

# TELEMATICS

DIRECTING THE FUTURE  
OF TRANSPORT

# SUMMARY

1	INTRODUCTION	3
2	THE TELEMATICS REVOLUTION	4
3	CONNECTING TO THE FUTURE	7
	WHY WE BUY	7
	WAVECOM TECHNOLOGY	11
4	CONCLUSION	13
5	CUSTOMER REFERENCES	14



# 1 INTRODUCTION



## automotive

In the early days of the automotive boom, a customer could have 'any colour he wants, as long as it's black' – as the famous declaration of Henry Ford stated. Things have come a long way since then. Variety and added value services are now part and parcel of both the private and commercial automotive sector, with manufacturers differentiating models and therefore gaining market share not only through slick design, but also through extensive 'add-ons' that make the life of the driver easier and safer, and ease the process of vehicle ownership and operation.

The next 'big thing' in the automotive sector is widely expected to be a surge in the telematics market. Telematics – literally the combination of telecommunications and informatics – is essentially about the provision of one and two-way communications systems into vehicles, integrated with existing and emerging applications. Viewed not only as a way of providing enhanced (and added value) services to drivers, telematics technologies also provide a means of improving driving and vehicle safety, security and performance, whether for private vehicles or commercial fleets.

Of course, the ability to communicate whilst on the road is, in itself, nothing new – telephones, am and fm radio, and even the good old CB radio have long enabled drivers to communicate with the outside world and receive information. However, the next generation of wireless telematics applications are taking the concept of the wireless connection to a higher level, with the principle of adding intelligence to the driving experience as a key driver. It's no longer about simplifying the driving process through power steering, cruise control or ABS systems - long controlled by micro-processors - but rather a question of helping drivers make more intelligent decisions whether in terms of where they're going or how they're going to get there; and also to ensure that driver and vehicle are as safe as possible along the way.

The idea is to integrate GSM/GPRS functionality, often combined with GPS, into the vehicle's systems for intelligent connectivity. Thus, traffic information, itineraries, roadside assistance, emergency calls, real-time logistics management and much more become a reality – all managed and controlled via wireless connectivity. It's an area with huge potential – and one that is still only in its infancy.

This paper therefore looks at the potential offered by the telematics revolution, and how wireless technologies are going to facilitate the next generation of transport for us all.



# 2

## THE TELEMATICS REVOLUTION

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1997, worldwide annual market for automotive semiconductors reached \$7 billion, with the total value of automotive electronics systems standing at \$60 billion. (Motorola, The Hansen Report).

Global in-vehicle computing systems are projected to be worth up to \$5 billion by 2004 (Frost and Sullivan report, automotive and transportation interiors).

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There are really four aspects to the telematics revolution:

- Enhancing the driver (and passenger) experience – **the comfort zone**
- Ensuring driver and vehicle safety – **the safety zone**
- Enhancing vehicle maintenance – **the maintenance zone**
- Optimising resources – **the efficiency zone**



The comfort zone is all about building in services that will make the process of getting from a to b more pleasurable; about enabling drivers to make informed choices as to the journeys that they make; about building added value communications into the vehicle, whether route finders, information services, entertainment or simply communications tools. The key debate in this comfort zone of the telematics revolution is how to get intelligence into transport without compromising on safety. Numerous studies show that mobile phone usage while driving is a significant cause of vehicle accidents – whether or not ‘hands-free’ kit is in use. So how can vehicles be fitted with wireless communications tools that will enhance the driving experience without compromising driver alertness? Is it wise to make a driver’s life too easy – surely it’s better to make sure that a driver has to stay alert, to concentrate, to think while on the road?

Most companies operating in the automotive sector are therefore now looking at developing non-intrusive wireless driver aid systems. Route planners that tell you where to go and when, without needing you to look away from the road, voice-operated systems that don’t distract a driver’s attention, entertainment systems for back-seat passengers.

In the safety zone, the focus is on enhancing the safety of drivers, vehicles and goods. Here, driver distraction is not an issue – the focus is on automating wireless vehicle systems to facilitate eg stolen-vehicle tracking, or instant lock-up at the moment of unauthorised access; of linking emergency signals to air bag activation, facilitating fast emergency vehicle call out; of providing wireless monitoring systems to ensure drivers are driving safely and prompt action if not.

In the maintenance zone, the focus is on pre-empting potential vehicle problems – so again, providing remote monitoring of vehicle functions to prompt action if required, or even to allow remote fixing. By linking wireless connectivity into engine diagnostics systems it is possible to, for example, detect abnormal fuel consumption and pinpoint where the possible cause may be within the engine. A driver is then prompted to have the vehicle checked out at the earliest opportunity – or the problem can be fixed remotely using in-vehicle electronics systems. Whatever, early action avoids potentially more serious problems, and also saves money by ensuring that only what needs to be fixed is fixed.

With both the safety and maintenance zone, the key for developers of telematics systems is automation. By linking systems directly into in-vehicle electronics, wireless monitoring can be carried out on an alerts-based system – without needing any action on the part of the driver. Obvious benefits for an individual, who knows that ‘someone’ is therefore keeping an eye on his/her vehicle’s operation – but even more so for the fleet operator, who wants to maximise efficiency of operations all round.

In the efficiency zone the point is to make your available resources work better for you. So, for example, when looking at logistics or fleet management, it’s about making sure that you are using the right number of vehicles as effectively as possible – and therefore not wasting time or money on pointless activity. In the efficiency zone, the key for telematics systems developers is to ensure that all resources within a fleet of vehicles are tracked and integrated into a holistic picture – so integrating vehicle location with job requirements, fuel consumption and mileage information, driver hours with vehicle condition means that operators can ensure that their customer service is first class, as well as ensuring that employees and vehicles are being utilised as effectively as possible.

The fact is that no-one yet knows which telematics systems are going to prove to be the killer apps in the vehicle of the future – but there is huge potential for investment and development. Let’s look in more detail at how wireless telematics could impact on vehicle usage.



# 3

## CONNECTING TO THE FUTURE

### WHY WE BUY



After real estate, a vehicle is probably one of the most expensive investments any of us make in our lives. It therefore makes sense that we ensure that this investment works for us as effectively as possible – and that we look after it. In all other areas of life we hope that our investments will provide a good return, with cast-iron guarantees of what will happen and when, and instant feedback on status, wherever possible. So why should we not expect the same reassurance with our vehicle purchase too?



The key factors in private vehicle purchase used to be the obvious, external characteristics – looks, power etc. However, increasingly now the motivation behind vehicle purchase is functionality that makes driving safer, easier and more enjoyable. Therefore, security, entertainment features and ease of maintenance are all climbing up the ladder of ‘must haves’ for potential vehicle owners.



Likewise, the requirements of goods vehicles are also changing. Legislation is demanding that fleet operators are able to monitor the speed, whereabouts, distances travelled and fuel consumed by their vehicles; the time their drivers spend at the wheel. Vehicles are travelling longer distances, with logistics one of the growth industries of the moment. So the routes drivers are taking, the timing of rest stops, all these too are areas with potential for monitoring, to ensure the fastest time to market and the most efficient fleet management. But it's not all about ‘big brother’ style control – monitoring systems also ensure that controllers always know the whereabouts of goods, vehicles and drivers, and can take prompt action in case of difficulty.

For both the private and goods vehicle therefore, intelligent wireless systems are an essential element of ‘next generation’ transport. And these systems can take many forms.

This paper therefore looks at the potential offered by the telematics revolution, and how wireless technologies are going to facilitate the next generation of transport for us all.

# 3



## COMFORT

The world of infotainment impacts on both the driver and the passenger. For the driver, the process of getting from a to b is all about location, location, location. But just knowing where you are is not enough – you also need to know how to make the most of that location. So whether it's a question of being able to receive traffic alerts giving advice on alternative routes, or using itinerary services, wireless connectivity provides the link to the answer. Access to maps and local information services (such as hotel, restaurant location) are also of obvious benefit – and already becoming a standard facility for mobile phone users, and therefore moving into the vehicle sphere very soon.

There's a serious side to the information signal too – police, for example, could poll all vehicles in a certain area to warn about potential upcoming traffic hazards, ensuring that vehicles slow down well in advance of any trouble spots.

For the back seat passenger, as technology improves, wireless connectivity gives the potential for online gaming or movie downloads to become part of the in-vehicle experience. Never again will 'how many miles' ring out from the children in advance of another game of I-Spy, as email, audio and video communications become part of the standard in-car entertainment package.



## SECURITY

When we talk security, we're looking at both people and the vehicle itself. For people, this means an SOS button which can be activated in case of danger (such as assault or accident) that links the vehicle via wireless communications directly to an emergency centre, alerting controllers to the crisis, or an emergency signal that automatically connects when an airbag inflates. GPS location systems enable the vehicle to be pinpointed instantly. A wireless communications channel can be opened automatically to enable communication between driver and controller, and emergency services dispatched automatically to the scene. All crash statistics show that the first few minutes after an accident are crucial for passenger survival – early assistance makes a difference, and by establishing a direct connection between the car and the emergency centre with the help of wireless communications, it is made as fast as possible.

For vehicles, security means the ability to trace a stolen truck or car. A recent UK gov't survey shows that a car is stolen every 23 seconds, with over 400,000 vehicles going missing last year in the UK alone. If a car is stolen, wireless connectivity linked into GPS systems means it can be tracked as it moves, enabling the police to locate it quickly, and hopefully before any damage is done. But wireless connectivity is not just about providing the vital tracking link – it's also about stopping access in the first place. Via a wireless connection, a vehicle can be immobilised or locked remotely after unauthorised access, ensuring that even if thieves do get in, they might not get much further!

# 3

## MAINTENANCE/DIAGNOSTICS



Why should you have to go to the garage to be able to assess what's wrong with your vehicle? How do manufacturers know that you need to get everything fixed after 12,000 miles? The answer is, you don't – and they don't either. The latest vehicles coming into the market are integrating diagnostics into the engine itself, to ensure that the vehicle benefits from 'personalised' attention to its performance and maintenance needs. We're used to the dashboard lighting systems telling us that our car is operating as it should – the latest advances in onboard computing take the dashboard principle one step further, extending it to other features of the vehicle to keep a track of key systems and work out when things are going wrong.

Most in-vehicle systems are now microprocessor controlled - triggered by emission, fuel and safety regulations imposed by government legislation in the 1970s. It's all about optimising emissions, fuel consumption and performance. Vehicle differentiation is already made through electronics - transmission and chassis systems (eg antilock brakes), airbags, air conditioning and even cruise control, audio, heating and ventilation systems. These are now viewed as standard features on most new cars. It's therefore only a simple step to link these systems up to the external world and ensure that an expert will take care of them for you – and with wireless connectivity, that is now a reality.

Of course, integrating maintenance and diagnostics advice into the vehicle itself is not only beneficial to the driver, but to the manufacturer too. In these days of Customer Relationship Management, companies are increasingly realising that it is in the added value customer services that they provide that brand loyalty is created. Through a wireless connection into the vehicle, the manufacturer is also building a direct communications link to each and every customer. It's not just about reminding when a service is due, but also, for example, providing information on special promotions. It's about making the customer feel that the manufacturer (or dealer!) is looking out for them, rather than them becoming a non-entity the second they leave the garage forecourt.



## EFFICIENCY/LOGISTICS

A bit of a catch-all here, but we're really talking about a wealth of functionality that makes driving and fleet management easier and more efficient! From navigation systems to roadside assistance, fleet management systems to driver alerts, wireless connectivity is working to ensure that telematics makes vehicle management as simple as possible.

For example, integrated wireless communications systems can summon instant roadside assistance should a vehicle break down, by linking through to a control centre to ask for help and assistance. Or a locked door can be opened via remote access into the car's onboard computer system, ensuring that stupidity doesn't necessarily mean long-term inconvenience!





# 3

And with congestion charges and traffic management schemes hitting the headlines across the world, wireless connectivity also provides a means of installing toll collection devices, or ensuring that a vehicle has permission to enter certain spaces. And if you can locate a car and its owner, why not remind them when in the vehicle about registration requirements, insurance or license renewal? If it can be handled via an onboard computer and wireless connectivity before a car is allowed to drive, immobilising the vehicle until the correct fees are paid, then unlicensed and uninsured vehicles could become a thing of the past.

With fleet management, operators are keen to ensure not only that goods, drivers and vehicles are safe and secure, but also that the fleet as a whole is operating as effectively as possible. So, two-way wireless communication between controller and vehicle enables efficient operational planning, using the most appropriate vehicle for each specific job, as well as giving the opportunity for 'on the road' updates – the last minute diversion to a valued customer for an urgent job from a vehicle in the vicinity.

In terms of fleet operations, the key drivers are 'just in time' delivery – ensuring that goods arrive when expected, at the right location. So keeping track of vehicle status is a major concern. Delays, whether due to traffic problems or mechanical issues, can be a huge issue in terms of customer service – but at least, if the problem can be highlighted early, alternative measures can be made. GSM connectivity allows drivers to keep controllers informed of the latest situation on the road, and vice versa, as well as enabling early flagging of mechanical issues enabling maintenance to be made at the earliest possible point – before a drama becomes a crisis.

Security of vehicles and goods is another major issue – whether hijack, break-ins or stowaways, by integrating GSM connectivity and GPS location systems, any threat to a vehicle can be monitored remotely and the appropriate emergency action taken as quickly as possible. Whether sending out security forces, immobilising a vehicle or alerting a driver to a disturbance, GSM connectivity is the key to keeping a remote eye on valuable cargoes.

GSM connectivity also enables fleet controllers to check on driver actions. Any erratic or unexpected behaviour can be picked up quickly and easily, and a dialogue opened with the driver in question, whether unscheduled stops, abnormal itineraries, or over long time at the wheel. This can either be flagged up via GPS tracking connectivity, or via monitoring of vehicle systems. Either way, fleet managers are able to ensure that their fleet is operating to peak performance, and that they are looking after their drivers, vehicles and customer cargoes as effectively as possible.

Finally, in the next generation of vehicles, it's also possible that in-car navigation will be taken to the next step, with automatic driving and advanced vehicle control as standard.

The essence of all these systems is to nip trouble in the bud. By taking pre-emptive action the driving experience is made safer for all of us. But how is technology actually going to make this happen?

# 3

## WAVECOM TECHNOLOGY

Given its very public profile and a very competitive marketplace, the automotive industry naturally has very high quality requirements for all aspects of vehicle design and manufacture. A 'best of breed' approach, using specialists in different areas to integrate their technologies to provide a complete solution, is widely viewed as the best means of guaranteeing performance without cutting back on quality. This is where, on the wireless side, Wavecom finds its place. As an expert in digital wireless standard module development, the company is already working with many manufacturers to provide the vital wireless link between the vehicle and the outside world. And the company practices what it preaches, outsourcing its own manufacturing to top-tier electronics manufacturers itself, such as Solectron, to ensure its customers can always be guaranteed of manufacturing excellence in its own products.

### WISMO



Wavecom was the first company to commercialise wireless technology in the form of a standard module, the WISMO - the key to the next generation of in-vehicle services. WISMO provides complete integration of the wireless function in-vehicle, and is positioned to address the entire dashboard market.

WISMO modules constitute fully integrated GSM/GPRS and CDMA implementations, packing all the required software and hardware into a range of compact, lightweight, low energy consumption products. WISMO modules help break down the barriers to wireless connectivity for any device by providing ready-to-use solutions for voice and data applications, making wireless technology available to everyone.

Today, two main Wavecom products, based on WISMO technology, are already being used by the automotive industry to develop wireless applications:

WISMO Quik is a range of integrated, ready-to-use products. Adaptable and easy to use, WISMO Quik is ideal both for handset manufacturers that want fast time-to-market, as well as for the vertical markets for wireless communication such as machine-to-machine, mobile computing and automotive applications.

The WISMO Quik range is unique in the market in that it includes modules based on the two most broadly accepted wireless technologies: GSM/GPRS and CDMA.



# 3

## WIRELESS MODEMS



The Integra and Fastrack modems offer instant wireless capabilities within a rugged package. The modems are housed in a hardy metallic casing, built to withstand the toughest environment, and are therefore ideal for automotive and other applications where long performance in difficult conditions such as varied temperatures, humidity etc are required.



The modems also come with full type approval, having been certified for compliance by all appropriate regulatory authorities. Offering both GSM/GPRS and WAP capabilities, the modems combine voice, data, SMS and fax functionality for a single integrated wireless solution.

## MUSE PLATFORM



Wavecom's MUSE Platform (Modular User Software Environment) lets developers use the untapped power and memory of WISMOs to embed and run wireless applications based on standard AT commands directly on WISMO modules and modems. This enhances development autonomy and flexibility, and uses WISMO as an intelligent, customised, wireless sub-system. Because developers can embed their applications directly onto the module or modem, there is no need for extra circuit boards or components. Development costs and time are reduced, and new products get to market faster.

Of particular interest in the automotive industry, the ACP protocol can be run directly on the MUSE Platform software. This popular, open standard can be adapted to many telematics platforms, making telematics developments faster and easier. For developers, the key here is to focus on applications, rather than lower layer technologies. MUSE Platform makes this a possibility.



# 4

## CONCLUSION

Telematics looks set to be the next wave of in-vehicle investment, with the potential return on investment tremendous. However, there is one major factor to consider - the fact that the success of telematics systems extends beyond the vehicle itself to the surrounding transport infrastructure. Telematics is by its very nature a two-way science, with the link between vehicle and its surrounding environment the key to service success. The wireless GSM/GPRS link is therefore crucial - but equally so is the supporting infrastructure, and a major investment is required here to make the potential benefits of telematics become a reality.

Itineraries are only going to be as good as the maps that define them, emergency services will only be effective if the services themselves are available. Therefore perhaps the biggest potential offered by the telematics revolution is that of radically altering the way the automotive industry works. It's clear that an integrated approach is needed. But this also means looking not just at automotive culture, but transportation as a whole.

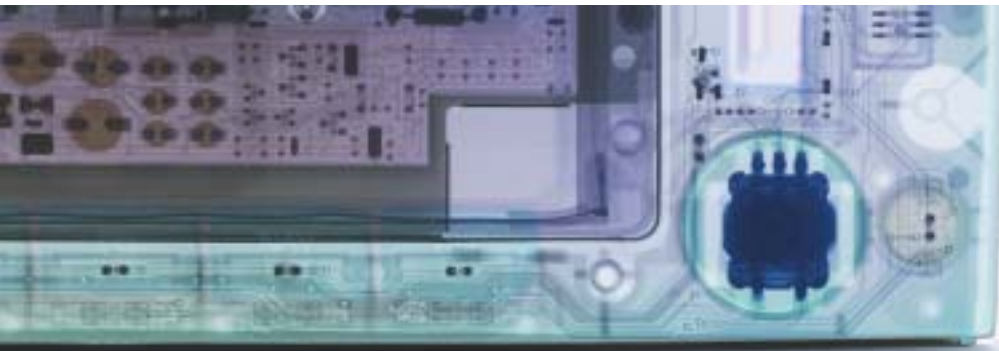
With growing debates over whether or not the vehicle is the best means of transferring people and goods from a to b in the light of increased congestion and ageing infrastructure, we also need to look at integration with other forms of transport. And only by governments, transportation providers, fleet companies, motorists etc all working together, will that approach be a success.

The issue of standards also needs to be considered. At present, with so many potential players involved in the market, we risk an in-vehicle 'betamax v vhs' debate, where some systems quickly become obsolete, and not necessarily for lack of technological advantage! Again, here the idea of a clear vision of the future is important - look at the massive digital TV investment, which is now running the risk of falling completely on its face across Europe.

We also need to think about a driver's actual abilities. It's all very well to build intelligent connectivity into vehicles, but this must not distract from the process of driving itself. Voice recognition and 'head up' display technologies are currently still in their infancy, but do give the potential to resolve some of the 'driver overload' issues. But much work still needs to be done.

And finally there is still the 'big brother' aspect - combining the freedom of the driver to 'go their own way' and 'do their own thing' with the intentions of government, emergency services, manufacturers or controllers to direct a particular course of action, direction or status.

The telematics revolution certainly will have a huge impact on transport infrastructure in the future, although as yet, the precise direction this future will take is uncertain. However, what IS sure is that wireless connectivity, between vehicle and controller, driver and vehicle, vehicle and infrastructure, and vehicle to vehicle, is going to be the key connecting factor. Whether moving into the comfort, safety, maintenance or efficiency zone, Wavecom, as a leader in this market already, is perfectly positioned to make the future of telematics become a reality.



# 5

## CUSTOMER REFERENCES

### AUTOLIV

Autoliv is integrating Wavecom's WISMO technology into its Volvo On Call telematic system that provides both automated and user-activated alerts to the Volvo On Call Alarm Centre, as well as remote diagnosis and resolution of issues. The idea is to enhance driver and passenger safety in the event of, for example, a car breakdown, theft, or a driver assault, as well as offering a link into information services such as traffic news and even providing remote door unlocking. Volvo On Call is activated by either deployment of in-vehicle air bags or other in-car sensors, or from an emergency SOS and road assistance button provided to the driver. In either case, Volvo On Call sends a text message to a Volvo On Call Alarm Centre that opens a voice line for communication with the alarm centre operator as well as enabling remote function activation.

### GRUNDIG

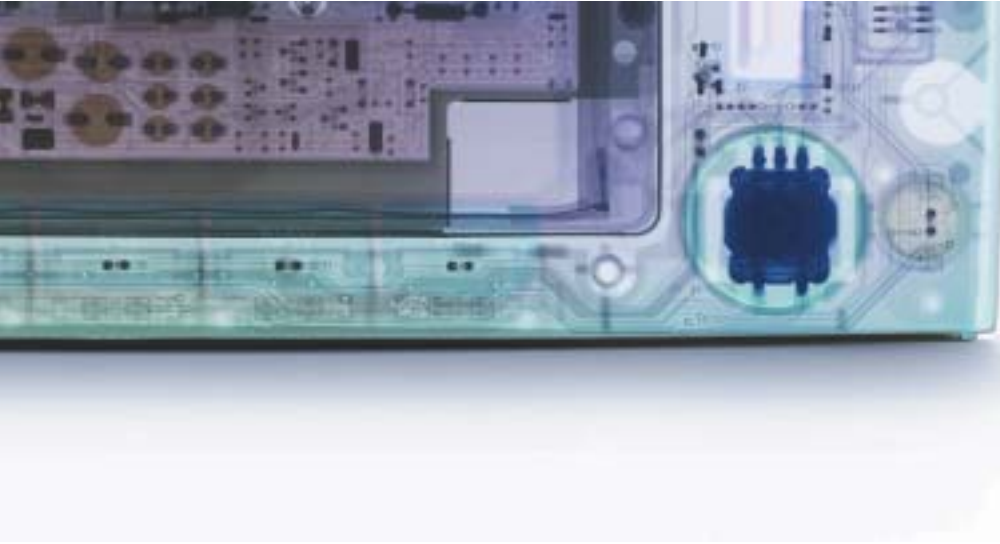
Grundig's Car InterMedia System business unit uses wireless technology from Wavecom in on-board terminals for use in trucks under Germany's "Toll Collect" system. In order to provide the data needed for automatic toll charge calculation, Grundig's on-board terminals combine Global Positioning System (GPS) and GSM technology. GPS is used to pinpoint precisely the truck's position and calculate its mileage. Thanks to the wireless connectivity provided by Wavecom, the information is transmitted over the GSM network to a Toll Collect central, which invoices the vehicle owners every month based on the data received. Grundig's sophisticated on-board terminals also enable vehicle owners themselves to use the location and mileage information collected, notably for fleet management initiatives such as navigation assistance and load tracking.

### ICS

ICS uses Wavecom's WISMO technology to provide trip data such as mileage, hours driven, driving behaviour and location via GPS and GSM. Dispatchers use this information to plan shipments, reroute drivers and generally make more efficient use of their fleets. Wavecom's WISMO technology provides instantaneous two-way data communication between drivers and the dispatch centre, cutting communications costs and time, and increasing overall fleet control. Customers benefit too – they can be kept up to date with delivery progress!

### MAGNETI MARELLI

Magneti Marelli has integrated Wavecom's WISMO technology into CONNECT, its advanced on-board voice and data transmission system. Already implemented in Fiat's Stilo and Doblo models and the Alfa Romeo 147, CONNECT provides access to communications, navigation, security and maintenance services, including a dual-band, hands-free GSM phone, a GPS module and an SOS button. Call centre connectivity provides access to a wide range of services and information, from technical assistance to travel information and emergency support.



# 5

## MINORPLANET

UK-based Minorplanet uses Wavecom's WISMO technology to offer management services to companies that lease or own fleets of vehicles. Wavecom's WISMO technology lets trucking companies check fuel consumption, receive information on technical problems and locate and identify vehicles. The Minorplanet system can also report any unscheduled or banned activities, including extended or unscheduled stops, route deviations, visits to prohibited locations and excessive idling.

## SIEMENS VDO AUTOMOTIVE

Wavecom's WISMO technology is integrated into Siemens VDO Automotive's range of integrated car information systems for Opel, enabling motorists to receive a host of road and travel information via a computer screen on their dashboard. At the touch of a button, remote servers provide drivers with information on traffic conditions, emergency assistance, routing, hotel and restaurant possibilities and more. Wavecom's WISMO technology provides the GSM connectivity between the vehicle and the information centre.

## TRIMBLE

Trimble has integrated Wavecom's WISMO technology into its CrossCheck GSM mobile communicator. CrossCheck provides the foundation for enterprise and consumer applications such as workforce and fleet management, telematics, roadside assistance, stolen vehicle recovery and navigation. The combination of GPS and wireless communications allows automated monitoring and reporting of vehicle activity and status, as well as voice communications. Wavecom's WISMO technology provides the connection between the vehicle and Trimble's suite of sophisticated web-based applications and services.

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