PROJECT PROFILE

2A106: Ultra-high data-rate wireless communication (Qstream)

TECHNOLOGY PLATFORM FOR NEXT-GENERATION CORE CMOS PROCESS

Partners:

CEA-LETI
CNRS-ENSTbr
CNRS-IEMN
CNRS-IMS
CNRS-LAAS
Cyner Substrates
IMEC
Institute for Applied Radio System Technology (IAF)
NXP Semiconductors
Signal Generix
STMicroelectronics
Thomson
Uni Braunschweig
Uni Eindhoven (TU/e)
Uni Kaiserslautern (TUKL)

Project leader:

Cicero Vaucher
NXP Semiconductors

Key project dates:

Start: April 2008
End: March 2011

Countries involved:

Belgium
Cyprus
France
Germany
Italy
The Netherlands

The Qstream project is tackling the scientific and technological challenges encountered in the development of low-cost, highly-integrated, ultra-high-data-rate streaming applications in the millimetre waveband. Complete receiver and transmitter integrated circuits – radio frequency and digital baseband – will be developed in CMOS technology, in addition to system-in-package mm-wave front ends, aerial arrays and active chips on a low-cost substrate. The validity of such concepts will be demonstrated in two functional prototypes. These low-cost integrated systems will enable a new range of ultra-high data-rate wireless communications devices opening up global markets for European manufacturers.

Short-distance wireless video streaming at extremely high mm-wave frequencies is set to become a key electronic development and an important economic application in the very near future. The results of the MEDEA+ 2A106 Qstream project will make available the necessary high speed, reliable high-quality wireless links. Such links will offer an improved comfort and ease of use to the consumer by eliminating the need for interconnecting cables in the home and in the mobile environment.

The number of applications that can benefit from such a link is expected to grow significantly in the coming years, starting with wireless interfaces for high-definition (HD) television and extending to new applications such as the wireless transmission of signals to create 3D virtual-reality experiences.

Integrated solutions

Realisation of low-cost integrated systems operating in the 60 GHz band will facilitate the development a new range of ultra-high data-rate wireless communications systems. A wireless high-definition multimedia interface (HDMI) will offer much improved ease-of-use and increased comfort levels for home video systems. It will lead to user-experience advancements similar to that currently provided by wireless local area network (WLAN) systems incorporated in portable devices such as laptop and notebook computers, personal digital assistants (PDAs) and smart phones.

Kiosk downloading is a new idea enabling transfer of videos, music and other content at very high speeds. Complete films could be conveniently transferred from a kiosk server to portable devices such as iPods, smart phones and PDAs in seconds. For example, the downloading of a 120-minute DVD takes 10 minutes with a WiFi 54 Mb/s link and 13 seconds with a WLAN 2 Gb/s link but would only take 4 seconds using a wireless HDMI 6 Gb/s link.

However, successful realisation of a total systems solution lies in taking a multidisciplinary approach to the technical challenges involved. Qstream is developing a design and implementation strategy for low-cost, highly-integrated and high-data-rate streaming applications in the 60 GHz band, involving technological, circuit-level, architectural and systems-level aspects.

The MEDEA+ project intends to prove the adequacy of the concepts and technical

choices by hardware demonstration. A low-cost and low-power implementation is of fundamental importance as the main applications address consumer markets. Qstream will provide two point-to-point indoor demonstrators: SYSTEM1 will feature 3 Gb/s and multiple communication beams for guaranteed quality-of-service for video streaming; while SYSTEM2 will demonstrate 6 Gb/s for fast file download in kiosk applications.

Competitive edge for Europe

Only the combined efforts of Europe's top semiconductor manufacturers and research institutions in this project can give Europe a competitive edge in mm-wave wireless communications. Qstream provides the opportunity for leading European players to work together to resolve the problems of mm-wave communication devices. The consortium will enable the link between application and systems knowledge on the one hand and process technologies on the other.

This MEDEA+ project will therefore secure Europe's competitive position in high frequency wireless communications, particularly for mobile phones, PDAs, iPod portable media players and laptop computers.

Standardisation in the mm-wave domain – in particular WirelessHD, IEEE 802.11ad and Wireless Gigabit Alliance (WiGig) – will be actively driven by experienced partners. Wireless transmission standardisation processes are international; common work at European level, with aligned targets in the major European companies, could balance out the substantial influence of other parts of the world – such as the USA and Asia – which currently dominates standardisation processes in the wireless area.

Five consortium partners – IMEC, NXP, STMicroelectronics, Braunschweig University of Technology and Thomson – are involved with the IEEE standardisation efforts and will be in a position to propose additions to the standards, generated from within Qstream.

Practical applications

Multimedia applications involving use of mobile phones for picture swapping, audio and video processing, web surfing, online gaming and mobile payment services will continue to emerge as a key driver of semiconductor growth in the communications sector during the next few years. Multifunction mobile phones will drive the demand for multifunction semiconductor solutions.

Companies that plan to be major players in this emerging market must be capable of designing and producing multi-function wireless connectivity solutions.

Providing advanced technology, such as wireless HDMI is of strategic importance to ensure competitiveness for the European consumer industry. Wireless HDMI is considered a very promising technology with a strong value proposition. It potentially offers major advantages compared with existing technologies, including

- Simplicity, through the removal of cabling;
- Quality, by supporting fully uncompressed high-definition video; and
- Spectrum availability, by exploiting the unused unlicenced portion of the spectrum.

These elements are the basis of the business opportunity for wireless HDMI applications. According to the Isuppli market research company, the potential semiconductor market for 60 GHz wireless HDMI technologies will be in the range of 270 million chips in 2012 and 420 million in 2013.

Impact on comfort and speed

This MEDEA+ project will contribute to the competitiveness of Europe by providing technical and scientific results that will enable European companies to address new market opportunities in the mm-wave frequency range with timely and cost-competitive solutions, leading to market leadership positions and opportunities for increased employment.

Streaming applications in the mm-wave bands are a significant opportunity for European chipmakers and consumer-electronics companies to strengthen their position as leading suppliers of electronic components and systems, particularly for mobile video handsets and other mobile TV applications. In addition, small and medium-sized enterprises (SMEs) can become part of the mm-wave communications value chain by providing key system components and implementation knowledge during product concept and prototyping phases.

Moreover, the involvement of a large number of universities in Qstream will help stimulate the availability of highly qualified multidisciplinary personnel for future developments in the European microelectronics industry.

MEDEA+

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MEDEA+ (EUREKA Σ!2365) is the industry-driven pan-European programme for advanced co-operative R&D in microelectronics to ensure Europe's technological and industrial competitiveness in this sector on a worldwide basis.

MEDEA+ focuses on enabling technologies for the Information Society and aims to make Europe a leader in system innovation on silicon.