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Technology driving tomorrow's cars



Technology driving tomorrow's cars

Houlin Zhao, ITU Secretary-General



“The automotive and information and communication technology (ICT) industries are converging at a rapidly increasing rate.”

The automotive and information and communication technology (ICT) industries are converging at a rapidly increasing rate. This is good news for businesses, consumers and city planners who stand to benefit in a wide variety of ways – from fresh industry growth to better road safety to a range of Smart City solutions as Intelligent Transport Systems begin to reduce traffic congestion and increase connectivity and mobility for urban dwellers.

But how can these two very different industries – and the public sector entities that help govern them – find ways to collaborate to extend the benefits of connected car innovation safely to everyone?

The [ITU](#) and [UNECE](#) held the fifth annual Symposium on the Future Networked Car 2018 ([FNC-2018](#)) on the opening day of the [88th Geneva International Motor Show](#) to discuss these pressing issues.

FNC-18 brought together representatives of vehicle manufacturers, the automotive and ICT industries, governments and their regulators. Participants explored important topics, including the security, standards and regulation of our connected cars of the future.

ITU will have the important role of allocating the radio spectrum necessary to power the 5G systems that will be required for connected cars at the next World Radio Communication Conference in 2019 ([WRC-19](#)). See also in this edition of ITU News Magazine how ITU's Telecommunication Standardization Sector (ITU-T) Study Group work is supporting the development of Intelligent Transport Systems.

Read on to find out how these sectors are collaborating to build the cars of the future – together.



Technology driving tomorrow's cars

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Technology driving tomorrow's cars



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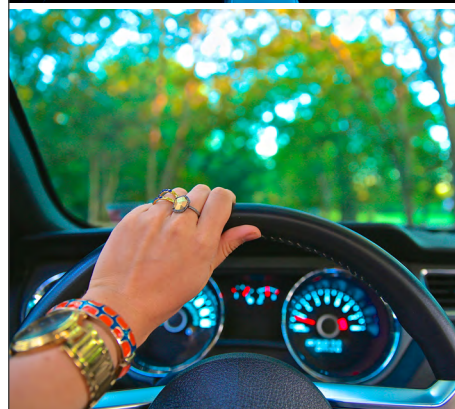
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Top 5 trends in connected cars

By Roger Lanctot

Director, Automotive Connected Mobility, Strategy Analytics

Distilling recent automotive market developments down to five essential things that will emerge as the most important underlying automotive industry trends associated with connectivity is a great challenge. But here are five key trends for connected cars that I see moving forward.

1 Browser on wheels

First and foremost, the car has become a browser on wheels.

It is difficult to overstate this phenomenon, because it means nothing less than driving has become the equivalent of online search (an industry worth upwards of USD 100 billion) with all that that implies for monetizing driving behaviour.



“Cars are getting smarter at understanding what humans are doing and helping them move and arrive at their destinations accurately and safely.”

Roger Lancot
Director, Automotive Connected
Mobility, Strategy Analytics

[See interview](#)

Every action by a driver is an indication of intent and intent is monetizable for advertisers and car makers.

General Motors' Marketplace platform is a perfect example being delivered in cars today of a system making recommendations to drivers in real time directly from the dashboard based on predictive analytics around customer preferences and historical behaviour.

2 Artificial intelligence

This 'browser-fication' phenomenon is being accelerated by the shift of artificial intelligence capabilities – in support of automated driving and digital assistants – shifting from the cloud to in-vehicle systems in the form of more powerful processors, improved vehicle networks and on-board storage.

Cars are getting smarter at understanding what humans are doing and helping them

move and arrive at their destinations accurately and safely.

HERE is working to integrate location information related to navigation with sensor-based contextual information compiled from Audi, BMW and Daimler vehicles to help drivers avoid obstacles and road hazards along their path.

3 New value propositions

Cars themselves are beginning to be networked, further enhancing safe operation and creating new value propositions and ultimately obviating the need for vehicle ownership.

This trend will play out over a much longer timeline, but the elements are being put in place via cellular connections to enable an entirely different transportation value proposition with collateral and profound impacts on car makers, car dealers and the supporting transportation and wireless infrastructure.

General Motors is modifying its Maven car sharing program to enable all GM vehicles to use the Maven program to allow existing GM vehicle owners to share their cars with other users.

Meanwhile, a growing number of auto makers including Porsche, Audi, Volvo, Lexus, Ford and others are introducing wireless connection-enabled, subscription-based programs that allow participants to freely swap cars on a weekly or monthly basis or, indeed, on demand.

4

Carmakers as MVNOs

As part of this transformation, car companies are looking to become mobile virtual network operators (MVNOs) in their own right as they

seek to achieve a carrier-independent business model.

Car companies want their vehicles to be seeking out the best local wireless connections regardless of the service provider.

5

Wireless networks' role in vehicle safety

Wireless networks will also play an essential role in combating cybersecurity threats and supporting real-time

map updates for automated driving and software updates for critical – and not-so-critical – on-board systems. But overall, the most significant change coming to automotive connectivity is the recognition and acceptance within the automotive industry that the wireless network has a valid and essential role in vehicle safety.

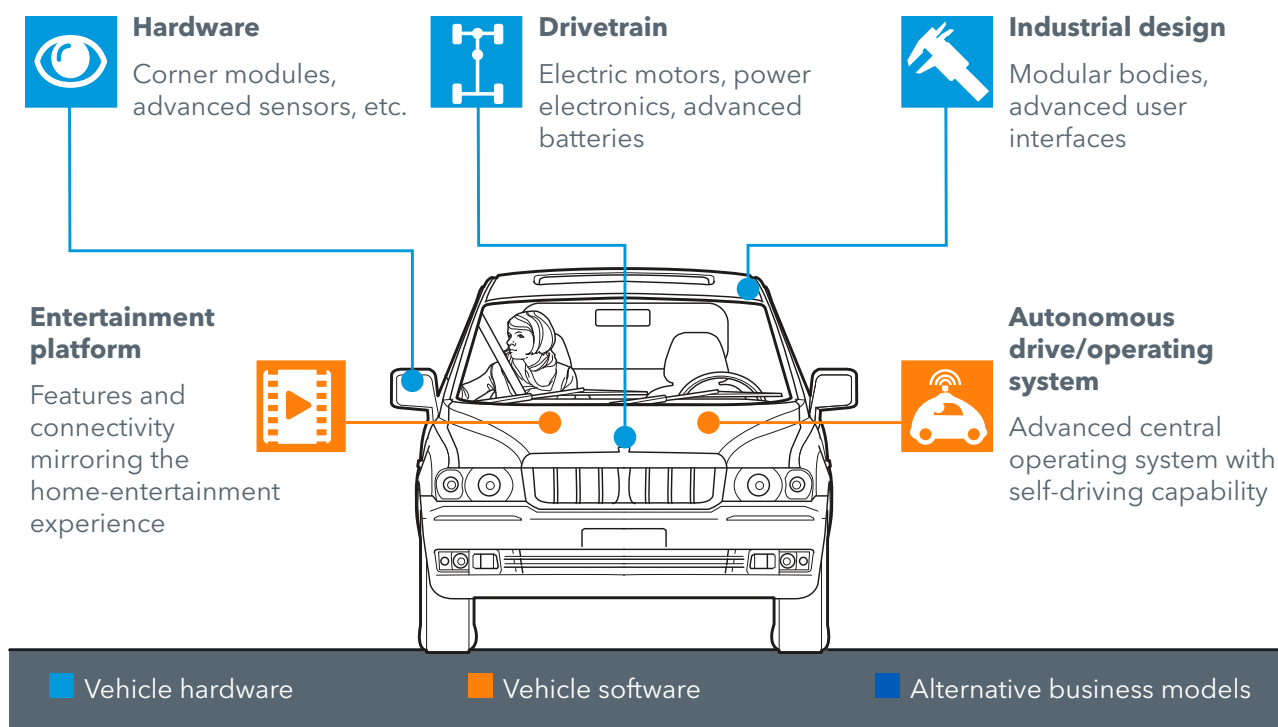
The first manifestation of this reality – C-V2X – is nothing less than a revolution in the achievement of true automotive IoT. It is amazing to ponder what lies ahead, in just a few short years, with the onset of 5G.

The good news is that for the first time, at a critical evolutionary point in the wireless network industry, the automotive industry is working closely with the wireless industry on mutually agreed-upon standards and protocols.



Technology is reshaping the global automotive sector

In the future, cars will become computers on wheels as tech players move into the automotive sector to leverage their existing capabilities



Apps and services
Full library of applications from third parties

Alternative business models
Autonomous vehicle sharing, new service offerings, etc.

Data analytics
Fully connected cloud processing and data feeds for manufacturers

The Symposium on the Future Networked Car 2018

The [ITU/UNECE](#) Symposium on the Future Networked car 2018 ([FNC-2018](#)) brought together representatives of vehicle manufacturers, the automotive and information and communication technology (ICT) industries, governments and their regulators to discuss the status and future of vehicle communications and automated driving.

The event took place at the [88th Geneva International Motor Show](#)'s opening day, on 8 March.

Connected and automated vehicles at the cross-road to success

Ubiquitous connectivity: 5G, AI and big data changing the game

Cybersecurity impact and outlook for automotive systems

The deployment of automated mobility services: what is needed?

See the [event website](#) and [full programme](#).

ITU, as the United Nations ([UN](#)) specialized agency for information and communication technologies, has a commitment to advancing the 17 UN Sustainable Development Goals ([SDGs](#)) and their associated targets.

“ITU concentrates on the critical areas of the radio frequency spectrum and international standards, and that’s the role that we bring to this discussion.”

Malcolm Johnson, ITU Deputy Secretary-General, speaking at the [ITU/UNECE](#) Symposium on the Future Networked Car ([FNC-18](#)) at the Geneva International Motor Show, 8 March 2018



Highlights video:
[Symposium on the Future Networked Car 2018](#)

(The power of the future networked car)

“Responsible connectivity could be essential to improving congestion and fighting pollution. With proper policies in place, significant results could be achieved.”

Jean Todt, the UN Secretary General's Special Envoy for Road Safety and President of **FIA** speaking at the **ITU/UNECE** Symposium on the Future Networked Car (**FNC-18**) at the Geneva International Motor Show, 8 March 2018

“The United Nations says that we should halve the number of deaths and injuries on roads by 2020, and clearly that is only going to be possible through transport management techniques, automotive radar, autonomous vehicles, etc.”

Malcolm Johnson, ITU Deputy Secretary-General, speaking at the **ITU/UNECE** Symposium on the Future Networked Car (**FNC-18**) at the Geneva International Motor Show, 8 March 2018

ITU is helping to advance the United Nations (UN) Sustainable Development Goals (SDGs) and targets related to road traffic, transport, and road safety

3 GOOD HEALTH AND WELL-BEING



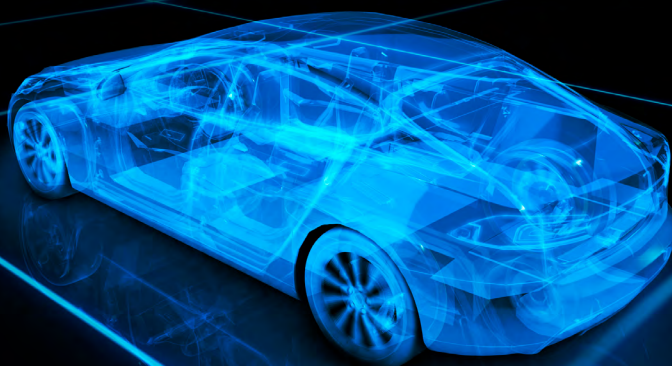
By 2020, halve the number of global deaths and injuries from road traffic accidents.

11 SUSTAINABLE CITIES AND COMMUNITIES



By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

Read more about the **17 UN Sustainable Development Goals** to transform our world, and the **ITU/UNECE** Symposium on the Future Networked Car 2018 (**FNC-18**); supported by the 88th Geneva International Motor Show (**GIMS**).



#ICT4SDG

Video-interview insights

Thought leaders shared with us their insights on the topics discussed at the Symposium on the Future Networked car 2018 (FNC-2018).



“For all of us in the industry, there is enormous work to do. We need to be connected. We need networks. And because we are a global company, we need to have this connection all over the world. Obviously for us to have standards we can apply will help accelerate this transformation.”

Pierre Masai
CIO, Toyota Motor Europe

[See interview](#)

“The connected car has a lot opportunities for safety – to save lives in traffic – to have solutions available for customers. This is a big challenge, and a big change in the industry. And we as an inspection industry, doing the periodical technical inspection, need to be part of that system.”

Christophe Nolte
Technical Director, DEKRA



[See interview](#)



“Security is a very important topic ... Security is not only limited to the network itself. The network between the cars and the back end infrastructure is only one part of the security. We as an operator are heavily engaged in end-to-end security so we are providing tools and efforts for security within a car.”

Johannes Springer
5G Automotive Lead, Deutsche Telekom

[See interview](#)



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Connected vehicles at the cross-roads: What is needed for success?

As connected cars and automated driving speed toward widespread commercialization and market acceptance, they hold great promise to improve road safety, reduce congestion and emissions, and improve our lives in a wide variety of ways.

But how can the expanding range of key public and private-sector stakeholders align to ensure the potential is actually realized, across borders – and in a safe and secure way?

Top automotive and technology experts discussed and debated this and a range of other critical issues regarding connected cars at the [ITU/UNECE Symposium on the Future Networked Car 2018 \(FNC-2018\)](#) in Geneva, Switzerland, on 8 March, at the 88th [Geneva International Motor Show](#).

Challenges and opportunities

During technical presentations and panel discussions, many experts underscored the tremendous opportunities and challenges facing both the automotive and ICT industries as auto-tech convergence shifts into high gear.

Curtis Hay, a technical fellow with General Motors started his presentation on *Autonomous Vehicle Localization by Leveraging Cellular Connectivity* by paraphrasing a GM executive who recently said: “We don’t run a car company, we run a tech company.”

Several other experts echoed that point in their remarks, with many noting the inherent tensions as very different industries – and business models – merge.

For instance, the shorter ICT product development lifecycles need to be reconciled with the longer automotive product development lifecycles as players from both industries begin to work together more frequently.

The impact of 5G

The launch of 5G will support the acceleration of connected-car solutions and intelligent transport systems, but can the auto industry move as fast as the ICT industry?

Johannes Springer, Program Lead of the 5G automotive program at T-systems, Deutsche Telekom Group, told the audience that the roll-out 5G, beginning by the end of 2018 or early 2019, will be an evolutionary process for the company. But “in terms of development cycles for the auto industry ... it’s tomorrow.”

“We receive more than one trial request per week” from automakers wanting to try new 5G-enabled solutions, said Stefano Sorrentino of Ericsson, who chairs the 5G Automotive Association’s Working Group 2 on System Architecture and Solution Development.

“Software, defense, communications are all moving into the auto sector.”

James Colgate, Strategy Director for Williams Grand Prix Engineering Limited

“Software, defense, communications are all moving into the auto sector,” said James Colgate, Strategy Director for Williams Grand Prix Engineering Limited. “It’s not just about the car, it’s about all the mobility solutions. A key element is selecting the right pace of that development. Anything we do now needs to be forward looking and make sure it matches the life of the vehicle.”

Viable business models needed

Like many others at the Symposium on the Future Networked Car, Mr Colgate also mentioned the challenge of creating viable new business models.

“If you are from the auto industry, connected vehicles are a new revenue stream and a brand differentiator,” said Sorrentino.

Viable business models was one of four overarching challenges laid out by David Wong, Senior Technology and Innovation Manager of the Society of Motor Manufacturers and Traders of the United Kingdom. He said that, when developing new connected-car services, the auto and

tech industries really need to ask themselves: "Who's going to pay? Will they pay?"

When it comes to safety of connected cars, Sorrentino stressed the need for public-private partnerships. "To save lives, we need new business models," he said.

New partnerships for better services

One strong takeaway that repeatedly emerged from the discussions was that groundbreaking innovation has resulted from the increasing integration between the informatics, telecommunications, automotive, and even the financial sectors.

For example, Jason Ellis, a business development director for Qualcomm, explained that the semiconductor and telecoms equipment company has increasingly invested in serving the automotive industry, including the rollout of a new Cellular Vehicle-to-Everything (C-V2X) chipset to complement the connected-car ecosystem by helping to enhance range, reliability, speed, support, and cost efficiency.

In addition to building new partnerships, car-makers may need to redefine the way they view their own industry, experts said.

Jacques Bonifay is from Transatel, which provides connectivity solutions that can allow non-telecom players to become Mobile Virtual Network Operators (MVNOs). "Car manufacturers need to be MVNOs and have their own virtual mobile networks," he said.

“We have a fragmented standards environment. We need more standards, and the worldwide use of harmonized standards.”

Christoph Nolte, DEKRA
automotive solutions

A need for global standards and policy frameworks

Christoph Nolte, Technical Director for DEKRA automotive solutions, emphasized the need for global standards to make global connectivity happen. "We have a fragmented standards environment. We need more standards, and the worldwide use of harmonized standards. Connected cars need a lot of power so new standards for 5G can be the basis for connected vehicle standards."

David Wong, Senior Technology and Innovation Manager for the Society of Motor Manufacturers and Traders in the UK, also noted that policy, regulation and standards together make up one of four major challenges he sees for connected-car development. Harmonized international regulations, insurance and liability frameworks, as well as regulations on data protection and sharing, and standards for 5G and the Internet of Things, are still needed before autonomous cars can become a reality, he said.

(The power of the future networked car)

These highlights just scratch the surface of a rich day of discussions at FNC-2018.

Technical sessions also examined advances in the area of road safety thanks to connected vehicles (V2V, V2X) – as well as the relationship between vehicle communications and automated driving analysing the crucial roles of connectivity, cybersecurity, blockchain, virtual reality and artificial intelligence.

The symposium, which was supported by **DEKRA**, **Qualcomm** and **Green Hills**, also discussed how standards bodies can best collaborate to meet industry needs and to achieve interoperability.

To learn more about the impressive and diverse roster of presenters – and view their presentations – please visit the [FNC program page](#).

For enquiries about next year's event: tsbcar@itu.int.



SYMPOSIUM

Future Networked Car

8 March 2018
Geneva, Switzerland

Geneva International Motor show

#ConnectedCar



Organized by

 **UNECE** 



Can cybersecurity keep pace with connected car innovation?

Conconnected vehicles and automated driving are fast moving onto public roads, holding great promise to improve road safety, reduce congestion and emissions, and increase the accessibility of personal mobility.

Electronics have become central to vehicle control. We are seeing a major shift from hardware to software in the automotive industry, with modern vehicles now relying on 100 to 150 million lines of code. This shift from hardware to software, matched with increasing vehicle connectivity, creates a “perfect storm of cybersecurity vulnerabilities,” says Giuseppe Faranda, Cybersecurity Advisor at Karamba Security.

Faranda was speaking at the Symposium on the Future Networked Car (**FNC-2018**) on 8 March 2018.

The automotive industry is underestimating the gravity of the cybersecurity challenge, says Faranda.

Connectivity can provide malicious actors with access to electronics controlling engine ignition, acceleration, steering and braking. Cyberattacks have the potential to put lives in danger, erode confidence in emerging technologies and inflict major blows to carmakers’ brand reputation.

"Software failure is not an option. It should not be an important role, it should be the important role within our systems," said Chuck Brokish, Director of Automotive Business Development for Green Hills Software. "You will never be able to secure every line of code in a vehicle. But you can isolate the components and keep code small enough and contained enough."

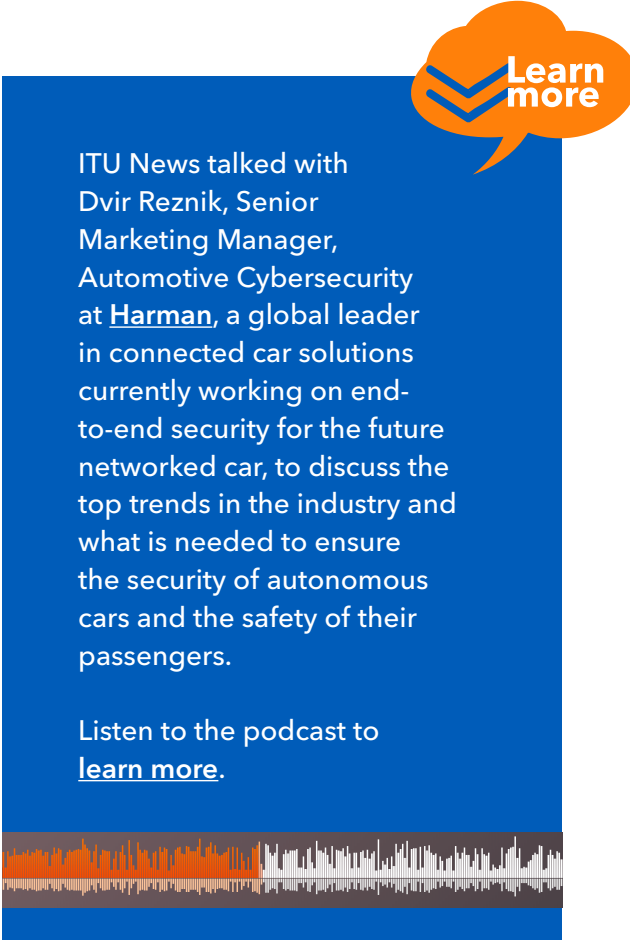
To illustrate some of the security issues, Tom Lysemose, the Chief Technology Officer of PROMON in Norway showed the audience a case study that purported to demonstrate how a Tesla could be "stolen" by hacking the app.

Mr Brokish told the audience that much more needs to be done and warned against adding too many features too quickly without proper security in place. "As an industry, we need to ask ourselves are we part of the solution or are we part of the problem," he said.

The security challenge is significant, not insurmountable

Lysemose draws a comparison between the automotive and financial services industries. "We have seen smartphones replacing car keys, much as smartphones are replacing credit cards and the need to visit a bank branch."

The financial services industry – a prime target for cyberattacks – has been relatively successful in balancing innovation with strong end-user demand for security, says Lysemose. The industry has gained cybersecurity experience of great relevance to other industries developing new ICT-enabled products and services.



ITU News talked with Dvir Reznik, Senior Marketing Manager, Automotive Cybersecurity at [Harman](#), a global leader in connected car solutions currently working on end-to-end security for the future networked car, to discuss the top trends in the industry and what is needed to ensure the security of autonomous cars and the safety of their passengers.

Listen to the podcast to [learn more](#).

Innovation often outpaces the development of associated security measures. Security experts see this imbalance emerging in the automotive industry. ICTs are enabling carmakers to add new features to their products at a blistering pace, but security continues to lag behind.

"We must start to consider security as core functionality," says Brokish. "We are adding features with reckless abandon. The imbalance is clear. Safety and security must be added faster."

What will it take to balance innovation and security in the automotive industry?

For security experts participating in the Symposium on the Future Networked Car, the answer is 'security by design' – security should be considered core functionality to be integrated in product design, operation and maintenance.

Regulation supported by standards

ITU has delivered a new international standard for secure over-the-air software updates to connected vehicles. This field of work is expanding. The expert group for security, ITU Telecommunication Standardization Sector (ITU-T) **Study Group 17**, has established a new work stream to coordinate a growing volume of work on security aspects of intelligent transport systems.

ITU has also built successful collaboration with UNECE, the body responsible for global vehicle regulations. ITU-T Study Group 17 is an active contributor to the UNECE task force on automotive cybersecurity and over-the-air updates, a task force developing a much-anticipated paper expected to be released in June 2018.

“Industry will be able to demonstrate that they are abiding by UNECE recommendations by highlighting their conformance with relevant technical standards.”

Darren Handley, UK Department for Transport, Co-Chair of the UNECE Task Force

“The United Nations will use the paper to globalize an approach to cybersecurity for automotive,” says Darren Handley of the UK Department for Transport, Co-Chair of the UNECE Task Force.

Technical standards developed by bodies such as ITU, SAE, ISO and Auto-ISAC can offer valuable support to the regulations issued by UNECE.

“Standards have a key role to play,” says Handley. “Industry will be able to demonstrate that they are abiding by UNECE recommendations by highlighting their conformance with relevant technical standards.”



Driving gender equality: Empowering women in the automotive industry

For International Women's Day, ITU News caught up with Manuela Papadopol, a co-founder and Managing Director of Sansea Consulting, a global management and marketing consulting firm. Manuela Papadopol serves as an advisory board member for Udacity and the Los Angeles Auto Show. She is also an active member of Women in Automotive Technology, an organization created to connect, educate and drive the future of the automotive industry. She is an avid advocate of gender diversity and equality. (This interview was edited for length).

As an active member of Women in Automotive Technology, what are the challenges you are trying to address for women in the industry?

MP – One challenge we are trying to address is the disconnect that currently exists in the industry. More than 85% of car-purchasing decisions in households are influenced by women, while the automotive industry has only 16% of women as Senior Executives.

Another challenge that made me look into supporting this initiative for Women in Automotive Technology is that we absolutely need to have diversity and variety in the workplace, because that allows for creating better products, from the design to the purchasing phase of automobiles.

The other thing that is interesting is that not enough women are brave enough to ask for help, or join communities, networking and mentorship groups.

But the problem does not start with the existing workforce, it starts with small children—girls and boys. So I have teamed up with some friends of mine to create an initiative called Create the Future. Its goal is to educate kids—boys and girls on how to design, code and sell a product. We need to make sure all kids have equal opportunities, and to give girls technology and the ability to design and market a product. I have received great feedback from the folks I have shared this idea with and I'm really excited to see this in action in Spring of this year.

In your opinion, what steps are needed to ensure women are active in automotive and technology industry?

MP – We will need the help of the legislators and government, because without fair and equal compensation and benefits we will continue to see a gender gap. For example, there have to be equal opportunities for fathers to take time off to spend with kids and allow mothers to go back to the workforce right after they have children if they want to. Companies should provide that kind of flexibility.

There is a big disconnect from US to Europe to Asia when it comes to compensation and benefits, so we need to look at creating global standards and agreements. Government officials also need to take on more responsibility to address these issues.

“I’m very impressed with Mercedes Benz’s networking initiative for women. It allows women to talk about opportunities, learn, and exchange information. All carmakers should create professional platforms for women.”

Manuela Papadopol, Co-founder and Managing Director of Sansea Consulting

It comes down to companies finding ways to identify their best people and enabling them to grow professionally without sacrificing their personal life. For example, very few companies have day care. Can you imagine how much the economy can be improved if companies just opened up day care centres for their staff! Especially in the automotive sector. It's still a very male-driven environment. This sector can learn about best practices from other parts of the world and it can make a big difference.

I'm very impressed with Mercedes Benz's networking initiative for women. It allows women to talk about opportunities, learn, and exchange information. All carmakers should create professional platforms for women.



Become a member of She's Mercedes Lounge, that encourages the exchange of inspiring ideas.

As we witness convergence between the automotive sector and information and communications technologies (ICTs), how has working in the auto industry changed in the past decade?

MP – When I started at Microsoft in 2004, I was part of the team of 2 people working on the Powered by Microsoft brand and that was used in millions of vehicles, for the infotainment system in the car. What a difference that brand made! In 2015, and that is already 2 to 3 car generations later, we were already talking about self-driving cars, so we have shifted from infotainment and creating a user experience in a car to, 'How do we move from point a to point b and be driven?'. I find it incredible how technology has evolved. It sounds like science fiction but it's reality.

Now technologies like Artificial Intelligence (AI) will allow carmakers to create better user experiences. A lot more products coming to market will be powered by AI – including better interaction between the car and the driver. The car will know whether there is a child in the car, what time of day it is, who is driving, and will be able to make informed decisions without being prompted by the driver on providing directions, ordering groceries, or playing music and movies.

We are also seeing shifts in business models and revenue streams, as carmakers are becoming tech companies. They are asking themselves how to keep cars more relevant in the market to meet the needs of consumers today. We change devices every year, but we can't do that with a car. Cars need the ability to update with new applications and functionalities over time.

In terms of connected vehicles, in your view, what are the biggest hurdles right now for the industry?

MP – The car is a place where we spend a lot of time and where we are consuming technology but still in a very unsafe way. We are still guilty of checking our phone when we are driving – to read our texts, or for navigation and music. That is because the interaction between the car and the driver is still in its infancy, it's still not done right. With better user interaction and speech technology we would not need to touch our phones.

Carmakers are slowly getting there. Speech technology simply doesn't exist in most cars so we are still relying on phones.

There are also safety and security issues that need to be considered, like hackers. We need to design cars with these risks in mind and make vehicles that are safe and secure.

Standards are also very important and we need to continue working on these. The vehicle of today and tomorrow is different from the ones from 3 years ago. So different standards need to be created, especially for self-driving cars. We also need to look at legislation, and questions like how we design cities, roads lanes and parking spaces.



“The other thing that we’ll need to look at is standards – to revisit the current standards – and also create new ones as we move into the new world of mobility.”

Manuela Papadopol
co-founder and Managing Director of Sansea Consulting

[See interview](#)

Your company, Sansea Consulting, works with technology and automotive companies and startups? Can you describe the challenges and opportunities for innovation in the automotive tech sphere?

MP – I founded Sansea with a friend, which surfaced from my desire to work with technology and car companies to help them rethink business models and strategies, and to ensure that the products they are developing are relevant.

I am on the board of advisers for the Los Angeles auto show. It is incredible to see how we are changing the auto show into more of a technology event. I think that is one of the challenges: how do we change what we have today in terms of events, education, and corporations to meet the technologies that exist in our life. All of these technologies are reshaping our lives, the way we learn, and the way we work together.

I am also on the board of Udacity, and they are revolutionizing education. They are looking at new ways to bring awareness and educate next generation of leaders, and that is something I am incredibly passionate about.

As someone who has received awards, I think we need to recognize the best people we have, men and women equally, and give awards to people who deserve it. We don’t do enough to promote ourselves and our capabilities.

Women in particular should have the courage to stand up and speak up, learn something new, ask for a raise or for a different role in the company, and trust in ourselves.



How ITU is supporting the emergence of a trusted ecosystem of intelligent vehicles

Chaesub Lee

Director, [ITU](#) Telecommunication Standardization Bureau

Information and communication technologies (ICTs) continue to spur innovation in fields such as energy, financial services, healthcare, smart cities, and of course transportation. The result has been that the ICT sector has gained a range of new stakeholders, with significant implications for the work of ITU.



“Technical standards developed by bodies such as ITU, SAE and ISO can offer valuable support to the regulations issued by UNECE.”

Chaesub Lee

Intelligent Transport Systems (ITS) form an excellent case study of ICT-enabled convergence.

The ICT and automotive sectors have different business cultures and product-development processes and lifecycles. They operate within the bounds of different regulatory frameworks. The technologies employed by the two sectors have been converging, but mechanisms to coordinate the various elements of this convergence were slower to gather pace.

ITU's first task in supporting ITS innovation was to offer a platform for the ICT and automotive sectors to open new lines of communication, learn from one another and build common understanding of how they might improve the coordination of their respective contributions to automotive ICT innovation.

Our [Symposium on the Future Networked Car](#) within the Geneva International Motor Show – moving into its 14th edition in 2019 – has made a key contribution in service of this aim, assisting the collaboration of the ICT and automotive industries as well as their supporting standards bodies and regulatory authorities.

ITU has also established a successful partnership with the United Nations Economic Commission for Europe ([UNECE](#)), the body responsible for global vehicle regulation. ITU and UNECE co-organize the Symposium on the Future Networked Car and together we have built productive collaboration between our communities.

UNECE now looks to ITU for communications standards to support vehicle regulations. A prime example is found in the new global regulation on vehicle emergency calls, "Automatic Emergency Call Systems", which makes reference to an ITU-T voice-quality performance standard.

2010-2020: The United Nations' 'decade of action on road safety'

Standardization will be essential in building a trusted ecosystem of intelligent vehicles. ITU standardization work is supporting the increasing integration of ICTs in vehicles with road safety and data security as our top priorities.

ITU develops specifications for vehicle-to-vehicle and vehicle-to-infrastructure communications, dedicated short-range communications, millimeter wave vehicle collision avoidance radars, and sensor technologies for the monitoring and identifying of objects near vehicles. The ITU World Radiocommunication Conference 2015 ([WRC-15](#)) allocated spectrum in the 79 GHz frequency band to the operation of short-range, high-resolution automotive radar. Studies in preparation for WRC-19 are now addressing the harmonization of spectrum for ITS in the mobile service.

ITU standards define the requirements of vehicle gateway platforms, tests to assess the performance of mobile phones when connected as gateways to vehicle hands-free systems, and speech communication requirements for vehicle emergency calls.

ITU's standardization sector is welcoming new members from the automotive and insurance industries, as well as emerging market segments in IoT, M2M and IMT-2020 (5G) including machine learning and artificial intelligence. Our work with these emerging market segments is taking on new dimensions as innovators look to ITU for resources to support global V2X (Vehicle-to-Anything) connectivity and in-car emergency communications.

The automotive industry is also significantly invested in ITU's international standardization of 5G systems. The safety-critical ICT applications of the automotive industry can allow no margin for error. These applications must work perfectly every time. Ensuring this reliability is a significant requirement for 5G development – every application will be able to perform to its full potential.

Building trust in ITS will call for improvements in security

The vertical markets depending on ICTs for large parts of their future value propositions are increasingly looking to ITU expertise for answers to their concerns around security, privacy and trust.

We have seen this in our work on digital financial services and the same is true of our work on ITS.

Electronics have become central to vehicle control. We are seeing a major shift from hardware to software in the automotive industry, with modern vehicles now relying on 100 to 150 million lines of code. This shift from hardware to software, matched with increasing vehicle connectivity, has increased the gravity of the automotive cybersecurity challenge.

Connectivity can provide malicious actors with access to electronics controlling engine ignition, acceleration, steering and braking. Cyber attacks have the potential to put lives in danger, erode confidence in emerging technologies and inflict major blows to carmakers' brand reputation.

This understanding is reflected in contributions being submitted to the ITU standardization expert group for security, [ITU-T Study Group 17](#).

ITU-T Study Group 17 has developed a new ITU standard for secure over-the-air software updates to connected cars, and this work continues with the development of a new ITU standard on the security of V2X (Vehicle-to-X) communications.

This field of work is expanding. ITU-T Study Group 17 has established a new work stream to coordinate a growing volume of work on security aspects of ITS. Alongside security guidelines for V2X communications, ITU-T Study Group 17 is developing new ITU standards on topics including the security of vehicle-accessible external devices, in-vehicle system intrusion detection, the security of vehicular edge computing, and security-focused big data analytics.

Coordinated convergence demands effective collaboration

ITU aims to be a valuable partner to all interests driving ICT innovation.

We continue to offer a neutral platform for the collaboration of the automotive and ICT industries and continue to invest in the successful partnership that we have built with UNECE.

We are an active contributor to the UNECE task force on automotive cybersecurity and over-the-air updates. This task force developing a much-anticipated paper expected to be released in June 2018, a paper that the United Nations will use to globalize an approach to automotive cybersecurity for automotive.

Technical standards developed by bodies such as ITU, SAE and ISO can offer valuable support to the regulations issued by UNECE. ITU thus remains an ardent supporter of the work of the Collaboration on ITS Communications Standards, an initiative steering the standards collaboration we know to be critical to our work to deliver a cohesive set of technical standards in support of ITS.

It is thanks to a strong spirit of collaboration that we can all look forward to the imminent arrival of connected, automated driving.





How IoT and M2M are spurring fresh demand for ITU numbering resources

ITU News interviewed Phil Rushton, Chairman of the ITU Telecommunication Standardization Sector (ITU-T) [Study Group 2](#), to learn more about how the group's work is supporting IoT (Internet of Things) and M2M (Machine-to-Machine) applications emerging as part of intelligent transport systems.

ITU-T Study Group 2 is the world's foremost authority on international numbering and related telecommunication identifiers. Its work on numbering, naming, addressing and identification is taking on new dimensions as an increasing array of interests look to ITU for resources to support global IoT and M2M connectivity.

Could you give us a brief introduction to ITU-T Study Group 2 and its work on international numbering resources in particular?

PR – ITU-T Study Group 2 (SG2) is the ITU's standardization expert group that deals with operational aspects of telecommunications, including telephone numbers and related identifiers, as well as telecommunications network management. In addition to telephone numbers, SG2 is also responsible for identifiers associated with mobile handsets, known as IMSIs (International Mobile Subscription Identifier) and identifiers associated with SIMs, known as Issuer Identifier Numbers. In all three instances the resource can be (and has been) allocated to ITU Member States to assign to operators; the so-called indirect allocation process.

An alternative to operators or service providers being allocated resources from a geographic country code is for operators or service providers to apply directly to ITU for an allocation of one of these resources. These direct allocations for global or universal numbers are for resources behind country codes that SG2 has assigned to ITU and which it administers based on criteria and rules that SG2 has agreed upon.

The rules and criteria for these universal, or global, numbers are specified in ITU standards (ITU-T Recommendations), and fulfil the same function as the rules and criteria that are applied by Member States in the administration of the resources that they have allocated.

For international numbering resources administered by ITU, the Recommendations that are produced cover both the criteria for the consideration of assignment of such resources, and the rules that must be followed in using a particular resource.

What is the role played by international numbering resources in supporting the rise of IoT and M2M and what are the most significant challenges to be overcome in this arena?

PR – IoT and M2M bring a new aspect to the use of numbers. The nature of the communication is changing with many Member States allowing, or working towards allowing, permanent roaming of their numbering resources. Such is bringing with it new challenges. One of the challenges that arise from permanent roaming is encountered in the extraterritorial use of numbering resources in a new, interesting and innovative way.

Originally the numbering resources that SG2 were responsible for were allocated to a Member State. That evolved to cover numbers allocated to universal services or directly to operators. The introduction of mobile technology began to change that relationship, with national mobile numbers being able to “roam”. The application of general national numbering resources for M2M and IoT are extending that use, not only in the case of national mobile numbers but other types of national numbering resources as well.

This is also true of the resources that are administered by ITU. SG2 is currently dealing with applications for universal, or global, numbers from ranges administered by ITU. As a consequence, the evaluation of such requests against the existing criteria is challenging as there is no one M2M or IoT service description.

What are the main considerations factoring into SG2's work to meet this challenge?

PR – The use and governance of numbers and related identifiers are evolving to meet the requirements of M2M and IoT and the nature of IoT and M2M communications is also evolving, from voice to short bursts of data traffic, and that brings with it concerns as to how numbers allocated to IoT and M2M will be used. SG2 is experiencing challenges to meet differing requirements from ITU Member States and ITU-T Sector Members.

On the one hand, there are those Member States that have allocated the use of number resources under their control to emerging services that challenge the geographic nature of management and use of numbering resources. On the other hand, there are those Member States who are taking a more focused approach, either on the rules associated with permanent roaming or on the use of their resources for permanent roaming or IoT and M2M.

SG2 is exploring what rules and mechanisms can be deployed for those numbers directly administered by ITU, and at the same time providing advice to Member States for the use of their numbers, with respect to supporting the deployment of IoT and M2M. There is a fine dividing line between supporting innovative use of numbers and extending the boundary of use to an unacceptable place. A case in point was the request to use universal or global numbers to support voice associated with emergency M2M/IoT communication. This type of request for the use of voice is an example of new and innovative use. The limited use of voice from an emergency point, such as in elevators, is limited communication with no opportunity for additional calls to be made.

What are the projects underway in SG2 to support vehicle connectivity and intelligent transport systems?

PR – The strength of the identifiers used in telecommunications that SG2 is responsible for is that they are technology and service independent. This allows international numbering resources to be introduced to meet emerging innovative service and communication requirements. A case in point is the new requirements for vehicle communication.

Currently work is being done by ITU Member States to provide numbering resources under their responsibility to meet the demand of communications in vehicles. Additionally, efforts are underway in SG2 to evolve the requirements of universal or global numbers to ensure their future availability. Efforts in SG2 are currently focused on using the country code 878 for IoT and M2M services. The current requirements for 878 must be modified as they apply to Universal Personal Telecommunications (UPT).

The modification of these requirements is being driven by the requirement to provide a universal, or global code for in-car emergency communication, such as the European eCall. Although 878 is already deployed for UPT services, its use was overtaken by the deployment of mobile phones. Re-use of the 878 country code will allow IoT and M2M to exploit the fact that the code has already been deployed.

Looking more closely at emergency communications, how will international numbering resources help government and industry to deploy these services efficiently?

PR – One of the benefits of utilizing universal, or global, codes for in-car emergency communication is the reduction of the demand for numbering resources from ITU Member States to support such a service. This helps mitigate the possibility of number exhaust in any Member State as a result of supporting such requests.

The communication element within a car is likely to require multiple identifiers to identify the SIMs (either physical or embedded), IMSIs (to support mobility) and telephone numbers to identify potential inbound calls. The multiplicity of identifiers required to provide in-car emergency communication, engine management diagnostics, and infomatics that will support consumer choice should not be underestimated. Cars built in one country and exported to another need to have identifiers that best meet the consumer's goal. In-car emergency calling needs to use numbering resources in a manner that does not create barriers to emergency response. This will vary country by country. SG2 requirements have proven to be flexible in allowing universal, or global, resources to be paired with national resources. Providing resources for in-car emergency calling will prove no different.

What has SG2 observed as the main incentives for the automotive industry's adoption of international numbering resources?

PR – The use of a universal or global numbering resource from day one in the deployment of in-car communication can be beneficial overall to car manufacturers. This would avoid any possible delay of obtaining relevant national numbering resources, be that a telephone number, IMSI or IIN (Issuer Identification Number), from a national regulator. In addition, when utilizing national resources, there may be a need to change the resources if the resources in question have been exported with the vehicle. Use of universal or global numbers avoids the potential requirement for "re-programming" a vehicle's communication identity. Member States are recognizing the trend that telecommunication identifiers will have a major impact on the demand for national numbers. In other words, the use of such numbers will not be confined to the country from which the identifier is sourced. This additional impact on the use of national resources can be avoided by utilizing universal, or global, numbering resources. An additional benefit for service providers who seek assignment of universal, or global, numbers is the size of the resource that is allocated. ITU-T assigns 10^{10} telephone numbers and IMSI resources directly to applicants who meet the criteria.





Interview with Jacques Bonifay, CEO of ITU member Transatel

ITU News took the opportunity to interview Jacques Bonifay, Chief Executive Officer of [Transatel](#) (an ITU member) and Head of the European Union Mobile Virtual Network Operator (MVNO) Association during his presence and participation at the [ITU/UNECE Symposium on the Future Networked car \(FNC-2018\)](#).

How is the market for connectivity evolving to support such a diverse range of ICT applications?

Connectivity is going to be important for differentiation between the car manufacturers, and we at Transatel think that it is going to be part of their core business to become mobile virtual network operators (MVNOs), because they need to control securities, service differentiation, and we want to do it in a homogenous way across the world.

Could you tell us more about Transatel's work in the automotive space? What are the major challenges and opportunities emerging in your market segment?

There is a great opportunity for IoT MVNOs to serve the automotive industry, as well as telecom equipment manufacturers, because I think that some car manufacturers will want to actually invest in telecom infrastructure. That's where already I see the opportunities.



“I think there is a great opportunity for IoT MVNOs to serve the automotive industry.”

Jacques Bonifay
CEO of Transatel and Head of the European Union
Mobile Virtual Network Operator (MVNO) Association

And also for the mobile operators. There will be much more data which will be used on their networks, so it is also a great opportunity for them to deploy the network, whether it be 3G, 4G and tomorrow, 5G, and to have a usage that is much higher than it is today, because vehicles are going to use a huge amount of data.

Transatel is a new ITU member, what role does global harmonization and standards play in helping to advance the field of connected cars?

I can tell you one of our issues. It is basically the fact that in some countries you have GSM (global system for mobile communications) and in other countries you have CDMA (code-division multiple access). The modems which work in Europe are not exactly working in Asia or in North America.

If we take the example of the US, the fact that T-mobile, Verizon, Sprint and AT&T are not working on the same bandwidth, brings complexity. It would be good in the long term if we have some harmonization of the bandwidth and protocols used by all mobile operators across the world.

Do you have any predictions when we will see autonomous cars on the roads?

It will maybe take another 5 to 10 years but car manufacturers are going to differentiate more and more with the service that they will be providing in the car for their consumers and their customers.

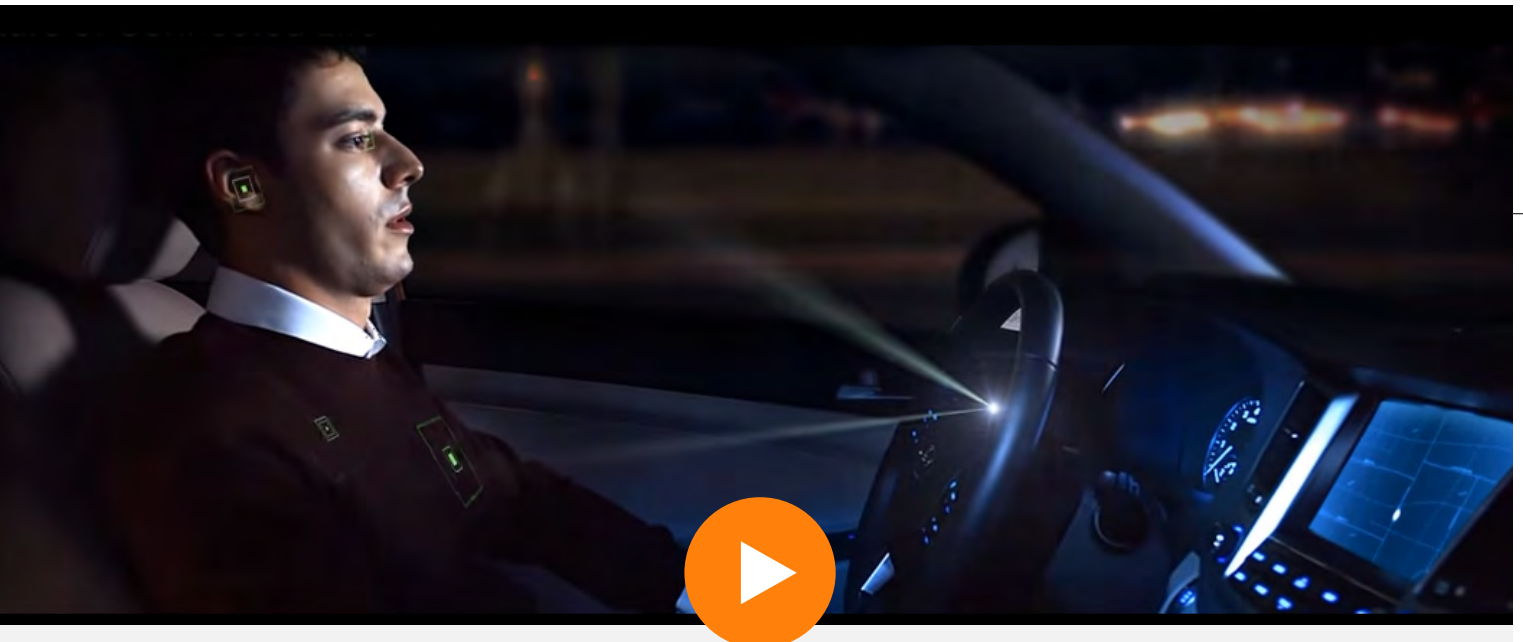
Cisco and Hyundai: ITU members join forces in connected-car innovation

ITU members Cisco and Hyundai have recently joined forces to speed up innovation, highlighting once again the increasing convergence of the automotive and information and communication technology (ICT) industries.

A unique combination of networking and auto expertise will enable the two companies to work together, at a faster pace, to develop next-generation, connected-car technologies.

Cisco and Hyundai aim to create a flexible and more secure platform that would offer a path to innovate and build on smart-vehicle solutions, and Hyundai hopes to feature the new in-vehicle network in its premium 2019 vehicles.

“Hyundai Motor Group’s ongoing collaboration with top global technology companies is a testament to our ‘open innovation’ spirit; one that will prepare us for continued leadership as transportation and mobility undergo an unprecedented evolution,” said Seung-ho Hwang, Executive Vice President and Head of Hyundai Motor Group’s Auto Intelligence Business Department.



Hyundai Motor – Cisco Connected Car Platform

"Our partnership with Cisco is an outstanding example of such efforts, and in 2019 we will unveil the first vehicle equipped with groundbreaking connected-car technologies jointly developed by the two companies."

A unique combination of networking and auto expertise will enable the two companies to work together, at a faster pace, to develop next-generation, connected-car technologies.

Bringing flexibility, lower costs and more security

The development of first-generation solutions to enable 1Gbps Ethernet will significantly increase the in-vehicle bandwidth. The

solutions will provide flexibility, lower costs, and improved security. By enabling IP and Ethernet services, legacy buses and devices will work together with the new Ethernet attached devices and services.

So what's new?

The platform is highly configurable and secure – and will provide 'over-the-air updates' and accelerate the time it takes to bring new capabilities to market, the companies say.

Cisco and Hyundai aim to create a flexible and more secure platform that would offer a path to innovate and build on smart-vehicle solutions.

Also, the use of a 'Software-Defined Vehicle (SDV)' architecture sets the stage for adaptive technologies by offering integrated, multi-layer security, as well as full end-to-end networking – allowing for true sensor integration. It will also enable new, high-speed services through an integration layer between software and legacy hardware.

"Cisco is pleased to bring a standards-based approach in partnership with the automotive industry; one that will help accelerate innovation and increase the value to the consumer. By creating a flexible, scalable, and secure platform, we are allowing automotive companies to deliver better cars – faster," said Ruba Borno, Vice President, Growth Initiatives and Chief of Staff to CEO, Cisco.

The recent announcement shows that by moving to an open, highly secure platform, the companies have laid the groundwork for an exciting future.



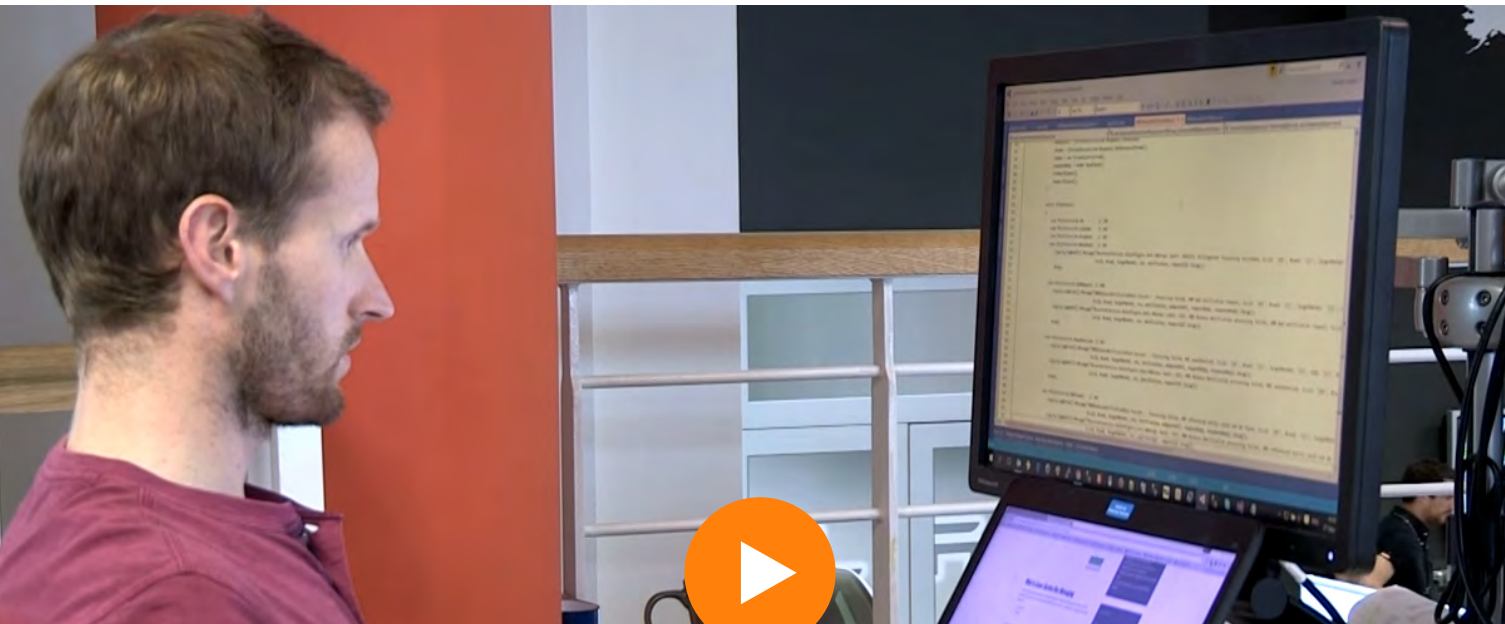
How ITU's newest member, Cubic Telecom, is driving in-car connectivity

Cubic Telecom, a leader in delivering Connected Intelligence and driving in-car connectivity, has just become a member of ITU's standardization arm (ITU-T), underscoring again the importance of increased collaboration between the automotive and information and communications technology (ICT) industries in an era of rapid convergence.

Cubic Telecom's participation in ITU will support the company in solidifying its status as a global technology enabler. Cubic counts some of the

world's leading auto original equipment manufacturers (OEMs) as customers and partners with Tier 1 mobile network operators (MNOs) around the globe to provide seamless connectivity for end users.

"**Cubic Telecom** has become a member of ITU as this is a globally recognized and credible international body. By adhering to its technical standards Cubic can offer its secure solutions on a global scale," said Robert Mourik, Director for Carrier Relations & Regulatory Affairs at Cubic.



Let's see why Cubic chose Microsoft Azure

Connecting over 1 million cars

Cubic Telecom recently announced that it has technically enabled more than one million cars since launching its software platform 15 months ago. It says that cars are connecting every day in more than 35 countries across 40 mobile networks, and the company's customers – original equipment manufacturers (OEMs) – include blue-chip brands within the Volkswagen Group.

Microsoft's Azure Cloud – a natural choice

Using the Microsoft Azure cloud, Cubic Telecom provides the car OEMs with the flexibility to add content services efficiently and to securely scale the connected car programme to their global fleet.

The company is working to further support the range of in-car applications, local content and how the car communicates with its external environment.

“Cubic Telecom has become a member of ITU as this is a globally recognized and credible international body. By adhering to its technical standards Cubic can offer its secure solutions on a global scale.”

Robert Mourik, Director for Carrier Relations & Regulatory Affairs at Cubic

Innovative connectivity services using Qualcomm's Snapdragon

Just a month earlier, in January, Cubic Telecom had announced plans to develop advanced in-car services for next generation vehicles using the cutting-edge application processing and wireless capabilities of the **Qualcomm®** Snapdragon™ automotive modems.

The solution is designed to support automakers with over-the-air feature updates and applications, network and vehicle analytics, and the ability to help drive connected vehicle services worldwide – using a single architecture that takes advantage of multiple wireless operator deployments across regions.





One world, one global SIM: How ITU-allocated 'global IMSI ranges' support IoT and M2M connectivity

Demand for global connectivity for Internet of Things (IoT) and Machine-to-Machine (M2M) applications is motivating an increasing number of IoT and M2M players to apply for ITU-allocated 'global IMSI ranges'.

Global International Mobile Subscriber Identity (IMSI) ranges are signified by the shared Mobile Country Code '901', a code without ties to any particular country. Global IMSI ranges enable 'global SIMs', providing network-agnostic, cross-border connectivity at a single price.

The allocation of global IMSI ranges to ITU members is led by the ITU Telecommunication Standardization Sector (ITU-T) **Study Group 2**, the world's foremost authority on international numbering.

Evolving use cases

Global IMSI ranges have been of great value in providing maritime and aerospace connectivity for both satellite and cellular communications.

In 2007, ITU allocated a global IMSI range to the **United Nations Office for the Coordination of Humanitarian Affairs** as an international identification system for ICT devices involved in coordinating relief efforts in the wake of disasters.

Fresh interest in global IMSI ranges is now emerging from industry players working to offer global M2M and IoT services to energy utilities, carmakers, healthcare providers and more.

Operate anywhere

Mobile Virtual Network Enablers (MVNEs) such as **Transatel**, **Plintron**, **Bics**, **MTX Connect**, **Teleena** and **Emnify** have become Associate members of ITU-T Study Group 2 to apply for global IMSI ranges.

“Through the global IMSI range and with network partnerships, Plintron will be in a position to offer simplified global connectivity solutions for IoT devices,” says Mohan Kumar Sundaram, Chairman and co-founder of Plintron. “This will catalyze growth in the B2B segment of MVNOs [Mobile Virtual Network Operators] and will enable the launch of a new generation of applications in the IoT space.”

“The 901 IMSI [global IMSI range] will enable Teleena to provide its existing and future IoT customers with a truly global solution from a single source,” says Timo Smit, Executive Director of Teleena. “This solution alongside our network and technology-agnostic IoT platform means we offer the best-of-breed global managed-connectivity services for any IoT business case.”

ITU’s assignment of global IMSI ranges (MNC under a shared MCC 901 xx) is garnering considerable interest from across the telecoms industry, particularly amongst Mobile Network Operators (MNOs), Mobile Virtual Network Enablers (MVNEs) and full Mobile Virtual Network Operators, that are seeking to offer seamless global IoT/M2M services.

ITU has also received significant interest from various verticals such as the automotive and energy industries.

In response to this growing demand, ITU is creating more awareness of this global numbering resource through speaking engagements at various regional and global events such as the **MVNOs World Congress** that will be held in Madrid from 23-26 April.



See all the organizations in possession of an ITU-allocated global IMSI range [here](#).

Learn more about global IMSI ranges in the new [infographic](#).

For more information, contact the ITU-T Membership team at ITU-Tmembership@itu.int.

(The automotive industry and ITU membership)



GLOBAL SIM

One world, one global SIM

ITU allocates global IMSI ranges led by the Mobile Country Code "901". These global International Mobile Subscriber Identity (IMSI) ranges enable "global SIMs" - non-geographic SIMs that support service operation across countries, at a single price.

Global SIMs enable cross-border worldwide machine-to-machine (M2M) and Internet of Things (IoT) connectivity, helping manufacturers to build once and sell anywhere.

Evolving technology, evolving use cases

Global SIMs have traditionally been used for maritime and aerospace connectivity for both satellite and cellular communications.

Today, Mobile Virtual Network Enablers (MVNEs) and Mobile Virtual Network Operators (MVNOs) are using global SIMs to offer global connectivity to M2M and IoT industry players.



Bodytrace's weighing scales use cellular technology for data connectivity anywhere in the world.



AeroMobile offers in-flight calling capability.



Transatel's SIM 901 is a universal, network-agnostic SIM that enables global connectivity at a single price.

Enabling global M2M and IoT connectivity

Global SIMs are helping companies to expand IoT and M2M operations seamlessly across countries and industry sectors.



Smart cities
Traffic control, emergency services, smart energy devices.



Smart healthcare
Connecting healthcare devices, providers, patients and insurers.



Smart logistics
Global product and asset tracking.



Smart retail
Secure real-time payments worldwide and digital signage.



Smart manufacturing
Tracking machines worldwide.



Smart utilities
Making electricity, gas and water more efficient.



Smart automotive
Cross-border transport systems, fleet management, emergency calls.

11.6 billion

IoT devices by 2020 connected by over 500 mobile networks

Emergency communications



Global SIMs assist emergency communications in the wake of disasters. ITU has assigned a global IMSI range to the UN Office for the Coordination of Humanitarian Affairs as an international identification system for ICT devices involved in coordinating relief efforts.

How it works, how providers benefit

The 901 code is a shared Mobile Country Code (MCC) without ties to any particular country. The SIM embedded in a device is identified as a global SIM if its MCC is 901. Global SIMs enable network-agnostic, cross-country service operation.

Connectivity anywhere
Land, sea or air.



Unified roaming rates
Single price for connectivity.



Global SIM advantage
Build once, embed SIM in device, avoid network failover.

Greater flexibility
One MNC for all countries.

Join the ITU standards community

ITU is the United Nations specialized agency for information and communication technology (ICT). The ITU membership comprises 193 Member States and over 700 private-sector entities and 150 academic and research institutes.

Participation in ITU standardization is an opportunity to influence the development of the standards that will give shape to 5G systems, the Internet of Things (IoT) and smart cities.



Study groups

Membership-driven study groups develop international standards



Focus groups

Open-to-all focus groups define new directions in ITU standardization



Workshops and symposia

Open-to-all events analyze emerging trends and encourage peer-learning

Allocation of Global IMSI ranges

To learn more about how ITU-T Study Group 2 leads the allocation of global IMSI ranges to ITU members, contact: tsbsg2@itu.int

For more information on ITU-T Study Group 2 activities, please visit: www.itu.int/tsg02

Eligibility to apply for global IMSI ranges (MNC under a shared MCC 901) is afforded to organizations which hold either Sector Membership in ITU-T or ITU-T Associate status in Study Group 2 (ITU-T 2012). Global IMSI ranges are assigned to organizations that satisfy the assignment criteria contained within Annex A of ITU-T Recommendation E.212.





Drive Sweden – a Swedish effort towards the next-generation mobility system

By Jan Hellåker

Program Director, [Drive Sweden](#)

After many years with a society in which the privately-owned car has been a cornerstone for personal mobility, we are about to enter a new era. Many new cars are already well connected via wireless services, and we are also starting to see a rapid increase of advanced features that will make new vehicles gradually become more and more self-driving. Add to this entirely new business models, serving the trend among the younger generations who prefer access to services over owning an asset; and we have a new system for personal mobility being shaped.



“ We believe that tomorrow’s mobility can be safer, more efficient, more environmental friendly, more affordable; while also reclaiming lots of valuable space in cities. ”

Jan Hellåker

No longer will we need to own a car that is standing still 95% of the time, but instead we will be able to subscribe to a mobility service, that combines different vehicles and transportation modes in a seamless, always-connected system with an integrated payment mechanism.

This is the vision of **Drive Sweden**, a vision that we have animated in the “City of tomorrow” video below. As can be seen in this video, we believe that tomorrow’s mobility can be safer, more efficient, more environment-friendly, more affordable; while also reclaiming lots of valuable space in cities.

However, in order for this to happen we need to work in a cross-functional way. For example, a vehicle manufacturer cannot trigger this development only by itself; neither can a city facilitate the transformation of mobility without working closely with lots of other stakeholders.

A few years ago, the Swedish government established a new instrument for addressing complex areas with huge potential to come up with sustainable solutions to challenges in our society, but – at the same time – requiring close cooperation among several stakeholders to succeed.

This video animation was originally created by the Drive Me project in order to build awareness among the general public about what the future will bring in terms of automated cars. It was recently updated and has now been approved by Drive Sweden’s board as a visualization of our common vision for Drive Sweden.



A visualization of our long-term vision

Both these criteria apply perfectly to the opportunities and challenges with the next-generation mobility system, and hence Drive Sweden was awarded a contract to address this domain as one of seventeen such Strategic Innovation Programs, (SIPs). As a SIP, Drive Sweden is currently in the third year of an expected total duration of 12 years, and with a considerable co-funding behind it.

The SIPs are funded by **Vinnova**, the Swedish Innovation Agency, jointly with its sister agencies, **FORMAS** and the **Swedish Energy Agency**. In early 2018, the Drive Sweden partnership had grown to 77 partners including government agencies, several branches of relevant industry and the research community. Along the way Drive Sweden has also gathered interest from several international organizations that are keen to explore this area in this unique, cross-functional way of working, which is very typical for Swedish society.

In order to create this new mobility era, four key ingredients are necessary. We will take a brief look at the status of each of these; Vehicles, Information, Policy, and Users.

Vehicles

Given a population of only 10 million, Sweden is home to an impressive range of vehicle manufacturers who obviously all play key roles in Drive Sweden. Volvo Cars, Scania and the Volvo Group (commercial vehicles) are all world-leading manufacturers with already a strong track record in automation. But Sweden also has new vehicle manufacturers; Einride is a two-year-old company aiming to deploy not only driverless, but even cab-less, trucks on Swedish roads during 2018. NEVS stems from the old SAAB brand, and have several interesting projects going on in which the vehicle will serve more like a component in the mobility services value chain. Lync&Co is another new car brand, with features allowing it to be easily shared.



Information

Information will be critical to build a seamless system for mobility. To date the single biggest Drive Sweden investment has been the creation of the Drive Sweden Open Innovation Cloud. Here all partners are invited to share their data with others, and vehicle manufacturers, public transport operators, cities and national traffic authorities are already contributing to this environment. We have already seen the first examples of how this melting pot of information has been used to create new existing services, relevant for the new mobility era.

Policy

The paradigm shift ahead of us, is not only depending on new technologies and business models, but we will also have to discuss and possibly adjust policies. Regulations around self-driving vehicles is one obvious such case, in which Sweden just concluded a review of the current legal framework. It doesn't stop there; the sharing economy – a crucial component for the new mobility – will be another area requiring changes in the taxation system. Last but not least, future "robotaxis" will likely be a very inexpensive way of travelling that could even compete with existing mass transit. However, existing high-capacity links needs to remain the backbone of the transportation network, and balancing this will likely require some policy work.

Users

User acceptance will be critical for consumer acceptance, and Drive Sweden has started several projects in which the general public will be invited to try the new concepts. Two projects will be launched to address the acceptance of self-driving vehicles, one in Stockholm and one in Gothenburg.

The Stockholm pilot runs in Kista, outside of Stockholm since January 2018, where two shuttles will be in commercial operation along an approximately 1 km long city street from a subway station to the main hotel in the area. After six months in Kista it will be moved and expanded to the suburb of Barkarby, serving as a first/last mile connection from a very dense new development to public transportation hubs in the neighbourhood.

The Gothenburg pilot will start in Q2, 2018, when two vehicles will serve an intra-campus route at the Chalmers University of Technology during six weeks. Later in 2018, the two vehicles will be put in operation in a longer-term remote parking shuttle application at Lindholmen.

A third user-involving project (KOMPIS) is an effort to create a national framework for Mobility-as-a-Service, in which comprehensive efforts ultimately will lead to a nationwide pilot of seamless travel across the country.

Finally, **Drive Sweden** is an open initiative and we welcome international organizations to join us.





Autonomous mobility and the new transportation ecosystem

By Lissa Franklin

Vice President, Business Development and Marketing, [Bestmile](#)

Cities around the world are rapidly outgrowing their transportation infrastructures. Population growth is causing increased congestion and emissions, and as cities grow it can be extremely costly to extend services to new areas. Autonomous mobility services using electric vehicles have the potential to create personalized, convenient transit systems that get travelers from door to door more efficiently and at lower costs than conventional services, ultimately reducing or eliminating the need for personal vehicles and in the process reducing congestion and pollution.



“Project ‘SmartShuttle’ has been so successful that PostBus is expanding the service.”

Lissa Franklin

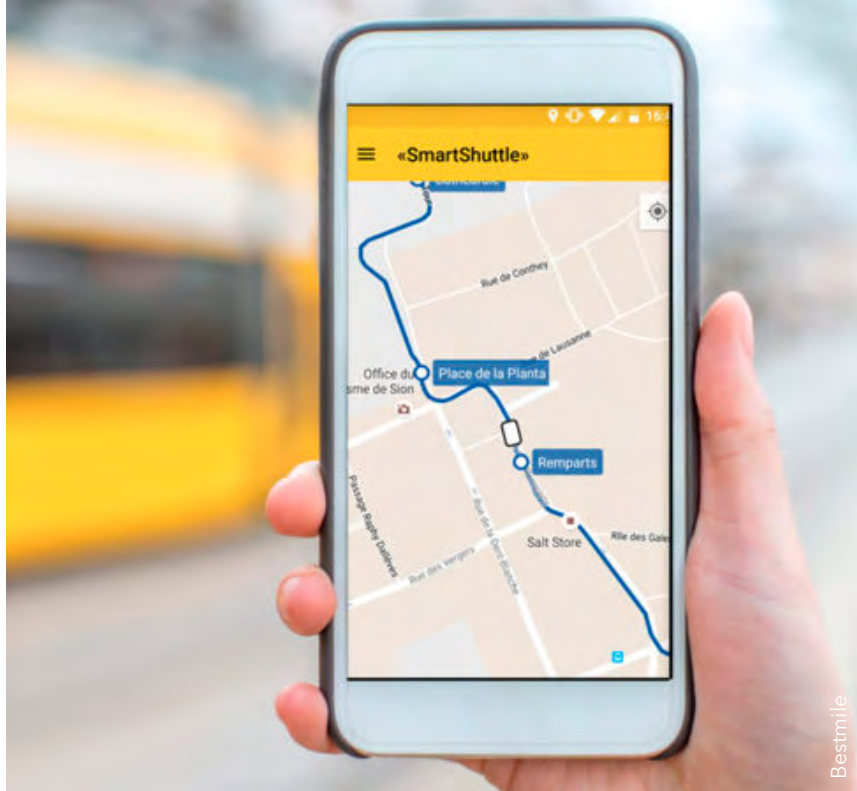
(Connected cars for smart cities)

The benefits of autonomous mobility don't lie solely in autonomous vehicles, but in what they can offer when they're operated and managed collectively in an integrated ecosystem. Developing mobility solutions that can manage multiple vehicle types and services and that integrates seamlessly and with existing transit systems are key to these services realizing their potential to improve existing transportation services.

Success in Sion, Switzerland

For example, in the city of Sion, Switzerland, PostBus, the country's largest bus transit company, was looking for a way to cost-effectively extend transportation service to areas not currently served by its famous yellow buses. Autonomous shuttles can help public transportation operators expand service areas with minimal new infrastructure, using electric fleets to reduce traffic and improve air quality. PostBus also wanted to validate customer acceptance and gain insights into the challenges of integrating autonomous shuttles into public transit.

PostBus and Bestmile worked together to create an autonomous shuttle service for the system's desired routes and schedules. The service consists of a 2-mile/3.2 km fixed-route loop with multiple stops in neighborhoods with narrow cobblestone streets shared by autos and pedestrians. Just seven months after announcing Project "SmartShuttle," the service was introduced to the public to support daily service throughout the city.



The Bestmile Mobility Services Platform provided PostBus with a turnkey solution to deploy, manage, and optimize autonomous shuttles. Bestmile's platform manages vehicles and service delivery and provides an operator dashboard and field agent applications to monitor and optimize services, along with a complete set of white label traveler applications. In just a few months, PostBus became the first public transit operator in the world to deploy autonomous shuttles for passenger transportation on public roads.

Public acceptance has been strong – the vast majority of autonomous shuttle travelers expressed "no or very minor concerns" about the service – a much higher acceptance level than before the system was implemented. Thousands of travelers have made the shuttle a part of their regular transportation routine. Project "SmartShuttle" has been so successful that PostBus is expanding the service to connect with the city's train station and is planning to implement autonomous shuttles in four more cities.

Integrating into existing systems

The primary challenges that transit agencies face in deploying autonomous mobility at scale have to do with managing diverse fleets of vehicles, integrating new fleets with existing transportation systems, and connecting multiple modes of human-driven and autonomous vehicles as new mobility services mature.

Many different businesses are developing autonomous vehicles, and thus far most are working independently of one another. Each is using different technology stacks to guide and communicate with vehicles. Managing the many types of vehicles and the technologies they use poses a significant challenge.

Many cities already have advanced public transit systems and it is unreasonable to expect agencies to abandon existing systems. It is critical that new mobility services are easily integrated into existing operator systems and co-managed to synchronize services and to minimize operational complexity. For example, autonomous shuttles can be aware of train and bus schedules and coordinate arrival times to streamline service for travelers.

The shift to autonomous mobility is unlikely to be swift. There will be a transition period where human-driven vehicles and services co-exist with autonomous mobility. Managing human-driven and autonomous vehicles and services in concert requires management solutions that can communicate with vehicles and drivers regardless of the type of vehicle or mode of operation being used.

A Vehicle agnostic approach

What is needed is a mobility management platform that can overlay any vehicle brand or type to manage multiple types of vehicles and fleets, that connects seamlessly with existing transit operator systems to provide a coordinated service delivery, and that supports both human-driven and autonomous services. This makes it easy for any service provider, new or existing, to create new mobility services or to integrate these services into existing service offerings in synchronization with surrounding transportation options for multi-modal mobility solutions.

Bestmile projects

Bestmile is working with the leading mobility service providers, vehicle manufacturers, and autonomous technology companies to build the ecosystem needed to enable new mobility services to achieve their potential to improve the quality of life in cities around the world. The platform makes it easy for new and existing mobility service providers to deliver autonomous shuttle, ridehailing, robotaxi, and micro-transit transportation solutions. Current projects include autonomous vehicle systems carrying passengers on four continents, and new solutions are in the works to enable providers to manage human-driven services alongside autonomous vehicles with the ability to transition to full autonomy when appropriate.



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