



D7.3 Dissemination and Communication Report II

Project Acronym	SONATA
Project Title	Service Programming and Orchestration for Virtualized Software Networks
Project Number	671517 (co-funded by the European Commission through Horizon 2020)
Instrument	Collaborative Innovation Action
Start Date	01/07/2015
Duration	30 months
Thematic Priority	ICT-14-2014 Advanced 5G Network Infrastructure for the Future Internet

Deliverable	D7.3 Dissemination and Communication Report II
Work Package	WP7 Exploitation, Dissemination, Standards and 5G Collaboration
Submission Date	30 June 2017
Version	Version 1.0
Status	To be approved by EC
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Deliverable Type		
R	Document	X
DEM	Demonstrator, pilot, prototype	
DEC	Web sites, patent filings, videos, etc.	
OTHER		
Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

Executive summary

This report summarizes the communication and dissemination activities undertaken under SONATA WP7 during the second year of the SONATA project, from the 1st of July 2016 to the 30th of June 2017.

The report starts with the presentation of the communication and dissemination plan defined by the consortium at the beginning of this second year. This includes: an analysis of the performance of the project in Y1 in order to identify weaknesses and strengths and introduce the adequate corrective actions in the Y2 plan; a review of the target market and the communication and dissemination goals of the project; a description of the marketing tools and channels to be used in Y2 and the activities planned for each of them; and, finally, the control mechanisms used by the project to ensure the success of the plan.

After the communication and dissemination plan for Y2 is presented, we detail how it has been executed and the main results and achievements of the project during this period.

Then, the comparison of these results with the activities and the KPIs we committed to reach at the beginning of the project, give a clear idea of the success of the defined communication and dissemination plan.

We finish the report with conclusions and next steps for the last six months of the project.

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1. Introduction

1.1 Deliverable purpose

This report summarizes the communication and dissemination activities undertaken under SONATA WP7 during the second year of the project, from the 1st of July 2016 to the 30th of June 2017.

1.2 Document organization

The deliverable is organized in the following manner:

- Section 1 (this section) is an introduction to the deliverable.
- Section 2 presents the SONATA's communication and dissemination plan drafted by the consortium at the beginning of year two.
- Section 3 provides information about how the communication and dissemination plan described in section 2 has been executed during this second year of life of the project. Detailed information is provided channel by channel.
- Section 4 is a scores table of all the KPIs defined for SONATA related to communication and dissemination.
- Section 5 provides conclusions and planned next steps.

1.3 List of acronyms

Acronym	Definition
3G	"3rd Generation" Networks
3GPP	3G Partnership Project
5G	"5th Generation" Networks
5GArch	5G Architecture
5G IA	5G Infrastructure Association
5GMan	Management of 5G Networks
5GPPP	The 5G Infrastructure Public Private Partnership
ACM	Association for Computing Machinery
ANIMA	Autonomic Networking Integrated Model and Approach
API	Application Programming Interface
BBF	BroadBand Forum
CCGrid	Cluster, Cloud and Grid Computing
DevOps	Development & Operations
DMTF	Distributed Management Task Force
DoW	Document of Work
DX.Y	Deliverable #.# (e.g. D7.1)

EC	European Commission
ETSI	European Telecommunications Standards Institute
EUCNC	European Conference on Networks and Communications
EVE	Evolution and Ecosystem
EWSDN	European Workshop on SDN
ICC	International Conference on Communications
ICDCS	International Conference on Distributed Computing Systems
ICN	International Conference on Networks
ICT	Information and Communication Technologies
IEEE	Institute of Electrical and Electronics Engineers
IEEE IM	IEEE Integrated Network and Service Management
IETF	Internet Engineering Task Force
IFA	Interfaces and Architecture
IRC	Internet Relay Chat
IRTF	Internet Research Task Force
ISG	Industry Specification Group
IISOMI	Informal Inter-SDO Open Model Initiative
ITN	Initial Training Project
ITU	International Telecommunication Union
ITU-T	ITU Telecommunication Standardization Sector
ITU-T IMT2020	ITU-T International Mobile Telecommunication system for 2020 and beyond
KPI	Key Performance Indicator
MX	Month # (e.g. M2)
MANO	Management and Orchestration
MEF	Metro Ethernet Forum
NetSoft	Network Softwarisation
NFV	Network Function Virtualization
NFVRG	Network Function Virtualization Research Group
NSD	Network Service descriptor
OAM	Open Access Manager
OASIS	Organization for the Advancement of Structured Information Standards
ONF	Open Networking Foundation
OPNFV	Open Platform for NFV
OS	Open Source

OSM	Open Source MANO
PoP	Point of Presence
PPP	Public Private Partnership
R&D	Research and Development
R&I	Research and Innovation
REL	Reliability
RG	Research Group
RNDM	Resilient Networks Design and Modelling
SDK	Service Development Kit
SDN	Software Defined Networks
SDO	Standards Development Organization
SEC	Security
SEO	Search Engine Optimisation
SIGCOMM	Association for Computing Machinery's Special Interest Group
SLA	Service Level Agreement
SOMA	NFV Service Development and Operations for the SONATA MANO Platform
SP	Service Platform
TX.Y	Task #.# (e.g. T7.1)
TMF	TM Forum
TOSCA	Topology and Orchestration Specification for Cloud Applications
TSC	Technical Steering Committee
TST	TeSTing, experimentation and open source
UK	United Kingdom
USA	United States of America
VNF	Virtual Network Function
WG	Working Group
WPX	Work Package # (e.g. WP5)
YX	Year # (e.g. Y2)
YANG	Yet Another Next Generation

Table 1: List of Acronyms

2. SONATA communication and dissemination plan for year 2

During the first months of the second year of the project, SONATA's communication and dissemination plan was updated, following the recommendations received at our first review meeting in September 2016.

The first step was to analyse the performance of the consortium in relation to communication and dissemination activities during the first year of the project. This analysis basically consisted of searching our own hearts regarding what we were doing and if we were doing it well with the main goal to identify areas that required improvement.

Both, objectives and target market, were also revisited again in order to make sure that we updated our communication and dissemination strategy on solid pillars that let us to achieve the biggest impact possible with the project results.

Taking into account the results of this analysis and also the activities and the KPIs that we had previously committed to, we defined our general marketing strategy for year two and worked on an action plan which was then agreed and approved by all partners at the following project plenary meeting that took place in Porto in November 2016.

2.1 Year one performance analysis

During year one, the project website, scientific publications and participation in events were the main communication and dissemination instruments utilised to spread SONATA's results, while a more moderate use was made of the rest of the channels. In the following sub-sections, the use of all these channels is analysed in more detail.

2.1.1 Website [1]

SONATA's web held a major role in the dissemination & communication plan during year one. An initial version of the SONATA website was launched during the first month of the project. Then, other upgrades were planned as follows:

- M1: Initial launch with a static web page.
- M3: First major upgrade with the architecture and uses cases inclusion.
- M7: Second major enhancements with the launch of a complete website structure.

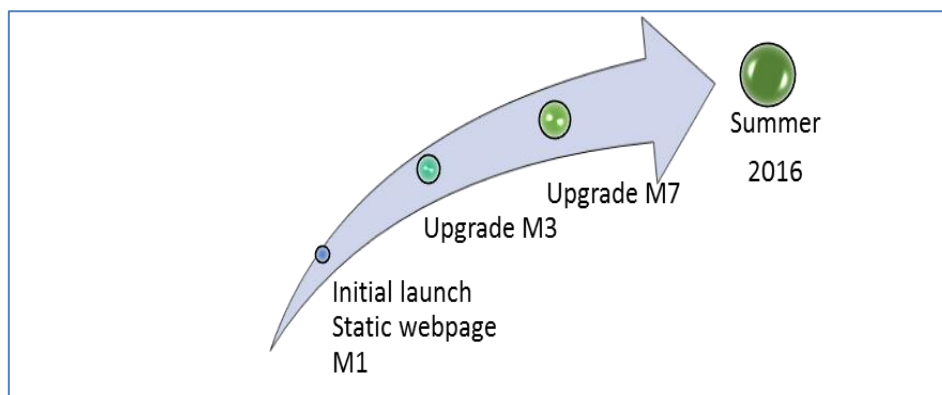


Figure 1: SONATA Website evolution in Y1

Although the overall quality of the website was good after taking into account the year one improvements, there was still room for improvement. For example, a new major upgrade to host the source code and all the related technical documentation was required.

In addition, the project recognized that the use of the website blog and the news section could be also improved.

2.1.2 Social media

SONATA's twitter account [2] and website blog [3], were the only social channels used to promote SONATA during this first year. Their use was also moderated.

We identified the need for improving our presence on social media platforms. The identified improvement was in terms of number of channels and activities, as well as the quality of the content provided.

2.1.3 Newsletter

This channel was not used by the project in year one. The plan was to start making use of it from year two, from the announcement of the first software release.

2.1.4 Supporting Materials

During year one, supporting materials were created with the intention of providing visual reinforcements to the SONATA agenda and to the representatives of the member companies as they promoted the project at various venues:

- 2 **posters** highlighting the architecture and innovations in MANO of SONATA solution.
- A modular, evolving **slide deck** that partners could use as a basis for presenting SONATA.

2.1.5 Publications

Regarding publications, the activity of the project during the first year was quite intensive:

- 8 conference publications submitted, 5 of them already accepted, published and presented.
- 2 transactions publications + 2 journal publications.
- 1 ITU-T recommendation + 4 contributing documents within ITU-T IMT2020 context.
- 2 white papers.

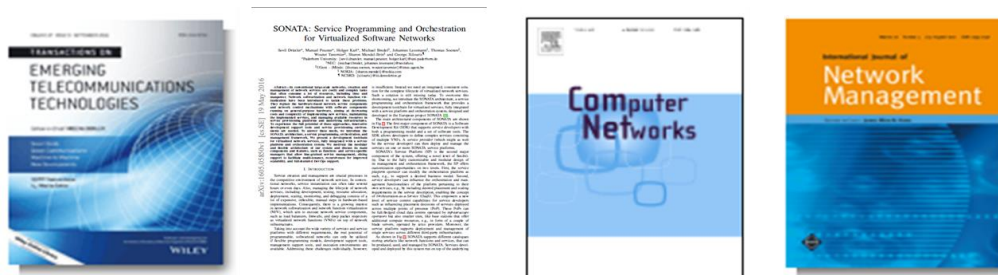


Figure 2: SONATA publications in Y1

2.1.6 Events

During its first 12 months, SONATA left tracks on different countries all over the world. Belgium, Germany, France, UK, Ireland, Sweden, Greece, USA, China, Korea are only some of the countries where the project was represented through the attendance and participation of the consortium partners in industry events, international conferences and workshops, standards organizations meetings, academic workshops, summer schools, etc.

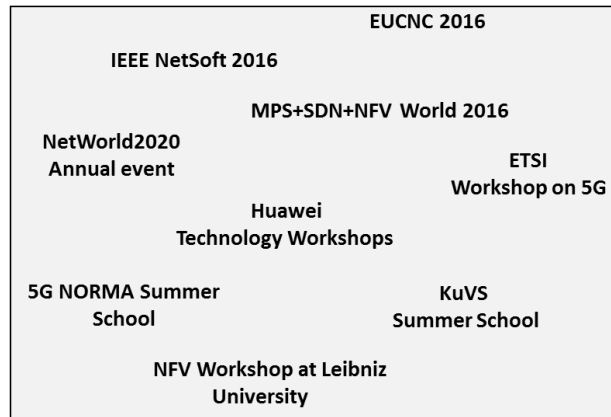


Figure 3: SONATA participation in events in Y1

2.1.7 Collaboration

2.1.7.1 Standards bodies organizations

In year one, we didn't just identify and address the key SDOs for the project, we also active participated in some of them. Special mention deserves to be given to the following: ETSI NFV, ITU, IETF/IRTF and TM Forum.

2.1.7.2 Open Source communities

The project activity in relation to open source communities was important last year because of the identification and engagement with the most relevant open source communities for the project: OpenStack, OSM and OPNFV.

2.1.7.3 5G PPP collaboration

➤ **5G PPP Working Groups (WG)**

In year one, SONATA had an active participation in two 5G PPP WGs:

- **Software Networks WG**, formed by 12 projects and co-chaired by SONATA.
- **Architecture WG**, constituted by 14 projects and where SONATA had an important role with contributions from several representatives.

➤ **5G PPP Projects**

During the first year of the project, we focused on identified those projects addressing goals aligned with SONATA's in order to start collaborations that could benefit both projects. Initial conversations took place with 5G-Exchange project [4].

2.2 Objectives

2.2.1 Project objectives

SONATA's objectives were identified at the beginning of the project and they have not changed since then. As a reminder for the reader, we list the core objectives here:

- **Reduce time-to-market of networked services:** SONATA streamlines development with abstract programming models, an SDK and a DevOps model that integrates operators, manufacturers and third-party developers. It also supports the full service lifecycle: development, testing, orchestration, deployment, management and operations.
- **Optimize resources and lower costs of service deployment and operation:** SONATA orchestrates complex services to connectivity, computing and storage resources, and automatically reconfigures running services.
- **Accelerate industry adoption of software networks:** The project results are available in a GitHub public repository under a permissive open source license (Apache v2.0) for full rights of modification and distribution. Among the many reasons that support this open source strategy we can highlight: 1) uptake maximization and 2) easy integration into larger solutions.

2.2.2 Communication and dissemination objectives

The communication and dissemination objectives, identified at the beginning of the project, haven't changed either and they are still valid.

These are the main goals for the period M13-M24:

- Achieve measurable impact through the successful penetration of SONATA results towards stakeholder communities.
- Create ongoing and valuable engagement with telco industry stakeholders as well as other open source communities strategic to SONATA.
- Encourage stakeholders to follow, evaluate, adopt and extend SONATA's open-source results.

2.3 Target market

SONATA's communication and dissemination plan aims to create measurable impact through proactive outreach to identified stakeholders, as well as the general public outside of the technical knowledge of the project in order to expand the project's goals and results to a wider audience.

2.3.1 Dissemination: SONATA stakeholders

SONATA stakeholders were identified in deliverable D7.5 Market Feasibility Study [5] released in Y1 of the project. In that deliverable, we also explained in detail how NFV has caused disruptive shifts for all actors in the classic telecommunications value chain along with their respective business models and how it has also opened the door to new actors.

As we described in D7.5, echoing the wide impact of NFV, SONATA aims at the whole value chain of the telecom sector and also expands in order to reach other groups and communities that are critical to create the widest impact possible with the project results. Figure 4 illustrates the simplified value chain of the SONATA project.

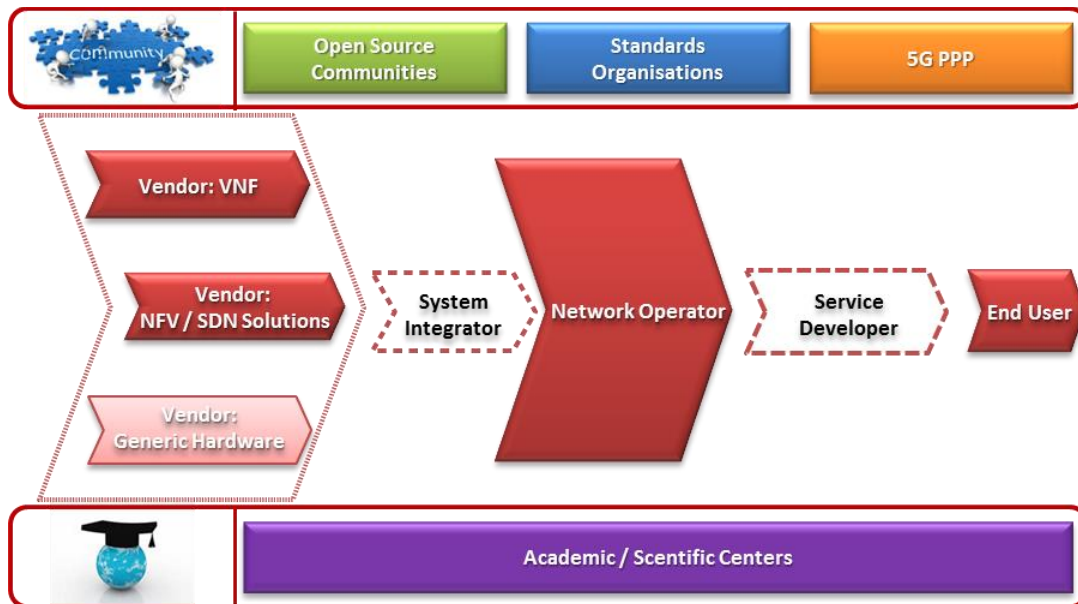


Figure 4: SONATA Value Chain

2.3.2 Communication: wider public

Communication activities above and beyond the peer-to-peer dissemination are targeted at all the above stakeholders, as well as at the general public and consumers outside of the technical knowledge of the project, thus expanding SONATA's goals and results to a wider audience. Both industry and academic partners are actively involved in carrying out these activities.

2.4 Marketing strategy

Taking into consideration the diagnostic of the situation, our goals and the target market we wanted to reach, we decided to adopt the following marketing strategies for each of the identified phases of our marketing plan:

	Awareness (M1-M30)*	Community building (M1-M30)	Feedback/ Evaluation (M12-M24)	Early uptake (M24-M30)
Website	X	X	X	
Social media	X	X	X	
Content marketing	X	X		
Participation in events, workshops, conferences, etc.	X	X	X	
Publications	X	X	X	
Presence in Press and Media channels	X			
Use of video marketing	X			
Mobile marketing (Responsive design website)	X			
Marketing material	X			
Presence in the Academia (winter/summer schools, projects, masters, PhDs, etc.)	X	X	X	
Networking and collaboration with strategic communities (5G PPP Projects/WGs, OS Communities, SDOs)	X	X	X	
Email marketing (Newsletter)		X	X	
Demos		X	X	X
Public repository support		X	X	X
Developer advocacy sessions		X	X	X
Process for external contributions		X	X	X
Interviews			X	X
Easy and automated installation			X	X
Installation videos			X	X
Tutorials and good technical documentation			X	X
Public repository support			X	X
Pilots				X

Table 2: Marketing tools used by SONATA

*Although the initial idea, according to the DoW, was that this phase covered only the 12 first months of the project, the consortium agreed that this activity should extend during the lifetime of the project.

2.5 Action plan

In order to successfully execute our marketing strategy, the consortium decided to follow an action plan based on the table of activities and KPIs we committed to achieve at the beginning of the project and shown in Table 3. That plan is detailed in the sections below.

Outreach Activity	KPIs
Web Campaign	
Project Website	≥ 5000 visits
Social Media Campaign	≥ 2 social media channels used regularly, including Twitter and LinkedIn
Project updates on partners' websites	= 15 (all) partners posting to company related portal ≥ 2 posts/partner
Press and Media Channels	
External Media Channels	≥ 5 external media channels covering the telecom sector
Project Press Release	≥ 100 downloads via website ≥ 5 external media covered
Online publishing, blogs, online magazines and newspapers	≥ 20 publications
Project Newsletters	≥ 100 recipients per 2 issues each period ≥ 50 people reported back/asked
Demonstrations	
Demonstrations	≥ 10 demonstrations online and face to face ≥ 50 organisations
Tutorials and developer advocacy	≥ 10 sessions ≥ 100 attendees
Events, Workshops and Conferences	
Presentations	≥ 10 presentations and ≥ 50 organisations
Organization and/or attendance to conferences/workshops/events	≥ 8 events ≥ 300 participants
Publications	
Open Access publications	≥ 10 publications
Reports and other Documents (public)	≥ 20 public documents (including deliverables)
Whitepapers	≥ 2 whitepapers
Collaboration	
Contribution to Standards	≥ 2 working groups – active collaboration
Involvement in Open Source communities	≥ 2 communities (OpenStack, OpenNFV, etc)
Organization of 5G PPP cluster activities with other projects	≥ 4 projects
Material (Online and Printed)	
Project Flyer, Booklet, Poster, etc.	≥ 1000 recipients (online +printed) ≥ 10 events distributed ≥ 2 posters, multiple events

Table 3: Communication activities and KPIs

2.5.1 Website

1. The Y1 version of the website needed to be renewed. This included a new structure to allocate all the projects outcomes, open source code and related documentation included.
2. The website had to constantly be updated and fed with new and fresh content through:
 - ✓ The publication of blog posts, news, deliverables, project presentations, publications, etc.
 - ✓ The “Software” section, with information regarding new releases, technical documentation, guides of installation, demonstrations, etc.

2.5.1.1 Blog

All partners agreed about the need to take more advantage of this channel by providing information of interest for our target market. Suggested potential topics were: NFV or any other new related technologies, general information about the telecom industry, specific topics related to the project, etc.

We also committed to publish, at least, one blog post per month, one per partner. For that, we created and agreed to follow the calendar shows in Figure 5:














Year 2	December 2016 	January 2017 	February 2017 	March 2017 
	April 2017 	May 2017 	June 2017 	
Year 3	July 2017 	August 2017 	September 2017 	October 2017 
	November 2017 	December 2017 		

Figure 5: SONATA Blog Post Calendar

2.5.1.2 News [6]

The same happened with the website's "News" section. We all agreed on the events that were candidates to trigger the publication of news:

- Deliverables
- Software releases
- Blog posts
- Newsletters
- New videos in our YouTube Channel
- Project publications
- Project presentations
- Participation in events, meetings, workshops, etc.
- Project meetings
- Web relevant updates
- Any other topic of interest for our audience

2.5.2 Partners websites

All partners committed to provide and execute an individual plan in relation to the promotion of SONATA on their organisations' websites. The idea was to accomplish the KPI below:

Project updates on partners' websites:

- =15 (all) partners posting to company related portal
- >= 2 post/partner

2.5.3 Social media

We all agreed that we needed to increase our presence on social media through the use of new channels, more proactive and frequent use of them and providing more valuable content for our audience.

These are the new channels proposed and suggested use:




Channel	Use purpose	Frequency of use
Twitter	<ul style="list-style-type: none"> • Content Marketing (own and third-parties content) • Project news 	2-3 posts/working day
LinkedIn 	<ul style="list-style-type: none"> • Blog posts • Deliverables • Publications • Project presentations • Software release announcements • Participation in events 	On demand
ResearchGate 	<ul style="list-style-type: none"> • Blog posts • Deliverables • Publications • Project presentations • Software release announcements • Participation in events 	On demand
YouTube 	<ul style="list-style-type: none"> • Video marketing • Project videos centralization: <ul style="list-style-type: none"> ▪ Installation videos ▪ Demos ▪ Presentation in events ▪ Etc. 	On demand

Table 4: SONATA's social media channels and use

2.5.4 Newsletter [7]

The consortium agreed to keep this channel for making important announcements of the project, for example, the delivery of new software releases.

This was the initial calendar proposed:

- M15: First software release announcement.
- M20: Second qualified release announcement.
- M25: Year two summary.
- M26: Final qualified version announcement.
- M30: Year three summary. End of project.

- Any other exceptional event.

The tool used to create and send the newsletter would be MailChimp [8], a free web tool that allows send marketing emails, automated messages, and targeted campaigns used by more than 15 million people and businesses around the world.

The newsletter would go out to all members in the SONATA distribution list (i.e. project members) who would then distribute it within their networks for greater exposure. It would also be promoted through the website's news section and all other social media channels. All newsletters would be available at any time on the newsletter section on the website, from where the user could also subscribe to it.

2.5.5 Supporting materials

In relation to supporting materials, we all agreed that the most interesting thing for the project in Y2 was to create a nice project brochure that could be used in events, conferences, etc., as well be shared through the partners' network and our different social media channels to promote the project.

2.5.6 Publications

As mentioned earlier, publications were one of the main channels used by the consortium to disseminate the project results during the first year of the project. The activity here was intense, so the goal for year two was to keep this track and continue with the job started in Y1.

2.5.7 Events/demos

Together with publications, events were one of the channels that the consortium used the most in year one, with the participation in a total of nine events, more than expected for a first year of life of a project. The goal for year two was to keep that record, focusing our participation on demos and more practical sessions developers-oriented, now that we had our first prototype of software to show.

2.5.8 Collaboration

Collaboration with standards bodies, open source communities and other 5G PPP projects are three of the basic pillars of the project impact strategy. In the following subsections we describe the plan agreed to promote that collaboration.

2.5.8.1 Standards organisations

Given the nature of standardization activities, the planned contributions to standardization bodies during the second year of the project would follow the same guidelines to the ones identified when the project started, with a few small adjustments to take into account changes in the target SDO landscape.

The main target bodies considered would be ETSI NFV, IETF and ITU-T, while monitoring others (MEF, TMF and 3GPP SA5) for potential opportunities. In addition, a couple of other fora were identified as connected with standardization, but not formally associated to a SDO yet: the multi-SDO coordination on NFV-based information models (IISOMI), and the proposal on Zero Touch Network Service Management.

The contributions intended to ETSI NFV would be associated with the issues being addressed by ongoing work-items, or those that were about to be initiated:

- Descriptor data models and package formats
- MANO security
- DevOps and continuous integration
- Network slicing
- Licensing matters
- VNF cloud nativeness
- Multi-domain issues

In the case of IETF (and IRTF) the plan was to contribute on:

- The Gatekeeper concept
- Data and information models, especially in relation with YANG
- Network-endpoint collaboration
- The initial discussions on 5G and slicing

In the case of ITU-T, the planned contributions would target the IMT2020 Focus Group, chartered to analyze how emerging 5G technologies would interact in future networks, and to publish these analyses in a Report to its parent group, ITU-T Study Group 13.

Other SDOs were considered although, given the project timeframe and resources, the plan would be to monitor them and take an active participation role just in case a clear opportunity to influence the process showed up:

- MEF and TMF announced a joint effort on an API for network service orchestration
- 3GPP SA5, starting to consider 5G service management

There were a couple of other initiatives that, at the beginning of the year, had an interesting potential for project contribution, though they were not formally taken the shape of a SDO, either by themselves or as part of a hosting organization:

- The multi-SDO initiative on information modeling (also referred as IISOMI), a joint collaboration initiative of BBF, DMTF, ETSI, IETF, ITU-T, MEF, ONF, TMF, open to collaboration with other SDOs, and focused on harmonizing information models and avoid points of friction among the different participating SDOs.
- The so-called Zero-Touch Network Service Management, initiated in a gathering of service providers, equipment manufacturers, and management software developers, with the goal of taking advantage of the additional degrees of freedom supported by SDN and NFV to achieve automated service management.

[2.5.8.2 Open source communities](#)

Our collaboration strategy would target the open source communities which we began collaborating with them in year one. We would focus on OSM and OpenStack Tacker project due to the synergies with SONATA and the networking through our partners within those organisations.

2.5.8.3 5G PPP Collaboration

➤ **5G PPP Working Groups**

In year two, SONATA would keep its active collaboration in the **Software Networks** and the **Architecture** WGs as in year 1. The plan was to get involved with our main targets being the **Security** and the **Network Management** WGs.

➤ **5G PPP Projects**

During this year, the project would try to improve collaboration with other 5G PPP projects. In this regard, we would continue the relationship with 5G-Exchange and open new opportunities with, at least, three other projects. The goal is to achieve the KPIs regarding “Organization of 5G PPP cluster activities with other projects” that we established at the beginning of the project.

2.5.9 Other press and media channels

The consortium agreed about the convenience of creating a press release with the delivery of each of the major software releases in M13, M20 and M26. These press releases, once created by the communication manager, should be then approved by each individual organization in the consortium who, besides, would promote them as much as possible using their own individual channels. The goal was to reach the widest coverage possible using internal and external media channels. The press releases would also be available on the project website for reading/downloading at any time [9].

All projects announcements / outcomes / publications would be also echoed using all the existing channels provided by the 5G PPP.

Our content marketing strategy would also facilitate the promotion and spread of the project results in other press and media channels.

2.6 Control mechanisms

As we have already mentioned, SONATA’s initial impact plan was accompanied by a set of KPIs to add quantitative metrics to the campaign.

This table of KPIs for each of the outreach activities on which we had also based our communication and dissemination plan for Y2 would be the anchor to determine the progress of our plan. In each of the plenary meetings, there would be a session to analyse our communication / dissemination performance in relation to the KPI table. During the session, and based on the analysis, we would agree and adopt the appropriate corrective measures when required.

3. Y2 communication and dissemination plan execution and results

3.1 Website

3.1.1 Upgrades

In this section, we describe the main activity performed in Y2 in relation to the SONATA's website:

SUMMER 2016: Major upgrade

1) New structure and content, giving top priority to the creation of two new sections:

- **Software:** to host the source code and related documentation.

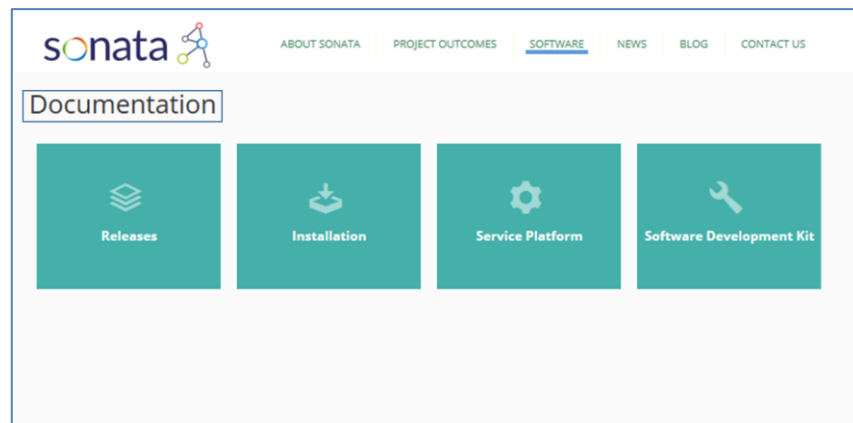


Figure 6: SONATA website - software section

- **Project outcomes:** a reference point for all the other project outcomes (deliverables, marketing material, publications, etc.).

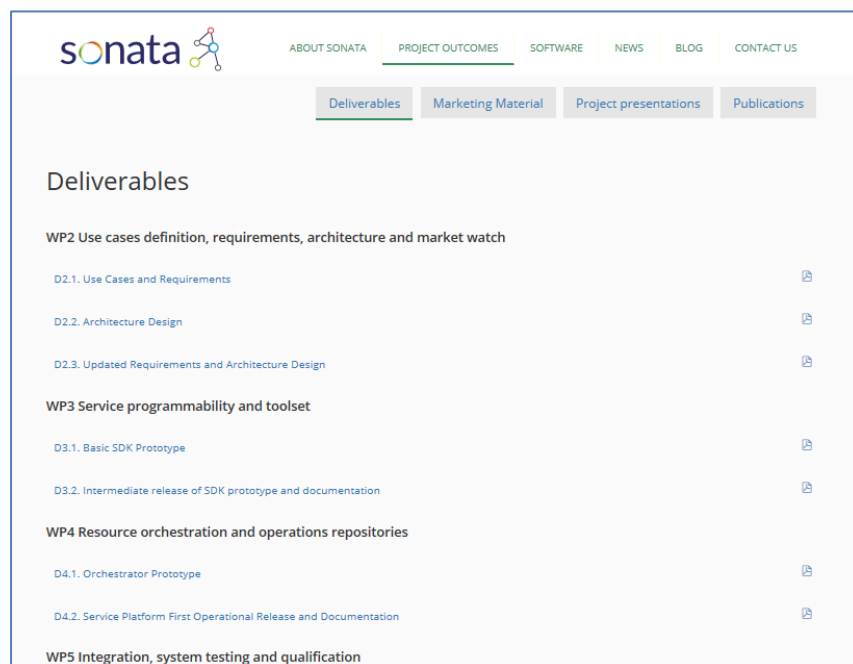


Figure 7: SONATA website - project outcomes section

Figure 8 shows the year two structure in comparison with the year one's:

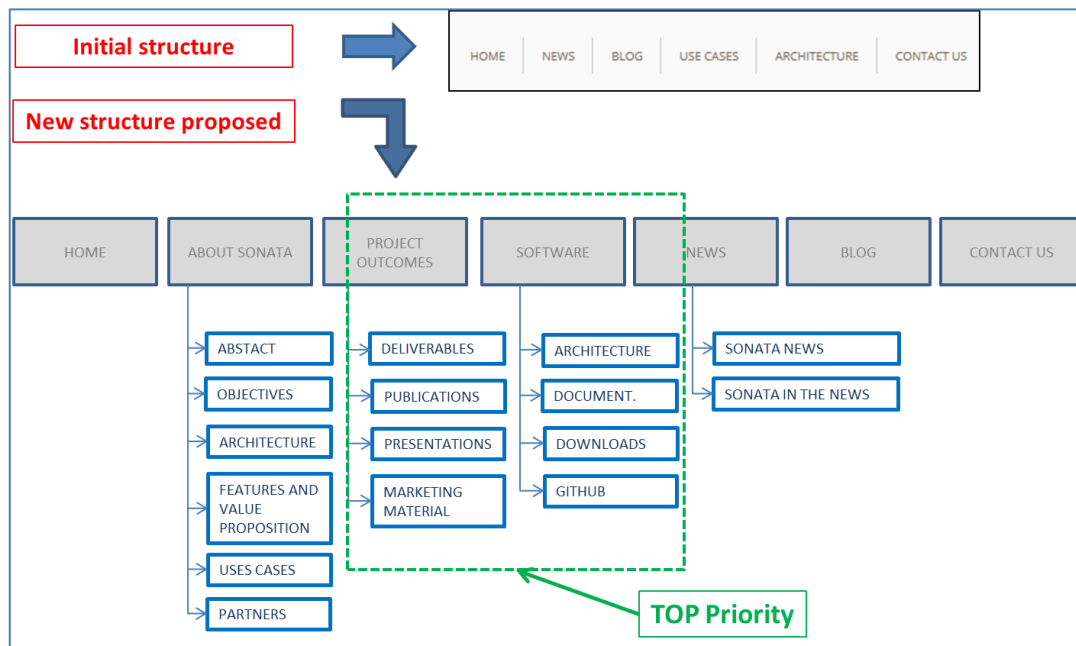


Figure 8: SONATA website - Y2 structure versus Y1's

2) Announcing the first SONATA's Prototype.

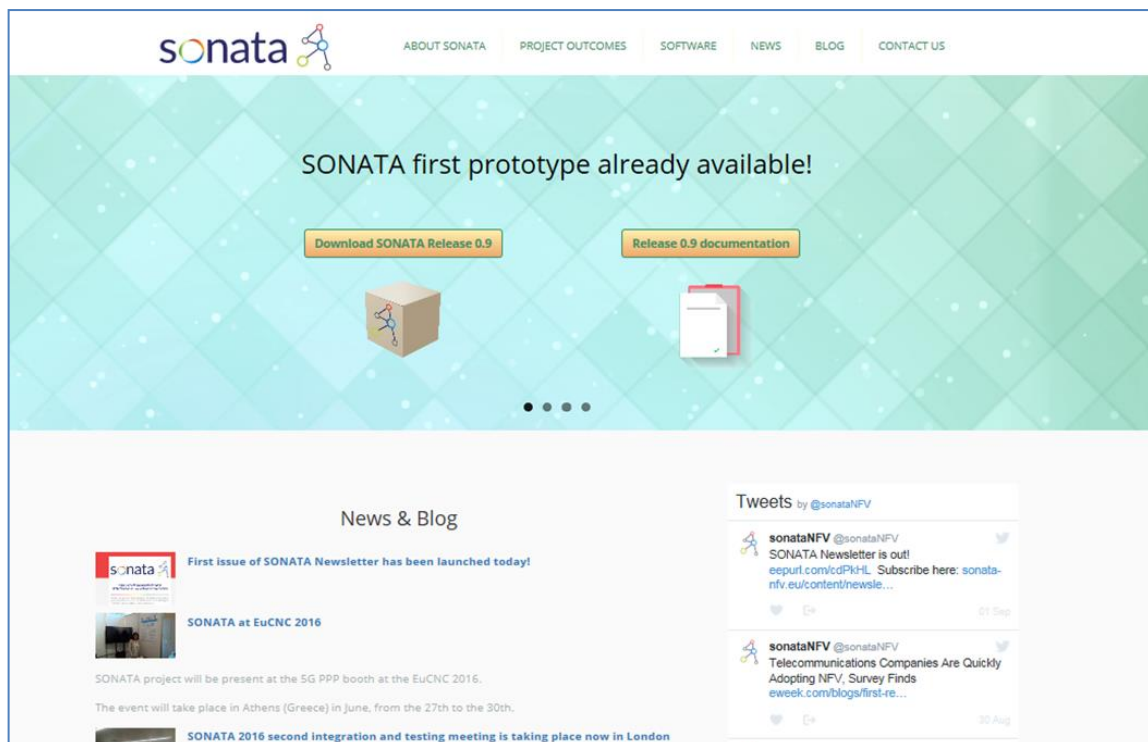


Figure 9: Home page carousel- announcement of SONATA's first prototype

SEPTEMBER 2016: Newsletter launch

3) Newsletter Integration with the website.

- 4) Newsletter issues availability in the website [7].
- 5) Sign-in form.

The screenshot shows the SONATA website's Newsletter section. At the top, there is a navigation bar with links: ABOUT SONATA, PROJECT OUTCOMES, SOFTWARE, NEWS, BLOG, and CONTACT US. Below this, there are three buttons: Sonata News, Sonata in the News, and Newsletter (which is highlighted). The main heading is "Newsletter". Below this is a "Subscribe to our mailing list" section. It contains three input fields: "Email Address" (with a red asterisk and a note "* Indicates required"), "First Name", and "Last Name". A "Subscribe" button is located below these fields. Below the subscription form, there are two newsletter thumbnails. The top one is labeled "Newsletter No.2" and shows a cover with the SONATA logo and the title "Agile Service Development and Orchestration in 5G virtualized networks". The bottom one is labeled "Newsletter No.1" and also shows the SONATA logo.

Figure 10: SONATA Newsletter on the website

NOVEMBER 2016

- 6) YouTube and ResearchGate integration with the website.
- 7) Embedded video on the home page: 2-minute general project presentation from the SDN World congress 2016.

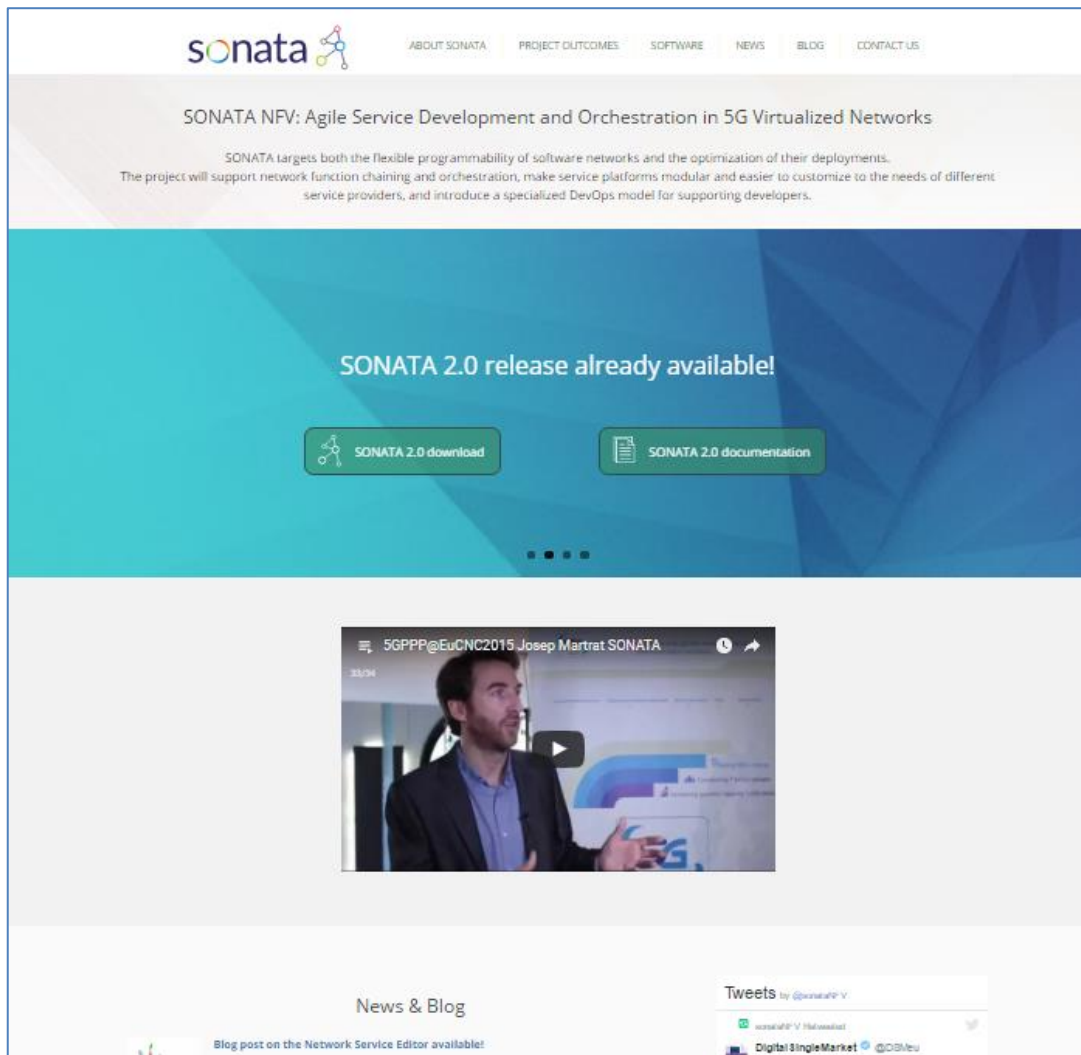


Figure 11: Embedded video on SONATA Homepage

JANUARY 2017

8) LinkedIn integration with the website.

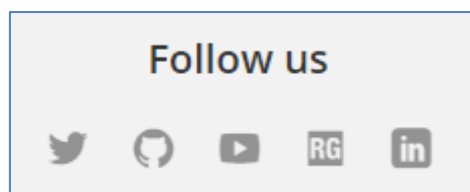


Figure 12: Integration of social media and SONATA website

9) Announcing SONATA's participation at the Softnetworking 2017 using the carousel on the home page.



Figure 13: Home page carousel- SONATA participation at the SOFTNETWORKING 2017

FEBRUARY 2017

- 10) New subsection: Project Presentations.

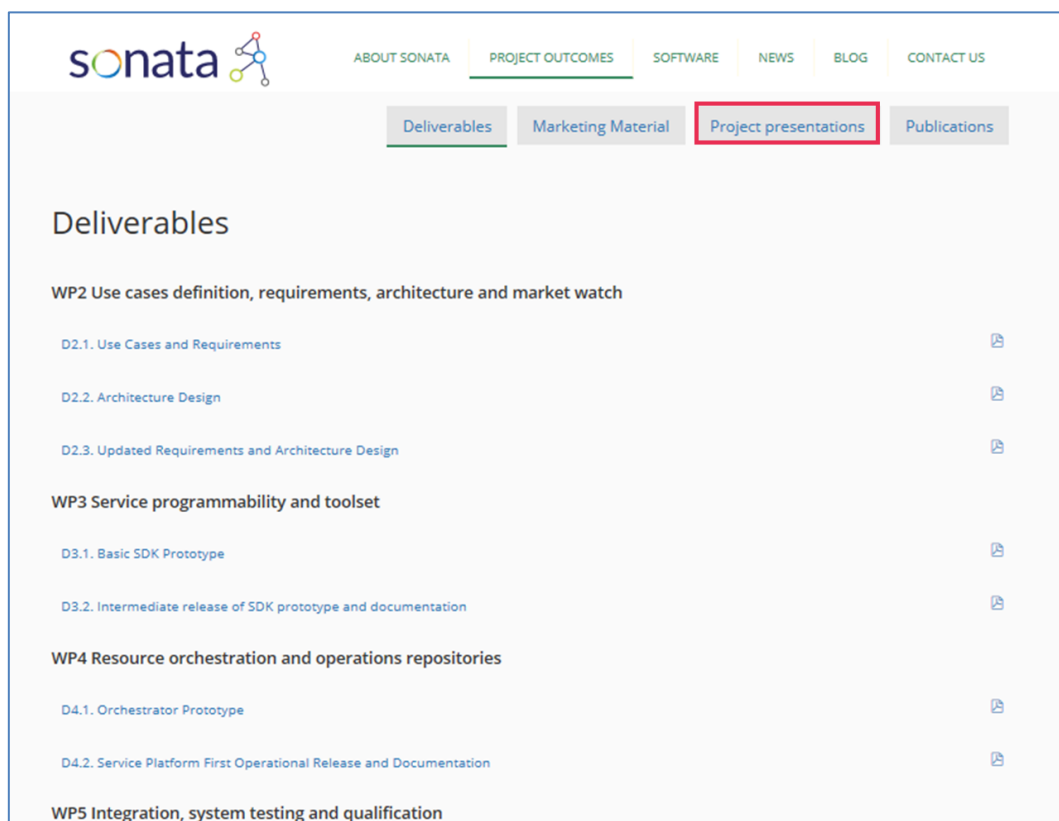


Figure 14: SONATA website - new section for presentations

- 11) SONATA 2.0 release announcement and updated release documentation.

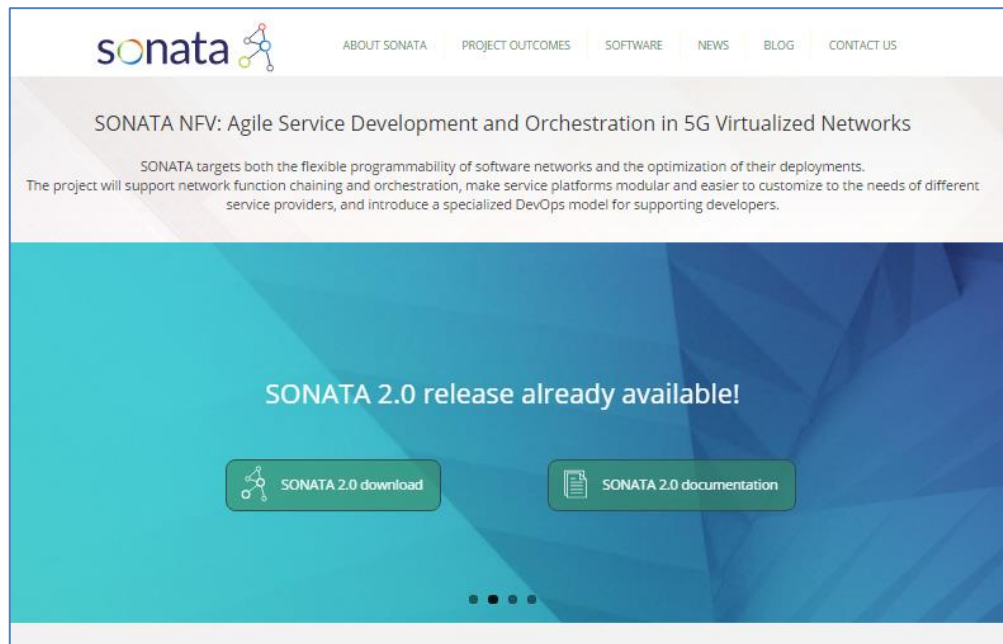


Figure 15: Home page carousel - SONATA 2.0 release announcement

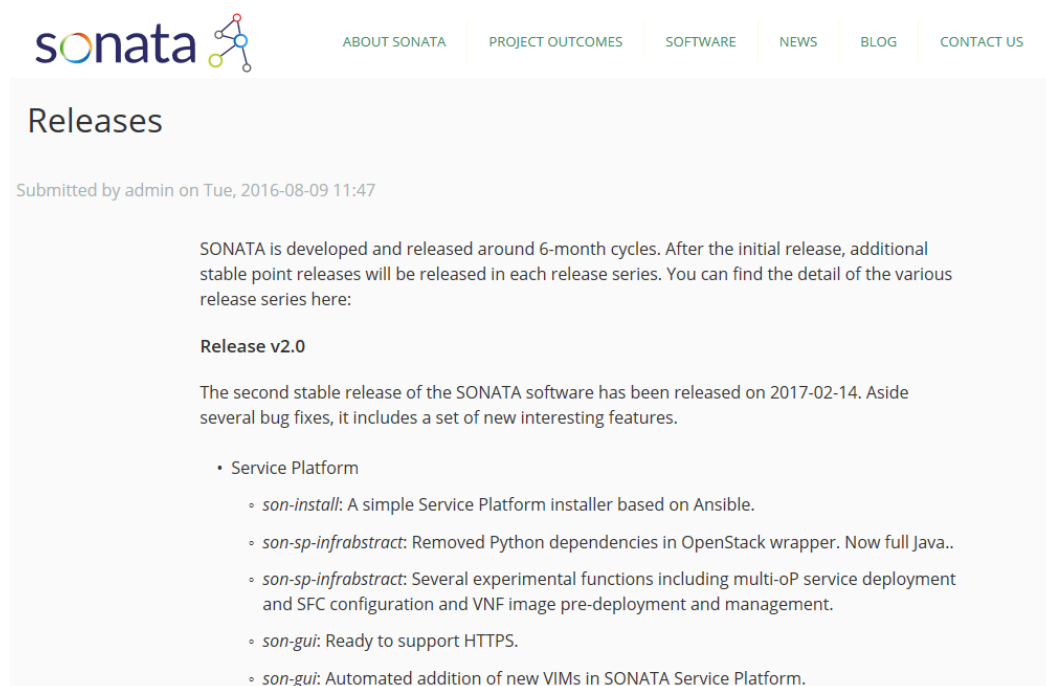


Figure 16: Software section - SONATA 2.0 release information

MAY 2017

- 12) Announcing SONATA's participation at the EuCNC 2017 using the carousel on the home page.



Figure 17: Home page carousel- SONATA participation at the EuCNC 2017

13) Updates related to SONATA 2.1 release.

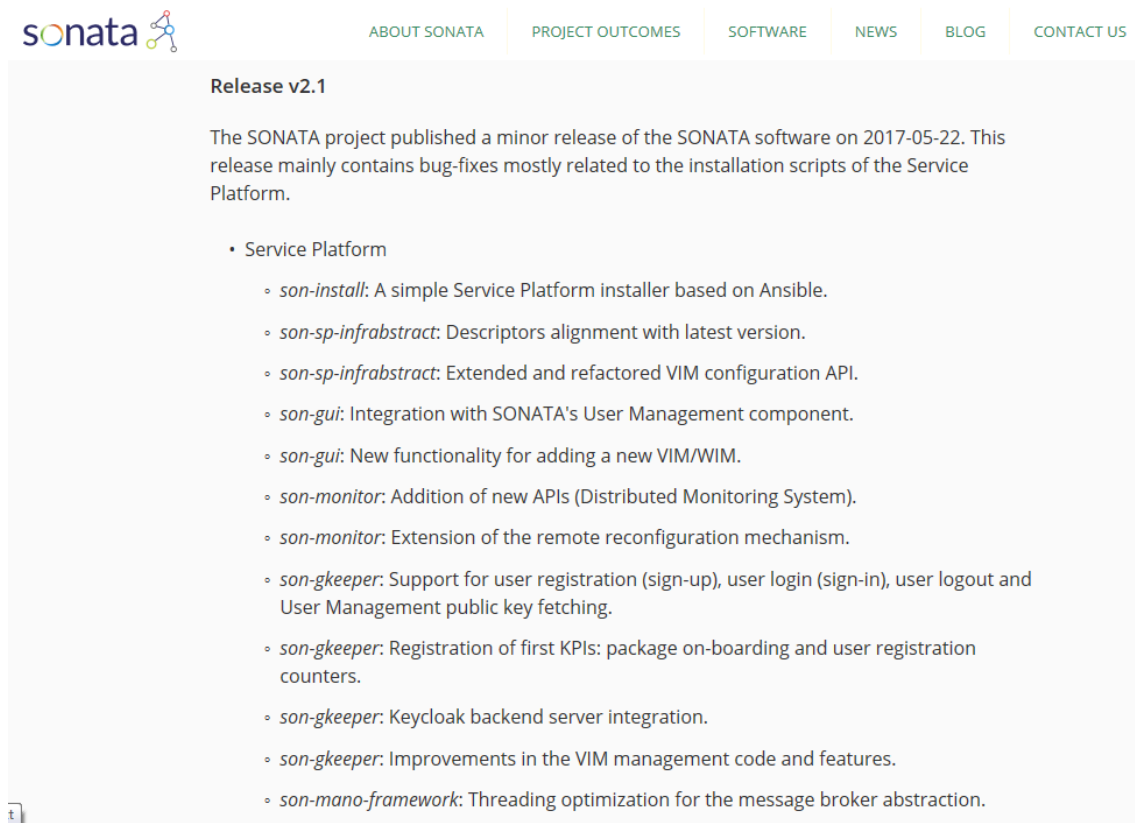


Figure 18: Software section - SONATA 2.1 release information

JUNE 2017

- 14) Announcing SONATA's demonstration at the NetSoft 2017 using the carrousel on the home page.



Figure 19: Home page carrousel- SONATA demonstration at the IEEE Netsoft 2017

3.1.2 Responsive design

One of the requirements for the design of SONATA's website was for a responsive website. A responsive design would make the website accessible for devices ranging from laptops to tablets or mobile phones. The website is also expected to be content adaptable for each device.

This was an important requirement for the project, as we wanted ensure that the content shared on our website reached the widest audience and was accessible anytime and anywhere.

Below, we present the results of a test performed to check the responsiveness of SONATA's website. We used a free tool provided by Google for this test [10]:

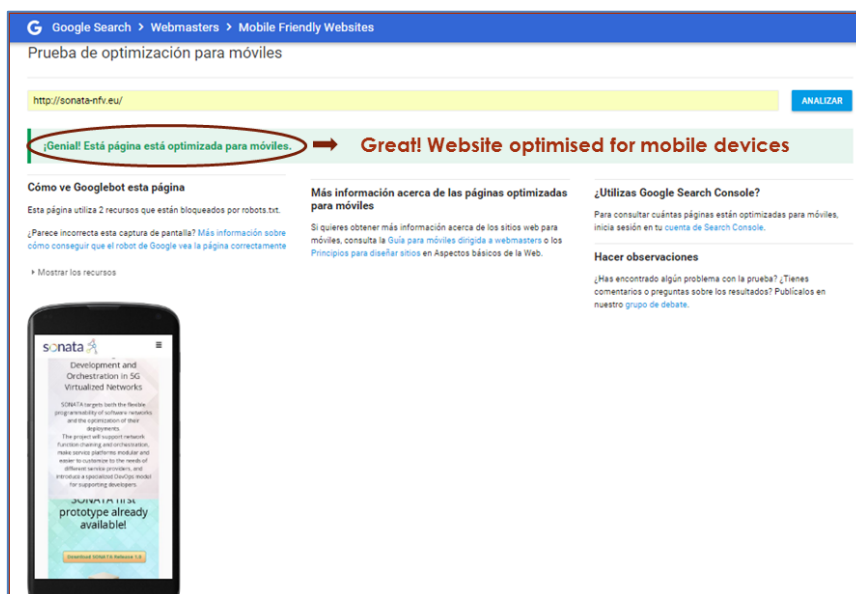


Figure 20: Google "responsive design checker" results for SONATA website

In addition, we performed a battery of tests using different mobile devices. Figure 21 shows some of the results:

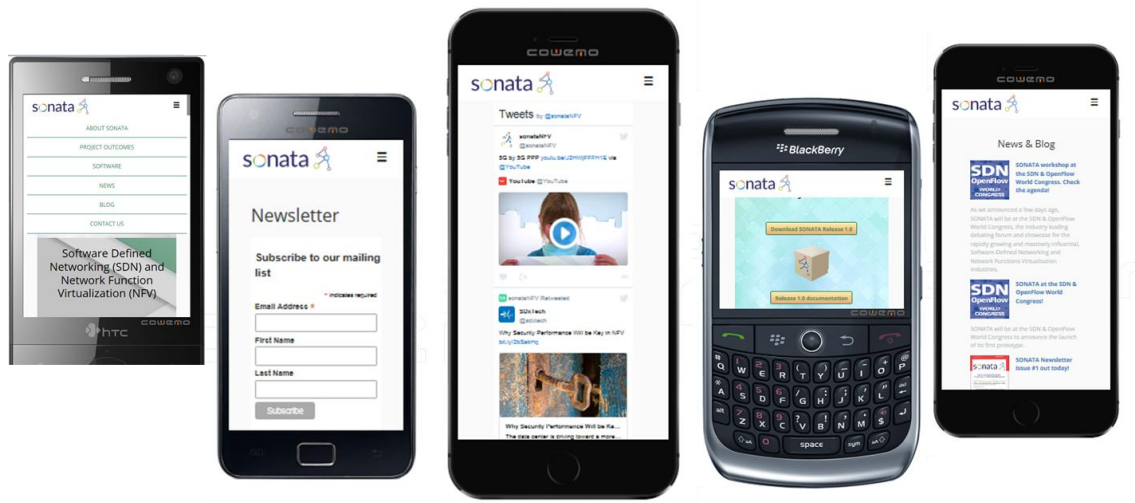


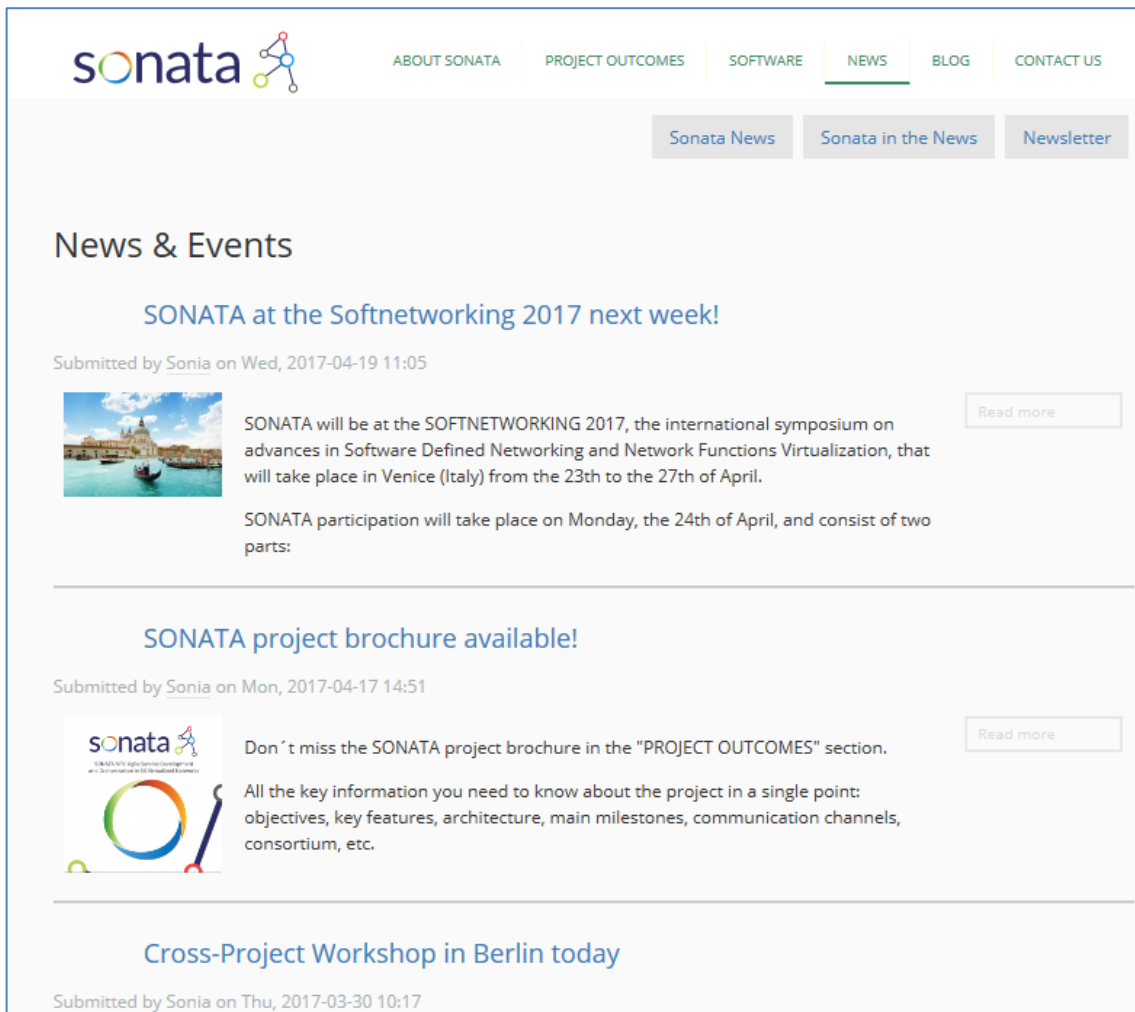
Figure 21: SONATA website view on mobile devices

3.1.3 News section

As indicated in our Communication and Dissemination Plan, one of our purposes for year two was to make better use of the News section of the project website.

As at the time of writing this report, we have published 41 news posts, a great improvement in comparison with year one, with only 6 news posts published.

To read the news published by the project, please visit the project news posts section [6].




sonata ABOUT SONATA PROJECT OUTCOMES SOFTWARE **NEWS** BLOG CONTACT US

Sonata News Sonata in the News Newsletter

News & Events

SONATA at the Softnetworking 2017 next week!

Submitted by Sonia on Wed, 2017-04-19 11:05




SONATA will be at the SOFTNETWORKING 2017, the international symposium on advances in Software Defined Networking and Network Functions Virtualization, that will take place in Venice (Italy) from the 23th to the 27th of April.

SONATA participation will take place on Monday, the 24th of April, and consist of two parts:

[Read more](#)

SONATA project brochure available!

Submitted by Sonia on Mon, 2017-04-17 14:51



Don't miss the SONATA project brochure in the "PROJECT OUTCOMES" section.

All the key information you need to know about the project in a single point: objectives, key features, architecture, main milestones, communication channels, consortium, etc.

[Read more](#)

Cross-Project Workshop in Berlin today

Submitted by Sonia on Thu, 2017-03-30 10:17

Figure 22: SONATA website news section

3.1.4 Blog

Content marketing was one of the strategies we wanted to use more in the second year of the project. The project blog is one of the tools adopted for accomplishing this. In line with our plans, these are the blog posts published by the project during the second year of the project:

December 2016



DevOps: bridge the Developers-Operations gap now!
By AlticeLabs

January 2017



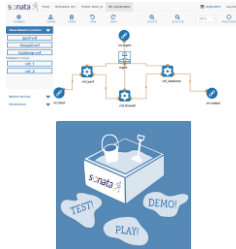
MANO Over Hybrid Virtualization Technologies
By Nokia

February 2017



End-to-end Service Management
By Optare Solutions

March 2017



SONATA Network Service Editor
By University of Paderborn

The SONATA SDK environment: A sandbox for NFV-based services
By Imec

April 2017



A pursuit for a Virtualised Infrastructure Management based on
Containers
By Demokritos

May 2017



Securely Publishing NFV-based Network Services
By I2CAT

June 2017

To be published
By NEC

To read the content of these blog posts, we encourage the reader to visit our blog [3].



Figure 23: SONATA Blog

3.1.5 Other publications on the website

News and blog posts have not been the only publications and updates made to the SONATA's website. We detail below all the documents uploaded to the project's website during the second year:

- Deliverables: 7 (all public reports corresponding to this period, all marked with the tag "To be approved by the European Commission")
- Presentations: 9
- Press releases: 2
- Newsletters: 2
- Marketing material: Project Brochure

3.1.6 Website statistics

In this section we provide some of the main metrics related to the performance of the project website during year two and its comparison with year one. Note: statistics were collected on June, 15th.

General overview

As can be seen in Figure 24, during the period of time July 1, 2016-June 14, 2017, we have seen:

- 7,062 sessions, with an average session duration of 3:34 minutes, and 3.85 pages per session. This peaked in March 2017 with over 800 sessions in that month alone.
- 4,070 users, of which 57% are new visitors, and 43% returning visitors.
- 27, 200 page views.

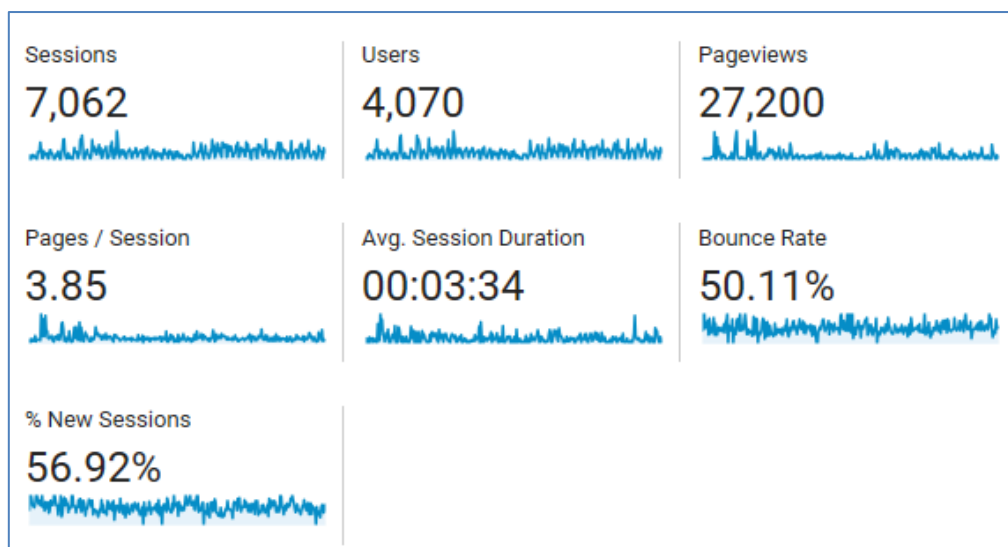


Figure 24: SONATA website main statistics

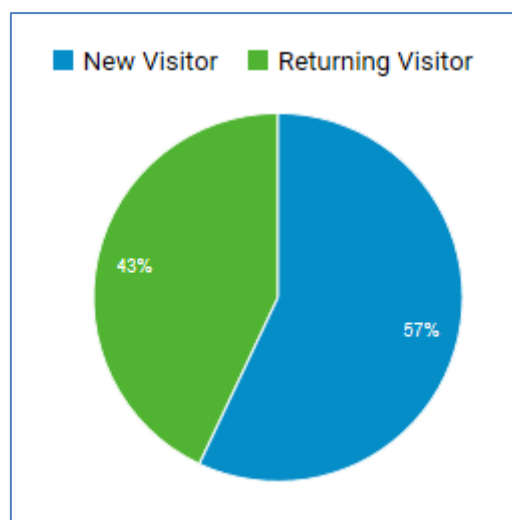


Figure 25: New visitors vs. returning visitors

The majority of users are from the United States, Spain and Germany, followed by the United Kingdom, Portugal and India.

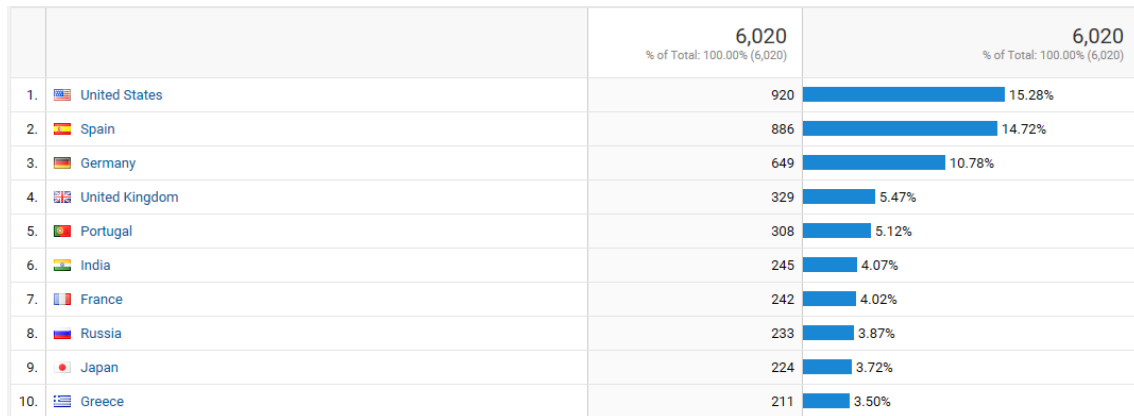


Figure 26: SONATA website users' main locations

However, as shown in the map below, SONATA website has received visitors from the five continents.

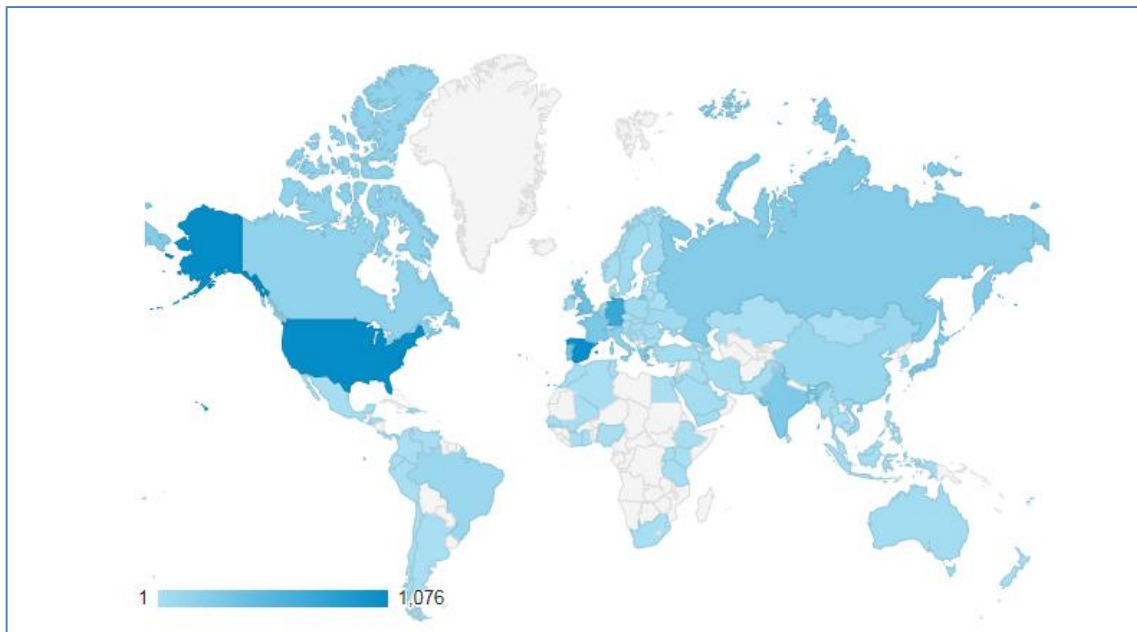


Figure 27: SONATA website users by country

In relation to the acquisition channels, most of the entries were via organic search and direct access, with 47.9% and 38.9% of the sessions respectively. This means that the SEO (Search Engine Optimisation) and promotion of the website have worked very well. Although social media platforms (mainly through Twitter and LinkedIn) and referrals (mainly through the partner's websites) have generated less visitors, it is important to mention that their bounce rate is lower (37.76% and 32.39% respectively).

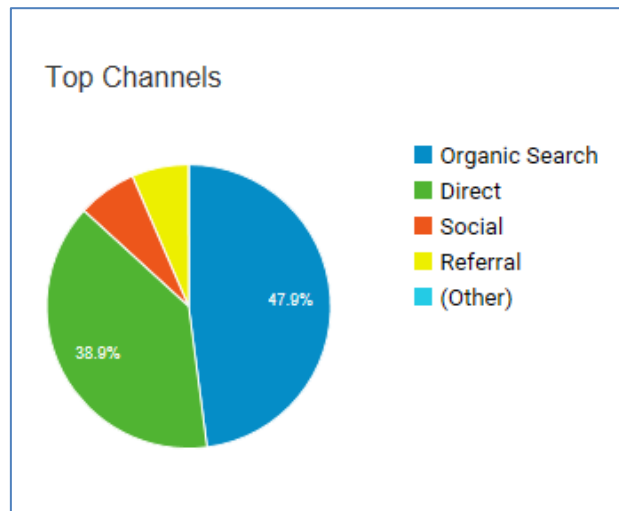


Figure 28: SONATA website top channels

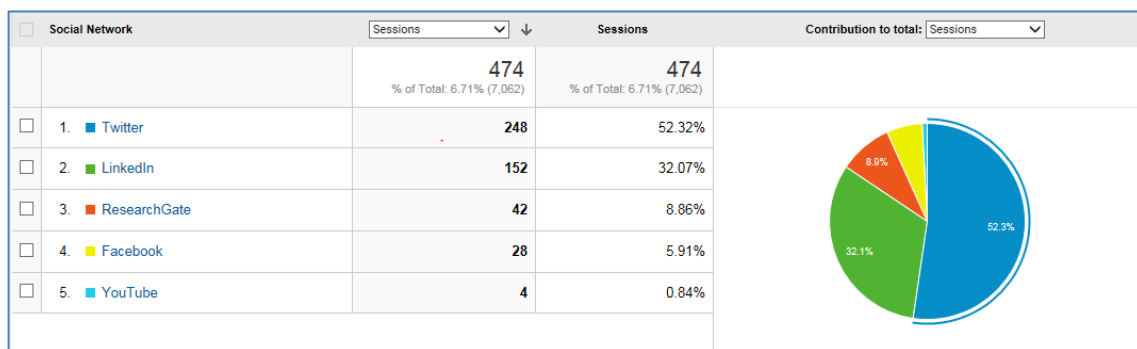


Figure 29: SONATA website social media top channels

If we compare Y2 performance with Y1's, we see that the statistics have improved considerably (apart from the percentage of new visitors, which is normal due to the increase of the customer base). Of particular note is the increase in number of page views (386.41%), sessions (262.34%) and users (239.45%) respectively.

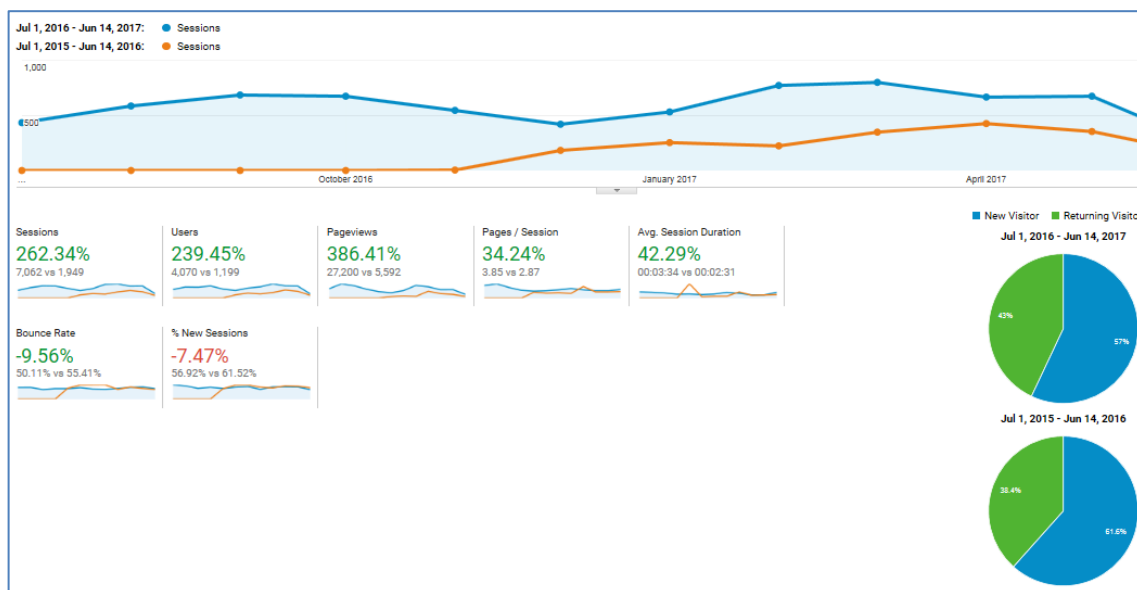


Figure 30: SONATA website performance, Y2 vs. Y1

We would also like to highlight the contribution of the project blog to the good performance of the SONATA website in Y2. From the graphics below, the red circle represents the publication date of a blog post, the publication and corresponding promotion of a blog post resulted in an increase in the traffic to the website. Although only a few months are shown in the graphics, this behavior repeats every month with every publication.

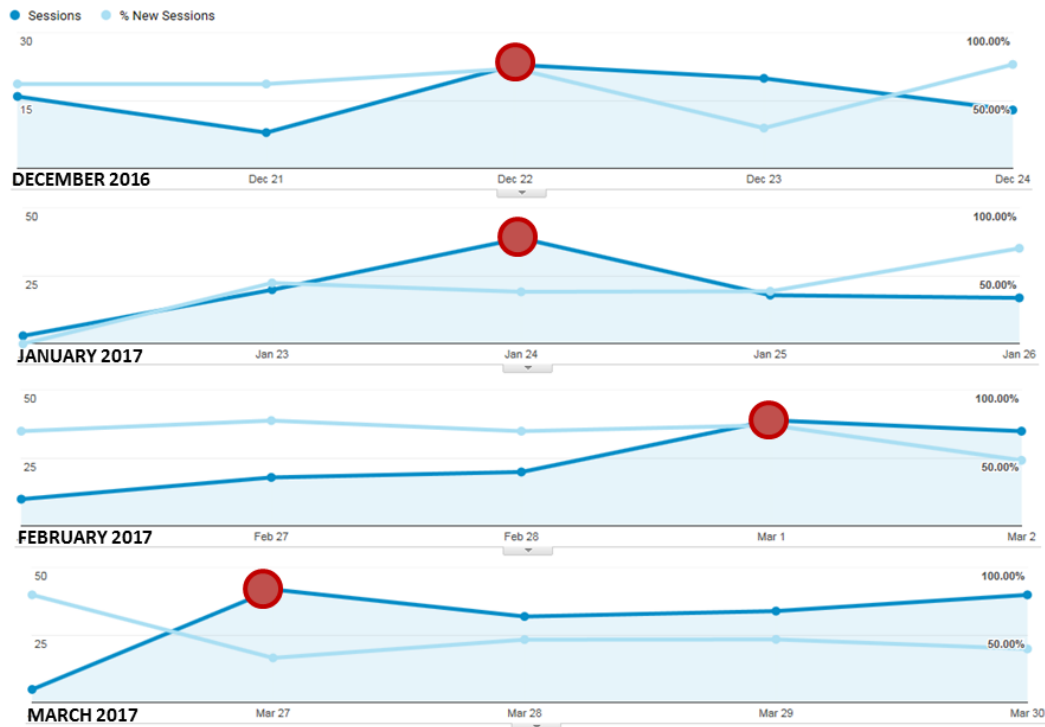


Figure 31: Effect of a blog post publication on the traffic to the SONATA website

3.2 Partners Websites

As mentioned previously, all partners committed to implement individual plans to promote SONATA using their organisations' websites. In the sub-sections below, we present a summary of the activities of each partner in relation to this.

3.2.1 ATOS

SONATA has been presented as a key project in the Atos R&I website [11] since December 2016:

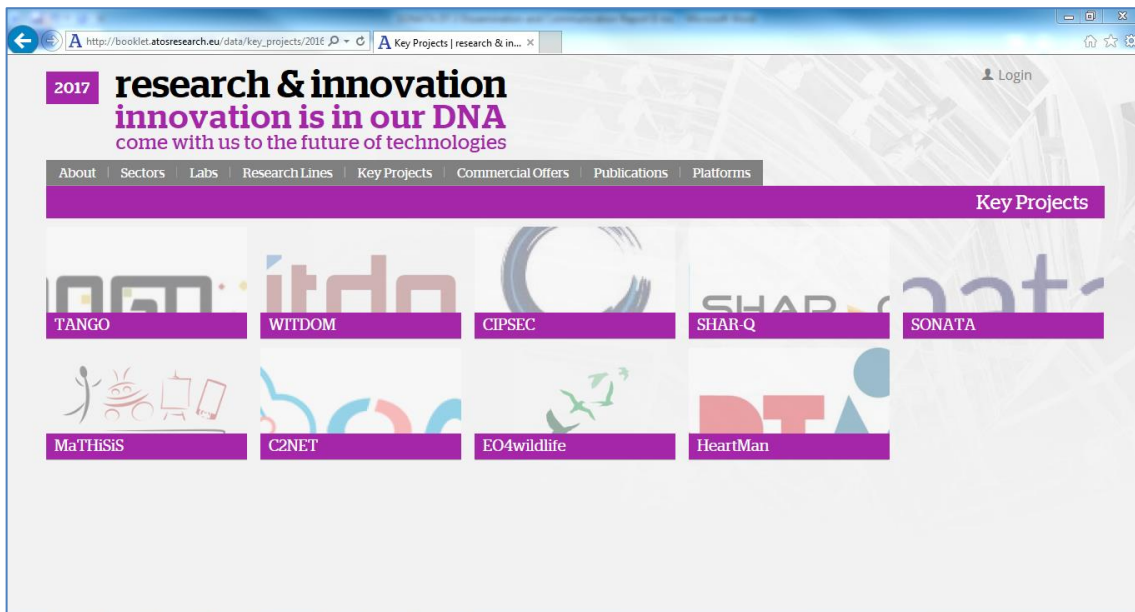


Figure 32: SONATA on Atos R&I website

As well as in the Atos R&I booklet 2017, printed in December 2016 and publicly available online [12].



Figure 33: SONATA on Atos R&I booklet 2017

ATOS Spain also published a press release in April 2017 in which SONATA was mentioned as one of the European projects with which the organisation is helping to build the future 5G.

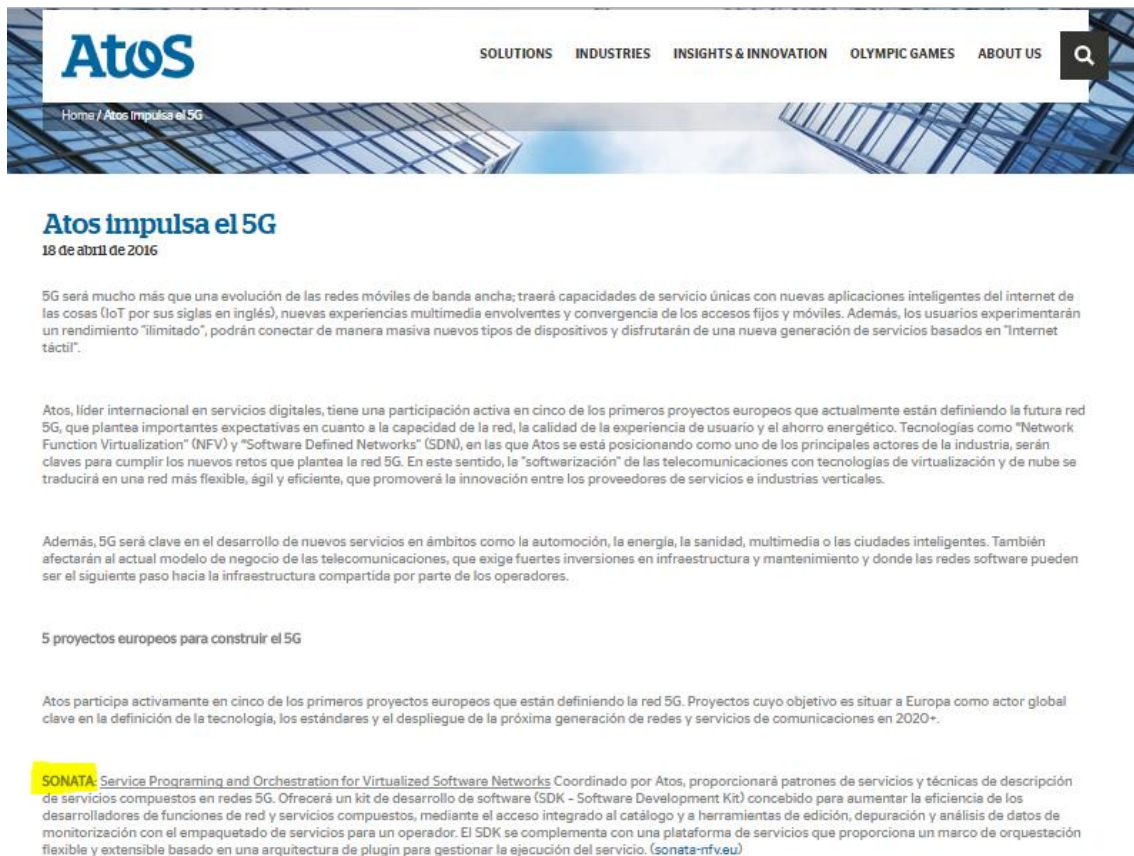


Figure 34: Atos Spain press release

3.2.2 NEC

SONATA was listed on NEC's website [13] in the second half of 2015. It will be there until the end of the project in December 2017.

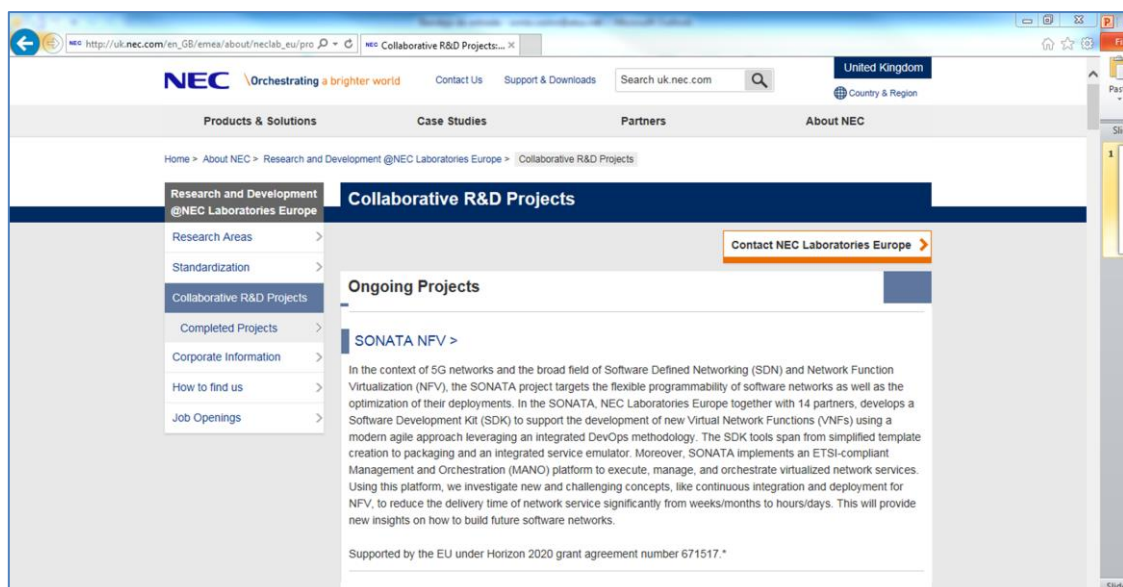


Figure 35: SONATA on NECLAB website

3.2.3 ALB

AlticeLabs' activity in relation to SONATA's promotion can be highlighted as follows:

1. Presence at the organization's website [14]:

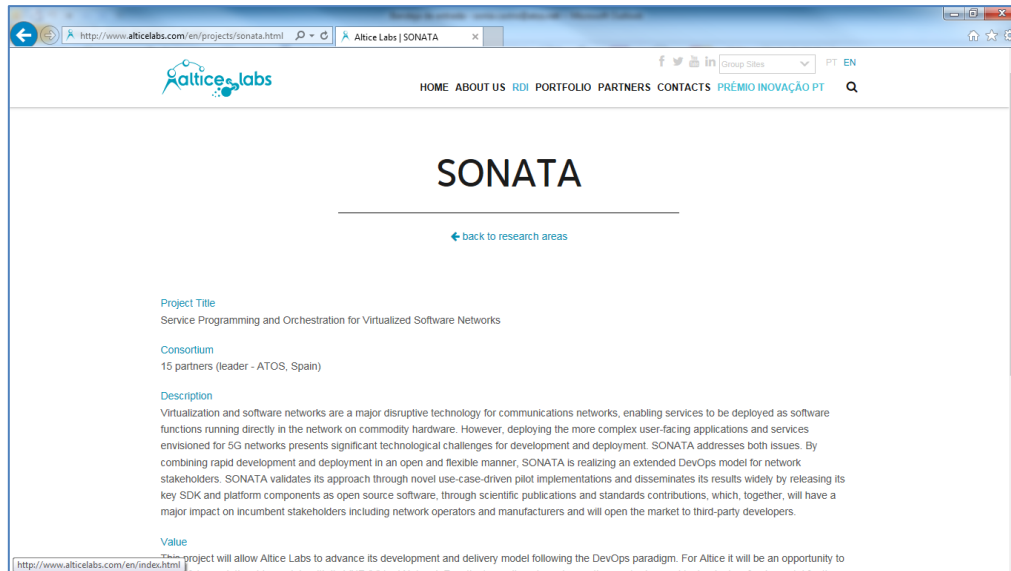


Figure 36: SONATA on ALTICE LABS website

2. Advertisement of the main actions related to the project. See video on DevOps for NFV / SDN as an example [15].



Figure 37: SONATA / ALTICE LABS video on DevOps for NFV

3. Altice also promotes internal workshops. These actions are also followed by news published in the group's intranet.

3.2.4 TID

A reference to SONATA is included among in the 5G-related projects area on Telefonica's website [16]:

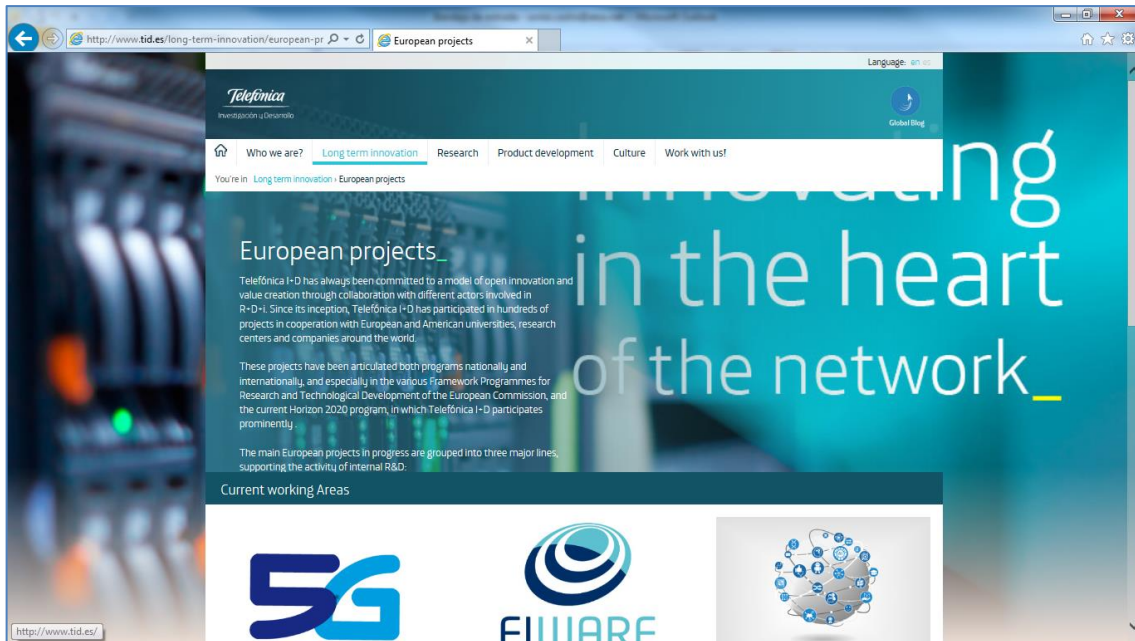


Figure 38: SONATA on TELEFONICA's website

The Telefonica's SONATA's team has also published several notes in the corporate Yammer account and announcements are made available in the intranet.

3.2.5 NOKIA

Nokia plans to publish SONATA's final release in M26 on Nokia's website under the news section [17].

3.2.6 UPB

SONATA has been listed on UPB's website [18] since the second half of 2015 and it will be there until the end of the project in December 2017.

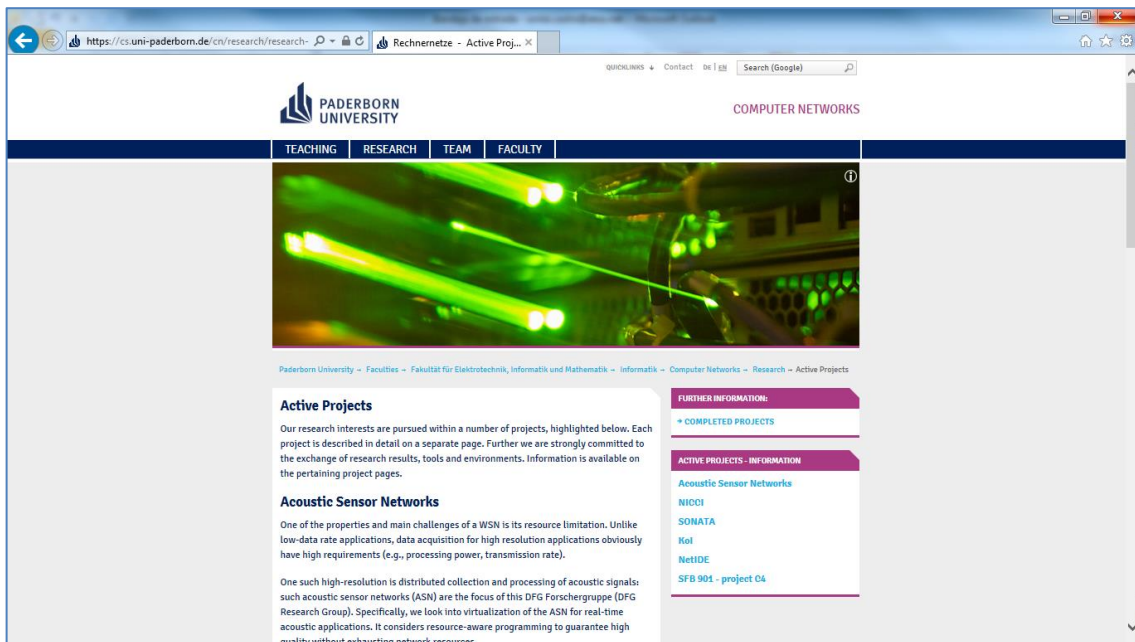


Figure 39: SONATA on UPB's website

They have also created SONATA related news posts on the faculty website [19].



Figure 40: UPB's News post

3.2.7 NCSRD

SONATA was listed on Demokritos' laboratory's website [20] at the beginning of the project and it will be there until the project finishes. They also maintain information regarding SONATA releases [21].



Figure 41: SONATA 2.0 on Demokritos' laboratory's website

3.2.8 IMEC

Information about SONATA is provided on the Ghent University [22] website. It is also listed in other places, for example, it is listed as a project using IMEC's testbed infrastructure [23], it is listed as part of the IBCN website (Internet Based Communication Networks and Services, subgroup of the university) [24], and as part of the IDLab website of Ghent University [25].

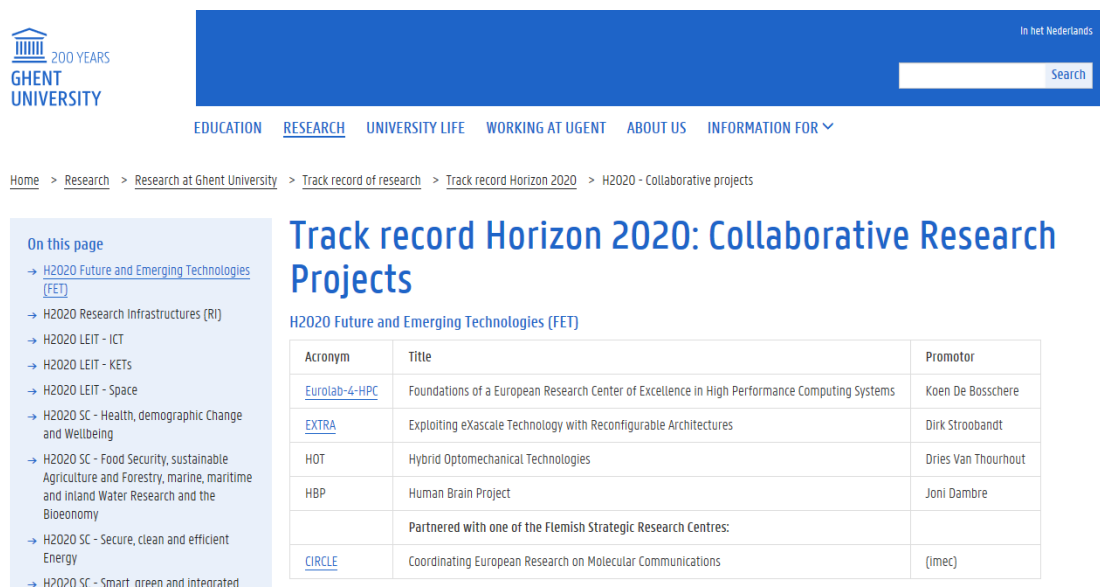


Figure 42: SONATA on Ghent University's website

3.2.9 OPTARE

SONATA has been listed as one of the on-going innovation projects on the Optare's website [26] since April 2016.

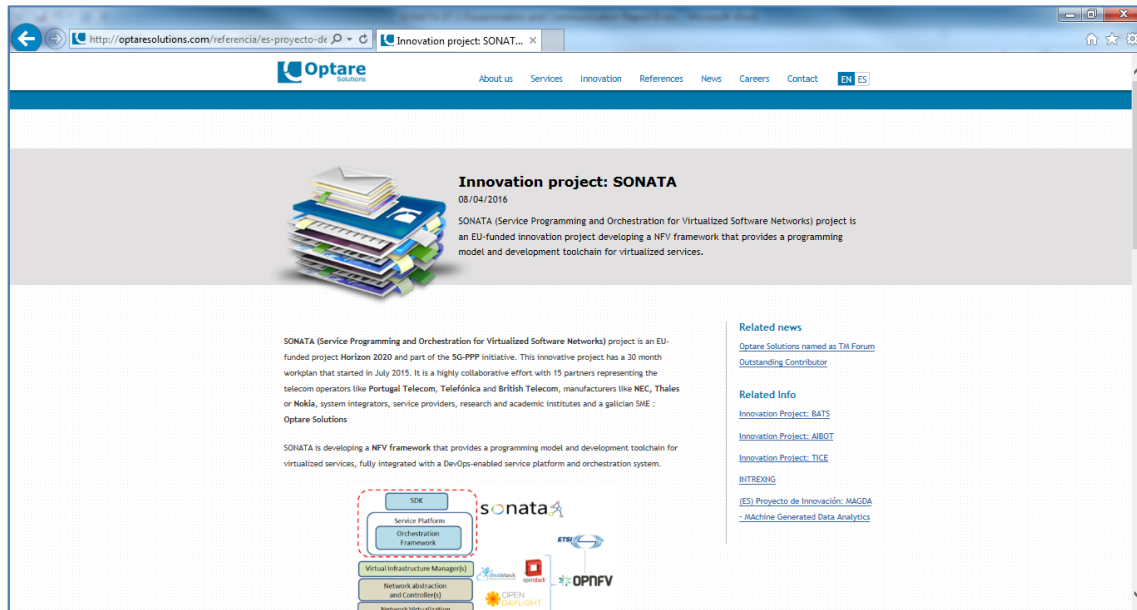


Figure 43: SONATA on OPTARE's website

SONATA's press release announcing the delivery of SONATA 2.0 was also published on Optare's website's news section [27].

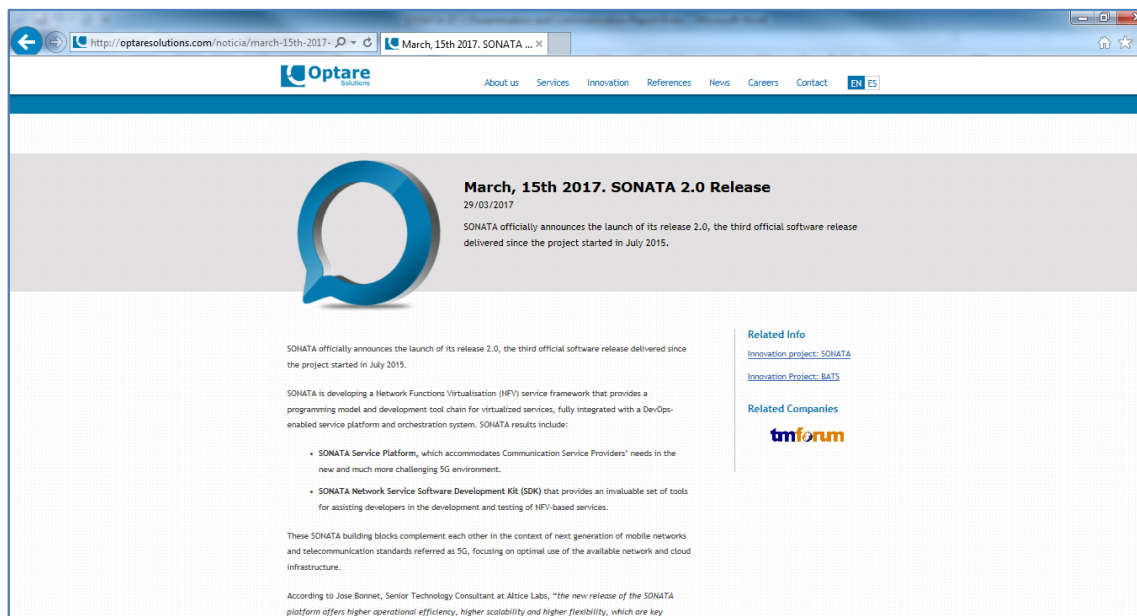


Figure 44: OPTARE's News post

3.2.10 I2CAT

SONATA was also listed as one of the on-going projects on the i2CAT's website in October 2015. It also features a dedicated page on i2CAT's website with brief details of the SONATA project [28].

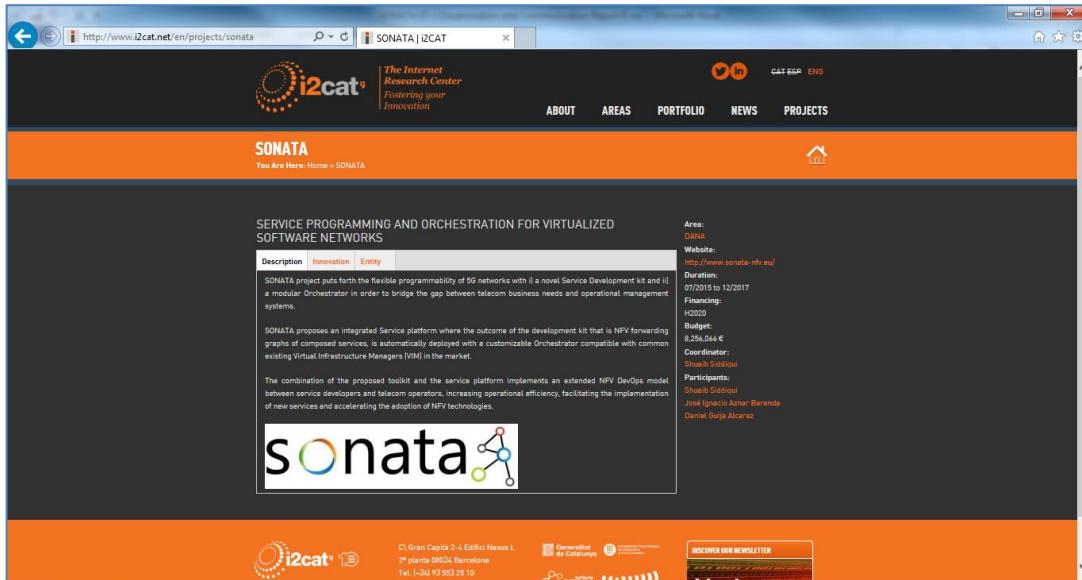


Figure 45: SONATA on I2CAT's website

3.2.11 SYN

SONATA is listed as one of the on-going innovation projects on Synelxis' website [29].

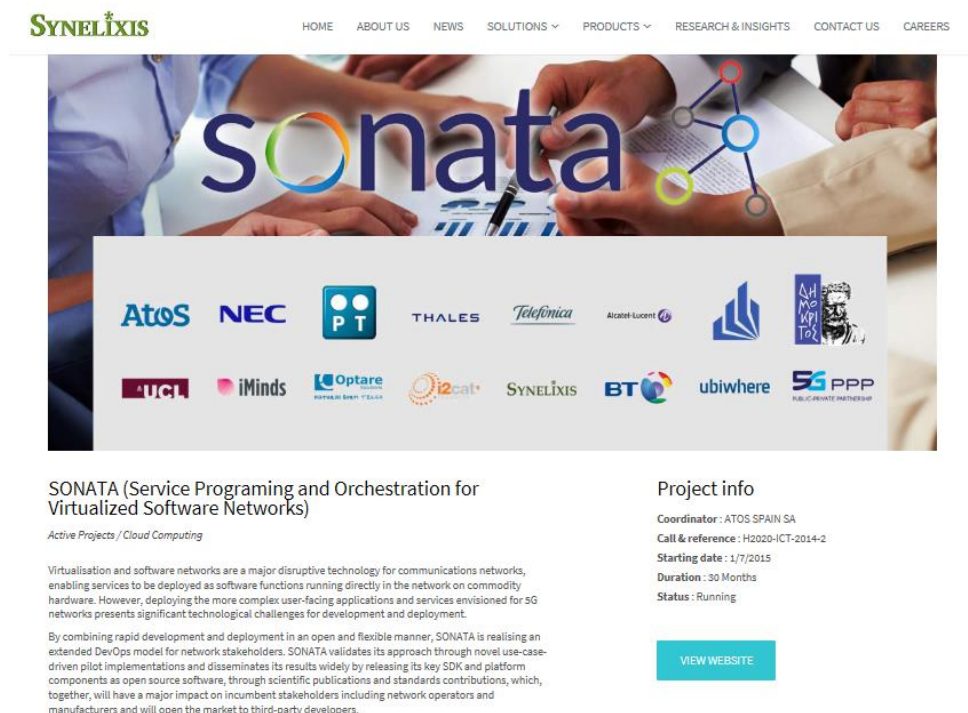


Figure 46: SONATA on Synelxis' website

Synelixis also promotes SONATA results, participation in events, etc. by frequently publishing news related to the project on their webpage news section. See, as examples: [30], [31], [32].

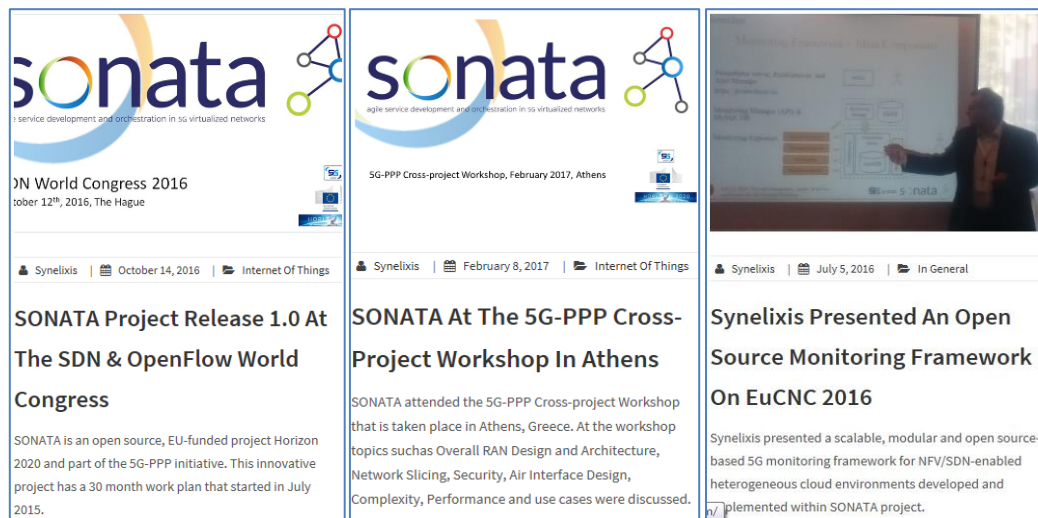


Figure 47: SONATA in Synelixis' website's news

In addition, Synelixis follows SONATA on several social media platforms and reposts SONATA's posts and news articles on Synelixis' Twitter and Facebook accounts.

3.2.12 UBI

SONATA is listed as one of the R&I projects of Ubiwhere and it has a dedicated description page [33] since 29/11/2016.

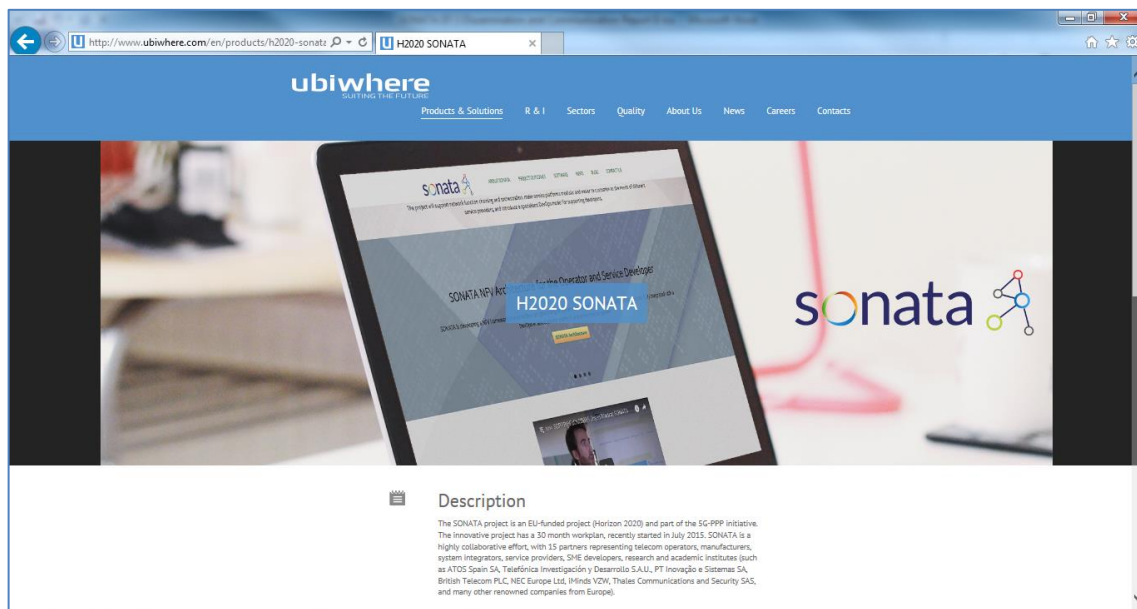


Figure 48: SONATA on UBIWHERE's website

SONATA was also described in the latest Ubiwhere's annual report [34] published in September 2016.



Figure 49: Ubiwhere's annual report

Additionally, regular entries have been added to Ubiwhere's communication blog [35].

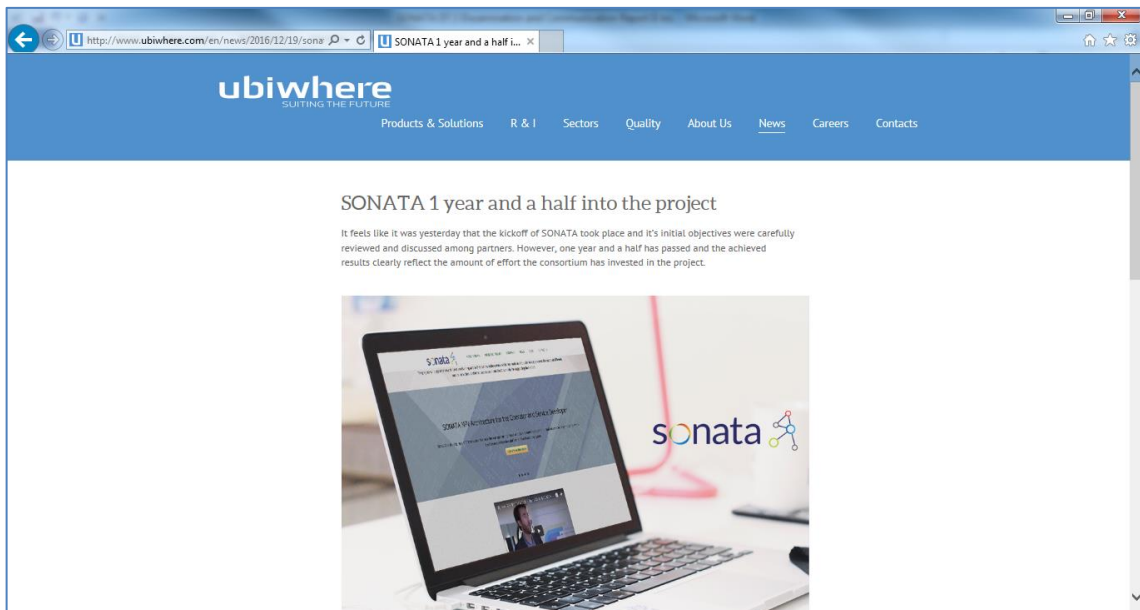


Figure 50: Ubiwhere's blog post

SONATA 2.0 release was also promoted using this channel [36].

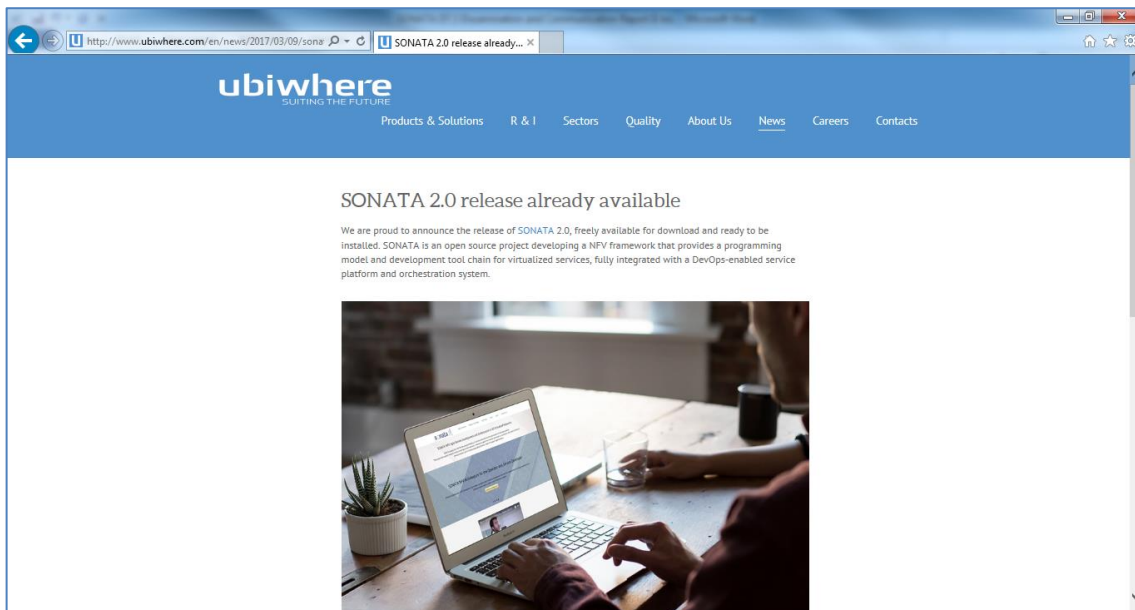


Figure 51: SONATA 2.0 release announcement

3.3 Social Media

3.3.1 Twitter

The SONATA twitter account has been one of the main social media channels used by the project to promote its results in Y2. We have already seen its contribution to generating traffic to the SONATA website (52.3% of the traffic generated by social media channels). It has also played a key role in our content marketing campaign.

We provide below some statistics that highlight the proactive manner in which this channel was utilised in year two, as well as its acceptance by the SONATA project followers. Note: Data extracted on 15/06/2017.



Figure 52: SONATA twitter account

As shown in the figure below, since its launch, SONATA has published 475 tweets and reached 229 followers. Keeping in mind the same statistics from year one (38 tweets and 86 followers), we can clearly say that we have achieved the main goal regarding the use of this channel according to the Y2 plan, which if you recall was to increase our presence by being more proactive in the use of all available channels to provide valuable content for our audience.

The following table presents more detailed information per month. Please, note the number of profile visits received (almost 7,000) as well as the number of impressions achieved (more than 79,000).

	Tweets*	Impressions	Profile Visits	Mentions	New followers
July	0	780	133	0	7
August	3	1,234	107	2	9
September	10	2,592	371	4	15
October	23	3,466	441	1	9
November	31	6,602	839	10	17
December	28	8,301	873	14	7
January	41	11,500	954	25	9
February	33	9,988	500	21	14
March	25	9,976	1091	24	10
April	27	7,518	506	16	7
May	33	11,500	893	16	29
June (first half)	9	5,788	238	8	13
Total	263	79,245	6,946	141	146

*Note: retweets not included

Table 5: SONATA twitter statistics per month in Y2

The performance of the blog posts (impressions, engagements and engagement rate) gives a clear indication of the type of content that our followers like to see. These are the top blog posts in terms of interest generated:






 <p>sonataNFV @sonataNFV We are happy to announce SONATA 2.0 release! http://us13.campaign-archive2.com/?u=cf65abfa16e7a08bbe874c18f&id=67ee93e2da&e=ad87f71816... pic.twitter.com/JGTxfvxxXI</p>	<p>Impressions 2,187</p> <p>Total engagements 46</p> <p>Retweets 16</p> <p>Link clicks 15</p> <p>Likes 7</p> <p>Detail expands 5</p> <p>Profile clicks 3</p>
 <p>sonataNFV @sonataNFV SONATA announces its release 1.0 at the SDN & OpenFlow World Congress. For more information visit us at: http://sonata-nfv.eu/newsroom pic.twitter.com/EobNnleThu</p>	<p>Impressions 2,123</p> <p>Total engagements 27</p> <p>Retweets 10</p> <p>Link clicks 8</p> <p>Likes 6</p> <p>Detail expands 2</p> <p>Profile clicks 1</p>
<p>sonataNFV @sonataNFV Have a look at @sonataNFV installation videos at https://www.youtube.com/channel/UC_vQQq7mjvHt4JzEkp4kppQ...! #5G #NFV #5GPPP #H2020 #MANO #programmingmodels #SDK #devops</p>	<p>Impressions 1,725</p> <p>Total engagements 21</p> <p>Link clicks 9</p> <p>Retweets 4</p> <p>Likes 3</p> <p>Profile clicks 3</p> <p>Replies 1</p> <p>Hashtag clicks 1</p>
 <p>sonataNFV @sonataNFV @sonataNFV will be at the SOFTNETWORKING 2017! More info here: http://www.sonata-nfv.eu/content/sonata-softnetworking-2017... pic.twitter.com/iHI9tZtuWt</p>	<p>Impressions 1,640</p> <p>Total engagements 37</p> <p>Link clicks 12</p> <p>Retweets 11</p> <p>Profile clicks 8</p> <p>Likes 5</p> <p>Detail expands 1</p>
 <p>sonataNFV @sonataNFV Don't miss @sonataNFV latest blog post on containers! http://www.sonata-nfv.eu/content/pursuit-virtualised-infrastructure-management-based-containers... pic.twitter.com/HDpysZ9D9R</p>	<p>Impressions 1,195</p> <p>Total engagements 30</p> <p>Link clicks 13</p> <p>Retweets 7</p> <p>Likes 6</p> <p>Detail expands 2</p> <p>Media engagements 1</p> <p>Profile clicks 1</p>
 <p>sonataNFV @sonataNFV Don't miss our latest blog post about the @SONATANFV Network Service Developer Kit, http://www.sonata-nfv.eu/content/sonata-sdk-environment-sandbox-nfv-based-services... pic.twitter.com/j64ibPXb4o</p>	<p>Impressions 1,121</p> <p>Total engagements 22</p> <p>Retweets 8</p> <p>Likes 5</p> <p>Link clicks 5</p> <p>Media engagements 2</p> <p>Profile clicks 2</p>

Figure 53: SONATA top blog posts.

The content provided through the SONATA twitter account has been varied, it ranges information related to the project, to general information about the industry, new technologies, etc. However, as extracted from our top blog posts, the most relevant information for our followers relates to information specifically about the project, including software releases, publication of videos in our YouTube channel, SONATA participation in events and project blog posts.

The following map, extracted using the tool Tweepstmap [37], shows the location of our twitter followers across the globe. They are mainly in Spain (17%), the United States (12%) and the United Kingdom (10%).

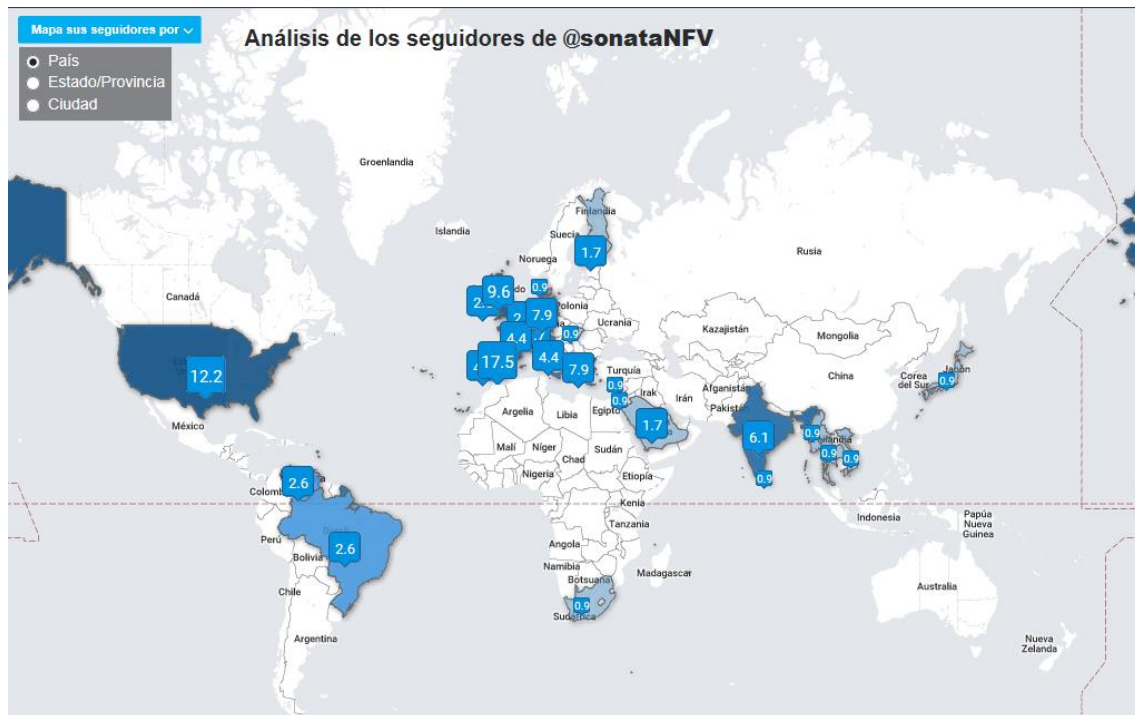


Figure 54: SONATA twitter followers' location

To conclude our analysis of the performance of our twitter channel in Y2, we would like to mention that SONATA is also included in two lists:

1. The European5Gprojects list [38], a list of the 5GPPP projects supported by the European Commission Horizon 2020 Programme.
2. Atos R&I European projects list [39], a list used by Atos Research and Innovation department to promote all the European projects in which the organisation participates.

In the same way, important announcements on SONATA twitter account directly related to the project have been echoed through the 5G PPP twitter channel.

3.3.2 LinkedIn [40]

LinkedIn is another one of the social media channels opened by the project in Y2. This is in line with our plan to increase our presence on social media through the use of new channels.

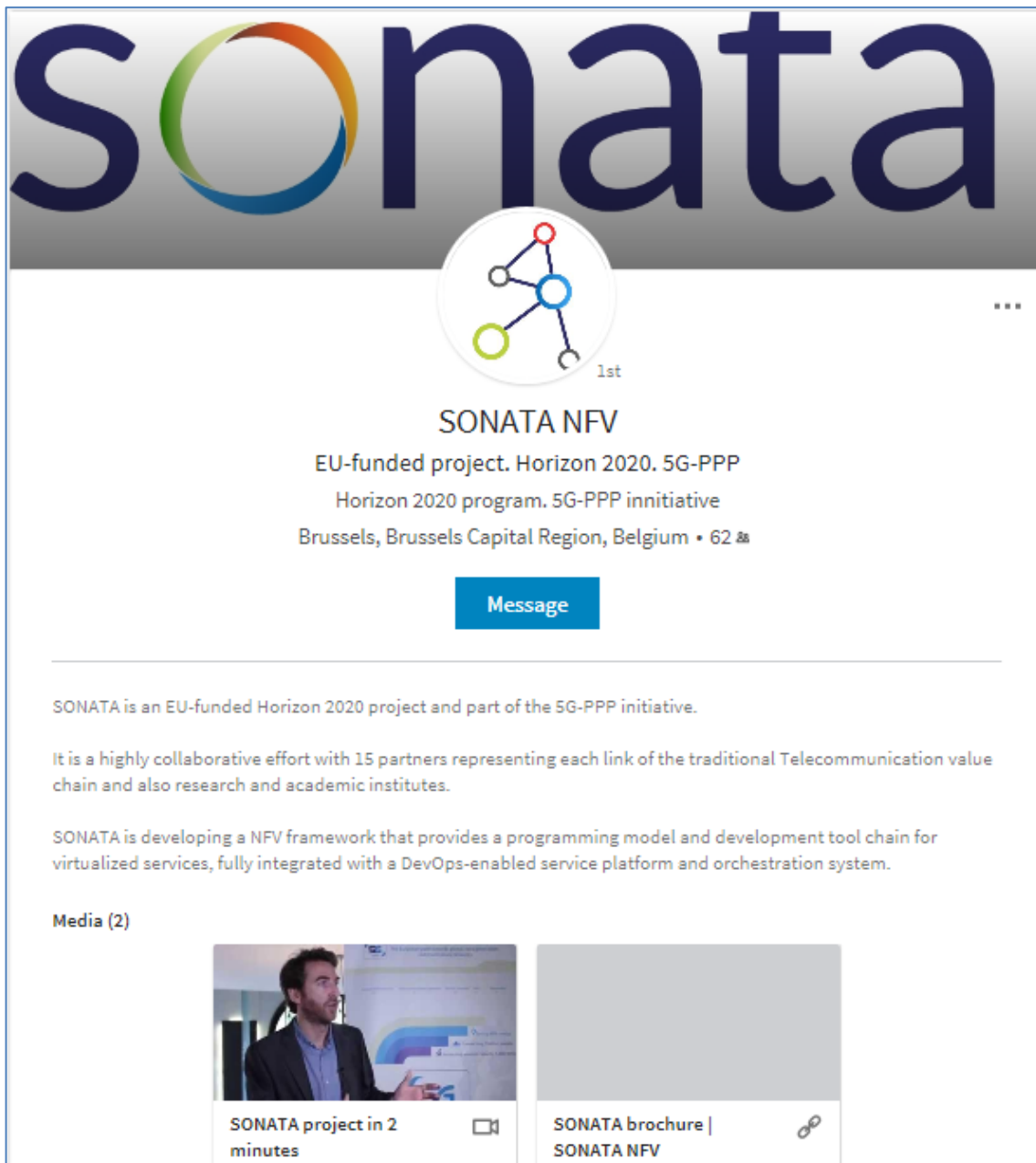


Figure 55: SONATA LinkedIn profile

It was created to provide more visibility of the main announcements of the project, and importantly, to repost project blog posts as successfully as we have seen on our Twitter feed.

This year we have published a total of 13 articles (corresponding to our blog posts) and other 33 more general posts.

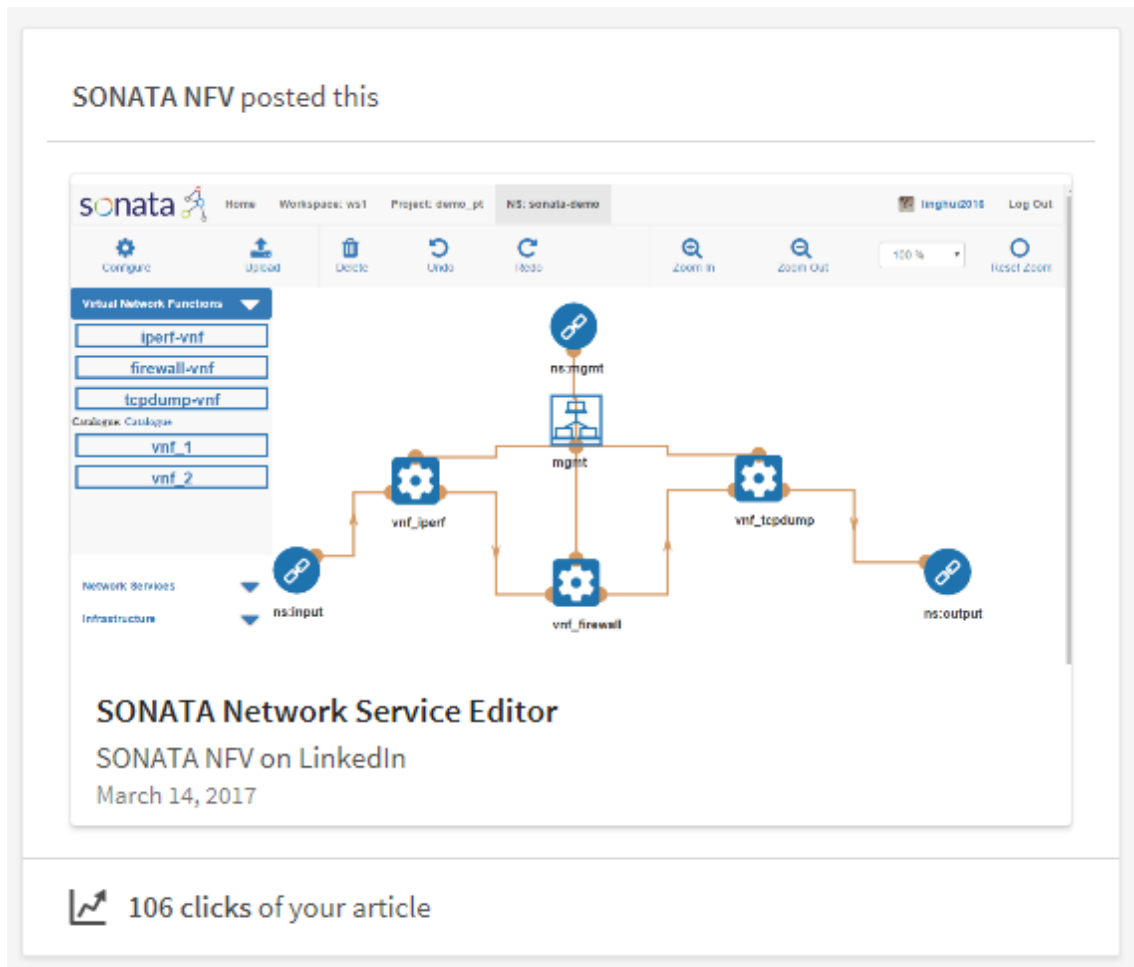


Figure 56: SONATA LinkedIn top article

It is not possible to ascertain the real impact of the project activities in LinkedIn due to the limitation in analytics engine provided by LinkedIn for non-premium accounts. However, we can say that, in less than six months, we have gained 72 followers and contributing a total of more than 32% of the social media traffic redirected to our website.

We would like also to mention that SONATA project is a member of the 5G PPP LinkedIn Group [41] and have actively participated in it with continuous contributions.



Figure 57: SONATA Christmas greeting in LinkedIn

3.3.3 ResearchGate [42]

ResearchGate is a social networking site for scientists and researchers to share papers, projects, ask or answer research questions, and find collaborators. It is the largest academic social network in terms of active users.

A project space for the SONATA project was created on ResearchGate in Y2 to disseminate SONATA project activities and scientific papers among the research community.

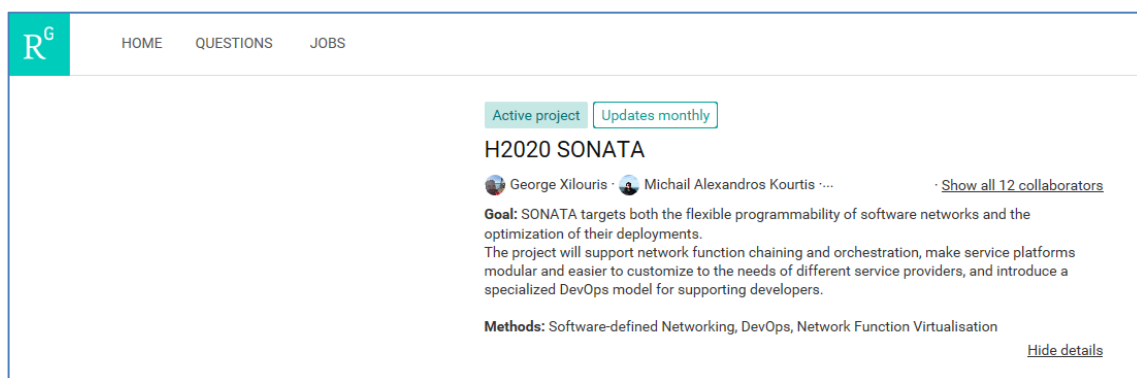


Figure 58: SONATA Project Space on ResearchGate

There has been reasonable interest of academic community in the SONATA project as shown by the statistics below:

- Recommendations 7
- References in Scientific Publications 13
- Followers 25
- Collaborators 12
- Reads 222

The community showed special interest in the publications and deliverables of the SONATA project. The most viewed project activity was about SONATA updated requirements and architecture design.

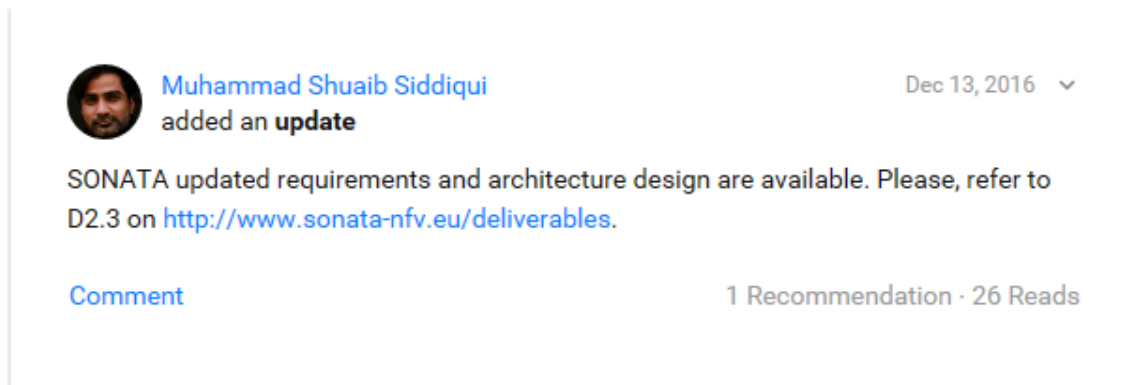


Figure 59: Top viewed post on SONATA ResearchGate space

3.3.4 YouTube [43]

YouTube is another social media channels inaugurated during this year, with the main goal of centralising all videos generated by the project, and to boost our video marketing strategy.

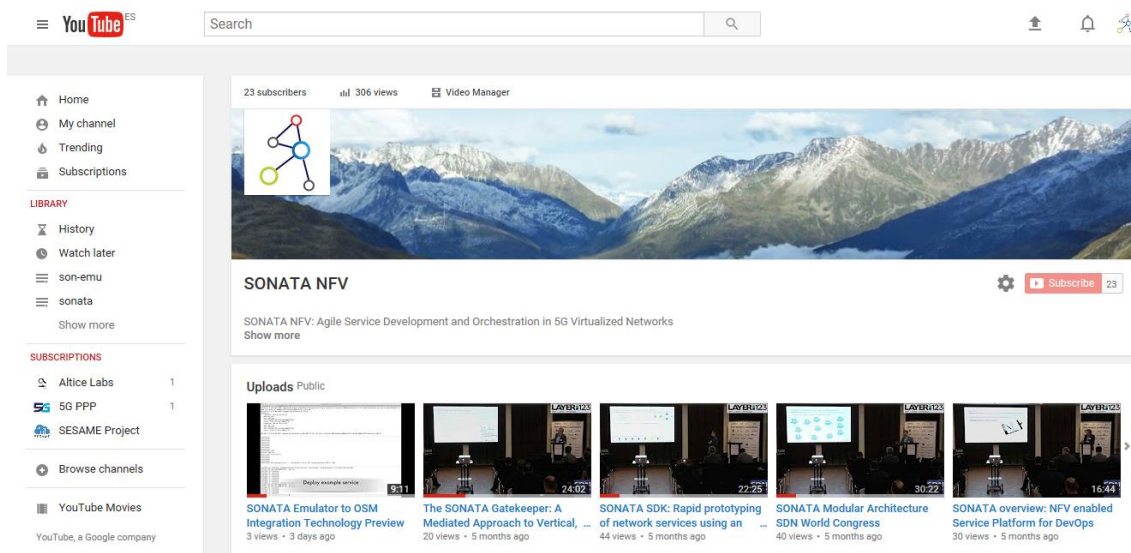


Figure 60: SONATA YouTube profile

In the few months after its creation, these are the main statistics achieved:

- Number of subscribers: 23
- Number of views: 306

- Uploaded public videos: 10
- Linked videos: 4

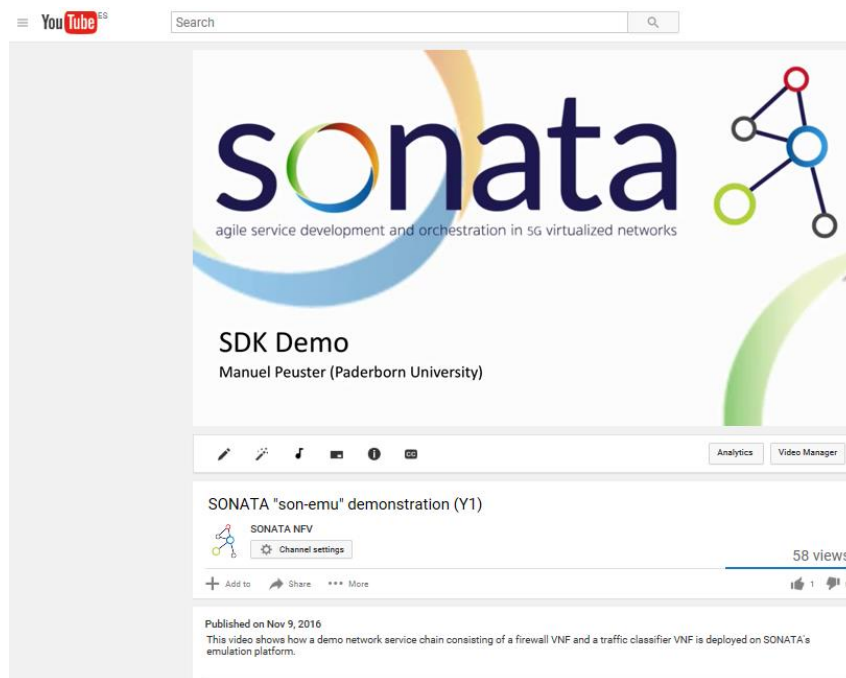


Figure 61: SONATA YouTube top video

3.4 Newsletters

According to our plan, the project sent two newsletters in Y2, both related to the launch of the software releases in September 2016 and February 2017. At the end of year two, another issue will be launched which would summarize the achievements reached by the project during the second year of life of the project, and providing information about upcoming events and publications.

All SONATA newsletters are available on the project website [7].

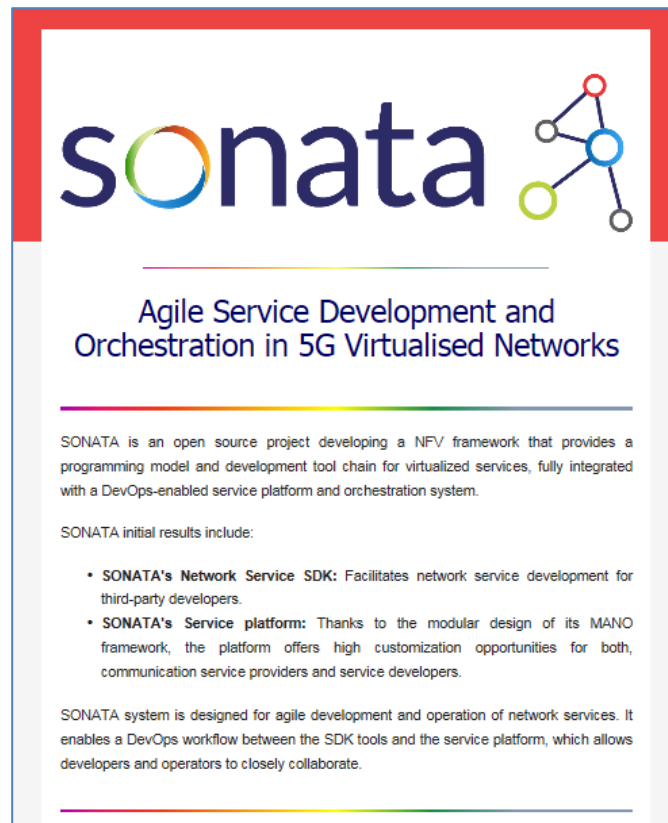


Figure 62: SONATA Newsletter Issue nº 1

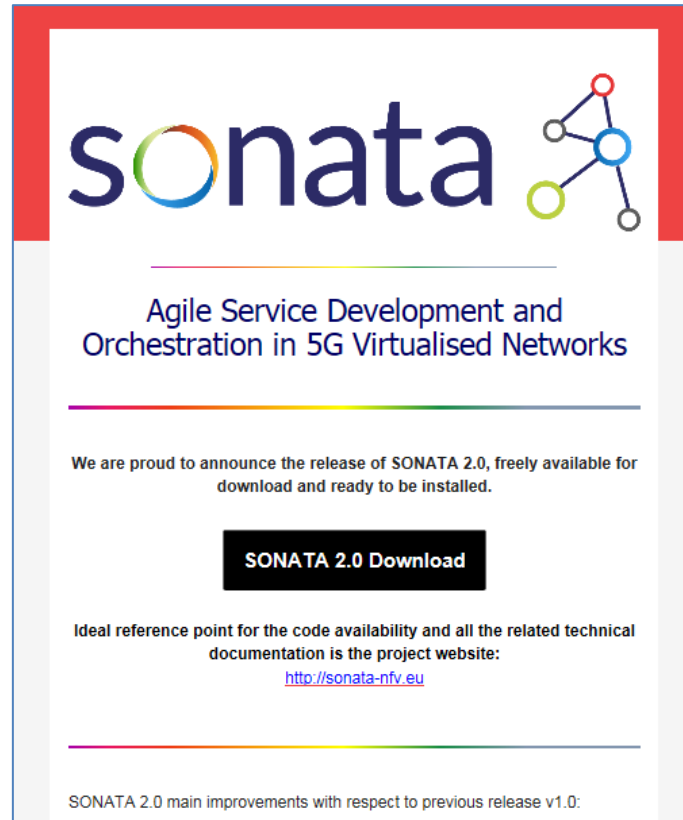


Figure 63: SONATA Newsletter Issue nº 2

3.5 Supporting Materials

According to the plan, a project brochure [44], a triptych, was created to be shared in events, conferences, workshops, etc. It is also meant to serve as a promotion tool through our different social media channels.



Figure 64: SONATA project brochure (triptych)

3.6 Publications

As already mentioned, the goal this year in relation to publications was to keep the good job initiated in year one, where the consortium made good strides. We can say that in Y2 the performance of the project has been ever better, surpassing initial expectations.

In the following subsections we provide detailed information about these Y2 publications.

3.6.1 Conference Publications

Title	Authors	Conference Proceedings	Publication Date	Status	Links and Additional Notes
Understand Your Chains: Towards Performance Profile-based Network Service Management	M. Peuster H. Karl	EWSDN 2016 The fifth edition of the European Workshop on Software Defined Networks The Hague, Netherlands	Oct. 2016	Published	https://www.ewsdn.eu https://arxiv.org/pdf/1703.08206.pdf
A Model to Select the Right Infrastructure Abstraction for Service Function Chaining	T. Soenen W. Tavernier et al.	IEEE NFV-SDN 2016 Conference on Network Function Virtualization and Software Defined Networks Palo Alto, California	Nov. 2016	Published	http://nfvsdn2016.ieee-nfvsdn.org/
Monitoring and debugging using an SDK for NFV-powered telecom applications	S. V. Rossem W. Tavernier M. Peuster et al.	IEEE NFV-SDN 2016 Conference on Network Function Virtualization and Software Defined Networks Palo Alto, California	Nov. 2016	Published	http://www.sonata-nfv.eu/publications
MeDICINE: Rapid Prototyping of Production-Ready Network Services in Multi-PoP Environments	M. Peuster H. Karl S. V. Rossem	IEEE NFV-SDN 2016 Conference on Network Function Virtualization and Software Defined Networks Palo Alto, California	Nov. 2016	Published	http://nfvsdn2016.ieee-nfvsdn.org
Efficient Algorithms for NFV-Enabled Multicasting in SDNs	Z. Xu A. Galis	IEEE Infocom 2017 Atlanta, USA	May 2017	Published	http://infocom2017.ieee-infocom.org

Title	Authors	Conference Proceedings	Publication Date	Status	Links and Additional Notes
Demystifying Network Slicing: From Theory to Practice	T. Soenen W. Tavernier et al.	IEEE IM Workshop 5GMan 2017	May 2017	Published	http://www.5gman.org/index.html
Joint Optimization of Scaling and Placement of Virtual Network Services	S. Dräxler H. Karl Z.Á. Mann	IEEE/ACM CCGrid 2017 17th International Symposium on Cluster, Cloud and Grid Computing	May 2017	Published	https://www.arcos.inf.uc3m.es/ccgrid2017
SONATA: Service Programming and Orchestration for Virtualized Software Networks	S. Dräxler H. Karl M. Peuster H. Razzaghi KouchaksaraeiM. Bredel J. Lessmann T. Soenen W. Tavernier S. Mendel-Brin G. Xilouris	5GArch 2017 Co-located with IEEE ICC 2017 4th International Workshop on 5G Architecture Paris, France	May 2017	Published	http://icc2017.ieee-icc.org/workshop/5garch-2017-4th-international-workshop-5g-architecture
Throughput Maximization and Resource Optimization in NFV-Enabled Networks	Z. Xu W. Liang A. Galis Y. Ma	IEEE ICC 2017 Software Defined Networking & Network Function Virtualization Paris, France	May 2017	Published	http://icc2017.ieee-icc.org/cfp
Approximation and Online Algorithms for NFV-Enabled Networks in SDN	Z. Xu W. Liang M. Huang M. Jia S. Guo	ICDCS 2017 The 37th IEEE International Conference on Distributed Computing Systems	Jun. 2017	Published (acceptance rate 16.5%!)	https://icdcs2017.gatech.edu/

Title	Authors	Conference Proceedings	Publication Date	Status	Links and Additional Notes
	A. Galis	Atlanta, USA			
A Flexible Multi-PoP Infrastructure Emulator for Carrier-grade MANO Systems	M. Peuster S. Dräxler, H. Razzaghi Kouchaksaraei S. V. Rossem, W. Tavernier H. Karl	IEEE Netsoft 2017 The 3rd IEEE Conference on Network Softwarization DEMO track Bologna, Italy	Jul. 2017	Accepted	http://sites.ieee.org/netsoft
Genome Centric Networking: a network function virtualization solution for genomic applications	D. Tusa et al.	IEEE Netsoft 2017 The 3rd IEEE Conference on Network Softwarization Bologna, Italy	Jul. 2017	Accepted	http://sites.ieee.org/netsoft
Automated Monitoring and Detection of Resource-limited NFV-based Services	S. V. Rossem W. Tavernier D. Colle M. Pickavet P. Demeester	IEEE Netsoft 2017 The 3rd IEEE Conference on Network Softwarization Bologna, Italy	Jul. 2017	Accepted	http://sites.ieee.org/netsoft/
Profile Your Chains, Not Functions: Automated Network Service Profiling in DevOps Environments	M. Peuster H. Karl	IEEE NFV-SDN 2017 Berlin, Germany	Nov. 2017	Submitted	http://nfvsdn2017.ieee-nfvsdn.org
Towards Predicting Resource Demands and Performance of Virtual Network Functions in a Video Streaming Context	S. Dräxler M. Peuster M. Illian H. Karl	IEEE NFV-SDN 2017 Fast Track Berlin, Germany	Nov. 2017	Submitted	http://nfvsdn2017.ieee-nfvsdn.org
Reliable Design of NFV Management &	T. Soenen W. Tavernier	IEEE RNDM 2017 The 8th International	Sep. 2017	To be submitted	http://www.rndm.pl/2017/

Title	Authors	Conference Proceedings	Publication Date	Status	Links and Additional Notes
Orchestration Using Microservices	et al.	Workshop on Resilient Networks Design and Modeling			
Leading Innovations Towards 5G - Europe's Perspective in 5G Infrastructure Public-Private Partnership	M. Bredel et al.	EuCNC 2017 Oulu, Finland		Declined	http://www.eucnc.eu/
A Network Service Development Kit Supporting the End-to-End Lifecycle of NFV-based Telecom Services	S. V.Rossem M. Peuster L. Conceicao W. Tavernier D. Colle M. Pickavet P. Demeester	SIGCOMM 2017 Los Angeles, USA		Declined	http://conferences.sigcomm.org/sigcomm/2017/cf-posters.html

Table 6: Conference Publications

3.6.2 Journal Publications

Title	Authors	Journal	Publication Date	Status	Links and Additional Notes
Experimenting with Management Information Orchestration for Virtual Software-Defined Networks	L. Mamatas S. Clayman A. Galis	Elsevier Computer Networks Journal Special Issue on Software-Defined Operations	Aug. 2016	Published	www.journals.elsevier.com/computer-networks
DevOps for Network Function Virtualization: Architectural Approach	H. Karl S. Dräxler M. Peuster A. Galis M. Bredel A. Ramos J. Martrat, M.S. Siddiqui S. Rossem W. Tavernier G. Xilouris	5G issue in Transactions on Emerging Telecommunication Technologies	Aug. 2016	Published	http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2161-3915;jsessionid=AC7DC3200F00E275EC16186D19CDD1EA.f04t04
Information Management as a Service for Network Function Virtualization Environments	L. Mamatas S. Clayman A. Galis	IEEE Transactions on Network and Service Management Special Issue on Management of Softwarised Networks	Sep. 2016	Published	http://ieee-tnsm.org
SONATA: Agile Service	Consortium	European 5G Annual	Nov. 2016	Published	https://bscw.5g-ppp.eu/pub/bscw.cgi/d105497/EURO-

Title	Authors	Journal	Publication Date	Status	Links and Additional Notes
Development and Orchestration in 5G Virtualised Networks		Journal: First Edition			5G Annual%202016 July%202016.pdf
Specification, Composition, and Placement of Network Services with Flexible Structures	S. Dräxler H. Karl	International Journal of Network Management	Jan. 2017	Published	http://onlinelibrary.wiley.com/doi/10.1002/nem.1963/fu
SONATA: Agile Service Development and Orchestration in 5G Virtualised Networks	Consortium	European 5G Annual Journal: Second Edition	Q3 2017	Submitted	

Table 7: Journal Publications

3.6.3 (Pre) Standards Publications

Title	Authors	SDO	Publication Date	Status	Links and Additional Notes
Autonomic Slice Networking- Context, Requirements, Definition and Reference Model	A. Galis	IETF ANIMA WG	Nov. 2016	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Contributing Document “Overall IMT-2020 network architecture framework” as input to “Framework of IMT-2020 network architecture”/ ITU-T IMT2020	A. Galis	ITU-T IMT2020	Dec. 2016	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Contributing Document “Networks, Services and Resources Orchestration Functional Requirements” as input to “Network Management Framework for IMT-2020” /ITU-T IMT2020	A. Galis	ITU-T IMT2020	Dec. 2016	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx

Title	Authors	SDO	Publication Date	Status	Links and Additional Notes
Contributing Document “Multi Service Control and Management” as input to “Network Management Framework for IMT-2020” /ITU-T IMT2020	A. Galis	ITU-T IMT2020	Dec. 2016	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Contributing Document “NWSoft Framework” as input to the “Network Softwarization” / ITU-T IMT2020	A. Galis	ITU-T IMT2020	Dec.2016	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Introduction to DevOps application for Network Service Management	D. Lopez	Multi-SDO Initiative on Information Modeling and Network Service Management	Dec. 2016	Presented	http://www.analysismason.com/Research/Content/Comments/Deutsche-Telekom-workshop-Feb2017-RMA07/article-PDF
Draft Report Recommendation: Application of network softwarization to IMT-2020 (O-041) – 150 pages /ITU-T IMT2020	A. Galis	ITU-T IMT2020	Jan. 2017	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx

Title	Authors	SDO	Publication Date	Status	Links and Additional Notes
Draft Recommendation: Framework for IMT-2020 overall network architecture (O-043) -18 pages /ITU-T IMT2020	A. Galis	ITU-T IMT2020	Jan. 2017	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Draft Recommendation: Network management framework for IMT-2020 (O-047) – 38 pages /ITU-T IMT2020	A. Galis	ITU-T IMT2020	Jan. 2017	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Draft Recommendation: IMT-2020 network management requirements (O-046) – 21 pages /ITU-T IMT2020	A. Galis	ITU-T IMT2020	Jan. 2017	Published	http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx
Network Slicing - Introductory Document and Problems Statement A	A. Galis	IETF Net Slices	Feb. 2017	2nd Draft submitted to IETF 98	https://tools.ietf.org/html/draft-galis-anima-autonomic-slice-networking-02
Towards 5G	A. Galis	IEEE 5G Tech Focus,	Mar. 2017	Published	http://5g.ieee.org/tech-focus/march-2017#networkslicin

Title	Authors	SDO	Publication Date	Status	Links and Additional Notes
Network Slicing - Motivations and Challenges	C. Lin	Volume 1, Number 1, March 2017			
Towards Slice Networking	A. Galis	IETF Net Slices	Mar. 2017	Presented	https://github.com/netslices/IETF-NetSlices/tree/master/IETF98_Sidemeeting02
Towards Integration of Slice Networking in NFV	A. Galis	IETF NFV RG	Mar. 2017	Presented	https://www.ietf.org/proceedings/98/slides/slides-98-nfvrg-sessb-14-towards-integration-of-slice-networking-in-nfv-00.pdf
Cognitive Network Management for 5G white paper	A. Galis	5GPPP Network Management WG	Mar. 2017	Published	https://5g-ppp.eu/wp-content/uploads/2017/03/NetworkManagement_WhitePaper_1.pdf
The Role of a Mediation Element in NFV DevOps	D. Lopez J. Bonnet M. Peuster P. Aranda	IRTF NFVRG	Mar. 2017	Published	https://www.ietf.org/id/draft-sonata-nfvrg-devops-gatekeeper-03.txt
Autonomic Slice Networking	A. Galis	IETF ANIMA WG	Mar. 2017	2nd Draft submitted to IETF 98	https://tools.ietf.org/html/draft-galis-anima-autonomic-slice-networking-02
4 IETF drafts: 1. Network Slicing - Revised Problem Statement Document	A. Galis	IETF	Jun. 2017	Published	<ul style="list-style-type: none"> https://www.ietf.org/internet-drafts/draft-galis-netslices-revised-problem-statement-00.txt

Title	Authors	SDO	Publication Date	Status	Links and Additional Notes
2. Network Slicing Architecture					<ul style="list-style-type: none"> • https://www.ietf.org/internet-drafts/draft-geng-netslices-architecture-01.txt
3. Network Slicing Use Cases					<ul style="list-style-type: none"> • https://www.ietf.org/internet-drafts/draft-netslices-usecases-00.txt
4. Gap Analysis for Network Slicing					<ul style="list-style-type: none"> • https://tools.ietf.org/html/draft-qiang-netslices-gap-analysis-00

Table 8: Standards Publications

3.7 Events and demos

The project has achieved the objective of keeping the previous year's rhythm regarding events, with the participation in a total of 12 events/workshops, 3 more than in Y1. In addition to that, the project has also begun running demonstrations of the software.

The tables below provide more information about that activity. In section 3.7.3 we provide more detailed information about the most relevant events for the project in Y2.

3.7.1 Events

Event	Date	Location	Audience profile	Partners representatives	Consortium activity	Additional information
SDN & OpenFlow World Congress	October 2016	The Hague (Netherlands)	Industry	J. Martrat (Atos) M. Bredel (NEC) E. Truova (NCSRD) D. Lopez (TID) M. Peuster (UPB)	2-hour workshop	https://www.layer123.com/sdn
				A. Galis (UCL)	Panel on "The Way Forward to 5G"	
Second Global 5G Event (EC & 5G-I-Association)	November 2016	Rome (Italy)	Research	D. Lopez (TID)	Participation on a panel on Software Networks implications for 5G. SONATA as a project had a short presentation of key ideas about software network evolution	https://5g-ppp.eu/event/second-global-5g-event-on-9-10-november-2016-in-rome-italy/
Network Service Management Workshop	December 2016	Bonn (Germany)	Industry	D. Lopez (TID)	Presentation of the challenges and opportunities for network service management brought by Software Networks, with a	

Event	Date	Location	Audience profile	Partners representatives	Consortium activity	Additional information
					<p>special emphasis on the DevOps capabilities provided by SONATA.</p> <p>Participation in a panel on the implications of applying open-source in network service managements, with SONATA as an example of agile open-source collaboration</p>	
5G-PPP Cross-project Workshop on Use cases and Overall 5G architecture	February 2017	Athens (Greece)	5G PPP	T. Zahariadis (SYN) G.Xilouris (NCSRD)	SONATA project presentation	https://5g-ppp.eu/metis-ii/
OSM meeting	February 2017	Bilbao (Spain)	Industry and Research	J. Martrat (Atos) M. Bredel (NEC) D. Lopez (TID)	SONATA project presentation	http://www.sonata-nfv.eu/content/sonata-osm-meeting-bilbao-week
Speech at Universidade do Minho	February 2017	Braga (Portugal)	Academia	J. Bonnet (ALB)	Presentation on DevOps	http://www.sonata-nfv.eu/content/devops-journey-not-event-jos%C3%A9-bonnet
Cloud Expo Europe	March 2017	London (UK)	Industry	D. Lopez (TID)	Introduction of the essential architectural and functional elements required for applying the DevOps principles to network service management, analysing the requirements in what relates	http://www.cloudexpoeurope.com http://www.cloudexpoeurope.com/show-news/prototypes-and-principles-diego-r-

Event	Date	Location	Audience profile	Partners representatives	Consortium activity	Additional information
					to supporting collaboration, achieving agility, and addressing security. This was done by using the example of the SONATA project, highlighting the elements developed within the project and the use cases considered. Participation in a panel on agile networks.	!%C3%B3pez
CleanSky ITN workshop	March 2017	Göttingen (Germany)	Research	H. Karl	Overview talk of challenges for next-gen IT in distributed cloud settings and the resulting network challenges. Explain how Sonata contributes to solving these challenges.	http://www.cleansky-itn.org/conference-series/goettingen
SONATA-Virtuwind-5GEx Technical workshop	March 2017	Berlin (Germany)	EU projects	M. Bredel (NEC) T. Soenen (IMEC)	Workshop with the objective of promoting collaboration between projects	http://www.sonata-nfv.eu/content/cross-project-workshop-berlin-today
SOFTNETWORKING 2017 SYMPOSIUM	April 2017	Venice (Italy)	Industry and Research	W. Tavernier (IMEC) T. Soenen (IMEC) S. V. Rossem (IMEC)	Special track: NFV Service Development and Operations for the SONATA MANO Platform DEMO: SONATA NFV SDK	The International Symposium on Advances in Software Defined Networking and Network Functions Virtualization https://www.iaria.org/co

Event	Date	Location	Audience profile	Partners representatives	Consortium activity	Additional information
					and MANO Service Platform hands-on	nferences2017/SOFTNET WORKING.html http://www.sonata-nfv.eu/content/sonata-softnetworking-2017-next-week
IEEE ComSoc Webinar: SDN/NFV – Time for Real Innovations.	May 2017	Online	Industry	J. Martrat (Atos)	Panel: Software Networks: Disruption, Opportunity and Reality	http://www.comsoc.org/webinars/sdnnfv-%E2%80%93-time-real-innovations
EuCNC 2017	June 2017	Oulu (Finland)	Industry	J. Martrat (Atos) G.Xilouris (NCSRD)	Software Networks WG workshop	http://www.sonata-nfv.eu/content/don%C2%B4t-miss-software-networks-workshop-eucnc
International Summer School on Latency Control for Internet of Services	June 2017	Karlstad (Sweden)	Academia	H. Karl	Tutorial	https://acro2017.hotell.kau.se/

Table 9: Y2 Events Reporting

3.7.2 Demos

Demo type	Event	Date	Location	Audience profile	Partners representatives	Additional information
Demo paper: Monitoring and debugging using an SDK for NFV-powered telecom applications	IEEE NFV-SDN 2016 (Conference on Network Function Virtualization and Software Defined Networks)	November 2016	Palo Alto California (USA)	Industry Research	S. V. Rossem (IMEC) W. Tavernier (IMEC) M. Peuster (UPB)	http://nfvsdn2016.ieee-nfvsdn.org http://nfvsdn2016.ieee-nfvsdn.org/program/demonstrations
Demo on SDK	CommNet2 Winter School (hosted by British Telecom)	November 2016	Remote	PhD students Researchers	M. Peuster (UPB)	https://www.commnet.ac.uk/cornerstone-draft
SDK hands-on	Sofnetworking 2017	April 2017	Venice (Italy)	Industry Academia	S. V. Rossem (IMEC)	https://www.iaria.org/conferences2017/SOFTNETWORKING.html
Service Platform demo					T. Soenen (IMEC)	http://www.sonata-nfv.eu/content/sonata-softnetworking-2017-next-week
Demo: Containernet and SONATA Emulator	International Summer School on Latency Control for Internet of Services	June 2017	Karlstad (Sweden)	PhD students Researchers	H. Karl (UPB) M. Peuster (UPB)	https://acro2017.hotell.kau.se/

Table 10: Y2 Demos Reporting

3.7.3 Additional information about the most relevant events of Y2

3.7.3.1 SDN World Congress 2016

SDN NFV World Congress has established itself as the principal network innovation conference in Europe for the global telecommunications industry. With over 100 supporting partners and sponsors and 1,600+ delegates in 2016, SDN NFV World Congress is the largest knowledge exchange and EXPO for the Carrier SDN NFV and MANO industries.

Its last edition took place from the 10th to the 14th of October 2016, in La Hague, Netherlands, as every year. On the second day, SONATA held a 2-hour workshop where the objective was two-fold:

1. Introducing SONATA NFV-based development toolkit and service platform and announce the release of its first version.
2. Discussing with experts the tools and processes required to drive the software development in a DevOps approach, something that is at the very core of the SONATA development cycle.

Figure 65 shows the agenda of the session. Presentations can be found on the project website [45] and videos of each of the panels are available in our YouTube channel [46].

In addition, a paper, “Understand Your Chains: Towards Performance Profile-based Network Service Management” [47], was presented at the fifth edition of the European Workshop on Software Defined Networks (EWSDN), which was co-located with the SDN world congress 2016. This paper, accepted in August 2016, was presented by our partner member Manuel Peuster (UPB) in the morning session of the 10th of October at the EWSDN.

Our participation at the SDN World congress was accompanied by the launch of a press release [9] announcing that SONATA would present its release 1.0 at the SDN World Congress. This press release was promoted through all SONATA channels and echoed on the 5G PPP website.

		10-14 October 2016 World Forum, The Hague, Netherlands	
15:35		Welcome and introduction	
15:40		SONATA overview: NFV-enabled service platform for DevOps. Josep Martrat / Telecom and Media Market Manager / Atos Research	
16:00		The SONATA Modular Architecture Michael Bredel / Senior Researcher / NEC Laboratories Europe	
16:20		The SONATA gatekeeper: A mediated approach to vertical, horizontal and operational NFV recursion Diego López / Senior Technology Expert, Chair of ETSI NFV ISG, Co-chair of IRTF's NFVRG / Telefonica+D	
16:40		The SONATA SDK: Rapid prototyping of network services using an integrated DevOps toolchain Manuel Peuster / PhD Student / University of Paderborn	
17:00		The SONATA Infrastructure Eleni Trouva / Network Engineer/ NCSRD Demokritos	
17:20		Q&A	
18:00		End of SONATA Workshop	

Figure 65: SONATA workshop at the SDN World Congress 2016. Agenda

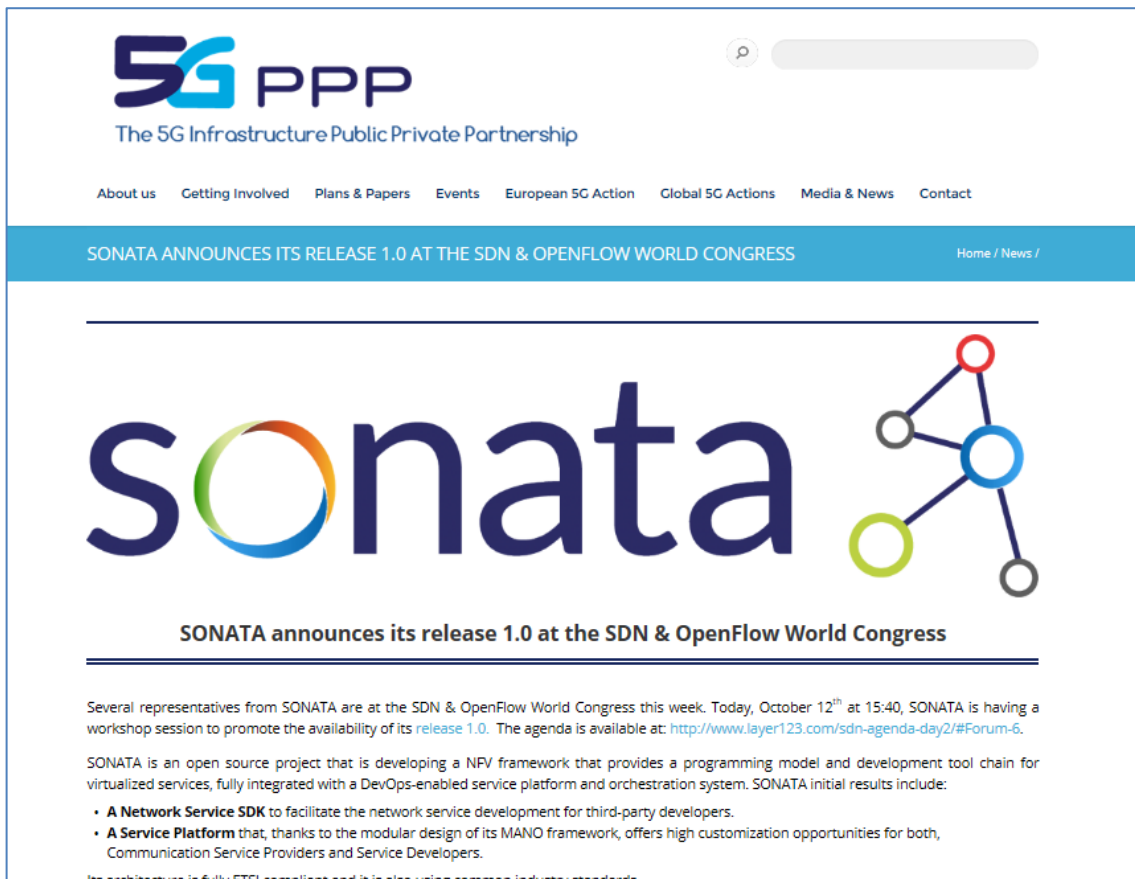


Figure 66: SONATA workshop at the SDN World Congress 2016. Press release

As main conclusions, we can highlight that this was the first commercial event in which SONATA results were introduced in detail. The overall interest was high, considering about 35-40 people actively participate in the specific SONATA session, including some members of ETSI OSM, like Silvia Almagia. Key comments were about the modularity of the orchestration scheme, the extended DevOps model across organizations in the Telecom value chain and other advance features. A general remark was related to the future sustainability and support of OS results beyond the R&D initiative.

It is also interesting to highlight that a strategic meeting took place between SONATA representatives with key contacts of the OSM community (Francisco Javier Ramon Salguero from Telefonica and OSM Chair; and Andy Reid, from British Telecom and vice chairman of ETSI OSM and key contributor to the ETSI NFV ISG) and Intel (Adrian Hoban, Chair OSM TSC). We discussed the possible contribution model, the necessary signature of member or participant agreement and how to synchronize development roadmaps. They were interested in the SONATA orchestration model, test procedures and the local environment for developers (emulator of SDK). As a result of these conversations, we agreed to participate in the next OSM meeting (Intermediate Release TWO) and it is envisage that some of SONATA outcomes can be contributed to future releases of OSM.

3.7.3.2 Sofnetworking 2017

At the International Symposium on Advances in Software Defined Networking and Network Functions Virtualization (IARIA SOFTNETWORKING 2017) organized on April 23-27 2017, SONATA was represented in two tracks.

The conference audience, together with the ICN mother conference, consisted of more than 50 people including experts from academia and industry. This was an excellent opportunity for the project to get visibility across a range of potential adopters, especially because the SONATA label was very visible on the conference website, as can be seen below.



Figure 67: SONATA at the SOFTNETWORKING 2017

The two SONATA tracks were:

- SOMA: NFV Service Development and Operations for the SONATA MANO Platform
- DEMO: SONATA NFV SDK and MANO Service Platform hands-on.

The first track consisted of a tutorial/workshop on the SONATA project in general, its Software Development Kit and the SONATA Service Platform. The agenda of this session is depicted in the figure below. The audience consisted of 20-30 people and resulted in multiple interactions with the presenters.




Timeslot	Title	Presenter
16:30-16:45	SONATA Introduction & overview	Wouter Tavernier 
16:45-17:15	SONATA SDK	Wouter Tavernier 
17:15-17:20	Break	
17:20-17:50	SONATA Service Platform	Thomas Soenen 
17:50-18:00	Questions & discussion	

Figure 68: SOMA workshop agenda

The second session was focused on a more hands-on audience, consisting of PhD students and technical people of industry and academia, consisting of tutorials of the developed SONATA software tools, as well in-depth demonstrations of the SDK and Service Platform on realistic services. The agenda of the hands-on session is depicted in Figure 69. This session was attended by about 10-15 technical-oriented attendants.




Timeslot	Title	Presenter
18:40-18:45	Tutorial overview	Wouter Tavernier 
18:45-19:30	SONATA SDK hands-on	Steven Van Rossem 
19:30-19:40	Break	
19:40-20:20	SONATA Service Platform demonstration	Thomas Soenen 
20:20-20:30	Questions & discussion	

Figure 69: Hands-on / demo session agenda

The discussion timeslots of the different sessions were extensively used by the audience, and resulted in interesting discussions as well as useful feedback. Both the SDK and SP were perceived as very useful software packages, especially because of their open-source character, and appropriate documentation. There are strong indications that our SDK software (in particular the emulator) & SP will be tested by people at Nextworks, Italtel and Bucharest University. In addition, Ericsson Sweden provided interesting feedback for future work (e.g., focusing on the ability to profile/control performance + scheduling in the infrastructure

layer). People from Nextworks suggested they may incorporate SONATA software into the SELFNET project [48].

3.7.3.3 EuCNC 2017

On June, SONATA consortium participated at the yearly edition of the European Conference on Networks and Communications (EuCNC 2017) that took place at Oulu (Finland), which is becoming one of the 5G cities to test new technologies advancements.

EuCNC is a relevant event to show the value of European research and innovation in the strategic domain of future communication and ICT services infrastructures. The theme this year was “5G – European Roadmap, Global Impact”, which aimed to provide a clear focus towards 5G technology validation and deployment, critical for Europe. 5G initiatives are ongoing worldwide and the conference programme also provided valuable views on the global actions (US, Japan, etc.), which is a valuable input to the European policies and R&D work programme (5G PPP phase 3 – Trials) targeting the 5G deployment by 2020.

At the event, most of the phase 1 5G PPP projects were presenting their main achievements after running for almost two years. Concretely, Josep Martrat (ATOS, SONATA coordinator) was interviewed on Wednesday about the key objectives, available results and overall impact of SONATA project in an elevator speech format. The video will be available in the 5G PPP website and SONATA’s YouTube channel once edited.

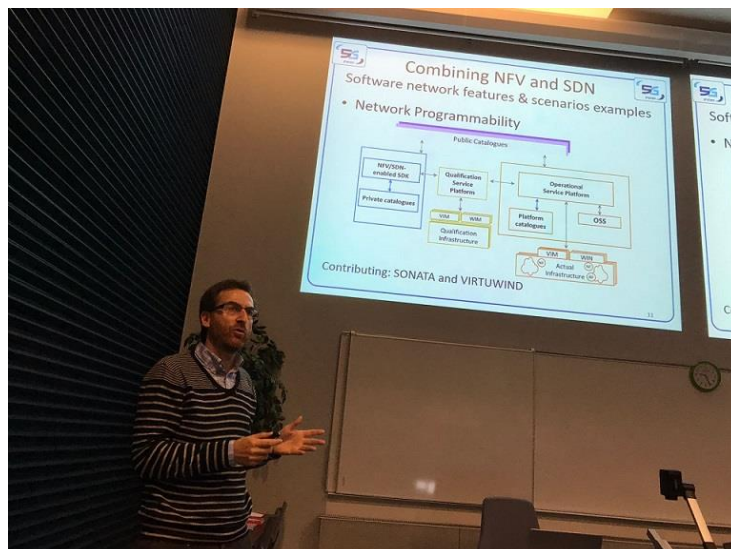


Figure 70: Software Networks workshop at EuCNC 2017 co-chaired by SONATA coordinator

In addition, SONATA co-led the ‘software network and 5G’ workshop of the first day of the event. The workshop consisted of a set of invited presentations of key 5G PPP research initiatives. The projects are addressing network service virtualisation and programmability (combining SDN/NFV trends), aiming at significant cost efficiency, introduction of new services and transformation of the networking market. The ecosystem of R&D actions examines the impact and the capabilities of virtualisation and programmability across all networking domains: from core to edge and access, from wired/optical to wireless and cellular.

SONATA had a presentation “DevOps: NFV programmability (SDK) and flexible Orchestration”, including also hands-on experience in pilots deployment that was finally presented by Dr. George Xilourys (NCSR-D) at the event.

3.8 Collaboration

Activities regarding collaboration in relation to standards, open source communities and the 5G PPP will be extensively covered in deliverable D7.7, as they constitute one of the main exploitation pillars of the project.

As D7.7 will be a confidential report, just available for members of the consortium (including the Commission Services), we summarize the main activity here.

3.8.1 Standards bodies organizations

As stated in the plan drafted at the beginning of the year, the project identified a set of main target bodies (ETSI NFV, IETF and ITU-T) while monitoring others (MEF, TMF and 3GPP SA5) for potential opportunities, as well as considering a couple of other initiatives for potential contribution. Our activity can be summarized as follows:

ETSI NFV:

- Although no result has been achieved yet, we foresee a strong influence of the SONATA findings when dealing with the packaging tools.
- SONATA team has contributed to the SEC014 document (Security Specification for MANO Components and Reference points) and to REL006 (Specification for maintaining service availability and continuity when updating/upgrading software) of the SEC and REL WG respectively.
- A couple of ETSI NFV EVE WG work-items are related with licensing and measurements and the project partners have contributed to the discussions, bringing the project results in what relates to the monitoring infrastructure and the license verifications performed during onboarding and deployment.
- ETSI NFV has started some work on identifying what are the characteristics that make services and VNFs suitable to be qualified as "cloud native" (EVE011). The SONATA team is participating in the discussions around cloud nativeness and several points regarding SONATA outcomes are being considered for contribution.
- Direct contribution on slice isolation and several additional updates on matters related to slice instantiation and VNF deployment on slices have already been made by the project to the EVE012 work-item, focused on analyzing how NFV principles can be applied to achieve network slicing use cases described by other SDOs or pre-standardization bodies.
- The project team has brought SONATA concepts and architectural results to discussions on multi-domain matters in the EVE, REL, SEC and TST working groups.

IETF/IRTF:

- The SONATA Gatekeeper model has been contributed to the NFVRG of the IRTF in a document that discusses its applicability for DevOps procedures and its role for user management, service package management, and monitor data transfer. An

introduction to the role of emulation in the DevOps cycle and some considerations on security implications are provided as well to this document.

- The SONATA team has contributed as well to the discussions on information and data models that are so common within the IETF. The experience on descriptors and packaging has been applied here as well.
- During this year, the IETF has hosted several discussions on 5G network requirements and network slicing. The SONATA partners have been very active in these discussions, contributing documents on:
 - Network Slicing - Revised Problem Statement Document
 - Network Slicing Architecture
 - Network Slicing Use Cases
 - Gap Analysis for Network Slicing
 - Autonomic Slice Networking

ITU-T:

The target in ITU-T was the IMT2020 Focus Group. The following are the contributions to ITU-T IMT2020 made by the SONATA team:

- Recommendation: Framework for IMT-2020 overall network architecture (O-043)
- Recommendation: Network management framework for IMT-2020 (O-047)
- Recommendation: IMT-2020 network management requirements (O-046)
- Recommendation: Application of network softwarisation to IMT-2020 (O-041)

Other SDOs monitored.

As mentioned, given the project timeframe and resources, other SDOs such as MEF, TMF and 3GPP SA5, were just monitored with the intention of taking an active participation role in case a clear opportunity to influence the process showed up.

3.8.2 Open Source communities

3.8.2.1 OpenStack Tacker

Since the first year, SONATA has sought closer collaboration with the OpenStack Tacker project, haven been involved in writing the blueprint for Tacker's Network Service Description (NSD) template.

However, the collaboration has been limited in year two due mainly to the following reasons:

1. The lack of support in the OpenStack community, with only few active developers contributing code.
2. Openstack's stacks development process requires a blueprints approval process that in Tacker's case turned out to be a very long process that did not match the short developing cycles of SONATA's.
3. The use of different programming languages which makes contributions, like the SONATA catalog system which turned out to be the most interesting bit for OpenStack Tacker, aren't as straight forward to integrate.

Despite the aforementioned challenges, we are still following the project closely attending even the regular Tacker online meetings and exchanging ideas. Moreover, it is worth noting that SONATA's partner NEC is still active in the Tacker project contributing to the NSD.

3.8.2.2 OSM

OSM has been without any doubts the key open source community for SONATA in year two. This co-collaboration is of mutual interest: SONATA benefits from the point of view of maximizing the impact and dissemination of the project, validating its results in a wider community, and guaranteeing the continuity of these results for exploitation; OSM obtains code implementing additional functionalities and a detailed review of part of its codebase from outside well-skilled developers.

As a result of the strong interaction, SONATA was invited to make a presentation at the OSM Midrelease#2 technical meeting in February 2017, where both open source communities discussed items of common interest and explored potential points of collaboration. Three main areas where SONATA could potentially contribute to OSM that were very well received by OSM members were:

1. The SONATA SDK / Emulator, which creates an easy-to-use test and local NFV deployment test platform, and is not intrusive and a complementary tool to OSM.
2. The SONATA package generation model.
3. The SONATA gatekeeper.

It is important to highlight that SONATA project is participating in the next OSM meeting that will take place in July 2017 at the ETSI headquarters in Sophia-Antipolis to discuss the inclusion of SONATA results in the blueprint for OSM Release THREE.

3.8.3 5G PPP Collaboration

3.8.3.1 5G PPP Working Groups

As planned, during year two, SONATA took an active role in the following WGs:

Software Networks

SONATA co-leads this 5G PPP working group. The WG delivered a white paper with the key findings of the technical discussions in January 2017 [49]. It addresses gaps for standardization in software networks and main OS software usage in the projects. SONATA explicitly contributed to network programmability chapter and open source communities analysis, in addition to overall edition of the paper (introduction, conclusions, etc.).

The WG also co-organised a software network workshop at EuCNC 2017 event. The objective was to present key technical achievements of 5G phase 1 projects. We are currently collecting available assets (mature, tested, well documented technical developments) that can be up taken or reused by 5GPPP phase 2 projects. This key information helps to understand how the assets can be sustained and evolved in phase 2, while guaranteeing future evolution of project results. The challenge is how to smoothly integrate new projects in the WG.

Architecture

The working group has, in this second year of the 5G PPP Phase 1 projects, tasked itself with producing an update to its 5G architecture white paper of 2016. At the time of writing this deliverable (early June 2017), the 2nd version of white paper on 5G Architecture was still undergoing final stages and harmonization amongst the various projects.

SONATA has made contributions on topics naturally related to its own scope of interests:

- Network softwarisation and programmability.
- Network Slicing Life Cycle Management.
- Recursive approaches.
- Service Management.

In addition, SONATA partner UCL assumed editorial responsibility for contributions to the 5G PPP Architecture working group documents.

Security

SONATA project participated in the two principal activities of the WG in Y2:

- A whitepaper titled, "5G-PPP Phase 1 Security Landscape", which describes the scope that is covered by 5G-PPP Phase 1 Projects from the specific viewpoint of 5G Security. SONATA project handsomely contributed to the whitepaper, especially to Section 2, New 5G major security requirements and risks.
- A workshop arranged by the WG at EuCNC 2017 in Oulu, Finland. The purpose of the workshop is threefold:
 - Present the 5G Security landscape whitepaper.
 - Open a discussion with other relevant stakeholders to complement the findings coming from the Landscape whitepaper on 5G security with their perspectives.
 - Provide the necessary guidance to future projects to continue to advance 5G Security in the right direction while taking advantages not only of findings but also assets coming from Phase 1 projects.

Two SONATA project members attended the workshop to present SONATA's take on 5G Security

Network Management

The working group has, in this second year of the 5G PPP Phase 1 projects, tasked itself with producing an update to its 5G Network Management white paper. The whitepaper on "Cognitive Network Management for 5G" was completed and issued as open publication on March 2017 [50].

SONATA has made contributions on topics naturally related to its own scope of interests:

- New Requirements for Network Management based on 5G.

- 5G Service & Network Management and Orchestration.
- Limitations and Challenges.

SONATA, mostly represented by UCL, assumed editorial responsibility for projects' contributions to the 5G Network Management working group documents.

[3.8.3.2 5G PPP Projects](#)

We list below the projects with which SONATA has actively collaborated during this second year of life as well as the activities that took place in this regard.

[VirtuWind \[51\]](#)

VirtuWind envisions lower capital expenditure and operational expenditure costs in control network infrastructure, so the project will play an important role in assisting wind energy sector to achieve cost reductions.

In Y2, VirtuWind and SONATA held a workshop to exchange ideas and elaborate on possible collaborations. The outputs from those discussions include how the projects can complement each other and which are the common topics that both are looking at. Those common topics are currently being analysed further. The overall idea is to see if and how the VirtuWind services can be transferred and operated by the SONATA platform. While this already seems possible for the cloud service used by VirtuWind, it might put a lot more stress on the guaranteed quality of service requirements needed by the industrial services. We still need to investigate how to integrate the VirtuWind extensions, like the OpenDaylight extensions, in the NVF infrastructure of SONATA.

[5G Exchange \[4\]](#)

5G Exchange (5GEx) project aims to enable cross-domain orchestration of services over multiple administrations or over multi-domain single administrations. At business level, the project targets the collaboration between operators regarding 5G infrastructure services.

During year two, several meetings have taken place between both 5GEx and SONATA in order to identify potential collaborations, as well as complementarities and synergies. Those potential areas of collaboration have been prioritised considering three criteria: i) interest for the scope of the project, ii) impact on 5G objectives and iii) the real feasibility to perform actions in terms of resources. As a result, the two topics with higher score have been considered to be tackled:

- Service Information Models - descriptors and formats.
- 5GEx east/west interfaces - SONATA SP recursiveness.

Based on the initial discussions, two specific task forces have been created to involve the key technical people from both projects. The results of these joint task forces will be reported in the last exploitation/communication reports at the end of the project.

[SELFNET \[48\]](#)

SELFNET has been other of the projects with which SONATA had a few discussions during Y2.

Several have been the areas of interest identified by both projects from those conversations.

A follow-up meeting focused on specific collaboration scenarios will be organized in the coming months in order to move forward. The result of such collaboration might be software integration (for example for a new use case that is being defined in SELFNET and will be implemented in year three), a deliverable contribution, joint publication, etc.

[CHARISMA \[52\]](#)

SONATA and Charisma projects share some partner members and that has facilitated the interaction between both projects during this year.

There were three main topics of interest between CHARISMA and SONATA projects including:

- **NFV Orchestrator:** A collaboration idea was to use SONATA platform instead of TeNOR (orchestrator built as part of T-NOVA project and used by CHARISMA) for deployment of network services on top of distributed VIM in the CHARISMA project. However, the idea did not materialize due to the technical challenges identified.
- **SONATA's SDK:** The CHARISMA project does not provide any tool for developers to create a network service based on existing or new VNFs as done in SONATA. A collaboration idea was to re-use SONATA SDK to facilitate network service development in the CHARISMA project. This idea faced the following challenges: different formats for the NS and VNF descriptors and the need to extend the SDK and CHARISMA Dashboard API to enable the communication between the two.
- **CHARISMA's Open Access Manager:** The Open Access Manager (OAM) is the core module of CHARISMA platform which not only enables infrastructure (compute, storage, & network) slicing but also involved in correct deployment of network services and resource orchestration. The collaboration idea was to enable slicing (compute and storage only) feature in SONATA platform by reusing CHARISMA OAM. In order to do so, substantial changes and new APIs were to be developed especially for SONATA Gatekeeper, User Management, and Infrastructure Adaptor modules. Unfortunately, for same reasons of lack of availability of effort and limited time, this idea was not further pursued.

The above mentioned activities were done during Y2. Although, all the potential collaboration ideas could not be implemented however, the exercise of analyzing how the two platforms could be extended in benefiting from modules developed in the other project to improve their feature set, paved the way for future adoption of these modules.

3.9 Other press and media channels

As agreed during the definition of the communication and dissemination plan for year 2, the consortium created press releases with the delivery of each of the project major software releases in M13 and M20. As planned, once approved by each individual organization in the consortium, those press releases were promoted through different channels: the project's channels, the partner's individual channels but also the 5G PPP ones. The goal was to reach the widest coverage possible. The press releases are also available on the project website for reading/downloading at any time [9].



Figure 71: SONATA press release issue 1

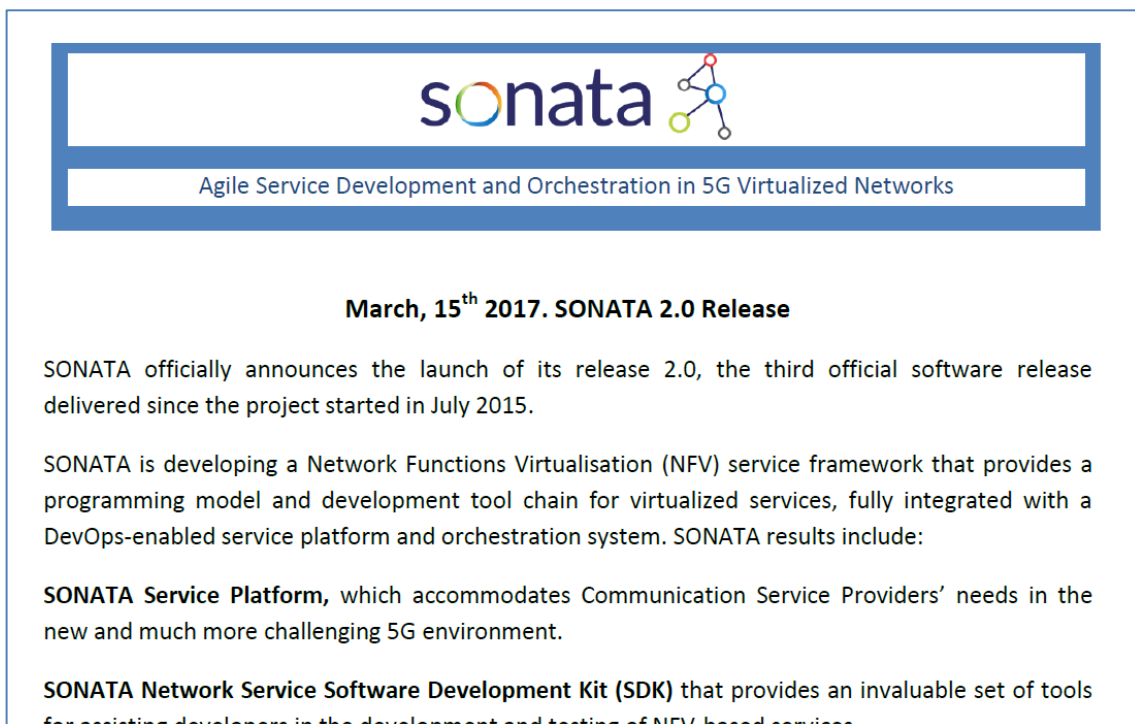
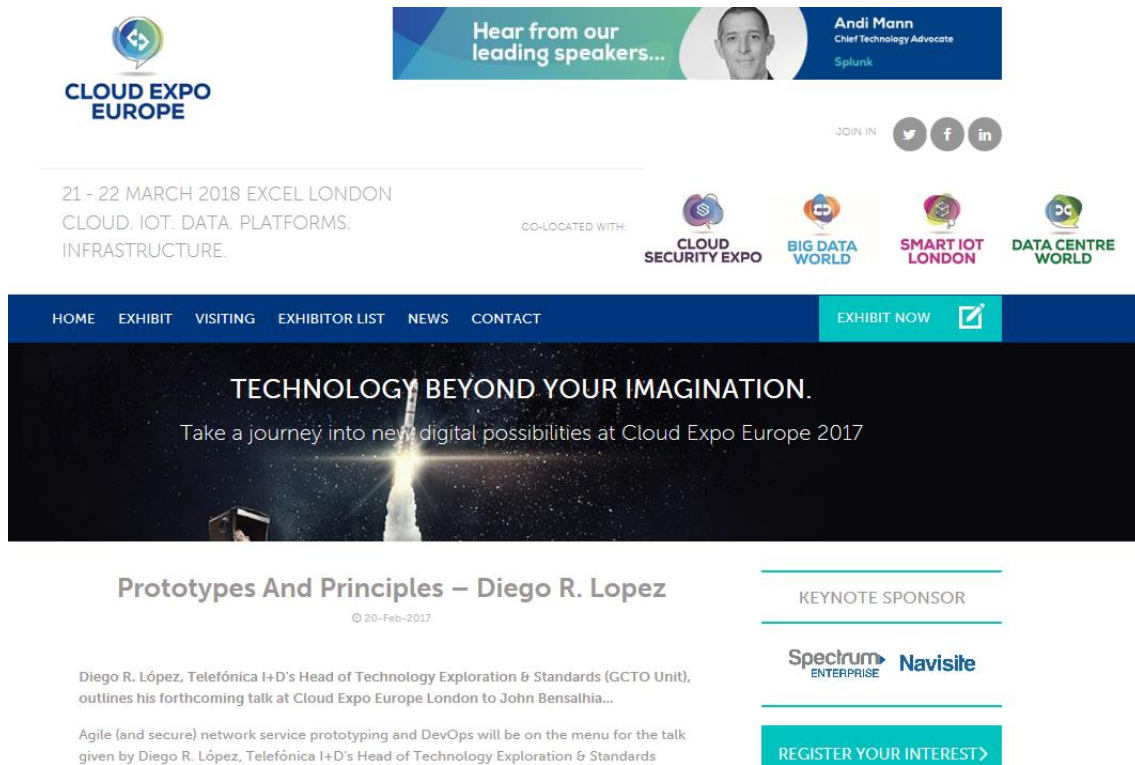


Figure 72: SONATA press release issue 2

Our proactive content marketing strategy has also facilitated the promotion and spread of the project results in other press and media channels. Figures below show some examples:



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Prototypes And Principles – Diego R. Lopez
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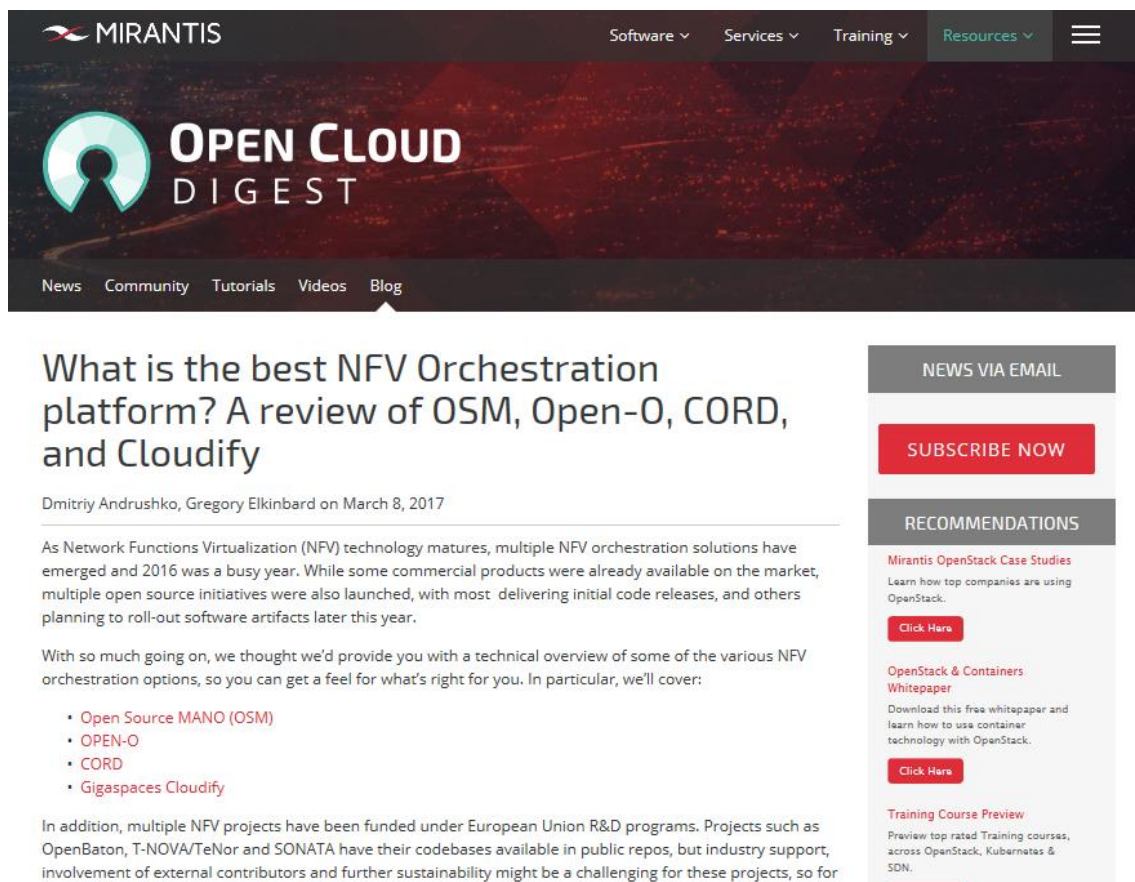
Diego R. López, Telefónica I+D's Head of Technology Exploration & Standards (GCTO Unit), outlines his forthcoming talk at Cloud Expo Europe London to John Bensalhia...

Agile (and secure) network service prototyping and DevOps will be on the menu for the talk given by Diego R. López, Telefónica I+D's Head of Technology Exploration & Standards

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Figure 73: SONATA on the Cloud Expo Euro Website [53]



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What is the best NFV Orchestration platform? A review of OSM, Open-O, CORD, and Cloudify

Dmitriy Andrushko, Gregory Elkinbark on March 8, 2017

As Network Functions Virtualization (NFV) technology matures, multiple NFV orchestration solutions have emerged and 2016 was a busy year. While some commercial products were already available on the market, multiple open source initiatives were also launched, with most delivering initial code releases, and others planning to roll-out software artifacts later this year.

With so much going on, we thought we'd provide you with a technical overview of some of the various NFV orchestration options, so you can get a feel for what's right for you. In particular, we'll cover:

- Open Source MANO (OSM)
- OPEN-O
- CORD
- Gigaspaces Cloudify

In addition, multiple NFV projects have been funded under European Union R&D programs. Projects such as OpenBaton, T-NOVA/TeNor and SONATA have their codebases available in public repos, but industry support, involvement of external contributors and further sustainability might be a challenging for these projects, so for

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Figure 74: SONATA on Mirantis blog [54]

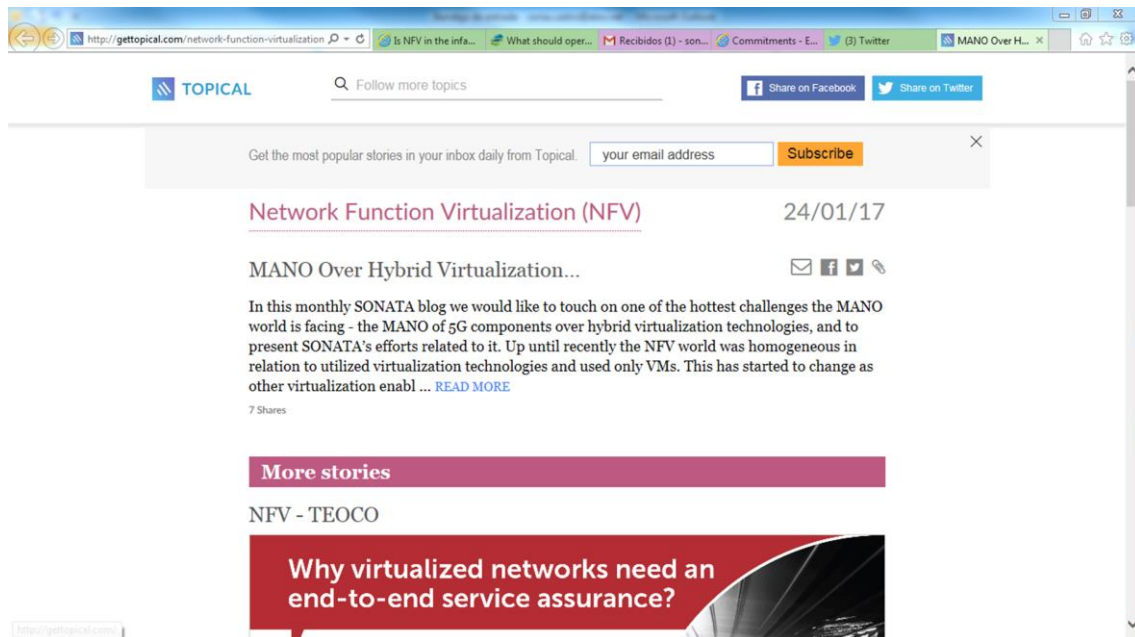


Figure 75: SONATA blog post on Topical blog [55]

It is also important to mention here that all SONATA communication activity has been reported and echoed by the 5G PPP through their main communication and dissemination channels, namely its website, its LinkedIn group and its twitter account.

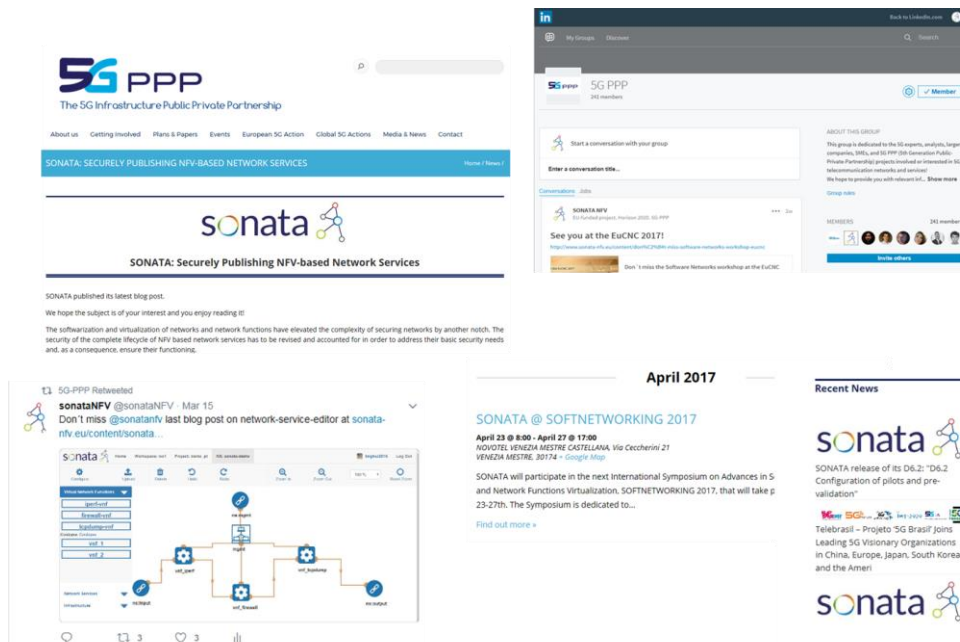


Figure 76: SONATA on the 5G PPP channels

4. KPI's

The tables below show the KPIs for each of the outreach activities that take part of our communication and dissemination plan. Achievements of the project so far are also reflected in order to facilitate the overall progress of the whole plan.




Outreach Activity	KPIs	Achievements at end of Y2	Status
Web Campaign			
Project Website	≥ 5000 visits	7062 visits, 141% of the expected ones during the life time of the project. Important to highlight also the number of pageviews (27,200), the viewed pages by session (3.85) and its average duration (3:34 minutes).	
Social Media Campaign	≥ 2 social media channels used regularly, including Twitter and LinkedIn	Twitter, LinkedIn, Researchgate and YouTube have been the social media channels regularly used by the project, the last three ones were opened in Y2.	
Project updates on partners' websites	= 15 (all) partners posting to company related portal	11 out of 15 partners have used their channels to promote SONATA so far, most with more than 2 posts published.	
	≥ 2 posts/partner		

Table 11: KPIs and project achievements: web and social media





Outreach Activity	KPIs	Achievements at end of Y2	Status
Press and Media Channels			
External Media Channels	≥ 5 external media channels covering the telecom sector	Our proactive content marketing strategy has facilitated the promotion of SONATA in different media channels. 5G PPP, Mirantis, Cloud Expo Euro website, Topical blog, etc. are just some examples of our presence in external media channels.	
Project Press Release	≥ 100 downloads via website	2 press releases has been published by the project so far, both promoted through different channels apart from the internal ones. Due to the diversity of channels used, It is difficult to estimate the number of downloads, but we foresee that the expected KPI has been surpassed by far.	
	≥ 5 external media covered		
Online publishing, blogs, online magazines and newspapers	≥ 20 publications	According to our calendar, the project will have published at least 20 blog posts by the end of the project. Those posts are being echoed through different channels internally and externally to the project. The project has also contributed the two editions of the 5G journal promoted by the 5G PPP and it is currently working on the edition of a chapter of a book on 5G that will be published by the end of this year.	
Project Newsletters	≥ 100 recipients per 2 issues each period	As planned, two newsletters have been published in year 2. These have reach to all the consortium members, who have also shared them through their own networks, as well as the 5G PPP community. Although we have been contacted as a result of these communications, the number of persons didn't achieve the expected KPI yet.	
	≥ 50 people reported back/asked		

Table 12: KPIs and project achievements: press and media channels



Outreach Activity	KPIs	Achievements at end of Y2	Status
Demonstrations			
Demonstrations	≥ 10 demonstrations online and face to face	The project demonstrations started in Y2, once the first SONATA prototype was available. So far, a total of 5 demos has been given. In the next 6 months, with our pilots ready to be demonstrated, our participation in events will be oriented to their demonstration.	
	≥ 50 organisations		
Tutorials and developer advocacy	≥ 10 sessions	Together with the public delivery of SONATA releases, in order to guarantee its use and uptake, the consortium is committed to provide and update all the documentation that may help SONATA adopters and developers to fully use and adapt the code to their liking and needs.	
	≥ 100 attendees	Apart from that, SONATA project has participated in a few sessions specially oriented to developers, as for example, all the sessions in the sofnetworking 2017 or the tutorial at the suumer school in Karlstad. Together with demos, the last 6 months of the project will be focused on this.	

Table 13: KPIs and project achievements: Demonstrations and developers advocacy




Outreach Activity	KPIs	Achievements at end of Y2	Status
Events, Workshops and Conferences			
Presentations	≥ 10 presentations and ≥ 50 organisations	SONATA partners have been present in a total of 15 industry events, international conferences, academic and industry workshops, summers schools, etc. in year Y2, that, together with the 8 events in which participated in Y1, made a total of 23. In all of them, the project members have been actively involved via coordination / management activities, presentations, panels, etc...	
Organization and/or attendance to conferences/workshops/events	≥ 8 events		
	≥ 300 participants		
Publications			
Open Access publications	≥ 10 publications	Publications was one of our main communication/dissemination tools in Y1, almost achieving the committed KPIs in the first year. In Y2, our activity in relation to publication has been even better. Here some numbers just from this year: 15 conference publications (10 published + 3 accepted + 2 submmited); 6 journal publications (5 published + 1 submitted); 15 contributing documents to (pre)standars.	
Reports and other Documents (public)	≥ 20 public documents (including deliverables)		
Whitepapers	≥ 2 whitepapers		

Table 14: KPIs and project achievements: events and publications





Outreach Activity	KPIs	Achievements at end of Y2	Status
Collaboration			
Contribution to Standards	≥ 2 working groups – active collaboration	SONATA is already active in several working groups. ETSI NFV, ITU, IRFT/IEFT deserve special mention.	
Involvement in Open Source communities	≥ 2 communities (OpenStack, OpenNFV, etc)	SONATA is already collaborating with several Open Source communities, but special focus is on OSM where we fore see the mos fruitful results from such collaboration.	
Organization of 5G PPP cluster activities with other projects	≥ 4 projects	SONATA is proactively collaborating with 4 phase 1 5G PPP projects: 5GEx, VirtuWind, SELFNET and CHARISMA.	
Material (Online and Printed)			
Project Flyer, Booklet, Poster, etc.	≥ 1000 recipients (online +printed)	Two posters and a project brochure (a triptych) have been created. All of them have been printed and are also available on the project's website.	
	≥ 10 events distributed	The posters were presented at the ETSI conference in Sophia Antipolis in April 2016 and at EUCNC event in Athens in June 2016 respectively. The project brochure, created in April this year, has been distributed in every event where we have participated. 2,000 units	
	≥ 2 posters, multiple events	have been printed so far.	

Table 15: KPIs and project achievements: collaboration and marketing material

As can be gathered from Tables above, SONATA communication and dissemination plan is progressing very well, much better than expected in most of the areas.

As reflected by the indicators, the focus of the project in the last six months will be on demonstrations and organizing special sessions dedicated to developers.

5. Conclusion & Next Steps

This deliverable has described the communication and dissemination plan designed by the SONATA consortium at the beginning of the second year of the project, aimed at ensuring wide impact of SONATA outcomes in the most relevant European and worldwide communities.

The execution of this plan and the project achievements, also presented in this document, shows the good performance of the project in relation to communication and dissemination activities for our target audience, from academic, industrial, SDOs and open source communities in the 5G networking area.

The presence of the project on the internet and social media channels has been impressive in year 2, as well as the participation of partner members in events and conferences. The intense project's activity in relation to publications, was our main communication / dissemination channel in Y1, has not just been repeated but has also been improved on in Y2. The strong involvement of some of the SONATA partners in open source activities, in standardisation bodies and in 5G PPP collaboration has been also a key point to create significant, multiple and targeted impact related to the SONATA technical topics.

The project, which is about to launch SONATA 3.0, is now focused on its pilot's demonstrations. These are still to be defined, but we anticipate that the communication and dissemination plan for Y3 will mainly revolve around this, as we are conscious of the impact that this kind of demos may have in relation to adoption.

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Note: the following URLs were captured in June 2017, the publication date of this deliverable, and may be outdated at time of reading.

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