5G SAMITEA

5G Sofia Airport Mobile PrIvate NeTwork PowEred by A1

D2.1 Requirements Analysis & Use Case Definition

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Editor(s):	WINGS
Author(s):	Ioannis Patsouras (WINGS), Martin Filev (A1), Evgeniya Petkova-Rasheva (A1)
Reviewer(s):	Dragomir A. Apostolov (A1) Andreas Georgakopoulos (WINGS), Nelly Giannopoulou (WINGS), Sokratis Barmpounakis (WINGS), Aleksandar Serafimov (Sof Connect)
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Executive Summary

The document addresses the detailed description of the UC scenarios, driven by the public safety, healthcare and mobility domains, which are considered of high added value SGIs by the consortium members. The requirements as perceived by the users are presented and the network KPI targets are also discussed and agreed. This document will serve as a reference for the upcoming network architecture, configuration, and testing activities as well as a starting point for the specific applications and services scenarios to be validated.

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List of Acronyms and Abbreviations

TERM	DESCRIPTION
3GPP	Third Generation Partnership Project
5G	Fifth Generation
5GPPP	5G Infrastructure Public Private Partnership
AI	Artificial Intelligence
AGV	Autonomous Ground Vehicle
AR/VR	Augmented Reality/Virtual Reality
CEF	Connecting Europe Facility
CCTV	Closed Circuit Television
DAS	Distributed Antenna System
DT	Digital Twin
E2E	End-to-End
EC	European Commission
EU	European Union
FOD	Foreign Object Damage
HDTV	High-Definition Television
IMS/PS	IP Multimedia Subsystem (IMS)/ Packet Switching (PS)
KPI	Key Performance Indicator
MCPTT	Mission Critical Push-To-Talk
MIMO	Multiple-Input Multiple-Output
MOCN	Multi-Operator Core Network
MPN	Mobile Private Network
MS	Milestone
NSA/SA	Non-Stand Alone/Stand Alone
PTZ	Pan Tilt Zoom
RAN	Radio Access Network
SGI	Services of General Interest
TMV WG	Test Measurement and Validation Working Group
TOS	Terminal Operations Supervisor
UC	Use Case
WP	Work Package

1 Introduction

As outlined in the EC's CEF-DIG-2023-5GSMARTCOM-EDGE-WORKS call [1], in order for numerous Services of General Interest (SGIs) to flourish and contribute to economic progress and social cohesion, key enablers are identified, with 5G networks characterized as one of the most crucial ones. The proposed 5G infrastructures should be capable of delivering leading-edge connectivity with characteristics such as Gigabit performance, high-user-density, ubiquitous coverage, capacity to connect IoT devices, low latency, and high reliability.

In order to protect passengers and aircraft and ensure a high and uniform level of safety throughout the EU, national safety rules have been replaced by common safety rules, which have been progressively extended to the entire air transport chain. "Placing users at the heart of the transport policy" seems to be the key action proposed by the Commission of the European Community in the aeronautical field [2]. In the recent version of its European Plan for Aviation Safety (EPAS) [3], the safe integration of emerging technologies (e.g. 5G, AI, VR), and new business concepts are recognised as key elements to upgrade the competences of personnel and extend the operational safety priorities and procedures.

The strategic objective of 5G SAMITEA is to provide high-quality 5G communication services to the end customers of Sofia International Airport for personal, business and governmental growth, to enable efficient, state-of-the-art Mobility, Healthcare and Public Safety SGIs and to support the deployment of 5G EDGE networks as part of the "Path to the Digital Decade" EU policy programme. Sofia International Airport is an SGI provider, entrusted with the safety and well-being of the airport visitors and employees and the 5G SAMITEA MPN along with the targeted use cases to be validated, will add allow for advances in passengers flow monitoring, airport security monitoring and safe evacuation as well required capacity and low latency for handing of emergency and critical situations.

This deliverable, D2.1, is the first technical deliverable published by the 5G SAMITEA consortium and presents the "Requirements Analysis & Use Case Definition" as defined during the first six (6) months of the project. The deliverable is produced as part of the Work Package 2 (WP2) "Requirements, Architecture & Scope of work" and Task 2.1 "Requirements/Security Analysis and Use Case/KPI definition" and marks the completion of the project's milestone MS3 "Use Case definition and target KPIs ready".

In the sections that follow the document presents the detailed requirements analysis of supporting the selected UCs and the expected network performance. The requirements, as determined also by external stakeholders (e.g. transport and tourism verticals), are mapped to the UC scenarios and translated into technical requirements. This allows for the most appropriate network settings/configurations to be selected. Additionally, the relevant security requirements for the network and its communication with the end-users are identified which will drive the design of the protection and firewall systems to be included in the E2E architecture. Specific targeted KPIs are defined for network performance. The outputs of this deliverable will be used to create the High- and Low-level Design of the network, and as such will act as input to Task T2.2 "5G End-2-End Architecture and Specifications" and Task T3.1 "Deployment prerequisites (procurement, licensing, etc.)".

The document is public and is addressed to a wide audience and specifically to the:

- project consortium itself, as a documented blueprint of the agreed technical scope and development plans and the means to validate that all objectives and proposed technological advancements have been analysed and, through the identified requirements, the next actions can be concretely derived.
- research community, other 5G projects and funding organisations, to summarise the scope, objectives and intended project innovations, describe the 5G SAMITEA UCs and performance targets together with the identified requirements that must be tackled to achieve the expected results to open the floor for fruitful exchange of opinions and collaboration.
- public, to obtain a better understanding of the framework and scope of the 5G SAMITEA project.

1.1 Structure of the document

The main topics addressed in this deliverable are presented through the following structure:

- Section 2 presents an overview of the project's scope of work, including the key objectives and core technical developments.
- Section 3 presents the demand analysis and requirements for the specifics of the Mobility, Healthcare and Public Safety SGIs, and correlates this regarding network and services platforms offerings to set the implementation targets. The 5G SAMITEA use cases that are integral to the 5G SAMITEA validation activities are elaborated.
- Section 4 provides concluding remarks and the next steps for facilitating the delivery of a fully operational and validated 5G SAMITEA network by the end of the project.

2 5G SAMITEA Scope of Work

5G SAMITEA will provide a purpose-built 5G private wireless network to support the Sofia International Airport operations. The project will cover indoor (terminals, operations facilities) and outdoor (apron[1], perimeter) areas in Sofia International Airport, Bulgaria. Sofia airport has become an external border for Schengen. This is significant for security related purposes and adds value to the 5G SAMITEA project deliverables.

Moreover, passengers and airport employees will also benefit from the dedicated 5G base station coverage and EDGE cloud and the upgraded services offered by the 3GPP Rel. 16 and 17 [4] features to be delivered by the project's deployments. Currently there is poor mobile network coverage, and a dated TETRA system is used for operational purposes and handling critical situations. 5G SAMITEA's paradigm will thus boost local innovation enabling 5G mm Wave - as well as IoT-based technologies (i.e. mobility and security sensor-based monitoring-like approaches and infrastructure, AGVs/robots assisting travellers) to create a safer and more efficient environment for travellers and employees alike.

Figure 1: 5G SAMITEA – Sofia International Airport

The 5G SAMITEA project has the following **four key objectives:**

Objective 1: Extend A1's 5G network (in terms of construction, configuration, and connection with the rest of the network) with 2 additional macro-RAN sites, new Distributed Antenna System (DAS), 5G mmWave

[1] The apron is the area of an airport where aircraft are parked, unloaded, loaded, refuelled, and maintained

coverage and with upgrade of 3 existing RAN sites, towards high capacity, reduced latency, and high reliability mobile services for Sofia International Airport areas, up to now under-served and/or with obsolete wireless technologies. Furthermore, the Core network will be upgraded to fully support MPN and the 5G Industry 4.0 vision. The novel 5G Core and RAN base stations will be connected to cloud and edge computing resources for video surveillance system at Sofia Airport premises and at one of the main A1 datacentres located around 4 kilometres from Sofia Airport. The activities to serve this objective are described in detail in WP2 "Requirements, Architecture and Scope of Work", WP3 "Network Design and Planning" and WP4 "Network Deployment and Integration".

Objective 2: Enable and demonstrate advanced Mobility, Healthcare and Public Safety domain SGIs, provided by WINGS, such as passenger flow monitoring, autonomous apron operations, security monitoring, emergency evacuation, and medical first-aid provision leveraging the new 5G MPN infrastructure that will be implemented for different use case scenarios, static or mobile. The work for this will be carried out within WP2 "Requirements, Architecture and Scope of Work", and WP5 "Testing and Use Cases Validation".

Objective 3. Provide a blueprint for digital innovation projects for innovative solutions in EU airports and replication possibilities to other transport hubs. In synergy with peer projects in this call, this blueprint will identify challenges and respective recommendations towards the realisation of challenging applications in airports or similar transport hubs, focusing primarily on Healthcare, Public Safety and Mobility services, but also Public Transport, Civil Protection, and other SGI domains. This will be served within WP6 "Outreach, dissemination and standardisation".

Objective 4: 4. Outreach to public audience, key stakeholders, dissemination, standardisation and further exploitation of the project's main achievements. This is also a core activity within WP6 "Outreach, dissemination and standardisation".

Objectives 1 and 2 refer to the deployment and usage of a high-quality 5G network in Sofia airport, which is not currently available both regarding coverage as well as functional characteristics, necessary to provide the envisaged services (low latency, priority to emergency personnel, etc.)

Delivering project objectives 1 and 2 is not possible with the existing mobile network coverage in the area of Sofia Airport, nor with the deployed Tetra and Wi-Fi networks. In the project description we have analysed the performance and the applicability of several wireless technologies, and the conclusion is that MPN networks are the most suitable solution in such cases.

Sofia Airport MPN will span over 8 square kilometres, covering outdoor facilities, aprons and buildings with close to 100% outdoor and 98.9% indoor 5G coverage. Sub 6GHz RAN extensions, the new RAN sites and the DAS system will be deployed in the first two years of the project, while mm Wave radio coverage will be fully completed in 2027 reaching 96.1% outdoor coverage. RAN part of Sofia Airport MPN will be built with 4G/5G Nokia Base Stations. MPN Core network designed to fully support the 5G Industry 4.0 vision. Sofia Airport MPN core include functional entities that implement dual mode Packet Core network functions, IMS core network functions, as well as Mission Critical Push-to-Talk (MCPTT). The MPN Core will be designed and deployed with high capacity, availability and redundancy on multiple levels, such as hardware, hypervisor, control and user plane levels. Sofia Airport MPN core will be fully Converged 4G & 5G-SA geo-redundant Data and IMS core. It includes all required licenses, compute and storage resources to support 1000 data and telephony subscribers. In order to guarantee 24/7 monitoring, Sofia Airport MPN will be integrated into the A1 MPN monitoring system and will be supervised by A1 first and second level support teams.

3 5G SAMITEA Use Cases and Requirements

Section 3 sets the strategy to implement the 5G SAMITEA mission to provide 5G network deployments suitable for Mobility, Healthcare and Public Safety UCs. We will present what are the requirements for each of the services of interest in terms of 5G potential to digitally transform end user services and analyse 5G SAMITEA scenarios for demonstrating these.

The process of identifying the appropriate requirements has included the identification of the key stakeholders that are affected by the requirements considered. These include the end-users, Sof Connects business, operations and technical personnel, the A1 engineering teams (such as planners, designers, operation teams) as well as WINGS, the technology solutions provider. The requirements gathered are organised as Technical and User Requirements. Furthermore, the process followed has addressed the full life cycle, design-deploy-operate, towards the appropriate 5G SAMITEA UCs realisation.

The Use Cases described in the next sections reflect the capabilities of the 5G SAMITEA network and applications to serve the needs of the Airport. The actual implementations on site will be determined during the implementation phases, based on the specific requirements per case and selected out of the scenarios elaborated in the document.

The 5G-PPP TMV WG White Paper "5G PPP Trials Results 2022 - Key Performance Indicators measured in advanced 5G Trial Sites" [5], is used throughout the document as a benchmark with regards to state-of-the-art 5G network capabilities. In [5], not only are 5G KPIs defined and described but also results in terms of performance and validation requirements are summarized and compared for various applications and user communities (e.g. Health, Logistics, PPDR, Smart Cities, etc.), covering Europe-wide trials of 5G-based networks.

The use case scenarios to be set up for testing and validating the 5G SAMITEA infrastructure will exploit WINGS experience from the wi.MOVE [6] platform for public safety, healthcare and mobility services.

3.1 Enhanced Passengers' Experience and Flow Monitoring Use Case

The Enhanced Passengers' Experience and Flow Monitoring Use Case (henceforth FM) aims at improving passengers' comfort at Sofia International Airport, particularly during congested situations. More specifically, the use of 5G. Internet of Things (IoT) sensors and Artificial Intelligence (AI)-powered algorithms, will allow for the passenger flow to become smoother by reducing waiting times and queues, which frequently form in different areas of the airport, such as for baggage drop-off and reclaim, security screening, passport control areas.

3.1.1 Service/Case Description

A solution will be developed to aggregate and analyse the passenger data (e.g., user profile, location, flight details, e-ticket, etc.). These will be collected from various applications, based on which AI-enabled robots will assist/inform/entertain passengers during their permanence at the airport. Various sensors will be installed in different areas of the airport, also to detect critical situations and promptly alert the terminal operations supervisor (TOS). The components that will come into play include:

- visual analytics to detect the volume of the passengers, that will be used to support preparedness and raise awareness of high-risk situations.
- operational platform for key end-users in the airport premises, that will ingest available data from arrays of sensors and cameras deployed through the airport halls and waiting areas, communicating

over reliable 5G networks and output insights and actionable intelligence on public safety monitoring system.

In the following Table 1 the targeted scenarios and individual elements of the offered system are described.

Table 1: UC FM Scenarios

Use Case Name	FM	
Scenarios	Description	Actors
Crowd concentration estimation	Detection of overcrowded situations in the monitored infrastructure, based on video acquired through CCTV / thermal cameras. A human and head detection model is built for optical and thermal cameras respectively. A tracking algorithm is applied to both models to extract the trajectories of the detected persons	CCTV/thermal cameras Sensors to monitor presence Airport facility data Flight data Data from network sites (e.g. camped in cells)
Anomaly detection and notifications/alerts	Alerts for passengers' volume/flows	WINGS AI analytics cloud platform
Service Robots for Enhanced Passengers' Experience	Personalised passenger services Recommendations Assistance	Service robots and control module Visualisation module

3.1.2 Validation approach

Network description

A1BG 4G/5G Mobile RAN network coverage and capacity will be extended and dedicated slice will be granted to Sofia Airport MPN (Figure 2). The new DAS system will improve indoor coverage and capacity at Sofia Airport. The DAS system should provide coverage in all public areas of Sofia airport – Terminal 2, as well as additional, requested by the airport management, staff only areas (e.g. Baggage). DAS should support 2x2 MIMO for the following frequency bands: 700/800/900/1800/2100/2600 MHz and 5G at 3400 - 3600 MHz band coverage in Departures, Arrivals, and gate areas. DAS should include an uninterruptible power supply, monitoring system for active modules and antennas with low visible impact in public areas.

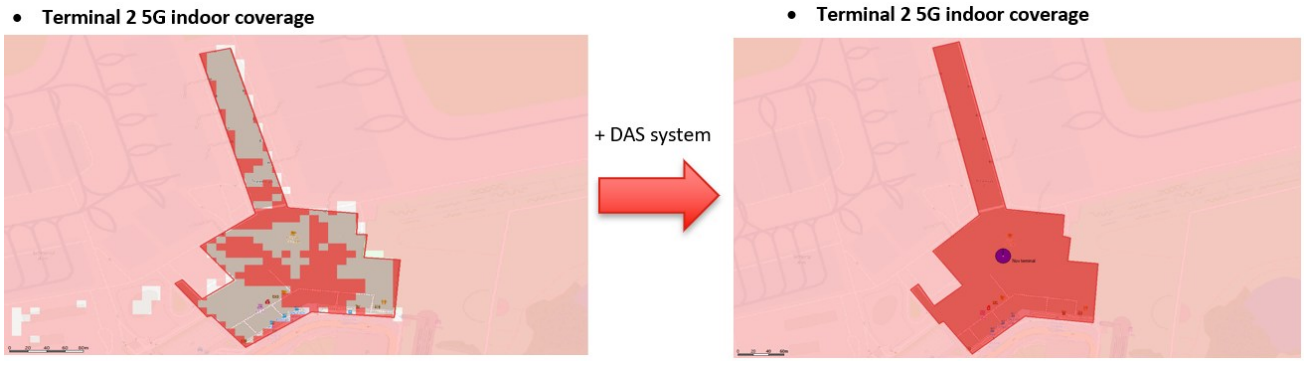

Figure 2: Indoor DAS Coverage in Sofia International Airport_Terminal 2 Area

Applications overview

The deployment and validation of this UC is based on WINGS wi.MOVE product suite, in order to facilitate the detection of overcrowded situations in the monitored airport facilities (Figure 3). The solution works as follows:

- Data will be collected from CCTV/thermal cameras (imaging data to measure distance between people and count people), 5G network infrastructure/camped in cells (received signal strength measurements), 5G/IoT sensors.
- AI mechanisms then come into play, employing algorithms to compute the concentration probability, based on mobility characteristics.
- Notifications/Alerts are raised for:
    - Retail, coffee shops, restaurants, etc. to activate counters, improve their customer handling capacity / flow, address health aspects
    - Services for enhancing the cleaning towards public areas like restrooms, etc.
- In cases of anomalies, as well as in cases that the system recognizes that a problematic passengers flow will occur in front of a specific check-in counter, the system will alert the Terminal Operations Supervisor (TOS) and their office assistant in real-time.
- The TOS will have the ability to remotely control the AI enabled robots to act immediately to prevent congestion in front of the check-in counters (Figure 4). The robots will help passengers by providing them with personalised information regarding their flights. The robots will confirm the correct check-in counter and propose to the passengers the most appropriate one, with less waiting time needed to fulfil their luggage drop off. Thus, the smart service robots will help airports to balance the demand of check-in counters used by airlines, by assisting in the decision-making process of the TOS and successfully optimizing the waiting times of passengers.

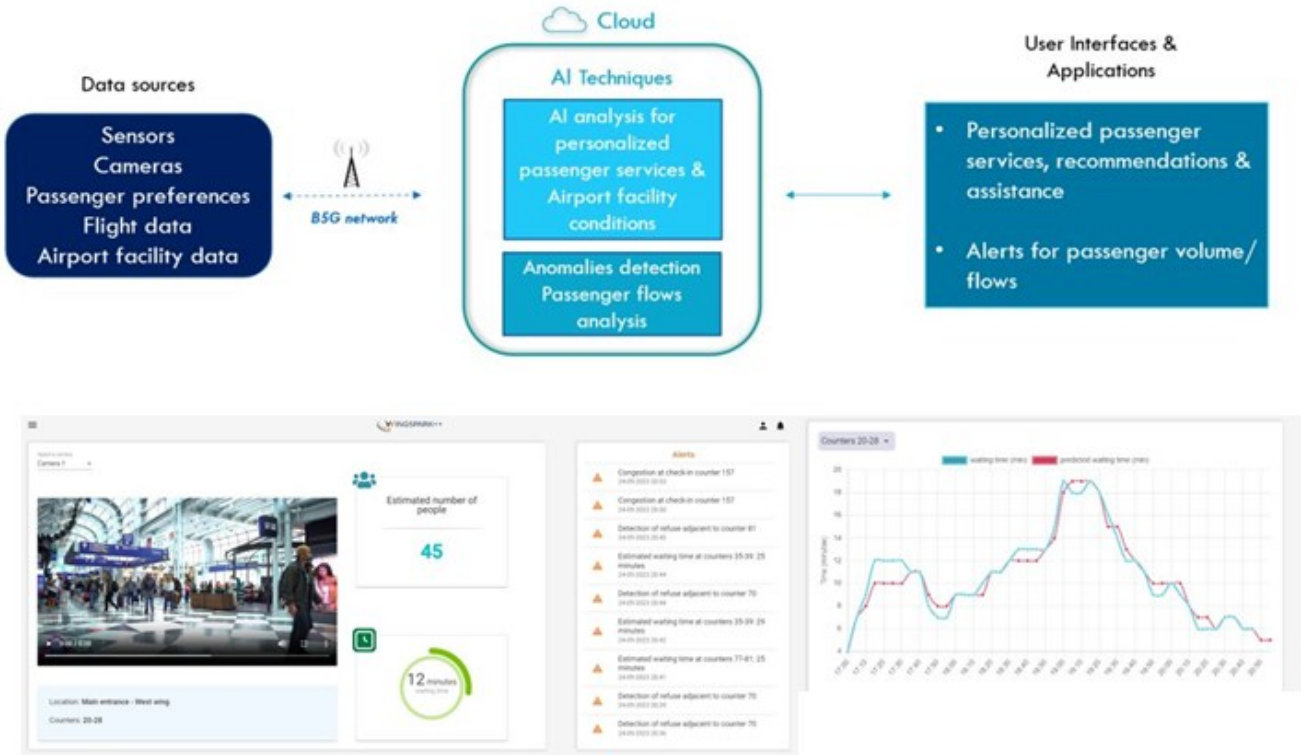

Figure 3: Flow Monitoring solution overview

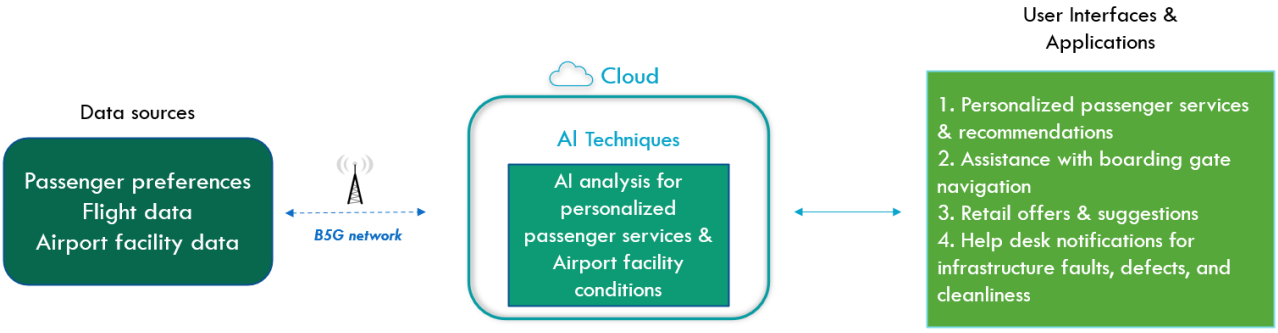

Figure 4: Personalised assistance and support solution overview

3.1.3 Technical and User Requirements

Based on [5] and in particular also recent Horizon project relevant to 5G for Mobility, 5G-TOURS [7] and TrialsNet [8] , the network and user requirements and results stemming out of these projects are used as reference in the 5G SAMITEA FM Use Case. While varying in range depending on the actual scenario to be implemented, the network requirements identified in Table 2 are targeted.

Table 2: KPIs with target values for FM UC

Scenarios	KPI	Target value
Crowd concentration estimation	Downlink throughput per device	1 – 5 Mbps
	Uplink throughput per device	1 – 5 Mbps
	Latency - round trip	<50 ms
	Latency - RAN	<15 ms
	Application round-trip latency	<150 ms
	Network Availability	99,99%
	5G Accessibility success ratio	99,9%
	5G Initial E-RAB Setup Success Ratio	99,9%
	Packet loss rate	0.01%
	5G Drop Ratio	0.10%
	Coverage percentage the whole area with the required levels of quality (-110 dBm or better) (Field measurement)	99%
	Downlink throughput per device	50 – 200 Mbps

Scenarios	KPI	Target value
Anomaly detection and notifications/alerts	Uplink throughput per device	10 - 50 Mbps
	Latency - round trip	<50 ms
	Latency - RAN	<15 ms
	Application round-trip latency	<150 ms
	Network Availability	99,99%
	5G SA Accessibility success ratio	99,9%
	5G NSA Accessibility success ratio	99,9%
	5G NSA Initial E-RAB Setup Success Ratio	99,9%
	Packet loss rate	0.01%
	5G NSA Drop Ratio	0.10%
	5G SA Drop Ratio	0.10%
	Coverage percentage the whole area with the required levels of quality (-110 dBm or better)	99%
Service Robots for Enhanced Passengers' Experience	Downlink throughput per device	50 – 200 Mbps
	Uplink throughput per device	10 - 50 Mbps
	Latency - round trip	<50 ms
	Latency - RAN	<15 ms
	Application round-trip latency	<150 ms
	Network Availability	99,99%
	Packet loss rate	0.01%
	5G SA Accessibility success ratio	99,9%

The network requirements are to be verified as part of the evaluation of the performance of this UC. For the implementation of this UC the following requirements from the user perspective are identified (Table 3).

Table 3: User requirements for FM UC

Scenarios	Requirement	Description
Crowd concentration estimation	Video Reception/ Transmission	Detect and classify behaviour and patterns
	Data Visualisation	View and analyse data in real time
	Average Flow	Estimation of the density and dynamics of large numbers of people present in the surveilled area
	Total number of people	Estimation of the total count of people entering a specific access point
	Security/Privacy	Respect data privacy directives and regulations
Anomaly detection and recommendations	Personalisation	Customisable alarm rules, based on specific criteria
	Data Visualisation	View and analyse data in real time
	Location information	track objects in real-time and provide detailed information about their location, speed, and direction.
	Alerting	Real-time alarm monitoring and notification to users via email, SMS, or mobile app
	Security/Privacy	Respect data privacy directives and regulations
Service Robots for Enhanced Passengers' Experience	Service availability	Period of time for which the mobile service is available for the users >99%
	Service reliability	>60-70% of the users expressing positive evaluation regarding the reliability of the devices, network, developed applications and services.
	Service trust	>60-70% of the users expressing positive evaluation regarding the robustness of the devices, the trustworthiness of the used AI algorithms, the E2E privacy of the system.

3.2 Airport Safe Evacuation Use Case

Airport terminals are very large and complex public venues with a large number of travellers, visitors and employees. Airport evacuations in general are currently based on pre-established plans and procedures to be executed during the emergency.

Sofia International Airport is the main gateway to Bulgaria and a Schengen border in general. Currently over 7 million passengers and 9 million passengers till 2030 per year will benefit of the extended 5G network coverage and high mobile data throughput.

The Airport's objective is to process this crowd in an efficient and safe manner, while at the same time having in place the relevant plans, tools and processes required to mitigate any emergency. An efficient and effective evacuation is one of the mitigation measures that are of particular importance in security incidents or even in the case of fire, gas leakage, etc.

This use case describes the way airports (in general) and other large-scale public infrastructures, can exploit 5G capabilities so as to bring in place an effective evacuation plan where personalized, dynamic and smart instructions can be provided in a reliable, instantaneous and massive-scale manner.

The Airport Safe Evacuation Use Case (ASE) aims to process Airport terminal evacuees in an efficient and safe manner, while at the same time having in place the relevant plans, tools and processes required to mitigate any emergency with the use of 5G based tools.

Ensuring public safety in transportation infrastructure is of major concern, especially when the risk incident takes place in large, crowded areas such as an airport, where the casualties and consequences of failure in this aspect are larger.

Main goal of the service is to assist current evacuation plans in large crowded indoor public spaces, resulting in:

- Minimizing the risk or magnitude of human casualties.
- Efficient handling of incidents that have complex and dynamic evacuation requirements (e.g., fire spreading, natural disaster incident, terrorist attack)
- Efficient implementation of training exercises.

Users can receive personalized guidance provided by the service through a dedicated mobile application.

The focus is on security related events by managing people counting, density, and dynamics of large numbers of people (flow directions, spread, speed). The overall objective is to leverage 5G capabilities to enable ultra-reliable processes and capabilities, powered by high capacity and low latency, and provide automated guidance for the evacuation route to residents and regular users of the facility as well as to visitors, travellers, and possible vulnerable people who are not aware of the facility. Real time data such as numbers of evacuees within an area, persons trapped, assistance to impaired people, visualization of real-time flows of people are evaluated to assess the impact of 5G technology.

Effective emergency communication at an airport is essential for ensuring the safety of passengers, staff, and responders during critical situations such as security threats, natural disasters, technical failures, or medical emergencies. A robust emergency communication system enables rapid information dissemination, coordination among various stakeholders, and efficient incident management. Direct and secure communication with police, fire, medical, and civil protection units is vital. The goal is to minimize response time, reduce risk, and ensure public safety through reliable, secure, and well-orchestrated communication.

The installation of an MPN 5G in Sofia Airport network is motivated by the need for enhanced technological capabilities. Its low latency and high bandwidth facilitate remote control functionalities, enabling swift and responsive management of operations and systems. This ensures seamless connectivity and efficient control, essential for real-time decision-making and optimized performance in various critical operations at the airport.

The integration of push-to-voice or push-to-video features serves as a fallback solution to mitigate challenges posed by professional radio or public network limitations. This innovative feature allows for instant voice or video communication, ensuring seamless connectivity even in situations where conventional communication networks might falter. By integrating these functionalities, it ensures reliable and immediate communication among team members, enhancing operational efficiency and response times, especially in critical situations where swift and effective communication is imperative.

Mission Critical Push-to-Talk and Push-to-Video applications, in combination with Centralized video surveillance system, will enhance Sofia Airport security and operational procedures in day-to-day work and emergency situations. Access and usage of such information will be controlled according to Sofia Airport internal information security policies and procedures in compliance with Bulgarian cyber security regulation.

3.2.1 Service/Case Description

In the following Table 4, the targeted scenarios and individual elements of the offered system are analysed.

Table 4: UC ASE Scenarios

Use Case Name	ASE	
Scenarios	Description	Actors
Emergency communication at the airport	Enabling national roaming between A1BG mobile core network and SA MPN is required for emergency communication at the airport for Bulgarian Public Authorities such as Police, Fire brigades, Healthcare First Aid, Counter Terrorist Units and thus guaranteed coverage, connectivity and capacity will be provided in case of an emergency situations. This solution ensures reliable and uninterrupted communication, which is essential for the safety and efficiency of airport operations, particularly during emergencies when multiple agencies and stakeholders must act in a coordinated manner. Enabling national roaming significantly enhances this capability by providing robust network resilience and coverage continuity within the airport premises and surrounding areas. By integrating National Roaming between both networks as part of emergency communication strategy, Sofia Airport can strengthen their crisis preparedness and response capabilities. This minimizes communication disruptions, improves coordination among diverse agencies, and ultimately helps protect passengers, staff, and critical airport infrastructure during unforeseen events.	Bulgarian Public Authorities such as Police, Fire brigades, Healthcare First Aid, Counter Terrorist Units; Sofia Airport Operational Personnel

Use Case Name	ASE	
Scenarios	Description	Actors
Mission Critical Push-to-Talk (MCPTT) communication solution	Push-to-voice or push-to-video features allow secure high-definition (HD) video calls facilitated by 5G connectivity, it streamlines communication and reduces the reliance on multiple devices typically required for workers. This advancement in communication technology not only ensures secure and reliable communication but also fosters enhanced collaboration among the workforce. By offering seamless HD video calls through 5G, it optimizes communication efficiency, enabling workers to collaborate effectively using fewer devices, thereby streamlining their workflows. Push-to-Talk (PTT) and Mission-Critical Voice Communication serve as a crucial coordination functionality for response teams managing critical situations. It enables instant, one-to-many voice communication over secure channels, ensuring that team members can relay urgent information, commands, or situational updates in real time. This feature significantly enhances operational efficiency and situational awareness by minimizing communication delays and enabling seamless coordination among multi-agency responders, especially in dynamic and high-pressure environments.	Sofia Airport Operational Personnel / PTT devices
AR/VR based evacuation	In the context of this scenario, a section of the airport will be provided, and volunteers (actors) will participate in an evacuation exercise. Naturally, such an emergency situation will call for low latency communications with high reliability of being realized, which means that a URLLC slice will have to be allocated so as to ensure that all travellers and airport personnel are notified and guided to the most appropriate exit immediately. A detailed 3D digital model of the section to be evacuated along with all objects contained therein, such as seats, desks and monitors, will be created and fed into the evacuation support system. Emergency exits will all be recorded and fed into the system supporting the evacuation procedure along with information on their exact location as well as their capacity, if they are accessible, etc. Initially, the Evacuation use case participants will be notified with a message to their mobile device about the emergency, while from that point on, they will	Sofia Airport Operational Personnel / AR-VR devices

Use Case Name	ASE	
Scenarios	Description	Actors
	be receiving further notifications on regular time intervals. Guidance will be provided in a personalized manner, taking into consideration the design of the physical space, any obstacles that might exist, the current occupancy, the capacity of the evacuation routes and the travellers' individual needs and limitations, such as their age, health status and mobility capabilities, etc. The location of the travellers will be also tracked to provide more targeted guidance especially for evolving events such as a fire spreading or an evacuation route becoming unavailable. The system can also be explored for early detection of passenger movement anomalies that can signify an evolving emergency and timely alarm airport response units. Enhanced location services will be made available through the 5G network.	

3.2.2 Validation approach

Network description

Delivering this use case is not possible with the existing mobile network coverage in the area of Sofia Airport. A Distributed Antenna System (DAS) is a network of spatially separated antennas connected to a common source, designed to enhance wireless service within a specific area—especially in large or complex indoor environments where traditional macro network signals may be weak or inconsistent. In the context of the Sofia airport building, implementing a DAS offers critical advantages at Terminals and boarding areas; Baggage claim zones; Security checkpoints and Underground areas (e.g., parking, tunnels). This is essential for both passenger experience and airport operations. Airports are typically large structures with dense materials (concrete, steel, glass) that can obstruct or degrade cellular signals. A DAS ensures seamless mobile connectivity. Reliable connectivity is vital for airport staff, emergency services, and security teams. A well-designed DAS ensures uninterrupted communication for Push-to-talk systems for ground crews and security and Private Mobile 5G networks for airport operations and emergency communication in case of incidents.

Evacuation solution

The following components will be deployed and validated:

- Complete service package providing optimized routing guidance in a personalized environment (Figure 5),

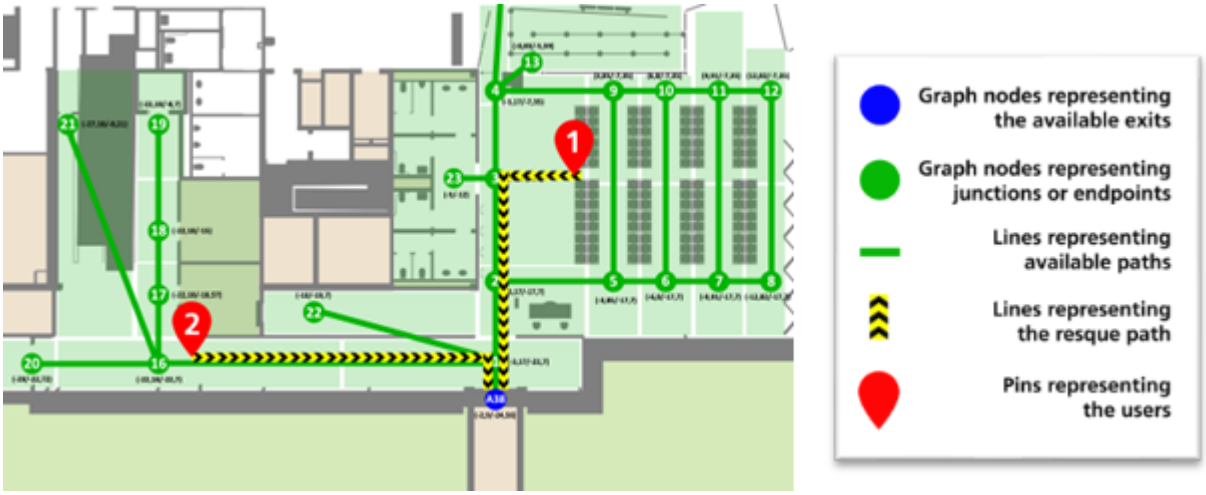

Figure 5: Evacuation Routing Service

- 3-D model implementation for airport digital twin (DT) (Figure 6),
  - Use of Sofia Airport CAD files to represent accurately the virtual space.
  - Create the basic plan top view.
  - Create the 3D model and all its features.

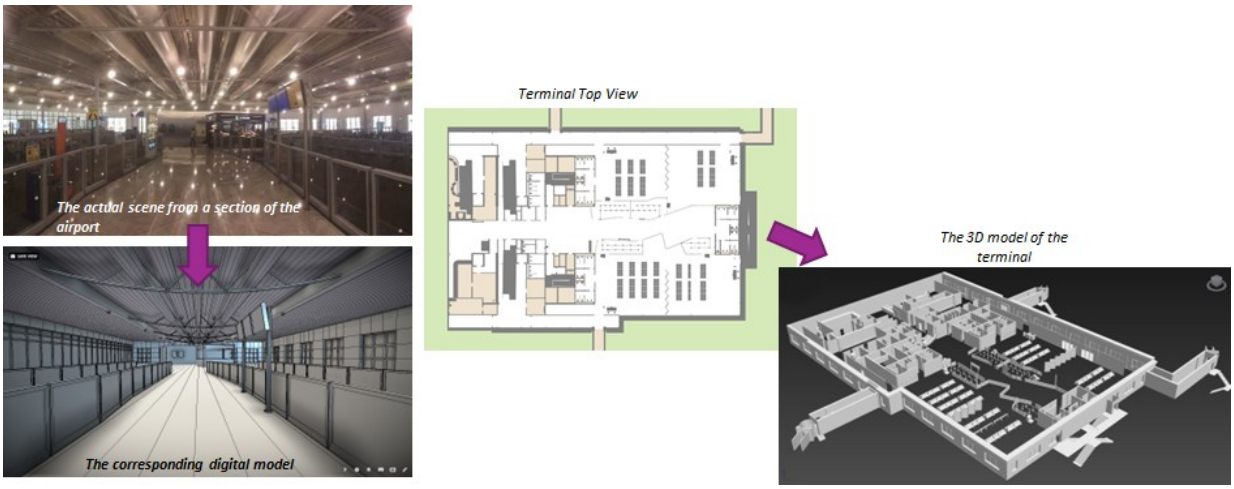

Figure 6: Evacuation area DT model

- Ability for the user to select AR/VR mode, (Figure 7),
  - To navigate through the digital model of the building, or through his camera's output only visualizing the "guidelines"
  - Personal profile to consider personal needs e.g., age, gender, disabilities

VR setup – digital model of the area

AR setup – camera output augmented with the navigation guidelines

Figure 7:Evacuation AR/VR setup

- Application enhancements and extensions
    - AGV s/cleaning/service robots with sensors, providing data for mapping the area and giving feedback to the digital twin to be used for the evacuation.
    - Similar for tracking assets, that can locate mobile objects such as suitcases, that may be posing obstacles in an evacuation situation that would block the exiting track.
    - Routing in terminals at the appropriate time to avoid congestion
    - Marketing purposes, providing routes through commercial key-spots according to personal preferences and needs of the user, including reviews from other users, relative information, etc.
    - Routing in large exhibitions/conferences to apply load balancing on visitors entering the venue

Emergency communication at the airport and Mission Critical Push-to-Talk (MCPTT) communication solution.

Sofia Airport MPN will span over 8 square kilometres, covering outdoor facilities, aprons and buildings with close to 100% outdoor and 98.9% indoor 5G coverage. Sofia Airport MPN (SA MPN) will consist of MPN dedicated IMS/PS Core and A1BG RAN network coverage. On A1BG RAN sites covering SA premises MOCN (multi-operator core network) features will be activated and dedicated S1 interfaces will be established between A1BG RAN sites and SA MPN Core. Dedicated A1BG RAN resources (slice), including baseband and frequency resources, will be granted to SA MPN. Additionally, in 5G SAMITEA project we'll establish connectivity between A1BG mobile core network and SA MPN for enabling national roaming required for emergency communication at the airport for Bulgarian Public Authorities such as Police, Fire brigades, Healthcare First Aid, Counter Terrorist Units and thus guaranteed coverage, connectivity and capacity will be provided in case of an emergency situations (Figure 8).

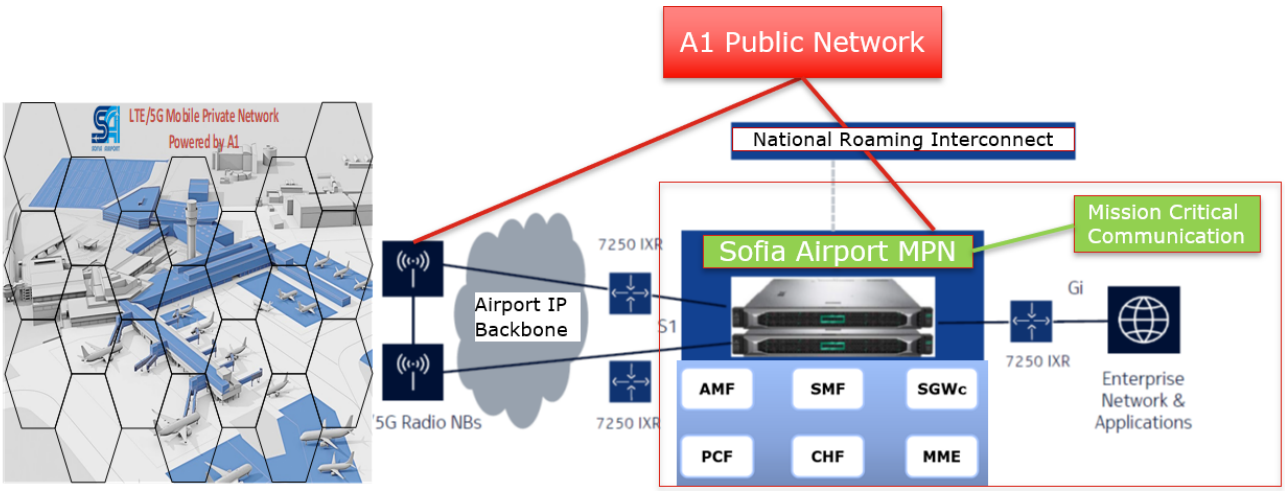

Figure 8: Emergency and Mission Critical Communication solutions

3.2.3 Technical and User Requirements

Based on [5] and in particular also recent Horizon project relevant to 5G for Mobility, 5G-TOURS [7] and TrialsNet [8] , the network and user requirements and results stemming out of these projects are used as reference in the 5G SAMITEA ASE Use Case. While varying in range depending on the actual scenario to be implemented, the network requirements identified in Table 5 are targeted.

Table 5: KPIs with target values for ASE UC

Voice communication in Emergency situations	Voice Establishment Setup Success Ratio	99,9%
	Voice Accessibility success ratio	99,9%
	Voice Drop Ratio	0.10%
	Coverage percentage the whole area with the required levels of quality (-110 dBm or better)	99%
MCPTT communication solution	Downlink throughput per device	1 – 5 Mbps
	Uplink throughput per device	1 – 5 Mbps
	Number of simultaneous calls	Up to 100
	Video Establishment Setup Success Ratio	99,9%
	Video Accessibility success ratio	99,9%
	Video Drop Ratio	0.10%
	Coverage percentage the whole area with the required levels of quality (-110 dBm or better)	99%
AR/VR based evacuation	Downlink throughput per device	1 – 5 Mbps
	Uplink throughput per device	0.5- 1 Mbps
	Latency - round trip (Field measurement)	<50 ms
	Application round-trip latency	<150 ms
	5G Accessibility success ratio	99,9%
	5G Initial E-RAB Setup Success Ratio	99,9%
	Packet loss rate	0.01%
	5G Drop Ratio	0.10%
	Coverage percentage the whole area with the required levels of quality (-110 dBm or better) (Field measurement)	99%

The network requirements are to be verified as part of the evaluation of the performance of this UC. For the implementation of this UC the following requirements from the user perspective are identified (Table 6).

Table 6: User requirements for ASE UC

Scenarios	Requirement	Description
Voice communication in Emergency situations	Number of simultaneous calls	Up to 100
MCPTT communication solution	Video Reception/ Transmission	yes
	Number of simultaneous calls	Up to 100
	Voice communication	yes
	Location information	<5m
	Fast response	<10 ms
	Reliability/Availability/Users' Acceptance Survey	>70-80% of the users expressing positive evaluation regarding the reliability of the devices, network, developed applications and services.
	Battery life	important
AR/VR based evacuation	Video Reception/ Transmission	ultra-reliable and low latency communication network to support both high user data rate, primarily in the DL direction
	Location information	high location accuracy to achieve guidance in personalized manner
	Fast response	yes
	Reliability/Availability/Users' Acceptance Survey	>70-80% of the users expressing positive evaluation regarding the reliability of the devices, network, developed applications and services.
	Density	Several users per m2
	Security/Privacy	The Emergency airport evacuation scenario involves notifying all airport attendees about an emergency situation and providing evacuation guidance in a personalized manner.

3.3 Airport Security Monitoring Use Case

5G SAMITEA Security Monitoring (SM) Use Case will support Sofia Airport facilities Centralized video surveillance management system, which will be managed by dedicated central infrastructure and will include perimetric video surveillance solution for protection of outdoor critical areas, as well as analytic video surveillance solution for improved proactive security.

Furthermore, we will showcase how autonomous and smart systems can perform typical ground handling operations at the APRON such as passenger handling, in-flight catering, aircraft fuelling, potable water & aircraft toilet servicing, baggage and cargo handling, and Foreign Object Damage (FOD) prevention. This will be achieved using remotely controlled or unmanned vehicles, such as collaborative robots. The Digital Twins of the APRON will be accessed by VR headsets, enabling a real-time depiction of the physical world inside the virtual one. Digital Twins have a significant impact in optimizing the operations of the staff supervising APRON, ensuring safer and incident-free operations. Operators can intervene remotely and take control of vehicles in critical situations.

3.3.1 Service/Case Description

The following scenarios will be validated:

Video Surveillance & Perimeter Monitoring

The system is designed to deliver high-performance video surveillance and perimeter protection in a complex, high-security environment such as an airport apron. The solution combines multi-layered analytics, thermal detection, and autonomous tracking to ensure early detection, classification, and response to intrusions and operational anomalies. It is optimized for 24/7 operation under varying lighting and weather conditions, while ensuring secure and reliable performance.

- The perimeter defence system will cover the fence of airport premises, with a high accuracy solution using 5G SAMITEA connected thermal camera and automated PTZ camera tracking providing:
    - 24/7 long range, reliable perimeter protection based on thermal cameras
    - Advanced AI based analytics running on Cameras, capable to detect people at 180m distance and distinguish between log, role crowing movement. Total Cost of ownership will be reduced thanks to the fact that no costly and maintenance heavy servers are required
    - Advanced AI based camera auto tracking features running completely on the cameras for complete situational awareness along the perimeter. The system gives the operator the clear picture if there is a need to dispatch a security patrol for investigation, which is again a big saving factor on resources
- The 5G SAMITEA connected cameras will also feed a vehicle movement analytic system which will recognize and follow movement of all vehicles providing ground traffic situation awareness for airport area between terminals and runway – existing power supply and high pillars for lightening will be used:
    - AI based object analytics for vehicle detection and classification along the runway and service roads for complete situational awareness.
    - Important traffic around the monitored zone - workers, animals, vehicle types

Autonomous Apron Operations

It is of paramount importance that the operations of the Airport's Apron are efficient and effective towards providing follow-me service to an aircraft, responding to emergencies, as well as maintaining a safe environment for all concerned users of the Apron. Current issues on the Apron, which airports are confronted with, mostly concern the efficiency of follow-me provisions for an aircraft during their arrival and departure

from parking positions which inevitably result in departure delays, staff's misdemeanours (exceeding speed limit or smoke), safety hazards such as fuel spillages which could lead to life-threatening circumstances.

Data will be collected from vehicles in the airport APRON and robots using a variety of sensors, including LIDAR and GPS, as well as images and videos from security cameras. Advanced AI techniques will be employed to analyse the data, identify patterns, and make accurate predictions, allowing for continuous monitoring and analysis of airport operations. Based on these analyses, alerts and suggestions will be generated to improve operations and enhance overall airport efficiency.

The integration of a distributed monitoring system will enable the continuous monitoring of unmanned vehicles, collaborative robots, and relevant resources. This system can collect data across the Edge and far Edge resources, and traffic profiling will be conducted to detect network anomalies and predict/prevent failures and security breaches. Automated mitigation procedures will be applied to address any issues that arise (Figure 9).

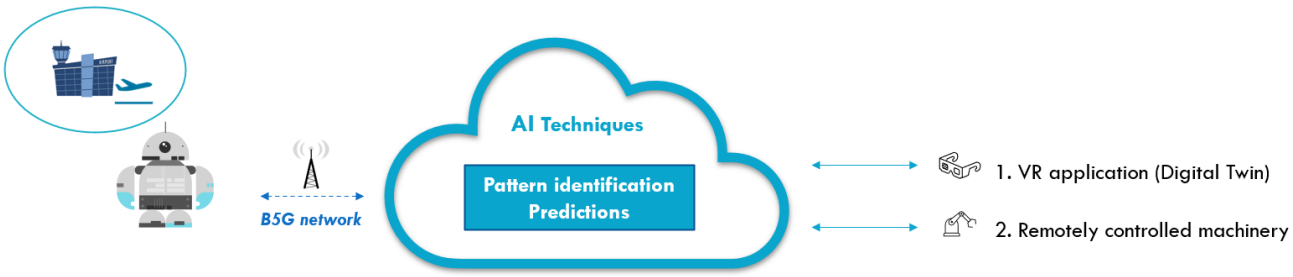

Figure 9:Autnomous apron high-level architecture

The utilization of 5G technology is crucial to this use case, as it enables low-latency, high-speed communication necessary for real-time monitoring and control of unmanned vehicles and resources. This in turn leads to more efficient and safer airport operations, facilitated by the advanced technologies mentioned above. The high bandwidth and low latency of 5G technology enables faster and more reliable data transfer, resulting in more accurate predictions, better decision-making, and overall improvements in airport operations.

In the following Table 7, the targeted scenarios and individual elements of the offered system are analysed.

Table 7: UC SM Scenarios

Use Case Name	SM	
Scenarios	Actors	Description
Video Surveillance & Perimeter Monitoring - ***Perimeter defense system***	96 × AXIS Perimeter Defender eLicense	Offers a combination of motion and AI-based long-range detection to automatically detect and classify humans and vehicles intruding on your property. Works optimally with Axis thermal cameras, for long-range detection at high-security locations.
	96 × AXIS Perimeter Defender PTZ	Enables advanced, automated tracking capabilities for PTZ cameras integrated with AXIS Perimeter Defender, allowing a PTZ camera to automatically follow a detected intruder or moving object with paired thermal camera.

Use Case Name	SM	
Scenarios	Actors	Description
	Autotracking eLicense	This feature enhances situational awareness and reduces operator workload by ensuring that threats remain in view without manual intervention.
	96 × AXIS Q6135-LE 50 Hz	Offers HDTV 1080p with 32x optical zoom. It features OptimizedIR up to 250 m (820 ft) or more depending on the scene and Lightfinder 2.0 for clear, sharp images even in challenging light.
	11 × AXIS Q1971-E 7 mm 30 fps	Camera can detect and verify regardless of weather and light conditions even in low-contrast scenes. With five lens alternatives, it ensures optimal detection to suit specific needs. This AI-based camera enables proactive surveillance. This modification is equipped with 7 mm 30 fps lens.
	29 × AXIS Q1971-E 13 mm 30 fps	Camera can detect and verify regardless of weather and light conditions even in low-contrast scenes. With five lens alternatives, it ensures optimal detection to suit specific needs. This AI-based camera enables proactive surveillance. This modification is equipped with 13 mm 30 fps lens.
	56 × AXIS Q1971-E 19 mm 30 fps	Camera can detect and verify regardless of weather and light conditions even in low-contrast scenes. With five lens alternatives, it ensures optimal detection to suit specific needs. This AI-based camera enables proactive surveillance. This modification is equipped with 19 mm 30 fps lens.
Video Surveillance & Perimeter Monitoring - ***Vehicle movement analytic system***	17 × AXIS P3748-PLVE	Offers four channels with 4K per channel at 12.5/15 fps. It includes 360° IR illumination with individually controllable LEDs and a removable IR cut filter. All four sensors are fully motorized and PTRZ functionality ensures ease of installation and configuration. Plus, presets make it easy to configure multiple devices.
	17 × AXIS Q1808-LE	With 4K and an ultra-high light sensitive 4/3” sensor, this powerful camera delivers exceptional low-light performance and less noise even at great distances. A deep learning processing unit enables more processing power to run advanced features and powerful analytics on the edge.
	17 × AXIS Perimeter Defender eLicense	Offers a combination of motion and AI-based long-range detection to automatically detect and classify humans and vehicles intruding on your property. Works optimally with Axis thermal cameras, for long-range detection at high-security locations.
	17 × AXIS Perimeter Defender	Enables advanced, automated tracking capabilities for PTZ cameras integrated with AXIS Perimeter Defender, allowing a PTZ camera to

Use Case Name	SM	
Scenarios	Actors	Description
	PTZ Autotracking eLicense	automatically follow a detected intruder or moving object with paired thermal camera. This feature enhances situational awareness and reduces operator workload by ensuring that threats remain in view without manual intervention.
Autonomous Apron Operations	AGV, VR Headsets, Digital Twin, AI Analytics module, airport personnel	The scenario involves the use of technology to optimize the transport of over-sized bags on an airport APRON. The purpose is to demonstrate how advanced technology such as unmanned vehicles, robots, and sensors can be used to improve typical ground handling operations by making the transport of oversized bags safer, more efficient, and more cost-effective. The steps for the trial are presented below: • The Airside Monitoring and Inspection personnel responsible for supervising the APRON operations use VR headsets to access the digital twin of the APRON. • They can see a detailed depiction of the APRON in real-time, which is updated with data from the various unmanned vehicles and robots moving around the APRON. • As the final boarding call is announced, some passengers are informed that their carry-on luggage exceeds the allowed dimensions and cannot be taken on board. • The Ground Handler immediately sends the remotely controlled robot, which can transport luggage, to collect the oversized bags and transport them to the aircraft. • The robot's position is tracked using markers and beacons on the ground, as it follows predefined routes on the APRON to navigate safely to the plane. • The Ground Handler monitors the robot's movement from their control room to ensure that it reaches the aircraft without any issues. • Thanks to this efficient use of technology, the robot can quickly and safely transport the oversized bags to the aircraft, saving valuable time for both the staff and the passengers.

3.3.2 Validation approach

Network description

The installation of new RAN sites is necessary due to the high bandwidth demand for HD cameras and drones. This technology provides the necessary infrastructure to support the transmission of high-definition video feeds and real-time data essential for surveillance cameras and drone operations. The enhanced bandwidth of 5G ensures seamless, high-quality video streaming and swift data transfer, critical for efficient monitoring and surveillance within the airport premises. As part of project 5G rollout, A1BG will deploy a high capacity 5G mmWave network across 23 sectors within the airport environment. This deployment is a key step in enabling

next-generation use cases that demand ultra-fast connectivity, minimal latency, and high bandwidth—capabilities that mmWave spectrum is uniquely suited to provide. One of the most impactful applications of this deployment will be the implementation of a perimetric video surveillance solution. Designed to protect outdoor critical areas of the airport, this system will interconnect through 5G router(s) to leverage the speed and responsiveness of 5G mmWave to stream ultra-high-definition video in real time. This not only improves visibility and control for security teams but also supports advanced video analytics at the edge, allowing for immediate detection of anomalies or threats at the airport perimeter.

Two additional macro sites and extension with new frequency layers of 4 RAN sites are required to improve outdoor coverage and capacity at Sofia Airport (Figure 10).

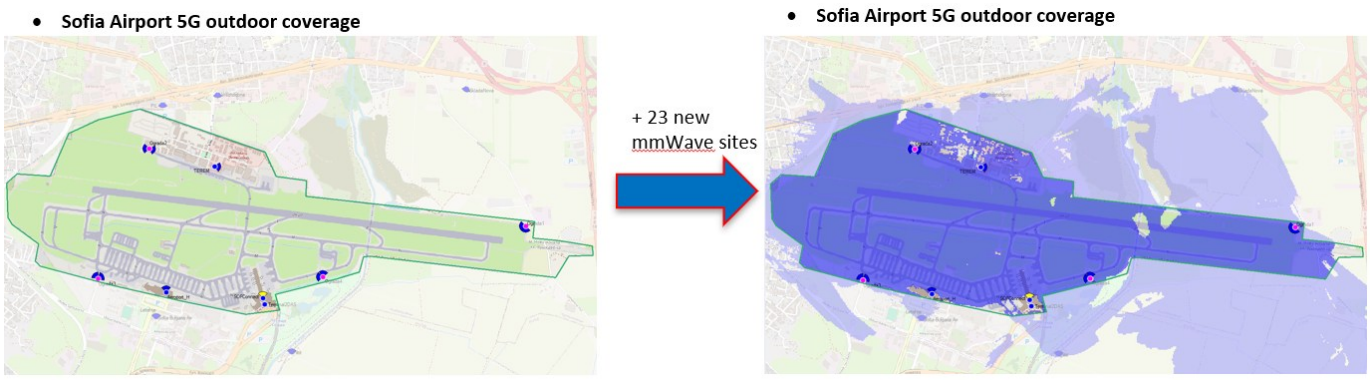

Figure 10: Outdoor mmWave Coverage in Sofia International Airport Perimeter Fence Area

Video Surveillance & Perimeter Monitoring

The perimeter system to be deployed is shown in Figure 11 below. A description of the system to be deployed is provided, in terms of components and functionalities in the following paragraphs.

Figure 11: Monitoring system in Sofia International Airport Perimeter Fence Area

Core Components and Functional Overview:

- Edge-based Video Analytics
    - The system includes 14 AXIS Perimeter Defender eLicenses, enabling real-time AI-driven detection and classification of humans and vehicles. This reduces false alarms and ensures prompt response to actual threats or operational violations.
    - In addition, 96 AXIS Perimeter Defender PTZ Autotracking eLicenses extend the system's capabilities by enabling synchronized PTZ camera autotracking and automated tracing — allowing the system to autonomously follow and maintain visual contact with intruding or moving objects. This improves situational awareness and enhances the precision of response protocols.
- Multisensor Camera Coverage for Apron Surveillance
    - 17 AXIS P3748-PLVE multisensor cameras provide seamless 360° or 270° coverage, each delivering 4 independent channels of 4K video. These cameras are strategically deployed for panoramic monitoring of critical apron zones, enabling precise observation of ground crew, vehicle traffic, and aircraft movements.
    - Each sensor features remote PTZR (Pan, Tilt, Zoom, Rotate) capability, allowing flexible repositioning during setup or remotely during operations and maintenance. This significantly reduces on-site labor time and ensures optimal field of view alignment.
- Autonomous PTZ Surveillance
    - 96 AXIS Q6135-LE PTZ cameras provide HDTV 1080p resolution with 32x optical zoom and OptimizedIR (up to 250m), ensuring excellent performance across varied lighting conditions.
    - These cameras support autotracking and advanced automated tracing, enabling the system to intelligently detect, follow, and zoom in on unauthorized persons or vehicles in real time — without operator input. This ensures continuous visual coverage and faster decision-making in dynamic scenarios.
    - Additional features include:
        - Sharpdome technology for distortion-free imaging above and below the horizon
        - Orientation aid and click-and-track functionality for intuitive manual control
        - Privacy masking with mosaic pixelation for GDPR-compliant video workflows
- Thermal Perimeter Protection
    - A total of 96 AXIS Q1971-E thermal cameras are deployed in three lens variants (7 mm, 13 mm, 19 mm) to provide customizable detection ranges based on location-specific security requirements.
    - These cameras ensure consistent object detection even in complete darkness, fog, smoke, or glare, and are ideally suited for mission-critical long-range monitoring. Thermal units are tightly integrated with analytics and PTZ systems to enable proactive perimeter security.
    - Key features include:
        - Support for AI-based classification and third-party analytics
        - Alarm I/O ports and edge-to-edge audio integration for deterrence scenarios
        - Axis Edge Vault with FIPS 140-2 Level 2 secure key storage

For critical surveillance of runway zones, 17 AXIS Q1808-LE cameras are deployed. These high-performance cameras are equipped with ultra-sensitive 4/3" image sensors and a choice of wide or telephoto lenses, making them ideal for large-area coverage or long-distance identification.

Each unit includes a deep learning processing unit (DLPU) for advanced edge analytics and delivers excellent imaging under extreme low-light conditions, enabling accurate monitoring of runway safety, aircraft positioning, and unauthorized movement at all hours.

Key features:

- 4K resolution and 10.3 MP sensor for high-detail inspection

- Built-in IR, Lightfinder, and Forensic WDR for challenging lighting conditions
- PoE-out functionality for connecting and powering additional devices
- Axis Edge Vault for secure identity management and cybersecurity

All deployed cameras and analytics units incorporate Axis Edge Vault, a hardware-based cybersecurity platform that safeguards device identity and ensures secure boot, signed firmware, and encryption key management.

System design and configuration are managed using AXIS Site Designer, which ensures consistency, documentation, and optimization across all hardware and analytic components.

For operational oversight, the system supports integration with third-party video management systems (VMS) via Axis-provided plugins, ensuring compatibility with existing infrastructure and unified command-and-control environments.

Autonomous Apron Operations

A location will be selected for the upcoming trials in the APRON area at Sofia International Airport, where ground handling activities and services take place. By conducting the trials in this area, a thorough assessment of the effectiveness and safety of new technology and handling methods will be allowed. The Airside Monitoring and Inspection personnel will closely monitor the trials, ensuring the safety of all involved while gathering valuable information for future improvements.

The infrastructure for the airport APRON use case will utilize cutting-edge technologies to streamline typical ground operations. The implementation of remotely controlled or unmanned vehicles, such as collaborative robots, will be made possible using devices such as sensors and cameras. Data collected from these devices will be transmitted over a 5G network to the cloud for further processing and analysis (Figure 12).

A distributed monitoring system will ensure the continuous monitoring of unmanned vehicles, collaborative robots, and relevant resources. Automated mitigation procedures will be applied to address any issues that arise, ensuring a safe and efficient use case deployment. The distributed monitoring system collects data from various application components potentially located at the far-edge/core resources to access and reason regarding the performance of the overall system in real-time. Such a system comprises several components and a central management platform for higher level decision or visualization purposes. As an outcome a complete view of achieved KPIs and KVIs will be provided.

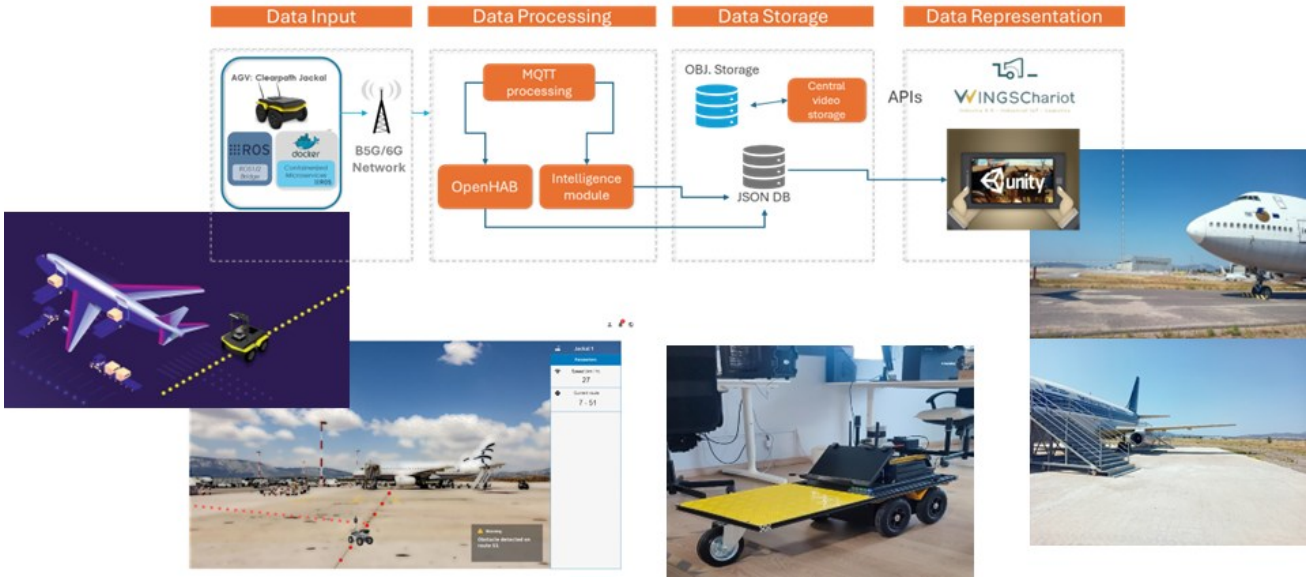

Figure 12: Overview of Autonomous Apron operations

3.3.3 Technical and User Requirements

Based on [5] and in particular also recent Horizon project relevant to 5G for Mobility, 5G-TOURS [7] and TrialsNet [8] , the network and user requirements and results stemming out of these projects are used as reference in the 5G SAMITEA SM Use Case. While varying in range depending on the actual scenario to be implemented, the network requirements identified in Table 8 are targeted.

Table 8: KPIs with target values for SM

Video Surveillance & Perimeter Monitoring	Downlink throughput per device	3-4 Mbps
	Uplink throughput per device	3-4 Mbps
	Latency - RAN	<15 ms
	5G SA Accessibility success ratio	99,9%
	5G NSA Accessibility success ratio	99,9%
	5G NSA Initial E-RAB Setup Success Ratio	99,9%
	Packet loss rate	0.01%
	5G NSA Drop Ratio	0.10%
	5G SA Drop Ratio	0.10%
	Coverage percentage the whole area with the required levels of quality (-110 dBm or better)	99%
Autonomous Apron Operations	Minimum Downlink and Uplink throughput per robotic device	50 Mbps/10 Mbps
	Network Latency	10-100 s
	Applications latency	800 ms
	5G SA Accessibility success ratio	99,9%
	5G NSA Accessibility success ratio	99,9%
	5G NSA Initial E-RAB Setup Success Ratio	99,9%
	Packet loss rate	0.01%
	5G NSA Drop Ratio	0.10%
	5G SA Drop Ratio	0.10%

	Coverage percentage the whole area with the required levels of quality (-110 dBm or better)	99%

The network requirements are to be verified as part of the evaluation of the performance of this UC. For the implementation of this UC the following requirements from the user perspective are identified (Table 9).

Table 9: User requirements for SM UC

Scenarios	Requirement	Description
Video Surveillance & Perimeter Monitoring	Video Reception/ Transmission	HD/4K bandwidth preservation through wireless transmission
	Reliability/Availability/Privacy /Users' Acceptance Survey	>70-80% of the users express positive evaluation regarding the robustness of the devices, the trustworthiness of the used AI algorithms, the reliability and the E2E privacy of the system.
Autonomous Apron Operations	Video Reception/ Transmission	Video feed to VR glasses
	Location accuracy	5-10 m
	Robotic mobility: speed at which a service robot can move while maintaining a stable network connection	>2 m/s
	Reliability/Availability/Users' Acceptance Survey	>60-70% of the users express positive evaluation regarding the robustness of the devices, the trustworthiness of the used AI algorithms, the reliability and the E2E privacy of the system.
	Robotic energy efficiency	At least 6 hours continuously
	Security/Privacy	>60-70% of the users express positive evaluation regarding the secureness of the devices and of the E2E system.

4 Conclusions

This deliverable provides the UC scenarios and associated network and platforms characteristics to articulate the functional and performance requirements of the 5G SAMITEA SGIs. These requirements will be considered by architecture, system design and implementation experts in WP2, 3 and 4, to select for each site location the most relevant scenario and parameters to validate 5G SAMITEA. These UC requirements will be taken forward in WP5 to determine the most appropriate way to measure performance against the required KPIs and develop verification and validation implementations.

Requirements management in 5G SAMITEA has not finished for WP2. It is not a one-way or waterfall process, but rather a concurrent or iterative development process. UC analysts have identified a need for validation of requirements, and particularly the User requirements. User expectations of 5G capabilities based on their desires may in some cases exceed expected standard 5G deployments, and in some instances even though 5G can meet the requirements, requirements are potentially over specified. Thus, WP2 has identified a need to, and shall, maintain user requirement dialogues through to project completion.

The phased delivery of the sites and services will result in a continual evolution of deployed and available capabilities at each of the UC trial sites. This presents challenges for WP3, WP4 and WP5. UC and platform verification and validation relies on correlating technical performance measurements from the systems along with data gathered from users based on their Quality of Experience and willingness to pay responses.

The final version of the technical requirements of the UCs and deployment implications will be included in the last deliverable of WP5, D5.3, to be delivered towards the end of the project.

5 References

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