Whitepaper 2023

ICADE
Des lieux où il fait bon vivre

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Introduction

Icade is a French real estate group and a subsidiary of the *Caisse des dépôts et consignations*. It organizes its activities into 3 main branches: a tertiary property company, a healthcare property company, and a residential and tertiary property development activity. The company, which operates in various sectors (offices, business parks, housing, health and public facilities), has placed innovation in connectivity as one of the challenges at the heart of its rationale and holds one of the 14 experimental 26GHz 5G platforms in France.

As part of its tertiary real estate activity, Icade faces 4 challenges related to the connectivity of its buildings:

- Icade's customers are increasingly sensitive to the connectivity of buildings: data is becoming the 4th main asset that the landlords will have to provide to their tenants, in the same way as water, electricity and air (heating, ventilation, air conditioning).

- In parallel with this development, the necessary search for energy efficiency and environmental quality makes new buildings impervious to external waves : indeed, the metal layers inserted in the openings of the new buildings envelopes, if they increase the energy performance of the buildings, also prevent the waves to reach the inside. This requires setting up an expensive mobile connectivity infrastructure (BTS + DAS) simply to ensure operator network availability indoors.

- At the same time, a long-term impact is to be expected for tertiary real estate with the arrival of «general public» 5G by 2023-2024 and «business» 5G in France. Leveraging the most of the potential of this technology through relevant business use cases is thus a real differentiator on the market.

Finally, given the length of the development cycle of a real estate project, today's technological choices directly influence the Icade programs that will be on the market in 4 years.

As such, connectivity is a challenge for Icade's development pipeline to be at the «state of the art» upon delivery of future buildings, and will impact the tertiary property value chain, bringing new responsibilities to anticipate, which includes, among other things, monitoring the environmental and health performance of these new technologies.

Presentation of the consortium

01

In May 2021, Icade signed a Pilot Agreement for this 5G experiment with a consortium of different stakeholders. This agreement includes :

Imagin'Office, a subsidiary of Icade (providing coworrking offices for businesses) : its main roles are making their premises available, financing some tests, and managing the deployment and launch of the tests from a business point of view. on the different technical and business use cases;

Colt Technology Services : lead the consortium in PB5 Building (La Défense) and covers WAN connectivity including 5G timing & Edge platform to deploy Open RAN and virtual 5G SA Core networks.

ADTRAN integrate the main elements and manage the network functionalities on their Adva Ensemble environment. They are acting as Solution Integrator and then an essential partner based on their End to End expertise.

Airspan is providing the OpenRAN platform and will introduce 5G modems to help us in our initial phase. Important note: Airspan was one of the very few Cloud native radio suppliers able to cover the target 5G spectrum.

Athonet is in charge of 5G Stand Alone virtual Core Network hosted in Colt's Network Edge platform in Amsterdam and support us for delivering the SIM cards.

Accedian provide Performance Monitoring solutions to monitor the Performance of the Private 5G network. Keysight will then be involved for deeper troubleshooting capabilities.

TIBCO is responsible for 5G installation, test and the run with the support of Adva and Colt. They also bring 5G devices and skillset to manage robotics applications.

Adtran

colt

tibco

ATHONET

Airspan

imagin' office
DES ESPACES FLEXIBLES À VOTRE IMAGE

"The incubation project is one of the first to test end-to-end private 5G in real estate using disaggregated architecture."

ADVA
provide the underlying infrastructure components, including hosting of virtual functions

Airspan
provide the RUs, 5G modems and End-to-End Open RAN software components

ATHONET
provide provide its Griffone 5G Stand Alone mobile core network

ICADE

imagin' office

❑ *Private 5G networks to the PB5 La Défense building in Paris, enabling the exploration of varied use cases for the co-working space environment managed by Imagin'Office, an Icade subsidiary.*
❑ *This field lab ecosystem will test 5G use cases, including creating immersive experiences for the future workplace for a variety of industries.*

colt
Coordinate the consortium / provide Internet/ Ethernet & Optical with 5G Sync and Distributed Edge facilities

ACCEDIAN
provide performance monitoring and analytics solutions to assure the digital experience of the 5G service.
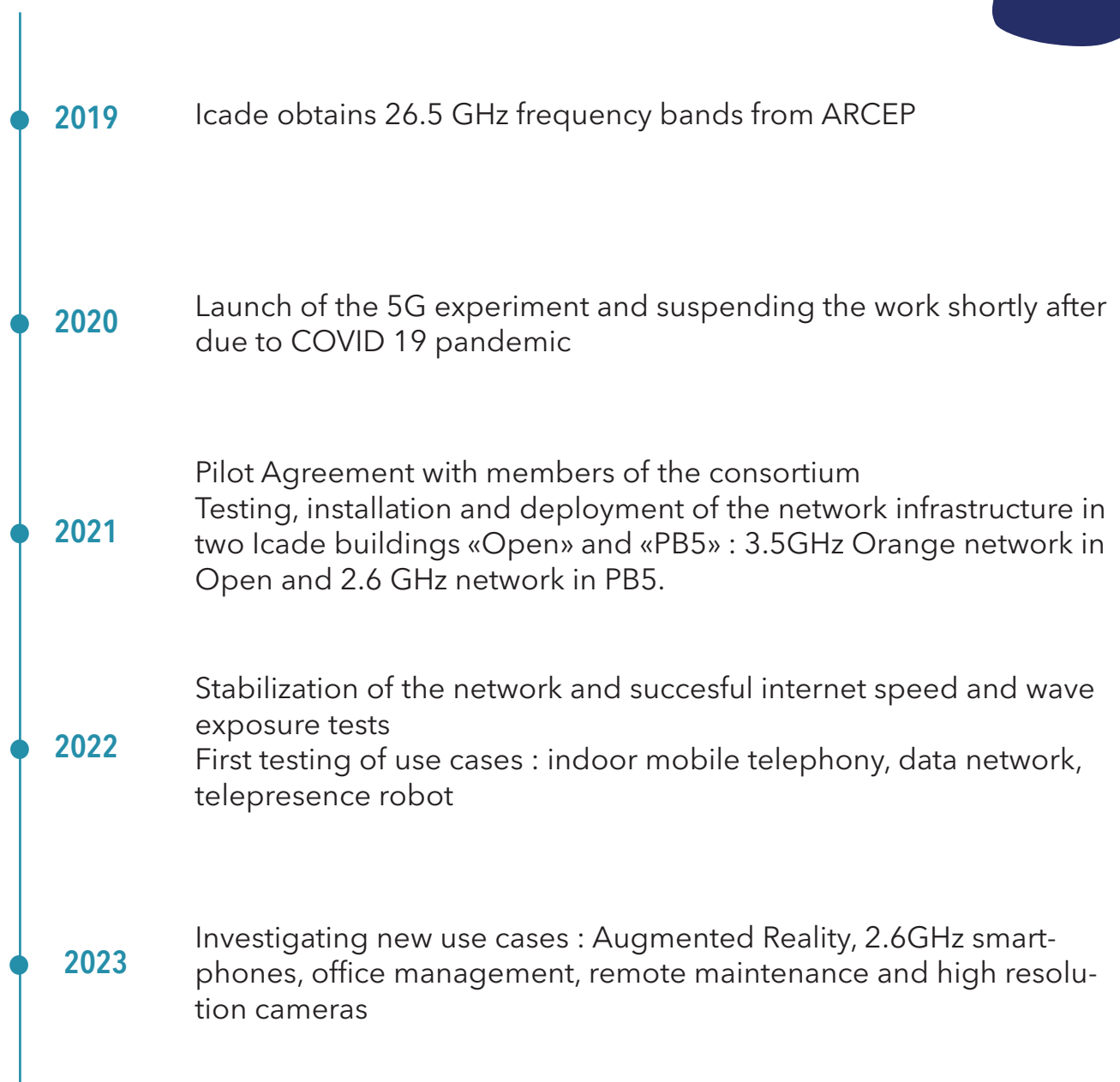
tibco
provide on field 5G network operation & manage workplace uses cases

In addition to this pilot in PB5 Building Paris La Défense, Icade has another important partnership with Orange and the *Caisse des dépôts et consignations*. Orange is the main provider of 5G network in Icade's headquarters ("Open" building in Issy-les-Moulineaux) while the *Caisse des dépôts et consignations* plays an important role in the investment and the financing of the project.

Key milestones of the 5G experiment

02

2019 — Icade obtains 26.5 GHz frequency bands from ARCEP

2020 — Launch of the 5G experiment and suspending the work shortly after due to COVID 19 pandemic

2021 — Pilot Agreement with members of the consortium
Testing, installation and deployment of the network infrastructure in two Icade buildings «Open» and «PB5» : 3.5GHz Orange network in Open and 2.6 GHz network in PB5.

2022 — Stabilization of the network and succesful internet speed and wave exposure tests
First testing of use cases : indoor mobile telephony, data network, telepresence robot

2023 — Investigating new use cases : Augmented Reality, 2.6GHz smartphones, office management, remote maintenance and high resolution cameras

Issues adressed, results, and lessons learned

Issues adressed

03

The main operational constraint encountered in 2022 lies in setting up a private 5G network at 2.6 GHz TDD SA, which is complex, the network has required a major configuration effort (change of physical servers, upgrade of the core network, stabilization of the power supply, GPS re-synchronization); that said, at the end of 2022, we demonstrated that it was possible to connect a certain number of devices to it, in particular the Samsung Galaxy S22 and the Crosscall Core Z.

The other major challenge is setting up the roaming between the private and the public network, which is still not in place as of today. Moreover, the building that hosts the 5G pilot is public, so it requires that all the mobile devices have to be compatible with the network frequency. The cost is also a problem because the business mo-

del for installing such networks for the operators and for Icade is not competitive.

Previously, we had constraints in setting up the experiment which were related to the maturity of the technologies on the 26.5 GHz bands. It is thus difficult to find full 5G compatible devices. Moreover, the operator Orange, initially asked by Icade to experiment on the frequency band allocated by ARCEP, preferred to redirect the experiment to the «general public» 5G frequency bands at 3.5 GHz for which an ecosystem is already in place with an effective commercial opening since November 2020.
This led us to start an intermediate stage of testing at 2.6 GHz with the consortium comprising Colt and Tibco Telecoms.

Contracting was also a complex subject and one that took us time: the contractual elements governing the innovation partnerships were validated in Q1 2021 and the signing of the experimentation agreements took place during Q2 2021.
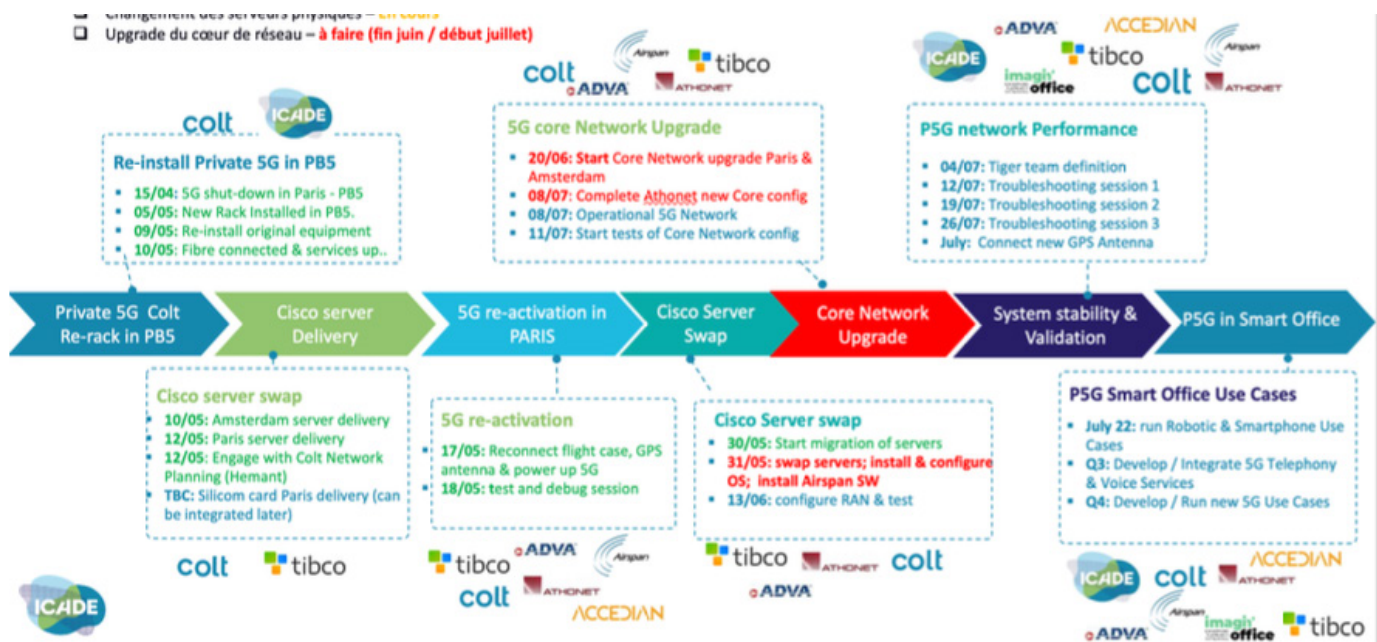
Network configuration that took place in 2022

Among the other operational and administrative constraints identified by Icade since the launch of the project, there have also been environmental controversies over 5G with its potential energy and health impacts which have affected the project, especially since the first studies were (ANSES , OMDIA, etc) were published during the first half of 2021. To take these considerations into account, Icade has set up a fairly strict action plan with its partners for 2021 to measure the impacts on site during experiments and rely on published studies (ANSES, High Council for the Climate, etc.).

Issues adressed, results, and lessons learned

Technical results

Energy consumption

An energy study was carried out by Tibco Télécoms on the "Open" building in the fall of 2021. This study dealt with Wifi, 3G/4G Orange, 3G/4G SFR and 5G Orange coverage.

The comparison of the energy consumption of the networks and technologies evaluated within the framework of this study shows a certain homogeneity between the 3G/4G and 5G networks.

The WiFi network seems to benefit from a better consumption rate per m2, but the switches on which these WiFi terminals are connected were not taken into account in the study. We considered that they could be seen as elements of the wired Ethernet network. By analogy, we could consider these switches with functions similar to the IRUs of 5G networks.

0,62 **kWh/square meter/year of energy consumption for the 5G network in average**

Wave exposure

Two studies were carried out by EXEM on each of the two buildings (Open and PB5) for the two frequencies (26.5 GHz and 2.6 GHz). They show that the exposure represents 2 % of the maximum allowed threshold, making it even lower than the 4G exposure.

0,2 **of the maximum allowed threshold : 1,26 V/m**

Speed and latency

Here are the main results for a 3.5 GHz 5G indoor network :

	Wifi 5 GHz (Smart-phone A6)	4G (Smart-phone A6)	5G average (Smart-phone A6)	CPE 5G (Lenovo laptop)	Direct 5G (Lenovo laptop)
Download speed (Mb/s)	65	80	650	90	336
Upload speed (Mb/s)	10	30	108	35	103
Latency (ms)	18	32	31	18	13

We see that the 5G network provides better performance than 4G. On the other hand, compared to Wifi, the gain is not perceptible. The latency value is largely in favor of Wifi.
- An *nperf* test carried out on an Icade company laptop connected to the internal Wifi network gives values of download speed of 285 Mb/s and upload speed of 350 Mb/s to the same server in Paris.
- In terms of measurements, it was found that the further we were away from the hotspot and the more obstacles there were, the more the measurements decreased due to signal attenuation.
- Finally, there were also differences in results between the different 5G smartphones available. Under the same test conditions, better results were observed on the IPhone and Xperia models of around 30%. This is attributable to the quality of the smartphones: number of antennas in the device, quality of the chipsets used and quality of the drivers (soft).

As seen on the table, the connection through the CPE is less efficient than a direct 5G connection, however it remains a credible alternative in certain use cases: provision of a network for an office with 5G Outdoor connection, or in extender mode for partial Indoor coverage , or for non-5G compatible workstations.

Issues adressed, results, and lessons learned

Use cases

Several business use cases meeting Icade's specific needs were tested:

Energy consumption

For the tenants occupying the building, this makes it possible to take advantage of the 5G network to set up a mobile telepresence solution in the offices to provide reception and remote support to end users / customers. For end users / customers, they will be able to use the telepresence robot set up on the premises to interact with the reception and customer support teams who are remote. The challenge for Icade is the reduction of onsite presence and the possibility for a team of office managers to be multi-site.

Ultra HD (4K) video conferencing (Logitech)

The aim is to improve the attractiveness of offices thanks to a phygital collaborative solution that allows several remote sites to be linked together. The user changes the way he collaborates with his colleagues by meeting them «almost» physically while they are remote thanks to very high definition cameras and a very high speed. It is also suitable for "post-covid" real estate strategies

Partners such as Logitech and Atelier Audiovisuel have been identified for testing these use cases.
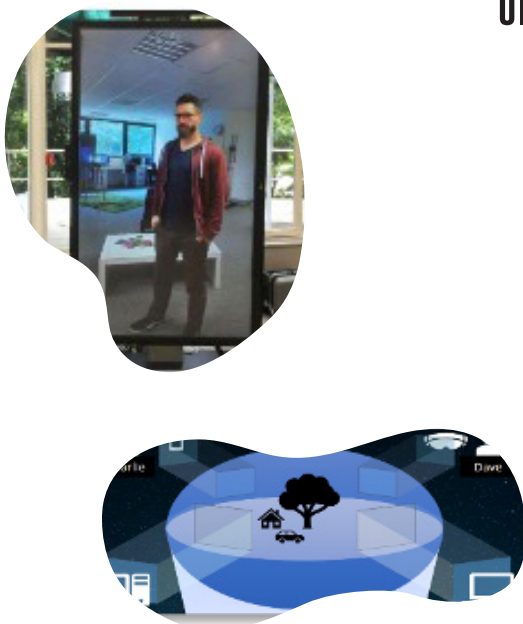
Augmented reality (Synergiz and Microsoft)

The challenge around this use case is to use the full potential of 5G to create collaborative and immersive 3D platforms, whether for professional meetings or virtual tours of spaces. For Icade, prospects can visit, configure and project themselves into future sites for rent thanks to a 3D platform allowing them to read HD content (models, plans, etc.) in augmented reality. For building operators, this facilitates operational interventions thanks to the digital twin available on site in AR to identify equipment and limit the impact of interventions (consultation of instructions, dismantling of false ceilings, etc.), draw changes…

5G Smartphones (Samsung and Crosscall)

We tested the 5G connectivity of these two smartphones with positive results.

5G Smartphones (Samsung and Crosscall)

The Airspan Airspot 7621 Indoor 5G Hotspots are reliable, easy to use and offer high performance service. They are one of the main elements of the 5G infrastructure installed in the building.

Conclusion

At this stage of progress of the project and considering the different objectives sought, our assessment of the experimentation is positive :
- The Icade teams as a whole are aware of having already learned a great deal on the subject;
- The partnerships have been formalized, the networks installed and the technical tests carried out with encouraging results;
- The prospects in terms of business use cases to be launched in 2023 are good and the first milestones have made it possible to foster a real positive dynamic among the teams.

Concerning our partners, we also notice a real commitment from their behalf. Our experiment on PB5 is characterized by:
- Its particularly innovative nature from a technological point of view (first in Europe on this type of network);
- The level of seniority and responsibility of the actors involved with our partners;
- Its operational model which brings together players representing the entire telecom value chain to the benefit of smart buildings.

Despite this, the road ahead remains long and uncertain. 5G is a technology allowing breakthroughs for business uses, but the realization of these breakthroughs within a successful user experience depends on the availability of three main assets :
1. Networks – 5G connectivity;
2. Devices – on this subject, in 2022 we tested a telepresence robot from the startup
Axin. However, user feedback was inconclusive. We also tested HoloLens augmented reality glasses from Microsoft and Cisco this year.
3. Content – the big differentiator of 5G lies in its ability to process data content (and in particular Image & video) in very high quality and instantaneously.
While exploitable content is starting to arrive, there are only too few networks and devices being deployed that are compatible with the 26.5 GHz frequency bands. In any case, the pursuit of our target will require us to remain very agile and flexible on the choices to be made.

This experiment is part of Icade's vision of Smart Building capabilities :
- **Business services**
- **Network services**
- **Occupancy services**
- **Remote control services**