



IoT and 5G City

LET'S MAKE IT HAPPEN!

Dr Monique Calisti

CEO Martel Innovate

NEXT GENERATION INTERNET OF THINGS

ngiot.eu

Table of contents

IoT and 5G City – The vision	3
Let's make it happen!.....	3
Is that all so easy?	5
Looking ahead – We are the Champions.....	5
At the IoT Week 2019, we had them all!.....	6
Insights and takeaways	10



IoT and 5G City – The vision

IoT and 5G technologies are playing a crucial role in the context of smart cities service offering opening up huge opportunities across various vertical market segments.

The vision is that 5G and IoT solutions will create the smart cities of tomorrow, where humans and technology will interact in connected and intelligent ecosystems. Municipalities will be able to turn infrastructure like roads, streetlights and traffic signals into smart city resources that can deliver real-time data and information, helping for instance to reduce congestion and improve air quality.

For this vision to become a reality, several aspects, at technological, business, legal and regulatory levels, need to be properly addressed in order to ensure scalability, reliability, security and liability aspects are properly tackled in increasingly diverse application scenarios, especially considering that by 2050, 68 percent of the entire world's population will live in urban areas¹.

To face such a massive urban population growth and empower the next generation smart cities, businesses and public authorities are increasingly investing in 5G and IoT technologies, with spending that is predicted to reach USD 158 billion in 2022².

Let's make it happen!

Smart cities services will rely on big data analytics fed by data captured at through IoT sensors and networks, with edge computing bringing data storage and processing closer to the data source and 5G networks ensuring ultra-fast and reliable data transfer, while connecting sensors and smart assets³. As of today, IoT is going everywhere, from logistics, industry, energy and transportation to housing/construction, healthcare and agriculture. By the end of 2019, 40 percent of the world's local and regional governments will begin implementing IoT in their cities⁴.

More than 64 billion IoT devices are expected to be in operation by 2025⁵, with 127 new IoT devices connecting to the internet each second⁶ leading to an expected market growth of over USD 3 trillion annually by 2016⁷. In particular, as recently reported⁸, by analyzing the global share of 1,600 IoT

¹ <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

² https://www.idc.com/getdoc.jsp?containerId=IDC_P37477

³ <https://flex.com/insights/live-smarter-blog/why-5g-will-make-smart-cities-reality>

⁴ https://www.idc.com/getdoc.jsp?containerId=IDC_P37477

⁵ <https://techjury.net/stats-about/internet-of-things-statistics/>

⁶ <https://www.mckinsey.com/industries/semiconductors/our-insights/whats-new-with-the-internet-of-things>

⁷ <https://www.businessinsider.com/internet-of-things-report?r=US&IR=T>

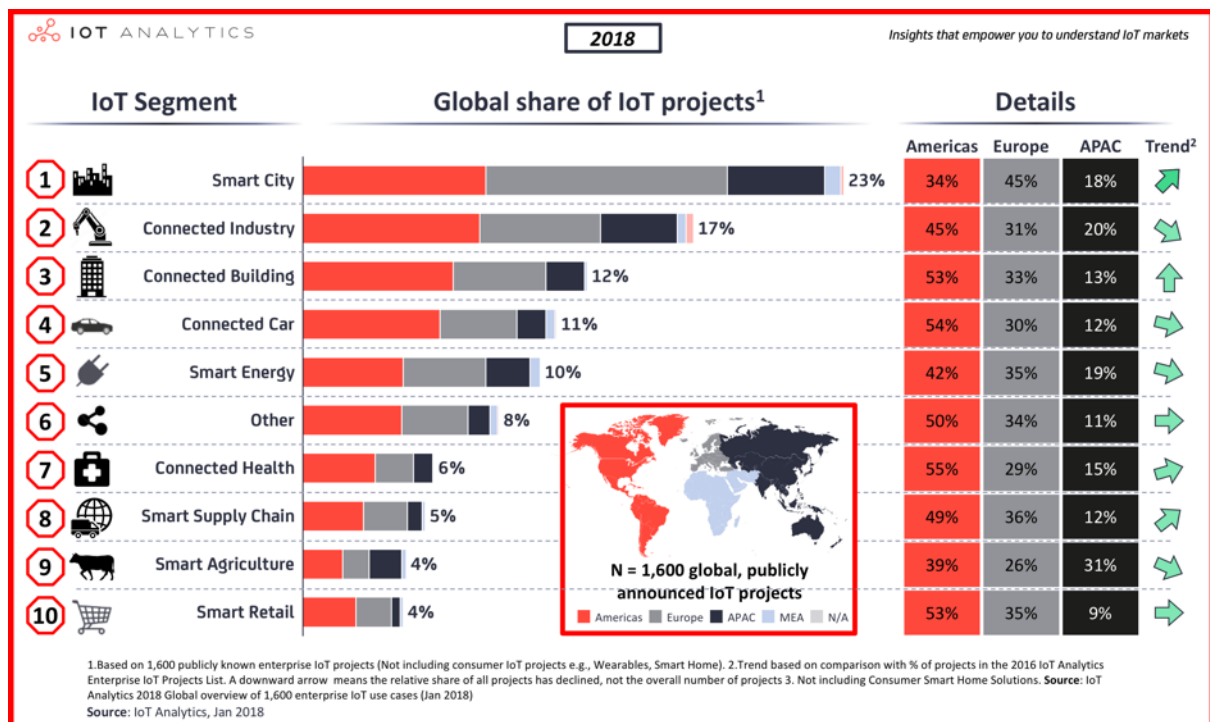
⁸ <https://iot-analytics.com/5-key-insights-from-350-smart-city-iot-projects/>



projects in 2018, Smart Cities (23%), Connected Industry (17%) and Connected Buildings (12%) are the top three IoT segments, with nearly half of the Smart City projects (45%) in Europe.

However, current mobile networks do not have the capacity to accommodate the increasing number and diversity of IoT connected devices, while ensuring integrity and fast delivery of the data.

This is where 5G is expected to have a major impact⁹. With the advent of 5G networks the promise is indeed to create an ideal environment for the IoT where multiple connected devices can gather and exchange data in real time. By enabling ultra-low latency, ultra-reliability, massive connectivity and devices (with a much longer battery life), major improvements are expected in the way cities face up to traffic congestion, pollution and mass transit challenges.



In particular, 5G networks are expected to be more flexible, scalable and context-aware than current networks, recognising different use case requirements and meeting them through programmable and switchable 'slices', according to priorities and needs.

⁹ <https://www.ecnmag.com/blog/2019/01/what-5g-means-future-internet-things>

Is that all so easy?

The combination of IoT and 5G to deliver smart connectivity for next generation networks is not such a straightforward process as it requires building new infrastructures, updating policies, and rethinking the role we play in the protection of privacy.

Some specific challenges are directly related to the costs of setting up the whole 5G network backbone, especially in densely populated cities, and the costs for the manufactures to deliver 5G devices. Another category of issues relates to the proliferation of different technologies that are often not interoperable and while standardisation efforts, led by several national and international bodies are at work, still, both on the 5G and IoT side, there are many open areas that need further work. For instance, a recent research report¹⁰ highlights the incredible diversity of what we usually indicate as IoT: out of 83 million devices scanned in 16 million homes, there is a total of around 14,000 manufacturers – even though 90 percent of devices are produced by only 100 vendors that obviously use a combination of different data formats, interfaces, security measures, etc.

Finally, what is probably even more challenging is the fact there is a broad range of security, privacy, and liability issues that need to be properly dealt with in order to equip the next generation of connected smart cities with the means to protect people's rights.

Looking ahead – We are the Champions

The good news is that there is an increasing community of both public and private organisations at work to ensure that the way in which new technologies are being developed and deployed will ensure the next generation of smart cities services are secure, trustworthy, open and inclusive.

Some of these initiatives have been pioneered by EU-funded projects and led to the establishment of communities, such as the Open and Agile Smart Cities (OASC) network¹¹ and the Eurocities network¹² that are growing and gaining momentum. OASC efforts feed into the G20 Smart Cities Alliance on Technology Governance¹³ led by the World Economic Forum that aims to establish universal norms and guidelines for implementation of smart cities technologies on interoperability, openness, transparency and the protection of privacy of data. EUROCITIES is gathering the local governments of over 140 of Europe's largest cities and over 45 partner cities, that between them govern 130 million people across 39 countries. FIWARE gather public and private organisations at work to build an open sustainable ecosystem around public, royalty-free and implementation-driven

¹⁰ https://press.avast.com/hubfs/stanford_avast_state_of_iot.pdf

¹¹ <https://oascities.org/>

¹² <http://www.eurocities.eu/>

¹³ <https://www.weforum.org/press/2019/06/world-economic-forum-to-lead-g20-smart-cities-alliance-on-technology-governance/>



software platform standards to ease the development of innovative smart applications in multiple sectors, including smart cities.

Other initiatives are pushed forward via close partnerships among industry, research and policy makers, like the FIWARE Foundation¹⁴ that triggered the creation of open APIs and of open source solutions, including specific ones dedicated to smart cities service offering, like Orchestra Cities¹⁵ that is an open source data-based and IoT-driven solution connecting smart devices, citizens and cities developed on top of FIWARE components.

At the IoT Week 2019, we had them all!

The IoT Week 2019 took place 17-21 June in Aarhus, Denmark gathering about 1,600 participants from all over the world, including innovators, researchers, public authorities, policy makers and media. Attendees included representatives in the digital innovation scene at work to shape the next generation of IoT technologies, standards and solutions. A rich programme included top notch keynote speeches, expert panels, interactive workshops, a start-up competition, a students' hackathon and an exhibition hosting private and public organisations developing IoT technologies and solutions.

Representatives of the European Commission, ongoing Horizon 2020 projects, OASC, EURO CITIES, FIWARE, standardisation bodies like ETSI, TM Forum, etc., of municipalities, top market players as well as of innovative start-ups and SMEs, gathered together to animate interesting debates and discussions around some core aspects that are paving the way ahead in the development and deployment of IoT-based solutions.

The **IoT and 5G City workshop**¹⁶, part of the two-day thematic track on IoT for Smart Cities and Communities, was an opportunity to focus on several priorities and challenges various major players in the IoT scene are pursuing.

The expert panel was moderated by Dr Monique Calisti, CEO of Martel Innovate and Communication Officer of the IoT-LSP Activity Group dedicated to Marketing and Promotion. The panel included top experts in the IoT scene: Rob Tiffany, Vice President and General Manager for IoT at Ericsson, Ulrich Ahle, CEO of the FIWARE Foundation, Paul Wilson CMO of the TM Forum, and Martin Løbel, CEO of CIBICOM.

Dr Calisti introduced the panel discussion by stressing the importance of gathering efforts and aligning initiatives across different communities as a key enabler for the IoT for 5G City vision to become a reality. *"Technologies must be defined and rolled-out with the ambition to empower people first and foremost. This can only be the case if we coordinate major research and innovation efforts that are ongoing in several domains. Europe leads a human-centric (not so) silent revolution in the way cities and citizens are empowered. Regulations, standardisations and the proliferation*

¹⁴ <https://www.fiware.org/>

¹⁵ <https://orchestracities.com>

¹⁶ <https://sites.grenadine.co/sites/iot/en/aarhus-2019/items/3562>



of open source solutions like Orchestra Cities, based on open APIs and open data, have the power to enable such a revolution, but education remains a core aspect. Education for a conscious and critical relation with technology.” said Monique, echoing her TeDX Talk¹⁷.

Rob Tiffany in his intervention focused on ongoing efforts at Ericsson in creating and rolling out 5G

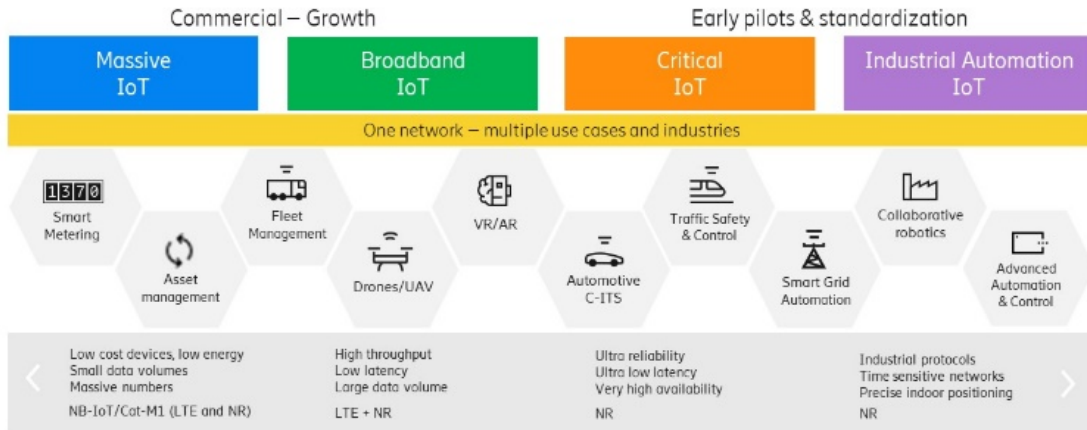


across the globe to empower people, cities, and the Internet of Things all around us. *“Cellular IoT comes in a variety of forms and impact the 5G smart city in many different ways. Massive IoT is a narrowband technology that facilitates long range and long battery life which make it perfect for smart meters, water leak detection and managing assets around the smart city.*

Broadband IoT provides the high data throughput and low latency needed to manage fleets of trucks and drones that deliver packages to residents of the smart city. Critical IoT provides the necessary reliability and ultra-low latency needed to safely manage a smart city’s public transportation and the autonomous cars of the future. Last but not least, Industrial Automation IoT will manage a city’s smart grid and provide advanced automation and control to orchestrate a smart city’s processes and activities.” Rob said.

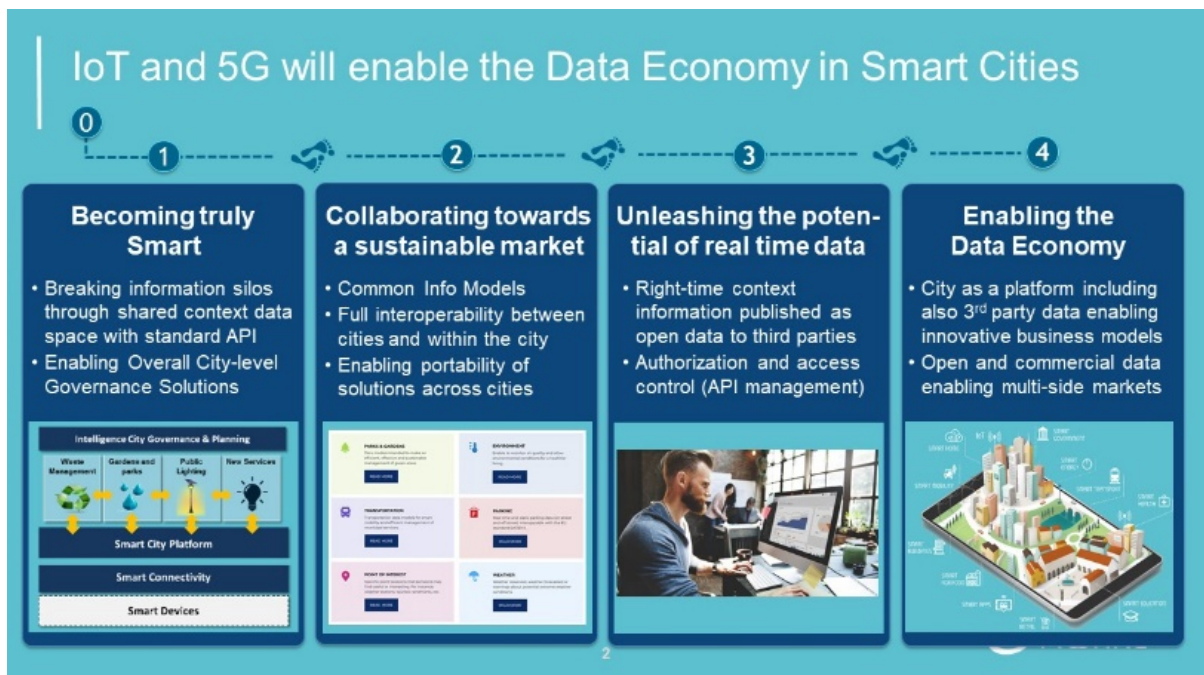
¹⁷ <https://www.martel-innovate.com/news/2018/07/09/martel-tedx-modena-salon/>

How Cellular IoT Impacts the 5G City



Ericsson External | MWC 2019

Ulrich Ahle pointed out that “Digital is changing our world: digital will be faster, stronger and cheaper. Making a city truly ‘smart’ means turning a city into a platform of growth for innovation, economic development and well-being. By adopting common standards and information models, cities can achieve this transformation with minimum impact, joining forces to build an ecosystem where they can connect and collaborate. 5G will play a major role for connectivity within Smart Cities of the future especially when it comes to close to real time data management like for autonomously driving cars or flying drones.” And he added: “FIWARE is open source. It helps cities to avoid vendor lock-in and protect their investment. It provides access to context information describing what is going on in the city in real-time and on a large scale. This data is accessible through a standard open API independently from the source of information.”



“Smart City projects have been working with emerging 5G technologies since 2015, when ‘Bristol Is Open’ created the world’s first ‘Open Programmable City’, deploying a software-defined network to deliver virtualized network slices at city scale. TM Forum’s City as a Platform Manifesto emerged in 2016, setting out 10 principles for private and public sectors to work together with citizens, to help cities learn from platform-based business and build a data economy that could help cities to recapture their primacy as the epicentres they came into existence to be. More than 150 organisations have signed up to the Manifesto from across the world. In 2017 the UK Government launched its £250m 5G Testbeds & Trials competition and in 2018 it launched the £50m Urban Connected Community competition won by the West Midlands Combined Authority (WM5G), aimed at creating a neutral host, city-region scale 5G testbed in time to showcase leading capabilities at the Commonwealth Games in 2022. In 2019 the first communication service providers launched 5G networks aimed at giving existing mobile phone customers an enhanced mobile broadband user experience.” Paul said, adding: “It is clear to see therefore that the research and public innovation community has seen the opportunity that 5G will bring to the development of Smart Cities for many years. The challenge will be to maintain this ambitious momentum to use 5G in its widest form, to include Massive Machine Type Communication for IoT and Ultra Reliable Low Latency, along with a fluid, virtualized and sliceable core networks. TM Forum’s City as a Platform Manifesto sets out the principles needed to bring the commercially run 5G world together with civically led Smart Cities and seems more apt than ever.”

2024: Moving towards the 5G enabled **Right-Time City**

tmforum



- Continuously innovating: real-time, data-driven leveraging augmented intelligence
- Demand true partnerships: trusted; agile; innovative domain experts
- Dependent on partner-based platforms and **open** ecosystems

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Insights and takeaways

- **From vision to action it takes a village to raise a child!** To succeed in engaging all stakeholders we need inspiration, strategies, structures, resources and plans. The good news is that many players, both from the public and private spheres are at work for the IoT in 5G City vision to become a reality, aligning on global priorities and common challenges.
- **The dialogue between public and private sphere is crucial** to unlock the potential of smart cities services delivery in a way that guarantees people's rights (privacy, security, inclusion, etc.) to be preserved. Europe is leading in this respect with important initiatives that aim to protect basic political, social and economic rights of all people both online and offline.
- **Coping with diversity is unavoidable** as it seems highly unrealistic to think that out of the many different technologies, services and solutions only a few will prevail. Possibly at the vertical market industry segment only a few specific technological choices will dominate and be standardized to facilitate interoperability for applications and solutions running across different domains / cities / vertical market segments, etc.
- **When humans do it better.** Despite new regulations and more agile mechanisms to enforce them, our political, legislative, regulatory and educational systems will never be able to keep pace with technology. There will always be a gap. Therefore, we need first to create awareness about the risks and opportunities of IoT in 5G City and go back to critical thinking and informed decision-making as core values to be taught to our children, also to those from older generations.



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