In the clouds?
How interaction between science and fiction can stimulate new concepts for terrestrial mobility

Stairway to Heaven
How intelligent multi-level Mobility Services boost maintenance efficiency
“What starts out as science fiction today, may wind up being finished tomorrow as a report.”

Norman Mailer
Dear Reader,

Creative inspiration, enlightening insights, planning reliability, sheer curiosity or pure entertainment: There are many reasons to look beyond where we are at present. The English literature Nobel Prize winner John Galsworthy understood the problem: "If you do not think about your future, you cannot have one." Fortunately, it is not only poets and thinkers that have addressed the issue, otherwise one of the sharpest comments would probably never have been said: "Do not go where the puck is," said Canadian hockey legend Wayne Gretzky to a teammate, "go where the puck is going to be."

Of course, anticipating opportunities is part of the job description of traffic experts like us. That is why the future of mobility has always been a big topic in the ITS magazine. So far, however, the stories have usually been based on existing trends and emerging developments or on technologies that have already been more or less thoroughly exploited. But the focus of this issue is actually going one step further. We have looked at the drawing boards of visionaries such as the American serial entrepreneur Elon Musk, who wants to send people at supersonic speed through the partial vacuum of special tubes. We asked the students of the Albert Einstein High School in Munich about their ideas regarding tomorrow’s mobility. And we talked to Thomas Le Blanc, who operates a unique „Fantastic Library“ with more than 250,000 publications devoted to futuristic themes.

Even if some of what is described may appear rather far-fetched when seen from today’s perspective, some of the mobility concepts portrayed are well worth a second look. What Le Blanc has to say about the interactions between science and fiction, is not only an exciting read, but also explains why the automotive industry is increasingly interested in the social and traffic-related scenarios that appear in futuristic literature.

How quickly utopias can become reality in our highly technological age has rarely been better described than by controversial best-selling author Norman Mailer: „What starts out as science fiction today, may wind up being finished tomorrow as a report."

I hope you have fun reading it.

Sincerely,

Markus Schlitt
Focus

06 „Varying degrees of improbability“
Thomas Le Blanc, director of the Fantastic Library in Wetzlar, Germany, on the interactions between science and fiction, the favored concepts for terrestrial mobility in science fiction literature, and the automotive industry’s growing interest in futuristic scenarios

13 From top to bottom
When traveling horizontally it is hard to find a way around congestion. That probably explains why so many visionaries seek a remedy in the vertical dimension and propose to send people and cargo either over the top or down via the subterranean route. Some are fairly realistic concepts, others are less so

16 Mobility X Dot Zero
What do young people imagine tomorrow’s mobility to look like? Students of the Albert Einstein High School in Munich have been asked to brainstorm on the topic – totally without the automatic censor that so often keeps experts from exploring seemingly far-fetched ideas

Trends & Events

20 Stairway to Heaven
Intelligent multi-level Mobility Service concepts initiate a true paradigm shift in servicing road traffic control equipment. On the bottom line: improved overall efficiency

22 We need to talk
On the route from Rotterdam to Vienna, vehicles will soon be able to communicate with each other and with the infrastructure. As proven on a demonstration tour in November, the technology is fit for practical application

23 Event News
Short trade fair reports: Gulf Traffic in Dubai and InnoTrans in Berlin

Partners & Projects

24 In the realm of opportunity
For an elective module of the successful Master’s program “Transportation Systems”, Munich Technical University relies on the know-how of Siemens experts
Window to the future
Is science fiction literature more than entertainment? The automotive industry, in any case, shows genuine interest in the social and traffic-related scenarios that appear in futuristic literature.

Know-how & Research

26 Data à la carte
Today, traffic engineers can rely on a whole range of new ‘master detectives’ to supplement the good old induction loop. The available range of technologies allow data recording tailored to the situation.

Mobility & Living Space

28 Sky-born efficiency
In only three months, the Slovakian toll system has been extended by another 15,000 kilometers of road – during ongoing operation and without investment in roadside infrastructure. This record speed was made possible by a gift from above, or more precisely, by the powerful combination of satellite navigation and mobile communication.

Profile

30 “A big step towards Vision Zero”
Roland Wunder, Product Manager Cooperative Systems for Siemens Mobility, talks about the socio-economic benefits of Car2X communication, the organizational challenges for the ITS Corridor Rotterdam-Vienna, and the roadmap for the introduction of autonomous vehicles.

Rubrics

29 In the side-view mirror
Reflections and lateral thoughts about the future of mobility: “Visions for the Cloud”

32 Imprint
Interview Thomas Le Blanc, founder and director of the Phantastische Bibliothek (Fantastic Library) in Wetzlar, Germany, on the interactions between science and fiction, the favored concepts for terrestrial mobility in science fiction literature, and the automotive industry’s growing interest in futuristic scenarios.
degrees obability“
The myCopter, a design study on the possible look of a Personal Aerial Vehicle*:

"If we could move above our roads in the third dimension, automobility would continue to exist. And so would the automobile industry, which by then may produce both land-bound vehicles and flying cars. A great market to serve, no doubt!"

(Above and on the right) VW research study, charging system of an electric car, futuristic display:

"The automakers do not want to know from us which model they should be supplying in 2044, but whether there will really still be a demand for cars"

* The basic technologies for a safe, eco-friendly and socially acceptable form of mobility in the third dimension have been explored by the Max-Planck Institute for Biological Cybernetics and leading European institutes and universities in the scope of the EU’s “myCopter” project (www.mycopter.eu).
Mr. Le Blanc, we are sitting here amidst more than 250,000 titles of ‘fantastic’ literature, in perfect harmony with aliens and androids, in a world of warp drives and matter transmitters. What percentage of all of this is science – and how much is fiction?

Let’s say this: For our “Future Life” research project, where we systematize and evaluate ideas described in science fiction literature, we have selected around 100,000 titles. These works include the more or less serious thought patterns of authors who at the very least are endeavoring to explain their fictional worlds in scientific terms and do not describe them as magic or spirit worlds. And believe me, these 100,000 books are more than enough to keep us going in our analysis.

In the parallel universe of the Star Trek cult, good old Scotty keeps beaming Klingons and Vulcans from one place to another. In real life, only the teleporting of quantum states has succeeded so far. Is this a typical example of the relationship between reality and science fiction?

Of course, in futuristic literature there are different degrees of improbability. Take the robot car. In reality, it is just growing out of the research phase, while in fiction it has long been among the most common means of transport. The descriptions may well convey ideas to industry about how people will use this technology and what their attitude will be. But in other works of fiction, we are dealing with scenarios that are significantly further into the future. These also sometimes bring up some very interesting answers – including those to the question, “What ideas would humankind arrive at if they had limitless possibilities and resources?” But of course we also encounter technological concepts where today we have great difficulty in imagining how they will ever work. Beaming undoubtedly falls into this
category, at last for the time being, even though Vienna-based Professor Anton Zeilinger is attracting media attention with such headlines for his experiments on quantum entangle-
ment. I think this is just a PR stunt, which is not necessarily wrong in itself, because it encourages the pub-
lic to engage in unusual mind games as regards mobility.

Just so that we can at least get an idea of the diversity of the ideas relating to terrestrial mobility, could you outline some of the creative superlatives that await visitors to the Fantastic Library?

Beaming is certainly the most far-reach-
ing vision of the future: It should not be ruled out completely, but will prob-
ably only become workable in 200 or 300 years’ time. The most interesting thing to me are flying cars – especially if we assume that anti-gravity propul-
sion will be invented relatively soon, which in my scientific opinion may well happen. Then the third dimension would be opened up for travel and we could move easily above our roads in the air. This in turn would mean that automobility would continue to exist. And so would the automobile industry, which by then may produce both land-
bound vehicles and flying cars. A great market to serve, no doubt! One of the concepts that we often meet in science fiction, and one that I consider to be highly probable, is the development of car-sharing models – an idea that in reality is still stuck in its infancy. In futuristic literature, people gener-
ally no longer possess their own cars, but rather use autonomous vehicles (one-seaters, or at the most two-
seaters), that are available in every town. They stand at the side of the road and can be started by means of a chip implanted in the user’s body. These little cabs are electrically powered, but do not have to stop to recharge because they are charged inductively while traveling. For indus-
try, this would mean that no one will buy his or her own car, let alone only to brag about it. The focus will no longer be on performance, image and status, but rather on reliability, as such vehicles will be traveling almost nonstop, and no longer mostly be standing around somewhere as is the case today.

That sounds like a preprogrammed farewell to the much-quoted joy of driving ... Who knows? Perhaps during the tran-
sition period there could be special resorts for passionate self-drivers, a sort of Disneyland. Or maybe individ-
ual cities will try to attract visitors by allowing them to continue to drive today’s design of cars in town. Science-
fiction writers typically do not think about such transitions from one mobility concept to another. They let their main characters leave the house in the morning and climb into a vehi-
cle somewhere.

The futuristic car-sharing model that you just described is essentially the fictional end point of a development that is already on the horizon today. During your analysis, how often do you come up with mobility concepts for which there is no equivalent in the present time?

All things considered, this is the more common case by far, in my observation. I think most of the ideas arise from the fact that the authors asks themselves, “What don’t I like about the world in which I live?” They then let their imagination run free – and their scientific knowledge, which is often remarkably comprehensive. For example, an author might think about how the history of mobility would have actually developed if other decisions had been taken at the end of the 19th century. If at that time Mr. Otto’s engine design had not been followed, but rather Mr. Siemens’ elec-
drive concept.

On average, how far ahead do the more serious authors look?
It varies a lot. Some only look a few years into the future – or not even that, because the technologies they
describe exist today, such as the robot car. In my opinion, one particular attraction are older novels about the future that play out at a time that was then still in the future, but now is already in the past. It can be very interesting to analyze which of the author’s visions have come true and which have not – and think about why this was so in one case but not in another. In stark contrast, there are also stories set in the year 3,000, 5,000 or 10,000. Those certainly have hardly anything to do with science, but rather only with fiction. I think that basically the novels that look ahead about 20 or

“Good science fiction has to be plausible, otherwise it is not good science fiction”

The most interesting and the most productive for our evaluations.

In such cases, how plausible are the initial physical and sociological condi-
tions from which the writers develop their utopian ideas?

Good science fiction has to be plausible, otherwise it is not good science fiction. Of course, that is not to say that all the technologies mentioned must already be known or can be explained with current knowledge. But the assumptions should not violate the basic laws of logic, and there must not be any cracks in the chain of argumentation. For instance, if the author introduces a new material with certain properties into the storyline, then everything that builds on it must defi-

When it comes to terrestrial mobility, which futuristic propulsion concepts are generally most fashionable with the authors?

Of course, science fiction is always liter-

ature of the time it was written. That is why in works created in the 1940s, for example, you can find a large number of vehicles using nuclear propulsion,
because at that time there were high hopes for nuclear energy and no one was really aware of the side effects. In futuristic literature, the internal combustion engine made just two relatively brief guest appearances, the first one shortly after the birth of the genre in the early 20th century – and then again in the 1950s and early 1960s. Since the 1970s, when the first serious discussions about the depletion of fossil resources took place, this type of engine has actually completely disappeared from such novels. In more modern works, people typically move around propelled by electric drives, using autonomous cars, monorail systems or underground tubes. The energy for this comes from either a high-capacity battery, which unfortunately is not yet available in reality, or transferred via induction from the road infrastructure. But please keep in mind, we are only talking about the literary majority view here: There are lots of different models, of course, some of which are very radical. In some cases this may go so far as having the characters in the stories traveling on foot only, because humanity has been unable to solve their energy problems.

First and foremost, science-fiction writers are wracking their creative minds to entertain readers. What exactly do companies and institutions expect, when they give you the order to search through futuristic literature for answers to specific questions?

**“In the future will there only be nerds who prefer to travel virtually?”**

Quite simply, science fiction literature is a huge treasure trove of ideas that has not yet been mined. The writers are in large part scientists who in their own day and age, are hitting the limits of technological feasibility in some of their concepts. In fiction, in contrast, these temporary limits can be overcome relatively easily. On the other hand, there are those specialists in the research and development departments of companies who are permanently looking for innovative solutions to meet the future wants and needs of their customers. And here science fiction has something to offer.

**So in the broadest sense this is all about market research – beyond demoscopic opinion polls and trend indicators?**

Evidently it is our clients who would have to actually answer this question. In any case, companies are not usually concerned with very specific feats of speculative engineering, but rather are looking for scenarios that may come about in the future.

**What insights do automakers, for example, hope to find when they make use of your services?**

Essentially, the companies are interested in general trends in society. Anything else would really make no sense, because setting too narrow a focus would exclude too many interesting ideas right at the outset. So the automakers do not want to know from us which model they should be supplying in 2044, but rather are more interested in whether there will really still be a demand for cars. We are asked questions such as, “How will people be living in 30 years’ time? Will they be socially-minded? Will they travel a lot? Will they take advantage of the extended leisure time and increased financial freedom that technology gives them to travel even more in the future? Or there will there soon only be nerds who prefer to travel virtually, because you can no longer distinguish the artificial world from the real one?”

**The auto industry would certainly prefer the first prospect...**

Absolutely. But even if the second option were to become reality, it would of course be an advantage if automotive companies could prepare for it in good time. For instance, if Daimler knew that people still placed value on cars as a status symbol in the virtual world, it might be worth thinking about developing a particularly well-appointed cyber-Mercedes.

**Does science fiction give an answer as to how the race between physical and virtual mobility, a race that has already begun, will work out?**

At least one trend has been observed. The majority of authors assume that in the future we humans, as fundamentally social beings, will make use of the various mobility options that will be available tomorrow to an even greater extent than we already do today. At the same time, there are a growing number of depictions of a world in which we withdraw completely into virtual reality and hardly put a foot outside the door. However, this has certainly partly to do with the fact that there are relatively many nerds among fans of science fiction, who naturally like to read about something that they themselves practice.

**How could the relative importance of individual and collective mobility shift in the coming decades?**

This is a question that almost no one will ask in the future, because the two areas are increasingly merging. Take for example the autonomous single-seat electric car, which we talked about earlier. In the city I will be traveling individually of course, so I can visit several personal destinations without having to change my means of transport. However, on longer routes the individual cabins will link together to form a collective means of transport. Hence it’s almost impossible to decide whether we are dealing with an individual or a collective form of transport. To be honest, I would advise any client to keep the list of questions they want us to answer rather general. Because in another 30 or 40 years, the distinction that you mentioned will probably not play any role anymore. Then it will just be a matter of how well the network of different means of transport functions. And people’s expectations in this regard are certain to increase.
What interests the traffic managers at least as keenly is the question, “Will there still be traffic jams on the roads of the future”?
In theory, it is likely that they will actually no longer exist. If only for the reason that most traffic jams are now caused by us humans, and in the age of autonomous vehicles we will more or less disappear as a disruptive factor. In practice, however, it is most likely that somewhere in the automatically controlled columns there will be some people who just feel like driving themselves. If these self-drivers then disable the autonomous system, the resulting chaos will be inevitable in the future as well.

The more autonomous the transport of the future, the more the question arises: Who will control it? Has science fiction an answer to this? In futuristic literature the controlling agents are more likely to be corporations, rather than governments. This is mainly due to a development that has already begun. The Internet is harder and harder to monitor either locally or nationally. In 30 or 40 years’ time, global players like Google, for example, will have more power over our movement patterns than the governments of the countries in which we live. In my opinion this may not necessarily be a disadvantage, as long as the company is aware of its responsibility.

And if the autonomous system can no longer be switched off?
That will not happen, because otherwise no one would ever use such a vehicle. Our skeptical attitude towards machines is too great for that. Such skepticism is actually deeper than many believe. In principle we are dealing with our primal human fear of becoming completely dependent on technology and, one day, being completely replaced by it. Science fiction provides plenty of evidence for this as well. And this fear can strengthen or weaken certain trends by more or less forcing the reader to take up a position with regard to a particular idea. I believe that futuristic literature not only has a forecasting function, but also a warning function. The most striking example of this is the novel “1984” by George Orwell. If this book had never existed, citizens’ opposition to the so-called police state would be far less that it is today. Or even more pointedly formulated: The vision of “1984” has not come about because the novel “1984” warned so insistently against it.

In principle, how do the authors weigh up the various factors that lead to the development of certain mobility concepts? Is it mainly about saving time, safety issues or the environment?
Here it is hardly possible to deduct any reliable statements from science fiction. For the authors, mobility is usually only a sideshow. It is necessary for the hero to move from A to B. Why a particular form of mobility is available, and not another, is rarely discussed. The ways of traveling chosen differ from one novel to the next because every author needs a specific form of mobility to develop the story.

Are there examples of mobility-specific strategies or concepts that have first been described in futuristic literature and later actually implemented in practice in a more or less similar form?
The most prominent prophet in this regard is certainly Jules Verne. Although he was not the inventor of the submarine, as you so often hear, he is in fact closely intertwined with the history of the modern nuclear submarine. When the American mechanical engineer Simon Lake devised the concept of an autonomous submarine fleet at the end of the 19th century, he had a clear role model in mind: Captain Nemo’s “Nautilus” from the science fiction novel “20,000 Leagues Under the Sea”.

Mr. Le Blanc, thank you for the interview.

„Futuristic literature does not only have a forecasting function, but also a warning function“
Focus | ITS magazine 4/2014

Futuristic modes of transport When traveling horizontally it is hard to find a way around congestion. That probably explains why so many visionaries seek a remedy in the vertical dimension and propose to send people and cargo either over the top or down via the subterranean route. While some of the concepts are fairly realistic, others are less so.

From top to bottom

Design draft for the “Hyperloop” project: Elon Musk, CEO of Tesla Motors, wants to send people in aluminum capsules at supersonic speed through the partial vacuum of special tubes.
“Remember my words”... An introduction of this kind normally prefaces a far-reaching message. This certainly applies to Henry Ford, whose prediction in 1940 was more than daring for the conditions of the day – or should we call it a prophecy? “Some day,” said the man who pioneered the principle of the production line and made it possible to build cars in their millions, “some day there will be a combination of aircraft and automobile. Go ahead and laugh – but it will come.”

If things had gone according to Carl Dietrich’s plan, Ford’s “some day” would already be a long time in the past. His company Terrafugia, headquartered in the US State of Massachusetts, has repeatedly announced that the start of mass production of the first flying car was imminent. In 2016, at any rate, things should finally get under way. According to Dietrich, 100 advance orders have been placed at a purchase price of US$ 279,000 apiece. A prototype of the first model, the Terrafugia Transition, has already managed a successful take-off, garnering much public attention.

The versatile device is powered by a 104 PS Rotax engine, making it capable of a maximum flight speed of 185 km/h and a maximum highway speed of 105 km/h. With its bodywork made of carbon fiber composite the whole flying car weighs just 440 kilograms. Under a special license from the US authorities, it is equipped with lightweight tires and glazing of extremely reduced weight.

However, when the congestion gets too much, you cannot simply take to the air in your Transition. In the first place, the driver has to be in possession of a pilot’s license before he can make the switch. And secondly, the machine needs a runway measuring around 800 meters in length. The firm is already working on a version capable of vertical take-off. But before the tiltrotor TF-X can make a standing start from out of the surrounding jam, it will be about another ten years according to even the manufacturer’s optimistic statement.

Take-off and landing distances for the prototype version 3.0 from Terrafugia’s Slovakian competitor AeroMobil, also claiming to be production-ready by 2016, are only 200 meters and 50 meters respectively. To date, only one man has flown it, namely its designer Stefan Klein. Once employed by Audi, BMW and Volkswagen among others, he has spent the last 20 years fashioning this dream of the future in its carbon reality. The engine, incidentally the same as the one found in the Transition, sits behind the cockpit and drives the front wheels when on the ground and the propeller when airborne.

Even if a massed take-off of flying cars will obviously take some time to come about, the future of individual mobility in the space above our heads has indeed begun. The machines that have made this step into the third dimension possible are known as autogiros or also gyrocopters and are usually two-seaters. While having all the outward appearance of a flying windmill, they actually operate on an ingenious principle: Unlike helicopter rotors, the rotor on an autogiro is not set in its gyroratory motion by an engine, but passively by the headwind. The resistance of the spinning rotor blades then generates the necessary lift. The on-board
The skies may be destined to become ever more crowded

engine powers only the propeller and is hence responsible for driving the vehicle forwards.

In Germany for example, autogiros are licensed as microlight aircraft. A sport pilot’s license is required in order to fly them. The natural conclusion that these are purely recreational machines is only partially true, however. For several years, gyrocopters have been used in Iraq for example, for police purposes. And researchers from the German Air and Space Center (DLR) have been collaborating since 2012 on a test program with the German Federal Agency for Technical Relief on exploring potential applications for autogiros in disaster relief and rescue missions.

Far less realistic, in fact at first sight looking more like an idea by Donald Duck’s inventor chum Gyro Gearloose, is the idea of the so-called Jetpack. However, the Martin Aircraft Company of New Zealand is perfectly serious with their concept for a jet-powered lifting pack. They have lately secured an official license for manned test flights in normal air traffic from the governing aviation authority. The lift generated by the device’s fans is sufficient to propel a person to altitudes of up to 1,500 meters. Its maximum speed is around 100 km/h.

The firm has both good and bad news for interested parties: Taking the controls of this futuristic machine supposedly requires no pilot’s licence, however the flying machine is likely to cost a hefty 150,000 dollars. The true mobility pioneers are apparently not put off by this in any way. Peter Coker, CEO of Martin Aircraft Company, is happy to report: “Over 10,000 people have already inquired about where the Jetpack will be for sale in future.”

Of a quite different dimension, and not only in terms of the figures on the price tag, is the idea with which US multi-entrepreneur Elon Musk tickled the world last year. The co-founder of the Internet payment system PayPal and boss of the electric vehicle manufacturer Tesla Motors, aims to carry people in aluminium capsules through special steel tubes at speeds of up to 1,220 km/h. “Hyperloop” is his name for the project with which he wants to “revolutionize travel”.

Air cushions will stabilize the projectiles, each carrying a maximum of 28 people, on their passage through the tubes that measure up to 3.3 meters in diameter. A partial vacuum within the tubes enables journey speeds up to just beyond the normal speed of sound without breaking the sound barrier. The capsules are accelerated and decelerated by asynchronous linear motors. The power required will be generated by solar panels that are positioned above the stilt-mounted steel tubes.

But the Internet billionaire has to admit that the concept is far from fully refined. He sees it rather as an open-source design on which others can collaborate and introduce their own technical ideas. The native of South Africa is hoping for the broadest possible external support for designing the capsule control mechanism, planning the details of the embarkation and disembarkation stations, and for tests on the overall Hyperloop engineering.

A pneumatic system of a different kind is occupying an interdisciplinary team at the Ruhr University in Bochum. It is the idea of Professor Dr. Dietrich Stein of the university’s Civil Engineering Department. His plan for the future is to dispatch yoghurt, tumble dryers, engineered components and much more that is traditionally being carried by truck, all over the Ruhr region through an underground system. CargoCap, as the concept has been named, is a type of mini-subway for freight traffic and intended to link together the most important centers in the agglomeration.

According to the project team’s estimate, about two-thirds of the goods packages that are ferried around Germany will fit in the CargoCap freight container without needing to be broken down any further. Thus there is a gigantic market for the innovative system. On the other hand, building the necessary tunnels beneath an entire region would demand no small investment. Just for the 80-kilometer stretch from the port of Duisburg to Dortmund airport, the planned construction costs stand at around half a billion euros. “Compared to other investments in improving transport capacity, this is really not a lot of money,” says Professor Stein. “The costs for one kilometer of tunnel line for CargoCap, including pipe jacking, amount to €3.2 million, while one kilometer of two-lane motorway costs €10 to €30 million, depending on the number and kind of special structures required, and the price for one kilometer of urban road tunnel often exceeds €100 million.”

Small items weighing less than 2.5 kilograms might in future take a far less earthbound route to their destinations. At the end of last year, a punchy announcement by Jeff Bezos, boss of Internet business Amazon, concerning the likely use of drones for delivering packages, was widely believed to be mere promotional waffle. In the meantime however, Web giant Google has also started to test this innovative type of air freight. Perhaps we have to get used to the idea that the skies are destined to become ever more crowded.
When experts are thinking about tomorrow’s mobility options, the focus is all too often on the things that will not work. This is why the editors of the ITS magazine decided to ask high-school students, whose youthful enthusiasm prevents them from subjecting their ideas to an automatic censor in their own minds. Under the direction of their arts teacher Sophia Leiss, students of the Albert Einstein High School in Munich have come up with a whole range of fascinating designs.

“Mobility is one of the key issues for the future, no doubt. Its high level of significance has been clearly demonstrated once again by the latest railroad strike in Germany: Many people could not get to their place of work or an appointment. This goes to show how important it is to develop alternatives for individual travel – and I have to say, there are quite a few interesting approaches among my students’ ideas.”

Sophia Leiss, Albert Einstein High School, Munich
“For me the main point was to come up with a concept that would help save energy. The Puzzle Car does just that: Any number of cars headed for the same destination can link together and form a kind of train. Then not all engines of all cars will have to run, but only a few. The whole process can be controlled via an app.”
Charlotte Popp, 9th grade

“I was simply looking for a way to travel quickly and comfortably from one place to another. In the movie ‘Wall-E’, people are driving about in this kind of easy chair. I think that’s really cool. The roads are tubes crisscrossing the city at a few meters’ height above the ground. The Speed Chairs are powered by some water-based propulsion system. No combustion engine, in any case.”
Felix Hadasch, 6th grade
“With these jet-powered office chairs, you can travel anywhere after work without even getting up from your seat. The key advantages are convenience and comfort – and of course eco-friendliness because the jet uses hydrogen as fuel. To my mind, the Traveling Office Chair would be a good alternative for all trips that we are currently doing by bike or on foot.”
Nuschin Rabiei, 10th grade

“The Bubbles are not made from some kind of solid material, they are magnetic fields that can be turned on and off using a dedicated app. This is also why they repel each other, so there will be no collisions. As you need not worry about traffic safety anymore, you will arrive at your destination totally relaxed.”
Carys-May Teixeira, 10th grade
“My design is called ‘Edfatsap’: Electronic Device for Apps, Teleport, Shopping and Phone. It is based on a computer chip that floats next to the owner’s head and is controlled by thought power. You can use it for just about anything: do your shopping, query information, or have yourself teleported to any ‘telespot’ on Earth.”

Tim Waßmund, 11th grade

“Even when I was little I always wished I could fly. So when the teacher gave us this assignment, the Flying Shoes came to my mind immediately. Maybe they wouldn’t be that good for traveling long distances because keeping your balance can get really tiring. But I think they would be perfect for the way to school and back.”

Linda Krisp, 6th grade
Mobility Services (part 1 of the series) - If a piece of equipment fails, the service crew will come out. That's how maintenance of traffic control equipment used to be done – and still is, but not that often anymore. Because today's innovative systems have the “visionary” power to predict and prevent failures before they even occur, based on an intelligent multi-level structure. The key objective and benefit of this technological advance is maximum system availability.

Always one step ahead: The future of maintenance has already begun

- **Prescriptive Maintenance**: Provision of specific recommendations, support of the solution-finding process.
- **Predictive Maintenance**: Prediction of impending failures, based on the analysis of data patterns and trends.
- **Condition-Based Maintenance**: Definition of suitable measures depending on the predicted condition of the system, prediction of impending failures, based on the analysis of data patterns and trends.
- **Preventive Maintenance**: Definition of suitable measures depending on the current condition of the system, based on diagnostic data and remote monitoring.
- **Reactive Maintenance**: Maintenance and possibly repair work done before a potential failure occurs, based on pre-defined service intervals and inspection.
- **Reactive Maintenance**: Repair work done in reaction to an incident.
There will be no early retirement for the good old screwdriver, of course. But in the future, it will have much less to do because its new colleague, the keyboard, is taking over more and more of the work. An increasing number of failures that until recently required a service technician’s visit on site, can now be solved per remote maintenance. Or, what’s even better, in many cases failures will not occur anymore because the system detects the root-cause defect early on and immediately initiates remedial measures before the defect has had time to develop into a problem.

Already today, traffic control centers of some 250 cities all over the world are linked up to Siemens’ so-called “common Remote Service Platform” (cRSP): The platform has been certified by external audits and meets the highest security standards so that it can be used for monitoring nuclear plants or large medical equipment, for instance. The cRSP provides automatic monitoring and preventive maintenance for the connected customer facilities. If needed, it allows the service experts to carry out remote repair services. Many cities using this service report that the increased availability of their traffic lights has helped ease their traffic problems.

The complex high-end system of the cRSP has its origins in medical technology, a highly sensitive area of application. But thanks to the constant transfer of know-how between different units of the company, Siemens mobility experts and their customers are among those who can profit from the numerous benefits of the innovative technology. “This is one of the key advantages of a big, diversified company,” says Fred Kalt, who is responsible for the service of Siemens Intelligent Traffic Systems around the world. “Our unit alone would not have been able to shoulder such an extensive project – or, at any rate, to offer this new service at such attractive prices.”

Only the collaboration between different Siemens units made it possible for Fred Kalt and his team to expand their service portfolio and initiate a true paradigm shift in servicing road traffic control equipment. Now the repair service covers not only those components that are already manifestly defective, but also any parts that may soon cause problems. The innovative five-level service offer is the step-by-step solution for achieving a clearly defined goal: maximum availability of the connected traffic control equipment.

It goes without saying that the service offer still rests on the so-called reactive service, i.e. site visits of service experts upon being informed of an equipment failure. “Siemens still has as many as 1,100 field service engineers out there, who will travel, rain or shine, to the site and repair the failed equipment, in some cases with guaranteed response times of 30 minutes,” says Senior Service Manager Konrad Weichmann. “For decades now, field service has been one of our key strengths and will remain a major factor for years to come, no doubt.”

The second level is also about analog services, but this time of the preventive kind:Suitably defined regular maintenance intervals and detailed inspection of all vulnerable components make it possible to detect weak spots in the system before they negatively impact the system’s performance. The timely exchange of any affected components prevents system malfunctions and helps ensure maximum traffic safety and/or the optimum flow of traffic.

Digital technology comes into play on the third level, condition-based maintenance. Via the common Remote Service Platform, Siemens experts at the Customer Support Centers in Munich are able to log directly into the customer’s system and use special agents (i.e. service tools) to search for any faults and impending defects. For example, frequent read and write errors on the hard drives are detected long before the customer notices them – and before they can actually cause noticeable trouble.

The next higher level on the service flight of steps is predictive maintenance: For this purpose, the system does not only monitor the current condition of the connected facilities, but also use special models and algorithms for projecting the equipment’s future state. This makes it possible to identify impending malfunctions at an early stage and promptly schedule suitable measures to ensure continuous plant operation. Moreover, planned service activities, which are generally more cost-effective, reliably prevent far more expensive consequential damage.

The top level of service is reached with prescriptive maintenance, a strategy that is rather new in road traffic engineering, but has been touted in the IT sector as a key trend for the future for some time now. Using all the tools of predictive maintenance, prescriptive maintenance goes beyond diagnosis, however, and derives specific recommendation for action from the findings. To explain how this service works, Fred Kalt draws a comparison to automotive technology: “This is as if the dashboard computer of a modern vehicle did not only indicate that the engine temperature was slowly approaching the critical range, but also that this was because of falling oil pressure, adding the advice to exchange the seal of the oilpan as soon as possible.” At this stage, a service expert evaluates the recommendation(s) for action and decides which measure should be taken.

The wide range of available innovative service concepts gives the customers the freedom of choice. Those who feel that this is a tough choice to make, can opt for an alternative approach to service contracting, the so-called ‘availability contract’. “Under this type of contract,” explains Fred Kalt, “the customer only defines the desired level of availability of the traffic control equipment – the rest is our responsibility.”
We need to talk

Car2X Corridor ■ The method of choice for making road traffic safer, more efficient and more eco-friendly will be the introduction of innovative communication systems, as the experts agree. To turn this promise into reality, the route from Rotterdam to Vienna will soon be equipped to enable vehicles to communicate with each other and the infrastructure. As a demonstration tour in November has proven impressively, the technology is now fit for practical application.

Up to recently, introducing an unknown factor “X” did not necessarily imply something positive. Now the variable is about to acquire a different quality because the launch of Car2X communication will soon herald a new era of mobility. And this era will not only make our roads safer, but also help traffic flow more freely, reducing the amount of traffic-generated pollutants at the same time. What is more, the communication link between vehicles and road network creates the foundation for the implementation of autonomous driving systems—a vision that is actually not that visionary anymore (see interview on page 30).

Car2X technology allows cars to communicate with other vehicles as well as with traffic control centers and roadside infrastructure devices. New “smart” control options enable intersections and road signs to cooperate with the vehicles and, for instance, provide drivers with up-to-the-minute hazard warnings for exactly the road section they are currently driving on. Another application is the provision of situation-specific recommended actions, such as route recommendations based on current traffic volumes, or the optimum speed on a street with coordinated green phases.

Following a range of in-depth tests and trials, the so-called Cooperative Systems are now ready for their first large-scale operation in Europe: In 2015, automotive companies, transport authorities and infrastructure operators will start their concerted action for implementing the Car2X Corridor from Rotterdam via Frankfurt/Main to Vienna. On this 1,300-km route, the many options offered by this technology will soon become reality. In a first step, the Corridor will include an application for alerting drivers to mobile roadworks and a system that collects driving data from the vehicles to map the current traffic situation. For additional applications, the three countries involved—the Netherlands, Germany and Austria—are currently developing a joint deployment strategy.

The technology has reached the required level of maturity, as has been proven impressively in the scope of a demonstration tour through Germany, Austria and the Netherlands in November 2014. In his kick-off speech for the tour at the electronica trade fair in Munich, Thilo Jourdan, head of the Siemens Mobility Division in Germany, underlined that, “Car2X has ceased to be a vision—it is a fascinating option already available for deployment today.”
Full scope

**Gulf Traffic** When it comes to traffic infrastructure expansion, the authorities in the Middle East are not in the habit of doing things by half only, as clearly demonstrated by the numbers published in the run-up to the region’s leading transport trade fair: The amount allocated for investments in roads and bridges across the Gulf region exceeds the equivalent of US$120 billion. Saudi Arabia alone has earmarked $29.6 billion for modernization projects involving transport infrastructure systems all over the country, while the total worth of Qatar’s current road transport infrastructure projects amounts to some $17 billion. Accordingly, the solutions and products showcased by more than 200 international exhibitors at this year’s Gulf Traffic from December 7 to 9 at the Dubai International Convention and Exhibition Center met with the intense interest of the visitors, the majority of which were top-level decision makers.

Among the special visitor magnets was also the latest generation of Siemens controllers: Thanks to extremely powerful hardware and innovative software, these controllers are setting completely new standards in terms of user-friendliness, flexibility, connectivity and efficiency, making them the forerunners of a new era of traffic control. Besides connection options for perfect networking, the multi-talented controllers feature innovative technology for as yet unparalleled possibilities for improving road safety: For the first time ever, the functionality of already deployed controllers can be expanded via remote updates – without interrupting signal operation, making dangerous ‘lights-out situations’ definitely a thing of the past. This is of course also true for the available remote maintenance option, which helps reduce on-site service visits to a minimum. The decision makers from the dynamic Gulf region were also impressed by the fact that the new controller’s functionality can be expanded in step with a city’s growing infrastructure requirements because it can be deployed in various configurations: either as a stand-alone solution without sensors and connection to a higher-level traffic computer system, or as an integral part of a big city’s complex traffic management system.

**InnoTrans** Strictly speaking, this event is the world’s leading trade fair for rail transport technology, but its focus is increasingly shifting to include also holistic integrated solutions. At this year’s InnoTrans from September 23 to 26 in Berlin, many of the nearly 140,000 trade visitors from over 100 nations showed interest in the integrated mobility platform presented by Siemens, which allows transport providers the easy and efficient integration of supplementary mobility services in their own range of services. This enables the creation of perfectly matched transport offers that make planning and booking intermodal services much easier, including user-friendly payment options. Another key tool for more attractive networked transport modes is the so-called eTicketing based on an electronic SmartCard, which will replace the paper ticket. The biggest advantage: The users do not have to check and compare fares and fees, they simply pay for the total distance traveled and the service used, no matter if they take the train, rent a bike or park their car.
In the realm of opportunity

Promoting young talent - The Master’s program “Transportation Systems” at Munich Technical University offers magnificent prospects for its graduates. This is a key result of its unique specialization but also of its active proximity to the real world. In his design of one of the elective modules, for example, Professor Dr. Fritz Busch relies on the up-to-date expertise of Siemens experts.

Precisely when the educational back-and-forth began, no one can say any more. “One thing is for sure: When I moved up to become Head of the Transport Engineering Department at Munich Technical University, we were already inviting specialists from Siemens to give talks once in a while,” recalls Professor Dr. Fritz Busch. “At the time these were rather sporadic events, however. With the inauguration of a new Master’s program a few years ago the collaboration became more intensive.”

That Master’s program is called Transportation Systems and is genuinely unique, at least in the German academic landscape. Because here, “transport” is the major, not merely one of a series of specializations. This gives the curriculum architects the opportunity to delve deeper into specific areas of expertise such as control methods. This is where the idea arose to devote an elective module to inner-urban transport, including planning and creation of traffic-actuated control systems: with four lectures plus a four-day Office course and two further days for tutorials.

Responsibility for this elective module lies with a team of Siemens experts grouped around Senior Software Engineer Dr. Andreas Poschinger, who, of course, coordinate the module’s content closely with Munich Technical University. “Two things are important for us in this context,” says Professor Busch: “On the one hand the lectures must be free of product placement, and on the other hand they should represent the absolute latest state of the art in terms of practical application. Ultimately, with this collaboration everybody is a winner, especially the students, who gain a qualification that is very highly valued among prospective employers precisely for its practical relevance.”

As demonstrated by the unremittingly high level of international applications for the program, students themselves have long recognized its benefits, which include more than just a close-up exposure to the real world of traffic control. There is also a direct line to high-quality mentoring for the Master’s thesis and the opportunity for attractive internships – and later perhaps for the perfect start to a professional career.
Integrated future

**Munich** - Bavaria’s central traffic management office (Zentralstelle für Verkehrsmanagement/ZVM) has decided to deploy a centralized control management system integrating any and all traffic lights in the South-German state. Operation and monitoring of the 2,100 traffic lights will be handled by a traffic computer of the Sitraffic Scala type, which can also be used to aggregate and analyze traffic data from all parts of Bavaria. In addition, the responsible technicians can now rely on a very user-friendly and secure web-based monitoring system: Sitraffic smartGuard. For the ZVM, this project is another step in Bavaria’s ambitious plans to take the lead in introducing Car2X Communication.

The city of Bydgoszcz in Poland is equipping its streets with ANPR cameras

**Bydgoszcz** - With the double objective of detecting traffic obstacles right away and boosting transport safety, the capital of the Polish voivodeship Kujavian-Pomeranian is equipping its street network with more than 50 cameras for automatic number plate recognition (ANPR). Starting in spring 2015, the Sitraffic Sicore video systems, which cover up to two lanes with the same or different travel directions, will detect more than half a million number plates. The cameras’ detection range is five to 35 meters. Their integrated reading technology ensures top recognition rates for vehicles traveling at speeds of up to 250 km/h. In addition, special algorithms enable the systems to distinguish between different vehicles classes and to monitor vehicles transporting hazardous goods.

Better view

**Zhuhai** - Zhuhai in the Chinese province of Guangdong is the country’s first city to install a prioritization system for a tram line, in this case Zhuhai Tram Line No. 1. To better meet the transport needs of its 1.5 million inhabitants, the city is using the new ST950 controller to efficiently coordinate individual travel and public transport. The project is part of a Memorandum of Understanding between the local government bodies and Siemens regarding cooperative efforts for a more eco-friendly organization of local transport.

The ZVM project in Bavaria uses also Sitraffic smartGuard

**More fluidity**

**Eindhoven** - Using innovative Car2X technology, the ‘Ghost Traffic Jam’ project on the A58 motorway between the Dutch cities of Eindhoven and Tilburg is expected to prevent or at least reduce the occurrence of tailbacks caused by surges in traffic density. The measure is one element in the ‘Beter benutten’ program set up jointly by the Ministry for Infrastructure and the Environment, the province of North Brabant and the district of Eindhoven. Commissioning of the system, for which Siemens is delivering data fusion solutions as well as Road Side Units and the Master Road Infrastructure Server, is scheduled for summer 2015.
Data à la carte

Detection systems ■ The equation is actually very simple: the better and more comprehensive the available data, the more efficient the traffic management. Today, traffic engineers can rely on a whole range of new ‘master detectives’ to supplement the good old induction loop. Here is an overview of the principal technologies used to record traffic information in line with the technical and financial requirements of each application.
From magnetic field to Bluetooth technology: The right detector system for any application

Induction technology
The tried-and-tested Sitraffic SLD4 and LD4-F loop detectors provide highly precise data on the traffic situation at intersections – independently of ambient conditions. Experience gathered in over 50,000 installations in the space of 30 years makes induction loops the solution of choice for all applications requiring robust technology and high precision.

Magnetic field technology
A relatively new addition to the family of traffic sensors is the unusually compact, wireless Wimag detector for in-pavement installation. With its reliable detection performance, extended useful life, low installation costs and optional micro-radar module for detecting bicycles and stationary vehicles, this innovative system is a true all-rounder.

Passive infrared technology (PIR)
As they score with extremely low power consumption and high data quality, PIR detectors are the perfect fit for solar-powered systems such as Traffic Eye Universal (TEU). As part of strategic detection applications, TEU can be used to measure current traffic volumes at any location, even where no connection to the power grid is available.

Video technology
Sivicam and Phoenix video detectors are the ideal solution when looking for cost-effective presence detectors for intersections. High-quality image processing and advanced sensor technology guarantee superior detection rates around the clock and under all ambient conditions. The Sicore ANPR camera system is able to read the number plates of vehicles driving at speeds of up to 250 km/h, which makes it an excellent choice for travel time measurement and access control applications.

Radar technology
The technology used makes the 24-GHz Heimdall radar detectors from Siemens completely immune to adverse optical effects. The easy-to-install Heimdall detectors are available in a range of versions optimized for different detection tasks. They are especially suitable for intersection control purposes.

Radio technology
Bluetooth scanners have proven highly efficient devices for travel time measurement in the scope of strategic detection applications. Thanks to their fast and easy set-up, their use makes sense not only in permanent installations, but also for mobile deployment at roadworks or on temporary diversion routes. Their integrated WLAN function allows the detection of modern smart phones, which are often “invisible” for purely Bluetooth-based devices.

Simply scan the QR code to access the tables listing the technical details of the different technologies.
Slovakian toll system ■ In a mere three months, the responsible authorities managed to extent what is by now Europe’s most extensive toll system by another 15,000 kilometers of road – during ongoing operation and without investment in additional roadside infrastructure. This record speed was made possible by a gift from above, or more concretely, by the powerful combination of satellite navigation and mobile communication.

If the high efficiency offered by satellite-based toll systems were still in need for proof, the recent expansion of the Slovakian toll scheme for vehicles of more than 3.5 tons has certainly provided impressive evidence. A push on the button was all it took, so to speak, to add a total of 3,162 new road sections: Practically overnight, the existing 2,447 kilometers of tolled road increased sevenfold to exactly 17,762 kilometers – more than enough to immediately push the Slovakian toll network to the top of the list in Europe. The scheme is also the only one in the EU to include such a high proportion of second- and third-class roads, which account for by far the largest part of the newly added sections.

No expensive detection stations at the roadside, no endless miles of cabling and no tightly spaced cordon of video cameras – already back in 2010, when the Slovakian toll system was introduced, the solution based on vehicle positioning via the Global Navigation Satellite System (GNSS) was regarded as a ground-breaking example of innovative flexibility. It
was the first system to work with an On-Board Unit (OBU) that could be user-installed within minutes. Data transfer between the now more than 200,000 installed OBUs and the processing center runs on the existing GSM networks. This makes it possible for the OBUs to receive “over-the-air” updates at any time, for instance new geographical data or new versions of the OBU software or the firmware for the hardware components.

“Over the air” was also the way to go for distributing the exceptionally complex update needed to implement the extra road sections at the beginning of this year. Despite the enormous data volumes, no downtime of the application was required. Neither did the expansion entail the costly installation of additional roadside infrastructure. All the traffic engineers needed to do was to define, within the geographic model, several thousand virtual toll gantries for the additional tolled sections. By the way, to further optimize the recognition of vehicles and the calculation of tolled trips, the engineers developed a patented “waypoint algorithm”, which made it possible for the Slovakian system to attain an effective detection rate of 99 percent right from day one of operation.

The true scope of the efficiency advantage offered by satellite-based toll systems, especially in case of such wide-ranging expansions, becomes even more obvious when looking at an alternative scenario: If the Slovakian authorities had originally chosen a toll system based on Dedicated Short Range Communication (DSRC) and then decided to add another 3,162 tolled sections, the installation of the required microwave sensors alone would have cost more than € 100 million – not to forget later operating costs, which would have accumulated to several times that much over the years.

The use of GNSS technology helped keep the costs for the extension of the tolled network by some 15,000 kilometers to an absolute minimum: Amounting to only a fraction of the original investment for implementing the toll system, the expansion costs were nearly paid for within only three months by the resulting rise in revenues. What is more, the authorities were saved most of the work usually entailed by traffic engineering projects: no lots to buy along the roads for the erection of roadside stations and no need to apply for thousands of building permits or to bury miles and miles of cabling.

Visions for the Cloud

Visions take their time. Eons may elapse before we mere mortals are able to discern the true strokes of genius.

There’s this problem with visions: The concept describes on the one hand optical illusions or hallucinations – but on the other, the vivid imagining of future discoveries, inventions or innovations. In some cases it only becomes clear in the centuries that follow which follow which category a certain visionary belonged to, because the boundary between the flash of inspiration and the misfire is often fluid.

If you take as a yardstick Werner von Siemens, Gottlieb Daimler and Carl Benz or Ferdinand Porsche, who was already designing a hybrid car with electric all-wheel drive as early as 1900, then true visionaries are something of an exception. But even the visions of, for example, the French author Jules Verne continue to have their impact. In 1865 he described the journey “From the Earth to the Moon” with technical details that one hundred years later actually became reality in the first Moon landing. And the mysterious genius Leonardo da Vinci, a bold pioneer of thought in the context of mobility, had by about the year 1500 already sketched out a three-wheeled vehicle with a clockwork drive – local emissions-free mobility of the highest order.

Every age has its special geniuses of course: Inspired by Facebook and Twitter, modern visionaries grouped around the American documentary film-maker Bruce Duncan are striving to completely digitize the personality of a human being – in other words to exchange physical existence for a virtual one. The “LifeNaut” avatar project makes it possible to chat with your virtual self during your lifetime, and instruct that self in your own thoughts, ideas and rhetorical capabilities – with the aim of holding sophisticated post-mortem discussions with others. In future the avatars should even be able to tweet or to maintain their own timeline autonomously.

For the Russian media entrepreneur Dmitri Itzkow, this is not visionary enough. He has put about 30 scientists from all disciplines to work with a first-stage objective of transplanting the complete brain into an easily-maintained robotic body. The long term aim however, according to Itzkow, is to do away with the androids and replace them with holograms.

Eternal life in the Cloud is an idea that is approaching one of mankind’s ancient dreams. A cerebral flash of genius you might say – so long as no one cuts the power.
“A big step towards Vision Zero”

Interview ▪ Roland Wunder, Product Manager Cooperative Systems for Siemens Mobility, talks about the socio-economic benefits of Car2X communication, the organizational challenges to be overcome for the ITS Corridor from Rotterdam to Vienna, and the roadmap for the introduction of autonomous vehicles.

Mr. Wunder, two-seat gyrocopters have been available for some time now, the first flying car is supposedly ready for series-production and there already seem to be jetpacks that actually work (see page 13): In view of these developments, do we still need revolutionary technologies such as Car2X communication for road traffic? Actually, for me this is not a question of either-or, because ultimately all these futuristic means of transport need to be able to communicate with each other and the road infrastructure, and not only for safety reasons. Anyway, even if the flying car and those other transport means had already reached the required level of technical maturity, their large-scale introduction would still have to wait for the necessary framework conditions to be created. Also in this respect we have already come much further in realizing our vision of Cooperative Systems. In financial terms too, all signs for the public authorities are on driving the development of Car2X forward at full speed. Recent studies show that every euro invested in this technology is worth many times as much in terms of socio-economic benefit.

Among the range of positive effects expected of Cooperative Systems, improved traffic safety, accelerated traffic flow and reduced pollutant emissions are mentioned most often. Which of these do you see as the most important effect? Essentially all three effects are of utmost importance for the future of mobility. But if I were to pick one of them, I’d go with traffic safety. It’s true, conventional tools have helped
reduce the number of fatal crashes by an impressive percentage, but there is no question that every single one of the 26,200 traffic deaths on Europe’s roads in 2012 is one too many. And I am convinced that the use of Cooperative Systems will bring us a big step closer to achieving Vision Zero.

Car2X communication includes communication both between different vehicles and between vehicles and infrastructure. In your eyes, which of these two uses promises the greater benefit? While for some time the automotive manufacturers had a different take on it, by now all organizations involved in Car2X development have come to realize that establishing communication links between vehicles only will not have the desired impact. The biggest benefits will be achieved if we consider the full literal meaning of the term “cooperative” and involve as many players into the cooperation as possible, on both the technical and the organizational level.

One of the first applications on the roadmap for Car2X communication is the creation of the ITS Corridor from Rotterdam to Vienna. Scheduled to start in 2015, the project, by its very nature, involves three countries (see page 22). Which area do you expect to produce tougher challenges for the implementation of the project: technology or organization? No doubt, the organizational challenges will be harder to overcome. The technology is ready for real-world applications, as repeatedly proven in various field trials. The remaining issues are mostly of an administrative nature, such as the question who will be responsible for defining and supervising the permissible scope of data to be exchanged between the elements of the system. And, of course, there is still some fine-tuning to do before we will have uniform specifications and functions across the countries involved.

How many vehicles equipped with the necessary transmitter-receivers have to be on the road to achieve significant positive effects? This depends on the application in question. In some cases, for instance when it comes to alerting drivers to mobile roadworks, already the very first vehicle will benefit. But if you want to compile speed profiles or detect the traffic situation at intersections, at least 80 percent of vehicles need to be equipped accordingly.

With its ITS Corridor, Europa is taking a big step into the future of road traffic. Are there similarly ambitious Car2X projects in other parts of the world? Car2X is definitely a focus topic across the globe, for the simple reason that the automotive industry is a global business. The US, for instance, have even pushed farther ahead with system standardization than the EU. And in other parts of the world, too, Car2X systems are about to be rolled out.

In the first phase, the ITS Corridor will only use two different applications: mobile-roadworks alert and the collection of data on the current traffic situation. In what ways will Cooperative Systems be better up to these tasks than satnav systems? The main differences relate to the local relevance of the data and the time that the information needs to reach the drivers. Generally, the data for satnav systems are first transmitted to a data processing center for aggregation before the information is passed on to the users. Car2X data, in contrast, are available practically in real time, and are of relevance for the driver’s current position. How important these differences are, becomes clear if we look at the example of a mobile roadworks zone blocking a lane behind the next bend in the road. In this case, being informed by my satnav of a traffic tailback twenty kilometers ahead will not really be helpful in preventing an accident around the next bend.

What other Car2X applications could already be implemented based on today’s state of the technology? For interurban traffic, the transmission of individual speed data would be of interest. If I am informed that a vehicle ahead of me has suddenly slowed down from 120 km/h to 20 km/h, I know that there is probably some kind of obstacle on the road ahead: the end of a tailback, an accident or whatever. But there are also a whole range of ideas for urban applications, from intersection assistants and pedestrian presence alerts right up to the distribution of information regarding public transport and events.

If we pursue this line of thought, we will end up with the idea of autonomous vehicles sooner rather than later, won’t we? Exactly. By the way, that’s the goal that the automotive manufacturers have set themselves for the next 10 to 20 years. But to reach that goal, we will definitely need an infrastructure capable of communicating.

By that time, will you already be traveling in a flying car, or will you stay on ground level and place your trust in Cooperative Systems? Since I am rather a down-to-earth person, I think I’ll definitely stick to the second option.

Mr. Wunder, thank you very much for talking to us.