PROJECT RESULT

High speed communications systems

MEDEA+

A110: Multi-standard integrated devices for broadband DSL access and in-home powerline communications (MIDAS)

Wide co-operation speeds and simplifies access and distribution of multimedia in the home

Close co-operation between design houses, chipmakers, system manufacturers, network operators, and design tool and test equipment manufacturers, supported by research centres and academia, has resulted in highly integrated solutions for domestic broadband access to a wide range of multimedia services. A particular focus was development of fully functional power-line signal distribution in the home for maximum consumer flexibility. The success of MIDAS is already leading to availability of design tools, chips and systems based on the technologies developed, boosting Europe's global lead in this area.

Ever greater use of broadband Internet – particularly with asymmetric digital subscriber line (ADSL) technology – has led to an explosion in domestic multimedia services such as multi-channel television as well as provision of high quality so-called triple-play (voice, data and video) services. However, it is necessary not only to deliver the signal to the home but also to distribute it internally as all the audio, video and PC systems involved cannot be next to the incoming connection.

The MEDEA+ A110 MIDAS project set out to ensure availability of broadband consumer services and develop power-line communications (PLC) to simplify internal distribution of the signal. PLC uses a power-line carrier to enable fast transmission of signals over the mains wiring rather than drilling holes in walls and pulling cables through. And it offers broadband distribution without the complexity of many current wireless technologies.

Big demand for chips

While ADSL is now technically mature, it has much to offer in terms of commercial development. There is big demand for ADSL chips and numerous businesses are developing around its use.

New standards – first ADSL2 and now ADSL2+ – offer bandwidths up to 24 MB, more than enough even for video on demand. However, bandwidth is dependent on distance from the exchange and this is very diverse. In Italy, 95% of lines are less than 2 km long because of the historical deployment of the network, so coverage is fairly good. But in the UK, there is a high number of long lines, so there is still a major need to install repeaters and DSL access multiplexer equipment close to customers. The capital cost of deploying new systems can therefore be high.

MIDAS grew out of common interest and complementarities between system equipment manufacturers, design houses, chipmakers, network operators, and design tool and test equipment manufacturers, supported by universities and research institutes to speed development of more adaptable systems and chips. The large companies involved attracted SME and academic partners around individual elements of technology, which were brought together in a final demonstrator.

Many of the basic technologies came from previous MEDEA projects such as MESA, INCA and UniAccess. There was also input from the EU Fifth Framework Programme (FP5) Adriatic project.

Two key needs were identified at the beginning:

1. New technology to enable manufacturers to design better systems – including development of new design tools; and

2. Different ways of implementation as older designs had become somewhat stuck in a rut when dealing with new, rapidly changing standards, such as ADSL2+.

These needs covered not only new hardware but also software – for example for security.

Mixing old and new

The project exploited a mixture of old and new technologies. There was much integration of existing ideas. One of the many SMEs involved manufactures design tools adapted to application-specific instruction set processors (ASIPs). These provide very small, highly adaptable programmable cores that can be used to implement parts of the digital content in a mixture of hardware and software – the software is derived from languages such as the open-source C but the technique makes it much easier for integration into an industrial design environment.

New technology was developed for the integration of analogue functions and to produce much smaller chips. Analogue integration is a real challenge because as density increases, the power supply voltage, noise margin and so on reduce. Particular effort was focused on analogue-to-digital converters to meet the performance needs of DSL applications that could be transferred to 0.13 μm technologies.

Innovative ideas and techniques were also applied in the form of middleware to measure and manage quality of service (QoS), and to keep networks running. The wide mix of technologies developed by the large consortium worked together effectively as demonstrated at the end of the project.

Another innovation was use of high speed digital signal processing for line test equipment – another SME involved successfully developed new test equipment for accreditation of the performance of a DSL line or measuring it against standards that continue to evolve.

As a result of MIDAS, design time for new products could be reduced markedly, making it possible to get new chips – particularly for the switch to ADSL2+ – to the market sooner. The new design flow is helping reduce the cost of chips for ADSL2+ with better use of smaller silicon areas.

So commercially, this project is already having an impact on the narrowing market window as communications and consumer equipment converge – no longer the domain of large telecommunications companies but in the hands of faster, nimbler PC-like equipment manufacturers that need well adapted design flows to keep up to date.

Successful prototypes

Several working prototypes had been developed successfully by the end of MIDAS. As a result, multistandard chips and systems, together with a novel line simulator, are already becoming available. This is yielding commercial benefits and maintaining European employment and Europe's position in the global marketplace – ADSL2 is a market in which Europe leads despite the first implementations being in the USA.

MIDAS also demonstrated the first in-home PLC network able to achieve speeds of up to 200 Mb/s with high-quality multistream video and data channels over the existing mains wiring in the home. These systems will be able to provide 100% coverage together with very high levels of security.

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