



A Modest Approach to the IP Business — that's Succeeded for Over Ten Years

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CAST 10 years
100 cores
IP that works



The IP Cores Business

Huge Promise

- ▶ Growing complexity of SoCs
- ▶ Easy reuse: plug in a core
- ▶ Build once, sell many times

Disappointing Reality

- ▶ Design for reuse expensive
- ▶ Reuse hard: big support load
- ▶ Customize for every sale

How has CAST thrived for 10 years?

A Needs-Driven Evolution

- ▶ New Jersey company founded in 1993 by a group of VHDL simulation experts
 - First VHDL simulation library delivered in 1994
 - First IP core delivered in 1995
 - First CAST production core delivered in 1996
- ▶ Bootstrapped funding model
 - No external funding or ownership
 - Lean operations, value-oriented investments
- ▶ Financially successful
 - Standard product IP Cores business grew by 50% in both 2002 and 2003
 - Consistently profitable (after the first three years)
 - Expanding resources and customer base
- ▶ Product/market approach
 - Create generic HDL IP for both ASIC and FPGA implementation
 - Leverage out from legacy-based solutions to high-interest commonly used functions, e.g., PCI, USB , MAC, FireWire, JPEG, MPEG

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CAST Success: Growing Customer Base

8051-Compatible Microprocessors
 American Microsystems, Inc.
 AMI Semiconductor, Inc.
 Anpec Electronics
 Beijing Fu Xing Xiao Cheng
 Electronic Technology Stock Co., Ltd.
 Chipcon AS
 Dragonchip Limited
 The East Development Group
 Fluence Technology, Inc.
 GOAL Semiconductor
 Goyatech Technology, Inc.
 Innochip Technology, Inc.
 InnovASIC, Inc.
 inSilicon Corporation
 Integrated Solutions Technology, Inc.
 Jet Propulsion Laboratory
 Microtek International
 MicroTune, Inc.
 Ours Technology Incorporation
 P&S Electronics (USA), Inc.
 Pijnenburg Custom Chips B.V.
 Progate Group Corporation
 Tachyon Semiconductor
 Telecommunication Lab
 TMT, Ltd.
 Tokyo Electron Device Ltd.
 Toshiba Fuchu-Works
 Ultra Electronics
 United States Postal Service
 Viewtel Corporation
 Westell, Inc.
 Wireless Interface Technologies, Inc.

Other Popular Processors
 ASIC Bank Co., Ltd.
 Celeritous Tech. Services, Corp.
 Cubic Defense Systems
 DNE Technologies, Inc.
 LTX Corp.
 Robert Bosch GmbH
 Thomson Marconi Sonar
 Xtramus Technologies
Bus and Network Interfaces
 Adman Sweden AB
 CIL USA
 Techsystems, Inc.
 Aristocrat Leisure Industries
 BFGoodrich Aerospace
 Boca Systems
 BTI Photonics
 C - RI
 CACI Technologies
 CCL/ITRI
 CMC Electronique, Inc.
 DaimlerChrysler Aerospace AG
 DaimlerChrysler AG
 Elisa Electronic Systems LTD.
 Embedded Wireless Labs Sdn Bhd
 EMC Corporation
 Ericsson Saab Avionics AB
 Goyatech Technology, Inc.
 Grundig AG

Encryption Functions
 Broad On Communications
 Comtech EF Data
 Fujitsu Laboratories, LTD
 Japan Radio Co., Ltd
 KODEN Electronics INC.
 Secure Systems
 Viacast Networks, Inc.
Serial Communications
 Adman Sweden AB
 Techsystems, Inc.
 Aristocrat Leisure Industries
 BFGoodrich Aerospace
 Boca Systems
 BTI Photonics
 C - RI
 CACI Technologies
 CCL/ITRI
 CMC Electronique, Inc.
 DaimlerChrysler Aerospace AG
 DaimlerChrysler AG
 Elisa Electronic Systems LTD.
 Embedded Wireless Labs Sdn Bhd
 EMC Corporation
 Ericsson Saab Avionics AB
 Goyatech Technology, Inc.
 Grundig AG

Heidelberger
 Hewlett Packard - Greeley
 Division
 Honeywell Defense Systems
 Intersil Corporation
 Japan Radio Co., Ltd
 Jet Propulsion Laboratory
 Kent Ridge Digital Labs (KRDL)
 Kenwood Corporation
 KLA-Tencor Corporation
 Kollmorgan
 Litton Applied Technology
 Lockheed Martin
 Lucent Technologies
 Marconi Communications
 Matsushita Electric Works, Ltd.
 Micro Systems, Inc.
 Nitsuko Corporation
 Nortel Networks
 Northstar Technologies
 Omron Corporation
 Progate Group Corporation
 Rafael - Missile Division
 Raytheon
 SCI Systems, Inc.
 SCI Systems, Inc.
 Siemens AG Munchen
 Snap-on Diagnostics
 SonoSite, Inc.
 Space Dynamics Laboratory
 Sparta, Inc. ...

- ▶ **Over 400 core sales**
- ▶ **Satisfying 300 different customers**

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The IP Marketplace

- ▶ Star IP (e.g. ARM, MIPS, Rambus, etc.)
 - Leading edge technology
 - Very expensive \$550K & up
- ▶ Large EDA vendors (e.g. Synopsys, Mentor)
 - Broad line HDL IP cores
 - High overhead / cost
- ▶ Foundry hard IP libraries (e.g. Artisan, Virage Logic)
 - A different kind of IP
- ▶ Focused IP companies (ex. Chipidea, Jennic, PLD Applications)
 - Narrow highly focused product lines
 - Largest number of IP companies

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Secrets of IP Success

- ▶ No secrets, just hard work
- ▶ Focus on standards-based IP: offers greatest opportunity
- ▶ Dependency on IP revenue leads to significant lessons:
 - Provide a Broad Range
 - Use Application Experts
 - Offer Competitive Prices and Simple Licensing
 - Deliver Complete, High-Quality Products
 - Provide Quick, Effective Customer Support

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Provide a Broad Range of IP

- ▶ Build trusted provider relationship with designers
 - "one stop shopping" makes IP choice easier
 - Lower risk, higher success rate for the customer
- ▶ Business is not dependent on a single market for success
 - No single technology
 - No single geographic region
 - No single market segment
- ▶ Easier to become known in the industry
- ▶ CAST offers over 100 different cores for new and replacement applications ...

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CAST Offers 100 Different Cores

Processors

8051s
Z80
165x
6805/11
68000
80186tx
DSPs



Peripherals

Smart Card Reader
NAND Flash Memory
Controller
DMA Controller
GPIO8 I/O Unit



Communications

UARTS
SDLC

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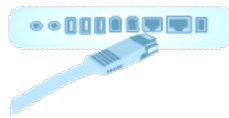
Multimedia

JPEG
JPEG 2000
MPEG-4
SPDIF
I2S
CSC
Toolbox



Interfaces

Ethernet MACs
FireWire
USB & OTG
PCI
CAN
LIN
I2C
ECP & EPP
SPI



Encryption

AES
DES
MD5
SHA-1



Basic Functions

TTL parts

Replacement Series

Processors
Bit Slices
Controllers
Peripherals
Timers
UARTs
Z80 Support



Examples of Multiple Purchases

- ▶ Set top box manufacturer
 - R8051
 - Ethernet MAC
 - USB
 - DES
- ▶ Wireless ASSP IC
 - R8051
 - USB
- ▶ Government contractor
 - R8051
 - SPI
 - I2C

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Use Application Experts

- ▶ Impossible to own application expertise across entire broad range
- ▶ Simply buying or contracting cores doesn't work
- ▶ CAST cultivates ongoing partnerships with key developers



We turn engineering into art
Processors, Controllers,
Bus Interfaces, DSP, ...



Graphics and
Multimedia



Processors



On-Chip
Debugging



Bus Interfaces



Encryption
Functions

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Offer Competitive Prices ...

- ▶ Control your costs in all areas
- ▶ The real development cost is in verification
 - 60%-70% of total development cost
 - Requires application experts and hardware engineers as well as RTL coders
 - Continuous improvements in this area essential
- ▶ Different business models for different customer segments
- ▶ Wait till standards are set to begin developing
 - The leading edge is expensive
 - May be tough to recover costs at real market prices

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... and Simple Licensing

- ▶ Understand why you are taking the positions you take on key issues
- ▶ Use industry standard approaches
- ▶ Avoid legal language where possible it is understandable
- ▶ Be flexible – some negotiation is always involved
- ▶ Use a single license to cover everything
- ▶ Up-front license usually preferred over royalties

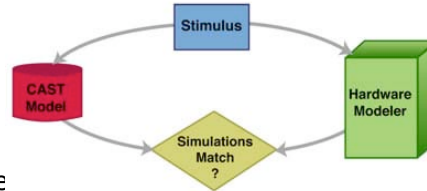


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Deliver Quality Products

- ▶ For designers to be successful, the cores they purchase must actually work
- ▶ Quality depends on:
 - Rigorous development process
 - Uniform standards and coding practices
 - Extensive verification
 - Complete deliverables
- ▶ Use standard measurements of quality:
 - Code coverage, VSIA QIP, hardware mode
- ▶ Implement cores and promote success
 - Demo systems and reference designs; customer products



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Provide Great Customer Support

- ▶ "Support" begins with first contacts with customer
 - Offer accurate, extensive core info through web site
 - Back this up with solid, detailed documentation
 - Answer queries quickly and effectively
 - Get it right before the sale
- ▶ Quality products and well-packaged deliverables reduce need for support
- ▶ Effective customer support must be fast
 - Build a 24 hour culture
 - Make the first response useful
 - Realize that this separates your company from the competition

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Summary

- ▶ Design reuse is challenging and the IP business is tough
- ▶ Success comes from:
 - Focusing on the right products
 - Developing and packaging quality deliverables
 - Offering value and simplicity in licensing
 - Backing products with application experts and fantastic support
- ▶ CAST's success for 10 years shows that this is possible
- ▶ The IP marketplace is still evolving ...

