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ONTIC D6.3: Exploitation strategy

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Online Network Traffic Characterization

Deliverable
Exploitation Strategy

ONTIC Project
(GA number 619633)

Deliverable D6.3
Dissemination Level: RESTRICTED

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1. Executive Summary

This document contains the initial exploitation strategy targeting to enhance exploitable project results in which is defined which project partners will invest time and effort in each result and the intentions of each partner with regard to the dissemination and use of all results.

Additionally the document defines a collection of concrete quantitative indicators as metrics for the success of the project.

2. Acronyms and Definitions

Acronyms:

Table 1. Acronyms

Acronym	Defined as
[QoS]	Quality of Service
[ISP]	Internet Service Provider
[OSS]	Operating Service Support
[KPI]	Key Performance Indicator
[CAPEX]	CAPital EXpenditures
[OPEX]	OPerating EXpense

Definitions

CAPEX:
An amount spent to acquire or upgrade productive assets (such as buildings, machinery and equipment, vehicles) in order to increase the capacity or efficiency of a company for more than one accounting period. Also called capital expenditure.

OPEX:
An expense incurred in carrying out an organization's day-to-day activities, but not directly associated with production. Operating expenses include such things as payroll, sales commissions, employee benefits and pension contributions, transportation and travel, amortization and depreciation, rent, repairs, and taxes. These expenses are usually subdivided into selling expenses and administrative and general expenses. Also called non-manufacturing expenses.

3. Intended audience

This document is oriented to partners participating in WP6.

4. Introduction

4.1 ONTIC Objectives

Proactive and dynamic QoS Management, Network intrusion detection and Early detection of network congestion problems, among others applications in the context of network management and engineering, can benefit from the existence of an accurate and scalable mechanism for online characterization of network traffic patterns evolution.

Nowadays, in a context of continuous exponential growth in network speed and the number of devices interacting with each other through the network, current approaches for online network traffic characterization clearly lack scalability and accuracy. Therefore, a new generation of scalable mechanisms and techniques to characterize online network traffic are required. ONTIC Project proposes to investigate, develop, test and validate such scalable mechanisms and techniques.

To this end, ONTIC Project proposes:

- **Scientific Objective 1: Investigate, implement and test a novel architecture of scalable mechanisms and techniques to be able to a) characterize online network traffic data streams, identifying traffic patterns evolution, and b) proactively detecting anomalies in real time when hundreds of thousands of packets per second are processed.**
- **Scientific Objective 2: Investigate, implement and test a completely new set of scalable offline data mining mechanisms and techniques to characterize network traffic, applying a big data analytics approach and using distributed computation paradigms in the cloud on extremely large network traffic summary datasets consisting of trillions of records.**
- **Technical Objective 3: Integrate offline and online mechanisms and techniques into an autonomous supervised or unsupervised network traffic characterization system to be used as cornerstone of a new generation of scalable and proactive network management and engineering applications.** Among other novelties, the online network characterization subsystem will interact with previously obtained offline characterizations to adjust its results in real time. Moreover, the detection of network intrusions will not be implemented with a typical rule based classifier, where the rules are fixed, but also modified in real time when the system catches the online evolutions of network traffic patterns. The system can be even more autonomous by using data mining techniques. It is then possible to avoid having a training phase. The system can construct its knowledge at run time only, for instance using clustering techniques. And the knowledge evolves during the running phase depending on network traffic pattern changes.
- **Technical Objective 4: Lead the dissemination and adoption of ONTIC outcomes to other application domains where scalability, accuracy and, in some cases, real time response are a must, such as bioinformatics, genomic, medicine, physics, social sciences, finances, marketing, etc.** To this purpose, ONTIC will generate an open source highly scalable offline/online analytics framework to be used by developers in other application domains.

4.2 Exploitation objectives

Exploitation of the research and development results is an important part of the project responsibilities and an area of activity that requires a specific approach to ensure success.

The purpose of this document is to set a strategy to ensure that at the end of the research process, the designed platform, the components, the researches, etc. are known in the relevant industries, universities and enterprises.

Therefore this document describes the techniques and general actions which the consortium and its members will make in order to bring those results get to the industries, markets, universities, etc.

5. Exploitation Strategy

ONTIC is pushing for an innovative and challenging way to foster research exploitation from the project. The exploitation strategy will be focused on the following ONTIC outcomes:

- ONTS (ONTIC Network Traffic) dataset (deliverable D2.4)
- The ONTIC framework (deliverable D5.4)
- Prototype for Network Intrusion Detection Use Case (deliverable D5.5)
- Prototype for Dynamic QoS management Use Case (deliverable D5.6)
- Prototype for Proactive Congestion Detection and Control Systems Use Case (deliverable D5.7)

The exploitation of the project's results is centered on four core principles:

- User focused activities and user engagement,
- Joint efforts by all consortium members,
- Continuous exploitation activities, from the start of the project on,
- Activities and effects lasting well past the end of the project.

5.1 Stakeholders

In the scope of this project, several types of users will be the main stakeholders for exploitation activities:

- Network operators.
- Service providers.
- Business users
- End users.

It is vital to address them all and integrate their needs into the research activities. Doing so not only produces market-relevant technologies but also ensures that all user groups get useful results out of the project.

On the other hand, ONTIC proposes the adoption of its outcomes to other application domains through the generation of a development framework (technical objective 4). In this context is important to include a new group of stakeholders formed by potential customers of those other areas where ONTIC results can be used.

5.2 Exploitation Activities and User Engagement

User integration is accomplished with several instruments:

- The external user group is comprised of industrial and commercial users, enabling them to give feedback and influence the development of the project, incorporating their actual problems and showing them possible solutions. They will probably be among the first users (early adopters) of the new technologies and thus also act as multipliers and "beacons" for others to follow.

- The thorough and overarching market and use case research undertaken in WP5 will outline key stakeholders, business users and end-users and, as a major element of this task, also seek their needs and requirements, to incorporate in all future activities.
- The dissemination activities in task 6.1 will alert a broader range of potential users to the new developments, possibly leading to feedback and further input and ideas for the project.
- The market studies carried out in task 6.3 address experts as well as end users, depending on the specific analyzed technology. This feedback influences the further exploitation focus of the technologies. Furthermore, target groups are defined and analyzed to identify possible unique attributes and selling points of the inventions.

By paying close attention to the specific user needs and through the thorough analysis of their feedback, market adoption is significantly increased or actually enabled. Technologies meeting no user demand must be examined closely, to see if further development is warranted or if the development direction should be altered.

5.3 Exploitation Joint Efforts

The commercial exploitation can only be fully successful, if all project partners are pulling in the same direction and deliver their committed results. All partners are extremely motivated and have pledged contributions to this end, as can be seen in the following sections:

5.3.1 EMC

EMC will use it´s Go To Market strategy to exploit and give visibility of the project in two different ways:

- Inside the company, at an international level, and using the different tools and mechanisms provide by the company to spread and share the objectives, best practices and results of the project between different groups that could take advantage of the initiative. Some examples of the internal use to be used can be:
  - EMC MARKETING
  - EMC COMMUNITIES
  - EMC Sales and Presales Community
  - EMC POWERKLINK (extranet)
  - EMC's Global Alliance network
- Outside the company, telling and sharing the story with our customers and partners with the objective of providing a real online/offline big data example and the capabilities of this kind of technologies.

5.3.2 ERICSSON

Ericsson exploits results of applied research projects in multiple ways:

- **Guiding product development** so that research outcomes are incorporated into existing or new Ericsson products and services;

  The aim of the Ericsson Spain Technology and Innovation group (the group leading the participation of Ericsson in the ONTIC project) is to cooperate closely with Ericsson's product units and other organizations (such as those in direct contact with

customers) that could be potential receivers of the outputs generated by ONTIC. The goal of this activity is to synchronize said outputs with the future needs of the Ericsson product portfolio (regardless of whether they are already in the development phase or in conception or early stages).

ONTIC addresses key research areas for Ericsson that later on could be incorporated to the product roadmaps so a close cooperation with product managers, system managers, development units, and other key people will be part of the day to day work.

To achieve this aim the following steps are proposed:

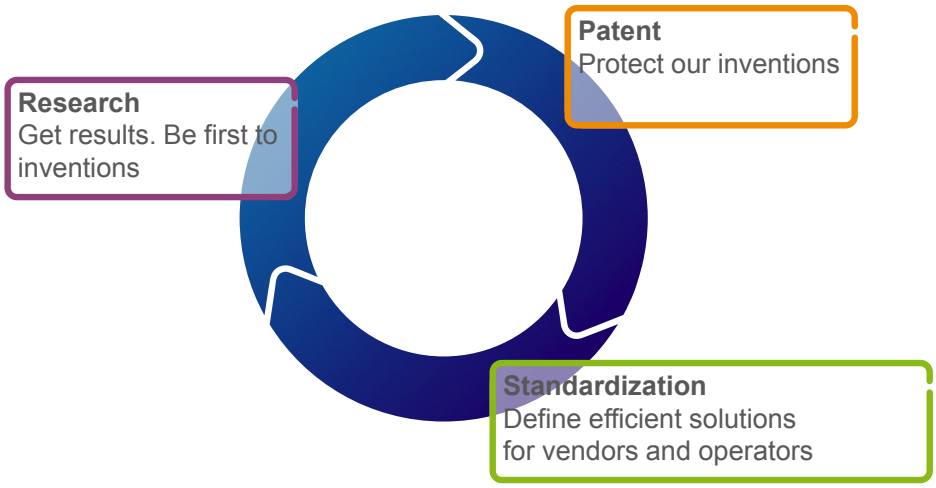
- Presentation of the ONTIC project objectives to key units within Ericsson:
    - Contact with engagement practices that are in contact with potential customers.
    - Close cooperation with Product Units in charge of the product evolution.
    - Close cooperation with Design Units and Operation Units.
- Participation in key decision forums to explain the advances done in the project and to get inputs from the units that later on could receive the results of the ONTIC project.

- Providing valuable input to **IPR Management and Standardization activities**.

  As a world's leading innovator in telecommunications, Ericsson supports its strong commitment to research and development with substantial contributions to various standards. Following Ericsson's policy, the Ericsson Spain Technology and Innovation Unit will identify, create, secure, and protect any result of ONTIC as long as it supports Ericsson's overall business goals (nowadays Ericsson has one of the industry's strongest intellectual property portfolios, which includes more than 35,000 granted patents worldwide and covers 2G, 3G and 4G technologies). Following the Ericsson's overall policies, when possible, IPR protection by means of patent application filing will be carried out only when Ericsson is the exclusive holder of the rights of an invention.

  In Ericsson, standardization is closely related to IPR management. In contrast with some industries in which patents are primarily used to exclude other companies from a market, patents play an active role in developing the telecommunications industry through standardization and licensing. Members of standardization bodies voluntarily commit to license any essential patents they hold on fair, reasonable and non-discriminatory –FRAND–terms. In practice, FRAND means reasonable accumulated Intellectual Property Rights (IPR) costs where the essential patent owners are compensated proportionally in relation to their technology contribution to the standard.

Figure 1: Ericsson approach to IPR Management and Standardization



Following Ericsson's policy, the Ericsson Spain Technology and Innovation Unit will identify any potential contribution to standards (either protected or not) and share them with the Ericsson decision makers within the Ericsson product management organization. If aligned with the product strategy, appropriate contributions will be created and contributed to standards through Ericsson's network of standardization delegates.

- Improving own knowledge capital by **incorporating knowledge transferred from project partners to the company's own knowledge base**
  - Online and Offline Big data analytics are features that will be key areas in the following years. Being in contact with top university groups and research centers within the project is key for Ericsson. The knowledge capital will be incorporated within the related product units as follow:
    - Showing Proofs of Concept to relevant product units and key people.
    - Internal dissemination of key concepts and research activities.
    - Internal papers and posts in relevant internal blogs to explain the main achievements generated by the project.
    - Being active in internal Big Data discussions and groups explaining the main achievements.

  As a summary, The Ericsson team involved in the activities within the project will push internally to spread the knowledge generated within the project to the rest of the company, both at national and international level.

Specifically, an online network traffic characterization system will be proposed as Proof of Concept.

5.3.3 SATEC

SATEC is a Spanish multinational that integrates highly specialised technological solutions in advanced services associated with diverse advanced engineering technologies. SATEC cooperate with its clients to innovate their processes, resources and technologies thereby contributing to change, productivity and business competitiveness. Thus the exploitation strategy will focus on its SATEC their current customers divided into two groups: telecommunication operators and other clients in need of massive data analysis (the latter corresponding to sectors such as healthcare, government, environment, etc.).

Taken into account the different groups of potential customers SATEC will exploit the results of the project in three different ways:

- Improving the services provided for SATEC such as OSS (Operating Service Support) in customer networks incorporating new algorithms to characterize traffic, to detect network attacks, etc.).
- Incorporating and improving new "Big Data" methods in order to ensure the scalability of processes which manage big datasets.
- Defining and propose new Big Data applications for different areas such as: e-health, government, energy/environment, telco's, etc. In which SATEC usually works.

SATEC will update its Big Data solution portfolio (services, products and projects) incorporating the last technologies and tools used during development of ONTIC project.

5.3.4 ADAPTIT

Based on the acquired knowledge and prototype results, ADAPTIT will form a presales/sales plan involving direct customer presentations and pilot projects aiming in its current and prospect clients in EMEA region.

ADAPTIT plans to further develop and incorporate the outcome of this project into their Analytics portfolio. Thus as of Q1 2016 their sales/presales managers will receive targets on generating interest from their customers about the outcome of the project and consequently of its deriving product. ADAPTIT's sales people will arrange meetings with C-level executives. They already have contacts from the following existing/potential customers:

- Deutsche Telekom Group - Greece, Albania, Macedonia, Romania, Bulgaria
- Vodafone Group - Italy, Albania, Greece
- Etisalat Group - Dubai, Abu Dabi, Egypt (depends on political situation)
- MTN Group - South Africa, Cyprus
- Orange Group - Bulgaria, Armenia, Jordan
- MTS Group - Armenia, Russia
- First Data - Germany, Greece, UK

These meetings if fruitful will be followed with more technical presentations with the technical managers of these organizations with proposals for pilot projects and at least one FOA (First Office Application), where ADAPTIT will bear the cost of the pilot project for a predetermined period of time (typically one or two months).

5.3.5 CNRS

The CNRS' exploitation plan during the ONTIC project takes part in two directions:

1) We first want to find new research directions: CNRS, and especially the SARA TEAM of the LAAS laboratory has been long involved in advanced networking research. It was one of the pioneering team in network measurement and monitoring, as well as on the use of data-mining and machine learning for issuing autonomous mechanisms for anomaly detection, network and traffic management, QoS management, etc. CNRS has strong skills in traffic traces analysis, characterization and modeling. But, it never had access to big traffic traces. Participating to the ONTIC project then opens the possibility to work on big traces, and to the possibility to propose data mining and machine learning techniques suited for big data analysis in real-time (online). CNRS expect to find new research directions in the framework of big traffic data analysis, in an autonomous, real time and scalable way for the benefits of network and traffic management, network security, QoS, etc.
2) Based on these new research directions and thanks to results obtained in ONTIC (published in major journals and conferences), CNRS plans to prospect for new academic and industrial partners for future research projects based on skills and results gained in ONTIC.

5.3.6 POLITO

POLITO exploitation objectives are the following:

- Contribute with publications of the scientific results in journals such as IEEE Transactions On Knowledge and Data Engineering and ACM Transactions on Knowledge Discovery. Also we expect to contribute to specific purpose conferences such as IEEE BIG DATA.
- Projects: Use ONTIC as base platform for research on novel Big Data algorithms and data mining techniques in H2020 or national projects (e.g., PRIN).
- Teaching in Degree:
  - Introduction of ONTIC results on the degree on Computer Engineering, chaired by Prof. Elena Baralis, both in practices and theoretical lectures.
  - Exploitation of ONTIC by students for completing their Degree Final Project.
- Master and PhD: Inclusion of ONTIC topics and results in PhDs coursed offered by the DAUIN Department.
- Transfer to industry: Use ONTIC to increase awareness among industry and professionals.

5.3.7 UPM

UPM as an academic institution focuses on non-profit exploitation activities. In accordance with this profile, UPM exploitation will primarily consist in leveraging the ONTIC platform and the knowledge and experience acquired from the ONTIC project in future R&D projects.

The knowledge obtained in the ONTIC project will be exploited through the following activities:

- Publication and dissemination of project results. Publication and presentation of project achievements and research results in renowned technical journals and conferences. We will continue to elaborate the ONTIC platform through PhD and

master theses work and publish and present these results. (time schedule : 12 months).

- Postgraduate courses. The results of ONTIC will be used in courses and seminars. (time schedule : 24 months)
- Master and PhD theses. We will propose master theses related to ONTIC and attract students to these in the next years. (time schedule: 24 months).
- Further research and development. Opening of new research areas extending project results and finding synergies and collaboration opportunities in future projects and applications, both at the regional and the international level (time schedule: 3-5 years).

Additionally, UPM will explore the following pre-commercial activities:

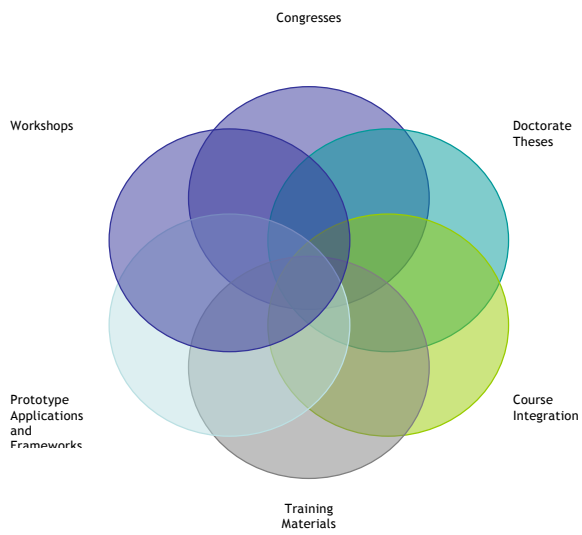
- Options to secure IP generated within the project and launch and incubate spin-offs or license the IP, all with the ultimate goal of introducing innovative services and/or products into the market.
- Dissemination of ONTIC results as an open source framework for high scalable online and offline analytics. This framework can be used in other application domains (e.g. bioinformatics, social sciences, financial, etc.).

5.4 Ongoing Process of Exploitation

From the start of the project, exploitation will play an important part in the project and in a way, it already has: Even from the outset, during project formation and partner search, the many results and their proper implementation have always - and continue to have - very high priority on the agenda, which shows in the top-tier industrial partners and the special, sector-specific technology transfer knowledge brought on board.

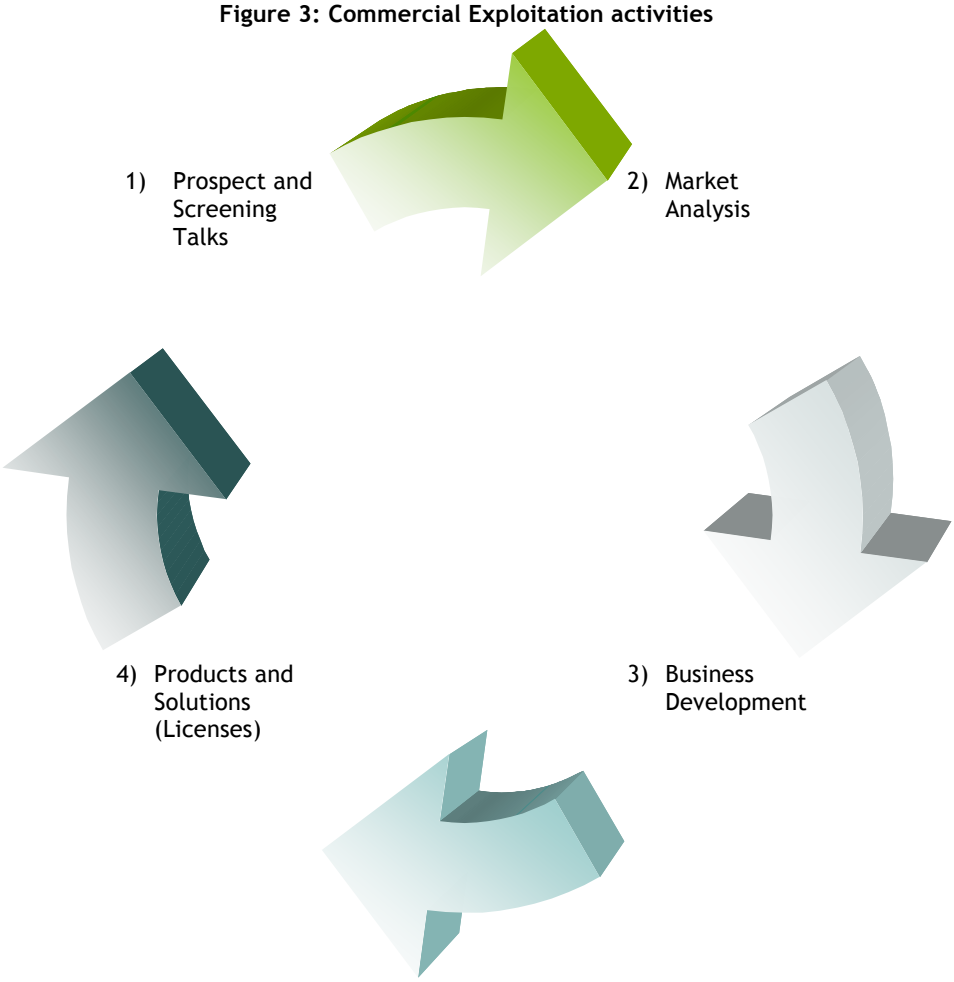
To adequately continue this process, a series of measures will ensure that the different exploitation aspects - scientific and commercial - receive adequate treatment. On the scientific side these include publications, speeches and talks in congresses and workshops, doctorate theses and course integration, as well as training materials, posters, stands and functional prototype applications and frameworks.

Figure 2: Scientific Exploitation activities



On the commercial side, the major industrial partners are certain that they will directly use the developed technologies in next-generation products and processes. For universities and those SMEs in need of it, a proven process will be enacted to transfer the technology to commercial application, starting with screening talks and covering IPR management, market analysis, business development and license negotiation. A dual-pronged approach is used to streamline the technological development as well as keep it in sync with the technology transfer process, so that shorter times to market can be reached and usual innovation transfer problems can be alleviated.

Figure 3: Commercial Exploitation activities



A special focus of the ONTIC model is on remedying the so-called “valley of death” – the phase between finished research activities and market adoption. Throughout the runtime of the project, many activities are conducted to ensure that the existing exploitation potentials are actually realized - from active marketing of the results to hands-on business development and proactive securing of additional funding, both public and private.

Commencing with the project will be the outreach to key stakeholders and decision-makers (through external member group, targeted dissemination and networking) as these are vital to any further and lasting use of the technologies, whether in science or in industry.

Of course, the effectiveness of all these activities will be continuously measured, so that the work can be steered towards the most beneficial actions or areas. Lacking areas can be identified quickly and counter measures can be introduced. The following chart gives an overview over the key performance indicators (KPIs) and explains them:

Table 2: Key Performance Indicators for project exploitation

Area	KPI	Estimated value (thereof guaranteed)	Explanation	Partners' contribution
Screening	Number of screening talks	20 (10)	Personal talks with the involved researchers to find out about current activities and stimulate idea disclosure notices.	EMC = 1 (1) ERICSSON = 2 (1) SATEC = 1 (1) ADAPTIT = 1 (1) CNRS = 5 (3) POLITO = 5 UPM = 5 (3)
	Validated Use cases	8 (3)	Ideas for a practical application of the technology.	ADAPTIT = 3 (2) CNRS = 2 (1) POLITO = 2 UPM = 2 (1)
	Business ideas	8 (4)	Specific idea for a business based on the new technology to be presented at the EUG meeting.	ERICSSON = 1 ADAPTIT = 3 (2) CNRS = 1 (1) POLITO = 1 UPM = 2 (1)
Valorization	Patent applications	3 (3)	Number of patent applications.	ERICSSON 1(1) UPM = 2 (2)
	Prototypes	3 (3)	Working prototypes; if no prototypes can be produced, technologies are too far from market.	3 Use Cases = 3 Prototypes
	Co-operation / license agreements	2 (2)	Agreements between research institutions and partners outside the project.	ADAPTIT = 1 (1) UPM = 1 (1)
	Initiated start-up proposals	2 (1)	Plans for the establishment of a new business.	ADAPTIT = 1 (1) UPM = 1 (1)

Area	KPI	Estimated value (thereof guaranteed)	Explanation	Partners' contribution
Contacts	Outreach to new R&D partners	50 (10)	Additional scientific contacts.	EMC = 3 ERICSSON = 5 (1) SATEC = 3 ADAPTIT = 2 CNRS = 10 (3) POLITO = 12 (3) UPM = 15 (3)
	Outreach to new industrial partners	20 (10)	Additional industrial contacts.	EMC = 3 (2) ERICSSON = 3 (1) SATEC = 5 (2) ADAPTIT = 3 (2) CNRS = 2 (1) POLITO = 2 (1) UPM = 2 (1)
	Outreach to different user groups	4 (4)	Contact to different user groups in the scope of market or case studies.	EMC = 1 (1) SATEC = 1 (1) POLITO = 1 (1) UPM = 1 (1)

Previous KPI estimated values have been set by the partners as reasonable and reachable goals according by their expertise and knowledge in these fields. Independently of estimated values for each Indicator a minimum guaranteed value has been set for each KPI.

In the cases in which KPIs could not be met the partners will agree the necessary actions to maintain the exploitation expected success.

5.4.1 Verification of project objectives

In order to verify compliance with the objectives of the project and its success, a set of quantitative indicators has been defined.

These indicators are the Key Performance Indicators (KPIs) which will be used as metrics for the verification of the project success.

The following table contains all the indicators with explanations, target figures and partner contributions.

Table 3: Key Performance Indicators for project success

Activity/Event	Indicator	Target	Partners' contribution
Publicity / Promotion campaign and awareness creation	Number of non-scientific publications (articles, press releases...)	12	UPM = 3 POLITO = 2 ADAPTIT = 2 SATEC = 2

			CNRS = 1 ERC = 2
	Updated web portal	Monthly	UPM will be in charge of this
	Participation in Scientific Conferences, including a paper that is presented here	5	UPM = 2 POLITO = 2 CNRS = 1
	Stakeholders workshops	2	SATEC = 2 (In house demonstrations and presentations for potential customers)
	Participation at industrial conferences to present ONTIC outcomes to industry (e.g. with exhibition booth or presentation)	5	ADAPTIT = 3 CNRS = 2 UPM = 2 POLITO = 1
Scientific dissemination	Publication of ONTIC articles in scientific journals, technical reports and papers	15	UPM = 5 POLITO = 6 CNRS = 4
Support of Standardization	Active participation in standardization meetings (3GPP, IETF, 3rd ITU) including input papers from ONTIC	3	ERC = 2 ADAPTIT = 1
	Roadmap of key standards and industry bodies and their planned development and relation to FIArch	1	UPM=1
Community networking	Concertation meeting side workshops	3	UPM = 1 CNRS = 1 ERC = 1
	Active participation at Commission concertation activities	6	UPM = 6
	Face to face meetings with external Standards Development Organizations (SDOs) / industrial alliances	10	UPM = 3 CNRS = 1 ERC = 2 EMC = 1 SATEC = 1 ADAPTIT = 2
	Project cooperation with other EU projects with joint events like experiments, common presentations and workshops	3	POLITO = 2 CNRS = 2 ERC = 1

5.5 Exploitation after Project Completion

After the project has ended, its work and its results will continue to influence policy, business, science and society, whether through additional scientific or validation projects based on the

technologies, through new products, services or companies, through new or improved international standards and through better and previously impossible experiences for every citizen.

Major factors in sustaining the results will be, on the one hand, the availability of new business models that are made available through the implementation of the technologies, such as:

- Service providers for specialized streaming services
- Virtual network providers and operators
- Brokers and exchanges for networks and transmission time slots
- Specialized solution providers for network automation and self-organizing (configuration, optimization and healing) technologies.

On the other hand, reduced market entry barriers for a variety of offerings, are a point where the continued influence of the project will be felt. It is expected that these two factors provide a key stimulation of commercial activity throughout Europe and worldwide, with European companies as first movers – they are most exposed to the new technologies and thus have a head start.

The aforementioned new and interesting markets and the possibility to operate within them successfully will be proven by newly generated spin-offs, which build solutions based on the new technologies, thus providing examples for others and stimulating new ventures.

Overall, the programme will enhance the competitiveness of European firms on many levels, from lowered CAPEX and OPEX requirements, new IT and communication solutions, to new markets for new services and products. Additional standards, built on the work of the project, are expected to go into effect after project end.

The project will also offer rich possibilities for follow-up projects, be they in specialised practical development or in national validation-type programmes. The public partners also see the possibility of applying for additional basic research grants from their individual states. Additional research potential also arises out of the co-operation with industrial partners, for which the project can lay the groundwork.

To facilitate easy access to the results, the project website will be maintained for at least 2 years after the end of the project.