Технологии QNX и ЗОСРВ «Нейтрино» в России

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«Решения NXP для сетевых, промышленных приложений и интернета вещей (Internet of Things). Семейства QorIQ и i.MX»

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СВД Встраиваемые Системы

Symmetron Group

NXP

Программа презентации

- Процессоры i.MX 6QuadPlus и i.MX 6DualPlus
- Расширение семейства i.MX 6 - процессоры i.MX 6UltraLite
- Представление процессоров i.MX 7
- Расширение семейства QorIQ LS1 – процессоры начального уровня на базе 64-разрядных ARM ядер (LS1012A, LS1043A, LS1088A)
- QorIQ LS2 – высокопроизводительные процессоры с 64-разрядными ARM ядрами и DPAA2 (DataPath Acceleration Architecture)

Product Longevity Program: lifecycle guarantee

Category	Family / Series	10-Year	15-Year	Product Launched
	i.mx 6			
Processors	i.MX 6 Series	i.MX 6SoloLite	-	November 2012
Processors	i.MX 6 Series	i.MX 6SoloX	i.MX 6SoloX (Auto)	February 2015
Processors	i.MX 6 Series	i.MX 6Solo	i.MX 6Solo (Auto)	November 2012
Processors	i.MX 6 Series	i.MX 6Dual	i.MX 6Dual (Auto)	November 2012
Processors	i.MX 6 Series	i.MX 6DualLite	i.MX 6DualLite (Auto)	November 2012
Processors	i.MX 6 Series	i.MX 6Quad	i.MX 6Quad (Auto)	November 2012

	QorIQ			
Processors	QorIQ	-	LS1020A/22A	September 2013
Processors	QorIQ	-	LS1021A	September 2013
Processors	QorIQ	P1010/14	-	November 2010
Processors	QorIQ	P1020/11	-	June 2008
Processors	QorIQ	P1021/12	-	December 2009
Processors	QorIQ	P1022/13	-	August 2011
Processors	QorIQ	P1023/17	-	August 2010
Processors	QorIQ	P1024/15	-	December 2009
Processors	QorIQ	P1025/16	-	December 2009
Processors	QorIQ	P2020/10	-	June 2008
Processors	QorIQ	P2040/41	-	May 2011
Processors	QorIQ	P3041	-	June 2010
Processors	QorIQ	P4040	-	September 2009
Processors	QorIQ	P4080	-	June 2008
Processors	QorIQ	P5020/10	-	June 2010
Processors	QorIQ	P5040/21	-	May 2012
Processors	QorIQ	-	T1024	April 2014
Processors	QorIQ	-	T1040/42	October 2012
Processors	QorIQ	-	T2080	June 2012
Processors	QorIQ	-	T2081	October 2012
Processors	QorIQ	T4160	-	February 2012
Processors	QorIQ	T4240	-	February 2012

i.MX 6 Series: Supreme Scalability and Flexibility

Leverage One Design Into Diverse Product Portfolio

Scalable series of **NINE** ARM-based SoC Families

i.MX 6 UltraLite Family

i.MX 6 SoloLite Family

i.MX 6 SoloX Family

i.MX 6 Solo Family

i.MX 6 DualLite Family

i.MX 6 Dual Family

i.MX 6 DualPlus Family

i.MX 6 Quad Family

i.MX 6 QuadPlus Family

Pin-to-pin Compatible

Software Compatible

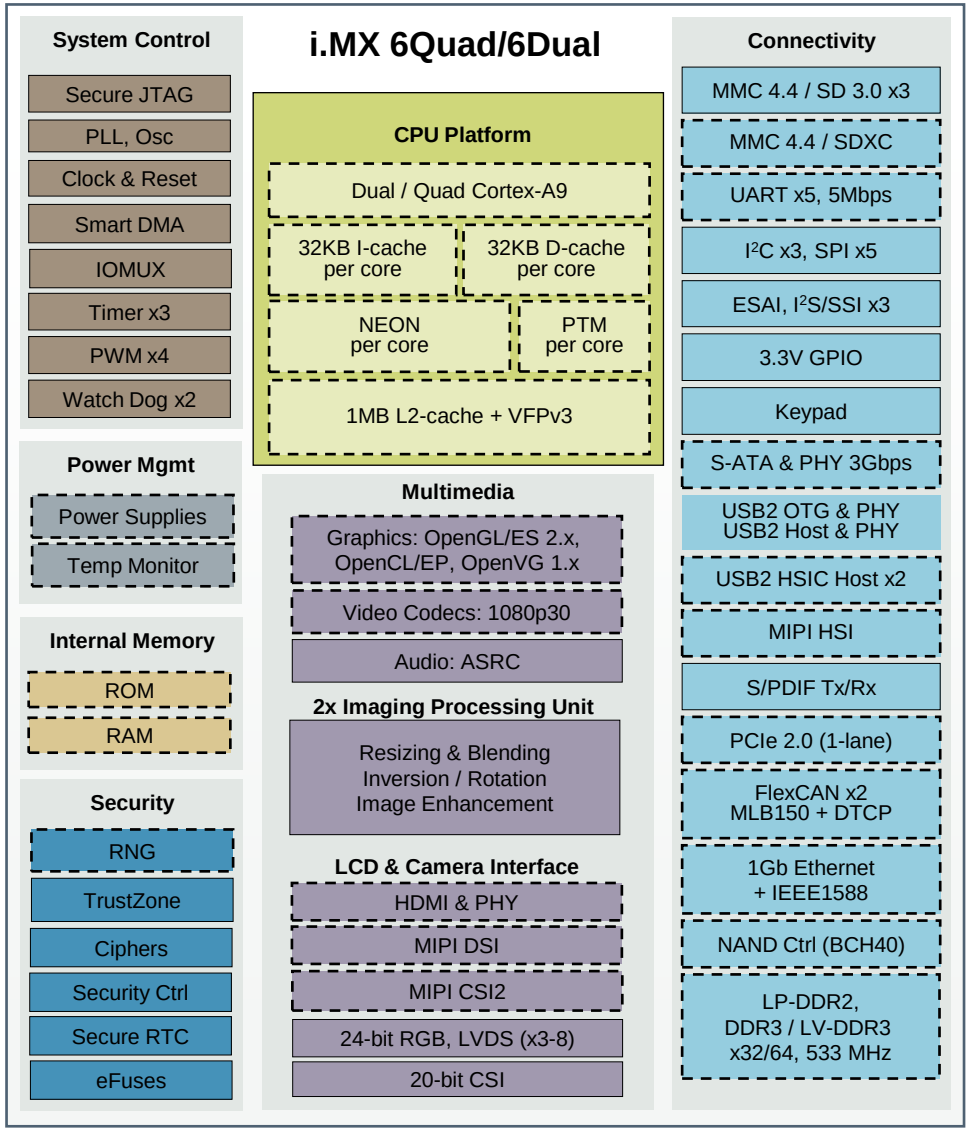
i.MX 6Quad/6Dual Applications Processor

► Specifications

- **CPU:** i.MX 6Quad 4x Cortex-A9 @1.2 GHz, 12000 DMIPS
  i.MX 6Dual 2x Cortex-A9 @1.2 GHz, 6000 DMIPS
- **Process:** 40nm
- **Core Voltage:** 1.1V
- **Package:** 21x21 0.8mm Flip-chip BGA
  12x12 PoP (LP-DDR2, NAND)

► Key Features and Advantages

- Multi-core architecture for high performance, 1MB L2 cache
- 64-bit LP-DDR2, DDR3 and raw / managed NAND
- S-ATA 3Gbps interface (SSD / HDD)
- Delivers rich graphics and UI in HW
  - OpenGL/ES 2.x 3D accelerator with OpenCL EP support and OpenVG 1.1 acceleration
- Drives high resolution video in HW
  - Multi-format HD1080 video decode and encode
  - 1080p60 decode, 720p60 encode
  - High quality video processing (resizing, de-interlacing, etc.)
- Flexible display support
  - Four simultaneous: 2x Parallel, 2x LVDS, MIPI-DSI, or HDMI
  - Dual display up to WUXGA (1920x1200) and HD1080
- MIPI-CSI2 and HSI
- Increased analog integration simplifies system design and reduces BOM
  - DC-DC converters and linear regulators supply cores and all internal logic
  - Temperature monitor for smart performance control
- Expansion port support via PCIe 2.0
- Car network: 2xCAN, MLB150 with DTCP, 1Gb Ethernet with IEEE1588



i.MX 6DualPlus/QuadPlus key changes

Freescale identified multiple fabric and IP changes to improve the overall memory and graphics performance of the existing i.MX 6Dual/6Quad processors, resulting in the i.MX 6DualPlus/6QuadPlus processors

i.MX 6DualPlus/6QuadPlus key features:

- Updated 3D, 2D and OpenVG GPUs
- New pre-fetch and resolve modules to improve efficiency
- Fabric modifications to improve memory bandwidth
- Multiple i.MX 6Dual/6Quad errata fixes
- Pin compatible with existing i.MX 6Dual/6Quad processors
- Increased current consumption in the SOC/PU domain, requiring power supply re-design

Benchmarking

- Multi-master use case shows dramatic increase in memory bandwidth utilization => i.MX 6DQPlus silicon ~2x DRAM utilization vs. i.MX 6DQ

Test case description
IPU fetches 2x 1080p 32bit @60Hz images for display. PRE pre-fetch is enabled in i.MXDQPlus
GPU3D off screen loop “3D read_write_render” case
GPU2D off screen loop 1080p 2D bitblit case
CPU doing memory copy

- Graphics benchmarks prove dramatic increase in 3D performance

3.14.28 kernel Driver 5.0.11P6	Unit	MX 6Dual/Quad	i.MX 6DQPlus
WebGL Aquarium Test	FPS	8-10	23-26
GLBenchmark 2.5 Egypt HD ETC1 C24Z16	FPS	25	40

i.MX 6UltraLite

The most power efficient, lowest cost and smallest i.MX6 member

Low Power and High Performance

ARM **Cortex- A7** @ 528 MHz
(**Neon** engine , FPU)

Advanced Security

TRNG, Crypto Engine (AES/TDES/SHA/RSA with DPA), HAB, Tamper Monitor, Secure Boot, OTF DRAM Encryption

Longevity, Quality and Maturity

On the **longevity program** (15 years)
Industrial qualification (-40°C to105°C)
Power-on for 10 years (24/7)
Same **mature Linux BSP** as other i.MX 6 devices

Connectivity

Optimized for industrial and IoT applications

i.MX 6UL-3 Industrial Processor

► Specifications

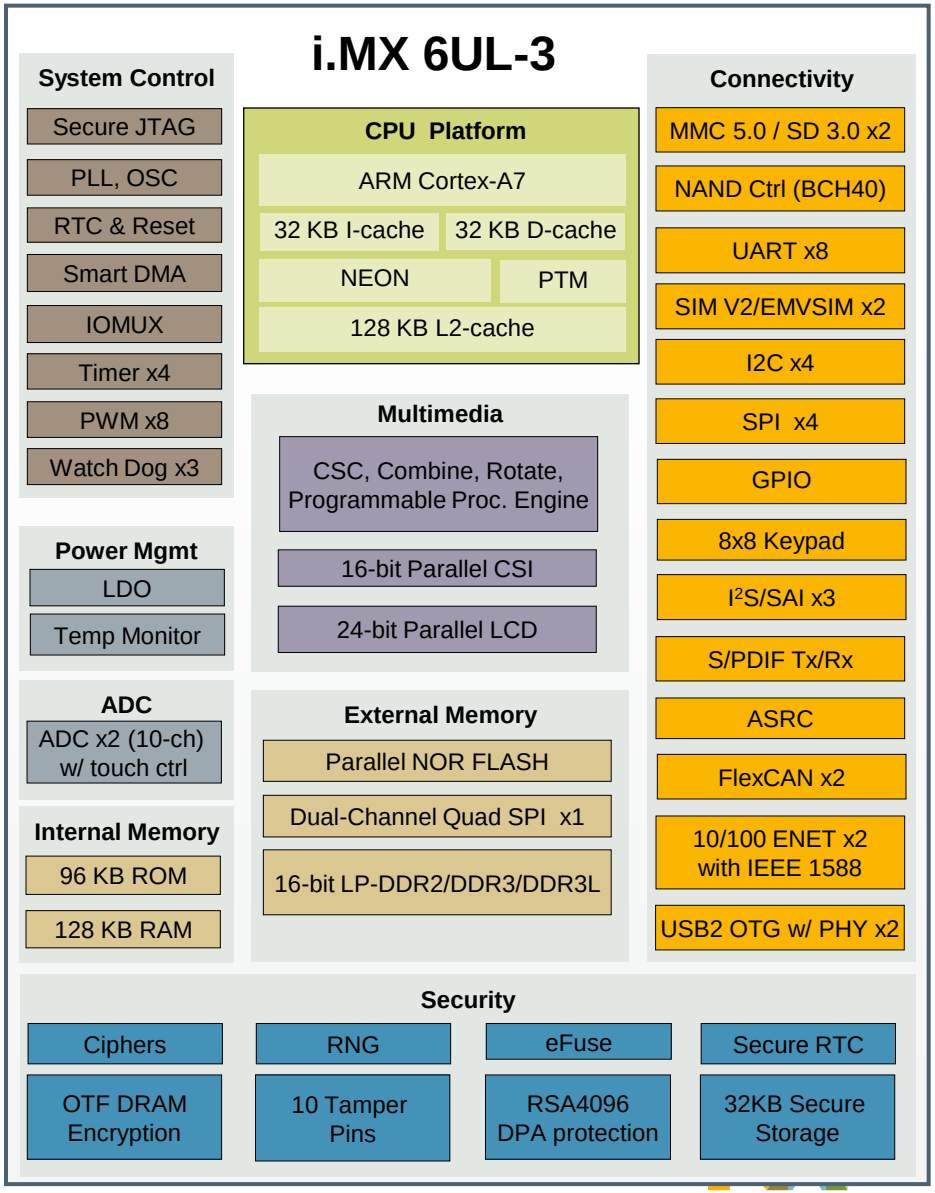
- **Process:** TSMC 40LP
- **Core Voltage:** 1.1V
- **Package:**
  - 289 MAPBGA (14x14, 0.8 mm pitch)
  - 289 MAPBGA (9x9, 0.5mm pitch)
- **Temperature:** -40C to 105C (Tj)

► Key Features and Advantages

- ARM Cortex-A7 @ 528 MHz, 128 KB L2 cache
- LCD Display up to WXGA (1366x768)
- 8-bit/10-bit/16-bit Parallel Camera Sensor Interface
- 16-bit LP-DDR2, DDR3/LV-DDR3
- 16-bit Parallel NOR FLASH / PSRAM
- Dual-channel QuadSPI NOR FLASH
- 8-bit Raw NAND FLASH with 40-bit ECC
- 2x MMC 5.0/SD 3.0/SDIO Port
- 2x USB 2.0 OTG, HS/FS, Device or Host with PHY
- Audio Interfaces include I2S/SSI, S/PDIF Tx/Rx
- 10/100 Ethernet with IEEE 1588 x 2
- **Security Block: TRNG, Crypto Engine (AES/TDES/SHA/RSA with DPA), Tamper Monitor, Secure Boot, SIMV2/EVMSIM X 2, OTF DRAM Encryption, PCI4.0 pre-certification**
- Partial PMU Integration

► Enablement

- Linux BSP from Freescale



i.MX 6UltraLite Development Platform Key Features

Processor
- Freescale i.MX 6UltraLite 528MHz ARM® Cortex™-A7 CPU

Memory
- 4Gb DDR3L DRAM memory
- 256Mb QSPI Flash
- Footprint for NAND
- Footprint for eMMC
- TF socket for boot

Display
- Parallel WVGA LCD add-on card via expansion connector
- HDMI connector and Footprint for HDMI transmitter
- Camera Connector

Audio
- Audio Codec
- 4-pole Audio Headphone Jack
- External speaker connection
- Microphone

Connectivity
- USB Host connector
- Micro USB OTG connector
- Two Ethernet (10/100T) connector
- SD/SDIO Connector
- Two CAN Transceivers
- EMV Smart Card connector

Debug
- JTAG connector
- Serial to USB connector

Sensors
- Footprint for FXAS21000CQR1 Gyro
- FXLS8471Q three-axis digital accelerometer
- MAG3110 Digital eCompass

Tools & OS Support
- Linux® BSPs from Freescale

Others
- CPU Module: 1.67x2.66 inch
- Base Board: 4.25x5.12 inch
- 4 layer through hole PCB

i.MX 7 Series Overview

i.MX 7Solo

- Single ARM® Cortex®-A7 up to 800 MHz
- Cortex-M4 up to 266 MHz
- 512KB L2 cache
- 16/32-bit DDR3/DDR3L and LPDDR2/3 at 533 MHz
- Single Gigabit Ethernet (AVB)
- **Full security with tamper resist**

i.MX 7Dual

- Dual ARM® Cortex®-A7 up to 1.0 GHz
- Cortex-M4 up to 266 MHz
- 512 KB L2 cache
- 16/32-bit DDR3/DDR3L and LPDDR2/3 at 533 MHz
- Dual Gigabit Ethernet (AVB)
- **Full security with tamper resist**
- EPD controller
- PCIe (x1 lane)

Red indicates change from column to the left

Pin-to-pin and power compatible

Software compatible

Consumer

Extended Consumer

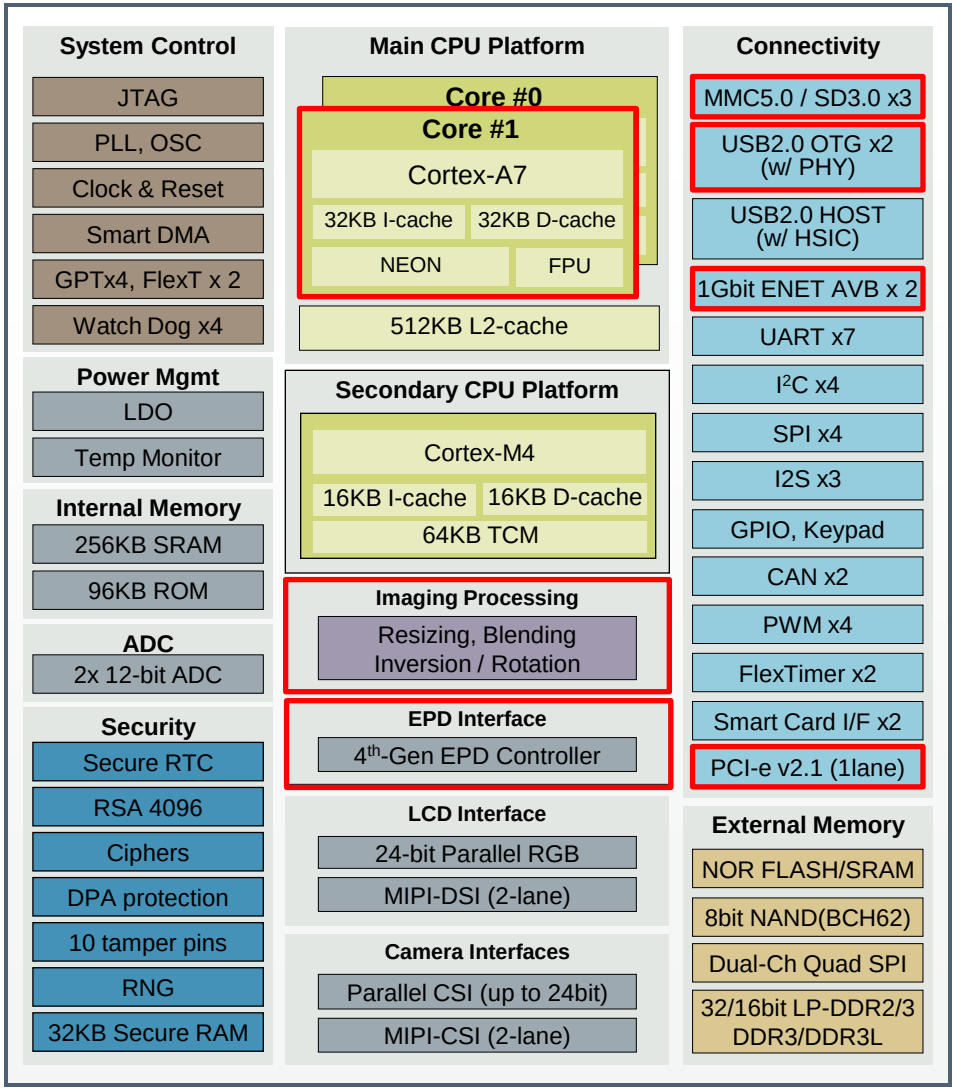
i.MX 7Dual

Specifications:

- **CPU:** Dual Core Cortex-A7 @ 1GHz
- **Package:** 19x19@0.75mm BGA
  12x12@0.4mm BGA*
- **Qualification:** Consumer (0C to 95C Tj)
  Extended Consumer* (-20C to 105C Tj)
  *10yr lifetime at 100% duty cycle

Key Features and Advantages

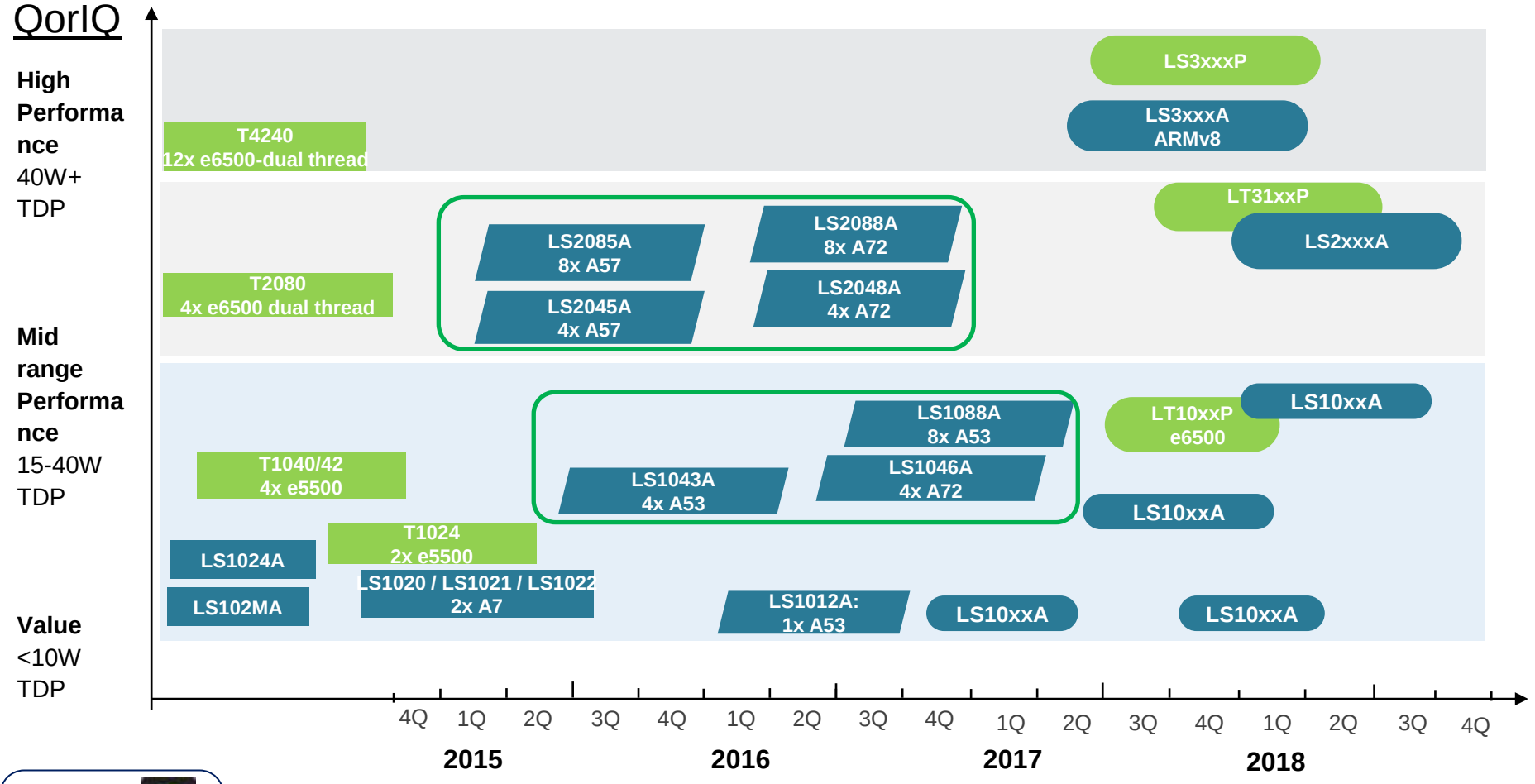
- **1GHz, Cortex-A7, 32KB I/D, 512KB L2 Cache**
- **266MHz Cortex M4, 16KB I/D, 64KB TCM**
- **Memory Support**
  - 16/32bit LP-DDR2/3, DDR3/L @ 533MHz;
  - Total of 256KB OCRAM (128KB dedicated to EPDC if used)
  - 3x SDIO3.0/eMMC5.0, 8-bit NAND Flash with ECC(BCH62)
- **Display / Camera**
  - 4th generation EPD Controller (2332x1650@106Hz)
  - LCD: 24-bit Parallel LCD and MIPI DSI (2-lane)
  - Parallel (up to 24-bit) and MIPI CSI (2-lane)
- **I/O**
  - 1x PCI-e (1-lane)
  - 2x USB 2.0 OTG w/ PHY + 1xUSB 2.0 HOST/HSIC
  - 2x GigE Ethernet Ports-AVB;
  - 4x SPI (1x is 60MHz and 3x at least 10MHz);
  - 4x 32-bit Timer (GPT), 2x FlexTimer
  - 4x PWMs; 4x I2C,
  - 7x UARTs
  - SIMv2/EMVSIM (ISO7816/EMV2000L1 support)
- **Security module - enabling PCI 4.0 compliance**



Updated from i.MX 7Solo

* Feature limited (1 ADC, 4 tamper pins)

QorIQ Multicore Processor Solution Roadmap



Power ARM

Freescale investing in both Power and ARM portfolio
Scalable portfolio from 1 to 20+ cores with common SW framework and SDK

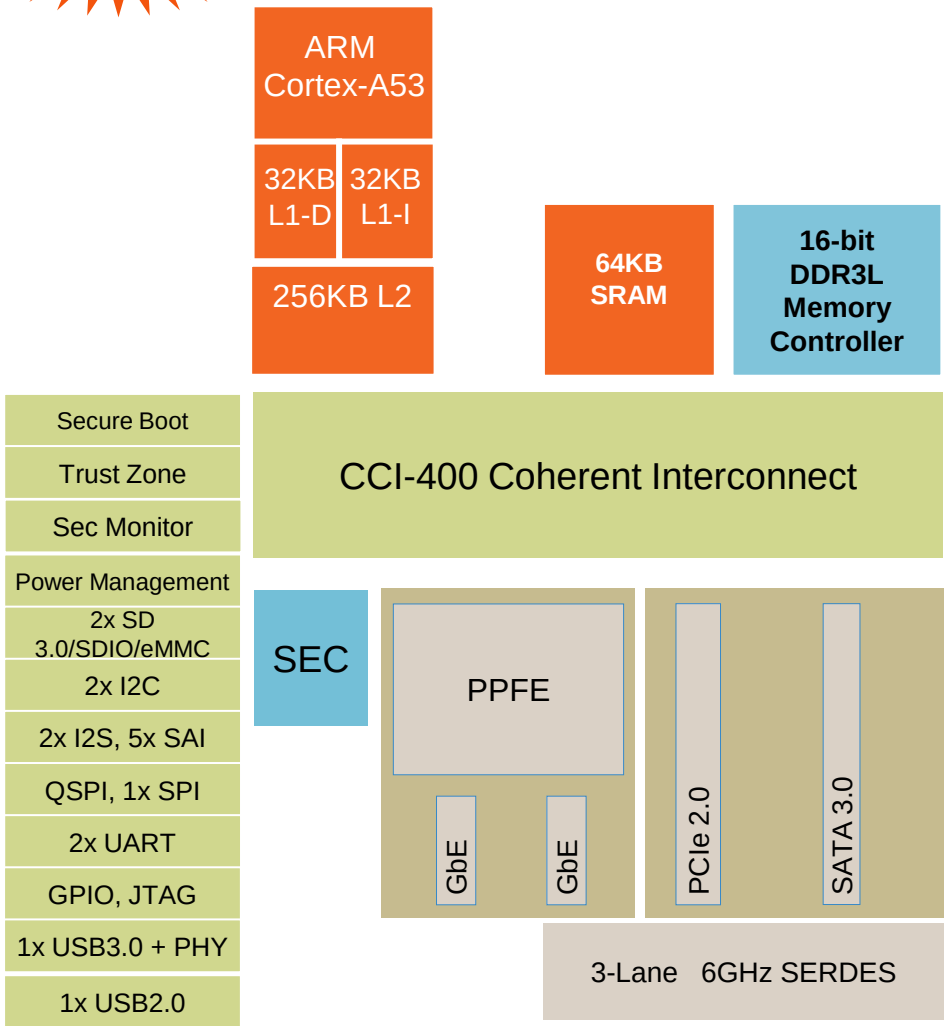
Production | Execution | Planning | Proposal

Production
Sample

Pin compatible solutions

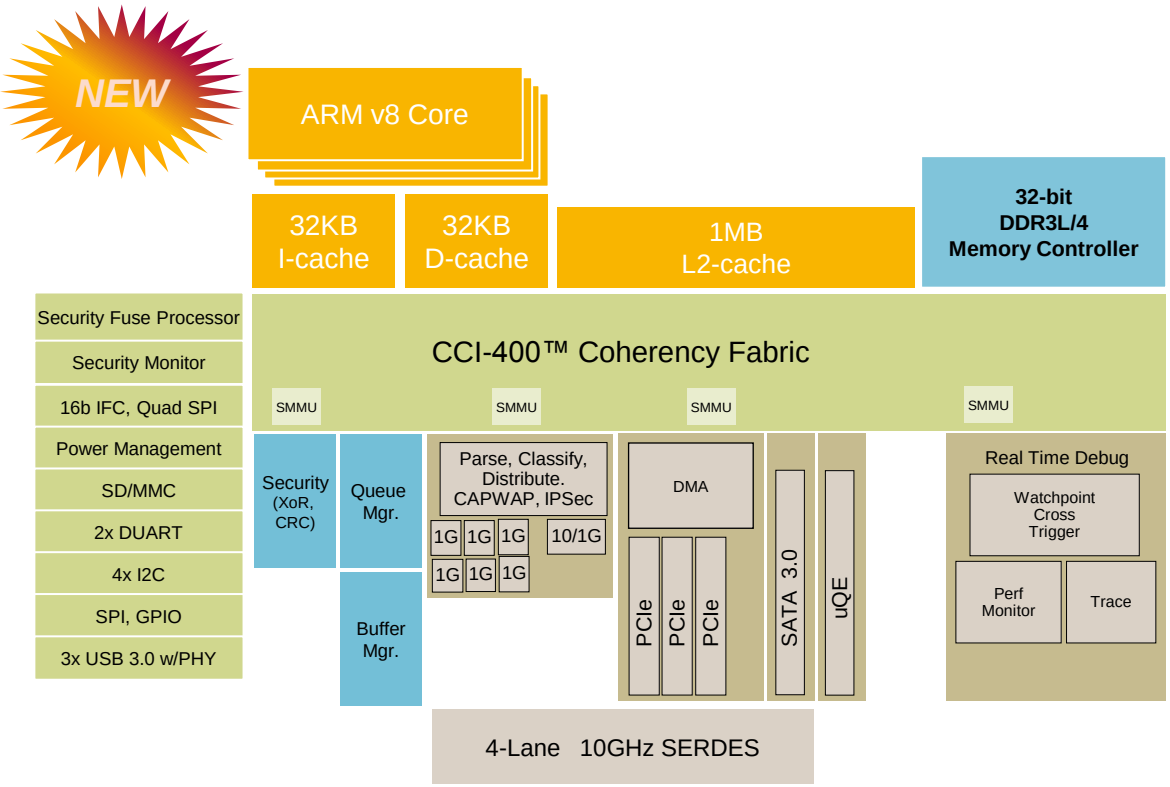
NEW

LS1012A: smallest 64-bit ARM based QorIQ



- Single ARM Cortex-A53 processor
  - 1840 DMIPS / 2600 Coremark @ 800MHz
  - NEON Co-processor and DP FPU
  - 256 KB L2 cache with ECC
- Memory Controller
  - DDR3L up to 1000 MHz
  - 16-bit data bus, 1 chip select
- High Speed Interconnect
  - 1x PCI Express Gen2
  - 1x SATA Gen3
  - 1x USB 3.0 w/PHY
  - 1x USB 2.0 w/ULPI
- Ethernet Packet Accelerator
  - 2x GbE (2.5G or 1G)
- Datapath
  - Packet Acceleration Engine (PPFE)
  - Security acceleration engine (SEC)
- 2x SD 3.0/SDIO/eMMC
- QSPI, 1x SPI, 2x UART, 2x I2C
- 2x I2S, 5x SAI
- Secure Boot, Trust Architecture, ARM TrustZone
- Advanced Power Management
- Package: 10x10mm, routable in 4-layers

LS1043A/23A: 64-bit ARM based QorIQ with 10Gb Ethernet + DPAA



Device

- 28HPM Process
- FCBPGA, 0.8mm pitch

Power target

- 5-8W

Schedule

- Production: Now

Security

- Hardware – Encryption (IPSec)
- Secure Boot
- Trust Zone & Trust Architecture

Performance

- IPSec: 5 Gbps (IMIX)
- IPv4: 5 Gbps (large packets)

Processor

- 2 or 4x A53, 64b, up to 1.4GHz
- Over 20,000 CoreMarks
- 1MB L2 cache shared by all cores (and platform elements)

Memory Subsystem

- 32b DDR3L/4 Controller up to 1600MHz

CCI-400 Switch Fabric

- Advanced VM hardware support

High Speed Serial IO

- 3x PCIe Gen2 Controllers
- 1x SATA 3.0, 6Gb/s
- 3x USB 3.0 with PHY

Network IO

- 1x10G + QSGMII or 3x 1/2.5G SGMII + 2x 1G RGMII
- Proven Packet Parse/Classify/Distribute

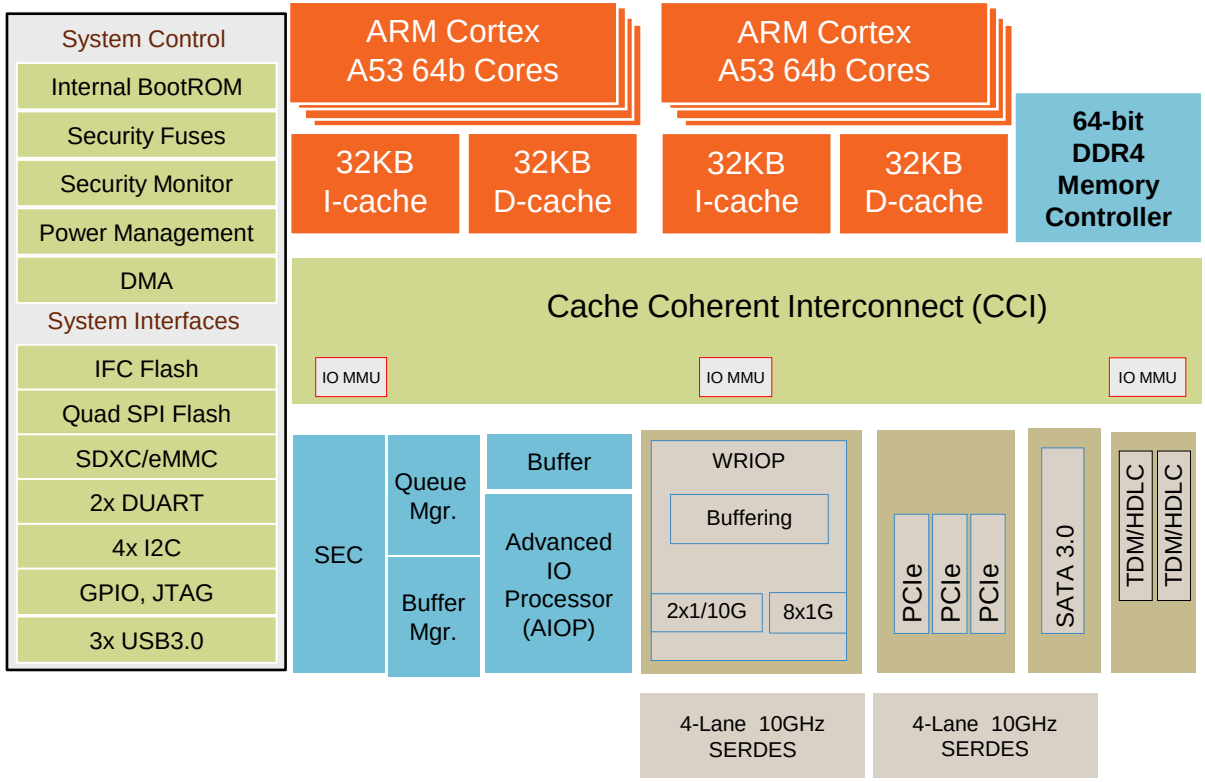
Industrial connectivity

- Ethernet, Serial (RS485/422), uQE (for additional serial fieldbus applications)

Industry's most efficient quad core communications SoC solution

NEW

LS1048A/88A: 64-bit ARM based QorIQ with DPAA2



General Purpose Processing Layer

- 8 x ARM A53 CPUs, 64b, 1.5GHz; 2MB L2 cache
- HW L1 & L2 Prefetch Engines
- Neon SIMD in all CPUs
- 1x64b DDR4 up to 2.1GT/s

Interfaces

- Supports x4,x2, x1 PCIe Gen2 controllers
- SATA 3.0, 3x USB 3.0
- SDXC/eMMC
- **Network IO**
- Wire Rate IO Processor:
  - 2x 10G and 8 x 1G; MACSEC on 4x 1G
  - XFI/KR, QSGMII, SGMII/KX, RGMII

Datapath Acceleration

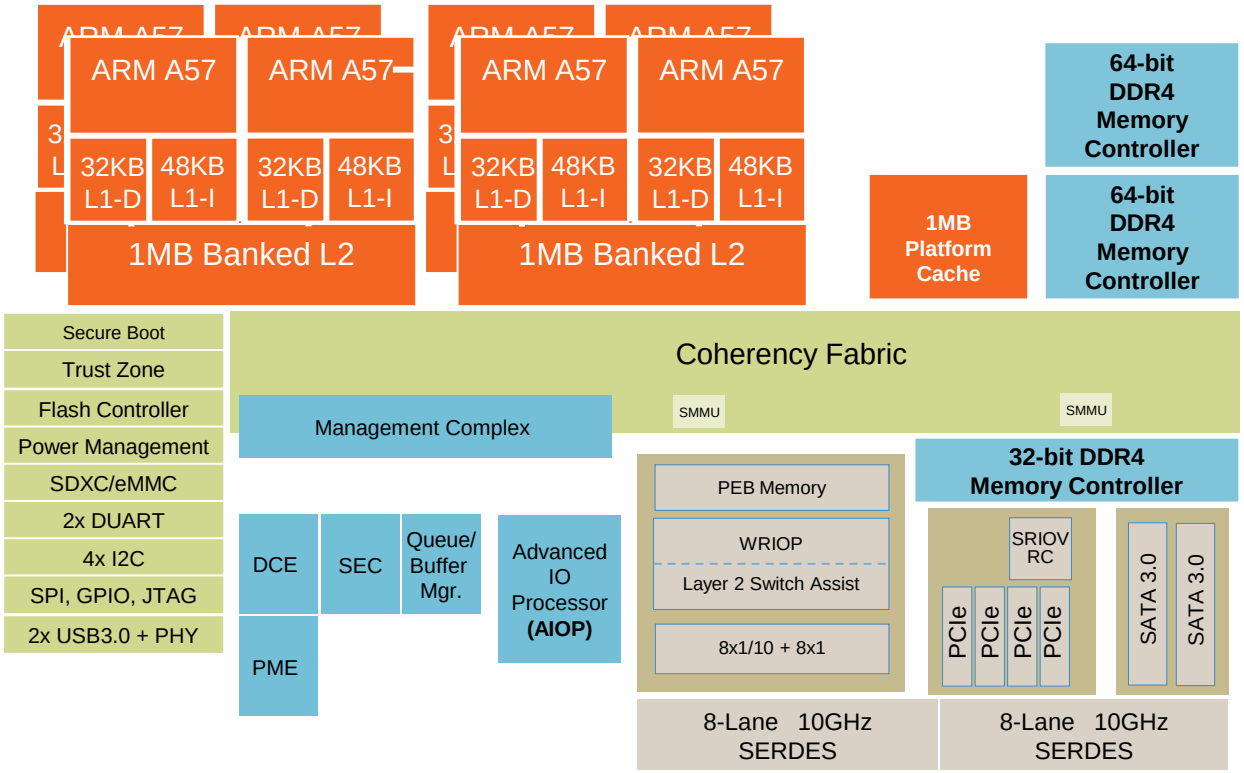
- SEC- crypto acceleration
- Packet processing engine (AIOP)
  - Protocol offload
  - Services

Other Parameters

- 23 x 23mm FCPBGA
- **Pin Compatible to LS1043A**
- 0.8mm Pitch, 780 Pins

Unprecedented performance/watt and ease of use for smarter, more capable networks

LS2085A/45A: 8x/4x ARM Cortex-A57 based QorIQ with DPAA2
LS2088A/48A: Cortex-A72 based QorIQ with DPAA2



General Purpose Processing

- 8x ARM A57 CPUs, 64 b, 2.0 GHz
  - 1 MB L2 cache
- HW L1 & L2 Prefetch Engines
- Neon SIMD in all CPUs
- 1 MB L3 platform cache w/ECC
- 4 MB Coherent Cache
- 2x64 b DDR4 up to 2.4GT/s

Accelerated Packet Processing

- 20 Gbps SEC- crypto acceleration
- 10 Gbps Pattern Match/RegEx
- 20 Gbps Data Compression Engine

Express Packet IO

- Supports1x8, 4x4, 4x2, 4x1 PCIe Gen3 controllers
  - SR-IOV support, Root Complex
- 2 x SATA 3.0, 2 x USB 3.0 with PHY

Network IO

- Wire Rate IO Processor:
  - 8x1/10GbE + 8x1G
  - XAUI/XFI/KR and SGMII
  - MACSec on up to 4x 1/10GbE
  - Layer 2 Switch Assist

Other Parametrics

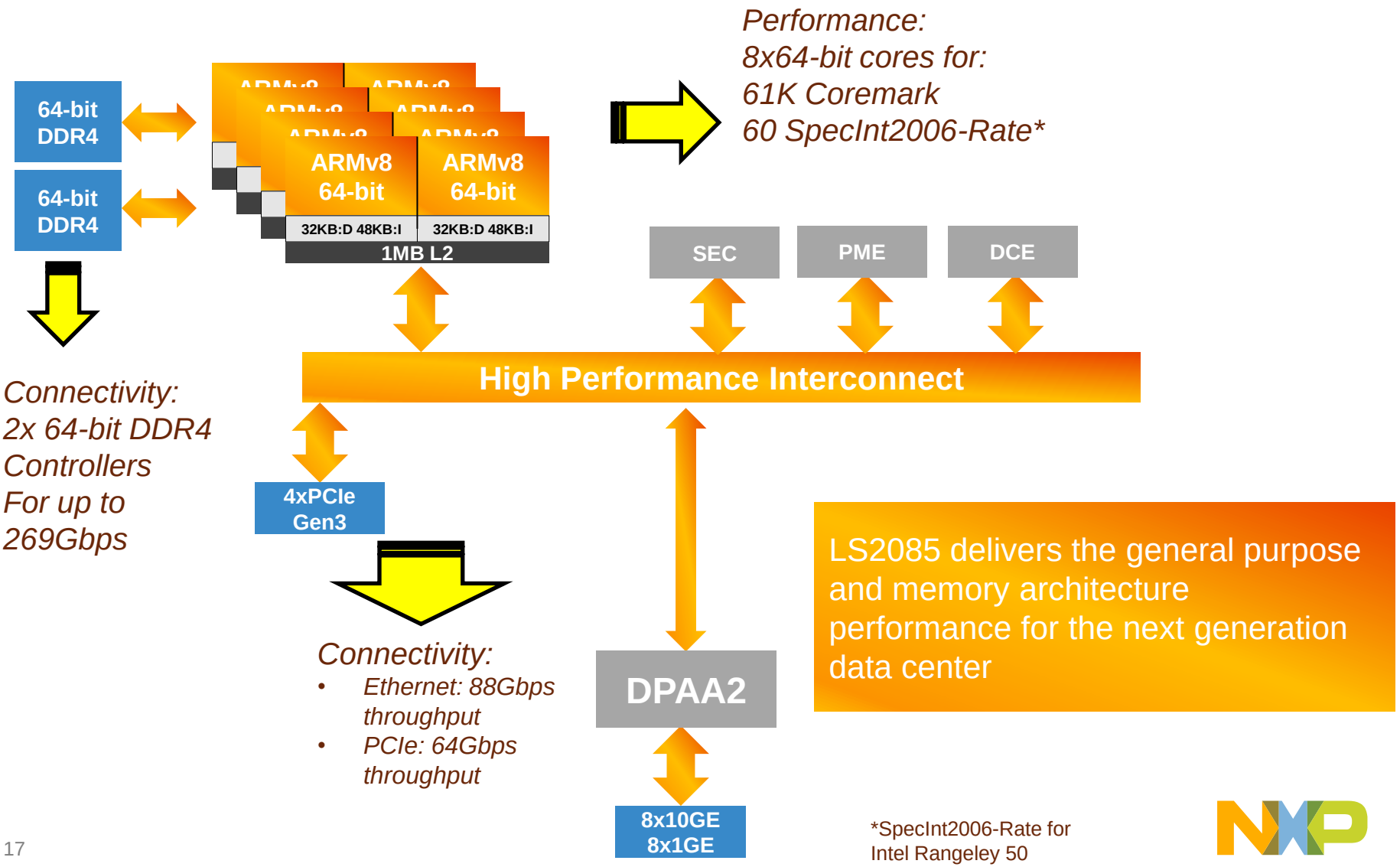
- 37.5x37.5 Flipchip
- 1 mm Pitch
- 1292pins

Datapath Acceleration

- **SEC**- crypto acceleration
- **DCE** - Data Compression Engine
- **PME** – Pattern Matching Engine
- **L2 Switching** -- via Datapath Acceleration Hardware
- **Management Complex** – Configuration Abstraction

Next Generation Data Centers

The need to increase computing power at a lower cost: providing a competitive edge to the enterprise.



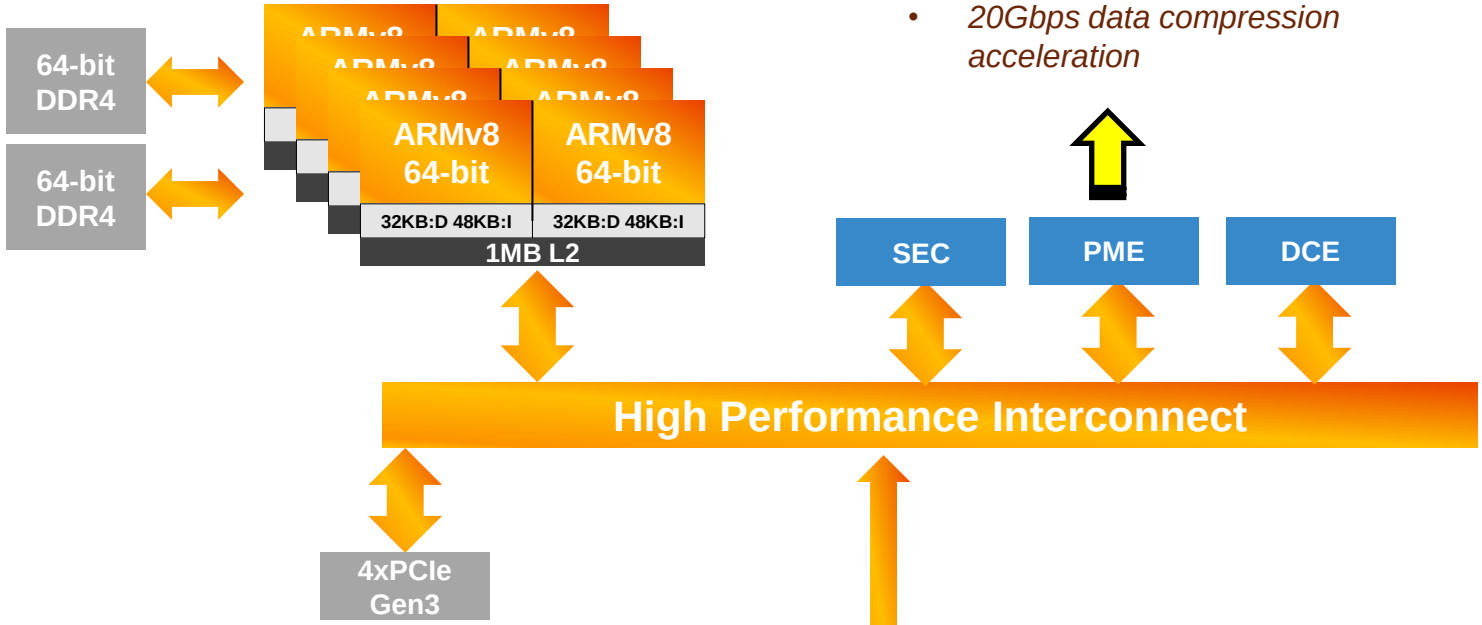
*SpecInt2006-Rate for Intel Rangeley 50

Next Generation Data Centers

Providing an architecture that provide higher performance on networking applications

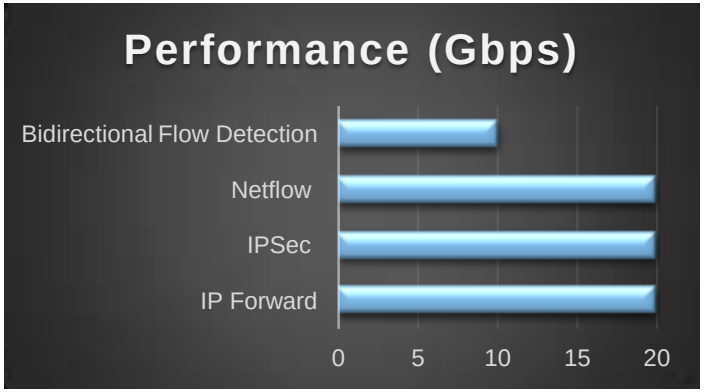
Targeted Acceleration

- *20Gbps Cryptography acceleration*
- *20Gbps Pattern Matching (Reg Ex)*
- *20Gbps data compression acceleration*



LS2085 delivers unmatched networking performance for the next generation data center

Flexible Networking Acceleration



QorIQ LS2 Target Markets/Key Features

High performance GPP

QorIQ LS2080A and LS2040A


Test and Measurement


Industrial Computing and Robotics


Substation/Bay controllers


UAV and Ruggedized Routers


Single Board Computing

QorIQ LS2085A and LS2045A


Enterprise Routing and Switching


Datacenter Switching


Enterprise Storage


Broadband and Access Routers


Security Appliance

Advanced Network Processor

The LS2 embedded processors were architected to provide breakthrough Performance and Power Balance. Showcases Highest Performance per Watt per Dollar

SECURE CONNECTIONS
FOR A SMARTER WORLD