ELECTRONIC PRODUCT DESIGN

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THE TECHNOLOGY MAGAZINE FOR ELECTRONICS DESIGNERS

BALANCING THE ROAD AHEAD FOR TELEMATICS

This evolution has allowed the proliferation of telematics, an enabling technology supported by trends and advancements in communications and automotive electronics.

Today, some 200 models, comprising 32 brands of cars and light trucks sold worldwide offer telematics as standard or optional equipment, according to industry research firm Telematics Research Group. Last year, approximately 2.5m telematics enabled vehicles were sold worldwide.

The evolution continues as x-by-wire and sensor-based smart car functions grow. Two factors, connectivity need and digital car capabilities, are driving long-term demand for telematics functionality in vehicles worldwide.

Telematics overview

Telematics Research Group has defined a telematics-enabled auto as meeting the following criteria: has two-way communications, has a location sensing device, and has a control unit that is interfaced to the automobile's electronic system.

Telematics applications tend to fall into vehicle-related and driver- or consumer-related categories. Vehicle-related telematics involve embedded vehicle functions such as automatic crash notification, remote diagnostics and door unlock. Consumer-related telematics involve information and content that users want in mobile settings, inside and outside the car.

OEMs enable vehicles through hands-free interfaces and other HMI (human machine interface) elements, such as multi-function displays or driver information systems. Future telematics systems should provide the foundation for embedded vehicle function and integration of mobile devices, including an integrated wireless profile. This could be used for safety and security, among other applications. These systems also should have interfaces for mobile devices, whether Bluetooth, Wi-Fi or docking stations.

Application and development tools have emerged that provide developers with the tools for building and distributing mobile and wireless applications. These allow applications to run on devices with low power and limited hardware resources, in effect turning cell phones into 'smart phones' and PDAs into PDA-phones. When coupled with GPS receivers, these devices become portable telematics terminals capable of location-based services, such as turn-by-turn navigation, across the countryside or even national borders.

During the last two decades, the automobile has transformed from an analogue machine with mostly mechanical and hydraulic control systems to a digital car with computer-based control systems

MobileGT Total5200 target hardware

Importance of platforms

Having the right development platforms, services and support, as well as performance levels are critical for integrating telematics into mobile and wireless applications.

Telematics Research Group projects that telematics systems and services will become increasingly available on passenger cars. By 2010 half of the cars sold around the world will come equipped with telematics hardware - in key regions like Europe, Asia and North America that number could climb as high as 70 per cent. By 2010, they predict, more than 100m vehicles worldwide will have telematics units installed as standard equipment.

Motorola, which has 90 per cent share of the automotive telematics control units (TCUs), according to Telematics Research Group, has introduced the next-generation MobileGT 5200, based on the MPC5200 processor. This 32bit embedded processor offers plenty of MIPS for future growth, low power operation, a wide variety of I/O and enhancements to assure fast throughput in any system.

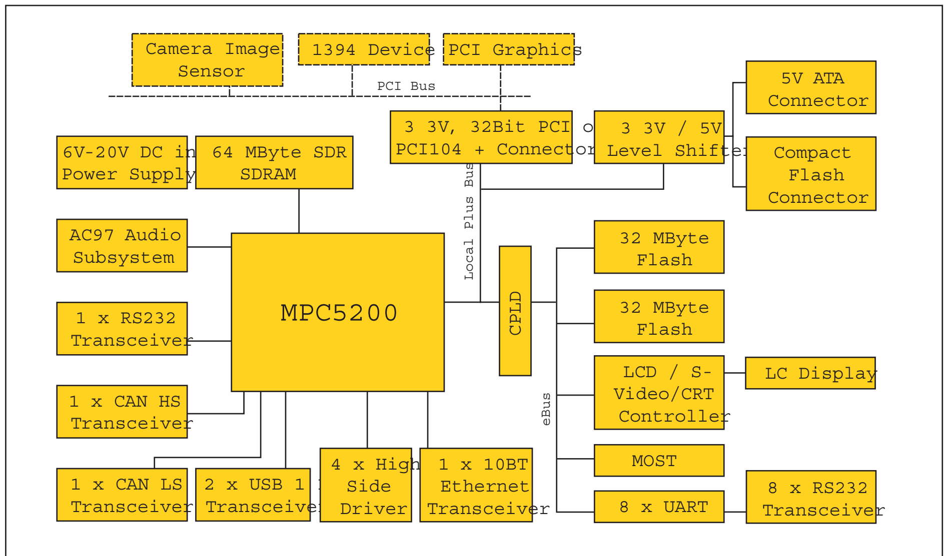
MobileGT is both an architecture and alliance of vendors, committed to enabling the latest, customised telematics and driver information systems technologies. The mobileGT development platform is a second-generation, PowerPC-based implementation, built on an open, scalable software environment. It includes additional support, application and development software from a variety of vendors.

Combining hardware and software technologies, the mobile GT platform is one of the most automotive network-ready platforms on which to integrate voice recognition, wireless communications, GPS, navigation, telematics, radio and Internet technologies, all via an open architecture. A complete audio subsystem makes for simple connection to various Bluetooth, car audio and hands-free phone implementations.

Powering platforms

The MPC5200 processor offers 760MIPS for high performance and growth, low power operation under 1W and a variety of I/O that delivers fast throughput with a new DMA (direct memory access) controller and DDR (double data rate) support.

With a -40 to 85°C automotive temperature rating at 400MHz (105°C parts will be available at 264MHz), it sets the standard for in-vehicle performance with 760MIPS coupled with a floating point unit. CAN and a BDLC-DJ1850 port are integrated onto the device for connectivity to automotive networks. MOST (Media Oriented Systems Transport) support is included on the platform. Additional I/O includes ATA, IDE, PCI, USB, 12S, I2C, AC97, Ethernet and multiple serial channels.



Block diagram of the mobileGT standard development platform

In the rapidly evolving telematics and associated markets, many functions including the TCU are converging into a single module. This is forcing a new set of requirements for processors to successfully and cost-effectively power these technologies. This includes low power, high MIPS, fast data throughput and processor longevity.

Designers are under pressure to pick the optimal, most cost-effective processor solution, and to also pick the right devices that will allow them to quickly and easily redeploy earlier work in the future

Designers have to balance (near) zero defect with low cost, and combine technologies into hybrid devices to deliver more compelling features, while lowering overall system cost. They may also be asked to develop more focused, lower-priced products that support a single function. An example of this might be a consumer's choice between a hands-free phone module integrated into the vehicle and a variety of standalone after-market devices.

Powering ahead

Designers are under pressure to pick the optimal, most cost-effective processor solution, and to also pick the right devices that will allow them to quickly and easily redeploy earlier work in the future. They must do this while assuring the RISC, and perhaps companion DSP, performs adequately and within their power budget.

Historically, the most significant requirement when selecting a processor has been MIPS. This continues to be true. Designers need to insure that sufficient processing power is in place to effectively handle the applications being used today and to support subsequent generations. This means selecting a processor with extra MIPS for future 'headroom'.

For cost-reduction and time-to-market reasons, the designer may also want to combine applications that have historically been hosted on DSPs, such as voice recognition, on to a single RISC processor in this system. More frequently, engineers demand a solution that can address both classes of RISC and DSP applications on a single core with a popular RTOS (real time operating system) and development environment, to achieve a simple, cost effective, open programming environment.

Processor management

Another issue confronting designers of next-generation systems is management of large amounts of data piped through the processor. The growing number of in-vehicle applications, such as camera-based systems for occupant detection, airbag deployment control, various hazard warning and lane departure schemes currently under development, mean that a high-speed data pipe into the processor, that easily connects to sensors and other imaging devices, becomes a 'must-have.' Once the data is in the processor, processing and notification to other vehicle subsystems must occur rapidly, within an extended temperature environment. While quickly processing that data, the designer must also be assured that management of the ongoing data transfers does not become all-consuming for the processor.

The best way to address this is through a three-pronged approach. Integrating a DDR memory controller directly onto the processor potentially doubles the memory access speed. Including a front-line interrupt control and data movement interface via a separate peripheral bus provides for data movement and management without demanding much of the main processor's attention. The third requirement is to move data into the device quickly. In this case, Motorola uses DDR support, a BestComm intelligent DMA controller and a high speed PCI.

Once the designer has chosen a microprocessor, product evolution and lifecycle become the next areas of concern. Engineers can be forced to redesign products once the current generation becomes obsolete. This is not tolerated in the automotive industry, which operates on five-year, or longer, product lifecycles.

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