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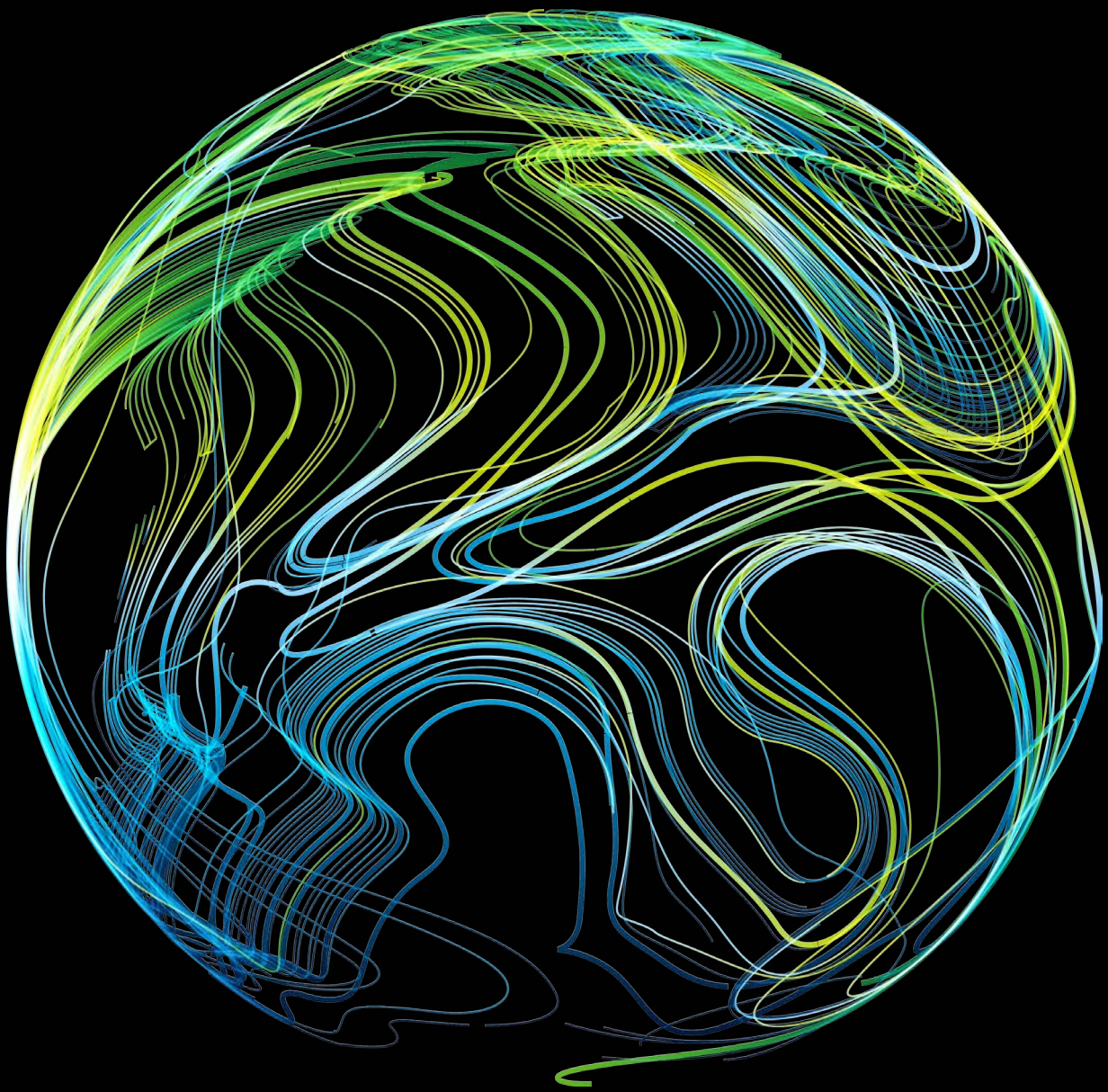

2017 Technology, Media and Telecommunications Predictions

Middle East edition

Foreword

Welcome to the 2017 edition of Deloitte's Predictions for the technology, media and telecommunications (TMT) sectors.

For the first time in our 5 years of releasing our Middle East edition, we are including predictions for all three sectors together, and not splitting them into different sub-industries. This, by itself, is a reflection of the exciting industry we are in. An industry that continues to blur the boundaries of innovation, and reshape how operators, media players and technology companies collaborate and interact in an increasingly integrated market place.

Across the global and regional predictions, we believe that the distinction between sectors is fast becoming obsolete. The introduction of dedicated machine learning capability to smartphones is relevant across all industry sectors, not just the technology or telecommunications verticals. The transition to 5G and resulting implications on machine to machine communication is a critical enabler to new technology adoption, starting with self-driving cars. IoT itself is the epitome of this borderless ecosystem with operators and technology companies working closely together to shape the cities and lives of tomorrow. Cybersecurity is an evergreen topic in the region raising threats to media companies and Telcos equally, and requiring cross sectorial regulations and safety measures.

With smart cities and nations so high in the agenda of the Middle East countries, our region is at the forefront of this borderless market place, with regional Telcos talking more about AI and IoT than network expansion. In this day and age, breaking borders, albeit at industry level, is a refreshing twist. 2017 promises to be yet another exciting year for the TMT sector. We wish you all the best for this year and trust that you and your colleagues will find this year's predictions a useful stimulant in your strategic thinking. We look forward to discussing them with you.

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Match made in heaven: self driving and 5G in GCC

Deloitte predicts that in the next three years the GCC will see a steady introduction of autonomous connected vehicles in controlled, public transport routes. Post 2020, we will see a greater surge in driverless technology, making autonomous vehicles part of the mainstream across the region. This initial launch will include cars which are not fully driverless but connected and assisted, exchanging valuable road information within current networks. 5G will enable vehicle-to-vehicle connectivity technology by lowering costs, battery consumption and latency for all machine-to-machine communication applications. When connected and driverless vehicles become commonplace, telecom operators will have to play an important role in driving the adoption of smart cars by focusing on continuously enhancing the futuristic customer experience.

Current initiatives

The UAE is one of the global leaders in driverless technology. In 2015 Etisalat and Nissan teamed up for the region's first connected car deployment. Starting with the 2016 models of the Nissan Maxima and the Nissan Patrol MY16, Nissan pre-installed a small device within the car, connected via an Etisalat M2M SIM card[89]. In April 2016, Huawei and Etisalat completed the first successful trial of smart parking in the Middle East. Huawei's partnership with Etisalat resulted in the first application of narrowband-IoT machine-to-machine communication[90]. Dubai has already launched its Autonomous Transportation Strategy, which states that by 2030, 25% of all trips in Dubai will be driverless. Dubai's Roads and Transport Authority (RTA) and Dubai Properties have already launched a fully functional autonomous 10-seater vehicle that has been shuttling passengers over a 600-meter-long track in Business Bay[91].

Setting the wheels in motion

Following the 5G launch in 2021, we predict that driverless technology adoption will grow exponentially until all vehicles will be capable of driving autonomously 20 years later. It is evident that vendors, flagship automotive industrialists and major cities are working together to move towards mature levels of connectivity, and that key to this evolution is the discussion on next generation networks. 5G is being developed to support a wide range of M2M and IoT applications, and amongst these are services and applications that will truly enable connected cars and driverless vehicles. This vehicle connectivity will involve several dimensions, as cars will need to connect to and exchange information with:

- Other vehicles
- Roadside infrastructure
- A backend server (e.g., from a vehicle manufacturer for analytics),
- The Internet
- Pedestrians
- A vehicle service center

Drivers and road infrastructure operators are already sharing a considerable amount of information about road conditions, police controls, accidents, points of interest, etc. However, coverage is limited on certain roads in rural areas and sometimes information on road conditions takes several seconds to arrive[92].

Why 5G for connected cars

For connected cars to exist, data has to be ubiquitously available more or less everywhere. This data does not necessarily have to be stored, but it must be transferred fast and efficiently from central and local points to various destinations, particularly to vehicles on the move. 5G will play a central role in offering viable solutions for the special requirements implicit in vehicle communication. More specifically, a fit for purpose 5G is necessary to resolve the issue of 1) network coverage along roads and in low-density areas where network coverage cannot be guaranteed, as well as to 2) offer ultra-fast, low-latency communication necessary for cooperative decision making – both critical elements in the implementation of driverless technology[93].

As vehicles advance towards higher autonomy and need to deal with increasingly complex road situations, there will be limitations and therefore a need for complementary communication technology for the exchange of cooperative information with higher bandwidth and improved reliability. Developing new parallel network infrastructure to cover all required areas would cost around US $4,300 per square kilometer. Leveraging the current cellular infrastructure (which already covers the necessary areas) with required upgrades on the other hand would realize the benefits at a fraction of these costs[94]. Since 5G characteristically features network slicing, we predict that both the automobile and ICT sectors will work towards a single shared network infrastructure with the establishment of scalable and deployable network slices comprising all necessary capabilities within the overall 5G infrastructure. Network slices are then used by specific operators involved in providing network connectivity to driverless vehicles while ensuring the prioritization of specialized services such as road safety over other Internet traffic.

What will connected vehicles be able to do?

Once the underlying technology is rolled out we predict that fully autonomous self-driving cars will be equipped with the following functionalities, bringing tangible benefits to transportation in a number of ways.

1. Automated overtaking: Cars will be able to perform overtake maneuvers not only on highways but also on two-way roads, where vehicles may be oncoming. This will be enabled by a broad range of sensors as well as cooperation among vehicles on multiple lanes, to create the necessary gap to allow the

overtaking vehicle to quickly merge onto the lane corresponding to its direction of travel, allowing the traffic to flow seamlessly within speed limits[95].

2. Cooperative collision avoidance: Mature AI technologies will allow vehicles to compute the optimal collision avoidance actions and apply them in a cooperative manner. Collisions will be avoided through driverless cars communicating with road infrastructure, other vehicles and other data such as weather and road conditions[96].

3. High density platooning: This is the creation of closely spaced multiple-vehicle chains on a highway. The benefits associated with this phenomenon include fuel saving, accident prevention and increased traffic flow. This requires cooperation among participating vehicles in order to form and maintain the platoon in the face of dynamic road situations. High density platooning will reduce the current distance between vehicles down to one meter. Since on-board sensors are not able to cope with such short distances, vehicles within a platoon will constantly exchange positioning and intention information in real time. This will allow following vehicles to implement throttle and brake controls, keeping the distance constant[97].

4. Bird's eye view: In the age of connected vehicles, intersections equipped with sensors such as cameras or radar can provide this streaming information to approaching vehicles which are also equipped with vehicle sensors including camera, radar, and ultra-sound. Data from intersections and other vehicles are then processed by the vehicle to build a bird's eye view of intersections, assist vehicles in determining future trajectories, and identify eventual pedestrians or free places. Exchange of data streams between devices and vehicles must be supported by very low latencies made possible by 5G[98].

5. See-through: Consider a situation where a pedestrian is crossing the road in front of a truck which is blocking a car. Driverless technology will allow the truck camera to detect the situation and share the image of the pedestrian with the car behind the truck, which sends an alert and shows the pedestrian in virtual reality on the windshield board. This use case requires very high reliability, network availability and low latency (a few tens of ms) as well as a high data rate to share all relevant data with vehicles and pedestrians in the neighborhood[99].

6. Vulnerable road user (VRU) discovery: In a world of connectivity, vehicles periodically announce their presence and position where pedestrians and cyclists carrying a mobile device discover vehicles in proximity and begin announcing themselves. In cases of imminent danger, mobile devices trigger a warning notification which vehicles in proximity incorporate and potentially notify both the driver and the pedestrian in danger. Key to the fulfillment of this use case is the reliable localization of the users, which will be possible only by increasing the accuracy of relative positioning, through combining satellite technology with 5G[100].

7. Augmented reality-based navigation: Real-time traffic information, including video feeds for complex intersections, can be received from sensors such as cameras and radars installed as part of roadside infrastructure and from other vehicles in the vicinity and overlaid with geographic information so as to provide enhanced situational awareness and augmented reality-based navigation. This would require that high bandwidth data streams from other vehicles and roadside infrastructure are provided to the navigation system with very low latency[101].

The unwinding road: a continued role for telcos

The key selling point of driverless cars is that they offer a transformed futuristic customer experience which is personalized, contextual and efficient, making transportation more secure, comfortable and easy. Telecom networks will provide the connectivity between the car and the corresponding backend in which these services are running. These telecom networks together with the backend operations will act as a complementary business platform for the automotive industry enabling this enhanced customer experience; Therefore the more robust, secure, agile and efficient the communications, the safer and more seamless the customer experience. Furthermore, in order to prevent collision due to an unexpected event, vehicles will have to act autonomously just before the collision takes place. The vehicles would not only exchange trajectories, but also other numerous parameters of sensor data with increasing message sizes to continuously re-adjust their positions. This level of automation will require lower latency and higher reliability, which is exactly where 5G will come in play.

The bottom line

With the reality of smart cities gaining traction, not only will people be connected to each other but so too will machines, automobiles, and city infrastructure, driving mobile data traffic to increase between 5,000 to 10,000% in the next 10 years. During this time, telecom operators will complement their traditional role of providing required network infrastructure by becoming the key provider of IoT platforms. As IoT application complexity increases with time, 5G adoption in these areas will surge in order to leverage lower latencies and longer device battery life. This enables telecom operators to target product diversification through industry vertical solutions, for example in transportation. The prospect of this future is exciting, and significant planning and investments in network infrastructure have been initiated, but wide-scale deployments should not be expected before 2020.