PROJECT PROFILE

AI06: Integrated network copper access (INCA)

DESIGN METHODOLOGIES

Partners:

Alcatel
Alcatel Microelectronics
CPR Centro Team
ENS
France Telecom R&D
FTW
ISD
KUL University
LTH University
STMicroelectronics
Telia Research AB
Thomson multimedia

Project leader:

Christophe Del-Toso,
STMicroelectronics

Key project dates:

Start: January 2001
End: December 2002

Countries involved:

Austria
Belgium
France
Greece
Italy
Sweden

The market for broadband xDSL services is expanding rapidly as the advantages of high-speed data handling using the existing local telephone loop become apparent to the end-user. Yet xDSL technologies are also developing fast, with companies around the world competing to develop faster and more integrated chipset designs. Experience has shown that successful market take-up depends on combining performance integration, chipset interoperability and acceptance by the standardisation bodies. The MEDEA+ A106 INCA project aims to help the European microelectronics industry develop all these competences to a level where it can compete successfully on the global market in this strategic sector.

Broadband ADSL (asynchronous digital subscriber line) telecommunication services are spreading rapidly as the price of such services drops. The ASDL advantage of high data transfer rates using the existing twisted-pair local telephone loop is proving increasingly attractive to both business and domestic consumers as the files they handle on their PCs grow in number and size.

While the ADSL standard is still evolving, the telecom industry is already looking beyond to VDSL (very-high-speed digital subscriber line) and even enhanced VDSL. Standardisation committees including ETSI/TM6, ANSIT1E1.4 and ITU-SG15/Q4 are currently developing specifications for VDSL. Moreover, the VDSL physical layer is a serious candidate for use in the future IEEE 'Ethernet in the First Mile' (EFM) standard, intended to extend LAN coverage.

Industry observers forecast that the market for xDSL (ADSL and VDSL) services will reach 60 million lines worldwide by 2004. There are already some two million ADSL connections in the USA and Asia Pacific, and in Europe demand will possibly even overtake that in the USA by 2003.

Boosting European competitiveness

The goal of the MEDEA+ INCA (Integrated Network Copper Access) project is to develop SoC (system-on-chip) and IC (integrated circuit) technologies for xDSL applications to the level where European companies can compete successfully in the global market for high data rate local access services. The project aims to contribute to the development of innovative integrated products for advanced telecommunications services by offering very high data rate processing capabilities combined with low cost to market.

US, Japanese and EU companies are all racing to establish competitive advantage in the highly aggressive xDSL market sector. Three of the project partners in the INCA project – Alcatel, Alcatel Microelectronics and STMicroelectronics – have already established a substantial market share. But if European industry is to gain market share, significant R&D investment is required into enhanced ADSL and VDSL technologies, and into ensuring they comply with the standardisation activities of the ETSI, ANSI and ITU-T committees.

Key objectives for the INCA project therefore include developing and integrating high performance enhanced ADSL and VDSL systems with advanced digital signal processing techniques and using the most advanced SoC design methodologies and silicon technologies. The partners also aim to build a European consortium to promote and eventually adopt worldwide standards based on INCA-developed chipsets and systems, then to deliver these systems as standard products on the market.

A highly relevant point is that among all the various access technologies being developed to support future high-speed communication network services – whether third generation cellular phones, wireless LANs (local area networks), cable modems or fibre-optic transceivers – xDSL technology will have one of the highest percentages of integrated circuits and devices. Developing a leadership position in xDSL is therefore of vital strategic importance for the European microelectronics industry.

Modular project structure

INCA is split into four work packages:

• Work package 1 focuses on developing an SoC design methodology for enhanced ADSL and VDSL. The objective is a new methodology starting from the highest system-level description (e.g. in C or C++ language), proceeding through further refinements eventually to hardware and software implementation.

• Work package 2 is devoted to the transport of multimedia services, including analogue voice telephony services, over the all-digital xDSL local loop. A challenge is to maintain the POTS (plain old telephone service)-style facility of ensuring that the customer is still able to use the voice telephony service from a simple telephone even during power outages. This assurance of being able to make emergency calls at all times has been the default provision ever since telephony services were first supplied.

• Work package 3 covers the development of advanced digital signal processing methods and the advanced error correction codes needed for enhanced ADSL and VDSL. The challenges include: finding ways to mitigate the effects of radio frequency interference from nearby radio transmitters; developing the signal repeaters and regenerators needed for the extended reach of VDSL systems; improving the systems' abilities to reduce crosstalk; and developing new error correction coding techniques.

• Work package 4 is dedicated to developing building blocks to integrate the chipsets, design as well as the demonstrators, and application platform into a coherent whole. Close attention is being paid to developing the best combination of performance, bandwidth, power dissipation and integration density. Each chipset developed will have its own associated demonstration and application platform, capable of supporting services such as high-speed interactive Internet, e-commerce, video-on-demand, interactive games and other services, depending on market requirements. Great emphasis is being placed throughout the management of the project on developing IC architectures that offer flexibility, scalability, reconfigurability and intellectual property (IP) reuse. This is in recognition of the need to develop an array of xDSL modem products to suit customers ranging from large businesses to individual consumers. Each modem platform will be optimised to host a specific set of customer services to suit the likely market for that type of product.

A strong consortium

The INCA project builds on the results of the earlier A114 xDSL project in the MEDEA programme. However INCA involves an enlarged vertical and horizontal consortium of partners capable of bringing specialised research and market knowledge to bear on the project to achieve a minimised time to market for the project results.

Two of the project partners, chip makers Alcatel Microelectronics and STMicroelectronics, have already developed the first generation of ADSL integrated chipsets and brought them to market in the MEDEA project A114 xDSL. The two see the INCA project as strengthening their expertise in xDSL to develop new, highly-integrated, low power xDSL devices. Thomson multimedia is contributing to the development of a validation and demonstration platform for ADSL/VDSL technology, targeting applications for broadband multimedia equipment and services.

The companies are also working together within INCA to define common system and architecture requirements to make future VDSL chipsets interoperable. France Telecom and Telia with their specific know-how as operators ensure ADSL/VDS interoperability, validation of new algorithms for enhanced VDSL, suitable tests on laboratory benches, and field trials.