Zynq UltraScale+ MPSoC

Target Markets

- Aerospace & Defense
- Automotive
- Data Center
- Wired Communications Infrastructure
- Wireless Infrastructure

Industry-leading Performance-per-Watt

- Heterogeneous workload distribution
- Up to 5X performance-per-watt over Zynq-7000 SoC
- Massive serial I/O and memory bandwidth

Greater Productivity in Software & Hardware Development

- Familiar C/C++ development environment
- Industry-standard tool and OS support
- Reference designs to quickly get up and running

BOM Cost Reduction

- Unparalleled integration reduces device count
- All programmability for adaptability and reuse
- 21 different devices for varying design needs

XILINX
ALL PROGRAMMABLE™

ZYNQ® UltraSCALE+

Industry's First Heterogeneous Multiprocessor SoC

Zynq® UltraScale+™ All Programmable MPSoCs provide up to 5X system-level performance-per-watt compared to the Zynq-7000 SoC family. Zynq UltraScale+ devices combine a high-performance ARM®-based multicore, multiprocessing system with ASIC-class programmable logic. Dual- and quad-core application processor equipped devices deliver maximum scalability, and are capable of offloading critical applications, such as graphics and video pipelining, to dedicated processing blocks, along with a full complement of integrated peripherals and connectivity cores suitable for next-generation systems.

For the most compute intensive processing tasks, integrated programmable logic offers up to 100X performance improvement over processor-based implementations. The 16nm FinFET+ programmable logic communicates with the processing system through 6,000 interconnects, enabling bandwidth that is not possible with multichip solutions. Dramatic power savings are achieved through fine-grained control of power domains and gated power islands. With specialized processing elements for different workloads, Zynq UltraScale+ MPSoCs integrate the right engines for the right tasks for next-generation embedded challenges.

Application Optimized Single-Chip Solution

The Zynq UltraScale+ MPSoC family consists of three distinct variants, providing flexibility across a broad spectrum of applications. Dual-core application processor equipped (CG) devices are optimal for industrial motor control and sensor fusion. Quad-core application processor equipped (EG) devices excel in wired and wireless infrastructure, data center, and Aerospace and Defense applications. Video codec equipped (EV) devices are ideal for multimedia, Automotive ADAS, and surveillance applications. With multiple processor variants, a wide range of connectivity options and programmable logic capacity, DSP architectural blocks, and on-chip memory, Zynq UltraScale+ MPSoC devices offer the perfect single-chip platform for both cost-sensitive and high-performance applications using industry-standard tools.

Building on the Success of Xilinx's UltraScale+ Portfolio

Zynq UltraScale+ MPSoCs are part of the UltraScale+ portfolio that combines new memory as well as FinFET+ technology for best-in-class performance. To enable an even higher level of integration, the UltraScale+ portfolio also includes a new IP interconnect optimization technology, SmartConnect, for even greater system-wide performance, power, and area advantages. Built upon Xilinx's UltraScale™ architecture, Zynq UltraScale+ devices provide package migration to future-proof systems for derivative applications.

Zynq UltraScale+ MPSoC Product Family

	CG Devices	EG Devices	EV Devices
Application Processing Unit	Dual-core ARM Cortex™-A53	Quad-core ARM Cortex-A53	Quad-core ARM Cortex-A53
Real-Time Processing Unit	Dual-core ARM Cortex-R5	Dual-core ARM Cortex-R5	Dual-core ARM Cortex-R5
Graphics Processing Unit	–	ARM Mali™-400 MP2	ARM Mali-400 MP2
Video Codec Unit	–	–	Supports H.264/H.265

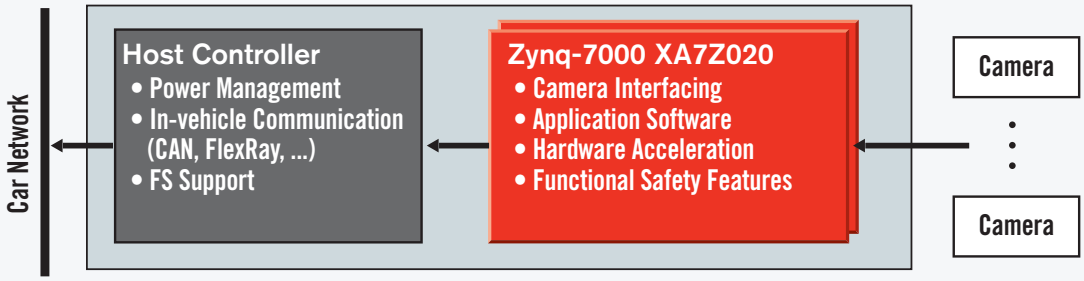
FEATURES OVERVIEW	
Quad- or Dual-core ARM Cortex A53 Application Processing Unit The heart of Zynq UltraScale+ MPSoCs, with exceptional performance-per-watt	• ARMv8 64-bit architecture running up to 1.5GHz • Up to 2.7X performance-per-watt over dual-core ARM Cortex-A9 • 2.3DMIPS/MHz performance • Hardware virtualization with terabyte memory access
Dual-core ARM Cortex-R5 Real-Time Processing Unit Low-latency, deterministic engine ideal for real-time applications or APU offloading	• ARMv7 32-bit architecture running up to 600MHz • 1.67DMIPS/MHz performance • Lock-step mode for high reliability, safety critical functions
ARM Mali-400 MP2 Graphics Processing Unit High-end graphics and video processing reduces APU workload and power consumption	• Multicore 2D/3D acceleration at 667MHz • 1080p resolution graphics • OpenGL ES 1.1 and 2.0 and OpenVG 1.0 and 1.1
Video Codec Unit Ideal for 4K UltraHD multistream video encode and decode	• Supports H.265 (HEVC) / H.264 (AVC) standards • Capable of simultaneous encode and decode at 8Kx4K (15fps) or 4Kx2K (60fps)
Dynamic Power Management Unprecedented power management unlocks full control and operational efficiency	• Multiple power domains with granular gating control • Platform Management Unit for power, safety, and reliability
High-Speed Connectivity Integrated peripherals with key IP/protocol support	• PCI Express® (PCIe) Gen3x16 and Gen4x8, MIPI D-PHY in FPGA logic • Processing system includes USB 3.0, SATA 3.1, PCIe Gen2, DisplayPort support for resolutions up to 4Kx2K (30fps) • 150G Interlaken and 100G Ethernet MAC cores in FPGA logic
Advanced Security, Safety, and Reliability Dedicated engines for a secure and reliable platform	• Configuration Security Unit for anti-tamper and lockdown • Support for 4096-bit RSA keys with SHA3 hash functions • Secure system boot with AES 256 decryption • Full ARM TrustZone support
Low-power 16nm FinFET+ FPGA Fabric from TSMC Industry-leading process from the #1 service foundry delivers a step function increase in performance-per-watt	• Over 2X performance-per-watt over Zynq-7000 SoC fabric • Scalable density from 100K to 1.1M system logic cells
Breakthrough Interconnect Bandwidth Maximize hardware acceleration performance improvements	• Twelve 128-bit high-performance AXI4 ports providing 6,000 interconnects between the processing system and programmable logic, nullifying multichip I/O limitations
Massive Memory Interface Bandwidth Next-generation DDR and serial memory support, along with new embedded RAM architecture	• Integrated memory controller in processing system • DDR4 at up to 2666Mb/s in FPGA fabric • UltraRAM to extend on-chip memory capabilities
Enhanced DSP Slices for Diverse Applications Enabling a massive jump in fixed- and floating-point performance	• Up to 6.3 TeraMACs of bandwidth at 891MHz operation • Double-precision floating point using 30% fewer resources • Complex fixed-point arithmetic in half the resources
Massive I/O Bandwidth and Protocol-Optimized Optimized to reduce power versus Zynq-7000 SoC	• High-density I/O optimized for cost, power, and target protocols • High-performance serial I/O with 16G and 32.75G support

Software and Ecosystem Features *Xilinx Offers Full, End-to-End, No-Charge Software and Tools Solutions*	
Open Source Operating Systems Unlock the performance of the integrated APU, RPU, and MicroBlaze™ soft processor core with familiar open source operating systems	• Linux – For general–purpose computing. Available as source code on GitHub, within Xilinx PetaLinux, or as industry-standard Yocto recipes • FreeRTOS – Ideal for simple, high performance tasks • Bare-Metal – Best for high performance, low level applications • Google Android by Mentor Embedded – for feature-rich, user-friendly graphical applications
System Software Configure and manage system activities between components to enable the full potential of the Zynq UltraScale+ MPSoC	• Xen Hypervisor – Enable multiple concurrent operating systems on the Cortex-A53 APU • Xilinx OpenAMP – Communicate and manage independent processors and software stacks • ARM Trusted Firmware – Guarantee secure access and protect key system resources • Boot loaders – Manage system from power-on-reset with many advanced features including decryption and authentication
Development Environment The right tools for software and hardware development on both the processing system and programmable logic	• Xilinx Software Development Kit (SDK) tools – Manage the full development and debug cycle for multiprocessor designs • System Performance Modeling and Analysis – Measure, analyze, and optimize your total system performance • SDSoC™ development environment – Compiles C/C++ applications into an optimized, fully functional Zynq UltraScale+ MPSoC system • Vivado® Design Suite – Implement hardware designs with RTL or High-Level Synthesis
QEMU Emulation Platform Accelerate and scale embedded software development	• Complete emulation platform of the Zynq UltraScale+ MPSoC for fast software development, architecture investigation, and design porting
Ecosystem Support Ever expanding collection of software designed to improve productivity and reduce product development resources	• Multiple Real-Time Operating Systems – Build your real-time or safety-critical designs with Micrium uC/OS, Wind River VxWorks, Mentor Nucleus, LynxOS7 • Hypervisors – Create complex, real-time, safety and security-critical system designs with the open source Xen Hypervisor, Sysgo PikeOS, Mentor Hypervisor, LynxSecure, Wind River Hypervisor • Ecosystem Tools – Debug, trace, and profile your complex heterogeneous multiprocessing system designs using industry-leading tools from partners such as ARM, Lauterbach, WindRiver, Yokogawa, and others

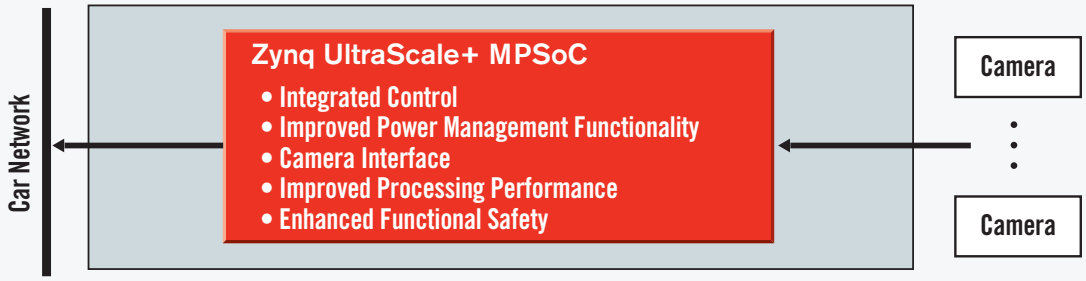
Camera-based Advanced Driver Assistance Systems (ADAS)

Key UltraScale+ Portfolio Benefits:

Existing Infrastructure



Zynq UltraScale+ MPSoC Solution



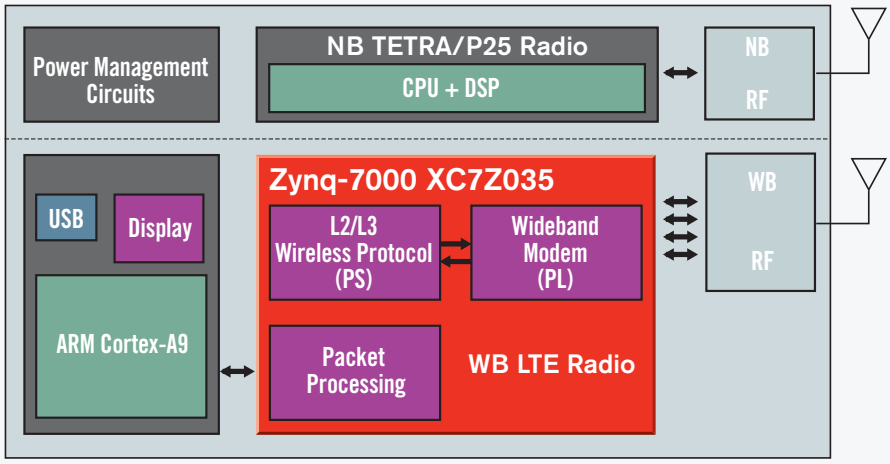
Solution Benefits
System Integration **3 Chips ⇨ 1 Chip**
System Performance **3X**
BOM Cost **-10%**
Total Power **-25%**

- Quad-core ARM Cortex-A53 for vision analytics, streaming, and automated metadata
- Dual-core ARM Cortex-R5 for real-time peripheral interfaces
- Advanced power management, power islands, and lock-step mode with real-time processing for functional safety
- Video encoder/decoder, supporting H.265/H.264 for display connectivity
- CAN2.0B and Gigabit Ethernet support for IEEE Std 1588 and AVB for in-vehicle communications

Public Safety and Military Mobile Radios

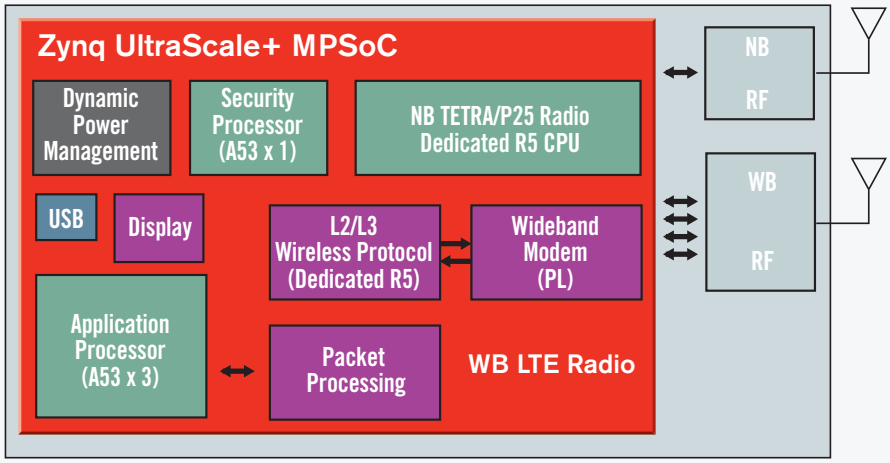
Key UltraScale+ Portfolio Benefits:

Existing Infrastructure



Solution Benefits
System Integration **3 Chips ⇨ 1 Chip**
System Performance **4X**
BOM Cost **-45%**
Total Power **-50%**

Zynq UltraScale+ MPSoC Solution



- Platform Management Unit (PMU) to dynamically lower power, maximizing battery life
- Quad-core ARM Cortex-A53 to integrate application processing and radio modem
- Vivado HLS and SDx™ Design Environment for high-level (C/C++) waveform development
- W-Mux DSP48 for efficient complex filter implementation
- Processing System (PS) with varying Programmable Logic (PL) for radio scalability with maximum software reuse
- Dedicated configuration security unit (CSU) for security management

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