50th DAC Global Forum

Portugal

A safe shore for your business, on the West Coast of Europe
The best crew for your SoChip

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I. Introduction

Portugal is the westernmost country of mainland Europe. During the 15th and 16th centuries Portugal was at the vanguard of European overseas exploration, discovering and mapping the coasts of Africa, Asia and Brazil, in what become known as the Age of Discovery. Today, with 10 million inhabitants, it is one of the most global and peaceful places in the world. Portuguese is the third most spoken European language in the world and the most spoken language in both South America and the Southern Hemisphere, with 230 million total speakers.

Technology is very welcomed in Portugal.. Portugal is a world leader in renewable energy. More than half its electrical energy comes from wind, solar and hydro power. The first European prepaid mobile phone implementation was in Portugal in 1995. Portugal was the first country with a universally applied highway toll collection system – *via verde*. Portuguese ATMs provide an enormous amount of functionalities. PT, ZON optical fiber is one of the best fiber optic networks in the world. It was also the will to be globally connected that drove a Portuguese invention in the late 1400's: the Caravel.

II. Chip Design and EDA presence

Portuguese industry in microelectronics related fields can be described in three groups: IP design, packaging and system specific design.

A. *IP design*

Synopsys has the larger microelectronics design center in Portugal with two sites: Porto and Lisbon. Synopsys activity in Portugal includes both analog and digital IP design for different applications including connectivity, data conversion and audio.

Founded in 2008, Silicongate is a power management IP provider. Silicongate's IP menu includes high performance switched and linear voltage regulators and ultra low power crystal oscillators.

Founded in 2003, Acacia developed a portfolio of best-in-class, high performance data converter IP and was acquired by Silicon & Software Systems (S3) in 2007, keeping a strong design center near Lisbon since then.

Coreworks started in 2001 and is a leading provider of Semiconductor Intellectual Property (SIP) for multi-standard multimedia such as DTV, IPTV, portable audio players, and mobile internet devices.

Awaiba, located in Funchal since 2004, designs and produces image sensors for, among others, industrial inspection, medical endoscopy, automotive on board cameras, and high speed video systems.

B. *Packaging*

NANIUM is a world-class provider of semiconductor packaging, test and engineering services, and a leader in 300mm Wafer Level Packaging (WLP), now working with Intel Mobile Communications (IMC).

C. *System Specific Design*

Fleet management: Tecmic was founded in 1988 and is now the provider of XTraN, the most advanced professional

Capital	Lisbon
Largest city	Lisbon
Language	Portuguese
Area Total	92,345 km^2
Population (2011 World Bank)	10,640,000
Currency	Euro (€)
Time zone	**(UTC +0)**
Internet TLD	.pt

fleet management system on the market.

Nokia Siemens Networks Portugal develops competencies in the optical, multimedia and telecommunications networks management domain, exporting solutions and know how all over the world.

III. Academia (Universities preparing EDA and Chip Design specialists)

Academic and research work in microelectronics related fields can be described in two areas: electronic design automation and chip design.

A. *Electronic Design Automation*

Groups at INESC ID/IST – TU Lisbon, IT/IST - TU Lisbon IEETA/U. Aveiro, IT/U. Aveiro and INESC Tec/Oporto U. conduct research on EDA covering the following topics: electromagnetic modeling and analysis, power grid analysis and verification, variability-Aware modeling and verification, nonlinear modeling, nonlinear system identification, algorithms for low-power filter design and optimization, optimization of multiple constant multipliers, algorithms and tools for reasoning about dependable systems, answer set programming with boolean satisfiability, polynomial hierarchy algorithms applications, analog IC design automation, design optimization, evolutionary computation. design and test of analog and digital systems, programmable logic for wireless communications and biomedical applications, structural testing of embedded systems, reconfigurable computing, dynamic reconfiguration supported by functional optimization, co-design HW/SW.

This research constitutes joint work with multiple international partners such as MIT, IBM Austin Labs, Cadence Design Systems, NXP, Magwell, AustriaMicroSystems, etc.

B. *Chip Design*

Groups at INESC ID/IST, at Uninova/New Lisbon U, IT/U. Aveiro, INESC Tec/Oporto U. and others develop work in chip design in the following areas of application: RF, data conversion, sensors interface circuits (radiation detectors, magneto-resistive), power harvesting (RF) and quaternary circuits (in standard CMOS), data converters, transceiver design and optimization, wireless power conversion and transmission, software defined radio, cognitive radio transceivers, characterization and adaptive correction of A/D and D/A converters. Circuits for Digital signal processing, power optimization: power management, digital and mixed signal testing.

IV. Government Programs (EDA and Chip Design industy development support)

The International Iberian Nanotechnology Laboratory-INL is an Intergovernmental Organisation created to foster interdisciplinary research in Nanotechnology and Nanoscience. INL provides a high-tech research environment addressing major challenges in nanomedicine, nanotechnology applied to environmental & food control nanoelectronics, and nanomachines and molecular manipulation at nanoscale.

Portuguese government supports R&D mainly through the FCT (Foundation for Science and Technology), member of the European Science Foundation, which provides funding for: Research Units and Associated Laboratories, projects and scholarships.

A. *Research Units and Associated Laboratories*

Most scientific research in Portugal takes place in R&D institutions financed and evaluated by FCT. There are currently 293 R&D Units and 26 Associated Laboratories, with more than 12 000 researchers. INESC-ID, LIP, i3N, IT, LARSyS and the International Iberian Nanotechnology Laboratory - INL are research centers with activity in microelectronics and EDA.

B. *Projects*

There are frequent calls for projects on different research areas. Projects are scored according to an international panel of experts. The projects that receive funds are executed for a period, typically, of 36 months. The funds of national projects can be used on scholarships, equipment, sw or IC prototyping, typically through the Europractice program.

C. *Scholarchips*

FCT grants through public calls a great variety of fellowships and grants. The most frequent scholarships in EDA and IC design are 1) individual scholarships granted directly to PhD students. These scholarships can be totally funded by FCT or half funded by industry 2) project specific scholarships.

V OPPORTUNITIES

Either powering your success with Portuguese industry or finding your innovation path with a research partner, in Portugal you will find a safe shore for your business and the best crew for your SoChip.

Marcelino Santos is the CTO of SILICONGATE, a power management IP design company that offers ultra low-power crystal oscillators and high performance voltage regulators. He teaches microelectronics at the IST, Technical University of Lisbon since 1990 and he is the head of the research group at INESC-ID: Quality and Test HwSw since 2010. The group's activity is focused on low power design and power management solutions: voltage regulation and dynamic voltage scaling. Research activity is aligned with the challenges faced by the cutting edge power management IP industry.