kpn

Gemeente Amsterdam

JOHAN CRUIJFF ARENA

5G Fieldlab Amsterdam

Project Plan

Version history

Version	Name	remark
0.8	Project team	First draft

Distribution list

Name	Role	Organization
		City of Amsterdam
		City of Amsterdam
		City of Amsterdam
		Johan Cruijff ArenA
		Johan Cruijff ArenA
		Johan Cruijff ArenA
		Johan Cruijff ArenA
		KPN
		KPN
		KPN
		KPN
		KPN
		KPN
		Nokia
		Nokia
		Nokia

1. 5G

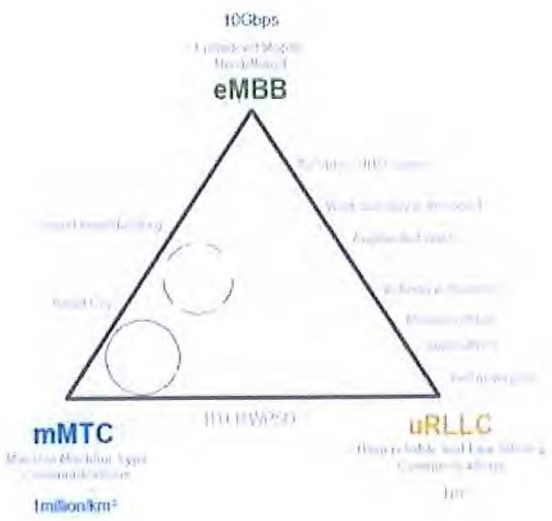


5G is the successor of 4G networks and a characteristic of 5G is the extremely high speed. Much faster than your wireless network at home and about 50 times faster than the current 4G network. In tests, speeds of up to 1 terabyte per second have been achieved. But it's not just about the high speed. With 5G new applications will be possible, which can have huge impact, such as remote patient operation via a video connection.

In addition, the latency (response time of the network) is much lower with 5G networks. You notice this especially when you play a game, use virtual reality or try to operate a PC remotely. The latency in 4G network is tens of milliseconds but decreases with 5G to 1 millisecond.

Massive Machine Type Communications (mMTC) aims to meet demands for a further developed digital society and focuses on service that include high requirements for connection density, such as smart city and smart agriculture.

The expansion of service scope for mobile networks enriches the telecom network ecosystem. Several traditional industries, such as automotive, healthcare, energy and municipal systems participate in the construction of this ecosystem. 5G is the beginning of the promotion of digitalization from personal entertainment to society interconnection. Digitalization creates tremendous opportunities for the mobile communication industry but poses strict challenges towards mobile operators.



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1.1. Cause

Together with customers and technology partners, KPN has started 4 different (pre) 5G Fieldlabs to discover the value of 5G applications. Testing smart antennas in urban area, investigate connection of drones for precision farming, virtual reality in industries and autonomous driving. Thanks to 5G this technology will become reality in Amsterdam, Drenthe, Rotterdam and Helmond.

Where 4G connects people, 5G will connect the whole society. Its therefore very important that KPN, together with customers and technology partners, investigate how 5G can optimize business processes and improve the customer experience. It will also be investigated how this network technology can be used in combination with developments such as artificial intelligence, drones and virtual reality for a wide range of applications.

In contract of 4G, 5G is expected to be an ecosystem that many industries and areas can benefit from. In addition to higher speed, 5G focusses explicitly on flexibility in the network to support very short response times and higher reliability. This enables a wide range of new applications for customers and industries. With the 4G network, KPN is going to pre-sort on the arrival of 5G and starts with 4 different Fieldlabs for 5G applications in urban areas, agriculture, transport & logistics and the automotive sector.

City of Amsterdam, the Johan Cruijff ArenA and KPN will test various 5G applications in Amsterdam South East and in the Johan Cruijff ArenA, together with technology partner Nokia.



1.2. Context

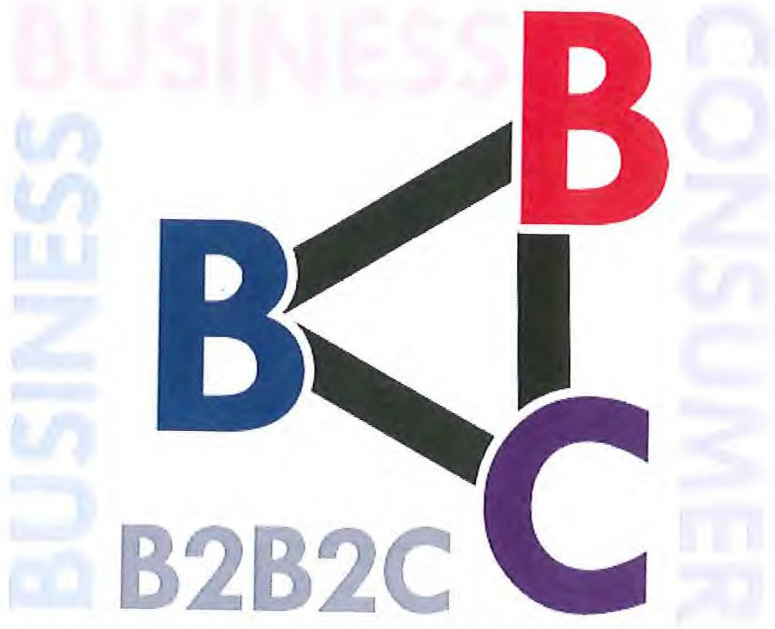
Amsterdam South East is a very interesting area where digitalization and 5G meet in an urban environment. The area is unique due to the following characteristics:

- High concentration of (economic) activity
- Important location for sports and cultural events (such as EURO2020),
- Important tourism destination
- Large-scale long-term area development and increase in housing
- Leading in sustainability and the use of digitalization.

These developments are placing increasing pressure on the district in terms of quality of life, accessibility, safety and business activity. Various bottlenecks (value) in the physical space are visible:

- Accessibility (parking places, public transport road etc.)
- Liveability (air-quality, noise pollution, safety, greenery, experience.
- Vacancy of non-sustainable / flexible offices (real estate development).
- Low occupancy rate of the room (equipped for XL events in the premises)
- more visitors, who spend more in the area.

Where the other 5G Fieldlabs are more business market related the goal of the Amsterdam Fieldlab is to investigate consumer usecases for 5G. This can be business-to-consumer cases but also business-to-business-to-consumer. How can the inhabitants of Amsterdam ZO or the visitors of the Johan Cruijff ArenA or the surroundings benefit from 4G, directly or indirectly.



The different aspects result in demand for answers in the physical and virtual space with associated connectivity. Because the problem is so transcending and multidisciplinary this requires change in thinking, working, the will to bridge differences for success. Digitization of society together with good, affordable

connectivity has proven itself in recent years as an important factor in arriving at solutions for society and economy. More and more aspects of life can become more fun, freer or easier by developing technology – such as shorter travel times and parking time, a richer sport and cultural experiences, making you feel free and productivity / impact of employees.

The importance of the digital infrastructure is just as big as the physical infrastructure, but less well understood. This is seen by the municipality of Amsterdam as a key enabler for the sustainable development of a liveable and economic healthy city.

1.3. Project objective

The project aims to provide users 5G services with a mobile broadband communication network which will support **integrated safety** and **fan experience** methodologies in Amsterdam Zuid Oost and around the Johan Cruijff ArenA which is located at a very popular event location in Amsterdam Zuid Oost.

City of Amsterdam wants to ensure that the **safety and mobility of its citizens** will be covered by providing 5G network in this specific area. The approach can help the city reduce uncertainties and the time during this event resulting in significantly improved solutions for mobile broadband communication when compared with 4G.

The project partners and stakeholders of the Amsterdam 5G Field Lab project will demonstrate under carefully controlled conditions relevant POCs to explore the three use cases described in Annex 1.

From the very beginning, an outline of the use cases will be deployed by the consortium, ensuring its feasibility to explore and understand the use cases and challenges of this area in relation to (pre-) 5G connectivity capabilities. The need to learn how the progress can be made by applying digital technologies and the capabilities of the 5G technology.

KPN does not place techniques of the network as a priority. The innovative applications and business solutions enabled with the use of such techniques are the primary focus. Parties intend to perform Proofs of Concept (POCs) to demonstrate viable use cases with (pre-) 5G technology. They further wish to share and disseminate learnings and results. Other 5G field labs of KPN in Netherlands are intended to focus on other types of challenges (V2X, Harbour, Rural).

The Johan Cruijff ArenA has the ambition to be the first driving participant of urban digitization ecosystem supported by 5G. Within the City of Amsterdam, the area South-East has been selected to be the first 'incubator area' for digital transformation and 5G. ArenApoort is the central location of this area. All this technology will be accompanied by a strong communication and dissemination strategy, communication on spreading general information about the project and its results to the general public and stakeholders linked with the project activities. In synergy communication will cover the whole range of stakeholders leading at overcoming specific barriers related to the development of a 5G mobile broadband communication network.

Parties foresee a future possibility of performing other, new POCs within the Fieldlab together and feed the learnings into 5G program & deployment of both KPN &

Amsterdam. The project plan will detail the objectives, deliverables, schedule and activities.

1.4. Expected project deliverables and results

1.4.1. 5G network

To fulfill the needs of the project KPN defined a network architecture which can be enhanced and/or modified per usecase. This basic network contains the following building blocks.

- Mobile Core
- Radio base stations
- Mobile Edge Computing infrastructure
- Transmission between Den Haag and Amsterdam

The network can provide the necessary connectivity and on top of that, various applications can be implemented on the Mobile Edge Computing (MEC) depending on each usecase. For example: machine learning algorithms can run on top of the video analytics to provide useful insight for the 'Crowd Control' usecase.

The architecture is divided over 2 geographical locations.

- The Hague, Prinses Beatrixlaan 400 (PB400) - lab environment of KPN.
- [illegible]

In the lab environment of KPN (PB400) the mobile core network, the MEC and the radio equipment is installed so that the first test can take place in the, controlled, lab-environment,

Outdoor 5G antenna positions



Informatie over de posities van de antennas:

Site 1:
Longitude 4,943547
Latitude 52,312604
https://goo.gl/maps/[illegible]
NHLQ72

Site 2:
Longitude 4,945229
Latitude 52,312855
https://goo.gl/maps/[illegible]
qoGou

Site 3:
Longitude 4,940113
Latitude 52,312979
https://goo.gl/maps/[illegible]
dxaqL2

1.4.2. Camera's



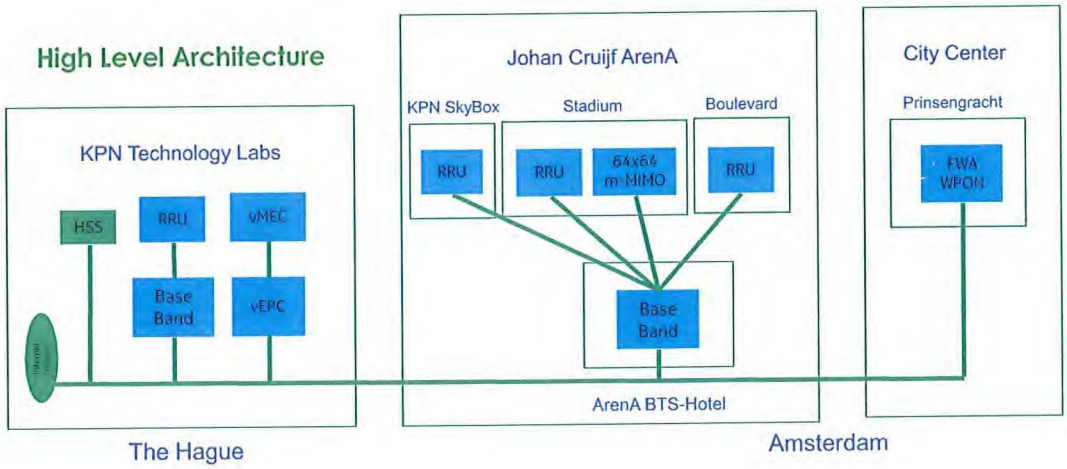
For the crowd control usecase bodycams and cameras on the ArenA boulevard will be installed.

1.5 5G element usecases

Start now with technology and usecases / ecosystem

The 5G Fieldlab brings essential 5G technology components:

- Network slicing (with end2end QoS)
- Massive MIMO
- mmWave
- Mobile Edge Computing
- Scalability
- Mobile Edge Computing



1.6 Usecases

The consortium has already identified three use cases in which 5G mobile broadband technology will be developed in Amsterdam South-East. Detailed descriptions and the functional specifications of the use cases and the associated objectives are given in Annex 1, along with the test scenario's and result capture methodology to allow effective evaluation of the results.

Crowd Control / digital perimeter

The main purpose of this use case is the possibility to:

- Can 5G enable the critical communications to establish a digital perimeter? The default is wide area physical access control as required by UEFA to secure the perimeter surrounding the stadium.
- What operational benefits can be gained by the ability to do real-time processing and analyses for crowd security control? That is deploying edge computing capabilities through low latency mission critical communications, for delivering local intelligence and distributed common operational picture, based on data from various fixed and mobile sensors, with low reaction times.
- How can 5G enable applications and services to increase the feeling of safety of the crowd (inside and outside the stadium)?

Fan-Experience *"On the move fan engagement"*

The main purpose of this use case is the possibility to:

- Enable bandwidth savvy content services, e.g. 4K video on the move.
- Enable local loop media orchestration through zero latency edge computing for processing of shareable content allowing elastic distribution to massive on-premises user groups.
- Enable tests audio visual Smart City technologies and embed these solutions in a dedicated Smart City Playground to serve as a venue platform to support proof of concepts and trials, with focus on creative enriching fan experience
- Enable immediate consumer interaction, which can accelerate new, unique applications based on AR and VR.
- The measurement of use load scale-up and the allocation of local wireless network capacity will indicate the 5G capabilities to handle network is of major interest.
- As a reference the [redacted] program will serve, to derive functional test cases.

5G street *"Wireless fibre to the home"*

The main purpose of this use case is the possibility to:

- Investigate if 5G can be a substitute for the fixed line (fibre) in a dense urban area.

- Investigate if it's possible to deliver so called fixed line propositions via 5G (f.e. iTV)

1.6.1 Demo's, tests & evaluation

The first trials with selected demonstrations of the 5G capabilities for the three use cases are scheduled for October 2018. The use cases from the A & B class will be planned during soccer matches in the Johan Cruijff ArenA.

1.7 Assumptions

- All parties will bear the costs made by the party themselves. The will be no financial transactions between the consortium participants except if this is explicitly agreed between parties.
- The goal of the Fieldlab is in alignment between parties and parties agree upon the specific deliverables. All participants commit themselves to the delivery and/or contribution to achieve the agreed deliverables although the value can differ per item for each partner.
- Parties will actively share their network to share knowledge, access new partners for the ecosystem and work together on events, actions and investigations to pilot 5G usecases or challenges.
- All communications need to be aligned between parties and their communications specialists. A high-level communication plan will be drafted for the wider communication from KPN on the 5G Fieldlabs but also specifically for 5G Fieldlab Amsterdam.
- .....

1.8 Project demarcation

This agreement shall commence on the effective date and shall remain in force for a period of one (1) year, from 11th of April 2018 until 11th of April 2019.

The agreement shall be evaluated after nine (9) months after the effective date to jointly assess the viability to extend the project beyond the EURO2020 event. The Agreement is automatically terminated when the corporation is deemed unsuccessful by either party but can be extended by means of a written agreement by all Parties until the 5G network is commercially live.

The goal of the consortium is to find a commercial solution and positive business case for after the pilot period in such a way that the use case(s) can be migrated into regular commercial proposition(s)/solution(s) before 2020.

1.9 Preconditions

-
-
- Privacy statement and approval for the use of different smart camera solutions (such as but not limited to heat mapping, counting people and face-recognition).
- Approval for antenna installation on, and around, the ArenA boulevard.

1.10 Relationship with other projects and/or initiatives

For KPN and City of Amsterdam the 5G Fieldlab is part of a bigger 5G initiative within City of Amsterdam and KPN. There are other initiatives in the city of Amsterdam, ex. as part of the smart city initiative, that have overlap with the 5G use cases.

The Johan Cruijff ArenA is very active on fan-experience and enrichment of the user experience of their visitors and are testing several techniques and solutions.

In general, the 5G Fieldlab in Amsterdam contributes, for all parties, to a higher goal and initiative. For now, it's not expected that this will limit the opportunity in the 5G Fieldlab. In case that there are complications due to related project/initiatives this need to be discussed and solved between partners in the regular governance.

2 Risk analyses

2.5 Business risks

-
-

2.6 Project risks

-
- Privacy discussion / public opinion regarding crowd control via smart camera's (privacy versus security)
- Approval and/or permits for the installation of antenna's and network equipment.

3 Project organization

3.1 Consortium

City of Amsterdam, Johan Cruijff ArenA and KPN entered into a cooperation agreement to demonstrate the unique capabilities of 5G with 3 use case models.

A. **Enhanced Mobile Broadband**
fan-experience – multi-media orchestration & distribution.

B. **Crowd control**
digital perimeter – secure private critical communications for streaming content & voice.

C. **Wireless 'fibre to the home' ***
super broadband internet for all, delivery of 'fixed services' via the mobile network (such as iTV)

* This use case is only for City of Amsterdam and KPN.

Parties are equally involved in the 5G Fieldlab.

Nokia is the technology vendor from KPN for 5G Fieldlab Amsterdam. Nokia will be involved in specific discussions, meetings and solutions but operates as a technology partner behind KPN.

3.2 Steering Committee

During the cooperation agreement frequent steering committee meetings will be held. The goal of these meetings will be to discuss progress, raise impediments, issues or concerns and jointly decide upon queries from the project.

The steering committee participants are:

City of Amsterdam

-
-

Johan Cruijff ArenA

-
-

KPN

-
-

3.3 Roles and responsibilities

3.3.1 KPN

KPN will have the following tasks and responsibilities

a) KPN provides the network, as well as expertise and resources to design and implement the PoC, according to the Project Plan for every use case, to be agreed upon between the parties. KPN appoints, at its discretion, a hardware supplier(or multiple) as its subcontractor who will take part in the PoC(s) for the delivery of
expertise and hardware.

b) In close corporation with Amsterdam ArenA and City of Amsterdam, develop the Project Plan with detailed description of deliverables, required activities, costs & resources and planning, the success/acceptance criteria for the PoC and the governance structure.

c) Ensures the necessary infrastructure (e.g. connectivity, storage, processing, hardware) of third party applications ("ecosystem").

d) KPN will appoint a "Fieldlab Commercial Lead" who is responsible for the relation between KPN regarding the execution of the PoC(s).

e) E2E day 1 solution indoor & outdoor (3.5GHz 40MHz spectrum bundled with 3.5GHz 40MHz of Amsterdam ArenA applications, UE, networking.

f) Governance communication

g) Manage commercial partners attached to the 5G Fieldlab

3.3.2 Johan Cruijff ArenA

Johan Cruijff ArenA will have the following tasks and responsibilities

a) To support 5G ecosystem development by promoting the initiative towards other stakeholders (building owners and building developers in the area, Amsterdam police ...).

b) To provide sufficient staff, to facilitate housing of and network equipment inside ArenA or required changes, to facilitate applications in OMC.

c) 3.7GHz/40MHz spectrum license, trial content for test and possible partners who can supply test user equipment, to enable the agreed PoC(s) as set out in the Project Plan within the bounds of fairness.

d) Appoint a single point of contact during the execution of the PoC(s).

e) For the period without Project Plan: Each party shall bear its own cost in connection with this Agreement and the PoC(s), whether such costs were incurred before or after the date of this Agreement, unless the Parties agree otherwise in writing in the Project Plan, after having made the cost calculation.

f) Facilitation temporary deployment of radio equipment in the ArenA.

g) Definition of test of 5G Fieldlab usecases by end-users.

h) Support of 5G KPN/ArenA/Amsterdam Fieldlab OMC to assess potential use.

i) Provide relevant content of different events for specified 'experience usecase'.

j) Grant KPN to deploy temporary the 5G 3.5GHz 40MHz spectrum license to be bundled with KPN licence for on the pitch & outdoor use.

3.3.3 City of Amsterdam

The city of Amsterdam will have the following tasks and responsibilities:

To support 5G ecosystem development by promoting the initiative towards other stakeholders (building owners, Amsterdam police, policy makers, UEFA) An efficient permit process will be key for the success of this Fieldlab and 5G.
To address any privacy debate (Fieldlab will always be in accordance to Dutch law) related to the PoC.

To provide sufficient man hours, facilities and resources to be able to carry out the PoC as set out in the Project Plan of which a high-level ambition is set out in ANNEX 1.

For the period without project plan: Each party shall bear its own costs in connection with this Agreement and the PoC(s), whether such costs were incurred before or after the date of this Agreement, unless the Parties agree otherwise in writing n the Project Plan, after having made the cost calculation.

Appoint a single point of contact during the execution of the PoC(s).

Issues permits of physical infrastructure works including digging, placement of cameras, system components and deployment of radio equipment.

Managing public interaction & discussions relating usecases of the Fieldlab, e.g. privacy discussion.

Provide all relevant guidelines with respect to, but not limited to, privacy, safety and security.

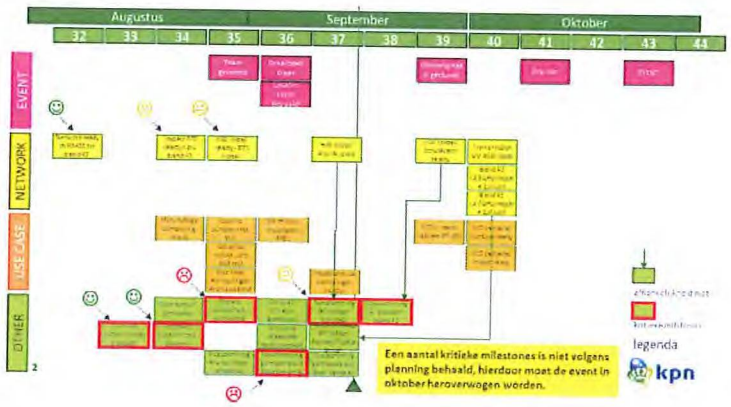
3.4 Project team

To be determined

3.5 Phasing

To be determined

The planning of the "Crowd Control" use case can be seen in the following picture:



3.6 Activities

To be determined

The below activities are the main steps of the Crowd Control use case:

What	Progress
Preparations for the equipment in the lab (power supply, site survey, cabling)	Done
HW installed in the lab	Done
SW installed in the lab elements	Done
All elements configured	Done
Integration to existing KPN elements	Done
First data call	Done
Transmission between Den Haag and Amsterdam	Ongoing, scheduled for week 37
Site survey in JCA (Johan Cruijff Arena)	Done
HW installed in the	Ongoing, planned for week 38
HW installed on the roof of JCA (B42)	Ongoing, scheduled for week 38
SW installations in of JCA	Ongoing, scheduled for week 41

First data call	Scheduled for week 40
HW installation for B43	Initial plan if for week 42
Camera installations on ArenA Boulevard	On hold, pending permission
Antennas on Arena Boulevard	On hold, pending permission
SW installed on the Mobile Edge Computing platform	On hold, pending budget decision

3.7 Communication

A joined communication plan, for the 5G Fieldlab in Amsterdam, is being created between City of Amsterdam, Johan Cruijff ArenA and KPN. This will be added to this project plan in Annex X.

4. Project budget (under construction)

The project plan will entail explicit calculation of effort and costs carried by KPN, City of Amsterdam and Johan Cruijff ArenA.

Network

Civil works antennas

Civil works antennas

Civil works for band - estimate

Crowd Control Usecase

for costs to be made for crowd control usecase