

D9.2 Press Kit 1

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Abstract: This deliverable will provide the first iteration of project-specific materials to summarize objectives, target audience, technology results and expected impact from the project for industries targeted by FRACTAL	

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1 Introduction

This deliverable will provide the first iteration of project-specific materials to summarize 1) **objectives**, 2) **target audience**, 3) **technology results** and 4) **expected impact** from the project for industries targeted by FRACTAL.

The aim of this initial Press Kit 1 document is to assist program partners in communication activities about FRACTAL project.

The plan is to produce two advanced press kits in the program's duration including update of presentation, brochure, and leaflet.

- Press Kit 2, June 2021
- Press Kit 3, April 2022.

The press kit has several links to FRACTAL SharePoint and FRACTAL web pages.

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2 Program Background

The aim of FRACTAL is to create a reliable computing platform node, realizing a so-called Cognitive Edge under industry standards. This computing platform node will be the building block of scalable decentralized Internet of Things (ranging from Smart Low-Energy Computing Systems to High-Performance Computing Edge Nodes).

To achieve industrial edge computing, new devices are required to satisfy a new set of challenging requirements such as time-predictability, dependability, energy-efficiency, and security.

The key aspect here is “Cognitivity”, that will allow FRACTAL nodes to learn how to improve its performance and dependability despite the uncertainty of the environment. Supported by Artificial Intelligence methods, internal and external architectures FRACTAL nodes will be able to proactively adapt to changes in the surrounding world. However, while these features are critically important, focusing only on them leaves aside the enhancement opportunities brought by the continuous emergence of more powerful solutions in the area of Cyber-Physical Systems (CPS), Systems of Systems (SoS) and Internet of Things (IoT). For instance, opportunities coming from advanced microelectronics, high-performance computing, smart system integration, and improved cloud services have traditionally been mostly neglected. Missing those opportunities may easily make the node fail to meet the stringent requirements for increased autonomy coming from the new application domains.

As a result of the integration of these cognitive systems into an edge fractal network, there will be an intrinsic crucial advantage, a combination of safety, adaptability and emergence of new possibilities. Therefore, new industrial functions will flourish through the created space of possibilities of our cognitive systems. This scalable fractal network will transfer all those cognitive advantages to a new Cognitive Edge, a computing paradigm that lies between the physical world and the cloud.

FRACTAL follows a disruptive approach. Taking advantage of the latest research in high-performance processor architectures and artificial intelligence, FRACTAL will make smart systems in particular, and edge systems in general, able to learn from the surrounding context, adapt to changes, transform themselves and stay connected with an extremely dynamic environment. This will allow edge systems to become Cognitive Systems that will gain capabilities and efficiency in a fully autonomous manner as required for the most demanding industrial applications.

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3 Program Basic Info

3.1 Coordinator

Project Coordinator Aizea Lojo (IKERLAN), alojo@ikerlan.es, +34 943 71 24 00

Technical Coordinator Leire Rubio (IKERLAN): lrubio@ikerlan.es

Innovation Coordinator Jaume Abela (BSC): jaume.abella@bsc.es

3.2 Contributors per Partners

The updated list of contributors and contacts are available through the FRACTAL SharePoint service

[https://ikerlan.sharepoint.com/:x:/r/sites/FRACTAL_project/Documentos%20comp artidos/SIEG%20FRACTAL%20Consortium%20contacts%20and%20mails.QUAxlsx .xlsx?d=w1ac7a025749f4c29876224494fa80546&csf=1&web=1&e=awEOAc](https://ikerlan.sharepoint.com/:x:/r/sites/FRACTAL_project/Documentos%20comp%20artidos/SIEG%20FRACTAL%20Consortium%20contacts%20and%20mails.QUAxlsx.xlsx?d=w1ac7a025749f4c29876224494fa80546&csf=1&web=1&e=awEOAc)

A public partner list with summary can be found from <https://fractal-project.eu/partners/>

3.3 Fact Sheet

Project Number	877056
Project Acronym	FRACTAL
Project title	Cognitive Fractal and Secure EDGE based on an unique Open-Safe-Reliable-Low Power Hardware Platform Node
Call (part)	H2020-ECSEL-2019-2-RIA
Topic	ECSEL-RIA-2019-2-Special-Topic-2 EDGE COMPUTING
Number of EU programs funded in this call special topic	2
Starting date	1.9.2020
Duration in months	36
Free keywords	Edge Computing, Open Source Software/Hardware, Time-critical, Reliability, Security, Complexity
Partners	28 partners
Countries	7
Countries by name and partners per country	Spain (8), Italy (7), Austria (3), Germany (4), France (1), Switzerland (2), Finland (3)
Person Months total	1 949.50
Number of Work Packages	9
Number of Tasks	34
Number of Deliverables	48

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Number of Use cases	9
Coordinator	IKERLAN S.Coop

Table 1 – Fact Sheet

Project summary table from the Grant Agreement has useful info to explain the project, see the table below.

Project Number ¹	877056	Project Acronym ²	FRACTAL
One form per project			
General information			
Project title ³	A Cognitive Fractal and Secure EDGE based on an unique Open-Safe-Reliable-Low Power Hardware Platform Node		
Starting date ⁴	01/09/2020		
Duration in months ⁵	36		
Call (part) identifier ⁶	H2020-ECSEL-2019-2-RIA		
Topic	ECSEL-RIA-2019-2-Special-Topic-2 EDGE COMPUTING		
Fixed EC Keywords			
Free keywords	Edge Computing, OSS, time-critical, Reliability, Security, Complexity		
Abstract ⁷			
<p>The objective of this research activity is to create a reliable computing node that will create a Cognitive Edge under industry standards. This computing node will be the building block of scalable Internet of Things (from Low Computing to High Computing Edge Nodes). The cognitive skill will be given by an internal and external architecture that allows to forecast its internal performance and the state of the surrounding world. Hence, this node will have the capability of learning how to improve its performance against the uncertainty of the environment.</p> <p>As a result of the integration of these cognitive systems into a fractal network, there will be another intrinsic crucial advantage, emergency and adaptability, new functions will flourish through the created space of possibilities of our cognitive Systems. This complex network will transfer all those cognitive advantages to the Edge, a computing paradigm that lay down between the physical world and the cloud.</p>			

Figure 1 – Project Summary from the grant agreement

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4 Resources for the press and other communication

4.1 Web Pages - A Resource for Public Information

The FRACTAL project relies on its web presence accessible under:

<https://fractal-project.eu/>

to inform the public on its progress. This web presence will be continuously updated throughout the project and in addition to this this Press Kit document, will contain news, partner descriptions as well as links to available reports.

The www presence will be handled by Task 9.2 leader.

4.2 Project Overview Presentations

A general overview of the FRACTAL program can be found from the following Youtube presentation [FRACTAL project overview](https://youtu.be/ajbwuLOBBzQ). <https://youtu.be/ajbwuLOBBzQ>

<https://www.youtube.com/watch?v=ajbwuLOBBzQ&feature=youtu.be>

The link to the project summary PowerPoint presentation [FRACTAL Project Overview](#)

4.3 Digital Artwork

We have developed logos, official templates and graphical resources to be used by FRACTAL members and made them available in FRACTAL SharePoint is located in three places:

- [Logos](#)
- [Official templates](#)
- [Graphic Resources](#)

Note, that Fractal PowerPoint and document templates are for both FRACTAL internal and external communication and should be used when applicable.

Other official templates to be used can be found in the FRACTAL SharePoint, see [Official Templates](#)

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5 Program Summary Presentation

5.1 Objectives

The overall objective of the FRACTAL project is to create a cognitive edge node enabling a fractal edge that can be qualified to work under different safety-related domains such as automotive, railway and smart cities to name a few. This computing node will be the basic building block of intelligent, scalable and non-ergodic IoT (ranging from Low-Energy Computing to High-Performance Computing Edge Nodes).

The cognitive skills will be enabled by an internal and external architecture that allows forecasting its internal state and the state of the surrounding world. This node will have the capability of adapting to improve its behaviour (performance, safety, security, power efficiency, etc.) and deliver new services against the uncertainty of the environment.

FRACTAL will provide autonomy, context awareness and intelligence in the edge by means of an open-safe-reliable and power-efficient cognitive edge node

The **strategic objectives** to implement and prioritize the different requirements of a FRACTAL node are:

- O1: Design and Implement an Open-Safe-Reliable Platform to Build Cognitive Edge Nodes of Variable Complexity
- O2: Guarantee extra-functional properties (dependability, security, timeliness and energy-efficiency) of FRACTAL nodes and systems built using FRACTAL nodes (i.e., FRACTAL systems).
- O3: Evaluate and validate the analytics approach by means of AI to help the identification of the largest set of working conditions still preserving safe and secure operational behaviors.
- O4: To integrate fractal communication and remote management features into FRACTAL nodes.

5.2 Overall Structure of the Work Plan

The FRACTAL project work plan can be summarized in:

WP1- Project, Risk and Innovation Management - This WP is devoted to project risk and innovation management to ensure progress at the technical level as well as administrative management allowing proper steering of the project and interactions with the EC and national authorities.

WP2-Specifications and Methodology - This WP represents our collective effort to fix the details and limit of how much we want to go ahead into the future and how much we can safely produce in three years. It is governed by the fundamental principle of providing a fractal cognitive computing node for edge computing. This WP is orchestrated by industrial partners at the beginning of the project and will bring

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the framework specification, the tools and interfaces needed, and their assessment in the use cases. The correctness and value of the FRACTAL technological innovations, methodology and tools, and the easy or taught of their integration depend upon the coherence and vision formalized in this initial effort of the project.

WP3-Node Architecture & Building Blocks - The main goal of this work package is to provide reference architecture of a cognitive edge computing node with FRACTAL properties. This reference architecture will be based on modularity and separation of concerns. Also, this WP will focus on the setting-up of a common repository of generic qualified components.

WP4-Safety, Security & Low Power Techniques - The goal of this work package is to develop safety, security and low-power services for individual FRACTAL nodes as well as hierarchical systems comprised of FRACTAL nodes with wire-bound and wireless networks. The services shall encompass fault-tolerance based on adaptive time-triggered computations and networks, security mechanisms in the presence of malicious attackers and taking into considerations intrinsic regulation and embedded platform constraints. Low-power techniques will ensure the suitability of FRACTAL for energy-constrained devices.

WP5-AI & Safe Autonomous Decision - WP5 focuses on FRACTAL approaches to AI, by giving emphasis to AI for context awareness and control as in the vehicle use cases and algorithms optimization for the edge as in the automotive and totem use cases. In addition, the mutability concept will be considered in order to autonomously adapt the FRACTAL system configuration and operation to the environmental conditions. **WP6-CPS Communication Framework** - The goal of this work package is to design, develop and deploy the FRACTAL system engineering framework considering a “microservices and containers”-based software implementation. It consists of: (i) a processing platform at the edge with connection to different IoT devices and cloud platforms; (ii) and an edge controller infrastructure (in the cloud) to manage and control the edge nodes update and operation. This solution will follow a fractal configuration improving the scalability from Low Computing to High Computing edge node.

WP7-Integration and Verification - This WP will integrate the FRACTAL building blocks, technologies –and methodologies apply to the cognitive nodes with well-identified performance, security and safety requirements. A verification task will be used to measure the efficiency and effectiveness of the technological innovations, tools, methodologies, and asses the metrics established for the nodes both quantitatively and qualitatively. It has to be understood as a technological integration WP ahead of the following demonstration WP.

WP8-Case Studies, Benchmarking and Quality assurance - This WP demonstrates how the FRACTAL building blocks, technologies and methodologies apply to industrial applications with well-identified performance, security and safety requirements. The framework will also be assessed regarding productivity and usability aspects. Use-cases will be used to measure quantitatively and qualitatively

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the efficiency and effectiveness of technological innovations, tools, methodologies, and assess the metrics established for them.

WP9-Exploitation, Dissemination, Training and Standardization - This WP includes all the dissemination activities aimed at securing adoption at the edge industrial, CPSoS- Cyber Physical Systems of Systems, Autonomous Applications and research stakeholder.

5.3 Use Cases

FRACTAL has nine use cases to demonstrate the technology developed by the project. A longer summary of FRACTAL use cases can be found on FRACTAL web pages under <https://fractal-project.eu/use-cases/>

- Edge computing technologies applied for engineering and maintenance works, led by
- Automotive air path control, led by
- Smart meters for everyone, led by
- Low-latency Object Detection as a generic building block for perception in the edge for Industry 4.0, led by
- Autonomous Mobile Marine Inspection Laboratory, led by
- Automatic accurate stopping and safe passenger transfer based on Computer Vision and AI-enhanced techniques, led by
- Intelligent Totem
- SPIDER autonomous robot use case, led by
- Shuttle with Cognitive Capabilities based on FRACTAL Nodes for Improved Throughout, Reliability and Availability in Warehouse Systems, led by

5.4 Target Audience

The FRACTAL dissemination and communication target groups include:

- General public
- Interested general public, including concerned citizens
- Highly specialized public, including stakeholders interested in adopting the results of the project
- Interested decision makers, including local related politicians and regional/national politicians, local business leaders
- Specialized decision makers, including industrial and nonindustrial stakeholders that are key for scaling up the results of the project.

5.5 Technology Results

FRACTAL outcomes are related to several key application areas of the MASP

- Transport and Smart Mobility. FRACTAL is contributing to the major challenge of secure connected, cooperative and automated mobility and transportation.

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Major use cases of FRACTAL nodes are related to autonomous driving, mobility, clean propulsion and logistics as high profile application where the use of AI technologies and real-time and highly critical decision making on the edge are needed.

- Energy. One of the high priority areas is the update of control software with edge computing to support low- latency applications, such as real-time grid control. FRACTAL will contribute to the development of edge computing nodes to run AI and machine learning analysis to optimize parameters in a reasonable time in changing environments.
- Digital Industry. Edge and Cloud-based computing and integration will change the value chain. The main challenge that FRACTAL is supporting is to research and develop devices, platforms and applications offering a high degree of interoperability, configurability, orchestration manager and security. FRACTAL is supporting the development of highly distributed IoT applications involving a high degree of distribution and processing at the edge of the network with AI capabilities.
- Digital Life: FRACTAL is aligned with the challenge of a larger diffusion of the physical edge nodes (making them more performant, power-efficient, safe, and secure). Innovative solutions will allow a larger diffusion of the physical edge nodes, making them more effective in terms of communication, data elaboration (analytic) and power management to realize the anticipation functionality.

5.6 Expected Impact

Innovations in embedded systems-on-a-chip (SoCs) have opened doors to new commercial devices that are strong enough to run fully-fledged complex algorithms and operating systems. These trends are increasing the potential of the Internet of Things (IoT) that now enables complex computation to be carried out on-site.

An edge computing application utilizes the IoT devices' processing power to score, aggregate, pre-process or filter IoT data. It utilizes the flexibility and power of cloud services to execute complex analytics on that data and, in a feedback loop, support actions and decisions on and about the "physical world".

Edge Computing brings real-time, high-bandwidth, low-latency access to latency-dependent applications, distributed at the edge of the network. Since Edge Computing layer is closer to the end-user and apps, it allows for a new class of cloud-native applications and allows network operators to open their networks to a new ecosystem and value chain.

Edge computing layer enables an excess of vertical and horizontal use cases (e.g. leveraging low-latency implying significant commercial opportunities). This is critical as the whole industry is trying to uncover new, exclusive sources of revenue.

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Such use case scenarios can benefit from Edge-specific features such as low- latency, network awareness, or optimal allocation of resources. Therefore, edge computing will yield benefits for both customers and the operator itself.

5.6.1 Societal Impact

FRACTAL cognitive edge nodes make products smarter, more interconnected, interdependent, collaborative and autonomous.

- Increases data security and improves data privacy.
- Better application performance by reducing the lag time and improving real-time data analysis and processing.
- Reduced operational costs thanks to the decrease in the usage of cloud infrastructure costs.
- Improved business efficiency and reliability. Lower data traffic and reduced cloud storage, in turn, lead to more efficient business operations

5.6.2 Benefits

Benefits of edge computing for the use-case scenarios

- Low latency
- Resilience
- Security
- Optimal allocation of resources
- Workload or time-shifting to optimize cost and performance (e.g. applications)
- Network (context) awareness
- Being closer to VNFs allows telcos and customers to analyze network information in real-time to optimize content/application etc.
- Data sovereignty/localization
- Lower end-device power consumption
- Backhaul cost savings
- Core congestion avoidance

FRACTAL's success at reaching targets related to the exploitation objectives will be evaluated using exploitation key performance indicators (KPIs). The main objectives include the successful adoption of results and benefits within the industry, research communities and standards advisers and ensuring the longevity of the project's results through either standards uptake, further research or commercial applications.

KPIs will be set at multiple levels to ensure that the exploitation potential is considered thoroughly. At this stage it is, however, too early to formulate specific KPIs as the project partners are only starting to think about the exploitation

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dimension. The KPIs will be defined and developed as the exploitation targets become clearer over the course of the final year of the project.

5.6.3 Exploitation KPIs

- Growth and job creation in participating organizations.
 - +650 employments to exploit the results of the project after 5 years
- Turnover growth
 - Companies will increase their turnover between 2% and 25%
- Expected increased investment in the research field
 - +30M € will be invested to continue with the research activities and TRL9 Actual system proven in operational environment
- Number of new R&D projects
 - +40 new R&D projects are expected to come out after FRACTAL
- Number of commercial/research agreements for the project results
 - The commercial impact is huge being the results able to reach +200 customers in 5 years
- Number of new innovative products to the market
 - Apart from the +37 potential results of the project it is expected to create new products
- Number of prototypes and testing activities
 - 9 industrial use cases within the project duration
- Number of publications
 - 21 publications in peer-reviewed high impact journals and number of joint public-private publications, opening doors to further and broader research activities
- Number of opensource releases
 - Minimum there will be 20 open-source releases.
- Number of patent applications
 - Goal is -to apply for 5 new patents within the whole consortium during the project execution
- Growth and job creation in participating organizations.
 - +650 employments to exploit the results of the project after 5 years

5.7 Exploitation Business Model

In FRACTAL program define a credible strategy to explore the possibility


of joint exploitation among the members of the consortium. This strategy will be determined through an iterative analysis along the project lifetime, including: (1) a constant monitoring market for a comprehensive analysis, (2) the identification of potential business models for the FRACTAL technology, and (3) the development of a sustainability plan to ensure further research, developments and enhancements of the FRACTAL hardware and software architecture beyond the funding period

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<p>Key Partners:</p> <ul style="list-style-type: none"> Public sector Edge providers (with interest in security, safety and low power) Universities and research centres Innovative SMEs in edge computing and AI domains HW and SW developers IA algorithms developers Industrial system integrators Citizens (needed to embrace the innovation and facilitate adoption) 	<p>Key activities:</p> <ul style="list-style-type: none"> Edge computing for real time analytics Open, Safe, reliable and low power hardware platform AI based algorithms Mutability, environment awareness and autonomous node Fractality from low to high power computing Demonstration in realistic use cases, representative to customer demands 	<p>Customer relationships:</p> <ul style="list-style-type: none"> IoT and data analytics value chain Open-source community Open-fog community Education and training Consultancy Personalised AI based services for each customer segment Thought leadership Support 	<p>Customer Segments:</p> <ul style="list-style-type: none"> Smart domains including: Smart cities, Smart mobility, Smart manufacturing, Smart health etc. Edge, Cloud and data service providers Public sector (city councils, governments, institutions, etc) Data analytics, AI algorithms and Edge computing developers Secured and low power hardware platforms developers Public-private partnership (e.g. private operator, public customer)
<p>Key Resources:</p> <ul style="list-style-type: none"> Data-sets HW developers SW developers Integrators Test sites 	<p>Value Propositions:</p> <ul style="list-style-type: none"> Open Safe Reliable and Low Power Node Architecture Low Power and High Performance Trade-off Cognitive Safe Autonomous Node Mutable and Fractal Communications 	<p>Channels:</p> <ul style="list-style-type: none"> Events Conferences Workshops General press Website and social media Direct contracts and referrals 	
<p>Cost Structure:</p> <ul style="list-style-type: none"> Personnel cost (expertise) Operations costs (personnel, hardware and service resources) Pre-sales and sales-effort Edge and cloud infrastructure costs Marketing, branding and dissemination costs Third parties involvement Costs associated to the V&V at uses cases 		<p>Revenue Streams:</p> <ul style="list-style-type: none"> Value add services/products within use-cases scenarios Edge computing HW/SW infrastructure development for real time data analytics Security, safety and low power HW/SW solutions development New public and private research contracts 	

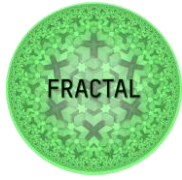
Figure 2 – FRACTAL Business Model Canvas

All Partners' exploitation plan summaries can be found from the grant agreement, starting from page 232, see the link [Grant Agreement](#).

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8 List of Abbreviations and Terms

Business Model Canvas	Strategic management and lean startup template for developing new or documenting existing business models.
ECSEL-RIA	An ECSEL Research and Innovation Action (ECSEL-RIA) primarily consists of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service, method, tool or solution. For this purpose they may include applied research, technology development and/or method/tool and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment. The activities have their centre of gravity at TRL 3-4.
Edge computing	Edge computing is a distributed computing paradigm that brings computation and data storage closer to the location where it is needed, to improve response times and save bandwidth.
KPI	Key performance indicator
TRL	Technology readiness level

Table 2 – List of abbreviations and terms

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9 Versions

Version	Comment	Contributors	Reviewers
1.0	Version to reviewers	Matti Vakkuri, Polina Feshchenko	Juan José Rodríguez Frank K. Gürkaynak
1.1	Reviewed final version	Matti Vakkuri, Polina Feshchenko	

Table 3 – List of document versions