As 3G networks and handsets finally make it to market, semiconductor houses are already preparing to support the next wave of multimedia phone services. Megapixel camera phones with basic multimedia audio/video functionality are becoming the standard in the marketplace with further extensions such as video recording, streaming and mobile TV. We can expect to see at least some of these features filtering through to the mainstream in the future.

Incorporating such rich functionality into a handset is not easy. The tiny form factor and limited battery life restrict the technology used. The first generation of multimedia or high end 3G platforms still use an older system architecture. Basically, the conventional baseband processor is simply enhanced by a coprocessor executing the basic set of required multimedia functions or 3G services.

To enable advanced features for next generation services, changes from chip level up to the complete system architecture are required. For instance, the ‘old’ single processor centric approach is being replaced by a distributed processing concept, with several loosely coupled units controlled by a microprocessor.

The distributed processing concept has been triggered by the issue of static power consumption in 90nm technologies and smaller. For mobile phones, it is difficult to raise clock frequencies as easily as in the PC space. Therefore, it is increasingly logical to execute complete functions in parallel. Independent units perform special tasks such as MPEG encoding, or others, like audio decoding. Unused units can be switched off completely and power consumption (static and dynamic) is reduced. Positive results are also found with regard to possible data throughput. Distributed systems allow very efficient processing of independent data streams or concurrent tasks.

Not that long ago, a mobile phone only needed a relatively simple 16 or 32bit microcontroller coupled with a DSP coprocessor, executing the codec algorithms. However, we have seen a transition to an extended system architecture - the baseband executing basic phone control functions, alongside the DSP - has become an independent subsystem. The overall control of this subsystem has moved to a larger, faster main processor. The recently defined application processor now forms the main core of the mobile phone.

New data, new device
The DSP portion of the baseband does not, however, evolve to a ‘super DSP’, executing everything associated with DSP or multimedia. Instead, the application processor controls a series of further subsystems executing independent and concurrent multimedia algorithms, or new data streams associated with the next generation services, such as DVB-H or WLAN initiated packets.

The application processor, such as the SH-Mobile platform from Renesas Technology, plays the role of the host in a distributed system. Running an open operating system, such as Symbian, Windows CE (for mobile phones) or Linux, the host controls the entire system.

Higher integration through technology advances was required for this evolution, to enable integration into a standard mobile phone without exceeding the commercially useful cost of handsets.

The advances in vertical and horizontal integration allow for additional wireless technologies for 3.5 or 4G and provide more room for service improvements and next generation support. Through the advances of packaging technology in particular, such as system in package, different technologies that are historically difficult to combine can be integrated into single packages, enabling future progression.

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