



H2020 5GASP Project

Grant No. 101016448

D7.5 5GASP Business Plan

Abstract

At month 24 of this 36-month project, the 5GASP consortium has defined two Value Propositions (VPs) for the project. This document shall present business models formed around these value propositions. It will discuss costs to offer the respective value proposition services and shall estimate expected revenues. This document shall also discuss the business considerations that are specific to the two industries the project is mainly addressing: the Automotive and the PPDR markets. Moreover, the major risks behind the business success of the project in both markets are described. It is evident that the project must liaise with stakeholders from these markets, and this has now been set as a strategic goal of the project. Last but not least, it should be noted that the estimated revenues and other growth metrics might change until the end of the project given the high speed of the 5G market evolution. As such, updates shall be provided to the EC on a 6-month basis.

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Disclaimer

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Executive Summary

5GASP aims to shorten the idea-to-market process through the creation of a European Network Application deployment, testing and certification ecosystem primarily developed for SMEs and start-ups, that is fully automated and self-service, to foster rapid development and testing of innovative Network Applications built using the 5G NFV based reference architecture. Building on top of existing physical infrastructures, 5GASP intends to focus on innovations related to the operation of experiments and tests across several domains, providing software support tools for Continuous Integration and Continuous Deployment (CI/CD) of VNFs and CNFs in a secure and trusted environment for European SMEs capitalizing in the 5G market.

5GASP's main technical objective is to build and operate an Open 5G NFV-based European network of experimental facilities catering for the instantiation of fully softwarised architectures of vertical industries (e.g. Automotive, cooperative mobility and PPDR) for testing, validation and pre-certification, in close to real-life state of the art 5G environments.

One of 5GASP innovative solutions for businesses aiming to capitalize in cloud-native 5G applications and services is a showcase portal of registered network applications (NetAppStore) providing operational information collected automatically during the Network Applications' independent testing on the 5GASP platform. The Network Application Store is complemented by the Network Application Community portal supporting Network Applications developers, and generally, interested third party end-users.

The project follows the open-source code philosophy. Interested customers have the possibility to leverage 5GASP's Open-Source Software (OSS) repository and **selectively integrate those components that could help them to add extra value to their Platforms and/or commercial Products**. For example, as manifested by our partner VMware who has a validation and certification platform for Network Applications, **some of our OSS tools could make their platform easier to use by a programmer making it a stress-free task to onboard their code and validate it on the VMware platform and other similar platforms**.

It is important to note at this point that 5GASP relies and builds on existing European 5G testbeds. These testbeds are offered to the project by the testbed owners ITAV, UoP, UniBris, OdinS and ININ, all being partners of the consortium. As such, 5GASP allows potential customers to use its own already developed, configured, and deployed testbeds: their Core and Edge hardware and the Internet Connectivity between them (provided by GÉANT). This means that the 5GASP project itself will not need to purchase additional hardware or Internet Services to connect testbeds. Therefore, such Capital Expenditures (CAPEX) will not be discussed in this document when it comes down to deriving the costs of the 5GASP business.

This deliverable provides the steps that the project followed up to Month 24 to develop the 5GASP business model. The first and most important step, the definition of our Value Propositions has been completed. **The 5GASP's Value Propositions to customers are the following:**

- I. the 5GASP DevOps-friendly platform where SMEs & startups may develop, test and certify their Network Applications.
- II. the 5GASP Network Application Store: a Premium 'e-Catalogue' Service where the customer (vendor, service provider, integrator) may find the right SME & start up partner. To enter our Store, the partner's Network Application will have been deployed and validated on the 5GASP platform and will have been certified by the 5GASP project.

We believe that the characteristic of the DevOps-friendliness of the 5GASP platform is a major Value Proposition of the 5GASP endeavor: the creation of a self-service portal with easy-to-use CI/CD tools, so that a non 5G expert user may validate their software in a user-friendly portal which controls the state-of-the-art 5GASP fabric. **On the other hand, the 5GASP NetAppStore is indeed a real business need, as clearly communicated to the consortium by our two large industrial partners: VMWare and Orange RO.**

5GASP's two business offerings could be **both** adopted by an interested business, and this is manifested according to the encouraging feedback we have from our two large industrial partners, VMWare and ORO.

Specifically as per our discussions with **VMWare**, the latter sees that both the user-friendly tools of 5GASP and its Network Application Store could both be of business interest for (a) making their platform easier to access/use and (b) for finding niche and promising SMEs to enter the Network Application certification programme, respectively.

As per our discussions with **Orange RO**, the latter is looking to monetize its nationwide 5G infrastructure by enabling the development of new services and products targeting SMEs and large enterprise customers. **According to Orange RO, the 5GASP platform can provide a solid ground for the development of such new services and new opportunities** while Orange RO envisions a three-pillar approach to directly exploit the business offerings of 5GASP:

- **Testbed-as-a-Service provided to 3rd parties (large enterprises, SMEs and start-ups) that wish to deploy, test and certify their Network Applications.**
- **Technology and knowhow transfer to specific business verticals such as Automotive and PDDR as well as for cross-vertical verticals.**
- **Platform enabler for call for start-ups and spin-offs to be on-boarded on Orange Fab corporate accelerator.**

1 Introduction

5GSAP is an ICT-41 project aiming to develop a DevOps-friendly platform and its associated portal and CI/CD tools for Network Application self-service onboarding, validation, testing and pre-certification. In the project a multidisciplinary approach is adopted, engaging partners: (I) already having their own similar platforms, such as VMware and Orange; (II) SMEs who have niche business offerings that could benefit the 5G industry and mainly the Automotive and PPDR verticals, as well as SMEs and Universities working in cross-vertical service for the 5G Core or MEC; (III) partners having stable state-of-the-art 5G testbeds and proven experience in developing open source software for a user-friendly Network Application onboarding, validation, testing and pre-certification processes.

Under this light, the collaboration of multi-disciplinary technical and business teams within the 5GASP consortium has resulted in a systematic and close-to-industry process for the development of the business models of the 5GASP project.

1.2 Deliverable Goal

The goal of this deliverable is to present work until Month 24 of the 5GASP consortium on the business models of the project. This work has involved a spectrum of tasks and discussions amongst multi-disciplinary technical and business teams. This deliverable aims to become the solid ground of the 5GASP business model developments and is expected to be improved with the outcomes of the ongoing business-wise liaisons with (I) other ICT-41 projects developing similar to 5GASP platforms; (II) members of the 5GASP advisory board, experts in the Automotive and PPDR verticals; and, (III) focus groups where the business aspects of the project will be explained and feedback shall be recorded and analyzed so that the 5GASP business models are as much as close to providing solutions to real business problems, mainly drawn from the Automotive and PPRD industries albeit not excluding other industries such as the 5G industry itself, who seeks easy to use platforms and tools for validation and testing of innovative cloud-native 5G applications and services.

1.3 Organization of the deliverable

The rest of the document is organized as follows. Section 2 discussed the key elements of the business model canvas that shall be used for depicting the 5GASP business models. One business model shall be presented and explained in respect to the 1st Value Proposition “the 5GASP DevOps-friendly platform where SMEs & startups may develop, test and certify their Network Applications to reduce their time to revenue” (which we introduced in the Executive Summary) of the project whilst another business model shall be discussed in respect to the 2nd Value Proposition.

Section 3 discusses how the 5GASP business models can be implemented in the Automotive Market. To that end, a relevant Canvas with users being Automotive players shall be presented and discussed in section 3.

Similarly to section 3, section 4 shall elaborate how the 5GASP business model can be materialized for the PPDR vertical.

Section 5 shall present how 5GASP can have business impact to other verticals apart from Automotive and PPDR.

Section 6 discusses the risks and challenges of the 5GASP business plan and explains in more details the risks and challenges for every distinct market addressed by the project: Automotive, PPDR and cross-vertical markets.

Finally, section 7 concludes the document and provides directions for future work, specifically the work to be carried out between the date of the submission of this document and the upcoming June 2023 project review in Murcia.

2 5GASP business ecosystem

To explain the main concepts around the 5GASP business models, we shall leverage the business canvas method. The business canvas that we have drawn for the 5GAP business initiative is depicted in Figure 1. In the rest of this section shall explain in detail all components of our canvas.


<div></div> <div><u>Keypartners</u></div> <div><ul style="list-style-type: none">• 5GASP’s testbed owners<ul style="list-style-type: none">• 5GASP’s SMEs• 5GASP’s large industrial partners</div>	<div><u>Value Propositions</u></div> <div><p>VP1: the 5GASP DevOps-friendly platform where SMEs & startups may develop, test and certify their Network Applications</p><p>VP2: the 5GASP Network Application Store: a Premium ‘e-Catalogue’ Service where the customer (vendor, service provider, integrator) may find the right SME & start up partner</p></div>	<div><u>Customer Relationships</u></div> <div><ul style="list-style-type: none">• Personal customers engaging with the 5GASP NetAppStore• Non-personal for customers/tenants of the 5GASP platform</div>	<div><u>Customers</u></div> <div><p><u>Customer Segment 1:</u> <i>(linked with VP1)</i></p><ul style="list-style-type: none">• SMEs• Startups<p><u>Customer Segment 2:</u> <i>(linked with VP2)</i></p><ul style="list-style-type: none">• Vendors• Service Providers• System Integrators</div>
<div><u>Key Resources and Activities</u></div> <div><ul style="list-style-type: none">• Operational support and maintenance of the 5GASP Platform and its NetAppStore• Customers helpdesk via subject matter expert consulting during experimentation• Marketing activities to spread the 5GASP mantras</div>	<div><u>Revenues</u></div> <div><p><u>Revenue stream 1:</u> Subscription / license fees and consulting fees to onboard, test and validate customers’ Network Applications on 5GASP platform</p><p><u>Revenue stream 2:</u> Subscription and intermediary fees to liaise with interested members of the 5GASP NetAppStore</p></div>	<div><u>Channels</u></div> <div><ul style="list-style-type: none">• Dissemination• Exploitation through all consortium partners<ul style="list-style-type: none">• Participation to industrial fora• Participation to standardization bodies</div>	
<div><u>Costs</u></div> <div><ul style="list-style-type: none">• Costs to maintain and support the 5GASP fabric• Costs to support the 5GASP platform and the 5GASP NetAppStore and Community Portal<ul style="list-style-type: none">• Marketing costs</div>	<div><u>Key Behaviours</u></div> <div><ul style="list-style-type: none">• Resistance against new platforms and tools• Willingness to invest on innovative solutions coming from startups tested outside own infrastructures• Openness and flexibility of the vertical partners to become early adopters of 5GASP</div>	<div><u>Key Influencers</u></div> <div><ul style="list-style-type: none">• One or two early adopters from large enterprises, SMEs and start-ups from each of the 5GASP testbed countries<ul style="list-style-type: none">• Start-ups and spin-offs• Large Industrial Partners of the Consortium• Community of engaged Business Players (vertical specific and vertical agnostic 5G vendors & service providers)</div>	

Figure 1 5GASP business canvas – main concepts

2.1 Value proposition & customers

This section on value proposition (VP) shows the benefits and the reasons why customers would turn to 5GASP and articulates how 5GASP solves and satisfies the need and use of certified Network Applications. 5GASP is specifically helping to create value for SMEs & startups in the 5G space, 5G vendors, 5G communication service providers and 5G system integrators with a platform and catalogue service that can be categorized as the value propositions:

VP1: the 5GASP DevOps-friendly platform where SMEs & startups may develop, test and certify their Network Applications to reduce their time to revenue.

VP2: the 5GASP NetAppStore: a Premium 'e-Catalogue' Service where the customer (vendor, service provider, integrator) may find the right SME & start up whose solutions for new Network Applications have been deployed on the 5GASP platform, have been validated and have been pre-certified by the 5GASP project.

For VP1: 5GASP DevOps-friendly platform: **SMEs and startups** at a minimum want to increase their market reach and be in a shop window towards potential collaborators (vendors, service providers, integrators). However of even more benefit are the pre-defined 5GASP test suites and the possibility to interact with experts to develop new tests that can guide them through pre-certification or full certification of their Network Application solution. This along with the general processes of that getting their Network Application integrated with the platform, configured/ customized, instantiated, and functionally operational will place all involved SMEs and startups in a position to be ready for deployment in the marketplace.

For VP2, 5GASP NetAppStore, the customer segments comprise of:

Vendors: are always searching for 5G system gains above and beyond what their competitors can offer and they certainly do not want to waste time with pure start-up ideas but instead want access to well formed and near production ready solutions. Purchasing admittance to the 5GASP premium 'e-Catalogue' service offers such vendors a ready made environment to gain access to such solutions and confidence that a selected Network Applications can be incorporated in their system in a short time to market.

Service Providers: will have a 5G system in place but will have a want to address all of their customers edge use cases. Purchasing access to a 5GASP premium 'e-Catalogue' service offers them solutions that can be leveraged to address all such customer edge case scenarios.

System Integrators: are in a perpetual mode of offering the widest possible 5G system solution set, with a view that all offered Network Applications can be seamlessly integrated and instantiated within their customers deployment in a timely manner. Purchasing access to a 5GASP premium 'e-Catalogue' service advances their solution scope, with timely integration and instantiation of required Network Applications, which in turn extends a frictionless and automated 5G system to build out their SI offering.

2.2 Key resources & activities

In order that the 5GASP Value Propositions become a business reality, it is at least required: (I) operational support and maintenance of the 5GASP software and hardware ecosystem (OSS tools and 5G fabric); and, (II) marketing activities needed to spread the mantras of the project to the relevant audience to each Value Proposition.

Providing operational support to the customer demands human resources. Maintaining the 5GASP OSS tools needs OPEX. Maintaining the participating 5G testbeds need CAPEX for necessary upgrades and OPEX. Finally, marketing needs its own specialized resources and dedicated and targeted missions in order that the right customer base is reached.

The costs associated to all necessary resources and activities shall be estimated in the next sub-section of this document.

2.3 Costs

The costs described in the following of this document are the ones discussed in the previous section i.e. the necessary costs to cover key resources and activities. They are elaborated in the following sub-sections.

2.3.1 Operational costs of the 5GASP fabric

In 5GASP project, there are five (5) testbeds, each with its specific characteristics. Testbeds are geographically distributed across five respective EU country-members; thus salary wages differ for human resources to support testbeds at the operational level.

The yearly operational costs per testbed are presented in Figure 2. Note that CAPEX is assumed to be zero for the hardware, software and installation and maintenance costs for all testbeds prior to the beginning of the project, given that the testbeds were funded by other EC projects and/or own partner investments.

	Number of persons to operate the testbed on a yearly basis	PM rate	Testbed total
ITAV	2	5,400.00 €	10,800.00 €
UoP	2	6,000.00 €	12,000.00 €
UniBris	2	6,900.00 €	13,800.00 €
ININ	3	6,200.00 €	18,600.00 €
OdinS	3	4,150.00 €	12,450.00 €
Total operational costs (per year) for all testbeds			67,650.00 €

Figure 2 Operational costs of testbeds of the 5GASP substrate

2.3.2 Costs to maintain the 5GASP NetAppStore and Community Portal

The 5GASP NetAppStore and Community Portal <https://community.5gasp.eu/> maintenance costs are mainly labour costs, were partners are providing for free the hardware and the

internet connectivity services which are mandatory to host the NetAppStore and Community portal.

Activity	Number of positions	Role	Monthly gross salary per employee	Brief Job description
Maintenance of 5GASP NetAppStore	1	Web developer	1500 €	Mainly web development to maintain updated NetAppStore. Requires communication with Network Application owners.
Maintenance of 5GASP community portal	1	Web developer	1500 €	Mainly web development tasks to keep the portal constantly updated.
Gross monthly salary costs for maintaining the NetAppStore and Community Portal			3000 €	

The above result in **36,000 € yearly costs** (see section 2.3.5 which aggregates all cost categories on a yearly basis).

Monthly costs have been estimated according to Greek wages. They can be different of course if such services would be offered in some other EU country member.

2.3.3 Consulting costs to customers of the 5GASP Platform

Customers, i.e. Network Application developers in the case of the Value Proposition under discussion, would often require support to onboard, validate and test their software when using one or more 5GASP testbeds.

The relevant testbed owners have provided their 2023 consulting fee hourly rates. They are presented in Figure 3.

	Hourly rate to support an experimenter as as consultant
ITAV	100.00 €
UoP	100.00 €
UniBris	182.00 €
ININ	100.00 €
OdinS	120.00 €
average:	120.40 €

Figure 3 Average consulting fees per hour

In the remainder of this section, we shall work under the assumption that customers are evenly distributed across all testbeds. Therefore, we shall use the average value of 120.40 € as the man-hour consultant fee to customers.

2.3.4 Marketing costs

Marketing costs are described in the following table.

Table 1 Marketing costs activities cost estimations

Activity	Yearly costs	Brief description
Dedicated marketing to attract Automotive customers	30,000 €	CES, MWC, Eco-motion etc. marketing material and web site Demonstrations
Dedicated marketing to attract PPDR customers	30,000 €	Relevant business conferences and trade fairs related to the PPDR domain, e.g, EENA, Public Safety Communication Europe, Critical Communications World
Marketing to expand the number of Network Applications in the NetAppStore	50,000 €	All potential marketing activities to grow the number of Network Applications in our NetAppStore (webinars, hackathons, events, etc.)
Grand Total (per annum)	110,000 €	

2.3.5 Summary of fixed costs

The costs are summarized in the following table.

Table 2 Summary of 5GASP fixed costs per annum

5GASP overall fixed costs (yearly)	
Costs to maintain and support the 5GASP fabric	67,750 €
Costs to maintain 5GASP NetAppStore and Community Portal	36,000 €
Marketing costs	110,000 €
Grand total (per annum)	213,650 €

Note that costs associated to supporting customers of the 5GASP business endeavour are non-fixed costs. They have been discussed in subsection 2.3.3 as consulting costs. These costs shall be used in the calculation of Net Income in section 2.4 below.

2.4 Revenues, pricing and profitability metrics

The estimation of the revenues from 5GASP's premium services as well as the estimation of profitability metrics such as ROI not only are compulsory for 5GASP's business models but are also important in aiding the 5GASP business strategy for the following reasons:

- They can be used as input for us to develop the most commercially viable pricing strategies for our premium services.
- Given the market potential of this project in the emerging 5G market and beyond, growth factors such as ROI (or CAGR, etc.) estimations would help convincing investors that 5GASP would be a good investment option.

This sub-section discusses the economic benefits that could be expected from the customer segments identified in section 2.1 considering expected number of customers and the price of the offered service per segment, also in accordance with the discussion of section 2.1 of this document and the business canvas presented in section 2.

In this sub-section we estimate the revenues for customers (SMEs, startups) who would either directly use the 5GASP platform to validate, test and pre-certify their codebase or for customers (large enterprises) who would be paying for 5GASP consulting services, so that they could integrate the 5GASP Open Source Software within their existing platforms and hence make their existing platforms more user-friendly which is the key message around the Value Proposition that we consider in this sub-section. We also consider the service around our second Value Proposition i.e. the e-Catalogue service to be used by large companies in order to attract talented programmers with innovative ideas that can be capitalized in the 5G market.

When selling such a 5GASP user-friendly platform for validation, testing and pre-certification of 5G cloud native applications, both benefits for users and payers should be considered. Users could consider the 5GASP's platforms self-service portal and similar user-friendly services as the motivation for testing their innovations whereas a large enterprise could consider reputation the critical parameter to consider for purchasing our first premium service offering. Both forementioned parties should be considered as linked parties as it could be the case that the incentive for buying the premium service will be the user satisfaction / attrition (considering as user an SME or a startup collaborating with a large vendor in their existing certification programmes and respective platforms/ experimentation services) whilst the final decision will be made by the management of the large vendor.

For the calculation of the revenues, the following input parameters have been used.

Table 3 Inputs for estimations of Customer Segment 1 revenues

INPUTS for Customer Segment 1 (customers who purchase Service with Value Proposition 1)	
number of clients in the first year of go-live	20
customer base growth rate	80%
Average number of hours per client for 5GASP platform usage (€)	32
yearly subscription fee (€)	120
yearly license fee (€)	1000
percentage of customers with license & subscription	0.25

Table 4 Inputs for estimations of Customer Segment 2 revenues

INPUTS for Customer Segment 2 (customers who purchase Service with Value Proposition 2)	
number of clients in the first year of go-live	5
customer base growth rate	80%
yearly subscription fee (€)	50000
fee to liaise with a 5GASP tenant (€)	1000
percentage of tenants (number of clients in CS 1-VP 1) to be liaised with	3%

Revenues from the 5GASP platform's customers are estimated in Table 5 below.

Table 5 Revenue analysis

	Customers using the 5GASP Platform per year	Consulting costs per client per hour (€)	Average number of hours per client for 5GASP platform usage (€)	Consulting rate per hour (€)	Revenues from Customer Segment 1 (€)	Customers using the 5GASP NetAppStore (per year)	Revenues from Customer Segment 2 (€)	Total Revenues
Year 1	20	120.4	32	250	165,600.00 €	5	250,600.00 €	416,200.00 €
Year 2	36	120.4	32	230	275,040.00 €	9	451,080.00 €	726,120.00 €
Year 3	65	120.4	32	200	432,864.00 €	16	811,944.00 €	1,244,808.00 €
Year 4	117	120.4	32	190	741,830.40 €	29	1,461,499.20 €	2,203,329.60 €
Year 5	210	120.4	32	180	1,268,110.08 €	52	2,630,698.56 €	3,898,808.64 €

The yearly **Net Income** based on the above revenues and the costs calculated in section 2.3 are estimated in Table 6 below.

Table 6 Net Income projections

Total Revenues	Fixed costs per annum	Consulting costs	Total costs	Net Income
416,200.00 €	213,650 €	77,056 €	290,706 €	125,494 €
726,120.00 €	213,650 €	138,701 €	352,351 €	373,769 €
1,244,808.00 €	213,650 €	249,661 €	463,311 €	781,497 €
2,203,329.60 €	213,650 €	449,391 €	663,041 €	1,540,289 €
3,898,808.64 €	213,650 €	808,903 €	1,022,553 €	2,876,256 €

Based on:

- the Table 6 estimations
- the EC initial investment of **5,203,388 €**
- a discount factor of 1%
- pricing dropping per annum to keep up with the competition (see 'Consulting rate per hour' column in Table 5).

the estimated ROI is ~9%.

Figure 4 depicts the 5-year projection of the profitability metrics Gross profit margin and Net income profit margin.

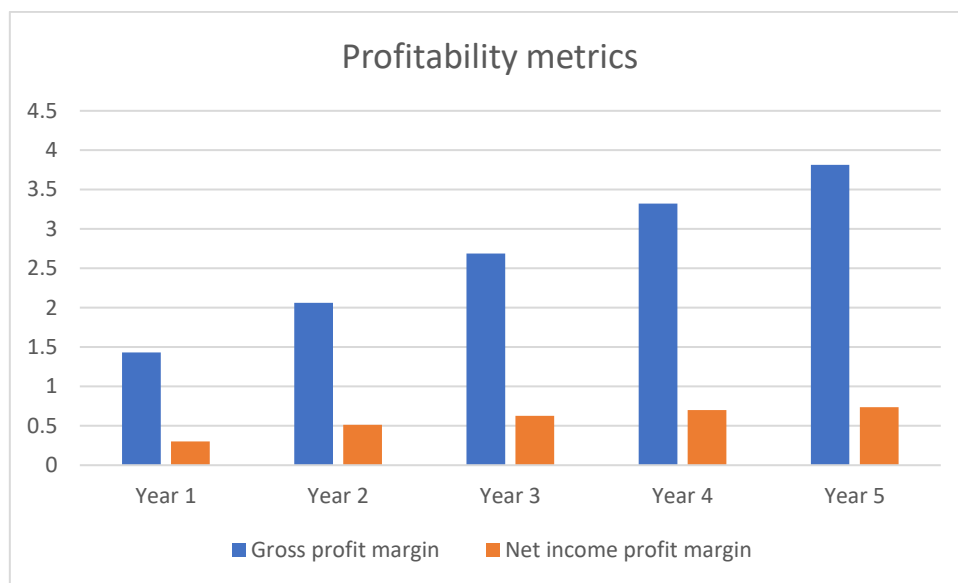


Figure 4 5GASP's profitability metrics

We see that both profitability ratios increase over time, and this is explained due to our customer growth assumptions which we believe could be reasonable for such as niche offering; however our assumptions shall be regularly updated, on a 6 month basis until the end of this 36 months project.

In respect to the gross profit margin, we can see that the 5GASP business is clearly expected to be producing profit over and above its costs as well as the gross profit margin is estimated to be increasing over time.

Similarly, the net income profit margin ratio in Figure 4 indicates the percentage of how much each euro of revenue becomes profit. It starts from ~30% in Year 1 and could reach ~70% at the end of the 5-year time project window we use in our analysis.

Concluding this sub section, initial estimations indicate that 5GASP has the potential of becoming a profitable business. However, these initial estimations might change according to the dynamics of the niche market we are addressing. To that end, the project shall be closely

monitoring the competition (see next sub-section) and shall be taking into consideration the latest market research studies. Therefore, we shall be updating our economic analysis every 6 months until the end of the project.

2.5 Competition

If we are considering European footprint, we can assume that 5GASP business offering will compete with business offerings coming from some of the world largest cloud computing players, and in the same time is competing with other EU-funded ICT-41 platforms offerings.

Amazon Web Services, Google Cloud Platforms and Microsoft Azure are the three hyperscalers cloud platforms racing to capture market share among 5G network operators. All of them are marketing that telcos shall reduce their operational expenses on power consumption while giving them access to a rich catalog of software and potentially Network Applications. As a consequence, most of the operators' corporate entities explore the partnerships with all three hyperscalers to offer cloud / edge computing services and Network Applications to their business customers, while considering also to migrate their core network functions.

There are a number of 5G vendors, that host similar platforms in this space, for example Ericsson host an enterprise ecosystem platform, that brings together cross industry expertise, products and solutions with particular focus on Industry 4.0, IoT and Automotive industries [Ericsson Ecosystem Collaboration] with fully dedicated co-creation spaces in their D-15 Lab (USA) and Industry 4.0 Center of Excellence (Germany). Nokia host Open EcoSystem Network [Nokia Open EcoSystem Network] an open co-creation environment which brings together companies and individuals to help them innovate and grow their businesses on 5G. The collaborations is further enhanced with a set of regionally communities.

Other major players such as Oracle, IBM and VMware also offer various cloud services that can evolve to potential competitors for 5GASP business offering.

5GASP is not the only EU funded Horizon 2020 project targeting the creation of a European fully automated and self-service Network Application deployment and testing ecosystem for SMEs, start-ups and large enterprises, that is using the 5G NFV based reference architecture. VITAL-5G Horizon 2020 project will release a flexible platform adapted to serve the specific needs of the Transport & Logistics sector focused on the creation, deployment, management and validation of Network Applications. VITAL-5G objective is to create an open, virtualized and flexible experimentation facility comprised of an intelligent virtual platform, three distributed European 5G-testbeds and associated vertical infrastructure, to enable the testing and validation of Transport & Logistics Network Applications in real-life conditions, utilizing 5G connectivity.

2.6 Key behaviors

Common to innovation-driven endeavors such as the 5GASP business initiative, the resistance of the well-established industrial ecosystem (vendors, service providers) against new platforms and tools is a key behavior that might influence the business success of our

initiative. This resistance must be overcome with the right marketing and relationships that we shall strive to accomplish until the end of the project.

Moreover, the willingness to invest on innovative solutions coming from startups tested outside vendor-specific infrastructures is also a behavior that can affect our business success. As in the case of resistance mentioned above, targeted marketing and business relationships need to be established with players who are already well-established and recognized within the 5G market.

On the other hand, the key behaviour to enable the 5GASP technology and knowhow transfer to specific business verticals is the openness and flexibility of the vertical partners to become our early adopters.

Under this light, the consortium members need to educate fast the business developers from our organizations to be able to spread the work around 5GASP innovations. To that end, our partner ORO is undergoing various projects with large enterprise partners targeting the Automotive and Smart Mobility segments. One example is the ORO's C-V2X demonstrator for smart vehicle-to-everything communications over 5G, in collaboration with Bosch Engineering Center Cluj. [Business Review, 2021]. By leveraging the technological gain from 5GASP, ORO tries to benefit from a more robust superset of technical capabilities for current or future projects, including the capacity to on-board and automate the testing and deployment of 5G cloud native Network Applications. Such applications include CCAM (Collaborated, Connected and Automated)-class apps, running in Orange RO's mobile edge and further leverage multi-slicing capabilities and Private Mobile Networks deployments.

Similar efforts must be carried out by the whole consortium and by each partner of the consortium, each partner mobilizing its own contact networks. This is included in the roadmap of all partners for the 3rd year of the project.

2.7 Key influencers

Considering the three business offerings categories mentioned by partner ORO in the executive summary of this deliverable, we can acknowledge the key influencers per category.

In case of the Testbed-as-a-Service we need to focus the presales energy on one or two early adopters from large enterprises, SMEs and start-ups from each of the 5GASP testbed countries. Their Network Applications' onboarding and testing results will have to be very well documented and communicated with a relevant media coverage within their specific business verticals. 5GASP partners' SMEs Network Applications testimonies will amplify specific verticals media coverage. Moreover, Orange RO envisions potential in developing such a service based on the existing Testbed architecture, used in 5GASP and the CI/CD Services and End-to-End Certification process developed in 5GASP. The business proposition is to have an offering that differentiates Orange RO in the local market, to the other 5G Operators and to reuse existing pipelines to channel partner B2B customers and new prospects among those who develop, integrate or resell Network Applications. This service could be part of a standard services offering, with a specific SLA derived from the KPI measurements and the overall knowledge gained through the 5GASP experimentation activities.

In case of the platform enabler for call for start-ups and spin-offs to be on-boarded on Orange Fab corporate accelerator, the key influencers are the early tech start-ups and spin-offs that will benefit from the 5GASP ecosystem. Orange Fab RO is a non-equity program launched in 2017 in Romania and has since accelerated more than 40 Start-ups, generated more than 2M Euros in sales through more than 90 projects. 5GASP could provide a key role in enabling a DevOps-friendly environment for SMEs who wish to develop, test and certify their 5G, cloud native and edge-enabled applications. A shared-revenue Business Model, which has already been tested and validated in Orange Fab RO through a number of projects, could be applicable for SMEs wishing to deploy their applications to their customers, using Orange RO's 5G nationwide infrastructure. Research and Education, alongside entrepreneurship, is another pillar of Orange RO's innovation actions. Orange RO and our academic partners, Romania's top universities, have long been collaborating to provide structured, up-to-date knowledge and hands-on experimentation on technologies used in telco environments. Following a partnership with two prestigious universities - POLITEHNICA University of Bucharest and "Gheorghe Asachi" University of Iași, Orange RO deployed two Orange 5G Labs, in the respective cities of Romania, where students and academic spin-offs can access the technologies developed in 5GASP and experiment in a controlled-environment testbed. This enables opportunities in feeding the pipelines used to funnel innovations through the Orange Fab RO accelerator.

3 Business model specifics for the Automotive market

3.1 Automotive-specific business model considerations

The 5GASP business models could be tailored in the following way for the case of engaged automotive customers:

1. **Yearly Subscription model for automotive industry integrators and service providers:** These companies could pay a fee on an annual basis, to access the technology and use it to develop and deploy 5G-based solutions specifically tailored for the automotive market. **Initial estimations would be that the pricing of such yearly subscription could be up to 60,000€** (as per our 'finder' subscription fee for the service around VP2, see section 2).
2. **Licensing:** To drive innovation in the automotive industry, 5GASP could be licensed to small and medium enterprises in the automotive technology field. These companies could use the technology to develop their own products and services that meet the unique needs of the automotive market. The terms of the license could include a fee for the use of the technology, as well as royalties based on the revenue generated by the licensed products. This business model shall be made more concrete after face-to-face discussions with automotive players during the next six months of the project where the project is strongly focused in liaising with automotive players to boost the 5GASP uptake from the Automotive Industry.
3. **Automotive-specific APIs offered by 5GASP's 'automotive-enabled' testbeds:** To enable third parties in the automotive industry to access and utilize certain features or functionality of the technology, 5GASP could offer APIs (Application Programming Interfaces) in the testbeds offering automotive capabilities; currently those of ITAV and OdinS. These APIs could be offered to automotive customers on a pay-per-use or subscription basis, with fees based on the number of API calls or the volume of data transferred.
4. **Automotive-specific consulting and professional services:** To help customers in the automotive industry effectively implement and optimize the use of the technology, 5GASP has a strong potential to capitalize the gained through the project expertise of both the testbeds (ITAV, OdinS) offering automotive testing capabilities as well as the expertise of the automotive SMEs (i.e. OdinS, DriveU, YokoGo) that have used the relevant testbeds to validate their Network Applications. Under this light, 5GASP could also offer consulting and professional services that are specific to automotive players. This could include things like training, technical support, and custom development services specifically tailored to the needs of the automotive market.

3.2 Success factors to achieve business impact to the automotive market

There are several success factors so that 5GASP can achieve impact in the automotive market:

1. **Compliance with industry standards:** To ensure that 5GASP is widely adopted in the automotive market, it is important to adhere to relevant industry standards and regulations, such as those set by the 3GPP and the ISO.
2. **Establishing partnerships:** To successfully bring 5GASP to the automotive market, it will be necessary to establish partnerships with car brands and other industry stakeholders. This could involve working with OEMs to integrate the technology into their vehicles, or collaborating with suppliers and service providers to develop and deploy solutions that can be very fast be tested on the 5GASP platform and be assessed for their technical feasibility, before the go decision is made for their further development (and capital investment).
3. **Testing and validation:** To ensure that 5GASP is reliable, secure, and capable of meeting the demands of the automotive industry, it will be important to thoroughly test and validate the technology. This may involve conducting simulations, field tests, and other types of evaluations to demonstrate the effectiveness and feasibility of the technology especially those of our automotive SMEs: OdinS, DriveU and YokoGo. These are the critical mass to boost the expansion of 5GASP to the automotive market.
4. **Marketing and branding:** To generate interest and demand for 5GASP within the automotive industry, it will be important to effectively communicate the value and benefits of the technology. This may involve developing marketing materials and campaigns, as well as building relationships with key influencers and decision-makers within the automotive industry. As discussed earlier this is a key goal of the project for the next six months i.e. from month 24 to month 30 (June 2023).
5. **Customer support:** To ensure the success of 5GASP in the automotive market, it will be important to provide automotive-specific customer support and technical assistance. This could include things like training materials, documentation, and support hotlines to help customers understand and utilize the technology effectively. SMEs Odins, YokoGo and DriveU can help significantly in this direction and share best practices on the 5GASP Community Portal.

The 5GASP consortium (in WP6 and in WP7) continuously tries to address the above success factors with the goal to position itself for success in the automotive market and help drive innovation and growth within the automotive industry. The momentum is right, and the opportunity is there as according to studies such as [ResearchDive, 2022] “the internet of vehicles sub-segment is predicted to have the fastest growth rate of 71.8% and register revenue of \$123,201.9 million during the forecast period.” As such, 5GASP shall heavily mobilize resources to liaise with the right partners and associations to best reach the emerging automotive market.

4 Business considerations for the PPDR market

The PPDR business plan related considerations are based on PPDR market status and trends which have been previously extensively discussed in D7.3. Findings in D7.3 show that the 5G PPDR network and services market in the EU is not established yet or is very limited, although there are a few incentives promoting evolution from the narrow-band to broad-band communications for the PPDR sector since there have been identified certain needs which could be solved using broad-band technologies, as well as challenges related to cross-border communications which can be also solved by mobile communication systems such as 5G.

Since the 5GASP platform is an experimental platform, its business potential fits well with the current status in the field of PPDR communications, meaning the main value proposition considered should be in providing an all-in-one PPDR-grade environment for development, testing and verification of 5G PPDR network architectures and services, i.e., among common features (e.g., general 5G infrastructure, cloud backend infrastructure, Network Application marketplace, test and validation tools, monitoring tools, technical/customer support and consultations), the environment also provides some specific features which may be of interest for the PPDR applications such as availability of development and testing in cross-border environment and in isolated-operation mode (IOPS), industrial and ruggedized end user devices, reference PPDR Network Applications, etc. Considering the IOPS operations, it should be considered whether to also provide the possibility for the customer to lease portable 5G IOPS solution to be deployed at the customer's premises (limited to EU territory) and connected to certain 5GASP testbed, thus providing additional flexibility for the customer in terms of locations where certain 5GASP platform features can be utilized.

In terms of the general statement of providing platform for the development, testing and verification of 5G PPDR network architectures and services, further consideration is required to address more specifically what challenges 5GASP environment could help to solve, who are potential customers experiencing specific issues and how 5GASP environment and partners can help. In order to identify and properly address and advertise 5GASP added-value proposition towards targeted customers, it is essentially to understand all these details.

Table 4.1 lists potential niche markets/customers and their respective needs 5GASP could/should address. Further, some specific issues identified at the current state of the PPDR market are discussed in the table 4.2.

Table 7: List of PPDR related niche markets/customers which 5GASP could/should address and provide them with added value

Customer	Needs	Challenges	Risks
5G equipment vendors	test & verification of 5G PPDR features, standards & regulatory compliance	unavailability of 5G PPDR and IOPS environments, lack of understanding of practitioners' needs, 5G PPDR regulation	features are not adopted by practitioners, telcos cut investments/competition
Commercial mobile operators	test/verify 5G equipment against PPDR features,	unavailability of 5G PPDR environments, lack of tolls for in-	features are not adopted by PPDR practitioners,

	QoS/QoE/SLA measurements, deployment/config support	depth QoS/QoE/SLA monitoring	compliance issues of 5G equipment
PPDR network & services integrators, application developers	test & verification of PPDR applications for 5G, promote the app in 5G PPDR, understand 5G technologies for PPDR	no access to 5G PPDR environments, limited access to 5G PPDR domain partners	poor adoption by PPDR practitioners
PPDR practitioners (incl. public safety agencies)	test/verify PPDR services/capabilities in a 5G environment, better understanding benefits of 5G for PPDR, technological modernization, regulatory compliance, business development (owned, shared, hosted etc.)	lack of technical knowledge and skills, no access to telco-grade 5G PPDR demos, compliance of offers with established procedures/practice, need to train personnel for new services/tech	features are not suited to or adopted by practitioners, compliance issues of provided services against established procedures

Table 8 List of 5G PPDR related issues, potential customers facing issues, and possible solutions to be provided by 5GASP partners

Customer issue	Potential customers experiencing the issue	Solution provided by 5GASP
5G infrastructures for test and verification for PPDR needs not available/affordable	vendors, commercial mobile operators, PPDR operators, PPDR network & services integrators, application developers, PPDR practitioners	5GASP environment available, including test, monitoring, verification and certification tools, NetAppStore, technical support, etc.
5G IOPS system implementations not available	vendors, commercial mobile operators, PPDR operators, PPDR network & services integrators	5G IOPS Network Application solution provided
cross-border 5G testbed not available	vendors, commercial mobile operators, PPDR operators, PPDR network & services integrators, application developers, PPDR practitioners	Five 5GASP testbeds available (each located in different country/state)
cross-testbed environment not available	vendors, commercial mobile operators, PPDR operators, PPDR network & services integrators, application developers	Five 5GASP testbeds available
limited locations where test/verification can take place	PPDR network & services integrators, PPDR practitioners	Portable 5G IOPS solution provided
available 5G implementations lack configuration flexibility	vendors, commercial mobile operators, PPDR operators, PPDR network & services integrators	5GASP testbeds are highly flexible, technical support and education to be provided

test and verification tools and procedures not available or not integrated to the testbed	vendors, commercial mobile operators, PPDR operators, PPDR network & services integrators, application developers, PPDR practitioners	Set of pre-defined test, certification program, test design and implementation support
set of reference Network Applications not available	PPDR services integrators, application developers	5GASP NetAppStore
lack of 5G technical knowledge	PPDR practitioners, application developers	Training, help with product/service design, development and deployment support

Understanding customers' needs, 5GASP value proposition and the fact the EU 5G PPDR market maturity level is low at moment, following revenue streams should be considered:

- Subscriptions: for lease or usage of the 5GASP system resources, fees can be further dependent on features utilized, volume units and/or resources utilized, etc.
- Licensing: to be applied for certain features or software modules used by 3rd parties for development of their own use and/or used in their products.
- Consulting, dedicated/custom support, trainings, education and workshops: to be provided by requested topic experts and charged per unit, hourly rates or bundles.
- Test/verification support, benchmarking: to be provided by requested topic experts and charged per unit, hourly rates or bundles.
- R&D funding, solution/product co-design, technical development: price based on cost/benefit analysis performed for each single case proposed.

The main concern after all is how to attract customers to recognize the value of the 5GASP environment for their business. In this scope, common 5GASP dissemination, exploitation, standardization, community building strategies should be considered and even strengthen:

- adhering to industry standards: to ensure adoption in the market, it is important to adhere to relevant industry standards and regulations; the latter can be a bit of challenge within the PPDR domain since each country may have some specific rules applied;
- establishing partnerships: to successfully bring 5GASP to the market, it will be necessary to establish partnerships with stakeholders mentioned in the tables 4.1 and 4.2; presence at various PPDR conferences and trade fairs, e.g., EENA, Public Safety Communication Europe (PSCE), Critical Communications World, should be considered, as well as liaison with similar projects following the idea of shaping 5G for the PPDR domain.

5 Business considerations for other industries

5G is an emerging market and this market addresses a wide variety of industries. Indicatively, apart from the automotive and PPDR industries, 5G embraces Manufacturing, Energy & Utilities, Media & Entertainment, IT & Telecom, Transportation & Logistics, Healthcare, amongst others.

The CAGR of the 5G market is high, ranging from ~40% to ~70% according to the market studies that the project has studied and summarized in Table 9 below.

Table 9 List of market studies around 5G (all entries referenced in References section at the end of the document)

<u>Market Report</u>	<u>Projection Date</u>	<u>Market Size (USD)</u>	<u>Expected Growth (CAGR)</u>
Gartner	2022	\$23,254.3 Billion	39%
The Business Research Company	2026	\$534.93 Billion	54.0%.
Precedence Research	2030	\$297.1 Billion	70.4%
Report linker	2030	\$131.40 Billion	68.7%
Research and Markets)	2030	\$36.08 Billion	47.5%
Research Dive	2028	\$468,271.9 Million	70.8%.
Market Research Future	2030	\$198.44 Billion	47.6%

To address the needs of this wide range of industries, 5G seeks novel solutions to provide mission-critical, industry-oriented private services. As such the 5GASP offering in terms of catering for testing of new ideas over a state-of-the-art 5G environment is important and without any doubt, by following correct marketing strategies, 5GASP could have the potential to reach out to players from industries apart from Automotive and PPDR. The reason is that for all industries, innovative ideas, and concepts from startups and/or innovative SMEs have to be validated on a user-friendly CI/CD environment with self-service and certification capabilities and this is aligned with the first Value Proposition discussed in section 2.1 of this document.

Finally, it is important to note that the 5GASP project will also put in place its NetAppStore and thus shall demonstrate its potential to other industries its cross-vertical Network Applications, i.e. those that are not bound to a specific market. This is the case of the PrivacyAnalyzer Network Application which operates in the 5G core, interacting with the NEF for providing a privacy analysis service that could be used for various use cases by the telco industry and its clients e.g. by clients of 5G private networks to ensure that privacy guarantees are met.

6 Risks & challenges pertinent to the industries addressed by 5GASP

6.1 Risks and Challenges of the 5GASP pertinent to the Automotive market

The following table provides an account of the main risks and challenges that are related to the success of 5GASP within the Automotive market.

Table 10 Risks and challenges for 5GASP uptake in the Automotive market

Type of risk/challenge	Explanation
Technological risks	There may be technical challenges associated with developing and deploying 5GASP in the automotive market, such as ensuring the reliability and security of the technology. These challenges could impact the adoption and success of 5GASP in the automotive industry.
Regulatory risks	There may be regulatory challenges associated with bringing 5GASP to the automotive market, such as navigating industry standards and requirements, and obtaining necessary approvals and certifications. These challenges could impact the ability of 5GASP to operate in the automotive industry.
Customer adoption	There is always the risk that the 5GASP technology may not be widely adopted by customers in the automotive industry, which could impact the viability of the business model. It will be important to effectively communicate the value and benefits of the technology to potential customers in the automotive market.
Changes in market demand	There may be changes in market demand for 5G-based solutions in the automotive industry, which could impact the adoption and success of 5GASP. It will be important to monitor changes in market demand and adjust the business model accordingly.

By carefully considering and managing these risks, 5GASP can help to mitigate their impact and increase the chances of success in the automotive market.

6.2 Risks and Challenges of the 5GASP pertinent to the PPDR market

The following table provides an account of the main risks and challenges that are related to the success of 5GASP within the PPDR market.

Table 11 Risks and challenges for 5GASP uptake in the PPDR market

Type of risk/challenge	Explanation
Technological risks	5G UEs and other terminal equipment with supported PPDR functionalities may not be commercially available, features may not be suited to practitioners' real needs, limited 5G coverage area provided by 5GASP testbeds, lack of interest of application developers to develop new services/applications.
Regulatory risks	Specific regulation requirements in different regions (frequency bands, cyber and physical security aspects, etc.), market entrance barriers, potential compliance issues against established standards, lack of regulations addressing 5G usage in PPDR (i.e., EU and national 5G PPDR deployment strategies), certifications.
Customer adoption	PPDR users may not be yet ready or willing to adopt new technologies, lack of knowledge on 5G and its potential benefits for PPDR, compliance issues of provided services against established procedures.
Changes in market demand	Considerable infrastructure investments for 5G, niche market, slow growth of 5G PPDR market, status of PPDR network operator.

7 Conclusions

This document presented an account of the consortium's Month 24 work on the 5GASP Business Plan. It discussed our Value Propositions, their respective Customer Segments, the cost and revenues expected from the 5GASP business initiative. It also presented key aspects such as the Competition, the Key Influencers, and the Key Behaviours. Furthermore, it highlighted the potential to reach out to the Automotive, the PPDR and also to other verticals.

Based on our initial estimations and given the feedback of our large industrial partners VMWare and Orange RO, 5GASP does have the momentum and the potential to become a business success. However, we have identified risks that may become a barrier to this success and the document discussed in detail these risks.

Addressing the identified risks shall be the main focus of the project for the next 12 months and we shall be reporting our risk management strategies treating this deliverable as a living document, which we shall be updating on a 6 month basis with: (a) our risk management strategies and the outcomes of our risk management actions, (b) feedback from subject-matter experts through our Advisory Board, experts from other ICT-41 projects and via targeted engagement actions with important stakeholders; and (c) updates of our economic factor estimations given the competition in the fast growing 5G market.

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