

知识产权 (IP) 发展对集成电路和嵌入式系统的影响

谭军

ARM 中国总裁

2009年3月28日, 北京。

嵌入式系统联谊会

Embedded System Beijing Forum (ESBF)

THE ARCHITECTURE FOR THE DIGITAL WORLD®

1

ARM®

消费者身边日益增多的数字产品



嵌入式系统联谊会

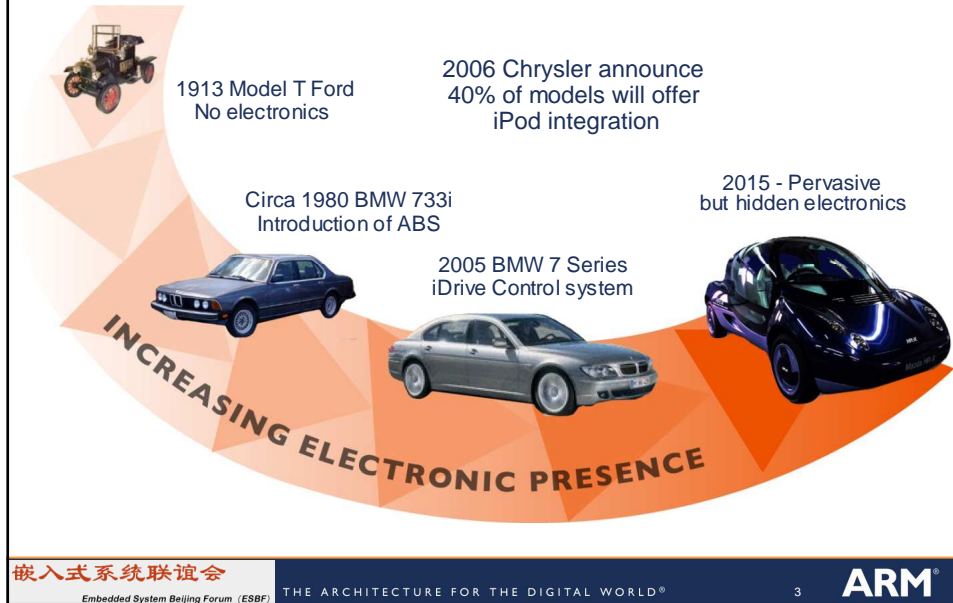
Embedded System Beijing Forum (ESBF)

THE ARCHITECTURE FOR THE DIGITAL WORLD®

2

ARM®

逐渐“隐藏”的嵌入式技术



不断提高的性能（计算、通信、图形、用户界面）

- Increased performance and functional integration

- Multiple processors
- Multiple software layers
- Very high gate counts
- Mixed signal
- Platform cost put at \$1B*

*Gartner, February 2006

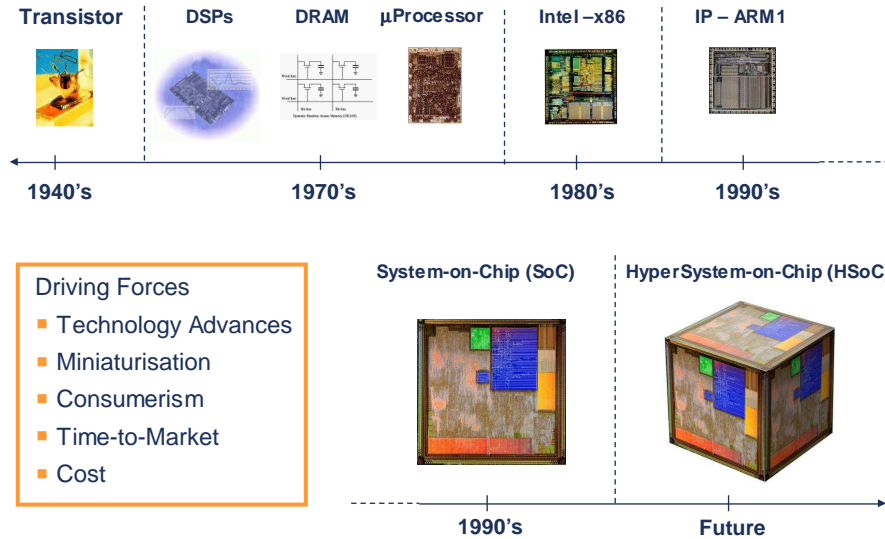
ARM CPU Estimator (ACE)

Device	Name	CPU Family	Speed
	O2	Xda Exec	ARM9 520 MHz
	Dell	Axim X51v	ARM9 416 MHz
	T-Mobile	MDA III	ARM9 377 MHz
	Orange	SPVM2000	ARM9 377 MHz
	T-Mobile	MDA II	ARM9 299 MHz
	Motorola	E680	ARM9 286 MHz

www.arm.com/ace/bench/login



一场由半导体技术推动着“数字革命”



嵌入式系统联谊会

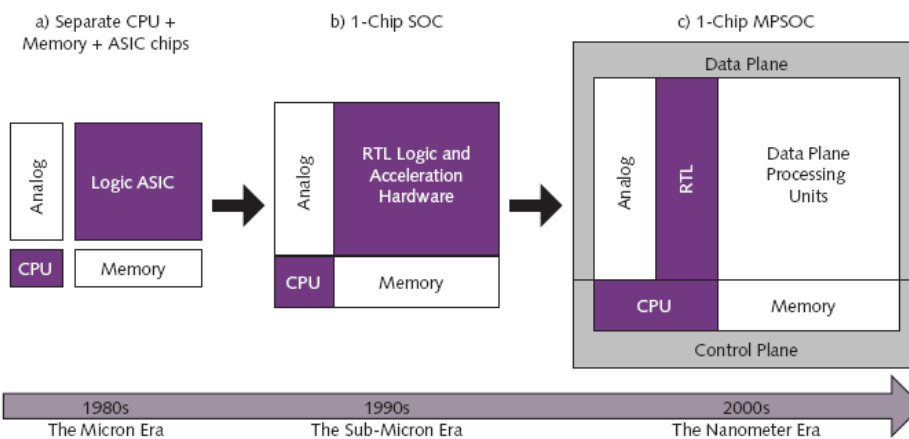
Embedded System Beijing Forum (ESBF)

THE ARCHITECTURE FOR THE DIGITAL WORLD®

5

ARM®

从单片机上的集成电路升级的系统级芯片 (SoC)



嵌入式系统联谊会

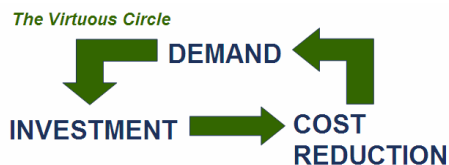
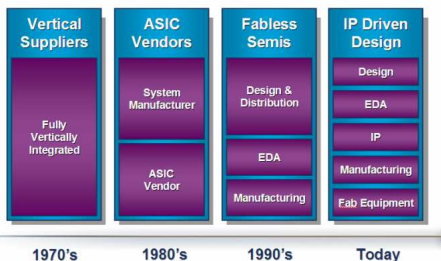
Embedded System Beijing Forum (ESBF)

THE ARCHITECTURE FOR THE DIGITAL WORLD®

6

ARM®

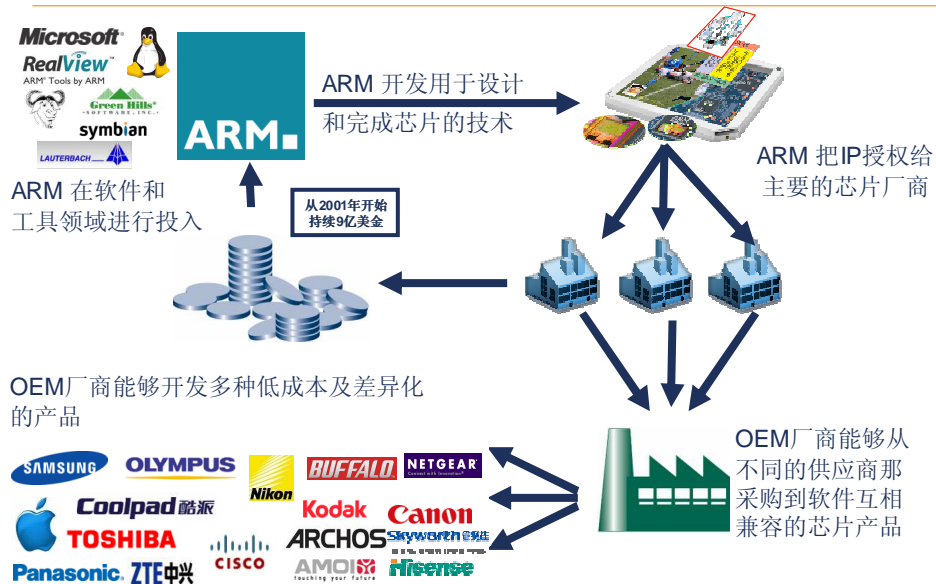
今天：一个“崭新”的半导体产业



	1970	1980	1990	2002
Cost of 1 MHz	\$7,600.82	\$103.40	\$25.47	\$0.17
Cost of 1 Megabit storage	\$5,256.90	\$614.40	\$7.85	\$0.33
Cost of sending 1 trillion bits	\$150,000.00	\$129,166.67	\$90.42	\$0.12

Source: "The New Paradigm" Federal Reserve Bank of Dallas 1999 Report and 2002 Actuals

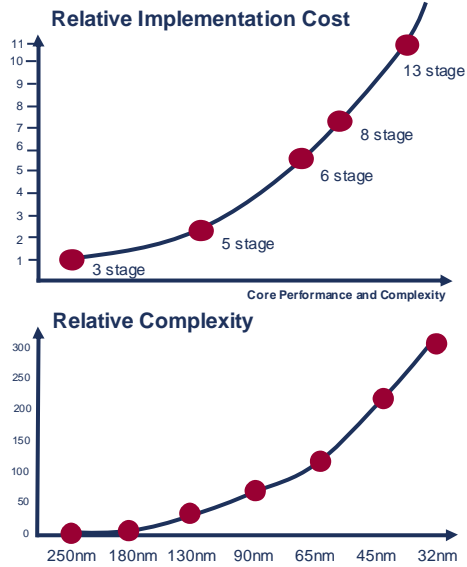
ARM商业模式：知识产权（IP）授权



知识产权业务模式的经济效益

- Outsource R&D
 - Reduces up-front design costs
 - ARM has invested **\$900M** in R&D since 2001 and created ARM11 and Cortex families
 - **72** ARM11 licenses
 - **56** Cortex licenses
 - Would have cost industry more than **\$16Bn** to create equivalent product portfolios
 - Adding delay and risk without differentiation

- IP **cost-sharing** business model is required for a mature industry to remain profitable



知识产权业务模式促进差异化创新及市场增长

1997

ARM and Partners Enabling



Ecosystem Delivering Low Power Today
Diverse Range of Products
Rapidly Growing Markets



4 Bn Users
(2009)



Intel Platforms have only driven size and speed
How much has your laptop changed over the years?



1 Bn Users²

¹ Strategy Analytics 2007
² www.c-i-a.com

Innovations: Costs + Risks + Time to Market

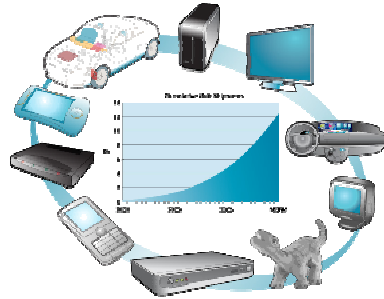
2009年：今天的ARM

- 业界领先的硅知识产权公司
 - 领先的32 bit RISC 体系架构
 - 累计出货140亿ARM处理器
 - 全球每人两个ARM
 - 领先的物理知识产权
 - 每年1500新项目基于ARM的标准单元

- 2008年：40亿个 ARM处理器出货
 - Now 1 Billion ARM Processors shipments each Quarter

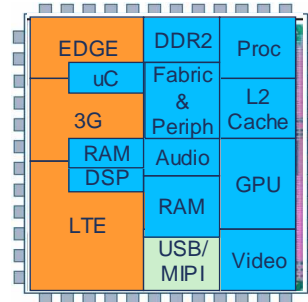
- 全球1700位员工, 32 个地区办公室

- 2008年：全球四分之一的电子产品是由我们的合作伙伴提供的并基于ARM的技术。



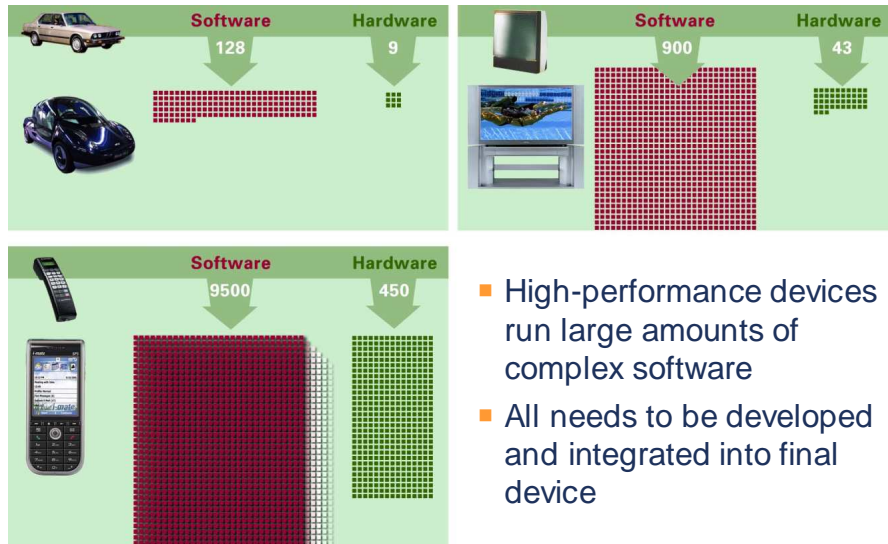
未来的移动芯片：复杂的硬件集成

- ARM typically supplies:
 - The processor subsystem
 - How fast facebook opens
 - Whether Flash10 content is possible
 - What type of games can be played
 - Responsiveness of UI
 - Battery life
 - The graphics processor & software
 - Desktop quality graphics
 - “Coverflow” type interfaces
 - Gaming experience
 - Fast panning, zooming, flipping
 - Battery life

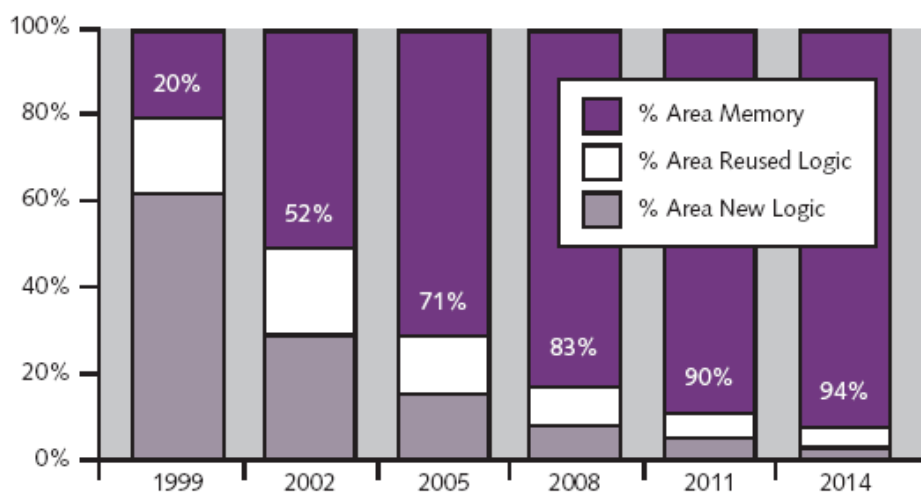


Processor & graphics affect:
 Services
 User experience
 OEM/Operator ARPU

不断上升的软件集成费用



1999–2014 SoC中的内存比例的提升



Source: IC Insights, SIA Roadmap, and others

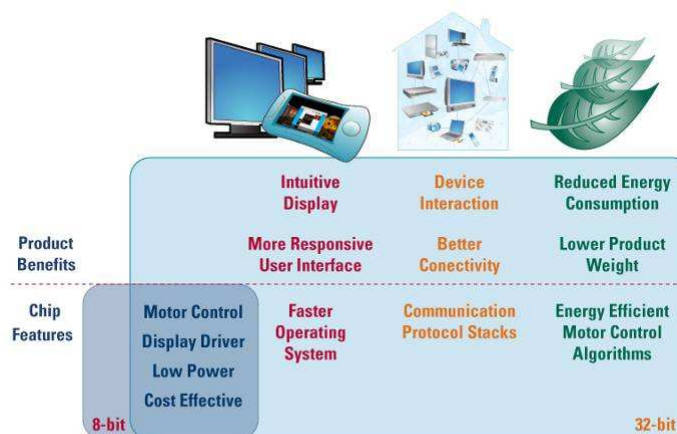
今天的现实：来自复杂的软件挑战



Source: WindRiver

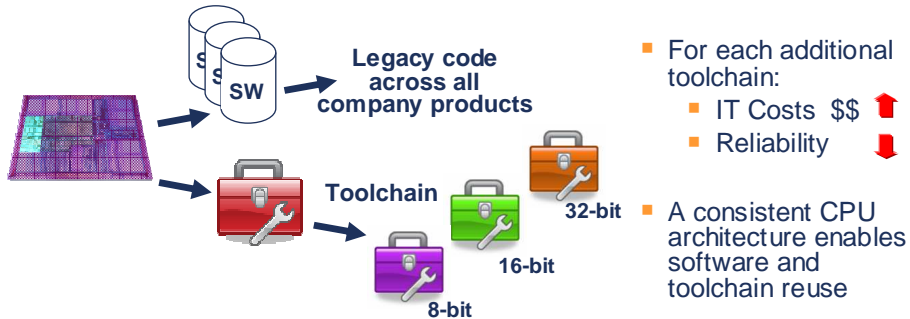
嵌入式MCU软件给消费者带来的用户体验

- What can "32-bit" really mean to the end customer



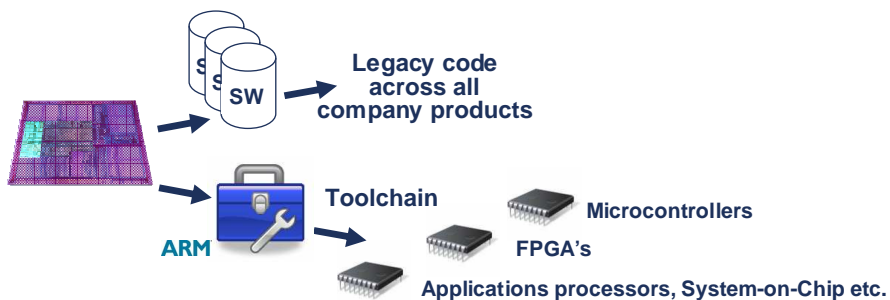
Silicon advances have enabled low power, cost-effective 32-bit Microcontrollers but what truly differentiates these new products is their capability to run more powerful software

为什么要关心CPU?



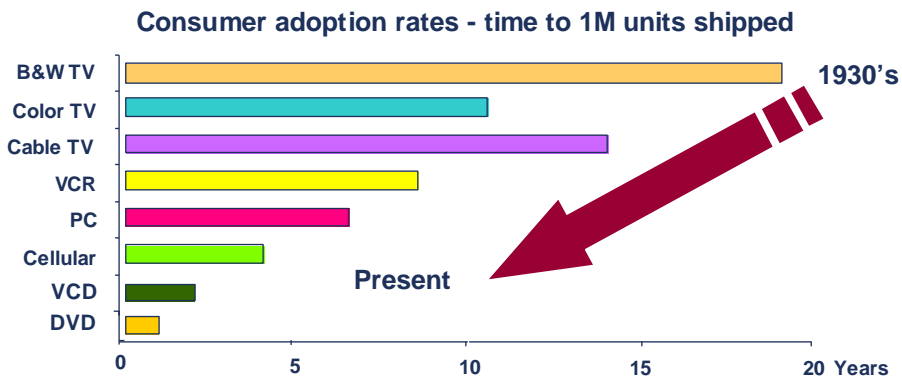
- For each additional toolchain:
 - IT Costs \$\$ ↑
 - Reliability ↓
 - A consistent CPU architecture enables software and toolchain reuse
- **What would happen in the computer software industry if..**
 - Every new PC used a different CPU architecture
 - You had to maintain different compilers for every new PC
 - **Common architecture can make Embedded Software reuse a reality**

ARM技术授权的软件优势



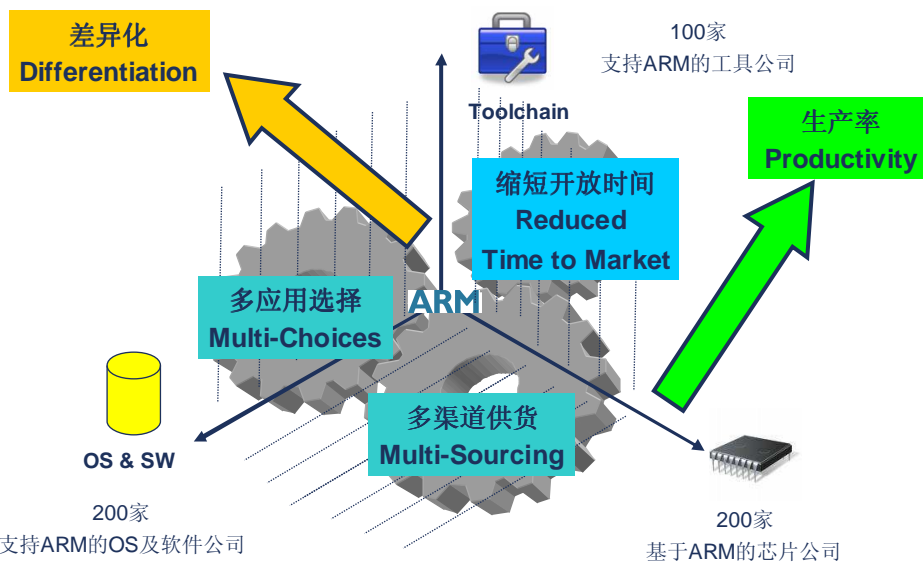
- **Enabling a standard platform for embedded development**
 - Protecting investment in software design
 - Forget traditional 8/16/32-bit perceptions, think of it as a 'Software Engine'
 - Enable reuse, not just from MCU to MCU but onto other digital solutions

不断加速的变化：上市时间及上量时间

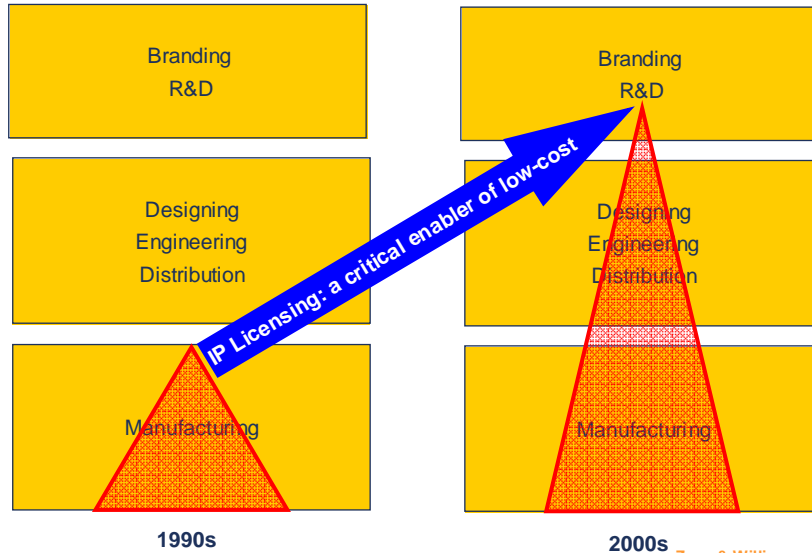


- Market majority is accepting of technology
- Electronic markets becoming more driven by fashion and style
- Requires fast time-to-market and ramp-to-volume

ARM知识产权模式在嵌入式的优势



中国低成本创新的新阶段



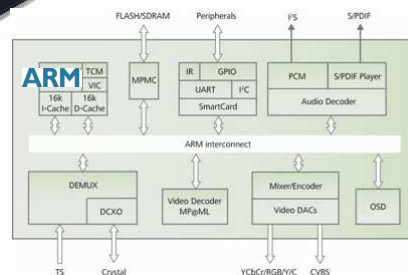
Zeng & Williamson (2008)

ARM客户的成功： 更好的生活， 更美的未来！

HiSilicon 海思—双向多功能 DVB-C机顶盒芯片解决方案

SMIC 中芯国际集成电路制造有限公司
Semiconductor Manufacturing International Corporation

Artisan
ARM® Physical IP



Hi3110E集成电源管理模块，支持机顶盒真待机、低功耗、自动唤醒
(stand-by power<1W, working power<7W)。

海思初步测算如果全国运营商采用基于海思芯片的“绿色机顶盒”，每年节能降耗 17.34 亿度

ARM合作伙伴技术联盟: 50多个中国伙伴

Silicon	Design	SW&Training

嵌入式系统联谊会 THE ARCHITECTURE FOR THE DIGITAL WORLD® 23 ARM®

知识产权发展对集成电路和嵌入式系统的影响

- 半导体行业的不断细分化分工导致了知识产权业务模式的成长
 - 廉价的计算、通信、存储成本使梦想成真
- 消费电子产品的需求正在推动半导体及嵌入式产业的发展
 - 数字化革命才刚刚开始、绿色节能推动模拟控制技术数字化
- 差异化的“产品快速上量、价格的迅速下滑”矛盾挑战陈旧嵌入式的软硬件系统集成
 - 软件复杂度及成本影响竞争优势，平台化开发是必然
- 未来：中国低成本制造+嵌入式创新的成功
 - PC时代已过，未来属于嵌入式！

