Expanding the COM Express® I/O

Alternative processor architectures on the COM Express form factor

San Jose, CA
October 2011

freescale

AGENDA

- Embedded market trends
- Processors architecture challenges and solutions
- COM Express for factor – expanding I/O connectivity for alternative architectures

Connected Devices Evolution

1960 - 1985
Host era

1985-2006
PC Era

2006 - 2025
Internet of Things

Census

Personal Productivity

Health, Safety, Transportation, Communications, Entertainment, Automation

Proprietary Hardware & Software

Intel Architecture / Windows OS

Non-proprietary Hardware & Software / Open Source

freescale

COM Express®

Embedded Processing Requiring Increased Performance & Integration

Market Opportunity


Aerospace & Defense


Smart Energy


3G / 4G Infrastructure


Portable Medical


Auto: Networking


Cloud Computing


Tablets


Auto: Active Safety


Enterprise Networking


Smart Phones

Auto: Hybrid / Electric


Industrial Control


Consumer Applications

MCUs | DSPs | App. Processors | Comm. Processors | GP Microprocessors

Embedded Processing Engines

freescale

Wireless Infrastructure Trends

Goal: Add cost-effective capacity and coverage to global networks

- **Technology Trends**
  - Multi-standard support for new equipment and upgrades
    - GSM, UMTS, LTE
  - Heterogeneous networks for coverage
    - Small (Femto & Pico) and large cells (Metro & Macro)
  - Cloud-based RAN architectures

- **R&D Challenges**
  - Create a **future-proof portfolio** of products supporting multiple standards, ranging in performance and cell sizes
  - **Reduce total cost of ownership** while adding **increased differentiation**

The Tablet Usage Model is Rapidly Evolving

Today

Near Term

Good, Better, Best

Small, Medium, Large Form Factors

Price Segments

Longer Term

General purpose
Printer
Home multimedia
eReaders
eLearning
Gaming
Ruggedized/Industrial
Business productivity
Medical
Auto infotainment
Enterprise VOIP phones
Media phones
Smart monitors
Appliance displays

Segment Introduction → Value (Traditional) Segmentation → Segmentation Proliferation/Maturity

Embedded Markets Drive Increasing Integration

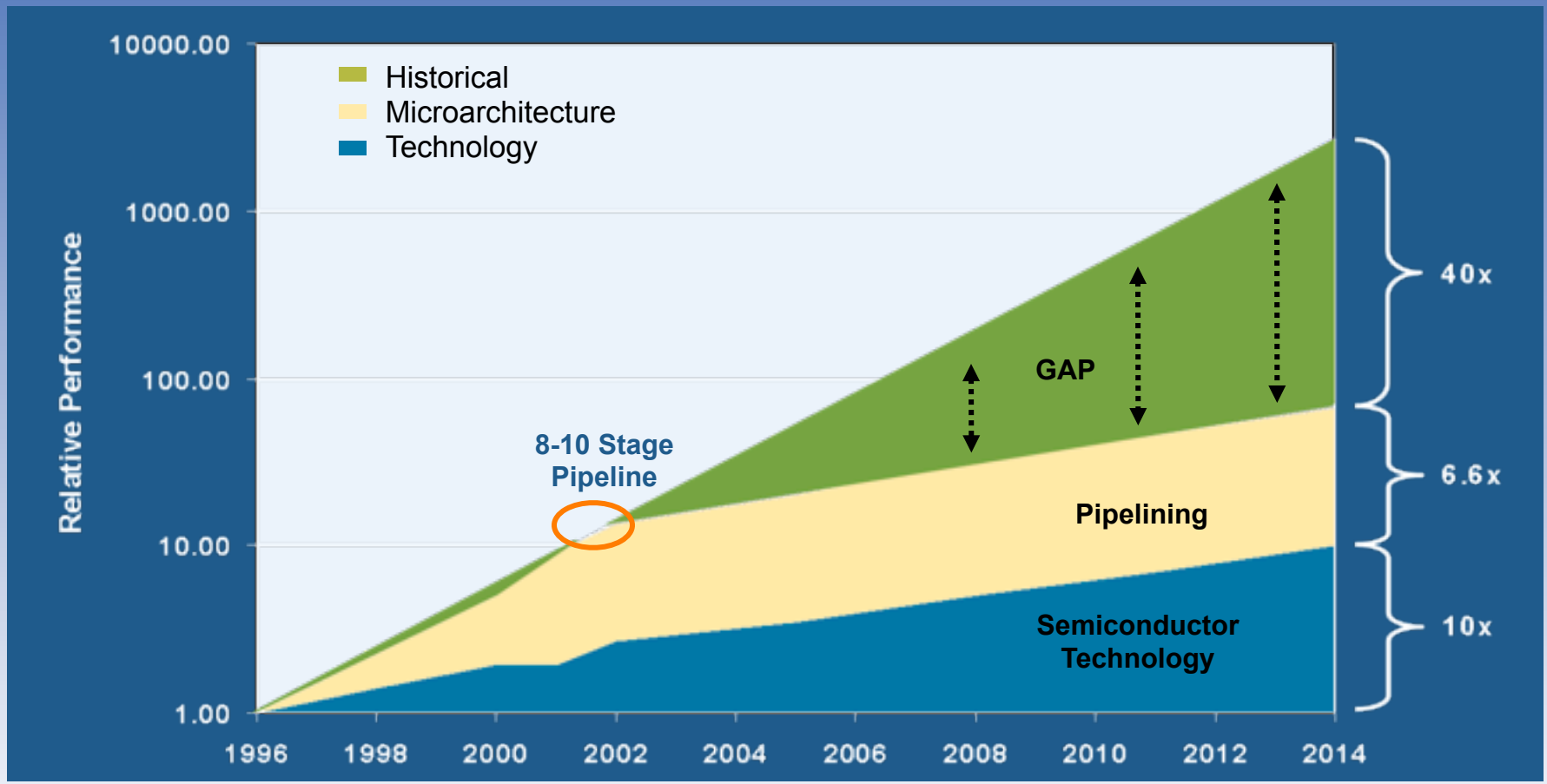
- No “one size fits all” in the embedded space
- Similar principles driving increased performance, reduced cost and reduced power are critical in all embedded markets
- Intelligent Integration is a driving force for all markets

COM Express®

MPU Challenge Going Forward

Performance Scaling and Technology Challenges

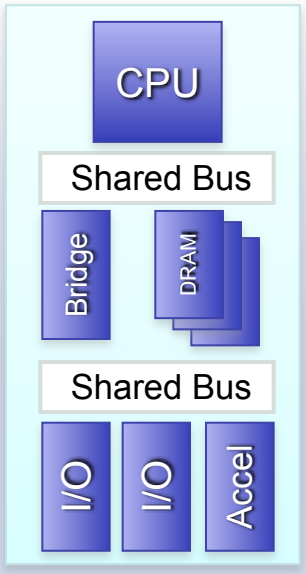
Clock rate improvements slowing: 40%/year to 12%/year



Source: UT Dept. Computer Science

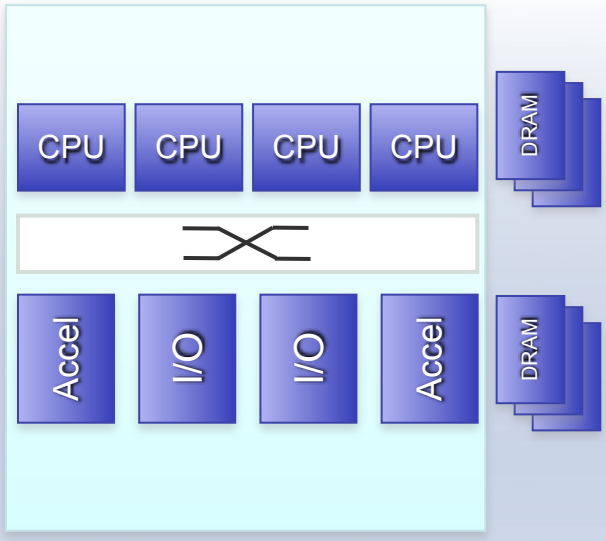
Intelligent Integration Options

Single Core with Hardware Accelerators	Homogeneous Multicore	Heterogeneous Multicore



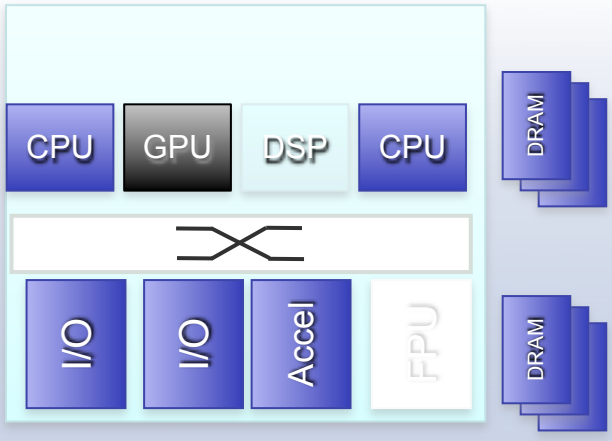
General-purpose processing

Hardware acceleration provides more power/performance efficiency than software



General-purpose processing with some parallelism for more computing power

Hardware acceleration for specific tasks



Truly integrated system

Most power/performance efficient

Software complexity and Portability

Increasing Software Complexity

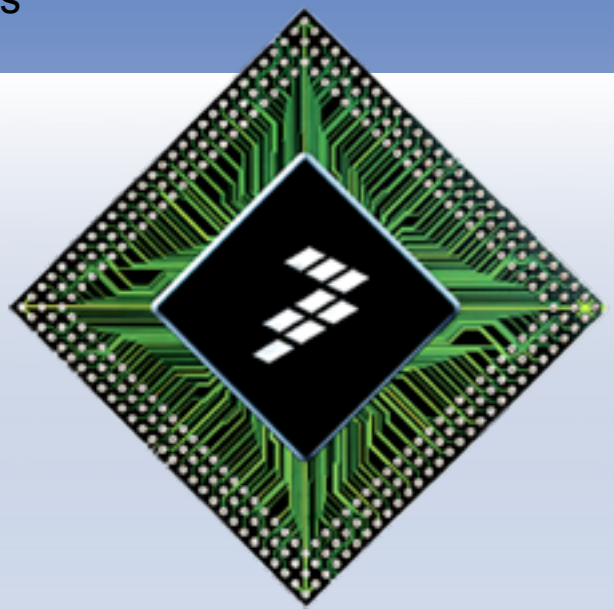
The New Embedded Processing Paradigm: Intelligent Integration

Heterogeneous Cores & Functional IP

Processor IP
- Communication processors
- Digital signal processors
- Application processors

Accelerator IP
- Data path accelerator
- Security engine
- Baseband accelerator
- Vertex accelerator
- Video engine
- Image processing unit
- Vector processing unit
- Graphics processing unit

Multimedia IP
- Audio codec
- Image capture



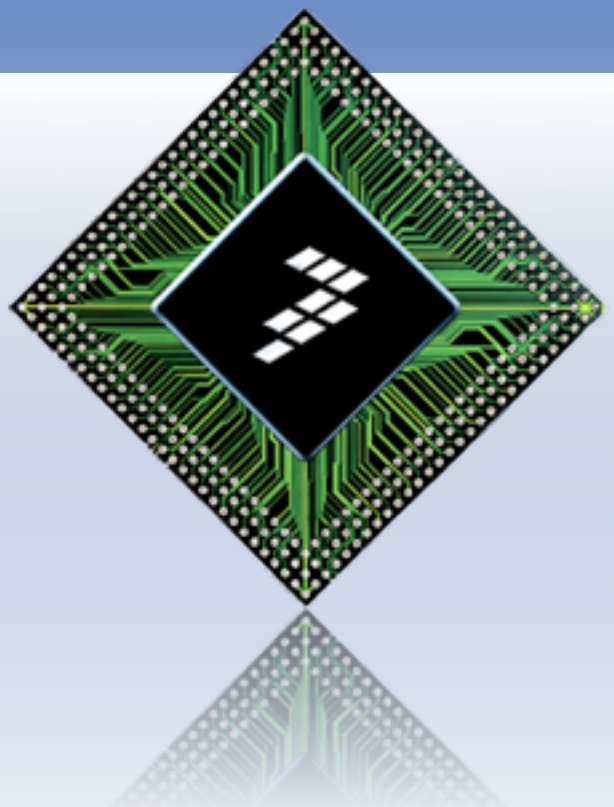
Connectivity IP
- Gigabit Ethernet
- Multichannel SerDes
- High-speed interconnects
- USB 2.0
- PCI Express®

Display Interfaces
- HDMI
- LVDS
- MIPI DSI
- WVGA / XGA
- RGB

Memory and Mass Storage Interfaces
- DDR3
- LPDDR2
- SATA

The New Embedded Processing Paradigm: Intelligent Integration

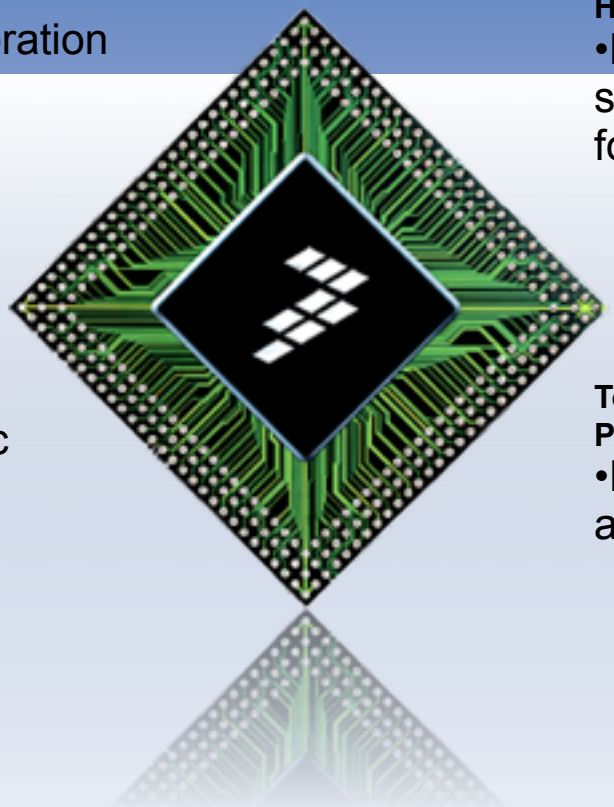
Heterogeneous Cores & Functional IP



The New Embedded Processing Paradigm: Intelligent Integration

Software, Tools and Ecosystem Support

Architecture Alliances
•Strategic technology collaboration to develop embedded power budgets, security IP and content-aware packet processing



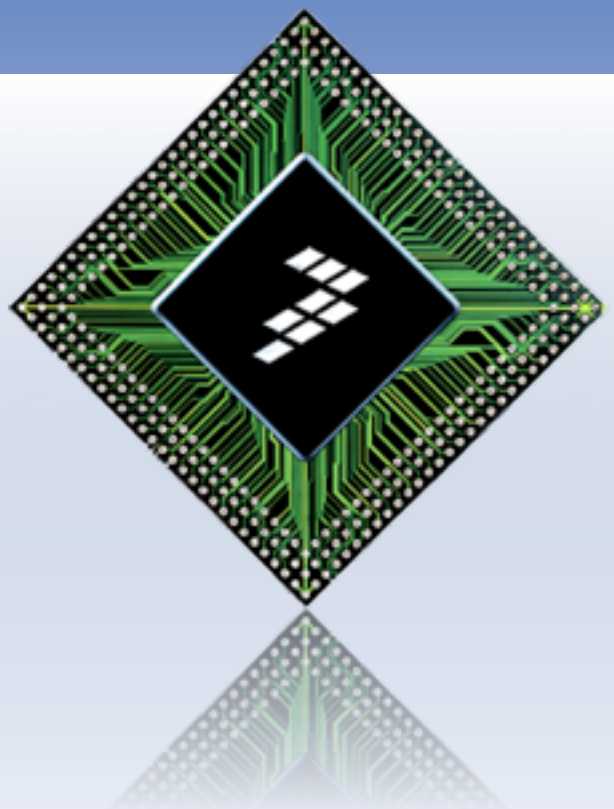
Hardware Partners
•Development and production systems in standard industry form factors

Applications Development Partners
•Optimize application-specific stacks for continual improvement in network security solutions

Tools and OS Software Partners
•Enable faster time-to-market and market longevity

The New Embedded Processing Paradigm: Intelligent Integration

Software, Tools and Ecosystem Support



QorIQ T4240 AMP Product Features

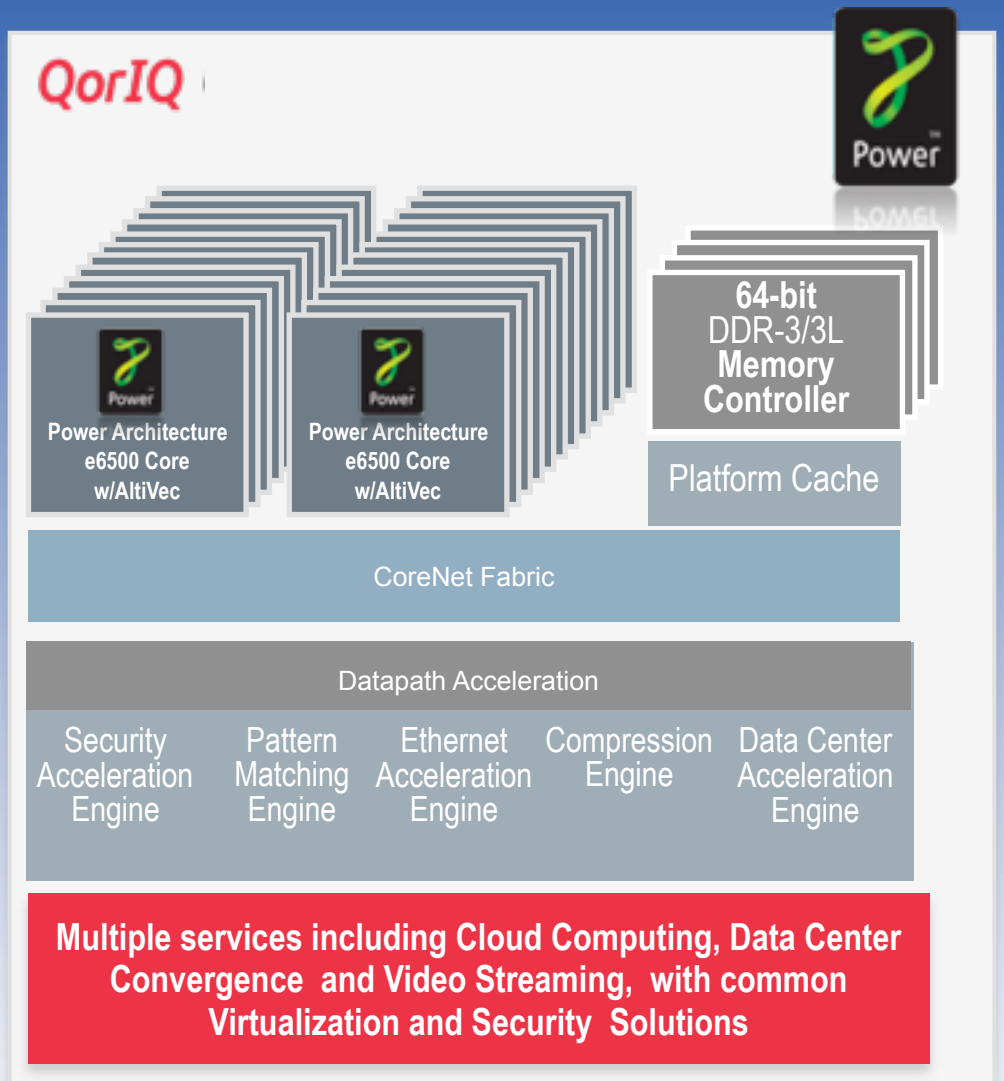
NEW!

Programmability for Innovation

- **e6500 core builds on existing QorIQ cores**
  - Dual threads
  - AltiVec® technology
  - 64-bit Power Architecture® technology
  - 24 virtual cores

- **Accelerated processing on demand**
- Data compression / decompression
- Interlaken look-aside
- Security and trust architecture

- **Intelligent processor Integration delivers 400% performance improvements:**
- **4x more** application performance than previous generation - QorIQ P4080 with e500mc Power Architecture core



Expanding the Processor I/O Connectivity Options for COM Express Form Factor

Emerson Network Power, Kontron and Freescale Semiconductor

- Three companies coming together to advance I/O connectivity for COM Express form factors – announcement on October 31, 2011 – COM Express Day
- Collaboration enables availability of Freescale's multicore QorIQ AMP processors on popular COM Express form factor
- Goals of Collaboration
  - New Pin out definition for modules that are compatible with COM Express mechanical requirements
  - New modules can plug into existing carriers without damage to carrier or module
  - Provide expanded flexibility and expanded embedded signals to the market
  - React quickly to market interest
  - Follow Type 6 signaling where possible

The Signal Definitions

- Kept A-B connector signals
- Provided 24 SerDes signals to allow more flexibility and take advantage of the ability to define 1Gb and 10Gb Ethernet, SATA, USB, RapidIO® interface and debug ports
- IEEE® 1588 to support growing list of time stamping of Industrial signals (AFDX, EtherNet/IP™, Ethernet AVB, LXI and many more freescale.com/IEEE1588)
- Added Pin Type Module definition pin

New definition available at freescale.com/sbc

What's Next for COM Express?

- Is it time to begin defining 10 GHz SerDes?
- Processor agnostic from the beginning
  - Power Architecture® technology
  - ARM® technology
  - MIPS® technology

Summary

- COM Express has seen an acceptance by the market for alternative architectures – the concept is proven for deeply embedded applications
- Kontron, Emerson and Freescale have been able to react quickly to market requirements
- Now is the time to begin working on next generation I/O definitions to be ready when processors become available

COM Express®

Q & A