Executive Summary

Continuing innovation in communication and computing technologies is creating new opportunities for in-vehicle solutions for infotainment and telematics. Some of the key benefits of new infotainment and telematics solutions are increased driver productivity, improved routing and scheduling, and reduced operating costs.

In the commercial automotive market segment, companies face the challenge of developing responsive products and services with attractive returns on investment in these technologies. By focusing on a standards-based approach to design, infotainment and telematics developers can provide robust, flexible, and easy to incorporate systems specifically geared to the needs of the commercial vehicle market segment.

Kontron, an Intel® Communications Alliance Premier member, and Sunit Oy, a Finnish manufacturer with more than 20 years experience in delivering state-of-the-art onboard computer systems, have helped Scania add high-value telematics offerings to their line of automotive products. By using Intel® processors and chipsets, Kontron provides the flexibility to address several levels of performance, price points and form factors demanded by the commercial vehicle market segment.
The Challenge

In the automotive industry, infotainment refers to the integration of information, education and entertainment functions in vehicular environments. Telematics is the convergence of communications and computing technologies that has come to be nearly synonymous with “automotive telematics” because of its increasing use in cars, trucks and buses. These two applications are beginning to converge for in-vehicle solutions, combining mobile communications, voice/data, CD, DVD, navigation and vehicle monitoring.

Continuing innovation in wireless communication services and technology has paved the way for new automotive infotainment telematics products and services. These rapidly evolving products and services have turned telematics into a highly sophisticated offering that requires a substantial amount of technical expertise and an extensive network ecosystem, such as shown in Figure 1.

A controller area network (CAN) inside the vehicle provides a means to integrate onboard monitoring and communications systems, providing two-way communications between the vehicle and the home office. A link to a global positioning satellite helps the driver navigate to the destination while allowing the office to have up-to-date location information about its fleet to respond quickly and efficiently to any change in route or schedule.

Communication links are provided through carriers offering wireless access through global system for mobile communications (GSM), general packet radio service (GPRS), terrestrial trunked radio (TETRA), and wireless local area network (WLAN) systems.

Due to the infancy of some technological capabilities, the question of how to best implement an in-vehicle solution presents a unique set of technical and business challenges.

OPEN STANDARDS

The lack of clearly defined standards and the fragmented state of the infotainment telematics industry have hampered efforts to create cost-effective solutions. According to a Frost & Sullivan report, market penetration for telematics continues to be low at least in part because of the high cost associated with proprietary systems!
PERFORMANCE
With the rich selection of software and device options to choose from, clear differentiation is often best measured in terms of performance. Customers have come to expect real-time processing, high-visual imagery, and tight integration of their entertainment, navigation, voice recognition, high-speed connectivity, and monitoring applications. Supporting these feature-rich applications requires increasing data and graphics processing power.

SCALABILITY
New ideas as well as improvements to current designs for infotainment and telematics applications are constantly appearing. These ideas and improvements inspire the development of new products and services and the need for their integration into larger systems, and in turn create new business opportunities. At the same time, consumers of infotainment telematics may be resistant to frequent replacements of hardware systems to receive updates or added features. As a result, the ideal system should provide flexibility and headroom to accommodate future expandability and new functionality.

IN-VEHICLE FRAMEWORK
Design for the transportation environment presents a unique set of challenges to infotainment telematics systems because vehicles are designed to operate in rapidly and sometimes unpredictably changing conditions. Integrated mobile systems must be able to operate efficiently in wide ranges of temperature, humidity, shock and vibration. In-cabin space is limited which translates to compact configurations. In most cases, vehicle manufacturers have only a standard radio slot in which to install an in-vehicle PC (IPC).

The Solution
AN OVERVIEW
As the demand for in-vehicle infotainment telematics solutions grows, Intel® architecture has responded. The Pentium® M processor is designed for power-sensitive requirements. Combined with the Intel® 855GME and Intel® 915GM chipsets, the Pentium M processor enables platforms with a variety of performance levels. Furthermore, the long-term availability of Intel’s embedded processors and chipsets allows suppliers to offer customized solutions to customers that require production and delivery over several years. In addition, the considerable ecosystem supporting Intel’s products gives manufacturers a competitive advantage in developing compelling solutions with a shorter time to market.

When the Swedish truck and bus manufacturer, Scania, wanted an in-vehicle information system to help transport companies monitor what their vehicles are doing and where they are located—the company turned to Finnish vehicle PC manufacturer Sunit Oy and Kontron AG for help. Kontron, a market leader for embedded computer technology, worked closely with Sunit to develop high-performance onboard computers based on Intel technology for Scania’s Fleet Management System (www.scania.com/services/fleetmanagement).

Using Intel building blocks, the companies developed a 10.4-inch touch panel integrated with the vehicle dashboard. Borrowing from the modern laptop, the Scania Interactor® 600 or 500, is seamlessly integrated into the standard radio DIN 2 dashboard slot in the truck cockpit.

This collaborative solution creates customer value by:

- Streamlining the supply chain
- Increasing driver productivity
- Reducing operational and maintenance costs
- Gathering critical information for strategic planning

OPEN SYSTEM: AN AUTOMOTIVE FRAMEWORK
Automotive technology today involves thousands of electrical and mechanical components designed to work together to ensure proper operation. A successful telematics product must support the vehicle manufacturer’s product design specifications and meet strict automotive standards. With the added requirement of offering a system to fit the dimensions of a radio slot of a car, designing and manufacturing a telematics system can be a challenging task.
With new discoveries for uses and applications in telematics, some technology-related industries have been moving towards open standards. Some standards that are directly applicable to a scalable, high-performance in-vehicle infotainment platform include peripheral component interconnect (PCI) and PCI Express*, universal serial bus (USB), and parallel and serial ATA. Adherence to these standards in an in-vehicle infotainment telematics platform increases performance choices.

By relying on the Pentium M processor and the Intel 855GME chipset, Kontron AG and Sunit Oy benefit from a broad range of applications, software tools and development environments. Choosing open system applications has accelerated the market penetration of Sunit computers in the global economy by offering a high level of flexibility to meet the growing need for general-purpose applications. The result enables customers to safely and efficiently extend their connected lifestyle to the road.

**The Details**

**SYSTEM ARCHITECTURE AND TECHNOLOGY**

Scania’s specifications required the system to seamlessly fit within a DIN 1 dashboard slot. Based on the Sunit in-vehicle computer platform (Figure 2), Kontron started with its CP306 CompactPCI* assembly. In addition to features designed for more demanding applications, this platform already fulfilled most of the system requirements for in-vehicle applications:

- Pentium M processor (1.1 to 2 GHz)
- Intel 855GME chipset with integrated graphics controller
- Up to 1 GB soldered SDRAM
- Gigabit Ethernet and Fast Ethernet interfaces
- Four USB interfaces
- Four RS232 interfaces

Drawing on the expertise of Sunit in meeting the demands of in-vehicle systems, the Kontron CP306 provides efficient operation at temperature, humidity and altitude ranges normally encountered in commercial transportation. The system meets or exceeds requirements for electromagnetic compatibility (EMC), temperature cycling, vibration, impact, heat and power consumption, and technical layout concepts from Sunit’s experience in the field.

**COMPUTING PERFORMANCE**

Because the Pentium M processor delivers outstanding performance and low power consumption, it is an ideal choice for the Scania Interactor 600 and 500. This processor boasts several architectural improvements including a large 1 MB L2 cache, a 400 MHz front side bus, and enhanced Intel SpeedStep® technology. New power management enhancements include aggressive clock gating to turn off circuits which are not in use and real-time dynamic switching between multiple voltage and frequency points to reduce power consumption during idle periods.

Figure 2. The Sunit Oy in-vehicle computer platform
Up to 1 GB of DDR-SDRAM with ECC can be accessed at 333 MHz, and the compute performance provided by the Pentium M processor allows users to take full advantage of the navigation and GPS applications installed on both Scania Interactor models. As a result, Scania is able to offer a complementary range of fleet management services to commercial customers, by building on the value of their existing product line.

**SHOCK AND HEAT RESISTANCE**

Kontron directly solders the processor and memory to the board, reducing weight and providing a high resistance to shock and vibration. The heat sink is fanless and tightly screwed on the board. Kontron tests and verifies each board and CPU to ensure operability in extended temperature ranges, from -45°C to +85°C.

**GRAPHIC PERFORMANCE**

Using the Intel 855GME chipset, the integrated graphics accelerator delivers high-performance graphics, including intense, realistic 3D graphics with sharp images. This chipset also provides balanced memory usage between graphics and system demands for optimal performance. The display image can rotate 90, 180 or 270 degrees, and follows DirectX® and OpenGL® pixelization rules, allowing for a rich user interface and compelling navigation map rendering.

Figure 3 illustrates the variety of peripheral components that can be integrated using the combination of the Pentium M processor with the Intel 855GME chipset. The flexibility and connectivity of the Intel 855GME chipset allow Kontron to deliver customer-specific solutions quickly and at a competitive cost.

The Scania Interactors designed for high-end applications in vehicles use either Pentium M processors or the Mobile Intel® Pentium® III processors. SunIt IPCs were created to serve as a reliable platform for any conceivable vehicle applications, and they adapt their basic computer to individual customer needs. This means the primary PC functions are isolated from the more customer-specific features such as interface layout,
communication or navigation modules illustrated in Figure 4. This arrangement allows Sunit to react quickly and with precision to specific customer requirements based on the PC core.

This system supports Windows* 2000, Windows XP Pro, Windows XP Embedded, Linux*, and VxWorks*, providing another level of flexibility.

Solution Benefits

Intel, Kontron and Sunit quickly built an open infotainment telematics solution to Scania’s specification that is standards-based at the hardware, operating system, and application services level. The resulting Intel architecture solution incorporates Pentium M processors with the Intel 855GME chipset in a CompactPCI assembly. The solution provides high-performance computing and graphics capabilities to fulfill the demands of infotainment telematics applications while also addressing system integration and interoperability issues. And the benefits to commercial transportation are clear:

- **Increased driver productivity**—The human-machine interface effectively integrates voice and data communication, navigation, monitoring, and audio and visual entertainment. Creating a user-friendly environment using telematics helps reduce driver workload and increase productivity.2

- **Improved routing and scheduling**—With wireless communications and onboard telematics, companies have greater access to a wealth of data from their vehicles. This greatly aids companies in coordinating trucking schedules, streamlining transportation networks, and planning business strategies.

- **Reduced operating costs**—By using a standards-based solution, telematics systems can work seamlessly with onboard sensors to monitor and transmit real-time information on utilization and performance of vehicles. This helps companies maximize value in their fuel and maintenance costs.

Conclusion

As a member of the Intel® Communications Alliance, Kontron has developed a rich inventory of basic components based on Intel technology that allows it to develop individual customer designs more quickly and economically than pure contract developers. Sunit Oy has been using Intel building blocks for nearly a decade for their proven performance in the automotive environment in terms of meeting requirements for vibration, temperature cycling, power consumption and electronic magnetic compatibility.

Sunit benefited from its relationship with Kontron by responding quickly to Scania’s request to build on its existing automotive

![Figure 4. Sunit modular blocks](image-url)
infotainment telematics product offerings and expand into the commercial transportation market segment. Kontron’s collaboration with Sunit further benefited both companies by enabling them to reengineer existing products to support Sunit’s application solution to satisfy the needs of Scania.

Using industry-standard software and accessories simplify system engineering. This results in reduced engineering costs and simplifies scalability to next generation products, with fast time-to-market and fast return on investment. The telematics demand for computing resources is well satisfied with Intel-based embedded products, ecosystem, interoperability and standards. The benefits of this approach are clear:

- **Lower development costs and decreased time-to-market**—Infotainment and telematics integrators can focus on platform differentiation, reducing development time and delivering solutions with increased value.
- **Supply chain flexibility**—Hardware and software products can be delivered at every level of integration.
- **Solid platform strategy**—Building with industry-standard components increases flexibility and scalability.
- **Support**—Intel and Kontron offer long-time availability and long-time support to their customers.

**ABOUT INTEL CORPORATION**

By advancing silicon technologies and driving industry standards, Intel is leading the convergence of computing and communications to provide new ways for people to gain value from technology and transform their world. Intel is meeting the expanding need for innovative, cost-effective and standards-based building blocks in wired and wireless networking and communications infrastructure. Intel’s strength in silicon design, integration and high-volume manufacturing delivers high-performance, low-power components at lower costs that provide the flexibility and faster time-to-market necessary in today’s communications industry.

**ABOUT SUNIT**

Sunit provides state-of-the-art in-vehicle computers, vehicle telematics and Automatic Vehicle Location (AVL) technology for any kind of in-vehicle applications. Sunit onboard computers are produced fulfilling vehicle industry requirements on the component level and verified in accordance with vehicle industrial ISO, IEC and EMC standards.

**ABOUT KONTRON AG**

A global leader in embedded computer technology and mobile rugged solutions, Kontron supplies a diversified customer base of OEMs, system integrators and application providers in the automation, test and measurement, communications, medical, gaming and entertainment, military, aerospace, public safety, transportation, and energy markets. The company helps its customers to considerably reduce their time-to-market and to gain a competitive advantage with products including high-performance open computer platforms and systems, single board computers, human-machine interfaces and mobile rugged computers. Kontron employs more than 2,300 people worldwide and has manufacturing facilities in Europe, North America, and Asia Pacific. The company is listed on the German TecDAX 30 stock exchange under the symbol “KBC.” Kontron is a Premier member in the Intel® Communications Alliance which means earliest access to leading-edge Intel technologies and privileged engineering support. For additional information on Kontron, please visit www.kontron-emea.com.

To learn more about innovative solutions, visit the following web sites:

- www.intel.com
- www.kontron.com
- www.sunit.fi

1. http://transportation.frost.com
2. Ward’s Auto World, May 2005
The Intel® Communications Alliance

A TRUSTED SUPPLY LINE FOR NEXT-GENERATION SOLUTIONS

Intel Communications Alliance members have a close working relationship with Intel and have demonstrated the high levels of design expertise, research capabilities and manufacturing capacity required to deliver high value to customers in the communications and embedded market segments. Combined with Intel’s communications and silicon expertise and high-volume manufacturing capabilities, this broad community helps to ensure rapid innovation on a consistent architecture. It also helps to ensure the wide availability of interoperable solutions at every level of integration, so TEMs, carriers and service providers have a trusted supply line for deploying and supporting next-generation services. Intel Communications Alliance represents the trust, commitment and relevance of Intel’s ecosystem through the development of standards-based, off-the-shelf components, silicon and hardware/software building blocks.

Intel Communications Alliance provides a single point of entry through which customers can efficiently locate and connect with Intel’s world-class ecosystem as well as view the depth and breadth of product offerings coming from members.

For more information about the Intel Communications Alliance, visit www.intel.com/go/ica