Programmable IC: Innovation with CAP Technology

Dr. Ming Liu, Chairman & CEO
Dec. 2014
Tough Challenges
New Opportunities
History of FPGA Industry

-New trend, Big money,
-Long time, High return

-Many have given up
-More have been trying

China Commercial FPGA Vendor: CME joined the big family from 2010
## ROI Analysis for ASIC

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASIC / ASSP (65nm) Development Cost</td>
<td>$55M</td>
</tr>
<tr>
<td>20% of Revenue on R&amp;D</td>
<td></td>
</tr>
<tr>
<td>Revenue Target</td>
<td>$275M</td>
</tr>
<tr>
<td>$10 to $50 Device ASP</td>
<td></td>
</tr>
<tr>
<td>Unit Volume Req’d</td>
<td>5Mu to 27Mu</td>
</tr>
</tbody>
</table>

### New Product Business Plan Version 1.0

*Very Few High Volume Applications Justify ASIC / ASSP Development*

Source: Altera 2011 Q1 report
Perception Changed...

Great for development

Great for production

In reality, things have changed...

Source: Altera 2011 Q1 report
FPGA Evolution

Expansibility and Flexibility

Configurable Application Platform on chip with uP

Application driven platform with scalability and flexibility

2014

2005

2004

2002

2000

1992

1985

Complexity and performance

Glue Logic

Block Logic

Single Platform Logic

System Logic

Domain-opt. System Logic

uP Integration System Logic

- FPGA Fabric
- Block RAM
- Embedded Registers and Multipliers
- Clock Management
- Multi-standard Programmable IO
- Embedded Microprocessor
- Multi-gigabit Transceivers
- Embedded Ethernet MACs
- PSoC

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- Block RAM
- Embedded Registers and Multipliers
- Clock Management
- Multi-standard Programmable IO
- Embedded Microprocessor
- Multi-gigabit Transceivers
- Embedded DSP-optimized Multipliers
- Embedded Ethernet MACs
- MCU/MIPS/ARM integration in die
- Hardcore system in a package
- CSoC, target design platform
SoC Development Trend

From 2022 to 2032 all SoCs will be programmable, a combination of today’s architectures

2022 – 2032
ARM + FPGA
FPGAs improved performance by 10X, 20X, or 30X, while moving FPGA core into the Xeon package, it will double the performance again.
Bing Results with FPGAs

1,632 Servers with FPGAs Running Bing Page Ranking Service (~30,000 lines of C++)

95% Query Latency vs. Throughput

- 2x Increase in Throughput
- 29% Latency Reduction
- SW + FPGA
  - < 30% Cost
  - < 25 W Power
  - 0 HW Failures

Source from Microsoft’s FPGA announcement at ISCA 2014
Why CME?
Local Market Needs Domestic Vendor

FPGA revenue in Asia/Pacific counted for 38%, 40%, and 70%, respectively, for Xilinx, Altera, and Lattice in 2013

Revenue Percentage by Geography (CY2013)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Altera</th>
<th>Xilinx</th>
<th>Lattice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>38%</td>
<td>34%</td>
<td>69%</td>
</tr>
<tr>
<td>Q2</td>
<td>39%</td>
<td>36%</td>
<td>74%</td>
</tr>
<tr>
<td>Q3</td>
<td>39%</td>
<td>38%</td>
<td>76%</td>
</tr>
<tr>
<td>Q4</td>
<td>41%</td>
<td>40%</td>
<td>76%</td>
</tr>
</tbody>
</table>

- Americas: 20%, 17%, 18%, 19%, 31%, 31%, 31%, 29%, 13%, 12%, 10%, 12%
- Asia Pacific: 38%, 39%, 39%, 41%, 34%, 36%, 38%, 40%, 69%, 74%, 76%, 76%
- EMEA: 27%, 28%, 28%, 24%, 26%, 24%, 22%, 22%, 18%, 14%, 14%, 12%
- Japan: 15%, 16%, 15%, 16%, 9%, 9%, 9%, 9%
Emerging FPGA Market Segments

- Cloud—Big Data
- 4G-LTE Network
- Smart City
- Smart Phone
- IOT
- LED Display
- Smart Home
- Wearable
- Smart Home
Emerging SAM

Predict all of SOC would have programmable functions from 2022 to 2032

Source: Xilinx Estimates

2016E Available

ASIC
ASSP

2016E Serviceable
>$16B SAM

2016E Xilinx SAM

Embedded
ASIC/ASSP Displacement
Core PLD

$2B SAM
$8B SAM
$6B SAM

ALL Programmable SAM
Evolutionary FPGA SAM

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FPGA Market Growth Forecast in China

Exclude emerging markets
**CAP — Configurable Application Platform**

**ASICS**
- High performance
- Cost

**Application Specific**
- Application optimization
- Limited flexibility

**Common PLDs**
- Flexibility
- Lost cost and power

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**Programmable SOC**
Embedded FPGA, MCU, ADC, SRAM, etc.
Seamless Integration

CPU/MCU
IP/ASIC/ASSP
MEMORY
SENSORS
FPGA

Confidential
CAP Ecosystem

Customer Applications

CAP – H/W
- MCU/CPU
- FPGA
- IPs

+ CAP - S/W

= Application Oriented Solution

Configurable Platform

Third Party Tools & IPs
4 CAPs in CME

• **CAP products** — Configurable Applications Platform
  ✓ Programmable SOC with embedded FPGA, MCU, ADC, SRAM, ASIC cores

• **CAP features** — low Cost, wide Adaptability, high Performance
  ✓ Competitive advantage

• **CAP culture** — Communication, Accountability, Persistency
  ✓ Hybrid Chinese and Western corporate culture

• **CAP relationship** — Complementary, Alliance, Prosperity
  ✓ Strategic partnership with Win-Win business model
4 Critical Factors for CME Success

Team — Rapidly growing CME team welcomes more talents to join: marketing and sales executive, sales representatives, FAEs, analyst, experienced engineers in IC design, software development, system applications, etc.

Market — Largest FPGA market provides great opportunities

Technology — 165 patents, 4 families of products

Funding — More funding opportunities in China
Products & Applications
Roadmap

Density

# of LUTs

Time

FPGA + CPU + DSP + ASIC + Serdes

已研发的“云”系列 Cloud

已研发的“河”系列 River

极高性能

22~14nm

CME-Px

FPGA+MCU+SRAM+ASIC+FLASH

已开始量产的“山”系列 Mountain

可定制保安全高附加

CME-M0

CME-M1

CME-M3

CME-M5

CME-M7

CME-M9

40nm

CME-C1

CME-C2

CME-C3

CME-C5

CME-C6

CME-C8

CME-C9

28nm

40nm

京微雅格（北京）科技有限公司

Capital Microelectronics

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Orientation & Target

- Performance-driven
- Cost-driven
- Density-driven
- Power-driven

- 40nm: High performance
- 65nm
- 130nm

- High density
- Low power
River Family

F256
HR, 16
(181)

C256
HR3, 6, 16
(166)

C192
HR3, 5, 6, 16
(127)

Q68
HR1, 2, 3
(48)

C144
HR3, 6, 16
(93)

C100
HR1, 2, 3, 6, 16
(65)

U81
HR1, 2, 3, 6
(83)

U49
HR1, 2, 3
(33)

U36
HR1, 2
(25)

Note:
1. Q → QFN, U → uC BGA, C → sBGA, L → LQFP, W → WL CSP
Panel Display
Smart Home

- Image 1: Control panel showing temperature and humidity settings.
- Image 2: Additional control panel with temperature adjustment.
- Image 3: Bedroom air control panel with temperature and mode settings.
- Image 4: Electronic circuit board.
Full Color LED Display
Youth Olympics in Nanjing
RX Solution

Sync LED Display – RX Card

- ARM Cortex-M3
- FPGA
- Sensors
- SDRAM 2M*32bit
- To LED Module
- LCD display
- Ethernet PHY
- Ethernet PHY
- Ethernet Magnetics
- RJ-45 Connector
- RJ-45 Connector
- 1000M Ethernet
- 1000M Ethernet
- CAP

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Sync LED Display – TX Card

- PC
- DVI Receiver
- USB Bridge
- ARM Cortex-M3
- FPGA
- USB
- UART
- DVI
- RGB
- PCI
- Power
- SDRAM 2M*32bit
- SDRAM 2M*32bit
- Ethernet PHY
- Ethernet PHY
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Async LED Display Solution

USB Flash disk

PC

Sensor

Ethernet PHY

ARM Cortex-A8

FPGA

DDR2

SDRAM

NandFlash/SD

74HC245

CAP

USB 2.0 OTG

……
Self-Stabilization System

Digital Gyro

Body Shaking → SPI/I2C → Anti-Shaking Algorithm → PWM (FPGA) → Motor Control

CME-HR
3-Axis Head System

Digital Gyro -> SPI/I2C -> Gimbal Controller (ARM Cortex-M3) 300MHz -> PWM (FPGA) -> Motor

Accelerometer -> SPI/I2C -> FPGA

Motor Control

Chicken Head Tracking

3-AXIS Professional Gimbal
Balance Car

CME-M7

Digital Gyro → SPI/I2C

Accelerometer → SPI/I2C

Self-Balancing Algorithm (ARM Cortex-M3) 300MHz → PWM (FPGA)

Motor Control → Motor
Drone

Digital Gyro → SPI/I2C → Flying Control (ARM Cortex-M3) 300MHz → PWM (FPGA)

Accelerometer → SPI/I2C → CME-M7

CMOS Sensor → BT.656 → Video Encode (FPGA) → RF Module → Antenna

Motor Control → Motor → Motor → Motor
Somatosensory Games

Digital Gyro → SPI/I2C → Motion Data Processing → UART (FPGA) → Bluetooth Module

Accelerometer → SPI/I2C → CME-HR
CME Activities
River Family HR3 Press Conference
Mountain Family M7 Press Conference
CME-FPGA Day Events

2014-6-27

2014-7-03

2014-7-08

2014-7-17

2014-7-22

2014-7-24

2014-7-29

2014-7-31
Thanks