



EU Market Analysis, Commercial deployment, Value Creation

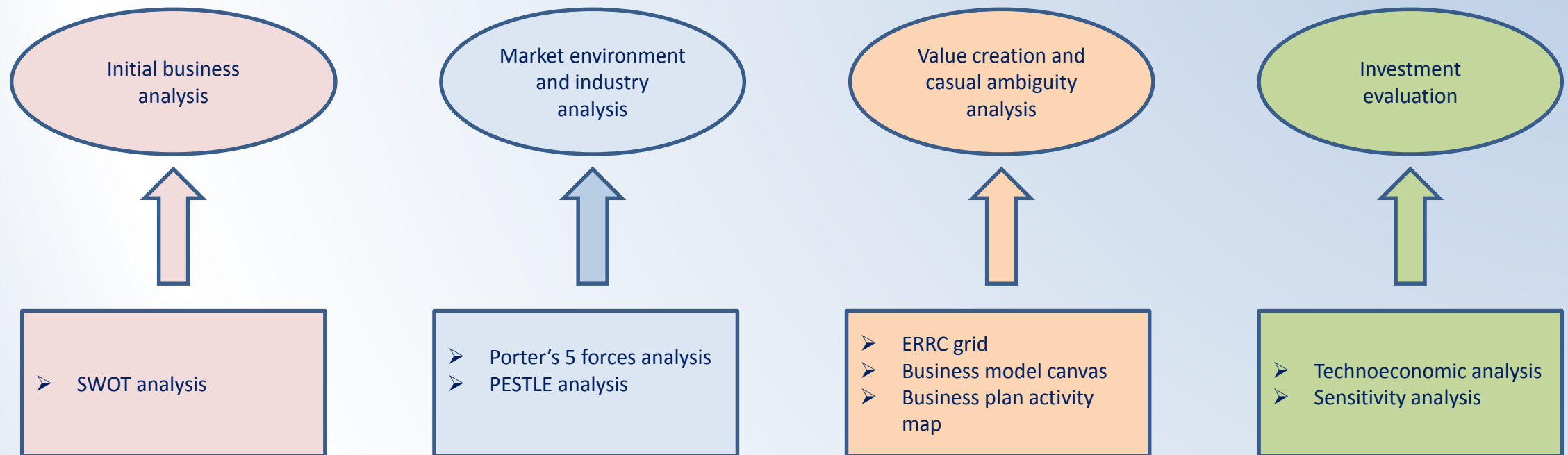
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The 5G Infrastructure Public Private Partnership

Focus areas and analysis tools



SWOT analysis for 5G ESSENCE (1/2)



| Internal factors | |
|--|---|
| Strengths | Weaknesses |
| <ul style="list-style-type: none">➤ Compliant to the 5G PPP reference architecture.➤ Open innovation-oriented model.➤ Approach based on open source tools and platforms➤ Addressing a variety of market needs and requirements.➤ Consortium stakeholders possess the required know-how.➤ The items of cost can be clearly identified.➤ Customizable solution for different customer segments➤ Meet QoS targets while providing low latency and high bandwidth➤ Collaboration with the 5GPPP body to develop standards and ensure future adoption of 5G ESSENCE in the industry sector.➤ Architecture based on ETSI-MEC and NFV de facto specifications, to ensure exploitation and adoption by a wide and easily accessible audience; | <ul style="list-style-type: none">➤ The partners and ecosystems should be properly selected depending on the specific application scenario➤ High flexibility needed for the business champion in organization, processes to adapt to the pretty dynamic market trends and needs➤ Required prompt experimentation and in case adoption, of the cutting-edge technology; therefore, also critical planning of investments, and continuous formation of personnel➤ Reluctance (e.g. for an MNO) to invest on a new wide variety of technologies (e.g 5G with MEC, NFV and SDN), while having already bulk assets on previous technology (e.g. 4G), with still high potentialities |

SWOT analysis for 5G ESSENCE (2/2)



| External factors | |
|---|---|
| Opportunities | Threats |
| <ul style="list-style-type: none">➤ Funding opportunities for 5G projects.➤ Entertainment market is readiness for 5G.➤ EU support Policies in relevant threads.➤ Progressive spreading of the neutral host model.➤ Industrial, academic, governmental, standardization and social stakeholders worldwide are strongly committed to develop and foster the adoption of novel technologies.➤ technological innovation fosters new business models.➤ Mass-diffusion of 5G fosters adoption and diminished costs.➤ Steady increase of mobile data consumption.➤ Higher diffusion of AR/VR.➤ Users devices follow the technology trends and potentialities.➤ The social trend of user produced and shared content is steadily increasing. | <ul style="list-style-type: none">➤ Stakeholders distrust towards novel solutions especially when sensitive data exchange is involved.➤ Low market stakeholder awareness around 5G possibilities.➤ The international trade wars could increase cost and hamper diffusion of innovation worldwide on a large scale➤ Rapid technology evolutions could raise interoperability and backward compatibility issues➤ Heterogeneity and fragmentation of measures aimed at developing digital culture➤ Inadequate level of ICT skills in population.➤ Limited growth in the propensity to pay for novel multimedia broadband services➤ Impact of the predominant model for Telcos |

5G Edge network acceleration for a stadium: 5 Forces of Porter analysis



| Forces of Competition | Competitive Force Strength | Brief Analysis |
|---|----------------------------|---|
| The Bargaining Power of Suppliers | High | <ul style="list-style-type: none"> ➤ Suppliers are an oligopoly. Buyers with economies of scale can push down purchase prices. ➤ High forward integration threat. |
| The Bargaining Power of Buyers | Low | <ul style="list-style-type: none"> ➤ Providing an optimized 5G empowered architecture with unique performance output |
| Threat of New Entrants | Low | <ul style="list-style-type: none"> ➤ High costs of establishing channels of distribution. ➤ High buyer switching costs. ➤ High R&D costs of 5G. |
| Threat of Substitute Products or Services | High | <ul style="list-style-type: none"> ➤ Many existing similar products (Wowza, Vimeo Livestream, Teradek, Haivision, Zixi, Quicklink, Enesys, Make TV) |
| Rivalry among Existing Firms | High | <ul style="list-style-type: none"> ➤ Similar products: Directly comparable product 3 Current similar products ± 20 ➤ Suppliers who could become providers: Cloud Service Providers ± 200 Telco operators in Europe ± 40 Infrastructure providers ± 10 |

5G Edge network acceleration for a stadium: EU market PESTLE analysis



| PESTLE | Positive/Neutral/Negative overall assessment | Highlights |
|---------------|--|--|
| Political | Positive | <ul style="list-style-type: none"> ➤ Political stability is high within EU member states and the EU as a whole. ➤ Government regulations create a solid background for sustainable growth (ex. Labor, trade). ➤ Governmental support provided through funding and grants. ➤ Very strict procurement regulations. |
| Economical | Positive | <ul style="list-style-type: none"> ➤ Steady GDP growth, low and harmonized interest rates and interest rates, harmonized debt ratio. ➤ Resilient to foreign exchange fluctuations due to using a common currency (EUR). ➤ Growing population, live stream market expected to increase. ➤ Low inflation and slight increase in disposable income. |
| Social | Positive | <ul style="list-style-type: none"> ➤ Relative consumer habits: rising attendance on sport events, high penetration of smartphones. ➤ Increase in data transfer requirements. ➤ Increase in social media interaction and customer reviews trends. |
| Technological | Positive | <ul style="list-style-type: none"> ➤ Technological innovations in telecommunications technologies. ➤ 5G networks expanding along with 5G handheld devices being made available in the market. ➤ Manufacturers focus on 5G infrastructure energy efficiency. |
| Legal | Positive | <ul style="list-style-type: none"> ➤ GDPR framework creates a solid legal basis. |
| Environmental | Positive | <ul style="list-style-type: none"> ➤ EU Energy consumption and EMF related regulations. ➤ EU average corporate tax reduction trend. ➤ EU introduces a mix of voluntary and mandatory actions to promote CSR/RBC ➤ The core of EU policies aims towards creating a ground for sustainable business development |

5G Edge network acceleration for a stadium: ERRC grid



Eliminate

- Need for reactive video quality

Raise

- Multiple Camera Angles through many to many transmission
- End-to-End Lower Latency for industry requirements
- Immersive Fan Experience

Reduce

- Cost Complexity

Create

- Localized Stream Security/Geo Location Planning
- Venue Owner Brand Strengthening
- New Revenue Streams

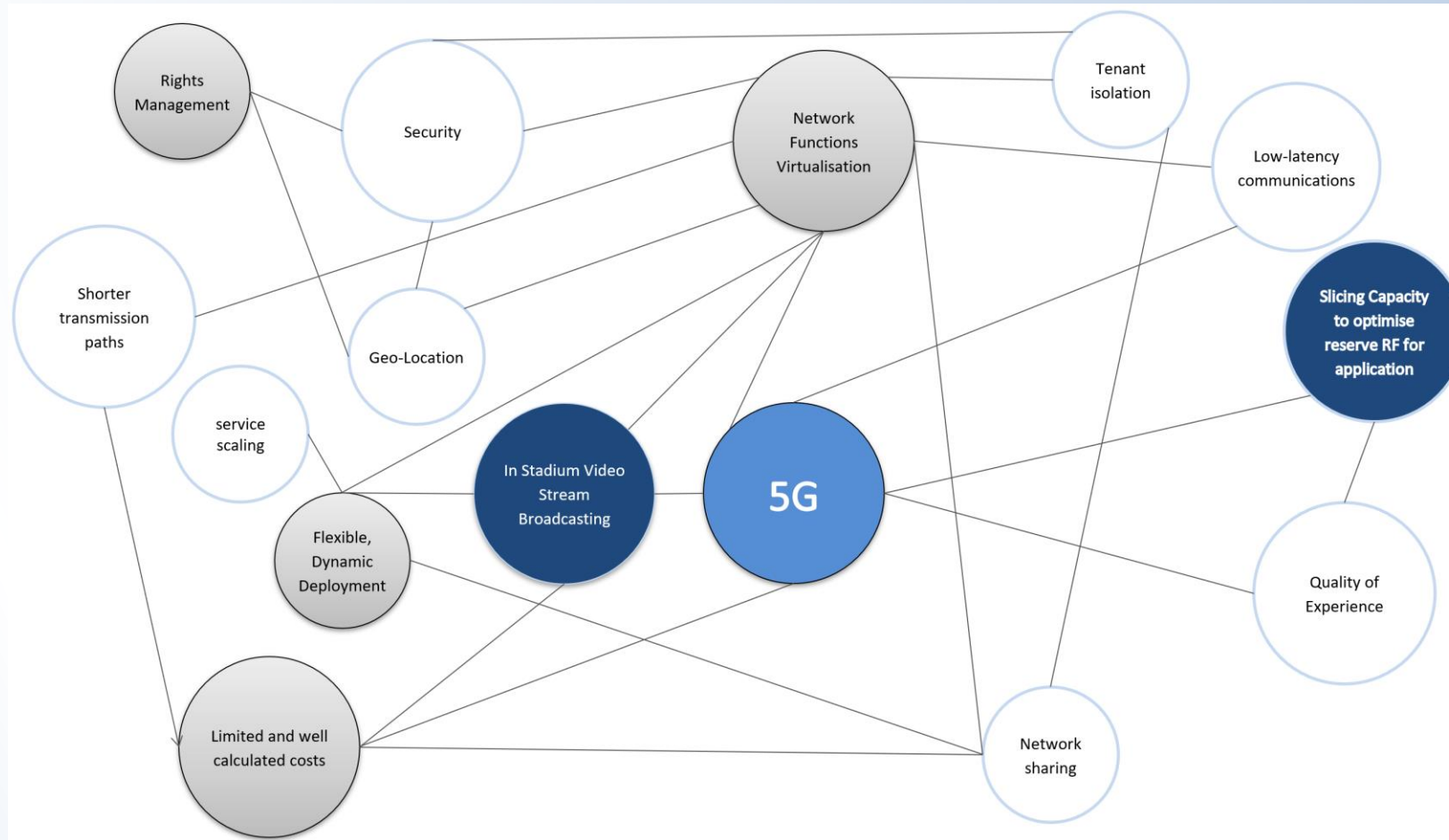
Our product is eligible for creating a blue ocean market environment!

5G Edge network acceleration for a stadium: Business Model Canvas



| | | | | |
|---|---|---|--|---|
| Key Partners -5G Essence Consortium -Telco champion partners (OTE, WIND) -Infrastructure providers (Athonet) | Key Activities - B2B sales (to venue owners) -Customer support (B2B) -Infrastructure installation (hardware, software) -Video content delivery | Value Proposition - To provide venue owners with end-to-end, low latency and high-quality multi-screen video transmission with optimized backhaul and increased security. - Strengthen brand positioning - Increasing fan experience | Customer Relationships -B2B -SLA contracts -B2B integration customer support | Customer Segments -Stadium/venue owners -Media broadcast companies |
| Key Resources - 5g network - main and light data centers - Slicing infrastructure - Broadcasting VNFs | | | Channels -Telco champion partner sales channel -Telco champion partner brand name | |
| Cost Structure - Capex: Infrastructure Tools Facilities - Opex: Infrastructure including electricity Tools and facilities SLA management Support CRM to keep contact with the revenue stream | | Revenue Streams -B2B sale of the value proposition -Pricing strategy focuses on profitability per country. Wholesale model including the licenses per user per year charge on the venue owner (who would transfer it to the end user with their own pricing strategy) and generate new revenue streams to the venue through advertising and sponsoring of the video streams -Technical support for configuring and operating solutions. | | |

5G Edge network acceleration for a stadium: Activity Map



5G Edge network acceleration for a stadium: Technoeconomic analysis



Base Scenario:

- Market: Germany, Bundesliga
- 48,000 average spectators per match out of which 10% (very conservative projection) will be using our service with a 3% increase per year.
- Pricing: 65 EUR per user per year charged on a B2B basis on the stadium owner
- Costs including:
 - 5G infrastructure
 - Video cameras and video transcoding/encoding infrastructure
 - SW and SW licenses
 - cloud resources
 - Backbone infrastructure (Routers, EPC, VNF, Light DC, Main DC)
 - Electricity costs
 - Installation costs
 - Customer support costs (B2B)

5G Edge network acceleration for a stadium: Technoeconomic analysis



Base Scenario performance indicators:

- The initial investment required is 516,340€ including 469,400€ for the CAPEX and 46,940€ for OPEX costs.
- NPV 300,190€
- Payback period: 4 Years
- IRR: 14.33%

5G Edge network acceleration for a stadium: Sensitivity analysis



Alternative scenarios and respective performance indicators:

Launching the product in **Italy** (27,8% corporate tax, 35,000 average number of spectators per match)

- NPV = -62,355€
- Payback period = 6 Years
- IRR = 5,90%

Increasing the price from 65€ to 80€ per user per year would give the following results:

- NPV = 231,430
- Payback period = 4 Years
- IRR = 12,77%

Launching the product in **Spain** (25% corporate tax, 45,000 average number of spectators per match)

- NPV = 260,617€
- Payback period = 4 Years
- IRR = 13,31%

Mission critical applications for public safety: 5 Forces of Porter analysis



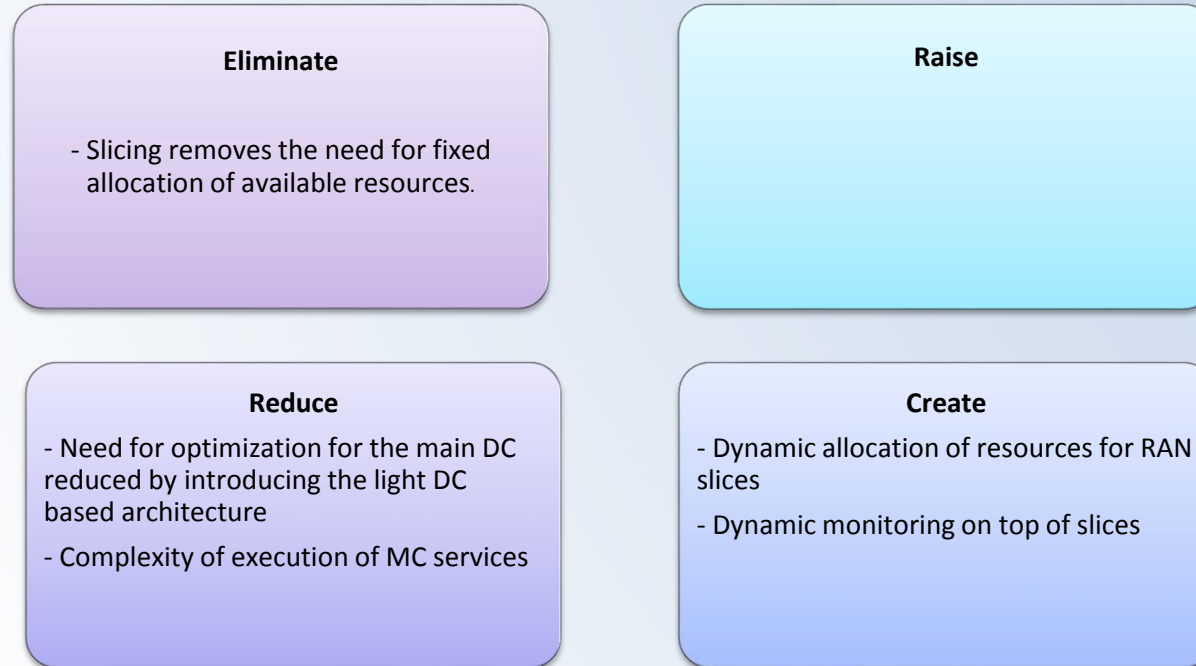
| Forces of Competition | Competitive Force Strength | Brief Analysis |
|---|----------------------------|---|
| The Bargaining Power of Suppliers | Moderate | <ul style="list-style-type: none">➤ Oligopoly of suppliers for infrastructure elements and telco operators.➤ High forward integration risk. |
| The Bargaining Power of Buyers | Moderate | <ul style="list-style-type: none">➤ Tendering process sales.➤ Existing pull demand for public safety IP based solutions. |
| Threat of New Entrants | High | <ul style="list-style-type: none">➤ Market forecast 19.8 billion USD by 2024.➤ Public safety LTE infrastructure investments estimated to grow CAGR 40% 2015-2020.➤ Existing pull demand for safety solutions by non-public safety market. |
| Threat of Substitute Products or Services | Low | <ul style="list-style-type: none">➤ Similar TETRA products exist but limits set by compliance policies and privacy policies in mission critical services create an unfriendly environment for non-experts. |
| Rivalry among Existing Firms | Moderate | <ul style="list-style-type: none">➤ Limited number of vendors with high market concentration➤ MCPTT open standards will offer market space for new competitors |

Mission critical applications for public safety: EU market PESTLE analysis



| PESTLE | Positive/Neutral/Negative overall assessment | Highlights |
|---------------|--|---|
| Political | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. ➤ Governments expected to spend 1.7% of their GDP in order and safety and 9.9% in healthcare. |
| Economical | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. |
| Social | Positive | <ul style="list-style-type: none"> ➤ LTE infrastructure investments expected to grow at CAGR of 40% 2015-2020. ➤ Increasing demand for IP-based Public Safety communications. ➤ Increased population demand for advanced public safety services. |
| Technological | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. ➤ 5G improves the independency from the core telecommunications network, enhances network stability and improves the allocation of resources to manage priorities in the services provided. |
| Legal | Positive | <ul style="list-style-type: none"> ➤ GDPR framework creates a solid legal basis. ➤ Countries like Belgium, Finland and Norway create legislations to better facilitate MC services. |
| Environmental | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. |

Mission critical applications for public safety: ERRC grid



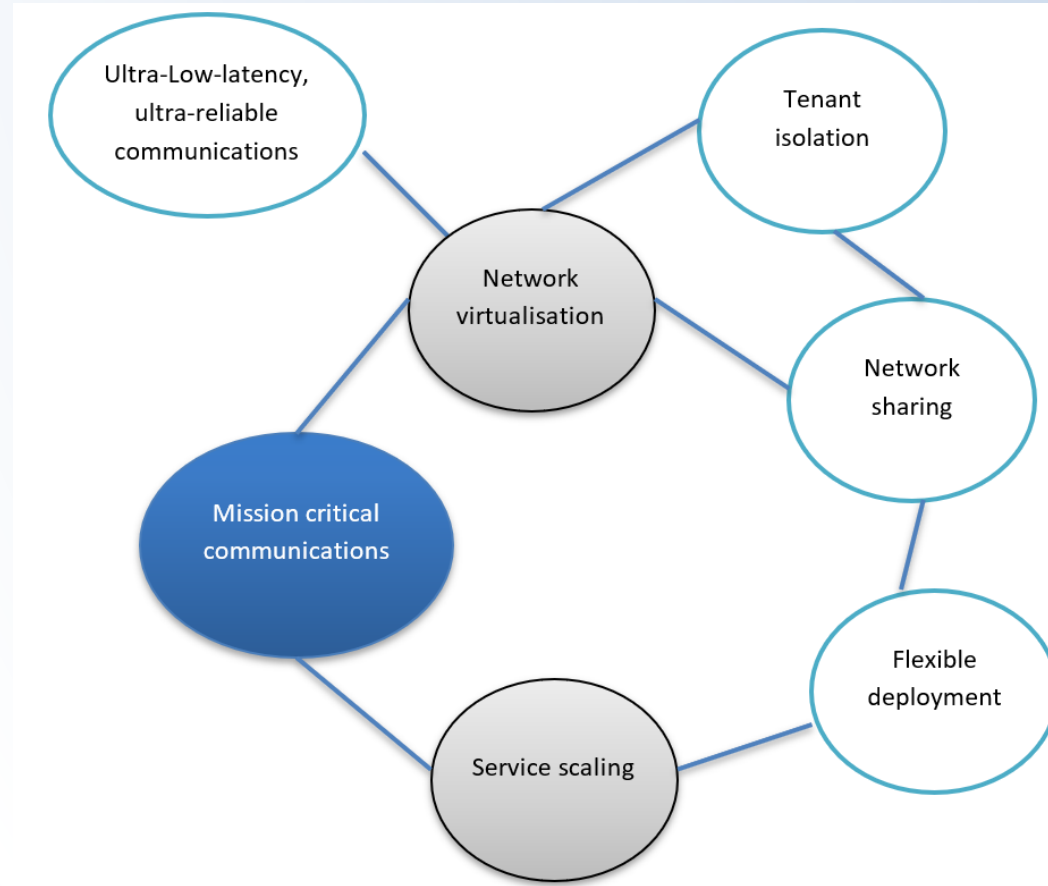
Our product is eligible for creating a blue ocean market environment!

Mission critical applications for public safety: Business Model Canvas



| | | | | |
|---|---|---|---|---|
| Key Partners -5G Essence Consortium -Local stakeholders in the mission critical sector | Key Activities - B2B sales (to municipalities) -Customer support (B2B) -Infrastructure provision (hardware, software) -MCPTT service provision | Value Proposition To provide mission critical services: -Mission critical push-to-talk voice communications service (standard compliant) -Chat and localization service. - increased situation awareness to the end user - better decision making due to improved situation awareness | Customer Relationships -B2B -SLA contracts -B2B integration customer support | Customer Segments -Municipalities -Government institutions -Network Operators |
| Key Resources - main and light data centers - Slicing infrastructure - Broadcasting VNFs | | | Channels -Direct sales -Associations with key partners | |
| Cost Structure - Capex: Infrastructure Tools Facilities - Opex: Infrastructure including electricity Tools and facilities SLA management Support CRM to keep contact with the revenue stream | | | Revenue Streams -B2B sale of the value proposition -Pricing strategy focuses on profitability objectives. Wholesale model including the licenses per user per year charge on the buyer (municipality, government or Network Operator). | |

Mission critical applications for public safety: Activity Map



Mission critical applications for public safety: Technoeconomic analysis



Base Scenario:

- Market: Spain, Small municipality in Spain
- 100 users
- Pricing: 1,950€ per user per year
- Costs including:
 - Application and end user devices
 - Deployment costs for a small deployment
 - Service maintenance
 - Faulty device replacement costs

Mission critical applications for public safety: Technoeconomic analysis



Base Scenario performance indicators:

- The initial investment required on Year 0 is 360,000 EUR for the CAPEX costs. CAPEX and OPEX cash needs will be covered by the revenues generated from Year 1 and on.
- NPV 132,024€
- Payback period: **7 Years**
- IRR: 13.34%

Mission critical applications for public safety: Sensitivity analysis



Alternative scenarios and respective performance indicators:

Launching the product in **Cyprus** (12,5% corporate tax)

- NPV = 189,641€
- Payback period = 6 Years
- IRR = 16,23%

Launching the product in **France** (34,4% corporate tax)

- NPV = 96,310€
- Payback period = 8 Years
- IRR = 11,39%

In-flight entertainment systems: 5 Forces of Porter analysis



| Forces of Competition | Competitive Force Strength | Brief Analysis |
|---|----------------------------|--|
| The Bargaining Power of Suppliers | Moderate | <ul style="list-style-type: none">➤ Limited number of industry specific suppliers.➤ Low forward integration threat. |
| The Bargaining Power of Buyers | Moderate-High | <ul style="list-style-type: none">➤ B2B (aerospace contractors) high bargaining power➤ B2C (airline companies) moderate bargaining power |
| Threat of New Entrants | Low | <ul style="list-style-type: none">➤ Inflight entertainment market is expected to grow from 2017 to 2022 on a approximate CAGR of 12.7%.➤ Unique industry know how required. |
| Threat of Substitute Products or Services | High | <ul style="list-style-type: none">➤ Existing products based on LAN and WiFi technology |
| Rivalry among Existing Firms | High | <ul style="list-style-type: none">➤ Limited number of vendors with high market concentration (Panasonic, Honeywell, Global Eagle, GoGo, Thales, Zodiac) |

In-flight entertainment systems: EU market PESTLE analysis



| PESTLE | Positive/Neutral/Negative overall assessment | Highlights |
|---------------|---|--|
| Political | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. ➤ Restrictive regulations regarding inflight frequencies |
| Economical | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. ➤ In 2017, 1.043 million people in the EU travelled by air, an increase of 7.3 % compared with 2016, with an expected market of 1.5 billion passengers by 2038 |
| Social | Positive | <ul style="list-style-type: none"> ➤ Number of aircrafts equipped with IFEC systems is growing exponentially. ➤ Passengers expect some sort of entertainment service when they fly. ➤ Passengers presume that the available good quality wireless system on-board. ➤ Demand for inflight social media interaction platform |
| Technological | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. ➤ 5G allow providers to customize services depending on the need of users and the environment conditions |
| Legal | Positive | <ul style="list-style-type: none"> ➤ GDPR framework creates a solid legal basis. |
| Environmental | Positive | <ul style="list-style-type: none"> ➤ Same basis of analysis as in Use Case 1. |

In-flight entertainment systems: ERRC grid



The product provided by Use Case 3 competes on the same basis with the existing in-flight entertainment products industry. It introduces a new technology for inflight content delivery but it does not create a new ground of competition thus, it cannot be considered as a proper candidate for introducing a new market.

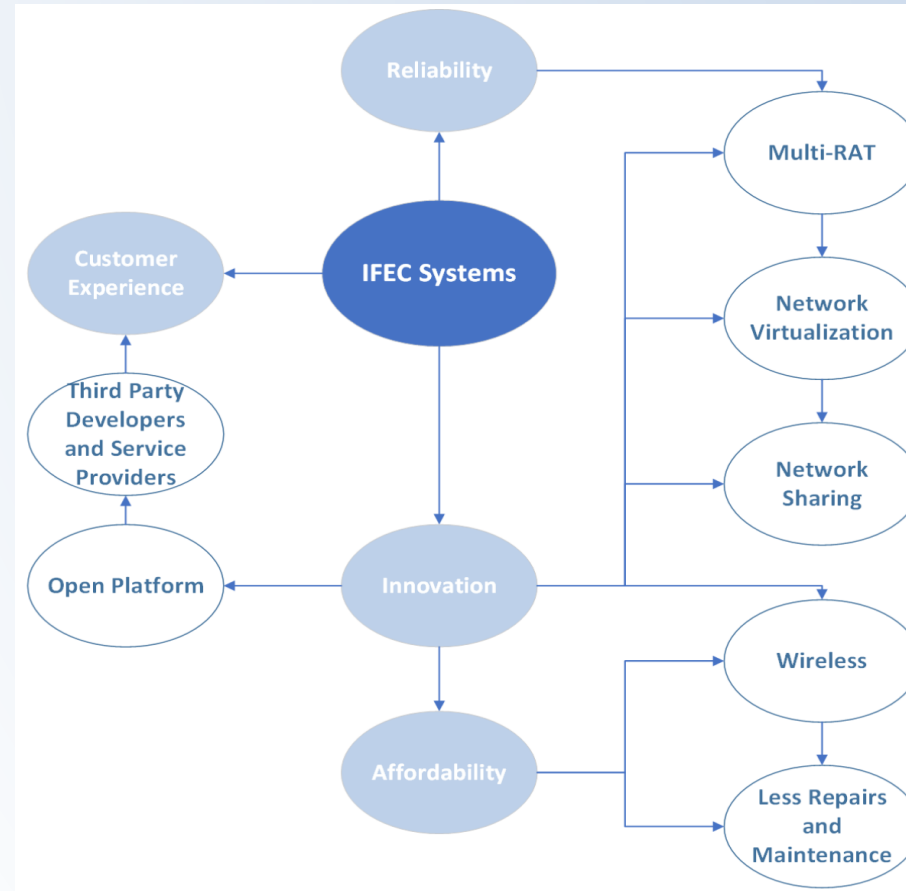
Our product is not eligible for creating a blue ocean market environment!

In-flight entertainment systems: Business Model Canvas



| | | | | |
|---|---|---|--|---------------------------------------|
| Key Partners -5G Essence Consortium -Champion partners (Thales, Zodiac) | Key Activities -B2B sales (to airlines) -Infrastructure installation (hardware, software) - Inflight content delivery service provision | Value Proposition To provide a high-quality inflight entertainment system using an innovative technology to optimize network usage and enhance customer experience. | Customer Relationships -B2B -SLA contracts | Customer Segments -Airlines |
| Key Resources - main and light data centers - Slicing infrastructure - Broadcasting VNFs | | | Channels -Direct sales | |
| Cost Structure - Capex: Infrastructure Tools Facilities - Opex: Infrastructure including electricity Tools and facilities SLA management Support CRM to keep contact with the revenue stream | | | Revenue Streams -B2B sale of the value proposition -Pricing strategy focuses on profitability objectives. Contracts will be executed on a timely manner and payments will occur upon delivery of X number of upgraded airplanes per year. | |

In-flight entertainment systems: Activity Map



In-flight entertainment systems: Technoeconomic analysis



Base Scenario:

- Market: German, Lufthansa
- 15 aircrafts Airbus A320 (180 passengers)
- Pricing: 635,000€ per airplane
- Costs including:
 - Seat Screens
 - Access Point
 - Small Cell
 - Media Server
 - On-board Data Centre

In-flight entertainment systems: Technoeconomic analysis



Base Scenario performance indicators:

- The initial investment required on Year 0 is 360,000 EUR for the CAPEX costs. CAPEX and OPEX cash needs will be covered by the revenues generated from Year 1 and on.
- NPV = 2,601,038€
- Payback period: 1 **Year**
- IRR: 96.46%

The main reasons behind the very short payback period and the extremely high IRR is the fact that we consider the CAPEX costs and the Working Capital for the project to be 0. All contributing partners in 5G Essence have occurred CAPEX costs in order to facilitate the design and testing of the project but those costs are not considered to be part of its commercial launch since they have already been covered by the project EU funding. Moreover, the CAPEX costs incurred to deploy 5G Essence in the aircrafts is directly transferred to the airline company in a very short period of time thus no depreciation and amortization costs can be taken into consideration.

Thank you!

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