Welcome

Altera Technology Roadshow 2013

30 YEARS
LEADERSHIP
INNOVATION
COMMUNITY

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Altera at a Glance

Founded in Silicon Valley, California in 1983

Industry's first reprogrammable logic semiconductors

$1.78 billion in 2012 sales

Over 2,900 employees

Leading supplier of FPGAs, ASICs, and CPLDs

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Altera Around the World

Global Offices Serving Over 13,000 Customers

Headquarters

R&D and Sales Offices

Distribution and Sales Representative Offices

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# Innovation Leader Across Industries

Industrial and Automotive

Automation and Process Control	**PLC and I/O Modules, Motion and Motor Control, Industrial Networking, Sensor/Encoder Interfaces**
Building Control and Security	**Video Surveillance, Access Control, HVAC Control**
Automotive	**Displays, Infotainment, Driver Assistance**
Smart Energy	**Smart Grid/Meter, Energy Management, Power Distribution**

Communications

Networking	**Switches, Routers**
Wireline	**Optical Metro Access**
Wireless	**Remote Radio Head, Basestations, Wireless LAN**
Broadcast	**Studio, Satellite, Broadcasting**
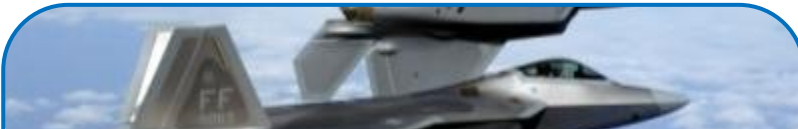
Military and Aerospace
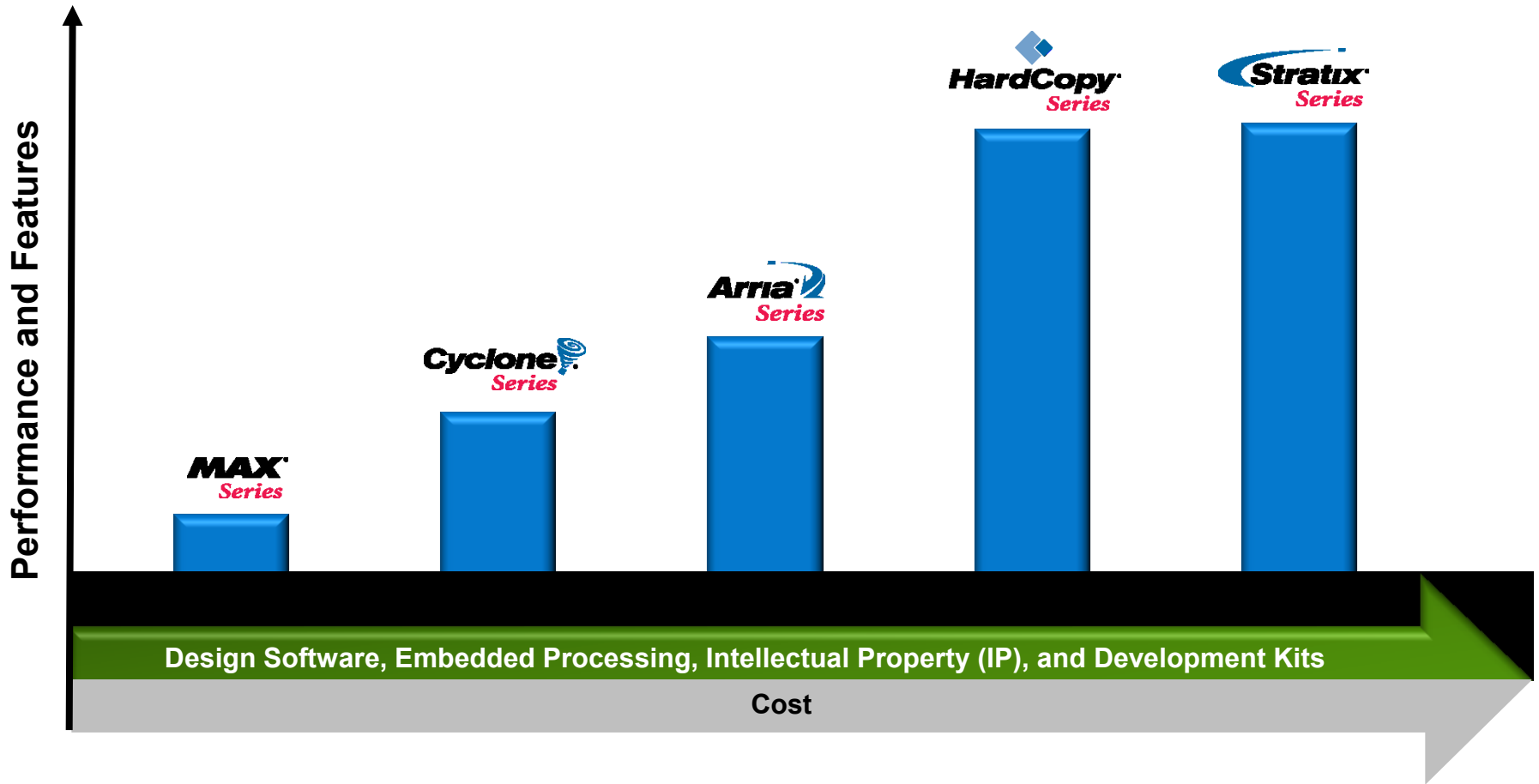
Intelligence	**Deep Packet Inspection, Data Analysis, High Performance Computing, Acceleration, Access**
EW/Radar	**Counter-IED, Jammers, Decoys, Early Warning Radar; Airborne, Ship-Borne and Stationary Radar**
Secure Communications	**In-Line Network Encryptors; Airborne, Vehicular, Tower and Tactical Radios**
Guidance & Control	**Aircraft, Missile, Vehicle and Robot Guidance and Control, Instrumentation Clusters**

Computing, Consumer, Storage, Test, and Medical

Computer and Storage	**Servers, RAID, High Performance Computing, Flash Storage, MFP**
Consumer	**Displays, Set-Top-Boxes**
Test	**IP Video Testers, Protocol Testers**
Medical	**CT Equipment, Ultrasound**

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Innovation Leader Across the Board

Performance and Features

MAX Series

Cyclone Series

Arria Series

HardCopy Series

Stratix Series

Design Software, Embedded Processing, Intellectual Property (IP), and Development Kits

Cost

Optimized for Performance, Productivity, Power, and Price

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Altera in the News

June 10, 2013 **Altera Announces Breakthrough Advantages with Generation 10**

May 21, 2013 **Altera Stratix V GX FPGAs Achieve PCIe Gen3 Compliance and Listing on PCI-SIG Integrators List**

May 14, 2013 **Altera to Deliver Breakthrough Power Solutions for FPGAs with Acquisition of Power Technology Innovator Enpirion**
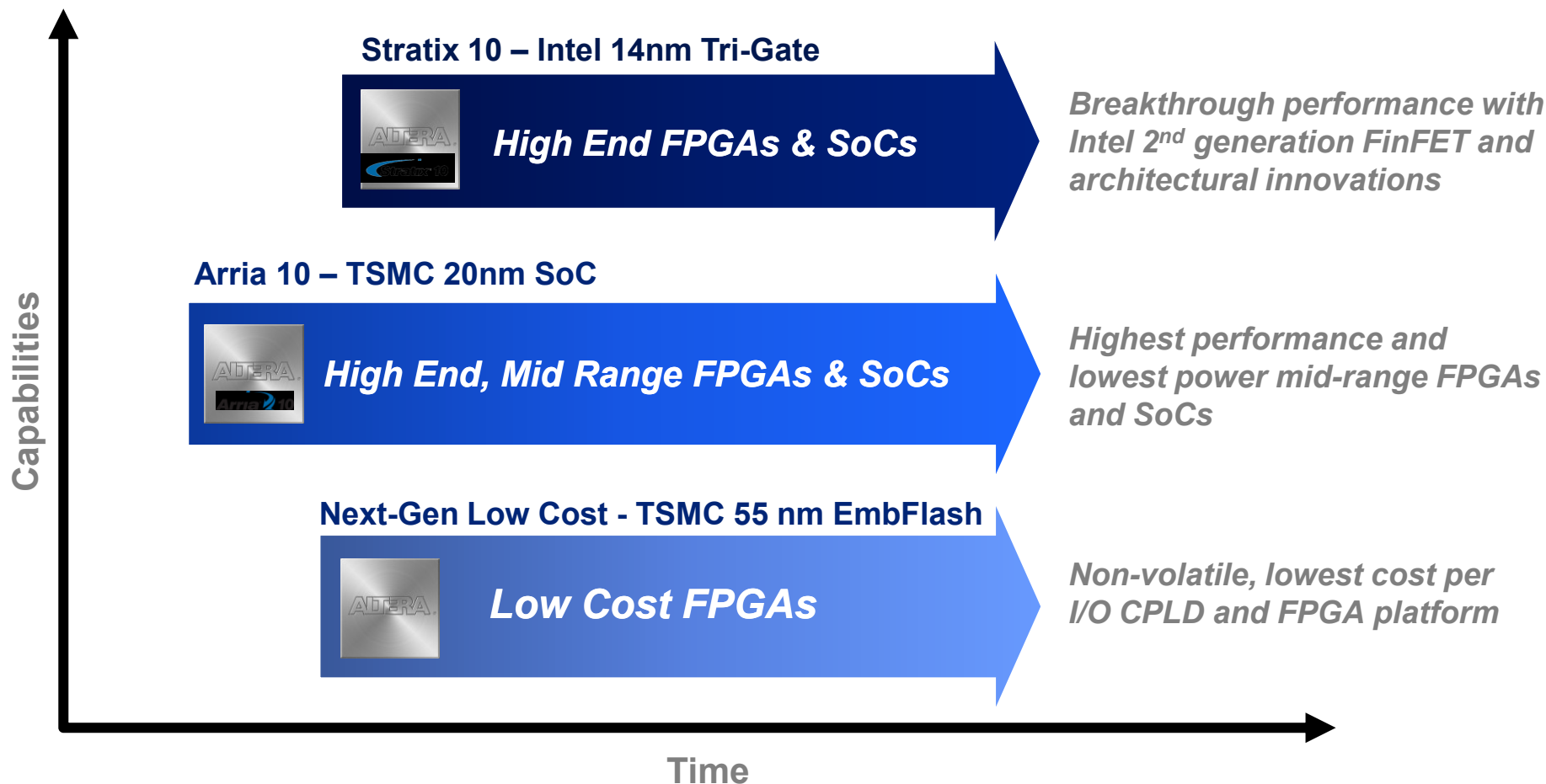
May 06, 2013 **Altera Opens the World of FPGAs to Software Programmers with Broad Availability of SDK and Off-the-Shelf Boards for OpenCL**

May 06, 2013 **Altera Quartus II Software v13.0 Enables World's Fastest FPGA Designs**

April 22, 2013 **Altera Announces Availability of Cyclone V SoC Development Kit**

April 15, 2013 **Altera and TSMC Collaborate on 55 nm EmbFlash Process**

Breakthrough with Generation 10

Stratix 10 – Intel 14nm Tri-Gate

High End FPGAs & SoCs

Breakthrough performance with Intel 2nd generation FinFET and architectural innovations

Arria 10 – TSMC 20nm SoC

High End, Mid Range FPGAs & SoCs

Highest performance and lowest power mid-range FPGAs and SoCs

Next-Gen Low Cost - TSMC 55 nm EmbFlash

Low Cost FPGAs

Non-volatile, lowest cost per I/O CPLD and FPGA platform

Capabilities

Time

Tailored to deliver optimized capabilities to meet a broad range of applications

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Breakthrough Power Solutions

Faster time-to-market

- **Pre-validated, easy-to-use solutions**

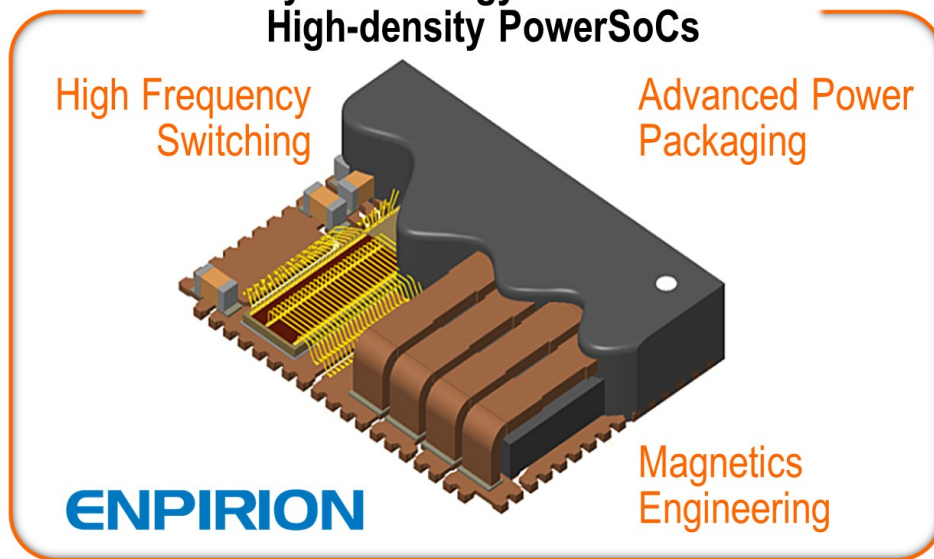## Frees up board space

- **Smaller footprint**
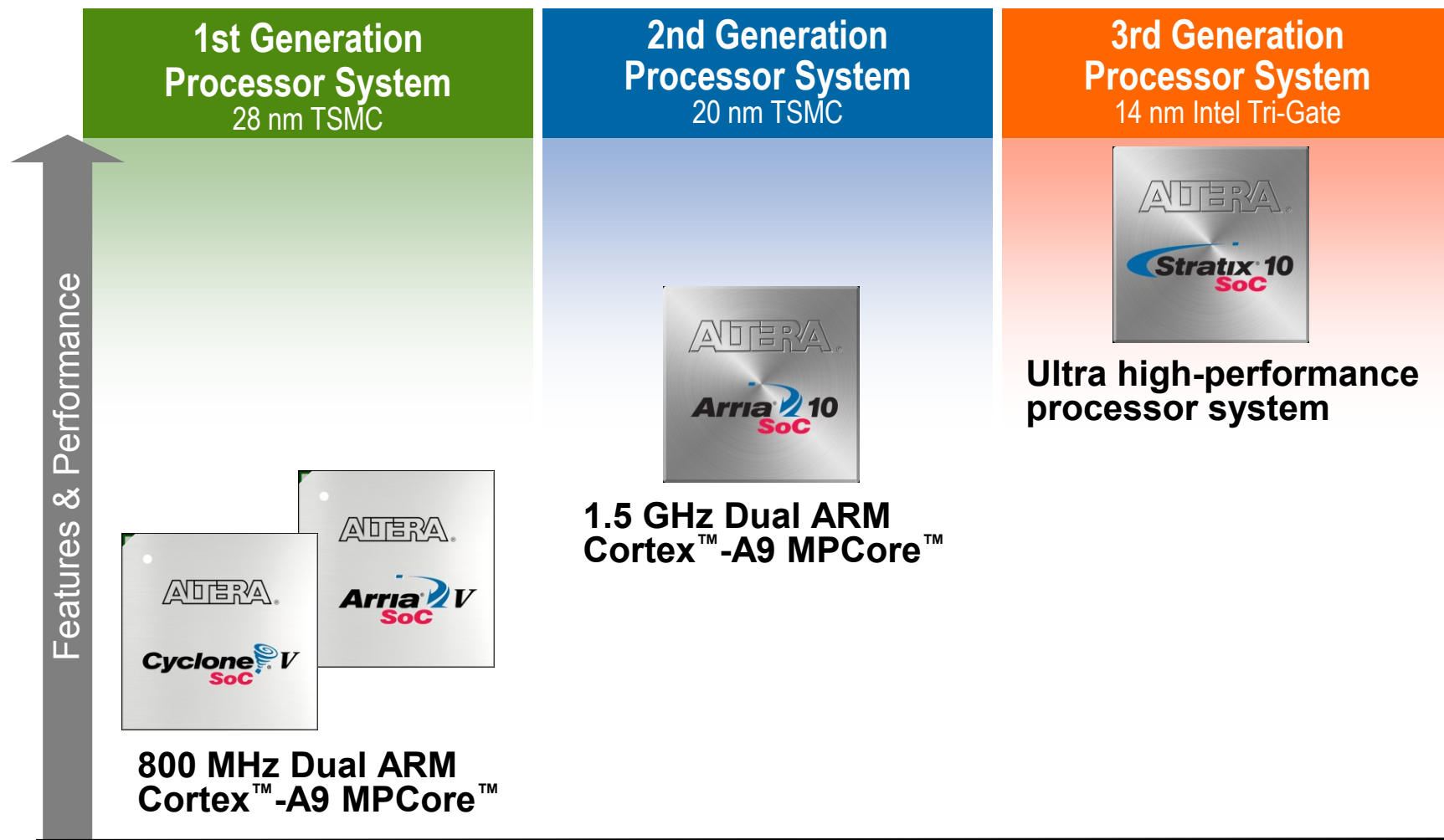
Higher performance

- **High efficiency and low noise**

Increased system reliability

- **Fewer components**

Key Technology Enablers of High-density PowerSoCs

High Frequency Switching

Advanced Power Packaging

Magnetics Engineering

ENPIRION

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Breakthrough SoC Roadmap

1st Generation Processor System 28 nm TSMC	2nd Generation Processor System 20 nm TSMC	3rd Generation Processor System 14 nm Intel Tri-Gate

Features & Performance

Stratix 10 SoC

Ultra high-performance processor system

Arria 10 SoC

1.5 GHz Dual ARM Cortex™-A9 MPCore™

Arria V SoC

Cyclone V SoC

800 MHz Dual ARM Cortex™-A9 MPCore™

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Breakthrough Productivity

Hardware Designer	DSP Designer	Software Developer	
QUARTUS II	**DSP Builder**	**SoC EDS**	**Altera® SDK for OpenCL™**
Industry's Fastest Compile Time 8X Speed Up	**Industry's Only** Model-Based, Performance-Driven HLS Tool	**Industry's Only** FPGA-Adaptive Debug	**Industry's Only** OpenCL Solution for FPGAs
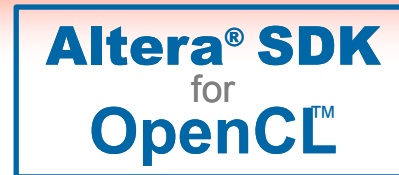
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Altera SDK for OpenCL

Today's News

- **Altera today announces its SDK for OpenCL**

Altera Joins Khronos Group	**Altera working with Proof of Concept Customers**	**Altera Opens OpenCL Early Access Program**	**Altera announces SDK for OpenCL**
2010	2011	2012	2012
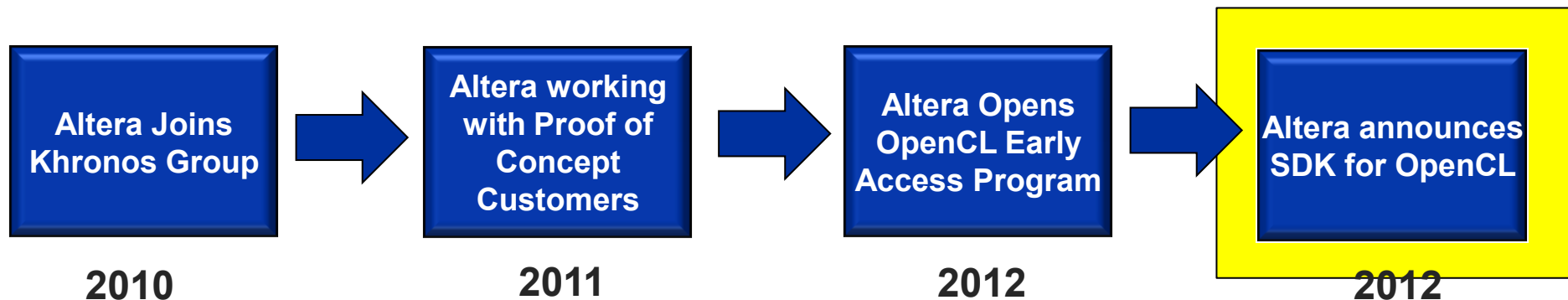
- **OpenCL allows software developers to boost system performance by using an FPGA's massively parallel architecture**

- **Increases designer productivity by raising the level of design abstraction**

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Performance Challenge

Multimedia
- HD Video Processing
- Image processing

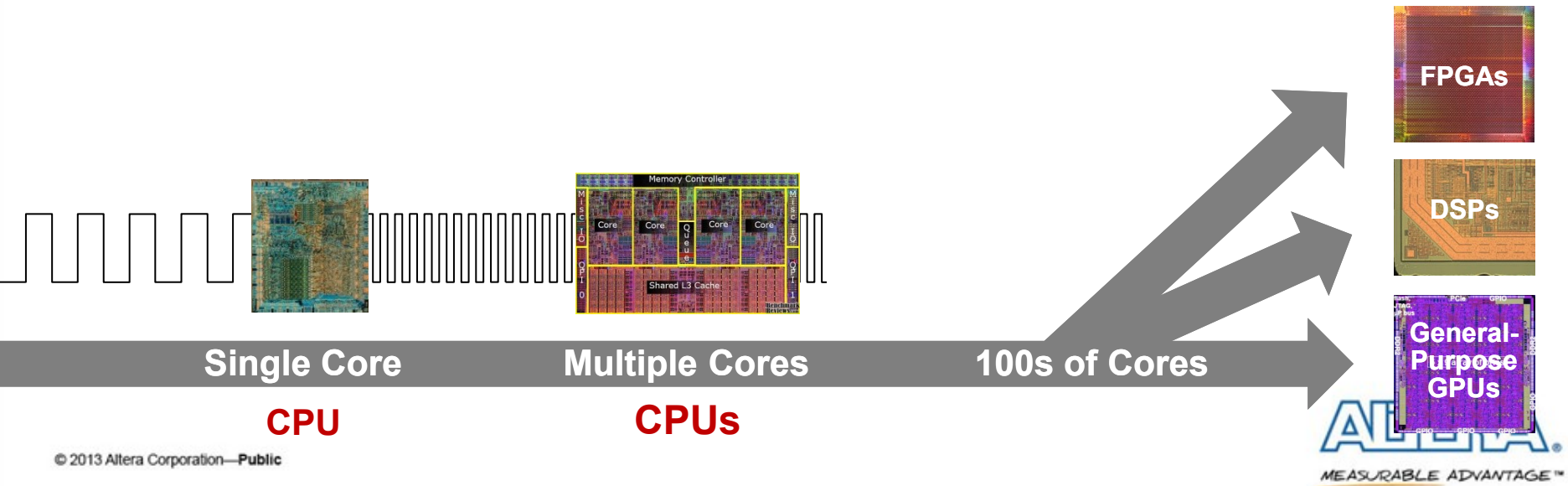### Medical
- Medical imaging
- Bio informatics

Military
- Radar image processing
- Persistent surveillance
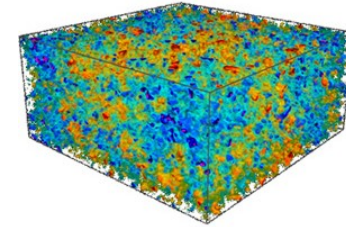
High-Performance Computing
- Financial Modeling
- Big data analytics
- Scientific computing

Performance Challenges

Single Core

CPU

Multiple Cores

CPUs

100s of Cores

FPGAs

DSPs

General-Purpose GPUs

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Altera Is Driving Silicon Convergence

General Processors	FPGAs	Application-Specific

FPGA Combines the Best of All Four + FPGA

Need for **Efficiency** »   « Need for **Flexibility**

General Processors: µP DSP

FPGAs: µP ASIC **FPGA** DSP ASSP

Application-Specific: ASIC ASSP

- Software programmable
- Great flexibility
- Poor power efficiency
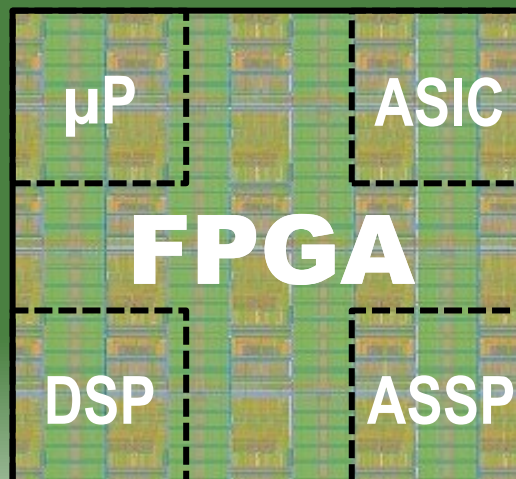
- **Hardware *and* software programmable**
- ***Great* flexibility**
- ***Good* power efficiency**

- Not programmable, hard wired
- Inflexible
- Great power efficiency
- Many contain embedded processors

= Microprocessor
+ DSP
+ Application-Specific IP
+ Programmable Fabric

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OpenCL for Heterogeneous Solutions
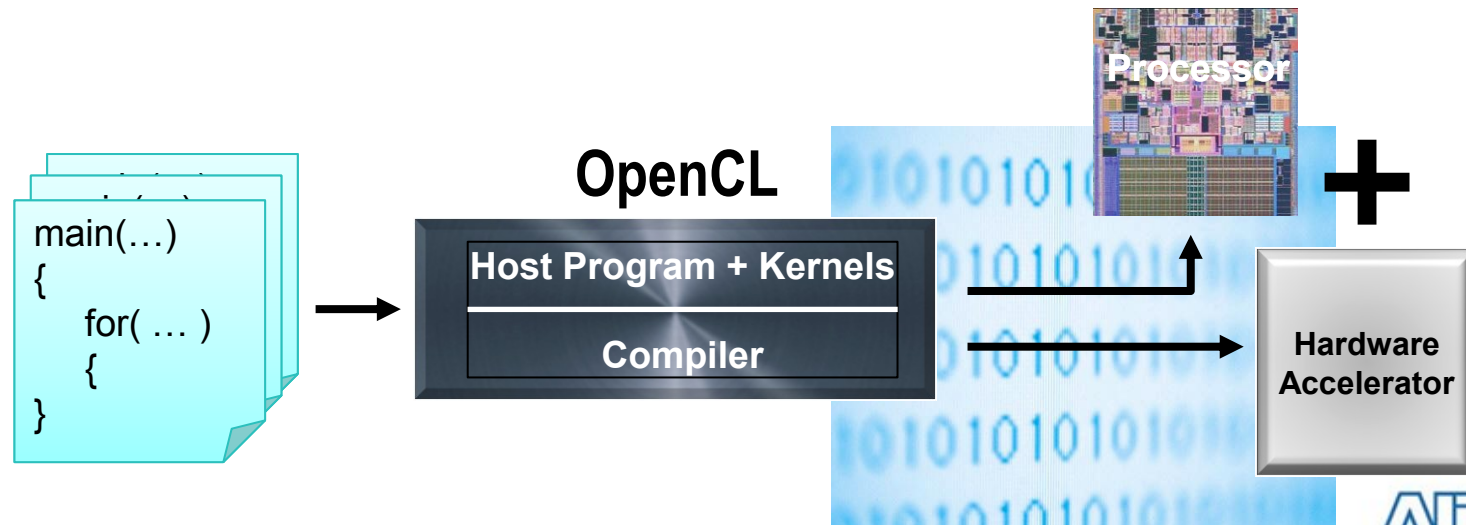
- ## C-based language with extensions:
  - Standard C Language
  - Altera OpenCL C extensions (adds parallelism to C)
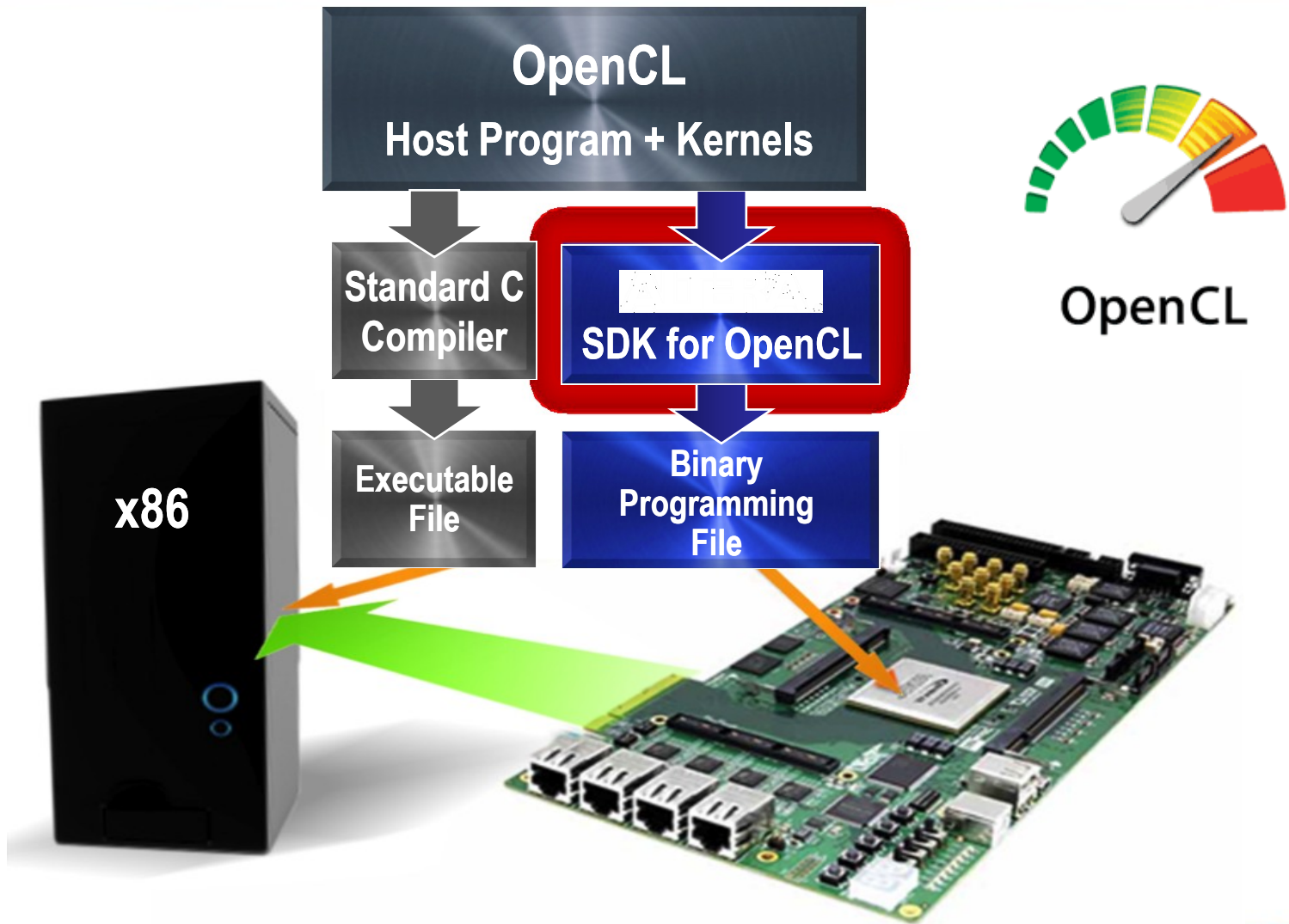 - API (Open standard for different devices)

- ## Programming model supports parallelism in heterogeneous systems
  - CPU/GPU/FPGA

OpenCL

OpenCL

| Host Program + Kernels |
| Compiler |

Processor

+

Hardware Accelerator

```
main(…)
{
    for( … )
    {
}
```

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Introducing Altera SDK for OpenCL

OpenCL
Host Program + Kernels

Standard C Compiler

SDK for OpenCL

Executable File

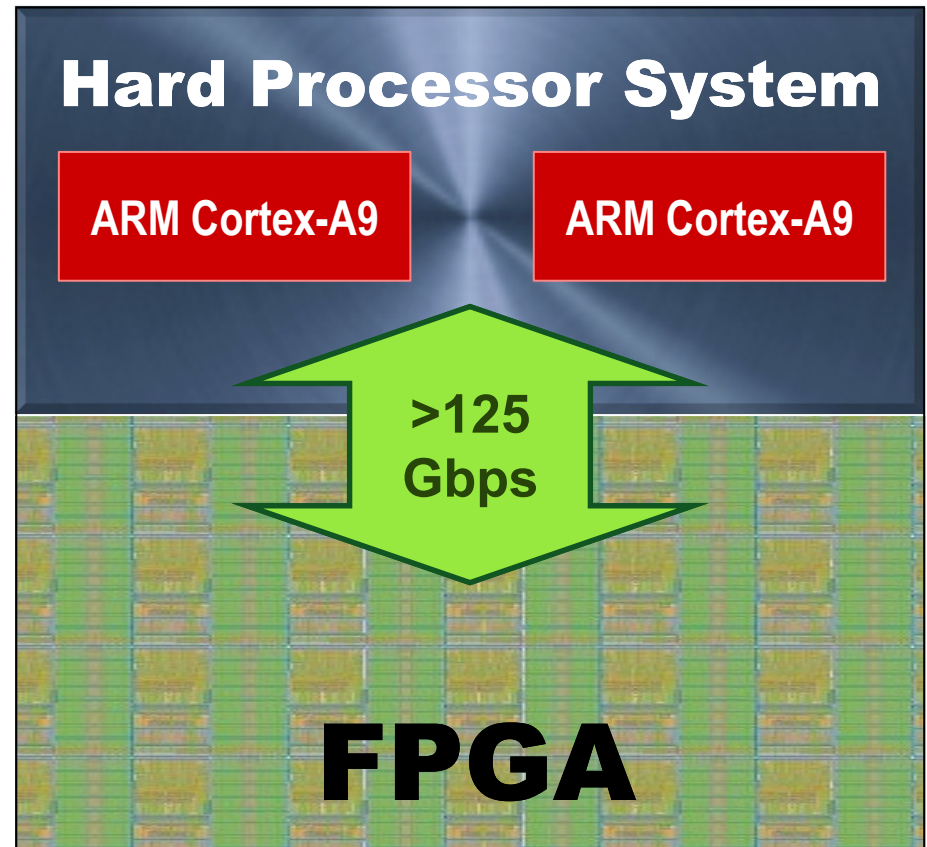Binary Programming File

OpenCL

x86

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Accelerating Performance with SoC FPGAs

Single-Chip OpenCL Solution:

- SoC = ARM + FPGA

Integration Enables:

- Higher bandwidth and lower latency between FPGA and processor
  - >125Gbps Interconnect
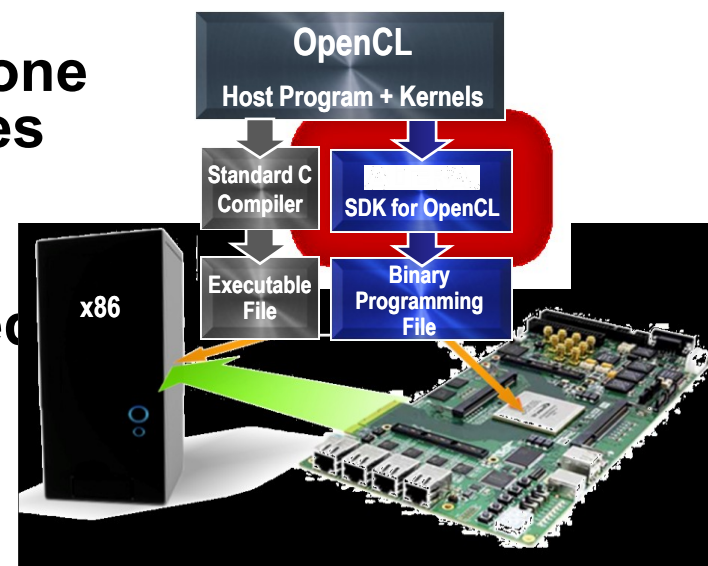- Processor integration reduces system cost

Hard Processor System

ARM Cortex-A9   ARM Cortex-A9

>125 Gbps

FPGA

Benefits of Altera OpenCL for FPGA

✓ **Superior Design Productivity**
  - **Quick and easy evaluation of different solutions**
  - **Fast development / debug / optimization cycles**
  - **Faster time-to-market**

✓ **Higher Performance**
  - **>9X greater performance vs CPU alone running a Monte-Carlo Black Scholes simulation**

✓ **Improved Power Savings**
  - **>5X performance/Watt vs GPU-based heterogeneous systems running a document search algorithm**

✓ **Greater Portability**
  - **Reuse across multiple platforms, multiple generations**

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