, one processor
- Optimized power with the Cortex-M4 core for real-time processing



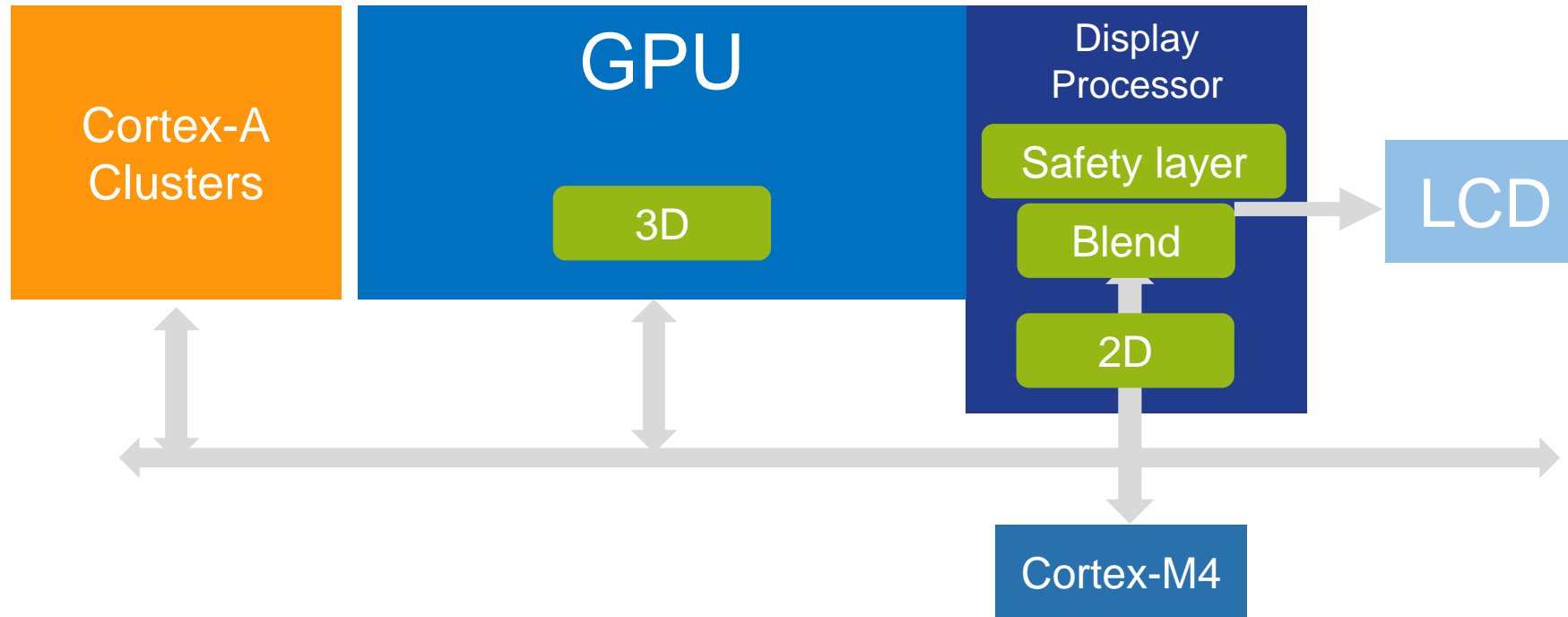
i.MX 8 and 8X Flexible and Fast Boot



i.MX 8 and 8X Boot Flow

- Flexible multi-boot options
- Critical function alignment (Cortex-M4 versus Cortex-A53)
- Enables early backup camera, CAN receipt and display

i.MX 8 and 8X Family Display Processor with Failover Feature



i.MX 8 and 8X Family Display Processor:

- Runs independently, even if GPU and Cortex-A cores crash
- Has integrated 2D graphics unit
- Can be driven by Cortex-M4 core (safety layer support)
- Can drive 4x independent displays without the GPU

Second Order Benefit: Animation at Power On

- Display animated Company logo at power up, prior to boot
- Gracefully handle a system firmware upgrade with notifications
- Drive secondary display that cannot be 'corrupted' by main display

'Failover' Display



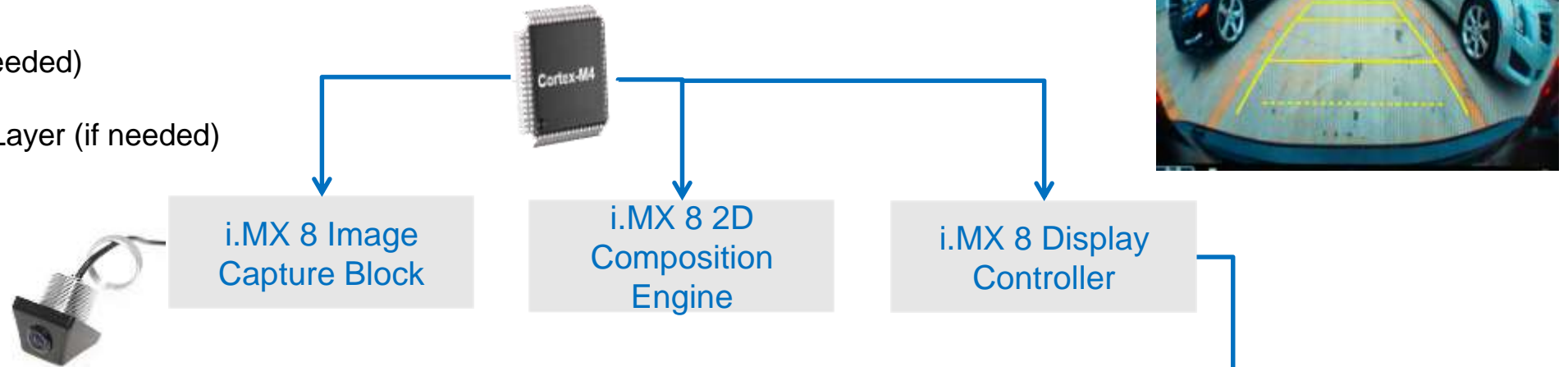
Normal Display



i.MX 8 & 8X Enable Fast Camera Path and Failover Display

Fast Boot Initialization (using Cortex-M4):

- Initialize Camera
- Initialize Image Capture
- Initialize 2D Engine (if needed)
- Initialize Display Output
- Initialize Display Safety Layer (if needed)



Camera Flow to Display:

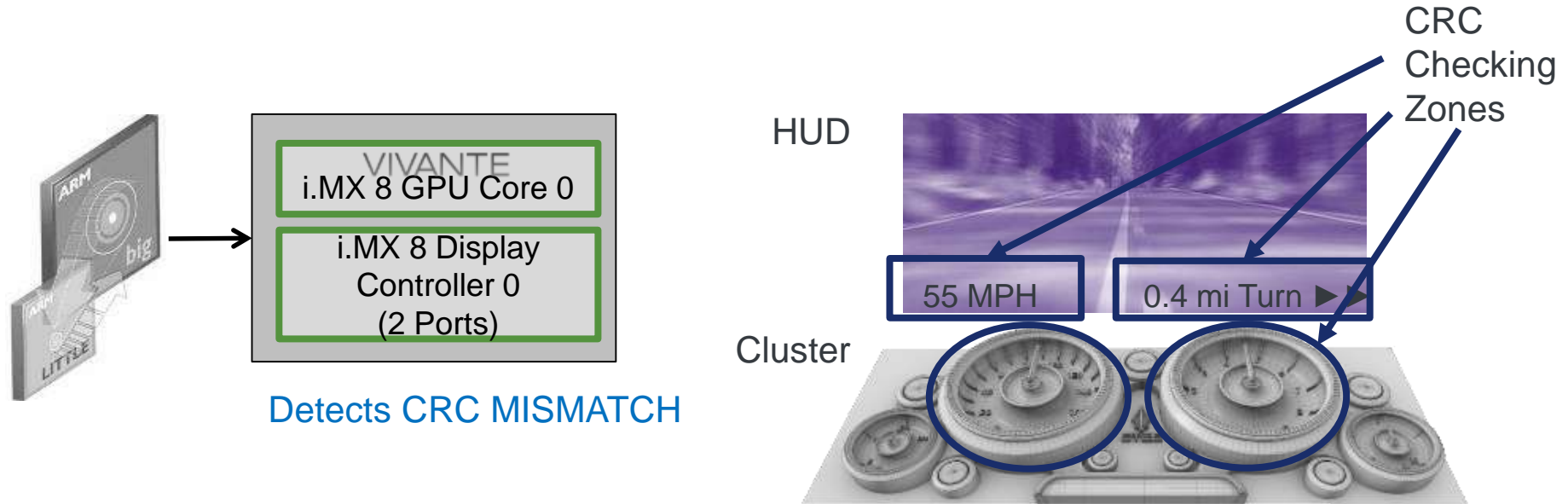
- 1) Imaging Subsystem reads and writes out camera frame to memory
- 2) Image Subsystem provides interrupt for frame complete
- 3) *2D Engine composes data (scale / filter) (optional)*
- 4) Update Shadow Register for new address pointer to Display Controller
- 5) Upon Display Frame Complete, Increment Address pointer to Shadow Register
- 6) Mark Imaging Source Frame Complete

Safety Stream:

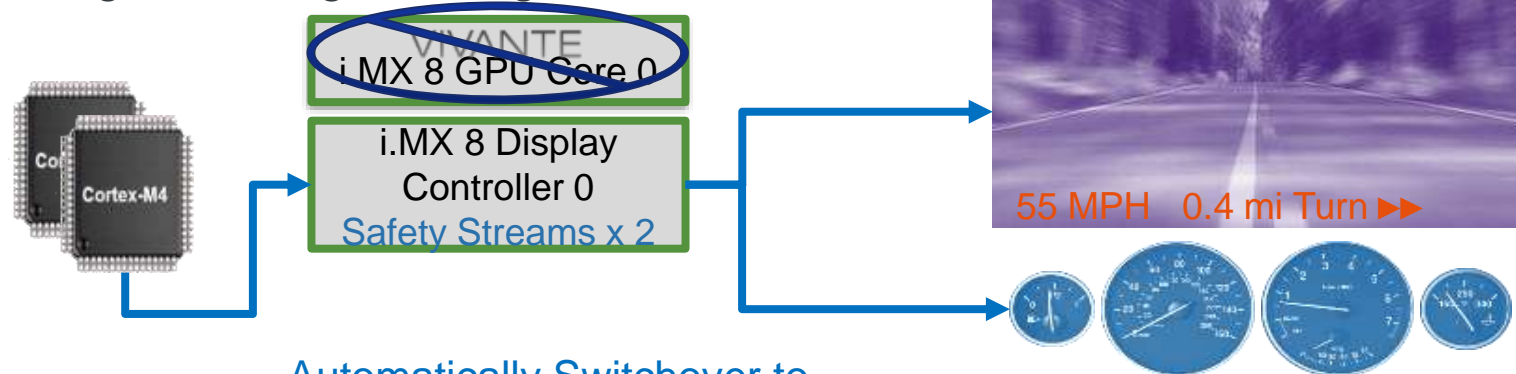
Check Video Watermarking for failsafe
Secondary Source frame always supplied



i.MX 8 Display Failover Strategy



Failover images running in background



Automatically Switchover to Simplified Cluster / HUD

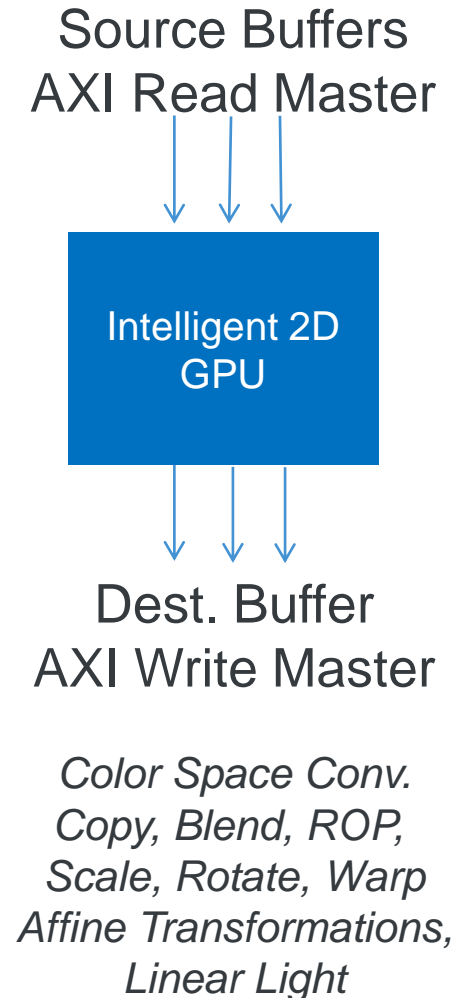
NXP SafeAssure Software Packages

NXP SafeAssure Application Framework	SafeAssure RVC (Rear View Camera) ASIL-A	SafeAssure Display (Instrument Cluster) ASIL-B in development	SafeAssure Audio (Chimes) ASIL-A in development
Complete Documentation Packages	<ul style="list-style-type: none"> • FMEDA • SafeAssure Camera Safety Manual • Code & Supporting Documentation 	<ul style="list-style-type: none"> • FMEDA • SafeAssure Display Safety Manual • Code & Supporting Documentation 	<ul style="list-style-type: none"> • FMEDA • SafeAssure Audio Safety Manual • Code & Supporting Documentation

i.MX 8 and 8X Family 2D GPU = Efficiency, Performance and Safety

2D Graphics Engine Support:

- **Reduces burden on main GPUs:**
Allows the 3D GPU to be a 3D GPU
- **Plays nice with video:** Overlays native video and graphics with minimal trips to system memory
- **Saves power:** 3D Engine can remain off for windowing GUIs (Android HW Composer)



i.MX 8 and 8X GPU for Graphics and Computing

OpenGL ES 1.1, 2.0, 3.0, 3.1, 3.2;
OpenGL 2.1 , 3.0; DirectX 11 9_3

OpenGL Vulkan

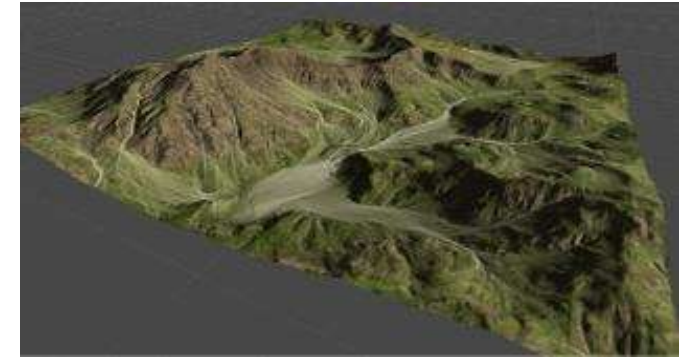
- Low-level CPU-like language (like bare metal software)
- Very efficient - lets the user talk closer to the hardware
- More dangerous if the programmer is inexperienced

Tessellation Shading (-> OpenGL ES 3.2)

- GPU hardware function that increases the detail of given polygons via a shader program.
- Great for detailed maps (navigation), car or other 3D models.

Geometry Shading

- GPU hardware function that can modify existing 3D primitives or create NEW polygons programmatically
- Unlimited use cases, e.g. terrain generation in automotive mapping

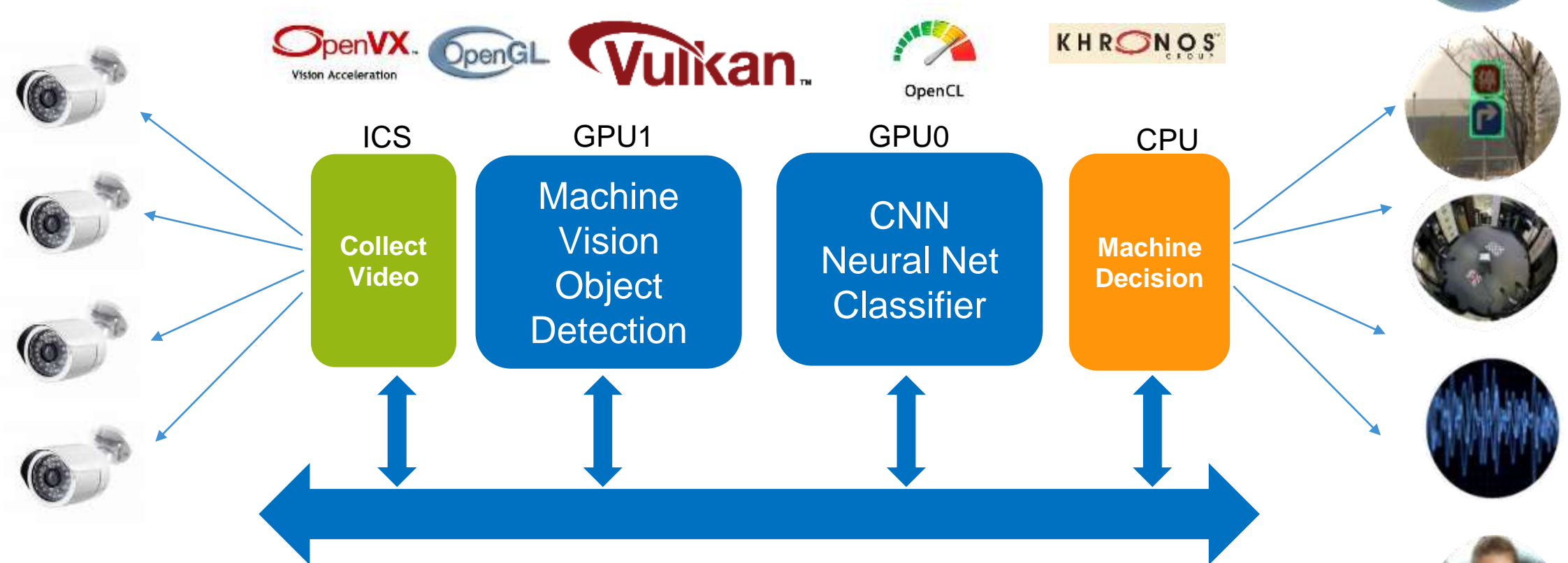


OpenCL 1.0, 1.1, 2.0

OpenVX, OpenCV

- VX Hardware additions to GPU enable image processing use cases
- 40% increase in efficiency vs other GPU for OpenVX workloads

i.MX 8QuadMax – Automotive Edge Computing



i.MX 8QuadMax
A complete Machine Vision
and Neural Net Processing Edge Node

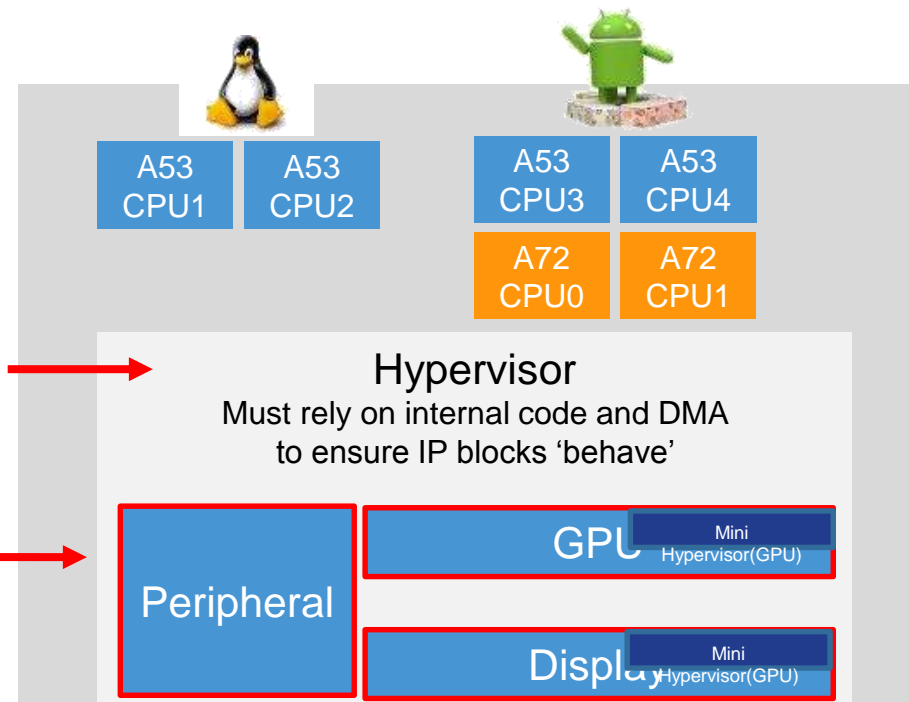
I Want to Run Two Operating Systems. Competition's Limitations?

What I want to do:
2x independent platforms, same chip



Someone Else's Processor

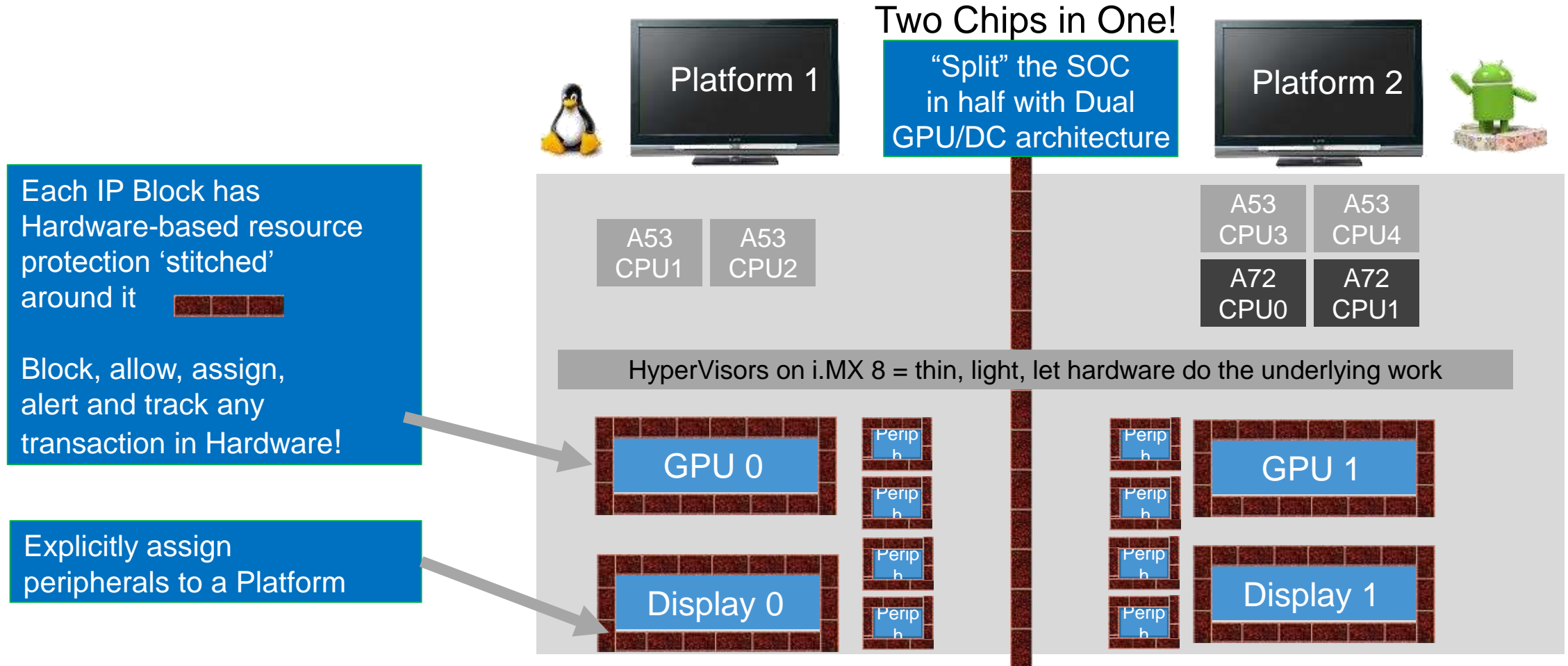
What I want to do:
2x independent platforms, same chip



Steers requests, ensures no access conflicts, protects domain secrets

'Shares' all IP resources with only SW to guarantee protection

i.MX 8 (not 8X) Family: Full Chip Hardware Virtualization with Resource Domain Protection



Second Order Benefit

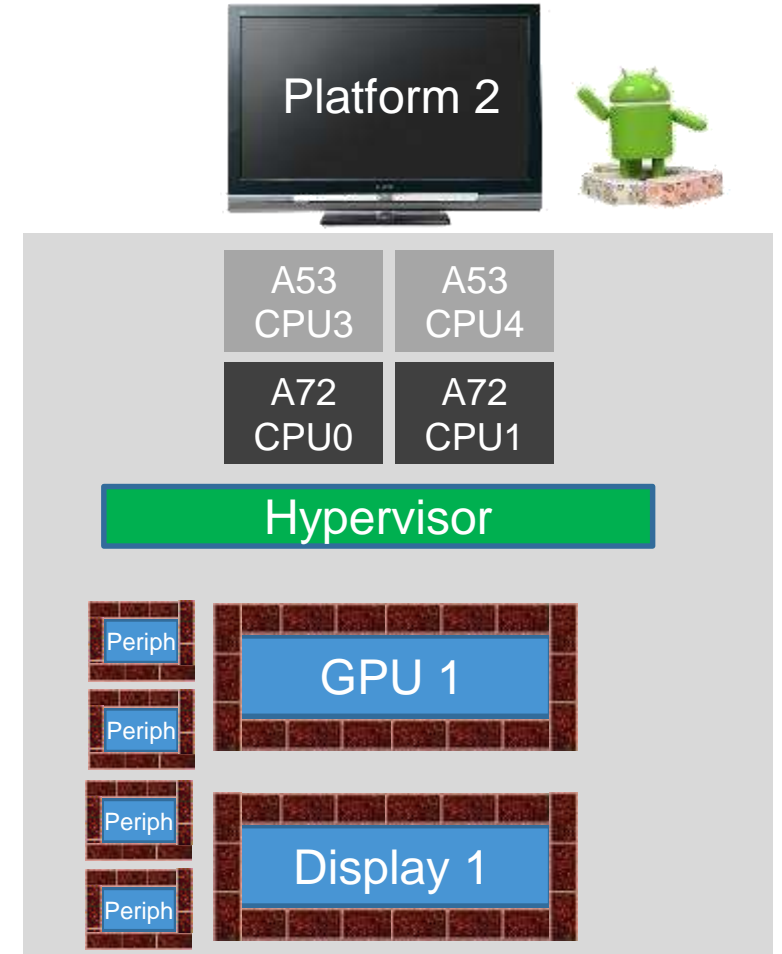
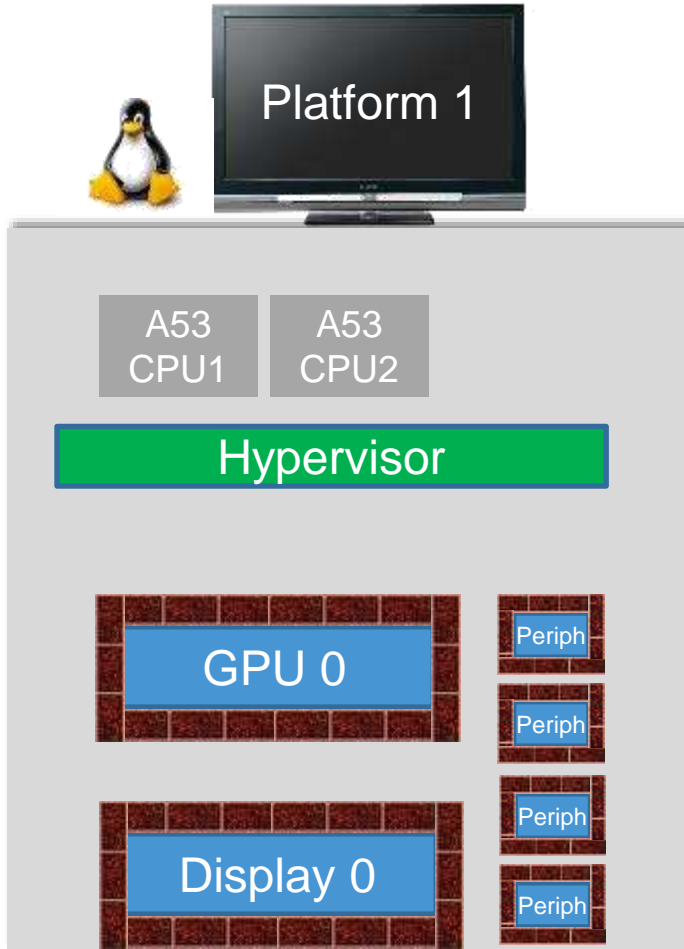


Develop the Linux 'side' independently and in isolation from fully developing the Android 'side'

Then 'merge' them together at the last minute

They don't share resources so...

Two Chips in one, remember?



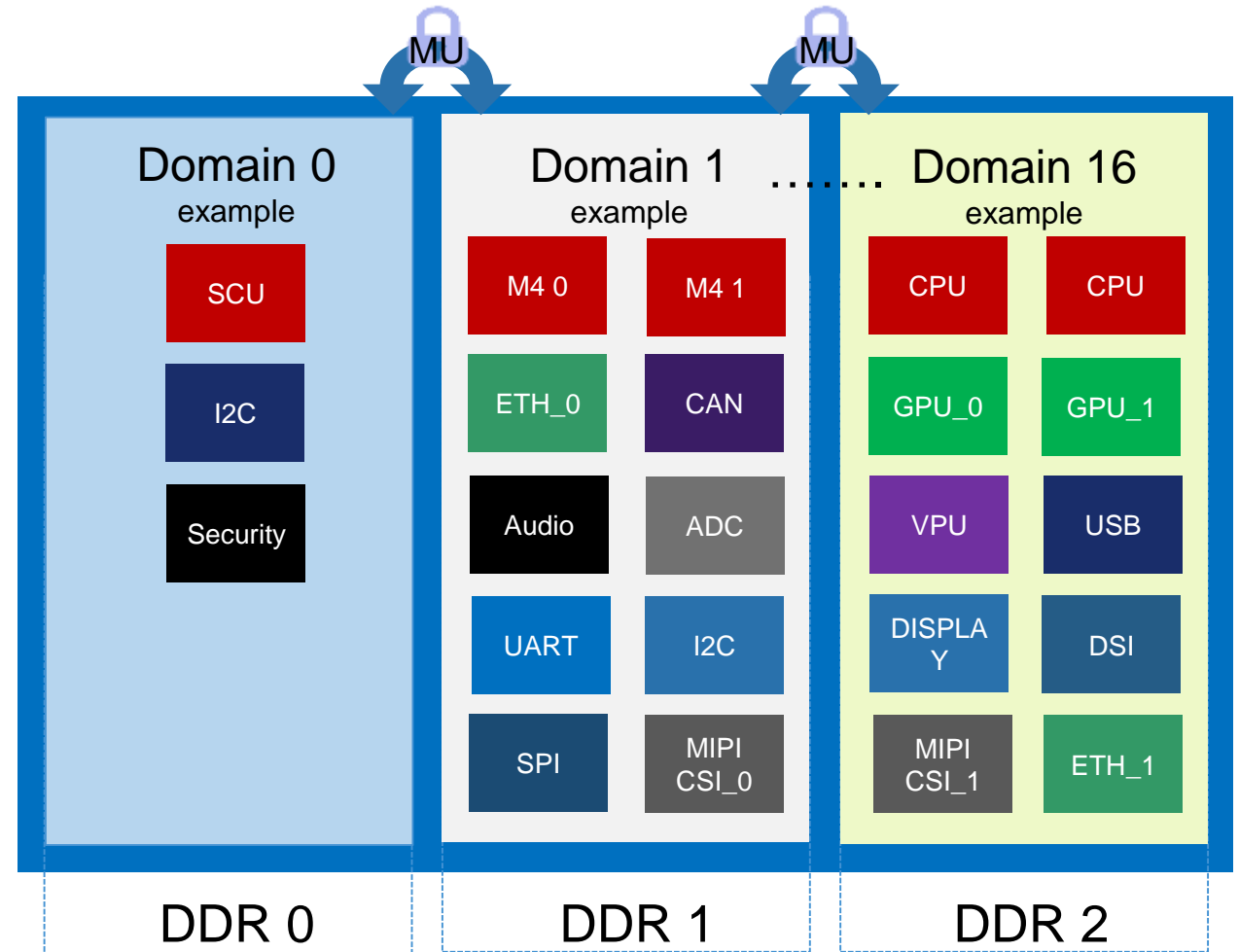
Resource Partitioning on i.MX 8 Family

How Partitioning Works:

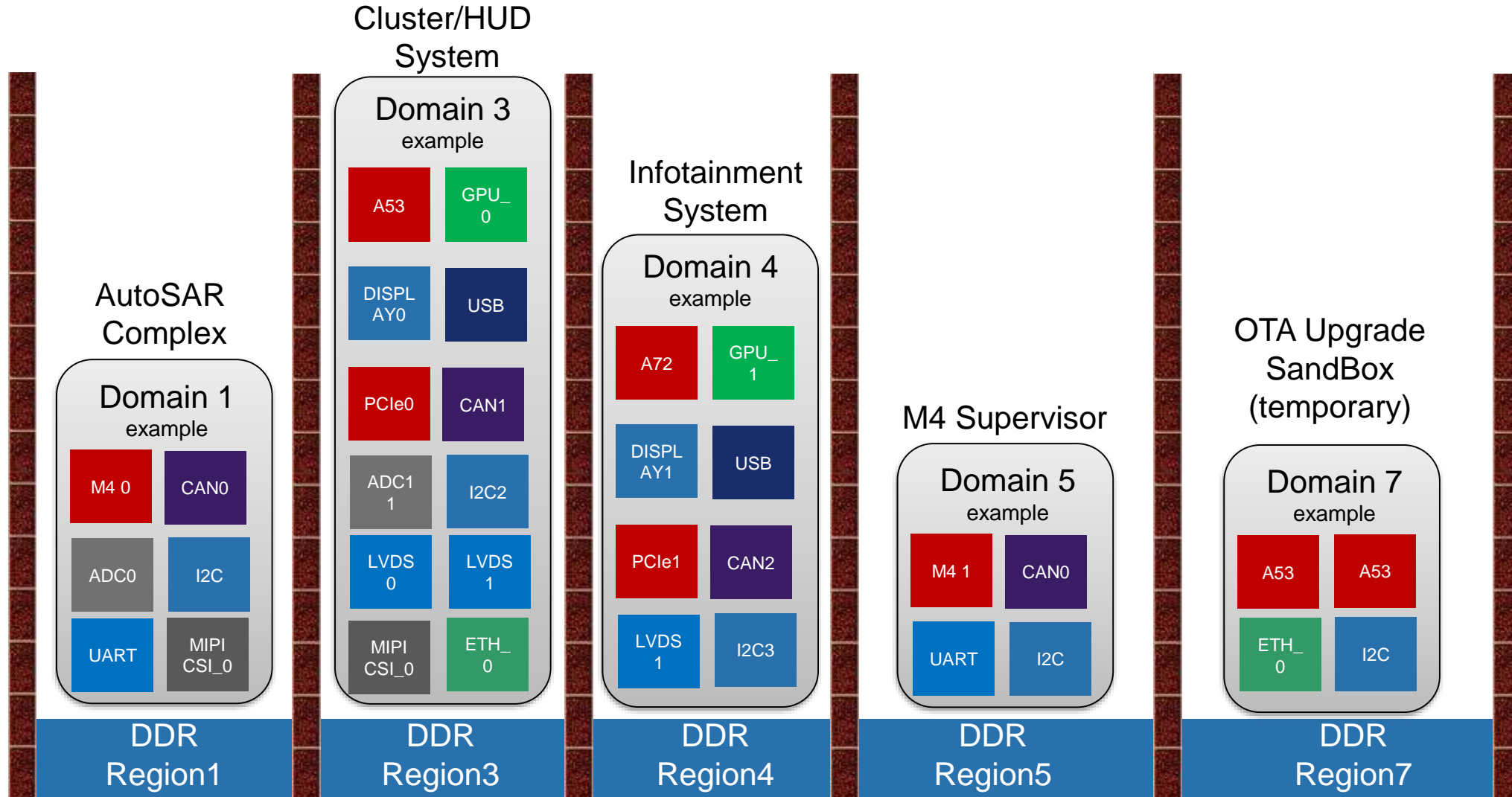
- The system controller commits peripherals and memory regions into a specific domains.
(This is customer defined in the System Configuration Data)
- Any communication between domains are forced to use messaging protocols through Messaging Units (MU's)
- If a domain peripheral tries to access other domains illegally, a bus error will occur.

Benefits of Partitioning:

- Reporting of immediate illegal accesses helps track down hard to find race conditions before they go to production (AKA Sandbox Methods)
- Provides security on a finished product: protects system critical SoC peripherals from less trusted apps and intentional security breaches



Domaining Partitions @ Runtime



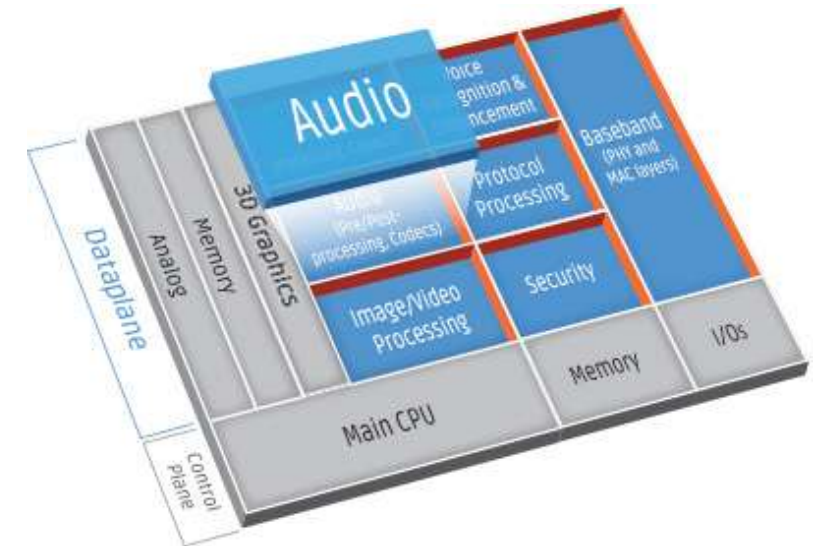
i.MX 8 and 8X Family Video

- Decode: HEVC + H.264 + all legacy formats
 - up to 4K
- Encode: H.264
 - up to 1080p
- Multi stream (up to 4 stream support)



Tensilica HiFi 4 High Performance Audio DSP Core

- **Offload the ARM core:** Highly optimized audio processor geared for efficient execution of audio and voice codecs and pre- and post-processing module
- **Expansive Range** of Audio Software
- The HiFi 4 Audio Engine is a configuration option that can be included with the Xtensa LX 6 processor
- **Ease of Programming:** All HiFi 4 Audio Engine operations can be used as intrinsic in standard C/C++ applications. Simplifies maintenance of existing codecs and development of new codecs.
- **Toolchain is flexible** to build what you want



i.MX 8 Family Connectivity

DDR4

~~DDR3L~~

LPDDR4

PCI **3.0**
EXPRESS™



USB20TG



OctoSPI



HDMI
HIGH-DEFINITION MULTIMEDIA INTERFACE
2.0



((HDCP))
2.2



i.MX 8X Family Connectivity

~~DDR4~~

DDR3L

LPDDR4

OctoSPI

~~HDMI
HIGH-DEFINITION MULTIMEDIA INTERFACE
2.0~~

~~((HDCP))
2.2~~

PCI 3.0
EXPRESS™

~~SERIAL
ATA 3~~

USB20TG

USB 3.0

i²C
BUS 3.4Mbps

~~DisplayPort~~

MIPI
DSI

MIPI
CSI

~~embedded
DisplayPort~~

Power Management IC – PR8100/8200

- Proven robustness, lower risk, & shorter time to market
 - Co-developed with MCU team
 - Support of advanced MCU technologies with high precision and enhanced thermal management
- Reduced complexity for functional safety implementation
 - Scalable Functional safety from QM to ASIL-B
 - Inputs to monitor additional supplies enables system level functional safety
- Reduced system cost
 - Scalable Architectures matched to MCU and application
 - OTP configurability allows flexibility during development
 - Optimize BOM size (<200mm² component area)
- Faster certification through radiation reduction
 - Multiple frequency tuning optimization (Spread Spectrum, freq sync, Manual tuning)



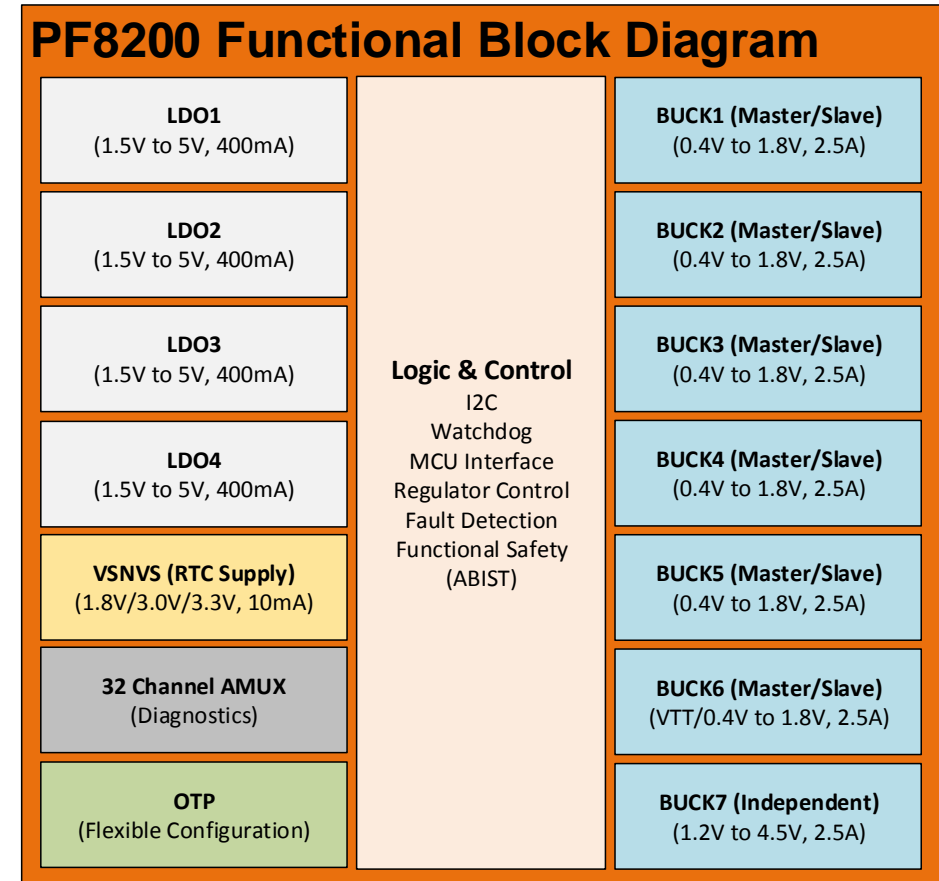
PF8100/PF8200 PMIC (Industrial/Automotive)

Differentiators

- High Power, High Efficiency up to 10 A Core supply and > 19A total output power with tight accuracy and advanced thermal management
- Proven & Robust solution co-developed with MCU. BSP and reference designs provided.
- Scalable supply with OTP configurability options
- Minimize EMC with Spread spectrum, frequency tuning, frequency synchronization and multi-phase operation
- Optimized Size through advanced architecture, < 200mm² component area
- Fit for ASIL-B Application (PF8200)

Features

- Vin 2.7 – 5.5 V
- 6 Buck 0.4- 1.8 V, 2.5A Master/Slave; 1 Buck 1.2- 4.5V Independent
- 4 LDO 1.5 - 5 V
- -40°C to 105°C Operating Ambient Temperature (150°C Tj)
- Prog Freq, Dynamic Freq Spread Spectrum , Ext Clock Synch
- 32 Channel AMUX, OV,UV
- Qualified for QM level (PF8100) or ASIL-B Safety Level (PF8200)
- 8x8mm 56-LD QFN-EP
- Consumer, Industrial, and Automotive grades available



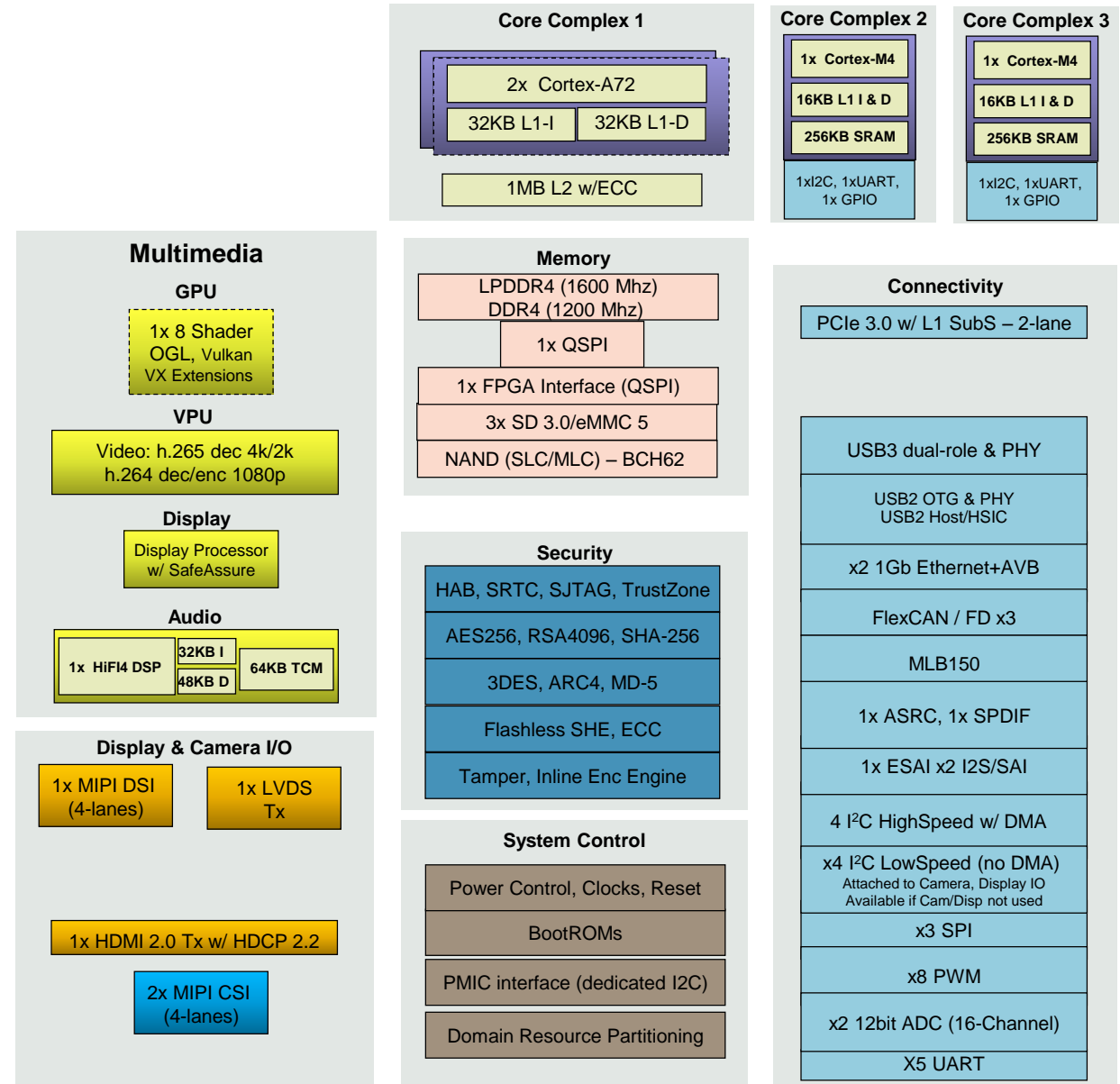
i.MX 8DualMax

New Product






i.MX 8 DualMax Overview

- 2x Cortex A72 @ 1.6Ghz, 2x Cortex M4, HiFi 4 DSP
- 8 Shaders GC7000XSVX GPU (same 8QMax)
- 64-bit LPDDR4 -1600/3200
- 1x Display Controller and Image Capture w/ Failsafe
- HW Multi-Domaining, HW Virtualization
- 3 Displays, 4K h.265 VPU decode, 1080p encode
- Two packages: 23x23 (0.65) and 29x29 (0.75)
- Fully Software Compatible with i.MX 8QMax, 8QPlus



i.MX 8 Family

*Up and
To The
Right*

	CPU	GPU	Virtual	Vision	Display	VPU	DDR
	3.5x	8x	New	10x	4x	8x	3x
	2.5x	4x	New	5x	4x	8x	3x
	1.5x	4x	New	5x	3x	8x	3x



i.MX 8 Series Scalability: Hardware and Software for Embedded

- **i.MX 8 Designed for Scalability**

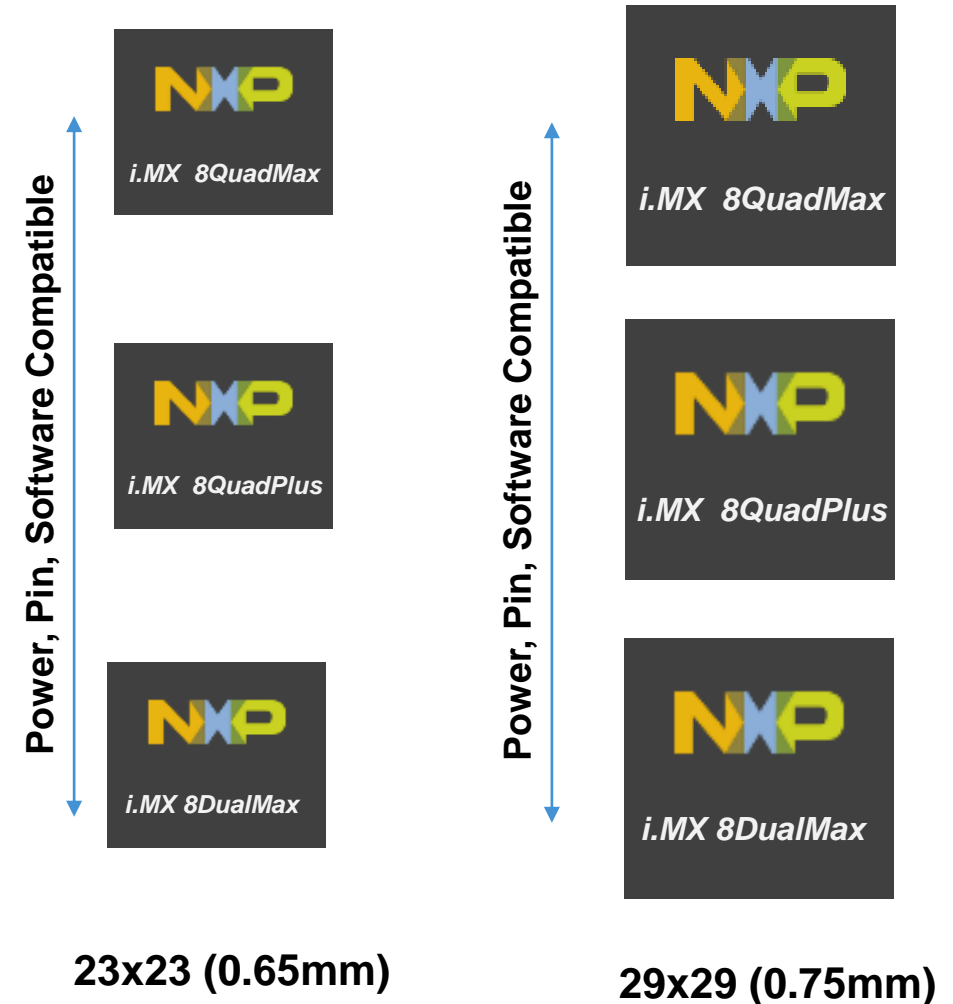
- Power Compatible Pkg
- Board Compatible Pkg
- NEW: Software compatible (same IP)

- **Software Compatible**

- Write an app to the 8QuadMax display/GPU
- It will run without change on 8DualMax and 8QuadPlus
- Same hardware... this is a game changer!

- **Two Package options**

- Simplified board routing: 0.75mm pitch 29x29
- Smaller form factors: 0.65mm pitch 23x23

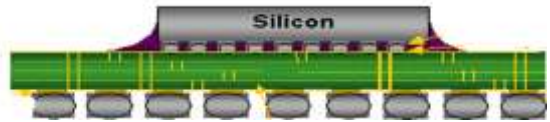


i.MX 8 Family Packaging

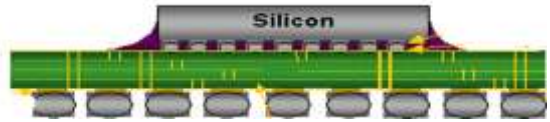
Pin compatible



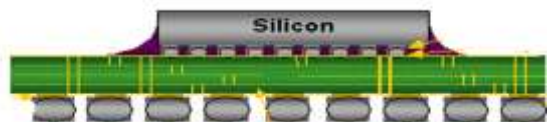
29x29 FCBGA (0.75 pitch)



29x29 FCBGA (0.75 pitch)

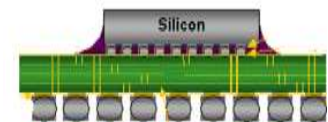


29x29 FCBGA (0.75 pitch)

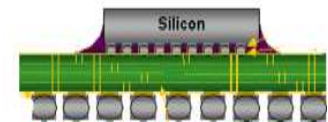


Pin compatible

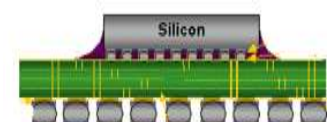
23x23 FCBGA (0.65 pitch)



23x23 FCBGA (0.65 pitch)



23x23 FCBGA (0.65 pitch)



i.MX Support

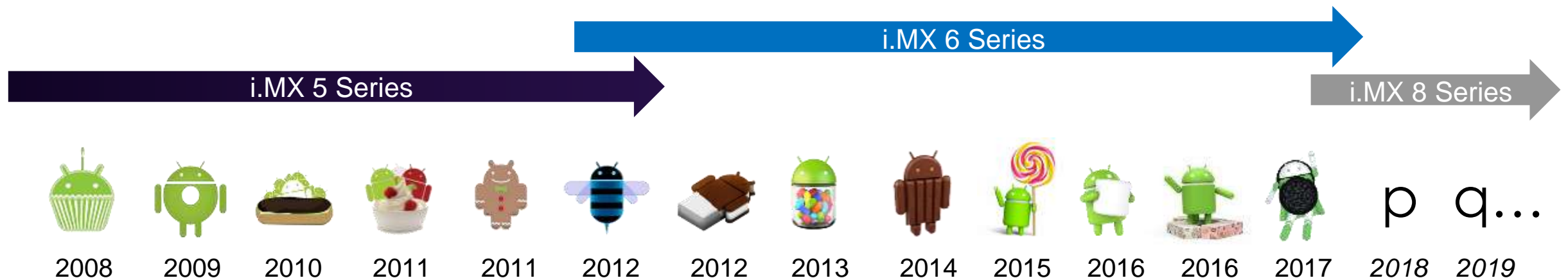
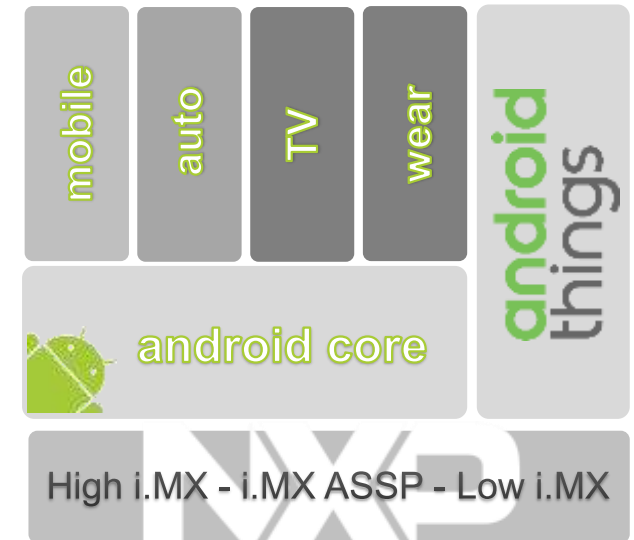


Strongest Operating Systems for i.MX Applications Processors

Supplier	i.MX 6, 7 and 8 series ARM Cortex-A technology	i.MX 6SoloX, i.MX 7 and 8 series ARM Cortex-M technology
NXP Semiconductor	Linux Long Term Support (LTS) OS, supported in the Yocto Project and Android OS (Android Things on selected devices)	FreeRTOS AUTOSAR MCALs (separate license)
Mentor Embedded	Linux OS and Nucleus RTOS	Nucleus RTOS
Micrium (Silicon Labs)	uC/OS II and III RTOS, Micrium OS	uC/OS II and III RTOS, Micrium OS
QNX	Neutrino RTOS (background IP from NXP)	-
Green Hills	INTEGRITY RTOS (background IP from NXP)	-
Embedded Access	-	MQX RTOS
Express Logic	ThreadX RTOS (coming soon)	ThreadX RTOS (coming soon)
Microsoft	WindowsCE, Win10 (pilot)	-
Timesys, Wind River, Canonical, and others	Commercial Linux	

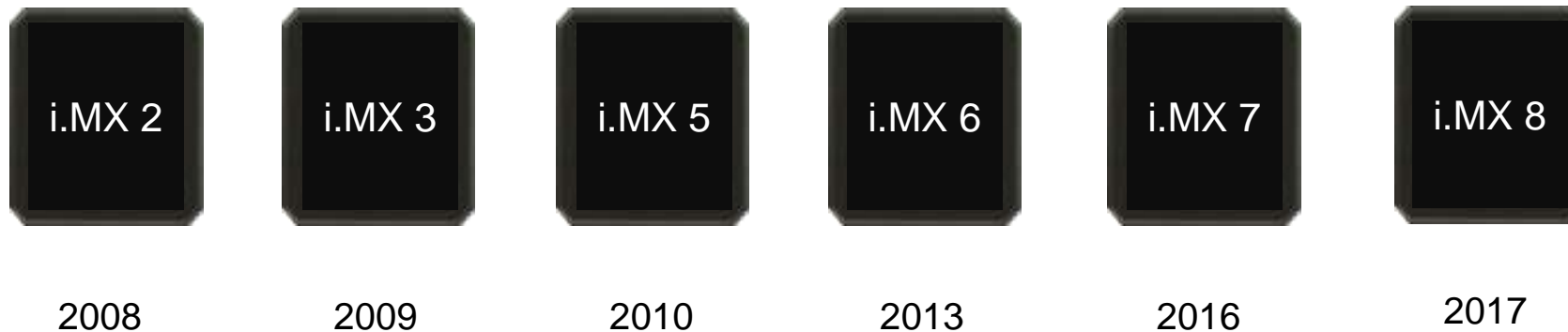
i.MX android Enablement

- **Commitment:** 13 Android OS versions released over past 9 years
- **Broad Acceptance:** 35,000+ downloads of Android BSPs to date
- **Fast Development:** ~4 months from development start to production release on multiple Android versions
- **Cross Market Robustness:** Automotive, Embedded/Industrial, Consumer, Things, TV
- Early Access Partner with Google for Android Automotive, Android Things
- **Leadership:** i.MX – FIRST Android system shipping in a top 5 OEM infotainment platform
- Multiple Android OS head units in OEM and aftermarket based on i.MX



i.MX – QNX Collaboration

- **Commitment:** Partnering with QNX on i.MX since 2008
- **Customer Driven:** QNX works directly with customers to provide the BSP
- **Cross Market Robustness:** Automotive, Embedded/Industrial
- **Continued Support:** Strong relationship and partnering between QNX and NXP Graphics support provided directly from NXP to QNX



Early Access Partners Launching with i.MX 8 Series

i.MX 8M Family:
i.MX 8M Quad, QuadLite, Dual

Compulab (Israel, USA - Florida)

Emcraft (USA, AMEC)

Innocomm (Taiwan, Global)

Seco (Italy, EMEA, USA, India, Taiwan)

SolidRun (Israel)

TechNexion (Taiwan, Global)

Variscite (Global)

VVDN (Global) source for the NXP EVK

i.MX 8X Family:
i.MX 8QuadXPlus, 8DualXPlus

Digi International (USA, Global)

Phytec (Germany, EMEA +AMEC)

TQ (Germany, China, AMEC)

Toradex (Switzerland, Global)

Variscite (Global)

Some i.MX 8 Family partners will add 8X, e.g. Variscite

i.MX 8 Family:
i.MX 8QuadMax, 8QuadPlus

Advantech (Taiwan, Global)

BCM Advanced (USA, Taiwan, China, Denmark, Japan)

Congatec (Germany, USA, Taiwan)

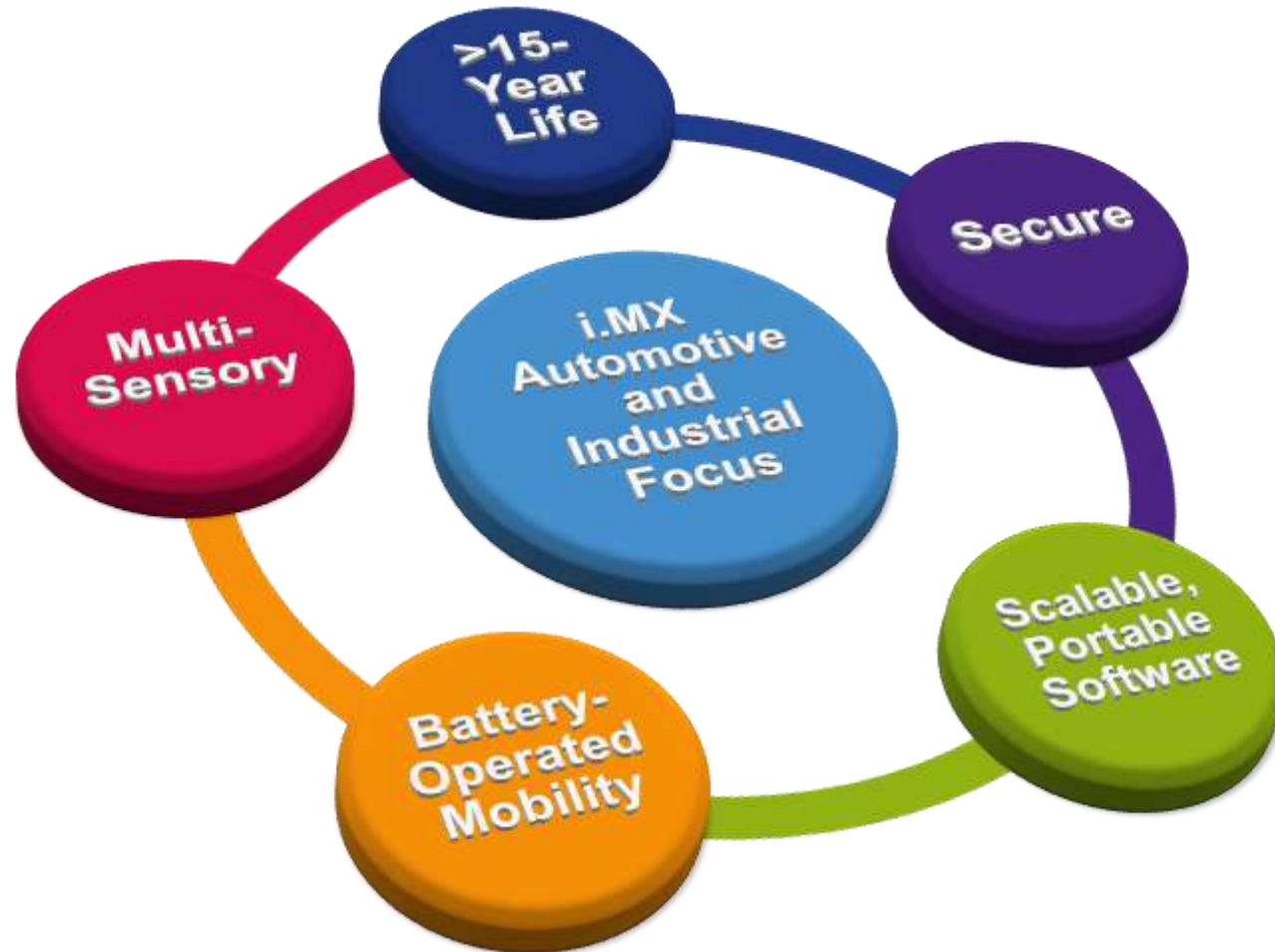
iWave (India, Japan, Global)

Phytec (Germany, EMEA+AMEC)

Toradex (Switzerland, Global)

Variscite (Global)

i.MX 8 and 8X Applications Processors



- Built for scalable, safe and secure multimedia and computing
- Sampling now for alpha and beta customers
- www.nxp.com/imx8

Thank-you for considering the i.MX 8 Series!



SECURE CONNECTIONS
FOR A SMARTER WORLD

www.nxp.com