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Abstract	This deliverable describes the dissemination and communication activities pursued by the ORCA partners in Y3 to guarantee broad and effective visibility, promotion and uptake of the project's work and outcomes.
Keywords	Dissemination, communication, events, impact creation, exploitation

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Nature of the deliverable:		R
Dissemination Level		
PU	Public, fully open, e.g. web	✓
CI	Classified, information as referred to in Commission Decision 2001/844/EC	
CO	Confidential to ORCA project and Commission Services	

* R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patents filing, press & media actions, videos, etc.

OTHER: Software, technical diagram, etc

EXECUTIVE SUMMARY

The ORCA Work Package 8, WP8, coordinated the “Dissemination, Communication and Exploitation” and aimed at defining and executing the appropriate mechanisms and tools to ensure broad visibility and impact of the project’s work and results. The main objective was to promote the developed project’s concepts and technologies, including the four main show cases the consortium’s partners are focusing on. Furthermore, WP8 was responsible for the promotion of the project’s Open Calls.

This deliverable describes how ORCA has followed, in Y3, a comprehensive and effective approach to dissemination and promotion activities as per the strategy defined in D8.1. The project has been extended till M42 (June 2020) and the dissemination and communication activities have been timely stretched to be aligned with the project’s work progress. Furthermore, the recommendations given by the reviewers during the 2nd Year Review Meeting were taken into consideration to strengthen the effectiveness of the dissemination activities.

During the third year of the ORCA project, the consortium has harvested fruitful results from a wide range of dissemination and promotion activities. The different communication channels and dissemination tools identified at the beginning of the project were used in order to promote the main news, activities and results of the ORCA project.

The COVID-19 emergency had an impact on some of the activities planned for the last quarter of the project, such as the participation to events. Some of them were cancelled, some other were moved online: where possible ORCA’s partners contributed to online events (e.g. the 6th 5G Wireless Summit), nevertheless, the online migration of the EuCNC 2020 hampered the opportunity to showcase ORCA’s demos and final results to the European 5G projects’ audience, which was clearly among our main target audience. The Final Assessment workshop will be conducted in Gent on 8th September 2020, co-located with the imec [Wireless Community Event](#). The consortium has already envisaged a back-up plan in case the in-person event cannot take place, as detailed in Section 2.

The key achievements are listed as follows:

- Implemented the reviewers’ suggestion to present ORCA as a “service platform” with functionalities and testbeds accessible through a unique portal. This approach shall support the results’ uptake beyond the project’s lifetime
- ORCA has participated in 24 relevant external events and present itself to relevant stakeholders
- In Year 3, 45 scientific publications have been published presenting advances marked by ORCA (75 since beginning of the project) and 6 demonstrations were conducted
- The Third Open Call for Experiments was launched in the second quarter of 2019 and widely communicated
- Overall, the project has contributed to 6 Standardizations
- In the 42 months of work, ORCA has widely promoted its results and activities to **more than 115,000 stakeholders** (including subscribers to social media channels, website visitors and mailing lists of both NGI-EXP, 5G PPP among others)
- In Year 3, 10 new videos were published on ORCA’s YouTube channel and website, bringing the total to 18 videos.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
TABLE OF CONTENTS	4
LIST OF FIGURES	5
LIST OF TABLES	7
INTRODUCTION	8
1 DISSEMINATION, COMMUNICATION ACTIVITIES Y3	9
1.1 Objectives and Target Audience	9
1.2 Addressing Reviewers suggestions	10
1.3 Dissemination of the 3rd Open Call for Experiments	11
1.4 Promotional Materials.....	13
1.4.1 Project Flyer, Roll-up and Posters	13
1.4.2 ORCA’s functionality and showcase flyers	16
1.4.3 Video	16
1.5 Online Dissemination.....	22
1.5.1 Website structure and content update	22
1.5.2 Social Media	24
1.5.3 Newsletter	25
1.6 Events Attended	28
1.7 Journals and Conference Publications	43
2 PLAN OF ACTIVITIES AFTER PROJECT END	49
3 EXPLOITATION AND STANDARDIZATION RESULTS	51
3.1 Exploitation Achievements	51
4 ASSESSMENT OF ORCA OUTREACH AT PROJECT END	56
4.1 KPIs.....	56
4.2 Deliverables and Milestones	57
4.3 Total Communication reach.....	58
4.4 Open Calls participation.....	58
4.5 Qualitative results	59
CONCLUSIONS AND LESSONS LEARNT	60

LIST OF FIGURES

Figure 1: Promotional channels used to communicate OC3	11
Figure 2: NCP Contacts reached with one-to-one emails	12
Figure 3: ORCA’s Twitter post promoting the 3rd Open Call for Experiments.....	12
Figure 4: ORCA’s flyer promoting the Third Open Call for Experiments	13
Figure 5: Screenshot of the 2019 edition of the ORCA flyer.....	14
Figure 6: Screenshot of the ORCA Roll-up	14
Figure 7: Screenshots of ORCA’s EuCNC 2019 booth posters.....	15
Figure 8: Screenshot of the ORCA factory showcase poster	16
Figure 9: Screenshot from the IEEE openwifi video presentation.....	17
Figure 10: Screenshot from the IEEE antenna switching scheme paper video presentation ...	17
Figure 11: Screenshot “Interview with Professor Ingrid Moerman”	18
Figure 12: Screenshot “How ORCA solutions meet beyond-5G evolution”	18
Figure 13: Screenshot “Mandate driven networking ecosystem: A paradigm shift”	19
Figure 14: Screenshot of “Openwifi talk at FOSDEM 2020”	19
Figure 15: Screenshot of “Openwifi project is online now!”	20
Figure 16: Screenshot of “ORCA broadcasted on German and Japanese TV”	20
Figure 17: Screenshot “DALI – Dual Connectivity Solution for ORCA – OAI Tutorial”	21
Figure 18: Screenshot “DALI - Dual Connectivity Solution for ORCA – ns3 Tutorial”	21
Figure 19: Screenshot of the new ORCA’s website homepage	22
Figure 20: Website Statistics Traffic Overview	23
Figure 21: Website Statistics Visit Duration.....	23
Figure 22: Website Statistics Top Visited pages.....	23
Figure 23: Website Statistics - Top 10 on visits from different countries	24
Figure 24: Screenshot of the ORCA Twitter Account	25
Figure 25: Screenshot of ORCA’s 7 th Newsletter	26
Figure 26: Screenshot of ORCA’s 8 th Newsletter	26
Figure 27: Screenshot of the ORCA’s 9 th Newsletter	27
Figure 28: Screenshot of the ORCA’s 10 th Newsletter	28
Figure 29: Xianjun Jiao presenting at FOSDEM 2020	32
Figure 30: Openwifi’s booth at FOSDEM 2020	32
Figure 31: C. P. Yépez with the Best Demonstration Award at IEEE MASS Conference.....	33
Figure 32: Team SCATTER at Spectrum Collaboration Challenge 2019	34

Figure 33: Paolo Di Francesco presenting ORCA at The National Wireless 2019	34
Figure 34: The ORCA demo at 5G Summit and 5G World Forum 2019	35
Figure 35: Yi Zhang presenting the ORCA demo at ECOC 2019	36
Figure 36: The ORCA booth at EuCNC 2019	37
Figure 37: Dr. Ingrid Moerman (IMEC) on EuCNC 2019's live stream	37
Figure 38: Balancing robot demo of TUD in the Uni-tag event.	38
Figure 39: The ORCA Multi-RAT platform showcase at NI Week 2019	39
Figure 40: Visual from the installation using the ORCA demo developed by TUD	40
Figure 41: TUD demo at the Villa Bienert.....	40
Figure 42: Screenshot of the Japanese TV coverage of the TUD robot demonstrator.....	41
Figure 43: M. Shahwaiz Afaqui presenting the work at IEEE INFOCOM 2019	42
Figure 44: Prof. Luiz A. DaSilva during the keynote at IEEE WCNC workshop	42
Figure 45: Dr. Ingrid Moerman (IMEC), interviewed during the SCC	43
Figure 46: ORCA's Final Assessment Workshop, Promotional Card	49
Figure 47: Screenshots from the upcoming "Best of ORCA" video.....	50
Figure 48: NI PCIe-8880 Controller	52
Figure 49: NI USRP 2974 PCIe expansion capability used in ORCA SC4.....	53
Figure 50: NI ns-3 Application Example on github	53
Figure 51: Website Statistics – Unique users (Feb 2017 – May 2020).....	58
Figure 52: ORCA's Open Calls participants.....	59

LIST OF TABLES

Table 1: Events attended by ORCA in Y3	31
Table 2: Scientific Publications in Year 3 (M25-M42).....	48
Table 3: Dissemination & Communication KPIs.....	57
Table 4: WP8 Deliverables and Milestones	57

INTRODUCTION

D8.5 is the Report on Dissemination and Promotion Activities for Year 3. This document provides in detail the dissemination and communication activities performed during the third and final year of the project. Due to the 6-month project's extension, this Deliverable, previously planned at M36 (December 2019) has been postponed to M41 (May 2020) to better reflect the Dissemination and Communication activities. It also provides an outlook on the planned activities beyond the project life, among the others, the Final Assessment Workshop, which will be carried out along with the Final Review Meeting in Gent, in September 2020. Furthermore, it addresses the suggestions provided by the reviewers at the Y2 Project Review meeting, with a focus on the promotion of the 3rd Open Call for Experiment. The grounding of such activities was clearly defined and guided by both the Description of Action (DoA), Deliverable D8.1 – Dissemination, and communication strategy and plan, (D) 8.2 - Exploitation strategy, Deliverable D8.3 – First Report on Dissemination and communication activities and D8.4 – Second Report on Dissemination and communication activities. The purpose of the current deliverable is therefore three-fold:

1. Report on the ORCA project's dissemination and communication activities held from month 25 to month 41 (January – May 2020); that is the final report covering Year 3 of the project;
2. Report on the ORCA's contribution to standardizations and the exploitation results in Y3.
3. Assess the overall project's dissemination results through its lifetime; the lessons learned, and activities planned after the project end.

This document is organised as follows:

- Section 1 focuses on activities undertaken in the Final Year of the project
- Section 2 briefly presents the activities planned after the project ends
- Section 3 introduces the Exploitation and Standardization Results
- Section 4 summarizes the results achieved at the end of the project, from a quantitative and qualitative perspective

1 DISSEMINATION, COMMUNICATION ACTIVITIES Y3

1.1 Objectives and Target Audience

As detailed in the previous ORCA Dissemination and Communication Deliverables (D8.1 *Dissemination and Communication Strategy Plan* and the *Dissemination and Communication Reports*, D8.3 and D8.4) ORCA's communication objectives can be summarised as follows:

- To **promote broad visibility** of the project's work and disseminate its results to the FED4FIRE+, NGI, 5G PPP communities and beyond, while contributing to promote the overall Future Connectivity Systems Unit offering for increased uptake by innovative players.
- To **create and maintain the ORCA project web site**, the media communication channels and the planned dissemination tools to effectively promote the ORCA's work and guarantee broad visibility of the project within the whole scientific and innovation Future Internet landscape.
- To **participate to and organize events** to maximise the dissemination of the information to target stakeholders and promotion of ORCA's Open Calls and project's tools and functionalities.
- To assist in the **promotion of the ORCA Open Calls**, as a means to broadly promote and validate the ORCA research outcomes and collect feedback from the work performed by the participants to the competition.
- To **establish liaisons with related initiatives and projects** both within the ORCA programme context and in related initiatives, including in particular the 5G-PPP, FED4FIRE+ and NGI communities, for mutual exchange of know-how and broad visibility of the ORCA's work. Contribution to related Open Source initiatives and Standardization activities, with a specific focus on 5G PPP, ETSI working groups, WinnF and possibly IETF.
- Promote the **uptake and exploitation of the ORCA's results** among the research community

We have engaged the following main target groups.

- **New experimenters** that could potentially join Fed4FIRE+, especially Small and Medium-sized players, in the cognitive radio domain that could benefit from the ORCA concepts, technologies and testbeds to experiment, test and speed up the time-to-market for new applications and services.
- **Innovators and researchers** both in the academic and corporate R&D&I domains working on resources allocation and optimization in dynamic and densely populated wireless networking domains.
- **Industrial players**, including small to medium and large organisations, covering industry manufacturers, telecommunications operators and service providers, such as, but not limited to, the 5G-PPP members and associated members, and industrial organizations that have participated in former FIRE programme.
- **The General public and the society as a whole** including citizens, students, public authorities, etc. that could benefit from enhanced wireless connectivity serving at social inclusion and engagement.
- **Standardization bodies** ORCA is uniquely situated to make contributions to open source initiatives and standardization. The partners involved in the project have already established good working relations with spectrum regulators through several years of related work.
- In relation to the selected showcases, target players are also industrial players, SMEs and researchers in the fields of smart factories, robots-to-human interaction, SDRs, SDN, service-aware wireless infrastructures that could **uptake and/or complement and extend the ORCA technologies**.

1.2 Addressing 2nd Year Review Report

Following the 2nd Review Meeting the consortium has discussed each suggestion brought forward and took actions to improve the dissemination and communication activities, as follows:

1. *The recommendations about the need to search for new candidates for participating into the next Open calls, are the following:*

- *work on the concept of “ORCA Platform as a Service”, targeting access via a unique portal like for a commercial product.*

The homepage of the website has been revised completely and a new website area called “ORCA offer” has been implemented (See Section 1.5)

- *Information about OC3 should be distributed also for national research centre’s research and developments existing in the EU member states.*

The partners have compiled a mailing list of the relevant national contact points (NCP), leveraging on the information available online, and delivered a 1-to-1 mailing describing OC3 and asking for promotional dissemination within their network.

- *Development of the Non-disclosure Agreement draft form to be used by consortium partners in contacts with commercial companies is recommended.*

The agreement of the use of the ORCA test facility is included as part of the proposal template. The terms regarding intellectual property of companies are discussed in Annex B article 4. The experimenters are aware of the terms before they start application. Results achieved by the experimenter will be owned by experimenter, the consortium however can collect information anonymously to improve the test facility.

2. *The recommendations about the activities of communication, and dissemination are the following:*

- *Prepare a White Book, summarizing all the achievements (including tools and extensions) coming out of the ORCA project.*

The White Book is planned by the end of the project before the Final Review Meeting, once the OC3 experiments results are consolidated. It will be made available online on the website and echoed across media.

- *Provide MooCs, and Training sessions targeting specifically start-ups and spinoffs.*

The consortium decided to develop video tutorials, which have been published on the project’s YouTube channel and linked to from the website. Moreover, start-ups and SMEs have been reached through the OC3 promotional activities engaging platforms such as Funding Box and F6S which are highly focused on these segments (See Section 1.3).

- *Targeting EuCNC 2020 conference for a major showcase/demonstration.*

The EuCNC has been planned by the Consortium and booth organization started when the COVID-19 restrictive measures forced the organizers to reshape the event online. The consortium is now targeting the imec Wireless Community Event in September for the Final Assessment Workshop and the final showcase. Contingency plan is in place in case this event goes online as well (See Section 2)

- *Provide synthetic and incisive executive summaries for each deliverable.*

This has been done for all Y3 deliverable

- *Introducing appealing executive summaries in the advertising documents (flyers, posters, videos). Avoid too much details when non-necessary and illustrate with examples.*

The Promotional Materials area of the website has been reorganized and short descriptions have been added (See Section 1.5)

- *On the other side, for the technical deliverables core content, it would be beneficial for the consortium members and future testbeds users, to introduce more detailed explanations and descriptions.*

We included a diagram in the Introduction section of all the technical deliverables. This diagram gives an overview of how the contributions are linked to each other. Later on, in subsequent sections, the contributions are discussed in detail.

- *Continuing to improve the formalism describing the important results coming out from the demos and imagine at least one showcase that “speaks” to SMEs.*

The ORCA showcases have been built to attract industrial applications; this is reflected by Y3 open call proposals. For instance, the winner of SDR IoT has clearly built his project around showcase 2, and NFV2X has built the proposal based on information of showcase 3. The final event or ORCA is targeted on an industrial community event, then all showcases will “speak” to SME.

1.3 Dissemination of the 3rd Open Call for Experiments

The communication strategy and multimedia campaign to promote the 3rd (and last) Open Call for Experiments has been orchestrated by Martel with the cooperation of all the partners. The Open Call 3 has been communicated across all ORCA’s media (website, newsletter, social media) and at several events, presenting the Open Call where possible or distributing the dedicated flyer. The communication was also extended to media not owned by ORCA, reaching relevant stakeholders, with a focus on SMEs (less represented in previous proposals’ submission). The Figure 1 below shows the channels (outside the ORCA own) used to promote the Open Call 3, including: 5G PPP mailing list and social media channels, the F6S online community (<http://f6s.com>), the Funding Box Newsletter, the NCP mailing list, the NGI LinkedIn Group. It can be estimated that the communication effort reached around 65,000 contacts.

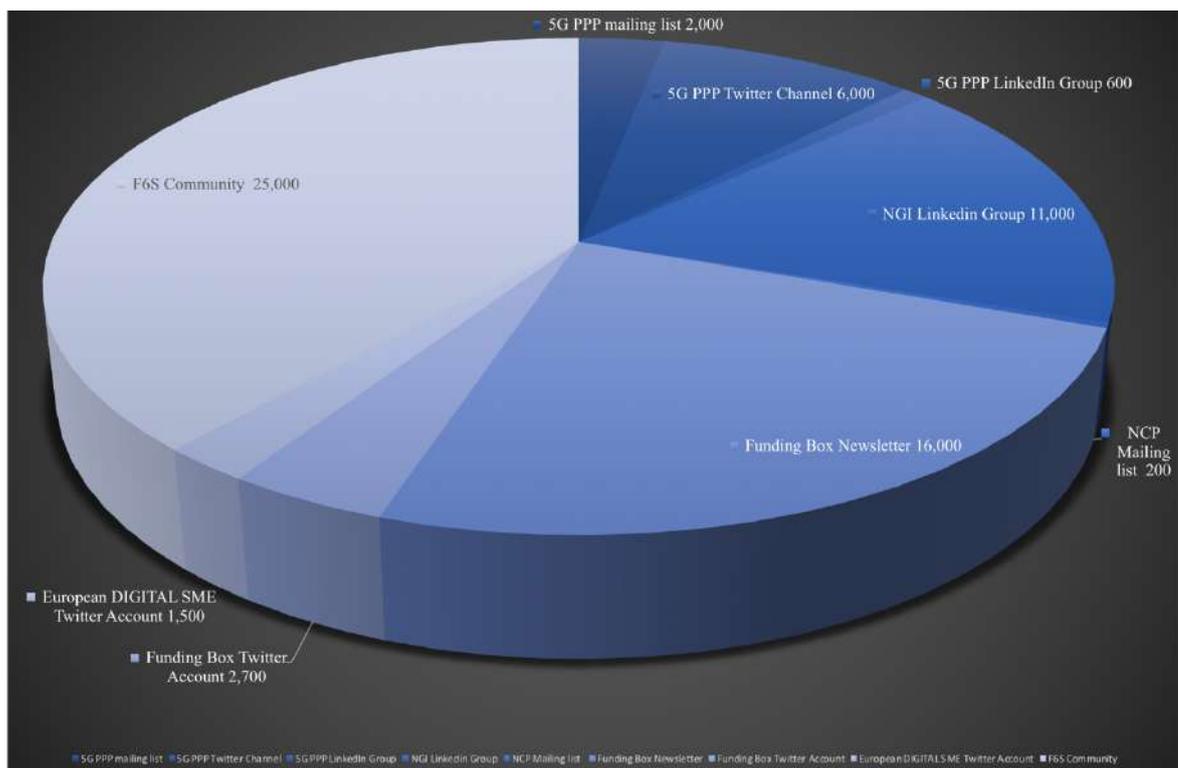


Figure 1: Promotional channels used to communicate OC3

A dedicated 1-to-1 mailing has been directed to the National Contact Points (NCP) for the ICT and Future and Emerging Technologies. Sixty-three people have been contacted representing all EC and third countries (for some countries multiple contact points), as the Figure 2 below clearly presents. Unfortunately, it is very difficult to monitor the actions which might have been taken by each of them. The only representatives which replied directly to the email expressing their interest and support were Romania and Switzerland.



Figure 2: NCP Contacts reached with one-to-one emails

The creative team developed a dedicated set of promotional materials to be distributed online and offline (e.g. events). The images below show the Twitter card and the flyer dedicated to the 3rd Open Call.



Figure 3: ORCA's Twitter post promoting the 3rd Open Call for Experiments



Figure 4: ORCA’s flyer promoting the Third Open Call for Experiments

1.4 Promotional Materials

The ORCA project supported impact creation activities through a number of dissemination channels and marketing materials. This section details the promotional materials developed during Year 3, which are all available for consultation and download on the ORCA’s [website dedicated area](#).

Project Flyer, Roll-up and Posters

As presented in D8.3 ORCA updated the project’s flyer. Since the beginning of the project until now around 2,500 copies have been distributed online and offline.



ORCHESTRATING DIFFERENT NETWORK SEGMENTS

ORCA believes that each network segment should have their own orchestrator, tailored to the segment's particularities. The use of a separate orchestrator for each network segment reduces complexity and breaks down the larger E2E network orchestration problem into smaller parts. In this way, each segment orchestrator can focus on a limited number of well-defined tasks, reducing the software complexity, both in terms of design and implementation.

WIRED ORCHESTRATION

A wired network orchestrator is in charge of provisioning paths and deploying services in a wired network slice, building on SDN and NFV respectively.

WIRELESS ORCHESTRATION

A wireless network orchestrator is in charge of instantiating Radio Access Technologies (RATs) and providing radio coverage, leveraging Software defined Radio (SDR) and Remote Radio Heads (RRHs).

TECHNICAL HIGHLIGHTS

- ORCA makes SDR talk to commercial devices
- ORCA creates multiple radio interfaces on an SDR for free
- ORCA makes real-time experimentation with SDR as easy as simulations
- ORCA provides multi-standard SDRs for prototyping on all layers
- ORCA offers flexible low-latency MAC-PHY architecture
- ORCA provides full-duplex capable SDRs for high-throughput networking experimentation
- ORCA offers CSMA MAC with real-time collision detection

orca-project.eu

Figure 5: Screenshot of the 2019 edition of the ORCA flyer

Following the same design and conceptual approach the project developed a roll-up which has been used at several events within the duration of the project.

The roll-up features the ORCA logo and tagline 'Orchestration and Reconfiguration Control Architecture'. It highlights the 'SOFTWARE DEFINED RADIO FACILITY' and aims 'TO ACCELERATE WIRELESS INNOVATION'. It states that ORCA offers experimentation facilities to promote wireless innovation in several market segments. The 'OVERALL CONCEPT' section includes a diagram of the network architecture. The 'INNOVATION POTENTIAL' section mentions 'ORCA will offer Cognitive Radio as a Service (CRaaS) to the wireless research community by giving easy access to a worldwide, open and ready-to-go test environment.' There is a section for 'ORCA OPEN CALLS' with a QR code and the text 'The ORCA project will distribute 2M € via Open Calls. Subscribe to our newsletter to stay tuned.' At the bottom, it provides the website 'www.orca-project.eu', social media handles '@ORCA_Project_L' and 'in groups/6589461', and 'PROJECT FACTS' including start date (Sep 2017), duration (36 Months), call number (10101475010), topic (5G-10010), and funding source (Research & Innovation Action). The 'CONSORTIUM' section lists partners like emec, 3, and others.

Figure 6: Screenshot of the ORCA Roll-up

ORCA realised 3 posters specifically thought for the ORCA’s booth at the EuCNC 2019 in Valencia, Spain. The first poster describes the mmWave system at 26 GHz with compact multi-beam antenna array; the second illustrates prototyping and experimentation of multiple radio access technologies (RAT); the third shows open source full stack real-time SDR Wi-Fi on FPGA with embedded ARM and Linux (see the images below).

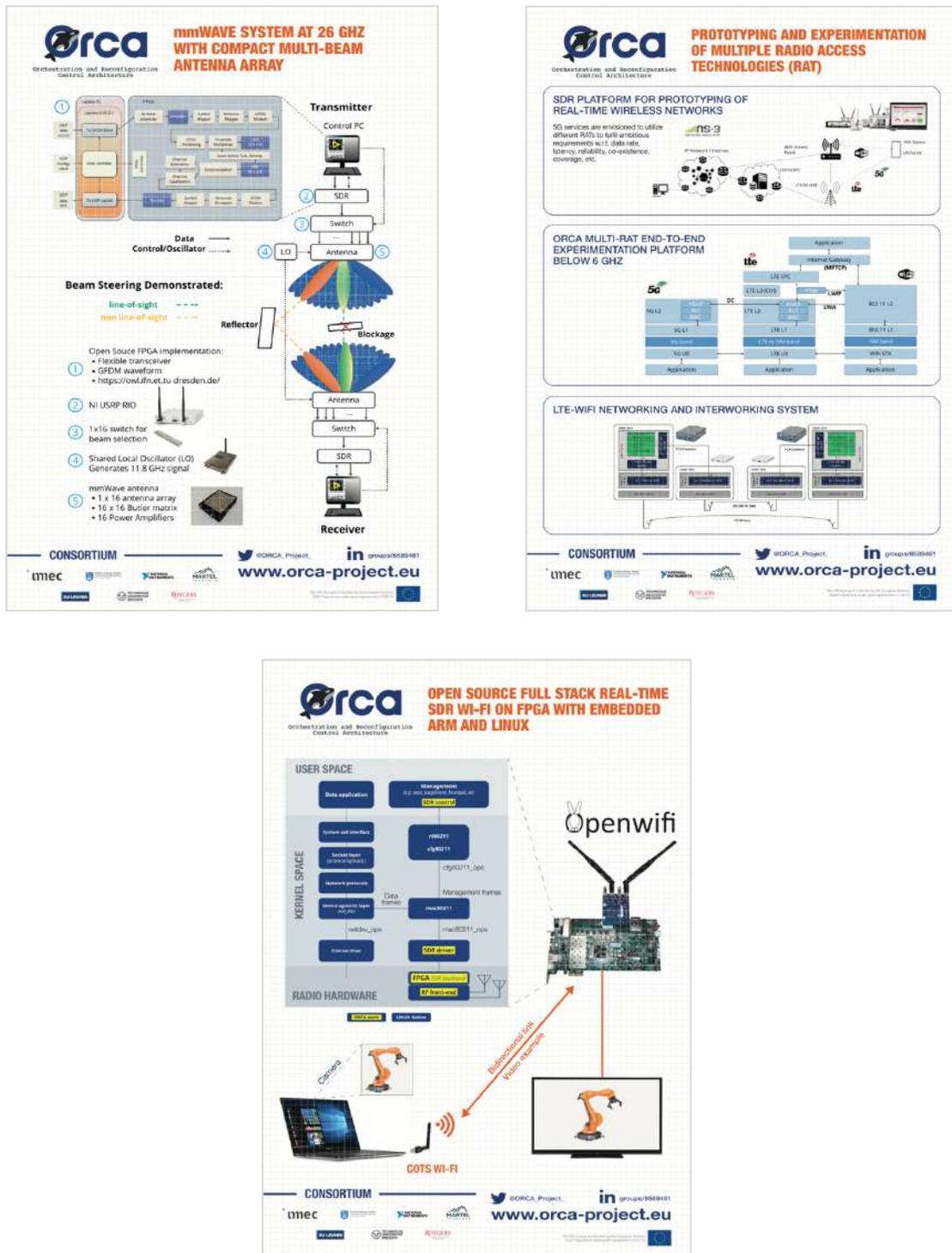


Figure 7: Screenshots of ORCA’s EuCNC 2019 booth posters

ORCA also realised an additional poster in April 2020, illustrating the “ORCA factory” showcase (see image below) – The poster is available for download on ORCA’s [website](#) and was designed to be used during the public event/final review.

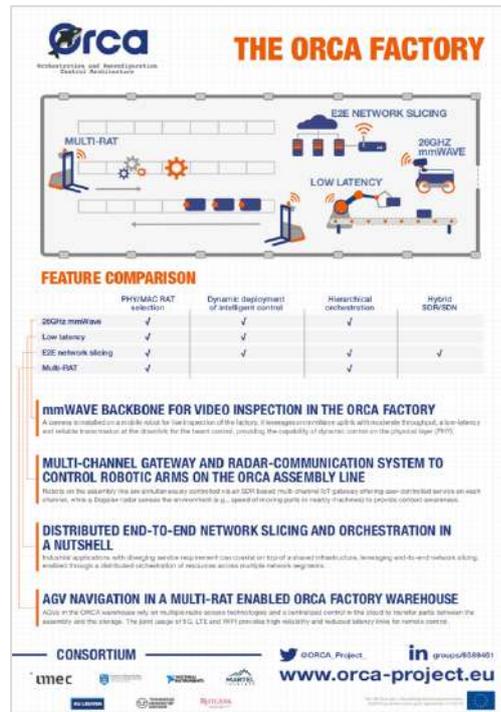


Figure 8: Screenshot of the ORCA factory showcase poster

ORCA’s functionality and showcase flyers

ORCA realized individual factsheet flyers for each showcase to illustrate in a clear, synthetic and easily readable manner the information regarding the testbeds. Information regarding the 3rd open call will be added to the website as soon as experimentation has been completed and results made available.

The factsheets flyers are available on ORCA’s website, under the following categories:

- [ORCA 2nd open call for extensions results](#)
- [ORCA 2nd open call for experiments results](#)
- [ORCA Brochure for the 1st open call results](#)
- [ORCA Showcases & Functionalities brochure](#)

Video

In Year 3 ORCA released 10 videos which have been uploaded on the [ORCA YouTube channel](#) and mirrored on ORCA’s website. They are available to all the partners to use them at presentations and events. So far, the ORCA YouTube Channel reached a total of 650 views.

- The video “openwifi: a free and open-source IEEE802.11 SDR implementation on SoC”, is a video presentation originally created for IEEE VTC 2020’s virtual event. Source and presenter: Xianjun Jiao, Senior Researcher (imec - Ghent university). The video was published in May 2020.

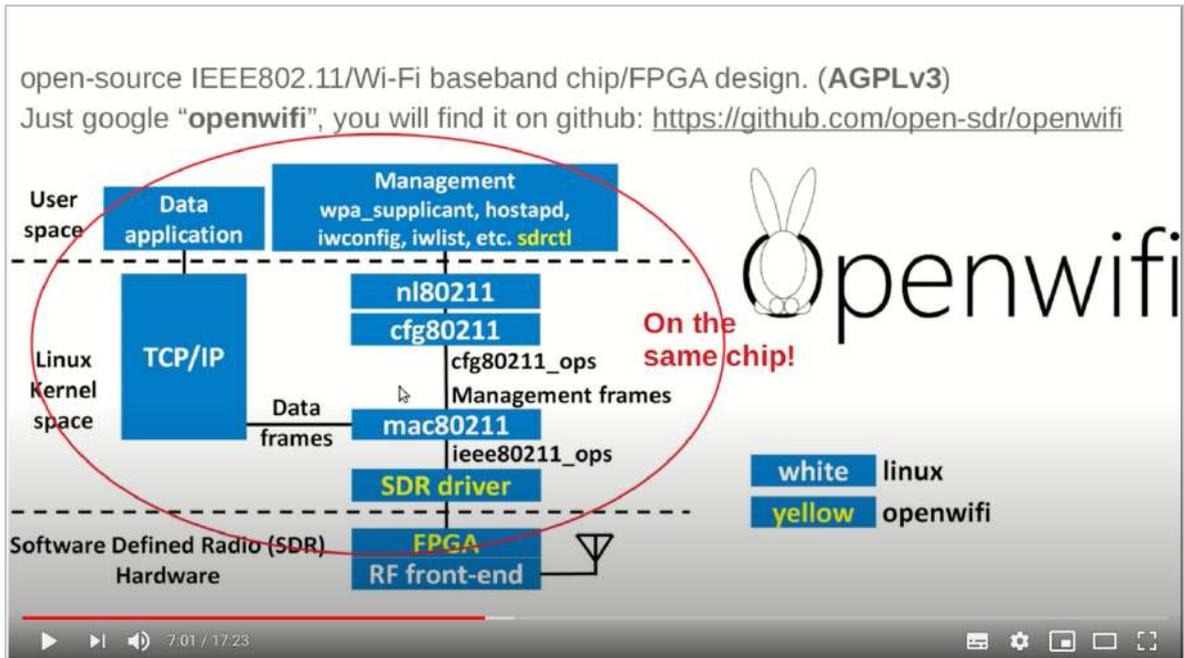


Figure 9: Screenshot from the IEEE openwifi video presentation

- The video “An antenna switching based NOMA scheme for IEEE 802.15.4 concurrent transmission”, is a video paper presentation originally created for IEEE VTC 2020’s virtual event. Source and presenter: Xianjun Jiao, Senior Researcher (imec - Ghent university). The video was published in May 2020.

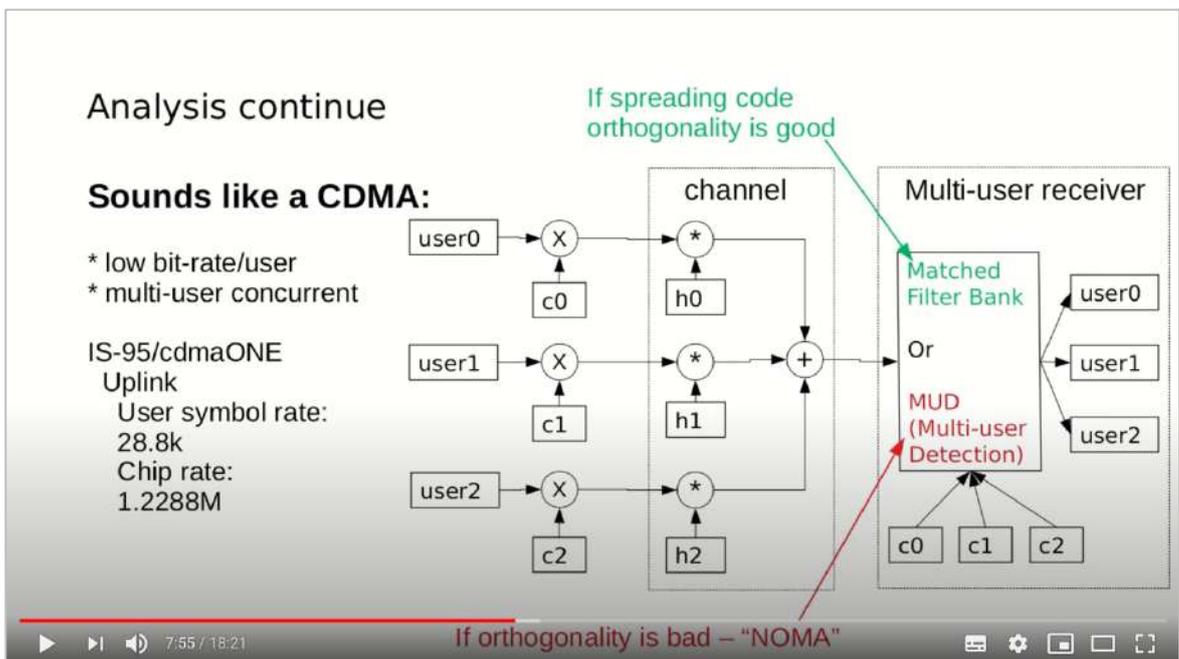


Figure 10: Screenshot from the IEEE antenna switching scheme paper video presentation

- The video “Interview with Professor Ingrid Moerman”, was filmed during the COVID-19 lockdown. Dr Ingrid Moerman (imec) explains how ORCA managed activities during the crisis. The interview was conducted by Dr Monique Calisti (Martel), and it was published in May 2020.



Figure 11: Screenshot “Interview with Professor Ingrid Moerman”

- The video “How ORCA solutions meet beyond-5G evolution” consists of a video presentation originally held by Prof. Ingrid Moerman (Ghent University – IMEC, Belgium) during the MATILDA “5G & Beyond” online workshop (Spring 2020). It was published in May 2020.



Figure 12: Screenshot “How ORCA solutions meet beyond-5G evolution”

- The video “Mandate driven networking ecosystem: A paradigm shift in end-to-end communications” presents a recording of a presentation of a paper related to the ORCA vision, held by Prof. Ingrid Moerman (Ghent University, IMEC) during the 6G Wireless Summit 2020 virtual event in March 2020. It was published in the same month.



Figure 13: Screenshot “Mandate driven networking ecosystem: A paradigm shift”

- The video “Openwifi talk at FOSDEM 2020” presents a talk on Openwifi given by Xianjun Jiao (IMEC), filmed and recorded at FOSDEM in February 2020 and published in the same month.

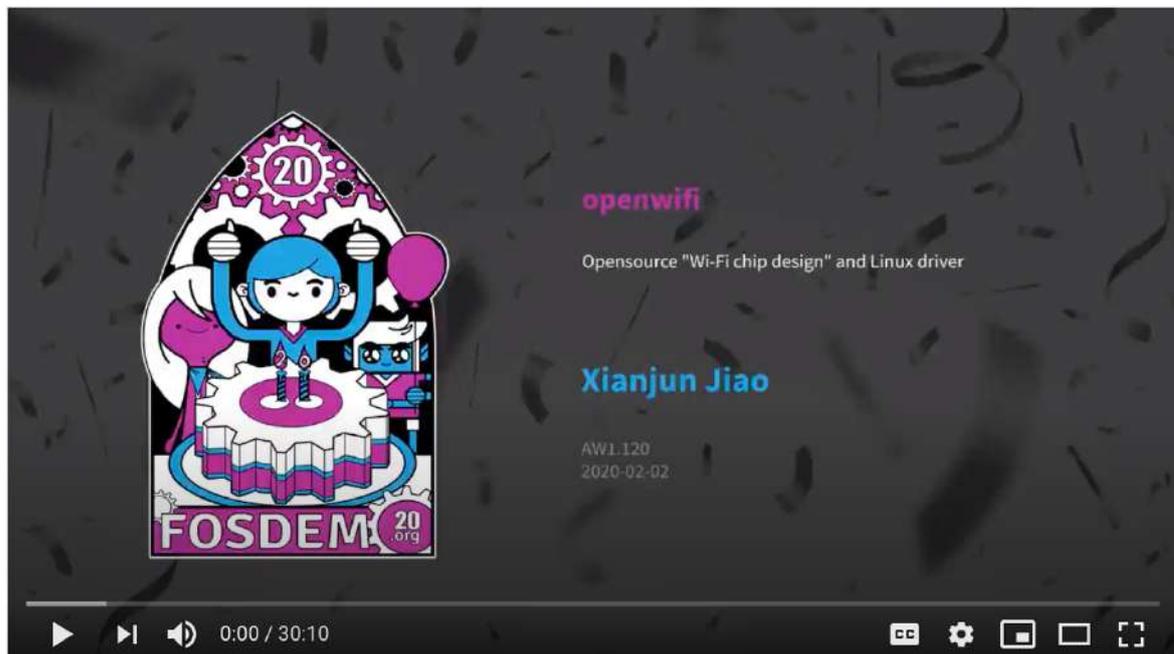


Figure 14: Screenshot of “Openwifi talk at FOSDEM 2020”

- The video “Openwifi project is online now!” presents ORCA partner IMEC’s open source project. It was published in December 2019.

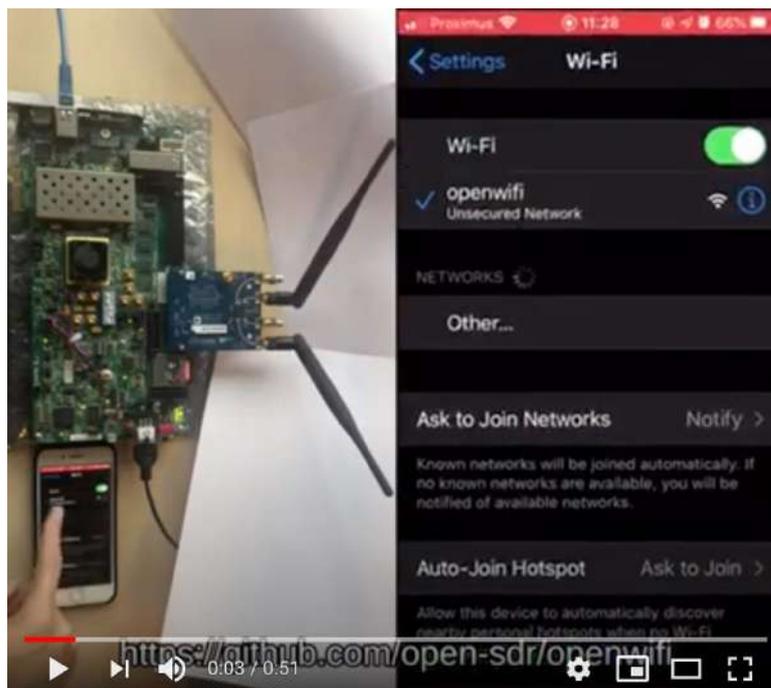


Figure 15: Screenshot of “Openwifi project is online now!”

- The video “ORCA broadcasted on German and Japanese TV” is composed by footage filmed at the Connect Conference in June 2019 in Dresden. It presents ORCA year 2 robot demonstrations (conducted by Nick Schwarzenberg of TUD) featured in several television programs in Germany (MDR, ZDF) and Japan. It was published in September 2019.

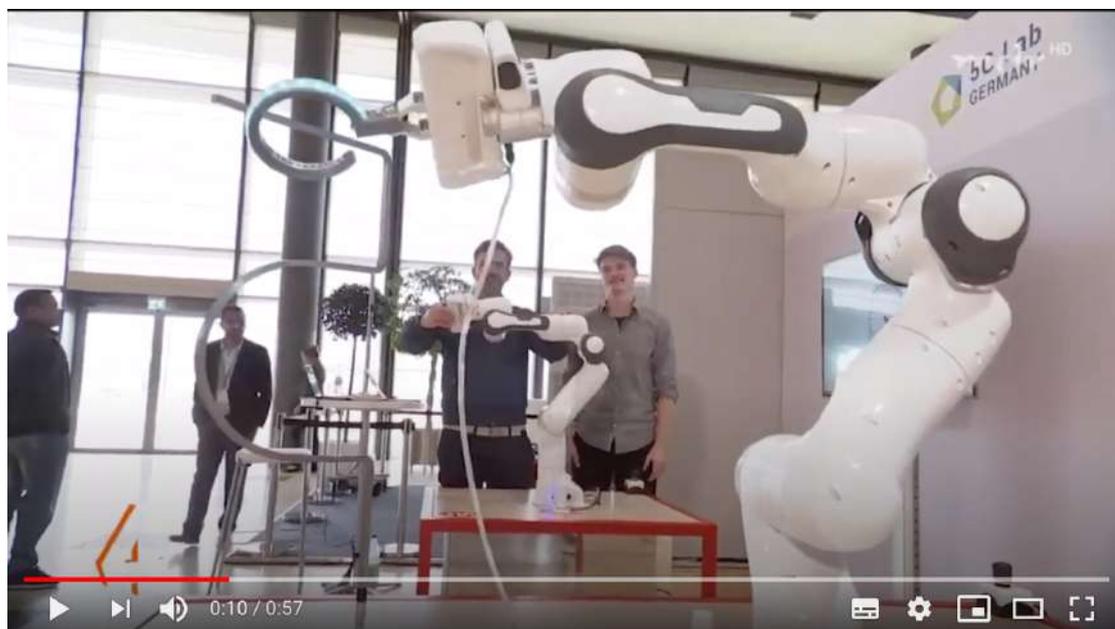


Figure 16: Screenshot of “ORCA broadcasted on German and Japanese TV”

- The video “DALI – Dual Connectivity Solution for ORCA – OAI Tutorial” presents a tutorial explaining the usage of the OAI-based dual connectivity (DC) implementation. It was published in August 2019. *Principal Investigator: Ilker Demirkol (ilker.demirkol@upc.edu), Universitat Politecnica de Catalunya Spain | Main Developer (DALI-OAI): Carlos Pupiales Yépez | ORCA Patron: Walter Nitzold, Clemens Felber, National Instruments, Germany.*



Figure 17: Screenshot “DALI – Dual Connectivity Solution for ORCA – OAI Tutorial”

- The video “DALI - Dual Connectivity Solution for ORCA – ns3 Tutorial” presents a tutorial explaining the usage of the ns-3-based dual connectivity (DC) implementation. It was published in August 2019.

Principal Investigator: Ilker Demirkol (ilker.demirkol@upc.edu), Universitat Politecnica de Catalunya, Spain | Main Developer (DALI-ns3): Daniel Maldonado-Hurtado | ORCA Patron: Walter Nitzold, Clemens Felber, National Instruments, Germany.



Figure 18: Screenshot “DALI - Dual Connectivity Solution for ORCA – ns3 Tutorial”

1.5 Online Dissemination

Website structure and content update

The ORCA website has been updated all along the project's lifetime and adapted to the different stages of the work. The flexibility of the structure of our website gave us the possibility to adapt and highlight the advancements and outcomes of the project proactively. This is the case, for the Homepage, the "Promotional Materials" section, the "Key Features" section and during this last period of the project.

To increase the visibility and access to the key features taking the opportunity to present ORCA more as a Service, as suggested during the 2nd Review Meeting, **the Homepage** of the website was rethought and restructured. After the main slider for promotion on top of the homepage we designed and developed a responsive 3x3 grid with a set of interactive banners with the titles of the Key Features. When rolling over a banner, it flips, showing a short description of the feature and a button to access the corresponding block on the Key Features web page. This action transformed the main entry point of ORCA's website clearly presenting the ORCA Offer.

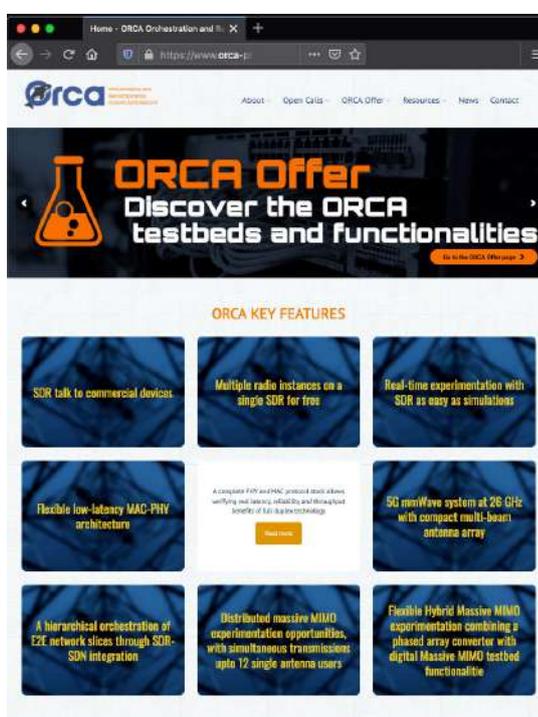


Figure 19: Screenshot of the new ORCA's website homepage

The Promotional Materials section (located under "Resources") was updated and reorganised as well, to enhance the visibility of the different supports created all along the project to support our outcomes. Instead of the simple list of materials, we have developed an accordion view grouping together the materials by type of support. That facilitates the navigation and the understanding of the set of dissemination and communication tools used during the project. Each type has an introduction explaining the nature of the support and the links to the corresponding materials.

The Key Features section aims at highlighting the most relevant aspects of the ORCA offer (Testbeds and Functionalities) such as mmWave link or full stack Wi-Fi solution.

A set of 9 key features was defined to attract people with diverse interests and a dedicated page was created under the "About" section. This section provides a brief description of each of the 9 features together with an illustrative image and a link to the corresponding testbed or functionality (ORCA offer).

Website results

ORCA’s official web portal (<http://orca-project.eu>) was set up at the beginning of the project (M1). For Y3, at the time of writing this deliverable (end of May 2020), the website has yielded **6,298 Unique visitors, who generated 22,636 Page views**. The average of page view per user is approximately 2.12 (pages). Regarding specific pages on the website, **the most popular one (except the homepage) is the “3rd open call for experiments” page, with 1,787 views (1,513 unique page views)**.

The figures below provide the details: Figure 20 (Traffic Overview), Figure 21 (Visit Duration), Figure 22 (Top Visited Pages) and Figure 23 (Visits per Country).



Figure 20: Website Statistics Traffic Overview



Figure 21: Website Statistics Visit Duration

Page	Page Views	Unique Page Views	Avg. Time on Page	Entrances	Bounce Rate	% Exit	Page Value
	22,636 <small>% of Total: 100.00% (22,636)</small>	18,554 <small>% of Total: 100.00% (18,554)</small>	00:02:02 <small>Avg for View: 00:02:02 (0.00%)</small>	10,578 <small>% of Total: 100.00% (10,578)</small>	53.83% <small>Avg for View: 53.83% (0.00%)</small>	46.73% <small>Avg for View: 46.73% (0.00%)</small>	US\$0.00 <small>% of Total: 0.00% (US\$0.00)</small>
1. /	5,889 (26.02%)	4,926 (26.55%)	00:01:09	4,629 (43.76%)	44.67%	43.90%	US\$0.00 (0.00%)
2. /open-calls/3rd-open-call-for-experiments/	1,787 (7.89%)	1,513 (8.15%)	00:03:52	645 (6.10%)	61.52%	61.00%	US\$0.00 (0.00%)
3. /testbeds/	1,295 (5.72%)	1,047 (5.64%)	00:03:16	367 (3.47%)	58.13%	48.96%	US\$0.00 (0.00%)
4. /orca-functionalities/	1,033 (4.56%)	580 (3.13%)	00:01:03	204 (1.93%)	36.63%	18.01%	US\$0.00 (0.00%)
5. /about/	1,014 (4.48%)	858 (4.62%)	00:01:31	187 (1.77%)	63.10%	40.43%	US\$0.00 (0.00%)
6. /open-calls/2nd-open-call-for-experiments/	864 (3.82%)	700 (3.77%)	00:01:44	261 (2.47%)	54.75%	49.54%	US\$0.00 (0.00%)
7. /ieee802-11-full-stack-based-on-sdr-openwifi/	827 (3.65%)	637 (3.43%)	00:04:29	517 (4.89%)	53.46%	60.46%	US\$0.00 (0.00%)
8. /open-calls/	770 (3.40%)	653 (3.52%)	00:00:55	371 (3.51%)	36.66%	30.13%	US\$0.00 (0.00%)
9. /resources/scientific-publications/	701 (3.10%)	601 (3.24%)	00:04:55	230 (2.17%)	63.29%	60.77%	US\$0.00 (0.00%)
10. /news/	655 (2.89%)	458 (2.47%)	00:01:20	111 (1.05%)	56.76%	32.37%	US\$0.00 (0.00%)

Figure 22: Website Statistics Top Visited pages

Country	Users	% Users
1.  United States	1,189	18.40%
2.  Germany	460	7.12%
3.  Belgium	352	5.45%
4.  Italy	346	5.36%
5.  Spain	331	5.12%
6.  India	285	4.41%
7.  United Kingdom	282	4.36%
8.  China	271	4.19%
9.  France	266	4.12%
10.  Greece	179	2.77%

Figure 23: Website Statistics - Top 10 on visits from different countries

The website contents have been constantly updated with the projects' news, events, publications and new promotional resources made timely available online. Website has been updated frequently and traffic kept high even after closure on the 3rd Open Call, demonstrating interest on ORCA's solutions and resources made available online. Geographically, the number of visits reflects the area of influence of the consortium's partners, with an interesting performance of visits from the U.S., where the project had great resonance through specifically relevant events.

Social Media

The social media activity has been concentrated on Twitter (@ORCA_project_) and LinkedIn (<https://www.linkedin.com/groups/8589461>) Group. These social media channels proved to be effective to disseminate the most relevant information about the project reaching specific audiences.

Twitter

So far, ORCA's Twitter account has attracted **397 followers** (including project partners, similar projects, interested stakeholders, etc.). Among all around 718 Tweets have been posted. ORCA also follows 70 accounts, mostly initiatives and organizations in similar fields or of approximate nature where partners have been involved. The figure here below shows the current homepage of the ORCA Twitter account.

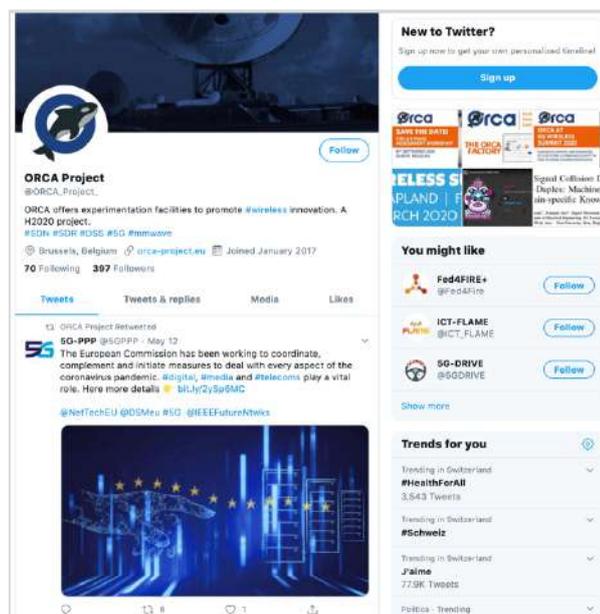


Figure 24: Screenshot of the ORCA Twitter Account

LinkedIn

LinkedIn has been active since the beginning of the project and has gathered 38 members so far. It is mostly used to share the latest progress of ORCA, echoing key promotional messages from Twitter and the Project website. It has posted a total of 43 discussions. The limited reach ORCA's LinkedIn page is related to the low usage of this social media by the relevant audience of the project. Moreover, the choice made at the beginning, of creating a LinkedIn Group (rather than a LinkedIn page) proved not to be successful: a) a LinkedIn group needs a wide community of authors contributing to the content of the page and this is not the case for a highly specialized project b) posts published on a LinkedIn Group page cannot carry handles (@), reducing the possibility to attract followers and sharing of the posts.

Newsletter

As anticipated, **10 Newsletters have been edited and distributed** to stakeholders through ORCA's mailing lists as well as made available on the project website. So far, **207 stakeholders have subscribed to receive ORCA's Newsletters**. In terms of further analysis on the efficiency of the communication:

- The 7th newsletter was sent to 95 subscribers / 47% opens / 17% clicks
- The 8th newsletter was sent to 101 subscribers / 51% opens / 11% clicks
- The 9th newsletter was sent out to 143 subscribers / 42% opens / 11% clicks
- The 10th newsletter was sent out to 207 subscribers / 52% opens / 11% clicks

1) Newsletter 7 (March 2019)

The 7th newsletter of ORCA, published in March 2019, has announced the winners of the 2nd open call for experiments and ORCA team being honoured at the MWC 2019 "Spectrum Collaboration Challenge" panel organised by DARPA, the U.S. Defense Advanced Research Projects Agency.

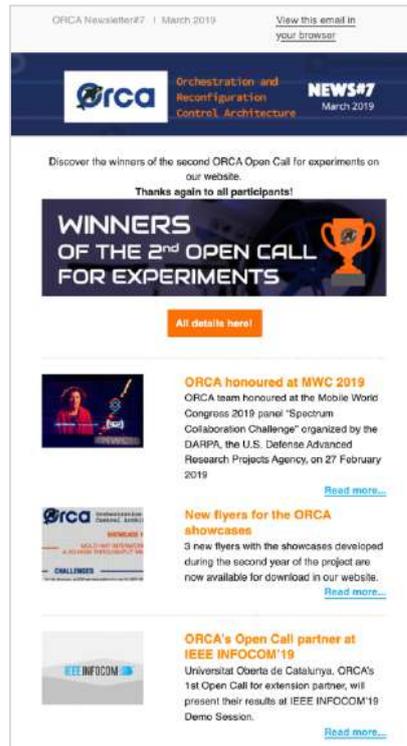


Figure 25: Screenshot of ORCA's 7th Newsletter

2) Newsletter 8 (July 2019)

The 8th newsletter of ORCA, published in July 2019, has announced the 3rd open call for experiments, introduced the new “ORCA offer” section of the website and reported on robot demonstrator’s coverage on German and Japanese TV.

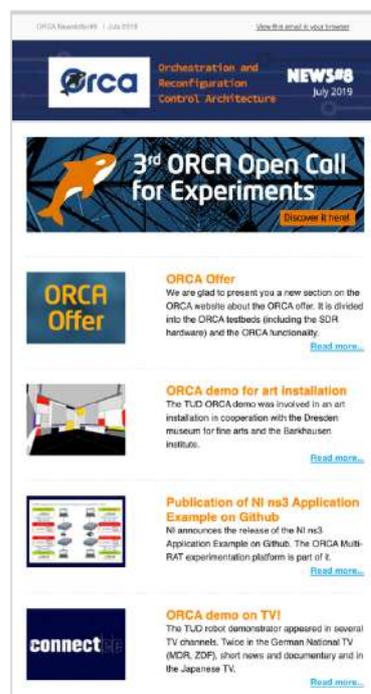


Figure 26: Screenshot of ORCA's 8th Newsletter

3) Newsletter 9 (November 2019)

The 9th newsletter of ORCA, published in November 2019, announced the winners of the 3rd open call for experiments, reported on ORCA project partners awarded for Best Demo at IEEE MASS Conference 2019 and announced ORCA and partners' participation to several events, including the finale of DARPA Challenge.



Figure 27: Screenshot of the ORCA's 9th Newsletter

4) Special Final Edition Newsletter (May 2020)

The tenth newsletter of ORCA was published in May 2020, covering and promoting the project's highlights and participation to events in the period between November 2019 and May 2020. It also announced and promoted the "Save the Date" to the project's Final Assessment Workshop and provided the link to the latest publications presented by ORCA's partners.



Figure 28: Screenshot of the ORCA's 10th Newsletter

1.6 Events Attended

ORCA's partners have attended or **participated to a total of 24 events in Y3 of the project**, presenting demos, giving keynote presentations, presenting papers, promoting the 3rd Open Call for Experiments. Table 1 below summarises the events attended. These events' participation has been reported in the News section of the project's website and promoted through the social media channels.

Event Name	Date, Place	Type of Audience	Approx. size of Audience	Activity run	Partner
EuCNC (online)	18-20 June 2020	Researchers, Policy Makers	1,000	Poster presentation	NI
IEEE VTC Spring	25 May-31 July 2020	Researchers	500	Paper presentation	KUL, IMEC
6G Wireless Summit 2020 virtual event	17 March 2020	Policy Makers, Researchers	200	Keynote presentation	IMEC
FOSDEM	1-2 February 2020,	Researchers, Industry	80	Booth, Keynote presentation	IMEC

	Brussels, Belgium				
Open Air Interface Workshop	3-5 December 2019, Beijing, China	Researchers, Industry	150	Presentation	NI
Wireless Community workshop	14 November 2019, Leuven, Belgium	Researchers, Industry	100	Demo, Workshop	IMEC, KUL
GEFI Workshop	7-8 November 2019, Coimbra, Portugal	Researchers, Industry	50	Keynote presentation, workshop	IMEC
IEEE MASS Conference 2019	4 November 2019, Monterey, USA	Researchers, Industry	100	Demo, Paper	NI, UPC (Open Call experimenter)
DARPA Spectrum Collaboration Challenge 2019, Mobile World Congress Los Angeles 2019	23 October 2019, Los Angeles, USA	Industry, Policy makers, Researchers	500	Challenge, Demo	IMEC, RUTGERS
National Wireless Expo 2019	23 October 2019, Lucca, Italy	Industry	50	Keynote presentation	Assoprovider (Open Call experimenter)
5G Summit and 5G World Forum 2019	30 September – 2 October 2019, Dresden, Germany	Industry, Policy Makers, Researchers	1,000	Demos	TUD
ECOC 2019	22 - 26 September 2019,	Industry, Policy	1000	Paper presentation, Demo	TCD

	Dublin, Ireland	makers, Researchers			
GNU Radio Conference	16-20 September 2019, Huntsville, Alabama, USA	Researchers, Industry	300	Keynote presentation	NI
Workshop on Next-Generation Wireless with ns-3	19 June 2019 Florence, Italy	Researchers	70	Presentation, Demo	NI
EuCNC 2019	18-21 June 2019, Valencia, Spain	Policy Makers, Researchers	5,000	Booth, Demos, Live streaming presentation	TUD, KUL, IMEC, MARTEL, NI
Uni-Tag 2019	25 May, 2019, Dresden, Germany	Students, General public	50	Demo	TUD
IEEE ICC 2019	20-24 May 2019, Shanghai, China	Policy Makers, Researchers	2,000	Paper presentation	TCD, TUD
NI Week 2019	20-23 May 2019, Austin, USA	Research, Industry	50	Demo, Showcase	NI
Wireless Innovation Forum European Summit on Wireless Communication Technologies	15 May 2019, Berlin, Germany	Industry, Policy makers, Researchers	100	Panel presentations	IMEC, TCD
Technology moves art and history at Villa Bienert	9 May 2019, Dresden, Germany	General public	100	Art installation, Demo	TUD
Connect Conference 2019	2-5 May 2019,	Industry, Policy Makers	1,000	Demos	TUD

	Dresden, Germany				
IEEE INFOCOM 2019	29 April - 2 May 2019, Paris, France	Policy Makers, Researchers	1000	Presentation, Booth	NI
IEEE WCNC workshop	15-18 April 2019, Marrakesh , Morocco	Policy Makers, Researchers	100	Keynote presentation, Paper presentation	TUD, TCD
Mobile World Congress 2019	27 February 2019, Barcelona, Spain	Industry, Policy makers, Researchers	500	Challenge, Award	IMEC, RUTGERS, MARTEL

Table 1: Events attended by ORCA in Y3

IEEE VTC Spring, Antwerp (virtual event) 25-28 May 2020

Multiple ORCA related papers are presented during VTC Spring in Antwerp by the Belgian ORCA partners IMEC and KU Leuven, including a joint paper. All talks are recorded online and available through the VTC spring website.

6G Wireless Summit 2020 virtual event, March 2020

A paper on Mandate-driven Networking Eco-system - related to the ORCA vision - was presented by our project coordinator Ingrid Moerman (Ghent University, IMEC) at the 6G Wireless Summit 2020 ongoing virtual event. The presentation is available through ORCA's website and YouTube channel [in video format](#).

FOSDEM, 1-2 February 2020, Brussels, Belgium

Openwifi - related to ORCA project - was present at FOSDEM 2020 with a booth and a talk held by Xianjun Jiao (IMEC). A recording of the talk is available ORCA's website and YouTube channel [in video format](#).



Figure 29: Xianjun Jiao presenting at FOSDEM 2020



Figure 30: Openwifi's booth at FOSDEM 2020

Open Air Interface Workshop, 3-5 December 2019, Beijing, China

Clemens Felber from National Instruments Corp (partner of ORCA) held a presentation on “Prototyping wireless systems with NI SDR and open source stacks” at this event. The presentation is available on ORCA’s website, in the [Resources section](#).

Wireless Community workshop, 14 November 2019, Leuven, Belgium

ORCA project showed the Openwifi demo successfully during the “The Future of Wireless Technology” workshop. The Openwifi demo had many visitors, such as Airbus, Proximus (biggest mobile operator in Belgium), many IMEC and KU Leuven researchers and SMEs. Visitors used their cell phone to connect to our Openwifi AP and accessed internet smoothly. People expressed strong interests and believed Openwifi could be very useful on many research topics, since it will be the 1st “open source Wi-Fi chip design”. They are looking forward to the day of Openwifi open source code going online,

and eager to try it out in their Wi-Fi related research activities.

GEFI Workshop, 7-8 November 2019, Coimbra, Portugal

A presentation about “AI-Enabled radios for dynamic spectrum sharing” (ORCA and DARPA challenge) was done by ORCA partners from IMEC. The Global Experimentation for Future Internet (GEFI) community connects researchers and research sponsors in the EU, US, Japan, Korea, and Brazil to advance international collaboration for experimental research in future networks. GEFI 2019 is the third workshop in the GEFI series, which expands on several previous bilateral and regional international collaborations. The presentation is available [online](#).

IEEE MASS Conference 2019, 4 November 2019, Monterey, USA

In conjunction with the Open Call 2 for Extensions, Carlos Pupiales Yépez and Ilker Demirkol from Universitat Politècnica de Catalunya (Spain) implemented Interfaces for 5G and LTE interworking into Open Air Interface together with Clemens Felber and Walter Nitzold from National Instruments. The outcome of this extension was presented at IEEE MASS Conference 2019 and won the Award for Best Demonstration. A document detailing the demonstration is available [online](#).



Figure 31: C. P. Yépez with the Best Demonstration Award at IEEE MASS Conference

DARPA Spectrum Collaboration Challenge 2019, Mobile World Congress Los Angeles 2019, 23 October 2019, Los Angeles, USA

Team SCATTER, with researchers from ORCA’s partners IMEC and Rutgers University ended on the 6th place (out of 10) in the finale of the DARPA Spectrum Collaboration Challenge. The team developed a very collaborative intelligent radio system, with excellent features in terms of spectrum efficiency and QoS support (respecting max. latency, min. throughput and min. reliability requirements). The system was based on LTE-technology, and that was designed for respecting isolation between co-located networks and not for being resistant against interference, which appeared to be the most important feature in the top 5 matches. The team gained a lot of insights that will certainly shape the next decade of research. A full recording of the event’s live stream is available [online](#) (Team SCATTER is presented at 06:42).



Figure 32: Team SCATTER at Spectrum Collaboration Challenge 2019

National Wireless Expo 2019, 23 October 2019, Lucca, Italy

Our open call experimenter Paolo Di Francesco presented ORCA at The National Wireless Expo with the presentation: “5G and NGN networks: big opportunities for small operators”. The presentation gives some hints to small operators on the latest technologies and how those innovations can enable new opportunities also for small operators. The presentation is available (in Italian) [online](#).



Figure 33: Paolo Di Francesco presenting ORCA at The National Wireless 2019

5G Summit and 5G World Forum 2019, 30 September – 2 October 2019, Dresden, Germany

ORCA demonstrations were held at the joint event. The central element of the overall demo was a base station with an attached cloud computing platform. This base station was mounted inside a bicycle

rickshaw for quick deployments and tests in industrial or outdoor scenarios. In the demo all 5 devices/clients were controlled by this base station. One pair of devices belonged to the industrial robot arm demonstrator, showed in the year 2 review meeting. The next pair of devices were used to connect the air hockey table of the Barkhausen Institut. Finally, one USRP-device was mounted inside a moveable platform used for transportation tasks on factory floors. For the overall set-up to work, the prototype base station had to provide low latency cloud access to all clients. This was achieved by the open source physical layer implementation developed by the Vodafone Chair in the ORCA project. Every client was served with a round trip time of 1ms and very low jitter. In addition, separate time slots were scheduled by the base station for a device-to-device communication link between the two robot arms.

During the conference, the visitors could experience the capabilities of low latency networks in several ways. Besides the two robot arms, the air hockey table allowed to play against an AI-controlled robot. Here, a camera captured the position of the hockey puck and transmitted it to the cloud. In the cloud not only a defensive, but also an attacking strategy was calculated. After the respective motor control commands were transferred to the X-Y table like robot, it would try to score a goal.

The moveable transport platform brought in by the TACNET project could be controlled either manually via a joystick or by a cloud application developed by the Deutsche Telekom Chair of the TU Dresden.



Figure 34: The ORCA demo at 5G Summit and 5G World Forum 2019

ECOC 2019, 22 - 26 September 2019, Dublin, Ireland

Orca partner Trinity College Dublin has shown a successful ORCA-acknowledged demo at ECOC 2019 (The 45th European Conference on Optical Communication) and received good feedback. The demo, titled “Coordinated fibre and wireless spectrum allocation in SDN-controlled wireless-optical-cloud converged architecture” (created by Frank Slyne, Rafael S. Guimaraes, Yi Zhang, Magnos Martinello, Reza Nejabati, Marco Ruffini, and Luiz A. DaSilva) is an experimental demonstration of LTE multi-cell resource allocation in a converged LTE-over-PON architecture for the slicing of virtual network operators. The proposed SDN controller dynamically adjusts the wireless bandwidth of each cell, according to their demand, jointly with their fronthaul rate and reserved PON capacity. For more details, a poster for the demo is available on the [ORCA website](#).

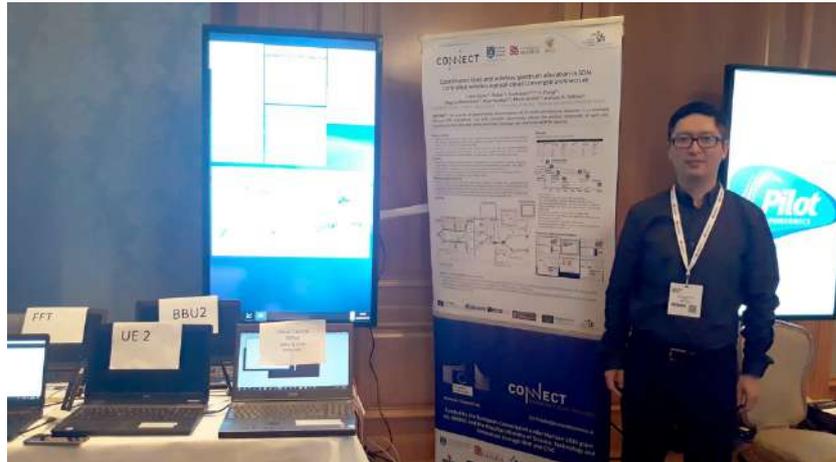


Figure 35: Yi Zhang presenting the ORCA demo at ECOC 2019

GNU Radio Conference, 16-20 September 2019, Huntsville, Alabama, USA

Walter Nitzold, Clemens Felber and Vincent Kotsch from National Instruments Corp (partner of ORCA) held a presentation on “Prototyping LTE-WiFi Interworking on a Single SDR Platform” at the event. The presentation is available on the [ORCA website](#).

Workshop on Next-Generation Wireless with ns-3, 19 June 2019, Florence, Italy

ORCA partners from National Instruments held a presentation and showcased a demo on “Implementation of the 3GPP LTE-WLAN Inter-working Protocols in NS-3” at this event. The presentation is available on the [ORCA website](#).

EuCNC 2019, 18-21 June 2019, Valencia, Spain

ORCA project attended EuCNC 2019 with Open Call 3 announced.

Many visitors have shown interest on ORCA functionality/full-stack offer. Meanwhile some ORCA offers were also demoed at the ORCA booth. Our guests from academy and industry had many fruitful discussions on the demos with ORCA project members.

TUD and KUL presented the 16-beam antenna array operating at 26 GHz, where they demonstrated a video transmission with the real-time GFDM system operating with the NI-USRP RIO and 26 GHz frequency band. The experiment consisted of a LoS (Line of Sight) and a non LoS transmission depending on the transmit and receive beams, such that the visitors could experience the beam steering functionality of this ORCA offer.

NI presented a demo of the Multi-RAT Experimentation Platform. The demonstration was built upon network simulator ns-3 with a full end-to-end network topology that consists of a simple internet model as well as LTE and WiFi radio access networks. This environment was enhanced with an application programming interface (API) towards the software-defined radio (SDR) system of National Instruments, including USRP-2974 as hardware platform with FPGA-based real-time implementations of physical layers of LTE and WiFi.

IMEC demoed the open source and free full-stack SDR Wi-Fi design “Openwifi”. Live video streaming demo was shown over SDR Wi-Fi and commercial Wi-Fi to demonstrate that Openwifi achieves interoperability with commercial Wi-Fi.

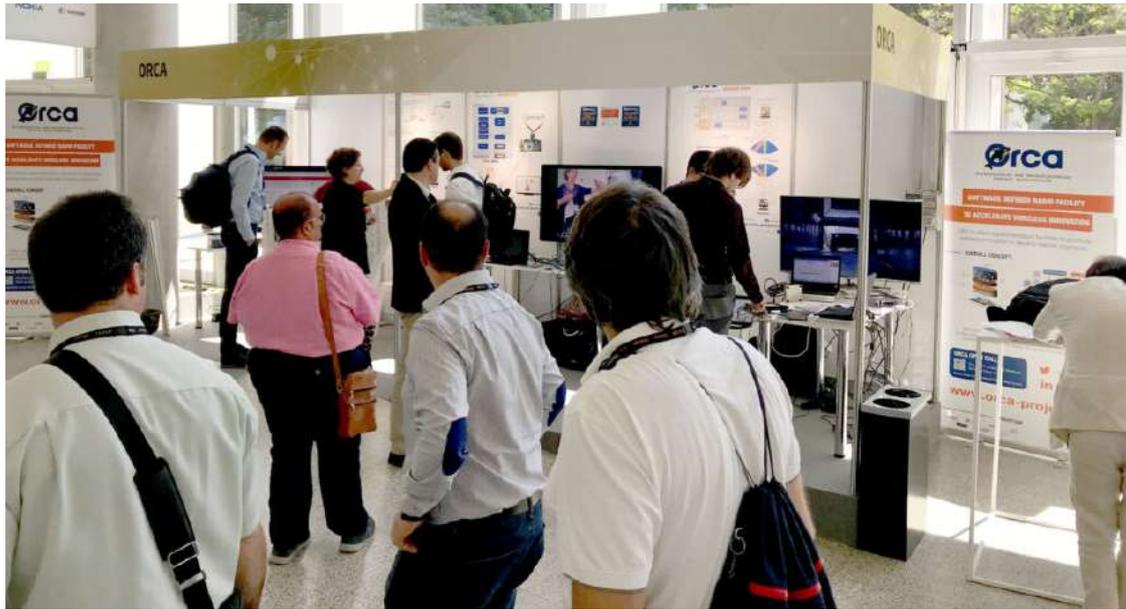


Figure 36: The ORCA booth at EuCNC 2019

Our coordinator Dr. Ingrid Moerman (IMEC) presented the ORCA project on day 3 of the EuCNC TV live streaming during the 2019 edition. The entire recording of the broadcast is available through the [news section of ORCA's website](#).



Figure 37: Dr. Ingrid Moerman (IMEC) on EuCNC 2019's live stream

Uni-tag, 25 May 2019, Dresden, Germany

On the 25th of May 2019, the TU Dresden opened its doors even wider than on normal days. Prospective students, parents and teachers, students and graduates of the university, as well as the community, were invited to visit the various presentations.

ORCA participated in this event by showing the balancing robot demo. In this demo, the box-shaped body of a robot is standing on two wheels. The robot needs to move back and forth to keep itself standing. On the robot, there are sensors which detect the angle of tilting. These sensor data will be used as input data for a control loop, which triggers the wheel to roll forward or backward. To keep the body straight, the latency between sense and act should be less than 13ms. The sensor data will be sent to the USRP on the right side (see figure below), transferred using GFDM PHY, implemented on FPGA, to the left side, and processed on the laptop on the left side. The generated control data will be transferred back to the robot's motor reversely. Since the latency of our GFDM PHY is extremely low ($\sim 1\text{ms}$), the robot acts extremely fast, and it won't fall, even if someone tilts the robot's body on purpose.



Figure 38: Balancing robot demo of TUD in the Uni-tag event.

IEEE ICC 2019, 20-24 May 2019, Shanghai, China

In this conference, TUD presented the paper “Time-Variant Pilot- and CP-Aided Channel Estimation for GFDM”. Trinity College Dublin was also present with a paper on the subject: “Towards Enabling RAN as a Service - The Extensible Virtualisation Layer”- Both papers are available among the [scientific publications on ORCA’s website](#).

NI Week 2019, 20-23 May 2019, Austin, USA

Vincent Kotzsch and Ben Coffin from National Instruments showcased the ORCA Multi-RAT platform for advanced end-to-end research with WiFi and LTE at NI’s tradeshow and conference.



Figure 39: The ORCA Multi-RAT platform showcase at NI Week 2019

Wireless Innovation Forum European Summit on Wireless Communication Technologies, 15 May 2019, Berlin, Germany

Within the “Networking Aspects of Software Defined Systems” session, ORCA was present in two panels:

“From laboratory to the field: An open source Software Defined Radio project coupled with native Linux driver framework”

Xianjun Jiao (Ghent University – IMEC, IDLab, Belgium); Wei Liu (University Ghent – IMEC, Belgium); Muhammad Aslam (Ghent University – IMEC, IDLab, Belgium); Felipe Augusto Pereira de Figueiredo (Ghent University, Belgium); Ingrid Moerman (Ghent University – IMEC, Belgium); Filip Louagie (Ghent University – IMEC, IDLab, Belgium)

“Hierarchical Orchestration of End-to-End Networks”

Joao F. Santos (Trinity College Dublin & CONNECT/CTVR, Ireland); Jonathan van de Belt (Trinity College Dublin, Ireland); Luiz DaSilva (Trinity College & Trinity College Dublin, Ireland)

Technology moves art and history at Villa Bienert, 9 May 2019, Dresden, Germany

An ORCA demo developed by partners TUD was involved in an art installation organised in cooperation with the Dresden Museum for Fine Arts and the Barkhausen Institute. More details (in German) on the Barkhausen Institute [webpage](#).

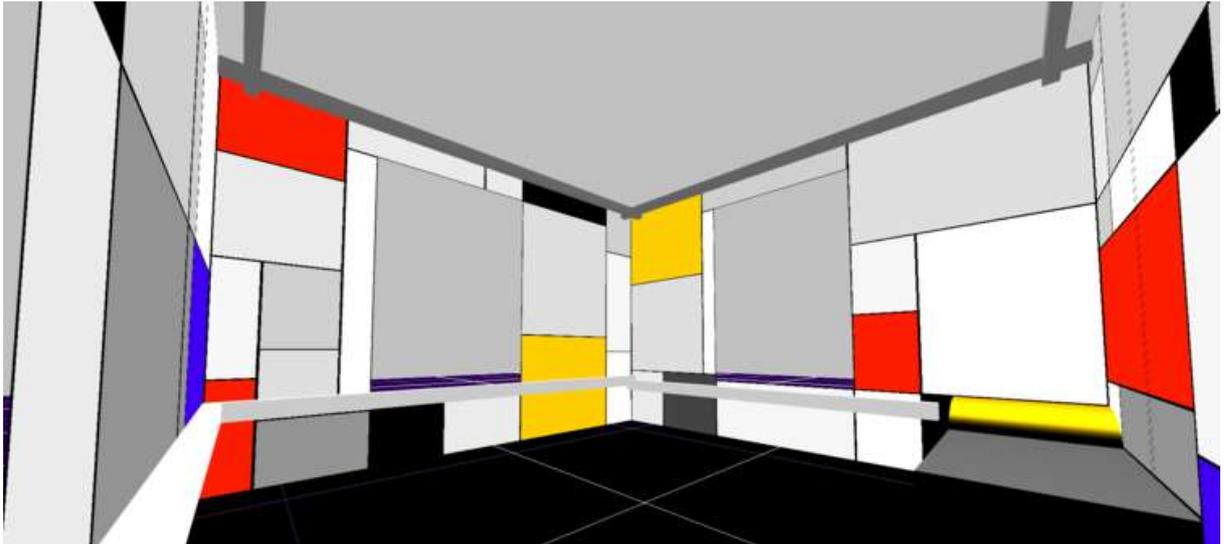


Figure 40: Visual from the installation using the ORCA demo developed by TUD

Regarding the demo: different latency constraints of human beings exist for seeing, hearing, and feeling. The latency requirement of feeling is the most critical one. To fulfil the latency constraint for feeling, a communication system should be able to exchange data within 1ms. In this demo, there are two robot arms, one is the master, and the other is the slave. The slave robot arm will imitate the master's exact movements, and it will also send force feedback to the master if it touches obstacles. The control and feedback data are transferred by our GFDM system, which is implemented on the FPGA. Our GFDM PHY can achieve 1ms round trip latency, which fulfils the tactile internet requirement. In the demo, one will be asked to move the master robot arm. Since the latency of the control loop is extremely low, one cannot notice the latency either by seeing the movement of the slave robot arm nor by feeling the force feedback on the master robot arm.



Figure 41: TUD demo at the Villa Bienert.

Connect Conference 2019, 2-5 May 2019, Dresden, Germany

The robot demonstrator developed by partners TUD was showcased at the event, which focused more on consumer and industry applications than academia. The demonstration subsequently appeared in several TV channels: twice in the German National TV (MDR, ZDF) and on Japanese TV. An edit of the TV coverage was published on [ORCA's YouTube channel](#) in September 2019.



Figure 42: Screenshot of the Japanese TV coverage of the TUD robot demonstrator

IEEE INFOCOM 2019, 29 April - 2 May 2019, Paris, France

Joint work on LTE-WiFi interworking technologies LWA and LWIP between Universitat Oberta de Catalunya and National Instruments was presented by M. Shahwaiz Afaqui at this event (see figure below). The presented work was the outcome of the first Open Call for Extensions within the ORCA project. Furthermore, the demo was shown being remotely connected to the OWL Testbed at TU Dresden in Germany.

Dr Ingrid Moerman, ORCA's project coordinator, was the keynote speaker at the "CNERT: Computer and Networking Experimental Research using Testbeds" workshop, organized during the event.

Seyed Ali also presented his work on joint communication and radar signal processing as a full paper during the INFOCOM conference.



Figure 43: M. Shahwaiz Afaqui presenting the work at IEEE INFOCOM 2019

IEEE WCNC workshop, 15-18 April 2019, Marrakech, Morocco

Professor Luiz A. DaSilva (from ORCA partner Trinity College Dublin) gave a keynote presenting work on ORCA, with focus on Ultra-High Speed, Low Latency and Massive Connectivity.



Figure 44: Prof. Luiz A. DaSilva during the keynote at IEEE WCNC workshop

Mobile World Congress 2019, 27 February 2019, Barcelona, Spain

ORCA team was honoured during the panel “Spectrum Collaboration Challenge” organized by the DARPA, the U.S. Defense Advanced Research Projects Agency. For the second time in a row, team SCATTER, with researchers from IMEC-IDLab and Rutgers University (US), partners of ORCA project, won a prize in the DARPA Spectrum Collaboration Challenge.

Spectrum Collaboration Challenge is the first-of-its-kind collaborative machine-intelligence competition to overcome scarcity in the radio frequency (RF) spectrum. SCC aims to ensure that the exponentially growing number of wireless devices can co-exist and operate in the increasingly crowded electromagnetic spectrum. In SCC, competitors reimagine a new, more efficient wireless paradigm in

which radio networks autonomously collaborate to dynamically determine how the spectrum should be used moment to moment.

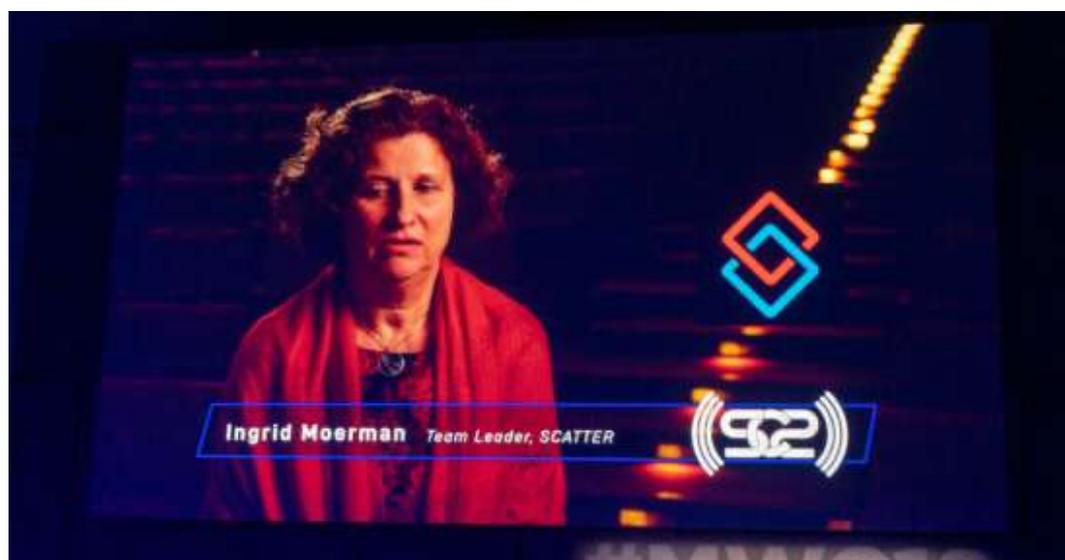


Figure 45: Dr. Ingrid Moerman (IMEC), interviewed during the SCC

1.7 Journals and Conference Publications

ORCA's partners have been particularly active in submitting scientific papers to conference publications and scientific journal, starting from M1 of the project. **In Year 3 of the project, 45 papers have been published and they can be found on ORCA's website** in the [Scientific Publications](#) area.

Publication authors and title	Submission to	Leading Partner
Ingrid Moerman (contributor) " 6G White Paper on RF & Spectrum "	6G Channel	IMEC
Ingrid Moerman (contribution as editor) " 6G White Paper on Networking "	6G Channel	IMEC
Ingrid Moerman (contribution as editor) " White Paper on Critical and Massive Machine Type Communication towards 6G "	6G Channel	IMEC
Seyed Ali Hassani, Barend van Liempd, Andre´ Bourdoux, Francois Horlin and Sofie Pollin, " Adaptive Filter Design for Simultaneous In-band Full-duplex Communication and Radar "	EuRAD 2020	KUL
Walter Nitzold, Clemens Felber " Joint 5G-LTE-WiFi Prototyping Platform for RAT Interworking Experiments "	EuCNC 2020	NI
Hossein Ajourloo, Cormac J. Sreenan, Roberto Bomfin, Martin Danneberg, Gerhard Fettweis " Using double links "	FNC 2020	UCC (OC2 Experiment of TUD)

for stabilizing mmWave wireless channels in autonomous vehicles and augmented reality systems”		
Muhammad Aslam, Xianjun Jiao, Wei Liu, Ingrid Moerman “CMCVT: A Concurrent Multi-Channel Virtual Transceiver”	Elsevier international journal of electronics and communications	IMEC
Seyed Ali Hassani, Vesa Lampu, Karthick Parashar, Lauri Anttila, Andre’ Bourdoux, Barend van Liempd, Mikko Valkama, Francois Horlin and Sofie Pollin “In-band Full-duplex Radar-communication System”	IEEE Systems Journal	KUL
Xianjun Jiao, Muhammad Aslam, Wei Liu, Ingrid Moerman “An antenna switching based NOMA scheme for IEEE 802.15.4 concurrent transmission”	IEEE VTC 2020	IMEC
Seyed Ali Hassani, Xianjun Jiao, Ingrid Moerman and Sofie Pollin, “Instantaneous Signal Collision Detection Using In-Band Full-Duplex: Machine Learning VS Domain-specific Knowledge”	IEEE VTC 2020	KUL, IMEC
Achiel Colpaert, Evgenii Vinogradov, Sofie Pollin, “Fixed mmWave Multi-User MIMO: Performance Analysis and Proof-of-Concept Architecture”	IEEE VTC 2020	KUL
Xianjun Jiao, Wei Liu, Michael Mehari, Muhammad Aslam and Ingrid Moerman, “openwifi: a free and open-source IEEE802.11 SDR implementation on SoC”	IEEE VTC 2020	IMEC
Bin Liu, Andrea P. Guevara, Sibren De Bast, Qing Wang, and Sofie Pollin, “Massive MIMO Indoor Localization with 64-Antenna Uniform Linear Array”	IEEE VTC 2020	KUL
Wei Liu, Joao F. Santos, Jonathan van de Belt, Xianjun Jiao, Ingrid Moerman, Johann Marquez-Barja, Luiz DaSilva, Sofie Pollin, “Enabling Virtual Radio	Wireless Personal Communications	IMEC, TCD, KUL

Functions on Software Defined Radio for Future Wireless Networks”		
Beiran Chen, Yi Zhang, George Iosifidis, and Mingming Liu, “Reinforcement Learning on Computational Resource Allocation of Cloud-based Wireless Networks”	IEEE 6th World Forum on Internet of Things	TCD
R. Bomfin, M. Chafii and G. Fettweis, “A Novel Iterative Receiver Design for CP-Free Transmission Under Frequency-Selective Channels”	IEEE Communications Letters	TUD
Ana Belen Martinez, Atul Kumar, Marwa Chafii, Gerhard Fettweis, “A Chirp-Based Frequency Synchronization Approach for Flat Fading Channels”	6G Wireless Summit 2020	TUD
Ingrid Moerman, Djamal Zeglache, Adnan Shahid, Joao F. Santos, Luiz A. DaSilva, Klaus David, John Farserotu, Ad de Ridder, Wei Liu, Jeroen Hoebeke, “Mandate-driven Networking Ecosystem: A Paradigm Shift in End-to-End Communications”	6G Wireless Summit 2020	IMEC, TCD
Carlos Pupiales and Ilker Demirkol “Software-based Implementation of Dual Connectivity for LTE”	IEEE MASS Conference 2019	NI (Patron)
A. P. Guevara, S. De Bast and S. Pollin, “MaMIMO User Grouping Strategies: How much does it matter?”	2019 53rd Asilomar Conference on Signals, Systems, and Computers,	KUL
Martin Danneberg, Roberto Bomfin, Ahmad Nimr, Zhongju Li, Gerhard Fettweis, “USRP-based platform for 26/28 GHz mmWave Experimentation”	WCNC 2020 Smart Spectrum Workshop	TUD
Frank Slyne, Rafael S. Guimaraes, Yi Zhang, Magnos Martinello, Reza Nejabati, Marco Ruffini, and Luiz A. DaSilva, “Coordinated fibre and wireless spectrum allocation in SDN-controlled wireless-optical-cloud converged architecture”	ECOC 2019 (The 45th European Conference on Optical Communication)	TCD
Pereira de Figueiredo, F. A., Aniceto, N. F. T., Seki, J., Moerman, I., & Fraidenraich, G., “Comparing f-OFDM	5GWF2019, the 2019 IEEE 2nd 5G World Forum	IMEC

and OFDM Performance for MIMO Systems Considering a 5G Scenario”		
Roberto Bomfin, Marwa Chafii, Gerhard Fettweis. “Performance Assessment of Orthogonal Chirp Division Multiplexing in MIMO Space Time Coding”	5G World Forum	TUD
Shahab Ehsanfar, Marwa Chafii, Gerhard Fettweis. “A Frame Design for MIMO UW based Systems: Overhead Analysis and Channel Estimation”	5G World Forum	TUD
Walter P. Nitzold, Clemens Felber, Vincent Kotzsch “An LTE-WiFi Interworking Platform with Real-Time PHY Layer Interface”	5G World Forum	NI
Ahmad Nimr, Marwa Chafii, Gerhard Fettweis. “Precoded-OFDM within GFDM Framework”	2019 IEEE 89th Vehicular Technology Conference	TUD
Ahmad Nimr, Marwa Chafii, Gerhard Fettweis. “Low-Complexity Transceiver for GFDM systems with Partially Allocated Subcarriers “	IEEE Wireless Communications and Networking Conference	TUD
M. Shahwaiz Afaqui, Cristina Cano, Vincent Kotzsch, Clemens Felber, and Walter Nitzold. “Implementation of the 3GPP LTE-WLAN Interworking Protocols in ns-3“	WNS3 2019	NI (Patron)
Shahwaiz Afaqui, Cristina Cano, Vincent Kotzsch, Clemens Felber, Walter Nitzold. “Real-time operation of LTE/Wi-Fi interworking via NS-3 and SDR interfacing”	IEEE International Conference on Computer Communications (INFOCOM 2019)	NI (Patron)
Vincent Kotzsch, Clemens Felber, Walter Nitzold. “Prototyping LTE-WiFi Interworking on a Single SDR Platform”	EuCNC 2019	NI
Muhammad Aslam, Xianjun Jiao, Wei Liu, and Ingrid Moerman. “An Enhanced Version of IEEE 802.15.4 Standard Compliant Transceiver Supporting Variable Data Rate”	EuCNC 2019	IMEC
Joao F. Santos, Maicon Kist, Jonathan van de Belt, Juergen Rochol, and Luiz A. DaSilva. “Towards Enabling RAN as a	IEEE ICC 2019	TCD

Service: The Extensible Virtualisation Layer”		
Shahab Ehsanfar, Marwa Chafii and Gerhard Fettweis. “Time-Variant Pilot- and CP-Aided Channel Estimation for GFDM”	IEEE ICC 2019	TUD
Xianjun Jiao, Wei Liu, Muhammad Aslam, Felipe Augusto Pereira de Figueiredo, Ingrid Moerman, Filip Louagie. “From laboratory to the field: An open source Software Defined Radio project coupled with native Linux driver framework”	Wireless Innovation Forum 2019	IMEC
Martin Danneberg, Roberto Bomfin, Shahab Ehsanfar, Ahmad Nimr, Zhitao Lin, Marwa Chafii and Gerhard Fettweis. “Online Wireless Lab Testbed”	IEEE Future Networking Workshop for 5G and Beyond Testbed and Trials	TUD
Joao F. Santos, Jonathan van de Belt, Luiz DaSilva. “Hierarchical Orchestration of End-to-End Networks”	WInnComm Europe 2019	TCD
Roberto Bomfin, Marwa Chafii and Gerhard Fettweis. “Low-Complexity Iterative Receiver for Orthogonal Chirp Division Multiplexing”	2019 Advanced 5G radio access network features and performance (ARANFP2019)	TUD
Roberto Bomfin, Marwa Chafii and Gerhard Fettweis. “A Novel Modulation for IoT: PSK-LoRa”	2019 IEEE 89th Vehicular Technology Conference	TUD
Cheng-Ming Chen, Qing Wang, Abdo Gaber, Andrea P. Guevara and Sofie Pollin. “Experimental Study of User Selection for Dense Indoor Massive MIMO”	INFOCOM 2019 WKSHP – CNERT 2019	KUL
Andrea P. Guevara, Cheng-Ming Chen, Sofie Pollin. “Partial Multi-cell MMSE vector combining to reduce computational cost for Massive MIMO systems”	2019 IEEE ICC: Wireless Communications Symposium	KUL
Seyed Ali Hassani, Karthick Parashar, Andre’ Bourdoux, Barend van Liempd and Sofie Pollin. “Doppler Radar with In-Band Full Duplex Radios”	IEEE International Conference on Computer Communications (INFOCOM 2019)	KUL
Muhammad Aslam, Xianjun Jiao, Wei	IEEE Access	IMEC

Liu, Ingrid Moerman. “An Approach to Achieve Zero Turnaround Time in TDD Operation on SDR Front-End “		
Shahab Ehsanfar, Maximilian Matthe, Marwa Chafii, Gerhard Fettweis. “Pilot- and CP-aided Channel Estimation in MIMO Non-Orthogonal Multi-Carriers”	TWC journal	TUD
Ahmad Nimr, Marwa Chafii, Gerhard Fettweis. “Practical GFDM-based Linear Receivers”	Conference on Systems, Communications and Coding (SCC) 2019	TUD

Table 2: Scientific Publications in Year 3 (M25-M42)

2 PLAN OF ACTIVITIES AFTER PROJECT END

The ORCA project's communication and dissemination activities will not stop at M42. In fact, as mentioned before, ORCA partners will:

- Conduct the **Final Assessment Workshop** on 8th September 2020 in Gent, Belgium, presenting the final project's demo at the IMEC [Wireless Community Event](#). In case, due to the COVID-19 restrictive measures, the event could not be held physically, the partners have already discussed two alternative contingency plans: a) joining the online IMEC Wireless Community Event, b) organize a stand-alone ORCA online webinar. The partners are already at work to define the demo's technical and narrative details. The booth will be used as a communication and dissemination opportunity to promote further uptake of the project by other research initiatives. The promotion of the ORCA Final Assessment Workshop initiated in May 2020 online through the special and final edition of ORCA Newsletter, through social media and relevant mailing lists. The promotion will continue between June and August 2020, providing further details as they become available.



Figure 46: ORCA's Final Assessment Workshop, Promotional Card

- ORCA, in collaboration with the 3rd Open Calls for Experiments partners, will produce and make available the **flyers presenting the results achieved by each experiment**, and publish them on the website.
- ORCA will produce **4 videos** to present the final demos. They will be used to support the Final Assessment Workshop (in case it is hold online) and published on the project's YouTube channel to further disseminate the ORCA's results.
- Also, the project has in the pipeline a **final Showcase Brochure (white book)**, to effectively summarise the project's showcase results, the tools and extensions developed within the project, enhancing its unique and consistent narrative.
- The **ORCA web domain <https://orca-project.eu/> will remain active for two years** after the project end so that ORCA results by other research initiatives and or industry, SMEs, etc. who interested in the technology can benefit from the results achieved. Martel will be available to update the website when needed and keep the social media channels active accordingly.
- A **"Best of ORCA" video**, under production at the time of writing, will be a brief (< 3min) show reel of the key achievements of the project, along with some "entertaining" backstage cuts, from events' participation and filming interviews. The video will be presented at the Final Assessment Workshop and distributed online.



Figure 47: Screenshots from the upcoming “Best of ORCA” video

3 EXPLOITATION AND STANDARDIZATION RESULTS

Within this section ORCA promotes the exploitation of specific Year 3 project results across partners and stakeholders. Further contributions of selected Year 3 project's results to relevant standardization forums/activities are listed. The results within this deliverable are made publicly available. Non-Public results are feed back to the European Commission via the EC portal.

3.1 Exploitation Achievements

IMEC

- The research activity of imec in ORCA has led to Openwifi project, an open source Wi-Fi FPGA design combined with Linux drivers on embedded SDR platforms. The HDL and driver source code are made available on github <https://github.com/open-sdr/openwifi>. Up to the time of writing, it has received 693 stars and forked 96 times. Interested individuals are interacting with developers through github issues.
- In addition, IMEC's w-iLab.t testbed also support external users to test Openwifi on the testbed, if they cannot obtain the required hardware. So far, we received individual requests even beyond Europe (e.g., China, Australia).
- Openwifi has also been used for education purposes and is the basis for recent new projects and future research proposals and collaboration with industrial partners
- Apart from Openwifi, we have also exploited concurrent multichannel virtual transceiver, implemented over IEEE 802.15.4 PHY layer on SDR. This has led to a recent publication (Muhammad Aslam, Xianjun Jiao, Wei Liu, Ingrid Moerman, "CMCVT: A Concurrent Multi-channel Virtual Transceiver". Elsevier international journal of electronics and communications, Apr. 2020.) and it also has been offered in ORCA open call.
- Finally, the concept established in ORCA white paper regarding "hierarchical orchestration" different network segments for network slicing has been adopted in ETSI's TR document (more details see content in standardization contributions), and also incorporated into recent 6G vision activities (more details see contributions in publications).

KUL

KU Leuven has leveraged it's work in the ORCA project to strengthen its network and expertise in the domain of Massive MIMO, full duplex, mmWave communication. A main effort is the creation of measurement-based datasets, that are shared with the community to serve future research work. In addition, relevant code contributions (e.g., for the full duplex physical layer) are made available as open source. In this respect, following contributions of KU Leuven in the ORCA project are made fully available to the public, as public datasets or open source code:

1. Seyed Ali Hassani, Xianjun Jiao, Ingrid Moerman, Sofie Pollin, "Instantaneous Signal Collision Detection Using In-Band Full-Duplex: Machine Learning VS Domain-specific Knowledge", IEEE Dataport, 2020. [Online]. Available: <http://dx.doi.org/10.21227/m9dg-pb95>. Accessed: May. 05, 2020.
2. Data collected using the Massive MIMO testbed is available on the KU Leuven-ESAT-TELEMIC website: <https://www.esat.kuleuven.be/telemic/research/NetworkedSystems/infrastructure/massive-mimo-5g>
3. The digital self-interference cancelation code is available through the MIT license here: https://github.com/SAHassani/KU_Leuven_DiSIC.git

A test code with LabVIEW is also involved in the repository to enable out-of-the-box test with NI USRP.

MARTEL

MARTEL has leveraged on its consolidated experience in supporting innovation management and creation to support the ORCA exploitation plan. During the three years of the project, MARTEL kept promoting the use of ORCA concepts and findings within the FED4FIRE+, 5G PPP and NGI context, by promoting the project open calls and results through community mailing lists, communities twitter accounts (e.g. @5GPPP which is managed by MARTEL and counts over 7,500 followers) at selected events (such as EuCNC and MWC). Martel has focused on capturing and disseminating lessons learned in particular with respect to the case study it is involved in developing.

In this respect, the expertise, visibility and contacts gained by MARTEL in servicing the ORCA project have for the company two immediate exploitation outcomes:

- The first relates to follow up EC proposals either directly or indirectly related to ORCA that Martel has been invited to participate to.
- The second aspect relate to the more technical work developed in relation to the ORCA case study Martel is also involved in. This path is being explored in view of possibly developing, possibly in collaboration with other ORCA partners, innovative services and products for intelligent wireless network management.

NI

Within the third Year of the ORCA project NI continued exploitation of research work from ORCA project towards their products. To provide broader hardware support for experimenters within testbeds, NI added modifications to the 802.11 Application Framework as well as the LTE Application Framework products to support NI PXIe-8880 Controller.



Figure 48: NI PCIe-8880 Controller

With the Multi-RAT experimentation platform developed in ORCA and demonstrated in ORCA Showcase 4, NI exploited an advanced application example to customers, which uses the PCIe expansion capability of the NI 2974 USRP to run two different RATs in parallel on a single SDR with a small form factor. This allows cost saving and the re-use of existing legacy USRPs which helps testbed providers to easily extend their facilities.

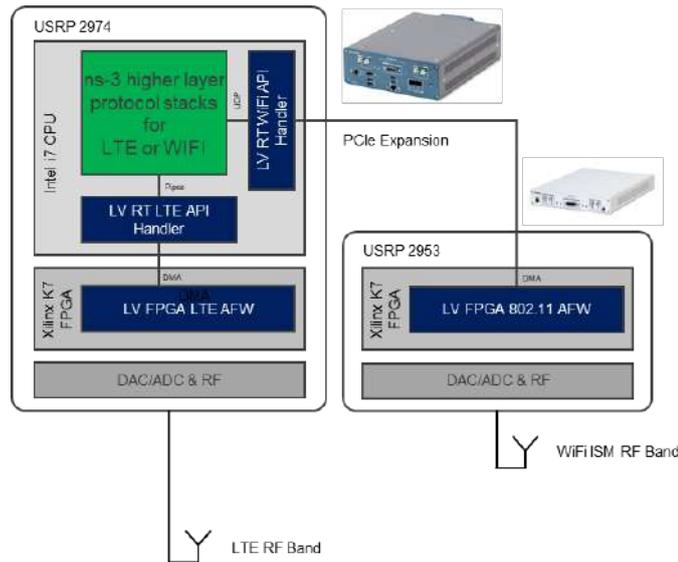


Figure 49: NI USRP 2974 PCIe expansion capability used in ORCA SC4

Further NI decided to make the adapted LabVIEW, ns-3 and upper L1-L2 API code which was developed within ORCA project public available on Github under <https://github.com/ni/NI-ns3-ApplicationExample> using the GPL-2.0 and MIT license. This complex software system shows exemplary the capabilities of NI USRP devices and gives the wireless industry the tools at hand to accelerates productivity, innovation, and discovery through an open, software-defined platform.

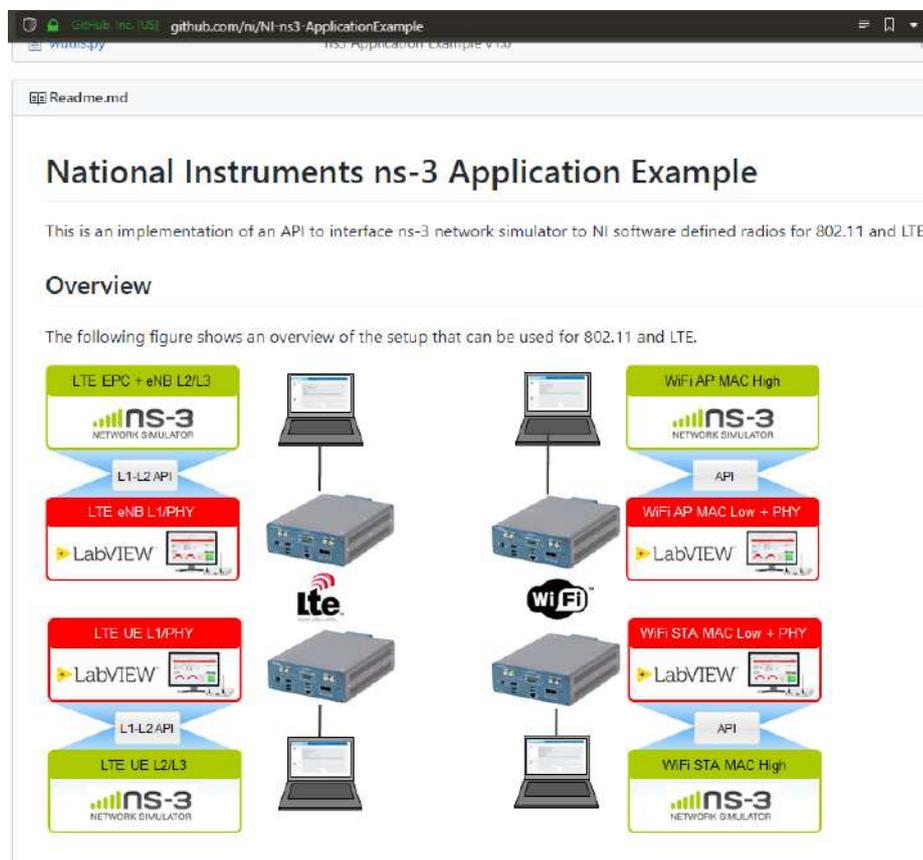


Figure 50: NI ns-3 Application Example on github

RUTGERS

Participation of RUTGERS University in ORCA led to the deployment of more FPGA based low latency, high bandwidth applications in ORBIT testbed. Ettus research RFNoC framework was used to develop applications like wideband spectrum sensing (used in the DARPA Spectrum Challenge design) and channel sounding.

Further, results of an ORCA open call extension - Millimeter wave SDR based Open experimentation platform (MISO), developed by researchers at IMDEA Networks Institute, Spain, were integrated into COSMOS testbed:

<https://wiki.cosmos-lab.org/wiki/Tutorials/Wireless/mmwave80211adORCA>

This gives experimenters access to FPGA based 802.11ad preamble detection blocks, and enables software-hardware co-design for mmWave experiments.

TUD

The activities of TUD which will be further explored in the future research projects are related to the experiments realized in the testbed, the real-time flexible implementation and the new mmWave radio access technology.

- TUD's testbed has been set up and will be continued to be used for both internal and external purposes <http://owl.ifn.et.tu-dresden.de/>. Through the ORCA open calls, TUD acquired experience and developed mechanisms to share the hardware and software resources internally and externally. This knowledge will be certainly explored in the further development of the testbed and projects.
- The TUD's open source implementation of flexible PHY for SDR platforms allowed live demonstrations of 5G applications in several wireless communications conferences and events <https://fusionforge.zih.tu-dresden.de/projects/flexiblegfdmphy/>. With this implementation, TUD could explore the 5G challenges from both theoretical and practical approaches, with several paper publications in journals and conferences. In addition, it will still be explored in the future research projects. In particular, we target at investigating the proof of concept of more advanced waveforms and PHY algorithms for beyond 5G applications.
- The TUD's 26 GHz mmWave frontends developed in ORCA allowed experimentation with novel 5G frequencies <http://owl.ifn.et.tu-dresden.de/orca/mmwave26ghz/>. This setup will continue to be explored in different ways, for instance, we plan to investigate novel beam steering algorithms using these antennas. In additions, we also intend to perform intensive channel measurements with mmWave.

3.2 Standardization Contributions 2019-2020

IMEC

IMEC has contributed to ETSI Technical Report 103 626, "Autonomic network engineering for the self-managing Future Internet (AFI); An Instantiation and Implementation of the Generic Autonomic Network Architecture (GANA) Model onto Heterogeneous Wireless Access Technologies using Cognitive Algorithms", available at: https://www.etsi.org/deliver/etsi_tr/103600_103699/103626/01.01.01_60/tr_103626v010101p.pdf. More specifically, Section 6 of this document discusses impact of virtualization and hardware acceleration, and the cross-domain orchestration is based on ORCA white paper.

IMEC and TCD

IMEC has presented “From laboratory to the field: An open source Software Defined Radio project coupled with native Linux driver framework” at WinnComm 2019, and also demonstrated Openwif functionality on the conference (<https://europe.wirelessinnovation.org/2019-showcase-demos>). Full presentation available at https://orca-project.eu/wp-content/uploads/sites/4/2019/05/SDR-From-laboratory_to_the_field-public.pdf

TCD has presented “Hierarchical Orchestration of End-to-End Networks”. WinnComm Europe 2019, Berlin, Germany, 15-16 May 2019. The presentation is available at <https://orca-project.eu/wp-content/uploads/sites/4/2020/05/WInnForum-2019-Hierarchical-Orchestration-of-End-to-end-Networks.pdf>

In addition, IMEC has also contributed to an IETF Internet draft, with the subject “In-band Network Telemetry for 6TiSCH Networks”, available at <https://tools.ietf.org/html/draft-karaagac-6tisch-int-00>.

NI

NI’s standardization activities in Year 3 mainly focused towards monitoring the respective standardization working groups for specific input to help aligning the research and work within ORCA to the overall architecture decisions of 3GPP. Therefore, NI attended the following 3GPP meetings:

- Feb 2019: Athens, RAN1#96
- May 2019: Reno, USA, RAN1#97
- Aug 2019: Prague, RAN1#98
- Oct 2019: Chongqing, RAN1#98bis
- Nov 2019: Reno, USA, RAN1#99

Here NI mainly focused on 5G related topics like eMBB, URLLC for 3GPP Rel-16 and tracked relevant change requests of Rel-15. The insights and learnings from this monitoring activity have been fed actively into the work of the ORCA consortium. First, as NI is constantly aligning its architecture towards the 3GPP specification. Secondly, a summary of these monitoring activities has been provided digital to the ORCA consortium to share the information for a streamlined ORCA vision.

4 ASSESSMENT OF ORCA OUTREACH AT PROJECT END

The upcoming end of the project allows an assessment of the project outreach results in the arch of the three years (42 months), looking not only at the KPIs, Milestones and Deliverables set at the inception of the project, but also to other quantitative metrics and some qualitative indicators as described in this Section.

4.1 KPIs

The consortium has kept a close eye on the KPIs set at the beginning of the project, to monitor the Dissemination & Communication Results. ORCA has achieved (and in several cases surpassed) the KPIs set at the inception of the work, as shown in the table below.

Measure	Indicators	Target number	Results achieved at M40
Brochure	N. of brochures (updated once a year) distributed (by the end of the project)	>1,500	2,500 online and offline (including OC promotional flyers, showcase brochures etc).
Project Website	N. of unique visitors to the website (average per year)	>2,000	6,298 unique visitors in Y3 (12,739 unique visitors since Feb 2017)
Social networks	N. of followers in LinkedIn, Twitter, YouTube (average new followers per year)	>100	397 Twitter followers 38 members LinkedIn Group
Newsletter	N of subscribers (by the end of the project)	>200	207
Publications	N of peer-reviewed publications in journals, conferences and workshops	>4 per year	45 in Y3 (75 in total at the end of the project)
Webinars	N. of webinars N. of participants	1-2 per year 15 participants per webinar	5 video tutorials, 3 online project presentations and 1 webinar for 1 st OC for experiments
Inception, Engagement and Final Assessment Workshops	Average number of participants per workshop	At least 30 participants per workshop	Y1: Inception Workshop at EuCNC >60 participants Y2: 40 people attending the 2 nd Engagement Workshop (FEC3) Y3: Final Assessment Workshop co-located with the imec Wireless Community event on 8 th September 2020

Videos	N. of videos published on ORCA YouTube channel and average number of views	At least 5 videos and 300 views per video	18 videos published (10 new videos in Y3) Total 650 views of ORCA videos on YouTube
Standardization	No of contributions to standardizations fora	At least 2 per year	6

Table 3: Dissemination & Communication KPIs

4.2 Deliverables and Milestones

Deliverables and Milestones	Description	Achievements
D8.1	Dissemination and Communication Strategy and Plan	Done by April 2017
D8.2	Exploitation strategy and plan	Done by December 2017
D8.3	First Report on Dissemination and Communication Activities	Done by December 2017
D8.4	Second Report on Dissemination and Communication Activities	Done by December 2018
D8.5	Final Report on Dissemination and Communication Activities	Done by May 2020
MS1	Public website up and running	Done by January 2017
MS4	Inception workshop organized	Done in June 2017 (EuCNC)
MS6	First engagement workshop organised	Done in September 2017 (CROWNCOM)
MS9	Second engagement workshop organised	Done in March 2018 (FEC)
MS14	Final assessment workshop organised	As agreed with PO it will be co-located with the IMEC Wireless Community event on 8 th September 2020 in Gent (or hold online)

Table 4: WP8 Deliverables and Milestones

4.3 Total Communication reach

We estimate that across all media, events, press coverage, mailing lists, video views and promotional materials the project reached **over 115,000 individuals among our key stakeholders (researchers, policy makers, innovators, SMEs, industry) in the 42 months of work**. All these communication materials will remain available online, allowing further reach and possible uptake after project ends.

ORCA's website attracted 12,739 unique users (see figure below). **ORCA's Twitter account made a total of 365,939 impressions** from the beginning of the project.

The documents uploaded online, publications, deliverables, flyers were seen 3,521 times, giving an estimate metric of people looking at more detailed information regarding the project activities and research results.



Figure 51: Website Statistics – Unique users (Feb 2017 – May 2020)

4.4 Open Calls participation

It is also interesting to notice the increased number of proposals received for each Open Call, reaching 25 proposals submitted for the final Open Call 3 for Experiments in 2019. The positive trend can be related to several factors:

- the project's awareness, which grew with time
- the promotional actions suggested by the Project Officer and the Reviewers and taken in Y3 (see Section 1.7)
- the participation to several events in 2019 where the Open Calls have been heavily promoted

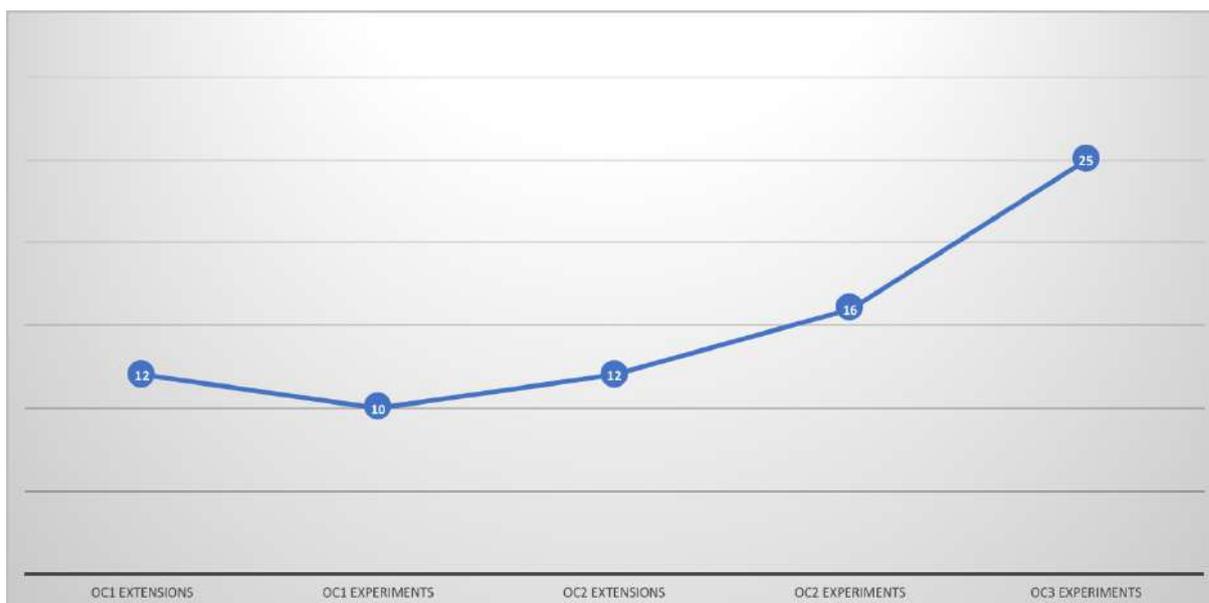


Figure 52: ORCA's Open Calls participants

4.5 Qualitative results

The project has successfully involved a wide range of stakeholders in Europe and beyond (see the participants to Open Calls), it has strengthened and stretched the partners' communication and dissemination abilities engaging in communities such as the 5GPPP, participating to industrial events such the Mobile World Congress both in Y2 and Y3. All the partners have successfully contributed to the communication efforts through a closed collaboration and timely update of their activities, which allowed the WP8 leader to keep the online communication channels always active and alive. On the other hand, the creative team behind the project's branding and communication materials development has contributed to give a distinctive and clear personality to the ORCA project, maintaining consistency through the time and the media. The COVID-19 restrictive measures have hampered the opportunity for partners to meet in person but did not stop the continuous remote collaboration. The EuCNC event would have offered the partners' the opportunity to showcase in a dedicated booth, first-hand, the demos to a wide and relevant audience, this opportunity was hampered by the online migration, nevertheless, it prompted the consortium to work on dedicated videos and to transform a poster presentation to a virtual video session including online chat.

CONCLUSIONS AND LESSONS LEARNT

The communication of a high technology driven research project such ORCA requires a specific tone of voice and must consider that the active interested community is very well defined as a sub-segment of telecommunication engineering researchers. This specific target has unique communication channels and habits. Therefore, the project's newsletter needed to be disseminated widely through other initiatives mailing lists (e.g. FED4FIRE+, 5GPPP, NGI) to reach a solid user base. Also, in the future, it could be considered to consolidate newsletter's mailing lists and contents with similar projects (e.g. FED4FIRE project) from the beginning, this would provide richer and relevant contents to a wider community. Also, the LinkedIn and the Twitter social media channels have been relevant to widespread the project's results to the wide public, policy makers and the general academic community, but the specific news content of ORCA project could not exceed the results obtained, which at a first glance, can seem limited. The cooperation with similar projects and relevant initiatives (especially within the FED4FIRE+ and 5GPPP communities) in the organization of events, conferences and workshops proved successful, allowing the optimization of the budget resources and the maximisation of visibility. The partners, thanks to their network and experience were successful in gaining top visibility at major international conferences and events. The activities run in Year 3 to promote the Open Call proved to be fruitful, almost doubling the number of proposals received: this suggests that platforms and websites which consolidate and disseminate EC funding opportunities are good and exploitable opportunities. Last but not least the continuous collaboration among the partners, the fruitful cooperation with the Project Officer and reviewers allowed ORCA to maximise the communication results, keeping the communication flow always active, ensuring flexibility and timely actions, leveraging on each partner expertise and network. ORCA multiplied the impact rather than summing up the individual seeds generated by each partner.