Hello Future Articles Archive

Year: 2022

Welcome to the Hello Future articles archive for the year 2020. This document compiles all articles published during this period, reflecting the ideas, innovations, and insights that defined the year.

The purpose of this archive is to preserve and share significant contributions from the Hello Future community, while providing an overview of developments and trends.

Digital culture | Article

At the heart of CES 2020

Monday 20th of January 2020 - Updated on Wednesday 22nd of June 2022

So, what was new at the Consumer Electronic Show that took place in Las Vegas from 6th to 9th January? 5G, AI, connected objects, resilience, transport… An overview in five keywords with the help of Olivier Ezratty, a consultant and author who publishes a report on CES each year.
The need is felt to create a more responsible digital offer and even to manage a kind of digital excess.

5G

It's not at the LAS Vegas CES that innovations in the area of smartphones are the most prominent. Both manufacturers and operators save these for MWC Barcelona, which will take place at the end of February. However, several innovations should still be mentioned in the wake of 5G, of which the first applications were presented, "notably for broadcasting 8K videos, such as the France Télévisions experiment at Roland Garros in May 2019", Olivier Ezratty notes.
As according to general opinion, will the applications not be "firstly b2b"? "It's possible, he replies, but we shouldn't underestimate human creativity, which is capable of rapidly exploiting any new technological ability. Applications based on virtual and augmented reality could play this role."

Artificial Intelligence

More so than last year, AI was leading the pack this year at CES. All the major exhibitors gave demonstrations and delivered their key messages in this area, starting with Google and Apple, whose voice command sales battle knew no ceasefire in the show's aisles, in fact quite the opposite. Another raging battle is that of AI components, Olivier Ezratty observes, "as much for equipping data centers as for edge computing and connected objects". Exhibitors in this area detected by the consultant include: Nvidia, Intel, Horizon Robotics, and, on the French side, STMicroelectronics, Cartesiam (hosted by the latter), Kalray (hosted by NXP), and GrAI Matter Labs. And of course, Qualcomm, HiSilicon, Mediatek, etc. who equip smartphones and set-top boxes.

Where there's AI there's privacy, or its policies, and this theme was not missing from CES this year. "AI integrated in connected objects also makes it possible to better respect privacy, Olivier Ezratty writes. After Snips and Linagora (present on the Eureka Park Business France stand), others are offering means of managing voice command locally."

AI is also being developed in the area of healthcare and Olivier Ezratty highlights the wide variety of diagnostic tools, "some offer to perform a medical check-up just by examining your face with a webcam".

Connected objects

Like each year in Las Vegas, CES is in some ways the connected objects show. The home, family, health, sport… are the usual fields of application but we can now add sleep to this list, an area in which, Olivier Ezratty notes, "the creativity of startups is rather advanced", as well as "anything that enables surveillance of babies and pets".

Whether they're about sleeping better, meditation, or still about capturing our emotions, for the most part the solutions rely on brainwave-capturing (EEG) headsets. For Olivier Ezratty, "the most surprising one is that of French company NextMind, which analyses brainwaves from the visual cortex that are picked up through 9 EEG sensors, and deduces what we're looking at thanks to a bit of AI. It can be used in particular for video games."

The consultant is surprised at the lack of innovation in the robotics field, an area which, he deplores, "always moves at the speed of a snail being slowed down by a tortoise".

"We always see the same telepresence robots, the service robots, i.e. moving tablets that don't hear what is being said for the noise, and small programmable robots for educational purposes. Of course, there are some robots that try to capture human emotions and adapt to them but this is, thankfully, highly rudimentary.

Resilience

A feature of the 2019 show, the notion of resilience, had not disappeared this year. Beyond the environmental questions, "the need is felt to create a more responsible digital offer and even to manage a kind of digital excess", Olivier Ezratty observes. Thus, privacy was the subject of debate in which a representative of Apple took part; a first at CES and even "probably in a major show in the world".

Resilience from an environmental perspective was at the heart of the Eureka Park Climate Change Innovators awards.

Worth mentioning according to Olivier Ezratty are an air conditioning system that makes water evaporate (ST Engineering Innosparks Airbitat Compact Cooler), a French solar energy sharing system (Sunleavs), photovoltaic solar panels equipped with ultra-transmissive glass that improves efficiency by 15 % (Edgehog), a

carpooling application (RideSVP Green Carpool Network), a technology for manufacturing flexible electronic circuits (Omniply Technologies Mekal), and a solution for reducing fossil fuel consumption by using an ethanol-based fuel in traditional motorbikes (Green Systems Automotives).

He also mentions Odd.Bot (The Netherlands) and its Project.BB, a small robot on four wheels that is supposed to roam beaches and rid them of contaminants, of plastic in particular; as well as Zero Mass Water (USA) and Watergen (Israel), two companies who offer a solution for collecting water from the air, as long as an energy source is available, be that solar or other.

Transports

For several years now, CES has played a leading role in the transport technology sector. "Electric propulsion and range are still on the agenda; however, it is on the technological side of assisted-driving or autonomous vehicles that innovation is most visible" this year.

Autonomous vehicles mean LiDAR and, in the aisles of CES, competition was visible "between traditional vehicles *à la* Velodyne with their rotating laser and new so-called solid-state versions without mobile parts, such as those at Innoviz, LeddarTech, or Quanergy, not to mention the high-resolution radars that are starting to compete with LiDARs, such as those of Vayyar".

In terms of LiDAR and more broadly of autonomous vehicles, AI is never far away, of course, as it's about gathering and interpreting considerable volumes of data in real time. Olivier Ezratty brings French company Outsight to our attention, "who is a best-in-class in this area with a multifrequency LiDAR and a high-level interpretation AI". Outsight won a CES Innovation Award and has announced partnerships with Faurecia, Safran, and ADP.

Drones were the stars of this year's CES, which "sanctified their professional uses and the software solutions that accompany these, in particular for automated guidance", the consultant underlines, adding: "also to be mentioned is a topic of high interest combining drones, aerial imagery, and agriculture: hyperspectral imaging, which enables very fine analysis of the composition of soils and harvests."

Data | Article

Mahali ensures e-commerce in Africa is properly addressed

Monday 20th of January 2020

The development of e-commerce in Africa is still facing a fundamental pitfall: the absence or lack of structuring of addressing systems. Due to the lack of a precise or complete postal address, delivering products is a risky business—at the moment, half of all deliveries cannot be made. The Mahali web app offers a simple, digital response to this problem which is tailored to local practices and uses.

Offering buyers, sellers and couriers a digital location service tailored to local practices.

Although e-commerce is now a standard component of everyday life for hundreds of millions of people, its development varies by region. In Africa, the growth of digital sales remains constrained—among other things—by payment and delivery issues in countries where the use of banks is not widespread and addressing systems are not necessarily advanced. For example, in Ivory Coast, 99% of the population does not have a postal address (United Nations report from 2011).

Digital for an "essential" service

This observation led Alexis Bafcop and Géraud Lacaze, two Orange engineers, to create Mahali, which means "place" in Swahili. This digital location service is tailored to the local practices of buyers, sellers and couriers. In countries where people tend to indicate their position by using a location description and referring to landmarks, Mahali translates this use into a simple web app that is available on a smartphone (www.mahali.me). The tool incorporates a database of locations which is fueled in part by the users themselves, who can provide their address by indicating the town, district and landmarks with photos. The courier of a package receives a code which, once registered in Mahali, allows them to access the necessary information and send a delivery window to the buyer. The buyer can then pay with their mobile (Mahali currently integrates this functionality with Orange Money).

In addition to being used for e-commerce, the address created on the app can be used for other purposes such as guiding emergency services or visitors to the address.

Born on the ground

Like Orange Money, Mahali was created from closely observing and analyzing the land and habits of the inhabitants in Abidjan, Ivory Coast. "The team immersed themselves in studying the ways used to locate and describe a place in the region," explain Alexis Bafcop and Géraud Lacaze, the co-founders of the app. "We interviewed people in e-commerce warehouses, couriers, buyers, founders of start-ups, etc., to identify the reality and issues faced by various players in the field. We then developed an initial simplified version of the service (MVP – minimum viable product) that enabled us to validate our hypotheses and solutions first with a few e-traders and buyers as early as June 2019 before finally launching a complete version in Abidjan on December 5, 2019."

Originally submitted via the Ideas Wall, a tool for internal ideation within the Group, the project was subsequently supported and accompanied by Orange's intrapreneurship structure, Intrapreneurs Studio. In addition, Mahali is based on the expertise of Orange entities such as Orange Labs Services, XDLAB (UX design), and receives a great deal of support from the Orange Côte d'Ivoire teams: Orange Money, Corporate Services, Customer Test Center and data scientists.

Artificial intelligence to the rescue

The launch on December 5 was just the beginning of the road. Currently in its beta version, Mahali is intended to grow and offer new functionalities to its users. AI is already used to moderate user photos, but the team wants to go further and is working in particular on an IA/data analysis site to study the data relating to the landmarks provided in the app. "The service has been designed to be universal, accessible and simple to use. But the way that location descriptions are formulated can be tedious from a user perspective. A semantic analysis of the descriptions and landmarks created on Mahali will make this task easier by taking local habits into account. For example, Ivorians use travel time more than distances to locate places, often refer to three landmarks, and use pharmacies a lot as a reference point. Ultimately, we can rebuild a description from the user experience."

An interface with Orange Money is also being developed to secure the act of payment. In the coming months, the solution will also be deployed in other countries, including Senegal and Cameroon.

To learn all about and follow our developments, visit mahali.biz.

Artificial intelligence | Article

X-AI: understanding how algorithms reason

Monday 20th of January 2020

Explainability of artificial intelligence defines the ability to explain the way in which an algorithm works in order to understand how and why it produces a particular result. This new field of research is also a democracy issue and a scientific challenge.

It's the "black box" phenomenon: algorithms whose inputs and outputs can be observed, but whose internal workings we do not understand. The question of confidence is pivotal to the future of AI. A lack of public confidence would hinder its development. Tomorrow, it will therefore be about finding a satisfactory compromise between efficiency and explainability.

Advances made by artificial intelligence (AI) and its increasing use in sensitive areas such as health, justice, education, or banking and insurance are forcing us to question ourselves about the (regulatory, ethical, environmental, etc.) issues that are raised by these technologies.

Among these issues, Explainable AI (or X-AI), is emerging as one of the criteria for an ethical AI. With algorithms being more and more involved in decision-making processes that can have a significant impact on the lives of those concerned, it is important to understand how they "reason".

Thus, the doctor who makes a diagnosis with the help of a decision-making algorithm or the judge who imposes a sentence based on recidivism-prediction software should be able to know how these systems achieve such or such a result. In the same way, someone who is refused a bank loan by a credit scoring algorithm should be able to know why.

The problem is that these technologies, and in particular those based on machine learning techniques, are often opaque. It is sometimes very difficult – even for their developers – to explain their predictions or their decisions.

It's the "black box" phenomenon: algorithms whose inputs and outputs can be observed, but whose internal workings we do not understand. In effect, as opposed to traditional algorithms, which follow a set of predetermined rules, machine learning algorithms automatically generate the rules they follow by themselves.

For fairer and more reliable algorithms

According to the <u>Villani public report on artificial intelligence</u>, explainability of AI is one of the conditions of its social acceptability.

First of all, the report reminds us, it is a "question of principle" because as a society we cannot allow certain important decisions to be made with no explanation: "Without being able to explain decisions taken by autonomous systems, it is difficult to justify them: it would seem inconceivable to accept what cannot be justified in areas as crucial to the life of an individual as access to credit, employment, accommodation, justice and health".

Several examples have shown that algorithms can take "bad" decisions due to errors or biases of human origin that are present in the datasets or the code. By making their reasoning transparent, explainability helps to identify the source of these errors and biases, and to correct them.

This also makes it possible to guarantee the reliability and <u>fairness of algorithms</u>, and thus to establish public confidence. This question is pivotal to the future of AI, as a lack of public confidence could hinder its development.

Improving explainability of algorithms without adversely affecting efficiency

What, precisely, does the concept of explainable AI imply?

Explainability – or interpretability – is a component of algorithm transparency.

It describes the AI system's property of being easily understandable by humans.

The information must therefore be presented in a form that is intelligible for experts (programmers, data scientists, researchers, etc.) but also for the general public.

In other words, publishing the source code is not enough, not only because that doesn't systematically make it possible to identify algorithmic bias (the running of certain algorithms cannot be apprehended independently from the training data), but also because it is not readable by a large majority of the public.

Furthermore, this could be in conflict with intellectual property rights, as an algorithm's source code can be assimilated with a trade secret.

What's more, X-AI holds several challenges. The first is in the complexity of certain algorithms, based on machine learning techniques such as deep neural networks or random forests, which are intrinsically difficult to grasp for humans; then there is the large quantity of variables that are taken into account.

Second challenge: it's precisely this complexity that has made algorithms more efficient. In the current state of the art, increasing explainability is often achieved at the expense of precision of the results.

A new field of research

Research works on X-AI are still fairly recent. In 2016, the United States Defense Advanced Research Projects Agency (DARPA) launched its program aimed at creating a suite of machine learning techniques to "produce more explainable models, while maintaining a high level of learning performance" and "enable human users to understand, appropriately trust, and effectively manage the emerging generation of artificially intelligent partners".

It's all about fostering the development of explainable models "by design" (i.e. right from the design phase) that are capable of describing their reasoning and of identifying their strengths and weaknesses, in combination with the production of more intelligible user interfaces.

In France, the National Centre for Scientific Research (CNRS), the Institute for research in computer science and automation (Inria), and several research laboratories of the Hauts-de-France region have decided to join forces to reflect on these questions within an alliance called "humAIn". Their work draws notably upon a set of symbolic AI techniques, "based on …"symbolic" (human-readable) representations".

On the startup side, we can mention craft ai, which offers AI APIs "as a service". This fresh French startup has chosen to limit its offer to explainable models by using decision trees, which are graphs that represent the hierarchy of the data structure in the form of sequences of decisions, with a view to predicting a result. It is undertaking a huge research effort to improve these algorithms, industrialise them, and make them more accessible to businesses.

Algorithms squared

The number of explainable-by-design AI systems remains limited, which has led to the emergence of "algorithms that explain algorithms". This means adding an extra layer of explainability to the black box models that make it possible to understand how and why an algorithm produces its results, for example by highlighting the importance of certain variables or by representing the decision-making process.

The complexity introduced by machine learning has enabled considerable improvement of algorithm performance in many areas. This quest for efficiency has often been carried out at the expense of transparency. Today, explainability is seen ever more as an important criterion of a "good" algorithm, more so with regulation evolving in this direction. Tomorrow, it will therefore be about finding a satisfactory compromise between efficiency and explainability.

Internet of things | Article

How digital can make cities more resilient?

Monday 27th of January 2020 - Updated on Monday 2nd of May 2022

At a time when many of the world's regions are suffering the consequences of climate change, cities, which are home to more than half the global population, are under pressure: they must not only become smarter but also more "resilient".
For the first time in human history, cities are home to more than 50% of the population. In Europe, this figure even reaches 77%. 140 cities account for 44% of the European GDP. Most cities are faced with major challenges related to the environment, traffic, pollution, or insecurity.
Cities, where resources and competences are concentrated, are also the best laboratories for the smart solutions of tomorrow. Technology is becoming a phenomenon that is central to these large cities: the number of connected devices in the world is continually growing exponentially, rising from 15 to 75 billion between 2015 and 2025 according to Statista.
On this matter, the experts are unanimous: making a city truly smarter, isn't just about installing sensors and software, it's about using technology and data to serve a better quality of life, as climate change sets fresh challenges.
The resilient urban fabric requires a systemic approach to the city, which must be considered as a complex system with its personality, its own specificities.
In the face of climate change, technology could help make cities resilient, in other words cities that are thought out according to the disturbances they are likely to suffer, cities that will be capable of adapting to and resisting climate crises.

Greater agility and robustness

Author of a notable report on the subject, the McKinsey Global Institute thus lists three essential layers to the smartness of a city: the technical layer of course, which includes networks of interconnected devices and sensors; the software layer made up of data analysis applications; the human layer:

this is the way in which citizens adopt these tools to make better decisions and change their behaviours.

The potentials are huge. The McKinsey Global Institute explains, for example, how tens of digital solutions currently available for cities can make infrastructure systems more agile and more robust as well as provide solutions in terms of energy or intervention management in the event of a natural disaster.

Health, energy, waste, and mobility

In the area of health, telemedicine is the most promising; but there is also air quality monitoring and that of infectious diseases.

In the energy sector, smart street lamps get mentioned, but also energy consumption tracking systems on the scale of a neighbourhood that enable dynamic electricity pricing, which could influence virtuous behaviours. In this area, the talk is of Enernet or the Internet of energy, with data promising to improve network energy efficiency so much.

We could continue this list for a long time, looking for example at water consumption, where leak detection and management systems make it possible to limit wastage. Waste management can also be improved thanks to tools that optimise collection routes; whereas smart traffic lights, real-time information on public transport, and predictive maintenance of transport infrastructures will decongest the city.

In terms of mobility too, digital systems make it possible to model behaviour: by knowing supply and demand at all times, it is possible to adjust transport offerings by encouraging carsharing, by taxing the use of personal vehicles, or by easing access to the city's car parks.

Systemic approach

These systems implicate all the stakeholders of the urban fabric, starting with its population, with transmission and reception of information in real time contributing to the city's self-regulation. What matters is not the number or the variety of applications but their interconnection to the residents' service.

For Isabelle Thomas, professor of urban planning at The Université de Montréal, "the resilient urban fabric requires a systemic approach to the city, which must be considered as a complex system with its personality, its own specificities".

And with its main components, she adds, of strong leadership and integrated governance, in other words an implication of the whole set of players and stakeholders.

Without a doubt, resilience is a future value for urban planning. In fact, the 11th Sustainable Development Goal (SDG) set by the UN in 2015, recalls the urgent need to "make cities inclusive, safe, resilient and sustainable".

Rotterdam, champion of resilience

Should there be a ranking of the most resilient cities, Rotterdam would undoubtedly stand on top of the podium.
In effect, The Netherland's second largest city is the first metropolis to put in place a resilience strategy.
Among the 68 initiatives working together to prepare the city for the hazards of the 21st century, are a citizen-managed green energy production company, urban farms on the roofs of buildings, and "water squares", these pedestrian or play areas that only reveal their resilience when there is a flood, by absorbing excess rainfall.

But Rotterdam being an industrial port of utmost importance, its strategy is built firstly around the development and securing of digital networks dedicated to the running of port activities, such as that of controlling the energy needed for pumping water.

Given the importance of providing a robust internet connection to the actors of the resilient city, the Rotterdam Internet Exchange (R-iX) foundation is financing ultra-fast network infrastructure and innovative internet service projects in the region.

It is also working on the mutualisation of local internet providers' capacities thanks to "peering" technology: this method, which facilitates internet traffic exchange, makes it possible to guarantee provision and continuity of digital services and systems, even in difficult conditions.

Data | Article

Identity, the foundations of digital services

Monday 3rd of February 2020 - Updated on Wednesday 24th of March 2021

With Mobile ID, the French carriers which are members of AF2M are proposing a new offer to simplify their customers' experience with partner digital services and thereby enhance confidence in their usage. Orange has been one of the driving forces behind this initiative.
This offer is made possible thanks to the availability of data from mobile carriers and, of course, the consent of the customer.
With Mobile ID, operators can limit identity fraud, optimise how online accounts are created and make user identification more reliable.
In 2020, Internet users continue to create between 10 and 20 customer accounts every year. The process is too complex — 35% of purchases are abandoned because of online registration and one of the main ways in which fraud is committed is by hacking accounts. Identification, therefore, is one of the key challenges of the decade in terms of user experience. With Mobile ID, carriers are offering to limit identity fraud, optimise how online accounts are created and make user identification more reliable, all thanks to the data they possess with the consent of their customers. When compared to players like Apple or Facebook, which are currently unable to check the identity of their users, a carrier like Orange can capitalise on reliable, verified data with a high degree of data completeness.

Carrier data as a source

Mobile ID is a B2B2C solution (selling an offer to a business that is targeted to the end-customer) that includes four products: Form ID to automatically fill in an online form, Home Verify to obtain instant proof of address, Match ID to check the consistency of information provided by a user and SIM Verify to manage the risk of SIM card fraud. Mobile ID can be integrated with the service provider's customer experience. The user moves through three stages: identification, consent in accordance with GDPR (General Data Protection Regulations), data retrieval and sharing. Orange already uses Mobile ID resources during the registration process for its mobile banking service, Orange Bank. But the service is compatible with many

sectors: banking transactions like e-commerce, insurance, transport and social networks.

Building a simple and secure experience

Frederic Reboulleau, Data Products and AI Director at Orange, launched the project in the Group. He explains: "The two challenges were to improve customer experience and give the customer the confidence to share this data. This is mainly reflected in how authentication is carried out and how consent is provided. You can't pretend that you're making life easier for users and then ask them for a username and password, which they don't know most of the time". With Mobile ID, different mechanisms are at work: customers receive an SMS with an identification code when connecting via Wi-Fi and they are automatically authenticated on the carrier's network when they are using 3G/4G mobile. In terms of security, network enhancement involves authentication partitioning, dedicated solely to data sharing so as to avoid the potential for compromise that comes with general authentication.

At the core of identification is personal data

GDPR — four letters that crop up whenever personal data is mentioned, a potentially tricky topic. In the case of Mobile ID, several consent rules linked to different scenarios have been set. For example, there is one-time consent for the bank and it can last for 12 months in other situations. In short, consent can be set for a specified period of time, with the need to be explicit and flexible for the customer, but also not onerous for the service provider.

Multi-carrier cooperation

The development of Mobile ID, with the coordination of AF2M (Association française pour le développement des services et usages multimédias multi-opérateurs), has led to unprecedented collaboration between carriers. "This technology is already being used to some extent in North America. We have sought AT&T partners' support in Europe. Once properly developed, we approached Bouygues Telecom and SFR in order to share our knowledge. We wanted to start collaborating so that we could bring this technology out. Because in addition to the technical challenges, Mobile ID is now faced with the challenge of spreading the good news to the market. To do this, we had to unite the players and create an ecosystem".

Aggregators, technical and commercial intermediaries

A series of APIs have been developed internally by each carrier. To build closer relationships with service providers, the choice was made to work with aggregators, such as, DQE Software, Néthéos, Infobip, Capadresse and Payphone, all of which boast large customer portfolios across all sectors. In addition to simplified management via a single contract, this avoids the complexity of service provider integration. Orange and its partners are currently working with five aggregators in France and are aiming for ten in 2020. Orange is also considering the opportunity to develop Mobile ID technology elsewhere in Europe.

The carrier, a leader in matters of identity

For a player like Orange, the issue at Mobile ID is twofold, as explained by Laure Jouffre, Digital Identity, Personal Data, Security Innovation Director: "There is, of course, an internal objective, because extending the use of this data goes hand in hand with our multi-service strategy. It is also a question of adding value to our identity as a carrier. By providing our customers with a simple and secure personal data experience, we are increasing their trust in us and we are securing our place in this new market. It is a logical step in line with Orange's purpose, which is to give everyone the keys to a responsible digital world".

Digital culture | Article

Baah Box: find the right muscle!

Monday 17th of February 2020 - Updated on Monday 7th of December 2020

A philanthropic project spearheaded by a team of Orange researchers and developers and backed by Orange's Intellectual Property Department, Baah Box is an open-source rehabilitation software kit designed to teach individuals with disabilities how to operate their prostheses.

This article is a complement to the folder "Intellectual Property, a marker of innovation".

"Find the right muscle and put it to work! That is what Baah Box, a cheap, easy-to-build open-source kit, can offer"

When a person has the use of only one limb – either from birth or as a result of an accident – it can be difficult to know which muscle to use to operate a prosthetic. Myoelectric prostheses are very pricey – €17,000 to €60,000 – and prior to implant, they require training that puts patients through a number of contraction exercises to find the muscles needed.

"The current rehabilitation system is long and tedious, plus it forces patients to travel to a specialised centre often far from where they live for a session that lasts only a few minutes," states Orange designer/developer Marc Poppleton. Having had his forearm amputated at birth, he knows how hard patients have to work to stimulate their prosthetic.

Creating an open-source kit

With this in mind, to allow both patients and hospitals to benefit from the technologies most suited to their needs and, in particular, to make the equipment accessible to the greatest number of people, a group of Orange developers and designers led by software engineer Frédérique Pinson designed an easy-to-build kit and published the plans as open source (https://github.com/Orange-OpenSource/BaahBox-Arduino/). Baah Box (like the sound a sheep makes) comprises a box connected to two electrodes, which are placed on the muscles and communicate via Bluetooth with games on a user's smartphone or tablet (iOS and Android).

"Next, patients simply launch the games that, in time, will help them to operate their prosthetic limbs," explains project co-creator Marc Poppleton. "For example, making a little sheep jump over a fence by contracting a muscle or steering a

spaceship right or left to avoid hitting obstacles by using two muscles."

"To supplement the technological benefits this kit has to offer," explains Frédérique Pinson, "we wanted to make the games fun, especially for kids who can use the kit in their homes and avoid having to wait for an appointment at the rehabilitation centre."

The kit can also be used for functional rehabilitation by connecting the box to a joystick, for instance. The kit is currently undergoing tests with patients at the Lannion-Trestel University Hospital, a leading centre for functional rehabilitation in northern Brittany. "It's a way of meeting patients' true needs while innovating at the same time," she adds.

According to department head Bruno Terrien who supported this goal, "This social, digital and human initiative has unleashed employees' creativity, fostered a sense of letting go, built bridges and encouraged new discussions both within and beyond one department or one division, thereby boosting everyone's motivation for teamwork."

A philanthropic approach backed by Orange's Intellectual Property Department

From its inception, the project has been approached with a philanthropic aim. Orange's Intellectual Property Department wanted to highlight this when it agreed to publish the various elements as open source under a viral licence. "This type of licence is rights-free and allows anyone that wishes to make changes to the software to publish their changes," comments Alain de Laval from Orange's Intellectual Property and Licensing Department. This system makes the results of a person's work available to the greatest number of people by preventing it from being privatised by a third party.

"This is ideal for the project to be able to continue to adapt to different types of injuries," concludes Frédérique Pinson. Rehabilitation centres were awaiting this progress.

Artificial intelligence | Article

A control tower against illegal streaming, supported by AI

Monday 9th of March 2020 - Updated on Thursday 17th of September 2020

The ways in which creative content and video streaming are pirated may diversify in the near future. Digital countermeasures aimed at protecting legal distributors are either now being developed or are already operational. These include the Anti-Piracy Centre, which uses artificial intelligence (AI).

Anti-Piracy Centre package comprises a range of high-level operational and consulting services, drawing in particular on methodologies from the world of cybersecurity.

Streaming services are multiplying and it is becoming easier to access high-quality files with both fixed and mobile devices using high-speed and very high-speed connections, from a larger and more varied range of terminals. Will the illegal redistribution and sharing of video content intensify?

A threat with a thousand faces…

"We're facing new types of piracy", said Kevin Le Jannic, Product Director for Security at Viaccess-Orca, a subsidiary of Orange. "Today's hackers have a larger area of potential attack and an ability to reach their 'customers' with systems that work for all kinds of terminals, including mobile." Viaccess-Orca, as a global provider of content delivery, management, protection and monetisation services, is capitalising on its wide experience and expertise in security matters. Its offering in the areas of protection and content access also covers the worlds of TV and over-the-top (OTT) services, not only through its conditional access systems (CAS) and digital rights management (DRM) but also thanks to its Secure Video Player. This subsidiary of Orange has recently expanded its range of solutions with a view to responding more effectively to current and emerging piracy trends. Unveiled at the 2019 International Broadcasting Convention (IBC), its Anti-Piracy Centre package comprises a range of high-level operational and consulting services, drawing in particular on methodologies from the world of cybersecurity, adapted to the constraints and specific problems of media players.

Monitoring, detection and removal: an end-to-end anti-piracy solution

The Anti-Piracy Centre is a veritable control tower, tracking and fighting against suspicious usage. It is structured around four blocks of complementary solutions. The first—Eye on Piracy—was designed to keep a close eye on online feeds, based on engines that track and identify fraudulent links. Watermarking, or digital tattooing, is the second pillar of the portal and aims to identify the redistribution source of illegal streaming services. All content is marked, or tattooed, with a unique identifier that can be extracted in case of piracy in order to find the original source. A result of combining the expertise of the b<>com Institute of Research and Technology (1) in the field of cybersecurity and Viaccess-Orca's know-how in protecting content and analysing pirate feeds, this solution paves the way for dynamic digital watermarking, in real time and for all types of screens. "At present, there is no algorithm that is sufficiently robust to counter all attacks, and hackers will always find new ways of overriding watermarking. The innovation implemented with b<>com consists of introducing a dynamic and renewable approach to this equation — we can juggle multiple algorithms so we don't give hackers enough time to break the watermarking."

Data analysis and AI as reinforcements

The other two building blocks of the Anti-Piracy Centre relate to detecting breaches and monitoring password sharing.
The first is aimed at detecting anomalies and identifying suspicious behaviour, through monitoring and analysing data likely to be out of the ordinary. "We have defined a set of tracking rules on the basis of which algorithms detect deviations from the defined model and issue alerts, before a human investigation is launched. The relevant data is collected and aggregated in a Security Information and Event Management (SIEM) tool. The scarcity of labelled data represents a challenge in the fight against piracy compared to the detection of 'generic' fraud. This makes unsupervised or semi-supervised approaches even more attractive."
The second building block relates to employing the usage data of TV services by different learning algorithms to detect the sharing of logins and passwords outside the home, the theft of accounts by hackers and their resale on the black market.
By using data and AI in this way via its Anti-Piracy Centre platform, Viaccess-Orca is consolidating its detection abilities and is enriching its arsenal of barriers against an aggravated threat. Moreover, the relevance of its solution is already recognised within the ecosystem. In fact, its watermarking technology has recently been granted certification by Cartesian, a North American organisation that specialises in the fields of telecommunications, media and technologies.
[1] You may also like to read: How to leverage the dormant resources of private datacentres

Internet of things | Article

Fairphone 3 and Livebox 5: more "responsible" devices

Monday 16th of March 2020 - Updated on Wednesday 15th of June 2022

Able to be disassembled, repaired and recycled… Fairphone 3 and Livebox 5 are two examples of an eco-friendly approach to ensure the best for our planet. "Orange, a player committed to respecting the planet, responds to customers' environmental concerns."

Orange has been pursuing an eco-friendly, pro-circular economy approach for a long time due to its awareness of the digital industry's environmental impact. It showed its commitment to being eco-friendly with the Fairphone 3, a smartphone with detachable parts that comes with a screwdriver. Julien Giner, a Project Manager at Orange, explained this unique quality of the phone: "In just a few minutes, using a simple screwdriver, I can disassemble the phone and replace most of its components: the battery, screen, antennas". "This modular approach, where everything can not only be disassembled, but also repaired and recycled, means the phone's shelf life is extended. Compared to the 18-month to 2-year shelf life expected for smartphones, on the hardware side the Fairphone is expected to last 5 or 10 years", added Xavier Augustin, manager of the Fairphone account at Orange. Created in 2013 by a crowdfunding campaign, Fairphone, a Dutch company with the same name as the product it markets, is not intending to release new models every six months in a bid for improved performance, as most manufacturers do.

A partnership between Orange and Fairphone

This partnership, originating from the distribution of the Fairphone 2 by Orange France in 2017, reflects the environmental values shared between Orange and Fairphone.

Fairphone's creators wanted to make the electronics industry fairer by producing more sustainable smartphones. They did this by responsibly sourcing recycled materials and integrating fair trade rules into their supply chain. Mineral suppliers are verified and selected according to different environmental criteria.

By designing niche phones, the company targets conscious customers, who buy repairable products and who are increasingly focused on issues related to climate

change and digital equality. "This type of customer is growing in number", said Xavier Augustin, referring to numerous opinion studies that show environmental issues are one of people's major concerns. "At Orange, we firmly believe that in the coming years, it will not be possible to perform well economically without an exemplary social and environmental record".

Following the success of the Fairphone in France, Orange aims to market it soon in Portugal and then in Spain. The idea is also to convince manufacturers to change their environmental practices, from the product design stage.

Economic performance and an exemplary social and environmental record with the Livebox 5

Orange also pursues this idea with the Livebox 5. "Marketed last September, this box incorporates the various principles of the circular economy that our group has long adhered to. First and foremost, with the use of recycled products", said Elyass Najmi, Head of Livebox 5 at Orange. The circular economy enables most materials to be reused and includes the possibility of repairing and recycling. "We must consider the end of life of the products from the outset, for example, being able to disassemble their different components, separate them, find out if any parts can be recycled, and identify and avoid certain pollutants."

Answers to all these issues were considered at Orange as part of the launch of Livebox 5. "Work started very far in advance to ensure that it was environmentally friendly, from design to end of life."

A transformation of the production and distribution processes

Everywhere in France, whenever an Orange customer brings his or her Livebox for repair, the boxes get a full overhaul that extends their lifetime and helps reduce their environmental impact. After registering the boxes to ensure their traceability, they are separated into three categories. Faulty equipment is repaired under the manufacturer's warranty. Working equipment is restored by sanding and polishing the case, and cleaning and changing cables if necessary. Each restored box then undergoes a series of technical tests to ensure that it is performing as new. Equipment at the end of its life is sent to a recognised body so its components can be recycled and reused.

The Livebox 5 also benefits from environmentally friendly packaging: only vegetable-based inks are used and the paper is FSC-certified, having an environmental label that represents structured planting of trees when one is cut down.

It can more efficiently be loaded by haulage companies due to being more compact and lightweight (25% lighter than Livebox 4). "A pallet can hold 232 Liveboxes compared to 204 for Livebox 4", Elyass Najmi noted.

Easily repairable, the Livebox 5 has a case made from 100% recycled plastic, with

fewer components than the previous box. The plastic granules are produced in Austria. The case is 35% of the total weight of the packaged product and the carbon footprint of the recycled plastic is 42% smaller than the original material. "This box has a 29% smaller carbon footprint and achieves better technological performance than the Livebox 4", concluded Elyass Najmi.

Recycling, restoring, and reconditioning constitute a process of continuous improvement that ultimately balances economic performance with the sustainable approach of a carrier committed to the environment and respecting the planet.

Networks and IT | Article

Open source drives the networks of the future

Monday 27th of April 2020

Cédric Ollivier, a Network Automation Expert at Orange, has just been elected to the Linux Foundation Networking governing board as the developers' representative. For both Cédric and Orange, this appointment recognises the quality of the contributions made to the open source community over the years.
"By fostering the creation of technologies with a de facto standard, open source is responding to challenges shared by all carriers".
Linux Foundation Networking (LFN), the networking division of the Linux Foundation, is a not-for-profit consortium that brings together thousands of contributors, including some of the largest companies in the industry, with the goal of redefining the way in which the networks and services of tomorrow are created. "The open source world is based on merit, where peer validation is the ultimate expression of recognition", said Cédric. "It is an honour to have been elected to the LFN governing board. Above all, the contributions published by Orange show just how involved we are in these issues and confirm our commitment. For Orange, open source is not just a way to foster collaborative research and innovation, but more importantly, it is an opportunity to make real change in the telco ecosystem. The stakes are quite clear; by developing more unified interfaces, we simplify our integrations (how software and equipment is installed on an information system) and, in short, our business".

A driving force for virtualisation

LFN is working on about 15 major projects, related in particular to strategic subjects such as network virtualisation and orchestration. For example, the OPNFV (Open Platform for Network Function Virtualization) project, in which Orange is the leading contributor, aims to develop a platform to integrate virtual network functions into the cloud. "With network virtualisation, software takes precedence over hardware. This means short releases, with numerous updates and as many versions to be tested quickly. In response to this technical development, automating testing is a crucial factor". It is one of the first tools made as part of the OPNFV project. Orange currently uses it internally to test its infrastructure.

Creating a de facto standard

The Group is also very active in the ONAP (Open Networking Automation Platform) project, supported by carriers including Orange, AT&T, Verizon and Vodafone. The advantage for those involved lies in having a shared voice when prompting suppliers to integrate technology into their products. This leverage has meant Orange could use ONAP to ensure better automation of its future 5G network, for example. The same collaborative approach is being adopted with the CNTT (Common NFVI Telco Task Force), whose ambition is to create and document a common infrastructure for virtualising network functions. By fostering the creation of technologies with a de facto standard, open source is responding to challenges shared by all carriers and helping to develop more efficient networks.

Companies — more "open" than ever?

This is how open source is gaining traction in the strategies of players such as Microsoft, for example, which bought software hosting giant GitHub for $7.5 billion in 2018. Cédric Ollivier explains why open source is good for the industry: "Embracing open source means that we no longer only have access to our internal skills and knowledge, but to that of all the industry experts. It is an infinite source of help. No company is capable of financing such research and innovation potential on its own. It also provides a way in which to strengthen brand image because contributors speak at conferences, publish reports and feature in projects. It is not about using open source for everything, but about understanding the benefits that those in the same industry can obtain by pooling certain resources. In terms of network virtualisation in particular, we want to show that it is in carriers' best interests to work together towards a common goal".

Research | Article

Data sharing, distributed factories: open source against Covid-19

Thursday 7th of May 2020 - Updated on Wednesday 15th of June 2022

The pandemic is bringing about a wave of global cooperation among researchers, scientists, and doctors. Open source tools and methods are amplifying and supporting this momentum.

"Faced with the Covid-19 pandemic, individuals and organisations are drawing on global resources in order to meet local needs."

Since the start of the Covid-19 crisis, thousands of open source projects have been emerging across the world to model the pandemic and develop solutions to mitigate the shortage of equipment. On GitHub for example there are over 25,000 repositories associated with Covid-19. In parallel, scientific research is opening up like never before. Institutions such as Johns Hopkins University in the United States are freely sharing their data, whilst prestigious journals including "The Lancet" or "Science" are sharing their publications, and laboratories their research results.

Modelling Covid-19

Modelling pandemic-related data helps to understand the extent, progression and impacts of the virus, and helps with decision-making. It is the reason why many countries and institutions are allowing the general public to freely view and use their data. The dataset that is the most used by health authorities, researchers, data scientists, and journalists today is that of the Johns Hopkins University Center for Systems Science and Engineering (CSSE). At the end of January 2020, it published an interactive dashboard based on several sources, and in particular on the Chinese community platform DXY. This dashboard makes it possible to follow in virtually real time, the number of confirmed, recovered, and deceased cases of Covid-19 in the world. The data that is gathered, updated daily, and available in a GitHub repository, has already been reused in many visualisations and algorithmic models.
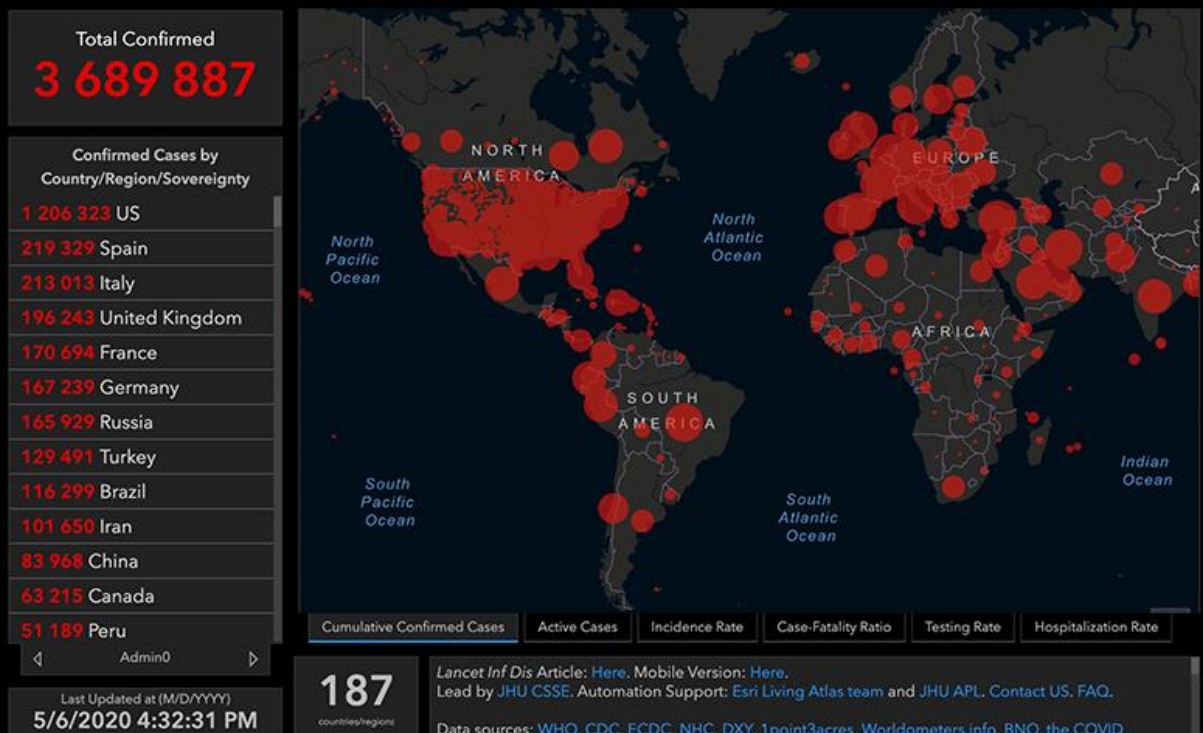
For its part, the Penn Medicine Predictive Healthcare team, of the renowned academic medical centre in Pennsylvania, has developed an open source tool to assist hospitals in planning their capacities. CHIME provides them with estimates of the number of hospitalisations, admissions to intensive care, and patients requiring respiratory assistances, based on the SIR epidemic model.

Mitigating shortages of equipment

With national shortages of protective devices and medical equipment arising, communities of makers rapidly got into action to meet the needs of hospitals, nursing homes, and of professions in the front line facing the coronavirus by prototyping masks, protective screens, detection kits, accessories for breathing assistance apparatuses, and even ventilators.
 https://youtu.be/lnM7UVT2i-o
YouTuber Monsieur Bidouille (French for "Mr. Tinker") thus explains how French makers set up a "distributed factory" for protective face-shields. To coordinate the production and distribution of the thousands of face-shields by people throughout the country, the makers set up into local groups, who then contacted care workers in their area to find out their needs and organise a logistics chain. The tinkerers and FabLabs receive orders via Facebook groups. They produce the face-shields in their homes. These face-shields are then collected, disinfected, put together, and delivered along with an instruction manual. Being open source, the plans could quickly go through several iterations and be adapted for different uses. Approved by several hospitals, these models are now inspiring manufacturers.

In France, but also in Spain, Poland and several countries across Africa and the Middle East (Cameroon, Côte d'Ivoire, Senegal, Tunisia, etc.), around fifty Solidarity FabLabs, supported by the Orange Foundation, have set about the production of over 200,000 visors in collaboration with hospitals.

Some makers have gone as far as designing prototypes of ventilators that are more or less complete. However, many ongoing projects are highlighting the limits with which these initiatives are faced. Complex and putting patients' lives at stake, these devices must be subjected to stringent tests and be awarded certification before they can be used in hospitals.

Production also meets several requirements. The design and manufacture of open source ventilators are not aimed at simple tinkerers, which is emphasized by a volunteer team trained within the MIT in Boston that is developing a simple and low-cost emergency ventilator.

In France, a citizen group of doctors, scientists, and association managers, at the origin of the MUR (Minimal Universal Respirator) ventilator project developed with the support of intensive care doctors, has set about the first step of the certification process. The MakAir project, a life support machine specifically for Covid-19 patients designed by the Makers for Life group, is also undergoing tests.

The opening up of science

Open science consists in opening up access to research data and scientific publications. This is the mantra of the OpenCovid19 collaborative programme, hosted on the Just One Giant Lab (JOGL) platform, a research and innovation laboratory based in Paris that brings together scientists, engineers, healthcare professionals, etc., around the resolution of problems of general interest thanks to the use of open source tools and methods. OpenCovid19 aims to develop a series of low-cost open source solutions to fight the pandemic. Voluntary contributors from all over the world are carrying out projects dedicated to the detection, prevention, and treatment of the disease. The first result is a diagnostic test.

Many researchers and political decision-makers underline the role of open science in getting Covid-19 research to make progress. According to them, knowledge sharing is essential in order to accelerate understanding of the virus and the development of a treatment and vaccine. The UNESCO Director-General has called on governments to "integrate open science in their research programmes". As for the European Commission, it has launched an online coronavirus data platform, providing "an open, trusted, and scalable European and global environment where

researchers can store and share datasets, such as DNA sequences, protein structures, data from pre-clinical research and clinical trials, as well as epidemiological data".

The strengths of the open source model

These implementations of collective intelligence using an open source approach make it possible to improvise simple, efficient, and low-cost solutions in emergency situations. According to Monsieur Bidouille, volunteers thus make up a true research and development department. Enthusiastic contributors actively take part in the development and continuous improvement of the projects. Innovators, researchers, and developers work together, sometimes in cooperation with citizens, sharing the resources and knowledge produced so as to solve a common problem. This community dimension is the main force of the open source model, as opposed to the proprietary model, which puts people into competition with one another.
This global community knows how to structure itself on a local scale, as shown by the example of the protective face-shield production. The source codes, prototypes, and data being open, anybody can use them, modify them, and adapt them to specific constraints. Faced with the Covid-19 pandemic, a virus that knows no boundaries but that affects countries at different times and in different ways, individuals and organisations are drawing on global resources, made available by mass collaboration and a robust and resilient technological infrastructure, in order to meet local needs.

Digital culture | Article

Additive manufacturing is making its mark

Monday 18th of May 2020 - Updated on Wednesday 15th of June 2022

The continuous improvement of the techniques and precision of 3D printing, as well as the use of an array of new materials are making it possible to produce ever more effective parts and to widen the scope of application of this technology, from construction to medicine, through aeronautics. The stakes are shorter and cheaper processes that require less energy and raw materials.

"– 3D printing can support the practice of repairing by facilitating access to spare parts at an affordable price."

Buildings erected in just a few days

Concrete 3D printing is starting to emerge in the construction industry, with projects relying on this technology having proliferated over the last few years.

3D-printed social housing was thus inaugurated in Nantes in 2018. It is a 95 m² house comprising 5 rooms and a set of complex architectural forms created thanks to a process combining additive manufacturing and robotics developed by two laboratories from the university of Nantes.

Named Batiprint3D, this consists in depositing three layers of material via a polyarticulated robot: two layers of expanding foam, acting as formwork for a third layer of concrete. Once the building of the walls is finished, the foam remains in place so as to achieve insulation of the home with no thermal bridge.

However, this house is nothing compared to the biggest 3D-printed building in the world, erected in Dubai in 2019 by Russian firm Apis Cor. The two-storey administrative building is 9.5 m high for a total surface area of 640 m². The city has adopted a real strategy in this area and has announced its wish to reach 25 % of new buildings built with 3D printing by 2030.

3D printing in the construction industry has many benefits. First of all, it enables a reduction in construction times and costs. The Nantes house was built from the ground up in just a few days, at a cost of € 195,000.

It also enables a reduction in the use of raw materials and in waste creation thanks, in particular, to the optimisation of the structures. On the Dubai construction site, waste production was reduced by 60 %, according to the city officials.

Furthermore, 3D printing provides a high degree of architectural freedom with the possibility to imagine a variety of complex forms that are impossible to create using traditional techniques.

The repair sector rejuvenated

"Don't throw it away, fix it" is the motto of DIY enthusiasts. A pillar of the circular economy, repair work contributes to extending the useful life of products and reduces the environmental impacts generated by their production and the management of associated waste. 3D printing can support this practice by facilitating access to spare parts at an affordable price.

In 2017, the French environment and energy management agency (ADEME) published the first French study on product repairs using 3D printing and attending digital manufacturing spaces (fab labs), acknowledging the role played by these technologies and by third spaces to rejuvenate the repair sector.

When a part is faulty (the main cause of breakdowns), 3D printing makes it possible to make a new one on demand, be it the button of an electronic or domestic appliance, a radiator tap, drawer handle, or zip fastener. Concretely, it is now possible to download models from 3D-file sharing platforms (such as Thingiverse or Cults) and make the desired spare part oneself by using one's own 3D printer, by going to a fab lab, or through an online 3D printing service.

On the retailer side, Boulanger was a forerunner in this area with its launch of the Happy3D platform, on which its 3D models of spare parts are shared. Small appliance manufacturer SEB has been experimenting for several years now with the reparation of spare parts printed in 3D.

Tomorrow, 3D-printed working organs?

It is the size of a cherry. The first vascularised heart printed in 3D using a patient's own cells was revealed by Tel Aviv University in April 2019. A few months later, in the United States, researchers from Carnegie Mellon University presented a functional heart valve, printed from collagen.

These two prototypes are pushing back the boundaries of bioprinting in the area of regenerative medicine and represent a hope in the treatment of cardiovascular diseases.

An emerging technique of 3D printing, bioprinting consists in piling up living cells by using a computer-assisted layer-by-layer deposition process to make living tissue and organs.

For researchers and surgeons, the "holy grail" would be to manage to print fully-working biocompatible complex organs – using the recipient's cells – for transplant. This would make it possible to meet the increasing demand for grafts and to reduce the risk of rejection.

But the perspective of a human transplant of a 3D-printed heart, pancreas, or liver is still a long way off. Bioprinting will probably first repair an existing organ, such as a heart having suffered a loss of function.

In parallel, research carried out on the production and transplant of simple tissues such as skin, bone or cartilage, has yielded promising results. Today, bioprinting primarily enables the production of biological tissues destined for medical research, pharmaceutical research, and cosmetic tests, which are sold by companies such as Organovo, in the United States, or Poïetis, in France.

Tailor-made and easily-accessible prostheses

The prosthesis 3D-printing sector has gone beyond the experimental stage and is today part of the everyday lives of thousands of people the world over. Intended to replace a limb or a joint, prostheses are essential in the improvement of patients' quality of life. The problem: they are expensive and are often unsightly.

3D printing makes it possible to produce unique prostheses that are adapted to each patient at a fraction of the cost of traditional techniques.

After discovering 3D printing in a fab lab, Nicolas Huchet, whose right hand was amputated following a workplace accident, launched his open source myoelectric prosthesis project, Bionicohand. The young man managed to bring together a team of makers and develop a 3D-printable device costing less than € 1,000. Today, his My Human Kit association is carrying on the development of Bionicohand as well as other projects linked to DIY and disability by encouraging the participation of those concerned.

The e-Nable association, for its part, relies on a community of around 20,000 volunteers spread across more than 100 countries, who design and make upper-limb prostheses for children and adults affected by agenesis (born without fingers or without hands), or who have undergone amputation. Since its creation, over 8,000 devices have been delivered free of charge.

In 2017, Handicap International launched a project of 3D-printed lower-limb prostheses, aimed at making fitting accessible to populations living in conflict zones or isolated regions.

Industrial applications

The number of applications of 3D printing does not stop growing. In the automotive and aeronautical industries, use cases go from "simple" rapid prototyping to the manufacturing of parts integrated into cars and aeroplanes. Several tyre manufacturers are working, for example, on concepts of ecological tyres printed in 3D. During the 2019 Paris Air Show, Safran Aero Boosters announced that it had obtained certification from the European and American civil aviation authorities for an aeroplane engine lubrication unit (fitted in the Airbus A320neo) made with 3D metal printing. A first!

Networks and IT | Article

Open source and networks: an immersive video solution shows the way

Monday 25th of May 2020 - Updated on Wednesday 15th of June 2022

Experimenting with new features and anticipating the future prospects for mobile network developments on the RAN parts (Radio Access Network, which communicate with mobile devices) and core parts (through which all transmissions pass), both depend on an open source framework. A project to create an immersive video solution based on an open source infrastructure thus provides insight into the future of mobile networks and services.
"Quickly deploying a mobile network at a remote site to test and validate an immersive video service"
Open source (OS) frameworks (or software environments) enable players from the mobile network ecosystem to work together on collaborative projects that take advantage of the technological advances of networks, such as RAN softwarisation. They make it possible to directly design, test and validate innovative services that can be deployed on a large scale in the future.

An OS platform for immersive videos

Developed under the European 5G EVE project, this is an initiative that seeks to provide an experimental open source 4G/5G platform to test immersive headset-based VR (Virtual Reality) experiences. The experiment shows how an open source mobile network can be rapidly deployed both on the go and remotely in order to test out a specific use case or, over time, to meet operational needs. This network as a service was created based on the implementation of an open source orchestration tool, ONAP (Open Network Automation Platform), which instantiates VNFs (Virtual Network Functions) and manages deployment at remote sites.

End-to-end architecture

This project is the result of a collaboration between Orange and several French and European partners from the academic and industrial sectors. According to Rodolphe Legouable, Network Project Manager at Orange, the infrastructure designed within this framework and used for the immersive video use case allows "certain benefits of 4G/5G networks to be tested and validated, such as their ability to meet specific needs relating to latency, in particular, which is a key concern for virtual reality as it can provoke feelings of nausea". Several links make up the network architecture running the experience: "The specific aim is to deploy a video application server that hosts the content as close as possible to the antenna, which then passes through the core network and the RAN before reaching the user's VR headset. The platform is created using open source code from OpenAirInterface (OAI) Software Alliance for the RAN. The ONAP/Kubernetes orchestrator automatically deploys virtual network functions—Radio and User Plane Function (UPF) parts—to remote site(s). The network core is centrally controlled from one location, the Orange Gardens site in Châtillon, France, for the demonstration. The RAN is connected to the core network by a software core designed by the b<>com Technology Research Institute (known as the Wireless Edge Factory, WEF), which is itself interfaced with the application server".

A breeding ground for innovation

Once this network is deployed, users will be able to connect to it to access the application server and video content. The platform also supports different frequency bands (B7, B28, B38, B40) and can therefore adapt to the allocated emission rights. In addition to highlighting how quickly and easily a mobile network can be deployed, this demonstration more generally illustrates the opportunities created by international open source ecosystems. "Orange's commitment to the open source world is useful in several ways. It allows us to gain knowledge of the interfaces between equipment and network features, to play with the 'puzzle' by mixing open source and proprietary components, among other things, and to combine efforts: The ONAP community is important because we cannot do or understand everything alone and it enables us to develop and test new services and features".

Networks and IT | Article

Energy efficiency: AI for mobile networks

Monday 25th of May 2020 - Updated on Wednesday 22nd of June 2022

The new mechanisms introduced by 5G improve the energy efficiency of networks and optimise their carbon footprint. The combination of Big Data and AI technologies, for example, gives us a glimpse of significant prospects for progress for less polluting mobile networks.

"Over a large perimeter, these algorithms are capable of identifying sites that are atypical compared to a reference site."

Each generation of mobile telephony networks coincides with a leap forward in energy efficiency per bit transported, the gains of which are estimated at a factor of 10 during the transition from one generation to the other. 5G is no exception to this rule and, from the infrastructure design stage, introduces new levers for technical and operational optimisation. Instead of waiting for these changes, carriers are developing solutions to minimise the carbon footprint of current 3G/4G networks.

These efficiency levers are already paying off

In this regard, Orange is working in the long term to reduce consumption and CO2 emissions linked to its infrastructure, products and services. In particular, its Engage 2025 strategic plan aims to reduce the Group's CO2 emissions by 30% by 2025 (compared to 2015), moving towards a long-term "Net zero carbon" objective by 2040. The Green ITN plan, which has been deployed for several years, is a major building block of this ambition and focuses on Orange's main source of energy consumption: networks and information systems. "Significant efforts have been made within the framework of the Green ITN 2020 plan," says Quentin Fousson, Green RAN & Benchmark project manager. The identification, design and deployment of some fifty levers for optimisation have, over the past ten years, prevented 2.7 million tonnes of CO2 emissions and reduced the energy costs for our networks by one billion euros. In recent years, Orange has managed to stabilise the amount of CO2 emissions linked to the operation of its networks. The Green ITN dynamic plan is now projected for 2025 and new areas of work such as the energy efficiency of 5G and the eco-design of data centres are already under way."

Measure, analyse, optimise

In recent years, Orange has deployed meters on a large scale in the countries where it operates to collect a large amount of data on the consumption of its network infrastructure. The dynamic visualisation and analysis of this data, with Big Data technologies, are very valuable vehicles for rationalisation in the monitoring and operation of current networks. This data can then be used for the targeted implementation of energy efficiency solutions, such as the application of standby mode when and where possible, to limit consumption when traffic is slowed down.

Using AI to systematise

This work continues with the research and development of new improvement methods accelerated by artificial intelligence techniques. "We are using AI to take our optimisation even further," said R&D engineer Yuanyuan Huang. Algorithms have been developed to review the masses of data available to us, and compare the performance of radio sites on traffic delivered to the customer and their energy consumption. Over a large perimeter, these algorithms are capable of identifying sites that are atypical compared to a reference site. In the event of too great a discrepancy — if one site has a higher consumption than another site with an equivalent volume and quality of past traffic, for example — energy efficiency recommendations may be issued for the sites concerned: reduction of the power emitted by the antenna or placing transmitters on standby during periods without traffic."

Other applications being studied

This is just one of several use cases studied in the Group's different countries today. AI also makes it possible to detect oversized sites or to identify time windows to which standby mode can be applied. A dozen use cases were explored, with average savings in network consumption and CO_2 emissions ranging from 2% to 10% depending on the use case and the network architecture in the subsidiaries.

Networks and IT | Article

Monitored telephone poles with IoT

Monday 15th of June 2020 - Updated on Friday 12th of June 2020

Across France, there are 15 million telephone poles providing customers with high- and very high-speed services. To be able to better monitor the condition of these poles and facilitate the work of field engineers, Orange is preparing to deploy an ad hoc solution consisting of intelligent and connected poles, with the aim of anticipating breakdowns and network incidents.

"An IoT device draws on existing solutions to monitor telephone poles remotely and in real time"

Currently, maintaining these poles to guarantee customers receive a high-quality service is a largely reactive process. As part of a project led by Orange, specialist companies perform year-round testing on the poles to ensure the quality of this infrastructure.

But when adverse weather events or accidents occur, it is often the residents, local authorities or customers themselves who report that one of the poles has fallen down.

From a reactive approach to a proactive outlook

This way of working presents several problems. A damaged or collapsed pole puts both residents and road users at risk, and service quality is affected until the necessary maintenance work has been carried out. The travel required to take stock also comes at a financial and environmental cost.
These limitations have prompted Orange to look into designing a proactive remote monitoring process to achieve optimum visibility and control over the poles. The Internet of Things (IoT) offers a viable solution.

Connected poles that communicate

Initially, the solution consists of fitting sensors to a sample group of vulnerable poles that can transmit data and feed Orange's information systems on a regular and automatic basis. As Philippe Delbarre, IoT B2B Project Manager, explains, "the idea is to get these poles—which have been silent up to now—talking. Valuable information about their status (geographic location, battery, ID etc.) is transported through the LoRa network to Live Objects, our management platform for connected objects. This data is sent in real time to an operational monitoring platform that can also continuously monitor the poles and organise a response if the IoT device issues an alert that a pole is leaning at an angle of more than 45°, as identified by the accelerometer that is built into the sensor". Potential service disruptions and safety risks linked to the damaged pole are therefore reduced.
A total of one million poles that are particularly at risk will be equipped over the next five years.

Capitalising on existing technological bricks

The device also stands out because of the added value that it offers, which is not just operational—in the form of real-time monitoring and proactive maintenance—but also technological and financial. The IoT solution and its related processes are, in effect, based on existing bricks and assets such as Live Objects and the LoRa network, which are stitched together to create an end-to-end service chain. "The LoRa network", highlights Delbarre, "is particularly well-adapted to this use case, which requires a small amount of data to be communicated. Over time, it will also be able to support a system designed to be long-lasting, with a minimum battery life of 12 years — which would not have been possible before, especially with a 2G network".
The age of intelligent poles is upon us!

Internet of things | Article

XR: 5G extends the boundaries of reality

Monday 6th of July 2020 - Updated on Wednesday 22nd of June 2022

Extended Reality (XR), a generic concept that encompasses all immersive technologies, is slow to deliver on its promises. But 5G is poised to change the game and address some of the challenges by paving the way for an optimised distribution of processing capabilities. The ecosystem and its players are mobilised for this revolution spearheaded by Qualcomm Technologies, a leading innovator in the world of mobile technologies.

"5G can be used for split processing to distribute some of the processing capabilities to the network to take the load off headsets."

Immersive systems known as Extended Reality (XR)—such as virtual reality, augmented reality and mixed reality—are gaining momentum for both personal and professional uses. However, these systems still have ways to go to deliver on their full potential; they sometimes struggle to achieve their ambition of interconnecting the real world with the virtual one due to technological and physical limitations.

The world as an interface

The immersion revolution is coming, gradually, but it is coming. A player like Qualcomm, global leader in the mobile world, has been investing in VR (Virtual Reality), AR (Augmented Reality) and MR (Mixed Reality) technologies – collectively XR – for the past decade. It is confident that these technologies will transform the computing world and that there is an imminent move from traditional devices (PCs, tablets, smartphones) to a new generation of computing epitomised by portable connected objects. "Screens will eventually disappear and the world around us will act as a browser", predicts Brian Vogelsang, Senior Director of XR Product Management at Qualcomm. "In the future, smartphones may well disappear, and XR will take over". This dynamic is already underway, with use cases continually developing as much for the general public (mainly in the area of entertainment) as in the B2B sphere, but in segmented approaches. They will, however, still be limited by what current technologies can—or rather cannot—do.

XR + 5G: 5G in the XR equation

How can you make a fluid, seamless and universally accessible extended reality possible on a headset that does not have the same power as a PC, whilst requiring optimal resolution and graphics performance? Some of the answers lie with 5G. Firstly thanks to its direct properties themselves, as well as the leap forward it represents in terms of throughput and latency. But also because it can be used to unload or distribute some of the computing and processing capabilities at the edge of the network and to render images there before they are streamed to the headset. Processing capabilities, which were previously embedded and integrated into the device, can now be shared and partially transferred to the network and the edge cloud, through what is known in the industry as the 'Cloud XR'.

XR2, the 5G-ready extended reality platform

The next-generation, high-performance Qualcomm Snapdragon XR2 Platform, launched at the end of 2019, was designed to support this split processing and 5G specifications, using mmWave and sub-6 GHz. Qualcomm has launched the world's first high-performance XR/5G platform, "because we are familiar with the needs of extended reality from both a hardware and software perspective. The chips we integrate with XR terminals require optimisations over and above those found in our smartphones. In terms of hardware, we need to be able to support several cameras. As opposed to a maximum of three or four cameras in a smartphone, XR2 currently supports seven. When it comes to software, artificial intelligence must be given a leading role. It plays a major role in tracking and managing information from the sensors on headsets. A combination of AI and artificial vision is at work to read, understand and predict user positioning and movements. XR2 technology allocates and dedicates blocks of hardware to these AI and artificial vision streams, for optimal and low-power processing". These new capabilities will allow existing and emerging use cases such as holographic telepresence to gain a new dimension and to overcome current constraints.

The Qualcomm Snapdragon XR2 5G Platform offers a reference design, tested and validated on Ericsson's 5G infrastructure, available to headset manufacturers to reduce the time-to-market and design costs.

Working together within the ecosystem

To further facilitate and accelerate the adoption of 5G in general, and of XR in particular, Qualcomm has introduced the concept of 'XR Viewer'. It initiated a collaborative effort with ecosystem players—among them 15 global carriers, including Orange—to support the development of such products. The principle is simple. Glasses are tethered to a 5G-enabled smartphone, offering a premium way of experiencing extended reality. The 'XR Optimized' certification programme for manufacturers of XR viewers and smartphones was launched by Qualcomm at the same time as a way to promote compatibility between these two product families.
"The whole challenge is to think about new models and new use cases in all areas", adds Morgan Bouchet, Director of Digital Content-Innovation & Head of XR at Orange. "Ultimately, to bring innovative experiences of extended reality to life, for example the metaverse (a persistent 3D virtual world that relies on all or part of the real world), in terms of social interactions. Based on this perspective, joint work with our ecosystem partners, in the technical sphere of course but also in the artistic world, is essential. A carrier like Orange brings its expertise in networking. And Qualcomm, thanks to its technologies, is well positioned to harness all these contributions".
With 5G, extended reality without limits and constraints will be more than just a promise.

https://hellofuture.orange.com/en/the-best-of-fine-watchmaking-and-connectivity-together-in-one-watch/

Internet of things | Article

The best of fine watchmaking and connectivity, together in one watch

Monday 20th of July 2020 - Updated on Wednesday 15th of June 2022

The connected watch market is currently exploding, driven by smartphone players Apple and Samsung positioning themselves in the dual role of manufacturer and OS designer. Year after year, these products are getting smarter and more ergonomic, offering increasingly robust connectivity. Not to be outdone, the world of traditional watchmaking has its "timekeepers", a bridge between centuries-old know-how and cutting-edge innovation.
"The first high-end smartwatch that runs on Wear OS by Google with eSIM support and 4G connectivity capable of operating in fully autonomous mode"
Montblanc is among such high-end smartwatch pioneers. In 2017, the maker with the snowy cap logo launched the Summit, its first luxury smartwatch. It was the watchmaker's way of showing it could, by joining forces with Google and its wearables-dedicated OS, reinvent itself and equip its chronograph with Bluetooth and a Wi-Fi connection.

Summit 2+, packed with connectivity

Three years later, the company is releasing Summit 2+, the first high-end smartwatch to run on Wear OS by Google™ with eSIM support and equipped with the Snapdragon Wear™ 3100 platform by Qualcomm®. Its onboard 4G LTE connectivity and Orange Multi-SIM option allow it to operate without a smartphone. As one of the first operators to market eSIM-connected watches running on Watch OS and Tizen, Orange is now sharing its cellular connectivity expertise and deploying it within the Wear OS by Google ecosystem. Wear OS by Google has evolved over the last several months to provide eSIM compatibility with dedicated management within its companion app. "Orange and Google are taking the same approach of democratising connected devices with cellular," explained Orange's Connected Objects Marketing Director Lionel Bonnet. "The Wear OS by Google ecosystem gravitates around several market segments including luxury, fashion, and sports. As an operator, we are very invested in eSIM because it can connect more products, especially smartwatches, and their related remote devices." The launch of

the Summit 2+ is the culmination of concerted efforts between Montblanc, Orange and Google to bring a new standard of eSIM support, in both hardware and software, to the smartwatch market.

Optimised activation experience

The watch, which users can activate 4G LTE service traditionally using a QR code, also offers an On Device Service Activation for a smoother and seamless user experience. The Wear OS companion app natively integrates everything required for activation, including eSIM profile initialisation and to the optional eSIM Multi-SIM Calling and Data setup required to connect in 4G, and, lastly, to send and receive mobile calls on both watch and smartphone. "This approach and the resulting interface have undergone GSMA standardisation to offer users a seamless eSIM provisioning experience. Users will be able to rely on their smartwatch to continuously stay connected to their world even when away from their phone."

A watch assistant

With its cellular connectivity, Google Assistant on Summit 2+ can be accessed simply by swiping right. Users will be able to search, call, and respond to voice messages as part of an optimised experience. "As operating systems continue to evolve to enhance the user experience, we are encouraging and pushing app developer and publisher ecosystems. The goal is for them to design and offer fully autonomous services on 4G for connected watches."
Orange is the first operator in Europe to launch the Montblanc Summit 2+ smartwatch in France and Spain on 4G networks in the second quarter of 2020.

Data | Article

Selective data sorting against dark data

Friday 31st of July 2020 - Updated on Wednesday 15th of June 2022

Organisations have a tendency to keep useless data. This storage has both financial and environmental costs, that can be kept to a minimum with greater digital frugality.

"For greater digital frugality, start by establishing a data map"

According to a study by Veritas, 52 % of company data stored on servers is never used. This inert data is what is known as dark data. This can be data collected within the frame of an abandoned project or data that complies with regulatory compliance requirements and that has not been deleted within the legal deadlines. Mass emailing and redundancy of computer files contribute to this waste.

0%

Dark data is growing exponentially with the development of artificial intelligence and the internet of things, which generate a continuous flow of information (geolocation data, log files). An IDC report thus predicts that the amount of data stored in the world will increase from 33 zettabytes (10^{21}) in 2018 up to 175 ZB in 2025. This rapid increase in data volume generates extra storage costs. This data mobilises substantial energy resources with a heavy impact on the environment.

According to , dark data will be at the origin of 6.4 million tonnes of CO_2 released into the atmosphere in 2020. That is the equivalent of the production of 80 countries. Either through negligence or with the secret hope of profiting from it in the future, organisations and businesses tend to keep all of their data and not go through a "selective sorting" process. They have trouble letting go of this bad habit that is nurtured, on the one hand by the constant drop in storage costs, and on the other by the growth of GAFAM, whose business model is based on the mass storage of this dormant data.

Data governance

In order to go back to greater digital frugality, an organisation must start by getting an overview of the data circulating in its IT system. This data mapping must not ignore "shadow IT", i.e. applications deployed under the radar of the CIO. This "parallel" IT generates an invisible stream of data.
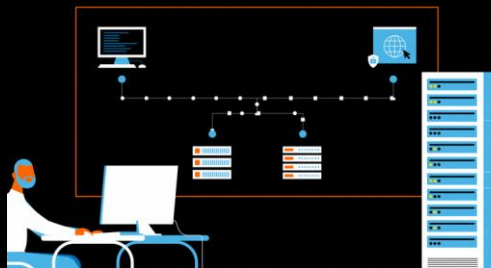
From this data mapping, the company can set rules for data gathering and storage according to its criticality and value over time.

In this respect we distinguish hot data, that is used frequently, from cold data, that is archived. The colder the data is, the less its hosting costs as it calls upon media such as magnetic tape or cloud archiving solutions. Furthermore, as cold data is rarely called upon, its recovery is low-energy consuming.

Automatic purges

Entering into force two years ago, the European General Data Protection Regulation (GDPR) consolidates the implementation of this data governance. In effect, the GDPR introduces a right to erasure.
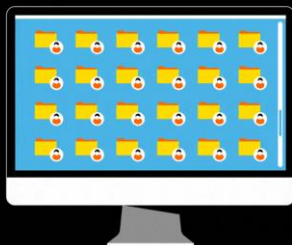
With this "right to be forgotten", organisations must guarantee people who request so, that their data be deleted from their systems within 30 days.

Technically, this assumes industrialisation of the data destruction process. These automatic purges also concern data that has passed the legal time limit for storage, such as customers who have been inactive (no longer responding to contact) for three years.

Beyond collective action, staff must be made aware of their role in the increase of dark data. They should be regularly reminded of good practices such as avoiding sending multiple copies of emails, unsubscribing from newsletters they no longer

open, or regularly deleting documents that have become useless. Individual awareness can have a snowball effect.

https://hellofuture.orange.com/en/selective-data-sorting-against-dark-data/

Internet of things | Article

Smart street lighting thanks to the LoRa® network

Monday 14th of September 2020 - Updated on Wednesday 22nd of June 2022

Over the past few years, "smart city" apps connected to LPWAN networks have been helping local authorities to "smarten up". Street lighting management, in particular, has become much more efficient thanks to the LoRa® network. "A comprehensive solution, with a system for remote monitoring and control of street lighting fleets, thanks to the strength of LoRa® networks".

When astronomical clocks are synchronised with the LoRa® network

BH Technologies, an innovative company from Grenoble partnered with Datavenue Ready and established in 1998, is one of the high-tech players in France directly involved in the Smart City movement. When it was still known as BHL Électronique, this company sold astronomical clock systems for street lighting control cabinets. This led it to acquire considerable experience and expertise in street lighting fleet management, and become finely attuned to the real needs of local authority customers. Capitalising on this knowledge enabled BH Technologies to broaden its horizons, both in terms of technology and expertise, with the creation of the BH Environment division to provide services for optimising waste collection. As the IoT developed, the company expanded its range of solutions to include connectivity offerings. For example, its core product Radiolite, a socio-astronomical clock, is now equipped with a radio antenna. "We were drawn to LoRa® radio technology because of the many advantages associated with LPWAN solutions", explains Youssef Et-Tayach, Marketing and Business Manager at BH Technologies. "We have chosen to team up with Orange, whose nationwide LoRa® network means we can reach the largest possible number of local authorities and respond to their needs".

Optimising lighting switch-on times

BH Technologies' connected devices send and receive data via the LoRa® network, and are declared on Live Objects, Orange's open, multi-connectivity IoT platform. The data flows processed on this platform are then fed into the Grenoble SME's Environment and Lighting business platforms. Customers can monitor their lighting fleets, or waste collectors, via a dedicated portal called LUCE.

For street lighting, this solution facilitates optimised and enhanced monitoring capabilities and processes. Street lighting control becomes dynamic and interactive: the object remotely reports its operating status, switch-on and switch-off times can be programmed and re-programmed, and so on. The IoT layer also doubles as an AI module, with an in-house algorithm that calculates and adjusts brightness based on ambient light, determined in real time using sensors installed around communities. The result: "The benefits lie in its operation. It has an intuitive management platform that you don't have to be a specialist to master. Switch-on times are optimised and reduced, leading to financial and environmental benefits for cities and local authorities. This also streamlines system maintenance plans, making it possible to schedule on-site technical servicing and therefore avoid unexpected call-outs".

Helping local authorities make the environmental transition

The added value of the services offered by BH Technologies lies in its extensive knowledge of the field. Building on this, the company has "put together a comprehensive solution, involving three steps, with a view to bringing its local authority customers in line with the Factor Four concept. It starts with the deployment of programmed switch-on/switch-off and synchronised commutation solutions. Then, we focus on making massive energy savings, by replacing inefficient lighting with LED systems or installing dimmers. The final step involves optimising fleet monitoring and remote control, which is where IoT technology and LoRa® connectivity step in and show their true value".

By utilising Orange's LoRa® network, BH Technologies can provide efficient and ready-to-use solutions to any local authority in France, especially those who choose to take advantage of the full force of a network that is managed and monitored by a carrier.

Research | Article

Orange and the scientific community — Interview with Gérard Berry

Friday 18th of September 2020 - Updated on Wednesday 15th of June 2022

Specialist in the computerisation of objects, main creator of the programming language Esterel, winner of the CNRS gold medal, professor at the Collège de France and member of the French Academy of Sciences, Gérard Berry accepted the presidency of the Orange Scientific Council in 2020. In this article, the renowned computer scientist presents the role of this institution and sheds light on some of the issues surrounding the relationship between science and industry in the digital revolution.

"Doubt and questioning are an integral part of the scientific method"

What is the mission of the Orange Scientific Council?

It is an advisory body that aims to help the company's management in its understanding of the world by providing it with advice and recommendations on broader scientific issues that concern it. We are, of course, interested in the so-called "hard" sciences—IT, telecoms, networks etc.—but also hugely, and increasingly, in the disciplines that cover the social aspects of technology and innovation. This broad spectrum is reflected in the Council's composition, which intentionally brings together people with varied expertise: robotics and artificial

intelligence with <u>Raja Chatila</u>, distributed systems with <u>Anne-Marie Kermarrec</u>, network virtualisation with <u>Olivier Festor</u>, medicine and space with <u>Claudie Haigneré</u>, but also history with <u>Valérie Schafer</u> and economics with <u>Pierre-Noël Giraud</u>.

Why do you think it's essential for a company like Orange to invest in research and maintain close links with the scientific community?

In a changing world, not conducting research is like condemning yourself in the more or less long term. There are many examples of large companies that have disappeared, or simply lost their leadership, because they failed to understand the significance of major technological innovations: Previously, IBM missed the potential of the PC, which had emerged from its own labs; and, more recently, we have seen a giant like Intel edged out by ARM after missing the shift towards mobile chips. Because doubt and questioning are an integral part of the scientific method, companies that feed on the work of researchers are less prone to excessive pride — less focused on the knowledge and models of the past.
In the case of Orange, it seems to me that this issue is all the more important because we are living in exceptional times: We are witnessing the convergence of computing and telecommunications, which are becoming completely integrated and blended together. And Orange is one of the few—if not the only—French player to fully embrace this phenomenon, to try to understand all the dimensions of this convergence and its multiple impacts in terms of mastery of technology, infrastructure, applications, security, competition, social impacts etc.

How and on which topics does the Scientific Council work?

The great virtue of this institution is that it pushes people to put their ideas on the table and synthesise them. Each session is organised around a theme, which is prepared in a very professional way by establishing contacts with top specialists in each topic. In essence, the topics discussed reflect the diversity of Orange's research and its interactions with the academic world, that of the major institutions of the basic and applied sciences. This ranges from issues related to the computerisation of the world—distributed computing, security, data analysis, etc.—to the major societal questions posed by digital technology: protection of privacy, environmental footprint, acceptability of new uses, human/machine interactions etc.

You have long been committed to increasing public education in sciences, particularly computer science: How does the current "digital revolution" make this issue even more important to you?

I have noticed that, whilst software is everywhere in our lives these days, the same cannot be said of knowledge of IT. In France, in particular, we have world-leading higher education in this discipline but it is still far too absent from secondary and primary education.

This can be seen at an individual level, with a real digital divide in the population, the negative effects of which appear even starker during this health crisis, when both employees and citizens are being asked to use digital tools more and more. But that is also true at company level: For example, an industry cannot be sustainably protected if its employees do not share a minimum knowledge of cybersecurity. Likewise, the promises of digital technology in the healthcare sector will not come true if doctors do not focus more heavily and intensively on the functioning of devices, networks, software, databases and algorithms that play an increasing role in their daily practice.

In general, there is a profound lack of education in IT and networks. People know how to use these technologies but they have no knowledge of the concepts behind them or how they work. And this limits their ability to make free and informed choices — for example, with respect to the "fake free" model, where the Internet user, often unknowingly, pays for the content they consume with their personal data, which is resold for advertising purposes.

I believe that, in order not to be dependent on or a victim of technology, you must first know and understand it. That's why I spend a great deal of time teaching about and raising awareness of these issues.

Finally, you bring an element of the famous pataphysics of Alfred Jarry to the Orange Scientific Council. How can this intellectual exercise—the "science of imaginary solutions"—offer a form of inspiration to the research community?

I have the honour of being Regent of Deformatics at the College. It's a way of looking at my subject differently: Computer science is the science of information; deformatics is the opposite! It's guided by the words of Oscar Wilde: "Lean on principles, one day they'll end up giving way"; it's not a question of thinking about disinformation, but about deformable subjects. The Internet, for example, has no shape; one cannot draw a definitive map of it, it's intangible.

The benefit of this kind of intellectual exercise is thinking about scientific subjects differently — not always thinking in a linear way and sometimes doing things that seem unnecessary. I believe this stance is important for researchers. Because a researcher who thinks he has "discovered" something once and for all is certainly someone to be wary of; science is never finished. We must keep moving forward, moving on to something else.

5G enables real-time applications for business

Friday 2nd of October 2020 - Updated on Wednesday 22nd of June 2022

Virtualised networks, 5G connectivity and edge computing give a glimpse of potential breakthrough services that will primarily benefit the B2B market, says Jehanne Savi, Senior VP Innovation for Future Connectivity Business & Beyond at Orange.
"5G frees the company from a physical wired infrastructure, making it easier to modify and adapt the production line."
"5G is coming! Good news?" This was the thought-provoking title of one of the sessions at SIDO 2020, a European event dedicated to the IoT, AI and robotics, which took place in early September in Lyon. Jehanne Savi reiterates her contribution: "One thing is certain; real-time applications are growing. Some studies suggest that, within five years, 30% of data generated will be for real-time applications. We are talking about substantial volumes here—in particular, live video processing, thanks to computer vision and artificial intelligence—but also about the Internet of Things, to a lesser extent. The new technologies, as an end-to-end architecture combining on-demand networks, 5G connectivity and edge computing, provide a technical response to the emergence of these new uses in a very different way than 4G and the centralised cloud." Network slicing is one of the areas with the most potential, as it allows the service quality and level of security to be adapted to each use.

A turning point for the industry

At the port of Antwerp, Orange is conducting an experiment that demonstrates the potential of network slicing: "It is an interesting situation because it brings together several players, each with their own activities. We have built two public network slices on the site for non-sensitive, multi-customer and multi-purpose flows, and six private slices dedicated to customers and to one of these new applications specific to their activities. For example, a tugboat that manoeuvers ships in the port: a complex task in a tight space with real-time challenges. The system we have put in place combines video recording of the environment with IoT data from radar in

particular. At the same time, we are collaborating with the LACROIX Group on autonomous logistics, combining robotics and vision." Depending on the case, fibre may be suitable for this type of use. But 5G has the advantage of freeing the company from a physical wired infrastructure, making it easier to modify and adapt the production line. This is one of the challenges faced by the industry, as production models—and even economic models—are being overwhelmed with greater demands for flexibility.

Beyond smart factories

These "on-demand" models have the advantage of being constantly in line with needs, with economic and environmental optimisation as key factors. Among the first areas to benefit from these 5G-specific features are Smart Cities and Utilities, particularly the water and energy sectors. However, customer experience isn't missing out. For example, in Rennes train station, Orange and SNCF (*Société Nationale des Chemins de Fer français* — the French state-owned railway company) are conducting a project to allow near-instant downloads of high-definition content. This is one of the areas explored by SNCF to build a seamless customer experience from platform to train, including while customers wait. There are many possible avenues per sector: customer experience and business efficiency in the distribution sector, employee safety in the manufacturing and construction sectors etc. For B2C, the avenues for development are almost exclusively linked to augmented and virtual reality, in games or at events. However, while these areas are promising, they are far from being fully developed in terms of applications. This is because companies also have to undergo a transformation process and their business models need an overhaul.

A shared ambition

There are still some technological barriers to be overcome. There are currently few 5G modems for the IoT, and trials remain focused on static slices. Manufacturers and carriers must work together to meet objectives, prioritising interoperability, which requires the development of more APIs. "This is essential to guarantee availability and the potential of 'quality on demand' on end-to-end services. Co-innovation—between players from the IoT and robotics, connectivity, the cloud and the application world—is heading in the right direction. This is seen in the recent partnership between Orange and Google, which includes an extensive innovation component on <u>edge computing</u>. With this shared strategic interest, we will play to our complementary strengths—connectivity for Orange and cloud computing for Google—in order to successfully secure our position in this emerging market. Edge computing, including the ability to accelerate AI at the edge, is likely to solidify the ambitions of telecoms and IT ecosystems in the coming years, as it opens up all these new opportunities."

Networks and IT | Article

The race is on to build the quantum internet

Monday 12th of October 2020

Although we're unlikely to be carrying quantum computers around in our pockets anytime soon, the quantum internet is already within reach - and has plenty of surprises in store besides its fledgling applications in cryptography.
"Once you can create entanglement, it opens up a whole range of new functionalities such as quantum teleportation."
"Quantum Key Distribution", or QKD, will undoubtedly be the first technology to make practical use of the potential applications of quantum physics outside the laboratory. Such is the three-year goal set by the European project entitled OpenQKD, which brings together research centres and industry partners from thirteen different countries. For Europe, OpenQKD is a pilot project paving the way for EuroQCI – the European Quantum Communication Infrastructure. EuroQCI's vocation is to create a functioning quantum internet within fifteen years, capable of supporting a multitude of new functionalities extending well beyond digital cryptography.

A complex network for complex applications

Speaking from her laboratory at the CNRS / Sorbonne Université, Research Director Eleni Diamanti explains: "So far, we have mainly carried out point-to-point quantum communications experimentations. In terms of security, we can already see that quantum technology has the potential to improve several protocols beyond key distribution, such as coin flipping or currency transaction. However, if we want to go beyond basic point-to-point connections and communicate over long distances, or achieve more complex protocols, we'll have to be able to set up network nodes and to distribute entangled states. These entangled states are one of the unique aspects of quantum physics, as they provide correlations not found in classical physics. Once you can create entanglement it opens up a whole range of new functionalities, such as quantum teleportation. From there, we can start to imagine applications like secure electronic voting, transmission of anonymous messages, etc. These are the applications that we aim to demonstrate in the coming years."

It's important to distinguish between applications (such as QKD) which only involve the creation and measure of quantum states, and can work on a network of "classic" nodes, and those that will require a network whose infrastructures have yet to be invented. In particular, these infrastructures will need to provide repeaters capable of transmitting the entangled states, and will also need to solve the problem of storing quantum states, which are highly fragile and volatile.

Cloud-based "quantum services"

At the Delft University of Technology, researchers at the QuTech institute are busy setting up what could be the world's first quantum network, connecting four cities in the Netherlands. One key of QuTech's key challenges is to develop the abstraction layers that will envelop the physical network. Victoria Lipinska, a researcher at the Delft institute, explains one possible application of the quantum internet: the concept of Blind Quantum Computing. "Because of their enormous size and complexity, it's unlikely we'll be seeing quantum computers in the public domain any time soon. However, big data centres already have access to these types of computers. What will likely happen is that, within twenty years, industries will use these computers as a service. Companies will use small quantum devices, which will send queries to a remote computer. Due to the nature of the protocol itself, this computer has no knowledge of the data being sent, which is why we call it Blind Computing."
A report from the McKinsey agency estimates that the first sectors to be affected, already within the next decade, will be finance, energy and advanced technologies. Later, pharmaceutical companies will be able to test medications by using quantum computers capable of modelling even the most complex molecules.

A new network running alongside the internet

Both researchers agree that the quantum internet will not replace our current internet. Rather, it should be seen as an extra layer that will be used to undertake specific tasks. There are several challenges to be overcome before a functional quantum network can be established, starting with the transportation of photons. While fibre optic technology is an effective transporter, it causes unavoidable depletion of the light particles. Satellites are one option to bypass this limitation, but they pose problems in terms of performance and infrastructure. Like most powers involved in the race to develop quantum technology, Europe is currently in favour of a global quantum network that would combine terrestrial and spatial pathways.

Making the leap from laboratory to market

Key actors involved in the research include university institutes and space agencies, as well as industrial and telecoms operators. In France, the CNRS is working with

companies such as Thales, Airbus, Nokia and Orange. According to Eleni Diamanti, "we're seeing more and more interdisciplinary cooperation, which is a good thing: if we are to build a quantum internet, we'll need computer scientists and physicians, as well as electronics engineers and network experts." These bridges between the worlds of academia and industry will also set the stage for what follows the fundamental and experimental research: determining use-cases. This is what Victoria Lipinska is currently working on; after four years at Delft University, Dr. Lipinska joined KPN, the Dutch telecommunications company: "It's no small feat. We're taking a completely new technology and trying to apply it to a service that can be provided to a client. But with its unparalleled security capabilities, the quantum internet is full of promise."

At this stage, it's difficult to predict all the possible applications of the quantum internet, but both Diamanti and Lipinska are hopeful that its impact will match that of our current internet: after all, when two computers from the Arpanet network communicated with one another for the first time, who could have imagined meetings being held via videoconference, communications on social media, streaming movies, remote surgery, and so much more?

Internet of things | Article

Health, safety, and comfort at the heart of people flow management
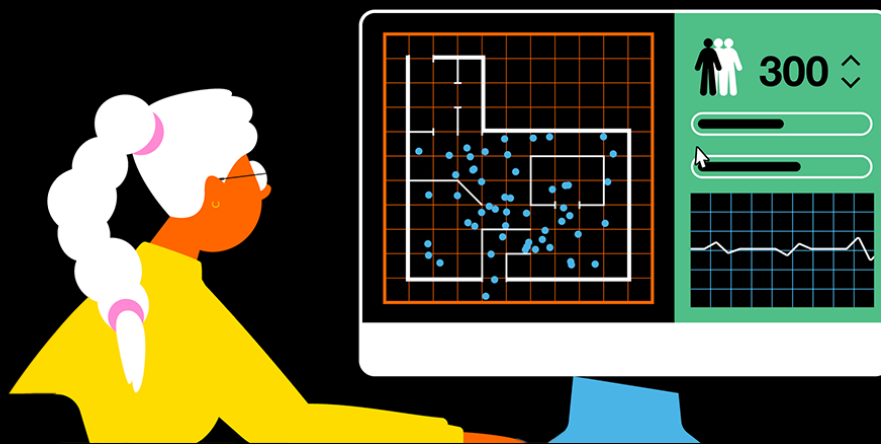
Monday 19th of October 2020 - Updated on Thursday 16th of June 2022

People flow analysis and management, based on a variety of technologies, are used in many areas, for example to reinforce the security of an area, to improve comfort of movement, or to increase a business's income.

"In the COVID-19 context, these technologies are proving particularly useful for facilitating the implementation of physical distancing measures"

The need to limit the number of people in a particular place so as to slow down the spread of COVID-19 has brought people-counting technologies to the fore and, more broadly, those of flow analysis and management. In the post-lockdown context, many museums, shops, businesses, etc. are turning to these technologies to apply physical distancing measures and protect their customers' and/or employees' health. But their scope of application is much wider.

People counting to know and to manage people flows

Generally speaking, people counting is performed at the entrance to a building thanks to a device installed on the ceiling, which automatically counts people as they cross a virtual line. The latest generation of counters uses 3D-cameras equipped with computer vision algorithms. Less intrusive – as no picture is taken – connected flooring performs the same function. The solution offered by startup Technis comprises pressure sensors integrated into the flooring combined with artificial intelligence techniques to recognise the events sensed: impact of foot, fall, etc.

These technologies offer advantages in many areas. In the sales sector, they enable retailers to evaluate the popularity of their store, to determine peak periods and allocate personnel accordingly, and potentially measure the number of visitors converted into buyers as well as the impact of advertising campaigns. Chain store managers can also do comparative analyses, and shopping centres can study traffic to measure the efficiency of each area – which will help them, for example, to set the amount of rent charged – or the congestion of certain aisles.

Museums and other public institutions, for their part, need to use precise attendance figures to obtain grants and donations, and to comply with safety standards.

People counting is also used as a basis for queue management systems. FoxQMS for example, which is used in Paris Charles de Gaulle airport, provides an estimation in real time of wait times at the various security screening checkpoints.

In the COVID-19 context, these technologies are proving particularly useful for facilitating the implementation of physical distancing measures. Technis has adapted its solution to help public spaces and businesses avoid exceeding the limits of numbers of people. It now includes a digital terminal, placed in front of the building, to show if a path is clear. The limit is configured and adjusted using an application.

People counting is part of the system implemented by Orange to facilitate return to the workplace. The Group, which organises staff presence, for example, by adapting the number of workstations available to the authorised workforce in offices or factories, uses a system of this kind to limit numbers in places such as canteens.

Simulation to guarantee safety and comfort

When taken into consideration right from the design of public spaces or offices (or once the decision has been made to improve them), people flow management can solve several problems: checking the building's capacity (and its capacity to absorb increases in attendance), guaranteeing rapid evacuation in the event of an incident, and optimising flow sizes to improve comfort in a normal situation. In order to do this, architects and consultants often use crowd simulation software, the workings of which are explained in French journal "Les Cahiers Techniques du Bâtiment".

This entails producing a simplified 2D or 3D model of the building, and modelling people's behaviour – where they come from, where they are going, and at what speed – in a normal situation and in the event of an evacuation. The virtual agents are capable of moving around a complex path and avoiding obstacles. The calculation (for example of a simulation of the evacuation of thousands of people in ten minutes) generates hundreds of trajectories. It is then necessary to align the model with reality. The software includes several default parameters and the user enters those that correspond to the project. The results can then be exploited so as to dimension the building. SimWalk was used, for example, in the Toulouse-Matabiau train station to check if its current layout could handle a significant increase in number of passengers. Thus, 11,240 pedestrians were modelled by group and by type (with or without luggage, persons with reduced mobility, etc.). The results made it possible to identify potential bottlenecks and to suggest improvements.
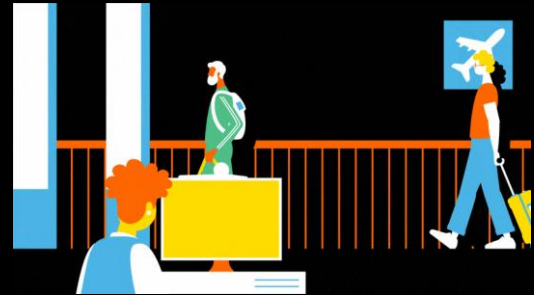
Biometrics to control access to a building and improve passenger experience

Access control in the workplace is another field of application of people flow management. In addition to traditional technologies (digital codes, badges, QR code readers) we now also have biometrics, which should have the advantage of being more ergonomic and reliable. However, their use is strictly regulated by the CNIL (the French data protection authority), as biometric data is now considered "sensitive" by the GDPR, and must be justified.

Airports are also exploring biometrics in order to reconcile two requirements: reinforcing security and making flow smoother on the ground, that is the set of steps a passenger goes through from their arrival in the terminal through to boarding the plane. The idea is to create a correspondence between a passenger's facial characteristics and their passport so they may go through all of these steps without presenting travel documents. This is known as "Single Token Travel".

In 2018, Delta Airlines opened the first biometric terminal in the United States, at Atlanta airport, enabling customers on a direct international flight to use facial recognition technology in Terminal F. After entering their passport information when registering online and scanning their face at a dedicated terminal, they can drop their baggage, pass security control and customs, and board the plane. The same year, Air France tested its "biometric boarding pass", which consisted in encrypting the biometric data of the passenger's face into the barcode of their boarding pass. The company had planned to launch an experiment of this type in Paris Orly and Paris Charles de Gaulle airports in March 2020.

SITA, the Société Internationale de Télécommunication Aéronautique, has been carrying out trials on different biometric devices for several years all over the world. Today they offer the SITA Smart Path, "the most comprehensive whole-journey identity management solution where your face is your boarding pass". People flow management and analysis make it possible to know traffic in real time and to gather a certain amount of useful information. Crucial to the improvement of security and comfort in public spaces, counting or biometric systems must nevertheless be the topic of a genuine reflection on their potential to invade people's privacy.

How the CNIL defines biometrics: "Biometrics include all automated processes used to recognise an individual by quantifying their physical, physiological or behavioural characteristics. Biometric data are personal data because they allow the identification of a person. For the most part they are unique and permanent (DNA, fingerprints, DNA, etc.)."

Links:
Faciliter le retour sur site en toute sérénité (Facilitating return to the workplace with ease): https://www.orange-business.com/fr/dossier/faciliter-le-retour-sur-site
Cahiers Techniques du Bâtiment article on simulation in people flow management: https://www.cahiers-techniques-batiment.fr/article/flux-de-personnes-comment-organiser-les-circulations.16765
Le contrôle d'accès biométrique sur les lieux de travail (Biometrics access control in the workplace) https://www.cnil.fr/fr/le-controle-dacces-biometrique-sur-les-lieux-de-travail
The world of air transport in 2018: https://www.icao.int/annual-report-2018/Pages/FR/the-world-of-air-transport-in-2018.aspx

Networks and IT | Article

Underwater Wi-Fi to come soon?

Friday 30th of October 2020 - Updated on Wednesday 15th of June 2022

After Li-Fi, Aqua-Fi: some Saudi researchers are suggesting to use light to transmit data under the sea and thus facilitate communication amongst divers. The test phase has yielded promising initial results.
"The Aqua-Fi project calls upon LED lighting and lasers."
After Wi-Fi on Earth, Wi-Fi under the sea? Having already invaded our everyday earthling lives, wireless technologies could now reach right down to the depths of the oceans. Underwater Wi-Fi would enable divers to communicate without having to use hand signs or a write on a board and send data to the surface.
A team of researchers from the King Abdullah University of Science and Technology in Saudi Arabia is attempting to develop just this. Its research project, Aqua-Fi, is aimed at professional divers and scientists for the time being.
Under the sea, wireless internet communication can go of three ways: radio signals, acoustic signals, or light signals. The first two are limited: radio signals can only carry data over short distances, and acoustic signals can cover long distances but with very limited speed.
This only leaves light, which can travel far and carry a lot of data. However, light signals require a clear line of sight between the emitter and the receiver. This is what Li-Fi (Light Fidelity) does on Earth, using light to transmit information.

Over 2 Mo/s (megaoctets per second)

At the King Abdullah University of Science and Technology, the team led by Basem Shihada has selected this option, with the Aqua-Fi project calling upon LED lighting or lasers. LEDs are low energy consumption for short-distance communications, whereas lasers carry data further but are less energy-efficient.
For their experiments, the researchers retained green LEDs and a 520 nm (nanometre) laser to send multimedia data from a nanocomputer (in this case a Raspberry Pi) to a light sensor connected to another computer several metres away from the first one.
The first terminal converts photos and videos into a series of 1s and 0s. This binary data is then translated into light beams that switch on and off at very high speed. The light sensor detects this flicker and converts it into a new string of 1s and 0s

that the receiver computer converts back so as to recreate the file in its original format.
The result: a maximum speed for data transfer of 2.11 Mo/s with an average delay of one millisecond for a return trip. It should be noted that the test was performed in optimal conditions and in still water.

Some remaining obstacles

In the future, Aqua-Fi aims to associate different technologies. Radio waves will enable data to be sent from a diver's smartphone to a "bridge" device attached to their equipment, which will transmit data via a light beam to a computer that is on the surface. This computer will be connected to the internet via satellite.
The Saudi researchers have still several obstacles to overcome. Under real conditions, the waters are moving yet the light beam must remain perfectly aligned with the receiver. The team is considering using a spherical receiver that can capture light from all angles. Professor Basem Shihada hopes that one day, "Aqua-Fi will be as widely used underwater as Wi-Fi is above water".
Beyond communication amongst divers or between divers and a boat on the surface, a high-speed underwater connection would enable datacentres set in the underwater depths to communicate with terrestrial network infrastructures. For two years, Microsoft has thus been experimenting with a submarine data centre off the coast of Scotland. It appears to be more energy-efficient, as the seawater cools its servers, but also more sustainable, with data centres on Earth suffering from corrosion due to the oxygen in the air.
– "Angling for underwater WiFi"
https://discovery.kaust.edu.sa/en/article/957/angling-for-underwater-wifi%E2%80%8B
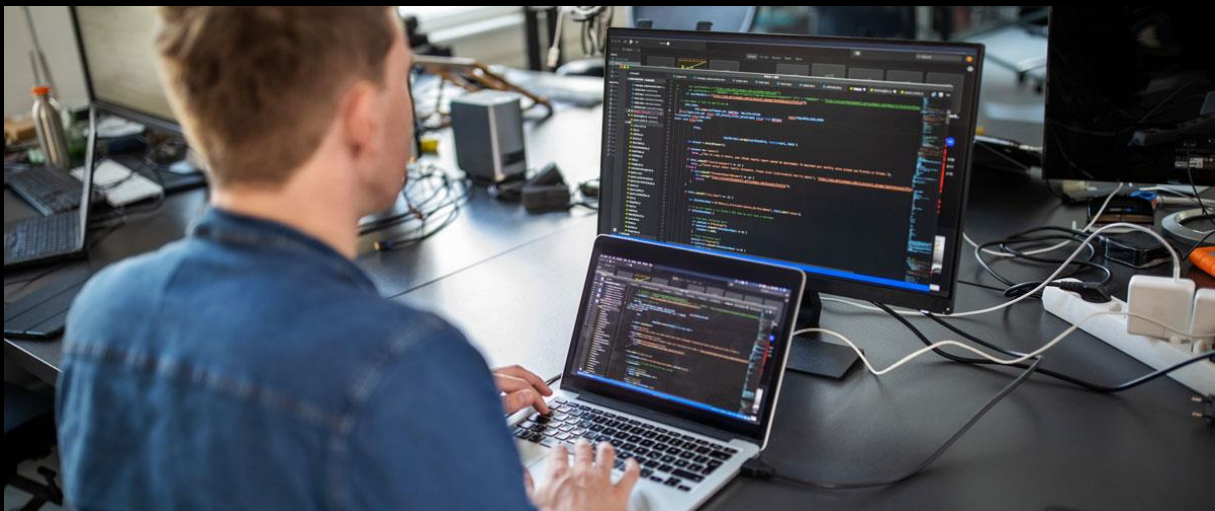– "Li-Fi, a relevant and complementary alternative to the Wi-Fi network"
https://hellofuture.orange.com/en/li-fi-relevant-complementary-alternative-wi-fi-network/

Networks and IT | Article

A multi-vendor ecosystem to prepare for the 5G of tomorrow

Monday 9th of November 2020 - Updated on Wednesday 22nd of June 2022

5G, which has begun to be rolled out in recent months, is worlds apart from the previous generation of networks. It is the arrival of the so-called Standalone 5G (SA 5G) that heralds this network of the future. The foundation of a virtualised, on-demand SA 5G network is being built and tested in an Orange laboratory, as part of experiments involving several key ecosystem players.
"An interoperable and authenticated first SA 5G call, resulting from multi-stakeholder collaboration"
Progress for the here and now, and a revolution by 2022/2023: this is how 5G's planned rise to power can be described. While the leap from 4G is already apparent with the gradual deployment of the first commercial networks, it will take a few years for the new generation of mobile networks to reach its full potential.

SA 5G under construction

From so-called Non-Standalone 5G, which still relies in part on the existing 4G infrastructure, we will move to the era of Standalone 5G, which is fully autonomous, more flexible, more efficient and more resilient. And this is now being structured and refined, thanks to close cooperation among key ecosystem players. Efforts are being made in this regard in Lannion, France, at one of the Orange sites, where a major milestone was reached at the beginning of October with the completion of the first SA 5G call. While this watershed moment is not unprecedented in the industry, the experiment undertaken in Lannion stands out in that it involves a multitude of partner suppliers, thus illustrating the interoperability between different technological building blocks. The initiative brings together players from all walks of life, with varying degrees of maturity on new networks. Some are established, recognised and indispensable, such as Nokia and Ericsson for radio and core network components.

The "big players" vs the newcomers

Others take the role of challengers and have less market visibility. They are no less relevant however in playing a leading role in the development of these future pure 5G networks. In this regard, US company Casa Systems, in particular, is providing its IT and cable/fibre access management expertise as core network protocols move to the web/Cloud sphere with SA 5G. HPE is also one of the project partners, as well as Openet for aspects related to the relaxation of quality of service rules for Data and Voice sessions. With regard to handsets, two of the world's leading manufacturers, Qualcomm and Mediatek, have proposed prototypes, including Oppo's smartphones. "The establishment of this multi-stakeholder environment, and the resulting demonstration, have helped to explain the maturity of interoperability", says Philippe Hémon, 5G Experimentation Project Manager at Orange. On this occasion, we were able to explore topics such as replacing a network feature from partner X with one from partner Y. This study will become a reality in the very near future, in the form of an operational SA 5G network, with the option to fluidly select the best application from the best partner via a catalogue and via the Cloud, according to parameters adapted to the use case: ease of instantiation, speed of execution, resilience etc."

Bringing the automated and "on-demand" network to life

Earlier this year, the experimental network deployed in Lannion gave rise to an initial experiment that highlighted some of 5G's innovative traits: slicing and automation. "With the first generations of networks, we had a unified infrastructure to serve all customers, with a unique commitment to quality of service", resumes Philippe Hémon. Then we began to deploy more specific or targeted networks, to support business needs and uses, for example. With SA 5G and all the possibilities opened up by Cloud technologies, edge computing and automation, we are moving towards a flexible, customisable and on-demand network. The demonstration conducted with Casa Systems and HPE implemented a mini-robot connected to a SA 5G network. This robot was capable of recognising a deterioration in quality of service and of escalating an alert to the orchestrator in real time to create a new, specific slice of the network dedicated to the robot on demand. And what may have taken several hours with the first generation of virtualisation can now be accomplished, with Cloud-based technologies implemented in the core of the network—Kubernetes, containers and so on—in less than a minute. This means optimal resilience, which is essential for critical applications that are highly sensitive in terms of latency".

Ongoing research work

Following on from these major steps, the Lannion laboratory is planning on other subjects of study. This kind of test is essential to master this new generation of networks and to share this experience with all countries where Orange is a carrier. It also provides the ability to reference the world's best suppliers.
In the longer term, research projects are being initiated in collaboration with Technopôle Anticipa, the Images et Réseaux hub and the municipality of Lannion Trégor to explore 5G-related use cases such as drones and port and nautical activities in the region.

Networks and IT | Article

Augmented reality with a video package

Friday 4th of December 2020 - Updated on Tuesday 14th of June 2022

The immersive experiences created by augmented and virtual reality (AR/VR) can still only go so far in terms of content quality and interactivity. With its Overlap Reality® technology, the start-up SkyBoy is bringing AR to new heights.
"Skyboy layers cutting-edge cinematic expertise over AR technology, guaranteeing very high-quality content"
The start-up SkyBoy has been deploying its concept of Overlap Reality® for eight years now, in a range of different contexts and use cases, spanning the cultural, tourism and event industries. To give life to an immersive experience weaving a link between physical and digital experience, the company creates something like a small metaverse for mobile, laying cutting-edge cinematic expertise over AR technology, guaranteeing very high-quality content.

Patented Overlap Reality® technology

The promise of this patented Overlap Reality® technology is to create a situation in which the real world enhances immersion. AR platforms often provide a first level of solutions that involve adding effects and filters to a shot. SkyBoy goes further. In 2020, François-Xavier Goemaere, SkyBoy CEO and Co-Founder, explains that "our goal is to have a raw material, for which we control the cinematic experience from start to finish. We rely on our SkyBoy Studio and an animation studio to capture real-life 360° images using real actors. Once the video package has been reworked and given the green light, the technology takes over. This package is exported to our platform, which geotags it and determines where the video can be activated. This might be anywhere or at a specific location. All users need to do is connect to either WiFi or 4G/5G and access this content via the browser of their smartphone or tablet. They can quite literally open a window onto the story they're being told via content that overlaps with reality".

An enhanced solution

Based on experience and listening to what its customers need, SkyBoy has developed new features and integrated them into the original concept, making Overlap Reality an end-to-end solution. One early development of theirs made it possible to tailor experiences to products. Such experiences could be activated anywhere, not just at a specific location. The switch to browser mode also made content more accessible since needing the app had been an obstacle for the audience. SkyBoy also enables the production of a wide range of activations, from games (gamification) to the conversion of experiences into NFTs. Finally, the "marketing platform" brick added in 2018 allows to collect, analyze and use the data from each experience: "We attract highly skilled audiences and it was important to allow our clients to get feedback on their campaigns".

Overlap Reality boosting acceptance of 5G projects

Thanks to 5G increasing performance in terms of throughput and latency, SkyBoy is about to reach a whole new level of quality and interactivity. In season 1 of the Orange Fab 5G acceleration programme, the start-up is exploring these topics and collaborating with the Group on a new project. Preparing and deploying the next generation of mobile networks has proved problematic in terms of acceptance and SkyBoy is using its expertise to help keep affected residents informed. Raphaël Lestienne from the Ile-de-France UPR (Unité de Pilotage Réseau — network control unit) explains: "We are negotiating with major project backers to install new antenna or upgrade existing equipment. We therefore have a duty of care, which is most often expressed in the form of signage, both before and during construction work, in the stairwells or at the entrances of the buildings affected. In partnership with SkyBoy, we wanted to go further than these formal displays since it's impossible for us to know how effective they are. So an experiment will be [has been] carried out in 2021 on a pilot site, consisting of a geotagged Overlap Reality photomontage before and after the antenna's installation. It will take the form of one of the Orange employees working on the project. In this way, we are giving the works a human face and sharing information that occupants would previously have had to find for themselves. This information will cover integration procedures specifically and mobile networks and electromagnetic waves more generally. Then, at the end of the Overlap Reality experience, occupants will be invited to consult dedicated resources via a click-to-action. And we will be able to analyse the impact of the campaign, by seeing how many people have accessed the experience and so on".
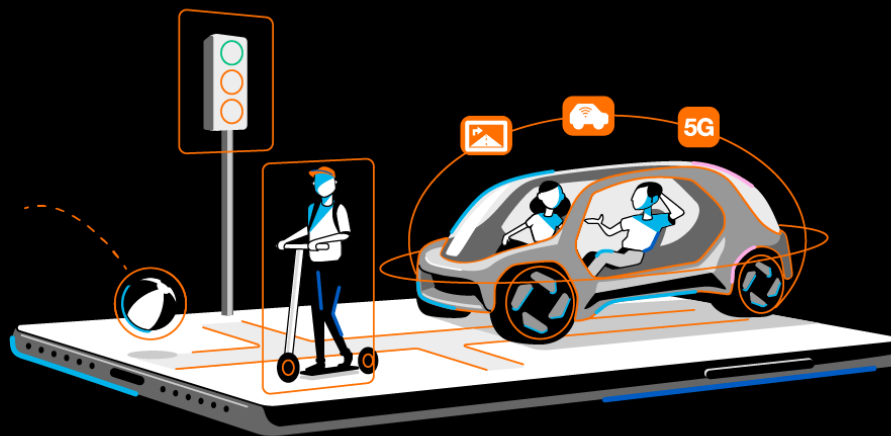
At VivaTech 2022, SkyBoy is presenting an experience enhanced by collaboration with Orange 5G Lab.

Networks and IT | Article

The connected car crosses national borders

Monday 14th of December 2020 - Updated on Wednesday 22nd of June 2022

The European research project 5GCroCo concerns a relatively unexplored field of communication called "Vehicle-to-Everything" (V2X) — the provision of CCAM (Connected, Cooperative and Automated Mobility) services across national borders. "The European project aims to provide seamless and harmonised V2X services, from one country to another using mobile networks."
What potential barriers are there to the connected self-driving car? Every year, technological developments in this field bring us closer and closer to the highest level of autonomy — vehicles that can drive themselves, without drivers or passengers. But this progress has a very real limit in the form of national borders. The question of how to provide seamless and harmonised CCAM services from one country to another using the new mobile networks is being explored in depth by the 5G CroCo consortium.

Three use cases, a huge potential for innovation

This European project, itself part of 5G PPP (the 5G Infrastructure Public Private Partnership) Phase 3, involves 24 partners from 7 countries, including carriers, network equipment manufacturers, vehicle manufacturers and suppliers, a motorway operations manager, research institutes and SMEs.
https://www.dailymotion.com/video/x7y0lkh
Its research work is divided into five work packages—preparation for trials and test sites, software and network architecture, execution of tests, V2X business potentials and exploitation of results—and three use cases. "The first [use case] concerns tele-operated driving or how to control a vehicle from a remote operation centre", explains Stefan Wendt, Radio Communications Expert and Senior Project Manager at Orange. "The second focuses on high-definition mapping and investigating how to update maps to reflect the emergence or development of certain parameters along traffic lanes. The final use case is ACCA (Anticipated Cooperative Collision Avoidance), which aims to use the intelligence of the network to transmit alerts from one stationary or broken-down vehicle to others." To this end, a series of tests is initially being carried out on five small-scale sites, before moving on to real roads, namely two cross-border corridors — between Germany and Luxembourg and Germany and France.

5G, a key technical enabler for ACCA

In the context of this project, Orange's expertise is particularly valuable in terms of assessing and validating the feasibility of the ACCA use case. Despite the increasing number of in-vehicle sensors (radars, cameras lidars etc.), the vehicles still have a limited awareness of their surroundings and, even more so, a limited ability to detect and anticipate certain dangerous situations. The ACCA use case aims to improve vehicle reactions by facilitating the anticipated detection and localisation of events such as traffic jams or emergency braking. For this, a car must be able to share data via a geoservice embedded in a server that is part of the V2X infrastructure.
Facilitated by the 5G network performance, Mobile Edge Computing capabilities and slicing, "the ACCA system relies on both local data processing and cloud computing", explains Stefan Wendt. "A traffic management system interacts with the various geoservices, while the software architecture allows urgent messages to be issued, for every car in its region of interest, within a 10–20 km radius. We will ultimately be able to manage all vehicles, transmit data, monitor traffic, prioritise tasks and provide local warnings very quickly".
Here, 5G leverages its potential in URLL (Ultra-Reliable Low-Latency) communication and MEC (Multi-access Edge Computing) to help process data as close as possible to the vehicles and provide real-time signalling.

Focusing on a cross-border context

Although the tests carried out in September 2020 at the TEQMO site in Montlhéry, France, validated the 5G Non StandAlone and software network architecture required, certain questions remain. "We need to concentrate on reality, on the networks as they are now, and therefore look closely at the switch between 4G and 5G networks. We found that the transition between networks in a cross-border context required further fine-tuning and configuration. We also need optimal service continuity and interaction between 5G infrastructures from one side of the border to another. The corresponding service architecture also needs to be fine-tuned so that it is capable of registering messages in different formats".

These different critical bricks in the service will be analysed and optimised in anticipation of the move from testing to real-life large-scale situations. A testing campaign is planned for 2021 on several sections of private road along the French A320 motorway between Forbach and Saarbrücken. In the meantime, the new generation of mobile networks is already demonstrating its ability to support the use cases linked to CCAM services, thanks in particular to Edge Computing and reliability guarantee mechanisms.

Research | Article

Infringement: an issue at the heart of intellectual property

Monday 21st of December 2020 - Updated on Wednesday 15th of June 2022

- Intellectual property rights specifically protect the innovative nature of Orange's networks and services.
- The carrier's inventions are sometimes subject to infringement by third parties. The size of Orange's patent portfolio often deters third parties from taking action.
- This article is a complement to the folder "Intellectual Property, a marker of innovation".

"The strong growth of patents in telecommunications in recent years clearly poses an infringement threat to industry stakeholders, not to mention carriers."

"High Efficiency Video Coding" or HEVC, is a codec, a video compression standard. It can reduce the file size of an HD or Full HD video by about 50% and, therefore, the bit rate required to send it, while maintaining the video quality.

Developed around seven years ago and now embedded in all smartphones, tablets, routers, etc., this standard is closely monitored by Orange engineers, who have broken ground in the video coding field and are advised in this respect by patent lawyers in order to protect their inventions. Their role is, first and foremost, to obtain the most favourable patent by investigating upcoming infringement cases and also throughout all the years of proceedings before the patent offices of the world. Secondly, they confirm whether or not this standard is being infringed using filed patent portfolios.

Defined as the exploitation of an intellectual property right without the authorisation of its owner, infringement affects trademarks, designs, patents, copyrights, software, integrated circuits etc.

Basically, for inventions to be protected, a patent needs to be filed. In order for there to be infringement, there must be a patent and proof of the existence and prior art of the invention. A person who wishes to use an idea that has been protected and is therefore clearly identified as the property of another must request authorisation from its inventor. The inventor may grant them a licence for a fee. Using such an idea without an agreement constitutes an infringement.

Telecommunications: an industry of infringements

According to Sandrine Millet, Director of Intellectual Property and Patents at Orange, "the strong growth of patents in telecommunications in recent years clearly poses an infringement threat to industry stakeholders, not to mention carriers".

Infringement can affect any sector: from mobile networks to television services to satellites. It is at the heart of intellectual property activities.

There can be no infringement if a patent has not been filed

Most of the time, the enforcement of intellectual property rights requires there to be a patent that has been filed. A patent prohibits the non-negotiated use of an invention for twenty years. Once an idea has been registered and published, the means to prohibit and/or monetise its use must be available, "an objective that can prove complicated in the telecommunications industry, especially in a group like Orange which, with a portfolio of 8000 patents, covers a wide range of activities", notes Sandrine Millet. "So, to detect infringement, there are several approaches available to us", she says.

Patent lawyers can, first and foremost, draw upon the regulatory texts of technological standards to investigate the infringement of essential patents. In this case, they have the advantage of having access to texts written in a very precise manner. In addition, the financial stakes involved in infringement are a determining factor in the carrier's choice of action. "Technology from our patent portfolio, which represents high market expectations, will be paid particular attention in order to detect potential infringement and request licence fees", says Sandrine Millet.

Orange often joins forces with other telecommunications players to assert its rights with respect to infringement cases. "This is the case, for example, with the HEVC standard", she says. "We have teamed up with other HEVC patent holders to assert our rights and share licensing negotiations for this technology with terminal manufacturers."

An infringement case is therefore prepared based on the financial valuation of a technology. The selection of technologies to license is made in close collaboration with Orange's licensing department.

Often more linguistic than technical

Building an infringement case involves several steps, during which a patent lawyer works closely with an expert in the relevant technical field. They study the texts drafted at the time the patent is filed and, in particular, they study what is known as the claim or legal scope, which describes the characteristics of the invention in a few lines. "It's a text that can range from four lines to a whole page, depending on the type of invention, where every word is carefully chosen", emphasises Sandrine Millet. The choice of words is important because the document will then be translated into different languages and then potentially subject to subsequent interpretation. "Sometimes discussions are more about linguistics than technical or legal matters", she says.

The lack of an agreement between the infringing party and the inventor can end up before the court.

Trade secret: better than a patent?

There is another option: when a technological invention is extremely complex, requiring a lot of know-how, it is sometimes better to keep it a secret. "This is another form of protection that allows us to protect our innovations", Sandrine Millet points out. Since there is no publication involved, this option makes sense, particularly when the act of the invention being put into effect by a third party is difficult to detect. A trade secret avoids publication all together and thus avoids infringement as well, even though it would be difficult to identify the infringing parties. This option is therefore very valuable.

Currently, the international trade of counterfeit and pirated products is having a detrimental effect on virtually all markets. Counterfeiting and infringement is second largest source of criminal income in the world (2016). It results in a significant loss of revenue for companies.

Artificial intelligence | Article

Neuroprosthetics, virtual reality, and AI tackle motor disabilities

Monday 15th of June 2020 - Updated on Friday 12th of June 2020

Technological progress provides many perspectives for the rehabilitation and compensation of disabilities. Blaise Yvert, research director at the Inserm (the French national institute of health and medical research) and leader of the BrainTech Lab Neurotechnology and Network Dynamics team, reviews three technologies that aim to give more independence to people with motor disabilities and to improve their quality of life.

"Post-stroke rehabilitation consists in stimulating brain plasticity to enable the patient to recover part of the motor skills lost."

The Clinatec research centre's Brain Computer Interface (BCI) project

"For the first time, a tetraplegic patient was able to walk and control both arms using this neuroprosthetic, which records, transmits, and decodes brain signals in real-time to control an exoskeleton", the French Alternative Energies and Atomic Energy Commission (CEA) proudly announced in October 2019.

Developed at the Clinatec research centre, within the CEA, BCI is a brain-machine interface project that aims to enable people with severe motor disabilities to gain mobility thanks to mental control of an exoskeleton. A neuroprosthetic implanted in the cortex collects brain signals that are emitted when there is movement intention. These signals are then decoded thanks to a machine learning algorithm so as to predict the voluntary movement imagined by the patient and control the exoskeleton.

Blaise Yvert: "There are essentially two approaches concerning brain-machine interfaces. The first, a non-invasive approach, consists in measuring brain activity via electrodes placed on the scalp (EEG). This enables people to control a computer cursor or type letters on a screen. The downsides are that it is relatively slow, it's

difficult to control many degrees of freedom, and in general it requires a high level of concentration from the patient.

To obtain something that is higher performing, we use intracortical electrodes, i.e. that are implanted in the cortex, to record the activity of individual neurons and predict the movement that the person wishes to make. This is, for example, the principal of the BrainGate project. The advantage of this second method is that it is faster and more precise, but it also requires opening up the skull and the dura mater, with all of the medical complications that this can entail.

The approach chosen by Clinatec is halfway between the two: the electrodes are implanted under the skull but on the surface of the dura mater. We are therefore freed from the bone, which is not very conductive, to obtain better quality signals than an EEG. We do however remain at the macroscopic level, at a certain distance from the brain.

What is interesting with the study carried out at Clinatec is that the researchers show it is possible to control and carry out up to eight degrees of freedom via these macroscopic electrodes, as well as wireless transmission through the skin thus minimising the risk of infection.

The control of so many degrees of freedom had, up until now, only been carried out with intracortical electrodes.

However, the movements obtained are still quite approximate, and huge efforts still need to be made in order to improve the precision of the recordings provided by this type of implant."

A virtual reality rehabilitation system for stroke patients

Strokes are the primary cause of acquired physical disabilities in adults. When they affect an area of the brain involved in mobility, they can cause paralysis in a part of the body.

Post-stroke rehabilitation consists in stimulating brain plasticity to enable the patient to recover part of the motor skills lost. Developed by American company Penumbra and used at Cooper University Health Care, New Jersey, the REAL Immersive System is a virtual reality system for stroke patient upper-extremity rehabilitation. Thanks to a series of interactive exercises, it aims to reactivate neuroplasticity, that is to help the brain "rewire" itself and create new neural connections. The system comprises a headset equipped with a screen and a series of sensors placed on the body of the patient, who is immersed in a virtual environment. Thanks to a tablet, a therapist can choose from a series of activities that prompt the patient to move their arms.

Blaise Yvert: "Here we try in a fun way to get the patient to move their arms, which will motivate them to work more than with traditional rehabilitation systems. The concept is interesting as it is based on play as a reward for efforts made by the patient wanting to move to stimulate plasticity.

An approach based on this principle is being developed at the École polytechnique fédérale de Lausanne, Switzerland, by the team of professor Grégoire Courtine. The

researchers have managed to give paraplegic monkeys the ability to walk again thanks to targeted stimulation of the spinal cord in response to cerebral activity produced by the animal when it wants to move.

The fact that there is a correlation between the intention to move and the carrying out of this movement, even if in the beginning this is done through an artificial system, makes it possible to elicit brain plasticity, axonal growth, and to re-establish connections between the brain, the spinal cord, and the limbs.

A similar approach has also yielded promising results in patients who have been paralysed for several years.

Google's project Euphonia

Automatic speech recognition tools create a paradox: they are supposed to make our everyday lives easier, but they are not always adapted to the users who need them most. Thus, people with a motor disability that prevents them from expressing themselves in a "natural" manner have difficulty being understand by voice assistants and interacting with their smart devices, the generalisation of which could become another factor of exclusion.

Aware of this issue, Google launched project Euphonia, the aim of which is to improve the ability of voice recognition tools to recognise non-standard forms of language thanks to artificial neural networks.

Blaise Yvert: "Automatic speech recognition is based on the training of neural networks that require large amounts of data in order to learn. We therefore use databases containing thousands of hours of recordings from different individuals. However, to be able to understand a person with severe dysarthria, the network must be trained on this person's speech. The problem is that we cannot acquire that amount of data from one single speaker.

The Google engineers therefore adapted a neural network, which had already learnt from a huge corpus of standard speech, to the particular speech of a subject by retraining it over a short period of time with a much smaller dataset.

This seems to work well. Their results show that this approach reduces considerably the error rate of words produced by the network for this person.

We are trying to do something similar at the BrainTech Lab with cerebral activity. We have designed a voice synthesizer that is capable of turning articulatory movements into speech with the help of a deep neural network trained on a large corpus.

We are now trying to adapt it to patients after having converted their brain signals into articulatory movements with a short calibration phase from a rather small amount of data."

Networks and IT | Article

Technological innovation at the heart of future submarine cable 2Africa

Thursday 24th of September 2020 - Updated on Thursday 16th of June 2022

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"The aim of this new submarine cable: to speed up Africa's digital transformation" With a length of 37,000 km, which will make it one of the longest in the world, future submarine cable 2Africa will link up Western Europe with the Middle East and 16 African countries as of 2023 or 2024, the date announced for it to go live.

With a nominal capacity of up to 180 Tbit/s on the system's key elements, it should enable the improvement of connectivity in Africa and meet the increasing demand for capacity in the Middle East. It is also aimed at facilitating the deployment of 4G, 5G, and high-speed access for hundreds of millions of people.

The stakes are high: although the African continent has seen a sharp increase in the number of internet users, its internet penetration rate is still low in comparison with the rest of the world. According to the International Telecommunication Union (ITU), only 24.4 % of Africans used the internet in 2018.

What's more, disparities across the continent are huge between "over-connected" countries, such as Nigeria, South Africa and Morocco, and "under-connected" countries, such as Sudan, Somalia, the DRC and the Republic of the Congo.

Yet, as we know, access to the internet and digital technologies is strategic, as the digital transformation influences key areas such as the economy and public governance, which includes healthcare, education, banking and insurance, agriculture, etc.

Such is the aim of this new submarine cable: to speed up Africa's digital transformation by becoming one of the main pillars of the expansion of internet on the continent, with the underlying development of new services (mobile financial services, digital tools for agriculture or digital public services for example) and new uses for public institutions, businesses, and private individuals.

High-level performance

In order to achieve this, the 2Africa project will benefit from the most advanced technologies as the aim is to provide the highest possible level of performance and availability.

The cable will thus integrate the new SDM1 technology (Spatial Division Multiplexing), designed by Alcatel Submarine Networks (ASN) to improve capacity whilst optimising costs. This will enable the deployment of a maximum of 16 fibre pairs where previous technologies only supported eight.

2Africa will also benefit from "optical switching" technology for flexible bandwidth management. Telecom Egypt is to provide a new link between the Red Sea and the Mediterranean, with the option of an optical interconnection between East Africa and Europe.

This project includes two new landfall stations in Egypt, Ras Gharib and Port-Said, connected by two different land routes along which new generation fibre will be deployed.

Running parallel to the Suez Canal, these routes will be completed by a new submarine link establishing a third connection between Ras Gharib and Suez.

In the interests of fairness, service providers will receive capacity via neutral data centres – i.e. that do not belong to one single operator – or open-access landfall stations, this will contribute to a "healthy internet ecosystem" for both businesses and private individuals who will thus benefit from the best services at the best prices.

Research | Article

Shared computing: putting PCs to use in the fight against diseases

Monday 21st of December 2020 - Updated on Wednesday 15th of June 2022

Dividing a certain quantity of computer work into units spread across thousands of computers made available by volunteers: this model, which makes it possible to reach phenomenal computing speeds, is contributing to the progress of scientific knowledge. In the medical field, for example, it has led to a considerable leap forward in the science of proteins, which is essential to fight AIDS, Alzheimer's disease, the Ebola virus and, more recently, COVID-19.

"Thanks to massive mobilisation involving thousands of individuals and organisations, Folding@home has exceeded the symbolic threshold of the exaflop."
In March 2020, distributed computing project Folding@home exceeded the symbolic threshold of the exaflop and reached a computing speed superior to that of IBM's Summit, the most powerful supercomputer at the time (since superseded by Fujitsu's Fugaku). This feat was made possible thanks to the mobilisation of thousands of internet users, businesses and public institutions, who decided to share their computers' resources in the context of the COVID-19 pandemic so as to enable modelling of the proteins responsible for the disease and accelerate discovery of a treatment.

Scientific research requires phenomenal computing speed to carry out ever more complex simulations, which are essential in the solving of large-scale problems in different areas. However, researchers do not always have the financial means that would enable them to use a supercomputer.

By "distributing" a computing calculation across thousands of personal computers connected to the internet, shared computing works like a super powerful virtual computer that can solve large-scale computing problems, which would otherwise require a very long time in a traditional environment. The users download and install a piece of software onto their machines. This software runs in the background, only using available and unused resources to perform the calculation tasks, it then sends the results back to the source. Most of the time, each user can choose the project or projects in which they wish to take part.

From the search for signs of extra-terrestrial life…

The pioneer in the field is the SETI@home project, developed by the University of California, Berkeley, in cooperation with the SETI (Search for Extraterrestrial Intelligence) programme. Launched in 1999, it had two objectives: to prove the viability of distributed computing on the one hand, and to detect the presence of extra-terrestrial life by analysing data provided by the Arecibo radio telescope (on the island of Puerto Rico) to spot any signals on the other.

Only the first objective was achieved. SETI@home proved to the scientific community that distributed computing made it possible to obtain computing power that could compete with the most powerful supercomputers.

The BOINC platform, which has supported the software since 2005, now supports several distributed computing projects in a wide range of areas: biology and medicine, physics and nanotechnologies, astronomy, climatology, mathematics and computing. It brings together a large community of users and reaches a total average computing power of over 33 petaflops spread across around 550,000 computers.

In 2019, the two most popular projects on the platform were Collatz Conjecture, which aims to refute the eponymous statement by testing mathematical sequences, and Einstein@Home, destined to detect gravitational waves by analysing interferometer data.

… to the fight against diseases

In parallel, BOINC is used in the World Community Grid (WCG) project. Created in partnership with IBM in 2004, WCG brings together several scientific research projects of strong humanitarian interest – the fight against AIDS or the Ebola virus, climate study, research for new materials in the renewable energy field, etc. – in a unique computing grid (users are included in all projects by default).

Among these projects, Décrypthon has facilitated progress in the understanding of genetic and rare diseases. Launched during the 2001 Téléthon by the French Muscular Dystrophy Association (AFM) and IBM, the project aimed to produce a proteome map (the entire set of proteins expressed in a cell), to be made available to researchers. In total, 75,000 internet users got involved.

Each computer contributed approximately 133 hours, that is over 10 million hours computing in total, and 550,000 proteins of the living world have been catalogued. It would have taken over 1,170 years to do this using only one computer. Following this, around ten scientific projects selected through calls for proposals have been carried out within the framework of the Décrypthon programme.

Also in the area of research on proteins, Folding@home, founded in 2000 by Vijay Pande at Stanford University in California, seeks to further the understanding of protein folding by simulating this process in diverse conditions. The aim being to draw useful knowledge that can enable the development of new medications against

several diseases, such as Alzheimer's disease and certain types of cancer. The computation results will be available to scientists the world over.

In February 2020, the Folding@home team announced that part of its efforts would be focused on research into a treatment against SARS-CoV-2, the virus at the origin of COVID-19, and launched an appeal to internet users encouraging them to contribute from their home by installing the software.

The aim is to understand how the viral proteins responsible for the disease work (read below "How the proteins responsible for SARS-CoV-2 work") by 3D-modelling them.

Massive mobilisation involving thousands of individuals and organisations has enabled Folding@home to exceed the symbolic threshold of the exaflop. Over the following months, the researchers put this computing power to use: "We've simulated nearly the entire proteome of the virus and discovered more than fifty new and novel targets to aid in the design of antivirals", declared a researcher from the Washington University School of Medicine . "We have also been simulating drug candidates in known targets, screening over 50,000 compounds to identify 300 drug candidates."

How the proteins responsible for SARS-CoV-2 work

In the scope of the fight against COVID-19, the aim of Folding@home is to understand how the viral proteins responsible for the disease work by 3D-modelling them. The first step of the infection occurs in the lungs when a viral protein, called spike protein, binds to a protein present on the surface of lung cells: the ACE2 receptor. A therapeutic antibody is a type of protein that could prevent this process, thus stopping the virus from infecting the lung cell. Source: https://foldingathome.org/2020/02/27/foldinghome-takes-up-the-fight-against-covid-19-2019-ncov/

Digital culture | Article

Advertising, video, short formats: digital is changing literature

Monday 17th of February 2020 - Updated on Wednesday 22nd of June 2022

The advent of the web, the development of social networks, and the democratisation of digital uses have reconfigured literary creation, which now lives off advertising, appears in videos, and uses formats that are sometimes very short.
"YouTube is a laboratory of creation where on-the-screen writing is being born and multiple traditions, from art video to happening are crossing paths"
The spread of IT into our everyday lives as of the 1980s, followed by the advent of the web in the 1990s, have led to a "reconfiguration" of literary creation, according to Marcello Vitali-Rosati, a professor in the Department of French Literature at the University of Montréal and chairholder for the Canada Research Chair on Digital Textualities. What does it mean to write in the digital era?

A change in economic model

In the first instance, "economic models changed radically", he stresses. Designed to support editors, distributors, and booksellers, the copyright system facilitated a content production and distribution infrastructure within which an author could sometimes enjoy a professional status. "This system is no longer the only one in existence, and it has even become the minority", Marcello Vitali-Rosati specifies. "Today, a large part of literary work is no longer based on copyright. All of the productions circulating on proprietary social networks live on the basis of an economic model based on advertising."

"LittéraTube"

In parallel to this change in economic model, with digital, literary production has found other modes of distribution than the printed book. Contemporary writers use personal websites and blogs to disseminate their printed works and enrich them by providing drafts, manuscripts, interviews, and university studies. Some authors, such as François Bon with his Tiers-Livre (Third-Book), Arnaud Maisetti, Jean-Yves

Fick or Cécile Portier, are breaking from print and offering natively digital literary creations.

This production is deployed in particular across online writing forums ("Jeunes Écrivains"; "Le Monde de l'écriture"), collaborative writing platforms (such as Wattpad) and social networks. For Gilles Bonnet, professor of modern and contemporary literature at University Lyon 3 where he is head of the Marge group and author of Pour une poétique numérique (For digital poetics), "YouTube has well and truly become, among a thousand other things, a socio-literary network". He talks of "LittéraTube" when referring to current experiments of video-writing. Within this "laboratory of creation", "on-the-screen writing" is being born and "multiple traditions, from art video to happening" are crossing paths. Web-literature in video format produces personal journals (for example, the vlogs of Arnaud de la Cotte or Michel Brosseau), video-poems (Gwen Denieul or Marine Riguet) and performances (Charles Pennequin or Studio Doitsu).

Works combining short formats

As well as the evolutions in practices and media, there is an influence on the formats themselves. "We are witnessing the emergence of short formats, of romans-fleuves written in fragments, as well as works that combine both short and very long formats", remarks Marcello Vitali-Rosati.

As evidenced by the success of sentimental literature series After, written by American Anna Todd on her iPhone, this brevity, the hallmark of writing on social networks and messaging systems, has found its audience.

Artificial intelligence | Article

Fake news arms race prompts boom in AI

Monday 30th of March 2020 - Updated on Monday 13th of March 2023

- Exponential progress in generative AI, as illustrated by GPT-3 and Chat GPT and tools that can imitate human voices, has added to the threat posed by fake news.
- These new risks have prompted a need for innovative technologies that can distinguish between truth and falsehood and improve the precision of investigators attempting to detect disinformation campaigns.
- Cutting-edge analysis tools powered by machine learning and neural networks have the capacity to detect content generated by artificial intelligence.

"Decoding of information is benefiting more and more from technological advances."

Hot on the heels of deep fake video that gives the illusion of real footage, artificial intelligence has now brought us audio tools that can convincingly imitate individual human voices when trained with a few soundbites. Entire telephone conversations and radio messages can be faked adding to the already formidable arsenal at the disposal of the creators of fake news, and disinformation campaigns that are often

perceived as genuine on social networks. When they are viewed by large numbers of Internet users, fake news and disinformation can generate very real social tension, influence voter preferences and do real damage to corporate and personal reputations. According to a recent report by the American think tank, Brookings, deep fakes now represent a significant geopolitical risk in as much as they can utilized in military and subversive intelligence operations. Worse still, the researchers who authored this report warn of the ease and rapidity with which these deep fakes can now be produced.

Algorithms will soon produce content that is indistinguishable from that produced by humans

The AI arms race

A technological arms race is now underway between the creators of fake news and the developers of systems that can detect and flag mendacious content to audiences that may be exposed to it. New tools based on advanced language models like Chat GPT-3, or applications like FaceSwap and DeepFaceLab, have raised many questions. According to the World Economic Forum, "algorithms will soon produce content that is indistinguishable from that produced by humans". For Georgetown University researcher, Josh A. Goldstein, there is also a risk that artificial intelligence will be used to produce fake content that is tailormade for individual Internet users, which could, for example, take into account data sourced from their social networks, making it all the more believable. Artificial intelligence also has the capacity to cut the cost of producing fake news, which could pave the way for disinformation on a massive scale.

In Madrid, the media company Newtral has gone as far as deploying its own AI language model, christened ClaimHunter, which has been trained to analyse and fact-check political speeches (especially with regard to data and figures) pronounced by candidates; an effort that has proved successful. Newtral is now working with the London School of Economics and the TV channel ABC Australia to develop a further version of its tool to distinguish falsehood from truth in political discourse.

The need to improve fact-checking

'The race between fact-checkers and those they are checking on is an unequal one", points out Tim Gordon in "Wired", the co-founder of the Best Practice AI consultancy. For Gordon, the generative capacity of AI will make fact-checking, often undertaken by small organisations, well-nigh impossible. At the same time, however, the decoding of information has also come on apace with technology. Since 2018, researchers from the Computer Science and Artificial Intelligence Lab (Massachusetts Institute of Technology) and the Qatar Computing Research Institute thus claim that the best approach against fake news is to look at the actual sources

rather than isolated news items. They have developed a machine-learning-based system to detect if a source is pertinent or biased.

In France also solutions are emerging to attempt to contain the fake news problem. Within the frame of the Content Check project started in 2016, four research laboratories and media such as Le Monde are working together to develop software aimed at journalists in order to check facts.

Ioana Manolescu, a computer science researcher at the French National Institute for Research in Digital Science and Technology (Inria), is one of the pioneers of Content Check. "My starting point was the observation that with the development of open data, everyone has access to a lot of information, the researcher confides to Farid Gueham, of the Fondation pour l'Innovation Politique. But this information is widely spread and not always easy to access: it is very complicated to link it all together." The team is working for example on software that improves the accessibility of Insee (The French National Institute of Statistics and Economic Studies) data. A crawler (an indexing robot) analyses the website, the data is then extracted thanks to an API and is consolidated in a database by an algorithm that identifies the type of each cell. The software makes it possible to answer a journalist's research query by returning a value and a link to the original table.

Artificial intelligence and neural networks

At the Institut de recherche en informatique et systèmes aléatoires (Research institute of computer science and random systems), Vincent Claveau, French National centre for scientific research (CNRS) research fellow specialising in natural language processing, is concentrating on fake videos that are circulating on social networks.

Often modified and compressed several times, the content is analysed so as to detect if there are similar images on the web. "A neural network is trained to identify them, by comparing vector representations", the researcher confides to Industrie & Technologies magazine. Calculation of the difference between the two images then makes it possible to highlight modified areas and to identify the changes made.

His team is also starting to work on image decontextualisation, analysing the characteristics of images and their associated text, again thanks to deep learning. The arms race continues more than ever.

Artificial intelligence | Article

Neuroprosthetics, virtual reality, and AI tackle motor disabilities

Monday 15th of June 2020 - Updated on Friday 12th of June 2020

Technological progress provides many perspectives for the rehabilitation and compensation of disabilities. Blaise Yvert, research director at the Inserm (the French national institute of health and medical research) and leader of the BrainTech Lab Neurotechnology and Network Dynamics team, reviews three technologies that aim to give more independence to people with motor disabilities and to improve their quality of life.
"Post-stroke rehabilitation consists in stimulating brain plasticity to enable the patient to recover part of the motor skills lost."

The Clinatec research centre's Brain Computer Interface (BCI) project

"For the first time, a tetraplegic patient was able to walk and control both arms using this neuroprosthetic, which records, transmits, and decodes brain signals in real-time to control an exoskeleton", the French Alternative Energies and Atomic Energy Commission (CEA) proudly announced in October 2019.
Developed at the Clinatec research centre, within the CEA, BCI is a brain-machine interface project that aims to enable people with severe motor disabilities to gain mobility thanks to mental control of an exoskeleton. A neuroprosthetic implanted in the cortex collects brain signals that are emitted when there is movement intention. These signals are then decoded thanks to a machine learning algorithm so as to predict the voluntary movement imagined by the patient and control the exoskeleton.
Blaise Yvert: "There are essentially two approaches concerning brain-machine interfaces. The first, a non-invasive approach, consists in measuring brain activity via electrodes placed on the scalp (EEG). This enables people to control a computer cursor or type letters on a screen. The downsides are that it is relatively slow, it's difficult to control many degrees of freedom, and in general it requires a high level of concentration from the patient.

To obtain something that is higher performing, we use intracortical electrodes, i.e. that are implanted in the cortex, to record the activity of individual neurons and predict the movement that the person wishes to make. This is, for example, the principal of the BrainGate project. The advantage of this second method is that it is faster and more precise, but it also requires opening up the skull and the dura mater, with all of the medical complications that this can entail.

The approach chosen by Clinatec is halfway between the two: the electrodes are implanted under the skull but on the surface of the dura mater. We are therefore freed from the bone, which is not very conductive, to obtain better quality signals than an EEG. We do however remain at the macroscopic level, at a certain distance from the brain.

What is interesting with the study carried out at Clinatec is that the researchers show it is possible to control and carry out up to eight degrees of freedom via these macroscopic electrodes, as well as wireless transmission through the skin thus minimising the risk of infection.

The control of so many degrees of freedom had, up until now, only been carried out with intracortical electrodes.

However, the movements obtained are still quite approximate, and huge efforts still need to be made in order to improve the precision of the recordings provided by this type of implant."

A virtual reality rehabilitation system for stroke patients

Strokes are the primary cause of acquired physical disabilities in adults. When they affect an area of the brain involved in mobility, they can cause paralysis in a part of the body.

Post-stroke rehabilitation consists in stimulating brain plasticity to enable the patient to recover part of the motor skills lost. Developed by American company Penumbra and used at Cooper University Health Care, New Jersey, the REAL Immersive System is a virtual reality system for stroke patient upper-extremity rehabilitation. Thanks to a series of interactive exercises, it aims to reactivate neuroplasticity, that is to help the brain "rewire" itself and create new neural connections. The system comprises a headset equipped with a screen and a series of sensors placed on the body of the patient, who is immersed in a virtual environment. Thanks to a tablet, a therapist can choose from a series of activities that prompt the patient to move their arms.

Blaise Yvert: "Here we try in a fun way to get the patient to move their arms, which will motivate them to work more than with traditional rehabilitation systems. The concept is interesting as it is based on play as a reward for efforts made by the patient wanting to move to stimulate plasticity.

An approach based on this principle is being developed at the École polytechnique fédérale de Lausanne, Switzerland, by the team of professor Grégoire Courtine. The researchers have managed to give paraplegic monkeys the ability to walk again

thanks to targeted stimulation of the spinal cord in response to cerebral activity produced by the animal when it wants to move.

The fact that there is a correlation between the intention to move and the carrying out of this movement, even if in the beginning this is done through an artificial system, makes it possible to elicit brain plasticity, axonal growth, and to re-establish connections between the brain, the spinal cord, and the limbs.

A similar approach has also yielded promising results in patients who have been paralysed for several years.

Google's project Euphonia

Automatic speech recognition tools create a paradox: they are supposed to make our everyday lives easier, but they are not always adapted to the users who need them most. Thus, people with a motor disability that prevents them from expressing themselves in a "natural" manner have difficulty being understand by voice assistants and interacting with their smart devices, the generalisation of which could become another factor of exclusion.

Aware of this issue, Google launched project Euphonia, the aim of which is to improve the ability of voice recognition tools to recognise non-standard forms of language thanks to artificial neural networks.

Blaise Yvert: "Automatic speech recognition is based on the training of neural networks that require large amounts of data in order to learn. We therefore use databases containing thousands of hours of recordings from different individuals. However, to be able to understand a person with severe dysarthria, the network must be trained on this person's speech. The problem is that we cannot acquire that amount of data from one single speaker. The Google engineers therefore adapted a neural network, which had already learnt from a huge corpus of standard speech, to the particular speech of a subject by retraining it over a short period of time with a much smaller dataset.

This seems to work well. Their results show that this approach reduces considerably the error rate of words produced by the network for this person. We are trying to do something similar at the BrainTech Lab with cerebral activity. We have designed a voice synthesizer that is capable of turning articulatory movements into speech with the help of a deep neural network trained on a large corpus. We are now trying to adapt it to patients after having converted their brain signals into articulatory movements with a short calibration phase from a rather small amount of data."

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